ERM NC, Inc.

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April 22, 2014

Mr. Lucas Berresford
SCDHEC – State Voluntary Cleanup Section
Bureau of Land & Waste Management
2600 Bull Street
Columbia, SC 29201
803-896-4071

Subject: In-Situ Chemical Oxidation Pilot Test Work Plan
Joslyn Clark Controls, LLC Facility
2013 West Meeting Street
Lancaster County, South Carolina

Dear Mr. Berresford:

On behalf of Joslyn Clark Controls, LLC, ERM NC, Inc. (ERM) is pleased to present one hard copy and one electronic copy of the In-Situ Chemical Oxidation Pilot Test Work Plan for the above referenced site. A UIC permit application has also been submitted to Mr. Mr. Christopher Wargo at the UIC Section. We look forward to your expeditious review and approval.

Should you have any questions or comments, feel free to contact us at (704) 541-8345.

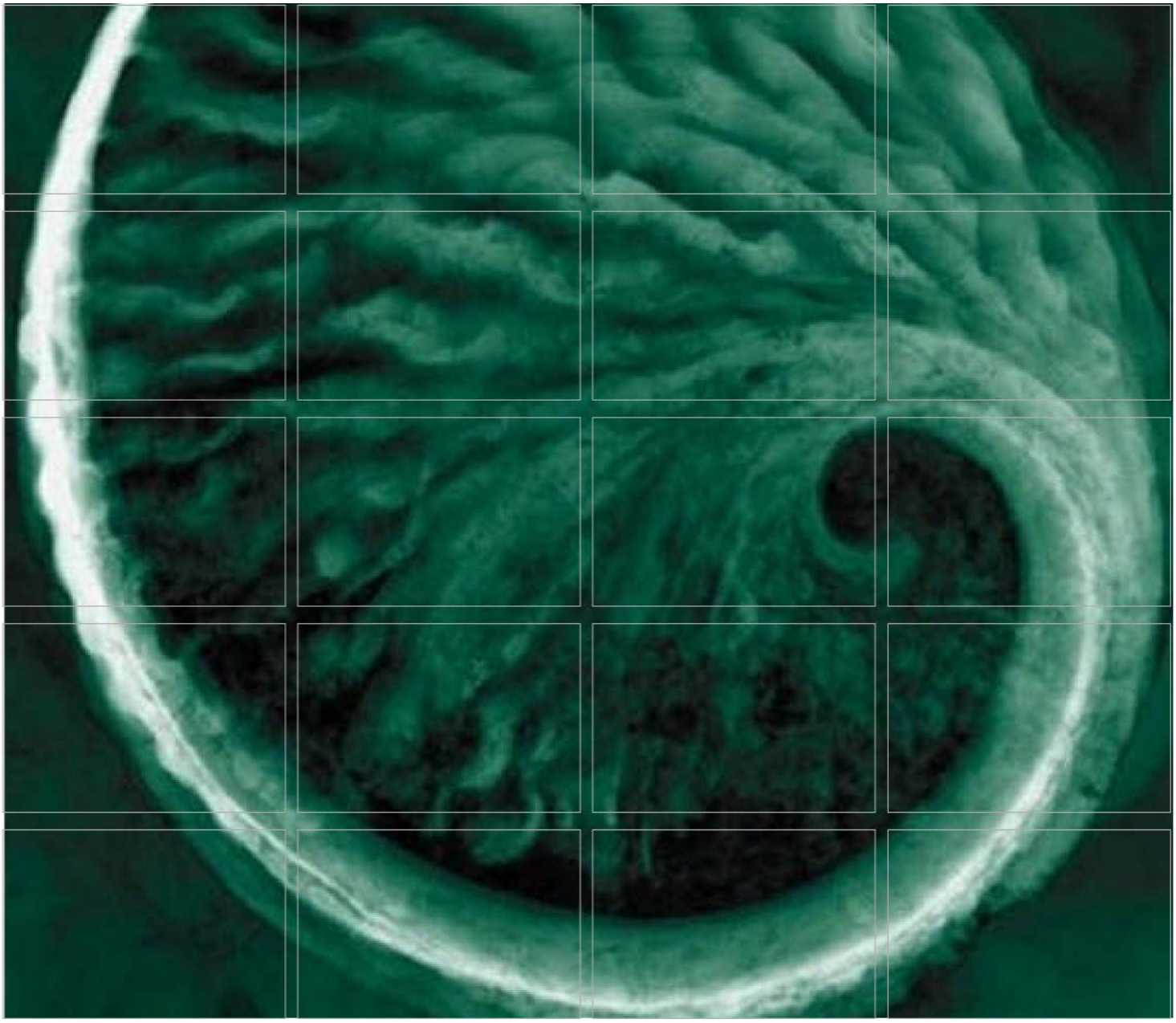
Sincerely,

Rick Tarravechia, P.G.
Partner in Charge

RICHARD J. TARRAVECHIA REGISTERED NO. 2060 SOUTH CAROLINA PROFESSIONAL GEOLOGIST

Michael Pressley, P.G.
Project Manager

cc: Mr. Carl Grabinski – Joslyn Clark Controls



In-Situ Chemical Oxidation (ISCO) Pilot Test Work Plan

Joslyn Clark Controls Facility
2013 W. Meeting Street
Lancaster, South Carolina

April 8, 2014

WORKPLAN

Joslyn Clark Controls, Inc.

In-Situ Chemical Oxidation (ISCO) Pilot Test Work Plan

2013 W. Meeting Street,
Lancaster, South Carolina

April 8, 2014

Rick Tarravechia, P.G.
Principal-in-Charge

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TABLE OF CONTENTS

ACRONYMS

AS/SVE	Air Sparge/Soil Vapor Extraction
COCs	Constituents of Concern
DCE	Dichloroethene
DO	Dissolved Oxygen
EPA	Environmental Protection Agency
ERM	Environmental Resources Management
FT BLS	Feet Below Land Surface
ISCO	*in-situ* Chemical Oxidation
MCLs	Maximum Contaminant Levels
$KaMnO_4$	Potassium Permanganate
O&M	Operation and Maintenance
ORP	Oxidation Reduction Potential
PCC	Post Closure Care
PRBs	Permeable Reactive Barriers
PRGs	Preliminary Remediation Goals
PWR	Partially Weathered Rock
RCRA	Resource Conservation Recovery Act
RI	Remedial Investigation
SCDHEC	South Carolina Department of Health and Environmental Control
SCM	Site Conceptual Model
SII	Siemens Industries Inc.
SPLP	Synthetic Precipitation Leaching Procedure
SVE	Soil Vapor Extraction
SWMU	Solid Waste Management Unit
TCE	Trichloroethene
VOCs	Volatile Organic Compounds

Note: See document for acronym context

1.0 INTRODUCTION

ERM NC, INC (ERM), on behalf of Joslyn Clark Controls, Inc. (Joslyn Clark), is submitting this In-Situ Chemical Oxidation (ISCO) Pilot Test Work Plan for the Joslyn Clark site located at 2013 W. Meeting Street in Lancaster, South Carolina. A site location map for the Lancaster, South Carolina facility is presented as Figure 1, and a site layout map is provided as Figure 2. This Pilot Test is being conducted as part of a Feasibility Study under preparation for the subject property. The purpose of the Pilot Test is to evaluate ISCO as a remediation technique for treating contaminated groundwater at the source area. The site remediation effort is being performed under Voluntary Cleanup Contract (VCC) 13-5875-RP executed between Joslyn Clark and SCDHEC on October 2, 2013.

2.0 BACKGROUND

The subject property consists of 23 acres of land and is developed with two main buildings. The now vacant former manufacturing building was constructed in 1964 and consists of approximately 180,000 square feet of floor space. The now vacant former warehouse/storage building was constructed in 1967 and consists of approximately 14,400 square feet of floor space. The subject property has been used to manufacture electrical control equipment for fire safety purposes since its construction in 1964. Figure 2 illustrates the general property layout.

The principal raw materials for manufacturing onsite included sheet metal, copper wire, pre-manufactured metal and plastic components, electrostatic paint, and oil-based paint. Joslyn Clark's primary production included the fabrication of metal cabinets, which were populated with various electrical, plastic, and metal components purchased from other off-site manufacturers. The Joslyn Clark facility had been a regulated source of air emissions, industrial wastewater discharge, and hazardous waste.

Previous site assessment activities have included:

- A Phase I Environmental Site Assessment (ESA) was conducted by ERM in January 2009 that identified potential environmental concerns related to a former metal plating operation and a former degreasing operation which used trichloroethylene (TCE) as a solvent.
- Phase II ESA activities conducted in 2009 included the installation of 15 soil borings and seven permanent monitoring wells (MW-1 through MW-7) to assess areas of potential environmental concern identified in the Phase 1 ESA. TCE was detected in several soil samples at low concentrations. TCE was also detected in four monitoring wells at concentrations ranging from 7.7 µg/L to 2,700 µg/L, which is above the established South Carolina Maximum Contaminant Level (MCL) of 5.0 µg/L.
- During January of 2011, Joslyn Clark conducted a sensitive receptor survey (SRS). The SRS indicated that the closest water supply well to the site was located at a trailer park about 645 feet upgradient from the Joslyn Clark site and according to the property owner, was not in use. The next closest water well was almost 3,500 feet from the Joslyn Clark site, also in the general upgradient direction.
- Phase III ESA activities were conducted in 2011 to further delineate the volatile organic compound (VOC) plume in groundwater and collect additional soil samples. Three additional shallow monitoring wells (MW-8, MW-9 and MW-10) were installed to further evaluate the horizontal extent of the VOC plume. Two deep wells (MW-3D and MW-10D) were installed to evaluate the vertical extent of the VOC impacted groundwater at the site. Groundwater samples collected during the Phase III activities showed multiple chlorinated compounds, with TCE and PCE being the most prevalent.

- A passive soil gas survey (SGS) took place on November 27-29, 2012 with the installation of 60 soil gas points in the northwest portion of the manufacturing building. Twenty-five (25) VOCS were identified in the soil gas samples. The highest VOC concentrations were found at the two locations in the northwest portion of the building, in the vicinity of the former wastewater treatment room, and the former paint booth and sump (southwestern portion of the building).
- During March and April 2013, ERM conducted a Remedial Investigation at the facility in order to further characterize the source of the observed TCE plume originating inside the building and to collect additional information to facilitate subsequent groundwater remediation activities. Activities included the installation of five soil borings, one temporary well and three permanent monitoring wells inside the building (MW-11, MW-11I, and MW-11D). The results of these activities included:
    - The passive soil gas study indicated that PCE and TCE vapors are present within the pore space of the soil in the vicinity of the former wastewater treatment room and former paint booth and sump (southwestern portion of the building). Confirmatory samples collected from these areas did not identify the presence of chlorinated VOCs in soil.
    - 1, 4-Dioxane was detected in soil samples collected from each of the five borings at the shallow (3-5 foot) and deep (13-15 foot intervals. The concentrations ranged from 0.404 mg/kg to 0.992 mg/kg, which exceeded the risk-based protection of groundwater standard of 0.00014 mg/kg, but not the residential soil screening level of 4.9 mg/kg. 1, 4-Dioxane was detected in only two groundwater samples, temporary well GP-19 (0.95 ug/L) and shallow well MW-11 (0.787 ug/L).
    - The vertical extent of VOC-affected groundwater has not been completed defined; however, the bulk of the VOC mass in groundwater is at the shallow depths, further delineation of the vertical extent of TCE-affected groundwater is not necessary for remedial purposes.
    - The horizontal extent of the TCE-affected groundwater at the site is delineated and the TCE plume is confined to the subject property.
- A human health risk assessment (HHRA) was conducted and the results indicate there is limited risk/hazard to human health receptors at the site, with the exception of site/ maintenance workers who may be exposed to organic vapors migrating from groundwater, and to a lesser extent construction workers who may contact impacted subsurface soil during future excavation or trenching activities.

Figure 3 presents a groundwater isoconcentration map for TCE in groundwater using the data from the most recent comprehensive groundwater analytical sampling event (May and June 2013). It should be noted that monitor well MW-9 was installed proximal to the two former off-site wastewater lagoons. The former lagoons are not associated with the Joslyn Clark site.

3.0 COMPOUNDS OF CONCERN

This section lists the constituents of concern (COCs) identified for the Site based on the collective results of the RI assessment activities and groundwater monitoring program. Based on the results of the voluntary assessment, risk from the minor residual soil impact is negligible. Therefore, the focus of this pilot test is on remediation of impacted groundwater at the source area.

Based on the most recent sampling results (May and June 2013), COCs in groundwater are predominantly trichloroethene (TCE) and its associated daughter products, as summarized in the following table:

Maximum TCE and Daughter Product Concentrations in Source Area Groundwater (September 2009 – June 2013)

Compound	Maximum Concentration (µg/l)	SC MCL Groundwater Standard (µg/l)
Trichloroethene	3,200 (MW-3)	5
1,1-Dichloroethene	155 (MW-11)	7
cis 1,2-Dichloroethene	64.8 (MW-11)	70
Vinyl Chloride	Not Detected	2

µg/L = micrograms per liter

4.0 SUMMARY OF SITE CONCEPTUAL MODEL

The Site is located near the Western Piedmont Physiographic Province of South Carolina. According to the Geologic Map of South Carolina (1997) and *The Geology of the Carolinas, Horton and Zullo, 1991*, the Lancaster area is located within the Charlotte Belt and is specifically underlain by mica gneiss. Saprolite, a layer of weathered and variably decomposed bedrock, commonly mantles bedrock in this region. Saprolite has the appearance of compact clayey to sandy soil, with original bedrock textures and features preserved. A partially weathered rock (PWR) zone (transition zone) is commonly present between the saprolite and competent underlying bedrock.

Soils encountered during drilling activities consisted of light brown to orangish-brown, fine-grained, micaceous clayey silt from near the surface grade to approximately 10 feet BGS. The soil changes to mostly coarse-grained sand (saprolite) between 10 feet and approximately 80 feet BGS. Density of the saprolite increased with depth, resulting in hollow-stem auger refusal at approximately 35 feet BGS. Bedrock was encountered between 50 feet below grade surface (BGS) in the northeast corner of the property and 80 feet BGS in the southwest corner of the property.

Groundwater in the shallow saprolite zone occurs in the interstitial pore space of the saprolite. The depth to groundwater in the saprolitic zone at the subject site ranges from 42 to approximately 50 feet below grade. The assessment activities at the site indicated that the saprolite aquifer zone extends from depths of 42 feet to 143 feet (approximately 101 feet of saturated zone). The saprolite at the site is characterized by orange to-brown, fine-grained, sandy silt to approximately 70 feet below grade, where it then grades into a tan and greenish-grey partially weathered siltstone. Groundwater flow in the saprolite and partially weathered rock zones is governed by water table conditions. This means that groundwater will flow under unconfined conditions and generally mimic topography. Therefore, groundwater movement will be from upland areas (recharge zones) to nearby surface streams (discharge zones, such as Cane Creek and its tributaries, farther to the southeast). Contaminant transport of VOCs typically follows the advective flow of groundwater.

During the assessment activities, one double-cased, bedrock well was installed (MW-11D) into the very top of the mica gneiss bedrock. Competent bedrock surface at the site was encountered at 143 feet below land surface (bls). Above 143 feet, thin, intermittent layers of hard bedrock and weathered saprolite had been encountered. Deep well MW-11D was installed to a depth of 150 feet, 7 feet into competent bedrock (mica gneiss). Because 10 feet of well screen was utilized in MW-11D, the well straddles the saprolite/bedrock interface.

Hydraulic conductivity for the Site has been calculated during the RI using slug test data collected from monitor wells MW-3, MW-7, MW-11, MW-11I, and MW-11D.
The data from the slug tests were analyzed using the Bouwer and Rice solution. The results of the hydraulic conductivity tests are as follows:

Well Location	Hydraulic Conductivity (Feet/day)
MW-3	0.0281
MW-7	0.1104
MW-11	0.7391
MW-11I	0.4555
MW-11D	1.4373

Using the geometric mean hydraulic conductivity (K_h) of 0.1319 feet per day, assuming an effective porosity (*n*) of 0.25 for silty sand, and a gradient (dh/dl) of 0.0108 (as measured between MW-1 and MW-10), the average linear velocity for the shallow aquifer at the site is 0.0057 feet per day (2 feet per year). However, based on the approximate length of the VOC plume (≈1,050 feet); the age of the building (49 years - constructed in 1964); and assuming that the release affected groundwater within 10 years of building construction, a better groundwater flow estimate may be within the range of 20 to 30 feet/year.

Based on this model and the distribution of VOCs in soil and groundwater, the following conclusions are made concerning chemical transport mechanisms at the site:

1. Dense non-aqueous phase liquid (DNAPL) is not present at the Site.
2. Contaminants of concern are not present in the soil above EPA soil screening levels for residential or industrial settings (see Tables 1 and 2). TCE, the primary constituent of concern in groundwater, was detected in three soil samples, the highest concentration being 0.043 mg/kg in GP-3 under the former plating area (source area vicinity).
3. Vapor phase transport – volatilized contaminant mass may migrate through the vadose zone due to advection and diffusion, thereby creating a vapor plume near the source area. The results of the passive soil gas survey conducted in December 2012 verified the presence of TCE in soil vapor in the vicinity of the source area.
4. Groundwater transport – dissolved phase contamination below the water table will be transported primarily by the process of advection. However, many transport processes (e.g. molecular diffusion, adsorption, chemical and biological transformation, and colloid-facilitated transport) will affect the dissolved phase contaminant transport.
5. Surface water transport – dissolved phase contamination present in the Site groundwater system is contained onsite, and has not encountered any hydrologic boundary (i.e., creeks, ponds, or intermittent drainages).

5.0 ISCO REMEDIATION PILOT TEST

5.1 DESCRIPTION OF THE PERMANGANATE TECHNOLOGY

Several types of chemical oxidants are potentially applicable to the site including ozone, Fenton's Reagent, and sodium permanganate. In-depth information on available oxidants is outlined in *Technical and Regulatory Guidance for In Situ Chemical Oxidation of Contaminated Soil and Groundwater* (The Interstate Technology & Regulatory Council, January 2005). For the purposes of this pilot study, sodium permanganate will be utilized as the chemical oxidant. Sodium permanganate offers the following advantages: 1) It has been documented to be effective against the site-specific chemicals of concern, including trichloroethene (TCE) and 1,1-dichloroethene; 2) it is the most environmentally stable oxidant available; 3) It is safe to handle with respect to its chemical characteristics and reactivity; and 4) It is easy to monitor the distribution of sodium permanganate within the subsurface due to its distinct purple color.

The oxidative reaction between sodium permanganate and chlorinated alkenes, such as TCE, breaks the bonds between carbon atoms and dechlorinates the individual molecules, resulting in the production of carbon dioxide. In this reaction, several byproducts, including carbon dioxide, manganese dioxide, chloride, and hydrogen ions are generated and released to the groundwater. The byproducts of this reaction are not expected to be a problem since most are either innocuous or will readily react with aquifer material and subsequently stabilize. It is well documented that sodium permanganate has the ability to oxidize chlorinated alkenes in groundwater. However, the oxidant is not selective and any compound that can be oxidized that is present in the soil and groundwater will consume the sodium permanganate. The results of the permanganate natural oxidant demand (PNOD) tests on the saturated zone soil in the proposed treatment area indicated that the PNOD ranges between 0.0 and 0.8 grams of sodium permanganate per kilogram of sandy silt. Copies of the analytical results are presented in Appendix A.

5.2 CHEMICAL OXIDATION PILOT STUDY ACTIVITIES

The pilot study will focus on the source area located inside the former manufacturing building. This source area is located in the vicinity of MW-3, where the highest concentrations of TCE (relative to Joslyn Clark's activities) have been detected at the site. Two permanent injection locations will be installed in a line approximately 7.5 feet upgradient of MW-3, spaced 10-feet apart.

The implementation of this pilot study consists of several components, as follows: 1) Regulatory permit acquisition; 2) Utility clearance; 3) Installation of two pilot test injection wells and one new pilot test observation well; 4) Collection of baseline groundwater samples; 5) Injection of the sodium permanganate solution into the injection wells during a single event; 6) Conduct quarterly groundwater monitoring events within the pilot test area for one year; and 7) Evaluate the groundwater monitoring data and incorporate the data evaluation results into the Feasibility Study. The components of this Pilot Study are presented below in order of completion during the test.

5.3 PERMITS

An Underground Injection Control (UIC) permit for the injection of oxidant (sodium permanganate) to groundwater will be required. As such, a UIC permit application was submitted to the UIC board under separate cover and is attached herein in Appendix B. A more detailed description of the injection and observation wells, including depths, spacing, and screened intervals, is presented in Section 5.5.

5.4 UTILITY CLEARANCE

Prior to commencement of drilling activities, proposed drilling locations will be marked for underground utility clearance. South Carolina One Call (Call 811) will be notified no less than 48 hours prior to the start of work. In addition, a private utility locator will be retained to identify underground utilities in the vicinity of the drilling locations.

5.5 INJECTION WELL INSTALLATION

Two injection well clusters (IW-1 and IW-2) were completed on March 13, 2014 using conventional rotary hollow stem drilling and air rotary methods. The wells were installed as monitor wells under Permit No. MW-09521, issued February 20, 2014. Figure 3 illustrates the relative location and orientation of the wells with respect to MW-3. The two injection wells are approximately 9 feet upgradient of existing well MW-3, each spaced 10 feet apart.

The borehole for injection well cluster IW-1 was advanced to a depth of 73 feet below surface grade (bsg). Auger refusal was encountered at this location at approximately 50

feet bsg. Air rotary drilling was then used to advance the borehole to 73 feet bsg. The wells were constructed with 2-inch diameter PVC materials with 10 feet of 0.010-inch machine slotted well screen. Screened intervals were set at 63-73 feet bsg and 50-60 feet with solid riser pipe to within 6-inches of the ground surface. Two feet of hydrated bentonite sealed the annulus between the two wells screens.

The borehole for injection well cluster IW-2 was advanced to a depth of 70 feet bsg where auger refusal was encountered. The wells were constructed with 2-inch diameter PVC materials with 10 feet of 0.010-inch machine slotted well screen. Screened intervals were set at 63-70 feet bsg and 50-60 feet with solid riser pipe to within 6-inches of the ground surface. As with IW-1, two feet of hydrated bentonite sealed the annulus between the two wells screens.

Each of the four injections wells have been designated by either an "A" or a "B" following the IW-1 or IW-2 designation in order to identify the depth. For example, injection well IW-1A designates the shallow injection well installed at the IW-1 well cluster, while IW-1B will designates the deeper injection well at that same location. Well construction diagrams, boring logs, and construction records are presented in Appendix C.

5.6 OBSERVATION WELL INSTALLATION

One 2-inch diameter groundwater observation well (designated OW-1) was completed on March 7, 2014 at a distance of 7.5 feet downgradient of MW-3. Auger refusal was encountered at approximately 60 feet bsg. The well was therefore constructed with 10 feet of slotted well screen, from 50 to 60 feet. Existing monitor well MW-3 will also serve as an observation well during the pilot test. Figure 3 illustrates the proposed locations of the two injection wells around MW-3 and the observation well. A well construction diagram, boring log, and construction record are presented in Appendix D.

5.6 BASELINE GROUNDWATER SAMPLING

ERM will collect baseline groundwater samples from the two clustered injection locations (four samples – IW-1A, IW-1B, IW-2A, and IW-2B), existing monitor well MW-3, and observation well OW-1prior to injecting the chemical oxidant. These samples will be used to evaluate baseline groundwater conditions prior to introducing the sodium permanganate into groundwater. The samples will be collected by low-flow purge techniques used during the RI and other onsite sampling events. The baseline groundwater samples will be analyzed for the following:

- VOCs by EPA Method 8260;
- Sodium and manganese by EPA Methods 6010;
- Chloride by EPA Method 300.0;
- General water quality parameters, including dissolved oxygen concentration,

reduction/oxidation potential, specific conductivity, turbidity, temperature, and pH.

All groundwater sample analyses will be performed by a South Carolina certified laboratory, except general water quality parameters, which will be measured in the field during purging activities with an in-line, flow-through cell. All groundwater samples submitted for laboratory analyses will be preserved, stored, and shipped in accordance with the guidelines provided in the RI work plan.

5.7 ISCO INJECTION EVENT

Upon SCDHEC approval of the UIC and drilling permit applications and issuance of the appropriate permits, ERM and its subcontractors will mobilize to the site with equipment and personnel necessary to complete the injection. Sodium permanganate concentrate will be shipped directly to the site and staged near the southern loading dock and in the area of the planned injection. Approximately 500 gallons of 5% sodium permanganate solution (approximately 48 gallons of Remox L® and 452 gallons of per injection point) will be mixed and pressure injected at the site into each of the injection points (four wells located at two cluster locations (see Section 5.5)). A layout of the injection points is provided as Figure 3. This oxidant injection application approach is anticipated to facilitate the vertical distribution of oxidant though the upper 25 feet of saturated zone. The sodium permanganate solution has a specific gravity greater than that of water, and can be expected to migrate vertically downward over time, potentially allowing for continued treatment within the deeper saprolite aquifer zone. The locations of the injection well clusters and the observation well will be surveyed by a South Carolina licensed surveyor.

The above procedure may be modified in the field based on site conditions, as necessary. Any such modifications will be reported to SCDHEC within 24 hours via telephone or email. In the event that the borehole is not as receptive to injection as expected, the injection will be suspended for a period of 10 to 15 minutes and then restarted. The total injection volume and location of each borehole will be noted in the field logbook.

5.8 POST ISCO GROUNDWATER MONITORING PROGRAM

Five post injection monitoring events are planned as part of this pilot test over the course of one year. After the first year of post ISCO monitoring, the groundwater monitoring program will be evaluated and modified to meet evolving project objectives. Revisions to the groundwater monitoring program will be submitted to SCDHEC for approval.

The first monitoring event will be conducted the day after the chemical oxidant injections are completed, in order to determine the lateral distribution of the chemical oxidant solution within the immediate vicinity of the injection point. The sodium

permanganate solution that will be injected during the pilot study will have a distinct purple color, which is easily identified when present in groundwater. Therefore, groundwater samples will only be collected for visual color observation during this monitoring event to determine the lateral distribution of the sodium permanganate solution around each injection point.

Additional post ISCO monitoring events will be performed 90, 180, and 270 days following the injection event, as described below:

- Gauging depth-to-water in wells MW-2, MW-3, OW-1, OW-2, and all four injection well points;
- Making a visual observation in the above referenced wells for the absence / presence of sodium permanganate which is readily identified in the well by a characteristic dark purple color;
- In the absence of sodium permanganate, sampling of the wells as outlined in Section 5.6.

The fifth post ISCO monitoring event will be conducted one year following the injection activities, and will include gauging and sampling of all onsite monitor wells for VOCs (EPA Method 8260). Any of wells which still exhibit a purple color will be treated with ascorbic acid to quench the oxidation reaction and a allow for VOC analyses. In addition, wells MW-3, OW-1, and all four injection well points (IW-1A, IW-1B, IW-2A, and IW-2B) will be analyzed for the other constituents outlined in Section 5.6.

5.8.1 QA/QC Sampling

Blind duplicate samples are proposed for groundwater samples at a rate of one blind duplicate sample per 10 standard samples. Additionally, one trip blank per cooler will be prepared by the laboratory for transport and analysis during monitoring well sampling activities. QA/QC groundwater samples will be analyzed for VOCs by EPA Method 8260B. QA/QC samples will be evaluated in regard to standard industry data quality indicators, including bias, completeness, comparability, precision, and method sensitivity.

5.8.2 Health and Safety Considerations

A comprehensive Health and Safety Plan (HASP) will be developed for the site to guide safe work practices during implementation of the ISCO activities. All field work will be conducted in conformance with the HASP.

5.8.3 Post ISCO Implementation Reporting

A summary of the ISCO injection event and subsequent post injection groundwater monitoring events will be presented to SCDHEC in the quarterly Progress Reports as required by the VCC. The Progress Reports will include analytical results /laboratory results and figures showing the actual installed location of the injection and sample points. Copies will be provided to the UIC board.

A final ISCO pilot test report will be submitted following the completion of the year-long test which will include detailed analysis of the test results. The report will present, at a minimum, the trend of oxidant and VOC concentrations in the pilot test area, discussions, conclusions, and recommendations based on the information obtained from the pilot test activities.

6.0 INVESTIGATION-DERIVED WASTE HANDLING, CLASSIFICATION, AND DISPOSAL

It is anticipated that the proposed activities will generate the following investigation-derived wastes:

- Soil boring cuttings and decontamination fluids generated during injection well and observation well installation are currently stored in a secured area inside the building and are containerized and labeled;
- Purge water generated during monitor and sampling.

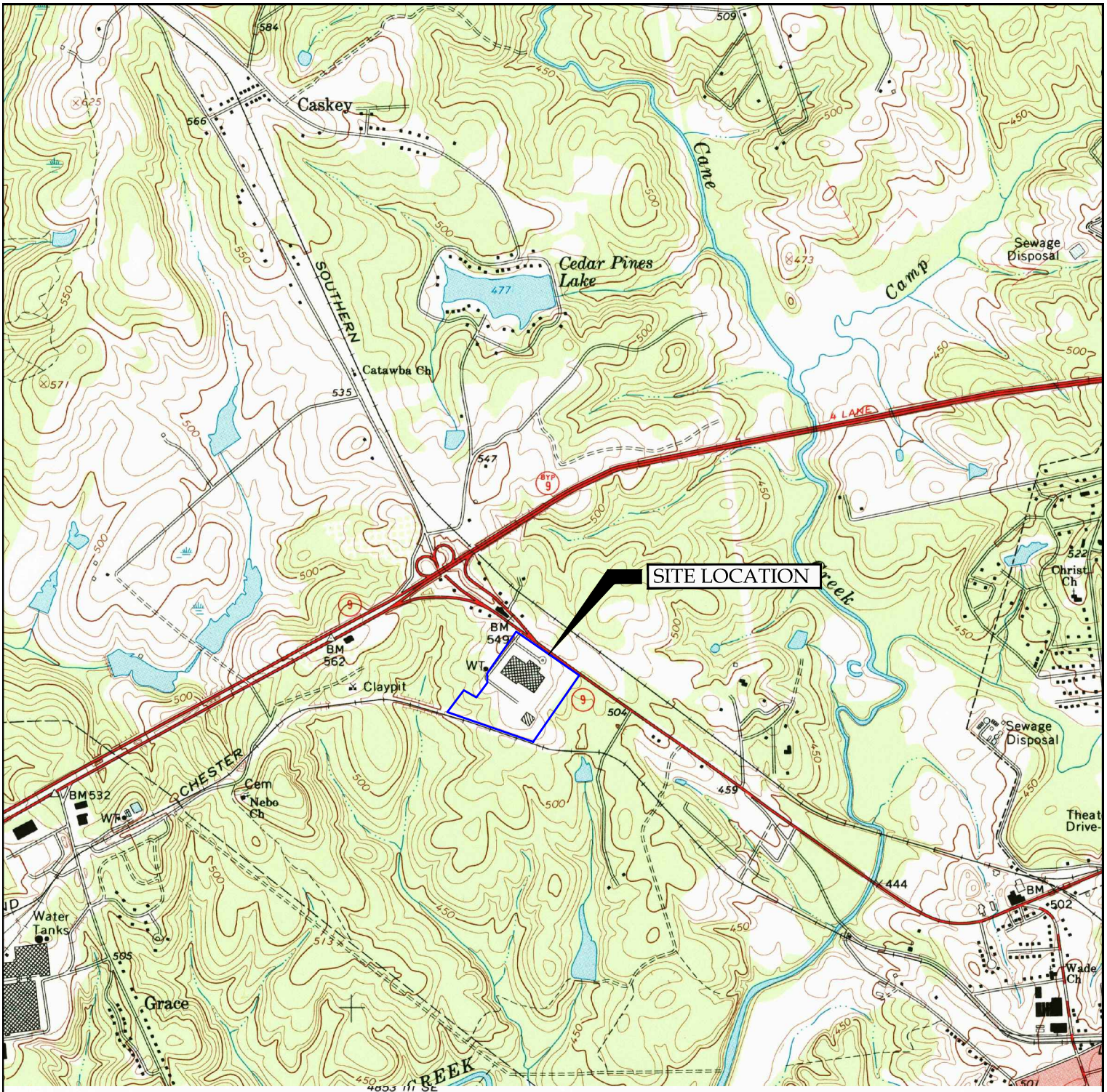
Wastes will be containerized immediately upon their generation in 55-gallon steel drums. The container will be properly labeled and transported to a secure storage area within the facility building. The IDW will be managed and subsequently disposed in accordance with SCDHEC guidance.

7.0 SCHEDULE

A summary schedule or activities is presented in the following table:

Task	Target Completion Date
Submit Pilot Test Work Plan to SCDHEC	April 20, 2014
SCDHEC Work Plan and UIC Approval	Day 0
Submittal of 3rd Progress Report	May 28, 2014
Key Monitor Wells and Observation Wells Sampled	Day 20 (20 days after approval)
Injection Event Begins	Day 45
First Post ISCO Injection Groundwater Sampling Event	Day 47
Submittal of 4th Progress Report	August 28, 2014
Second Post ISCO Injection Groundwater Sampling Event	Day 135
Submittal of 5th Progress Report	November 27, 2014
Third Post ISCO Injection Groundwater Sampling Event	Day 225
Submittal of 6th Progress Report	February 27, 2015
Fourth Post ISCO Injection Groundwater Sampling Event	Day 315
Submittal of 7th Progress Report	May 27, 2015
Fifth Post ISCO Injection Groundwater Sampling Event	Day 405
Submittal of 8th Progress Report	August 27, 2015
Pilot Test Evaluation Report Submittal	Day 465

FIGURES



SCALE 1:24000

1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 10 FEET

DATUM IS MEAN SEA LEVEL

ROAD CLASSIFICATION

Primary highway, all weather, hard surface

Light-duty road, all weather, improved surface

Secondary highway, all weather, hard surface

Unimproved road, fair or dry weather

U. S. Route

State Route

MN GN

2° 36 MILS

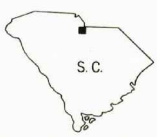
0°06′ 2 MILS

UTM GRID AND 1969 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

LANCASTER, S. C.

N3437.5—W8045/7.5

1969



QUADRANGLE LOCATION

ERM NC, Inc.

FIGURE 1

SITE LOCATION PLAN
2013 W. Meeting Street
Lancaster, South Carolina

DESIGN: MP	DRAWN: ABF	CHKD.:
DATE: 4/4/2014	SCALE: AS SHOWN	REV.:
W.O.NO.: 2014_UIC App_Figs.dwg		

ERM NC, Inc.

FIGURE 2

SITE PLAN MAP
2013 W. Meeting Street
Lancaster, South Carolina

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W.O.NO.: 2014_UIC App_Figs.dwg		

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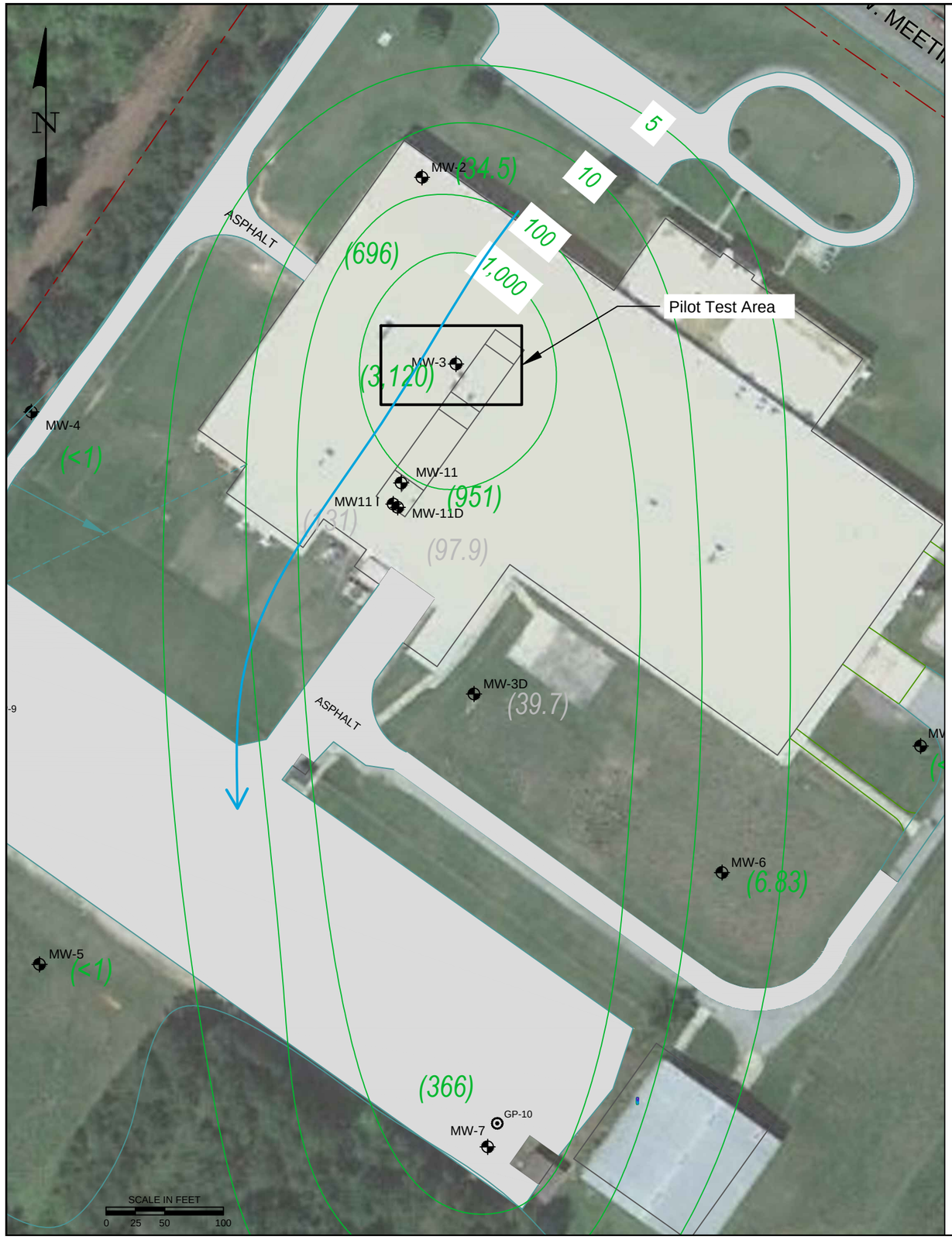

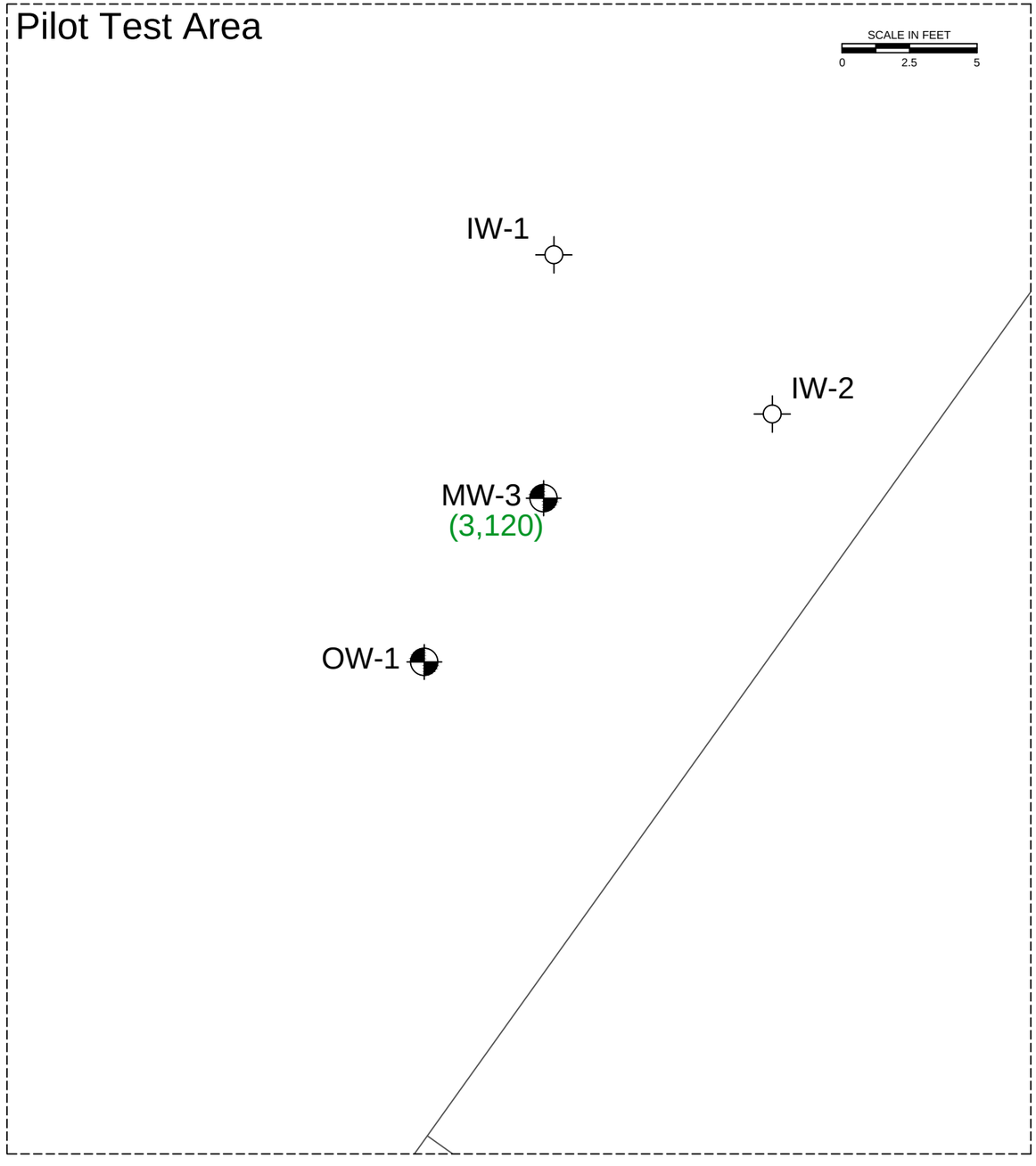

LEGEND

- MONITOR WELL LOCATION
- PROPOSED INJECTION WELL LOCATION
- (300) TCE CONCENTRATION IN µg/L (micrograms per liter)
- 5 TCE CONCENTRATION CONTOUR
- APPROXIMATE GROUNDWATER FLOW DIRECTION

ERM NC, Inc.

FIGURE 3

PROJECT AREA MAP
Former Joslyn Clark Site
2013 W. Meeting Street
Lancaster, South Carolina

DESIGN: EH	DRAWN: ABF	CHKD.:
DATE: 4/4/2014	SCALE: AS SHOWN	REV.:

W.O.NO.: 2014_UIC App_Figs.dwg

ERM

Appendix A
Laboratory Analytical Data Sheets - PNOD

Carus Remediation Technologies
Remediation Report

27 March 2014

Customer: ERM NC, Inc. CC: T. Lizer
15720 John J. Delaney Dr. Suite 120
Charlotte, NC 28277

Attention: Michael Pressley

From: L.Mueller

TECH # 14-052

Subject: RemOx® L ISCO Reagent Permanganate Natural Oxidant Demand

Summary
The overall average RemOx® L ISCO reagent permanganate natural oxidant demand (PNOD) at 48 hours for the soil samples was determined to be 0.3 g/kg. The average demands ranged from 0.0 g/kg to 0.8 g/kg. These values are calculated on a weight as sodium permanganate ($NaMnO_4$) per dry weight of soil.

Background
Three soil samples were received from ERM NC, Inc. from the Joslyn Clark project in Lancaster, SC on March 14, 2014. The soil sample designations were OW-1-57-59, IW-1-54-56, and IW-2-67-67.5. The samples were analyzed for permanganate natural oxidant demand. The measurement of the permanganate natural oxidant demand is used to estimate the concentration of permanganate that will be consumed by the natural reducing agents during a given time period of 48 hours.

Experimental
The samples were analyzed for permanganate natural oxidant demand following ASTM D7262-07 Test Method A. A brief summary is as follows:

To determine the PNOD, the soil was baked at 105°C for 24 hours then allowed to cool to room temperature. The soil was then blended and passed through a U.S. 10 sieve (2 mm). Reactors were loaded with 50 grams of soil and 100 mL of 20 g/L $NaMnO_4$ for an initial dose of 40 g/kg NaMnO4 on a dry soil weight basis at a 1:2 soil to aqueous reagent ratio. Each soil dose was performed in triplicate. The reaction vessels were inverted once to mix the reagents. Residual permanganate (MnO_4^-) was determined at 48 hours. The demands were calculated on a dry weight basis.

Results
The permanganate demand is the amount of permanganate consumed in a given amount of time. It should be noted that in a soil or groundwater sample, the oxidation of any compound by permanganate is dependent on the initial dose of permanganate and the reaction time available. As the permanganate dose is increased, the reaction rate and oxidant consumption may also

increase. Some compounds that are not typically oxidized by permanganate under low doses can become reactive with permanganate at higher concentrations.
The 48-hour PNOD results can be seen in Table 1 (on a dry soil basis).

Table 1: 48-Hour PNOD *

Soil Sample Identification	Average and Standard Deviation (g/kg)	Replicate 1 (g/kg)	Replicate 2 (g/kg)	Replicate 3 (g/kg)
OW-1-57-59	0.1 ± 0.26	0.0	0.4	0.0
IW-1-54-56	0.8 ± 0.36	0.3	1.0	1.0
IW-2-67-67.5	0.0 ± 0.29	0.2	0.0	0.0
Overall Average	0.3			

*Demands were calculated on a weight $NaMnO_4$/dry soil weight basis from an initial dose of 40.0 g/kg $NaMnO_4$ initial dose at a 1:2 soil to aqueous solution ratio

Conclusions
For this application the amount of permanganate needed will be dependent on the reaction time allowed. On average, the soil samples had a 48-hour permanganate demand value of 0.3 g/kg. The average demands ranged from 0.0 g/kg to 0.8g/kg. Generally, remediation sites with a soil demand of less than 20.0 g/kg at the time of interest are favorable for *in situ* chemical oxidation with permanganate (see Table 2 for additional information).

Table 2: Correlation of Permanganate Natural Oxidant Demand Results*

PNOD (g/kg)	**Rank**	Comment
<10	Low	ISCO with MnO_4^- is recommended. Soil contribution to MnO_4^- demand is low.
10-20	Moderate	ISCO with MnO_4^- is recommended. Soil contribution to MnO_4^- demand is moderate. Economics should be considered.
>20	High	ISCO with MnO_4^- is technically feasible. Other technologies may provide lower cost alternatives.

*Dry Weight Basis

CARUS®

CHAIN OF CUSTODY RECORD

*ITEMS LISTED IN RED MUST BE COMPLETED BY CLIENT

CLIENT* ERM NC, Inc.	PROJECT NAME Joslyn Clark	SITE LOCATION Lancaster, SC	P.O. NUMBER	(FOR LAB USE ONLY) TECH # 14-052
ADDRESS 15720 John J. Delaney Dr. Ste 120	PHONE NUMBER 704-541-8345	FAX NUMBER	DATE SHIPPED 3/13/14	LOGGED BY: SOD
CITY Charlotte STATE NC ZIP 28277	SAMPLER (PLEASE PRINT) Thomas Fisher		REMOX® ISCO REAGENT ☒ SOLID ☒ LIQUID ☐ EITHER	
PROJECT MANAGER Michael Pressley	SAMPLER'S SIGNATURE Thomas Fisher			

ANALYSIS REQUESTED: PNOD Soil Demand ASTM D7262-07; Sodium Permanganate

SAMPLE DESCRIPTION	DATE COLLECTED	TIME COLLECTED	SAMPLE TYPE SOIL	SAMPLE TYPE GW	SOIL TYPE	# OF CONT	PNOD Soil Demand ASTM D7262-07	Sodium Permanganate	REMARKS
OW-1-57-59	3/7/14	1430	X		SPSI	2	X	X	
IW-1-54-56	3/12/14	1200	X		SPSI	3	X	X	
IW-2-67-67.5	3/10/14	1600	X		SPSI	3	X	X	

TURNAROUND TIME REQUESTED (PLEASE CIRCLE) (RUSH IS SUBJECT TO CARUS CORPORATION APPROVAL) NORMAL RUSH

SEND RESULTS TO: Michael.Pressley@erm.com

ADDITIONAL COMMENTS: Call Michael Pressley to discuss,

RELINQUISHED BY: (SIGNATURE) Thomas Fisher	DATE 3/13/14 TIME 1610	RECEIVED BY: (SIGNATURE)	DATE TIME	COMMENTS: (FOR LAB USE ONLY)	
RELINQUISHED BY: (SIGNATURE)	DATE TIME	RECEIVED AT LAB BY: (SIGNATURE)	DATE 3/14 TIME 1PM	SAMPLE(S) RECEIVED ON ICE BOTTLES RECEIVED IN GOOD CONDITION BOTTLES FILLED WITH ADEQUATE VOLUME SAMPLES RECEIVED WITHIN HOLD TIME(S)	Y OR N Y OR N Y OR N Y OR N

Ship samples to: Carus Corporation, 1500 8th Street, Bldg 45 – Customer Service Lab, LaSalle, IL 61301

Appendix B
Underground Injection Control Permit Application

ERM NC, Inc.
Ballantyne One
15720 John J Delaney Dr.
Suite 120
Charlotte, NC 28277
(704) 541-8345
(704) 624-7928 (fax)
www.erm.com

April 8, 2014

Mr. Christopher Wargo
SC DHEC Bureau of Water – Groundwater Quality Section
Underground Injection Control Program
2600 Bull Street
Columbia, South Carolina, 29201

RE: Underground Injection Control Permit Application
Joslyn Clark Controls, LLC Facility
2013 W. Meeting Street
Lancaster, Lancaster County, South Carolina
VCC 13-5875-RP

Dear Mr. Wargo:

On behalf of Joslyn Clark Controls, LLC (Joslyn Clark), ERM NC, Inc. (ERM) respectfully presents three copies of the Underground Injection Control (UIC) permit application for the area of groundwater impact in the vicinity of the existing on-site monitor well MW-3 at the Lancaster, South Carolina facility (Site). A site location map is presented as Figure 1. The enclosed UIC Permit application is submitted for the proposed *in-situ* chemical oxidation (ISCO) pilot test for groundwater remediation using sodium permanganate.

The pilot test design will focus on the area around the on-site monitor well MW-3 area, as shown on Figure 2. This location was selected as it contains the highest on-site contaminant concentrations and it represents conditions expected to be encountered in other portions of the contaminant plume that may be treated in a full-scale design. Because this pilot test area is located on-site and Joslyn Clark owns the property, no consent was needed.

A formal Work Plan for the pilot test is being sent to Mr. Lucas Berresford of the SC DHEC Bureau of Land and Waste Management under separate cover.

The proposed in-situ chemical oxidation remedial efforts are considered pilot scale. Additional ISCO remedial efforts may be expected to follow the pilot scale remediation. Therefore, Joslyn Clark requests that this permit application apply to the proposed injection locations, and that additional re-permitting (beyond a summary letter style notification of activity) will not be required for the additional application of oxidant volume, as long as the proposed solution, solution strength, approximate locations, and injection methods remain as stated in this UIC application.

Enclosed, please find the SCDHEC UIC Permit Application Form I (2502) and Attachments A-L of the UIC permit. If you have any questions, please contact us at 704-541-8345.

Sincerely,

Michael Pressley
Project Manager

Rick Tarravechia, P.G.
Partner-in Charge
SC PG License # 2060

Attachments

cc: *Carl Grabinski –Joslyn Clark*
ERM file copy

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ATTACHMENT A: Activity for Review

The proposed approach is to utilize sodium permanganate an *in-situ* chemical oxidation (ISCO) technology, in treating the dissolved-phase volatile organic compound (VOC) plume at the Site and to refine design parameters to allow the development of a full scale implementation of the ISCO technology at several locations on Site. The injection design will focus on the area around on-site monitor well MW-3. This location was selected as it contains the highest on-site contaminant concentrations and it represents conditions expected to be encountered in other portions of the contaminant plume that may be treated in a full-scale design. Because this pilot test area is located on-site and Joslyn Clark owns the property, permission to conduct the pilot test was not required.

Oxidants are typically injected into existing 2-inch inside-diameter injection wells, but may also be deployed into uncased borings (via direct push or traditional drilling methods) strategically placed relative to areas of contamination. Due to the presence of partially weathered bedrock within 5-25 feet of the water table, ERM will utilize standard Type II monitor wells for the pilot test. Two injection well cluster locations (IW-1 and IW-2) have been installed for the pilot test area in a line approximately 9.0 feet upgradient of existing well MW-3, each spaced 10 feet apart. The boreholes for IW-1 and IW-2 were advanced to depths of approximately 70 to 73 feet, respectively, which is approximately 23.5-26.5 feet below the water table in the MW-3 area.

Wells to be used for ISCO injection wells are located upgradient of MW-3 to account for potential variation in groundwater flow direction during the 1 year pilot test period. This arrangement will increase the probability that permanganate migration will continuously move toward MW-3. One 2-inch diameter groundwater observation well (OW-1) has been installed 7.5 feet downgradient of MW-3, or 15 feet downgradient of the injection wells. Existing monitor well MW-3 will also serve as an observation well during the pilot test. Figure 3 illustrates the locations of the two injection wells around MW-3 and the observation well.

It is anticipated that the maximum distance sodium permanganate will migrate down gradient over a 1 year period is approximately 15-20 feet. The permanganate will be pressure injected at the site into each of the injection points (four wells located at two cluster locations). This oxidant injection application approach will facilitate the vertical distribution of oxidant though the upper 25 feet of saturated zone. The sodium permanganate solution has a specific gravity of approximately 2.7 at 68 degrees F, and can be expected to migrate vertically downward over time, potentially allowing for continued treatment within the deeper saprolite aquifer zone.

ATTACHMENT B: Well Construction Details

Two injection well clusters (IW-1 and IW-2) and one observation well (OW-1) have been installed using conventional rotary hollow stem drilling and air rotary methods. Figure 3 illustrates the relative location and orientation of the injection and observation wells with respect to MW-3.

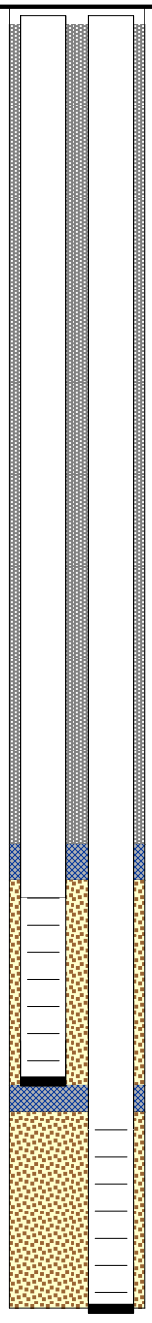
The borehole for injection well cluster IW-1 was advanced to a depth of 73 feet below surface grade (bsg). Auger refusal was encountered at this location at approximately 50 feet bsg. Air rotary drilling was then used to advance the borehole to 73 feet bsg. The wells were constructed with 2-inch diameter PVC materials with 10 feet of 0.010-inch machine slotted well screen. Screened intervals were set at 63-73 feet bsg and 50-60 feet with solid riser pipe to within 6-inches of the ground surface.

The borehole for injection well cluster IW-2 was advanced to a depth of 70 feet bsg where auger refusal was encountered. The wells were constructed with 2-inch diameter PVC materials with 10 feet of 0.010-inch machine slotted well screen. Screened intervals were set at 63-70 feet bsg and 50-60 feet with solid riser pipe to within 6-inches of the ground surface.

The borehole for observation well OW-1 was advanced to a depth of 60 feet bsg where auger refusal was encountered. The well was constructed with 2-inch diameter PVC with 10 feet of 0.010-inch machine slotted well screen. Solid riser pipe completed the well to within 6-inches of the ground surface.

Each new well was completed with a flush-mount 8-inch manhole and secured with locking caps. Well diagrams and construction records are provided on the following pages.

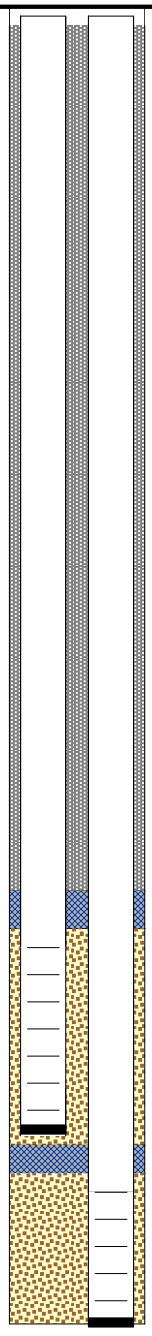
Client:	Joslyn Clark Facility	**Boring ID:**	IW-1
Project:	Joslyn Clark	**Logged By:**	Thomas Fisher
Site Location:	2013 W. Meeting Street	**Date Started:**	3/10/14
Project Number:	238259	**Date Completed:**	3/13/14

Depth	Lithology	Lithologic Description	Well Construction	Well Construction Details
0		Concrete		Flush Grade Locking Cap
4		Brown fine sandy SILT, slightly plastic.		Portland/Bentonite Grout
8		Light brown fine sandy SILT, slightly dense.		
12				
16		Brownish orange fine sandy SILT, slighly dense.		
20		Gray fine sandy SILT, highly weathered, saprolite; @ 29' white fine sandy seams slightly vertical with horizontal intrusions;		10.25 Diameter Borehole
24				
28				
32				2" Sch. 40 PVC Casing
36		Gray and tan fine sandy SILT, with angled/dipping brown hairlike seams; @ 39' vertical layering; gray, white, and brown, fine sandy SILT, H.S.A. refusal at 50'.		
40				
44				
48				Bentonite Seal Well Sand Filter Pack
52		Gray and brown sandy SILT, saprolite, highly weathered, with blocky rock structure at 58' bgs.		**A** - 2" Sch. 40 PVC 0.010" Slot Screen
56				
60				End Cap Bentonite Seal Well Sand Filter Pack
64				
68				**B** - 2" Sch.40 PVC 0.010" Slot Screen
72				End Cap
76				

Drilling Contractor:	Saedacco	**Sampling Method:**	Split Spoon
Drilling Method:	HSA/Air Rotary	**Total Depth (ft):**	60', 73'
Drilling Equipment:	Diedrich D-50	**Screened Interval:**	50'-60', 63'-73'
Responsible Professional:	Rich Lemire	**Riser Depth:**	0 - 50', 0 - 63'
Registration No.:	1423	**Elevation (msl):**	TBD

ERM

Client:	Joslyn Clark Facility	**Boring ID:**	IW-2
Project:	Joslyn Clark	**Logged By:**	Thomas Fisher
Site Location:	2013 W. Meeting Street	**Date Started:**	3/10/14
Project Number:	238259	**Date Completed:**	3/13/14

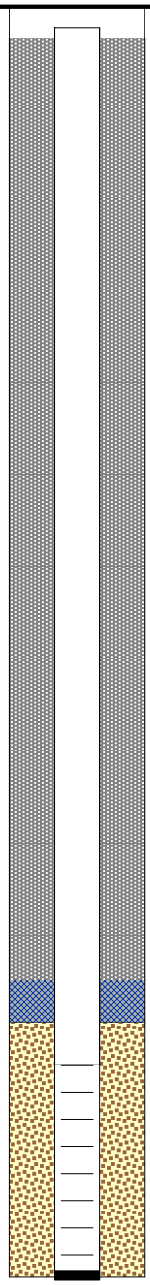
Depth	Lithology	Lithologic Description	Well Construction	Well Construction Details
0		Concrete		Flush Grade Locking Cap
4		Brown fine sandy SILT, slightly plastic.		Portland/Bentonite Grout
8		Light brown and gray fine sandy SILT, vertical layering at 9'-11', slightly dense.		
12				
16		Brownish orange fine sandy SILT, slightly dense, weathered manganese deposits present in hairlike seams.		10.25 Diameter Borehole
20				
24				
28				2, 2" Sch. 40 PVC Casings
32		Gray fine sandy SILT with angled layering, saprolite.		
36				
40				
44				
48		Brown to brownish orange silty SAND with angled layering and some high angled seams, saprolite.		Bentonite Seal Well Sand Filter Pack
52				**A** - 2" Sch. 40 PVC 0.010" Slot Screen
56		Gray highly weathered rock with highly friable rock fragments.		
60				End Cap Bentonite Seal Well Sand Filter Pack
64		Light brown weathered rock, blocky, some friable, H.S.A. refusal @ 70'.		**B** - 2" Sch.40 PVC 0.010" Slot Screen End Cap
68				
72				

Drilling Contractor:	Saedacco	**Sampling Method:**	Split Spoon
Drilling Method:	HSA	**Total Depth (ft):**	60', 70'
Drilling Equipment:	Diedrich D-50	**Screened Interval:**	50'-60', 63'-70'
Responsible Professional:	Rich Lemire	**Riser Depth:**	0 - 50', 0 - 63'
Registration No.:	1423	**Elevation (msl):**	TBD

ERM

Client:	Joslyn Clark Facility	**Boring ID:**	OW-1
Project:	Joslyn Clark	**Logged By:**	Thomas Fisher
Site Location:	2013 W. Meeting Street	**Date Started:**	3/7/14
Project Number:	238259	**Date Completed:**	3/7/14

Depth	Lithology	Lithologic Description	Well Construction	Well Construction Details
0		Concrete		Flush Grade Locking Cap
4		Brownish orange fine sandy SILT, slightly plasitc		Portland/Bentonite Grout 8.25" Diameter Borehole
8				2" Sch. 40 PVC Casing
12				
16		Brown fine sandy SILT, slightly dense, slow auger advancement.		
20				
24				
28				
32				
36				
40				
44				
48				Bentonite Seal
52				Well Sand Filter Pack
56				2" Sch. 40 PVC 0.010" Slot Screen
60		Partially Weathered Rock		End Cap
64				



Drilling Contractor:	Saedacco	**Sampling Method:**	Split Spoon
Drilling Method:	HSA	**Total Depth (ft):**	60'
Drilling Equipment:	Diedrich D-50	**Screened Interval:**	50'- 60'
Responsible Professional:	Rich Lemire	**Riser Depth:**	0 - 50'
Registration No.:	1423	**Elevation (msl):**	TBD

ERM

9903

D H E C
PROMOTE PROTECT PROSPER

Water Well Record
Bureau of Water
2600 Bull Street, Columbia, SC 29201-1708; (803) 898-4300

1. WELL OWNER INFORMATION:
Name: JOSLYN-CLARK (last) (first)
Address: 2013 MEETING STREET
City: LANCASTER State: SC Zip:
Telephone: Work: 704-541-8345 Home:

2. LOCATION OF WELL: COUNTY: LANCASTER
Name: Joslyn Clark
Street Address: 2013 W. Meeting Street
City: Lancaster, South Zip: Carolina
Latitude: 33.94146 Longitude: -81.929413

3. PUBLIC SYSTEM NAME: OW-1 **PUBLIC SYSTEM NUMBER:** OW-1

4. ABANDONMENT: ☐ Yes ☒ No
Give Details Below
Grouted Depth: from _____ ft. to _____ ft.

Formation Description	*Thickness of Stratum	Depth to Bottom of Stratum
TAN SILT/CLAY	0	48
PWR	48	60
WATER AT 47'		
*Indicate Water Bearing Zones (Use a 2nd sheet if needed)		

5. REMARKS:
BENTONITE AT 46'TO48'.

6. TYPE: ☐ Mud Rotary ☐ Jetted ☒ Bored ☐ Dug ☐ Air Rotary ☐ Driven ☐ Cable tool ☐ Other

7. PERMIT NUMBER:

8. USE:
☐ Residential ☐ Public Supply ☐ Process
☐ Irrigation ☐ Air Conditioning ☐ Emergency
☐ Test Well ☒ Monitor Well ☐ Replacement

9. WELL DEPTH (completed) 60' ft. Date Started: 3-7-2014 Date Completed: 3-10-2014

10. CASING: ☒ Threaded ☐ Welded
Diam.: 2"
Type: ☒ PVC ☐ Galvanized ☐ Steel ☐ Other
0 in. to 50' ft. depth
_____ in. to _____ ft. depth
Height: Above/(Below)
Surface _____ ft.
Weight _____ lb./ft.
Drive Shoe? ☐ Yes ☒ No

11. SCREEN:
Type: PVC Diam.: 2"
Slot/Gauge: .010 Length: 10
Set Between: 50' ft. and 60' ft.
_____ ft. and _____ ft.
NOTE: MULTIPLE SCREENS USE SECOND SHEET
Sieve Analysis ☐ Yes (please enclose) ☒ No

12. STATIC WATER LEVEL 46.4' ft. below land surface after 24 hours

13. PUMPING LEVEL Below Land Surface.
_____ ft. after _____ hrs. Pumping _____ G.P.M.
Pumping Test: ☐ Yes (please enclose) ☒ No
Yield: _____

14. WATER QUALITY
Chemical Analysis ☐ Yes ☒ No Bacterial Analysis ☐ Yes ☒ No
Please enclose lab results.

15. ARTIFICIAL FILTER (filter pack) ☒ Yes ☐ No
Installed from 48 ft. to 60 ft.
Effective size #2 Uniformity Coefficient SAND

16. WELL GROUTED? ☒ Yes ☐ No
☐ Neat Cement ☐ Bentonite ☒ Bentonite/Cement ☐ Other _____
Depth: From 0 ft. to 46' ft.

17. NEAREST SOURCE OF POSSIBLE CONTAMINATION: _____ ft. _____ direction
Type _____
Well Disinfected ☐ Yes ☒ No Type: _____ Amount: _____

18. PUMP: Date installed: _____ Not installed ☐
Mfr. Name: _____ Model No.: _____
H.P._____ Volts_____ Length of drop pipe_____ ft. Capacity ____ gpm
TYPE: ☐ Submersible ☐ Jet (shallow) ☐ Turbine ☐ Jet (deep) ☐ Reciprocating ☐ Centrifugal

19. WELL DRILLER: Rich Lemire CERT. NO.: 1423
Address: (Print) SAEDACCO 9088 Northfield Drive
Level: A (B) C D (circle one)
Telephone No.: (803) 548-2180 Fax No.: (803) 548-2181

20. WATER WELL DRILLER'S CERTIFICATION: This well was drilled under my direction and this report is true to the best of my knowledge and belief.

Signed: Ricky L Lemire Well Driller Date: 3/13/2014

If D Level Driller, provide supervising driller's name:

DHEC 1903 (03/2004)

COPY 1 MAIL TO SCDHEC, COPY 2 TO WELL OWNER, COPY 3 TO WELL DRILLER

Water Well Record
Bureau of Water
2600 Bull Street, Columbia, SC 29201-1708; (803) 898-4300

DHEC — PROMOTE PROTECT PROSPER

1. WELL OWNER INFORMATION:
Name: JOSLYN-CLARK (last) (first)
Address: 2013 MEETING STREET
City: LANCASTER State: SC Zip:
Telephone: Work: 704-541-8345 Home:

2. LOCATION OF WELL: COUNTY: LANCASTER
Name: Joslyn Clark
Street Address: 2013 W. Meeting Street
City: Lancaster, South Zip: Carolina
Latitude: 33.94146 Longitude: -81.929413

3. PUBLIC SYSTEM NAME: IW-1 **PUBLIC SYSTEM NUMBER:** IW-1

4. ABANDONMENT: ☐ Yes ☒ No
Give Details Below
Grouted Depth: from _____ ft. to _____ ft.

Formation Description	*Thickness of Stratum	Depth to Bottom of Stratum
TAN SILT/CLAY	0	48
PWR	48	70
WATER AT 47'		
*Indicate Water Bearing Zones (Use a 2nd sheet if needed)		

5. REMARKS: TWO WELLS IN ONE BORE HOLE.

6. TYPE: ☐ Mud Rotary ☐ Jetted ☒ Bored ☐ Dug ☐ Air Rotary ☐ Driven ☐ Cable tool ☐ Other

7. PERMIT NUMBER:

8. USE: ☐ Residential ☐ Public Supply ☐ Process ☐ Irrigation ☐ Air Conditioning ☐ Emergency ☒ Test Well ☐ Monitor Well ☐ Replacement

9. WELL DEPTH (completed) 60'/73 ft. Date Started: 3-7-2014 Date Completed: 3-13-2014

10. CASING: ☒ Threaded ☐ Welded
Diam.: 2"
Type: ☒ PVC ☐ Galvanized ☐ Steel ☐ Other
0 in. to 50' ft. depth
0 in. to 63' ft. depth
Height: Above/(Below)
Surface _____ ft.
Weight _____ lb./ft.
Drive Shoe? ☐ Yes ☒ No

11. SCREEN:
Type: PVC Diam.: 2"
Slot/Gauge: .010 Length: 10
Set Between: 50' ft. and 60' ft.
63' ft. and 73' ft.
NOTE: MULTIPLE SCREENS USE SECOND SHEET
Sieve Analysis ☐ Yes (please enclose) ☒ No

12. STATIC WATER LEVEL 46.4' ft. below land surface after 24 hours

13. PUMPING LEVEL Below Land Surface.
_____ ft. after _____ hrs. Pumping _____ G.P.M.
Pumping Test: ☐ Yes (please enclose) ☒ No
Yield: _____

14. WATER QUALITY
Chemical Analysis ☐ Yes ☒ No Bacterial Analysis ☐ Yes ☒ No
Please enclose lab results.

15. ARTIFICIAL FILTER (filter pack) ☒ Yes ☐ No
Installed from 49/62 ft. to 60/73 ft.
Effective size #2 Uniformity Coefficient SAND

16. WELL GROUTED? ☒ Yes ☐ No
☐ Neat Cement ☐ Bentonite ☒ Bentonite/Cement ☐ Other _____
Depth: From 0 ft. to 47' ft.

17. NEAREST SOURCE OF POSSIBLE CONTAMINATION: _____ ft. _____ direction
Type _____
Well Disinfected ☐ Yes ☒ No Type: _____ Amount: _____

18. PUMP: Date installed: _____ Not installed ☐
Mfr. Name: _____ Model No.: _____
H.P. _____ Volts _____ Length of drop pipe _____ ft. Capacity _____ gpm
TYPE: ☐ Submersible ☐ Jet (shallow) ☐ Turbine ☐ Jet (deep) ☐ Reciprocating ☐ Centrifugal

19. WELL DRILLER: Rich Lemire CERT. NO.: 1423
Address: (Print) SAEDACCO 9088 Northfield Drive
Level: A (B) C D (circle one)
Telephone No.: (803) 548-2180 Fax No.: (803) 548-2181

20. WATER WELL DRILLER'S CERTIFICATION: This well was drilled under my direction and this report is true to the best of my knowledge and belief.

Signed: Richy A Lemire Well Driller Date: 3/13/2014

If D Level Driller, provide supervising driller's name:

DHEC 1903 (03/2004)

COPY 1 MAIL TO SCDHEC, COPY 2 TO WELL OWNER, COPY 3 TO WELL DRILLER

Water Well Record
Bureau of Water
2600 Bull Street, Columbia, SC 29201-1708; (803) 898-4300

DHEC — PROMOTE PROTECT PROSPER

1. WELL OWNER INFORMATION:
Name: JOSLYN-CLARK (last) (first)
Address: 2013 MEETING STREET
City: LANCASTER State: SC Zip:
Telephone: Work: 704-541-8345 Home:

2. LOCATION OF WELL: COUNTY: LANCASTER
Name: Joslyn Clark
Street Address: 2013 W. Meeting Street
City: Lancaster, South Zip: Carolina
Latitude: 33.94146 Longitude: -81.929413

3. PUBLIC SYSTEM NAME: IW-2 **PUBLIC SYSTEM NUMBER:** IW-2

4. ABANDONMENT: ☐ Yes ☒ No
Give Details Below
Grouted Depth: from _____ ft. to _____ ft.

Formation Description	*Thickness of Stratum	Depth to Bottom of Stratum
TAN SILT/CLAY	0	48
PWR	48	73
WATER AT 47'		
*Indicate Water Bearing Zones (Use a 2nd sheet if needed)		

5. REMARKS: TWO WELLS IN ONE BORE HOLE.

6. TYPE: ☐ Mud Rotary ☐ Jetted ☒ Bored ☐ Dug ☐ Air Rotary ☐ Driven ☐ Cable tool ☐ Other

7. PERMIT NUMBER:

8. USE: ☐ Residential ☐ Public Supply ☐ Process ☐ Irrigation ☐ Air Conditioning ☐ Emergency ☒ Test Well ☐ Monitor Well ☐ Replacement

9. WELL DEPTH (completed) 60'/70 ft. Date Started: 3-7-2014 Date Completed: 3-13-2014

10. CASING: ☒ Threaded ☐ Welded
Diam.: 2"
Type: ☒ PVC ☐ Galvanized ☐ Steel ☐ Other
0 in. to 50' ft. depth
0 in. to 63' ft. depth
Height: Above/(below)
Surface _____ ft.
Weight _____ lb./ft.
Drive Shoe? ☐ Yes ☒ No

11. SCREEN:
Type: PVC Diam.: 2"
Slot/Gauge: .010 Length: 10
Set Between: 50' ft. and 60' ft.
63' ft. and 70' ft.
NOTE: MULTIPLE SCREENS USE SECOND SHEET
Sieve Analysis ☐ Yes (please enclose) ☒ No

12. STATIC WATER LEVEL 46.4' ft. below land surface after 24 hours

13. PUMPING LEVEL Below Land Surface.
_____ ft. after _____ hrs. Pumping _____ G.P.M.
Pumping Test: ☐ Yes (please enclose) ☒ No
Yield: _____

14. WATER QUALITY
Chemical Analysis ☐ Yes ☒ No Bacterial Analysis ☐ Yes ☒ No
Please enclose lab results.

15. ARTIFICIAL FILTER (filter pack) ☒ Yes ☐ No
Installed from 49/62 ft. to 60/70 ft.
Effective size #2 Uniformity Coefficient SAND

16. WELL GROUTED? ☒ Yes ☐ No
☐ Neat Cement ☐ Bentonite ☒ Bentonite/Cement ☐ Other _____
Depth: From 0 ft. to 47' ft.

17. NEAREST SOURCE OF POSSIBLE CONTAMINATION: ____ ft. ____ direction
Type _____
Well Disinfected ☐ Yes ☒ No Type: _____ Amount: _____

18. PUMP: Date installed: _____ Not installed ☐
Mfr. Name: _____ Model No.: _____
H.P. _____ Volts _____ Length of drop pipe _____ ft. Capacity ____ gpm
TYPE: ☐ Submersible ☐ Jet (shallow) ☐ Turbine ☐ Jet (deep) ☐ Reciprocating ☐ Centrifugal

19. WELL DRILLER: Rich Lemire CERT. NO.: 1423
Address: (Print) SAEDACCO 9088 Northfield Drive
Level: A (B) C D (circle one)
Telephone No.: (803) 548-2180 Fax No.: (803) 548-2181

20. WATER WELL DRILLER'S CERTIFICATION: This well was drilled under my direction and this report is true to the best of my knowledge and belief.

Signed: Rich Lemire Well Driller Date: 3/13/2014

If D Level Driller, provide supervising driller's name:

COPY 1 MAIL TO SCDHEC, COPY 2 TO WELL OWNER, COPY 3 TO WELL DRILLER

9903

D H E C
PROMOTE PROTECT PROSPER

Water Well Record
Bureau of Water
2600 Bull Street, Columbia, SC 29201-1708; (803) 898-4300

1. WELL OWNER INFORMATION:
Name: JOSLYN-CLARK (last) (first)
Address: 2013 MEETING STREET
City: LANCASTER State: SC Zip:
Telephone: Work: 704-541-8345 Home:

2. LOCATION OF WELL: COUNTY: LANCASTER
Name: Joslyn Clark
Street Address: 2013 W. Meeting Street
City: Lancaster, South Zip: Carolina
Latitude: 33.94146 Longitude: -81.929413

3. PUBLIC SYSTEM NAME: OW-1 **PUBLIC SYSTEM NUMBER:** OW-1

4. ABANDONMENT: ☐ Yes ☒ No
Give Details Below
Grouted Depth: from _____ ft. to _____ ft.

Formation Description	*Thickness of Stratum	Depth to Bottom of Stratum
TAN SILT/CLAY	0	48
PWR	48	60
WATER AT 47'		
*Indicate Water Bearing Zones (Use a 2nd sheet if needed)		

5. REMARKS: BENTONITE AT 46'TO48'.

6. TYPE: ☐ Mud Rotary ☐ Jetted ☒ Bored ☐ Dug ☐ Air Rotary ☐ Driven ☐ Cable tool ☐ Other

7. PERMIT NUMBER:

8. USE: ☐ Residential ☐ Public Supply ☐ Process ☐ Irrigation ☐ Air Conditioning ☐ Emergency ☐ Test Well ☒ Monitor Well ☐ Replacement

9. WELL DEPTH (completed) 60' ft. Date Started: 3-7-2014 Date Completed: 3-10-2014

10. CASING: ☒ Threaded ☐ Welded
Diam.: 2"
Type: ☒ PVC ☐ Galvanized ☐ Steel ☐ Other
0 in. to 50' ft. depth
_____ in. to _____ ft. depth
Height: Above/(Below)
Surface _____ ft.
Weight _____ lb./ft.
Drive Shoe? ☐ Yes ☒ No

11. SCREEN:
Type: PVC Diam.: 2"
Slot/Gauge: .010 Length: 10
Set Between: 50' ft. and 60' ft.
_____ ft. and _____ ft.
NOTE: MULTIPLE SCREENS USE SECOND SHEET
Sieve Analysis ☐ Yes (please enclose) ☒ No

12. STATIC WATER LEVEL 46.4' ft. below land surface after 24 hours

13. PUMPING LEVEL Below Land Surface.
_____ ft. after _____ hrs. Pumping _____ G.P.M.
Pumping Test: ☐ Yes (please enclose) ☒ No
Yield: _____

14. WATER QUALITY
Chemical Analysis ☐ Yes ☒ No Bacterial Analysis ☐ Yes ☒ No
Please enclose lab results.

15. ARTIFICIAL FILTER (filter pack) ☒ Yes ☐ No
Installed from 48 ft. to 60 ft.
Effective size #2 Uniformity Coefficient SAND

16. WELL GROUTED? ☒ Yes ☐ No
☐ Neat Cement ☐ Bentonite ☒ Bentonite/Cement ☐ Other _____
Depth: From 0 ft. to 46' ft.

17. NEAREST SOURCE OF POSSIBLE CONTAMINATION: _____ ft. _____ direction
Type _____
Well Disinfected ☐ Yes ☒ No Type: _____ Amount: _____

18. PUMP: Date installed: _____ Not installed ☐
Mfr. Name: _____ Model No.: _____
H.P._____ Volts_____ Length of drop pipe_____ ft. Capacity ____ gpm
TYPE: ☐ Submersible ☐ Jet (shallow) ☐ Turbine ☐ Jet (deep) ☐ Reciprocating ☐ Centrifugal

19. WELL DRILLER: Rich Lemire CERT. NO.: 1423
Address: (Print) SAEDACCO 9088 Northfield Drive
Level: A (B) C D (circle one)
Telephone No.: (803) 548-2180 Fax No.: (803) 548-2181

20. WATER WELL DRILLER'S CERTIFICATION: This well was drilled under my direction and this report is true to the best of my knowledge and belief.

Signed: Richy A Lemire Well Driller Date: 3/13/2014

If D Level Driller, provide supervising driller's name:

DHEC 1903 (03/2004) COPY 1 MAIL TO SCDHEC, COPY 2 TO WELL OWNER, COPY 3 TO WELL DRILLER

Water Well Record
Bureau of Water
2600 Bull Street, Columbia, SC 29201-1708; (803) 898-4300

DHEC — PROMOTE PROTECT PROSPER

1. WELL OWNER INFORMATION:
Name: JOSLYN-CLARK (last) (first)
Address: 2013 MEETING STREET
City: LANCASTER State: SC Zip:
Telephone: Work: 704-541-8345 Home:

2. LOCATION OF WELL: COUNTY: LANCASTER
Name: Joslyn Clark
Street Address: 2013 W. Meeting Street
City: Lancaster, South Zip: Carolina
Latitude: 33.94146 Longitude: -81.929413

3. PUBLIC SYSTEM NAME: IW-1 **PUBLIC SYSTEM NUMBER:** IW-1

4. ABANDONMENT: ☐ Yes ☒ No
Give Details Below
Grouted Depth: from _____ ft. to _____ ft.

Formation Description	*Thickness of Stratum	Depth to Bottom of Stratum
TAN SILT/CLAY	0	48
PWR	48	70
WATER AT 47'		
*Indicate Water Bearing Zones (Use a 2nd sheet if needed)		

5. REMARKS: TWO WELLS IN ONE BORE HOLE.

6. TYPE: ☐ Mud Rotary ☐ Jetted ☒ Bored ☐ Dug ☐ Air Rotary ☐ Driven ☐ Cable tool ☐ Other

7. PERMIT NUMBER:

8. USE: ☐ Residential ☐ Public Supply ☐ Process ☐ Irrigation ☐ Air Conditioning ☐ Emergency ☒ Test Well ☐ Monitor Well ☐ Replacement

9. WELL DEPTH (completed) 60'/73 ft. Date Started: 3-7-2014 Date Completed: 3-13-2014

10. CASING: ☒ Threaded ☐ Welded
Diam.: 2"
Type: ☒ PVC ☐ Galvanized ☐ Steel ☐ Other
0 in. to 50' ft. depth
0 in. to 63' ft. depth
Height: Above/(Below)
Surface _____ ft.
Weight _____ lb./ft.
Drive Shoe? ☐ Yes ☒ No

11. SCREEN:
Type: PVC Diam.: 2"
Slot/Gauge: .010 Length: 10
Set Between: 50' ft. and 60' ft.
63' ft. and 73' ft.
NOTE: MULTIPLE SCREENS USE SECOND SHEET
Sieve Analysis ☐ Yes (please enclose) ☒ No

12. STATIC WATER LEVEL 46.4' ft. below land surface after 24 hours

13. PUMPING LEVEL Below Land Surface.
_____ ft. after _____ hrs. Pumping _____ G.P.M.
Pumping Test: ☐ Yes (please enclose) ☒ No
Yield: _____

14. WATER QUALITY
Chemical Analysis ☐ Yes ☒ No Bacterial Analysis ☐ Yes ☒ No
Please enclose lab results.

15. ARTIFICIAL FILTER (filter pack) ☒ Yes ☐ No
Installed from 49/62 ft. to 60/73 ft.
Effective size #2 Uniformity Coefficient SAND

16. WELL GROUTED? ☒ Yes ☐ No
☐ Neat Cement ☐ Bentonite ☒ Bentonite/Cement ☐ Other _____
Depth: From 0 ft. to 47' ft.

17. NEAREST SOURCE OF POSSIBLE CONTAMINATION: ____ ft. ____ direction
Type _____
Well Disinfected ☐ Yes ☒ No Type: _____ Amount: _____

18. PUMP: Date installed: _____ Not installed ☐
Mfr. Name: _____ Model No.: _____
H.P. _____ Volts _____ Length of drop pipe _____ ft. Capacity ____ gpm
TYPE: ☐ Submersible ☐ Jet (shallow) ☐ Turbine ☐ Jet (deep) ☐ Reciprocating ☐ Centrifugal

19. WELL DRILLER: Rich Lemire CERT. NO.: 1423
Address: (Print) SAEDACCO 9088 Northfield Drive
Level: A (B) C D (circle one)
Telephone No.: (803) 548-2180 Fax No.: (803) 548-2181

20. WATER WELL DRILLER'S CERTIFICATION: This well was drilled under my direction and this report is true to the best of my knowledge and belief.

Signed: Richy A Lemire Date: 3/13/2014
Well Driller

If D Level Driller, provide supervising driller's name:

DHEC 1903 (03/2004) COPY 1 MAIL TO SCDHEC, COPY 2 TO WELL OWNER, COPY 3 TO WELL DRILLER

Water Well Record
Bureau of Water
2600 Bull Street, Columbia, SC 29201-1708; (803) 898-4300

DHEC — PROMOTE PROTECT PROSPER

1. WELL OWNER INFORMATION:
Name: JOSLYN-CLARK (last) (first)
Address: 2013 MEETING STREET
City: LANCASTER State: SC Zip:
Telephone: Work: 704-541-8345 Home:

2. LOCATION OF WELL: COUNTY: LANCASTER
Name: Joslyn Clark
Street Address: 2013 W. Meeting Street
City: Lancaster, South Zip: Carolina
Latitude: 33.94146 Longitude: -81.929413

3. PUBLIC SYSTEM NAME: IW-2 **PUBLIC SYSTEM NUMBER:** IW-2

4. ABANDONMENT: ☐ Yes ☒ No
Give Details Below
Grouted Depth: from _____ ft. to _____ ft.

Formation Description	*Thickness of Stratum	Depth to Bottom of Stratum
TAN SILT/CLAY	0	48
PWR	48	73
WATER AT 47'		
*Indicate Water Bearing Zones (Use a 2nd sheet if needed)		

5. REMARKS: TWO WELLS IN ONE BORE HOLE.

6. TYPE: ☐ Mud Rotary ☐ Jetted ☒ Bored ☐ Dug ☐ Air Rotary ☐ Driven ☐ Cable tool ☐ Other

7. PERMIT NUMBER:

8. USE: ☐ Residential ☐ Public Supply ☐ Process ☐ Irrigation ☐ Air Conditioning ☐ Emergency ☒ Test Well ☐ Monitor Well ☐ Replacement

9. WELL DEPTH (completed) 60'/70 ft. Date Started: 3-7-2014 Date Completed: 3-13-2014

10. CASING: ☒ Threaded ☐ Welded
Diam.: 2"
Type: ☒ PVC ☐ Galvanized ☐ Steel ☐ Other
0 in. to 50' ft. depth
0 in. to 63' ft. depth
Height: Above/(Below)
Surface _____ ft.
Weight _____ lb./ft.
Drive Shoe? ☐ Yes ☒ No

11. SCREEN:
Type: PVC Diam.: 2"
Slot/Gauge: .010 Length: 10
Set Between: 50' ft. and 60' ft.
63' ft. and 70' ft.
NOTE: MULTIPLE SCREENS USE SECOND SHEET
Sieve Analysis ☐ Yes (please enclose) ☒ No

12. STATIC WATER LEVEL 46.4' ft. below land surface after 24 hours

13. PUMPING LEVEL Below Land Surface.
_____ ft. after _____ hrs. Pumping _____ G.P.M.
Pumping Test: ☐ Yes (please enclose) ☒ No
Yield: _____

14. WATER QUALITY
Chemical Analysis ☐ Yes ☒ No Bacterial Analysis ☐ Yes ☒ No
Please enclose lab results.

15. ARTIFICIAL FILTER (filter pack) ☒ Yes ☐ No
Installed from 49/62 ft. to 60/70 ft.
Effective size #2 Uniformity Coefficient SAND

16. WELL GROUTED? ☒ Yes ☐ No
☐ Neat Cement ☐ Bentonite ☒ Bentonite/Cement ☐ Other _____
Depth: From 0 ft. to 47' ft.

17. NEAREST SOURCE OF POSSIBLE CONTAMINATION: _____ ft. _____ direction
Type _____
Well Disinfected ☐ Yes ☒ No Type: _____ Amount: _____

18. PUMP: Date Installed: _____ Not installed ☐
Mfr. Name: _____ Model No.: _____
H.P. _____ Volts _____ Length of drop pipe _____ ft. Capacity _____ gpm
TYPE: ☐ Submersible ☐ Jet (shallow) ☐ Turbine ☐ Jet (deep) ☐ Reciprocating ☐ Centrifugal

19. WELL DRILLER: Rich Lemire CERT. NO. 1423
Address: (Print) SAEDACCO
9088 Northfield Drive
Level: A (B) C D (circle one)
Telephone No.: (803) 548-2180 Fax No.: (803) 548-2181

20. WATER WELL DRILLER'S CERTIFICATION: This well was drilled under my direction and this report is true to the best of my knowledge and belief.

Signed: Rich Lemire Date: 3/13/2014
Well Driller

If D Level Driller, provide supervising driller's name:

DHEC 1903 (03/2004) COPY 1 MAIL TO SCDHEC, COPY 2 TO WELL OWNER, COPY 3 TO WELL DRILLER

D H E C

PROMOTE PROTECT PROSPER

Catherine B. Templeton, Director

Promoting and protecting the health of the public and the environment

Monitoring Well Approval

Date of Issuance: **February 20, 2014** **Approval #: MW-09521**

Approval is hereby granted to: Carl Grabinski
1500 Mittel Road
Wood Dale, IL 60191

Facility: Joslyn Clark (File 400619)
2013 West Meeting Street
Lancaster SC 29720

This approval is for the installation of 5 groundwater monitoring wells. The monitoring wells are to be installed in the locations as illustrated and per the proposed construction details provided in the February 4, 2014 submittal of the monitoring well installation permit applications. These monitoring wells are to be installed following all of the applicable requirements of R.61-71.

Please note that R.61-71 requires the following:

1. All wells shall be drilled, constructed, and abandoned by a South Carolina certified well driller per R.61-71.D.1.

2. All wells shall be properly developed per R.61-71.H.2.d. A Water Well Record Form or other form provided or approved by the Department shall be completed and submitted within 30 days after well completion or abandonment unless another schedule has been approved by the Department. The form should contain the "as-built" construction details and all other information required by R.61-71.H.1.f

3. All analytical data and water levels obtained from each monitoring well shall be submitted to the author of this approval within 30 days of receipt of laboratory results unless another schedule has been approved by the Department as required by R.61-71.H.1.d.

4. All monitoring wells shall be labeled as required by R.61-71.H.2.c.

5. If any of the information provided to the Department changes, including the proposed drilling date, the Author (PM Phone Number) shall be notified at least twenty-four (24) hours prior to well construction as required by R.61-71.H.1.a.

This approval is pursuant to the provisions of Section 44-55-40 of the 1976 South Carolina Code of Laws and R.61-71 of the South Carolina Well Standards, dated April 26, 2002.

Lucas Berresford
State Remediation Section
Bureau of Land and Waste Management

D H E C

PROMOTE PROTECT PROSPER

Catherine B. Templeton, Director

Promoting and protecting the health of the public and the environment

RECEIVED

FEB 25 2014

Monitoring Well Approval

Date of Issuance: **February 20, 2014** **Approval #: MW-09521**

Approval is hereby granted to: Carl Grabinski
1500 Mittel Road
Wood Dale, IL 60191

Facility: Joslyn Clark (File 400619)
2013 West Meeting Street
Lancaster SC 29720

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Please note that R.61-71 requires the following:

1. All wells shall be drilled, constructed, and abandoned by a South Carolina certified well driller per R.61-71.D.1.

2. All wells shall be properly developed per R.61-71.H.2.d. A Water Well Record Form or other form provided or approved by the Department shall be completed and submitted within 30 days after well completion or abandonment unless another schedule has been approved by the Department. The form should contain the "as-built" construction details and all other information required by R.61-71.H.1.f

3. All analytical data and water levels obtained from each monitoring well shall be submitted to the author of this approval within 30 days of receipt of laboratory results unless another schedule has been approved by the Department as required by R.61-71.H.1.d.

4. All monitoring wells shall be labeled as required by R.61-71.H.2.c.

5. If any of the information provided to the Department changes, including the proposed drilling date, the Author (PM Phone Number) shall be notified at least twenty-four (24) hours prior to well construction as required by R.61-71.H.1.a.

This approval is pursuant to the provisions of Section 44-55-40 of the 1976 South Carolina Code of Laws and R.61-71 of the South Carolina Well Standards, dated April 26, 2002.

Lucas Berresford
State Remediation Section
Bureau of Land and Waste Management

ATTACHMENT C: Operating Data

ERM and its subcontractors will mobilize to the site with equipment and personnel necessary to complete the injection. Sodium permanganate (NaMnO4) concentrate will be shipped directly to the site and staged near the southern loading dock and in the area of the planned injection. Approximately 500 gallons of 5% sodium permanganate solution (approximately 48 gallons of Remox L® and 452 gallons of per injection point) will be mixed and pressure injected at the site into each of the injection points (four wells located at two cluster locations (see Attachment B)). A layout of the injection points is provided as Figure 3. This oxidant injection application approach will facilitate the vertical distribution of oxidant though the upper 25 feet of saturated zone. The sodium permanganate solution has a specific gravity of approximately 2.7 at 68 degrees F, and can be expected to migrate vertically downward over time, potentially allowing for continued treatment within the deeper saprolite and upper bedrock aquifer zones.

The above procedure may be modified in the field based on site conditions, as necessary. Any such modifications will be reported to SCDHEC within 24 hours via telephone or email. In the event that the borehole is not as receptive to injection as expected, the injection will be suspended for a period of 10 to 15 minutes and then restarted. The total injection volume and location of each borehole will be noted in the field logbook. Deployment of the sodium permanganate will likely require one working day. The minimum length of the pilot test will be one year from the date oxidant injection is complete.

ATTACHMENT D: Monitoring Program

ERM will collect ground water samples from IW-1, IW-2, MW-3, and OW-1 for field and laboratory analyses prior to the pilot test to establish a baseline of contaminant concentrations and natural aquifer conditions in each well. The baseline groundwater samples will be analyzed for the following:

- VOCs by EPA Method 8260;
- Sodium and manganese by EPA Methods 6010;
- Chloride by EPA Method 300.0;
- General water quality parameters, including dissolved oxygen concentration, reduction/oxidation potential, specific conductivity, turbidity, temperature, and pH.

Groundwater sample analyses will be performed by a South Carolina certified laboratory, except general water quality parameters, which will be measured in the field during purging activities with an in-line, flow-through cell. Groundwater samples submitted for laboratory analyses will be preserved, stored, and shipped under a chain-of-custody.

For Quality Assurance/Quality Control (QA/QC) purposes, blind duplicate samples are proposed for groundwater samples at a rate of one blind duplicate sample per 10 standard samples. Additionally, one trip blank per cooler will be prepared by the laboratory for transport and analysis during monitoring well sampling activities. QA/QC groundwater samples will be analyzed for VOCs by EPA Method 8260B. QA/QC samples will be evaluated in regard to standard industry data quality indicators, including bias, completeness, comparability, precision, and method sensitivity.

The first monitoring event will be conducted the day after the chemical oxidant injections are completed, to determine the lateral distribution of the chemical oxidant solution within the immediate vicinity of the injection points. The sodium permanganate solution that will be injected during the pilot study will have a distinct purple color, which is easily identified when present in groundwater. Therefore, groundwater samples will only be collected for visual color observation during this monitoring event to determine the lateral distribution of the sodium permanganate solution around each injection point.

Additional post ISCO monitoring events will be performed 90, 180, and 270 days following the injection event, as described below:

- Gauging depth-to-water in wells MW-2, MW-3, OW-1, and all four injection well points;
- Making a visual observation in the above referenced wells for the absence / presence of sodium permanganate which is readily identified in the well by a characteristic dark purple color;
- In the absence of sodium permanganate, sampling of IW-1, IW-2, MW-3, and OW-1 for the parameters outlined above.

The fifth post ISCO monitoring event will be conducted one year following the injection activities, and will include gauging and analytical sampling for VOCs of all site wells. Wells within the injection area that still exhibit a purple color will be treated with ascorbic acid to quench the oxidation reaction and allow for VOC analyses. ERM will also sample monitor wells MW-3 and all four injection well points for VOCs (EPA Method 8260) and other constituents outlined above.

ATTACHMENT E: Existing or Pending State/Federal Permits

The site has not historically operated under a state or federal permit (e.g. RCRA Part B Permit). Remediation efforts are being performed under Voluntary Cleanup Contract (VCC) 13-5875-RP executed between Joslyn Clark and SCDHEC on October 2, 2013. Additionally, UIC permits have not historically been obtained for the site.

ATTACHMENT F: Description of Business

The Joslyn Clark facility is located at 2013 West Meeting Street in Lancaster, Lancaster County, South Carolina at Latitude 34 º 43' 18"N and Longitude 80º 49' 30"W. A Site location map is provided as Figure 1 and a Site map with significant environmental features is provided as Figure 2. The Joslyn Clark facility ceased operations in 2009. While in operations, the subject facility was used to manufacture electrical control equipment for fire safety purposes since its construction in 1964.

According to site personnel, the facility formerly contained a metal plating operation and associated wastewater pre-treatment operation. Metals used in the plating operation were reported to be zinc, nickel, copper, lead, and cyanide. The plating operation was discontinued in 2002-2003. Prior to 1979, the waste stream generated from the plating operation was piped to two off-site lagoons located west of the employee parking lot (southwest of the manufacturing building). Once the lagoons were closed (in 1979 with SCDHEC oversight), the wastewater pre-treatment operation came on-line to remove suspended solids and adjust pH of the water, prior to discharge to the municipal sewer system. The plating operation was then discontinued in 2002-2003.

A paint booth was previously operated in the southwest portion of the building, adjacent to the former wastewater pre-treatment area. The room containing the booth contained a degreasing pit that used trichloroethylene (TCE) as a solvent.

ATTACHMENT G: Area of Review

The site vicinity within one mile of the project area is shown on Figure 4. The area of review will be a fixed, ¼ mile radius from the eastern and western edges of the line of injection wells. Figure 5 shows the extent of the area of review. Included within the area of review are several residences, including a trailer park, apartment complex, and single-family residences; a manufacturer of geogrids and high strength polyester fabrics (Synteen); and wooded/undeveloped property owned.

Site Background

A Phase I Environmental Site Assessment (ESA) was conducted by ERM in January 2009 that identified potential environmental concerns related to a former metal plating operation and a former degreasing operation which used trichloroethylene (TCE) as a solvent. A TCE tank (size unknown) was reported to be formerly located inside the building, near the northwestern wall. TCE was also reportedly used near the paint booth. However, monitor wells installed into these locations (MW-2 at the former tank area and MW-11, MW-11I, and MW-11D at the paint booth) did not detect elevated TCE concentrations at the levels detected in well MW-3. Groundwater concentrations at MW-3 have historically shown TCE levels above 3,000 ug/L, the highest onsite. The exact source of the TCE detected in MW-3 is not known.

TCE Distribution

The maximum on-site TCE concentration detected in groundwater during the May 2013 sampling event was 3,120 µg/L in the sample collected from monitor well MW-3. Based on historical sampling results, VOC concentrations in MW-3 generally are stable.

TCE has migrated into the fractured bedrock aquifer zone with a concentration of 213 µg/L in MW-11I (a 100 foot deep well adjacent to the former degreasing pit) and 97.9 µg/L in MW-11D (a 150 foot deep well, also adjacent to the former degreasing pit). Bedrock well MW-3D, located approximately 150 feet downgradient from the source area (outside the building) detected TCE at 39.7 µg/L in May 2013. MW-3D is 110 feet deep. As previously stated, the VOC plume originating from the building has not migrated off-site, as demonstrated by no VOC detections in well pair MW-10/MW-10D, located at the southeast property corner.

ATTACHMENT H: Maps of Wells and Area of Review

Figures 4 through Figure 11 illustrate physical and hydrogeologic setting of the project area. The site vicinity within one mile of the project area, including known areas of soil and/or groundwater impact (no areas of known impact have been identified), is shown on Figure 4. Details of the Area of Review are shown on Figure 5.

Potentiometric Surface

Depth to groundwater measurements were collected at the site in May 2013. Well construction details are included in Table 1. Historical potentiometric data is included in Table 2.

A contoured potentiometric surface map for the saprolite aquifer (May 2013 well gauging event) is presented as Figure 6.

Groundwater Analysis

Historical groundwater geochemical quality data is presented in Table 3. Historical VOC data is present in Table 4. Groundwater analytical results from the May 2013 sampling event are included as Figure 7 and an isoconcentration map of TCE from the May 2013 event is included as Figure 8.

ATTACHMENT I: Cross Sections/Diagrams

A cross section location map is presented as Figure 9. Cross sections A-A′ and B-B′ are presented as Figure 10 and Figure 11, respectively for the May 2013 sampling event. The injection wells have been installed upgradient of existing monitor MW-3 monitor well cluster with screened intervals set within the saprolite aquifer from 5 to 28 feet below the water table.

ATTACHMENT J: Name and Depth of Underground Sources of Drinking Water

The aquifer targeted for oxidant injection is the saprolite aquifer. The conceptual model for flow within the upper saprolite aquifer, as shown in Figure 6, is to the southeast. Known potable wells in the area are listed below.

Well #	Property Owner	Property Address	Approximate Distance from the center of the Building (ft)	Municipal Water Supply?
1	Sanchez Concrete Co. Inc.	2048 West Meeting St. Lancaster, SC 29720	645	Yes
2	Williams, Cletis	1710 Partridge Circle Lancaster, SC 29720	3,495	No
3	Hamby, Mary	1686 Partridge Circle Lancaster, SC 29720	3,685	No
4	Haselden, Russell	1652 Partridge Circle Lancaster, SC 29720	3,865	No
5	Goldsmith, Brooks	1670 Partridge Circle Lancaster, SC 29720	3,910	No
6	Baxley, Daniel & Suzanne	1668 Partridge Circle Lancaster, SC 29720	3,990	No
7	Bradley, William & Beverly	1727 Morning Dove Rd Lancaster, SC 29720	4,005	No
8	Neely, Robert	1026 East Shore Drive Lancaster SC 29720	4,620	Unknown
9	Weathersbee, Joyce	1005 East Shore Drive Lancaster SC 29720	4,770	Unknown
10	Mullis, Sam	1099 East Shore Drive Lancaster SC 29720	5,050	Unknown
11	Haupt, Bill	1408 Somerset Drive Lancaster SC 29720	4,930	Yes
12	Harris, Larry	1400 Somerset Drive Lancaster SC 29720	5,190	Yes

None of the identified wells are located downgradient of the planned injection area.

ATTACHMENT K: Hydraulic Control

The use of ISCO is localized and will not alter the natural hydraulic gradients in the area.

Horizontal Hydraulic Gradient

Based on the groundwater elevations measured in May 2013, groundwater flow is to the south, towards Cane Creek with a horizontal hydraulic gradient of 0.0106, as measured between MW-1 and MW-10.

Vertical Hydraulic Gradient

The deep monitor wells, MW-3D, MW-10D, MW-11D, and MW-11I, did not show a significant difference in hydraulic head from the adjacent saprolite wells. Hydraulic head differences between MW-11, MW-11I and MW-11D are within 0.04 feet.

ATTACHMENT L: Additional Supporting Documentation

- Carus – ISCO Data Sheets

CARUS
REMEDIATION



CAS Registry No. 10101-50-5
EINECS No. 233-251-1

RemOx® L ISCO Reagent

FACT SHEET

RemOx® L ISCO reagent has been specifically manufactured for environmental applications such as remediation of soils and associated groundwater. This product can be used to degrade a variety of contaminants including chlorinated solvents, polyaromatic hydrocarbons, phenolics, organo-pesticides, and substituted aromatics. RemOx L is shipped with a certificate of analysis to document assay, pH, and trace metals.

PRODUCT SPECIFICATIONS

Assay
39.5-41.0% as $NaMnO_4$

pH
5.0-8.0

Trace Metals
(see Table 1)

CHEMICAL/PHYSICAL DATA

Formula	$NaMnO_4$
Formula Weight	141.93 g/mol
Appearance	Dark Purple Solution
Specific Gravity	1.365-1.385 g/mL
Freezing Point	-15° C/ 5° F
Solubility in Water	Miscible with water in all proportions.

Material will pass through a 10 micron filter.

APPLICATIONS

RemOx L is used for soil and groundwater remediation by *in situ* or *ex situ* chemical oxidation and as an active agent in subsurface reactive barriers for treatment of: chlorinated ethenes, phenolic compounds, polyaromatic hydrocarbons, RDX, HMX, and various pesticides.

SHIPPING CONTAINERS

5-gallon pail (20-L) (UN Specification: UN3H1/Y1.8/100) Made of high-density polyethylene (HDPE), weighs 3.5 lbs (1.6 kg). The net weight is 57 lbs (25.9 kg). The pail stands approximately 14.8 in (37.6 cm) tall, 10.6 in (26.9 cm) wide, and 11.0 in (27.9 cm) deep. (Domestic and international)

55-gallon drum (208-L) (UN Specification: UN1H1/Y1.41100) Made of high-density polyethylene (HDPE), weighs 22 lbs (10 kg). The net weight is 550 lbs (250 kg). The drum stands approximately 34.8 in (88.3 cm) tall, has an outside diameter of 23.3 in (59.1 cm). (Domestic and international)

SHIPPING CONTAINERS

275-gallon IBC (Intermediate Bulk Container) (1040-L) (UN Specification: UN31HA1/Y1.9/100) They are also marked "MX" for multi-trip. IBC weighs 139 lbs (65 kg). The net weight is 3000 lbs (1360 kg). The IBC contains 263 gallons (1000 L) of product. The IBC dimensions are 45.4 in (115.3 cm) high, 48 in (121.9 cm) long, and 40 in (101.6 cm) wide. The IBC has a 2 in (5 cm) butterfly valve with NPT threads in bottom sump. (Domestic)

275-gallon IBC (Intermediate Bulk Container) (1040-L) (UN Specification: UN31HA1/Y1.9/100) They are also marked "MX" for multi-trip. IBC weighs 132.5 lbs (60 kg). The net weight is 3000 lbs (1360 kg). The IBC contains 263 gallons (1000 L) of product. The IBC dimensions are 45.8 in (116.2 cm) high, 39.4 in (100.0 cm) long, and 47.3 in (120.0 cm) wide. The IBC has a 2 in (5 cm) butterfly valve with NPT threads in bottom sump. (International)

Bulk Shipping- Quantities up to 4000-gallons (15,142-L) are available. (Domestic only)

HANDLING, STORAGE, AND INCOMPATIBILITY

Like any strong oxidizer RemOx L should be handled with care. Protective equipment during handling should include face shields and/or goggles, rubber or plastic gloves, and rubber or plastic apron. If clothing becomes spotted, wash off immediately; spontaneous ignition can occur with cloth or paper. In cases where significant exposure exists use the appropriate NIOSH-MSHA dust or mist respirator.

Store in accordance with NFPA 30 requirements in the United States or the European Fire Protection Association in Europe for Class II oxidizers. Additional regulations in Europe are REACH (Regulation for Registration, Evaluation, Authorisation and Restriction of Chemicals), and CLP (Classification, Labeling, Packaging). REACH is a regulation that increases the responsibility of the industry to manage the risks that the chemical may pose. For REACH registration numbers refer to the eSDS. The product should be stored in a cool, dry area in closed containers. Concrete floors are preferred. Check local regulations to ensure proper storage. Avoid wooden decks. Spillage should be collected and disposed of properly. To clean up spills and leaks follow the steps recommended in our MSDS or eSDS.

Avoid contact with acids, peroxides, and all combustible organic or readily oxidizable materials including inorganic oxidizable materials and metal powders. With hydrochloric acid, chlorine gas is liberated. RemOx L is not combustible, but will support combustion. It may decompose if exposed to intense heat. Fires may be controlled and extinguished by using large quantities of water. Refer to the MSDS or eSDS for more information.

CARUS CORPORATION

ONE COMPANY, ENDLESS SOLUTIONS

CORPORATE HEADQUARTERS I 315 Fifth Street, Peru IL 61354 I Tel + 1.815.223.1500 / 1-800-435-6856 I Fax + 1.815.224.6697 I Web: www.caruschem.com I E-Mail: salesmkt@caruschem.com

CARUS EUROPE I Parque Empresarial de ASIPO I C/Secundino Roces 3, Planta 1, Oficina 13-14 I 33428 Cayes, Llanera Spain I Tel +34.985.78.55.13 / Fax +34.985.78.55.10

rev. 09/13
form RX 1603

CARUS REMEDIATION



CAS Registry No. 10101-50-5
EINECS No. 233-251-1

RemOx® L ISCO Reagent

FACT SHEET

RemOx® L ISCO reagent is classified as an oxidizer for both domestic and international transportation. Liquid permanganate is shipped domestically as Freight Class 70 and in E.U. as Class 5.1.

Proper Shipping Name: Permanganates, inorganic, aqueous solution n.o.s. (contains sodium permanganate).

Hazard Class: Oxidizer, Class 5.1
Identification Number: UN 3214
Division/APR/RID Class: 5.1
Label Requirements: Oxidizer, 5.1
Packaging Group: II
Packaging Requirements: 49 CFR Parts 171 to 180
Sections: 173.152, 173.202, 173.242
Quantity Limitations:

1 liter net for passenger aircraft or railcar:
5 liters net for cargo aircraft.

Vessel Stowage, (IMDG Regulation):

D-material must be stowed " on-deck" on a cargo vessel, but is prohibited on a passenger vessel. Other provisions: stow separately from ammonium compounds, hydrogen peroxide, peroxides, super-oxides, cyanide compounds, and powdered metal.

H.S. Code 28.41.69.00

SHIPPING CONTAINERS

RemOx L is compatible with many metals and synthetic materials. Natural rubbers and fibers are often incompatible. Solution pH and temperature are also important factors. The material selected for use with liquid permanganate must be compatible with any kind of acid or alkali being used.

In neutral and alkaline solutions, RemOx L is not corrosive to carbon steel and 316 stainless steel. However, chloride corrosion of metals may be accelerated when an oxidant such as liquid permanganate is present in solution. Plastics such as Teflon, polypropylene, and HDPE are also compatible with liquid permanganate.

Aluminum, zinc, copper, lead, and alloys containing these metals may be (slightly) affected by RemOx L. Actual corrosion or compatibility studies should be made under the conditions in which RemOx L will be used.

Table 1: Typical Trace Metal Content and Specifications

Element	Typical Analysis (mg/kg)	Specifications (mg/kg)	DL* (mg/kg)	Element	Typical Analysis (mg/kg)	Specifications (mg/kg)	DL* (mg/kg)
Ag	BDL	0.15	0.034	Fe	BDL	2.00	0.053
Al	BDL	2.00	0.24	Hg	BDL	0.03	0.003
As	BDL	4.00	0.006	Ni	BDL	0.1	0.03
Ba	2.96	15.00	0.016	Pb	BDL	0.70	0.16
Be	BDL	0.50	0.08	Sb	BDL	0.70	0.16
Cd	BDL	0.10	0.016	Se	0.0034	0.50	0.0003
Cr	3.2	5.00	0.031	Tl	BDL	3.50	0.80
Cu	BDL	0.10	0.022	Zn	0.034	0.40	0.011

DL* is detection limit
BDL is below detection limit

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CARUS EUROPE I Parque Empresarial de ASIPO I C/Secundino Roces 3, Planta 1, Oficina 13-14 I 33428 Cayes, Llanera Spain I Tel +34.985.78.55.13 / Fax +34.985.78.55.10

rev. 09/13
form RX 1603

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Form I UIC

D H E C

Underground Injection Control
Permit Application
Ground-Water Protection Division
(Collected under the Authority of Title 48 Chapter I of the 1976 South Carolina Code of Laws)

I. EPA ID NUMBER

	T/A	C
U		

Read attached instructions before starting.
For OfficialUse Only

Application Approved month day year	Date Received month day year	Permit Well Number

Comments

II. Facility Name and Address	III. Owner/Operator and Address
Facility Name: Joslyn Clark Controls, LLC	Owner/OperatorName: Joslyn Clark Controls, LLC Attention: Carl Grabinski
Street Address: 2013 W. Meeting Street	Street Address: 1500 Mittel Road
City: Lancaster; State: South Carolina; Zip Code: 29720	City: Wood Dale; State: Illinois; Zip Code: 60191

IV. Ownership Status (Select One)

☐ A. Federal ☐ B. State ☒ C. Private
☐ D. Public ☐ E. Other (Explain)

V. SIC Codes

3625

VI. Well Status (Select A, B or C)

☐ A. Operating Date Started *(MM/DD/YYYY)* ☐ B. Modification/Conversion ☒ C. Proposed

VII. Type of Permit Requested - Class and Type of Well (see reverse)

A. Class(es) enter code(s)	B. Type(s) enter code(s)	C. If class is "other" or type is code 'Y', explain	D. Number of Wells per type
V.A	I		4

VIII. Location of Wells or Approximate Center of field or Project

C	A. Latitude				B. Longitude			
I		Deg	Min	Sec		Deg	Min	Sec
		34	43	17.9		80	49	29

IX. Attachments

Complete the following questions on a separate sheet(s) and number accordingly; see instructions for **Classes 11, 111, and V, complete and submit on a separate sheet(s) attachments A-U as appropriate. Attach maps where required. List attachments by letter which are applicable and include with your application.**

X. Certification

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of a fine and imprisonment.

A. Name (Type or Print)	Title	B. Phone No.
C. Signature		D. Date Signed (MM/DD/YYYY)

DHEC2502(08/1997)

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Well Class and Type Codes

Class I			Industrial, municipal, and other injection wells for the subsurface disposal of fluids. (Prohibited)
Class II			Oil and gas production and storage related injection wells.
	Type	"D"	Produced fluid disposal well
		"R"	Enhanced recovery well
		"R"	Hydrocarbon storage well (excluding natural gas)
		"X"	Other Class II wells
Class III			Special process injection wells.
	Type	"G"	Solution mining well
		"S"	Sulfur mining well by frasch process
		"U"	Uranium mining well (excluding solution mining of conventional mines)
		"X"	Other Class III wells
Class IV			Hazardous or radioactive waste disposal injection wells. (Prohibited)
Class V.A			Injection wells not included in Class I, II, III, IV or V.B
	Type	"A"	Storm runoff drainage wells
		"B"	Aquifer recharge wells
		"C"	Salt-water intrusion barrier wells
		"D"	Subsidence control wells
		"E"	Backfill wells associated with subsurface mining
		"F"	Geothermal energy recovery wells
		"G"	Experimental technology well
		"H"	Natural gas storage wells
		"I"	Corrective action wells
Class V.B			Non-contact return flow system wells
	Type	"A"	Heat pump return flow wells
	Type	"B"	Cooling water return flow wells

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Instructions for Attachments to Form 1
Underground Injection Control
for Corrective Action Wells
(effective 01/91)

The following ATTACHMENTS should be submitted with an underground injection control (UIC) permit application for Class V.A. corrective action wells associated with aquifer remediation that are to be used to inject fluid whose chemical constituents are below all drinking water standards, as established under R.61-58.5.

Attachment A: Activity for Review

Submit a brief description of the activities to be conducted that require a UIC permit.

Attachment B: Well Construction Details

Submit schematic or other appropriate drawings of the surface and subsurface construction details of the recovery and injection wells.

Attachment C: Operating Data

Submit the following proposed operating data for each injection well:

1) Average and maximum daily rate and volume of fluid to be injected. In addition, indicate the average and maximum daily rate and volume of fluid to be withdrawn from each recovery well. Verification of the aquifer's hydraulic ability to produce and accept the quantities proposed should be presented.

2) Average and maximum injection pressure.

3) Pumping schedule (i.e. continuous, alternating cycles, etc.).

4) Proposed ranges in the concentration of all contaminant constituents within the injection fluid. Include comprehensive ground-water quality data from a "worst case" well sample.

5) Length of time the project is expected to require injection to complete remediation (to ensure the effective dates of the permit will allow sufficient time to complete the project).

Attachment D: Monitoring Program

Discuss the planned monitoring program in detail:

1) Include a discussion of monitoring devices, sampling frequency (sufficient to verify treatment system efficiency), sampling protocol, sampling location, parameters to be analyzed, and proposed method(s) of analysis.

2) This plan should indicate how, through monitoring, the proposed contaminant levels in the injectate will be verified.

3) This plan should also clearly illustrate exactly how hydraulic control of the contaminant plume (and injectate, where relevant) will be verified through monitoring (i.e., piezometers, quality analyses, etc.).

Attachment E: Existing or Pending State/Federal Permits

List the program and permit number of any existing State or Federal permits for the facility (i.e., NPDES, RCRA, UST, etc.).

Attachment F: Description of Business

Give a brief description of the nature of the business of the facility and any immediately adjacent facilities.

Attachment G: Area of Review

1) The area of review should be a fixed radius of 1/4 mile from the injection well, the outermost injection wells (if a wellfield).

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2) If a fixed radius is not selected, the methods and the calculations used to determine the size of the area of review should be submitted.

Attachment H: Maps of Wells and Area of Review

1) Submit a topographic map of the area, extending one mile beyond the project property boundaries. This map should show all hazardous waste treatment, storage, or disposal facilities, and all intake and discharge structures associated with the project facility. Any known areas of soil and/or ground-water contamination within a one mile radius should be indicated. Also indicate all surface bodies of water, springs, mines (surface and subsurface), quarries, and other pertinent surface features such as residences, roads, and geologic faults (known or suspected).

2) A scaled map(s) should be included which shows the name and/or number and the location of ALL production, injection, monitoring, abandoned and dry wells within the area of review. This should be accomplished by file and field surveys. Information regarding the construction (i.e., total depth, diameter, casing/screened intervals, grouting, etc.) and the current status (i.e., actively used, temporarily abandoned, permanently abandoned) of ALL wells within the area of review should be submitted. If any wells have been abandoned, details on the method the wells were abandoned (i.e., cemented/grouted, filled with sand, etc.) should be included.

3) A potentiometric map of the project site should be submitted which accurately locates all monitoring wells and proposed recovery and injection wells and outlines the horizontal extent of both the free-phase contaminant (where applicable) and dissolved contaminant plumes. Include all water level and product thickness data. The date and time that water levels and product thicknesses were measured should be indicated.

Attachment I: Cross Sections/Diagrams

1) Geologic cross sections indicating the lithology and stratigraphy of the site and the horizontal and vertical extent of the contaminant plume, should be submitted. At least two stratigraphic cross sections, one parallel and one perpendicular to the horizontal ground-water flow direction, should be submitted. In areas where the site stratigraphy is complex, additional cross sections should be submitted to clearly illustrate the local conditions.

2) A schematic diagram, in the form of a cross section, showing the proposed remediation system with the components of flow (above and below ground) and all associated appurtenances (i.e., stripping tower, piping, wells, etc.).

Attachment J: Name and Depth of Underground Sources of Drinking Water (USDW's)

Identify and describe all aquifers which may be affected by the injection.

Attachment K: Hydraulic Control

1) Sufficient supporting data (i.e. time/drawdown data, Theis curves and methods, calculations, etc.), used to determine aquifer characteristics to verify complete hydraulic control over the contaminant plume (and injectate, if proposed injectate quality does not conform to classified ground-water standards) during injection should be submitted. At a minimum, values should be given for transmissivity, hydraulic conductivity, effective porosity and specific yield.

2) Demonstrate the presence and magnitude of, or the absence of, any vertical hydraulic gradient at the site. If a vertical hydraulic gradient exists, show how its direction and magnitude are incorporated in the calculations demonstrating hydraulic control.

3) Ground-water flow computer models (especially 2-D map view with potentiometric and flow lines) may be utilized and submitted. All calculations should be in English units. All model-derived data and maps should be properly labeled and keyed so as to be clearly understood.

Subsequent Action

After receipt of a complete Underground Injection Control Permit Application, the Department will make a determination to deny or issue a Permit to Construct the injection well(s). After the well(s) is/are constructed, the Department should be notified in writing of the well(s) completion and sent a copy of the completed well record form(s) signed by a South Carolina certified well driller which illustrates the "as built" well construction. If the system is in compliance with the approved application, the Department may then issue an Approval to Operate. This Approval to Operate is the final permission necessary prior to injection.

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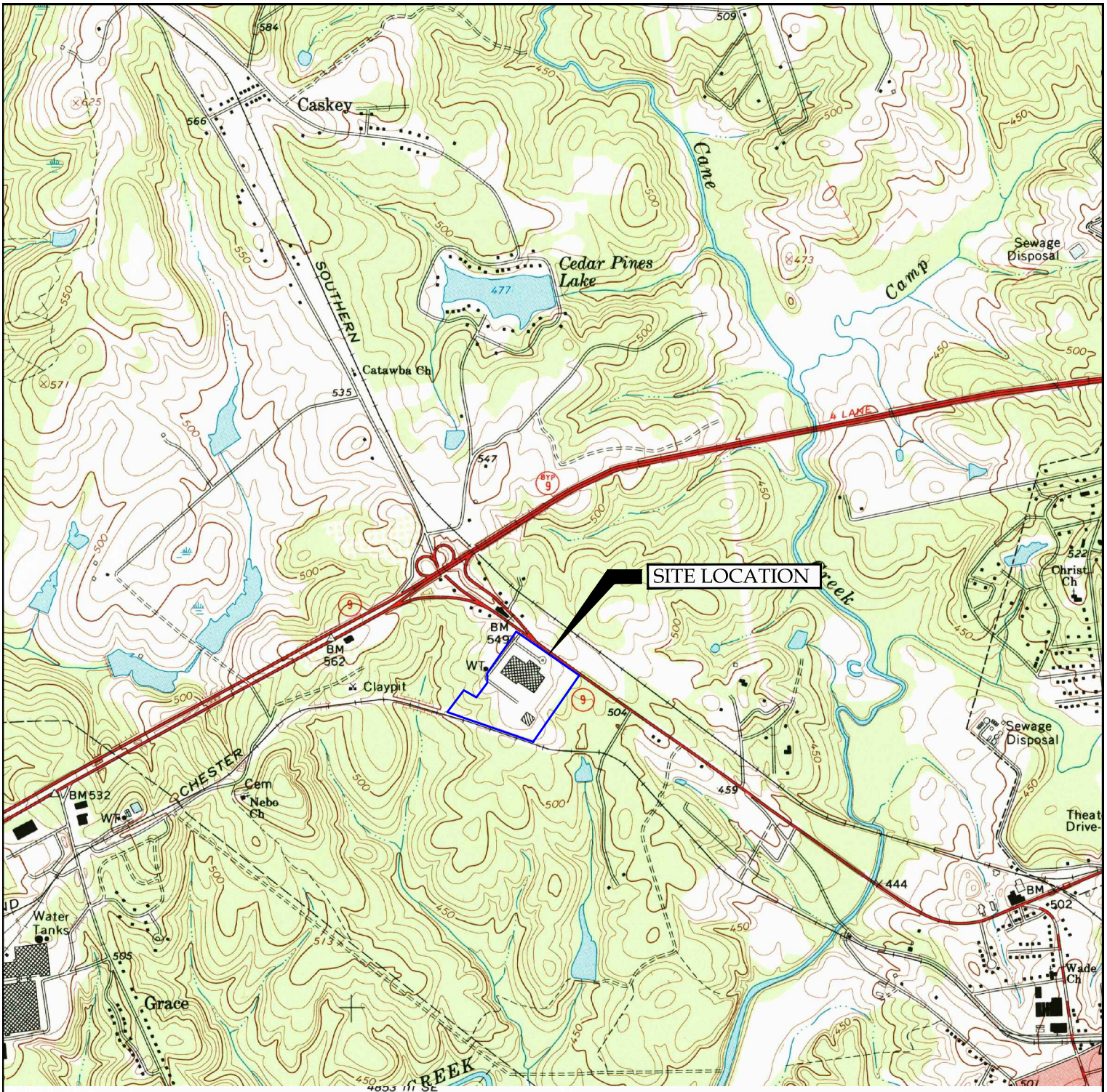
Figures



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1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 10 FEET

DATUM IS MEAN SEA LEVEL

ROAD CLASSIFICATION

Primary highway, all weather, hard surface

Light-duty road, all weather, improved surface

Secondary highway, all weather, hard surface

Unimproved road, fair or dry weather

U. S. Route

State Route

MN GN

2° 36 MILS

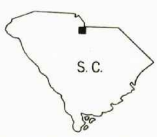
0°06′ 2 MILS

UTM GRID AND 1969 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

LANCASTER, S. C.

N3437.5—W8045/7.5

1969



QUADRANGLE LOCATION

ERM NC, Inc.

FIGURE 1

SITE LOCATION PLAN
2013 W. Meeting Street
Lancaster, South Carolina

DESIGN: MP	DRAWN: ABF	CHKD.:
DATE: 4/4/2014	SCALE: AS SHOWN	REV.:
W.O.NO.: 2014_UIC App_Figs.dwg		

ERM NC, Inc.

FIGURE 2

SITE PLAN MAP
2013 W. Meeting Street
Lancaster, South Carolina

DESIGN: MP	DRAWN: ABF	CHKD.:
DATE: 4/4/2014	SCALE: AS SHOWN	REV.:
W.O.NO.: 2014_UIC App_Figs.dwg		

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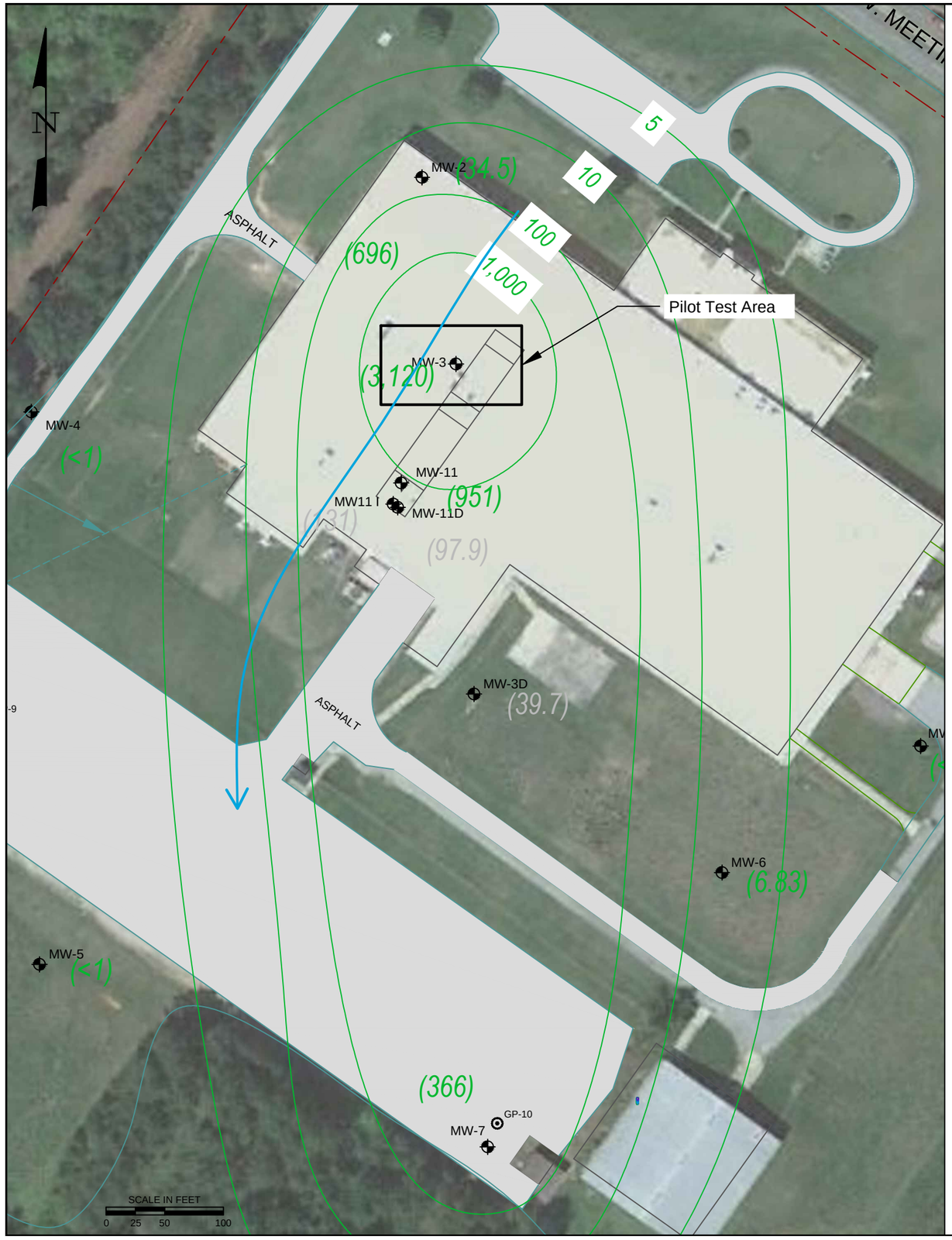
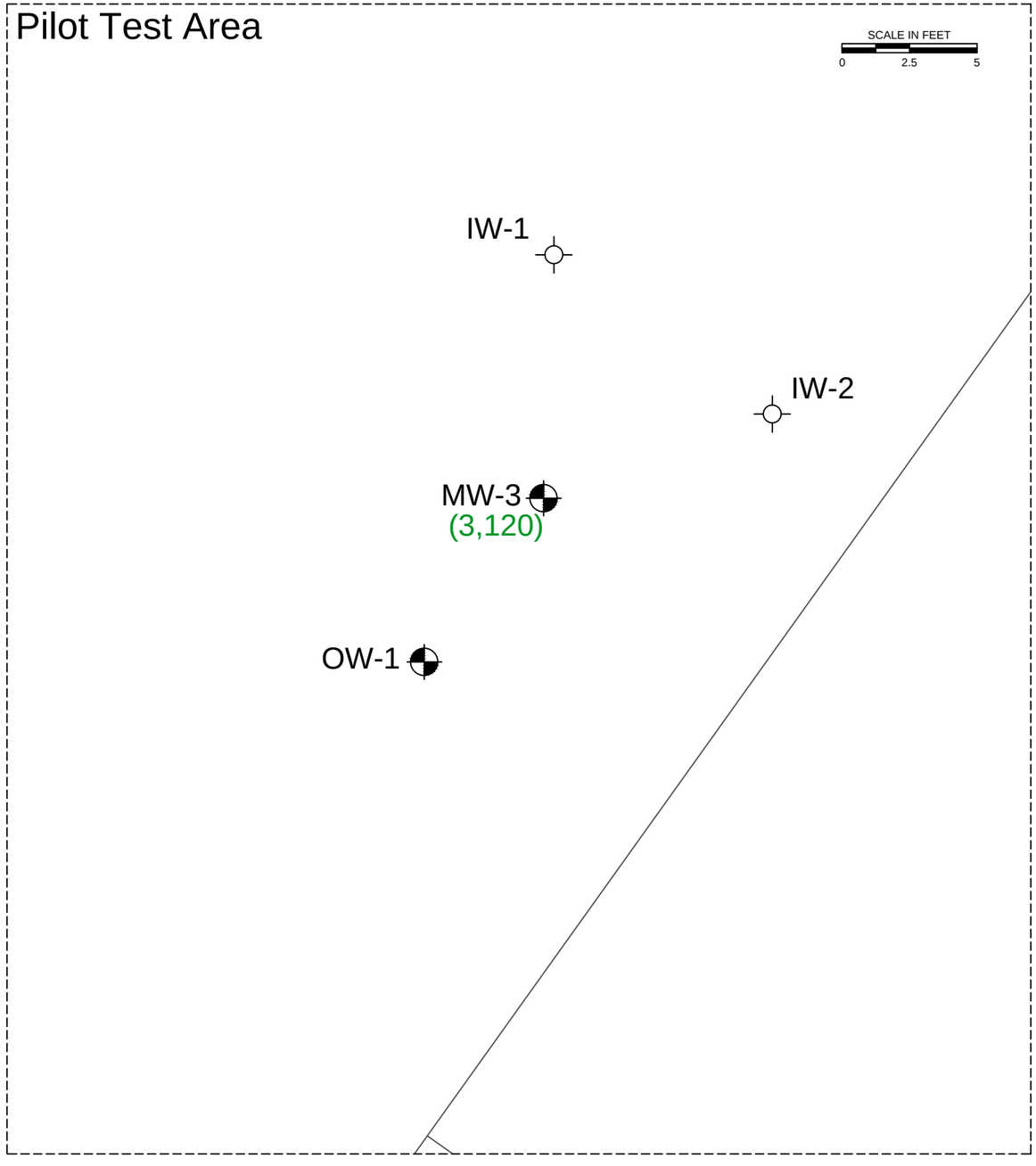




LEGEND

- MONITOR WELL LOCATION
- PROPOSED INJECTION WELL LOCATION
- (300) TCE CONCENTRATION IN µg/L (micrograms per liter)
- 5 TCE CONCENTRATION CONTOUR
- APPROXIMATE GROUNDWATER FLOW DIRECTION

ERM NC, Inc.

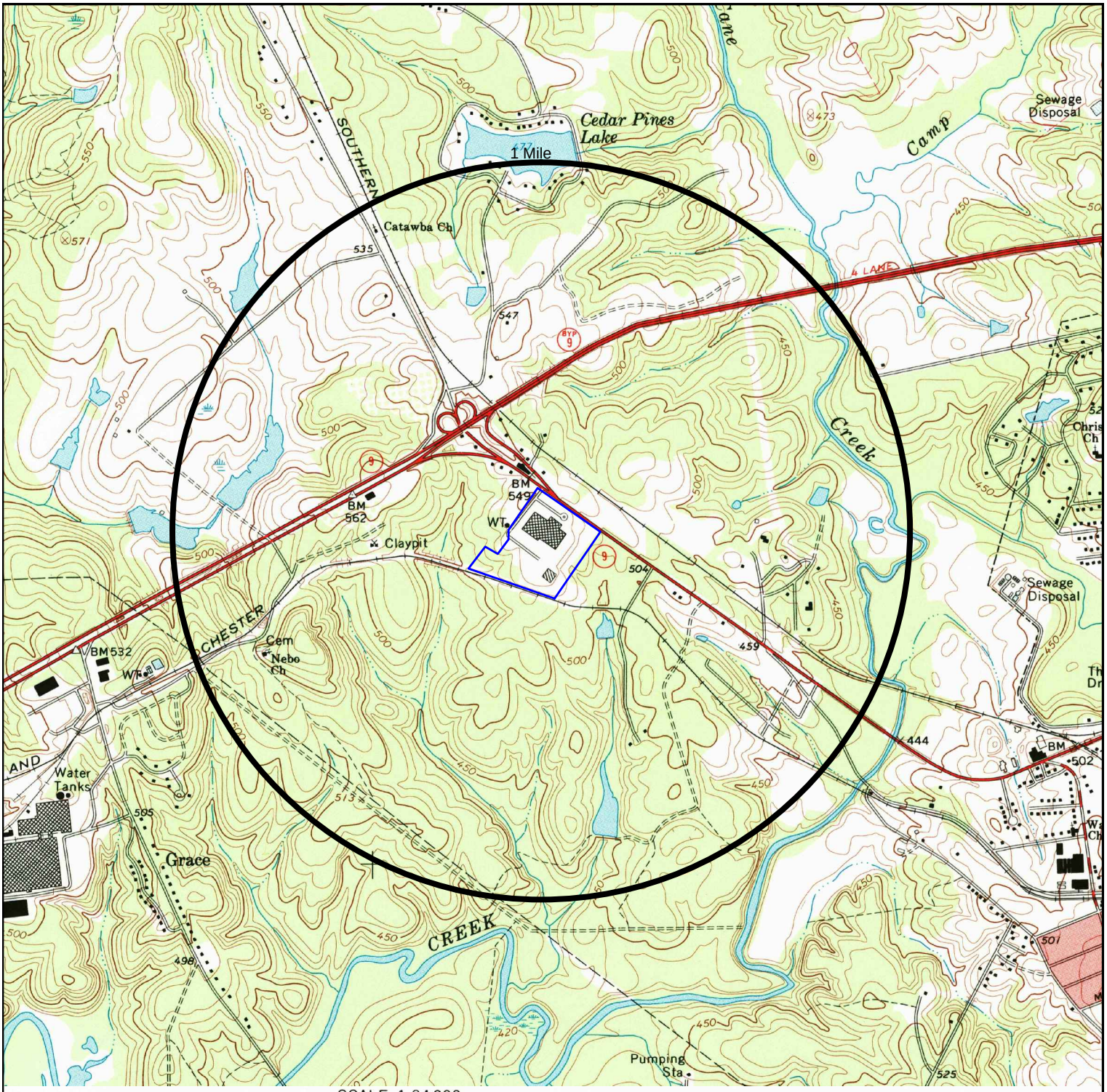
FIGURE 3

PROJECT AREA MAP
Former Joslyn Clark Site
2013 W. Meeting Street
Lancaster, South Carolina

DESIGN: EH	DRAWN: ABF	CHKD.:
DATE: 4/4/2014	SCALE: AS SHOWN	REV.:

W.O.NO.: 2014_UIC App_Figs.dwg

ERM



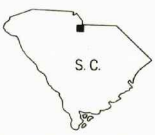
SCALE 1:24 000

1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 10 FEET
DATUM IS MEAN SEA LEVEL



QUADRANGLE LOCATION

ROAD CLASSIFICATION

Primary highway, all weather, hard surface

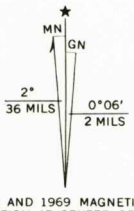
Light-duty road, all weather, improved surface

Secondary highway, all weather, hard surface

Unimproved road, fair or dry weather

U. S. Route

State Route



UTM GRID AND 1969 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

LANCASTER, S. C.
N3437.5—W8045/7.5

1969

ERM NC, Inc.

FIGURE 4

Project Vicinity Map
2013 W. Meeting Street
Lancaster, South Carolina

DESIGN: MP	DRAWN: ABF	CHKD.:
DATE: 4/4/2014	SCALE: AS SHOWN	REV.:
W.O.NO.: 2014_UIC App_Figs.dwg		

LEGEND

APPROXIMATE PROPERTY BOUNDARY

0 300 600

SCALE FEET

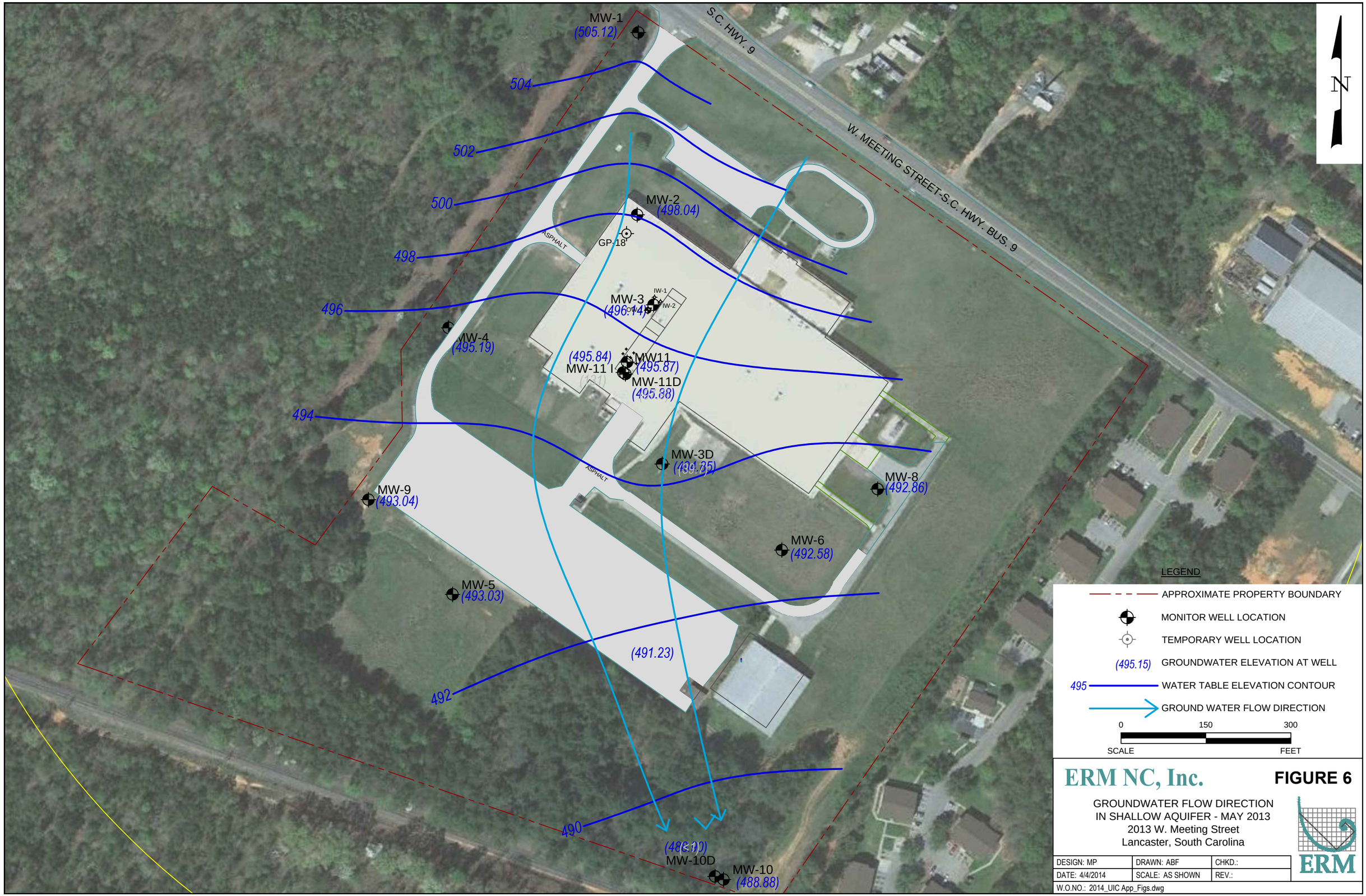
ERM NC, Inc.

FIGURE 5

AREA OF REVIEW
2013 W. Meeting Street
Lancaster, South Carolina

DESIGN: MP	DRAWN: ABF	CHKD.:
DATE: 4/4/2014	SCALE: AS SHOWN	REV.:
W.O.NO.: 2014_UIC App_Figs.dwg		

ERM



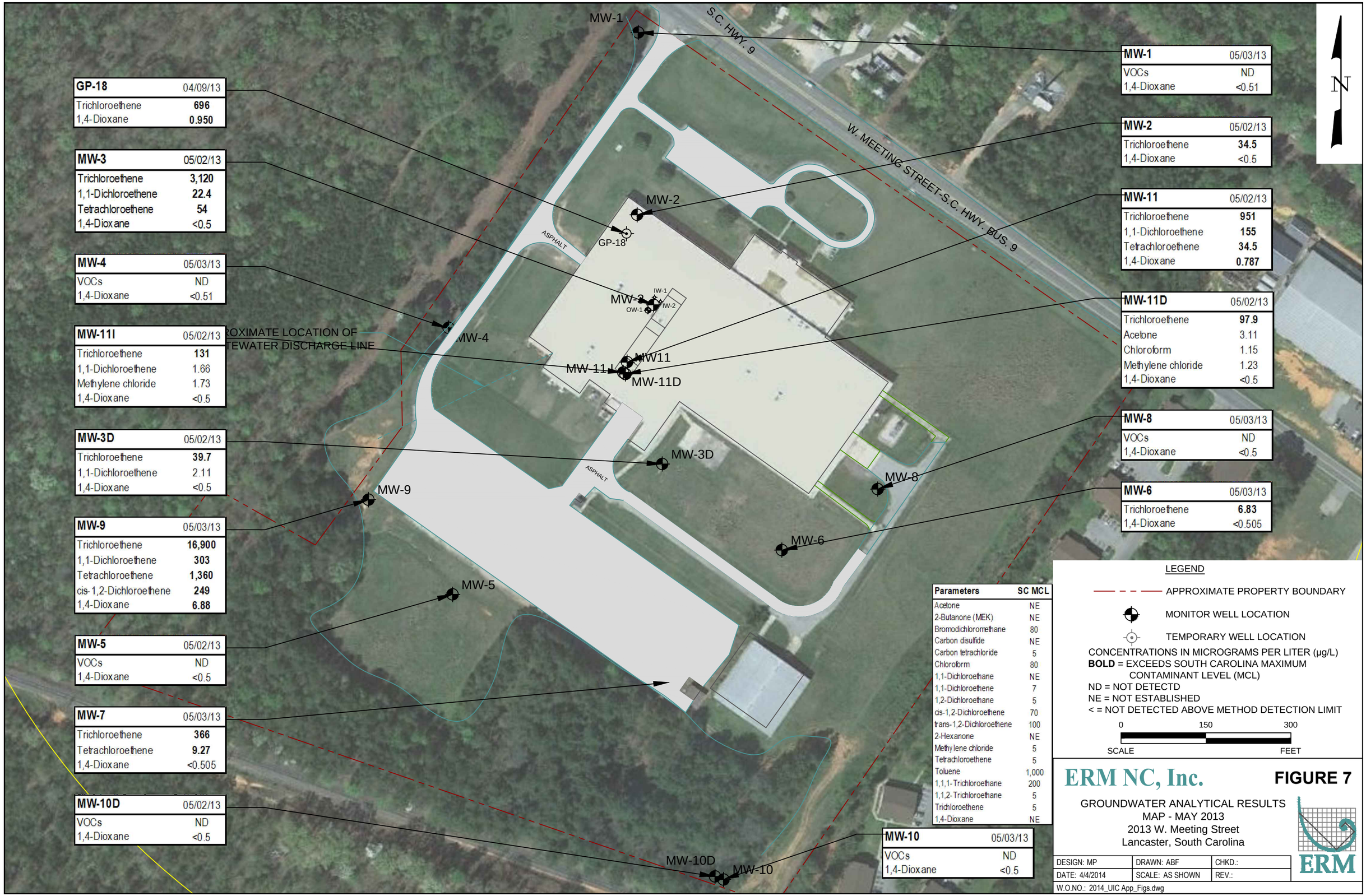
ERM NC, Inc.

FIGURE 6

GROUNDWATER FLOW DIRECTION
IN SHALLOW AQUIFER - MAY 2013
2013 W. Meeting Street
Lancaster, South Carolina

DESIGN: MP	DRAWN: ABF	CHKD.:
DATE: 4/4/2014	SCALE: AS SHOWN	REV.:
W.O.NO.: 2014_UIC App_Figs.dwg		

ERM

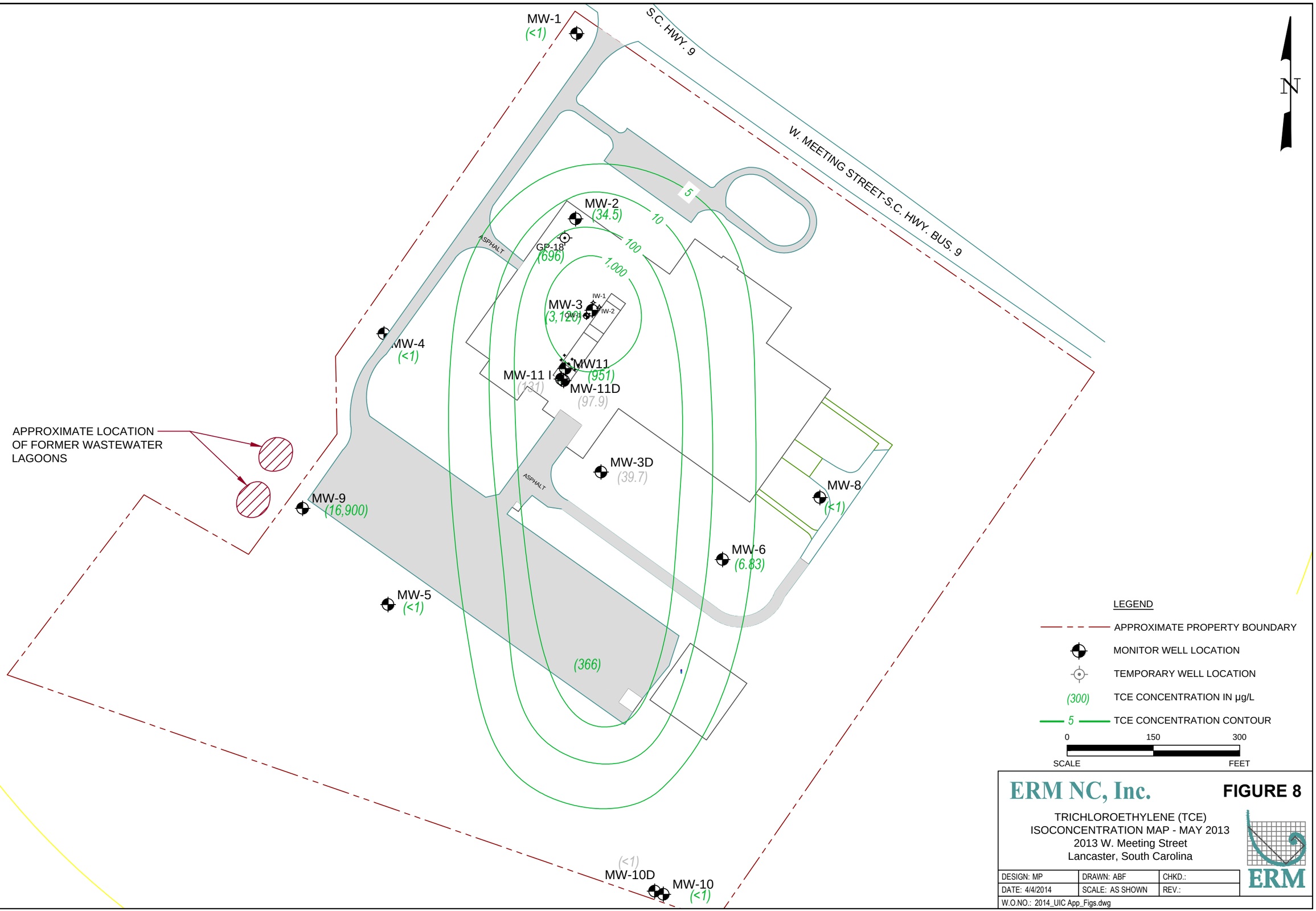


ERM NC, Inc.

FIGURE 7

GROUNDWATER ANALYTICAL RESULTS
MAP - MAY 2013
2013 W. Meeting Street
Lancaster, South Carolina

DESIGN: MP	DRAWN: ABF	CHKD.:
DATE: 4/4/2014	SCALE: AS SHOWN	REV.:
W.O.NO.: 2014_UIC App_Figs.dwg		



ERM NC, Inc.

FIGURE 8

TRICHLOROETHYLENE (TCE)
ISOCONCENTRATION MAP - MAY 2013
2013 W. Meeting Street
Lancaster, South Carolina

DESIGN: MP	DRAWN: ABF	CHKD.:
DATE: 4/4/2014	SCALE: AS SHOWN	REV.:

W.O.NO.: 2014_UIC App_Figs.dwg

ERM

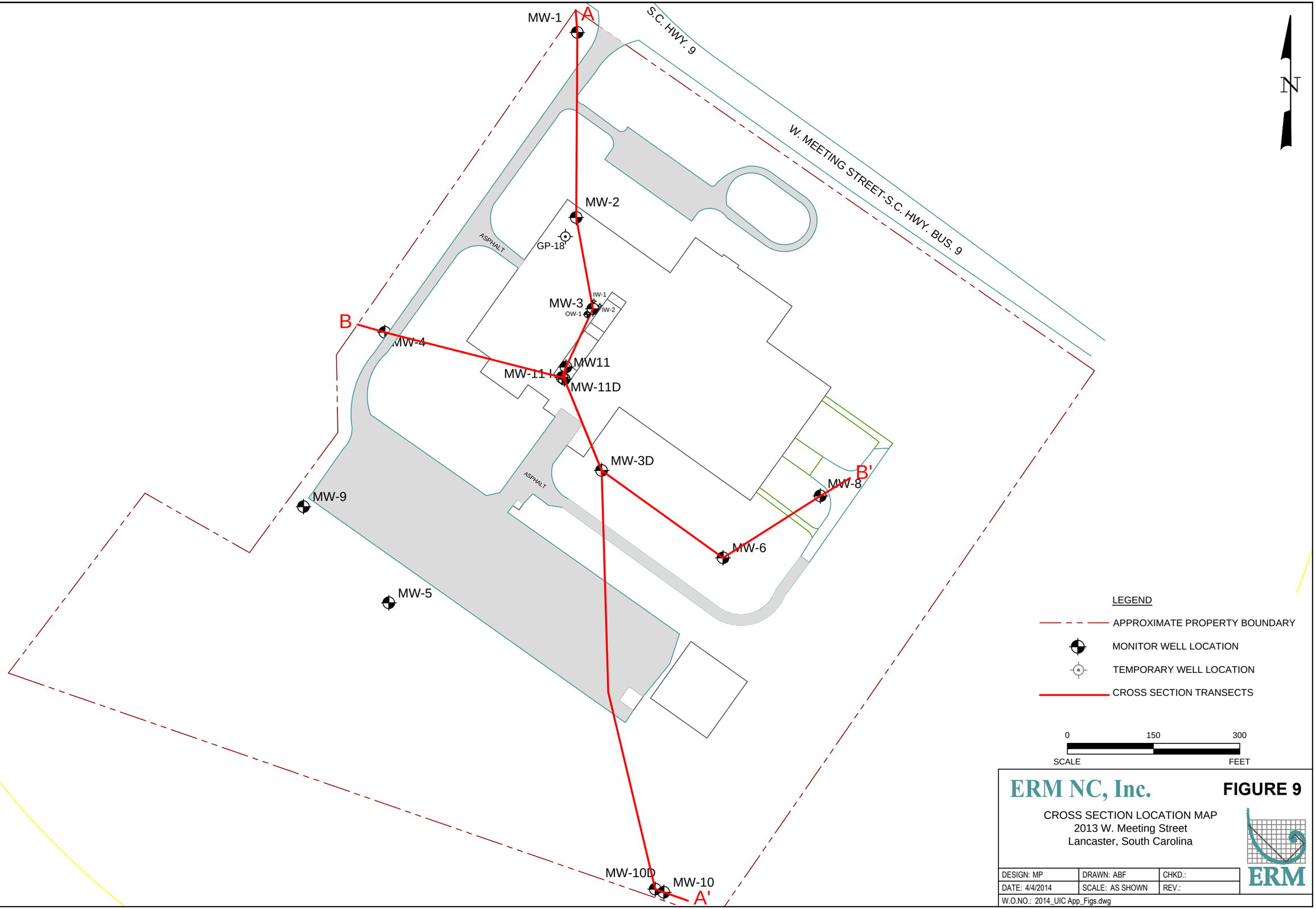


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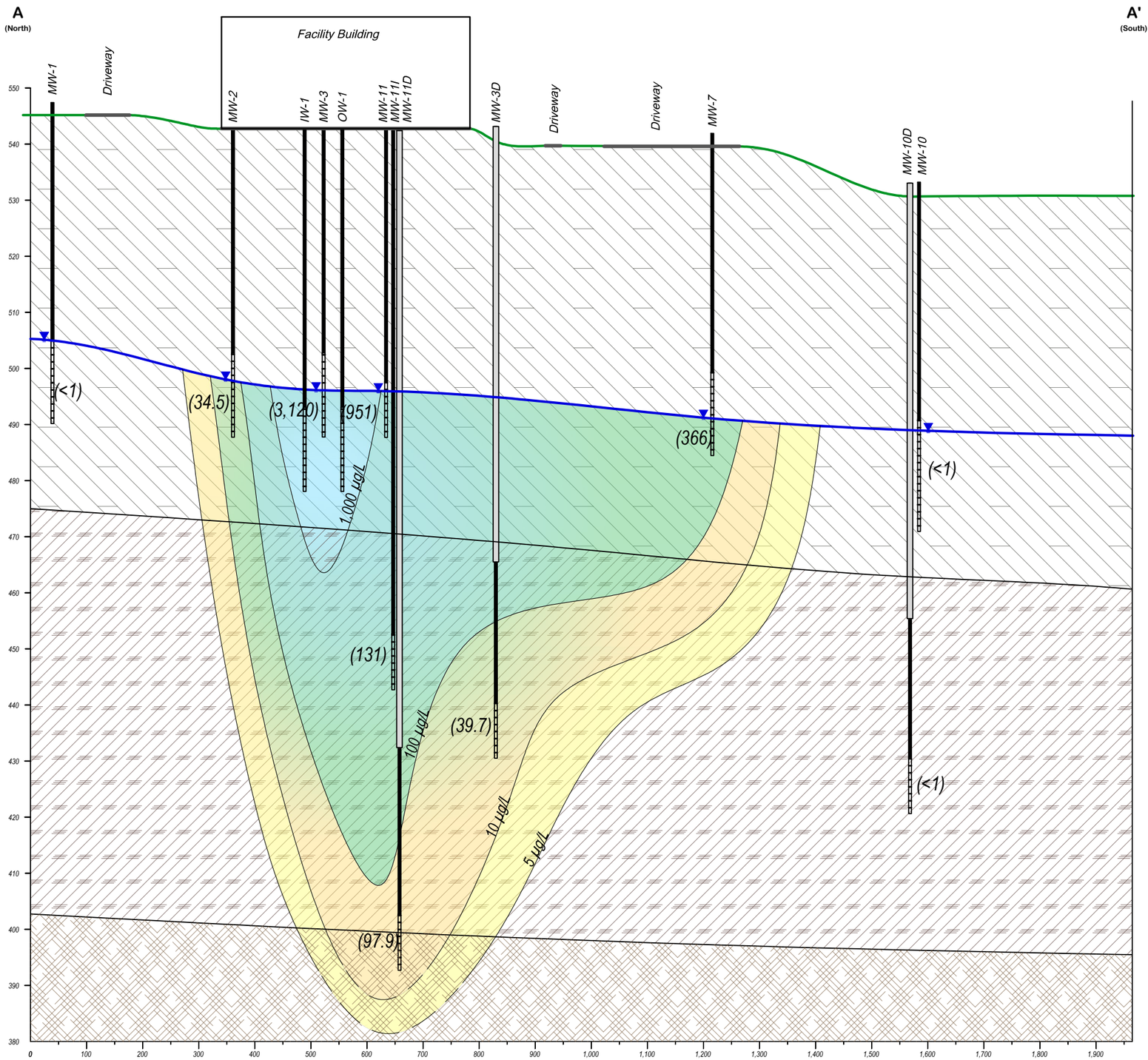
FIGURE 9

CROSS SECTION LOCATION MAP
2013 W. Meeting Street
Lancaster, South Carolina

DESIGN: MP	DRAWN: ABF	CHKD.:
DATE: 4/4/2014	SCALE: AS SHOWN	REV.:
W.O.NO.: 2014_UIC App_Figs.dwg		

ERM



Notes

Outer Casing
(Type III Wells Only)

Monitor Well Riser

Monitor Well Screened Interval

(5) TCE Concentration (µg/L) - Most recent data from each well used in contouring

Water Table Surface Elevation

Approximate Groundwater Surface

Fine-grained Sandy Silt

Partially Weathered Siltstone

Bedrock (Mica Schist)

TCE Concentration >1,000 µg/L

TCE Concentration >100 µg/L

TCE Concentration >10 µg/L

TCE Concentration >5 µg/L

SC MCL standard for TCE is 5 µg/L

< = Not detected greater than the laboratory method detection limit

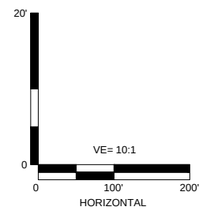


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FIGURE 10

CROSS SECTION A - A'
2013 W. Meeting Street
Lancaster, South Carolina

DESIGN: MP	DRAWN: ABF	CHKD.:
DATE: 4/4/2014	SCALE: AS SHOWN	REV.:
W.O.NO.: 2014_UIC App_Figs.dwg		

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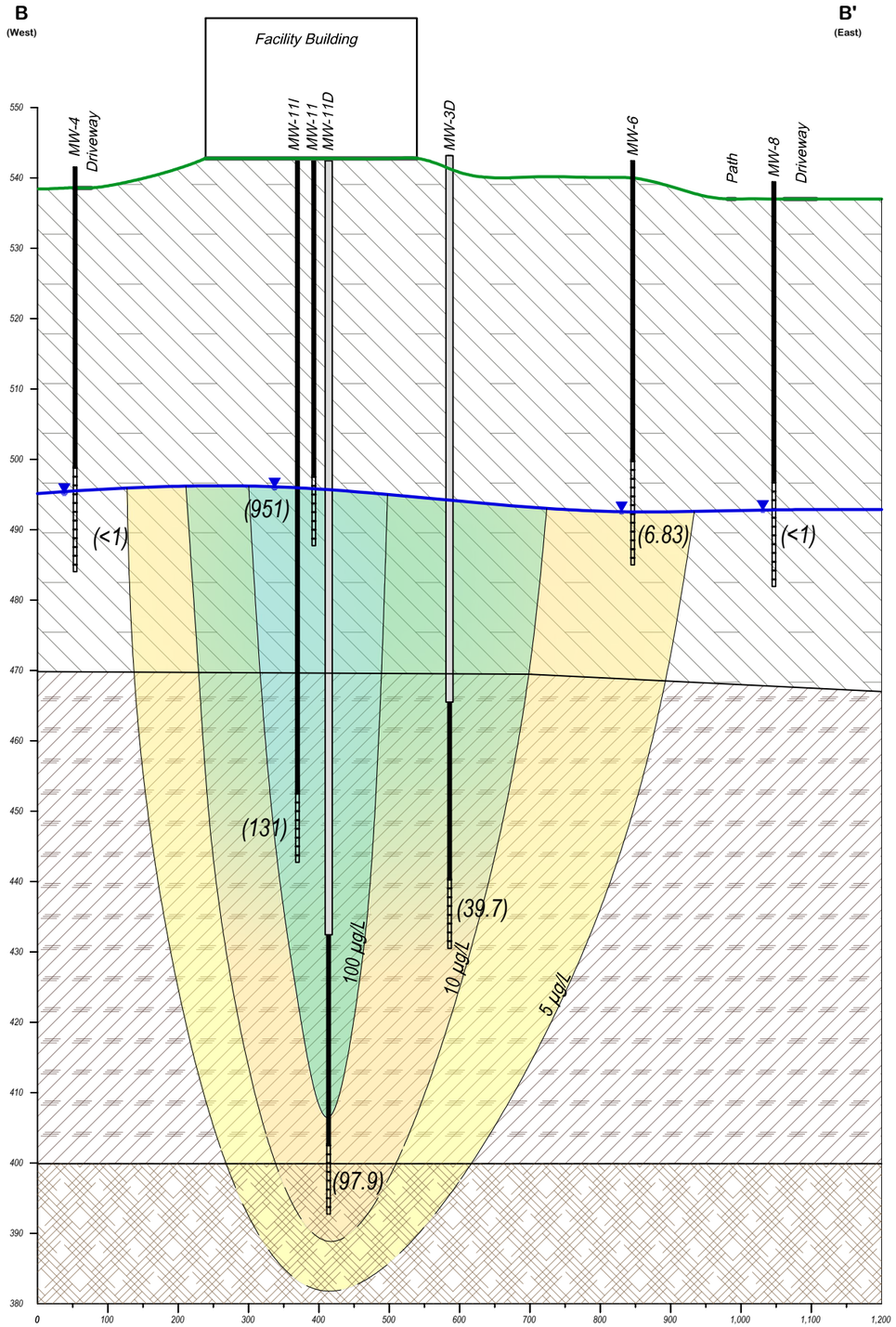

Notes

Outer Casing
(Type III Wells Only)

Monitor Well Riser

Monitor Well Screened Interval

(5) TCE Concentration (µg/L) - Most recent data from each well used in contouring

Water Table Surface Elevation

Approximate Groundwater Surface

Fine-grained Sandy Silt

Partially Weathered Siltstone

Bedrock (Mica Schist)

TCE Concentration >100 µg/L

TCE Concentration >10 µg/L

TCE Concentration >5 µg/L

SC MCL standard for TCE is 5 µg/L

< = Not detected greater than the laboratory method detection limit

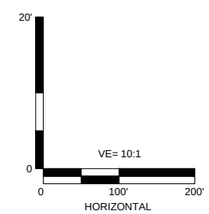

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FIGURE 11

CROSS SECTION B - B'
2013 W. Meeting Street
Lancaster, South Carolina

DESIGN: MP	DRAWN: ABF	CHKD.:
DATE: 4/4/2014	SCALE: AS SHOWN	REV.:
W.O.NO.: 2014_UIC App_Figs.dwg		

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Tables

TABLE 1
MONITOR WELL CONSTRUCTION DATA
JOSLYN CLARK FACILITY
LANCASTER, SOUTH CAROLINA

Well ID	Installation Date	Drilling Method	Type Well	Well Depth (ft bls)	Land Surface Elevation (feet)	Measuring pt. Elevation-TOC (feet)	Screened Interval (ft bls)
MW-1	8/25/2009	HSA	II	55	545.17	547.41	40-55
MW-2	8/28/2009	HSA	II	55	542.75	542.54	40 - 55
MW-3	8/28/2009	HSA	II	55	542.76	542.52	40 - 55
MW-3D	10/19/2011	HSA / AR	III	110	540.50	543.15	100 - 110
MW-4	8/25/2009	HSA	II	55	538.95	541.51	40 - 55
MW-5	8/25/2009	HSA	II	55	538.14	540.63	40 - 55
MW-6	8/26/2009	HSA	II	55	539.97	542.41	40 - 55
MW-7	8/26/2009	HSA	II	55	539.48	541.92	40 - 55
MW-8	10/13/2011	HSA	II	55	536.99	539.50	40 - 55
MW-9	10/13/2011	HSA	II	55	538.09	540.69	40 - 55
MW-10	10/12/2011	HSA	II	60	530.93	533.20	45 - 60
MW-10D	10/13/2011	HSA / AR	III	110	530.65	533.05	100 - 110
MW-11	4/9/2013	HSA	II	55	542.71	542.40	45 - 55
MW-11I	4/18/2013	HAS / AR	II	100	542.71	542.38	90 - 100
MW-11D	4/18/2013	HSA / AR	III	150	542.71	542.41	140 - 150

Notes:
All measurements in feet; AR = Air Hammer; MP = Measuring Point; All wells constructed with 2-inch PVC
Groundwater depth measured from top of casing
Elevations are measured to USGS Monuments
HSA = Hollow stem auger drilling method; TOC = Top of Casing
Ft bls = Feet below measuring point (top of PVC casing)

TABLE 2
GROUNDWATER ELEVATION DATA
JOSLYN CLARK FACILITY
LANCASTER, SOUTH CAROLINA

Well No.	Top of Casing Elevation (feet)		Well No.	Top of Casing Elevation (feet)		Well No.	Top of Casing Elevation (feet)		Well No.	Top of Casing Elevation (feet)	
MW-1	547.41		**MW-2**	542.54		**MW-3**	542.52		**MW-3D**	543.15	
Dates:	Water Depth (Ft. BGS)	Water Elevation (Ft. MSL)	Dates:	Water Depth (Ft. BGS)	Water Elevation (Ft. MSL)	Dates:	Water Depth (Ft. BGS)	Water Elevation (Ft. MSL)	Dates:	Water Depth (Ft. BGS)	Water Elevation (Ft. MSL)
9/30/09	44.54	502.87	9/30/09	42.47	500.07	9/30/09	44.43	498.09	11/10/11	47.91	495.24
11/10/11	46.86	500.55	11/10/11	44.02	498.52	11/10/11	45.67	496.85	5/2/13	48.30	494.85
5/3/13	42.29	505.12	5/2/13	44.50	498.04	5/2/13	46.38	496.14			

Well No.	Top of Casing Elevation (feet)		Well No.	Top of Casing Elevation (feet)		Well No.	Top of Casing Elevation (feet)		Well No.	Top of Casing Elevation (feet)	
MW-4	541.51		**MW-5**	540.63		**MW-6**	542.41		**MW-7**	541.92	
Dates:	Water Depth (Ft. BGS)	Water Elevation (Ft. MSL)	Dates:	Water Depth (Ft. BGS)	Water Elevation (Ft. MSL)	Dates:	Water Depth (Ft. BGS)	Water Elevation (Ft. MSL)	Dates:	Water Depth (Ft. BGS)	Water Elevation (Ft. MSL)
9/30/09	44.56	496.95	9/30/09	46.59	494.04	9/30/09	49.23	493.18	9/30/09	49.63	492.29
11/10/11	46.47	495.04	11/10/11	47.62	493.01	11/10/11	50.31	492.10	11/10/11	50.72	491.20
5/3/13	46.32	495.19	5/2/13	47.60	493.03	5/3/13	49.83	492.58	5/3/13	50.69	491.23

NM = Not Measured; Ft MSL = Feet above Mean Sea Level

TABLE 2
GROUNDWATER ELEVATION DATA
JOSLYN CLARK FACILITY
LANCASTER, SOUTH CAROLINA
PAGE 2 OF 2

Well No.	Top of Casing Elevation (feet)		Well No.	Top of Casing Elevation (feet)		Well No.	Top of Casing Elevation (feet)		Well No.	Top of Casing Elevation (feet)	
MW-8	539.50		**MW-9**	540.69		**MW-10**	533.20		**MW-10D**	533.05	
Dates:	Water Depth (Ft. BGS)	Water Elevation (Ft. MSL)	Dates:	Water Depth (Ft. BGS)	Water Elevation (Ft. MSL)	Dates:	Water Depth (Ft. BGS)	Water Elevation (Ft. MSL)	Dates:	Water Depth (Ft. BGS)	Water Elevation (Ft. MSL)
11/10/11	46.91	492.59	11/10/11	48.00	492.69	11/10/11	46.51	486.69	11/10/11	44.56	488.49
5/3/13	46.64	492.86	5/3/13	47.65	493.04	5/3/13	44.32	488.88	5/2/13	44.15	488.90

Well No.	Top of Casing Elevation (feet)		Well No.	Top of Casing Elevation (feet)		Well No.	Top of Casing Elevation (feet)	
MW-11	542.40		**MW-11I**	542.38		**MW-11D**	542.41	
Dates:	Water Depth (Ft. BGS)	Water Elevation (Ft. MSL)	Dates:	Water Depth (Ft. BGS)	Water Elevation (Ft. MSL)	Dates:	Water Depth (Ft. BGS)	Water Elevation (Ft. MSL)
5/2/13	46.53	495.87	5/2/13	46.54	495.84	5/2/13	46.53	495.88

TABLE 3
GROUNDWATER ANALYTICAL RESULTS -
GEOCHEMICAL PARAMETERS
JOSLYN CLARK FACILITY
LANCASTER, SOUTH CAROLINA

		Geochemical Parameters (µg/L)						
Sample ID	Sample Date	Iron	Manganese	Sodium	Chloride	Nitrate	Sulfate	Total Organic Carbon
MW-1	09/30/09	290	960	2,000	NA	NA	NA	NA
	11/10/11	320	10	2,100	NA	NA	NA	NA
	05/03/13	NA	25	3,890	3,010	2,040	<200	NA
MW-2	09/30/09	690	77	8,800	NA	NA	NA	NA
	11/11/11	530	10	6,900	NA	NA	NA	NA
	05/02/13	NA	<15	6,800	10,300	<500	869	NA
MW-3	09/30/09	1,100	120	11,000	NA	NA	NA	NA
	11/11/11	820	27	9,600	NA	NA	NA	NA
	05/02/13	NA	<15	8,670	8,200	2,210	543	<1000
MW-3D	11/11/11	4,800	180	14,000	NA	NA	NA	NA
	05/02/13	NA	21	11,300	7,160	862	2,670	<1000
MW-4	09/30/09	630	89	4,800	NA	NA	NA	NA
	11/10/11	180	7	4,100	NA	NA	NA	NA
	05/03/13	NA	54	5,950	1,220	<500	2,290	NA
MW-5	10/01/09	540	140	7,400	NA	NA	NA	NA
	11/10/11	3,500	92	8,100	NA	NA	NA	NA
	05/02/13	NA	<15	8,530	22,600	1,750	286	NA
MW-6	10/01/09	1,000	68	5,600	NA	NA	NA	NA
	11/11/11	1,700	49	4,300	NA	NA	NA	NA
	05/03/13	NA	<15	5,730	7,310	1,510	211	NA

TABLE 3
GROUNDWATER ANALYTICAL RESULTS -
GEOCHEMICAL PARAMETERS
JOSLYN CLARK FACILITY
LANCASTER, SOUTH CAROLINA

		Geochemical Parameters (µg/L)						
Sample ID	Sample Date	Iron	Manganese	Sodium	Chloride	Nitrate	Sulfate	Total Organic Carbon
MW-7	10/01/09	8,700	560	9,200	NA	NA	NA	NA
	11/11/11	1,600	43	7,700	NA	NA	NA	NA
	05/03/13	NA	16	8,870	4,020	659	344	NA
MW-8	11/10/11	2,300	120	15,000	NA	NA	NA	NA
	05/03/13	NA	23	15,900	10,200	887	962	NA
MW-9	11/10/11	390	330	9,700	NA	NA	NA	NA
	05/03/13	NA	18	10,700	6,610	<500	498	NA
MW-10	11/10/11	3,100	130	14,000	NA	NA	NA	NA
	05/03/13	NA	18	16,700	11,400	<500	1,100	NA
MW-10D	11/10/11	130	10	14,000	NA	NA	NA	NA
	05/02/13	NA	<15	14,000	11,100	<500	688	NA
MW-11	05/02/13	<200	150	9,330	7,080	1,080	1,810	<1,000
MW-11I	05/02/13	2,020	79	16,000	7,810	1,280	16,700	<1,000
MW-11D	05/02/13	<200	42	52,700	10,200	873	35,600	3,900

Notes:

ug/l = Micrograms/liter
NA = Not Analyzed

TABLE 4
GROUNDWATER ANALYTICAL RESULTS - ORGANIC COMPOUNDS
JOSLYN CLARK FACILITY
LANCASTER, SOUTH CAROLINA

		Volatile Organic Compounds by EPA Method 8260 (µg/L)																			EPA Method 8011 (µg/L)		SVOCs
Sample ID	Sample Date	Acetone	2-Butanone (MEK)	Bromodichloromethane	Carbon disulfide	Carbon tetrachloride	Chloroform	Chloromethane	1,1-Dichloroethane	1,1-Dichloroethene	1,2-Dichloroethane	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	2-Hexanone	Methylene chloride	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	1,1,2-Trichloroethane	Trichloroethene	1,2-Dibromo-3-chloropropane (DBCP)	1,2-Dibromoethane (EDB)	1,4-Dioxane
MW-1	09/30/09	<20	<10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10	<1.0	<1.0	<1.0	<1.0	<1.0	0.76J	<0.020	<0.020	NA
	11/10/11	<20	NA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10	<1.0	0.44J	<1.0	<1.0	<1.0	3.8	NA	NA	NA
	05/03/13	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NA	NA	<0.51
MW-2	09/30/09	<20	<1.0	<1.0	<1.0	<1.0	0.50J	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10	<1.0	0.22J	0.34J	<1.0	<1.0	**38**	<0.019	<0.019	NA
	11/11/11	<20	NA	<1.0	<1.0	<1.0	0.36J	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10	<1.0	0.16J	<1.0	<1.0	<1.0	**35**	NA	NA	NA
	05/02/13	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**34.5**	NA	NA	<0.5
MW-3	09/30/09	<200	<100	<10	<10	<10	<10	<10	23	**18**	<10	<10	<10	<100	<10	**39**	<10	<10	**4.6J**	**2700**	0.011JP	<0.020	NA
	11/11/11	<400	NA	<20	<20	<20	<20	<20	30	**20**	<20	<20	<20	<200	<20	**55**	<20	<20	**6.5J**	**3,200**	NA	NA	NA
	05/02/13	<20	<20	<20	<20	<20	<20	<20	<20	**22.4**	<20	<20	<20	<20	<20	**54**	<20	<20	<20	**3,120**	NA	NA	<0.5
MW-3D	11/11/11	<20	NA	<1.0	<1.0	<1.0	0.54J	<1.0	<1.0	1.6	<1.0	<1.0	<1.0	<10	<1.0	0.65J	<1.0	<1.0	<1.0	**26**	NA	NA	NA
	05/02/13	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	2.11	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**39.7**	NA	NA	<0.5
MW-4	09/30/09	<20	<10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10	<1.0	<1.0	<1.0	<1.0	<1.0	0.62J	<0.019	<0.019	NA
	11/10/11	<20	NA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10	<1.0	0.73J	<1.0	<1.0	<1.0	**5.5**	NA	NA	NA
	05/03/13	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NA	NA	<0.51
MW-5	10/01/09	<20	<10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.019	<0.019	NA
	11/10/11	<20	NA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NA	NA	NA
	05/02/13	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NA	NA	<0.5
MW-6	10/01/09	<20	<10	<1.0	<1.0	<1.0	<1.0	0.52J	<1.0	<1.0	<1.0	<1.0	<1.0	<10	<1.0	<1.0	<1.0	<1.0	<1.0	**7.7**	<0.019	<0.019	NA
	11/11/11	<20	NA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10	<1.0	<1.0	<1.0	<1.0	<1.0	**7.5**	NA	NA	NA
	05/03/13	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**6.83**	NA	NA	<0.505
MW-7	10/01/09	<20	<10	<1.0	<1.0	<1.0	0.62J	0.37J	0.24J	<1.0	<1.0	<1.0	<1.0	<10	<1.0	**6.6**	<1.0	<1.0	<1.0	**220**	<0.019	<0.019	NA
	11/11/11	<20	NA	<1.0	<1.0	<1.0	1.8	<1.0	1.1	<1.0	<1.0	2.8	<1.0	<10	<1.0	**11**	<1.0	<1.0	<1.0	**370**	NA	NA	NA
	05/03/13	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**9.27**	<5.0	<5.0	<5.0	**366**	NA	NA	<0.505
MW-8	11/10/11	<20	NA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10	<1.0	0.57J	<1.0	<1.0	<1.0	3	NA	NA	NA
	05/03/13	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NA	NA	<0.5
Regional Screening Level - Tapwater		1,200	490	0.12	72	0.39	0.19	19	2.4	26	0.15	2.8	8.6	3.4	8.4	3.5	86	750	0.041	0.26	0.00032	0.0065	0.67
MCL		NE	NE	80	NE	5	80	NE	NE	7	5	70	100	NE	5	5	1,000	200	5	5	0.2	0.05	NE

Notes:

BOLD values indicate an exceedence of EPA MCLs, May 2013
ug/l = Micrograms/liter; All analytical results expressed in ug/L
B = Detected in Method blank
J = Less than practical quantification level but equal to or greater than minimum detection limit
EPA = Environmental Protection Agency
MCL = Maximum Contaminant Level
ND = Not Detected; NA=Not analyzed; NE = Not Established; N/A = Not applicable
SVOC = semi-volatile organic compound; SVOC analyses by EPA Method 8270C
* = 80 ug/L is the MCL for all combined halomethanes

TABLE 4
GROUNDWATER ANALYTICAL RESULTS - ORGANIC COMPOUNDS
JOSLYN CLARK FACILITY
LANCASTER, SOUTH CAROLINA

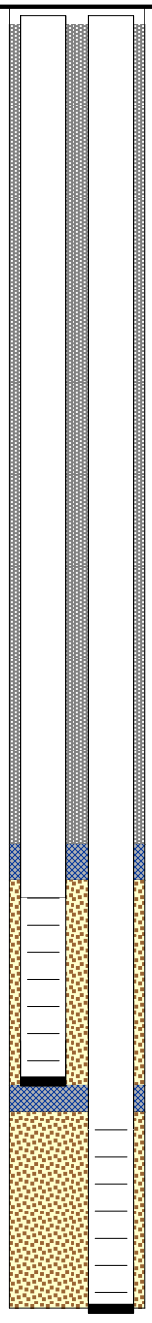
		Volatile Organic Compounds by EPA Method 8260 (µg/L)																		EPA Method 8011 (µg/L)		SVOCs
Sample ID	Sample Date	Acetone	2-Butanone (MEK)	Bromodichloromethane	Carbon disulfide	Carbon tetrachloride	Chloroform	Chloromethane	1,1-Dichloroethane	1,1-Dichloroethene	1,2-Dichloroethane	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	2-Hexanone	Methylene chloride	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	1,1,2-Trichloroethane	Trichloroethene	1,2-Dibromo-3-chloropropane (DBCP)	1,2-Dibromoethane (EDB)	1,4-Dioxane
MW-9	11/10/11	<20	NA	0.65J	1.3	0.36J	26	<1.0	3.6	**320**	3.5	**250**	1.8	<10	<1.0	**970**	0.37J	0.82J	**14**	**12,000**	NA	NA	NA
	05/03/13	<200	<200	<200	<200	<200	<200	<200	<200	**303**	<200	**249**	<200	<200	<200	**1,360**	<200	<200	<200	**16,900**	NA	NA	**6.88**
MW-10	11/10/11	<20	NA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.17J	<1.0	<1.0	<1.0	<10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NA	NA	NA
	05/03/13	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NA	NA	<0.5
MW-10D	11/10/11	<20	NA	<1.0	0.12J	<1.0	0.42J	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NA	NA	NA
	05/02/13	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NA	NA	<0.5
MW-11	05/02/13	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**155**	<5.0	<5.0	<5.0	<5.0	<5.0	**34.5**	<5.0	<5.0	<5.0	**951**	NA	NA	**0.787**
	06/26/13	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**87.1**	<5.0	64.8	<5.0	<5.0	<5.0	**12**	<5.0	<5.0	<5.0	**394**	NA	NA	NA
MW-11I	05/02/13	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.66	<1.0	<1.0	<1.0	<1.0	1.73	<1.0	<1.0	<1.0	<1.0	**131**	NA	NA	<0.5
	06/26/13	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	**213**	NA	NA	NA
MW-11D	05/02/13	3.11	<1.0	<1.0	<1.0	<1.0	1.15	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.23	<1.0	<1.0	<1.0	<1.0	**97.9**	NA	NA	<0.5
	06/26/13	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	**167**	NA	NA	NA
GP-18	04/09/13	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	**696**	NA	NA	**0.95**
Regional Screening Level - Tapwater		1,200	490	0.12	72	0.39	0.19	19	2.4	26	0.15	2.8	8.6	3.4	8.4	3.5	86	750	0.041	0.26	0.00032	0.0065	0.67
MCL		NE	NE	80	NE	5	80	NE	NE	7	5	70	100	NE	5	5	1,000	200	5	5	0.2	0.05	NE

Notes:

BOLD values indicate an exceedence of EPA MCLs, May 2013
ug/l = Micrograms/liter; All analytical results expressed in ug/L
B = Detected in Method blank
J = Less than practical quantification level but equal to or greater than minimum detection limit
EPA = Environmental Protection Agency
MCL = Maximum Contaminant Level
ND = Not Detected; NA=Not analyzed; NE = Not Established; N/A = Not applicable
SVOC = semi-volatile organic compound; SVOC analyses by EPA Method 8270C
* = 80 ug/L is the MCL for all combined halomethanes

Appendix C
Injection Well Construction Diagram

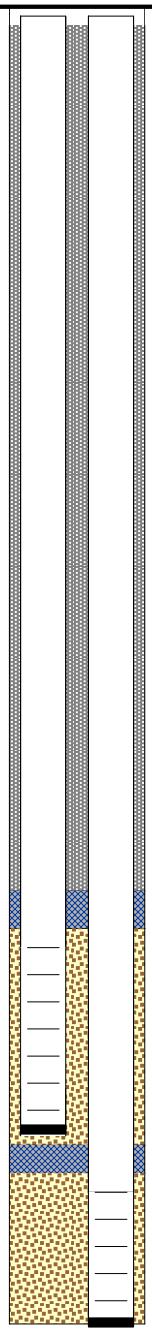
Client:	Joslyn Clark Facility	**Boring ID:**	IW-1
Project:	Joslyn Clark	**Logged By:**	Thomas Fisher
Site Location:	2013 W. Meeting Street	**Date Started:**	3/10/14
Project Number:	238259	**Date Completed:**	3/13/14

Depth	Lithology	Lithologic Description	Well Construction	Well Construction Details
0		Concrete		Flush Grade Locking Cap
4		Brown fine sandy SILT, slightly plastic.		Portland/Bentonite Grout
8		Light brown fine sandy SILT, slightly dense.		
12				
16		Brownish orange fine sandy SILT, slighly dense.		
20		Gray fine sandy SILT, highly weathered, saprolite; @ 29' white fine sandy seams slightly vertical with horizontal intrusions;		10.25 Diameter Borehole
24				
28				
32				2" Sch. 40 PVC Casing
36		Gray and tan fine sandy SILT, with angled/dipping brown hairlike seams; @ 39' vertical layering; gray, white, and brown, fine sandy SILT, H.S.A. refusal at 50'.		
40				
44				
48				Bentonite Seal Well Sand Filter Pack
52		Gray and brown sandy SILT, saprolite, highly weathered, with blocky rock structure at 58' bgs.		**A** - 2" Sch. 40 PVC 0.010" Slot Screen
56				
60				End Cap Bentonite Seal Well Sand Filter Pack
64				
68				**B** - 2" Sch.40 PVC 0.010" Slot Screen
72				End Cap
76				

Drilling Contractor:	Saedacco	**Sampling Method:**	Split Spoon
Drilling Method:	HSA/Air Rotary	**Total Depth (ft):**	60', 73'
Drilling Equipment:	Diedrich D-50	**Screened Interval:**	50'-60', 63'-73'
Responsible Professional:	Rich Lemire	**Riser Depth:**	0 - 50', 0 - 63'
Registration No.:	1423	**Elevation (msl):**	TBD

ERM

Client:	Joslyn Clark Facility	**Boring ID:**	IW-2
Project:	Joslyn Clark	**Logged By:**	Thomas Fisher
Site Location:	2013 W. Meeting Street	**Date Started:**	3/10/14
Project Number:	238259	**Date Completed:**	3/13/14

Depth	Lithology	Lithologic Description	Well Construction	Well Construction Details
0		Concrete		Flush Grade Locking Cap
4		Brown fine sandy SILT, slightly plastic.		Portland/Bentonite Grout
8		Light brown and gray fine sandy SILT, vertical layering at 9'-11', slightly dense.		
12				
16		Brownish orange fine sandy SILT, slightly dense, weathered manganese deposits present in hairlike seams.		10.25 Diameter Borehole
20				
24				
28				2, 2" Sch. 40 PVC Casings
32		Gray fine sandy SILT with angled layering, saprolite.		
36				
40				
44				
48		Brown to brownish orange silty SAND with angled layering and some high angled seams, saprolite.		Bentonite Seal Well Sand Filter Pack
52				**A** - 2" Sch. 40 PVC 0.010" Slot Screen
56		Gray highly weathered rock with highly friable rock fragments.		
60				End Cap Bentonite Seal Well Sand Filter Pack
64		Light brown weathered rock, blocky, some friable, H.S.A. refusal @ 70'.		**B** - 2" Sch.40 PVC 0.010" Slot Screen End Cap
68				
72				

Drilling Contractor:	Saedacco	**Sampling Method:**	Split Spoon
Drilling Method:	HSA	**Total Depth (ft):**	60', 70'
Drilling Equipment:	Diedrich D-50	**Screened Interval:**	50'-60', 63'-70'
Responsible Professional:	Rich Lemire	**Riser Depth:**	0 - 50', 0 - 63'
Registration No.:	1423	**Elevation (msl):**	TBD

ERM

D H E C

PROMOTE PROTECT PROSPER

Catherine B. Templeton, Director

Promoting and protecting the health of the public and the environment

RECEIVED

FEB 25 2014

Monitoring Well Approval

Date of Issuance: **February 20, 2014** **Approval #: MW-09521**

Approval is hereby granted to: Carl Grabinski
1500 Mittel Road
Wood Dale, IL 60191

Facility: Joslyn Clark (File 400619)
2013 West Meeting Street
Lancaster SC 29720

This approval is for the installation of 5 groundwater monitoring wells. The monitoring wells are to be installed in the locations as illustrated and per the proposed construction details provided in the February 4, 2014 submittal of the monitoring well installation permit applications. These monitoring wells are to be installed following all of the applicable requirements of R.61-71.

Please note that R.61-71 requires the following:

1. All wells shall be drilled, constructed, and abandoned by a South Carolina certified well driller per R.61-71.D.1.

2. All wells shall be properly developed per R.61-71.H.2.d. A Water Well Record Form or other form provided or approved by the Department shall be completed and submitted within 30 days after well completion or abandonment unless another schedule has been approved by the Department. The form should contain the "as-built" construction details and all other information required by R.61-71.H.1.f

3. All analytical data and water levels obtained from each monitoring well shall be submitted to the author of this approval within 30 days of receipt of laboratory results unless another schedule has been approved by the Department as required by R.61-71.H.1.d.

4. All monitoring wells shall be labeled as required by R.61-71.H.2.c.

5. If any of the information provided to the Department changes, including the proposed drilling date, the Author (PM Phone Number) shall be notified at least twenty-four (24) hours prior to well construction as required by R.61-71.H.1.a.

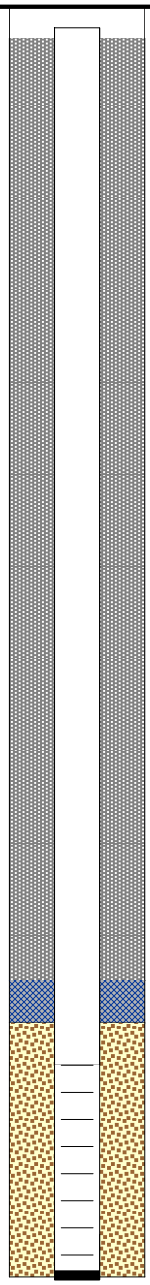
This approval is pursuant to the provisions of Section 44-55-40 of the 1976 South Carolina Code of Laws and R.61-71 of the South Carolina Well Standards, dated April 26, 2002.

Lucas Berresford
State Remediation Section
Bureau of Land and Waste Management

Appendix D
Observation Well Construction Diagram

Client:	Joslyn Clark Facility	**Boring ID:**	OW-1
Project:	Joslyn Clark	**Logged By:**	Thomas Fisher
Site Location:	2013 W. Meeting Street	**Date Started:**	3/7/14
Project Number:	238259	**Date Completed:**	3/7/14

Depth	Lithology	Lithologic Description	Well Construction	Well Construction Details
0		Concrete		Flush Grade Locking Cap
4		Brownish orange fine sandy SILT, slightly plasitc		Portland/Bentonite Grout 8.25" Diameter Borehole
8				2" Sch. 40 PVC Casing
12				
16		Brown fine sandy SILT, slightly dense, slow auger advancement.		
20				
24				
28				
32				
36				
40				
44				
48				Bentonite Seal
52				Well Sand Filter Pack
56				2" Sch. 40 PVC 0.010" Slot Screen
60		Partially Weathered Rock		End Cap
64				



Drilling Contractor:	Saedacco	**Sampling Method:**	Split Spoon
Drilling Method:	HSA	**Total Depth (ft):**	60'
Drilling Equipment:	Diedrich D-50	**Screened Interval:**	50'- 60'
Responsible Professional:	Rich Lemire	**Riser Depth:**	0 - 50'
Registration No.:	1423	**Elevation (msl):**	TBD

ERM

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D H E C
PROMOTE PROTECT PROSPER

Water Well Record
Bureau of Water
2600 Bull Street, Columbia, SC 29201-1708; (803) 898-4300

1. WELL OWNER INFORMATION:
Name: JOSLYN-CLARK (last) (first)
Address: 2013 MEETING STREET
City: LANCASTER State: SC Zip:
Telephone: Work: 704-541-8345 Home:

2. LOCATION OF WELL: COUNTY: LANCASTER
Name: Joslyn Clark
Street Address: 2013 W. Meeting Street
City: Lancaster, South Zip: Carolina
Latitude: 33.94146 Longitude: -81.929413

3. PUBLIC SYSTEM NAME: OW-1 **PUBLIC SYSTEM NUMBER:** OW-1

4. ABANDONMENT: ☐ Yes ☒ No
Give Details Below
Grouted Depth: from _____ ft. to _____ ft.

Formation Description	*Thickness of Stratum	Depth to Bottom of Stratum
TAN SILT/CLAY	0	48
PWR	48	60
WATER AT 47'		
*Indicate Water Bearing Zones (Use a 2nd sheet if needed)		

5. REMARKS:
BENTONITE AT 46'TO48'.

6. TYPE: ☐ Mud Rotary ☐ Jetted ☒ Bored ☐ Dug ☐ Air Rotary ☐ Driven ☐ Cable tool ☐ Other

7. PERMIT NUMBER:

8. USE:
☐ Residential ☐ Public Supply ☐ Process
☐ Irrigation ☐ Air Conditioning ☐ Emergency
☐ Test Well ☒ Monitor Well ☐ Replacement

9. WELL DEPTH (completed) 60' ft. Date Started: 3-7-2014 Date Completed: 3-10-2014

10. CASING: ☒ Threaded ☐ Welded
Diam.: 2"
Type: ☒ PVC ☐ Galvanized ☐ Steel ☐ Other
0 in. to 50' ft. depth
_____ in. to _____ ft. depth
Height: Above/(Below)
Surface _____ ft.
Weight _____ lb./ft.
Drive Shoe? ☐ Yes ☒ No

11. SCREEN:
Type: PVC Diam.: 2"
Slot/Gauge: .010 Length: 10
Set Between: 50' ft. and 60' ft.
_____ ft. and _____ ft.
NOTE: MULTIPLE SCREENS USE SECOND SHEET
Sieve Analysis ☐ Yes (please enclose) ☒ No

12. STATIC WATER LEVEL 46.4' ft. below land surface after 24 hours

13. PUMPING LEVEL Below Land Surface.
_____ ft. after _____ hrs. Pumping _____ G.P.M.
Pumping Test: ☐ Yes (please enclose) ☒ No
Yield: _____

14. WATER QUALITY
Chemical Analysis ☐ Yes ☒ No Bacterial Analysis ☐ Yes ☒ No
Please enclose lab results.

15. ARTIFICIAL FILTER (filter pack) ☒ Yes ☐ No
Installed from 48 ft. to 60 ft.
Effective size #2 Uniformity Coefficient SAND

16. WELL GROUTED? ☒ Yes ☐ No
☐ Neat Cement ☐ Bentonite ☒ Bentonite/Cement ☐ Other _____
Depth: From 0 ft. to 46' ft.

17. NEAREST SOURCE OF POSSIBLE CONTAMINATION: _____ ft. _____ direction
Type _____
Well Disinfected ☐ Yes ☒ No Type: _____ Amount: _____

18. PUMP: Date installed: _____ Not installed ☐
Mfr. Name: _____ Model No.: _____
H.P._____ Volts_____ Length of drop pipe_____ ft. Capacity ____ gpm
TYPE: ☐ Submersible ☐ Jet (shallow) ☐ Turbine ☐ Jet (deep) ☐ Reciprocating ☐ Centrifugal

19. WELL DRILLER: Rich Lemire CERT. NO.: 1423
Address: (Print) SAEDACCO 9088 Northfield Drive
Level: A (B) C D (circle one)
Telephone No.: (803) 548-2180 Fax No.: (803) 548-2181

20. WATER WELL DRILLER'S CERTIFICATION: This well was drilled under my direction and this report is true to the best of my knowledge and belief.

Signed: Ricky L Lemire Well Driller Date: 3/13/2014

If D Level Driller, provide supervising driller's name:

DHEC 1903 (03/2004)

COPY 1 MAIL TO SCDHEC, COPY 2 TO WELL OWNER, COPY 3 TO WELL DRILLER

Water Well Record
Bureau of Water
2600 Bull Street, Columbia, SC 29201-1708; (803) 898-4300

DHEC — PROMOTE PROTECT PROSPER

1. WELL OWNER INFORMATION:
Name: JOSLYN-CLARK (last) (first)
Address: 2013 MEETING STREET
City: LANCASTER State: SC Zip:
Telephone: Work: 704-541-8345 Home:

2. LOCATION OF WELL: COUNTY: LANCASTER
Name: Joslyn Clark
Street Address: 2013 W. Meeting Street
City: Lancaster, South Zip: Carolina
Latitude: 33.94146 Longitude: -81.929413

3. PUBLIC SYSTEM NAME: IW-1 **PUBLIC SYSTEM NUMBER:** IW-1

4. ABANDONMENT: ☐ Yes ☒ No
Give Details Below
Grouted Depth: from _____ ft. to _____ ft.

Formation Description	*Thickness of Stratum	Depth to Bottom of Stratum
TAN SILT/CLAY	0	48
PWR	48	70
WATER AT 47'		
*Indicate Water Bearing Zones (Use a 2nd sheet if needed)		

5. REMARKS: TWO WELLS IN ONE BORE HOLE.

6. TYPE: ☐ Mud Rotary ☐ Jetted ☒ Bored ☐ Dug ☐ Air Rotary ☐ Driven ☐ Cable tool ☐ Other

7. PERMIT NUMBER:

8. USE: ☐ Residential ☐ Public Supply ☐ Process ☐ Irrigation ☐ Air Conditioning ☐ Emergency ☒ Test Well ☐ Monitor Well ☐ Replacement

9. WELL DEPTH (completed) 60'/73 ft. Date Started: 3-7-2014 Date Completed: 3-13-2014

10. CASING: ☒ Threaded ☐ Welded
Diam.: 2"
Type: ☒ PVC ☐ Galvanized ☐ Steel ☐ Other
0 in. to 50' ft. depth
0 in. to 63' ft. depth
Height: Above/(Below)
Surface _____ ft.
Weight _____ lb./ft.
Drive Shoe? ☐ Yes ☒ No

11. SCREEN:
Type: PVC Diam.: 2"
Slot/Gauge: .010 Length: 10
Set Between: 50' ft. and 60' ft.
63' ft. and 73' ft.
NOTE: MULTIPLE SCREENS USE SECOND SHEET
Sieve Analysis ☐ Yes (please enclose) ☒ No

12. STATIC WATER LEVEL 46.4' ft. below land surface after 24 hours

13. PUMPING LEVEL Below Land Surface.
_____ ft. after _____ hrs. Pumping _____ G.P.M.
Pumping Test: ☐ Yes (please enclose) ☒ No
Yield: _____

14. WATER QUALITY
Chemical Analysis ☐ Yes ☒ No Bacterial Analysis ☐ Yes ☒ No
Please enclose lab results.

15. ARTIFICIAL FILTER (filter pack) ☒ Yes ☐ No
Installed from 49/62 ft. to 60/73 ft.
Effective size #2 Uniformity Coefficient SAND

16. WELL GROUTED? ☒ Yes ☐ No
☐ Neat Cement ☐ Bentonite ☒ Bentonite/Cement ☐ Other _____
Depth: From 0 ft. to 47' ft.

17. NEAREST SOURCE OF POSSIBLE CONTAMINATION: _____ ft. _____ direction
Type _____
Well Disinfected ☐ Yes ☒ No Type: _____ Amount: _____

18. PUMP: Date installed: _____ Not installed ☐
Mfr. Name: _____ Model No.: _____
H.P. _____ Volts _____ Length of drop pipe _____ ft. Capacity _____ gpm
TYPE: ☐ Submersible ☐ Jet (shallow) ☐ Turbine ☐ Jet (deep) ☐ Reciprocating ☐ Centrifugal

19. WELL DRILLER: Rich Lemire CERT. NO.: 1423
Address: (Print) SAEDACCO 9088 Northfield Drive
Level: A (B) C D (circle one)
Telephone No.: (803) 548-2180 Fax No.: (803) 548-2181

20. WATER WELL DRILLER'S CERTIFICATION: This well was drilled under my direction and this report is true to the best of my knowledge and belief.

Signed: Richy A Lemire Well Driller Date: 3/13/2014

If D Level Driller, provide supervising driller's name:

DHEC 1903 (03/2004)

COPY 1 MAIL TO SCDHEC, COPY 2 TO WELL OWNER, COPY 3 TO WELL DRILLER

Water Well Record
Bureau of Water
2600 Bull Street, Columbia, SC 29201-1708; (803) 898-4300

DHEC — PROMOTE PROTECT PROSPER

1. WELL OWNER INFORMATION:
Name: JOSLYN-CLARK (last) (first)
Address: 2013 MEETING STREET
City: LANCASTER State: SC Zip:
Telephone: Work: 704-541-8345 Home:

2. LOCATION OF WELL: COUNTY: LANCASTER
Name: Joslyn Clark
Street Address: 2013 W. Meeting Street
City: Lancaster, South Zip: Carolina
Latitude: 33.94146 Longitude: -81.929413

3. PUBLIC SYSTEM NAME: IW-2 **PUBLIC SYSTEM NUMBER:** IW-2

4. ABANDONMENT: ☐ Yes ☒ No
Give Details Below
Grouted Depth: from _____ ft. to _____ ft.

Formation Description	*Thickness of Stratum	Depth to Bottom of Stratum
TAN SILT/CLAY	0	48
PWR	48	73
WATER AT 47'		
*Indicate Water Bearing Zones (Use a 2nd sheet if needed)		

5. REMARKS: TWO WELLS IN ONE BORE HOLE.

6. TYPE: ☐ Mud Rotary ☐ Jetted ☒ Bored ☐ Dug ☐ Air Rotary ☐ Driven ☐ Cable tool ☐ Other

7. PERMIT NUMBER:

8. USE: ☐ Residential ☐ Public Supply ☐ Process ☐ Irrigation ☐ Air Conditioning ☐ Emergency ☒ Test Well ☐ Monitor Well ☐ Replacement

9. WELL DEPTH (completed) 60'/70 ft. Date Started: 3-7-2014 Date Completed: 3-13-2014

10. CASING: ☒ Threaded ☐ Welded
Diam.: 2"
Type: ☒ PVC ☐ Galvanized ☐ Steel ☐ Other
0 in. to 50' ft. depth
0 in. to 63' ft. depth
Height: Above/(below)
Surface _____ ft.
Weight _____ lb./ft.
Drive Shoe? ☐ Yes ☒ No

11. SCREEN:
Type: PVC Diam.: 2"
Slot/Gauge: .010 Length: 10
Set Between: 50' ft. and 60' ft.
63' ft. and 70' ft.
NOTE: MULTIPLE SCREENS USE SECOND SHEET
Sieve Analysis ☐ Yes (please enclose) ☒ No

12. STATIC WATER LEVEL 46.4' ft. below land surface after 24 hours

13. PUMPING LEVEL Below Land Surface.
_____ ft. after _____ hrs. Pumping _____ G.P.M.
Pumping Test: ☐ Yes (please enclose) ☒ No
Yield: _____

14. WATER QUALITY
Chemical Analysis ☐ Yes ☒ No Bacterial Analysis ☐ Yes ☒ No
Please enclose lab results.

15. ARTIFICIAL FILTER (filter pack) ☒ Yes ☐ No
Installed from 49/62 ft. to 60/70 ft.
Effective size #2 Uniformity Coefficient SAND

16. WELL GROUTED? ☒ Yes ☐ No
☐ Neat Cement ☐ Bentonite ☒ Bentonite/Cement ☐ Other _____
Depth: From 0 ft. to 47' ft.

17. NEAREST SOURCE OF POSSIBLE CONTAMINATION: ____ ft. ____ direction
Type _____
Well Disinfected ☐ Yes ☒ No Type: _____ Amount: _____

18. PUMP: Date installed: _____ Not installed ☐
Mfr. Name: _____ Model No.: _____
H.P. _____ Volts _____ Length of drop pipe _____ ft. Capacity ____ gpm
TYPE: ☐ Submersible ☐ Jet (shallow) ☐ Turbine ☐ Jet (deep) ☐ Reciprocating ☐ Centrifugal

19. WELL DRILLER: Rich Lemire CERT. NO.: 1423
Address: (Print) SAEDACCO 9088 Northfield Drive
Level: A (B) C D (circle one)
Telephone No.: (803) 548-2180 Fax No.: (803) 548-2181

20. WATER WELL DRILLER'S CERTIFICATION: This well was drilled under my direction and this report is true to the best of my knowledge and belief.

Signed: Rich Lemire Well Driller Date: 3/13/2014

If D Level Driller, provide supervising driller's name:

COPY 1 MAIL TO SCDHEC, COPY 2 TO WELL OWNER, COPY 3 TO WELL DRILLER

9903

D H E C
PROMOTE PROTECT PROSPER

Water Well Record
Bureau of Water
2600 Bull Street, Columbia, SC 29201-1708; (803) 898-4300

1. WELL OWNER INFORMATION:
Name: JOSLYN-CLARK (last) (first)
Address: 2013 MEETING STREET
City: LANCASTER State: SC Zip:
Telephone: Work: 704-541-8345 Home:

2. LOCATION OF WELL: COUNTY: LANCASTER
Name: Joslyn Clark
Street Address: 2013 W. Meeting Street
City: Lancaster, South Zip: Carolina
Latitude: 33.94146 Longitude: -81.929413

3. PUBLIC SYSTEM NAME: OW-1 **PUBLIC SYSTEM NUMBER:** OW-1

4. ABANDONMENT: ☐ Yes ☒ No
Give Details Below
Grouted Depth: from _____ ft. to _____ ft.

Formation Description	*Thickness of Stratum	Depth to Bottom of Stratum
TAN SILT/CLAY	0	48
PWR	48	60
WATER AT 47'		
*Indicate Water Bearing Zones (Use a 2nd sheet if needed)		

5. REMARKS: BENTONITE AT 46'TO48'.

6. TYPE: ☐ Mud Rotary ☐ Jetted ☒ Bored ☐ Dug ☐ Air Rotary ☐ Driven ☐ Cable tool ☐ Other

7. PERMIT NUMBER:

8. USE: ☐ Residential ☐ Public Supply ☐ Process ☐ Irrigation ☐ Air Conditioning ☐ Emergency ☐ Test Well ☒ Monitor Well ☐ Replacement

9. WELL DEPTH (completed) 60' ft. Date Started: 3-7-2014 Date Completed: 3-10-2014

10. CASING: ☒ Threaded ☐ Welded
Diam.: 2"
Type: ☒ PVC ☐ Galvanized ☐ Steel ☐ Other
0 in. to 50' ft. depth
_____ in. to _____ ft. depth
Height: Above/(Below)
Surface _____ ft.
Weight _____ lb./ft.
Drive Shoe? ☐ Yes ☒ No

11. SCREEN:
Type: PVC Diam.: 2"
Slot/Gauge: .010 Length: 10
Set Between: 50' ft. and 60' ft.
_____ ft. and _____ ft.
NOTE: MULTIPLE SCREENS USE SECOND SHEET
Sieve Analysis ☐ Yes (please enclose) ☒ No

12. STATIC WATER LEVEL 46.4' ft. below land surface after 24 hours

13. PUMPING LEVEL Below Land Surface.
_____ ft. after _____ hrs. Pumping _____ G.P.M.
Pumping Test: ☐ Yes (please enclose) ☒ No
Yield: _____

14. WATER QUALITY
Chemical Analysis ☐ Yes ☒ No Bacterial Analysis ☐ Yes ☒ No
Please enclose lab results.

15. ARTIFICIAL FILTER (filter pack) ☒ Yes ☐ No
Installed from 48 ft. to 60 ft.
Effective size #2 Uniformity Coefficient SAND

16. WELL GROUTED? ☒ Yes ☐ No
☐ Neat Cement ☐ Bentonite ☒ Bentonite/Cement ☐ Other _____
Depth: From 0 ft. to 46' ft.

17. NEAREST SOURCE OF POSSIBLE CONTAMINATION: _____ ft. _____ direction
Type _____
Well Disinfected ☐ Yes ☒ No Type: _____ Amount: _____

18. PUMP: Date installed: _____ Not installed ☐
Mfr. Name: _____ Model No.: _____
H.P._____ Volts_____ Length of drop pipe_____ ft. Capacity ____ gpm
TYPE: ☐ Submersible ☐ Jet (shallow) ☐ Turbine ☐ Jet (deep) ☐ Reciprocating ☐ Centrifugal

19. WELL DRILLER: Rich Lemire CERT. NO.: 1423
Address: (Print) SAEDACCO 9088 Northfield Drive
Level: A (B) C D (circle one)
Telephone No.: (803) 548-2180 Fax No.: (803) 548-2181

20. WATER WELL DRILLER'S CERTIFICATION: This well was drilled under my direction and this report is true to the best of my knowledge and belief.

Signed: Richy A Lemire Well Driller Date: 3/13/2014

If D Level Driller, provide supervising driller's name:

DHEC 1903 (03/2004) COPY 1 MAIL TO SCDHEC, COPY 2 TO WELL OWNER, COPY 3 TO WELL DRILLER

Water Well Record
Bureau of Water
2600 Bull Street, Columbia, SC 29201-1708; (803) 898-4300

DHEC — PROMOTE PROTECT PROSPER

1. WELL OWNER INFORMATION:
Name: JOSLYN-CLARK (last) (first)
Address: 2013 MEETING STREET
City: LANCASTER State: SC Zip:
Telephone: Work: 704-541-8345 Home:

2. LOCATION OF WELL: COUNTY: LANCASTER
Name: Joslyn Clark
Street Address: 2013 W. Meeting Street
City: Lancaster, South Zip: Carolina
Latitude: 33.94146 Longitude: -81.929413

3. PUBLIC SYSTEM NAME: IW-1 **PUBLIC SYSTEM NUMBER:** IW-1

4. ABANDONMENT: ☐ Yes ☒ No
Give Details Below
Grouted Depth: from _____ ft. to _____ ft.

Formation Description	*Thickness of Stratum	Depth to Bottom of Stratum
TAN SILT/CLAY	0	48
PWR	48	70
WATER AT 47'		
*Indicate Water Bearing Zones (Use a 2nd sheet if needed)		

5. REMARKS: TWO WELLS IN ONE BORE HOLE.

6. TYPE: ☐ Mud Rotary ☐ Jetted ☒ Bored ☐ Dug ☐ Air Rotary ☐ Driven ☐ Cable tool ☐ Other

7. PERMIT NUMBER:

8. USE: ☐ Residential ☐ Public Supply ☐ Process ☐ Irrigation ☐ Air Conditioning ☐ Emergency ☒ Test Well ☐ Monitor Well ☐ Replacement

9. WELL DEPTH (completed) 60'/73 ft. Date Started: 3-7-2014 Date Completed: 3-13-2014

10. CASING: ☒ Threaded ☐ Welded
Diam.: 2"
Type: ☒ PVC ☐ Galvanized ☐ Steel ☐ Other
0 in. to 50' ft. depth
0 in. to 63' ft. depth
Height: Above/(Below)
Surface _____ ft.
Weight _____ lb./ft.
Drive Shoe? ☐ Yes ☒ No

11. SCREEN:
Type: PVC Diam.: 2"
Slot/Gauge: .010 Length: 10
Set Between: 50' ft. and 60' ft.
63' ft. and 73' ft.
NOTE: MULTIPLE SCREENS USE SECOND SHEET
Sieve Analysis ☐ Yes (please enclose) ☒ No

12. STATIC WATER LEVEL 46.4' ft. below land surface after 24 hours

13. PUMPING LEVEL Below Land Surface.
_____ ft. after _____ hrs. Pumping _____ G.P.M.
Pumping Test: ☐ Yes (please enclose) ☒ No
Yield: _____

14. WATER QUALITY
Chemical Analysis ☐ Yes ☒ No Bacterial Analysis ☐ Yes ☒ No
Please enclose lab results.

15. ARTIFICIAL FILTER (filter pack) ☒ Yes ☐ No
Installed from 49/62 ft. to 60/73 ft.
Effective size #2 Uniformity Coefficient SAND

16. WELL GROUTED? ☒ Yes ☐ No
☐ Neat Cement ☐ Bentonite ☒ Bentonite/Cement ☐ Other _____
Depth: From 0 ft. to 47' ft.

17. NEAREST SOURCE OF POSSIBLE CONTAMINATION: ____ ft. ____ direction
Type _____
Well Disinfected ☐ Yes ☒ No Type: _____ Amount: _____

18. PUMP: Date installed: _____ Not installed ☐
Mfr. Name: _____ Model No.: _____
H.P. _____ Volts _____ Length of drop pipe _____ ft. Capacity ____ gpm
TYPE: ☐ Submersible ☐ Jet (shallow) ☐ Turbine ☐ Jet (deep) ☐ Reciprocating ☐ Centrifugal

19. WELL DRILLER: Rich Lemire CERT. NO.: 1423
Address: (Print) SAEDACCO 9088 Northfield Drive
Level: A (B) C D (circle one)
Telephone No.: (803) 548-2180 Fax No.: (803) 548-2181

20. WATER WELL DRILLER'S CERTIFICATION: This well was drilled under my direction and this report is true to the best of my knowledge and belief.

Signed: Richy A Lemire Date: 3/13/2014
Well Driller

If D Level Driller, provide supervising driller's name:

DHEC 1903 (03/2004) COPY 1 MAIL TO SCDHEC, COPY 2 TO WELL OWNER, COPY 3 TO WELL DRILLER

Water Well Record
Bureau of Water
2600 Bull Street, Columbia, SC 29201-1708; (803) 898-4300

DHEC — PROMOTE PROTECT PROSPER

1. WELL OWNER INFORMATION:
Name: JOSLYN-CLARK (last) (first)
Address: 2013 MEETING STREET
City: LANCASTER State: SC Zip:
Telephone: Work: 704-541-8345 Home:

2. LOCATION OF WELL: COUNTY: LANCASTER
Name: Joslyn Clark
Street Address: 2013 W. Meeting Street
City: Lancaster, South Zip: Carolina
Latitude: 33.94146 Longitude: -81.929413

3. PUBLIC SYSTEM NAME: IW-2 **PUBLIC SYSTEM NUMBER:** IW-2

4. ABANDONMENT: ☐ Yes ☒ No
Give Details Below
Grouted Depth: from _____ ft. to _____ ft.

Formation Description	*Thickness of Stratum	Depth to Bottom of Stratum
TAN SILT/CLAY	0	48
PWR	48	73
WATER AT 47'		
*Indicate Water Bearing Zones (Use a 2nd sheet if needed)		

5. REMARKS: TWO WELLS IN ONE BORE HOLE.

6. TYPE: ☐ Mud Rotary ☐ Jetted ☒ Bored ☐ Dug ☐ Air Rotary ☐ Driven ☐ Cable tool ☐ Other

7. PERMIT NUMBER:

8. USE: ☐ Residential ☐ Public Supply ☐ Process ☐ Irrigation ☐ Air Conditioning ☐ Emergency ☒ Test Well ☐ Monitor Well ☐ Replacement

9. WELL DEPTH (completed) 60'/70 ft. Date Started: 3-7-2014 Date Completed: 3-13-2014

10. CASING: ☒ Threaded ☐ Welded
Diam.: 2"
Type: ☒ PVC ☐ Galvanized ☐ Steel ☐ Other
0 in. to 50' ft. depth
0 in. to 63' ft. depth
Height: Above/(Below)
Surface _____ ft.
Weight _____ lb./ft.
Drive Shoe? ☐ Yes ☒ No

11. SCREEN:
Type: PVC Diam.: 2"
Slot/Gauge: .010 Length: 10
Set Between: 50' ft. and 60' ft.
63' ft. and 70' ft.
NOTE: MULTIPLE SCREENS USE SECOND SHEET
Sieve Analysis ☐ Yes (please enclose) ☒ No

12. STATIC WATER LEVEL 46.4' ft. below land surface after 24 hours

13. PUMPING LEVEL Below Land Surface.
_____ ft. after _____ hrs. Pumping _____ G.P.M.
Pumping Test: ☐ Yes (please enclose) ☒ No
Yield: _____

14. WATER QUALITY
Chemical Analysis ☐ Yes ☒ No Bacterial Analysis ☐ Yes ☒ No
Please enclose lab results.

15. ARTIFICIAL FILTER (filter pack) ☒ Yes ☐ No
Installed from 49/62 ft. to 60/70 ft.
Effective size #2 Uniformity Coefficient SAND

16. WELL GROUTED? ☒ Yes ☐ No
☐ Neat Cement ☐ Bentonite ☒ Bentonite/Cement ☐ Other _____
Depth: From 0 ft. to 47' ft.

17. NEAREST SOURCE OF POSSIBLE CONTAMINATION: _____ ft. _____ direction
Type _____
Well Disinfected ☐ Yes ☒ No Type: _____ Amount: _____

18. PUMP: Date Installed: _____ Not installed ☐
Mfr. Name: _____ Model No.: _____
H.P. _____ Volts _____ Length of drop pipe _____ ft. Capacity _____ gpm
TYPE: ☐ Submersible ☐ Jet (shallow) ☐ Turbine ☐ Jet (deep) ☐ Reciprocating ☐ Centrifugal

19. WELL DRILLER: Rich Lemire CERT. NO. 1423
Address: (Print) SAEDACCO
9088 Northfield Drive
Level: A (B) C D (circle one)
Telephone No.: (803) 548-2180 Fax No.: (803) 548-2181

20. WATER WELL DRILLER'S CERTIFICATION: This well was drilled under my direction and this report is true to the best of my knowledge and belief.

Signed: Rich Lemire Date: 3/13/2014
Well Driller

If D Level Driller, provide supervising driller's name:

DHEC 1903 (03/2004) COPY 1 MAIL TO SCDHEC, COPY 2 TO WELL OWNER, COPY 3 TO WELL DRILLER