



**BUNNELL-LAMMONS ENGINEERING, INC.**  
GEOTECHNICAL, ENVIRONMENTAL AND CONSTRUCTION MATERIALS CONSULTANTS

September 13, 2007

NCDENR  
Division of Waste Management  
Environmental Compliance – Solid Waste Section  
1646 Mail Service Center  
Raleigh, NC 27699-1646

Attention: Mr. Ervin Lane  
Hydrogeologist

Subject: **Groundwater Contamination Assessment Plan  
Macon County Lined Landfill, Permit #57-03  
Franklin, North Carolina  
BLE Project Number J07-1101-02**

Dear Mr. Lane:

Bunnell-Lammons Engineering, Inc. (BLE) is pleased to submit this work plan to the North Carolina Department of Environment and Natural Resources (NCDENR) to perform a limited groundwater assessment at the subject site.

**PROJECT INFORMATION**

Macon County owns and operates a recycling center and solid waste disposal facility at 1448 Lakeside Drive in Franklin, North Carolina. The facility includes a network of groundwater monitoring wells which are sampled semi-annually in accordance with the facility permit. Groundwater sampling and reporting is currently performed by REI Consultants, Inc (REIC) under contract with the county.

Based on the continued detection of volatile organic compounds in two monitoring wells (MW-1A and MW-1B) which exceed North Carolina groundwater standards promulgated under NCAC Title 15A 02L .0202 (2L Standards), the NCDENR has required the facility to initiate an assessment monitoring program. The county was notified of the requirement in a NCDENR letter dated August 24, 2007.

The letter specifies that the county must submit a groundwater assessment plan to the NCDENR within 30 days of the receipt of the letter (by approximately September 28<sup>th</sup>). This work plan has been prepared by BLE on behalf of Macon County. The plan contains the minimum elements for the required tasks as negotiated with NCDENR during our telephone conversation with your office on September 5, 2007. The work plan includes proposed well locations, well construction methodology, laboratory analyses, and a project schedule.

## SCOPE OF SERVICES

The required tasks for this assessment are limited to the installation and sampling of a minimum number of groundwater monitoring wells. These wells will be used to establish the on-site groundwater flow direction in the area of concern and to determine if the subject contaminants have impacted groundwater quality.

### Monitoring Well Installation, Development, and Survey

BLE will mobilize an ATV-mounted CME-750 drill rig and a truck-mounted Schramm drill rig to install 3 (three) monitoring wells at the locations shown on Figure 1. The proposed MW-23 will be installed using the CME rig via hollow stem auger and the proposed MW-1D and MW-5D will be installed using the Schramm rig via downhole air hammer. The actual well locations and depths will be dependent on site conditions. The well installation will be performed in general accordance with the procedures in Appendices A and B. Each well will include a surface completion consisting of a 3 by 3 foot by 4-inch thick concrete pad with a lockable well cap and steel stickup cover.

We propose to install monitoring well MW-23 to a depth of 28 feet below ground surface (bgs) which is the estimated depth to partially weathered rock or bedrock.

We propose to install monitoring well MW-5D to a depth of 65 feet bgs. We have assumed that rock will be encountered at a depth of 40 feet bgs and groundwater will be encountered at approximately 55 feet bgs at the MW-5D location.

We propose to install monitoring well MW-1D to a depth of 60 feet bgs for vertical delineation of the subject contaminants. We have assumed that rock will be encountered at a depth of 14.5 feet bgs and groundwater will be encountered at approximately 6 feet bgs at the MW-1D location. We propose to install well screen in MW-1D from approximately 55 to 60 feet bgs or as need to bracket water bearing fractures within the bedrock. Please note that monitoring well MW-1A is installed to a depth of 29.5 bgs which should result in a vertical separation of 25.5 feet between the screened zones of MW-1A and the proposed MW-1D.

BLE will provide well development services for each newly installed monitoring well. The monitoring wells will be developed to remove fine particles from the sand pack around the well screen. The well development will consist of the following:

1. Place a manual hand pump or bailer in the monitoring well;
2. Purge the well; and
3. Intermittently surge the well with a surge block.

Ground-water turbidity will be measured periodically during well development using a HF Scientific model DRT-15 Portable Turbidity Meter, or equivalent.

Each monitoring well location and elevation will be surveyed by North Carolina registered land surveyor. We understand that this service will be provided by McGill Associates (McGill) under direct contract with the county.

**Groundwater Sampling and Analysis**

We understand that REIC will collect a groundwater sample from each of the newly installed wells after development is complete. Groundwater sampling will be performed in general accordance with the facility permit. The samples will be analyzed for the Appendix I compound list.

Groundwater levels will be obtained (by REIC) from the new and previously existing monitoring wells and a potentiometric surface map will be prepared.

As part of the requirement to enter into an assessment monitoring program, the county must propose a subset of wells for Appendix II sampling and analysis. Based on our telephone conversation with the NCDENR on September 5, 2007, a three (3) well subset is proposed for Appendix II monitoring. The wells are to be sampled during the next regularly scheduled semi-annual sampling event (Mid-October 2007). Those wells are to consist of MW-17 (background), MW-1A, and MW-1B. Future Appendix II monitoring requirements are to be determined based on the results of the initial event.

**Reporting**

BLE will prepare a report with appropriate documentation of the completion of the project objectives. The report will include well logs, sampling logs, a potentiometric surface map, laboratory analytical results, and conclusions and recommendations. The report will be submitted to Macon County, McGill and the NCDENR.

**SCHEDULE**

Based on our present schedule, we can begin work on this project immediately after receiving NCDENR authorization to proceed. Since the next regularly scheduled semi-annual sampling event by REIC is scheduled for October 2007, we request an accelerated response from NCDENR for this plan. The anticipated implementation schedule is shown below:

• Well installation & development (September 2007)	2 weeks
• Well sampling (by REIC, October 2007)*	1 week
• Well surveying (by McGill)*	2 weeks
• Groundwater laboratory analysis (by REIC)*	3 weeks
• Reporting, maps, logs, & project management	<u>3 weeks</u>
Project completion	11 weeks**

\* Performed by others and may require additional time for scheduling, etc.

\*\* Several tasks will be performed concurrently which will shorten the total time required to complete the project. The total time estimate is presented as an indicator of total project effort not for determination of deadlines.

**CLOSING**

Macon County and BLE appreciate the opportunity to work with NCDENR on this project. Please provide comments and approval at your earliest convenience so that we may meet the proposed deadlines. Please contact BLE at (864) 288-1265 if you have any questions.

Sincerely,

**BUNNELL-LAMMONS ENGINEERING, INC.**

  
Andrew W. Alexander, P.G.  
Senior Hydrogeologist  
Registered, NC #1475

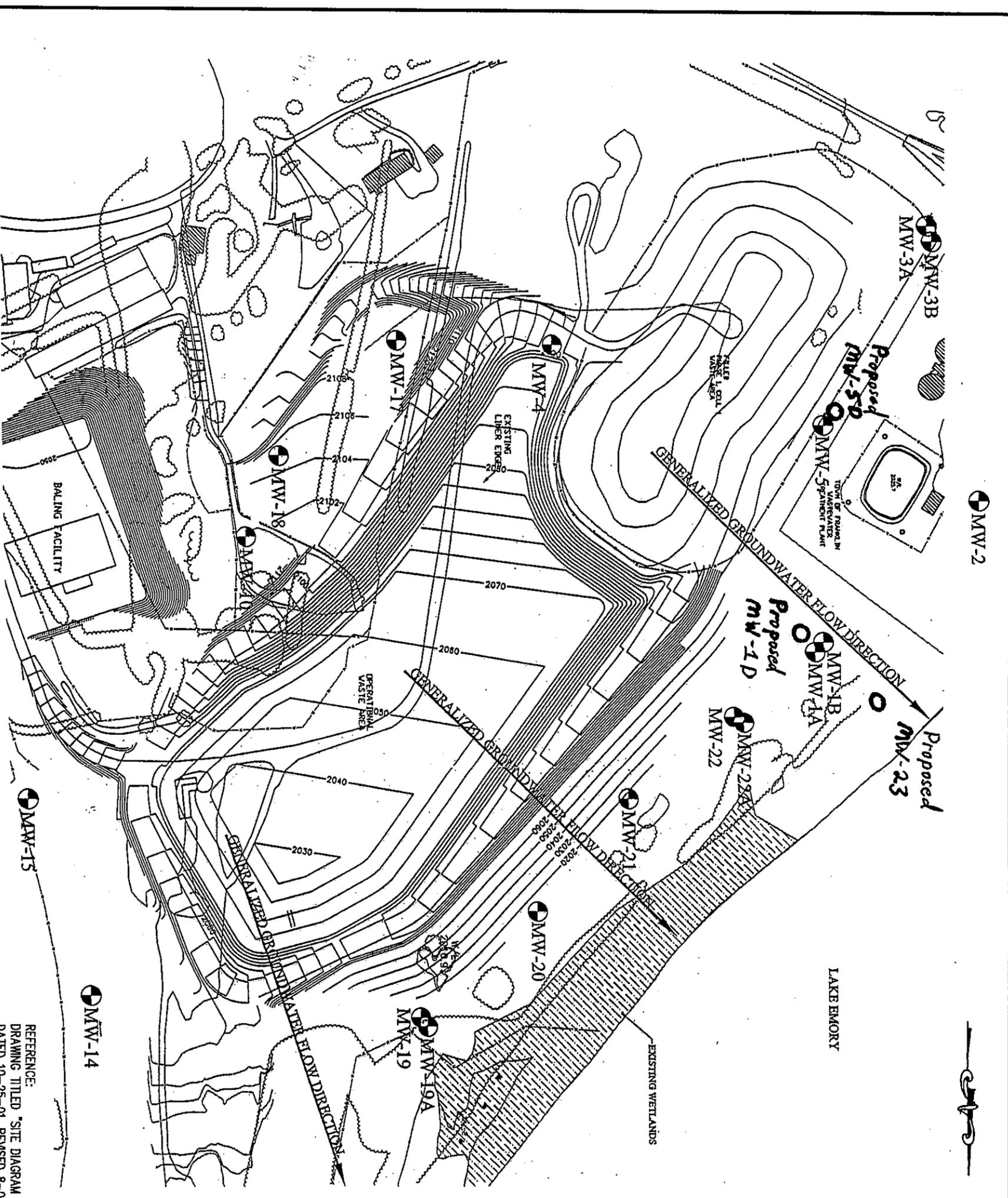


  
Trevor J. Benton, P.G.  
Staff Hydrogeologist  
Registered, NC #2025

CC: Mr. M. Chris Stahl – Macon County  
Mr. Jeff Bishop, PE -- McGill  
Mr. Mike Hofe -- REIC

Attachments: Figures  
Appendices

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- NOTES:
1. MAP IS BASED ON AN ELECTRONIC FILE PROVIDED BY MACON COUNTY.
  2. MW-2 WAS SCALED FROM A DRAWING PROVIDED BY PISGAH ENVIRONMENTAL DATED OCTOBER 2000.
  3. MW-4 WAS SCALED FROM A DRAWING PROVIDED BY PISGAH ENVIRONMENTAL DATED DECEMBER 1997.
  4. GENERALIZED GROUNDWATER FLOW DIRECTION IS BASED ON OCTOBER 2000 WATER LEVEL DATA.

LEGEND

— EXISTING TOPOGRAPHY AND FEATURES

● MW-14 MONITORING WELLS



REFERENCE:  
DRAWING TITLED "SITE DIAGRAM WITH GENERALIZED GROUNDWATER FLOW DIRECTION" BY ALTAMONT ENVIRONMENTAL, INC., DATED 10-25-01, REVISED 8-05-02.

DRAWN BY:	AWA	DATE:	09-13-07
CHECKED BY:	AWA	FILE:	Macon Well Plan 1101-02
APPROVED BY:	AWA	JOB NO.:	J07-1101-02

REVISIONS	
No.	DESCRIPTION

**BUNNELL-LAMONS ENGINEERING, INC.**  
 6004 POWERS COURT  
 GREENVILLE SOUTH CAROLINA 29615  
 PHONE: (864)288-1265 FAX: (864)288-4430

PROPOSED MONITORING WELL LOCATION PLAN  
 MACON COUNTY MSW LANDFILL  
 1448 LAKESIDE DRIVE  
 FRANKLIN, NORTH CAROLINA

**APPENDIX A****DRILLING PROCEDURES****Air Hammer Drilling**

Air drilled borings will be advanced through the unconsolidated and consolidated materials using a downhole air hammer and compressed air to remove the soil and rock cuttings. The pneumatic drill hammer rapidly strikes the soil or rock while the drill pipe is slowly rotated. The drill hammers are typically constructed of alloy steel with tungsten-carbide inserts that provide the chipping or cutting surfaces. An in-line air filter is attached to the air compressor on the rig to remove oil from the air and to prevent oil contamination in the borehole.

Representative portions of the soil samples will be placed in glass jars or plastic bags. The samples will be examined by a geologist to verify the technician's and/or driller's field classifications and Soil Boring Records will be prepared. Soil borings are assumed to be advanced to their required termination depths for monitoring well installation.

**Hollow Stem Auger Drilling**

Soil borings will be advanced by mechanically twisting a continuous flight steel auger into the soil. Soil sampling will be performed by collecting samples of the auger cuttings or split spoon sampler, as needed.

**General**

To help prevent cross-contamination between borings, all downhole drilling equipment will be steam cleaned prior to drilling each boring.

**APPENDIX B****WELL INSTALLATION PROCEDURES****Type II Monitoring Well**

Type II ground-water monitoring wells will consist of 2-inch Schedule 40 polyvinyl chloride (PVC) casing with flush-threaded joints installed in a borehole. The bottom 5- or 10-foot section of each well will consist of a manufactured well screen with 0.01-inch wide machined slots. The well screen will be installed to the termination depth of the borehole.

In the Type II wells, a washed sand filter pack will be placed around the outside of the casing from the bottom of the well casing to from one to five feet above the top of the well screen. The sand filter pack is used to stabilize the formation and to help yield a less turbid ground-water sample.

A two-foot thick (minimum) bentonite seal will be installed on top of the sand filter pack to seal the monitoring well at the desired level. The well annulus will then be grouted to the surface with a cement/bentonite grout mixture. A lockable PVC cap and a protective steel cover will be placed over each well.