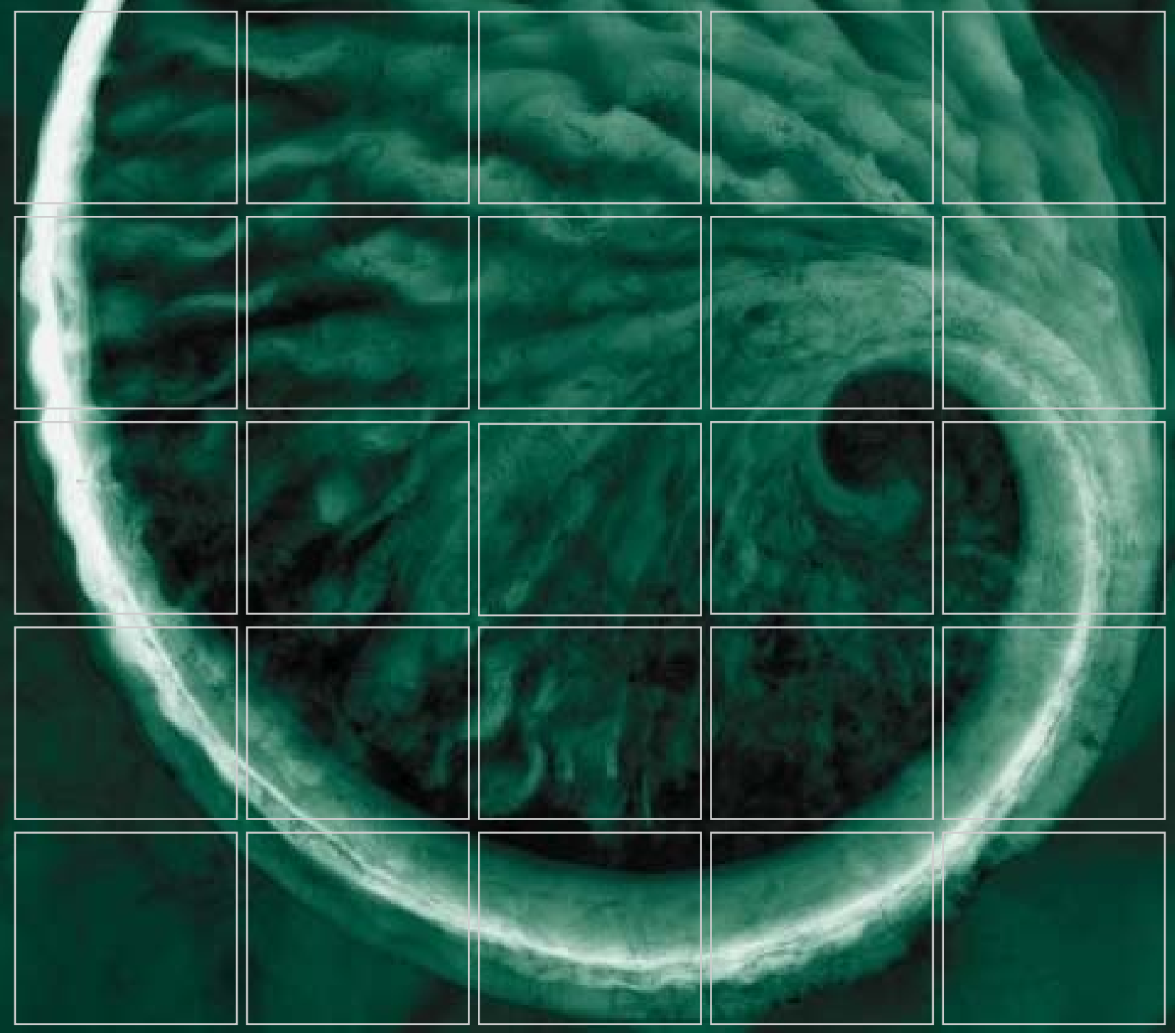

R.J. Reynolds Tobacco Company

Corrective Action Plan

Edwards Road Landfill - Permit # 34-05
Edwards Road
Rural Hall, Forsyth County,
North Carolina

February 2014

Delivering sustainable solutions in a more competitive world

ERM

ERM NC, Inc.

15720 John J. Delaney Drive
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Charlotte, NC 28277
(704) 541-8345
(704) 624-7928 (fax)

February 4, 2014

NCDENR – Division of Waste Management
Solid Waste Section
1646 Mail Service Center
Raleigh, North Carolina 27699-1646
Attention: Ms. Jackie Drummond – Compliance Hydrogeologist

Via Email

Reference: Groundwater Corrective Action Plan
Edwards Road Landfill - Permit #34-05
Rural Hall, Forsyth County

Dear Jackie:

On behalf of R.J. Reynolds Tobacco (RJRT), ERM NC, Inc. is submitting the *Corrective Action Plan* (CAP) for the Edwards Road Landfill site in Rural Hall, North Carolina. The CAP is submitted in response to your October 10, 2013 letter to RJRT and your January 7, 2014 approval letter of ERM's request to extend the submittal date to February 8, 2014.

Please contact Yong Yi of RJRT (336 741-1491) or myself if you have any questions or require additional information.

Sincerely,

Alan D. Martin

Alan Martin, P.G.
Project Manager

Thomas M Wilson

Thomas M. Wilson, P.G.
Principal-in-Charge

Attachment: Corrective Action Plan – Permit #34-05

cc: Yong Yi, R.J. Reynolds

R.J. Reynolds Tobacco Company

Corrective Action Plan

Edwards Road Landfill - Permit # 34-05
Edwards Road
Rural Hall, Forsyth County,
North Carolina

February 4, 2014

Project No. 0215005

Alan Martin, PG
Project Manager

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1.0 INTRODUCTION AND BACKGROUND

This report documents the proposed corrective action activities planned for the Edwards Road Landfill, Permit Number 34-05, previously operated by R.J. Reynolds Tobacco Company (RJRT). The landfill is located northeast of the jurisdictional boundary of Rural Hall in Forsyth County, North Carolina and the location of the landfill is shown on Figure 1.

1.1 BACKGROUND

The Edwards Road Landfill was permitted by the North Carolina Department of Environment and Natural Resources (NCDENR) – Division of Waste Management (DWM) for disposal of coal ash and construction & demolition debris generated at off-site RJRT manufacturing facilities. This landfill encompasses approximately 16.7 acres of disposal area within a 145-acre tract of land and was operated by RJRT from 1986 to 2002 under DWM Permit # 34-05 issued to RJRT. The landfill ceased receiving waste in December 2002 and placement of final cover soils over the disposal limits was completed in 2004. Monitoring of the groundwater and surface water during operations and post-closure has detected certain inorganic compounds (sulfates, total dissolved solids, iron, and manganese) in excess of the 2L groundwater and 15A NCAC 2B surface water standards.

On behalf of RJRT, ERM NC, Inc. (ERM) conducted site assessment activities for the referenced site between 2009 and 2012. A performance evaluation of the soil landfill cap determined that the cap was not performing adequately to reduce rainfall infiltration to desired levels. Based on these results, RJRT commissioned ERM to submit a synthetic lined landfill cap modification design to the DWM for approval. This cap modification design was submitted on June 14, 2011 and approved by the DWM on August 12, 2011. Construction of the cap modification including installation of a 40-mil Linear Low Density Polyethylene (LLDPE) synthetic liner and drainage improvement began in March 2012 and was completed September 2012. The DWM approved the Construction Quality Assurance (CQA) Certification for Closure Modification on October 11, 2013.

On October 1, 2013, RJRT submitted a *North Carolina Solid Waste .0500 Groundwater Corrective Action Application* and associated supporting documents to DWM to address the elevated levels of inorganics in groundwater. The selected remedy includes source area contaminant control and intrinsic remediation with performance monitoring as remedial technologies for restoration of water quality at and beyond the compliance boundary at the site. The DWM approved the selected remedy in its October 10, 2013 correspondence to RJRT and requested the submission of a Corrective Action Plan (CAP) in accordance with 15 NCAC 13B.0503(2)(d) and 15A NCAC 2L.

Land use restrictions designed to protect the cover and structural integrity of the landfill and prevent potential exposure to contaminants were recorded on portions of the property in January 2014. A plat with the land use restrictions was filed at the Forsyth County Register of Deeds on January 6, 2014.

1.2 PHYSICAL SETTING

The landfill is located in the northern portion of Forsyth County, North Carolina less than one mile northeast of the jurisdictional limits of Rural Hall. The area surrounding the site is comprised of sparsely to moderately populated land used for livestock grazing and partially wooded land with a few single-family residences. The landfill is located in the northern portion of the Piedmont Physiographic Province. The Piedmont Province generally consists of hills and ridges which are intertwined with an established system of draws and streams. The Piedmont Province is predominately underlain by igneous rock and metamorphic rocks which were initially formed during the late Proterozoic and to middle Paleozoic eras.

In this northern area of the Piedmont, topographic relief is well pronounced with elevations varying greatly over short distances. Elevations range from a high of 1,000 feet above mean sea level located west of the sites to a low of 700 feet above mean sea level located along Town Fork Creek northeast of the Edwards Road Landfill. Topographic relief generally slopes sharply to well-defined drainage basins with the presence of creeks or streams flowing from the southwest to the northeast.

1.2.1 REGIONAL GEOLOGY

The Site is located within the Inner Piedmont geologic belt of North Carolina and specifically within the Sauratown Mountain Anticlinorium which is comprised of metamorphic rocks including biotite gneiss and kyanite schist according to the Geologic Map of North Carolina (1985) and Goldsmith, et. al. (1988).

The native undisturbed soils encountered in this area are the residual product of in-place chemical weathering of rock. In areas not altered by erosion or disturbed by the activities of man, the typical residual soil profile consists of clayey soils near the surface, where soil weathering is more advanced, underlain by sandy silts and silty sands. The boundary between soil and rock is not sharply defined. This transitional zone termed "partially weathered rock" is normally found overlying the parent bedrock. Partially weathered rock (PWR) is defined, for engineering purposes, as residual material with Standard Penetration Resistances in excess of 100 blows per foot. Weathering is facilitated by fractures, joints and by the presence of less resistant rock types. Consequently, the profile of the partially weathered rock and hard rock is irregular and erratic, even over short horizontal distances. Also, it is common to find lenses and boulders of hard rock and zones of partially weathered rock within the soil mantle, well above the general bedrock level.

1.2.2 REGIONAL HYDROGEOLOGY

The occurrence and movement of groundwater in the Piedmont province is within two separate, but interconnected, water bearing zones. A shallow water-bearing zone typically occurs within the saprolite zone, and a deeper zone occurs within the underlying bedrock. Groundwater in the shallow saprolite zone occurs in the interstitial pore space of the saprolite. The depth to groundwater in the saprolitic zone can range from 20 to 45 feet along ridges and upland areas. In low lying stream valleys, the groundwater level will approach the local surface water elevations in stream channels.

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Groundwater flow in this zone is typically 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).

The occurrence and movement of groundwater in the deeper water-bearing zone within crystalline bedrock is controlled by secondary joints, fractures, and faults within the bedrock. Groundwater within the bedrock zone may be under confined or unconfined conditions. The occurrence and movement of groundwater is difficult to predict on a small scale due to the erratic nature of the secondary openings that control groundwater flow in bedrock. Small surface water features generally do not provide an indication of the direction of groundwater movement in bedrock. However, on a regional scale, the direction of groundwater movement will generally be from upland areas to major surface streams downgradient.

1.3 POTENTIAL RECEPTORS

1.3.1 WATER SUPPLY

Water in the vicinity of the Edwards Road Landfill is provided via supply wells installed into bedrock. The nearest municipal water supply piping operated by Forsyth County is located near the center of the Town of Rural Hall approximately 3,800 feet southwest of the Edwards Road Landfill.

1.3.2 WATER SUPPLY WELLS

Former Onsite Water Supply Well PW-1

One inactive water supply well is located on the Edwards Road Landfill property immediately west of the limits of the landfill. This well, identified as PW-1, provided non-potable water to the property for equipment wash down. This well was not used as a potable water source by RJRT or the previous property owner, Mr. and Mrs. Hawks. This well was removed from service on August 11, 2009 and the well is now utilized for groundwater quality monitoring purposes only. The location of the PW-1 well is depicted on Figure 2.

Off-Site Water Supply Wells

Groundwater in the vicinity of the Edwards Road Landfill is utilized for potable uses. Six off-site water supply wells were identified within 1,500 feet of the limits of the Edwards Road Landfill and six additional water supply wells were identified between 1,500 and 2,100 feet from the limits of the landfill. The nearest off-site water supply well is located approximately 1,090 feet east of the landfill limits. All identified wells are screened in bedrock to total depths ranging between 185 and 705 feet below ground surface and all but one are active. The locations of the identified water supply wells are depicted on Figure 6.

Samples were collected from 11 of the active water supply wells in 2009 and 2011 to evaluate groundwater quality at these locations. Additional sampling of one supply

well was conducted in 2012 and 2013. No concentrations of sulfates, which is the primary constituent associated with the Edwards Road Landfill, were detected above the North Carolina 2L groundwater quality standard in any of the well samples.

Analyses of groundwater collected from two water supply wells in 2009, the Don Stewart well and the Sprinkle well, indicated elevated concentrations of lead. The source of elevated lead detected in the initial sample from the Sprinkle well and three of the seven samples from the Don Stewart residential water supply well has not been determined. Evidence indicates that the elevated concentrations of lead reported in the Sprinkle and Stewart residential well samples are localized conditions. The absence of lead detected in the three additional samples from other water supply wells along Crestbrook Road and the absence or low concentrations of lead in the other six well samples surrounding the Stewart residential well indicate that the lead affected groundwater is not a wide-spread condition. Additionally, no significant concentrations of sulfates, which is the primary constituent associated with the Edwards Road Landfill, were detected in any of the well samples. Based on these results, the elevated lead concentrations reported in samples from the Sprinkle and Stewart water supply wells are unrelated to the Edwards Road Landfill.

1.3.3 Surface Water

Topographic map coverage of the vicinity is illustrated on Figure 1. The nearest water body to the Edwards Road Landfill is Leak Creek which defines the eastern boundary of the property. An unnamed tributary to Leak Creek is located to the north and northwest of the Edwards Road Landfill.

1.3.4 Subsurface Utilities

Subsurface utilities in the surrounding areas are limited to local water piping from wells to structures, sanitary wastewater discharge piping to septic tanks and associated leach fields plus stormwater piping. These subsurface utilities should be relatively shallow, and located above the water table, which at the subject site has been found at depths from six to 110 feet below ground surface. Therefore, it is unlikely that underground utilities would serve as preferential pathways for contaminant migration in groundwater.

2.0 GROUNDWATER AND SURFACE WATER QUALITY CONDITIONS

Groundwater and surface water quality monitoring has been conducted in the vicinity of the Edwards Road Landfill since 1989 in accordance with the conditions of Permit Number 34-05 and the approved Post Closure Monitoring Plan.

Groundwater and surface water samples from the Edwards Road Landfill site have been analyzed for inorganic compounds including 13 metals, nitrates, sulfates, total dissolved solids, total organic carbon as well as pH, specific conductivity and temperature. These analytical parameters were established as part of the landfill operation permit. Figure 2 depicts the locations of the groundwater monitor wells and surface water sampling locations and Table 1 presents a summary of available well construction details. Historical laboratory analytical results for available groundwater and surface water samples are summarized in Appendix A. Groundwater and surface water sample analytical results from the September 2013 sampling event are presented on Figures 4 and 5, respectively. Figure 6 depicts the isoconcentration contours of sulfates in groundwater at the site and Figure 7 presents a hydrogeologic conceptual site model and cross-section.

Based on the historic analytical results, sulfates, total dissolved solids, iron, and manganese are the primary constituents detected in groundwater samples collected from monitoring wells at the Edwards Road Landfill at concentrations above the applicable North Carolina Groundwater Standards (see Appendix A - Table A1). In addition, intermittent exceedances of barium, cadmium, chromium, selenium and lead have been observed in the groundwater. No other constituents have been detected in concentrations above the applicable North Carolina Groundwater Standards. Groundwater samples collected upgradient of the landfill have contained background levels of iron, manganese and, occasionally, cadmium, chromium, lead and selenium at concentrations above applicable groundwater quality standards. Sulfate concentrations in groundwater over time are presented graphically in Appendix B.

Based on the historical surface water analyses at the site, sulfates, manganese and aluminum are the primary constituents detected in surface water samples collected from the streams adjacent to the Edwards Road Landfill at concentrations above the applicable North Carolina Surface Water Standards (see Appendix A - Table A2). In addition, intermittent exceedances of cadmium, copper, iron, and zinc have been observed in the surface water. Surface water samples collected upstream of the landfill have contained background levels of aluminum, cadmium, copper, iron, zinc, and other metals at concentrations above applicable surface water quality standards. Sulfate concentrations in surface water over time are presented graphically in Appendix B.

Elevated concentrations of iron, manganese, and aluminum are naturally occurring in background groundwater and surface water quality samples upgradient of the landfill. Sulfate is a primary constituent related to the landfill and is used as an indicator of impact to groundwater or surface water quality. The monitoring results indicate that the area of sulfate-affected groundwater occurs primarily within the Edwards Road Landfill property. Similarly, the sulfate-affected surface water occurs within limited stream segments located immediately adjacent to the landfill property. Detections of

other constituents above the applicable groundwater or surface water standard, including cadmium and selenium, are intermittent or are limited in geographic area.

2.1 GROUNDWATER MODELING RESULTS

ERM conducted groundwater flow plus plume fate-and transport modeling in 2012 and 2013. The modeling was developed to evaluate the extent of affected groundwater under existing conditions and future conditions following the landfill cover modifications completed in 2012. Appendix C presents the modeling results including groundwater flow and groundwater quality conditions at the compliance boundary at time steps of 5, 10 and 25 years following installation of the synthetic liner and drainage improvements.

The groundwater flow modeling indicates that groundwater at the Site discharges into Leak Creek and the unnamed tributary directly downgradient of the perimeter of the landfill. These streams and tributaries near the perimeter of the landfill are the ultimate receptors for the sulfate-affected groundwater.

The flow modeling indicates that the private water wells in the surrounding areas are not receiving groundwater from the Edwards Road Landfill site. The simulated capture zones of the private water wells located east of Leak Branch do not extend to the Edwards Road landfill. The modeling results are supported by the analytical results of groundwater samples collected from private water wells which indicate no groundwater quality impacts due to the landfill.

Fate-and-transport modeling was conducted to simulate the effects of advection, dilution, dispersion, and degradation. Modeling scenarios were developed for sulfates, the primary contaminant of concern, as well as iron and manganese which occur naturally at elevated levels in the vicinity of the site. The 2013 fate-and-transport modeling simulated groundwater quality conditions at the compliance boundary at time steps of 5, 10 and 25 years following installation of the synthetic liner and drainage improvements. ERM also developed groundwater modeling scenarios depicting approximately when water quality conditions will achieve the applicable North Carolina groundwater standards (15A NCAC 2L) or site-specific background conditions at the compliance boundary. For the Edwards Road Landfill, the compliance boundary is defined as 250 feet from the waste boundary or 50 feet within the property boundary, whichever is closer to the source. The figures in Appendix C illustrate the above scenarios. Each figure depicts reasonable worst-case modeled conditions for the four modeled aquifers including the saprolite, shallow bedrock, intermediate bedrock, and deep bedrock zones.

According to the modeling results, sulfate concentrations in groundwater beyond the compliance boundary significantly decline between 10 and 25 years after installation of the synthetic liner and drainage improvements. The modeling estimates that sulfate concentrations in groundwater at the compliance boundary will be remediated to the current North Carolina groundwater standard for sulfate of 250 milligrams per liter (mg/L) in approximately 55 years after the landfill capping.

The modeling scenarios indicate groundwater quality near the compliance boundary will steadily improve following the installation of the synthetic liner and drainage improvements. Sulfates concentrations, the primary contaminant, will decrease within a reasonable timeframe given the minimal risk to human health or the environment. The fate-and-transport groundwater modeling may be updated in the future based on observed water quality conditions or other information, if warranted.

3.0 HYDROGEOLOGICAL CONCEPTUAL SITE MODEL

Based on site investigation activities, the following hydrogeological conceptual site model has been developed. This conceptual site model has been updated to incorporate the effects of the 2012 landfill cover modifications, including installation of a 40-mil LLDPE synthetic liner and drainage improvements, plus the conclusions of groundwater flow and fate-and-transport modeling in 2012 and 2013. Figure 7 depicts the current hydrogeological conceptual site model.

The site is underlain by sulfidic biotite gneiss (metagraywacke) with minor amphibolite and kyanite schist of the Ashe Formation group. The biotite gneiss has a strongly developed planar cleavage with a general northeast orientation and a moderate to shallow dip to the southeast, averaging 35°. The southeast dip reflects the regional thrust faulting in the region and low angle faulting is expected to be common within the study area. The other rock type found in the study area is vein quartz, also known as "bull quartz". Massive "bull" quartz veins occur sporadically within the study area.

The drainage pattern surrounding the landfill is controlled by the generally northeast-trending strike of the biotite gneiss foliation and cleavage which is also parallel to thrust faulting that has been mapped in the region. The N45°W-oriented structural features are likely vertical based on topographic lineaments in the area.

The saprolite aquifer is largely absent in the study area. However, the presence of perched groundwater along the transition zone at the bedrock-saprolite interface is evident based on groundwater levels in shallow monitoring wells (i.e. W-2 & W-3) and surface water quality data collected from locations northwest and east of the landfill. The bedrock aquifer is both quasi-confined and unconfined. Groundwater flow within the bedrock aquifer appears to be controlled by low angle geologic structures or stratigraphically controlled transmissive and/or confining zones. In the upper bedrock aquifer zone, secondary fracture sets may provide lateral groundwater flow paths and interconnection between low angle geologic structures.

The key features of the site hydrogeological conceptual model include the following:

- The orientation of the creeks and streams in the study area are primarily controlled by the orientation of the stratigraphy (northeast). Bedrock is present along almost the entirety of these streams.
- The depth to groundwater ranges from 0 feet bgs at the creeks to more than 110 feet along topographic ridges. The saprolite aquifer is largely absent within the study area due to the shallow level of bedrock across the site (0 – 30 feet bgs). However, some of the water that infiltrated the ash landfill prior to the 2012 landfill cover modifications appears to be migrating laterally along the top of bedrock surface. Surficial expressions of this "perched water" migration are discharges on the side slope between Leak Creek and the access road near the base of the landfill.
- The regional groundwater flow regime within the lower portion of the bedrock aquifer flows to the northeast toward the nearest regional drainage feature, Town Fork Creek.

- Groundwater in the bedrock aquifer locally flows from areas of higher elevation to areas of low elevation. Groundwater in the uppermost portion of the bedrock aquifer discharges into the creeks adjacent to the landfill.
- Rainfall infiltration through the landfill was significantly reduced or eliminated following the landfill cover modifications in 2012. Prior to the 2012 landfill cover modifications, rainfall infiltration migrated through the previous soil landfill cover vertically downward through the ash under the influence of gravity. Constituents within the ash were dissolved by the infiltration water and became mobile.
- Infiltration water enters into the bedrock along stratigraphically or structurally controlled permeable zones, particularly the foliation or cleavage planes. The predominant strike and dip of these zones beneath the landfill is northeast and approximately 35° southeast respectively. Vertically oriented northwest striking structures may also act as conduits to the bedrock aquifer.
- Once the infiltration water enters the bedrock aquifer, it migrates laterally and vertically along the stratigraphically and structurally controlled permeable zones and secondary fracture sets. With increasing depth, there is a general decrease in the frequency and interconnectivity of the fractures resulting in reduced permeability and an upward vertical hydraulic gradient in the lower bedrock aquifer, as indicated by artesian flow in bedrock monitor well W-3B at the site.
- The creeks surrounding the landfill act as a "perimeter drain" and much of the groundwater derived from infiltration through the landfill migrates along the permeable zones in the bedrock and discharges into these creeks.
- The contaminant levels within the creeks adjacent to the landfill decrease with distance from the landfill due to dilution with unaffected water entering the creeks from the drainage basins.
- Some of the groundwater derived from infiltration of the landfill migrates vertically within the bedrock aquifer and does not discharge into the creeks unless a conduit through a confining unit, such as monitor well W-3B, or a naturally occurring permeable feature, allows upward migration of the affected groundwater. Groundwater within the deeper portion of the bedrock aquifer would be expected to eventually enter the deep regional flow regime and flow northeastward toward the Town Creek drainage.
- The lateral extent of the sulfate-affected groundwater has been identified sidegradient to the northwest and southeast and downgradient to the northeast of the landfill.
- Based on the absence of elevated levels of sulfates and manganese in the groundwater samples collected from the side-gradient monitoring wells and off-site water supply wells in the area, affected groundwater is not present in the vicinity of the nearest off-site water wells located approximately 1,100 feet east of the landfill.
- The simulated groundwater capture zones of the private water wells located east of Leak Branch do not extend to the Edwards Road landfill.

4.0 CORRECTIVE ACTION PLAN

4.1 IMPLEMENTATION OF SELECTED REMEDIES

The objective of the proposed remedial activities is to restore groundwater quality beyond the compliance boundary, to stop unacceptable impacts to the adjacent surface waters, and to reduce the overall groundwater contamination at the facility.

The selected remedy includes source area contaminant control via the previous installation of the synthetic liner (cap) over the limits of waste plus drainage improvements (completed in 2012) to minimize rainfall infiltration, leachate generation and discharge of constituents to groundwater, to allow intrinsic remediation of the existing affected-groundwater. These two remedial methods are appropriate to meet the remedial objectives within a reasonable timeframe. The following selected remedies were approved by the DWM in a letter dated October 10, 2013.

4.1.1 SOURCE AREA CONTROL

Construction of the cap modification including a 40-mil Linear Low Density Polyethylene (LLDPE) synthetic liner and drainage improvement began in March 2012 and was completed September 2012. The synthetic liner and drainage improvements provide source control measures that will significantly reduce or eliminate rainfall infiltration and leachate generation from the landfill. This decrease in leachate generation will mitigate the migration of landfill constituents to groundwater and surface water at the site and will allow the gradual reduction of constituent concentrations in groundwater and surface water to levels protective of human health. Improvements to water quality as a result of the synthetic liner installation and drainage modifications will be observed via the existing network of groundwater monitoring wells and surface water sampling locations.

The synthetic lined landfill cap modification design was submitted to the Division of Waste Management (DWM) on June 14, 2011 and approved by the DWM on August 12, 2011. The DWM granted approval of the Construction Quality Assurance (CQA) Certification for Closure Modification on October 11, 2013.

4.1.2 INTRINSIC REMEDIATION

Reduction of rainfall infiltration and leachate generation from the landfill via the liner installation and drainage improvements will mitigate the migration of contaminants from the landfill and allow natural processes to gradually remediate water quality beyond the compliance boundary. Routine groundwater and surface water monitoring will be conducted at the Site to monitor contaminant concentrations and concentration trends over time. The performance monitoring results will be used to evaluate the effectiveness of the source area control remedy for the remediation of the affected groundwater and surface water.

Semi-annual water quality sampling has been conducted three times since installation of the liner and drainage improvements were completed in in September 2012. Sampling occurred in September 2012, April 2013, and September 2013. As noted by

NCDENR in its July 2, 2013 correspondence to RJRT, the April 2013 results "were consistent with historical results, but the water quality results did show a slight decrease in concentrations of specific constituents." Sulfate concentrations in surface water have generally declined since 2010 and there were only two exceedances of the applicable North Carolina Surface Water Standard in the September 2012 sample results and one exceedance in the September 2013 sample results. No surface water standard exceedances for sulfates were observed in the April 2013 results.

As determined by historical monitoring data and the fate-and-transport modeling results, the streams and tributaries near the perimeter of the landfill serve as hydraulic boundaries for groundwater flow and effectively limit the extent of migration of site-related contaminants in groundwater. Surface water quality impacts to the tributary streams have been relatively limited. Groundwater sampling of private water wells in the surrounding areas confirm that there are no impacts to the water wells due to the Edwards Road Landfill site.

4.2 CONTINGENCY PLANS

As required in the *Groundwater Corrective Action Application*, two contingency plans are provided in the event that source area control and intrinsic remediation are determined to be ineffective at adequately reducing contaminant concentrations beyond the compliance boundary. The effectiveness of the primary corrective actions will be evaluated and reported every five years in the *Corrective Action Effectiveness Report* (CAER). Additional discussion of the effectiveness evaluation is provided in Section 6.2.

The approaches described for both Contingency Plans would be subject to successful bench scale and *in situ* pilot testing prior to full-scale implementation of either of these remedial options. Both contingencies will also be subject to permitting by NCDENR's Underground Injection Control (UIC) Program.

4.2.1 CONTINGENCY PLAN A

Contingency Plan A consists of groundwater treatment by *in situ* enhancement of biological sulfate reduction through the addition of supplemental electron donor (lactate) and additional sulfate reducing bacteria (SRB), if required. The sulfate would be chemically reduced to sulfides via anaerobic processes. The lactate and SRB would be injected into the zone of contaminated groundwater via a network of injection wells that would be installed along the perimeter of the landfill.

Prior to a full scale implementation, bench scale and pilot testing will be conducted. Bench scale testing will include submittal of contaminated soil and groundwater samples to a treatment laboratory for testing of various concentrations of lactate and SRB, determining the general viability of the treatment method and developing appropriate concentrations of treatment injectants for the *in situ* pilot test.

The location of the pilot test will be determined based on site conditions and will be situated in the area with the highest concentration of sulfate. The pilot test will likely

consist of the installation of up to two injection points and up to four observation wells. The formulation of the injectant will be determined at the time of pilot test implementation based on the most current site specific data, but will likely include injection of between 500 and 1,000 gallons of a 20% by weight carbon substrate (e.g. Anaerobic Biochem produced by Redox Tech). The pilot test area will be monitored for approximately two years to allow adequate time for biological activity to be stimulated. Based on the results of an analysis of the pilot test data, either a full scale injection will be conducted, or Contingency Plan B will be considered.

4.2.2 CONTINGENCY PLAN B

Contingency Plan B consists of amending the previously injected carbon substrate and SRB with zero valent iron (ZVI) to allow for hydrogen production from iron oxidation which is subsequently used to reduce sulfate by microbially mediated (biotic) reactions, and, to a lesser extent, allow for direct (abiotic) sulfate reduction by ZVI. Bench scale and pilot testing of Contingency Plan B will be conducted similarly to Plan A. Using the bench scale testing results as a design basis, a second pilot test will be conducted to determine the effectiveness of Contingency Plan B using the Contingency Plan A pilot test area injection and observation points. The Contingency Plan B pilot test would continue for up to two years to allow time for microbial stimulation prior to full scale implementation.

4.2.3 CONTINGENCY TRIGGER

The alternate remedial options will be considered in the event that source area control and intrinsic remediation are ineffective and the performance monitoring results indicate a significant and sustained migration of contaminants beyond the current plume limits or a sustained increase in contaminant concentrations beyond the compliance boundary. Valid indications of concentration trends will be determined after accounting for sampling variability and seasonal fluctuations. In the event that implementation of a Contingency Plan is triggered, the CAER report will include a detailed work plan for the bench scale and pilot test.

5.0 WATER QUALITY MONITORING PLAN

A semi-annual monitoring plan and quarterly landfill cap inspections will be implemented following approval of this CAP.

5.1 GROUNDWATER AND SURFACE WATER MONITORING

Groundwater and surface water monitoring will continue to be conducted on a semi-annual basis in accordance with the following sampling and analysis plan. Prior to sample collection, depth-to-groundwater measurements will be collected from available monitor wells.

SAMPLING LOCATIONS

MONITOR WELLS	PIEZOMETERS	SURFACE WATER
W-1	PZ-1	SS-01
W-2	PZ-2	SS-02
W-3	PZ-3	SS-20
W-3B	PZ-4	SS-25
W-6	PZ-5	SS-30
W-7		SS-40
W-8		SS-50
W-9		SS-60
PW-1		SS-70
		SS-80
		SS-90
Subtotal: 9	***Subtotal: 5***	***Subtotal: 11***

Groundwater samples collected from the piezometers and surface water samples will be collected as grab samples. All samples will be collected in general accordance with EPA Region 4's *Field Branches Quality System and Technical Procedures* and the *NCDENR Solid Waste Section Guidelines for Groundwater, Soil, and Surface Water Sampling* (April 2008).

Groundwater samples collected from the monitor wells will be collected using a low flow, low volume sample collection technique. The low-flow sampling technique involves pumping the groundwater from the monitor well at a low flow rate (<250 ml/min) through a flow-through cell where water quality parameters (pH, oxidation reduction potential (ORP), dissolved oxygen (DO), specific conductivity, and temperature) are monitored until they stabilize, after which a groundwater sample is collected for laboratory analysis. The water level in the well is monitored during purging every 3 to 5 minutes, and ideally, the purge rate should equal the well recharge rate so that there is little or no drawdown in the well. The water level should stabilize for the specific purge rate.

Groundwater samples will be transported under chain-of-custody procedures to a North Carolina-certified laboratory for analysis. All samples will be analyzed for sulfates, site-specific metals, total dissolved solids and field parameters. The proposed analytes and laboratory methods are presented in the following table.

LABORATORY ANALYSES AND ANALYTICAL METHODS

INORGANICS		FIELD PARAMETERS
EPA Method 6010	EPA 300.0	Depth to Water
Aluminum	Sulfates	pH
Barium		Specific Conductivity
Cadmium	SM 2540C	Temperature
Chromium (Total)	Total Dissolved Solids	Oxidation-Reduction Potential
Iron		Dissolved Oxygen
Lead		
Manganese		
Selenium		

No significant or consistent concentrations of arsenic, copper, mercury, silver, zinc, nitrates and total organic carbon have been reported in previous sample results and they will no longer be analyzed for.

5.2 LANDFILL CAP INSPECTIONS

In accordance with the most recently approved Post Closure Cover Maintenance Plan (December 23, 2003, prepared by Shield Engineering, Inc.), inspections of the Edwards Road Landfill cap will be conducted on a quarterly basis or within one week of a 2-inch, 24-hour rainfall event. Documentation of the inspections will be maintained by ERM and/or R. J. Reynolds and will be available to NCDENR upon request. Maintenance of the landfill cap will include mowing of vegetation at least twice per year; typically spring and fall. The inspections will include, at a minimum, the following items:

GATES
- Check for damage to the gates
- Ensure that gates are properly locked
- Inspect condition of the locks

ACCESS ROAD & DITCHES
- Check for Erosion
- Check for Debris

EROSION CONTROL
- Check for structural integrity of embankments
- Check for excessive accumulation of sediment in traps (ST-1 through ST-3)
- Check for sediment leaving the site

LEAK BRANCH
- Check for sediments from site
- Check clarity of surface water

ANCHOR TRENCH DRAIN PIPES
- Check for Obstructions
- Check Rip Rap Outlet Conditions

PERIMETER DRAINAGE DITCHES
- Check for erosion
- Check for any obstructions to water flow

BENCHES
- Check for erosion
- Verify that berms are draining properly
- Check the condition of the vegetative cover

LANDFILL CAP

Check for any signs of erosion
Check for any ponding of water
Check for any shifting or sinking of cap
Check the condition of the vegetative cover
Verify that no trees are growing on cap
Verify date of last mowing (site to be mowed twice per year)

Any action items identified during an inspection will be addressed and repaired. The formal inspection program will continue for five (5) years following landfill closure. Based on results of proven stability and landfill cap performance, the formal inspection program may cease following the initial five (5) year post closure period.

6.0 REPORTING SCHEDULE

6.1 ANNUAL WATER QUALITY MONITORING REPORTS

Groundwater and surface water quality monitoring reports will be submitted on an annual basis to NCDENR. Each Water Quality Monitoring Report will include a summary of the work completed, a description of the current groundwater and surface water quality during each of the semi-annual events, tabulated data, and groundwater potentiometric and isoconcentration maps. Data will also be submitted in the electronic data deliverable (EDD) format required by the solid waste section.

6.2 CORRECTIVE ACTION EFFECTIVENESS REPORTS

The effectiveness of the corrective action will be evaluated and documented every five years following CAP approval. Corrective Action Effectiveness Reports (CAERs) will be prepared in accordance with the published SWS guidance and will include:

- Proof that a reduction in contaminant concentrations is occurring along specific transects;
- A demonstration that contaminant reduction is caused by chemical or biologic attenuation of the contaminant(s) of concern. Include historical data for reference; and
- Proof that the plume has stabilized or is decreasing within the horizontal and vertical extent based upon the data.

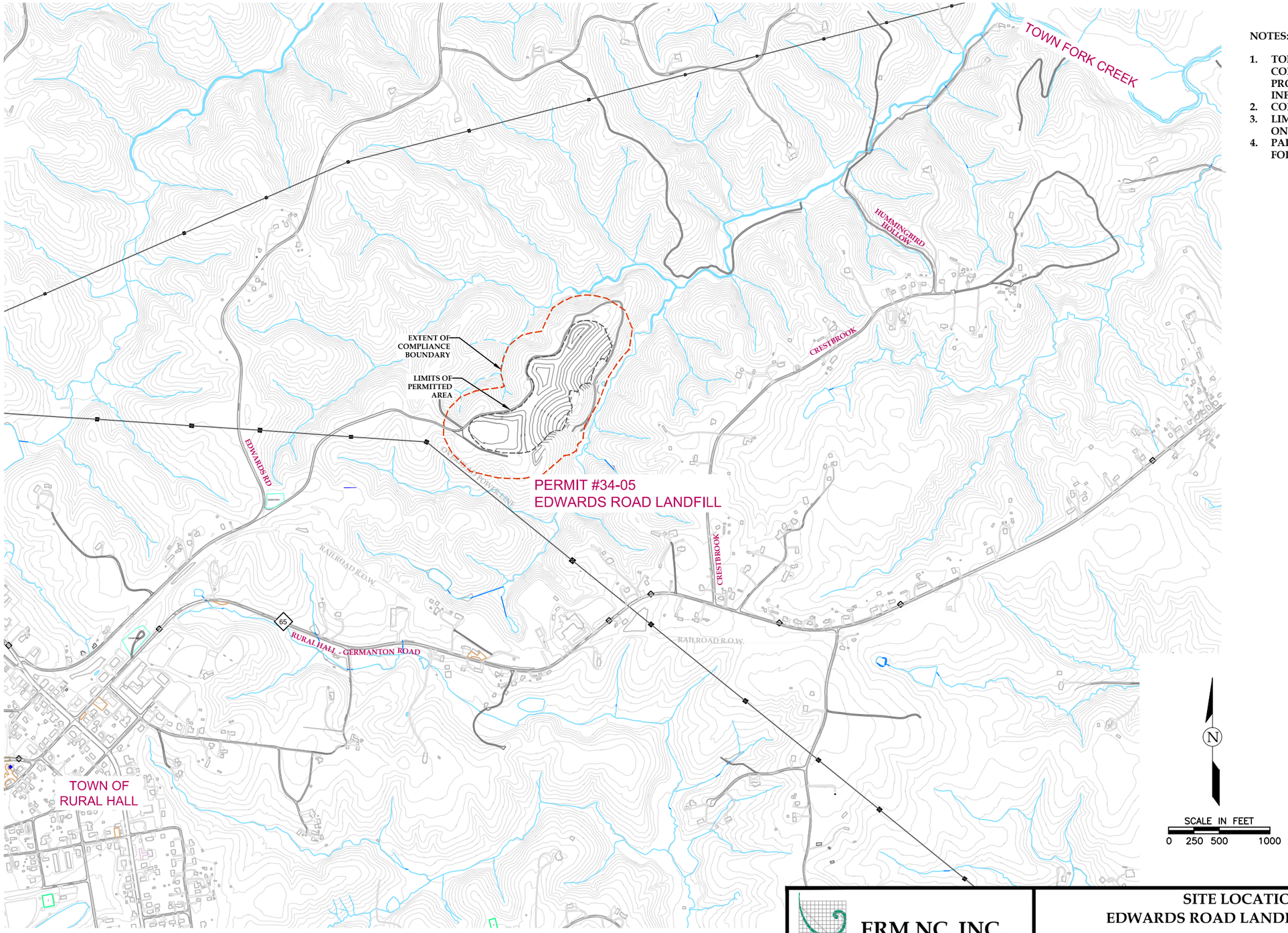
7.0 SUMMARY AND CONCLUSIONS

Source area contaminant control and intrinsic remediation with performance monitoring are proposed as remedial technologies for restoration of water quality at and beyond the compliance boundary at the site. These two technologies are appropriate to meet the remedial objectives within a reasonable timeframe given the limited risk to nearby receptors including surface water bodies and private water supply wells. Surface water quality conditions appear to have improved since completion of the source area control measures and fate-and-transport modeling results indicate that sulfate concentrations in groundwater will continue to decrease until acceptable levels are reached within approximately 55 years beyond the compliance boundary. Likewise, iron and manganese concentrations in groundwater and surface water will be remediated to naturally-occurring background levels. Enhanced bioremediation alternatives will be evaluated as contingencies in the event that the source control and intrinsic remediation are ineffective.

8.0 REFERENCES

Date	Title	Source
1986-05-29	*Solid Waste Permit No. 34-05* issued to R.J. Reynolds Tobacco Company	NCDENR
1999-10-19	*R. J. Reynolds Tobacco Company Ash Landfill Transition Plan*	Geo-Environmental Consultants, Inc.;
2000-01-25	*Work Plan for Upgrading Groundwater Monitoring, Phase II Ash Fill Area*	Geo-Environmental Consultants, Inc.;
2000-03-13	*Upgrade of Groundwater Monitoring Program, Phase II Ash Fill Area*	Shield Environmental Associates, Inc.
2001-01-02	*Modifications to Transition Plan, Permit #34-05*	Shield Environmental Associates, Inc.
2003-12-23	*Post Closure Cover Maintenance Plan, Permit #34-05*	Shield Environmental Associates, Inc.
2009-04-17	*Compliance Order with Administrative Penalty, Facility #34-05*	NCDENR
2009-07-17	*Preliminary Site Assessment Work Plan, Facility #34-05*	ERM
2009-10-29	*Summary Report – Preliminary Site Assessment, Facility #34-05*	ERM
2010-01-29	*Groundwater and Surface Water Monitoring Summary Report - October 2009*	ERM
2010-07-28	*Groundwater and Surface Water Monitoring Summary Report - April 2010*	ERM
2010-12-17	*Groundwater and Surface Water Monitoring Summary Report - October 2010*	ERM
2010-11-15	Letter correspondence to NCDENR DWM regarding Off-Site Well Locations, Facility #34-05	ERM
2011-03-10	*Summary Report – Phase II Site Assessment*	ERM
2011-06-14	*Proposed Closure Modification - Edwards Road Landfill, Permit No. 34-05*	ERM
2011-06-28	*Groundwater and Surface Water Monitoring Summary Report - April 2011*	ERM
2011-08-12	Regulatory approval *Letter Of Closure Modification, Permit No. 34-05*	NCDENR
2011-12-21	*Groundwater and Surface Water Monitoring Summary Report - October 2011*	ERM
2012-04-30	*Summary Report – Ground Water Modeling for Site Assessment*	ERM
2012-05-08	*Groundwater and Surface Water Monitoring Summary Report – March 2012*	ERM
2012-09-21	*Construction Quality Assurance for Closure Modification, Permit No. 34-05*	ERM
2012-10-09	Letter correspondence to NCDENR regarding Groundwater Modeling & Water Quality Monitoring, Facility #34-05	ERM
2012-10-30	*Groundwater and Surface Water Monitoring Summary Report – Sept. 2012*	ERM
2012-11-07	*Groundwater Corrective Action Permit Modification Application*	ERM
2013-06-07	*Groundwater and Surface Water Monitoring Summary Report – April 2013*	ERM
2013-10-01	*Groundwater Corrective Action Application and Revised Groundwater Modeling Scenarios*	ERM
2013-10-10	Regulatory approval of *Groundwater Corrective Action Application*	NCDENR
2013-10-11	Regulatory approval of *Construction Quality Assurance for Closure Modification, Permit No. 34-05*	NCDENR
2013-11-27	*Groundwater and Surface Water Monitoring Summary Report – Sept. 2013*	ERM

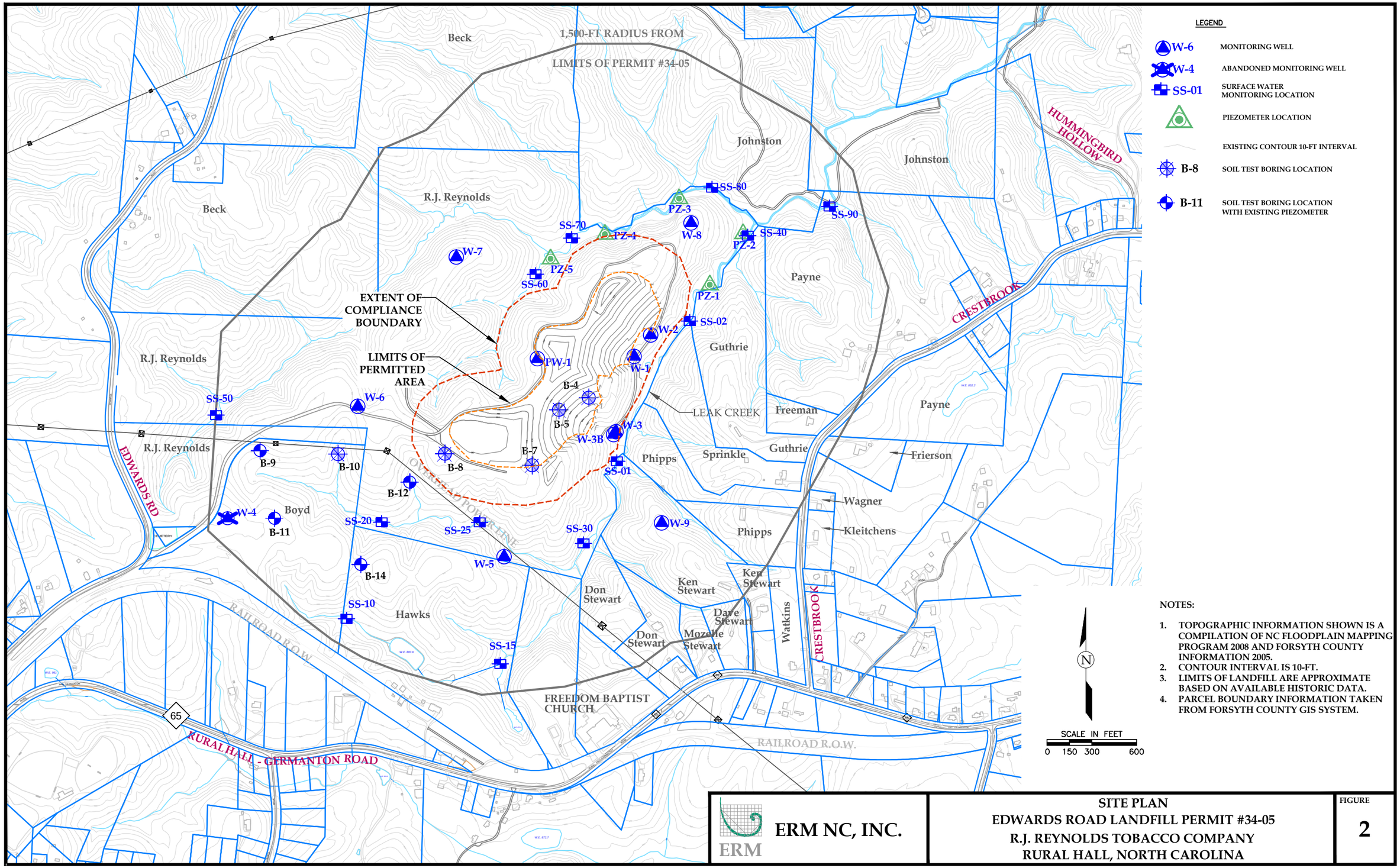
Figures



NOTES:

1. TOPOGRAPHIC INFORMATION SHOWN IS A COMPILATION OF NC FLOODPLAIN MAPPING PROGRAM 2008 AND FORSYTH COUNTY INFORMATION 2005.
2. CONTOUR INTERVAL IS 10-FT.
3. LIMITS OF LANDFILL ARE APPROXIMATE BASED ON AVAILABLE HISTORIC DATA.
4. PARCEL BOUNDARY INFORMATION TAKEN FROM FORSYTH COUNTY GIS SYSTEM.

ERM NC, INC.	SITE LOCATION PLAN EDWARDS ROAD LANDFILL PERMIT #34-05 R.J. REYNOLDS TOBACCO COMPANY RURAL HALL, NORTH CAROLINA	FIGURE 1



LEGEND

W-6	MONITORING WELL
W-4	ABANDONED MONITORING WELL
SS-01	SURFACE WATER MONITORING LOCATION
	PIEZOMETER LOCATION
	EXISTING CONTOUR 10-FT INTERVAL
B-8	SOIL TEST BORING LOCATION
B-11	SOIL TEST BORING LOCATION WITH EXISTING PIEZOMETER

NOTES:

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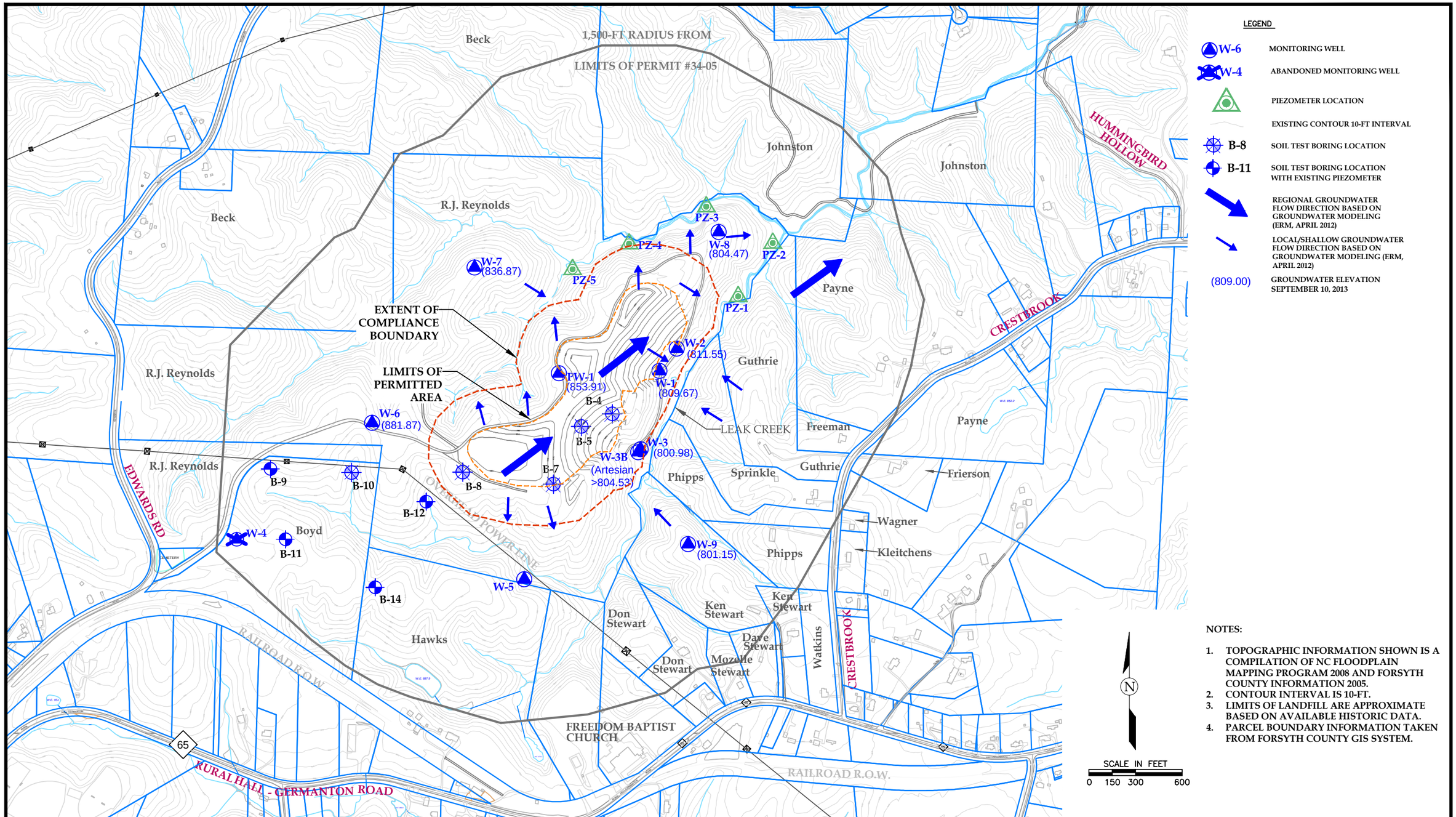
ERM NC, INC.

SITE PLAN
EDWARDS ROAD LANDFILL PERMIT #34-05
R.J. REYNOLDS TOBACCO COMPANY
RURAL HALL, NORTH CAROLINA

FIGURE
2



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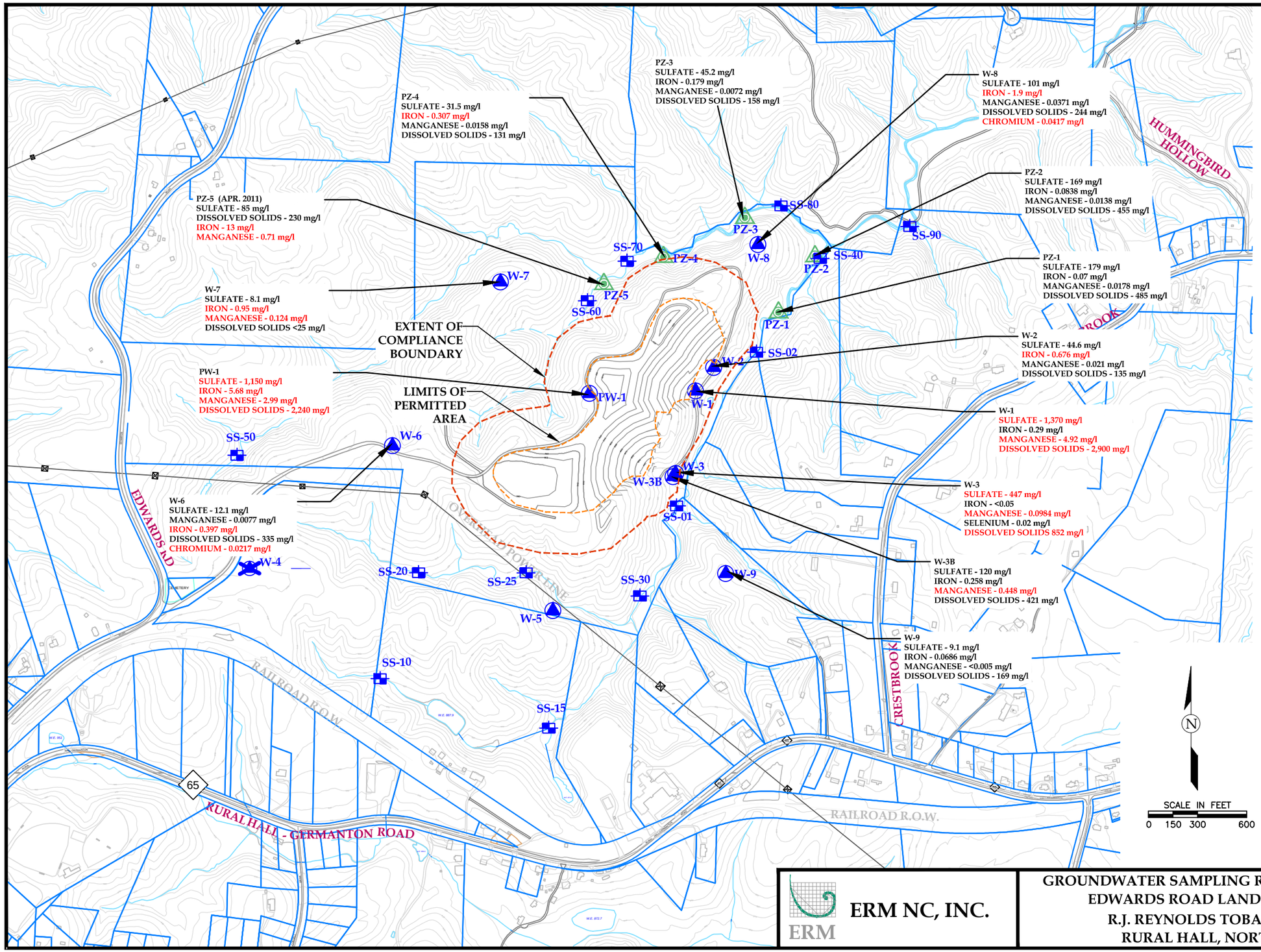
ERM NC, INC.

GROUNDWATER FLOW DIRECTIONS
EDWARDS ROAD LANDFILL PERMIT #34-05
R.J. REYNOLDS TOBACCO COMPANY
RURAL HALL, NORTH CAROLINA

FIGURE 3



LEGEND

W-6	MONITORING WELL
W-4	ABANDONED MONITORING WELL
SS-01	SURFACE WATER MONITORING LOCATION
	PIEZOMETER LOCATION
	EXISTING CONTOUR 10-FT INTERVAL

NC 2L GROUNDWATER STANDARDS

ARSENIC	0.010
BARIUM	0.700
CADMIUM	0.002
CHROMIUM (TOTAL)	0.010
IRON	0.300
LEAD	0.015
MANGANESE	0.050
SELENIUM	0.020
SULFATE	250
DISSOLVED SOLIDS	500
pH	6.5-8.5

NOTE: CONCENTRATIONS ARE IN MILLIGRAMS PER LITER (mg/L) UNLESS OTHERWISE INDICATED.

NOTES:

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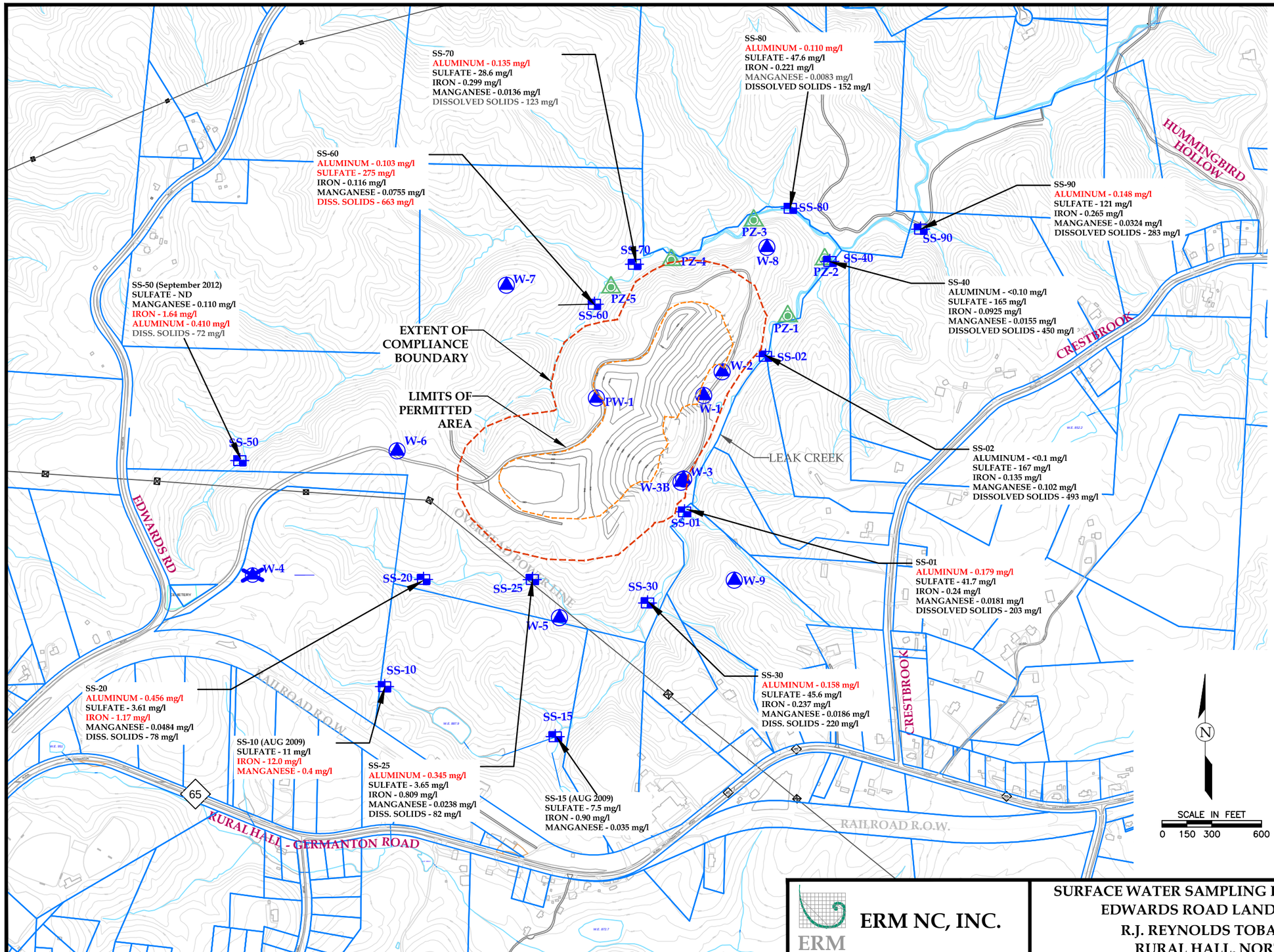
3. LIMITS OF LANDFILL ARE APPROXIMATE BASED ON AVAILABLE HISTORIC DATA.
4. PARCEL BOUNDARY INFORMATION TAKEN FROM FORSYTH COUNTY GIS SYSTEM.
5. MONITOR WELLS SAMPLES IN APRIL 2013 UNLESS OTHERWISE INDICATED.

ERM NC, INC.

GROUNDWATER SAMPLING RESULTS SEPTEMBER 2013
EDWARDS ROAD LANDFILL PERMIT #34-05
R.J. REYNOLDS TOBACCO COMPANY
RURAL HALL, NORTH CAROLINA

FIGURE
4



LEGEND

W-6	MONITORING WELL
W-4	ABANDONED MONITORING WELL
SS-01	SURFACE WATER MONITORING LOCATION
	PIEZOMETER LOCATION
	EXISTING CONTOUR 10-FT INTERVAL

NC 2B SURFACE WATER STANDARDS

ALUMINUM	0.087
BARIUM	1
CADMIUM	0.002
CHROMIUM (TOTAL)	0.05
IRON	1
LEAD	0.025
MANGANESE	0.2
MERCURY	0.000012
SELENIUM	0.005
SULFATE	250
pH	6.0-9.0
DISSOLVED SOLIDS	500
TEMPERATURE	NE
CONDUCTIVITY	NE
TURBIDITY	NE
ORP	NE
DISSOLVED OXYGEN	NE

NOTE: CONCENTRATIONS ARE IN MILLIGRAMS PER LITER (mg/L) UNLESS OTHERWISE INDICATED.

NOTES:

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3. LIMITS OF LANDFILL ARE APPROXIMATE BASED ON AVAILABLE HISTORIC DATA.
4. PARCEL BOUNDARY INFORMATION TAKEN FROM FORSYTH COUNTY GIS SYSTEM.
5. SURFACE WATER SAMPLES FROM APRIL 2013, UNLESS OTHERWISE NOTED.

ERM NC, INC.

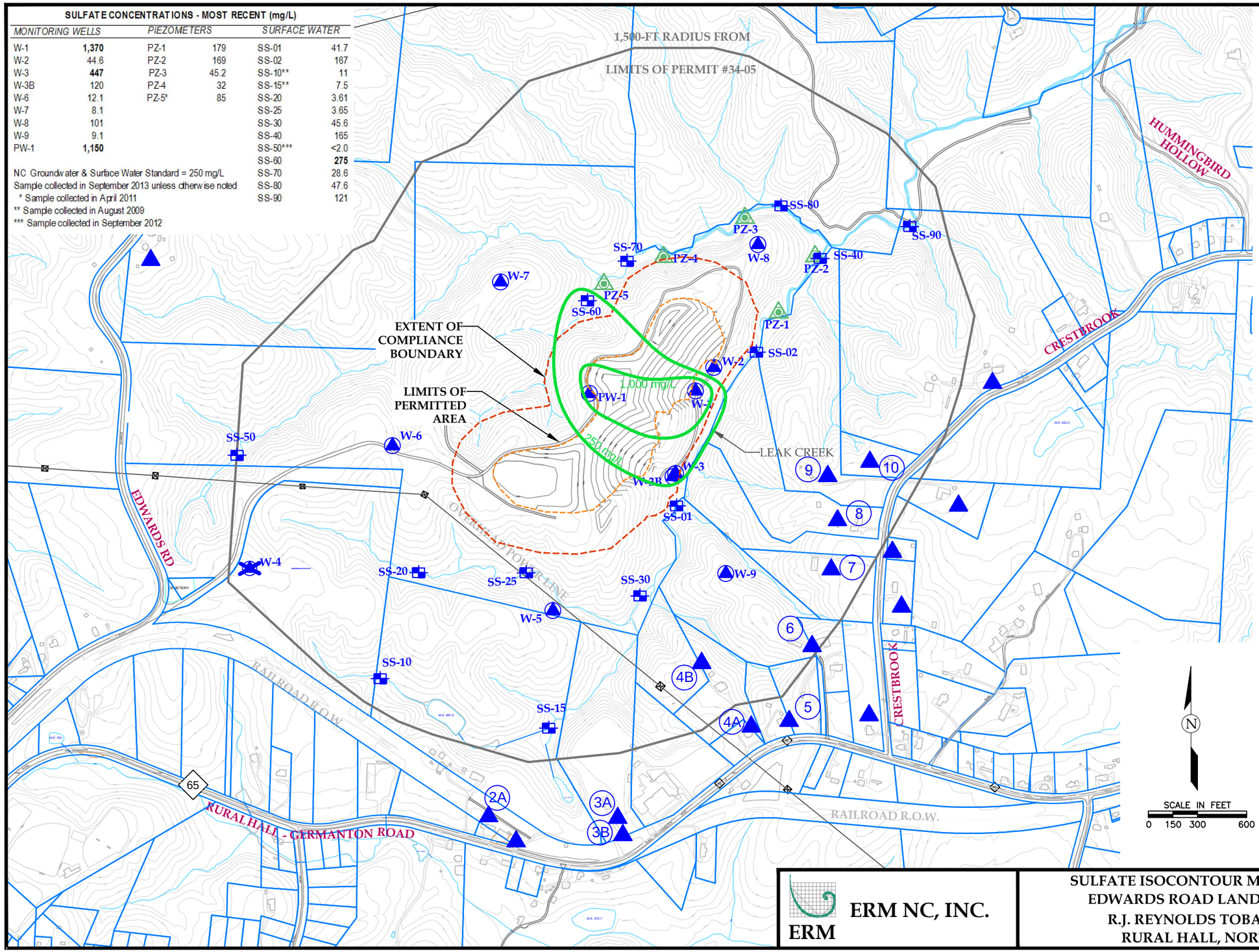
SURFACE WATER SAMPLING RESULTS SEPTEMBER 2013
EDWARDS ROAD LANDFILL PERMIT #34-05
R.J. REYNOLDS TOBACCO COMPANY
RURAL HALL, NORTH CAROLINA

FIGURE 5

SULFATE CONCENTRATIONS - MOST RECENT (mg/L)

MONITORING WELLS		PIEZOMETERS		SURFACE WATER	
W-1	**1,370**	PZ-1	179	SS-01	41.7
W-2	44.6	PZ-2	169	SS-02	167
W-3	**447**	PZ-3	45.2	SS-10**	11
W-3B	120	PZ-4	32	SS-15**	7.5
W-6	12.1	PZ-5*	85	SS-20	3.61
W-7	8.1			SS-25	3.65
W-8	101			SS-30	45.6
W-9	9.1			SS-40	165
PW-1	**1,150**			SS-50***	<2.0
				SS-60	**275**
				SS-70	28.6
				SS-80	47.6
				SS-90	121

NC Groundwater & Surface Water Standard = 250 mg/L
Sample collected in September 2013 unless otherwise noted
* Sample collected in April 2011
** Sample collected in August 2009
*** Sample collected in September 2012



LEGEND

- W-6 — MONITORING WELL
- W-4 — ABANDONED MONITORING WELL
- SS-01 — SURFACE WATER MONITORING LOCATION
- PIEZOMETER LOCATION
- EXISTING CONTOUR 10-FT INTERVAL
- GROUNDWATER SULFATE ISOCONTOUR
- 5 — WELL ID ASSIGNED DURING SAMPLING (SOME WELLS UNIDENTIFIED); WELL ID CORRESPONDS TO TABLE 1; WATER SUPPLY WELL IDENTIFIED

NC WATER STANDARDS

	2L	2B
ALUMINUM	-	0.087
ARSENIC	0.010	-
BARIUM	0.700	1.000
CADMIUM	0.002	0.002
CHROMIUM (TOTAL)	0.010	0.050
IRON	0.300	1.000
LEAD	0.015	0.025
MANGANESE	0.050	0.200
MERCURY	0.001	0.000012
SELENIUM	0.020	0.005
SULFATE	250	250
DISSOLVED SOLIDS	500	-
pH	6.5-8.5	6.0-9.0

NOTE: CONCENTRATIONS ARE IN MILLIGRAMS PER LITER (mg/L) UNLESS OTHERWISE INDICATED.

N

SCALE IN FEET
0 150 300 600

NOTES:

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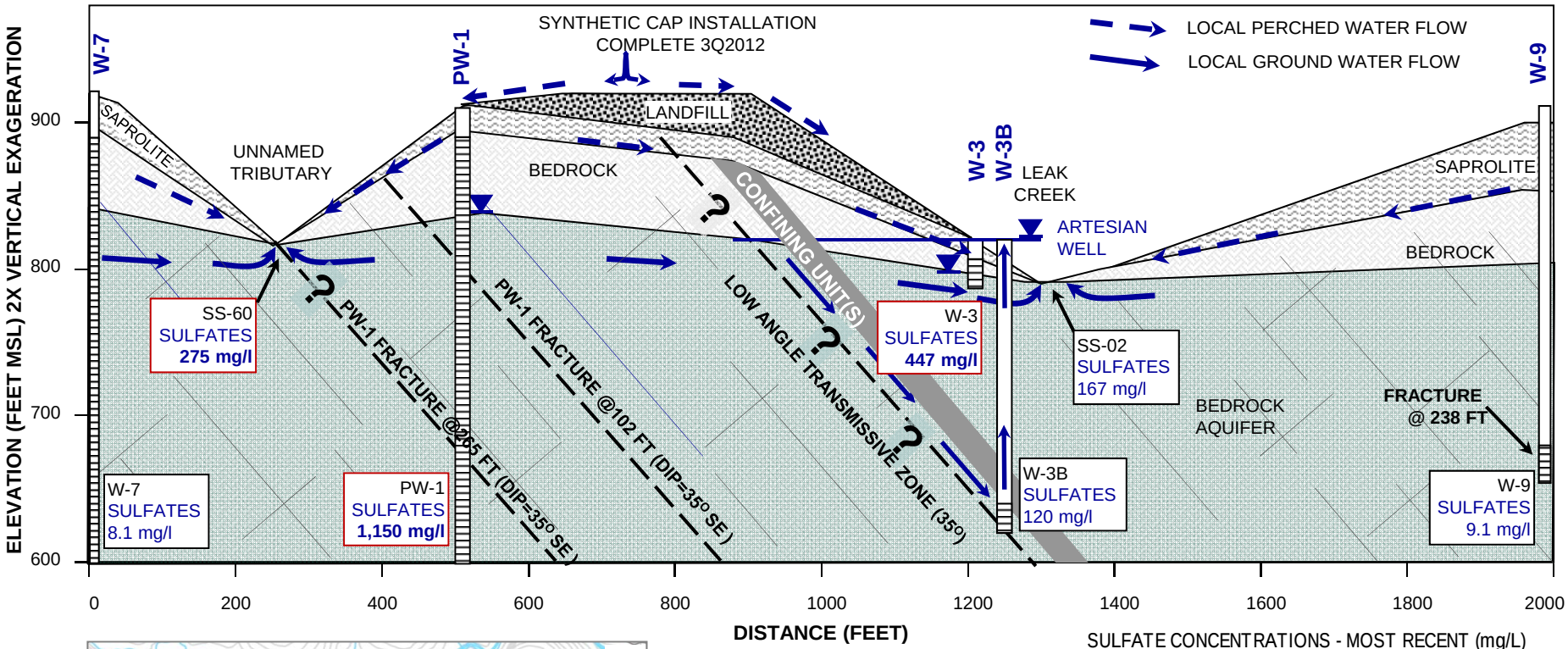
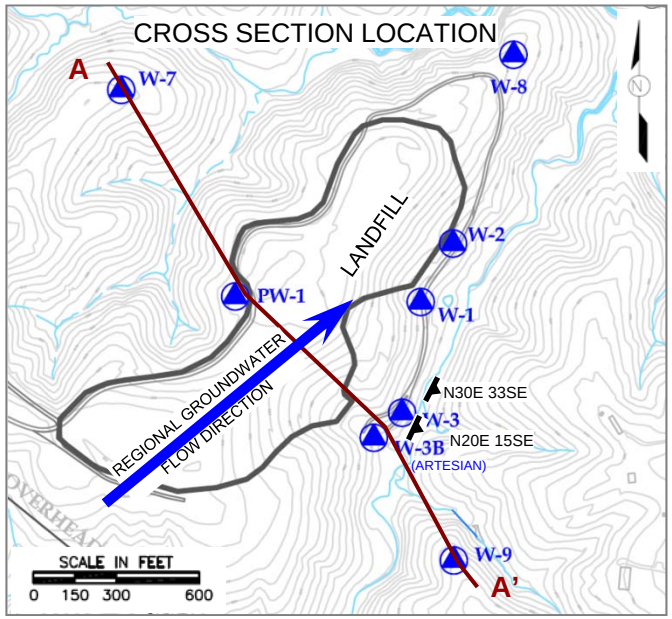
4. PARCEL BOUNDARY INFORMATION TAKEN FROM FORSYTH COUNTY GIS SYSTEM.

ERM NC, INC.

SULFATE ISOCONTOUR MAP - GROUNDWATER
EDWARDS ROAD LANDFILL PERMIT #34-05
R.J. REYNOLDS TOBACCO COMPANY
RURAL HALL, NORTH CAROLINA

FIGURE 6





SULFATE CONCENTRATIONS - MOST RECENT (mg/L)

MONITORING WELLS		*PIEZOMETERS*		*SURFACE WATER*	
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W-2	44.6	PZ-2	169	SS-02	167
W-3	447	PZ-3	45.2	SS-10**	11
W-3B	120	PZ-4	32	SS-15**	7.5
W-6	12.1	PZ-5*	85	SS-20	3.61
W-7	8.1			SS-25	3.65
W-8	101			SS-30	45.6
W-9	9.1			SS-40	165
PW-1	1,150			SS-50***	<2.0
				SS-60	275
				SS-70	28.6
				SS-80	47.6
				SS-90	121

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Sample collected in September 2013 unless otherwise noted
* Sample collected in April 2011
** Sample collected in August 2009
*** Sample collected in September 2012

ERM NC, INC.

HYDROGEOLOGIC CONCEPTUAL MODEL
EDWARDS ROAD LANDFILL PERMIT # 34-05
R.J. REYNOLDS TOBACCO COMPANY
RURAL HALL, NORTH CAROLINA

FIGURE
7

Table

TABLE 1
MONITOR WELL CONSTRUCTION DETAILS
EDWARDS ROAD LANDFILL - PERMIT 34-05
RURAL HALL, NORTH CAROLINA

Well ID	Install Date	Northing	Easting	Ground Elevation (ft MSL)	TOC Elevation (ft MSL)	Boring Depth (ft BGL)	Outer Casing Depth (ft BGL)	Screened Interval (ft BGL)	Geologic Zone Screened	Comments
PW-1	5/26/87	912314.4964	1623168.8166	920.51	920.66	405 (soft bottom at 326)	21.5	21.5-405	Bedrock	Former supply well, pump removed (8/09): 6 inch dia. galv. casing; Construction details per Clayton Well Drilling log and video inspection by ERM (8/09 & 4/10); Open rock to 405 ft, Total well yield 25 gpm with no other obvious water-bearing zones below 103 ft (Clayton). Silted in to 326 ft (video).
W-1	10/13/87	912330.4235	1623815.4903	819.69	822.68	20.5	NA	10-20	Saprolite	2 inch dia. PVC, Well replaced 11/93, DWM permit-required sample location
W-2	12/6/89	912472.7625	1623927.6441	824.21	827.30	17	NA	7-17	Sap/PWR	2 inch dia. PVC, DWM permit-required sample location, (alternate IDs MW-1A, RH-MW-002)
W-3	12/7/89	911826.4895	1623693.8609	802.00	804.43	17	NA	7-17	Sap/PWR	2 inch dia. PVC, DWM permit-required sample location, (alternate IDs W-3A, W-2A, RH-MW-003)
W-3B	5/14/04	911806.8916	1623678.0188	801.23	804.32	210	Unknown	190-210	Bedrock	2 inch dia. PVC, DWM permit-required sample location, Artesian well
W-4	6/8/93	NE	NE	NE	NE	188	NA	138-188	Bedrock	2 inch dia. PVC, damaged, *abandoned 8/27/03, former background well, replaced with W-6 in 2003.*
W-5	5/17/93	NE	NE	NE	NE	24	NA	13-23.5	Bedrock	2 inch dia PVC, Phase 3 permanent MW
W-6	8/22/03	911995.8163	1621967.2266	977.93	980.71	200	NA	170-200	Bedrock	2 inch dia. PVC, DWM permit-required sample location, (alternate IDs MW-6), current background well, replaced W-4 as background well in 2003
W-7	12/15/10	912994.6847	1622626.2276	929.51	931.58	341	NA	42-341	Bedrock	6 inch dia. open-rock hole, 6" galavanized casing to 42 ft bgs, TOC value for 6" casing
W-8	12/14/10	913222.6284	1624196.9546	859.39	861.67	129	NA	45-65	PWR	2 inch dia. PVC
W-9	12/13/10	911216.1086	1624000.7073	909.35	911.38	259	NA	229-259	Bedrock	2 inch dia. PVC, Ken Stewart's pasture,
B-9	5/20/93	NE	NE	NE	NE	23	NA	18-22.5	Saprolite	2 inch dia PVC, Phase 3 temporary piezometer, no protective well box around well
B-10	5/19/93	NE	NE	NE	NE	14	NA	9-13.5	Saprolite	2 inch dia PVC, Phase 3 temporary piezometer, *not located October 2009*
B-11	5/20/93	NE	NE	NE	NE	54	NA	48-53	Saprolite	2 inch dia PVC, Phase 3 temporary piezometer, no protective well box around well
B-12	5/19/93	NE	NE	NE	NE	8.5	NA	3.5-8	Saprolite	2 inch dia PVC, Phase 3 temporary piezometer, no protective well box around well
B-14	5/20/93	NE	NE	NE	NE	54	NA	48-53	Saprolite	2 inch dia PVC, Phase 3 temporary piezometer, no protective well box around well
PZ-1	12/15/10	NE	NE	NE	NE	1.5	NA	1.0 - 1.5	Alluvium	1 inch dia PVC temporary piezometer
PZ-2	12/15/10	NE	NE	NE	NE	4.0	NA	3.0 - 4.0	Alluvium	1 inch dia PVC temporary piezometer
PZ-3	12/15/10	NE	NE	NE	NE	1.5	NA	0.5 - 1.5	Alluvium	1 inch dia PVC temporary piezometer
PZ-4	12/16/10	NE	NE	NE	NE	5.0	NA	4.2 - 5.0	Alluvium	1 inch dia PVC temporary piezometer
PZ-5	12/16/10	NE	NE	NE	NE	5.0	NA	3.0 - 5.0	Alluvium	1 inch dia PVC temporary piezometer

NE - Not Established
MSL - above mean sea level
BGL - Below ground level
TOC - Top of casing
PWR = Partially Weathered Rock
Survey data by Lawrence Associates, P.A., January 4, 2010, January 4, 2011 & February 28, 2011

Appendix A
Summary of Historical Analytical Results

APPENDIX A1
GROUND WATER ANALYTICAL RESULTS SUMMARY
EDWARDS ROAD LANDFILL - PERMIT 34-05
RURAL HALL, NORTH CAROLINA

Sample Location / ID	Date	Aluminum	Arsenic	Barium	Cadmium	Chromium (Total)	Copper	Iron	Lead	Manganese	Mercury	Selenium	Silver	Zinc	Nitrate-nitrogen	Sulfate	Dissolved Solids	Total Organic Carbon	pH	Temperature (degrees Celsius)	Conductivity (µmhos/cm)	Turbidity (NTUs)	Oxidation-Reduction Potential (mV)	Dissolved Oxygen
NC 2L Ground Water Standard		3.5 [1]	0.010	0.700	0.002	0.010	1.0	0.300	0.015	0.050	0.001	0.020	0.020	1.00	10.0	250	500	NE	6.5 - 8.5	NE	NE	NE	NE	NE
Solid Waste Section Limit		NE	0.010	0.100	0.001	0.010	0.010	0.300	0.010	0.050	0.0002	0.010	0.010	0.010	10.0	250	NE	NE	NE	NE	NE	NE	NE	NE
NC 2B Surface Water Standard		0.087	0.050	1.0 [2]	0.002	0.050	0.007	1.0	0.025	0.200 [2]	0.000012	0.005	0.00006	0.05	10.0 [2]	250 [2]	500 [2]	NE	6.0 - 9.0	NE	NE	50	NE	>5.0
	4/29/88	8.03	<0.010	0.235	0.008	0.016	<0.020	17.4	<0.005	1.10	<0.00020	<0.010	<0.010	0.031	2.20	130	156	2.24	5.9	--	--	--	--	--
W-1	7/13/89	--	<0.010	0.100	<0.002	<0.020	--	--	<0.005	--	<0.00020	0.005	<0.010	<0.020	--	--	--	--	--	--	--	--	--	--
	9/24/90	5.62	<0.010	0.189	<0.002	<0.020	<0.020	8.90	<0.005	0.150	<0.00020	0.059	<0.010	<0.020	0.71	13.5	185	13.0	6.3	19.3	195	--	--	--
	10/24/91	0.161	<0.010	0.346	<0.002	<0.020	<0.020	0.150	<0.005	0.097	<0.00020	0.0239	<0.010	<0.020	0.238	126	303	12.0	6.2	20.3	425	--	--	--
(RHMW-001)	3/26/92	2.85	<0.010	0.736	<0.002	<0.020	<0.020	0.833	<0.005	1.83	0.00032	0.0219	<0.010	0.038	1.25	123	482	14.0	6.6	9.3	682	--	--	--
	9/30/92	--	<0.010	0.120	<0.002	<0.020	<0.020	--	<0.005	0.310	<0.00020	0.032	<0.010	<0.020	0.382	292	798	5.0	5.9	17.8	1,153	--	--	--
	3/31/93	0.364	<0.010	0.137	<0.002	<0.020	<0.020	1.13	<0.005	2.23	<0.00020	0.0132	<0.010	0.033	0.550	486	1,169	33.0	5.5	16.1	1,587	--	--	--
	9/17/93	28.6	<0.010	0.697	0.004	<0.020	0.044	59.7	0.013	3.49	<0.00020	0.0051	<0.010	0.195	0.925	565	1,643	6.0	5.9	18.0	2,310	--	--	--
well replaced 11/93	3/30/94	5.32	<0.010	0.545	<0.002	<0.020	0.020	18.8	0.008	0.505	<0.00020	0.006	<0.010	0.107	0.39	633	1,680	--	5.6	15.2	1,250	--	--	--
	9/30/94	1.81	<0.010	<0.250	<0.002	<0.020	0.022	9.96	<0.005	4.47	<0.00020	0.013	<0.010	0.019	0.45	758	2,420	123	6.0	18.1	3,010	--	--	--
	3/31/95	24.0	<0.010	1.25	<0.002	<0.020	0.026	53.9	0.011	1.58	<0.00020	0.012	<0.010	0.115	0.85	797	2,140	--	5.9	15.8	2,820	--	--	--
	9/29/95	7.65	<0.010	0.367	0.004	<0.020	0.024	18.8	0.010	4.02	<0.00020	0.012	<0.010	--	1.00	464	2,780	4.04	4.5	16.2	3,720	--	--	--
	3/20/96	149	<0.010	0.960	0.050	0.200	0.220	--	0.063	11.4	<0.00020	<0.010	<0.010	0.695	--	2,320	2,670	8.75	6.5	15.0	3,060	--	--	--
	9/27/96	7.11	<0.010	<0.250	<0.002	<0.020	<0.020	22.6	0.007	2.30	<0.00020	<0.010	<0.010	0.051	1.52	1,320	2,970	3.81	6.1	19.0	3,350	--	--	--
	3/29/97	2.99	<0.010	<0.250	<0.002	<0.020	<0.020	--	0.016	2.34	<0.00020	<0.010	<0.010	0.072	1.20	1,360	2,860	6.87	6.0	14.0	1,890	--	--	--
	9/17/97	2.94	<0.010	<0.250	0.003	<0.020	<0.020	12.9	0.006	3.68	<0.00020	0.033	<0.010	0.136	1.70	1,300	3,110	5.29	6.3	17.0	3,540	--	--	--
	3/27/98	2.40	<0.010	<0.250	<0.002	<0.020	<0.020	7.83	<0.005	2.34	<0.00020	0.016	<0.010	<0.020	0.575	1,060	3,040	3.64	6.5	19.6	627	--	--	--
	9/30/98	2.35	<0.010	<0.250	<0.002	<0.020	<0.020	5.18	0.015	2.71	<0.00020	0.021	<0.010	<0.020	1.05	1,030	3,210	17.5	6.2	20.0	1,250	--	--	--
	9/30/98	1.25	<0.010	<0.250	<0.002	<0.020	<0.020	4.98	<0.005	2.72	<0.00020	0.030	<0.010	<0.020	1.10	1,040	3,320	9.25	--	--	--	--	--	--
	3/31/99	1.82	<0.010	<0.250	<0.002	<0.020	<0.020	4.69	0.010	2.45	<0.00020	0.015	<0.010	<0.020	0.75	1,830	3,230	8.82	5.6	17.0	1,610	--	--	--
duplicate	3/31/99	1.17	<0.010	<0.250	<0.002	<0.020	<0.020	4.20	<0.005	2.56	<0.00020	0.018	<0.010	<0.020	0.45	1,920	3,230	3.73	--	--	--	--	--	--
	9/29/99	1.65	<0.010	<0.250	<0.002	<0.020	<0.020	4.78	0.008	2.79	<0.00020	0.031	<0.010	<0.020	0.44	2.06	3,440	3.73	5.7	19.0	1,980	--	--	--
	9/15/00	0.979	<0.010	<0.250	<0.002	<0.020	<0.020	3.20	0.008	2.93	<0.00020	0.022	<0.010	<0.020	0.80	1,540	3,480	13.3	5.8	18.0	1,040	--	--	--
	3/16/00	1.82	<0.010	<0.250	<0.002	<0.020	<0.020	3.36	0.006	2.84	<0.00020	<0.010	<0.010	0.031	0.402	1,390	3,330	3.93	--	--	--	--	--	--
	3/23/01	0.226	<0.010	<0.250	<0.002	<0.020	<0.020	1.86	0.010	3.18	<0.00020	<0.010	<0.010	<0.020	0.37	1,260	3,320	6.13	6.2	17.0	1,090	--	--	--
	10/4/01	0.728	<0.010	<0.250	0.002	<0.020	<0.020	3.14	0.009	2.89	<0.00020	<0.010	<0.010	0.037	0.43	1,420	3,380	31.0	8.0	21.0	3,300	--	--	--
	3/28/02	1.01	<0.010	<0.250	<0.002	<0.020	0.020	3.60	0.008	3.27	--	<0.010	<0.010	0.048	0.35	1,220	3,310	3.43	6.0	15.0	1,090	--	--	--
duplicate	3/28/02	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	5.45	<0.005	3.58	--	<0.010	<0.010	<0.020	0.35	1,050	2,920	3.43	6.0	15.0	1,090	--	--	--
	10/3/02	8.96	<0.010	<0.250	0.002	<0.020	<0.020	14.0	0.008	3.91	<0.00020	<0.010	<0.010	0.051	0.74	1,330	3,210	3.19	6.3	18.0	1,280	--	--	--
	3/25/03	1.42	<0.010	<0.250	<0.002	<0.020	<0.020	2.77	0.007	3.54	<0.00020	<0.010	<0.010	0.025	1.21	1,130	3,310	3.21	6.4	19.0	910	--	--	--
	10/2/03	0.402	<0.010	0.414	<0.002	<0.020	<0.020	2.33	0.005	3.84	<0.00020	<0.010	<0.010	<0.020	1.97	1,350	3,470	3.52	5.9	20.0	3,210	--	--	--
	4/28/04	1.44	<0.010	<0.250	<0.002	<0.020	<0.020	6.89	0.012	3.92	<0.00020	<0.010	<0.010	<0.020	1.13	1,350	3,580	5.13	--	15.1	3,670	--	--	--
	10/26/04	7.45	<0.010	<0.250	<0.002	<0.020	0.021	20.1	0.010	4.80	<0.00020	<0.010	<0.010	<0.020	0.438	1,310	3,630	3.10	--	--	3,510	--	--	--
	4/27/05	0.697	<0.010	<0.250	0.002	<0.020	<0.020	3.99	0.010	4.08	<0.00020	<0.010	<0.010	<0.020	0.408	1,820	3,601	3.45	--	--	3,610	--	--	--
	10/20/05	9.03	<0.010	<0.250	<0.002	<0.020	0.283	18.4	0.015	3.92	<0.00020	<0.010	<0.010	0.104	0.449	790	3,520	52.0	--	--	2,370	--	--	--
	10/19/06	0.214	<0.010	<0.250	<0.002	<0.020	<0.020	0.926	0.006	4.16	<0.00020	<0.010	<0.010	0.056	0.383	1,790	3,310	3.74	--	--	2,120	--	--	--
	4/27/07	0.787	<0.010	<0.250	<0.002	<0.020	<0.020	1.25	<0.005	3.55	<0.00020	<0.010	<0.010	<0.020	0.484	1,300	3,390	6.35	--	--	4,510	--	--	--
	11/19/07	0.186	<0.010	<0.250	<0.002	<0.020	<0.020	0.778	<0.005	4.08	<0.00020	<0.010	<0.010	<0.020	0.178	1,950	3,430	3.95	--	--	3,460	--	--	--
	4/30/08	0.291	<0.010	<0.250	<0.002	<0.020	<0.020	0.536	<0.005	3.87	<0.00020	<0.010	<0.010	<0.020	0.158	1,920	3,410	2.99	--	--	3,590	--	--	--
duplicate	4/30/08	0.349	<0.010	<0.250	<0.002	<0.020	<0.020	0.698	<0.005	3.91	<0.00020	<0.010	<0.010	<0.020	0.149	1,860	3,380	2.85	--	--	3,600	--	--	--

APPENDIX A1
GROUND WATER ANALYTICAL RESULTS SUMMARY
EDWARDS ROAD LANDFILL - PERMIT 34-05
RURAL HALL, NORTH CAROLINA

Sample Location / ID	Date	Aluminum	Arsenic	Barium	Cadmium	Chromium (Total)	Copper	Iron	Lead	Manganese	Mercury	Selenium	Silver	Zinc	Nitrate-nitrogen	Sulfate	Dissolved Solids	Total Organic Carbon	pH	Temperature (degrees Celsius)	Conductivity (µmhos/cm)	Turbidity (NTUs)	Oxidation-Reduction Potential (mV)	Dissolved Oxygen
NC 2L Ground Water Standard		3.5 [1]	0.010	0.700	0.002	0.010	1.0	0.300	0.015	0.050	0.001	0.020	0.020	1.00	10.0	250	500	NE	6.5 - 8.5	NE	NE	NE	NE	NE
Solid Waste Section Limit		NE	0.010	0.100	0.001	0.010	0.010	0.300	0.010	0.050	0.0002	0.010	0.010	0.010	10.0	250	NE	NE	NE	NE	NE	NE	NE	NE
NC 2B Surface Water Standard		0.087	0.050	1.0 [2]	0.002	0.050	0.007	1.0	0.025	0.200 [2]	0.000012	0.005	0.00006	0.05	10.0 [2]	250 [2]	500 [2]	NE	6.0 - 9.0	NE	NE	50	NE	>5.0
W-1 (continued)	10/29/08	<0.100	<0.010	0.026	0.00032	<0.010	<0.010	0.427	0.0049	3.99	<0.0002	<0.010	<0.010	<0.010	0.24	1,640	3,310	4.95	--	--	3,840	--	--	--
	4/30/09	<0.100	<0.010	0.031	0.00344	<0.010	0.0049	0.599	0.0131	4.56	<0.0002	<0.010	0.00144	<0.010	0.101	1,890	3,370	6.06	--	--	3,860	--	--	--
	10/12/09	0.098	0.0029	0.022	<0.001	0.002	0.0011	0.410	<0.005	4.00	<0.0002	<0.020	0.0005	<0.30	0.28	1,500	3,100	77.9	6.1	14.9	4,620	14	87	3.32
	4/20/10	3.50	<0.010	0.130	<0.001	0.012	<0.010	6.0	<0.005	4.20	<0.0002	<0.020	<0.005	<0.030	0.67	1,500	3,100	56.5	6.1	16.5	11,800	58	119	<0.01
	10/11/10	0.063	0.0067	0.027	<0.001	0.0009	<0.025	0.300	0.0013	5.00	<0.0002	0.033	0.0013	0.012	0.78	1,400	3,100	26.6	6.1	20.4	2,990	110	147	<0.01
	4/22/11	0.470	0.0068	0.043	<0.0001	<0.005	0.015	2.90	<0.001	4.80	<0.0001	0.030	<0.001	<0.010	0.53	1,300	3,000	3.40	6.2	13.1	2,780	406	150	0.58
	10/17/11	1.55	<0.005	0.066	<0.001	<0.005	0.0517	2.64	<0.005	4.40	<0.00020	<0.010	<0.005	<0.010	<0.20	1,150	2,620	25.7	6.7	20.1	3,740	73	130	0.64
	3/16/12	<0.10	<0.005	0.024	<0.001	<0.005	0.005	2.64	<0.005	4.48	<0.0002	<0.010	0.0068	<0.010	0.27	1,190	3,860	21.7	6.2	18.2	3,547	1	44	0.48
	9/24/12	0.279	<0.0027	0.0322	<0.050	<0.0020	<0.0020	0.494	<0.0040	4.58	<0.00010	<0.005	<0.0025	<0.0050	0.45	1,500	2,890	--	6.5	19.6	3,750	9.6	312	<0.01
	4/18/13	0.501	<0.01	0.0352	<0.001	<0.005	<0.005	0.692	<0.005	4.59	<0.0002	<0.01	<0.005	<0.01	0.36	1,380	2,610	23.50	6.3	17.5	3,354	8.0	-442	0.32
	9/10/13	0.117	<0.01	0.0340	<0.001	<0.005	<0.005	0.290	<0.005	4.92	<0.0002	<0.01	<0.005	<0.01	0.20	1,370	2,900	27.60	6.2	22.5	3,067	7.3	49	0.29
W-2 (RHMW-002, MW-1A)	1/16/90	--	<0.010	0.210	<0.002	<0.020	--	--	<0.005	--	0.0002	<0.010	<0.010	--	--	--	--	--	6.1	--	--	--	--	--
	9/24/90	0.850	<0.010	0.219	0.0083	<0.020	<0.020	1.40	<0.005	9.90	<0.00020	<0.010	<0.010	--	--	41	533	14.0	6.2	16.7	717	--	--	--
	10/24/91	0.169	<0.010	0.082	<0.002	<0.020	<0.020	9.30	0.0074	16.5	<0.00020	<0.010	<0.010	--	1.67	1,150	1,937	15.0	6.0	18.7	2,080	--	--	--
	3/26/92	2.79	<0.010	<0.250	0.0034	<0.020	<0.020	38.4	0.016	--	<0.00020	<0.010	<0.010	--		1,860	2,611	12.0	5.8	13.8	2,880	--	--	--
	9/30/92	--	<0.010	<0.250	<0.002	<0.020	<0.020	'--	<0.005	21.3	<0.00020	<0.010	<0.010	--	1.03	1,320	2,525	6.00	6.1	17.9	2,670	--	--	--
	3/31/93	0.417	<0.010	0.177	<0.002	<0.020	<0.020	1.28	0.0076	0.053	<0.00020	<0.010	<0.010	0.040	0.05	600	948	2.00	5.6	15.2	167	--	--	--
	9/17/93	5.65	<0.010	0.508	0.0038	<0.020	0.079	34.7	0.012	22.3	<0.00020	<0.010	<0.010	0.062	0.166	1,570	3,350	12.0	6.4	20.8	4,030	--	--	--
	3/30/94	18.7	<0.010	2.77	0.003	0.076	<0.020	50.9	0.034	2.40	<0.00020	<0.010	<0.010	0.025	6.00	200	555	--	5.7	16.0	1,640	--	--	--
	9/30/94	21.4	<0.010	0.942	<0.002	0.037	0.058	0.362	0.013	3.71	<0.00020	<0.010	<0.010	0.088	0.45	415	969	15.9	6.2	18.3	1,440	--	--	--
	3/31/95	45.0	<0.010	1.71	<0.002	0.078	0.058	5.05	0.028	3.66	<0.00020	<0.010	<0.010	0.172	0.85	155	460	--	6.2	13.7	930	--	--	--
	9/29/95	109	<0.010	3.95	0.030	0.209	0.142	206	0.068	3.75	<0.00020	0.005	<0.010	0.292	0.313	379	944	7.37	5.6	16.4	1,345	--	--	--
	3/30/96	66.5	<0.010	1.25	0.012	0.105	0.078	96.6	0.044	3.61	<0.00020	<0.010	<0.010	0.183	--	12.6	127	4.68	5.6	14.0	316	--	--	--
	9/27/96	89.1	<0.010	1.51	<0.002	<0.020	0.0088	150	0.015	3.06	<0.00020	<0.010	<0.010	0.098	0.11	--	373	9.22	7.0	21.0	840	--	--	--
	3/29/97	64.4	<0.010	1.10	0.020	0.102	0.072	98.0	0.047	2.50	<0.00020	<0.010	<0.010	0.150	0.09	1,010	2,020	10.8	6.4	14.0	1,300	--	--	--
	9/17/97	56.5	<0.010	1.62	0.013	0.087	0.088	99.9	0.035	20.2	<0.00020	<0.005	<0.010	0.201	1.13	1,410	3,600	11.3	6.6	17.0	3,780	--	--	--
	3/27/98	10.9	<0.010	0.584	<0.002	<0.020	<0.020	26.0	<0.005	6.16	<0.00020	<0.010	<0.010	<0.020	<0.050	116	1,130	6.34	6.8	19.9	743	--	--	--
	9/30/98	15.4	<0.010	0.518	<0.002	0.039	0.034	28.8	0.022	15.0	<0.00020	<0.010	<0.010	0.060	0.78	762	3,380	15.7	6.4	21.0	753	--	--	--
	3/31/99	2.38	<0.010	0.852	<0.002	0.045	0.035	47.0	0.021	6.92	<0.00020	<0.010	<0.010	0.073	0.32	26	262	1.41	6.2	18.0	126	--	--	--
	9/29/99	9.70	<0.010	0.296	<0.002	0.036	<0.020	26.9	0.009	0.203	<0.00020	<0.010	<0.010	<0.020	0.08	293	458	15.3	6.2	20.0	182	--	--	--
	9/15/00	5.49	<0.010	0.508	<0.002	<0.020	<0.020	1.60	0.007	1.14	<0.00020	<0.010	<0.010	<0.020	0.06	93.4	374	1.89	6.6	19.0	170	--	--	--
	3/16/00	12.7	<0.010	0.434	<0.002	0.028	0.025	19.4	<0.005	2.16	<0.00020	<0.010	<0.010	0.028	0.136	281	642	7.36	--	--	--	--	--	--
	3/23/01	2.60	<0.010	<0.250	<0.002	<0.020	<0.020	4.74	0.006	0.234	<0.00020	<0.010	<0.010	0.037	0.08	26.3	173	6.82	6.5	18.0	270	--	--	--
	3/28/02	17.9	<0.010	<0.250	<0.002	0.047	0.046	45.3	0.016	3.03	--	<0.010	<0.010	0.088	<0.050	23.4	219	11.9	6.7	14.0	140	--	--	--
	10/3/02	--	--	--	--	--	--	'--	--	--	--	'--	--	--	--	--	'--	--	--	--	--	--	--	--
	3/25/03	6.07	<0.010	0.264	<0.002	<0.020	<0.020	8.42	<0.005	0.115	<0.00020	<0.010	<0.010	0.025	0.069	14.4	118	5.29	6.1	18.0	140	--	--	--
	10/2/03	4.63	<0.010	0.277	<0.002	<0.020	<0.020	10.9	0.008	11.1	<0.00020	<0.010	<0.010	<0.020	0.122	1,270	3,380	7.78	6.1	20.0	3,020	--	--	--
	4/28/04	3.60	<0.010	<0.250	<0.002	<0.020	<0.020	11.0	0.006	2.63	<0.00020	<0.010	<0.010	0.036	0.193	233	634	8.13	--	14.4	1,460	--	--	--
	10/26/04	30.2	<0.010	2.14	0.009	0.112	0.083	65.6	0.021	5.08	<0.00020	<0.010	<0.010	0.144	4.17	1,710	3,800	7.22	--	--	3,690	--	--	--
	4/27/05	2.75	<0.010	<0.250	0.006	<0.020	<0.020	9.15	0.008	8.95	<0.00020	<0.010	<0.010	0.026	1.08	1,260	2,868	13.8	--	--	3,170	--	--	--
	10/20/05	9.38	<0.010	0.377	0.002	0.020	0.203	26.2	0.009	6.80	<0.00020	<0.010	<0.010	0.116	0.55	1,510	1,700	22.0	--	--	1,110	--	--	--

APPENDIX A1
GROUND WATER ANALYTICAL RESULTS SUMMARY
EDWARDS ROAD LANDFILL - PERMIT 34-05
RURAL HALL, NORTH CAROLINA

Sample Location / ID	Date	Aluminum	Arsenic	Barium	Cadmium	Chromium (Total)	Copper	Iron	Lead	Manganese	Mercury	Selenium	Silver	Zinc	Nitrate-nitrogen	Sulfate	Dissolved Solids	Total Organic Carbon	pH	Temperature (degrees Celsius)	Conductivity (µmhos/cm)	Turbidity (NTUs)	Oxidation-Reduction Potential (mV)	Dissolved Oxygen
NC 2L Ground Water Standard		3.5 [1]	0.010	0.700	0.002	0.010	1.0	0.300	0.015	0.050	0.001	0.020	0.020	1.00	10.0	250	500	NE	6.5 - 8.5	NE	NE	NE	NE	NE
Solid Waste Section Limit		NE	0.010	0.100	0.001	0.010	0.010	0.300	0.010	0.050	0.0002	0.010	0.010	0.010	10.0	250	NE	NE	NE	NE	NE	NE	NE	NE
NC 2B Surface Water Standard		0.087	0.050	1.0 [2]	0.002	0.050	0.007	1.0	0.025	0.200 [2]	0.000012	0.005	0.00006	0.05	10.0 [2]	250 [2]	500 [2]	NE	6.0 - 9.0	NE	NE	50	NE	>5.0
W-2 (continued)	10/19/06	3.63	<0.010	<0.250	<0.002	<0.020	<0.020	8.08	0.006	1.90	<0.00020	<0.010	<0.010	0.044	0.133	749	1,210	8.99	--	--	1,050	--	--	--
	4/27/07	46.5	<0.010	0.451	<0.002	0.002		55.9	--	--	<0.00020	<0.010	<0.010	0.046	0.452	1,570	2,800	9.01	--	--	1,880	--	--	--
	11/19/07	5.75	<0.010	<0.250	<0.002	<0.020	<0.020	12.0	0.008	3.03	<0.00020	<0.010	<0.010	<0.020	<0.050	1,330	1,310	9.71	--	--	1,330	--	--	--
	4/30/08	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	4.45	0.005	0.334	<0.00020	<0.010	<0.010	0.072	0.071	246	330	7.26	--	--	609	--	--	--
	4/30/09	5.17	<0.010	0.268	<0.001	0.0139	0.0113	12.5	0.0118	0.441	<0.0002	<0.010	<0.010	0.038	0.072	10.4	157	7.57	--	--	94	--	--	--
	10/15/09	30.0	0.013	1.60	0.0048	0.110	0.067	200	0.036	3.40	<0.0002	0.042	<0.005	0.410	Not sampled - insufficient sample volume				6.4	15.9	900	30	-145	1.21
	4/20/10	0.430	<0.010	0.180	<0.001	<0.005	<0.010	0.49	<0.005	2.40	<0.0002	<0.020	<0.005	<0.030	<0.20	830	1,900	48.8	8.0	13.8	1,880	411	15	5.88
	10/11/10	2.30	0.0024	0.240	0.00068	0.0087	0.011	6.60	0.0017	2.30	<0.0002	0.011	<0.005	0.081	0.21	660	1,400	10.1	6.3	17.0	1,340	712	46	3.99
	4/22/11	1.70	0.0023	0.150	<0.0001	<0.005	0.0018	2.10	<0.001	4.00	<0.0001	0.014	<0.001	<0.010	0.033	760	1,700	8.60	Not measured - insufficient sample volume due to limited recharge					
	10/17/11	2.18	<0.005	0.113	<0.001	<0.005	0.0061	2.71	<0.005	4.02	<0.00020	<0.010	0.0058	<0.005	<0.20	365	842	18.7	Not measured - insufficient sample volume due to limited recharge					
	3/16/12	2.54	<0.005	0.122	<0.001	<0.005	0.0061	3.27	<0.005	0.045	<0.0002	<0.010	<0.005	<0.010	<0.20	30	153	7.70	6.5	16.1	1,144	8	-9	5.75
	9/24/12	2.02	<0.0027	0.119	<0.050	<0.0020	<0.0020	3.91	<0.0040	2.87	<0.00010	<0.005	<0.0025	<0.0050	0.43	276	2,030	--	Not measured - insufficient sample volume due to limited recharge					
	4/18/13	0.192	<0.01	0.339	<0.001	<0.005	<0.005	0.182	<0.005	<0.005	<0.0002	<0.01	<0.005	<0.01	0.43	56.8	149	5.00	6.5	16.7	261	NM	97	7.37
	9/10/13	0.451	<0.01	0.315	<0.001	<0.005	<0.005	0.676	<0.005	0.02	<0.0002	<0.01	<0.005	<0.01	0.09	44.6	135	10.20	Not measured - insufficient sample volume due to limited recharge					
W-3 (RHMW-003 / 003A, W-2A)	1/16/90	--	<0.010	0.300	<0.002	<0.020	--	'--	<0.005	--	<0.00020	<0.010	<0.010	--	--	--	'--	--	7.0	--	--	--	--	--
	9/6/90	--	<0.010	8.99	0.020	0.810	--	'--	0.330	--	0.0005	0.0059	<0.005	--	--	--	'--	--	6.7	--	--	--	--	--
	9/21/90	2.17	<0.010	0.134	0.0081	<0.040	<0.020	2.00	<0.005	0.080	<0.00020	<0.005	<0.010	<0.020	0.67	8.5	174	12.0	6.5	16.2	238	--	--	--
	10/23/91	0.213	<0.010	0.149	<0.002	<0.040	<0.020	0.24	0.330	0.116	<0.00020	<0.005	<0.010	<0.020	<0.050	<10.0	214	12.0	6.7	19.7	207	--	--	--
	3/25/92	<0.200	<0.010	0.119	<0.002	<0.020	<0.020	<0.100	<0.005	<0.020	<0.00020	<0.005	<0.010	<0.020	6.81	22.5	136	10.0	6.1	13.1	307	--	--	--
	9/29/92	0.670	<0.010	0.120	<0.002	<0.020	<0.020	0.58	<0.005	0.410	0.0003	<0.005	<0.010	<0.020	0.232	20	189	1.0	5.9	17.1	223	--	--	--
	3/31/93	1.17	<0.010	0.180	<0.002	<0.020	<0.020	2.30	<0.005	<0.020	<0.00020	<0.005	<0.010	0.055	<0.050	14.9	163	2.0	5.5	15.7	207	--	--	--
	9/17/93	9.46	<0.010	0.444	0.0028	<0.020	0.071	20.7	0.010	0.173	<0.00020	<0.005	<0.010	0.106	0.25	12	207	2.0	6.2	18.3	282	--	--	--
	3/30/94	4.42	<0.010	0.259	<0.002	<0.020	0.024	10.7	0.150	0.264	<0.00020	<0.005	<0.010	0.107	1.48	17	180	<5	5.7	15.9	180	--	--	--
	9/30/94	25.4	<0.010	0.485	<0.002	0.026	0.067	32.0	0.017	0.526	<0.00020	<0.005	<0.010	0.086	<0.050	<20	193	26.1	6.3	18.0	202	--	--	--
	3/31/95	31.3	<0.010	0.466	<0.002	0.027	0.055	36.4	0.025	0.430	<0.00020	<0.005	<0.010	0.186	0.280	133	206	<5	6.6	12.7	220	--	--	--
	9/29/95	55.4	<0.010	0.813	0.007	0.051	0.122	70.1	0.042	1.02	<0.00020	<0.005	<0.010	0.183	0.200	139	302	1.32	5.4	15.4	245	--	--	--
	3/30/96	17.1	<0.010	0.436	0.002	0.020	0.046	25.9	0.019	0.409	<0.00020	<0.005	<0.010	0.100	1.25	19.5	217	3.41	5.6	13.0	285	--	--	--
	9/27/96	11.2	<0.010	0.257	<0.002	<0.020	<0.020	16.4	0.015	0.235	<0.00020	<0.005	<0.010	0.094	0.110	59.8	215	1.10	7.8	18.0	243	--	--	--
	3/29/97	16.4	<0.010	0.347	0.003	<0.020	0.043	23.0	0.013	0.384	<0.00020	<0.005	<0.010	0.051	0.120	21.1	223	7.86	6.6	12.0	153	--	--	--
	9/17/97	32.2	<0.010	0.478	0.004	0.027	0.067	40.2	0.024	0.590	<0.00020	<0.005	<0.010	0.280	1.10	88.9	262	1.29	6.9	16.0	366	--	--	--
	3/27/98	12.2	<0.010	0.491	<0.002	<0.020	<0.020	21.3	<0.005	0.604	<0.00020	<0.010	<0.010	<0.020	0.130	19.1	248	1.26	6.1	19.9	542	--	--	--
	9/30/98	4.15	<0.010	<0.250	<0.002	<0.020	<0.020	5.69	<0.005	0.151	<0.00020	<0.010	<0.010	0.039	0.300	5.05	238	1.34	6.8	20.0	276	--	--	--
	3/31/99	2.38	<0.010	<0.250	<0.002	<0.020	<0.020	3.93	<0.005	0.126	<0.00020	<0.010	<0.010	0.073	0.320	26.3	262	1.41	6.2	18.0	126	--	--	--
	9/29/99	2.13	<0.010	<0.250	<0.002	<0.020	<0.020	4.23	<0.005	0.090	<0.00020	<0.010	<0.010	<0.020	0.210	27.3	272	1.71	6.8	19.0	315	--	--	--
	9/15/00	6.59	<0.010	0.323	<0.002	<0.020	0.026	9.90	0.011	0.309	<0.00020	0.017	<0.010	<0.020	0.120	20.9	187	1.53	6.7	18.0	390	--	--	--
	3/16/00	11.7	<0.010	0.356	<0.002	<0.020	0.035	15.7	0.007	0.334	<0.00020	0.016	<0.010	0.036	0.208	17.8	193	2.63	--	--	--	--	--	--
	3/23/01	0.828	<0.010	<0.250	<0.002	<0.020	<0.020	1.02	0.009	0.045	<0.00020	<0.010	<0.010	0.023	0.200	27.4	175	1.56	6.7	17.0	310	--	--	--
	10/4/01	3.64	<0.010	<0.250	<0.002	<0.020	<0.020	6.02	0.008	0.221	<0.00020	0.013	<0.010	<0.020	0.220	24.7	186	3.20	6.1	17.0	200	--	--	--
	3/28/02	1.72	<0.010	<0.250	<0.002	<0.020	<0.020	2.82	<0.005	0.100	--	<0.010	<0.010	<0.020	0.400	38.5	203	1.45	6.7	14.0	470	--	--	--
	3/28/02	2.37	<0.010	<0.250	<0.002	<0.020	<0.020	2.82	<0.005	0.100	<0.00020	0.017	<0.010	<0.020	0.287	25.6	177	<1.0	--	--	238	--	--	--
duplicate	10/3/02	8.77	<0.010	0.387	<0.002	<0.020	0.022	16.4	<0.005	0.450	<0.00020	<0.010	<0.010	0.035	0.350	58.2	231	1.02	8.1	19.0	210	--	--	--
	3/25/03	15.3	<0.010	0.362	<0.002	<0.020	0.026	23.8	0.008	0.622	<0.00020	<0.010	<0.010	0.045	0.520	42.6	194	<1.0	6.2	19.0	210	--	--	--
	10/2/03	2.46	<0.010	0.646	<0.002	<0.020	<0.020	4.08	<0.005	0.212	<0.00020	<0.010	<0.010	<0.020	0.371	28.3	199	<1.0	6.7	17.0	243	--	--	--
	4/28/04	1.49	<0.010	<0.250	<0.002	<0.020	<0.020	2.82	<0.005	0.080	<0.00020	0.013	<0.010	<0.020	0.259	1,350	171	<1.0	--	14.6	225	--	--	--

APPENDIX A1
GROUND WATER ANALYTICAL RESULTS SUMMARY
EDWARDS ROAD LANDFILL - PERMIT 34-05
RURAL HALL, NORTH CAROLINA

Sample Location / ID	Date	Aluminum	Arsenic	Barium	Cadmium	Chromium (Total)	Copper	Iron	Lead	Manganese	Mercury	Selenium	Silver	Zinc	Nitrate-nitrogen	Sulfate	Dissolved Solids	Total Organic Carbon	pH	Temperature (degrees Celsius)	Conductivity (µmhos/cm)	Turbidity (NTUs)	Oxidation-Reduction Potential (mV)	Dissolved Oxygen
NC 2L Ground Water Standard		3.5 [1]	0.010	0.700	0.002	0.010	1.0	0.300	0.015	0.050	0.001	0.020	0.020	1.00	10.0	250	500	NE	6.5 - 8.5	NE	NE	NE	NE	NE
Solid Waste Section Limit		NE	0.010	0.100	0.001	0.010	0.010	0.300	0.010	0.050	0.0002	0.010	0.010	0.010	10.0	250	NE	NE	NE	NE	NE	NE	NE	NE
NC 2B Surface Water Standard		0.087	0.050	1.0 [2]	0.002	0.050	0.007	1.0	0.025	0.200 [2]	0.000012	0.005	0.00006	0.05	10.0 [2]	250 [2]	500 [2]	NE	6.0 - 9.0	NE	NE	50	NE	>5.0
W-3 (continued)	10/26/04	2.37	<0.010	<0.250	<0.002	<0.020	<0.020	3.49	<0.005	0.129	<0.00020	0.017	<0.010	<0.020	0.287	25.6	177	<1.0	--	--	238	--	--	--
	4/27/05	0.874	<0.010	<0.250	<0.002	<0.020	<0.020	1.58	<0.005	0.066	<0.00020	0.016	<0.010	0.040	0.254	34.4	192	0.74	--	--	277	--	--	--
	10/20/05	3.50	<0.010	0.252	<0.002	<0.020	0.107	4.23	<0.005	0.072	<0.00020	0.030	<0.010	0.071	0.356	44	218	18.0	--	--	317	--	--	--
	10/19/06	0.553	<0.010	0.277	<0.002	<0.020	<0.020	1.02	<0.005	0.037	<0.00020	0.048	<0.010	<0.020	0.389	70.4	237	0.69	--	--	330	--	--	--
	4/27/07	<0.10	<0.010	0.262	<0.002	<0.020	<0.020	0.708	<0.005	<0.010	<0.00020	--	<0.010	<0.020	0.452	89.4	251	1.51	--	--	388	--	--	--
	11/19/07	0.124	<0.010	0.263	<0.002	<0.020	<0.020	0.156	<0.005	<0.010	<0.00020	0.065	<0.010	<0.020	0.190	53	293	0.86	--	--	403	--	--	--
	11/19/07	0.139	<0.010	0.254	<0.002	<0.020	<0.020	0.158	<0.005	0.012	<0.00020	0.065	<0.010	<0.020	0.203	64.2	278	0.88	--	--	402	--	--	--
	4/30/08	<0.100	<0.010	0.261	<0.002	<0.020	<0.020	0.148	<0.005	<0.010	<0.00020	0.094	<0.010	<0.020	0.553	91	331	0.76	--	--	470	--	--	--
	10/29/08	<0.100	<0.010	0.274	0.00033	0.0106	<0.010	0.216	0.0033	0.124	0.0001	0.096	0.00515	<0.010	0.474	96	360	1.04	--	--	571	--	--	--
	4/30/09	0.442	<0.010	0.368	<0.001	<0.010	<0.010	0.638	0.0085	0.0616	<0.0002	0.154	<0.010	0.0682	0.535	199	399	0.94	--	--	603	--	--	--
duplicate	4/30/09	0.571	<0.010	0.268	<0.0010	<0.010	0.0025	0.332	0.0071	0.0308	<0.0002	0.153	<0.010	0.0324	0.510	203	389	1.07	--	--	617	--	--	--
	10/12/09	0.026	0.0027	0.160	<0.0010	0.0009	<0.010	<0.050	<0.005	0.016	0.00008	0.150	<0.005	<0.30	0.740	140	430	15.8	5.9	15.2	>99,000	9	121	2.82
	4/20/10	0.870	<0.010	0.280	<0.0010	<0.005	<0.010	0.940	<0.005	0.049	<0.0002	0.100	<0.005	<0.030	0.710	100	380	9.0	6.0	12.5	644	23	264	3.74
	10/11/10	<0.250	<0.005	0.110	<0.001	0.0013	<0.025	0.021	<0.005	0.0016	<0.0002	0.077	<0.005	0.020	0.790	89	310	4.0	5.9	18.0	497	7	256	1.39
	4/21/11	<0.040	0.0021	0.140	<0.0001	<0.005	<0.001	0.210	<0.001	0.067	<0.0001	0.100	<0.001	<0.010	0.850	120	330	1.0	5.8	13.1	399	<1	299	3.68
	10/18/11	0.380	<0.005	0.195	<0.005	<0.005	<0.005	0.262	<0.005	0.0221	<0.00020	0.102	<0.005	<0.010	1.10	360	413	7.70	6.9	17.5	764	6	128	1.76
	3/16/12	<0.10	<0.005	0.098	<0.001	<0.005	<0.005	0.101	<0.005	0.0102	<0.0002	0.112	0.0058	<0.010	1.70	220	1,070	7.80	5.5	14.3	755	1	126	2.36
	9/24/12	<0.050	<0.0027	0.087	<0.050	<0.0020	<0.0020	<0.0250	<0.0040	0.0491	<0.00010	0.0519	<0.0025	<0.0050	1.00	418	719	--	5.8	17.8	1,110	1.6	521	<0.01
	4/18/13	<0.1	<0.01	0.056	<0.001	<0.005	<0.005	<0.05	<0.005	0.0757	<0.0002	0.0296	<0.005	<0.01	0.84	401	852	10.6	5.7	14.0	1,146	1.1	-443	0.54
	9/10/13	<0.1	<0.01	0.046	<0.001	<0.005	<0.005	<0.05	<0.005	0.0984	<0.0002	0.0200	<0.005	<0.01	0.59	447	852	9.3	5.9	18.9	959	1.1	222	0.44
W-3B (RHMW-003B)	10/26/04	2.33	<0.010	<0.250	<0.002	<0.020	<0.020	3.17	<0.005	0.157	<0.00020	<0.010	<0.010	0.024	<0.050	174	545	2.71	--	--	862	--	--	--
	4/27/05	0.203	<0.010	<0.250	0.002	<0.020	<0.020	1.83	0.015	0.907	<0.00020	0.041	<0.010	0.036	<0.050	590	840	10.1	--	--	1,180	--	--	--
	10/20/05	3.63	<0.010	<0.250	<0.002	<0.020	0.029	4.29	0.005	0.068	<0.00020	<0.010	<0.010	0.075	<0.050	146	627	30.0	--	--	550	--	--	--
	10/19/06	0.135	<0.010	<0.250	<0.002	<0.020	<0.020	0.950	0.005	0.811	<0.00020	<0.010	<0.010	0.042	<0.050	318	750	5.24	--	--	739	--	--	--
	4/27/07	0.238	<0.010	<0.250	<0.002	<0.020	<0.020	0.901	<0.005	1.28	<0.00020	<0.010	<0.010	<0.020	<0.050	475	1,050	2.57	--	--	1,240	--	--	--
	11/19/07	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	1.17	<0.005	1.27	<0.00020	<0.010	<0.010	<0.020	<0.050	582	101	22.6	--	--	1,310	--	--	--
	4/30/08	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	0.505	<0.005	1.01	<0.00020	<0.010	<0.010	<0.020	<0.050	570	955	1.18	--	--	1,270	--	--	--
	10/29/08	<0.100	<0.010	0.048	<0.001	0.0049	<0.010	1.95	<0.010	0.946	0.00007	<0.010	<0.010	0.0105	<0.05	305	760	0.83	--	--	1,080	--	--	--
	4/30/09	<0.100	<0.010	0.0426	<0.001	<0.010	<0.010	0.490	0.0105	0.999	<0.0002	0.0097	0.0015	0.0087	<0.050	185	827	5.56	--	--	1,150	--	--	--
	10/12/09	0.039	0.0036	0.043	<0.001	0.0009	<0.010	0.330	<0.005	0.880	<0.0002	<0.020	<0.0050	<0.30	<0.20	250	780	16.1	7.2	14.6	>99,000	14	-42	3.40
	4/20/10	<0.10	<0.010	0.049	<0.0010	<0.0050	<0.010	0.500	<0.005	0.970	<0.0002	<0.020	<0.0050	<0.30	<0.20	280	770	11.2	6.8	17.5	2,320	108	-51	0.23
	10/11/10	<0.250	0.005	0.045	<0.005	<0.005	<0.025	0.500	<0.005	0.980	<0.0002	0.0099	<0.005	<0.050	0.140	300	830	<0.20	6.7	17.5	1,010	41	-25	<0.01
	4/21/11	<0.040	0.0025	0.051	<0.0001	<0.005	<0.001	0.970	<0.001	1.20	<0.0001	0.012	<0.001	<0.010	0.085	370	890	1.10	6.6	15.4	956	<1	-72	0.48
	10/18/11	<0.050	<0.005	0.052	<0.001	<0.005	<0.005	0.606	<0.005	1.32	<0.00020	<0.010	<0.005	<0.010	<0.20	460	1,090	9.70	9.5	15.0	1,750	9.4	-86	<0.01
duplicate	10/18/11	<0.100	<0.005	0.0509	<0.001	<0.005	<0.005	0.587	<0.005	1.28	<0.00020	<0.010	<0.005	<0.010	<0.20	408	1,050	8.00	9.5	15.0	1,750	9.4	-86	<0.01
	3/16/12	<0.10	<0.005	0.0485	<0.001	<0.005	<0.005	0.472	<0.005	1.56	<0.0002	<0.010	<0.005	0.0476	<0.20	559	533	9.80	6.7	14.5	1,474	2.9	-35	0.79
	9/24/12	<0.050	<0.0027	0.0451	<0.050	<0.0020	<0.0020	0.537	<0.0040	1.34	<0.00010	<0.005	<0.0025	0.0271	<0.02	422	1,050	--	7.1	16.0	1,650	3.6	-26	<0.01
	4/18/13	<0.1	<0.01	0.0403	<0.001	<0.005	<0.005	0.397	<0.005	0.74	<0.0002	<0.01	<0.005	<0.01	<0.02	248	623	16.8	6.6	14.9	961	0.0	-71	0.47
	9/10/13	<0.1	<0.01	0.0432	<0.001	<0.005	<0.005	0.258	<0.005	0.45	<0.0002	<0.01	<0.005	<0.01	<0.02	120	421	6.6	7.2	19.3	1,380	9.2	-43	<0.01

APPENDIX A1
GROUND WATER ANALYTICAL RESULTS SUMMARY
EDWARDS ROAD LANDFILL - PERMIT 34-05
RURAL HALL, NORTH CAROLINA

Sample Location / ID	Date	Aluminum	Arsenic	Barium	Cadmium	Chromium (Total)	Copper	Iron	Lead	Manganese	Mercury	Selenium	Silver	Zinc	Nitrate-nitrogen	Sulfate	Dissolved Solids	Total Organic Carbon	pH	Temperature (degrees Celsius)	Conductivity (µmhos/cm)	Turbidity (NTUs)	Oxidation-Reduction Potential (mV)	Dissolved Oxygen
NC 2L Ground Water Standard		3.5 [1]	0.010	0.700	0.002	0.010	1.0	0.300	0.015	0.050	0.001	0.020	0.020	1.00	10.0	250	500	NE	6.5 - 8.5	NE	NE	NE	NE	NE
Solid Waste Section Limit		NE	0.010	0.100	0.001	0.010	0.010	0.300	0.010	0.050	0.0002	0.010	0.010	0.010	10.0	250	NE	NE	NE	NE	NE	NE	NE	NE
NC 2B Surface Water Standard		0.087	0.050	1.0 [2]	0.002	0.050	0.007	1.0	0.025	0.200 [2]	0.000012	0.005	0.00006	0.05	10.0 [2]	250 [2]	500 [2]	NE	6.0 - 9.0	NE	NE	50	NE	>5.0
W-4	4/4/95	9.72	<0.010	<0.250	<0.002	<0.020	<0.020	15.6	0.007	0.564	<0.00020	<0.010	<0.010	0.058	1.0	7.88	231	136	6.1	19.0	234	--	--	--
	9/17/97	4.42	<0.010	<0.250	0.002	<0.020	<0.020	10.0	0.006	0.406	<0.00020	<0.010	<0.010	0.190	0.550	8.86	212	3.19	7.5	18.0	366	--	--	--
	3/27/98	3.41	<0.010	<0.250	<0.002	<0.020	<0.020	6.25	<0.005	--	<0.00020	<0.010	<0.010	0.044	<0.050	7.12	226	2.69	6.7	19.2	390	--	--	--
	9/30/98	0.219	<0.010	<0.250	<0.002	<0.020	<0.020	1.61	<0.005	0.299	<0.00020	<0.010	<0.010	<0.020	<0.050	6.42	200	7.26	5.9	21.0	322	--	--	--
(Background)	3/31/99	0.637	<0.010	<0.250	<0.002	<0.020	<0.020	2.15	<0.005	0.285	<0.00020	<0.010	<0.010	<0.020	<0.050	5.71	202	8.53	6.5	16.0	279	--	--	--
(damaged & replaced 2003 with W-6)	9/29/99	0.127	<0.010	<0.250	<0.002	<0.020	<0.020	1.44	0.005	0.271	<0.00020	<0.010	<0.010	0.024	<0.050	<5.0	207	2.85	6.4	18.0	315	--	--	--
	3/16/00	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	1.47	<0.005	0.298	<0.00020	<0.010	<0.010	<0.020	<0.050	<5.0	191	6.05				--	--	--
	9/15/00	0.165	<0.010	<0.250	<0.002	<0.020	<0.020	1.09	<0.005	0.252	<0.00020	<0.010	<0.010	<0.020	0.080	5.3	241	15.5	6.2	17.0	310	--	--	--
	3/23/01	2.75	<0.010	<0.250	0.004	<0.020	<0.020	9.91	0.016	0.447	<0.00020	<0.010	<0.010	0.028	<0.050	6.53	219	5.99	6.4	16.0	240	--	--	--
	10/4/01	0.204	<0.010	<0.250	<0.002	<0.020	<0.020	0.915	0.007	0.229	<0.00020	<0.010	<0.010	<0.020	<0.05	<5.0	186	7.80	6.3	20.0	300	--	--	--
	3/28/02	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	1.46	<0.005	0.212	--	<0.010	<0.010	<0.020	<0.050	5.16	196	1.68	6.2	14.0	190	--	--	--
	10/3/02	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	1.13	<0.005	0.237	<0.00020	<0.010	<0.010	0.029	<0.050	5.08	202	4.07	6.1	19.0	280	--	--	--
	3/25/03	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	0.976	<0.005	0.212	<0.00020	<0.010	<0.010	<0.020	<0.050	6.05	185	1.61	6.2	16.0	260	--	--	--
W-6	10/2/03	1.92	<0.010	<0.250	<0.002	0.268	0.024	3.22	<0.005	0.154	<0.00020	<0.010	<0.010	0.440	0.207	95	466	34.0	7.3	19.0	661	--	--	--
	4/28/04	1.16	<0.010	<0.250	<0.002	0.030	0.026	0.917	0.007	0.037	<0.00020	<0.010	<0.010	0.149	0.137	370	692	139	--	14.7	937	--	--	--
	10/26/04	0.790	<0.010	<0.250	<0.002	0.089	0.032	0.259	<0.005	0.012	<0.00020	<0.010	<0.010	0.087	0.096	116	630	79.2	--	--	917	--	--	--
	4/27/05	0.389	<0.010	<0.250	<0.002	<0.020	<0.020	<0.100	0.005	<0.010	<0.00020	<0.010	<0.010	0.056	<0.050	87.5	565	13.2	--	--	932	--	--	--
(Background)	10/20/05	<0.100	<0.010	<0.250	<0.002	<0.020	0.040	0.356	<0.005	<0.010	<0.00020	<0.010	<0.010	0.060	0.064	35.4	553	27.0	--	--	939	--	--	--
Replaced W-4 9/2003	10/19/06	0.529	<0.010	<0.250	<0.002	<0.020	<0.020	0.077	<0.005	0.012	<0.00020	<0.010	<0.010	0.066	<0.050	46.4	471	29.3	--	--	655	--	--	--
	4/27/07	2.66	<0.010	<0.250	<0.002	0.029	<0.020	2.79	<0.005	0.106	<0.00020	<0.010	<0.010	0.168	<0.050	29.5	442	8.84	--	--	776	--	--	--
	11/19/07	0.627	<0.010	<0.250	<0.002	<0.020	<0.020	0.711	<0.005	0.024	<0.00020	<0.010	<0.010	0.038	<0.050	11.2	431	8.98	--	--	694	--	--	--
	4/30/08	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	<0.100	<0.005	<0.010	<0.00020	<0.010	<0.010	0.037	<0.050	<10.0	392	5.61	--	--	615	--	--	--
	10/29/08	0.235	<0.010	0.0358	0.00041	0.0068	<0.010	0.268	<0.010	0.0093	<0.00020	<0.010	<0.010	0.067	<0.050	<10.0	393	4.13	--	--	724	--	--	--
duplicate	10/29/08	0.222	<0.010	0.293	0.001	<0.010	0.0027	0.460	0.0049	0.0846	0.00016	0.101	<0.010	<0.010	0.488	99	384	0.86	--	--	574	--	--	--
	4/30/09	0.139	<0.010	0.037	<0.001	0.007	<0.010	0.0331	0.0029	0.0015	<0.0002	0.0081	<0.010	0.0332	<0.050	10.5	463	10.3	--	--	807	--	--	--
	10/12/09	0.140	0.0023	0.028	<0.001	0.0055	0.0043	0.044	<0.0050	0.0017	<0.0002	0.046	<0.005	<0.300	<0.200	17	380	11.1	10.6	18.9	1,020	33	-243	0.16
	4/20/10	1.70	<0.010	0.059	<0.001	0.400	0.014	3.20	<0.005	0.087	<0.0002	<0.020	<0.005	0.069	<0.20	16	450	9.1	10.7	18.9	930	209	-227	0.03
	10/11/10	0.320	<0.005	0.037	<0.001	0.420	0.019	2.80	<0.005	0.056	<0.0002	<0.005	<0.005	0.063	0.120	13	410	3.9	10.6	17.7	816	36	-250	<0.01
	4/22/11	0.260	0.0012	0.033	<0.001	0.190	0.007	1.00	0.0013	0.028	<0.0001	0.0011	<0.001	0.017	0.021	16	410	3.8	11.1	13.9	562	10	-189	1.01
	10/18/11	0.421	<0.005	0.027	<0.001	0.0609	0.089	0.311	<0.005	0.0068	<0.0002	<0.010	<0.005	0.0601	<0.20	11	414	6.1	12.2	18.1	1,040	9	-313	0.37
	3/16/12	0.221	<0.005	0.045	<0.001	0.0085	<0.005	0.083	<0.005	<0.005	<0.0002	<0.010	<0.005	0.0101	<0.20	11.4	499	5.2	11.2	17.3	845	2	-234	0.38
	9/26/12	0.202	<0.0027	0.037	<0.050	0.0236	<0.0020	0.162	<0.0040	<0.0025	<0.00010	<0.005	<0.0025	0.0141	<0.02	12.2	317	--	11.4	16.3	667	8.9	-21	<0.01
	4/19/13	0.517	<0.01	0.041	<0.001	0.0183	<0.005	0.277	<0.005	0.0064	<0.0002	<0.01	<0.005	0.0212	<0.02	12.2	334	4.90	10.4	15.8	620	8.6	-451	0.40
	9/11/13	0.312	<0.01	0.047	<0.001	0.0217	<0.005	0.397	<0.005	0.0077	<0.0002	<0.01	<0.005	0.0194	--	12.1	335	4.39	10.6	17.9	506	6.9	83	0.71
W-7	1/6/11	--	--	0.110	<0.0001	<0.0050	--	0.200	<0.010	0.120	--	<0.010	--	--	--	9.3	200	--	7.1	15.4	298	5	83	2.00
	4/21/11	0.092	<0.001	0.080	<0.0001	<0.005	<0.001	0.520	<0.001	0.160	<0.0001	<0.001	<0.001	<0.010	0.044	6.6	190	<0.001	7.3	15.2	301	<1	12	0.62
Open borehole 42'-341'	9/25/12	0.318	<0.0027	0.077	<0.050	<0.0020	<0.0020	0.628	<0.0040	0.173	<0.00010	<0.005	<0.0025	<0.0050	<0.02	6.2	206	--	8.1	15.1	403	18.2	46	<0.01
	4/18/13	0.403	<0.01	0.140	<0.001	<0.005	0.006	1.460	<0.005	0.146	<0.0002	<0.01	<0.005	<0.01	<0.02	10.2	173	29.00	6.9	15.7	271	17.1	-448	1.70
	9/11/13	0.257	<0.01	0.112	<0.001	<0.005	<0.005	0.950	<0.005	0.124	<0.0002	<0.01	<0.005	<0.01	--	8.1	<25	3.31	7.4	16.2	271	7.7	4	0.87
W-8	1/6/11	--	--	0.330	0.00012	<.0050	--	2.90	<0.010	0.065	--	<0.010	--	--	--	73	210	--	7.5	14.8	300	50	182	7.88
	4/20/11	0.390	0.0012	0.180	<0.0001	<0.005	<0.001	0.940	<0.001	0.020	<0.0001	0.0089	<0.001	<0.010	0.240	68	240	1.1	5.7	15.1	391	133	203	7.06
	9/26/12	0.643	<0.0027	0.166	<0.050	0.0252	0.0077	0.777	<0.0040	0.064	<0.00010	<0.005	<0.0025	0.151	0.250	86.8	242	--	6.1	20.5	382	6.2	158	5.9
	4/18/13	5.94	<0.01	0.465	<0.001	0.0864	0.0856	9.760	<0.005	0.220	<0.0002	<0.01	<0.005	0.122	0.290	95	247	5.20	5.8	19.5	330	9.6	-428	5.3
	9/10/13	1.18	<0.01	0.407	<0.001	0.0417	0.0400	1.900	<0.005	0.037	<0.0002	<0.01	<0.005	0.067	0.290	101	244	5.60	5.7	21.8	310	9.3	95	6.0

APPENDIX A1
GROUND WATER ANALYTICAL RESULTS SUMMARY
EDWARDS ROAD LANDFILL - PERMIT 34-05
RURAL HALL, NORTH CAROLINA

Sample Location / ID	Date	Aluminum	Arsenic	Barium	Cadmium	Chromium (Total)	Copper	Iron	Lead	Manganese	Mercury	Selenium	Silver	Zinc	Nitrate-nitrogen	Sulfate	Dissolved Solids	Total Organic Carbon	pH	Temperature (degrees Celsius)	Conductivity (µmhos/cm)	Turbidity (NTUs)	Oxidation-Reduction Potential (mV)	Dissolved Oxygen
NC 2L Ground Water Standard		3.5 [1]	0.010	0.700	0.002	0.010	1.0	0.300	0.015	0.050	0.001	0.020	0.020	1.00	10.0	250	500	NE	6.5 - 8.5	NE	NE	NE	NE	NE
Solid Waste Section Limit		NE	0.010	0.100	0.001	0.010	0.010	0.300	0.010	0.050	0.0002	0.010	0.010	0.010	10.0	250	NE	NE	NE	NE	NE	NE	NE	NE
NC 2B Surface Water Standard		0.087	0.050	1.0 [2]	0.002	0.050	0.007	1.0	0.025	0.200 [2]	0.000012	0.005	0.00006	0.05	10.0 [2]	250 [2]	500 [2]	NE	6.0 - 9.0	NE	NE	50	NE	>5.0
W-9	1/5/11	--	--	0.027	<0.0001	<0.0050	--	**0.440**	<0.010	0.032	--	<0.010	--	--	--	16	150	--	8.4	15.9	274	119	22	<0.01
	4/20/11	0.083	<0.001	0.039	<0.0001	<0.005	<0.001	0.170	<0.001	0.023	<0.0001	<0.001	<0.001	<0.010	0.042	10	130	<1.0	8.8	16.8	286	121	-10	0.45
	9/26/12	0.116	<0.0027	**0.102**	<0.050	0.010	<0.0020	0.108	<0.0040	0.010	<0.00010	<0.005	<0.0025	<0.0050	<0.02	8.8	149	--	11.0	16.3	350	7.9	12	<0.01
	4/19/13	0.281	<0.01	**0.115**	<0.001	0.009	<0.005	0.157	<0.005	0.008	<0.0002	<0.01	<0.005	<0.01	<0.02	9.3	155	2.40	9.6	16.5	286	9.7	-455	0.22
	9/10/13	0.114	<0.01	0.094	<0.001	<0.005	<0.005	0.069	<0.005	<0.005	<0.0002	<0.01	<0.005	<0.01	<0.02	9.1	169	2.41	10.5	16.5	272	4.0	-73	0.27
PW-1 Open Borehole 21'-326'	4/29/88	0.152	<0.011	0.059	**0.008**	<0.016	**0.057**	0.057	<0.024	**0.314**	<0.00020	<0.005	<0.014	**0.576**	1.52	37	500	1.28	6.9	--	--	--	--	--
	7/13/89	--	<0.010	0.100	<0.008	--	<0.020	--	<0.100	--	<0.00020	<0.005	<0.006	--	--	--	--	--	--	--	--	--	--	--
	9/6/90	--	<0.010	0.090	<0.0010	<0.010	--	--	0.0099	--	<0.00020	<0.005	<0.005	--	--	--	--	--	6.8	--	--	--	--	--
	10/23/91	0.130	<0.010	<0.080	<0.002		<0.020	**0.620**	<0.005	**1.23**	<0.00020	<0.005	<0.010	**3.31**	0.050	**460**	**850**	8.0	6.4	15.1	1,247	--	--	--
	8/10/09	--	--	0.035	<0.0010	<0.005	--	**4.80**	<0.005	**1.80**	--	<0.020	--	--	--	**680**	--	--	7.0	15.3	2,860	32	13	<0.01
Packer interval - 95'-115'	5/14/10	<0.100	<0.010	0.034	<0.0010	<0.005	<0.010	**2.90**	<0.005	**2.00**	<0.00020	<0.020	<0.005	**0.560**	--	**800**	**1,900**	--	6.8	15.0	2,430	217	-20	14.9
Packer interval - 180'-200'	5/14/10	<0.100	<0.010	0.044	<0.0010	<0.005	<0.010	**6.30**	0.0094	**2.40**	<0.00020	<0.020	<0.005	**21.0**	--	**940**	**2,100**	--	6.8	16.1	2,570	166	-50	13.2
Packer interval - 250'-270'	5/13/10	<0.100	<0.010	0.046	<0.0010	<0.005	<0.010	**6.80**	<0.005	**2.50**	<0.00020	<0.020	<0.005	**5.10**	--	**1,000**	**2,100**	--	6.7	16.5	2,580	215	-54	13.5
Packer interval - 300'-326'	5/13/10	Dry, no sample collected			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Open borehole - 21'-326'	4/21/11	0.280	**0.011**	0.046	<0.0001	<0.005	<0.001	**4.40**	<0.001	**3.00**	<0.0001	**0.054**	<0.001	<0.010	<0.020	**920**	**2,000**	2.1	6.2	16.6	2,250	<1	24	0.60
	9/26/12	1.06	<0.0027	0.052	<0.050	<0.0020	<0.0020	**4.28**	<0.0040	**2.78**	<0.00010	<0.005	<0.0025	**0.0135**	0.450	**1,190**	**2,980**	--	6.8	15.9	2,890	8.7	2.0	<0.01
	4/18/13	1.08	<0.01	0.055	<0.001	<0.005	<0.005	**3.83**	<0.005	**2.70**	<0.0002	<0.01	<0.005	**0.0101**	0.630	**1,080**	**1,940**	14.2	6.2	16.2	2,401	3.0	-453	0.60
	9/10/13	1.01	<0.01	0.052	<0.001	<0.005	<0.005	**5.68**	<0.005	**2.99**	<0.0002	<0.01	<0.005	**0.0188**	<0.02	**1,150**	**2,240**	20.5	6.2	17.7	2,191	5.2	44	0.40
PZ-1	1/4/11	--	--	0.081	<0.0001	<0.0050	--	**1.60**	<0.010	**0.078**	--	<0.010	--	--	--	98	180	--	Not measured - insufficient sample volume due to limited recharge					
	4/20/11	0.040	<0.001	0.063	<0.0001	<0.005	0.0019	**2.70**	0.0016	**0.110**	<0.0001	<0.001	<0.001	<0.010	0.110	30	100	4.2	Not measured - insufficient sample volume due to limited recharge					
	9/25/12	<0.050	<0.0027	0.0997	<0.050	<0.0020	<0.0020	0.138	<0.0040	**0.119**	<0.00010	<0.005	<0.0025	<0.0050	1.90	**319**	**806**	--	Not measured - insufficient sample volume due to limited recharge					
	4/17/13	0.182	<0.01	0.0643	<0.001	<0.005	<0.005	0.200	<0.005	**0.056**	<0.0002	<0.01	<0.005	<0.01	0.24	96	217	5.0	Not measured - insufficient sample volume due to limited recharge					
	9/10/13	<0.1	<0.01	0.0827	<0.001	<0.005	<0.005	0.072	<0.005	0.018	<0.0002	<0.01	<0.005	<0.01	1.58	179	485	6.5	Not measured - insufficient sample volume due to limited recharge					
PZ-2	1/4/11	--	--	**0.120**	<0.0001	<0.0050	--	**0.770**	<0.010	**0.410**	--	<0.010	--	--	--	180	360	--	Not measured - insufficient sample volume due to limited recharge					
	4/20/11	**4.20**	<0.001	0.0099	<0.0001	0.0069	0.0027	**7.40**	0.0034	**0.410**	0.00014	<0.001	<0.001	<0.010	0.100	82	250	6.7	Not measured - insufficient sample volume due to limited recharge					
	9/25/12	<0.050	<0.0027	**0.113**	<0.050	<0.0020	<0.0020	0.106	<0.0040	0.0389	<0.00010	<0.005	<0.0025	<0.0050	2.0	**306**	**767**	--	Not measured - insufficient sample volume due to limited recharge					
	4/17/13	0.222	<0.01	0.064	<0.001	<0.005	<0.005	0.247	<0.005	0.0284	<0.0002	<0.01	<0.005	<0.01	0.2	98	197	4.6	Not measured - insufficient sample volume due to limited recharge					
	9/10/13	<0.1	<0.01	0.084	<0.001	<0.005	<0.005	0.084	<0.005	0.0138	<0.0002	<0.01	<0.005	<0.01	1.7	169	455	6.3	Not measured - insufficient sample volume due to limited recharge					
PZ-3	1/5/11	--	--	**0.140**	<0.0001	0.0094	--	**14.0**	<0.010	**1.70**	--	<0.010	--	--	--	24	140	--	Not measured - insufficient sample volume due to limited recharge					
	4/21/11	<0.04	<0.001	0.055	<0.0001	<0.005	<0.001	**6.70**	<0.001	**0.560**	<0.0001	<0.001	<0.001	<0.010	0.049	25	100	3.0	Not measured - insufficient sample volume due to limited recharge					
	9/25/12	Could not be located, no sample collected				--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	4/17/13	0.914	<0.01	0.056	<0.001	<0.005	<0.005	**1.09**	<0.005	0.010	<0.0002	<0.01	<0.005	<0.01	<0.02	30.5	87	3.2	Not measured - insufficient sample volume due to limited recharge					
	9/9/13	<0.1	<0.01	0.069	<0.001	<0.005	<0.005	0.18	<0.005	0.007	<0.0002	<0.01	<0.005	<0.01	0.068	45.2	158	13.3	Not measured - insufficient sample volume due to limited recharge					
PZ-4	1/5/11	--	--	**0.170**	<0.0001	**0.012**	--	**10.0**	<0.010	**0.089**	--	<0.010	--	--	--	46	190	--	Not measured - insufficient sample volume due to limited recharge					
	4/21/11	0.170	<0.001	0.058	<0.0001	<0.005	<0.001	**0.450**	<0.001	0.015	<0.0001	<0.001	<0.001	<0.010	0.052	24	<10	2.3	Not measured - insufficient sample volume due to limited recharge					
	9/25/12	0.168	<0.0027	0.082	<0.050	<0.0020	<0.0020	0.285	<0.0040	0.0405	<0.00010	<0.005	<0.0025	<0.0050	<0.02	58.4	181	--	Not measured - insufficient sample volume due to limited recharge					
	4/17/13	0.889	<0.01	0.054	<0.001	<0.005	<0.005	**1.050**	<0.005	0.0124	<0.0002	<0.01	<0.005	<0.01	<0.02	30	89	3.3	Not measured - insufficient sample volume due to limited recharge					
	9/9/13	0.155	<0.01	0.062	<0.001	<0.005	<0.005	**0.307**	<0.005	0.0158	<0.0002	<0.01	<0.005	<0.01	0.054	31.5	131	3.5	Not measured - insufficient sample volume due to limited recharge					
PZ-5	1/5/11	--	--	0.092	<0.0001	<0.0050	--	**1.30**	<0.010	**1.30**	--	<0.010	--	--	--	130	**510**	--	Not measured - insufficient sample volume due to limited recharge					
	4/21/11	**5.30**	<0.001	0.081	<0.0001	0.010	**0.014**	**13.0**	0.0029	**0.710**	<0.0001	0.0022	<0.001	**0.020**	0.060	85	230	11.0	Not measured - insufficient sample volume due to limited recharge					
	9/25/12	Dry, no sample collected			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	4/17/13	Dry, no sample collected			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	9/9/13	Dry, no sample collected			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

All concentrations in milligrams per liter

NE - Not established

-- - Not sampled

[1] - No 2L standard established. NCDWM SWS Groundwater Protection presented

[2] - No freshwater aquatic life standard established. Water Supply criteria presented

Bold indicates exceedance of Solid Waste Section Limits (SWSL)

Gray background indicates exceedance of NC Ground Water Standard

APPENDIX A2
SURFACE WATER ANALYTICAL RESULTS SUMMARY
EDWARDS ROAD LANDFILL - PERMIT 34-05
RURAL HALL, NORTH CAROLINA

Sample Location / ID	Date	Aluminum	Arsenic	Barium	Cadmium	Chromium (Total)	Copper	Iron	Lead	Manganese	Mercury	Selenium	Silver	Zinc	Nitrate-nitrogen	Sulfate	Dissolved Solids	Total Organic Carbon	pH	Temperature (degrees Celsius)	Conductivity (µmhos/cm)	Turbidity (NTUs)	Oxidation-Reduction Potential (mV)	Dissolved Oxygen
NC 2L Ground Water Standard		3.5 [1]	0.010	0.70	0.0020	0.010	1.00	0.300	0.015	0.050	0.00100	0.020	0.020	1.00	10	250	500	NE	6.5 - 8.5	NE	NE	NE	NE	NE
Solid Waste Section Limit		NE	0.010	0.10	0.0010	0.010	0.010	0.300	0.010	0.050	0.00020	0.010	0.010	0.010	10	250	NE	NE	NE	NE	NE	NE	NE	NE
NC 2B Surface Water Standard		0.087	0.050	1.00 [2]	0.0020	0.050	0.007	1.000	0.025	0.200 [2]	0.000012	0.005	0.00006	0.050	10 [2]	250 [2]	500 [2]	NE	6.0 - 9.0	NE	NE	50	NE	>5.0
SS-01	4/29/88	<0.152	<0.010	**0.118**	**0.0080**	<0.016	<0.019	0.086	<0.024	<0.014	<0.00020	<0.005	<0.014	**0.015**	0.22	64.0	220	2.81	6.8	--	--	--	--	--
	7/13/89	--	<0.010	0.100	<0.002	<0.020	--	--	<0.005	--	<0.00020	<0.010	<0.010	--	--	--	--	--	--	--	--	--	--	--
	9/6/90	--	<0.010	0.064	<0.001	--	--	--	<0.0025	--	<0.00020	<0.005	<0.005	--	--	--	--	--	7.9	--	--	--	--	--
(RHSS-001)	9/21/90	**0.140**	<0.010	<0.080	**0.0048**	<0.040	<0.020	0.200	<0.005	<0.020	<0.00020	<0.005	<0.010	<0.020	0.52	40.0	352	12.0	7.2	11.6	490	--	--	--
Surface Water - Upstream	10/23/91	**0.109**	<0.010	<0.080	<0.002	<0.020	<0.020	<0.100	<0.005	<0.020	<0.00020	<0.005	<0.010	<0.020	0.15	108	248	12.0	7.9	17.2	381	--	--	--
	3/25/92	**4.15**	<0.010	<0.080	**0.0034**	<0.020	<0.020	**5.00**	**0.0158**	**0.064**	<0.00020	<0.005	<0.010	<0.020	0.25	9.4	185	14.0	5.8	11.3	126	--	--	--
	9/29/92	<0.100	<0.010	<0.100	<0.002	<0.040	<0.020	0.160	<0.005	**0.085**	<0.00020	<0.005	<0.010	<0.020	0.19	84.0	241	2.0	5.7	13.8	356	--	--	--
	3/31/93	<0.200	<0.010	<0.100	<0.002	<0.020	<0.020	**0.400**	<0.005	**0.077**	<0.00020	<0.005	<0.010	**0.029**	1.34	70.4	127	2.0	5.9	13.0	207	--	--	--
	9/17/93	**0.240**	<0.010	<0.125	<0.002	<0.020	<0.020	**0.598**	<0.005	0.028	<0.00020	<0.005	<0.010	<0.020	0.45	77.4	251	3.0	7.1	20.9	360	--	--	--
	3/30/94	**0.220**	<0.010	<0.120	<0.002	<0.020	<0.020	**0.873**	<0.005	0.030	<0.00020	<0.005	<0.010	<0.020	0.25	30.6	108	5.0	5.9	14.0	380	--	--	--
	9/30/94	**1.30**	<0.010	<0.250	<0.002	<0.020	<0.020	**1.69**	0.006	**0.084**	<0.00020	<0.005	<0.010	<0.020	0.43	64.8	255	30.0	7.1	19.1	332	--	--	--
	3/31/95	**3.58**	<0.010	<0.250	<0.002	<0.020	<0.020	**2.44**	<0.005	**0.106**	<0.00020	<0.005	<0.010	**0.246**	0.19	48.9	211	<5.0	7.8	13.9	290	--	--	--
	9/29/95	**0.200**	<0.010	<0.250	<0.002	<0.020	<0.020	**0.358**	0.007	0.038	<0.00020	<0.005	<0.010	<0.020	0.50	70.0	264	3.74	5.2	13.9	458	--	--	--
	3/30/96	**0.279**	<0.010	<0.250	<0.002	<0.020	<0.020	**0.547**	<0.005	0.014	<0.00020	<0.005	<0.010	<0.020	0.19	31.3	129	1.79	6.7	11.0	193	--	--	--
	9/27/96	**0.125**	<0.010	<0.250	<0.002	<0.020	<0.020	0.300	0.005	0.021	<0.00020	<0.005	<0.010	**0.095**	0.29	56.1	225	2.36	7.7	19.0	336	--	--	--
	3/29/97	**0.307**	<0.010	<0.250	<0.002	<0.020	<0.020	**0.552**	<0.005	0.016	<0.00020	<0.005	<0.010	**0.013**	0.225	30.0	138	3.04	7.6	16.0	94	--	--	--
	9/17/97	**0.476**	<0.010	<0.250	<0.002	<0.020	<0.020	**0.835**	<0.005	0.040	<0.00020	<0.005	<0.010	**0.169**	0.625	47.4	224	1.67	7.9	19.0	319	--	--	--
	3/27/98	**0.190**	<0.010	<0.250	<0.002	<0.020	<0.020	**0.685**	<0.005	0.012	<0.00020	<0.010	<0.010	**0.061**	0.68	38.7	163	5.23	7.6	18.6	473	--	--	--
	9/30/98	**0.126**	<0.010	<0.250	<0.002	<0.020	<0.020	**0.540**	0.006	0.033	<0.00020	<0.010	<0.010	<0.020	0.30	28.0	177	4.09	7.2	18.0	322	--	--	--
	3/31/99	**0.239**	<0.010	<0.250	<0.002	<0.020	<0.020	**0.332**	<0.005	0.044	<0.00020	<0.010	<0.010	<0.020	0.12	63.2	191	2.49	7.1	16.0	247	--	--	--
	9/29/99	**1.53**	<0.010	<0.250	<0.002	<0.020	<0.020	**3.33**	0.005	**0.088**	<0.00020	<0.010	<0.010	<0.020	0.09	23.2	143	8.81	7.8	16.0	308	--	--	--
	9/15/00	**0.327**	<0.010	<0.250	<0.002	<0.020	<0.020	0.166	<0.005	0.038	<0.00020	<0.010	<0.010	<0.020	0.16	26.1	157	5.08	7.3	19.0	410	--	--	--
	3/16/00	**0.117**	<0.010	<0.250	<0.002	<0.020	<0.020	**1.94**	<0.005	**0.922**	<0.00020	<0.010	<0.010	<0.020	0.199	50.9	202	3.78	--	--	--	--	--	--
	3/23/01	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	0.158	<0.005	0.010	<0.00020	<0.010	<0.010	<0.020	<0.050	26.1	113	2.81	6.9	16.0	150	--	--	--
	10/4/01	**0.116**	<0.010	<0.250	<0.002	<0.020	<0.020	<0.100	<0.005	0.029	<0.00020	<0.010	<0.010	<0.020	0.30	99.0	343	5.30	7.4	19.0	440	--	--	--
	3/28/02	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	0.201	<0.005	0.010	--	<0.010	<0.010	**0.027**	0.32	41.9	177	3.18	7.0	11.0	400	--	--	--
	10/3/02	**0.317**	<0.010	<0.250	<0.002	<0.020	<0.020	**0.767**	<0.005	**0.052**	<0.00020	<0.010	<0.010	<0.020	0.75	73.3	300	3.07		19.0	330	--	--	--
	3/25/03	**0.673**	<0.010	<0.250	<0.002	<0.020	<0.020	**0.607**	<0.005	0.024	<0.00020	<0.010	<0.010	<0.020	0.115	31.6	119	2.08	6.9	18.0	440	--	--	--
	10/2/03	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	**0.705**	<0.005	**0.072**	<0.00020	<0.010	<0.010	<0.020	0.446	29.4	181	2.38	6.3	15.0	249	--	--	--
	4/28/04	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	0.179	<0.005	**0.080**	<0.00020	<0.010	<0.010	<0.020	0.374	70.4	176	2.06	--	11.7	281	--	--	--
	10/26/04	**0.145**	<0.010	<0.250	<0.002	<0.020	<0.020	0.132	<0.005	0.036	<0.00020	<0.010	<0.010	<0.020	0.209	58.8	217	2.62	--	--	397	--	--	--
	4/27/05	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	0.105	<0.005	0.011	<0.00020	<0.010	<0.010	<0.020	0.149	41.4	174	2.15	--	--	294	--	--	--
	10/20/05	**0.347**	<0.010	<0.250	<0.002	<0.020	**0.084**	**0.453**	<0.005	0.015	<0.00020	<0.010	<0.010	**0.055**	0.288	47.6	213	9.50	--	--	232	--	--	--
	10/19/06	**0.937**	<0.010	<0.250	<0.002	<0.020	<0.020	**1.63**	<0.005	**0.130**	<0.00020	<0.010	<0.010	**0.022**	0.226	59.2	168	2.97	--	--	423	--	--	--
	4/27/07	**0.446**	<0.010	<0.250	<0.002	<0.020	<0.020	**1.24**	<0.005	0.018	<0.00020	<0.010	<0.010	<0.020	0.188	27.4	128	3.60	--	--	209	--	--	--
	11/19/07	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	0.104	<0.005	0.011	<0.00020	<0.010	<0.010	<0.020	0.117	61.5	243	3.54	--	--	371	--	--	--
	4/30/08	**0.170**	<0.010	<0.250	<0.002	<0.020	<0.020	0.242	<0.005	0.021	<0.00020	<0.010	<0.010	<0.020	0.238	56.3	171	2.69	--	--	260	--	--	--
	10/29/08	<0.100	<0.010	0.0564	0.0003	<0.010	0.003	0.0206	<0.010	0.006	**0.00005**	<0.010	<0.010	**0.0509**	0.229	76.3	254	2.87	--	--	392	--	--	--
	4/30/09	<0.100	<0.010	0.0648	<0.001	<0.010	<0.010	0.0778	0.0054	0.008	<0.0002	**0.0099**	<0.010	**0.0159**	0.302	52.3	211	4.47	--	--	325	--	--	--
	8/26/09	--	--	0.072	<0.001	<0.005	--	0.160	<0.005	0.014	--	<0.020	--	--	--	45.0	--	--	8.1	22.0	1,490	10.0	94	9.1
	10/12/09	**0.089**	0.0027	0.063	<0.001	0.0008	0.0011	0.086	<0.005	0.007	<0.0002	<0.020	<0.005	<0.30	0.370	49.0	240	8.60	7.8	13.1	2,380	8.9	160	12.7
	4/19/10	**0.190**	<0.010	0.064	<0.001	<0.005	<0.010	0.240	<0.005	0.012	<0.0002	<0.020	<0.005	<0.030	0.400	33.0	190	4.90	8.1	12.0	557	**63.1**	199	10.7
	10/11/10	0.052	0.0011	0.071	<0.001	0.0016	<0.025	0.160	<0.005	0.016	<0.0002	<0.005	<0.005	**0.036**	0.640	40.0	240	3.30	7.8	16.5	455	8.0	107	12.8
	4/20/11	0.062	<0.001	0.066	<0.0001	<0.005	<0.001	0.280	<0.001	0.013	<0.0001	<0.001	<0.001	<0.010	0.300	30.0	140	3.40	7.6	18.0	270	4.0	211	9.7
	10/18/11	**0.153**	<0.005	0.0767	<0.001	<0.005	<0.005	0.190	<0.005	0.0096	<0.00020	<0.010	<0.005	<0.010	0.250	39.2	210	5.70	7.5	16.9	289	8.3	236	9.6

APPENDIX A2
SURFACE WATER ANALYTICAL RESULTS SUMMARY
EDWARDS ROAD LANDFILL - PERMIT 34-05
RURAL HALL, NORTH CAROLINA

Sample Location / ID	Date	Aluminum	Arsenic	Barium	Cadmium	Chromium (Total)	Copper	Iron	Lead	Manganese	Mercury	Selenium	Silver	Zinc	Nitrate-nitrogen	Sulfate	Dissolved Solids	Total Organic Carbon	pH	Temperature (degrees Celsius)	Conductivity (µmhos/cm)	Turbidity (NTUs)	Oxidation-Reduction Potential (mV)	Dissolved Oxygen
NC 2L Ground Water Standard		3.5 [1]	0.010	0.70	0.0020	0.010	1.00	0.300	0.015	0.050	0.00100	0.020	0.020	1.00	10	250	500	NE	6.5 - 8.5	NE	NE	NE	NE	NE
Solid Waste Section Limit		NE	0.010	0.10	0.0010	0.010	0.010	0.300	0.010	0.050	0.00020	0.010	0.010	0.010	10	250	NE	NE	NE	NE	NE	NE	NE	NE
NC 2B Surface Water Standard		0.087	0.050	1.00 [2]	0.0020	0.050	0.007	1.000	0.025	0.200 [2]	0.000012	0.005	0.00006	0.050	10 [2]	250 [2]	500 [2]	NE	6.0 - 9.0	NE	NE	50	NE	>5.0
SS-01 (continued)	3/16/12	**0.170**	<0.005	0.0825	<0.001	<0.005	<0.005	0.238	<0.005	0.011	<0.0002	<0.010	<0.005	<0.010	<0.20	37.4	221	4.80	7.8	15.7	359	2.5	-27	11.3
	9/24/12	**0.147**	<0.0027	0.0941	<0.050	<0.0020	<0.0020	0.146	<0.0040	0.0102	<0.00010	<0.005	<0.0025	<0.0050	0.450	47.7	257	--	7.7	15.7	589	21.3	153	8.7
	4/17/13	**0.366**	<0.01	0.0735	<0.001	<0.005	<0.005	**0.492**	<0.005	0.0124	<0.0002	<0.01	<0.005	<0.01	0.140	29.0	131	4.4	8.0	20.9	297	4.9	76	6.9
	9/9/13	**0.179**	<0.01	0.0871	<0.001	<0.005	<0.005	0.240	<0.005	0.0181	<0.0002	<0.01	<0.005	<0.01	0.470	41.7	203	7.21	8.4	20.6	347	5.4	-173	9.4
SS-02	9/21/90	**0.13**	<0.010	0.094	**0.0046**	<0.020	<0.020	0.100	<0.005	--	<0.00020	<0.010	<0.010	<0.020	1.14	47.0	141	15.00	7.5	14.6	607	--	--	--
	10/23/91	--	<0.010	**0.170**	<0.002	<0.020	<0.020	**0.820**	<0.005	**0.711**	<0.00020	<0.010	<0.010	**0.080**	1.02	**490**	**806**	10.00	7.8	18.0	1,280	--	--	--
	3/26/92	**7.65**	<0.010	<0.250	**0.0021**	<0.020	<0.020	**8.07**	**0.0129**	**0.130**	<0.00020	<0.010	<0.010	<0.020	0.25	13.10	149	12.00	6.0	11.5	111	--	--	--
	9/30/92	**0.33**	<0.010	<0.250	<0.002	<0.020	<0.020	--	<0.005	--	<0.00020	**0.0073**	<0.010	<0.020	0.55	183	474	3.00	6.1	15.1	778	--	--	--
RHSS-002	3/31/93	**0.208**	<0.010	<0.250	<0.002	<0.020	<0.020	**0.675**	<0.005	**0.327**	<0.00020	<0.010	<0.010	<0.020	0.35	70.4	185	4.00	5.8	14.1	341	--	--	--
Surface Water - Downstream	9/17/93	**0.47**	<0.010	<0.250	<0.002	<0.020	<0.020	**1.27**	<0.005	**0.722**	<0.00020	<0.010	<0.010	<0.020	2.30	154	**523**	4.00	7.5	22.2	754	--	--	--
	3/30/94	**0.22**	<0.010	<0.250	<0.002	**0.032**	<0.020	**1.12**	<0.005	**0.117**	<0.00020	<0.010	<0.010	**0.165**	0.32	40.0	143	--	6.0	14.4	692	--	--	--
	9/30/94	**0.12**	<0.010	<0.250	<0.002	<0.020	**0.028**	**0.470**	<0.005	**0.356**	<0.00020	<0.010	<0.010	**0.024**	0.325	135	397	37.9	7.4	18.6	573	--	--	--
	3/31/95	**0.165**	<0.010	<0.250	<0.002	<0.020	<0.020	**0.526**	<0.005	**0.332**	<0.00020	<0.010	<0.010	**0.041**	0.75	102	342	--	7.9	14.5	496	--	--	--
	9/29/95	**0.406**	<0.010	<0.250	<0.002	<0.020	<0.020	**1.02**	0.006	**0.598**	<0.00020	<0.010	<0.010	<0.020	1.03	155	**505**	2.68	5.6	13.5	1,095	--	--	--
	3/30/96	**0.426**	<0.010	<0.250	<0.002	<0.020	<0.020	**0.787**	<0.005	**0.250**	<0.00020	<0.010	<0.010	<0.020	0.19	30.6	198	2.99	6.5	12.0	282	--	--	--
	9/27/96	0.061	<0.010	<0.250	<0.002	<0.020	<0.020	0.227	0.010	**0.262**	<0.00020	<0.010	<0.010	**0.047**	0.75	147	409	3.19	7.6	20.0	613	--	--	--
	3/29/97	**0.209**	<0.010	<0.250	<0.002	<0.020	<0.020	**0.644**	<0.005	**0.246**	<0.00020	<0.010	<0.010	0.010	0.45	72.8	255	2.47	7.8	16.0	224	--	--	--
	9/17/97	**0.165**	<0.010	<0.250	<0.002	<0.020	<0.020	**0.428**	0.006	**0.333**	<0.00020	<0.005	<0.010	**0.153**	2.21	160	**562**	2.43	7.8	18.0	826	--	--	--
	3/27/98	**0.220**	<0.010	<0.250	<0.002	<0.020	<0.020	**0.960**	<0.005	**0.363**	<0.00020	<0.010	<0.010	**0.032**	0.55	94.2	324	3.96	7.8	17.5	724	--	--	--
	9/30/98	**0.100**	<0.010	<0.250	<0.002	<0.020	<0.020	**0.595**	<0.005	**0.351**	<0.00020	<0.010	<0.010	<0.020	1.55	89.2	444	6.85	7.4	19.0	368	--	--	--
	3/31/99	**0.129**	<0.010	<0.250	<0.002	<0.020	<0.020	**0.947**	<0.005	**0.587**	<0.00020	<0.010	<0.010	<0.020	1.55	204	420	3.26	7.4	17.0	340	--	--	--
	9/29/99	**1.38**	<0.010	<0.250	<0.002	<0.020	<0.020	**3.03**	<0.005	**0.147**	<0.00020	<0.010	<0.010	**0.021**	0.16	45.7	173	8.10	7.6	17.0	623	--	--	--
	9/15/00	**0.283**	<0.010	<0.250	<0.002	<0.020	<0.020	0.225	<0.005	**0.416**	<0.00020	<0.010	<0.010	<0.020	1.24	170	439	6.58	7.4	20.0	640	--	--	--
	3/16/00	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	**0.960**	<0.005	**0.464**	<0.00020	<0.010	<0.010	<0.020	1.18	175	500	3.75	--	--	--	--	--	--
	3/23/01	**0.108**	<0.010	<0.250	<0.002	<0.020	<0.020	0.260	0.007	**0.135**	<0.00020	<0.010	<0.010	**0.034**	0.103	71.9	224	3.08	6.6	16.0	170	--	--	--
	10/4/01	**0.166**	<0.010	<0.250	<0.002	<0.020	<0.020	**0.746**	0.008	**0.910**	<0.00020	<0.010	<0.010	<0.020	6.32	**421**	**1,250**	27.0	7.2	19.0	680	--	--	--
	3/28/02	**0.121**	<0.010	<0.250	<0.002	<0.020	<0.020	**0.502**	<0.005	**0.206**	--	<0.010	<0.010	<0.020	0.32	127	405	2.97	7.4	11.0	510	--	--	--
	10/3/02	**0.220**	<0.010	<0.250	<0.002	<0.020	<0.020	**0.494**	<0.005	**0.549**	<0.00020	<0.010	<0.010	<0.020	1.11	**266**	**517**	4.28	5.8	18.0	130	--	--	--
	3/25/03	**1.57**	<0.010	<0.250	<0.002	<0.020	<0.020	**1.28**	0.006	**0.264**	<0.00020	<0.010	<0.010	**0.024**	0.162	90.3	234	1.91	6.0	18.0	1,260	--	--	--
duplicate	3/25/03	**1.75**	<0.010	<0.250	<0.002	<0.020	<0.020	**1.32**	<0.005	**0.265**	<0.00020	<0.010	<0.010	**0.024**	0.194	94.6	235	2.00	6.0	18.0	1,260	--	--	--
	10/2/03	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	**1.01**	<0.005	**0.546**	<0.00020	<0.010	<0.010	<0.020	0.61	115	395	2.50	6.5	14.0	556	--	--	--
	4/28/04	**0.109**	<0.010	<0.250	<0.002	<0.020	<0.020	**0.400**	<0.005	**0.417**	<0.00020	<0.010	<0.010	<0.020	0.608	220	394	2.26	--	12.7	623	--	--	--
	10/26/04	**0.216**	<0.010	<0.250	<0.002	<0.020	<0.020	**0.839**	<0.005	**0.582**	<0.00020	<0.010	<0.010	<0.020	2.00	**276**	**554**	3.06	--	--	807	--	--	--
	4/27/05	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	**0.356**	<0.005	**0.272**	<0.00020	<0.010	<0.010	<0.020	0.648	37.6	460	2.48	--	--	737	--	--	--
	10/20/05	<0.100	<0.010	<0.250	<0.002	<0.020	**0.072**	**1.12**	<0.005	**0.330**	<0.00020	<0.010	<0.010	**0.048**	0.546	240	**571**	3.40	--	--	419	--	--	--
	10/19/06	**0.530**	<0.010	<0.250	<0.002	<0.020	<0.020	**1.06**	<0.005	**0.534**	<0.00020	<0.010	<0.010	**0.032**	0.299	204	422	3.49	--	--	550	--	--	--
	4/27/07	**0.389**	<0.010	<0.250	<0.002	<0.020	<0.020	**0.811**	<0.005	**0.488**	<0.00020	<0.010	<0.010	<0.020	0.333	**439**	303	4.42	--	--	511	--	--	--
	11/19/07	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	0.136	<0.005	**0.308**	<0.00020	<0.010	<0.010	**0.023**	0.258	**300**	**647**	3.54	--	--	908	--	--	--
	4/30/08	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	0.278	<0.005	**0.254**	<0.00020	<0.010	<0.010	**0.046**	0.285	159	371	2.74	--	--	569	--	--	--
	10/29/08	<0.100	<0.010	0.0563	0.00024	<0.010	<0.010	0.128	<0.010	**0.318**	<0.00020	<0.010	<0.010	**0.0142**	0.407	**342**	**708**	3.43	--	--	1,070	--	--	--
	4/30/09	<0.100	<0.010	0.0608	<0.001	<0.010	<0.010	0.0894	<0.010	**0.222**	<0.0002	<0.010	<0.010	**0.0192**	0.499	201	**518**	3.39	--	--	821	--	--	--
	8/26/09	--	--	0.071	<0.001	<0.005	--	0.110	<0.005	**0.220**	--	<0.020	--	--	--	**310**	--	--	7.8	21.6	2,120	6.4	101	6.4
	10/12/09	0.043	0.0051	0.060	<0.001	0.0008	<0.010	0.045	<0.005	0.048	<0.0002	<0.020	<0.005	<0.30	0.320	210	**510**	10.3	7.8	13.3	3,360	8.7	123	13.0
	4/19/10	<0.10	<0.010	0.064	<0.001	<0.005	<0.010	0.260	<0.005	**0.260**	<0.0002	<0.020	<0.005	<0.030	0.420	150	390	6.30	7.6	10.6	632	**60.1**	181	10.2

APPENDIX A2
SURFACE WATER ANALYTICAL RESULTS SUMMARY
EDWARDS ROAD LANDFILL - PERMIT 34-05
RURAL HALL, NORTH CAROLINA

Sample Location / ID	Date	Aluminum	Arsenic	Barium	Cadmium	Chromium (Total)	Copper	Iron	Lead	Manganese	Mercury	Selenium	Silver	Zinc	Nitrate-nitrogen	Sulfate	Dissolved Solids	Total Organic Carbon	pH	Temperature (degrees Celsius)	Conductivity (µmhos/cm)	Turbidity (NTUs)	Oxidation-Reduction Potential (mV)	Dissolved Oxygen
NC 2L Ground Water Standard		3.5 [1]	0.010	0.70	0.0020	0.010	1.00	0.300	0.015	0.050	0.00100	0.020	0.020	1.00	10	250	500	NE	6.5 - 8.5	NE	NE	NE	NE	NE
Solid Waste Section Limit		NE	0.010	0.10	0.0010	0.010	0.010	0.300	0.010	0.050	0.00020	0.010	0.010	0.010	10	250	NE	NE	NE	NE	NE	NE	NE	NE
NC 2B Surface Water Standard		0.087	0.050	1.00 [2]	0.0020	0.050	0.007	1.000	0.025	0.200 [2]	0.000012	0.005	0.00006	0.050	10 [2]	250 [2]	500 [2]	NE	6.0 - 9.0	NE	NE	50	NE	>5.0
SS-02 (continued)	10/11/10	<0.250	0.0011	0.069	<0.001	0.0014	<0.025	0.270	<0.005	**0.310**	<0.0002	**0.0089**	<0.005	0.0064	1.20	250	**660**	4.70	7.6	15.2	999	0.0	113	8.3
	4/20/11	<0.040	<0.001	0.063	<0.0001	<0.005	<0.001	0.270	<0.001	**0.150**	<0.0001	0.004	<0.001	<0.010	0.630	120	360	3.00	7.6	18.6	602	4.2	241	9.7
	10/18/11	<0.100	<0.005	0.0749	<0.001	<0.005	<0.005	0.181	<0.005	**0.266**	<0.00020	<0.010	<0.005	<0.010	0.470	202	**582**	7.30	7.4	17.6	536	4.6	248	9.7
	3/16/12	<0.10	<0.005	0.0718	<0.001	<0.005	<0.005	0.171	<0.005	**0.0658**	<0.0002	<0.010	<0.005	<0.010	1.60	152	**614**	6.30	7.6	15.4	781	3.4	15	11.5
	9/25/12	<0.050	<0.0027	0.0976	<0.050	<0.0020	<0.0020	0.236	<0.0040	**0.301**	<0.00010	<0.005	<0.0025	<0.0050	1.60	**400**	**858**	--	8.5	16.2	1,420	9.7	181	9.1
	4/17/13	**0.194**	<0.01	0.0714	<0.001	<0.005	<0.005	0.242	<0.005	**0.110**	<0.0002	<0.01	<0.005	<0.01	0.21	79	207	5.00	8.1	20.8	382	4.7	79.6	8.0
	9/10/13	<0.1	<0.01	0.0830	<0.001	<0.005	<0.005	0.135	<0.005	**0.102**	<0.0002	<0.01	<0.005	<0.01	1.16	167	493	6.29	8.0	19.8	657	8.2	99.8	7.1
SS-10	8/11/09	--	--	0.065	<0.001	<0.005	--	**12.0**	<0.005	**0.400**	--	<0.020	--	--	--	11.0	--	--	7.1	20.6	1,890	42.9	-40	3.4
SS-15	8/11/09	--	--	0.052	<0.001	<0.005	--	**0.900**	<0.005	0.035	--	<0.020	--	--	--	7.5	--	--	7.8	20.7	1,840	**52.5**	114	9.7
SS-20	8/11/09	--	--	0.058	<0.001	<0.005	--	**0.800**	<0.005	0.046	--	<0.020	--	--	--	8.2	--	--	8.4	23.9	1,112	27.3	58	7.6
	4/21/11	**0.190**	<0.010	0.054	<0.0001	<0.005	<0.001	**0.550**	<0.001	0.017	<0.0001	<0.001	<0.001	<0.010	0.10	4.8	96	1.90	7.7	14.6	87	14.2	128	9.4
	9/24/12	**0.378**	<0.0027	0.0514	<0.050	<0.0020	<0.0020	**1.58**	<0.0040	**0.0511**	<0.00010	<0.005	<0.0025	<0.0050	<0.02	3.6	89	--	7.3	15.6	146	10.3	159	8.6
	4/17/13	**0.788**	<0.01	0.0560	<0.001	<0.005	<0.005	**1.05**	<0.005	0.0198	<0.0002	<0.01	<0.005	<0.01	<0.02	5.6	55	2.80	7.5	19.8	283	7.2	158	8.7
	9/9/13	**0.456**	<0.01	0.0603	<0.001	<0.005	<0.005	**1.17**	<0.005	0.0484	<0.0002	<0.01	<0.005	<0.01	0.274	3.6	78	2.28	7.4	21.7	97	9.7	24.2	8.4
SS-25	8/11/09	--	--	0.060	<0.001	<0.005	--	**0.590**	<0.005	**0.053**	--	<0.020	--	--	--	28.0	--	--	8.4	22.1	1,830	32.1	75	7.6
	4/21/11	**0.150**	<0.010	0.050	<0.0001	<0.005	<0.001	0.047	<0.001	0.008	<0.0001	<0.001	<0.001	<0.010	0.04	5.0	100	1.90	7.6	14.8	89	15.5	128	9.7
	9/24/12	**0.508**	<0.0027	0.0522	<0.050	<0.0020	<0.0020	**1.58**	<0.0040	**0.103**	<0.00010	<0.005	<0.0025	<0.0050	0.02	39.8	156	--	7.2	15.9	257	13.6	145	8.4
	4/17/13	**0.820**	<0.01	0.0549	<0.001	<0.005	<0.005	**1.17**	<0.005	0.033	<0.0002	<0.01	<0.005	<0.01	<0.02	5.8	62	2.90	7.5	19.6	336	6.8	163	8.9
	9/9/13	**0.345**	<0.01	0.0543	<0.001	<0.005	<0.005	**0.81**	<0.005	0.024	<0.0002	<0.01	<0.005	<0.01	0.06	3.7	82	2.59	7.4	20.3	134	5.9	23.7	8.3
SS-30	8/11/09	--	--	0.072	<0.001	<0.005	--	0.150	<0.005	0.025	--	<0.020	--	--	--	95.0	--	--	8.5	22.8	5,250	21.7	57	8.1
	1/5/11	--	--	0.077	<0.0001	<0.005	--	**0.330**	<0.010	**0.13**	--	<0.010	--	--	--	63.0	370	--	8.6	3.9	388	6.9	132	10.4
	4/20/11	<0.040	<0.001	0.067	<0.0001	<0.005	<0.001	0.220	<0.001	**0.089**	<0.0001	<0.001	<0.001	<0.010	0.33	27.0	160	2.80	7.4	17.9	283	3.9	238	9.5
	9/24/12	**0.163**	<0.0027	0.088	<0.050	<0.0020	<0.0020	0.175	<0.0040	0.020	<0.00010	<0.005	<0.0025	<0.0050	0.28	84.7	312	--	7.8	15.4	567	14.9	152	8.8
	4/17/13	**0.352**	<0.01	0.076	<0.001	<0.005	<0.005	**0.455**	<0.005	0.013	<0.0002	<0.01	<0.005	<0.01	0.19	31.0	144	18.20	7.8	21.1	268	8.7	62.1	6.2
	9/9/13	**0.158**	<0.01	0.086	<0.001	<0.005	<0.005	0.237	<0.005	0.019	<0.0002	<0.01	<0.005	<0.01	0.50	45.6	220	4.99	8.1	20.4	318	4.6	17.9	7.1
SS-40	8/26/09	--	--	0.091	<0.001	<0.005	--	0.080	<0.005	0.022	--	<0.020	--	--	--	**300**	--	--	7.8	21.3	2,050	7.1	89	7.9
	4/20/11	0.057	<0.001	0.059	<0.0001	<0.005	<0.001	**0.330**	<0.001	**0.059**	**0.00025**	0.0021	<0.001	<0.010	0.81	110	270	2.90	7.3	17.5	494	4.6	223	10.2
	9/25/12	<0.050	<0.0027	**0.112**	<0.050	<0.0020	<0.0020	0.139	<0.0040	0.039	<0.00010	<0.005	<0.0025	<0.0050	2.0	**297**	**755**	--	8.0	14.8	1,260	9.8	174	9.3
	4/17/13	**0.221**	<0.01	0.061	<0.001	<0.005	<0.005	0.294	<0.005	0.026	<0.0002	<0.01	<0.005	<0.01	0.2	73	195	5.00	8.2	19.9	329	4.9	68.9	6.9
	9/10/13	<0.1	<0.01	0.090	<0.001	<0.005	<0.005	0.093	<0.005	0.016	<0.0002	<0.01	<0.005	**0.0204**	1.4	165	450	6.23	7.9	19.8	610	5.7	87.8	8.4
SS-50	8/11/09	--	--	0.029	<0.001	<0.005	--	**2.90**	<0.005	**0.180**	--	<0.020	--	--	--	5.6	--	--	7.8	25.4	1,180	32.0	-21	8.5
	4/21/11	**0.120**	<0.001	0.036	<0.0001	<0.005	<0.001	**1.10**	<0.001	**0.085**	<0.0001	<0.001	<0.001	<0.010	0.13	3.7	71	2.00	6.9	14.7	85	16.3	92	9.9
	9/25/12	**0.410**	<0.0027	0.0419	<0.050	<0.0020	<0.0020	**1.64**	<0.0040	**0.110**	<0.00010	<0.005	<0.0025	<0.0050	0.14	<2.0	72	--	8.7	17.6	161	9.6	16	8.8
	4/17/13	Dry, no sample collected			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	9/9/13	Dry, no sample collected			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SS-60	8/26/09	--	--	**0.140**	<0.001	<0.005	--	0.280	<0.005	**0.980**	--	<0.020	--	--	--	**350**	--	--	7.1	20.3	4,040	**65.9**	10	6.7
	4/21/11	0.068	<0.001	0.061	<0.0001	<0.005	<0.001	0.240	<0.001	0.011	<0.0001	0.0041	<0.001	<0.010	0.12	130	270	2.70	7.2	15.9	446	14.3	177	8.9
	9/25/12	**0.120**	<0.0027	0.0759	<0.050	<0.0020	<0.0020	**0.312**	<0.0040	**0.085**	<0.00010	<0.005	<0.0025	<0.0050	<0.02	58.1	191	--	8.4	12.5	337	11.7	179	8.8
	4/17/13	**0.534**	<0.01	0.0634	<0.001	<0.005	<0.005	**0.667**	<0.005	0.044	<0.0002	<0.01	<0.005	<0.01	<0.02	164	274	4.20	7.8	20.2	380	8.6	70.6	10.8
	9/10/13	**0.103**	<0.01	**0.1200**	<0.001	<0.005	<0.005	0.116	<0.005	**0.076**	<0.0002	<0.01	<0.005	<0.01	2.12	**275**	**663**	6.15	7.5	21.0	423	8.4	87.6	8.2

APPENDIX A2
SURFACE WATER ANALYTICAL RESULTS SUMMARY
EDWARDS ROAD LANDFILL - PERMIT 34-05
RURAL HALL, NORTH CAROLINA

Sample Location / ID	Date	Aluminum	Arsenic	Barium	Cadmium	Chromium (Total)	Copper	Iron	Lead	Manganese	Mercury	Selenium	Silver	Zinc	Nitrate-nitrogen	Sulfate	Dissolved Solids	Total Organic Carbon	pH	Temperature (degrees Celsius)	Conductivity (µmhos/cm)	Turbidity (NTUs)	Oxidation-Reduction Potential (mV)	Dissolved Oxygen
NC 2L Ground Water Standard		3.5 [1]	0.010	0.70	0.0020	0.010	1.00	0.300	0.015	0.050	0.00100	0.020	0.020	1.00	10	250	500	NE	6.5 - 8.5	NE	NE	NE	NE	NE
Solid Waste Section Limit		NE	0.010	0.10	0.0010	0.010	0.010	0.300	0.010	0.050	0.00020	0.010	0.010	0.010	10	250	NE	NE	NE	NE	NE	NE	NE	NE
NC 2B Surface Water Standard		0.087	0.050	1.00 [2]	0.0020	0.050	0.007	1.000	0.025	0.200 [2]	0.000012	0.005	0.00006	0.050	10 [2]	250 [2]	500 [2]	NE	6.0 - 9.0	NE	NE	50	NE	>5.0
SS-70	8/26/09	--	--	**0.120**	<0.001	<0.005	--	**1.10**	<0.005	**0.250**	--	<0.020	--	--	--	65.0	--	--	6.9	20.6	2,520	6.8	91	6.4
	4/21/11	**0.160**	<0.001	0.050	<0.0001	<0.005	<0.001	**0.380**	<0.001	0.0058	**0.00012**	<0.001	<0.001	<0.010	0.053	23.0	92	2.30	7.0	16.4	138	8.3	189	10.3
	9/25/12	**0.120**	<0.0027	0.082	<0.050	<0.0020	<0.0020	**0.303**	<0.0040	**0.0587**	<0.00010	<0.005	<0.0025	<0.0050	<0.02	61.3	203	--	8.2	12.6	367	10.1	143	8.3
	4/17/13	**0.694**	<0.01	0.051	<0.001	<0.005	<0.005	**0.986**	<0.005	0.0134	<0.0002	<0.01	<0.005	<0.01	<0.02	24.1	89	3.30	8.0	19.3	129	7.3	60.9	7.7
	9/10/13	**0.135**	<0.01	0.059	<0.001	<0.005	<0.005	0.299	<0.005	0.0136	<0.0002	<0.01	<0.005	<0.01	1.39	28.6	123	3.51	7.9	20.9	419	7.6	85.3	8.1
SS-80	8/26/09	--	--	**0.120**	<0.001	<0.005	--	0.250	<0.005	0.025	--	<0.020	--	--	--	82.0	--	--	7.1	20.6	5,190	5.8	100	8.3
	4/21/11	**0.110**	<0.001	0.056	<0.0001	<0.005	<0.001	**0.310**	<0.001	<0.005	<0.0001	<0.001	<0.001	<0.010	0.099	27.0	120	2.10	6.8	15.5	161	6.8	92	10.6
	9/25/12	**0.192**	<0.0027	0.087	<0.050	<0.0020	<0.0020	0.263	<0.0040	0.0159	<0.00010	<0.005	<0.0025	<0.0050	<0.02	74.6	270	--	8.5	11.7	399	4.8	205	9.1
	4/17/13	**0.643**	<0.01	0.053	<0.001	<0.005	<0.005	**0.921**	<0.005	0.0075	<0.0002	<0.01	<0.005	<0.01	<0.02	27.6	88	3.20	7.4	20.1	139	7.6	70.8	7.1
	9/10/13	**0.110**	<0.01	0.072	<0.001	<0.005	<0.005	0.211	<0.005	0.0083	<0.0002	<0.01	<0.005	<0.01	0.265	47.6	152	3.43	7.7	21.6	417	6.9	87.9	7.9
SS-90	1/4/11	--	--	0.044	<0.0001	<0.005	--	**1.20**	<0.010	0.016	--	<0.010	--	--	--	26.0	97	--	8.4	3.0	390	4.2	152	10.6
	4/20/11	0.083	<0.001	0.057	<0.0001	<0.005	<0.001	**0.330**	<0.001	0.021	<0.0001	0.0021	<0.001	<0.010	0.33	56.0	130	2.60	6.7	16.9	292	4.6	293	11.7
	9/25/12	**0.121**	<0.0027	**0.115**	<0.050	<0.0020	<0.0020	0.212	<0.0040	0.0304	<0.00010	<0.005	<0.0025	<0.0050	0.98	202	**511**	--	8.1	11.9	840	12.1	207	9.0
	4/17/13	**0.491**	<0.01	0.056	<0.001	<0.005	<0.005	**0.709**	<0.005	0.0174	<0.0002	<0.01	<0.005	<0.01	0.04	39	127	3.70	7.9	19.7	203	6.9	66	7.6
	9/10/13	**0.148**	<0.01	0.087	<0.001	<0.005	<0.005	0.265	<0.005	0.0324	<0.0002	<0.01	<0.005	<0.01	0.64	121	283	4.92	7.9	22.2	429	7.9	91.6	7.3
RETENTION POND MW-001	9/30/94	**2.58**	**0.016**	<0.250	<0.002	<0.020	**0.044**	**23.2**	<0.005	**6.49**	<0.00020	<0.010	<0.010	**0.035**	2.95	**787**	**2,230**	258	7.4	22.5	3,140	--	--	--
	3/31/95	**0.660**	<0.010	<0.250	<0.002	<0.020	<0.020	**5.15**	<0.005	**2.36**	<0.00020	<0.010	<0.010	**0.155**	8.88	**794**	**2,540**	459	7.8	17.5	3,680	--	--	--
	9/29/95	**0.156**	<0.010	<0.250	<0.002	<0.020	<0.020	**5.24**	0.008	**4.88**	<0.00020	<0.010	<0.010	<0.020	1.03	**801**	**2,660**	4.95	5.4	14.8	4,220	--	--	--
	3/30/96	**0.112**	<0.010	<0.250	**0.002**	<0.020	<0.020	**5.02**	<0.005	**5.40**	<0.00020	<0.010	<0.010	<0.020	2.08	--	**2,340**	6.65	7.2	15.0	3,050	--	--	--
Water from Sediment Basin at W-1	9/27/96	**0.167**	<0.010	<0.250	<0.002	<0.020	<0.020	--	0.009	**4.53**	<0.00020	<0.010	<0.010	**0.066**	1.70	**1,010**	**2,700**	4.04	7.3	23.0	1,510	--	--	--
	3/29/97	**0.097**	<0.010	<0.250	<0.002	<0.020	<0.020	**6.18**	<0.005	**5.46**	<0.00020	<0.010	<0.010	0.010	1.29	**1,050**	**2,460**	4.31	7.5	22.0	1,770	--	--	--
	3/17/97	**0.164**	<0.010	<0.250	<0.002	<0.020	<0.020	**3.66**	<0.005	**5.40**	<0.00020	<0.010	<0.010	**0.055**	0.61	**1,160**	**3,000**	6.43	7.2	22.0	3,660	--	--	--
duplicate	3/27/98	<0.100	0.010	<0.250	<0.002	<0.020	<0.020	**11.4**	<0.005	**5.90**	<0.00020	<0.010	<0.010	**0.021**	0.29	**942**	**2,780**	4.43	7.2	23.4	1,419	--	--	--
	9/30/98	**0.274**	<0.010	<0.250	<0.002	<0.020	<0.020	--	<0.005	**4.94**	<0.00020	<0.010	<0.010	<0.020	--	**666**	**2,700**	15.40	7.6	20.0	1,200	--	--	--
	3/31/99	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	**7.55**	0.006	**4.45**	<0.00020	<0.010	<0.010	<0.020	0.60	**1,560**	**2,930**	7.92	7.3	18.0	1,021	--	--	--
	9/29/99	**0.877**	<0.010	<0.250	<0.002	<0.020	<0.020	**6.77**	<0.005	**0.86**	<0.00020	<0.010	<0.010	**0.080**	3.36	**330**	**715**	13.3	7.1	18.0	2,930	--	--	--
	3/16/00	**0.410**	<0.010	<0.250	<0.002	<0.020	<0.020	**72.0**	<0.005	**4.54**	<0.00020	<0.010	<0.010	<0.020	1.09	**948**	**2,610**	10.6	--	--	--	--	--	--
	9/15/00	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	**2.02**	<0.005	**3.48**	<0.00020	<0.010	<0.010	<0.020	6.27	**894**	**2,470**	5.21	6.6	19.0	980	--	--	--
	3/23/01	**0.144**	<0.010	<0.250	**0.004**	<0.020	<0.020	**35.9**	**0.012**	**4.07**	<0.00020	<0.010	<0.010	<0.020	0.48	**926**	**2,630**	5.85	6.5	17.0	480	--	--	--
duplicate	3/23/01	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	**6.90**	0.007	**4.19**	<0.00020	<0.010	<0.010	<0.020	0.35	**939**	**2,640**	7.52	6.5	17.0	480	--	--	--
	10/4/01	**0.204**	<0.010	<0.250	<0.002	<0.020	<0.020	**0.915**	0.007	**0.23**	<0.00020	<0.010	<0.010	<0.020	<0.05	<5.00	186	7.80	6.3	20.0	300	--	--	--
	3/28/02	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	**5.10**	<0.005	**3.66**	--	<0.010	<0.010	<0.020	0.28	**1,000**	**3,010**	3.77	6.4	12.0	1,080	--	--	--
	10/3/02	<0.100	<0.010	<0.250	**0.002**	<0.020	**0.027**	**1.52**	<0.005	**3.34**	<0.00020	<0.010	<0.010	<0.020	1.82	**1,030**	**2,940**	4.94	6.7	18.0	370	--	--	--
duplicate	10/3/02	<0.100	<0.010	<0.250	**0.002**	<0.020	**0.024**	**1.58**	<0.005	**3.33**	<0.00020	<0.010	<0.010	<0.020	1.78	**1,040**	**2,860**	5.12	5.7	18.0	370	--	--	--
	3/25/03	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	**6.69**	0.006	**3.56**	<0.00020	<0.010	<0.010	**0.025**	0.41	**846**	**2,530**	3.72	6.6	17.0	330	--	--	--
	10/2/03	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	**11.3**	0.007	**3.88**	<0.00020	<0.010	<0.010	**0.042**	0.17	**916**	**2,710**	3.92	5.6	15.0	3,050	--	--	--
duplicate	10/2/03	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	**11.4**	0.006	**3.88**	<0.00020	<0.010	<0.010	<0.020	<0.050	**958**	**2,690**	3.90	5.6	15.0	3,170	--	--	--
	4/28/04	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	**11.1**	0.006	**6.08**	<0.00020	<0.010	<0.010	<0.020	<0.050	**1,460**	**2,550**	5.36	--	17.3	2,860	--	--	--
	10/26/04	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	**5.25**	<0.005	**4.55**	<0.00020	<0.010	<0.010	<0.020	0.29	**1,190**	**2,950**	3.64	--	--	3,480	--	--	--
	4/27/05	<0.100	<0.010	<0.250	**0.002**	<0.020	<0.020	**7.63**	0.007	**5.73**	<0.00020	<0.010	<0.010	<0.020	<0.050	**1,100**	**2,550**	4.71	--	--	2,870	--	--	--

APPENDIX A2
SURFACE WATER ANALYTICAL RESULTS SUMMARY
EDWARDS ROAD LANDFILL - PERMIT 34-05
RURAL HALL, NORTH CAROLINA

Sample Location / ID	Date	Aluminum	Arsenic	Barium	Cadmium	Chromium (Total)	Copper	Iron	Lead	Manganese	Mercury	Selenium	Silver	Zinc	Nitrate-nitrogen	Sulfate	Dissolved Solids	Total Organic Carbon	pH	Temperature (degrees Celsius)	Conductivity (µmhos/cm)	Turbidity (NTUs)	Oxidation-Reduction Potential (mV)	Dissolved Oxygen
NC 2L Ground Water Standard		3.5 [1]	0.010	0.70	0.0020	0.010	1.00	0.300	0.015	0.050	0.00100	0.020	0.020	1.00	10	250	500	NE	6.5 - 8.5	NE	NE	NE	NE	NE
Solid Waste Section Limit		NE	0.010	0.10	0.0010	0.010	0.010	0.300	0.010	0.050	0.00020	0.010	0.010	0.010	10	250	NE	NE	NE	NE	NE	NE	NE	NE
NC 2B Surface Water Standard		0.087	0.050	1.00 [2]	0.0020	0.050	0.007	1.000	0.025	0.200 [2]	0.000012	0.005	0.00006	0.050	10 [2]	250 [2]	500 [2]	NE	6.0 - 9.0	NE	NE	50	NE	>5.0
RETENTION POND MW-001 (continued)	10/20/05	**1.63**	<0.010	<0.250	**0.004**	<0.020	**0.028**	**103**	0.006	**4.88**	<0.00020	<0.010	<0.010	**0.057**	0.43	**403**	**3,010**	89.0	--	--	529	--	--	--
	10/19/06	**0.172**	<0.010	<0.250	**0.002**	<0.020	**0.347**	**27.4**	<0.005	**3.60**	<0.00020	<0.010	<0.010	**0.027**	0.14	**1,320**	**2,850**	4.37	--	--	2,000	--	--	--
	4/27/07	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	**5.36**	<0.005	**2.38**	<0.00020	<0.010	<0.010	<0.020	0.29	**1,380**	**2,750**	4.01	--	--	4,830	--	--	--
	11/19/07	<0.100	**0.042**	<0.250	**0.002**	<0.020	<0.020	**48.2**	<0.005	**3.28**	<0.00020	<0.010	<0.010	**0.025**	<0.050	**1,560**	**3,060**	3.82	--	--	3,300	--	--	--
	4/30/08	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	**9.68**	<0.005	**2.99**	<0.00020	<0.010	<0.010	**0.022**	0.16	**1,100**	**2,910**	3.38	--	--	4,880	--	--	--
	10/29/08	<0.100	<0.010	0.0687	<0.001	<0.010	<0.010	**4.84**	0.0035	**2.88**	<0.00020	<0.010	<0.010	<0.010	<0.050	188	**3,060**	3.51	--	--	4,200	--	--	--
	4/30/09	<0.100	<0.010	0.0774	**0.0018**	<0.010	0.0036	**4.08**	0.0044	**3.10**	<0.0002	<0.010	<0.010	<0.010	0.26	38	**2,904**	3.94	--	--	4,070	--	--	--
RETENTION POND MW-003	9/30/94	**1.77**	<0.010	<0.250	<0.002	<0.020	**0.113**	**3.37**	<0.005	**2.20**	<0.00020	<0.010	<0.010	**0.096**	0.20	159	415	20.1	6.9	19.6	519	--	--	--
	3/31/95	--	<0.010	<0.250	<0.002	<0.020	<0.020	**4.86**	<0.005	**5.98**	<0.00020	<0.010	<0.010	**0.032**	0.10	**294**	**625**	--	7.6	13.6	896	--	--	--
	9/29/95	**1.64**	<0.010	<0.250	<0.002	<0.020	<0.020	**3.42**	0.007	**2.94**	<0.00020	<0.010	<0.010	**0.104**	0.46	**314**	**740**	3.74	4.9	14.0	1,040	--	--	--
	3/30/96	**11.4**	<0.010	<0.250	**0.002**	<0.020	<0.020	**23.3**	0.009	**3.16**	<0.00020	<0.010	<0.010	**0.126**	0.13	222	**552**	3.83	7.2	12.0	750	--	--	--
Water from Sediment Basin at W-3	9/27/96	**0.110**	<0.010	<0.250	<0.002	<0.020	<0.020	**1.01**	0.007	**2.36**	<0.00020	<0.010	<0.010	**0.030**	0.16	**283**	**737**	6.73	7.6	20.0	974	--	--	--
	3/29/97	**0.238**	<0.010	<0.250	<0.002	<0.020	<0.020	**1.93**	<0.005	**3.05**	<0.00020	**0.013**	<0.010	**0.020**	0.18	**809**	**807**	4.17	7.8	16.0	590	--	--	--
	9/17/97	**0.169**	<0.010	<0.250	<0.002	<0.020	<0.020	**0.72**	0.005	**3.06**	<0.00020	**0.006**	<0.010	**0.212**	0.33	**562**	**1,290**	5.29	7.7	19.0	1,650	--	--	--
	3/27/98	**0.270**	<0.010	<0.250	<0.002	<0.020	<0.020	**2.50**	<0.005	**3.37**	<0.00020	**0.013**	<0.010	**0.041**	0.25	--	**929**	6.98	7.2	20.0	1,214	--	--	--
	9/30/98	**0.353**	<0.010	<0.250	<0.002	<0.020	<0.020	**1.38**	<0.005	--	<0.00020	**0.017**	<0.010	<0.020	0.78	**367**	**1,280**	10.1	6.9	19.0	920	--	--	--
	3/31/99	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	**4.83**	<0.005	**5.55**	<0.00020	<0.010	<0.010	<0.020	0.19	**482**	**842**	7.58	7.1	16.0	592	--	--	--
	9/29/99	**0.677**	<0.010	<0.250	<0.002	<0.020	<0.020	**1.94**	<0.005	**0.89**	<0.00020	<0.010	<0.010	<0.020	0.10	**258**	413	8.14	7.7	19.0	741	--	--	--
	9/15/00	**0.224**	<0.010	<0.250	<0.002	<0.020	<0.020	**2.38**	<0.005	**2.80**	<0.00020	<0.010	<0.010	<0.020	0.16	**550**	**1,260**	8.58	7.1	21.0	680	--	--	--
	3/23/01	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	**3.69**	0.010	**2.25**	<0.00020	<0.010	<0.010	**0.030**	0.23	**530**	**1,230**	5.72	6.6	17.0	640	--	--	--
	10/4/01	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	**4.24**	0.006	**3.65**	<0.00020	<0.010	<0.010	<0.020	0.08	**592**	**1,440**	30.0	7.0	20.0	600	--	--	--
	3/28/02	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	**5.62**	<0.005	**2.18**	--	<0.010	<0.010	<0.020	0.11	**682**	**1,590**	5.36	6.4	13.0	680	--	--	--
	10/3/02	<0.100	<0.010	<0.250	**0.002**	<0.020	<0.020	**6.51**	<0.005	**5.29**	<0.00020	<0.010	<0.010	<0.020	<0.050	**932**	**1,900**	8.51	6.2	19.0	150	--	--	--
	3/25/03	**3.28**	<0.010	<0.250	<0.002	<0.020	<0.020	**6.17**	0.008	**4.29**	<0.00020	<0.010	<0.010	**0.078**	0.09	**784**	**1,520**	1.34	6.4	18.0	110	--	--	--
	10/2/03	**0.634**	<0.010	<0.250	<0.002	<0.020	<0.020	**5.95**	0.008	**6.75**	<0.00020	<0.010	<0.010	**0.050**	0.17	**765**	**1,420**	3.97	6.1	14.0	1,460	--	--	--
	4/28/04	**0.152**	<0.010	<0.250	<0.002	<0.020	<0.020	**8.37**	<0.005	**6.72**	<0.00020	<0.010	<0.010	<0.020	0.22	**1,040**	**1,810**	3.89	--	12.1	2,030	--	--	--
	10/26/04	**0.554**	<0.010	<0.250	**0.005**	<0.020	<0.020	**16.3**	<0.005	**4.22**	<0.00020	<0.010	<0.010	**0.036**	0.29	**1,070**	**2,140**	5.16	--	--	2,150	--	--	--
	4/27/05	<0.100	<0.010	<0.250	**0.002**	<0.020	<0.020	**4.47**	<0.005	**6.11**	<0.00020	<0.010	<0.010	<0.020	0.25	**1,075**	**2,090**	4.05	--	--	2,320	--	--	--
	10/20/05	<0.100	<0.010	<0.250	**0.005**	<0.020	**0.027**	**7.90**	<0.005	**5.87**	<0.00020	<0.010	<0.010	**0.044**	0.28	**1,300**	**2,090**	30.0	--	--	1,060	--	--	--
	10/19/06	<0.100	<0.010	**1.46**	<0.002	<0.020	<0.020	**6.04**	<0.005	**4.55**	<0.00020	<0.010	<0.010	**0.021**	0.28	**1,170**	**1,920**	4.20	--	--	1,370	--	--	--
	4/27/07	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	**8.33**	<0.005	**4.19**	<0.00020	<0.010	<0.010	<0.020	0.29	**1,130**	**2,130**	3.83	--	--	2,230	--	--	--
	11/19/07	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	**8.20**	<0.005	**6.00**	<0.00020	<0.010	<0.010	<0.020	0.06	**1,680**	**2,550**	4.59	--	--	2,710	--	--	--
	4/30/08	<0.100	<0.010	<0.250	<0.002	<0.020	<0.020	**3.36**	<0.005	**3.80**	<0.00020	<0.010	<0.010	**0.037**	0.30	**2,090**	**2,110**	3.56	--	--	2,290	--	--	--
	10/29/08	<0.100	<0.010	0.0593	<0.001	<0.010	<0.010	**2.88**	0.0023	**4.36**	<0.00020	<0.010	<0.010	<0.010	0.17	**988**	**2,360**	3.48	--	--	2,740	--	--	--
	4/30/09	<0.100	<0.010	0.0532	<0.001	<0.010	<0.010	**4.62**	0.0072	**4.96**	<0.00020	<0.010	<0.010	**0.0146**	0.34	**261**	**2,460**	4.11	--	--	2,930	--	--	--

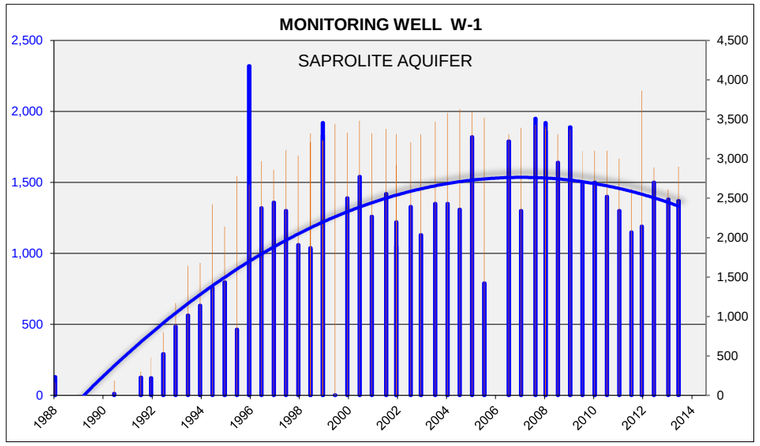
All concentrations in milligrams per liter

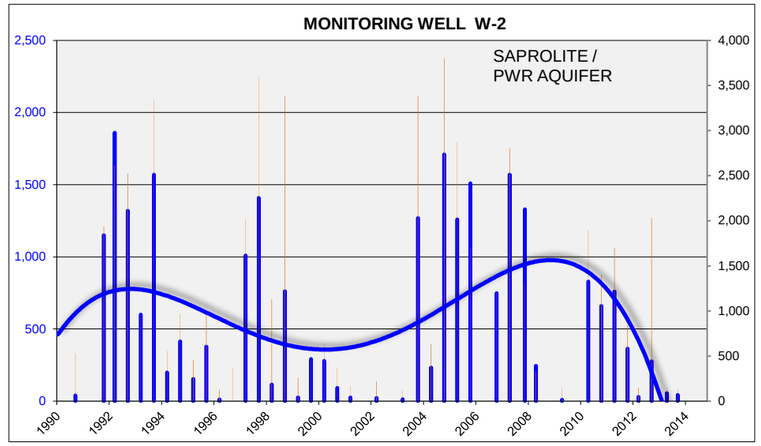
NE - Not established
-- - Not sampled

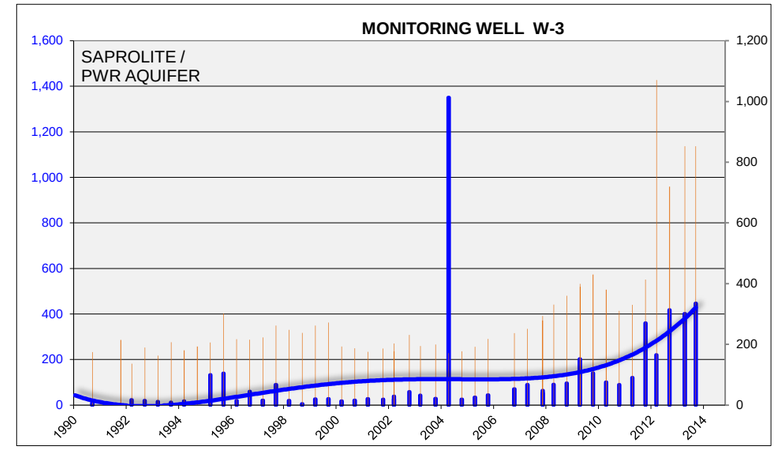
[1] - No 2L standard established. NCDWM SWS Groundwater Protection presented
[2] - No freshwater aquatic life standard established. Water Supply criteria presented

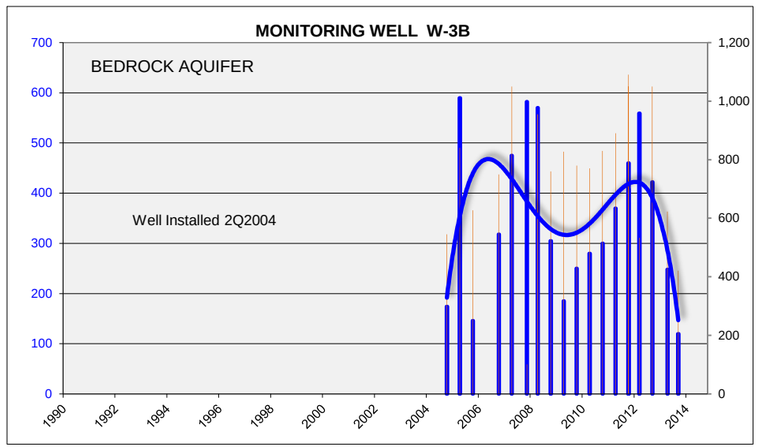
Bold indicates exceedance of Solid Waste Section Limits (SWSL)
Gray background indicates exceedance of NC Ground Water Standard

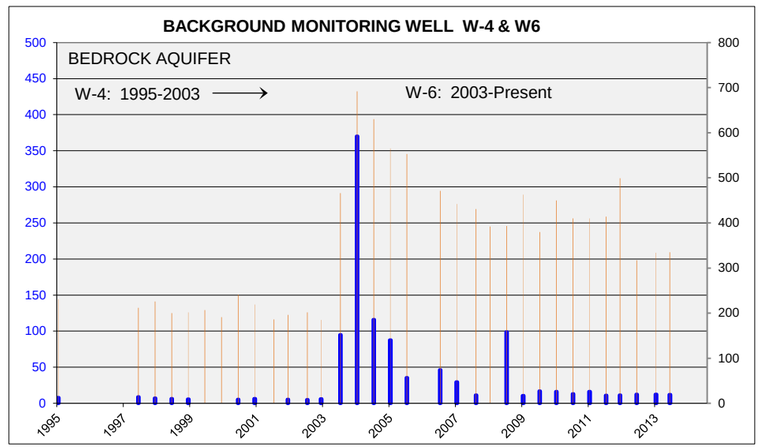
Appendix B
Sulfate Trends – Groundwater and Surface Water

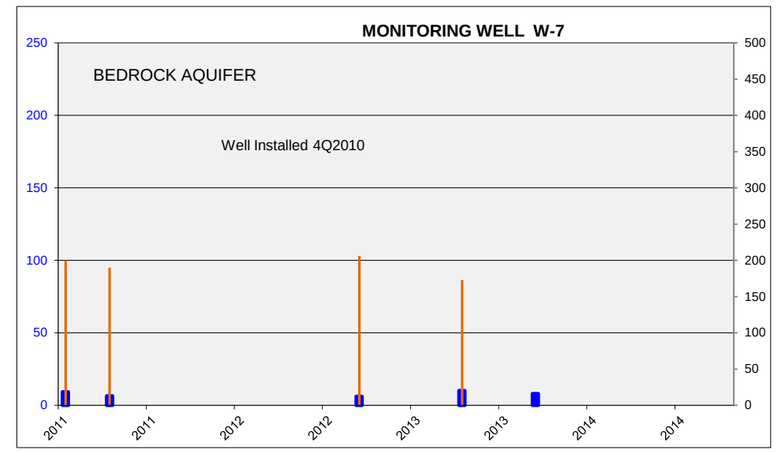


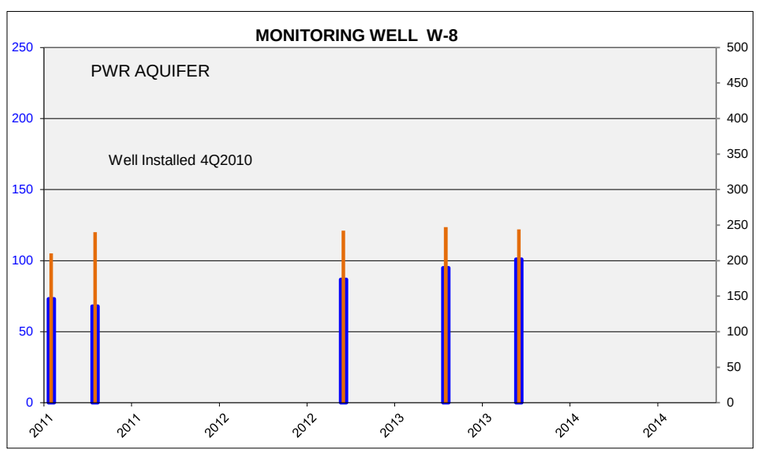


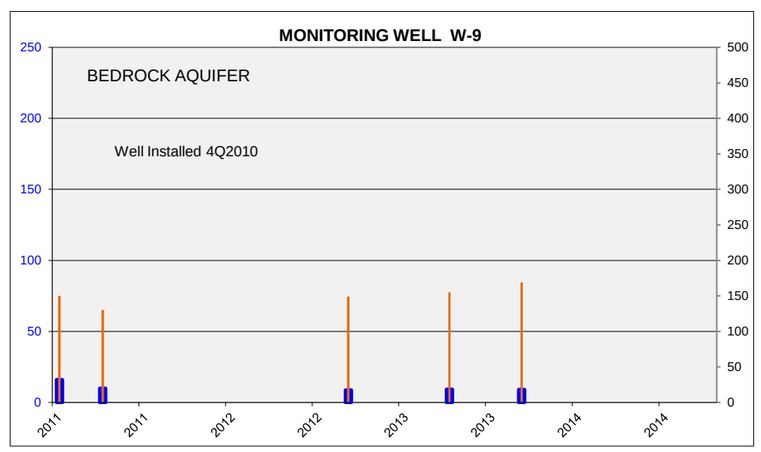


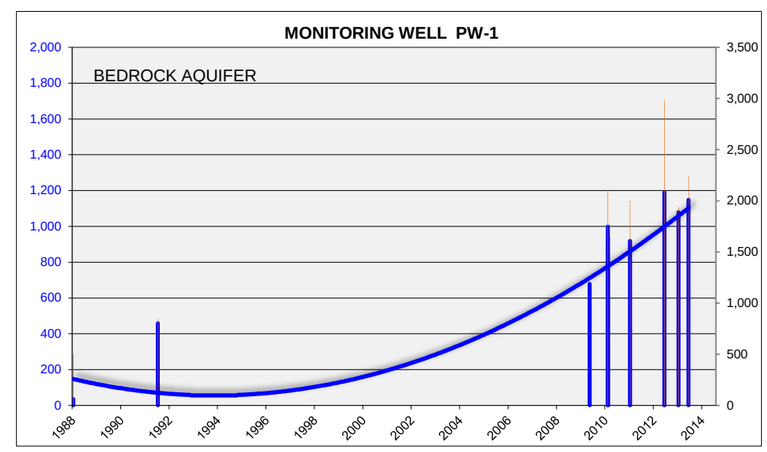












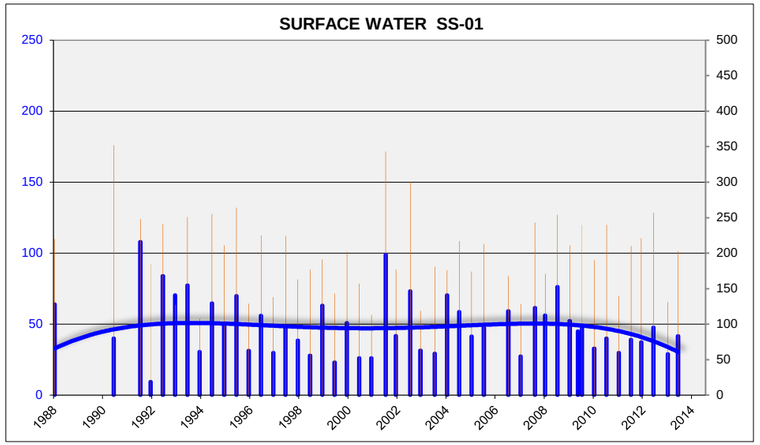
LEGEND

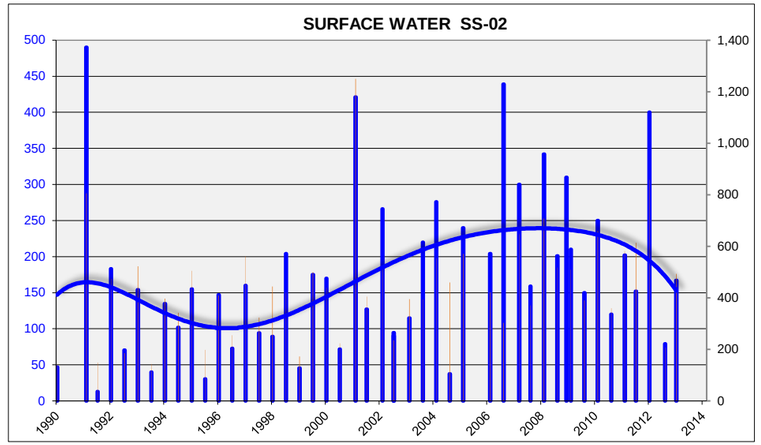
	NC2L GW STD	NC2B SW STD
Sulfates	250 mg/L	250 mg/L
Total Dissolved Solids	500 mg/L	500 mg/L

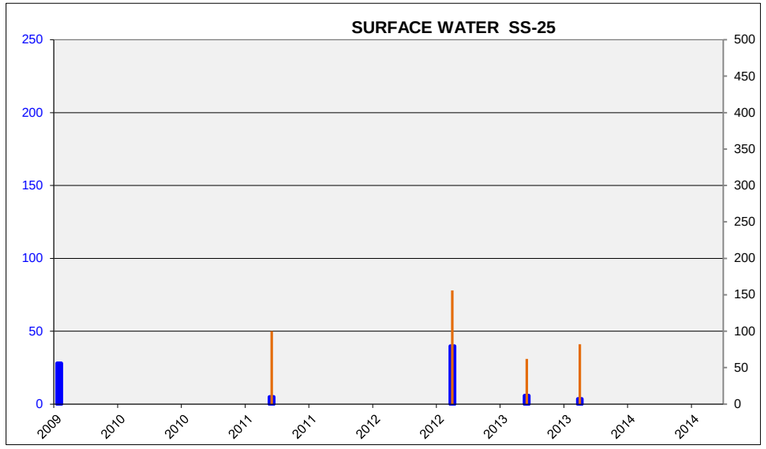
ERM NC, Inc.

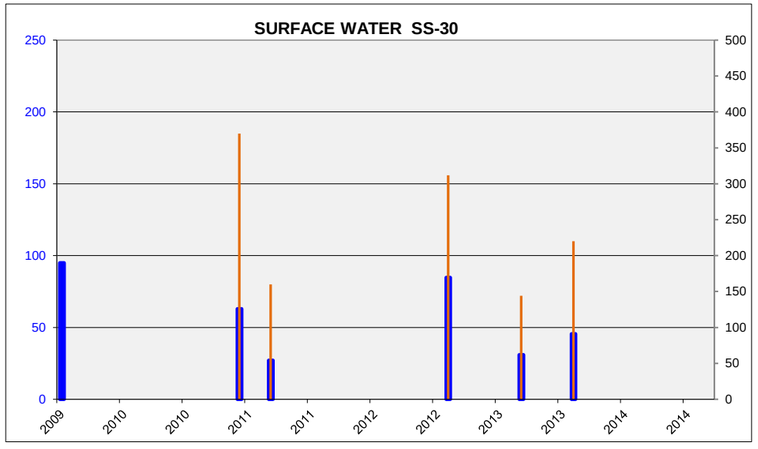
SULFATE TRENDS - GROUNDWATER
EDWARDS ROAD LANDFILL PERMIT # 34-05
R.J. REYNOLDS TOBACCO COMPANY
RURAL HALL, NORTH CAROLINA

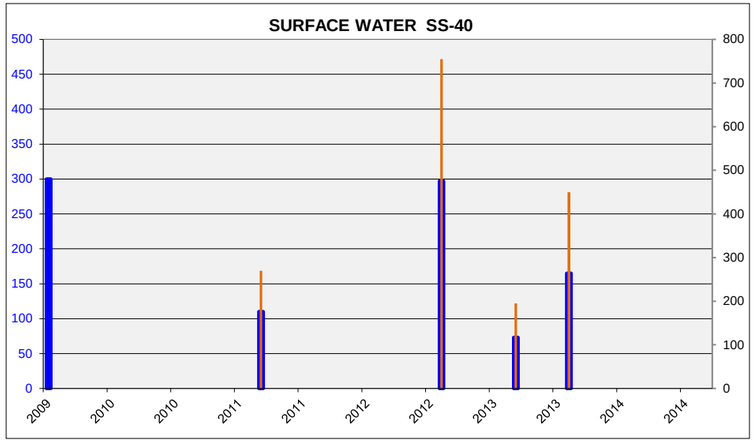
FIGURE
8

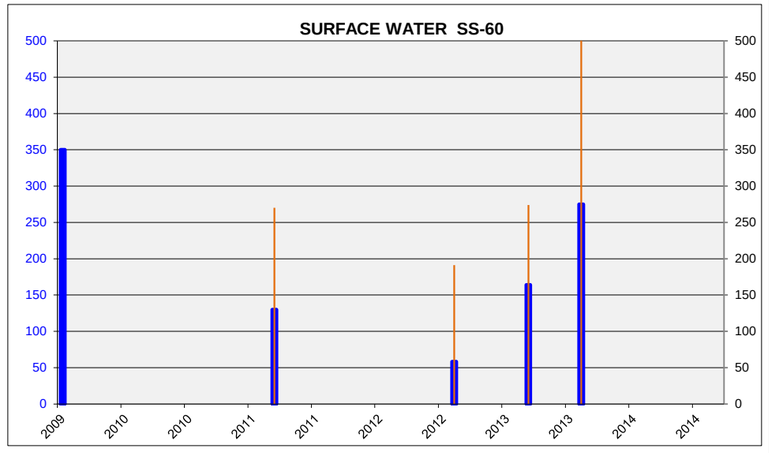


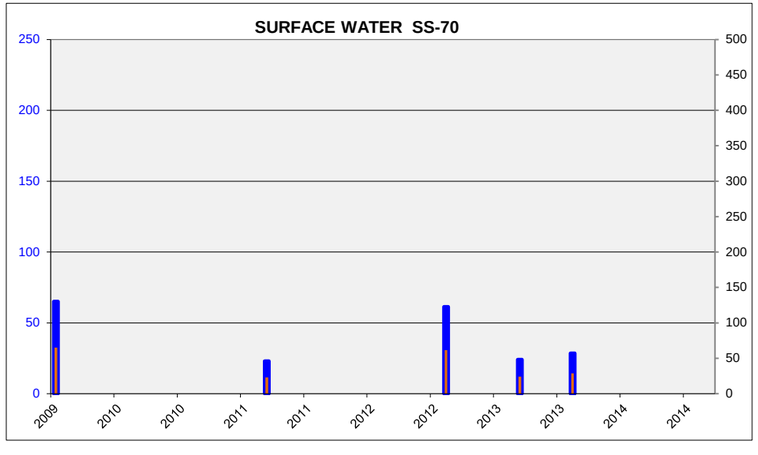


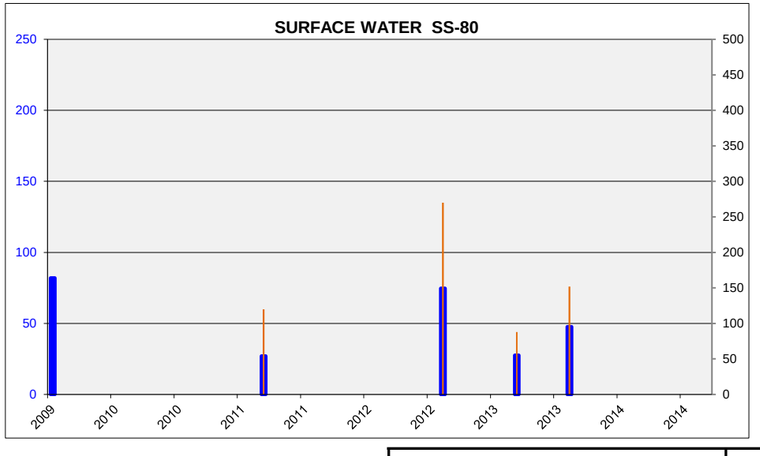


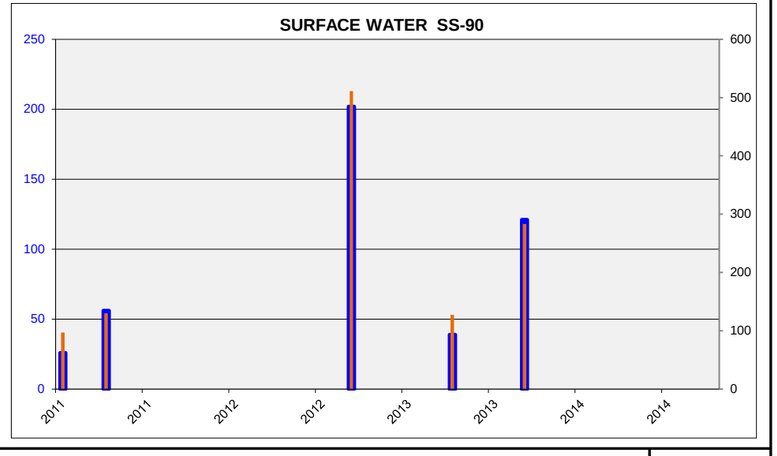












LEGEND

- Sulfates
- Total Dissolved Solids

	NC2L GW STD	NC2B SW STD
Sulfates	250 mg/L	250 mg/L
Total Dissolved Solids	500 mg/L	500 mg/L

ERM NC, Inc.

SULFATE TRENDS - SURFACE WATER
EDWARDS ROAD LANDFILL PERMIT # 34-05
R.J. REYNOLDS TOBACCO COMPANY
RURAL HALL, NORTH CAROLINA

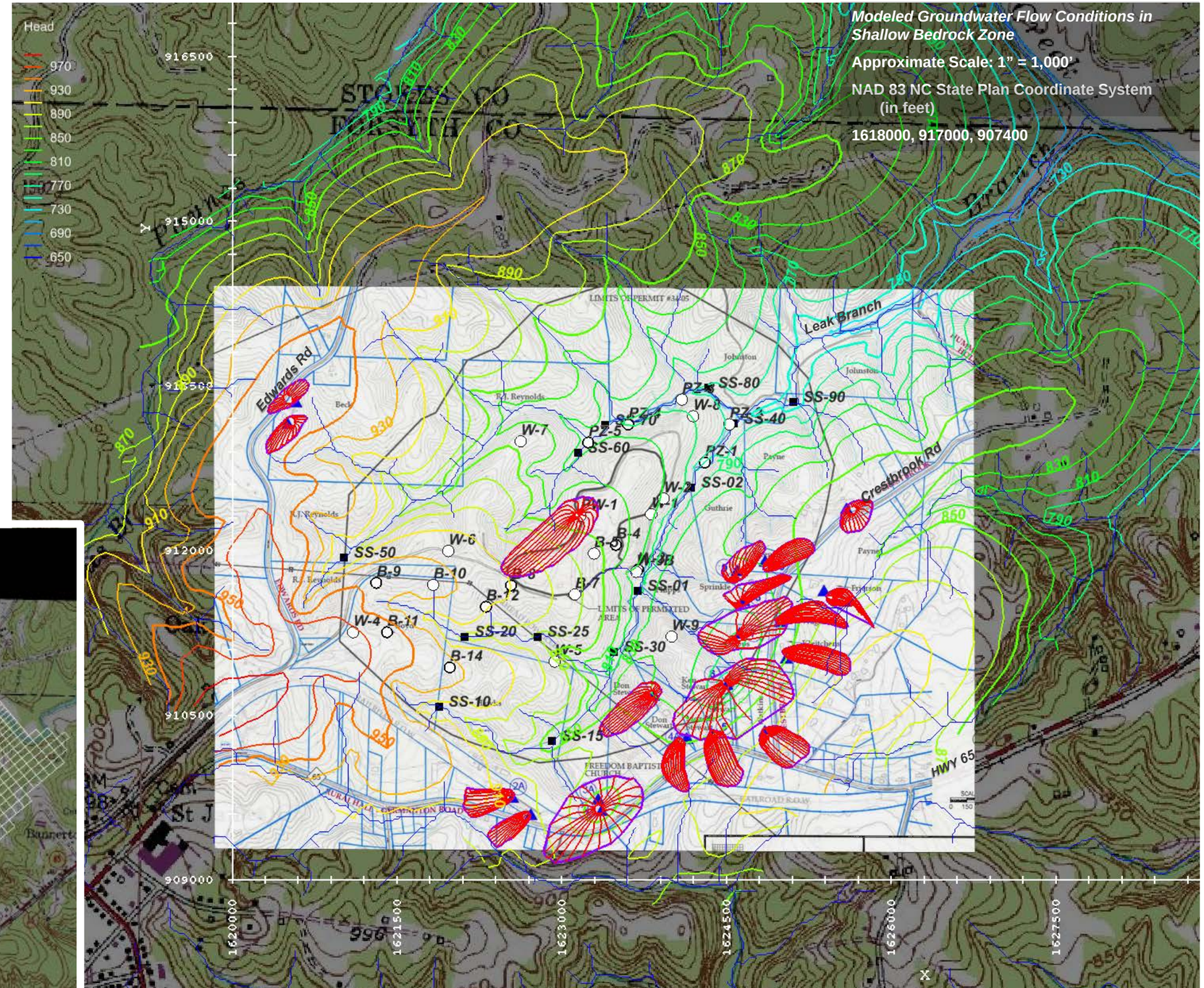
FIGURE

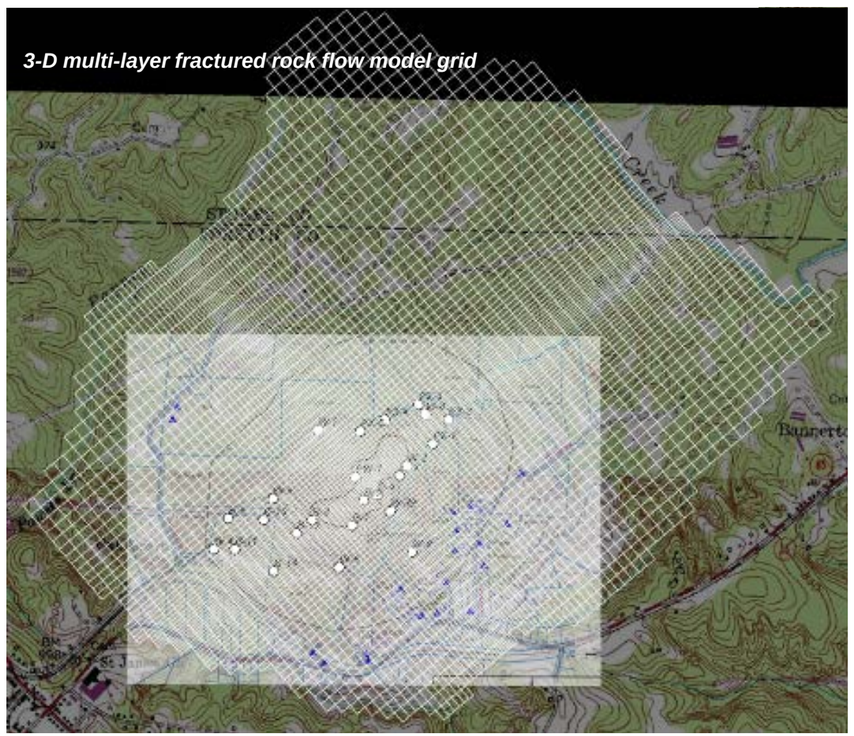
9

Appendix C
Groundwater Modeling Results

LEGEND

- Landfill Boundary
- Monitoring Wells
- Modeled Streams
- Off-site Residential Wells
- Stream Sampling Locations
- Modeled groundwater contours, feet amsl
- Modeled 3-D groundwater flow lines and well capture zones





ERM NC, Inc.

Modeled Groundwater Flow Conditions in Shallow Bedrock Zone

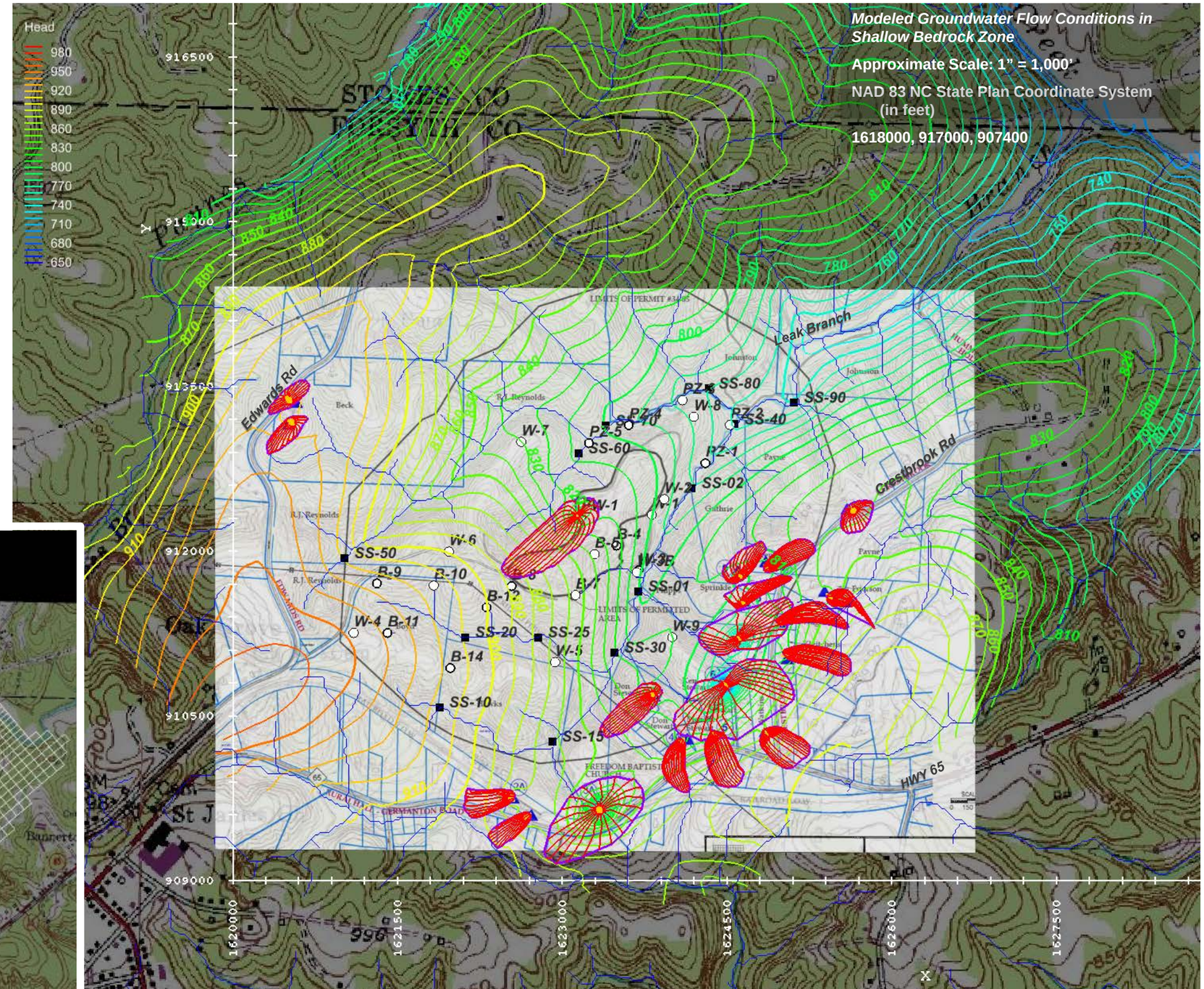
Edwards Road Landfill - Rural Hall, North Carolina

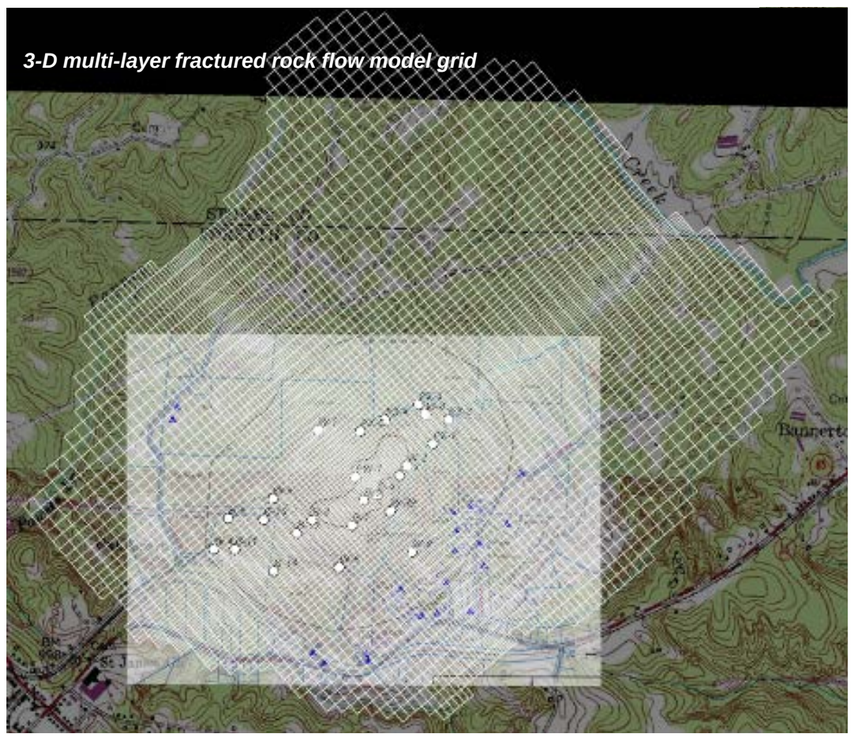
FIGURE

1A

LEGEND

- Landfill Boundary
- Monitoring Wells
- Modeled Streams
- Off-site Residential Wells
- Stream Sampling Locations
- Modeled groundwater contours, feet amsl
- Modeled 3-D groundwater flow lines and well capture zones





ERM NC, Inc.

Modeled Groundwater Flow Conditions in Deep Bedrock Zone

Edwards Road Landfill - Rural Hall, North Carolina

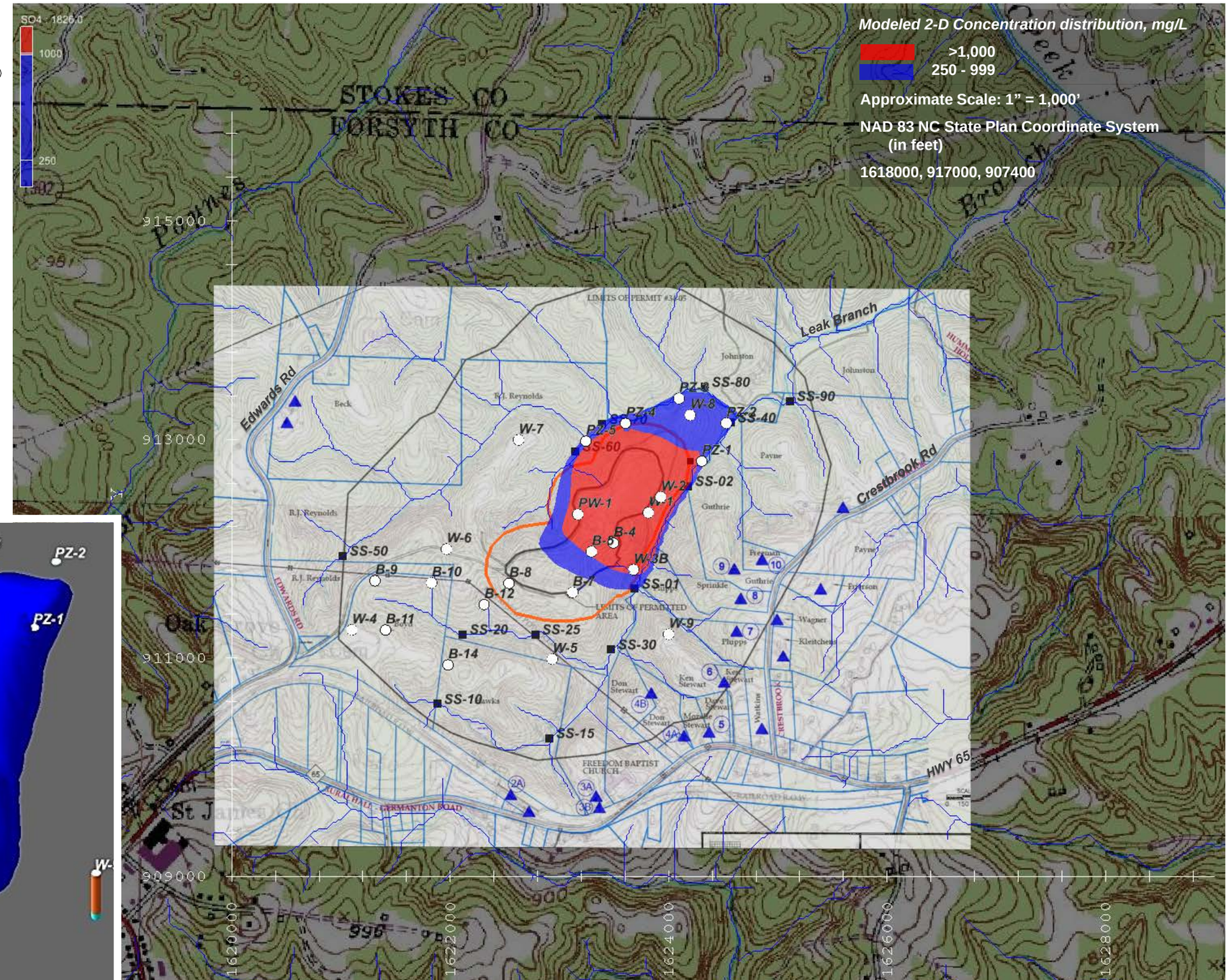
FIGURE

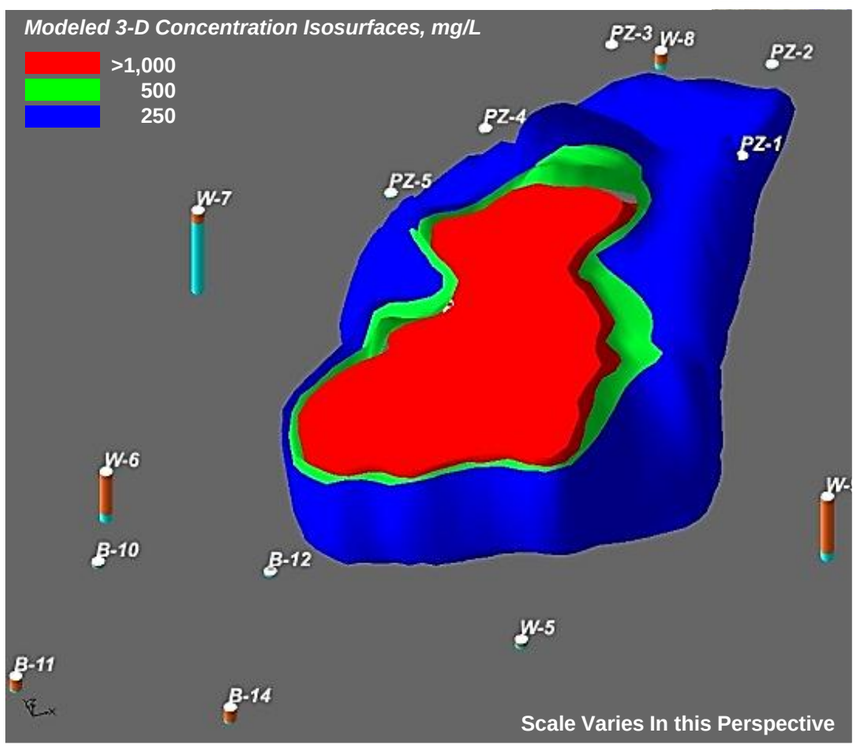
1B

LEGEND

- Landfill Boundary
- Monitoring Wells
- Modeled Streams
- Off-site Residential Wells
- Stream Sampling Locations
- Compliance Boundary

Modeled Sulfate Concentration, mg/L			
Well	Year 5	Well	Year 5
PW-1	274	W-2	1,634
PZ-1	44	W-3	197
PZ-2	30	W-3B	800
PZ-3	27	W-6	19
PZ-4	30	W-7	19
PZ-5	48	W-8	19
W-1	1,771	W-9	19
2L Standard	250	Modeled Regional Background	19





ERM NC, Inc.

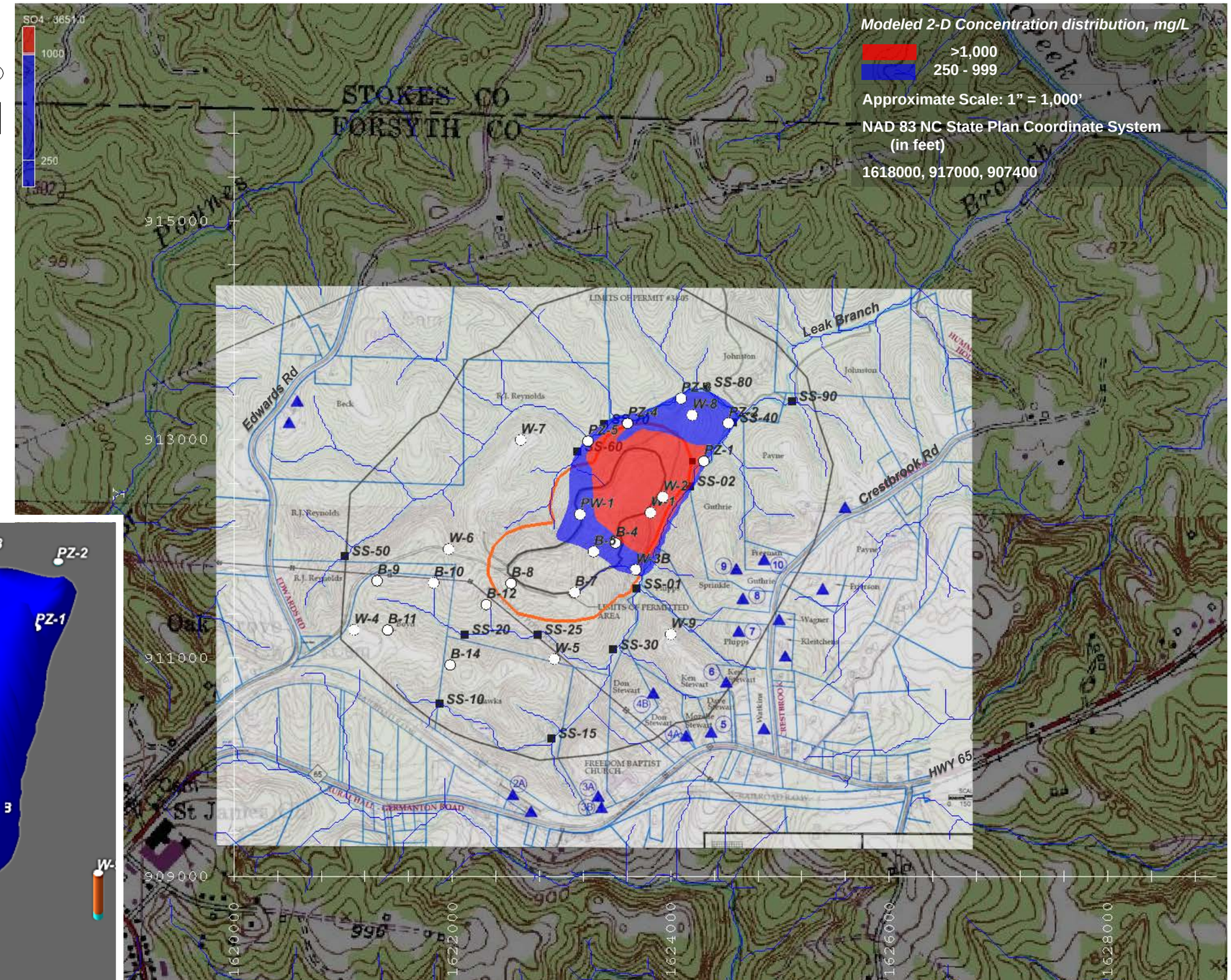
Modeled Future Distribution 5 Years After Landfill Capping
Sulfate In Deep Bedrock Zone
Edwards Road Landfill - Rural Hall, North Carolina

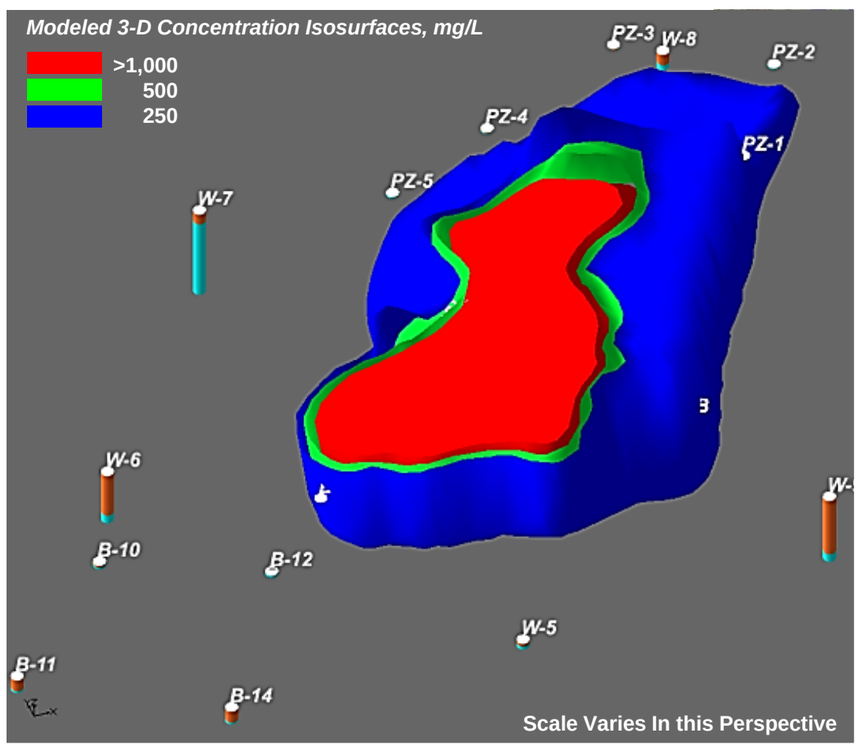
FIGURE 2A

LEGEND

- Landfill Boundary
- Monitoring Wells
- Modeled Streams
- Off-site Residential Wells
- Stream Sampling Locations
- Compliance Boundary

Modeled Sulfate Concentration, mg/L			
Well	Year 10	Well	Year 10
PW-1	149	W-2	1,985
PZ-1	49	W-3	126
PZ-2	32	W-3B	213
PZ-3	27	W-6	19
PZ-4	30	W-7	19
PZ-5	47	W-8	19
W-1	2,066	W-9	19
2L Standard	250	Modeled Regional Background	19





ERM NC, Inc.

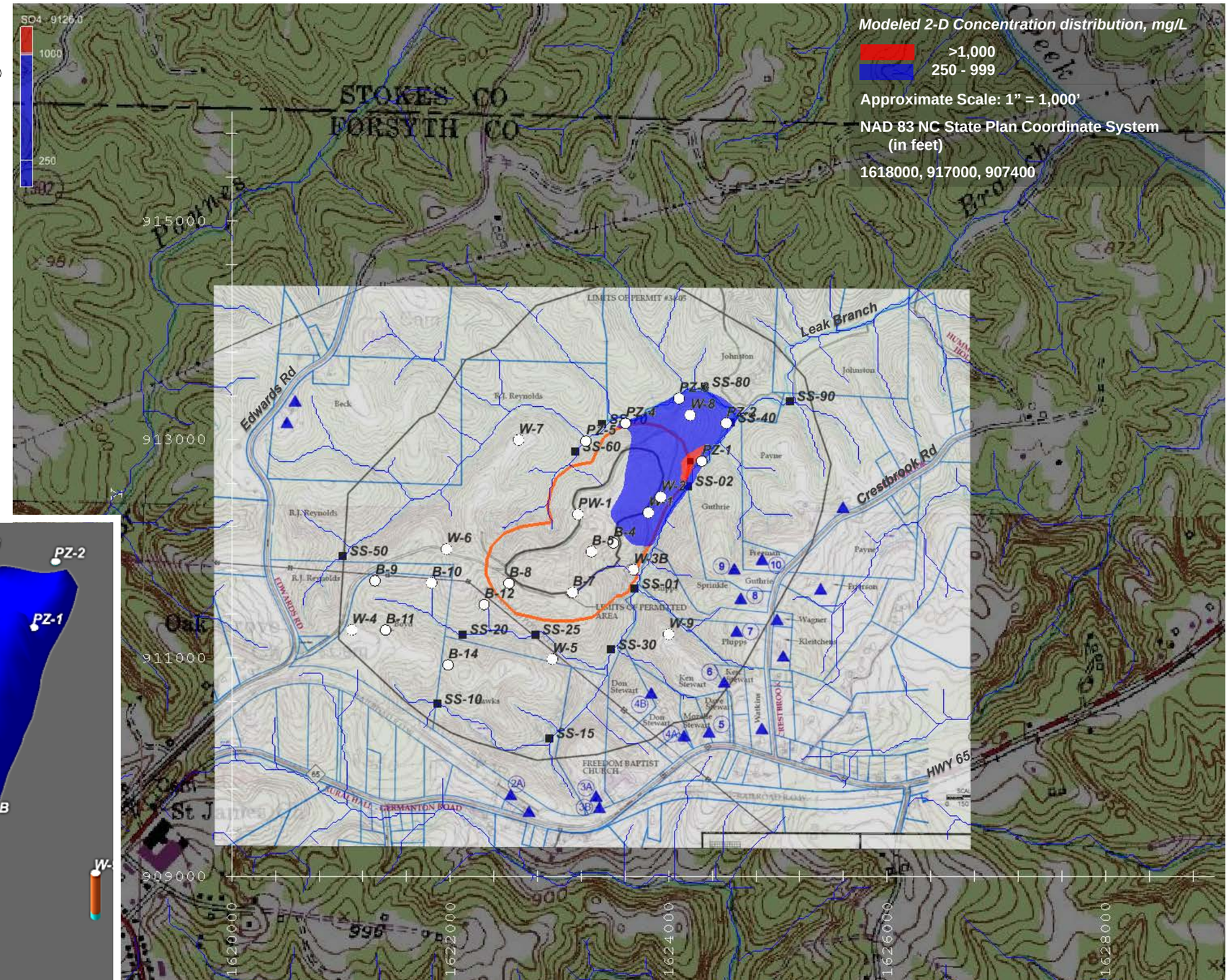
Modeled Future Distribution 10 Years After Landfill Capping
Sulfate In Deep Bedrock Zone
Edwards Road Landfill - Rural Hall, North Carolina

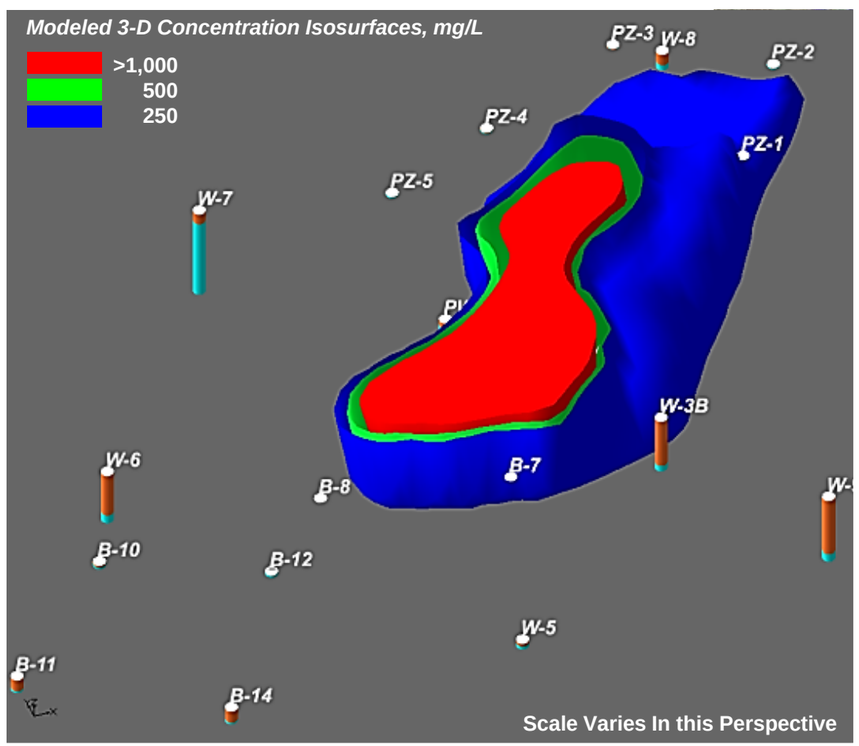
FIGURE **2B**

LEGEND

- Landfill Boundary
- Monitoring Wells
- Modeled Streams
- Off-site Residential Wells
- Stream Sampling Locations
- Compliance Boundary

Modeled Sulfate Concentration, mg/L			
Well	Year 25	Well	Year 25
PW-1	36	W-2	850
PZ-1	49	W-3	39
PZ-2	36	W-3B	39
PZ-3	26	W-6	19
PZ-4	24	W-7	19
PZ-5	27	W-8	19
W-1	838	W-9	19
2L Standard	250	Modeled Regional Background	19





ERM NC, Inc.

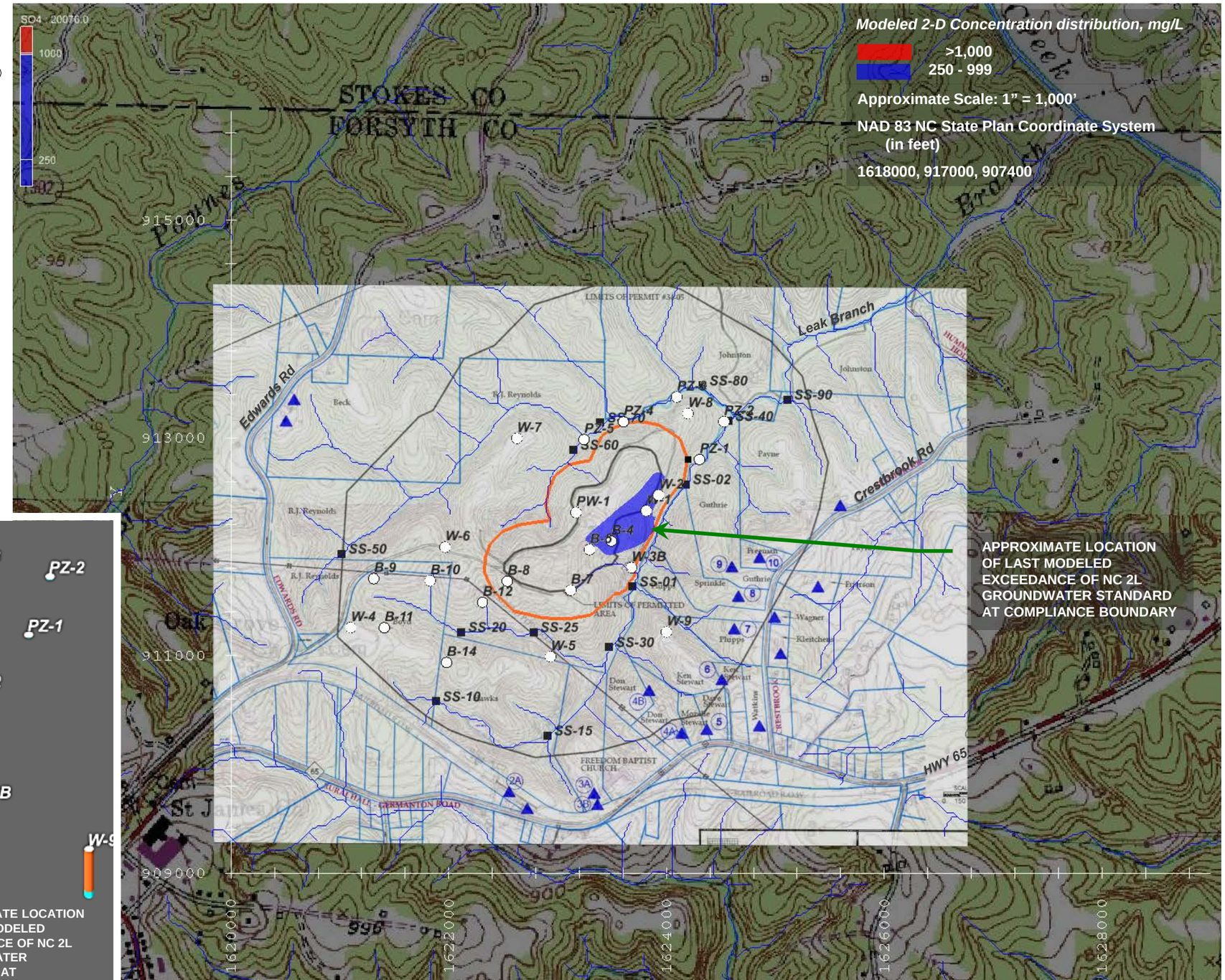
Modeled Future Distribution 25 Years After Landfill Capping
Sulfate In Deep Bedrock Zone
Edwards Road Landfill - Rural Hall, North Carolina

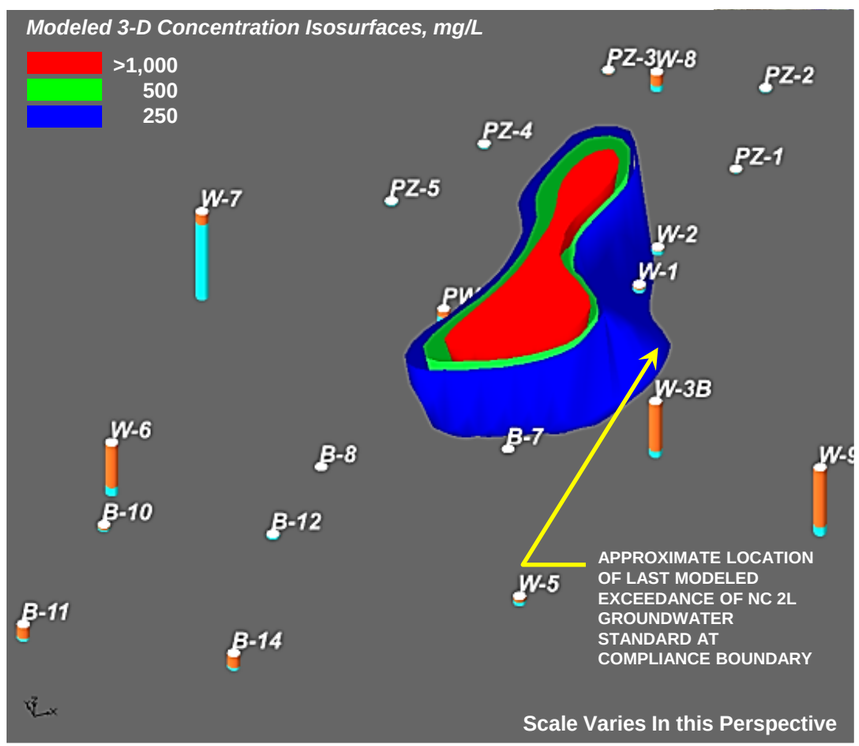
FIGURE
2C

LEGEND

- Landfill Boundary
- Monitoring Wells
- Modeled Streams
- Off-site Residential Wells
- Stream Sampling Locations
- Compliance Boundary

Modeled Sulfate Concentration, mg/L			
Well	Year 55	Well	Year 55
PW-1	19	W-2	272
PZ-1	22	W-3	20
PZ-2	19	W-3B	19
PZ-3	19	W-6	19
PZ-4	19	W-7	19
PZ-5	19	W-8	19
W-1	295	W-9	19
2L Standard	250	Modeled Regional Background	19





ERM NC, Inc.

Modeled Future Distribution 55 Years After Landfill Capping
Sulfate In Intermediate Bedrock Zone
Edwards Road Landfill - Rural Hall, North Carolina

FIGURE
2D

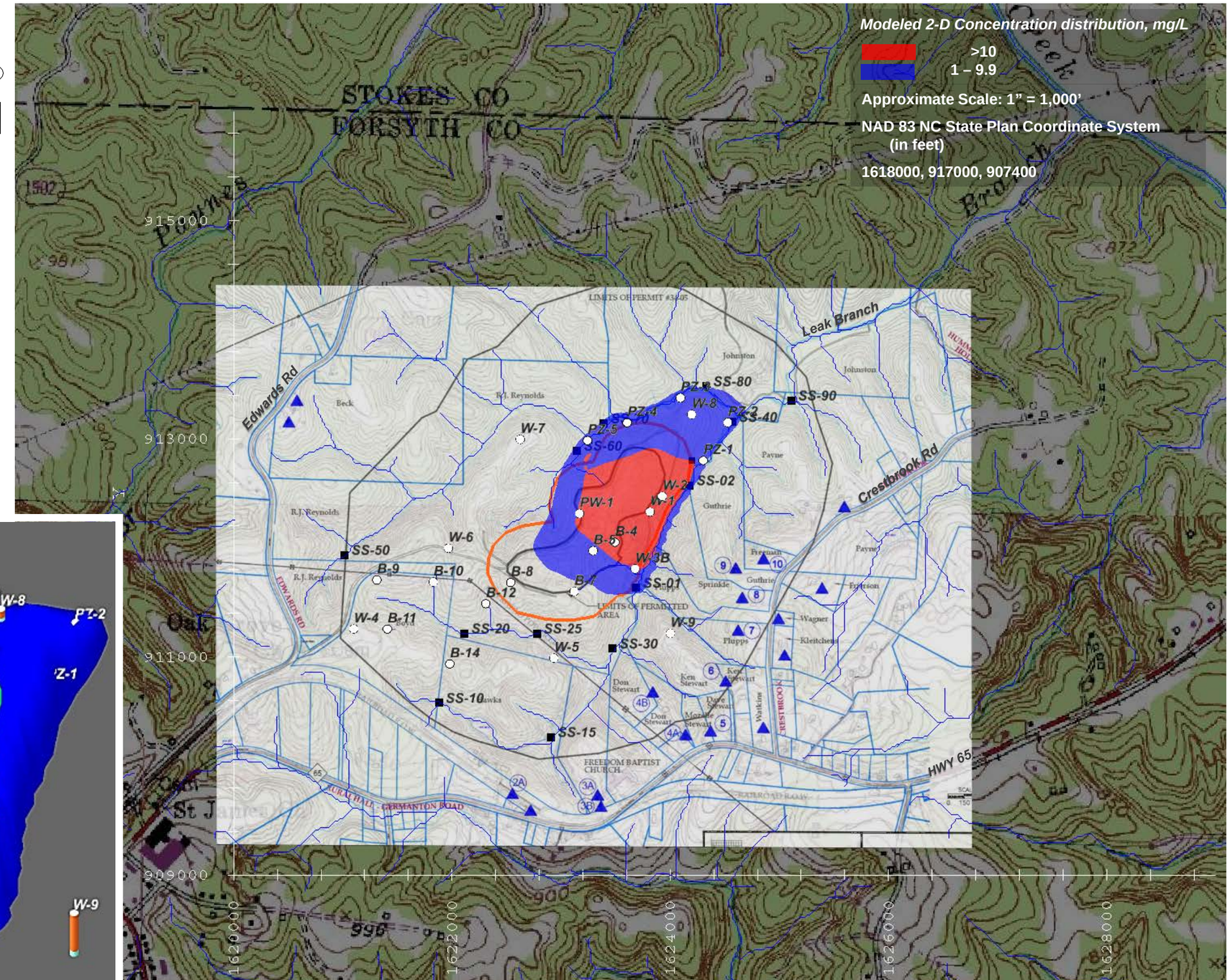
LEGEND

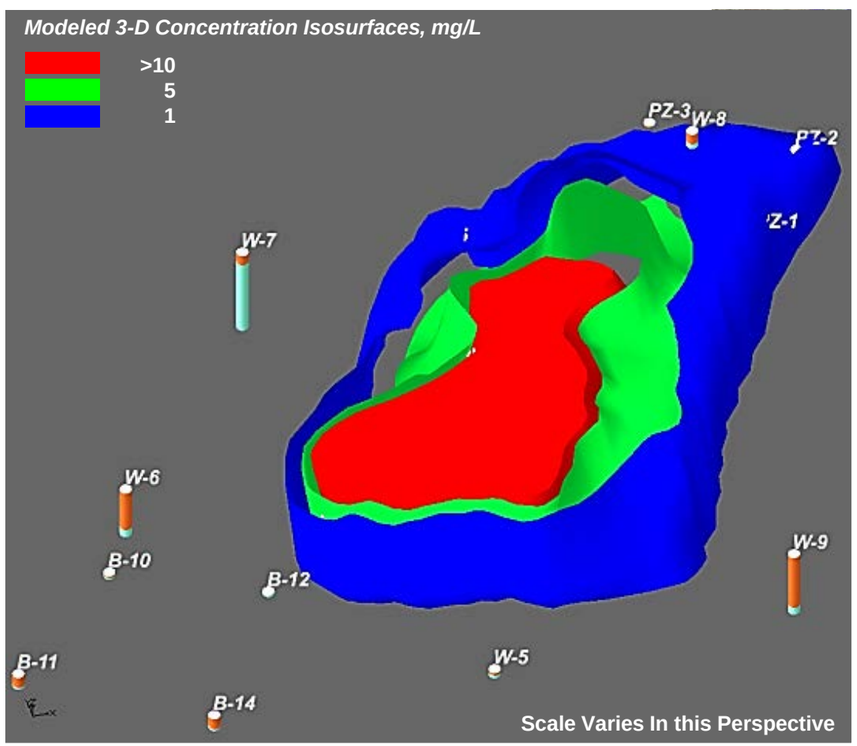
- Landfill Boundary
- Monitoring Wells
- Modeled Streams
- Off-site Residential Wells
- Stream Sampling Locations
- Compliance Boundary

Modeled Iron Concentration, mg/L

Well	Year 5	Well	Year 5
PW-1	1.92	W-2	10.52
PZ-1	0.50	W-3	1.35
PZ-2	0.40	W-3B	1.52
PZ-3	0.39	W-6	0.30
PZ-4	0.37	W-7	0.30
PZ-5	0.48	W-8	0.49
W-1	8.57	W-9	0.30
2L Standard	0.050	Modeled Regional Background	0.030
		Site-Specific Background *	0.940

* Historical average W-6 results (1/2011-4/2013)





ERM NC, Inc.

Modeled Future Distribution 5 Years After Landfill Capping
Dissolved Iron In Deep Bedrock Zone
Edwards Road Landfill - Rural Hall, North Carolina

FIGURE 3A

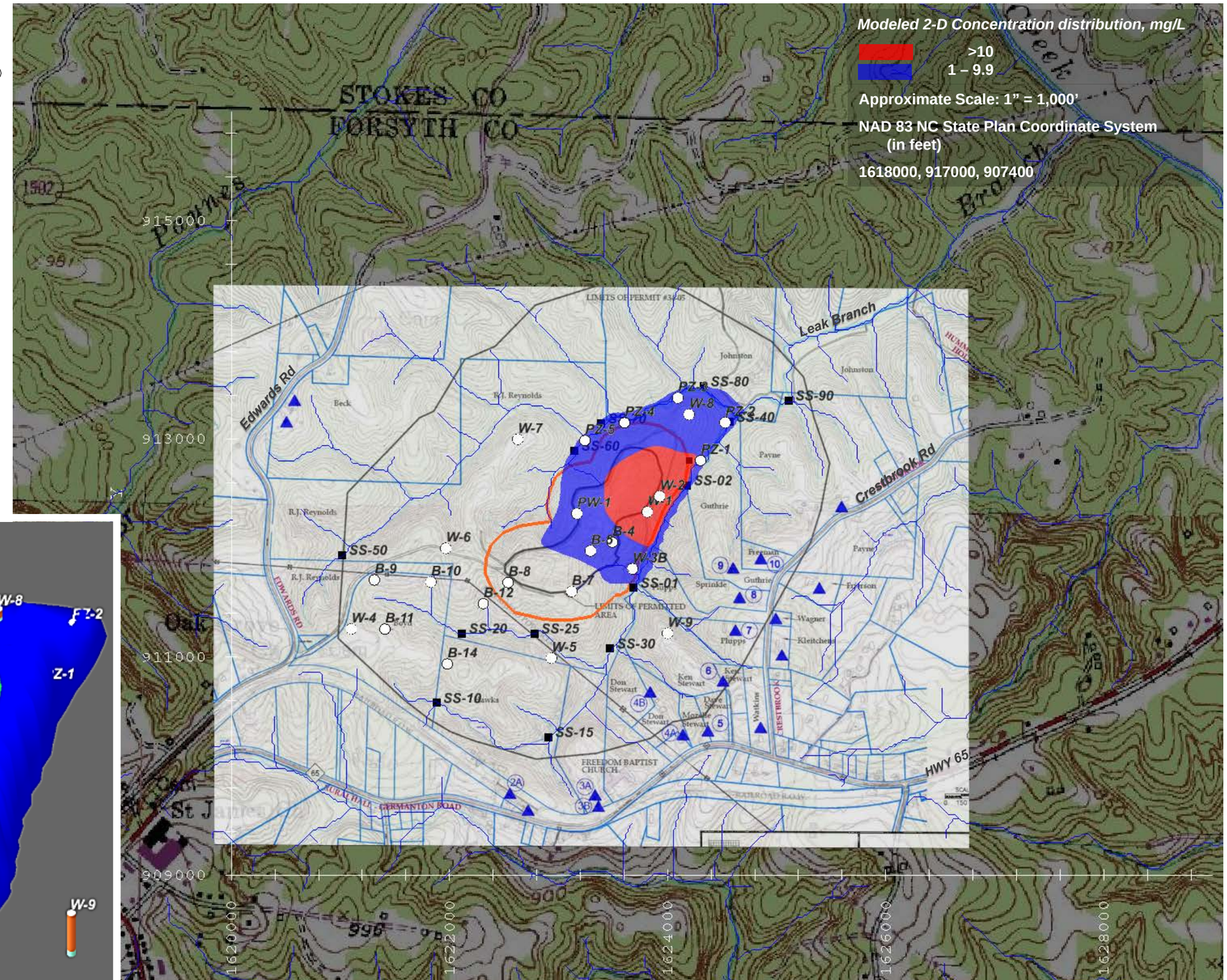
LEGEND

- Landfill Boundary
- Monitoring Wells
- Modeled Streams
- Off-site Residential Wells
- Stream Sampling Locations
- Compliance Boundary

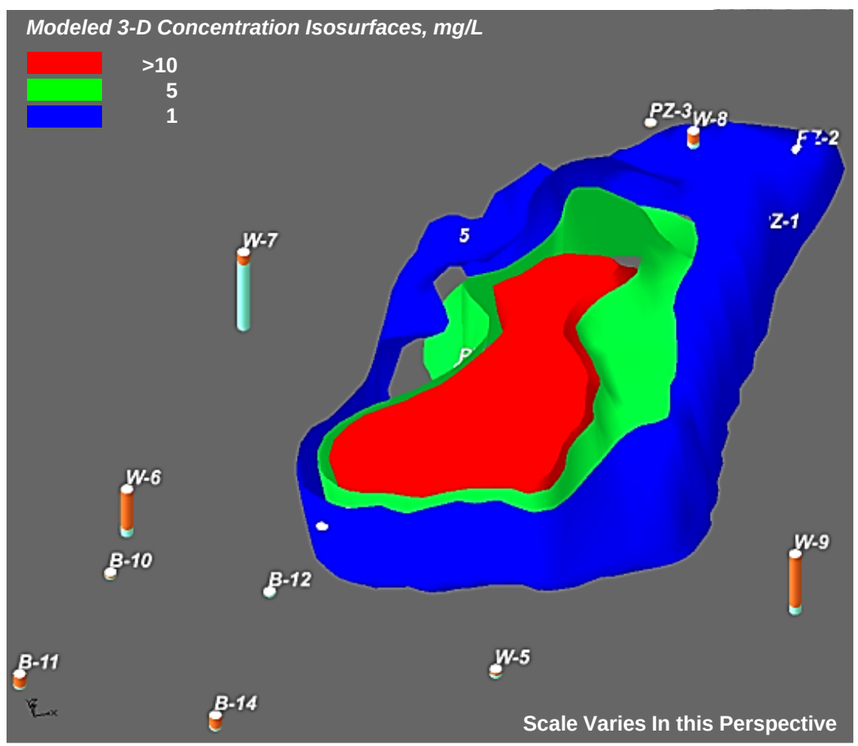
Modeled Iron Concentration, mg/L

Well	Year 10	Well	Year 10
PW-1	1.18	W-2	13.41
PZ-1	0.52	W-3	1.13
PZ-2	0.41	W-3B	1.04
PZ-3	0.38	W-6	0.30
PZ-4	0.37	W-7	0.30
PZ-5	0.47	W-8	0.30
W-1	10.89	W-9	0.30
2L Standard	0.050	Modeled Regional Background	0.030
		Site-Specific Background *	0.940

* Historical average W-6 results (1/2011-4/2013)



Modeled 3-D Concentration Isosurfaces, mg/L



ERM NC, Inc.

Modeled Future Distribution 10 Years After Landfill Capping
Dissolved Iron In Deep Bedrock Zone
Edwards Road Landfill - Rural Hall, North Carolina

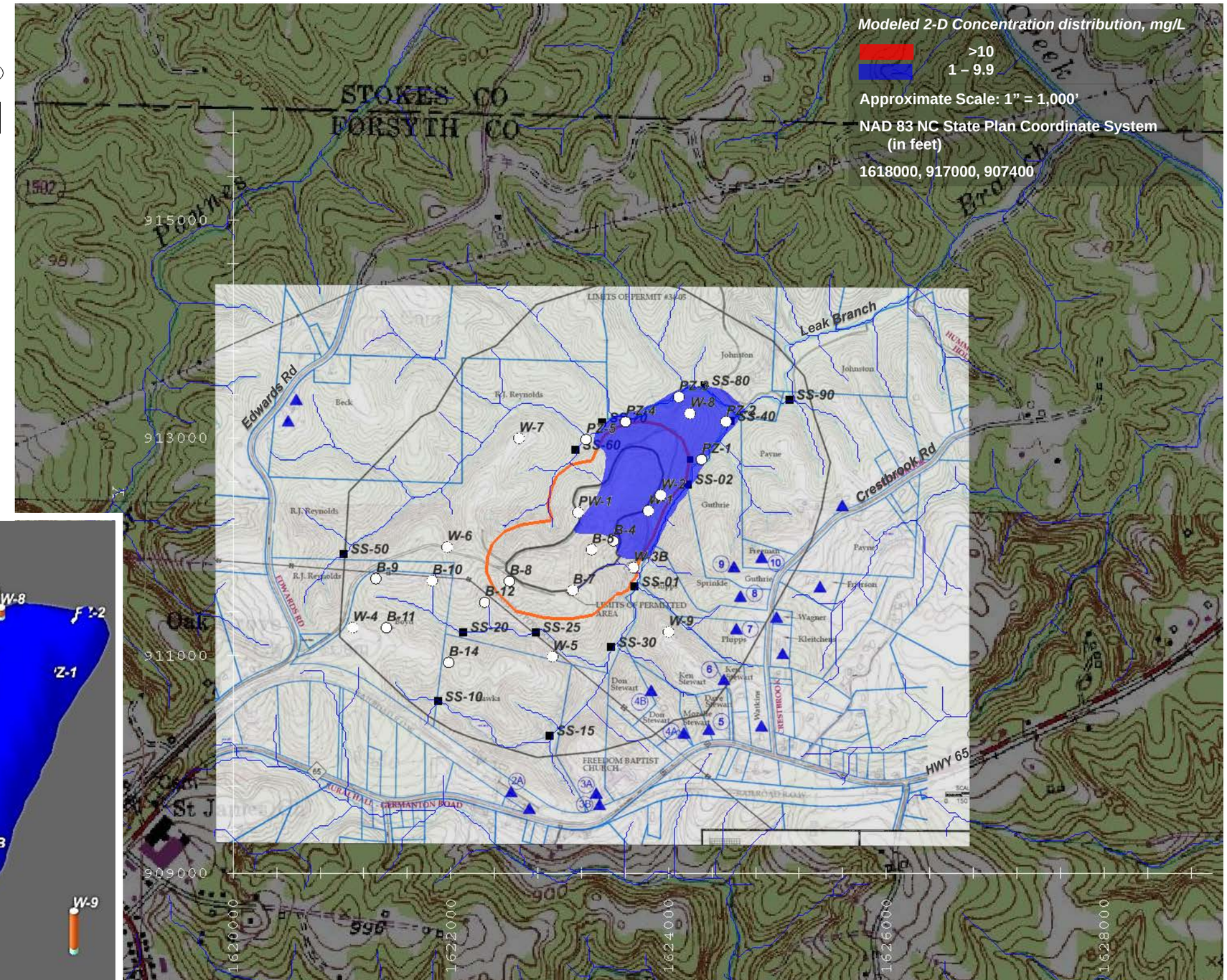
FIGURE
3B

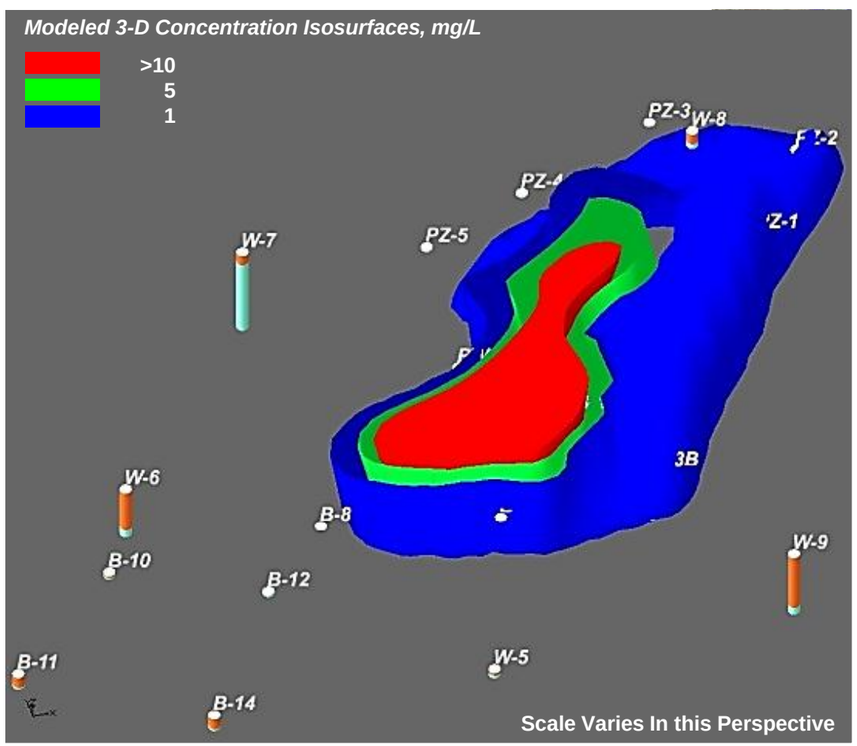
LEGEND

- Landfill Boundary
- Monitoring Wells
- Modeled Streams
- Off-site Residential Wells
- Stream Sampling Locations
- Compliance Boundary

Modeled Iron Concentration, mg/L			
Well	Year 25	Well	Year 25
PW-1	0.44	W-2	5.97
PZ-1	0.51	W-3	0.43
PZ-2	0.42	W-3B	0.44
PZ-3	0.35	W-6	0.30
PZ-4	0.33	W-7	0.30
PZ-5	0.35	W-8	0.30
W-1	4.54	W-9	0.30
2L Standard	0.050	Modeled Regional Background	0.030
		Site-Specific Background *	0.940

* Historical average W-6 results (1/2011-4/2013)





ERM NC, Inc.

Modeled Future Distribution 25 Years After Landfill Capping
Dissolved Iron In Deep Bedrock Zone
Edwards Road Landfill - Rural Hall, North Carolina

FIGURE 3C

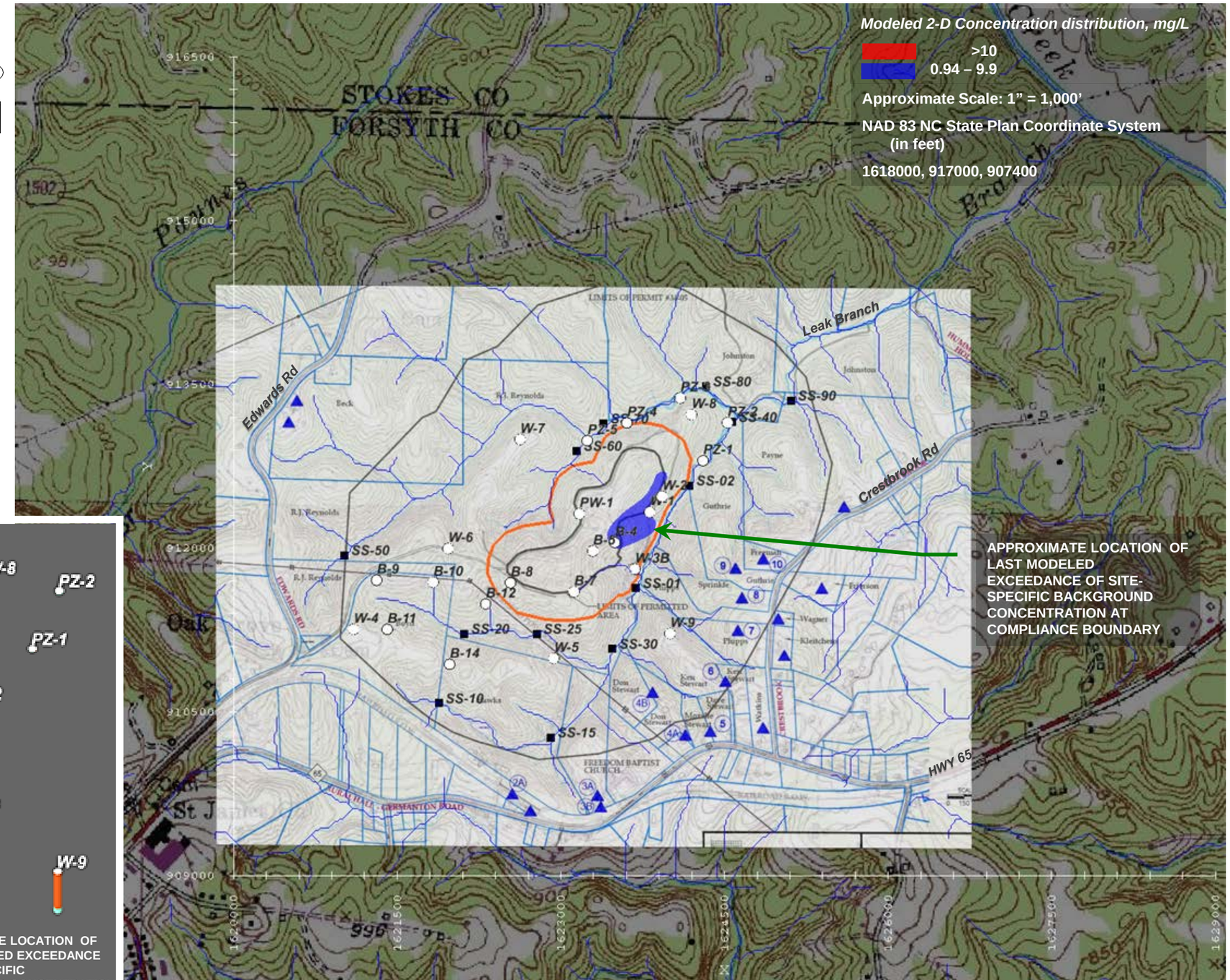
LEGEND

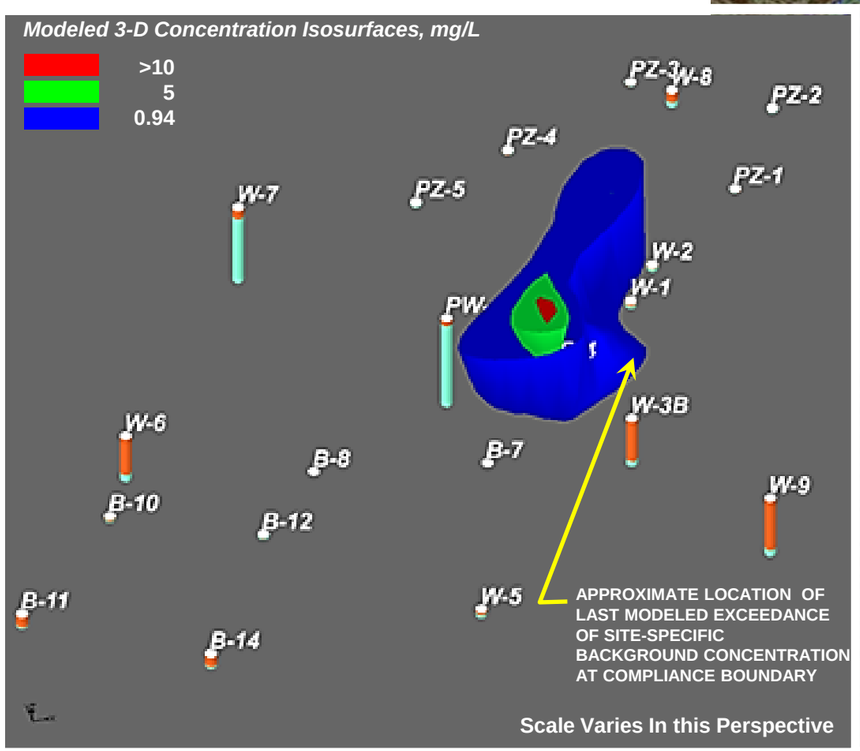
- Landfill Boundary
- Monitoring Wells
- Modeled Streams
- Off-site Residential Wells
- Stream Sampling Locations
- Compliance Boundary

Modeled Iron Concentration, mg/L

Well	Year 90	Well	Year 90
PW-1	0.30	W-2	0.83
PZ-1	0.30	W-3	0.31
PZ-2	0.30	W-3B	0.30
PZ-3	0.30	W-6	0.30
PZ-4	0.30	W-7	0.30
PZ-5	0.29	W-8	0.30
W-1	0.84	W-9	0.30
2L Standard	0.050	Modeled Regional Background	0.030
		Site-Specific Background *	0.940

* Historical average W-6 results (1/2011-4/2013)





ERM NC, Inc.

Modeled Future Distribution 90 Years After Landfill Capping
Dissolved Iron In Deep Bedrock Zone
Edwards Road Landfill - Rural Hall, North Carolina

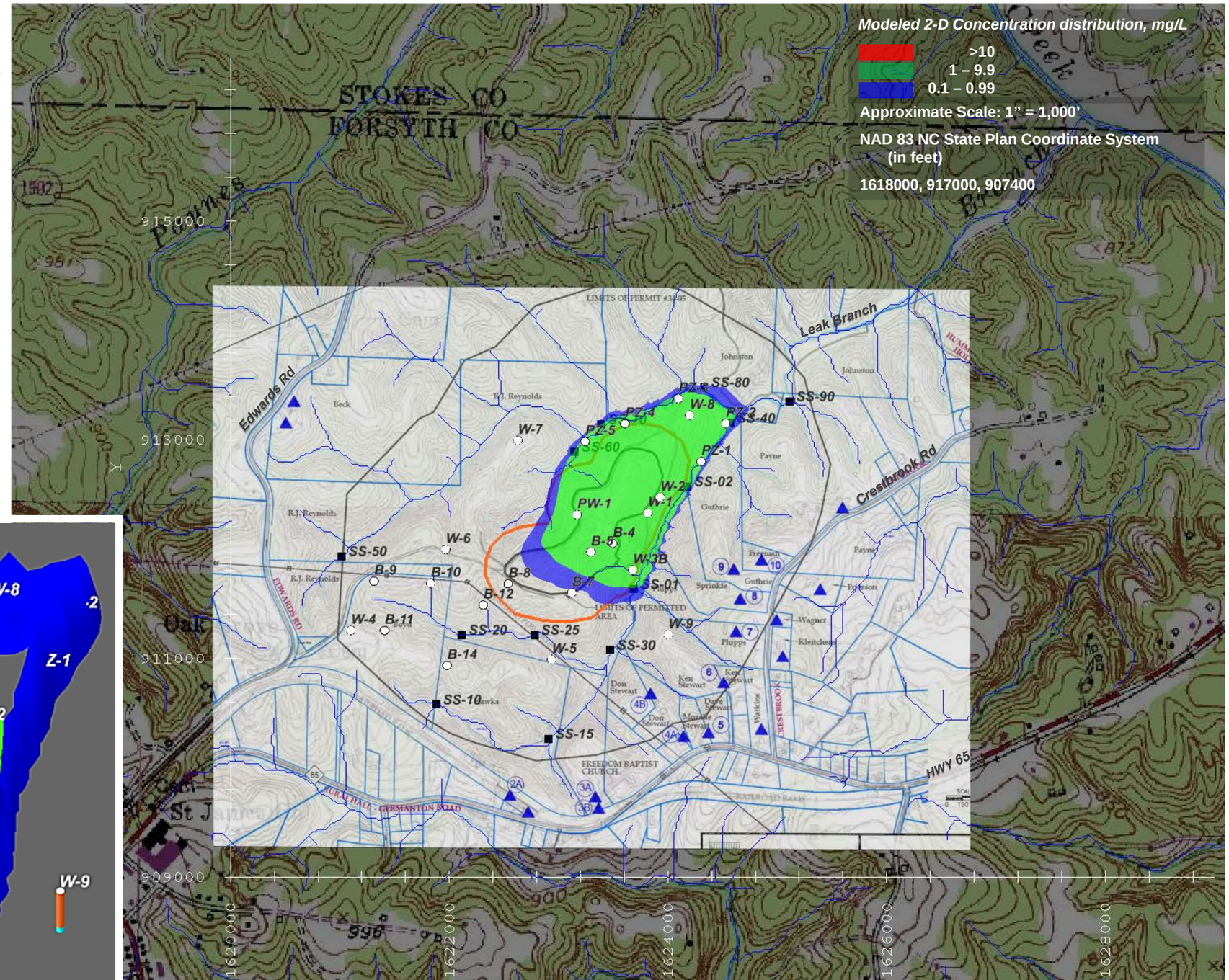
FIGURE 3D

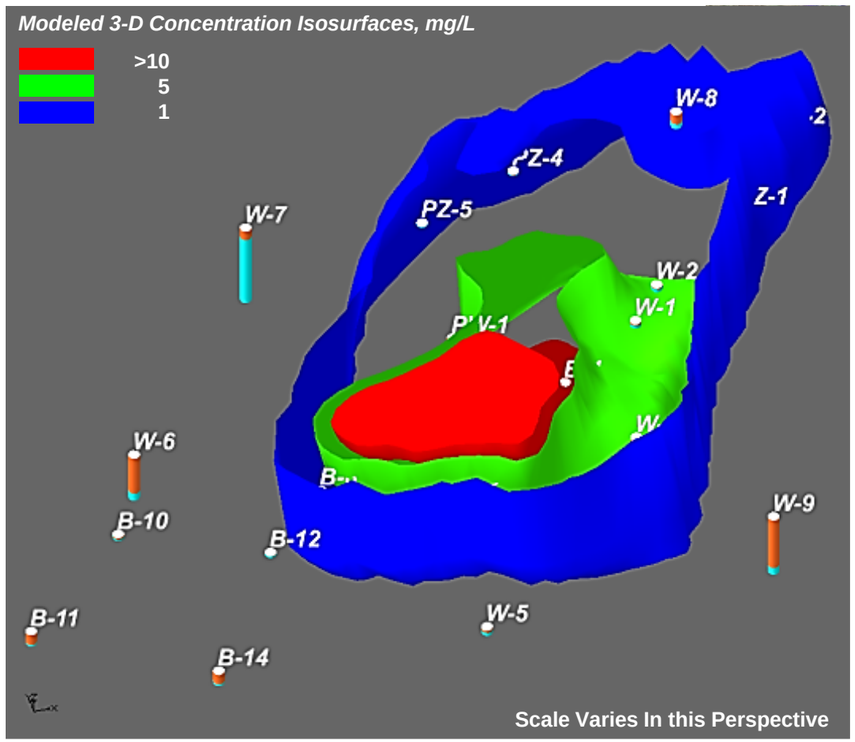
LEGEND

- Landfill Boundary
- Monitoring Wells
- Modeled Streams
- Off-site Residential Wells
- Stream Sampling Locations
- Compliance Boundary

Modeled Manganese Concentration, mg/L			
Well	Year 5	Well	Year 5
PW-1	4.860	W-2	4.820
PZ-1	0.115	W-3	0.615
PZ-2	0.070	W-3B	2.580
PZ-3	0.058	W-6	0.030
PZ-4	0.068	W-7	0.030
PZ-5	0.127	W-8	0.030
W-1	6.030	W-9	0.030
2L Standard	0.050	Modeled Regional Background	0.030
		Site-Specific Background *	0.150

* Historical average W-7 results (1/2011-4/2013)





ERM NC, Inc.

Modeled Future Distribution 5 Years After Landfill Capping
Dissolved Manganese In Deep Bedrock Zone
Edwards Road Landfill - Rural Hall, North Carolina

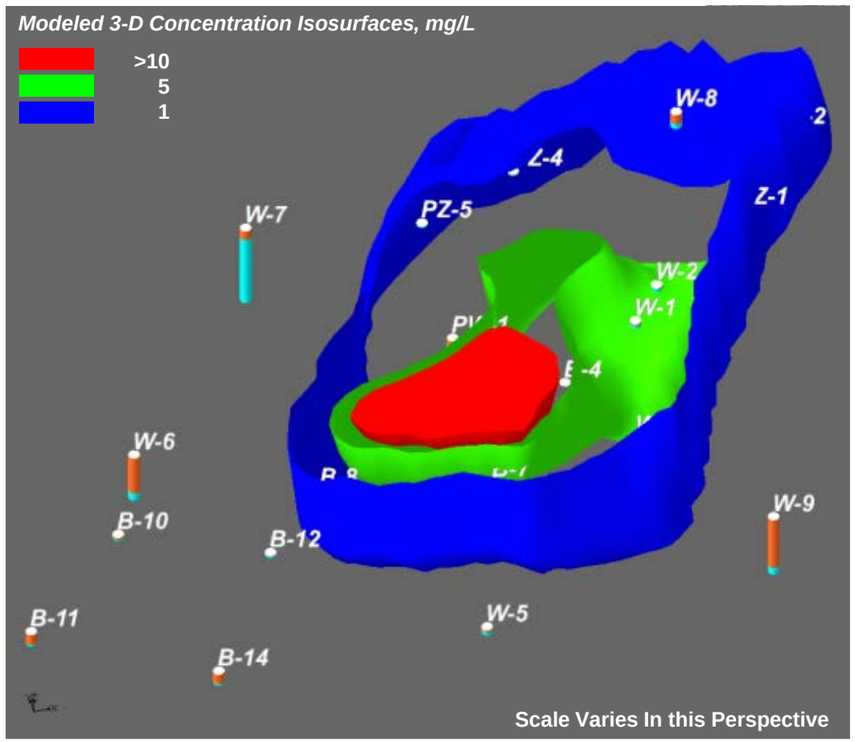
FIGURE
4A

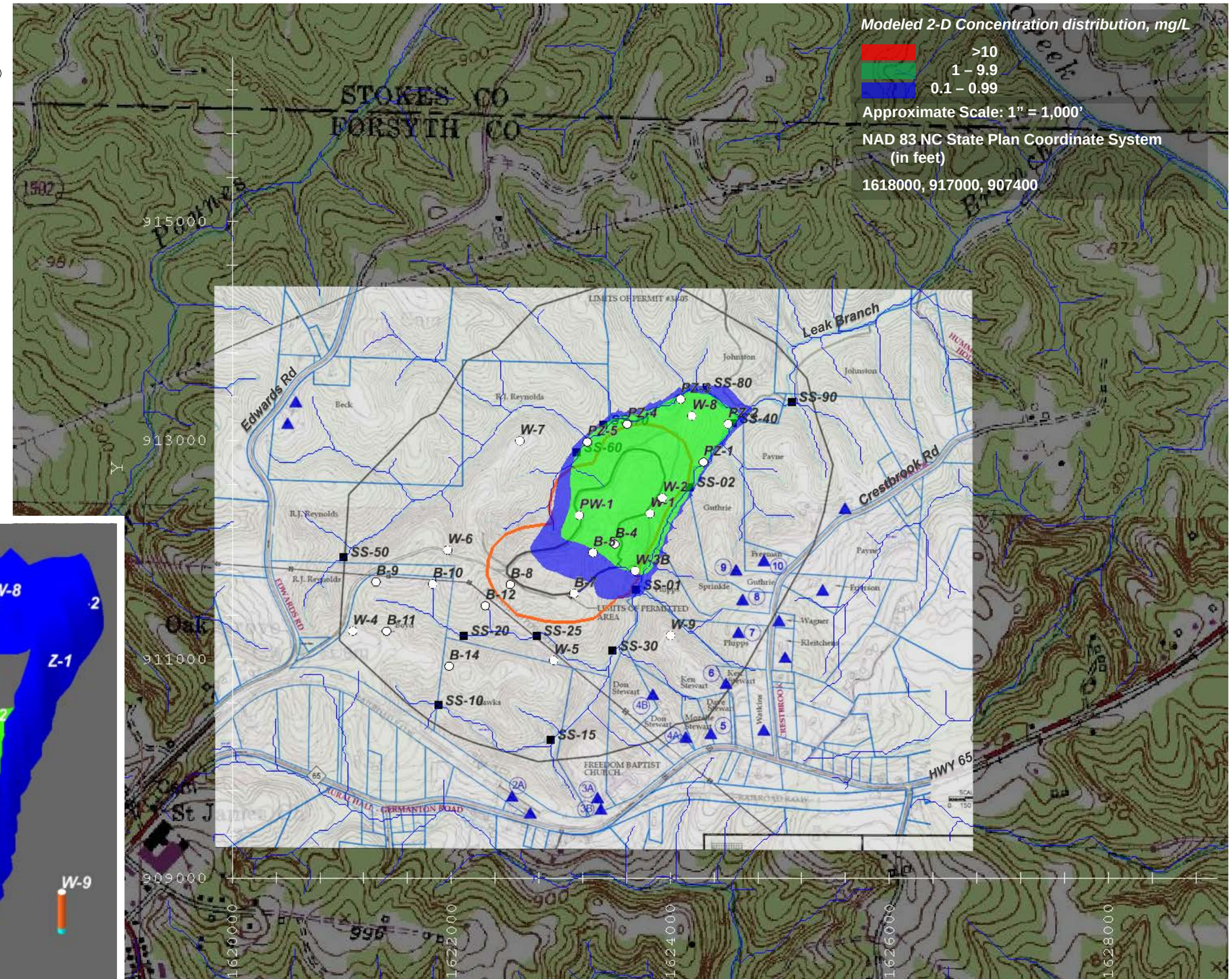
LEGEND

- Landfill Boundary
- Monitoring Wells
- Modeled Streams
- Off-site Residential Wells
- Stream Sampling Locations
- Compliance Boundary

Modeled Manganese Concentration, mg/L			
Well	Year 10	Well	Year 10
PW-1	1.990	W-2	5.900
PZ-1	0.131	W-3	0.382
PZ-2	0.075	W-3B	0.660
PZ-3	0.057	W-6	0.030
PZ-4	0.069	W-7	0.030
PZ-5	0.126	W-8	0.030
W-1	6.830	W-9	0.030
2L Standard	0.050	Modeled Regional Background	0.030
		Site-Specific Background *	0.150

* Historical average W-7 results (1/2011-4/2013)





ERM NC, Inc.

Modeled Future Distribution 10 Years After Landfill Capping
Dissolved Manganese In Deep Bedrock Zone
Edwards Road Landfill - Rural Hall, North Carolina

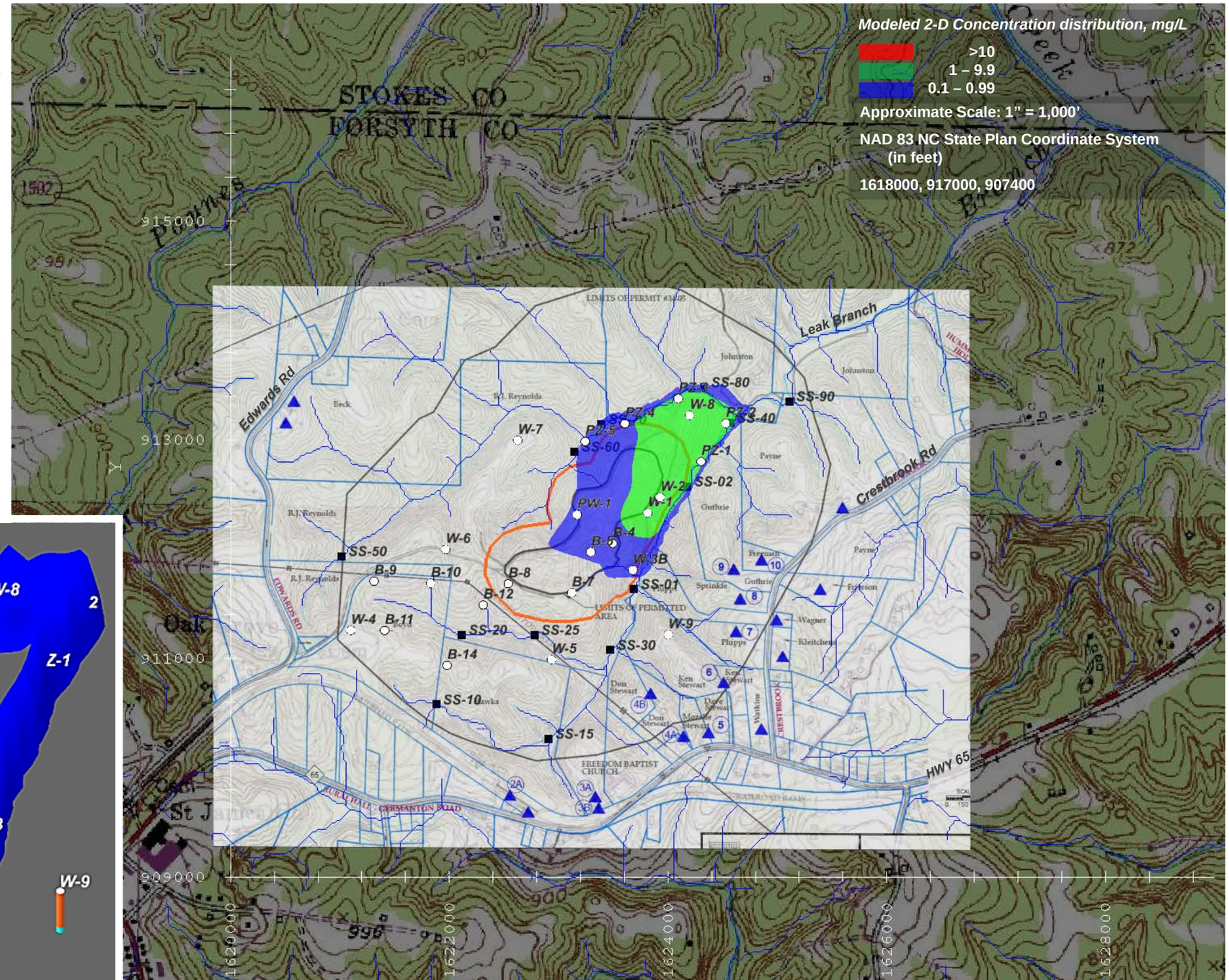
FIGURE
4B

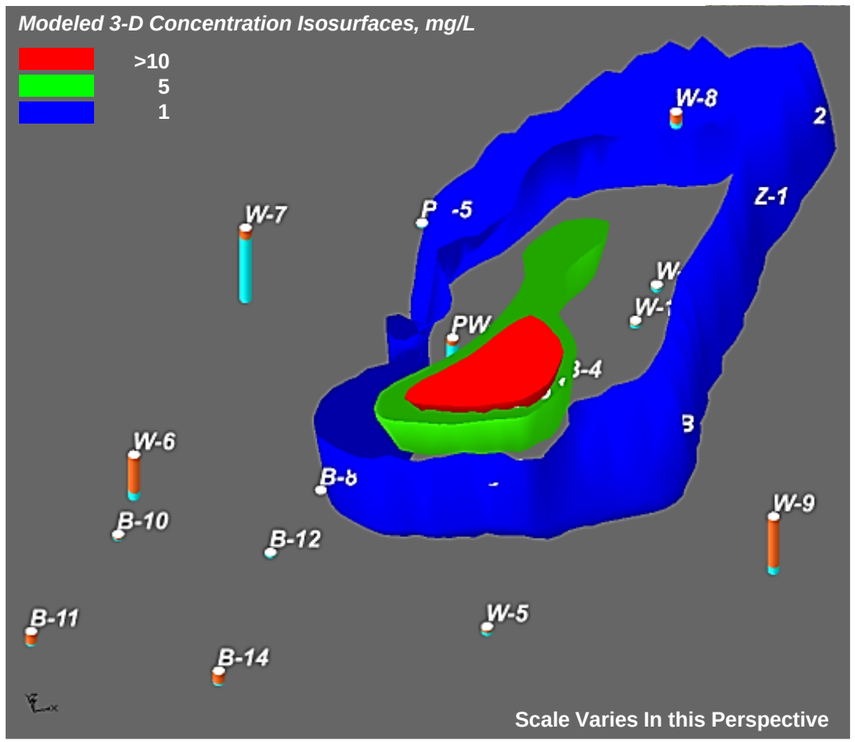
LEGEND

- Landfill Boundary
- Monitoring Wells
- Modeled Streams
- Off-site Residential Wells
- Stream Sampling Locations
- Compliance Boundary

Modeled Manganese Concentration, mg/L			
Well	Year 25	Well	Year 25
PW-1	0.190	W-2	2.150
PZ-1	0.127	W-3	0.095
PZ-2	0.088	W-3B	0.096
PZ-3	0.053	W-6	0.030
PZ-4	0.047	W-7	0.030
PZ-5	0.056	W-8	0.030
W-1	2.750	W-9	0.030
2L Standard	0.050	Modeled Regional Background	0.030
		Site-Specific Background *	0.150

* Historical average W-7 results (1/2011-4/2013)





ERM NC, Inc.

Modeled Future Distribution 25 Years After Landfill Capping
Dissolved Manganese In Deep Bedrock Zone
Edwards Road Landfill - Rural Hall, North Carolina

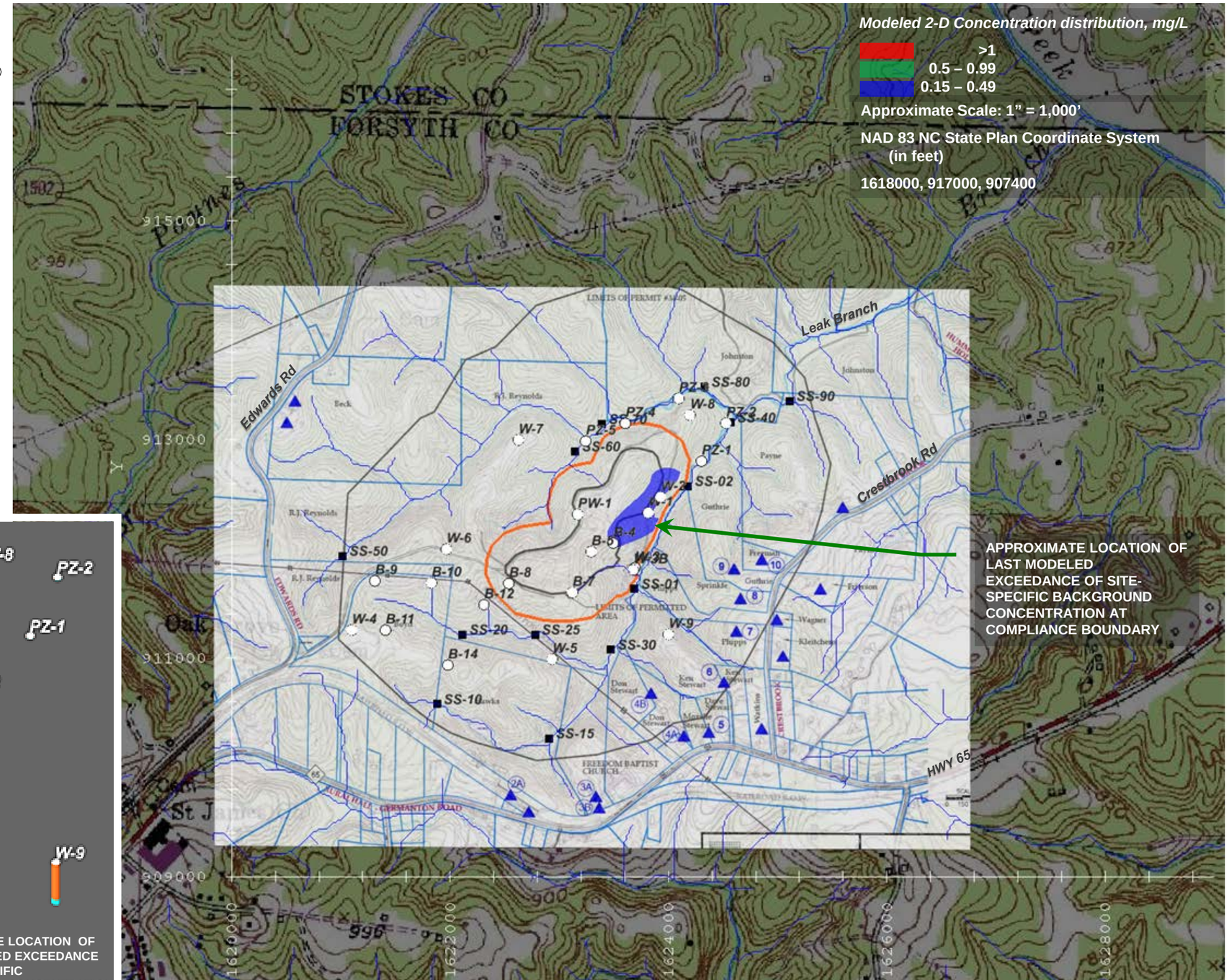
FIGURE
4C

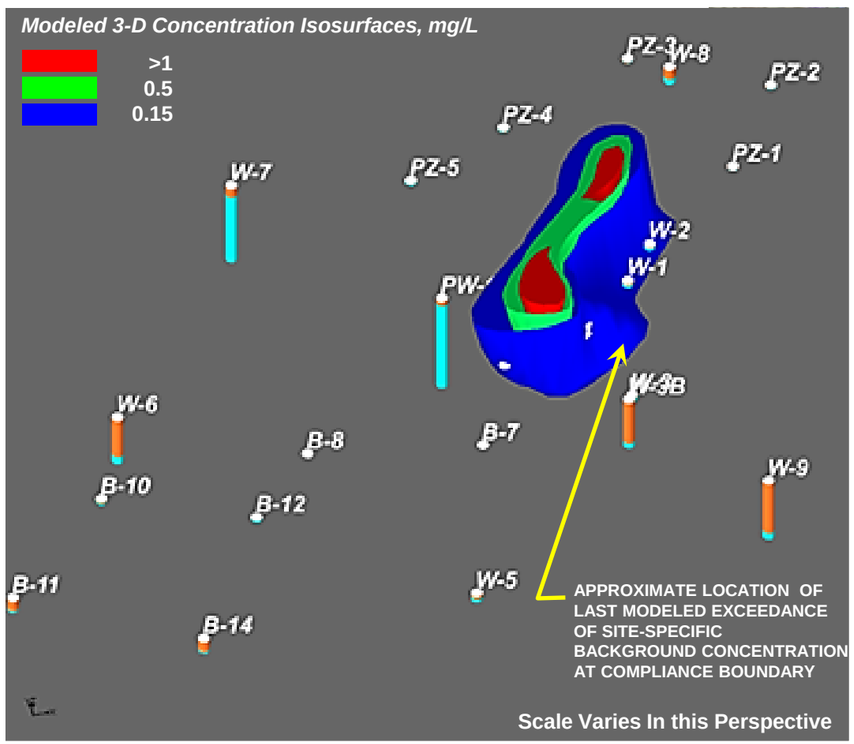
LEGEND

- Landfill Boundary
- Monitoring Wells
- Modeled Streams
- Off-site Residential Wells
- Stream Sampling Locations
- Compliance Boundary

Modeled Manganese Concentration, mg/L			
Well	Year 110	Well	Year 110
PW-1	0.030	W-2	0.162
PZ-1	0.030	W-3	0.042
PZ-2	0.030	W-3B	0.030
PZ-3	0.030	W-6	0.030
PZ-4	0.030	W-7	0.030
PZ-5	0.029	W-8	0.030
W-1	0.168	W-9	0.030
2L Standard	0.050	Modeled Regional Background	0.030
		Site-Specific Background *	0.150

* Historical average W-7 results (1/2011-4/2013)





ERM NC, Inc.

Modeled Future Distribution 110 Years After Landfill Capping
Dissolved Manganese In Deep Bedrock Zone
Edwards Road Landfill - Rural Hall, North Carolina

FIGURE 4D

ERM has over 140 offices across the following countries and territories worldwide

Argentina
Australia
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India
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Italy
Japan
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New Zealand
Panama
Peru
Poland
Portugal
Puerto Rico
Romania
Russia
Singapore
South Africa
South Korea
Spain
Sweden
Taiwan
Thailand
United Arab Emirates
UK
US
Vietnam

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