

**WHITE STREET LANDFILL
PHASE II (PERMIT NO. 41-03)
WELL INSTALLATION REPORT
GREENSBORO, NORTH CAROLINA**
S&ME Project No. 1584-98-081

Prepared for:
City of Greensboro
Environmental Service Department
P.O. Box 3136
Greensboro, North Carolina 27402-3136

Prepared by:
S&ME, Inc.
3718 Old Battleground Road
Greensboro, North Carolina 27410

October 1, 2013



October 1, 2013

City of Greensboro
Environmental Services Department
P.O. Box 3136
Greensboro, NC 27410-3136

Attention: Ms. Gail Hay, P.E.
Technical & Planning Support Division Manager

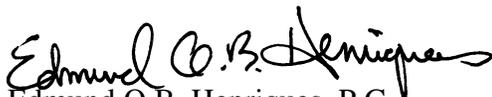
Reference: Well Installation Report
White Street Landfill, Phase II (Permit # 41-03)
Greensboro, North Carolina
S&ME Project No. 1584-98-081

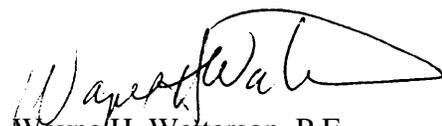
Dear Ms. Hay:

S&ME, Inc. is pleased to present the enclosed Well Installation Report for compliance well II-4A, located in Phase 2 of the White Street Landfill. If you should have any questions or need additional information please contact us at (336) 288-7180. On behalf of the City of Greensboro, S&ME submitted a copy of this report to the NCDENR, Division of Waste Management, Solid Waste Section.

Respectfully submitted,

S&ME, Inc.


Edmund Q.B. Henriques, P.G.
Project Manager


Wayne H. Watterson, P.E.
Senior Engineer

Cc NCDENR, DWM, Solid Waste Section, 1646 Mail Service Center, Raleigh, NC
27699-1646, Attention: Ms. Jaclynne Drummond



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Figure 1 Site Base Map

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Appendix I S&ME Boring Log and Well Completion Record for Well II-4A.
Appendix II Slug Test Data

1. INTRODUCTION

Compliance Monitoring Well II-4 at the White Street Landfill monitors the shallow aquifer in an area north of a portion of White Street Landfill, Phase II (e.g. closed MSW landfill with an active C&D landfill piggy backed on top). The location of Monitoring Well II-4 is depicted on **Figure 1**.

Monitoring Well II-4 has exhibited higher than normal turbidity for a number of years. For groundwater sampling, a turbidity level of 10 NTU or less was established as the one of the target stabilization criteria. Previously, S&ME redeveloped the well on more than one occasion in an effort to reduce the turbidity; however, the turbidity problem persisted. It has been our contention that the high turbidity level exhibited by the water yielded from this well is a source for the somewhat elevated metals concentrations detected at this location.

2. PRE-DRILLING ACTIVITIES

On July 12, 2013, S&ME submitted letter to the North Carolina Department of Environment and Natural Resources – Division of Waste Management, Solid Waste Section (NCDENR-DWM-SWS) to request permission to replace compliance Monitoring Well II-4. In a letter dated August 1, 2013, the NCDENR-DWM-SWS approved the request.

3. DRILLING ACTIVITIES

The following sections describe S&ME drilling activities, including installation of replacement Monitoring Well II-4A, well development, pump transference, and slug testing of Monitoring Well II-4A.

3.1 Well Installation

Following boring location, S&ME installed Monitoring Well II-4A at the location shown on Figure 1. The replacement groundwater monitoring well was installed in general accordance with the 15A NCAC 2C standards. A North Carolina licensed geologist and North Carolina registered well driller were on-site during well installation activities.

Drilling activities were performed using a track-mounted drill rig (Geoprobe 6200 DT). Drilling equipment and tooling were decontaminated using a high pressure steam cleaner prior to arriving on-site. The borehole for II-4A was advanced using 6 ¼-inch hollow stem augers to a depth of 25 feet below land surface. The groundwater level in the boring was then allowed to stabilize for one hour prior to obtaining a groundwater level measurement for the boring. The groundwater level recorded after the 1-hour stabilization period was 10.1 feet below land surface.

After boring completion, S&ME constructed a Type II monitoring well within the boring to a depth of 25 feet below land surface. The well was constructed of 2-inch inside diameter schedule 40 PVC well screen and casing with the lowermost portion consisting of a 15-foot section with 0.010-inch slotted well screen. The annulus of the borehole surrounding the screen was backfilled with #2 silica sand to two feet above the top of the

screen. Above the sand interval, a 5-foot thick bentonite seal was placed and hydrated prior to filling the remaining annular space above the bentonite with neat cement.

After construction, the well was completed with an above grade, 4-inch square, lockable aluminum protective cover, and with a 2-foot square concrete pad. The driller engraved and attached a permanent well tag to the protective cover in accordance with North Carolina well regulations. *Appendix I* includes a boring log and well construction record for Monitoring Well II-4A.

3.2 Well Development

After installation, the replacement groundwater monitoring well was developed to remove clay, silt, and sand particles that may have been introduced into the formation or filter pack during installation. Development was conducted immediately after well installation and approximately 30 gallons of water were removed during development. The well was developed again on August 14, 2013 and on September 6, 2013, prior to the installation of the dedicated well pump.

3.3 Pump Transference

Following development of Monitoring Well II-4A, S&ME transferred the dedicated pump from Monitoring Well II-4 to replacement Monitoring Well II-4A. The pump was removed, decontaminated, and fitted with new Teflon®-lined poly tubing. The pump was installed approximately one foot above the bottom of the well screen, consistent with other dedicated pumps on-site.

3.4 Well Abandonment

Monitoring Well II-4, for which Monitoring Well II-4A replaces, was not abandoned.

4. POST-DRILLING ACTIVITIES

The following sections describe S&ME's slug testing, coordination of surveying activities, and reporting of well installation records to NCDENR.

4.1 Slug Testing

A rising head slug test was performed at Monitoring Well II-4A on August 15, 2013. The slug testing initially comprised lowering a pressure transducer to below the water level into the well for the collection of time, temperature, and pressure. Time was allowed for the water level to equilibrate from the transducer insertion and the water level was recorded as the initial measurement from which to measure water level recovery. Water was then removed from the well by pumping and the pressure transducer/data recorder recorded the rate of water level change back toward static condition. The test was repeated after the water level recovered approximately 90%.

The transducer data were graphically evaluated in the field using Win-Situ® computer software. The Win-Situ® data were imported into Microsoft Excel® for analysis using Bouwer-Rice techniques (Bouwer, 1989; Bouwer and Rice, 1976) for partially- or fully-

penetrating well screens using Aqtesolv® computer software. The slug test results indicated an average hydraulic conductivity of approximately 0.295 feet per day. The hydraulic conductivity values obtained for well II-4A are similar to those previously obtained for Monitoring Well II-4. The slug test dataset and analyses documentation are included in **Appendix II**.

4.2 Surveying

Following installation of replacement Monitoring Well II-4A, the City of Greensboro contacted in house City land surveying staff to survey the well and provide coordinates, and a top of casing elevation. The location of the replacement well is identified on **Figure 1- Site Base Map**. The survey data provided for Monitoring Well II-4A is as follows:

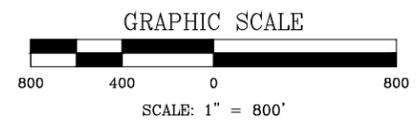
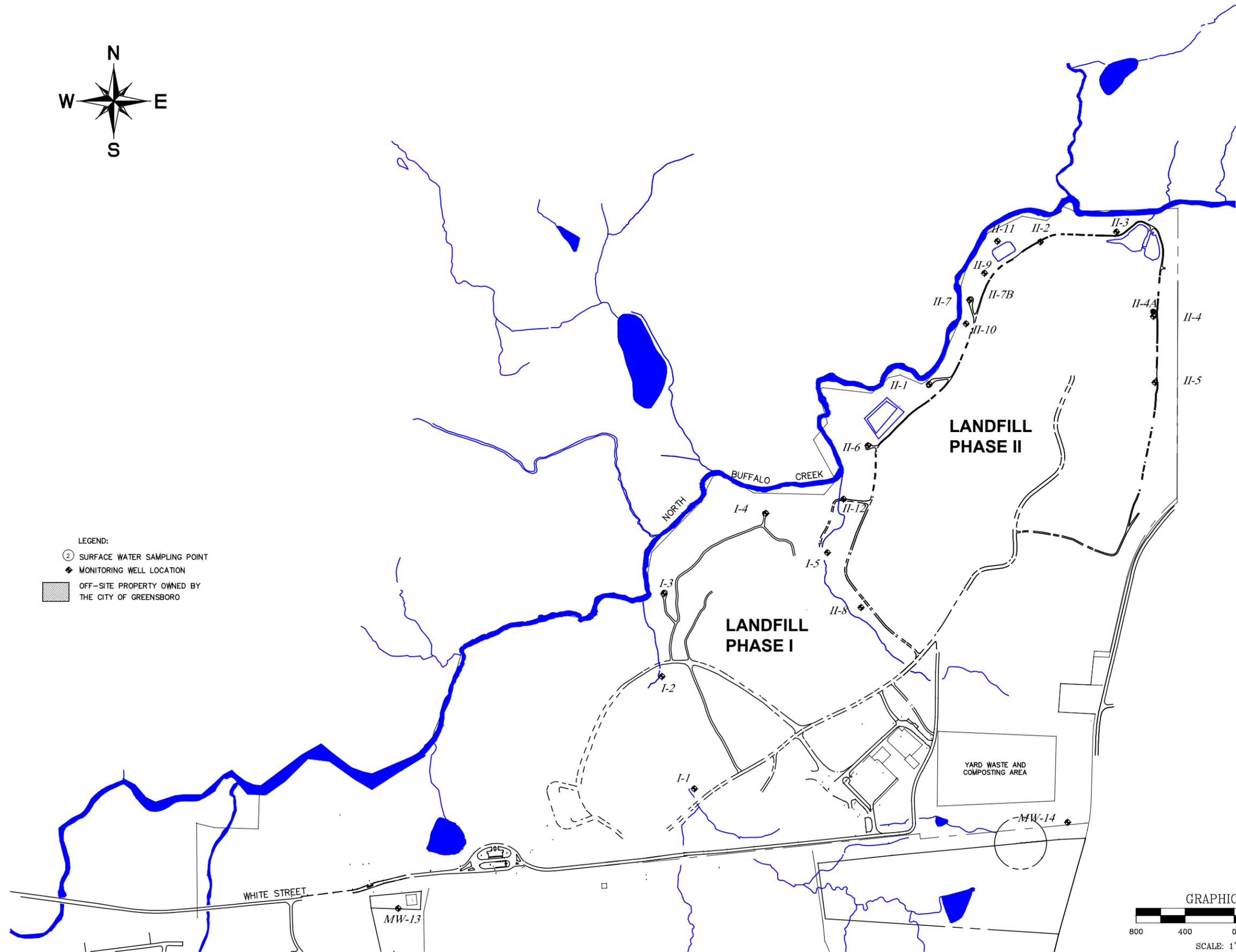
Northing: 863581.98
Easting: 1789359.52
Top of Casing Elevation: 707.30 ft MSL
Casing Stick up: 2.60 ft above ground surface

4.3 Reporting to NCDENR

S&ME prepared and submitted a well construction record (GW-1b) for replacement Monitoring Well II-4A to the NCDENR within 30-days of well completion. A copy of the submittal to NCDENR is included in **Appendix I**.



- LEGEND:
- ② SURFACE WATER SAMPLING POINT
 - ◆ MONITORING WELL LOCATION
 - OFF-SITE PROPERTY OWNED BY THE CITY OF GREENSBORO



SITE BASE MAP

PHASE II

WHITE STREET LANDFILL
GREENSBORO, NORTH CAROLINA

SCALE: AS SHOWN

CHECKED BY: EQBH

DRAWN BY: DSB/RDM

JOB NO. 1584-98-081B

DATE: DECEMBER 2012

FIGURE NO. 1



APPENDIX I

COMPLETION REPORT OF WELL No. II-4A

PROJECT: **White Street Landfill**
 PROJECT NO: **1584-98-081**
 PROJECT LOCATION: **Greensboro**

WATER LEVEL: **692'**

DRILLING CONTRACTOR: **Probe Technology**
 DRILLING METHOD: **HSA**
 DATE DRILLED: **8/13/13**

LATITUDE: **36° 7' 14"**
 LONGITUDE: **79°43' 6"**
 TOP OF CASING ELEVATION: **703'**
 DATUM: **MSL**
 LOGGED BY: **E. Henriques**

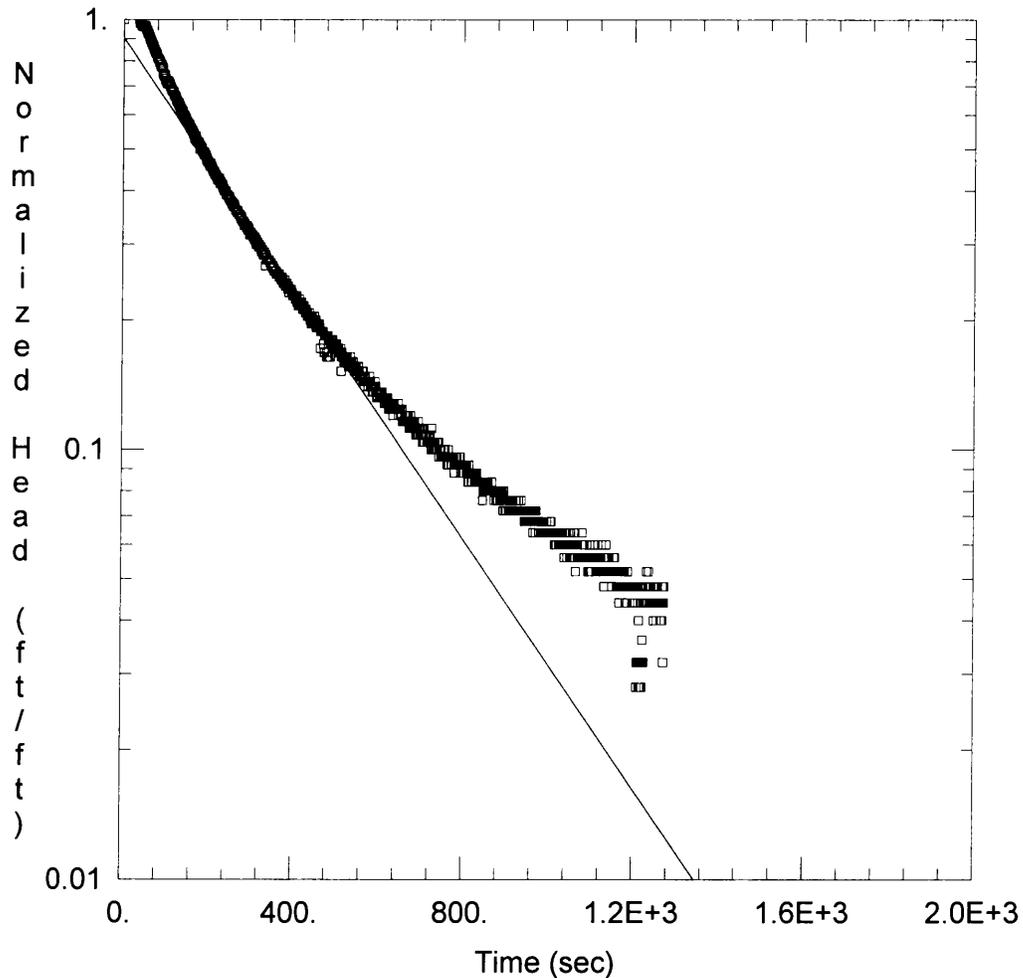
STRATA			WELL DETAILS	DEPTH (ft.)	LEGEND	ELEVATION (ft.)	WELL CONSTRUCTION DETAILS
DESCRIPTION	SYMBOL	DEPTH (ft.)					
Topsoil	▨	0		0.00	GS	0.00	<p>PROTECTIVE CASING Diameter: Type: Post Interval: 0-2.4</p> <p>RISER CASING Diameter: 2" Type: PVC Interval: -2.4-10</p> <p>GROUT Type: Portland Interval: 0-3</p> <p>SEAL Type: Bentonite Interval: 3-8</p> <p>FILTERPACK Type: #2 Sand Interval: 8-25</p> <p>SCREEN Diameter: 2 Type: PVC Interval: 10-25</p> <p>LEGEND</p> <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>□ FILTER PACK</p> <p>■ BENTONITE</p> <p>▨ CEMENT GROUT</p> <p>▩ CUTTINGS / BACKFILL</p> <p>▼ STATIC WATER LEVEL</p> </div> <div style="width: 45%;"> <p>TOC TOP OF CASING</p> <p>GS GROUND SURFACE</p> <p>BS BENTONITE SEAL</p> <p>FP FILTER PACK</p> <p>TSC TOP OF SCREEN</p> <p>BSC BOTTOM OF SCREEN</p> <p>TD TOTAL DEPTH</p> <p>CG CEMENT GROUT</p> </div> </div>
Fill: Dry Light Brown Silty SAND	▨	3.00		3.00			
Dry Light Brown Fine Sandy SILT with Rust mottles, with organics (Roots)	▨	5.00		5.00			
Moist Gray White Clayey SILT with small rock fragments	▨	8.00		8.00			
Moist Gray Light Brown Clayey SILT with Orange oxidation stains	▨	10.00		10.00			
Moist Transition to gray-brown Fine Sandy SILT (Saprolite)	▨	15.00		15.00			
Moist-Saturated Light Brown Reddish Brown Fine Sandy SILT slightly Micaceous (Saprolite)	▨	20.00		20.00			
Saturated Brown-Greenish Gray Fine Sandy SILT micaceous (saprolite) with grey-green mottles	▨	25.00		25.00			
Saturated White partially weather quartz vein	▨	25.00		25.00			
Saturated Gray White (Salt & Pepper) Fine Sandy SILT Micaceous (Saprolite)	▨	25.00		25.00			

MONITORING WELL - 1584-98-081 WHITE STREET LANDFILL - 2011 FILE GPJ S&ME GDT 9/11/13



COMPLETION REPORT OF WELL No. II-4A

APPENDIX II



WHITE STREET LANDFILL - MONITORING WELL II-4A

Data Set: S:\...II-4A DUP.aqt

Date: 09/16/13

Time: 08:01:05

PROJECT INFORMATION

Company: S&ME

Client: City of Greensboro

Project: 1584-98-081

Location: White Street Landfill

Test Well: II-4A (DUP)

Test Date: 8-15-2013

AQUIFER DATA

Saturated Thickness: 25. ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (II-4A)

Initial Displacement: 2.5 ft

Static Water Column Height: 15. ft

Total Well Penetration Depth: 25. ft

Screen Length: 15. ft

Casing Radius: 0.0833 ft

Well Radius: 0.0833 ft

Gravel Pack Porosity: 0.25

SOLUTION

Aquifer Model: Unconfined

Solution Method: Bower-Rice

K = 0.2922 ft/day

y0 = 2.258 ft

