HODGES, HARBIN, NEWBERRY & TRIBBLE, INC.

CONSULTING ENGINEERS

484 MULBERRY STREET, SUITE 265 • POST OFFICE BOX 974
MACON, GEORGIA 31201

H. LOWRY TRIBBLE, JR., PE
WILLIAM F. HODGES, PE
HAROLD L. NEWBERRY, PE
J. STEVEN HARBIN, PE
JEFFREY M. BROWNE, PE

TELEPHONE (478) 743-7175
FAX (478) 743-1703

August 10, 2001

AUG 2001
Received
Section

Mr. Jim Coffey
NC Department of Environment & Natural Resources
1646 Mail Service Center
Raleigh, NC 27699-1646

Re: JMN/Cleveland Container LF
Permit No. 23-02
HHNT Project No. 6703-030-03 and 6703-030-01

Dear Mr. Coffey:

We have enclosed a "Groundwater Monitoring Well Installation & Abandonment Report" for your review and approval.

Should you have any questions, please call.

Sincerely,

HODGES, HARBIN, NEWBERRY & TRIBBLE, INC.

William F. Hodges, P.E.
Principal

Carmen Johnson

Facility/Site ID | Date | Doc ID#
23-02 | 2/2/12 | DIN

WFH/jlm

cc: John Murray, P.E., w/encl.
Don Edwards, w/encl.
Brant Lane, P.E., w/o encl.
Mark Preddy, w/o encl.

Carmen Johnson 2/2/12
23-02

AUG 2001 Received Section

BLE INC.

BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL, ENVIRONMENTAL AND CONSTRUCTION MATERIALS CONSULTANTS

GROUND-WATER MONITORING WELL INSTALLATION & ABANDONMENT REPORT

JMN/CLEVELAND CONTAINER INDUSTRIAL LANDFILL CLEVELAND COUNTY, NORTH CAROLINA

Prepared for:

HODGES, HARBIN, NEWBERRY, & TRIBBLE, INC.
484 Mulberry Street, Suite 265
Macon, Georgia 31201

NORTH CAROLINA LICENSED SEAL 1043 GEOLOGIST MARK S. PREDDY 8/4/01

Prepared by:

BUNNELL-LAMMONS ENGINEERING, INC.
1200 Woodruff Road, Suite B-7
Greenville, South Carolina 29607

August 4, 2001

BLE Project Number J01-1307-09

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

AUG 2001
Received
Solid Waste
Section

August 4, 2001

Hodges, Harbin, Newberry, & Tribble, Inc.
484 Mulberry Street, Suite 265
Macon, Georgia 31201

Attention: Mr. William F. Hodges, P.E.

Subject: **Ground-Water Monitoring Well Installation & Abandonment Report**
JMN/Cleveland Container Industrial Landfill
Cleveland County, North Carolina
BLE Job Number J01-1307-09

Gentlemen:

As authorized, Bunnell-Lammons Engineering, Inc. has recently performed monitoring well installation and abandonment at the JMN/Cleveland Container Industrial Landfill. The enclosed report describes the work performed and provides the soil test boring logs, monitoring well construction diagrams, well development results, and slug test results. The ground-water monitoring wells were installed in compliance with the ground-water monitoring plan for the site and are to be used as part of the detection monitoring system.

We appreciate the opportunity to serve as your hydrogeological consultant on this project and look forward to working with you on future projects. If you have any questions, please contact us at (864) 288-1265.

Sincerely,

BUNNELL-LAMMONS ENGINEERING, INC.

NORTH CAROLINA LICENSED SEAL 1043 8/4/01 GEOLOGIST MARK S. PREDDY

Mark S. Preddy, P.G.
Senior Hydrogeologist
Registered, North Carolina No. 1043

Thomas L. Lammons, P.G.
Principal Hydrogeologist
Registered, North Carolina No. 1264

d:\msp files\cleveland container lf nc\130709\1307-09.doc

1200 WOODRUFF ROAD, SUITE B-7
GREENVILLE, SOUTH CAROLINA 29607

PHONE (864) 288-1265
FAX (864) 288-4430

1.0 PROJECT INFORMATION

The subject industrial waste landfill is located in Cleveland County, North Carolina near the town of Shelby (Figure 1). The site consists of about 110 acres, which includes an existing landfill, borrow areas, and a proposed Phase 2 expansion area. The site is owned and operated by Republic Services of North Carolina, LLC.

The ground-water monitoring system at the existing landfill has been modified, as outlined in BLE's *Site Hydrogeologic Report* [SHR], *JMN/Cleveland Container Industrial Landfill, Cleveland County, North Carolina*, dated October 2, 2000 (BLE Project Number J99-1307-04). The modifications included two new background monitoring wells (MW-1B and MW-1C), and two new downgradient wells (MW-6A and MW-7A), plus the abandonment of six existing wells.

Bunnell-Lammons Engineering, Inc. (BLE) was contracted by Hodges, Harbin, Newberry & Tribble, Inc. (HHNT) to perform the installation and abandonment activities, which are documented in this report.

2.0 FIELD EXPLORATION

2.1 General

Field activities were performed between March 6 and July 2, 2001. Superior Drilling, Inc. of Raleigh, North Carolina and AE Drilling, Inc. of Greenville, South Carolina performed well abandonment, drilling, and well installation activities under the supervision of a North Carolina registered geologist from BLE. Representatives of BLE also performed well development, slug testing, and soil laboratory testing. Tommy Fields (RLS) of Troy, North Carolina surveyed the monitoring wells for horizontal and vertical control, after completion of the drilling activities. The surface elevation data for the new monitoring wells is summarized on Table 1.

2.2 Monitoring Well Abandonment

Monitoring wells MW-1, MW-1A, MW-2, MW-3, MW-6, and MW-7 were abandoned. During abandonment procedures, the PVC casings of the monitoring wells were either drilled-out from the ground using hollow stem augers or pulled-out of the ground. For those wells in which the PVC casing was pulled out, the boreholes were subsequently drilled-out to the total well depth. The resulting boreholes were grouted from the bottom of the holes to the ground surface with a mixture of water, Portland Type I cement, and approximately 5% Quik-Gel bentonite powder. Well abandonment forms are included in Appendix A.

2.3 Soil Test Borings and Soil Sampling

The soil test borings were conducted in general accordance with ASTM D-1586 by Superior Drilling, Inc. using an ATV-mounted drilling rig employing hollow stem augers. Bedrock borings were performed by AE Drilling, Inc. using an ATV-mounted drilling rig employing air-hammer drilling techniques. Refer to Appendix B for a discussion of the Drilling Procedures.

The soil and rock descriptions on the field boring logs (Appendix C) and the final soil test boring logs (Appendix D) were based on visual examination by a North Carolina registered geologist and grain size estimations in accordance with the Unified Soil Classification System (USCS). An information sheet describing the USCS terms and symbols used on the soil test boring logs is also included in Appendix D.

Soil samples collected from the screened interval of monitoring wells MW-1B and MW-7A were analyzed to determine particle size distribution in accordance with ASTM D 1140. Laboratory procedures and results are included in Appendix E.

2.4 Ground-Water Monitoring Well Installation and Development

A total of four, two-inch inner diameter (ID) ground-water monitoring wells (MW-1B, MW-1C, MW-6A and MW-7A) were installed in the water table aquifer at locations shown on the attached

Figure 2. Three of the monitoring wells were installed with screened intervals set to intersect the water table in the residual soils (MW-1B and MW-7A) or the fractured bedrock (MW-6A). Monitoring Well MW-1C was set to intersect the uppermost bedrock fractures below the water table. Monitoring well installation procedures are described in Appendix F and monitoring well installation records are included on the soil test boring logs in Appendix D. Well construction data is summarized on Table 1.

Ground-water levels were measured in the new monitoring wells at the time of boring and after 24-hours. A tabulation of the ground-water level data for the newly installed monitoring wells is included on Table 2. Additionally, water levels were collected from the monitoring wells and piezometers across the site on June 13, 2001; these data are included on Table 3. A ground-water elevation contour map is included as Figure 2.

Field permeability (slug) tests were performed in the monitoring wells to measure the *in situ* hydraulic conductivity of the aquifer materials exposed to the well screens. Slug test field procedures and results are presented in Appendix G and Section 3.2.

The four monitoring wells were purged and developed to reduce the ground-water turbidity to the lowest practical level utilizing conventional development techniques. Monitoring well development field logs are attached in Appendix H and discussed in Section 3.5.

3.0 RESULTS

3.1 Subsurface Conditions Encountered

The subsurface conditions encountered at the four monitoring well/boring locations agree with observations described in the previous SHR. Each of the monitoring wells were installed to similar depths as proposed in the SHR. Our findings are summarized below:

- **MW-1B** - Residual micaceous silty sand and sandy silt with partially weathered rock were present down to 59.3 feet below ground surface (bgs) where auger refusal was encountered. Ground water was encountered at about 50 feet bgs at the time of boring and after 24 hours. The

monitoring well's screened interval was set at 44.0 to 59.0 feet bgs. The screened interval of the well intersects the stabilized water table surface.

- **MW-1C** - Residual micaceous silty sand and sandy silt with partially weathered rock were present down to 60 feet bgs, followed by gneiss bedrock with partially weathered rock seams from 60 to 76 feet bgs. Several water-producing fractures were encountered between 62.5 to 73.0 feet bgs. The monitoring well's screened interval, 65.7 to 75.7 feet bgs, was set to intersect the water producing fractures. Ground water was encountered at about 63 feet bgs at the time of boring, and stabilized to about 48.5 feet bgs after 24-hours.

- **MW-6A** - Residual micaceous silty sand with partially weathered rock were present down to 20 feet bgs, followed by gneiss bedrock with partially weathered rock seams from 20 to 37 feet bgs. Several water-producing fractures were encountered between 27 to 31 feet bgs. The monitoring well's screened interval, 22.0 to 37.0 feet bgs, was set to intersect the water producing fractures. Ground water was encountered at about 27 feet bgs at the time of boring, and stabilized to about 25.2 feet bgs after 24-hours. The screened interval of the well intersects the stabilized water table surface.

- **MW-7A** - Residual micaceous silty sand and silty sand were present down to 37.9 feet bgs. Ground water was encountered at about 26 feet bgs at the time of boring and at about 28.5 feet bgs after 24 hours. The monitoring well's screened interval was set at 22.6 to 37.6 feet bgs. The screened interval of the well intersects the stabilized water table surface.

3.2 Slug Test Results

Slug tests were performed in the field on wells MW-1B, MW-1C, MW-6A, and MW-7A to estimate the *in situ* hydraulic conductivity of the water table aquifer at each monitoring well. Hydraulic conductivity is defined as the volume of water that will move through a porous medium in unit time under a unit hydraulic gradient through a unit area at right angles to the direction of flow. The slug test results indicate a range of hydraulic conductivity from 8.8×10^{-4} cm/sec to 7.8×10^{-5} cm/sec. The results of slug testing are summarized on Table 4.

3.3 Effective Porosity and Specific Yield

Effective porosity is the volume of void spaces through which water or other fluids can travel in a rock or sediment divided by the total volume of the rock or sediment. Effective porosity can be assumed to be approximately equal to specific yield. Specific yield is defined as the ratio of the volume of water that drains from a saturated rock owing to the attraction of gravity to the total volume of rock.

The grain size analyses performed on soil samples collected from the screened interval of monitoring wells MW-1B and MW-7A were used to estimate specific yield (Fetter, 1988). The results indicate a specific yield of about 22.5% and 19.0% in the aquifer at the MW-1B and MW-7A locations, respectively. The effective porosity can be expected to range from about 5% to 10% for fractured crystalline bedrock at MW-1C and MW-6A (Kruseman and deRidder, 1989). A summary of the estimated effective porosity values is on Table 4.

3.4 Ground-Water Flow Velocity

The velocity of ground-water movement (V) is a function of existing hydraulic gradient (i), the hydraulic conductivity (K) and the effective porosity (n), in the equation $V = Ki/n$.

Based on these parameters and the data provided above, the horizontal movement of ground-water ranges from approximately 0.14 to 1.8 feet/day in the four newly installed monitoring wells. Table 5 summarizes the ground-water flow velocity data.

3.5 Monitoring Well Development Results

The well development consisted of purging and surging the wells by pumping and bailing for durations of 5.5 to 9.0 hours each. Turbidity, pH, temperature, and specific conductivity were measured during the well development. In general, turbidity values were over 1000 NTUs at the inception of the well development for each well, and were reduced to 1 to 24 NTUs at the completion of well development.

Volumes of ground water removed from the wells were about 68 gallons (45 casing volumes) from MW-1B, about 82 gallons (18 casing volumes) from MW-1C, about 82 gallons (42 casing volumes) from MW-6A, and about 86 gallons (56 casing volumes) from MW-7A. Well development logs are attached in Appendix H.

4.0 CONCLUSION

Six ground-water monitoring wells were permanently abandoned because either they were too close to the waste cell (MW-6 and MW-7), no longer used (MW-1, MW-2, and MW-3), or an alternative location had been selected (MW-1A).

Four new monitoring wells have been installed to monitor ground-water quality at the site. A background well pair (MW-1B and MW-1C) was installed between the landfill waste and the closest residences' drinking water well. Monitoring wells MW-6A and MW-7A replace abandoned monitoring wells that were originally installed too close to the waste cell. No waste was encountered in the installation of the new wells. The slug test results from the new wells indicate a range of hydraulic conductivity from 8.8×10^{-4} cm/sec to 7.8×10^{-5} cm/sec. Turbidity of the ground water from the new wells has been greatly reduced by extensive well development. Installation and development of these wells has been accomplished in accordance with the facility permit and the Division of Solid Waste Management rules.

5.0 REFERENCES

Bouwer, H. and Rice, R.C., 1976, "A slug test method for determining hydraulic conductivity of unconfined aquifers with completely or partially penetrating wells," Water Resources Research, Vol. 12, No. 3, pp. 423-428.
- Slug testing data reduction procedures.

Cooper, H.H., Bredehoeft, J.D., and Papadopulos, 1967, "Response of a finite diameter well to an instantaneous change in water", Water Resources Research, Vol. 3, No. 1, pp. 263-269.
- Slug testing data reduction procedures.

Fetter, C.W., 1988, *Applied Hydrogeology*: Merrill Publishing Company, Columbus, Ohio.
- Basic hydrogeologic principles and estimates of effective porosity in soils.

Kruseman, G.P., and deRidder, N.A., 1989, *Analysis and Evaluation of Pumping Test Data: Publication 47*, International Institute for Land Reclamation and Improvement, Wageningen, The Netherlands.
- Estimates of effective porosity in fractured bedrock.

TABLES

TABLE 1

WELL CONSTRUCTION INFORMATION
JMN/Cleveland Container Industrial Landfill
Cleveland Co., North Carolina
BLE Project Number J01-1307-09

Monitoring Well	Ground Elevation	TOC Elevation	Depth to water (BTOC)	Depth to water (BGS)	Water Table Elevation	Screen Depth	Screen Elevation
MW-1B	780.35	783.13	53.77	50.99	729.36	44.0 - 59.0	736.4 - 721.4
MW-1C	777.98	780.61	51.16	48.53	729.45	65.7 - 75.7	712.3 - 702.3
MW-6A	634.58	637.16	28.28	25.70	608.88	22.0 - 37.0	612.6 - 597.6
MW-7A	656.06	658.76	31.77	29.07	626.99	22.6 - 37.6	633.5 - 618.5

Notes:
Elevations are in FEET above mean sea level (MSL)
TOC = top of casing
BTOC = below top of casing
BGS = below ground surface
Water level measurements were collected on June 13, 2001

Prepared by: MSP
Checked by: TJB

TABLE 2

GROUND-WATER ELEVATION MEASUREMENTS FROM NEWLY INSTALLED MONITORING WELLS
JMN/Cleveland Container Industrial Landfill
Cleveland Co., North Carolina
BLE Project Number J01-1307-09

Monitoring Well	Ground Elevation	TOC Elevation	DGW (bgs) TOB	Water Elev.	DGW (bgs) 24-Hour	Water Elev.
MW-1B	780.35	783.13	50.5	729.9	50.00	730.35
MW-1C	777.98	780.61	63	715.0	48.53	729.45
MW-6A	634.58	637.16	27	607.6	25.15	609.43
MW-7A	656.06	658.76	26	630.1	28.50	627.56

Notes:
Elevations are in FEET above mean sea level (MSL)
TOC = top of casing
TOB = time of boring
BGS = below ground surface
DGW = depth to ground water

Prepared by: MSP
Checked by: TJB

TABLE 3

GROUND-WATER ELEVATION MEASUREMENTS
JMN/Cleveland Container Industrial Landfill
Cleveland Co., North Carolina
BLE Project Number J01-1307-09

Piezometers & Monitoring Wells	Ground Elev.	TOC Elev.	DGW 6/13/01	Water Elev.
MW-1B	780.35	783.13	50.99	729.36
MW-1C	777.98	780.61	48.53	729.45
MW-4	630.13	632.83	4.79	625.34
MW-5	622.45	625.32	10.88	611.57
MW-6A	634.58	637.16	25.70	608.88
MW-7A	656.06	658.76	29.07	626.99
MW-8	736.21	739.39	45.74	690.47
PZ-1ab	677.48	680.14	16.53	660.95
PZ-1c	677.83	679.54	17.85	659.98
PZ-2ab	648.93	651.37	30.69	618.24
PZ-3	669.21	670.53	Dry	
PZ-4ab	617.68	620.13	19.34	598.34
PZ-4c	618.15	619.48	19.85	598.30
PZ-5ab	646.50	648.44	31.02	615.48
PZ-6b	630.01	632.79	3.11	626.90

NOTES:

1. Measurements are in feet; elevations are relative to mean sea level
2. DGW = Depth to Ground Water below ground surface
3. TOC = Top Of Casing

Prepared by: MSP
Checked by: TJB

TABLE 4

SLUG TEST DATA
JMN/Cleveland Container Industrial Landfill
Cleveland Co., North Carolina
BLE Project Number J01-1307-09

Monitoring Well	Method	Aquifer Unit	K(ft/min)	K(cm/sec)	K(ft/day)	Effective Porosity
MW-1B	Bouwer-Rice	Soil	2.4E-04	1.2E-04	3.4E-01	22.5%
MW-1C	Bouwer-Rice	Bedrock	1.5E-04	7.8E-05	2.2E-01	7.5%
MW-6A	Bouwer-Rice	Bedrock	1.7E-03	8.8E-04	2.5E+00	7.5%
MW-7A	Bouwer-Rice	Soil	3.5E-04	1.8E-04	5.1E-01	19.0%

Notes:
Porosity values for fractured crystalline bedrock were obtained from Table 1.1 of Kruseman & DeRidder (1990).
Porosity value for soil was obtained from Figure 4.11 and Table 4.3 of Fetter (1988).
K = Hydraulic Conductivity

Prepared by: MSP
Checked by: TJB

TABLE 5

GROUND-WATER FLOW VELOCITIES
JMN/Cleveland Container Industrial Landfill
Cleveland Co., North Carolina
BLE Project Number J01-1307-09

	Aquifer Unit	Hydraulic Conductivity			Hydraulic Grad. (ft/ft)	Effective Porosity	Flow Vel. (ft/day)	Flow Vel. (ft/year)
		K(ft/min)	K(cm/sec)	K(ft/day)				
MW-1B	Soil	2.4E-04	1.2E-04	3.4E-01	0.11	22.5%	0.17	62
MW-1C	Bedrock	1.5E-04	7.8E-05	2.2E-01	0.11	7.5%	0.33	119
MW-6A	Bedrock	1.7E-03	8.8E-04	2.5E+00	0.054	7.5%	1.8	657
MW-7A	Soil	3.5E-04	1.8E-04	5.1E-01	0.054	19.0%	0.14	53

Notes:

$\mathbf{V = Ki/n_e}$ where **V** is velocity, **K** is hydraulic conductivity, **i** is hydraulic gradient, and $\mathbf{n_e}$ is effective porosity.

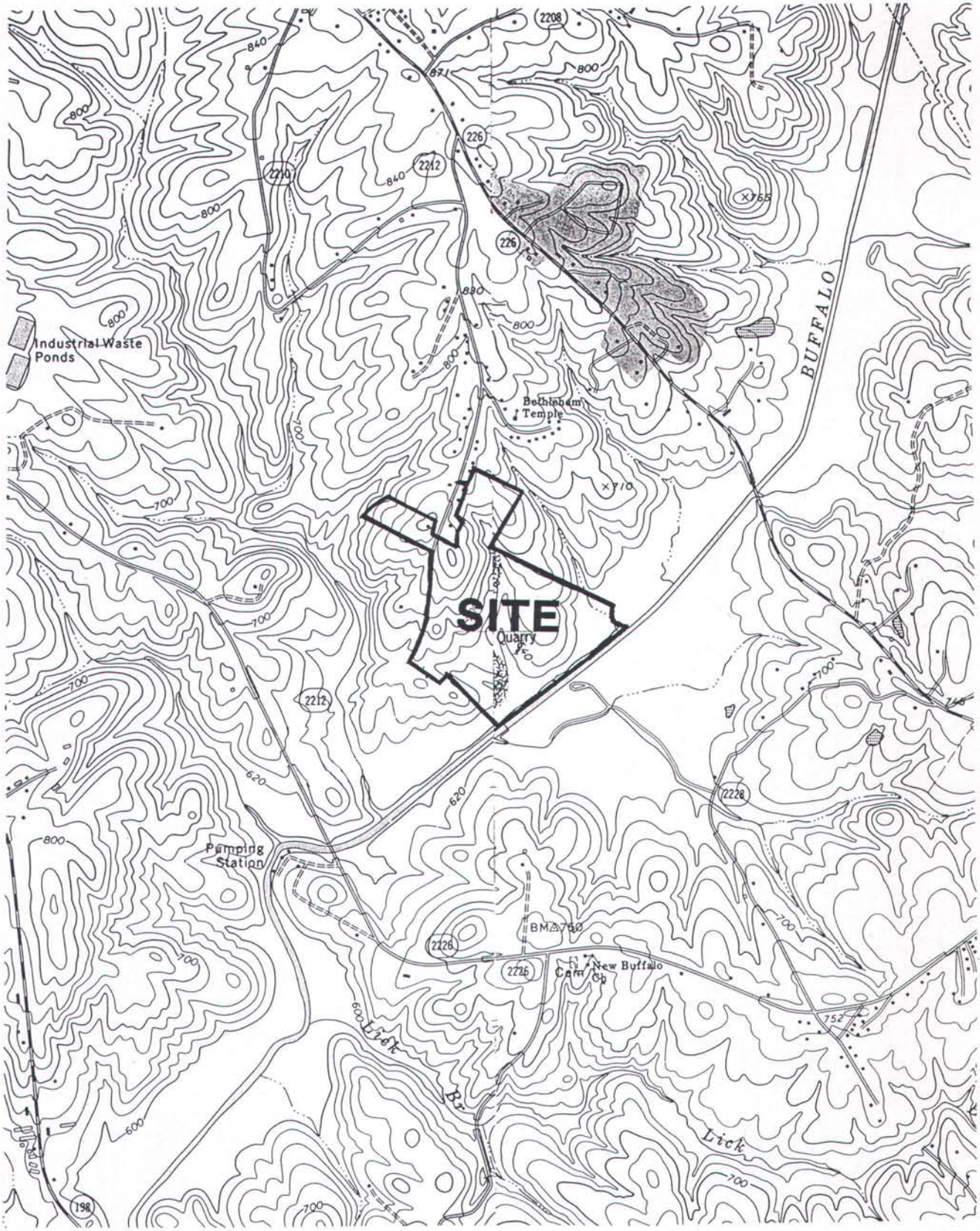
Porosity values for fractured crystalline bedrock were obtained from Table 1.1 of Kruseman & DeRidder (1990).

Porosity value for soil was obtained from Figure 4.11 and Table 4.3 of Fetter (1988).

Hydraulic gradient values were obtained from the ground-water elevation contour map (Figure 2).

Hydraulic conductivity values are from slug test results.

FIGURES



2000 1000 0 2000 4000

APPROXIMATE SCALE IN FEET

REFERENCE:
USGS TOPOGRAPHIC MAP, 7.5 MINUTE SERIES,
BLACKSBURG NORTH AND GROVER, N.C.-S.C. QUADRANGLES, 1971 AND 1993.

DRAWN: AEH	DATE: 02-24-99	BLE INC. BUNNELL-LAMMONS ENGINEERING, INC. 1200 WOODRUFF ROAD, SUITE B-7 GREENVILLE, SOUTH CAROLINA 29607 PHONE: (864)288-1265 FAX: (864)288-4430	SITE LOCATION MAP CLEVELAND CONTAINER LANDFILL SHELBY, NORTH CAROLINA	FIGURE 1
CHECKED: MSP	CAD: CCLF-SLM			
APPROVED:	JOB NO: J99-1307-02			

APPENDICES

APPENDIX A

Monitoring Well Abandonment Forms

Department of Natural Resources and Community Development
Division of Environmental Management

P. O. Box 27687, Raleigh, N. C., 27611

WELL ABANDONMENT
RECORD

CONTRACTOR Superior Drilling, Inc. - Raleigh, NC / Floyd Cox, CWD REG. NO. 1769

WELL LOCATION: (Show a sketch of the location on back of form.)

Nearest Town: Shelby County Cleveland

JMN/Cleveland Cont. ILF, Roseborough Rd. Quadrangle No. Blacksburg North, and Grover, NC-SC

(Road, Community, Subdivision, Lot No.) 7.5-min. USGS Quad.

OWNER: Republic Services of North Carolina, LLC

ADDRESS: 1220 Commerce Str, SW, Conover, NC 28613

TOPOGRAPHY: draw, slope, **HILLTOP**, valley, flat

USE OF WELL: Monitoring DATE ABAND: 3/7/01

TOTAL DEPTH: 50.0-feet DIAMETER: 2-inch

CASING REMOVED:

feet	diameter
50	2"

SEALING MATERIAL:

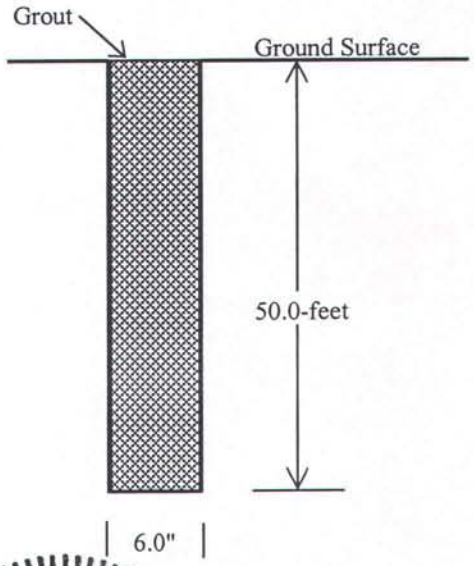
Neat Cement		Sand Cement	
bags of cement	4.3	bags of cement	
gals. of water	43	yds. of sand	
		gals. of water	

Other
Type Material Bentonite powder
Amount 5%

EXPLAIN METHOD OF EMPLACEMENT OF MATERIAL
The PVC casing and screen were drilled-out from the ground using hollow stem augers. The resulting borehole was then tremie grouted from the bottom of the hole to the ground surface.

WELL DIAGRAM: Draw a detailed sketch of the well showing total depth, depth and diameter of screens remaining in the well, gravel interval, intervals of casing perforations, and depths and types of fill materials.

MW-1A



I do hereby certify that this well abandonment record is true and exact.

8/4/01

Signature of Contractor or Agent Date
Mark S. Preddy, P.G.
Bunnell-Lammons Engineering, Inc.

NORTH CAROLINA LICENSED SEAL 1043 GEOLOGIST MARK S. PREDDY

Submit original to the Division of Environmental Management, one copy to the Driller, and one copy of the Owner.

Department of Natural Resources and Community Development
Division of Environmental Management

P. O. Box 27687, Raleigh, N. C., 27611

WELL ABANDONMENT
RECORD

CONTRACTOR Superior Drilling, Inc. - Raleigh, NC / Floyd Cox, CWD REG. NO. 1769

WELL LOCATION: (Show a sketch of the location on back of form.)

Nearest Town: Shelby County Cleveland

JMN/Cleveland Cont. ILF, Roseborough Rd. Quadrangle No. Blacksburg North, and Grover, NC-SC

(Road, Community, Subdivision, Lot No.) 7.5-min. USGS Quad.

OWNER: Republic Services of North Carolina, LLC

ADDRESS: 1220 Commerce Str, SW, Conover, NC 28613

TOPOGRAPHY: draw, slope, **HILLTOP**, valley, flat

USE OF WELL: Monitoring DATE ABAND: 3/7/01

TOTAL DEPTH: 54.0-feet DIAMETER: 2-inch

CASING REMOVED:

feet	diameter
54	2"

SEALING MATERIAL:

Neat Cement		Sand Cement	
bags of cement	4.6	bags of cement	
gals. of water	46	yds. of sand	
		gals. of water	

Other
Type Material Bentonite powder
Amount 5%

EXPLAIN METHOD OF EMPLACEMENT OF MATERIAL
The PVC casing and screen were drilled-out from the ground using hollow stem augers. The resulting borehole was then tremie grouted from the bottom of the hole to the ground surface.

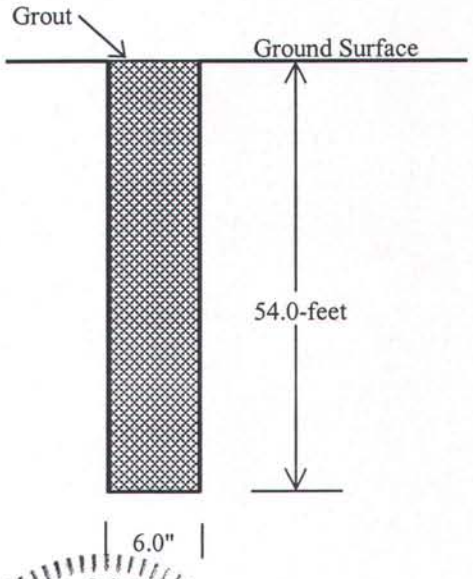
I do hereby certify that this well abandonment record is true and exact.

Mark S. Preddy 8/4/01

Signature of Contractor or Agent Date
Mark S. Preddy, P.G.
Bunnell-Lammons Engineering, Inc.

WELL DIAGRAM: Draw a detailed sketch of the well showing total depth, depth and diameter of screens remaining in the well, gravel interval, intervals of casing perforations, and depths and types of fill materials.

MW-1



NORTH CAROLINA LICENSED SEAL 1043 GEOLOGIST MARK S. PREDDY

Submit original to the Division of Environmental Management, one copy to the Driller, and one copy of the Owner.

Department of Natural Resources and Community Development
Division of Environmental Management

P. O. Box 27687, Raleigh, N. C., 27611

WELL ABANDONMENT
RECORD

CONTRACTOR Superior Drilling, Inc. - Raleigh, NC / Floyd Cox, CWD REG. NO. 1769

WELL LOCATION: (Show a sketch of the location on back of form.)

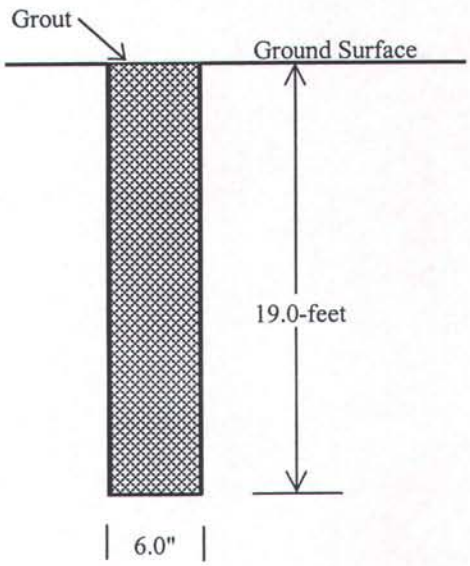
Nearest Town: Shelby
JMN/Cleveland Cont. ILF, Roseborough Rd.
(Road, Community, Subdivision, Lot No.)

County Cleveland
Quadrangle No. Blacksburg North, and Grover, NC-SC
7.5-min. USGS Quad.

OWNER: Republic Services of North Carolina, LLC
ADDRESS: 1220 Commerce Str, SW, Conover, NC 28613
TOPOGRAPHY: draw, slope, hilltop, valley, **FLAT**
USE OF WELL: Monitoring DATE ABAND: 3/6/01
TOTAL DEPTH: 19.0-feet DIAMETER: 2-inch

WELL DIAGRAM: Draw a detailed sketch of the well showing total depth, depth and diameter of screens remaining in the well, gravel interval, intervals of casing perforations, and depths and types of fill materials.

MW-2



CASING REMOVED:

feet	diameter
19	2"

SEALING MATERIAL:

Neat Cement		Sand Cement	
bags of cement	1.6	bags of cement	
gals. of water	16	yds. of sand	
		gals. of water	

Other
Type Material Bentonite powder
Amount 5%

EXPLAIN METHOD OF EMPLACEMENT OF MATERIAL
The PVC casing and screen were pulled from the ground.
The borehole was then wash drilled-out,
and tremie grouted from the bottom of the hole to the
ground surface.

I do hereby certify that this well
abandonment record is true and exact.

Mark S. Preddy 8/4/01

Signature of Contractor or Agent Date
Mark S. Preddy, P.G.
Bunnell-Lammons Engineering, Inc.

NORTH CAROLINA LICENSED SEAL 1043 GEOLOGIST MARK S. PREDDY

Submit original to the Division of Environmental Management, one copy to the Driller, and one copy of the Owner.

Department of Natural Resources and Community Development
Division of Environmental Management

P. O. Box 27687, Raleigh, N. C., 27611

WELL ABANDONMENT
RECORD

CONTRACTOR Superior Drilling, Inc. - Raleigh, NC / Floyd Cox, CWD REG. NO. 1769

WELL LOCATION: (Show a sketch of the location on back of form.)

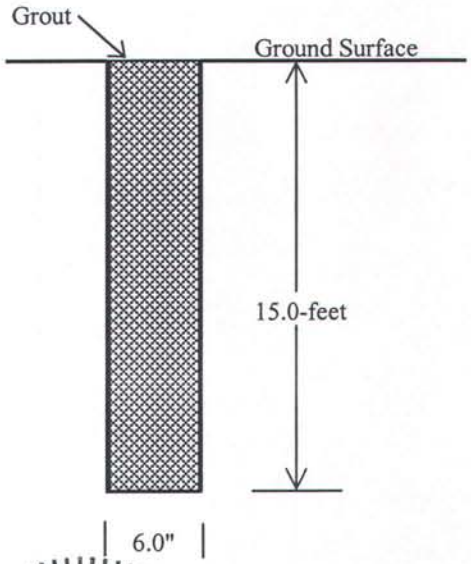
Nearest Town: Shelby
JMN/Cleveland Cont. ILF, Roseborough Rd.
(Road, Community, Subdivision, Lot No.)

County Cleveland
Quadrangle No. Blacksburg North, and Grover, NC-SC
7.5-min. USGS Quad.

OWNER: Republic Services of North Carolina, LLC
ADDRESS: 1220 Commerce Str, SW, Conover, NC 28613
TOPOGRAPHY: draw, slope, hilltop, valley, **FLAT**
USE OF WELL: Monitoring DATE ABAND: 3/6/01
TOTAL DEPTH: 15.0-feet DIAMETER: 2-inch

WELL DIAGRAM: Draw a detailed sketch of the well showing total depth, depth and diameter of screens remaining in the well, gravel interval, intervals of casing perforations, and depths and types of fill materials.

MW-3



CASING REMOVED:

feet	diameter
15	2"

SEALING MATERIAL:

Neat Cement		Sand Cement	
bags of cement	1.3	bags of cement	
gals. of water	13	yds. of sand	
		gals. of water	

Other
Type Material Bentonite powder
Amount 5%

EXPLAIN METHOD OF EMPLACEMENT OF MATERIAL
The PVC casing and screen were pulled from the ground.
The borehole was then wash drilled-out,
and tremie grouted from the bottom of the hole to the
ground surface.

I do hereby certify that this well
abandonment record is true and exact.

Mark S. Preddy 8/9/01

Signature of Contractor or Agent Date
Mark S. Preddy, P.G.
Bunnell-Lammons Engineering, Inc.

NORTH CAROLINA LICENSED SEAL 1043 GEOLOGIST MARK S. PREDDY

Submit original to the Division of Environmental Management, one copy to the Driller, and one copy of the Owner.

Department of Natural Resources and Community Development
Division of Environmental Management

P. O. Box 27687, Raleigh, N. C., 27611

WELL ABANDONMENT
RECORD

CONTRACTOR Superior Drilling, Inc. - Raleigh, NC / Floyd Cox, CWD REG. NO. 1769

WELL LOCATION: (Show a sketch of the location on back of form.)

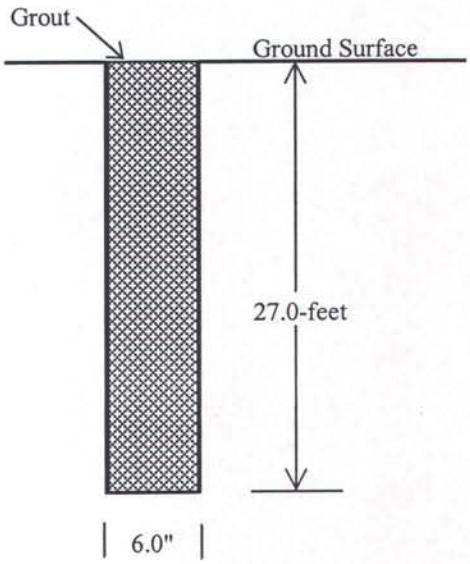
Nearest Town: Shelby
JMN/Cleveland Cont. ILF, Roseborough Rd.
(Road, Community, Subdivision, Lot No.)

County Cleveland
Quadrangle No. Blacksburg North, and Grover, NC-SC
7.5-min. USGS Quad.

OWNER: Republic Services of North Carolina, LLC
ADDRESS: 1220 Commerce Str, SW, Conover, NC 28613
TOPOGRAPHY: draw, **SLOPE**, hilltop, valley, flat
USE OF WELL: Monitoring DATE ABAND: 3/6/01
TOTAL DEPTH: 27.0-feet DIAMETER: 2-inch

WELL DIAGRAM: Draw a detailed sketch of the well showing total depth, depth and diameter of screens remaining in the well, gravel interval, intervals of casing perforations, and depths and types of fill materials.

MW-6



CASING REMOVED:

feet	diameter
27	2"

SEALING MATERIAL:

Neat Cement		Sand Cement	
bags of cement	2.3	bags of cement	
gals. of water	23	yds. of sand	
		gals. of water	

Other
Type Material Bentonite powder
Amount 5%

EXPLAIN METHOD OF EMPLACEMENT OF MATERIAL
The PVC casing and screen were pulled from the ground. The borehole was then drilled-out using hollow stem augers, and tremie grouted from the bottom of the hole to the ground surface.

I do hereby certify that this well abandonment record is true and exact.

Mark S. Preddy 8/4/01

Signature of Contractor or Agent Date
Mark S. Preddy, P.G.
Bunnell-Lammons Engineering, Inc.

NORTH CAROLINA LICENSED SEAL 1043 GEOLOGIST MARK S. PREDDY

Submit original to the Division of Environmental Management, one copy to the Driller, and one copy of the Owner.

Department of Natural Resources and Community Development
Division of Environmental Management

P. O. Box 27687, Raleigh, N. C., 27611

WELL ABANDONMENT
RECORD

CONTRACTOR Superior Drilling, Inc. - Raleigh, NC / Floyd Cox, CWD REG. NO. 1769

WELL LOCATION: (Show a sketch of the location on back of form.)

Nearest Town: Shelby County Cleveland

JMN/Cleveland Cont. ILF, Roseborough Rd. Quadrangle No. Blacksburg North, and Grover, NC-SC
(Road, Community, Subdivision, Lot No.) 7.5-min. USGS Quad.

OWNER: Republic Services of North Carolina, LLC

ADDRESS: 1220 Commerce Str, SW, Conover, NC 28613

TOPOGRAPHY: draw, **SLOPE**, hilltop, valley, flat

USE OF WELL: Monitoring DATE ABAND: 3/6/01

TOTAL DEPTH: 28.0-feet DIAMETER: 2-inch

CASING REMOVED:

feet	diameter
28	2"

SEALING MATERIAL:

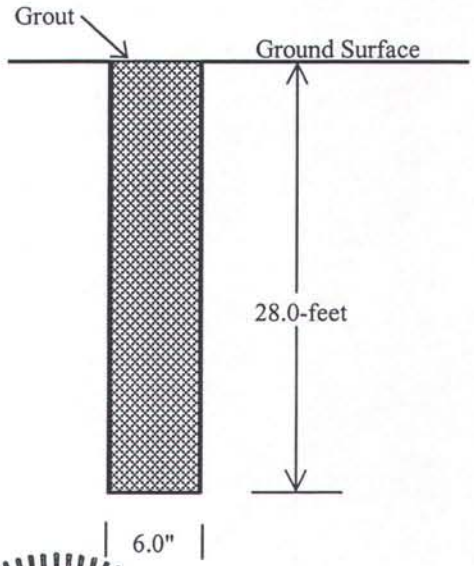
Neat Cement		Sand Cement	
bags of cement	2.4	bags of cement	
gals. of water	24	yds. of sand	
		gals. of water	

Other
Type Material Bentonite powder
Amount 5%

EXPLAIN METHOD OF EMPLACEMENT OF MATERIAL
The PVC casing and screen were pulled from the ground. The borehole was then drilled-out using hollow stem augers, and tremie grouted from the bottom of the hole to the ground surface.

WELL DIAGRAM: Draw a detailed sketch of the well showing total depth, depth and diameter of screens remaining in the well, gravel interval, intervals of casing perforations, and depths and types of fill materials.

MW-7



I do hereby certify that this well abandonment record is true and exact.

Mark S. Preddy 8/4/01

Signature of Contractor or Agent Date
Mark S. Preddy, P.G.
Bunnell-Lammons Engineering, Inc.

NORTH CAROLINA LICENSED SEAL 1043 GEOLOGIST MARK S. PREDDY

Submit original to the Division of Environmental Management, one copy to the Driller, and one copy of the Owner.

APPENDIX B

Drilling Procedures

APPENDIX B

Soil Boring Procedures

Soil Test Boring

Soil test borings were advanced by mechanically twisting a continuous flight steel hollow-stem auger into the soil. Soil sampling and penetration testing was performed in general accordance with ASTM D 1586. At regular intervals, soil samples were obtained with a standard 1.375-inch inside diameter (ID), 2-inch outside diameter (OD), stainless steel split-tube sampler. The sampler was first seated 6-inches to penetrate any loose cuttings, and then driven an additional 12 inches with blows of a 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler the final 12 inches was recorded and designated the penetration resistance.

Air Hammer Drilling

Borings drilled by air hammer were advanced through the unconsolidated and consolidated materials using a downhole air hammer with 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.

General

A North Carolina registered geologist examined the soil samples and cuttings and prepared soil test boring logs. The down-hole equipment was steam cleaned prior to drilling activities at each location.

APPENDIX C

Field Logs

TEST BORING REPORT

BORING NO. MW-1B

PROJECT: Cleveland Container LF - Shelby, NC
CLIENT: HHNT
CONTRACTOR: Superior Drilling, Inc.
EQUIPMENT USED: CME 550 ATV

BLE JOB NO. J01-1307-09
PAGE NO. 1 of 3
LOCATION:
ELEVATION:
DATE START: 3/8/01
DATE FINISH: 3/8/01
DRILLER: F. Cox
PREPARED BY: M. Reddy

GROUND WATER		DEPTH TO:		
DATE	HRS AFT COMP	WATER	BOT. OF CASING	BOT. OF HOLE
	TOB	50.5		
	24	50.0		

	CASING	SAMPLER	CORE BARREL
TYPE	HSA	SS	—
SIZE ID/OD	8¼OD	2"	—
HAMMER WT	XXX	140 lb	XXX
HAMMER FALL	XXX	30"	XXX

DEPTH IN FEET	CASING BLOWS PER FT	SAMPLER BLOWS PER 6"	SAMPLE NUMBER	USCS	FIELD CLASSIFICATION AND REMARKS
					no topsoil
	11	6 6 5	S-1	ML	stiff red-br + yel-br sli. moist mic slicly F. sdy SILT - residuum
5	28	7 11 17	S-2	ML	v. stiff as above
	27	9 12 15	S-3	ML	v. stiff as above
10	50/5"	7 20 50/5"	S-4	PWR	PWR SA yel-br sli moist mic si F SAND
15	38	9 18 20	S-5	SM	Dense br, gray, white sli moist mic si F-M SAND
20	35	9 17 18	S-6	SM	Dense dk red-br sli moist v. mic si F-M SAND

WELL: Grout; 2" PVC

BLOWS/FT	DENSITY	BLOWS/FT	CONSISTANCY	SAMPLE ID		WELL DESCRIPTION
0-4	VERY LOOSE	0-2	VERY SOFT	SS	SPLIT SPOON	STICKUP =
5-10	LOOSE	3-4	SOFT	HP	HYDROPUNCH	TOP SAND = 41.85
11-20	FIRM	5-8	FIRM	UD	UNDISTURBED TUBE	TOP BENT. = 36.6
21-30	VERY FIRM	9-15	STIFF	G	GRAB	SCREEN = 44 - 59.0
31-50	DENSE	16-30	VERY STIFF	C	COMPOSITE	SCREEN LENGTH = 15
51+	VERY DENSE	31-50	HARD	B	BAG	END CAP = 0.3
		51+	VERY HARD	NR	NO RECOVERY	WELL TD = 59.3

60.3
1.0
59.3

TEST BORING REPORT

BORING NO. MW-1B

Cleveland Container LF - Shelby, NC

J01-1307-09

DEPTH IN FEET	CASING BLOWS PER FT	SAMPLER BLOWS PER 6"	SAMPLE NUMBER	USCS	FIELD CLASSIFICATION AND REMARKS	WELL
25	18	5 8 10	S-7	SM	Firm yel-br sl: moist v. mic si F-M SAND	Grout
30	17	6 8 9	S-8	SM	Firm gray + lt. gray sl: moist mic si F-M SAND	Grout
35	17	5 7 10	S-9	SM	Firm dk br sl: moist v. mic si F-M SAND	2" PVC; Grout; 36.6
40	7	3 4 3	S-10	SM	loose lt. gray + yel-br sl: moist mic F-M SAND	Bentonite; 41.8
45	13	4 5 8	S-11	ML	stiff yel-br moist cly F. sdy SILT	Sand; 44.0

BLOWS/FT	DENSITY	BLOWS/FT	CONSISTANCY	SAMPLE ID		WELL MATERIALS
0-4	VERY LOOSE	0-2	VERY SOFT	SS	SPLIT SPOON	SAND =
5-10	LOOSE	3-4	SOFT	HP	HYDROPUNCH	
11-20	FIRM	5-8	FIRM	UD	UNDISTURBED TUBE	BENTONITE =
21-30	VERY FIRM	9-15	STIFF	G	GRAB	
31-50	DENSE	16-30	VERY STIFF	C	COMPOSITE	GROUT =
51+	VERY DENSE	31-50	HARD	B	BAG	WELL O.D. =
		51+	VERY HARD	NR	NO RECOVERY	WELL TYPE =

TEST BORING REPORT

BORING NO. MW-1B

Cleveland Container LF - Shelby, NC

J01-1307-09 PAGE 3 OF 3

DEPTH IN FEET	CASING BLOWS PER FT	SAMPLER BLOWS PER 6"	SAMPLE NUMBER	USCS	FIELD CLASSIFICATION AND REMARKS	WELL
50	15	6 6 9	S-12	SM	Firm as below	PVC
55	23	10 11 12	S-13	SM	v. Firm gray-br moist v. mic si F-M SAND	
60	50/2"	50/2	S-14	PWR	PWR SA gray + yel-br moist mic si F-M SAND	59.0 59.3
					AR = 59.3'	← 8.25" →
65			S-15			
70			S-16			

BLOWS/FT	DENSITY	BLOWS/FT	CONSISTANCY	SAMPLE ID		WELL MATERIALS
0-4	VERY LOOSE	0-2	VERY SOFT	SS	SPLIT SPOON	SAND = 8.5 bags
5-10	LOOSE	3-4	SOFT	HP	HYDROPUNCH	
11-20	FIRM	5-8	FIRM	UD	UNDISTURBED TUBE	BENTONITE = 2 bags
21-30	VERY FIRM	9-15	STIFF	G	GRAB	
31-50	DENSE	16-30	VERY STIFF	C	COMPOSITE	GROUT = yes
51+	VERY DENSE	31-50	HARD	B	BAG	WELL O.D. = 2"
		51+	VERY HARD	NR	NO RECOVERY	WELL TYPE = PVC

TEST BORING REPORT

BORING NO. MW-1C

PROJECT: Cleveland Container LF - Shelby, NC
CLIENT: HHNT
CONTRACTOR: AE Drilling
EQUIPMENT USED: CME 75 ATV

BLE JOB NO. J99-1307-04
PAGE NO. 1 of 2
LOCATION:
ELEVATION:
DATE START: 5/25/01
DATE FINISH: 5/25/01
DRILLER: Kevin
PREPARED BY: M. Preddy

GROUND WATER DATE	HRS AFT COMP	DEPTH TO: WATER	BOT. OF CASING	BOT. OF HOLE
		bgs		
	0	63.0		
	24	48.53		

	CASING	SAMPLER	AIR ROTARY HAMMER
TYPE	HSA	—	hammer
SIZE ID/OD	10¼"OD	—	6"OD
HAMMER WT	XXX	XXX	XXX
HAMMER FALL	XXX	XXX	XXX

DEPTH IN FEET	DRILL RATE FT/min	TIME	SAMPLE NUMBER	USCS	FIELD CLASSIFICATION AND REMARKS
				ML	Temporary Steel casing set to 7.0'
					See Boring log for MW-1B for soil lithology
10			R-1	ML	
			R-2	SM	
20			R-3	SM	
			R-4	SM	
30			R-5	SM	
			R-6	SM	
		946			
40	5.0		R-7	SM	

WELL: Grout; 2" PVC

BLOWS/FT	DENSITY	BLOWS/FT	CONSISTANCY	SAMPLE ID		WELL DESCRIPTION
0-4	VERY LOOSE	0-2	VERY SOFT	SS	SPLIT SPOON	STICKUP =
5-10	LOOSE	3-4	SOFT	HP	HYDROPUNCH	TOP SAND = 63.5
11-20	FIRM	5-8	FIRM	UD	UNDISTURBED TUBE	TOP BENT. = 58.0
21-30	VERY FIRM	9-15	STIFF	G	GRAB	SCREEN = 65.7-75.7
31-50	DENSE	16-30	VERY STIFF	C	COMPOSITE	SCREEN LENGTH = 10
51+	VERY DENSE	31-50	HARD	B	BAG	END CAP = 0.3
		51+	VERY HARD	NR	NO RECOVERY	WELL TD = 76.0

80.3
4.3
76.0

TEST BORING REPORT

BORING NO. MW-1C

Cleveland Container LF - Shelby, NC J99-1307-04 PAGE 2 OF 2

DEPTH IN FEET	DRILL RATE FT/min	TIME	SAMPLE NUMBER	USCS	FIELD CLASSIFICATION AND REMARKS	WELL
		947				Grout
		948				
	1.7		R-8	SM		
		951				
		954				
50	5.0		R-9	SM		2" PVC
		955				
		957				
	2.5		R-10	SM		
		959				
		1001				58.0
60	1.7		R-11 60			Bed
		1004		Gneiss	gray F-m grained Biotite-Feldspar-quartz GNEISS	
		1006	62.5 63	PWR	PWR SA Brown moist mic si F-m SAND	63.5
	1.7		R-12	Gneiss		
			65 66	PWR	Gray GNEISS / PWR SA Brown moist mic si F-m SAND	65.7
		1009				Sand
		1011		Gneiss	Gray GNEISS	
70	0.8		R-13 69	PWR	PWR SA brown moist mic si F-m SAND	
		1017	71 72	Gneiss	Gray GNEISS	
		1019	73	PWR	PWR SA Brown moist mic si F-m SAND	
	0.7		R-14	Gneiss	Gray GNEISS	
		1024	76			75.7 76.0
					Boring terminated at 76.0'	← 6" →
80						
90						

BLOWS/FT	DENSITY	BLOWS/FT	CONSISTANCY	SAMPLE ID		WELL MATERIALS
0-4	VERY LOOSE	0-2	VERY SOFT	SS	SPLIT SPOON	SAND = 4 bags DSI
5-10	LOOSE	3-4	SOFT	HP	HYDROPUNCH	
11-20	FIRM	5-8	FIRM	UD	UNDISTURBED TUBE	BENTONITE = 1 bag DSI Shur Plug 3/8"
21-30	VERY FIRM	9-15	STIFF	G	GRAB	
31-50	DENSE	16-30	VERY STIFF	C	COMPOSITE	GROUT = yes
51+	VERY DENSE	31-50	HARD	B	BAG	WELL O.D. = 2"
		51+	VERY HARD	NR	NO RECOVERY	WELL TYPE = PVC

TEST BORING REPORT

BORING NO. MW-6A

PROJECT: Cleveland Container LF - Shelby, NC
CLIENT: HHNT
CONTRACTOR: Superior Drilling, Inc.
EQUIPMENT USED: CME 550 ATV

BLE JOB NO. J01-1307-09
PAGE NO. 1 of 1
LOCATION:
ELEVATION:
DATE START: 3/6/01
DATE FINISH: 3/6/01
DRILLER: E. Cox
PREPARED BY: M. Pieddy

GROUND WATER DATE	HRS AFT COMP	DEPTH TO: WATER	BOT. OF CASING	BOT. OF HOLE

	CASING	SAMPLER	CORE BARREL
TYPE	HSA	SS	—
SIZE ID/OD	8 1/4" OD	2" OD	—
HAMMER WT	XXX	140 lb	XXX
HAMMER FALL	XXX	30"	XXX

DEPTH IN FEET	CASING BLOWS PER FT	SAMPLER BLOWS PER 6"	SAMPLE NUMBER	USCS	FIELD CLASSIFICATION AND REMARKS	WELL
					no topsoil	
	41	8 20 21	S-1	SM	Dense dk gray + lt. gray dry mic si F-M SAND-residuum	
5	7	6 3 4	S-2	SM	loose dk gray + brown sli moist v. mic si F-M SAND	
	7	3 3 4	S-3	SM	as above	
10	6	2 3 3	S-4	SM	as above	
15	28	7 15 13	S-5	SM	v. Firm dk gray + lt gray sli moist mic si F-M SAND	
20	50/3"	50/3" —	S-6	PWR	PWR SA dk gray + br sli moist mic si F-M SAND	

Auger refusal 20.0'

BLOWS/FT	DENSITY	BLOWS/FT	CONSISTANCY	SAMPLE ID		WELL DESCRIPTION
0-4	VERY LOOSE	0-2	VERY SOFT	SS	SPLIT SPOON	STICKUP =
5-10	LOOSE	3-4	SOFT	HP	HYDROPUNCH	TOP SAND =
11-20	FIRM	5-8	FIRM	UD	UNDISTURBED TUBE	TOP BENT. =
21-30	VERY FIRM	9-15	STIFF	G	GRAB	SCREEN =
31-50	DENSE	16-30	VERY STIFF	C	COMPOSITE	SCREEN LENGTH =
51+	VERY DENSE	31-50	HARD	B	BAG	END CAP =
		51+	VERY HARD	NR	NO RECOVERY	WELL TD =

TEST BORING REPORT

BORING NO. MW-6A

PROJECT:	Cleveland Container LF - Shelby, NC
CLIENT:	HHNT
CONTRACTOR:	AE Drilling
EQUIPMENT USED:	CME 75 ATV

BLE JOB NO.	J99-1307-04
PAGE NO.	1 of 1
LOCATION:	
ELEVATION:	
DATE START:	5/24/01
DATE FINISH:	5/24/01
DRILLER:	Kevin
PREPARED BY:	M. Preddy

GROUND WATER DATE	HRS AFT COMP	DEPTH TO: WATER bgs	BOT. OF CASING	BOT. OF HOLE
	0	27.0		
	24	25.15		

	CASING	SAMPLER	AIR ROTARY HAMMER
TYPE	HSA	—	hammer
SIZE ID/OD	10¼OD	—	6"OD
HAMMER WT	XXX	XXX	XXX
HAMMER FALL	XXX	XXX	XXX

DEPTH IN FEET	DRILL RATE Ft/min	TIME	SAMPLE NUMBER	USCS	FIELD CLASSIFICATION AND REMARKS
					Temporary steel casing set to 7.0'
		220			See SPT boring for lithology 0'-20'
10	2.5		R-1	SM	
		222			
		225			
	5		R-2	SM	
		226			
		228			
20	1.7		R-3	SM	
		231			Gray F-M grained biotite, feldspar, quartz GNEISS; dry
		233			
	1.25		R-4	Gneiss	
		237			
		239		PWR	PWR SA brown moist mic si F-M SAND
30	1.0		R-5	Gneiss	Gray GNEISS
				PWR	PWR SA brown wet mic si F-M SAND
		244			Gray F-M grained biotite, feldspar, quartz GNEISS
		255			
	0.6		R-6	Gneiss	
		304			
					Boring terminated at 37.3'
40					

WELL: Grout; Bent; Sand; 6"

17.0 — 20.0 — 22.0 — 37.0 — 37.3

BLOWS/FT	DENSITY	BLOWS/FT	CONSISTANCY	SAMPLE ID		WELL DESCRIPTION
0-4	VERY LOOSE	0-2	VERY SOFT	SS	SPLIT SPOON	STICKUP =
5-10	LOOSE	3-4	SOFT	HP	HYDROPUNCH	TOP SAND = 20.0
11-20	FIRM	5-8	FIRM	UD	UNDISTURBED TUBE	TOP BENT. = 17.0
21-30	VERY FIRM	9-15	STIFF	G	GRAB	SCREEN = 22.0 - 37.0
31-50	DENSE	16-30	VERY STIFF	C	COMPOSITE	SCREEN LENGTH = 15
51+	VERY DENSE	31-50	HARD	B	BAG	END CAP = 0.3
		51+	VERY HARD	NR	NO RECOVERY	WELL TD = 37.3

1 bag DSI Shur Plug 3/8" chips
4 bags DSI Sand

45.3
8.0
37.3

TEST BORING REPORT

BORING NO. MW-7A

PROJECT:	Cleveland Container LF - Shelby, NC
CLIENT:	HHNT
CONTRACTOR:	Superior Drilling, Inc.
EQUIPMENT USED:	CME 550 ATV

BLE JOB NO.	J01-1307-09
PAGE NO.	1 of 2
LOCATION:	
ELEVATION:	
DATE START:	3/7/01
DATE FINISH:	3/7/01
DRILLER:	F. Cox
PREPARED BY:	M. Pieddy

GROUND WATER		DEPTH TO:		
DATE	HRS AFT COMP	WATER	BOT. OF CASING	BOT. OF HOLE
	0	26'		
	24	28.5		

	CASING	SAMPLER	CORE BARREL
TYPE	HSA	SS	—
SIZE ID/OD	8 1/4" OD	2" OD	—
HAMMER WT	XXX	140 lb	XXX
HAMMER FALL	XXX	30"	XXX

DEPTH IN FEET	CASING BLOWS PER FT	SAMPLER BLOWS PER 6"	SAMPLE NUMBER	USCS	FIELD CLASSIFICATION AND REMARKS
					No topsoil
	6	2 2 4	S-1	CL	Firm red-br moist mic Fandy si CLAY-residuum
5	8	3 4 4	S-2	ML	Firm br sli moist mic F. sdy SILT
	10	4 5 5	S-3	SM	loose br sli moist v. mic si F-M SAND
10	8	4 4 4	S-4	SM	loose as above
15	11	6 5 6	S-5	SM	Firm as above
20	13	6 7 6	S-6	SM	Firm as above

WELL

Grout

2" PVC

16.3

Bent.

BLOWS/FT	DENSITY	BLOWS/FT	CONSISTANCY	SAMPLE ID		WELL DESCRIPTION
0-4	VERY LOOSE	0-2	VERY SOFT	SS	SPLIT SPOON	STICKUP =
5-10	LOOSE	3-4	SOFT	HP	HYDROPUNCH	TOP SAND = 20.4
11-20	FIRM	5-8	FIRM	UD	UNDISTURBED TUBE	TOP BENT. = 16.3
21-30	VERY FIRM	9-15	STIFF	G	GRAB	SCREEN = 22.6 – 37.6
31-50	DENSE	16-30	VERY STIFF	C	COMPOSITE	SCREEN LENGTH = 15
51+	VERY DENSE	31-50	HARD	B	BAG	END CAP = 0.3
		51+	VERY HARD	NR	NO RECOVERY	WELL TD = 37.9

40.3
2.4

TEST BORING REPORT

Cleveland Container LF - Shelby, NC

J01-1307-09

BORING NO. MW-7A

PAGE 2 OF 2

DEPTH IN FEET	CASING BLOWS PER FT	SAMPLER BLOWS PER 6"	SAMPLE NUMBER	USCS	FIELD CLASSIFICATION AND REMARKS	WELL
						20.4
						22.6
25	15	5 7 8	S-7	SM	Firm br moist v. mic si F-m SAND	
30	15	7 8 7	S-8	SM	Firm br wet v. mic. si F-m SAND	
35	19	7 8 11	S-9	SM	Firm as above	37.6 37.9
40			S-10		Boring terminated at 37.9'	← 8¼" →
45			S-11			

BLOWS/FT	DENSITY	BLOWS/FT	CONSISTANCY	SAMPLE ID		WELL MATERIALS
0-4	VERY LOOSE	0-2	VERY SOFT	SS	SPLIT SPOON	SAND = 7 bags
5-10	LOOSE	3-4	SOFT	HP	HYDROPUNCH	
11-20	FIRM	5-8	FIRM	UD	UNDISTURBED TUBE	BENTONITE = 1 bag
21-30	VERY FIRM	9-15	STIFF	G	GRAB	hole plug
31-50	DENSE	16-30	VERY STIFF	C	COMPOSITE	GROUT = yes
51+	VERY DENSE	31-50	HARD	B	BAG	WELL O.D. = 2"
		51+	VERY HARD	NR	NO RECOVERY	WELL TYPE = PVC

APPENDIX D

Soil Test Boring Logs and Monitoring Well Installation Records

KEY TO SOIL CLASSIFICATIONS AND CONSISTENCY DESCRIPTIONS

BUNNELL-LAMMONS ENGINEERING, INC.
GREENVILLE, SOUTH CAROLINA

Penetration Resistance* Blows per Foot	Relative Density
SANDS	
0 to 4	Very Loose
5 to 10	Loose
11 to 20	Firm
21 to 30	Very Firm
31 to 50	Dense
over 50	Very Dense

Penetration Resistance* Blows per Foot	Consistency
SILTS and CLAYS	
0 to 2	Very Soft
3 to 4	Soft
5 to 8	Firm
9 to 15	Stiff
16 to 30	Very Stiff
31 to 50	Hard
over 50	Very Hard

*ASTM D 1586

Particle Size Identification

Boulder: Greater than 300 mm
Cobble: 75 to 300 mm
Gravel:
Coarse - 19 to 75 mm
Fine - 4.75 to 19 mm
Sand:
Coarse - 2 to 4.75 mm
Medium - 0.425 to 2 mm
Fine - 0.075 to 0.425 mm
Silt & Clay: Less than 0.075 mm

KEY TO DRILLING SYMBOLS

Split Spoon Sample

Air-hammer drilling run

Groundwater Table at Time of Drilling

Groundwater Table 24 Hours after Completion of Drilling

KEY TO SOIL CLASSIFICATIONS

Gneiss

Silty Sand

Sandy Silt

Silty Clay

Partially Weathered Rock

BLE INC.

BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

GROUND WATER MONITORING WELL NO. MW-1B

PROJECT: Cleveland Container Landfill — PROJECT NO.: J01-1307-09

CLIENT: HHNT — DATE START: 3-8-01 END: 3-8-01

LOCATION: Shelby, North Carolina — ELEVATION: 780.35

DRILLER: Superior Drilling, Inc., F. Cox — LOGGED BY: MSP

DRILLING METHOD: Hollow stem auger

DEPTH TO - WATER> INITIAL: 50.5 AFTER 24 HOURS: 50.0 CAVING>

ELEVATION/ DEPTH (FT)	DESCRIPTION	SOIL TYPE	SAMPLES	STANDARD PENETRATION RESULTS BLOWS/FOOT (2 5 10 20 30 40 50 70 90)
780	No topsoil			
2	Stiff to very stiff, reddish-brown and yellowish-brown, slightly moist, micaceous, slightly clayey, fine sandy SILT - (residuum)			11
4				28
775 6				27
8				
770 10	PARTIALLY WEATHERED ROCK which sampled as yellowish-brown, slightly moist, micaceous, silty, fine SAND			50/5"
12				
14	Dense, brown, gray and white, slightly moist, micaceous, silty, fine to medium SAND			38
765 16				
18	Dense to firm, dark reddish-brown and yellowish-brown, slightly moist, very micaceous, silty, fine to medium SAND			35
760 20				
22				
24				18
755 26				
28	Firm, gray and light gray, slightly moist, micaceous, silty, fine to medium SAND			17
750 30				
32	Firm, dark brown, slightly moist, very micaceous, silty, fine to medium SAND			17
34				
745 36				
38	Loose, light gray and yellowish-brown, slightly moist, micaceous, fine to medium SAND			7
740 40				
42	Stiff, yellowish-brown, moist, clayey, fine sandy SILT			13
44				
735 46				
48	Firm to very firm, grayish-brown, moist, very micaceous, silty, fine to			15

MONITOR WELL INSTALLATION DETAILS

SURFACE COMPLETION
stick-up

Northing = 536,869.32'
Easting = 1,252,622.31'
Top of PVC elev. = 783.13'
Ground elev. = 780.35'

Neat cement, 0 to 36.6 feet

Bentonite seal, 36.6 to 41.8 feet

Filter pack, sand 41.8 to 59.3 feet

GEOT_WELL 1307 7/5/01

BLE INC.

BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

GROUND WATER MONITORING WELL NO. MW-1B

PROJECT: Cleveland Container Landfill — PROJECT NO.: J01-1307-09

CLIENT: HHNT — DATE START: 3-8-01 END: 3-8-01

LOCATION: Shelby, North Carolina — ELEVATION: 780.35

DRILLER: Superior Drilling, Inc., F. Cox — LOGGED BY: MSP

DRILLING METHOD: Hollow stem auger

DEPTH TO - WATER> INITIAL: 50.5 AFTER 24 HOURS: 50.0 CAVING>

ELEVATION/ DEPTH (FT)	DESCRIPTION	SOIL TYPE	SAMPLES	STANDARD PENETRATION RESULTS BLOWS/FOOT (2 5 10 20 30 40 50 70 90)	MONITOR WELL INSTALLATION DETAILS
730	medium SAND				.010-inch slotted Schedule 40 PVC well screen, 44 to 59 feet
52					
54			23		
725 56					
58	PARTIALLY WEATHERED ROCK which sampled as gray and yellowish-brown, moist, micaceous, silty, fine to medium SAND		50/2"	50/2"	Pipe cap
720 60					Total well depth, 59.3 feet
62	Auger refusal at 59.3 feet. Ground water encountered at 50.5 feet at time of drilling and at 50.0 feet after 24 hours.				Borehole diameter, 8.25-inches
64					
715 66					Well diameter, 2.0-inches
68					
710 70					
72					
74					
705 76					
78					
700 80					
82					
84					
695 86					
88					
690 90					
92					
94					
685 96					
98					

BLE INC.

BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

GROUND WATER MONITORING WELL NO. MW-1C

PROJECT: Cleveland Container Landfill — PROJECT NO.: J01-1307-09

CLIENT: HHNT — DATE START: 5-25-01 END: 5-25-01

LOCATION: Shelby, North Carolina — ELEVATION: 777.98

DRILLER: A E Drilling, Inc., Kevin — LOGGED BY: MSP

DRILLING METHOD: Air hammer

DEPTH TO - WATER> INITIAL: ▽ 63.0 AFTER 24 HOURS: ▼ 48.53 CAVING>

ELEVATION/ DEPTH (FT)	DESCRIPTION	SOIL TYPE / SAMPLES	STANDARD PENETRATION RESULTS BLOWS/FOOT (2 5 10 20 30 40 50 70 90)
775 / 2, 4, 6, 770 / 8	Temporary steel casing set to 7 feet No topsoil Stiff to very stiff, reddish-brown and yellowish-brown, slightly moist, micaceous, slightly clayey, fine sandy SILT - (residuum)		
10, 12, 765	PARTIALLY WEATHERED ROCK which sampled as yellowish-brown, slightly moist, micaceous, silty, fine SAND		R-1
14, 16, 760 / 18	Dense, brown, gray and white, slightly moist, micaceous, silty, fine to medium SAND		R-2
20, 22, 755, 24, 26	Dense to firm, dark reddish-brown and yellowish-brown, slightly moist, very micaceous, silty, fine to medium SAND		R-3, R-4
750 / 28, 30	Firm, gray and light gray, slightly moist, micaceous, silty, fine to medium SAND		R-5
32, 745, 34, 36	Firm, dark brown, slightly moist, very micaceous, silty, fine to medium SAND		R-6
740 / 38, 40	Loose, light gray and yellowish-brown, slightly moist, micaceous, fine to medium SAND		R-7
42, 735, 44, 46	Stiff, yellowish-brown, moist, clayey, fine sandy SILT		R-8
730 / 48 ▼	Firm to very firm, grayish-brown, moist, very micaceous, silty, fine to		

MONITOR WELL INSTALLATION DETAILS

SURFACE COMPLETION
stick-up

Northing = 536,866.10
Easting = 1,252,606.53'
Top of PVC elev. = 780.61'
Ground elev. = 777.98'

Neat cement, 0 to 58 feet

BLE INC.

BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

GROUND WATER MONITORING WELL NO. MW-1C

PROJECT: Cleveland Container Landfill — PROJECT NO.: J01-1307-09

CLIENT: HHNT — DATE START: 5-25-01 END: 5-25-01

LOCATION: Shelby, North Carolina — ELEVATION: 777.98

DRILLER: A E Drilling, Inc., Kevin — LOGGED BY: MSP

DRILLING METHOD: Air hammer

DEPTH TO - WATER> INITIAL: ▽ 63.0 AFTER 24 HOURS: ▼ 48.53 CAVING>

ELEVATION/ DEPTH (FT)	DESCRIPTION	SOIL TYPE	SAMPLES	STANDARD PENETRATION RESULTS BLOWS/FOOT (2 5 10 20 30 40 50 70 90)	MONITOR WELL INSTALLATION DETAILS
52, 54, 56	medium SAND		R-9, R-10		
58, 60	PARTIALLY WEATHERED ROCK which sampled as gray and yellowish-brown, moist, micaceous, silty, fine to medium SAND		R-11		Bentonite seal, 58 to 63.5 feet
62, 64	Gray, fine to medium grained biotite-feldspar-quartz GNEISS		R-12		
66, 68	PARTIALLY WEATHERED ROCK which sampled as brown, moist, micaceous, silty, fine to medium SAND				Filter pack, sand 63.5 to 76 feet
70	Gray GNEISS		R-13		
72, 74	PARTIALLY WEATHERED ROCK which sampled as brown, moist, micaceous, silty, fine to medium SAND				.010-inch slotted Schedule 40 PVC well screen, 65.7 to 75.7 feet
74	Gray GNEISS		R-14		
76, 78	PARTIALLY WEATHERED ROCK which sampled as brown, moist, micaceous, silty, fine to medium SAND				Pipe cap
78	Gray GNEISS				Total well depth, 76 feet
80, 82	PARTIALLY WEATHERED ROCK which sampled as brown, moist, micaceous, silty, fine to medium SAND				Borehole diameter, 6-inches
84	Gray GNEISS				Well diameter, 2.0-inches
86, 88, 90, 92, 94, 96, 98	Boring terminated at 76 feet. Ground water encountered at 63 feet at time of drilling. Soil descriptions from 0 to 57 feet are from MW-1B.				

Elevation scale: 725, 720, 715, 710, 705, 700, 695, 690, 685, 680

GEOT_WELL 1307-0 7/5/01

BLE INC.

BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

GROUND WATER MONITORING WELL NO. MW-6A

PROJECT: Cleveland Container Landfill — PROJECT NO.: J01-1307-09

CLIENT: HHNT — DATE START: 5-24-01 END: 5-24-01

LOCATION: Shelby, North Carolina — ELEVATION: 634.58

DRILLER: A E Drilling, Inc., Kevin — LOGGED BY: MSP

DRILLING METHOD: Air hammer

DEPTH TO - WATER> INITIAL: 27.0 AFTER 24 HOURS: 25.15 CAVING>

ELEVATION/ DEPTH (FT)	DESCRIPTION
2	Temporary steel casing set to 7 feet
	No topsoil
4	Dense, dark gray and light gray, dry, micaceous, silty, fine to medium SAND - (residuum)
630 / 6	
8	Loose, dark gray and brown, slightly moist, very micaceous, silty, fine to medium SAND
625 / 10	
12	Very firm, dark gray and light gray, slightly moist, micaceous, silty, fine to medium SAND
14 / 620	
16	
18	PARTIALLY WEATHERED ROCK which sampled as dark gray and brown, slightly moist, micaceous, silty, fine to medium SAND
615 / 20	
22	Gray, fine to medium grained biotite, feldspar, quartz GNEISS; dry
24 / 610	
26	
28	PARTIALLY WEATHERED ROCK which sampled as brown, moist, micaceous, silty, fine to medium SAND
605 / 30	
	Gray GNEISS
32	PARTIALLY WEATHERED ROCK which sampled as brown, wet, micaceous, silty, fine to medium SAND
34 / 600	
36	Gray, fine to medium grained biotite, feldspar, quartz GNEISS
38	Boring terminated at 37.3 feet. Ground water encountered at 27.0 feet at time of drilling and at 25.25 feet after 24 hours.
595 / 40	
42	
44 / 590	
46	
48 / 585	

SOIL TYPE / SAMPLES

STANDARD PENETRATION RESULTS BLOWS/FOOT (2 5 10 20 30 40 50 70 90)

41, 7, 7, 6, 28, 50/3", R-3, R-4, R-5, R-6

MONITOR WELL INSTALLATION DETAILS

SURFACE COMPLETION
stick-up

Northing = 534,710.93'
Easting = 1,253,114.90'
Top of PVC elev. = 637.16'
Ground elev. = 634.58'

Neat cement, 0 to 17 feet

Bentonite seal, 17 to 20 feet

Filter pack, sand 20 to 37.3 feet

.010-inch slotted Schedule 40 PVC well screen, 22 to 37 feet

Pipe cap

Total well depth, 37.3 feet
Borehole diameter, 6-inches
Well diameter, 2.0-inches

GEOT_WELL 1307-7/5/01

BLE INC.

BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

GROUND WATER MONITORING WELL NO. MW-7A

PROJECT: Cleveland Container Landfill — PROJECT NO.: J01-1307-09

CLIENT: HHNT — DATE START: 3-7-01 END: 3-7-01

LOCATION: Shelby, North Carolina — ELEVATION: 656.06

DRILLER: Superior Drilling, Inc., F. Cox — LOGGED BY: MSP

DRILLING METHOD: Hollow stem auger

DEPTH TO - WATER> INITIAL: 26 AFTER 24 HOURS: 28.5 CAVING>

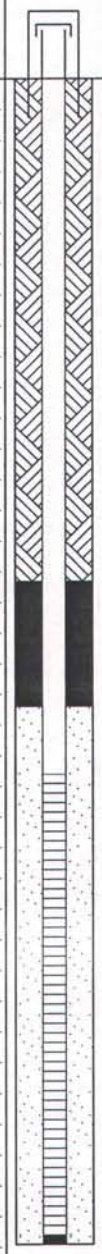
ELEVATION/ DEPTH (FT)	DESCRIPTION
655 / 2	No topsoil
4	Firm, reddish-brown, moist, micaceous, fine sandy, silty CLAY - (residuum)
650 / 6	Firm, brown, slightly moist, micaceous, fine sandy SILT
8	Loose to firm, brown, slightly moist, very micaceous, silty, fine to medium SAND
10	
645 / 12	
14	
640 / 16	
18	
20	
635 / 22	
24	Firm, brown, moist, very micaceous, silty, fine to medium SAND
630 / 26	
28	Firm, brown, wet, very micaceous, silty, fine to medium SAND
30	
625 / 32	
34	
620 / 36	
38	Boring terminated at 37.9 feet. Ground water encountered at 26.0 feet at time of drilling and at 28.5 feet after 24 hours.
40	
615 / 42	
44	
610 / 46	
48	

SOIL TYPE / SAMPLES

STANDARD PENETRATION RESULTS BLOWS/FOOT (2 5 10 20 30 40 50 70 90)

6, 8, 10, 8, 11, 13, 15, 15, 19

MONITOR WELL INSTALLATION DETAILS



SURFACE COMPLETION
stick-up

Northing = 534,873.11'
Easting = 1,252,609.96'
Top of PVC elev. = 658.76'
Ground elev. = 656.06'

Neat cement, 0 to 16.3 feet

Bentonite seal, 16.3 to 20.4 feet

Filter pack, sand 20.4 to 37.9 feet

.010-inch slotted Schedule 40 PVC well screen, 22.6 to 37.6 feet

Pipe cap

Total well depth, 37.9 feet

Borehole diameter, 8.25-inches

Well diameter, 2.0-inches

GEOT_WELL 1307-0 7/13/01

APPENDIX E

Soils Laboratory Test Procedures and Results

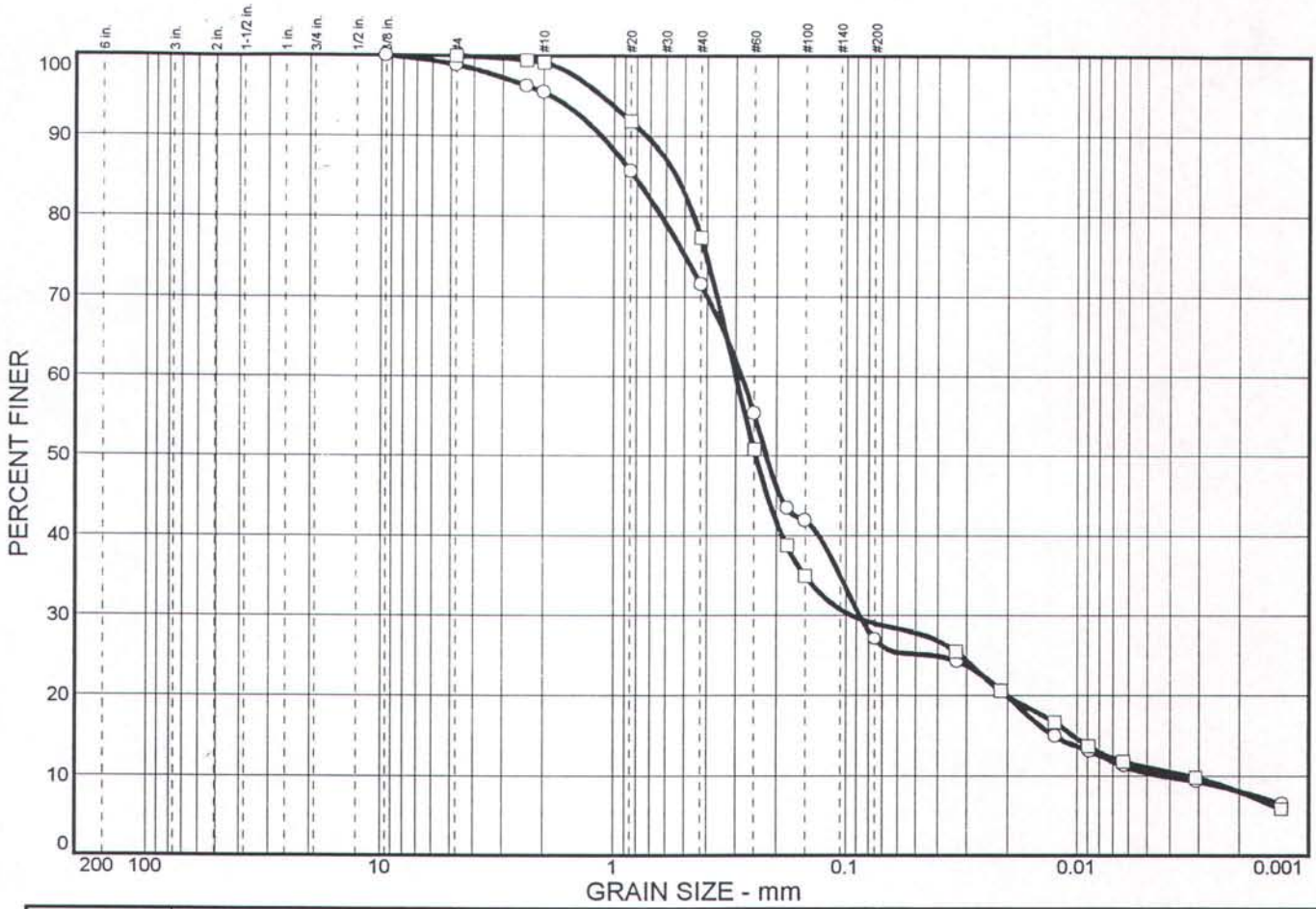
APPENDIX E

Soils Laboratory Test Procedures and Results

Particle Size Distribution

The distribution of soils coarser than the No. 200 (75-um) sieve is determined by passing a representative specimen through a standard set of nested sieves. The weight of material retained on each sieve is determined and the percentage retained (or passing) is calculated. A specimen may be washed through only the No. 200 sieve, if the full range of particle sizes is not required. The percentage of material passing the No. 200 sieve is reported. The distribution of materials finer than No. 200 sieve is determined by use of the Hydrometer. The particle sizes and distribution are computed from the time rate of settlement of the different size particles while suspended in water. These tests are performed in accordance with ASTM D 421, D 422, and D 1140.

Particle Size Distribution Report



	% COBBLES	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○	0.0	0.0	1.1	3.4	24.0	44.4	16.8	10.3
□	0.0	0.0	0.0	0.8	21.8	48.4	18.0	11.0

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	DESCRIPTION	USCS
○	Well	MW-1B	53.5-55.0	Dark grey silty fi-med. SAND	SM
□	Well	MW-7A	28.5-30.0	Dark grey silty fi.-med. SAND	SM

Particle Size Distribution Report

BUNNELL-LAMMONS ENGINEERING, INC.

Client: Hodges, Harbin, Newberry & Tribble Inc.

Project: Cleveland Container Landfill

Project No.: J01-1307-09

Plate

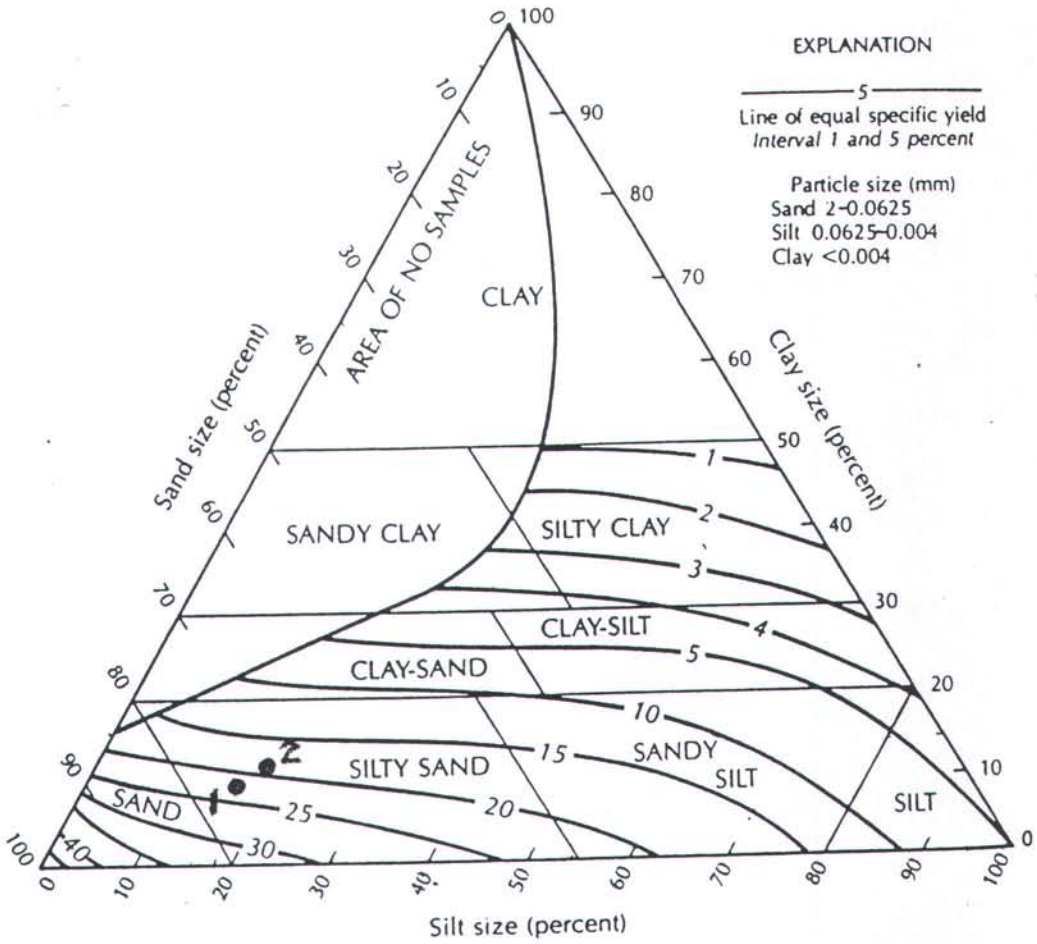


FIGURE 4.11 Textural classification triangle for unconsolidated materials showing the relation between particle size and specific yield. Source: A.I. Johnson, U.S. Geological Survey Water-Supply Paper 1662-D, 1967.

1 = MW-1B (53.5-55.0)
2 = MW-7A (28.5-30.0)

JMN/ Cleveland Container Landfill
Cleveland Co., NC
J01-1307-09

APPENDIX F

Monitoring Well Installation Procedures

Type II ground-water monitoring wells consisted of 2-inch polyvinyl chloride (PVC) Schedule 40 casing with flush-threaded joints installed in a 8.25-inch nominal diameter augered borehole or a 6-inch nominal diameter air-hammered borehole. The bottom 10 to 15-foot section of each well was a manufactured well screen with 0.01-inch wide machined slots. Washed sand backfill was placed around the outside of the pipe to at least 2 feet above the top of the well screen. The sand backfill is used to stabilize the formation and to help yield a less turbid ground-water sample. A bentonite seal was installed on top of the sand backfill to seal the monitoring well at the desired level. The boreholes were grouted with a cement/bentonite grout to the ground surface. A PVC cap and a lockable 4-inch protective steel cover were placed over each well. A sloped concrete pad was put at the base of each well. Monitoring well construction records are attached in Appendix D.

APPENDIX G

Slug Test Procedures and Results

APPENDIX G

Slug Test Procedures and Results

Slug tests were performed in the field on the wells to estimate the average hydraulic conductivity of the water table aquifer. Hydraulic conductivity is a constant of proportionality relating to the ease with which a fluid passes through a porous medium. These data were used to estimate the ground-water flow velocities of ground-water beneath the site. The field procedure was as follows:

- Measure the static ground-water elevation in the well to be tested;
- Affect an instantaneous change to the static water level in the well by removing a known volume of water; and
- Measure the rate at which the water level recovers to its original level.

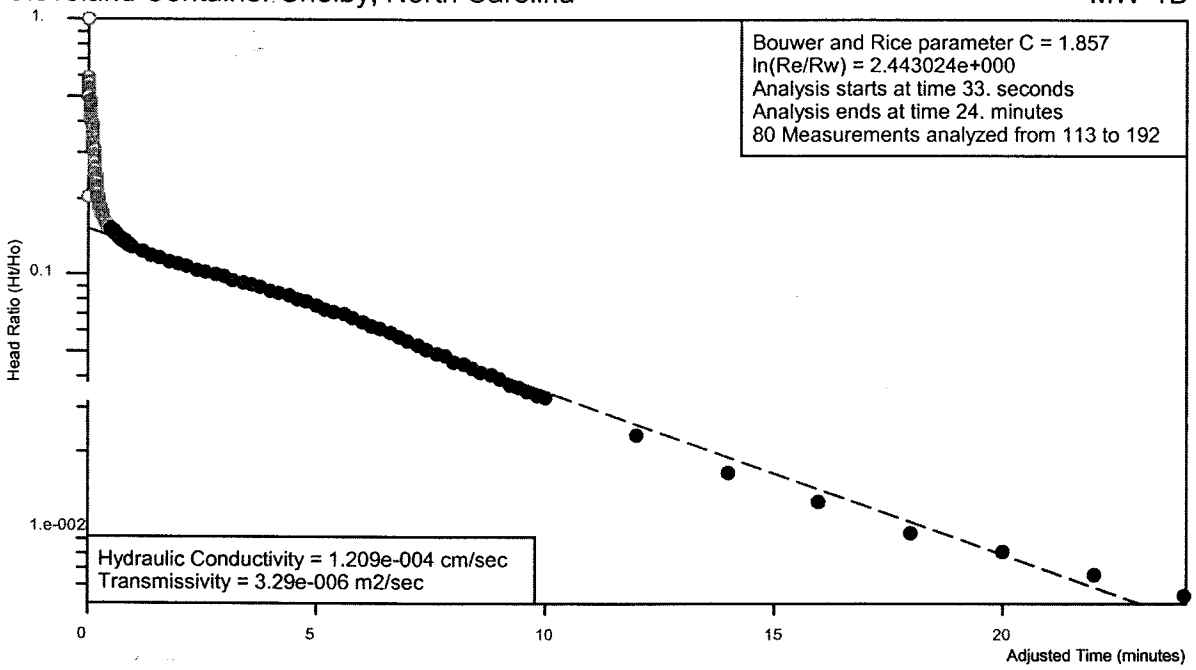
The resulting slug test data (time versus water level) was reduced and hydraulic conductivity values were calculated using the Bouwer and Rice Method for partially penetrating wells in unconfined aquifers or the Cooper, et al. Method for wells in confined aquifers.

MW-1B Rising Head Slug Data: 3/27/01

Bouwer and Rice Graph

Cleveland Container Shelby, North Carolina

MW-1B



Ho is 6.229 feet at 0.6 seconds

Project Number J01-1307-09 for HHNT

Analysis by Bunnell-Lammons Engineering, Inc.

MW-1B Rising Head Slug Data:

Site Name:	Cleveland Container
Location:	Shelby, North Carolina
Test Date:	3/27/01
Client:	HHNT
Project Number:	J01-1307-09
Import File:	C:\Public\Projects\Cleveland Container\Revised Data\MW-1B.txt

Well Label:	MW-1B
Aquifer Thickness:	8.93 feet
Screen Length:	8.93 feet
Casing Radius:	8.33e-002 feet
Effective Radius:	0.344 feet
Static Water Level:	0. feet
Water Table to Screen Bottom:	8.93 feet
Anisotropy Ratio:	1.
Time Adjustment:	0.6 Seconds

Test starts with trial 2
There are 192 time and drawdown measurements
Maximum head is 6.229 feet
Minimum head is 0. feet

Trial	Time (minutes)	Adjusted Time (minutes)	Drawdown (feet)	Head (feet)	Head Ratio
1	3.3e-003	-6.7e-003	1.497	1.497	0.2403
2	6.6e-003	-3.4e-003	1.852	1.852	0.2973
3	1.e-002	0.	6.229	6.229	1.
4	1.33e-002	3.3e-003	1.266	1.266	0.2032
5	1.66e-002	6.6e-003	3.594	3.594	0.577
6	2.e-002	1.e-002	3.673	3.673	0.5897
7	2.33e-002	1.33e-002	3.562	3.562	0.5718
8	2.66e-002	1.66e-002	3.486	3.486	0.5596
9	3.e-002	2.e-002	3.473	3.473	0.5576
10	3.33e-002	2.33e-002	3.381	3.381	0.5428
11	3.66e-002	2.66e-002	3.331	3.331	0.5348
12	4.e-002	3.e-002	3.28	3.28	0.5266
13	4.33e-002	3.33e-002	3.245	3.245	0.521
14	4.66e-002	3.66e-002	3.197	3.197	0.5132
15	5.e-002	4.e-002	3.166	3.166	0.5083
16	5.33e-002	4.33e-002	3.099	3.099	0.4975
17	5.66e-002	4.66e-002	3.033	3.033	0.4869
18	6.e-002	5.e-002	3.007	3.007	0.4827
19	6.33e-002	5.33e-002	2.966	2.966	0.4762
20	6.66e-002	5.66e-002	2.912	2.912	0.4675
21	7.e-002	6.e-002	2.89	2.89	0.464
22	7.33e-002	6.33e-002	2.845	2.845	0.4567
23	7.66e-002	6.66e-002	2.795	2.795	0.4487
24	8.e-002	7.e-002	2.731	2.731	0.4384
25	8.33e-002	7.33e-002	2.699	2.699	0.4333
26	8.66e-002	7.66e-002	2.661	2.661	0.4272
27	9.e-002	8.e-002	2.611	2.611	0.4192
28	9.33e-002	8.33e-002	2.588	2.588	0.4155
29	9.66e-002	8.66e-002	2.538	2.538	0.4074
30	0.1	9.e-002	2.493	2.493	0.4002
31	0.1033	9.33e-002	2.439	2.439	0.3916
32	0.1066	9.66e-002	2.411	2.411	0.3871
33	0.11	0.1	2.366	2.366	0.3798

34	0.1133	0.1033	2.322	2.322	0.3728
35	0.1166	0.1066	2.293	2.293	0.3681
36	0.12	0.11	2.246	2.246	0.3606
37	0.1233	0.1133	2.214	2.214	0.3554
38	0.1266	0.1166	2.173	2.173	0.3489
39	0.13	0.12	2.132	2.132	0.3423
40	0.1333	0.1233	2.09	2.09	0.3355
41	0.1366	0.1266	2.065	2.065	0.3315
42	0.14	0.13	2.03	2.03	0.3259
43	0.1433	0.1333	1.989	1.989	0.3193
44	0.1466	0.1366	1.948	1.948	0.3127
45	0.15	0.14	1.941	1.941	0.3116
46	0.1533	0.1433	1.894	1.894	0.3041
47	0.1566	0.1466	1.849	1.849	0.2968
48	0.16	0.15	1.799	1.799	0.2888
49	0.1633	0.1533	1.78	1.78	0.2858
50	0.1666	0.1566	1.754	1.754	0.2816
51	0.17	0.16	1.722	1.722	0.2764
52	0.1733	0.1633	1.707	1.707	0.274
53	0.1766	0.1666	1.691	1.691	0.2715
54	0.18	0.17	1.637	1.637	0.2628
55	0.1833	0.1733	1.596	1.596	0.2562
56	0.1866	0.1766	1.551	1.551	0.249
57	0.19	0.18	1.557	1.557	0.25
58	0.1933	0.1833	1.519	1.519	0.2439
59	0.1966	0.1866	1.491	1.491	0.2394
60	0.2	0.19	1.504	1.504	0.2415
61	0.2033	0.1933	1.469	1.469	0.2358
62	0.2066	0.1966	1.431	1.431	0.2297
63	0.21	0.2	1.38	1.38	0.2215
64	0.2133	0.2033	1.392	1.392	0.2235
65	0.2166	0.2066	1.373	1.373	0.2204
66	0.22	0.21	1.367	1.367	0.2195
67	0.2233	0.2133	1.348	1.348	0.2164
68	0.2266	0.2166	1.342	1.342	0.2154
69	0.23	0.22	1.304	1.304	0.2093
70	0.2333	0.2233	1.31	1.31	0.2103
71	0.2366	0.2266	1.266	1.266	0.2032
72	0.24	0.23	1.256	1.256	0.2016
73	0.2433	0.2333	1.262	1.262	0.2026
74	0.2466	0.2366	1.24	1.24	0.1991
75	0.25	0.24	1.237	1.237	0.1986
76	0.2533	0.2433	1.231	1.231	0.1976
77	0.2566	0.2466	1.228	1.228	0.1971
78	0.26	0.25	1.212	1.212	0.1946
79	0.2633	0.2533	1.196	1.196	0.192
80	0.2666	0.2566	1.174	1.174	0.1885
81	0.27	0.26	1.174	1.174	0.1885
82	0.2733	0.2633	1.161	1.161	0.1864
83	0.2766	0.2666	1.164	1.164	0.1869
84	0.28	0.27	1.142	1.142	0.1833
85	0.2833	0.2733	1.161	1.161	0.1864
86	0.2866	0.2766	1.148	1.148	0.1843
87	0.29	0.28	1.142	1.142	0.1833
88	0.2933	0.2833	1.132	1.132	0.1817
89	0.2966	0.2866	1.116	1.116	0.1792
90	0.3	0.29	1.107	1.107	0.1777

91	0.3033	0.2933	1.097	1.097	0.1761
92	0.3066	0.2966	1.104	1.104	0.1772
93	0.31	0.3	1.11	1.11	0.1782
94	0.3133	0.3033	1.094	1.094	0.1756
95	0.3166	0.3066	1.088	1.088	0.1747
96	0.32	0.31	1.085	1.085	0.1742
97	0.3233	0.3133	1.116	1.116	0.1792
98	0.3266	0.3166	1.107	1.107	0.1777
99	0.33	0.32	1.082	1.082	0.1737
100	0.3333	0.3233	1.066	1.066	0.1711
101	0.35	0.34	1.053	1.053	0.169
102	0.3666	0.3566	1.034	1.034	0.166
103	0.3833	0.3733	1.024	1.024	0.1644
104	0.4	0.39	1.012	1.012	0.1625
105	0.4166	0.4066	1.002	1.002	0.1609
106	0.4333	0.4233	0.993	0.993	0.1594
107	0.45	0.44	0.983	0.983	0.1578
108	0.4666	0.4566	0.974	0.974	0.1564
109	0.4833	0.4733	0.967	0.967	0.1552
110	0.5	0.49	0.958	0.958	0.1538
111	0.5166	0.5066	0.951	0.951	0.1527
112	0.5333	0.5233	0.945	0.945	0.1517
113	0.55	0.54	0.939	0.939	0.1507
114	0.5666	0.5566	0.929	0.929	0.1491
115	0.5833	0.5733	0.923	0.923	0.1482
116	0.6	0.59	0.917	0.917	0.1472
117	0.6166	0.6066	0.91	0.91	0.1461
118	0.6333	0.6233	0.904	0.904	0.1451
119	0.65	0.64	0.898	0.898	0.1442
120	0.6666	0.6566	0.891	0.891	0.143
121	0.6833	0.6733	0.885	0.885	0.1421
122	0.7	0.69	0.878	0.878	0.141
123	0.7166	0.7066	0.872	0.872	0.14
124	0.7333	0.7233	0.869	0.869	0.1395
125	0.75	0.74	0.863	0.863	0.1385
126	0.7666	0.7566	0.856	0.856	0.1374
127	0.7833	0.7733	0.853	0.853	0.1369
128	0.8	0.79	0.847	0.847	0.136
129	0.8166	0.8066	0.844	0.844	0.1355
130	0.8333	0.8233	0.84	0.84	0.1349
131	0.85	0.84	0.834	0.834	0.1339
132	0.8666	0.8566	0.831	0.831	0.1334
133	0.8833	0.8733	0.825	0.825	0.1324
134	0.9	0.89	0.825	0.825	0.1324
135	0.9166	0.9066	0.818	0.818	0.1313
136	0.9333	0.9233	0.815	0.815	0.1308
137	0.95	0.94	0.812	0.812	0.1304
138	0.9666	0.9566	0.809	0.809	0.1299
139	0.9833	0.9733	0.806	0.806	0.1294
140	1.	0.99	0.802	0.802	0.1288
141	1.2	1.19	0.764	0.764	0.1227
142	1.4	1.39	0.742	0.742	0.1191
143	1.6	1.59	0.723	0.723	0.1161
144	1.8	1.79	0.704	0.704	0.113
145	2.	1.99	0.685	0.685	0.11
146	2.2	2.19	0.669	0.669	0.1074
147	2.4	2.39	0.653	0.653	0.1048

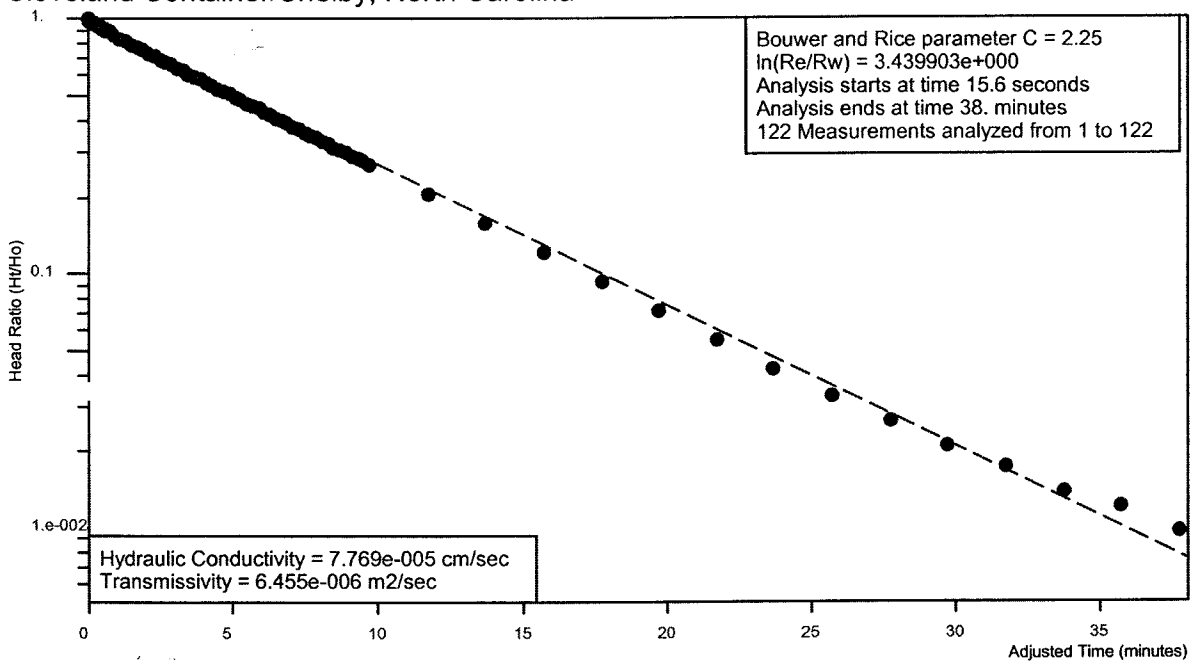
148	2.6	2.59	0.64	0.64	0.1027
149	2.8	2.79	0.625	0.625	0.1003
150	3.	2.99	0.609	0.609	9.777e-002
151	3.2	3.19	0.596	0.596	9.568e-002
152	3.4	3.39	0.583	0.583	9.359e-002
153	3.6	3.59	0.571	0.571	9.167e-002
154	3.8	3.79	0.555	0.555	8.91e-002
155	4.	3.99	0.542	0.542	8.701e-002
156	4.2	4.19	0.526	0.526	8.444e-002
157	4.4	4.39	0.514	0.514	8.252e-002
158	4.6	4.59	0.501	0.501	8.043e-002
159	4.8	4.79	0.485	0.485	7.786e-002
160	5.	4.99	0.472	0.472	7.577e-002
161	5.2	5.19	0.456	0.456	7.321e-002
162	5.4	5.39	0.444	0.444	7.128e-002
163	5.6	5.59	0.434	0.434	6.967e-002
164	5.8	5.79	0.422	0.422	6.775e-002
165	6.	5.99	0.406	0.406	6.518e-002
166	6.2	6.19	0.393	0.393	6.309e-002
167	6.4	6.39	0.38	0.38	6.1e-002
168	6.6	6.59	0.368	0.368	5.908e-002
169	6.8	6.79	0.355	0.355	5.699e-002
170	7.	6.99	0.342	0.342	5.49e-002
171	7.2	7.19	0.33	0.33	5.298e-002
172	7.4	7.39	0.317	0.317	5.089e-002
173	7.6	7.59	0.307	0.307	4.929e-002
174	7.8	7.79	0.298	0.298	4.784e-002
175	8.	7.99	0.285	0.285	4.575e-002
176	8.2	8.19	0.276	0.276	4.431e-002
177	8.4	8.39	0.266	0.266	4.27e-002
178	8.6	8.59	0.257	0.257	4.126e-002
179	8.8	8.79	0.25	0.25	4.013e-002
180	9.	8.99	0.241	0.241	3.869e-002
181	9.2	9.19	0.231	0.231	3.708e-002
182	9.4	9.39	0.225	0.225	3.612e-002
183	9.6	9.59	0.215	0.215	3.452e-002
184	9.8	9.79	0.209	0.209	3.355e-002
185	10.	9.99	0.203	0.203	3.259e-002
186	12.	11.99	0.145	0.145	2.328e-002
187	14.	13.99	0.104	0.104	1.67e-002
188	16.	15.99	7.9e-002	7.9e-002	1.268e-002
189	18.	17.99	6.e-002	6.e-002	9.632e-003
190	20.	19.99	5.e-002	5.e-002	8.027e-003
191	22.	21.99	4.1e-002	4.1e-002	6.582e-003
192	24.	23.99	3.4e-002	3.4e-002	5.458e-003

Falling Head Slug Test Data 7/2/01

Bouwer and Rice Graph

Cleveland Container Shelby, North Carolina

MW-1C



Ho is 3.63 feet at 15.6 seconds

Project Number J01-1307-09 for HHNT

Analysis by Bunnell-Lammons Engineering, Inc.

Falling Head Slug Test Data

Site Name:	Cleveland Container
Location:	Shelby, North Carolina
Test Date:	7/2/01
Client:	HHNT
Project Number:	J01-1307-09
Import File:	C:\Public\Projects\Cleveland Container\Revised Data\Slug Test Data 7-2-01\MW-1c.txt

Well Label:	MW-1C
Aquifer Thickness:	27.26 feet
Screen Length:	10. feet
Casing Radius:	8.3e-002 feet
Effective Radius:	0.25 feet
Static Water Level:	0. feet
Water Table to Screen Bottom:	27.26 feet
Anisotropy Ratio:	1.
Time Adjustment:	15.6 Seconds

Test starts with trial 0
There are 122 time and drawdown measurements
Maximum head is 3.63 feet
Minimum head is 0. feet

Trial	Time (minutes)	Adjusted Time (minutes)	Drawdown (feet)	Head (feet)	Head Ratio
1	0.26	0.	3.63	3.63	1.
2	0.2633	3.3e-003	3.621	3.621	0.9975
3	0.2666	6.6e-003	3.617	3.617	0.9964
4	0.27	1.e-002	3.617	3.617	0.9964
5	0.2733	1.33e-002	3.617	3.617	0.9964
6	0.2766	1.66e-002	3.614	3.614	0.9956
7	0.28	2.e-002	3.611	3.611	0.9948
8	0.2833	2.33e-002	3.611	3.611	0.9948
9	0.2866	2.66e-002	3.608	3.608	0.9939
10	0.29	3.e-002	3.608	3.608	0.9939
11	0.2933	3.33e-002	3.605	3.605	0.9931
12	0.2966	3.66e-002	3.602	3.602	0.9923
13	0.3	4.e-002	3.602	3.602	0.9923
14	0.3033	4.33e-002	3.598	3.598	0.9912
15	0.3066	4.66e-002	3.598	3.598	0.9912
16	0.31	5.e-002	3.595	3.595	0.9904
17	0.3133	5.33e-002	3.592	3.592	0.9895
18	0.3166	5.66e-002	3.592	3.592	0.9895
19	0.32	6.e-002	3.589	3.589	0.9887
20	0.3233	6.33e-002	3.586	3.586	0.9879
21	0.3266	6.66e-002	3.586	3.586	0.9879
22	0.33	7.e-002	3.583	3.583	0.9871
23	0.3333	7.33e-002	3.583	3.583	0.9871
24	0.35	9.e-002	3.573	3.573	0.9843
25	0.3666	0.1066	3.563	3.563	0.9815
26	0.3833	0.1233	3.557	3.557	0.9799
27	0.4	0.14	3.551	3.551	0.9782
28	0.4166	0.1566	3.538	3.538	0.9747
29	0.4333	0.1733	3.528	3.528	0.9719
30	0.45	0.19	3.519	3.519	0.9694
31	0.4666	0.2066	3.509	3.509	0.9667
32	0.4833	0.2233	3.5	3.5	0.9642
33	0.5	0.24	3.49	3.49	0.9614

34	0.5166	0.2566	3.484	3.484	0.9598
35	0.5333	0.2733	3.474	3.474	0.957
36	0.55	0.29	3.465	3.465	0.9545
37	0.5666	0.3066	3.458	3.458	0.9526
38	0.5833	0.3233	3.449	3.449	0.9501
39	0.6	0.34	3.442	3.442	0.9482
40	0.6166	0.3566	3.43	3.43	0.9449
41	0.6333	0.3733	3.423	3.423	0.943
42	0.65	0.39	3.417	3.417	0.9413
43	0.6666	0.4066	3.408	3.408	0.9388
44	0.6833	0.4233	3.398	3.398	0.9361
45	0.7	0.44	3.392	3.392	0.9344
46	0.7166	0.4566	3.382	3.382	0.9317
47	0.7333	0.4733	3.373	3.373	0.9292
48	0.75	0.49	3.366	3.366	0.9273
49	0.7666	0.5066	3.36	3.36	0.9256
50	0.7833	0.5233	3.35	3.35	0.9229
51	0.8	0.54	3.341	3.341	0.9204
52	0.8166	0.5566	3.334	3.334	0.9185
53	0.8333	0.5733	3.325	3.325	0.916
54	0.85	0.59	3.319	3.319	0.9143
55	0.8666	0.6066	3.309	3.309	0.9116
56	0.8833	0.6233	3.303	3.303	0.9099
57	0.9	0.64	3.296	3.296	0.908
58	0.9166	0.6566	3.287	3.287	0.9055
59	0.9333	0.6733	3.28	3.28	0.9036
60	0.95	0.69	3.271	3.271	0.9011
61	0.9666	0.7066	3.265	3.265	0.8994
62	0.9833	0.7233	3.255	3.255	0.8967
63	1.	0.74	3.249	3.249	0.895
64	1.2	0.94	3.144	3.144	0.8661
65	1.4	1.14	3.058	3.058	0.8424
66	1.6	1.34	2.975	2.975	0.8196
67	1.8	1.54	2.892	2.892	0.7967
68	2.	1.74	2.816	2.816	0.7758
69	2.2	1.94	2.74	2.74	0.7548
70	2.4	2.14	2.667	2.667	0.7347
71	2.6	2.34	2.597	2.597	0.7154
72	2.8	2.54	2.527	2.527	0.6961
73	3.	2.74	2.46	2.46	0.6777
74	3.2	2.94	2.396	2.396	0.6601
75	3.4	3.14	2.333	2.333	0.6427
76	3.6	3.34	2.272	2.272	0.6259
77	3.8	3.54	2.212	2.212	0.6094
78	4.	3.74	2.155	2.155	0.5937
79	4.2	3.94	2.098	2.098	0.578
80	4.4	4.14	2.043	2.043	0.5628
81	4.6	4.34	1.989	1.989	0.5479
82	4.8	4.54	1.939	1.939	0.5342
83	5.	4.74	1.888	1.888	0.5201
84	5.2	4.94	1.84	1.84	0.5069
85	5.4	5.14	1.792	1.792	0.4937
86	5.6	5.34	1.745	1.745	0.4807
87	5.8	5.54	1.697	1.697	0.4675
88	6.	5.74	1.656	1.656	0.4562
89	6.2	5.94	1.611	1.611	0.4438
90	6.4	6.14	1.57	1.57	0.4325

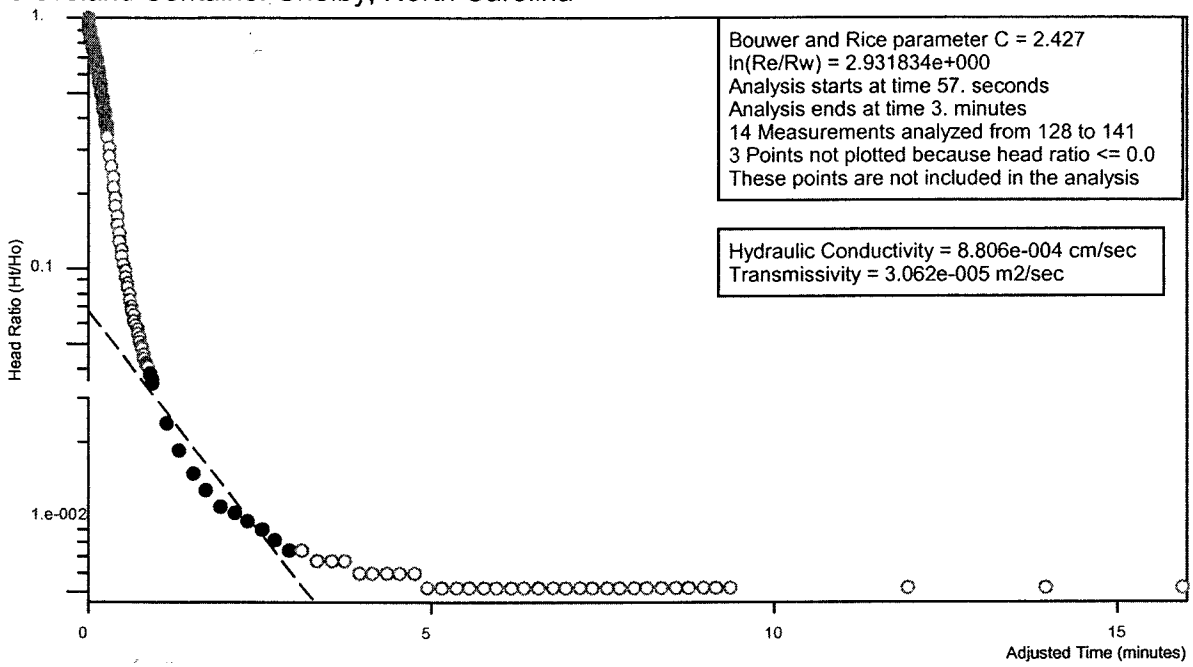
91	6.6	6.34	1.528	1.528	0.4209
92	6.8	6.54	1.49	1.49	0.4105
93	7.	6.74	1.452	1.452	0.4
94	7.2	6.94	1.414	1.414	0.3895
95	7.4	7.14	1.376	1.376	0.3791
96	7.6	7.34	1.341	1.341	0.3694
97	7.8	7.54	1.306	1.306	0.3598
98	8.	7.74	1.274	1.274	0.351
99	8.2	7.94	1.239	1.239	0.3413
100	8.4	8.14	1.207	1.207	0.3325
101	8.6	8.34	1.176	1.176	0.324
102	8.8	8.54	1.144	1.144	0.3152
103	9.	8.74	1.115	1.115	0.3072
104	9.2	8.94	1.087	1.087	0.2994
105	9.4	9.14	1.058	1.058	0.2915
106	9.6	9.34	1.029	1.029	0.2835
107	9.8	9.54	1.004	1.004	0.2766
108	10.	9.74	0.978	0.978	0.2694
109	12.	11.74	0.75	0.75	0.2066
110	14.	13.74	0.575	0.575	0.1584
111	16.	15.74	0.441	0.441	0.1215
112	18.	17.74	0.34	0.34	9.366e-002
113	20.	19.74	0.26	0.26	7.163e-002
114	22.	21.74	0.2	0.2	5.51e-002
115	24.	23.74	0.152	0.152	4.187e-002
116	26.	25.74	0.12	0.12	3.306e-002
117	28.	27.74	9.5e-002	9.5e-002	2.617e-002
118	30.	29.74	7.6e-002	7.6e-002	2.094e-002
119	32.	31.74	6.3e-002	6.3e-002	1.736e-002
120	34.	33.74	5.e-002	5.e-002	1.377e-002
121	36.	35.74	4.4e-002	4.4e-002	1.212e-002
122	38.	37.74	3.5e-002	3.5e-002	9.642e-003

Rising Head Slug Test Data 7/2/01

Cleveland Container Shelby, North Carolina

Bouwer and Rice Graph

MW-6A



Ho is 4.192 feet at 1.998 seconds

Project Number J01-1307-09 for HHNT

Analysis by Bunnell-Lammons Engineering, Inc.

Rising Head Slug Test Data

Site Name:	Cleveland Container
Location:	Shelby, North Carolina
Test Date:	7/2/01
Client:	HHNT
Project Number:	J01-1307-09
Import File:	C:\Public\Projects\Cleveland Container\Revised Data\MW-6a.txt

Well Label:	MW-6A
Aquifer Thickness:	11.41 feet
Screen Length:	11.41 feet
Casing Radius:	8.3e-002 feet
Effective Radius:	0.25 feet
Static Water Level:	0. feet
Water Table to Screen Bottom:	11.41 feet
Anisotropy Ratio:	1.
Time Adjustment:	1.998 Seconds

Test starts with trial 0
There are 179 time and drawdown measurements
Maximum head is 4.192 feet
Minimum head is 0. feet

Trial	Time (minutes)	Adjusted Time (minutes)	Drawdown (feet)	Head (feet)	Head Ratio
1	3.33e-002	0.	4.192	4.192	1.
2	3.66e-002	3.3e-003	4.128	4.128	0.9847
3	4.e-002	6.7e-003	4.068	4.068	0.9704
4	4.33e-002	1.e-002	3.969	3.969	0.9468
5	4.66e-002	1.33e-002	3.944	3.944	0.9408
6	5.e-002	1.67e-002	3.912	3.912	0.9332
7	5.33e-002	2.e-002	3.903	3.903	0.9311
8	5.66e-002	2.33e-002	3.836	3.836	0.9151
9	6.e-002	2.67e-002	3.814	3.814	0.9098
10	6.33e-002	3.e-002	3.766	3.766	0.8984
11	6.66e-002	3.33e-002	3.738	3.738	0.8917
12	7.e-002	3.67e-002	3.694	3.694	0.8812
13	7.33e-002	4.e-002	3.665	3.665	0.8743
14	7.66e-002	4.33e-002	3.659	3.659	0.8729
15	8.e-002	4.67e-002	3.624	3.624	0.8645
16	8.33e-002	5.e-002	3.595	3.595	0.8576
17	8.66e-002	5.33e-002	3.544	3.544	0.8454
18	9.e-002	5.67e-002	3.503	3.503	0.8356
19	9.33e-002	6.e-002	3.468	3.468	0.8273
20	9.66e-002	6.33e-002	3.44	3.44	0.8206
21	0.1	6.67e-002	3.405	3.405	0.8123
22	0.1033	7.e-002	3.379	3.379	0.8061
23	0.1066	7.33e-002	3.354	3.354	0.8001
24	0.11	7.67e-002	3.325	3.325	0.7932
25	0.1133	8.e-002	3.3	3.3	0.7872
26	0.1166	8.33e-002	3.259	3.259	0.7774
27	0.12	8.67e-002	3.23	3.23	0.7705
28	0.1233	9.e-002	3.192	3.192	0.7615
29	0.1266	9.33e-002	3.148	3.148	0.751
30	0.13	9.67e-002	3.126	3.126	0.7457
31	0.1333	0.1	3.113	3.113	0.7426
32	0.1366	0.1033	3.091	3.091	0.7374
33	0.14	0.1067	3.046	3.046	0.7266

34	0.1433	0.11	3.002	3.002	0.7161
35	0.1466	0.1133	2.967	2.967	0.7078
36	0.15	0.1167	2.932	2.932	0.6994
37	0.1533	0.12	2.903	2.903	0.6925
38	0.1566	0.1233	2.862	2.862	0.6827
39	0.16	0.1267	2.878	2.878	0.6865
40	0.1633	0.13	2.834	2.834	0.676
41	0.1666	0.1333	2.799	2.799	0.6677
42	0.17	0.1367	2.748	2.748	0.6555
43	0.1733	0.14	2.707	2.707	0.6458
44	0.1766	0.1433	2.662	2.662	0.635
45	0.18	0.1467	2.656	2.656	0.6336
46	0.1833	0.15	2.618	2.618	0.6245
47	0.1866	0.1533	2.593	2.593	0.6186
48	0.19	0.1567	2.558	2.558	0.6102
49	0.1933	0.16	2.529	2.529	0.6033
50	0.1966	0.1633	2.497	2.497	0.5957
51	0.2	0.1667	2.469	2.469	0.589
52	0.2033	0.17	2.434	2.434	0.5806
53	0.2066	0.1733	2.409	2.409	0.5747
54	0.21	0.1767	2.38	2.38	0.5677
55	0.2133	0.18	2.332	2.332	0.5563
56	0.2166	0.1833	2.316	2.316	0.5525
57	0.22	0.1867	2.294	2.294	0.5472
58	0.2233	0.19	2.259	2.259	0.5389
59	0.2266	0.1933	2.231	2.231	0.5322
60	0.23	0.1967	2.199	2.199	0.5246
61	0.2333	0.2	2.177	2.177	0.5193
62	0.2366	0.2033	2.142	2.142	0.511
63	0.24	0.2067	2.113	2.113	0.5041
64	0.2433	0.21	2.085	2.085	0.4974
65	0.2466	0.2133	2.056	2.056	0.4905
66	0.25	0.2167	2.028	2.028	0.4838
67	0.2533	0.22	2.002	2.002	0.4776
68	0.2566	0.2233	1.974	1.974	0.4709
69	0.26	0.2267	1.948	1.948	0.4647
70	0.2633	0.23	1.92	1.92	0.458
71	0.2666	0.2333	1.894	1.894	0.4518
72	0.27	0.2367	1.869	1.869	0.4458
73	0.2733	0.24	1.84	1.84	0.4389
74	0.2766	0.2433	1.815	1.815	0.433
75	0.28	0.2467	1.79	1.79	0.427
76	0.2833	0.25	1.764	1.764	0.4208
77	0.2866	0.2533	1.739	1.739	0.4148
78	0.29	0.2567	1.713	1.713	0.4086
79	0.2933	0.26	1.691	1.691	0.4034
80	0.2966	0.2633	1.666	1.666	0.3974
81	0.3	0.2667	1.644	1.644	0.3922
82	0.3033	0.27	1.618	1.618	0.386
83	0.3066	0.2733	1.596	1.596	0.3807
84	0.31	0.2767	1.571	1.571	0.3748
85	0.3133	0.28	1.548	1.548	0.3693
86	0.3166	0.2833	1.526	1.526	0.364
87	0.32	0.2867	1.504	1.504	0.3588
88	0.3233	0.29	1.479	1.479	0.3528
89	0.3266	0.2933	1.456	1.456	0.3473
90	0.33	0.2967	1.434	1.434	0.3421

91	0.3333	0.3	1.412	1.412	0.3368
92	0.35	0.3167	1.291	1.291	0.308
93	0.3666	0.3333	1.177	1.177	0.2808
94	0.3833	0.35	1.072	1.072	0.2557
95	0.4	0.3667	0.974	0.974	0.2323
96	0.4166	0.3833	0.888	0.888	0.2118
97	0.4333	0.4	0.809	0.809	0.193
98	0.45	0.4167	0.742	0.742	0.177
99	0.4666	0.4333	0.679	0.679	0.162
100	0.4833	0.45	0.628	0.628	0.1498
101	0.5	0.4667	0.58	0.58	0.1384
102	0.5166	0.4833	0.539	0.539	0.1286
103	0.5333	0.5	0.501	0.501	0.1195
104	0.55	0.5167	0.469	0.469	0.1119
105	0.5666	0.5333	0.438	0.438	0.1045
106	0.5833	0.55	0.412	0.412	9.828e-002
107	0.6	0.5667	0.387	0.387	9.232e-002
108	0.6166	0.5833	0.368	0.368	8.779e-002
109	0.6333	0.6	0.349	0.349	8.325e-002
110	0.65	0.6167	0.33	0.33	7.872e-002
111	0.6666	0.6333	0.314	0.314	7.49e-002
112	0.6833	0.65	0.298	0.298	7.109e-002
113	0.7	0.6667	0.285	0.285	6.799e-002
114	0.7166	0.6833	0.273	0.273	6.512e-002
115	0.7333	0.7	0.26	0.26	6.202e-002
116	0.75	0.7167	0.25	0.25	5.964e-002
117	0.7666	0.7333	0.241	0.241	5.749e-002
118	0.7833	0.75	0.231	0.231	5.51e-002
119	0.8	0.7667	0.222	0.222	5.296e-002
120	0.8166	0.7833	0.212	0.212	5.057e-002
121	0.8333	0.8	0.206	0.206	4.914e-002
122	0.85	0.8167	0.2	0.2	4.771e-002
123	0.8666	0.8333	0.19	0.19	4.532e-002
124	0.8833	0.85	0.184	0.184	4.389e-002
125	0.9	0.8667	0.177	0.177	4.222e-002
126	0.9166	0.8833	0.171	0.171	4.079e-002
127	0.9333	0.9	0.168	0.168	4.008e-002
128	0.95	0.9167	0.161	0.161	3.841e-002
129	0.9666	0.9333	0.158	0.158	3.769e-002
130	0.9833	0.95	0.152	0.152	3.626e-002
131	1.	0.9667	0.146	0.146	3.483e-002
132	1.2	1.167	0.101	0.101	2.409e-002
133	1.4	1.367	7.9e-002	7.9e-002	1.885e-002
134	1.6	1.567	6.3e-002	6.3e-002	1.503e-002
135	1.8	1.767	5.4e-002	5.4e-002	1.288e-002
136	2.	1.967	4.7e-002	4.7e-002	1.121e-002
137	2.2	2.167	4.4e-002	4.4e-002	1.05e-002
138	2.4	2.367	4.1e-002	4.1e-002	9.781e-003
139	2.6	2.567	3.8e-002	3.8e-002	9.065e-003
140	2.8	2.767	3.4e-002	3.4e-002	8.111e-003
141	3.	2.967	3.1e-002	3.1e-002	7.395e-003
142	3.2	3.167	3.1e-002	3.1e-002	7.395e-003
143	3.4	3.367	2.8e-002	2.8e-002	6.679e-003
144	3.6	3.567	2.8e-002	2.8e-002	6.679e-003
145	3.8	3.767	2.8e-002	2.8e-002	6.679e-003
146	4.	3.967	2.5e-002	2.5e-002	5.964e-003
147	4.2	4.167	2.5e-002	2.5e-002	5.964e-003

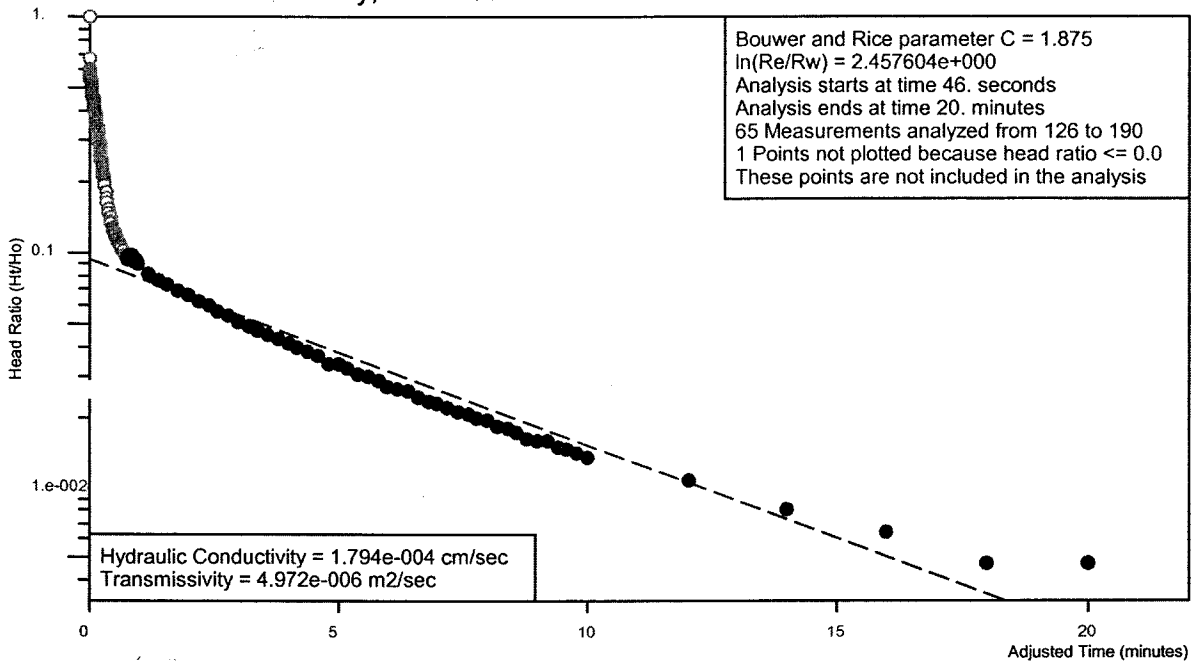
148	4.4	4.367	2.5e-002	2.5e-002	5.964e-003
149	4.6	4.567	2.5e-002	2.5e-002	5.964e-003
150	4.8	4.767	2.5e-002	2.5e-002	5.964e-003
151	5.	4.967	2.2e-002	2.2e-002	5.248e-003
152	5.2	5.167	2.2e-002	2.2e-002	5.248e-003
153	5.4	5.367	2.2e-002	2.2e-002	5.248e-003
154	5.6	5.567	2.2e-002	2.2e-002	5.248e-003
155	5.8	5.767	2.2e-002	2.2e-002	5.248e-003
156	6.	5.967	2.2e-002	2.2e-002	5.248e-003
157	6.2	6.167	2.2e-002	2.2e-002	5.248e-003
158	6.4	6.367	2.2e-002	2.2e-002	5.248e-003
159	6.6	6.567	2.2e-002	2.2e-002	5.248e-003
160	6.8	6.767	2.2e-002	2.2e-002	5.248e-003
161	7.	6.967	2.2e-002	2.2e-002	5.248e-003
162	7.2	7.167	2.2e-002	2.2e-002	5.248e-003
163	7.4	7.367	2.2e-002	2.2e-002	5.248e-003
164	7.6	7.567	2.2e-002	2.2e-002	5.248e-003
165	7.8	7.767	2.2e-002	2.2e-002	5.248e-003
166	8.	7.967	2.2e-002	2.2e-002	5.248e-003
167	8.2	8.167	2.2e-002	2.2e-002	5.248e-003
168	8.4	8.367	2.2e-002	2.2e-002	5.248e-003
169	8.6	8.567	2.2e-002	2.2e-002	5.248e-003
170	8.8	8.767	2.2e-002	2.2e-002	5.248e-003
171	9.	8.967	2.2e-002	2.2e-002	5.248e-003
172	9.2	9.167	2.2e-002	2.2e-002	5.248e-003
173	9.4	9.367	2.2e-002	2.2e-002	5.248e-003
174	9.6	9.567	1.9e-002	1.9e-002	4.532e-003
175	9.8	9.767	1.9e-002	1.9e-002	4.532e-003
176	10.	9.967	1.9e-002	1.9e-002	4.532e-003
177	12.	11.97	2.2e-002	2.2e-002	5.248e-003
178	14.	13.97	2.2e-002	2.2e-002	5.248e-003
179	16.	15.97	2.2e-002	2.2e-002	5.248e-003

MW-7A Rising Head Slug Data: 3/27/01

Cleveland Container Shelby, North Carolina

Bouwer and Rice Graph

MW-7A



Ho is 5.855 feet at 0.6 seconds

Project Number J01-1307-09 for HHNT

Analysis by Bunnell-Lammons Engineering, Inc.

MW-7A Rising Head Slug Data:

Site Name:	Cleveland Container
Location:	Shelby, North Carolina
Test Date:	3/27/01
Client:	HHNT
Project Number:	J01-1307-09
Import File:	C:\Public\Projects\Cleveland Container\Revised Data\MW-7A.txt

Well Label:	MW-7A
Aquifer Thickness:	9.09 feet
Screen Length:	9.09 feet
Casing Radius:	8.33e-002 feet
Effective Radius:	0.344 feet
Static Water Level:	0. feet
Water Table to Screen Bottom:	9.09 feet
Anisotropy Ratio:	1.
Time Adjustment:	0.6 Seconds

Test starts with trial 2
There are 191 time and drawdown measurements
Maximum head is 5.855 feet
Minimum head is 0. feet

Trial	Time (minutes)	Adjusted Time (minutes)	Drawdown (feet)	Head (feet)	Head Ratio
1	3.3e-003	-6.7e-003	1.659	1.659	0.2833
2	6.6e-003	-3.4e-003	2.516	2.516	0.4297
3	1.e-002	0.	5.855	5.855	1.
4	1.33e-002	3.3e-003	3.318	3.318	0.5667
5	1.66e-002	6.6e-003	3.949	3.949	0.6745
6	2.e-002	1.e-002	3.527	3.527	0.6024
7	2.33e-002	1.33e-002	3.385	3.385	0.5781
8	2.66e-002	1.66e-002	3.445	3.445	0.5884
9	3.e-002	2.e-002	3.451	3.451	0.5894
10	3.33e-002	2.33e-002	3.423	3.423	0.5846
11	3.66e-002	2.66e-002	3.404	3.404	0.5814
12	4.e-002	3.e-002	3.334	3.334	0.5694
13	4.33e-002	3.33e-002	3.293	3.293	0.5624
14	4.66e-002	3.66e-002	3.245	3.245	0.5542
15	5.e-002	4.e-002	3.178	3.178	0.5428
16	5.33e-002	4.33e-002	3.14	3.14	0.5363
17	5.66e-002	4.66e-002	3.134	3.134	0.5353
18	6.e-002	5.e-002	3.077	3.077	0.5255
19	6.33e-002	5.33e-002	3.029	3.029	0.5173
20	6.66e-002	5.66e-002	3.004	3.004	0.5131
21	7.e-002	6.e-002	2.96	2.96	0.5056
22	7.33e-002	6.33e-002	2.915	2.915	0.4979
23	7.66e-002	6.66e-002	2.887	2.887	0.4931
24	8.e-002	7.e-002	2.855	2.855	0.4876
25	8.33e-002	7.33e-002	2.823	2.823	0.4822
26	8.66e-002	7.66e-002	2.788	2.788	0.4762
27	9.e-002	8.e-002	2.769	2.769	0.4729
28	9.33e-002	8.33e-002	2.715	2.715	0.4637
29	9.66e-002	8.66e-002	2.68	2.68	0.4577
30	0.1	9.e-002	2.636	2.636	0.4502
31	0.1033	9.33e-002	2.63	2.63	0.4492
32	0.1066	9.66e-002	2.62	2.62	0.4475
33	0.11	0.1	2.569	2.569	0.4388

34	0.1133	0.1033	2.535	2.535	0.433
35	0.1166	0.1066	2.509	2.509	0.4285
36	0.12	0.11	2.471	2.471	0.422
37	0.1233	0.1133	2.436	2.436	0.4161
38	0.1266	0.1166	2.405	2.405	0.4108
39	0.13	0.12	2.42	2.42	0.4133
40	0.1333	0.1233	2.338	2.338	0.3993
41	0.1366	0.1266	2.328	2.328	0.3976
42	0.14	0.13	2.3	2.3	0.3928
43	0.1433	0.1333	2.278	2.278	0.3891
44	0.1466	0.1366	2.23	2.23	0.3809
45	0.15	0.14	2.217	2.217	0.3787
46	0.1533	0.1433	2.173	2.173	0.3711
47	0.1566	0.1466	2.17	2.17	0.3706
48	0.16	0.15	2.128	2.128	0.3635
49	0.1633	0.1533	2.109	2.109	0.3602
50	0.1666	0.1566	2.081	2.081	0.3554
51	0.17	0.16	2.059	2.059	0.3517
52	0.1733	0.1633	2.043	2.043	0.3489
53	0.1766	0.1666	2.017	2.017	0.3445
54	0.18	0.17	1.992	1.992	0.3402
55	0.1833	0.1733	1.967	1.967	0.336
56	0.1866	0.1766	1.941	1.941	0.3315
57	0.19	0.18	1.906	1.906	0.3255
58	0.1933	0.1833	1.9	1.9	0.3245
59	0.1966	0.1866	1.872	1.872	0.3197
60	0.2	0.19	1.853	1.853	0.3165
61	0.2033	0.1933	1.824	1.824	0.3115
62	0.2066	0.1966	1.802	1.802	0.3078
63	0.21	0.2	1.78	1.78	0.304
64	0.2133	0.2033	1.757	1.757	0.3001
65	0.2166	0.2066	1.735	1.735	0.2963
66	0.22	0.21	1.71	1.71	0.2921
67	0.2233	0.2133	1.697	1.697	0.2898
68	0.2266	0.2166	1.672	1.672	0.2856
69	0.23	0.22	1.653	1.653	0.2823
70	0.2333	0.2233	1.63	1.63	0.2784
71	0.2366	0.2266	1.615	1.615	0.2758
72	0.24	0.23	1.592	1.592	0.2719
73	0.2433	0.2333	1.573	1.573	0.2687
74	0.2466	0.2366	1.548	1.548	0.2644
75	0.25	0.24	1.529	1.529	0.2611
76	0.2533	0.2433	1.513	1.513	0.2584
77	0.2566	0.2466	1.484	1.484	0.2535
78	0.26	0.25	1.472	1.472	0.2514
79	0.2633	0.2533	1.446	1.446	0.247
80	0.2666	0.2566	1.434	1.434	0.2449
81	0.27	0.26	1.408	1.408	0.2405
82	0.2733	0.2633	1.396	1.396	0.2384
83	0.2766	0.2666	1.38	1.38	0.2357
84	0.28	0.27	1.358	1.358	0.2319
85	0.2833	0.2733	1.345	1.345	0.2297
86	0.2866	0.2766	1.323	1.323	0.226
87	0.29	0.28	1.313	1.313	0.2243
88	0.2933	0.2833	1.294	1.294	0.221
89	0.2966	0.2866	1.281	1.281	0.2188
90	0.3	0.29	1.262	1.262	0.2155

91	0.3033	0.2933	1.25	1.25	0.2135
92	0.3066	0.2966	1.234	1.234	0.2108
93	0.31	0.3	1.221	1.221	0.2085
94	0.3133	0.3033	1.205	1.205	0.2058
95	0.3166	0.3066	1.193	1.193	0.2038
96	0.32	0.31	1.177	1.177	0.201
97	0.3233	0.3133	1.164	1.164	0.1988
98	0.3266	0.3166	1.151	1.151	0.1966
99	0.33	0.32	1.139	1.139	0.1945
100	0.3333	0.3233	1.126	1.126	0.1923
101	0.35	0.34	1.059	1.059	0.1809
102	0.3666	0.3566	0.999	0.999	0.1706
103	0.3833	0.3733	0.948	0.948	0.1619
104	0.4	0.39	0.904	0.904	0.1544
105	0.4166	0.4066	0.866	0.866	0.1479
106	0.4333	0.4233	0.831	0.831	0.1419
107	0.45	0.44	0.799	0.799	0.1365
108	0.4666	0.4566	0.774	0.774	0.1322
109	0.4833	0.4733	0.752	0.752	0.1284
110	0.5	0.49	0.733	0.733	0.1252
111	0.5166	0.5066	0.713	0.713	0.1218
112	0.5333	0.5233	0.698	0.698	0.1192
113	0.55	0.54	0.685	0.685	0.117
114	0.5666	0.5566	0.669	0.669	0.1143
115	0.5833	0.5733	0.66	0.66	0.1127
116	0.6	0.59	0.647	0.647	0.1105
117	0.6166	0.6066	0.641	0.641	0.1095
118	0.6333	0.6233	0.631	0.631	0.1078
119	0.65	0.64	0.621	0.621	0.1061
120	0.6666	0.6566	0.606	0.606	0.1035
121	0.6833	0.6733	0.602	0.602	0.1028
122	0.7	0.69	0.599	0.599	0.1023
123	0.7166	0.7066	0.593	0.593	0.1013
124	0.7333	0.7233	0.568	0.568	9.701e-002
125	0.75	0.74	0.571	0.571	9.752e-002
126	0.7666	0.7566	0.564	0.564	9.633e-002
127	0.7833	0.7733	0.558	0.558	9.53e-002
128	0.8	0.79	0.555	0.555	9.479e-002
129	0.8166	0.8066	0.548	0.548	9.36e-002
130	0.8333	0.8233	0.568	0.568	9.701e-002
131	0.85	0.84	0.568	0.568	9.701e-002
132	0.8666	0.8566	0.561	0.561	9.582e-002
133	0.8833	0.8733	0.561	0.561	9.582e-002
134	0.9	0.89	0.548	0.548	9.36e-002
135	0.9166	0.9066	0.542	0.542	9.257e-002
136	0.9333	0.9233	0.548	0.548	9.36e-002
137	0.95	0.94	0.539	0.539	9.206e-002
138	0.9666	0.9566	0.539	0.539	9.206e-002
139	0.9833	0.9733	0.533	0.533	9.103e-002
140	1.	0.99	0.526	0.526	8.984e-002
141	1.2	1.19	0.482	0.482	8.232e-002
142	1.4	1.39	0.453	0.453	7.737e-002
143	1.6	1.59	0.431	0.431	7.361e-002
144	1.8	1.79	0.409	0.409	6.985e-002
145	2.	1.99	0.387	0.387	6.61e-002
146	2.2	2.19	0.368	0.368	6.285e-002
147	2.4	2.39	0.352	0.352	6.012e-002

148	2.6	2.59	0.33	0.33	5.636e-002
149	2.8	2.79	0.314	0.314	5.363e-002
150	3.	2.99	0.301	0.301	5.141e-002
151	3.2	3.19	0.285	0.285	4.868e-002
152	3.4	3.39	0.276	0.276	4.714e-002
153	3.6	3.59	0.263	0.263	4.492e-002
154	3.8	3.79	0.253	0.253	4.321e-002
155	4.	3.99	0.241	0.241	4.116e-002
156	4.2	4.19	0.234	0.234	3.997e-002
157	4.4	4.39	0.222	0.222	3.792e-002
158	4.6	4.59	0.215	0.215	3.672e-002
159	4.8	4.79	0.199	0.199	3.399e-002
160	5.	4.99	0.199	0.199	3.399e-002
161	5.2	5.19	0.19	0.19	3.245e-002
162	5.4	5.39	0.18	0.18	3.074e-002
163	5.6	5.59	0.174	0.174	2.972e-002
164	5.8	5.79	0.168	0.168	2.869e-002
165	6.	5.99	0.158	0.158	2.699e-002
166	6.2	6.19	0.155	0.155	2.647e-002
167	6.4	6.39	0.152	0.152	2.596e-002
168	6.6	6.59	0.142	0.142	2.425e-002
169	6.8	6.79	0.136	0.136	2.323e-002
170	7.	6.99	0.133	0.133	2.272e-002
171	7.2	7.19	0.13	0.13	2.22e-002
172	7.4	7.39	0.123	0.123	2.101e-002
173	7.6	7.59	0.12	0.12	2.05e-002
174	7.8	7.79	0.117	0.117	1.998e-002
175	8.	7.99	0.114	0.114	1.947e-002
176	8.2	8.19	0.107	0.107	1.827e-002
177	8.4	8.39	0.104	0.104	1.776e-002
178	8.6	8.59	0.101	0.101	1.725e-002
179	8.8	8.79	9.5e-002	9.5e-002	1.623e-002
180	9.	8.99	9.2e-002	9.2e-002	1.571e-002
181	9.2	9.19	9.2e-002	9.2e-002	1.571e-002
182	9.4	9.39	8.8e-002	8.8e-002	1.503e-002
183	9.6	9.59	8.5e-002	8.5e-002	1.452e-002
184	9.8	9.79	8.2e-002	8.2e-002	1.401e-002
185	10.	9.99	7.9e-002	7.9e-002	1.349e-002
186	12.	11.99	6.3e-002	6.3e-002	1.076e-002
187	14.	13.99	4.7e-002	4.7e-002	8.027e-003
188	16.	15.99	3.8e-002	3.8e-002	6.49e-003
189	18.	17.99	2.8e-002	2.8e-002	4.782e-003
190	20.	19.99	2.8e-002	2.8e-002	4.782e-003
191	22.	21.99	1.9e-002	1.9e-002	3.245e-003

APPENDIX H

Monitoring Well Development Forms

MONITORING WELL DEVELOPMENT LOG

DATE	3/27/01	TOTAL WELL DEPTH (TWD); TOP OF CASING =	62.24 1/100 ft
PERSONNEL	TJB	DEPTH TO GROUND WATER (DGW) =	53.31 1/100 ft
SITE	JMN/Cleveland Container LF - Shelby, NC	LENGTH OF WATER COLUMN (LWC) = TWD - DGW =	8.93 1/100 ft
JOB #	J01-1307-09	1 CASING VOLUME (CV) = LWC x 0.17 =	1.5 gallons
WELL ID	MW-1B	NUMBER CV REMOVED =	45 CV
		TOTAL VOLUME OF WATER REMOVED =	68 gallons
		METHOD OF WELL DEVELOPMENT =	bailer
		WELL YIELD =	Moderate yield

TIME	ELAPSED DEV. TIME (hrs)	VOLUME PURGED event (gallons)	VOLUME PURGED total (gallons)	SURGE	WATER TEMP (C)	pH (units)	SPECIF. COND. (µmho/cm)	TURBIDITY (NTU)	COLOR (subjective)	PURGING METHOD
3/27/01 8:45	0	0	0	surge	15.3	5.5	74.2	97.5	v. lt. tan	bailer
3/27/01 9:30	0:45	2	2	surge	16.0	6	91.6	>1000	dk brown	bailer
3/27/01 9:59	1:14	2	4	surge	15.4	6	105.6	>1000	dk brown	bailer
3/27/01 10:50	2:05	8	12	surge	16.6	6	128	425	orange brown	bailer
3/27/01 11:33	2:48	8	20	surge	15.8	6	132.4	387	lt. tan	bailer
3/27/01 12:15	3:30	8	28	surge	16.2	6	121.8	239	lt. tan	bailer
3/27/01 12:47	4:02	8	36	surge	16.4	6	132	118.3	lt. tan	bailer
3/27/01 13:45	5:00	2	38	-	15.1	6	136.2	180.1	lt. tan	bailer
3/27/01 13:55	5:10	4	42	-	14.7	6	136.5	74.9	lt. tan	bailer
3/27/01 14:03	5:18	4	46	-	14.4	6	137.1	76.2	lt. tan	bailer
3/27/01 14:21	5:36	8	54	-	14.7	6	137.1	28	clear	bailer
3/27/01 14:26	5:41	2	56	-	14.5	6	139.3	20.6	clear	bailer
3/27/01 14:30	5:45	2	58	-	14.7	6	142.9	24.9	clear	bailer
3/27/01 14:36	5:51	2	60	-	14.5	6	140.6	29.5	clear	bailer
3/27/01 14:40	5:55	2	62	-	14.9	6	138.8	26.6	clear	bailer
3/27/01 14:46	6:01	2	64	-	14.6	6	139.9	31.4	clear	bailer
3/27/01 15:01	6:16	2	66	-	14.7	6	139.9	30	clear	bailer
3/27/01 15:07	6:22	2	68	-	14.4	6	140.4	24.3	clear	bailer

MONITORING WELL DEVELOPMENT LOG

DATE	6/13/01	TOTAL WELL DEPTH (TWD); TOP OF CASING =	78.50 1/100 ft
PERSONNEL	TJB	DEPTH TO GROUND WATER (DGW) =	51.16 1/100 ft
SITE	JMN/Cleveland Container LF - Shelby, NC	LENGTH OF WATER COLUMN (LWC) = TWD - DGW =	27.34 1/100 ft
JOB #	J01-1307-09	1 CASING VOLUME (CV) = LWC x 0.17 =	4.6 gallons
WELL ID	MW-1C	NUMBER CV REMOVED =	18 CV
		TOTAL VOLUME OF WATER REMOVED =	82 gallons
		METHOD OF WELL DEVELOPMENT =	bailer
		WELL YIELD =	Moderate yield

TIME	ELAPSED DEV. TIME (hrs)	VOLUME PURGED event (gallons)	VOLUME PURGED total (gallons)	SURGE	WATER TEMP (C)	pH (units)	SPECIF. COND. (µmho/cm)	TURBIDITY (NTU)	COLOR (subjective)	PURGING METHOD
6/13/01 10:45	0	0	0	surge	19.6	7	184.2	8.51	clear	bailer
6/13/01 10:56	0:11	6	6	surge	19.8	6.5	222.5	957	orange/brown	bailer
6/13/01 11:25	0:40	8	14	surge	19.7	6.5	231.0	728	orange/brown	bailer
6/13/01 11:44	0:59	6	20	surge	19.3	6.5	229.0	1020	orange/brown	bailer
6/13/01 15:49	5:04	6	26	surge	20.5	6	222.2	988	orange/brown	bailer
6/13/01 16:46	6:01	10	36	-	19.7	6	227.8	247	lt. tan	bailer
6/13/01 16:58	6:13	6	42	-	19.6	6	225.7	210	lt. tan	bailer
6/13/01 17:09	6:24	6	48	-	19.0	6	258.7	576	orange/brown	bailer
6/13/01 17:40	6:55	6	54	-	19.2	6	250.0	485	tan	bailer
6/13/01 17:52	7:07	4	58	-	19.1	6	251.6	363	tan	bailer
6/13/01 18:08	7:23	6	64	-	19.2	6	250.0	201	lt. tan	bailer
6/13/01 18:24	7:39	4	68	-	18.8	6	241.6	89.2	v. lt. tan	bailer
6/13/01 18:39	7:54	6	74	-	18.8	6	240.7	100.3	v. lt. tan	bailer
6/13/01 18:48	8:03	4	78	-	18.4	6	243.4	122.8	v. lt. tan	bailer
6/13/01 19:06	8:21	2	80	-	18.8	6	240.4	118.6	v. lt. tan	bailer
6/13/01 19:15	8:30	2	82	-	18.7	6	240.0	99	v. lt. tan	bailer
6/13/01 19:50	9:05	0	82	-	18.9	6	236.5	6.82	clear	bailer

MONITORING WELL DEVELOPMENT LOG

DATE	6/13/01	TOTAL WELL DEPTH (TWD); TOP OF CASING =	39.80 1/100 ft
PERSONNEL	TJB	DEPTH TO GROUND WATER (DGW) =	28.28 1/100 ft
SITE	JMN/Cleveland Container LF - Shelby, NC	LENGTH OF WATER COLUMN (LWC) = TWD - DGW =	11.52 1/100 ft
JOB #	J01-1307-09	1 CASING VOLUME (CV) = LWC x 0.17 =	2.0 gallons
WELL ID	MW-6A	NUMBER CV REMOVED =	42 CV
		TOTAL VOLUME OF WATER REMOVED =	82 gallons
		METHOD OF WELL DEVELOPMENT =	bailer, hand pump
		WELL YIELD =	Moderate yield

TIME	ELAPSED DEV. TIME (hrs)	VOLUME PURGED event (gallons)	VOLUME PURGED total (gallons)	SURGE	WATER TEMP (C)	pH (units)	SPECIF. COND. (µmho/cm)	TURBIDITY (NTU)	COLOR (subjective)	PURGING METHOD
6/13/01 8:15	0	0	0	-	18.4	6	124.2	11.5	clear	bailer
6/13/01 8:25	0:10	2	2	surge	17.9	6	175.7	825	gray	bailer
6/13/01 8:40	0:25	2	4	surge	18.0	6	207.2	455	gray	bailer
6/13/01 8:50	0:35	2	6	surge	17.7	6	211.4	686	gray	bailer
6/13/01 9:20	1:05	6	12	surge	18.3	6	233.0	424	gray	hand pump
6/13/01 9:45	1:30	18	30	surge	18.8	6.5	281.0	83	lt. gray	hand pump
6/13/01 9:55	1:40	6	36	surge	18.4	6.5	289.8	36.8	lt. gray	hand pump
6/13/01 12:00	3:45	6	42	surge	18.6	6.5	279.6	66.4	lt. gray	hand pump
6/13/01 12:25	4:10	2	44	surge	18.9	6.5	281.8	380	gray	hand pump
6/13/01 12:41	4:26	12	56	surge	19.0	6.5	291.0	67.8	lt. gray	hand pump
6/13/01 12:54	4:39	10	66	surge	18.6	6.5	295.1	22.1	clear	hand pump
6/13/01 13:02	4:47	10	76	surge	18.6	6.5	304.6	2.9	clear	hand pump
6/13/01 13:30	5:15	2	78	-	18.5	6.5	282.6	30.1	clear	bailer
6/13/01 13:35	5:20	2	80	-	18.6	6.5	283.1	28.2	clear	bailer
6/13/01 13:46	5:31	2	82	-	18.5	6.5	283.0	20.0	clear	bailer

MONITORING WELL DEVELOPMENT LOG

DATE	3/26/01	TOTAL WELL DEPTH (TWD); TOP OF CASING =	40.88 1/100 ft
PERSONNEL	TJB	DEPTH TO GROUND WATER (DGW) =	31.79 1/100 ft
SITE	JMN/Cleveland Container LF - Shelby, NC	LENGTH OF WATER COLUMN (LWC) = TWD - DGW =	9.09 1/100 ft
JOB #	J01-1307-09	1 CASING VOLUME (CV) = LWC x 0.17 =	1.5 gallons
WELL ID	MW-7A	NUMBER CV REMOVED =	56 CV
		TOTAL VOLUME OF WATER REMOVED =	86 gallons
		METHOD OF WELL DEVELOPMENT =	bailer
		WELL YIELD =	Moderate yield

TIME	ELAPSED DEV. TIME (hrs)	VOLUME PURGED event (gallons)	VOLUME PURGED total (gallons)	SURGE	WATER TEMP (C)	pH (units)	SPECIF. COND. (µmho/cm)	TURBIDITY (NTU)	COLOR (subjective)	PURGING METHOD
3/26/01 9:20	0	0	0	-	13.3	4.5	151.3	2.69	clear	bailer
3/26/01 9:40	0:20	2	2	surge	14.0	4.5	148.5	55.8	brown/gray	bailer
3/26/01 9:59	0:39	4	6	surge	12.7	5	155.9	812	brown/gray	bailer
3/26/01 10:12	0:52	2	8	surge	13.3	5	158.7	>1000	brown/gray	bailer
3/26/01 10:16	0:56	2	10	-	12.3	5	156.5	239	tan	bailer
3/26/01 10:25	1:05	2	12	surge	13.9	5	166.9	659	tan	bailer
3/26/01 10:33	1:13	2	14	-	13.6	5	160.3	679	tan	bailer
3/26/01 11:00	1:40	6	20	surge	13.6	5	167.2	1150	tan	bailer
3/26/01 11:08	1:48	2	22	surge	13.7	5	160.1	1259	tan	bailer
3/26/01 11:25	2:05	4	26	surge	13.6	5	166.5	850	tan	bailer
3/26/01 11:38	2:18	4	30	surge	13.6	5	164.8	698	tan	bailer
3/26/01 12:06	2:46	4	34	surge	15.8	5	154.5	158	lt. tan	bailer
3/26/01 13:35	4:15	6	40	-	14.8	5	157.7	991	tan	bailer
3/26/01 14:01	4:41	8	48	-	15.4	5	162.1	448	tan	bailer
3/26/01 14:20	5:00	4	52	-	14.7	5	169.9	273	lt. tan	bailer
3/26/01 14:34	5:14	4	56	-	15.3	5	165.4	278	lt. tan	bailer
3/26/01 14:42	5:22	4	60	-	15.2	5	156.4	135	lt. tan	bailer
3/26/01 14:51	5:31	4	64	-	14.7	5	159.6	138	lt. tan	bailer
3/26/01 15:00	5:40	2	66	-	15.1	5	168.4	85	v. lt. tan	bailer
3/26/01 15:06	5:46	2	68	-	14.6	5	155	96	v. lt. tan	bailer
3/26/01 15:15	5:55	2	70	-	14.4	5	157.5	110	v. lt. tan	bailer
3/26/01 15:28	6:08	4	74	-	13.7	5	157.4	130	v. lt. tan	bailer
3/26/01 15:36	6:16	2	76	-	14.3	5	167.3	96	v. lt. tan	bailer
3/26/01 15:55	6:35	2	78	-	13.8	5	156.3	90	v. lt. tan	bailer
3/26/01 16:12	6:52	4	82	-	13.9	5	157.8	98	v. lt. tan	bailer
3/26/01 16:19	6:59	2	84	-	13.7	5	155.9	99	v. lt. tan	bailer
3/26/01 16:26	7:06	2	86	-	14.0	5	157	104	v. lt. tan	bailer
3/27/01 8:00	7:06	0	86	-	12.9	5	159.9	0.95	clear	bailer