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COOLING TOWER BLOWDOWN LINE

ASSESSMENT REPORT

SHEARON HARRIS NUCLEAR POWER PLANT

NEW HILL, NORTH CAROLINA

PREPARED FOR:

Progress Energy

PROGRESS ENERGY CAROLINAS

PREPARED BY:

SSi

SILAR SERVICES, INC.
983 BUTLER PIKE
BLUE BELL, PA 19422

April 2009

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TABLE OF CONTENTS

1 INTRODUCTION 1-1

1.1 Purpose of Report 1-1

1.2 Project Background 1-1

1.2.1 Project Location 1-1
1.2.2 Project Background 1-2

1.3 Scope and Objectives 1-2

1.4 Report Organization 1-2

2 ASSESSMENT ACTIVITIES AND FINDINGS 2-3

2.1 Assessment Activities 2-4

2.1.1 Soil Borings/Groundwater Monitoring Well Installation 2-4
2.1.2 Groundwater Elevation Measurements 2-6
2.1.3 Groundwater Sampling 2-6

2.2 Assessment Findings - Water Results 2-8

2.3 Surveying and Mapping 2-9

3 PHYSICAL CHARACTERISTICS OF THE STUDY AREA 3-1

3.1 Surface Features 3-1

3.2 Geology 3-1

3.3 Groundwater Hydrology 3-2

4 SUMMARY AND CONCLUSIONS 4-1

4.1 Summary of Groundwater Conditions 4-2

4.2 Conclusions 4-3

LIST OF FIGURES

Figure 1 Site Location Map
Figure 2 Site Layout Map
Figure 3 Groundwater Flow Map
Figure 4 Groundwater Analytical Results Summary March 4, 2009
Figure 5 Geologic Cross Section

LIST OF TABLES

Table 1 Monitoring Well Construction Summary
Table 2 Water Level Measurements
Table 3 Analytical Results - Water Samples

LIST OF APPENDICES

Appendix A Boring Logs
Appendix B NCDENR Well Construction Records
Appendix C Field Notes
Appendix D Calculations

1 INTRODUCTION

1.1 Purpose of Report

Silar Services Incorporated (SSi) has prepared this Cooling Tower Blowdown Line (CTBL) Assessment Report to document the results of investigation activities performed along a section of the CTBL at the Shearon Harris Nuclear Power Plant (SHNPP), located in New Hill, North Carolina. The purpose of the assessment was to identify the potential presence and extent of radiological materials in groundwater within the assessment area of the line with respect to the integrity of the line.

The initial assessment activities were conducted at the Site from January 21, 2009 through March 4, 2009. This Assessment Report, issued on April 1, 2009, provides a presentation of the activities completed and the findings of the assessment.

1.2 Project Background

This section includes information on the location, description and history of the Site.

1.2.1 Project Location

The Shearon Harris Nuclear Power Plant is located approximately 1.6-miles east of the Town of New Hill, North Carolina, and is situated on approximately 10,700 acres site. The Site location is depicted on **Figure 1**.

The Cooling Tower Blowdown Line, which is buried several feet below the ground surface, runs for approximately 2 miles from the cooling tower south to the edge of Harris Lake. The line assessment area is located between Air Release System Manhole #1 (ARS#1) which is located adjacent to the composite sampler shed (approximately 0.5 miles from the cooling tower) to ARS#2, located approximately 1,110 feet south of ARS#1. The assessment area is also depicted on **Figure 1**.

1.2.2 Project Background

On December 15, 2008, Progress Energy personnel discovered the presence of water in ARS#2. The manhole was investigated by purging the water from the manhole and evaluating conditions. It was observed that subsequent to purging the manhole dry, water was continuing to enter the bottom of the manhole through a 2-inch pipe designed to drain the manhole. A water sample was collected and analyzed for tritium. Tritium was detected at an approximate concentration of 800 pCi/l. Based on these observations, Progress Energy determined that additional evaluation was warranted.

1.3 Scope and Objectives

The overall objectives of the Cooling Tower Blowdown Line Assessment are as follows:

- Characterize the hydrogeology and geology in the area
- Provide groundwater sampling and elevation measuring points
- Evaluate groundwater flow and groundwater quality
- Assess potential sources of tritium concentration in water.

The scope of the assessment included the collection of data as close as reasonably possible to the Cooling Tower Blowdown Line while not compromising the integrity of the line.

1.4 Report Organization

The organization and content of the remainder of this report are described below.

Section 2.0 - Investigation Activities and Findings

A summary of the activities completed during planning and implementation of the assessment is provided. The methods, locations, and results of the sampling and analysis program are presented in detail for soil and groundwater.

Section 3.0 - Physical Characteristics of the Study Area

A description of the study area including surface features, geology and soils, surface water hydrology, and groundwater hydrology is provided in Section 3.

Section 4.0 - Summary and Conclusions

A summary of the relevant environmental conditions to satisfy the objectives of the investigation is provided in Section 4.

2 ASSESSMENT ACTIVITIES AND FINDINGS

The planning of the assessment activities included a number of conference calls and meetings with appropriate plant personnel. A scope of work to complete the assessment objectives was prepared by SSi and submitted to Progress Energy on January 6, 2009. The initial scope of work called for the installation of up to 20 shallow (approximately 25 feet below ground surface or bgs) soil borings/monitoring wells to complete the study objectives.

The assessment field activities were completed in two phases. The first phase was completed from January 21 to February 6, 2009, and included the following activities:

- Installation of six (6) groundwater monitoring wells BDL-MW1 through BDL-MW6 at points along the blowdown line and near ARS#2,
- Collection of preliminary groundwater samples from BDL-MW1, BDL-MW2, and BDL-MW-3 on January 23, 2009, and
- Water level measurements and preliminary groundwater samples from BDL-MW5 and BDL-MW6 on February 6, 2009.

Based on these initial activities and findings, the original scope of work was revised to reduce the number of wells due to the general absence of shallow groundwater.

The second phase of the assessment was completed from February 17 to March 4, 2009, and included:

- Installation of three (3) groundwater monitoring wells BDL-MW7 through BDL-MW9 at ARS#2 and downgradient of ARS#2 toward Harris Lake,
- Measuring water level elevations on March 3, 2009, and
- Collecting a complete round of water samples from the monitoring wells and ARS#2 on March 4, 2009.

These activities are described in detail below. The locations of the groundwater monitoring wells installed in the area are depicted on **Figure 2**.

The activities and findings are summarized in the following subsections. The analytical results are presented and, where concentrations of radiological materials were observed, the results are also presented on figures. Throughout this section, groundwater data are discussed with respect to the USEPA drinking water standard of 20,000 pCi/L (picocuries per liter).

2.1 Assessment Activities

To accomplish the objectives of the assessment, several investigation activities were completed including: soil borings/monitoring well installation, groundwater elevation measurements and groundwater sampling. The assessment methods and results are discussed in the following subsections.

Objective 1.3a Installation of additional monitoring wells

2.1.1 Soil Borings/Groundwater Monitoring Well Installation

The primary objectives of the soil boring/monitoring well installation were to evaluate subsurface conditions and establish a network of monitoring wells in the Cooling Tower Blowdown Line assessment area to evaluate geology, hydrogeology and groundwater quality. To accomplish this objective, soil borings were advanced and monitoring wells were installed at the locations illustrated on **Figure 2**. Boreholes were logged from split spoon samples and cuttings. The screened interval for each monitoring well was selected to intersect the depth intervals where groundwater was observed. Where no groundwater was observed the bottom of the screened interval was

placed at the maximum penetration depth of the drilling technique and below observed water levels in the adjacent manholes.

Hollow-stem auger (HSA) drilling methods were employed to complete the installation of groundwater monitoring wells BDL-MW1 through BDL-MW6. HSA and air rotary drilling methods were employed to complete the installation of groundwater monitoring wells BDL-MW7 through BDL-MW9. The drilling activities are described in the following sections.

During the investigation, a total of nine (9) shallow groundwater monitoring wells were installed as shown on **Figure 2.** The general monitoring well installation procedures are summarized below.

- The depth for each of the wells was selected based on presence and depth of groundwater at each well location. Where no groundwater was observed, the bottom of the well was set at the maximum drilling depth using the HSA techniques (BDL-MW 4 through BDL-MW6, only) and below the water level in ARS#2.
- The wells were generally installed using 4¼-inch inside diameter (ID) hollow stem augers and/or 4-inch air hammer.
- At least ten feet of 2-inch-ID, Schedule 40 PVC, machine cut, well screen with 0.020-inch-slot size was set at the bottom of each well. A sufficient length of 2-inch ID, Schedule 40 PVC riser pipe was coupled to the screen to allow the PVC riser pipe to extend a minimum of two feet above the ground surface. Well screens were fitted with a nominal 2-inch solid (unslotted) bottom sediment trap.
- The annular space around the well screens was backfilled with clean uniform sand (filter pack sieve #2). The filter pack was placed from the bottom of the well to a minimum of 2 feet above the top of the well screen. A minimum 2-foot-thick bentonite seal was placed above the sand and allowed to hydrate.
- All wells were completed as stick-up wells, with lockable expansion plugs.

- A concrete pad will be installed around the wells that are determined by Progress Energy and SSi to be completed as permanent wells.
- Boring Logs were prepared for each monitoring well.

A summary of the monitoring well construction details is provided in **Table 1** and depicted in the Boring Logs included in **Appendix A**. NCDENR Well Construction Records are included in **Appendix B**.

2.1.2 Groundwater Elevation Measurements

Groundwater elevation measurements were collected from the monitoring wells and used to provide data to map the potentiometric surface of the aquifer and interpret the horizontal groundwater flow in the aquifer. One complete round of depth-to-water measurements was collected from the nine monitoring wells on March 3, 2009. Measurements were collected using a Solinst Level Indicator Probe capable of measuring depth to water within 0.01-foot accuracy. Results of these measurements are summarized in **Table 2**, presented on **Figure 3**, and discussed in Section 3 of this report.

2.1.3 Groundwater Sampling

One round of groundwater samples was collected from the monitoring wells. All monitoring wells were sampled except BDL-MW4, which was dry. In addition, a water sample was collected directly from the drainpipe in manhole ARS#2. Water samples were analyzed for tritium at Progress Energy's Harris Energy and Environmental Center Radiochemistry Laboratory to the same lower limit of detection as the NC Division of Radiation Protection (NCDRP) laboratory. In addition, select water samples were analyzed for total zinc.

Prior to sampling, each monitoring well was purged in accordance with low-flow groundwater sampling procedures to assure collection of a representative groundwater sample. Groundwater sampling was completed using a peristaltic pump, dedicated

pump (flex) tubing, and dedicated down-hole polyethylene tubing at each monitoring well to eliminate the potential for cross-contamination between sampling points. Water quality measurements (pH, temperature, dissolved oxygen, conductivity, and oxidation/reduction potential) were collected during the purging activities and recorded in the field logbook (**Appendix C**). The procedure for monitoring well purging and sampling is generally as follows:

- The security cap was removed, and the depth to water in the well was determined with a water level meter. The depth to water was recorded in the field logbook.

- The dedicated down-hole tubing was lowered into the monitoring well, cut to the desired length, attached to the pre-cut flex tubing on the peristaltic pump, a new section of poly tubing was inserted on the effluent side of the pump. The sample line was connected from the pump to the in-line water quality instrument (YSI MP556 with flow through cell), the effluent line from the flow-through cell was inserted into a purge water container to capture purge water, the peristaltic pump was started, and purging of groundwater at the well was commenced.

- An optimum low-flow pumping rate was established at each well to minimize drawdown. The groundwater quality parameters and depth to water were monitored and recorded at prescribed time intervals to determine when the water quality parameters had stabilized to within 10%.

- Following the stabilization of the groundwater quality parameters, groundwater samples were collected from the wells and delivered to the radiological analytical laboratory.

- Purge water was collected and transported to the designated disposal point. ARS#2 was sampled in general accordance with the methodology specified above.

2.2 Assessment Findings - Water Results

Groundwater samples were collected from the monitoring wells on March 4, 2009. All water samples from the wells (8 samples) and manhole (1 sample) were analyzed for tritium at the on-site radiological analytical laboratory. Samples from BDL-MW1, BDL-MW5, BDL-MW8, and ARS#2 were also analyzed for zinc, since zinc is added to the cooling water and can be used as a marker analyte. Analytical results are summarized in **Table 3**. **Figure 4** depicts the analytical results for tritium in the water samples. The results are summarized below.

- Tritium was detected in five (5) of the eight (8) monitoring wells sampled and in the ARS#2 sample. The detection limit for the analyses was approximately 233 pCi/L.

- Tritium in the nine (9) samples ranged from less than the detection limit (three wells) to 2,120 pCi/L at manhole ARS#2.

- The highest concentration of tritium detected in the samples was detected in the immediate area of ARS#2 (ARS#2, BDL-MW5, and BDL-MW6). The second highest concentration of tritium was detected at BDL-MW3, near the wetland in the area of groundwater discharge. These three wells are located in close proximity to the backfilled trench of the blowdown line which is likely acting as a preferential pathway of water transport.

- The horizontal migration of tritium in groundwater from the blowdown line appears to be limited as no tritium was detected in samples from BDL-MW8 and BDL-MW9.

- The vertical migration of tritium in groundwater from the blowdown line appears to be limited as no tritium was detected in the sample from BDL-MW7.

- The highest concentration of zinc was detected in the sample from ARS#2 at a concentration of 187 ug/l, lower concentrations of zinc were detected in samples from BDL-MW8 (96 ug/l), BDL-MW5 (18 ug/l) and BDL-MW1 (8 ug/l).

Based on the occurrence and distribution of tritium in the water samples, it appears that the source of tritium is a leak(s) along the Cooling Tower Blowdown Line. Analysis of the hydrogeology and groundwater conditions within the area is presented and discussed in Section 3, and further discussion regarding the possible sources of tritium is presented in Section 4. Conclusions and potential additional activities that may be performed to further evaluate the blowdown line are also presented in Section 4.

2.3 Surveying and Mapping

A site survey was performed and certified by a North Carolina Registered Land Surveyor (Smith and Smith). Initial surveying activities were performed on January 22, 2009 during which time the centerline of the Cooling Tower Blowdown Line was located and demarcated. On February 20, 2009 all monitoring wells, manhole ARS#1, and manhole ARS#2 were surveyed.

A survey map was produced that includes scale, benchmarks, North arrow, and the locations of monitoring wells. The survey map provided the information required to produce a site basemap for this Assessment Report.

3 PHYSICAL CHARACTERISTICS OF THE STUDY AREA

This section presents the physical characteristics of the Site including surface features, geology, surface water hydrology, and groundwater hydrology.

3.1 Surface Features

The SHNPP is located approximately 1.6 miles east of the town of New Hill, North Carolina. Access to the SHNPP is from Shearon Harris Road. The owner controlled area encompasses approximately 10,700 acres. The area of the Cooling Tower Blowdown Line, which is the focus of this assessment, includes approximately 15 acres.

As discussed in Section 1, the Cooling Tower Blowdown Line runs underground for approximately 2 miles from the Cooling Tower south to the edge of Harris Lake. The assessment area is on a peninsula which is surrounded by Harris Lake to the south, east, and west and bounded to the north by SHNPP. Specifically, the blowdown line assessment area is located between ARS#1, located adjacent to the composite sampler shed (approximately 0.5 miles from the cooling tower), to ARS#2 which is located approximately 1,110 feet south of ARS#1. The most significant surface feature in the assessment area is the topographic low area/wetlands, situated along the blowdown line approximately midway between ARS#1 and ARS#2. There is an approximately 30-foot elevation change between ARS#1 and the topographic low to the south. In addition, a portion of Harris Lake is located east of manhole ARS#2.

The Site location is shown on **Figure 1**, and the Site Layout is depicted on **Figure 2**.

3.2 Geology

Regional and site-specific geology have been extensively evaluated by others during the safety analyses for Unit 1 and more recently for proposed Units 2 and 3. These reports indicate that the plant is underlain by the Upper Triassic Age Newark Supergroup. The

group is characterized by siltstone and sandstone with subordinate amounts of claystone and conglomerated and igneous diabase intrusions. Additional information on regional and local geology can be found in the Final Safety Analysis Report (FSAR).

Site-specific geology observed in the area of the blowdown line is consistent with the regional geology. Soil borings encountered a thin layer of unconsolidated material (overburden), underlain by a reddish-brown weathered siltstone bedrock (regolith) underlain by reddish-brown siltstone. A site-specific interpretation of the geology in the area has been developed by using boring logs from the assessment activities and is presented as a cross-section on **Figure 5**.

3.3 Groundwater Hydrology

Regional and site-specific groundwater hydrology have been extensively evaluated by others during the safety analyses for Unit 1 and more recently for proposed Units 2 and 3. These reports indicate that the groundwater hydrology within the plant area is relatively complex as a result of the influence of the main and auxiliary reservoirs and the nature of the parent rock. The previous groundwater studies have focused on the plant area, located to the north of this assessment area. The nearest previously existing monitoring well is MWA-12, which is located approximately 1,000 feet northeast of ARS#1. Historic groundwater elevation at this location was approximately 235' MSL.

Groundwater monitoring activities were performed during this assessment to determine if the water entering ARS#2 is groundwater from the surrounding area, (i.e. is local groundwater discharging to ARS#2). Based on the depth to water in ARS#2, approximately 7 feet below ground surface (bgs), it was assumed that only shallow monitoring wells would be required to complete this study objective. Therefore, eight (8) shallow (less than 30 feet bgs) and one (1) deep (approximately 60 feet bgs) wells were installed during the assessment. One complete round of water level measurements was collected. Those water level measurements and resulting elevations are shown on **Figure 3**. Groundwater elevations are also shown on the geologic cross-section included as **Figure 5**. As indicated, the groundwater elevations are highly variable

particularly in the area of ARS#2. General observations regarding the assessment area groundwater are as follows:

- In the area of ARS#1, as characterized by BDL-MW1 through BDL-MW3, groundwater elevations indicate flow to the south toward the topographic low/wetland.

- In the area of ARS#2, water was detected in BDL-MW5 and BDL-MW6 several days after the wells were installed, however BDL-MW4 remains dry. This indicates that the water observed in BDL-MW5 and BDL-MW6 is not from a local/regional groundwater source.

- The water elevation in ARS#2 is higher than that in BDL-MW5 and BDL-MW6 indicating that flow is from the immediate vicinity of ARS#2 to these monitoring wells and not from a local/regional groundwater source.

- In the area of ARS#2, groundwater was detected in BDL-MW7 at a significantly lower elevation that the water levels detected in BDL-MW5 and BDL-MW6, indicating that the regional groundwater elevation may be significantly lower than the water level observed in BDL-MW5 and BDL-MW6.

- The groundwater elevation at BDL-MW8 was measured to be at or above the ground surface indicating local artesian conditions at this location.

- The groundwater elevation at BDL-MW9, which is located approximately 40 feet from the edge of Harris Lake, was measure at an elevation (~210 feet MSL) approximately 10 feet below the surface water level indicating that surface water from Harris Lake may be discharging to groundwater in this area.

4 SUMMARY AND CONCLUSIONS

Silar Services Incorporated (SSi) has prepared this Cooling Tower Blowdown Line Assessment Report to document the results of investigation activities performed along a section of the line at the Shearon Harris Nuclear Power Plant, located in New Hill, North Carolina. The purpose of the assessment was to identify the potential presence and extent of radiological materials in groundwater within the area of the line with respect to the integrity of the line.

The Cooling Tower Blowdown Line runs underground for approximately 2 miles from the cooling tower south to the edge of Harris Lake. The line assessment area is located between Air Release System Manhole #1 (ARS#1), which is located adjacent to the composite sampler shed (approximately 0.5 miles from the cooling tower), to ARS#2, located approximately 1,110 feet south of ARS#1. The overall objectives of the Cooling Tower Blowdown Line assessment are as follows:

- Characterize the hydrogeology and geology in the area
- Provide groundwater sampling and elevation measuring points
- Evaluate groundwater flow and groundwater quality
- Assess potential sources of tritium concentration in water.

The assessment field activities were completed in two phases. The first phase included the following activities:

- Installation of six (6) groundwater monitoring wells BDL-MW1 through BDL-MW6 at points along the blowdown line and ARS#2.
- Collection of preliminary groundwater samples from BDL-MW1, BDL-MW2, and BDL-MW-3.
- Water level measurements and preliminary groundwater samples from BDL-MW5 and BDL-MW6.

Objective 1.3b
Installation of
additional wells

The second phase of the assessment included:

- Installation of three (3) groundwater monitoring wells BDL-MW7 through BDL-MW9 at ARS#2 and downgradient of ARS#2 toward Harris Lake.
- Measuring water level elevations.
- Collecting a complete round of water samples from the monitoring wells and ARS#2.

4.1 Summary of Groundwater Conditions

Groundwater samples were collected from the monitoring wells (8 samples) and manhole (1 sample) and analyzed for tritium. Samples from BDL-MW1, BDL-MW5, BDL-MW8, and ARS#2 were also analyzed for zinc, since zinc is added to the cooling water and can be used as a marker analyte. Tritium was detected in five (5) of the eight (8) monitoring wells sampled and in the ARS#2 sample at concentrations up to 2,120 pCi/L. (detected at ARS#2).

The highest concentration of tritium detected in the samples was detected in the immediate area of ARS#2 (ARS#2, BDL-MW5, and BDL-MW6). The next highest concentration of tritium was detected at BDL-MW3, near the wetland in the area of groundwater discharge. The highest concentration of zinc was detected in the sample from ARS#2 at a concentration of 187 ug/l.

Objective 1.1c migration

The fate and transport of tritiated groundwater from the area near ARS#2 to off-site areas can be evaluated using data collected during this assessment. This evaluation assumes tritiated groundwater is introduced from ARS#2 to the environment at a concentration of approximately 1,260 pCi/L (tritium concentration detected in water sampled from BDL-MW5, located downgradient of ARS#2). Once introduced into the environment tritiated groundwater flows generally east northeast toward the owner–controlled area boundary at a rate of 0.529 ft/day or 193 ft/year (**Appendix D**). The owner–controlled area boundary in the general direction of groundwater flow is approximately 1.79 miles or 9,451 feet from the ARS#2 area. Based on these estimates it would take groundwater from the ARS#2 area approximately 49 years to reach the

owner control boundary. Based on the half-life of tritium (12.33 years), flow rate (193 ft/year), flow distance (9,451 feet) and initial tritium concentration in the environment (1,260 pCi/L) the concentration of tritium in groundwater reaching the owner control boundary in 49 years will have been reduced by approximately four half-lives and would be less than 80 pCi/L, below the current lower limit of detection. Supporting documentation for this analysis is provided in **Appendix D**.

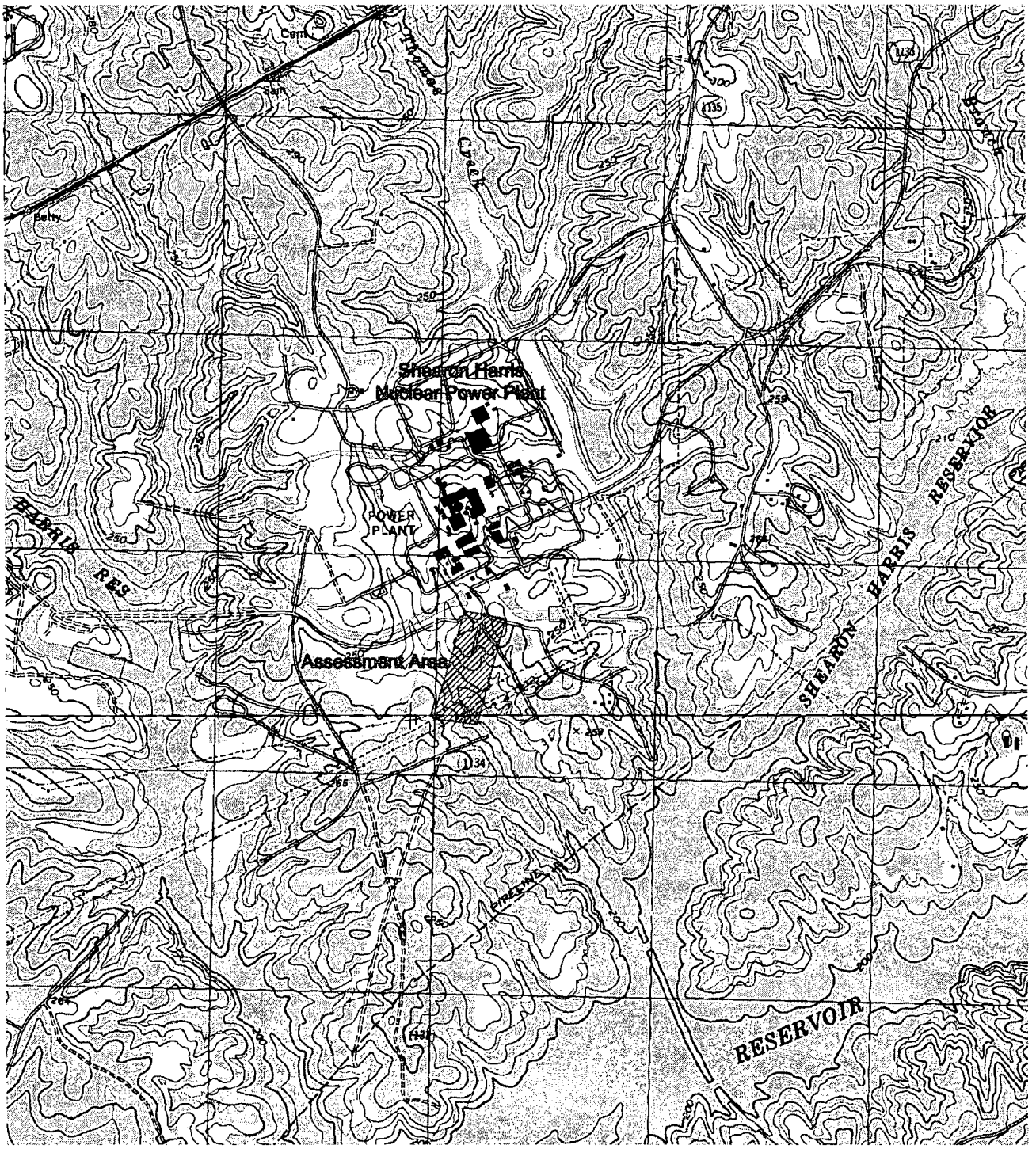
4.2 Conclusions

Based on the occurrence and distribution of tritium in the water samples, it appears that the source of tritium is a leak(s) along the Cooling Tower Blowdown Line. This is based on several observations. The highest observed tritium concentration was in the sample from the ARS#2 and its immediate vicinity. The water elevation in ARS#2 is higher than water elevations measured in BDL-MW5 and BDL-MW6, indicating that flow is from the immediate vicinity of ARS#2 to these monitoring wells. In the area of ARS#2, groundwater was detected in BDL-MW7 at a significantly lower elevation than the water levels detected in BDL-MW5 and BDL-MW6, indicating that the regional groundwater elevation may be significantly lower than the water level observed in BDL-MW5 and BDL-MW6. Water was observed to be entering ARS#2 through a pipe that was designed to drain water from the manhole to the surrounding backfill. It is possible that the backfill surrounding the blowdown line has created a preferential pathway for the flow of water. Water leaking from the pipeline in the vicinity of ARS#2, or at some point in the pipeline at a higher elevation, may be traveling along this preferential "horizontal" pathway as it also infiltrates the surrounding natural material toward the regional water table elevation. This would create an apparent groundwater mound adjacent to the line in areas where it is above the regional water table.

Further investigation is recommended including, but not limited to, the following:

- Evaluation of all manholes in the blowdown line
- Installation of sampling points within the blowdown line backfill
- Evaluation of the line integrity utilizing video surveillance and or pressure/exfiltration testing.

FIGURES



Quadrangle Location

0 2000 4000 Feet

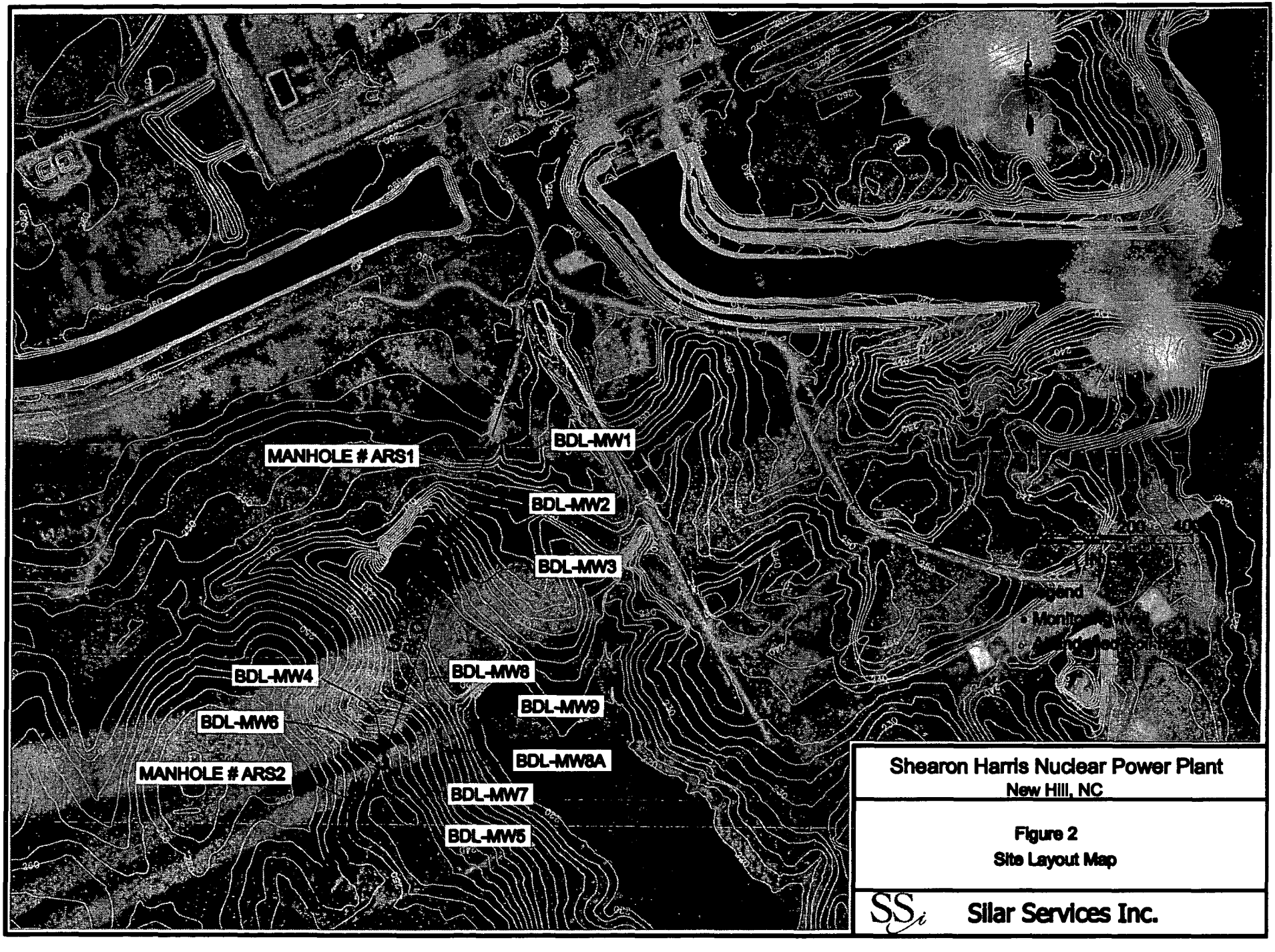
Source: U.S.G.S. Topographic Map (7.5 minute)
New Hill & Cokesbury, NC quadrangles

N

Shearon Harris Nuclear Power Plant
New Hill, NC

Figure 1
Site Location Map

SSi **Silar Services Inc.**



Shearon Harris Nuclear Power Plant
New Hill, NC

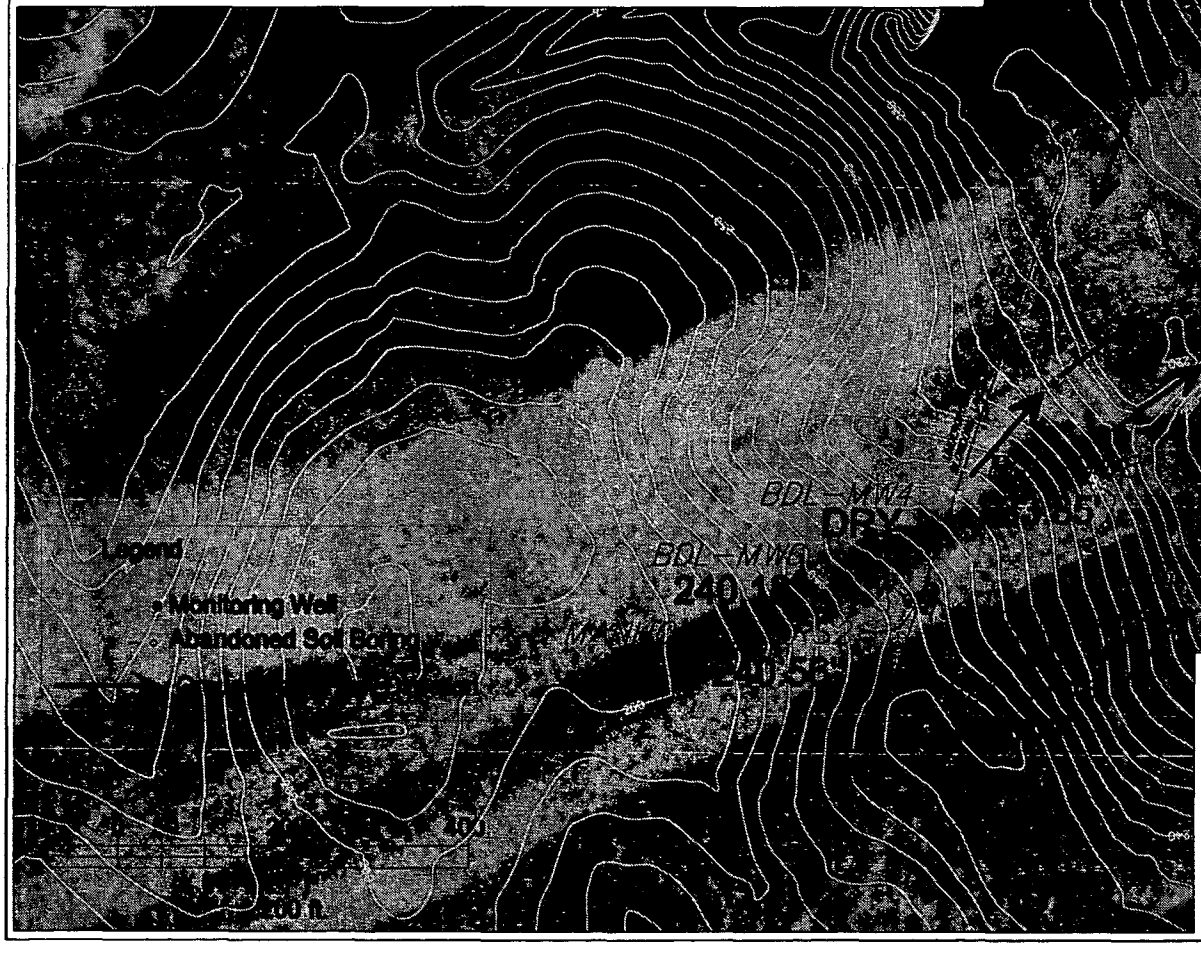
Figure 2
Site Layout Map

SSi **Silar Services Inc.**

LOCATION DATA

MANHOLE	NORTHING	EASTING	LATITUDE	LONGITUDE	ELEVATION	DEPTH TO GROUNDWATER	GROUNDWATER ELEVATION
MH #ARS1	N= 683,368.45	E = 2,013,313.58	35°37'40"	78°57'19"	252.68	NM	NA
MH #ARS2	N= 682,311.65	E = 2,012,959.85	35°37'29"	78°57'23"	247.31	6.75	240.56

MONITORING WELL	NORTHING	EASTING	LATITUDE	LONGITUDE	ELEVATION	DEPTH TO GROUNDWATER	GROUNDWATER ELEVATION
BDL-MW1.PVC	N= 683,346.51	E = 2,013,326.50	35°37'39"	78°57'18"	254.68	23.31	231.37
BDL-MW2.PVC	N= 683,128.39	E = 2,013,248.92	35°37'37"	78°57'19"	238.37	11.71	226.66
BDL-MW3.PVC	N= 682,926.76	E = 2,013,180.15	35°37'35"	78°57'20"	224.68	4.45	220.23
BDL-MW4.PVC	N= 682,319.25	E = 2,012,972.67	35°37'29"	78°57'23"	246.96	DRY	DRY
BDL-MW5.PVC	N= 682,300.08	E = 2,012,967.10	35°37'29"	78°57'23"	247.28	8.44	238.84
BDL-MW6.PVC	N= 682,308.18	E = 2,012,948.01	35°37'29"	78°57'23"	247.90	7.72	240.18
BDL-MW7.PVC	N= 682,308.67	E = 2,012,970.46	35°37'29"	78°57'23"	248.07	62.93	185.14
BDL-MW8.PVC	N= 682,370.85	E = 2,013,154.27	35°37'30"	78°57'20"	235.90	2.05	233.85
BDL-MW9.PVC	N= 682,417.76	E = 2,013,249.54	35°37'30"	78°57'20"	225.17	15.20	209.97



Shearon Harris Nuclear Power Plant
New Hill, NC

Figure 3
Groundwater Flow Map

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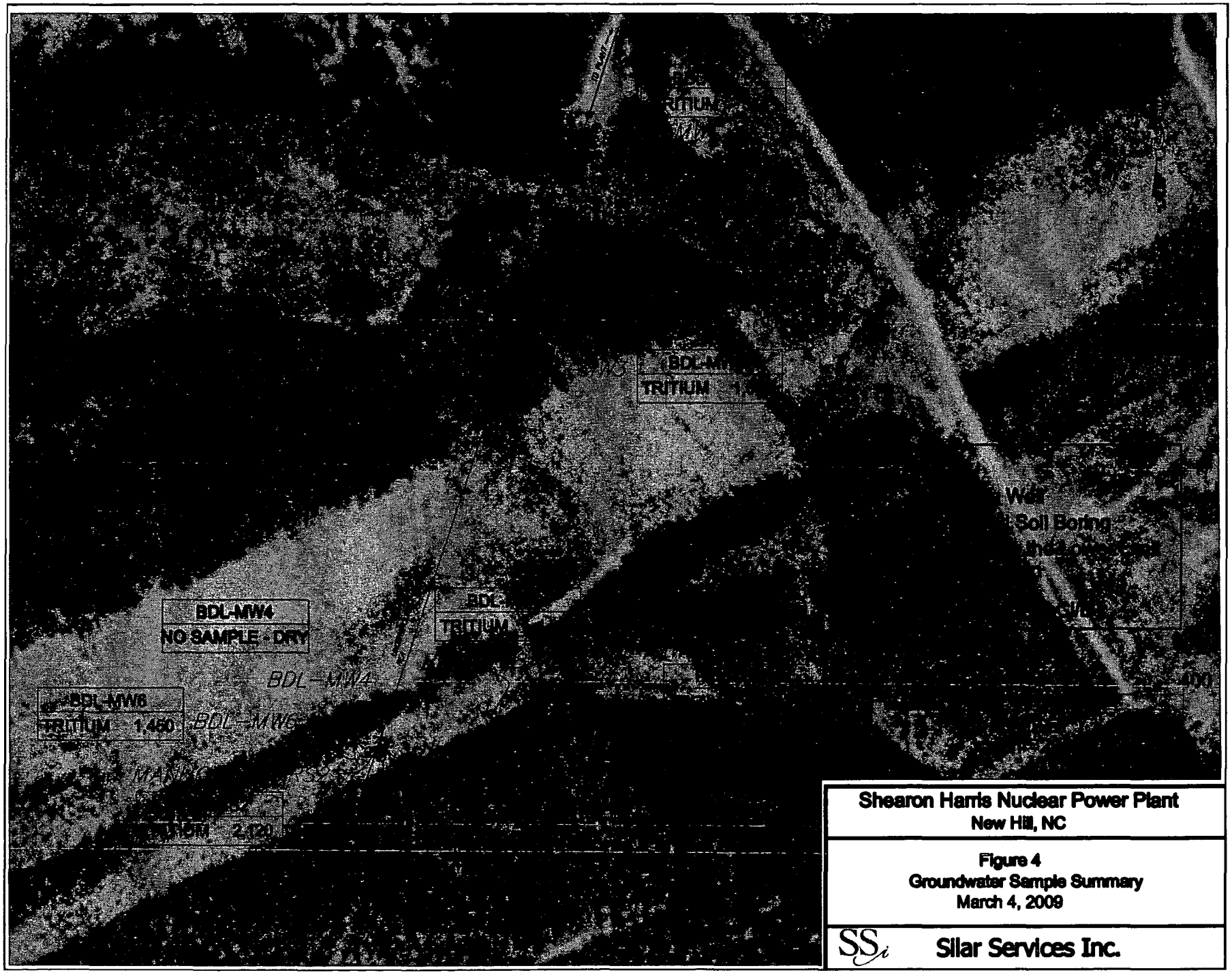
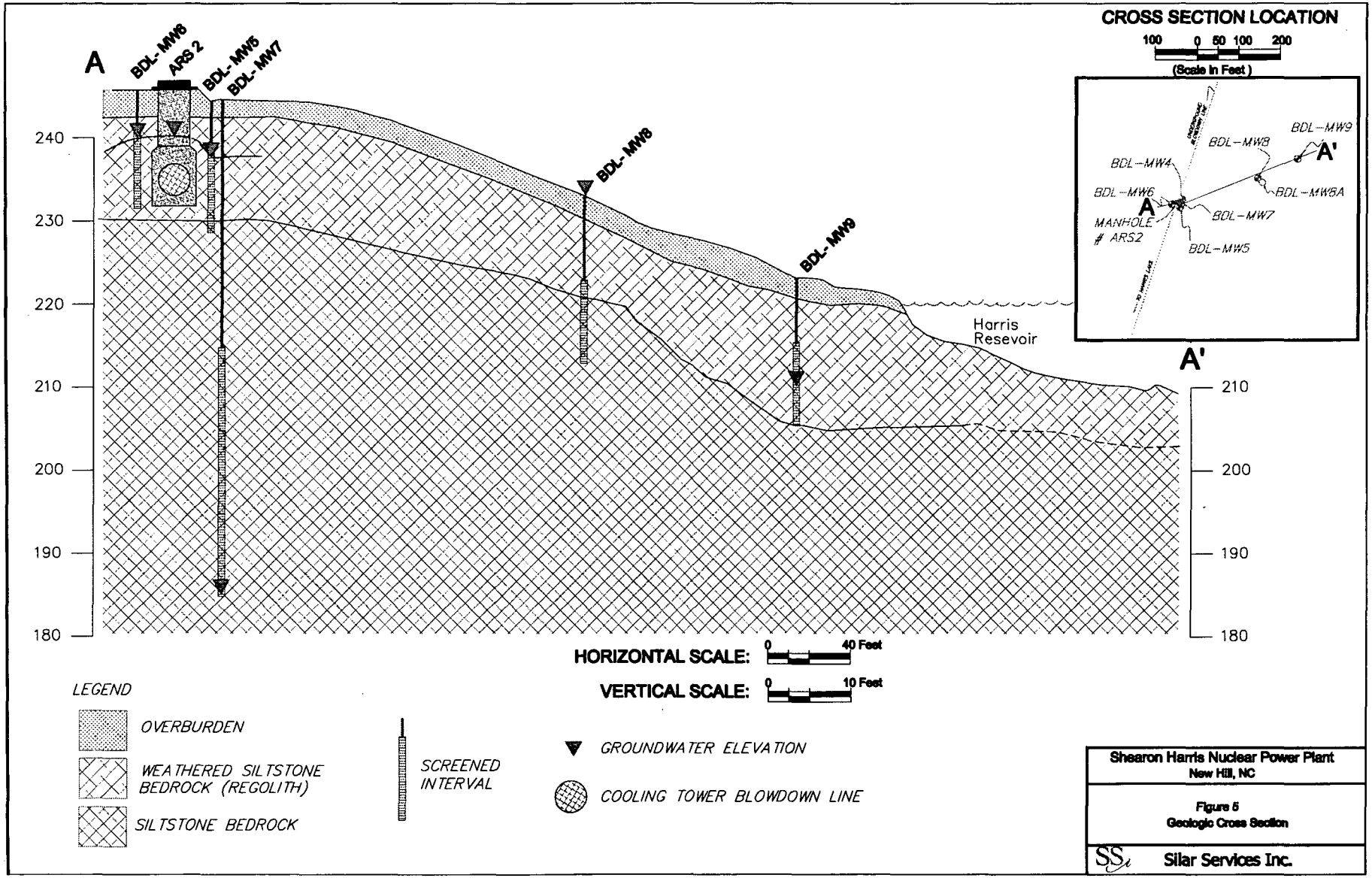


Shearon Harris Nuclear Power Plant
New Hill, NC

Figure 4
Groundwater Sample Summary
March 4, 2009

Silar Services Inc.



Shearon Harris Nuclear Power Plant
New Hill, NC

Figure 5
Geologic Cross Section

Silar Services Inc.

TABLES

Table 1
Monitoring Well Construction Summary
Cooling Tower Blowdown Line Assessment
Shearon Harris Nuclear Power Plant, New Hill, North Carolina

Well ID.	Well Depth (bgs)	TOC (MSL)	Ground Surface Elevation (MSL)	Annular Fill Material			
				Screen Interval (feet bgs)	Sand Interval (feet bgs)	Seal Interval (feet bgs)	Concrete Interval (feet bgs)
BDL-MW1	30.01	254.68	252.15	30-10	30-5	5-0	NA
BDL-MW2	19.34	238.37	236.78	19-9	19-5	5-0	NA
BDL-MW3	14.72	224.68	222.88	15-5	15-3	3-0	NA
BDL-MW4	17.29	246.96	245.14	17-7	17-5	5-0	NA
BDL-MW5	16.64	247.28	245.72	17-7	17-5	5-0	NA
BDL-MW6	14.02	247.9	246.12	14-4	14-2.5	2.5-0	NA
BDL-MW7	60.94	248.07	245.21	60-30	60-25	25-23	23-0
BDL-MW8	20.33	235.9	233.18	20-10	20-8	8-6	6-0
BDL-MW9	17.87	225.17	222.94	18-8	18-6	6-4	4-0

Notes:
bgs - Below Ground Surface
TOC - Top of Well Casing
MSL - Mean Sea Level
NA - Not Applicable
Survey data provided by Smith and Smith, accurate to 0.01 feet MSL

Table 2
Water Level Measurements
Cooling Tower Blowdown Line Assessment
Shearon Harris Nuclear Power Plant, New Hill, North Carolina

Location ID	Northing	Easting	Latitude	Longitude	Well Depth (bgs)	TOC (MSL)	Ground Surface Elevation (MSL)	Water Level Measurements	
								Depth to Water	Water Elevation (MSL)
ARS#1	683,368.45	2,013,313.56	35°37'40	78°57'19"	NA	NA	252.68	NA	NA
ARS#2	682,311.65	2,012,959.85	35°37'29"	78°57'23"	NA	NA	247.31	6.75	240.56
BDL-MW1	683,346.51	2,013,326.50	35°37'39"	78°57'18"	30.01	254.68	252.15	23.31	231.37
BDL-MW2	683,128.39	2,013,248.92	35°37'37"	78°57'19"	19.34	238.37	236.78	11.71	226.66
BDL-MW3	682,926.76	2,013,180.15	35°37'35"	78°57'20"	14.72	224.68	222.88	4.45	220.23
BDL-MW4	682,319.25	2,012,972.67	35°37'29"	78°57'23"	17.29	246.96	245.14	DRY	NA
BDL-MW5	682,300.08	2,012,967.10	35°37'29"	78°57'23"	16.64	247.28	245.72	8.44	238.84
BDL-MW6	682,308.18	2,012,948.01	35°37'29"	78°57'23"	14.02	247.9	246.12	7.72	240.18
BDL-MW7	682,308.67	2,012,970.46	35°37'29"	78°57'23"	60.94	248.07	245.21	62.93	185.14
BDL-MW8	682,370.85	2,013,154.27	35°37'30"	78°57'20"	20.33	235.9	233.18	2.05	233.85
BDL-MW9	682,417.76	2,013,249.54	35°37'30"	78°57'20"	17.87	225.17	222.94	15.2	209.97

Notes:
bgs - Below Ground Surface
TOC - Top of Well Casing
MSL - Mean Sea Level
NA - Not Applicable
Survey data provided by Smith and Smith

Table 3
Analytical Results - Water Samples
Cooling Tower Blowdown Line Assessment
Shearon Harris Nuclear Power Plant, New Hill, North Carolina

Sample Location	Tritium (pCi/liter)	Tritium LLD (pCi/liter)	Gamma Analysis * (pCi/liter)	Zinc (ug/l)
ARS#2	2,120	233	< LLD	187
BDL-MW1	372	232		8
BDL-MW2	373	233		
BDL-MW3	1,060	232		
BDL-MW4	dry			
BDL-MW5	1,260	233	< LLD	18
BDL-MW6	1,450	232		
BDL-MW7	< LLD	234		
BDL-MW8	< LLD	232	< LLD	96
BDL-MW9	< LLD	232		

* The gamma analysis were counted to the Radiological Environmental Program's Lower Limit of Detection (LLD)

Appendix A

Boring Logs

BORING LOG

Drill Rig:	Dietrich D-50	Date Drilled:	1/22/09	Logged By:
Boring Dia:	6.5 Inches	Boring Number:	BDL-MW1	Tim Silar

Sample	Blow Counts	Completion	Depth Feet	Lithology	Description
					Brn slt w/sm f gr sand
					Brn, gry brn slt, mottled
			5		Brn, tr gry slt w/ tr cly incresing w/ depth
					Gry f gr sand w/ organic matter
					Brn md-f gr sand
			10		Brn/gry cly
					Rd brn slt w/ sm f gr sand
					Grn gry slt w/ cly sm rd brn mottling
	spoon refusal at 13' bgs				Weathered rd brn siltstone with tr vf gr ss and tr sh
	50/4"		15		
	50/4"		20		
	50/2"		25		
			30		

Completion Notes:

Ground Elevation 252.15 Casing Elevation 254.68

Site:

SHNPP Cooling Tower Blowdown Line

New Hill, NC

Project No.: SHNPP-1

BORING LOG

Drill Rig:	Dietrich D-50	Date Drilled:	1/22/09	Logged By:
Boring Dia:	6.5 Inches	Boring Number:	BDL-MW2	Tim Silar

Sample	Blow Counts	Completion	Depth Feet	Lithology	Description
					Brn- lt brn f gr sand
					Rd brn slt
	30 50/2"		5		Weathered rd brn siltstone
	26 50/2"		10		
	26 50/5"		15		

Completion Notes:

Ground Elevation 236.78 Casing Elevation 238.37

Site:

SHNPP Cooling Tower Blowdown Line

New Hill, NC

Project No.: SHNPP-1

BORING LOG

Drill Rig:	Dietrich D-50	Date Drilled:	1/23/09	Logged By:
Boring Dia:	6.5 Inches	Boring Number:	BDL-MW3	Tim Silar

Sample	Blow Counts	Completion	Depth Feet	Lithology	Description
					Brn slty f gr sand, sm mottling
					Highly weathered rd brn siltstone
	40 50/4"		5		Weathered rd brn siltstone, good water zone @ ~10.5' bgs
	36 50/3.5"		10		
			15		

Completion Notes:

Ground Elevation 222.88 Casing Elevation 224.68

Site:

SHNPP Cooling Tower Blowdown Line

New Hill, NC

Project No.: SHNPP-1

BORING LOG

Drill Rig:	Dietrich D-50	Date Drilled:	1/23/09	Logged By:
Boring Dia:	6.5 Inches	Boring Number:	BDL-MW4	Tim Silar

Sample	Blow Counts	Completion	Depth Feet	Lithology	Description
					Brn slt w/ f gr sand, organic matter
					Rd brn w/ sm gry slt w/sm siltsone, possible fill
					Weathered rd brn siltstone, sm gry siltstone, dry
	16 50/4"		5		
	38 50/2"				
	50/4.5"				
			10		
	30 50/2"				
	36 50/4"		15		

Completion Notes:

Ground Elevation 245.14 Casing Elevation 246.96

Site:

SHNPP Cooling Tower Blowdown Line

New Hill, NC

Project No.: SHNPP-1

Page 1

BORING LOG

Drill Rig:	Dietrich D-50	Date Drilled:	1/26/09	Logged By:
Boring Dia:	6.5 Inches	Boring Number:	BDL-MW5	Tim Silar

Sample	Blow Counts	Completion	Depth Feet	Lithology	Description
					Brn with sm gry slt w/ sm cly, tr f gr sand, dense, dry
			5		
					Weathered rd brn siltstone, sm gry siltstone, dry
	50/4"				
			10		
	36 50/5"				
	50/4"				
			15		

Completion Notes:

Ground Elevation 245.72 Casing Elevation 247.28

Site:

SHNPP Cooling Tower Blowdown Line

New Hill, NC

Project No.: SHNPP-1

BORING LOG

Drill Rig:	Dietrich D-50	Date Drilled:	1/27/09	Logged By:
Boring Dia:	6.5 Inches	Boring Number:	BDL-MW6	Tim Silar

Sample	Blow Counts	Completion	Depth Feet	Lithology	Description
					Brn with sm rd brn slt w/ tr cly and vf gr sand, tr organic matter
	18 26 50/5"				Weathered rd brn siltstone, sm gry siltstone, dry
	26 50/5"		5		
	30 50/3"				
			10		
	20 40 50/3"				
	30 50/4"				
			15		

Completion Notes:

Ground Elevation 246.12 Casing Elevation 247.90

Site:

SHNPP Cooling Tower Blowdown Line

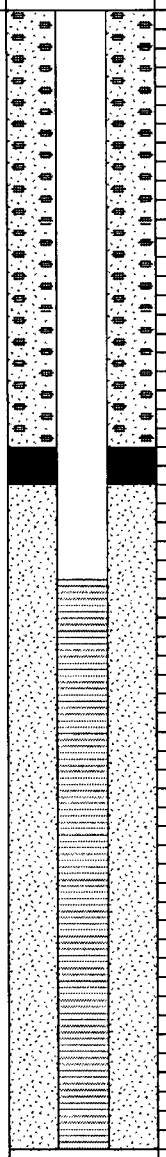
New Hill, NC

Project No.: SHNPP-1

BORING LOG

Drill Rig:	Geoprobe	Date Drilled:	2/17/09	Logged By:
Boring Dia:	4 Inches	Boring Number:	BDL-MW7	Tim Silar

Sample	Blow Counts	Completion	Depth Feet	Lithology	Description
					Brn with sm rd brn slt w/ tr cly and vf gr sand, tr organic matter
					Weathered rd brn siltstone, sm gry siltstone, dry
			5		
			10		
			15		
					Siltstone
			20		
			25		
			30		
			35		
			40		
			45		
			50		
			55		
			60		



Completion Notes:

Ground Elevation 245.21 Casing Elevation 248.07, Solid stem augers to ~17' bgs with air rotary from ~17-60' bgs

Site:

SHNPP Cooling Tower Blowdown Line

New Hill, NC

Project No.: SHNPP-1

BORING LOG

Drill Rig:	Geoprobe	Date Drilled:	2/17/09	Logged By:
Boring Dia:	4 Inches	Boring Number:	BDL-MW8	Tim Silar

Sample	Blow Counts	Completion	Depth Feet	Lithology	Description
					Brn with sm rd brn slt w/ tr cly and vf gr sand, tr organic matter
			5		Weathered rd brn siltstone, sm gry siltstone, dry
			10		
			15		Siltstone, water zone at 14-15' bgs
			20		

Completion Notes:

Ground Elevation 233.18 Casing Elevation 235.90, Solid stem augers to ~12' bgs with air rotary from ~12-20' bgs

Site:

SHNPP Cooling Tower Blowdown Line

New Hill, NC

Project No.: SHNPP-1

BORING LOG

Drill Rig:	Geoprobe	Date Drilled:	2/17/09	Logged By:
Boring Dia:	4 Inches	Boring Number:	BDL-MW9	Tim Silar

Sample	Blow Counts	Completion	Depth Feet	Lithology	Description
					Brn and gry cly slt
			5		
					Gry slt
					Rd brn siltstone, dry
			10		
			15		

Completion Notes:

Ground Elevation 222.94 Casing Elevation 225.17, Solid stem augers to ~8' bgs with air rotary ~18-18' bgs

Site:

SHNPP Cooling Tower Blowdown Line

New Hill, NC

Project No.: SHNPP-1

Appendix B

NCDENR Well Construction Records

NON RESIDENTIAL WELL CONSTRUCTION RECORD

North Carolina Department of Environment and Natural Resources- Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 2402

1. WELL CONTRACTOR:

MIKE MCCONAHEY
Well Contractor (Individual) Name

GEOLOGIC EXPLORATION, INC.
Well Contractor Company Name

STREET ADDRESS 176 COMMERCE BLVD

STATESVILLE NC 28625
City or Town State Zip Code

(704) 872-7686
Area code- Phone number

2. WELL INFORMATION:

SITE WELL ID #(if applicable) BDL-MW-1

STATE WELL PERMIT#(if applicable)

DWQ or OTHER PERMIT #(if applicable)

WELL USE (Check Applicable Box) Monitoring ☒ Municipal/Public ☐

Industrial/Commercial ☐ Agricultural ☐ Recovery ☐ Injection ☐

Irrigation ☐ Other ☐ (list use)

DATE DRILLED 01/22/09

TIME COMPLETED _____ AM ☐ PM ☐

3. WELL LOCATION:

CITY: NEW HILL COUNTY WAKE

SHEARON HARRIS ROAD 27562
(Street Name, Numbers, Community, Subdivision, Lot No., Parcel, Zip Code)

TOPOGRAPHIC / LAND SETTING:

☐ Slope ☐ Valley ☐ Flat ☐ Ridge ☐ Other
(check appropriate box)

LATITUDE
LONGITUDE

May be in degrees, minutes, seconds or in a decimal format

Latitude/longitude source: ☐ GPS ☐ Topographic map

(location of well must be shown on a USGS topo map and attached to this form if not using GPS)

4. FACILITY- is the name of the business where the well is located.

FACILITY ID #(if applicable)

NAME OF FACILITY SHEARON HARRIS NUCLEAR PLANT

STREET ADDRESS SHEARON HARRIS ROAD

NEW HILL NC 27562
City or Town State Zip Code

CONTACT PERSON PROGRESS ENERGY

MAILING ADDRESS PO BOX 10429

SOUTHPORT NC 28419
City or Town State Zip Code

( )-
Area code - Phone number

5. WELL DETAILS:

a. **TOTAL DEPTH:** 30.0 FEET

b. **DOES WELL REPLACE EXISTING WELL?** YES ☐ NO ☒

c. **WATER LEVEL** Below Top of Casing: 0.0 (DRY) FT.
(Use "+" if Above Top of Casing)

d. **TOP OF CASING IS** 0.0 FT. Above Land Surface*
*Top of casing terminated at/or below land surface may require a variance in accordance with 15A NCAC 2C .0118.

e. **YIELD (gpm):** N/A **METHOD OF TEST** N/A

f. **DISINFECTION: Type** N/A **Amount** N/A

g. **WATER ZONES** (depth):

From To From To
From To From To
From To From To

6. CASING:

Depth		Diameter	Thickness/ Weight	Material
From 0.0	To 10.0 Ft.	2 INCH	SCH 40	PVC
From	To Ft.			
From	To Ft.			

7. GROUT:

Depth	Material	Method
From To Ft.		
From To Ft.		
From To Ft.		

8. SCREEN:

Depth	Diameter	Slot Size	Material
From 10.0 To 30.0 Ft.	2.0 in.	.010 in.	PVC
From To Ft.	in.	in.	
From To Ft.	in.	in.	

9. SAND/GRAVEL PACK:

Depth	Size	Material
From 5.0 To 30.0 Ft.	20-40	FINE SILICA SAND
From To Ft.		
From To Ft.		

10. DRILLING LOG

From	To	Formation Description
0.0	1.0	GRASS/TOPSOIL
1.0	14.0	ORANGE/TAN/WHITE SANDY CLAYEY SILT
14.0	30.0	BROWN/RED SANDY SILT

11. REMARKS:

BENTONITE SEAL FROM 0.0 TO 5.0 FEET

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

SIGNATURE OF CERTIFIED WELL CONTRACTOR 02/24/09 DATE

MIKE MCCONAHEY
PRINTED NAME OF PERSON CONSTRUCTING THE WELL

Submit the original to the Division of Water Quality within 30 days. Attn: Information Mgt., 1617 Mail Service Center – Raleigh, NC 27699-1617 Phone No. (919) 733-7015 ext 568.

Form GW-1b
Rev. 7/05

NON RESIDENTIAL WELL CONSTRUCTION RECORD

North Carolina Department of Environment and Natural Resources- Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 2402

1. WELL CONTRACTOR:

MIKE MCCONAHEY
Well Contractor (Individual) Name

GEOLOGIC EXPLORATION, INC.
Well Contractor Company Name

STREET ADDRESS 176 COMMERCE BLVD

STATESVILLE NC 28625
City or Town State Zip Code

(704)- 872-7686
Area code- Phone number

2. WELL INFORMATION:

SITE WELL ID #(if applicable) BDL-MW-2

STATE WELL PERMIT#(if applicable)

DWQ or OTHER PERMIT #(if applicable)

WELL USE (Check Applicable Box) Monitoring ☒ Municipal/Public ☐
Industrial/Commercial ☐ Agricultural ☐ Recovery ☐ Injection ☐
Irrigation ☐ Other ☐ (list use)

DATE DRILLED 01/22/09

TIME COMPLETED ____ AM ☐ PM ☐

3. WELL LOCATION:

CITY: NEW HILL COUNTY WAKE

SHEARON HARRIS ROAD 27562
(Street Name, Numbers, Community, Subdivision, Lot No., Parcel, Zip Code)

TOPOGRAPHIC / LAND SETTING:
☐ Slope ☐ Valley ☐ Flat ☐ Ridge ☐ Other
(check appropriate box)

LATITUDE
LONGITUDE

May be in degrees, minutes, seconds or in a decimal format

Latitude/longitude source: ☐ GPS ☐ Topographic map
(location of well must be shown on a USGS topo map and attached to this form if not using GPS)

4. FACILITY- is the name of the business where the well is located.

FACILITY ID #(if applicable)

NAME OF FACILITY SHEARON HARRIS NUCLEAR PLANT

STREET ADDRESS SHEARON HARRIS ROAD

NEW HILL NC 27562
City or Town State Zip Code

CONTACT PERSON PROGRESS ENERGY

MAILING ADDRESS PO BOX 10429

SOUTHPORT NC 28419
City or Town State Zip Code

( )-
Area code - Phone number

5. WELL DETAILS:

a. **TOTAL DEPTH:** 19.0 FEET

b. **DOES WELL REPLACE EXISTING WELL?** YES ☐ NO ☒

c. **WATER LEVEL** Below Top of Casing: 0.0 (DRY) FT.
(Use "+" if Above Top of Casing)

d. **TOP OF CASING IS** 0.0 FT. Above Land Surface*
*Top of casing terminated at/or below land surface may require a variance in accordance with 15A NCAC 2C .0118.

e. **YIELD (gpm):** N/A **METHOD OF TEST** N/A

f. **DISINFECTION: Type** N/A **Amount** N/A

g. **WATER ZONES** (depth):

From	To	From	To

6. CASING:

Depth From	Depth To	Ft.	Diameter	Thickness/ Weight	Material
0.0	4.0		2 INCH	SCH 40	PVC

7. GROUT:

From	To	Ft.	Material	Method

8. SCREEN:

Depth From	To	Ft.	Diameter	in.	Slot Size	in.	Material
4.0	19.0		2.0		.010		PVC

9. SAND/GRAVEL PACK:

Depth From	To	Ft.	Size	Material
2.0	19.0		20-40	FINE SILICA SAND

10. DRILLING LOG

From	To	Formation Description
0.0	1.0	GRASS/TOPSOIL
1.0	10.0	ORANGE/TAN/WHITE SANDY CLAYEY SILT
10.0	19.0	BROWN/RED SANDY SILT

11. REMARKS:

BENTONITE SEAL FROM 0.0 TO 2.0 FEET

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

02/24/09
SIGNATURE OF CERTIFIED WELL CONTRACTOR DATE

MIKE MCCONAHEY
PRINTED NAME OF PERSON CONSTRUCTING THE WELL

Submit the original to the Division of Water Quality within 30 days. Attn: Information Mgt., 1617 Mail Service Center – Raleigh, NC 27699-1617 Phone No. (919) 733-7015 ext 568.

Form GW-1b
Rev. 7/05

NON RESIDENTIAL WELL CONSTRUCTION RECORD

North Carolina Department of Environment and Natural Resources- Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 2402

1. WELL CONTRACTOR:

MIKE MCCONAHEY
Well Contractor (Individual) Name

GEOLOGIC EXPLORATION, INC.
Well Contractor Company Name

STREET ADDRESS 176 COMMERCE BLVD

STATESVILLE | NC | 28625
City or Town | State | Zip Code

(704)- 872-7686
Area code- Phone number

2. WELL INFORMATION:

SITE WELL ID #(if applicable) BDL-MW-3

STATE WELL PERMIT#(if applicable)

DWQ or OTHER PERMIT #(if applicable)

WELL USE (Check Applicable Box) Monitoring ☒ Municipal/Public ☐
Industrial/Commercial ☐ Agricultural ☐ Recovery ☐ Injection ☐
Irrigation☐ Other ☐ (list use)

DATE DRILLED 01/23/09

TIME COMPLETED AM ☐ PM ☐

3. WELL LOCATION:

CITY: NEW HILL COUNTY WAKE

SHEARON HARRIS ROAD 27562
(Street Name, Numbers, Community, Subdivision, Lot No., Parcel, Zip Code)

TOPOGRAPHIC / LAND SETTING:
☐Slope ☐Valley ☐Flat ☐Ridge ☐ Other
(check appropriate box)

LATITUDE
LONGITUDE

May be in degrees, minutes, seconds or in a decimal format

Latitude/longitude source: ☐GPS ☐Topographic map
(location of well must be shown on a USGS topo map and attached to this form if not using GPS)

4. FACILITY- is the name of the business where the well is located.

FACILITY ID #(if applicable)

NAME OF FACILITY SHEARON HARRIS NUCLEAR PLANT

STREET ADDRESS SHEARON HARRIS ROAD

NEW HILL | NC | 27562
City or Town | State | Zip Code

CONTACT PERSON PROGRESS ENERGY

MAILING ADDRESS PO BOX 10429

SOUTHPORT | NC | 28419
City or Town | State | Zip Code

(_____)-
Area code - Phone number

5. WELL DETAILS:

a. **TOTAL DEPTH:** 15.0 FEET

b. **DOES WELL REPLACE EXISTING WELL?** YES ☐ NO ☒

c. **WATER LEVEL** Below Top of Casing: 0.0 (DRY) FT.
(Use "+" if Above Top of Casing)

d. **TOP OF CASING IS** 0.0 FT. Above Land Surface*
*Top of casing terminated at/or below land surface may require a variance in accordance with 15A NCAC 2C .0118.

e. **YIELD (gpm):** N/A **METHOD OF TEST** N/A

f. **DISINFECTION: Type** N/A **Amount** N/A

g. **WATER ZONES** (depth):

From___ To___ From___ To___
From___ To___ From___ To___
From___ To___ From___ To___

6. CASING:

Depth		Diameter	Thickness/ Weight	Material
From 0.0	To 5.0 Ft.	2 INCH	SCH 40	PVC
From	To Ft.			
From	To Ft.			

7. GROUT:

Depth		Material	Method
From	To Ft.		
From	To Ft.		
From	To Ft.		

8. SCREEN:

Depth		Diameter	Slot Size	Material
From 5.0	To 15.0 Ft.	2.0 in.	.010 in.	PVC
From	To Ft.	in.	in.	
From	To Ft.	in.	in.	

9. SAND/GRAVEL PACK:

Depth		Size	Material
From 3.0	To 15.0 Ft.	20-40	FINE SILICA SAND
From	To Ft.		
From	To Ft.		

10. DRILLING LOG

From	To	Formation Description
0.0	1.0	GRASS/TOPSOIL
1.0	6.0	ORANGE/TAN/WHITE SANDY CLAYEY SILT
6.0	15.0	BROWN/RED SANDY SILT

11. REMARKS:

BENTONITE SEAL FROM 0.0 TO 3.0 FEET

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

02/24/09
SIGNATURE OF CERTIFIED WELL CONTRACTOR DATE

MIKE MCCONAHEY
PRINTED NAME OF PERSON CONSTRUCTING THE WELL

Submit the original to the Division of Water Quality within 30 days. Attn: Information Mgt., 1617 Mail Service Center – Raleigh, NC 27699-1617 Phone No. (919) 733-7015 ext 568.

Form GW-1b
Rev. 7/05

NON RESIDENTIAL WELL CONSTRUCTION RECORD

North Carolina Department of Environment and Natural Resources- Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 2402

1. WELL CONTRACTOR:

MIKE MCCONAHEY
Well Contractor (Individual) Name

GEOLOGIC EXPLORATION, INC.
Well Contractor Company Name

STREET ADDRESS 176 COMMERCE BLVD

STATESVILLE NC 28625
City or Town State Zip Code

(704)- 872-7686
Area code- Phone number

2. WELL INFORMATION:

SITE WELL ID #(if applicable) BDL-MW-4

STATE WELL PERMIT#(if applicable)

DWQ or OTHER PERMIT #(if applicable)

WELL USE (Check Applicable Box) Monitoring ☒ Municipal/Public ☐ Industrial/Commercial ☐ Agricultural ☐ Recovery ☐ Injection ☐ Irrigation ☐ Other ☐ (list use)

DATE DRILLED 01/23/09

TIME COMPLETED AM ☐ PM ☐

3. WELL LOCATION:

CITY: NEW HILL COUNTY WAKE

SHEARON HARRIS ROAD 27562
(Street Name, Numbers, Community, Subdivision, Lot No., Parcel, Zip Code)

TOPOGRAPHIC / LAND SETTING:
☐ Slope ☐ Valley ☐ Flat ☐ Ridge ☐ Other
(check appropriate box)

LATITUDE
LONGITUDE

May be in degrees, minutes, seconds or in a decimal format

Latitude/longitude source: ☐ GPS ☐ Topographic map
(location of well must be shown on a USGS topo map and attached to this form if not using GPS)

4. FACILITY- is the name of the business where the well is located.

FACILITY ID #(if applicable)

NAME OF FACILITY SHEARON HARRIS NUCLEAR PLANT

STREET ADDRESS SHEARON HARRIS ROAD

NEW HILL NC 27562
City or Town State Zip Code

CONTACT PERSON PROGRESS ENERGY

MAILING ADDRESS PO BOX 10429

SOUTHPORT NC 28419
City or Town State Zip Code

( )-
Area code - Phone number

5. WELL DETAILS:

a. **TOTAL DEPTH:** 17.5 FEET

b. **DOES WELL REPLACE EXISTING WELL?** YES ☐ NO ☒

c. **WATER LEVEL** Below Top of Casing: 0.0 (DRY) FT.
(Use "+" if Above Top of Casing)

d. **TOP OF CASING IS** 0.0 FT. Above Land Surface*
*Top of casing terminated at/or below land surface may require a variance in accordance with 15A NCAC 2C .0118.

e. **YIELD (gpm):** N/A **METHOD OF TEST** N/A

f. **DISINFECTION: Type** N/A **Amount** N/A

g. **WATER ZONES** (depth):
From To From To
From To From To
From To From To

6. CASING:

	Depth		Diameter	Thickness/ Weight	Material
From 0.0	To 7.5	Ft.	2 INCH	SCH 40	PVC
From	To	Ft.			
From	To	Ft.			

7. GROUT:

	Depth		Material	Method
From	To	Ft.		
From	To	Ft.		
From	To	Ft.		

8. SCREEN:

	Depth		Diameter		Slot Size		Material
From 7.5	To 17.5	Ft.	2.0	in.	.010	in.	PVC
From	To	Ft.		in.		in.	
From	To	Ft.		in.		in.	

9. SAND/GRAVEL PACK:

	Depth		Size	Material
From 5.0	To 17.5	Ft.	20-40	FINE SILICA SAND
From	To	Ft.		
From	To	Ft.		

10. DRILLING LOG

From	To	Formation Description
0.0	1.0	GRASS/TOPSOIL
1.0	6.0	ORANGE/TAN/WHITE SANDY CLAYEY SILT
6.0	17.5	BROWN/RED SANDY SILT

11. REMARKS:

BENTONITE SEAL FROM 0.0 TO 5.0 FEET

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

02/24/09
SIGNATURE OF CERTIFIED WELL CONTRACTOR DATE

MIKE MCCONAHEY
PRINTED NAME OF PERSON CONSTRUCTING THE WELL

Submit the original to the Division of Water Quality within 30 days. Attn: Information Mgt., 1617 Mail Service Center – Raleigh, NC 27699-1617 Phone No. (919) 733-7015 ext 568.

Form GW-1b
Rev. 7/05

NON RESIDENTIAL WELL CONSTRUCTION RECORD

North Carolina Department of Environment and Natural Resources- Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 3214

1. WELL CONTRACTOR:

RANDY OWNBEY
Well Contractor (Individual) Name

GEOLOGIC EXPLORATION, INC.
Well Contractor Company Name

STREET ADDRESS 176 COMMERCE BLVD

STATESVILLE | NC | 28625
City or Town | State | Zip Code

(704) 872-7686
Area code- Phone number

2. WELL INFORMATION:

SITE WELL ID #(if applicable) BDL-MW-5

STATE WELL PERMIT#(if applicable)

DWQ or OTHER PERMIT #(if applicable)

WELL USE (Check Applicable Box) Monitoring ☒ Municipal/Public ☐ Industrial/Commercial ☐ Agricultural ☐ Recovery ☐ Injection ☐ Irrigation ☐ Other ☐ (list use)

DATE DRILLED 01/27/09

TIME COMPLETED AM ☐ PM ☐

3. WELL LOCATION:

CITY: NEW HILL COUNTY WAKE

SHEARON HARRIS ROAD 27562
(Street Name, Numbers, Community, Subdivision, Lot No., Parcel, Zip Code)

TOPOGRAPHIC / LAND SETTING:
☐ Slope ☐ Valley ☐ Flat ☐ Ridge ☐ Other
(check appropriate box)

LATITUDE
LONGITUDE

May be in degrees, minutes, seconds or in a decimal format

Latitude/longitude source: ☐ GPS ☐ Topographic map
(location of well must be shown on a USGS topo map and attached to this form if not using GPS)

4. FACILITY- is the name of the business where the well is located.

FACILITY ID #(if applicable)

NAME OF FACILITY SHEARON HARRIS NUCLEAR PLANT

STREET ADDRESS SHEARON HARRIS ROAD

NEW HILL | NC | 27562
City or Town | State | Zip Code

CONTACT PERSON PROGRESS ENERGY

MAILING ADDRESS PO BOX 10429

SOUTHPORT | NC | 28419
City or Town | State | Zip Code

( )-
Area code - Phone number

5. WELL DETAILS:

a. **TOTAL DEPTH:** 17.0 FEET

b. **DOES WELL REPLACE EXISTING WELL?** YES ☐ NO ☒

c. **WATER LEVEL** Below Top of Casing: 0.0 (DRY) FT.
(Use "+" if Above Top of Casing)

d. **TOP OF CASING IS** 0.0 FT. Above Land Surface*
*Top of casing terminated at/or below land surface may require a variance in accordance with 15A NCAC 2C .0118.

e. **YIELD (gpm):** N/A **METHOD OF TEST** N/A

f. **DISINFECTION: Type** N/A **Amount** N/A

g. **WATER ZONES** (depth):

From To From To
From To From To
From To From To

6. CASING:

	Depth		Diameter	Thickness/ Weight	Material
From 0.0	To 7.0	Ft.	2 INCH	SCH 40	PVC
From	To	Ft.			
From	To	Ft.			

7. GROUT:

	Depth		Material	Method
From	To	Ft.		
From	To	Ft.		
From	To	Ft.		

8. SCREEN:

	Depth		Diameter	Slot Size	Material
From 7.0	To 17.0	Ft.	2.0 in.	.010 in.	PVC
From	To	Ft.	in.	in.	
From	To	Ft.	in.	in.	

9. SAND/GRAVEL PACK:

	Depth		Size	Material
From 5.0	To 17.0	Ft.	20-40	FINE SILICA SAND
From	To	Ft.		
From	To	Ft.		

10. DRILLING LOG

From	To	Formation Description
0.0	1.0	GRASS/TOPSOIL
1.0	6.0	ORANGE/TAN/WHITE SANDY CLAYEY SILT
6.0	17.0	BROWN/RED FINE SANDY SILT

11. REMARKS:

BENTONITE SEAL FROM 0.0 TO 5.0 FEET

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

SIGNATURE OF CERTIFIED WELL CONTRACTOR — DATE 02/26/09

RANDY OWNBEY
PRINTED NAME OF PERSON CONSTRUCTING THE WELL

Submit the original to the Division of Water Quality within 30 days. Attn: Information Mgt., 1617 Mail Service Center – Raleigh, NC 27699-1617 Phone No. (919) 733-7015 ext 568.

Form GW-1b
Rev. 7/05

NON RESIDENTIAL WELL CONSTRUCTION RECORD

North Carolina Department of Environment and Natural Resources- Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 3214

1. WELL CONTRACTOR:

RANDY OWNBEY
Well Contractor (Individual) Name

GEOLOGIC EXPLORATION, INC.
Well Contractor Company Name

STREET ADDRESS 176 COMMERCE BLVD

STATESVILLE | NC | 28625
City or Town | State | Zip Code

(704) 872-7686
Area code- Phone number

2. WELL INFORMATION:

SITE WELL ID #(if applicable) BDL-MW-6

STATE WELL PERMIT#(if applicable)

DWQ or OTHER PERMIT #(if applicable)

WELL USE (Check Applicable Box) Monitoring ☒ Municipal/Public ☐
Industrial/Commercial ☐ Agricultural ☐ Recovery ☐ Injection ☐
Irrigation ☐ Other ☐ (list use)

DATE DRILLED 01/26/09

TIME COMPLETED ____ AM ☐ PM ☐

3. WELL LOCATION:

CITY: NEW HILL COUNTY WAKE

SHEARON HARRIS ROAD 27562
(Street Name, Numbers, Community, Subdivision, Lot No., Parcel, Zip Code)

TOPOGRAPHIC / LAND SETTING:
☐ Slope ☐ Valley ☐ Flat ☐ Ridge ☐ Other
(check appropriate box)

LATITUDE
LONGITUDE

May be in degrees, minutes, seconds or in a decimal format

Latitude/longitude source: ☐ GPS ☐ Topographic map
(location of well must be shown on a USGS topo map and attached to this form if not using GPS)

4. FACILITY- Is the name of the business where the well is located.

FACILITY ID #(if applicable)

NAME OF FACILITY SHEARON HARRIS NUCLEAR PLANT

STREET ADDRESS SHEARON HARRIS ROAD

NEW HILL | NC | 27562
City or Town | State | Zip Code

CONTACT PERSON PROGRESS ENERGY

MAILING ADDRESS PO BOX 10429

SOUTHPORT | NC | 28419
City or Town | State | Zip Code

( )-
Area code - Phone number

5. WELL DETAILS:

a. **TOTAL DEPTH:** 14.0 FEET

b. **DOES WELL REPLACE EXISTING WELL?** YES ☐ NO ☒

c. **WATER LEVEL** Below Top of Casing: 0.0 (DRY) FT.
(Use "+" if Above Top of Casing)

d. **TOP OF CASING IS** 0.0 FT. Above Land Surface*
*Top of casing terminated at/or below land surface may require a variance in accordance with 15A NCAC 2C .0118.

e. **YIELD (gpm):** N/A **METHOD OF TEST** N/A

f. **DISINFECTION: Type** N/A **Amount** N/A

g. **WATER ZONES** (depth):

From ____ To ____ From ____ To ____
From ____ To ____ From ____ To ____
From ____ To ____ From ____ To ____

6. CASING:

Depth From	Depth To	Diameter	Thickness/ Weight	Material
0.0	4.0	2-INCH	SCH 40	PVC

7. GROUT:

Depth From	Depth To	Material	Method

8. SCREEN:

Depth From	Depth To	Diameter	Slot Size	Material
4.0	14.0	2.0 in.	.010 in.	PVC
		in.	in.	
		in.	in.	

9. SAND/GRAVEL PACK:

Depth From	Depth To	Size	Material
2.0	14.0	20-40	FINE SILICA SAND

10. DRILLING LOG

From	To	Formation Description
0.0	1.0	GRASS/TOPSOIL
1.0	6.0	ORANGE/TAN/WHITE SANDY CLAYEY SILT
6.0	14.0	BROWN/RED FINE SANDY SILT

11. REMARKS:

BENTONITE SEAL FROM 0.0 TO 2.0 FEET

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

SIGNATURE OF CERTIFIED WELL CONTRACTOR — DATE 02/26/09

RANDY OWNBEY
PRINTED NAME OF PERSON CONSTRUCTING THE WELL

Submit the original to the Division of Water Quality within 30 days. Attn: Information Mgt., 1617 Mail Service Center – Raleigh, NC 27699-1617 Phone No. (919) 733-7015 ext 568.

Form GW-1b
Rev. 7/05

NON RESIDENTIAL WELL CONSTRUCTION RECORD

North Carolina Department of Environment and Natural Resources Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 3106

1. WELL CONTRACTOR:

James D. Barker
Well Contractor (Individual) Name

Quantex, Inc.
Well Contractor Company Name

STREET ADDRESS P.O. Box 41673

Raleigh, NC 27629
City or Town State Zip Code

(919) 219 - 9604
Area code- Phone number

2. WELL INFORMATION:

SITE WELL ID #(if applicable) NA BDL-MW-7

WELL CONSTRUCTION PERMIT#(if applicable) NA

OTHER ASSOCIATED PERMIT #(if applicable) NA

3. WELL USE (Check Applicable Box) Monitoring ☒ Municipal/Public ☐ Industrial/Commercial ☐ Agricultural ☐ Recovery ☐ Injection ☐ Irrigation ☐ Other ☐ (list use)

DATE DRILLED 2/17/09

TIME COMPLETED 10:30 AM ☒ PM ☐

4. WELL LOCATION:

CITY: New Hill COUNTY Wake

New Hill Holleman Road, New Hill, NC 27562
(Street Name, Numbers, Community, Subdivision, Lot No., Parcel, Zip Code)

TOPOGRAPHIC / LAND SETTING:
☒ Slope ☐ Valley ☐ Flat ☐ Ridge ☐ Other
(check appropriate box)

LATITUDE N35 deg. 37.024'

LONGITUDE W78 deg. 57.606'

May be in degrees, minutes, seconds or in a decimal format

Latitude/longitude source: ☒ GPS ☐ Topographic map
(location of well must be shown on a USGS topo map and attached to this form if not using GPS)

5. FACILITY- is the name of the business where the well is located.

FACILITY ID #(if applicable) NA

NAME OF FACILITY Progress Energy Shearon H. Plant

STREET ADDRESS New Hill Holleman Road

New Hill NC 27562
City or Town State Zip Code

CONTACT PERSON Tim Silar

MAILING ADDRESS New Hill Holleman Road

New Hill NC 27562
City or Town State Zip Code

( ) - NA
Area code - Phone number

6. WELL DETAILS:

a. **TOTAL DEPTH:** 60'

b. **DOES WELL REPLACE EXISTING WELL?** YES ☐ NO ☒

c. **WATER LEVEL** Below Top of Casing: NA FT.
(Use "+" if Above Top of Casing)

d. **TOP OF CASING IS** 2.5' FT. Above Land Surface*
*Top of casing terminated at/or below land surface may require a variance in accordance with 15A NCAC 2C .0118.

e. **YIELD (gpm):** NA **METHOD OF TEST** NA

f. **DISINFECTION: Type** NA **Amount** NA

g. **WATER ZONES** (depth):
From 40' To 50' From ___ To ___
From ___ To ___ From ___ To ___
From ___ To ___ From ___ To ___

7. CASING:

Depth		Diameter	Thickness/Weight	Material
From 0'	To 30' Ft.	2"	sch40	PVC
From ___	To ___ Ft.			
From ___	To ___ Ft.			

8. GROUT:

Depth		Material	Method
From 0'	To 26' Ft.	Neat Cement	Pour
From 26'	To 28' Ft.	Bentonite	Place
From ___	To ___ Ft.		

9. SCREEN:

Depth		Diameter	Slot Size	Material
From 30'	To 60' Ft.	2" in.	0.010 in.	PVC
From ___	To ___ Ft.	in.	in.	
From ___	To ___ Ft.	in.	in.	

10. SAND/GRAVEL PACK:

Depth		Size	Material
From 28'	To 60' Ft.	#2	Silica Sand
From ___	To ___ Ft.		
From ___	To ___ Ft.		

11. DRILLING LOG

From	To	Formation Description
0'	18'	SILT
18'	60'	SILT STONE

12. REMARKS:

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

SIGNATURE OF CERTIFIED WELL CONTRACTOR 3/12/09 DATE

James D. Barker
PRINTED NAME OF PERSON CONSTRUCTING THE WELL

Submit the original to the Division of Water Quality within 30 days. Attn: Information Mgt., 1617 Mail Service Center – Raleigh, NC 27699-1617 Phone No. (919) 733-7015 ext 568.

Form GW-1b
Rev.12/07

NON RESIDENTIAL WELL CONSTRUCTION RECORD

North Carolina Department of Environment and Natural Resources Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 3106

1. WELL CONTRACTOR:

James D. Barker
Well Contractor (Individual) Name

Quantex, Inc.
Well Contractor Company Name

STREET ADDRESS P.O. Box 41673

Raleigh, NC 27629
City or Town State Zip Code

(919) 219 - 9604
Area code- Phone number

2. WELL INFORMATION:

SITE WELL ID #(if applicable) ~~NA~~ BDL-MW-8

WELL CONSTRUCTION PERMIT#(if applicable) NA

OTHER ASSOCIATED PERMIT #(if applicable) NA

3. WELL USE (Check Applicable Box) Monitoring ☒ Municipal/Public ☐ Industrial/Commercial ☐ Agricultural ☐ Recovery ☐ Injection ☐ Irrigation ☐ Other ☐ (list use)

DATE DRILLED 2/17/09

TIME COMPLETED 2:00 AM ☐ PM ☒

4. WELL LOCATION:

CITY: New Hill COUNTY Wake

New Hill Holleman Road, New Hill, NC 27562
(Street Name, Numbers, Community, Subdivision, Lot No., Parcel, Zip Code)

TOPOGRAPHIC / LAND SETTING:
☒ Slope ☐ Valley ☐ Flat ☐ Ridge ☐ Other
(check appropriate box)

LATITUDE N35 deg. 37.024'

LONGITUDE W78 deg. 57.606'

May be in degrees, minutes, seconds or in a decimal format

Latitude/longitude source: ☒ GPS ☐ Topographic map
(location of well must be shown on a USGS topo map and attached to this form if not using GPS)

5. FACILITY- is the name of the business where the well is located.

FACILITY ID #(if applicable) NA

NAME OF FACILITY Progress Energy Shearon H. Plant

STREET ADDRESS New Hill Holleman Road

New Hill NC 27562
City or Town State Zip Code

CONTACT PERSON Tim Silar

MAILING ADDRESS New Hill Holleman Road

New Hill NC 27562
City or Town State Zip Code

( ) NA
Area code - Phone number

6. WELL DETAILS:

a. **TOTAL DEPTH:** 20'

b. **DOES WELL REPLACE EXISTING WELL?** YES ☐ NO ☒

c. **WATER LEVEL** Below Top of Casing: NA FT.
(Use "+" if Above Top of Casing)

d. **TOP OF CASING IS** 2.5' FT. Above Land Surface*
*Top of casing terminated at/or below land surface may require a variance in accordance with 15A NCAC 2C .0118.

e. **YIELD (gpm):** NA **METHOD OF TEST** NA

f. **DISINFECTION: Type** NA **Amount** NA

g. **WATER ZONES** (depth):
From 17' To 19' From ___ To ___
From ___ To ___ From ___ To ___
From ___ To ___ From ___ To ___

7. CASING:

Depth		Diameter	Thickness/Weight	Material
From 0'	To 10'	Ft. 2"	sch40	PVC
From ___	To ___	Ft. ___		
From ___	To ___	Ft. ___		

8. GROUT:

Depth		Material	Method
From 0'	To 6'	Ft. Neat Cement	Pour
From 6'	To 8'	Ft. Bentonite	Place
From ___	To ___	Ft. ___	

9. SCREEN:

Depth		Diameter	Slot Size	Material
From 10'	To 20'	Ft. 2" in.	0.010 in.	PVC
From ___	To ___	Ft. ___ in.	___ in.	
From ___	To ___	Ft. ___ in.	___ in.	

10. SAND/GRAVEL PACK:

Depth		Size	Material
From 8'	To 20'	Ft. #2	Silica Sand
From ___	To ___	Ft. ___	
From ___	To ___	Ft. ___	

11. DRILLING LOG

From	To	Formation Description
0'	11'	SILT
11'	20'	SILT STONE

12. REMARKS:

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

SIGNATURE OF CERTIFIED WELL CONTRACTOR — DATE 3/12/09

James D. Barker
PRINTED NAME OF PERSON CONSTRUCTING THE WELL

Submit the original to the Division of Water Quality within 30 days. Attn: Information Mgt., 1617 Mail Service Center – Raleigh, NC 27699-1617 Phone No. (919) 733-7015 ext 568.

Form GW-1b
Rev.12/07

NON RESIDENTIAL WELL CONSTRUCTION RECORD

North Carolina Department of Environment and Natural Resources Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 3106

1. WELL CONTRACTOR:

James D. Barker
Well Contractor (Individual) Name

Quantex, Inc.
Well Contractor Company Name

STREET ADDRESS P.O. Box 41673

Raleigh, NC 27629
City or Town State Zip Code

(919) 219 - 9604
Area code- Phone number

2. WELL INFORMATION:

SITE WELL ID #(if applicable) NA BDL-MW-9

WELL CONSTRUCTION PERMIT#(if applicable) NA

OTHER ASSOCIATED PERMIT #(if applicable) NA

3. WELL USE (Check Applicable Box) Monitoring ■ Municipal/Public ☐ Industrial/Commercial ☐ Agricultural ☐ Recovery ☐ Injection ☐ Irrigation ☐ Other ☐ (list use)

DATE DRILLED 2/17/09

TIME COMPLETED 4:30 AM ☐ PM ■

4. WELL LOCATION:

CITY: New Hill COUNTY Wake

New Hill Holleman Road, New Hill, NC 27562
(Street Name, Numbers, Community, Subdivision, Lot No., Parcel, Zip Code)

TOPOGRAPHIC / LAND SETTING:
■ Slope ☐ Valley ☐ Flat ☐ Ridge ☐ Other
(check appropriate box)

LATITUDE N35 deg. 37.024'

LONGITUDE W78 deg. 57.606'

May be in degrees, minutes, seconds or in a decimal format

Latitude/longitude source: ■ GPS ☐ Topographic map
(location of well must be shown on a USGS topo map and attached to this form if not using GPS)

5. FACILITY- is the name of the business where the well is located.

FACILITY ID #(if applicable) NA

NAME OF FACILITY Progress Energy Shearon H. Plant

STREET ADDRESS New Hill Holleman Road

New Hill NC 27562
City or Town State Zip Code

CONTACT PERSON Tim Silar

MAILING ADDRESS New Hill Holleman Road

New Hill NC 27562
City or Town State Zip Code

( ) NA
Area code - Phone number

6. WELL DETAILS:

a. **TOTAL DEPTH:** 18'

b. **DOES WELL REPLACE EXISTING WELL?** YES ☐ NO ■

c. **WATER LEVEL** Below Top of Casing: NA FT.
(Use "+" if Above Top of Casing)

d. **TOP OF CASING IS** 2.5' FT. Above Land Surface*
*Top of casing terminated at/or below land surface may require a variance in accordance with 15A NCAC 2C .0118.

e. **YIELD (gpm):** NA **METHOD OF TEST** NA

f. **DISINFECTION: Type** NA **Amount** NA

g. **WATER ZONES** (depth):
From 15' To 17' From ___ To ___
From ___ To ___ From ___ To ___
From ___ To ___ From ___ To ___

7. CASING:

Depth From	Depth To	Diameter	Thickness/Weight	Material
0'	8'	2"	sch40	PVC

8. GROUT:

Depth From	Depth To	Material	Method
0	4'	Neat Cement	Pour
4'	6'	Bentonite	Place

9. SCREEN:

Depth From	Depth To	Diameter	Slot Size	Material
8	18'	2"	0.010	PVC

10. SAND/GRAVEL PACK:

Depth From	Depth To	Size	Material
6	18'	#2	Silica Sand

11. DRILLING LOG

From	To	Formation Description
0'	14'	SILT
14'	18'	SILT STONE

12. REMARKS:

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

SIGNATURE OF CERTIFIED WELL CONTRACTOR DATE

James D. Barker
PRINTED NAME OF PERSON CONSTRUCTING THE WELL

Submit the original to the Division of Water Quality within 30 days. Attn: Information Mgt., 1617 Mail Service Center – Raleigh, NC 27699-1617 Phone No. (919) 733-7015 ext 568.

Form GW-1b
Rev.12/07

Appendix C

Field Notes

SHNPP Field Notes 1/21 - 3/4/09

January 21, 2009
0900 - TS @ SHP, to conduct GW investigation, weather cold ~25°C, snow cover ≈2"
Meet with Don Edwards to discuss SOW, waiting on GEX crew to mobilize from BNP.
Talk w/ Bob Wilson & Don Edwards about activities.
Mob to area with others to locate underground utilities.
1430 GEX on-site
1430-1650 Get GEX personnel briefed, get equipment thru security, staging equipment on concrete pad between 1st and 2nd gates.
1700 GEX off-site
Kick-off mtg in room 147, tom

1/21/09

→ January 22, 2009
0630 TS on-site, go to DE office to review docs in prep for 0800 pre-job meeting.
0755 GEL on-site
0800 Meeting, safety. Smith & Smith on-site for survey of pipe. If hit something call PE. Transmission line.
✱ Flag any locations that are re-drilled. Drill 6' from line, will be 10'. Friday siren test.
0900 Meeting adjourn
0900 Mob to staging area to unload equipment.
0945 Drill @ BDL-B2 x 15 on east side of BDL near sample shack.
0-2 Brn silt w/ sm f grsd
2-4 Brn, gry brn silt, mottled

T. Schl 11/22/08

4-6 Brn and gry silt with tr f grsd clay
6-8 AA increasing clay to 7.5 7.5-8 gry f gr sand with org material
1015-1045 Rig repair
8-10 Brn m-f gr sand to 9.5
9.5-10 Brn f gr clay
10-12 AA to 10.5
10.5-11.5 Red brn silt w/ some f gr sand
11.5-12 grn gry silt with clay some red brn mottling
12-14 refusal @ 13' Red brn weathered shale
14-16 50/4" Red brn with tr gry weathered siltstone/sh.
19-21 AA, section at end Fun vf gr ss.
24-26 50/2" shale
1215-1330 Lunch
Well dry hole, Ranger
1655

T. Schl 11/22/08

Continue to auger beyond 25'
Auger refusal @ 30' bgs
will set 2" well @ 30" with
20' of screen, sand to 5'
bentonite to surface. Designate
as BDL-MW1. No obvious water
zones encountered.
1500 Drill @ BDL-B2, located
~220' S of BDL-MW1 ~15'
east of BDL.
0-2 Brn-lt brn f gr sd, well
sorted
4-6 30-50/2
4.4' Rd brn slt
4.4-4.8' Rd brn weathered siltstone
9-11 26-50/2"
Reddish brn weathered siltstone
14-16 26-50/5"
A/A
Auger to ~19' bgs, auger
refusal
4 SSS
Set 2" well @ 19' bgs, sand
to 5', bentonite to surface

11/22/09

1655 Complete setting BDL-MW2
Demob equipment
from BDL-MW2 area
1715 - G&X off-site
1730 - TS off-site

11/22/09

→ January 23, 2009
0630 TS on-site
0645 GEX on-site
0645 mob to BDL-B3
BDL-MW1 DTW - 32.09
TD - 32.55 Ground ~30.1'

BDL-MW2 DTW - 12.23
TD 20.92 Ground ~19.2
0700 Drill @ BDL-B3
0-2 Brn silty f gr sd, some
nothing
Auger hard @ 4' bgs
4-6 40-50/4 wet @ ≈ 4' bgs
AA to 4.5
4.5-4.8 Highly weathered
Reddish brn siltstone
9-11 36-50/3.5
A/A
Auger, good water zone
@ ≈ 10.5 bgs, auger to
15' bgs
Install BDL-MW3
well set @ 15' bgs

Sand to 3' bgs, bentonite
to surface, install
expansion plug, cap
lock, demob from
area and mob to
area of ARS2.

0915-1130 Set up @ BDL-4
NE corner of ARS2.
0-2 Brn slt w/ f gr sand, org
2-4 Rd brn w/ some gr
slt with some siltstone, pos
fill, org material
4-6 36-50/4"
Rd. brn weathered siltstone
6-8 38-50/2"
A/A with some gry siltstone / weathered
8-10 50/4.5"
A/A, dry, all dry
10-12 30-50/2"
A/A
14-16 36-50/4"
A/A

Set well BDL-MW4 @ ~
17' bg, scrl to 5',
bentonite to surface

TS work on grabbing gw
samples from other
3 wells

Sample
BDL-B1
BDL-B2 } Sample from 1130-1200
BDL-B3

1230 TS & GEX off-site
Meet @ 0830 on Monday

TS 1/23/09

January 26, 2009
0830 TS on-site
0900 GEX on-site, get Randy
briefed
0930-1030 Mob to BDL-B5

Result for GW samples
BDL-MW1 - <243
BDL-MW2 - 787
BDL-MW3 - 533

BDL-MW4 - TD from TOC 18.85
BGS ~ 17.0 DRY

1030-1200 Battery dead on rig
to get battery, get rig running

Drill @ BDL-B5, ~10'
SE of SE corner of ARS2

0-2 Brn slt w some cly, tr
vf gr sand, dense, dry
2-4 A/A some gry

TS 1/26/09

4-6 A/A some weathered siltstone
6-9 4"/50 weathered siltstone
Auger to 8'
8-10 Siltstone, all dry
10-12 36 - 50/5"
Brn and some gry siltstone, Auger to 13'
1330-1430 Lunch
13 - 15 50/4" weathered siltstone
Auger to 17' bgs
Auger refusal

Set well @ 17' bgs, BDL-MW5
all indicates one
that well is dry!
Screen from 10-17' bgs
Sand to 5'
Seal to surface.
TD 18.2' TOC ~16.7' bgs
1630
Drill @ BDL-B6
0-2 Brn w/ sm reddish br
slt w/ tr clay and vf grsd
tr org mat.

TK 1/26/09

2-4 18-26-50/5" Rd brn some gry silt/weath ss
4-6 26-50/5" A/A ~~some gry siltstone~~
6-8 30-50/3" Rd brn weathered siltstone.
Auger to 8'
1745 Break for day
1800 Off-site

TK 1/26/09

January 27, 2009
0645 TS on-site
0700 GEX on-site
Mob to BDL-6, to continue drilling
Collect soil sample from 0-8 BDL-B6 @ 0800
8-10 Full sample, no spoon refusal Rd brn weathered siltstone
10-12 20-40-50/3 A/A
13-15 30-50/4 A/A
Auger refusal @ ~14.5, dry
Setwell @ 14.5 sand to 2.5 pellet to surface
BDL-MW6

0945 Mob to BDL-B7, east of ARS2 tornado lake ~ 1/2 way down slope to lake

4-6 4-4.5 Brn silt with tr vf gr sd, tr clay
4.5- Weathered siltstone
1/27/09

9-11 Weathered siltstone, dry refusal on 2nd 6" interval
Auger to ~11' bgs
Problems with gear box on rig.
1200-1300 Break for lunch
Can not make repair to gear box @ site, will need to send rig to shop. will attempt to withdraw HSAs and fill hole with sand
1300-1430 Pull auger, sand hole, pack up rig, steam clean
GEX off-site
1500 GEX off-site
1/27/09

February 6, 2005

0900 TS on site to check wells

BDL-MW5- DTW-~11.7'
≈10.2 from ground

BDL-MW6- DTW-~8.3'
~6.6 from ground

BDL-MW4- Dry @~17' bgs

Collect sample from BDL-MW5 and BDL-MW6

1030 TS off-site

February 17, 2005

0645 TS @ EE Center, waiting on drillers.

0700 Drillers on-site

0700 Badge drillers and Bob Wilson gives safety briefing.
- chemicals
- Don will hold badges.

0800 Complete briefing

0825- Driller thru security

0825. Mob to BDL and manhole area

0900 Start drilling @ BDL-MW7 SSAs to 17' bgs, rig up air. Air rotary to ~60' bgs. Shut down several times in effort to allow water to enter well, no visible water

BDL-MW6	8.68	DTW	6.9 bgs
BDL-MW5	9.25	DTW	7.6 bgs

Set well @ 60' bgs based on bottom elevation of well approximately 190' MSL.

GW-72 installed in 2006 was installed to 210' msl
Set well @ 60' with 30' of screen, sump to 25' seal to 23', cement/bentonite grout to surface

1430 Mob to BDL-MW8, down hill toward pond from manhole, SSAs to ~18' bgs, switch to air water @ 14-15' bgs continue circ to 20 bgs, screen from 10-20, sump to 8', seal to 6', grout to surface.

Drainhole near toilet

1530 Mob to BDL-MW9
0-7 Brn & gry clayey silt
7- Gry silt to ~8.5
8- Rd Brn weathered siltstone
AA to 18' bgs

Set well @ 18' bgs w/ 10 screen, sump to 6 bgs 2' seal, grout to surface. Put locking tops on all wells, will finish wells once determine which will be permanent

1630 Break down & demob

1730 TS off-site to go to Lab. Don remain with Driller to complete demob.

3 wells installed, complete need to determine which wells are permanent, for protective casing install

AV 2/17/09

February 20, 2009

0730 On-site to meet surveyors to survey in wells. meet Larry & Bill from Smith & Smith to discuss survey scope. 9 wells, 1 bary and manhole

MW-7 DTW - DRY

MW9 DTW - 18.11' TOC

MW8 DTW - 2.52' TOC

Tour areas of the site

0930 - Off-site

TW 2/20/09

March 3, 2009

0900 meet w/ Don

Activities: conduct WL measurement

BDL - MW1
TD 32.54 DTW 23.37

BDL - MW2
TD 20.93 DTW 11.71

BDL - MW3
TD 16.52 DTW 4.45

BDL - MW4
TD 18.85 DTW - DRY

BDL - MW5
TD 18.20 DTW 8.44

BDL - MW6
TD 15.80 DTW 7.72

BDL - MW7
TD 63.86 DTW 62.93

BDL - MW8
TD 23.05 DTW 2.05

BDL - MW9
TD ~~15.20~~ 20.1 DTW ~~20.1~~ 15.20

Manhole 6.97 - .2 - 6.75

1330 Meeting w/ OPS regarding BDL

1400-1600 Take continued space training

1600-1700 Prep for tomorrow

3/3/05

March 4, 2009

0700 TS on-site
0730 Meeting w/ LE, HB & DE to discuss project
0800 - Move to wells for sampling.

MW-6 DTW 7.90 @ 0922
purge @ 0923 / 1008
@ 250 ml/min

1011	11.90	646	4.94	8.27	13.4
1018	11.93	615	4.11	8.17	19.6
1024	11.94	548	7.66	8.29	23.9

Sample @ 0940

MW-5 DTW - 8.46
purge 0952 / 1037

1038	12.98	645	1.23	7.73	-55.4
1044	13.12	648	1.09	7.62	-61.8
1054	13.15	602	0.84	7.65	-67.5
1058	13.04	579	0.85	7.69	-64.9

Sample @ 1013

Sample mw-7 with bailer, < 1' of water in well @ 1020
BD mw-4 - DTW - 18.43
& 0.40' of water

1114 Start purge manhole
inserted tube ~3' into
tube at bottom of manhole
Sample @ 1114 @ start

1200	11.34	304	2.33	7.93	-40.0
1210	11.10	275	1.61	7.09	-8.5
1222	11.00	274	1.47	6.56	18.7
1228	11.12	294	1.40	6.66	11.6

Sample @ 1145

mw-8 start @
1205 / 1250

1304	11.93	146	0.78	7.12	-47.6
1313	12.34	137	0.59	6.91	66.7
1318	12.41	137	0.55	6.89	74.4
1325	12.43	135	0.54	6.90	80.7

Sample @ 1245
High turbidity, need to redevelopse

mw-9 DTW - 14.85
start @ 1255

1341	13.38	519	7.79	7.11	67.7
1346	13.53	554	7.45	6.97	67.9
1352	13.44	625	7.64	6.93	70.2

Sample @ 1310

Develop mw-8, purge ~25 gallons collect sample after purge

mw-3 3.85
Start @ 1407 / 1452

1453	13.97	1101	6.18	7.58	48.3
1458	13.24	1082	1.00	6.85	63.0
1503	12.66	1071	0.82	6.71	67.7
1508	12.33	1056	0.74	6.67	66.9
1515	12.22	1030	0.68	6.64	55.7
1520	12.05	990	0.72	6.56	6.9

Sample @ 1430

mw-2 DTW 11.70
Start @ 1448

	.3 .6 ppm zinc				
14.70	808	7.66	6.97	10.04	
1541	14.17	401	5.03	7.08	-16.8
1548	14.01	223	5.31	6.57	13.8
1554	13.93	213	5.19	6.51	12.6
1559	14.04	211	5.11	6.50	12.5
	Sample @ 1515				
MW-1	Start @ 1530/1615				
1617	16.55	3400	1.66	6.69	58.1
1624	17.06	4017	1.10	6.93	40.0
1625	16.78	3955	1.20	6.93	39.4
1633	16.48	3619	1.22	6.86	48.9
1639	16.30	3488	1.19	6.77	54.8
1643	16.23	3555	1.03	6.78	60.0
1646	16.24	3666	1.06	6.79	60.7
	Sample @ 1600				
Cooling Tower					
1700	23.02	451	8.52	8.26	12.0
1700	Off-site				

Appendix D

Calculations

APPENDIX D
CALCULATIONS

Groundwater Velocity Calculation

$$V/s = \frac{-K\,(dh/dl)}{ne}$$

V/s = Groundwater Velocity

dh = Water Elevation Difference
BDL-MW5 to BDL-MW8 = 4.99'

dl = Horizontal Distance Difference
BDL-MW6 to BDL-MW8 = 200'

K = Hydraulic Conductivity
1.14 ft/day (Arithmetic Mean Value from Table 2.4.12-208, FSAR)

ne = Porosity = 5%
(Freeze and Cherry, 1979)

$$V/s = 1.14 \text{ ft/day} \quad \frac{(4.99 \text{ ft}/215 \text{ ft})}{.05}$$

$$V/s = 0.529 \text{ ft/day}$$
$$= 193 \text{ ft/year}$$