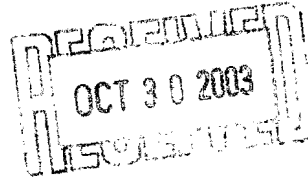




CHEMICAL COMPANY

October 28, 2003

Ms. Laura Leslie-Stuart
Geologist, Water Division
Arkansas Department of Environmental Quality
8001 National Drive
Little Rock, AR 72219



Re: Work Plan and QA/QC Plan for Groundwater Investigation at El Dorado Chemical Company, El Dorado, Arkansas.

Dear Ms. Stuart:

Two copies of the Groundwater QA/QC and Groundwater Investigation Work Plan are enclosed for your review. Please take a look at these documents and give me your comments. Once we have agreed on the conditions of the work plan, I will inform you of the dates for starting the fieldwork.

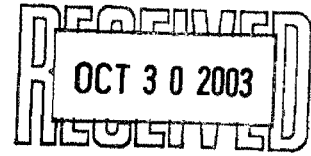
You can contact me at 870-863-1498 or email at rwhitmore@edc-ark.com

Sincerely,

A handwritten signature in black ink, appearing to read "Randall Whitmore".

Randall Whitmore
Responsible Care® Manager
El Dorado Chemical Company

fax#
863-1499



GEOLOGIC INVESTIGATION AND WELL INSTALLATION WORK PLAN

Prepared For:



El Dorado Chemical Company

Prepared By:



600 North 26th Avenue
Baton Rouge, Louisiana
(225) 751-5386

10/30/03
WJ 7/03

October 2003

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1.0 INTRODUCTION

This Work Plan documents the planned approach for conducting an investigation to further characterize the geology and hydrogeology of the El Dorado Chemical Company (EDC) facility in El Dorado Arkansas. The field activities will consist of the advancement and logging of eleven (11) borings and the installation of four (4) monitor wells. A map of the site is presented as Figure 1.

1.1 OBJECTIVES

The objectives of this investigation are to:

- Further characterize the shallow site stratigraphy with borings that penetrate through to the confining clay unit (Cook Mountain Clay); and ✓
- Install additional wells to further define ground water flow and quality. ✓

1.2 BACKGROUND

A Phase II site investigation of the EDC facility was conducted in June 1996. Eighteen monitor wells were installed within the shallow Cockfield Formation during the Phase II investigation. Boring logs containing the detailed lithologic descriptions and geotechnical data were generated and published the *Phase II Ground Water Investigation Report*. Four cross sections were constructed to illustrate the shallow geology beneath the facility and presented in the *2001 Annual Ground Water Report*. The 18 monitor wells were sampling during the Phase II investigation and again in May and November 2001, June, October and December 2002 and in May, June and September 2003.

1.3 CONSTITUENTS OF CONCERN

Ground water analytical results indicate the constituents of concern for this site are ammonia as N, nitrate as N, sulfate and minor amounts of chromium and lead. These constituents have

typically been detected north of the Production Area and on the north and southeast sides of Lake Kildeer. All constituents are non-volatile and are not expected to present any hazard to investigation personnel.

2.0 SITE SETTING

The regional shallow geology consists of the Claiborne Group, with two units that crop out in Union County: the Cockfield Formation and the Cook Mountain Formation. The Cockfield Formation, locally referred to as the "lignite sand", is generally characterized by fine sand, interbedded silty clay and lignite becoming more massive and containing less silt and clay with depth. Beneath the Cockfield Formation lies the Cook Mountain Formation. The Cook Mountain is 50 to 200 feet thick and is composed of clay and silty clay containing minor amounts of localized very fine to silty sand. These clays serve as a confining unit between the more permeable overlying Cockfield Formation and the underlying aquifer. The Cook Mountain is uniformly underlain by the Greensand Aquifer of the Sparta Sand. (w/ ...)

The shallow subsurface consists of interbedded sand, silty sand, silt and clay. Site boring logs indicate a clay/sand/clay/sand sequence with more clay in the northern area of the property and more sand to the south. However, the most of the borings drilled at the site do not extend into the upper part of the Cook Mountain Formation; therefore, the Cockfield Formation is not fully defined. The purpose of this additional investigation is to further define this unit both vertically and horizontally.

3.0 FIELD OPERATIONS

The planned field investigation procedures are described in the following sections. Should adjustments to any of the sampling rationale and/or locations become necessary during the course of the investigation for reasons as yet undetermined, EMS will coordinate the changes with EDC personnel prior to implementing the altered plan.

Prior to sampling, EMS will communicate with EDC personnel to locate underground utilities. No underground utilities in the sampling areas are anticipated.

3.1 SOIL SAMPLING

The following sections detail the methodology employed to further characterize the geology at the EDC site.

3.1.1 Soil Sampling Scope of Work

The field operation will consist of drilling and logging eleven (11) soil borings. The total depth will be approximately 30 feet, until the top of the Cook Mountain Formation (clay unit) is encountered. Figure 1 depicts the location of the proposed borings. Techniques used to characterize the soil conditions during this investigation include soil conductivity profiling; and soil collection for physical description and conductivity profile correlation. The methodology used for soil sample collection will consist of Geoprobe collection devices and probes.

3.1.2 Soil Sampling Equipment and Procedures

The site allows access in most areas to small (pickup) truck-mounted or track-mounted drilling equipment. Therefore, where accessible, a Geoprobe® Model 540 UD (pickup truck mounted) or Model 66 DT (posi-track mounted) direct-push sampling system will be used to collect soil samples for site characterization. Appropriate safety and operational considerations will be utilized in the sample collection efforts as described in the Site Specific Health and Safety Plan which will be prepared prior to mobilization to the site and is available upon request. All sampling equipment will be thoroughly cleaned prior to mobilization to the site.

Soil samples will be collected using a Geoprobe Macro-core 48-inch long, 2-inch diameter soil sampling probe equipped with a disposable 1.5-inch diameter clear PVC sample collection tube within the probe. Several decontaminated, pre-assembled soil probes are typically used in a Geoprobe soil boring effort to streamline the time necessary to acquire soil samples from a borehole location. Soil samples will be collected continuously, from ground surface to the

termination depth of each boring. Upon completion of each 4-foot soil “push”, the sample collection tube will be retrieved and split open, and the soil will be visually described and logged ✓ by the field geologist or hydrogeologist in accordance with the Unified Soil Classification System. All soil descriptions and other pertinent observations will be recorded on dedicated soil boring logs for each location. Soil cores collected will not be discarded; rather, they will be stored on site.

3.2 WELL INSTALLATION

Each monitor well will be installed using the Geoprobe’s direct-push capability driving 1.5-inch inside-diameter probe rod equipped with an expendable stainless-steel drive point. Once the desired depth is reached, the well will be installed within the probe rod and the rod extracted, leaving the temporary well and expendable drive point in place. Pre-packed screens or slotted screens with a filter pack may be used. If slotted screens are used, sufficient filter pack is installed to fully cover the screened interval plus two feet or more to provide a buffer against possible grout infiltration. The filter pack is placed in six-inch increments, as the 2.125-inch casing is pulled up in six-inch increments. The filter pack is placed in this manner to minimize the amount of open formation exposed and thus minimize the possibility for formation collapse. Following placement of the filter pack to at least two feet above the top of the screen, a grout seal is installed. The grout will consist of a mixture of bentonite, Portland cement and water in accordance with applicable Arkansas (Arkansas Water Well Construction Commission Rules and Regulations) and U.S. Environmental Protection Agency (*Environmental Investigations Standard Operating Procedures and Quality Assurance Manual*, USEPA, Region IV, Science and Ecosystem Support Division, November 2001) guidelines. To provide a minimal but appropriate level of security and access, an inside-threaded, countersunk plug, PVC “cleanout coupling” will be placed over the pipe and cemented in place using neat cement grout. Each well pipe will be equipped with a PVC slip-cap containing an approximately 1/8-inch hole drilled in the top of the slip-cap for ventilation. A depiction of the well construction detail is presented as Figure 2.

3.3 BORING ABANDONMENT

Borehole abandonment will be accomplished in accordance with applicable Arkansas (Arkansas Water Well Construction Commission Rules and Regulations) and U.S. Environmental Protection Agency (*Environmental Investigations Standard Operating Procedures and Quality Assurance Manual*, USEPA, Region IV, Science and Ecosystem Support Division, November 2001) guidelines. In general, borehole abandonment will be accomplished by pressure grouting the borehole using a tremie tube inserted through the Geoprobe drill rods to the bottom of the borehole and filling it from the bottom up as the drill rods and tremie tube are retracted. The solution used to abandon each borehole will consist of Portland Type I cement in 80lb. bags mixed with not more than 5-8% sodium bentonite powder by weight, and not more than 5 gallons of water per bag of cement. The solution will be mixed to a smooth consistency and pumped using the Geoprobe Model GS1000 grout pump or equivalent.

In soil sampling boreholes using the Geoprobe Macro-core sampler, upon completion of the soil sampling the borehole will be filled by pumping the bentonite grout mixture through the drill rods (minus the sample probe) from the bottom up. Upon filling the borehole and allowing some time for any settling of the grout solution in the borehole, the top of each abandoned borehole will be filled with like materials of the surface drilled (concrete, asphalt, etc.).

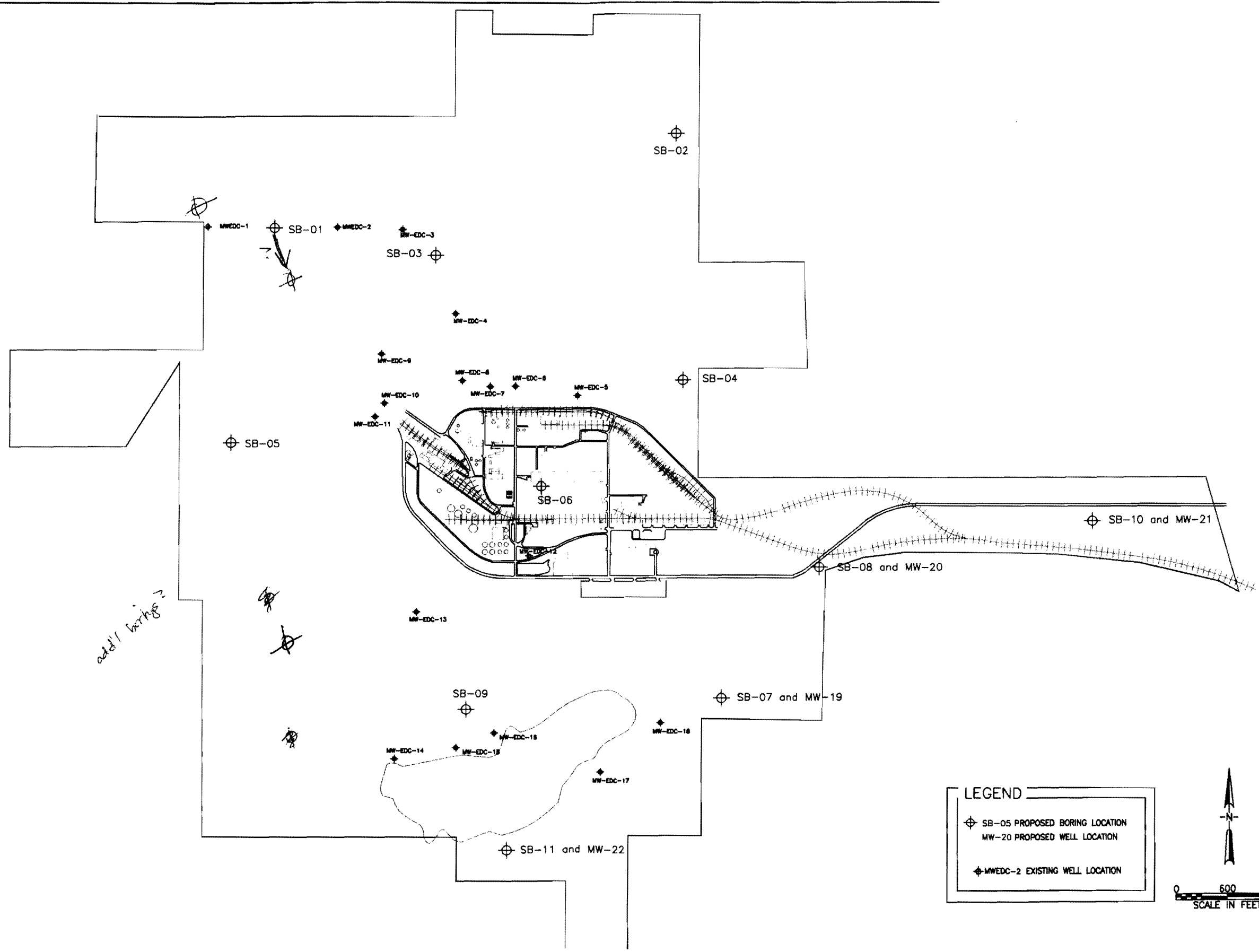
3.4 SURVEYING

The location and ground elevation and/or top of casing of each boring or well installed will be surveyed to provide accurate location data. Surveying will be accomplished throughout the project to establish a surveyed location of other borings, wells, site topography, and other points of interest as necessary.

4.0 REPORTING

Upon completion of field activities, a report documenting field activities and findings will be prepared. The report will include:

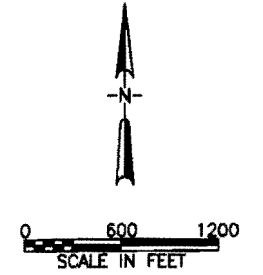
- Short description of drilling activities; ✓
- Soil boring and well construction logs; ✓
- Maps illustrating surveyed locations of new borings and wells; ✓
- Geologic cross-sections; and ✓
- An updated discussion on site geologic and ground water conditions. ✓



add 11 borings

LEGEND

- ⊕ SB-05 PROPOSED BORING LOCATION
- ⊕ MW-20 PROPOSED WELL LOCATION
- ⊕ MWEDC-2 EXISTING WELL LOCATION

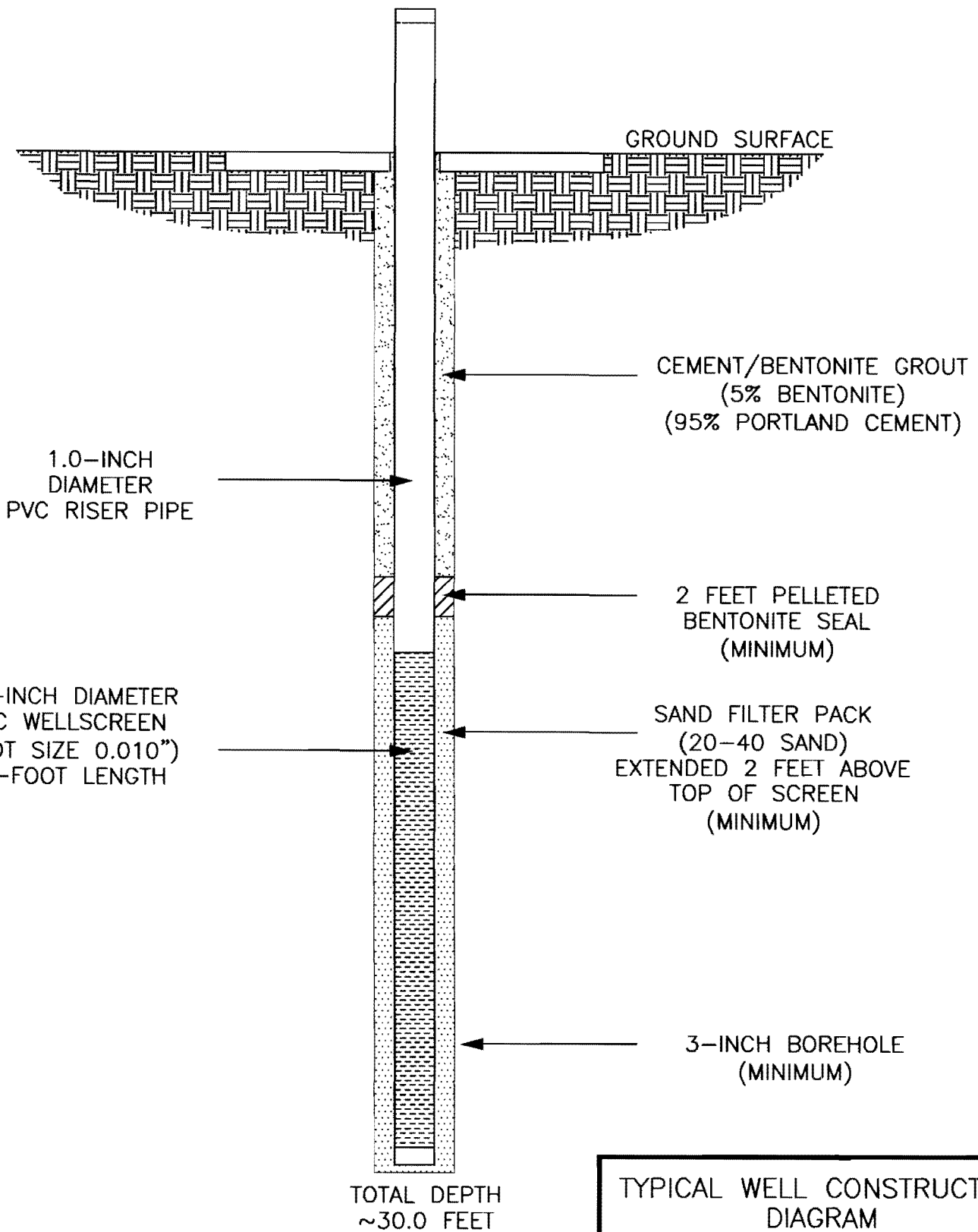


ENVIRONMENTAL
MANAGEMENT SERVICES, INC.

PROJECT NO: 2EC0100
CROSS SECTION FIGURE1.DWG
DRAFTED BY: KK/LM DATE: 02/18/02
APPROVED:
BY: DATE:

**PROPOSED BORING AND
MONITOR WELL LOCATION MAP**

EL DORADO CHEMICAL COMPANY
EL DORADO, ARKANSAS



TYPICAL WELL CONSTRUCTION
DIAGRAM

DATE: 02/25/03	APPROVED: BY: _____ DATE: _____	DRAWN BY: KRC
SCALE: N.T.S.		CAD NO. MON WELL DETAIL 01

Stuart-Leslie, Laura

From: Randall Whitmore [RWhitmore@edc-ark.com]
Sent: Friday, November 07, 2003 12:17 PM
To: 'STUART@adeq.state.ar.us'
Subject: RE: EDCC work plan

-----Original Message-----

From: STUART@adeq.state.ar.us [mailto:STUART@adeq.state.ar.us]
Sent: Friday, November 07, 2003 10:52 AM
To: RWhitmore@edc-ark.com
Subject: RE: EDCC work plan

Randall,

I have faxed a copy of Figure 1 with a location of one additional boring. Let me know if it is illegible or isn't clear. [Randall Whitmore] We will add the additional boring - no problem

A few quick questions/recommendations:

Clarification between Section 3.2, Pg 4 and Figure 2: Figure 2 shows a 1.0" diameter casing and screen, but in section 3.2, a 2.125" diameter casing is pulled up during filter pack placement. I'm assuming 1.0", but does the filter pack, screen and grout make up the difference between 1.0" pipe and 2.125"? [Randall Whitmore] The 2.125" casing is the drilling casing. The well will be set inside this casing. The finished well will be 1" diameter.

According to Figure 2, the screen length will be 10'. Depending on boring/well logs, it may be necessary to extend the screen length. I would rather see the screen length based on site conditions. However, since all the other wells have 10' screens, it might be best to maintain consistency. What are your thoughts? [Randall Whitmore] We should use at least 10' of screen but we can add additional screen in 2.5', 5' and 10' lengths.

In section 3.4, Pg. 5, please survey the well elevations to the nearest USGS marker, if available. As stated in your work plan, the locations may be surveyed to whatever marker is convenient for you.

[Randall Whitmore] We will survey from a USGS marker

Under section 5.0, Pg 6, please include driller's logs, if available, and all notes/observations (odors, visual characteristics) from the soil borings and well installations in the report. [Randall Whitmore] All field notes and field logs will be included in the report

Please let me know if you have any questions. Let's go ahead and get started as soon as possible with this project.

Thanks,
Laura

-----Original Message-----

From: Randall Whitmore [mailto:RWhitmore@edc-ark.com <mailto:RWhitmore@edc-ark.com>]
Sent: Thursday, November 06, 2003 11:42 AM
To: Laura Stuart (E-mail)
Subject: EDCC work plan

Laura - Have you had time to look over the work plan I sent you?
rw

— what length screen in eq. well?

2.125" well casing (pulled up?)

1.5" well → see fig 2 w/ 1" diam.

→ 0.625" filter pack, grout + screen

— survey for elev. to nearest USGS marker
survey for loc. to whatever benchmark is convenient

— report

incl. driller's logs if applicable w/ drilling activ

incl. any obser. w/ soil boring logs

= add'l boring E of MW-EDC-13
pass boring near MW-EDC-1

Stuart-Leslie, Laura

From: Stuart-Leslie, Laura
Sent: Friday, November 07, 2003 10:52 AM
To: 'Randall Whitmore'
Subject: RE: EDCC work plan

Randall,

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Thanks,
Laura

-----Original Message-----

From: Randall Whitmore [mailto:RWhitmore@edc-ark.com]
Sent: Thursday, November 06, 2003 11:42 AM
To: Laura Stuart (E-mail)
Subject: EDCC work plan

Laura - Have you had time to look over the work plan I sent you?

rw

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Date 11/7

of pages 1

To Randall Whitmore

From Laura Stuart

Co./Dept. EDCC

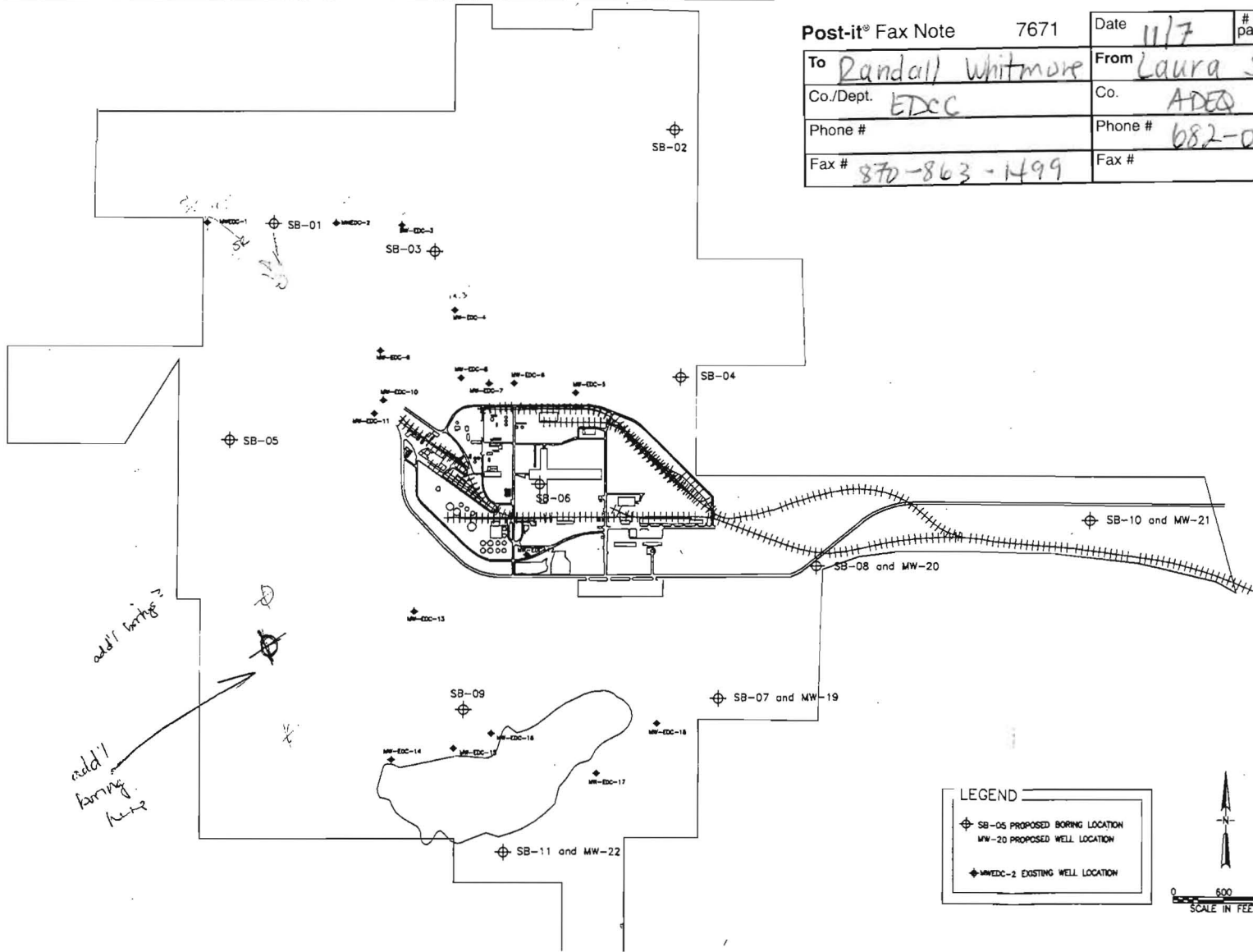
Co. ADEA

Phone #

Phone # 682-0642

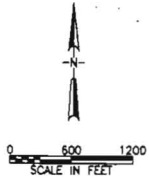
Fax # 870-863-1499

Fax #



LEGEND

- ⊕ SB-05 PROPOSED BORING LOCATION
- ⊕ MW-20 PROPOSED WELL LOCATION
- ⊕ MW-DC-2 EXISTING WELL LOCATION



Fax # 863-1499



ENVIRONMENTAL
MANAGEMENT SERVICES, INC.

PROJECT NO: 2ECD100
 CROSS SECTION FIGURE1.DWG
 DRAFTED BY: KK/LM DATE: 02/18/02
 APPROVED:
 BY: DATE:

PROPOSED BORING AND
 MONITOR WELL LOCATION MAP
 EL DORADO CHEMICAL COMPANY
 EL DORADO, ARKANSAS

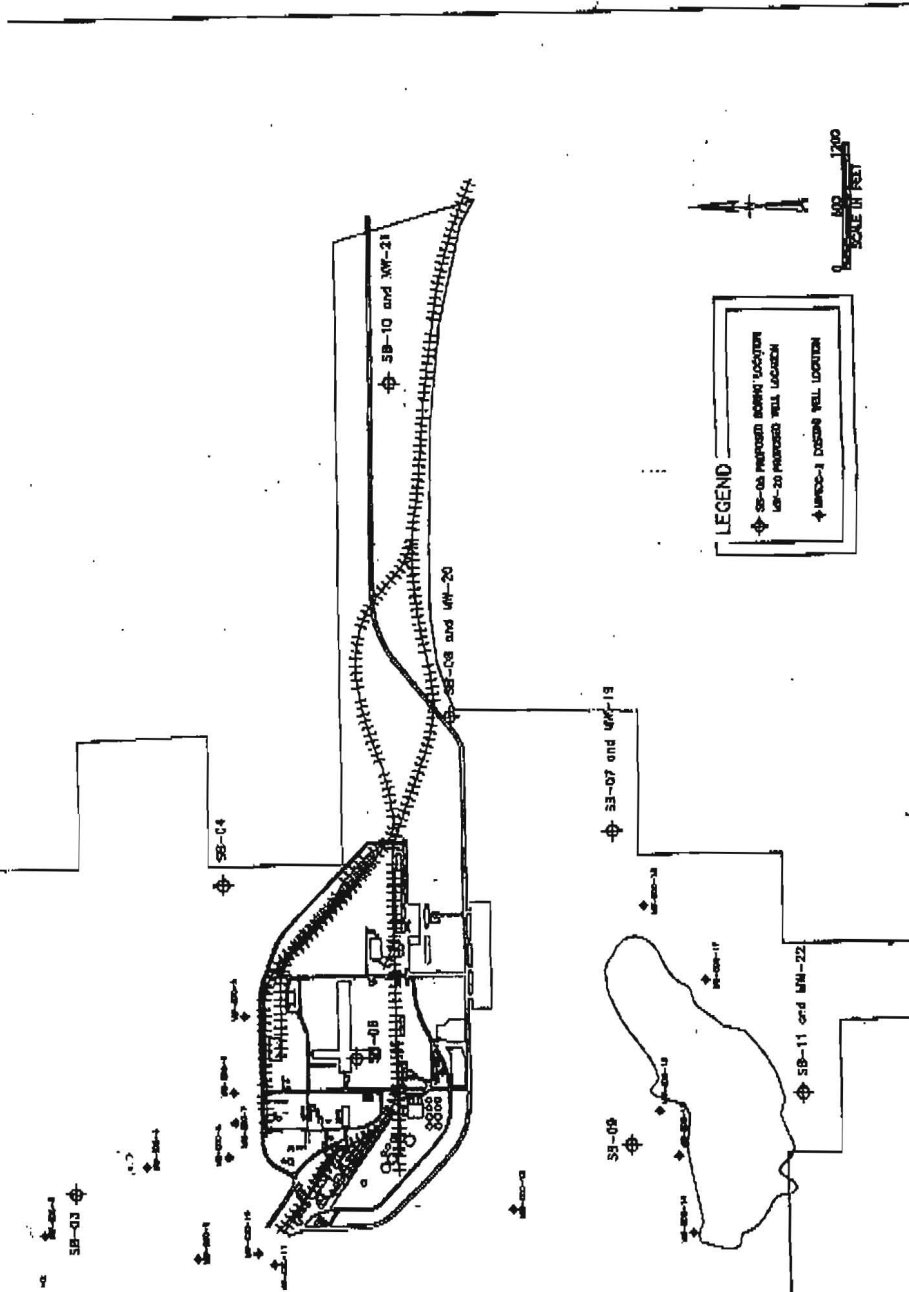
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 TEL : 501-682-2199
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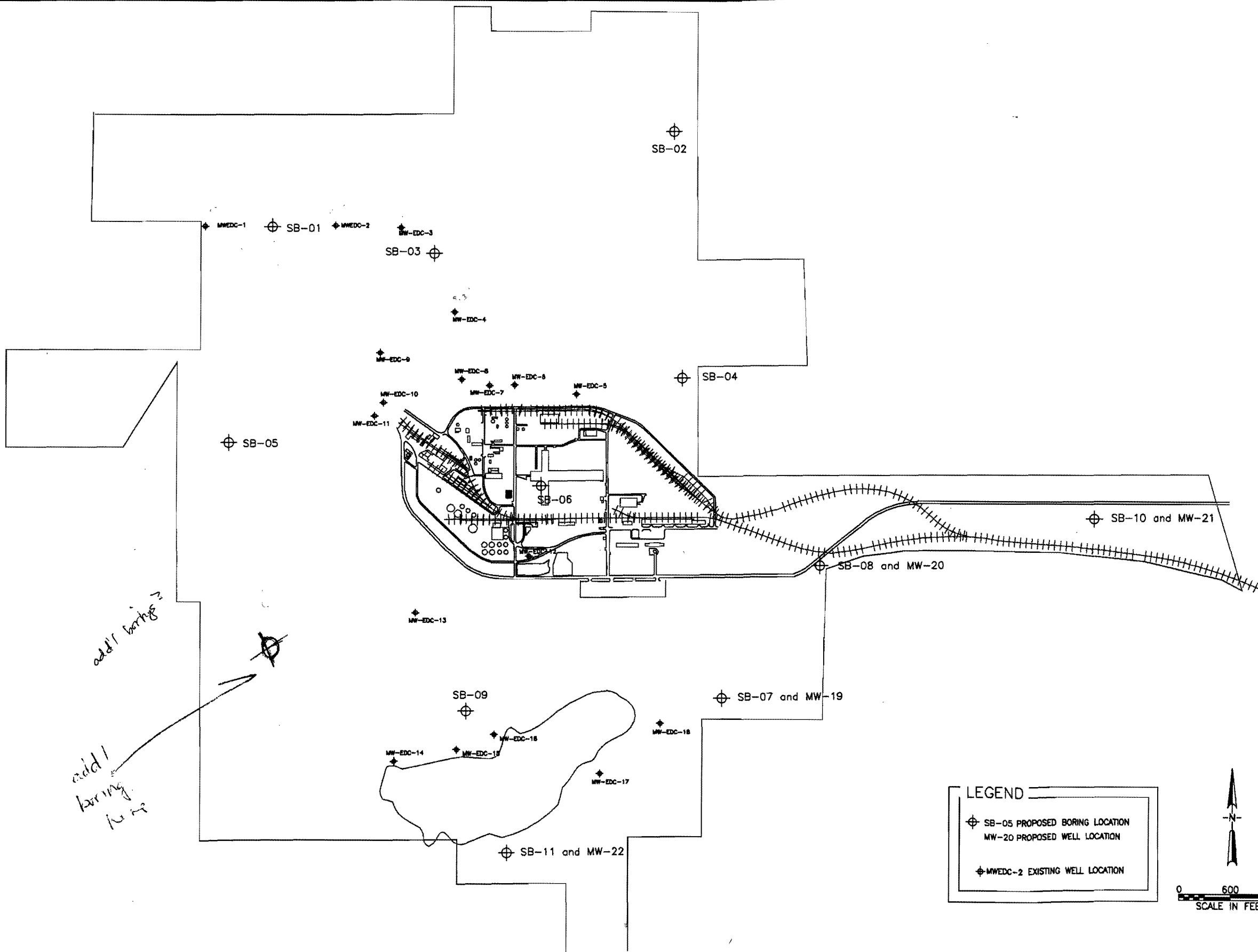
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Post-It® Fax Note	7671	Date	11/7	# of pages	1
To	Randal Whitmore	From	Laura Stuart		
Co./Dept.	ES&C	Co.	ADEQ		
Phone #		Phone #	682-0642		
Fax #	870-863-1499	Fax #			



		ENVIRONMENTAL MANAGEMENT SERVICES, INC.	PROJECT NO: 200310 CROSS SECTION FOUILLING DRAFTED BY: RYAN DATE: 10/13/02 APPROVED BY: DATE:	PROPOSED BORING AND MONITOR WELL LOCATION MAP EL DORADO CHEMICAL COMPANY EL DORADO, ARKANSAS	1
	SCALE IN FEET				



add 1 boring
to 2

Box #
865-1495



ENVIRONMENTAL
MANAGEMENT SERVICES, INC.

PROJECT NO: 2EC0100
 CROSS SECTION FIGURE1.DWG
 DRAFTED BY: KK/LM DATE: 02/18/02
 APPROVED:
 BY: DATE:

PROPOSED BORING AND
 MONITOR WELL LOCATION MAP
 EL DORADO CHEMICAL COMPANY
 EL DORADO, ARKANSAS