

Permit No.	Scan Date	DIN
5306-STRUCT-2015	March 24, 2015	24021

RECEIVED

March 24, 2015

Solid Waste Section

Asheville Regional Office

APPENDIX P
Water Quality Monitoring Plan

This page intentionally left blank.

WATER QUALITY MONITORING PLAN
COLON MINE RECLAMATION STRUCTURAL FILL SITE
1303 BRICKYARD ROAD
SANFORD, NORTH CAROLINA

Prepared for:

Mr. Mike Plummer, PE
HDR Engineering of the Carolinas, Inc.
440 South Church Street, Suite 1000
Charlotte, North Carolina 28202
Ph: 704-338-6843

NCDENR - Solid Waste Section
217 W. Jones Street
Raleigh, North Carolina 27603
Ph: 919-707-8200

and

NCDENR, Division of Energy, Minerals and Land Resources
512 N. Salisbury Street
Raleigh, North Carolina 27604
1612 Mail Service Center
Raleigh, North Carolina 27699
Ph: 919-707-9200

~~November 6, 2014~~ ~~January 4, 2015~~ March 6, 2015

Prepared by:

Ross Klingman, P.G.
Senior Geologist

This page intentionally left blank.

WATER QUALITY MONITORING PLAN
COLON MINE RECLAMATION STRUCTURAL FILL SITE
1303 BRICKYARD ROAD
SANFORD, NORTH CAROLINA

TABLE OF CONTENTS

1.0	WATER QUALITY MONITORING PLAN	
1.1	Groundwater Points of Compliance	1
1.2	Compliance Monitor Well Construction	1
1.3	Surface Water Sampling Locations	2
1.4	Leachate Sampling Location	2
1.5	Background Groundwater and Surface Water Monitoring, with Statistical Groundwater Evaluation	2
1.6	Semi-Annual Groundwater, Surface Water and Leachate Monitoring, With Statistical Groundwater Evaluation	3

LIST OF FIGURES

Water Quality Monitoring Plan

This page intentionally left blank.

1.0 WATER QUALITY MONITORING PLAN

Water quality monitoring will be conducted at the proposed Colon Mine RSFS, in accordance with NCSWS rules and guidance documents, General Assembly of North Carolina Session 2013-Senate Bill 729 (ratified) regarding coal combustion residuals, and requested changes to the Water Quality Monitoring Plan by Ms. Elizabeth Werner with the NCSWS during a February 20, 2015 conversation with Buxton Environmental, Inc. The water quality monitoring plan has been prepared to effectively provide early detection of any release of hazardous constituents, as to be protective of human health and the environment. Applicable NCSWS regulatory rules will be followed if a release of hazardous constituents is confirmed, however, required assessment and/or corrective measures have not been specifically outlined in this plan.

The monitoring activities will also be conducted in general accordance with NCSWS memorandums dated October 27, 2006, February 23, 2007 and October 16, 2007 concerning changes to laboratory detection limits and reporting requirements, and the *Solid Waste Section Guidelines for Groundwater, Soil and Surface Water Sampling* dated April 2008.

In developing the proposed water quality monitoring plan, we have considered structural fill configuration, waste stream, surrounding land use, site geologic and hydrogeologic characteristics (including but not limited to aquifer thickness, groundwater flow rate and direction, lithology, hydraulic conductivity, porosity and effective porosity). Supporting documentation concerning these considerations has been previously addressed in the Design Hydrogeologic Report.

1.1 Groundwater Points of Compliance

Buxton Environmental, Inc. proposes to conduct shallow groundwater quality monitoring at nine (9) permanent shallow compliance monitor wells (MW-1 through MW-9) (Figure 7). The wells will include the eight (8) downgradient/sidegradient compliance wells and one (1) upgradient background well (MW-3) (topographic high saddle along power line on near southwest corner of the site). Piezometers PZ-1 (MW-1) and PZ-7 (MW-2), which were installed during the Design Hydrogeologic investigation, will be utilized as compliance wells. The monitor wells will be generally installed at the review boundary (125 feet off the fill boundary) (where room allows); or ½ the distance from the fill boundary to the property boundary where the fill boundary is less than 250 feet off the property boundary. The permanent compliance wells should be completed prior to issuance of the Permit to Operate.

1.2 Compliance Monitor Well Construction

The compliance monitor wells should be constructed in a manner in which shallow groundwater quality and hydrogeologic characteristics can be adequately monitored.

The monitor wells will be installed by advancing a soil boring into the upper portion of the shallow aquifer. The wells will be constructed with 10 foot sections of 2-inch diameter mill slotted PVC screen attached to an appropriate length of 2-inch diameter PVC casing. A sand pack will be placed in the annular space of the boring to approximately 2-feet above the well screen, an approximately 2-foot thick bentonite seal will be placed above the sand, and the remaining annular space will be filled to

grade with bentonite grout. The wells will be completed at grade with a 3 x 3 foot x 6-inch thick concrete pad and lockable stand-up cover. Three well guard posts will be placed around each well to protect the well from vehicle damage. The proposed compliance monitor wells will be completed in accordance with North Carolina Well Construction Standards (15A NCAC 02C .0108). A typical compliance well construction diagram is provided in Appendix O of the Design Hydrogeologic Report.

Following the completion activities, each well will be developed to the fullest extent possible.

Following installation of new compliance wells, borings logs and Well Construction Records (Form GW-1b) should be submitted to the NCSWS in hard copy and electronic format (pdf). Boring logs and Well Construction Records for currently installed compliance wells PZ-1/MW-1 and PZ-7/MW-2 are provided in Appendix G of the Design Hydrogeologic Report.

1.3 Surface Water Sampling Locations

Surface water sampling is proposed to be conducted at two locations, including the intermittent tributary of Roberts Creek located to the immediate northeast of the site (SW-1) and the head waters of Roberts Creek to the southeast of the site (SW-2) (Figure 7). Off-site access agreements may be required.

1.4 Leachate Sampling Location

Buxton Environmental, Inc. understands that leachate from the Colon Mine RSFS will collect into three (3) sumps, which will then be pumped into an aboveground holding tank. One (1) composite leachate sample is proposed to be conducted from the aboveground holding tank, in order to determine site specific characteristics of the leachate.

1.5 Background Groundwater and Surface Water Monitoring Activities, with Statistical Groundwater Evaluation

A minimum of eight (8) independent background groundwater monitoring events should be conducted at the nine (9) proposed compliance wells. Ms. Elizabeth Werner with the NCSWS indicated during the February 20, 2015 telephone conversation with Buxton Environmental, Inc. that only 1 initial independent background groundwater sampling event would be necessary, prior to placement of coal combustion residuals. A minimum of one background sampling event should be conducted at the two surface water sample locations. The initial background groundwater and surface water monitoring events should be conducted prior to issuance of the Permit to Operate.

At each compliance monitor well, groundwater level measurements will be made to within 0.01 of a foot with a depth to water electrode.

The purging and sampling of the wells will be conducted with low flow sampling techniques specified in the *Solid Waste Section Guidelines for Groundwater, Soil and Surface Water Sampling* dated April 2008. Field parameters including temperature, pH, specific conductance, temperature, dissolved oxygen and turbidity will be collected until field parameters have stabilized within specific tolerances for three consecutive readings.

The groundwater and surface water samples will be analyzed for Appendix III constituents (including additional Appendix I metals outlined in 40 CFR Part 258 and in general accordance with applicable NCSWS guidance and Senate Bill 729). For quality control purposes, one trip blank and one equipment blank will be analyzed for Appendix III constituents (including additional Appendix I metals outlined in 40 CFR Part 258 and in general accordance with applicable NCSWS guidance and Senate Bill 729). The laboratory analyses will be conducted by a North Carolina certified laboratory in accordance with Level I (standard) QA/QC procedures. Sample collection, handling and storage will be conducted in general accordance with accepted protocol, including chain-of-custody documentation.

The eight (8) background monitoring events will be conducted over a 1 year period of time with an approximately 1.5 month spacing commencing immediately following issuance of the Permit to Construct. The initial independent background groundwater sampling event will be conducted prior to issuance of the Permit to Operate and placement of coal combustion residuals.

Statistical Groundwater Evaluation

A statistical evaluation of the background groundwater data will be conducted in accordance with NCSWS rules utilizing the basic method outlined below.

In order to determine the most appropriate statistical method to evaluate the groundwater data, a Shapiro-Wilk Test was first conducted to determine the normality (distribution) of the data. Based on the distribution (parametric or non-parametric) and percentage of detected target constituents at the site, the Kruskal-Wallis Test and/or the Wilcoxon Rank-Sum Test for Two Groups would likely be utilized to evaluate the background groundwater data. However, other approved statistical methods could be employed to more adequately analyze the data if needed, based on the groundwater analytical results.

The background groundwater and surface water sampling with statistical evaluation report will be submitted within 90 days of completion of the eighth (8th) and final background sampling event.

1.6 Semi-Annual Groundwater, Surface Water and Leachate Monitoring, with Statistical Groundwater Evaluation

Semi-annual groundwater, surface water and leachate monitoring activities will be conducted at the site. These activities are anticipated to be conducted in April and October of each year during the active life and post-closure period of the proposed Colon Mine RSFS.

At each compliance monitor well, groundwater level measurements will be made to within 0.01 of a foot with a depth to water electrode.

The low flow purging and sampling of the wells should be conducted as specified in the *Solid Waste Section Guidelines for Groundwater, Soil and Surface Water Sampling* dated April 2008. Field parameters including temperature, pH, specific conductance, temperature, dissolved oxygen and turbidity will be collected until field parameters have stabilized within specific tolerances for three consecutive readings.

The groundwater, surface water and leachate samples will be analyzed for Appendix III constituents (including additional Appendix I metals outlined in 40 CFR Part 258 and in general accordance with applicable NCSWS guidance and Senate Bill 729). The leachate sample will also be analyzed for biologic oxygen demand (BOD), chemical oxygen demand (COD), total dissolved solids (TDS), sulfate, nitrate and phosphate. For quality control purposes, one trip blank and one equipment blank will be analyzed for Appendix III constituents (including additional Appendix I metals outlined in 40 CFR Part 258 and in general accordance with applicable NCSWS guidance and Senate Bill 729). The laboratory analyses are proposed to be conducted by a North Carolina certified laboratory in accordance with Level I (standard) QA/QC procedures. Sample collection, handling and storage will be conducted in general accordance with accepted protocol, including chain-of-custody documentation.

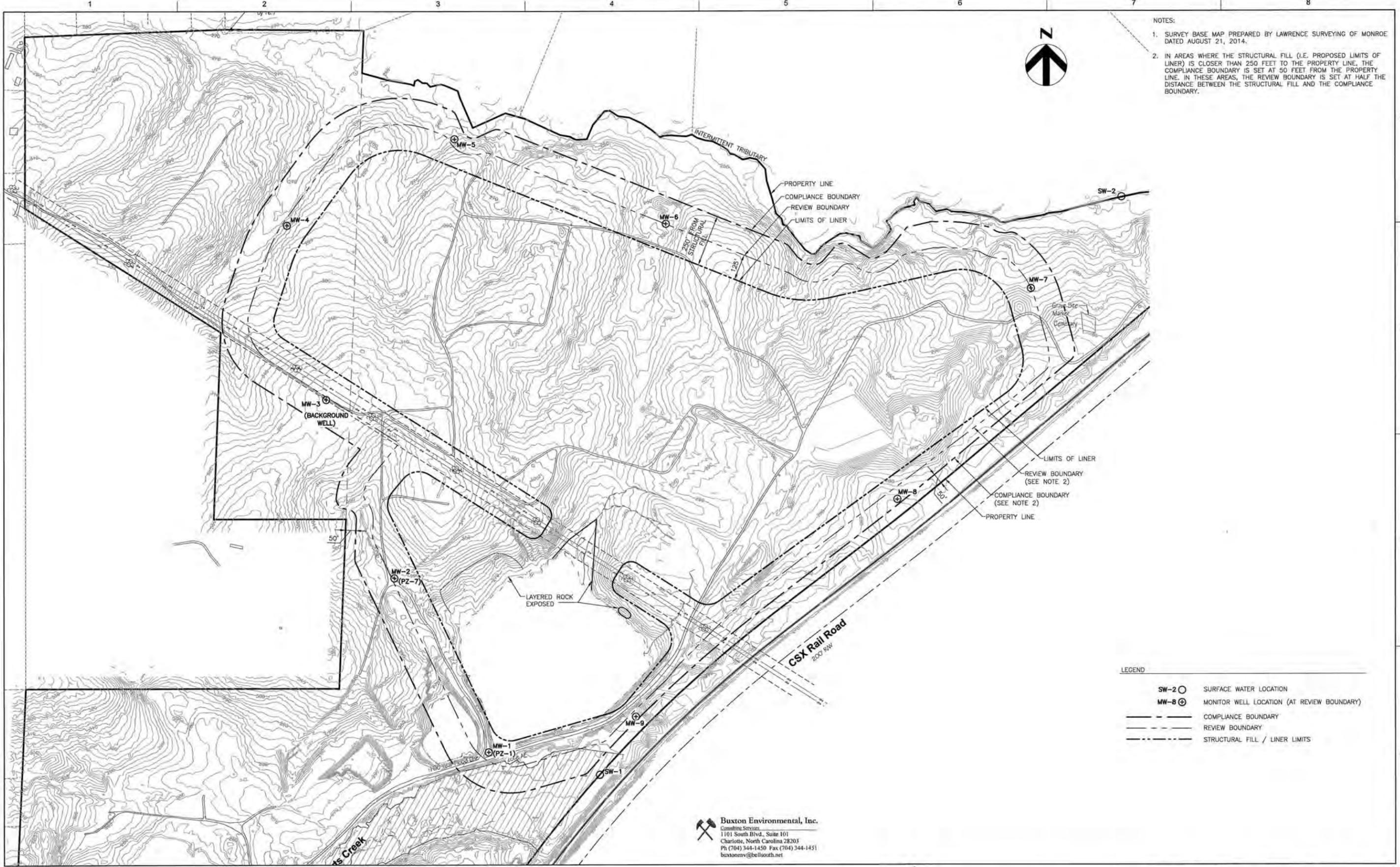
Statistical Evaluation of Historical Groundwater Quality Data

A statistical evaluation of historical groundwater quality data will be conducted in accordance with NCSWS rules utilizing the basic method outlined below.

Based on the distribution (parametric or non-parametric) and percentage of detected target constituents at the site, the Kruskal-Wallis Test and/or the Wilcoxon Rank-Sum Test for Two Groups would likely be utilized to evaluate the historical groundwater data. However, other approved statistical methods could be employed to more adequately analyze the data if needed, based on the groundwater analytical results.

Following receipt of the analytical data, a groundwater, surface water and leachate monitoring report with statistical evaluation of groundwater will be prepared in general accordance NCSWS guidelines. The report will include an executive summary, methods, results, conclusions and recommendations, tables of gauging and sample results, groundwater flow rates and groundwater flow direction map. The report will be prepared by a North Carolina Professional Geologist or Engineer.

A copy of the report should be submitted to the NCSWS within 120 days of the sampling date. The owner or operator shall notify the NCSWS of any exceedance of NCSWS, Groundwater Protection Standards (NCGPS's) within 14 days of this finding. An Assessment Monitoring Program will be required to be implemented within 90 days following an exceedance of the NCGPS, unless a successful alternate source demonstration can be made justifying an alternate cause of the exceedance.



- NOTES:
1. SURVEY BASE MAP PREPARED BY LAWRENCE SURVEYING OF MONROE DATED AUGUST 21, 2014.
 2. IN AREAS WHERE THE STRUCTURAL FILL (I.E. PROPOSED LIMITS OF LINER) IS CLOSER THAN 250 FEET TO THE PROPERTY LINE, THE COMPLIANCE BOUNDARY IS SET AT 50 FEET FROM THE PROPERTY LINE. IN THESE AREAS, THE REVIEW BOUNDARY IS SET AT HALF THE DISTANCE BETWEEN THE STRUCTURAL FILL AND THE COMPLIANCE BOUNDARY.

- LEGEND
- SW-2 ○ SURFACE WATER LOCATION
 - MW-8 ⊕ MONITOR WELL LOCATION (AT REVIEW BOUNDARY)
 - COMPLIANCE BOUNDARY
 - - - REVIEW BOUNDARY
 - - - - STRUCTURAL FILL / LINER LIMITS

Buxton Environmental, Inc.
 Consulting Services
 1101 South Blvd., Suite 101
 Charlotte, North Carolina 28203
 Ph (704) 344-1450 Fax (704) 344-1451
 buxtonenv@bellsouth.net



HDR Engineering, Inc.
 of the Carolinas
 440 S. Church St. Suite 1000
 Charlotte, NC 28202-2075
 704.338.6700
 N.C.B.E.L.S. License Number F-0116

ISSUE	DATE	DESCRIPTION	PROJECT NUMBER
B	12/31/14	REVISED PER NCDENR COMMENTS	453925-235691-018
A	11/2014	ISSUED FOR APPROVAL	

PROJECT MANAGER	M.D. PLUMMER, P.E.
DESIGNED BY	R. KLINGMAN, P.G.
DRAWN BY	J. GAUL
CHECKED BY	
PROJECT NUMBER	453925-235691-018



Charah
 COLON MINE SITE STRUCTURAL FILL
 SANFORD, NC

WATER QUALITY MONITORING PLAN

0 1" 2" FILENAME 00G-12.dwg SHEET
 SCALE 1"=200' FIGURE 7

C:\working\plan\00G-12.dwg, Pkg, 1/30/15 7:11:04 AM, mbr

This page intentionally left blank.