ALABAMA STATE PORT AUTHORITY
Environmental, Health & Safety Division

ALABAMA WOOD TREATING CORPORATION SITE

MOBILE, ALABAMA
EPA ID # ALD 058 221 326

FINAL
CORRECTIVE MEASURES IMPLEMENTATION WORKPLAN

February 13, 2003
Revised July 30, 2014
Revised March 9, 2018
Revised May 3, 2018
Revised June 8, 2018
Revised June 18, 2018
Revised January 10, 2025

WSP
4000 Meadow Lake Drive, Suite 121
Birmingham, AL 35242

WSP Project 7630233209

ASPA
250 N. Water Street
Mobile, AL 36602

CERTIFICATION STATEMENT
335-14-8-.02(2) (d)

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

John C. Driscoll
Director and Chief Executive Officer
Alabama State Port Authority

1/13/25
Date

TABLE OF CONTENTS

Page

1.0 CONCEPTUAL DESIGN 1-1
1.1 INTRODUCTION & BACKGROUND 1-1
1.1.1 Report Organization 1-1
1.1.2 AWTC Site Background 1-3
1.1.2.1 Ownership & Operation History 1-4
1.1.2.2 Facility Process Information 1-5
1.1.2.3 Waste Characteristics 1-6
1.1.3 RCRA Corrective Action Process 1-8
1.1.3.1 Initial Site Investigation Activities 1-8
1.1.3.2 Removal & Closure Activities 1-8
1.1.3.3 Post-Closure Permit Application & Permit 1-9
1.1.3.4 RCRA Facility Assessment (RFA) 1-9
1.1.3.5 RCRA Facility Investigation (RFI) 1-11
1.1.3.6 Additional Investigations 1-12
1.1.3.7 Corrective Measures Study (CMS) 1-12
1.1.3.8 Confirmatory Sampling Program 1-13
1.1.4 AWTC Site Corrective Measure SWMUs 1-13
1.1.4.1 SWMU 4 - Former Plant Operations and Storage Area 1-13
1.1.4.2 SWMU 5 - Wood Product Storage Area 1-14
1.1.4.3 SWMU 6 - Drainage Ditch 1-14
1.1.4.4 SWMU 8 - Former Creosote Unloading Area 1-15
1.1.5 Current Conditions 1-15
1.1.5.1 Surface Water 1-16
1.1.5.2 Geology and Hydrogeology 1-17
1.1.5.3 Groundwater & Drinking Water Supplies 1-20
1.1.5.4 Ecological Setting 1-21
1.1.6 Choctaw Point Redevelopment 1-21
1.2 CONCEPTUAL MODEL OF CONTAMINANT MIGRATION 1-22
1.2.1 Site Contamination & Risk Assessment 1-22
1.2.1.1 Soil Contamination 1-23
1.2.1.2 Groundwater Contamination 1-24
1.2.1.3 DNAPL Source Material 1-25
1.2.2 DNAPL Conceptual Site Model 1-25
1.2.2.1 Western Site Area 1-26
1.2.2.2 Central Site Area 1-27
1.2.2.3 Eastern Site Area 1-27
1.2.3 Groundwater Conceptual Site Model 1-27
1.2.3.1 Shallow Zone 1-28
1.2.3.2 Intermediate Zone 1-28
1.2.3.3 Deep Zone 1-29
1.3 CORRECTIVE MEASURES OBJECTIVES 1-29

1.3.1 Objective Overview 1-29
1.3.1.1 Groundwater Corrective Measures Objectives 1-29
1.3.1.2 Soil Corrective Measures Objectives 1-31
1.3.1.3 DNAPL Source Material Objectives 1-33
1.4 DESCRIPTION OF CORRECTIVE MEASURES 1-35
1.4.1 SWMU 1 Demolition 1-35
1.4.2 SWMU 6 DNAPL Excavation 1-35
1.4.3 SWMU 6 Covers 1-35
1.4.4 SWMUs 4, 5 & 8 Soil Cover 1-35
1.4.5 DNAPL Recovery Systems 1-37
1.4.6 Groundwater Monitoring System 1-38
1.4.7 Management Controls 1-38
1.5 PROJECT MANAGEMENT 1-39
1.6 DESIGN CRITERIA 1-39
1.7 DESIGN BASIS 1-40
1.8 WASTE MANAGEMENT PRACTICES 1-40
1.9 REQUIRED PERMITS 1-40
1.10 RCRA PERMIT RENEWAL & MODIFICATION 1-41
1.11 LONG-LEAD PROCUREMENT CONSIDERATIONS 1-42
2.0 PLANS & SPECIFICATIONS 2-1
2.1 SWMU 6 DNAPL EXCAVATION & COVER 2-2
2.1.1 Summary 2-2
2.1.2 Relevant Drawings 2-4
2.1.3 Specifications 2-4
2.2 SWMUS 4, 5, & 8 COVER 2-3
2.2.1 Summary 2-3
2.2.2 Drawings 2-3
2.2.3 Specifications 2-3
2.3 SWMU 1 DEMOLITION 2-3
2.3.1 Summary 2-3
2.3.2 Drawings 2-3
2.3.3 Specifications 2-3
2.4 DNAPL RECOVERY SYSTEM 2-3
2.4.1 Summary 2-3
2.4.2 Drawings 2-9
2.4.3 Specifications 2-9
2.5 MONITORING WELL DNAPL RECOVERY SYSTEM & GROUNDWATER MONITORING SYSTEM 2-9
2.5.1 Summary 2-10
2.5.2 Drawings 2-11
2.5.3 Specifications 2-11

2.6 OPERATION AND MAINTENANCE OF CORRECTIVE MEASURES SYSTEMS 2-11

3.0 CONSTRUCTION WORKPLAN 3-1

3.1 INTRODUCTION & PURPOSE 3-1
3.2 PROJECT MANAGEMENT 3-1
3.3 CONSTRUCTION QA/QC PROGRAMS 3-5
3.3.1 Overview 3-5
3.3.2 Coordination With Other Project Documents 3-6
3.3.3 Definitions 3-6
3.3.4 Construction Organization 3-6
3.3.5 Regulatory Oversight 3-7
3.3.6 Observations, Monitoring And Quality Control Testing 3-7
3.3.6.1 General 3-7
3.3.6.2 CQA Responsibilities 3-8
3.3.6.3 CQC Responsibilities 3-8
3.3.7 Documentation 3-9
3.3.7.1 Daily Recordkeeping 3-9
3.3.8 Weekly/Monthly CQA/CQC Summary Reports 3-10
3.3.9 Non-Conformance Documents 3-10
3.3.10 Administration Of Construction Changes 3-11
3.3.10.1 Field Changes and Approvals 3-11
3.3.10.2 As-Built Documentation 3-11
3.3.11 Submittal Requirements 3-12
3.4 WASTE MANAGEMENT PROCEDURES 3-12
3.4.1 Overview 3-12
3.5 SAMPLING & ANALYSIS 3-12
3.6 CONSTRUCTION CONTINGENCY PROCEDURES 3-13
3.6.1 Agency Notification 3-13
3.6.2 Other Contingency Considerations 3-13
3.7 CONSTRUCTION SAFETY PROCEDURES 3-13
3.8 COST ESTIMATE & FINANCIAL ASSURANCE 3-13

4.0 SAMPLING & ANALYSIS PLAN 4-1

5.0 QUALITY ASSURANCE PROJECT PLAN 5-1

5.1 INTENDED USE OF DATA 5-1
5.2 LEVELS OF DATA QUALITY 5-1
5.3 QA/QC SAMPLES 5-1
5.3.1 Field QC Samples 5-2
5.3.2 Laboratory QC 5-2
5.4 QUALITY ASSURANCE OBJECTIVES 5-3
5.4.1 Precision 5-3
5.4.2 Accuracy 5-3

5.4.3 Comparability 5-4
5.5 LABORATORY PROCEDURES FOR SAMPLE CUSTODY 5-4
5.6 LABORATORY ANALYTICAL PARAMETERS 5-4
5.6.1 Analytical Methods 5-4
5.6.2 Practical Quantification Limits 5-5
5.7 DATA REDUCTION, VALIDATION AND REPORTING 5-5
5.7.1 Data Reduction 5-5
5.7.2 Data Verification by the Laboratory 5-5
5.7.3 Data Validation 5-6
5.7.4 Data Reporting 5-6
6.0 CORRECTIVE MEASURES COMPLETION CRITERIA 6-1
6.1 OPERATION & MAINTENANCE CONTINGENCY PROCEDURES 6-1
6.2 DATA MANAGEMENT & DOCUMENTATION REQUIREMENTS 6-1
6.2.1 Records maintenance 6-1
6.2.1.1 Operating Logs 6-2
6.2.1.2 Maintenance Records 6-2
6.2.1.3 Inspection Records 6-2
6.2.1.4 Monitoring and Laboratory Analysis Records 6-2
6.2.1.5 Emergency Reports 6-2
7.0 SAFETY, HEALTH AND EMERGENCY RESPONSE PLAN 7-1
7.1 OVERVIEW 7-1
7.2 PROJECT PERSONNEL AND RESPONSIBILITIES 7-1
7.2.1 Certified Industrial Hygienist (CMC-CIH) 7-1
7.2.2 Health and Safety Officer (CMC-HSO) 7-1
7.2.3 Corrective Measures Contractor Site Superintendent (CMC-SS) 7-2
7.3 SITE-SPECIFIC HASP REQUIREMENTS & ACCIDENT PREVENTION PROGRAM 7-2
7.3.1 Site Orientation 7-2
7.3.2 Incident Reporting 7-2
7.3.3 OSHA Record Keeping (OSHA 300 Log) 7-2
7.3.4 Safety Inspections 7-3
7.3.5 Activity Hazard Analysis (AHA) 7-3
7.3.6 Air Monitoring Program 7-3
7.3.7 Heat/Cold Stress Procedure 7-3
7.3.8 Hot Work Permit 7-3
7.3.9 Daily Safety Tailgate Meeting 7-4
7.3.10 Lock-Out/Tag-Out Procedure 7-4
7.3.11 Confined Space Entry (CSE) 7-4
7.3.12 Training 7-4
7.4 HAZARD IDENTIFICATION AND CONTROL 7-4
7.5 AIR MONITORING 7-4

7.6 PERSONAL PROTECTIVE EQUIPMENT 7-5
7.7 SITE CONTROL: WORK ZONES 7-6
7.8 DECONTAMINATION PROCEDURES 7-6
7.9 MEDICAL SURVEILLANCE 7-6
7.10 EMERGENCY OPERATIONS PLAN 7-7
7.10.1 Pre-Emergency Planning 7-7
7.10.2 Responsibilities 7-7
7.10.2.1 Emergency Coordinator (EC) 7-7
7.10.2.2 Site Personnel 7-7
7.10.3 Emergency First Aid 7-8
7.10.3.1 First Aid 7-8
7.10.3.2 Emergency Procedures 7-8
7.10.4 On-Site Equipment and Procedure 7-8
7.10.5 Emergency Equipment 7-9
8.0 PUBLIC PARTICIPATION 8-1
9.0 REPORTING REQUIREMENTS 9-1
9.1 CONSTRUCTION PROGRESS REPORTS 9-1
9.2 CONSTRUCTION QA/QC REPORTS 9-1
9.3 CONSTRUCTION COMPLETION REPORT 9-1
9.4 O&M REPORTING 9-1
9.5 CORRECTIVE MEASURES COMPLETION REPORT 9-1
10.0 CORRECTIVE MEASURES IMPLEMENTATION SCHEDULE 10-1

FIGURES

Figure 1 General Site Location Map

Figure 2 Site Plan and Solid Waste Management (SWMU) Location Map

Figure 3 Contiguous Property Boundaries and Locations of SWMUs and AOCs

Figure 4 Locations of Monitoring Wells and DNAPL Recovery Wells

Figure 5 Potentiometric Surface Map – Shallow Zone Monitoring Wells – 06/02/01

Figure 6 Potentiometric Surface Map – Intermediate Zone Monitoring Wells – 06/02/01

Figure 7 Potentiometric Surface Map – Deep Zone Monitoring Wells – 06/02/01

Figure 8 Groundwater Contaminant Concentrations – Shallow Zone

Figure 9 Groundwater Contaminant Concentrations – Intermediate Zone

Figure 10 Groundwater Contaminant Concentrations – Deep Zone

Figure 11 DNAPL Source Area Map and Well Locations

TABLES

Table 1 Lithologic Characteristics of Geologic Units

Table 2 Alternate Concentration Limits

APPENDICES

Appendix A Drawings

Appendix B Specifications

Appendix C Operations and Maintenance Manual (O&M Manual)

1.0 CONCEPTUAL DESIGN

1.1 INTRODUCTION & BACKGROUND

The purpose of this Corrective Measures Implementation (CMI) process is to design, construct, operate, maintain and monitor the performance of the corrective measures selected for the Alabama Wood Treating Corporation (AWTC) site in Mobile, Alabama (USEPA I.D. No.: ALD 058 221 326). These corrective measures were selected during the Corrective Measures Study process and the primary objective of these measures is overall protection of human health and the environment. This Final CMI Workplan presents information, data, designs, plans and specifications that will achieve site remediation when implemented. The remediation of the AWTC site has proceeded in phases including initial site demolition and removal activities in 1987, subsequent removal and interim actions, and on-going DNAPL recovery operations that began in 1994. The CMI phase of the RCRA corrective action process builds on these prior actions and will allow the near-term redevelopment and re-use of the site.

The Alabama State Port Authority (ASPA) is the current owner of the AWTC site and has contracted Harding ESE, Inc. (MACTEC) to prepare the CMI Workplan. Following final design approval and a 45 day public comment period, the construction contractor or contractors will be selected and remedial actions initiated.

1.1.1 Report Organization

The Final CMI Workplan is organized into ten major sections, as described below, with supporting tables, figures, drawings and appendices. Some of these sections provide background information that has been presented in previous reports. This material is generally included in summary form with a reference to the source document.

Section 1.0 – Conceptual Design - Provides a description of the corrective measures selected as a result of the ADEM approved Corrective Measures Study. Included in the conceptual design section is background information on the AWTC site, the RCRA corrective action process, existing conditions at the AWTC facility and the corrective measures objectives. The section also presents a conceptual model of contaminant migration and the proposed project management, design criteria and design basis are summarized.

Section 2.0 - Plans & Specifications - Provides the drawings for the construction of the corrective measures. These include general site plans, process flow diagrams, excavation and earthwork drawings and piping and instrumentation diagrams. In the Final CMI Workplan these plans and specifications will be at a level of detail to include in a contract document for bid and construction.

Section 3.0 – Construction Workplan – Documents the overall management strategy, construction quality assurance procedures and schedule for constructing the corrective measures.

Section 4.0 – Sampling & Analysis Plan – References existing sampling and analysis plan that will guide the long term monitoring of the corrective action effectiveness.

Section 5.0 – Quality Assurance Project Plan – Provides an outline of the QA procedures which will govern the long term data collection and evaluation processes associated with the corrective action effectiveness monitoring program.

Section 6.0 – Corrective Action Completion Criteria – Provides a summary of the criteria which will determine when the media specific clean-up goals and objectives are achieved.

Section 7.0 – Health & Safety Plan – All field activities at the AWTC site, including construction are to be performed in accordance with a project specific Health and Safety Plan (HASP). It is considered the responsibility of the selected contractor to develop and implement a construction HASP. The HASP is required to address the specific hazards and exposure scenarios associated with the corrective measures and will include: personal protective equipment requirements, action levels, decontamination procedures, site organization and emergency contacts.

Section 8.0 – Public Participation – Documents the proposed public involvement activities for the corrective measures implementation that will be conducted in conjunction with the reissuance of the RCRA permit for the AWTC site and the Environmental Impact Statements in progress for the Choctaw Point Terminals and Garrows Bend projects.

Section 9.0 – Reporting Requirements – Summarizes the requirements for progress, construction completion and corrective measures completion reports throughout construction.

Section 10.0 – Corrective Measures Implementation Schedule – Provides the targeted project schedule.

In addition to these sections, additional material is included in appendices to the Final CMI Workplan. The drawings and plans are included in Appendix A; the specifications are included in Appendix B and the O&M Manual is included as Appendix C.

1.1.2 AWTC Site Background

The AWTC site is a former wood treating facility and consists of an approximately fourteen-acre tract of land situated in a heavily industrialized zone along the Mobile River in Mobile, Alabama. The site is located at the south end of Old Water Street and Virginia Street, approximately one-half mile east of Interstate 10, as shown in Figure 1. A plan view of the site is provided in Figure 2. Geographical coordinates of the facility are approximately latitude 30º40'08" North and longitude 88º02'20" East. The site is bordered to the north and northwest by inactive Star Enterprise-Texaco petroleum bulk storage terminals. Also present to the west is the former Shell Oil petroleum bulk storage terminal that is currently operated by Radcliff/Economy Marine Services. To the south, the property is bordered by the former PM Agricultural Products (PM Ag) and McKenzie Tank Lines, Inc. facilities. All these parcels are owned by the Alabama State Port Authority (ASPA), formerly known as the Alabama State Docks Department (ASD). The eastern edge of the site is bounded by the Mobile River.

Both the Star facilities and the former Shell facility were or are petroleum (oil products) storage and marketing terminals. All three properties have documented groundwater contamination related to petroleum releases. The PM Ag facility was used primarily for the storage and formulation of animal feedstuffs but has also been used for the storage and transfer of other substances. The storage and on-site disposal of pulp and paper industry related wastes have triggered RCRA activities at the site; including active remediation. ASPA understands that the RCRA permit for the PM Ag facility may be closed out in 2003 based on the latest permit modifications pending groundwater sampling and determination by ADEM. McKenzie Tank Lines was a storage and distribution terminal that handled a number of products under several facility operators. ADEM issued a draft administrative order to McKenzie in January 1998 citing past releases and demonstrated groundwater contamination. The draft order required the submission of a groundwater quality assessment report and a liquid phase recovery plan. ASPA owns rail lines and adjacent right-of-ways that run along the southern border and cross diagonally through the site from the southwest to the northeast. The diagonal rail lines service an active rail ferry terminal at the river. ASPA also owns several hundred acres of contiguous property to the south and southwest of the AWTC site.

The entire AWTC site is located in the 100-year flood plain as established by the Federal Emergency Management Agency. The area of the regulated units at the site is listed as Zone AE with a base flood elevation of 12 feet based on National Geodetic Vertical Datum (NGVD). No wave action or water velocity hazards are indicated except at the immediate shoreline.

The AWTC site has been in industrial land use since 1906. Mixed residential, commercial, and urban areas are located approximately one half mile to the west. The nearest residence is approximately one-quarter mile northwest (e.g., upgradient) of the AWTC site. Zoning at the AWTC site and the adjacent properties is Heavy Industrial (I-2).

The Final Corrective Measures Study Report specifies that future land use at the site and the surrounding area will continue to be industrial. ASPA has stated a commitment to exclusive industrial future land use at the site and institutional controls will be instituted to ensure that land use. ASPA is currently developing plans for a container port and intermodal transportation facility for the Choctaw Point area that would include the entire AWTC site. These projects are currently the subject of an ongoing Environmental Impact Study (Choctaw Point Terminals EIS). The container port would overlay the corrective measures detailed in this workplan.

1.1.2.1 *Ownership & Operation History*

Wood treating operations were conducted at the AWTC site from 1906 until 1985. The Owner/Operator history for the site for that period is summarized in the following table and detailed below:

Owner	**Period**	**Operator**	**Period**
Illinois Central Railroad	70 years	Reilly Industries	66 years
Alabama State Docks	9 years	AL Wood Treating Corp	13 years

The site owner from 1906 until 1976 was the Illinois Central Railroad (Illinois Central) or subsidiary or predecessor corporations to Illinois Central. These corporations include the GM&O Railroad that merged with the Illinois Central Railroad in 1972. The Illinois Central Railroad is now the Canadian National Railway. In 1976, the property was deeded to the ASPA (then the Alabama State Docks) as part of a larger land acquisition. This deed was subject to the existing lease for the ongoing wood treating operation. ASPA continues to be the owner of the site.

The operation of the wood treating facility from its opening in 1906 until 1972 was conducted by subsidiary or predecessor corporations to Reilly Industries, Inc. (Reilly). These corporations include Republic Creosoting Company and Reilly Tar & Chemical Corporation. In 1972 the Alabama Wood Treating Corporation bought the facilities and equipment from Republic Creosoting and assumed operation of the wood treating activities. AWTC operated the creosote and pentachlorophenol wood treating facility until 1985. The Alabama Wood Treating Corporation no longer exists as a viable corporate entity.

The Alabama Wood Treating Corporation submitted a Part B RCRA permit application for the AWTC facility in November 1984. The Alabama Department of Environmental Management's (ADEM) review of the application ultimately resulted in the issuance of a RCRA Complaint and Compliance Order to AWTC to cease and desist from wood treating activities. The facility ceased operations in 1985 when the Alabama State Docks was successful in obtaining an order from the State Circuit Court to evict AWTC from the site.

At that time, ASD also initiated civil actions against AWTC, Illinois Central and Reilly Industries concerning potential environmental liabilities from past operation and ownership of the AWTC site. As part of an agreement to stay that litigation, a committee of principal responsible parties (PRPs) was formed in 1986 to jointly address environmental concerns for the site. This committee, called the Joint Technical Committee (JTC), was comprised of representatives from ASD, Reilly Industries and Illinois Central. The agreement that formed the JTC required unanimity for all actions and prohibited unilateral communication by any of the participants with regulatory agencies.

The JTC managed site investigation and closure activities for the AWTC site until the committee was dissolved in August 1997 with the withdrawal of ASD. The stated purpose of the Alabama State Docks for withdrawing from the JTC was to initiate open and direct communication with ADEM and to facilitate the timely initiation and completion of additional actions at the AWTC site.

1.1.2.2 *Facility Process Information*

Active wood treating operations were conducted at the AWTC site for a period of approximately 80-years. During that period, various facility configurations and operations have existed on the site. Past facility layouts have been documented through the use of Sanborn insurance maps from 1904 through 1980 and aerial photographs from 1952 through 1990. While new units were added during this period, the operational areas and facility layout remained generally consistent. Specific modifications, such as the addition of the surface impoundments during the AWTC operating period, can be documented from these sources.

The following activities have been conducted at the site during various periods from 1906 until 1985:

- coal tar refining/creosote manufacturing;
- creosote product storage;
- creosote wood treating;
- pentachlorophenol wood treating.

Over the period of operation, creosote was the principal preservative. However, while both creosote and pentachlorophenol were used to treat various wood products, Copper/Chromium/Arsenate (CCA) preservatives have never been used at the AWTC site.

In general, structures from the former treating operations are no longer present on the site. The storage tanks, vats, pressure vessels, and associated building structures and foundations were dismantled and removed during site closure activities in 1986.

1.1.2.3 *Waste Characteristics*

Creosote and pentachlorophenol were used as preservative agents at the AWTC site and resulted in the contamination of site soil and groundwater. The U.S. Environmental Protection Agency (USEPA, 1977) has identified both contaminant specific and site specific factors that can influence the mobility and migration of site contaminants. These factors include:

Contaminant Characteristics
Solubility in water
Density
Viscosity
Volatility

Site Characteristics - Soil and Groundwater
pH
Pore space
Hydraulic conductivity
Extent to which the soil is saturated with water (or contaminants)
Natural organic content of the soil
Soil/subsurface material structure and heterogeneity
Soil particle size distribution
Weather conditions
Depth of groundwater
Ion exchange capacity of soil

The extent to which contaminants adsorb to the soil is influenced by several factors. Many contaminants, particularly organics, have a high affinity for natural organic soil materials. These contaminants are most strongly sorbed when the natural organic content of the soil is high. Contaminants generally adsorb to fine soil particles such as silt and clay more strongly than to larger soil particles such as sand and gravel. Contaminants that are not strongly adsorbed to the soil have a greater tendency to migrate.

The solubility of contaminants in water is also a major factor in contaminant migration. Water-soluble contaminants are often highly mobile. Contaminants that are dissolved in groundwater or surface water will migrate with the water. If contaminants are leached from the soil by surface water that flows into a stream, they can rapidly migrate offsite. The migration of contaminants dissolved in the groundwater, however, will generally occur more slowly.

Nonaqueous phase liquids (NAPLs) generally migrate more slowly than dissolved contaminants. The migration of NAPLs is usually due to gravity, rather than the movement of water. The rate of migration of these contaminants can also be less than the velocity of the groundwater if there is sorption onto soil particles and is dependent on the extent to which the soil is saturated with the NAPLs.

Creosote

Creosote is produced as a distillate from coal tar and is a variable mixture of hundreds of compounds, primarily semi-volatile organic compounds (SVOCs). In wood preserving applications, creosote may be used either full strength or diluted with petroleum. Undiluted creosote is denser than water and typically migrates vertically downward as a dense non-aqueous phase liquid (DNAPL). Polynuclear aromatic hydrocarbons (PAHs) are SVOCs that generally account for 85 percent (by weight) of the chemical constituents of undiluted creosote (EPA, 1992). The predominant PAHs in creosote have two to four aromatic rings, but larger compounds are also present. Some major components (percent by weight) of creosote are as follows (EPA, 1990) (EPA, 1992):

Acenaphthene	Fluoranthene
Acenaphthylene	Fluorene
Anthracene	2-Methylnaphthalene
Carbazole	Naphthalene
Chrysene*	Phenanthrene
Dibenzofuran	Pyrene

All of the compounds listed above are PAHs, except for carbazole and dibenzofuran. In addition many of the lower concentration components of creosote are also PAHs. Those having substantial environmental significance are listed below:

Benz(a)anthracene*	Dibenz(a,h)anthracene*
Benzo(b)fluoranthene*	Benzo(g,h,i)perylene
Benzo(k)fluoranthene*	Indeno(1,2,3-cd)pyrene*
Benzo(a)pyrene*	

The EPA Office of Health and Environmental Assessment (OHEA) has listed six of these lower concentration PAH creosote components (*) as well as Chrysene as probable human carcinogens (EPA, 1993).

EPA has identified several types of creosote wastes as listed hazardous wastes under RCRA. These include wastewater process residuals, preservative drippage, and spent formulations from plants that use creosote formulations (EPA hazardous waste code F034). Bottom sediment and sludge from wastewater treatment (K001) and discarded unused creosote (U051) are also listed hazardous wastes.

Pentachlorophenol

The pentachlorophenol solutions used in wood preserving are prepared by dissolving technical-grade pentachlorophenol (PCP) in oil to produce a solution that is 4 to 8 percent PCP. Unlike creosote, pentachlorophenol is a specific, individual compound. However, commercial formulations include a significant quantity of non-PCP contamination. Even

technical grade PCP is a mixture of compounds and contains 85 to 90 percent PCP; 2 to 6 percent higher molecular weight chlorophenols; 4 to 8 percent 2,3,4,6-tetrachlorophenol; and about 0.1 percent PCDDs and PCDFs (EPA, 1990)(EPA, 1992).

Pentachlorophenol is slightly soluble in water (2 mg per 100 ml) but very soluble in oil. Consequently, PCP-oil solutions that leach into the ground often collect as light non-aqueous phase liquids (LNAPLS). Pentachlorophenol itself has a specific gravity of 2.0 (water = 1.0) and adheres strongly to soil. The extent of sorption is influenced by organic content, pH, and soil type, with high organic content correlating most strongly with increased adsorption (EPA, 1992).

Corresponding RCRA hazardous wastes under RCRA for pentachlorophenol wastes include F032 (wastewater process residuals, preservative drippage, and spent formulations), K001 (bottom sediment and sludge from wastewater treatment) and F027 (discarded unused formulations).

1.1.3 RCRA Corrective Action Process

The RCRA Corrective Action (CA) process consists of a series of studies and actions that proceed from initial site assessments through corrective measures to the achievement of final site remediation goals. The following sections summarize the actions taken at the AWTC site during the RCRA CA process.

1.1.3.1 *Initial Site Investigation Activities*

Monitoring and investigation activities have been conducted at the AWTC site since 1985. Routine RCRA monitoring activities have been conducted at the site in conjunction with several phases of investigative activities to delineate the horizontal and vertical extent of contamination. The results of these initial investigations were summarized in a series of reports by ERM-Southeast, Inc. (ERM) and Keystone Environmental Resources, Inc. (Keystone). These reports include summaries of annual groundwater quality assessments and soil and groundwater investigation summaries of site-wide contamination as well as in the drainage ditch area and the process area.

1.1.3.2 *Removal & Closure Activities*

An interim status closure plan for the AWTC site was prepared and submitted for review in July 1986. The initial AWTC site closure plan was approved by USEPA and ADEM on October 2, 1986. The primary focus of the closure plan was on the former process area and the surface impoundments. Process area closure field work began in June 1987 and continued through November 1987. The operations area closure removed buildings, storage tanks, vats, pressure treatment vessels, associated foundations, above-ground piping, appurtenances, debris, soil, buried tanks, underground plumbing and piping.

During this removal action, 540 tons of tank sludges and 4,200 tons of debris were removed from the process area.

Surface impoundment closure activities began on June 25, 1987 with the removal of K001 sludge. Modifications to the impoundment closure plan were developed in late 1987 and 1988 and were submitted to ADEM on March 24 and August 5, 1988. ADEM approved the plans on September 7, 1988. Final closure field work began in February 1989 and ended in February 1990 with the completion of the concrete cap. The Closure Certification package, documenting final closure activities, was submitted to ADEM on September 25, 1990. Items removed during closure included rain and process water, wastewater sludge (K001), water lines, fuel lines, and a natural gas line. Approximately 1,970 tons of sludge and water were removed from the impoundment.

1.1.3.3 *Post-Closure Permit Application & Permit*

The post-closure permit application for the AWTC site was submitted for agency review in July 1986. Due primarily to the series of modifications that were made to reflect the closure activities, the permit was not issued until September 13, 1991. The post-closure permit included requirements for both a Corrective Action Plan and an RCRA Facility Investigation (RFI). The permit also required semi-annual groundwater investigations and an annual groundwater report. The performance of these investigations has produced a substantial database of site-specific environmental conditions.

The expiration date of the original post-closure permit was September 13, 2001. ASPA submitted a post-closure permit renewal application on March 16, 2001. The application is currently under revision by ASPA to incorporate the decisions and actions from the continuing CA process activities, including the CMI activities.

1.1.3.4 *RCRA Facility Assessment (RFA)*

Two RCRA Facility Assessments have been conducted by regulatory agencies at the AWTC site. The objectives of the RFA were to:

- Identify all Solid Waste Management Units (SWMUs) and other Areas of Concern (AOCs) located at the AWTC former wood treating site and contiguous properties.
- Assess the potential for release of hazardous wastes or constituents from each SWMU and AOC, using related information obtained from review of ADEM files and a site inspection.
- Determine for each SWMU and AOC what course of action, if any, should be followed to safeguard human health and the environment from a release. When further remedial investigation or corrective action is deemed appropriate, suggest site-specific further actions that may be used to initiate necessary clean-up and/or restoration.

SWMUs are defined as any unit which has been used for the treatment, storage, or disposal of solid waste at any time, irrespective of whether the unit is or ever was intended for the management of solid waste. RCRA regulated hazardous waste management units are also solid waste management units. SWMUs include areas that have been contaminated by routine and systematic releases of hazardous waste or hazardous constituents, excluding one-time accidental spills that are immediately remediated and cannot be linked to solid waste management activities (e.g. product or product spills).

An Area of Concern (AOC) includes any area having a probable release of a hazardous waste or hazardous constituent which is not from a solid waste management unit and is determined to pose a current or potential threat to human health and the environment.

1988 RFA

The Interim RFA of the AWTC site was completed in May 1988 by USEPA contractors (A.T. Kearney, Inc. and The Earth Technology Corporation). This assessment resulted in the identification of eight SWMUs and one AOC, as identified on Figure 2 and listed below:

- SWMU 1 - Wastewater Pretreatment Plant,
- SWMU 2 - Surface Impoundment,
- SWMU 3 - Drum Storage Unit,
- SWMU 4 - Former Plant Operations and Storage Area,
- SWMU 5 - Wood Product Storage Area,
- SWMU 6 - Drainage Ditch to Mobile Bay,
- SWMU 7 - Overflow Impoundment Area,
- SWMU 8 - Former Creosote Unloading Area,
- AOC 1 - Mobile Drum Storage Unit (not able to be shown on Figure 2 as it no longer exists).

EPA Region 4 subsequently issued a HSWA permit for the site in September 1991 that required the Joint Technical Committee to perform investigations of some of these units (e.g., SWMUs 4, 5, 6 and 8). EPA Region 4 determined from the available information that two SWMUs (1 & 3) and AOC-1 did not require additional investigation because no releases were known to have occurred at these units. The final two SWMUs (2 & 7) were identified in the RFA as having had prior releases to groundwater, but because they are regulated under the RCRA permit issued by the ADEM, they did require further investigation. These two units have been closed using an engineered cap.

2000 RFA

ADEM initiated a second RFA of ASPA property in September 2000. The final report on this second RFA was issued March 27, 2002. The 2000 RFA assessed most of the

ASPA-owned properties that are contiguous with the AWTC site. The 2000 RFA identified the following SWMUs and AOCs (Figure 3):

- SWMU 9 – Paint Containers
- SWMU 10 – Abandoned Drums
- SWMU 11 - Drum Yard at Red Line property,
- AOC 2- Abandoned Dumpsters,
- AOC 3 – Abandoned Drum,
- AOC 4 – Abandoned Drums,
- AOC 5 – Abandoned Automobile Gas Tanks
- AOC 6 – Soil/Spoil Area

The 2000 RFA required ASPA to conduct a confirmatory sampling program. That program is described in section 1.1.3.8. The results of the Confirmatory Sampling Program are reported in a separated document entitled, Contiguous Properties Confirmatory Sampling Report, dated February 2003.

1.1.3.5 *RCRA Facility Investigation (RFI)*

The RCRA Facility Investigation (RFI) is the second step of the Corrective Action Program. The goal of the RFI is to collect information that fully characterizes the nature, extent, and rate of migration of releases of hazardous waste or waste constituents, and to assess the geologic and hydrogeologic conditions at the site. The description of current conditions in Section 1.2 and the subsequent site models are based in large part on the results of the RCRA Facility Investigation. The regulatory agencies have required two RFI phases at the AWTC site.

Phase I RCRA Facility Investigation

The first RFI Workplan prepared by the AWTC Joint Technical Committee was approved by the EPA Region 4 in March 1993. RFI field activities were conducted in April 1993. The RFI report dated November 1993 was prepared by Remediation Technologies, Inc. The Phase I RFI report summarized data from previous investigations at the site and the RFI activities.

The scope of the Phase I RFI included characterization of waste constituents released to the groundwater and surface water at the site, characterization of confirmed releases of dense non-aqueous phase liquids (DNAPL) and dissolved-phase contaminants to groundwater from the entire site and the identified SWMUs, and the evaluation of potential receptors. The results of the Phase I RFI provide an assessment of site geologic and hydrogeologic conditions as well as an evaluation of the extent to which former operations at the site affected local soil and groundwater quality. The stated conclusion of the Phase I RFI report was that, with the exception of additional characterization of Tennessee Branch (Southern Drain), sufficient information was available to support a Corrective

Measures Study. The reviewing agencies did not concur with the conclusions of the Phase I RFI report and required additional investigations in the form of a Phase II RFI.

Phase II - RCRA Facility Investigation

The workplan for the Phase II RFI was submitted for agency review in November 1994. The workplan called for additional soil, sediment, groundwater and DNAPL investigations. The final workplan and scope was approved with significant modifications as part of a consent order between ASD and ADEM that was signed on March 24, 1998. The Phase II investigations were performed by QST Environmental, Inc. (QST or Harding ESE, now MACTEC) during the next several months. The final Phase II RFI report was submitted to ADEM in June 2000. The conclusion of the final Phase II RFI report was that sufficient information was available to support a Corrective Measures Study (CMS) and that a CMS was necessary. ADEM agreed with these conclusions and instructed ASPA to perform the CMS.

The CMS develops and recommends final remedial actions. These final actions address appropriate cleanup levels and require completed site characterization. In order to facilitate these actions, a risk assessment (RA) was conducted as part of the Phase II RFI. The RA evaluated the potential current and future human health and ecological risks that may be posed by the AWTC site. ADEM completed a third party technical review and approved the risk assessment.

1.1.3.6 *Additional Investigations*

During the interval between the Phase I and Phase II RFI reports several additional investigations were performed at the AWTC site or adjacent facilities as part of continuing permit compliance. The semi-annual groundwater sampling and annual groundwater quality assessments continued during this period with annual reports being submitted by the Joint Technical Committee or the ASPA. Additional investigations were also performed by regulatory agencies such as ADEM's Comprehensive Monitoring Evaluation for groundwater. Supplemental data were also available for portions of the site from investigations completed for non-AWTC projects such as the proposed rail-barge facility development project.

An investigation of the near-surface clay layer and overlaying DNAPL in the area west of the AWTC property was reported in September 2001. This study was conducted within the context of the Corrective Measures Study and the results were utilized in the evaluation of corrective measures alternatives.

1.1.3.7 *Corrective Measures Study (CMS)*

A Corrective Measures Study identifies, screens, and recommends corrective measure alternatives on a site-specific basis. A Draft CMS Report for the AWTC was submitted to

ADEM on October 24, 2000. ADEM reviewed the draft report and sent comments to ASPA in a letter dated February 8, 2001. ASPA responded in a May 14, 2001 letter, which ADEM followed with final comments and agreement in correspondence dated June 22, 2001. The final CMS report was submitted on September 28, 2001.

The focus of the CMS is not site characterization but the development, evaluation and recommendation of specific corrective measures. The CMS report developed media-specific, risk-derived corrective measures objectives. The objective development process included the groundwater Alternative Concentration Limits (ACL) demonstration. Applicable corrective measures technologies were identified and screened based on the criteria of implementability, reliability, performance and timeliness. Presumptive remedies for wood-treating sites were specifically addressed. Screened technologies were utilized to develop specific corrective measures alternatives for full evaluation. In addition, cost estimates were developed and evaluated for combinations of alternatives. Specific recommendations were made for corrective measures based on technical, environmental and human health criteria. ADEM selected the final corrective measures based on the alternative evaluations. Those selected corrective measures are carried forward into this Corrective Measures Implementation Workplan in order to complete the design, construction, and operation process.

1.1.3.8 *Confirmatory Sampling Program*

The 2000 RFA identified and required ASPA to investigate three SWMUs and five AOCs. These sites are located southwest of the AWTC property and primarily in the Monroe Park area (Figure 3) and are contiguous to the AWTC site. ASPA submitted a confirmatory sampling Workplan in May 2002 and following ADEM approval, initiated waste characterization and sampling activities field activities in July 2002. The program includes waste characterization and removal, confirmatory soil sampling and groundwater sampling at the SWMUs and AOCs. Results of the confirmatory sampling are provided in the Contiguous Properties Confirmatory Sampling Report, dated February 2003.

1.1.4 AWTC Site Corrective Measure SWMUs

The following sub-sections provide detailed descriptions of the four SWMUs that require corrective measures at the AWTC site. These four SWMUs (SWMU 4, 5, 6 and 8 located on Figure 2) are the focus of this Corrective Measures Implementation Workplan.

1.1.4.1 *SWMU 4 - Former Plant Operations and Storage Area*

SWMU 4 was the site of the actual wood treating operations, coal tar refining, and chemical storage operations. The wood treating process area was a conventional wood treating plant site comprised of a retort building, pressure treating cylinders, storage tanks, vats, boiler tanks, and drip track areas. The coal tar refinery was operated until the

1960's and was comprised of several stills and associated storage tanks/vessels for the refining of creosote from coal tar.

In 1986, several tanks and vats, three pressure vessels (i.e., cylinders), and a buried rail tank car were removed from the Former Plant Operations and Storage Area during site closure activities. Since 1986, most of the remaining surface structures and building foundations have been removed from this area.

DNAPL contamination is present in the SWMU 4 area to a depth of approximately 100-feet below ground surface.

1.1.4.2 *SWMU 5 - Wood Product Storage Area*

The Wood Product Storage Area (SWMU 5) is located south and east of the Former Plant Operations and Storage Area (SWMU 4) (Figure 2) and actually consists of two sub-areas located along the north and south sides of the railroad tracks. Treated wood products were removed from the pressure-treating cylinders in the process area, and then moved to the Wood Products Storage Area. Here, they were allowed to dry before being loaded onto rail cars for shipment. This area may have received preservative drippage from the stored timber.

The Wood Product Storage Area was also used for the storage of untreated timber which was likely to have been transported to the site by rail cars. The storage area at one time had contained a 20 by 50 foot pole storage shed that was used for the storage of treated and/or untreated telephone poles. Aerial photos, taken in the late 1970's, show that much of the storage area was covered by stockpiled wood. However, it is not known how much of this timber was treated. Currently, the area of SWMU 5 is devoid of structures, largely free of debris, and is vegetated.

Soil is the primary contaminant source in the SWMU 5 area with no significant DNAPL accumulation areas or zones.

1.1.4.3 *SWMU 6 - Drainage Ditch*

The Drainage Ditch to Mobile Bay (SWMU 6) is a topographic drainage feature that reportedly received discharge of wastewaters from preservative separation units prior to the construction of the Surface Impoundment (SWMU 2). The route of the drainage ditch has been redirected several times during the period of facility operation by the construction of roads (e.g., Ezra Trice Boulevard) and railroad tracks.

The drainage ditch received final effluent outfall from two preservative separation vats that were connected in series and which received discharge from the primary separation tank. This separation tank received drippings recovered from the drip pad area of the

pressure treating equipment in the Former Plant Operations and Storage Area (SWMU 4).

The drainage ditch traverses the AWTC site. The ditch currently runs from an area just south of the surface impoundment west and northwest for approximately 700 feet where it bifurcates. Originally, one fork of the ditch turned north-northwest, approximately 550 feet before turning under (via a culvert) Ezra Trice Boulevard and the present location of the railroad track spur. Here, the ditch turned south and adjacent to the spur for approximately 600 feet before turning southwest and west. The ditch terminates in Tennessee Branch (a.k.a. Southern Drain), a small stream that courses roughly 2,000 feet before discharging to Garrows Bend and ultimately to Mobile Bay. In 1978, portions of the ditch were filled to prepare a roadbed for re-routing a portion of the rail spur. This restricted flow into the northward flowing fork of the ditch. Consequently, the flow was directed primarily to the south-flowing fork. This fork continues adjacent to Ezra Trice Boulevard in a south-southeast direction for roughly 700 feet and finally in a southeast direction for approximately 1,100 feet before terminating in the Mobile River.

SWMU 6 has received significant discharges of creosote waste during the operational period. Portions of the existing channel are highly contaminated at the surface and a wide area surrounding the channel is contaminated to varying depths up to approximately 30 feet below ground surface.

1.1.4.4 *SWMU 8 - Former Creosote Unloading Area*

The former Creosote Unloading Area (SWMU 8) is located directly east of the Former Plant Operations and Storage Area (SWMU 4) and adjacent to the railroad tracks in the northeast corner of the facility (Figure 2). This area had reportedly been used for the transfer of creosote that was brought to the site by rail or barge. The area is currently devoid of structures although the remnants of a railroad spur are visible. Vegetation covers most of the area. Drainage from this area has been previously routed to a drainage structure along the northern site boundary. While portions of this drainage feature remain other portions have filled in over time. Currently, only the extreme northeastern end of the AWTC site drains into the remaining structure. Approximately 544 tons of soil and debris were excavated from this area and disposed at an off-site, permitted facility in May 1999.

1.1.5 Current Conditions

Current environmental conditions at the AWTC site and surrounding area have been thoroughly investigated and documented in previous reports including the two RFI reports. The following sections provide a brief overview of those findings.

1.1.5.1 *Surface Water*

Offsite Surface Water

The AWTC site is bordered on the east by the Mobile River. The AWTC Site is located on Choctaw Point, due west of Choctaw Pass. The major channel of the Mobile River extends between McDuffie and Little Sand Islands. The average flow of the Mobile River at this point is approximately 16,000 cubic feet per second (cfs) or 10.4 billion gallons per day (bgd). The conservative low flow (7Q10) is approximately 2,000 cfs or 1.3 bgd. The 7Q10 flow is the lowest seven-day average flow that may be expected during a ten-year period. In addition, the Mobile River is subject to tidal fluctuations in the AWTC site area.

Tennessee Branch, also known as the Southern Drain, receives discharge from the western portion of the site. The Tennessee Branch drainage basin includes a significant portion of the downtown Mobile area and the stream is subject to the extreme variations in discharge associated with urban stormwater runoff. Tennessee Branch discharges to Garrows Bend and ultimately to Mobile Bay. The City of Mobile is planning significant modifications to the Tennessee Branch drainage system in order to improve drainage. These actions will include replacement of the culverts under South Conception Street at the intersection with Pillans Street.

Onsite Surface Water

No major surface water features exist onsite. Site drainage is conveyed to the Mobile River by remnants of a former ditch along the site's northern boundary (e.g., the northern ditch) and a drainage ditch in the southwestern portion of the site (SWMU 6). Site runoff flows via sheet flow and shallow concentrated flow to either of these features. A smaller portion of runoff flows via sheet and shallow concentrated flow directly to the Mobile River.

Due to the very low gradient of SWMU 6, the flow rate in the channel is low and there often appears to be standing water in portions of the ditch. Observable flowing conditions do not typically occur in this drain way until the channel bifurcates and receives flow from an off-site storm water ditch from the north. In the vicinity of the site, the elevations of both the northern boundary line and the drainage ditch to Mobile Bay are significantly higher than the mean high tide elevation and, consequently, these features are not tidally influenced under typical conditions.

FEMA Flood Zone Information

Flood zone information for the AWTC site is available from the Federal Emergency Management Agency Flood Insurance Rate Map of the City of Mobile (FEMA, 1998). The AWTC site is within the 100-year flood area, but is not included in the areas indicated as subject to wave action (e.g., Zone AE). Therefore, no significant wave action is

anticipated during the 100-year flood and no significant hydrodynamic forces are expected. The base flood elevation for the site is 12 feet (NGVD).

1.1.5.2 *Geology and Hydrogeology*

Local Geology

Investigations have indicated the presence of five lithologic units comprising two water-bearing zones beneath the site as summarized in Table 1.

The surface geological materials of the site are made up of a varying mixture of shells and organic matter in a clayey silt to fine sand matrix. Beneath this is a layer of clayey silt to silty clay and a fine to medium grained sand, which varies in thickness between 15 to 20 feet. This layer is characterized by thin intermittent layers of clay and organic matter. The organic matter is composed of varying amounts of decaying plant and wood matter. These two layers comprise the upper water-bearing zone.

Beneath the interval of 15 to 20 feet the fine to medium sands grade into a medium to coarse grained, gray to brown sand. This sand is laterally extensive throughout the site and ranges in thickness from 20 to 30 feet. Below a depth of approximately 50 feet, the sand grades into a coarser sand with layers of pebbles and gravel lenses of varying thickness. Thin clay lenses are also found intermittently within the coarser sands. The coarser sand ranges in thickness from 40 to 50 feet. The gradational sands are presumed to represent the lower water-bearing zone.

Immediately below the lower water-bearing zone is a dark gray clay of probable Miocene Era. The Miocene is recognized as a pervasive hydrogeological unit throughout the Mobile area and the Gulf Coast region as a whole. The site investigation well logs report a stiff, gray to green clay that was reached at depths ranging from 91 to 105 feet below ground surface (bgs) (elevations ranging from -83.5 ft to -98 ft NGVD). Several borings were intentionally drilled into or through the clay layer as part of the site investigation work. One of these borings was drilled in April 1992 to establish a deep well (8-DK) that was screened below the deep clay layer. The deep clay is underlain by a medium to coarse-grained sand.

Results from installation of deep borings penetrating the Miocene clay unit indicated a thickness range for the unit of 2 to 19 ft. Generally, the surface of the Miocene clay dips gently to the west-southwest with an average dip of 0.5° SW.

A series of geologic cross sections are presented in the Phase I and Phase II RFI Reports. Significant changes were noted in east-west transects across the AWTC site. Clay layers are present in the surface and intermediate zones on the western end and to some extent on the eastern end of the site. However, the clay layers are largely absent from the central area of the site. The clay layers function as aquitards and significantly influence the

migration of site contaminants and particularly DNAPL. This distribution of clay layers is an important site characteristic and is a critical component in the site conceptual model.

Local Hydrogeology

Site hydrogeology has been characterized through the installation of over 65 monitoring wells and numerous investigation soil borings. Figure 4 displays the locations of the groundwater monitoring and DNAPL recovery wells. The aquifer at the site is composed of two hydraulically inter-connected water-bearing zones (e.g., the upper and the lower) and extends from the ground surface to the top of the Miocene clay layer. Groundwater is present under unconfined conditions in the upper water-bearing zone (10 to 15 feet-bgs) and under semi-confined conditions in the lower zones. The upper zone beneath the facility, also called the shallow zone, is comprised of a mixture of silt, clay, and fine-grained sand. This zone also contains discontinuous clay lenses and varying amounts of organic matter. For investigative purposes it has been convenient to describe the lower water-bearing zone as consisting of two additional sub-zones, the intermediate and the deep. The intermediate zone consists of fine to medium-grained sands. These sands grade to medium to coarse-grained in the deep zone.

The Miocene clay lies beneath the lower water-bearing zone at an approximate depth of 90 to 100 feet bgs. This dark gray clay comprises the lower confining layer beneath the site. The permeability of this clay is in the range of 1.0×10^{-8} cm/sec and, therefore, functions as an impediment to the downward vertical migration of contaminants. Groundwater quality data from well 8-DK, which is screened below the Miocene clay layer, indicate no measurable levels of PAHs or acid extractable compounds.

Previous investigations have indicated a significant year-to-year variation in the pattern and direction of groundwater flow within the shallow zone with no consistent and discernable trend. This is believed to be due to the discontinuous nature of the shallow deposits that result in materials of varying hydraulic conductivity and interconnection. Hydraulic gradients for the shallow zone generally range from 0.00096 to 0.0076. However a significant and consistent feature of the shallow zone is the groundwater mounding that occurs along the northern boundary of the site (Figure 5). This mounding is caused by rainfall detention and subsequent infiltration within the tank berms on the Star property. This mounding is expected to attenuate when the tanks and containment structures are demolished for site redevelopment. Currently, the upper range of recorded groundwater elevations is a constraint on the elevations of the DNAPL recovery well vaults.

Within the intermediate zone groundwater flow is generally to the east towards the Mobile River (Figure 6) with hydraulic gradients ranging between 0.00025 and 0.00065. Flow in the deep zone is consistent with the intermediate zone (Figure 7) with hydraulic gradients ranging between 0.0002 and 0.0009.

Small vertical hydraulic gradients between the three zones indicate a consistent, though minor, downward flow.

Tidal influences from the Mobile River have been consistently observed in the intermediate and deep zones but not to a significant extent in the shallow zone. Although no flow reversal has been observed, decreases in hydraulic gradients within the intermediate and deep zones occur during high tides. As would be expected, the greatest tidal influence is observed in wells closest to the river.

Local Hydraulic Properties

Hydraulic Conductivity

Previous hydrogeological investigations have determined the hydraulic conductivity of the shallow, intermediate, and deep groundwater zones at various monitoring well and soil boring locations. K-values ranged from 8.8×10^{-5} cm/sec to 4.0×10^{-3} cm/sec in the shallow zone; 6.1×10^{-4} cm/sec to 1.0×10^{-2} cm/sec in the intermediate zone; and 1.3×10^{-3} cm/sec to 1.3×10^{-2} cm/sec in the deep zone.

Laboratory analyses of a relatively undisturbed (Shelby tube) sample from the Miocene clay indicated an index of plasticity of 34 and a vertical hydraulic conductivity of 7.3×10^{-9} cm/s. This sample was collected during the installation of well 8-DK where the clay layer was found to be approximately 19 ft thick.

Groundwater Velocity

Estimated horizontal groundwater velocities ranged from 0.003 to 0.11 ft/day (1.1 to 40 ft/yr) in the intermediate zone, and 0.004 to 0.060 ft/day (1.5 to 22 ft/yr) in the deep zone. These estimates are based upon the range of reported gradients across the site.

The significant impact of localized soil and hydraulic conditions severely limit the accuracy and applicability of calculated shallow zone velocities. However the comparable range in groundwater velocities for the shallow zone has been estimated to range between 0.0013 to 0.059 ft/day.

These calculations were discussed in the Phase II RFI report and represent an estimate of the rate of groundwater movement. The migration rate of any dissolved-phase, site-related constituents in groundwater would probably be less than these values due to sorption/desorption phenomena and biological or chemical degradation. The variability of the groundwater velocities may, in part, be attributed to the effect of the tides on the hydraulic gradient. Slight differences in the depositional environment in which each well is screened (e.g., clay lenses or stringers) may also contribute to differences in calculated velocities for different areas of the site.

1.1.5.3 *Groundwater & Drinking Water Supplies*

Large quantities of groundwater are available from permeable sands throughout Mobile County. The principal water bearing sands in Mobile County are in the Miocene series and in the Citronelle Formation of the Pliocene Series. The sands are referred to collectively as the Miocene-Pliocene aquifer. This aquifer generally will yield 1 mgd per well, and large wells tapping the aquifer will range in depth from 150 feet to 800 feet. This aquifer can be used for public water supply and industrial purposes in Mobile County. In addition, alluvium and low terrace deposits potentially yield 0.5 to 1.0 million gallons per day (mgd) per well. In some areas of Mobile County, wells tapping these deposits yield large supplies where saturated sands are of sufficient thickness.

A 1984 RCRA 3012 Site Inspection Report presented the results of a survey of non-community drinking water wells in the Mobile area and noted that there were no wells within two miles of the AWTC site. City water is available at and throughout the area surrounding the AWTC site. The water source for the public water system in the City of Mobile is Big Creek Lake Reservoir that is located more than 15 miles west (i.e., upgradient) of the AWTC site. The groundwater zones above the Miocene clay formation (i.e., the shallow, intermediate and deep zones) are not utilized as water supplies.

The quality of groundwater in the Miocene-Pliocene ranges from very poor to excellent. The most objectionable constituents are chlorides and iron. Chlorides can occur in high concentrations as a result of salt-water intrusion, which is especially significant in the floodplain of the Mobile River. Here, saltwater intrusion occurs as a result of surface water in the river mixing with shallow groundwater, thus degrading the quality of groundwater in the shallow aquifers near the river. In areas adjacent to the Mobile River and Mobile Bay, groundwater may have a dissolved solids content that exceeds 1,000 mg/l, a sulfurous odor, and a chloride content that exceeds 500 mg/l. Water has a salty taste at 100 mg/l and the functional limit for water uses including irrigation is 250 mg/l.

Measurements of electrical conductivity provide a good indicator of the relative presence of chloride, other ions and total dissolved solids in groundwater. Conductivity values for the AWTC site shallow and intermediate depth wells range generally from 200 to 800 umhos/cm. However some wells at these depths have significantly higher conductivities in the 1,100 to 3,150 umhos/cm range. Conductivity values for the deep wells vary considerably, with all wells exhibiting a specific conductance greater than 1,000 umhos/cm. Significantly higher values exist at specific deep wells with conductivities up to 21,800 umhos/cm. These values are consistent with the observed tidal influences in the deep and intermediate zones. Potable water is generally in the range of 50 to 1,500 umhos/cm. The shallow, intermediate and deep groundwater zones at the AWTC site are not utilized as water supplies and from a practical standpoint are not useable or viable water sources.

1.1.5.4 *Ecological Setting*

Most of the natural habitat in the area of the AWTC site (including the drainage ways, SWMU 6 and the Mobile River) has been disturbed as a result of heavy industrial operations since the turn of the century. When the AWTC site was active, there was essentially no site vegetation due to the nature of the operations (i.e., wood treating and product storage). Currently, there are scattered vegetative areas outside the AWTC site and along the SWMU 6 drainage way. However, these vegetated areas do not represent substantial habitat to support viable wildlife populations. Although the Game and Fish Division of the Alabama Department of Conservation reports that eight endangered species and seven threatened species are found in Mobile County, none of these species would be expected to be found at the AWTC site. Corrective measures and subsequent redevelopment of the AWTC site will involve the removal of trees and shrubs. Thus, this area has been and will continue to be significantly developed to meet the mission of ASPA. In summary, the area is highly industrialized which has resulted in a lack of significant habitat for ecological receptors.

The Mobile River and Mobile Bay represent ecosystems of significance for wildlife. Environmental stresses from growth and development within and around the Mobile Bay estuary have impacted the system. Mobile Bay has been evaluated as part of an environmental monitoring and assessment program by ADEM (1998) and also the National Estuary Program. The quality of sediment and surface water within the Mobile Bay has been evaluated as part of an environmental monitoring and assessment program by ADEM (1998) and also the National Estuary Program, and the quality of sediment and surface water within the northwest region of Mobile Bay is reported to be in good condition (ADEM, 1998).

1.1.6 Choctaw Point Redevelopment

ASPA is implementing plans to develop the entire Choctaw Point area, including the AWTC site, as a container port facility with an associated intermodal terminal and value-added distribution facilities. The conceptual design proposes that new berths be constructed that would extend the existing Choctaw Point shoreline 200-800 feet towards the Mobile River Channel. The container port would cover an area from the Mobile River on the east to Ezra Trice Boulevard on the west and from McDuffie Island on the south to the Mobile River Terminal on the north.

The corrective measures have been primarily designed to meet the required regulatory objectives in the most efficient manner possible. However, the compatibility of the corrective measures with the proposed redevelopment has been a secondary design consideration. Because the container port design is still in the conceptual phase, the corrective measures can not be fully integrated in the redevelopment. The container port design will incorporate the requirements of the corrective measures but may require that some systems be dismantled and repositioned (e.g., the DNAPL recovery system) or protected and modified (i.e., groundwater monitoring wells) during port construction. As

a result, the container port design may require modifications to the post-closure permit. In general, the container port will be developed above the surface elevation of the AWTC site corrective measures. For example, the CMS selected a soil cover for the SWMU 5 area. The minimum elevation of this cover is the 100-year floodplain elevation of 12 feet. The proposed finished asphalt yard elevation for the container terminal is between 16 and 12 feet. The port construction is anticipated to further ensure the effectiveness of some corrective measures and eliminate the inspection and operation and maintenance requirements (e.g., vegetative cover maintenance) of the corrective action.

1.2 CONCEPTUAL MODEL OF CONTAMINANT MIGRATION

1.2.1 Site Contamination & Risk Assessment

A series of site characterization investigations, including the RFI, indicate widespread contamination of the soils, sediments and groundwater at the AWTC site associated with past wood treating operations. Soil and sediment contamination can be generally attributed to specific SWMUs or operations. However, the groundwater contamination in all three zones reflects the contribution of multiple sources with overlapping plumes with multiple contaminants. While significant removal actions have been performed at the site, the near-surface soils and sediments still constitute a continuing contamination source. More significantly, the DNAPL that is perched, pooled and dispersed throughout the 100-foot interval from the ground surface to the top of the Miocene clay formation constitutes a major and ongoing contamination source. The presence and distribution of the creosote DNAPL can significantly impact the technical impracticability of groundwater restoration (USEPA 1993; USEPA 1996) and did significantly impact the selection of corrective measures in the CMS phase. The following sections briefly summarize the site contamination information for soil, groundwater and DNAPL sources.

A risk assessment was performed as part of the RFI in order to evaluate the relative significance of the demonstrated contamination and assist in the assessment of required future actions. These future actions included the needs assessment for a corrective measures study, the establishment of cleanup goals and the development of alternative concentration limits (ACLs) for the groundwater protection standards established in the post-closure permit. The risk assessment included both human health and ecological considerations.

The ecological risk assessment evaluated the significance of the contamination to the soils, sediments, surface waters and groundwater on and around the AWTC site. This included systems in the receiving streams of Tennessee Branch and the Mobile River. In every case, the impacts caused by this contamination to the ecological receptors were found to be insignificant. None of the exposure pathways justified the need for corrective measures.

The human risk assessment did indicate significant impacts from different media under different exposure scenarios. Site-specific target levels (SSTLs) were developed in

response to these risk estimates. The SSTLs represent cleanup targets or goals in terms of contaminant concentrations for the AWTC site. These targets could be reached either through active remediation by treatment and removal or through institutional and engineering controls.

1.2.1.1 *Soil Contamination*

The field investigations of the Phase I and Phase II RFI included the collection and analysis of soil samples from the listed SWMUs. The sampling locations were selected to complement the existing soil samples collected during previous investigations. Soil samples from the SWMU 4, SWMU 5 and SWMU 8 areas indicate that soils are impacted by PAHs, acid extractable organic compounds (notably, pentachlorophenol and 2,4-dimethylphenol), and several dioxin and furan isomers. There is substantial variation in the concentrations and distribution of soil contamination across the site with the highest concentrations generally in the SWMU 4 area.

Sediment contamination was assessed by evaluating data from the Phase I report, the Phase II investigations and previous investigations. Sediments in both the western and eastern forks of the drainage ditch (SWMU 6) appear to have been impacted by the direct discharge of preservative wastewaters from the process area. The northern portion of the drainage ditch demonstrates much lower impacts with PAHs being notably absent. Sediments in the western fork of SWMU 6 (i.e., west of Ezra Trice Boulevard) exhibited elevated concentrations of PAHs throughout the course of the ditch to its confluence with Tennessee Branch. Samples collected from Tennessee Branch indicate the impact of significant sources of contamination upstream of the SWMU 6 confluence. The presence of free petroleum product in the western branch of SWMU 6 suggests that the ditch has also been impacted by the adjacent petroleum storage facility.

The Phase I investigation revealed elevated levels of oil and grease throughout the length of the drainage ditch on the eastern side of Ezra Trice Boulevard. Subsequent to the Phase I and as part of a proposed capital development project data indicated that contamination levels significantly declined over the five year period in the lower portion of the eastern fork. However, contamination levels in SWMU 6 remain very high in the primary channel from the closed surface impoundments on the east to Ezra Trice Boulevard on the west.

The human health risk assessment for the soil conditions at the AWTC site indicated a significant potential risk to both construction & facility workers. Either treatment/removal or institutional controls are options that could largely mitigate these risks. Institutional controls include items related to site development for future use (e.g., site paving or soil cover) and restrictions on below ground construction activities. Primary soil contaminants of concern for the future construction worker scenario at SWMU 4 and SWMU 5 are benzo(a)pyrene, dibenzo(a,h)anthracene, benz(a)anthracene, benzo(b)-fluoranthene, indeno(1,2,3-cd)pyrene, 1,2,3,6,7,8-hexachlorodibenzo-p-dioxin, 1-methylnaphthalene and naphthalene. The soil constituents of concern for the future facility worker are similar

for SWMU 8 and include a larger list of contaminants for the combined assessment of SWMU 4 and SWMU 5.

The human health risk assessment of the sediments in SWMU 6 indicates a significant risk to construction workers in specific areas of the drainage ditch. The primary contaminants or constituents of concern again include benzo(a)pyrene, dibenzo(a,h)anthracene, benz(a)anthracene, benzo(b)-fluoranthene, indeno(1,2,3-cd)pyrene, naphthalene and 1-methylnaphthalene.

1.2.1.2 *Groundwater Contamination*

Groundwater quality in each SWMU area was assessed by evaluating historical data that was generated from monitoring activities. Figures 8, 9 and 10 summarize groundwater contaminant concentrations (µg/l) for selected parameters in the shallow, intermediate and deep zones per the Final RFI Report, June 2000. Figures 5, 6 and 7 are the corresponding figures for the potentiometric elevations in each zone and the implied groundwater flow direction (e.g., generally towards the Mobile River). The analytical data indicate that groundwater in the vicinity of SWMU 4 has been impacted by former wood treating operations. Groundwater beneath SWMU 5 has also been impacted by former site operations, as indicated by the presence of polynuclear aromatic hydrocarbons (PAHs) in samples from monitoring wells located within the boundaries of the SWMU.

Groundwater beneath SWMU 6 has been impacted by the direct discharge of preservative wastewaters from the process area and from overflow from the surface impoundment. This contamination extends through portions of both forks of the ditch. Considering the direction of groundwater flow, it is unlikely that PAHs in groundwater could have migrated from the other SWMUs to SWMU 6. PAHs were also detected in groundwater beneath SWMU 8, although these constituents may be attributable, in whole or part, to an upgradient source.

Although the occurrence and extent of groundwater contaminants was determined for each SWMU area, distinct groundwater contaminant plumes cannot be defined for these SWMUs. Rather, groundwater contamination in some of these areas has resulted from multiple sources with multiple contaminants and the contaminant plumes from the different source areas have co-mingled.

The groundwater portion of the human health risk assessment indicated that there was a significant risk under the construction worker scenario in the shallow zone. This was primarily based on exposure during below ground construction activities to groundwater containing benzo(a)pyrene, dibenzo(a,h)anthracene, benzo(b)fluoranthene, indeno-(1,2,3-cd)pyrene, benz(a)anthracene, benzo(k)fluoranthene, bis(2-ethylhexyl)phthalate, naphthalene, benzene, di-n-octylphthalate and dibenzofuran. This risk could be mitigated through groundwater treatment or the use of personal protective equipment and the institutional control of below surface construction activities. The lack of complete

exposure routes for the intermediate and deep groundwater zones precludes significant risks, including under the construction worker scenario.

The human health risk assessment demonstrated that there was not a complete exposure route for consumption of groundwater at or downgradient of the AWTC site. The groundwater is currently not used as a drinking water source. In fact, the uppermost aquifer, affected by the site, cannot be used as a potable water supply due to adverse natural water quality, specifically high Total Dissolved Solids, exceeding Alabama MCLs. The high level of Total Dissolved Solids in the aquifer is a natural condition that is unrelated to waste management practices at the site. The ecological risk assessment demonstrated that there was also no significant impact to the biological communities of the Mobile River from the groundwater.

1.2.1.3 *DNAPL Source Material*

DNAPL has been documented on a number of the soil borehole and well installation logs at the AWTC site. In addition, fourteen of the fifty-six groundwater monitoring wells have demonstrated apparent DNAPL thicknesses ranging from trace amounts to over six feet. DNAPL accumulations did not occur in one common area of the site, nor was the DNAPL present at one common depth interval. DNAPL was present in six of the eighteen shallow (S) monitoring wells (33.3%), four of the twenty-six intermediate (I) wells (15.4%), and three of the sixteen deep (D and DK) monitoring wells (18.8%). In general, DNAPL was present in some of the monitoring wells in the former process area (SWMU 4) and around the drainage ditch area (SWMU 6). The horizontal and vertical extent and the distribution of the DNAPL were specifically addressed in the Phase II RFI through cone penetrometer testing and borehole investigations. In addition, specific DNAPL investigations have been made of the SWMU 4, SWMU 8 and SWMU 6 areas.

Two DNAPL recovery programs are currently in operation at the AWTC site. The monitoring well DNAPL recovery system includes recovery actions at 14 monitoring wells and one fixed-base recovery well that have demonstrated measurable amounts of DNAPL. The total volume of DNAPL recovered from these fifteen wells from July 1998 through February 2002 was approximately 115 gallons. The second system currently consists of three fixed-base wells (RW-3, RW-4, and RW-5) and one converted monitoring well (17-S). These four wells have recovered approximately 9,500 gallons of DNAPL and are collecting at an annualized rate of approximately 3,000 gallons.

The consolidated DNAPL data and mechanisms of DNAPL transport have been evaluated to postulate a DNAPL conceptual site model.

1.2.2 DNAPL Conceptual Site Model

The DNAPL conceptual site model was developed in order to explain or predict the presence and movement of DNAPL at the AWTC site. The model is based on a

considerable volume of data from past site investigations that were performed over several years and by several parties at the AWTC site. Sources of this information include logs from well installations, investigation boreholes, cone penetrometer tests and specific investigations intended to define the horizontal and vertical extent of DNAPL plumes. Additional information was provided by the seismic study defining the deep Miocene confining layer of Allison and Isphording (1994). The following introductory observations can be made concerning DNAPL at the AWTC site:

- DNAPL contamination is widespread;
- DNAPL is generally associated with specific SWMUs;
- DNAPL is not restricted to specific, below ground elevations across the site;
- DNAPL distribution is significantly influenced by low permeability clay layers and strata with high organic content.
- DNAPL, including residual deposits, has a significant influence on groundwater quality.

The DNAPL conceptual site model integrates information on the transport of immiscible fluids and DNAPL through porous media, site-specific information on geology and lithology, and the information on potential sources of DNAPL based on past wood treating operations and product/waste management practices.

Information from site investigations combined with the DNAPL transport mechanisms indicates that there are three primary and distinctly different areas of DNAPL accumulation and migration. Figure 11 displays these three areas of DNAPL accumulation in plan view.

1.2.2.1 *Western Site Area*

An extensive and continuous upper clay layer varying in both thickness and in depth is present in the western area of the site. This discernable layer ranges in thickness from approximately one foot to over ten feet in some areas. The clay thins and appears to pinch out east of the closed surface impoundments (SWMUs 2 & 7). The upper clay layer is generally within ten to twenty feet of the ground surface with a DNAPL plume perched on the clay in many parts of the western site area. DNAPL has also been found perched on intermediate layers with clay or silt components below the shallow clay layer, which may not be continuous over the entire western area.

Phase II RFI investigations indicated that DNAPL has evidently not migrated to the top of the Miocene clay unit in the western site area, with the exception of the DNAPL occurrence at the edge of the former surface impoundment (SWMU 2).

The conceptual site model for the western site area, where DNAPL is perched on shallow or intermediate clay and silt lenses, corresponds very well with the observed pattern of DNAPL in the monitoring wells. The source of the DNAPL appears to be the drainage

ditch, SWMU 6. Based on the review of historical aerial photos, it appears a former pool or depression area existed along SWMU 6 in this western site area. This area may have served as an impoundment and accumulated significant quantities of site contaminants and product.

1.2.2.2 *Central Site Area*

The near-surface clay observed in the western area of the site appears to pinch out towards the middle of the AWTC site. Several geologic logs in this central area of the AWTC site indicate thin or apparently discontinuous clay lenses. However, the lack of clay is most notable in the former process area (SWMU 4) and the DNAPL surveys and recovery efforts indicate a significant DNAPL plume at approximately the 100-foot below ground surface level. It appears that the lack of clay layers and lenses has allowed the DNAPL to migrate down to the top of the Miocene clay. While a substantial amount of DNAPL has pooled on top of the Miocene clay layer in this area, there are also substantial quantities of perched or residual DNAPL throughout the water column.

1.2.2.3 *Eastern Site Area*

Intermittent clay lenses are again found in the eastern portion of the site along with clayey sands and silty sands. While there is not evidence of a thick, continuous clay layer as in the western site area, the eastern area appears to have sufficient clay lenses to impede the downward migration of the DNAPL present at shallow depths.

Based on historical operations, it is expected that the total amount of DNAPL would be less in the Former Creosote Unloading Area (SWMU 8) than in the Former Plant Operations and Storage Area (SWMU 4). If the volumes are small enough, the DNAPL may be absorbed in a state of immobile residual saturation with no resultant vertical migration occurring. However, if migration is still underway then the direction of migration would be controlled by the local slope of the clay or silt lens. This direction could also be significantly impacted by past construction and fill activities and near-surface facility structures (e.g., footings and foundations). The discontinuous nature of the lenses makes it impossible to accurately predict the direction of migration. An interim removal action of contaminated soil and debris was conducted in the SWMU 8 area and approximately 544 tons of contaminated soil and debris were removed for off-site disposal.

1.2.3 Groundwater Conceptual Site Model

The groundwater conceptual site model was developed to explain the movement of groundwater at the AWTC site and predict the migration or transport of dissolved groundwater contaminants. Groundwater data has been collected for over 15 years at the AWTC site and has yielded a remarkably consistent view of groundwater flow and contamination. This view included the following observations:

- Groundwater contamination is widespread,
- Groundwater contamination is generally associated with DNAPL sources,
- Groundwater contamination exists within all three groundwater zones (i.e., shallow, intermediate and deep),
- Horizontal or lateral flow is much greater than vertical flow, and
- Groundwater flow is predominantly towards the Mobile River and Bay.

The groundwater conceptual site model is based on the site-specific soil and hydrogeologic date and was used in the demonstration of alternate concentration limits in the Corrective Measures Study.

1.2.3.1 *Shallow Zone*

Groundwater data for the shallow zone displays the most year-to-year variability. The variation of rainfall events and subsequent infiltration account for part of this variability. However, the influence of local drainage features (i.e., ditches and containment areas) and local impediments to infiltration (i.e., clay lenses or paved areas) are significant contributing factors. The most notable example is the significant groundwater mounding from the Star property secondary containment along the northern property boundary (Figure 5). Even with this significant variation, the predominant groundwater flow direction is towards the Mobile River.

1.2.3.2 *Intermediate Zone*

The predominant direct of groundwater flow in the intermediate zone is to the east and southeast. The hydraulic conductivity and horizontal groundwater velocity are greater in the intermediate than the shallow zone and a tidal influence exists. The difference in the horizontal and vertical groundwater velocity is significant in the intermediate zone and indicates that the flow of groundwater from off-site through the dispersed DNAPL is a more significant contributor of groundwater contamination than surface infiltration through contaminated surficial soils. Removal or control of surficial sources with the simultaneous control of the at-depth DNAPL sources would not achieve groundwater remediation.

1.2.3.3 *Deep Zone*

The hydraulic gradient and conductivity of the deep zone is greater and the resulting horizontal velocities are as great as or greater than in the intermediate or shallow zones. The impact of contaminated surface soils is further attenuated and the primary source of contamination appears to be the perched and residual DNAPL contamination throughout the 100 foot column above the Miocene clay layer. Again, control of surface sources would have minimal impact on groundwater contamination.

1.3 CORRECTIVE MEASURES OBJECTIVES

1.3.1 Objective Overview

The primary objective of any remedial strategy is overall protection of human health and the environment. Ancillary to that primary objective is the attainment of media cleanup standards and the control of contaminant sources. Specific objectives must consider regulatory requirements and guidance. This section presents the corrective measures objectives for groundwater, soil and DNAPL source control as developed in the Corrective Measures Study. The groundwater objectives include the development of alternative concentration limits (ACLs) based on site-specific factors. DNAPL source control objectives are significantly impacted by both site and contaminant characteristics and include considerations of the technical limitations of source control at the AWTC site.

1.3.1.1 *Groundwater Corrective Measures Objectives*

RCRA groundwater policy discusses groundwater cleanup objectives as consisting of three components: groundwater cleanup levels, the point of compliance, and the remediation time frame. These specific components are developed in the CMS.

One corrective measure objective for groundwater is to achieve the RCRA Groundwater Protection Standard as specified in 40 CFR 264.92 through 264.96. Provisions of the RCRA Groundwater Protection Standard include:

- Concentration limits must be met at the Point of Compliance for all Appendix VIII constituents that have been detected in groundwater in the uppermost aquifer underlying a regulated unit, and that are reasonably expected to be in or derived from waste contained in a regulated unit.
- The Point of Compliance is at the downgradient edge of the waste management area, which includes an area circumscribing all SWMUs at the facility.
- Concentration limits at the Point of Compliance must not exceed:
    a) Background
    b) Maximum Contaminant Limits (MCLs) established under the Safe Drinking Water Act, or
    c) An Alternate Concentration Limit (ACL).

ACLs may be established for a constituent if it is determined that the constituent will not pose a substantial present or potential hazard to human health or the environment as long as the alternate concentration limit is not exceeded. This determination must consider potential adverse effects on groundwater and surface water quality. EPA has published guidance for documenting that ACLs are protective of human health and the environment. ACLs were established in the CMS according to appropriate regulatory and USEPA guidance and received approval by ADEM. The ACLs will be incorporated into the revised post-closure permit as groundwater protection standards.

Facility-specific corrective measures objectives have been developed for the AWTC site and include three specific components:

- Groundwater cleanup levels,
- Point of compliance, and
- Remediation time frames.

EPA policy states that short-term protectiveness goals and environmental indicators can be achieved when the contaminated groundwater discharges to surface water (EPA 1999a). Guidance further states that final groundwater remediation goals should use three threshold criteria:

- Protect human health and the environment;
- Achieve media cleanup objectives appropriate to current and reasonably expected land uses; and,
- Remediate the source of releases, where practicable, so as to eliminate or reduce further releases of hazardous wastes or hazardous constituents that may pose a threat to human health and the environment.

Cleanup Levels

Groundwater cleanup levels are facility-specific chemical concentrations in groundwater that a final remedy should achieve for the remedy to be considered complete. ACLs are generally developed for regulated units (e.g., the closed surface impoundments) and can serve as groundwater cleanup levels for SWMUs and AOCs. Groundwater cleanup levels for the AWTC site are the ACLs summarized in Table 2.

These cleanup levels are protective of human health and the environment. The groundwater at and down gradient of the AWTC site is not a current or reasonably expected future source of drinking water. The ACLs are protective of the use designations for Mobile River and Bay and are protective of ecological systems. The ACLs, as approved by ADEM will be incorporated into the permit, change the groundwater protection standard under ADEM administrative code (i.e., rule) 335-14-5-.06(3), (4) and (5).

Point of Compliance

The point of compliance (POC) represents the location where groundwater cleanup levels should be achieved. The POC is defined in rule 335-14-5.06(6) and 40 CFR 264.95 as the vertical surface at the down gradient limit of the waste management area that extends down into the uppermost aquifer. The waste management area is described by an imaginary line circumscribing all the SWMUs on the facility. At the AWTC site this imaginary line is approximately equivalent to the eastern and southern site boundaries because virtually the entire site is within one or more regulated units or SWMUs. Because the groundwater plume is in confluence with the Mobile River at the facility boundary, the point of exposure (POE) for the ACL demonstration is equivalent to the POC. ADEM has established the following list of sixteen compliance/boundary wells for the AWTC site (Figure 4):

7-S, 8-S, 15-S, 32-S
7-IR, 8-I, 9-I, 15-I, 16-I, 31-I, 32-I
7-D, 8-D, 15-D, 16-D, 31-D

Remediation Time Frame

Remediation time frames include both the time it would take to implement the remedy and the estimated time to achieve the groundwater cleanup levels at the point of compliance. Because current groundwater concentrations are within the limits of the groundwater cleanup levels as defined by the ACLs, a remediation time frame is not necessary.

1.3.1.2 *Soil Corrective Measures Objectives*

Corrective action requirements are based on both regulations and guidance. These two sources functionally determine the soil corrective measures objectives.

Regulations for soil corrective measures are primarily located in ADEM rule 335-14-5-06, Releases from Solid Waste Management Units. Subsections 11 and 12 of that rule establish the requirements for the corrective action program and corrective action from solid waste management units. Specifically, rule 335-14-5.06(12)(a) requires that owners or operators must institute corrective action as necessary to protect human health and the environment for all releases of hazardous waste and constituents. The Alabama requirement generally adopts the federal requirements.

In addition, the hazardous waste facility post-closure permit for the AWTC site (permit number: ALD 058 221 326) details the requirements for a Corrective Action Program in Condition II.C.2. and establishes the Corrective Measures Study and Implementation process for SWMUs in Condition III.F. The final approved site remedy (i.e., corrective

measures alternative) must be based on protection of human health and the environment as per specific site conditions, existing regulations and guidance.

The majority of the guidance for corrective measures and actions has been published by EPA. The guidance most often takes the form of proposed rules and advanced notices of proposed rulemaking (ANPR) (e.g., EPA 1990, EPA 1996 and EPA 1999). A central theme of all the guidance is the RCRA mandate of protection of human health and the environment. The specific requirements and guidance have been incorporated into the development of soil corrective measures objectives. The issue of the necessary and appropriate level of protection has been addressed through the site-specific risk assessment.

A site-specific human and ecological risk assessment was performed as part of the Phase II RFI. The full text is included as Volume 4 of that final report (ESE 2000). The risk assessment has been reviewed and approved through ADEM by a third-party reviewer. The site-specific human and ecological risk assessments identified the following significant exposure pathways for the AWTC site:

- Future general construction worker exposure to soil, sediment and shallow groundwater;
- Future general facility worker exposure to soil and dusts as well as indoor vapors associated with affected soil and groundwater site-wide; and,
- Future hypothetical facility worker exposure to groundwater via potable use.

No significant ecological risks were identified by the RA. Groundwater risks were addressed under the groundwater objectives. Based on this assessment of risk and potential exposure pathways corrective measures objectives were developed and recommended.

The overall objective is to limit exposure to contaminated media. The goal, therefore, is to remediate the sources of releases so as to eliminate or reduce further releases of hazardous wastes or hazardous constituents that may pose a threat to human health or the environment.

- Meet SSTLs through treatment, removal or containment;
- Eliminate or reduce releases from the contaminated soil to a protective level;
- Reduce or eliminate exposure to the contaminated soil.

Compliance Area

The SWMUs constitute virtually the entire AWTC site. The compliance area for soil corrective measures objective includes all SWMUs that have had a release.

Remediation Time Frame

Removal actions have been conducted over a period of 14 years. These corrective actions removed the most significantly contaminated soils at the site.

The risk posed by the contaminated soils is directly related to the active use of the site and the potential future exposure of construction and facility workers. The approved corrective measures will virtually eliminate the potential for future exposure to contaminated soils. Through coordination with the redevelopment engineering contractor, contingencies have been incorporated into the corrective measures design that should eliminate the need to excavate/contact contaminated soils.

Active use of the site is conditional upon appropriate remediation. Therefore, one aspect of an acceptable remediation time frame is the schedule for site redevelopment by the Alabama State Port Authority. Agency preference is generally for shorter rather than longer remediation time frames and the redevelopment schedule for the Choctaw Point area reinforces the appropriateness of is perspective.

1.3.1.3 *DNAPL Source Material Objectives*

A source is contaminated material that contributes to the continued migration of contamination to surrounding environmental media. Creosote DNAPL is the primary source at the AWTC site. EPA expects facilities to control or eliminate surface and subsurface sources where feasible and practicable (EPA 1996). Source controls include a range of actions designed to protect human health and the environment including removal (excavation or pumping), containment (barrier walls, low-permeable covers, liners) and treatment in place (bioremediation).

Source control is a fundamental component of most of the EPA guidance on remediation objectives. For example, EPA guidance on final groundwater remediation goals states that three threshold criteria should be used:

- Protect human health and the environment
- Achieve media cleanup objectives appropriate to current and reasonable expected land uses; and,
- Remediate the source of releases so as to eliminate or reduce further releases of hazardous wastes or hazardous constituents that may pose a threat to human health and the environment.

In addition, many groundwater extraction remedies and in situ treatment technologies are effective for plume restoration only when source areas have been contained or removed.

However, the technical impracticability considerations are germane to the issue of DNAPL source control. Technical impracticability (TI) is a regulatory-based determination that

achieving cleanup objectives is not possible from an engineering perspective. Complete source control at the AWTC site is not practicable.

The contaminant conditions that would influence the restoration potential under a TI determination reflect the DNAPL conditions present at the AWTC site, including: large volumes, continual release over a long period, low biotic decay potential, low volatility, high contaminant sorption potential, large volume of contaminated media and deep contamination depth. The facility-specific conditions influencing the restoration potential include the clay conditions in both the western and central site areas and the presence of DNAPL in the subsurface in both free-phase and residual forms. In some areas (e.g., SWMU 4) residual contamination occurs from the ground surface to a depth of 100 feet. Most of the DNAPL in the SWMU 6 area is largely immobile and not amenable to collection or containment measures. The simple presence of DNAPL is not sufficient for a TI determination. However the additional considerations, including the amount, location and specific characteristics of the DNAPL source material, indicate that complete removal or containment is not feasible or practicable.

Cleanup Levels

Given that areas exist at the AWTC where it has been determined that it is not feasible, reasonable or practicable to treat, remove, contain or recover the DNAPL source the target cleanup level is the reduction or elimination of exposure to degree practicable and reasonable.

Compliance Area

DNAPL is present at most SWMUs at the AWTC site; either in residual or free-product form. From an engineering perspective, practicable DNAPL corrective measures can address the concentrated, near-surface contamination in the SWMU 6 channel and the deep DNAPL free-product in SWMU 4.

Remediation Time Frame

Corrective measures can be implemented at both SWMU 6 and SWMU 4 within a short time frame but the remedial action completion schedule will be distinctly different for the two areas. Removal and/or treatment corrective measures for the SWMU 6 surface sources can be implemented and completed over a period of several months. In contrast, while corrective measures have already been implemented for the DNAPL collection efforts at SWMU4 and site-wide, the specific waste characteristics of the DNAPL as well as the hydrogeologic and lithologic features of the AWTC site dictate a much longer completion time frame.

1.4 DESCRIPTION OF CORRECTIVE MEASURES

The Corrective Measures study developed and evaluated alternatives for the remediation of the AWTC site. The Final CMS Report presented those evaluations and recommended corrective measures to ADEM. ADEM selected and approved the final corrective measures. The following sections summarize the selected measures.

1.4.1 SWMU 1 Demolition

SWMU 1 consists of the Wastewater Pretext treatment Plant including four tanks. It is recommended that the four wastewater pretreatment tanks be cleaned, disassembled, and removed from the site. Three of the tanks (T-1, T-2 & T-3) are described in the 1988 RFA as being components of the treatment system for the surface impoundment closure. These tanks are described as upright steel cylinders of approximately 17,000 gallon capacities. The fourth tank (T-4) is of similar construction and 5,000 gallon capacity. The tanks were reportedly cleaned after the impoundment closure and are empty except for apparent rainwater and some residue. The tanks are open to the atmosphere and do not contain significant volumes of waste.

Processes involved in removal of the four wastewater pretreatment tanks include purging the tanks to remove residual hazardous vapors, decontamination by steam cleaning, sludge/solids disposal (as necessary), wastewater and decontamination water disposal, disassembly of the tanks, and proper disposal of the tanks. Additionally, any concrete slabs and other appurtenances associated with SWMU 1 will be properly removed as well including the adjacent shed.

1.4.2 SWMU 6 DNAPL Excavation

The SWMU 6 DNAPL excavation is directed by the DNAPL source removal corrective measures objective. The primary channel of SWMU 6 contains high DNAPL contaminant concentrations at or near the ground surface from the closed surface impoundments to Ezra Trice Boulevard. The excavation will include a 10 foot wide and 5 foot deep cross section along an 800 foot length of channel. Excavated material will be dewatered in temporary sediment drainage beds and then shipped off-site for appropriate treatment and disposal. The excavated channel will be filled to grade with materials meeting the appropriate construction specification.

1.4.3 SWMU 6 Covers

The SWMU 6 areas on both the east and west side of Ezra Trice Boulevard will be covered. A compacted, permeable soil cover has been designed for the eastern area and is primarily designed to meet the corrective measures objective for soil by preventing human contact with contaminated soil. The soil cover will be installed to a minimum elevation of 12 feet, the 100-year flood plain elevation. Side slopes will be constructed at

a 4:1 slope and run-on/runoff will be controlled with a drainage ditch. The SWMU 6 east cover area is approximately 3.2 acres in size. The specified fill will be appropriate to function as sub-grade material for the anticipated Container Port development. The cover will be finished with topsoil and vegetated cover to minimize erosion. It is likely that this area will subsequently be asphalted for the port. This would enhance the cover durability and significantly reduce maintenance costs.

The plans and specifications for the original approved soil cover design for SWMU 6 east as well as subsequent amendments to the original approved soil cover design to accommodate the Container Port development are included in Section 2.0. Subsequent amendments include:

- March to June 2018: A prior amendment to the original approved soil cover design (Backfill and Paving Design Amendment) that included removing and replacing about 255 square feet of the 3.2 acres of SWMU 6 east cover to install radiation portal monitors at the Container Port terminal.

- January 2025: The current amendment to the original approved soil cover design (Inter-Terminal Connector Amendment) includes removing about 6,300 square feet of the 3.2 acres of SWMU 6 east cover to construct a mechanically stabilized earth (MSE) wall system/embankment, supporting the roadway connector project between the Garrows Bend Intermodal Container Transfer Facility (ICTF) to the Container Port terminal.

These amendments to the original approved soil cover design for SWMU 6 east are included as stand-alone documents at the beginning Section 2.0.

The configuration of the SWMU 6 area west of Ezra Trice Boulevard restricts options for extending the side-slopes beyond the footprint of the SWMU area. The railroad to the east, the water main to the south and the triangular of crescent shape limit would require excessively steep slopes to maintain the minimal 12 foot elevation. Therefore, the cover in the SWMU 6 west area will be asphalt. The existing drainage ditch will be filled and run-on/runoff will be controlled with a central culvert for drainage. The SWMU 6 west cover area is approximately 2.3 acres. The SWMU 6 west cover has not been designed to withstand heavy loadings (i.e. parking lots). Long term access restrictions will be in place to prevent unauthorized access to the area. This area should have minimal impact from the container port development.

1.4.4 SWMUs 4, 5 & 8 Soil Cover

A compacted, permeable soil cover supporting a vegetative cover will be utilized in the SWMUs 4, 5, and 8 areas. The purpose is to prevent human contact with the contaminated soil in support of the corrective measures objective for soil. A rip rap shore protection wall will be installed at the existing shoreline to allow the installation of the

cover to the 12 foot elevation. The site will be cleared, grubbed and graded. The existing service road will be closed and an area of approximately 12 acres will be covered with fill. The specified fill will meet the sub-grade requirements for the container port development. The side slopes will extend on to the Star property to the north of the AWTC facility. The cover will be crowned and a drainage ditch will be constructed at the toe of the 4:1 side slopes. The cover will be maintained with vegetated topsoil. Discharge from the drainage ditch will be to both the Mobile River and Ezra Trice Boulevard. This area will subsequently be developed for the Choctaw Point Container Port and will be converted to an asphalt cover. The minimum elevation of 12 feet will be incorporated into the container port design.

1.4.5 DNAPL Recovery Systems

The corrective measures objectives for DNAPL source control will be addressed through the expansion and operation of two existing DNAPL recovery systems.

Recovery Well System

The existing SWMU 4 recovery well system will be doubled in size to six recovery wells. The existing system of three wells will be dismantled, and taken out of operation and protected during the soil cover construction. Well RW-2, which is no longer in operation, will be abandoned under applicable ADEM regulations. After site grading activities, new pipelines will be installed below grade to the six well locations. Once the soil cap is constructed the three new wells will be installed and positive displacement piston pumps will be installed in all six well locations. All six wells will be enclosed in vaults. A new waste water treatment (WWTS)/DNAPL storage tank will be constructed on the adjacent property (former Star Enterprise property). This will likely include some demolition of miscellaneous items such as concrete pads and fencing. The WWTS will include the control equipment for the pumps, primary separation tanks for product recovery, an oil/water separator with a polishing AQAM filter and an effluent holding tank. Treated water will be discharged to the adjacent sanitary sewer manhole.

During the timeframe of the 2024 Post-Closure Permit Renewal Application, Enhanced Fluid Recovery (EFR) was recommended for DNAPL recovery in the Recovery Well System. This included the permanent removal of the aforementioned six piston pumps, which had been non-operational since 2018 (with the exception of RW-6, which was intermittently operational in 2019 though DNAPL recovery was negligible). EFR activities are summarized in Section 2.6.2.6 of the O&M Manual.

Monitoring Well Recovery System

The monitoring well recovery system (MWRS) was established under a Consent Order between ASPA and ADEM. It currently includes twelve converted monitoring wells and one converted DNAPL recovery well. Wells were originally pumped on a weekly basis but extremely low product yields have allowed operation on a semi-annual basis. Upon approval of the CMI Workplan the following monitoring well DNAPL recovery wells will be abandoned: 13-S, 14-S, 14-I, 17-I, 18-S, 22-S, and 27-D. The monitoring well DNAPL recovery wells remaining in operation will include: 4-D, 4-DK, 18-I, 20-I, 21-S, and RW-1.

Well 17-S has been converted from the mobile monitoring well recovery system to a fixed-base operation and would continue in service.

Wells to be closed would be abandoned according to applicable regulations and grouted to the surface. Wells remaining in service would be protected during cover construction, extended as necessary to conform to new cap elevations. Eventually, some of these

wells will be flush mounted in vaults to conform to the container port redevelopment requirements.

1.4.6 Groundwater Monitoring System

There are currently 60 groundwater monitoring wells on the AWTC site of which twelve have been converted to DNAPL recovery wells. During the CMS review and approval process, ADEM and ASPA reached agreement on the number and location of boundary/compliance, effectiveness, deep and background wells for the AWTC site. This agreement will be reflected in the permit renewal. Specifically these wells include:

Background Well:	19-S
Deep Well:	8-DK
Boundary/Compliance Wells:	7-S, 7-IR, 7-D, 8-S, 8-I, 8-D, 9-I, 15-S, 15-I, 15-D, 16-I, 16-D, 31-I, 31-D, 32-S, 32-I
DNAPL Effectiveness Wells:	6-S, 6-I, 11-S, 11-I, 12-I, 13-I, 17-D, 18-D, 21-I, 23-I, 23-D, 25-I, 26-I

The 31 wells listed above will be protected during cover construction, extended as necessary to conform to new cap elevations and ultimately flush mounted for the container port redevelopment.

ASPA will close all other monitoring wells, including: 1-S, 1-I, 1-D, 2-S, 4-S, 4-1, 5-I, 10-I, 10-D, 12-S, 13-D, 19-I, 25-S, 29-I, 30-I, and 30-D.

1.4.7 Management Controls

Management controls will include both engineering and institutional controls. Institutional controls will include a deed notice restricting land use to industrial, prohibiting the use of groundwater as a potable source, and requiring specific actions for any land disturbance activities below the soil covers. The wording of the deed restriction will be submitted to ADEM for approval. ADEM may require that this restriction not only be recorded but that a Consent Order is entered to enforce performance guarantees. During the construction period the contractor will be responsible for ensuring that workers are appropriately trained and have the proper personal protective equipment. Post construction and as part of O&M practices, ASPA will establish operational procedures for worker protection, including training and personal protective equipment requirements associated with routine activities that may involve contact with contaminated soil or groundwater. Physical barriers in the form of fences will be utilized during construction to limit access to the SWMUs. As required post construction fencing and signage will be installed to control access to the SWMU areas. In addition and to minimize the potential for future contact with contaminated subsurface media once the property is redeveloped, ASPA is including provisions for subsurface utility corridors as part of the corrective action construction activities. The locations of the utility corridor(s) are work-in-progress and are

subject to change. Once located and as part of CMI construction activities, the utility corridor(s) will be excavated and backfilled with clean backfill in accordance with engineered specifications. (Note: The utility corridor(s) will be over excavated by two feet along the side and bottom to limit future contractor exposure associated with utility installation.) Following the container port development the entire site will be a restricted access area controlled by port security.

1.5 PROJECT MANAGEMENT

The ASPA Project Manager for the Corrective Measures Implementation Program will be the Environmental Director. The ASPA Engineer will be the Engineering Director.

Actual corrective measures implementation and construction will require the professional services of an experienced environmental remediation and construction contractor. The work to be performed will require HAZWOPER (40-hour) trained crews, a thorough knowledge of RCRA, hazardous waste and ADEM requirements and experience with remedial construction including appropriate personal protective equipment (PPE) requirements.

ASPA has not yet contracted for these professional and construction services. It is likely that a General Contractor will be retained with sub-contractors for specific project components. The Alabama State Port Authority CEO and Director will approve the final contractor following staff evaluation and recommendation. At a minimum, the contractor management team will include the project management positions of a Project Manager, a Site Superintendent, and a Health and Safety Officer.

1.6 DESIGN CRITERIA

The design criteria are specific performance requirements for both the overall corrective measure and for each major component. They are a specific extension of the corrective measures objectives. The following general design criteria were applied to develop the conceptual design:

- Proven technology
- Implementability/constructability
- Reliability
- Durability (service life)
- Cost-effectiveness
- Operational flexibility

In general, the performance criteria for the soil cover systems are to prevent human contact with contaminated soil, prevent erosion of contaminated soil and minimize operation and maintenance requirements. The soil covers are permeable and are not intended to restrict infiltration. The performance criteria for the DNAPL recovery system

are to remove pooled DNAPL in the SWMU 4 area, minimize the cogeneration of wastewater, and produce a decreased lateral footprint of dissolved impacts and a reduction of DNAPL thickness in other monitoring wells (i.e., DNAPL MWRS). The design criteria for the SWMU 6 excavation are the removal and disposal of highly contaminated, near-surface, channel sediments, the collection and disposal of cogenerated wastewater, the stabilization of the channel with fill adequate to support the container port operations, and the prevention of human exposure to the surface contamination in the channel.

1.7 DESIGN BASIS

The design basis presents the process and methods for designing all major components of the corrective measures including the engineering design and calculations for site features that govern the remedy. The basis of design has been developed using data obtained from previous investigations supplemented by additional data collected during the pre-design investigations and analyses performed during preparation of the conceptual design reports. The design basis for each of the corrective measures is presented in Section 2.0 for each of the corrective measures systems.

1.8 WASTE MANAGEMENT PRACTICES

The implementation of the corrective measures will generate both hazardous and non-hazardous wastes. This waste will be directly generated by waste removal actions and indirectly generated through ancillary actions such as decontamination. Waste management will be conducted in conformance with applicable state and federal regulations. Waste management regulatory compliance will be the direct responsibility of the environmental remediation contractor.

1.9 REQUIRED PERMITS

As a department of the State of Alabama, ASPA is exempt from most local permit requirements. Access agreements will not be required for the properties. Storm water, erosion and sedimentation will require management and plans (and are included in the drawings package). Coordination with the railroads and utilities will be necessary. In addition, it is likely that Ezra Trice Boulevard will be closed for a period during the SWMU 6 channel excavation and cover construction. This is a private road, owned by ASPA, and access restrictions can be effectively managed. The following potential permits and clearances may be required during construction of the Corrective Measures:

- Site Access Authorization - Construction personnel will require appropriate clearances to enter the site.

- Storm Water Pollution Prevention Plan, Best Management Practices Plan, Corps. Of Engineers (COE, Mobile District) - Stormwater management, erosion and sedimentation control during construction will likely require construction permits through the COE. These permits identify specific measures that will be

undertaken during construction to mitigate potential adverse impacts to surface waters.

- Storm Water Discharge Permits - Water to be managed from existing drainage channels may require permitting; temporary permits may be required to address intermittent dewatering measures, if required. These permits will likely be addressed and managed in accordance with the COE permits identified above.

- Stormwater Diversion - In the event excess stormwater requires diversion during the construction measures, a temporary permit to construct and operate the diversion measures may be required.

- Utility Permits - Several construction elements will likely require utility-related permits and clearances prior to implementing. These include hot work permits for electrical work and line-breaking / construction permits for tie-in to the local sanitary sewer system.

- Hazardous Waste Transportation Permits - The transportation and disposal of potentially hazardous wastes will require state and federal permits prior initiating work.

- Road Encroachment - No work will be conducted on public roads; however, if these roads are affected during construction measures, a road encroachment permit may be required.

- Traffic Control - No traffic control is anticipated as all site work will be conducted on private AWTC property.

- Wastewater Discharge Permit - Once the SWMU 4 wastewater treatment system is constructed and commissioned, a State Indirect Discharge Permit for discharge of the treated effluent will be required (see Section 1.10 below)

- Spill Prevention Control and Counter Measure Plan (SPCC) – The wastewater treatment system will require a SPCC plan in accordance with Section 112 of the Clean Water Act.

Additional permitting may be identified during construction planning.

1.10 RCRA PERMIT RENEWAL & MODIFICATION

The original RCRA/AHWMMA permit for the AWTC site was issued on September 13, 1991 with an expiration date of September 13, 2001. In March 2001, ASPA submitted a Permit Renewal Application to ADEM. ADEM and ASPA agreed that the best overall approach would be to wait until the CMS and CMI were completed. Therefore, the March 2003 Revised Permit Renewal Application incorporated the corrective measures activities

per the CMS (September 2001) and this CMI Work Plan (February 2003). A renewed permit was issued by ADEM effective August 25, 2003 (2003 Permit).

Two permit modifications were issued prior to the September 30, 2014 permit renewal. Permit Modification 1, effective May 2, 2008, was issued to address changes to the final design of the RCRA concrete cap in place at SWMUs-2 and -7. This permit modification also incorporated changes to the CMIP to address changes in facility use and design associated with development activities to build the container terminal port. These activities included the addition of a roller-compacted concrete cover over a significant footprint of the former process areas of the AWTC facility, and construction of a wharf and sheet pile wall along the frontage of the Mobile River, near SWMU-8. Permit Modification 2, effective September 16, 2011, was issued to address a railroad track realignment in the area of SWMU-6 West, known as the Ezra Trice Bypass Rail Tracks project.

In February 2013, ASPA submitted a Permit Renewal Application to ADEM, which was then revised in October 2013 and July 2014 before the permit was renewed on September 30, 2014. The September 30, 2014 permit was amended effective on August 13, 2018 (Modification 1), August 24, 2018 (Modification 2), and September 25, 2019 (Modification 3). Permit Modification 1 was issued to reflect the addition of two newly acquired parcels associated with the contiguous properties, the addition of detected Appendix IX constituents, revision to the groundwater protection standards for specific constituents based on calculated alternate concentration limits, revision to the Contingency Plan updated to include personnel changes, and revision to groundwater tables to reflect the extension of the monitoring wells (9-I, 16-I, and 16-D) and piezometer (PZ-16-S) located at the MCT. Permit Modification 2 updated facility contact information, corrected grammatical errors/typos, and revised Section 4 of the permit application. Permit Modification 3 was issued to remove a sold parcel of contiguous property and correct minor errors on contiguous property maps. Documentation demonstrating this filing is included in Appendix C.

ASPA submitted a Permit Renewal Application in April 2024 and a revised application in August and September 2024 to address ADEM comments. During this time period, this CMI Work Plan and the associated O&M Manual were also revised, specifically for edits related to the Inter-Terminal Connector construction and EFR activities in the DNAPL RWS.

1.11 LONG-LEAD PROCUREMENT CONSIDERATIONS

There are no long-lead procurement considerations beyond the selection of the environmental remediation contractor. The specified equipment includes standard manufactured units that will be available for delivery in less than eight weeks from date of order.

2.0 PLANS & SPECIFICATIONS

This section of the Final CMI Workplan includes the plans and specifications necessary to construct the corrective measures. This Final CMI Workplan provides a Final design package and includes design plans, specifications, and an Operation and Maintenance manual. The Final CMI Workplan will include final plans and specifications that are sufficient to include in a contract document or bid package.

The plans (Appendix A) are generally organized by design discipline: civil, mechanical, electrical. Plans included in the Final CMI Workplan are:

Number	Plan Title
T1	Title Sheet
T2	Legend and General Notes
C1	Project Overview
C2	Current and Future Land-Use Conditions
C3	SWMU 4, 5, and 8 Existing Conditions
C4	SWMU 4, 5, and 8 Erosion Control Plan
C5	SWMU 4, 5, and 8 Utility Trenches Grading and Staking Plan
C6	SWMU 4, 5, and 8 Grading Plan
C7	SWMU 4, 5, and 8 Staking Plan
C8	SWMU 6 Existing Conditions
C9	SWMU 6 Sediment Excavation and Erosion Control Plan
C10	SWMU 6 Erosion Control Plan
C11	SWMU 6 Grading Plan
C12	SWMU 6 Staking Plan
C13	DNAPL Recovery System Layout
C14	DNAPL Recovery System Details
C15	Erosion and Sediment Control Details (Sheet 1)
C16	Erosion and Sediment Control Details (Sheet 2)
C17	Miscellaneous Details
C18	Well Abandonment and Demolition Plan
C19	Chain Link Fence Details
M1	DNAPL Recovery Well & Equipment Installation
M2	DNAPL Recovery System Flow Diagram
M3	DNAPL Recovery System Process and Instrumentation Diagram
M4	Tank Farm Layout and Cross-Section
E1	Electrical Site Plan
E2	Electrical Control Schematic
E3	Electrical Details
E4	Single Line Diagram

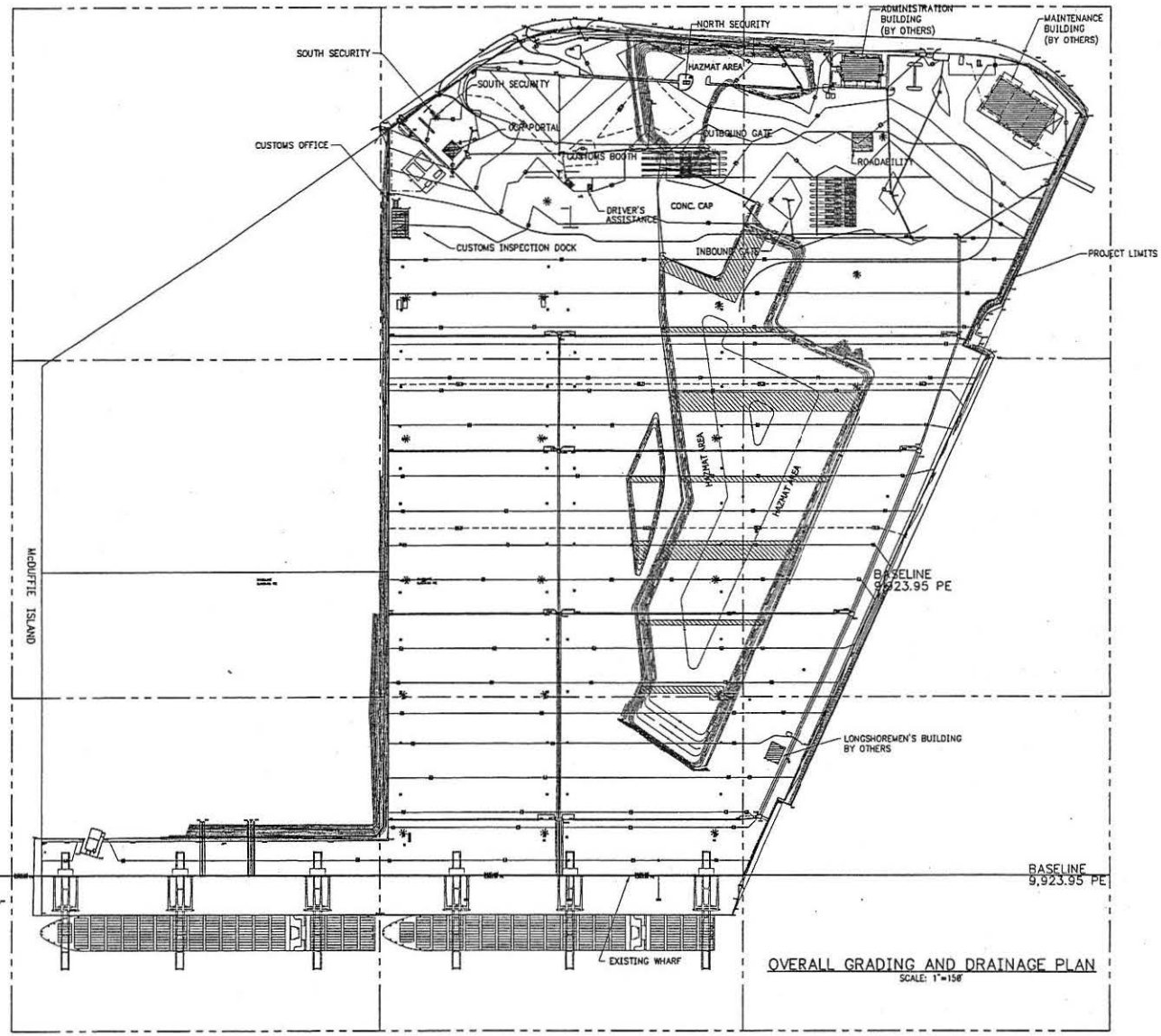
Amendment to AWTC Site CMIP for Fill and Pavement design

This site was filled to an elevation of approximately 12' to 14'. The site work will build on top of this fill and bringing the top of pavement to 12.75 at the wharf and then will undulate from 13' to 16'. The entire area will be paved with roller compacted concrete and asphalt except as shown on the drawings,. The areas not receiving pavement are the out slopes along the north and west side of the site, and the landscape area around the Administration Building. The out slopes will be grassed. The environmental area between the paved area and Ezra Trice Blvd. has a lining under the storm water system so that the contaminants will be protected from storm water runoff.

Drawings are attached showing the placement and thickness of the paved surface. Section A (heavy duty) will consist of 6" of concrete stabilized sand and two lifts of roller compacted concrete. The lifts will be 8" and 7". Section B (medium duty) will consist of 6" of concrete stabilized sand and 8" of roller compacted concrete placed in one lift. The employee parking area will consist of 6" of concrete stabilized sand and 4-1/2" of asphalt. The asphalt will be placed in two lifts. Lift 1 will be 3' of base course and lift 2 will be 1-1/2" of surface course. The base course will conform to ALDOT 429 Improved Bituminous Concrete Base. The surface course will conform to ALDOT 429 Improved Bituminous Concrete wearing surface.

Amendment to AWTC Site CMIP for Modifying the Groundwater Wells and the Monitoring Well DNAPL Recovery Wells

The wells will be cut below the surface. A manhole ring and cover will be placed over the wells to protect them form traffic. There will be a 2" air gap between the well and the manhole cover. See drawing attached.



OVERALL GRADING AND DRAINAGE PLAN
SCALE: 1"=150'

LEGEND

- INDEX CONTOUR
- INTERMEDIATE CONTOUR
- SPECIAL CONTOUR
- RCP/HDPE
- INLET
- JUNCTION BOX
- ELEVATION
- EXISTING MANUAL RECOVERY WELL
- WATER QUALITY UNIT
- TC — TOP OF CASTING
- EXISTING MONITORING WELL
- HIGH MAST LIGHT POLE
- FIRE HYDRANT
- NODE

1"=150' 0 150 300 FT.

GRAPHIC SCALES CHECK BEFORE USE

IF SHEET IS LESS THAN 24" X 36" IT IS A REDUCED PRINT. SCALE ACCORDINGLY

ISSUED FOR CONSTRUCTION
OCTOBER 10, 2007

REVISIONS NO.	DESCRIPTION	DATE	BY	NO.	DESCRIPTION	DATE	BY

HPA

GSE Gulf States Engineering, Growing Solutions, 4110 Merkel Road, Mobile, AL 36618, (251) 460-4648

3/3/08

Mobile Container Terminal

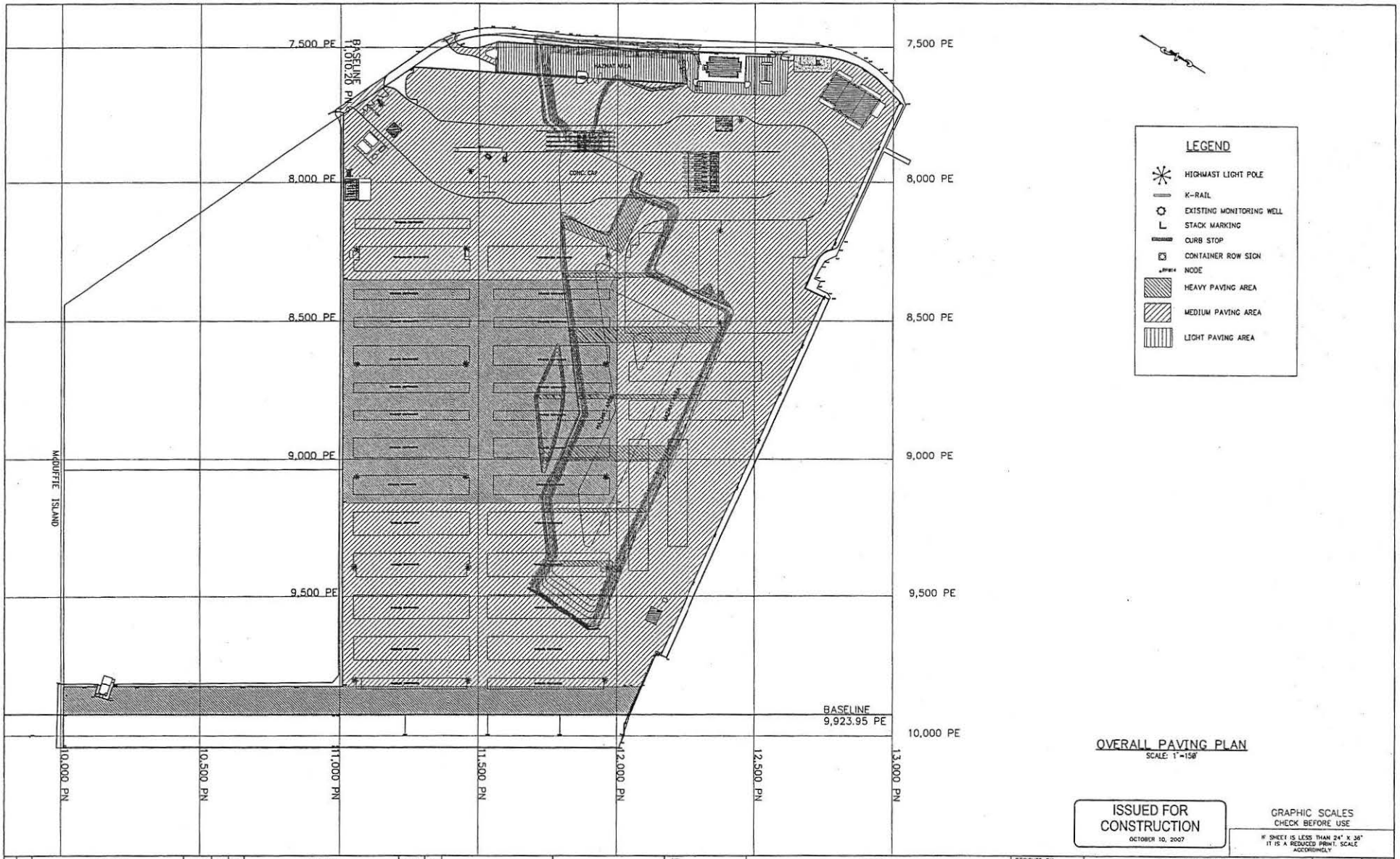
DESIGNED BY	RAA
DRAWN BY	RBB
CHECKED BY	RAA
PROJECT ENGR	RAA

CONTAINER TERMINAL
AT CHOCTAW POINT
PAVEMENT, UTILITIES, AND GATE STRUCTURES

OVERALL GRADING AND DRAINAGE PLAN

SCALE 1"=150'-0"
DATE 10/10/07
REVISION

DRAWING NO.
C-100



OVERALL PAVING PLAN
SCALE: 1"=150'

ISSUED FOR CONSTRUCTION
OCTOBER 10, 2007

GRAPHIC SCALES CHECK BEFORE USE
IF SHEET IS LESS THAN 24" X 36" IT IS A REDUCED PRINT. SCALE ACCORDINGLY

REVISIONS NO.	DESCRIPTION	DATE	BY	NO.	DESCRIPTION	DATE	BY

HPA

GSE Gulf States Engineering Consulting Solutions 4110 Moffett Road Mobile, AL 36618 (334) 460-4040

3/3/08

Mobile Container Terminal

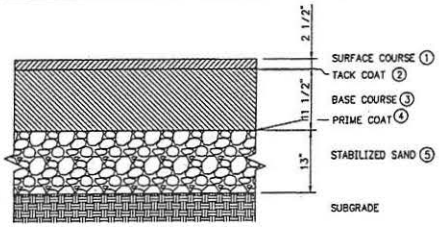
DESIGNED BY	RAA
DRAWN BY	RBD
CHECKED BY	RAA
PROJECT ENGR	RAA

CONTAINER TERMINAL
AT CHOCTAW POINT
PAVEMENT, UTILITIES, AND GATE STRUCTURES

OVERALL PAVING PLAN

SCALE	REVISION
1"=150'-0"	
DATE 10/10/07	

DRAWING NO.
C-200

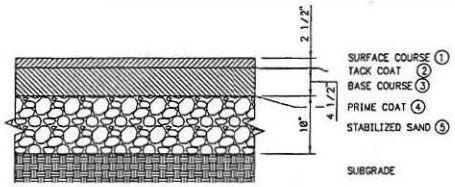


ALTERNATE:
2 1/2" SURFACE COURSE
12 1/2" BASE COURSE
13" GRANULAR BASE

A TYPICAL HEAVY DUTY ASPHALT SECTION
SCALE: 1" = 1'-0"

C281 C286 C282 C283 C284 C285

①	2 1/2" ASPHALT SURFACE COURSE 19MM SUPERPAVE PG 76-22
②	TACK COAT 0.05 GALLONS /SY
③	11 1/2" ASPHALT BASE COURSE 25MM SUPERPAVE PG 67-22
④	PRIME COAT 0.20 GALLONS / SY
⑤	13" STABILIZED SAND

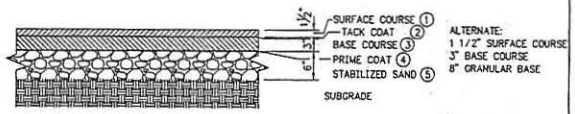


ALTERNATE:
2 1/2" SURFACE COURSE
5 1/2" BASE COURSE
12" GRANULAR BASE

B TYPICAL MEDIUM DUTY ASPHALT SECTION
SCALE: 1" = 1'-0"

C282 C286 C283 C284 C285 C287

①	2 1/2" ASPHALT SURFACE COURSE 19MM SUPERPAVE PG 76-22
②	TACK COAT 0.05 GALLONS /SY
③	4 1/2" ASPHALT BASE COURSE 25MM SUPERPAVE PG 67-22
④	PRIME COAT 0.20 GALLONS / SY
⑤	10" STABILIZED SAND



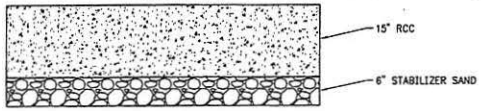
ALTERNATE:
1 1/2" SURFACE COURSE
3" BASE COURSE
8" GRANULAR BASE

C TYPICAL LIGHT DUTY ASPHALT SECTION
SCALE: 1" = 1'-0"

C286 C285 C287

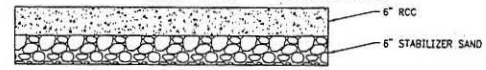
①	1 1/2" ASPHALT SURFACE COURSE 19MM SUPERPAVE PG 67-22
②	TACK COAT 0.05 GALLONS /SY
③	3" ASPHALT BASE COURSE 25MM SUPERPAVE PG 67-22
④	PRIME COAT 0.20 GALLONS / SY
⑤	6" STABILIZED SAND

PRELIMINARY ALTERNATE RCC SECTION A ⚠1
SCALE: 1" = 1'-0"



PRELIMINARY ALTERNATE RCC SECTION B ⚠1
SCALE: 1" = 1'-0"

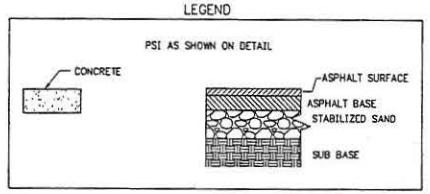
PRELIMINARY ALTERNATE RCC SECTION C ⚠1
SCALE: 1" = 1'-0"



PRELIMINARY DESIGN	OPTION 1	OPTION 2	OPTION 3
SECTION A	2 1/2" HMA SURFACE COURSE 12 1/2" HMA BASE 13" GRANULAR BASE	2 1/2" HMA SURFACE COURSE 11 1/2" HMA BASE 13" STABILIZED SAND	15" RCC 6" STABILIZED SAND
SECTION B	2 1/2" HMA SURFACE COURSE 5 1/2" HMA BASE 12" GRANULAR BASE	2 1/2" HMA SURFACE COURSE 4 1/2" HMA BASE 10" STABILIZED SAND	8" RCC 6" STABILIZED SAND
SECTION C	1 1/2" HMA SURFACE COURSE 3" HMA BASE 8" GRANULAR BASE	1 1/2" HMA SURFACE COURSE 3" HMA BASE 6" STABILIZED SAND	6" RCC 6" STABILIZED SAND
CONTAINER STACKING	BPA MANUAL REQUIRES A MIN. 15" RCC FOR STACKING LOADED CONTAINERS IN BLOCKS 5 HIGH BPA MANUAL REQUIRES A MIN. 8" IN RCC FOR STACKING EMPTY CONTAINERS IN BLOCKS 3 HIGH		

NOTE:
THE CONTRACTOR SHALL PROVIDE EXAMPLES OF MATERIALS DESIGN, WORKMANSHIP AND IN-SERVICE PERFORMANCE FROM SIMIALAR PROJECTS. THE LABORATORY AND FIELD TRAILS ARE TO BE COMPLETED AND THE DESIGN REVIEWED BEFORE CONSTRUCTION.

LEGEND



NOTE:
1. PLACE ASPHALTIC CONCRETE IN LIFTS NOT TO EXCEED 4 1/2"
2. PLACE RCC IN LIFTS NOT EXCEED 8"
3. CONTRACTOR MUST SUPPLY FINAL RCC DESIGN PRIOR TO IMPLEMENTATION
4. REFER TO SHEET R-102 FOR LIMITS OF RCC ⚠1

1"=1'-0" 0 1 2 FT.

ISSUED FOR CONSTRUCTION
OCTOBER 10, 2007

GRAPHIC SCALES CHECK BEFORE USE
IF SHEET IS LESS THAN 24" X 36" IT IS A REDUCED PRINT. SCALE ACCORDINGLY

REVISIONS

NO.	DESCRIPTION	DATE	BY	NO.	DESCRIPTION	DATE	BY
1	CHANGED STATION TO SECTION ADDED NOTE 4.	8/5/07	RA				

HPA

GSE Gulf States Engineering Consulting Solutions 4100 Moffett Road Mobile, AL 36618 (251) 460-1646

ALABAMA LICENSED PROFESSIONAL ENGINEER ROBERT A. ARNOLD 5/5/08

Mobile Container Terminal

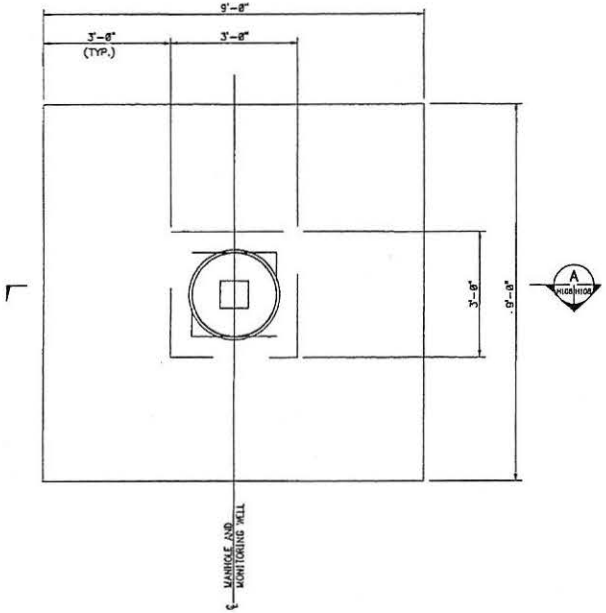
DESIGNED BY	BA
DRAWN BY	JTB
CHECKED BY	
PROJECT ENGR	

CONTAINER TERMINAL AT CHOCTAW POINT
PAVEMENT, UTILITIES, AND GATE STRUCTURES

PAVEMENT SECTIONS AND DETAILS
SHEET 1 OF 9

SCALE 1"=1'-0" | DATE 10/10/07 | REVISION

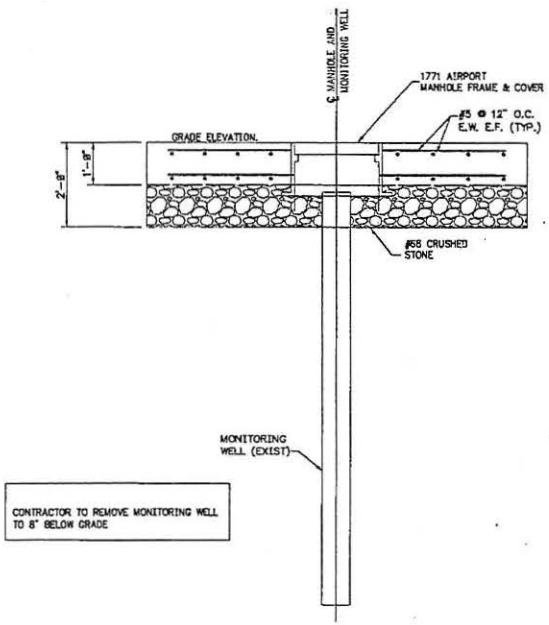
DRAWING NO. C-208



52 H182/H185 H184 H185 H186 H187

MANUAL RECOVERY/MONITORING WELL REFIT DETAIL

SCALE: 3/4"=1'-8"



CONTRACTOR TO REMOVE MONITORING WELL TO 8" BELOW GRADE

A H108/H108 SECTION

SCALE: 3/4"=1'-8"

3/4"=1'-8" 0 1 2 3 FT.

BID DOCUMENTS

JULY 23, 2007

GRAPHIC SCALES
CHECK BEFORE USE

IF SHEET IS LESS THAN 24" X 36" IT IS A REDUCED PRINT. SCALE ACCORDINGLY

REVISIONS	NO.	DESCRIPTION	DATE	BY	NO.	DESCRIPTION	DATE	BY

HPA

GSE Gulf States Engineering Consulting Solutions

ALABAMA LICENSED PROFESSIONAL ENGINEER ROBERT A. ASHLEY 10/1/07

Mobile Container Terminal

DESIGNED BY	RAA
DRAWN BY	RBS
CHECKED BY	RAA
PROJECT ENGR	RAA

CONTAINER TERMINAL
AT CHOCTAW POINT
PAVEMENT, UTILITIES, AND GATE STRUCTURES

RECOVERY/MONITORING
WELL DETAIL

SCALE: 3/4"=1'-0"
DATE: 5/18/07
REVISION:

DRAWING NO.
H-108

Amendment to AWTC Site CMIP for Wharf Construction and Fill

As part of the wharf construction project a continuous steel sheet pile wall was installed along the entire frontage on the Mobile River. The new sheet pile wall was tied into the existing sheet pile wall at the foot of the Virginia Street Right of Way and was installed running east approximately 240 LF to a point approximately 375 Ft west of the Mobile River Channel. From there, it ran south paralleling the Channel until it intersected the shoreline of McDuffie (nee Sand) Island.

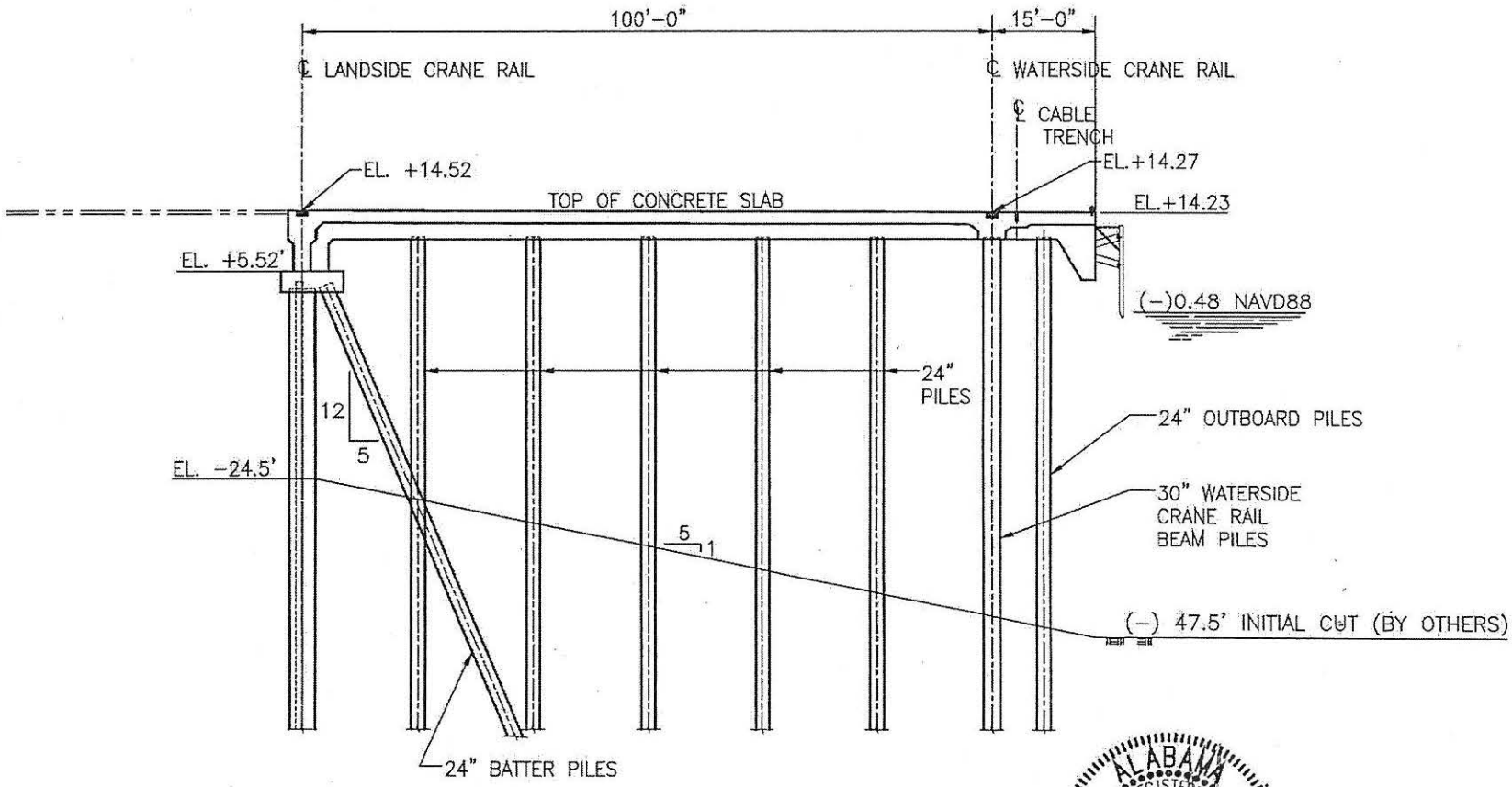
The sheet pile wall, which extends 62 Ft below MLLW, was used to retain the fill placed behind it and also became an integral part of the wharf structure that sits above it. The wharf itself is a pile supported concrete deck approximately 115 Ft wide by 2,000 LF in length. The finished elevation on the face of the wharf is at +14.23 Ft which is 2.23 Ft above the Federal Emergency Management Agency (FEMA) 100-year flood elevation for the area. A cross section of the wharf is attached for reference.

The project involved a substantial amount of filling both in terms of land reclamation between the existing shoreline and the sheet pile structure, and raising the ground elevations of the existing site so the finished pavement surface would be above the Federal Emergency Management Agency (FEMA) 100-year flood elevation of +12 Ft.

All of the material placed on the site was free of clay clods, debris, roots, wood, vegetation, refuse, deterious, or other objectionable materials, and was tested and proved to be suitable for underwater backfill. The backfill material was inorganic non-plastic sandy soil having a SP or SP-SM classification of which not more than 15 percent by weight passing the No 200 sieve.

The material for the land reclamation portion of the work was placed both hydraulically and mechanically up to an elevation of approximately +2 Ft. Wick drains were installed to facilitate site stabilization with a 3 Ft spacing. From this elevation to the desired grades, all of the fill material, including that placed on the existing shoreline and upland areas was placed in 8 inch lifts and compacted to 100 percent Standard Proctor (ASTM D 698).

The land reclamation portion behind the new dock was surcharged (overburdened) to elevation +27 Ft to alleviate future settlement using the same materials described previously. Once the desired settlement was obtained, the excess material was removed down to an elevation of approximately +12 Ft and used to fill the remaining portion of Garrows Bend to Elevation to +3 Ft. This area will be filled higher utilizing the same methodology as outlined above as additional suitable fill material becomes available from other projects.



STAGE ONE MAIN WHARF TYPICAL SECTION

1"=20'

B

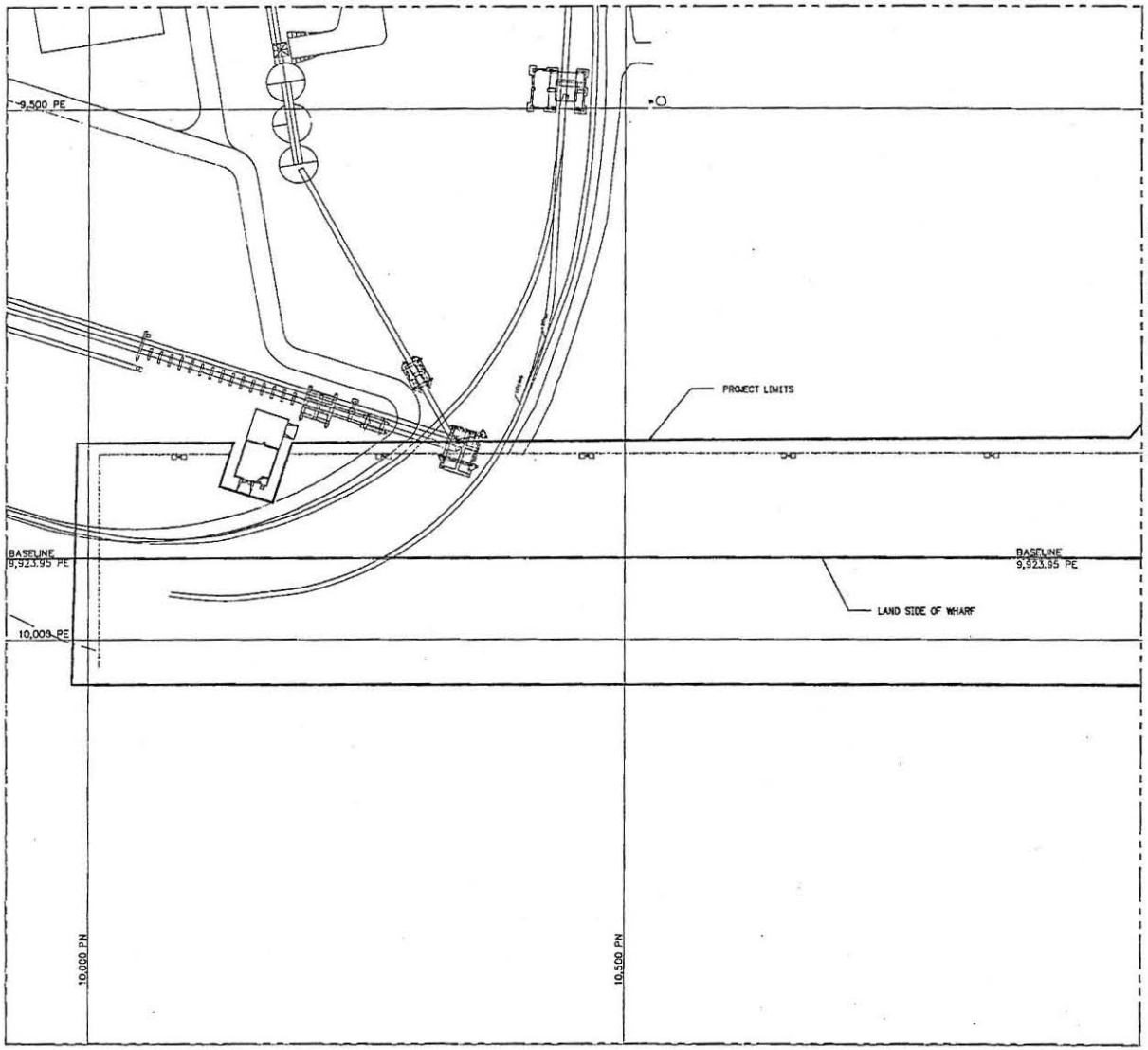
C04 C05

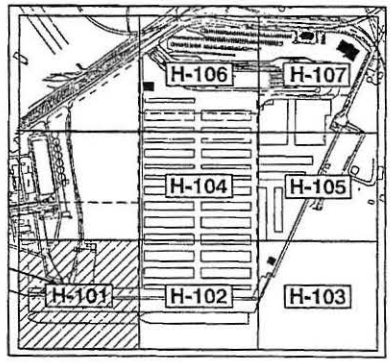
ALABAMA REGISTERED No. 15930 PROFESSIONAL ENGINEER RICHARD S. GOTTLIER

SECTI WALL

1"=20'

AZ





KEY PLAN

1"=500' 0 500 1000 FT.

LEGEND

- PREPARED CORIDOR
- HIGHMAST LIGHTING POLE
- PERIMETER LIGHTS
- MANUAL RECOVERY WELL
- MONITORING WELL TO BE CLOSED (BY OTHERS)

NOTES:

CONTRACTOR TO PROTECT AND PRESERVE MONITORING WELLS AND RECOVERY SYSTEM.

1"=50' 0 50 100 FT.

BID DOCUMENTS

JULY 23, 2007

GRAPHIC SCALES
CHECK BEFORE USE

IF SHEET IS LESS THAN 24" X 36" IT IS A REDUCED PRINT. SCALE ACCORDINGLY

REVISIONS NO.	DESCRIPTION	DATE	BY	NO.	DESCRIPTION	DATE	BY

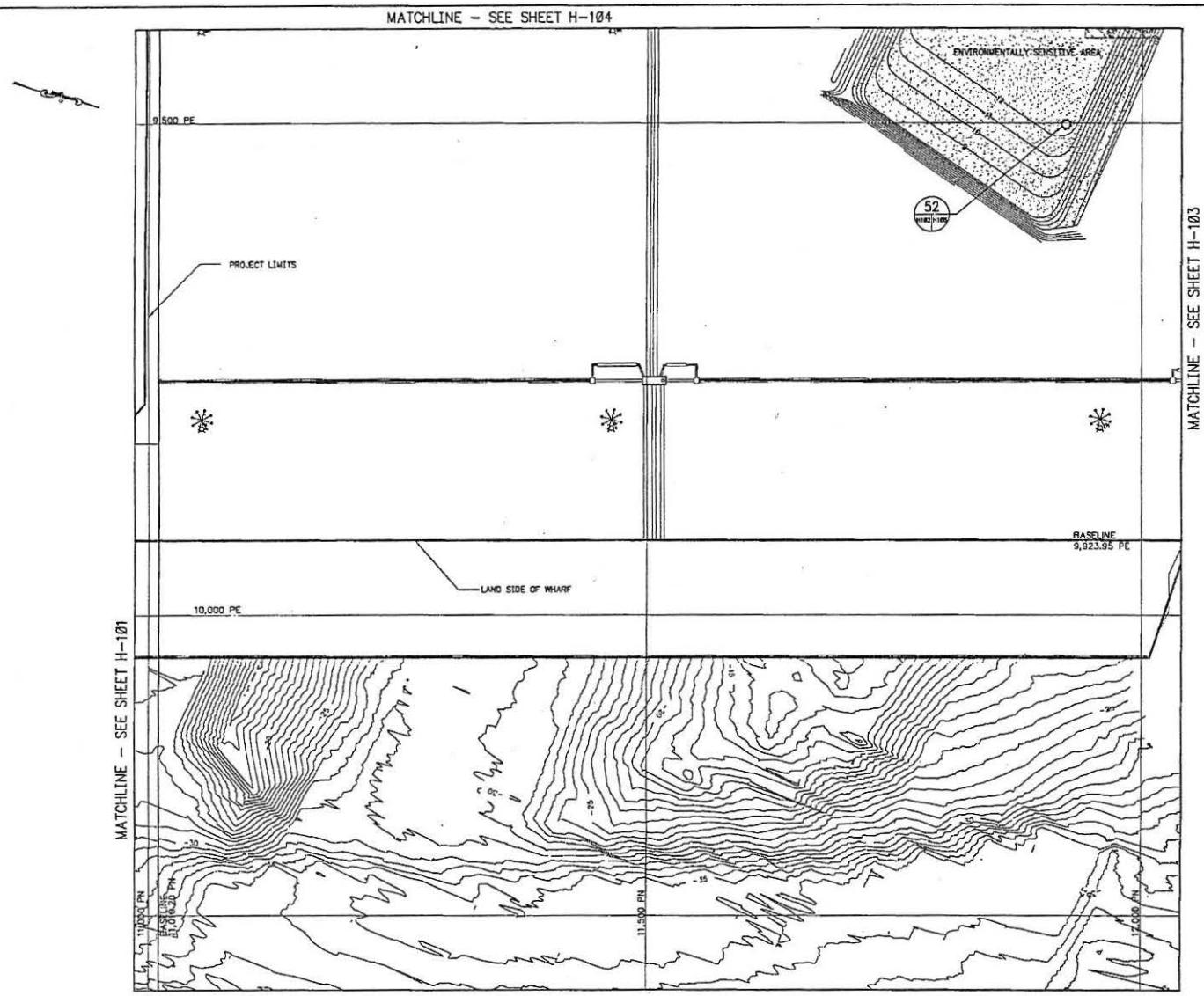
HPA

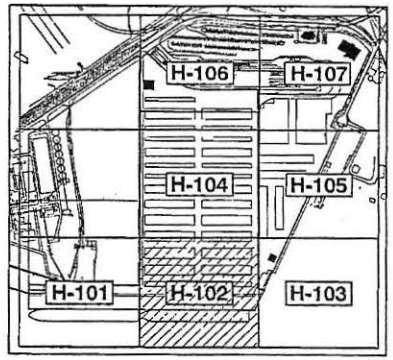
GSE
GULF STATES ENGINEERING
Consulting Solutions
4150 Hartford Road
Mobile, AL 36618
(251) 460-6648

ALABAMA LICENSED PROFESSIONAL ENGINEER ROBERT A. ARDAY 10/1/07

Mobile Container Terminal

DESIGNED BY C.S.	CONTAINER TERMINAL AT CHOCTAW POINT PAVEMENT, UTILITIES, AND GATE STRUCTURES	SCALE AS SHOWN	REVISION
DRAWN BY J.R.		DATE 5/18/07	
CHECKED BY C.S.	ENVIRONMENTALLY SENSITIVE AREAS-SHEET 1 OF 7	DRAWING NO. H-101	
PROJECT ENGR C.S.			





KEY PLAN

1"=500' 0 500 1000 FT.

LEGEND

- PREPARED CORIDOR
- HIGHMAST LIGHTING POLE
- PERIMETER LIGHTS
- MANUAL RECOVERY WELL
- MONITORING WELL TO BE CLOSED (BY OTHERS)

NOTES:

CONTRACTOR TO PROTECT AND PRESERVE MONITORING WELLS AND RECOVERY SYSTEM.

1"=50' 0 50 100 FT.

BID DOCUMENTS

JULY 23, 2007

GRAPHIC SCALES
CHECK BEFORE USE

IF SHEET IS LESS THAN 24" X 36" IT IS A REDUCED PRINT. SCALE ACCORDINGLY

REVISIONS NO.	DESCRIPTION	DATE	BY	NO.	DESCRIPTION	DATE	BY

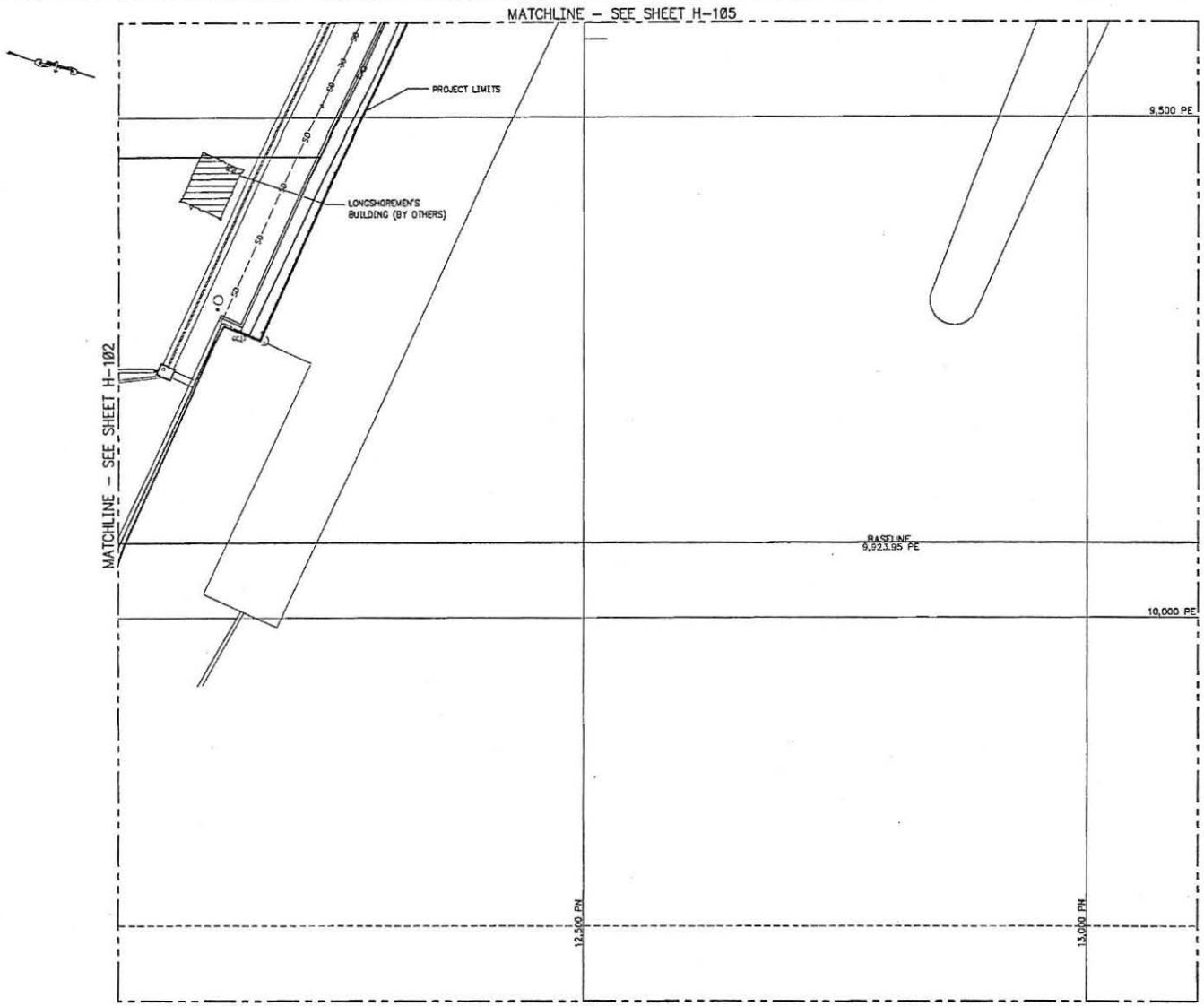
HPA

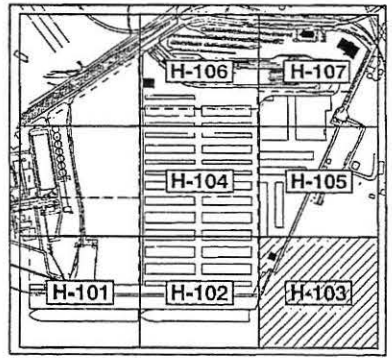
GSE Gulf States Engineering Company Services 4160 Moffett Road Mobile, AL 36618 (251) 460-4646

ALABAMA LICENSED PROFESSIONAL ENGINEER ROBERT A. ARDARY 10/1/07

Mobile Container Terminal

DESIGNED BY C.S.	CONTAINER TERMINAL AT CHOCTAW POINT PAVEMENT, UTILITIES, AND GATE STRUCTURES	SCALE AS SHOWN	REVISION
DRAWN BY J.R.		DATE 5/18/07	
CHECKED BY C.S.	ENVIRONMENTALLY SENSITIVE AREAS-SHEET 2 OF 7	DRAWING NO. H-102	
PROJECT ENGR C.S.			





KEY PLAN

1"=500' 0 500 1000 FT.

LEGEND

- PREPARED CORIDOR
- HIGHMAST LIGHTING POLE
- PERIMETER LIGHTS
- MANUAL RECOVERY WELL
- MONITORING WELL TO BE CLOSED (BY OTHERS)

NOTES:

CONTRACTOR TO PROTECT AND PRESERVE MONITORING WELLS AND RECOVERY SYSTEM.

1"=50' 0 50 100 FT.

BID DOCUMENTS

JULY 23, 2007

GRAPHIC SCALES
CHECK BEFORE USE

IF SHEET IS LESS THAN 24" X 36" IT IS A REDUCED PRINT. SCALE ACCORDINGLY

REVISIONS NO.	DESCRIPTION	DATE	BY	NO.	DESCRIPTION	DATE	BY

HPA

GSE
GULF STATES ENGINEERING
Consulting Solutions
4110 Southern Street
Mobile, AL 36615
(334) 443-4646

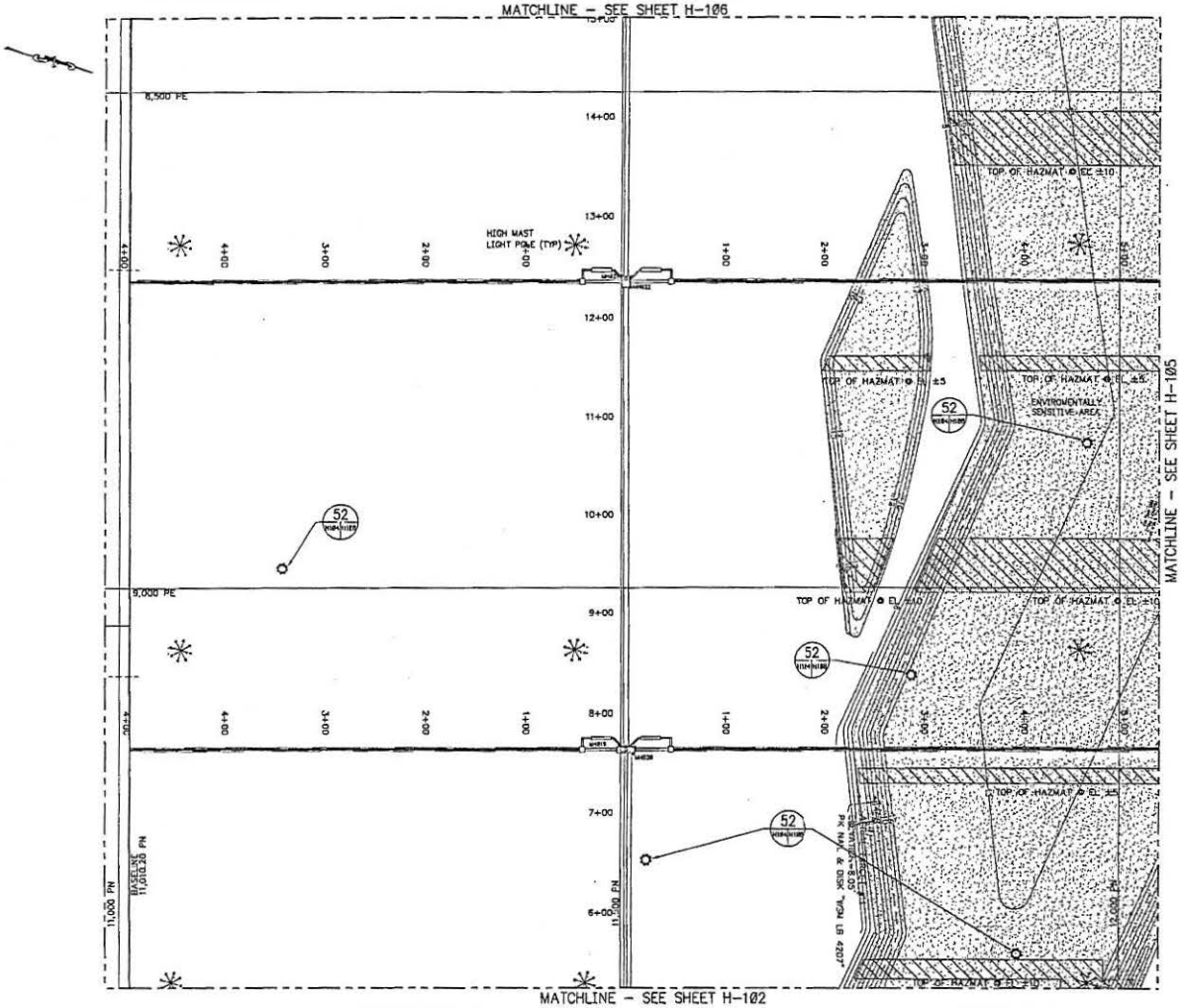
Mobile Container Terminal

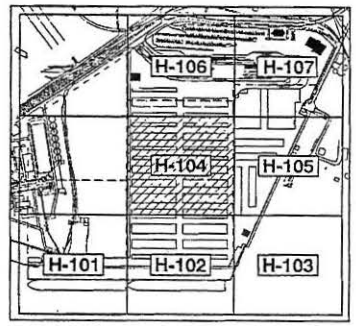
DESIGNED BY	C.S.
DRAWN BY	J.R.
CHECKED BY	C.S.
PROJECT ENGR	C.S.

CONTAINER TERMINAL
AT CHOCTAW POINT
PAVEMENT, UTILITIES, AND GATE STRUCTURES

ENVIRONMENTALLY
SENSITIVE AREAS-SHEET 3 OF 7

SCALE AS SHOWN
DATE 5/16/07
REVISION
DRAWING NO. H-103





KEY PLAN

1"=500' 0 500 1000 FT.

LEGEND

- PREPARED CORRIDOR
- HIGHMAST LIGHTING POLE
- PERIMETER LIGHTS
- MANUAL RECOVERY WELL
- MONITORING WELL TO BE CLOSED (BY OTHERS)

NOTES:

CONTRACTOR TO PROTECT AND PRESERVE MONITORING WELLS AND RECOVERY SYSTEM.

1"=50' 0 50 100 FT.

BID DOCUMENTS
JULY 23, 2007

GRAPHIC SCALES CHECK BEFORE USE
IF SHEET IS LESS THAN 24" X 36" IT IS A REDUCED PRINT. SCALE ACCORDINGLY

REVISIONS	NO.	DESCRIPTION	DATE	BY	NO.	DESCRIPTION	DATE	BY

HPA

GSE Gulf States Engineering, Country Subway, 5210 Market Road, Mobile, AL 36618, (251) 456-4648

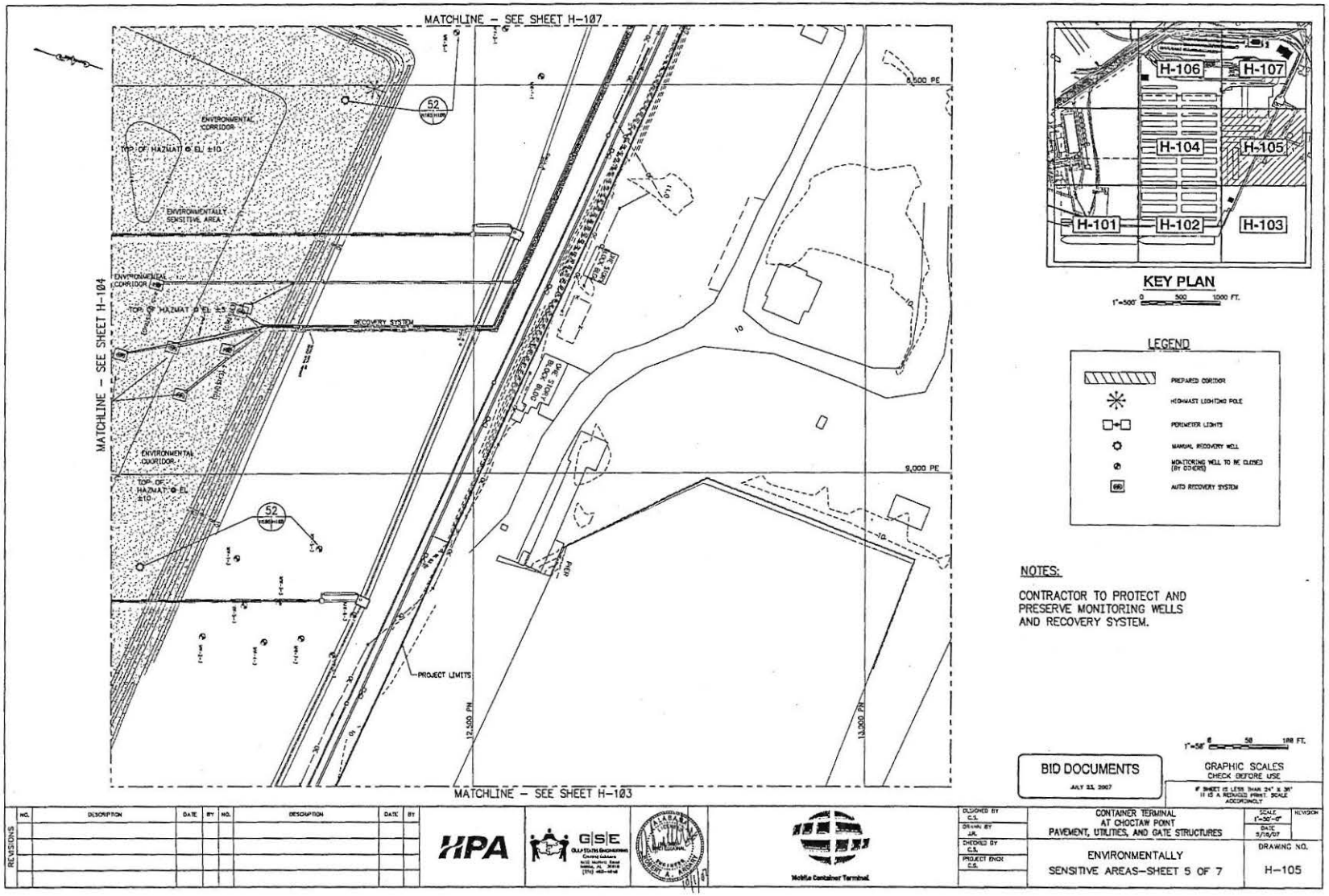
Mobile Container Terminal

DESIGNED BY	C.S.
DRAWN BY	J.R.
CHECKED BY	C.S.
PROJECT ENGR	C.S.

CONTAINER TERMINAL
AT CHOCTAW POINT
PAVEMENT, UTILITIES, AND GATE STRUCTURES

ENVIRONMENTALLY SENSITIVE AREAS–SHEET 4 OF 7

SCALE	1"=50'-0"
DATE	3/16/07
REVISION	-
DRAWING NO.	H-104



KEY PLAN

1"=500' 0 500 1000 FT.

LEGEND

- PREPARED CORRIDOR
- HIGHMAST LIGHTING POLE
- PERIMETER LIGHTS
- MANUAL RECOVERY WELL
- MONITORING WELL TO BE CLOSED (BY OTHERS)
- AUTO RECOVERY SYSTEM

NOTES:

CONTRACTOR TO PROTECT AND PRESERVE MONITORING WELLS AND RECOVERY SYSTEM.

1"=50' 0 50 100 FT.

BID DOCUMENTS

JULY 23, 2007

GRAPHIC SCALES CHECK BEFORE USE

IF SHEET IS LESS THAN 24" X 36" IT IS A REDUCED PRINT. SCALE ACCORDINGLY

REVISIONS	NO.	DESCRIPTION	DATE	BY	NO.	DESCRIPTION	DATE	BY

HPA

GSE GULF STATES ENGINEERING

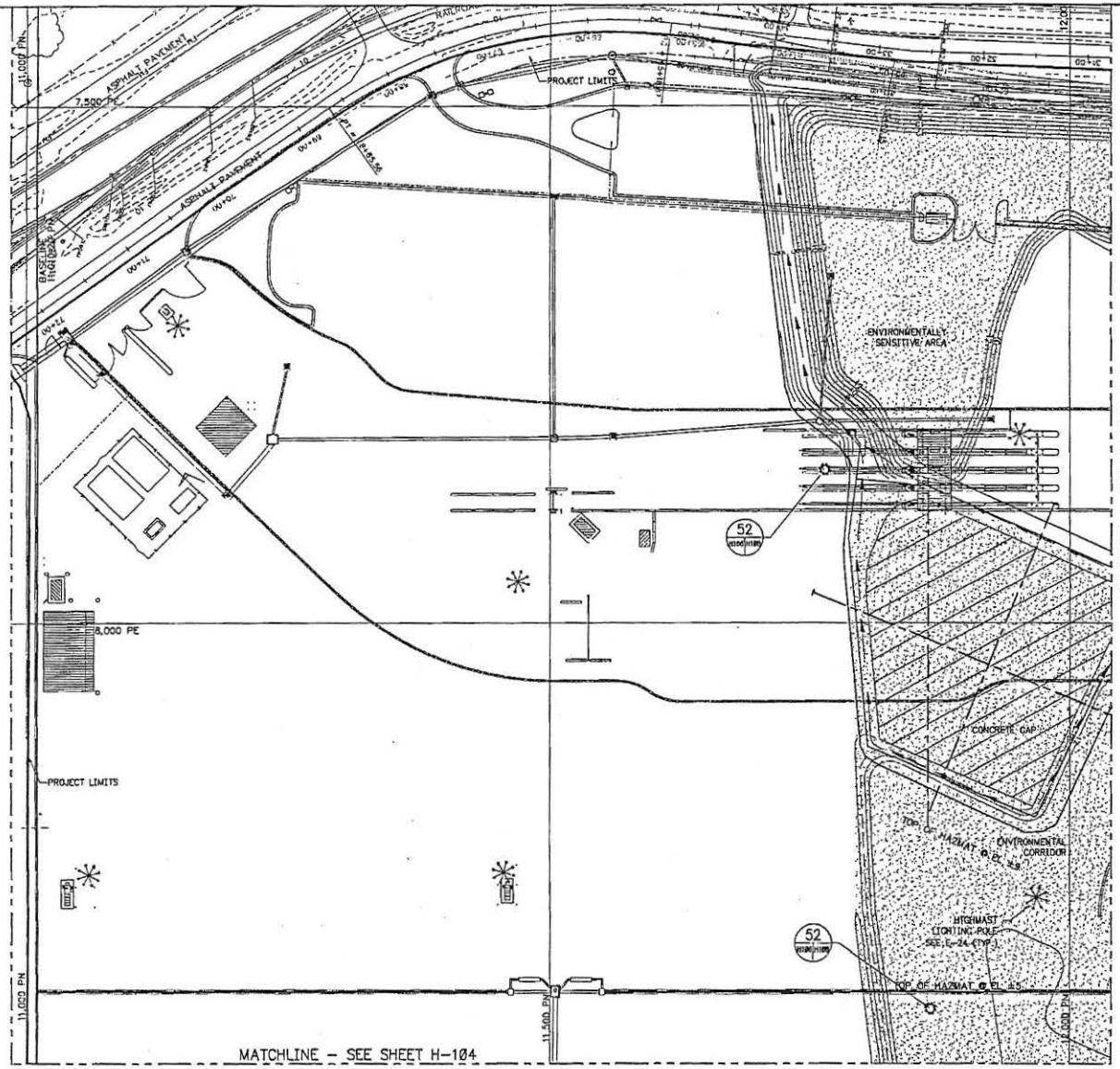
Mobile Container Terminal

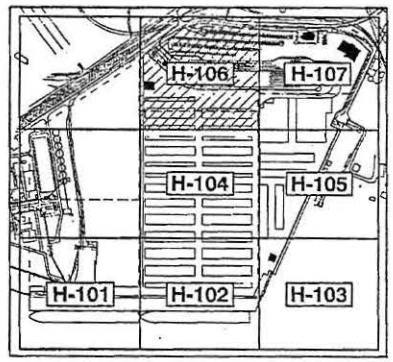
DESIGNED BY	C.S.
DRAWN BY	J.R.
CHECKED BY	C.S.
PROJECT ENGR	C.S.

CONTAINER TERMINAL AT CHOCTAW POINT
PAVEMENT, UTILITIES, AND GATE STRUCTURES

ENVIRONMENTALLY SENSITIVE AREAS–SHEET 5 OF 7

SCALE	1"=50'-0"
REVISION	
DATE	5/18/07
DRAWING NO.	H-105





KEY PLAN

1"=500' 0 500 1000 FT.

LEGEND

- PREPARED CORRIDOR
- HIGHMAST LIGHTING POLE
- PERIMETER LIGHTS
- MANUAL RECOVERY WELL
- MONITORING WELL TO BE CLOSED (BY OTHERS)

NOTES:

CONTRACTOR TO PROTECT AND PRESERVE MONITORING WELLS AND RECOVERY SYSTEM.

1"=50' 0 50 100 FT.

BID DOCUMENTS

JULY 23, 2007

GRAPHIC SCALES CHECK BEFORE USE

IF SHEET IS LESS THAN 24" X 36" IT IS A REDUCED PRINT. SCALE ACCORDINGLY

REVISIONS	NO.	DESCRIPTION	DATE	BY	NO.	DESCRIPTION	DATE	BY

HPA

GSE Gulf States Engineering

Mobile Container Terminal

DESIGNED BY	C.S.
DRAWN BY	J.K.
CHECKED BY	C.S.
PROJECT ENGR	C.S.

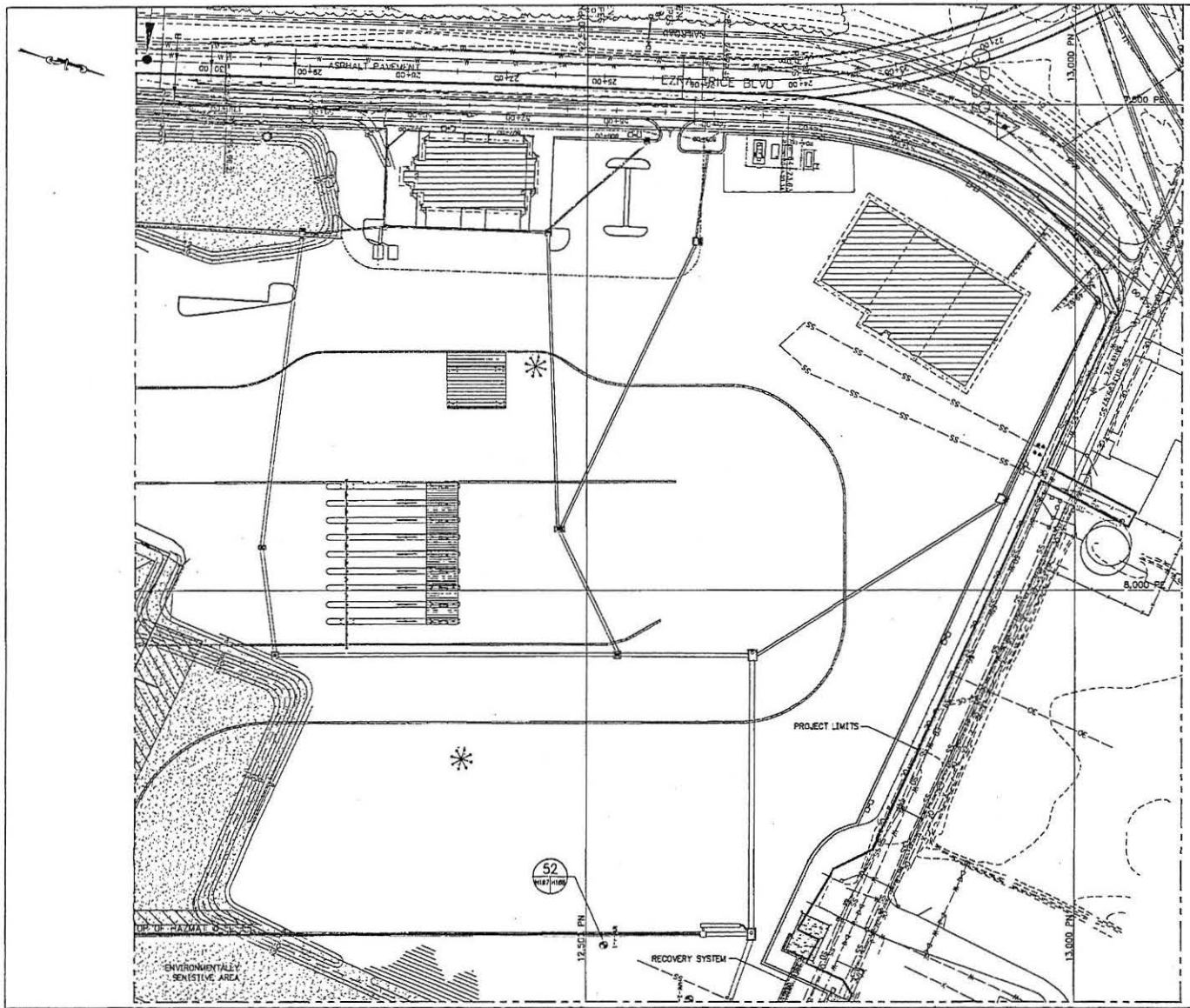
CONTAINER TERMINAL AT CHOCTAW POINT
PAVEMENT, UTILITIES, AND GATE STRUCTURES

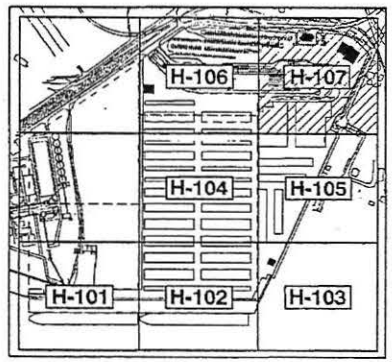
ENVIRONMENTALLY SENSITIVE AREAS–SHEET 6 OF 7

SCALE 1"=50'-0" | REVISION

DATE 9/18/07

DRAWING NO. H-106





KEY PLAN

1"=500' 0 500 1000 FT.

LEGEND

- PREPARED CORRIDOR
- HIGHMAST LIGHTING POLE
- PERIMETER LIGHTS
- MANUAL RECOVERY WELL
- MONITORING WELL TO BE CLOSED (BY OTHERS)

NOTES:

CONTRACTOR TO PROTECT AND PRESERVE MONITORING WELLS AND RECOVERY SYSTEM.

1"=50' 0 50 100 FT.

BID DOCUMENTS
JULY 23, 2007

GRAPHIC SCALES CHECK BEFORE USE
IF SHEET IS LESS THAN 24" X 36" IT IS A REDUCED PRINT. SCALE ACCORDINGLY

REVISIONS

NO.	DESCRIPTION	DATE	BY	NO.	DESCRIPTION	DATE	BY

HPA

GSE Gulf States Engineering

Mobile Container Terminal

DESIGNED BY C.S.	CONTAINER TERMINAL AT CHOCTAW POINT PAVEMENT, UTILITIES, AND GATE STRUCTURES
DRAWN BY J.S.	SCALE 1"=50'-0"
CHECKED BY C.S.	DATE 5/18/07
PROJECT ENGR C.S.	ENVIRONMENTALLY SENSITIVE AREAS–SHEET 7 OF 7
	DRAWING NO. H-107
	REVISION

Solid Waste Management Unit 6 East (SWMU-6E)
Backfill and Pavement Design Amendment

Background:

The original approved soil cover design for SWMU-6E consisted of an engineered soil cover designed to prevent human contact with impacted materials. The engineered soil cover at SWMU-6E raised existing grade by approximately six feet, to 12 feet (ft.) mean sea level (MSL), the 100-year flood plain elevation. An amendment to the SWMU-2/7, SWMU-4/5/8, and SWMU-6E (the SWMUs) approved cover designs (Amendment to AWTC Site CMIP for Fill and Pavement Design) was implemented as part of site development for future use as a shipping container terminal, including raising grade at the SWMUs, to approximately 12 to 14 ft. MSL, followed by emplacement of six inches of stabilizer sand overlain by an 8-inch thick section of roller compacted concrete (RCC). The shipping container terminal development work also included construction of an outbound gate with four truck lanes at SWMU-6E to control truck traffic and containers leaving the site. The site currently operates as AMP Terminals (the Site) where shipping containers are transferred from land to sea.

Backfill and Pavement Design Amendment:

This backfill and paving design amendment is a continuation of the previous site outbound gate construction development work at SWMU-6E. The current phase of work will consist of the construction of two additional outbound gate lanes with radiation portal monitors (RPMs). The construction of the two additional outbound gates is located in the southeast quadrant of SWMU-6E and will include limited subsurface construction over about 255 square feet (SF) of the 3.2 acres that comprise SWMU-6E. The existing cover in the area of the planned work is approximately 7.25 feet thick, with the RCC cap and sand stabilizer layer being about 1.25 feet thick and the soil cover being about six feet thick. Approximately 80% of the planned work (about 210 SF) will have a maximum depth of 24 to 27 inches below existing site grade. The remaining 20% of the planned work (about 45 SF) will have maximum depth of six feet below existing site grade.

Selected drawings from the construction plans – (APM Terminals, APMT Mobile Container Terminal, Outbound Gate, RPM Lane Expansion, January 2018) showing SWMU-6E and the location, plans, and sections, of the outbound gate construction over SWMU-6E are included as follows:

- G1 – Title Sheet.
- G2 – General Notes and Drawing Index.
- G-3 – Existing Site Plan (Limits of SWMU-6E soil cover highlighted).

- G4 – New Site Plan (Limits of subsurface construction in SWMU-6E soil cover highlighted).
- D1 – Enlarged Demolition Plan 1 of 2 (Subsurface construction in SWMU-6E soil cover highlighted).
- S1 – Enlarged New Site Plan (Subsurface construction in SWMU-6E soil cover highlighted).
- S3 – Sections and Details (RPM Stand, Foundation, and Conduit Section and Details).
- S4 – RPM Stand Details.
- S5 – Sections and Details (Above ground kiosk and painting section and details).

The additional phase of work will consist of the following activities:

- Sawcut and removal of approximately 255 SF of RCC (eight-inch section) in locations shown on drawings G4, D1, and S1. The plan and sections for the new foundation construction are shown on drawings S3/1 and S3/2.

- Excavation and removal of approximately 165 SF of subgrade material to 19 inches below removed RCC (about 27 inches in total depth) in foundation areas (Drawings D1 and S3/A).

- Excavation and removal of approximately 45 SF of subgrade material to 16 inches below removed RCC (about 24 inches in total depth) in trench areas (Drawings D1 and S3/C).

- Excavation and removal of approximately 45 SF of subgrade material to six feet total depth at six new bollard locations (Drawings D1 and S3/A).

- Installation of RPM stand anchor bolts (Drawing S3), Schedule 40 steel pipe bollards (Drawing S3/A and B), and electrical utility lines (Drawing S3/C).

- Backfill of bollard and foundation areas with steel reinforced cast-in-place concrete with a compressive strength of 4,000 pounds per square inch at 28 days (Drawing G2). The bollards will be installed within 17.5 foot by six foot raised concrete foundations which will be finished up to six inches above existing grade (Drawing S3/1/2).

- Backfill of trench areas with certified clean compacted structural fill and RCC section with steel reinforced cast-in-place concrete with a compressive strength of 4,000 pounds per square inch at 28 days to match the top of existing RCC (Drawing S3/C). Certified clean structural

- fill will be sampled and analyzed by the structural fill source for all constituents listed as Hazardous Substances (Exhibit B) in the recorded environmental covenant (EC) for the Site. If the structural fill source laboratory testing results do not include all of the Hazardous Substances listed as Exhibit B in the EC, one composite sample from the approximately 50 yards of structural fill planned to be used for the project will be collected and analyzed.

- Excavation in the area of SWMU-6E will be performed in accordance with the existing EC for the Site by following the approved plans and specifications (including the CMI Workplan) for excavation activities. The existing SWMU-6E area and the areas of proposed subsurface construction are shown on Drawings G3 and G4. The area of proposed subsurface construction is limited to approximately 255 SF of the approximately 139,400 SF (about 0.2%) of the existing SWMU-6E area. The removed concrete will be recycled and the earthen cover material will be stockpiled or containerized for waste characterization and disposal. Should the impacted material within SWMU 6 East be excavated, the material will be stored in a drum and immediately transferred to the AWTC wastewater treatment system enclosure for waste characterization and disposal.

Other than those described above, no additional subsurface excavations, foundations, or support structures are planned at this time. Additionally, no groundwater wells will be impacted by the work described in the amendment. If additional excavation in SWMU soil cover areas is proposed, the proposed changes will be submitted to ADEM for approval prior to work being conducted. Once the construction activities described above are completed and as-built drawings are available, the EC will be revised.

Summary:

The existing cover at SWMU-6E was designed to meet the following criteria:

1. Prevent human contact with contaminated soil.

2. Maintain minimum elevation of 12 feet MSL (the 100-year flood plain elevation).

3. Function as subgrade material for a shipping container terminal.

The activities described in this amendment will not impact the long-term cover performance in meeting these design criteria.

The following is a summary of the anticipated changes to the cover design criteria as a result of the amendment development activities:

1. Prevent human contact – the replacement of existing soil cover with additional concrete cap will meet or exceed the performance of the previous cover in preventing human contact with contaminated soil. The additional concrete cap is higher strength than the soil cover, making it more durable and difficult to remove than a soil cover, resulting in a longer lasting and more protective cap. The additional concrete cover is also lower permeability than a soil cover, better protecting groundwater and human health exposures to impacted groundwater.

2. Maintain Minimum Elevation – the replacement concrete cover will be installed to match or raise existing site elevations, maintaining the minimum elevation of the cover or increasing it.

3. Function as Subgrade - the replacement soil cover and concrete cover will be installed to meet existing cover specifications, and is therefore expected to perform in a similar manner to the previous cover, with minimal degradation over time.

Potential short-term impacts to the existing cover associated with this amendment will be mitigated by performing the proposed activities in general accordance the approved Final Corrective Measure Implementation Workplan (CMIP). This specifically includes the following:

- The Construction Workplan (Section 3.0) and Construction Quality Assurance/Quality Control Plan (Section 3.3).
- Sampling and Analysis Plan (Section 4.0).
- Quality Assurance Project Plan (Section 5.0)

The work described in this amendment will also be conducted in general accordance with the Safety, Health, and Emergency Response Plan (Section 7.0) in the CMIP, which includes procedures and protocols for the protection of the health and safety of the public and Site/Construction workers. The Safety, Health, and Emergency Response Plan (SHERP) includes the following sections and details:

- Overview – includes description of establishment of the SHERP to protect workers and the public from potential hazards posed by the Site.

- Project Personnel and Responsibilities – includes description of the personnel responsible for the safety and health program to be implemented at the Site.

- Site-Specific Health and Safety Plan Requirements and Accident Prevention Program – includes description of Site-specific hazard analysis

conducted for the remediation activities and the programs to be implemented to prevent accidents and injury to Site personnel.

- Hazard Identification and Control – includes description of the significant health hazards and the plan to limit worker exposure.

- Air Monitoring – includes description of air monitoring activities to be performed when work is being conducted.

- Personal Protective Equipment (PPE) – includes description of appropriate PPE to be donned when work is being conducted.
- Site Control: Work Zones – includes description of work zones to be established and access allowed to the work zones when work is being conducted.

- Decontamination Procedures – includes description of procedures to be followed for decontamination of PPE and equipment.

- Medical Surveillance – includes description of the medical surveillance program to be followed for Site workers and contractors.

- Emergency Operations Plan – includes description of pre-emergency planning, responsibilities in an emergency, and emergency first-aid.

Potential long-term impacts to the existing and newly amended portions of the cover will be mitigated by following the approved Operation, Maintenance, and Monitoring (OM&M) Manual, Appendix C of the Final CMIP. This specifically includes performing routine inspections of the cover (Section 2.4.2.2 of the OM&M Manual) and reporting and correcting observed issues as described in the OM&M Manual.

Correcting issues observed during inspections will include repairs of cracks in the concrete cap. Cracks in the concrete cap will be repaired in accordance with the following construction and repair specifications:

Construction Specifications:

- CMIP Cast-In-Place Concrete Specification Section 03300.

- APM Terminals RPM Lane Expansion Project Technical Specifications, Cast-In-Place Concrete Specification Section 03300.

Repair Specifications:

- Alabama Department of Transportation (ALDOT) Standard Specifications for Highway Construction, 2018 Edition, Section 453, Pressure Grouting and Repair of Portland Cement Concrete Pavement.

The ALDOT Standard Specification Section 453, Pressure Grouting and Repair of Portland Cement Concrete Pavement generally describes the following concrete cracks and repairs of the cracks which will implemented at the Site:

- Hairline cracks – small, tight cracks which in width resemble shrinkage cracks. No corrective repair is required for hairline cracks.

- Low severity cracks – wider than hairline cracks with the crack opening clearly visible. The concrete on both sides of the crack is acting with interlock between the cracked pieces limited movement of the individual pieces. Low severity crack repair does not require the removal of pavement. The crack will be routed (cutting of the pavement along the crack to allow a reservoir for sealant and sidewall for adhesion) and sealed.

- Medium severity cracks – the concrete on both sides of the crack is acting with partial interlock between the cracked pieces allowing potential for (or actual) small movement of the individual pieces. The crack will require removal and replacement of at least a portion of the slab.

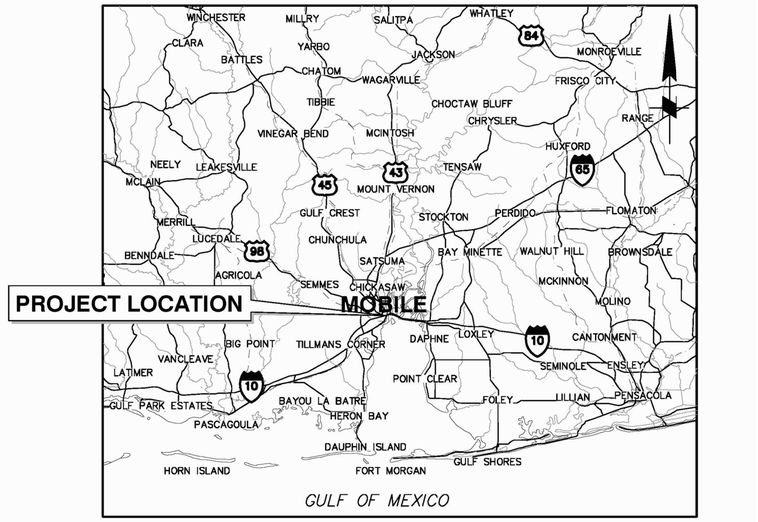
- High severity cracks - the concrete on both sides of the crack is acting independently allowing movement of the individual pieces. The crack will require removal and replacement of at least a portion of the slab.

Based on the annual inspections of the concrete cap, it is expected that the repair of the cracks will be conducted at the low severity crack stage, and cracks are unlikely to reach the medium or high severity stage.

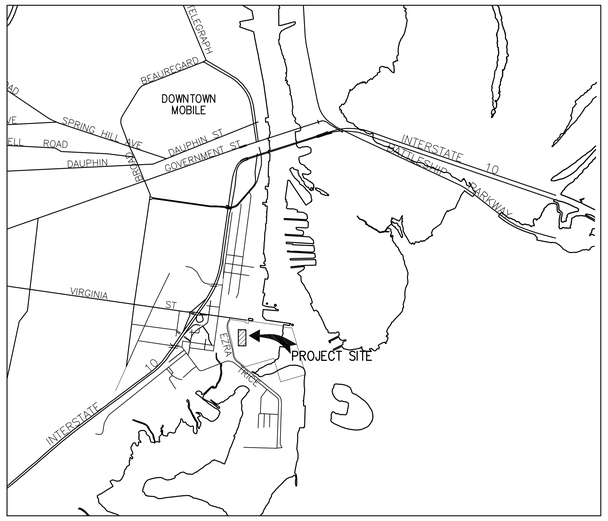
Vapor intrusion is not expected to be an issue associated with the work in this amendment. There are no enclosed structures that will be constructed over the soil cover and/or concrete cap as part of the amendment. The only new structure constructed as part of this amendment that will be occupied (and only on an intermittent, temporary basis) is the new stair foundation. The new kiosk consists of technology for Site communications and is not occupiable. The new stair foundation will be constructed of 1.5-inch diameter schedule 40 pipe and 1.25-inch width serrated grating (Drawing S6/5) and vapor will not collect in or around the stair foundation due to venting associated with its open-air style construction.

APM TERMINALS Lifting Global Trade

APMT MOBILE CONTAINER TERMINAL
OUTBOUND GATE
RPM LANE EXPANSION



VICINITY MAP
NTS



LOCATION PLAN

APTIM PORT SERVICES, LLC

JANUARY 2018

NOTES

REFERENCE DRAWINGS	NO.	REVISION	DRAWN	CK'D	APPD	DATE
	A	ISSUED FOR BID	LRH	MED	RSG	01/26/18

THIS DOCUMENT IS THE PROPERTY OF APTIM. IT MAY CONTAIN INFORMATION DESCRIBING TECHNOLOGY OWNED BY APTIM AND DEEMED TO BE COMMERCIALLY SENSITIVE. IT IS TO BE USED ONLY IN CONNECTION WITH WORK BEING PERFORMED BY APTIM. REPRODUCTION IN WHOLE OR IN PART FOR ANY PURPOSE OTHER THAN WORK PERFORMED BY APTIM IS FORBIDDEN EXCEPT BY EXPRESS WRITTEN PERMISSION OF APTIM. IT IS TO BE SAFEGUARDED AGAINST BOTH DELIBERATE AND INADVERTENT DISCLOSURE TO ANY THIRD PARTY.

DRAWN: LRH | CK'D: MED | APPD: RSG | DATE: 12/01/17 | SCALE: NONE

APM TERMINALS Lifting Global Trade

CLIENT DWG NO:

OUTBOUND GATE
RPM LANE EXPANSION
TITLE SHEET

FOR: APM TERMINALS – MOBILE, ALABAMA

PROJECT NO: 4155 | DWG NO: G1 | REV: A

GENERAL NOTES

1.0 GENERAL

1.1 ALL CONSTRUCTION SHALL MEET OR EXCEED LOCALLY ADOPTED INTERNATIONAL BUILDING CODE (ICC–IBC), NATIONAL ELECTRICAL CODE (NFPA 70), AND LOCAL REQUIREMENTS.
1.4 ALL MATERIALS AND EQUIPMENT SHALL BE INSTALLED IN STRICT ACCORDANCE WITH MANUFACTURERS WRITTEN INSTRUCTIONS, AS APPLICABLE AND THE APPROVED DESIGN DOCUMENTS.
1.5 ALL SURFACES DAMAGED DURING CONSTRUCTION SHALL BE REPAIRED TO MATCH EXISTING CONDITIONS AND ADJACENT SURFACE FINISH (COLOR, SLOPE, TEXTURE AND APPEARANCE).
1.6 ALL SIGNS SHALL COMPLY WITH STATE DOT STANDARDS AND MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD) STANDARDS.
1.7 CONTRACTOR SHALL MAINTAIN AND PROVIDE A SET OF RED LINE DESIGN DOCUMENTS (DRAWINGS, SPECIFICATIONS, ETC) TO PACIFIC NORTHWEST NATIONAL LABORATORY (PNNL) INDICATING ALL CHANGES AND FIELD ROUTING AUTHORIZED BY PNNL DURING INSTALLATION.
1.8 CONTRACTOR SHALL OBTAIN AND PAY FOR ALL REQUIRED PERMITS AND FEES AS DESCRIBED IN CONTRACT DOCUMENTS AND AS REQUIRED BY LOCAL JURISDICTION.
1.9 CONTRACTOR SHALL COORDINATE THE START OF AT–SITE WORK WITH THE PNNL SITE MANGER AND/OR CONSTRUCTION MANAGER.
1.11 CONTRACTOR SHALL CONDUCT LAYOUT FOR RPM HARDWARE AND BELOW GRADE SUBSTRUCTURE. MARK AND LOCATE PRIOR TO START OF EXCAVATION WORK. APTIM, APM TERMINAL, U.S. CUSTOMS AND BORDER PROTECTION (CBP) AND PNNL SHALL BEAR NO RESPONSIBILITY FOR EXPENSES INCURRED AS A RESULT OF FAILURE ON THE PART OF THE CONTRACTOR TO VERIFY DIMENSIONS AND/OR VERIFIABLE SITE CONDITIONS PRIOR TO BEGINNING WORK.

2.0 STEEL

2.1 UNLESS SPECIFIED OTHERWISE, ALL STEEL SHALL BE ASTM A36.
2.2 WELDING QUALIFICATIONS AND FABRICATION FOR CARBON STEEL SHALL BE PER AWS D1.1. PERFORM 100% VISUAL EXAMINATION OF ALL FINAL WELDS FOR FIELD WELDS AND WELDS ON STRUCTURAL COMPONENTS OR REBAR PER AWS D1.1, SECTION 6, WITH ACCEPTANCE CRITERIA PER SECTION 6, PART C.
2.3 MINOR FIELD WELDING (UNI–STRUT, RELOCATABLE BASE PLATES, AND SIGNAGE) DOES NOT REQUIRE INSPECTION BY CERTIFIED WELD INSPECTOR. THE WELDING SHALL BE PERFORMED BY A CERTIFIED WELDER. REMOVE PAINT/GALVANIZING PRIOR TO WELDING. REMOVE SLAG, WIRE BRUSH AND APPLY PRIMER/PAINT TO FINAL WELD. THE WELDS SHALL BE CONSISTENT WITH GOOD WELDING PRACTICES.
2.4 ALL STEEL PIPE SHALL BE ASTM A53, GRADE B.
2.5 FABRICATE ALL STRUCTURAL STEEL FOR CLOSE FIT WITH ERECTION HOLES ACCURATELY ALIGNED, AND WITHIN TOLERANCES GIVEN IN AISC MANUAL OF STEEL CONSTRUCTION.

3.0 PAINT

3.1 COMPLY WITH MANUFACTURER'S WRITTEN INSTRUCTIONS AND RECOMMENDATIONS IN "MPI ARCHITECTURAL PAINTING SPECIFICATION MANUAL" APPLICABLE TO SUBSTRATES INDICATED.
3.2 GALVANIZED–METAL SUBSTRATES:
PRIME COAT: PRIMER, EPOXY, ANTI–CORROSIVE, FOR METAL, MPI #101.
– SHERWIN–WILLIAMS; INDUSTRIAL & MARINE, DURAPLATE 235 MULTI–PURPOSE EPOXY, B67 SERIES
INTERMEDIATE COAT: POLYURETHANE, TWO–COMPONENT, PIGMENTED, GLOSS (GLOSS LEVEL 6), MPI #72.
– SHERWIN–WILLIAMS; PROTECTIVE & MARINE, ACROLON 218 HS POLYURETHANE GLOSS, B65 SERIES.
TOPCOAT: POLYURETHANE, TWO–COMPONENT, PIGMENTED, GLOSS (GLOSS LEVEL 6), MPI #72.
– SHERWIN–WILLIAMS; PROTECTIVE & MARINE, ACROLON 218 HS POLYURETHANE GLOSS, B65 SERIES.
COLOR: SAFETY YELLOW
3.3 TOUCH–UP METAL SURFACES AT COMPLETION OF INSTALLATION.

4.0 ELECTRICAL

4.1 ELECTRICAL INSTALLATION SHALL BE IN ACCORDANCE WITH THE LOCALLY ADOPTED ITERATION OF THE NATIONAL ELECTRICAL CODE AND SUPPLEMENTED BY THE LOCAL AUTHORITY HAVING JURISDICTION. INSTALLATION SHALL BE CHECKED FOR CODE COMPLIANCE AND REWORK SHALL BE REQUIRED TO MEET CODE AS NECESSARY AT CONTRACTOR'S EXPENSE.
4.2 IN INSTANCES WHERE LOCAL CODE JURISDICTIONS DO NOT REQUIRE AN ELECTRICAL INSPECTION, THE CONTRACTOR WILL HIRE AN INDEPENDENT NEC QUALIFIED INSPECTOR TO INSPECT THE FINAL ELECTRICAL INSTALLATION.
4.3 ALL CABLES AND PULL STRINGS SHALL BE MARKED WITH A CABLE LABEL THAT HAS PERMANENT BLACK LETTERING ON A WHITE BACKGROUND. CABLE NOMENCLATURE SHALL BE CONSISTENT WITH THE CONDUIT SCHEDULE AND RPM SITE ELECTRICAL SCHEMATIC MARKINGS.
4.4 PROVIDE AND INSTALL CORRECT, TYPEWRITTEN, PANEL DIRECTORIES OF NEW OR REVISED PANEL AND/OR SUB–PANEL CIRCUITS.
4.5 PROVIDE AND INSTALL AN ELECTRONICALLY GENERATED OR ENGRAVED ADHESIVE LABEL FOR IDENTIFICATION AT NEW PANELS, SUB–PANELS AND/OR RPM EQUIPMENT AS DIRECTED.
4.6 PROVIDE A SEPARATE INDIVIDUAL NEUTRAL CONDUCTOR FOR EACH RPM CIRCUIT.
4.11 ALL FINAL TERMINATIONS SHALL BE MADE BY THE CONTRACTOR. ALL RPM CONNECTIONS SHALL BE MADE BY THE CONTRACTOR UNDER PNNL VENDOR'S SUPERVISION.
4.12 THE CONTRACTOR SHALL SEAL ELECTRICAL CONDUIT ENTERING AREAS OF TEMPERATURE CHANGE BY SEALING TYPE FITTINGS TO PREVENT AIR MIGRATION AND CONDENSATION.
4.13 THE ENTIRE WIRING SYSTEM SHALL BE TESTED FOR SHORT CIRCUITS, GROUNDS AND INSULATION RESISTANCE BETWEEN CONDUCTORS AND TO GROUND.
4.14 FURNISH AND INSTALL ALL CONDUITS, WIRES, BOXES, SWITCHES, LIGHT FIXTURES (WITH LAMPS), RECEPTACLES, SERVICE DEVICES, AND PANEL BOARDS REQUIRED FOR A COMPLETE AND OPERATIONAL ELECTRICAL SYSTEM. ALL STARTERS, FUSED DISCONNECTS, BREAKERS, FUSES, CONTACTORS, SWITCHES, J–BOXES, CONDUIT, CONDULETS AND WIRES THAT ARE NOT SUPPLIED BY THE EQUIPMENT MANUFACTURER IN A PREWIRED PANEL ARE BY THE CONTRACTOR UNLESS OTHERWISE NOTED.
4.15 ALL DISCONNECT SWITCHES AND ENCLOSED CIRCUIT BREAKERS DISCONNECTING MOTORS OR CONTROLLING ELECTRICAL DISCHARGE LIGHTING SHALL BE WITHIN SIGHT OF MOTORS OR FIXTURES (NOT OVER 50 FT) OR BE CAPABLE OF BEING LOCKED IN THE OPEN POSITION.
4.16 THE ELECTRICAL DRAWINGS ARE DIAGRAMMATIC AND DO NOT SHOW ALL OFFSETS, BENDS, FITTINGS, JUNCTIONS, BOXES, PULL BOX AND EXPANSION FITTINGS REQUIRED TO MEET FIELD CONDITIONS. THE CONTRACTOR SHALL DETERMINE ACTUAL MATERIAL AND HARDWARE REQUIREMENTS AND VERIFY ALL DIMENSIONS BY FIELD INSPECTION.
4.17 MINIMUM DEPTH OF DIRECT BURIAL AND CONCRETE ENCASED CONDUIT SHALL BE 24" (OR PER LOCAL CODE) FROM FINISHED SURFACE UNLESS OTHERWISE NOTED.
4.18 ELECTRICAL EQUIPMENT AND DEVICES INSTALLED OUTDOORS SHALL BE ENCLOSED IN WEATHERPROOF, CORROSION RESISTANT, STAINLESS STEEL NEMA 4X ENCLOSURES.
4.19 CONTRACTOR SHALL PROVIDE AND INSTALL PULL BOXES, WEATHERPROOF ENCLOSURES, JUNCTION BOXES, AND VAULTS, AS NECESSARY TO FACILITATE INSTALLATION AND MEET CODE (EVEN IF NOT SHOWN IN THE DRAWINGS).

5.0 POWER WIRING

5.1 FOR ALL DRY AND DAMP LOCATIONS USE COPPER WIRE WITH THHN OR THWN INSULATION.
5.2 FOR ALL WET LOCATIONS USE COPPER WIRE WITH XHHW–2 INSULATION.
5.3 MINIMUM WIRE GAUGE FOR RPM POWER CIRCUITS SHALL BE 12 AWG.

6.0 RPM SIGNAL CABLE

6.1 CABLING BETWEEN THE CONTROL BOX AND ANNUNCIATORS (INDOOR OR OUTDOOR) OR CONTROL BOX AND RSPS SHALL BE 8 CONDUCTOR (4 TWISTED PAIR, SHIELDED) OUTDOOR RATED COMMUNICATION CABLE WITH DIRECT BURIAL JACKET. REFER TO RPM8 RADIATION PORTAL MONITOR SYSTEM INSTALLATION MANUAL (LATEST REVISION) FOR REQUIRED CONDUCTOR SIZE. NOTE THAT THE CONTRACTOR SHALL COMPLY WITH SIZES RECOMMENDED IN THIS MANUAL.
6.2 CONTRACTOR TO VERIFY FINAL RUN LENGTHS IN THE FIELD.
6.3 ALL FINAL TERMINATIONS SHALL BE MADE BY THE CONTRACTOR.
6.4 DATA CABLE HANDLING AND INSTALLATION SHALL BE ACCOMPLISHED BY TRAINED INSTALLERS ONLY.
6.5 SIGNAL CABLES SHALL BE VERIFIED AT BOTH ENDS FOR ACCURATE TERMINATION AND CONTINUITY.

7.0 ETHERNET CABLE (CATEGORY 6)

7.1 MAXIMUM CAT6 RUN IS 240 FEET FOR NETWORK CABLES TO RPM CONTROL BOX; 295 FEET FOR ALL OTHERS. CONTRACTOR TO VERIFY FINAL RUN LENGTHS IN FIELD.
7.2 TERMINATE ALL CAT 6 CABLE WITH AN RJ–45 CONNECTOR. NO SPLICING ALLOWED.
7.3 THE CONTRACTOR SHALL TEST THE CABLES WITH A DTX CABLEANALYZER CABLE TESTER (OR APPROVED EQUIVALENT). DTX CABLEANALYZER IS A REGISTERED TRADEMARK OF FLUKE NETWORKS AND SERVICES.
7.4 USE TIA–568B FOR ALL ETHERNET CONNECTORS.

8.0 ETHERNET CABLE (FIBER OPTIC CABLE)

8.1 INSTALL AND TEST THE FIBER OPTIC MEDIA IN ACCORDANCE WITH CONTRACT DRAWINGS, SPECIFICATIONS, INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS (IEEE) STANDARD C2, NFPA 70 AND TELECOMMUNICATION INDUSTRY (TIA) STANDARD TIA–590–A.
8.2 ALL SPLICES IN FIBER OPTIC CABLE SHALL BE FUSED SPLICES
8.3 DO NOT ALLOW BENDS IN MEDIA WHICH EXCEED THE MANUFACTURER'S MINIMUM RECOMMENDED RADIUS OR 10 TIMES THE OUTSIDE DIAMETER OF THE CABLE, WHICHEVER IS GREATER.
8.4 A HORIZONTAL SLACK OF APPROXIMATELY 3' SHALL BE LEFT ON EACH SIDE OF CONNECTION BOXES AND AT POINTS WHERE CONNECTIONS ARE BROUGHT ABOVE GROUND. ADDITIONAL SLACK SHALL BE PROVIDED TO MAKE ANY NECESSARY CONNECTIONS.
8.5 CONTRACTOR WILL PROVIDE PNNL WITH TOTAL INDIVIDUAL LINK TEST AND RESULTS DOCUMENTATION FOR EACH FIBER RUN, CABLE, AND STRAND.
8.6 SINGLE MODE FIBER SHALL BE TESTED IN ACCORDANCE WITH TIA–526–7 (OPTICAL POWER LOSS). MULTI MODE FIBER SHALL BE TESTED IN ACCORDANCE WITH TIA–526–14–A AFTER ALL TERMINATIONS AND SPLICES ARE COMPLETE.
8.7 DATA CABLE HANDLING AND INSTALLATION SHALL BE ACCOMPLISHED BY A TRAINED INSTALLER ONLY.
8.8 TERMINATIONS WILL BE WITH TERMINAL TYPES AS SPECIFIED IN THE DRAWINGS. VERIFY AND MATCH EXISTING AS REQUIRED.
8.9 THE CONTRACTOR SHALL TERMINATE AS MANY STRANDS OF THE FIBER OPTIC CABLE AS SHOWN IN DESIGN PLUS TWO SPARES. CABLE AND CONNECTORS WILL BE CHECKED BY A HIGH PERFORMANCE OPTICAL TIME DOMAIN REFLECTOMETER FOR MULTIMODE AND SINGLE MODE SYSTEMS (OR APPROVED EQUIVALENT). THE CONNECTORS SHALL EXHIBIT <=0.5DB LOSS PER CONNECTION @ BOTH 1300NM AND 1550NM, AS MEASURED PER FOTP–171 D3.
8.10 SAW CUT FIBER CABLE SHALL BE INSTALLED PER MANUFACTURER'S SPECIFICATIONS.

9.0 CONDUIT

9.2 MINIMUM CONDUIT SIZES SHALL BE 3/4" OR AS OTHERWISE SHOWN ON DRAWINGS. CONTRACTOR SHALL VERIFY CONDUIT SIZES FOR COMPLIANCE TO NEC BASED ON ACTUAL WIRE RUNS.
9.4 USE RMC FOR ALL DAMP AND WET EXTERIOR ABOVE GRADE RACEWAYS.
9.5 USE POLYMER COATED RMC FOR ALL TRANSITIONS FROM HORIZONTAL THROUGH VERTICAL STUB–UPS.
9.6 USE RMC OR EMT FOR ALL EXTERIOR ABOVE GRADE RACEWAYS UNDER CANOPIES.
9.7 USE EMT FOR ALL INTERIOR RACEWAYS.
9.8 COMPRESSION TYPE FITTINGS SHALL BE USED WITH EMT WHERE EXPOSED TO WEATHER (OUTDOORS).
9.9 PROVIDE PULL STRINGS AND LABELS IN ALL EMPTY CONDUITS. CAP AND MAKE WATERTIGHT ALL EMPTY CONDUITS. ALL EMPTY CONDUIT STUB–UPS SHALL EXTEND 3" ABOVE FINISH SURFACE.
9.10 CONDUIT LOCATED UNDERGROUND IN ANY AREA OF VEHICULAR TRAFFIC MUST BE PLACED A MINIMUM OF 24" (OR PER LOCAL CODE) BELOW THE SURFACE. ALL OTHER UNDERGROUND CONDUIT MUST BE PLACED A MINIMUM OF 24" BELOW THE SURFACE.
9.11 CONDUIT SHALL BE ROUTED AROUND AND BENEATH ANCHOR BOLT REBAR CAGE AT FOUNDATIONS AS REQUIRED.
9.12 MYERS (GASKETED) HUBS SHALL BE USED FOR ALL CONDUIT PENETRATIONS INTO THE RSP, CONTROL BOX, BATTERY BOX, AND ALL JUNCTION BOXES.
9.13 DO NOT USE FLEX CONDUIT UNLESS SPECIFIED IN THE DESIGN DRAWINGS.

10.0 MISC HARDWARE

10.1 ALL CARBON STEEL NUTS, BOLTS, AND WASHERS SHALL BE GALVANIZED PER ASTM A563, GRADE DH.
10.2 RPM ANCHOR BOLTS SHALL BE ASTM F 1554 GRADE 55. ANCHOR BOLT NUTS SHALL BE ASTM DH. ALL COMPONENTS SHALL MEET ASTM A153, STANDARD SPECIFICATION FOR ZINC COATING (HOT–DIP) ON IRON AND STEEL HARDWARE.
10.3 ALL STAINLESS STEEL NUTS, BOLTS AND WASHERS SHALL BE ASTM SERIES 300 (UNLESS OTHERWISE NOTED).
10.4 ALL GALVANIZED BOLTS SHALL BE A307 OR SAE GRADE 5, WITH ASTM A563 GRADE A CLASS 2B HEX NUTS AND ASTM F436 FLAT CIRCULAR PLAIN WASHERS FOR OVERHEAD STRUCTURE AND ALL ASSOCIATED ELECTRICAL EQUIPMENT (UNLESS OTHERWISE NOTED).
10.5 FIELD VERIFY ALL DIMENSIONS OF THE EQUIPMENT BEING MOUNTED PRIOR TO INSTALLATION. FIELD DRILL OR SHOP DRILL ALL SURFACES TO MATCH EQUIPMENT.
10.6 CONTRACTOR SHALL PROVIDE AND INSTALL ALL REQUIRED EQUIPMENT AND MATERIAL NOT SPECIFICALLY IDENTIFIED AS GOVERNMENT FURNISHED EQUIPMENT (GFE).
10.7 CONTRACTOR SHALL PROVIDE AND INSTALL ALL MISCELLANEOUS HARDWARE REQUIRE TO COMPLETE RPM INSTALLATION (EVEN IF NOT SHOWN IN THE DRAWINGS).
10.8 ALL NUTS REQUIRE FULL BOLT THREAD ENGAGEMENT.

11.0 LIGHTNING PROTECTION

11.1 LIGHTNING PROTECTION OF RPM EQUIPMENT IS BASED ON A GRADED APPROACH. SPECIFIC GUIDANCE FOR MEASURES REQUIRED TO MITIGATE DAMAGE FROM LIGHTNING INDUCED SURGES IS PROVIDED IN THE DRAWINGS AND TECHNICAL SPECIFICATIONS.
11.2 ALL RPM STANDS SHALL BE BONDED AND GROUNDED TO A COPPER OR COPPER COATED STEEL GROUNDING ROD OR PLATE (LOCAL CODES SHALL APPLY).
11.3 ALL NEW POWER PANELS SHALL BE EQUIPPED WITH INTEGRATED SURGE SUPPRESSION CERTIFIED PER UL1449.
11.4 RPM SHROUDS ARE INHERENTLY HARDENED AGAINST EFFECTS OF LIGHTNING. NO ADDITIONAL LIGHTNING PROTECTION/ATTRACTION (AIR TERMINALS) EQUIPMENT IS REQUIRED.
11.5 SURGE PROTECTION DEVICES, (SPD) SHALL BE PROVIDED TO BOTH TERMINATIONS OF EACH ETHERNET CAT 6 CABLE FROM OUTSIDE COMPONENTS.
11.6 CONTRACTOR TO USE 110 PUNCH DOWN BLOCK TOOL TO LAND WIRES TO SPD. SPD TO BE SECURELY MOUNTED AND TIE DOWN CABLES USED TO PREVENT WIRE MOVEMENT.
11.7 FOR OUTDOOR SPD INSTALL IN NEAREST COMMUNICATION JB. DRILL HOLE IN BOTTOM OF WALL OF JB AND INSTALL STRAIN RELIEF CONNECTOR MAINTAINING NEMA 4 RATING OF BOX. ROUTE BARE SOLID OR JACKETED GREEN #6 COPPER GROUNDING WIRE THROUGH STRAIN RELIEF.
11.8 FOR INDOOR SPD GROUND PER MANUFACTURER'S INSTRUCTIONS WITH #6 STRANDED COPPER WIRE TO NEAREST EARTH GROUND.

12.0 DESIGN CRITERIA

12.1 DESIGN DRAWINGS ARE BASED ON HORIZONTAL LOADS AS FOLLOWS: WIND LOADS BASED ON A 155 MPH 3–SECOND PEAK GUST FOR RISK CATEGORY II AND EXPOSURE C, PER ASCE 7–10 AND AN ALLOWABLE SOIL PRESSURE OF 1500 PSF.
12.2 DESIGN DRAWINGS ARE BASED ON A LIGHTNING FLASH DENSITY AS DEFINED BY NFPA 780 OF 0.5 FLASHES/KM2/YEAR, CORRESPONDING TO A LOW.
12.3 ELECTRICAL CONDUCTOR SIZE IS BASED ON A 3.5A MAXIMUM CURRENT DRAW AT 120VAC FOR RPMS AND SHALL BE SIZED TO PREVENT A VOLTAGE DROP NOT TO EXCEED 3% FOR FEEDER CIRCUITS AND 2% FOR BRANCH CIRCUITS.

13.0 METAL FINISHES

13.1 ALL GALVANIZED ITEMS SHALL BE "HOT DIPPED" G210 GALVANIZED, 2.1 OUNCES MIN PER SQUARE FOOT, AFTER FABRICATION. ALL WELDED AREAS, AND ALL AREAS WHERE GALVANIZED SURFACE HAS BROKEN FOR ANY REASON, SHALL BE REPAIRED WITH LANCO GALVACON OR APPROVED EQUAL, APPLIED ACCORDING TO MANUFACTURER'S SPECIFICATIONS.
13.2 ALL EXPOSED CARBON STEEL TO BE HOT DIPPED GALVANIZED. EXCEPT WHERE DRAWINGS STATE OTHERWISE.

14.0 TRAFFIC BARRIER

14.1 K–RAILS: CONCRETE TRAFFIC BARRIERS SHALL MEET STATE DOT REQUIREMENTS AS APPLICABLE.
14.2 ALL K–RAILS SHALL BE PINNED ACCORDING TO STATE DOT REQUIREMENTS AS APPLICABLE, OR AT A MINIMUM USING 1"ø X 24" PINS, MINIMUM OF 4 PER K–RAIL 12'–6" AND LESS, MINIMUM 6 PER K–RAIL OVER 12'–6", UNLESS OTHERWISE NOTED.
14.3 ALL K–RAILS SHALL BE PROVIDED WITH PRECAST PIN POCKETS, AS REQUIRED.

15.0 HOLD POINTS

15.1 PNNL OBSERVES DELIVERY OF RPM EQUIPMENT.
15.2 LAYOUT INSPECTION (INCLUDING RPM CRITICAL DIMENSIONS VERIFICATION) AND APPROVAL PRIOR TO COMMENCEMENT OF EXCAVATION (IF EXCAVATION OR TRENCHING IS REQUIRED) AND RPM INSTALLATION.
15.3 PNNL OBSERVES SITE PREPARATION FOR FOUNDATION EXCAVATION AND ASSEMBLY INSPECTION PRIOR TO SCHEDULING CONCRETE (IF FOUNDATION MODIFICATIONS ARE REQUIRED).
15.8 ALL WIRE AND CABLE TO BE INSPECTED PRIOR TO INSTALLATION.
15.9 PNNL OBSERVES COMPLETED ELECTRICAL BEFORE CONCEALMENT.
15.10 PNNL REVIEWS ELECTRICAL TEST REPORTS (POWER AND SIGNAL CABLE) BEFORE ELECTRICAL CONTRACTOR IS RELEASED.

16.0 SPECIAL INSPECTIONS

FOLLOWING LIST AND TABLE DESCRIBES WORK ACTIVITIES THAT REQUIRE SPECIAL INSPECTION. SPECIAL INSPECTIONS ARE THE RESPONSIBILITY OF THE OWNER OR ENGINEER AND SHALL BE PERFORMED BY QUALIFIED, AND AS APPLICABLE, CERTIFIED PERSONNEL PER IBC, CHAPTER 17 AND/OR CONTRACT DOCUMENTS. CONTRACTOR SHALL COORDINATE INSPECTIONS AND PROVIDE ACCESS. SPECIAL INSPECTION IS NOT A SUBSTITUTE FOR INSPECTION REQUIRED BY LOCAL JURISDICTIONS. INSPECTIONS AND TESTS SHALL BE DOCUMENTED AND PROVIDED TO PNNL PRIOR TO REQUESTING ACCEPTANCE OF WORK.

SEE SPECIAL INSPECTIONS TABLE(S) AS NOTED

16.12	CONCRETE:	NONE
16.13	STEEL:	NONE
16.14	POST–INSTALLED ANCHORS:	NONE
16.15	SOILS:	NONE

17.0 REQUESTS FOR INFORMATION

17.1 PNNL DESIGN AUTHORITY SHALL REVIEW AND APPROVE ALL CONTRACTOR RFI'S RELATED TO RPM INFRASTRUCTURE INSTALLATION.

18.0 CONCRETE

18.1 CAST–IN–PLACE CONCRETE SHALL ATTAIN A MINIMUM COMPRESSIVE STRENGTH OF 4000 PSI AT 28 DAYS.
18.2 REINFORCING BARS SHALL BE DEFORMED AND SHALL CONFORM TO ASTM A615, GRADE 60.
18.3 EMBEDDED STEEL MATERIAL SHALL CONFORM TO ASTM A36. ALL EMBEDDED STEEL ITEMS WILL BE HOT–DIP GALVANIZED IN ACCORDANCE WITH ASTM A–123 AND ASTM A–143 UNLESS NOTED OTHERWISE.
18.4 GROUT MATERIAL UNDERNEATH ALL STRUCTURAL COLUMNS, EQUIPMENT BASES, ETC SHALL BE PREPACKAGED, CEMENTITIOUS, NON–SHRINK, NON–METALLIC GROUT. GROUT MATERIAL THAT WILL BE SUBJECTED TO DYNAMIC LOADS, SUCH AS UNDERNEATH LARGE ROTATING EQUIPMENT, SHALL BE AN EPOXY BASED MATERIAL.
18.5 EPOXY MATERIAL FOR DRILLED AND GROUTED REBAR AND ANCHORS SHALL BE AS CALLED FOR ON THE DRAWINGS (HILTI) OR ENGINEERING APPROVED EQUAL.
18.6 COORDINATE CONCRETE WORK WITH PIPING, ELECTRICAL AND MECHANICAL WORK PRIOR TO PLACING CONCRETE. EQUIPMENT ATTACHMENT DETAILS AND BOLTING REQUIREMENTS INDICATED ON DRAWINGS ARE FOR REFERENCE ONLY. CONTRACTOR SHALL VERIFY INTERFACE BETWEEN ALL EQUIPMENT AND CONCRETE FOUNDATIONS PRIOR TO PLACEMENT OF CONCRETE. ANY DISCREPANCIES BETWEEN THE DETAILS INDICATED ON THE DRAWINGS AND THE ACTUAL REQUIRED INTERFACE SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER. ANY REWORK REQUIRED DUE TO INADEQUATE COORDINATION SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
18.7 EXPOSED EDGES OF CONCRETE SHALL HAVE A 1" CHAMFER.
18.8 CONCRETE COVER FOR REINFORCING IN CAST–IN–PLACE CONCRETE WORK SHALL BE AS FOLLOWS UNLESS SPECIFICALLY NOTED OTHERWISE ON THE DETAIL DRAWINGS:
– CONCRETE CAST AGAINST AND PERMANENTLY EXPOSED TO THE EARTH – 3 INCHES
– CONCRETE EXPOSED TO WEATHER – 2 INCHES
– ALL OTHER REINFORCING – 1½ INCHES (MINIMUM)
18.9 SPLICES IN REINFORCING BARS SHALL BE CLASS "B" SPLICES AS DEFINED BY ACI 318 UNLESS NOTED OTHERWISE ON THE DRAWING.
18.10 CONCRETE FLOOR SLABS, DOCK SURFACE, ROADWAYS AND AREA PAVING SHALL HAVE A BROOM FINISH. VERTICAL WALLS SHALL HAVE A RUBBED FINISH AS DESCRIBED IN THE PROJECT SPECIFICATIONS.
18.11 PROVIDE CORNER BARS FOR ALL HORIZONTAL WALL REINFORCEMENT STEEL WITH A MINIMUM LAP OF 36 BAR DIAMETERS.
18.12 CORNER BARS SHALL BE REQUIRED AT ALL REENTRANT CORNER INTERSECTIONS, UNLESS NOTED OTHERWISE ON THE DRAWINGS. THESE BARS SHALL BE #5 WITH A LENGTH OF 4'–0" PLACED AT 45° TO THE CORNER.
18.13 AT LOCATIONS WHERE NEW CONCRETE IS TO BE PLACED AGAINST PREVIOUSLY HARDENED CONCRETE, THE EXISTING CONCRETE SURFACE SHALL BE CLEAN AND FREE OF LAITANCE AND ROUGHENED TO A FULL AMPLITUDE OF APPROXIMATELY ¼ INCH. PRIOR TO PLACING THE NEW CONCRETE, AN EPOXY BONDING AGENT SHALL BE APPLIED TO THE CLEAN, ROUGHENED SURFACE. EPOXY BONDING AGENT SHALL BE "SIKA HI–MOD 32" OR APPROVED EQUAL.

19.0 ENVIRONMENTAL

19.1 EXCAVATION CONTRACTOR/SUBCONTRACTOR SHALL HAVE OSHA HAZWOPER CERTIFICATION.
19.2 ENVIRONMENTALLY SENSITIVE AREAS SHOWN ON THESE DRAWINGS ARE AN RCRA PERMITTED SITE KNOWN AS THE FORMER ALABAMA WOOD TREATING CORPORATION SITE WHICH HANDLED CREOSOTE AND PENTACHLOROPHENOL.
19.3 REFER TO APPENDIX A OF THE SPECIFICATIONS FOR THE ENVIRONMENTAL COVENANT FOR THE ENVIRONMENTALLY SENSITIVE ARES. THE ENVIRONMENTALLY SENSITIVE AREAS ARE IDENTIFIED AS "SWMU 6 EAST" IN THE ENVIRONMENTAL COVENANT.
19.4 EXCAVATIONS IN THE ENVIRONMENTALLY SENSITIVE ARES SHALL BE PERFORMED IN ACCORDANCE WITH THE ENVIRONMENTAL COVENANT. THE CONCRETE CAP AND EARTHEN COVER CAN BE DIRECT LOADED FOR STANDARD DISPOSAL. THE CONTAMINATED SOIL IS APPROXIMATELY 6 TO 7 FEET BELOW THE EXISTING CONCRETE SURFACE AND THIS EXCAVATED MATERIAL SHALL BE PLACED IN DRUMS AND SAMPLED FOR WASTE CHARACTERIZATION. DEPENDING ON RESULTS, THIS MATERIAL MAY HAVE TO BE DISPOSED OF AS HAZARDOUS WASTE.

DRAWING CONTENTS

4155–G1	TITLE SHEET
4155–G2	GENERAL NOTES AND DRAWING INDEX
4155–G3	EXISTING SITE PLAN
4155–G4	NEW SITE PLAN
4155–D1	ENLARGED DEMOLITION PLAN 1 OF 2
4155–D2	ENLARGED DEMOLITION PLAN 2 OF 2
4155–S1	ENLARGED SITE NEW PLAN
4155–S2	ENLARGED NEW SITE PLAN
4155–S3	SECTIONS & DETAILS
4155–S4	SECTIONS & DETAILS
4155–S5	RPM STAND DETAILS
4155–S6	SECTIONS & DETAILS
4155–S7	ENLARGED NEW SITE PLAN
4155–S8	CAMERA/TRAFFIC LIGHT POLE DETAILS
4155–E1	CONDUIT PLAN
4155–E2	ENLARGED CONDUIT PLAN
4155–E3	ENLARGED CONDUIT PLAN
4155–E4	PANEL SCHEDULE & DETAILS
4155–E5	PLC WIRING DIAGRAM
4155–E6	(NOT USED)
4155–E7	WIRING SCHEMATIC
4155–E8	WIRING SCHEMATIC
4155–E9	CABLE & CONDUIT SCHEDULES
4155–E10	EQUIPMENT SCHEDULES
4155–E11	BOOTH DETAILS
4155–E12	ENLARGED CONDUIT PLAN

NOTES

NO.	REVISION	DRAWN	CK'D	APPD	DATE
A	ISSUED FOR BID	LRH	MED	RSG	01/26/18

REFERENCE DRAWINGS

APTIM PORT SERVICES, LLC

THIS DOCUMENT IS THE PROPERTY OF APTIM. IT MAY CONTAIN INFORMATION DESCRIBING TECHNOLOGY OWNED BY APTIM AND DEEMED TO BE COMMERCIALLY SENSITIVE. IT IS TO BE USED ONLY IN CONNECTION WITH WORK BEING PERFORMED BY APTIM. REPRODUCTION IN WHOLE OR IN PART FOR ANY PURPOSE OTHER THAN WORK PERFORMED BY APTIM IS FORBIDDEN EXCEPT BY EXPRESS WRITTEN PERMISSION OF APTIM. IT IS TO BE SAFEGUARDED AGAINST BOTH DELIBERATE AND INADVERTENT DISCLOSURE TO ANY THIRD PARTY.

DRAWN: LRH | CK'D: MED | APPD: RSG | DATE: 12/01/17 | SCALE: NONE

APM TERMINALS Lifting Global Trade

CLIENT DWG NO:

OUTBOUND GATE
RPM LANE EXPANSION
GENERAL NOTES AND DRAWING INDEX

FOR: APM TERMINALS – MOBILE, ALABAMA

PROJECT NO: 4155 | DWG NO: G2 | REV: A

Form: CMS–630–00–FM–03104 APTIM ANSI F.dwg

R:\Project Folders\M4100\M4155 – APM Outbound Gate RPM\Cad Files\CURRENT\4155–G2–REV A.dwg By: Rick.Hartley Printed: Fri 26–Jan–2018 – 12:50PM

SWMU-6E

Limits of Shallow Soil Cover
(Eight Feet of Soil Cover)

ENVIRONMENTALLY SENSITIVE AREA

CONTOUR LINES INDICATE LIMITS OF THE ENVIRONMENTALLY SENSITIVE AREA AND NOT FINAL GRADE ELEVATIONS.

1
G3 D1

JB-C2F

JB-C2D

DROP INLET C2E

DROP INLET C2G

JB-C2F2

CM-22

EMH-22

MONITORING WELL 4D

MONITORING WELL 4DK

CM-22A

EXIST. CBP BOOTH

CM-23

EXIST. DRIVERS ASSISTANCE HELP KIOSK

EMH-23

ENVIRONMENTALLY SENSITIVE AREA

KEEP CLEAR

KEEP CLEAR

KEEP CLEAR

LEGEND:

CM COMMUNICATIONS MANHOLE

EMH ELECTRICAL MANHOLE

JB JUNCTION BOX

SITE PLAN

1"=20'

NOTE:
1.) SITE PLANS MAY NOT CAPTURE THE EXACT LOCATION, QUANTITY, OR DETAIL OF ALL EXISTING EQUIPMENT. CONTRACTOR SHALL FIELD VERIFY WHEN NECESSARY.

0 10' 20' 40' 60'

SCALE: 1" = 20'-0"

APM TERMINALS Lifting Global Trade

CLIENT DWG NO:

NOTES

NO.	REVISION	DRAWN	CK'D	APPD	DATE
A	ISSUED FOR BID	LRH	MED	RSG	01/26/18

REFERENCE DRAWINGS

APTIM PORT SERVICES, LLC

THIS DOCUMENT IS THE PROPERTY OF APTIM. IT MAY CONTAIN INFORMATION DESCRIBING TECHNOLOGY OWNED BY APTIM AND DEEMED TO BE COMMERCIALLY SENSITIVE. IT IS TO BE USED ONLY IN CONNECTION WITH WORK BEING PERFORMED BY APTIM. REPRODUCTION IN WHOLE OR IN PART FOR ANY PURPOSE OTHER THAN WORK PERFORMED BY APTIM IS FORBIDDEN EXCEPT BY EXPRESS WRITTEN PERMISSION OF APTIM. IT IS TO BE SAFEGUARDED AGAINST BOTH DELIBERATE AND INADVERTENT DISCLOSURE TO ANY THIRD PARTY.

DRAWN: LRH | CK'D: MED | APPD: RSG | DATE: 12/01/17 | SCALE: 1"=20'

OUTBOUND GATE
RPM LANE EXPANSION
EXISTING SITE PLAN

FOR: APM TERMINALS – MOBILE, ALABAMA

PROJECT NO: 4155 | DWG NO: G3 | REV: A

SWMU-6E

Limits of Shallow Soil Cover
(Eight Feet of Soil Cover)

Limits of Subsurface Construction in SWMU-6E Soil Cover

CONTOUR LINES INDICATE LIMITS OF THE ENVIRONMENTALLY SENSITIVE AREA AND NOT FINAL GRADE ELEVATIONS.

(2) NEW CAMERA/TRAFFIC LIGHT POLES AND CROSS PIPE SEE DWG S7 & S8 FOR DETAILS

NEW TRAFFIC MARKINGS ON LANES 5 & 6 SEE DWG S6

RELOCATE EXIST K-RAIL, TYP

1 G4 S1

2 G4 S2

NEW KIOSK AND STAIR FOUNDATION

DROP INLET C2G

CM-22

EMH-22

JB-C2

JB-C2F2

JB-C2D

DROP INLET C2E

MONITORING WELL 4D

MONITORING WELL 4DK

CM-22A

EXIST. CBP BOOTH

CM-23

EMH-23

EXIST. DRIVERS ASSISTANCE HELP KIOSK

ENVIRONMENTALLY SENSITIVE AREA

STOP

KEEP CLEAR

6 5 4 3 2 1

LEGEND:

CM COMMUNICATIONS MANHOLE

EMH ELECTRICAL MANHOLE

JB JUNCTION BOX

N W E S

SITE PLAN

1"=20'

NOTE:
1.) SITE PLANS MAY NOT CAPTURE THE EXACT LOCATION, QUANTITY, OR DETAIL OF ALL EXISTING EQUIPMENT. CONTRACTOR SHALL FIELD VERIFY WHEN NECESSARY.

0 10' 20' 40' 60'

SCALE: 1" = 20'-0"

APM TERMINALS Lifting Global Trade

CLIENT DWG NO:

NOTES

NO.	REVISION	DRAWN	CK'D	APPD	DATE
A	ISSUED FOR BID	LRH	MED	RSG	01/26/18

REFERENCE DRAWINGS

APTIM PORT SERVICES, LLC

THIS DOCUMENT IS THE PROPERTY OF APTIM. IT MAY CONTAIN INFORMATION DESCRIBING TECHNOLOGY OWNED BY APTIM AND DEEMED TO BE COMMERCIALLY SENSITIVE. IT IS TO BE USED ONLY IN CONNECTION WITH WORK BEING PERFORMED BY APTIM. REPRODUCTION IN WHOLE OR IN PART FOR ANY PURPOSE OTHER THAN WORK PERFORMED BY APTIM IS FORBIDDEN EXCEPT BY EXPRESS WRITTEN PERMISSION OF APTIM. IT IS TO BE SAFEGUARDED AGAINST BOTH DELIBERATE AND INADVERTENT DISCLOSURE TO ANY THIRD PARTY.

DRAWN: LRH | CK'D: MED | APPD: RSG | DATE: 12/01/17 | SCALE: 1"=20'

OUTBOUND GATE

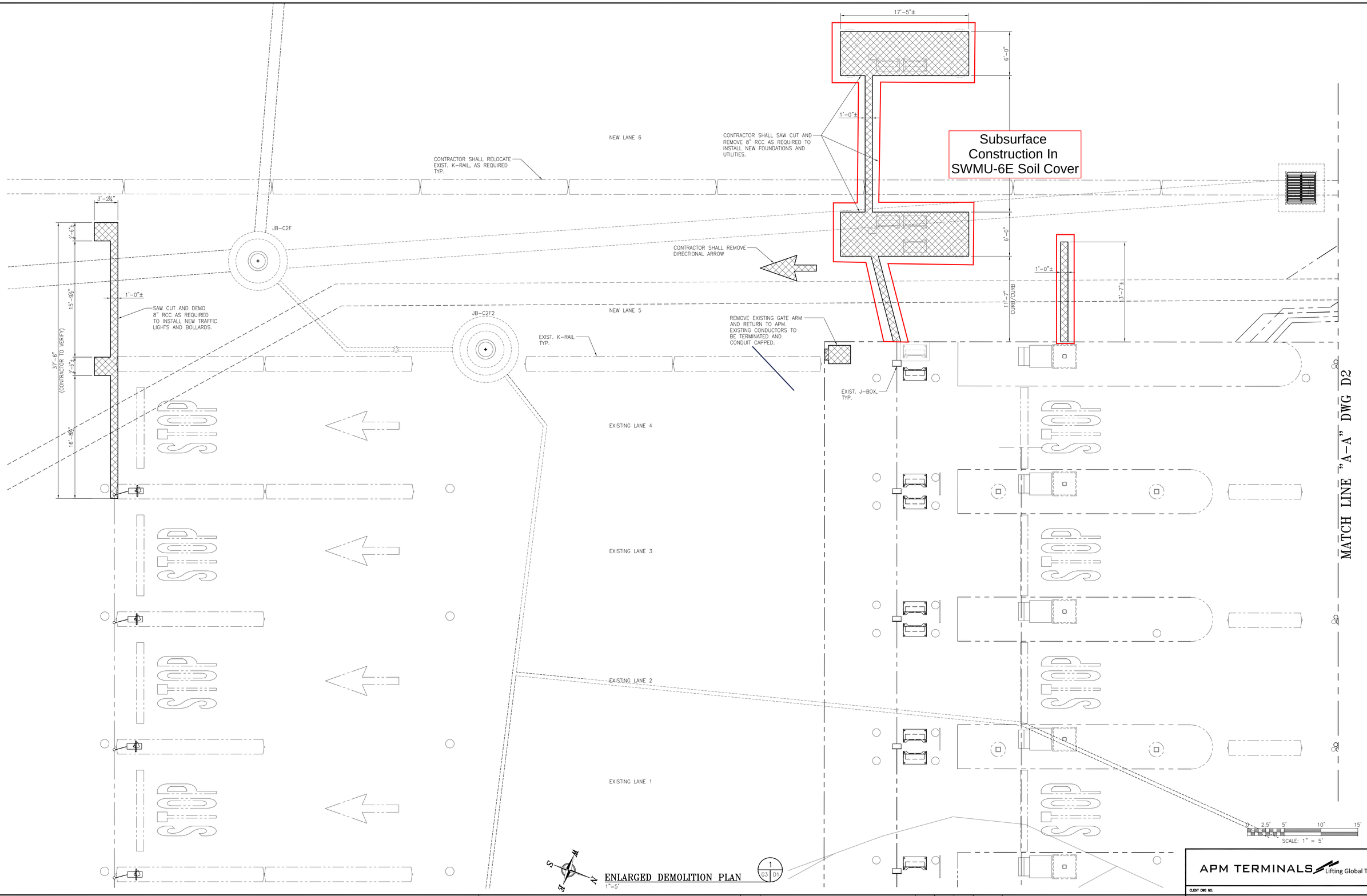
RPM LANE EXPANSION

NEW SITE PLAN

FOR: APM TERMINALS – MOBILE, ALABAMA

PROJECT NO: 4155 | DWG NO: G4 | REV: A

Form: CMS-630-00-FM-02104 APTIM ANSI T.dwg



NOTES

LEGEND:

CM COMMUNICATIONS MANHOLE

EMH ELECTRICAL MANHOLE

JB JUNCTION BOX

NO.	REVISION	DRAWN	CK'D	APPD	DATE
A	ISSUED FOR BID	LRH	MED	RSG	01/26/18

REFERENCE DRAWINGS

THIS DOCUMENT IS THE PROPERTY OF APTIM. IT MAY CONTAIN INFORMATION DESCRIBING TECHNOLOGY OWNED BY APTIM AND DEEMED TO BE COMMERCIALLY SENSITIVE. IT IS TO BE USED ONLY IN CONNECTION WITH WORK BEING PERFORMED BY APTIM. REPRODUCTION IN WHOLE OR IN PART FOR ANY PURPOSE OTHER THAN WORK PERFORMED BY APTIM IS FORBIDDEN EXCEPT BY EXPRESS WRITTEN PERMISSION OF APTIM. IT IS TO BE SAFEGUARDED AGAINST BOTH DELIBERATE AND INADVERTENT DISCLOSURE TO ANY THIRD PARTY.

APTIM PORT SERVICES, LLC

DRAWN: LRH | CK'D: MED | APPD: RSG | DATE: 12/01/17 | SCALE: 1"=5'

APM TERMINALS Lifting Global Trade

CLIENT DWG NO:

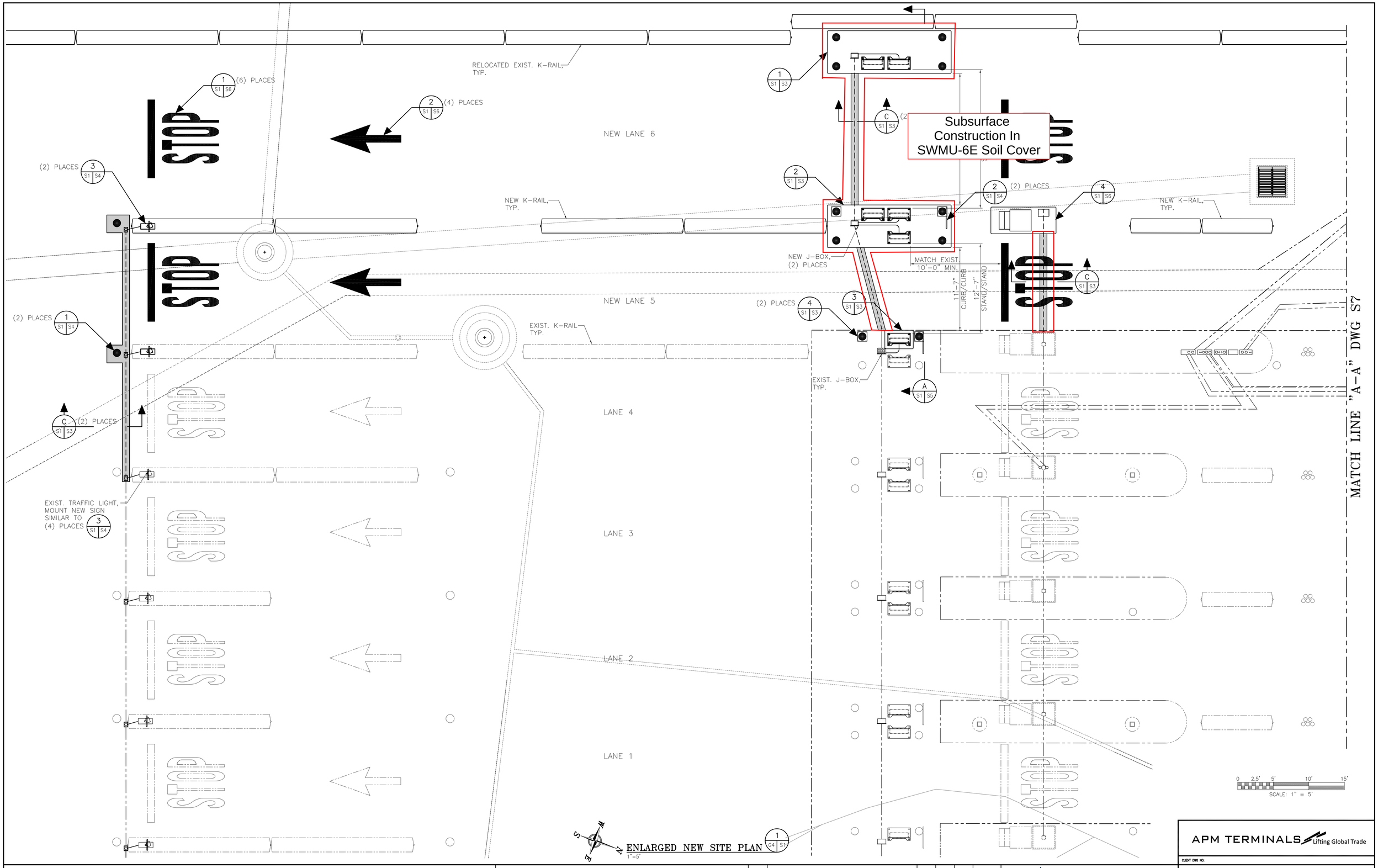
OUTBOUND GATE
RPM LANE EXPANSION
ENLARGED DEMOLITION PLAN 1 OF 2

FOR: APM TERMINALS – MOBILE, ALABAMA

PROJECT NO: 4155 | DWG NO: D1 | REV: A

H:\Project Folders\M4100\M4155 – APM Outbound Gate RPM\Cad Files\CURRENT\4155-D1 & D2-REV A.dwg By: Rick.Hartley Printed: Wed 24-Jan-2018 – 12:57PM

Form: CMS-630-00-FM-02104 APTIM ANSI F.dwg



NOTES

REFERENCE DRAWINGS

NO.	REVISION	DRAWN	CK'D	APPD	DATE
A	ISSUED FOR BID	LRH	MED	RSG	01/26/18

APTIM PORT SERVICES, LLC

THIS DOCUMENT IS THE PROPERTY OF APTIM. IT MAY CONTAIN INFORMATION DESCRIBING TECHNOLOGY OWNED BY APTIM AND DEEMED TO BE COMMERCIALLY SENSITIVE. IT IS TO BE USED ONLY IN CONNECTION WITH WORK BEING PERFORMED BY APTIM. REPRODUCTION IN WHOLE OR IN PART FOR ANY PURPOSE OTHER THAN WORK PERFORMED BY APTIM IS FORBIDDEN EXCEPT BY EXPRESS WRITTEN PERMISSION OF APTIM. IT IS TO BE SAFEGUARDED AGAINST BOTH DELIBERATE AND INADVERTENT DISCLOSURE TO ANY THIRD PARTY.

DRAWN: LRH | CK'D: MED | APPD: RSG | DATE: 12/01/17 | SCALE: 1"=5'

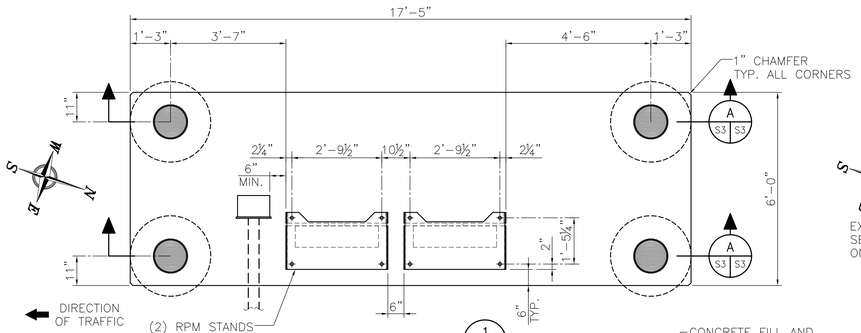
APM TERMINALS Lifting Global Trade

CLIENT DWG NO:

OUTBOUND GATE
RPM LANE EXPANSION
ENLARGED NEW SITE PLAN

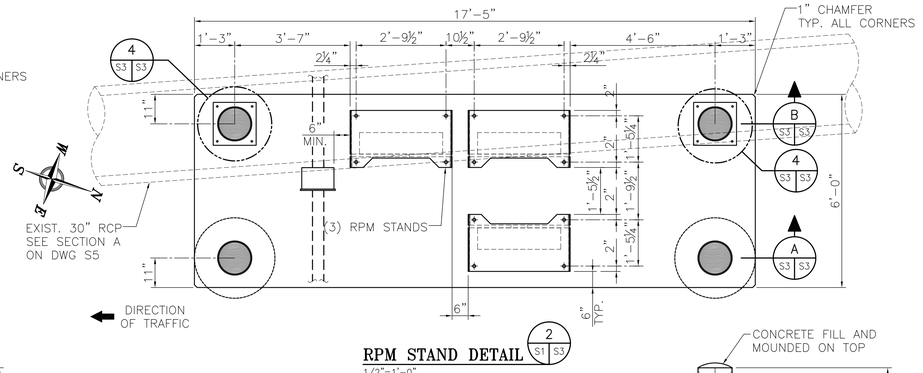
FOR: APM TERMINALS – MOBILE, ALABAMA

PROJECT NO: 4155 | DWG NO: S1 | REV: A



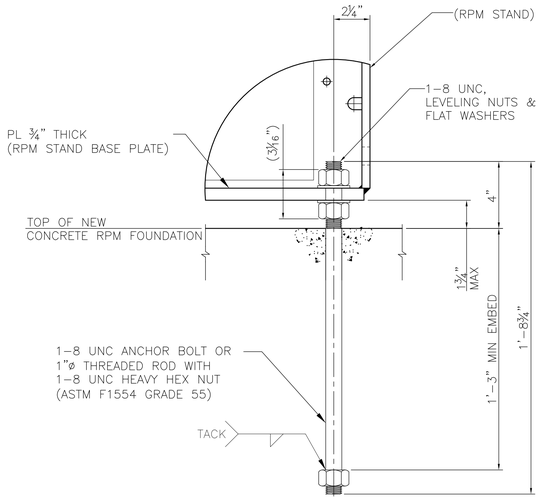
RPM STAND DETAIL 1
S1 S3
1/2"=1'-0"

NOTE: SEE ELECTRICAL DRAWINGS FOR ADDITIONAL INFORMATION.



RPM STAND DETAIL 2
S1 S3
1/2"=1'-0"

NOTE: SEE ELECTRICAL DRAWINGS FOR ADDITIONAL INFORMATION.



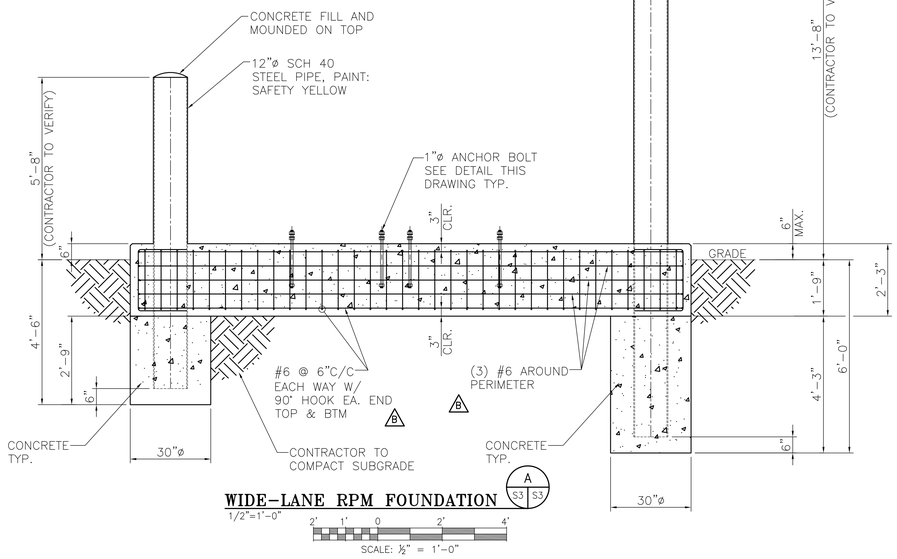
RPM STAND ANCHORING & LEVELING
3"=1'-0"

SCALE: 3" = 1'-0"

NOTES:

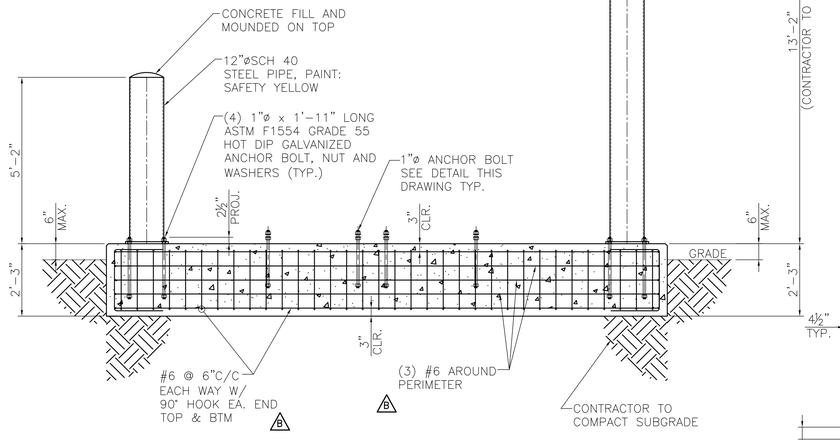
1.) TIGHTEN NUTS HOLDING STAND TO ANCHOR BOLTS TO 275 ft. lbs. AFTER 48 HOURS TORQUE THE NUTS TO 302 ft. lbs.

2.) BOLT, WASHERS, AND NUTS ARE PROVIDED AND INSTALLED BY CONTRACTOR..



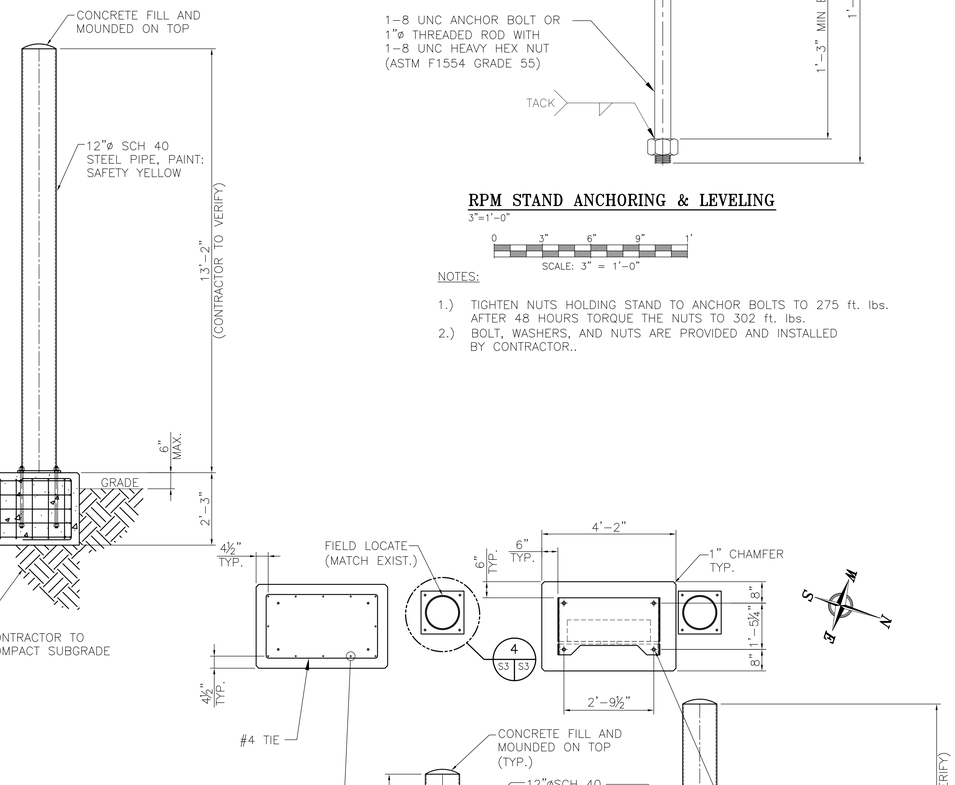
WIDE-LANE RPM FOUNDATION
A S3 S3
1/2"=1'-0"

SCALE: ½" = 1'-0"



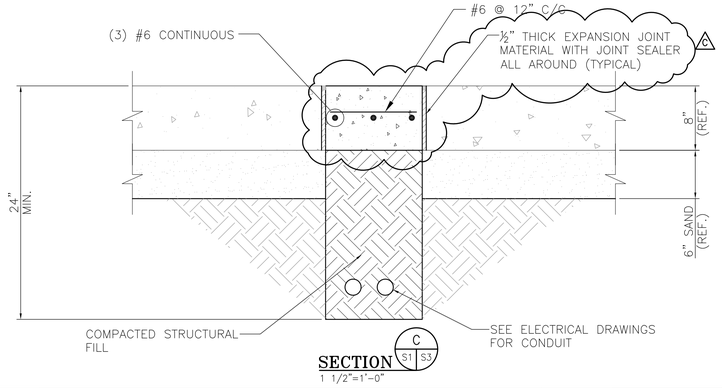
WIDE-LANE RPM FOUNDATION
B S3 S3
1/2"=1'-0"

SCALE: ½" = 1'-0"

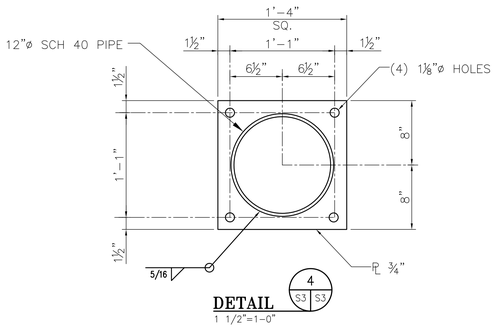


RPM FOUNDATION DETAIL
3 S1 S3
1/2"=1'-0"

SCALE: ½" = 1'-0"



SECTION
C S1 S3
1 1/2"=1'-0"



DETAIL
4 S3 S3
1 1/2"=1'-0"

NOTES

1. ADDITIONAL BACKFILL SHALL BE A GRANULAR MATERIAL WITH A MAXIMUM OF 20% PASSING THE NUMBER 200 SIEVE AND IT SHALL BE PLACED IN UNIFORM LIFTS OF 8 INCHES, LOOSE MEASUREMENT. BACKFILL AND EXISTING SUBGRADE SHALL BE THOROUGHLY COMPACTED TO 98% OF ITS MAXIMUM DRY DENSITY WITHIN + 2% OF ITS OPTIMUM MOISTURE CONTENT IN ACCORDANCE WITH ASTM D698 (STANDARD PROCTOR).
2. IN-PLACE DENSITY TESTS SHOULD BE PERFORMED DURING CONSTRUCTION TO INSURE THAT PROPER COMPACTION IS BEING ACHIEVED. CONTRACTOR SHALL BE RESPONSIBLE FOR HIRING THE TESTING LABORATORY.

NO.	REVISION	DRAWN	CK'D	APPD	DATE
C	ADDED EXPANSION JOINT MATERIAL @ SECTION C	LRH	MED	RSG	02/20/18
B	ADDED REINFORCING NOTE	LRH	MED	RSG	02/09/18
A	ISSUED FOR BID	LRH	MED	RSG	01/26/18

REFERENCE DRAWINGS

THIS DOCUMENT IS THE PROPERTY OF APTIM. IT MAY CONTAIN INFORMATION DESCRIBING TECHNOLOGY OWNED BY APTIM AND DEEMED TO BE COMMERCIALLY SENSITIVE. IT IS TO BE USED ONLY IN CONNECTION WITH WORK BEING PERFORMED BY APTIM. REPRODUCTION IN WHOLE OR IN PART FOR ANY PURPOSE OTHER THAN WORK PERFORMED BY APTIM IS FORBIDDEN EXCEPT BY EXPRESS WRITTEN PERMISSION OF APTIM. IT IS TO BE SAFEGUARDED AGAINST BOTH DELIBERATE AND INADVERTENT DISCLOSURE TO ANY THIRD PARTY.

APTIM PORT SERVICES, LLC

DRAWN: LRH | CK'D: MED | APPD: RSG | DATE: 12/01/17 | SCALE: AS NOTED

APM TERMINALS Lifting Global Trade

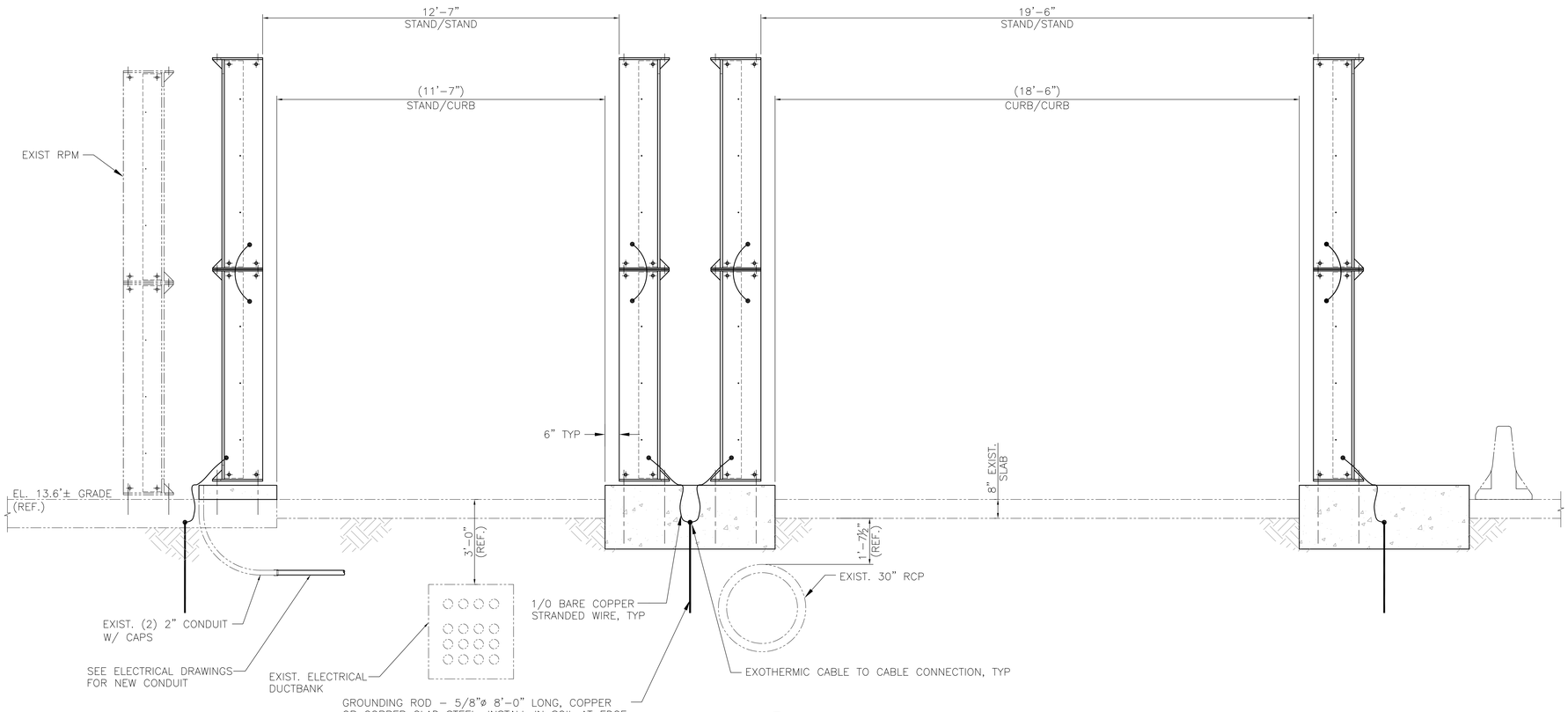
CLIENT DWG NO:

OUTBOUND GATE
RPM LANE EXPANSION
SECTIONS AND DETAILS

FOR: APM TERMINALS – MOBILE, ALABAMA

PROJECT NO: 4155 | DWG NO: S3 | REV: C

Form: CMS-630-00-FM-02104 APTIM ANSI F.dwg

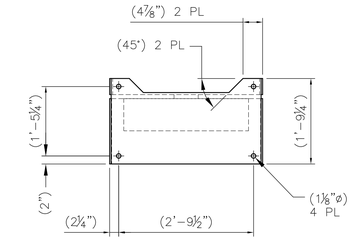


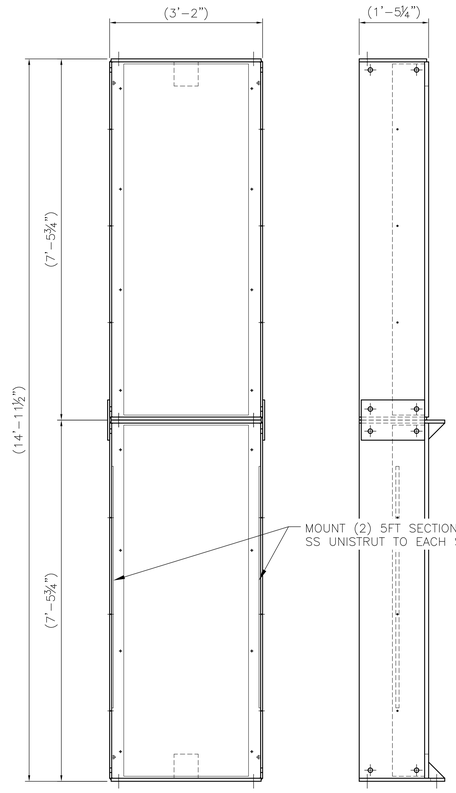
RPM ELEVATIONS (A / S1 / S5)

1/2"=1'-0"

2' 1' 0 2' 4'

SCALE: ½" = 1'-0"





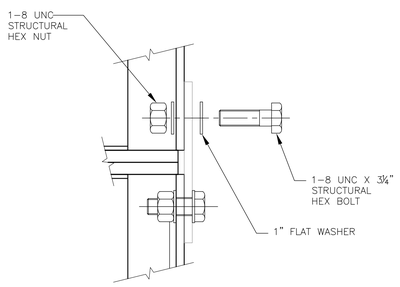
CARGO RPM STAND

3/4"=1'-0"

1' 0 1' 2' 3'

SCALE: ¾" = 1'-0"

NOTES:
1.) CONTRACTOR SHALL ASSEMBLE (2) DETECTOR HOUSINGS INTO (1) COMPLETE RPM STAND WITH HARDWARE PROVIDED.
2.) DETECTOR HOUSINGS GOVERNMENT PROVIDED.
3.) CARGO DETECTOR S/N CONTAINS "-N1" DESIGNATOR.
4.) MOUNT (2) 5FT SECTIONS OF P7000 SS UNISTRUT TO EACH STAND. SEE EQUIPMENT LIST (PART NUMBER 173). CONTRACTOR TO PROVIDE AND INSTALL.



(TENSIONED TO 51,000 LBS)

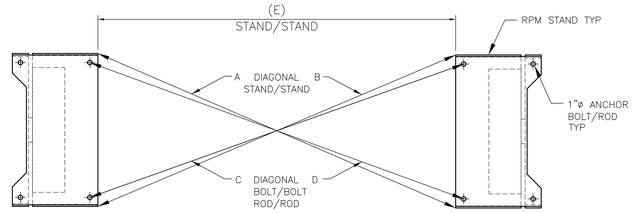
UPPER AND LOWER STAND

3"=1'-0"

0 3" 6" 9" 1'

SCALE: 3" = 1'-0"

NOTE:
1.) BOLT, WASHERS, AND NUT ARE GOVERNMENT FURNISHED AND CONTRACTOR INSTALLED.



A = B ±¼"
C = D ±¼"

RPM STAND ANCHOR BOLT/ROD - ALIGNMENT

NONE

NOTES:
1.) RPM STANDS SHALL BE PLUMB.
2.) SEE RPM CRITICAL DIMENSIONS TABULATION ON THIS SHEET.

CARGO RPM CRITICAL DIMENSIONS

LANE	DIMENSION A/B	DIMENSION C/D	DIMENSION (E)
LANE 5	12'-11 1/16"	13'-2 9/16"	(12'-7")
LANE 6	20'-0 3/8"	19'-9 1/16"	(19'-6")

NOTES

REFERENCE DRAWINGS	NO.	REVISION	DRAWN	CK'D	APPD	DATE
	A	ISSUED FOR BID	LRH	MED	RSG	01/26/18

THIS DOCUMENT IS THE PROPERTY OF APTIM. IT MAY CONTAIN INFORMATION DESCRIBING TECHNOLOGY OWNED BY APTIM AND DEEMED TO BE COMMERCIALLY SENSITIVE. IT IS TO BE USED ONLY IN CONNECTION WITH WORK BEING PERFORMED BY APTIM. REPRODUCTION IN WHOLE OR IN PART FOR ANY PURPOSE OTHER THAN WORK PERFORMED BY APTIM IS FORBIDDEN EXCEPT BY EXPRESS WRITTEN PERMISSION OF APTIM. IT IS TO BE SAFEGUARDED AGAINST BOTH DELIBERATE AND INADVERTENT DISCLOSURE TO ANY THIRD PARTY.

DRAWN: LRH | CK'D: MED | APPD: RSG | DATE: 12/01/17 | SCALE: AS NOTED

APM TERMINALS Lifting Global Trade

CLIENT DWG NO:

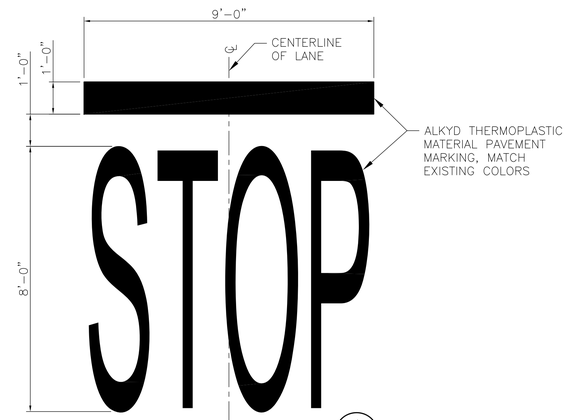
OUTBOUND GATE
RPM LANE EXPANSION
RPM STAND DETAILS

FOR: APM TERMINALS - MOBILE, ALABAMA

PROJECT NO: 4155 | DWG NO: S5 | REV: A

Form: CMS-830-00-FM-02104 APTM ANSI F.dwg

H:\Project Folders\M4100\M4155 - APM Outbound Gate RPM\Cad Files\CURRENT\4155-S5-REV A.dwg By: Rick.Hartley Printed: Wed 24-Jan-2018 - 01:10PM

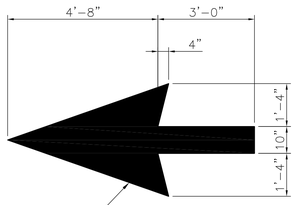


Ppainted stop line detail (1 / S1 | S6)

1/2"=1'-0"

2' 1' 0 2' 4'

SCALE: ½" = 1'-0"



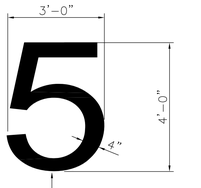
ALKYD THERMOPLASTIC MATERIAL PAVEMENT MARKING, MATCH EXISTING COLORS

DIRECTIONAL ARROWS (2 / S1 | S6)

½"=1'-0"

2' 1' 0 2' 4'

SCALE: ½" = 1'-0"



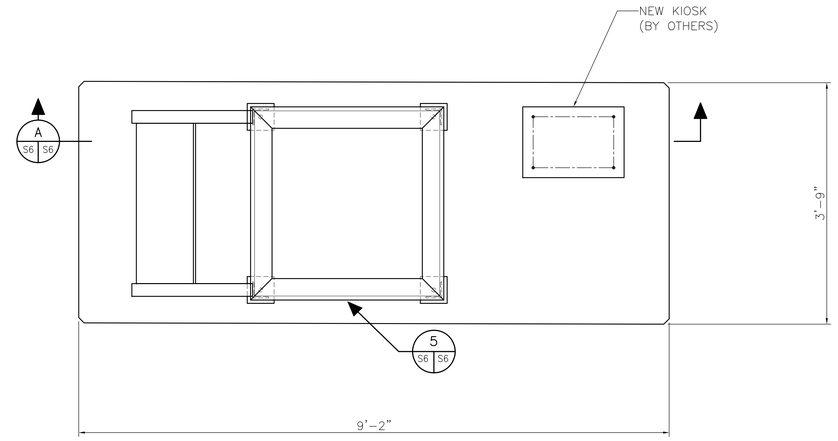
ALKYD THERMOPLASTIC MATERIAL PAVEMENT MARKING, MATCH EXISTING COLORS

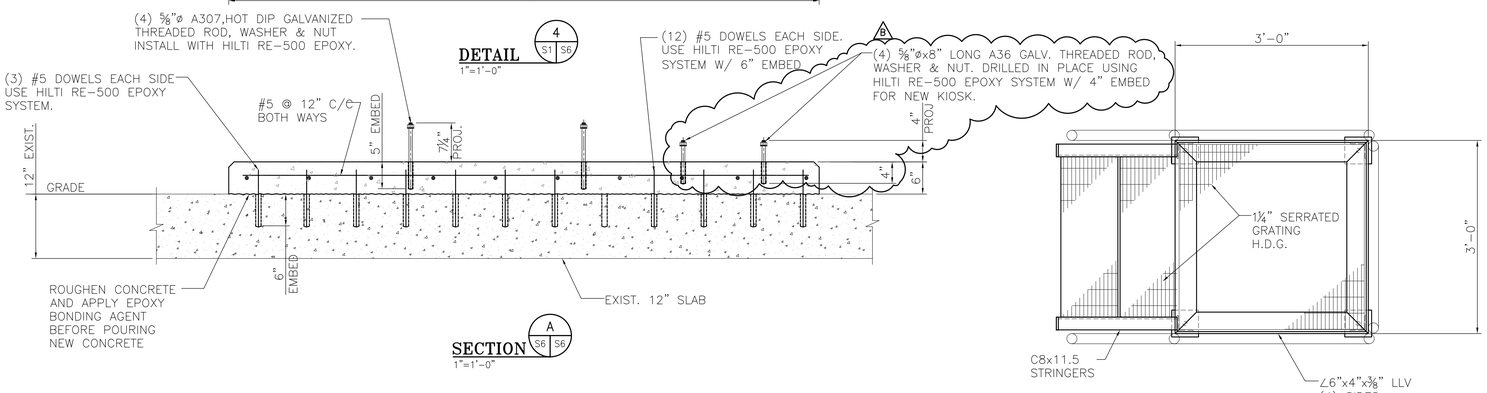
NUMBER DETAIL (3 / S4 | S6)

½"=1'-0"

2' 1' 0 2' 4'

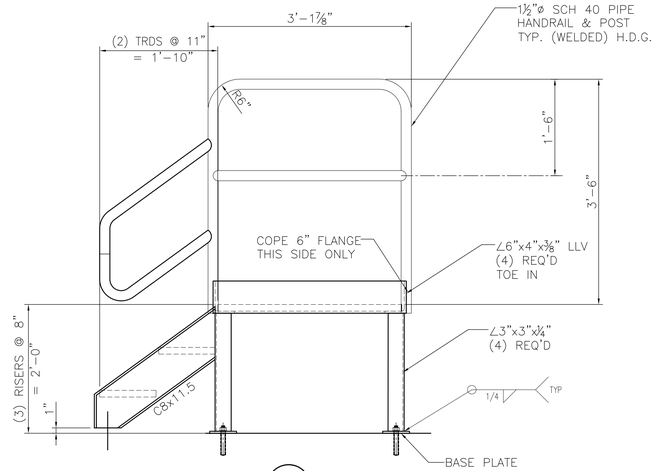
SCALE: ½" = 1'-0"





DETAIL (4 / S1 | S6) 1"=1'-0"

SECTION (A / S6 | S6) 1"=1'-0"



DETAIL (5 / S6 | S6) 1"=1'-0"

NOTE:
CONTRACTOR TO COORDINATE WITH APM AND KIOSK PROVIDER PRIOR TO FABRICATION.

NOTES

1. ALL THERMOPLASTIC PAVEMENT MARKINGS SHALL BE IN ACCORDANCE WITH ALDOT SPECIFICATIONS. PAVEMENT MARKINGS SHALL BE CLASS 2, TYPE B.

NO.	REVISION	DRAWN	CK'D	APPD	DATE
B	REVISED FOR BID	LRH	MED	RSG	02/22/18
A	ISSUED FOR BID	LRH	MED	RSG	01/26/18

REFERENCE DRAWINGS

APTIM PORT SERVICES, LLC

THIS DOCUMENT IS THE PROPERTY OF APTIM. IT MAY CONTAIN INFORMATION DESCRIBING TECHNOLOGY OWNED BY APTIM AND DEEMED TO BE COMMERCIALLY SENSITIVE. IT IS TO BE USED ONLY IN CONNECTION WITH WORK BEING PERFORMED BY APTIM. REPRODUCTION IN WHOLE OR IN PART FOR ANY PURPOSE OTHER THAN WORK PERFORMED BY APTIM IS FORBIDDEN EXCEPT BY EXPRESS WRITTEN PERMISSION OF APTIM. IT IS TO BE SAFEGUARDED AGAINST BOTH DELIBERATE AND INADVERTENT DISCLOSURE TO ANY THIRD PARTY.

DRAWN: LRH | CK'D: MED | APPD: RSG | DATE: 12/01/17 | SCALE: AS NOTED

APM TERMINALS Lifting Global Trade

CLIENT DWG NO:

OUTBOUND GATE
RPM LANE EXPANSION
SECTIONS AND DETAILS

FOR: APM TERMINALS – MOBILE, ALABAMA

PROJECT NO: 4155 | DWG NO: S6 | REV: B

Form: CMS-630-00-FM-02104 APTIM ANSI T.dwg

Solid Waste Management Unit 6 East (SWMU-6E)
Inter-Terminal Connector Amendment

Background:

The original approved soil cover design for SWMU-6E consisted of an engineered soil cover designed to prevent human contact with impacted materials. The engineered soil cover at SWMU-6E raised existing grade by approximately six feet to 12 feet (ft.) mean sea level (MSL), the 100-year flood plain elevation. An amendment to the SWMU-2/7, SWMU-4/5/8, and SWMU-6E (the SWMUs) approved cover designs (Amendment to AWTC Site CMIP for Fill and Pavement Design) was implemented as part of site development for future use as a shipping container terminal, including raising grade at the SWMUs to approximately 12 to 14 ft. MSL followed by emplacement of six inches of stabilizer sand overlain by an eight-inch-thick section of roller compacted concrete (RCC). The shipping container terminal development work (Backfill and Pavement Design Amendment) also included construction of an outbound gate with four truck lanes at SWMU-6E to control truck traffic and containers leaving the site followed by construction of two additional outbound gate lanes with radiation portal monitors (RPMs). The site currently operates as AMP Terminals (the Site) where shipping containers are transferred from land to sea.

Inter-Terminal Connector (ITC) Amendment:

The current phase of work will consist of the construction of a mechanically stabilized earth (MSE) wall/embankment system on the eastern portion of SWMU-6 East. The MSE wall is part of the larger Inter-Terminal Connector project, a 3,330 ft. roadway project connecting the Garrows Bend Intermodal Container Transfer Facility (ICTF) and the Site. Approximately 870 feet of the project is located within the AWTC facility and approximately 345 feet of that is the MSE wall system. Within the AWTC facility, activities associated with the proposed project primarily include removal and restoration of the SWMU-6 East concrete cap and soil cover to construct the MSE wall foundation. The wall foundation will extend a minimum of two feet below the existing concrete ground surface but will not extend lower than an elevation of 10 feet. The area of proposed subsurface construction is limited to approximately 6,300 square feet of the approximately 139,400 square feet of the existing SWMU-6 East area.

Overlay figures in addition to selected drawings from the construction plans – (Inter-Terminal Connector Between Mobile Container Terminal & ICTF, May 2024) showing SWMU-6E and the location, plans, and sections of the MSE wall over SWMU-6E are included as follows:

- ITC Figure 1 – Contiguous Property Map with ITC Overlay
- ITC Figure 2 – MSE Wall Extent

- ITC Figure 3 – SWMU-6 East Extent
- 1 – Title Sheet.
- 1A – Index to Sheets.
- 1E – Plans Legend Sheet.
- 1F – Plans Legend Sheet Abbreviations.
- 1J – Primary Survey Control and Geometric Layout Sheet
- 2C – Typical Section
- 2D – Typical Section
- 2G – Project Details
- 2H – Project Details
- 7 – Plan Sheet (beginning and ending stations for MSE wall highlighted)
- 7A – Profile Sheet (MSE wall profile highlighted)
- 8 – Plan Sheet (portion of MSE wall located over SWMU-6 East outlined)
- 8A – Profile Sheet – MSE Wall 1A (MSE wall notes highlighted)
- 8B – Profile Sheet – MSE Wall 1B (MSE wall notes highlighted)
- 8C – Profile Sheet – MSE Wall 1C (MSE wall notes highlighted)
- 48 – Traffic Control Plan – Staging Areas (provide for context on entirety of project)
- 60 – Erosion and Sediment Control Plans Legend
- 64 – Erosion and Sediment Control Plan

The MSE wall construction will consist of the following activities:

- Sawcut and removal of approximately 6,300 SF of RCC (eight-inch section) in the location shown on Drawing 8. Profiles of the foundation construction for the MSE wall are shown on Drawings 8A, 8B, and 8C.

- Excavation and removal of approximately 6,300 SF of subgrade material to approximately 22 inches below removed RCC (about 30 inches in total depth) in foundation areas (Drawings 8A, 8B, and 8C).

- Backfill MSE foundation areas with certified clean compacted structural fill and RCC section with steel reinforced cast-in-place concrete with a compressive strength of 4,000 pounds per square inch at 28 days to match the top of existing RCC (Drawings 2G and 7). Aggregate, sand, or certified clean structural fill will be used as backfill. Certified clean structural fill will be sampled and analyzed by the structural fill source for all constituents listed as Hazardous Substances (Exhibit B) in the recorded environmental covenant (EC) for the Site. If the structural fill source laboratory testing results do not include all of the Hazardous Substances listed as Exhibit B in the EC, one composite sample from the approximately 50 yards of structural fill planned to be used for the project will be collected and analyzed.

- Excavation in the area of SWMU-6E will be performed in accordance with the existing EC for the Site by following the approved plans and specifications (including the CMI Workplan) for excavation activities. The existing SWMU-6E area and the areas of proposed subsurface construction are shown on Drawings 7 through 8C. The area of proposed subsurface construction is limited to approximately 6,300 SF of the approximately 139,400 SF (less than 5%) of the existing SWMU-6E area. The removed concrete will be recycled, and the earthen cover material will be stockpiled or containerized for waste characterization and disposal. Should the impacted material within SWMU 6 East be excavated, the material will be stored in a drum and immediately transferred to the AWTC wastewater treatment system enclosure for waste characterization and disposal.

Other than those described above, no additional subsurface excavations, foundations, or support structures are planned at this time. Additionally, no groundwater wells will be impacted by the work described in the amendment. If additional excavation in SWMU soil cover areas is proposed, the proposed changes will be submitted to ADEM for approval prior to work being conducted. Once the construction activities described above are completed and as-built drawings are available, a Corrective Measures Implementation report will be submitted.

Summary:

The existing cover at SWMU-6E was designed to meet the following criteria:

1. Prevent human contact with contaminated soil.

2. Maintain minimum elevation of 12 feet MSL (the 100-year flood plain elevation).

3. Function as subgrade material for a shipping container terminal.

The activities described in this amendment will not impact the long-term cover performance in meeting these design criteria.

The following is a summary of the anticipated changes to the cover design criteria as a result of the amendment development activities:

1. Prevent human contact – the replacement of existing soil cover with additional concrete cap will meet or exceed the performance of the previous cover in preventing human contact with contaminated soil. The additional concrete cap is higher strength than the soil cover, making it more durable and difficult to remove than a soil cover, resulting in a longer lasting and more protective cap. The

additional concrete cover is also lower permeability than a soil cover, better protecting groundwater and human health exposures to impacted groundwater.

2. Maintain Minimum Elevation – the replacement concrete cover will be installed to match or raise existing site elevations, maintaining the minimum elevation of the cover or increasing it.

3. Function as Subgrade – the replacement soil cover and concrete cover will be installed to meet existing cover specifications and is therefore expected to perform in a similar manner to the previous cover, with minimal degradation over time.

Potential short-term impacts to the existing cover associated with this amendment will be mitigated by performing the proposed activities in general accordance the approved Final Corrective Measure Implementation Workplan (CMIP). This specifically includes the following:

- The Construction Workplan (Section 3.0) and Construction Quality Assurance/Quality Control Plan (Section 3.3).
- Sampling and Analysis Plan (Section 4.0).
- Quality Assurance Project Plan (Section 5.0)

The work described in this amendment will also be conducted in general accordance with the Safety, Health, and Emergency Response Plan (Section 7.0) in the CMIP, which includes procedures and protocols for the protection of the health and safety of the public and Site/Construction workers. The Safety, Health, and Emergency Response Plan (SHERP) includes the following sections and details:

- Overview – includes description of establishment of the SHERP to protect workers and the public from potential hazards posed by the Site.

- Project Personnel and Responsibilities – includes description of the personnel responsible for the safety and health program to be implemented at the Site.

- Site-Specific Health and Safety Plan Requirements and Accident Prevention Program – includes description of Site-specific hazard analysis conducted for the remediation activities and the programs to be implemented to prevent accidents and injury to Site personnel.

- Hazard Identification and Control – includes description of the significant health hazards and the plan to limit worker exposure.

- Air Monitoring – includes description of air monitoring activities to be performed when work is being conducted.

- Personal Protective Equipment (PPE) – includes description of appropriate PPE to be donned when work is being conducted.

- Site Control: Work Zones – includes description of work zones to be established and access allowed to the work zones when work is being conducted.

- Decontamination Procedures – includes description of procedures to be followed for decontamination of PPE and equipment.

- Medical Surveillance – includes description of the medical surveillance program to be followed for Site workers and contractors.

- Emergency Operations Plan – includes description of pre-emergency planning, responsibilities in an emergency, and emergency first-aid.

Potential long-term impacts to the existing and newly amended portions of the cover will be mitigated by following the approved Operation, Maintenance, and Monitoring (OM&M) Manual, Appendix C of the Final CMIP. This specifically includes performing routine inspections of the cover and MSE wall (Section 2.4.2.2 of the OM&M Manual) and reporting and correcting observed issues as described in the OM&M Manual.

Correcting issues observed during inspections will primarily include repairs of cracks in the concrete cap. Cracks in the concrete cap will be repaired in accordance with the following construction and repair specifications:

Construction Specifications:

- CMIP Cast-In-Place Concrete Specification Section 03300.

- APM Terminals RPM Lane Expansion Project Technical Specifications, Cast-In-Place Concrete Specification Section 03300.

Repair Specifications:

- Alabama Department of Transportation (ALDOT) Standard Specifications for Highway Construction, 2018 Edition, Section 453, Pressure Grouting and Repair of Portland Cement Concrete Pavement.

The ALDOT Standard Specification Section 453, Pressure Grouting and Repair of Portland Cement Concrete Pavement generally describes the following concrete cracks and repairs of the cracks which will implemented at the Site:

- Hairline cracks – small, tight cracks which in width resemble shrinkage cracks. No corrective repair is required for hairline cracks.

- Low severity cracks – wider than hairline cracks with the crack opening clearly visible. The concrete on both sides of the crack is acting with interlock between the cracked pieces limited movement of the individual pieces. Low severity crack repair does not require the removal of pavement. The crack will be routed (cutting of the pavement along the crack to allow a reservoir for sealant and sidewall for adhesion) and sealed.

- Medium severity cracks – the concrete on both sides of the crack is acting with partial interlock between the cracked pieces allowing potential for (or actual) small movement of the individual pieces. The crack will require removal and replacement of at least a portion of the slab.

- High severity cracks - the concrete on both sides of the crack is acting independently allowing movement of the individual pieces. The crack will require removal and replacement of at least a portion of the slab.

Based on the annual inspections of the concrete cap, it is expected that the repair of the cracks will be conducted at the low severity crack stage, and cracks are unlikely to reach the medium or high severity stage.

Vapor intrusion is not expected to be an issue associated with the work in this amendment. There are no enclosed structures that will be constructed over the soil cover and/or concrete cap as part of the amendment.

Legend

- Area of Concern (AOC) or Solid Waste Management Unit (SWMU)
- Monitoring Well
- Approximate Limits of Contiguous Properties
- AWTC Facility Boundary
- AOC 11 and AOC 12
- AOCs
- SWMUs

AOC-12
AOC-6A
AOC-6
AOC-11
SWMU-11
S11-MW-1
SWMU-9
AOC-4
AOC-5
AOC-3
AOC-2
SWMU-10
CSX Transportation
Maryland St
Virginia St
Miami St
N Carolina St
S Carolina St
Shawnee St
Pillans St
Tennessee St
Kentucky St
Gorgas St
Baltimore St
Seneca St
Heustis St
Easton St
Oakdale Ave
Bay Ave
Alba St
Cottrell St
Arlington St
Choctaw St
Preston Ave
I-10 Service Rd
Sutton Ave
Nellie St
Duval St
Canadian National
Charles St
S Washington Ave
S Dearborn St
Wilkinson St
Gayle St
Marine St
S Broad St
S Scott St
Kelly St
Ross St
Oakdawn Dr
Quigley St
Race Track Ln
Odonnell St
Bayview St
Clarke St
B St
C St
D St
New Jersey St
S Lawrence St
S Warren St
Virginia Street
Bank Street
Bena Street
Bena Street Blvd
Access Road
Primary Construction Entrance
Secondary Construction Entrance
Temporary Construction Entrance
Contractor to use the primary construction entrance unless otherwise directed by the Owner. The temporary construction entrance is to be used by the contractor as needed to reduce the haul distance during wet weather conditions.
Contractor will need to coordinate with the Owner and Tenant of this project at the pre-construction meeting to discuss the use of the temporary construction entrance during this time.
Can only be used for offsite trailer, material deliveries with weight restrictions. Any damages to the roadway caused by this entrance will be repaired at the contractor's expense.
Can only be used for offsite trailer, material deliveries with weight restrictions. Any damages to the roadway caused by this entrance will be repaired at the contractor's expense.
Legend
Laydown Staging Areas
Current Project
Link St Others
0 500 1,000 2,000 Feet
N

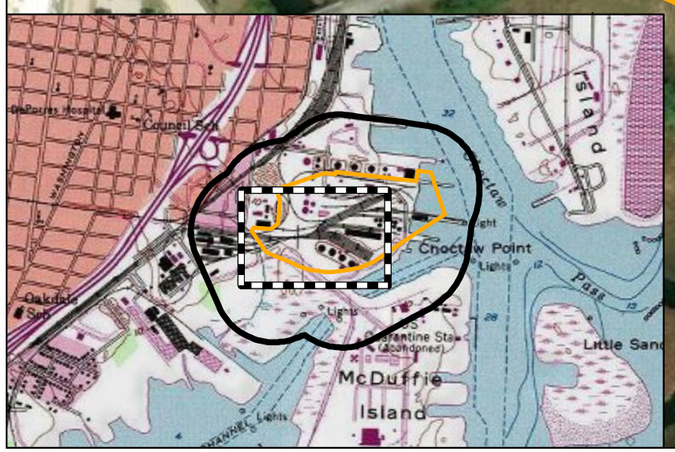
Path: G:\ASPA\mxds\2024_Permit_Renewal_Application\Working_MXDs\Contiguous_Property_Map_with_Bridge_Georeference.mxd

Alabama State Port Authority	
CMIP Inter-Terminal Connector Amendment	
Contiguous Properties Map with ITC Overlay	
Prepared By-Date: SLH: 8/1/2024	ITC Figure 1
Checked By-Date: MPL: 8/1/2024	
Project Number: 7630233209	

Legend

- Area of Concern (AOC)
- Monitoring Well Recovery System
- Background
- DNAPL Recovery Well
- DNAPL Effectiveness Monitoring Well
- Point of Compliance Well
- Piezometer
- Point of Exposure
- Point of Compliance
- Waste Management Area
- CAD Basemap
- AWTC Facility Boundary
- SWMU/AOC Boundary

Former Shell Radcliff Terminal
SWMU 3
AOC-9
SWMU 1
RW-8
13-I
25-I
Groundwater Treatment System
SWMU 5
AOC-8
6-I
6-S
Combined SWMU's 2/7
20-I
Oil Recovery, Inc. (Former Star Enterprise)
18-DR
18-IR
Ezra Trice Blvd.
AOC-10
SWMU 6 East
4-D
4-DK
23-I
23-D
Former McKenzie Tank Lines, Inc.
SWMU 6 West
17-D
17-S
21-I
RW-1
PZ-30-D
Former Norden Industries
8-D
31-IR
31-DR
Former PM AG
9-I
PZ-16-S
32-I
32-S
16-D
16-I
N
0 75 150 300 Feet



Alabama State Port Authority	
CMIP Inter-Terminal Connector Amendment	
AWTC Facility Map - MSE Wall Extent	
Prepared By-Date: JRM: 8/14/2024	ITC Figure 2
Checked By-Date: MPL: 8/14/2024	
Project Number: 7630233209	

Path: G:\ASPA\mxds\2024_Permit_Renewal_Application\Working_MXDs\AWTC_Facility_Map_with_Proposed_ Bridge_MSE_Wall_Extent.mxd

Legend

- Area of Concern (AOC)
- Monitoring Well Recovery System
- Background
- DNAPL Recovery Well
- DNAPL Effectiveness Monitoring Well
- Point of Compliance Well
- Piezometer
- Point of Exposure
- Point of Compliance
- Waste Management Area
- CAD Basemap
- AWTC Facility Boundary
- SWMU/AOC Boundary

Former Shell Radcliff Terminal

Groundwater Treatment System

SWMU 3

SWMU 1

SWMU 5

Combined SWMU's 2/7

SWMU 6 East

SWMU 6 West

AOC-9

AOC-8

AOC-10

PZ-19-I

19-SR

20-I

18-DR

18-IR

17-D

17-S

21-I

RW-1

6-I

6-S

4-D

4-DK

23-I

23-D

Ezra Trice Blvd

0 50 100 200 Feet

N

Alabama State Port Authority

CMIP Inter-Terminal Connector Amendment

AWTC Facility Map - SWMU 6 East Extent

Prepared By-Date: JRM: 8/14/2024

Checked By-Date: MPL: 8/14/2024

Project Number: 7630233209

ITC Figure 3

Path: G:\ASPA\mxds\2024_Permit_Renewal_Application\Working_MXDs\AWTC_Facility_Map_with_Proposed_ Bridge_SWMU_6_East_Extent.mxd

ISSUED FOR BID

ALABAMA PORT AUTHORITY
PORT OF MOBILE

INTER-TERMINAL CONNECTOR BETWEEN MOBILE CONTAINER TERMINAL & ICTF

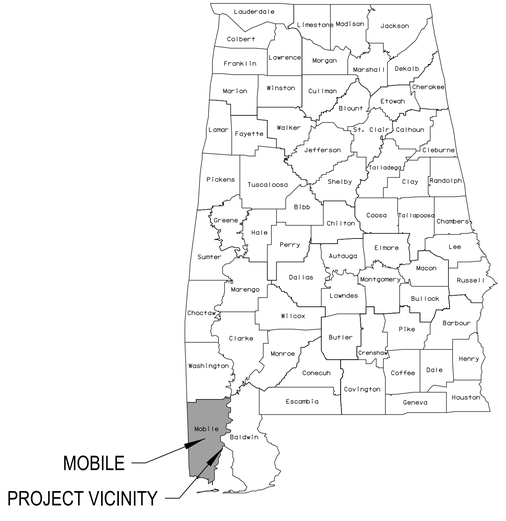
MOBILE, ALABAMA
(11165 TASK 1 - MAY 2024)

KAY IVEY, GOVERNOR
JOHN C. DRISCOLL, DIRECTOR AND C.E.O.

ALABAMA STATE PORT AUTHORITY - BOARD OF DIRECTORS
BEN C. STIMPSON, CHAIRMAN

ALVIN K. HOPE II, 1st VICE CHAIR
DARYL H. DEWBERRY
TONY COCHRAN
CARL JAMISON, 2nd VICE CHAIR

DR. PATRICIA SIMS
HORACE HORN
ZEKE SMITH
RANDALL DUEITT



LOCATION MAP
N.T.S.

ALABAMA LICENSED
No. 32805
PROFESSIONAL
ENGINEER
KARMAN RICHARDSON

5/13/2024

NO.	REVISION	DATE	INITIALS

INDEX TO SHEETS

REFERENCE PROJECT NO	FISCAL YEAR	SHEET NO
11165 TASK 1	2024	1A

SHEET NO.	DESCRIPTION
1	TITLE SHEET
1A	INDEX TO SHEETS
1B-1D	STANDARD AND SPECIAL DRAWINGS
1E	PLANS LEGEND SHEET
1F	PLANS LEGEND SHEET ABBREVIATIONS
1G-1J	PRIMARY SURVEY CONTROL AND GEOMETRIC LAYOUT SHEET
1K	GEOMETRIC DATA SHEET
2-2D	TYPICAL SECTIONS
2E-2J	PROJECT DETAIL SHEET
2K-2L	PROJECT NOTES
2M	LIGHTING PROJECT NOTES
2N	GENERAL TRAFFIC CONTROL PLAN NOTES
3-3G	SUMMARY OF QUANTITIES
4	PLAN SHEET - STA 82+00 - STA 94+50
4A	PROFILE SHEET - STA 82+00 - STA 94+50
5	PLAN SHEET - STA 94+50 - STA 108+50
5A	PROFILE SHEET - STA 94+50 - STA 108+50
6	PLAN SHEET - STA 108+50 - STA 122+50
6A	PROFILE SHEET - STA 108+50 - STA 122+50
7	PLAN/PROFILE SHEET - STA 122+50 - STA 133+44.39
7A	PROFILE SHEET - STA 122+50 - STA 133+44.39
8	PLAN SHEET - MSE WALL
8A	PROFILE SHEET - MSE WALL - 1A
8B	PROFILE SHEET - MSE WALL - 1B
8C	PROFILE SHEET - MSE WALL - 1C
9	OMITTED
10-13	DRAINAGE SECTIONS
14-19	OMITTED
20-23	PAVING LAYOUT, STRIPING AND SIGNING SHEET
24	OMITTED
25	SIGNING SHEET
26-39	OMITTED
40	TRAFFIC CONTROL PLAN - SEQUENCE OF CONSTRUCTION
41	TRAFFIC CONTROL PLAN - LEGEND
42-47	TRAFFIC CONTROL PLAN - PHASE II
48	TRAFFIC CONTROL PLAN - STAGING AREAS

SHEET NO.	DESCRIPTION
49-51	TRAFFIC CONTROL PLAN DETAIL SHEETS
52-59	OMITTED
60	ECP - LEGEND
61-64	EROSION AND SEDIMENT CONTROL PLAN
65	ELECTRICAL LEGEND AND ABBREVIATIONS
66	POLE DESIGNATION SCHEME AND LIGHTING CRITERIA
67	LIGHTING SCHEDULE
68-69	OMITTED
70-73	REQUIRED LIGHTING PLANS
74-77	REQUIRED SINGLE LINE WIRING DIAGRAM
78-81	REQUIRED COMMUNICATION LAYOUT
82-99	OMITTED
100-103	UTILITY SHEET
104-109	OMITTED
110-128	BRIDGE SHEETS (INCLUDES 118A, 118B)
129-138	BRIDGE BORING SHEETS
139-183	BRIDGE SHEETS (INCLUDES 143A, 158A, 158B, 182A)
184-192	BRIDGE BORING SHEETS
193-202	BRIDGE SPECIAL PROJECT DRAWINGS
203-229	OMITTED
230-293	CROSS SECTIONS - STA 83+00 - STA 133+50
294-299	OMITTED
300	EARTHWORK SUMMARY SHEET

NO.	REVISION	DATE	INITIALS

PLAN SUBMITTAL

100%

ALABAMA PORT AUTHORITY
PORT OF MOBILE

NOT TO SCALE

SHEET TITLE: INDEX TO SHEETS

ROUTE: PORT CONNECTOR

User Is: Jonathan.Roper 13-MAY-2024 21:53 Plot Scale=1.000000i1.000000 $$COLORTABLE$$ $$PENTABLE$$ Projects\11147000 - APM ICTF Connector Bridges & Roadway\Project Design\Plans Assembly\APM ICTF Connector\001A_000_Idx.dgn

PLANS LEGEND SHEET

REFERENCE PROJECT NO	FISCAL YEAR	SHEET NO
11165 TASK 1	2024	1E

ROADWAY

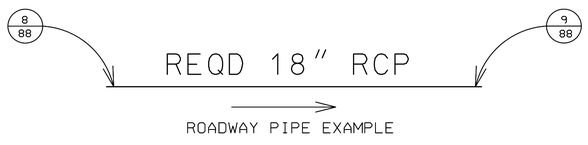
55+00

CENTER LINE .....
STATE BOUNDARY LINE .....
COUNTY BOUNDARY LINE .....
CITY OR TOWN LIMITS .....
SECTION LINES ..... SEC 22 / SEC 23
QUARTER-SECTION LINES .....
RANGE-TOWNSHIP LINES ..... R-17-E / R-18-E
PROPERTY LINES ..... PL
PRESENT ROW .....
ACQUIRED ROW .....
DENIED ACCESS .....
REQUIRED FENCE .....
CONSTRUCTION LIMITS ..... CONST LIM
CLEARING LIMITS .....
RAILROAD .....
EXISTING WOOD FENCE .....
EXISTING BARBED WIRE FENCE .....
EXISTING CHAIN LINK FENCE .....
EXISTING ELECTRIC FENCE .....
EXISTING HOG WIRE FENCE .....
TREES .....
WOODS LINE .....
MARSH .....
EXISTING DITCH .....
REQUIRED DITCH.....
GRAVEL ROAD .....
EXISTING GUARDRAIL .....
REQUIRED GUARDRAIL .....
SATELLITE DISH .....
TRAFFIC LIGHT .....
BENCH MARK .....
SURVEY POINT .....
ENVIRONMENTAL CLEARED LIMITS ..... ENV

EXISTING PIPE .....
REQUIRED PIPE (WITH PIPE END TREATMENT).....
REQUIRED PIPE END TREATMENT.....
EXISTING BOX CULVERT .....
REQUIRED BOX CULVERT .....
EXTENDED CULVERT .....
DROP INLET OR JUNCTION BOX (SEE PLANS DESCRIPTION).....
BRIDGE .....
PIPE CULVERT (ELEVATION VIEW) .... FL=410.25
BOX CULVERT (ELEVATION VIEW) ..... FL=420.55

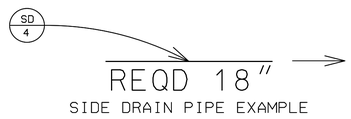
DRAINAGE STRUCTURE INDEX NUMBERS

DRAINAGE STRUCTURE WRITE-UPS ARE LOCATED ON THE DRAINAGE CROSS-SECTION SHEETS. STRUCTURES WITH WRITE-UPS ARE INDEXED AT EACH END, WITH NUMBERS ASSIGNED BY DIRECTION OF FLOW. THE NUMBER IN THE UPPER HALF OF THE CIRCLE (EXAMPLE 8 OR 9) IS THE DRAINAGE STRUCTURE INDEX NUMBER. THE NUMBER IN THE LOWER HALF (EXAMPLE 88) IS THE SHEET REFERENCE NUMBER.



ROADWAY PIPE EXAMPLE

ALL INFORMATION CONCERNING THE DISPOSITION OF SIDE DRAIN PIPE IS SHOWN ON THE SUMMARY OF QUANTITIES BOX SHEET. THE TOP LETTERS (SD) ARE FOR SIDE DRAIN AND THE BOTTOM NUMBER IS THE DRAINAGE STRUCTURE INDEX NUMBER.



SIDE DRAIN PIPE EXAMPLE

DIRECTION OF FLOW .....

UTILITIES

	EXISTING	PROPOSED
POWER POLE		
LIGHT POLE		
TELEPHONE POLE		
ANCHOR		
STUB (POWER)		
STUB (TELEPHONE)		
ELECTRIC DUCT	EL 4MTD	EL 4MTD
BURIED ELECTRIC CABLE	BE	BE
OVERHEAD ELECTRIC CABLE	OE	OE
ELECTRIC MANHOLE	E	E
TOWER		
TELEPHONE PEDESTAL	T	T
TELEPHONE DUCT	TP 4MTD	TP 4MTD
BURIED TELEPHONE CABLE	BTC	BTC
OVERHEAD TELEPHONE CABLE	OTC	OTC
TELEPHONE MANHOLE	TMH	TMH
SANITARY SEWER	S	SS
WATER LINE	W	W
WATER MAIN	WM	WM
WATER VALVE		
FIRE HYDRANT		
WATER METER		
GAS LINE	G	G
GAS MAIN	GM	GM
GAS VALVE		
GAS REGULATOR		
BURIED CABLE TELEVISION.....	BTV	BTV
OVERHEAD CABLE TELEVISION.....	OTV	OTV

EXISTING PAVEMENT (RETAIN).....
EXISTING PAVEMENT (REMOVE).....
EXISTING PAVEMENT (RETAIN AND OVERLAY)..
CONCRETE (EXISTING OR REQUIRED).....
EXISTING CONCRETE (REMOVE).....
RIP RAP (EXISTING OR REQUIRED).....
BRICK (EXISTING OR REQUIRED).....
EXISTING BRICK (REMOVE).....

NO.	REVISION	DATE	INITIALS

PLAN SUBMITTAL
100%

ALABAMA PORT AUTHORITY
PORT OF MOBILE

NOT TO SCALE

SHEET TITLE: PLANS LEGEND SHEET

ROUTE: PORT CONNECTOR

User Is: Jonathan.loper 13-MAY-2024 21:53 Plot Scale=1.000000ti1.000000 $$COLORTABLE$$ $$PENTABLE$$ Projects#11147000 - APM ICTF Connector Bridges & Roadway#Project Design#Plans Assembly#APM ICTF Connector#001E_000_pln-lgnd.dgn

PLANS LEGEND SHEET ABBREVIATIONS

REFERENCE PROJECT NO	FISCAL YEAR	SHEET NO
11165 TASK 1	2024	1F

ABANDON(ED)	ABAN
ABUTMENT	ABUT
ACCELERATION	ACCL
ACQUIRED	ACQD
ACRE	AC
AHEAD	AH
ALABAMA	AL
ALABAMA DEPARTMENT OF TRANSPORTATION	ALDOT
ALTERNATE	ALT
APPROXIMATE(LY)	APP
AREA	A
ASPHALT	ASP
AVERAGE ANNUAL DAILY TRAFFIC	AADT
BACK	BK
BACK OF GUARDRAIL	BK-GR
BACKSIGHT	BS
BARBED WIRE	B/W
BARREL	BBL
BARRIER	BAR
BASE LINE	BL or ℄
BEARING	BRNG
BEGIN	BEG
BEGINNING OF PROJECT	BOP
BETWEEN	BTW
BILLBOARD	BBD
BENCH MARK	BM
BITUMINOUS	BIT
BITUMINOUS COATED CORRUGATED METAL PIPE	BCCMP
BOUNDARY	BDY
BRIDGE	BRG
BRIDGE END SLAB	BES
CAPACITY	CAPY
CAST IRON	CI
CAST IN PLACE	CIP
CATCH BASIN	CB
CENTER LINE	℄
CHAIN LINK	C/L
CLASS	CLS
CONCRETE	CONC
CONNECTION	CONN
CONSTRUCTION LIMITS	CONST LIM
CORNER	COR
CORRECTION	CORR
CORRUGATED IRON	CORI
CORRUGATED METAL	CM
CORRUGATED METAL PIPE	CMP
CORRUGATED PLASTIC PIPE	CPP
COUNTY	CO
COUNTY ROAD	CO-RD
CREEK	CK
CROSS SECTION	X-SECT
CROWN REMOVED	CR
CUBIC FEET	FT3 or CU FT
CUBIC FEET PER SECOND	CFS
CUBIC YARD	YD3 or CU YD
CUBIC METERS	M3
CULVERT	CULV
CULTIVATED	CULT
CURB FACE	CF
CURB AND GUTTER	C&G
CUT	C
CURVE TO SPIRAL	CS
DECELERATION	DECEL
DECLINATION	DECL
DEGREE OF CURVE	D
DENIED ACCESS	D/A
DEPARTURE	DEP
DIAMETER	DIA
DIRECTION	DIR
DISTANCE	DIST
DOUBLE	DBL
DOUBLE BARREL CULVERT	CD
DRAINAGE AREA	DA
DRIVE	DR
DROP INLET	DI
EACH	EA
EASEMENT	ESMT
EAST	E
EAST BOUND ROADWAY	EBR
EDGE OF PAVEMENT	EP
ELEVATION	EL or ELEV
END OF RETURN	ER
END ANCHOR	E/A
END OF PROJECT	EOP
EQUATION	EQ
EROSION CONTROL PRODUCTS	ECP
EXCAVATION	EXCAV
EXISTING	EX
EXPANSION	EXP
EXTENSION	EXT
EXTERNAL	E
EXTRA STRENGTH	EXT STR
FEET	FT
FILL	F
FILTER BLANKET	FLT BLNK
FINISHED GRADE	FG
FINISHED SURFACE	FS
FISCAL YEAR	FY
FIXED	FIX
FLAT BOTTOM	FB
FLOW LINE	FL or ℄
FORESIGHT OR FRONTSIGHT	FST
FRACTIONAL	FRAC
FULL SUPERELEVATION	FS
GALLON	GAL
GASOLINE PUMPS	GPP
GARAGE	GAR
GAUGE	GA
GIRDER	GDR
GOVERNMENT	GOV
GRASS	GRS
GRADE CHANGE	GC
GRADE POINT	GP
GRADE ROD	GRD
GRAVEL	GRV
GUARDRAIL	GR
HEADWALL	HDWL
HECTARE	HA
HIGH WATER MARK	HWM
HEIGHT	HT
HEIGHT OF INSTRUMENT	HI
HIGH WATER	HW
HIGHWAY	HWY
HOGWIRE	H/W
HORIZONTAL	HOR
HUB & TACK	H&T
HYDRANT	HYD
IMPACT ATTENUATOR	IA
IN ACCORDANCE WITH	I/A/W
IN PLACE	IN-PL
INCHES	IN
INCLUDING	INCL
INCORPORATED	INC
INSTRUMENT	INST
ISLAND	ISL
JOINT	JT
JUNCTION	JCT
JUNCTION BOX	JB
KILOMETER	KM
KILOMETER POST	KMP
KILOMETERS PER HOUR	KPH
LANE	LN
LATITUDE	LAT
LEFT	LT
LEFT AHEAD	LA
LEFT BACK	LB
LENGTH OF CURVE	L
LINK	LK
LIMIT	LIM
LINEAR	LIN
LINEAR FEET	LIN FT
LONGITUDE	LONG
MANHOLE	MH
MARKER	MRK
MAXIMUM	MAX
MEAN HIGH WATER	MHW
MEAN LOW WATER	MLW
MEASUREMENT	MEAS
MEDIAN	MED
METER	M
MERIDIAN	MER
MILE POST	MP
MILES	MI
MILES PER HOUR	MPH
MILLIMETER	MM
MINIMUM	MIN
MONUMENT	MON
MULTIPLE	MULT
NORMAL	NORM
NORMAL CROWN	NC
NORMAL CROWN SLOPE	NCS
NORTH	N
NORTH BOUND ROADWAY	NBR
NORTHING-EASTING	NE
NOT IN CONTRACT	NIC
NOT TO SCALE	NTS
NUMBER	NO
OBSERVATION	OBS
ON CENTER	OC
ORIGINAL	ORIG
OVERHEAD	OHD
OVERHAUL	OH
OUT TO OUT	OO
PAINT	PNT
PAVED	PVD
PAVED SHOULDER	PVD SH
PAVEMENT	PVMT
PIPE END TREATMENT	PET
PIPE ENTERING CULVERT	PEC
PLATE GIRDER	PL GDR
POINT OF BEGINNING	POB
POINT OF COMPOUND CURVE	PCC
POINT OF CURVATURE	PC
POINT OF REVERSE CURVATURE	PRC
POINT OF ENDING	POE
POINT OF INTERSECTION	PI
POINT OF TANGENCY	PT
POINT ON CURVE	POC
POUND	LB
PRESENT	PRES
PROFILE GRADE	PG
PROJECT	PROJ
PROJECT CONTROL	PJC
PROPERTY LINE	ℙ
PROPOSED	PROP
QUADRUPLE	QUAD
QUADRUPLE BARREL CULVERT	CQ
QUANTITY	QUANT
RADIUS	R
RAILROAD	RR
RANGE	RGE
RECORD	REC
REDUCTION	RED
REFERENCE	REF
REFERENCE POINT	RP
REFERENCE POINT FOR POINT ON TANGENT	RPPOT
REINFORCED	REINF
REINFORCED CONCRETE	RC
REINFORCED CONCRETE DECK GIRDER	RCDG
REINFORCED CONCRETE PIPE	RCP
REINFORCING STEEL	REINF STL
RELOCATE	RELC
REMOVE	REM
REQUIRED	REQD
RETAIN(ING)	RET
REVERSE CROWN	RC
REVISION	REV
RIGHT	RT
RIGHT AHEAD	RA
RIGHT BACK	RB
RIGHT OF WAY	ROW
RIGHT OF WAY MARKER	ROWM
RIVER	RIV
ROAD	RD
ROADWAY	RDWY
SECTION	SEC
SERVICE ROAD	SER RD
SHEET	SHT
SHEET PILING	SHT PILE
SHOULDER	SHLD
SIDE DRAIN	SD
SIDEWALK	SW
SIGHT DISTANCE	S DIST
SINGLE BARREL CULVERT	CS
SKEW	SK
SLOPE STAKE	SST
SOLID SODDING	SOL SOD
SOUTH	S
SOUTH BOUND ROADWAY	SBR
SPECIAL	SP
SPECIAL DITCH	SP-DT
SPECIAL DITCH LEFT	SDL
SPECIAL DITCH MEDIAN	SDM
SPECIAL DITCH RIGHT	SDR
SPECIAL DRAWING	SP-DWG
SPECIFICATIONS	SPEC
SPRING LINE	SL
SPIRAL TO CURVE	SC
SPIRAL POINT OF INTERSECTION	SPI
SPIRAL TO TANGENT	ST
SQUARE	SQ
SQUARE FEET	FT2 or SQ FT
SQUARE METERS	M2
SQUARE YARD	YD2 or SQ YD
STAKE	STK
STANDARD	STD
STANDARD DRAWING	STD-DWG
STANDARD STRENGTH	STD STR
STATION	STA
STATION & ELEVATION	SE
STATION & OFFSET	SO
STOPPING SIGHT DISTANCE	SSD
STREET	ST
STRUCTURE	STR
SUB-GRADE	SG
SUPERELEVATION	SE, se or e
SURVEY	SRV
SYMMETRICAL	SYM
TANGENT	TAN
TANGENT LENGTH (CURVE DATA)	T
TANGENT TO SPIRAL	TS
TEMPORARY	TEMP
TEMPORARY BENCH MARK	TBM
THROAT	TH
TOWNSHIP	TSHP
TRIPLE	TR
TRIPLE BARREL CULVERT	CT
TURN OUT	TO
TURNING POINT	TP
TYPE	TY
UNIT	U
UNKNOWN	UNK
UNPAVED	UNPVD
VALLEY GUTTER	VG
VARIABLE	VAR
VERTICAL	VERT
VERTICAL CURVE	VC
VERTICAL POINT OF CURVATURE	PVC
VERTICAL POINT OF INTERSECTION	PVI
VERTICAL POINT OF TANGENCY	PVT
VITRIFIED	VIT
VOLUME	VOL
WEST	W
WEST BOUND ROADWAY	WBR
WING WALL	WW
WITNESS CORNER	WC
WOOD	WD
WORKING POINT	WP
WOVEN WIRE	W/W
YARD	YD

STRUCTURES

NUMBER OF STORIES	1, 2, 3, 4
FRAME	FR
BUILDING	BLDG
BLOCK	BLK
BRICK	BR
STUCCO	STU
METAL	MET
RESIDENCE	RES
BUSINESS	BUS
WAREHOUSE	WHSE
CHICKEN HOUSE	CH HSE
CHURCH	CH
SCHOOL	SCH
DOUBLE WIDE MOBILE HOME	DW MH
MOBILE HOME	MH

UTILITIES

ANCHOR WIRE	AW
BURIED ELECTRIC	BE
BURIED FIBER OPTIC	BFO
BURIED TELEPHONE CABLE	BTC
BURIED CABLE TELEVISION	BTV
CAST IRON	CI
CIRCUIT	CKT
DUCTILE IRON	DUC IRON
EASEMENT	ESMT
FIBER OPTIC	FO
FIRE HYDRANT	FH
FORCED MAIN (SANITARY SEWER)	FM
GAS MAIN	GM
GAS METER	GMET
GAS VALVE	GV
GUY WIRE	GUY
HIGH PRESSURE	HP
KILOVOLT AMPS	KVA
MANHOLE	MH
MERCURY VAPOR LIGHT	MVL
OVERHEAD FIBER OPTIC	OFO
OVERHEAD TELEPHONE CABLE	OTC
OVERHEAD ELECTRIC CABLE	OE
OVERHEAD CABLE TELEVISION	OTV
PAIR	PR
PEDESTAL	PED
POLY-VINYL CHLORIDE PIPE	PVC
POWER POLE	PP
SANITARY SEWER	SS
SERVICE	SERV
STEEL	STL
STORM DRAIN	STM
STORM SEWER	STMS
SWITCH	SW
TELEPHONE	TEL
TELEPHONE MANHOLE	TMH
TRANSFORMER	TRAN
TRANSMISSION LINE	TR LN
TRIAXIAL CABLE (SERVICE)	TRIX
VITRIFIED CLAY PIPE	VCP
WATER MAIN	WM
WATER METER	WMET
WATER VALVE	WV

PROPERTY

DEED BOOK	DB
REAL PROPERTY BOOK	RP
PLAT BOOK	PB
MAP BOOK	MB
PAGE	PG
OFFICIAL RECORD	OR
CAPPED (TYPICAL PLASTIC SURVEYORS CAP)	CAP
ALUMINUM CAP	ALUM CAP
BRASS CAP	BR CAP
IRON PIPE	IP
CRIMPED	CR
REINFORCING STEEL	REBAR
CONCRETE MONUMENT	CM
DAMAGED	DAM
CHISELED X	CH" X"
HUB AND TACK	H&T
NAIL AND BOTTLE TOP	N&BT
PARKER-KALON (MASONARY NAILS)	PK NAIL
FENCE POST	F-POST
RAILROAD IRON	RR IRON
COTTON SPINDLE	COT SP
ANGLE IRON	ANGLE IRON

NO.	REVISION	DATE	INITIALS

PLAN SUBMITTAL: 100%

ALABAMA PORT AUTHORITY
PORT OF MOBILE

NOT TO SCALE

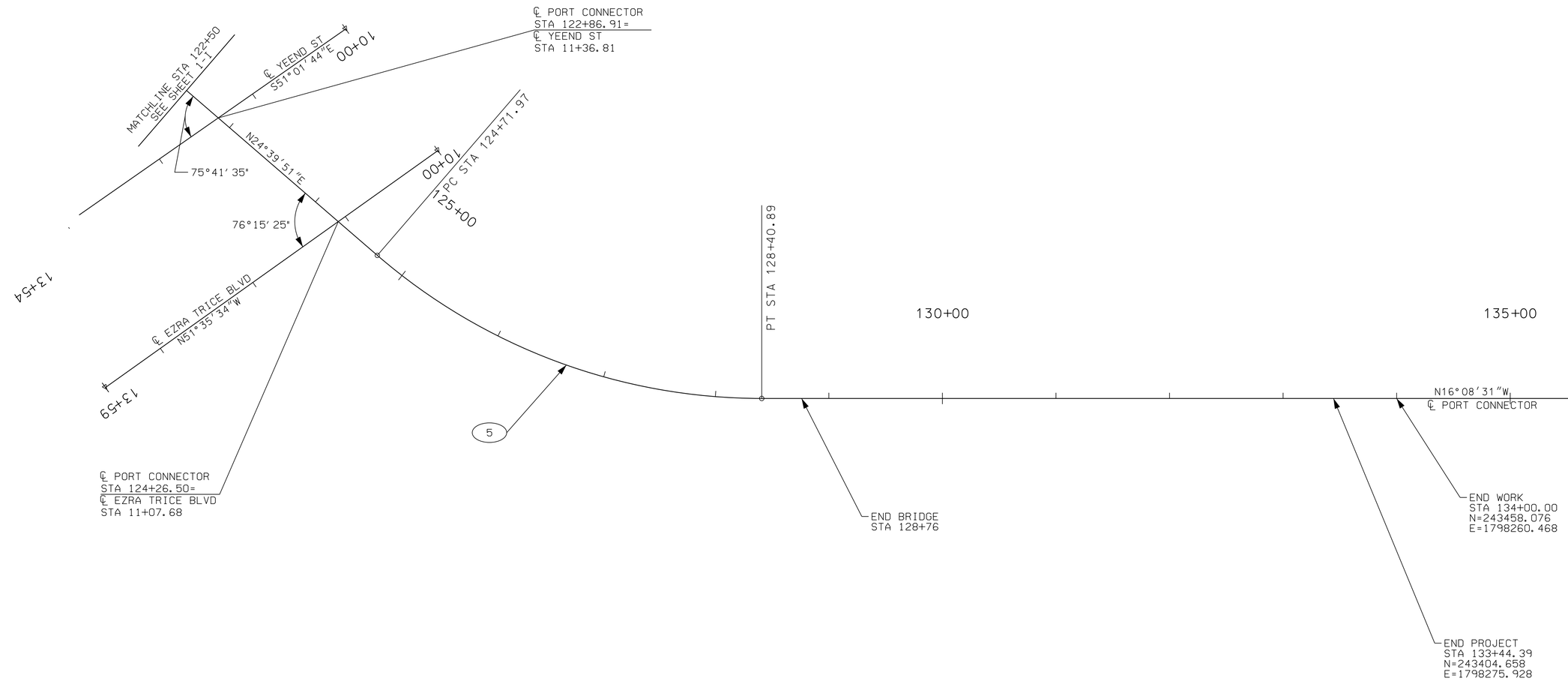
SHEET TITLE: PLANS LEGEND SHEET ABBREVIATIONS

ROUTE: PORT CONNECTOR

PRIMARY SURVEY CONTROL AND GEOMETRIC LAYOUT SHEET

REFERENCE PROJECT NO	FISCAL YEAR	SHEET NO
11165 TASK 1	2024	1J

TBM #4 (NOT SHOWN ON PLANS)
ELEVATION=12.49'
DESCRIPTION=CAPPED ROD SET
N=243849.885
E=1797969.523



NOTE: POINT COORDINATES ARE BASED ON THE HORIZONTAL DATUM-NAD83/92 (HPGN) ALABAMA STATE PLANE WEST ZONE, VERTICAL DATUM-NAVD 88, AND US SURVEY FOOT UNIT OF MEASURE. A COMBINED AVERAGED SCALE FACTOR OF 0.999967045 HAS BEEN CALCULATED USING THIS DATUM.

NO.	REVISION	DATE	INITIALS

PLAN SUBMITTAL
100%

ALABAMA PORT AUTHORITY
PORT OF MOBILE

HORIZ 50 0 50 SCALE (FEET)

SHEET TITLE: PRIMARY SURVEY CONTROL AND GEOMETRIC LAYOUT SHEET

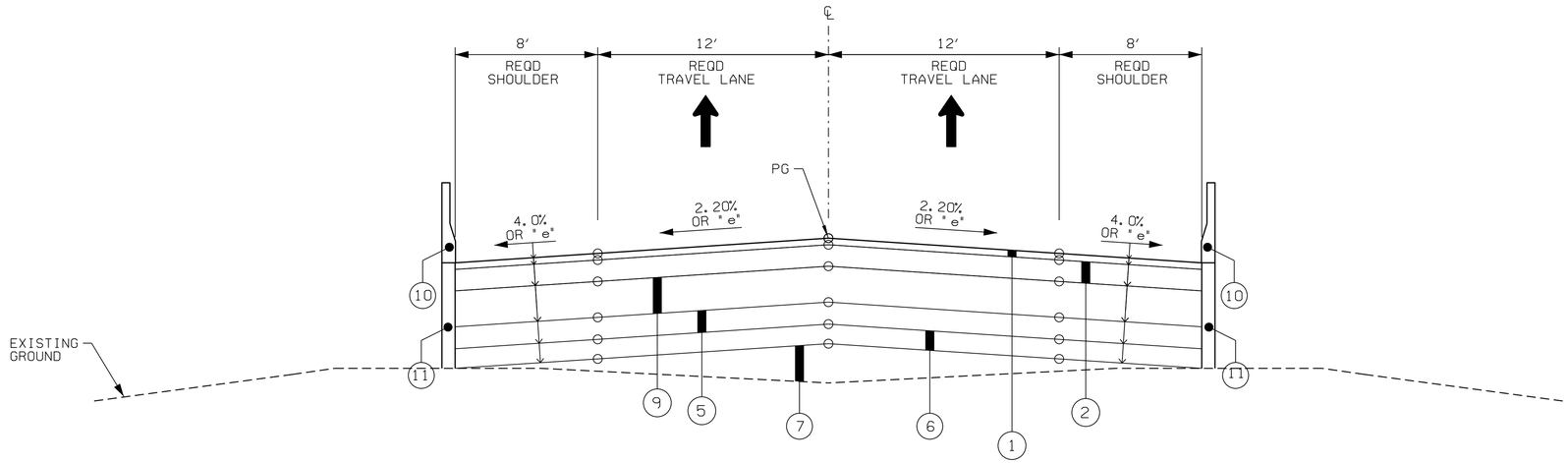
ROUTE: PORT CONNECTOR

User Is: Jonathan.loper 13-MAY-2024 21:53 Plot Scale=50.000000:1.000000 $$COLORTABLE$$ $$PENTABLE$$
Projects#1147000 - APM ICTF Connector Bridges & Roadway#Project Design#Plans Assembly#APM ICTF Connector#001J_000_geo.dgn

TYPICAL SECTION

REFERENCE PROJECT NO	FISCAL YEAR	SHEET NO
11165 TASK 1	2024	2C

PROJECT NOTES	GN-2 NOTES
201	104
202	116
203	
204	
205	
208	



TYPICAL SECTION-PORT CONNECTOR
BRIDGE END SLAB
N.T.S.

STA 128+76.00 TO STA 129+00.56

EXISTING AND REQUIRED MATERIALS LEGEND

LEGEND NO.	ITEM NO.	DESCRIPTION
(1)	424A280	SUPERPAVE BITUMINOUS CONCRETE WEARING SURFACE LAYER, 1/2" MAXIMUM AGGREGATE SIZE MIX, ESAL RANGE E (APPROX. 225 LBS/SY)
(2)	424B281	SUPERPAVE BITUMINOUS CONCRETE UPPER BINDER LAYER, 1" MAXIMUM AGGREGATE SIZE MIX, ESAL RANGE E (APPROX. 300 LBS/SY)
(6)	230A000	ROADBED PROCESSING
(7)	210A000 AND/OR 210D010	UNCLASSIFIED EXCAVATION AND/OR BORROW EXCAVATION (A-2 OR BETTER)
(9)	450B000	REINFORCED CEMENT CONCRETE BRIDGE END SLAB (APPROX 9" THICK)
(10)	629A078	CONCRETE MEDIAN OR SAFETY BARRIER, TYPE CSF-36 (MODIFIED)
(11)	529A012	RETAINING WALL(MSE)

NO.	REVISION	DATE	INITIALS

PLAN SUBMITTAL
100%

ALABAMA PORT AUTHORITY
PORT OF MOBILE

NOT TO SCALE

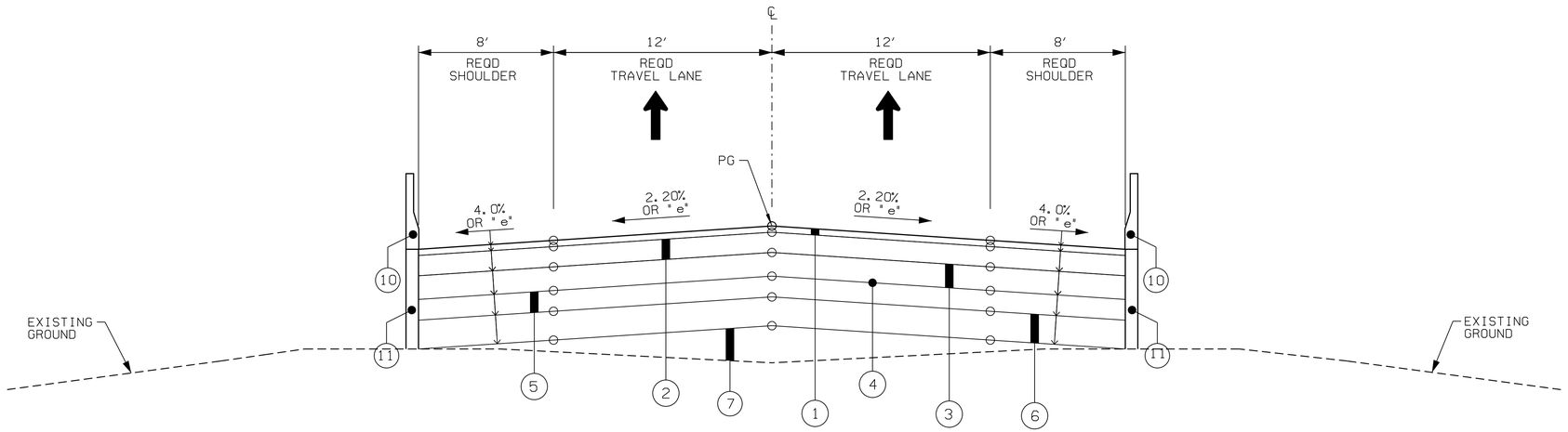
SHEET TITLE	ROUTE
TYPICAL SECTION	PORT CONNECTOR

User Is: jonathan.loper 13-MAY-2024 21:53 Plot Scale=5.000000:1.000000 $$COLORTABLE$$ $$PENTABLE$$ Projects#1147000 - APM ICTF Connector Bridges & Roadway#Project Design#Plans Assembly#APM ICTF Connector#002_000_typ.dgn

TYPICAL SECTION

REFERENCE PROJECT NO	FISCAL YEAR	SHEET NO
11165 TASK 1	2024	2D

PROJECT NOTES	GN-2 NOTES
201	104
202	116
203	
204	
208	



TYPICAL SECTION-PORT CONNECTOR

WALL SECTION
N.T.S.

STA 129+00.56 TO STA 133+44.39

EXISTING AND REQUIRED MATERIALS LEGEND

LEGEND NO.	ITEM NO.	DESCRIPTION
①	424A280	SUPERPAVE BITUMINOUS CONCRETE WEARING SURFACE LAYER, 1/2" MAXIMUM AGGREGATE SIZE MIX, ESAL RANGE E (APPROX. 225 LBS/SY)
②	424B281	SUPERPAVE BITUMINOUS CONCRETE UPPER BINDER LAYER, 1" MAXIMUM AGGREGATE SIZE MIX, ESAL RANGE E (APPROX. 300 LBS/SY)
③	424B581	SUPERPAVE BITUMINOUS CONCRETE LOWER BINDER LAYER, 1" MAXIMUM AGGREGATE SIZE MIX, ESAL RANGE E (APPROX. 330 LBS/SY)
④	401A000	BITUMINOUS TREATMENT A
⑤	301A012	CRUSHED AGGREGATE BASE COURSE, TYPE B, PLANT MIXED, 6" COMPACTED THICKNESS
⑥	230A000	ROADBED PROCESSING
⑦	210A000 AND/OR 210D010	UNCLASSIFIED EXCAVATION AND/OR BORROW EXCAVATION (A-2 OR BETTER)
⑩	629A078	CONCRETE MEDIAN OR SAFETY BARRIER, TYPE CSF-36 (MODIFIED)
⑪	529A012	RETAINING WALL(MSE)

NO.	REVISION	DATE	INITIALS

PLAN SUBMITTAL
100%

ALABAMA PORT AUTHORITY
PORT OF MOBILE

NOT TO SCALE

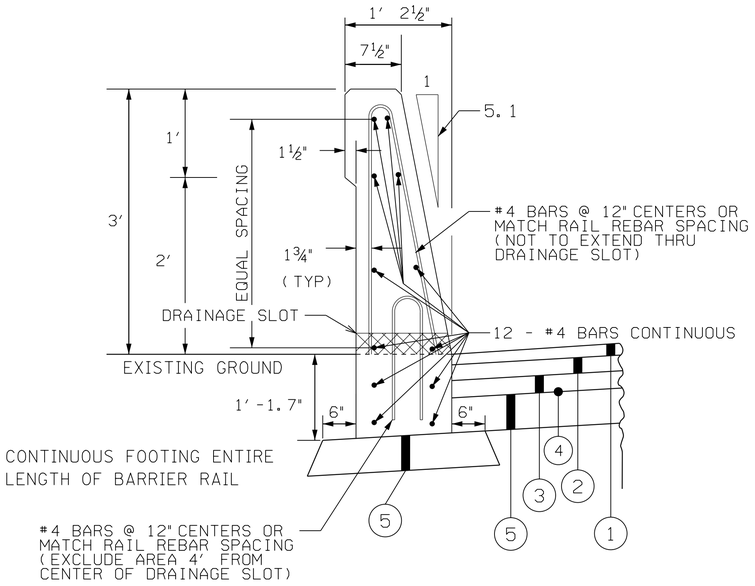
SHEET TITLE: TYPICAL SECTION

ROUTE: PORT CONNECTOR

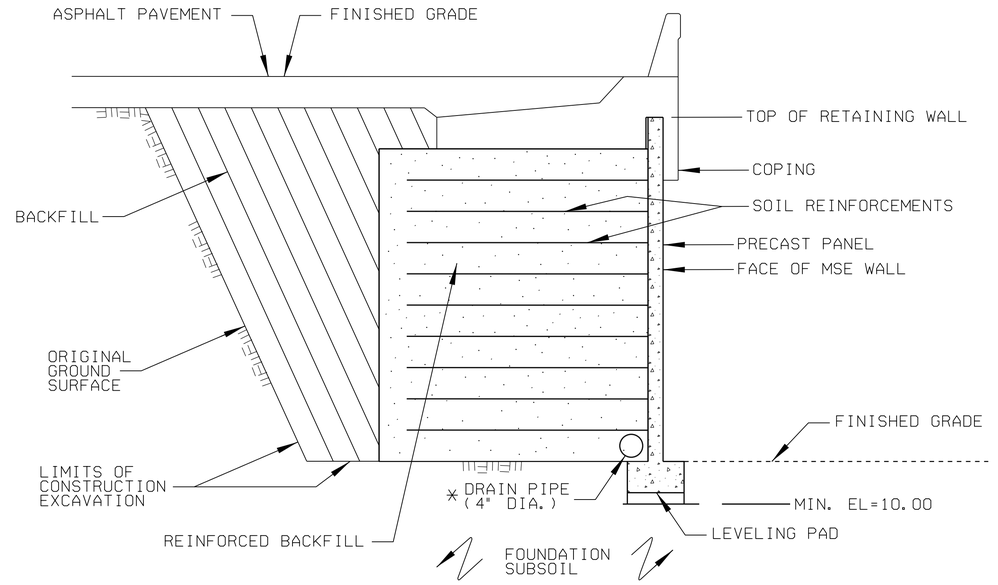
User Is: Jonathan.loper 13-MAY-2024 21:53 Plot Scale=5.000000:1.000000 $$COLORTABLE$$ $$PENTABLE$$ Projects\11147000 - APM ICTF Connector Bridges & Roadway\Project Design\Plans Assembly\APM ICTF Connector\002_000_typ.dgn

PROJECT DETAILS

REFERENCE PROJECT NO	FISCAL YEAR	SHEET NO
11165 TASK 1	2024	2G



DETAILS OF CONCRETE BARRIER
TYPE CSF-36 (MODIFIED)

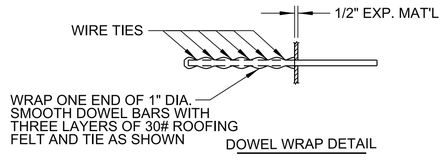


RETAINING WALL (MSE) SECTION

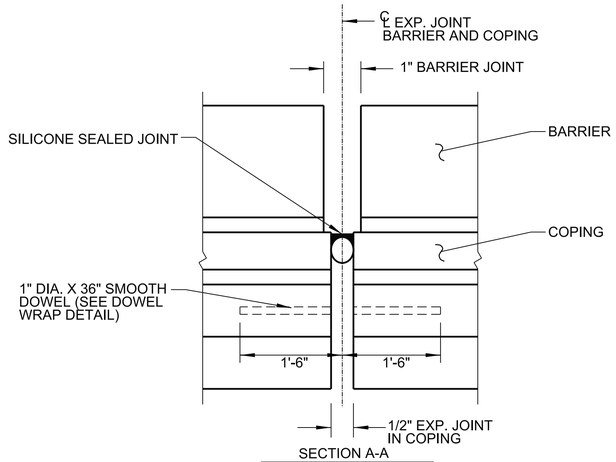
* DRAIN PIPE AND STUB OUTS FOR REINFORCED BACKFILL MATERIAL TO BE INCLUDED IN THE DESIGN OF THE WALL BY THE MSEW CONTRACTOR AT NO DIRECT PAY.

NOTES

1. MSE WALL FOUNDATIONS ARE TO BE NO LOWER THAN ELEVATION 10′.



DOWEL WRAP DETAIL



SECTION A-A
BARRIER AND COPING REINFORCING NOT SHOWN FOR CLARITY

EXISTING AND REQUIRED MATERIALS LEGEND

LEGEND NO.	ITEM NO.	DESCRIPTION
(1)	424A280	SUPERPAVE BITUMINOUS CONCRETE WEARING SURFACE LAYER, 1/2" MAXIMUM AGGREGATE SIZE MIX, ESAL RANGE E (APPROX. 225 LBS/SY)
(2)	424B281	SUPERPAVE BITUMINOUS CONCRETE UPPER BINDER LAYER, 1" MAXIMUM AGGREGATE SIZE MIX, ESAL RANGE E (APPROX. 300 LBS/SY)
(3)	424B581	SUPERPAVE BITUMINOUS CONCRETE LOWER BINDER LAYER, 1" MAXIMUM AGGREGATE SIZE MIX, ESAL RANGE E (APPROX. 330 LBS/SY)
(4)	401A000	BITUMINOUS TREATMENT A
(5)	301A012	CRUSHED AGGREGATE BASE COURSE, TYPE B, PLANT MIXED, 6" COMPACTED THICKNESS

NO.	REVISION	DATE	INITIALS

PLAN SUBMITTAL
100%

ALABAMA PORT AUTHORITY
PORT OF MOBILE

NOT TO SCALE

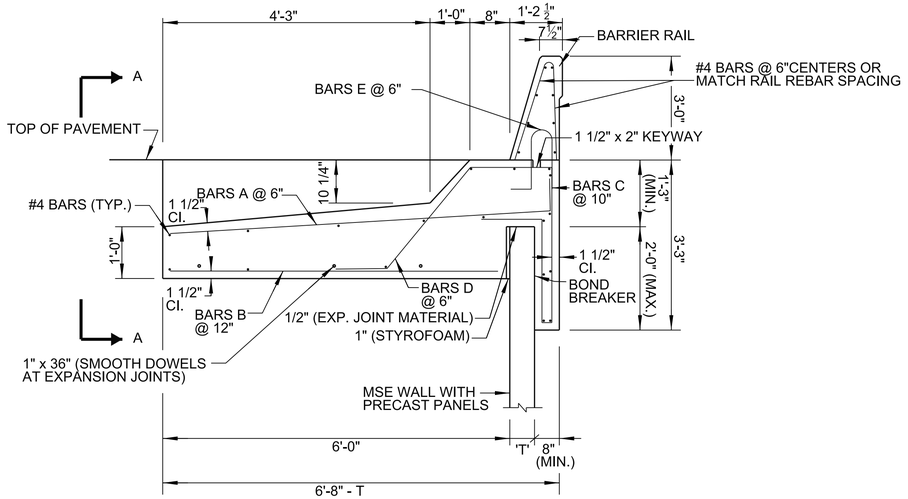
SHEET TITLE: PROFILE DETAILS

ROUTE: PORT CONNECTOR

User Is: Jonathan.Toper 13-MAY-2024 21:54 Plot Scale=5.000000:1.000000 $$COLORTABLE$$ $$PENTABLE$$ Projects#11147000 - APM ICTF Connector Bridges & Roadway#Project Design#Plans Assembly#APM ICTF Connector#002_000_typ.dgn

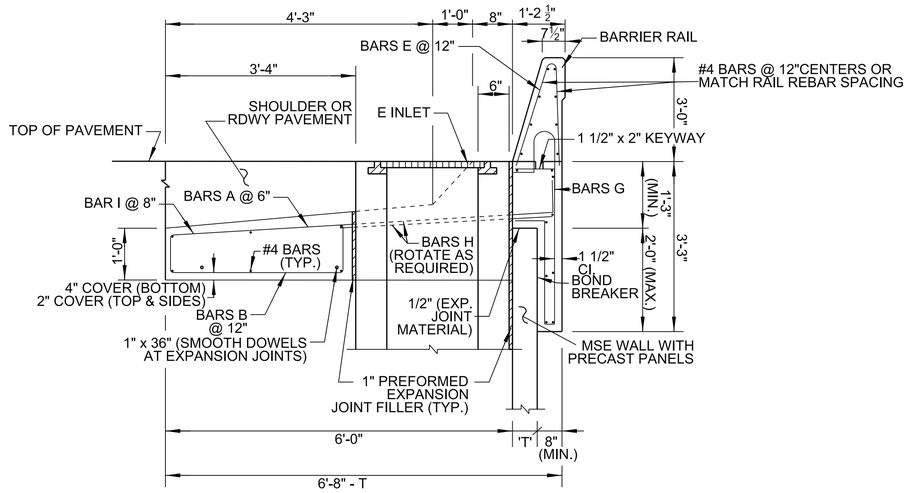
PROJECT DETAILS

REFERENCE PROJECT NO	FISCAL YEAR	SHEET NO
11165 TASK 1	2024	2H



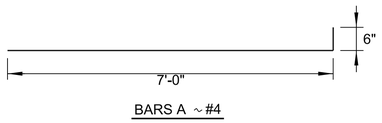
RETAINING WALL (MSE) COPING DETAIL

NO SEPARATE PAY ITEM FOR COPING, CONCRETE AND REINFORCEMENT
THESE ITEMS SHALL BE INCLUDED UNDER CSF-36 (RETAINING WALL MOUNTED) ITEM 629A-087

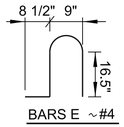


MSE WALL COPING DETAIL AT DRAINAGE INLET OPENINGS

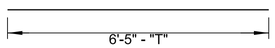
NO SEPARATE PAY ITEM FOR COPING, CONCRETE AND REINFORCEMENT
THESE ITEMS SHALL BE INCLUDED UNDER CSF-36 (RETAINING WALL MOUNTED) ITEM 629A-087



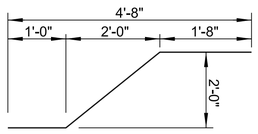
BARS A ~#4



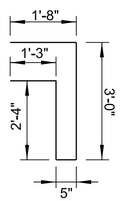
BARS E ~#4



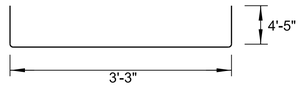
BARS B ~ #4



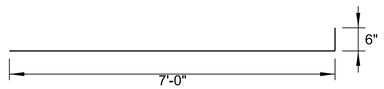
BARS D ~ #4



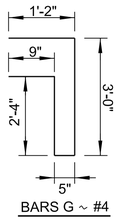
BARS C ~ #4



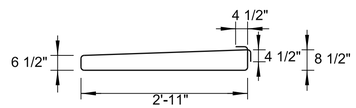
BARS H ~ #4



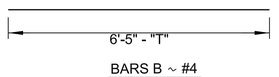
BARS A ~#4



BARS G ~ #4



BARS I ~ #4



BARS B ~ #4

GENERAL NOTES:
COPING AND BARRIER JOINT LOCATION TO COINCIDE WITH PANEL JOINTS. MAXIMUM 25' JOINT SPACING FOR COPING AND BARRIER JOINTS.
SEE NEXT SHEET FOR MSE WALL COPING DETAIL AT DRAINAGE INLET OPENINGS.

NO.	REVISION	DATE	INITIALS

PLAN SUBMITTAL
100%

ALABAMA PORT AUTHORITY
PORT OF MOBILE

NOT TO SCALE

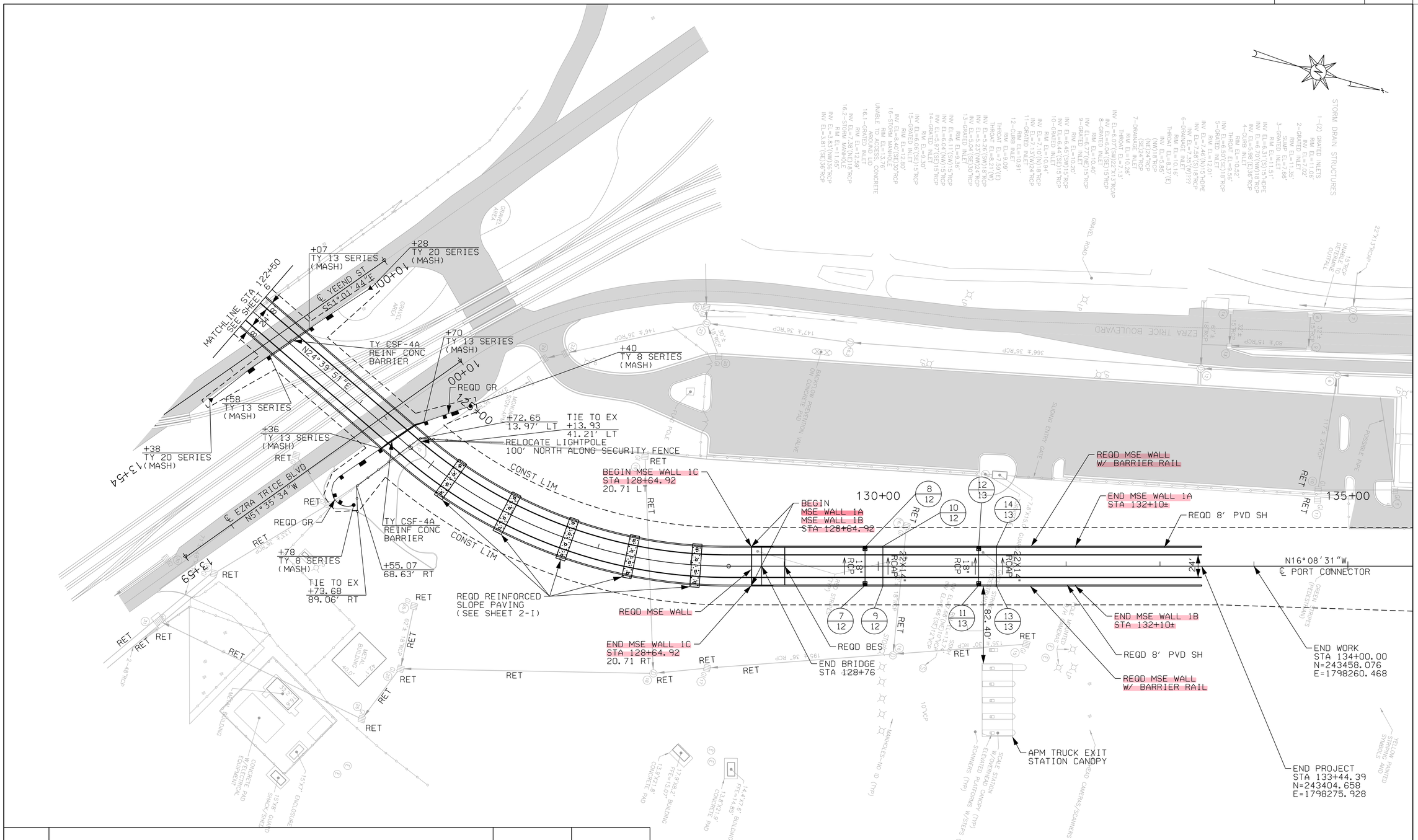
SHEET TITLE: PROFILE DETAILS

ROUTE: PORT CONNECTOR

User Is: Jonathan.Toper 13-MAY-2024 21:54 Plot Scale=5.000000:1.000000 $$COLORTABLE$$ $$PENTABLE$$
Projects\11147000 - APM ICTF Connector Bridges & Roadway\Project Design\Plans Assembly\APM ICTF Connector\002_000_typ.dgn

PLAN SHEET

REFERENCE PROJECT NO	FISCAL YEAR	SHEET NO
11165 TASK 1	2024	7



NO.	REVISION	DATE	INITIALS

PLAN SUBMITTAL: 100%

ALABAMA PORT AUTHORITY
PORT OF MOBILE

HORIZ 50 0 50 SCALE (FEET)

SHEET TITLE	ROUTE
PLAN SHEET	PORT CONNECTOR

User Is: jonathan.loper 13-MAY-2024 21:53 Plot Scale=50.000000:1.000000 $$COLORTABLE$$ $$PENTABLE$$ Projects#11147000 - APM ICTF Connector Bridges & Roadway#Project Design#Plans Assembly#APM ICTF Connector#007__000_pln.dgn

PROFILE SHEET - PORT CONNECTOR

REFERENCE PROJECT NO	FISCAL YEAR	SHEET NO
11165 TASK 1	2024	7A

EOP
EOP
Sta 123+12.00
e 2.20%
Sta 124+17.00
e 5.00%
Sta 124+92.00
e 7.00%
LT EOP
"e" @ 7.0%
RT EOP
Sta 128+05.00
e 7.00%
Sta 128+98.91
e 2.20%
Sta 129+41.96
e 0.00%
Sta 129+85.00
e 2.20%
NC @ 2.2%
LT & RT EOP
Sta 132+54.00
e 2.20%
Sta 132+98.88
e 1.54%
Sta 133+44.00
e 1.54%

PVI= 123+75.00
EL= 50.25

PG @ ℄ PORT CONNECTOR
END BRIDGE
STA 128+76
-4.27%
TRAFFIC

L=601.21
K=76.40

PVI= 126+75.61
EL= 37.41

VERTICAL ABUTMENT
RETAINING WALL (MSE)

RAILROAD TRACK
RAILROAD TRACK
RAILROAD TRACK
RAILROAD TRACK
RAILROAD TRACK

REQD RETAINING
WALL (MSE)

L=150.00
K=37.27

PVC= 131+72.16
EL= 16.20

PVT= 133+22.16
EL= 12.81

END PROJECT
PVI= 133+44.39
EL= 12.75

-0.25%

PVI= 132+47.16
EL= 12.99

DRAINAGE INDEX 7-8
REQD 18" RCP
INV=±14.37

DRAINAGE INDEX 9-10
REQD 22X14" RCAP
INV=±13.06

DRAINAGE INDEX 13-14
REQD 22X14" RCAP
INV=±13.17

DRAINAGE INDEX 11-12
REQD 18" RCP
INV=±14.49

EXISTING GROUND
@ ℄ PORT CONNECTOR

END WORK
STA 134+00.00

EX 24" RCP
EL=6.82
(RETAIN)

EX 18" RCP
EL=UNKNOWN
(RETAIN)

	PROPOSED	EXISTING
125+00	44.22	10.84
	44.21	10.00
	42.89	12.97
	40.26	12.85
	36.37	12.41
130+00	32.09	12.39
	27.82	13.15
	23.55	13.03
	19.28	13.17
	15.11	13.21
135+00	12.93	12.88
	12.67	
	12.38	
	13.20	

NO.	REVISION	DATE	INITIALS

PLAN SUBMITTAL
100%

ALABAMA PORT AUTHORITY
PORT OF MOBILE

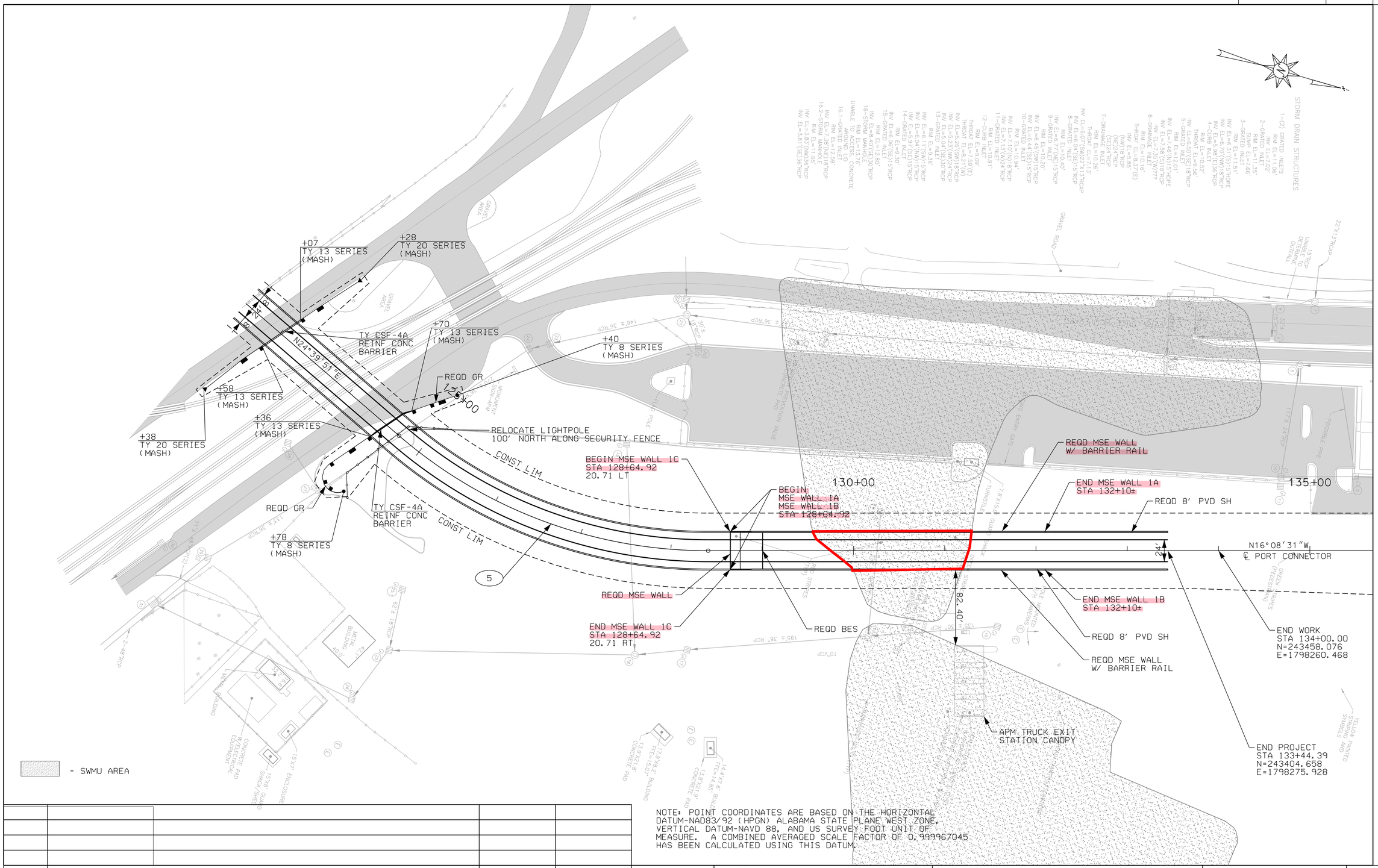
HORIZ 50 0 50
VERT 5 0 5
SCALE (FEET)

SHEET TITLE: PROFILE SHEET - PORT CONNECTOR
ROUTE: PORT CONNECTOR

User Is: jonathan.loper 13-MAY-2024 21:53 Plot Scale=50.000000:1.000000 $$COLORTABLE$$ $$PENTABLE$$
Projects#1147000 - APM ICTF Connector Bridges & Roadway#Project Design#Plans Assembly#APM ICTF Connector#007A_000_prf.dgn

PLAN SHEET - MSE WALLS

REFERENCE PROJECT NO	FISCAL YEAR	SHEET NO
11165 TASK 1	2024	8



NOTE: POINT COORDINATES ARE BASED ON THE HORIZONTAL DATUM-NAD83/92 (HPGN) ALABAMA STATE PLANE WEST ZONE, VERTICAL DATUM-NAVD 88, AND US SURVEY FOOT UNIT OF MEASURE. A COMBINED AVERAGED SCALE FACTOR OF 0.999967045 HAS BEEN CALCULATED USING THIS DATUM.

NO.	REVISION	DATE	INITIALS

PLAN SUBMITTAL: 100%

ALABAMA PORT AUTHORITY
PORT OF MOBILE

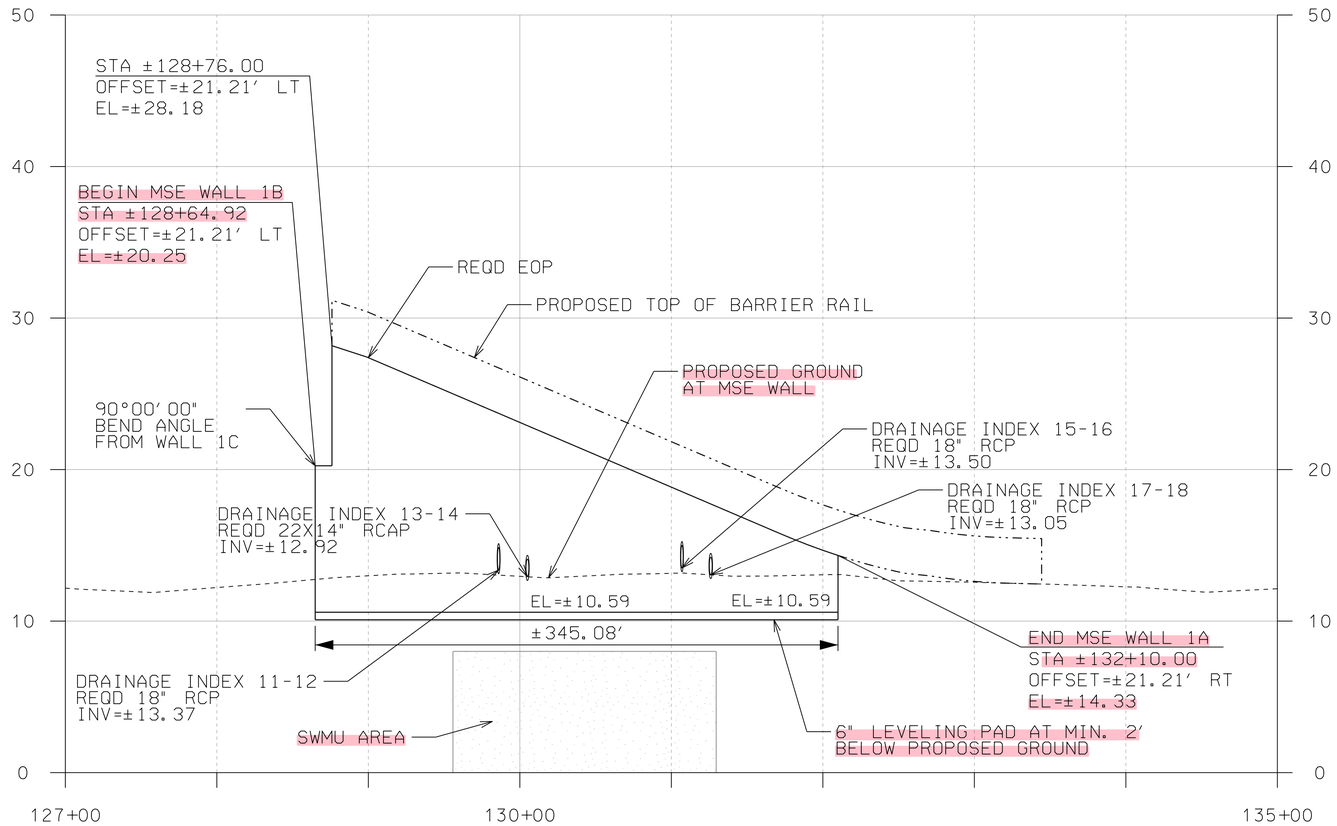
HORIZ 50 0 50 SCALE (FEET)

SHEET TITLE	ROUTE
PLAN SHEET - MSE WALLS	PORT CONNECTOR

User Is: jonathan.loper 13-MAY-2024 21:55 Plot Scale=50.000000:1.000000 $$COLORTABLE$$ $$PENTABLE$$ Projects#11147000 - APM ICTF Connector Bridges & Roadway#Project Design#Plans Assembly#APM ICTF Connector#008__000_pln.dgn

PROFILE SHEET - MSE WALL 1A

REFERENCE PROJECT NO	FISCAL YEAR	SHEET NO
11165 TASK 1	2024	8A



NOTE:
MSE WALL FOUNDATIONS ARE TO BE NO LOWER THAN ELEVATION 10'.

NO.	REVISION	DATE	INITIALS

PLAN SUBMITTAL
100%

ALABAMA PORT AUTHORITY
PORT OF MOBILE

HORIZ 50 0 50 SCALE (FEET) VERT 5 0 5

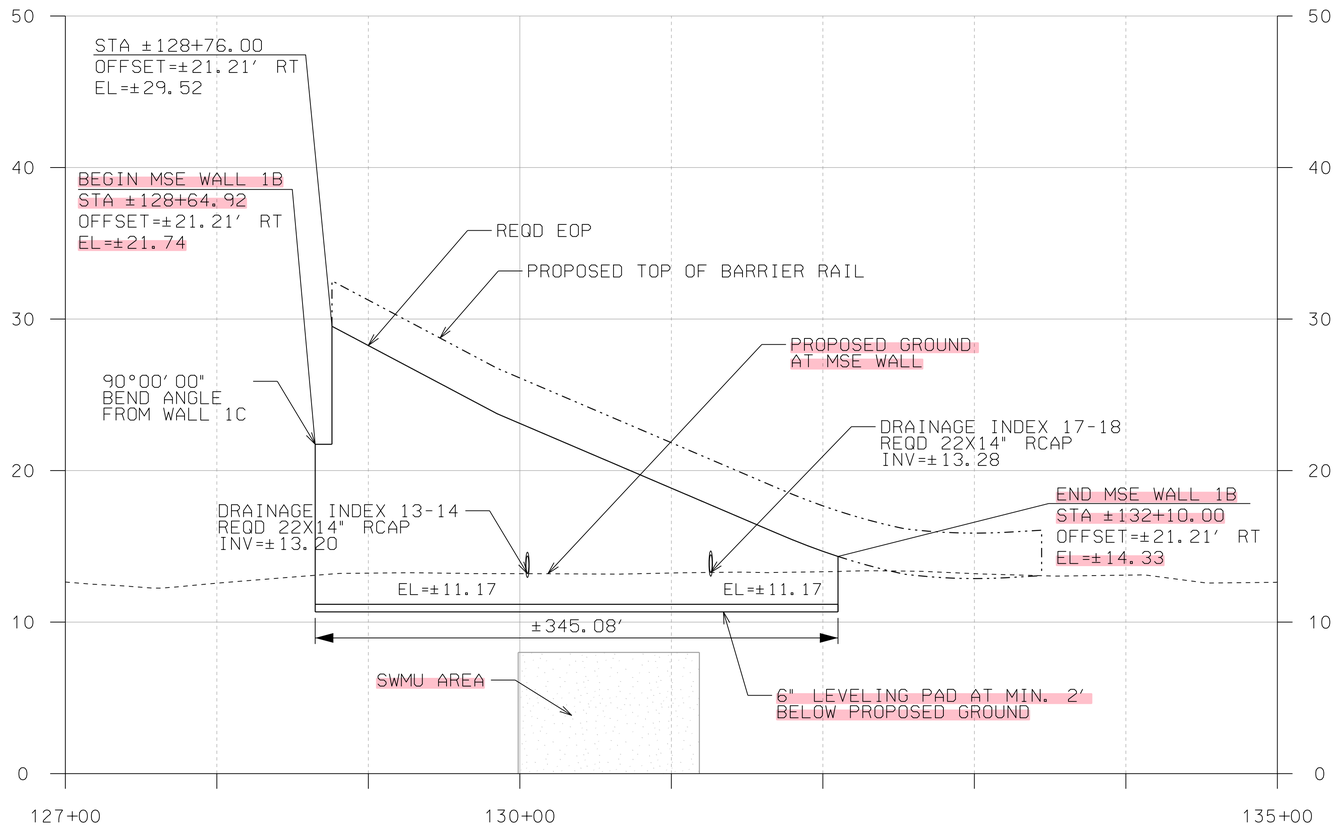
SHEET TITLE: PROFILE SHEET - MSE WALL 1A

ROUTE: PORT CONNECTOR

User Is: Jonathan.Roper 13-MAY-2024 21:53 Plot Scale=50.000000:1.000000 $$COLORTABLE$$ $$PENTABLE$$
Projects#11147000 - APM ICTF Connector Bridges & Roadway#Project Design#Plans Assembly#APM ICTF Connector#008A_000_prf-LEFT.dgn

PROFILE SHEET - MSE WALL 1B

REFERENCE PROJECT NO	FISCAL YEAR	SHEET NO
11165 TASK 1	2024	8B



NOTE:
MSE WALL FOUNDATIONS ARE TO BE NO LOWER THAN ELEVATION 10'.

NO.	REVISION	DATE	INITIALS

PLAN SUBMITTAL
100%

ALABAMA PORT AUTHORITY
PORT OF MOBILE

HORIZ 50 0 50 SCALE (FEET) VERT 5 0 5

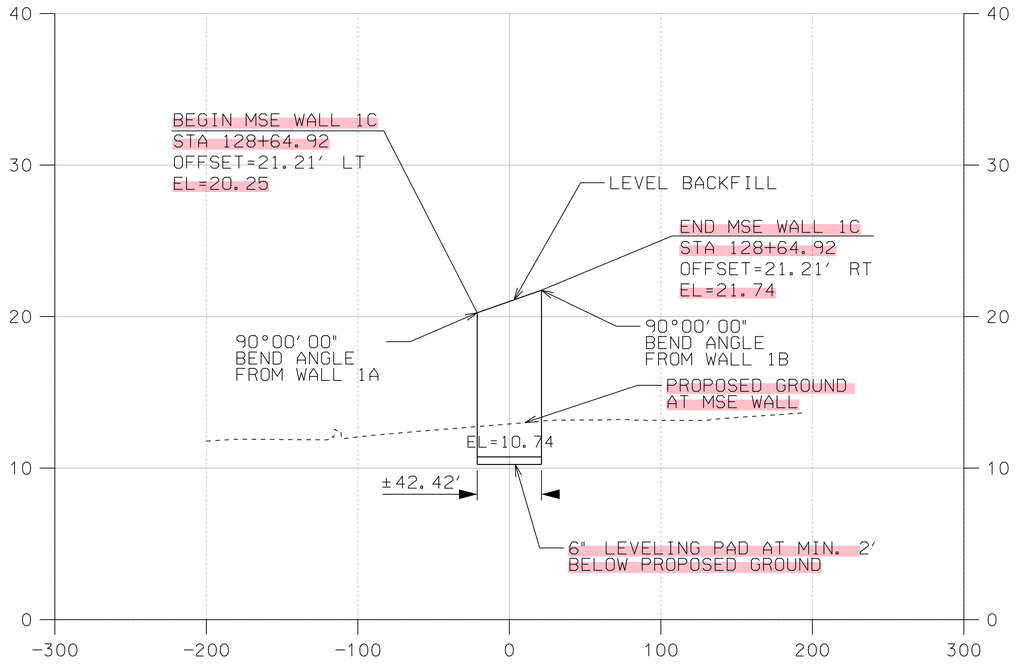
SHEET TITLE: PROFILE SHEET - MSE WALL 1B

ROUTE: PORT CONNECTOR

User Is: jonathan.loper 13-MAY-2024 21:53 Plot Scale=50.000000:1.000000 $$COLORTABLE$$ $$PENTABLE$$
Projects#11147000 - APM ICTF Connector Bridges & Roadway#Project Design#Plans Assembly#APM ICTF Connector#008B_000_prf-RIGHT.dgn

PROFILE SHEET - MSE WALL 1C

REFERENCE PROJECT NO	FISCAL YEAR	SHEET NO
11165 TASK 1	2024	8C



NOTE:
MSE WALL FOUNDATIONS ARE TO BE NO LOWER THAN ELEVATION 10'.

NO.	REVISION	DATE	INITIALS

PLAN SUBMITTAL
100%

ALABAMA PORT AUTHORITY
PORT OF MOBILE

HORIZ 50 0 50 SCALE (FEET) VERT 5 0 5

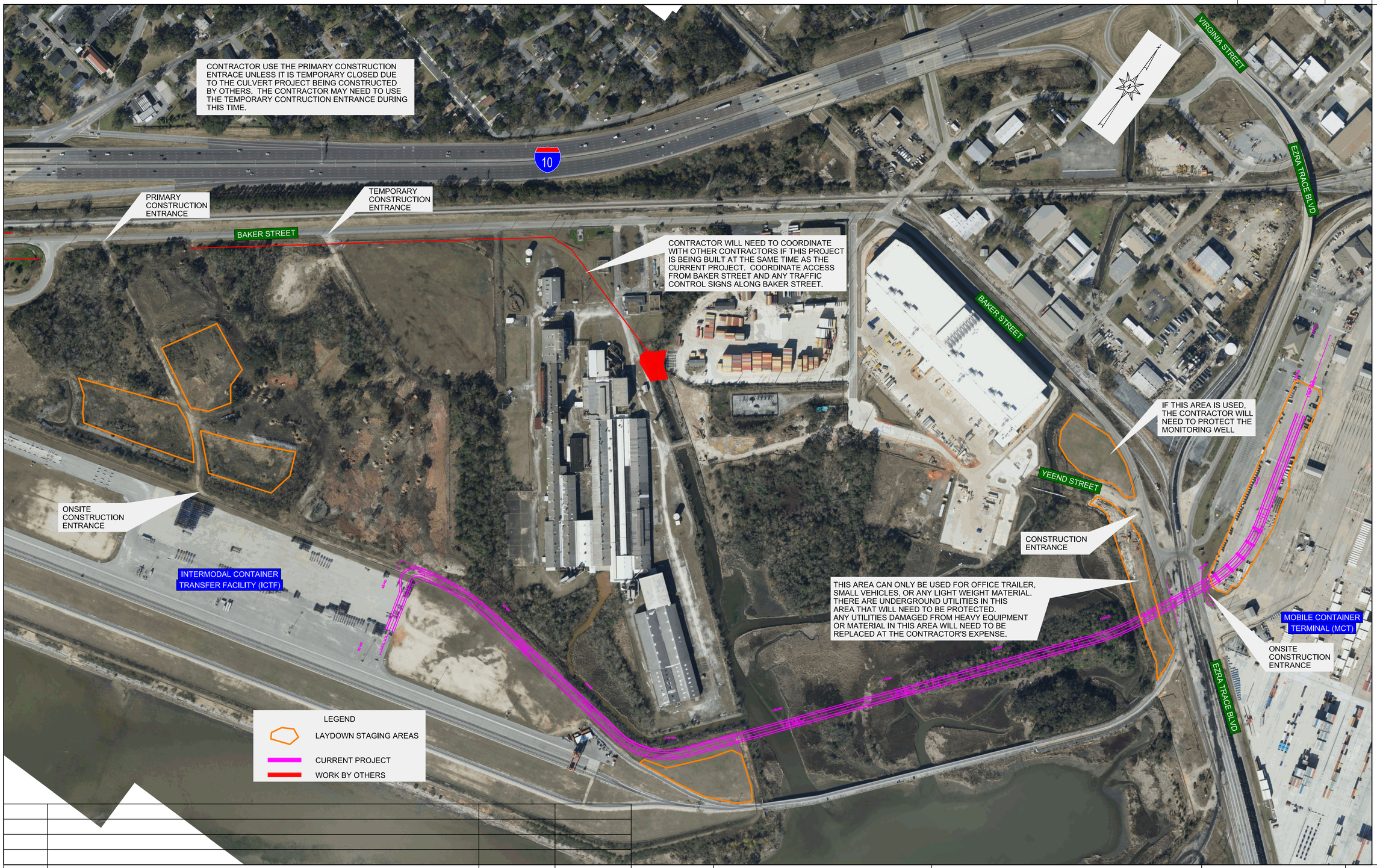
SHEET TITLE: PROFILE SHEET - MSE WALL 1C

ROUTE: PORT CONNECTOR

User Is: jonathan.loper 13-MAY-2024 21:53 Plot Scale=50.000000:1.000000 $$COLORTABLE$$ $$PENTABLE$$
Projects\1147000 - APM ICTF Connector Bridges & Roadway\Project Design\Plans Assembly\APM ICTF Connector\008C_000_prf-CENTER.dgn

TRAFFIC CONTROL PLAN - STAGING AREAS

REFERENCE PROJECT NO	FISCAL YEAR	SHEET NO
11165 TASK 1	2024	48



NO.	REVISION	DATE	INITIALS

PLAN SUBMITTAL
100%

ALABAMA PORT AUTHORITY
PORT OF MOBILE

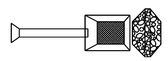
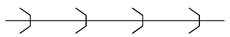
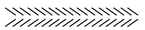
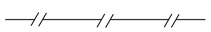
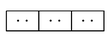
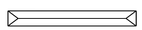
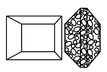
HORIZ 200 0 200 SCALE (FEET)

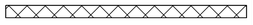
SHEET TITLE	ROUTE
TRAFFIC CONTROL PLAN - STAGING AREAS	PORT CONNECTOR

EROSION AND SEDIMENT CONTROL PLANS LEGEND

REFERENCE PROJECT NO	FISCAL YEAR	SHEET NO
11165 TASK 1	2024	60

BEST MANAGEMENT PRACTICES (BMP's)

TEMPORARY SLOPE DRAIN PIPE WITH ROCK DITCH CHECK AND SUMP EXCAVATION	
TEMPORARY EARTH BERM	
BRUSH BARRIER	
SILT FENCE SEDIMENT BARRIER	
FLOATING BASIN BOOM	
HAY BALE DITCH CHECK	
SAND BAG DITCH CHECK	
WATTLE DITCH CHECK	
SILT DIKE DITCH CHECK	
ROCK DITCH CHECK	
ROCK DITCH CHECK WITH SUMP EXCAVATION	
SILT FENCE DITCH CHECK	
WATTLE SLOPE INTERRUPTERS	

INLET PROTECTION	
STABILIZED CONSTRUCTION ENTRANCE	
EROSION CONTROL PRODUCTS	
SLOPE DRAIN	
TEMPORARY EARTH BERM WITH POLYETHYLENE	
DREDGE, FILL	
PRIMARY STORMWATER DISCHARGE POINT	
SECONDARY STORMWATER DISCHARGE POINT	
BACKGROUND POINT	
SEDIMENT RETENTION BARRIER	
SOLID SODDING	
TEMPORARY RIPRAP BERM	
TEMPORARY SEDIMENTATION BASIN	
PERMANENT DETENTION BASIN	

--SPECIFICATIONS--
CURRENT ALABAMA DEPARTMENT OF TRANSPORTATION

THIS DRAWING REPRESENTS DESIGNS PREPARED FOR USE BY THE ALABAMA DEPARTMENT OF TRANSPORTATION AND IS NOT TO BE COPIED, REPRODUCED, ALTERED, OR USED BY ANYONE, OR ANY ORGANIZATION, WITHOUT THE EXPRESSED WRITTEN CONSENT OF THE ALABAMA DEPARTMENT OF TRANSPORTATION REPRESENTATIVE AUTHORIZED TO APPROVE THIS USE. ANYONE MAKING UNAUTHORIZED USE OF THIS DRAWING MAY BE PROSECUTED TO THE FULLEST EXTENT OF THE LAW.

REVISIONS

ALABAMA DEPARTMENT OF TRANSPORTATION
1409 COLISEUM BOULEVARD
MONTGOMERY, AL 36130-3050

DESIGN BUREAU SPECIAL DRAWING

EROSION & SEDIMENT CONTROL LEGEND

Bureau Std Engr: L.V.S.
DRAWN BY: W.D.H. DATE DRAWN: 10-14-16

SPECIAL DRAWING NO: SPECIAL PROJECT DETAIL
INDEX NO:

NO.	REVISION	DATE	INITIALS

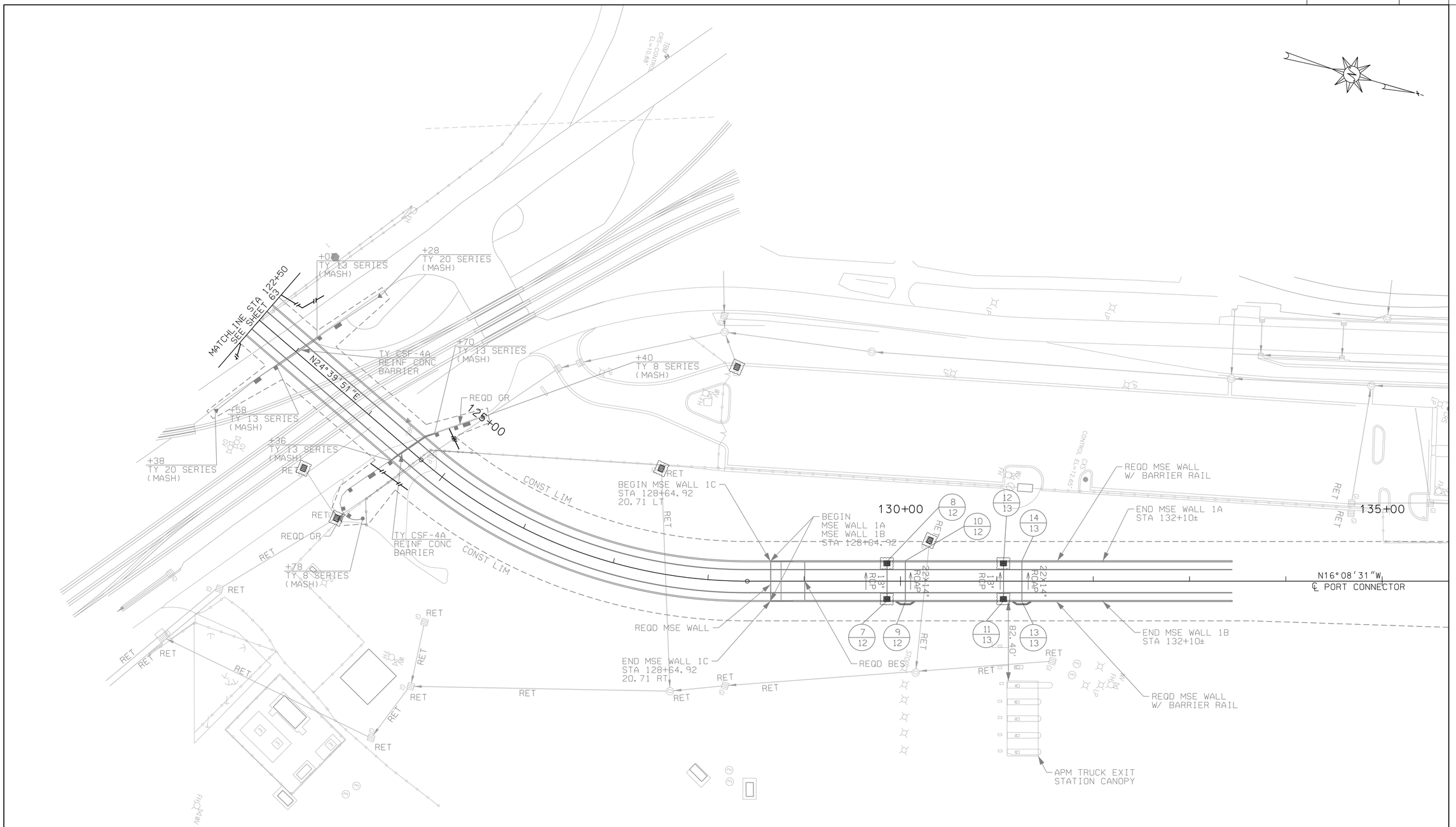
PLAN SUBMITTAL
100%

ALABAMA PORT AUTHORITY
PORT OF MOBILE

SHEET TITLE: EROSION AND SEDIMENT CONTROL PLANS LEGEND
ROUTE: PORT CONNECTOR

EROSION AND SEDIMENT CONTROL PLAN

REFERENCE PROJECT NO	FISCAL YEAR	SHEET NO
11165 TASK 1	2024	64



NO.	REVISION	DATE	INITIALS

PLAN SUBMITTAL: 100%

ALABAMA PORT AUTHORITY
PORT OF MOBILE

HORIZ 50 0 50 SCALE (FEET)

SHEET TITLE: EROSION AND SEDIMENT CONTROL PLAN

ROUTE: PORT CONNECTOR

User Is: jonathan.loper 13-MAY-2024 21:55 Plot Scale=50.000000:1.000000 $$COLORTABLE$$ $$PENTABLE$$
Projects\11147000 - APM ICTF Connector Bridges & Roadway\Project Design\Plans Assembly\APM ICTF Connector\064_000_ecp.dgn

The base map for most of the civil plans is based on the topographical and boundary surveys performed by Rowe Surveying & Engineering Company, Inc. of Mobile, AL. These surveys became available to Harding ESE on August 6, 2002.

2.1 SWMU 6 DNAPL EXCAVATION & COVER

2.1.1 Summary

There are three distinct corrective measures that specifically address SWMU 6:

- Near-surface DNAPL contaminated soils/sediments will be excavated from a discharge channel located within the SWMU 6 area east of Ezra Trice Boulevard;
- A permeable, soil cover will be constructed over the SWMU 6 area east of Ezra Trice Boulevard; and
- An asphalt cover will be constructed over the SWMU 6 area west of Ezra Trice Boulevard.

Other actions in the SWMU 6 area include:

- DNAPL recovery in the dedicated system at Monitoring Well 17-S;
- DNAPL recovery from the Monitoring Well Recovery System (MWR system) from wells 4-D, 4-DK, 18-I, 20-I, and 21-S as well as Recovery Well RW-1;
- Closure of monitoring wells 17-I, 18-S and 22-S in the MWR system;
- Closure of recovery well RW-2;
- Protection during construction and then improvements of the DNAPL recovery effectiveness monitoring wells including 17-D, 18-D, and 21-I;
- Closure of groundwater monitoring wells 4-S, 4-I, 30-I and 30-D.

The SWMU 6 area is divided by Ezra Trice Boulevard and the railroad tracks that run parallel. The area of project land disturbance is approximately 3.2 acres for the eastern section and 2.3 acres for the western (Drawing C8). The eastern property wraps around the Radcliff Economy Marine Terminal and measures approximately 640 LF along the western north-south side and 440 LF along the southern east-west boundary. The western parcel borders two sides of the Oil Recovery Company (formerly Star) terminal on S. Conception Street and is approximately 600 LF on the eastern north-south side and 640 LF along the southern east-west edge.

<u>Corrective Measures at SWMU 6 East</u>

The excavation of DNAPL contaminated soils/sediments in the SWMU 6 East area is directed by the DNAPL source removal corrective measures objective. The primary drainage channel of SWMU 6 contains high DNAPL contaminant concentrations at or near the ground surface presumably originating from the closed surface impoundments

to Ezra Trice Boulevard. The excavation will generally include a 10 foot wide and 5 foot deep (bgs) channel 800 foot in length (Drawing C9). Excavated materials will be dewatered in temporary sediment drainage beds and then transported off-site for appropriate treatment and disposal. The excavated drainage channel will be filled to grade with materials meeting the appropriate construction specification. Drainage from the existing ditch will be rerouted to a new diversion channel on the south side of the soil cover (detail Drawing C11). An HDPE geomembrane liner will be incorporated into the diversion channel design. Placement of the temporary sediment drainage beds are shown in Drawing C6 with details on Drawing C14. The final combined surface area of the two beds is likely to be 5,000 to 10,000 sq. ft. The drainage bed design includes a geocomposite liner over an HDPE geomembrane and a minimum bed slope of 2%. The sediment drainage beds will be removed after completion of the off-site shipment of the excavated materials.

A compacted, permeable soil cover has been designed for the eastern area and is intended to meet the corrective measures objective for soil by preventing human contact with contaminated soil. The soil cover will be installed to a minimum approximate elevation of 12 feet, the 100-year flood plain elevation (Drawing C11). Current non-channel elevations for this area generally range from seven to nine feet. A water main is present along the southern boundary of the proposed soil cover area. Side slopes will be constructed at a 4:1 slope and run-on/runoff will be controlled with a drainage ditch. The side-slope drop down structure and toe drainage ditch detail are shown on Drawing C16. A turf reinforcement matting system is utilized in the drop down areas and drainage ditches. In August 2002, the ASPA Board approved the termination of the Radcliff lease. The current discharge point for the Radcliff tank farm containment area is at the southwest corner. The drainage plan for the cover area assumes that this discharge is routed to the southeast corner of the containment area. Drainage from the eastern SWMU 6 area is directed to Ezra Trice Boulevard and then primarily south towards Choctaw pass and the Mobile River.

Monitoring wells will be protected during cover construction in both the eastern and western SWMU 6 areas. These wells will subsequently be extended as appropriate. Wells to be abandoned will adhere to an ADEM approved well abandonment plan (Drawing C18).

The specified fill will be appropriate to function as sub-grade material for the anticipated Container Port development. The cover will be finished with topsoil and vegetated cover to minimize erosion. It is likely that this area will subsequently be asphalted for the port. This would enhance the cover durability and significantly reduce maintenance costs.

The plans and specifications for the original approved soil cover design for SWMU 6 east as well as subsequent amendments to the original approved soil cover design to accommodate the Container Port development are included in Section 2.0. The current amendment to the original approved soil cover design (Inter-Terminal Connector Amendment) includes removing about 6,300 square feet of the 3.2 acres of SWMU 6 east

cover to construct a MSE wall system/embankment, supporting the roadway connector project between the ICTF to the Container Port terminal. The amendments to the original approved soil cover design for SWMU 6 east are included as stand-alone documents at the beginning Section 2.0.

Corrective Measures at SWMU 6 West

The configuration of the SWMU 6 area west of Ezra Trice Boulevard restricts options for extending the side-slopes beyond the footprint of the SWMU area (Drawing C5). Non-ASPA properties and a sewer easement to the west, the railroad to the east, the water main to the south and the crescent parcel shape significantly restricts the cover design. Substantial portions of the area would not achieve the minimal 12 foot elevation or excessively steep slopes would be required. Current elevations on the western SWMU 6 area are generally between five and nine feet but lower in the drainage channel. Therefore, the design in the SWMU 6 west area incorporates an asphalt cover system with an approximate maximum elevation of 10 feet (Drawing C11). The existing drainage ditch will be filled and run-on/runoff will be controlled with a central, 30-inch reinforced concrete pipe culvert for drainage (approximately 850 LF). Discharge would continue to be to Tennessee Branch (Southern Drain). Currently, conceptual designs for the container port development indicate minimal impacts to the SWMU 6 west area.

2.1.2 Relevant Drawings

The following drawings present construction details for the SWMU 6 corrective measures:

C1	Project Overview
C2	Current and Future Land-Use Conditions
C8	SWMU 6 – Existing Conditions
C9	SWMU 6 – Sediment Excavation and Erosion Control Plan
C10	SWMU 6 – Erosion Control Plan
C11	SWMU 6 – Grading Plan
C12	SWMU 6 – Staking Plan
C15	Erosion & Sediment Control Details (Sheet 1)
C16	Erosion & Sediment Control Details (Sheet 2)
C17	Miscellaneous Details
C18	Well Abandonment and Demolition Plan
C19	Chain Link Fence Details

These drawings are included in Appendix A of this document.

2.1.3 Specifications

Construction Specifications which include details for implementing the corrective measures are included in Appendix B.

2.2 SWMUS 4, 5, & 8 COVER

2.2.1 Summary

The primary corrective measure for SWMUs 4, 5 and 8 is a permeable, soil cover to be constructed over the combined SWMU area. No DNAPL excavations will be performed.

Other corrective measure actions in the SWMUs 4, 5 and 8 area include:

- DNAPL recovery via an expanded 6-well recovery system
- Closure of Monitoring Well Recovery System (MWR system) wells 13-S, 14-S, 14-I, and 27-D
- Protection during construction and, then, improvements of the DNAPL recovery effectiveness monitoring wells including 6-S, 6-I, 11-S, 12-I, 13-I, 25-I and 26-I
- Protection during construction and, then, improvements of the boundary and compliance groundwater wells including 7-S, 7-IR and 7-D
- Closure of groundwater monitoring wells 2-S, 5-I, 12-S, 13-D, 25-S, 29-I and 30-D.

The SWMUs 4, 5 and 8 area includes most of the original AWTC site with an approximate land disturbance area of 14.9 acres (Drawings C1 & C2). The area measures approximately 375 LF along the eastern shoreline and 900 LF along the western north-south boundary. The east-west boundaries measure approximately 1,515 LF on the northern boundary and 1,740 LF on the south. The soil pile in the northwest corner of the AWTC site is outside the cover area and will be used as borrow material as required. The area is currently bisected by the rail track for the Rail-Ferry terminal. This active facility requires that a small, separate cover be constructed over portions of SWMU 5. This elliptical shaped cover measures approximately 480 LF along the east-west axis and 120 LF along the north-south axis.

A compacted, permeable soil cover supporting a vegetative cover will be utilized in the SWMUs 4, 5, and 8 areas to prevent human contact with the contaminated soil in support of the corrective measures objective for soil (Drawings C5 and C6). The site will be cleared, grubbed and graded. The existing service road will be closed and access to the site controlled with an extension of the existing fence to the northwest corner of the closed surface impoundments and the Radcliff fence.

A shore protection wall constructed of rip rap material will be installed at the existing shoreline (approximately 270 LF) to allow the installation of the cover to the required elevation (Drawing C6). The wall will step-down at the northern and southern ends to facilitate discharge from the drainage structures at the required elevation. Current site elevations are generally in the eight to ten foot range but drop to five foot within 50 feet of the shoreline. Side slopes will be constructed at a 4:1 slope and run-on/runoff will be controlled with a perimeter drainage ditch (Drawing C16). The side-slope drop down

structure and toe drainage ditch details are similar to those for the SWUM 6 cover. A turf reinforcement matting system will be utilized in the drop down areas and drainage ditches. The current discharge points for the SWMUs 4, 5 and 8 areas are the Mobile River and SWMU 6 drainage ditch. This flow pattern will be largely maintained. The specified fill will be appropriate to function as sub-grade material for the anticipated Container Port development. The cover will be finished with topsoil and vegetated cover to minimize erosion. It is likely that this area will subsequently be asphalted for the port. This would enhance the cover durability and significantly reduce maintenance costs.

Monitoring wells will be protected during cover construction. These wells will subsequently be extended as appropriate. Wells to be abandoned will adhere to an ADEM approved well abandonment plan.

2.2.2 Drawings

The following drawings present construction details for SWMUs 4, 5 and 8 corrective measures:

C1	Project Overview
C2	Current and Future Land-Use Conditions
C3	SWMU 4, 5 and 8 – Existing Conditions
C4	SWMU 4, 5 and 8 – Erosion Control Plan
C5	SWMU 4, 5 and 8 – Utility Trenches Grading and Staking Plan
C6	SWMU 4, 5 and 8 – Grading Plan
C7	SWMU 4, 5 & 8 – Staking Plan
C15	Erosion & Sediment Control Details (Sheet 1)
C16	Erosion & Sediment Control Details (Sheet 2)
C17	Miscellaneous Details
C18	Well Abandonment and Demolition Plan

2.2.3 Specifications

Construction Specifications which include details for implementing the corrective measures are included in Appendix B.

2.3 SWMU 1 DEMOLITION

2.3.1 Summary

SWMU 1 consists of the four wastewater pretreatment tanks from the wood treating operation (Drawing C1). The four tanks will be cleaned, disassembled, and removed from the site. Three of the tanks (T-1, T-2 & T-3) are described in the 1988 RFA as upright steel cylinders of approximately 17,000 gallon capacities. The fourth tank (T-4) is of similar construction and 5,000 gallon capacity. The tanks were reportedly cleaned after

the impoundment closure and are empty except for apparent rainwater and some residue. The tanks are open to the atmosphere and do not contain significant volumes of waste.

Processes involved in removal of the four wastewater pretreatment tanks include purging the tanks to remove residual hazardous vapors, decontamination by steam cleaning, sludge/solids disposal (as necessary), wastewater and decontamination water disposal, disassembly of the tanks, and proper disposal of the tanks. Additionally, any concrete slabs, other appurtenances, and the adjacent shed associated with SWMU 1 will be properly removed.

2.3.2 Drawings

The following drawings present information regarding the SWMU 1 tank demolition activity:

C1	Project Overview
C3	SWMU 4, 5, and 8 Existing Conditions

2.3.3 Specifications

Construction Specifications which include details for implementing the corrective measures are included in Appendix B.

2.4 DNAPL RECOVERY SYSTEM

2.4.1 Summary

The corrective measures objectives for DNAPL source control will also be addressed through the operation of two DNAPL recovery systems - the existing recovery system at SWMU 4 and the recovery systems at 12 converted monitoring wells (see Section 2.5). The SWMU recovery system is discussed below.

Recovery Well System

The existing SWMU 4 recovery well system will be doubled in size from three wells (RW-3, RW-4 and RW-5) to six wells (RW-6, RW-7 and RW-8) (Drawings C9 and E1). The existing three wells will be taken out of operation and protected during cover construction. The above ground structures will be dismantled and the wellheads protected. Well RW-2, which is no longer in operation, will be abandoned under applicable ADEM regulations.

After site grading activities, new pipelines will be installed below grade to the six well locations (detail Drawing C13). The pipelines will be 1-inch galvanized steel pipes enclosed in 3-inch HDPE secondary containment pipe. Once the soil cap is constructed

the three new wells will be installed and pump systems will be installed (Drawing M1). The stainless steel wells will be installed approximately 3 - 5 feet into the Miocene clay unit that is approximately 100 feet below ground surface (Drawing M1). This allows the well screen to extend into the clay along with the 3 foot sump. The well pumps have a documented performance record for DNAPL recovery operations and minimize the cogeneration of wastewater. The well will be finished with a flanged surface casing that bolts to and bears the weight of the pump and product riser pipe. The wells will be enclosed in a 4 foot diameter precast manhole at the surface. This modular design allows adjustments in surface elevations through the addition or removal of extension collars.

A new treatment system will be constructed on the adjacent property to the north of SWMU 4. This will require some demolition of piping and containment berms at Star (Drawing C18). The system will include control equipment for the pumps, primary separation tanks for product recovery, an oil/water separator with a polishing filter and an effluent holding tank (Drawing M4). Treated water will be pumped via a 480 LF 2-inch galvanized steel pipe to the existing wastewater treatment area on the AWTC site. A process flow diagram and the process and instrumentation diagram are shown in drawings M2 and M3 respectively. The electrical site plan, control schematic electrical details, and single line diagram are included as drawings E1, E2, E3, and E4, respectively.

The new treatment system will be based in a 40’ x 30’ concrete, secondary containment area. Product recovery lines originate from each of the six recovery wells and can be diverted into individual drums for system performance measurements. Product production will be estimated by direct measurement of product in the drums, elapsed time interval, and pump cycle counts. Product flows into one of two 3,000 gallon, conical-bottomed, stainless steel product separation tanks. DNAPL will be collected at the bottom of the tanks and periodically pumped out for off-site recycling. The supernatant wastewater from the separation tank flows to the oil/water separator. Inflow is diverted to the second separation tank when the first separation tank is nearly full. The oil/water separator also removes any LNAPL in the wastewater and facilitates the recovery of any carry-over DNAPL. Both the LNAPL and DNAPL will be periodically collected and sent off-site for recycling. The oil/water separator includes a polishing filter that can be used as necessary to achieve discharge requirements. Excess area is also available within the containment area for additional treatment equipment (i.e., air strippers, filters, carbon units) if required in the future.

The containment area of the treatment system will be sloped to a sump area. Non-contaminated rainwater will be pumped to the stormwater system on an as-needed basis. Contaminated water will be pumped back into the wastewater treatment system. High level cutoff switches are included in all tanks, the measurement drums and the containment area (Drawing M3).

The container port redevelopment may require that this system be dismantled during future redevelopment construction. The system will be dismantled and repositioned as needed.

During the timeframe of the 2024 Post-Closure Permit Renewal Application, EFR was recommended for DNAPL recovery in the Recovery Well System. This included the permanent removal of the aforementioned well pumps, which had been non-operational since 2018 (with the exception of RW-6, which was intermittently operational in 2019 though DNAPL recovery was negligible), and decommissioning of the piping from the recovery wells to the treatment system. No change to the function of the treatment system process was planned. EFR activities are summarized in Section 2.6.2.6 of the O&M Manual.

2.4.2 Drawings

The following drawings present construction details for the DNAPL recovery:

C1	Project Overview
C2	Current and Future Land-Use Conditions
C13	DNAPL Recovery System Layout
C14	DNAPL Recovery System Details
C15	Erosion & Sediment Control Details (Sheet 1)
C16	Erosion & Sediment Control Details (Sheet 2)
C17	Miscellaneous Details
C18	Well Abandonment and Demolition Plan
M1	DNAPL Recovery Well & Equipment Installation
M2	DNAPL Recovery System Flow Diagram
M3	DNAPL Recovery System Process and Instrumentation Diagram
M4	Tank Farm Layout & Cross-section
E1	Electrical Site Plan
E2	Electrical Control Schematic
E3	Electrical Details
E4	Single Line Diagram

2.4.3 Specifications

Construction Specifications which include details for implementing the corrective measures are included in Appendix B.

2.5 MONITORING WELL DNAPL RECOVERY SYSTEM & GROUNDWATER MONITORING SYSTEM

2.5.1 Summary

Monitoring Well Recovery System

The monitoring well recovery system was established under a Consent Order between ASPA and ADEM. The system currently includes twelve converted monitoring wells and one converted DNAPL recovery well. Then wells were originally pumped on a weekly basis; however, extremely low product yields have allowed operation on a semi-annual basis. ASPA has proposed in their permit renewal application that most of the wells be closed based on very low recovery rates. Over 43 months of operation the monitoring well recovery system has only recovered 151 gallons of product with 82% being recovered from two of the wells. The wells to be closed include wells 13-S, 14-S, 14-I, 17-I, 18-S, 22-S, and 27-D. The wells remaining in operation would include 4-D, 4-DK, 18-I, 20-I, 21-S, and RW-1. In addition, well 17-S has been converted from the mobile monitoring well recovery system to a fixed based operation and would continue in service.

Wells to be closed would be abandoned according to applicable regulations and grouted to the surface (Drawing C18). Wells being kept in service would be protected during cover construction and extended as necessary to conform to new cap elevations. Eventually, some of these wells will be flush mounted in vaults to conform to the container port redevelopment requirements.

Groundwater Monitoring Wells

There are currently 60 groundwater monitoring wells on the AWTC site of which twelve have been converted to DNAPL recovery wells. During the CMS review and approval process, ADEM and ASPA reached agreement on the number and location of different types of monitoring wells for the groundwater monitoring program. This agreement will be reflected in the permit renewal. These wells include:

Background Well:	19-S
Deep Well:	8-DK
Boundary/Compliance Wells:	7-S, 7-IR, 7-D, 8-S, 8-I, 8-D, 9-I, 15-S, 15-I, 15-D, 16-I, 16-D, 31-I, 31-D, 32-S, 32-I
DNAPL Effectiveness Wells:	6-S, 6-I, 11-S, 11-I, 12-I, 13-I, 17-D, 18-D, 21-I, 23-I, 23-D, 25-I, 26-I

Groundwater samples are collected for analysis from the Boundary/compliance, deep and background wells. The effectiveness wells are monitored for the presence or absence of DNAPL.

The wells listed above will be protected during cover construction, extended as necessary to conform to new cap elevations and ultimately flush mounted for the container port redevelopment.

Upon approval of the CMI Workplan, ASPA will close all other monitoring wells not included in one of these systems, including: 1-S, 1-I, 1-D, 2-S, 4-S, 4-1, 5-I, 10-I, 10-D, 12-S, 13-D, 19-I, 25-S, 29-I, 30-I, and 30-D.

2.5.2 Drawings

The following drawings present relevant information regarding the monitoring well systems discussed above:

C18 Well Abandonment and Demolition Plan

2.5.3 Specifications

Construction Specifications which include details for implementing the corrective measures are included in Appendix B.

2.6 OPERATION AND MAINTENANCE OF CORRECTIVE MEASURES SYSTEMS

The activities associated with operation and maintenance (O&M) of the corrective measures are presented in the Operations and Maintenance Manual included in Appendix C. Many elements of the O&M Manual cannot be fully detailed until after completion of the construction activities, therefore sections of the manual varies in their degree of completeness.

3.0 CONSTRUCTION WORKPLAN

3.1 INTRODUCTION & PURPOSE

The Construction Workplan documents the overall management strategy, construction quality assurance procedures and schedules for constructing the corrective measures. Several sections of the construction workplan will require "supplemental" program plans or amendments following contractor selection by ASPA. These supplemental program plans and amendments will also conform to the general requirements of the construction workplan.

3.2 PROJECT MANAGEMENT

The project management component summarizes the construction management approach to the project including levels and authority and responsibility, lines of communication and the qualifications of key personnel who will direct the corrective measures construction tasks.

The corrective measures construction team will include the following personnel.

Owner

- The Owner, Alabama State Port Authority, is responsible for the design, construction, and operations and maintenance of the Site. This responsibility includes complying with the requirements of the permitting agency, the submission of the CQA/CQC documentation, and assuring the permitting agency that the corrective measure was constructed as prescribed in the remedial design in accordance with the drawings and specifications approved by the permitting agency (USEPA, 1993). Specific activities may be delegated to contractors.

- Owner Project Manager (OPM): Mr. Robert Harris will serve as the Owner's Project Manager and the Owner's liaison with ADEM. Mr. Harris will be responsible for providing monthly progress reports to these agencies.

- Owner Project Engineer (OPE): Mr. Jerald Kichler will serve as the Owner's Project Engineer. Mr. Kichler will be responsible for overseeing that all work is executed and documented in accordance with the drawings and specifications.

Corrective Measures Contractor

- The Corrective Measures Contractor is responsible for constructing the prescribed remedial design in accordance with the drawings and specifications. The

Corrective Measures Contractor may retain the services of specialty subcontractors (e.g., material suppliers, manufacturers, installers, soils and concrete testing firms). The Corrective Measures Contractor, or his subcontractors, will have experience in successful projects of similar size and technical scope including contaminated sediment excavation, hazardous and non-hazardous waste disposal, general earthwork, DNAPL system installation and operation, monitoring well construction, system operation and maintenance (O&M) and will have current state and federal licenses as appropriate.

- Corrective Measures Contractor Certified Industrial Hygienist (CMC-CIH): The CMC-CIH serves as the individual responsible for the health and safety of the corrective measures. The CMC-CIH duties are to develop, implement, and enforce the site-specific Safety, Health and Emergency Response Plan (SHERP); conduct initial site-specific training; provide continuing health and safety support, as needed; review results of air monitoring and accident reports; and provide regular on-site supervision and continued evaluation of the effectiveness of the SHERP.

- Corrective Measures Contractor Health and Safety Officer (CMC-HSO): The CMC-HSO is on-site full time or during key construction phases and reports directly to the CMC-CIH involving safety policy and implementation of the Corrective Measures Contractor's corporate safety program and standards for day-to-day operations in the field. The primary responsibilities of the CMC-HSO are to provide the Corrective Measures Contractor's Project Manager and Site Superintendent with site-specific hazard assessments, and to implement and maintain the Contractor's safety program. During periods of low construction activity, the Site Superintendent may also serve as the CMC-HSO.

- Corrective Measures Contractor Project Manager (CMC-PM): Day-to-day management of the project resources and activities is the primary responsibility of the CMC-PM. The CMC-PM's qualifications include relevant remedial construction project experience including prior project management experience. Ultimately, the CMC-PM is responsible for the overall project success. Success of the project is measured by the achievement of the quality assurance goals of the corrective measures and safe completion of the project on schedule and within the established budget. The CMC-PM supports the implementation of the CQA/CQC Plan by effectively communicating the on-site quality assurance program policies, objectives, and procedures to all of the project personnel. The CMC-PM, in conjunction with the Site Superintendent (see below), will coordinate and communicate with directly to the OPE.

- Corrective Measures Contractor Site Superintendent (CMC-SS): The CMC-SS reports directly to the CMC-PM and is responsible for the day-to-day supervision of the on-site remedial activities. The CMC-SS directs the on-site project resources, including subcontractors and suppliers, required for daily work activities and communicates project progress to the CMC-PM. The CMC-SS's involvement

in QA/QC includes communicating the necessity of quality in performance of all remedial activities to the subcontractors and the on-site project staff. His specific responsibilities include, but are not limited to, the following:

- Determine if CQC objectives are being met for the project;
- Implement CQC procedures;
- Prepare daily observation reports;
- Review subcontractor's QA/QC manuals; and
- Conduct ongoing CQC training of current and new personnel.

- Corrective Measures Contractor CQC Personnel (CMC-CQC Personnel): CMC-CQC Personnel are individuals who work for the Corrective Measures Contractor and whose job it is to ensure that construction is taking place in accord with the drawings and specifications (USEPA, 1993). CMC-CQC Personnel report directly to the CMC-SS and is responsible for implementing the CQC elements of the drawings and specifications. The CMC-SS may also serve as the CMC-CQC Personnel. Additional CMC-CQC Personnel will be available on-site as needed during periods of high activity to assist monitoring and controlling the quality of the construction.

- Corrective Measures Contractor Subcontractors: The Corrective Measures Contractor will subcontract some elements of the project such as manufactured materials and geosynthetics installation.

- Manufacturer: The manufacturer is responsible for the production of materials and products to be used on this project and their delivery to the Site. The manufacturers must be able to provide sufficient production capacity and qualified personnel to meet the project schedule.

- Specialty Installer: The specialty installer will perform all aspects of the installation of specialty items. The specialty installer may also be responsible for other specialized construction tasks. The specialty installer will be trained and qualified to install the specialty items proposed for this project. Further, the specialty installer must be pre-qualified and approved by the Owner. The qualifications required of the specialty installer are listed in the specifications.

Engineer

- Certifying Engineer (CE): The CE is responsible for certifying to the Owner and regulatory agency that, in his opinion, the Site has been constructed in accord with the drawings and specifications. The certification statement is accompanied by a final Certification Report that contains all the appropriate documentation, including daily observation reports, sampling locations, test results, drawings of record or sketches, or other relevant data (USEPA, 1993). The CE may be an employee of

the Corrective Measures Contractor's firm or may be independently retained by the Owner. The CE must be a licensed Professional Engineer in the State of Alabama. The CE will report to ASPA's Project Engineer.

- CQA Engineer: The CQA Engineer reports directly to the CE and is responsible for review of the specifications at each phase of the design process and ensures that the specifications are being met. The CQA Engineer will be available on-site on an as needed basis to assist in monitoring, controlling, and documenting the quality of any changes to the design and the on-site corrective measure activities. The CQA Engineer is responsible for implementing the CQA portion of the CQA/CQC Plan and verifying that the quality assurance objectives for the project are being met. His specific responsibilities include, but are not limited to, the following:

    - Tracking validation data and verifying adherence to published guidelines;
    - Determining if quality assurance objectives are being met for the project;
    - Certifying the level of QA that has been achieved during the generation of analytical data;
    - Implementing CQA procedures;
    - Verifying the continuity of chain-of-custody evidence (if applicable);
    - Initiating and overseeing all audit functions;
    - Compiling and submitting all CQA Reports;
    - Compiling, revising, updating, and submitting the CQA/CQC Plan;
    - Reviewing contractor's and subcontractor's QA manuals and/or laboratory quality management plans; and
    - Conducting ongoing CQA training of current and new personnel.

- CQA/CQC Technician (Technician): Technicians will be available on-site as needed during periods of high activity to assist either the CMC-SS and his CMC-CQC Personnel or the CQA Engineer in monitoring and controlling the quality of the construction. Technicians are individuals (the number of personnel will depend on activities underway) who are experienced in the provision of CQA/CQC services for similar projects. Technicians will be experienced in monitoring the construction of the various elements of the remedial design.

- Surveyor: The Surveyor will be a registered Land Surveyor in the State of Alabama and independent from the Owner. The Surveyor will be a subcontractor to the CE's firm. The Surveyor will be responsible for staking out elements of the work, producing as-built documentation of the design, and assisting with the calculation of quantities of work for measurement and payment.

3.3 CONSTRUCTION QA/QC PROGRAMS

Construction Quality Assurance/Quality Control Performance Criteria have been incorporated into each of the construction specifications.

3.3.1 Overview

This document presents the outline for the site-specific Construction Quality Assurance and Quality Control Plan (CQA/CQC Plan) for the Corrective Measures. The final CQA/CQC Plan will be developed or modified by the Corrective Measures Contractor following selection by ASPA.

A CQA/CQC Plan includes the following:

- A description of the quality control organization;
- An outline of the role of each party during construction;
- Identification of quality assurance personnel and resources;
- Descriptions of observations and control testing to monitor the corrective measure activities;
- A schedule for inspections;
- A schedule for submittals;
- Procedures for survey control; and
- Reporting procedures.

The CQA/CQC Plan does not address design guidelines, installation specifications, or selection of construction materials.

The key to the construction quality assurance (CQA) is the completion of three phases of inspections prior to and during the performance period of the construction activities. This inspection format provides an effective methodology for verifying quality control in the field through multiple inspections during all phases of job performance. The three-phase approach includes the following:

- Preparatory construction phase inspections;
- Initial construction phase inspections; and
- Follow-up construction phase inspections.

Preparatory inspections will be performed prior to beginning each definable feature of work. Initial inspections will be performed when work begins on a representative portion of a definable feature of a work element. Follow-up inspections will be performed to verify compliance with project documents and regulatory requirements, including cost effectiveness, efficiency of operations, and control testing until completion of the definable feature of work.

3.3.2 Coordination With Other Project Documents

The CQA/CQC Plan is intended to supplement other project documents. The other documents associated with this project include:

- Specifications;
- Drawings;
- Corrective Measures Response Plan;
- Spill Control and Countermeasures Plan;
- Safety, Health and Emergency Response Plan;
- Corrective Measures Waste Plan;
- Decontamination Plan; and
- Erosion and Sediment Control Plan.

3.3.3 Definitions

This CQA/CQC Plan describes CQA and CQC procedures to be adopted for the implementation of the Corrective measure. In the context of this plan, CQA and CQC are defined as follows:

- CQC – A planned system of inspections that is used to directly monitor and control the quality of a construction project (USEPA, 1986). CQC is normally performed by a systems/product installer or for natural soil materials by the earthwork contractor, and is necessary to achieve quality in the constructed or installed system. CQC refers to measures taken by the installer or contractor to determine compliance with the requirements for materials and workmanship as stated in the plans and specifications for the project (USEPA, 1993).

- CQA – A planned system of activities that provides the owner and permitting agency assurance that the facility was constructed as specified in the design (USEPA, 1986). CQA includes inspections, verifications, audits, and evaluations of materials and workmanship necessary to determine and document the quality of the constructed facility. CQA refers to measures taken by the CQA organization to assess if the installer or contractor is in compliance with the plans and specifications for the project (USEPA, 1993).

3.3.4 Construction Organization

Roles and responsibilities for the CQA/CQC organization are described in Section 3.2 and include the following personnel:

- Owner's Personnel
  - Owner (ASPA)
  - Owner Project Manager (OPM)
  - Owner Project Engineer (OPE)
- Corrective Measures Contractor Personnel
  - Corrective Measures Contractor (CMC)
  - Corrective Measures Contractor Certified Industrial Hygienist (CMC-CIH)
  - Corrective Measures Contractor Health and Safety Officer (CMC-HSO)
  - Corrective Measures Contractor Project Manager (CMC-PM)
  - Corrective Measures Contractor Site Superintendent (CMC-SS)
  - Corrective Measures Contractor CQC Personnel (CMC-CQC Personnel)
  - Corrective Measures Contractor Subcontractors
  - Manufacturer
  - Specialty Installer
- Engineer
  - Certifying Engineer (CE)
  - CQA Engineer
  - CQA/CQC Technician (Technician)
  - Surveyor

3.3.5 Regulatory Oversight

ADEM Project Coordinator: Mr. Tim Wright is the designated ADEM Project Coordinator for this project.

3.3.6 Observations, Monitoring And Quality Control Testing

3.3.6.1 *General*

The Corrective Measures Contractor and his subcontractors will participate in observation and inspection activities throughout the corrective measure construction period. The benefits are:

- Communication between the OPE, CE and CMC will prevent nonconformance of construction activities and reduce misunderstandings;
- Good communication will prevent small problems from escalating into major conflicts and will help ensure the correct interpretation of the contract documents; and
- Timely documentation of the activities will provide the necessary information when it is needed.

Field observations will be routinely conducted, documented, and reported to ensure that:

- There is correlation between design and construction;

- Correct interpretation of the project documents is made; and
- Conformance with the project documents is achieved.

3.3.6.2 *CQA Responsibilities*

Appropriate CQA personnel will be provided to monitor and document construction. Depending upon an individual's qualifications and experience, one individual may serve multiple roles. In general, CQA will perform the following:

- Become familiar with project documents, including the remedial design, drawings and specifications;
- Review site-specific documentation, including proposed layouts, soil sampling and analysis reports, and geosynthetics materials manufacturer's and installer's literature;
- Become familiar with the CQA requirements for the project;
- Attend the CQA-related meetings;
- Review the ongoing preparation of the record drawing(s);
- Monitor construction activities and report conformance issues to the OPE, CMC-PM and CE;
- Monitor locations for testing and sampling, as needed;
- Verify the calibration and condition of on-site CQC equipment;
- Prepare field observation reports;
- Review laboratory testing reports for conformance with the specifications;
- Review supplier, manufacturer, and installer certifications and documentation and make appropriate recommendations;
- Evaluate any non-conformance with the specifications and recommend appropriate changes in procedures or specifications; and
- Review the record drawings.

3.3.6.3 *CQC Responsibilities*

Appropriate CQC personnel will be provided to monitor and document construction. Depending upon an individual's qualifications and experience, one individual may serve multiple roles. In general, CQC will perform the following:

- Become familiar with project documents, including the remedial design, including drawings and specifications;
- Review site-specific documentation, including proposed layouts, soil sampling and analysis reports, and geosynthetics materials manufacturer's and installer's literature;
- Become familiar with the CQC requirements for the project;
- Attend the CQC-related meetings;
- Review the ongoing preparation of the record drawing(s);

- Monitor construction activities and report conformance issues to the OPE, CMC-PM and CE;
- Monitor locations for testing and sampling;
- Verify the calibration and condition of on-site CQC equipment;
- Prepare daily and periodic field observation reports;
- Prepare daily QC reports;
- Oversee the collection and shipping of laboratory test samples;
- Review laboratory testing reports for conformance with the specifications;
- Review supplier, manufacturer, and installer certifications and documentation and make appropriate recommendations; and
- Evaluate any non-conformance with the specifications and recommend appropriate changes in procedures or specifications.

3.3.7 Documentation

3.3.7.1 *Daily Recordkeeping*

Standard reporting procedure includes preparation of a daily CQA/CQC report which, at a minimum, will consist of: (i) field notes; and (ii) monitoring logs and testing data sheets. This information will be maintained on-site.

Documentation of Discussions

The CE, or his representative, will document discussions held with the CMC. At a minimum, the documentation will include the following information:

- Date, project name, location, and other identification;
- Name of parties to discussion;
- Relevant subject matter or issues; and
- Suggested resolutions.

The documentation will be submitted to the OPE.

Monitoring Logs and Test Data Sheets

The CMC-SS, CMC-CQC Personnel, CQA Engineer, or Technician may prepare monitoring logs. It is anticipated that the CE and/or CQA Engineer will document the periodic Site visits. Test data sheets will be prepared as required to document all the testing requirements of the specifications. At a minimum, these daily reports and data sheets will include the following information:

- An identifying sheet number for cross referencing and document control;
- Date, project name, location;

- Data on weather conditions;
- Descriptions and specific locations of areas, or units, of work being tested and/or observed and documented;
- Summary of test results;
- Calibrations or recalibrations of test equipment, and actions taken as a result of recalibration;
- Delivery schedule of off-site materials received, including QC documentation; and
- Decisions made regarding acceptance of units of work, and/or actions taken in instances of substandard quality.

3.3.8 Weekly/Monthly CQA/CQC Summary Reports

The CMC-PM will prepare weekly/monthly CQA/CQC summary reports for Owner's review. These reports will include a general discussion summarizing the work activities and inspections completed during the week/month. As necessary, the report will include the following:

- Inspection and Test Reports;
- Nonconformance and Corrective Measures Reports; and
- Analytical Test Results.

3.3.9 Non-Conformance Documents

The CMC-PM will report each nonconforming item. The report for non-conformance will include the following information:

- Name and job title of individual who identified the non-conformance;
- Description of the non-conformance;
- Effect of non-conformance on the work;
- Immediate corrective actions already taken; and
- Recommended action or variance/field change to the project documents.

The CMC-PM will log it on the Non-compliance Check-Off List. The Non-compliance Check-Off List will be included in the weekly/monthly CQA/CQC summary report. The CMC-PM, OPE, CQA Engineer, and CMC-SS will review this list. A Corrective Action Memo will be initiated if a non-conformance is not satisfactorily corrected in a timely manner. The Corrective Action Memo will include the following and will be signed by all responsible parties:

- Summary of the affected project requirements;
- The nature of the non-compliance;
- Action to be taken;
- Action items/responsibilities for each affected individual;

- A schedule for completion of the corrective action; and
- Recommendations for preventing recurrence of the problem.

The OPE will review unresolved Corrective Action Memos and take appropriate measures to ensure the corrective measures are completed on schedule. The OPE will conduct an inspection to verify that the Corrective Action Memo is resolved, update the Non-compliance Check-Off List, and note such in the weekly/monthly CQA/CQC summary reports.

3.3.10 Administration Of Construction Changes

3.3.10.1 *Field Changes and Approvals*

Any changes or deviations from the project documents will be documented by the CMC-SS and/or CMC-PM and immediately reported to the OPE and CE. Actions taken in response to the changes will be dependent on the nature of the changes.

A Field Change Request becomes a Field Change Order when all approvals are complete. Any substantive design modification will be provided to ADEM for acceptance, prior to implementation. Each Request or Order will be documented. The documentation will include the following:

- Date of request/order;
- Change number;
- Name of originator of request/order;
- Summary of existing requirements;
- Description of requested/ordered changes in the affected requirements, in sufficient detail for cost, schedule, and technical evaluations; including appropriate vendor literature, sketches, and drawings;
- Description of estimated cost impact of change;
- Description of estimated schedule impact of change; and
- Approval signatures of the OPE, CMC-PM, and CE.

The OPE will establish and maintain a log to track dates of requests, approvals, and completions.

3.3.10.2 *As-Built Documentation*

The CMC-PM will establish and maintain a set of up-to-date Project Documents in the project office for the purpose of tracking project progress and deviations from the approved Project Documents. New drawings and specifications will be added to the set, if required. Copies of all Field Change Orders, notes, sketches, and memoranda will be kept on file and available for reference. The as-built documents will be submitted to the

CE and Owner at the completion of the project and incorporated into the final Certification Report.

3.3.11 Submittal Requirements

The CMC-PM has primary responsibility for maintaining records and documentation of submittals in accordance with specification requirements. All required submittal documents will be transmitted as required by the CMC-PM, either directly or by his explicit delegation of authority to a staff member to the CE. All records will be reviewed by the CMC-PM prior to submittal to ensure that project records are adequate, complete, and accurate. Submittal documents will be numbered sequentially by type and entered in a Master Document List. A cover letter or letter of transmittal will accompany major submittals specified in the Master Document List. Routine submittals that are self explanatory, such as daily CQA/CQC reports, will not require cover letters or letters of transmittal.

All documents and records will be filed in the CMC-PM field office at the Site and in the Engineer's home office. A file directory will be available to help locate any individual document or record. Original documents and records accumulated by the CE during the performance of the work will be transferred to the Owner upon completion.

3.4 WASTE MANAGEMENT PROCEDURES

3.4.1 Overview

This section addresses the management (i.e., handling and disposal) of waste generated during corrective measures. Specific waste management procedures are included in the Plans and Specifications and in the Contractor Site-Specific Health and Safety Plan (minimum requirements for the site specific Health and Safety Plan are included in Section 7.0). Wastes generated during the corrective measures, are anticipated to include, but not limited to, scrap geosynthetics, environmental controls (i.e., silt fencing), dike materials, trash, rubbish and waste associated with personal protective equipment, decontamination processes and site emergencies. If the waste to be managed is not covered in these reference documents, a specific waste plan will be developed for that waste.

3.5 SAMPLING & ANALYSIS

Sampling and analysis activities associated with construction activities will be addressed in the Construction Quality Assurance Quality Control Plan. Relative to post construction activities, the existing sampling plan will be amended to include the new monitoring well network and performance monitoring of the SWMU 4 Waste Water Treatment System. The modification of the existing sampling plan will be performed in conjunction with the RCRA Permit renewal process. The SAP will incorporate standard sampling and

analytical techniques that have been approved by ADEM, USEPA Region 4, other government or reviewing organizations or follow accepted engineering practices.

3.6 CONSTRUCTION CONTINGENCY PROCEDURES

In general, the CMI will follow the Contingency Plan developed as part of the permit requirements for the AWTC site. This Contingency Plan will be reviewed and supplemented as necessary for project-specific conditions that are not adequately addressed. The objective of the revised Corrective Measures Response Plan will be to protect the local affected community in the event of an accident or an emergency during the implementation of the corrective measures. The plan will meet the prescribed requirements given in Chapter 4.0 of the publication "Remedial Design/Remedial Action Handbook" (USEPA, 1995).

3.6.1 Agency Notification

If an emergency situation should arise, the appropriate response should be taken and then the ASPA Project Manager should be notified. The emergency phone numbers from the existing AWTC Site Contingency Plan will be posted at the site and will be maintained in the SHERP. Maps of site evacuation routes and maps to medical facilities will also be posted and maintained. Communication with the public and press will be coordinated through the manager of ASPA's Public Affairs office, Ms. Sarah Teague.

3.6.2 Other Contingency Considerations

Air Monitoring and Emergency Operation Response Contractor Planning requirements are described in the Safety, Health and Emergency Response Plan (SHERP – Section 7.0).

In addition, the Corrective Measures Contractor will prepare a Spill Control and Countermeasures Plan prior to commencing construction. This plan will deal with measures for the control and dealing with spillage associated with oil, petroleum products, and other hazardous materials brought to the Site.

3.7 CONSTRUCTION SAFETY PROCEDURES

The Corrective Measures Contractor will be required to prepare a Construction Safety Plan to supplement the procedures in the SHERP (Section 7.0).

3.8 COST ESTIMATE & FINANCIAL ASSURANCE

As a State Agency, ASPA is exempt from the requirements for cost estimates and financial assurance.

4.0 SAMPLING & ANALYSIS PLAN

Sampling and analysis will be conducted according to the post-closure permit requirements and the associated Sampling and Analysis Plan (SAP) for the AWTC site. New sampling requirements or analytical procedures will be included as amendments to the existing SAP.

5.0 QUALITY ASSURANCE PROJECT PLAN

All sampling and analysis activities performed during the corrective measure construction and the O&M timeframes will be in accordance with a site-specific Quality Assurance Plan. The QA program will be reviewed with the analytical laboratory to ensure coordination with the laboratory's internal QA program. As a result of this process some changes to the existing Quality Assurance Plan may result. It is the responsibility of the selected contractor(s) to ensure the Quality Assurance Plan is in place and flowed. This section establishes minimum requirements for the Quality Assurance Plan.

5.1 INTENDED USE OF DATA

Ground-water samples are collected during the O & M period for analysis to evaluate any changes in ground-water conditions at their particular location and depths. Wastewater discharge samples are collected once per month or per discharge event to monitor for compliance with wastewater discharge permit. Other analytical samples or measurements may be taken for a variety of project reasons.

5.2 LEVELS OF DATA QUALITY

Definitive data are collected and used during O & M of the AWTC Site corrective measures. Definitive data are generated using rigorous analytical methods, such as approved EPA methods. Data are analyte-specific, with confirmation of analyte identity and concentration. Definitive data Quality Assurance/Quality Control (QA/QC) elements include:

- Sample documentation (location, date and time collected, batch, etc.),
- Chain-of-custody
- Determination and documentation of detection limits
- Analyte(s) identification
- Analyte(s) quantification
- QC blanks (method)
- Matrix spike and blank spike recoveries

5.3 QA/QC SAMPLES

QA/QC field and laboratory samples are collected or prepared to check the accuracy and precision of the measurement system. The overall objective for this effort is to limit the chance that sample data will lead to an incorrect conclusion for each of the various data uses. An important aspect of this objective is to minimize the possibility of reporting false negatives and false positives. To achieve this objective, control limits on precision, accuracy, representativeness, comparability and completeness (PARCC parameters) have been established, based on the intended uses of the data.

Field QA/QC techniques consist of the use of trip blanks (for volatiles analysis only) and field replicate (duplicate) samples. Laboratory QA/QC techniques consist of method blanks, matrix spike and matrix spike duplicate samples, surrogate recovery, retention time windows, and laboratory control samples (LCS).

5.3.1 Field QC Samples

Trip Blanks

Trip blanks are containers of demonstrated analyte-free water that are kept with the field sample containers from the time the samples are prepared for shipment until they reach the laboratory. A trip blank will be included with each cooler sent from the field to the laboratory for analysis for VOCs. The purpose of the trip blank is to determine whether the sample results are biased due to contamination during transit.

Field Duplicate Samples

One field duplicate sample will be collected for each 20 field samples as a measure of the mutual agreement among individual measurements of the same parameter under similar conditions.

5.3.2 Laboratory QC

Method Blanks

A method blank is prepared at the frequency specified by the referenced method. The purpose of the method blank is to ensure that contaminants are not introduced by the glassware, reagents, standards, personnel, or sample preparation environment.

Spiked Samples

A matrix spike (MS) is an aliquot of an environmental sample to which known concentrations of analytes are added by the laboratory. The MS is taken through the entire analytical procedure and the recovery of the analytes is calculated. Results are expressed as percent recovery and checked during data validation. The MS is used to evaluate the effect of the sample matrix on the accuracy of the analysis.

A matrix spike duplicate (MSD) is a replicate of the MS sample, which has the recoveries of the known concentrations of the analytes calculated in percent. The MS and MSD are processed separately and the results are compared to determine the effects of the matrix on the precision of the analysis. Results of the comparison are expressed in terms of relative percent difference (RPD), which will be checked during data validation.

One MS/MSD set is typically analyzed for every 20 investigative samples. MS/MSD aliquots will need to be collected for the ground-water samples from the IWS. The IWS samples will be batched with the same sample delivery group as the MS and MSD analyses.

In addition to the MS samples, laboratory control samples (LCS) are blank water samples fortified with spike standard solutions containing target analytes of interest. The recovery of these standards is quantitatively measured during analyses. When an MS test fails spike recovery criteria, then the LCS must be evaluated to ascertain if there is a matrix interference. If the LCS fails, then the batch must be reprocessed. If the LCS passes, then the matrix effect is confirmed and the affected data are qualified as appropriate.

Surrogate Recovery

Surrogate standards are added to all samples requiring analysis for chlorinated pesticide compounds in accordance with the method being utilized. Surrogate recoveries will be checked during data validation and must meet method acceptance criteria before the analytical data will be released. In some instances the sample matrix may produce interference, which adversely affects recoveries. Surrogate recovery interference must be confirmed by reanalysis of the sample and evaluation of the LCS.

5.4 QUALITY ASSURANCE OBJECTIVES

The measurement of quality of this application includes the PARCC parameters (precision, accuracy, representativeness, comparability, and completeness). The procedures described herein are designated to obtain PARCC data for each analytical method. Specific PARCC measurements will be addressed to satisfy the QA objectives. These measurements are discussed in the following subsections along with data quality acceptance criteria.

5.4.1 Precision

Whereas accuracy measures the average properties of an analytical method, precision examines the spread of the reported values about their mean. The spread of reported values refers to how different the individual reported values are from the average reported value. Precision is a measure of the magnitude of errors that can be measured in a variety of ways. Precision will be determined from replicate samples; thus, precision is expressed as relative percent difference (RPD).

5.4.2 Accuracy

Accuracy is a determination of how close the measurement is to the true value. When applied to a set of observed values, accuracy will be a combination of a random component and a common systematic error (or bias) component. Bias is defined as the

deviation due to matrix effects of the measured value from a known spiked amount. Field sampling and laboratory accuracy may be assessed by evaluating the results of the field duplicate, and analytical accuracy may be assessed through evaluation of the results of the surrogates and the MS, MSD and LCS samples. Accuracy will be determined from the analyte recoveries of spiked samples. Accuracy objectives will be as stated in the particular analytical method.

5.4.3 Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another set. Sample data should be comparable with other measurement data for similar samples, sample conditions, and collection techniques. This goal will be achieved through using EPA methods to analyze representative samples and using standard sampling protocols to collect these samples. Analytical results will be reported in the appropriate units as specified by the method.

5.5 LABORATORY PROCEDURES FOR SAMPLE CUSTODY

The laboratory has an established program of sample custody that is designed to ensure that each sample is accounted for at all times. Laboratory Standard Operating Procedures (SOPs) for sample custody protocol are maintained by the laboratory and adhered to by laboratory personnel.

5.6 LABORATORY ANALYTICAL PARAMETERS

Laboratory and field data gathering techniques have been specified for meeting the data quality objectives. Data quality objectives will be accomplished in conformance with a quality assurance program, laboratory standards operating procedures and applicable regulatory requirements. This section lists parameters to be evaluated in the laboratory, the practical quantitation limits (PQLs) to be achieved, and the analytical methodology to achieve these limits with necessary levels of control to produce data of known and desired quality.

5.6.1 Analytical Methods

This information will be developed in conjunction with the selected analytical laboratory. ADEM and USEPA approved analytical methods will be used. Consistent use of these methods throughout the project will allow comparability among the samples collected, and achieve the data quality objectives for the project.

5.6.2 Practical Quantification Limits

The Practical Quantitation Limit (PQL) represents the normally obtainable quantification level achieved by the laboratory under practical and routine laboratory conditions for the sample matrix of interest. Sample-specific PQLs may vary from the standard PQL as a result of matrix interference and dilution of samples with compound concentrations above the calibration range.

5.7 DATA REDUCTION, VALIDATION AND REPORTING

The analyst who generates the analytical data has responsibility for the correctness and completeness of the data. All data are generated and reduced following protocols specified in the laboratory Standard Operating Procedures (SOPs). Each analyst reviews the quality of the work based on an established set of guidelines per the SOP. QC data validation criteria set forth in the corresponding methods will be used to evaluate the data.

5.7.1 Data Reduction

Raw analytical data generated in the laboratory are collected on printouts from the instruments and associated data system(s) or manually in bound notebooks. Analysts review data as they are generated to confirm that the analytical instruments are performing within specifications. This review may include, but is not limited to calibration checks, surrogate recoveries, blanks checks, retention time reproducibility, holding times, and other QC checks. If any problems are noted during the analytical run, corrective action is taken and documented. Each analytical run is reviewed for completeness prior to interpretation and raw data reduction to reportable results.

5.7.2 Data Verification by the Laboratory

Following interpretation and data reduction by a laboratory analyst, data are transferred to the laboratory sample management system either by direct data upload from the analytical data system or manually. The data are reviewed by the Laboratory Group Leader or another analyst and marked on the sample management system as being verified. The person performing the verification step reviews all data including quality control information prior to verifying the data. The laboratory will complete the appropriate forms summarizing the quality control information, and transfer copies of all raw data (instrument print outs, spectra, chromatogram, etc.) to the Project Management Group. This group will combine the information from the various analytical groups and the analytical reports from the laboratory sample management system into one package. This package is reviewed by the Quality Assurance Department for conformance with laboratory SOPs and to ensure that all QC goals have been met. Any analytical problems are discussed in the case narrative, which is included with the data package deliverables.

5.7.3 Data Validation

Following data verification by the laboratory, data will be transferred to the validator. The validator will then conduct data validation using the either USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (USEPA, 1994a) or the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (USEPA, 1994b) as guidance, depending upon the analytical method.

5.7.4 Data Reporting

Laboratory reports will contain the following information:

- General Discussion: Description of sample types, test performed, any problems encountered and general comments are given.
- Analytical Data: Data are reported by sample or by test. Pertinent information including, dates sampled, received, prepared and extracted are included on each results page. The reporting limit for each analyte is also given.
- Laboratory Performance QC Information: The results (percent recovery) of the laboratory control samples (LCS) and all surrogates analyzed with the project are listed, together with the control limits. Also, the analytical results for method blanks generated during the analyses are given.
- Matrix-Specific QC Information: Results of any sample duplicates, matrix spikes, matrix spike duplicates or other project-specific QC data are reported. RPDs will be calculated and reported.
- Methodology: Reference for analytical methodology used.
- Raw data

The reporting scheme from collection of raw data through document storage is as follows:

- Raw data collected by laboratory technical personnel.
- Data reviewed/verified by laboratory supervisor.
- Data receive QA/QC review and approval from Laboratory QA Director.
- Written report, with accompanying QC data, is submitted by the laboratory to the Project Coordinator.
- The Data Validator uses the IWS QAPP and EPA's National Functional Guidelines as guidance in the review the data. The Validator prepares a data validation summary report.

6.0 CORRECTIVE MEASURES COMPLETION CRITERIA

Corrective measures completion criteria define when the corrective measures have achieved media cleanup goals or objectives thereby determining when maintenance and monitoring activities may cease. They are in part defined by the post-closure permit for the AWTC site. For example, groundwater monitoring is required at the AWTC site and groundwater quality standards (ACLs) are being met for the site. However, because SWMUs were closed with waste in-place, groundwater monitoring must continue for the entire post-closure period of 30-years. The soil and asphalt caps meet the corrective measures completion criteria of preventing uncontrolled human exposure to contaminated soils and sediments. However the covers will require long-term maintenance. Those maintenance requirements may be reduced by the container port development.

Satisfaction of the completion criteria triggers the submittal of the Corrective Measures Completion Report.

6.1 OPERATION & MAINTENANCE CONTINGENCY PROCEDURES

O&M contingency procedures address system breakdown and operational problems and include redundant and emergency back-up equipment and procedures. The alternative procedures must be able to prevent the release of hazardous wastes that may endanger human health and the environment. In the event of a major breakdown or complete failure of the corrective measures ASPA will orally notify ADEM with 24 hours of the event and notify in writing within 72 hours.

The O&M contingency procedures have been developed in conjunction with the design specifications (Appendix B) and are provided in the O&M Manual (Appendix C).

6.2 DATA MANAGEMENT & DOCUMENTATION REQUIREMENTS

A summary of the records to be maintained during the O & M period and reporting requirements is presented in this Section.

6.2.1 Records maintenance

Operating logs, maintenance records, sampling data and analytical data will be maintained by ASPA or a designated contractor.

6.2.1.1 *Operating Logs*

Operating logs will be maintained in the project file. Summaries of the daily operating logs will be included in the reports to ADEM.

6.2.1.2 *Maintenance Records*

Maintenance records will be maintained documenting all activities performed on-site during the post-remediation period. Summaries of the maintenance records will be included in the reports to ADEM.

6.2.1.3 *Inspection Records*

Inspections will be documented using designated forms. The forms will be completed and signed by the inspector. Summaries of the inspection records will be included in the reports to ADEM.

6.2.1.4 *Monitoring and Laboratory Analysis Records*

Water-level monitoring and sampling activities will be documented on designated forms. The results of laboratory analyses for groundwater and wastewater discharges will be submitted to ADEM at intervals specified in the appropriate permit.

6.2.1.5 *Emergency Reports*

Emergency reports will be maintained in the project file and will be included in the reports to ADEM.

7.0 SAFETY, HEALTH AND EMERGENCY RESPONSE PLAN

The ASPA is requiring that the selected contractor develop and implement a site-specific health and safety plan. The plan requirements are provided in this section and in the Construction Specifications in Appendix B.

7.1 OVERVIEW

The requirements of the Safety, Health, and Emergency Response Plan (SHERP) have been established to protect workers and the public from potential hazards posed by work at the Site. The SHERP requirements are documented in accordance with the Occupational Safety and Health Administration's (OSHA) regulations specifically 1910.120 and 1926.65. The SHERP also follows guidance given in the "Remedial Design/Remedial Action Handbook" (USEPA, 1995). The SHERP will be finalized by the selected contractor prior to initiating construction activities.

7.2 PROJECT PERSONNEL AND RESPONSIBILITIES

The following personnel are responsible for the safety and health program to be implemented during this project.

7.2.1 Certified Industrial Hygienist (CMC-CIH)

The Certified Industrial Hygienist will report to the Corrective Measures Contractor. His duties are to:

- Develop, implement, and enforce the site-specific SHERP;
- Conduct initial site-specific training;
- Provide continuing health and safety support, as needed;
- Review results of air monitoring and accident reports; and
- Provide regular on-site supervision and continued evaluation of the effectiveness of this SHERP.

7.2.2 Health and Safety Officer (CMC-HSO)

Duties are to:

- Assist in the implementation and enforcement of the SHERP;
- Conduct air monitoring, training, site safety inspections, and accident investigations;
- Remain on-site during project operations;
- Stop operations in case of imminent danger; and

- Complete a daily log of all site safety and health activities.

7.2.3 Corrective Measures Contractor Site Superintendent (CMC-SS)

Duties are to:

- Oversee work operations;
- Allocate resources to safely perform all operations;
- Supervise and monitor compliance with the SHERP and the performance of good work practices of all personnel; and
- Correct any work practice and/or conditions that would expose personnel to possible injury or illness.

7.3 SITE-SPECIFIC HASP REQUIREMENTS & ACCIDENT PREVENTION PROGRAM

Based upon the site-specific hazard analysis conducted for the remediation activities, the following programs will be implemented to prevent accidents and prevent injury to site personnel. Information regarding tasks and their anticipated hazards and a listing of the contaminants along with their relevant toxicological information will be included in an attachment.

Material Safety Data Sheets (MSDS) for the contaminants present on-site and any material, requiring an MSDS, brought onto the site are to be kept on-site.

7.3.1 Site Orientation

A site orientation will be given to all project personnel and visitors to the Site prior to conducting any site activities. The orientation will include a review of the requirements of this SHERP.

7.3.2 Incident Reporting

In the event of a personal injury, accident, or near miss incident, the HSO must be immediately notified. An accident or incident report will be generated and distributed to all project team members.

7.3.3 OSHA Record Keeping (OSHA 300 Log)

An OSHA 300 Log, as required by OSHA for reporting of injuries and illnesses, will be maintained for this project relative to the project site. This log will be posted at the work site during the month of February (February 1 through March 1) as required by OSHA,

each year for the duration of the project. Statistical information will be prepared and posted if recordable injuries or illnesses occur on the project.

7.3.4 Safety Inspections

The CMC-HSO will conduct daily inspections to ensure that general safe work practices are being followed and to ensure compliance with the SHERP. These inspections will be documented. Follow up on corrective action will be done as soon as reasonably possible. Serious or potentially serious findings will be immediately corrected. Safety audits will be conducted as needed.

7.3.5 Activity Hazard Analysis (AHA)

All tasks that will be conducted must be evaluated using the AHA process. The CMC-CIH, CMC-HSO, and CMC-SS will be responsible for preparing the activity hazard analyses. Activity Hazard Analyses will be included as an attachment.

7.3.6 Air Monitoring Program

Air monitoring will be performed during activities that have potential for emitting air-borne contaminants. Both area and personal air monitoring readings are to be taken as necessary to characterize site activities. Air monitoring results will be documented. Calibration and maintenance of air monitoring equipment will follow manufacturer specifications. Air monitoring action levels are provided to indicate the chemical concentrations in the breathing zone that require an upgrade in level of personal protection equipment (PPE). An additional discussion of the air monitoring requirements is provided in Section 7.5.

7.3.7 Heat/Cold Stress Procedure

Heat and cold stress procedures will be followed for field use as a means to prevent heat/cold stress related injury. A heat stress control program will be provided as an attachment.

7.3.8 Hot Work Permit

Hot work permits are required for any open flames such as torch cutting or welding that may be conducted on-site. Hot work permits must be completed and approved by the on-site CMC-HSO prior to initiating hot work. All requirements identified on the permit must be followed.

7.3.9 Daily Safety Tailgate Meeting

A daily safety meeting will be held. The purpose of these meetings is to place accident prevention foremost in the mind of each individual and to acquaint the workforce with the daily tasks and their associated control measures. A form documenting attendance and subject will be filled out and kept on-site.

7.3.10 Lock-Out/Tag-Out Procedure

Lock-out/tag-outs are required whenever working on systems that may contain an energy source, including electrical power or fluid/air pressure. Lock-out/tag-out procedures will be included as an attachment.

7.3.11 Confined Space Entry (CSE)

A confined spaced entry program will be followed when entering trenches, manholes and braced excavations greater than 4 feet in depth.

7.3.12 Training

As site specific training program will be developed along with the specifications that addresses the training requirements for workers who will be performing specific tasks.

7.4 HAZARD IDENTIFICATION AND CONTROL

The major health hazard at this Site is exposure to creosote, pentachlorophenol and associated contaminants. The SHERP will be developed to limit worker exposure to these contaminants.

A table will be included by the contractor that presents information concerning hazard identification and their associated controls. Field personnel will complete appropriate training for task specific hazards prior to initiating work activities.

7.5 AIR MONITORING

Air monitoring will be conducted to determine worker exposure to contaminants of concern and airborne particulates. This will be accomplished by implementing real time and integrated monitoring programs.

Monitoring will consist of monitoring in the work area and at the site perimeter when excavation or soil disturbing activities are conducted. Equipment to be used will be direct reading monitor and a particulate monitor (TSI or equivalent). Readings will be taken every two hours and documented. Before each day's use, an operational test will be

performed. The operations test consists of powering the instrument and determining battery and sensor status. If the LO BAT indicator remains on, then the instrument is recharged or the battery pack replaced. A copy of the operating manual will be kept on site. In addition, a functional test will be performed once every week. The purpose of the functional test is to determine if the instrument response falls within the prescribed range. The procedure for performing the functional test is outlined in the operating manual.

The particulate monitor is to be zeroed and an operational check performed each day. The procedures are outlined in the operating manual. A dust control plan which includes mitigation procedures will be provided as an attachment.

Specific action levels will be implemented for the constituents of concern. These actions may include an increase in the level of PPE required or may dictate the site work be suspended. Specific actions will be tied to numeric concentration ranges.

7.6 PERSONAL PROTECTIVE EQUIPMENT

Only PPE that meets the following American National Standards Institute (ANSI) standards are to be worn.

- Eye protection - ANSI Z87.1 – 1989
- Head protection - ANSI Z89.1 - 1986
- Foot protection - ANSI Z41- 1991

Employees must maintain proficiency in the use and care of PPE that is to be worn. Typically, this is covered during formal and informal refresher training sessions.

Level D is the minimum acceptable level of protection for this Site. Upgrade to Modified Level D occurs when the possibility of contact to the skin or work uniform can occur from contaminated media. Upgrade to Level C will occur when air monitoring results reveal action levels have been exceeded. Hearing protection will be provided for high noise areas.

The following is a description of the Levels of Protection to be used:

- Level D
    - Work uniform
    - Steel-toed boots
    - Approved safety glasses or goggles

- Modified Level D
    - Level D plus one or more of the following:
    - Chemical resistance boots (Neoprene)

  - Tyvek suit, cotton inner outer and outer gloves
  - Hearing protection (muffs and/or plugs); if necessary
  - Decontamination tasks, if splash is possible, use face shield and protective goggles; nitrile gloves

- Level C
  - Level D and Modified Level D as specified above, plus:
  - NIOSH/MSHA – approved half- or full-face respirator with job-specific, appropriate cartridges

Prior to use, all equipment must be inspected to ensure proper working condition.

7.7 SITE CONTROL: WORK ZONES

Employees entering the work zone must wear the proper PPE for that area. Work and support zones will be established based on ambient air monitoring data, necessary security measures, and site-specific conditions. Work zones will be identified as either Hot Zone (HZ)/Exclusion Zone (EX); Decontamination Zone (DZ)/Contamination Reduction Zone (CRZ); or Clean Zone (CZ)/Support Zone (SZ). Access to the Exclusion Zone will be restricted to personnel who are wearing the proper PPE, have received the required medical examination, and have undergone safety and health training. Site control will be maintained by fencing and signs stating that only authorized personnel are permitted to enter into the Exclusion Zone. The development and control of Work Zones is provided in more detail in the Construction Specifications (Appendix B).

7.8 DECONTAMINATION PROCEDURES

Operations conducted at this Site have the potential to contaminate field equipment and PPE. To prevent the transfer of contamination to vehicles, administrative offices and personnel, the site-specific procedures must be followed. These site-specific decontamination procedures are included in the Construction Specifications (Appendix B).

7.9 MEDICAL SURVEILLANCE

The Corrective Measures Contractor will utilize the services of physicians who are board certified or eligible to be board certified in occupational medicine to supervise the medical surveillance program. The Corrective Measures Contractor will obtain a certification from the occupational physician that the employee is medically fit to wear respiratory protection and has no medical condition that would place the employee at an increased risk. No employee will be permitted to work in the Exclusion Zone until a certificate from an occupational physician has been submitted

7.10 EMERGENCY OPERATIONS PLAN

Pre-emergency planning, responsibilities, and emergency first aid information are presented below.

7.10.1 Pre-Emergency Planning

Based on a preliminary need analysis, the type of potential emergencies includes fire, explosion, medical emergencies, and extreme weather conditions. Emergency contacts, a hospital location map with directions and the appropriate emergency first aid information will be maintained at the work site and in work vehicles.

7.10.2 Responsibilities

7.10.2.1 *Emergency Coordinator (EC)*

- Must be able to recognize an emergency situation (on-site), and take appropriate action.
- Notifies Emergency Medical Services (EMS), as appropriate.
- Notifies Corrective Measures Contractor's Management.
- Notifies ASPA's representative.
- Notifies the local and state authorities, as appropriate.
- Documents the events of the emergency and assists in follow up reporting.
- Administers first aid (as required).
- Attends to the cause of the emergency.
- Initiates spill response measures (as required).
- Accounts for all site personnel.
- Informs EMS personnel of applicable PPE to be worn and hazards to be expected.
- Provides EMS personnel with applicable PPE. Emergency PPE kits must be available at all times.
- Guides emergency service personnel into and away from the emergency area.
- Provides for a means of minimizing the spread of contamination to EMS personnel and EMS vehicles.
- Initially reports to the Site and meets the EC
- Receives pertinent information from the EC
- Acts on emergency as necessary

7.10.2.2 *Site Personnel*

- Exit the Exclusion Zone, when required, in an orderly manner
- Follow instructions from the EC
- Meet at assembly area.

7.10.3 Emergency First Aid

7.10.3.1 *First Aid*

Ingestion:	DO NOT INDUCE VOMITING. Call Poison Control - follow instructions. Administer cardiopulmonary resuscitation (CPR), if necessary. Seek medical attention.
Inhalation:	Remove person from contaminated environment. Administer CPR if necessary. Seek medical attention.
Skin Contact:	Brush off dry material; remove wet or contaminated clothing. Flush skin thoroughly with potable water. Seek medical attention if irritation persists.
Eye Contact:	Flush eyes with potable water for 15 minutes. Seek medical attention.
Exposure Symptoms:	Headache, dizziness, nausea, drowsiness, irritation of eyes, nose, throat, breathing difficulties. Seek medical attention.
Contingency Plan:	Report incident to Superintendent and HSO after emergency procedures have been implemented.

Responder must have a current certificate to administer first aid or CPR.

7.10.3.2 *Emergency Procedures*

1) Survey the situation. Do not endanger your own life.
2) Call 911 IMMEDIATELY. Explain the physical injury and the type of emergency.
3) Decontaminate the victim without delaying life-saving procedures.
4) If victim's condition appears to be non-critical, but seems to be more severe than minor cuts, transport to the nearest hospital by trained EMS personnel. Let the doctor assume the responsibility for determining the severity of the injury. If the condition is obviously serious, EMS must transport the victim.
5) Notify the CMC-SS and the CMC-HSO. Complete the Incident Report within 24 hours.

7.10.4 On-Site Equipment and Procedure

The Corrective Measures Contractor will provide first aid supplies and equipment, emergency eyewash stations, emergency deluge showers, and potable water for all on-site work. At least one fully stocked industrial first aid kit and stretcher will be provided

and maintained. Additional first aid stations will be provided, as necessary. These kits will be adequately marked (highly visible) and will include buffer solutions for treating caustic burns. An adequate water supply will also be provided at first aid locations

7.10.5 Emergency Equipment

In addition to those items specified elsewhere, the CMC-HSO will maintain the following equipment and protective clothing in the event of emergencies:

- Emergency eye-wash bottles and a water bottle
- Fire extinguishers
- Three complete sets of Modified Level D PPE
- Air horns
- Portable, two-way radios
- Emergency eye wash station

8.0 PUBLIC PARTICIPATION

This section addresses only those activities to be initiated by ASPA.

Both ASPA and ADEM have specific roles relative to public participation. To the extent practicable ASPA will coordinate its public participation for the RCRA Corrective Action Program with the public participation activities associated with the Choctaw Point Terminals Environmental Impact Statement (EIS) and the Garrows Bend EIS. The public participation programs for the two EIS projects are well established and include:

- Public Presentations/Meeting
- Printed Materials
- Website (www.choctawpoint.com) and,
- Advisory groups.

To expedite the flow and availability of information to the public relative to the RCRA Corrective Action Program, ASPA intends to establish a link on the current website to a RCRA Corrective Actions page. In addition to the website link and in accordance with RCRA Guidelines and Requirements, ASPA's public participation activities are summarized below:

RCRA Corrective Action	Public Participation Activities
Permit Renewal	• ASPA to provide notice in local newspaper and announce the 45 day comment period • ASPA to notify mailing list
CMI	• Notify public when plans and specifications are available for review (this will be conjunction with Permit Renewal Process) • As appropriate/provide fact sheets on remedy implementation for posting on website.

9.0 REPORTING REQUIREMENTS

There are a number of reporting regulatory and program reporting requirements for the CMI project.

9.1 CONSTRUCTION PROGRESS REPORTS

ASPA will submit monthly progress reports to ADEM during the period of active construction. These reports will describe work accomplished during the month, variances from the project schedule, variances from the project design, identified problems and actions taken to solve the problems.

9.2 CONSTRUCTION QA/QC REPORTS

Daily, weekly and monthly QA/QC reports are required as detailed in Sections 3.4.6 and 3.4.7.

9.3 CONSTRUCTION COMPLETION REPORT

A construction completion report is required within 30 days of receipt of the certification report from the CE. The construction completion report will include the information that documents the completed project is consistent with the Final Plans and Specifications.

9.4 O&M REPORTING

Reporting during the O&M Phase of the CMI will be in accordance with the stated reporting schedule provided in the O&M Manual.

9.5 CORRECTIVE MEASURES COMPLETION REPORT

A Corrective Measures Completion Report is triggered when the corrective measures completion criteria have been satisfied. The report demonstrates how the criteria have been met and justifies the termination of the corrective measures and monitoring.

10.0 CORRECTIVE MEASURES IMPLEMENTATION SCHEDULE

The targeted schedule for CMI activities both within and outside the control of ASPA is presented below for the major project completion milestones. This schedule is aggressive and have been developed on currently available information including anticipated timing for future planned redevelopment activities.

ACTIVITY	TARGETED COMPLETION DATE
• Draft CMI Workplan Submittal	December 18, 2002
• ADEM Review Complete	January 17, 2003
• Final CMI Workplan Submittal	February, 2003
• ADEM Approval of Final Workplan	March, 2003
• Public Comment Period	March – May, 2003
• CMI Contractor Selection by ASPA	March – May, 2003
• Contractor Mobilization	May, 2003
• Site Preparation & Demolition o Recovery Well (RW) System dismantling o Groundwater Well (GW) protection & extension o GW Well abandonment o Cut, grub & grade cover areas o Utility removal	July, 2003
• Tank Demolition (SWMU 1)	July, 2003
• SWMU 6 Excavation	July, 2003
• SWMU 6 Waste Dewater, Test & Dispose	August, 2003
• SWMU 6 Cover Construction	September, 2003
• RW DNAPL System Pipe Installation	July, 2003
• SWMU 4/5/8 Cover Construction	October, 2003
• RW DNAPL System Installation	November, 2003
• GW Monitoring System Improvements	November, 2003
• Post Construction Management Controls	November , 2003
SWMU 6 East – Backfill and Paving Design Amendment	
• Install Additional Outbound Gate Lanes	August, 2018
SWMU 6 East – Inter-Terminal Connector	
• Construction of MSE Wall	January, 2026
EFR for DNAPL Recovery in RWS	
• Initial Period	Two years after initial implementation

FIGURES

Legend

- Area of Concern (AOC) or Solid Waste Management Unit (SWMU)
- Approximate Limits of Contiguous Properties
- AWTC Facility Boundary
- AOC 11 and AOC 12
- AOCs
- SWMUs
- AWTC 1000 ft Buffer
- AWTC 1 mile Buffer

City of Mobile

Interstate 10

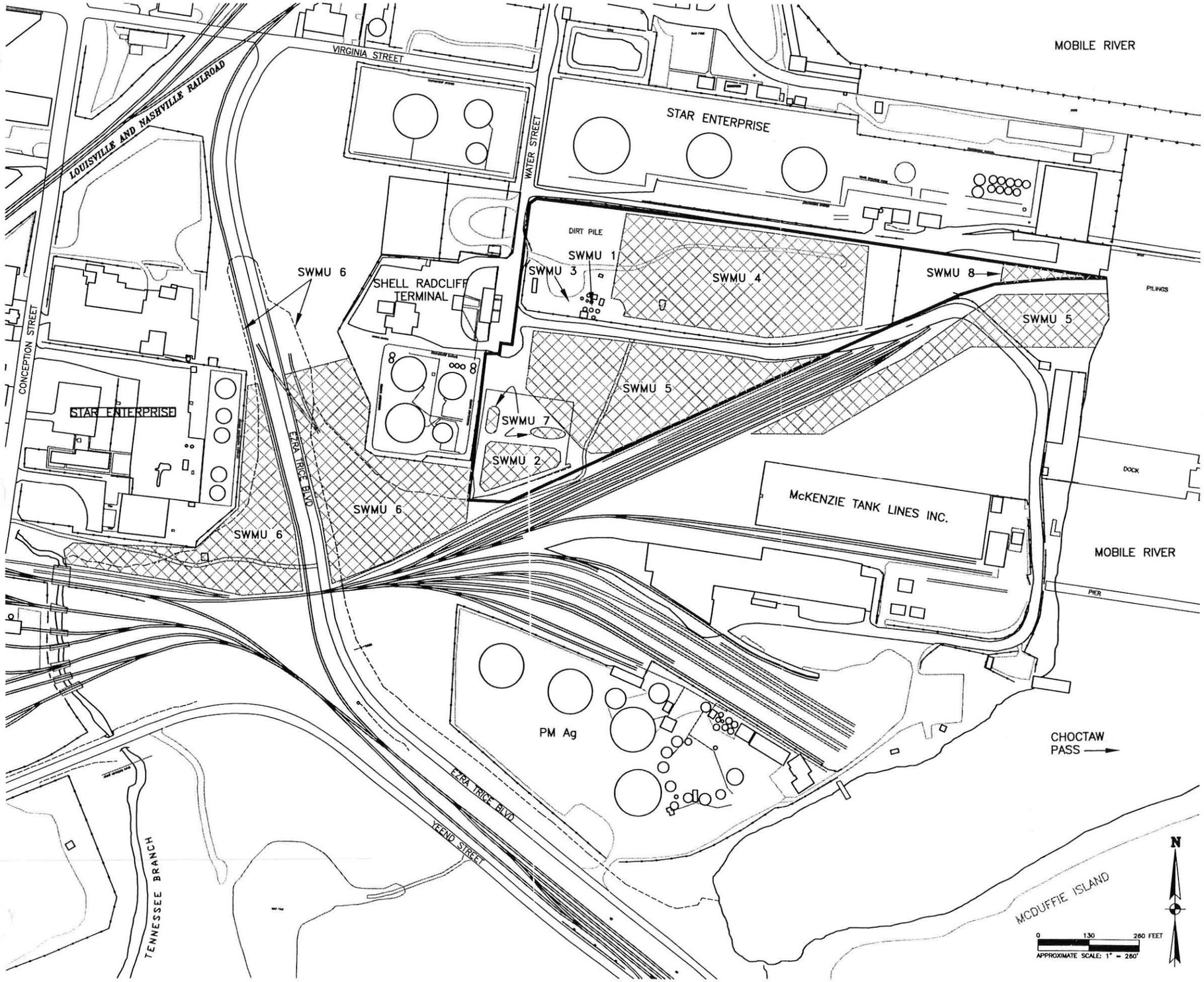
N

0 1,000 2,000 4,000 Feet

Path: G:\ASPA\mxds\2024_Permit_Renewal_Application\ASPA_Property_Location_Map.mxd

Alabama State Port Authority	
Corrective Measures Workplan	
ASPA Property Location Map	
Prepared By-Date: SLH: 5/30/2024	**Figure: 1**
Checked By-Date: MPL: 5/30/2024	
Project Number: 7630233209	

J:\ASD\CMI\Final\ASD 08-30-02 CMI FIGS.dwg - Layout1 02/13/2003 2:30pm ralexand



LEGEND

- APPROXIMATE SITE BOUNDARY ALABAMA WOOD TREATING CORPORATION SITE
- APPROXIMATE SOLID WASTE MANAGEMENT UNIT (SWMU) BOUNDARY OR AREA (SWMU 6)
- APPROXIMATE SOLID WASTE MANAGEMENT UNIT NO. 6 (SWMU-6) DRAINAGE CHANNEL
- RAILROAD

MACTEC

FIGURE 2
SITE PLAN AND SOLID WASTE MANAGEMENT UNIT (SWMU) LOCATION MAP
ALABAMA WOOD TREATING CORPORATION SITE
CORRECTIVE MEASURES STUDY
MOBILE ALABAMA

SOURCE: HARDING ESE, SEPTEMBER 2001

Legend

- Area of Concern (AOC) or Solid Waste Management Unit (SWMU)
- Monitoring Well
- Approximate Limits of Contiguous Properties
- AWTC Facility Boundary
- AOC 11 and AOC 12
- AOCs
- SWMUs

AOC-12
AOC-6A
AOC-6
AOC-11
SWMU-11
S11-MW-1
SWMU-9
AOC-4
AOC-5
AOC-3
AOC-2
SWMU-10

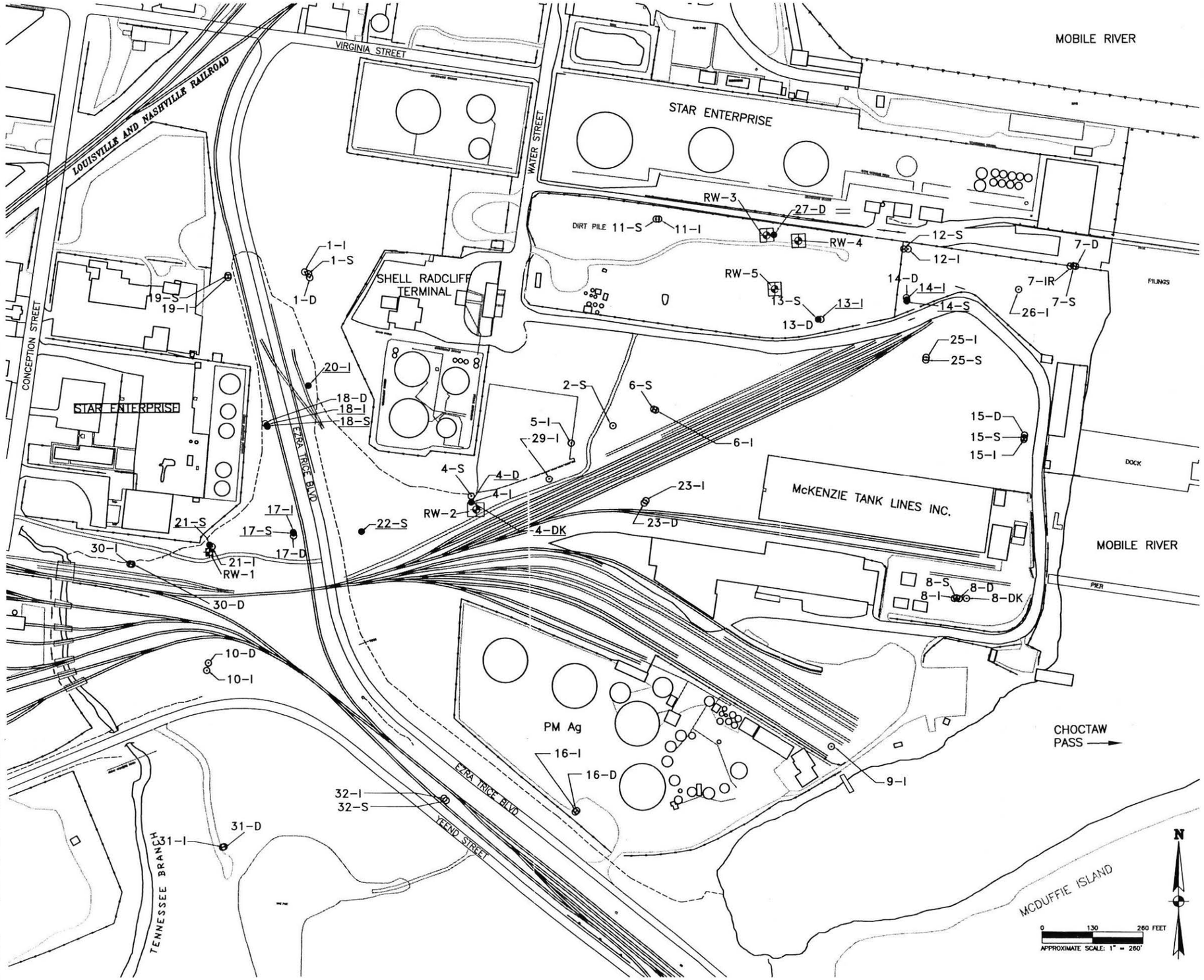
N

0 500 1,000 2,000 Feet

Path: G:\ASPA\mxds\2024_Permit_Renewal_Application\Contiguous Property Map.mxd

Alabama State Port Authority		
Corrective Measures Workplan		
Contiguous Properties Map		
Prepared By-Date: SLH: 5/30/2024	wsp	Figure: 3
Checked By-Date: MPL: 5/30/2024		
Project Number: 7630233209		

J:\ASD\CMI\Final\ASD 08-30-02 CMI FIGS.dwg - Layout1 02/13/2003 2:56pm ralexand



LEGEND

19-S — MONITORING WELL LOCATIONS

RW-1 — DNAPL RECOVERY STATION LOCATIONS

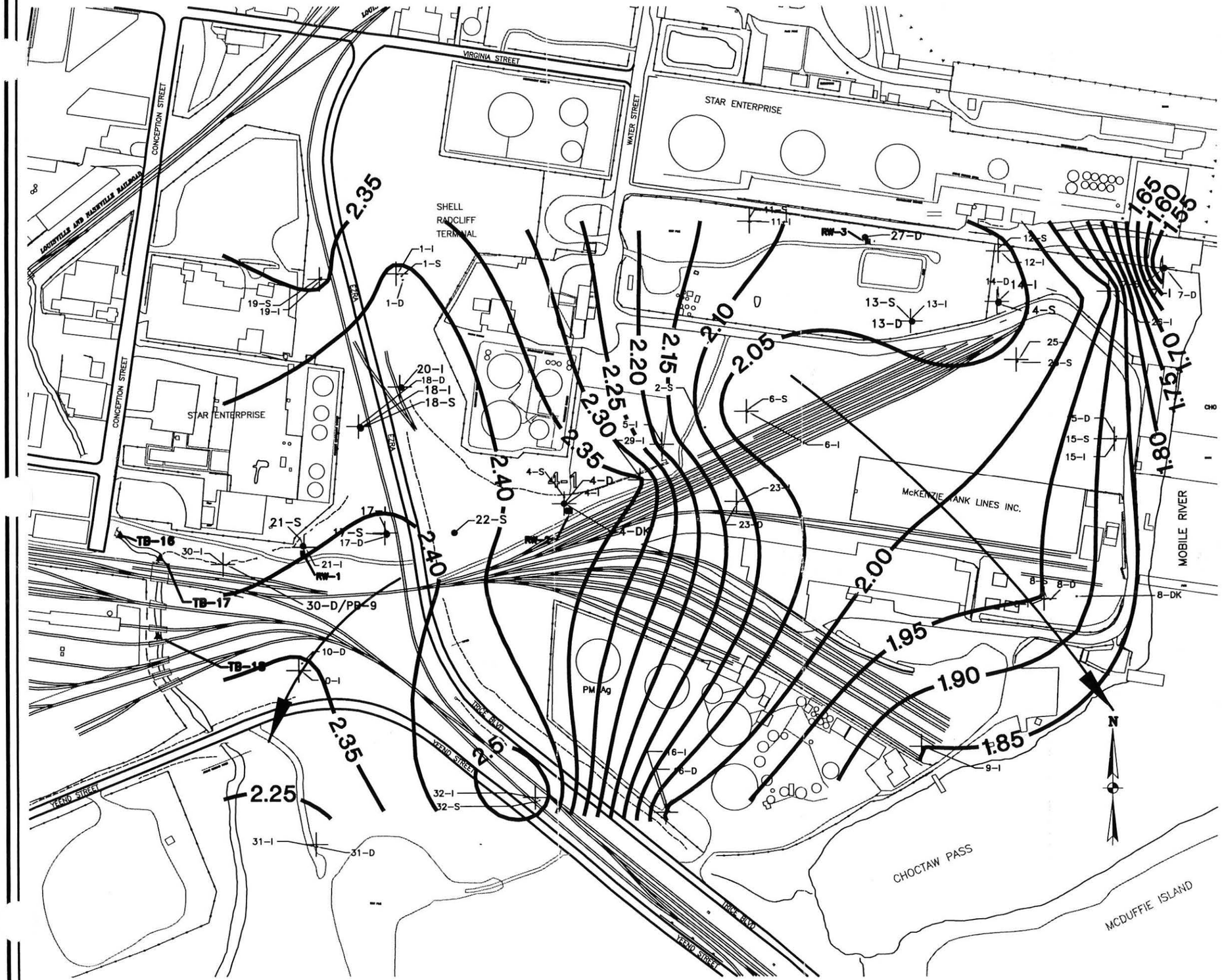
27-D — MONITORING WELL DNAPL RECOVERY LOCATIONS

MACTEC

FIGURE 4
LOCATIONS OF MONITORING WELLS
AND DNAPL RECOVERY WELLS
ALABAMA WOOD TREATING CORPORATION SITE
CORRECTIVE MEASURES STUDY
MOBILE ALABAMA

SOURCE: HARDING ESE, SEPTEMBER 2001

J:\ASD\CMI\Final\POTMAPS09-01.dwg – INTERMEDIATE 02/13/2003 3:04pm ralexand



LEGEND

19-S — MONITORING WELL LOCATION

RW-1 — EXISTING DNAPL RECOVERY WELL LOCATION

MONITORING WELL/ WATER ELEVATION MEASURING POINT

GROUND WATER CONTOUR ELEVATIONS REPORTED IN FT-MSL

DIRECTION OF GROUND-WATER FLOW

0 130 260 FEET
APPROXIMATE SCALE: 1" = 260'

MACTEC

FIGURE 6
POTENTIOMETRIC SURFACE MAP
INTERMEDIATE MONITOR WELLS- 06/20/01
ALABAMA WOOD TREATING CORPORATION SITE
MOBILE ALABAMA
SOURCE: HARDING ESE 2001 REVISED: CMC – 2002

J:\ASD\CMI\Final\POTMAPS09-01.dwg - DEEP 02/13/2003 3:05pm ralexand

...\ASD\CMI\DRAWINGS\POTMAPS09-01.DWG

LEGEND

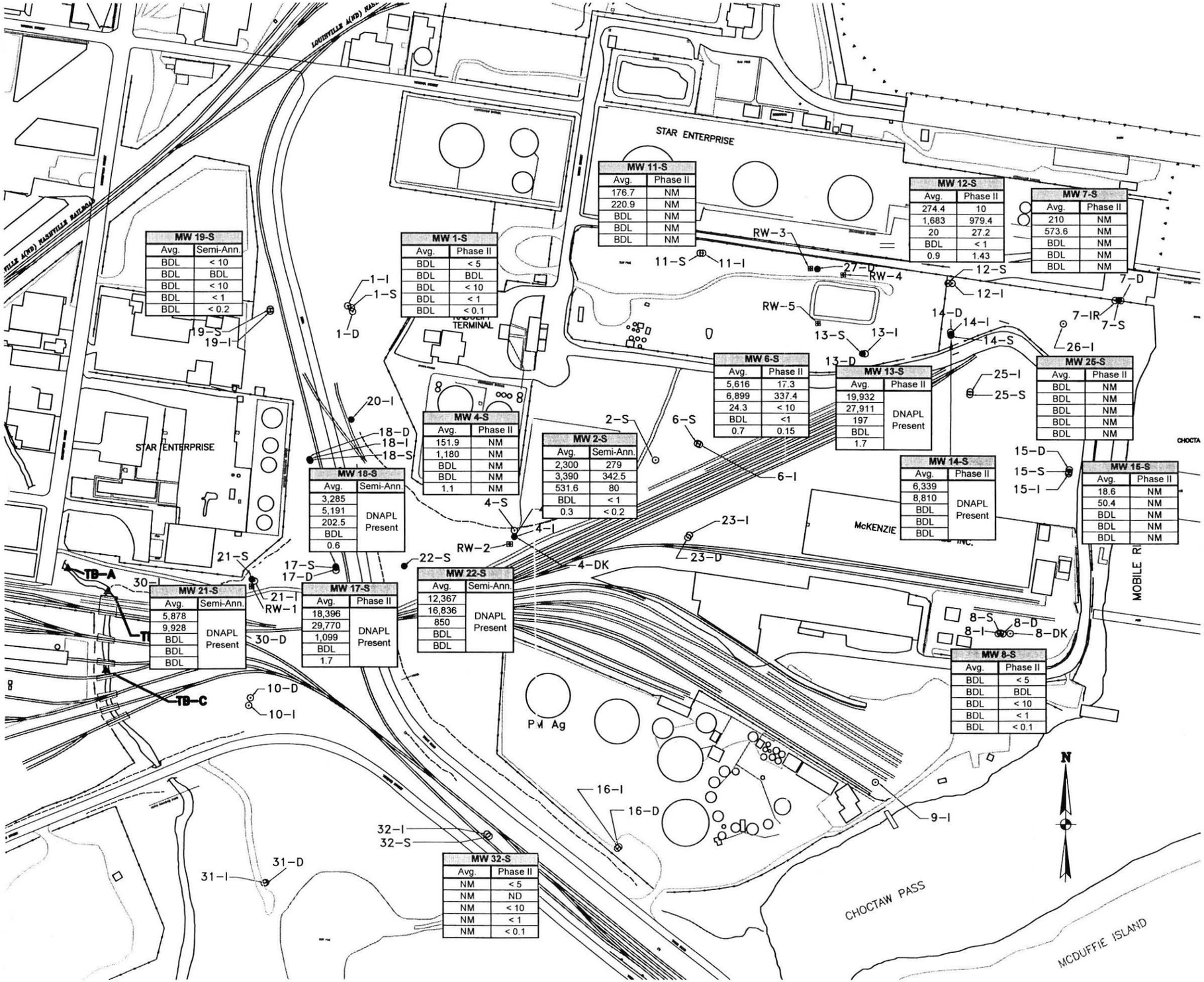
- 19-S — MONITORING WELL LOCATION
- RW-1 — EXISTING DNAPL RECOVERY WELL LOCATION
- 27-D — MONITORING WELL/DNAPL RECOVERY LOCATION
- MONITORING WELL/ WATER ELEVATION MEASURING POINT
- GROUND WATER CONTOUR ELEVATIONS REPORTED IN FT-MSL
- DIRECTION OF GROUND-WATER FLOW

0 130 260 FEET
APPROXIMATE SCALE: 1" = 260'

MACTEC

FIGURE 7
POTENTIOMETRIC SURFACE MAP
DEEP MONITOR WELLS - 06/20/01
ALABAMA WOOD TREATING CORPORATION
MOBILE ALABAMA
SOURCE: Harding ESE - 2001 REVISED: CMC - 2002

J:\ASD\CMI\Final\ASD 08-30-02 CMI Fig 8.dwg - SITE PLAN 02/13/2003 3:17pm ralexand



LEGEND

- 19-S — MONITORING WELL LOCATIONS
- 27-D — MONITORING WELL DNAPL RECOVERY LOCATIONS
- RW-1 — DNAPL RECOVERY WELL LOCATIONS

MW #	
Avg.	Phase II
Naphthalene	
Total PAHs	
2,4-Dimethylphenol	
Pentachlorophenol	
Benzo(a)pyrene	

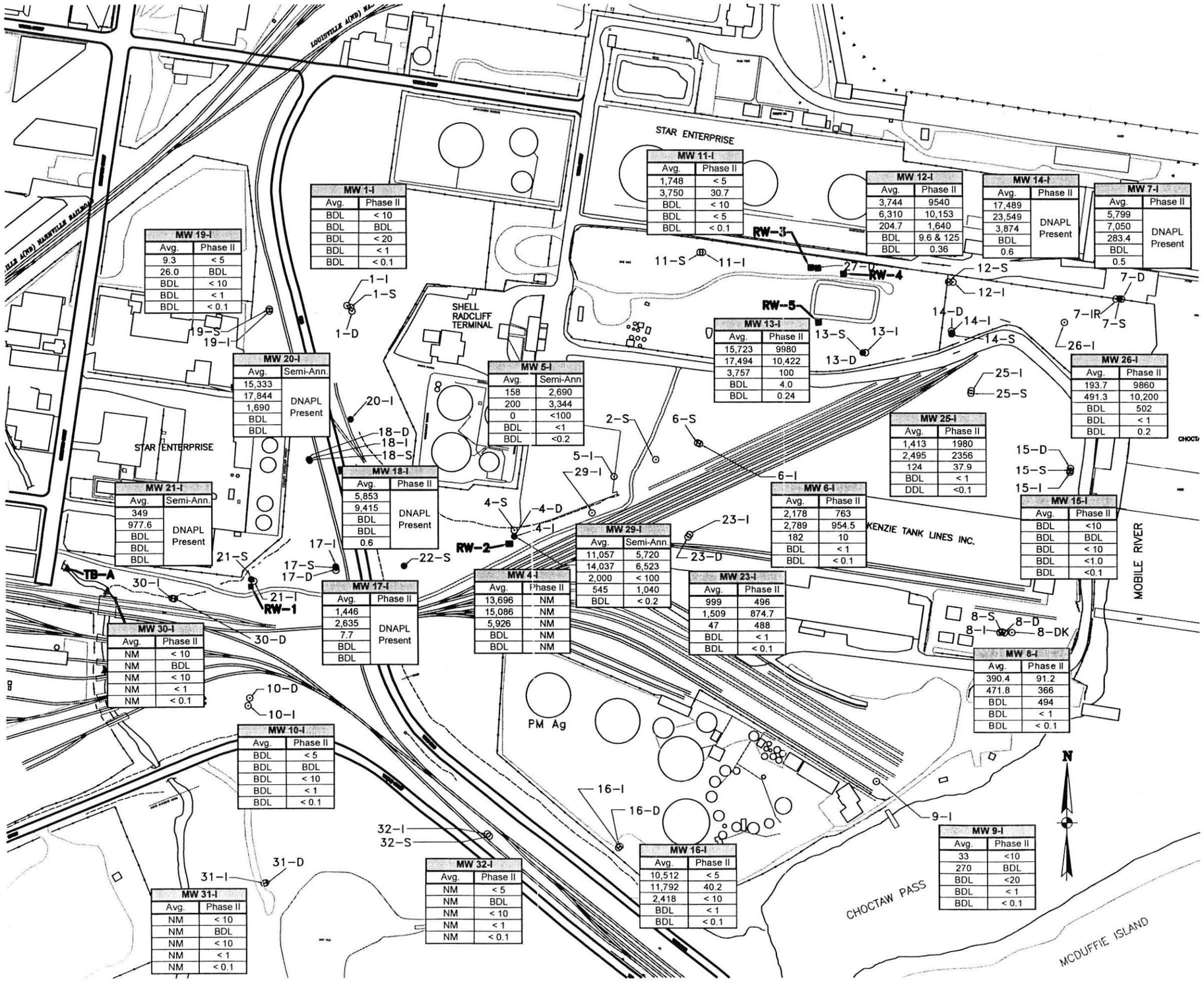
WELL CONTAMINANT LIST (ug/L)

0 130 260 FEET
APPROXIMATE SCALE: 1" = 260'

MACTEC

FIGURE 8
SHALLOW ZONE GROUNDWATER CONTAMINANT CONCENTRATIONS FOR SELECTED PARAMETERS / AVERAGE & PHASE II RFI DATA
ALABAMA WOOD TREATING CORPORATION SITE
MOBILE ALABAMA
SOURCE: HARDING ESE, SEPTEMBER 2001

J:\ASD\CMI\Final\ASD 08-30-02 CMI Fig 9.dwg – SITE PLAN 02/13/2003 3:21pm ralexand



LEGEND

19-S — MONITORING WELL LOCATIONS

27-D — MONITORING WELL DNAPL RECOVERY LOCATIONS

RW-1 — DNAPL RECOVERY WELL LOCATIONS

MW #	
Avg.	Phase II
Naphthalene	
Total PAHs	
2,4-Dimethylphenol	
Pentachlorophenol	
Benzo(a)pyrene	

WELL CONTAMINANT LIST (ug/L)

0 130 260 FEET
APPROXIMATE SCALE: 1" = 260'

MACTEC

FIGURE 9

INTERMEDIATE ZONE GROUNDWATER CONTAMINANT CONCENTRATIONS FOR SELECTED PARAMETERS / AVERAGE & PHASE II RFI DATA
ALABAMA WOOD TREATING CORPORATION SITE
MOBILE ALABAMA
SOURCE: HARDING ESE, SEPTEMBER 2001

J:\ASD\CMI\Final\ASD 08-30-02 CMI Fig 10.dwg - SITE PLAN 02/13/2003 3:29pm ralexand

STAR ENTERPRISE

SHELL RADCLIFF TERMINAL

STAR ENTERPRISE

McKENZIE TANK LINES INC.

PM Ag

CHOCTAW PASS

MCDUFFIE ISLAND

MW 1-D	
Avg.	Phase II
BDL	< 5
BDL	BDL
BDL	< 10
BDL	< 1
BDL	< 0.1

MW 27-D	
Avg.	Phase II
12,600	DNAPL Present
18,388	
653	
BDL	
BDL	

MW 7-D	
Avg.	Phase II
BDL	< 5
BDL	BDL
BDL	< 10
BDL	< 1
BDL	< 0.1

MW 18-D	
Avg.	Phase II
143.7	20.8
377.7	54.8
BDL	< 10
BDL	< 1
BDL	< 0.1

MW 14-D	
Avg.	Phase II
9.8	NM
19.7	NM
BDL	NM
BDL	NM
BDL	NM

MW 17-D	
Avg.	Phase II
116	< 5
295.0	68.5
BDL	< 10
BDL	<1
BDL	< 0.1

MW 15-D	
Avg.	Phase II
NS	< 5
NS	BDL
NS	< 10
NS	< 1
NS	< 0.1

MW 4-D	
Avg.	Phase II
1,196	DNAPL Present
2,023	
408.6	
BDL	
0.7	

MW 23-D	
Avg.	Phase II
23.3	< 5
25.2	125
BDL	< 10
BDL	41.5 & 188
BDL	< 0.1

MW 30-D	
Avg.	Phase II
NM	< 10
NM	BDL
NM	< 10
NM	< 1
NM	< 0.1

MW 8-D	
Avg.	Phase II
BDL	< 5
BDL	BDL
BDL	< 10
BDL	< 1
BDL	< 0.1

MW 10-D	
Avg.	Phase II
BDL	< 5
86.8	18
BDL	< 10
BDL	< 1
BDL	< 0.1

MW 16-D	
Avg.	Phase II
17.7	< 5
55.9	BDL
BDL	< 10
BDL	< 1
BDL	< 0.1

MW 31-D	
Avg.	Phase II
NM	< 10
NM	42
NM	< 10
NM	< 1
NM	< 0.1

LEGEND

MONITORING WELL LOCATIONS

MONITORING WELL DNAPL RECOVERY LOCATIONS

DNAPL RECOVERY WELL LOCATIONS

MW #	
Avg.	Phase II
Naphthalene	
Total PAHs	
2,4-Dimethylphenol	
Pentachlorophenol	
Benzo(a)pyrene	

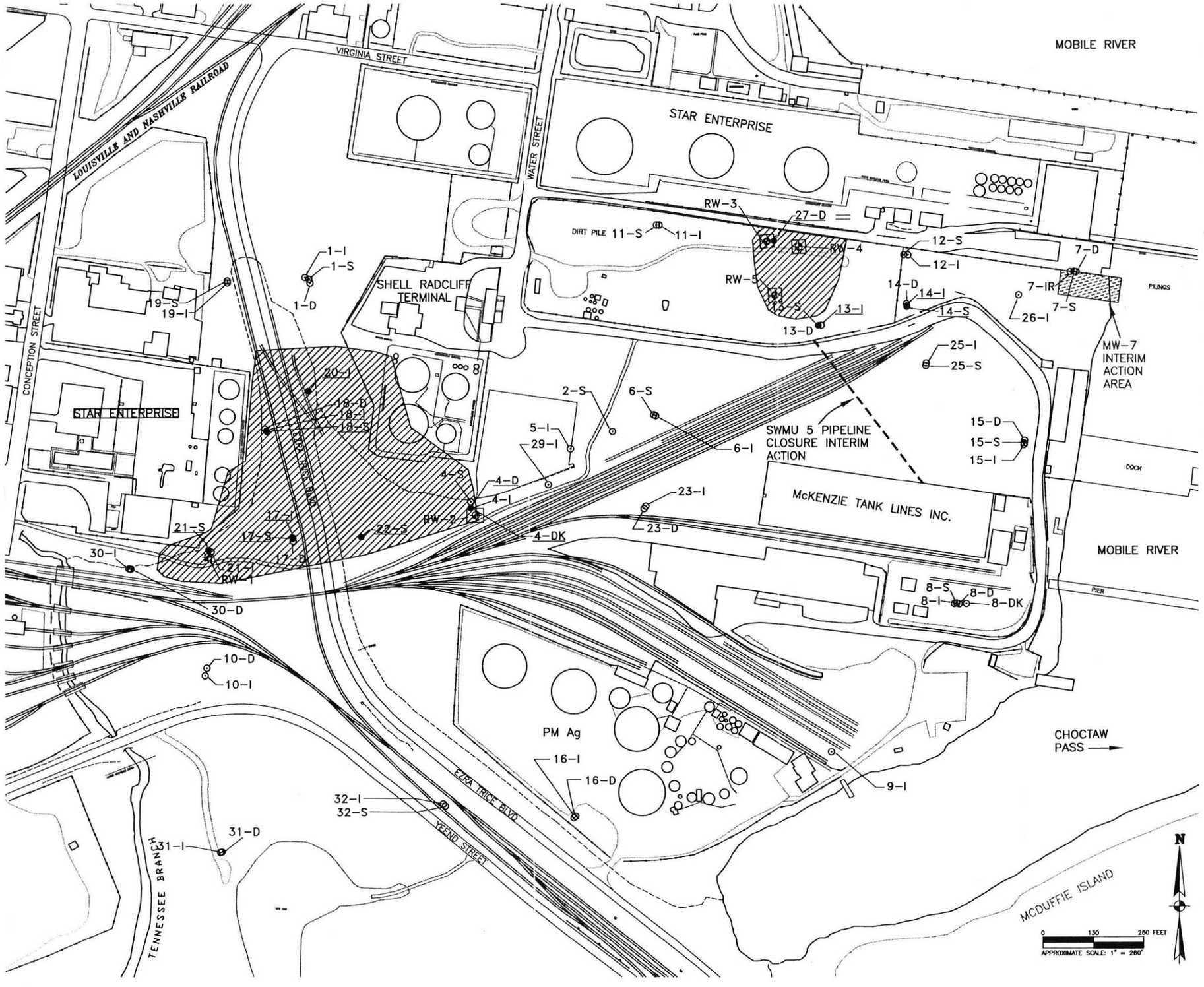
WELL CONTAMINANT LIST (ug/L)

0 130 260 FEET
APPROXIMATE SCALE: 1" = 260'

MACTEC

FIGURE 10
DEEP ZONE GROUNDWATER CONTAMINANT CONCENTRATIONS FOR SELECTED PARAMETERS / AVERAGE & PHASE II RFI DATA
ALABAMA WOOD TREATING CORPORATION SITE
MOBILE ALABAMA
SOURCE: HARDING ESE, SEPTEMBER 2001

J:\ASD\CMI\Final\ASD 08-30-02 CMI FIGS.dwg - Layout1 02/13/2003 3:08pm ralexand



LEGEND

- 19-S — MONITORING WELL LOCATIONS
- RW-1 — DNAPL RECOVERY STATION LOCATIONS
- 27-D — MONITORING WELL DNAPL RECOVERY LOCATIONS
- ESTIMATED EXTENT OF DNAPL PLUME
- INTERIM ACTION AREA
- CLOSED PIPELINE

MACTEC

FIGURE 11
DNAPL SOURCE AREA MAP
AND WELL LOCATIONS
ALABAMA WOOD TREATING CORPORATION SITE
CORRECTIVE MEASURES STUDY
MOBILE ALABAMA

SOURCE: HARDING ESE, SEPTEMBER 2001

TABLES

TABLE 1

LITHOLOGIC CHARACTERISTICS OF GEOLOGIC UNITS
ALABAMA WOOD TREATING CORPORATION SITE
MOBILE, ALABAMA

MATERIAL	THICKNESS	DESCRIPTION
UPPER WATER-BEARING ZONE **(SHALLOW ZONE)**		
Organic Rich Clayey Silt to Fine Sand	Thickness of 1-2 feet	Mixture of Shells and Black, Organic-Rich, Clayey Silt to Fine Sand
Clayey Silt to Fine Sand	Ranges in Thickness from 15-20 feet	Gray Clayey Silt and Fine Sand with Intermittent Thin Lenses of Clay and Organic Matter
LOWER WATER-BEARING ZONE **(INTERMEDIATE ZONE)**		
Fine to Medium Sand	Thickness of 20-30 Feet	Fine to Medium Grained Gray to Brown Sands
(DEEP ZONE)		
Medium to Very Coarse Sand	Thickness of 40-50 Feet	Medium to Very Coarse Sand, Contains Thin Layers of Pebbles, Gravel and Clay.
LOWER CONFINING LAYER		
Clay	Approximate Depth of 90-100 Feet Below Ground Surface	Dark Grey Clay

TABLE 2 - ALTERNATE CONCENTRATION LIMITS (ACLs)
MINIMUM ACLs FOR THE AWTC SITE
Alabama Wood Treating Corporation Site, Mobile, Alabama

ACL Constituent	ACL_{SW} (ug/L)	ACL_{Air} (ug/L)	ACL_{Min} (ug/L)	Maximum Observed Concentration (ug/L)	ACL (ug/L)
Acenaphthene	1.38.E+06		1.38.E+06	1.79.E+04	See Table 8A
Acenaphthylene	1.38.E+06		1.38.E+06	2.50.E+02	See Table 8A
Anthracene	4.96.E+04		4.96.E+04	3.60.E+03	See Table 8A
Arsenic	9.91.E+06		9.91.E+06	3.90.E+02	See Table 8A
Benz(a)anthracene	8.26.E+04		8.26.E+04	8.96.E+03	See Table 8A
Benzene	3.03.E+07	1.46.E+03	1.46.E+03	1.70.E+02	See Table 8A
Benzo(a)pyrene	2.75.E+04		2.75.E+04	6.65.E+03	See Table 8A
Benzo(b)fluoranthene	8.26.E+04		8.26.E+04	1.13.E+04	See Table 8A
Benzo(ghi)perylene	8.26.E+04		8.26.E+04	3.43.E+03	See Table 8A
Benzo(k)fluoranthene	8.26.E+04		8.26.E+04	1.40.E+03	See Table 8A
Bis(2-ethylhexyl) phthalate	2.31.E+06		2.31.E+06	2.90.E+02	See Table 8A
Chrysene	2.75.E+06		2.75.E+06	8.66.E+03	See Table 8A
Copper	6.33.E+04		6.33.E+04		See Table 8A
Dibenzofuran	2.75.E+06		2.75.E+06	1.12.E+04	See Table 8A
Dimethyl phenol 2,4-	2.75.E+06		2.75.E+06	1.30.E+04	See Table 8A
Di-n-octyl phthalate	1.95.E+08		1.95.E+08	1.20.E+03	See Table 8A
Fluoranthene	4.41.E+05		4.41.E+05	2.93.E+04	See Table 8A
Fluorene	6.88.E+05		6.88.E+05	1.44.E+04	See Table 8A
Hexachloroethane	2.59.E+06		2.59.E+06		See Table 8A
Indeno(1,2,3-cd)pyrene	8.26.E+05		8.26.E+05	2.79.E+03	See Table 8A
Methylaniline, 2- (o-Toluidine)	2.73.E+06		2.73.E+06	2.90.E+02	See Table 8A
Methylnaphthalene, 1-	2.75.E+06		2.75.E+06	7.80.E+02	See Table 8A
Methylnaphthalene, 2-	1.16.E+06		1.16.E+06	1.82.E+04	See Table 8A
Methylphenol, 4-	2.75.E+06		2.75.E+06	3.40.E+03	See Table 8A
Naphthalene	3.85.E+05	3.63.E+03	3.63.E+03	1.12.E+05	See Table 8A
Naphthylamine, 1-	5.51.E+05		5.51.E+05		See Table 8A
Naphthylamine, 2-	5.51.E+05		5.51.E+05		See Table 8A
Nitrosodiphenylamine, N-	9.14.E+07		9.14.E+07	4.44.E+03	See Table 8A
Pentachlorophenol	2.75.E+05		2.75.E+05	1.04.E+03	See Table 8A
Phenanthrene	4.13.E+05		4.13.E+05	5.43.E+04	See Table 8A
Phenol	1.60.E+07		1.60.E+07		See Table 8A
Phenolics, total	5.50.E+07		5.50.E+07		See Table 8A
Pyrene	6.61.E+04		6.61.E+04	3.81.E+04	See Table 8A
Xylenes, total	5.23.E+06	4.53.E+04	4.53.E+04	2.60.E+02	See Table 8A

[1]ACL for naphthalene has been revised based on updated indoor air volatilization parameters.

ACL = Alternate Cleanup Level

ACL_{SW} = Alternate Cleanup Level for Surface Water

ACL_{Air} = Alternate Cleanup Level for Air

ACL_{Min} = Minimum Alternate Cleanup Level for Surface Water and Air

AWTC = Alabama Wood Treating Company

ug/L = micrograms per liter

PREPARED BY/DATE: LMS 10/16/13

REVISED BY/DATE: MPW 1/10/25

TABLE 8A
GROUNDWATER PROTECTION STANDARDS FOR SITE-SPECIFIC CONSTITUENTS
Alabama Wood Treating Corporation Site
Mobile, Alabama

Annual Groundwater Quality Monitoring		
Corrective Action Monitoring Program		
Site-Specific Constituent	**Laboratory Method of Analysis**	**ACL (mg/L)**
Acenaphthene	SW8270	17.9
Acenaphthylene	SW8270	0.25
Aldrin	SW8081	0.026
Anthracene	SW8270	3.60
Arsenic	SW6010 or 6020	0.39
Benzo(a)anthracene	SW8270	8.96
Benzene	SW8260	0.17
Benzo(a)pyrene	SW8270	5.18
Benzo(b)fluoranthene	SW8270	11.3
Benzo(g,h,i)perylene	SW8270	3.11
Benzo(k)fluoranthene	SW8270	1.4
Bis(2-ethylhexyl) phthalate	SW8270	0.29
Chrysene	SW8270	8.66
Cobalt	SW6010 or 6020	155.5
Copper	SW6010 or 6020	59.6
Dibenzofuran	SW8270	11.2
1,1-Dichloroethane	SW 8260	25.9
Dimethylphenol 2,4-	SW8270	13.0
Di-n-octyl phthalate	SW8270	1.2
1,4-Dioxane	SW8270	11.6
Fluoranthene	SW8270	26.4
Fluorene	SW8270	14.4
Hexachloroethane	SW8270	32.9
Indeno(1,2,3-cd)pyrene	SW8270	2.8
Methylaniline hydrochloride, 2- (o-toluidine)	SW8270	0.29
Methylnaphthalene, 1-	SW8270	0.78
Methylnaphthalene, 2-	SW8270	18.2
Methylphenol, 4- (p-cresol)	SW8270	3.4
Naphthalene	SW8270	41.2
1-Naphthylamine	SW8270	74.9
2-Naphthylamine	SW8270	1,161.13
N-Nitrosodiphenylamine	SW8270	4.44
Pentachlorophenol	SW8270	1.04
Phenanthrene	SW8270	29.0
Phenol	SW8270	1,122.3
Phenolics, total	EPA 420.1	1,122.3
Pyrene	SW8270	28.5
Vanadium	SW6010 or 6020	596
Vinyl chloride	SW 8260	60.6
Xylenes, total	SW8260	0.26

ACL - Alternate Concentration Limit

mg/L - milligrams per liter

ACLs are updated in accordance with Appendix F of the 2024 permit renewal application

Performed in accordance with schedule shown on Table 9 of the 2024 permit renewal application

DNAPL Effectiveness Wells will be analyzed for the parameters included in the Corrective Action Monitoring Program noted above

APPENDIX A – DRAWINGS

Engineering Drawings are provided in a separate volume.

APPENDIX B - SPECIFICATIONS

WORKPLAN
SPECIFICATIONS
FINAL CORRECTIVE MEASURES IMPLEMENTATION

FOR
ALABAMA WOOD TREATING CORPORATION SITE
MOBILE, ALABAMA

Prepared for:

ALABAMA STATE PORT AUTHORITY
Technical Services

Prepared by:

MACTEC ENGINEERING AND CONSULTING, INC.
Kennesaw, Georgia

ISSUED FOR
REGULATORY REVIEW

February 13, 2003

TABLE OF CONTENTS

CORRECTIVE MEASURES IMPLEMENTATION WORKPLAN
SPECIFICATIONS
for
ALABAMA WOOD TREATING CORPORATION SITE
MOBILE, ALABAMA

BID DOCUMENTS

Owner's standard forms or EJCDC standard forms

CONTRACT DOCUMENTS

Owner's standard forms or EJCDC standard forms

SPECIAL PROVISIONS

Owner's standard forms or EJCDC standard forms

GENERAL PROVISIONS

Owner's standard forms or EJCDC standard forms

SPECIFICATIONS

DIVISION 1 - GENERAL REQUIREMENTS

Section Number	Title
01110	Summary of Work
01140	Work Restrictions
01150	Health and Safety
01270	Measurement and Payment ***[to be provided in the Construction Contract Documents]***
01310	Project Management & Coordination
01330	Submittal Procedures
01450	Quality Control
01500	Temporary Facilities and Controls ***[to be provided in the Construction Contract Documents]***
01575	Temporary Soil Erosion and Sediment Control
01722	Construction Surveying
01770	Closeout Procedures ***[to be provided in the Construction Contract Documents]***
01780	Closeout Submittals ***[to be provided in the Construction Contract Documents]***
01785	Operation and Maintenance Data ***[to be provided in the Construction Contract Documents]***

DIVISION 2 - SITE CONSTRUCTION

Section Number	Title
02110	Excavation of Contaminated Materials
02120	Off-Site Transportation and Disposal
02130	Decontamination
02165	Temporary Sediment Drainage Beds
02220	Demolition
02230	Site Clearing
02240	Dewatering
02245	Surface Water Handling
02317	Trenching and Backfilling
02318	Fill Placement and Grading
02352	Geomembrane
02353	Geotextile
02354	Drainage Geocomposite
02373	Erosion Control Matting
02374	Riprap
02522	Recovery Wells
02526	Well Abandonment
02630	Storm Drainage System
02692	Ground Water Treatment System Buried Piping
02722	Aggregate Base Course
02743	Bituminous Concrete Pavement
02821	Chain Link Fences and Gates
02926	Seeding and Mulching
02927	Sodding

DIVISION 3 - CONCRETE

Section Number	Title
03110	Cast-in-Place Concrete Forms
03200	Concrete Reinforcement
03300	Cast-in-Place Concrete

DIVISION 9 - FINISHES

Section Number	Title
09985	Protective Coatings for Concrete

DIVISION 11 - EQUIPMENT

Section Number	Title
11511	Recovery Well Pumps
11512	Treatment System Pumps
11520	Treatment System Piping and Appurtenances
11532	Settling Tanks and Accessories
11533	Treated Water Storage Tanks and Accessories
11544	Air Compressor and Appurtenances
11552	Oil/Water Separator

DIVISION 16 - ELECTRICAL

Section Number	Title
16050	Basic Electrical Materials and Methods
16220	Motors
16489	Variable Speed Drives
16500	Lighting
16900	Controls and Instrumentation

SECTION 01110
SUMMARY OF WORK

1.01 SUMMARY

A. Section Includes:

1. Work covered by Contract Documents

2. Work sequence

1.02 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work consists of, in general, corrective measures implementation for the Alabama Wood Treating Corporation (AWTC) site in Mobile, Alabama.

B. The Work generally includes, but is not necessarily limited to, the following items:

1. Obtaining required permits and authorizations from governing jurisdictions

2. Preparation and submittal of a Health and Safety Plan (HASP) and other specified plans and documents prior to commencement of the Work

3. Mobilization of supplies, equipment and personnel, including transportation to Site, set-up and maintenance of all equipment and temporary facilities and controls required for project execution

4. Installation and maintenance of temporary soil erosion and sediment control measures

5. Implementation of health and safety procedures in compliance with all applicable regulations of authorities having jurisdiction and as specified herein, including decontamination facilities and procedures

6. Location and protection of all existing utilities (buried and above grade), monitoring wells, recovery wells, structures, and other facilities on the Site not indicated to be removed

7. Clearing of vegetation within defined limits for Soil Cover and Asphalt Cover construction, and on-site placement or off-site disposal as specified

8. Abandonment of indicated existing monitoring and recovery wells, and protection of other wells to remain in place

9. Abandonment or removal of indicated existing storm drainage piping and structures

10. Demolition and disposal of indicated existing structures including: tanks, concrete structures, shed, and other facilities in SWMU 1 and 3; structures at recovery well to be abandoned; and chain link fencing

11. Construction of temporary sediment drainage beds if required for dewatering of excavated contaminated sediments

12. Excavation and removal of contaminated sediments within defined limits of the existing primary drainage channel in SWMU 6 East, and placement in sediment drainage beds for dewatering as required

13. Off-site transportation and disposal of contaminated excavated sediments

14. Installation of storm drainage piping and inlets in SWMU 6 West

15. Subgrade preparation and stabilization for construction of Soil Covers in SWMU 6 East and in SWMU 4, 5 and 8

16. Construction of new diversion channel on the southern and western limits of the SWMU 6 East, including geomembrane liner, gravel layer and vegetated topsoil layer

17. Construction of Soil Cover in SWMU 6 East and SWMU 4, 5 and 8

18. Construction of amendments to original approved soil cover design in SWMU 6 East.

19. Construction of riprap shore protection along the Mobile River at the edge of Soil Cover construction

20. Construction of Asphalt Cover in SWMU 6 West, including preparation of subgrade, placement of aggregate base and bituminous concrete pavement

21. Extension of designated existing recovery well risers, installation of new recovery wells, and installation of well vaults at recovery wells in SWMU 4, 5 and 8

22. Installation of recovery well pumps, piping and accessories

23. Installation of dual-containment piping (galvanized steel carrier pipe and HDPE containment pipe) from recovery wells to treatment system

24. Construction of reinforced concrete containment structure (including application of protective coating) for ground water treatment system, and

25. Furnishing and installation of ground water treatment system components, including 55-gallon drums, settling tanks, oil/water separator, treated water storage tank, pumps, piping, accessories, and appurtenances

26. Electrical controls and instrumentation for recovery well pumps, treatment system units, and treatment pumps

27. Installation of chain link security fencing around the perimeter of SWMU 6 West

28. Permanent erosion control measures, including storm outlet protection riprap, stormwater dropdown structures, and seeding and mulching

29. Site cleanup and demobilization

30. Decommissioning of recovery well pumps and dual-containment piping from recovery wells to treatment system for implementation of EFR program

1.03 WORK SEQUENCE

A. The sequence of the Work shall be the responsibility of the Contractor as long as the requirements of these specifications are met, the Contractor's progress is according to the schedule approved by the Engineer and Owner, and Contract Times stated in the Agreement are complied with.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01140
WORK RESTRICTIONS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Contractor's use of premises

2. Site access and parking

3. Work hours

1.02 CONTRACTOR'S USE OF PREMISES

A. Contractor's use of the premises shall be limited to the Work being performed under the Contract Documents.

B. Confine all operations, including the storage of materials, to the designated areas of the Site as shown on the Drawings, or as otherwise approved in writing by Owner or Engineer. Contractor shall be responsible for arranging for, and paying the costs of, any necessary off-site storage.

C. The Owner and Engineer will not assume responsibility for damages to facilities on the Site due to negligence or carelessness on the part of the Contractor. The Owner and Engineer will not be liable for loss or damage of Contractor's tools, equipment or materials due to theft, vandalism or any other cause.

1.03 SITE ACCESS AND PARKING

A. Contractor's vehicles shall enter and exit the Site only at the locations designated on the Drawings or as otherwise approved in writing by Engineer.

B. Park construction vehicles and construction equipment only in areas designated for such purpose.

C. Vehicles shall not be parked in any locations where they impede traffic or access to areas where Work is being conducted.

1.04 WORK HOURS

A. Normal Work hours shall be from no earlier than [7:30 A.M. to no later than 6:30 P.M., Monday through Friday], or as otherwise approved in advance by Engineer. No work shall be performed on Sundays and Holidays. The specified Work hours are subject to availability of adequate light, so that the Work can be conducted safely and Engineer can effectively observe the Work. Furnish adequate lighting for activities conducted by prior written approval of Engineer between sunset and sunrise.

B. Any variation from normal Work hours shall be subject to approval by Engineer and the Owner. Submit notice to Engineer no less than 48 hours prior to any necessary variation from normal Work hours, to allow for adequate review and coordination of staff. Contractor's notice to Engineer shall include Work activities to be conducted outside of normal Work hours, the hours and days that those activities will be conducted and the requested duration of the change in Work hours.

C. Emergency repairs of equipment outside of normal Work hours may be performed without 48-hour notice, but Contractor shall verbally notify Engineer prior to such emergency maintenance.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01150
HEALTH AND SAFETY

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Submittals
2. Applicable regulations and publications
3. Contractor's responsibility for health and safety
4. Delineation of work zones
5. Personal protective equipment
6. Health and safety equipment
7. Health and Safety Officer
8. Engineering controls

B. Related Sections:

1. Section 02130 - Decontamination

1.02 SUBMITTALS

A. Prepare and submit a Site-Specific Health and Safety Plan (HASP) to the Engineer in accordance with the time limit specified in Section 01330. In the preparation of the Contractor's HASP, Contractor shall review the Engineer's HASP (copy to be provided to Contractor), and shall include, at a minimum, the level of protection included in the Engineer's HASP. The Contractor's HASP will be reviewed and commented on, but will not be approved by the Owner or Engineer. The following subjects shall be addressed in the Contractor's HASP:

1. Names of key personnel and alternates responsible for health and safety, including a Site Health and Safety Officer (HSO) (specified in subsection 1.08).
2. Employee training assignments to assure compliance with 29 CFR 1910.120 and 29 CFR 1926.
3. Medical surveillance requirements in accordance with the program in 29 CFR 1910.120.
4. Delineation of specific work tasks and the associated hazards and protective measures.

5. Site control measures in accordance with the control program required in 29 CFR 1910 and 29 CFR 1926.

6. Frequency and types of air monitoring, personnel monitoring, and environmental sampling techniques and instrumentation to be used by the Contractor for the purpose of employee safety, including methods of maintenance and calibration of monitoring and sampling equipment.

7. Corrective actions and upgrading of personnel protection based on monitoring of air, personnel, and environmental sampling, with specific action levels identified.

8. Decontamination procedures for equipment and personnel as specified in Section 02130.

9. An emergency response plan meeting federal, state, and local requirements for safe and effective responses to emergencies, including the necessary PPE and other equipment.

10. Explanation of potential emergencies and contingency plan of action, including description of the route to the nearest appropriate hospital, hospital route map, and posting of emergency telephone numbers at the Site.

11. A description of engineering controls used to reduce the hazards of equipment operation and exposure to Site hazardous chemicals.

B. Prior to initiating Work, submit documentation of employee training and medical certifications required under 20 CFR 1910.120. Specifically, documentation of the following is required for construction personnel:

1. Initial 40-hour OSHA hazardous waste health operations and emergency response (HAZWOPER) training and current annual 8-hour refresher training.

2. Eight-hour OSHA hazardous waste supervisory training (required for the Contractor's Superintendent or the Site HSO).

3. Enrollment in a medical monitoring program, with clearance within the previous 12 months from a licensed physician allowing the worker to participate in field activities and use respiratory protective equipment. Subcontractor shall not submit detailed medical information for employees.

4. Current respiratory fit testing certification.

5. Current Cardiopulmonary Resuscitation (CPR) and first aid certification for at least two workers assigned to work on the Site.

6. For one who is assigned the role of a "competent person", documentation of sufficient and relevant training and experience to perform the assigned duties and responsibilities of that role. As defined in 29 CFR 1926.31, the competent person shall be "one who is capable of identifying existing and predictable hazards ... and who has authorization to take prompt corrective measures to eliminate them." Relevant training and experience shall be in the same type of project activities included in the Work under this Contract.

C. Submit the following written communications to the Engineer during performance of the Work:

1. Immediate notifications regarding any and all health and safety incidents.

2. Notification at least five days prior to bringing any hazardous material, equipment, or process to the Site.

3. Immediate notification of any and all hazards that Contractor discovers on the Site other than that identified in the Contract Documents.

1.03 APPLICABLE REGULATIONS AND PUBLICATIONS

A. Applicable regulations and publications include, but are not limited to, the following:

1. Occupational Safety and Health Administration (OSHA), Title 29 CFR Part 1910, Occupational Safety and Health Standards, and Title 29 CFR Part 1926, Safety and Health Regulations for Construction Sites.

2. National Fire Protection Association (NFPA), Flammable and Combustible Liquids Code, NFPA 30, most recent revision.

3. United States Environmental Protection Agency (USEPA), Standard Operating Safety Guidelines, November 1984.

4. U.S. Department of Health and Human Services (DHHS), "Manual of Analytical Methods", 3rd edition Volumes I and II, DHHS (NIOSH) Publication 84-100.

5. NIOSH/OSHA/USCG/EPA, Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, USDHHS/PHS/CDC/NIOSH, October 1985.

6. NIOSH Pocket Guide to Chemical Hazards, USDHHS/PHS/CDC/NIOSH, June 2000 or most recent.

7. USEPA, Health and Safety Requirements for Personnel Engaged in Field Activities, EPA Order No. 14402.

8. Departments of Transportation (DOT) Standards and Regulations, 49 CFR 171 and 49 CFR 172.

9. ACGIH, Threshold Limit Values and Biological Exposure Indices for 2000 or most recent.

B. Where two or more regulations or publications conflict, the one(s) offering the greatest degree of protection shall apply.

C. Comply with any and all state and local ordinances and regulations.

1.04 CONTRACTOR'S RESPONSIBILITY FOR HEALTH AND SAFETY

A. Contractor shall be responsible for the health and safety of Contractor's and subcontractors' employees, visitors, and the general public who are present on the Site.

B. Contractor shall be responsible for emergency response planning and notification, and for actual response to any and all emergencies that may occur during the course of the Work, including emergencies occurring when Contractor is not present at the Site.

C. Contractor shall communicate daily with Engineer regarding health and safety issues for Engineer's safe conduct of Engineer's duties, but such communication shall not imply any duty or responsibility on the part of Engineer with regard to Contractor's health and safety. Engineer's responsibility and duty with regard to health and safety shall be limited to Engineer's employees. Contractor shall have responsibility and duty to Engineer to communicate health and safety issues accurately and in a timely manner to allow Engineer to take appropriate actions to protect Engineer's employees and Owner's employees.

D. Contractor shall also follow all applicable local, state, and federal health and safety standards and guidelines implemented through, but not limited to, the Occupational Safety and Health Administration (OSHA), the National Institute for Occupational Safety and Health (NIOSH), the American Conference of Governmental Industrial Hygienists (ACGIH), and United States Environmental Protection Agency (USEPA). Where these are in conflict, the most stringent requirement shall be followed.

E. An ambient air monitoring program shall also be conducted by the Contractor in accordance with the requirements of the Engineer's HASP if the Engineer determines that this task should be part of the Contractor's scope. The purpose of the ambient air monitoring program is to mitigate potential releases of contaminated dust particles during excavation and loading of site soils. The program includes, but is not limited to, perimeter monitoring and air sampling to monitor airborne dust particulates on each property.

1.05 DELINEATION OF WORK ZONES

A. Prior to implementation of work activities, establish the boundaries of the work areas as approved by the Owner and Engineer. These areas shall include Exclusion Zones, Contamination Reduction Zones, and Support Zones, as described in the following paragraphs.

1. Exclusion Zones

   a. An Exclusion Zone shall be set up for each property requiring removal action.

   b. Each Exclusion Zone shall include the areas of excavation and stockpiling of contaminated materials.

   c. Set up each Exclusion Zone so that residents can enter and leave their homes without encroaching on the Exclusion Zone and violate OSHA regulations.

   d. To enter Exclusion Zones, the personal protection required by the Contractor's Health and Safety Plan shall be complied with at all times.

   e. Exclusion Zones shall be clearly marked with barrier fences or stakes and caution tape, and signs to prevent unauthorized access.

2. Contamination Reduction Zones

   a. Contamination Reduction Zones shall occur at the interface of Exclusion and Support Zones.

   b. Contamination Reduction Zones shall provide for: decontamination of waste transport vehicles, construction equipment and tools prior to entering the Support Zone from the Exclusion Zone; decontamination of personnel and clothing prior to entering the Support Zone; and physical separation of the Support and Exclusion Zones.

3. Support Zone

   a. Support Zone shall be one or more areas outside the zones of significant contamination.

   b. Support Zone shall be secured against active or passive contamination from the work Site.

   c. The function of the Support Zone is to provide: an entry area for personnel, material, and equipment to the Exclusion Zones; an exit area for decontaminated personnel, materials and equipment from the Exclusion Zones; a location for support area facilities; and a storage area for clean safety and work equipment.

1.06 PERSONAL PROTECTIVE EQUIPMENT (PPE)

A. Furnish and maintain materials and equipment for the safety and health of Contractor's and subcontractors' employees. Provide all required health and safety equipment, first aid equipment, tools, monitoring equipment, PPE, and ancillary equipment and methods required to ensure worker health and safety and to comply with the HASP. Engineer will

furnish PPE and monitoring for Engineer's employees but will use Contractor's decontamination areas and materials.

1.07 HEALTH AND SAFETY EQUIPMENT

A. Contractor is required to have the following equipment available on the Site:

1. First aid kits

2. Fire suppression equipment (appropriate to location and type of flammable materials present)

3. Personnel decontamination facilities and equipment

4. Other equipment or supplies as determined to be necessary or prudent by Contractor

1.08 HEALTH AND SAFETY OFFICER (HSO)

A. Contractor shall designate a Site HSO on the Site during the Work. The Site HSO shall, as a minimum, have at least one year of experience as an Site HSO on sites with similar hazards, and have 40-hour OSHA Hazardous Waste Operations training and 8-hour OSHA Supervisor training. Contractor's Project Superintendent, if qualified, may be the designated Site HSO if approved by Engineer.

B. Thc Site HSO shall establish and enforce the standards of safety for all Contractor personnel on-site at all times. The Site HSO shall ensure that all employees of the Contractor and subcontractors working at the Site follow the HASP, including wearing the designated level of PPE. If the Site HSO elects to require a higher level of protection than that specified in the HASP, the extra costs associated with such higher level shall be borne by Contractor, unless such extra costs are approved in advance in writing by Engineer.

C. The Site HSO shall monitor activities and shall document the need for additional worker protection as required, based on activities performed and action levels specified in the HASP.

D. The Site HSO shall verify that all activities are performed in accordance with the HASP and all federal, state, local, and health and safety standards, regulations, and guidelines.

E. In coordination with Engineer, Contractor shall hold safety meetings for all workers on the Site a minimum of once per week for each work shift (or more frequently if deemed necessary by the Owner or Engineer), to address health and safety issues, changing Site conditions, activities, and personnel. Hold additional safety meetings at the start of each major task and for changes in Site conditions that affect personnel safety. Additional Health and Safety briefings shall be conducted daily prior to initiation of on-site field activities.

F. In the event of a health and/or safety risk as determined by the Site HSO, Contractor shall not proceed with the Work until a method for handling the risk has been determined in consultation with Engineer, and implemented. Any health or safety risk resulting in a stoppage of work shall be reported immediately to Engineer in writing.

G. The designated Site HSO shall not be replaced without written notice to, and approval by, the Engineer. Written notice shall be submitted a minimum of one week prior to the proposed change.

1.09 ENGINEERING CONTROLS

A. Contractor shall, at a minimum, provide the following engineering controls to reduce the hazards of equipment operation and exposure to Site contamination:

1. Roll over cages for bulldozers, back hoes, loaders, and tractors

2. Back-up alarms for all trucks and heavy equipment.

3. Reducing dust during the Work

5. Decontamination of personnel and equipment

6. Barricades for open excavations

7. Protection of utilities to remain

8. Other controls as determined to be necessary by Contractor or as directed by the Engineer.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01310
PROJECT MANAGEMENT AND COORDINATION

PART 1 GENERAL

1.01 SUMMARY

A. Section includes general requirements for management, scheduling, and coordination of the Work, and project meetings.

1.02 CONSTRUCTION MANAGEMENT PLAN

A. Submit a Construction Management Plan within the time limit specified in subsection 1.02 of Section 01330.

B. The Construction Management Plan shall indicate how the construction activities are to be implemented and coordinated. The Plan shall include the following:

1. Identification of key project personnel and lines of authority, and descriptions of the duties of the key personnel along with an organizational chart.

2. Project communication and coordination.

3. Contractor quality control.

4. Construction procedures, major equipment, staging of operations, materials, and methods to be used for the Work.

5. Documentation control.

1.03 CONSTRUCTION PROGRESS SCHEDULE

A. Submit initial Construction Progress Schedule within the time limit specified in subsection 1.02 of Section 01330.

B. Prepare the Construction Progress Schedule in the form of a horizontal bar chart. The Schedule is to be used as the baseline/target schedule.

C. Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate the early and late start, early and late finish, float dates, and duration. Identify all Critical Path elements.

D. The Construction Schedule shall be in accordance with the required work sequence and completion dates specified in the Agreement.

E. The Construction Progress Schedule shall be revised as appropriate throughout the project to indicate anticipated and actual durations and sequence of activities. Copies of revised Schedules shall be provided promptly to the Engineer for review and comment.

F. Indicate estimated percentage of completion for each item of Work at each submission. Schedule updates shall present baseline/target bars for individual construction activities directly beneath current timeline bars for comparison purposes.

G. Whenever it becomes apparent from the current Construction Progress Schedule that delays to the Critical Path have resulted, and hence, that the contract completion date will not be met, Contractor shall submit to the Engineer for approval a written Recovery Plan stating the steps Contractor intends to take to remove or arrest the delay to the Critical Path in the Construction Progress Schedule. The Contractor shall take some or all of the following actions at no additional cost to the Owner:

1. Increased construction manpower in such quantities and crafts as will substantially eliminate, in the judgment of the Engineer, the backlog of work.

2. Increase the number of working hours per shift, shifts per working days per week, the amount of construction equipment, or any combination of the foregoing, sufficiently to substantially eliminate, in the judgment of the Engineer, the backlog of work.

3. Reschedule activities to achieve maximum practical concurrence of accomplishment of activities, and comply with the revised Construction Progress Schedule.

H. The Contract Time will be adjusted by the Engineer only as defined in the General Conditions. If the Engineer finds that the Contractor is entitled to any extension of the Contract Time under the provisions of this Contract, the Engineer's determination as to the total number of days extensions will be based upon the currently approved Construction Progress Schedule and on all data relevant to the request for extension.

1.04 PRECONSTRUCTION CONFERENCE

A. The [Engineer] [Owner] will schedule and administer a preconstruction conference in accordance with paragraph 2.06 of the General Conditions.

B. The location of the preconstruction conference will be at a site convenient for all parties, as designated by the [Engineer] [Owner].

C. Parties responsible for attending the preconstruction meeting are representatives of the Owner, Contractor, Engineer, and other parties as appropriate.

D. Agenda:

1. Review of Contract Documents

2. Review of: [Contractor's Construction Management Plan; Construction Progress Schedule; Schedule of Submittals; lists of subcontractors and suppliers]

3. Discussion of construction quality assurance procedures

4. Designation of Engineer's personnel and personnel representing the parties in Contract

5. Procedures for processing of submittals, applications for payment, and contract modifications.

6. Procedures for quality control testing, and maintaining Project Record Documents

7. Use of premises, including work areas, storage areas, temporary facilities, and housekeeping procedures

8. Site security and work hours

9. Scheduling for progress meetings

10. Other items as required

1.05 PROGRESS MEETINGS

A. The Engineer will schedule and administer regular progress meetings. The progress meetings will be held monthly or more frequently, if needed.

B. The location of the progress meetings will be at a site convenient for all parties, as designated by the Engineer.

C. Attendance: Representatives of the Engineer, Contractor, Owner, and other parties as appropriate.

D. Agenda:

1. Review, approval of minutes of previous meeting

2. Health and safety issues

3. Quality assurance and quality control procedures

4. Pending changes and substitutions, and effect on Construction Progress Schedule

5. Review of off-site fabrication, delivery schedules

6. Revisions to Construction Progress Schedule

7. Review of submittal schedules

8. Work hours

9. Other business, as appropriate

1.06 COORDINATION

A. Coordinate scheduling, submittals, and Work of the various sections of the Specifications to assure efficient and orderly sequence of installation of interdependent construction elements.

B. Coordinate work of various specification sections having interdependent responsibilities for installing, connecting to, and placing in service, all equipment.

C. Coordinate Work with the Owner so that construction will not adversely impact Owner's operations.

D. Connections to, or alteration of, existing utilities or facilities shall be made at times when the facility or utility involved is not in use or at times, established by the Owner, when use of the facility or utility can be conveniently interrupted for the period of time needed to make the connection or alteration.

E. Before any roadway or facilities are blocked off, the Owner shall be contacted to coordinate operations for the site.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01330
SUBMITTAL PROCEDURES

PART 1 GENERAL

1.01 SUMMARY

A. Section includes submittal procedures and types of submittals required prior to the beginning of certain phases of the Work, prior to the incorporation of products in the Work, and during the progress of the Work.

1.02 INITIAL SUBMITTALS

A. Submit the following to the Engineer for review not more than [fourteen] calendar days after the Effective Date of the Agreement:

****

The following is an example list of initial submittals. The list may be modified within the Construction Contract Documents. All "initial" submittals, which the Contractor is required to submit after the Effective Date of the Agreement and prior to mobilization, should be listed in this subsection.

****

1. Preliminary Schedule of Values (specified in Section 01290)

2. Construction Management Plan (specified in Section 01310)

3. Storm Water Best Management Practices Plan (specified in Section 01500)

4. Spill Prevention, Control and Countermeasures Plan (specified in Section 01500)

5. Health and Safety Plan (specified in Section 01150)

7. Initial Construction Progress Schedule (specified in Section 01310)

8. Schedule of Submittals (specified in this Section)

9. Qualifications Documentation on Quality Control Firm(s) and Laboratory(ies) (specified in Section 01450)

1.03 PROGRESS SUBMITTALS

A. Provide submittals during the progress of the Work as required in individual sections of the Specifications and in the [General Conditions and Supplementary Conditions].

1.04 SCHEDULE OF SUBMITTALS

A. The Schedule of Submittals shall include the following:

1. List of all submittals required, with applicable section and paragraph number indicated

2. The planned dates for Contractor's submittals

3. The dates approved submittals will be required from the Engineer

4. The planned dates of manufacture, delivery and installation of materials, supplies and equipment

B. Maintain an accurate dated Submittal Log and bring this log to each scheduled progress meeting. The Submittal Log shall include all required information listed for the Schedule of Submittals, and the following items:

1. Submittal description and file number assigned as each submittal is made

2. Date sent to Engineer

3. Date returned to Contractor from Engineer

4. Status of submittal

5. Date of resubmittal and return (if applicable)

6. Date material released for fabrication (if applicable)

7. Projected date of fabrication (if applicable)

8. Projected date of delivery to site

1.05 SHOP DRAWINGS

A. When used in the Contract Documents, the term "shop drawings" shall be as defined in the General Conditions. These drawings shall be complete and detailed. Shop drawings shall include: fabrication, erection, setting, and schedule drawings; and manufacturer's scale drawings.

B. All details on shop drawings submitted for approval shall show clearly the evaluations of the various parts to the main members and lines of the structure or equipment, and where correct fabrication of the Work depends upon field measurements, such measurements shall be made and noted on the shop drawings before being submitted for approval.

1.06 PRODUCT DATA

A. Product data as specified in individual sections, include, but are not necessarily limited to, standard prepared data for manufactured products (sometimes referred to as catalog data), such as the manufacturer's product specification and installation instructions, availability of colors and patterns, manufacturer's printed statements of compliance and applicability, catalog cuts, product photographs, printed performance curves, production or quality control inspection and test reports and certifications, mill reports, and printed product warranties, as applicable to the Work.

1.07 GENERAL PROCEDURES FOR SUBMITTALS

A. Submit, with reasonable promptness and in such sequence as shown on the Schedule of Submittals so as to cause no delay in the Contract Work or in the Work of other contractors, all shop drawings, product data, quality control reports, record drawings, and other submittals required by the Contract Documents. No extension of time will be authorized because of the Contractor's failure to transmit complete and acceptable submittals sufficiently in advance of the Work.

B. Provide no less than 14 calendar days for review from the time the Engineer receives them, unless otherwise agreed with the Engineer.

C. Submit the number of copies of submittal packages that Contractor requires, plus three copies which will be retained by the Engineer. Submit an additional copy to the Engineer's Site Representative.

D. Review submittals prior to submission in accordance with [paragraph 6.17.D of the General Conditions].

E. Submittals shall clearly indicate any deviations or variations from the requirements of the Contract Documents in accordance with [paragraph 6.17.D.3 of the General Conditions].

F. All submittals shall be furnished with the following information:

1. Number and title of the submittal

2. Date of submittal

3. Name of Contractor, subcontractor, and manufacturer, as applicable

4. Clear identification of contents and location of the work

5. Contractor's certification statement as defined in subsection 1.07.G below

6. Specification reference

7. Contract Drawing number reference, if applicable

G. Each submittal shall bear a stamp or specific written indication that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval of that submittal. The certification shall be signed by the Contractor's authorized representative, and shall read as follows:

> "By this submittal, I hereby represent that I have determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers, and similar data, and I have checked and coordinated each item with other applicable approved shop drawings and all Contractor requirements"

H. Submittal packages that do not include the Contractor's certification statement will be returned to the Contractor, without review at the Engineer's option, for non-conformance with this requirement.

I. Utilize a nine-character submittal identification numbering system in the following manner:

1. The first five digits shall be the applicable Specification Section number.

2. The next three digits shall be the numbers 001 to 999 to sequentially number each initial separate item or drawing submitted under each specific Section number.

3. The last character shall be a letter A to Z, indicating the submission, or resubmission of the same submittal (e.g.: A = first submission; B = second submission; C = third submission).

J. Contractor shall not begin any work affected by a submittal which has been returned with the notations "Revise and Resubmit" or "Not Acceptable" until a revision or correction of the submittal has been resubmitted and returned with the notations "Approved" or "Approved as Noted". Corrections noted on the submittals shall be followed without exception. The Contractor shall be responsible for and bear all costs of damages that may result from the ordering of any material or from proceeding with any part of the Work prior to the review and approval by Engineer of the necessary submittals.

K. [In accordance with paragraph 6.17.E of the General Conditions,] T(t)he Engineer's review and approval are to determine conformance with information given in the Contract Documents and compatibility with the design concept of the completed project as a functioning whole as indicated in the Contract Documents. The Engineer's review and approval shall not relieve the Contractor from compliance with the Contract Documents.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01450
QUALITY CONTROL

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Regulatory requirements
2. References
3. Qualifications submittals
4. Source quality control testing
5. Quality control of installation - general requirements
6. Manufacturers' field services and reports
7. Quality control services
8. Qualifications and duties of QC firms and laboratories
9. Quality control submittals
10. Limits on authority of QC Firm(s)
11. Contractor's responsibilities

1.02 REGULATORY REQUIREMENTS

A. Comply with all applicable local, state and federal regulations.

1.03 REFERENCES

A. Conform to latest edition of reference standards as of date of Contract Documents or date otherwise specified in specification sections.

B. Should specified reference standards conflict with Contract Documents, request clarification from Engineer before proceeding.

C. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.04 QUALIFICATIONS SUBMITTALS

A. Prior to start of Work, within the time limit specified in Section 01330, submit name, address, and telephone number, and names of full time registered engineer or specialist and responsible officer for each quality control (QC) firm and laboratory to be retained.

B. Submit documentation that QC firms and laboratories comply with applicable qualifications as specified in subsection 1.09 of this Section.

C. Submit names and qualifications statements (resumes) of all personnel to be at site, showing compliance with the required experience.

D. Submit documentation of testing equipment calibrations as specified.

1.05 SOURCE QUALITY CONTROL TESTING

A. Materials and equipment forming the Work under this Contract are subject to inspection and testing at the point of manufacture or fabrication. Standard specifications for quality and workmanship are indicated in the Contract Documents.

B. Provide statements or certificates from the manufacturers and fabricators that the materials and equipment provided by them are manufactured or fabricated in full accordance with the standard specifications for quality and workmanship indicated in the Contract Documents.

C. All costs of this testing and providing statements and certificates shall be a subsidiary obligation of the Contractor, and no extra charge to the Owner or Engineer shall be allowed on account of such testing and certification.

1.06 QUALITY CONTROL OF INSTALLATION - GENERAL REQUIREMENTS

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply fully with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Engineer before proceeding.

D. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Work shall be performed by persons qualified to produce workmanship of specified quality.

1.07 MANUFACTURERS' FIELD SERVICES AND REPORTS

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel (representatives) to observe and document site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, testing and adjusting of equipment as applicable, and initiation of instructions when necessary.

B. Submit qualifications of manufacturers' and suppliers' representatives to Engineer 15 days in advance of required observations. Representatives are subject to approval by Engineer.

C. The suppliers' or manufacturers' representatives shall report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

1.08 QUALITY CONTROL SERVICES

A. Owner will employ and pay for the services of inspection QC firms to perform specified inspection and testing services.

B. Qualifications, duties and responsibilities of the QC firms and laboratories are specified in subsection 1.09 of this Section.

C. Contractor shall allow sufficient time in the Construction Progress Schedule for quality control testing, evaluation, and reporting of test results. Contractor shall give particular attention to this in areas where results/approvals will be required prior to continuing with the Work.

D. If Contractor elects to continue with work in advance of receipt of test results and Engineer's [and Owner's] approval, it shall be understood that it shall be entirely at Contractor's risk. Engineer and Owner will not be responsible for consequential delays attributable to failing test results or retesting requirements.

1.09 QUALIFICATIONS AND DUTIES OF QC FIRMS AND LABORATORIES

A. Quality Control Firm

1. The QC Firm shall be an approved testing, inspection, and quality control organization, independent from the Contractor and Owner. The QC Firm's office delivering such services shall have a minimum of three years experience with quality control services for construction of similar scope.

2. The QC Firm shall be responsible for the overall administration of quality control procedures. The QC Firm shall be responsible for on-site observation, sampling and testing, and testing laboratories. Field and laboratory testing shall be conducted by the QC Firm or an independent third-party testing organization.

3. The QC Firm shall prepare daily field reports and submit them to the Engineer. These reports shall include, as a minimum, the following:

   a. Date, project name, location, and time of arrival/departure.

   b. Descriptions and locations of construction underway during the time frame of the daily report.

   c. Description of work accomplished.

   d. Description and location of testing performed.

4. Test results shall be reported directly to the Engineer by the QC Firm.

B. Physical Quality Control Laboratories (PQCL)

1. The PQCL shall be approved organization(s), independent from the Contractor and Owner, responsible for the physical testing and reporting of all submitted soil and aggregate samples, and all other product samples, with the exception of geosynthetics. A minimum of five years of similar laboratory experience will be required.

C. All QC laboratories shall maintain a full-time Alabama-registered engineer or other specialists, as needed, on staff to review services. Testing equipment shall be calibrated in accordance with the standards and procedures of the National Institute of Standards and Technology (NIST). QC laboratories shall comply with the recommendations for quality assurance of the NIST, and other applicable qualifications and standards.

D. QC Firm(s) shall:

1. Provide qualified personnel at the site;

2. Cooperate with Engineer and Contractor in performance of services;

3. Perform specified inspection, sampling, and testing of products in accordance with specified standards;

4. Promptly notify Engineer and Contractor of observed irregularities or non-conformance of Work or Products;

5. Perform additional inspections and tests required by the Engineer and Owner; and

6. Attend Preconstruction Meeting and progress meetings.

1.10 QUALITY CONTROL SUBMITTALS

A. QC Firm(s) shall submit two copies of laboratory reports to Engineer and to Contractor within two working days after obtaining results of each inspection and test.

B. Reports shall include, as applicable:

1. Date issued
2. Project title and number
3. Name of inspector
4. Date and time of sampling or inspection
5. Identification of product or material
6. Identification of applicable section of the Specifications
7. Location in the project
8. Type of inspection or test
9. Date sample received in laboratory, and name of person receiving sample
10. Date of test
11. Results of tests
12. Signature of appropriate specialist on laboratory report certifying accuracy of data

C. When requested by Engineer, provide interpretation of test results.

1.11 LIMITS ON AUTHORITY OF QC FIRM(S)

A. QC Firm(s) shall not release, revoke, alter, or enlarge on requirements of Contract Documents.

B. QC Firm(s) shall not approve or accept any portion of the Work, and shall not assume any duties of Contractor, Engineer or Owner.

1.12 CONTRACTOR'S RESPONSIBILITIES

A. Cooperate with QC Firm(s) to provide access to Work.

B. Furnish incidental labor and facilities:

1. To provide access to work to be tested;
2. To obtain and handle samples at the project site or at the source of products to be tested;
3. To facilitate inspections and tests; and

4. For storage and curing of test samples.

C. Notify QC Firm(s) sufficiently in advance of operations to allow for assignment of personnel and scheduling of tests and inspections.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01575
TEMPORARY SOIL EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.01 SUMMARY

A. Section includes construction of temporary measures to control storm water and soil erosion and sediment transport during the Work.

B. Related Sections:

1. Section 02245 – Surface Water Handling

2. Section 02353 - Geotextile

3. Section 02926 – Seeding and Mulching

1.02 REFERENCES

A. "Best Management Practices (BMP) Manual for Alabama Construction", published by Alabama Department of Environmental Management (ADEM), reprinting date July 1999

B. "Standard Specifications for Highway Construction", 2002 Edition, Alabama Department of Transportation (ALDOT Specifications)

C. American Association of State Highway and Transportation Officials (AASHTO):

1. AASHTO M 288, Standard Specification for Geotextiles

D. American Society for Testing and Materials (ASTM):

1. ASTM D 4355, Standard Test Method for Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus)

2. ASTM D 4491, Standard Test Methods for Water Permeability of Geotextiles by Permittivity

3. ASTM D 4632, Standard Test Method for Grab Breaking Load and Elongation of Geotextiles

4. ASTM D 4751, Standard Test Method for Determining Apparent Opening Size of a Geotextile

1.03 QUALITY ASSURANCE

A. Comply with the requirements of pollution control laws, rules and regulations of governmental authorities having jurisdiction, including, but not limited to, Alabama Department of Environmental Management (ADEM), US Army Corps of Engineers, and USEPA.

1.04 SEQUENCING REQUIREMENTS

A. The use of temporary control measures shall be coordinated with the permanent erosion control features specified elsewhere in the Specifications to the extent practical, to assure effective and continuous erosion control.

PART 2 PRODUCTS

2.01 TEMPORARY VEGETATION

A. Grass seed for temporary vegetation shall be as specified in Section 02926.

2.02 SILT FENCING

A. Silt fencing for sediment barriers shall consist of filter fabric (geotextile fabric), woven wire and posts as indicated on the Drawings and specified in the following paragraphs.

B. Geotextile fabric shall conform to the requirements of AASHTO M 288 for temporary silt fencing. Minimum total width of fabric shall be 36 inches or as otherwise indicated on the Drawings. Geotextile for unsupported temporary silt fence shall meet or exceed the following specifications:

Property	**Test Method**	**Test Value[1]**
Grab Tensile Strength	ASTM D 4632	180 lbs.
Permittivity	ASTM D 4491	0.05 sec^{-1}
Apparent Opening Size (AOS)	ASTM D 4751	0.60 mm (max.)
Ultraviolet Resistance (% Retained at 500 hours)	ASTM D 4355	70 %

[1] Minimum Average Roll Value (unless otherwise noted) in weakest principal direction

C. Posts shall be wood or steel, a minimum of five feet in length. Minimum sizes of wood posts shall be: 1.5-inch by 1.5-inch for hardwoods; and three-inch diameter or two-inch by four-inch for softwoods. Steel posts shall be standard "U" or "T" sections having a minimum weight of 1.2 pounds per foot. Furnish wire staples (17 minimum gauge) or nails (14 minimum gauge) for wood posts.

D. Furnish woven wire fence backing. Woven wire shall have at least six horizontal wires. Vertical wires shall have a maximum spacing of 12 inches. The top and bottom horizontal wires shall be at least 10 gauge and all other wires shall be at least 12 ½ gauge.

2.03 INLET SEDIMENT TRAPS

A. Inlet sediment traps shall consist of silt fencing as shown on the Drawings.

2.04 STRAW BALES

A. Bales to be used for sediment barriers on the Site shall be either hay or straw containing a minimum of five cubic feet of material and having a weight of not less than 35 pounds.

2.05 CHECK DAMS

A. Materials for check dams shall consist of geotextile and riprap as indicated on the Drawings and specified in the following paragraphs.

B. Furnish nonwoven geotextile conforming to the requirements of Section 02353.

C. Riprap shall be hard, angular shaped stone, meeting the quality requirements of Section 814 of the ALDOT Specifications. Gradation shall comply with Section 814 of the ALDOT Specifications for Class 1 Riprap.

2.06 FLOATING SILT CURTAIN

A. Floating silt curtain shall be "Mark II Silt Curtain" manufactured by American Boom and Barrier Corporation, or approved equal.

2.07 CONSTRUCTION EXIT

A. Aggregate shall conform to the applicable requirements for coarse aggregate in Articles 801.01 through 801.03 of the ALDOT Specifications. Gradation shall be as specified in the Coarse Aggregate Gradation Table in Subarticle 801.11(d) for Size Number 1 aggregate as summarized below:

Sieve Size	**Percent Passing, by Weight**
2 inch	100
1 1/2 inch	90 – 100
1 inch	20 - 55
3/4 inch	0 – 15
3/8 inch	0 – 5

B. Furnish nonwoven geotextile conforming to the requirements of Section 02353.

PART 3 EXECUTION

3.01 GENERAL

A. Temporary control measures shall be those that are needed prior to installation of permanent control features, or that are needed temporarily to control erosion that develops during normal construction activities, but are not associated with permanent control features on the project.

B. All Work under this Contract shall be performed in such a manner that objectionable sediment shall not be created in watercourses through or adjacent to the Project area.

C. The Owner or Engineer shall have the authority to limit the surface area of erodible earth material exposed by clearing, grading and fill operations, and to direct the Contractor to provide, at no additional cost to the Owner, immediate, temporary or permanent erosion and sediment control measures to minimize effects on adjacent streams or other drainage features on or adjacent to the Site.

D. Temporary erosion and sediment control measures shall conform to the requirements of this Section and as indicated on the Drawings.

E. All storm water, including pre-existing water in excavation areas, shall be managed in accordance with the requirements of Sections 02245.

3.02 INSTALLATION OF SILT FENCING

A. Temporary silt fences shall be installed where indicated on the Drawings and at other locations where surface water can leave the construction area as determined by the Engineer.

B. Securely fasten fabric to upstream side of posts using heavy-duty wire staples (at least one-inch long), tie wires, nails or hog rings. Six to eight inches of the fabric shall extend into the trench.

C. At the time of installation, the fabric will be rejected if it has defects, deterioration or damage incurred during manufacture, transportation, storage or installation and replaced at the Contractor's expense.

3.03 INSTALLATION OF SILT CURTAIN

A. Install floating silt curtain where indicated on the Drawings.

B. Conform to manufacturer's recommendations for assembly, deployment and maintenance of the silt curtain.

3.04 INSTALLATION OF INLET SEDIMENT TRAPS

A. Install inlet sediment traps as indicated on the Drawings around all storm drainage inlets to be left in place within and downgradient from the areas to be excavated and graded.

3.05 CHECK DAMS

A. Construct check dams at the locations and to the dimensions indicated on the Drawings.

3.06 APPLICATION OF TEMPORARY GRASS SEED

A. Comply with Section 02926.

B. Temporary seeding shall be performed in areas lacking vegetation if no construction activities will be performed in the area for more than 14 days. Temporary seed mixtures shall be applied to such areas immediately after temporarily suspending work in the area.

C. Where the initiation of temporary seeding is precluded by adverse weather conditions, stabilization measures shall be initiated as soon as practicable.

3.07 INSPECTION AND MAINTENANCE

A. Temporary erosion and sediment control measures shall be inspected at least weekly and after each rainfall event.

B. Remove sediment deposits that reach approximately one-third the height of sediment barriers. Sediment shall be placed in areas approved by the Engineer and spread uniformly over the ground surface.

C. Replace or reconstruct sediment barriers when the measures no longer effectively perform.

3.08 REMOVAL OF TEMPORARY EROSION CONTROL MEASURES

A. Silt fencing, inlet sediment traps, straw bales and check dams and floating silt curtains shall not be removed until approved by the Owner or Engineer. The upgradient areas shall be sufficiently stabilized with riprap or grass, as applicable, prior to removals.

B. Any sediment deposits remaining after the sediment barriers are removed shall be spread over the ground surface. Graded material shall be seeded using permanent seed mix specified in Section 02926.

END OF SECTION

SECTION 01722
CONSTRUCTION SURVEYING

PART 1 GENERAL

1.01 SUMMARY

A. Section includes field surveying for control and documentation of the lines, grades and elevations of the Work, surveying for measurement and payment, and preparation of record survey drawings.

1.02 QUALITY CONTROL

A. Record surveys for review and approval shall be performed by an independent surveying firm with a Registered Land Surveyor (RLS) licensed and registered in the State of Alabama, retained by the Contractor, and acceptable to the Engineer.

B. Day to day surveying for Contractor's control purposes may be performed by Contractor's own surveyors.

1.03 SUBMITTALS

A. Submit the following qualifications documentation for proposed RLS to Engineer:

1. Name, address, telephone number, and photocopy of registration of RLS.

B. All field notes, computations, data logger information, and other survey records for the purposes of layout, initial, progress and final surveys shall be provided to the Engineer on a daily basis.

C Submit record survey drawings (specified in subsection 3.03 of this Section), certified by the RLS, along with computer files on diskette in AutoCad 2000 format. Redline mark-ups of the Contract Drawings are not acceptable. A digitized tracing of a manually drawn record survey drawing, derived from non-digital surveying techniques, is also not acceptable.

1.04 EXAMINATION

A. Verify locations of survey control points prior to starting Work.

B. Promptly notify Engineer of any discrepancies discovered.

1.05 SURVEY REFERENCE POINTS

A. [The Owner's surveyor has established benchmarks and horizontal control for the Work. Control datum for survey is indicated on the Drawings.]

B. Locate and protect survey control and reference points.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL SURVEY REQUIREMENTS

A. Utilize recognized engineering survey practices appropriate for obtaining the information specified.

B. Protect and preserve established benchmarks during construction.

C. Promptly report to Engineer the loss or destruction of any reference point or relocation required because of changes in grades or other reasons. Replace dislocated reference points based on original survey control. Make no changes without prior written notice to Engineer and Owner.

D. The Work shall be executed in conformance with the lines and grades shown on the Drawings, unless otherwise approved by the Engineer.

E. Establish elevations, lines, and levels required for all items of the Work.

3.02 SURVEYS FOR MEASUREMENT AND PAYMENT

A. Contractor's RLS shall perform surveys to determine quantities of unit cost work, including control surveys to establish measurement reference lines. Notify Engineer prior to starting survey.

B. Contractor's RLS shall submit calculations and certify the correctness of quantities for payment purposes.

3.03 DOCUMENTATION OF THE WORK

A. Maintain a complete and accurate log of control and survey work as it progresses.

B. Record survey drawings shall be prepared to fully document the Work, as specified in individual specification sections.

C. Promptly submit the drawings (with computer files) to Engineer for review at critical stages of construction as specified in individual specification sections.

D. RLS shall prepare and certify the record survey drawings.

END OF SECTION

SECTION 02110
EXCAVATION OF CONTAMINATED MATERIALS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes: excavation and on-site transport of contaminated sediments within defined limits along the primary drainage channel in SWMU 6 East; and excavation and on-site placement of materials for the utility trenches.

B. Related Sections:

1. Section 01575 - Temporary Erosion and Sediment Control
2. Section 02120 – Off-Site Transportation and Disposal
3. Section 02165 – Temporary Sediment Drainage Beds
4. Section 02230 – Site Clearing
5. Section 02240 - Dewatering
6. Section 02245 – Surface Water Handling
7. Section 02318 – Fill Placement and Grading

1.02 SUBMITTALS

A. Submit information on proposed on-site truck haul routes to Engineer for review.

B. During the progress of the Work, submit to Engineer a written record of daily progress of the excavation work in a form acceptable to Engineer. Daily progress records shall be submitted at the beginning of the subsequent day's work.

1.03 PROJECT CONDITIONS

A. The Contractor is solely responsible for excavation slope stability. Excavation work shall be in compliance with applicable OSHA regulations.

B. Work shall be performed in a manner that does not disturb or damage existing structures, utilities, recovery wells, monitoring wells or other facilities not indicated to be removed. Damaged structures and other facilities shall be repaired or replaced as required.

C. Take every effort necessary to prevent cross-contamination and re-contamination of excavated areas and adjacent undisturbed areas. Equipment used for excavation and on-site handling of contaminated soils shall be decontaminated prior to use in Soil Cover construction or removal from the Site.

D. Work will involve the handling of materials containing substances that are potentially harmful to the health and safety of construction personnel. Perform work in compliance with applicable OSHA regulations.

1.04 COORDINATION AND SCHEDULING

A. Coordinate sediment excavation work in the drainage channel with dewatering in sediment drainage beds (specified in Section 02165) and transportation of excavated contaminated materials for off-site disposal (specified in Section 02120).

B. Sequence the sediment excavation work to allow the required time for dewatering of sediments.

C. Excavation work shall be performed in accordance with approved progress schedule.

PART 2 PRODUCTS

2.01 GEOTEXTILE

A. Geotextile to be placed at the limits of excavations shall be a polyester or polypropylene nonwoven fabric, having a minimum weight of seven ounces per square yard.

PART 3 EXECUTION

3.01 PREPARATION

A. Provide temporary erosion and sediment controls as specified in Section 01575.

B. Clear vegetation as specified in Section 02230.

C. Construct temporary sediment drainage beds in SWMU 6 East as specified in Section 02165, unless otherwise approved by the Engineer.

D. Contractor's RLS shall stake excavation corners indicated on the Drawings. Protect and preserve the survey stakes during the Work.

3.02 EXCAVATION

A. Excavate contaminated sediments from the primary drainage channel in SWMU 6 East along the alignment and length indicated on the Drawings. Sediments and roots of vegetation shall be excavated to a depth of five feet below existing grade (measured from top of channel side slope) and to a width of 10 feet centered on the approximate centerline of the channel.

B. Contractor shall provide bypassing of drainage channel flows and remove standing water as specified in Section 02245 and dewatering of excavations as specified in Section 02240.

C. Excavate and remove existing soils for the utility trenches to the dimensions and alignments indicated on the Drawings. Place excavated soils on-site as specified in subsection 3.05 of this Section.

3.03 PLACEMENT OF SEDIMENT IN DRAINAGE BEDS

A. Contaminated sediments excavated from the drainage channel in SWMU 6 East shall be loaded directly into transport vehicles and moved to the temporary sediment drainage beds, unless otherwise approved by the Engineer.

B. Procedures for placement of sediments into the drainage beds are specified in Section 02165.

3.04 ON-SITE LOADING AND HAULING

A. Prepare and load all trucks for transport of excavated sediment and other contaminated materials to the temporary drainage beds in compliance with all applicable health and safety regulations.

B. Load all trucks carefully to prevent spills. If required, spread polyethylene sheeting over an area sufficient for truck loading.

C. Clean up sediment and other contaminated materials that are spilled onto the ground surface during transport to the drainage beds. Spilled materials and impacted soil shall be removed and placed into the drainage beds.

3.05 PLACEMENT OF EXCAVATED UTILITY TRENCH SOIL

A. Excavated soil shall be placed on the ground surface adjacent to the excavations. Uniformly spread the soil in lifts not exceeding eight inches thickness, loose measure.

B. Compact the excavated soil by applying at last two coverages with compaction equipment or as otherwise required to provide a stable subgrade for Soil Cover construction as determined by the Engineer.

C. Placement of backfill in utility trenches is specified in Section 02318.

END OF SECTION

SECTION 02120
OFF-SITE TRANSPORTATION AND DISPOSAL

PART 1 GENERAL

1.01 SUMMARY

A. Section includes loading, transportation and disposal of demolition debris, sediment dewatering waste, excavated contaminated sediments, and other waste materials.

B. Related Sections:

1. Section 02110 – Excavation of Contaminated Materials

2. Section 02165 – Temporary Sediment Drainage Beds

1.02 SUBMITTALS

A. Submit the following to the Engineer for review prior to commencing the Work:

1. Information on proposed truck haul routes.

2. Written certification for vehicle weight scales used for measurement of quantities of materials transported to disposal facilities.

3. List of proposed waste haulers, and copies of all necessary permits and certifications, including haul route permits.

4. Identity (name), location and regulatory status of proposed off-site disposal facilities, copies of all necessary permits and certifications, and identification of haul route to each facility.

B. Submit results of analysis of contaminated sediments and dewatering waste for disposal, and copies of manifests.

C. Submit written certifications of proper transport and final disposal of wastes within ten working days after receipt of certifications by the Contractor.

1.03 DEFINITIONS

A. "Waste materials" shall mean: all debris resulting from demolition; excavated contaminated sediments; dewatering waste from temporary sediment drainage beds; sediment drainage bed geosynthetic construction materials that have contacted sediment or sediment drainage water; cleared vegetation; and spent PPE.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 PREPARATION FOR TRANSPORT

A. Retain an approved licensed/permitted waste transporter to transport waste materials to approved off-site disposal facilities.

B. Supply the Engineer with adequate information concerning the regulatory status of the Contractor's proposed disposal facilities.

3.02 LOADING

A. Prepare and load all trucks for transport and disposal of waste materials as specified in the following paragraphs.

B. Coordinate with the selected waste hauler to furnish all vehicles required for transportation of waste materials from the Site.

C. Visually inspect and decontaminate the exterior of all vehicles in compliance with all applicable regulations.

D. Coordinate loading operations and hours with the operating hours of the disposal facilities.

E. Load all trucks carefully to prevent spills. Stage trucks so that spills will be contained within the SWMU areas and easily removed. If required, spread polyethylene sheeting over an area sufficient for truck loading.

F. Contractor shall be solely responsible for proper loading of, and abiding by the load limits and weight limits for, all vehicles leaving the Site. All fines, taxes, penalties or judgments resulting from overweight or improperly loaded vehicles shall be the Contractor's responsibility.

G. Excavated sediments shall be loaded for transport to the Contractor's designated off-site disposal facility as soon as practical after completion of dewatering of each designated volume of sediment.

3.03 OFF-SITE HAULING

A. Transportation of waste materials shall be in compliance with all applicable regulations.

B. The possibilities of accidents and waste spillage or leakage during transportation shall be considered and addressed in the Contractor's Site-Specific Health and Safety Plan. In the event of a release or threatened release of hazardous substances outside SWMU 6 East, regardless of whether less than a reportable quantity is involved, Contractor shall immediately inform the Engineer.

C. Visually inspect each truck before it leaves the Site to ensure that the tailgate is secure and that the load is covered.

D. In the event that a loaded truck is involved in a wreck that results in a spill, the licensed waste hauler shall follow clean-up procedures approved by the authorities having jurisdiction. Contractor shall immediately inform the Engineer.

E. It is imperative that all haul routes be kept free of any contamination due to the Contractor's operations. Promptly clean up any spills on haul routes, if they occur, with suitable equipment at no cost to the Project.

F. Loaded trucks transporting contaminated sediments shall not leave the Site or be loaded within 30 minutes of the time that the off-site disposal facility closes for the day. Loaded trucks shall dump their loads in the off-site disposal facility the same day they are loaded.

3.04 TRANSPORTATION ROUTES

A. Identify the main roadways intended for hauling of materials and obtain any required permits.

B. Trucks and vehicles leaving the Site shall not leave any accumulations of mud or debris on public roads.

3.05 MANIFESTS

A. Contractor shall perform required sampling and testing to determine the regulatory status of contaminated sediments for disposal.

B. Contractor shall prepare manifests, and prepare necessary paperwork for transportation and disposal of waste materials.

C. All waste materials shall be manifested in accordance with applicable regulations. The manifests shall be based on waste profiles accepted at the disposal facility.

D. The manifests shall be submitted to the Engineer for Owner's signature.

3.06 TRANSPORTATION REGULATIONS

A. Obtain all required transportation permits for shipment of waste materials.

B. Transportation of waste materials shall be in accordance with applicable state, USDOT, and other applicable regulations including: 40 CFR 261, 262, 263; and 49 CFR 171 through 179.

3.07 DISPOSAL FACILITIES

A. Waste materials classified as hazardous waste shall be transported to an approved hazardous waste disposal facility complying with the requirements in paragraph 3.07.C.

B. Waste materials classified as non-hazardous waste shall be transported to an approved disposal facility complying with the requirements specified in paragraph 3.07.C.

C. Disposal facilities shall conform to applicable regulations for Subtitle C or Subtitle D facilities and shall be approved by the Owner and Engineer.

END OF SECTION

SECTION 02130
DECONTAMINATION

PART 1 GENERAL

1.01 SUMMARY

A. Section includes decontamination of vehicles, construction equipment and tools during performance of the Work.

B. Related Sections:

1. Section 01150 – Health and Safety

2. Section 02110 – Excavation of Contaminated Materials

3. Section 02120 – Off-Site Transportation and Disposal

1.02 SUBMITTALS

A. Submit, for Engineer's review, decontamination procedures as part of the Contractor's Site-Specific HASP specified in Section 01150. Provide the following information:

1. Number and locations of decontamination stations.

2. Procedures for decontamination of equipment.

3. Procedures for the collection, treatment, and disposal of decontamination water and residuals.

B. At each progress meeting, submit two copies of up-to-date Equipment Decontamination Log(s)

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 DECONTAMINATION STATIONS

A. Construct and maintain decontamination stations for vehicles, equipment and tools. The stations shall be constructed and equipped as required to retain and collect decontamination water and debris. The stations shall be properly identified and isolated from other areas.

3.02 DECONTAMINATION OF VEHICLES, EQUIPMENT AND TOOLS

A. Decontaminate all vehicles, equipment and tools used in the excavation, loading and hauling of contaminated materials prior to use in fill placement and grading activities and prior to removal from the Site.

B. Decontamination shall include removal of soil from the chassis (which includes undercarriage, suspension, and tire tracks) and other parts of vehicles and equipment as required.

C. Decontamination shall involve physical removal of contaminants using brushes, high-pressure water sprays or other suitable methods and tools to comply with applicable regulations.

D. Extreme care shall be taken while decontaminating vehicles and equipment to avoid contaminating personnel, other parts of the vehicle or equipment, or the surrounding areas. Personnel involved in vehicle and equipment decontamination shall be dressed in the appropriate level of PPE and shall follow all other applicable safety procedures.

E. All decontamination procedures involving sprays shall be performed in a bermed and lined area decontamination area. The decontamination area shall contain a sump to collect decontamination water.

F. Prevent contamination of haul trucks by loading vehicles in conformance with the requirements of Section 02110.

3.03 DISPOSAL OF DECONTAMINATION WASTE

A. Loose materials removed from vehicles and equipment by brushing shall be immediately collected by shoveling and sweeping and shall be loaded onto trucks for disposal.

B. Collect and dispose of decontamination water and waste in accordance with applicable regulations. Contractor shall properly document disposal.

C. At completion of removal and disposal of contaminated materials, materials used to construct the decontamination facilities shall be disposed as hazardous waste.

D. Transportation and disposal shall conform to the requirements of Section 02120.

3.04 DOCUMENTATION

A. Maintain Equipment Decontamination Log(s) to document that all vehicles and equipment utilized for excavation, loading and hauling of contaminated materials have been properly decontaminated and inspected prior to leaving the Site and prior to use in fill placement and grading activities.

END OF SECTION

SECTION 02165
TEMPORARY SEDIMENT DRAINAGE BEDS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Construction of temporary sediment drainage beds for sediments excavated from the primary drainage channel in SWMU 6 East.

2. Operation of sediment drainage beds, including placement of excavated sediments, management of liquids resulting from rainfall and sediment drainage, and removal of sediment from the drainage beds for disposal.

3. Removal and disposal of sediment drainage bed construction materials upon completion of sediment excavation and dewatering work.

B. Related Sections:

1. Section 02110 – Excavation of Contaminated Materials

2. Section 02120 – Off-Site Transportation and Disposal

3. Section 02230 – Site Clearing

4. Section 02352 – Geomembrane

5. Section 02353 - Geotextile

6. Section 02354 – Drainage Geocomposite

1.02 REFERENCES

A. "Standard Specifications for Highway Construction", 2002 Edition, Alabama Department of Transportation (ALDOT Specifications)

B. American Society for Testing and Materials (ASTM):

1. ASTM D 422, Standard Test Method for Particle-Size Analysis of Soils

2. ASTM D 2487, Standard Test Method for Classification of Soils for Engineering Purposes

1.03 SUBMITTALS

A. Submit the following to the Engineer, for review and approval, prior to shipment of the materials to the Site:

1. Written certification from the supplier for aggregate for Drainage Layer material for the drainage berm (if applicable).

2. Written test reports of all specified tests showing conformance of the materials with the specifications.

1.04 PROJECT CONDITIONS

A. The need for construction and use of temporary sediment drainage beds for dewatering of sediments prior to off-site disposal shall be determined by the Contractor. Contractor shall be responsible for determining the number, areal dimensions and location of drainage beds.

B. The procedures for placement and working of sediments within the drainage beds and the duration of time required for proper dewatering of sediments shall be the responsibility of the Contractor.

C. The extent of dewatering shall be based on the requirements of the disposal facility. Contractor shall be responsible for sampling and testing to determine the regulatory status of contaminated sediments for disposal as specified in Section 02120.

D. Work shall be performed in a manner that does not damage existing structures, monitoring wells, or other facilities not indicated to be removed.

E. Sediment drainage bed removal shall be completed prior to placement of soil cover in the area.

PART 2 PRODUCTS

2.01 SOURCE QUALITY CONTROL

A. Proposed materials and source of supply shall be approved by the Engineer as specified prior to delivery and use in the construction.

B. Testing of Imported Common Soil Fill:

1. Soil Classification (ASTM D 2487): Minimum of one test per borrow source and for each change in material.

C. Testing of Drainage Layer Material:

1. Grain Size (ASTM D 422) and Soil Classification (ASTM D 2487): Minimum of one test per borrow source for each change in material.

2.02 COMMON SOIL FILL

A. Common Soil Fill to be used for the drying bed subgrade and containment berms shall, to the extent practicable, be obtained at the sediment drainage bed locations by grading to produce balanced cut and fill. The soil shall be substantially free of roots and debris. Soil placed within six inches of the geomembrane subgrade shall be free of stones greater than 1/4-inch in dimension.

2.03 DRAINAGE LAYER MATERIAL

A. Drainage Layer material for the drainage berm shall consist of ALDOT Size No. 89 aggregate or clean sands (SW or SP as defined by the USCS). Aggregate gradation shall conform to the Coarse Aggregate Gradation Table in Subarticle 801.11(d) of the ALDOT Specifications. The soil shall be free of organic matter, with no more than five percent of the material (by weight) passing a No. 200 sieve.

2.04 GEOMEMBRANE

A. Specified in Section 02352.

2.05 DRAINAGE GEOCOMPOSITE

A. Specified in Section 02354.

2.06 GEOTEXTILE

A. Geotextile for drainage berm is specified in Section 02353.

PART 3 EXECUTION

3.01 SUBGRADE PREPARATION

A. Clear existing vegetation from drainage bed areas as specified in Section 02230.

3.02 SEDIMENT DRAINAGE BED GRADING

A. Construct each sediment drainage bed to the areal dimensions determined by the Contractor. Grade as required to provide the bottom slope shown on the Drawings.

B. Construct containment berms, water collection trenches and run-on control berms as shown on the Drawings.

C. The subgrade for the geomembrane shall be smooth and uniform, and free of all stones greater than 1/4-inch in dimension, trash and debris.

3.03 INSTALLATION OF GEOMEMBRANE AND DRAINAGE GEOCOMPOSITE

A. Install geomembrane over the completed and approved subgrade as specified in Section 02352 and as shown on the Drawings.

B. Install drainage geocomposite over the geomembrane as specified in Section 02354 and as shown on the Drawings.

3.04 CONSTRUCTION OF DRAINAGE BERM

A. Construct drainage berm in each sediment drainage bed as shown on the Drawings.

B. Install geotextile as specified in Section 02353.

3.05 EXCAVATION AND BACKFILLING OF ANCHOR TRENCHES

A. Excavate anchor trenches and install geomembrane in the trenches as shown on the Drawings.

B. Care shall be taken when backfilling the trenches to prevent any damage to the geomembrane. At no time, shall construction equipment come into direct contact with the geomembrane.

3.06 PLACEMENT OF SEDIMENT IN DRAINAGE BEDS

A. Excavate sediments as specified in Section 02110.

B. Place excavated sediment in sediment drainage beds by end dumping from transport vehicles.

C. Construct access ramps over the containment berms at locations selected by the Contractor. However, access ramps shall not be constructed over the drainage berm and shall not interfere with operation of the water collection trench. The access ramps shall be constructed of Common Soil Fill.

D. Movement of sediment in drainage beds shall be accomplished using trackhoes or other methods that do not involve equipment operating on or damaging the drainage geocomposite and geomembrane.

E. Sequence sediment placement in the two drainage beds to provide required time for sediment drainage and removal.

3.07 REMOVAL OF SEDIMENT FROM DRAINAGE BEDS

A. Sediment that is ready for removal from the drainage beds as determined by the Contractor shall be loaded directly into transport vehicles for off-site treatment and disposal as specified in Section 02120.

B. Sediment removal shall be accomplished in a manner that will not damage the drainage geocomposite, geomembrane and geotextile (geosynthetics). Replace all damaged materials at no cost to the Owner or Engineer.

C. As the final sediment is removed from the drainage beds, soil used for access ramp construction inside the top of containment berms shall be removed with the sediment.

3.08 MANAGEMENT OF DEWATERING WASTE

A. All liquids and debris that collect in the water collection trenches and sediment drainage beds, both as a result of precipitation and draining from the excavated sediment, shall be managed and disposed of by the Contractor.

B. Pumps shall be placed in the low point of each water collection trench and operated to transfer liquids from the trench to portable storage tanks. The pumps shall be operated as necessary on a 24-hour basis after excavated sediment is placed in the drainage beds to prevent liquids from overflowing the water collection trenches.

C. Remove sediment and other waste materials from the collection trenches.

D. All liquids removed from the trenches shall be: disposed off-site as specified in Section 02120; or treated, analyzed and discharged on-site. On-site shall conform to Owner's requirements and applicable regulations.

E. Sediment and other waste materials removed from the trenches shall be disposed off-site with other excavated sediment.

3.09 REMOVAL OF SEDIMENT DRAINAGE BEDS

A. Remove the sediment drainage bed construction materials after the final sediment, dewatering liquids and debris have has been removed.

B. The geosynthetics shall be removed, loaded into transport vehicles and disposed as hazardous waste in accordance with the requirements of Section 02120.

C. Removal of geosynthetics shall be accomplished so that any remaining sediment is not spilled onto the ground surface. If such spillage does occur, the spilled sediment and impacted soil shall be removed and disposed with the other sediment drainage bed materials.

D. The sediment drainage bed berms and trenches shall be graded to restore the area to the approximate preconstruction elevations.

END OF SECTION

SECTION 02220
DEMOLITION

PART 1 GENERAL

1.01 SUMMARY

A. Section includes demolition and removal of structures indicated on the Drawings, including the following:

1. Four wastewater pretreatment tanks, piping and appurtenances in SWMU 1
2. Concrete slabs, walls and foundations
3. Storage shed adjacent to tanks
4. Chain link fencing
5. Storm water piping and other subsurface utilities
6. Concrete structures at wells to be abandoned

B. Related Sections:

1. Section 01500 – Temporary Facilities and Controls
2. Section 02120 – Off-Site Transportation and Disposal

1.02 SUBMITTALS

A. Submit to the Engineer written certification that the tanks and appurtenances are removed and disposed in accordance with all applicable permits, safety rules and regulations.

B. Submit to the Engineer written certification that all liquids and residues resulting from tank cleaning are removed and disposed in accordance with all applicable permits, safety rules and regulations

1.03 QUALITY ASSURANCE

A. Conform to applicable local, state, and federal regulations (including 29 CFR 1926, Part T – Demolition) related to operation of equipment and tools, protection of persons and property, and environmental controls.

B. Cleaning, handling, and removal of tanks and appurtenances shall be performed under qualified supervision by experienced personnel aware of and familiar with the hazards to public safety and the environment. The Contractor shall locate demolition equipment and tools to prevent hazardous material release.

C. It is essential that all personnel working on tank demolition understand the need for careful planning of the job, be briefed as to procedures to be followed in accomplishing the stated goals, and follow precautionary measures and procedures as outlined in this specification and applicable regulatory guidance documents. Personnel working on the project shall be informed on the specific properties, characteristics, and potential hazards associated with the liquids, residues, and tank system materials.

1.04 PROJECT CONDITIONS

A. Work with Engineer [and Owner] to coordinate schedule for demolition and removals.

B. During demolition and removal, use all procedures necessary to assure that no portion of the structures, either that to be removed or to remain, become a hazard to persons by instability or other condition.

C. Notify all federal, state, and local agencies and complete all necessary forms required for tank removals.

D. Obtain all necessary permits and licenses to accomplish the removal, transportation and disposal of the tanks and related components and residual liquids and waste. Furnish a copy of all licenses and permits to the Engineer before starting tank demolition work.

E. The following is a description of the four wastewater pretreatment tanks to be demolished in SWMU 1:

1. Three of the tanks (T-1, T-2 and T-3) are upright steel cylinders with storage capacity of approximately 17,000 gallons each.

2. Tank T-4 is an upright steel cylinder with storage capacity of approximately 5,000 gallons.

3. The tanks have apparently been cleaned and are empty except for apparent rainwater and some residue. The tanks are open to the atmosphere and do not contain significant volumes of waste.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 PREPARATION

A. Protect existing structures, utilities, monitoring wells, fences and all other facilities that are not designated to be demolished or removed.

B. A site review shall be performed prior to removal of the existing tank system. The review shall include, but is not to be limited to, the following:

1. Review "as built" construction drawings if available;

2. Locate all tanks, dispensers, and associated product and vent lines to be removed;

3. Locate nearby underground utility lines or conduits; and

4. Observe and maintain site drainage conditions.

C. Limits of the work area, including temporary stockpile area(s), will be designated by the Engineer or Owner prior to beginning any work.

D. Prepare a safe work area by eliminating all potential sources of ignition during the tank purging and cleaning operation in accordance with the federal, state and local governmental agency requirements. This shall include as a minimum:

1. "No Smoking" signs;

2. Shut-down of all flame and spark producing equipment within 50 feet;

3. Use of non-sparking tools; and

4. Controlling static electricity.

E. Barricade the work area from pedestrian and vehicular traffic. Post "No Trespassing" and other necessary warning signs around the work site during the entire duration of construction. Maintain barricades and signs during the construction period.

F. Locate all utility lines in the vicinity of the tanks on site. However, the Contractor shall be aware that utility lines are still in the ground and shall take precautions on encountering such utility lines that their disturbance or removal shall not endanger personnel or equipment at the facility.

G. Check the weather conditions prior to tank or content removal to ensure that safe conditions will exist for work activities.

H. All personnel shall wear proper personal protective equipment during the working period. Explosimeters or combustible gas indicators and oxygen meters shall be readily available and shall be used frequently.

I. No person shall enter any tank during the performance of this Contract without written acknowledgement from the Owner and Engineer. If tank entry is required, proper OSHA Confined Space Entry Procedures shall be followed.

3.02 TANK CLEANING

A. Drain product piping into the tanks to avoid any spillage. Cap and remove product piping in tank area.

B. Liquids and residues shall be removed from the tanks using explosion-proof or air-driven pumps. Pump motors and suction hoses shall be bonded to the tanks or otherwise grounded to prevent electrostatic ignition hazards. The use of a hand pump may be required to remove the final liquids from the bottom of the tanks. If a vacuum truck is used for removal of liquids or residues, the area of operation for the vacuum truck shall be vapor free. The truck shall be located upwind from the tanks and outside the path of probable vapor travel. Vacuum pump exhaust gases shall be discharged through a hose of adequate size and length downwind of the truck and tank area.

C. All liquids and residues removed from the tanks shall be handled in accordance with appropriate federal, state and local regulations. [The liquids and residues are classified as hazardous wastes.]

D. Decontaminate tanks using steam cleaning or other appropriate methods in compliance with applicable regulations.

3.03 REMOVAL OF PIPING AND ACCESSORIES

A. Remove all exposed connective piping, accessories, tank appurtenances and fixtures. Dispose of materials as specified in subsection 3.08.

3.04 VAPOR-FREEING

A. A combustible gas indicator shall be provided and used to assess vapor concentration in the tank pit and work area. Precautions shall be taken to:

1. Eliminate all potential sources of ignition from the area (smoking materials, nonexplosion-proof electrical and internal combustion equipment, open flame and other spark-producing equipment),

2. Use explosion-proof electrical equipment in accordance with NFPA 70B Class I, Division I, Group D, or other approved equipment for use in potentially explosive atmospheres,

3. Prevent the discharge of static electricity during the venting of flammable vapor, and

4. Prevent the accumulation of vapors at ground level.

B. All vapors shall be vented from the tanks at a minimum height of 12 feet above grade and three feet above any adjacent roof lines until the tanks are purged of flammable vapors.

C. Freeing of flammable tank vapor shall be performed as required by [applicable codes]. Vapor or fumes should be removed from the tanks until an acceptable reading has been taken with a [combustible gas indicator below the 20 percent lower explosive limit or as otherwise dictated by local fire code regulations].

3.05 TANK DEMOLITION

A. After vapor-freeing and before tank removal, all accessible holes shall be plugged or capped. One plug shall have a one-eighth inch vent hole to prevent excessive differential pressure within the tank caused by temperature changes. The tank shall be positioned with this vent plug on top of the tank during subsequent transport and storage.

B. After each tank has been cleaned and purged to remove residual hazardous vapors, it shall be rendered unsuitable for future use as a storage tank by puncturing or cutting, and as otherwise required by regulations.

C. If tanks are to be cut up for removal, cutting shall not commence until flammable vapors or fumes have been removed and an acceptable reading has been taken with a [combustible gas indicator (below the 20 percent lower explosive limit or local fire code regulation)]. A non-flammable atmosphere shall be maintained in the tanks until the tanks can be cut up for disposal.

D. Tanks shall be disposed as specified in the following subsection 3.08 as promptly as possible after vapor-freeing procedures have been completed.

3.06 REMOVAL OF CHAIN LINK FENCING

A. Remove fencing (including fabric, posts and accessories) at locations indicated on the Drawings.

B. Remove fence posts and concrete footings to full depth.

3.07 DEMOLITION OF OTHER STRUCTURES

A. Demolish and remove shed and other buildings down to grade, including all interior debris, building structure and components.

B. Break up and remove all structural concrete slabs, walls, tank foundations within the designated demolition area using suitable equipment.

C. Remove the abandoned railroad tracks to the required limits at the locations indicated on the Drawings. Remove rails, ties and all track accessories.

3.08 REMOVAL OF SUBSURFACE UTILITIES

A. Remove all existing underground pipelines within the construction limits indicated on the Drawings.

B. Excavate and remove all storm water piping and inlets.

C. Cap all sanitary sewer, gas and potable water lines. Capping of pipelines shall be performed in accordance with local codes and utility requirements.

3.09 DISPOSAL OF REMOVED MATERIALS

A. Load and transport removed materials and dispose at an approved off-site disposal facility as specified in Section 2120.

B. Collect and dispose of liquids and debris resulting from tank cleaning in accordance with all applicable federal, state and local environmental regulations.

C. Disposal of removed tanks shall comply with all applicable federal, state and local regulations. The removed tanks and accessories shall be disposed at an approved off-site disposal facility within 21 days of tank system demolition.

END OF SECTION

SECTION 02230
SITE CLEARING

PART 1 GENERAL

1.01 SUMMARY

A. Section includes clearing, grubbing and disposal of vegetation.

B. Related Sections:

1. Section 01575 – Temporary Soil Erosion and Sediment Control

2. Section 02120 – Off-Site Transportation and Disposal

1.02 PROJECT CONDITIONS

A. Implement temporary erosion and sediment control measures specified in Section 01575.

B. Site clearing shall be performed in a manner that does not damage existing structures, monitoring wells, recovery wells, or other facilities not indicated to be removed.

C. Perform work in accordance with applicable health and safety regulations.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 CLEARING OF VEGETATION

A. Remove exposed vegetation from within the limits of construction as defined on the Drawings and in accordance with the following paragraphs.

B. Cut and remove trees, brush, grass and other vegetation down to the existing ground surface. Dispose of cleared vegetation off-site as specified in subsection 3.03.

C. All soil adhering to plant material shall be removed prior to off-site disposal. Disturbance of the ground surface within the limits of the SWMUs during removal of vegetation shall be minimized to the extent practicable.

3.02 GRUBBING

A. Remove roots of all vegetation (including tree stumps) to a minimum depth of one foot below existing grade, or the proposed final graded elevation, whichever is lower.

3.03 DISPOSAL OF VEGETATION

A. Cleared vegetation that is removed above the ground surface shall be transported off-site and disposed in accordance with all applicable regulations as specified in Section 02120.

B. Roots of vegetation that are removed from the SWMU 4, 5 and 8 area shall be chipped on site and placed within the limits of the Soil Cover.

C. Roots of vegetation that are removed from the SWMU 6 East area shall be transported off-site for disposal in accordance with all applicable regulations as specified in Section 02120. If Engineer allows, material may be chipped and spread on site.

D. Roots of vegetation that are removed from the SWMU 6 West area may be chipped and placed within the limits of SWMU 6 West.

E. Chipped materials shall be uniformly spread on the existing ground surface to a maximum depth of 12 inches and compacted as much as practicable

F. Burning of cleared vegetation will not be permitted.

END OF SECTION

SECTION 02240
DEWATERING

PART 1 GENERAL

1.01 SUMMARY

A. Section includes dewatering requirements for removal of water from excavations.

1.02 DESIGN REQUIREMENTS

A. Contractor shall be responsible for the design of all temporary dewatering systems.

B. Dewatering systems shall be designed to provide a working area free of standing water until construction is completed in each excavation. Water shall be pumped, drained by gravity or removed by other means [, and stored, analyzed,] and discharged as specified in this Section.

C. The extent of control of water includes, but is not limited to:

1. Furnishing, installing and operating all necessary pumps, piping and accessories.

2. Removing such temporary works and equipment after they have served their purpose.

1.03 QUALITY ASSURANCE

A. The Contractor shall have demonstrated experience in dewatering operations of the type required in the proposed work.

1.04 SUBMITTALS

A. Submit a plan for control of water to the Engineer for review.

B. The plan shall indicate: method of dewatering to be used; location of sumps and pumps as applicable; and how water will be discharged.

1.05 PROJECT CONDITIONS

A. Some subsurface information has been obtained and is available for review by the Contractor. Contractor is responsible for determining the character of materials, extent of water or other conditions to be encountered. No warranty, either expressed or implied, is made as to the accuracy of the subsurface information presented by the Owner and Engineer.

1.06 COORDINATION

A. Dewatering work shall be coordinated with other phases of the Work to comply with the approved schedule, to provide required conditions for stability of excavation, control of water during excavation activities, and proper disposal of removed water as specified.

PART 2 PRODUCTS

2.01 EQUIPMENT

A. Provide and maintain at all times proper and approved pumping machinery of sufficient capacity to meet the maximum requirements for the removal of water from excavations as specified.

B. Keep on hand, or have immediate access to, additional pumps of sufficient capacity to provide reasonably for any breakdown or to dewater the work in case of flooding.

C. Sufficient suction and discharge hose or piping shall be available for adequate disposal of pumped liquids without causing erosion, sedimentation or other adverse consequences.

PART 3 EXCAVATION

3.01 DEWATERING

A. [Water encountered during excavations shall be lowered to a depth of approximately two feet below proposed excavation bottom.]

B. Dewatering shall be accomplished using [pumping from a perimeter ditch located around the perimeter of the excavation]. [Pumping directly from excavation bottom shall not be permitted].

C. Maintain and operate the dewatering equipment until excavation of materials, and placement and compaction of backfill is complete.

D. Removal of liquids shall not interfere with other work.

E. Provide erosion and sediment control necessitated by the liquids removal operations.

3.02 HANDLING OF LIQUIDS

A. All water removed during dewatering operations shall be [collected, stored, analyzed and] discharged to [_____] using approved equipment and methods.

B. [Perform all necessary analyses on samples of liquids for the purpose of characterization prior to disposal.]

C. Coordinate with the Owner prior to discharge of water. [Sediment shall be minimized as much as possible, however filtration will not be required.]

3.03 REMOVAL OF DEWATERING SYSTEM

A. At completion of backfilling, the dewatering system shall be deactivated and removed.

B. Prior to removal from site, all components of the dewatering system shall be decontaminated by steam cleaning on [the Owner's decontamination pad].

C. Water from decontamination activities will be collected [in the existing sump for treatment by the Owner]. Coordinate with the Owner prior to discharge of water. [Sediment shall be minimized as much as possible, however filtration will not be required.]

END OF SECTION

SECTION 02245
SURFACE WATER HANDLING

PART 1 GENERAL

1.01 SUMMARY

A. Section includes requirements for handling of surface water flows and removal of water from drainage channels within the limits of cover construction as required for sediment excavation, backfilling and cover construction.

B. Related Sections:

1. Section 02110 - Excavation of Contaminated Sediments

2. Section 02165 – Temporary Sediment Drainage Beds

3. Section 02318 – Fill Placement and Grading

1.02 PERFORMANCE REQUIREMENTS

A. Bypass pumping or diversion systems for all drainage channels shall be designed to provide, until completion of the Work, a working area free of standing water, and proper discharge of the removed water.

1.03 QUALITY ASSURANCE

A. Handling of water shall be in conformance with the requirements of the [____ Stormwater Management Plan].

1.04 PROJECT CONDITIONS

A. Some information is available for review by the Contractor, including information on drainage channel flows, and other related data. Contractor is responsible for determining the character of materials, surface water flows and other conditions to be encountered. No warranty, either expressed or implied, is made as to the accuracy of the information presented by the Owner and Engineer.

1.05 COORDINATION

A. Control of water shall be coordinated with other phases of the Work to comply with the approved schedule, to provide required conditions for bypassing of flows, and proper disposal of removed water as specified.

B. Removal of water from the drainage channels shall be coordinated with excavation of sediments (specified in Section 02110) and placement of fill (specified in Section 02318).

PART 2 PRODUCTS

2.01 EQUIPMENT AND MATERIALS

A. Provide and maintain at all times proper pumps, piping, and other equipment and structures of sufficient capacity to meet the requirements for the handling of drainage channel flows and removal of water as necessary for sediment excavation in the primary drainage channel in SWMU 6 East and for backfilling of all drainage channels.

B. In addition to the requirement for pumping capacity to handle drainage channel flows, keep on hand, or have immediate access to, additional pumps of sufficient capacity to reasonably provide for any equipment breakdown.

C. Sufficient filters and screens shall be provided for adequate intake and discharge of pumped liquids without causing excess turbidity values, erosion, sedimentation or other adverse consequences.

D. Piping, hoses, fittings and valves shall be of sufficient length and size to convey and discharge drainage channel flows and accumulated standing water to downstream sections [and to convey standing water removed from drainage channel to _____]. Fittings shall be equipped with seals to prevent leaks.

PART 3 EXECUTION

3.01 PREPARATION

A. Implement and maintain controls to minimize erosion and to contain sediment resulting from removal of water from the drainage channels and discharge of water into the downstream section of each drainage channel.

B. Contain and remove surface runoff discharging into the section of drainage channel from which sediments will be excavated or backfill will be placed.

3.02 BYPASSING OF DRAINAGE CHANNEL FLOWS

A. Provide continuous bypassing of drainage channel flows until completion of backfilling and cover construction activities.

B. Pump intakes shall be constructed and positioned at a suitable upstream location in each drainage channel in such a manner that excess sediment will not be drawn into the pipeline and transported downstream. Install structures or devices to stabilize the intake, and install filters and screens as necessary to minimize sediment transport.

C. Furnish and install pumps and piping sized to handle the design flow.

D. The discharge end of piping shall be installed at a location downstream of the area of cover construction in such a manner that soil erosion is minimized and pipe is stabilized.

3.03 REMOVAL OF STANDING WATER IN DRAINAGE CHANNELS

A. Upon initiation of drainage channel flow bypassing, accumulated free-standing water shall be removed as specified in this subsection.

B. Pumps shall be capable of operating continuously during initial drawdown of standing water and during drawdown after storm events.

C. Pump intakes and discharge lines shall be constructed and positioned in such a manner that excess sediment will not be transported to the downstream discharge points. Install structures or devices to stabilize the intake and discharge points, and install filters and screens as necessary to minimize sediment transport.

3.04 REMOVAL OF WATER FROM DRAINAGE CHANNEL SEDIMENTS

A. Dewatering of excavated sediments shall be performed as specified in Section 02165.

3.05 SITE CLEAN-UP AND REMOVAL OF EQUIPMENT AT COMPLETION

A. Remove all dewatering equipment, piping and other materials used in the flow diversion operations upon completion of the cover construction.

END OF SECTION

SECTION 02317
TRENCHING AND BACKFILLING

PART 1 GENERAL

1.01 SUMMARY

A. Section includes excavation, backfill and compaction for the installation of underground pipelines.

B. Related Sections:

1. Section 2240 - Dewatering

2. Section 02318 – Fill Placement and Grading

3. Section 02630 – Storm Drainage System

4. Section 02692 – Ground Water Treatment System Buried Piping

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM).

1. ASTM D 698, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort

2. ASTM D 1556, Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method

3. ASTM D 2487, Standard Test Method for Classification of Soils for Engineering Purposes

4. ASTM D 2937, Standard Test Method for Density of Soil in Place by the Drive-Cylinder Method

1.03 SUBMITTALS

A. Submit reports of all specified tests showing conformance of the materials and constructed work with the specifications. Submit test results within three days after samples are obtained.

1.04 QUALITY CONTROL

A. The QC Firm shall perform specified tests to determine conformance of the materials and constructed work with the Specifications.

1.05 PROJECT CONDITIONS

A. The Contractor is solely responsible for excavation slope stability. Excavation work shall be in compliance with applicable OSHA regulations.

B. Work will involve the handling of materials that are potentially harmful to the health and safety of construction personnel. Perform work in compliance with applicable OSHA regulations.

PART 2 PRODUCTS

2.01 SOURCE QUALITY CONTROL

A. Proposed materials shall be approved by the Engineer as specified, prior to delivery and use of the materials in the construction.

2.02 PIPE BEDDING MATERIAL AND INITIAL TRENCH BACKFILL

A. Shall be sand or fine gravel, having characteristics consistent with SW, SP, GW or GP soils as defined by the Unified Soil Classification System (USCS), and shall be substantially free of sharp edges or corners, and debris. Maximum particle size shall be 3/8-inch or less.

B. Testing of Bedding Material and Initial Trench Backfill:

1. Soil Classification (ASTM D 2487): Minimum of one test for each visible change in material, in the judgment of the Engineer.

2.03 FINAL TRENCH BACKFILL

A. Final trench backfill for storm drainage piping in SWMU 6 West shall consist of soil excavated from the trench that is free of roots, trash, and rocks larger than one inch in greatest dimension.

B. Material specifications and testing requirements for Final Trench Backfill in pipe trenches for recovery system piping and ground water treatment system effluent piping shall conform to the requirements for Soil Fill in Section 02318.

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

A. Testing of Final Trench Backfill for Recovery System Piping and Treatment System Effluent Piping:

1. In-Place Density (using ASTM D 1556 or D 2937): Minimum of one test for every 24 inches (vertically) of backfill placed or fraction thereof, and for every 100 feet of trench, or fraction thereof.

3.02 TRENCH EXCAVATION

A. Trenches shall be excavated to the dimensions shown on the Drawings, and as indicated in the following paragraphs.

B. The depth of trench excavation for storm drainage piping and ground water treatment system effluent piping shall be as required to provide the invert elevations indicated on the Drawings. Excavate trenches to the minimum width necessary for proper installation of the piping, and in compliance with OSHA regulations regarding trench excavation. Accurately grade the bottom to provide uniform bearing for the pipe.

C. Trenches for recovery system piping shall be excavated to the dimensions shown on the Drawings.

D. If existing material below the trench bottom grade is unsuitable for properly laying pipe (such as excessively soft soil and saturated soil) as determined by the Engineer, excavate and remove the unsuitable material to a depth of approximately four inches and replace the same with Pipe Bedding Material (meeting the qualifications of subsection 2.02) properly compacted to produce a firm and even bearing surface.

E. Removal of materials beyond the indicated subgrade elevations, without authorization by the Engineer, shall be classified as unauthorized excavation and shall be backfilled and compacted at no additional cost to the Owner.

F. Remove water from the excavations as required for installation of piping and placement of backfill as specified in Section 02240. Remove saturated soil as specified in paragraph 3.02.D above.

3.03 PIPE INSTALLATION

A. Engineer must approve pipe bedding prior to placement of piping.

B. Installation of all pipe and appurtenances shall be subject to the review of the Engineer.

C. Install piping as shown on the Drawings and as specified in Sections 02630 and 02692.

3.04 BACKFILLING AND COMPACTING

A. Do not completely backfill trenches until the piping system as installed conforms to the specifications.

B. Place Initial Trench Backfill around and over piping in layers not exceeding six inches loose thickness. Pipe bedding shall be placed on both sides of the pipe at the same time and to approximately the same elevation. Each layer shall be thoroughly compacted using manually-guided compaction equipment.

C. Final Trench Backfill shall be placed in layers not exceeding 12 inches loose thickness up to existing grade.

D. For ground water treatment system effluent piping, Final Trench Backfill shall be compacted to achieve at least 95 percent of the material's maximum dry density as determined by ASTM D 698. Backfill placed within 12 inches of the subgrade elevation for pavement reconstruction shall be compacted to a minimum of 98 percent of the material's maximum dry density as determined by ASTM D 698

E. Final Trench Backfill for recovery system piping shall comply with the compaction requirements for Soil Fill in Section 02318. Final Trench Backfill for storm drainage piping shall be compacted as required to provide a stable base of subsequent fill placement.

F. Compaction of initial and final trench backfill shall be performed in a manner that does not damage the pipe. Pipe that is damaged shall be replaced at the Contractor's expense.

G. Construction traffic shall not be allowed to cross installed pipelines prior to placement of and compaction of the full depth of cover.

H. Materials not meeting density specification requirement shall be scarified, recompacted and retested at Contractor's expense.

3.05 DISPOSAL OF MATERIAL

A. Excess and unsuitable materials shall be uniformly spread over the ground surface adjacent to the backfilled trenches as approved by the Engineer.

END OF SECTION

SECTION 02318
FILL PLACEMENT AND GRADING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Placement and compaction of backfill in the SWMU 6 East primary drainage channel after removal of contaminated sediments

2. Placement and compaction of backfill in the excavated utility trenches and excavations resulting from removal of existing storm sewer piping

3. Placement of soil fill and grading of subgrade for the asphalt cover in SWMU 6 West

4. Grading and construction of new diversion channel in SWMU 6 East

5. Placement, compaction and grading of Soil Fill as part of the Soil Cover in SWMU 6 East and SWMUs 4, 5 and 8

6. Placement of Topsoil as part of the Soil Cover in SWMU 6 East and SWMUs 4, 5 and 8

7. Grading and placement of aggregate base for ground water treatment system concrete containment structure

B. Related Sections:

1. Section 01722 – Construction Surveying

2. Section 02110 – Excavation of Contaminated Materials

3. Section 02165 – Temporary Sediment Drainage Beds

4. Section 02220 - Demolition

5. Section 02230 – Site Clearing

6. Section 02352 – Geomembrane

7. Section 02373 – Erosion Control Matting

8. Section 02374 - Riprap

9. Section 02526 – Well Abandonment

10. Section 02630 – Storm Drainage System

11. Section 02926 - Seeding and Mulching

12. Section 02927 - Sodding

1.02 REFERENCES

A. "Standard Specifications for Highway Construction", 2002 Edition, Alabama Department of Transportation (ALDOT Specifications)

B. American Association of State Highway and Transportation Officials (AASHTO):

1. AASHTO M145, Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes

2. AASHTO T89, Determining the Liquid Limit of Soils

3. AASHTO T90, Determining the Plastic Limit and Plasticity Index of Soils

4. AASHTO T180, Moisture-Density Relations of Soils Using a 10-lb. Rammer and an 18-in. Drop

C. American Society for Testing and Materials (ASTM):

1. ASTM D 1556, Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method

2. ASTM D 1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort

3. ASTM D 1883, Standard Test Method for CBR (California Bearing Ratio) of Laboratory-Compacted Soils

4. ASTM D 2216, Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock

5. ASTM D 2487, Standard Test Method for Classification of Soils for Engineering Purposes

6. ASTM D 2922, Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

7. ASTM D 2974, Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils

8. ASTM D 3017, Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)

9. ASTM D 4318, Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

10. ASTM D 4972, Standard Test Method for pH of Soils

1.03 SUBMITTALS

A. Submit written reports of all specified tests showing conformance of the materials and constructed work with the Specifications. Submit test results within five days after samples are obtained.

B. Submit product data for utility trench markers showing conformance with the Specifications.

C. Submit record survey drawing of completed Soil Cover in each SWMU area, adjacent graded areas, and limits of utility trenches as specified. Survey data and record drawings shall be prepared by a Registered Land Surveyor as specified in Section 01722.

1.04 QUALITY ASSURANCE

A. The QC Firm shall perform specified tests to determine conformance of the materials and constructed work with the Specifications.

B. Record surveys shall be performed by the Registered Land Surveyor as specified in this Section.

1.05 DELIVERY, STORAGE AND HANDLING

A. Soil Fill and Topsoil meeting different specifications shall be stockpiled separately and shall be adequately protected to preserve the fitness and quality of the materials.

1.06 PROJECT CONDITIONS

A. Work shall be performed in a manner that does not disturb newly installed and existing recovery and monitoring wells, utilities structures and other facilities not indicated to be removed.

1.07 COORDINATION AND SCHEDULING

A. The following work activities shall be completed prior to placement of backfill in excavations, subgrade preparation for concrete containment structure, and placement of soil fill in each SWMU area that is affected by the activity:

1. Clearing of vegetation (specified in Section 02230)

2. Abandonment of designated existing wells (specified in Section 02526)

3. Demolition and removal of designated structures (specified in Section 02220)

4. Excavation, dewatering and removal of contaminated sediments from the primary drainage channel in SWMU 6 East and removal of sediment drainage beds (specified in Sections 02110 and 02165).

5. Excavation of utility trenches and on-site placement of excavated materials (specified in Section 02110)

6. Installation of storm drainage piping and inlets in SWMU 6 West (specified in Section 02630)

PART 2 PRODUCTS

2.01 SOURCE QUALITY CONTROL

A. Proposed materials and source of supply shall be approved by the Engineer as specified prior to delivery and use in the construction.

B. Testing of Proposed Soil Fill Material (for Engineer's approval of borrow source):

1. Soil Classification (AASHTO M145): Minimum of one test per borrow source.

2. Laboratory Moisture Content (ASTM D 2216): Minimum of one test per borrow source.

3. Atterberg Limits (ASTM D 4318 or AASHTO T89 and T90): Minimum of one test per borrow source.

4. Moisture-Density Curve (ASTM D 1557 or AASHTO T180): Minimum of one test per borrow source.

5. Soaked California Bearing Ratio (CBR) (ASTM D 1883): Minimum of one test per borrow source

C. Testing of Proposed Topsoil Material (for Engineer's approval of borrow source):

1. Soil Classification (ASTM D 2487): Minimum of one test per borrow source.

2. Laboratory Moisture Content (ASTM D 2216): Minimum of one test per borrow source.

3. Atterberg Limits (ASTM D 4318 or AASHTO T89 and T90): Minimum of one test per borrow source.

4. Organic Content (ASTM D 2974): Minimum of one test per borrow source.

5. pH (ASTM D 4972): Minimum of one test per borrow source.

D. Chemical Analyses of Proposed Soil Fill and Topsoil Materials:

1. A minimum of one sample per borrow source shall be obtained by the [Contractor and delivered to the Engineer] for laboratory analytical testing. The testing laboratory will analyze for [_____].

2.02 GRAVEL

A. Gravel to be installed as part of the diversion channel lining system shall consist of sound, durable, naturally rounded rock (river gravel). Crushed stone or crushed gravel will not be acceptable. Gradation shall be as specified in the Coarse Aggregate Gradation Table in Subarticle 801.11(d) for Size Number 4 aggregate as summarized in the following table:

Sieve Size	Percent Passing, by Weight
2 inch	100
1 1/2 inch	90 - 100
1 inch	20 – 55
3/4 inch	0 – 15
3/8 inch	0 - 5

2.03 SOIL FILL

A. Soil Fill shall not contain concentrations of chemical parameters for which the soil is analyzed that are above natural background levels, as determined by the Engineer. No fill material shall be used without prior approval by the Engineer.

B. Soil Fill to be placed greater than 18 inches below final grade of the Soil Cover (one foot below bottom of topsoil layer) shall conform to the following specifications:

1. Material shall have characteristics consistent with group classifications A-1, A-2-4, A-3, A-4 or A-6 as defined in AASHTO M145

2. Material shall be free of particles larger than approximately three inches in greatest dimension, and substantially free of wood, organics, debris and other material which may be compressible or which cannot be compacted properly.

3. Moisture content (as delivered to the site) shall be less than 20 percent

4. Plasticity index shall be less than 15, and liquid limit shall be not greater than 40

5. Material shall have a soaked California Bearing Ratio (CBR) of not less than 10, as determined by ASTM D 1883

6. Maximum dry density shall be a minimum of 100 pounds per cubic foot

7. Processed recycled products such as crushed concrete, reclaimed asphalt pavement, slag, foundry sand and reef shell may also be suitable for this portion of the Soil Cover, if approved by the Engineer, provided that the material conforms to all applicable local, state and federal environmental regulations and the material conforms to the requirements in paragraphs 1 through 6 above.

C. Soil Fill to be placed in the top one foot beneath the topsoil layer shall conform to the following specifications:

1. Material shall have characteristics consistent with group classifications A-1a and A-3 as defined in AASHTO M145. Material meeting A-2-4 or A-2-6 classifications having less than 15 percent fines (material passing standard No. 20 sieve) will also be acceptable.

2. Material shall be free of particles larger than approximately two inches in greatest dimension, and substantially free of wood, organics, debris and other material which may be compressible or which cannot be compacted properly.

3. Moisture content (as delivered to the site) shall be less than 20 percent

4. Plasticity index shall be less than 6

5. Material shall have a soaked California Bearing Ratio (CBR) of not less than 10, as determined by ASTM D 1883

6. Maximum dry density shall be a minimum of 105 pounds per cubic foot

2.04 TOPSOIL

A. Topsoil shall be natural, fertile, agricultural topsoil, capable of sustaining vigorous plant growth, and shall have characteristics consistent with SM, SC, SP-SC, SP-SM, ML, CL or OL soils (or blends of these materials) as defined by the Unified Soil Classification System (USCS). The soil shall be free of live plants and their roots, sticks, and other extraneous matter. The organic content shall be three percent minimum as determined by ASTM D 2974, and pH range shall be between 5.5 to 7.0 as determined by ASTM 4972.

B. Topsoil shall not contain concentrations of chemical parameters for which the soil is analyzed that are above natural background levels, as determined by the Engineer.

2.05 MARKERS FOR UTILITY TRENCHES

A. Markers for limits of utility trenches shall be Rhino TriView Flex™ polypropylene or PathMarker™ high density polyethylene markers manufactured by REPNET Inc., or approved equal. Furnish a minimum of one decal for each marker. Decals shall be marked with the words "UTILITY TRENCH LIMITS" using manufacturer's standard colors and design. Furnish required quantity for locations indicated in subsection 3.08 of this Section

2.06 CRUSHED STONE BASE

A. Crushed stone for installation under concrete slabs shall consist of crushed stone or gravel conforming to the requirements of Section 801 of the ALDOT Standard Specifications. Gradation shall be as specified in the Coarse Aggregate Gradation Table in Subarticle 801.11(d) for Size Number 10 aggregate as summarized in the following table:

Sieve Size	Percent Passing, by Weight
3/8 inch	100
No. 4	85 - 100
No. 100	10 - 30

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

A. The following testing of Soil Fill shall be performed by the QC Firm after approval of the borrow source and prior to placement:

1. Soil Classification (AASHTO M145): Minimum of one test per 3,000 cubic yards and at every change in material.

2. Laboratory Moisture Content (ASTM D 2216): Minimum of one test per 3,000 cubic yards and at every change in material.

3. Atterberg Limits (ASTM D 4318 or AASHTO T89 and T90): Minimum of one test per 3,000 cubic yards and at every change in material.

4. Moisture-Density Curve (ASTM D 1557 or AASHTO T180): Minimum of one test per 5,000 cubic yards and at every change in material.

B. The following testing of Topsoil shall be performed by the QC Firm after approval of the borrow source and prior to placement:

1. Organic Content (ASTM D 2974): Minimum of one test per 3,000 cubic yards and at every change in material.

2. pH (ASTM D 4972): Minimum of one test per 3,000 cubic yards and at every change in material.

C. The following tests shall be performed by the QC Firm during construction of the Soil Fill layer:

1. In-Place Density (using ASTM D2922 or ASTM D1556): Minimum of one test per 40,000 square feet for each compacted lift.

2. Moisture Content (using ASTM D3017 or ASTM D2216): Minimum of one test per 40,000 square feet for each compacted lift.

3. In-place density and moisture content testing performed using nuclear instruments shall be checked by comparison to test results using laboratory methods.

D. Record Surveying

1. The limits of utility trench excavations shall be surveyed.

2. The completed Soil Cover (top surface of Topsoil layer) and adjacent graded areas in each SWMU area, including diversion channel in SWMU 6 East, shall be surveyed on a 50-foot maximum grid pattern, including top and bottom of all side slopes and all breaks in grade.

3.02 PROOF-ROLLING AND GROUND STABILIZATION

A. Low lying areas of the existing ground surface shall be drained, allowed to dry, and then filled in a controlled manner to match surrounding grades. Placement of fill shall conform to the requirements for Soil Fill in subsection 3.06.

B. The existing ground surface within the limits of Soil Cover construction shall be proof-rolled (and stabilized as required) under the observation of the Engineer. This requirement shall apply to areas outside the limits of excavation for contaminated sediments and excavation of the utility trenches.

C. Proof-rolling shall be accomplished using a large rubber- tired vehicle of sufficient weight to reveal soft, yielding areas requiring stabilization, as determined by the Engineer. The vehicle shall have a minimum weight of 30,000 pounds for a 4-wheel vehicle or equivalent.

D. Soft, yielding areas shall be stabilized by either drying and reworking the area or by undercutting.

E. If undercutting is performed for stabilization, excavation shall extend to a depth sufficient to produce a stable bearing surface for fill placement as indicated by the proof-rolling equipment. Backfill material shall consist of Soil Fill specified in this Section.

F. Material excavated during undercutting shall be placed on the ground surface in stable areas adjacent to the excavation. Uniformly spread the excavated material in thin layers not exceeding eight inches, and work the material to promote drying

G. After stabilization, proof-roll surface again as specified above.

3.03 PLACEMENT OF BACKFILL

A. Excavations resulting from removal of contaminated sediment in the primary drainage channel, removal of existing storm sewer piping and construction of utility trenches shall be backfilled as specified in the following paragraphs.

B. Soil Fill shall be placed in uniform layers not exceeding 12-inch lift thickness. Compact the soil to a minimum of 90 percent of the material's maximum dry density as determined by AASHTO T180.

C. Place backfill up to existing adjacent ground surface elevation.

3.04 GRADING OF SUBGRADE FOR ASPHALT COVER

A. Spread Soil Fill in uniform lifts not exceeding eight inches loose lift thickness. Compact each lift to a minimum of 90 percent of the material's maximum dry density as determined by AASHTO T180.

B. Uniformly grade the area to the elevations required for placement of aggregate base course as shown on the Drawings.

C. Material removed during grading of the area shall be used as fill in low areas.

3.05 SUBGRADE PREPARATION FOR CONCRETE CONTAINMENT STRUCTURE

A. Uniformly grade the area to the elevations and dimensions required for placement of crushed stone base and construction of concrete slab as indicated on the Drawings.

B. Place crushed stone base and uniformly spread in one lift to the thickness indicated on the Drawings. Compact to a minimum of 100 percent of the material's maximum dry density, as determined by ASTM D 698. Uniformly grade the top of the crushed stone base to the elevation required for construction of the concrete slab.

3.06 DIVERSION CHANNEL CONSTRUCTION

A. Excavate and grade new diversion channel in SWMU 6 East to the elevations, horizontal limits and alignment indicated on the Drawings.

B. Where required, place and compact Soil Fill in accordance with the requirements of subsection 3.06.

C. Provide uniform slopes between points where elevations are shown on the Drawings, or between such points and existing grades. Graded channel and adjacent areas shall be shaped to be free from irregular surface changes.

D. Subgrade for ditch bottom and side slopes shall be undisturbed material or compacted Soil Fill. Prepare graded surface for installation of geomembrane liner. The subgrade for the geomembrane shall be smooth and uniform, and free of all stones greater than 1/4-inch in dimension, trash and debris.

E. Install geomembrane liner as specified in Section 02352 and as shown on the Drawings.

F. Place a six-inch thick layer of gravel over the installed geomembrane. Place the material using lightweight equipment. Use care in placing the gravel layer to avoid damaging the geomembrane. Any damage to the geomembrane caused by the Contractor's activity shall be repaired, retested and recertified at the Contractor's expense

G. Place topsoil over the gravel layer within the drainage channel and as shown on the Drawings.

3.06 PLACEMENT OF SOIL FILL

A. Place Soil Fill over backfilled excavations and existing grade to the thickness, elevations and grades shown on the Drawings.

B. Spread the Soil Fill uniformly in lifts not exceeding eight inches loose lift thickness.

C. Soil Fill shall be compacted to a minimum of 95 percent of the material's maximum dry density as determined by AASHTO M 180. The moisture content of Soil Fill during compaction shall be maintained within plus or minus two percent of the material's optimum moisture.

D. Shape the graded surface to be free from irregular surface changes. Compact with uniform levels or slopes between points where elevations are shown on the Drawings, or between such points and existing grades.

E. Finished surface of Soil Fill shall be graded to the elevations required for placement of Topsoil layer and to provide final Soil Cover elevations indicated on the Drawings within a tolerance of plus or minus two inches.

3.07 PLACEMENT OF TOPSOIL

A. Topsoil shall not be placed on the Soil Fill until all specified quality control testing has been performed and the results are acceptable.

B. Place Topsoil to the thickness and elevations shown on the Drawings.

C. A full six-inch thickness of Topsoil shall be placed in one pass.

D. Use care in placing the material to avoid damaging the Soil Fill layer. Damaged areas shall be repaired, and will require retesting and recertification as determined by the Engineer.

E. Topsoil will not require compaction other than that provided by the equipment used to place the material.

F. Shape the final surface of Topsoil to be free from irregular surface changes.

G. Based on the results of surveying of the final surface, areas of the completed Soil Cover that are not constructed to the required elevations shown on the Drawings, within specified tolerance, shall be adjusted to the proper elevations using methods approved by the Engineer. The limits of reworking will be determined by the Engineer.

3.08 INSTALLATION OF UTILITY TRENCH MARKERS

A. Install markers along the alignment of both sides of each utility trench. At a minimum, the markers shall be installed at a spacing of 100 feet, at trench terminations, and as otherwise required by the Engineer and Owner based on actual field installation.

B. Markers shall be set vertically into an excavated hole to a depth of approximately 18 inches below final grade. Thoroughly compact soil around installed markers.

3.09 SLOPE AND DITCH STABILIZATION

A. Construct riprap protection along the eastern shoreline of SWMUs 4, 5 and 8 as shown on the Drawings and as specified in Section 02374.

B. Install turf reinforcement matting as shown on the Drawings and as specified in Section 02373.

C. Construct storm water drop down structures as shown on the Drawings.

3.10 ESTABLISHMENT OF VEGETATION

A. Apply seed and mulch over the surface of the topsoil layer as specified in Section 02926.

B. Lay sod in drainage channels as specified in Section 02927.

3.11 MAINTENANCE AND PROTECTION

A. Protect newly graded areas from traffic and erosion.

B. Where completed graded areas are disturbed by subsequent construction operations or adverse weather, regrade to the required elevations and compact to the required densities specified in this Section.

END OF SECTION

SECTION 02352
GEOMEMBRANE

PART 1 GENERAL

1.01 SUMMARY

A. Section includes furnishing and installing smooth high density polyethylene (HDPE) geomembrane for lining the diversion channel on the western and southern edge of SWMU 6 East and in temporary sediment drainage beds.

B. Related Sections:

1. Section 02165 – Temporary Sediment Drainage Beds

2. Section 02318 – Fill Placement and Grading

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM D 638, Standard Test Method for Tensile Properties of Plastics

2. ASTM D 792, Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement

3. ASTM D 1004, Standard Test Method for Initial Tear Resistance of Plastic Film and Sheeting

4. ASTM D 1505, Standard Test Method for Density of Plastics by the Density-Gradient Technique

5. ASTM D 1603, Standard Test Method for Carbon Black in Olefin Plastics

6. ASTM D 3895, Standard Test Method for Oxidative-Induction Time of Polyolefins by Differential Scanning Calorimetry

7. ASTM D 4437, Standard Practice for Determining the Integrity of Field Seams Used in Joining Flexible Polymeric Sheet Geomembranes

8. ASTM D 4833, Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products

9. ASTM D 4873, Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls

10. ASTM D 5199, Test Method for Measuring Nominal Thickness of Geotextiles and Geomembranes

11. ASTM D 5397, Standard Test Method for Evaluation of Stress Crack Resistance of Polyolefin Geomembranes Using Notched Constant Tensile Load Test (Appendix - Procedure to Perform a Single Point Notched Constant Tensile Load (SP-NCTL) Test)

12. ASTM D 5596, Standard Test Method for Microscopic Evaluation of the Dispersion of Carbon Black in Polyolefin Geosynthetics

13. ASTM D 5641, Standard Practice for Geomembrane Seam Evaluation by Vacuum Chamber

B. Geosynthetic Research Institute (GRI):

1. GRI-GM6, "Pressurized Air Channel Test for Dual Seamed Geomembranes"

2. GRI-GM10, "Specification for the Stress Crack Resistance of HDPE Geomembrane Sheet"

3. GRI-GM13, "Test Properties, Testing Frequency and Recommended Warrant for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes"

1.03 SUBMITTALS

A. Submit the following to the Engineer, for review and approval, no later than 30 calendar days prior to scheduled shipment of geomembrane:

1. A material properties sheet, indicating at a minimum all properties specified in subsection 2.02 of this Section and test methods used.

2. Sample of the material.

3. Example Material Warranty and Liner Installation Guarantee complying with subsections 1.07 and 1.08 of this Section.

B. Submit the following to the Engineer, for review and approval, at time of shipment of the geomembrane:

1. The manufacturers' quality control certifications, including results of source quality control testing of the products, as specified in subsection 2.01, to verify that the materials supplied for the project are in compliance with all product specifications in this Section. The certifications shall be signed by a responsible party employed by the manufacturer, such as the QA/QC Manager, Production Manager, or Technical Services Manager. Certifications shall include lot and roll numbers, and corresponding shipping information.

C. Additional Submittals (In-Progress and at Completion):

1. Manufacturer's material warranty and geomembrane installation guarantee (specified in subsections 1.07 and 1.08)

1.04 QUALITY ASSURANCE

A. Furnish all labor, materials, equipment, services, incidentals and other items necessary for the placement and installation of geomembrane as shown on the Contract Drawings and as specified herein.

C. Installer's Qualifications: The Geomembrane Installer shall be the manufacturer or an approved contractor qualified to install the manufacturer's geomembrane.

1.05 DELIVERY, STORAGE AND HANDLING

A. Each roll of geomembrane delivered to the site shall be labeled by the manufacturer. The label shall be firmly affixed and shall clearly state the manufacturer's name, product identification, lot number, material thickness, roll number, roll dimensions, and roll weight.

B. Geomembrane shall be handled and stored in accordance with ASTM D 4873, as applicable.

C. Provide all labor and equipment required to assist the Engineer in the observation of materials delivered to the site.

D. Rolls shall be stored away from high traffic areas. Continuously and uniformly support rolls on a prepared surface elevated above grade away from standing water.

1.06 PROJECT CONDITIONS

A. Geomembrane shall not be installed in the presence of standing or ponded water, while precipitation (including fog) is occurring, where the subgrade has been softened by precipitation, or in the presence of excessive winds.

B. Geomembrane shall also not be installed when material and ambient temperatures are outside the limits recommended by the manufacturer.

1.07 MATERIAL WARRANTY

A. Geomembrane manufacturer shall warrant the membrane material against manufacturing defects and material degradation in the outdoor exposure for a period of 20 years from the date of installation. The manufacturer shall provide new material to replace, on a prorated basis over the remaining life of the geomembrane, any material which fails from the above causes within the warranty period.

B. The manufacturer shall furnish a written warranty covering the requirements of the above paragraph 1.07.A.

1.08 GEOMEMBRANE INSTALLATION GUARANTEE

A. Guarantee the geomembrane installation against defects in installation and workmanship for one year commencing with the date of final acceptance. The guarantee shall include the

services of qualified service technicians and all material required for the repairs at no expense to the Owner.

B. The Geomembrane Installer shall furnish a written warranty covering the requirements of the above paragraph 1.08.A.

PART 2 PRODUCTS

2.01 SOURCE QUALITY CONTROL

A. Manufacturer's Quality Control Testing:

1. Testing of HDPE geomembrane shall be performed by the manufacturer, prior to shipment, in conformance with GRI GM13, as summarized in the following table. Required test values are listed in subsection 2.02.D.

Property	**Test Method**	**Testing Frequency (minimum)**
Thickness (min. avg. and lowest individual of 10 values)	ASTM D 5199	Each roll
Sheet Density (min.)	ASTM D 1505 or D 792	200,000 pounds
Tensile Strength at Yield and Break (min. avg.)	ASTM D 638, Type IV	20,000 pounds
Elongation at Yield and Break (min. avg.)	ASTM D 638, Type IV	20,000 pounds
Tear Resistance (min. avg.)	ASTM D 1004	45,000 pounds
Puncture Resistance (min. avg.)	ASTM D 4833	45,000 pounds
Stress Crack Resistance (min.)	ASTM D 5397 (Appendix)	Per GRI-GM10
Carbon Black Content (range)	ASTM D 1603	20,000 pounds
Carbon Black Dispersion	ASTM D 5596	45,000 pounds
Oxidative Induction Time, Standard (min. avg.)	ASTM D 3895	200,000 pounds

2. The test results shall be submitted to the Engineer at time of shipment of the geomembrane.

2.02 GEOMEMBRANE

A. The geomembrane shall consist of new, first quality products designed and manufactured specifically for the purpose of this work, which shall have been satisfactorily demonstrated by prior testing to be suitable and durable for such purposes. The geomembrane shall be an unmodified seamless smooth high-density polyethylene (HDPE), containing no plasticizers, fillers, chemical additives, or extenders.

B. The geomembrane shall be supplied as a continuous sheet with no factory seams, in rolls. The roll length and width shall be maximized to provide the largest manageable sheet for the fewest field seams.

C. The geomembrane material shall be produced free of holes, blisters, undispersed raw materials or any signs of contamination by foreign matter.

D. Physical, Mechanical and Chemical Property Requirements

1. Smooth HDPE geomembrane shall meet or exceed the values specified in GRI GM13, as summarized in the following table.

Property	Test Method	Test Value
Thickness (min. avg. and lowest individual of 10 values)	ASTM D 5199	40 mils (min. avg.) 36 mils (lowest individual)
Sheet Density (min.)	ASTM D 1505 or D 792	0.940 g/cc
Tensile Strength at Yield (min. avg.)	ASTM D 638, Type IV	84 lb/in.
Tensile Strength at Break (min. avg.)	ASTM D 638, Type IV	152 lb/in.
Elongation at Yield (min. avg.)	ASTM D 638, Type IV	12 %
Elongation at Break (min. avg.)	ASTM D 638, Type IV	700 %
Tear Resistance (min. avg.)	ASTM D 1004	28 lb
Puncture Resistance (min. avg.)	ASTM D 4833	72 lb
Stress Crack Resistance (min.)	ASTM D 5397 (Appendix)	200 hours
Carbon Black Content (range)	ASTM D 1603	2.0 – 3.0 %
Carbon Black Dispersion	ASTM D 5596	Categories 1 or 2
Oxidative Induction Time, Standard (min. avg.)	ASTM D 3895	100 minutes

PART 3 EXECUTION

3.01 SUBGRADE PREPARATION

A. The geomembrane subgrade shall be prepared as specified in Sections 02318 or 02165, as applicable. The subgrade shall be smooth and uniform, and free of all trash and debris, prior to installation of the geomembrane.

B. For placement of geomembrane in the diversion channel, subgrade damaged by construction equipment during the geomembrane deployment operation shall be repaired prior to placement of the geomembrane. Subgrade damaged by erosion, rutting, or other means following geomembrane deployment shall be exposed and the damage repaired.

3.02 GEOMEMBRANE PLACEMENT

A. No geomembrane shall be deployed until the applicable certifications and quality control certificates listed in subsection 1.03 of this Section are submitted to and approved by the Engineer. Should geomembrane material be deployed prior to Engineer's approval, it shall be at sole risk of the Geomembrane Installer and Contractor, and if the material does not meet project specifications, it shall be removed from the project at no additional cost to the Owner.

B. Install geomembrane on prepared subgrade in diversion channel and the temporary sediment drainage beds to the limits shown on the Drawings. Anchor geomembrane as shown.

C. As much as practical, one full roll width of geomembrane shall be installed along the alignment of the diversion channel. Rolls shall be continuous for the full length of each section of the diversion channel as much as practical. Seams, if required, shall be oriented across the width of the channel.

D. Seams for geomembrane placed in sediment drainage beds shall be oriented with the long dimension parallel to (down) the line of maximum slope. The total length of field seams shall be minimized.

E. Geomembrane shall be placed in an effort to reduce wrinkles and subsequent fishmouths at seam interfaces.

F. All geomembrane handling and installation procedures shall be performed by workers wearing proper shoes. No vehicular traffic shall travel on the geomembrane.

G. Panels that become seriously damaged (torn or twisted permanently) shall be replaced. Less serious damage shall be repaired according to the requirements herein.

H. Where seaming is required, adjacent panels shall be overlapped prior to seaming to whatever extent is necessary to effect a good weld. In no case shall this overlap be less than five inches for fusion welding.

3.03 SEAMING PROCEDURES

A. Seaming is not allowed while precipitation is occurring unless proper precautions are made to allow the seam to be made on dry geomembrane material. The surface below the geomembrane shall not be saturated.

B. Extra care shall be taken to clean and remove dirt, dust and other foreign materials from the surfaces of the geomembrane to be seamed. Surfaces shall be cleaned immediately prior to seaming.

C. The surface of the seam edges shall be prepared as recommended by the manufacturer. The welding process shall bond the exposed edge of the panel to the underlying geomembrane.

D. Seaming shall be performed using an automatic double wedge fusion welding system, equipment, and techniques. Extrusion welding shall only be used where fusion welding is not possible, such as at pipe penetrations.

3.05 FIELD QUALITY ASSURANCE/QUALITY CONTROL

A. Geomembrane will be inspected by the Engineer when the panels are initially deployed. Inspection will be for identification of defects, holes, and any sign of contamination by foreign matter. Defects in seam and non-seam areas shall be repaired as specified in subsection 3.03.D.

B. All field seams shall be non-destructively tested by the Geomembrane Installer over the full length of the seams. Testing shall be done as the seaming work progresses, not at the completion of field seaming. All defects found shall be repaired and retested to indicate completion of the repair.

C. Non-destructive testing shall be performed using: vacuum boxes in compliance with ASTM D 5641; ultrasonic test units in compliance with ASTM D 4437; or air pressure testing in compliance with GRI GM6. All test equipment shall be furnished by the Geomembrane Installer.

D. Repair Procedures

1. Defective seams shall be repaired with a capstrip or extrusion weld over the full length of the defect.

2. Blisters, tears and holes in the geomembrane sheet shall be repaired with patches. Abrasions, and other defects and damage of the geomembrane material which are not punctured through the material may be repaired using extrudate, unless otherwise directed by the Engineer.

3. Capstrips and patches shall be rounded at the corners, made of the same material as for the geomembrane sheet, and extend a minimum of six inches beyond the edge of the defects.

3.06 DISPOSAL OF SCRAP MATERIALS

A. On completion of installation, the Geomembrane Installer shall dispose of all trash and scrap materials off-site, remove equipment used in connection with geomembrane installation, and leave the premises in a neat and acceptable manner. No scrap material shall be allowed to remain on the geomembrane or ground surface.

END OF SECTION

SECTION 02353
GEOTEXTILE

PART 1 GENERAL

1.01 SUMMARY

A. Section includes furnishing and installing geotextile around the drainage berms in the temporary sediment drainage beds, and under riprap.

B. Related Sections:

1. Section 02165 – Temporary Sediment Drainage Beds

2. Section 02318 – Fill Placement and Grading

3. Section 02374 - Riprap

1.02 REFERENCES

A. American Association of State Highway and Transportation Officials (AASHTO):

1. AASHTO M 288, Standard Specification for Geotextiles

B. American Society for Testing and Materials (ASTM):

1. ASTM D 4355, Standard Test Method for Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus)

2. ASTM D 4491, Standard Test Methods for Water Permeability of Geotextiles by Permittivity

3. ASTM D 4533, Standard Test Method for Trapezoid Tearing Strength of Geotextiles

4. ASTM D 4632, Standard Test Method for Grab Breaking Load and Elongation of Geotextiles

5. ASTM D 4751, Standard Test Method for Determining Apparent Opening Size of a Geotextile

6. ASTM D 4833, Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products

1.03 SUBMITTALS

A. Submit the following to the Engineer, for review and approval, 14 days prior to shipment of geotextile:

1. Manufacturers' descriptive documentation, including material properties sheets for geotextile

B. Submit manufacturers' quality control certifications to the Engineer, for review and approval, at time of shipment of geotextile. The manufacturers' quality control certifications shall include results of source quality control testing of the products to verify that the materials supplied for the project are in compliance with all product specifications in this Section. The certifications shall be signed by a responsible party employed by the manufacturer, such as the QA/QC Manager, Production Manager, or Technical Services Manager. Certifications shall include lot and roll numbers, and corresponding shipping information

1.04 QUALITY CONTROL

A. Manufacturer's Qualifications: The manufacturer shall have at least five years experience in the manufacture of geotextile of the type specified.

1.05 DELIVERY, STORAGE AND HANDLING

A. Geotextile rolls shall be marked or tagged with manufacturer's name, product identification, lot number, roll number, and roll dimensions.

B. Rolls shall be stored away from traffic areas. Continuously and uniformly support rolls on a prepared surface elevated above grade.

C. No hooks, tongs, or other sharp instruments shall be used for handling the geotextile. Rolls shall not be lifted by use of cables or chains in contact with the products. Geotextile shall not be dragged along the ground.

D. Cover rolls with tarp for protection from sun, dirt and other deleterious conditions if the protective wrap around the geotextile is damaged.

PART 2 PRODUCTS

2.01 GEOTEXTILE PRODUCTS

A. Geotextile shall be resistant to ultraviolet degradation and biological and chemical environments normally found in soils.

B. Geotextile shall be a continuous filament polypropylene nonwoven needle-punched fabric, Survivability Class 1 (as defined in AASHTO M 288), meeting or exceeding the following specifications:

Property	Test Method	Test Value[1]
Grab Tensile Strength	ASTM D 4632	203 lbs.
Grab Tensile Elongation	ASTM D 4632	50 %
Trapezoid Tear Strength	ASTM D 4533	80 lbs.

Property	Test Method	Test Value[1]
Puncture Strength	ASTM D 4833	80 lbs.
Permittivity	ASTM D 4491	1.2 sec^{-1}
Apparent Opening Size (AOS)	ASTM D 4751	0.180 mm (max.)
Ultraviolet Resistance (% strength retained at 500 hours)	ASTM D 4355	50 %

[1] Minimum Average Roll Value (unless otherwise noted) in weakest principal direction

PART 3 EXECUTION

3.01 PREPARATION

A. Prepare subgrade for geotextile as specified in Sections 02165 or 02318, as applicable.

B. Surfaces to receive geotextile shall be free of litter, sharp protrusions, and large stones.

3.02 GEOTEXTILE INSTALLATION

A. Geotextile shall not be deployed until the required submittals listed in subsection 1.03 are submitted to and approved by the Engineer.

B. Geotextile shall be installed in such a manner that placement of overlying material will not tear or excessively stretch the geotextile.

C. Seaming of geotextile will not be required. Overlap adjacent sections or rolls of geotextile a minimum of one foot along the length of rolls and at ends.

3.03 GEOTEXTILE REPAIR

A. Holes or tears in the geotextile shall be repaired with a patch of the same material, unless otherwise approved by the Engineer.

B. Geotextile patches shall be sized to cover a minimum of 36 inches beyond the limits of the damaged area in all directions and shall be spot seamed.

END OF SECTION

SECTION 02354
DRAINAGE GEOCOMPOSITE

PART 1 GENERAL

1.01 SUMMARY

A. Section includes furnishing and installing drainage geocomposite as part of the temporary sediment drainage bed construction.

B. Related Sections:

1. Section 02165 – Temporary Sediment Drainage Beds

2. Section 02352 - Geomembrane

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM D 1238, Standard Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer

2. ASTM D 1505, Standard Test Method for Density of Plastics by the Density-Gradient Technique

3. ASTM D 3776, Standard Test Methods for Mass per Unit Area (Weight) of Fabric

4. ASTM D 4218, Standard Test Method for Determination of Carbon Black Content in Polyethylene Compounds by the Muffle-Furnace Technique

5. ASTM D 4355, Standard Test Method for Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus)

6. ASTM D 4491, Standard Test Methods for Water Permeability of Geotextiles by Permittivity

7. ASTM D 4595, Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method

8. ASTM D 4632, Standard Test Method for Grab Breaking Load and Elongation of Geotextiles

9. ASTM D 4716, Standard Test Method for Determining the (In-Plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head

10. ASTM D 4751, Standard Test Method for Determining Apparent Opening Size of a Geotextile

11. ASTM D 4833, Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products

12. ASTM D 5199, Standard Test Method for Measuring Nominal Thickness of Geotextiles and Geomembranes

13. ASTM F 904, Standard Test Method for Comparison of Bond Strength or Ply Adhesion of Similar Laminates Made from Flexible Materials

1.03 SUBMITTALS

A. Submit the following to the Engineer, for review and approval, 14 days prior to shipment of drainage geocomposite:

1. Manufacturer's descriptive documentation, including material properties sheets and manufacturing quality control program description

2. Sample of drainage geocomposite product

B. Submit manufacturers' quality control certifications to the Engineer, for review and approval, at time of shipment of drainage geocomposite product.

1.04 QUALITY ASSURANCE

A. Manufacturer's Qualifications: The manufacturer shall have at least five years experience in the manufacture of drainage geocomposite.

1.05 DELIVERY, STORAGE AND HANDLING

A. Drainage geocomposite rolls shall be marked or tagged with manufacturer's name, product identification, lot number, roll number, and roll dimensions.

B. Rolls shall be protected from ultraviolet light exposure, precipitation or other inundation, mud, dirt, dust, puncture, cutting or any other damaging or deleterious condition.

PART 2 PRODUCTS

2.01 SOURCE QUALITY CONTROL

A. Quality control testing of drainage geocomposite components (prior to lamination) and finished geocomposite product shall be performed by the manufacturer prior to shipment.

2.02 DRAINAGE GEOCOMPOSITE

A. Drainage geocomposite shall be composed of a geonet core material with a non-woven needle-punched geotextile heat bonded to one side of the geonet. No burn through geotextiles shall be permitted. No glue or adhesive shall be permitted. Geocomposite shall conform to the specifications in the following subsection 2.02.B.

B. Drainage Geocomposite Material Specifications

1. The geonet component of the geocomposite shall meet or exceed the following specifications:

Property	Test Method	Test Value[1]
Density	ASTM D 1505	0.94 g/cm^3
Resin Melt Index	ASTM D 1238	1.0 g/10 minutes (maximum)
Carbon Black Content	ASTM D 4218	2.0 %
Thickness	ASTM D 5199	5.0 mm
Tensile Strength	ASTM D 4595	45 lbs./inch

[1] Minimum average roll value (MARV) or minimum value, unless otherwise noted

2. The geotextile component of the geocomposite shall meet or exceed the following specifications:

Property	Test Method	Test Value[1]
Fabric Weight	ASTM D 3776	6 oz/yd^2
Grab Tensile Strength	ASTM D 4632	170 lbs.
Puncture Resistance	ASTM D 4833	110 lbs.
Permittivity	ASTM D 4491	110 gpm/s.f.
AOS	ASTM D 4751	0.18 mm (max.)
Ultraviolet Resistance (% strength retained at 500 hours)	ASTM D 4355	70 %

[1] MARV or minimum value (unless otherwise noted) in weakest principal direction

3. The finished geocomposite product shall meet or exceed the following specifications:

Property	Test Method	Test Value[2]
Transmissivity[1]	ASTM D 4716	1 x 10^{-4} m^2/sec
Ply Adhesion	ASTM F 904	0.5 lbs./in

Notes:
[1] Test parameters and procedures for transmissivity: 10,000 psf confining pressure; gradient of 0.10; between steel plates; seating period extended to length of time required to determine the minimum or "long term" flow rate per unit width.
[2] For transmissivity: The minimum value of all tests performed by the manufacturer on the product supplied for the project.

PART 3 EXECUTION

3.01 PREPARATION

A. Geomembrane installation shall be completed as specified in Section 02352.

3.02 GEOCOMPOSITE INSTALLATION

A. No geocomposite shall be deployed until the required submittals specified in subsection 1.03 are submitted to and approved by the Engineer.

B. Install drainage geocomposite over the geomembrane in the sediment drainage beds as shown on the Drawings. Care shall be taken to assure that underlying geomembrane is not damaged during placement of the geocomposite.

C. Install drainage geocomposite with the geotextile side facing upward.

D. Overlap adjacent geocomposite rolls along the roll length and along the roll width a minimum of 12 inches.

END OF SECTION

SECTION 02373
EROSION CONTROL MATTING

PART 1 GENERAL

1.01 SUMMARY

A. Section includes furnishing and installing turf reinforcement matting to provide surface stabilization of drainage ditches, stormwater dropdowns, and slopes where shown on the Drawings.

B. Related Sections:

1. Section 02926 – Seeding and Mulching

1.02 SUBMITTALS

A. Submit manufacturer's certificate for turf reinforcement matting (TRM) product showing compliance with the Specifications.

PART 2 PRODUCTS

2.01 SOURCE QUALITY CONTROL

A. Proposed materials shall be approved by the Engineer as specified prior to delivery and use of the materials in the construction.

2.02 TURF REINFORCEMENT MATTING

A. Approved manufacturers and products:

1. North American Green P550 composite turf reinforcement mat, or approved equal.

PART 3 EXECUTION

3.01 SITE PREPARATION

A. Redirect runoff away from the area to be covered during installation of erosion control matting.

B. Grade surface of installation area, shaping and smoothing the soil. Remove significant soil clods, rocks, roots, trash, or vehicle imprints.

C. Distribute soil amendments and seed over prepared soil surface as specified in Section 02926 prior to installation of TRM.

3.02 INSTALLATION OF TURF REINFORCEMENT MATTING

A. Install TRM where indicated on the Drawings.

B. Excavate side slope, upstream and downstream terminal, and intermittent check slot anchor trenches as shown on the Drawings and recommended by the manufacturer.

C. Roll TRM over the prepared soil surface using sequence and arrangement, and overlapping adjacent sections as shown on the Drawings and as specified below. The long dimension of TRM rolls shall be parallel to the primary flow direction and ditch alignment.

D. Install TRM in terminal and transverse anchor trenches as shown on the Drawings using procedures recommended by the manufacturer. Place and compact backfill in anchor trenches. Backfill shall consist of suitable materials excavated from anchor trenches.

E. For each ditch section, place the first roll of TRM on the ditch bottom, centered on the ditch centerline. The second and third rolls shall be overlapped over the first roll by four inches on the sideslopes, shingled downslope (upgradient roll overlapping downgradient roll). Proved a three-foot overlap at roll ends.

F. Secure TRM using staples recommended by the manufacturer, installed as shown on the Drawings.

G. Installed TRM shall be taut, laying flush with the soil surface, in correct alignment and location, and properly anchored to prevent displacement.

3.03 MAINTENANCE

A. Protect installed TRM from damage.

B. No heavy earthwork equipment shall be allowed on the installed products.

END OF SECTION

SECTION 02374
RIPRAP

PART 1 GENERAL

1.01 SUMMARY

A. Section includes placement of riprap at culvert inlets and outlets, for slope stabilization (shore protection) of the eastern edge of SWMU 4, 5 & 8, and at other locations as shown on the Drawings.

B. Related Sections:

1. Section 02318 – Fill Placement and Grading

2. Section 02353 – Geotextile

1.02 REFERENCES

A. "Standard Specifications for Highway Construction", 2002 Edition, Alabama Department of Transportation, (ALDOT Specifications).

1.03 SUBMITTALS

A. Submit certifications from suppliers indicating that riprap and bedding stone comply with the Specifications.

PART 2 PRODUCTS

2.01 SOURCE QUALITY CONTROL

A. Proposed materials shall be approved by the Engineer as specified, prior to delivery and use of the materials in the construction.

B. Riprap and bedding stone material shall meet specified gradation prior to placement. All processing shall be completed at the source.

2.02 GEOTEXTILE

A. Specified in Section 02353.

****

The following specifications for bedding stone and riprap for shore protection are pending verification.

****

2.03 BEDDING STONE

A. Bedding stone for riprap shore protection shall be coarse aggregate conforming to the requirements of Section 801 of the ALDOT Specifications. Gradation shall conform to the gradation requirements in the table of aggregate gradations in for size number [467] coarse aggregate, as follows:

Sieve Size	Percent Passing, by Weight
2 inch	100
1.5 inch	95 – 100
3/4 inch	35 – 70
3/8 inch	10 – 30
No. 4	0 – 5

2.04 RIPRAP

A. Riprap shall be hard, angular shaped stone, meeting the quality and gradation requirements in Section 814 of the ALDOT Specifications. Gradation shall be as follows:

1. Riprap for shore protection shall be [Class 4 Riprap]. Individual stones shall range in weight from approximately [50 to 1000 pounds].

2. Riprap to be placed in all other areas shall be Class 1 Riprap. Individual stones shall range in size from 10 to 100 pounds.

PART 3 EXECUTION

3.01 PREPARATION OF SUBGRADE

A. Prior to placing riprap, the Soil Cover shall be constructed as specified in Section 02318. Grade as required for placement of riprap to the depth indicated on the Drawings.

3.02 GEOTEXTILE INSTALLATION

A. Install geotextile as specified in Section 02353.

3.03 PLACEMENT OF BEDDING STONE

A. Bedding stone shall be placed over the geotextile to the thickness indicated on the Drawings.

B. Compact as necessary to provide a stable bedding for riprap.

3.04 PLACEMENT OF RIPRAP

A. Riprap shall be placed beginning at the toe and proceeding up the slope. Riprap shall form a reasonably well-graded mass of stone with a minimum of voids. Place in conformance with the dimensions and thicknesses shown on the Drawings.

B. Placement of riprap by dumping into chutes or similar methods which are likely to cause segregation of the riprap, damage of the geotextile, or disturbance of the bedding stone layer will not be permitted.

C. Place riprap to its full thickness in one operation. Riprap shall not be placed in layers.

END OF SECTION

SECTION 02522
RECOVERY WELLS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Installation and development of new recovery wells

2. Protection of existing wells

3. Extensions to existing recovery wells

4. Furnishing and installation of precast concrete well manholes and accessories

B. Related Sections

1. Section 02120 – Off-Site Transportation and Disposal

2. Section 11511 – Recovery Well Pumps

1.02 REFERENCES

A. "Standard Specifications for Highway Construction", 2002 Edition, Alabama Department of Transportation (ALDOT Specifications)

B. American Society for Testing and Materials (ASTM):

1. ASTM C 150, Standard Specification for Portland Cement

2. ASTM D 1586, Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils

3. ASTM D2488, Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)

4. ASTM D 5787, Standard Practice for Monitoring Well Protection

5. ASTM F 480, Standard Specification for Thermoplastic Well Casing Pipe and Couplings Made in Standard Dimension Ratios (SDR), SCH 40 and SCH 80

C. American Water Works Association (AWWA):

1. AWWA A100-97, Standard for Water Wells

D. United States Environmental Protection Agency (USEPA) Region IV Environmental Compliance Branch, Standard Operating Procedures, November 2002

1.02 SUBMITTALS

A. Submit the following to Engineer for review and approval prior to construction:

1. Documentation that all operating licenses required by local, state and federal agencies have been obtained for well drilling

2. Manufacturer's product data and certifications showing conformance with the specifications for all specified products.

3. Description of equipment and methods to be used for well installation and development.

B. At completion of recovery well installation, submit well installation documentation, consisting of boring logs and Well Construction and Installation Diagrams.

1.04 QUALITY ASSURANCE

A. Construction of recovery wells shall meet all applicable state and local requirements. Work shall be performed by a state of Alabama licensed water well contractor under the direction of an experienced professional geologist or geotechnical engineer.

1.05 PROJECT CONDITIONS

A. Work shall be restricted to the areas shown on the Drawings or as otherwise designated by the Engineer.

B. Work shall be performed in a manner that does not disturb existing utilities, recovery wells, monitoring wells or other facilities not indicated to be removed.

PART 2 PRODUCTS

2.01 WELL RISER

A. Well riser pipe shall be fabricated of Schedule 40 PVC conforming to ASTM F 480. Riser pipes shall be threaded.

B. Well riser pipe diameter shall be as shown on the Drawings.

C. Total length of riser for each well shall be as shown on the Drawings. The well risers shall extend to the required height above the bottom of the well manhole.

2.02 WELL SCREEN

A. Well screen shall be of the continuous-slot type, fabricated of Type 316 or 304 stainless steel of the type manufactured by Boart Longyear, or approved equal. The wire configuration shall produce inlet slots with sharp outer edges, widening inwardly.

B. The well screen for each well shall have a nameplate indicating its diameter, length, weight, type of screen, and slot size.

C. Well screen length, diameter and slot size shall be as shown on the Drawings.

2.03 SAND PACK

A. Sand used for sand pack around the well screen shall consist of a clean silica sand meeting the gradation requirements indicated on the Drawings.

2.04 BENTONITE SEAL MATERIAL

A. Bentonite seal shall consist of a mixture of water and palletized bentonite to provide a tight seal between the riser pipe and the borehole in the annular space above the sand pack.

2.05 CEMENT-BENTONITE GROUT

A. Cement-bentonite grout shall be a mixture of Type II or IV Portland cement (complying with ASTM C150) and clean water in the proportion of 5 to 6 gallons of water per 94-pound bag of cement. The mix shall also contain approximately two to six percent sodium bentonite. Adjust the mix, if required and as approved by the Engineer, to limit the potential for shrinkage.

2.06 WELL CAPS

A. Furnish well caps at top of riser. Caps shall accommodate piping and wiring from the well pump.

2.07 STONE BASE FOR WELL MANHOLES

A. Base material shall consist of crushed stone, gravel or uncrushed gravel conforming to the applicable requirements of Articles 801.01 through 801.02 of the ALDOT Specifications. Gradation shall be as specified in the Coarse Aggregate Grdation Table in Subarticle 801.11(d) for Size Number 57 aggregate.

2.08 PRECAST CONCRETE WELL MANHOLES

A. Well manholes shall be precast reinforced concrete, fabricated as shown on the Drawings.

B. Openings for well riser and pipe penetrations shall be pre-drilled by supplier or drilled on-site by the Contractor at the locations and to the sizes required. Furnish resilient connectors or other approved devices to provide watertight connections.

2.09 ACCESS COVERS

A. Furnish manhole frame and cover for each well manhole as indicated on the Drawings.

PART 3 EXECUTION

3.01 PREPARATION

A. Locations for new recovery wells and existing recovery wells requiring extensions are indicated on the Drawings.

B. Prior to drilling activities, the new recovery well locations shall be surveyed for both horizontal and vertical control to provide for accurate placement.

C. All down-hole drilling equipment shall be steam-cleaned prior to drilling and between drilling locations.

3.02 FIELD QUALITY CONTROL

A. Establish and maintain quality control for all soil boring, well construction, installation and development to assure compliance with contract requirements.

B. Final boring logs shall state materials encountered during drilling, water levels measured in borehole, equipment used, and other pertinent details of the boring activity. Description of materials shall include USCS soil classification, color, density, consistency, and moisture content. A chart shall be submitted illustrating soil classification criteria, terminology and symbols.

C. Well Construction and Installation Diagrams: Shall contain a cross-section drawing to depict the well installation as it exists in the ground. Diagram shall include identification of construction materials used, borehole diameters and depths., and static water level measured following installation.

3.03 WELL PROTECTION

A. No existing or newly installed wells shall be damaged by the Contractor other than those wells identified in the Drawings to be abandoned. Damage shall be defined as disturbance to the well, which causes it to be no longer plumb or damages the surface seal. Repairs or replacement of damaged wells shall be paid by the Contractor.

3.04 EXTENSIONS TO WELLS

A. Well risers for designated existing recovery wells shall be extended as necessary to provide the required top of casing elevations indicated on the Drawings.

B. Attach new riser pipe to existing riser using materials and methods acceptable to the Engineer.

3.05 SOIL BORINGS FOR WELLS

A. Boreholes for new wells shall be of rotary-drilled/ mud rotary construction as approved by the Engineer. Bentonite drilling mud or revert shall be used for drilling.

B. Obtain continuous split-spoon (split-barrel) samples in accordance with ASTM D 1586 starting at a depth of 85 feet and continuing to top of clay. Visually classify soil in accordance with ASTM D 2488.

C. Boreholes shall be terminated at a depth of approximately three feet below the top of clay unit. The depth shown on the Drawings is only approximate. Actual depth will vary according to location.

3.06 WELL INSTALLATION

A. Installation of Screen and Riser

1. Join well riser and well screen by screwing both units together.

2. Provide centralizers to maintain well screen and riser in center of drilled borehole as indicated on the Drawings.

3. Well screens shall be handled with due care to avoid any deviation in shape or dimensions. Well screen shall not be lowered into a borehole until it has been determined that it's dimensions and characteristics correspond with those approved for that particular well. Well screens not meeting the acceptable conditions or showing any appreciable damage or deformation will be rejected. Due precautions shall be taken during the lowering of the well screens into the boreholes to prevent any damage or deformation.

4. Well screens shall be lowered to a depth six inches below the top of the clay unit as indicated on the Drawings.

5. Well risers shall extend to the elevations shown on the Drawings.

B. Installation of Sand Pack, Bentonite Seal and Cement-Bentonite Grout

1. Install sand pack within the annular space around the well screen and riser.

2. Place sand pack by using a tremie pipe lowered to the bottom of the annular space to be packed and slowly raised as the sand fills the annulus. Place up to approximately five feet above the top of the well screen.

3. Place a three-foot thick bentonite seal above the top of the sand pack in each well. Bentonite pellets or chips shall be placed within the annular space around the well casing. Allow at least one hour for pellets to expand before grouting remaining annular space.

4. Install cement-bentonite grout by use of tremie. Lower the tremie pipe to the top of the bentonite seal where the grout is to be placed and initiate grouting. Gradually raise tremie pipe throughout the process of grouting while maintaining the end of the tremie pipe a minimum of five feet into the grout. The annular space shall be grouted up to the elevations shown on the Drawings.

C. Recovery wells shall be true, round, straight and vertical. If, in the opinion of the Engineer, a well might be out of plumb or alignment, it shall be tested at the Contractor's expense in accordance with Section 1-6, "Testing for Plumbness and Alignment," of the AWWA Standard A100-97. Should the well fail to meet the requirements established by such standards, the well shall be corrected by the Contractor.

3.07 WELL MANHOLE INSTALLATION

A. Prepare the soil surface around recovery wells for placement of stone base to the dimensions of the well manhole.

B. Place and compact approximately six-inch thickness of stone base as indicated on the Drawings. Uniformly grade and level the top of the stone base to the required elevation for installation of well manhole. Top of installed well manholes shall be at the elevation indicated on the Drawings.

C. Well manholes shall be installed at all new recovery wells and at existing recovery wells. Manholes shall not be installed at existing recovery wells until risers are extended to the required elevations.

3.08 RECOVERY WELL DEVELOPMENT

A. Development of each recovery well shall not be carried out until well casing has been set in place and the bentonite seal has been in place for a period of not less than 24 hours.

B. Furnish all necessary pumps, compressors, tools, piping, hoses, and any other equipment needed to develop the recovery wells.

C. Develop each well by removing a minimum of three saturated borehole volumes or as otherwise directed by the Engineer.

3.09 WELL COMPLETION

A. Install pumps and accessories in wells and manholes as specified in Section 11511 and as shown on the Drawings.

B. Well caps shall be seated on top of the well riser as indicated on the Drawings.

3.10 DISPOSAL OF MATERIALS

A. Spent drilling fluid and soil cuttings resulting from soil borings and well installation shall be placed into drums or watertight containers for disposal in accordance with the requirements of Section 02120.

B. Discharge water and drilling fluids expelled from each recovery well during well development shall be discharged into drums or watertight containers for disposal in accordance with the requirements of Section 02120.

C. Following the disposal of drilling fluids and soil cuttings, the drums and other equipment used to transfer the soil cuttings and drilling fluids shall be properly decontaminated. Following the drilling activities, the decontaminated drums shall be properly disposed of off-site.

3.11 CLEANUP

A. At all times keep the premises free from accumulations of waste materials.

B. After recovery well installation and well riser extension work has been completed, the well locations shall be cleaned of all foreign substances, including tools, timbers, rope, debris of any kind, cement, oil, grease, joint dope and scum.

END OF SECTION

SECTION 02526
WELL ABANDONMENT

PART 1 GENERAL

1.01 SUMMARY

A. Section includes abandonment of designated existing monitoring wells.

B. Related Sections:

1. Section 02220 - Demolition

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM C 150, Standard Specification for Portland Cement

B. Alabama Department of Environmental Management (ADEM), Ground Water Branch

1. "Alabama Environmental Investigation and Remediation Guidance", March 2002

C. Alabama Department of Environmental Management (ADEM), Resource Conservation and Recovery Act (RCRA) Program

D. United States Environmental Protection Agency (USEPA) Region IV Environmental Compliance Branch, Standard Operating Procedures, November 2002

1.03 SUBMITTALS

A. Submit the following to Engineer for review and approval prior to construction.

1. Manufacturer's product data and certifications showing conformance with the specifications for all specified products.

2. Description of equipment and method to be used for well installation.

B. At completion of abandonment activities, submit Well Abandonment Documentation as specified in subsection 3.02 of this Section.

1.04 QUALITY ASSURANCE

A. Abandonment of wells shall be performed in compliance with all applicable regulations, including: applicable regulations of the ADEM RCRA Program; the referenced ADEM guidance document; and applicable regulations of the USEPA Region IV Environmental Compliance Branch.

B. Work shall be performed by a qualified well driller under the direction of an experienced professional geologist or geotechnical engineer.

1.05 PROJECT CONDITIONS

A. The Engineer will obtain approval from ADEM before the Contractor will be allowed to proceed with well abandonment.

B. Work shall be restricted to the areas shown on the Drawings or as otherwise designated by the Engineer.

C. Work shall be performed in a manner that does not disturb existing utilities, monitoring wells, recovery well, or other facilities not indicated to be removed or abandoned.

PART 2 PRODUCTS

2.01 CEMENT-BENTONITE GROUT

A. Cement-bentonite grout shall be a mixture of Type II or IV Portland cement (complying with ASTM C 150) and clean water in the proportion of 5 to 6 gallons of water per 94-pound bag of cement. The mix shall also contain approximately two to six percent sodium bentonite by weight.

PART 3 EXECUTION

3.01 PREPARATION

A. Prior to commencement of the work, the wells to be abandoned will be marked by the Engineer. Abandonment activities shall not proceed until Engineer marks and verifies location.

3.02 FIELD QUALITY CONTROL

A. Well Abandonment Documentation shall be prepared for each abandoned well and shall include: well location and number; materials used; well diameter; and total well depth.

3.03 ABANDONMENT OF MONITORING WELLS

A. The following procedures shall be used to abandon existing monitoring wells. The wells to be abandoned are identified in Table 1 (attached to this Section) and on the Drawings.

B. Remove and dispose of all surface completion components such as well cover manholes, protective covers, concrete pads and protective bollards as specified in Section 02220.

C. In accordance with referenced guidelines and regulations, an attempt shall be made to completely remove the well casing and screen from the borehole using the following procedures:

1. Auger with a hollow-stem auger over the well casing to the bottom of the borehole, thereby removing the grout and filter pack materials from the hole.

2. Remove well casing from the hole using appropriate equipment.

3. Backfill the clean borehole with specified cement-bentonite grout. The grout shall be placed into the borehole from the bottom to the top by pressure grouting with the positive displacement method (tremie method).

4. The top two feet of the borehole shall be filled with concrete to insure a secure surface seal.

D. If the well casing breaks during removal of PVC wells, the borehole shall be cleaned out using one of the following procedures:

1. The borehole shall be cleaned out by using a drag bit or roller cone bit with the wet rotary method to grind the casing into small cuttings that will be flushed out of the borehole by the selected drilling method.

2. An alternative method for cleaning of the borehole is to use a solid-stem auger with a carbide auger head to grind the PVC casing into small cuttings that will be brought to the surface on the rotating flights. After the casing materials have been removed from the borehole, the borehole shall be cleaned out and pressure grouted with the specified cement-bentonite grout.

3. After the casing materials have been removed and the borehole cleaned out, the borehole shall be pressure grouted with the specified cement-bentonite grout in accordance with the requirements of subsection 3.03.C.3.

4. The top two feet of the borehole shall be filled with concrete to insure a secure surface seal.

E. If a well to be abandoned cannot be completely removed due to existing access restriction or inability to remove the well without damaging an adjacent monitoring well, then with prior approval from ADEM, the well may be abandoned by grouting in place in accordance with the following procedures:

1. Cut the casing off two to three feet below grade.

2. Place specified cement-bentonite grout into the borehole from the bottom to the top by pressure grouting with the positive displacement method (tremie method).

3. The top two feet of the borehole shall be filled with concrete to insure a secure surface seal.

F. Backfill excavations resulting from the removal of well components. Place and compact backfill material to grade. Backfill shall consist of native excavated material.

3.04 CLEANUP

A. At all times keep the premises free from accumulations of waste materials.

B. After all designated wells have been abandoned, the area shall be cleaned of all foreign materials and substances used in the work, including tools, grout and debris.

END OF SECTION

TABLE 1
WELL ABANDONMENT TABLE

Well Number	Total Depth (ft bgs)	Screen Interval (ft bgs)	Screened Strata	Casing Diameter & Material	Depth of Outer Casing (ft bgs)	Filter Pack Interval (ft bgs)	Grout Interval (ft bgs)	Installation Date	Current Condition
MW-1-S	18.5	5.0 - 16.0	silty sand	Outer casing - 8.0-inch ID PVC, Inner casing - 2.0-inch ID PVC	5	4.5-18	0-2.5	Jan-86	Servicable
MW-1-I	43	30.0 - 40.0	fi-med sand	Outer casing - 8.0-inch ID PVC, Inner casing - 2.0-inch ID PVC	5	26-43	0-24.5	Jan-86	Servicable
MW-1-D	107	94.0 - 104.0	fi-med-coarse sand	outer casing 1 - 10.0-inch ID PVC, Outer casing 2 - 6.0-in ID PVC, Inner casing - 2.0-inch ID PVC	#1 - 5 #2- 65	90-103	0.0 - 87.0	Nov-98	Serviceable
MW-2-S	18.5	5.0 -16.0	fi-silty sand	Outer casing - 8.0-inch ID PVC, Inner casing - 2.0-inch ID PVC	5	4.5 - 18.0	0.0 - 2.5	Jan-86	Serviceable
MW-4-S	18.5	5.0 -16.0	silty sand	Outer casing - 8.0-inch ID PVC, Inner casing - 2.0-inch ID PVC	5	4.5 - 18.0	0.0 - 2.5	Jan-86	Serviceable
MW-4-I	61.5	49.0 - 59.0	sand	Outer casing - 8.0-inch ID PVC, Inner casing - 2.0-inch ID PVC	5	45.5 - 61.5	0.0 43.0	Jun-86	Serviceable
MW-5-I	62.5	50.0 - 60.0	silty sand	Outer casing - 8.0-inch ID PVC, Inner casing - 2.0-inch ID PVC	5	48.0 - 62.5	0.0 - 38.5	Jun-86	Serviceable
MW-10-I	50.0	37.5 -47.5	coarse sand	Outer casing - 8.0-inch ID PVC, Inner casing - 2.0-inch ID PVC	5	35.0 -50.0	0.0 - 32.0	Jun-86	Serviceable
MW-10-D	105.5	93.0 -103.0	coarse-gravelly sand	Outer casing - 8.0-inch ID PVC, Inner casing - 2.0-inch ID PVC	5	89.5 -105.5	0.0 - 85.0	Jun-86	Serviceable
MW-12-S	15.0	5.0 - 15.0	silty sand	Outer casing - 6.0-inch ID PVC Inner casing - 2.0-inch ID PVC	5	3.0 - 15.0	0.0 - 2.0	Nov-88	Serviceable
MW-13-S[1]	17.0	5.0 -15.0	fi-med sand	Outer casing - 6.0-inch ID PVC, Inner casing - 2.0-inch ID PVC	3	4.0 - 15.0	0.0 - 2.0	Nov-88	MWDRS*
MW-13-D	100.0	88.5-98.5	fi-med sand	outer casing - 8.0-inch ID PVC, Inner casing - 2.0-inch ID PVC	5	85.0-100.0	0.0 - 82.0	Nov-00	Serviceable
MW-14-S[1]	18.0	5.0 - 15.0	clayey/med. sand	Outer casing - 6.0-inch ID PVC, Inner casing - 2.0-inch ID PVC	5	5.0 - 15.0	0.0 - 3.0	Nov-88	MWDRS

TABLE 1
WELL ABANDONMENT TABLE

Well Number	Total Depth (ft bgs)	Screen Interval (ft bgs)	Screened Strata	Casing Diameter & Material	Depth of Outer Casing (ft bgs)	Filter Pack Interval (ft bgs)	Grout Interval (ft bgs)	Installation Date	Current Condition
MW-14-I[(1)]	53.0	40.0 - 50.0	med-coarse sand	outer casing #1 - 10.0-inch ID PVC, Outer casing #2 - 6.0-in ID PVC, Inner casing - 2.0-inch ID PVC	#1 - 5 #2- 25	38.0 - 50.0	0.0 - 34.0	Nov-88	MWDRS
MW-17-I[(1)]	50.0	40.0 - 50.0	fi-med sand	outer casing #1 - 10.0-inch ID PVC, Outer casing #2 - 6.0-in ID PVC, Inner casing - 2.0-inch ID PVC	#1 - 5 #2- 25	36.0 -50.0	0.0 - 30.0	Nov-88	MWDRS
MW-18-S[(1)]	17.5	5.0 -15.0	fi-med sand & clay	Outer casing - 6.0-inch ID PVC, Inner casing - 2.0-inch ID PVC	5	5.0 - 15.0	0.0 - 4.0	Nov-88	MWDRS
MW-19-I	51.5	40.0 - 50.0	med-coarse sand	outer casing #1 - 10.0-inch ID PVC, Outer casing #2 - 6.0-in ID PVC, Inner casing - 2.0-inch ID PVC	#1 - 5 #2- 25	38.0 - 50.0	0.0 - 36.0	Aug-89	Serviceable
MW-22-S[(1)]	20.5	7.5 - 17.5	silty sand	Outer casing - 6.0-inch ID PVC, Inner casing - 2.0-inch ID PVC	5	6.0 - 17.5	0.0 - 4.5	Sep-89	MWDRS
MW-25-S	18	5.0 - 15.0	silty-clayey sand	Outer casing - 6.0-inch ID PVC, Inner casing - 2.0-inch ID PVC	5	5.0 - 15.0	0.0 -3.0	Aug-89	Serviceable
MW-27-D[(1)]	100.5	87.0 - 97.0	med-coarse sand	outer casing #1 - 12.0-inch ID PVC, Outer casing #2 - 6.0-in ID PVC, Inner casing - 2.0-inch ID PVC	#1 - 5 #2- 75	84.0 - 97.0	0.0 - 75.0	Sep-89	MWDRWS
MW-29-I	63	50.0-60.0 est	sand	NA	NA	47.0-50.0 est	0.0 -45.0 est	Feb-89	Serviceable
MW-30-I	48	38.0 - 48.0	med-coarse sand	Outer casing - 6.0-inch ID PVC, Inner casing - 2.0-inch ID PVC	25	35.0 - 48.0	0.0 - 35.0	May-98	Serviceable
MW-30-D	66.5	105	fine-coarse clayey sand	outer casing #1 - 1.0-inch ID PVC, Outer casing #2 - 6.0-in ID PVC, Inner casing - 2.0-inch ID PVC	#1 - 5 #2- 75	83.0 - 105.0	0.0 - 83.0	May-98	Serviceable
RW-2	103	90.0 - 100.0	coarse-gravelly sand	Outer casing - 12.0-inch ID steel, Inner casing - 4.0-inch ID PVC Sch 80, Screen -4.0-inch stainless steel	6	86.0 - 103.0	0.0 - 83.0	Apr-92	Serviceable

Notes:

(1) Former monitor well/DNAPL recovery well

SECTION 02630
STORM DRAINAGE SYSTEM

PART 1 GENERAL

1.01 SUMMARY

A. Section includes furnishing and installation of storm drainage piping, inlets, headwalls and pipe outfalls in SWMU 6 West.

B. Related Sections:

1. Section 02317 – Trenching and Backfilling

1.02 REFERENCES

A. "Standard Specifications for Highway Construction", 2002 Edition, Alabama Department of Transportation, (ALDOT Specifications).

B. American Association of State Highway and Transportation Officials (AASHTO):

1. AASHTO M 170, Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe

C. American Society for Testing and Materials (ASTM):

1. ASTM C 76, Standard Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe

2. ASTM C 443, Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets

3. ASTM C 923, Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals

1.03 SUBMITTALS

A. Submit manufacturer's product information showing conformance with the Specifications.

B. At completion of the work, submit record survey drawing(s) for review and approval by the Engineer, showing locations and elevations of all installed piping, inlets and other drainage structures.

1.04 QUALITY CONTROL

A. Manufacturers shall have manufacturing and quality control facilities capable of producing and assuring the quality of the piping, inlets, headwalls and other drainage structures specified.

1.05 DELIVERY, STORAGE AND HANDLING

A. During loading, transporting and unloading, exercise care to prevent damage to products.

B. Pipe shall be marked with manufacturer's identification symbol, size, date of manufacture, class of pipe and applicable product specification identification number.

C. All materials shall be inspected upon delivery to the Site. Damaged or defective materials shall be rejected and shall be replaced with new materials at the supplier's or Contractor's expense.

PART 2 PRODUCTS

2.01 REINFORCED CONCRETE PIPE

A. Reinforced concrete pipe (RCP) shall be round pipe conforming to ASTM C 76 or AASHTO M 170, Class III. Joints shall be tongue and groove compression gasket joints complying with ASTM C 443.

2.02 DRAINAGE INLETS

A. Drainage inlets shall conform to the requirements of Section 621 of the ALDOT Specifications and in accordance with the details shown on the Drawings.

B. Openings for pipe connections shall be provided at the locations and to the sizes required, and shall not be closer than one foot to the nearest joint. Furnish or cast in place resilient connectors conforming to ASTM C 923, such as manufactured by Press-Seal Gasket Corporation or approved equal.

C. Section joints for pre-cast concrete structures shall be tongue and groove with preformed gaskets conforming to ASTM C 443.

D. Cast iron drainage gratings, cover, frames and other castings for drainage structures shall conform to Section 836 of the ALDOT Specifications and in accordance with the details shown on the Drawings.

2.03 HEADWALLS AND PIPE OUTFALLS

A. Headwalls and pipe outfalls shall be either cast-in-place or precast concrete constructed in accordance with the details shown on the Drawings. Cast-in-place concrete construction shall conform to the requirements of Section 620 of the ALDOT Specifications. Precast concrete structures shall conform to the requirements of Sections 619 of the ALDOT Specifications.

2.04 PIPE TRENCH MATERIALS

A. Pipe bedding and backfill materials shall be as specified in Section 02317.

PART 3 EXECUTION

3.01 EXCAVATION AND BEDDING

A. Prepare subgrade for drainage inlets, headwalls and pipe outfalls to provide a stable base for each installation. Subgrade shall be undisturbed or shall be compacted pipe bedding material conforming to the material specifications in subsection 2.02 of Section 02317.

B. Excavate trenches and prepare pipe bedding as specified in Section 02317.

3.02 RECORD DOCUMENTS

A. During the progress of the storm drainage system installation, record installed locations, elevations, and all changes and deviations from the original design by marking up construction drawings. Mark-ups shall show the following information:

1. Size and type of storm drain pipe and drainage structure installed

2. Locations of storm drain pipe and drainage structures

3. Surveyed invert elevations of pipes and drainage structures

3.03 INSTALLATION OF PIPE

A. Pipe joints shall be inspected and all dirt, gravel, sand, debris or other foreign material shall be completely removed from the mating surfaces before installation.

B. Field cutting of piping, where required, shall be made with a machine specially designed for cutting piping and in accordance with the manufacturer's instructions. Cuts shall be made carefully, without damaging piping, leaving a smooth end at right angles to the axis of the piping. Damaged piping shall be replaced or repaired at Contractor's expense.

C. Install piping accurately to line and grade shown. Slope piping uniformly between elevations shown on the Drawings. Accurate means of determining and checking the alignment and grade shall be used, which shall be subject to the approval of the Engineer. Incorrectly installed piping shall be removed and reinstalled at Contractor's expense.

D. Do not lay piping in water, unless approved by the Engineer. Maintain a dry trench until jointing and backfilling are complete.

E. Begin installing piping at lowest point and proceed toward the higher elevations. Pipe shall be installed with the bell and groove end upgrade. Piping shall be installed so that the barrel of the piping receives the bearing pressure from the pipe bedding.

F. Complete joints in accordance with manufacturer's recommendations, and in conformance with reference standards.

G. All lifting holes in RCP pipe shall be completely filled with non-shrink grout after pipe is placed in the trench and prior to placement of any backfill material over the pipe

H. No piping shall be brought into position until the preceding pipe joint has been installed and secured in place. As soon as possible after each joint is made, sufficient backfill material shall be placed along the pipe to prevent pipe movement off line or grade. Joints shall not be covered until the Engineer has completed pipe inspection and all defective piping has been repaired.

I. Whenever pipe installation is not actively in progress, the open ends of the piping shall be closed by a temporary plug or cap to prevent soil, water and other foreign matter from entering the piping.

J. For junction with other pipe materials, use type of transition coupling and technique recommended by the pipe manufacturer.

3.04 DRAINAGE STRUCTURE CONSTRUCTION

A. Construct drainage structures at the locations indicated on the Drawings and as specified in the following paragraphs.

B. Construction of drainage structures shall conform to the requirements of Sections 619, 620 or 621 of the ALDOT Specifications, as applicable. Construct to the dimensions and elevations indicated on the Drawings.

C. Set pre-cast concrete structures at the proper elevations, carefully leveled, and aligned as indicated on the Drawings. Joints in precast concrete drainage inlets shall be constructed in accordance with manufacturer's recommendations and shall be made watertight.

D. Install drainage grates, covers, frames and other castings in accordance with the manufacturers' recommendations and as shown on the Drawings. Top of grate elevation shall match final grade (top of pavement).

3.05 PIPE CONNECTIONS

A. Pipe connections to drainage structures shall be installed true to line and grade as shown on the Drawings. All pipe connections shall be watertight.

3.06 BACKFILLING AND COMPACTING

A. Place and compact backfill over pipes and around structures as specified in Section 02317.

B. Placement and compaction of backfill shall be performed in a manner that does not damage the pipe and structures. Damaged pipe and structures shall be replaced or repaired at the Contractor's expense, and as approved by the Engineer.

END OF SECTION

SECTION 02692
GROUND WATER TREATMENT SYSTEM BURIED PIPING

PART 1 GENERAL

1.01 SUMMARY

A. Section includes furnishing and installation of buried piping for: ground-water recovery system from recovery wells to the treatment system; and ground-water treatment system effluent line.

B. Related Sections:

1. Section 02317 – Trenching and Backfilling

2. Section 11511 – Recovery Well Pumps and Accessories

3. Section 11520 – Treatment System Piping and Appurtenances

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM A 53, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

2. ASTM A 865, Standard Specification for Threaded Couplings, Steel, Black or Zinc-Coated (Galvanized) Welded or Seamless, for Use in Steel Pipe Joints

3. ASTM D 2321, Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications

4. ASTM D 2657, Standard Practice for Heat-Joining Polyolefin Pipe and Fittings

5. ASTM D3034, Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings

6. ASTM D 3035, Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter

7. ASTM D 3212, Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals

8. ASTM D 3261, Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing

9. ASTM D 3350, Standard Specification for Polyethylene Plastics Pipe and Fittings Materials

10. ASTM F 477, Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

11. ASTM F 714, Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter

B. Uni-Bell PVC Pipe Association:

1. "Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe", UNI-B-6-98

1.03 SUBMITTALS

A. Submit the following to the Engineer for approval:

1. Manufacturer's documentation showing conformance with the specifications for specified pipe.

2. Certification of personnel training in heat fusion procedures for high density polyethylene pipe, as specified in subsection 1.04.B of this Section.

B. Submit one set of marked up construction drawings to the Engineer showing the following as-built information:

1. Location of pipe runs, connections, and invert elevations.

2. Identification of all utilities encountered.

1.04 QUALITY ASSURANCE

A. Pipe manufacturers shall have manufacturing and quality control facilities capable of producing and assuring the quality of the materials specified.

B. Heat fusion of polyethylene piping shall be performed by personnel trained in the pipe manufacturer's recommended procedures. Training shall have been received not more than 12 months prior to start of construction.

1.05 DELIVERY, STORAGE AND HANDLING

A. During loading, transporting, and unloading, exercise care to prevent damage to materials.

B. Piping shall be marked with manufacturer's identification symbol, size, date of manufacture, material classification, pressure rating, and other applicable product specification identification numbering.

C. All materials shall be inspected by the Contractor upon delivery to the Site. Damaged or defective materials shall be rejected and shall be replaced with new materials at the supplier's or Contractor's expense.

PART 2 PRODUCTS

2.01 PIPE BEDDING AND BACKFILL

A. Specified in Section 02317.

2.02 PIPING MATERIALS SCHEDULE

A. Piping, fittings, gaskets and other wetted parts shall be compatible with the materials being handled.

B. Buried recovery system piping from recovery wells to the ground-water treatment system shall consist of a field assembled dual containment system consisting of the following piping materials:

1. Carrier pipe shall be galvanized steel pipe, specified in subsection 2.03.

2. Containment piping shall be butt-fused high density polyethylene (HDPE) pipe, specified in subsection 2.04.

C. Ground-water treatment system effluent piping shall be PVC pipe as specified in subsection 2.05.

2.03 GALVANIZED STEEL PIPE AND FITTINGS

A. Galvanized steel pipe and fittings shall comply with ASTM A 53. Furnish threaded NPS 1 size, Schedule 40, standard weight class pipe. Furnish galvanized threaded couplings complying with ASTM A 865.

2.04 HDPE PIPE AND FITTINGS

A. HDPE pipe and fittings shall have a minimum cell classification of PE345434C in compliance with ASTM D 3350. Dimensions and pressure rating shall be in compliance with ASTM F 714 or ASTM D 3035. Pipe shall have a standard dimension ratio (SDR) of 17 or stronger.

B. Nominal pipe size shall be as indicated on the Drawings.

C. Molded fittings shall be manufactured in accordance with ASTM D 3261.

2.05 PVC SEWER PIPE AND FITTINGS

A. Pipe shall be polyvinyl chloride (PVC) gravity sewer pipe and fittings manufactured in conformance to ASTM D 3034, SDR 35.

B. Joints shall conform to ASTM D 3212 with factory-installed elastomeric gaskets conforming to ASTM F 477.

C. Furnish suitable transition and connection fittings required for connection to existing sanitary sewer pipe or manhole, as applicable.

PART 3 EXECUTION

3.01 PREPARATION

A. Excavate trenches and prepare bedding for pipe installation as specified in Section 02317.

3.02 PIPE INSTALLATION

A. Field assemble galvanized steel carrier pipe and HDPE containment pipe in sections using procedures that will provide completed dual containment pipelines from each recovery well to the treatment system as shown on the Drawings.

B. Field cutting of piping, where required, shall be made using suitable tools as recommended by the manufacturer. Cuts shall be carefully done, without damage to piping, so as to leave a square end at right angles to the axis of the piping. Piping damaged by improper or careless methods of cutting shall be replaced or repaired at Contractor's expense.

C. HDPE Pipe Jointing:

1. HDPE joints shall be made using thermal butt fusion procedures in accordance with ASTM D2657 and the manufacturer's recommendations. Jointing shall be performed in the presence of the Engineer.

2. When making a butt fusion joint, the equipment shall hold the heating element square to the ends of the pipe, compress the heated ends of the pipe, and hold the pipe in proper alignment while the plastic hardens.

3. Heat fusion equipment shall be kept in good working conditions at all times. Faces of the cleaning elements shall be cleaned properly after each use.

4. Containment pipe penetrations at structures shall be made as shown on the Drawings. A watertight connection shall be provided.

5. Trial testing of butt fusion jointing shall be performed as specified in subsection 3.03.

D. Galvanized Steel Pipe Jointing:

1. Prepare pipe ends, fittings and couplings in accordance with manufacturer's recommendations.

2. Remove scale, dirt and debris for both inside and outside of pipe and fittings before assembly.

3. Join pipe sections and pipe fittings with threaded couplings in accordance with the manufacturer's recommendations and as required to meet the pressure requirements of the system.

4. Pressure testing of piping shall be performed as specified in subsection 3.04.

E. Dual Containment Piping Assembly:

1. Insert galvanized steel pipe inside HDPE containment piping. Centralizers will not be required.

2. Piping shall be assembled using methods that will not damage or excessively stress pipe joints.

3. Connect galvanized steel carrier piping to exposed piping in recovery well vaults and at treatment system as specified in Sections 11511 and 11520 and as shown on the Drawings.

F. Install dual containment piping in prepared trenches. Install elbow fittings at changes in alignment.

G. Install PVC pipe in conformance with ASTM D 2321.

H. Do not lay piping in water. Maintain a dry trench until pipe bedding, installation and jointing are complete.

I. Whenever pipe laying is not actively in progress, the open ends of piping shall be closed by a temporary plug or cap to prevent soil and other foreign matter from entering the piping.

J. Anchorage and Blocking for Buried Pipe:

1. Provide suitable concrete thrust blocking as required to prevent movement of piping causing by internal pressure in all piping tees and bends.

2. Concrete thrust blocking shall be constructed between solid ground and the fitting to be anchored. Unless otherwise indicated or directed, the base and thrust bearing sides of thrust blocks shall be poured directly against undisturbed earth. The sides of thrust blocks not subject to thrust may be poured against forms. Blocking shall be constructed so that the fitting joints will be accessible for repair.

3.03 PIPE CONNECTION TO MANHOLE

A. Pipe connection to existing manhole shall be made using approved couplings. All pipe connections shall be watertight.

3.04 TESTING OF HDPE PIPE

A. Contractor shall notify Engineer of date and time of tests at least 48 hours prior to executing tests. Testing shall be performed in the presence of the Engineer.

B. Butt Fusion Trial Testing

1. On every day that butt heat fusions are to be made, a trial fusion shall be performed prior to the start of construction fusion joining.

2. The trial fusion shall be performed under the same conditions and with the same equipment as for construction fusion.

3. After allowing the fusion to cool completely, one fusion test strap shall be cut out at the joint. The test strap dimensions shall be: 12 inches minimum in length, with the fusion at the center; and one inch minimum in width.

4. The test strap shall be bent until the ends of the strap touch. If the fusion fails at the joint, fusion procedures and machine setup shall be changed as necessary, and a new trial fusion shall be prepared and tested.

5. Construction butt fusion shall not commence until a trial fusion has passed the bent strap test.

C. The date, name of tester, and outcome of all trial tests shall be observed and recorded by the QC Firm, and submitted to the Engineer.

D. Visually inspect completed piping to assure joints are intact. This shall include inspection of fusion beads at each joint. The size and shape of the fusion beads shall comply with the manufacturer's recommendations.

E. Hydrostatic Testing:

1. Hydrostatic testing of HDPE piping will not be required for this project.

3.05 PRESSURE TESTING OF STEEL PIPE

A. Contractor shall notify Engineer of date and time of pressure tests at least 48 hours prior to executing tests. Testing shall be performed in the presence of the Engineer.

B. In general, pressure tests shall be performed on piping before connection to equipment. In no case shall any piping or equipment be subjected to pressures exceeding their rating.

C. Blank off or remove valves, pumps, and other devices which may be damaged by test pressure.

D. Pressure testing shall be performed by maintaining an internal water pressure of [150]

psig for a period of three hours. Before applying the specified test pressure, all piping shall be flushed and all air expelled from pipe. While piping system is pressurized all joints shall be inspected with an acceptable leak detection fluid. Any leaks that occur shall be repaired to the satisfaction of the Engineer and pressure testing repeated until pipe is accepted by Engineer.

E. All defective work shall be repaired or replaced, and the testing shall be repeated. The use of caulking or other temporary patching methods. to stop leaks will not be permitted.

F. The date, name of tester, and outcome of all trial tests shall be observed and recorded by the QC Firm, and submitted to the Engineer.

3.06 LEAKAGE TESTING

A. Prior to connection to active sewers, the installed pipeline shall be tested for leakage using test methods approved by the Engineer as specified in the following paragraphs and in accordance with the requirements of the utility owner. Hydraulic infiltration or exfiltration testing are the preferred methods. Testing shall be performed in the presence of the Engineer.

B. Construct weirs and bulkheads as required to isolate sections for testing. Furnish all water, labor, test plugs, power, pumps, meters and other equipment necessary for the tests.

C. Infiltration Testing:

1. Infiltration testing shall be performed for locations where the ground water level is greater than approximately one foot above the top of the sewer pipe at the upper end of the section being tested, as determined by the Engineer.

2. Infiltration shall be measured using a suitable weir or other device acceptable to the Engineer.

D. Exfiltration Testing:

1. Exfiltration testing shall be performed when the Engineer determines that infiltration cannot be properly tested (such as in cases where the ground water level is less than one foot above the top of the sewer pipe at the upper end of the section being tested).

2. Plug the pipe at the lower end of section to be tested. Fill pipeline section and manholes with clean water to a height of approximately four feet above the top of the sewer at its upper end.

3. The amount of water required to maintain the water level at the upper end shall be measured using devices acceptable to the Engineer. The test period shall be a minimum of two hours.

E. Leakage as measured by either the infiltration test or exfiltration test shall not exceed 50 gallons per inch diameter per mile of sewer pipe per 24 hours.

F. When leakage exceeds the maximum amount specified, satisfactory correction shall be made and retesting shall be performed. Testing, correction, and retesting shall be made at no additional cost to the Project. Visible leaks encountered shall be corrected regardless of leakage test results.

G. Low pressure air testing may be performed for determination of leakage if acceptable to Engineer. PVC plastic pipelines shall conform to the applicable requirements of the Uni-Bell publication UNI-B-6-98.

H. If low pressure air testing is performed, leakage tests on manholes shall be conducted independently of the pipeline testing by use of hydraulic infiltration or exfiltration testing as directed by the Engineer. Allowable infiltration over a 24-hour period shall be zero. Allowable exfiltration over a 24-hour period shall be zero when tested by plugging the manhole and filing it with water to a depth of four feet above the top of the sewer.

3.07 BACKFILL

A. Place soil backfill around and over installed piping as specified in Section 02317.

B. Care shall be taken to place backfill without damaging or displacing the piping.

END OF SECTION

SECTION 02722
AGGREGATE BASE COURSE

PART 1 GENERAL

1.01 SUMMARY

A. Section includes construction of graded aggregate base course for the SWMU 6 West asphalt cover.

B. Related Sections:

1. Section 01722 – Construction Surveying

2. Section 02318 – Fill Placement and Grading

3. Section 02743 – Bituminous Concrete Pavement

1.02 REFERENCES

A. "Standard Specifications for Highway Construction", 2002 Edition, Alabama Department of Transportation (ALDOT Specifications)

B. American Society for Testing and Materials (ASTM):

1. ASTM C 136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates

2. ASTM D 698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort

3. ASTM D 1556, Standard Test Method for Density and Unit Weight of Soil in Place by the Sand Cone Method

4. ASTM D 2922, Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

1.03 SUBMITTALS

A. Submit written certification, signed by the material producer, stating that the materials meet or exceed the specified requirements. Submit information to Engineer, for review and approval, no later than 14 calendar days prior to scheduled delivery of specified materials to the Site.

B. Submit copy of truck ticket for every load of aggregate base material delivered to the Site.

C. Submit record survey drawing of completed aggregate base course as specified in this Section.

1.04 QUALITY ASSURANCE

A. QC Firm shall perform specified tests to determine conformance of materials and constructed work with the Specifications.

1.05 PROJECT CONDITIONS

A. Work shall be performed in a manner that does not disturb existing and new facilities not indicated to be removed. Damage caused by the Contractor to facilities not indicated to be removed shall be repaired or replaced at the Contractor's expense in conformance with the provisions of the Contract Documents.

PART 2 PRODUCTS

2.01 SOURCE QUALITY CONTROL

A. Proposed materials and source of supply shall be approved by the Engineer as specified prior to delivery and use in the construction.

B. Aggregate shall meet specified gradation prior to placement. All processing shall be completed at the source. Should the aggregate, at any time, deviate from the required gradation, the Contractor shall, at his own expense, correct the inconsistency to the satisfaction of the Engineer.

2.02 AGGREGATE

A. Aggregate for base course under asphaltic concrete pavement shall be crushed aggregate conforming to the requirements of Section 825 of the ALDOT Specifications.

B. Gradation shall conform to the requirements of Section 825 for Type B crushed aggregate as summarized in the following table:

Sieve Size	**Percent Passing, by Weight**
2 inch	100
1 1/2 inch	90 – 100
1 inch	75 – 98
1/2 inch	60 – 85
No. 4	40 – 70
No. 8	28 – 54
No. 16	19 – 42
No. 50	9 – 32
No. 200	4 - 18

C. Quality Control Testing of Aggregate:

1. If determined necessary by the Engineer, verification testing samples shall be taken upon delivery of aggregate to the Site, at a minimum rate of one for every 1,000 tons of material, and for each visible change in material. The following tests shall be performed:

a. Sieve analysis (using ASTM C 136)

b. Moisture - density relationship (using ASTM D 698)

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

A. Tests specified below shall be performed by the QC Firm during placement and compaction of aggregate base course.

1. In-Place Density (using ASTM D 1556, ASTM D 2922, or other test method approved by ALDOT in Section 306 of the ALDOT Specifications): Minimum of one test per lift for every 40,000 square feet (or fraction thereof) of material placed, and at every material change as determined by the Engineer.

B. Record Surveying

1. Surveying shall be performed by the Contractor's RLS to monitor completed aggregate base course construction. Survey on a 50-foot maximum grid pattern.

2. Provide survey data and record survey drawing to the Engineer for review and approval before proceeding with subsequent construction of bituminous concrete pavement.

3. Survey data and record drawings shall be prepared by a Registered Land Surveyor as specified in Section 01722.

C. Aggregate base course thickness and uniformity of surface shall be checked and approved by the QC Firm during installation. Construction of subsequent bituminous concrete pavement shall not proceed until the Engineer approves the finished surface of aggregate base course.

3.02 PREPARATION

A. Preparation of subgrade (including placement and compaction of fill) for aggregate base course shall be completed as specified in Section 02318.

3.03 PLACING AND COMPACTING BASE COURSE

A. Construct aggregate base course in accordance with the applicable requirements of Article 301.03 of the ALDOT Specifications, and as specified in the following paragraphs.

B. Construct aggregate base course in one uniform layer to a compacted thickness of six inches.

C. Place, spread, shape, and compact the aggregate base course as continuously as practicable during each day's operations. Place the material in a manner to avoid segregation. Uncontrolled spreading shall not be permitted.

D. Level and contour surfaces to elevations and gradients required to achieve the final pavement grades indicated on the Drawings.

E. At the time aggregate base is placed, it shall have a moisture content sufficient to obtain the required compaction. If necessary, uniformly apply water over the base material during compaction. Prevent free water from appearing on the surface during, or subsequent to, compaction operations. Compaction shall follow the spreading operation closely to prevent loss of contained moisture and displacement of material.

F. The depth of aggregate base course shall be carefully controlled, with periodic measurements of the loose and compacted depth.

G. The aggregate base course shall be compacted to a density of 100 percent of the material's maximum dry density as determined by ASTM D 698.

H. Areas of aggregate base course that do not meet the specified density requirement shall be recompacted and retested.

3.04 THICKNESS AND SURFACE TOLERANCES

A. Acceptable tolerance for thickness of aggregate base course shall not be more than 1/2 inch less nor one inch more than the specified thickness.

B. The finished surface of the aggregate base course shall be uniform.

C. Based on the results of surveying (specified in subsection 3.01), areas of the aggregate base course that are not constructed to the required thickness and elevations, within the allowed tolerance, shall be adjusted to the proper thickness and elevations using methods approved by the Engineer.

3.05 MAINTENANCE AND PROTECTION

A. The completed aggregate base course shall be maintained smooth and uniform until covered by bituminous concrete pavement (specified in Section 2743).

B. Damaged areas shall be repaired using methods approved by the Engineer.

END OF SECTION

SECTION 02743
BITUMINOUS CONCRETE PAVEMENT

PART 1 GENERAL

1.01 SUMMARY

A. Section includes construction of bituminous concrete pavement over aggregate base course for the SWMU 6 West cover.

B. Related Sections:

1. Section 02722 - Aggregate Base Course

1.02 REFERENCES

A. "Standard Specifications for Highway Construction", 2002 Edition, Alabama Department of Transportation (ALDOT Specifications)

B. American Association of State Highway and Transportation Officials (AASHTO):

1. AASHTO T 168, Sampling Bituminous Paving Mixtures

1.03 SUBMITTALS

A. Submit the following to the Engineer, for review and approval, no later than 14 calendar days prior to scheduled delivery of specified materials to the Site:

1. Job-mix formulas for bituminous concrete pavement.

2. Certificates, signed by the material producers, stating that the materials meet or exceed the specified requirements.

B. Submit copy of truck ticket for every load of bituminous concrete delivered to the Site.

1.04 QUALITY ASSURANCE

A. QC Firm shall perform specified tests to determine conformance of materials and constructed work with the Specifications.

B. Bituminous concrete materials and construction shall conform to the applicable requirements of Sections 410 and 429 of the ALDOT Specifications.

1.05 PROJECT CONDITIONS

A. Bituminous concrete pavement shall be placed only during periods of acceptable weather conditions in accordance with the requirements of Subarticle 410.03(b) of the ALDOT Specifications.

PART 2 PRODUCTS

2.01 SOURCE QUALITY CONTROL

A. Proposed materials and source of supply shall be approved by the Engineer as specified prior to delivery and use in the construction.

B. Quality Control of Bituminous Concrete Pavement Mix (if determined necessary by the Engineer):

1. If directed by the Engineer, Contractor shall obtain loose samples of bituminous concrete pavement mixtures produced for the project as delivered in trucks for testing by the QC Firm. Samples shall be obtained in accordance with AASHTO T 168 at the rate of one sample per lot (one day's production).

2. QC Firm shall determine asphalt content, maximum specific gravity, air void content, voids in mineral aggregate (VMA), Marshall stability and flow, and aggregate gradation in accordance with ALDOT and AASHTO testing methods referenced in Article 106.09 of the ALDOT Specifications.

3. Variances in test results from the approved Job Mix Formula are subject to rejection in accordance with the applicable requirements of Article 106.09, and as determined by the Engineer.

2.02 BITUMINOUS PRIME COAT

A. Bituminous prime coat shall conform to the applicable requirements of Section 401 of the ALDOT Specifications.

2.03 BITUMINOUS CONCRETE PAVEMENT MIX

A. Bituminous concrete mix shall be 429-A, Improved Bituminous Concrete Wearing Surface Layer, conforming to the applicable requirements of Sections 410 and 429 of the ALDOT Specifications, and as follows:

1. Maximum aggregate size mix shall be 1/2-inch

2. Design traffic 18-kip equivalent single axle load (ESAL) designation shall be "A" (less than 3.0×10^5)

3. The 50 Blow Marshall Mix Design method shall be used for the determination of appropriate design characteristics of the bituminous concrete mix.

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

A. Density Testing by QC Firm (during compaction):

1. Acceptance of each day's placement of bituminous concrete will be determined by using a nuclear densitometer in accordance with the ALDOT testing method referenced in Article 106.09 of the ALDOT Specifications. A minimum of three tests shall be conducted for every 3,000 square yards of material placed, and a minimum of three tests per lot.

2. Pavement areas where the density falls outside the specified range shall be recompacted until the required density is obtained. Density requirements are specified in subsection 3.05.

B. Completed pavement areas where the laboratory-determined density falls outside the specified range are subject to payment reductions in accordance with the applicable requirements of Subarticle 410.08(c), and as determined by the Engineer.

C. Surface Tolerance:

1. Contractor shall test the finished surface of bituminous concrete pavement with a 16-foot straightedge at locations directed by the Engineer.

2. The deviation of the finished surface of the surface course from the testing edge of the straightedge shall not exceed 1/4 inch.

3. Deviations greater than the specified tolerance shall be corrected in accordance with the applicable requirements of Article 410.06 of the ALDOT Specifications, and as approved by the Engineer.

D. Tests for Depth: The depth of pavement course shall be carefully controlled by the Contractor. Periodic measurements of the loose and compacted depth shall be taken under the observation of the QC Firm.

3.02 PREPARATION

A. Aggregate base course shall be completed as specified in Section 02722.

B. Remove and dispose of debris and other unsuitable material from the surface of the aggregate base course.

3.03 PRIME COAT

A. Apply prime coat over the finished surface of the aggregate base course immediately prior to placement of bituminous concrete pavement in accordance with the applicable requirements of Section 401 of the ALDOT Specifications.

3.04 BITUMINOUS CONCRETE PAVEMENT CONSTRUCTION

A. Construct bituminous concrete pavement over the prepared aggregate base to the limits shown on the Drawings.

B. The specified bituminous concrete pavement course shall be constructed in one uniform lift to the required total compacted thickness of two inches. The depth of pavement shall be carefully controlled, with periodic measurements of the loose and compacted depths.

C. The average in-place density of the pavement course placed within any lot shall be not less than 94 percent of the density obtained using the Marshall method of laboratory sample preparation, 50 blow method.

D. Place bituminous concrete pavement using spreaders equipped with hoppers and strike-off plates or screeds capable of producing courses ten to 15 feet wide, free of grooves, depressions and holes.

E. Ironing screeds used with strike-offs and screeds on the spreader shall be heated to at least 250 degrees before starting operations to prevent sticking or tearing of the surface.

F. Placement shall be planned to minimize the number of cold joints. The edges of spreads shall be smooth and sloped six to 12 inches to provide a bonding surface with the adjacent spread. Cold surfaces shall be heated with an infrared heater just before forming joints.

G. The final pavement surface shall be constructed to the grade and cross-sections indicated on the Drawings.

H. All paved areas shall drain with no puddles or areas of standing water.

3.05 MAINTENANCE AND PROTECTION

A. The completed pavement surface shall be protected from damage until acceptance of the construction work.

B. Damaged areas shall be repaired using methods approved by the Engineer.

END OF SECTION

SECTION 02821
CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.01 SUMMARY

A. Section includes installation of new chain link fencing, gates, and warning signs around the perimeter of the asphalt cover at SWMU 6 West.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM A 90, Standard Test Method for Weight (Mass) of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings

2. ASTM A 392, Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric

3. ASTM C 33, Standard Specification for Concrete Aggregates

4. ASTM C 150, Standard Specification for Portland Cement

5. ASTM F 567, Standard Practice for Installation of Chain-Link Fence

6. ASTM F 626, Standard Specifications for Fence Fittings

7. ASTM F 900, Standard Specification for Industrial and Commercial Swing Gates

8. ASTM F 1043, Standard Specification for Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework

9. ASTM F 1083, Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures

1.03 SUBMITTALS

A. Submit product data and shop drawings showing materials, finishes and dimensions for fencing and gates.

B. Submit shop drawings showing fabrication of warning signs and materials and methods for attachment to chain-link fencing.

PART 2 PRODUCTS

2.01 FABRIC

A. Height of fence fabric shall be six feet.

B. Fabric shall be number 9 gage (0.148 inch) (coated wire size) galvanized steel wires, [two-inch] mesh, with [top and bottom selvages knuckled]. Galvanized coating shall conform to ASTM A 392, Class 1, 1.2 ounces per square foot of surface area when tested in accordance with ASTM A 90.

2.02 POSTS

A. Posts shall conform to one of the following specifications:

1. Round hot-dipped galvanized Schedule 40 steel pipe conforming to ASTM F 1083.

2. Round SS-40 coated steel pipe as manufactured by Allied Tube & Conduit, or approved equal. Pipe shall conform to ASTM F 1043 and have a minimum yield strength of 50,000 psi.

B. Line posts shall have a minimum nominal outside diameter (O.D.) of two inches.

C. End, Corner, and Pull Posts shall have a minimum nominal O.D. of three inches.

D. Gate post sizes shall be as follows for one single gate leaf or one leaf of double gate installation:

1. For six-foot maximum gate leaf width: round posts shall be not less than three inches nominal O.D.

2. For six-foot to 13-foot gate leaf width: round posts shall be not less than four inches nominal O.D.

2.03 TOP RAILS AND BRACE RAILS

A. Rails shall be either SS-40 coated steel pipe (conforming to ASTM F 1043) or hot-dipped galvanized Schedule 40 steel pipe (conforming to ASTM F 1083). Minimum nominal O.D. shall be 1-5/8 inches.

B. Furnish rails in manufacturer's longest lengths, with expansion type couplings, approximately six inches long, for each joint. Provide means for attaching the top rail securely to each gate, corner, pull, and end post.

2.04 FENCE FITTINGS

A. Fence fittings shall conform to ASTM F 626, except as modified in this subsection.

B. Post and line caps shall be designed to accommodate passage of top rail through cap, where top rail is required.

C. Truss Rod Assembly: Steel truss rods shall be 3/8-inch diameter.

2.05 GATES

A. Use same fabric as for fence, unless otherwise indicated. Furnish swing gates as shown on the Drawings, and shall be complete with latches, stops, keepers, hinges. Swing gates shall conform to ASTM F 900.

B. Gate Hardware: Furnish galvanized steel or malleable iron hardware and accessories for each gate, consisting of hinges, latches, stops and keepers as specified in paragraphs 1 through 4 below, and as applicable.

1. Hinges: Shall be of adequate strength for gate, and with large bearing surfaces for clamping in position. The hinges shall not twist or turn under the action of the gate. The gates shall be capable of being opened and closed easily by one person.

2. Latches: Shall have a plunger-bar arranged to engage the center stop (for double swing gates), or other standard latch for sliding gates as approved by the Engineer. A forked latch may be provided for single swing gates of openings less than 10 feet wide. Latch shall permit operation from either side of gate. Include locking device and padlock eyes as an integral part of the latch, using one padlock for locking each gate.

3. Center Stops: For double swing gates, provide a center stop consisting of a device arranged to be set in concrete and to engage a plunger bar of the latch. No stop is required on single swing gates.

4. Hold-Open Keepers: Shall consist of a mechanical device for securing the free end of each swing gate leaf when in the full open position.

2.06 CONCRETE FOR POST FOOTINGS

A. Concrete shall consist of Type I Portland cement complying with ASTM C 150, one-inch maximum size aggregates complying with ASTM C 33, and clean water. Concrete mix shall be proportioned such that the 28-day compressive strength of moist-cured laboratory samples achieves not less than 3,000 pounds per square inch (psi).

2.07 WARNING SIGNS

A. Provide warning signs with required accessories for attachment to chain-link fencing.

B. Provide the number of signs required to install at the spacing and locations specified in subsection 3.04 of this Section.

C. Warning signs shall be 24 inches by 30 inches, made of 10-gage galvanized sheet metal or 8-gage aluminum, painted or coated white with red letters as follows:

4" letters: **STOP - RESTRICTED AREA**
4" letters: **AUTHORIZED PERSONNEL ONLY**
3" letters: FOR ACCESS INFORMATION CALL _____ (number to be furnished later)

PART 3 EXECUTION

3.01 PREPARATION

A. Establish required locations for fencing and gates.

B. Do not begin fence installation and erection before grading, paving and other construction is completed at the fence location.

3.02 FENCE INSTALLATION

A. Construct fencing in accordance with ASTM F 567, except as modified in this subsection, and in accordance with the fence manufacturer's recommendations.

B. Provide all necessary hardware for a complete installation.

C. Install new fencing as shown on the Drawings or where otherwise directed by the Engineer. Install posts at spacings not greater than ten feet.

D. Fence posts shall have concrete encasement as described below:

1. Excavate holes to a minimum diameter of 12 inches and a minimum depth of 30 inches as shown on the Drawings.

2. Center and align posts in holes three inches above bottom of excavation. Place concrete around posts in a continuous pour to two inches above finish grade. Vibrate or tamp concrete for consolidation. Check each post for vertical and top alignment, and hold in position during placement and finishing operations.

E. Do not install fence fabric until concrete has cured for a minimum of seven days.

F. Alternate materials and methods of post anchorage may be used if reviewed and approved by the Engineer.

3.03 GATE INSTALLATION

A. Install gates in accordance with manufacturer's recommendations and acceptable industry practice.

B. Install gates, plumb, level, and secure, for full opening without interference. Install ground-set items in concrete for anchorage, as recommended by the fence manufacturer. Adjust hardware for smooth operation and lubricate where necessary.

3.04 INSTALLATION OF WARNING SIGNS

A. Attach signs securely to chain-link fence using materials and methods that will minimize the potential for theft.

B. Signs shall be installed on the exterior face of the chain-link fence at approximately 200 foot intervals (or as otherwise required by ADEM) and adjacent to or on each gate. The center of each sign shall be at a distance of five feet above the final grade at the fence line.

END OF SECTION

SECTION 02926
SEEDING AND MULCHING

PART 1 GENERAL

1.01 SUMMARY

A. Section includes establishing permanent grass over the Soil Cover in SWMU 4, 5 and 8 area and in SWMU 6 East, and in all other non-paved areas disturbed by construction.

B. Related Sections:

1. Section 01575 – Temporary Soil Erosion and Sediment Control

2. Section 02318 –Fill Placement and Grading

3. Section 02373 – Erosion Control Matting

1.02 REFERENCES

A. "Standard Specifications for Highway Construction", 2002 Edition, Alabama Department of Transportation (ALDOT Specifications)

1.03 SUBMITTALS

A. Submit the following for review not later than seven days prior to shipment of materials to the Site:

1. Soil sample analysis results and recommendations for soil amendments.

B. Submit the following for approval at time of shipment of materials to the Site:

1. Certification of grass seed from seed vendor for each grass seed mixture stating the botanical and common name and percentage by weight of each species and variety, and percentage of purity, germination and weed seed.

2. Manufacturer's certification for lime and fertilizer showing compliance with the specifications.

3. Bag tags, receipts, truck weight tickets, and other information necessary to confirm application rates and types for all seed, lime and fertilizer.

1.04 QUALITY ASSURANCE

A. Seeding shall be accomplished according to standard local practice and in compliance with requirements of applicable state and federal regulations.

B. Contractor shall retain the services of a testing firm to perform analysis of soil samples as specified in this Section. The testing firm shall be an independent laboratory approved by the Owner, having the experience and capability to conduct the testing specified.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver packaged materials in containers showing weight, analysis and name of manufacturer.

B. Protect materials from deterioration during delivery, and while stored at the Site.

1.06 PROJECT CONDITIONS

A. Perform seedbed preparation and seeding as soon as possible after completion of topsoil placement for the soil cover in each area.

PART 2 PRODUCTS

2.01 FERTILIZER

A. Fertilizer shall be a standard commercial fertilizer, in dry or liquid form, complying with Subarticle 860.12(c) of the ALDOT Specifications.

B. The grade of fertilizer shall be as indicated on the Drawings or as otherwise recommended based on soil test results and approved by the Engineer.

2.02 LIME

A. Lime shall be limestone used for agricultural liming purposes complying with Subarticle 860.12(d) of the ALDOT Specifications.

2.03 SEED

A. Seed shall be fresh, clean, new-crop seed mixed in the proportions specified for species and variety, complying with the applicable requirements of Article 860.01 of the ALDOT Specifications.

B. Seed mixture for temporary grassing, if required, shall be a mixture of one or more of the following seed types for planting dates of September through December:

Seed Type	Rate per Acre
Abruzzi Rye	70 lbs.
Kentucky 31 Fescue	30 lbs.
Weeping Lovegrass	5 lbs.

C. Seed for permanent grassing shall be as indicated on the Drawings.

D. Seed that has become wet, moldy or otherwise damaged will not be acceptable.

2.04 MULCH

A. Mulch shall consist of clean, dry native hay or threshed straw of oats wheat or rye from the latest available crop, substantially free of noxious weeds and foreign materials, and complying with the requirements of Subarticle 860.03(b) of the ALDOT Specifications.

PART 3 EXECUTION

3.01 SOIL SAMPLING

A. The independent testing firm shall obtain samples of the soil to be seeded, analyze the samples, and provide recommendations on fertilizer and lime to be used.

B. At least one sample of the soil to be seeded shall be obtained. Sample size shall be 10 ounces minimum.

3.02 PREPARATION

A. Maintain temporary erosion and sediment control measures as specified in Section 01575 until a satisfactory stand of grass has been established.

B. Fill placement and grading shall be completed as specified in Section 02318. Surface shall be reasonably smooth and free of litter, large clods, roots, sharp protrusions, and large stones.

C. For seeding methods other than hydroseeding, graded surfaces shall be scarified a depth of approximately four inches.

3.03 TEMPORARY VEGETATION

A. Uniformly apply fertilizer for temporary vegetation at the rate of 1000 pounds per acre of 8-8-8 fertilizer. Lime will not be required for temporary vegetation.

B. Seed mixture for temporary vegetation shall be uniformly applied at the rate specified in subsection 2.03.B.

3.04 APPLICATION OF SOIL AMENDMENTS

A. Uniformly apply fertilizer and lime for permanent vegetation at the rate indicated on the Drawings or as otherwise recommended based on soil test results and approved by the Engineer.

3.05 APPLICATION OF PERMANENT SEEDING AND MULCH

A. Uniformly apply seed for permanent vegetation at the rates indicated on the Drawings.

B. Apply seed in conformance with the applicable requirements of Subarticle 652.03(d) of the ALDOT Specifications.

C. Immediately after seeding, protect seeded areas with mulch or erosion control matting as specified in the following paragraphs.

D. Protect slopes not steeper than 3 horizontal to 1 vertical (3:1) with mulch. Spread mulch uniformly over seeded area in a continuous blanket at a rate of approximately two tons per acre. Spread mulch by hand, blower or other suitable equipment. Mulch placed on slopes steeper than 3 percent shall be anchored or "walked in" with a cleated track dozer.

E. Install turf reinforcement matting for protection of seeded areas on slopes and in drainage channels as specified in Section 02373.

3.06 HYDROSEEDING

A. Fertilizer, seed and mulch may be placed using hydroseeding, or other suitable mechanical methods that will not damage the completed Work.

B. Hydroseeding shall conform to the applicable requirements of Section 658 of the ALDOT Specifications.

3.07 ESTABLISHMENT OF GRASS

A. Begin maintenance of seeded areas immediately after seed placement. Water, repair washed or eroded areas, and otherwise protect and maintain the seeded areas until date of Substantial Completion.

B. Final acceptance of grassed areas will not be made until a satisfactory stand of grass is obtained in all areas seeded. A satisfactory stand of grass is defined as a cover of living plants, after true leaves are formed, of the seed species applied, in which gaps larger than one square foot do not occur. Bare spots shall be scattered, and the total bare areas shall not comprise more than one percent of the total seeded area.

C. Re-seed bare and eroded areas as determined necessary by the Engineer. Repair of washed or eroded areas and re-seeding of bare areas shall be performed at no additional cost to the Owner.

END OF SECTION

SECTION 02927
SODDING

PART 1 GENERAL

1.01 SUMMARY

A. Section includes requirements for planting and maintenance of sod.

B. Related Sections:

1. Section 02318 – Fill Placement and Grading

2. Section 02926 – Seeding and Mulching

1.02 SUBMITTALS

A. Submit the following for review not later than seven days prior to shipment of materials to the Site:

1. Soil sample analysis results and recommendations for soil amendments.

B. Submit the following for approval at time of shipment of materials to the Site:

1. Sod certification for grass species and location of sod source

C. Submit maintenance instructions for continued maintenance of sodded areas, including: cutting method and maximum grass height; and types, application frequency, and recommended coverage of fertilizer.

1.03 QUALITY CONTROL

A. Sodding shall be accomplished according to standard local practice and in compliance with requirements of applicable state and federal regulations.

B. Sod shall be obtained from grassed area having a minimum age of 18 months, with root development that will support its own weight, without tearing, when suspended vertically by holding the upper two corners.

C. Sod producer shall be a firm specializing in sod production and harvesting with minimum five years experience, and certified by the State of Alabama Department of Agriculture.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver sod on pallets or in rolls. Protect exposed roots from dehydration.

B. Do not deliver more sod than can be laid within 24 hours of harvesting based on manpower, available resources, and weather conditions at the site.

1.06 PROJECT CONDITIONS

A. Sodding shall be accomplished only during the appropriate growing season, as recommended by the local agricultural extension office and approved by the Engineer.

1.07 MAINTENANCE

A. Maintain sodded areas immediately after placement until grass is well established and exhibits a vigorous growing condition.

B. Furnish service and maintenance of sodded areas for until final completion of the project.

PART 2 PRODUCTS

2.01 TOPSOIL

A. Topsoil is specified in Section 02318.

2.02 SOD

A. Sod shall be field grown grass sod [of the species indicated on the Drawings].

B. Sod shall have a strong fibrous root system free of stones, burned or bare spots, and shall be substantially free of weeds.

2.03 SOIL AMENDMENTS

A. Fertilizer and lime shall comply with the requirements of Section 02926.

2.04 ACCESSORIES

A. Furnish metal sod staples of sufficient size and length to ensure anchorage of sod on slopes.

PART 3 EXECUTION

3.01 SOIL TESTING

A. Conform to the requirements of Section 02926.

3.02 PREPARATION FOR SODDING

A. Remove foreign materials and undesirable plants and their roots. Do not bury foreign material beneath areas to be sodded.

B. Place topsoil as specified in Section 2318 and as shown on the Drawings.

C. Surface of topsoil shall be reasonably smooth and free of litter, large clods, roots, sharp protrusions, and large stones.

3.04 APPLICATION OF FERTILIZER AND LIME

A. Apply fertilizer and lime in accordance with the requirements of Section 02926.

B. Apply fertilizer and lime no more than 48 hours before laying sod. Mix amendments thoroughly into upper three inches of soil

3.05 LAYING SOD

A. Moisten prepared surface immediately prior to laying sod.

B. Lay sod within 24 hours after harvesting to prevent deterioration.

C. Lay sod tight with no open joints visible, and no overlapping. Stagger end joints 12 inches minimum. Do not stretch or overlap sod pieces.

D. On slopes 3 to 1 and steeper, lay sod perpendicular to slope and secure every row with metal sod staples at a minimum of four per square yard of sod. Drive staples flush with soil portion of sod.

E. Water sodded areas immediately after installation. Saturate sodded area to soil depth of approximately three inches.

F. After sod and soil have dried sufficiently, roll sodded areas to ensure good bond between sod and soil. Roll sodded areas with roller not exceeding 100 pounds.

3.06 MAINTENANCE

A. Sod shall not be mowed the first four weeks following placement.

B. Water to prevent grass and soil from drying out. Periodically water sod as required for a period of [two months] after placement to assure the sod is well established.

C. Immediately replace sod in areas that show deterioration or bare spots.

D. Protect sodded areas with warning signs during maintenance period.

[E. During extended maintenance period, mow grass at regular intervals to maintain an average grass height of three inches. Do not allow height to exceed six inches. Do not cut more than 1/3 of grass blade at any one mowing]

END OF SECTION

SECTION 03110
CAST-IN-PLACE CONCRETE FORMS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes formwork for cast-in place concrete.

1.02 REFERENCES

A. American Concrete Institute (ACI)

1. ACI 347R-94, Guide to Formwork for Concrete

1.03 SUBMITTALS

A. Submit product data for form accessories and form coating materials.

1.04 QUALITY CONTROL

A. Conform to applicable code for design, fabrication, erection, and removal of formwork.

1.05 DESIGN REQUIREMENTS

A. Design and construct formwork, shoring, and bracing to conform to design and code requirements.

B. The formwork shall be designed for loads, lateral pressure, and allowable stresses in accordance with ACI 347R-94. Forms shall have sufficient strength to withstand the pressure resulting from placement and vibration of the concrete and shall have sufficient rigidity to maintain specified tolerances.

PART 2 PRODUCTS

2.01 FORMS

A. Forms shall be fabricated with facing materials, structurally adequate, properly aligned, and adequately supported to produce concrete conforming to the dimensions shown on the Drawings.

2.02 FORM ACCESSORIES

A. Ties and other similar form accessories to be partially or wholly embedded in the concrete shall be of a commercially manufactured type.

B. Plastic snap ties may be used in locations where the surface will not be exposed to view.

2.03 FORM COATING

A. Form coating shall be a commercial formulation of satisfactory and proven performance that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatment of concrete surfaces depending upon bond or adhesion nor impede the wetting of surfaces to be cured with water or curing compounds.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify lines, levels, and centers before proceeding with formwork. Ensure that dimensions agree with Drawings.

3.02 INSTALLATION

A. Forms shall be mortar tight, properly aligned and adequately supported to produce concrete surfaces meeting the specified requirements.

B. Where concrete surfaces are to be permanently exposed to view, joints in form panels shall be arranged to provide a pleasing appearance.

C. Where forms for continuous surfaces are placed in successive units, care shall be taken to fit the forms over the completed surface so as to obtain accurate alignment of the surface and to prevent leakage of mortar.

D. Forms shall not be re-used if there is any evidence of surface wear and tear or defects which would impair the quality of the surface.

E. All surfaces of forms and embedded materials shall be cleaned of any mortar from previous concrete placement work and of all other foreign material before concrete is placed in them.

3.03 INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Provide formed openings where required for items to be embedded in concrete.

B. Locate and set in place items which will be cast directly into concrete.

C. Coordinate with work of other Sections in forming and placing openings, sleeves, bolts, anchors, other inserts, and components of other work.

D. Install accessories in accordance with manufacturer's instructions, straight, level, and plumb. Ensure items are not disturbed during concrete placement.

3.04 CHAMFERING

A. All exposed joints, edges and external corners shall be chamfered by molding placed in the forms, unless the Drawings specifically state that chamfering is to be omitted or as otherwise specified.

3.05 COATING

A. Forms shall be coated with form oil or a form-release agent before the form or reinforcement is placed in final position.

B. The coating shall be used as recommended by the manufacturer.

C. Surplus coating on form surfaces and coating on reinforcing steel and construction joints shall be removed before placing concrete.

3.06 FORM REMOVAL

A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads (including wind load).

B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.

C. Store removed forms in a manner that will not damage surfaces to be in contact with fresh concrete. Discard damaged forms.

END OF SECTION

SECTION 03200
CONCRETE REINFORCEMENT

PART 1 GENERAL

1.01 SUMMARY

A. Section includes reinforcing steel and accessories for cast-in-place concrete.

1.02 REFERENCES

A. American Concrete Institute (ACI):

1. ACI 318, Building Code Requirements for Structural Concrete

2. ACI SP-66, ACI Detailing Manual

B. American Society for Testing and Materials (ASTM):

1. ASTM A 184, Standard Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement

2. ASTM A 185, Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement

3. ASTM A 497, Standard Specification for Steel Welded Wire Fabric, Deformed for Concrete Reinforcement

4. ASTM A 615, Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

C. Concrete Reinforcing Steel Institute (CRSI):

1. "Manual of Standard Practice"

1.03 SUBMITTALS

A. Submit manufacturer's certificates documenting that products meet or exceed specified requirements.

1.04 COORDINATION

A. Coordinate with placement of formwork and other related work.

PART 2 PRODUCTS

2.01 REINFORCEMENT

A. Reinforcing Steel: Deformed billet steel bars in accordance with ASTM A 615, grade 60, unfinished.

B. Dowel Bars: Plain billet steel bars in accordance with ASTM A 615, grade 40.

C. Welded Wire Fabric: Smooth welded steel wire in accordance with ASTM A 185, unfinished, furnished in flat sheets or rolls, unless otherwise specified or approved by the Engineer.

2.02 ACCESSORY MATERIALS

A. Tie Wire: Minimum 16 gage annealed type.

B. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions.

2.03 FABRICATION

A. Fabricate concrete reinforcing in accordance with CRSI Manual of Standard Practice, ACI SP-66, ACI 318, and ASTM A 184.

PART 3 EXECUTION

3.01 INSTALLATION

A. Unless otherwise approved by the Engineer, reinforcement shall be fabricated to the shapes and dimensions shown on the Drawings, and installed where indicated.

B. At the time of concrete placement all reinforcement shall be free from loose, flaky rust, scale (except tight mill scale), mud, oil, grease, or any other coating that might reduce the bond with the concrete.

C. Accurately position, support, and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required.

D. Place reinforcement to obtain at least the minimum coverages for concrete protection as shown on the Drawings. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

E. Do not place reinforcing bars more than two inches beyond the last leg of continuous bar support. Do not use supports as bases for runways for concrete conveying equipment and similar construction loads.

F. Tolerance for bar placement shall be plus or minus one bar diameter, but not exceeding one inch. Tolerance for cover over reinforcement shall be plus or minus one-half inch.

G. Splices in reinforcement steel shall be in accordance with approved splicing procedures and the requirements of ACI 318.

H. Welding or butt-welding of re-bar will not be allowed.

I. Install welded wire fabric in as long lengths as practical. Lap adjoining pieces at least one full mesh and lace splices with 16 gage wire.

J. Install dowels as shown on the Drawings.

K. Exposed end of dowels installed at expansion joints shall be lubricated prior to placement of concrete.

END OF SECTION

SECTION 03300
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SUMMARY

A. Section includes cast-in-place concrete construction of the ground water treatment system containment structure (slab, walls, sump, and steps), and miscellaneous concrete work.

B. Related Sections

1. Section 02318 – Fill Placement and Grading

2. Section 09985 – Protective Coatings for Concrete

1.02 REFERENCES

A. American Concrete Institute (ACI):

1. ACI 212.3R-91, Chemical Admixtures for Concrete

2. ACI 301-99, Specifications for Structural Concrete

3. ACI 306.1-90, Standard Specification for Cold Weather Concreting

B. American Society for Testing and Materials (ASTM):

1. ASTM C 31, Standard Practice for Making and Curing Concrete Test Specimens in the Field

2. ASTM C 33, Standard Specification for Concrete Aggregates

3. ASTM C 39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens

4. ASTM C 94, Standard Specification for Ready-Mixed Concrete

5. ASTM C 143, Standard Test Method for Slump of Hydraulic Cement Concrete

6. ASTM C 150, Standard Specification for Portland Cement

7. ASTM C 172, Standard Practice for Sampling Freshly Mixed Concrete

8. ASTM C 173, Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method

9. ASTM C 260, Standard Specification for Air Entraining Admixtures for Concrete

10. ASTM C 494, Standard Specification for Chemical Admixtures for Concrete

11. ASTM C 618, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete

1.03 SUBMITTALS

A. Submit the following to the Engineer, for review and approval, no later than seven calendar days prior to scheduled delivery of materials to site:

1. Concrete mix design

2. Manufacturer's certification that concrete materials meet or exceed specification requirements.

3. Manufacturer's product data sheets for concrete admixtures, waterstops, joint sealants, and other specified materials.

C. Submit copy of truck ticket for every load of concrete delivered to the site.

D. Additional Submittals (In-Progress and at Completion):

1. Field quality control test results.

1.04 QUALITY CONTROL

A. Contractor shall retain the services of an approved independent QC Firm to determine conformance of the materials and the constructed work with the Specifications.

1.05 COORDINATION

A. Coordinate concrete pours with placement of reinforcement and installation of treatment system components.

1.06 PROJECT CONDITIONS

A. Concrete shall be placed only during periods of acceptable ambient temperatures in accordance with the referenced standards as specified below.

1. Comply with the applicable requirements of ACI 301-99 for hot weather concreting procedures.

2. Comply with ACI 306.1-90 and the applicable requirements of ACI 301-99 for cold weather concreting procedures.

B. Concrete shall not be placed on subgrade that is excessively wet. Concrete shall not be placed during periods of precipitation without adequate protection that meets the approval of the Engineer.

PART 2 PRODUCTS

2.01 CONCRETE MATERIALS

A. Cement shall comply with ASTM C 150, Portland cement, Type I or II.

B. Fine and coarse aggregates shall comply with ASTM C 33. Maximum coarse aggregate size shall be one inch.

C. Water shall be clean and not detrimental to concrete.

D. Fly ash, if used, shall comply with ASTM C 618, Class C or F.

2.02 ADMIXTURES

A. Air entrainment admixtures shall conform to ASTM C 260. Add air-entraining agent to normal weight concrete mix for work exposed to exterior.

B. Chemical Admixtures:

1. The use of chemical admixtures shall be approved by the Engineer.

2. Chemical admixtures (including any combination of water-reducing, retarding and accelerating admixtures) shall conform to the requirements of ASTM C 494, and shall be used in accordance with the instructions and principles stated in ACI 212.3R.

3. The use of calcium chloride shall not be permitted.

2.03 CONCRETE MIX

A. Select and proportion concrete materials and mix in accordance with the applicable requirements of ACI 301-99.

B. Mix Design:

1. Concrete mix shall be proportioned such that the 28-day compressive strength of moist cured laboratory samples achieve not less 3000 pounds per square inch (psi).

2. Slump Range: No greater than four inches.

3. Entrained Air Content: Not greater than five percent (as determined by ASTM C173).

2.04 WATERSTOPS

A. Waterstops shall be as indicated on the Drawings.

2.05 JOINT SEALANT

A. Joint sealant and accessory materials for installation in joints in the containment area slab shall be as indicated on the Drawings.

B. Alternate sealant may be used if approved by the Engineer, providing it is compatible with the specified protective coatings and the service environment.

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

A. Sampling and testing during the placement of concrete shall conform to the requirements of Section 1.6.4.2 of ACI 301-99, and as specified below.

1. Sampling Fresh Concrete: Comply with ASTM C 172.

2. Slump Testing (ASTM C 143): One test for each concrete load at point of discharge; and one for each set of compressive strength test specimens.

3. Concrete Temperature: Tested hourly when air temperature is 40 degrees F. and below, and when 80 degrees F. and above, and each time a set of compression test specimens is made.

4. Compression Test Specimens (ASTM C 31): One set of four standard cylinders for each compressive strength test.

5. Air Entrainment (ASTM C 173): One test for each set of compression specimens.

6. Compressive Strength Test (ASTM C 39): One set for every 50 cubic yards or fraction thereof, of each concrete mixture placed in any one day, and at least one set per pour. One specimen of each set shall be tested at seven days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required.

3.02 PREPARATION

A. Construct subgrade as specified in Section 02318.

B. Verify requirements for concrete cover over reinforcement.

C. Verify that anchors, seats, plates, reinforcement, and other items to be cast into concrete are accurately placed and positioned securely.

3.03 CONCRETE MIXING

A. Mix in accordance with the applicable requirements of ACI 301-99.

B. Truck mixers shall furnish a concrete batch that is homogeneous with respect to consistency, mix, and grading.

3.04 CONCRETE PLACEMENT

A. Place concrete in compliance with the applicable requirements of ACI 301-99, and as specified in this Section.

B No concrete for a specific pour shall be ordered for delivery to the Site until pertinent concrete mix design and specified materials are approved by the Engineer. Should concrete be placed prior to Engineer's approval, it shall be at sole risk of the Contractor, and if the material does not meet project specifications, it shall be removed from the project at the expense of the Contractor.

C. Concrete that has been batched for over 1-1/2 hours shall not be placed.

D. In order to ensure consistent slump at the point of placement, a small quantity of "trim water" may be held out at the batch plant. The amount of withheld water shall be indicated on the truck ticket, and the truck shall leave the batch plant with a full water tank.

E. When concrete arrives at the point of delivery with a lower than specified slump and the concrete is unsuitable for placing at that slump as determined by the Engineer or QC Firm, the slump may be adjusted to the required maximum by adding water. Water may be added up to the amount allowed in the accepted mixture proportions unless otherwise approved by the Engineer.

F. The addition of mixing water at the jobsite shall be in accordance with ASTM C 94. The specified water/cement ratio shall not be exceeded.

G. Do not use concrete which becomes non-plastic and unworkable, or does not meet the required quality control limits, or which has been contaminated by foreign materials.

H. Deposit concrete as nearly in final position as practical to avoid rehandling. Do not permit concrete to drop freely a distance greater than three feet. Where longer drops are necessary, use chutes, tremies, or other conveyance to prevent separation.

3.05 JOINTS

A. Construct the required type of joint to the dimensions and at the locations shown on the Drawings.

B. Install waterstops where shown on the Drawings and in accordance with manufacturer's recommendations.

3.06 CONCRETE CONSOLIDATION

A. Consolidate concrete in accordance with the applicable requirements of ACI 301-99, to suit the type of concrete and project conditions, and as specified herein.

B. As soon as concrete is deposited, thoroughly agitate with mechanical vibrators and suitable hand tools to work mixture into corners of forms and around reinforcing and embedded items. Do not over-vibrate or use vibrators to transport concrete within forms.

3.07 FINISHING

A. Finish concrete in accordance with the applicable requirements of ACI 301-99, to suit the type of concrete and project conditions, and as specified herein.

B. Detailed Requirements for Finishing of Concrete Slabs:

1. Strike off (screed) concrete to required elevations and immediately start finishing and flattening operations. Ensure finishing operations are no more than necessary to remove irregularities and meet specified tolerances (specified in subsection 3.10).

2. Immediately after screeding, proceed with initial hand floating operations using appropriate tools to compact and consolidate unformed concrete surfaces, including slab surfaces and tops of walls. Complete floating work before any excess moisture or bleeding water is present on the surface.

3. Allow concrete to stiffen before proceeding with finishing operations. No subsequent operation should be accomplished until the concrete will sustain foot pressure with only about 1/4-inch indentation.

4. After evaporation of most of the bleed water has taken place, proceed with the second floating operation on slab surfaces and tops of walls using either hand floats or power floats as appropriate.

C. For unformed surfaces (including tops of walls) occurring adjacent to formed surfaces, strike off smooth and finish with texture matching the adjacent exposed formed surfaces.

D. The exposed surfaces of concrete walls shall receive a smooth rubbed finish no later than one day after form removal.

3.08 CURING AND PROTECTION

A. For concrete curing and protection conform to the applicable requirements of ACI 301-99, and as specified in the following paragraphs.

B. Curing shall be performed using wet coverings such as burlap, or moisture retaining coverings such as polyethylene film. Place coverings as soon as possible after finishing operations and after concrete has hardened sufficiently to prevent surface damage. Cover entire surface, including edges. Seal and secure laps and edges with six inches minimum overlap.

C. Use curing compound only where approved by the Engineer and if compatible with protective coating materials. Cure formed surfaces with curing compound applied in accordance with manufacturer's directions as soon as forms are removed and finishing is completed.

D. During the curing period, protect concrete from damaging mechanical disturbances including load stresses, heavy shock, excessive vibration, and from damage caused by rain or flowing water.

3.09 JOINT SEALING

A. Install joint sealant in accordance with manufacturer's recommendations.

B. Sealing of joints within the containment area shall be coordinated with application of protective coating as specified in Section 09985. Allow joint sealant to cure a minimum of 24 hours prior to application of protective coating over concrete surface.

3.10 TOLERANCES

A. Tolerances for formed and unformed surfaces shall conform to the applicable requirements of ACI 301-99 and as specified in Table 1.

TABLE 1
CONSTRUCTION TOLERANCES FOR REINFORCED CONCRETE CONSTRUCTION

(1)	Variation from plumb in the lines and surfaces of walls	Less than 1/2 inch in 10 feet
(2)	Variation of the linear structural lines from established position in plan and related position of walls	1 inch
(3)	Variation in the thickness and height of walls	Plus or minus 1/2 inch
(4)	Slab thickness tolerance	Plus or minus 1/2 inch
(5)	Slab Surface: Maximum gap of 1/4 inch at any point between an unleveled 10 foot straightedge and the slab, anywhere on the slab (Measure within 72 hours after slab placement).	

3.11 CORRECTION OF DEFECTIVE WORK

A. Concrete work that does not conform to the specified requirements, including strength and finishes, shall be corrected at the Contractor's expense, as determined by the Engineer.

END OF SECTION

SECTION 09985
PROTECTIVE COATINGS FOR CONCRETE

PART 1 GENERAL

1.01 SUMMARY

A. Section includes surface preparation, materials, and application procedures for coating (lining) of the groundwater treatment system containment area slab, walls, and sump.

B. Related Sections:

1. Section 03300 – Cast-in-Place Concrete

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM D 4258, Standard Practice for Surface Cleaning Concrete for Coating

2. ASTM D 4259, Standard Practice for Abrading Concrete

3. ASTM F 1869, Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride

1.03 SUBMITTALS

A. Submit the following to the Engineer, for review and approval, seven days prior to bringing materials on site and beginning work:

1. Description of surface preparation and coating application procedures showing conformance with the Specifications.

2. Material Safety Data Sheet (MSDS) and product data sheet for primer and lining materials.

3. Certification of qualifications for the firm(s) performing surface preparation and lining system application.

B. Submit lining system manufacturer's material warranty and applicator's installation guarantee.

1.04 QUALITY ASSURANCE

A. QC Firm shall perform specified tests on substrate surface preparation, and shall inspect lining system materials and installation to verify conformance with the Specifications.

B. Surface preparation shall be performed by a firm having a minimum of three years experience in the type of work.

C. Lining system applicator shall be approved by the lining system manufacturer and shall have a minimum of three years experience in the application of the materials to be used.

D. Surface preparation and lining system materials and methods shall comply with all applicable health and safety regulations.

E. Prior to commencement of the work specified in this Section, a meeting shall be held to discuss requirements and methods for surface preparation, lining system application and materials handling. The meeting attendees shall include: Engineer; Contractor; lining system manufacturer's representative; and subcontractor(s) performing surface preparation and lining system application.

G. Copies of MSDS's for all materials to which the applicator's and Contractor's personnel may be exposed shall be kept on site in the Contractors' office and available for review by the applicator's personnel, Owner and Engineer.

1.05 DELIVERY, STORAGE AND HANDLING

A. Lining system materials shall be in the manufacturer's original, unopened, sealed containers that legibly show: the product names; formula or specification numbers; batch numbers; color; quantity; date of manufacture; manufacturer's formulation numbers; manufacturer's directions, including warnings and special precautions; and name of manufacturer.

B. Materials shall be kept in a cool and dry area out of direct sunlight. Comply with manufacturer's recommendations regarding shelf life for the expected climatic conditions. For example, maximum shelf life is six months at 70 degrees F, with shorter shelf life for higher temperatures and humid conditions.

1.06 PROJECT CONDITIONS

A. New concrete shall be properly cured and all concrete surfaces shall be prepared in accordance with the coating manufacturer's recommendations and as specified in this Section.

B. Lining system materials shall be applied only when the ambient temperatures, relative humidity, substrate temperature and moisture are as recommended by the lining system manufacturer. Do not attempt application of lining system materials if substrate temperature is within 5 degrees F of the dew point or if relative humidity is greater than 95 percent.

C. Comply with manufacturer's recommendations for application times and protection of the work area. Application of lining system materials in the late afternoon or early evening is recommended. Take precautions such as shading of the work area from sunlight to minimize heating of the substrate.

D. In the event heating devices are used at any time to create or maintain temperature and moisture conditions in compliance with the specification requirements, these devices shall be explosion-proof and the type that does not exhaust sooty or oily residue or any other contaminants into the air. Heating devices shall not be used when, in conjunction with existing temperature and humidity conditions, these devices may create dew point conditions.

E. Exercise all necessary safety precautions to insure that no accidents or damage occurs to personnel or buildings. Coordinate with the Owner to comply with Owner's special safety requirements.

1.07 MATERIAL WARRANTY

A. Lining system manufacturer shall warrant the material against manufacturing defects and material degradation in the service environment for a minimum period of one year from the date of final acceptance.

B. The manufacturer shall furnish a written warranty covering the requirements of the above paragraph 1.07.A.

1.08 INSTALLATION GUARANTEE

A. Guarantee the installation against defects in installation and workmanship for a minimum period of one year commencing with the date of final acceptance. The guarantee shall include the services of qualified technicians and all material required for repairs at no expense to the Owner.

B. Furnish a written warranty covering the requirements of the above paragraph 1.08.A.

PART 2 PRODUCTS

2.01 LINING SYSTEM MATERIALS

A. Lining system shall consist of PENNCOAT® 331 Lining with PENNTROWEL® Vinyl Ester Primer as manufactured by Henkel Surface Technologies Corporation. Alternative lining systems may be used, subject to acceptance by the Engineer. Lining system shall be resistant to creosote (up to 95 percent concentration) and pentachlorophenol.

B. Furnish fiberglass mesh, one-foot minimum width, for installation over contraction and construction joints.

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

A. Concrete surface moisture vapor emission shall be tested as specified in subsection 3.02.

B. Each lining system material component delivered to the site shall be determined to have the correct product designation, used within its shelf life and have its batch number recorded.

C. The QC Firm shall inspect the lining system in accordance with standard industry practice. Uneven areas, embedded debris, voids, or other defective conditions shall not be permitted and shall require repair or rework.

D. The manufacturer's recommendations for handling, mixing, application methods, drying time between coats, and application equipment shall be rigidly followed.

3.02 CONCRETE SURFACE PREPARATION

A. New concrete shall be allowed to cure for at least 28 days.

B. Remove oils, grease and contaminants by solvent cleaning in accordance with ASTM D 4258.

C. Brush blast entire surface in accordance with ASTM D 4259 to remove laitance and curing agents and to provide a uniform surface texture similar to 100-grit sandpaper. Perform blast cleaning to open up voids and bugholes so that holes are concave. Care shall be taken to keep aggregate exposure to a minimum.

D. The materials and procedures used for surface preparation shall be approved by the Owner and Engineer prior to start of the preparation work.

E. Concrete surface shall be free of moisture as much as possible. Prior to application of lining system materials, check moisture vapor emission in accordance with ASTM F 1869.

3.03 APPLICATION OF PRIMER AND MESH

A. Apply primer with a stiff brush and work into the surface with a strong scrubbing action so as to emulsify the wetness at the concrete surface and to penetrate into the concrete. Other application methods, such as spraying or rolling, may be used if approved by the Engineer and in accordance with manufacturer's recommendations. Excess primer shall be removed from the surface.

B. Concrete surfaces to be coated shall consist of interior face of walls, slab surface and exposed interior of sump and steps on interior of containment area.

C. Apply one full coat of primer, applied at a rate to achieve 15 mils wet film thickness (WFT).

D. Apply primer over contraction and construction joints. Install fiberglass mesh over each joint while primer is being applied. Center mesh over joint so that six inches of mesh is provided on each side of joint.

E. Allow primer to cure until dry to touch before proceeding with application of lining coats.

3.04 APPLICATION OF LINING COATS

A. Apply specified lining material by brush, roller or spray. Natural bristle brushes and short nap wool or mohair rollers may be used.

B. Comply with manufacturer's recommendations for application equipment, pot life (working time of the material), and quantity of material readied (mixed and blended) for application.

C. Work shall be planned such that the primer and both coats of the lining material are applied within the shortest time possible.

D. Apply intermediate coat (first coat of lining material) to all surfaces specified in subsection 3.03.B. Apply at a rate to achieve 15 mils WFT.

E. Apply finish coat of lining material at a rate to achieve 15 mils WFT.

F. Curing and drying time shall be in accordance with the manufacturer's recommendations.

G. If the first coat is left uncoated beyond the time required for complete curing, or if recoating of cured lining is required, the surface shall be cleaned and abrasive blasted to promote bonding of the next coat.

H. The total dry fil thickness of the complete lining system shall not be less than 30 mils.

3.05 CLEAN-UP

A. All mixing equipment, spray equipment, rollers and brushes shall be cleaned immediately after use. Follow manufacturer's recommendation for clean-up chemicals and procedures.

B. Remove all tools, equipment, excess materials and debris from the project site.

END OF SECTION

SECTION 11511
RECOVERY WELL PUMPS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes furnishing and installing pumps and accessories in recovery wells.

B. Related Sections:

1. Section 02522 – Recovery Wells

2. Section 02692 – Ground Water Treatment System Buried Piping

1.02 SUBMITTALS

A. Submit the following to the Engineer for review and approval prior to installation:

1. Shop Drawings, including: information as required to fully describe pumps, controls, mounting hardware, and overall performances curves, identifying all deviations from the specified requirements.

2. Control panel layout, construction, and wiring diagrams.

3. Manufacturer's originals installation, operation and maintenance manuals.

B. Submit manufacturer's guarantee as specified in subsection 1.04.

1.03 MANUFACTURER SERVICES

A. A manufacturer's representative for the equipment specified shall be present at the job site for a minimum of two days excluding travel time for installation assistance, inspection and certification of the installation, and equipment testing.

1.04 GUARANTEE

A. The manufacturer shall guarantee in writing that the recovery pump system will meet the performance requirements provided that the manufacturer's operations and maintenance procedures are followed. The manufacturer shall guarantee the system, parts and labor included, for one year from the first day the system is placed in operation.

PART 2 PRODUCTS

2.01 PUMPS

A. Recovery pump system shall be Blackhawk Anchor Pump Model 101E with accessories, or approved equal.

B. The recovery pump system shall be provided complete and shall consist of the following:

1. Inverter Duty Electric Motor (stainless steel)
2. Seal Plate (viton)
3. Seal Plate Seals (delrin)
4. Relief Valve (stainless steel)
5. Relief Valve Discharge TEE (stainless steel)
6. Stuffing Box shall be used at surface grade to prevent liquid from entering the drive head motor assembly.
7. Fiberglass Sucker Rod Assembly
8. Drive Rod Connector (stainless steel)
9. Drive Piston Seal (viton); to resist chemical degradation
10. Drive Piston Check Valve (delrin)
11. Drive Piston (delrin)
12. Piston Cylinder (stainless steel)
13. Foot Valve Check Ball (delrin)
14. Foot Valve (delrin)
15. Intake Screen (stainless steel); as part of the suction inlet assembly
16. Pump Control Panel with accessories (output dampened low pass filter, shielded and isolated limit switches, included) and electrical cables

C. Design flow rate shall be 1.5 GPM minimum at total dynamic head (TDH) of 280 feet.

D. Pump shall be positive displacement piston, powered by electric top head drive motor. The pump shall be stainless steel, with self cleaning check-ball assemblies, and a fiberglass drive rod

E. The top head drive assembly shall be connected to the cylinder by means of the riser eduction pipe. The up and down motion of the surface head drive shall be transferred to the fiberglass drive rod, which shall be attached to the inlet drive piston. This motion shall press and lift the liquid being pumped past the bottom intake of the foot valve into the cylinder pump assembly to the surface for discharge.

F. The self cleaning piston drive assembly shall resist malfunction due to dissolved mineral encrustation, and biological slime.

2.02 MOTORS

A. Motors shall be 230/460 volts, 3 phase, 60 Hz, 1/2-HP standard, variable speed (stroke) control motor.

PART 3 EXECUTION

3.01 FABRICATION

A. The pump field control panel shall be completely shop fabricated. Field work shall be limited to mounting, connecting, testing, and start-up.

3.02 INSTALLATION

A. Pumping equipment and appurtenances shall be installed in accordance with the manufacturer's instructions and as shown on the Drawings. All appurtenances required for a complete and operating recovery system shall be provided, including piping, conduits, valves, anchors, pumps, controls, and stroke counters.

B. Valves, piping, and controls associated with the recovery pumps shall be installed as shown on the drawings, and in accordance with manufacturer's instructions to give complete and regulating controls.

3.03 TESTING

A. All major system components shall be factory tested for compliance with the construction and functional requirement specified herein.

B. Prior to system start-up, all system components shall be inspected for proper alignment, noise levels, proper connection, and satisfactory performance. The manufacturer's representative shall provide a written certification to the Owner or Engineer for all system components that the furnished equipment has been installed in accordance with the manufacturer's instructions and is ready for permanent operation.

C. Operational acceptance tests shall be performed for a minimum of three days to demonstrate that the furnished system performs in accordance with all provisions of these specifications. In the case of a non-conforming system, the Owner may, at his option, withhold final payment to the manufacturer until the system is reclassified as conforming.

END OF SECTION

SECTION 11512
TREATMENT SYSTEM PUMPS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes furnishing, installing, testing and startup of the following pumps within the tank farm as part of groundwater treatment system:

1. Double Diaphragm Pump for product transfer from storage drums to settling tanks

2. Dense Non-Aqueous Phase Liquid (DNAPL) Discharge Pump for DNAPL transfer from oil/water separator to settling tanks

3. Sump Pump for drainage of secondary containment area (runoff shall be discharged in nearby, field identified, storm sewer inlet)

B. Related Sections:

1. Section 11520 – Treatment System Piping and Appurtenances

2. Section 11532 – Settling Tank and Accessories

3. Section 11533 – Treated Water Storage Tank and Accessories

4. Section 11544 – Air Compressor and Appurtenances

5. Section 11552 – Oil/Water Separator

1.02 DESCRIPTION

A. The pump systems shall be provided complete and shall consist of the following:

1. Motors and electrical cables

2. Level control, where indicated on Drawings, wiring and mounting hardware

3. Flexible hose, lifting cable and mounting hardware

4. Pump control panel with accessories

1.03 SUBMITTALS

A. Submit the following to the Engineer for review and approval:

1. Shop Drawings, including: information as required to fully describe pumps, controls, mounting hardware, and overall performances curves, identifying all deviations from the specified requirements.

2. Control panel layout, construction, and wiring diagrams.

3. Manufacturer's originals installation, operation and maintenance manuals.

B. Submit manufacturer's guarantee as specified in subsection 1.05.

1.04 MANUFACTURER SERVICES

A. A manufacturer's representative for the specified equipment shall be present at the job site for a minimum of one day excluding travel time for installation assistance, inspection and certification of the installation, and equipment testing.

1.05 GUARANTEE

A. The manufacturer shall guarantee in writing that the pump system will meet the performance requirements provided that the manufacturer's operations and maintenance procedures are followed. The manufacturer shall guarantee the system, parts and labor included, for one year from the first day the system is placed in operation.

PART 2 PRODUCTS

2.01 DIAPHRAGM PUMP

A. The double diaphragm pump shall be WARREN RUPP SandPIPER air operated pump EB1-SM type 3 (TC3-A).

B. The diaphragm pump shall be designed for 10 GPM as a flow and total dynamic head (TDH) of 20 psi.

C. The pump shall be aluminum construction with double diaphragm made of viton.

D. The air for diaphragm pump operation shall be provided by Gardner Denver, model LVR5-8 compressor, 5HP, as specified in Section 11544.

2.02 DNAPL DISCHARGE PUMP

A. DNAPL pump shall be a gear type pump with bronze pump body and bronze gears.

B. Pump seals shall be mechanical, preferably Viton or other compatible material recommended by manufacturer and approved by the Engineer.

C. DNAPL pump body, inlet and outlet shall be sized to accommodate a discharge flow of 1 GPM at a total dynamic head (TDH) of 25 to30 feet.

D. Pump shall include NPT connections.

E. The motor shall be a TEFC, close coupled for outdoor installation. Voltage shall be 230/460 Volts, 3 phase and 60 Hz, 1/3 HP.

F. The pump manufacturer shall be Oberdorfer, model N991S5 or approved equal.

2.03 SUMP PUMP

A. Sump pump shall be a cast iron submersible pump, Sta-Rite DC233 series, 1/3 HP, 115 V with tethered switch and solid handling capacity up to 1/2-inch diameter.

B. Construction shall be rugged cast iron with cover on motor.

C. Intake shall be screened in order to prevent debris from entering the pump.

D. Discharge shall be NPT connection, 1 1/2-inch diameter.

PART 3 EXECUTION

3.01 FABRICATION

A. The pump field control panel shall be completely shop fabricated. Field work shall be limited to mounting, connecting, testing, and start-up.

3.02 INSTALLATION

A. Pumping equipment and appurtenances shall be installed as described in manufacturer's installation manual and shown on the drawings. All appurtenances required for a complete and operating recovery system shall be provided, including piping, conduits, valves, anchors, switches and controls.

B. Valves, piping, and controls associated with the pumps shall be installed as shown on the drawings, and in accordance with manufacturer's instructions to give complete and regulating controls.

3.03 TESTING

A. All major system components shall be factory tested for compliance with the construction and functional requirement specified herein.

B. Prior to system start-up, all system components shall be inspected for proper alignment, noise levels, proper connection, and satisfactory performance. The manufacturer's representative shall provide a written certification to the Owner for all system components that the furnished equipment has been installed in accordance with the manufacturer's instructions and is ready for permanent operation.

C. Operational acceptance tests shall be performed for a minimum of two days to demonstrate that the furnished system performs in accordance with all provisions of these specifications. In the case of a non-conforming system, the Owner may, at his option, withhold final payment to the manufacturer until the system is reclassified as conforming.

END OF SECTION

SECTION 11520
TREATMENT SYSTEM PIPING AND APPURTENANCES

PART 1 GENERAL

1.01 SUMMARY

A. Section includes furnishing and installing process piping with necessary fittings and accessories. Piping within the tank farm shall consist of threaded galvanized steel pipe and fittings, and chemical resistant flexible hose, unless otherwise specified.

B. Related Sections:

1. Section 02317 - Trenching and Backfilling

2. Section 02629 – Ground Water Treatment System Buried Piping

3. Section 11511 – Recovery Well Pumps and Accessories

1.2 REFFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM A 53, Standard Specification for Pipe, Steel, Black, and Hot-Dipped, Zinc-Coated, Welded and Seamless

2. ASTM A 865, Standard Specifications for Threaded Couplings, Steel, Black or Zinc-Coated (Galvanized) Welded and Seamless, for Use in Steel Pipe Joints

1.03 SUBMITTALS

A. Submit the following to the Engineer for approval:

1. Manufacturer's documentation showing conformance with the specifications for specified pipe and accessories, including pipe supports, flanges and gaskets; and chemical-resistant flexible hose.

1.04 QUALITY CONTROL

A. Install pipe, hose, accessories and fittings to meet requirements of regulatory agencies and local standard practice.

B. Pipe manufacturers shall have manufacturing and quality control facilities capable of producing and assuring the quality of the specified materials.

1.05 DELIVERY, STORAGE AND HANDLING

A. During loading, transporting, and unloading, exercise care to prevent damage to materials.

B. Pipe shall be marked with manufacturer's identification symbol, size, date of manufacture, material classification, pressure rating, and other applicable product specification identification numbering.

C. All material shall be inspected by the Contractor upon delivery to the Site. Damaged or defective materials shall be rejected and shall be replaced with new materials at the supplier's or contractor's expense.

PART 2 PRODUCTS

2.01 GENERAL

A. Provide pipe and tube of type, joint type, grade, size and weight (wall thickness or class) indicated for each service. Where type, grade or class is not indicated, provide proper selection as determined by installer for installation requirements, and comply with governing regulations and industry standards.

2.02 PIPING MATERIALS SCHEDULE

A. Piping, fittings, gaskets and other wetted parts shall be compatible with the materials being handled.

B. All process piping and fittings shall be of Schedule 40, 150 psi threaded galvanized steel construction, unless otherwise specified.

C. All process piping from the point of entry into the tank farm to the location where flow from six recovery wells is combined (downstream of 55-gallon drums) shall be 1-inch diameter Schedule 40, threaded galvanized steel pipe with 150 psi rated fittings.

D. All process piping connecting the settling tanks to oil/water separator, and oil/water separator to the effluent storage tank shall be 4-inch diameter Schedule 40, threaded galvanized steel pipe with 150 psi rated fittings.

E. Process piping connecting double diaphragm with any of the 55-gallon drums, and 55-gallon drum to the influent pipeline toward the settling tank shall be 1-inch double walled flexible hose with quick connect fittings.

E. Effluent line from water storage tank to the discharge point shall be 2-inch diameter schedule 40, threaded galvanized steel pipe with 150 psi rated fittings.

G. Dense non-aqueous phase liquid (DNAPL) return process piping from oil/water separator to the settling tank shall be 1-inch diameter schedule 40, threaded galvanized steel pipe with 150 psi rated fittings. Refer to Drawings for connection details.

H. The air supply lines, which direct pressurized air to the double diaphragm pump shall be 1/4-inch Teflon tubing. Air Tubing Fittings shall be all brass construction Imperial Eastman, or Engineer approved equal.

2.03 GALVANIZED STEEL PIPE AND FITTINGS

A. Galvanized steel pipe and fittings shall comply with ASTM A 53, Schedule 40. Furnish threaded couplings complying with ASTM A 865.

B. Required pressure rating 150 psi, as minimum.

C. Nominal pipe size is indicated on the Drawings.

2.04 DOUBLE-WALLED FLEXIBLE HOSE

A. Black EPDM Day-Flo Water Discharge Hose Series 7306 as manufactured by Southeastern Hose, Inc. for service in heavy-duty industrial applications (compatible with creosote), or approved equal.

2.05 PIPE HANGERS, INSERTS AND SUPPORTS

A. Pipe hangers, inserts and supports shall conform to MSS SP-58 and SP-69. Provide support at spacings not exceeding manufacturer's recommendations.

2.06 HOSE CONNECTORS

A. Shall be Dover Corporation, OPW Division, Twin-Kam Kamlock Couplers, or approved equal. Hose connectors shall be stainless steel with Viton gaskets.

PART 3 EXECUTION

3.01 GENERAL

A. Install pipe in accordance with manufacturer's instructions.

B. Space pipe supports, arrange reducers, and pitch piping to allow air to be vented at system high points and to allow the system to be drained at the low points as required.

C. Plug all ends of piping and equipment, except when work is being performed, to minimize entrance of dirt and debris.

D. Pipe shall not be supported by adjoining equipment. Piping shall not exert strain on or cause misalignment of equipment.

E. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

F. Remove scale, slag, dirt and debris for both inside and outside of piping and fittings before assembly.

3.02 INSTALLATION

A. Install all piping as exposed, except as noted on drawings. Field cutting of piping, where required, shall be made using suitable tools as recommended by the manufacturer. Cuts shall be carefully done, without damage to piping, so as to leave a square end at right angles to the axes of the piping. Piping damaged by improper or careless methods of cutting shall be replaced or repaired at Contractor's expense.

B. Keep all exposed piping close to edges of containment slab.

C. Install piping so as not to interfere with equipment.

D. Install piping free of sags or bends and with ample space between piping to permit proper insulation installation.

E. Galvanized Steel Pipe jointing:

1. Prepare pipe ends, fittings and couplings in accordance with manufacturer's recommendations.

2. Remove scale, dirt and debris for both inside and outside of pipe and fittings before assembly.

3. Join pipe sections and pipe fittings with threaded couplings in accordance with the manufacturer's recommendations and as required to meet the pressure requirements of the system.

4. Pressure testing of piping shall be performed as specified in subsection 3.08.

3.04 PIPE FITTINGS

A. Make all changes in size and direction of galvanized steel piping with standard fittings.

B. Where branch piping is the same size as the main piping, tees shall be used.

C. Use eccentric reducing couplings where required to bring tops or bottoms of pipe in line to prevent water or air pockets.

D. Thoroughly purge existing pipe of all hazardous material prior to cutting.

3.05 CONNECTIONS

A. Install unions in piping 2-inch and smaller at the final connection to each piece of equipment and plumbing fixture.

B. Install flanges in piping 2-1/2-inch and larger, at the final connection to each piece of equipment and plumbing fixture, and where otherwise indicated on the Drawings.

C. Provide flanges or unions to equipment and control valves to facilitate dismantling. Arrange connections so that the equipment being served may be removed without disconnecting other piping.

D. Install all piping at design line size with any change in size being made at the equipment being serviced.

3.06 PIPE SLEEVES AND ESCUTCHEONS

A. Sleeves

1. All new pipe openings through walls and slabs shall have sleeves with internal diameter at least 2-inches larger than the outside diameter of uninsulated lines, or of the insulation. Sleeve shall not be used to support pipe.

2. Install sleeves through interior walls and partitions flush with finished surfaces; sleeves through outside walls shall project 1/2-inch on outside of walls and be flush with inside finished surface; and floor sleeves shall project 2-inch above finished floors.

3. Set Sleeves securely in place before pouring concrete.

4. Fill the space between outside of pipe or insulation and the inside of the sleeve with fiberglass.

B. Escutcheons: Install escutcheons on both sides of the penetration for all pipes exposed to view passing through walls, floors, ceilings and partitions whether or not insulated. Escutcheons shall fit over the sleeve tight to the pipe.

3.07 PIPE SUPPORT HANGERS, SUPPORTS, ANCHORS AND GUIDES

A. Use generally accepted stock or production parts wherever possible. Support vertical risers by riser clamps preferably installed below pipe hubs or by resting clamps on the floor slabs or pipe sleeve.

B. Piping located within two feet of the floor shall be supported on stands, piers or standard pipe supports.

C. Horizontal support spacing shall be as follows:

Steel Pipe Dia. (Inches)	Span (Feet)
1/2"	5'
3/4"	6'
1"	7'
1-1/2"	9'
2"	10'

D. Hangers: Hanger rods for both single and double rod hangers shall conform to the following schedule:

1.

Nominal Pipe Diam. (Inches)	Hangar Dia. (Inches)
1" & under	3/8"
1-1/4"	3/8"
1-1/2"	3/8"
2"	3/8"

2. Where there is more than one size pipe on a pipe group hanger, the spacing of the hanger shall be determined by the size of the smallest pipe.

3.08 CLEANING AND PRESSURE TESTING

A. Flushing and Cleaning: Prior to operations, all piping systems shall be flushed cleaned.

B. Pressure Tests for Piping Within the Tank Farm

1. Contractor shall notify Engineer of date and time of pressure tests at least 48 hours prior to executing tests. Engineer may observe tests to verify tightness.

2. In general, pressure tests shall be applied to piping only before connection of fixtures, equipment and appliances. In no case shall any piping, fixtures, equipment or appliances be subjected to pressures exceeding their rating.

3. Blank off or remove diaphragm valves, relief valves, pumps, traps, and instruments, which may be damaged by test pressure. Open, but do not back-seat all valves.

4. All defective work shall be repaired or replaced, and the tests shall be repeated.

5. Pressure testing shall be performed by maintaining an internal water pressure of 125 psi for a period of three hours. Before applying the specified test pressure, all piping shall be flushed and all air expelled from pipe. While piping system is pressurized all joints shall be inspected with an acceptable leak detection fluid. Any leaks that occur shall be repaired to the satisfaction of the Engineer and pressure testing repeated until pipe is accepted by Engineer.

6. The use of caulking or other temporary fixers, etc., to stop leaks is not permitted.

END OF SECTION

SECTION 11532
SETTLING TANKS AND ACCESSORIES

PART 1 GENERAL

1.01 SUMMARY

A. Section includes furnishing and installing settling tanks as part of groundwater treatment system.

B. Related Sections:

1. Section 11520 - Treatment System Piping and Appurtenances

1.02 SUBMITTALS

A. Submit shop drawings of the tank including material of construction, location of fittings, weight of tank, dimensions, wall thickness, location and weight of auxiliary equipment. Drawings shall be stamped by a professional engineer licensed in the state of Alabama. Included with the submittal shall be a complete set of detailed instructions on the installation of the tank which reference specifically the methods for this installation.

B. Submit manufacturer's literature, cut sheets, and installation details on tank level indicators and level switches.

C. Submit manufacturer's specifications, engineering data and design calculations.

E. Submit manufacturer's literature on coatings.

1.03 DELIVERY, STORAGE AND HANDLING

A. The tanks shall have the manufacturer's name, address, type or style model or catalog number, and serial number on a plate secured to the tank. The nameplate shall include the project designation for the tanks (Settling Tank 1 and Settling Tank 2).

1.04 GUARANTEE

A. The manufacturer shall guarantee in writing that the tanks will meet the performance requirements provided that the manufacturer's installation and maintenance procedures are followed. The manufacturer shall guarantee the tanks for one year from the first day of installation.

PART 2 PRODUCTS

2.01 GENERAL

A. The tank shall be furnished assembled or in major subassemblies with all accessories such that field work will involve final tank assembly and installation and connection of external equipment.

B. Mounting brackets: Supports and/or mounting brackets required for valves, or other mechanisms as indicated shall be suitable for the mechanism supplied. Coordinate the design requirements of such mechanisms with the tank fabricator to assure the proper lugs, brackets or guide supports are supplied on these tanks.

2.02 TANKS

A. The tanks shall have a volume capacity of 3,000 gallon, shall be 8ft diameter by 12ft overall height, vertical with a 45 degree cone bottom, single wall, on a skirt.

B. The tanks shall be manufactured from A-36 carbon steel throughout. The cone portion shall be ¼-inch steel and the side walls 3/16-inch steel. Tanks shall store extracted groundwater with high concentration in creosote at ambient temperature and at atmospheric pressure.

C. Each tank shall include a 24-inch bolted manway, a 4-inch PVC "U-Vent" with EPDM gaskets, two 4-inch flanges, lifting lugs, tie down lugs, and anchor clips around the base of the skirt sized for the appropriate seismic requirements of the installation location. Anchor bolts to be provided by Contactor.

D. The interior of the tank will be cleaned of slag, rust and/or debris. No interior coating provided. The tank exterior shall be primed and painted with enamel system.

PART 3 EXECUTION

3.01 INSTALLATION

A. Construct and place the tank in accordance with the manufacturer's recommendation and as shown on the Drawings.

B. Valves, piping, equipment, and controls associated with the tanks, which are to be installed by the contractor, shall be installed as shown on the Drawings, and in accordance with manufacturer's instructions to give complete and regulating controls.

C. Should any defects become evident during installation, testing, or within the guaranty period, the Contractor shall repair or replace the tank and/or fittings as approved by the Owner.

3.02 TESTING

A. The tank shall be hydrostatically tested for leaks by filling with water. The tanks shall be checked for leaks after it has been filled for at least one hour. Owner may request that this check be performed in their presence at the time of the tank inspection. Otherwise, manufacturer shall run the test prior to time of inspection.

B. If deficiencies are revealed during any test, such deficiencies shall be corrected and the test shall be repeated.

END OF SECTION

SECTION 11533
TREATED WATER STORAGE TANK

PART 1 GENERAL

1.01 SUMMARY

A. Section includes furnishing and installing a horizontal cross-linked polyethylene storage tank as part of groundwater treatment system.

B. Related Sections:

1. Section 11520 – Treatment System Piping and Appurtenances

1.02 SUBMITTALS

A. Submit shop drawings of the tank including material of construction, location of fittings, weight of tank, dimensions and wall thickness. Drawings shall be stamped by a professional engineer licensed in the state of Alabama. Included with the submittal shall be a complete set of detailed instructions on the installation of the tank.

B. Submit manufacturer's literature, cut sheets, and installation details on tank high level switches.

C. Submit manufacturer's specifications, engineering data and design calculations.

1.03 DELIVERY, STORAGE AND HANDLING

A. The tank shall have the manufacturer's name, address, type or style model or catalog number, and serial number on a plate secured to the tank. The nameplate shall include the project designation for the tank.

B. The proper caution or warning signs as prescribed by OSHA standard 29 CFR 1910.106 shall be supplied.

1.04 GUARANTEE

A. The manufacturer shall guarantee in writing that the tank will meet the performance requirements provided that the manufacturer's installation and maintenance procedures are followed. The manufacturer shall guarantee the tank for one year from the first day of installation.

PART 2 PRODUCTS

2.01 GENERAL

A. The tank shall be furnished assembled or in major subassemblies with all accessories such that field work will involve final tank assembly and installation and connection of external equipment.

2.02 TANK

A. The tank shall have a volume capacity of 1,050 gallon, as indicated on the Drawings.

B. The tank shall be fabricated from cross-linked polyethylene as manufactured by ALSCO Industrial Products, Inc., model 3281-1050 or approved equal. The material used shall be virgin polyethylene resin certified by the manufacturer. Polyethylene resin material shall contain a U.V. stabilizer.

B. Tank shall be manufactured for storage of treated water at ambient temperature and at atmospheric pressure.

C. Tank shall include a 24-inch vented threaded style manway, two 4-inch bolted double flange fittings, lifting lugs, tie down lugs, and molded legs for stable support sized for the appropriate seismic requirements of the installation location.

D. Tank shall be properly vented and shall comply with OSHA 1910.106 (f) (iii) (IV) (9) normal venting for atmospheric tanks or other accepted standards. As a minimum, U-vent shall be as large as the filling or withdrawal connection, whichever is larger but in no case less than one inch nominal inside diameter.

F. Tank fitting attachments shall be equipped with flexible couplers.

G. The interior of the tank will be clean.

PART 3 EXECUTION

3.01 INSTALLATION

A. Construct and place the tank in accordance with the manufacturer's recommendation and as shown on the Drawings.

A. Valves, piping, equipment, and controls associated with the tank, which are to be installed by the Contractor, shall be installed as shown on the Drawings, and in accordance with manufacturer's instructions to give complete and regulating controls.

C. Should any defects become evident during installation, testing, or within the guaranty period, the Contractor shall repair or replace the tank and/or fittings as approved by the Owner and Engineer.

3.02 TESTING

A. The tank shall be hydrostatically tested for leaks by filling with water. The tank shall be checked for leaks after it has been filled for at least one hour. Owner and Engineer may request that this check be performed in their presence at the time of the tank inspection. Otherwise, manufacturer shall run the test prior to time of inspection.

B. If deficiencies are revealed during any test, such deficiencies shall be corrected and the test shall be repeated.

END OF SECTION

SECTION 11544
AIR COMPRESSOR AND APPURTENANCES

PART 1 GENERAL

1.01 SUMMARY

A. Section includes furnishing and installing an air compressor that will supply pressured air for double diaphragm pump.

B. Related Sections:

1. Section 11512 – Treatment System Pumps

2. Section 11520 – Treatment System Piping and Appurtenances

1.02 SUBMITTALS

A. Submit the following to the Engineer for review and approval:

1. Shop drawings for air compressor

2. Manufacturer's product sheet for electrical components

3. Material of construction

4. Electrical control drawings and motor nameplate data

5. Operation and maintenance manuals

1.03 DELIVERY, STORAGE AND HANDLING

A. All parts shall be preassembled to the largest extent practical, compatible with transportation limitations and equipment protection considerations.

B. All equipment shall be crated and/or packed to protect against damage during shipping.

C. All parts shall be properly protected so that no damage or deterioration will occur during a prolonged delay from the time of shipment until installation is completed and the treatment system is ready for operation. Finished iron or steel surfaces shall be properly protected to prevent rust or corrosion.

D. Flange faces shall be protected from damage. Al openings shall be covered to prevent entrance of dirt, water and debris.

E. All equipment delivered and placed in storage shall be stored with proper protection from the weather, humidity, temperature variations, dirt and dust or other contaminants.

1.04 GUARANTEE

A. The manufacturer shall guarantee in writing that the compressor will meet the performance requirements provided that the manufacturer's operations and maintenance procedures are followed. The manufacturer shall provide 5-year prorated warranty on the compressor pump. The compressor package and valves will be warranted for one year from start-up or 18 months from date of shipment.

PART 2 PRODUCTS

2.01 GENERAL DESCRIPTION

A. Air compressor with after-cooler, receiver tank, discharge valve, and simplex controls shall provide pressured air for double diaphragm pump operation.

2.02 AIR COMPRESSOR

A. Air compressor shall be manufactured by Gardner Denver, Inc, model LVR5-8 with a 5 HP, 460V/3 phase/60Hz, TEFC 1.15 SF motor.

B. Compressor shall be a single stage, splash lubricated reciprocating belt-driven compressor delivering 19.1 cfm at 125 psi.

C. Compressor shall be equipped with multi-finned cylinders, gasket free integral cylinder, aluminum alloy domed first stage piston, cast iron second stage piston, two compressor rings, one oil ring, single unit disc valves, fan bladed flywheel, finned intercooler with pressure relief valve, tapered roller main bearings that support both ends of crankshaft, and centrifugal unloader for loadless starting.

D. Receiver tank shall be an ASME coded air receiver rated for MAWP of 200 psi and shall be equipped with pressure gauge, pressure relief valve, and automatic tank drain.

E. Compressor shall be equipped with an air-cooled after-cooler capable of reducing outlet air to within 20 degrees F of ambient.

F. Isolator pads will be provided.

G. Include with the compressor as standard:

1. OSHA approved belt guard

2. Multi-bladed finned flywheel

3. Incline check valve

4. ASME pressure relief valve in discharge line

5. Intake filter/silencer

6. Oil level sight glass

PART 3 EXECUTION

3.01 INSTALLATION

A. Install air compressor system and components in accordance with manufacturer's instructions and in accordance with the specification in the related section.

3.02 TESTING AND ADJUSTMENT

A. An operational test shall be performed to demonstrate that the air compressor system and components are not electrically, mechanically, structurally or otherwise defective. Tests shall include but will not be limited to checks for excessive vibration, leaks, correct operation of control systems and equipment, correct operation of alarms and interlocks and correct power consumptions.

B. If deficiencies are revealed during any test, such deficiencies shall be corrected and the tests shall be conducted again.

END OF SECTION

SECTION 11552
OIL/WATER SEPARATOR

PART 1 GENERAL

1.01 SUMMARY

A. Section includes furnishing and installation of a Pan America oil/water separator (OWS) with Alkyl Quaternary Ammonium Montmorillonite (AQAM) filter.

B. Related Sections:

1. Section 11512 – Treatment System Pumps

2. Section 11520 – Treatment System Piping and Appurtenances

1.02 REFERENCES

A. American Petroleum Institute (API):

1. API RP 421, Management of Water Discharges: Design and Operation of Oil-Water Separator, 1st Ed., 1990

B. National Fire Protection Association (NFPA)

1. NFPA 30, Flammable and Combustible Liquids Code

C. Occupational Safety and Health Administration, U.S. Department of Labor, Washington, D.C. (OSHA):

1. Occupational Safety and Health Standards (29 CFR 1910)

2. Safety and Health Regulations for Construction (29 CFR 1926.652)

D. Local Fire Marshal Regulations

E. Local Fire Code

1.03 SUBMITTALS

A. Submit the following to the Engineer for approval:

1. Shop drawings: Shop drawings shall include tank and related accessories installation. Shop drawings shall show locations of all fittings, accessories, and dimensions.

2. Materials list of items proposed to be provided under this section.

3. Manufacturer's literature, installation instructions, and manufacturer's operation and maintenance instructions.

4. Certificates, signed by the material producer and the Contractor, stating that the materials meet or exceed the specified requirements.

B. Additional Submittals

1. Bill of sale.

2. Completed manufacturer's installation checklist.

3. Documentation of inspection and testing of the OWS.

4. Documentation of installation activities.

5. Documentation of installation procedures which differ from manufacturer's instructions, if applicable.

6. Pressure test results.

7. Record drawings of installation.

8. Verification of proper installation of the OWS system.

1.04 QUALITY ASSURANCE / QUALITY CONTROL

A. Install OWS system following supplier's recommendation and installation procedures.

B. The OWS installer shall have no less than six years of successful experience installing OWS equipment. The installer shall have, on site, personnel in regular employment of his company that have completed training courses giving instructions for equipment provided in this section.

1.05 DELIVERY, STORAGE AND HANDLING

A. Products shall be handled at all times in accordance with good practice and manufacturer's recommendations so as to prevent damage. Products damaged by the Contractor while handling or during or after installation shall be replaced by the Contractor at Contractor's expense.

B. Inspect all equipment after installation to determine that it is free fro extraneous matter.

C. Provide plastic end caps on each pipe. Maintain end caps through shipping, storage and handling to prevent pipe-end damage and prevent entrance of dirt, debris and moisture.

D. Keep materials and products clean, dry and free from deteriorative conditions.

E. Comply with specific requirements for handling and inspection of OWS in subsection 3.02 of this Section.

PART 2 PRODUCTS

2.01 GENERAL

A. The OWS system OSD Series and AQAM filter to be provided by Pan America Environmental or equal. The oil/water separator will be designed and fabricated per API #421 Design & Operation of Oil/Water Separators Manual, February 1990 and Stokes law. The design will incorporate flexible flow rating capability based on application parameters.

2.02 INFLUENT CHAMBER

A. Influent flow enters the clog proof influent diffuser pipe and is immediately spreadout across the depth and width of the chamber.

B Any readily settleable solids drop to the bottom of the V-shaped solids accumulation chamber located directly under the coalescing media pack.

2.03 OIL/WATER SEPARATION CHAMBER

A. The separation chamber is to be packed with Flopak cross-corrugated coalescing media.

B. The media pack will be designed to create a quiescent zone, a laminar flow pattern to facilitate the impingement of oil on the media, and will provide numerous droplet impact sites and changes of flow direction.

C. The media shall have a 60 degree cross-corrugation angle.

2.04 SOLIDS ACCUMULATION CHAMBER

A. The separator shall have a V-shaped solids/DNAPL accumulation chamber located under the coalescing media. This chamber will provide temporary solids storage.

B. The chamber walls are to be pitched at 45 degrees to assure simple and thorough solids removal.

C. Dual outlet ports will be provided for sludge removal.

2.05 CLEAN WATER EFFLUENT CHAMBER

A. The cleansed water will flow under the oil retention baffle, over the water weir and into the effluent chamber. This chamber is to have the capability to be expanded at the factory by modifying the standard integral chamber so a greater volume of water is available for pump suction directly from the OSD tank.

2.06 LNAPL OIL RESERVOIR

A. An integral oil reservoir is to be provided for the temporary storage of separated oils. This chamber is located at the effluent end of the separator.

B. The reservoir will have fittings for pump suction and vent. The reservoir is to have an integral oil skimming weir.

2.07 SEPARATOR COVER

A. The separator is to have a multi-section cover that provides complete closure of the tank.

B. The separator cover will be mounted to the tank via zinc plate hardware and vapor sealed with an industrial grade closed cell, compressible polyethylene gasket.

2.08 FITTINGS

A. Up to 3" diameter, all fittings are to be FNPT coupling. Fittings larger than 3" in diameter are to be 150# FF ANSI flange.

2.09 LEVEL SWITCHES

A. Level switch assembly is to be provided to determine water / DNAPL interface and provide pump controls with an automatic on/off operation based on the DNAPL level.

B. Switch assembly shall consist of a dual float, read switch type float design. Both switches will sink in water and float in the DNAPL or any combination of differential required to operate with a DNAPL product density.

C. Switches are to be intrinsically safe when operated in combination with an intrinsically safe barrier device.

D. All construction shall be 304 stainless steel.

E. Manufacturer to be Madison or approved equal.

2.09 ALKIL QUATERNARY AMMONIUM MONTMORILLONITE (AQAM) FILTER

A. Oil/water separator is to be provided with AQAM filter to remove trace amounts of the creosote and PAHs.

B. AQAM filter (designed for the selective adsorption of free, dispersed oils, sheens, slightly soluble chlorinated hydrocarbons, heavy metals and high molecular weight organics) is an alkyl quaternary ammonium montmorillonite material distributed in a support bed of anthracite coal.

C. Filter housing shall be a 20 gallon capacity, coated steel construction that allows complete replacement of exhausted filter.

D. Drum construction shall be compatibility matched to the waste to be removed.

E. Minimum hydraulic retention time shall be two hours.

2.10 MATERIALS OF CONSTRUCTION

A. Tank shell, baffles and external structural members shall be constructed of A-36 carbon steel. Welded joints are to be double welded.

B. Interior surfaces shall be prepared to an SSPC-SP10 near white metal blast. Exterior surfaces shall be prepared to an SSPC-SP6 commercial blast.

C. Interior coating shall be a self-priming, high density, cross-linked, cycloaliphatic epoxy (12 DFT). Exterior coating shall be primer coat followed by industrial epoxy coat (6 DFT). Color is to be Rain Forest Green.

D. Internal piping shall be ASTM, A-53 steel.

E. Cross-corrugated, oleophilic Flopak coalescing media shall be provided as manufactured by Pan America Environmental or approved equal. The media construction shall be compatibility matched to the product being separated.

F. Closed cell, industrial grade polyethylene constructed vapor sealed cover gasketing shall be provided. No neoprene shall be permitted.

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

A. OWS shall be installed in strict accordance with the manufacturer's current recommended installation instructions and applicable sections of referenced standards.

B. Complete and submit to the Engineer the manufacturer's installation checklist. Provide Engineer with copies of any installation procedures which differ from OWS manufacturer's recommended installation instructions.

C. Upon completion of the OWS installation and testing, record drawings shall be prepared, detailing the location of the OWS, AQAM filter, appurtenances, and piping.

3.02 HANDLING AND INSPECTION

A. OWS system shall remain the property of the Contractor during transportation, storage and delivery to the job site. The Contractor shall retain responsibility for conditions of OWS until time of completion. OWS system damaged during transportation, storage or delivery shall be repaired or replaced at no additional cost to the Owner.

B. OWS shall be lifted using installation lifting lugs, and maneuvered using guide ropes. Under no circumstances shall chains or lifting cables be attached around the OWS.

C. The OWS shall not be manually unloaded. Only lifting equipment shall be used to move the OWS. Capacity of lifting equipment shall be checked prior to moving the OWS.

D. The OWS shall not be dropped or rolled. The OWS may be temporarily stored at the job site by setting on wood or pallets on smooth ground, free of rocks and foreign objects.

E. Upon delivery at the installation site and just prior to installation, the OWS shall be carefully inspected to detect any evidence of damage to outer surface or structure and to ensure that the materials are in accordance with the manufacturer's specifications. The Contractor shall notify the Engineer at least 48 hours prior to delivery of the OWS to the site. Upon arrival at the site, the OWS shall be inspected by the Contractor in the presence of the Engineer.

F. Damaged surface shall be repaired on-site with manufacturer-supplied material and in accordance with the manufacturer's instructions. When this is not possible or if damage is significant, such as denting, puncturing, or cracking, the manufacturer shall be employed by the Contractor to repair the equipment or coatings and to recertify or replace the OWS system as required at no cost to the Owner.

3.03 TESTING

A. OWS shall be pressure tested in strict accordance with the manufacturer's instructions. Contact Engineer 24 hours before pressure testing is to occur. QC Firm shall be present to witness that the pressure testing was performed according to the manufacturer's instructions.

B. In the event a tank leak is discovered or damage occurs, immediately contact the Engineer and manufacturer's representative, and repair or replace the tank as necessary.

C. Upon completion of system installation, the QC Firm shall verify in writing that the entire system is properly installed and safe for operation.

END OF SECTION

SECTION 16050
BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 GENERAL

1.01 SUMMARY

A. Electrical work includes but is not limited to the following:

1. General work associated with electrical systems and equipment including temporary power to the facility, conduit sleeves and supports, anchors, vibration and sound isolation, access panels, identification, record drawings, installation permits, tests, inspections by governing authorities, cutting and patching work, start up of electrical systems and equipment, training of Owner's operating personnel, operating and maintenance manuals, and final cleaning of electrical work.

2. Wiring and power distribution (including panelboard, enclosures, electrical boxes, conduit systems, raceways, wires/cables, wiring devices, overload protective devices, contactors, equipment connections, and grounding systems).

3. Wiring and wire termination for electrical systems of equipment specified in other sections.

1.02 CLASSIFICATION OF AREAS

A. All areas are classified as non-hazardous. Materials of construction shall be watertight, NEMA 3R.

1.03 SUBMITTALS

A. Not less than 30 days prior to furnishing of electrical materials, submit to the Engineer for review complete descriptive information on: combination panelboard/transformer unit; safety disconnect switches; circuit breakers; wires and cables; fuses; combination motor starters; wiring devices; and outlet boxes.

B. At completion of the work, furnish the following to the Engineer:

1. Bound sets of Equipment Manuals (including descriptive, dimensional and parts data) on all items listed in subsection 1.03.A.

2. Final inspection certificate from the local inspection authorities.

1.04 QUALITY ASSURANCE

A. Obtain all necessary permits, pay all legal fees and comply with all state and local building and safety laws relating to building and public health and safety.

B. All work performed and materials furnished shall be in accordance with the latest applicable rules, regulations, requirements and specifications of the following:

1. Local Laws and Ordinances
2. State and Federal Laws
3. National Electric Code (NEC)
4. State Fire Marshall
5. Underwriters' Laboratories (UL)
6. National Electrical Safety Code (NESC)
7. American National Standards Institute (ANSI)
8. National Electrical Manufacturer's Association (NEMA)
9. National Electrical Contractors' Association (NECA) Standard of Installation
10. Institute of Electrical and Electronics Engineers (IEEE)
11. Insulated Cable Engineers Association (ICEA)
12. Occupational Safety and Health Act (OSHA)
13. National Electrical Testing Association (NETA)
14. American Society for Testing and Materials (ASTM)

1.05 DELIVERY, STORAGE AND HANDLING

A. Coordinate deliveries of electrical materials and products with scheduling and sequencing of work.

B. At all times take precautions necessary to properly protect electrical equipment from damage. Failure to comply with the above to the Engineer's satisfaction shall be sufficient cause for rejection of the particular piece of equipment in question.

1.06 COORDINATION

A. Refer to other Specification sections to ensure electrical drawings show project requirements, including voltages, ratings and characteristics, and power availability for operation of each power consuming piece of equipment. Coordinate purchases to ensure uniform interface with each installed item requiring electrical power.

B. Where Contract Documents permit selection from several product options, do not proceed with purchasing until coordination of interface requirements has been checked and satisfactorily established.

C. Electrical service required for all equipment furnished under other Specification sections shall be furnished and connected as part of this work. Obtain correct roughing-in dimensions and requirements for the equipment.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Materials and equipment shall conform in all respects to the requirements set forth in these Specifications and in the accompanying Contract Drawings. Materials shall be new and shall bear the approval label of the Underwriters' Laboratories, Incorporated, and all other standards specified herein. Where manufacturer's name is used, equal products that meet the Engineer's written approval may be substituted.

2.02 WIRE AND CABLES

A. Conductors rated 600 Volt and less shall be copper, labeled per UL 83 and in conformance with NEMA WC7 and WC8, with 600 Volt insulation, and uniform color coded jacket (black insulation for sizes larger than #6 AWG). Conductors shall be stranded copper. Where conductors are installed in dry locations, the conductor insulation shall be type THW or THWN/THHN. Where conductors are installed in underground conduits or wet locations, the conductor insulation shall be type RH/RHW.

B. Instrumentation cable shall be 600 Volt #16 AWG twisted shielded pair, type TC. It shall be single pair designed for noise rejection and applicable for low current, computer or data logging applications. The cable shall be suitable for installation in conduit, cable trays, or other approved raceways and have a minimum temperature rating of 90 degrees C dry locations and 75 degrees C wet locations. Individual conductors shall be soft annealed copper, Class B, 7-strand concentric per ASTM B 8, 20 AWG, 7-strand tinned copper drain wire. Each conductor shall have a nominal 15-mil PVC and 4-mil nylon insulation.

C. Electrical tape shall be 7-mil thick vinyl plastic electric tape, rated for 0 degrees F to 220 degrees F applications, for ultraviolet, abrasion, moisture, alkali, acid and corrosion resistant applications, 600V application, and shall be manufactured by Scotch, Plymouth, Irvington or approved equal.

D. Conductor connectors and terminators shall be labeled per UL and shall be crimp, twist-on, setscrew, bolted or compression type.

E. Pulling lubricant shall chemically neutral to conduit material, conductors, and conductor insulation.

2.03 CONDUITS

A. Intermediate metallic conduit (IMC) and fittings shall be labeled per UL 1242, and shall conform to NFPA-70-345. Rigid galvanized steel (RGS) conduit shall be hot dipped galvanized ferrous steel, labeled per UL 6, and shall conform to NFPA-70-346. Fittings shall be hot-dipped galvanized ferrous steel, sherardized ferrous steel, or malleable iron, and shall be threaded. Connectors shall have insulated throat bushing, grounding locknuts, or grounding lug where bonding jumper is specified and where concentric knockouts are provided in the cabinet.

B. Liquid-tight flexible conduit shall be labeled per UL 360, and shall conform to NFPA 70-351. Fittings shall be labeled per UL 514B, and shall conform to NEMA FB-1. Connectors shall be metallic with nylon insulated throat bushing, locknuts and grounding lug.

C. Conduit expansion/deflection fittings shall be UL listed for both expansion and deflection movement, rain and concrete tight with copper bonding jumper and ground lugs. Appleton - "XJ", Crouse-Hinds - "XJ", OZ/Gedney - "AX" or "DX", Spring City Electrical Manufacturing - "AF", "EF", or "EDF".

2.04 OUTLET BOXES

A. Cast metal boxes shall be labeled per UL #514 and shall comply with NEMA OS-1 and NFPA 70-370. Boxes shall be cast of malleable iron or copper-free aluminum with a corrosive resistant finish with (NEMA 3R type for damp/wet locations, NEMA 4X for areas subject to wash or hose downs) threaded conduit entries, neoprene gasket, and threaded holes with screws for mounting coverplate (and device).

B. Junction boxes and pull boxes shall be labeled per UL #514 and shall comply with NEMA OS-1 and NFPA 70-370. Boxes for NEMA 3R locations shall be cast of malleable iron or copper-free aluminum, corrosion resistant finish, threaded conduit entries, bolt-on cover, neoprene gasket and stainless steel fasteners.

C. Wireways shall be labeled per UL #514 and shall comply NEMA OS-1 and NFPA 70-362.

2.05 WIRING DEVICES

A. GFCI duplex receptacles shall be feed-through type ground fault current interrupter receptacle 125V/20A/2P/3W/G - NEMA 5-20R with test/reset buttons. Urea or nylon body. Face color shall be brown. Devices shall be Arrow-Hart GF-5342 series, Leviton 6599 series, Slater SIR-20-F series.

B. Miscellaneous receptacles and special wiring devices shall be of the type, rating, and/or configuration as indicated. Match device color and coverplate style to other adjacent devices. Provide a mating plug for each receptacle. Devices shall be manufactured by Arrow-Hart, Hubbell, Leviton, or Slater.

C. Toggle switches shall be toggle or key operated switches as indicated, SPST, DPST, 3-way or 4-way operation as indicated, 120V/20A or 277V/20A rating to match circuit voltage, quiet type, maintained contact, back and side wired, with a green hexagonal ground screw or pigtail, urea or nylon body and non-framed face. Color shall be brown. Devices shall be Arrow-Hart 1990-G series, Hubbell 1220-G series, Leviton 1220-G series, Slater 720G-Ag series.

D. Weatherproof coverplates shall be hinged and gasketed with spring loaded closers, constructed of corrosion-resistant cast malleable iron and shall be secured with corrosion-resistant screws. Coverplate shall meet UL "wet location/cover closed" requirements.

2.06 DISCONNECT SWITCHES

A. Disconnect switches shall be labeled UL #98 (600A and less) and shall be NEMA KS-1 heavy-duty type, load make/break rated; with NEMA 3R enclosure for damp or wet locations. Voltage, amperage rating, and number of poles to match circuit characteristics and fused or non-fused as indicated. Switches shall be horsepower rated for motors served. Interrupting ratings shall be a minimum of 200,000 RMS symmetrical amperes. Switches shall be manufactured by Square D, General Electric, ITE, or Cutler-Hammer.

B. Fractional HP manual motor starter/disconnect switches shall be motor rated toggle switch with quick-make and break switch operation and silver alloy contacts. Rated for 1 HP/20A at 240 V, 1 or 2 pole; or up to 10 HP/30 amperes at 250V and 20A at 600V (to match the applied circuit characteristics). Provide NEMA 3R for damp or wet locations. Switches shall be manufactured by Square D, General Electric, Cutter-Hammer, or ITE.

2.07 FUSES

A. Fuses rated up to 600A shall be UL class RK1, dual element; current limiting, time delay. Fuses shall be Bussman Limitron LPN/LPS, Cefco Lo-1P, Gould-Shawmut Amp Trap II.

2.08 COMBINATION PANELBOARD/TRANSFORMER UNIT

A Unit shall be a prepackaged UL approved assembly containing a dry-type transformer and distribution panelboard. Size, capacity, and primary and secondary voltages shall be as indicated on the drawings. Enclosure shall be cleaned, phosphatized and electrostatically powder coated with ASA 49 color. Transformer and panelboard enclosures must be separate to provide the contractor with the option of installing the units assembled together or disassembled as independent units. Unit shall be manufactured by Square D.

1. Transformers shall be dry-type labeled per UL #506, conform with NEMA #250, #ST20 and #TR27 and shall be general purpose air-cooled drip-proof dry-type construction in a weatherproof enclosure for damp/wet locations. Maximum temperature rise of 115 degrees C in a 40 degrees C ambient. Transformer shall be equipped with two 5 percent full capacity primary taps below normal. All insulating materials are to be in accordance with current ANSI C89.2 for a 185 degrees C UL component recognized insulation system. Transformer shall be encapsulated using a sand-epoxy resin mixture to provide maximum protection against moisture, dust and corrosive environments. Integrally mounted and wired

primary and secondary main circuit breakers shall be installed in accordance with National Electrical Code requirements.

2. Panelboard shall be labeled per UL #67 and #50, conform to NEMA #250 and PB1, NFPA #70-384 and 70-373. Panelboard interior shall be factory assembled, labeled per UL standard 67, comply with NEMA PB1 double row circuit arrangement. All phase bussing, neutral bus and ground bus shall be copper. The neutral bus shall have equal number of terminals as circuit spaces, equal ampacity to the phase bus, and set screws for connections. The ground bus shall have equal number of terminals as circuit spaces, 50 percent of the phase bus ampacity, set screw connections, and shall be mounted electrically isolated from the panelboard can and bonded to the can with a removable jumper. Bus bars shall have continuous insulator supports. Circuit breaker frame size and mounting on each side shall be independent of circuit breakers mounted on the other side. The enclosure shall have a hinged access door which maintains itself in the open position when desired, and which has padlock provisions to prevent unauthorized entry. All live parts are to be fully enclosed for personnel protection when installation is completed.

3. Molded case circuit breakers shall be thermal-magnetic plug-on type circuit breakers with quick-make, quick-break contacts, internal common trip on multi-pole breakers, trip-free operation with over-the-center toggle handle or non-removable monolithic tie-handle. Circuit breakers will be fully rated breakers. Trip indication shall be clearly shown by the breaker handle taking a position between ON and OFF when the breaker is tripped and by a visible circuit status indicator. Breaker shall be rated for mounting and operation in any position. Breaker terminals shall be rated to accommodate a minimum of 75°C conductors, copper or aluminum. AIC rating shall be as indicated on the Drawings or 10,000 rms symmetrical amperes minimum where not indicated. Use only Square D Type QO QUIK-GARD or approved equal circuit breakers.

2.10 GROUNDING

A. Bonding jumpers shall be flexible tinned copper braid, sized per NFPA 70-250, unless indicated otherwise.

B. Buried ground cable shall be bare rope lay type copper conductor, sized as per NFPA 70-250, unless indicated otherwise.

C. Ground conductors shall be copper, sized per NFPA 70-250, unless indicated otherwise.

D. Welded ground connections shall be exothermic welding (cadweld).

E. Ground rods shall be steel core with bonded copper-clad jacket, 3/4-inch diameter by 10 feet long.

PART 3 EXECUTION

3.01 GENERAL

A. Applicable rules of the latest edition of the National Electrical Code and local codes or ordinances shall apply as minimum standards for work performed under this contract.

B. These specifications and accompanying Drawings are intended to describe complete workable systems. Items of materials, work not specifically mentioned, but normally necessary for the proper execution of the work, shall be provided as if specifically called for. Conform with the arrangement indicated by the Drawings, recognizing that portions are shown in diagrammatic form only. The Drawings show approximate locations only of electrical work (including feeders, branch circuits, and outlets), except where specific routing or dimensions are indicated. The Engineer reserves the right to make reasonable changes in locations indicated, before roughing-in, without additional cost to the Owner. Because of the small scale of the Drawings, it is not possible to indicate all the offsets, fittings, and accessories required. Investigate the structural and finish conditions and arrange work accordingly, furnishing fittings, bends, junction boxes, pull boxes access panels, and accessories required to meet such conditions.

C. Coordinate installation of electrical and telephone service with the respective utility company and include in bid any and all charges for installation and connection of service.

3.02 CUTTING AND PATCHING

A. Do not cut structural framing, walls, floors, decks and other members intended to withstand stress, except with Engineer's written authorization. Authorization will be granted only where there is no reasonable method for completing the electrical work, and where proposed cutting clearly does not weaken the structure.

B. Do not endanger or damage other work through procedures and processes of cutting to accommodate electrical work. Review proposed cutting with installer of work to be cut, and comply with their recommendations to minimize damage. Where necessary, engage original installer or other specialist to execute cutting in the recommended manner.

C. Where patching is required to restore other work because of cutting or other damage occurring during installation to accommodate electrical work, engage original installer to perform patching. Restore work in every respect, including elimination of visual defects in exposed finishes, as judged by the Engineer.

3.03 COORDINATION OF ELECTRICAL INSTALLATION

A. Sequence, coordinate, and integrate various elements of electrical work so that electrical systems will perform as indicated. Engineer will not supervise coordination, which is the exclusive responsibility of the Contractor.

B. Install conduit and similar services straight and true, aligned with other work and close to walls.

C. Arrange work to facilitate maintenance and repair or replacement of equipment. Locate services requiring maintenance on wiring devices and similar units in front of services requiring less maintenance. Connect equipment for ease of disconnecting, with minimum of interference with other work. Locate operating and control equipment and devices for easy access.

D. Give right of way in confined spaces to piping which must slope for drainage, and to services which are less conformable than electrical work.

3.04 MOUNTING HEIGHTS

A. Unless otherwise noted on the Drawings or required by the Engineer, the following maximum mounting heights shall apply:

Toggle switches	4 feet 0 inches
Receptacles	1 foot 6 inches
Panelboards	6 feet 6 inches to top
Telephone outlets	1 foot 6 inches
Motor control equipment	5 feet 0 inches

3.05 EQUIPMENT LABELS

A. Panelboards, safety switches, equipment cabinets, motor starters and other equipment shown on the Drawings and furnished and/or installed under this division of the specifications shall be labeled with laminated plastic nameplates, black (red for emergency) with 1/4-inch white etched letters, inscribed to identify equipment with the designation shown on the Drawings for panelboards, the name of the equipment controlled for motor starters and disconnects, or the system function for other equipment.

3.06 WIRE AND CABLES

A. Provide copper conductors, installed in conduit, for all electrical power and branch circuit conductors. Minimum size conductor shall be #12.

B. Establish phasing at the service and maintain throughout the entire electrical system. Each conductor throughout the system shall be identified:

	208Y/120V	480Y/277V
Phase A	black	brown
Phase B	red	orange
Phase C	blue	yellow
Neutral	white	gray
Ground	green	green

C. Apply color coding tape to each non-color coded conductor. Locate tape at every junction or pull box and at termination and connection of each conductor.

D. Provide crimp or twist-on type connectors for wire sizes #10 and smaller, set-screw, bolted, or compression for #8 and larger. Splices are not acceptable and shall not be made in panelboards, pull boxes, and fittings. Apply electrical insulating tape or heat shrinkable tubing to any un-insulated portion of a conductor, connection, terminal, or termination.

F. Group and route all conductors in all equipment, panels and other devices parallel to or perpendicular to the enclosure's construction in wireway or gutter areas. Group and harness conductors with tie raps or conductor harnesses.

G. Comply the manufacturer's recommendation for the installation of conductors. Pull conductors simultaneously where more then one is being installed with pulling means (fish tape, cable, rope and basket weave wire/cable grips) which will not damage cables or raceway. Apply pulling lubricants to reduce stress.

3.07 CONDUIT

A. Intermediate metallic conduit (IMC) or rigid galvanized steel (RGS) conduit shall be used in all locations. Liquid-tight flexible metallic conduit shall be used (minimum 3 feet 0 inches) for all connections to motors, transformers and vibrating equipment in damp or wet locations.

B. Conduit expansion/deflection fittings shall be used where any conduit crosses an expansion joint, or slab joint. Conduit throughwall seals shall be used where any conduit transitions between interior and exterior spaces, wet and dry environments, or underground and interior spaces

C. Conduit sizes shown are minimum size based on type THW conductors. Conduit sizes shall be increased where ground conductors are required. Circuits and homeruns for isolated ground outlets or dedicated outlets shall not be combined. Branch circuits for lighting and general purpose receptacles may be combined up to a maximum of three phase (must be of different phases) and one neutral conductor or up to six phase (maximum of two per phase) and two neutral conductors (increase wire size in accordance with note 8 of NEC table 310). Conduit homeruns shall be run directly into panelboard or equipment cabinet and shall not be collected in junction boxes or wireways.

D. Maintain a minimum of 3-inch separation between conduits of different systems. Maintain a minimum separation between underground conduits of seven inches. Underground conduits shall be a minimum of 24 inches below grade.

E. Exposed conduits shall be installed parallel with or perpendicular to the structural construction. Maintain conduit runs as straight and direct as possible. Limit each bend to a maximum of 90 degrees. Limit the bend radius to a minimum of six times the conduit diameter for low voltage conductors.

F. Maintain the grounding continuity and capacity of metallic conduits by cleaning all connections, coating with joint compound and connecting for a tight, secure connection. Use grounding wedge lugs and locknuts designed to bite metal on conduit connections to the box or cabinet and maintain a solid connection. Provide ground wire lugs on all conduit connectors on service and feeder conduits or where concentric knockouts are provided.

G. Support conduits at intervals not to exceed 10 feet or as permitted by the NEC. Conduit supports shall be rated for three (3) times actual load. Provide steel channel attached to wall structure for vertical runs. Provide and install inserts prior to concrete pour or drill and use stainless steel expansion anchors for attaching to concrete

H. Provide spring steel friction or latching clamps or clamps with bolts or screws for attaching to structure and for single suspended conduit attachment. Provide two section bolted conduit clamps for attaching to channel framing. Provide spring steel friction clamp with bolt for attaching to structural steel. Provide and install inserts prior to concrete pour or drill and use stainless steel expansion anchors for attaching to concrete.

I. Blow out or swab all raceways clear of debris, water and other foreign matter prior to installation of conductors. A "fish wire" shall be installed in all empty conduits. Seal the ends of empty conduits with tape where in dry location or with conduit plug in damp or wet locations.

3.08 OUTLET, JUNCTION AND PULLBOXES

A. Provide boxes for all devices, fixtures, equipment, junctions and splice and pull boxes, except where box is integral part of a device fixture or equipment.

B. Provide cast metal boxes where surface mounted in wet locations or dry locations.

C. Provide junction and pull boxes where conduits 1 1/4-inch diameter and larger trade sizes are to be installed.

D. Support each box from the structure independently of conduit. Support system shall be capable of carrying 3 times the load. On structural steel bolt directly to steel member, fasten to a spring clip attached to steel member, or fasten to a bolt-type beam clamp. On concrete, bolt to pre-set concrete inserts, bolt to stainless steel expansion anchors set in drilled holes or fasten with power actuated anchor studs.

E. In soil, set boxes on a 3-inch gravel bed and compact earth around box.

F. Outlet locations indicated on the plans are approximate. Coordinate and determine, in the field, the exact location. Where outlets at different levels are shown adjacent, install them on the same vertical centerline.

G. Install boxes plumb and level and flush with adjacent surface. Grout around boxes installed on concrete or masonry. Locate boxes and conduit bodies so that covers are accessible and removable.

H. Size boxes based on NEC fill capacity. Install pull boxes to limit pulling distance and/or pulling bends to cable manufacturer's recommended pulling tension. Cover unused conduit openings with threaded plugs for cast boxes.

3.09 WIRING DEVICES

A. Furnish and install devices of the type indicated. Coordinate the device/coverplate colors and finishes with Engineer. Mount devices vertically, unless noted otherwise. Mount switches with on position up. Where more than one device is indicated at a location, the devices shall be mounted in a multi-gang box and covered with a single multi-gang plate.

B. Coordinate the mounting heights and arrangements prior to rough-in.

C. Provide an 8-inch long pigtail connection for phase, neutral and ground connections. Do not "throughwire devices". Connections to devices shall be made on screw terminals, not to push-in slots.

3.10 DISCONNECT SWITCHES

A. Provide disconnects at each location indicated, sized to match the equipment ratings and circuit characteristics. Coordinate fuses or thermal overload protection to match actual installed equipment requirements.

B. Provide support channel for mounting when wall mounting is not available. Mount directly to equipment only if approved in writing by equipment manufacturer.

3.11 FUSES

A. Provide fuses for all equipment requiring fuses, including disconnect switches, panelboards, switchboards, and other devices.

B. Provide a minimum of three spare fuses of each type and size used.

3.12 COMBINATION PANELBOARD/TRANSFORMER UNIT

A. Install unit surface mounted as directed on the Drawings. Anchor enclosure to structural surfaces.

B. Fill out (typewritten) the enclosure's circuit directory card upon completion of work.

C. Coordinate mounting arrangements and clearances with the equipment of other trades.

D. Ground transformer secondary neutral to a driven ground rod.

3.13 GROUNDING SYSTEM

A. All electrical work shall be grounded in accordance with the National Electric Code and with IEEE Standard 142.

B. Bond all receptacles, switches, and other wiring devices with an 8-inch long green insulated copper ground conductor from device grounding lug to the metallic box or the branch circuit grounding conductor.

C. Bond all conduit connector ground lugs together and to housing lug or ground bus with copper grounding conductor sized in accordance with table 250-95 of the National Electric Code. Provide a green jacketed copper ground conductor in all raceways and flexible conduits, sized per Article 250 of the National Electric Code and bonded to the equipment or ground bus at each end.

D. Any cable-to-cable, cable-to-structural steel, cable-to-pipe, or rod connections located in soil or encased in concrete shall be by exothermic weld.

E. Bond each of the following to main service ground bus with copper ground conductor, sized per NEC 70-250 in PVC conduit to provide a common grounding electrode system: concrete-encased electrode consisting of 20 feet of number 2/0 awg bare copper conductor encased in a footing or foundation in direct contact with the earth, and a made electrode consisting of three driven ground rods spaced ten feet apart to form an equilateral triangle and bonded together with a ground conductor to form a loop.

3.14 EXCAVATING FOR ELECTRICAL WORK

A. Excavation and backfilling shall be as specified in Section 02317.

3.15 ACCEPTANCE TESTING

A. Notify Engineer about scheduled dates of electrical equipment testing. Equipment testing shall be coordinated with Engineer and equipment vendors.

B. Motor Starters

1. Test, adjust and clean motor starters, as required by design specifications and manufacturers' published instructions.

2. Record all nameplate data on starters and motors and information on components such as fuses, current transformer ratios, overload relays and settings.

3. Check all connections for tightness. Check all contacts for proper alignment and pressure. Verify that all moveable parts operate freely.

4. Take insulation resistance readings of components using 500 Volt megger for equipment rated 440 to 600 Volts. Investigate and correct the causes if an insulation resistance less than 45 megohms is measured.

5. Check starter control sequence by using a source of control voltage, and dropping it through each of its protective devices, interlocks, pushbuttons, and so forth.

6. Check all fuses for continuity and proper rating.

C. 480V Motors

1. Test the insulation of all motors with a 500 Volt megger and record readings. Megger test for each 480 Volt motor shall include the cables feeding it. The minimum acceptable megger reading is 20 megohms.

2. Check motors for proper rotation after insulation tests and lubrication check and before coupling motor to the load.

3. Motors shall be checked for proper alignment of coupling and end play adjusted if necessary. Notify Engineer if temperature rise is excessive.

D. Grounding

1. Ground test for plant network shall be performed. Visually inspect systems, raceway, and equipment grounds to determine the integrity of the grounding network.

2. Test each individual ground rod after it is driven, but before it is connected to the building grid to verify an earth resistance of 5 Ohms or less. A direct reading earth tester, such as Biddle Model 250260, shall be used to perform the test. If a resistance value of 5 Ohms or less is not measured then add additional sections to the ground rod or drive additional ground rods. Provide a written report to the Engineer of each ground rod resistance reading, and of the resistance reading of the entire ground system.

E. Dry Type Distribution Transformers

1. Lighting transformers, and other small transformers shall be meggered with their connections. The primary windings and feeder cables shall be meggered between ground using a 1000 Volt megger. When meggering the primary windings, the secondary windings and cables shall be grounded to the megger test unit ground. The minimum acceptable megger reading is 45 megohms. The secondary windings and cables shall be meggered between ground using a 500 Volt megger. When testing the secondary windings, the primary windings and cables shall be grounded to the megger test unit ground. NOTE: disconnect neutral before testing secondary windings. The minimum acceptance megger reading is 30 megohms.

2. After power has been applied, confirm output voltage for phase balance and voltage level.

F. Low Voltage Cable Testing

1. After installation but prior to termination, all cables shall be tested for continuity. The continuity test shall be performed using a bell or a buzzer.

2. All 480 Volt feeder cables shall be tested with a 500 Volt megger. Each conductor shall be tested phase-to-phase and phase-to-ground. A minimum megger reading of 45 megohms shall be obtained. A written report documenting the megger test shall be submitted to the Owner.

3. Any cable or wire not passing the continuity or megger test shall be replaced at the Contractor's expense.

3.16 ELECTRICAL WORK CLOSEOUT

A. During electrical closeout phase, meet with Engineer frequently and agree upon status of operational responsibility for electrical systems, including security provisions to prevent unauthorized operation, including protective measures to ensure that systems are not neglected or misused.

B. Maintain a set of electrical Contract Drawings and shop drawings in clean undamaged condition, for mark-up of actual installations which vary from work as shown. Select and mark-up Contract Drawings and shop drawings which are most capable of showing installed conditions accurately. In general, record every substantive installation of electrical work which is not shown or has been shown inaccurate, including the following as applicable:

1. Underground conduits drawn to scale and fully dimensioned.

2. Work concealed behind or within other work, in a non-accessible arrangement.

3. Mains and branches of wiring systems, with switchboards, panelboards and control equipment and devices located and numbered.

4. Scope of each change order, denoting change order number.

5. Grounding system.

6. Sensor and signal locations of alarms and control systems.

C. Prepare and transmit Record Drawings as specified in Section 01780.

D. Coordinate testing of equipment specified in other sections with testing of related electrical systems. Check each item in each system to determine that it is set for proper operation. With Owner's Representative and Engineer present, operate each system in a test run of appropriate duration to demonstrate compliance with performance requirements. During or following test runs, make final corrections or adjustments of systems to refine and improve performance where possible, including noise and vibration reduction, elimination of hazard, better response of controls, signals and alarms, and similar system performance improvements. Provide testing or inspection devices as may be reasonably requested for Engineer's observation of actual system performances. Demonstrate that controls and items requiring service or maintenance are accessible.

E. After final performance test run of each electrical system, clean system both internally and externally. Touch-up minor damage to painted finishes; refinish work where damage is extensive.

F. Provide general operating instructions for each operational system and equipment item of electrical work. Coordinate instructions with instructions for mechanical work, elevators and other equipment where associated with electrical systems or equipment.

G. Display and conduct "thumb-through" explanation of maintenance manuals, record drawings, spare parts inventory, storage of extra materials, meter readings and similar service items.

H. After completion of testing and Owner's operating instructions and demonstrations, remove installer's tools, test equipment, and similar devices used in execution of the electrical work.

END OF SECTION

SECTION 16220
MOTORS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes squirrel cage induction motors.

1.02 RELATED WORK

A. All motor driven equipment sections except hermetic refrigerant motor-compressors and submersible motors.

1.03 WORK SPECIFIED ELSEWHERE

A. Except as noted, equipment specified in this Section is provided under Division 11 of the Specifications. Included under this Section is receiving, storage, handling and wiring.

1.04 QUALITY ASSURANCE

A. Equipment Standards: NEMA MG-1.

B. Efficiency: Premium design; guaranteed minimum values determined in accordance with IEEE Standard 112, Test Method B including stray load loss as follows:

	Synchronous RPM			
HP	3600	1800	1200	900 and less
15 – 49	90 %	91 %	90 %	88 %
50 – 99	92 %	93 %	92 %	90 %
100 and above	94 %	95 %	94 %	92 %

C. Provide the manufacturer's highest available design for motors less than 15 horsepower and for motors specified with special torque (NEMA design C or D) or duty cycle (intermittent operation).

1.05 SUBMITTALS

A. Submit shop drawings showing certified dimensions and nameplate data.

B. Submit expected and guaranteed minimum efficiency values for operation at 100, 75, 50 and 25 percent load.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. General Electric

B. Reliance

C. U.S. Motors

2.02 RATING

A. Horsepower (HP): As noted. Where no value is noted, match the requirements of the driven equipment.

B. Phase

1. Less than 1/2 HP: Single phase.

2. 1/2 HP and Larger: Three phase.

C. Voltage

1. Single Phase Motors: 115/200/230 volt reconnectable. Exception: Single voltage motors will be permitted if the voltage matches the supply characteristics shown on the Electrical Drawings.

2. Three-Phase Motors: 200/230/460 volt reconnectable. Exception: Single voltage motors will be permitted if the voltage matches the supply characteristics shown on the Electrical Drawings.

D. Speed, Revolutions Per Minute (RPM): As noted. Where no value is noted, match the requirements of the driven equipment.

E. Torque and Starting Current: NEMA design B unless otherwise noted. Exceptions: Provide NEMA design C or D where required by the driven equipment. Unless specifically noted NEMA design A motors are not acceptable.

F. Service Factor: 1.15.

G. Insulation and Temperature Rise: Except as noted, Class B or Class F insulation with temperature rise, measured by resistance, corresponding to the insulation class in accordance with NEMA standards for operation in a 40 degree C ambient. Exception: For motors used with variable frequency drives provide Class F insulation with temperature rise in accordance with Class B limits.

2.03 CONSTRUCTION

A. Enclosure: Totally enclosed fan cooled (TEFC) unless otherwise noted.

B. Windings: Copper. Exception: Aluminum windings are acceptable where the aluminum to copper transition is done by the manufacturer with copper leads brought out to the motor conduit box.

C. Bearings: Minimum five year B-10 life rating per AFBMA standards.

D. Starting: Suitable for full voltage starting.

2.04 ACCESSORIES

A. Provide lifting eyes for 182 and larger frame size.

B. Where noted provide normally closed thermostat for winding protection.

C. Where noted provide 120 volt, single-phase space heater. Size heater to increase motor temperature approximately 10 degrees C above ambient.

D. Nameplate: Permanently affixed and stamped so as to permit recovery of the nameplate data in the event the nameplate is painted over.

PART 3 EXECUTION

3.01 INSTALLATION

A. Verify clearances and alignment prior to operation.

B. Lubricate in accordance with the manufacturer's instructions.

C. Check rotation and correct as necessary.

END OF SECTION

SECTION 16489
VARIABLE SPEED DRIVES

PART 1 GENERAL

1.01 SUMMARY

A. Section includes AC variable frequency drives.

B. Related Sections:

1. Section 16220 - Motors

1.03 WORK SPECIFIED ELSEWHERE

A. Except as noted, equipment specified in this Section is provided under other Divisions. Include, under this Division, receiving, storage and handling; wall or floor mounting of drive control panels (including equipment pads); and wiring.

1.04 SUBMITTALS

A. Submit shop drawings.

B. Submit installation instructions.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. AC Drives: Equal to Allen Bradley.

2.02 AC DRIVE CONTROLLERS

A. Type: Variable frequency consisting of an input full wave rectifier and output inverter capable of producing a constant volts per hertz output suitable for operating a standard squirrel cage induction motor.

1. 480 Volts and Below: Drives are pulse width and modulated (PWM) 2-circuit board design with power components on one board and control components on another board.

B. Ratings

1. Speed Range: 6 to 60 Hertz with a constant torque load. Variable torque drives are permitted only where specifically noted.

2. Efficiency: 95 percent minimum at 100 percent speed.

3. Service Factor: 1.0 continuous; 1.5 for one minute.

4. Speed Regulation: 3 percent.

C. Equip drive with adjustments for minimum speed, maximum speed, acceleration-deceleration rate and current limit.

D. Protective Features

1. Input molded case circuit breaker rated 22,000 AIC to disconnect the drive and control circuits.

2. Output contactor to disconnect the motor when the drive is off. Interlock contactor with drive to prevent starting unless the drive is at zero volts and hertz. Provide restart delay to allow equipment to coast to rest before restarting. Output contactor may be rated in accordance with NEMA or IEC standards.

3. Solid state protective circuits with diagnostic capabilities for over/under voltage, loss of voltage, inverse time and instantaneous overcurrent, phase loss, phase unbalance, and thermal overload. Activation of all protective functions shall be accomplished without damage to the drive and without need to replace any components. Over/under voltage and loss of voltage are to reset automatically when voltage returns to normal; all other conditions are to be manually reset.

4. Provide protective circuitry, if not inherent in the drive design, to shut down without damage to the drive if an out of synch condition occurs, i.e., running drive connected to a stopped motor, plug reversal or motor stall.

5. Where motor temperature switches are specified, provide circuitry to shut down the drive if the switch opens.

E. Input Voltage and Phase

1. Less than 3 HP: 480 volt, single phase.

2.03 CONTROLS

A. Provide the following door mounted operator control devices:

1. Local-Off-Remote selector switch for remote start/stop. Local-Remote selector for remote speed control.

2. Manual start stop selector and speed adjustment knob.

3. Speed indicating meter.

4. Power on indicating light.

B. Provide the following for remote control interface:

1. Remote (auto) speed command, isolated 4-20 mA DC.

2. Remote start stop command, maintained dry contact, close to run. (Two contacts if constant speed bypass with H-O-A or L-O-R constant speed on off control).

3. Isolated 4-20 output signal for remote speed indication.

4. 120 volt, 10 amp dry contact for remote run indication; closed when running.

5. 120 volt, 10 amp dry contact for remote alarm indication; closed on occurrence of any fault condition.

6. Two 120 volt powered contacts, one closed when motor operates and one open when motor operates, for accessories (motor space heater, pump seal water solenoid, etc.). Provide 750 VA spare capacity in drive control power transformer for accessories.

2.04 SERVICE CONDITIONS

A. Operating Temperature: 0 to 40 degrees C.

B. Altitude: Up to 3,300 feet above sea level.

C. Relative Humidity: 0 to 90 percent.

D. Voltage Variation: +5 percent to -10 percent.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with the manufacturer's instructions.

B. Verify motor alignment prior to operation.

C. Insure adequate space for air circulation around drive ventilation openings.

END OF SECTION

SECTION 16500
LIGHTING

PART 1 GENERAL

1.01 SUMMARY

A. Section includes furnishing and installing lighting fixtures, lamps, ballasts, emergency lighting units, and accessories.

1.02 DEFINITIONS

A. Fixture: A complete lighting unit. Fixtures include lamps and parts required to distribute light, position and protect lamps, and connect lamps to power supply.

B. Average Life: The time after which 50 percent fails and 50 percent survives under normal conditions.

1.03 SUBMITTALS

A. Product Data describing fixtures, lamps, and ballasts. Arrange Product Data for fixtures in order of fixture designation. Include data on features and accessories and the following:

1. Outline drawings indicating dimensions and principal features of fixtures.

2. Electrical Ratings and Photometric Data: Certified results of independent laboratory tests for fixtures and lamps.

B. Shop Drawings detailing nonstandard fixtures and indicating dimensions, weights, method of field assembly, components, features, and accessories.

C. Wiring diagrams detailing wiring for control system showing both factory-installed and field-installed wiring for specific system of this Project, and differentiating between factory-installed and field-installed wiring.

D. Product certificates signed by manufacturers of lighting fixtures certifying that their products comply with specified requirements.

E. Field test reports indicating and interpreting test results specified in Part 3 of this Section.

F. Maintenance data for fixtures (include in the operation and maintenance manual specified in Section 01785).

1.04 QUALITY ASSURANCE

A. Electrical Component Standard: Provide components that comply with NFPA 70 and that are listed and labeled by UL.

B. Listing and Labeling: Provide fixtures and accessory components specified in this Section that are listed and labeled for their indicated use and installation conditions on Project.

1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.

2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

1.05 WARRANTY

A. General Warranty: The special warranty specified in this subsection shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Warranties:

1. Exterior Luminaires: Submit a written warranty signed by manufacturer and installer agreeing to replace external parts of lighting fixtures exhibiting a failure of finish as specified below. This warranty is in addition to, and not a limitation of, other rights and remedies the Owner may have under the Contract Documents.

a. Protection of Metal from Corrosion: Warranty against perforation or erosion of finish due to weathering.

b. Color Retention: Warranty against fading, staining, and chalking due to effects of weather and solar radiation.

c. Special Warranty Period: 5 years from date of Substantial Completion.

1.06 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.

1. Lamps: Furnish at least one of each type.

2. Ballasts: Furnish at least one of each type.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, fixtures that may be incorporated into the Work include, but are not limited to, the products specified on the Drawings.

2.02 FIXTURES AND FIXTURE COMPONENTS, GENERAL

A. Metal Parts: Free from burrs, sharp corners, and edges.

B. Sheet Metal Components: Corrosion-resistant aluminum for exterior, except as indicated. Form and support to prevent warping and sagging.

C. Exterior Fixture Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag or deform in use. Provide filter/breather for enclosed fixtures.

D. Doors, Frames, and Other Internal Access: Smooth operating, free from light leakage under operating conditions, and arranged to permit relamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during relamping and when secured in operating position.

E. Reflecting Surfaces: Minimum reflectance as follows, except as otherwise indicated:

1. Specular Surfaces: 83 percent.

2. Diffusing Specular Surfaces: 75 percent.

F. Lenses, Diffusers, Covers, and Globes: 100 percent virgin acrylic plastic or annealed crystal glass, except as otherwise indicated.

1. Plastic: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

2. Lens Thickness: 0.125 inch (3 mm) minimum; except where greater thickness is indicated.

3. Exterior Fixtures: Use heat- and aging-resistant, resilient gaskets to seal and cushion lens and refractor mounting in fixture doors.

G. Photoelectric Relays: Conform to UL 773A.

1. Contact Relays: Solid-state, with SPST dry contacts rated for 120 volts and capable of operating a minimum of 1200 volt-amperes. Contacts shall fail in the ON position and be factory set to turn light unit on at 1.5 to 3 foot-candles (16 to 32 lux) and off at 4.5 to 10 foot-candles (48 to 108 lux) with 15-second minimum time delay.

2. Outdoor Sealed Units: Weather-tight housing, resistant to high temperatures and equipped with sun-glare shield and ice preventer.

H. High-Intensity-Discharge (HID) Fixtures: Conform to UL 1572.

I. HID Ballasts: Conform to UL 1029 and ANSI C82.4. Include the following features, except as otherwise indicated.

1. Constant wattage autotransformer (CWA) or regulating high power factor type, unless otherwise indicated.

2. Operating Voltage: As indicated on the Drawings.

3. Single-Lamp Ballasts: Minimum starting temperature of minus 30 deg C.

4. Normal Ambient Operating Temperature: 40 deg C.

5. Open circuit operation will not reduce average life.

6. High Pressure Sodium (HPS) Ballasts: Equip with a solid-state igniter/starter having an average life in pulsing mode of 10,000 hours at an igniter/starter case temperature of 90 deg C.

7. Encapsulation: Manufacturer's standard epoxy-encapsulated model designed to minimize audible fixture noise.

2.03 LAMPS

A. Comply with ANSI C78 series that is applicable to each type of lamp.

2.04 FINISHES

A. Manufacturer's standard, except as otherwise indicated, applied over corrosion-resistant treatment or primer, free of streaks, runs, holidays, stains, blisters, and similar defects.

PART 3 EXECUTION

3.01 INSTALLATION

A. Set units plumb, square, and level and secure according to manufacturer's written instructions and approved Shop Drawings. Support fixtures according to requirements of Section 16050.

3.02 CONNECTIONS

A. Ground lighting units. Tighten electrical connectors and terminals, including grounding connections, according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.03 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replaced damaged fixtures and components.

B. Give advance notice of dates and times for field tests.

C. Provide instruments to make and record test results.

D. Tests: Verify normal operation of each fixture after fixtures have been installed and circuits have been energized with normal power source.

E. Replace or repair malfunctioning fixtures and components, then retest. Repeat procedure until all units operate properly.

F. Report results of tests.

G. Replace fixtures that show evidence of corrosion during Project warranty period.

3.04 ADJUSTING AND CLEANING

A. Clean fixtures after installation. Use methods and materials recommended by manufacturer.

B. Adjust aimable fixtures to provide required light intensities.

END OF SECTION

SECTION 16900
CONTROLS AND INSTRUMENTATION

PART 1 GENERAL

1.01 SUMMARY

A. Controls and instrumentation work includes but is not limited to furnishing and installing all control wiring, control panel, auxiliary relays, motor starters, alarm lights, control switches, instrumentation components, PLC system, system programming and testing, and other related work as specified and as indicated on the Drawings.

B. Related Sections:

1. 16050 - Basic Electrical Materials and Methods

1.02 GENERAL REQUIREMENTS

A. The Contractor shall employ a Systems Integrator to implement the controls and instrumentation. The Contractor shall have overall system responsibility and shall provide all additional materials and work necessary to supplement the materials and work provided by the Systems Integrator. The Contractor shall require the Systems Integrator to conform to the requirements of this section including the following:

1. Completing the detail design.

2. Providing specified submittals.

3. Providing panels, panel components, field components, instrumentation, computers, software, and ancillary devices required for a complete and operating system.

4. Certifying the correct installation of the system by inspecting, calibrating, and testing it.

5. Starting up and testing the control system.

6. Providing the required Owner training and documentation.

7. Providing the Instrumentation and Control System O & M Manuals.

B. Product Quality

1. Manufacturer's names and model numbers are used to establish the quality and features that shall be provided. If equipment that differs from these specifications and Drawings is offered and determined to be equal to the specified equipment, all revisions of the design and/or construction of the structure, piping, appurtenant equipment, and electrical work required to accommodate the substitution shall be made at no additional cost to the Owner. Obtain the Engineer's approval for all revisions.

2. Like items of equipment shall be the end products of one manufacturer and of one model series for the consistency of appearance, operation, maintenance, spare parts, and manufacturer's service.

3. Implement all same or similar functions in a same or similar manner (for example, control logic, sequence controls, display layouts, etc).

4. Provide all work and equipment necessary to effect a Controls and Instrumentation System that satisfies the performance, functional, and equipment requirements of these specifications and Drawings.

1.03 QUALITY ASSURANCE

A. The Systems Integrator shall have at least six years of experience in designing and installing similar systems. The Contractor shall require that the Systems Integrator provide on-site supervision for the installation of the control and instrumentation system. The Systems Integrator shall have, as minimum experience, designed and installed three similar sized control and instrumentation systems and successfully completed the start-up of these systems.

B. The Systems Integrator shall be a corporation with ten or more full-time employees, and shall be one of the following approved Systems Integrators:

1. Control Instruments, Inc.; Atlanta, GA 404-351-1085

2. Enviromation, Inc.; Syracuse, NY 315-432-4416

3. Hi-Ran Systems, Inc.; Pineville, NC 704-588-2302

4. Revere Control Systems; Birmingham, AL 205-824-0004

5. Transdyn Controls; Norcross, GA 678-473-6400

1.04 GENERAL SUBMITTAL REQUIREMENTS

A. Submit complete descriptive and dimensional data on each component of work, including Drawings on any equipment which will be assembled by the contractor or local shop.

B. Provide materials necessary to show compliance with these specifications and Drawings. All submittals shall be complete, neat, orderly, and in accordance with the Controls and Instrumentation System delivery schedule. Provide each submittal with a cover sheet indicating the Integrator's name, address, and phone number; the project name; project numbers; the submittal name; the date of completion; and the individual responsible for preparation. Provide each submittal with a table of contents. All text shall be typed. Provide small submittals with a protective cover labeled with the project and submittal name. Bind medium and large submittals in hard-cover 3-ring binders with labeled tab dividers. Label the front and side of all binders with the project and submittal name. Reference all equipment by the tag ID's used in the Drawings. For each submittal, indicate which requirements the submittal is intended to satisfy and describe and justify every

proposed deviation from these specifications and Drawings. Provide the following information as a minimum.

C. Controls and Instrumentation System Delivery Schedule: Provide scheduled dates for each activity under the following categories.

1. Delivery of each submittal.
2. Manufacturing.
3. Programming.
4. Shipment.
5. Installation.
6. Services.
7. Delivery of documentation.

D. Manufacturer's Information: Provide Catalog information, descriptive literature, wiring diagrams showing all external signal and power connections, dimensional Drawings, installation requirements and details, operation and maintenance instructions, and storage requirements for all equipment; including power supplies, relays, surge suppressors, terminal blocks, circuit breakers, heaters, thermostats, etc.

E. Component Data Sheets: Provide individual data sheets for each component type. Each sheet shall include the following information: project name; component name and code; manufacturer name; name, address, and telephone number of manufacturer's local office, representative, distributor, or service facility; and quantity provided. To supplement the manufacturer's information, indicate all specific features for each specific component, including tag ID, location or service, scale range, set-points, materials of construction, special options included, and complete model number(s) or other number(s) for identification.

F. Panel Construction Drawings: Provide shop drawings and catalog material for all panels, racks, and enclosures. Indicate all materials of construction, painting requirements, dimensions, etc. Show, to scale, the locations of all front and rear panel mounted devices, doors, hardware, louvers, sub-panels, etc. Include a panel legend or bill of material identifying all equipment by description and tag ID, nameplate inscriptions, and component inscriptions.

G. Panel Wiring Diagrams: Show all devices that require an electrical connection, including all relays, alarms, fuses, lights, fans, heaters, surge protectors, etc. Identify all: wire numbers, types, and colors; terminal numbers; power circuits; grounding circuits; equipment terminations; and I/O identifications (addresses). Show and annotate each circuit individually. Do not use common diagrams. Each drawing shall have line (rung) numbers. Number each wire, terminal, and relay with the associated line number. For each relay, list the line numbers where associated contacts are shown and underline only the line numbers for normally closed contacts. Indicate the action of all process switches (e.g. close rising or close falling for pressure, level, flow, etc.). The wiring diagrams in the Drawings are provided to show necessary functions rather than actual wiring.

H. Provide interconnecting wiring diagrams showing all electrical connections between equipment, panels, and field mounted components. Diagrams shall show all component and panel terminal board identification numbers, and external wire and cable numbers. Diagrams, device designations, and symbols shall be in accordance with NEMA ICS 1-101.

I. Loop Diagrams: Provide a wiring diagram for each analog loop showing all wire numbers, all terminal ID's, all power supplies and power wiring, all dropping resistors, etc. Show all twisted pair wire and shield terminations such that no wire splicing is required. Divide each loop diagram into three areas for identification of equipment locations: front panel, inside panel, and field. For each loop present a tabular summary of: (1) the output capability of the transmitting equipment, (2) the input impedance of each receiving item, (3) an estimate of the loop wiring impedance based on the wire sizes and lengths, (4) the total loop impedance, (5) reserve output capacity, and (6) any assumptions made. Loop diagrams shall meet the minimum requirements of ISA S5.4.

J. Provide installation details for all instrumentation elements including pressure gauges, field sensors and transmitters.

K. Legend: Define all symbols and abbreviations used that are not in accordance with ISA terminology.

L. Clearly show or make note of all installed spares and all provisions for future work including reserved front or rear panel space and unused equipment, wiring, and terminals.

1.05 TESTING SUBMITTAL REQUIREMENTS

A. Provide detailed descriptions, procedures, forms, and schedules for all tests. Information shall be provided individually for each loop and each equipment item. Describe in detail each process variable manipulation procedure and each simulation technique that will be used. All information shall be complete except for specific entries that must be provided during the test.

B. Test Documentation: Provide complete documentation of all tests.

1.07 AS-BUILT DOCUMENTATION REQUIREMENTS

A. Provide updated and consolidated copies of all previous submittals.

B. Provide equipment operation and maintenance manuals including all information shipped with each item from the manufacturer and including instructions and procedures for the following.

1. Operation.
2. Installation.
3. Maintenance.
4. Troubleshooting.
5. Calibration, adjustment, programming, and configuration.

C. Provide updated program printouts, documentation, and panel wiring schematics within four weeks after start-up is complete.

PART 2 PRODUCTS

2.01 INSTRUMENTATION COMPONENTS

A. Provide the components as indicated on the drawings.

2.02 CONTROL PANELS

A. Panels shall be UL listed, and shall be completely fabricated, instruments and control components installed and wired in the equipment suppliers' factories. All wiring shall be completed and tested prior to shipment. All external connections shall be by way of numbered terminal blocks. Terminal blocks shall be grouped such that 120 volt AC circuits are separate from 24 volt DC circuits.

B. Sufficient terminal blocks shall be provided to terminate all spare conductors. In addition, the greater of 20 percent or six unused spare terminals shall be provided.

C. Panels shall be enclosures conforming to the requirements of NEMA and shall be rated as noted in the individual equipment specifications. In addition to the NEMA standards, the panels shall conform to the following requirements:

1. Minimum metal thickness shall be 14 gauge.

2. All doors shall be rubber gasketed and have a continuous hinge.

3. Panel cutouts for instruments and other devices such as pilot lights and switches shall be cut, punched and smoothly finished with rounded edges.

4. Where panels are mounted outside or in unheated areas, provide thermostatically controlled heaters that will maintain their inside temperature above 40°F. Heaters shall be Hoffman Design Air electric heaters or engineer approved equal.

5. Unless otherwise noted, panels shall be constructed with front access only.

6. Panels shall be manufactured by Hoffman, H. F. Cox, Rittal, or engineer approved equal.

7. All control panels shall be equipped with suitable surge arresting devices to protect the equipment from damage due to electrical transients.

2.03 CONTROL PANEL ELECTRICAL

A. General: All electrical work shall be in accordance with the applicable state and local codes and the NEC.

B. Power distribution within panels:

1. Control panels that have three phase power requirements and contain motor starters in addition to logic controls shall contain a main circuit breaker interlocked with the panel door. Operator controls and indications as specified herein shall be

mounted on the front access door. Main circuit breaker shall be operable without opening the panel.

2. Circuit breakers shall meet the requirements of UL and NEMA AB1. All breakers shall have a 25,000-ampere RMS symmetrical interrupting rating, minimum, at 480 volt unless otherwise indicated in the equipment specifications. Main and branch circuit breakers, except motor branch circuit breakers, shall be molded case thermal magnetic. Provide a method for padlocking of motor branch circuit breakers in the OFF position. Motor branch circuit breakers shall be thermal magnetic with adjustable magnetic trip units. Motor branch circuit breaker ratings shall be as recommended by the manufacturer for maximum motor protection. Tripping of breakers shall be indicated by operator handle position. Provide circuit breakers suitable for use with 75 degrees C wire at full NEC 75 degrees C ampacity.

3. Full voltage magnetic motor starters shall meet NEMA ICS 2, Class A, NEMA size one minimum. Motor starters shall include 3-pole bimetallic or eutectic alloy thermal overload relays sized for the motor which it protects. Overload relays shall be manual reset type. IEC rated motor starters will not be accepted.

4. All motor control shall be 120V AC (except intrinsically safe circuits where applicable). Provide a control power transformer that has sufficient capacity to serve the connected load including 500VA for the duplex outlet plus 100VA (minimum) to limit voltage variation to 15 percent during contactor pickup. Fuse one side of the secondary winding and ground the other side. Provide primary winding fuses in all ungrounded conductors.

5. Provide a power monitoring relay to protect 3-phase equipment against single phasing, phase unbalance and phase reversal. Provide separate, isolated contact outputs to stop all motors and to activate an alarm light in the event of an abnormal condition. Phase monitoring relay shall have 10,000-volt transient voltage protection and shall be Furnas Class 47, or equal.

6. Power distribution blocks shall be used to parallel feed line side of branch circuit protective devices. "Leap frogging" of power conductors shall not be acceptable.

C. Wiring: Wiring within panels, consoles, and assemblies shall meet the following requirements:

1. Wires for ac circuits shall be 600-volt, Type THHN stranded copper and shall be sized for the current to be carried, but not smaller than No. 14 AWG.

2. Wires for analog signal circuits shall be stranded copper and shall be twisted shielded pairs not smaller than No. 18 AWG.

3. Wires for other dc circuits shall be 600-volt, Type THHN stranded copper and shall not be smaller than No. 18 AWG.

4. All analog and other dc circuits shall be separated at least 6 inches from any ac power and control wiring.

5. All wiring shall be enclosed in either sheet metal raceways or plastic wiring ducts. Wiring ducts shall be complete with rounded ends, covers and wire protectors.

6. Wiring shall be numbered and tagged at each termination. Wire tags shall be snap-on or slip-on PVC wire markers with legible machine printed markings and numbers. Adhesive or taped-on tags are not acceptable.

D. Wiring Interface: Wiring entering or leaving each panel, console, rack, or cabinet shall be terminated and identified as follows:

1. Analog and discrete signal wiring shall be terminated at numbered terminal blocks.

2. Wiring for special signals such as communications, digital data, and multiplexed signals may be terminated at manufacturer's standard connectors.

E. Terminal Blocks: Terminal blocks for panels, consoles, rack and cabinets shall meet the following requirements:

1. Provide sufficient terminations to accommodate both present and future needs. Wire all spare or unused panel mounted elements to their panels' terminal blocks. Provide 20 percent of all connected terminals as unused spare terminals.

2. Provide 600-volt screw clamp compression, dead front barrier type terminal blocks with current bar providing direct contact with wire between the compression screw and yoke. Provide yoke, current bar, and clamping screw constructed of high strength and high conductivity metal. Use yoke that guides all strands of wire into the terminal. Use current bar providing vibration-proof connection. Supply terminals that allow connection of wire without any preparation other than stripping. Rail mount individual terminals to create a complete assembly. Provide terminals constructed such that jumpers can be installed with no loss of space on terminal or rail.

3. No more than two wires may be terminated on any single terminal. Size all terminal block components to allow insertion of all necessary wire sizes and types. Supply terminal blocks with marking system allowing the use of preprinted or field-marked tags. Provide UL listed terminal blocks manufactured by Weidmuller, Ideal, Electrovert, or equal.

F. Grounding: Panels, consoles, racks, and cabinets shall be provided with an internal copper grounding bus for all ground connections.

G. Relays:

1. Control circuit switching shall be accomplished with relays, these relays, for interfacing and control applications, shall be the compact general-purpose plug-in type having low coil inrush and holding current characteristics. Contact arrangements shall be rated for no less than 10 amperes at 120V ac or 28V dc. A status indicating light shall be provided as part of each relay. Non-latching relays shall have single coil. Latching relays shall have two coils, unlatching being

accomplished by energizing one coil, and latching being accomplished by energizing the other coil. Relays shall have plain plastic dust covers, test buttons, and mounting sockets with screw terminals, and hold-down springs. Relays shall be UL listed. Relays shall be Potter and Brumfield KUP or KUL Series; Struthers-Dunn Series 219; or equal.

2. Time delays functions shall be accomplished with time delay relays. Units shall be adjustable time delay relays with the number of contacts and contact arrangements required. Contacts shall be rated for 10 amperes at 120V ac. Integral knob with calibrated scale shall be provided for adjustment of time delay. Time delay rangeability shall be at least 10:1. Operating voltage shall be 120V ac. plus 10 percent, -15 percent at 60-Hz. Operating temperature shall be -20 degrees F to 165 degrees F. Repeat timing accuracy shall be plus or minus 10 percent over the operating range. Units shall be Amerace Corp., Control Products Division, Agastat Series 7000; Cutler-Hammer Series D 87; or equal.

3. All relays shall have a screw terminal interface with the wiring. Terminals shall have a permanent, legible identification. Relays shall be mounted such that the terminal identifications are clearly visible and the terminals are readily accessible.

H. Front-of-Panel Devices:

1. Indicating Lights, Watertight: Units shall be heavy-duty, push-to-test type, watertight, industrial type with integral transformer for 120V ac applications. The lights shall be rated for NEMA 4X watertight, corrosion-resistant service. Units shall have screwed on plastic lenses, and shall have factory engraved legend plates for service legend. Units shall be Allen-Bradley Type 800H.

2. Pushbutton, Momentary, Watertight: Units shall be heavy duty, watertight, industrial type pushbuttons with momentary contacts rated for 120V ac service at 10 amperes continuous. The pushbuttons shall be rated for NEMA 4X watertight, corrosion-resistant service. Units shall have standard size, black field, legend plates with white markings for service legend. Units shall be Allen-Bradley Type 800H.

3. Selector Switch, Watertight: Units shall be heavy duty, watertight, industrial type selector switches with contacts rated for 120V ac service at 10 amperes continuous. The switches shall be rated for NEMA 4X watertight, corrosion-resistant service. Units shall have standard size, black field, legend plates with white markings, for service legend. Operators shall be black knob type. Units shall have the number of positions and contact arrangements as necessary. Units shall be single hole mounting, accommodating panel thicknesses from 1/16-inch minimum to 1/4-inch maximum. Units shall be Allen-Bradley Type 800H.

I. Nameplates, Name Tags, and Service Legends:

1. All components provided with the package system, both field and panel mounted, shall be provided with permanently mounted name tags bearing the entire ISA tag number of the component. Tag numbers shall be inside panels for panel mounted components. Panel mounted tags shall be plastic; field mounted tags shall be

stamped 316 stainless steel attached with screws or wire. Panel face mounted instrument name tags shall be mounted to the instrument behind the panel face.

2. Service legends (integrally mounted with instrument) and nameplates shall be engraved, rigid, laminated plastic type with adhesive back. Provide sufficient service legends and nameplates to adequately describe the functions of panel face mounted instruments. Color shall be black with white letters and letter height shall be 3/16 inch.

3. Each panel shall be provided with a face mounted laminated nameplate as specified above inscribed with the panel name and tag number. Color shall be black with white letters ½-inch high.

2.04 OPERATOR INTERFACE COLORS AND INSCRIPTIONS

A. Unless otherwise noted, the following color code and inscriptions shall be used for hardware and software operator interfaces.

Function/ Inscription	Color
ON	green
OFF	red
OPEN	green
CLOSED	red
HIGH	amber
LOW	amber
FAIL	amber
START	red
OTHER CONTROL	black

2.05 FRONT PANEL LAYOUT

A. Identify the function, including scale range, of each front panel device. Group together devices that monitor and control a particular item and identify the item by name. Devices and groups of devices shall be arranged in an orderly and regular pattern according to function.

2.06 SPARES, EXPENDABLES, TOOLS, AND TEST EQUIPMENT

A. Provide in sufficient quantity all spare material, expendable material, tools, test equipment, etc. necessary to maintain complete operation of the Controls and Instrumentation System for a minimum of one year after the entire system is demonstrated and certified to comply with all requirements of these specifications and Drawings. Package all items to protect against environmental and handling damage. Clearly mark the outside of each package with a description of the contents and label as spare. Items shall include the following. Where percentages are required, round the quantity up to the nearest whole number.

1. Selector switch, pushbutton, and indicating light: two of each type used.

2. Light bulb: one hundred percent of each type used.

3. Control and time delay relay: twenty percent of each type used.

4. Fuse: one hundred percent, two minimum, of each type and size used.

5. Surge arrestor: twenty percent, two minimum, of each type used.

6. Power supply: two of each type and size used.

7. Paint: one quart of each type and color used for panels.

8. Calibrator, Transmation Model 1045-01, or engineer approved equal: one.

9. Digital Multimeter with hard case, Fluke Model 27 YEL and C20, or engineer approved equal: one.

PART 3 EXECUTION

3.01 INSTALLATION

A. The Contractor shall be responsible for the installation of all system components. Location of system components and interconnections between system components and other systems. Installation shall be in accordance with the Drawings and specifications. Installation drawings and specifications shall be prepared using general component locations where shown, and shall be approved by the Engineer prior to installation.

B. Install materials and equipment in a workmanlike manner utilizing craftsmen skilled in the particular trade. Install all equipment in a location and manner that maximize access for operation, maintenance, and future construction. Provide work that has a neat and finished appearance. Coordinate Controls and Instrumentation work with the Owner and work of other trades to avoid conflicts, errors, delays, and unnecessary interference with operation of the plant during construction.

C. Store all equipment according to manufacturer's recommendations. At all times protect all equipment from loss, damage, and environmental effects. Provide covers and heaters at the job site for all control panels and instruments for protection against environmental conditions (e.g. moisture, construction dust, etc.).

D. Follow all manufacturer's installation, operation, and maintenance instructions and recommendations explicitly, unless otherwise noted. Maintain a copy of all manufacturer's instructions and recommendations at the job site at all times.

E. Maintain all premises, panels, and equipment enclosures free of waste material. Maintain all equipment surfaces free of defects.

3.02 CORROSION PROTECTION

A. All control panels containing electrical or instrumentation and control devices shall be protected from corrosion through the use of corrosion-inhibiting vapor capsules. The corrosion-inhibiting vapor capsules shall be Hoffman Model A-HC1 or equal.

3.03 CLEANING AND TOUCH-UP PAINTING

A. Upon completion of work, the Contractor shall remove materials, scraps, and debris from premises and from interior and exterior of all devices and equipment. Touch-up scratches, scrapes or chips in interior and exterior surfaces of devices and equipment with finishes matching the type, color and consistency of the original finish.

3.04 EQUIPMENT CERTIFICATION

A. The equipment suppliers shall observe and advise on the installation of the packaged systems by the Contractor, and certify in writing that the equipment will perform as required.

3.05 INSPECTIONS

A. All materials, equipment and workmanship shall be subject to inspection at any time by the Engineer or the Owner. Correct any work, materials or equipment not in accordance with these contract documents or found to be deficient or defective by the Engineer at no additional cost to the Owner.

3.06 WORKER QUALIFICATIONS

A. Provide an on-site technician or engineer to supervise and coordinate installation, adjustment, testing, and start-up of the Controls and Instrumentation System. Provide the services of a qualified manufacturer's representative as necessary to install, test, start-up, and provide training on specific equipment or systems.

3.07 TESTING, START-UP, AND TRAINING

A. Conduct all tests in accordance with the Test Information Submittals. Provide all materials (tools, test equipment, process measuring devices, process simulators, recorders, loggers, high pressure air sources, power sources, calibration solutions, etc.) and all work necessary to successfully complete all testing and start-up. At each test, provide: up-to-date copies of all submittals, including the master and additional copies of the Test Information; documentation of previously completed tests; and one set of the specifications, Drawings, Addenda, and Change Orders. Coordinate testing and start-up with all other activities at the job site. All tests may be witnessed by the Owner or Owner representative. Tests shall be repeated as directed by the Owner or Owner representative until they are successfully completed.

B. Factory Tests: Inspect and test all panels, and communication links at the Controls and Instrumentation System Integrator's facility prior to shipment of this equipment to the job site. Certify that this equipment complies with all requirements indicated in these specifications and Drawings. Provide a test panel and signal generators to simulate and monitor all System inputs and outputs. Provide travel (from Atlanta), room, and board expenses for two Owner selected people to attend all factory tests that are conducted outside of Metropolitan Atlanta.

C. Operational Readiness Tests: Prior to start-up, inspect and test the installed and completed Controls and Instrumentation System and certify that it complies with all requirements indicated in these specifications and Drawings. Inspect and test each loop and each component for proper installation, calibration, and adjustment, and certify that each is ready for start-up and operation.

D. Acceptance Tests (To be performed in the presence of the Engineer): Inspect and test the installed, completed, and operating Controls and Instrumentation System; and certify that it complies with all requirements indicated in these specifications and Drawings. Where possible, perform the tests with actual process variables, equipment, and data. Measure the process variable independent of the equipment being tested for calibration and setpoint checks. Where it is not possible to test with actual process variables, equipment, or data, provide a means of simulation that has been approved by the Engineer.

E. Training: Training shall be conducted at the job site by individuals qualified to conduct training on each component of the system. The attendees shall be selected by the Owner. Provide all materials (printed material, visual aids, tools, test equipment, programming devices, etc.) necessary to successfully complete all training. Provide and review in detail all Documentation. Provide the following training as a minimum.

1. One week operations and maintenance training for the panel and field hardware.

END OF SECTION

APPENDIX C – OPERATIONS AND MAINTENANCE MANUAL

ALABAMA STATE PORT AUTHORITY
Office of Environmental Management

ALABAMA WOOD TREATING CORPORATION SITE
MOBILE, ALABAMA
FACILITY ID # ALD 058 221 326

OPERATIONS, MAINTENANCE, AND MONITORING MANUAL

Prepared by:

WSP
4000 Meadow Lake Drive, Suite 121
Birmingham, Alabama 35242

Prepared for:

Alabama State Port Authority
250 N. Water Street
Mobile, Alabama 36602

December 2002
Revised February 2013
Revised October 2013
Revised July 2014
Revised December 16, 2015

Revised January 2025

WSP Project 7630233209

Table of Contents

1.0 INTRODUCTION & PURPOSE 1-1
1.1 ORGANIZATION AND RESPONSIBILITIES 1-1
1.2 OVERVIEW OF SYSTEMS AND REPORT INFORMATION 1-2
1.3 AWTC SITE INFORMATION 1-3
1.3.1 Site Regulatory Background 1-3
1.3.2 Regulated SWMU Summary 1-4
1.3.3 SWMUs & AOCs 1-4
1.3.4 AWTC Site Waste Characteristics 1-5

2.0 OPERATION, MAINTENANCE, AND MONITORING PROCEDURES 2-1
2.1 GENERAL PROCEDURES 2-1
2.1.1 Site Inspections 2-1
2.1.2 System Testing 2-2
2.1.3 Institutional Controls 2-2
2.2 SITE SECURITY SYSTEM 2-2
2.2.1 Description and Purpose 2-2
2.2.2 Routine Maintenance Procedures 2-3
2.2.3 Inspection Procedures 2-3
2.3 ASPHALT COVER SYSTEM (SWMU-6 WEST) 2-3
2.3.1 Description and Purpose 2-3
2.3.2 Routine Maintenance Procedures 2-3
2.3.3 Inspection Procedures 2-4
2.4 OTHER COVER SYSTEMS 2-4
2.4.1 Existing Cover Units (SWMUS-2 and -7) 2-4
2.4.2 Existing Cover Units (SWMUs-4, 5, 6 EAST and 8) 2-5
2.5 CONTIGUOUS PROPERTIES 2-5
2.5.1 Description 2-5
2.5.2 Routine Inspections 2-6
2.6 DNAPL RECOVERY 2-6
2.6.1 Extraction Well Network 2-6
2.6.2 DNAPL Recovery System Description 2-6
2.6.3 DNAPL MWRS 2-12
2.7 GROUNDWATER MONITORING WELL SYSTEM 2-14

3.0 WASTE MANAGEMENT PRACTICES 3-1

4.0 SAMPLING & ANALYSIS 4-1
4.1 MONITORING WELLS 4-1
4.2 DNAPL EFFECTIVENESS WELLS 4-1
4.3 DNAPL RECOVERY SYSTEM MONITORING 4-3
4.3.1 EFFLUENT MONITORING 4-3
4.3.2 SYSTEM PERFORMANCE MONITORING 4-3

5.0 CORRECTIVE MEASURES COMPLETION CRITERIA 5-1

6.0 OPERATION & MAINTENANCE CONTINGENCY PROCEDURES 6-1

7.0 PERSONNEL TRAINING 7-1

8.0 DATA MANAGEMENT, DOCUMENTATION AND REPORT REQUIREMENTS 8-1
8.1 RECORDS MAINTENANCE 8-1

8.1.1 Operating Logs....8-1
8.1.2 Maintenance Records....8-1
8.1.3 Boring Logs....8-1
8.1.4 Inspection Records....8-1
8.1.5 Monitoring and Laboratory Analysis Records....8-1
8.1.6 Emergency Reports....8-2
8.2 REPORTING....8-2
8.2.1 Annual Groundwater Quality Assessment and DNAPL Effectiveness Reports....8-2
8.2.2 Final Report of Corrective Measures....8-2

Figures

Figure 1 Site Location Map

Figure 2 AWTC Site Plan

Tables

Table 1 – Inspection and Reporting Frequency

Table 2 – Groundwater Monitoring Summary

Table 3 – Summary of Wells for Use in DNAPL Effectiveness Monitoring Program

Table 4 – DNAPL OM&M Protocol at Monitoring Well Recovery System

Enclosures

Enclosure A Inspection Forms

Enclosure B Field Sampling and Analysis Plan

Enclosure C Quality Assurance Project Plan

List of Acronyms and Abbreviations

Acronym/ Abbreviation	Definition
ACLs	Alternate Concentration Limits
ADEM	Alabama Department of Environmental Management
AOC	Areas of Concern
ASD	Alabama State Docks
ASPA	Alabama State Port Authority
AWTC	Alabama Wood Treating Corporation
CMER	Correction Measures Effectiveness Report
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CMER	Corrective Measures Effectiveness Report
CMI	Corrective Measures Implementation
CMS	Corrective Measures Study
DNAPL	Dense Non-Aqueous Phase Liquids
EC	Engineering Control
EFR	Enhanced Fluid Recovery
EPA	Federal Emergency Management Agency
ft	Feet
ft/ft	Foot per foot
GWPS	Groundwater Protection Standards
HDPE	High Density Polyethylene
HHE	Human Health and the Environment
IC	Institutional Control
ICTF	Garrows Bend Internodal Container Transfer Facility
JTC	Joint Technical Committee
LF	Linear Feet
LNAPL	Light Nonaqueous Phase Liquids
MCT	Mobile Container Terminal a.k.a. APM Terminals
mg/l	Milligrams Per Liter
mgd	Million Gallons Per Day
MLLW	Mean Lower Low Water
MSE	Mechanically Stabilized Earth
MSL	Mean Seal Level
MW	Monitoring Well
MWRS	Monitoring Well Recovery System
NAVD	North America Vertical Datum 1988

Acronym/ Abbreviation	Definition
NGVD	National Geodetic Vertical Datum
O&M	Operation and Maintenance
OM&M	Operations, Maintenance, and Monitoring
OHEA	Office of Health and Environmental Assessment
PAHs	Polynuclear aromatic hydrocarbons
PCDD	Polychlorinated Dibenzodioxins
PCDF	Polychlorinated Dibenzofuran
PCP	Pentachlorophenol
PM Ag	PM Agricultural Products
POC	Point of Compliance
POE	Point of Exposure
POTW	Publicly Owned Treatment Works
PRP	Principal Responsible Party
PSV	Preliminary Screening Value
PVC	Polyvinyl Chloride
RCRA	Resource Conservation and Recovery Act
Reilly	Reilly Industries, Inc.
RFA	RCRA Facility Assessment
RW	Recovery Well
Star	Star Enterprise-Texaco
SVOCs	Semi-Volatile Organic Compound
SWMU	Solid Waste Management Unit
TI	Technical Impracticability
TSDFs	Treatment, Storage and Disposal Facilities
ug/l	Micrograms per Liter
USEPA	United States Environmental Protection Agency
VSI	Visual Site Inspection
WMA	Waste Management Area

1.0 INTRODUCTION & PURPOSE

This Operations, Maintenance, and Monitoring Manual (OM&M) is intended to describe the long-term site operations, maintenance, and monitoring required now that the construction of the corrective measures at the Alabama Wood Treating Corporation (AWTC) site has been completed. Specific procedures presented in this manual are related to:

- Maintenance of site security
- Maintenance of cover systems
- Operations & Maintenance (O&M) of the dense non-aqueous phase liquid (DNAPL) Recovery Well System (RWS)
- O&M of the DNAPL Monitoring Well Recovery System (MWRS)
- O&M of the groundwater treatment system
- Maintenance of groundwater monitoring system
- Sampling and analysis of groundwater
- Sampling and analysis of wastewater discharges
- Quality assurance/quality control
- Emergencies
- Records and Reports

The current forms being used during the OM&M activities are included in this manual or maintained at the treatment facility located at 68 Virginia Street, Mobile, Alabama. It should be noted that the forms may be updated as needed by the Alabama State Port Authority (ASPA) to ensure compliance with Permit obligations.

1.1 ORGANIZATION AND RESPONSIBILITIES

The performance of OM&M activities at the AWTC site involves a number of individuals acting in specific project roles. These roles or project personnel positions are summarized below.

ASPA Manager

The ASPA Manager is responsible for the overall groundwater program, selection, and/or management of project contractors, approval and submission of reports to ADEM, maintenance of records at ASPA administrative offices, and communication with ADEM.

ASPA Project Manager

The ASPA Project Manager is responsible for effective day-to-day management of the selected project staff and direct communication and liaison with the ASPA Manager. The Project Manager's responsibility to Quality Assurance (QA) is to ensure that all project Quality Assurance/Quality Control (QA/QC) procedures in the work plan and Field Sampling and Analysis Plan (FSAP) are followed during the project.

Field Team Leader

The Field Team Leader is responsible for providing consistent and accurate field data and technical reports produced by project scientists or engineers and sampling personnel under his/her supervision. These individuals are responsible to the Project Manager to ensure that all personnel under their direction are knowledgeable of the QA/QC requirements of the project, that all QC and technical review procedures are followed, and that documentation is provided.

ASPA Site Supervisor

The Site Supervisor works in conjunction with the Project Manager to ensure that all project QA/QC procedures in the work plan and FSAP are followed during the project. If corrective measures are needed, they are performed under the supervision of the QA Supervisor.

Contractors

During the operations and maintenance period, ASPA may elect to use appropriate subcontractors. These subcontractors may include, but are not limited to, engineering consultants, specialty contractors, and environmental laboratories. ASPA Project Manager, in consultation with the ASPA Manager, will select the appropriate contractor for the task and ensure they are qualified and perform to the standards required to comply with the Permit.

1.2 OVERVIEW OF SYSTEMS AND REPORT INFORMATION

Corrective Measures systems are described in the Corrective Measures Implementation (CMI) Report and Section 4 of the Permit Renewal Application. This OM&M Manual provides discussions and procedures for the following systems in Section 2:

- Site Security System
- Asphalt Cover System (Solid Waste Management Unit [SWMU] -6 West)

- Existing Cover Units at SWMUs-2 & -7 and SWMUs-4,5,6 East and 8
- DNAPL RWS
  - Wastewater treatment system
  - Extraction well network
- DNAPL MWRS
- Groundwater Monitoring System

Applicable information for Contiguous Properties described in Sections 7 and 8 of the Permit Renewal Application is also included. The OM&M period is ongoing. The remaining sections of this manual are organized as follows:

Section 2 Operations, Maintenance, and Monitoring Procedures
Section 3 Waste Management Practices
Section 4 Sampling and Analysis
Section 5 Corrective Measures Completion Criteria
Section 6 Operation and Maintenance Contingency Procedures
Section 7 Personnel Training
Section 8 Data Management, Documentation, and Report Requirements

1.3 AWTC SITE INFORMATION

Detailed information regarding the past facility operations, potential waste sources, the characteristics of potential waste, and the geologic and hydrogeologic conditions at the AWTC site are included the main body of the Permit Renewal Application. This document contains information regarding the groundwater monitoring well networks and the specific sampling and analysis requirements of the Permit.

1.3.1 Site Regulatory Background

While the AWTC site had been in operation since 1906, significant environmental regulatory impacts were not realized until the facility was required to submit a Part B RCRA Permit Application in November 1984. ADEM's review of the application ultimately resulted in the issuance of RCRA Complaint and Compliance Order to AWTC to cease and desist from wood treating activities. The facility ceased operations as a wood treating facility in 1985 when the Alabama State Docks (ASD)

was successful in obtaining an order from the State Circuit Court to evict AWTC from the site. ASD also initiated civil actions against AWTC, Illinois Central, and Reilly Industries concerning potential environmental liabilities from past operation and ownership of the AWTC site. At this point, the facility has completed its corrective action obligations and is currently completing the post closure care obligations.

1.3.2 Regulated SWMU Summary

ADEM personnel conducted an initial RCRA Facility Assessment (RFA) of the 14-acre AWTC site in 1988 and identified eight SWMUs and one area of concern (AOC). Four of these SWMUs were the subject of a RCRA RFI. Figures 1 and 2 show the site location and site plan. There were two regulated units identified at the AWTC site:

- SWMU-2 - Surface Impoundment
- SWMU-7 - Overflow Impoundment Area

These two surface impoundments were constructed by AWTC after acquisition of the operation from Reilly Industries in 1972. The impoundments were unlined and surrounded by soil berms. Formal closure of the two regulated units was completed in 1990. Both units are displayed on Figure 2, and both units contained K001 sludge.

1.3.3 SWMUs & AOCs

Regulated units, SWMUs and AOCs at the AWTC facility, were identified by ADEM in the 1988 RFA. In addition to the two regulated units (SWMU-2 & SWMU-7), six additional SWMUs and one AOC were identified in the 1988 RFA. These units are displayed in Figure 2 and include:

- SWMU-1 Wastewater Pretreatment Plant,
- SWMU-3 Drum Storage Unit,
- SWMU-4 Former Plant Operations and Storage Area,
- SWMU-5 Wood Product Storage Area,
- SWMU-6 Drainage Ditch to Mobile Bay,
- SWMU-8 Former Creosote Unloading Area, and
- AOC-1 Mobile Drum Storage Unit.

Additional SWMUs and AOCs identified in the 2002 RFA and a 2020 RFA are as described in Sections 7 and 8 of the Permit Renewal Application.

1.3.4 AWTC Site Waste Characteristics

Creosote and pentachlorophenol were used as preservative agents at the AWTC site and environmental investigations demonstrated significant contamination of soil and groundwater by these preservatives. The characteristics of these contaminants affect their distribution and mobility at the site. Of particular importance are the contaminants water solubility, affinity for soil adsorption, and density.

1.3.4.1 Creosote

Creosote is produced as a distillate from coal tar and is a variable mixture of hundreds of compounds, primarily semi-volatile organic compounds (SVOCs). In wood preserving applications, it may be used either full strength or diluted with petroleum. Undiluted creosote is denser than water and typically migrates vertically downward as a DNAPL. Polynuclear aromatic hydrocarbons (PAHs) are SVOCs that generally account for 85 percent (by weight) of the chemical constituents of undiluted creosote. The predominant PAHs in creosote have two to four aromatic rings, but larger compounds are also present. Some major components (percent by weight) of creosote are as follows:

Acenaphthene	Fluoranthene
Acenaphthylene	Fluorene
Anthracene	2-Methylnaphthalene
Carbazole	Naphthalene
Chrysene*	Phenanthrene
Dibenzofuran	Pyrene

All of the compounds listed above are PAHs, except for carbazole and dibenzofuran. In addition, many of the lower concentration components of creosote are also PAHs.

Those having substantial environmental significance are listed as follows:

Benz(a)anthracene*	Dibenz(a,h)anthracene*
Benzo(b)fluoranthene*	Benzo(g,h,i)perylene
Benzo(k)fluoranthene*	Indeno(1,2,3-cd)pyrene*
Benzo(a)pyrene*	

The EPA Office of Health and Environmental Assessment (OHEA) has listed six of these lower concentration PAH creosote components (*) and Chrysene as probable human carcinogens. EPA has identified several types of creosote wastes as listed hazardous wastes under RCRA. These include wastewater process residuals, preservative drippage, and spent formulations from plants that use creosote formulations (EPA hazardous waste code F034). Bottom sediment and sludge from wastewater treatment (K001) and discarded unused creosote (U051) are also listed hazardous wastes.

1.3.4.2 Pentachlorophenol

The Pentachlorophenol (PCP) solutions used in wood preserving are prepared by dissolving technical-grade PCP in oil to produce a solution that is 4 to 8 percent PCP. Unlike creosote, PCP is an individual compound. However, even technical grade PCP is a mixture of compounds and contains 85 to 90 percent PCP; 2 to 6 percent higher molecular weight chlorophenols; 4 to 8 percent 2,3,4,6-tetrachlorophenol; and about 0.1 percent PCDDs and PCDFs (i.e., dioxins and furans). PCP is slightly soluble in water (2 milligrams per 100 milliliters) but very soluble in oil. Consequently, PCP-oil solutions that leach into the ground often collect as light nonaqueous phase liquids (LNAPLs). PCP itself has a specific gravity of 2.0 (water = 1.0). PCP adheres strongly to soil. The extent of sorption is influenced by organic content, pH, and soil type with high organic content correlating most strongly with increased adsorption.

2.0 OPERATION, MAINTENANCE, AND MONITORING PROCEDURES

The following sections present a summary of the OM&M procedures that will be followed to comply with both the post-closure care and the groundwater compliance program obligations.

2.1 GENERAL PROCEDURES

General procedures will typically include periodic inspections, system testing, and preventative maintenance activities. Each of these is discussed separately in the sections below.

2.1.1 Site Inspections

Inspections will generally include the following activities:

- Security fencing will be inspected for evidence of vandalism, degradation, and soil erosion.
- The SWMU-6 West Asphalt cover system will be inspected for cracks and vegetation intrusion.
- The ground surface beneath the bridge foundations and the mechanically stabilized earth (MSE) wall system associated with the Inter-Terminal Connector will be inspected for cracks, vegetation intrusion, and inadequate drainage.
- The DNAPL RWS and MWRS will be inspected for proper operation of the pumps and controls, condition of the recovery wells, vaults, and the condition of tanks and ancillary equipment, as applicable to each system.
- Groundwater monitoring wells will be inspected for integrity as required in the AWTC facility Post-Closure Permit.
- On an annual basis, the locations of the SWMUs-2 and -7 will be observed for disturbance of the roller-compacted concrete surface.
- On an annual basis, the locations of SWMUs-4, 5, and 8 will be observed for disturbance of the roller-compacted concrete surface.
- On an annual basis, land use controls specifically identified in the 2016 Environmental Covenant for the AWTC facility (use of property, construction activities, sheet pile wall/shore protection wall, signage, etc.) will be observed.
- Locks placed on gates at SWMU-6 West, SWMU-11, and the treatment system will be inspected semi-annually.
- On a semi-annual basis, the contiguous properties will be inspected.

Inspections will be documented using specific forms and figures. These forms are included in Enclosure A. Table 1 outlines the inspection frequency and reporting requirements for the inspections. Unscheduled inspections will be performed when warranted after severe storm events. Items identified will be addressed as necessary. Further discussion of the inspections associated with each of the SWMUs is described in the individual sections that follow.

2.1.2 System Testing

The wastewater treatment system and settling tanks will be tested on an annual basis. System testing will include:

- Testing of all alarm conditions in the wastewater treatment system and with the settling tanks.
- Performance evaluation of the wastewater treatment system and settling tanks for effective phase separation, decanting and treatment of water, and discharge to the publicly-owned treatment works (POTW).

2.1.3 Institutional Controls

The post-construction activities that comprise the OM&M program can be grouped into two categories: groundwater monitoring and institutional and engineering controls (ICs & ECs; environmental covenant). To ensure the integrity of the ECs for maintaining protection of human health and the environment (HHE), periodic inspections will be performed. This Information will be submitted to the ADEM in the annual report summarizing the inspections, maintenance, repairs, and the existing land-use controls. Every two years, a review of current land use and a water well survey will be performed.

2.2 SITE SECURITY SYSTEM

2.2.1 Description and Purpose

Fencing and locked gates control access to portions of the AWTC site. The purpose of the fence is to secure the site against entry by unauthorized personnel. Currently, ASPA maintains fencing around SMWU-6 West and the treatment plant. Access to SWMUs-1, 2, 3, 4, 5, 6 East, 7, and 8 are encompassed by the Mobile Container Terminal (MCT) fencing and controlled by the APM security procedures. MCT is under the jurisdiction of the Department of Homeland Security with restricted access to the facility through the Transportation Worker Identification Credential (TWIC) program.

2.2.2 Routine Maintenance Procedures

Damaged fencing and gates will be repaired or replaced as necessary to maintain access control. Signs that are illegible or missing will be replaced.

2.2.3 Inspection Procedures

The security fencing around the treatment system and SWMU-6 West and gates will be inspected on a semi-annual basis for evidence of vandalism, missing or deteriorated signs, fence degradation, and soil erosion. The fencing around the remainder of the AWTC will be inspected on an annual basis.

2.3 ASPHALT COVER SYSTEM (SWMU-6 WEST)

2.3.1 Description and Purpose

SWMU-6 West generally consists of an asphalt cover system and associated drainage structures. The asphalt cover system incorporates a layer of aggregate base course, covered with a binder course, and a surface course. The cover is sloped to the interior of the area where stormwater inlets are located eliminating surface runoff to adjacent properties. The purposes of the cover and drainage systems are to prevent contact with the materials under the cover and eliminate standing water from the site. The drainage-ways provide for controlled removal of runoff from the site. The purpose of the cover is to prevent contact with the underlying contaminated soils and sediment. In 2012, additional work was performed that consisted of construction/realignment of rail track and abandonment and subsequent relocation/re-installation of three monitoring wells. The activities associated with this project were constructed over the existing asphalt cap.

2.3.2 Routine Maintenance Procedures

If inspections reveal any deteriorating conditions (cracking, differential settlement, standing water, vegetation) on the cover, ASPA will evaluate the need and schedule for maintenance and perform the work accordingly. ADEM will be notified of the maintenance performed. Areas experiencing differential settlement to the extent that the slope does not function as designed will be repaired to the original grades. Obstructions to the drainage inlets will be removed to prevent interference with proper functioning of the system.

2.3.3 Inspection Procedures

The inspections will include inspecting for pavement distress (i.e., cracking, differential settlement, standing water, vegetation) and other conditions detrimental to performance of the asphalt cover. Visible areas of the drainage system will be inspected for sedimentation and damage (i.e., cracking). Inspections of the entire asphalt cover system will check for:

- Cracks, holes, areas of ponded water, subsidence, uplift, or excessive erosion or undercutting.
- Disturbed or damaged settlement observation points.
- Any other condition that may disturb the integrity of the cover system, allow movement or loss of soil, or allow water to percolate through the cover.

At this time, it is assumed that the cover system will be inspected semi-annually and after each major rainfall event. The schedule for maintenance will vary depending on the observations made during the periodic inspections. Repairs will be made on an as-needed basis.

2.4 OTHER COVER SYSTEMS

2.4.1 Existing Cover Units (SWMUS-2 and -7)

2.4.1.1 Description

SWMUs-2 and -7 are described as surface impoundments in the Hazardous Waste Facility Permit dated September 13, 1991. These surface impoundments were closed with waste in place and a concrete cover system installed. During the construction of the MCT, a geotextile, clean fill, and roller-compacted concrete was added above the concrete cover. The sole purpose of the additional construction activities was to facilitate development of the MCT. Currently, the original concrete cover system for SMWUs-2 and -7 are not visible as they were covered during MCT construction. These maintenance activities are being incorporated into this O&M Manual.

2.4.1.2 Routine Inspections

The approved corrective measures for SWMUs-2 and -7 included surface impoundments that were closed in place with a concrete cap and later covered with roller-compacted concrete and demarcated as part of an approved permit modification. Inspections of SWMUs-2 and -7 cover will be performed for evidence of disturbance of the surface concrete, signs of rutting, cracking or

buckling of the surface concrete, evidence of concrete deterioration, the groundwater drainage system, and the brass corner markers. The inspections are proposed on an annual basis.

2.4.2 Existing Cover Units (SWMUs-4, 5, 6 EAST and 8)

2.4.2.1 Description

Corrective measures for SWMUs-4, 5, 6 East, and 8 included an earth cover system. During the construction of the MCT, the area was capped with roller-compacted concrete and asphalt associated with the redevelopment of this area as the MCT. With the 2024 Permit Renewal Application and following CMI Work Plan revisions, information was provided detailing the construction of the Inter-Terminal Connector, a 3,330-foot-long connector roadway between the MCT and Garrows Bend Internodal Container Transfer Facility (ICTF) that includes earthen embankments, two bridges, and a MSE wall system. Within the boundary of the AWTC site, components of the connector roadway will include bridge foundations for the bridge over Ezra Trice Boulevard and the MSE wall system. The MSE wall system will extend across the eastern portion of SWMU-6 East, and foundation for the MSE wall system will be placed a minimum of two feet below the existing surface concrete but will not contact the original earth cover system.

2.4.2.2 Routine Inspections

Inspections of SWMUs-4, 5, 6 East, and 8 cover, bridge foundations, and the MSE wall system will be performed for evidence of disturbance of the surface concrete, signs of rutting, cracking, or buckling of the surface concrete, evidence of concrete deterioration, evidence of inadequate drainage, and that area monitoring wells and recovery wells surface markings and surface mounts are intact. The inspections are performed on an annual basis. It is noted that these areas are also monitored by APM security.

2.5 CONTIGUOUS PROPERTIES

2.5.1 Description

The Contiguous Properties include eight areas identified in the 2002 RFA and two areas identified in the 2020 RFA (AOCs-11 and -12). These properties consist of land parcels that were purchased by ASPA over time and are being used as part of the redevelopment activities. The properties are

located east of Interstate 10 adjacent to Mobile Bay (Figure 1). The areas of the Contiguous Properties are mostly undeveloped with some dirt and asphalt access roads.

2.5.2 Routine Inspections

Semi-annual visual inspections will be performed at the Contiguous Properties. These inspections evaluate if unauthorized dumping is observed and other changes noted relative to site use. Area fencing and signage is also inspected. The results of inspection activities will be documented on an inspection log form.

2.6 DNAPL RECOVERY

The DNAPL recovery system generally consists of the extraction well network (MWRS and RWS) and the wastewater treatment system. Each of these is discussed separately below.

2.6.1 Extraction Well Network

The extraction well system generally consists of recovery wells, diaphragm pumps, and associated piping and control panels. Inspection and maintenance of these systems will generally consist of:

- Annual DNAPL thickness measurements (excluding those collected as part of the Enhanced Fluid Recovery [EFR] activities – see Section 2.6.2.6). This frequency may be increased as needed to document effectiveness of the removal activities.
- Semi-annual inspection of recovery wells (make notes as to well integrity, presence of locking cap, etc.);
- Inspect and perform repairs to recovery wells as needed;
- Inspect exposed secondary containment piping for leaks; and
- Perform system enhancements, as necessary.

2.6.2 DNAPL Recovery System Description

A DNAPL recovery system was constructed in conjunction with the expansion of the RWS. The current design includes an oil/water separator after the product separation tanks. The recovery system consists of two discrete operations: the separation of recovered DNAPL and groundwater and the removal/discharge of the DNAPL and groundwater. The separation, removal, and discharge processes are performed on a batch basis.

The equipment for separation of the total fluids consists of mechanical equipment including an oil/water separator, air compressor, pumps, settling tanks, valves, and switches. Total fluids recovered will be transferred to one of two conical-bottomed settling tanks or stored in 55-gallon drums pending transfer to the settling tanks. DNAPL will be removed from the bottom of these tanks/drums periodically for disposal or recycle, while the groundwater proceeds to the oil/water separator. In the oil/water separator, residual DNAPL will be removed periodically from the bottom, and any LNAPL present will be removed from the top. The groundwater then proceeds to a storage tank. After the storage tank fills, the groundwater is sampled and analyzed for petroleum aromatic hydrocarbons (PAHs) prior to discharge to the POTW. O&M of the recovery system equipment is detailed below.

2.6.2.1 Routine System Start Up

The system is currently charged and operating as designed. A copy of the as-built Process Flow Diagram and Process and Instrumentation Diagram, M2 and M3, respectively, should be reviewed and studied by the operator prior to any activities or bring the system on-line following shutdowns for maintenance or other reasonable purposes.

<u>Treatment System Start Up Procedures (Refer to drawing M2, M3, and M4 for locations)</u>

1. Perform routine inspection of all tanks noting the levels of liquid in each tank.
2. Verify that Main Control Panel is “ON” and that level switches are working properly.
3. Observe any high alarms that may be displayed on the Main Control Panel. Address any alarms as necessary prior to start up.
4. Turn the O/W separator Control Panel in “ON” position and in the “Automatic” mode.
5. Verify that the ball valve located downstream of the Effluent Storage Tank is in the closed position.
6. Verify that ball valve installed on the pipeline leading toward one of the settling tanks is in “closed” position and in “open” position for the “active” settling tank.
7. Verify that the ball valves on the DNAPL recycle ports upstream of line before the settling tanks are in “open” position to the “active” tank and closed to the “inactive tank.”

CAUTION – BE CAREFUL TO AVOID SHOCK WHILE MANEUVERING INSIDE THE CONTROL PANELS.

2.6.2.2 Routine System Shut Down

To shut down equipment that operates in the automatic mode, place the field hand switch in the "OFF" position. To shut down equipment that operates in the manual mode, place the START/STOP switch in the field to the "STOP" position.

- Observe any high alarms that may be displayed on the Main Control Panel. Address any alarms as necessary prior to start-up.
- Turn Main Control Panel to "OFF" position and verify that level switches are working properly.
- Turn the O/W separator Control Panel to the "Off" position.
- Verify that ball valve at end of Effluent Storage Tank is in the closed position.
- Verify that ball valves are "closed" to both settling tanks. Verify that the ball valves at the recycle ports before the settling tanks are "closed."
- Perform routine inspection of all tanks noting the levels of liquid in each tank.

CAUTION – LOCKOUT /TAGOUT PROCEDURES SHOULD BE FOLLOWED PRIOR TO ANY MAINTENANCE ASSOCIATED WITH ELECTRICAL COMPONENTS.

2.6.2.3 Recovery System Equipment and Specifications

The treatment system generally consists of the following equipment:

Components	Quantity	Comments
55-gallon drums	6	To be used as needed
Settling Tanks (equipped with level switches and alarms)	2	N/A
Air Compressor	1	Powers Diaphragm Pump
Diaphragm Pump	1	Transfer DNAPL from drums
O/W Separator	1	N/A
Poly Storage Tank	1	Effluent storage

Equipment specifications for the process equipment identified above are on file in ASPA offices located at treatment system at 68 Virginia Street, Mobile, Alabama.

2.6.2.4 Routine Operations and Maintenance

Routine site inspections shall be completed on at least a semi-annual basis. Site inspections may also be performed at any time following a significant weather event. O&M of the treatment system

will be performed by ASPA or a designated firm on a regular basis as presented below. Read and become familiar with each of the manufacturer's recommendations for operation and maintenance of each of the system components (see attached sections). Establish inspection forms as necessary to document and maintain compliance.

Air Compressor, Diaphragm, Drums, and Control Panel

- Check oil levels in compressor and change oil and filter on a quarterly or semi-annual basis, as needed;
- Check system interlocks (at least weekly);
- Check and replace air filters and coalescing filters as needed;
- Clean and check condensate drains and auto drain times;
- Test pressure safety release;
- Inspect control panel, timing relays and solenoid valves;
- Adjust timing as needed;
- Repair/replace valves and switches as necessary;
- Repair and/or replace control valves as necessary;
- Test control valves and switches;
- Repair/replace valves and switches as necessary;
- Check pump for proper operation (check for leaks, damaged seals, etc.);
- Repair/replace diaphragm pump as necessary;
- Inspect and drain drums as needed; and
- Replace drums as needed.

Settling Tanks

- Schedule DNAPL removal/recycle to occur once DNAPL level within settling tank is within one foot of discharge pipe elevation. Open ball valves on other tank and close ball valves on full tank. Use dip stick to periodically check DNAPL elevation within tanks;
- When removing DNAPL from bottom of tanks, be careful not to draw supernatant water from tank to recycler's tank;
- Perform monthly inspections of exterior checking for leaks.
- Perform quarterly inspections of associated piping (check for leaks, blockages, etc.);
- Make necessary repairs as needed.

CAUTION – CONFINED SPACE ENTRY PROCEDURES SHOULD BE FOLLOWED PRIOR TO INSPECTIONS/MAINTENANCE WITHIN THE RECOVERY WELL VAULTS AND SETTLING TANKS.

Oil/Water Separator

- Remove LNAPL (floating oils) from O/W separator at least bi-weekly at ball valve on side of O/W separator.
- Perform monthly inspections of exterior checking for leaks, damaged seals, etc.;
- Perform quarterly inspections of interior checking for proper operation (check for fouling, buildup, clogs, etc.);
- Test control instruments;
- Repair/replace control instruments as necessary;
- Perform quarterly inspections of associated piping (check for leaks, cracks, etc.);
- Repair/replace worn parts or seals as necessary; and
- If recycle pump runs continuously, check settling tank DNAPL levels and/or level switches inside O/W separator.

Storage Tank

- Perform monthly inspections of exterior checking for leaks.
- Perform quarterly inspections of associated piping (check for leaks, blockages, etc.);
- Make necessary repairs as needed.

2.6.2.5 Equipment Replacement Schedule

It is not anticipated that a long-term equipment replacement schedule will be required. Components are expected to last the life of the project. Components that may fail are readily available from vendor stocks.

2.6.2.6 EFR for DNAPL Recovery in the RWS

As communicated to ADEM, including in the annual Corrective Measures Effectiveness Reports (CMERs), even after implementation of a trial double piston pump in 2018, DNAPL has not been recovered from RW-3 through RW-8 since 2014. As such, ASPA implemented a DNAPL Recovery Pilot Study in 2021 and 2022 to evaluate the viability of EFR as a method for removing DNAPL utilizing the RWS; the pilot was successful and over 157 equivalent gallons of creosote was removed.

Utilizing a contractor and conventional EFR methods, ASPA will perform rotating, biannual EFR DNAPL recovery events for an initial period of two years. RWS wells RW-3 through RW-8 will be utilized, and each event will be performed on three wells. Selection of wells will be RW-3, RW-5, and RW-8 in one event, and RW-4, RW-6, and RW-7 in the following event, or as directed by ADEM. DNAPL thickness will be measured in all six wells prior to initiating an EFR event, upon cessation of an event, and at one-month post event.

The EFR events will target one hour of extraction per well or 250 gallons of recovery per well, whichever occurs first. This timeframe was selected due to time and volume limitations. Performing extraction on three wells, for one hour each, each event, allows for a logistically reasonable time period for the EFR contractor to arrive onsite, perform pre-and post-gauging activities, mobilize and demobilize at each well, and transfer the recovered fluids to the on-site wastewater treatment system. Additionally, the 2021/2022 pilot demonstrated that extraction on each well for longer than one hour did not have a measurable effect on DNAPL recovery. Instead, a longer extraction period generated a large volume of recovered fluids that unnecessarily tied up the treatment system; utilization of EFR aims to target the extraction of DNAPL, not groundwater.

During the initial two-year period, wells will be removed from future EFR events when recovery has been accomplished to the extent practicable as indicated by one of the following:

- Upon reaching less than 0.5 foot of DNAPL measured in the recovery well,
- At which point a measured decrease of DNAPL thickness stops being observed, or
- Upon no longer recovering at least ten percent of DNAPL compared to total liquids recovered.

Again, utilization of EFR aims to target the extraction of DNAPL, and continued, attempted recovery efforts in a RWS well that is not producing a change in thickness or volume of DNAPL will only generate unnecessary groundwater to be processed through the treatment system. Upon removal of a well from recovery event implementation, ASPA will implement other feasible recovery methods (e.g., sorbent socks) and continue to monitor DNAPL thickness for a frequency and time period agreed upon by ADEM. Should later gauging indicate increased DNAPL thickness or greater than 0.5 feet of measured DNAPL, the well will be added back to the recovery event program. Success of the events will be determined by the continued recovery of DNAPL over each event and a decreased lateral footprint of dissolved impacts in adjacent monitoring wells. DNAPL recovery in other monitoring wells (i.e., DNAPL MWRS) will also be monitored for a decrease in lateral footprint and

reduction in volume of DNAPL recovered. Should all RWS wells reach a stable DNAPL thickness of less than 0.5 feet before the end of the initial two-year period, ASPA will cease the EFR program and continue to monitor DNAPL RWS thickness semi-annually for a time period to be agreed upon by ADEM.

No change to the function of the wastewater treatment system process is anticipated. For recovered fluids, ASPA plans to continue phase separation, decanting and treatment of water, discharge to the POTW, and handling of recovered creosote, as described in Section 3.0.

2.6.3 DNAPL MWRS

2.6.3.1 Description and Purpose

The MWRS currently includes five converted monitoring wells and one converted DNAPL recovery well. DNAPL recovery consists of a diaphragm pump used to remove DNAPL from monitoring well recovery wells 4-D, 4-DK, 18-I, 20-I, 21-S, and RW-1. The MWRS includes dedicated drums located at the wastewater treatment system. Collected fluids are periodically removed from the drum and manually added to the settling tanks. Wells were originally pumped on a weekly basis, but extremely low product yields have allowed operation on a monthly or semi-annual basis. In addition, well 17-S has been converted from the mobile MWRS to a fixed-based operation and will continue in service.

2.6.3.2 MWRS Equipment and Specifications

The monitoring well DNAPL system generally consists of the following equipment:

Component	Quantity	Comments
Portable Diaphragm Pump	1	Trailer mounted; mobile
Compressor and Tanks	1	Trailer mounted; mobile
Drums	6	Each drum dedicated to a specific well

Equipment specifications for the process equipment identified are located at ASPA offices.

2.6.3.3 Routine Maintenance Procedures

Startup, operation, and shutdown of the MWRS system is generally limited to the use of a portable diaphragm pump at each of the wells. Since these wells are manually operated, operation of these wells is generally associated with the periodic hookup of a trailer-mounted compressor to operate

the pump and hook-up of the pump discharge line to the dedicated trailer drum for fluids recovery. The recovered fluids are conveyed to the wastewater treatment for subsequent treatment and discharge.

2.6.3.4 Routine Checks, Operating Logs, and Inspection Procedures

Routine site inspections shall be completed on a semi-annual basis at a minimum. Site inspections may also be performed at any time following a significant weather event. Results of the inspections will be summarized in the annual report (see Section 8).

2.6.3.5 Equipment Replacement Schedule

It is not anticipated that a long-term equipment replacement schedule will be required. System components are expected to last the life of the project. Components that may fail are readily available from vendor stocks.

2.6.3.6 MWRS Operating Procedure Summary

The following sections present a summary of the operating procedures for the MWRS:

1. Ensure the DNAPL withdrawal line (intake) is placed approximately 6 inches below bottom of well screen and/or within the well sump.
2. Remove all DNAPL from wells, including well sumps. This may entail using a different pump or use of a vac truck with stinger (shallow wells only).
3. Document approx. removal and pump times/techniques of both water and estimated product.
4. Immediately after removal, document via direct measurement that the DNAPL has been removed. DNAPL thickness should be measured using approx. 18” length of angle iron (approx. ¾ inch) with a white cotton or nylon rope.
5. Remeasure for DNAPL (using same procedure Number 4) at a maximum of a month post removal, this could be done more frequently.
6. If DNAPL is present after a monitoring event document thickness and remove DNAPL (either pump or use vac truck).
7. If DNAPL accumulation is less than 0.5 feet for a period of six consecutive months, initiate process within Permit to petition abandonment.

See additional information provided in Section 4.2 related to termination criteria for the MWRS.

2.7 GROUNDWATER MONITORING WELL SYSTEM

There are currently 37 active groundwater monitoring wells on the AWTC site of which six have been converted to DNAPL MWRS wells. In addition, there are six piezometers used to support the development of the potentiometric surface. ADEM and ASPA reached agreement on the number and location of different types of monitoring wells for the groundwater monitoring program. The well identification and classification is included on Table 2. This table also presents a summary the activities associated with each monitoring well. As part of the groundwater compliance program for the AWTC facility, groundwater samples are collected for analysis from the boundary/point of compliance, deep, and background wells (see Sections 5.8 and 5.9 of the Permit Renewal Application). The effectiveness wells are monitored for the presence or absence of DNAPL, and select wells will be monitored for indicator constituents to supplement the DNAPL effectiveness monitoring program and support termination criteria (see Section 6 of the Permit Renewal Application and Section 4.2 herein).

3.0 WASTE MANAGEMENT PRACTICES

It is not anticipated that the normal O&M activity will generate significant volumes of waste. In all cases, appropriate waste determination and waste management procedures will be followed as specified in local, state, and federal regulations. Currently, the wastewater is discharged to a municipal wastewater treatment plant (POTW). Recovered DNAPL will be either sent for off-site disposal as a hazardous waste at an off-site facility or recycled.

4.0 SAMPLING & ANALYSIS

Sampling and analysis will be conducted according to the Post-Closure Permit requirements and the associated Field Sampling and Analysis Plan (FSAP) for the AWTC site. The Field Sampling and Analysis Plan is included as Enclosure B and is relative to the site's:

- Monitoring wells
- DNAPL effectiveness wells
- Groundwater treatment system monitoring

4.1 MONITORING WELLS

A summary of the monitoring well sampling schedule is included in Table 2. The location of the wells is shown in Figure 2. Sections 5.8 and 5.9 of the Permit Renewal Application describe the groundwater monitoring program for boundary/POC wells. The sample program for DNAPL effectiveness wells is described in Sections 4.2 herein. Sample procedures for groundwater monitoring for wells in the compliance program, and those associated with DNAPL effectiveness monitoring, are provided in the FSAP in Enclosure B herein.

4.2 DNAPL EFFECTIVENESS WELLS

Information presented in Section 6 of the Permit Renewal Application and in previous sections of this OM&M Manual summarized DNAPL recovery operations and corrective measures objectives for the DNAPL source material. As both ADEM and ASPA are aware, recovery alternatives have limited applications and it is not feasible, reasonable, or practicable to treat, remove, contain, or recover the entire DNAPL source due to the site history. DNAPL is present in both free-phase and residual forms. In some areas (e.g., SWMU-4), residual contamination occurs from the ground surface to a depth of 100 feet. As discussed in the Corrective Measures Study (CMS), most of the DNAPL in the SWMU-6 area is largely immobile and not amenable to collection or containment measures. While the simple presence of DNAPL is not sufficient for a technical impracticability (TI) determination, ASPA has implemented a remedy that is maintaining the overall protection of HHE. ASPA has determined based on the assessments done to date, the operation of the system, and performance of the remedy at other sites, that, based on the additional considerations specific to the AWTC site including the amount, location, and specific characteristics of the DNAPL source material, complete removal or containment is not feasible or practicable. As such, the target cleanup level for DNAPL is the reduction or elimination of exposure to degree practicable and reasonable.

ASPA will perform EFR events for an initial period of two years. Should all RWS EFR wells reach a stable DNAPL thickness of less than 0.5 feet before the end of the initial two-year period, ASPA will cease the EFR program and continue to monitor DNAPL RWS thickness semi-annually for a time period to be agreed upon by ADEM. The intent of the EFR program is to produce a decreased lateral footprint of dissolved impacts and a reduction of DNAPL thickness in RWS and other monitoring wells (i.e., DNAPL MWRS). As such, DNAPL mobility reduction criteria are only proposed for the MWRS. At such time that DNAPL reduction criteria are met for an individual well, ASPA will request a modification from ADEM of the DNAPL effectiveness recovery and monitoring program. Table 3 provides the basis for selection of wells proposed for the program and rationale for wells designated as DNAPL effectiveness wells but not proposed for analysis. Wells for analytical monitoring were generally selected based on proximity to the areas of DNAPL recovery. These wells will be sampled for the site-specific corrective action list on a two-year frequency, in even numbered years, while DNAPL recovery operations are ongoing. At such point that ASPA determines an endpoint for DNAPL MWRS recovery has been met, ASPA will petition ADEM for approval to change both the frequency of the DNAPL recovery effort and sampling of the effectiveness wells to be increased to semi-annually for a two-year period. Table 4 presents a decision logic diagram that provides “road maps” for the DNAPL recovery efforts and DNAPL effectiveness well sampling program to monitor the MWRS.

A detailed description of the monitoring well sampling schedule is included in Enclosure B (Field Sampling and Analysis Plan). Field methods for sampling are presented in this plan. An analytical QA Plan will also be in effect during analysis of collected samples. The analytical laboratory may be modified during the duration of the monitoring period. For each utilized laboratory, the Quality Assurance Project Plan (QAPP) in Enclosure C will be reviewed in detail to coordinate various aspects with the laboratory’s internal QA program. Additionally, as part of this review of the laboratory QA program, ASPA will review the laboratory method detection limits and compare the laboratory specific MDLs to the current ADEM-approved screening criteria. If it is determined by ASPA that a reasonable analytical method cannot be found to meet the aforementioned criteria, ASPA will consult with ADEM to determine the agreed upon course of action.

4.3 DNAPL RECOVERY SYSTEM MONITORING

The sampling and analysis for the recovery system will generally consist of monitoring activities for effluent quality and system performance. Each of these is discussed separately below.

4.3.1 EFFLUENT MONITORING

The sampling and analysis of the system effluent quality will be as per the requirements set forth by Mobile Area Water and Sewer (MAWS) Contract. Additional analysis may be conducted, if required as the contract changes over time.

DISCHARGE LIMITATIONS MONITORING REQUIREMENTS

	Daily Min	Monthly Avg+	Daily Max	Monitoring Frequency	Sample Type
Flow (MGD)			0.1	Daily	Meter
pH (s.u.)	6.0		0.5	1/mon	Grab
BTEX		Monitor	Monitor	1/mon	Grab
Biochemical Oxygen Demand			280	1/mon	Grab
Total Suspended Solids			250	1/mon	Grab
Oil & Grease			200	1/mon	Grab
Polynuclear Aromatic Hydrocarbons (PAH; ppd)			3.33	1/mon	Grab
Chemical Oxygen Demand		Monitor	Monitor	1/mon	Grab

*mg/L (expect as noted)

4.3.2 SYSTEM PERFORMANCE MONITORING

The sampling and analysis for system performance monitoring generally consisted of optimization and verification testing during system startup. Additional testing may be conducted if operating conditions require.

5.0 CORRECTIVE MEASURES COMPLETION CRITERIA

The CMS defined the corrective measures criteria for when the corrective measures have achieved media cleanup goals or objectives. Through implementation of the corrective measures, ASPA have met the corrective measures for soils/sediment preventing uncontrolled human exposure to contaminated soils and sediments through the installation of the asphalt and soil covers. Additionally, the MCT has been constructed, which reduces the OM&M requirements for the combined SWMUs-4, 5, and 8 and SWMU-6 East. Compliance groundwater monitoring is required at the AWTC site, and groundwater quality standards (ACLs) are being met for the site. However, because SWMUs were closed with waste in place, groundwater monitoring must continue. DNAPL recovery efforts are on-going. The DNAPL recovery efforts will continue until such time that the DNAPL has been removed to the maximum extent practical. Satisfaction of the completion criteria triggers the submittal of the Corrective Measures Completion Report.

6.0 OPERATION & MAINTENANCE CONTINGENCY PROCEDURES

O&M contingency procedures address system breakdown and operational problems and include redundant and emergency back-up equipment and procedures. The alternative procedures must be able to prevent the release of hazardous wastes that may endanger human health and the environment. In the event of a major breakdown or complete failure of the corrective measures, ASPA will verbally notify ADEM with 24 hours of the event and notify in writing within 72 hours.

7.0 PERSONNEL TRAINING

The RCRA Post-Closure Permit defines specific training requirements for the AWTC site including HAZWOPER 40-hour training. ASPA requires on-site personnel to successfully undergo an on-the-job training program to be completed within six months of employment. This program includes:

a. HAZWOPER 40-hour training
b. Review of the AWTC Contingency Plan, Groundwater FSAP, and OM&M implementation;
c. Procedures for using, inspecting, repairing, and replacing facility emergency and monitoring equipment
d. Annual and semi-annual security, operations, and maintenance inspections
e. Communications or alarm systems
f. Response to fires or explosions
g. Response to groundwater contamination incidents
h. Shutdown of operations

In addition, ASPA requires personnel to attend a HAZWOPER 8-hour annual refresher and participate in an annual tabletop review of the initial on-the-job training.

The O&M training requirements will be integrated with the Permit requirements. The level of technical training for the O&M requirements will vary significantly between tasks. Some system maintenance or repair operations will require outside contractors. Personnel training will be held in accordance with ADEM Admin. Code r. 335-1 4-5-.02 (7), and programs will be in accordance with ADEM Administrative Code r. 335-14-8-.02(5)(b)(12).

8.0 DATA MANAGEMENT, DOCUMENTATION AND REPORT REQUIREMENTS

A summary of the records to be maintained during the O&M period and reporting requirements is presented in the following sections. Results will be submitted in annual reports.

8.1 RECORDS MAINTENANCE

Operating logs, maintenance records, sampling data, and analytical data will be maintained by ASPA or a designated contractor.

8.1.1 Operating Logs

Operating logs will be maintained in the project file.

8.1.2 Maintenance Records

Maintenance records will be maintained documenting all activities performed on-site during the post-remediation period. ASPA will document all testing and maintenance activities in the facility operating record in accordance with ADEM Admin. Code r. 335-14-5-.03(4).

8.1.3 Boring Logs

Boring logs will be maintained documenting all activities performed on-site during the well installation process.

8.1.4 Inspection Records

Inspections will be documented using designated forms. The forms will be completed and signed by the inspector. Enclosure A displays the appropriate field forms. The responsible individual for ensuring the performance of the inspections is the Manager, Office of Environmental Management at ASPA. Copies of the inspection logs will be maintained at the facility for three years from date of inspection.

8.1.5 Monitoring and Laboratory Analysis Records

Water level monitoring and sampling activities will be documented on designated forms. The results of laboratory analyses for groundwater and wastewater discharges will be submitted to ADEM at

intervals specified in the appropriate permit's reporting requirements. A copy of the FSAP is included in Enclosure B.

8.1.6 Emergency Reports

Emergency reports will be maintained in the project file and will be included in the annual reports to ADEM.

8.2 REPORTING

The Post-Closure Care Permit requires the submittal of certain reports to ADEM. The following section outlines the proposed reports, general summary of the contents, and the overall schedule.

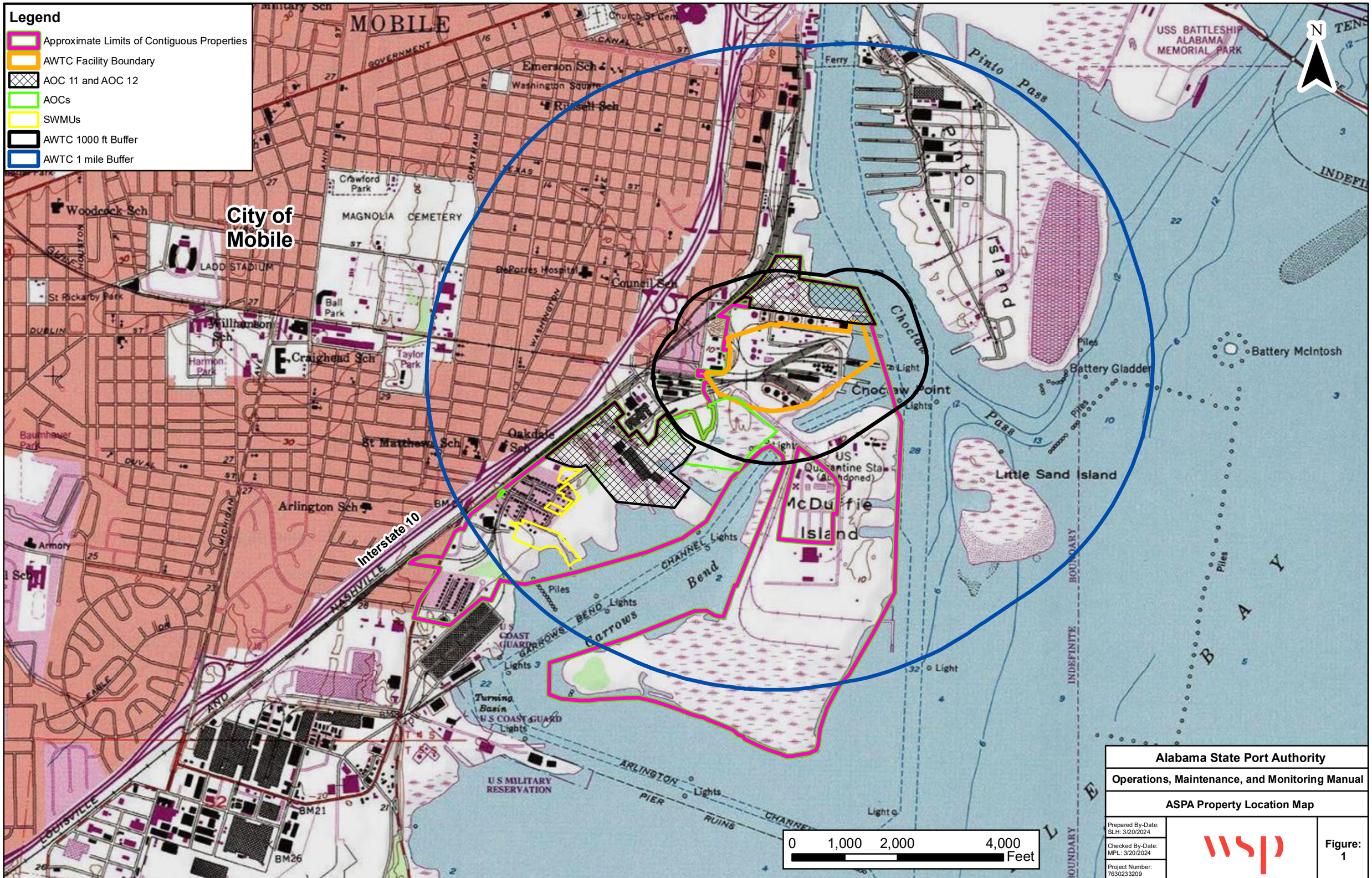
8.2.1 Annual Groundwater Quality Assessment and DNAPL Effectiveness Reports

The annual groundwater monitoring reports document the results of the compliance monitoring program, including the statistical comparison with the GWPS (if applicable) and the annual groundwater flow rate and direction determination. Monitoring of the DNAPL effectiveness monitoring wells will be performed semi-annually, and results documenting the effectiveness of the program will be reported annually in the Annual Groundwater Quality Assessment and CMER. The CMER will be submitted annually for the activities conducted in the previous calendar year.

8.2.2 Final Report of Corrective Measures

Following documentation of completion of the corrective measures, ASPA will submit a final report of corrective measures (FRCM). This report will be submitted within 90 days following attainment of cleanup goals.

Figures



Alabama State Port Authority

Operations, Maintenance, and Monitoring Manual

ASPA Property Location Map

Prepared By-Date: SLH: 3/20/2024

Checked By-Date: MPL: 3/20/2024

Project Number: 7630233209

wsp

Figure: 1

Path: G:\ASPA\mxds\2024_Permit_Renewal_Application\OMM_Plan\Operations_Maintenance_and_Monitoring_Manual.mxd

N

Groundwater Treatment System

PZ-1-S
PZ-1-D
PZ-13-D
19-SR
PZ-19-I
11-S
11-I
RW-3
RW-4
RW-6
12-I
7-IR
RW-5
RW-7
7-D
Combined SWMU's 4/5/8
RW-8
26-I
7-S
13-I
25-I
20-I
Combined SWMU's 2/7
6-S
6-I
15-I
15-S
15-D
18-IR
18-DR
Ezra Trice Blvd.
SWMU 6 East
4-D
23-I
23-D
21-S
21-I
17-D
17-S
4-DK
SWMU 6 West
RW-1
PZ-30-D
8-S
8-DK
8-I
8-D
31-IR
31-DR
9-I
32-S
16-I
PZ-16-S
32-I
16-D

Conception Street

Legend

- Background
- Monitoring Well Recovery System
- DNAPL Recovery Well
- DNAPL Effectiveness Monitoring Well
- Point Of Compliance Well
- Piezometer
- Fenceline
- Waste Management Area
- Point of Compliance
- Point of Exposure
- AWTC Facility/Environmental Covenant Boundary
- Combined SWMU Areas

0 200 400 800 Feet

Alabama State Port Authority

Operations, Maintenance, and Monitoring Manual

AWTC Current Site Plan

Prepared By-Date: SLH: 3/20/2024	wsp	Figure: 2
Checked By-Date: MPL: 3/20/2024		
Project Number: 7630233209		

Path: G:\ASPA\mxds\2024_Permit_Renewal_Application\OMM_Plan\OMM_AWTC_Current_Site_Plan.mxd

Tables

TABLE 1
INSPECTION AND REPORTING SUMMARY
Alabama Wood Treating Corporation Site
Mobile, Alabama

Inspection Item	Description	Frequency of Inspection	Report Frequency	
			Annual[(1)]	Submittal Date
Security Fencing	Combined SWMUs-4,5, and 8 and SWMU-6 East	Annual	X	March 1
	SWMU-6 West	Semi-Annual	X	March 1
Asphalt Cover System	SWMU-6 West	Semi-Annual*	X	March 1
DNAPL Recovery System**	Monitoring Well Recovery System	Semi-Annual	X	March 1
	Recovery Well System	Semi-Annual	X	March 1
	Creosote Recovery Facility	Semi-Annual	X	March 1
Groundwater Monitoring Wells	Site Wide	Annual	X	March 1
Concrete Cover	Combined SWMUs-4,5, and 8 and SWMU-6 East	Annual*	X	March 1
	Combined SWMUs-2 and -7	Annual*	X	March 1
Inter-Terminal Connector	Portion located within Site Boundary	Annual	X	March 1
Contiguous Properties	SWMUs and AOCs	Semi-Annual	X	March 1
Land Use Controls	Items as Specified within 2016 Environmental Covenant	Annual	X	March 1

Notes:
* - Inspections will also be performed following significant storm events.
** - Additional inspections are performed on a more frequent basis as suggested by the manufacturer.
(1) Report will be the Annual Groundwater Monitoring Report and Corrective Measures Effectiveness Report.

TABLE 2
GROUNDWATER MONITORING SUMMARY
Alabama Wood Treating Corporation Site
Mobile, Alabama

Well ID	Well Installation Date	Well Type	Latitude	Longitude	Ground Elevation (ft NAVD 88)[1]	Top of Casing Elevation (ft NAVD 88)[1]	Total Well Depth Installed (ft)[2]	Screened Interval (ft MSL)	Units Monitored	Monitored Zone	Semi-Annual Water Level Measurement	Annual Site Specific List Sampling Event[3]	DNAPL Effectiveness Analysis Well Program[4]	Annual Rotating Appendix IX Event[5]	Semi-Annual DNAPL Thickness Measurement	DNAPL Recovery
4-D	6/26/1986	DNAPL_MWRS	30°40'02.67"N	88°02'26.57"W	13.68	13.02	103.3	-80.4 to -90.4	SWMUs 2,4,5,6,7,8	Deep	X				X	X
4-DK	11/17/1988	DNAPL_MWRS	30°40'02.67"N	88°02'26.38"W	13.69	12.60	100.0	-82.1 to -92.1	SWMUs 2,4,5,6,7,8	Deep	X				X	X
6-I	6/25/1986	DNAPL_EFF	30°40'05.07"N	88°02'21.13"W	13.55	12.73	62.5	-42.6 to -52.6	SWMUs 2,4,5,6,7,8	Intermediate	X		X		X	
6-S	6/27/1986	DNAPL_EFF	30°40'05.1"N	88°02'21.18"W	13.46	11.82	19.5	-4.3 to -9.3	SWMUs 2,4,5,6,7,8	Upper	X		X		X	
7-D	6/20/1999	POC	30°40'08.78"N	88°02'08.64"W	15.31	14.25	96.1	-76.4 to -86.4	SWMUs 2,4,5,6,7,8	Deep	X	X		X		
7-IR	6/29/1999	POC	30°40'08.8"N	88°02'08.94"W	15.50	14.64	62.0	-42.8 to -52.8	SWMUs 2,4,5,6,7,8	Intermediate	X	X		X		
7-S	11/3/1988	POC	30°40'08.79"N	88°02'08.8"W	15.41	14.19	15.0	2.9 to -7.4	SWMUs 2,4,5,6,7,8	Upper	X	X		X		
8-D	11/10/1988	POC	30°40'00.21"N	88°02'12.06"W	14.52	13.98	96.0	-76.3 to -86.1	SWMUs 2,4,5,6,7,8	Deep	X	X		X		
8-DK	4/7/1992	POC	30°40'00.11"N	88°02'12.19"W	14.64	14.13	128.0	-105.52 to -115.52	SWMUs 2,4,5,6,7,8	Deep	X	X				
8-I	6/11/1986	POC	30°40'00.24"N	88°02'12.22"W	14.59	14.18	70.0	-48.1 to -58.1	SWMUs 2,4,5,6,7,8	Intermediate	X	X		X		
8-S	7/10/1986	POC	30°40'00.24"N	88°02'12.15"W	14.64	14.00	15.5	6.67 to -3.33	SWMUs 2,4,5,6,7,8	Upper	X	X		X		
9-I	6/12/1986	POC	30°39'56.44"N	88°02'15.88"W	14.00	13.24	62.5	-40.4 to -50.4	SWMUs 2,4,5,6,7,8	Intermediate	X	X		X		
11-I	11/7/1988	DNAPL_EFF	30°40'09.96"N	88°02'21.05"W	14.93	14.07	50.0	-30.9 to -40.9	SWMUs 2,4,5,6,7,8	Intermediate	X				X	
11-S	7/10/1986	DNAPL_EFF	30°40'09.96"N	88°02'21.14"W	15.11	14.19	15.5	6.03 to -3.97	SWMUs 2,4,5,6,7,8	Upper	X				X	
12-I	11/4/1988	DNAPL_EFF	30°40'09.19"N	88°02'13.64"W	12.96	12.26	50.0	-31 to -41	SWMUs 2,4,5,6,7,8	Intermediate	X				X	
13-I	11/4/1988	DNAPL_EFF	30°40'07.4"N	88°02'16.2"W	14.71	13.43	50.0	-30.8 to -40.8	SWMUs 2,4,5,6,7,8	Intermediate	X				X	
15-D	4/30/1998	POC	30°40'04.49"N	88°02'10.15"W	14.12	13.34	91.0	-73.0 to -83.01	SWMUs 2,4,5,6,7,8	Deep	X	X		X		
15-I	11/2/1988	POC	30°40'04.38"N	88°02'10.16"W	14.02	13.28	48.5	-31.0 to -41.0	SWMUs 2,4,5,6,7,8	Intermediate	X	X		X		
15-S	11/3/1988	POC	30°40'04.42"N	88°02'10.16"W	14.02	13.26	15.0	2.5 to -7.5	SWMUs 2,4,5,6,7,8	Upper	X	X		X		
16-D	9/13/1989	POC	30°39'54.81"N	88°02'23.45"W	13.45	12.68	106.0	-85.8 to -95.8	SWMUs 2,4,5,6,7,8	Deep	X	X		X		
16-I	11/15/1988	POC	30°39'54.82"N	88°02'23.45"W	13.39	12.67	50.0	-32.2 to -43.2	SWMUs 2,4,5,6,7,8	Intermediate	X	X		X		
17-D	9/7/1989	DNAPL_EFF	30°40'01.77"N	88°02'31.85"W	7.77	9.32	106.0	-85 to -95	SWMUs 2,4,5,6,7,8	Deep	X		X		X	
17-S	1/13/1988	DNAPL_RWS	30°40'01.83"N	88°02'31.86"W	7.80	10.10	15.0	2.5 to -7.5	SWMUs 2,4,5,6,7,8	Upper						X
18-DR	2/14/2012	DNAPL_EFF	30°40'03.84"N	88°02'32.39"W	8.37	9.84	105.0	-84.9 to -94.9	SWMUs 2,4,5,6,7,8	Deep	X				X	
18-IR	2/16/2012	DNAPL_MWRS	30°40'03.74"N	88°02'32.36"W	7.55	9.34	50.0	-29.6 to -39.6	SWMUs 2,4,5,6,7,8	Intermediate	X				X	X
19-SR	11/7/2011	BKG	30°40'08.43"N	88°02'33.98"W	9.09	10.98	20.0	-1.1 to -11.1	SWMUs 2,4,5,6,7,8	Upper	X	X		X		
20-I	9/7/1989	DNAPL_MWRS	30°40'05.67"N	88°02'31.38"W	11.44	10.90	53.0	-32.8 to -42.8	SWMUs 2,4,5,6,7,8	Intermediate	X				X	X
21-I	9/9/1989	DNAPL_EFF	30°40'01.49"N	88°02'34.27"W	7.59	9.54	50.5	-28.5 to -38.5	SWMUs 2,4,5,6,7,8	Intermediate	X		X		X	
21-S	9/5/1989	DNAPL_MWRS	30°40'01.54"N	88°02'34.35"W	7.83	10.69	22.6	1.5 to -8.5	SWMUs 2,4,5,6,7,8	Upper	X				X	X
23-D	9/14/1989	DNAPL_EFF	30°40'02.65"N	88°02'21.44"W	14.20	13.64	101.0	-78.9 to -88.9	SWMUs 2,4,5,6,7,8	Deep	X		X		X	
23-I	9/6/1989	DNAPL_EFF	30°40'02.72"N	88°02'21.39"W	14.06	13.55	48.5	-26.3 to -36.3	SWMUs 2,4,5,6,7,8	Intermediate	X		X		X	
25-I	8/31/1989	DNAPL_EFF	30°40'06.4"N	88°02'13.05"W	13.54	12.42	53.0	-31.7 to -41.7	SWMUs 2,4,5,6,7,8	Intermediate	X				X	
26-I	9/1/1989	DNAPL_EFF	30°40'08.18"N	88°02'10.33"W	14.87	14.32	53.0	-31.9 to -41.9	SWMUs 2,4,5,6,7,8	Intermediate	X				X	
31-DR	1/9/2007	POC	30°39'58.07"N	88°02'35.92"W	10.33	12.39	108.7	-85.9 to -95.9	SWMUs 2,4,5,6,7,8	Deep	X	X		X		
31-IR	1/8/2007	POC	30°39'58.08"N	88°02'35.88"W	10.26	12.59	53.6	-30.7 to -40.7	SWMUs 2,4,5,6,7,8	Intermediate	X	X		X		
32-I	4/24/1998	POC	30°39'55.12"N	88°02'27.4"W	10.35	10.09	48.0	-27.1 to -37.1	SWMUs 2,4,5,6,7,8	Intermediate	X	X				
32-S	4/21/1998	POC	30°39'55.07"N	88°02'27.32"W	10.37	10.20	20.0	0.8 to -9.2	SWMUs 2,4,5,6,7,8	Upper	X	X				
PZ-13-D	4/12/2012	Piezometer	30°40'12.81"N	88°02'16.64"W	14.74	17.09	81.0	-75.9 to -80.5	SWMUs 2,4,5,6,7,8	Deep	X					
PZ-16-S	4/17/2012	Piezometer	30°39'55.53"N	88°02'18.47"W	13.68	13.10	6.9	1.1 to -3.9	SWMUs 2,4,5,6,7,8	Upper	X					
PZ-19-I	4/17/2012	Piezometer	30°40'08.37"N	88°02'34.27"W	10.45	13.07	35.1	-29.6 to -34.6	SWMUs 2,4,5,6,7,8	Intermediate	X					
PZ-1-D	4/19/2012	Piezometer	30°40'12.57"N	88°02'34.56"W	10.95	13.40	98.0	-79.2 to -84.2	SWMUs 2,4,5,6,7,8	Deep	X					
PZ-1-S	4/17/2012	Piezometer	30°40'12.54"N	88°02'34.61"W	10.81	13.12	17.0	1.1 to -3.9	SWMUs 2,4,5,6,7,8	Upper	X					
PZ-30-D	4/23/2012	Piezometer	30°40'00.83"N	88°02'35.65"W	9.10	11.37	82.7	-77.2 to -82.2	SWMUs 2,4,5,6,7,8	Deep	X					
RW-1	4/11/1992	DNAPL_MWRS	30°40'01.44"N	88°02'34.45"W	8.35	10.03	20.0	0.2 to -9.8	SWMUs 2,4,5,6,7,8	Upper	X				X	X
RW-3	4/10/1992	DNAPL_RWS	30°40'09.51"N	88°02'17.67"W	14.28	8.63	101.0	-79.7 to -89.7	SWMUs 2,4,5,6,7,8	Deep						X
RW-4	4/13/1999	DNAPL_RWS	30°40'09.48"N	88°02'17.07"W	14.90	8.92	102.5	-81.4 to -91.4	SWMUs 2,4,5,6,7,8	Deep						X
RW-5	4/14/1999	DNAPL_RWS	30°40'08.39"N	88°02'17.72"W	14.04	8.41	99.5	-78.9 to -88.9	SWMUs 2,4,5,6,7,8	Deep						X
RW-6	7/14/2004	DNAPL_RWS	30°40'09.08"N	88°02'16.22"W	15.63	9.30	90.5	-78.5 to -88.5	SWMUs 2,4,5,6,7,8	Deep						X
RW-7	7/20/2004	DNAPL_RWS	30°40'08.82"N	88°02'16.88"W	14.89	8.72	94.6	-82.6 to -92.6	SWMUs 2,4,5,6,7,8	Deep						X
RW-8	7/6/2004	DNAPL_RWS	30°40'08.22"N	88°02'16.56"W	15.15	8.72	91.6	-79.6 to -89.6	SWMUs 2,4,5,6,7,8	Deep						X

Notes:
(ft) = feet
S = Shallow groundwater interval, upper water-bearing zone
I = Intermediate groundwater interval, upper water-bearing zone
D = Deep groundwater interval, lower water-bearing zone
DK = Deep groundwater interval, upper Miocene Series-Pensacola Clay water-bearing zone (screened below the bottom of Pensacola Clay confining layer)
R = Replacement Well
BKG = Background Monitoring Well
DNAPL_EFF = DNAPL Effectiveness Monitoring Well
POC = Point of Compliance Monitoring Well
DNAPL_MWRS = Monitoring Well Recovery System used for shallow DNAPL recovery (monitoring well converted for DNAPL recovery)
DNAPL_RWS = Recovery Well System used for deep DNAPL recovery
(1) Top of casing elevations updated based on new survey data submitted to ADEM on July 14, 2021 with ground elevations subsequently adjusted based on field surveys.
(2) Well depth based on boring log at installation and adjusted to reflect current grade and casing elevations per development activities.
(3) Refer to Table 8A/8B of the Permit Application for Site-Specific and Appendix IX Detections to be monitored annually at designated wells.
(4) DNAPL Effectiveness Program refer to Table 8A of the Permit Application for Site-Specific constituents to be monitored biennially, in even number years, at designated wells; also refer to Tables 3 and 4 of OMM Plan.
(5) Appendix IX Program rotating schedule (refer to Table 8C of the Permit Application for constituent group analysis to be performed at designated Appendix IX wells each year):
Year 1 (2024) 7-S, 7-IR, 7-D
Year 2 (2025) 31-IR, 31-DR
Year 3 (2026) 15-S, 15-I, 15-D
Year 4 (2027) 8-S, 8-I, 8-D
Year 5 (2028) 9-I, 16-I, 16-D, 19-SR

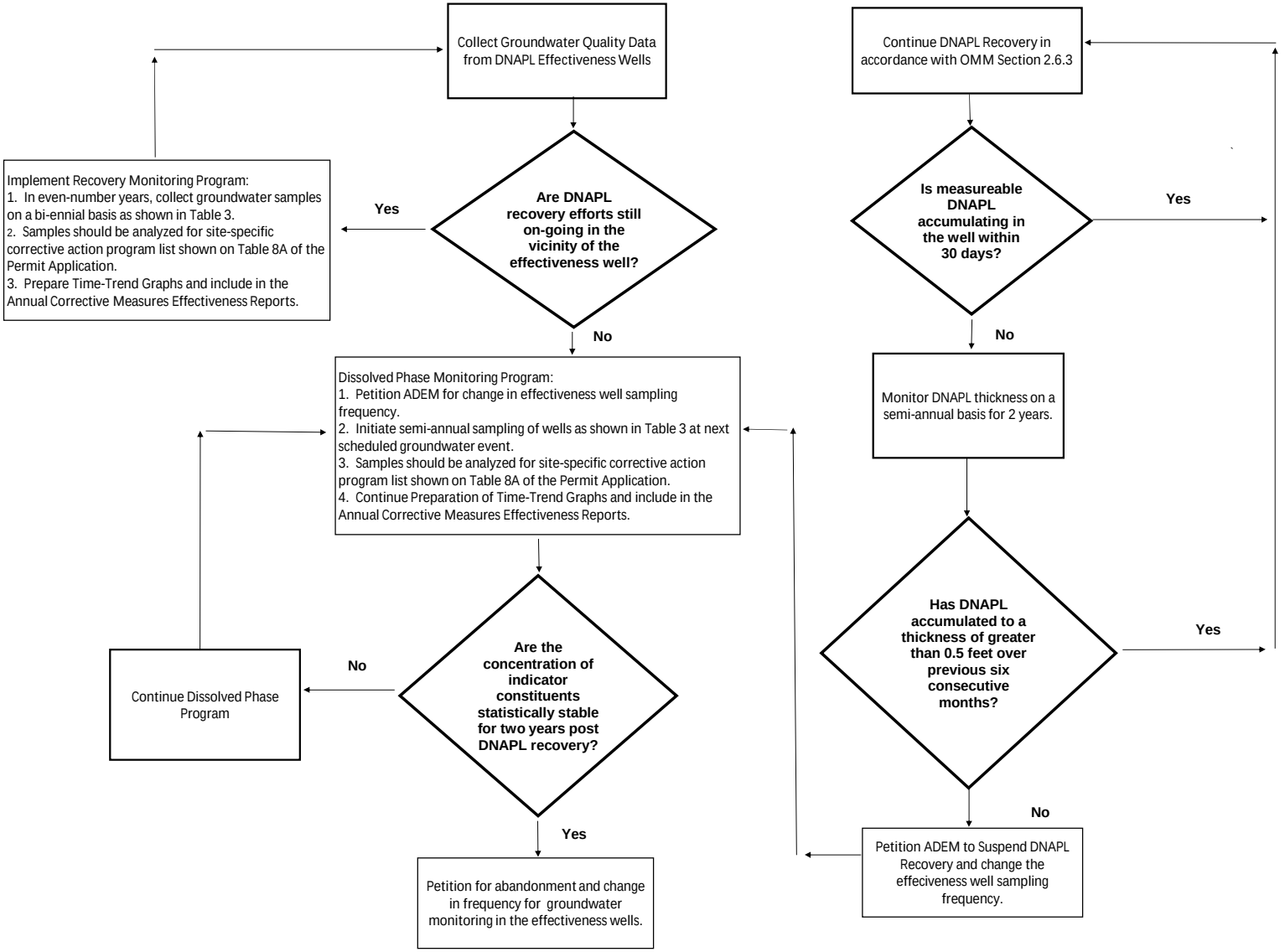
TABLE 3
SUMMARY OF WELLS FOR USE IN DNAPL EFFECTIVENESS MONITORING PROGRAM
Alabama Wood Treating Corporation Site
Mobile, Alabama

Well ID	Well Type	Ground Elevation (ft NAVD 88)[1]	Top of Casing Elevation (ft NAVD 88)[1]	Total Well Depth Installed (ft)[2]	Screened Interval (ft MSL)	Monitored Zone	Proposed for Use in Monitoring for Indicator Site Specific Constituents?	Basis for Selection in Monitoring Program	Frequency of Monitoring Program[3]	Constituents for Analysis[4]
6-I	DNAPL_EFF	13.55	12.73	62.5	-42.6 to -52.6	Intermediate	Yes	Monitor downgradient of SWMU-5	Every 2 years while DNAPL recovery is ongoing. Initiate semi-annual at termination of DNAPL recovery.	Refer to Table 8A of the Permit Application for Site-Specific constituents to be monitored biennially, in even number years.
6-S	DNAPL_EFF	13.46	11.82	19.5	-4.3 to -9.3	Upper	Yes	Monitor downgradient of SWMU-5	Every 2 years while DNAPL recovery is ongoing. Initiate semi-annual at termination of DNAPL recovery.	Refer to Table 8A of the Permit Application for Site-Specific constituents to be monitored biennially, in even number years.
11-I	DNAPL_EFF	14.93	14.07	50.0	-30.9 to -40.9	Intermediate	No	Located upgradient of DNAPL recovery operations		
11-S	DNAPL_EFF	15.11	14.19	15.5	6.03 to -3.97	Upper	No	Located upgradient of DNAPL recovery operations		
12-I	DNAPL_EFF	12.96	12.26	50.0	-31 to -41	Intermediate	No	Located sidegradient of DNAPL recovery operations, well 13-1 available to adequately monitor the area		
13-I	DNAPL_EFF	14.71	13.43	50.0	-30.8 to -40.8	Intermediate	No	Monitor downgradient of SWMU-4, monitor effectiveness of recovery wells RW-3 through RW-8		
17-D	DNAPL_EFF	7.77	9.32	106.0	-85 to -95	Deep	Yes	Monitor downgradient of SWMU-6 West, monitor effectiveness of recovery well 17-S	Every 2 years while DNAPL recovery is ongoing. Initiate semi-annual at termination of DNAPL recovery.	Refer to Table 8A of the Permit Application for Site-Specific constituents to be monitored biennially, in even number years.
18-DR	DNAPL_EFF	8.37	9.84	105.0	-84.9 to -94.9	Deep	No	No DNAPL noted in well 18-IR, and can adequately monitor this area with wells 17-D and 21-I		
21-I	DNAPL_EFF	7.59	9.54	50.5	-28.5 to -38.5	Intermediate	Yes	Monitor downgradient of SWMU-6 West, monitor effectiveness of recovery well RW-1	Every 2 years while DNAPL recovery is ongoing. Initiate semi-annual at termination of DNAPL recovery.	Refer to Table 8A of the Permit Application for Site-Specific constituents to be monitored biennially, in even number years.
23-D	DNAPL_EFF	14.20	13.64	101.0	-78.9 to -88.9	Deep	Yes	Monitor downgradient of SWMUs-2 and -7	Every 2 years while DNAPL recovery is ongoing. Initiate semi-annual at termination of DNAPL recovery.	Refer to Table 8A of the Permit Application for Site-Specific constituents to be monitored biennially, in even number years.
23-I	DNAPL_EFF	14.06	13.55	48.5	-26.3 to -36.3	Intermediate	Yes	Monitor downgradient of SWMUs-2 and -7	Every 2 years while DNAPL recovery is ongoing. Initiate semi-annual at termination of DNAPL recovery.	Refer to Table 8A of the Permit Application for Site-Specific constituents to be monitored biennially, in even number years.
25-I	DNAPL_EFF	13.54	12.42	53.0	-31.7 to -41.7	Intermediate	No	Downgradient area is adequately monitored by well 15 cluster		
26-I	DNAPL_EFF	14.87	14.32	53.0	-31.9 to -41.9	Intermediate	No	Area is adequately monitored by nearby well 7 cluster		

Notes:
(ft) = feet
S = Shallow groundwater interval, upper water-bearing zone
I = Intermediate groundwater interval, upper water-bearing zone
D = Deep groundwater interval, lower water-bearing zone
R = Replacement Well
DNAPL_EFF = DNAPL Effectiveness Monitoring Well
(1) Top of casing elevations updated based on new survey data submitted to ADEM on July 14, 2021 with ground elevations subsequently adjusted based on field surveys.
(2) Well depth based on boring log at installation and adjusted to reflect current grade and casing elevations per development activities.
(3) Refer to Table 4 of OM&M Manual for decision logic diagram of the DNAPL recovery operations and effectiveness well monitoring program.
(4) Based on frequency of detection during POC monitoring program and apparent indicator constituents.

TABLE 4
DNAPL OM&M PROTOCOL AT MONITORING WELL RECOVERY SYSTEM
Alabama Wood Treating Corporation Site
Mobile, Alabama

DNAPL OPERATIONS AND MAINTENANCE PROTOCOL - MWRS



Enclosure A

Inspection Forms

ANNUAL WELL INSPECTION LOG
AWTC SITE

INSPECTOR'S NAME: _____

INSPECTOR'S SIGNATURE: _____

SEMESTER: _____ DATE/TIME: _____

Note: This inspection log is for monitoring wells and piezometers only. Inspection of recovery wells and MW-17S is documented on Semi-Annual Inspection Checklists.

MONITORING WELLS								
WELL	SURFACE CAP[1]	NUMBER	LOCK	CASING[2]	NOTCH	CAP/VENT	CONCRETE EDGE[3]	COMMENTS & REQUIRED ACTIONS
4-D								
4-DK								
6-S								
6-I								
7-S								
7-IR								
7-D								
8-S								
8-I								
8-D								
8-DK								
9-I								
11-S								
11-I								
12-I								
13-I								
15-S								
15-I								
15-D								
16-I								
16-D								
17-D								

KEY:
X – WELL INSPECTED AND ACCEPTABLE CONDITION PRESENT
R – WELL INSPECTED AND REPAIR NEEDED
[1] IF COLUMN MARKED NA, PARAMETER NOT APPLICABLE DUE TO THE PRESENCE OF A RISER (NOT FLUSH MOUNT) OR AS OTHERWISE NOTED.
[2] IF COLUMN MARKED NA, PARAMETER NOT APPLICABLE AS WELL IS FLUSH MOUNT OR AS OTHERWISE NOTED.
[3] IF COLUMN MARKED NA, PARAMETER NOT APPLICABLE DUE TO LACK OF SEPARATE CONCRETE BASE STRUCTURE OR AS OTHERWISE NOTED.

ANNUAL WELL INSPECTION LOG
AWTC SITE

INSPECTOR'S NAME: _____

INSPECTOR'S SIGNATURE: _____

SEMESTER: _____ DATE/TIME: _____

Note: This inspection log is for monitoring wells and piezometers only. Inspection of recovery wells and MW-17S is documented on Semi-Annual Inspection Checklists.

MONITORING WELLS								
WELL	SURFACE CAP[1]	NUMBER	LOCK	CASING[2]	NOTCH	CAP/VENT	CONCRETE EDGE[3]	COMMENTS & REQUIRED ACTIONS
18-IR								
18-DR								
19-SR								
20-I								
21-S								
21-I								
23-I								
23-D								
25-I								
26-I								
31-IR								
31-DR								
32-S								
32-I								
PZ-1-D								
PZ-1-S								
PZ-13-D								
PZ-16-S								
PZ-19-I								
PZ-30-D								

KEY:
X – WELL INSPECTED AND ACCEPTABLE CONDITION PRESENT
R – WELL INSPECTED AND REPAIR NEEDED
[1] IF COLUMN MARKED NA, PARAMETER NOT APPLICABLE DUE TO THE PRESENCE OF A RISER (NOT FLUSH MOUNT) OR AS OTHERWISE NOTED.
[2] IF COLUMN MARKED NA, PARAMETER NOT APPLICABLE AS WELL IS FLUSH MOUNT OR AS OTHERWISE NOTED.
[3] IF COLUMN MARKED NA, PARAMETER NOT APPLICABLE DUE TO LACK OF SEPARATE CONCRETE BASE STRUCTURE OR AS OTHERWISE NOTED.

SEMI-ANNUAL INSPECTION LOG
CONTIGUOUS PROPERTIES (SWMUs and AOCs)
ALABAMA STATE PORT AUTHORITY
MOBILE, ALABAMA

DATE/TIME OF INSPECTION: _____ **/** _____

CONTIGUOUS PROPERTIES: _____

I. CONTIGUOUS PROPERTIES

_____ Has unauthorized dumping occurred?
_____ Have changes been made to the property?
_____ Is the perimeter fencing around SWMU-11 intact?
_____ Are the unmanned gates locked and secure?
_____ Are the security signs in place?

II. COMMENTS (Note any deficiencies observed during this inspection and corrective actions taken.)

Describe Change(s) to Contiguous Property:

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Inspected by:

_____
Print Name

_____
Title

_____
Signature

_____
Date Time

Corrective Action by:

_____
Print Name

_____
Title

_____
Signature

_____
Date Time

SEMI-ANNUAL INSPECTION CHECKLIST
FORMER AWTC SITE
ALABAMA STATE PORT AUTHORITY
MOBILE, ALABAMA

I. RECOVERY WELL SYSTEM (RWS)

_____ Subsurface concrete vaults checked for cracks & groundwater intrusion?
_____ Are surface mounts for recovery wells intact?
_____ Are manhole covers intact?
_____ Is the well surface marking clearly visible and legible?
_____ Any evidence of vault flooding?

II. MONITORING WELL RECOVERY SYSTEM (MWRS)

_____ Are MWRS wells intact and in good condition, marked, and with covers locked?
_____ Are the pneumatic pump hoses and connectors intact and in good condition?
_____ Dedicated pneumatic pumps operated correctly during last MWRS recovery?
_____ Are the well protection barriers intact (where applicable)?
_____ Recovery trailer tires, lights, wiring, & hitch operational and in good condition?
_____ Trailer mounted compressor serviced quarterly and operating properly?
_____ Trailer mounted battery, pump, times, drums, hoses, & connectors operational and in good condition?

III. CREOSOTE RECOVERY FACILITY (CRF)

A. Air Compressor, Control Panel, & Drums

_____ Compressor oil checked and oil and filter changed as needed?
_____ System interlocks checked and operational?
_____ Air filter & coalescing filters checked and changed as needed?
_____ Condensation lines checked and cleaned and auto drain times verified?
_____ Pressure safety relief valve checked for proper operation?
_____ Control panel, timing relays, & solenoid valves checked for proper operation?
_____ Pump timing checked/adjusted as needed?
_____ Control valves and switches tested and operating properly?
_____ Air hose in good condition with no leaks, cracks, or rust?
_____ Drums in good condition with no leaks, rust, or loose connections?
_____ Product pipe in good condition with no leaks, cracks, or rust?
_____ Float valves and gate valves checked and operating properly?

B. Storage / Settling Tanks

_____ Exterior of tanks checked at least monthly for leaks & rust?
_____ Check valves & gate valves checked for proper operation?
_____ Product level sensors electrically verified for proper operation?
_____ Access ladder, cage, hand railing, and lids are in good condition?
_____ Exterior of tank marked with proper placards?
_____ Discharge piping checked for leaks, blockages, and rust?

C. MWRS Drums

_____ Drums in good condition and secured in storage area?
_____ Drums properly marked and clearly visible and legible?
_____ Drums marked as Creosote?

D. Concrete Containment Area

_____ Concrete walls & floor in good condition and damage free?
_____ Interior sealant in good condition with no cracks or open joints?
_____ Sump pump operating properly?
_____ Perimeter fencing and gates in good condition and not damaged?
_____ Gates locked?
_____ Potable water line & hose bib in-tack and in good condition?
_____ Signage attached to fence and visible & legible?
_____ Facility ID sign, contact info,& address visible & legible?
_____ Any sign of vandalism or unauthorized access?
_____ Any erosion around exterior of concrete containment wall or steps?

SEMI-ANNUAL INSPECTION CHECKLIST
FORMER AWTC SITE
ALABAMA STATE PORT AUTHORITY
MOBILE, ALABAMA

IV. WASTEWATER TREATMENT SYSTEM (WWTS)

A. Oil-Water Separator

_____ Tank checked for leaks and all seals in good condition?
_____ Internal components checked for proper operation, fouling, buildup, & clogs?
_____ Sludge removed?
_____ Control instrument checked for proper operation?
_____ Piping checked for leaks, cracks, joints, & rust?
_____ Activated carbon filters checked for leaks & blockages and functioning properly?
_____ Activated carbon replaced?
_____ Rubber hoses checked for leaks, cracks, & fittings & in good working order?

B. Poly Water Storage Tank

_____ Tank checked for leaks and all seals in good condition?
_____ Float valves and gate valves checked and operating properly?
_____ Automatic O-W Separator shutdown checked for proper operation?
_____ Piping checked for leaks, cracks, joints, & rust?
_____ Flow meter checked, calibrated, and operating properly?

V. ASPHALT COVER (SWMU-6 WEST)

_____ Is the fence intact and the gates locked for the east section?
_____ Is the fence intact and the gates locked for the west section?
_____ Are all perimeter security signs in place?
_____ East and west asphalt covers intact?
_____ Asphalt cover over rail tracts intact?
_____ Any evidence of subsidence for any portion of the asphalt cover?
_____ Any signs of rutting, cracking, or buckling for any portion of asphalt cover?
_____ Any evidence of spills or leaks from rail traffic?
_____ Any evidence of train derailment?
_____ Are monitoring wells intact and in good condition, marked, and with covers locked?
_____ Is the product recovery storage tank in good condition with no leaks?
_____ Is the secondary containment uncompromised with no free product present?
_____ Is the secondary containment drain valve closed and locked?

COMMENTS: Note deficiencies observed during this inspection and corrective actions taken. Include area name, deficiency, and date(s) corrective action started and completed.

_____
_____
_____
_____
_____
_____

Inspected by:

_____
Print Name

_____
Title

_____
Signature

_____
Date Time

Corrective Action by:

_____
Print Name

_____
Title

_____
Signature

_____
Date Time

ANNUAL INSPECTION CHECKLIST
FORMER AWTC SITE
ALABAMA STATE PORT AUTHORITY
MOBILE, ALABAMA

I. RCC SURFACE OVER SOIL CAP (SWMUs-4, 5, 6 East & 8) – Now the Mobile Container Terminal

_____ Is the roller compacted concrete cover intact?
_____ Any evidence of subsidence?
_____ Any signs of rutting, cracking, or buckling of concrete?
_____ Are monitoring and recovery well surface markings intact and readable?
_____ Are surface mounts for monitoring and recovery well intact?
_____ Are monitoring well caps locked?
_____ Were areas checked for observations of disturbance?
_____ Is the fence intact and access controlled?

II. RCC SURFACE COVER OVER CONCRETE CAP (COMBINED SWMUs-2 and -7)

_____ Surface concrete cover (RCC) intact over original concrete cap?
_____ Any evidence of subsidence?
_____ Any signs of rutting, cracking, or buckling of concrete?
_____ Any evidence of undermining or deterioration of the concrete?
_____ Are brass corner markers intact?

III. INTER-TERMINAL CONNECTOR FOUNDATIONS AND MSE WALL

_____ Any signs of rutting, cracking, or buckling of concrete?
_____ Any evidence of undermining or deterioration of the concrete?
_____ Any evidence of vegetation intrusion in the embankments of the MSE wall?
_____ Any evidence of inadequate drainage in the MSE wall system?

IV. LAND USE CONTROLS

_____ Use of the property limited to industrial or commercial property?
_____ Groundwater not being utilized for potable water, irrigation, industrial, or agricultural purposes?
_____ Construction of future enclosed building(s) or other construction planned for SWMUs-4, 5, 6, or 8?
_____ Relocation, modification, disruption, dismantling, disturbance, or removal of sheet pile wall/shore protection wall structures?
_____ Disturbance of the surface of or impingement into the CMI constructed final earthen cover or the CMI constructed final asphalt cover?
_____ Routine maintenance, repair, and upkeep performed for the sheet pile wall/shore protection wall structures and containment, fill material, cover, and final concrete or asphalt surfacing?
_____ SWMUs 2 and 7 remain subject to Restrictive Covenants (concrete cap)?
_____ Existing fencing and gates maintained in good order, kept locked, and have signage indicating "Restricted Area – Authorized Personnel Only" for SWMU 6 West and DNAPL recovery/treatment?

COMMENTS: Note deficiencies observed during this inspection and corrective actions taken. Include area name, deficiency, and date(s) corrective action started and completed.

_____
_____
_____
_____
_____
_____

Inspected by:

_____
Print Name

_____
Title

_____
Signature

_____
Date Time

Corrective Action by:

_____
Print Name

_____
Title

_____
Signature

_____
Date Time

Enclosure B

Field Sampling and Analysis Plan

ALABAMA STATE PORT AUTHORITY
Office of Environmental Management

ALABAMA WOOD TREATING CORPORATION SITE
MOBILE, ALABAMA
FACILITY ID # ALD 058 221 326

Field Sampling and Analysis Plan

Prepared by:

WSP USA Environment & Infrastructure Inc.
4000 Meadow Lake Drive, Suite 121
Birmingham, AL 35242

August 2024

WSP Project 7630233209

Table of Contents

TABLES ..... **II**

1.0 INTRODUCTION **1-1**

2.0 GROUNDWATER MONITORING PROGRAM REQUIREMENTS **2-1**
2.1 Groundwater Monitoring Wells 2-1
2.2 General Groundwater Sampling & Analysis Requirements 2-1
2.3 Analytical Parameters 2-2
2.4 Analytical Methods and Laboratory QA/QC Program 2-3

3.0 FIELD PROCEDURES **3-1**
3.1 Preparation for Sampling 3-1
3.1.1 Office Preparation 3-1
3.1.2 Field Preparation 3-1
3.2 Groundwater Sampling 3-2
3.3 Sampling and Field Measurement Equipment 3-2
3.4 Special Sampling Requirements 3-2
3.5 Groundwater Sampling Equipment Decontamination 3-5
3.5.1 In-house Decontamination for Sampling Equipment 3-6
3.5.2 In-field Decontamination for Sampling Equipment 3-6
3.5.3 Sample Containers Cleaning Procedures 3-8
3.6 Sampling Protocols 3-8
3.6.1 Preparation for Groundwater Sampling 3-9
3.6.2 Sample Collection Procedures 3-9
3.7 Equipment Calibration and Quality Control 3-15
3.8 Field Performance and System Audits 3-16
3.9 Methods of Sample Preparation 3-17
3.9.1 Split and Duplicate Samples 3-17
3.9.2 Field Filtration of Samples 3-17
3.9.3 Sampling Containers, Volumes, Holding Times, and Preservation 3-18
3.10 Laboratory Sample Receipt, Custody, and Holding Time Requirements 3-19
3.11 Monitoring Well Installation and Abandonment 3-20
3.11.1 Monitoring Well Installation 3-20
3.11.2 Post Drilling Operations 3-22
3.11.3 Well Abandonment 3-23
3.12 Field Waste Disposal 3-24

4.0 SAMPLE CUSTODY **4-1**
4.1 Sample Custody Objectives 4-1
4.2 Definition of Legal Chain of Custody 4-1
4.3 Legal Custody Procedures 4-1
4.4 Documentation 4-2
4.5 Field Custody 4-2
4.6 Sample Labels 4-3
4.7 Additional Information for Monitor Wells 4-3

5.0 QC CHECKS, PRECISION & ACCURACY **5–1**
5.1 Field QC Samples 5–1
5.2 Equipment Blanks 5–1

5.3 Trip Blanks 5–2
5.4 Field Duplicates 5–2
5.5 MS/MSD Samples 5–2
5.6 Rinsate Blank 5–3
5.7 Field (Ambient) Blank 5–3
5.8 QC Checks on Field Measurements 5–3
5.9 Calibration Procedures and Frequency – Laboratory Equipment 5–3
5.9.1 Laboratory Quality Control Procedures 5–4
5.9.2 Laboratory Internal Audits 5–4
5.9.3 Laboratory Nonconformance/Corrective Actions 5–4

6.0 DATA REDUCTION, VALIDATION & REPORTING 6-1

7.0 CORRECTIVE ACTION 7-1
7.1 Short-Term Corrective Actions 7-1
7.2 Long-Term Corrective Actions 7-1
7.3 External Sources 7-2

Tables

Table 1 Specific Field Analytical Techniques and Measurement Instruments
Table 2 Required Containers, Preservation Techniques, and Holding Times
Table 3 Preventive Maintenance – Field Meters
Table 4 Field Waste Disposal
Table 5 Field Initial Calibration Requirements
Table 6 Frequency of Field QC Samples

Attachments

Attachment A Lab QA/QC Documentation
Attachment B Equipment Lists
Attachment C Field Forms

List of Acronyms and Abbreviations

Acronym/ Abbreviation	Definition
ADEM	Alabama Department of Environmental Management
AEIRG	Alabama Environmental Investigation & Remediation Guidance
ASPA	Alabama State Port Authority
ASTM	American Society for Testing and Materials
AWTC	Alabama Wood Treating Corporation
BOD	biochemical oxygen demand
°C	degrees Celsius
CFR	Code of Federal Regulations
CMI	Corrective Measures Implementation
COC	Chain of Custody
DI	deionized
DNAPL	dense nonaqueous phase liquid
DO	dissolved oxygen
EDB	1,2-dibromoethane
EPA	U.S. Environmental Protection Agency
FID	flame ionization detector
FSAP	Field Sampling and Analysis Plan
ft	foot
ft-bgs	feet below ground surface
GWSAP	Groundwater Sampling and Analysis Plan
HCl	hydrochloric acid
HNO_3	nitric acid
HPLC	high-performance liquid chromatography
ID	identification
mL	milliliter
mL/min	milliliters per minute
MS/MSD	matrix spike/matrix spike duplicate
MQO	matrix quality objective
NTU	nephelometric turbidity unit
O&G	oil and grease
OM&M	operations, maintenance & monitoring
ORP	oxidation-reduction potential
PID	photoionization device
ppb	parts per billion
PPE	personal protective equipment
PVC	polyvinyl chloride
QA	quality assurance
QC	quality control
RCRA	Resource Conservation and Recovery Act
SOP	standard operating procedure
TOC	total organic carbon
TOX	total organic halides
TRPH	total recoverable petroleum hydrocarbons
µm	micrometer
USDOT	U.S. Department of Transportation
USEPA	U.S. Environmental Protection Agency
VOA	volatile organic analyte
VOC	volatile organic compound

1.0 INTRODUCTION

This document constitutes the Field Sampling and Analysis Plan (FSAP) for the former Alabama Wood Treating Corporation (AWTC) site in Mobile, AL. The AWTC site is currently owned by the Alabama State Port Authority (ASPA) and is regulated under post-closure permit number ALD 058 221 326 issued by the Alabama Department of Environmental Management (ADEM). This FSAP is in fulfillment of Permit Condition I.C.10.a.

The FSAP documents procedures and methods for the collection and analysis of groundwater samples for the Compliance Monitoring Program at the AWTC site as described in Permit Condition III.B and III.D. The primary activities at the site include the collection for data in support of the DNAPL effectiveness monitoring program and the compliance monitoring program. Additional activities have been included that may be required over compliance period of the renewed permit.

The procedures for executing planned field activities and applicable sampling and laboratory analysis described herein are in general accordance with the operating procedures and guidance outlined in the most recent version of the Alabama Environmental Investigation & Remediation Guidance (AEIRG) (ADEM, 2017) and the most recent versions of *USEPA Region 4 Quality System and Technical Procedures for Laboratory Services and applied Science Division (LSASD) Field Branches* guidance documents. At the time of preparation of this FSAP, these procedures are commonly referred to as LSASD procedures, though several relevant procedures currently maintain the designation of the former entity that developed the procedures, the Science and Ecosystem Support Division (SESD) of US EPA. For the purposes of this FSAP, the references to LSASD and SESD procedures are intended to encompass the future entity that may supersede the current nomenclature for the branch within EPA which maintains responsibility for these procedures. The specific forms, equipment, procedures and personnel that have been and will be used at the AWTC site are subject to modification and variation. However, all variances from the specified procedures must meet the generic techniques and protocols of the USEPA Region 4 SOP & Quality Assurance (QA) Manual and this FSAP. Changes in the monitoring program may be required by several actions including permit modifications, administrative proceedings, enforcement actions and regulatory changes. Procedural changes may be necessitated by agency policy or method approval. Substitution of equipment brands and models will certainly be made over time. Changes within the generic

requirements will be documented in the program reporting requirements and through modifications to the FSAP.

Specifically the FSAP includes information on and procedures for:

- Section 2.0 Groundwater Monitoring Program Requirements
- Section 3.0 Field Procedures
- Section 4.0 Sample Custody
- Section 5.0 QC Checks, Precision & Accuracy
- Section 6.0 Data Reduction, Validation & Reporting
- Section 7.0 Corrective Actions

2.0 GROUNDWATER MONITORING PROGRAM REQUIREMENTS

Groundwater sampling has been conducted at the AWTC since 1982 and semi-annually since the issuance of the permit in 1991. The post-closure care permit for the AWTC site establishes a number of groundwater monitoring requirements relating to sampling, analysis and reporting. These requirements may be changed under a formal permit modification and other requirements may be added through regulatory change, administrative order or enforcement action. Since the modification of the permit in 2003, annual monitoring at AWTC has been performed since 2003. The annual monitoring typically occurs in June of each year.

2.1 Groundwater Monitoring Wells

Over 65 monitoring wells have been installed at the AWTC site. Of these wells, 31 monitoring wells are still active. Six of those wells are contaminated with Dense Non-Aqueous Phase Liquids (DNAPL) and are utilized as recovery wells. In addition to these 31 wells, there are six piezometers that are being used to develop the potentiometric surfaces. Wells have been installed and screened to generally sample three groundwater zones: shallow, intermediate, and deep. The last unit in the alphanumeric designation for the monitoring wells indicates the groundwater zone which is screened: Shallow - S; Intermediate - I, Deep – D. Summary well construction information is indicated on Table 2 of the Operations, Maintenance & Monitoring (OM&M) Manual.

The following sections of the SAP addresses those wells utilized in the compliance groundwater monitoring program. That program utilizes a specific subset of the existing monitoring wells. Table 2 of the OM&M Manual summarizes the Compliance, Boundary and Effectiveness wells currently included in the monitoring program, and will be updated as wells are added or removed from the program.

2.2 General Groundwater Sampling & Analysis Requirements

The groundwater compliance program for the AWTC site requires that the permit specified wells be sampled at permit specified intervals for specific parameters. It also requires that those samples be analyzed according to approved procedures and that the analytical results be reported according to an ADEM approved schedule contained in the governing permit. Within this framework of specific requirements is a general sequence of events which define the actual sampling and analysis process. The sequence of these events is often as important as the

adherence to specific procedures. These requirements or guidelines may include the order in which measurements are taken or samples are collected at a series of wells (e.g., least contaminated to most contaminated well, wells within a cluster prior to wells between clusters). They also include the order that specific tasks are performed at any given well (e.g., water level measurements prior to purging). And they include the order in which actions are taken within a specific task (e.g., collection of samples in the order of volatilization potential). This general sequence of events includes:

- Selection, decontamination, maintenance, calibration and maintenance of appropriate field equipment and sample containers prior to and during sampling events;
- Measurement of static water elevations and total monitoring well depths to 0.01 feet;
- Purging (evacuation) of monitoring wells and management of investigation derived waste;
- Collection, containerization, preservation, custody, transportation and documentation of groundwater and quality assurance samples (i.e., field, trip and equipment blanks) ;
- Collection and recording of field data and measurements;
- Laboratory analysis of samples within a QA/Quality Control (QC) framework of approved and documented methods and procedures;
- Data reduction, validation and reporting.

2.3 Analytical Parameters

As discussed above the post-closure permit specifies analytical parameters for the groundwater monitoring program. Collectively, Table 8 presents a summary of the proposed constituents for analysis and the corresponding laboratory methods; Table 8A presents the site-specific monitoring list, Table 8B presents the list of constituents detected during Appendix IX compliance monitoring and therefore designated as constituent additions to the Permit, and Table 8C summarizes the constituent groups and associated analytical methods evaluated as part of each Appendix IX event. Table 8 of the permit application will be modified as parameters are added or removed from the program or as analytical methods or requirements change.

2.4 Analytical Methods and Laboratory QA/QC Program

As required in the post-closure permit, all analytical methods must comply with those of the applicable and most current version of Test Methods for Evaluating Solid Waste: Physical/Chemical Methods (SW-846) or an alternate method approved by ADEM. Test methods for the constituents defined by the permit are included in collective Table 8 of the permit application. The proper performance of these procedures requires adherence to a comprehensive quality assurance/quality control program by the analytical laboratory. At this time, the laboratory has not been selected (the selected lab may vary from year to year). Any laboratory contracted by ASPA to analyze groundwater samples for the Corrective Action groundwater monitoring program must have in place a QA/QC plan that will be reviewed by the ASPA and included as Attachment A prior to performing the analysis for the project. Additionally, as part of this review of the laboratory QA program, the ASPA will review the laboratory method detection limits and compare the laboratory specific MDLs to the PSVs or current ADEM approved screening criteria. If it is determined by the ASPA that a reasonable analytical method cannot be found to meet the aforementioned criteria, the ASPA will consult with ADEM to determine the agreed upon course of action.

3.0 FIELD PROCEDURES

The following sections of the FSAP outlined the procedures for preparing for and collecting data to meet the data quality objectives of the compliance groundwater monitoring program.

3.1 Preparation for Sampling

Before beginning field activities, a field team leader will be assigned. Working in conjunction with the project manager, the field team leader is responsible for preparation and organization of the field activities. A general checklist of personal supplies and equipment is presented in Attachment B. The general responsibilities of the field team leader for site preparation and restoration are described below.

3.1.1 Office Preparation

Prior to leaving the office for field work, the ASPA Project Manager will assign a Field Team Leader to direct field activities and coordinate with project/task managers, and personnel. General responsibilities include:

- Reviewing this SAP;
- Notifying site personnel to arrange site access and coordinate schedules;
- Coordinating field efforts with the subcontractors and analytical laboratory;
- Generating appropriate paperwork for each event and shipping appropriate paperwork and field books to the site;
- Ordering appropriate supplies and equipment for delivery prior to the start of each event, including PPE;

3.1.2 Field Preparation

After arrival on site, but prior to commencement of operations, the following procedures will be employed:

- Verify that all required paperwork and equipment for field activities is on site and inventory all rental equipment;
- Conduct site set up activities to include posting of signage (if applicable), delineation of work zones as specified by the Field Team Leader;

- Check that monitoring equipment is functioning properly and calibrate monitoring equipment (as needed);
- Conduct team safety meetings as required by the HASP; and
- Conduct team review of the procedures to be followed.

3.2 Groundwater Sampling

The validity of analytical data is dependent on the integrity of the field procedures employed in obtaining a sample. Environmental sampling has many variables, which can affect analytical results. The properties of most contaminated materials warrant the analysis of a small aliquot of the bulk of the material. Proper sampling techniques must be employed to obtain a representative sample of the bulk material. For a sample to be representative, it must be collected and handled so as to keep its original physical form and chemical composition as much as possible and to protect against any loss or contamination. To achieve this sample's integrity, quality assurance procedures must be closely followed throughout the sampling effort.

3.3 Sampling and Field Measurement Equipment

The nature of the compliance groundwater monitoring program at the AWTC site dictates that equivalent substitutions of equipment will be required over time. The following lists of sampling and field measurement equipment should be considered generic in nature. An example list of equipment to be used for groundwater sampling is included in Attachment B.

Field measurement instrument probes (Table 1) will be rinsed, cleaned, and handled according to the manufacturers' instruction manual. These field instruments do not normally contact the groundwater sample to be taken to the laboratory for analyses.

3.4 Special Sampling Requirements

Wells with free product will not be sampled for trace chemical analysis. Priority pollutant samples (or any trace contaminant samples) will be analyzed in the parts-per-billion (ppb) range for many compounds; therefore, extreme care must be applied to prevent contamination of samples. When volatile organic compounds (VOCs) are included for analysis, field team members must use caution to ensure that the samples are not exposed to the atmosphere unnecessarily.

The following precautions should be taken when sampling for all trace contaminants:

1. New, disposable, unpowered latex or nitrile gloves are worn for each new sampling station. Other types of gloves may be used as long as the construction materials do not contaminate the sample or if safety procedures require greater protection.
2. Sampling must be performed in such a manner that any material or liquid being collected that contacts the gloves (and/or any external surface of the sample container) does not contaminate the sample.
3. When possible, samples should be collected from stations that are least contaminated (i.e., background) followed by stations in increasing order of contamination.
2. Unless otherwise required by ADEM, samples from monitor wells containing free product will not be analyzed for trace chemicals.

When sampling for the presence of volatiles, organics, and extractable organics parameters, the following additional precautions will be taken:

1. The sample bottles and equipment must be kept away from fuels and solvents. When possible, gasoline (used in generators) should be transported in a separate vehicle from bailers, sample bottles, purging pumps, water sampling bottles, etc. If possible, one person should be designated to handle samples and another to operate the generators/boat, and pump fuel for the truck/boat. If this is not feasible, disposable gloves should be worn for each activity and then properly discarded. Care must be taken not to spill any fuels on clothing.
2. The sampling equipment should be made of Teflon™, glass, or stainless steel.
3. Water samples for volatiles analyses must be taken with minimal agitation and/or aeration to prevent stripping of volatiles from the samples; the bottles should be slowly filled by running the sample down the side of the bottle until there is a convex meniscus over the neck of the bottle; the Teflon side of the septum (in cap) should be positioned against the meniscus and the cap screwed down tightly; the sample should be inverted and the bottle lightly tapped. The absence of an air bubble indicates a successful seal; if a bubble is present, the cap should be removed, more sample added, and the bottle resealed. If a successful seal cannot be achieved within three attempts, the entire sample container will be discarded and a new vial used to collect the sample.

4. Extra Teflon™ seals should be available because the seals are difficult to handle and might be dropped. Dropped seals should be considered contaminated and unusable. When replacing seals or if the seals become flipped, care must be taken to ensure that the Teflon™ side faces the sample.
5. Oil and grease (O&G) fractions should not be composited due to the possible loss of compounds on intermediate sample containers. Intermediate sample containers should not be used (if possible). Water samples should be taken from a well mixed portion of the water column, not from the surface.
6. Where practical and appropriate, water sampling equipment and sample containers (except pre-preserved containers) should be rinsed with sample water before the sample is taken. Exceptions to this include those sample fractions used for analysis of O&G, TRPH, microbiological samples, volatile organics, any organic extractables, or any pre-preserved sample container.
7. Unless field conditions justify other sampling regimes, the preferred order of sample collection is as follows:
    a. Volatile [volatile organic analyte (VOA), 1,2-dibromoethane (EDB), total organic halides (TOX), sulfides];
    b. Total organic carbon (TOC);
    c. Extractable organics [including total recoverable petroleum hydrocarbons (TRPH), oil & grease, pesticides, and herbicides];
    d. Total metals;
    e. Dissolved metals;
    f. Microbiological;
    g. Phenols;
    h. Cyanide;
    I. Various inorganics/nutrients, demands, and physical properties; and
    j. Radionuclides.

Table 2 presents a summary of the required containers, holding times, and preservation techniques.

3.5 Groundwater Sampling Equipment Decontamination

Purging and sampling equipment to be used at the AWTC site is listed in the Attachment B although equivalent equipment may be substituted. It is ASPA's policy that all sampling equipment will be decontaminated prior to mobilization to the sampling site. Decontamination procedures will be performed in general accordance with the most recent version of the AEIRG and the USEPA Region 4 LSASD guidance. Some disposable field equipment (such as bailers) may not require decontamination if the manufacturer’s protective packaging is intact at the time of sampling. Bailers used at the AWTC site are usually single-use, disposable and contaminate free. It is the responsibility of the Field Team Leader to verify that disposable field equipment meets the QA/QC requirements of the sampling program. Equipment will be transported to the field precleaned and ready to use. After use, all equipment is immediately rinsed with tap water. If field sampling equipment is not required for additional sampling (and field decontamination is unnecessary) the equipment will be tagged with the sample location and returned for the next premobilization decontamination procedure. Grossly contaminated sampling equipment will be rinsed with acetone prior to application of the regular decontamination procedure. After decontamination, the field and sampling equipment is stored in a contaminant free environment.

The standard decontamination solvent will be pesticide-grade isopropanol. If a more polar solvent is required for a particular investigation, pesticide-grade methanol may be used if written safety procedures covering the handling and use of methanol have been approved by the Safety Officer and included in the work plan or project QA form. The Project QA Supervisor must approve use of other solvents such as acetone, hexane, and petroleum ether. Use of acetone is generally discouraged because residues of acetone may be detected in samples being analyzed for acetone. Hexane and petroleum ether are not miscible with water and, therefore, are effective only if the equipment is dry. The use of any solvent other than pesticide-grade isopropanol for sampling equipment decontamination must be justified, and its use must be documented. Disposal of solvent rinses must be performed in an approved manner (i.e., containerized for disposal).

The following sampling equipment decontamination procedures are for sampling equipment that contact sample matrices. These methods are applicable to cleaning the sampling equipment prior to mobilization and in the field. However, hot tap water would not be available during field decontamination.

3.5.1 In-house Decontamination for Sampling Equipment

Sampling equipment for organic compounds, nutrients, and trace metal analyses:

1. Clean with Liquinox™ and hot tap water (a higher grade of water may always be substituted for tap water) using a brush, if necessary, to remove particulate matter and surface films.
2. Rinse thoroughly with tap water.
3. Rinse thoroughly with deionized (DI) water.
4. Rinse twice with pesticide-grade isopropanol.
5. Rinse thoroughly with analyte-free water (as available in the field).
6. Allow to air dry.
7. For storage, wrap in new aluminum foil or polyethylene, as appropriate, to prevent contamination.

3.5.2 In-field Decontamination for Sampling Equipment

1. Sampling equipment for organic compounds, nutrients, and trace metal analyses:
   a. Clean with Liquinox™ and tap water (a higher grade of water may always be substituted for tap water) using a brush, if necessary, to remove particulate matter and surface films.
   b. Rinse thoroughly with tap water.
   c. Rinse thoroughly with DI water.
   d. Rinse twice with pesticide-grade isopropanol.
   e. Allow to air dry.
   f. For overnight storage, wrap in new aluminum foil or polyethylene, as appropriate, to prevent contamination.

   Once used in the field, if no further sampling is required for a piece of sampling equipment, rinse with tap water if readily available, label with the sample location, and return to the lab for in-house decontamination procedure.

   Note: Do not attempt to decontaminate heavily contaminated sampling equipment in the field as the proper pre-rinse solvents will not normally be readily available. Instead, rinse with tap water, label with the sample location, and

return to the lab for in-house solvent pre-rinsing and decontamination procedures.

2. Groundwater purging and monitoring equipment:
    a. Elevation tapes, reusable lanyards, and slugs (slug testing) will be washed with an appropriate soap solution to remove particulates and film, rinsed with tap water, followed by a DI water rinse, allowed to air dry as long as possible, and placed in a polyethylene bag to prevent contamination during storage or transit. If gross contamination is evident, the gross materials will be wiped off as much as practical, and then cleaned according to the procedure provided in the previous Item.
    b. Submersible pumps used for well purging and sampling will be cleaned prior to use and between wells by flushing copious amounts of tap water through the pumps and associated hoses, followed by rinsing with DI water. The exterior of the submersible pumps and hoses which contact formation water will be cleaned by washing with Liquinox™ solution or comparable solution if deemed appropriate by the contractor , followed by tap water rinse, and a final DI water rinse. To prevent degradation of or damage to submersible pump seals, impellers, and electric motors, rinsing with solvents and/or acids should not be performed.
    b. Drop pipes and Teflon™ tubing used to purge wells will be cleaned prior to use and between wells by washing with Liquinox™ solution, rinsing with tap water or potable water, followed by rinsing with DI water, then rinsing with pesticide grade isopropanol, with a final rinse of DI water.

3. Drilling tools:
    a. All drilling equipment will be steam cleaned prior to shipment to a site.
    b. Between borings, drilling tools will be steam cleaned using tap water to remove traces of soil, rock, or other contaminants. In addition, downhole tools will be rinsed with DI water, followed by pesticide grade isopropanol, and air dried.

4. Classic water quality parameters requiring water sampling bottles, biochemical oxygen demand (BOD) samplers, grabs, etc.:
    a. Remove deposits of material/sediment with a brush if necessary.

b. Rinse with DI water.

c. Rinse with water from the next sampling location.

5. ISCO Automatic samplers -- Follow EPA's standard cleaning procedures for automatic sampling equipment. Silastic pump tubing will be decontaminated in-house by flushing an appropriate hot soapy solution through the tubing, followed by a through rinse with hot tap water, and DI water. Teflon™ tubing used with automatic sampling devices will be in contact with the sample medium and will be decontaminated in-house only by exteriorizing the outside with the washing methods previously described (see 1.a through f). The inside of the tubing will be decontaminated by pumping the sequence of solutions and solvents (see 1.a through f) through the entire length of the tubing.

6. Field filtration tubing (silastic rubber and Teflon™) will be decontaminated using the same procedures described Item 5 of this section for ISCO samplers or used just once.

7. All field decontamination wastes are collected and disposed of according to waste type. The field decontamination waste disposal procedures are described in detail according to waste type (i.e., solvents, acids, DI water, and water/soap solutions) in Table 5

3.5.3 Sample Containers Cleaning Procedures

This program uses the commercially cleaned sample containers provided by the subcontracting laboratory. Sample container requirements and cleaning procedures are summarized in the example laboratory QA plan included in Attachment A. It should be noted that over the renewal period, the laboratory performing the analysis may change. If the laboratory is changed, their QA manual will be obtained, reviewed by ASPA for conformance to the program requirements and maintained at the ASPA offices.

3.6 Sampling Protocols

Groundwater samples are typically obtained from existing or newly installed monitor wells. This section specifies details and procedures for collecting groundwater samples for chemical analysis. Groundwater samples will be collected from monitoring wells using an appropriate pump. Sampling and laboratory analysis will be performed in general accordance with the most

recent version of the AEIRG and the *USEPA Region 4 LSASD* guidance. Samples will be collected in general accordance with the procedures outlined in those SOPs, with specific details/deviations provided in this SAP. Chemical analyses will be performed in general accordance with the most current *SW-846 Edition*.

Field sampling activities will include collection of the following samples:

- Groundwater
- Equipment rinsates (when using non-dedicated equipment)
- Ambient blanks
- Field duplicates and extra aliquots for MS/MSDs

3.6.1 Preparation for Groundwater Sampling

General office and field event preparation procedures described in Section 3.1 and should be performed in preparation of groundwater sampling. Environmental conditions such as weather conditions, ongoing activities that may influence or disrupt sampling efforts, accessibility to the sampling locations (e.g., rough terrain, fallen trees, flooding) etc. should also be noted in the logbook. A Site Manager – Trip Log for use in guiding field activities is included in Attachment C Forms.

3.6.2 Sample Collection Procedures

Groundwater samples will be collected from monitoring wells. To the extent practicable, wells should be sampled in order of increasing contamination (i.e. - samples that are expected to be least contaminated will be collected before those that are more highly contaminated). Low-flow/micro-purge sampling methods will typically be used. In most cases, peristaltic pumps with disposable Teflon-lined tubing will be used to sample the wells. General guidelines for low-flow sampling procedures and procedural details to be followed while on site are described below. Disposable Teflon® bailers may be used under low recharge conditions, where low-flow/micro-purge methods are not applicable. Portable instruments will be used to measure water quality parameters such as pH, specific conductivity, temperature, turbidity, and dissolve oxygen. Calibration procedures for a commonly used photoionization and flame detection devices, DO, pH, conductivity, temperature, and turbidity meters are provided in Section 6 of this document. These samples will be collected according to the manufacturers' instructions included in the test kit. Decontamination of pumps and water

level indicators are required prior to and after each sampling event. A general supply list for groundwater sampling is given in Attachment B. Observations made during sample collection will be recorded in a field notebook and on a well sampling data form.

Water level measurements will be collected prior to groundwater sample collection with the goal of collecting all of the measurements within a 24 hour period. Water level measurements will be collected at wells to be sampled during the applicable monitoring event and recorded on the Monitor Well Water Level/Product Measurement Form included in Attachment C. Additionally, depth to groundwater and total well depth measurements will be performed at accessible onsite and offsite groundwater monitoring wells and at onsite piezometers on at least an annual basis throughout the remediation process. Table 2 of the OM&M manual lists existing site wells and piezometers as of the date of this FSAP. The depth to water will be measured from the top of the polyvinyl chloride (PVC) well casing and not from top of the protective cover or vault. Each well will be inspected prior to sampling to document the condition of the monitoring well.

General procedures for fluid level measurement and well depth measurements are provided below; procedures will be in accordance with the most recent versions of AEIRG and applicable USEPA Region 4 LSASD/SESD operating procedures/guidance for groundwater sampling and field measurements and associated tasks.

1. Typically, water levels are measured from the top-of-casing of the least-contaminated wells to the most contaminated wells to minimize the potential for cross contamination. The water level measurements in each of the wells should be performed in as short a time frame as feasible.

2. Locate the well to be sampled and record the condition of the well including any damage or evidence of tampering.

3. Water levels will be measured before purging, during purging, and after sampling, the water level probe should be carefully lowered down the well to minimize disturbance.

   Caution shall be used when opening each well to avoid fumes which may have accumulated and to prevent foreign materials from entering the well. A photoionization detector (PID) or flame ionization detector (FID) is used to measure

organic vapor levels from within the monitoring well immediately upon opening for health and safety purposes.

4. The sealed well covers shall be removed prior to collection of the water levels. The water levels must be allowed to stabilize after removing the sealed cover. The period of stabilization may vary between each well and should be determined to collect an accurate measurement.

5. The water-level indicator and tape will be decontaminated prior to each use. Equipment decontamination is discussed in Section 3.5; the decontamination procedure for the water level indicator or oil/water interface probe is:

   a. Hand wash the calibrated tape and probe with a solution of Alconox (or equivalent).
   b. Rinse with deionized (Reagent Grade II) water.
   c. If light nonaqueous phase liquid or DNAPL is noted to be present or is suspected, the following steps should be added to the decontamination procedure.
   d. Rinse with a pesticide grade solvent spray rinse, preferably hexane (all solvents must be pesticide grade or better) in a stainless steel bowl. The solvent waste will be containerized separate from other decontamination liquids and disposed in accordance with Federal and State Regulations.
   e. Rinse with isopropanol.
   f. Rinse with deionized water.

6. Measure the water level from the measuring point to the nearest 0.01 foot, as specified in American Society of Testing and Materials (ASTM) D4750.

7. DO NOT measure the total depth of the well immediately prior to sampling. Well depth should be obtained from well logs. Measuring to the bottom of the well casing may cause re-suspension of settled solids. Refer to Section 2 of the OM&M Manual for well depth measurement procedures.

The following presents the general procedures of the purging and sampling of the monitoring wells; groundwater quality samples will be collected from monitoring wells for laboratory analysis in accordance with the most recent versions of AEIRG and applicable USEPA Region 4

LSASD/SESD operating procedures/guidance for groundwater sampling and field measurements and associated tasks.

1. Monitor well purge volumes will be calculated using the Well Sampling Data Form located in Attachment C and information obtained from the site monitor well drilling records (Summarized on Table 2 of the OM&M manual).

2. Purging may be accomplished by using equipment consistent with the equipment choices recognized in the most recent version of AEIRG and EPA Region 4 LSASD/SESD operating procedures/guidance for groundwater sampling, and procedures for use of aforementioned equipment will also be consistent with those specified in the most recent version of EPA Region 4 SESD operating procedure for groundwater sampling, which may include:
    a. Using a decontaminated Teflon™ bailer for manual bailing,
    b. Using a decontaminated Teflon™ or stainless steel drop pipe with a motor-driven centrifugal lift pump,
    c. Using a decontaminated submersible pump and appropriate decontaminated tubing or other applicable portable pump (peristaltic, bladder, etc.).
3. The discharge during purging and sampling must flow with minimal turbulence or agitation.

4. The water level should stabilize and the pump rate should allow water to recharge the well so that little or no water level drawdown is observed.

5. Record groundwater level frequently until stabilization occurs. Adjust discharge rate appropriately to make sure that excessive drawdown does not occur. After stabilization, measure water levels at regular intervals.

6. If drawdown is greater than desired, decrease the discharge rate of the pump and repeat discharge and water level measurements. Repeat until the water level stabilizes to closely match the recharge rate. Record pumping rate and any adjustments and depths to water on the purging and sampling log sheet.

7. Ensure the field meters are properly calibrated and maintained in general accordance with Table 3 and manufacturer’s recommendation. If there is a conflict between Table 3

and the manufacturer's recommendation, the manufacturer's recommendation will supersede Table 3.

8. Prior to collecting a groundwater sample, purge the monitoring well. The above referenced AEIRG and applicable USEPA Region 4 LSASD/SESD guidance should be referred to so that an adequate purge is achieved prior to sampling. With respect to volume, an adequate purge is normally achieved when three to five well volumes have been removed, or if using low-flow sampling techniques, may be established in fewer than three well volumes based on stability of field measurements. Purging is generally considered complete if one of these following criteria are satisfied:

    a. Three well volumes (or fewer using low-flow techniques) purged and subsequent stabilization of field parameters (pH, conductivity, and temperature). Stabilization of field parameters is defined as "consecutive readings within 5 percent taken at least 5 minutes apart."
    b. Purging is considered complete at five well volumes even if field parameters have not stabilized. A total of five well volumes may be obtained without monitoring field parameters with the permission of the Project Manager.
    c. At least one fully dry purge with verifying water level measurements noted in the field notes. It has been suggested that one dry purge may not be adequate; therefore, a second dry purge is strongly recommended.
    d. Purge water will be managed and disposed of by appropriate means, which meet regulatory, requirements and as outlined in Table 4. In general at the AWTC site, purge water will be containerized, collected and treated in the on-site, permitted wastewater treatment plant.

9. Wells should not be purged dry, if possible. If a well is purged to a point at which a sufficient quantity of water cannot be removed, a sample will be collected as soon as sufficient recharge occurs. Stabilization of turbidity, ORP, DO, temperature, specific conductance, and pH is not required under this scenario.

10. Stabilization is achieved after three successive readings are within

    ± 0.1 Standard Units for pH
    ± 10 millivolts for ORP

± 3% for specific conductivity

± 10% for DO

<10 nephelometric turbidity units (NTU) for turbidity

11. Temperature will also be measured and recorded, but will not be used as a stabilization parameter. Sampling may begin once the well has stabilized.

12. Samples will generally be collected at a flow rate of 100 mL/minute). However, in the event of large sample volume or time constraints, only the sampling of VOCs would be performed at 100 mL/minute (+20 milliliters). The remaining parameters will be collected at a flow rate of up to 300 mL/minute.

13. Some pumps may be used for sampling groundwater based on the notes and restrictions defined in Sampling Equipment List located in Attachment B. The only pump approved to be used to collect volatile samples is a bladder pump that is constructed entirely of stainless steel and Teflon™ including hoses Sampling Equipment List located in Attachment B.

14. All sampling equipment will be kept off contaminated soil to prevent sample cross contamination (e.g., equipment may be placed on disposable polyethylene plastic sheeting).

15. Well sampling equipment will be decontaminated and protected from recontamination until use. Purging and sampling will be conducted in a manner that minimizes the agitation of sediments in the well and formation. Equipment will not be allowed to free fall into a well.

16. After samples have been collected, place samples into the cooler with ice and fill out required chain of custody (COC) documents and appropriate documentation in accordance with the procedures specified in Section 4. Replace the well cap and lock the security casing. Table 8 (collective Tables 8A, 8B, 8C) of the permit application shows the analytes and the sampling method.

17. During the sampling of each monitor well, information regarding the sampling will be kept in a field notebook and Well Sampling data Form located in Attachment C. The following data will be collected:

    a. Well number;
    b. Date;
    c. Time;
    d. Static water level [to + 0.01 foot (ft)];
    e. Depth of well;
    f. Number of bailer volumes removed or pumping rate, if applicable;
    g. Time (duration) of pumping, if applicable;
    h. Total volume of water evacuated from well;
    i. Water quality measurements of pH, specific conductance, and temperature;
    j. Other pertinent observations of water samples (color, turbidity, odor, etc.);
    k. Fractions sampled and preservation method;
    l. Weather conditions and/or miscellaneous observations;
    m. Signature of sampler and date; and
    n. Bailer inventory number, if pre-cleaned bailers are used.

3.7 Equipment Calibration and Quality Control

Equipment will be calibrated according to manufacturers' instructions or general accepted practices. Calibration of field instruments will be recorded in a calibration log. At this time, the contractor that will be collecting the samples has not been selected. As such, the specific equipment that will be used for data collection have not been selected and manufacturer's calibration procedures are not included. The manufacturer's recommended calibration procedures will be followed and recorded on a calibration record form. An example calibration record form is shown in Attachment C. General calibration information for the anticipated instruments is included below.

- The combination combustible gas/oxygen/hydrogen sulfide or carbon monoxide indicator used to screen for explosive conditions and hydrogen sulfide or carbon monoxide is factory-calibrated, but may be recalibrated by following manufacturer's instructions. Hydrogen sulfide gas (or carbon monoxide), ambient fresh air, and methane gas are used in the calibration procedure.

- Monitoring for organic vapors may be performed in the breathing zone and/or at the source (as appropriate) using a PID and/or an FID to detect and quantify organic vapor levels. The PID is factory-calibrated to a benzene gas standard. Calibration will be checked prior to each usage following procedures described in manufacturer's instruction manual. Isobutylene is used as a check gas for the on-site instrument calibration. The FID is factory-calibrated to a Methane gas standard. Calibration will be checked prior to and after each usage following procedures described in manufacturer's instruction manual. Methane is used as a check gas for the on-site instrument calibration. As applicable, the battery power supply will be recharged each evening before use.

- Chemical-specific detector tubes used in conjunction with the FID and PID to detect and quantify specific organic vapor levels are pre-calibrated prior to being shipped from the manufacturer. The pump used in sampling must be checked regularly to verify flow rate and sample volume per pump stroke.

- Where possible, an instrument that is designed to measure oxidation-reduction potential (ORP), dissolved oxygen (DO), pH, specific conductance, turbidity, and temperature of groundwater in-line at the wellhead will be used. This instrument will be calibrated per the manufacturer's instructions.

- Water level indicators, oil/water interface probes and steel or fiberglass measuring tapes will be visually checked to confirm that the measurement marks are readable and the equipment is in good working condition.

Field equipment will be stored overnight at a location to be determined by the field team leader in consultation with ASPA and contractor representatives. Equipment must be returned decontaminated and any malfunctions reported to the field team leader. The field team leader will take any actions necessary for the repair or replacement of the equipment. Equipment maintenance and calibration logs will be kept on file in the master project files. All sampling equipment should be maintained according to manufactured specifications before sampling or as otherwise specified. Table 5 presents a summary of generic field calibration information. It may be modified based on the specific equipment being used in accordance with manufacturer's recommendations.

3.8 Field Performance and System Audits

Field audits will consist of three elements: audits of field operations performed by ASPA personnel or their designees, self audits of field ASPA or contractor personnel on the documentation generated during the field operations. The field audits will ensure the quality of work. Section 7 of this FSAP discusses procedures for corrective actions to be taken in the event that nonconformance issues are identified.

3.9 Methods of Sample Preparation

3.9.1 Split and Duplicate Samples

Split samples allow the comparison of analytical results from separate laboratories. Split samples are obtained as subsamples from the same parent sample and are divided into two (or three) segments for analysis in separate laboratories. Discrepancies in analytical data from split samples can serve as an index for investigating laboratory or sampling performance.

When splitting aqueous samples, homogenization of the sample is only necessary if heterogeneity is suspected (VOA must not be homogenized). It is not generally necessary to homogenize groundwater or surface water samples when splitting, and it is generally unnecessary to divide a bailer's contents among several bottles.

Duplicates (for water) are collected by sampling from successively collected volumes (i.e., samples from the next bailer of sample water). Field duplicate samples, trip blanks, and field equipment (rinsate) blanks must be included as part of those samples which are split between the two or more laboratories involved.

3.9.2 Field Filtration of Samples

Typically, water samples collected for total metals analysis are not filtered, because a filtered sample does not accurately reflect the total metals concentration (dissolved plus suspended) of the matrix. When sampling and analysis for dissolved metals is required, filtered and unfiltered fractions are collected using the filtering procedures and equipment described in the following section.

Filtration of trace metal and nutrient samples will be performed using one of the following filtering procedures.

Clean, noncontaminated tubing will be attached to a valve at the bottom of a bottom-discharge type bailer containing sample water. The tubing will be connected to a peristaltic pump with a clean disposable inline filter [1.0 micrometer (µm) for dissolved metals in groundwater or 0.45 µm for other filtration requirements] attached to the tubing on the discharge (positive pressure) side of the pump. The filtered sample will be collected directly into the sample container from the filter discharge. Inline pre-filters will be used ahead of the filter as required for turbid samples. Both the filtered and unfiltered metal fractions will be preserved with acid and

chilled with wet ice prior to packaging for shipment/transport to the appropriate laboratory. Filtration tubing and filters will be used once and then discarded. Equipment blanks of the tubing, filter, and/or pre-filter will be collected as necessary.

For wells where the water level is deeper than 25 ft (1 atmosphere), a bladder-type or Grundfos submersible pump may be used to bring the sample to the surface though clean tubing. There, following the purge cycle, the flow rate will be reduced and a new inline filter will be attached to the end of the tubing. The filtered sample will be collected directly into the sample container from the filter discharge. Inline pre-filters will be used ahead of the filter as required for turbid samples. Both the filtered and unfiltered fractions will be preserved with acid and chilled with wet ice prior to packaging for shipment/transport to the appropriate laboratory. Filtration tubing and filters will be used once and then discarded.

In addition, demand nutrients may also be filtered in the field using filters in a filtration flask in conjunction with a vacuum filtration system.

3.9.3 Sampling Containers, Volumes, Holding Times, and Preservation

Sample handling involves the procedures used to label, identify, ship, and preserve samples collected in the field. Sample handling and documentation procedures for the Facility are presented below.

Sample containers will be labeled before sample collection (in pre-preserved bottles as appropriate). Once samples are collected, the bottles will be placed into an iced cooler. While the coolers are packed for shipment, sample bottles will be checked to ensure that each container is filled with the prescribed amount of sample and contains the proper type and amount of preservative, and that all sample labels contain the required information (date, time, sampler's identification, and whether the sample is preserved). The samples will be sealed in bubble bags and/or plastic sealable bags and placed into the cooler.

Ice in plastic bags (double-bagged) will be placed in the coolers to keep the samples at 4° Celsius (C; $\pm$2°C) throughout shipment. Each cooler will have a temperature blank. In addition, a trip blank will accompany any samples to be analyzed for volatiles. The COC will be completed and taped to the underside of the cooler lid along with the sample Request for Analysis. A custody seal will be placed on the front and on the rear of each cooler. The seals will be initialed and dated.

Sample custody in the field begins with labeling each sample container, collecting and preserving the samples, and packaging samples for shipment to the designated laboratory. Proper documentation of field samples includes completing the logbook, and the COC record for each sample shipment. QC samples are collected and analyzed to assess the quality of the sampling effort and the analytical data. Field QC samples include duplicates and replicates of field samples, MS/MSDs, rinsate blanks, trip blanks, and field (ambient condition) blanks. The type, description, preparation, collection, and frequency of field QC samples are described in Section 6.

3.10 Laboratory Sample Receipt, Custody, and Holding Time Requirements

This section presents the laboratory procedure for sample receipt condition verification, handling requirements/sample storage, intra-laboratory custody requirements, corrective actions for incoming samples, and analytical parameter holding times.

The sample containers, sample volume, method of preservation, and holding times are presented in Table 2.

Upon arriving at the lab, samples are logged in by a designated Sample Custodian giving each sample a unique identification (ID) code. Sample receipt protocols and storage conditions include the following:

- Determine if the temperature requirement has been maintained during shipment, notifying the site manager and senior chemist immediately, and documenting the cooler receipt form and COC.
- Verify the samples received are listed on the COC. Notify ASPA Project Manager if not listed.
- Verify the sample holding times have not been exceeded. Notify ASPA Project Manager if hold times have been exceeded.
- Examine shipping records for accuracy and completeness.
- Sign each COC and attach the waybill.
- Note other problems with the coolers and samples on the cooler receipt form, specifically with preservation. Notify site manager and senior chemist immediately.
- Log each sample into the Laboratory Information Management System, and attach the laboratory sample numbers to each sample bottle.

- Place the samples into proper laboratory storage.

Samples must arrive at the lab accompanied by a COC form. A copy of an example COC form is presented in Attachment C. The field personnel will also retain a copy of the COC. The lab project manager will send a copy of the laboratory sample receipt form via email to the Field Team Leader, to assure the samples were received intact and properly preserved. The lab will also generate an intra-lab COC that will be maintained while the samples are being analyzed and remain in lab custody. This ensures that the samples are maintained at the proper storage temperature, and that the sample integrity is maintained through adequate protection from contamination from outside sources or from highly contaminated samples.

Holding times are the responsibility of the lab for samples received within 48 hours of sampling or if less than half of the holding time has passed. If a holding time is exceeded, the laboratory identifies and documents the root cause of the delay, and contacts the ASPA Project Manager Immediately.

3.11 Monitoring Well Installation and Abandonment

The monitoring well network to support the groundwater compliance monitoring program is in place and functioning as intended. However, in the future existing wells may need to be abandonment and/or replacement wells may need to be installed. The following sections further describe these procedures.

3.11.1 Monitoring Well Installation

Hollow-stem, mud rotary or sonic drilling methods may all be required by site conditions. Well installation shall be conducted in accordance with AEIRG guidelines and applicable standards.

Monitoring wells will be designed and installation supervised by qualified environmental professionals according to project specifications, and in accordance with ADEM guidelines and previous well construction methodology. Monitoring wells will be designed and installed in a manner to accomplish the following objectives: to collect representative groundwater samples; to prevent contamination of the aquifer by the drilling equipment; to prevent vertical seepage of surface water or inter-aquifer contamination. Well risers will be constructed of either

PVC or stainless steel, and well screens (if applicable) will consist of new, commercially fabricated, threaded, flush joint, factory slotted or continuous wrap screen. Screen slot size will be based on previous available soil information, but will be generally sized to prevent 90 percent of the filter pack from entering the well. The screen slot size will be adjusted if site geologic conditions significantly differ from the expected conditions. Previous well installation at the Facility has generally used factory-slotted or wire-wrapped screens with 0.010-inch openings, approximately 10-feet in length. Depending upon the well design selected, filter pack, bentonite seal and grout seal installation will be performed consistent with AEIRG and USEPA guidelines. Surface completion (flush or projected above ground surface) will be based on well location and future area use and will be determined by the Project Manager/Project Coordinator. Wells will be secured after completion. Corrosion-resistant locks will be provided for both flush and aboveground surface completions.

Prior to setting up on the drilling location, the field team leader will confirm that the location has been cleared with appropriate utility companies and with the property owner. Drilling will only proceed where no aboveground or subsurface obstructions exist. Locations will be offset if these obstructions are identified or encountered after drilling has begun. The new locations will be as close as possible to the originally proposed locations; utility clearance will be performed again as necessary.

The geologist/engineer will log the subsurface conditions encountered in the boring, and record the information on a Drilling Log located in Attachment C and the logbook. Field screening of soil samples obtained from the boreholes for organic vapors may also be performed.

Should the use of water become necessary during drilling, it will be from a clean, potable source. ATWC's personnel that will supervise the drilling and record the amount of water used. Field waste disposal sampling, as discussed in Section 3.11, is also applicable to drilling activities.

Upon completion of drilling, each new well will be developed as necessary using a submersible pump (or similar) and surging to remove fines and increase the competence of any water-bearing fractures, consistent with AEIRG guidelines. Well development will not begin until at least 24 hours has elapsed following well installation and grouting or installation of the surface pad and outer protective casing, to allow for adequate grout curing time. Development will continue until the parameters of pH, temperature, turbidity and specific conductance have

stabilized and the column of water in the well is free of visible sediment. If water was used during drilling or well installation, that volume should be removed at a minimum prior to completing development. The well will be considered stabilized when three or more readings of each parameter do not change within allowable limits following removal of the minimum required volume. In the event that the above criteria have not been met after six hours of pumping, surging, and bailing (including recharge time for poorly recharging wells), development activities will be temporarily discontinued at that well. The ATWC field staff will advise the AWTC Project Manager/Project Coordinator who will decide whether or not to continue development of the well. No detergents, soaps, acids, bleaches, or other additives will be used to develop a well. Well development equipment will be decontaminated as specified in Section 3.6. Well development data will be recorded on Well Development Data Form. An example of this sheet is shown in Attachment C. Development water will be drummed or stored in bulk containers. The containers will be clearly labeled with site name, well name, date, and contents. The development water will be properly disposed in accordance with IDW procedures set forth in Section 3.11. Proper disposal will consist of sending the water through the on-site wastewater treatment plant, if available. At least 24 hours will be allowed to pass between development of the well and sample collection.

3.11.2 Post Drilling Operations

Before leaving the site, the following procedures will be performed by on-site personnel:

- Decontaminate all field equipment that has come in contact with soil or groundwater (refer to Section 3.6 for additional details).
- Ensure that each drilling location is clearly marked for surveying.
- Complete logbook, making notations as to site conditions, anomalous readings, etc.
- Drilling Logs – Attachment C.
- Ensure that equipment and associated supplies are shipped back to the office.
- Ensure that IDW containers (e.g. drill cuttings, decontamination water) or personal protective equipment (PPE) are sealed and have been labeled clearly with the date, name, contents and source.

- Ensure that the site is returned to its condition prior to drilling operations to the extent feasible (i.e., trash related to drilling operations must be disposed of prior to departure from the site).
- A form equivalent to Soil Sampling Control Log is used to record information for soil if soil samples are collected during drilling of the monitor wells. A representative Monitor Well Development Form is provided in Attachment C.

3.11.3 Well Abandonment

In order to maintain the monitoring well network, wells may be required to be abandoned. In accordance with the ADEM Ground Water Branch Guidelines for Well Abandonment and the AEIRG, removal of the well casing is the preferred method of well abandonment. A general description of planned procedures is provided below.

- Removal of the existing concrete well pads, guard posts, and manholes.
- Removal of the well casing and screen.
- Place a mixture of bentonite and cement grout in the borehole from the bottom up, using a tremie-pipe, taking care to prevent bridging, until undiluted grout is visible at the surface.
- Pour concrete into the top two feet of the borehole to form a secure surface seal
- (plug). Restore the surface to closely match surrounding conditions.

As stated above, in accordance with the ADEM Guidelines, the preferred method of abandonment is to completely remove the well casing and screen from the borehole. This may be accomplished using hollow stem auger methods over the well casing down to the bottom of the borehole, thereby removing the grout and filter pack materials from the hole. The well casing can then be removed from the hole with the drill rig or other appropriate equipment. The clean borehole will be overdrilled and then backfilled by pressure-grouting from the bottom to the top using the tremie method.

Because of its brittleness, PVC wells may be more difficult to remove than metal casing wells. If the PVC well casing breaks during removal, the borehole may be cleaned out using rotary or sonic drilling methods to grind the casing into small cuttings that can be flushed out of the borehole by the drilling fluid. An alternate method is to use a solid-stem auger to grind the PVC casing into small cuttings that will be brought to the surface on the rotating flights. After the

casing materials have been removed from the borehole, the borehole shall be overdrilled and pressure grouted using the tremie method, as described above. Following abandonment, a well abandonment form will be prepared. An example Well Abandonment Form is included in Attachment C.

3.12 Field Waste Disposal

Investigation- and remediation-derived waste will be containerized and managed consistent with the most current version of AEIRG (currently ADEM, 2017). Table 4 presents a summary of the disposal procedures.

Four categories of IDW are anticipated to be generated during Corrective Measures Implementation (CMI) field activities: .

- Soil cuttings from borings drilled for monitoring well installation
- Development and purge water from monitoring well development and groundwater sampling activities.
- Decontamination fluids resulting from cleaning of heavy equipment and from decontamination of sampling equipment.
- Miscellaneous waste, consisting of disposable supply containers and used PPE (i.e., Tyvek coveralls, boot covers, gloves and respirator cartridges)

Disposal options for the Facility IDW are based primarily on contaminant concentrations of the waste. Non-hazardous wastes may be disposed of off-site at a Resource Conservation and Recovery Act (RCRA) Subtitle D facility. Hazardous wastes must be containerized and disposed off-site in accordance with RCRA Subtitle C requirements.

IDW will be containerized at each site in 55-gallon drums or alternative storage containers which meet the requirements of 40 Code of Federal Regulations (CFR) Subpart I – Use and Management of Containers, including:

- Keeping the container in good condition
- Using containers made of material that is compatible with the waste
- Keeping the container closed during storage

A label will be placed on each drum identifying the site where the waste was generated, the matrix of the waste in the drum, and the date that accumulation of the waste began. Drum labels will be kept simple and easy to read. Further, drums containing hazardous waste will be labeled in accordance with applicable USDOT regulations, including 49 CFR Parts 172, 173, 178 and 179.

4.0 SAMPLE CUSTODY

4.1 Sample Custody Objectives

The primary objective of sample custody is to create an accurate written verified record that can be used to trace the possession and handling of the samples from the moment of collection until receipt by the laboratory. Adequate sample custody will be achieved by means of approved field and laboratory documentation.

4.2 Definition of Legal Chain of Custody

A sample for this project is defined to be in someone's custody if:

1. It is in one's actual physical possession;
2. It is in one's view, after being in one's physical possession;
3. It is in one's physical possession and then locked or otherwise sealed so that tampering will be evident; or
4. It is kept in a secure area, restricted to authorized personnel only.

4.3 Legal Custody Procedures

1. Formal chain of custody starts when the precleaned sample containers are dispatched to the field by the subcontractor laboratory.
2. In the field, the Field Team Leader or his designate, is responsible to ensure that the chain-of-custody form is maintained.
3. Copies of the chain-of-custody form and/or field sheets are maintained with project records.
4. Errors in all documents are corrected by drawing one line through the error, then signing, and dating the corrections.
5. Entries into the field and laboratory records are made with waterproof ink.
6. All documentation/logs are signed/initialed by appropriate personnel.

Due to evidentiary nature of the samples collected, possession must be traceable from the time the precleaned containers leave the laboratory to the field. Field chain of custody actually begins at the laboratory.

4.4 Documentation

The records for sample custody include the following Field Notebook Sheets and Field Forms found in Attachment C or equivalents:

Monitor Well Water Level Measurements
Soil Sampling Control Form
Well Sampling Data Form
Meter Calibration Form

Entries into all field records are made with waterproof ink.

4.5 Field Custody

Each sample is identified by affixing the pressure-sensitive gummed label produced by the subcontractor laboratory's information services. Each label has a unique combination of field group name and sequence number, and the sample station identification (ID). Each label also has spaces for the field team members to write in the date and time of sample collection, sampler's signature, and a new station ID, if different than the original station ID. New station IDs may be necessary due to changes in field and/or sampling conditions that require substitution of sampling stations. All changes in station ID are clearly noted in ink on the sample label, logsheet, and field notebook, and must be approved by the Field Team Leader.

Field procedures are designed to minimize sample handling and transfers. During sampling, the field crews will record the following information in the field notebooks and the sample chain-of-custody logsheet using indelible ink:

1. The unique sample number as obtained from the sample label;
2. Source of sample (including name, location, and sample type);
3. Date and time of sample collection (sample sequence);
4. Preservatives used;
5. Name(s) of collector(s);
6. Field data (pH, temperature, and specific conductance);
6. Names of all personnel and visitors onsite during sampling;
8. Purging and sampling equipment used (ID, if applicable);
9. Record of field equipment decontamination;

10. Types of field QC collected (include when and where collected);
11. Type of preservative used;
12. Sample pH checked; and
13. Use of fuel powered units.

4.6 Sample Labels

Sample labels will be filled out for each sample with an indelible pen. Where necessary, the label will be protected from water and solvents with clear label protection tape. Changes in the pre-prepared label information will be initialed by the sampler. Each label will contain the following information:

- Sample ID
- Location ID
- Initials of collector
- Date and time of collection
- Job name
- Preservative (if required)
- Analysis requested

4.7 Additional Information for Monitor Wells

During the sampling of each monitor well, information regarding the sampling will be kept in a field notebook. The following data will be collected:

1. Well number;
2. Date;
3. Sample sequence and time;
4. Static water level (to $\pm$ 0.01 ft);
5. Depth of well;
6. Number of bailer volumes removed or pumping rate, if applicable;
7. Date and time well was purged;
8. Total volume of water evacuated from well;
9. Water quality measurements of pH, specific conductance, and temperature;
10. Other pertinent observations of water samples (color, turbidity, odor, etc.);

11. Fractions sampled and preservation method;
12. Weather conditions and/or miscellaneous observations; and
13. Sampler's signature and date.

5.0 QC CHECKS, PRECISION & ACCURACY

5.1 Field QC Samples

Three types of QC samples may be processed: trip blanks, field duplicates, and equipment blanks. The analytical data derived from these QC samples are necessary to assess field operations: contaminant free sample containers, preserving reagents, and equipment; potential onsite environmental contamination; personnel expertise in sample collection; and problems that may occur in sample storage and transport. Field duplicate samples are collected to ensure the precision of sampling and analytical processes. Requirements for field QC samples are summarized in Table 6.

5.2 Equipment Blanks

Aqueous equipment blanks for groundwater samples are processed after field and/or laboratory decontamination by rinsing decontaminated sampling equipment with analyte free water. The rinse water is collected in sample bottles, preserved, and handled in the same manner as the samples.

1. Sampling events involving **10 or more samples** require:
   a. Equipment blanks prepared in the field by filling or rinsing each type of precleaned equipment set with analyte free water. The equipment blank is collected and analyzed at a rate of one blank or 5 percent (whichever is greater) of the samples in each analyte group for all matrices. If equipment is cleaned in the field then additional equipment blanks must be collected.
   b. Equipment blanks prepared after field decontamination by filling or rinsing each type of field cleaned equipment set with analyte free water. The equipment blank is collected and analyzed at a rate of one blank or 5 percent (whichever is greater) of the samples in each analyte group for all matrices.
2. Sampling events involving 5 to 10 samples of similar matrix requires: One equipment blank for each parameter group on field cleaned equipment or one equipment blank on precleaned equipment (field decontamination was not performed).

3. Sampling events involving less than 5 samples of similar matrix requires: One equipment blank on either precleaned or field cleaned equipment to be collected and analyzed for each parameter group.

5.3 Trip Blanks

Trip blanks for VOCs consist of sample bottles filled by the subcontract laboratory with organic-free water and any applicable preservatives or additives. They are sent to the sampling location with sampling kits and are returned unopened from the sampling location with the samples. These blanks should be included for shipping and analysis with every cooler of volatile samples shipped from the field. Trip blanks will be composed for volatile compounds for water samples.

Frequency: At least one trip blank for each proposed volatile organics method (601, 602, 8020, etc.) shall be provided and analyzed per cooler used for storing and transporting volatile sample vials.

5.4 Field Duplicates

A single sample divided into two equal parts for analysis, or two samples collected independently at a sampling location during a single act of sampling. Field duplicates will be collected at a frequency of approximately 10 percent of the samples collected. Field duplicate samples are collected to assure the precision of the sampling and analytical processes.

1. Sampling events involving **10 or more samples** require: During each independent sampling event, at least one sample or 10 percent of samples (whichever is greater) shall be collected in duplicate for analysis. This requirement applies to all parameter groups and matrices sampled.
2. Sampling events involving **5 to 10 samples** of similar matrix requires: One field duplicate shall be collected and analyzed for all parameter groups and matrices.

5.5 MS/MSD Samples

Samples analyzed by the laboratory to identify and diagnose problems related to sampling or analysis. One MS/MSD pair will be collected for approximately every 20 field samples.

5.6 Rinsate Blank

Samples consisting of reagent water collected from a final rinse of sampling equipment after the decontamination procedure are performed. The rinsate blank determines whether the sampling equipment is causing cross-contamination of samples. Rinsates will be collected at a frequency of one per matrix, per sampling technique, per event. The exception is groundwater sampling with peristaltic pumps and disposable tubing; rinsates will not be required for dedicated equipment or one- time-use disposable equipment.

5.7 Field (Ambient) Blank

Containers of organic-free reagent water that are collected at the sampling site. The field blank determines whether site activities are contributing to impacts on samples. Field blanks pertain only to VOCs; therefore, the container must contain no headspace. Field blanks are collected in the area where the samples are collected and are required only when samples are being collected downwind of possible VOC sources, such as road resurfacing.

5.8 QC Checks on Field Measurements

Field instruments shall be calibrated at the beginning of each sampling day, checked with one standard at intervals not to exceed 4 hours, and checked again at the end of sampling day. Instruments shall be calibrated if these QC checks do not meet acceptance criteria. All QC checks must be recorded in the field notebook.

5.9 Calibration Procedures and Frequency – Laboratory Equipment

The calibration of instruments and support equipment is necessary to ensure that the analytical system is operating correctly and functioning within the guidelines of precision, accuracy, and sensitivity.

Reference standards are used to calibrate the equipment. Physical reference standards include weights for scales and balances, and certified thermometers for calibrating working thermometers. Chemical reference standards include reference materials traceable to recognized standards suppliers, and are generally associated with normal instrument

calibrations. The standards must be verified by quantitation against a second known standard before the data is reported and must meet specified QC criteria for calibration verification.

At minimum, the laboratory equipment must be calibrated and maintained at intervals prescribed by the method. An instrument is said to be calibrated when an instrument response can be directly related to the concentration of an analyte graphically through the use of a calibration curve. The low standard of the curve shall be established by the laboratory as the method RL. Results above the highest standard will be diluted into the calibration range and reanalyzed.

5.9.1 Laboratory Quality Control Procedures

Laboratory overall method performance shall be monitored by the inclusion of various internal QC checks that allow an evaluation of method control (batch QC) and the effect of the sample matrix on the data being generated (matrix specific QC). The overall DQOs are to implement procedures for the laboratory analysis and reporting of the data that are indicative of the degree of quality consistent with their intended use. Laboratory QC samples consist of method and instrument blanks, LCSs, and calibration verification samples. Matrix specific QC samples consist of matrix spike /matrix spike duplicate (MS/MSDs, sample duplicates, and the use of surrogate compounds.

5.9.2 Laboratory Internal Audits

Annual laboratory audits must be conducted for each analytical area to verify that the lab procedures are compliant with the SOPs, documentation practices are complete and traceable to a certified source, data reviews are complete, well-documented, and effective, and data reporting practices are accurate and complete. The results must be presented in a QA report to the lab management.

5.9.3 Laboratory Nonconformance/Corrective Actions

Exceedences of matrix quality objectives (MQO) for MS/MSD samples may be problematic due to matrix effects, but are not necessarily indicative of poor laboratory performance. Corrective actions will depend on the type of interference and professional judgment of the analyst. When there is a potential for false negatives, lack of sensitivity, or an inability to detect a target

analyte, the analyst will inform the laboratory project manager, who will contact the senior chemist to determine a further course of action.

.

6.0 DATA REDUCTION, VALIDATION & REPORTING

Data reduction, validation, and reporting procedures for field activities are presented in the following section. All field information must be maintained for a minimum of three years. The use of standardized forms (e.g., Field Trip Approval Form, Field Sampling Request Form, Field Data Sheet, Well Sampling Request Form, Well Sampling Data Log, Equipment Calibration Forms, etc.) or their equivalent is required.

Field Team Supervisors are responsible for initial field data validation including:

1. Checking raw data entries and calculations,
2. Checking calibration integrity,
3. Following appropriate SOPs, and
4. Making careful and complete records of field activities including sample custody integrity.

Final validation of field data is conducted by the Project Manager and the Site Supervisor. Field records shall be evaluated, at a minimum, for the following:

1. Completeness of all field records,
2. Review of QC measures performed in the field (i.e., duplicates, check standards, calibration checks), and
3. Identification of anomalous field test data.

7.0 CORRECTIVE ACTION

Corrective action is necessary when any measurement system fails to follow this Groundwater Sampling and Analysis Plan (SAP). Items that may need corrective action range from a minor problem of a field team member failing to sign a field form to a major problem of an analyst using an improper analytical method. For this reason, corrective action protocols must be flexible. In general, items needing corrective action fall into three "correction" categories: short-term, long-term, and QC; each item requires different action.

7.1 Short-Term Corrective Actions

These actions consist of minor and major problems that can be corrected immediately. Examples include failure to date or sign a standard form, incorrectly preserving sample, and errors in data entry. Corrective action is initiated by verbally calling attention to the problem followed by written notification.

7.2 Long-Term Corrective Actions

The actions consist of minor and major problems that require a series of actions to resolve the problem. The actions to be taken are coordinated by the Project Manager. An example of this type of corrective action is as follows:

Problem -- A field team member fails to calibrate a conductivity meter in the field prior to use.

Corrective Action -- The problem is identified by the person originating the corrective action, responsibility is assigned to an appropriate person (may be someone other than person failing to calibrate the instrument), an appropriate calibration standard is selected, the standard is ordered, receipt of the shipment is verified that the order is filled properly, training of field members in the use of the standard is required, and the instrument is calibrated in the field during the next field trip. The Project QA Officer audits this process to assure that it is completed in an expeditious manner.

7.3 External Sources

Corrective action may also be initiated from external sources. This may include performance samples results, split samples, audits [onsite or field by ADEM, EPA, etc.], and data validation/review. Corrective actions recommended by agencies such as EPA, ADEM, etc. are prioritized, promptly acted on, and overseen by the Project QA Officer. Actions taken to resolve the problem will be documented and kept by the Project QA Officer.

FSAP Tables

Table 1
Specific Field Analytical Techniques and Measurement Instruments
Alabama Wood Treating Corporation Site
Mobile, Alabama

Analytical Parameter	Method	Container	Equipment
Temperature	Calibrated glass (mercury), dial (mechanical), or electrometric thermometer	In situ, beaker or integral probe container	Hydrolab7, YSI, Horiba, Orion, HACH or equivalent
pH	Electrometrically using a glass electrode in combination with a reference potential or a combination electrode	In situ, beaker or integral probe container	Hydrolab7, YSI, Horiba, Orion, HACH or equivalent
Dissolved Oxygen (DO)	Membrane electrode	In situ, beaker or integral probe container	Hydrolab7, YSI, Horiba, Orion, HACH or equivalent
Specific Conductance	Equivalent meter corrected to 25C	In situ, beaker or integral probe container	Hydrolab7, YSI, Horiba, Orion, HACH or equivalent
Turbidity	Nephelometric Method	Sample cells	Hydrolab7, YSI, Horiba, Orion, HACH or equivalent

Table 2
Required Containers, Preservation Techniques, and Holding Times
Alabama Wood Treating Corporation Site
Mobile, Alabama

Measurement	Container[1]	Preservation	Maximum Holding Time[2] (Waters and Soils)
Metals			
Chromium VI	P, G	Cool, 4°C	24 hours[3] 30 days for soil
Mercury	P, G	HNO_3 to pH<2	28 days
Metals, except chromium VI and mercury (filtered and unfiltered)	P, G	HNO_3 to pH<2	6 months
Inorganic Tests			
Acidity	P, G	Cool, 4°C	14 days[3]
Alkalinity	P, G	Cool, 4°C	14 days[3]
Ammonia	P, G	Cool, 4°C, H_2SO_4 to pH<2	28 days[3]
BOD	P, G	Cool, 4°C	48 hours[3]
Bromide	P, G	None required	28 days[3]
BOD, carbonaceous	P, G	Cool, 4°C	48 hours[3]
COD	P, G	Cool, 4°C, H_2SO_4 to pH<2	28 days[3]
Chloride	P, G	None required	28 days[3]
Chlorine, total	P, G	None required	Analyze immediately[3,7]
Color	P, G	Cool, 4°C	48 hours[3]
Cyanide, total and amenable to chlorination	P, G	Cool, ≤6°C, NaOH to pH>12, 0.6 g ascorbic acid[8]	14 days[3,8]
Fluoride	P	None required	28 days[3]
Hardness	P, G	HNO_3 to pH<2, H_2SO_4 to pH<2	6 months[3]
Hydrogen ion (pH)	P, G	Cool, 4°C	Analyze immediately[3]
Kjeldahl and organic nitrogen	P,G	Cool, 4°C, H_2SO_4 to pH<2	28 days[3]
Nitrate	P, G	Cool, 4°C	48 hours[3]
Nitrate (drinking water)			
Chlorinated	P, G	Cool, 4°C	28 days
Unchlorinated[12]	P, G	H_2SO_4 to pH <2	14 days
Nitrate-nitrite	P, G	Cool, 4°C, H_2SO_4 to pH<2	28 days[3]
Nitrite	P, G	Cool, 4°C	48 hours[3]
Oil and grease	G	Cool, 4°C, H_2SO_4 to pH<2	28 days[3]

Table 2
Required Containers, Preservation Techniques, and Holding Times
Alabama Wood Treating Corporation Site
Mobile, Alabama

Measurement	Container[1]	Preservation	Maximum Holding Time[2] (Waters and Soils)
Organic carbon	P, G	Cool, 4°C, HCl or H_2SO_4 to pH<2	28 days[3]
Orthophosphate	P, G	Filter immediately, cool, 4°C	48 hours[3]
Oxygen, dissolved (DO)			
Probe	G Bottle and top	None required	Analyze immediately[3]
Winkler	G Bottle and top G only	Fix onsite and store in dark	8 hours[3]
Phenols, Inorganic	P, G	Cool, 4°C, H_2SO_4 to pH<2	28 days[3]
Phosphorus (elemental)	G	Cool, 4°C	48 hours[3]
Phosphorus, total	P, G	Cool, 4°C, H_2SO_4 to pH<2	28 days[3]
MBAS	P, G	Cool, 4°C	48 hours[3]
Bromates (ion chromatography)	P, G	Cool, 4°C	30 days[3]
Corrosivity (calculated)	P, G	Cool, 4°C	7 days[9]
Odor	G	Cool, 4°C	6 hours[3]
Unionized Ammonia (calculated)	P, G	Cool, 4°C $Na_2S_2O_3$	8 hours[3] 28 days[10]
Residue, total	P, G	Cool, 4°C	7 days[3]
Residue, filterable	P, G	Cool, 4°C	7 days[3]
Residue, nonfilterable (TSS)	P, G	Cool, 4°C	7 days[3]
Residue, settleable	P, G	Cool, 4°C	48 hours[3]
Residue, volatile	P, G	Cool, 4°C	7 days[3]
Silica	P	Cool, 4°C	28 days[3]
Specific conductance	P, G	Cool, 4°C	28 days[3]
Sulfate	P, G	Cool, 4°C	28 days[3]
Sulfide	P, G	Cool, 4°C, add zinc acetate plus NaOH to pH>9	7 days[3]
Sulfite	P, G	None required	Analyze immediately[3]
Surfactants	P, G	Cool, 4°C	48 hours[3]
Temperature	P, G	None required	Analyze immediately[3]
Turbidity	P, G	Cool, 4°C	48 hours[3]
Organic Tests			

Table 2
Required Containers, Preservation Techniques, and Holding Times
Alabama Wood Treating Corporation Site
Mobile, Alabama

Measurement	Container[1]	Preservation	Maximum Holding Time[2] (Waters and Soils)
Purgeable halocarbons	G, Teflon™ - lined	septum store in dark	Cool, 4°C, 0.008% $Na_2S_2O_3$[5,6]14 days
Purgeable aromatic hydrocarbons	G, Teflon™ - lined septum	Cool, 4°C, 0.008% $Na_2S_2O_3$[5,6] HCl to pH2	14 days
Acrolein and acrylonitrile	G, Teflon™ - lined septum	Cool, 4°C, 0.008% $Na_2S_2O_3$[5]	14 days Adjust pH to 4-5
Phenols	G, Teflon™ - lined cap	Cool, 4°C, 0.008% $Na_2S_2O_3$[5] store in dark	7/40 days for waters[4] 14/40 days for soils[4]
Benzidines	G, Teflon™ - lined cap	Cool, 4°C, 0.008% $Na_2S_2O_3$[5] store in dark	7/40 days for water[4] 14/40 days for soils[4]
Phthalate esters	G, Teflon™ - lined cap	Cool, 4°C, store in dark	7/40 days for waters[4] 14/40 days for soils[4]
Nitrosamines	G, Teflon™ - lined cap	Cool, 4°C, 0.008% $Na_2S_2O_3$[5] store in dark	7/40 days for waters[4] 14/40 days for soils[4]
PCBs, pesticides, herbicides	G, Teflon™ - lined cap	Cool, 0-6°C, 0.008% $NA_2S_2O_3$[5] store in dark	7/40 days for water[4] 14/40 days for soils[4]
Nitroaromatics and isophorone	G, Teflon™ - lined cap	Cool, 4°C, 0.008% $Na_2S_2O_3$[5] store in dark	7/40 days for water[4] 14/40 days for soils[4]
Polynuclear aromatic hydrocarbons (PAH)	G, Teflon™ - lined cap	Cool, 4°C, 0.008% $Na_2S_2O_3$[5] store in dark	7/40 days for waters[4] 14/40 days for soils[4]
Haloethers	G, Teflon™ - lined cap	Cool, 4°C, 0.008% $Na_2S_2O_3$[6] store in dark	7/40 days for waters[4] 14/40 days for soils[4]
Volatile organics - water	G, Teflon™ - lined septum	Cool, 0-6°C, 0.008% Na_2SO_3[6] HCL to pH 2	14 days
Volatile organics - soil	5 g EnCore™ Sampler	Cool, 0-6°C	48 hours
Volatile organics - soil	5 g TerraCore™ Sampler	Cool, 0-6°C	14 days
EDB, DBCP	G, Teflon™ - lined septum	Cool, 0-6°C, 0.008% $Na_2S_2O_3$[6]	28 days

Table 2
Required Containers, Preservation Techniques, and Holding Times
Alabama Wood Treating Corporation Site
Mobile, Alabama

Measurement	Container[1]	Preservation	Maximum Holding Time[2] (Waters and Soils)
Chlorinated hydrocarbons	G, Teflon™ - lined cap	Cool, 4°C, store in dark	7/40 days for waters[4] 14/40 days for soils[4]
TCDD	G, Teflon™ - lined cap	Cool, 0-6°C, 0.008% $Na_2S_2O_3$[6] store in dark	7/40 days for waters[4] 14/40 days for soils[4]
Total organic halogens (TOX)	G, Teflon™ - lined cap	Cool, 4°C, H_2SO_4 to pH <2 store in dark	28 days[3]
Acid and base/neutral extractables	G, Teflon™ - lined cap	Cool, 0-6°C, 0.008% $Na_2S_2O_3$[6] store in dark	7/40 days for waters[4] 14/40 days for soils[4]
Nitroaromatics and Nitramines	G, Teflon™ - lined cap	Cool, 4°C	7/40 days for waters[4] 14/40 days for soils[4]
Toxicity Testing			
Acute tests	cubitainers	Cool in wet ice, 4°C	36 hours
Short-term chronic tests	cubitainers	Cool in wet ice, 4°C	7 days
Bacteriological Sampling			
Coliform	Sterile plastic Whirlpak or equivalent	Cool, 4°C, $Na_2S_2O_3$ Store in dark	6 hours
Coliform (drinking water)	Sterile plastic Whirlpak or equivalent	Cool, 4°C, $Na_2S_2O_3$ Store in dark	30 hours
Tissues			
Organics, inorganics and radiological tests	Aluminum foil and plastic bag	Freeze, -20°C or below	12 months
Metals tests	Plastic bag	Freeze, -20°C or below	12 months

The number and volume of containers necessary may vary depending upon specific laboratory requirements and processes. Also note that content provided regarding container type, preservation and hold times are subject to the method requirements in SW-846 or equivalent and subject to most current version of SW-846 (U.S. EPA SW-846).

Note:
BOD =biochemical oxygen demand.
°C = degrees Celsius.
COD =chemical oxygen demand.
DBCP =1,2-dibromo-3-chloropropane.
G = glass.
HCl = hydrochloric acid (metals grade).
HNO_3 =nitric acid (metals grade).
H_2SO_4 =sulfuric acid (metals grade).
NaOH =sodium hydroxide (ACS grade).

Na_2SO_3 =sodium sulfite (ACS grade).
$Na_2S_2O_3$ =sodium thiosulfate (ACS grade).
NS = none specified by EPA.
P = polyethylene.
PCB = polychlorinated biphenyl.

1 For nonvolatile organics, containers for soil and sediment samples are glass with Teflon™ -lined caps and for volatiles, containers are glass with Teflon™ -lined septum. Soil sample containers for inorganics are glass jars with Teflon™ -lined caps, polyethylene (P), or glass (G).

2 Samples should be analyzed as soon as possible after collection. The times listed are the maximum times that samples may be held before analysis and still considered valid. Samples may be held for longer periods only if the laboratory has data on file to show that the specific types of samples under study are stable for the longer time.

3 Holding times provided are for waters. EPA does not have holding times for these parameters in soil. These water holding times will be used as goals for those methods where a soil analysis is applicable.

4 7/40 = 7 days until extraction; 40 days from extraction until analysis. 14/40 = 14 days until extraction; 40 days from extraction until analysis.

5 Sample preservation should be performed immediately upon sample collection. The only preservation for soil samples is cooling at 4°C. For composite samples, each aliquot should be preserved at the time of collection. When use of an automatic sampler makes it impossible to preserve each aliquot, samples may be preserved by maintaining at 4□C until compositing and sample splitting are completed (maximum allowable time is 20 hours). $Na_2S_2O_3$ is used only in the presence of residual chlorine.

6 If residual chlorine is present, sodium thiosulfate is added to the sample vial first, the vial is then filled to almost full volume with sample, acid is added, and finally the vial is filled. Note: It is not recommended to mix the two preservatives (and sample) together in an intermediate vessel.

7 These parameters are best analyzed in the field.

8 The following test should be performed for cyanide samples:
(a) Oxidizing agents--Test the sample using KI-starch paper. If present, add a few crystals of ascorbic acid and test until negative. Add an additional 0.6 gram of ascorbic acid for each liter of sample to remove the chlorine.
(b) Sulfides--When sulfide is present as indicated by a positive test with lead acetate paper, the maximum holding time is 24 hours. Remove the sulfides by (1) filtration of sample if visible particulates are present, (2) precipitation with cadmium nitrate until a negative spot test is obtain, (3) filtration of the precipitate, and (4) addition of NaOH to pH >12 if sulfides are not removed with the previous procedure.

9 Temperature and pH must be measured onsite at the time of sample collection. Seven days is the maximum time for laboratory analysis of total alkalinity, calcium ion, and total solids.

10 The results of the measurements of pH, temperature, salinity (if applicable), and the ammonium ion concentration in the sample are used to calculate the concentration of ammonia in the un-ionized state. Temperature, pH, and salinity must be measured onsite at the time of sample collection. Laboratory analysis of the ammonium ion concentration should be conducted within 8 hours of sample collection. If prompt analysis of ammonia is impossible, preserve samples with H_2SO_4 to pH between 1.5 and 2. Acid-preserved samples, stored at 4°C, may be held up to 28 days for ammonia determination. Sodium thiosulfate should only be used if fresh samples contain residual chlorine.

11 Chlorinated means that the source water has a detectable amount of residual chlorine, as will be indicated by the field test.

12 Nonchlorinated means that the source water contains no detectable amount of residual chlorine (i.e., below the detection limit).

Table 3
Preventive Maintenance – Field Meters
Alabama Wood Treating Corporation Site
Mobile, Alabama

Instrument	Activity	Frequency
DO meter and probe	Check battery level Check to ensure that mechanical zero is set properly Check DO probe membrane Replace membrane	Daily and replace as needed Prior to each use As needed As needed
pH meter	Battery replacement Probe replacement	As needed As needed
Conductivity meter	Battery replacement Check loose connections Replatinization	As needed Daily As needed
Temperature probes	Check connections Check against calibrated thermometer	Daily Prior to field use
Portable organic vapor detection equipment	Clean exterior after use Check and recharge battery	Daily Daily
Turbidity Meter	Clean exterior after use Check and recharge battery	Daily Daily and replace as needed

Table 4
Field Waste Disposal
Alabama Wood Treating Corporation Site
Mobile, Alabama

Waste Type	Disposal Procedure
Waste soap solutions and DI/tap/analyte-free water	Dispose onsite or into a sanitary sewer.
Nitric/sulfuric acid and other acid wastes	Containerize in a corrosion proof container and transport back to the office, laboratory, or to be handled by a commercial contractor. In some cases, ASDD is able to handle and properly dispose of this waste by onsite wastewater treatment or through commercial contractor.
Calibration standards (pH and conductance)	May be diluted with waste soap solutions, DI/tap/analyte-free water and disposed of onsite or in a sanitary sewer.
All waste solvents (i.e. Isopropyl, Hexane, etc.) and GC standards	Shall be handled as a hazardous waste and must be collected and transported back to the office, laboratory or handled by a commercial contractor. In some cases, ASDD is able to handle and properly dispose of this waste by onsite wastewater treatment or through commercial contractor.
Purge and development water likely to contain contaminants in excess of the MCL (maximum contaminant level)	Waste will be containerized onsite until the waters can be characterized for appropriate disposal by approved analytical method(s) or transport/discharge to an onsite or offsite sewage treatment plant.
Drilling muds, foams, fluids, and soil cuttings from both drilling and hand borings	Shall be containerized onsite in temporary storage containers (i.e. drums) until they can be characterized by the appropriate approved analytical method(s).

Note:
Proper handling and disposal of all waste materials will be addressed prior to initiating site work. These wastes are categorized as either hazardous or non-hazardous wastes. Hazardous wastes shall be disposed of according to any state, county, or municipal regulations. Non-hazardous wastes shall also be disposed of appropriately. he following list is of materials that require proper treatment, storage, and disposal based on their hazardous or non-hazardous nature:

1. Personal protection equipment such as coveralls, gloves, boots, suits, disposable booties, and mask filters.
2. Other disposable equipment such as ground covers, equipment covers (aluminum foil, plastic bags, etc.), disposable tubing, broken or unused sample containers, etc.
3 Soil cuttings from drilling or hand borings.
4. Drilling mud, foam, or fluids.
5. Development and purge waters.
6. Decontamination wastes such as spent solvents and acids, soap solutions, and tap/DI water.
7. Spent calibration standards for field analytical equipment (field GC, conductance, pH, etc.).

Table 5
Field Initial Calibration Requirements
Alabama Wood Treating Corporation Site
Mobile, Alabama

Equipment	Standard Source	Standards	Acceptance/Rejection Criteria
D.O. Meter	Sat. Air Table	1	+/- 0.3 mg of corrected table value
Hydrolab Water Quality Meter	NIST-Traceable Thermometer	temp 1	+/- 0.2°C
	Commercial	pH 3	+/- 0.2 pH units
	Commercial, Tested against NIST-Traceable Stds	cond 3	+/- 1% FS of Range
	Sat. Air Table	DO 1	+/- 0.2 mg of corrected table value
pH/Cond Meter	Commercial	pH 3	+/- 0.3 pH units
	Commercial, Tested against NIST-Traceable Stds	cond 3	+/- 3% FS of Range
Surveyor II Hydrolab	NIST-Traceable Thermometer	temp 1	+/- 0.2°C
	Commercial	pH 3	+/- 0.2 pH units
	Commercial, Tested against NIST-Traceable Stds	cond 3	+/- 1% FS of Range
	Sat. Air Table	DO 1	+/- 0.2 mg of corrected table value
	Ambient Pressure	Depth 1	adjust to 0.00
	Commercial, Tested against NIST-Traceable Stds	cond 3	+/- 1%
Hydrolab Surveyor 3	NIST-Traceable Thermometer	temp 1	+/- 0.2°C
	Commercial	pH 3	+/- 0.2 pH units
	Commercial, Tested against NIST-Traceable Stds	cond 3	+/- 1% FS of Range
	Sat. Air Table	DO 1	+/- 0.2 mg of corrected table value
	Ambient Pressure	Depth 1	adjust to 0.00
	Commercial (pH w/Quinhydrone)	ORP 2	+/- 20 mV of expected value
HNU PID	Alphagaz	2	+/- 10 ppm of calibration standard
OVM PID	Alphagaz	2	+/- 10 ppm of calibration standard
OVM PID	Alphagaz	2	+/- 10 ppm of calibration standard
Turbidity Meter	Based on HACH	0, 20, 100	+/- 2% of 0, 20, 100 NTU standard
	2100P Manual Procedures	800 NTU	+/- 3% of 800 NTU standard

Note: NTU = nephelometric turbidity unit.

Table 6
Frequency of Field QC Samples
Alabama Wood Treating Corporation Site
Mobile, Alabama

QC Samples	Water	Soil
Trip Blank*	1 per cooler	NR
Precleaned Equipment Blank		
1-20 Samples	1 per day	1 per day
>20 Samples	5% per day	5% per day
Field Equipment Blank		
1-20 Samples	1 per day	1 per day
>20 Samples	5% per day	5% per day
Field Duplicates		
1-4 Samples	NR	NR
5-9 Samples	1 per event	1 per event
≥10 Samples	10% per event	10% per event

Note: NR = not required.

All parameters must meet QC sample type and frequency requirements. Numbers calculated from specification will be rounded up to the nearest whole number(s).

*For volatile samples only.

Attachment A

Laboratory QA Manual

At the time of submittal, the laboratory has not been selected (and may vary from event to event)

Attachment B
Equipment Lists

Sampling Equipment List

Type	Materials	Use and Restrictions	
Groundwater Equipment Usage			
Submersible Pumps			
2-inch Grundfos	Stainless steel/Teflon™	Sampling and purging	5,6,7*
2-inch Keck™	Stainless steel	Purging only	1,2,3,4,7
2-inch bladder	Stainless steel body and Teflon™ bladder	Purging and sampling	2,3,4,7
3-inch submersible	Steel	Purging only	1,3,4,5,7,12,18
4-inch submersible	Stainless steel	Purging only	1,2,3,4,7
4-inch, Grundfos™	Stainless steel body and impeller, Teflon™ seals and bearings	Purging only	1,3,4,7
Tubing	Teflon™, stainless steel, rigid PVC, polyethylene or polypropylene	Purging only	4,7,19
Suction Lift Pumps			
Centrifugal	NA	Purging only	1,3,4,5,7
Guzzler	NA	Purging only	1,3,4,5,7
Well point sampler	Stainless steel	Sampling only	6
Tubing	Teflon™, stainless steel, rigid PVC, polyethylene and polypropylene	Purging only	4,7,19,20
Peristaltic pumps	Stainless steel or glass and silastic tubing	Sampling and purging	5,6,18
Stage Lift Pumps			
B-K (staged check valves)	Rigid PVC	Purging only	4,7,19
Groundwater Samplers			
2-inch Grundfos Submersible Pump	Teflon™/Stainless Steel	Sampling and/or purging	5,21,6
PFA Teflon™ bailer	Teflon™	Sampling and/or purging	9
Clear PVC bailer	PVC	Sampling	8
Stainless steel bailer	Stainless steel and Teflon™	Sampling and/or purging	9
Wheaton no-transfer	Glass and Teflon™ in stainless steel holder	Sampling surface water and groundwater	13
1-inch PVC bailer	Rigid PVC	Purging and sampling	17

Sampling Equipment List

Type	Materials	Use and Restrictions	
2-inch PVC bailer	Rigid PVC	Purging and sampling	17
Bladder pump	Teflon™/stainless steel with Teflon™ hoses	Purging and sampling	5,21,24
Dedicated Well Sampling Pumps	Teflon™, Stainless Steel, PVC	Purging and sampling	5,18,21

*Restrictions Key:

1. Must be equipped with a check valve to prevent backflow of purge water.
2. Pump housing should be of stainless steel and Teflon™ construction.
3. Tubing used for purging or sampling will be cleaned and decontaminated before use.
4. Used for purging only with a pump system that includes a check/foot valve (as appropriate).
5. Must be equipped with a foot valve to prevent backflow of purge water.
6. Not appropriate for volatile organics sampling.
7. Tubing used with centrifugal or submersible pumps will be cleaned and decontaminated on the exterior, with the interior flushed with copious amounts of clean water before using. Submersible pumps will also have their exteriors decontaminated before use.
8. Use for visual inspection for floating petroleum products only.
9. Appropriate for sampling all parameter groups (VOCs must not be composited).
10. Samples will be collected in the appropriate glass or plastic jars as dictated by the analytical parameter group. This collection equipment will not be used for VOC, TRPH, Microbiology, and Oil & Grease parameter sampling. VOC, TRPH, Microbiology, and Oil & Grease sample fractions will be obtained by grab sampling techniques.
11. Samples transferred to glass or plastic jars as appropriate for analytical group or reactivity (consistent with SAP).
12. Not appropriate for trace metals sampling.
13. Used for non-transferred volatile organics samples only.
14. For specific parameter groups only (not appropriate for sampling organic compounds).
15. Analytical samples will be taken from the center of the tube.
16. Occasionally used as discrete soil/sediment sample containers; retrieved from split spoons, sealed with end-caps, labeled and preserved. Liner material is analyte specific; stainless steel for all parameter groups except metals; butyl plastic for metals and nutrients.
17. The use of polyvinyl chloride (PVC) bailers can be proposed on a site-specific basis for inorganics sampling.
18. Restricted to site-specific use, as approved by ADEM in GW-SAP.

19. Those portions of the pump/tubing contacting the formation water will be constructed of Teflon™ or stainless steel.
20. If PVC, polypropylene, or other polymer tubing is in contact with the formation water during purging, continuous pumping will be maintained as the pump and tubing is withdrawn from the well, then three additional bailers of water will be purged prior to sampling, using a Teflon™ or stainless steel bailer.
21. For sampling VOCs and/or purgeables, flow rate must be 500 mL/min or less.
22. Calibrate equipment per manufacturer's requirements.
23. Calibrate to demonstrate equivalence to FID.
24. For sampling VOCs and/or purgeables, the bladder pump, hoses, and other attachments must be constructed entirely of Teflon™ and stainless steel.

Miscellaneous Equipment and Instruments

I.D. Code	Equipment Title	Make	Use
CM001	UHF Hand Radio	Motorola	Field Communication
CM004	Head Set Radios	Various	Field Communications
CM006	Marine VHF Radio	Lorad	Field Communications
CM007	Portable Cellular Phone	Audiovox	Field Communications
CM007	Portable Cellular Phone	Panasonic	Field Communications
CP001	Laptop Computer	Toshiba	Field Soft Ware Use
CP002	Campbell Datalogger	Campbell	Elect. Data Recorder
CP003	Campbell BDR320 Datalogger	Campbell Sci.	Elect. Data Recorder
CP004	Telog 2107 Logger	Telog	Elect. Data Recorder
CP005	Telog DTU	Telog	Elect. Data Recorder
CP006	Sub-Notebook Computer	Gateway 2000	Field Soft Ware Use
FA003	Price Current Meter	Teledyne-Gurley	H2O Flow Velocity Meter
FA004	Pygmy Current Meter	Teledyne-Gurley	H2O Flow Velocity Meter
FA005	D.O. Meter	YSI	Diss. Oxygen Meter
FA007	Hydrolab WQ Meter	Hydrolab	H20 Qual. Measurements
FA008	Salinity, Conductivity , and Temperature (SCT) Meter	YSI	Water Sp. Cond.
FA009	Digital Thermometer	Adkins Technical	Temp
FA010	PH Meter Handheld	Corning & VWR	pH
FA012	Turbid Meter	Hach	Water Turbidity
FA013	Doppler Flow Meter	Sonic Control	H2O Flow Velocity Meter
FA014	Photospectrometer	Hach	Field Screen, Various
FA015	Torvane & Penetrometer	Soiltest	Cone Index, Shear Strength
FA020	PH/Cond Meter	Cole-Parmer	pH and Sp. Cond.
FA021	Surveyor II Hydrolab	Hydrolab	H2O Qual. Measurements
FA022	M-M Stream Flowmeter	Marsh-McBirney	H2O Flow Velocity Meter
FA023	Hydrolab Surveyor 3	Hydrolab	H2O Qual. Measurements
FA024	Impellor Flowmeter	AMJ-Signet/ET AL	H2O Flow Velocity Meter
FL001	Omega 5800 Flow XMTR	Omega	H2O Flow Velocity Meter
FL002	Time-Transient Flowmeter	Controlotron	H2O Flow Velocity Meter
GE004	Datalogger	Envirolab	Elect. Data Recorder
GE005	Voltage 15-psi Probe	Envirolab	Datalogger Probe
GE005	Current 15-psi Probe	Envirolab	Datalogger Probe
GE005	Press. Probe 15-psi 4-20MA	Druck	Datalogger Probe
GE006	Paroscientific Datalogger	Paroscientific	Elect. Data Recorder
GE007	15-psi Pressure Probe	Paroscientific	Datalogger Probe

Miscellaneous Equipment and Instruments

I.D. Code	Equipment Title	Make	Use
GE011	Geophy. Downhole Logger	MLS	Geo-Physical Measurements
GE019	Magnetometer	Schonstedt	Metal/Utility Detector
GE021	EM-31 Cond. Meter	Geonics LTD	Soil Conductivity Meter
GE022	Metal Detector	Garrett	Metal Detector
GE023	Portable Printer	Diconix (Kodak)	Field Data Printing
GE024	EM31 Logging System	Primline & Telog & ESE	EM-31 Data Logger
GE025	Cable/Line Locator System	3M Dynatel	Utility Detector
GE027	Press. XDCR Ext. Cables	ESE	Extension Cables
IH002	HNU PID	HNU	Volatiles Scanning
IH003	OVM PID	Thermo-Environmental	Volatiles Scanning
IH004	Explosimeter	MSA	Explos. Vapor Meter
IH004	Explosimeter	Bacharach	Explos. Vapor Meter
IH005	Headspace Kit	ESE	Soil Gas
IH006	Tritector	Exotox	Tox, Explo, Vapor & DO
IH007	Mini-Ram	MIE	Airborne Dust Measurement
IH011	Fid Portable	Foxboro	Volatiles Scanning
IH012	Mini-Ram Printer	MIE	Field Printer
IH013	Draeger Pump Kit	Various	Airborne Contam. Measurement
ML001	Evaporation Station	Weather Measure	Meteorology
ML002	Microbarograph	Belfort	Barometric Pressure
ML003	Recording Rain Gauge	Belfort	Precipitation
ML007	Sling Psychrometer	Various	Atmosph. Moisture
ML008	Tipping Bucket Rain Gauge	Texas El.	Precipitation
ML009	AM-Sigma Rain Gauge	American Sigma	Precipitation
MS001	Electric Drill	Black & Decker	Drilling
MS002	Rechargeable Drill	Makita	Drilling
MS006	Flashlight (non-incendiv)	Pelican	Lighting
MS006	Flashlight	Ace	Lighting
MS007	Lighted Marker Buoy	Various	Surf. H2O Station Marker
MS008	Rustrac Recorder	Ristrac	Temp
MS009	Rustrac Recorder	Ristrac	Temp
MS010	Bolt Cutters	--Various--	--Various--
MS011	Tool Kit	--Various--	--Various--
MS012	Sparkless Tool Kit	--Various--	--Various--
MS015	Cooler	Gott	Sample Shipment

Miscellaneous Equipment and Instruments

I.D. Code	Equipment Title	Make	Use
MS018	VOM/DMM	Metex	M4650
MS019	Shovel, Spade, etc.	--Various--	--Various--
MS020	Machete	--Various--	--Various--
MS021	Vacuum Pump	--Various--	--Various--
MS022	Drum Grapple	--Various--	--Various--
MS023	Magnetic Stirrer	--Various--	--VariousB
MS025	Shaker Table	--Various--	--Various--
MS030	Dye Calib. Set	ESE	Dye Tracking Tests
MS031	Diamond Core Drill	Atlantic Environmental	--Various--
MS032	Solvent Carrier	Baxter	Field Solv. Transport
OC001	U/W Timelapse Camera	ESE	Photos
OC006	Endeco 105 Current Meter	Endeco	H2O Flow Velocity Meter
OC008	Endeco 174 Current Meter	Endeco	H2O Flow Velocity Meter
OC009	Endeco Pinger Receiver	Endeco	Receiver for Endeco Meter
OC011	U/W Pingers	Helle	as above
OC012	Plankton Net	Wildco	Phyto/Zooplankton
OC013	Smith-Mac Grab	Kahl Sci. Instr. Co.	214WA250
OC014	Niskin/Go-Flo Bottle	General Oceanic	Surface Water Samples
OC015	Rosette Sampler	General Oceanic	Surface Water Samples
OC016	Wave and Tide Gauge	Seadata	Tidal Measurements
OC019	Otter Trawl	Marinovich Trawl Co.	Marine Fisheries Sampling
OC020	Secchi Disk	--Various--	Surface Water Clarity
PP001	Dye Injector System	ESE	Dye Tests
PP002	Zin Pump Hose	ESE	--None-- ESE Design
PP003	Centrifugal Pump	Honda	Monit. Well Purging
PP005	Dye Sampling Pump	Jabsco	Dye Test
PP006	Guzzler Handpump	Guzzler	Monit. Well Purging
PP007	BK Handpump	Brainard-Kilman	Monit. Well Purging
PP008	Keck Pump	Keck	Monit. Well Purging
PP009	Bladder Pump	ISCO	M. Well Purge/Sample
PP009	SS/Teflon™ Bladder Pump Sys.	QED	M. Well Purge/Sample
PP010	110V Submer. Pump	Trico	Monit. Well Purging
PP010	110V Submer. Pump	General Pump	Monit. Well Purging
PP011	220V Submer. Pump	Grundfos (e.i.)	M. Well Purge/Sample
PP013	220V 3HP Submer. Pump	Sta-Rite	M. Well Purging

Miscellaneous Equipment and Instruments

I.D. Code	Equipment Title	Make	Use
PP014	2IN Grundfos Submer. Pump	Grundfos (e.i.)	M. Well Purge/Sample
PP015	Teflon™ Surge Block Set	Brainard-Kilman	2" & 4"
PV001	Camcorder VHS-C	JVC	Video Taping
PW001	12V Battery	Sears	Remote Power
PW002	220V Generator	Honda	Elect. Power
PW003	110V Generator	Honda	Elect. Power
PW004	Power Inverter	Radio Shack	AC/DC Inverter
PW005	Power Cord	Various	Power Extension
PW006	Battery Charger	Various	Various--
RC001	ORS Scavenger System	ORS	Floating Filter
RC002	ORS Probe Scavenger Sys.	ORS	Down Hole/Well
RC005	2 Pump/2 Well Recovery System	ORS	2-Pump/2 Well System Custom
SE001	Life Preserver	Various	Various
SE002	Safety Harness	Various	Various
SE003	Pressure Washer	Delco	Hvy. Equip. Decontamination
SE009	Acidmaster Suit	Various	Safety
SE025	Safety Harness	Various	Safety
SE027	Scram Pack	Scott	Escape O2 Supply
SE028	SCBA System	Scott	O2 Supply
SE029	SCBA Spare Tank	Scott	O2 Supply
SE037	Eyewash Station	Nilcon	Safety
SE038	First Aid Kit	SEC -- Various	First Aid
SE040	Fire Extinguisher	SEC -- Various	BFires--
SE042	Voice Amplifier/Mike	EarMark	Safety
SE050	Hose Supplied Air System	Scott	O2 Supply
SE052	Unisuit Drysuit	Posiden Systems	Safety
SE055	Traffic Cone Set	SEC -- Various	Safety
SS001	Grab Sampler	Wheaton	Surf. H2O Sampling
SS002	Bucket Auger	Brainard-Kilman	Soil/Sed. Sampling
SS004	Oakfield Sampler	Brainard-Kilamn	Soil/Sed. Sampling
SS006	Vibra-Core	Wyco	Soil/Sed. Sampling
SS007	Hyd. Porta-Sampler	Brainard-Kilman	Porta-Sampler
SS008	Soil Gas Tripod	ESE	Soil Gas Equip.
SS010	Cathead Winch	Acker	Hvy. Lifting
SS012	Dbl Ring Infiltrometer	ESE	--None-- ESE Design

Miscellaneous Equipment and Instruments

I.D. Code	Equipment Title	Make	Use
SS013	Soil Gas Kit	ESE	Soil Gas
SS014	Stnls Stl Ponar Dredge	Wildco	Sediment Sampling
ST001	Acoustic Well Sounder	MSI	GW Level Measurements
ST003	Brunton Compass	Brunton	Mag. North
ST006	200FT F/G Tape	Various	Tape Measure
ST007	200FT Steel Tape	Lufkin	GW Level Measurement
ST008	Microwave Pos. Sys.	Decca	Field Posit. System
ST010	Dumpy Level	Wild	Level
ST010	Dumpy Level	Topcon	Level
ST011	Stadia Rod	Various	Various
ST011	Stadia Rod (Lenker)	Lenker	Various
ST014	Tripod	Various	Various
ST015	Gen. Pur. Datalogger	Esterline-Angus	Purge Recorder
ST016	El. Oil/Water Interfc Probe	Marine Moisture	Oil/Water Indicator
ST020	Topcon EDM Theodolite	Topcon	Field Posit. System
ST021	Fathometer (w/digitizer)	Raytheon	Depth Meter
ST023	Elect. w/l Tape	Solinst	GW Level Measurements
ST023	Elect. w/l Tape	E.I	GW Level Measurements
ST024	ORS Interface Tape	ORS	150 ft
ST025	GPS Magellan	Magellan	GEO. Posit. System
TL001	Circular Saw	Dewalt	--Various--
VB001	T-Craft Workboat	T-Craft	Work Boat
VL002	Dodge Ram Charger	Dodge	Work Truck
WS001	Clear Bailer	Various	Various
WS002	Stnls Stl Bailer	Various	Various
WS004	Steven Type A WL Recorder	Stevens	Water Level Recorder
WS005	Stevens Type F Recorder	Stevens	Water Level Recorder
WS006	W/L Recorder Housing	ESE	as above
WS007	1.5 L SS Kemmerer Btl	Wildco	Surface H2O Sampling
WS007	3.0 L SS Kemmerer Btl	Wildco	Surface H2O Sampling
WS008	PVC Kemmerer	Wildco	Surface H2O Sampling
WS010	ISCO 1680 Sampler	ISCO	Automatic Sampler
WS011	Vandorn Bottle	Wildco	Surface Water Sampling
WS012	Well Point Sampler	K-V Assoc.	Tempor. GW Well/Sampler
WS014	Press Filter Bailer Kit	Norwell	Field Filtration

Miscellaneous Equipment and Instruments

I.D. Code	Equipment Title	Make	Use
WS015	Teflon™ Bailer	Norton	GW Sampling
WS015	Teflon™ Bailer	Jensen Inert	GW Sampling
WS016	ISCO 1580 Comp. Sampler	ISCO	Automatic Sampler
WS017	ISCO HI-SPD Comp. Sampler	ISCO	Automatic Sampler
WS019	ISCO Flowmeter	ISCO	H20 Flow Velocity Meter
WS020	ISCO Chart Recorder	ISCO	Paper Chart Level Recorder
WS021	ISCO 3700	ISCO	Automatic Sampler
WS025	Telog w/L Rcrdr	Telog	Water Level Recorder
WS026	Elect. Bailer Reel	ESE	Elect. Bailer Reel
WS027	Druck 830 Press. XDCR	Druck	PDCR830
WS028	AM-Sigma 800SL	American Sigma	Automatic Sampler
WS029	Press. XDCR Collar Set	American Sigma	as above
WS030	AM-Sigma DTU	American Sigma	as above
NONE	Pressure Calibrator	Ametek	H2O Level Pres. Sensor
WS099	Stnls Stl Down Pipe	ESE	GW Well Purging

Note: psi = pounds per square inch.

1. Datalogger Calibrations are dependent on the sensor array chosen.
   Generally a 2 or 3 point linear calibration is performed with the appropriate standards.
2. SCBA Systems are inspected and checked before and after each trip.
   SCBA Tanks are inspected annually and Hydrotested as listed (3 or 5 years)

Attachment C

Example Field Forms

ANNUAL GROUNDWATER SAMPLING & SEMI-ANNUAL DNAPL SURVEY ALABAMA WOOD TREATING CORPORATION SITE	MONITOR WELL WATER/PRODUCT MEASUREMENTS

DATE: _____ DAY OF WEEK: _____

MEASURED BY: _____ REFERENCE MARK: Top of Well Casing ☐ Ground Surface: ☐

Well I.D.	Date	Time	Top of Casing Elevation (feet)MSL	Depth to Water (feet)	Depth to Bottom (feet)	NAPL Information			Comments
						None Present	Depth to LNAPL (feet)	Depth to DNAPL (feet)	
4-D*									
4-DK*									
6-S									
6-I									
7-S									
7-IR									
7-D									
8-S									
8-I									
8-D									
8-DK									
9-I									
11-S									
11-I									
12-I									
13-I									
15-S									
15-I									
15-D									
16-I									
16-D									
17-S*									
17-D									
18-IR*									
18-DR									
19-SR									

ANNUAL GROUNDWATER SAMPLING & SEMI-ANNUAL DNAPL SURVEY ALABAMA WOOD TREATING CORPORATION SITE	MONITOR WELL WATER/PRODUCT MEASUREMENTS

DATE: _____ DAY OF WEEK: _____

MEASURED BY: _____ REFERENCE MARK: Top of Well Casing ☐ Ground Surface: ☐

Well I.D.	Date	Time	Top of Casing Elevation (feet)MSL	Depth to Water (feet)	Depth to Bottom (feet)	NAPL Information			Comments
						None Present	Depth to LNAPL (feet)	Depth to DNAPL (feet)	
20-I*									
21-S									
21-I									
23-I									
23-D									
25-I									
26-I									
31-IR									
31-DR									
32-S									
32-I									
PZ-1-D									
PZ-1-S									
PZ-13-D									
PZ-16-S									
PZ-19-I									
PZ-30-D									
RW-1*									
RW-3*									
RW-4*									
RW-5*									
RW-6*									
RW-7*									
RW-8*									

* DNAPL recovery wells - measure DNAPL in accordance with Section 2.6 of OM&M Manual

ANNUAL GROUNDWATER SAMPLING & SEMI-ANNUAL DNAPL SURVEY ALABAMA WOOD TREATING CORPORATION SITE				DAILY FIELD TRIP LOG
Date:		Day of Week:		Page _____ of _____
Purpose of Trip:				

PERSONNEL INFORMATION

Field Team Leader:		
Field Team Members: (Names & Initials)		
Site/Project Contacts:		Phone:
		Phone:
Work Completed This Date:		
Work Remaining To Be Done:		

SAMPLES COLLECTED AND/OR DNAPL SURVEY COMPLETED

Well Number	Sample I.D.	Date	Time	Description	Field Crew

SIGNATURES

Field Team Leader:		Date:
Reviewer:		Date:

METER CALIBRATION FORM

PRE-FIELD ☐ FIELD ☐

INSTRUMENT: _____ I.D. NUMBER: _____

CALIBRATED BY: _____ DATE: _____

	FIRST		SECOND		THIRD		FOURTH		END
	Initial	Adjusted	Initial	Adjusted	Initial	Adjusted	Initial	Adjusted	Final
TIME									
TEMPERATURE (+/- 0.2°C)									
CONDUCTIVITY (+/- 1.0%)									
High Conc.									
Med. Conc.									
Low Conc.									
(umhos/cm)									
pH (+/- 0.3 s.u.)									
High Std.									
Med. Std.									
Low Std.									
Slope (92%-102%)									
TURBIDITY									
0 NTU (+/- 0.2%)									
20 NTU (+/- 0.2%)									
100 NTU (+/- 0.2%)									
800 NTU (+/- 0.3%)									
DISSOLVED OXYGEN									
Air Temp (°C)									
Saturation @ Air Temp.									
Method: Winkler or Air	W or A		W or A		W or A		W or A		W or A

SEMI-ANNUAL GROUNDWATER SAMPLING
ALABAMA WOOD TREATING CORPORATION SITE

WELL SAMPLING DATA FORM

DATE: _____ **TIME:** _____ **WELL NUMBER:** _____

WELL DATA

Casing Diameter: _____ (in.)

Depth to Water: _____ (ft.)

Depth to Bottom: _____ (ft.)

(measure to 0.01 ft. precision)

VOLUME TO BE REMOVED

Column of Water in Well: _____ feet

Conversion Factor (gal./ft.): x _____ (gallons/foot)

Total Volume of Casing: _____ gallons

# of Volumes to be Evacuated: x _____ (3 to 5)

Total Volume to be Evacuated: = _____ to _____ gallons

Casing Diameter (in.)	Gallons per Foot of Casing:
2 in.	0.1632
3 in.	0.3672
4 in.	0.6528
5 in.	1.02
6 in.	1.4688

PURGING INFORMATION

METHOD (Pump, Bailer, etc.): _____

Pump

Type: _____

Rate: _____

Bailer

Volume of Bailer: _____ (gal)

Number of Bailers Required: _____ Removed: _____

Other _____

Purge Time: Start: _____ End: _____ Volume Purged: _____ (gal)

FIELD ANALYSES

	Start	*Intermediate*	*Intermediate*	*End*
Volume purged (gal)				
Time (24-hour)				
pH (S.U.)				
Cond. (umhos/cm)				
Temperature (^{o}C)				
Turbidity (NTU)				
Appearance				

SAMPLING INFORMATION

Sample Device: _____ Sample Date: _____

Device Composition: _____ Sample Time: _____

Sample Collected by: _____ of: _____

Sample Number(s): _____ Analytical Lab: _____

Sample Fractions: _____

SIGNATURES

Sampler: _____ Reviewer: _____

Date: Date:

SOIL SAMPLING CONTROL LOG

	Depth from			PAGE 1 OF	
Test Pit	Date	Grd. Surface	HNU	VISUAL DESCRIPTION	Analysis

Well Abandonment Record

WELL NO.: _____

PROJECT NAME: _____

PROJECT NO: _____

FINISH DATE: _____

Name of Property Owner: _____

Address of Property: _____

Type of Well Installation Method: _____

_____

Date of Well Installation: _____

Original Purpose of Well Installation: _____

Total Depth of Well (measured from Top of Riser): _____

Top of Riser Height (above/below ground surface): _____

Well Diameter (nominal) and Material Type: _____

Screen Slot Size and Opening Type: _____

Screen Length and Backfill Material: _____

Depth to Water/Date (measured from Top of Riser): _____

Screened Formation or Aquifer Type: _____

Description of Well Abandonment Method: _____

Calculated Well Volume ($\prod r^2 L$ x 7.4805): _____

Type and Volume of Materials Used to Plug Well: _____

Riser and/or Screen Length Removed or Left in Place: _____

Drilling Contractor: _____ Driller's Name: _____

Additional Notes – Sketch of Monitor Well Location

Field Representative (signature): _____

WELL DEVELOPMENT DATA

PROJECT NAME _____ PROJECT No. _____

DEVELOPED BY _____ CHECKED BY _____ SHEET 1 OF _____

1. Well No.: _____ Site Location: _____
2. Date of Installation: _____
3. Date of Development: _____
4. Static Water Level: Before Development _____ ft.; 24 hrs. After _____ ft.; Date/Time _____
5. Organic Vapor: Before Development _____ ppm; After Development _____ ppm
6. Quantity of Water Loss During Drilling, If Used: _____ gal.
7. Quantity of Standing Water in Well and Annulus Before Development: _____ gal.
8. Depth From Top of Well Casing to Bottom of Well: _____ ft. (from Well Installation Diagram)
9. Well Diameter: _____ in.
10. Screen Length: _____ ft.
11. Minimum Quantity of Water to be Removed: _____ gal.
12. Depth to Top of Sediment: Before Development _____ ft.; After Development _____ ft.
13. Physical Character of Water (Before/After Development): _____

    _____
14. Type and Size of Well Development Equipment: _____

    _____
15. Description of Surge Technique, If Used: _____

    _____

    _____
16. Height of Well Casing Above Ground Surface: _____ ft. (from Well Installation Diagram)
17. Quantity of Water Removed: _____ gal. Time for Removal: _____ hr. / min.
18. 1-Liter Water Sample Collected: _____ (Time) Photographed? Y / N
19. Final Turbidity in Nephelometric Units: _____ NTUs
20. Final Imhoff Cone Measurements < 0.75 mL/L, If Applicable: _____

WELL DEVELOPMENT DATA
(Continued)

PROJECT NAME _____ PROJECT No. _____

DEVELOPED BY _____ CHECKED BY _____ SHEET _____ OF _____

Well No.: _____ Site Location: _____

Date/ Time	Hrs. Dev./ Cum. Hrs. Dev.	Gals. Purged/ Cum. Gals. Purged	pH	Temp.	Cond.	NTUs	Remarks

Enclosure C

Quality Assurance Project Plan

C1.0 Quality Assurance Project Plan

All sampling and analysis activities performed during the post closure timeframes will be in accordance with a site-specific Quality Assurance Plan (Appendix B). This QA program will be reviewed with the analytical laboratory to ensure coordination with the laboratory's internal QA program. As a result of this process some changes to the Quality Assurance Plan may result. It is the responsibility of the selected contractor(s) to ensure the Quality Assurance Plan is in place and flowed. This section establishes minimum requirements for the Quality Assurance Plan.

C1.1 Intended Use of Data

Ground-water samples are collected during the OM&M period for analysis to evaluate changes in ground-water conditions at their particular location and depths. Wastewater discharge samples are collected once per month or per discharge event to monitor for compliance with wastewater discharge permit. Other analytical samples or measurements may be taken for a variety of project reasons.

C1.2 Levels of Data Quality

Definitive data are collected and used during O&M of the AWTC Site corrective measures. Definitive data are generated using rigorous analytical methods, such as approved EPA methods. Data are analyte-specific, with confirmation of analyte identity and concentration. Definitive data Quality Assurance/Quality Control (QA/QC) elements include:

- Sample documentation (location, date and time collected, batch, etc.),
- Chain-of-custody
- Determination and documentation of detection limits
- Analyte(s) identification
- Analyte(s) quantification
- QC blanks (method)
- Matrix spike and blank spike recoveries

C1.3 QA/QC Samples

QA/QC field and laboratory samples are collected or prepared to check the accuracy and precision of the measurement system. The overall objective for this effort is to limit the chance that sample data will lead to an incorrect conclusion for each of the various data uses. An important aspect of this objective is to minimize the possibility of reporting false negatives and false positives. To achieve this objective, control limits on precision, accuracy, representativeness, comparability and completeness (PARCC parameters) have been established, based on the intended uses of the data.

Field QA/QC techniques consist of the use of trip blanks (for volatiles analysis only) and field replicate (duplicate) samples. Laboratory QA/QC techniques consist of method blanks, matrix spike and matrix spike duplicate samples, surrogate recovery, retention time windows, and laboratory control samples (LCS).

C1.4 Field QC Samples

Trip Blanks

Trip blanks are containers of demonstrated analyte-free water that are kept with the field sample containers from the time the samples are prepared for shipment until they reach the laboratory. A trip blank will be included with each cooler sent from the field to the laboratory for analysis for VOCs. The purpose of the trip blank is to determine whether the sample results are biased due to contamination during transit.

Field Duplicate Samples

One field duplicate sample will be collected for each 20 field samples as a measure of the mutual agreement among individual measurements of the same parameter under similar conditions.

C1.5 Laboratory QC

Method Blanks

A method blank is prepared at the frequency specified by the referenced method. The purpose of the method blank is to ensure that contaminants are not introduced by the glassware, reagents, standards, personnel, or sample preparation environment.

Spiked Samples

A matrix spike (MS) is an aliquot of an environmental sample to which known concentrations of analytes are added by the laboratory. The MS is taken through the entire analytical procedure and the recovery of the analytes is calculated. Results are expressed as percent recovery and checked during data validation. The MS is used to evaluate the effect of the sample matrix on the accuracy of the analysis.

A matrix spike duplicate (MSD) is a replicate of the MS sample, which has the recoveries of the known concentrations of the analytes calculated in percent. The MS and MSD are processed separately and the results are compared to determine the effects of the matrix on the precision of the analysis. Results of the comparison are expressed in terms of relative percent difference (RPD), which will be checked during data validation.

One MS/MSD set is typically analyzed for every 20 investigative samples. MS/MSD aliquots will need to be collected for the ground-water samples from the IWS. The IWS samples will be batched with the same sample delivery group as the MS and MSD analyses.

In addition to the MS samples, laboratory control samples (LCS) are blank water samples fortified with spike standard solutions containing target analytes of interest. The recovery of these standards is quantitatively measured during analyses. When an MS test fails spike recovery criteria, then the LCS must be evaluated to ascertain if there is a matrix interference. If the LCS fails, then the batch must be reprocessed. If the LCS passes, then the matrix effect is confirmed and the affected data are qualified as appropriate.

Surrogate Recovery

Surrogate standards are added to all samples requiring analysis for chlorinated pesticide compounds in accordance with the method being utilized. Surrogate recoveries will be checked during data validation and must meet method acceptance criteria before the analytical data will be released. In some instances the sample matrix may produce interference, which adversely affects recoveries. Surrogate recovery interference must be confirmed by reanalysis of the sample and evaluation of the LCS.

C1.6 Quality Assurance Objectives

The measurement of quality of this application includes the PARCC parameters (precision, accuracy, representativeness, comparability, and completeness). The procedures described herein are designated to obtain PARCC data for each analytical method. Specific PARCC measurements will be addressed to satisfy the QA objectives. These measurements are discussed in the following subsections along with data quality acceptance criteria.

C1.6.1 Precision

Whereas accuracy measures the average properties of an analytical method, precision examines the spread of the reported values about their mean. The spread of reported values refers to how different the individual reported values are from the average reported value. Precision is a measure of the magnitude of errors that can be measured in a variety of ways. Precision will be determined from replicate samples; thus, precision is expressed as relative percent difference (RPD).

C1.6.2 Accuracy

Accuracy is a determination of how close the measurement is to the true value. When applied to a set of observed values, accuracy will be a combination of a random component and a common systematic error (or bias) component. Bias is defined as the deviation due to matrix effects of the measured value from a known spiked amount. Field sampling and laboratory accuracy may be assessed by evaluating the results of the field duplicate, and analytical accuracy may be assessed through evaluation of the results of the surrogates and the MS, MSD and LCS samples. Accuracy will be determined from the analyte recoveries of spiked samples. Accuracy objectives will be as stated in the particular analytical method.

C1.6.3 Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another set. Sample data should be comparable with other measurement data for similar samples, sample conditions, and collection techniques. This goal will be achieved through using EPA methods to analyze representative samples and using standard sampling protocols to collect these samples. Analytical results will be reported in the appropriate units as specified by the method.

C1.7 Laboratory Procedures for Sample Custody

The laboratory has an established program of sample custody that is designed to ensure that each sample is accounted for at all times. Laboratory Standard Operating Procedures (SOPs) for sample custody protocol are maintained by the laboratory and adhered to by laboratory personnel.

C1.8 Laboratory Analytical Parameters

Laboratory and field data gathering techniques have been specified for meeting the data quality objectives. Data quality objectives will be accomplished in conformance with a quality assurance program, laboratory standards operating procedures and applicable regulatory

requirements. This section lists parameters to be evaluated in the laboratory, the practical quantitation limits (PQLs) to be achieved, and the analytical methodology to achieve these limits with necessary levels of control to produce data of known and desired quality.

C1.8.1 Analytical Methods

This information will be developed in conjunction with the selected analytical laboratory. ADEM and USEPA approved analytical methods will be used. Consistent use of these methods throughout the project will allow comparability among the samples collected, and achieve the data quality objectives for the project.

C1.9 Practical Quantification Limits

The Practical Quantitation Limit (PQL) represents the normally obtainable quantification level achieved by the laboratory under practical and routine laboratory conditions for the sample matrix of interest. Sample-specific PQLs may vary from the standard PQL as a result of matrix interference and dilution of samples with compound concentrations above the calibration range.

C1.10 Data Reduction, Validation and Reporting

The analyst who generates the analytical data has responsibility for the correctness and completeness of the data. All data are generated and reduced following protocols specified in the laboratory Standard Operating Procedures (SOPs). Each analyst reviews the quality of the work based on an established set of guidelines per the SOP. QC data validation criteria set forth in the corresponding methods will be used to evaluate the data.

C1.11 Data Reduction

Raw analytical data generated in the laboratory are collected on printouts from the instruments and associated data system(s) or manually in bound notebooks. Analysts review data as they are generated to confirm that the analytical instruments are performing within specifications. This review may include, but is not limited to calibration checks, surrogate recoveries, blanks checks, retention time reproducibility, holding times, and other QC checks. If any problems are noted during the analytical run, corrective action is taken and documented. Each analytical run is reviewed for completeness prior to interpretation and raw data reduction to reportable results.

C1.12 Data Verification by the Laboratory

Following interpretation and data reduction by a laboratory analyst, data are transferred to the laboratory sample management system either by direct data upload from the analytical data system or manually. The data are reviewed by the Laboratory Group Leader or another analyst and marked on the sample management system as being verified. The person performing the verification step reviews all data including quality control information prior to verifying the data. The laboratory will complete the appropriate forms summarizing the quality control information, and transfer copies of all raw data (instrument print outs, spectra, chromatogram, etc.) to the Project Management Group. This group will combine the information from the various analytical groups and the analytical reports from the laboratory sample management system into one package. This package is reviewed by the Quality

Assurance Department for conformance with laboratory SOPs and to ensure that all QC goals have been met. Any analytical problems are discussed in the case narrative, which is included with the data package deliverables.

C1.13 Data Validation

Following data verification by the laboratory, data will be transferred to the validator. The validator will then conduct data validation using the either USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (USEPA, 1994a) or the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (USEPA, 1994b) as guidance, depending upon the analytical method.

C1.14 Data Reporting

Laboratory reports will contain the following information:

- General Discussion: Description of sample types, test performed, any problems encountered and general comments are given.
- Analytical Data: Data are reported by sample or by test. Pertinent information including, dates sampled, received, prepared and extracted are included on each results page. The reporting limit for each analyte is also given.
- Laboratory Performance QC Information: The results (percent recovery) of the laboratory control samples (LCS) and all surrogates analyzed with the project are listed, together with the control limits. Also, the analytical results for method blanks generated during the analyses are given.
- Matrix-Specific QC Information: Results of any sample duplicates, matrix spikes, matrix spike duplicates or other project-specific QC data are reported. RPDs will be calculated and reported.
- Methodology: Reference for analytical methodology used.
- Raw data

The reporting scheme from collection of raw data through document storage is as follows:

- Raw data collected by laboratory technical personnel.
- Data reviewed/verified by laboratory supervisor.
- Data receive QA/QC review and approval from Laboratory QA Director.
- Written report, with accompanying QC data, is submitted by the laboratory to the Project Coordinator.

The Data Validator uses the IWS QAPP and EPA's National Functional Guidelines as guidance in the review the data. The Validator prepares a data validation summary report.