Appendix B

Local Government Approval Documentation

AFFIDAVIT OF PUBLICATION

NORTH CAROLINA.
Johnston County.) Ss.

NOTICE OF PUBLIC HEARING

The Johnston County Board of Commissioners will hold a public hearing on Tuesday, January 3, 2006, at 1:15 p.m., or as soon thereafter as possible, in the Commissioners' meeting room, Johnston County Courthouse Annex, Smithfield, N.C. 27577.

The public hearing will be for the purpose of informing the community and receiving public comment concerning the proposed amendment of the Johnston County Landfill Facility Plan. The proposed amendment involves the determination of the location and construction and operation of a County solid waste transfer station.

David E. Holt, Deputy Clerk
Johnston County
The Board of Commissioners
November 22

Before the undersigned, a Notary Public of Chatham County North Carolina, duly commissioned and authorized to administer oaths, affirmations, etc., personally appeared Donna Clayton, who, being duly sworn or affirmed, according to law, doth depose and say that she is Billing Manager-Legal Advertising of The Herald a corporation organized and doing business under the Laws of the State of North Carolina, and publishing a newspaper known as The Herald , in the City of Smithfield , Johnston County and State aforesaid, the said newspaper in which such notice, paper, document, or legal advertisement was published was, at the time of each and every such publication, a newspaper meeting all of the requirements and qualifications of Section 1-597 of the General Statutes of North Carolina and was a qualified newspaper within the meaning of Section 1-597 of the General Statutes of North Carolina, and that as such she makes this affidavit; that she is familiar with the books, files and business of said corporation and by reference to the files of said publication the attached advertisement for JOHNSTON COUNTY was inserted in the aforesaid newspaper on dates as follows: 11/22/05

Account Number: 98951001

The above is correctly copied from the books and files of the aforesaid Corporation and publication.

Donna Clayton

Billing Manager-Legal Advertising

Sworn or affirmed to, and subscribed before me, this 28 day of NOVEMBER , 2005 AD

In Testimony Whereof, I have hereunto set my hand and affixed my official seal, the day and year aforesaid.

Janet Scroggs

Notary Public

My commission expires 14th of March 2009.

Janet Scroggs Notary Public Chatham County, NC

JOHNSTON COUNTY

JOHNSTON COUNTY LANDFILL
RESOLUTION TO APPROVE THE AREA 2 C&D LANDFILL UNIT AND AMENDED LANDFILL FACILITY PLAN

BE IT RESOLVED that the Board of County Commissioners of Johnston County hereby grants approval for the issuance of a landfill permit by the Division of Waste Management for the Area 2 construction and demolition debris (C&D) landfill unit including an amended facility plan for the entire landfill facility in compliance with North Carolina Solid Waste Management Rules T15A NCAC 13B.1618(c)(5)(A). The proposed Area 2 landfill unit consists of up to approximately 15.8 acres of waste footprint located within the previously approved landfill facility boundary (approximate 500 acre tract owned by the County) as shown on Drawing S2 of Permit Drawings dated October 2005 (see attached). The Board of County Commissioners hereby approves the following items related to the proposed landfill unit and amended landfill facility plan:

1. Service Area:
   The landfill serves the State of North Carolina.

2. Disposal Rates:
   The landfill facility will accept waste at the following maximum rates (tons/day is based on 312 operating days per year):

   2006-2015 350,000 tons/year (1,122 tons/day)
   2016-2025 401,000 tons/year (1,285 tons/day)
   2026-2035 452,000 tons/year (1,449 tons/day)
   2036-2045 505,000 tons/year (1,619 tons/day)
   2046-2055 568,000 tons/year (1,821 tons/day)

   Of the rates shown, a maximum of 156,000 tons/year (500 tons/day) will be from outside the County.

3. Landfill Volumes:
   The landfill facility will provide the following gross volumes (volume of waste plus periodic and final cover soil) consistent with the contours shown on the Drawing S3 of the Permit Drawings dated October 2005 (see attached):

Landfill Units	Total Waste Footprint	Gross Volume
Lined MSW (Phases 4A and 5-10)	154.7 AC	18,367,420 CY
C&D (Areas 1 and 2)	32.0 AC	1,489,824 CY

4. Landfill Service Life:
Depending upon the actual disposal rates, the landfill is projected to have an approximate service life of between 29 and 46 years (MSW units) and between 12 to 14 years (C&D units).

Adopted, this 3rd day of January, 2006.

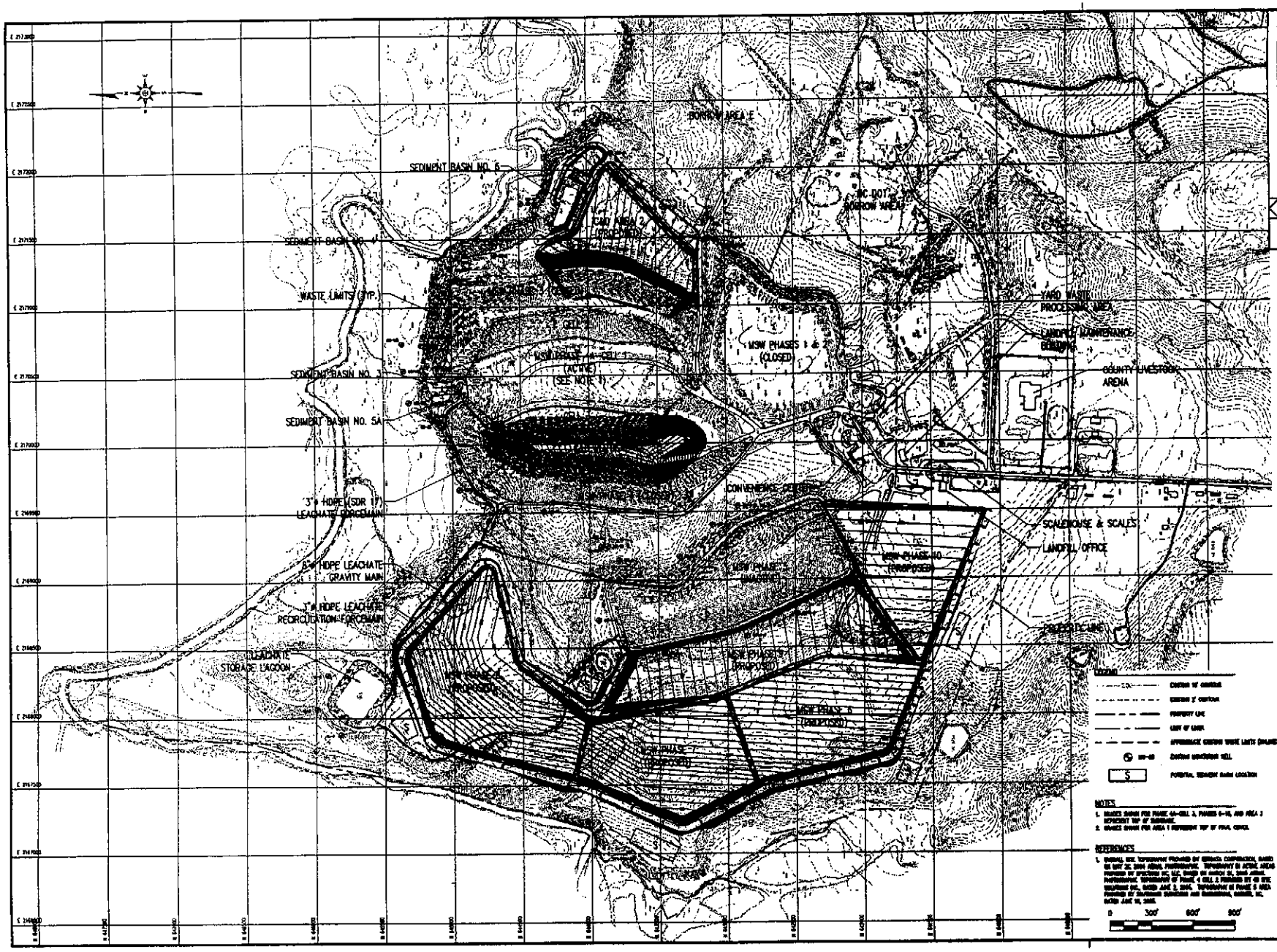
JOHNSTON COUNTY BOARD OF COMMISSIONERS

Cookie Pope

Cookie Pope, Chairman

April N. Byrd

Attest: April N. Byrd
Clerk to the Board



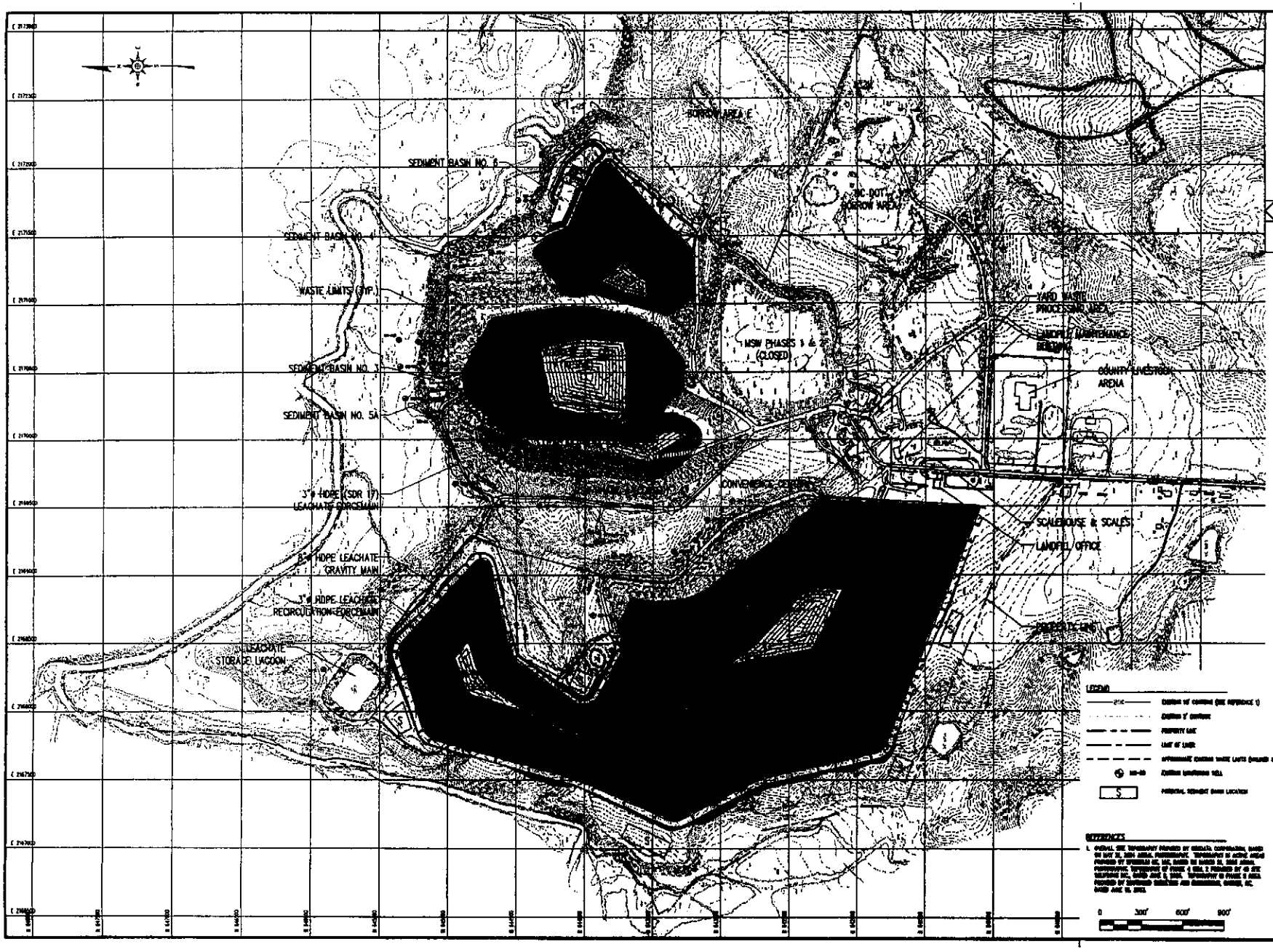
G. N. RICHARDSON & ASSOCIATES, INC.

JOHNSTON COUNTY C&D LANDFILL
AREA 2
PERMIT DRAWINGS

SITE DEVELOPMENT PLAN
BASE GRADES
(MSW AND C&D UNITS)

DRAWN BY: P.A.G.
CHECKED BY:
DRAWN BY: J.A.L.
PROJECT NO.:
SCALE:
DATE:
FILE NAME:

SHEET NO. 3
DRAWING NO. S2



G. N. RICHARDSON & ASSOCIATES, INC.

JOHNSTON COUNTY C&D LANDFILL
AREA 2
PERMIT DRAWINGS

SITE DEVELOPMENT PLAN
FINAL COVER GRADES
(MSW AND C&D UNITS)

4 | S3

That Johnston County has substantially complied or will substantially comply with all Federal, State, and local laws, rules, regulations, and ordinances applicable to the project and to the grants pertaining thereto.

Adopted this the 3rd day of January 2006 at Smithfield, North Carolina.

5. **Public Hearing – 1:15 p.m. – Proposed Amendment to County Landfill Facility Plan**
Advertised: November 22, 2005 The Smithfield Herald

The Chairman opened the public hearing and stated the purpose of the hearing is to inform the community and receive public comment concerning a proposed amendment to the Johnston County Landfill Facility Plan. The proposed amendment involves the permitting and installation of a construction and demolition (C&D) landfill cell.

Haywood M. Phthisic, Assistant Public Utilities Director, informed the Board that he would be presenting the County's Solid Waste Plan for development of the next Construction and Demolition phase (C&D - Area 2) and an amended facility plan for the entire landfill facility, and also requesting expansion of the landfill service area. He presented a power-point presentation, which included the following information:

- Aerial photo of the County's Solid Waste Facilities located on County Home Road, north of Smithfield.
- Graph illustrating solid waste trends (municipal solid waste (MSW), construction and demolition (C&D), and yard waste) from 1998 to 2005.
- Current solid waste disposal rates from July 1, 2004 to June 30, 2005; MSW disposal rate of 350 tons per day, and C&D disposal rate of 100 tons per day.
- MSW projections for 2015, 2025, and 2035.
- Current solid waste facility plan.
- Proposed solid waste plan amendment outlining proposed expansion areas; the proposed C&D – Area 2 is located to the east of the active sites, and the proposed MSW – Phase 5-10 cells are located to the west of the active sites.
- Cross section view of permitted and proposed facility plan; the proposed MSW – Phases 6-10 cells would top-out at 375 ft. above sea level; the current MSW - Phase 5 cell tops-out at 250 ft.
- Total operating capacity and life expectancy of proposed facility plan; the proposed lined cells would provide 15,135,600 cubic yards of air space, and life expectancy is up to 46.3 years; the proposed C&D – Area 2 would provide 1,254,045 cubic yards of air space, and life expectancy is up to 14.2 years.

Further, Mr. Phthisic stated the County's current permit only allows the landfill to accept waste from inside the county. He requested the Board approve the expansion of the landfill's service area to include the State of NC, with the stipulation that the Board of Commissioners must approve acceptance of waste from outside the county.

In response to questions from Commissioner Wade M. Stewart, Mr. Phthisic noted that since 1997, County policy has been to assess a fee four times the normal tipping fee charge for waste identified as coming from outside the county. He pointed out that expansion of the service area to include all of NC would allow Johnston County to assist other landfills in times of crises, i.e., hurricanes and other natural disasters.

County Manager Rick Hester clarified the Board would have to approve acceptance of waste from outside the county.

Commissioner Allen L. Mims, Jr. questioned whether accepting waste from outside Johnston County would affect the anticipated 70 year life of the County's landfill.

Mr. Phthisic responded the landfill's capacity would not be affected, given the County does not accept huge amounts of waste in times of crises from outside the county.

Commissioner Mims expressed that he did not have a problem with expanding the service area as long as all requests come before the Board of Commissioners for approval. Commissioner Jeffrey P. Carver agreed.

County Attorney Mark Payne added that expanding the service area would not affect the State's ability to force Johnston County to accept waste from other counties.

Dr. Greg Richardson, County Landfill Consultant, stated the power to control the acceptance of solid waste resides with the local authority, and pointed out the service area could be revised again at a later date, if the Board chose to take this action. He noted that Johnston County has the largest potential reserve capacity in the State.

In response to a question from Commissioner Cookie Pope regarding the difference between Johnston and Sampson counties, Mr. Richardson responded that Sampson County is a privately operated landfill, however, the County is still responsible for the landfill.

In response to a question from Commissioner Stewart, Mr. Phthisic stated the current landfill plan anticipates an approximate service life of between 29 and 46 years for MSW units, and 12 to 14 years for C&D units; however, he pointed out this plan does not include the additional acreage purchased.

Dr. Richardson added that, considering the additional acreage, Johnston County has the largest potential reserve capacity in the State.

Mr. Phthisic reiterated his request, and asked the Board to adopt a proposed resolution granting approval for the issuance of a landfill permit by the Division of Waste Management for the C&D – Area 2 landfill unit including an amended facility plan for the entire landfill facility, and expansion of the service area to include the State of NC.

There being no further comments, the Chairman closed the public hearing.

Decision Postponed Until January 3, 2006 6:00 pm Board Meeting

Commissioner Allen L. Mims, Jr. requested the Board postpone decision on the item until the January 3rd 6:00 pm meeting to allow Commissioner Mims ample time to review the proposed resolution. It was agreed that the decision be postponed as requested.

6. Surplus Property – Public Utilities

Haywood M. Phthisic, Assistant Public Utilities Director, requested the Board declare surplus the Trimble Pathfinder surveying equipment. In response to a question from Commissioner Wade M. Stewart, Mr. Phthisic noted the equipment, which uses Global Positioning Satellites (GPS), was purchased in 1997, and is now obsolete. The cost to keep the unit operational is greater than the replacement cost due to technological improvements.

Upon a motion by Commissioner DeVan Barbour, seconded by Commissioner Jeffrey P. Carver and carried by unanimous vote, the Board declared surplus the Trimble Pathfinder surveying equipment used by the Public Utilities department.

7. Board of Education – Request Approval of Budget Amendment

Chairman Pope postponed discussion of the item until a later date. (The Board of Education was requesting approval of a budget amendment, in the amount of $204,183.43, to adjust remaining bond balances to begin restoration of the South Campus Community School Gym.)

8. Board of Education - Request for Additional State ADM Construction Funding

On behalf of the Board of Education, Dr. Anthony Parker, Superintendent for Johnston County Schools, asked the Board to approve a request for additional State ADM Construction Funding, in the amount of $208,863, to allow early demolition of the three story building at Meadow Elementary School. He stated the Board of Education would like to authorize demolition of the three story building prior to the next bond sale scheduled for early summer 2006; the project was originally scheduled to be funded by this bond sale.

Commissioner Wade M. Stewart noted it was his understanding that the projected $2.5 million in funds from the summer 2006 bond sale is designated for the demolition of the three story building, and the construction of a new addition at the site. He questioned if $2.3 million from the bond sale would cover the

I hereby certify that this is a true and accurate copy which appears on record in the Minute Book of the Johnston County Board of Commissioners, Johnston County, N.C.
In Book 24, Page 380-381
Witness my hand and seal this the 7 day of Feb 2006
April N. Byrd, Clerk Dea C. Holt, Deputy Clerk
Johnston County Board of Commissioners

Pope, Commissioner Stewart noted that $2.3 million would cover the remainder of the project. He pointed out that there have been both under-runs and over-runs with several of the bond projects so far.

Commissioner DeVan Barbour, seconded by Commissioner Tony Braswell and carried by unanimous vote, the Board approved the Board of Education's request for additional State ADM

4. Board Reports and Comments

(A) Resolution To Approve the Area 2 C&D Landfill Unit and Amended Johnston County Landfill Facility Plan

Upon a motion by Commissioner Allen L. Mims, Jr., seconded by Commissioner DeVan Barbour and carried by unanimous vote, the Board adopted the following resolution approving the Area 2 C&D Landfill Unit and Amended Johnston County Landfill Facility Plan, as discussed at a public hearing held on January 3, 2006 at 1:15 pm:

RESOLUTION TO APPROVE THE AREA 2 C&D LANDFILL UNIT AND AMENDED JOHNSTON COUNTY LANDFILL FACILITY PLAN

BE IT RESOLVED that the Board of County Commissioners of Johnston County hereby grants approval for the issuance of a landfill permit by the Division of Waste Management for the Area 2 construction and demolition debris (C&D) landfill unit including an amended facility plan for the entire landfill facility in compliance with North Carolina Solid Waste Management Rules T15A NCAC 13B.1618(c)(5)(A). The proposed Area 2 landfill unit consists of up to approximately 15.8 acres of waste footprint located within the previously approved landfill facility boundary (approximate 500 acre tract owned by the County) as shown on Drawing S2 of Permit Drawings dated October 2005 (see attached). The Board of County Commissioners hereby approves the following items related to the proposed landfill unit and amended landfill facility plan:

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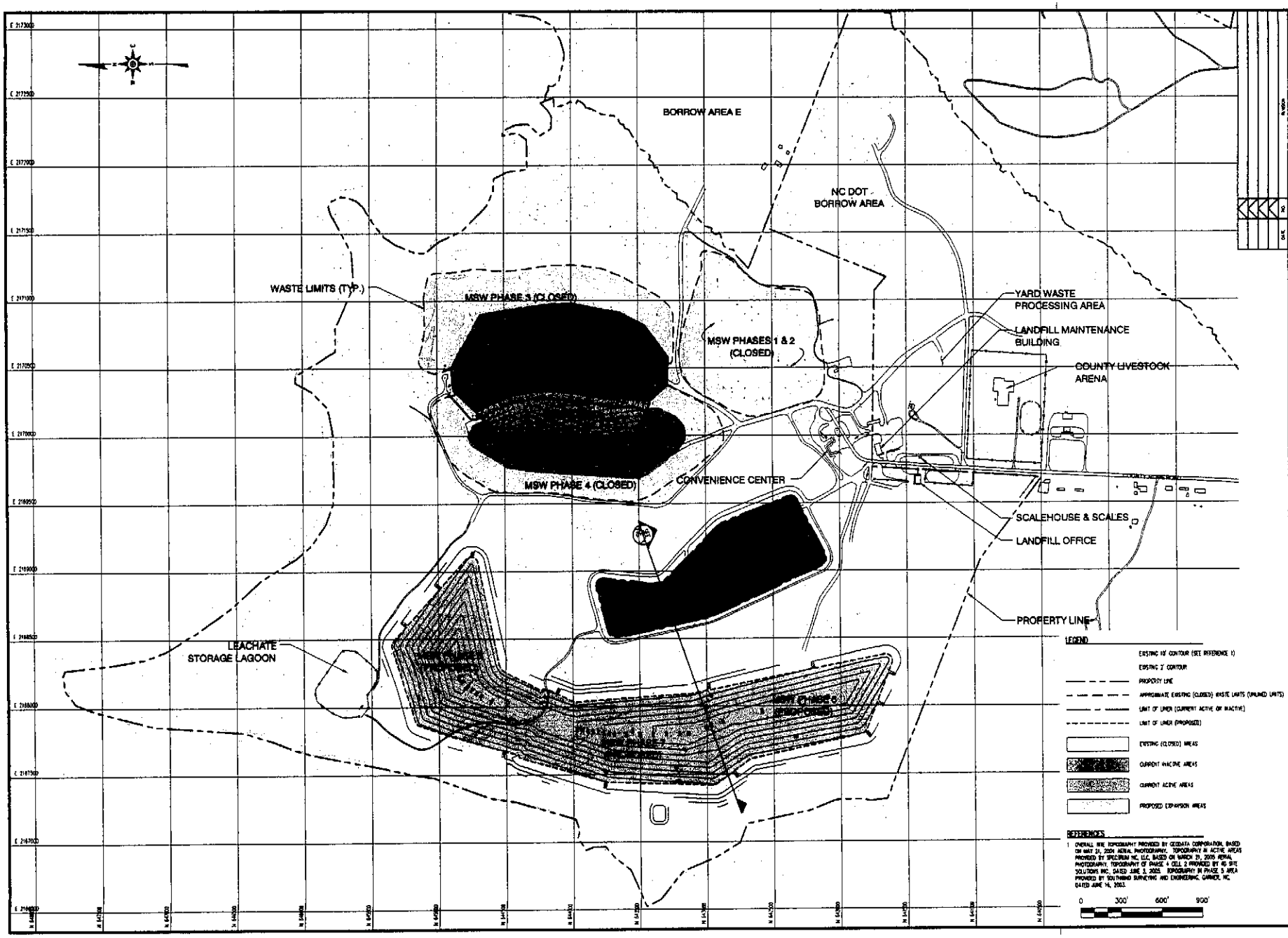
I hereby certify that this is a true and accurate copy which appears on record in the Minute Book of the Johnston County Board of Commissioners, Johnston County, N.C.
In Book 24, Page 396
Witness my hand and seal this the 1 day of February 20 06
Dera C. Holt
~~April N. Byrd, Clerk~~ Dera C. Holt, Deputy Clerk
Johnston County Board of Commissioners


BORROW AREA E
NC DOT BORROW AREA
WASTE LIMITS (TYP.)
MSW PHASE 3 (CLOSED)
MSW PHASES 1 & 2 (CLOSED)
MSW PHASE 4 (CLOSED)
CONVENIENCE CENTER
YARD WASTE PROCESSING AREA
LANDFILL MAINTENANCE BUILDING
COUNTY LIVESTOCK ARENA
SCALEHOUSE & SCALES
LANDFILL OFFICE
PROPERTY LINE
LEACHATE STORAGE LAGOON
LEGEND
EXISTING 10' CONTOUR (SEE REFERENCE 1)
EXISTING 2' CONTOUR
PROPERTY LINE
APPROXIMATE EXISTING (CLOSED) WASTE LIMITS (UNLINED LIMITS)
LIMIT OF LINER (CURRENT ACTIVE OR INACTIVE)
LIMIT OF LINER (PROPOSED)
EXISTING (CLOSED) AREAS
CURRENT INACTIVE AREAS
CURRENT ACTIVE AREAS
PROPOSED EXPANSION AREAS
REFERENCES
1 OVERALL SITE TOPOGRAPHY PROVIDED BY GEODATA CORPORATION, BASED ON MAY 31, 2004 AERIAL PHOTOGRAPHY. TOPOGRAPHY IN ACTIVE AREAS PROVIDED BY SPECIRUM NC, LLC, BASED ON MARCH 21, 2005 AERIAL PHOTOGRAPHY. TOPOGRAPHY OF PHASE 4 CELL 2 PROVIDED BY 45 SITE SOLUTIONS INC. DATED JUNE 3, 2005. TOPOGRAPHY IN PHASE 5 AREA PROVIDED BY SOUTHERN SURVEYING AND ENGINEERING, GARNER, NC. DATED JUNE 14, 2003.
0 300' 600' 900'
G. N. RICHARDSON & ASSOCIATES, INC.
Engineering and Geological Services
14 N. Boylan Ave.
Raleigh, N.C. 27603
www.gnra.com
ph: 919-828-0577
fax: 919-828-3889
NO. REVISION DATE
JOHNSTON COUNTY, NORTH CAROLINA
DEPT. OF PUBLIC UTILITIES
JOHNSTON COUNTY LANDFILL
SITE DEVELOPMENT PLAN
PERMITTED FACILITY PLAN
EXISTING & PROPOSED AREAS
DESIGNED BY: P.K.A.
DRAWN BY: C.T.J.
CHECKED BY:
PROJECT NO: JOHN-99
SCALE: AS SHOWN
DATE: DEC. 2005
FILE NAME: JOHN-FD005
SHEET NO.
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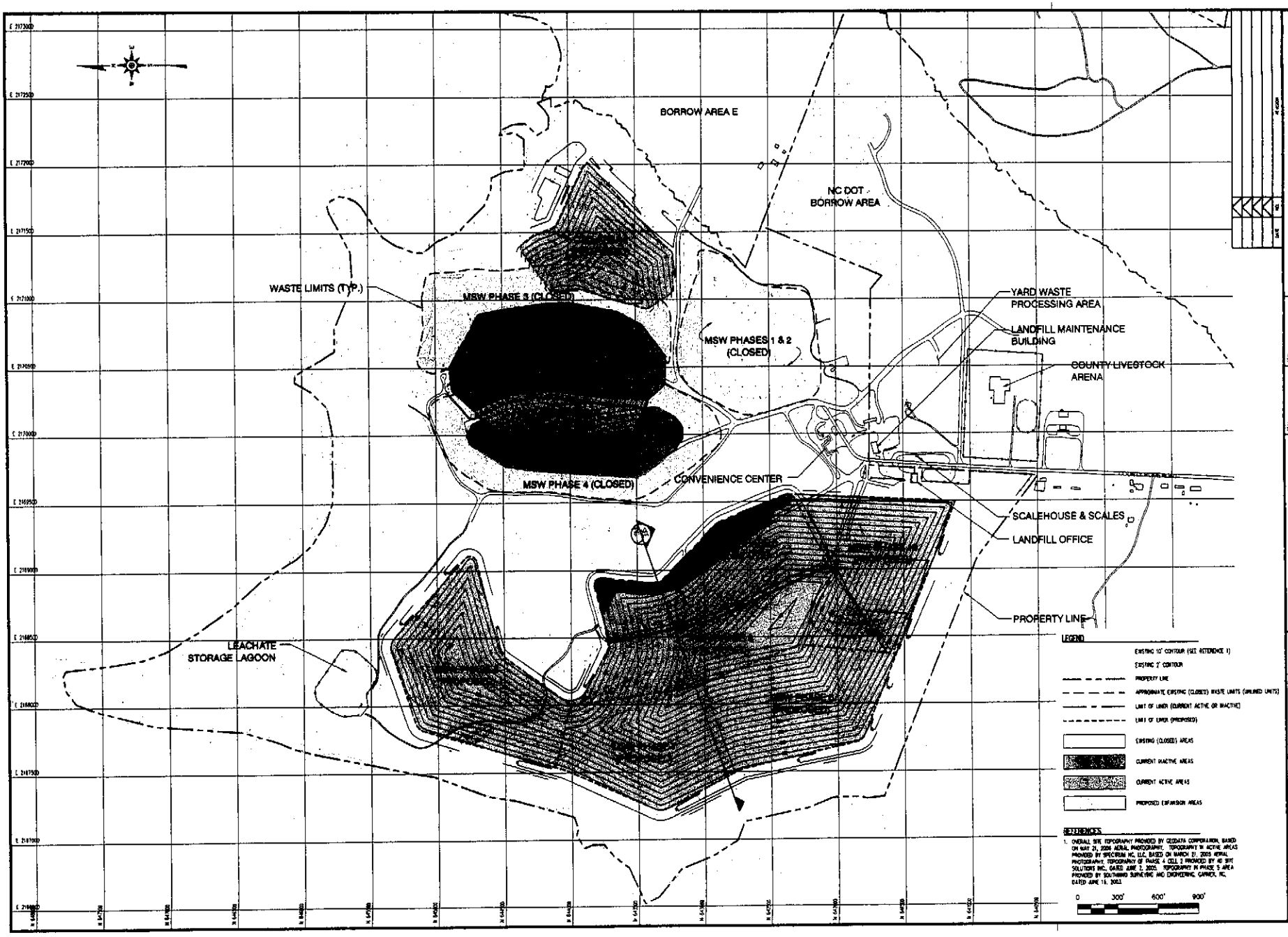
BORROW AREA E
NC DOT BORROW AREA
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MSW PHASE 4 (CLOSED)
CONVENIENCE CENTER
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LANDFILL MAINTENANCE BUILDING
COUNTY LIVESTOCK ARENA
SCALEHOUSE & SCALES
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0 300' 600' 900'
G. N. RICHARDSON & ASSOCIATES, INC.
Engineering and Geological Services
1416 Boylan Ave.
Raleigh, N.C. 27603
www.gnra.com
ph: 919-828-0877
fax: 919-828-3899
JOHNSTON COUNTY, NORTH CAROLINA
DEPT. OF PUBLIC UTILITIES
JOHNSTON COUNTY LANDFILL
SITE DEVELOPMENT PLAN
PROPOSED FACILITY PLAN
EXISTING & PROPOSED AREAS
DESIGNED BY: P.K.B.
DRAWN BY: C.T.J.
CHECKED BY:
PROJECT NO.: 2014-08
SCALE: AS SHOWN
DATE: DEC. 2005
FILE NAME: JOHN-CONN
SHEET NO.
DRAWING NO.: FIG. 2
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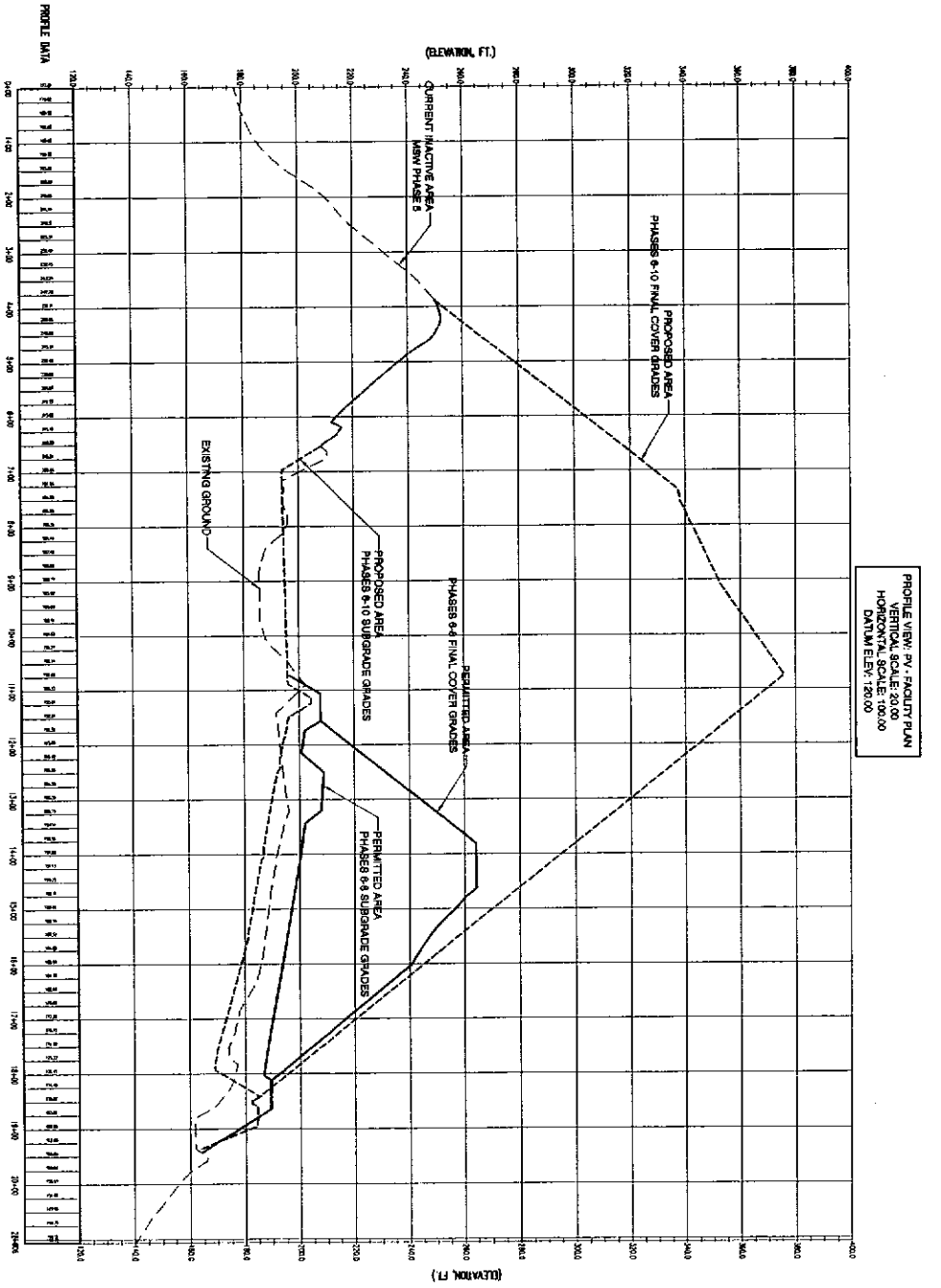

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0 20 40 60

DATE	NO.	REVISION

DRAWING TITLE: CROSS SECTION COMPARISON OF PERMITTED AND PROPOSED FACILITY PLANS

PROJECT NO.: JOHNSTON COUNTY, NORTH CAROLINA
DEPT. OF PUBLIC UTILITIES
JOHNSTON COUNTY LANDFILL
SITE DEVELOPMENT PLAN

SEAL

SEAL

G. N. RICHARDSON & ASSOCIATES, INC.
Engineering and Geological Services
14 N. Boylan Ave.
Raleigh, N.C. 27603
www.gnra.com
ph: 919-828-0577
fax: 919-828-3688

FIG. 3

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Johnston County

PLANNING & ZONING DEPARTMENT

"Here To Serve . . ."

February 01, 2006

Mr. Edward F. Mussler, P.E.
NC DENR Division of Waste Management
401 Oberlin Road, Suite 150
Raleigh, North Carolina 27605

RE: Johnston County Landfill - Permit No. 51-03
C&D Landfill - Area 2
Demonstration of Consistency with Zoning Ordinances

Dear Mr. Mussler:

In compliance with 15A NCAC 13B.500(1)(e)(ii) and 13B.1618(c)(5)(B), this letter is to notify you that the proposed Area 2 C&D landfill unit at the Johnston County Landfill is part of the currently permitted landfill site and that this site meets the applicable zoning requirements of Johnston County.

Should you have any questions or require clarification, please contact me at your earliest convenience.

Sincerely,

Johnston County Planning Director

cc: Pieter Scheer, G.N. Richardson & Associates

309 East Market Street • Smithfield, NC 27577
Telephone (919) 989-5150 • (Fax) (919) 989-5426
www.johnstonnc.com

Johnston County
DEPARTMENT OF PUBLIC UTILITIES
POST OFFICE BOX 2263
SMITHFIELD, N.C. 27577
(919) 989-5075

February 01, 2006

Mr. Edward F. Mussler, P.E.
NC DENR Division of Waste Management
1646 Mail Service Center
Raleigh, North Carolina 27699-1646

RE: Johnston County Landfill - Permit No. 51-03
C&D Landfill - Area 2
Demonstration of Consistency with Solid Waste Management Plan

Dear Mr. Mussler:

In compliance with 15A NCAC 13B.1618(c)(5)(C), this letter is to notify you that the operation of the proposed Area 2 C&D landfill unit at the Johnston County Landfill is consistent with Johnston County's approved solid waste management plan.

Should you have any questions or require clarification, please contact us at your earliest convenience.

Sincerely,

Haywood M. Phthisic, III
Assistant Director

cc: Pieter Scheer, G.N. Richardson & Associates
Timothy G. Broome, P.E.

Printed on recycled paper

State of North Carolina
Department of Environment,
Health and Natural Resources
Division of Parks & Recreation

James B. Hunt, Jr., Governor
Jonathan B. Howes, Secretary
Dr. Philip K. McKnelly, Director

RECEIVED
JUL 25 1994
Ans'd.....

DEHNR

July 20, 1994

Mike Sanchez
McKim and Creed
5625 Dillard Road
Building I, Suite 117
Cary, NC 27511

Subject: Proposed Landfill Expansion, Johnston County; Potential Impacts on Threatened and Endangered Species

Dear Mr. Sanchez,

Middle Creek contains populations of several rare species of aquatic animals, the most significant of which is the dwarf wedge mussel (Alasmidonta heterodon), federally and state-listed as Endangered. Other rare species include the Atlantic pigtoe (Fusconaia masoni), a candidate for federal listing and state-listed as Threatened; the brook floater (Alasmidonta undulata), state-listed as Threatened; the squawfoot (Strophitus undulatus), state-listed as Threatened; eastern lampmussel (Lampsilis radiata), state-listed as Special Concern; Neuse River waterdog (Necturus lewisii), state-listed as Special Concern; and Carolina madtom (Noturus furiosus), state-listed as Special Concern. Because of the high concentration of rare species within this drainage, Middle Creek has been identified as a Significant Aquatic Habitat by the Natural Heritage Program.

All of these species, but particularly the dwarf wedge mussel and the other bivalve species, are adversely affected by siltation and other forms of water pollution. The expansion of the landfill immediately next to Middle Creek may therefore contribute to their overall decline within this stream (the existing landfill may also have had an impact).

The current status of these animals downstream from the project site is somewhat unclear. Mussel surveys have concentrated further upstream and we are unaware of any work that has been done in the vicinity of the 1162 bridge crossing. We do have records, however, for the Neuse River waterdog and the Carolina madtom from the lower reach of Middle Creek below the landfill site. The dwarf wedge mussel and other rare bivalves are also known to occur within Swift Creek a short distance upstream from its confluence with Middle Creek.

Because of these uncertainties we strongly recommend that a survey of the mussels and other rare aquatic species be conducted before this project proceeds. We suggest that the NC Nongame and Endangered Wildlife Program (Randall Wilson, 733-7291) be contacted for the most recent information regarding the status of mussels in this watershed and to identify appropriate personnel to conduct the survey. We further recommend that the US Fish and Wildlife Service be contacted due to the potential for impacts to a federally-listed species. We will defer to these two agencies regarding estimation of possible impacts and the best means to mitigate these impacts.

Thank you for allowing us to review the proposed project. If you have any further questions, please feel free to contact us.

Sincerely,

Stephen P. Hall

Stephen P. Hall
North Carolina Natural Heritage Program

McKIM&CREED

August 2, 1994 M&C 0358-0036.OR(10)

ENGINEERS
SURVEYORS
ARCHITECTS
PLANNERS

Mr. Max D. Bahos
Special Agent Law Enforcement
U.S. Fish and Wildlife Service
P.O. Box 33096
Raleigh, North Carolina 27636

Dear Mr. Bahos:

Pursuant to previous telephone conversations I have had with Mr. David Horning, U.S. Fish and Wildlife Service, this letter outlines various measures to be implemented at the proposed Johnston County Landfill site so as not to violate Section 9 of The Endangered Species Act of 1973. These measures are based on recommendations made by both Mr. John Fridell, U.S. Fish and Wildlife Service, and Mr. John Alderman, North Carolina Wildlife Resources Commission, and are designed to be protective of the Federally-endangered dwarf wedge mussel and other rare aquatic species identified by the North Carolina Natural Heritage Program as potentially impacted by the proposed Johnston County Landfill site.

An initial review of the project by Mr. Stephen Hall, North Carolina Natural Heritage Program, resulted in the identification of several rare aquatic species known to be present in Middle Creek. This stream borders not only the entire north perimeter and a portion of the west perimeter of the proposed landfill site, but also a portion of the east perimeter of the existing site. As we discussed, Mr. Hall stated that his office would defer to the U.S. Fish and Wildlife Service and the North Carolina Wildlife Resources Commission in estimating the possible impacts of the proposed landfill and the best means to mitigate these impacts.

Subsequently, Mr. Randall Wilson, North Carolina Wildlife Resources Commission, was contacted and in his review he seemed to indicate that an aquatic survey of Middle Creek should be performed to determine the presence of rare aquatic species in the vicinity of the proposed landfill site. However, upon further consideration by both Mr. Fridell and Mr. Alderman, a consensus was reached that since Middle Creek is known to contain these rare aquatic species and there is no evidence to indicate that the stretch of Middle Creek near the proposed landfill is devoid of these species, the most cost effective approach would be to assume that these species are present and allow for a 300-foot buffer between the proposed waste disposal boundaries and Middle Creek.

SUITE 117
BUILDING I
5625 DILLARD ROAD
IC 27511
NE 919/233-8091
919/233-8031

Furthermore, Mr. Fridell and Mr. Alderman both mentioned two additional critical factors to consider in protecting the rare aquatic species: leachate management strategy and erosion and sediment control. Mussels in particular are very sensitive to water quality, and therefore, may be adversely impacted by contaminants potentially present in leachate generated at the landfill and by accumulation of sediment deposits in the stream.

Proper leachate management at the proposed Johnston County landfill will involve a composite liner, leachate collection piping, leachate pretreatment, discharge of pretreated leachate to the Johnston County Wastewater Treatment Plant for final treatment and disposal, and a final cap system to be installed once the landfill reaches capacity. Erosion and sediment control will be achieved with properly sloped drainage pathways, stormwater diversion channels, slope drains, and sediment basins. The following discussion provides more detail regarding the leachate management system and the erosion and sediment control measures to be incorporated in the construction of the proposed landfill.

LEACHATE MANAGEMENT

Composite Liner. The composite liner will be constructed on the landfill subgrade and will be at an elevation at least four feet above the seasonal high groundwater table elevation. The composite liner will consist of a clay liner and a geomembrane liner. The clay liner will form the base of the landfill and will consist of 24-inch thick compacted clay with a permeability of no more than 1×10^{-7} cm/sec. Immediately above the clay liner, the geomembrane liner with a water vapor transmission rate less than or equal to 0.03 gm/m^2day will be installed.

Leachate Collection System. A leachate collection system will be constructed directly above the composite liner and will effectively collect and remove leachate from the landfill while maintaining a minimum 24-inches of separation between the waste and the base liner system. The leachate collection system will include a drainage layer, a pipe network with cleanouts, and the necessary filters designed to prevent physical clogging and promote leachate collection and removal from the landfill.

Pretreatment Unit. The leachate pretreatment unit will be located just north of the currently permitted Phase 4 landfill. The pretreatment unit will consist of an aerated lagoon capable of reducing the Biological Oxygen Demand (BOD), volatile organic compound, and metals concentrations potentially exhibited by the

leachate. In addition, this unit will serve as a temporary storage facility prior to off-site disposal of the treated leachate. Sludge removed from the lagoon will be tested and subsequently incorporated into the sludge land application program used for disposal of sludge from the Johnston County Wastewater Treatment Plant.

Off-site Disposal. A pumping station will be installed in the vicinity of the pretreatment unit. The pumping station will pump the treated leachate to the Johnston County Wastewater Treatment Plant for final disposal.

Final Cap System. The final cap system will consist of 18-inches of compacted clay that has a permeability of no more than 1×10^{-7} cm/sec. Six inches of earthen material capable of sustaining native plant growth will be installed directly on top of the compacted clay. In addition, a gas collection system will be installed below the clay layer so as to minimize pressures exerted on the barrier.

Most of the proposed leachate management system components listed above will serve to contain leachate generated at the landfill. The final cap system, however, will minimize the volume of leachate generated by preventing infiltration of stormwater into the landfill.

EROSION AND SEDIMENT CONTROL

Extensive sedimentation and erosion control measures will be implemented during construction and operation of the landfill. For example, the landfill will be filled in five to ten foot lifts sloped to promote drainage away from the working area. As the landfill is filled but before exceeding the surrounding grade elevation, temporary berms will be used to prevent stormwater from flowing into the landfill and temporary slope drains will be used to divert stormwater that enters the landfill away from the working area. Once the fill elevation exceeds the surrounding grade elevation, temporary slope drains will be lain from the top of the landfill down along the side slopes to a channel around the toe of the landfill. Stormwater drainage will be achieved on the top of the landfill by maintaining an adequate top surface slope (> 5%) so as to convey stormwater away from the working face. The drainage channel around the toe of the landfill will convey accumulated stormwater to a sedimentation basin near the toe of the landfill. The proposed sedimentation basins will be designed for the 24-hour, 25-year storm event, in order to comply with *15A NCAC 13B.1625(b)(3)(B)*. In addition, it should be noted that by filling the landfill in lifts and by progressively constructing the stormwater drainage system as described above, the site may be

easily closed out at any time during the facility life with minimal effort needed to control stormwater runoff.

In summary, we propose that the following provisions be incorporated into the design, construction, operation, and closure of the proposed landfill in order to comply with The Endangered Species Act of 1973:

1. A 300-foot buffer between the proposed Johnston County Landfill site waste disposal limits and Middle Creek.
2. A leachate management system as described above to include a composite liner, leachate collection piping, leachate pretreatment, discharge of pretreated leachate to the Johnston County Wastewater Treatment Plant for final treatment and disposal, and a final cap system to be installed once the landfill reaches capacity.
3. Erosion and sediment control measures as described above to include sloped drainage pathways, stormwater diversion channels, slope drains, and sediment basins.

We would appreciate your review and comment on these proposed provisions. If you determine that these measures adequately meet the U.S. Fish and Wildlife Service requirements for compliance with The Endangered Species Act of 1973, please provide written notification to us to that effect. Also, please contact either me or Mr. C.T. Clayton, P.E. with any questions or comments.

Sincerely,

MCKIM & CREED ENGINEERS, P.A.

Michael J.E. Sanchez, EIT

Michael J.E. Sanchez, E.I.T.
Project Engineer

cc: David Horning, U.S. Fish and Wildlife Service
John Fridell, U.S. Fish and Wildlife Service
Frank McBride, North Carolina Wildlife Resources Commission
John Alderman, North Carolina Wildlife Resources Commission
Randall Wilson, North Carolina Wildlife Resources Commission
Stephen Hall, North Carolina Natural Heritage Program
C.T. Clayton, McKim and Creed Engineers

United States Department of the Interior
FISH AND WILDLIFE SERVICE
DIVISION OF LAW ENFORCEMENT
P.O. Box 33096
Raleigh, North Carolina 27636
(919) 856-4786

RECEIVED
AUG 09 1994
Ans'd.....

August 5, 1994

Mr. Michael J. E. Sanchez
McKim and Creed Engineers
Suite 117, Building #1
5625 Dillard Road
Cary, North Carolina 27511

Re: Endangered Species Concerns at the Proposed Johnston County Landfill Site

Dear Mr. Sanchez:

I am writing in reference to your letter dated August 2, 1994 in which you requested input and concurrence from the U.S. Fish and Wildlife Service regarding the proposed provisions that are planned for the new Johnston County Landfill Site. Specifically, your request involved endangered species concerns and compliance with the Endangered Species Act of 1973.

After reviewing the details of your letter and the proposed provisions that McKim & Creed have recommended in order to protect the Federally-listed, endangered dwarf wedge mussel *(Alasmidonta heterodon)*, it appears that an aggressive and concentrated effort has been made to insure that the biotic integrity in Middle Creek and the surrounding areas will be preserved and that a violation of the Endangered Species Act does not occur.

The dwarf wedge mussel and its habitat are Federally-protected under the Endangered Species Act. Section 9 of the Act, which applies to both federal and nonfederal parties, specifically prohibits "taking" of endangered wildlife. "Taking" is defined as "harassing, harming, pursuing, hunting, shooting, wounding, killing, trapping, capturing, or collecting, or attempting to engage in any such conduct". The regulations define "harm" as "An act which actually kills or injures wildlife. Such an act may include significant habitat modifications or degradation where it actually kills or injures wildlife by significantly impairing essential behavior patterns, including breeding, feeding or sheltering". Further, "harass" is defined as "An intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering".

The harm definition as it relates to dwarf wedge mussels is significant since habitat modifications can lead to future deaths and injuries even though none may be caused at the time of construction or modification to the existing site. With that in mind, any future activities associated with the proposed landfill site which cause a "take" to occur in Middle Creek may be investigated as Section 9 violations.

As mentioned during our discussion on August 5, 1994, I feel that McKim & Creed should seriously consider contracting the services of a mussel expert in order to have a formal Biological Evaluation conducted on Middle Creek for the purpose of determining the present mussel population in the area. This study would not only provide documented information regarding the biotic community in Middle Creek, but also protect McKim & Creed from potential false accusations stemming from landfill activities in the future.

The U.S. Fish and Wildlife Service appreciates the opportunity to assist you in your efforts on behalf of the dwarf wedge mussel and remain ready to coordinate and work with you on this and other projects in the future.

Sincerely yours,

Max D. Bahos
Special Agent, Raleigh, North Carolina

North Carolina Wildlife Resources Commission

512 N. Salisbury Street, Raleigh, North Carolina 27604-1188, 919-733-3391
Charles R. Fullwood, Executive Director

August 2, 1994

TO: Mike Sanchez

FROM: Franklin T. McBride, Program Manager
Habitat Conservation Program

SUBJECT: Johnston County Landfill Site Application

I talked with Mr. John Alderman concerning the recommended mussel survey. He indicated that since dwarf wedge mussels have been collected from Middle Creek above the proposed landfill site, it should be assumed that the species is present at the site. If this assumption is accepted and if a continuous 300 ft. wide, undisturbed buffer zone adjacent to Middle Creek is included as a condition of the permit, we feel that another mussel survey would not be necessary.

If you need additional information please call me at (919) 528-9886.

cc: John Holley, Land Quality Section
Wayne Jones, District 3 Fisheries Biologist

RECEIVED
MAR 21 1994
Rec'd

North Carolina Department of Cultural Resources

James B. Hunt, Jr., Governor
Betty Ray McCain, Secretary

Division of Archives and History
William S. Price, Jr., Director

March 16, 1994

C. T. Clayton, PE
McKim & Creed Engineers, PA
Suite 117, Buidling 1
5625 Dillard Road
Cary, NC 27511

Re: Johnson County High-Tech Landfill
ER 94-8402

Dear Mr. Clayton:

Thank you for your letter of February 25, 1994, concerning the above project.

There are no known recorded archaeological sites within the project boundaries. However, the project area has never been systematically surveyed to determine the location of significance of archaeological resources. The proposed project area contains a high probability for the presence of significant prehistoric archaeological resources.

We recommend that a comprehensive survey be conducted by an experienced archaeologist to identify the presence and significance of archaeological remains that may be damaged or destroyed by the proposed project. Potential effects on unknown resources should be assessed prior to the initiation of construction activities.

Enclosed is a list of archaeological consultants who have conducted or expressed an interest in conducting contract work in North Carolina. Individual files providing additional information on the consultants may be examined at the State Historic Preservation Office's Office of State Archaeology, 421 North Blount Street, Raleigh. If additional names are desired, you may consult the current listing of the members of the Society of Professional Archaeologists, or contact the society's current secretary/treasurer, David L. Carlson, Department of Anthropology, Texas A&M University, College Station, Texas 77843-4352, telephone 409/845-4044. Any of the above persons, or any other experienced archaeologist, may be contacted to conduct the recommended investigation.

We have conducted a search of our files and are aware of no structures of historical or architectural importance located within the planning area.

The above comments are made pursuant to Section 106 of the National Historic Preservation Act of 1966 and the Advisory Council on Historic Preservation's Regulations for Compliance with Section 106, codified at 36 CFR Part 800.

Thank you for your cooperation and consideration. If you have questions concerning the above comment, please contact Renee Gledhill-Earley, environmental review coordinator, at 919/733-4763.

Sincerely,

David Brook

David Brook
Deputy State Historic Preservation Officer

DB:slw

Enclosures

cc: Division of Solid Waste, DEHNR

North Carolina Department of Cultural Resources

James B. Hunt, Jr., Governor
Betty Ray McCain, Secretary

Division of Archives and History
William S. Price, Jr., Director

December 6, 1994

Michael J. E. Sanchez, E.I.T.
Project Engineer
McKim & Creed
Suite 117, Building 1
5625 Dillard Road
Cary, NC 27511

RECEIVED
DEC 9 1994
Ans'd.....

Re: Archaeological survey report, Johnston County Landfill, ER 94-8402, ER 95-7783

Dear Mr. Sanchez:

Thank you for your letter of October 25, 1994, and the accompanying archaeological survey report by Thomas Hargrove. We apologize for the delay in our response.

For purposes of compliance with Section 106 of the National Historic Preservation Act, we concur that the following properties are not eligible for the National Register of Historic Places under Criterion D:

31JT265&265**, 31JT266, 31JT267, 31JT268, 31JT269, 31JT270&270**, 31JT271&271**, 31JT272**, 31JT273, 31JT274, 31JT275, 31JT276

All of these sites are too disturbed to retain sufficient integrity to yield information important to history or prehistory.

The report meets our office's guidelines and those of the Secretary of the Interior. Based on the results of the survey, we do not recommend additional archaeological investigations at the proposed landfill site.

The above comments are made pursuant to Section 106 of the National Historic Preservation Act of 1966 and the Advisory Council on Historic Preservation's Regulations for Compliance with Section 106, codified at 36 CFR Part 800.

Thank you for your cooperation and consideration. If you have questions concerning the above comment, please contact Renee Gledhill-Earley, environmental review coordinator, at 919/733-4763.

Sincerely,

David Brook

David Brook
Deputy State Historic Preservation Officer

DB:slw

cc: North Carolina Division of Solid Waste
T. Hargrove

An Archæological Survey of the Proposed Johnston County Landfill Expansion, Smithfield Vicinity, Johnston County, North Carolina.

Thomas Hargrove

June 1994

ER 94-8402

A Report Submitted to McKim & Creed Engineers,
by
Archæological Research Consultants, Inc.,
Raleigh, North Carolina.

Contents

Management Summary 1
Introduction 2
Physical Environment 3
Prehistoric Background 3
Archæological Research in the Project Vicinity 4
Historical Background 4
Field Methods 5
Results of the Survey 5
Standards of Significance 17
Recommendations 18
References Cited 19
Appendix One: Comments of the Deputy State Historic Preservation Officer 21

List of Figures

Follows Page

Figure 1: North Carolina and the project area 2

Figure 2: Johnston County and the project area 2

Figure 3: The project area, with archæological sites 2

Figure 4: The project area, with archæological sites 2

Figure 5: Clearcut area in the vicinity of 31JT266 3

Figure 6: 31JT265 -- looking northwestward from the road 7

Figure 7: 31JT265 -- eastern (side) and northern (rear) elevations 7

Figure 8: 31JT265 -- eastern (side) elevation 7

Figure 9: 31JT265 -- interior 7

Figure 10: 31JT267 -- looking southward 8

Figure 11: 31JT270 -- log barn (west face) 11

Figure 12: 31JT270 -- setting of the Woodland component 11

Figure 13: 31JT271 -- looking southward 12

Figure 14: 31JT272 -- looking eastward 14

MANAGEMENT SUMMARY

The archæological survey of Johnston County's proposed 200-acre landfill expansion covered approximately 120 acres of future landfill and borrow pit areas (the remainder is in wetlands or buffer zones exempted from construction) near Smithfield in central Johnston County, North Carolina. The purpose of the survey was to examine the project area for prehistoric or historical archæological sites with significant remains that might be eligible for nomination to the National Register of Historic Places.

Surveying conditions were good to excellent because of the tract's history of farming and logging. Most of the proposed landfill construction site is either in fallow, cultivated fields, roads, or clearcut areas with extensive ground exposure and erosion. Recent trails created for soil drilling equipment also provided excellent survey transects.

Throughout the tract, we found evidence of small, prehistoric settlements, probably briefly occupied. Most of these sites are represented by very small numbers of non-diagnostic flakes, but we know that one site dates to the Middle Archaic Guilford phase and that two sites date to the Woodland period. Even with good to excellent collecting conditions, most of the sites yielded five or fewer prehistoric artifacts. The most productive prehistoric site produced only 40 artifacts. Three historic-period sites appear to date to the late nineteenth or early twentieth centuries, at the earliest. The survey recorded 12 sites:

31JT265	Late nineteenth/early twentieth century farmhouse; prehistoric lithic scatter (five flakes)
31JT266	Prehistoric lithic site (isolated flake)
31JT267	Prehistoric Woodland site (one sherd, 18 flakes)
31JT268	Prehistoric lithic site (two flakes)
31JT269	Prehistoric lithic site (isolated flake)
31JT270	Late nineteenth/early twentieth century farmhouse; prehistoric Woodland site (35 sherds, 5 flakes)
31JT271	Prehistoric lithic scatter (one flake, one blade)
31JT272	Late nineteenth/early twentieth century farmhouse
31JT273	Prehistoric lithic site (two flakes)
31JT274	Prehistoric Middle Archaic (Guilford) site, with one biface and two flakes
31JT275	Prehistoric lithic site (isolated biface fragment)
31JT276	Prehistoric lithic site (biface fragment and two flakes)

Since none of the sites in the inventory seem to be eligible for nomination to the National Register of Historic Places, we do not recommend additional archæological work on the proposed landfill expansion, as it is now designed.

INTRODUCTION

Project title: An Archæological Survey of the Proposed Johnston County Landfill Expansion, Smithfield Vicinity, Johnston County, North Carolina (ER 94-8402).

Location of the project: The 200 - acre landfill expansion tract is on the west side of the existing county landfill, south and east of Middle Creek, north of NC 210, and about 5 miles west of the county seat of Smithfield (see Figures 1, 2, and 3). Out of this tract, only about 120 acres will be used for construction of the landfill. The rest of the tract will be set aside as preserved buffer zones, floodplain, or wetlands.

Contracting organization: McKim & Creed, Engineers, Cary, North Carolina.

Principal Investigator and Field Director: Thomas H. Hargrove.

Field Crew: Sara Bon, Briece Edwards, Diane Levy.

Date of survey: May 26, 1994.

Scope of archæological work: According to our proposal of May 18, 1994, the archaeological survey would include:

1. A phase of background research into the area's prehistory and history, including consultations with the North Carolina Division of Archives and History, local archaeologists and historians (if any), and area residents;

2. A survey phase, covering the project area with a combination of systematic, screened shovel test transects at 100 foot intervals with examinations of exposed ground surfaces;

3. A laboratory and analysis phase, in which artifacts and sites (if any) are classified, described, and evaluated;

4. The report, in which the results of the background research, fieldwork, analysis, and site inventory are presented with evaluations of site significance and recommendations for or against tests or additional data recovery on particular sites.

The proposal for the survey phase did not include specific provisions for larger-scale test excavations or salvage excavations of archaeological sites, since we cannot predict whether potentially significant archaeological sites exist in the project area. The need for test excavations could only be determined toward the end of the survey phase, at which time we would report to the project sponsors with specific recommendations for tests on certain sites (if any), with detailed justifications and budget proposals for each site.

The following sections follow the format of the *Guidelines for Preparation of Archæological Survey Reports Reviewed by the Archæology Branch, Division of Archives and History, North Carolina Department of Cultural Resources* and the 1992 edition of the style guide for *American Antiquity* (volume 54, number 4). The sections include a description of the project's

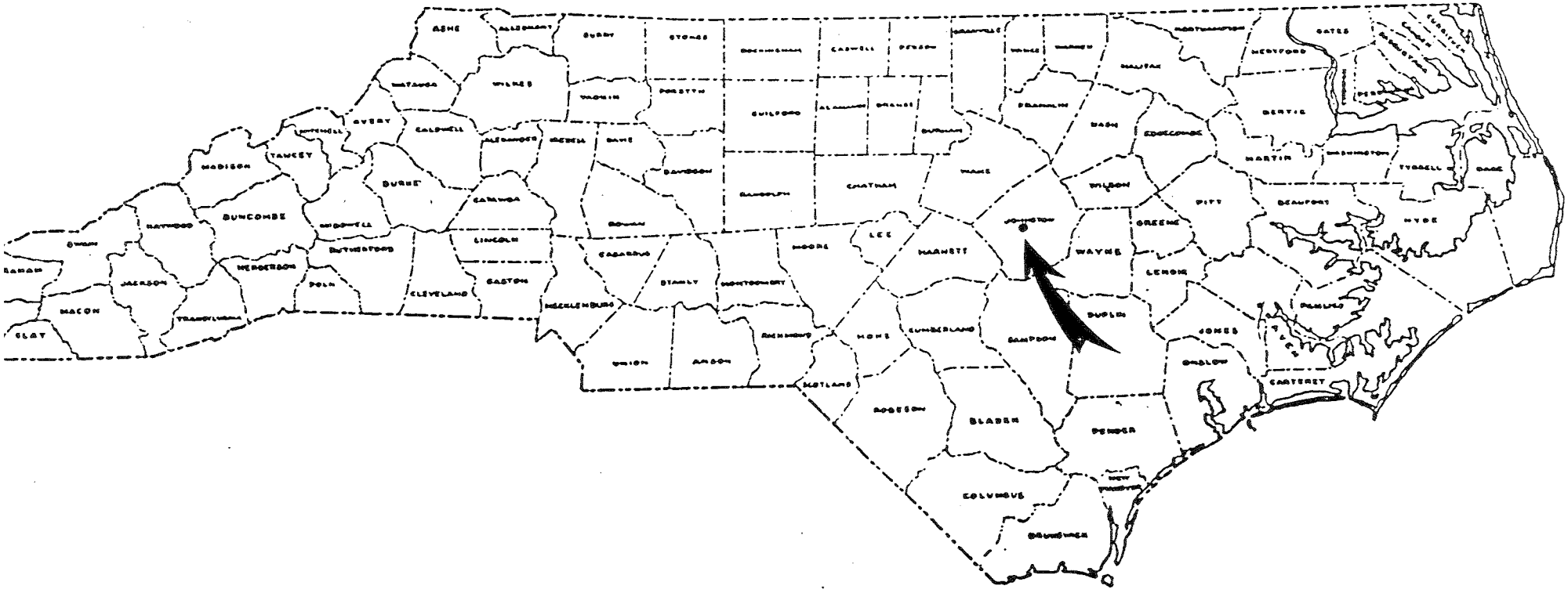

Figure 1: North Carolina and the project area (arrow).

Base map: North Carolina Division of Archives and History.

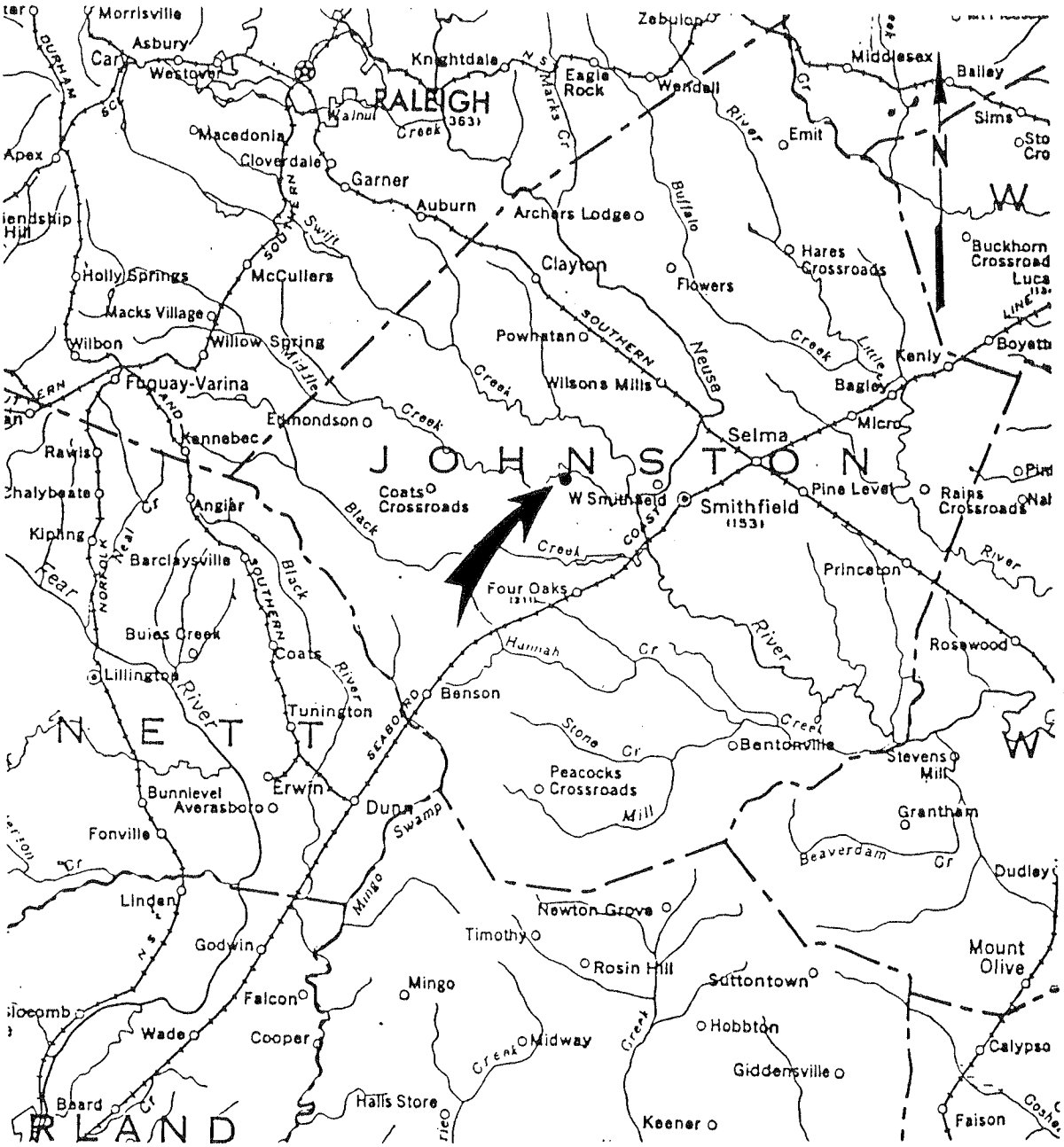

Figure 2: Johnston County and the project area (arrow).

Base map: U.S.G.S. *State of North Carolina.*

Scale: one inch = eight miles

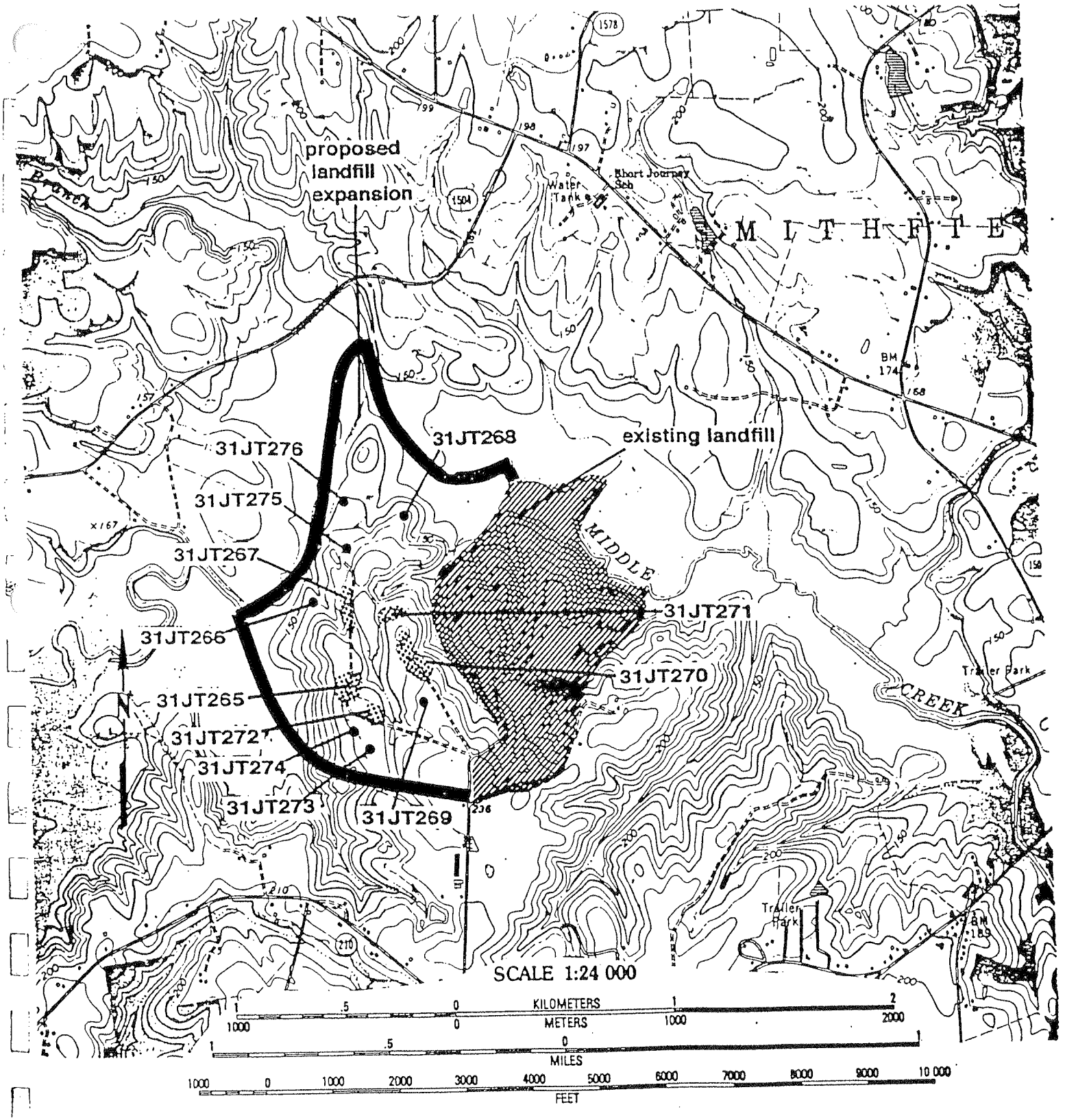

Figure 3: The project area, with archæological sites.

Base map: USGS *Powhatan* quad

physical environment and its probable influences on past settlement choices and site preservation; an outline of the area's prehistoric and historic background; a description of field techniques; an inventory of sites recorded during the survey; a discussion of the archæological significance of the sites recorded; recommendations for archæological management; and a list of sources consulted for the background research, survey, and evaluation.

PHYSICAL ENVIRONMENT

The project area is in eastern North Carolina's Middle Coastal Plain, which (in this area) features steep to gentle valley slopes and a moderately dissected drainage pattern with flat valley floors (Daniels et al. 1984:4). The terrain in the survey area includes wide, level floodplain wetlands on the south or east side of Middle Creek, steeply sloping ridge sides, and level, north-south trending ridges overlooking the wide floodplain. Elevations range from about 130 feet above mean sea level on the bank of Middle Creek, up to about 230 feet amsl on the ridgecrest. From a geological perspective, the area is in the Eastern Slate Belt in an area of phyllite and schist. Crypto-crystalline stone suitable for making stone tools in prehistoric times might have been available in a belt of felsic metavolcanic stone a few miles east of Smithfield (North Carolina Geological Survey 1985). The soils of Johnston County have not yet been described in published soil maps. The area is drained by Middle Creek and its tributary, Juniper Branch, part of the Neuse River basin.

The construction area is dominated by large expanses of recently clearcut timberland (mostly former pine plantation; see Figure 5) and abandoned cropland. Two fields on the south side of the tract are still under cultivation. An area of about 5 acres near the southeastern corner of the tract is a yard waste disposal area. Soil erosion throughout the project area has been severe, and two large fields on the tract have been terraced in an effort to slow this erosion.

PREHISTORIC BACKGROUND

Humans have lived in this part of North Carolina since at least the close of the last Ice Age, about 10,000 to 9,000 years B.C. The distinctively fluted Clovis projectile points from that period have been recorded as surface finds throughout the state, including Johnston County (Perkinson 1973). As the climate warmed and the forests changed into the modern oak-hickory woodlands we see today, local cultures developed regional hunting, fishing, and wild food gathering techniques to adapt to the new forests and animal communities (Willey 1966:60; Caldwell 1958). Several of these Archaic hunting-and-gathering cultures were apparently quite stable, demonstrating little visible change over centuries or millenia. The Early Archaic period is divided into the Palmer period (about 8,000 B.C.) and the Kirk period (7,000-6,000 B.C.), both characterized by corner-notched spear or dart points (Ward and Coe 1976:11-12). The Middle Archaic period is represented by the Stanly phase (6,000-5,000 B.C.), the Morrow Mountain phase (5,000-4,500 B.C.), the Guilford phase (4,500-4,000 B.C.), and the Halifax phase (about 3,500 B.C.), all typified by characteristic spear or dart points. In our project area, the Middle Archaic Guilford phase is represented at 31JT274 (see below). The Late Archaic or Savannah River period (4,000-500 B.C.) is characterized by large, stemmed triangular blades and by large soapstone bowls (Coe 1964:119; Ward and Coe 1976:1976). Archaic period sites occur throughout the uplands and well-drained lowlands of the region.

Figure 5: Clearcut area in the vicinity of 31JT266.

Following the nomadic, hunting-and-gathering Archaic period, the Woodland period in eastern North America was usually marked by the appearance of farming, pottery, the bow and arrow, and sometimes by the construction of burial mounds or temple mounds. In North Carolina, the first signs of the Woodland period are triangular arrow points and pottery. Significant reliance on farming and domesticated plants such as maize, beans and squash apparently came late to the North Carolina Piedmont and inner Coastal Plain, perhaps as late as A.D. 1000. The Woodland peoples of the region eventually became more reliant on cultivated crops and settled village life, which in turn led to distinctive regional differences such as those noted by some of the early European explorers in the late seventeenth and early eighteenth centuries. By the time European colonists and their African slaves arrived in this section, the local Indians had been devastated by generations of foreign diseases and warfare, and the scattered remnants of local groups such as the Tuscarora, Eno, Shakori, and Occaneechi had already moved to refuge areas in southeastern North Carolina, Virginia, South Carolina, or New York (Hargrove 1987). Woodland period village sites are normally found in well-drained lowlands or on nearby rises or ridgetoes, although smaller, satellite camps or hamlet sites are sometimes found in the uplands. Two small Woodland settlements were found on the tract at 31JT267 and 31JT270.

ARCHÆOLOGICAL RESEARCH IN THE PROJECT VICINITY

A review of the site files in the Office of State Archæology shows that no archæological sites had been recorded in the project area at the time of our survey (see also Appendix One).

HISTORICAL BACKGROUND

Background research on the project area included a review of maps and secondary historical sources in the North Carolina State Archives and in the North Carolina Collection at UNC Chapel Hill.

The area of present-day Johnston County was first settled by Europeans (mostly Scotch-Irish and English) and their African slaves in the first half of the 1700s. By 1746, the numbers of colonists had grown great enough to lead to the creation of a new local government, Johnston County, from a part of Craven County. The center of the county government was in the vicinity of present-day Clayton until 1771, when Wake County was formed out of Johnston and Orange Counties. At that time, the new county seat for Johnston was founded at a community that later became Smithfield, about 5 miles east of the project area. Throughout its history, Johnston County has been largely a rural, farming region, based at first on subsistence farming, then later in the nineteenth century on cash crops such as cotton, tar, and turpentine, changing to tobacco in the twentieth century. Up until the late nineteenth century, the county seat of Smithfield was also a small river port, officially the head of navigation on the Neuse River, but steamboat traffic was sporadic and unpredictable because of river blockages and wide variations in the river's flow. The coming of the railroads in the mid and late nineteenth century opened more regular connections with the outside world and its markets, and a number of small towns grew up near the new depots and train stations (Powell 1968; Southern 1977; State Board of Agriculture 1893:155; Sharpe 1958). The first detailed map of the survey area is probably the 1911 soil map of Johnston County (Hearn and Brinkley 1913). It shows two structures in the survey area, probably

corresponding with 31JT265 and 31JT270.

FIELD METHODS

Survey conditions were good to excellent because of the tract's recent history of farming and logging: Most of the proposed landfill construction site is either in fallow, cultivated fields, roads, or clearcut areas with extensive ground exposure and erosion. Recent trails created for soil drilling equipment also provided excellent survey transects. In areas with exposed ground surfaces, the surveyors closely examined the areas for prehistoric and historic artifacts. Wetlands or slopes exceeding 20% were not intensively surveyed.

We defined a prehistoric site as an area where we found at least one artifact dating to the prehistoric period (for example, a flake from manufacturing or repairing stone tools, a stone projectile point, or a potsherd). We defined an historic site as an area containing patterned evidence of settlement (house foundations or concentrations of building debris and domestic artifacts, for example) or industry (a mill or still site, for example) dating between colonial settlement in the mid-eighteenth century and 1944 (the minimum age for National Register of Historic Places eligibility is 50 years). Practically applied, we would classify, for instance, the remains of a house, a mill, a bridge, or a foundry dating before 1945 as an archæological site. An isolated fragment of whiteware or bottle glass would not be recorded as a site.

RESULTS OF THE SURVEY

This section presents the inventory of archæological sites recorded during our survey of the project area. We include information on the site's period of occupation (if known), the artifacts collected, the techniques used to locate and define the site, some of the relevant environmental details, indications of preservation or disturbance, potential for future research, and speculations on the effects of project construction on the site. The site forms submitted to the Office of State Archæology list additional environmental information (elevation, distance from water, etc.). Later sections address the question of site significance and recommendations.

The survey recorded 12 sites. Figures 3 and 4 show the location of each site. The site numbers are assigned by the Office of State Archæology (OSA) under the national system of site identification, in which "31" stands for North Carolina, "JT" stands for Johnston County, and the last numbers represent the order in which the site was entered into the OSA site files for that county. The accession numbers are also assigned by the OSA, and each number is inked onto the artifacts to help in future identification after curation.

Throughout the tract, we found evidence of small, prehistoric settlements, probably briefly occupied. Most of these sites are represented by very small numbers of non-diagnostic flakes, but we know that one site dates to the Middle Archaic Guilford phase and that two sites date to the Woodland period. Even with good to excellent collecting conditions, most of the sites yielded five or fewer prehistoric artifacts. The most productive prehistoric site produced only 40 artifacts. Three historic-period sites appear to date to the late nineteenth or early twentieth centuries, at the earliest.

31JT265	Late nineteenth/early twentieth century farmhouse; prehistoric lithic scatter (five flakes)
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31JT275	Prehistoric lithic site (isolated biface fragment)
31JT276	Prehistoric lithic site (biface fragment and two flakes)

In the descriptions of prehistoric potsherds, the inclusions or temper types will usually be classified according to grain size:

Pebbles = 4 mm and larger
Granules = 2 - 4 mm
Very coarse sand = 1 - 2 mm
Coarse sand = 1/2 - 2 mm
Medium sand = 1/4 - 1/2 mm
Fine sand = 1/8 - 1/4 mm

In the analysis of potsherds, we have tended to classify sherds with very coarse sand and small granules or grit as Middle Woodland sherds, and sherds with medium-to-coarse sand as Early Woodland types.

31JT265 (Project # JT LF 1) (Accession #94-252)

Type of site: This site has two components: a prehistoric lithic site and a late nineteen/early twentieth century farmhouse structure in dilapidated condition. The prehistoric component is a very thin scatter of debitage, represented in our collection by two felsic thinning flakes and three quartz thinning flakes, found in an area measuring about 40 meters in diameter.

Figure 6: 31JT265 -- looking northwestward from the road.

Figure 7: 31JT265 -- eastern (side) and northern (rear) elevations.

31JT266 (Project # JT LF 2) (Accession #94-253)

Type of site: This prehistoric lithic site is represented by an isolated find -- a single felsic thinning flake.

How recorded: During a surface inspection of a clearcut area, the surveyors found the single flake exposed on the surface. Surface visibility was very good -- about 80%.

Environment: The site is on the northern end of a logged ridgetop overlooking Middle Creek to the west.

Signs of preservation or disturbance: Clearcutting, heavy equipment traffic, and soil erosion are the major sources of disturbance. Disturbances here have been massive, creating large ditches and mounds of backdirt throughout the vicinity of the site (Figure 5).

Research potential: The low density of artifacts (one flake) and the very high degree of disturbance diminish the potential for additional research.

Impact of the project: The site is on the northern edge of the Phase I section of the proposed landfill expansion.

31JT267 (Project # JT LF 3) (Accession #94-254)

Type of site: This prehistoric Woodland site is represented by 18 flakes and one small, buff-colored Woodland sherd, tempered with medium sand, with a dense, compact paste and a plain or eroded exterior. The flakes include eight secondary flakes (five felsic and three quartz), and ten thinning flakes (nine felsic, one quartz) from an area measuring about 120 from north to south and about 20 meters from east to west (conforming to the narrow ridgetop). The sherd is buff-colored, . Based on the temper, the sherd may date to the Early Woodland, but an identification based on one small, eroded sherd must be considered very tentative.

How recorded: During a surface inspection of a wide farmroad and adjacent clearcut areas (Figure 10), the surveyors found the light scatter of lithics and the single sherd exposed on the surface. Surface visibility was good to excellent -- about 70 - 100%. The exposed area available for surface collecting within the site was close to 1,900 square meters.

Environment: The site is on a narrow, sandy ridgetop overlooking Middle Creek to the west and a small drainage (formerly a large lake, recently drained) on the east. The unpaved access road and adjacent clearcut areas cover most of the ridgetop.

Signs of preservation or disturbance: Road traffic, logging, heavy equipment movement, and soil erosion are the major sources of disturbance.

Research potential: The low density of artifacts and the high degree of disturbance diminish the potential for additional research.

Impact of the project: The site is in the southern section of the proposed Phase 6 of the landfill construction.

Figure 11: 31JT270 -- log barn (west face).

Figure 12: 31JT270 -- setting of the Woodland component.

Figure 13: 31JT271 -- looking southward.

31JT272 (Project # JT LF 8) (Accession #94-259)

Type of site: This historic-period farmstead site is represented by a collapsing, one-story, wooden frame farmhouse (apparently recently abandoned) surrounded by a dense scatter of late nineteenth or twentieth century ceramics and glass, from an area measuring about 80 meters in diameter (Figure 14). The house does not appear on the 1911 soil map of Johnston County (Hearn and Brinkley 1913), so it may post-date the map. The presence of "amethyst" glass (manufactured about 1880 to 1914, according to Munsey 1970) suggests that the occupation of the site began around that time or slightly later. The ceramics from the site lack the common diagnostic markers of eighteenth or early to mid-nineteenth century occupations (for example, white, salt-glazed stoneware, creamware, pearlware, mocha, or transfer-printed wares), suggesting a construction date in late the 1800s or early 1900s. The artifact collection included the following items (plastic was not collected):

Historic artifacts – kitchen group
- Ceramics
  - Ironstone/whiteware (1820 - present), undecorated (46)
  - Ironstone, handpainted (1)
  - Ironstone, yellow glaze (2)
  - Stoneware, white lead glazed (3)
  - "Fiesta" style ware (4)
  - Porcelainous (2)
  - Porcelainous, hand painted (1)
  - Heavy, leadglazed, utilitarian earthenware ()
- Glass
  - Colorless, bottle and Mason jar (7)
  - Cobalt (2)
  - Light green (3)
  - Aqua (12)
  - "Milk" (9)
  - Amethyst (date range, 1880's - ca. 1914) (2)
  - Pastel green, opaque (2)
- Spoon (WINTHROP SILVER PLATE 800)

Historic artifacts – building group
- Window glass, light brown (3)

Historic artifacts – clothing group
- Buttons
  - Colorless glass, faceted (1)
  - Metal, stamped (SWEET ORR) (1)
  - Metal, stamped (FLYS) (1)
  - Emerald-green glass, faceted (1)

Historic artifacts – activities group
- Dice, plastic

Other
- Tooth, human molar (1)

How recorded: During a surface inspection of the house yard and the adjacent road on its south side, the surveyors found a wide variety of glass, ceramics, and other artifacts exposed on the surface. The area around the house had little or no ground cover, so that surface visibility was very good to excellent – about 90 - 100%. The exposed areas for surface collecting amounted to about 3,500 square meters.

Environment: The site is on the eastern side of the crest of a wide, sandy ridgetop with a sparse grass cover.

Signs of preservation or disturbance: Soil erosion, leading to widespread sheetwash and gullying, is the major source of disturbance, especially on the west (downslope) side of the house. The house also appears to be on the point of collapse.

Research potential: The historic-period component appears to date to the late nineteenth century or early twentieth century. For historical research into the material culture of rural Johnston County in the early twentieth century, researchers would probably do better to study some of the hundreds of similar, better preserved farmsteads with standing structures throughout Johnston County, including nearly 100 farmsteads listed by the North Carolina Department of Agriculture as "Century Farms" (farms owned by a single family for at least 100 years) (North Carolina Department of Agriculture 1989).

Impact of the project: The site is on the southern edge of the Phase 1 section of the proposed expansion.

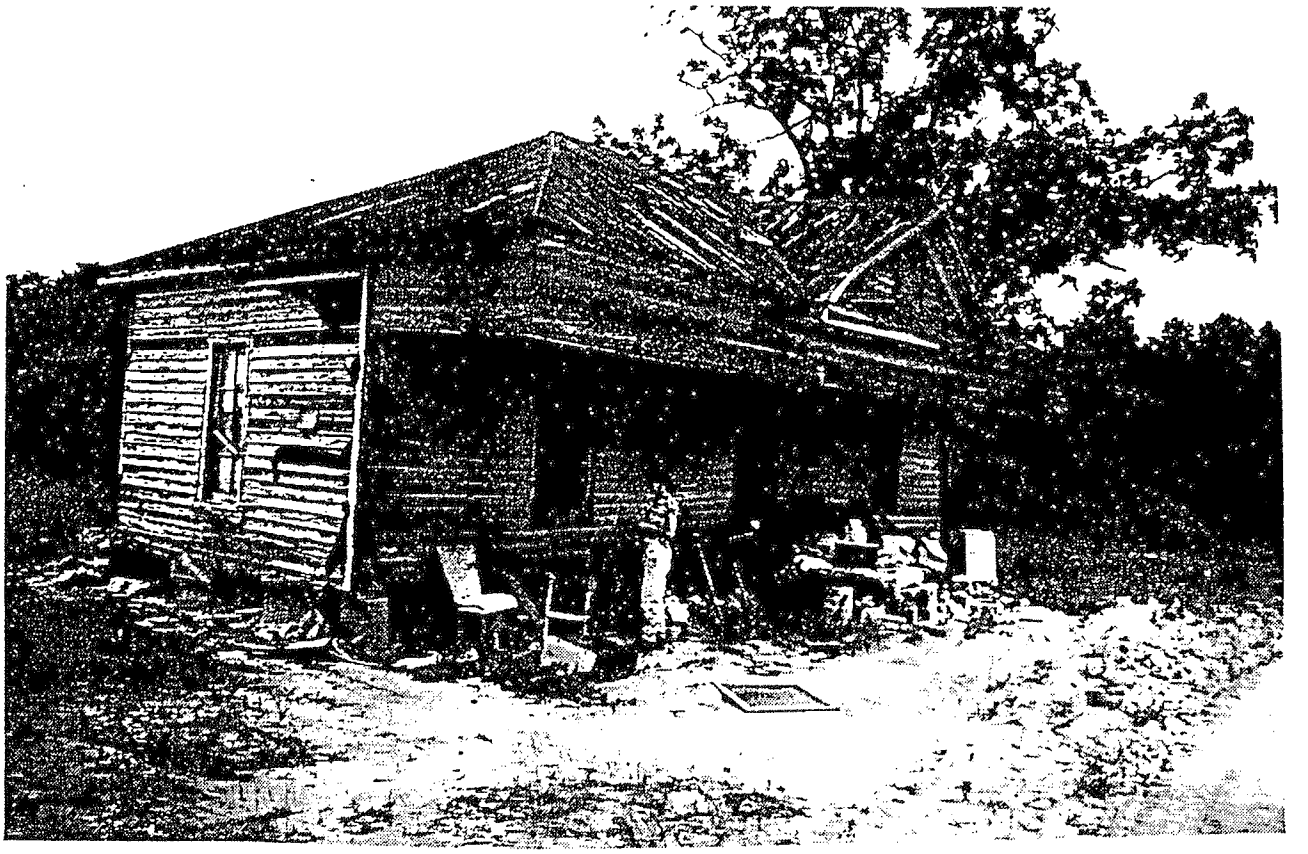

Figure 14: 31JT272 -- looking eastward.

31JT273 (Project #9) (Accession #94-260)

Type of site: This prehistoric lithic site is represented by a felsic thinning flake and a quartz thinning flake, found about 20 meters apart. The lack of diagnostic artifacts makes it impossible to assign a date to the site.

How recorded: During a surface inspection of a cultivated field, the surveyors found the two flakes exposed on the surface. Surface visibility was good to very good -- about 40 - 80%. The exposed area in the vicinity of the site available for surface survey amounted to over 10,000 square meters.

Environment: The site is on a cultivated, southwest-facing ridge. overlooking Middle Creek to the west.

Signs of preservation or disturbance: Plowing and soil erosion are the major sources of disturbance.

Research potential: The low density of artifacts and the high degree of disturbance diminish the potential for additional research.

Impact of the project: The site is in the proposed borrow pit area.

31JT274 (Project #10) (Accession #94-261)

Type of site: This prehistoric Middle Archaic site is represented by a Guilford projectile point of felsic stone (4,500 - 4,000 B.C.) and two quartz thinning flakes, from an area measuring about 30 meters in diameter.

How recorded: During a surface inspection of a cultivated field, the surveyors found the point and the two flakes exposed on the surface. Surface visibility was good to very good -- about 40 - 80%. The exposed area in the vicinity of the site available for surface survey amounted to over 10,000 square meters.

Environment: The site is on a cultivated, southwest-facing ridge. overlooking Middle Creek to the west.

Signs of preservation or disturbance: Plowing and soil erosion are the major sources of disturbance.

Research potential: The low density of artifacts and the high degree of disturbance diminish the potential for additional research.

Impact of the project: The site is in the proposed borrow pit area.

31JT275 (Project # JT LF 11) (Accession #94-262)

Type of site: This prehistoric lithic site is represented by an isolated find -- one fragment of a quartz biface midsection. The lack of diagnostic artifacts makes it impossible to assign a date to the site.

How recorded: During a surface inspection in a road and adjoining clearcut areas, the surveyors found the single artifact exposed on the surface. Surface visibility was very good -- about 90%.

Environment: The site is on the northwest side of a narrow, sandy ridge overlooking Middle Creek to the west.

Signs of preservation or disturbance: Logging, heavy vehicle traffic, and soil erosion are the major sources of disturbance.

Research potential: The low density of artifacts and the high degree of disturbance diminish the potential for additional research.

Impact of the project: The site is on the western edge of the future Phase 6 section of the proposed landfill expansion.

31JT276 (Project # JT LF 12) (Accession #94-263)

Type of site: This prehistoric lithic site is represented by a midsection fragment of a banded rhyolite biface and two quartz thinning flakes, from an area measuring about 20 meters in diameter. The lack of diagnostic artifacts makes it impossible to assign a date to the site.

How recorded: During a surface inspection of a road and adjoining clearcut areas, the surveyors found the three artifacts exposed on the surface. Surface visibility was fair to excellent -- about 40 - 100%.

Environment: The site is on the northwest side of a narrow, sandy ridge overlooking Middle Creek to the west.

Signs of preservation or disturbance: Logging, heavy vehicle traffic, and soil erosion are the major sources of disturbance.

Research potential: The low density of artifacts and the high degree of disturbance diminish the potential for additional research.

Impact of the project: The site is on the western edge of the future Phase 6 section of the proposed landfill expansion.

STANDARDS OF SIGNIFICANCE

Our evaluations of archæological significance come from the published criteria of the National Register of Historic Places for establishing historic significance for structures, sites, or objects that possess integrity of location, design, setting, materials, craft, feeling, and association and that:

A. are associated with events that have made a significant contribution to the broad patterns of our history; or

B. are associated with the lives of persons significant in our past; or

C. embody the distinctive characteristics of a type, period, or method of construction or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinctions; or

D. have yielded, or may be likely to yield, information important in prehistory or history.

(National Park Service 1986:1)

Some types of properties are usually not eligible for National Register status: properties less than 50 years in age; churches; cemeteries; commemorative items, such as public monuments; and structures moved from their original locations or substantially altered. If these types of properties are an integral part of a larger National Register district, they might qualify for National Register status (National Park Service 1986:1).

For most prehistoric sites, the relevant criterion is "D." Does a particular site or a set of sites have the potential to yield information that will give us new insights into the region's prehistoric past? If a site were excavated or intensively investigated with other means (for example, controlled surface or plowzone collections), would the remains from the site add significant new information on prehistoric chronology, the evolution of Native American cultures, subsistence and economics, settlement types and patterns, camp or village structure, regional cultural variations, stone tool manufacture in a particular time and place, or other areas of prehistoric research? Even with good to excellent collecting conditions, most of the sites yielded five or fewer prehistoric artifacts (the median number was two artifacts). The most productive prehistoric site produced only 40 artifacts. This paucity of artifacts, combined with the sites' history of disturbances from plowing or logging and erosion, makes it highly unlikely that any of them could be intensively studied in ways that would give us significant information on the region's prehistoric past. The prehistoric components of the sites do not appear to be eligible for nomination to the National Register of Historic Places.

For most historic-period archæological sites, the most relevant criterion is also "D," and we must ask whether these historic sites have the potential to produce significant information and new insights on the region's history. The historic-period components of 31JT265, 31JT270, and 31JT272 appear to date to the late nineteenth century or early twentieth century. For historical research into the material culture of rural Johnston County in the early twentieth century, researchers would probably do better to study some of the hundreds of similar, better preserved farmsteads throughout Johnston County, including nearly 100 Johnston County farmsteads listed

by the North Carolina Department of Agriculture as "Century Farms" (farms owned by a single family for at least 100 years) (North Carolina Department of Agriculture 1989). Inventories of Johnston County's surviving historic structures have listed other late nineteenth - twentieth century farmsteads, including the Ellington - Ellis House (Clayton vicinity), the Lemuel Hardee House (Four Oaks vicinity), and the John Eustace Yelvington House (Willow Springs vicinity) (N.C. Division of Archives and History 1977). The historic components also do not appear to be eligible for nomination to the National Register of Historic Places.

RECOMMENDATIONS

Since none of the sites in the inventory seem to be eligible for nomination to the National Register of Historic Places, we do not recommend additional archæological work on the proposed landfill expansion, as it is now designed.

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Appendix One

Comments of the Deputy State Historic Preservation Officer

RECEIVED
MAR 21 1994
Ack'd.....

North Carolina Department of Cultural Resources

James B. Hunt, Jr., Governor
Betty Ray McCain, Secretary

Division of Archives and History
William S. Price, Jr., Director

March 16, 1994

C. T. Clayton, PE
McKim & Creed Engineers, PA
Suite 117, Buidling 1
5625 Dillard Road
Cary, NC 27511

Re: Johnson County High-Tech Landfill,
ER 94-8402

Dear Mr. Clayton:

Thank you for your letter of February 25, 1994, concerning the above project.

There are no known recorded archaeological sites within the project boundaries. However, the project area has never been systematically surveyed to determine the location of significance of archaeological resources. The proposed project area contains a high probability for the presence of significant prehistoric archaeological resources.

We recommend that a comprehensive survey be conducted by an experienced archaeologist to identify the presence and significance of archaeological remains that may be damaged or destroyed by the proposed project. Potential effects on unknown resources should be assessed prior to the initiation of construction activities.

Enclosed is a list of archaeological consultants who have conducted or expressed an interest in conducting contract work in North Carolina. Individual files providing additional information on the consultants may be examined at the State Historic Preservation Office's Office of State Archaeology, 421 North Blount Street, Raleigh. If additional names are desired, you may consult the current listing of the members of the Society of Professional Archaeologists, or contact the society's current secretary/treasurer, David L. Carlson, Department of Anthropology, Texas A&M University, College Station, Texas 77843-4352, telephone 409/845-4044. Any of the above persons, or any other experienced archaeologist, may be contacted to conduct the recommended investigation.

We have conducted a search of our files and are aware of no structures of historical or architectural importance located within the planning area.

The above comments are made pursuant to Section 106 of the National Historic Preservation Act of 1966 and the Advisory Council on Historic Preservation's Regulations for Compliance with Section 106, codified at 36 CFR Part 800.

Thank you for your cooperation and consideration. If you have questions concerning the above comment, please contact Renee Gledhill-Earley, environmental review coordinator, at 919/733-4763.

Sincerely,

David Brook

David Brook
Deputy State Historic Preservation Officer

DB:slw

Enclosures

cc: Division of Solid Waste, DEHNR

FIELD BOREHOLE LOG

BOREHOLE NUMBER: PZ-1

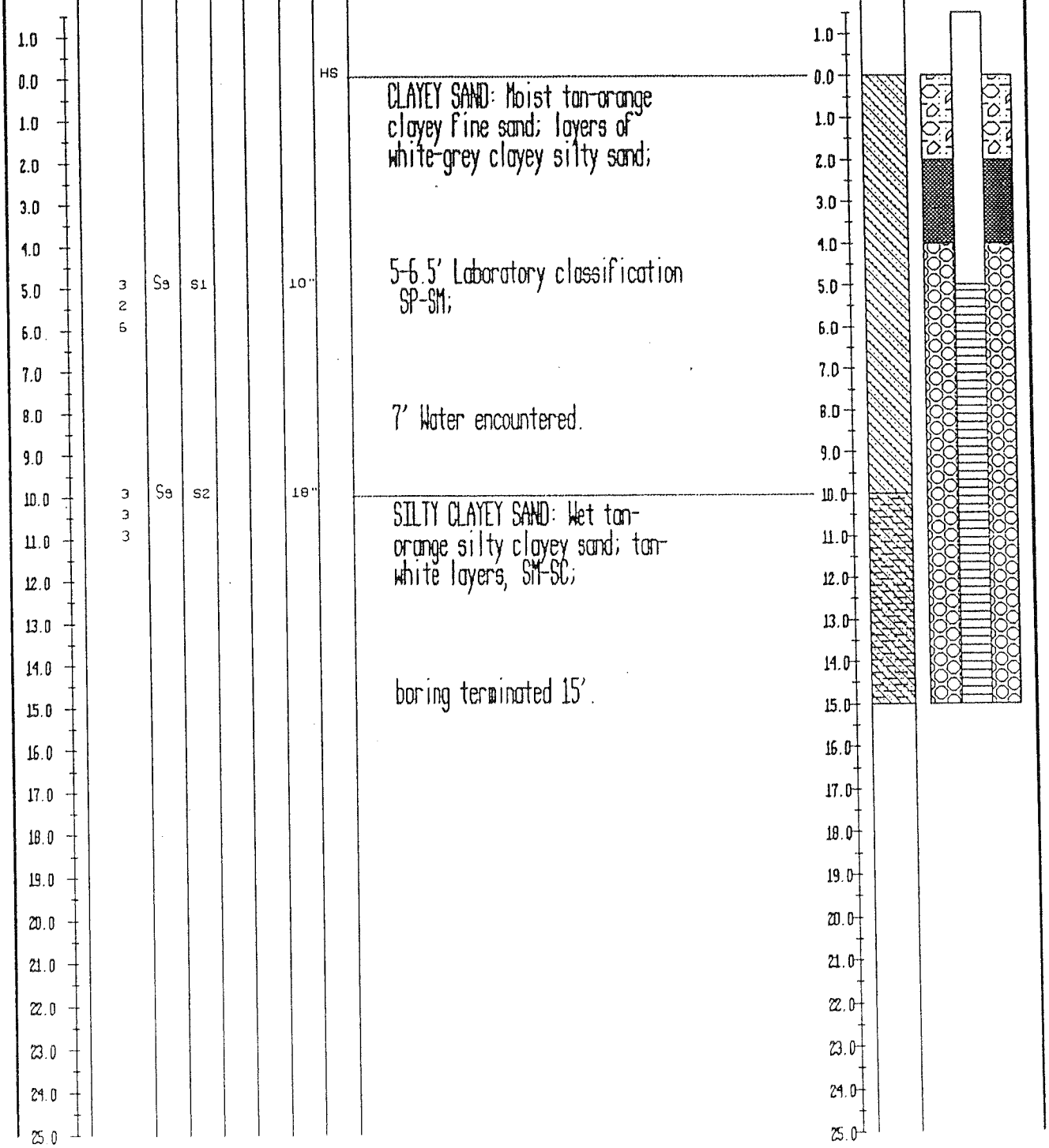
PROJECT NUMBER: Johnston-4
PROJECT NAME: Johnston County Landfill
LOCATION: Smithfield, North Carolina
DRILLING COMPANY: Engineering Tectonics
RIG TYPE & NUMBER: Mobile B-57
DRILLING METHOD: Hollow Stem Auger
WEATHER: Sunny 70 degrees
FIELD PARTY: David Barron
GEOLOGIST: Philip May
DATE BEGUN: 12-8-98 DATE COMPLETED: 12-8-98

TOP OF CASING ELEVATION: 178.87
TOTAL DEPTH: 15.0
GROUND SURFACE ELEVATION: 176.7
SHEET: 1 OF: 1

STATIC WATER LEVEL (BLS)		
WD=While Drilling AB=After Boring		
Depth(ft)	7.0	2.02
Time	3:30 pm	1:00 pm
Date:	12-8-98	12-10-98

DEPTH	BLOW COUNTS	SAMPLING METHOD	SAMPLE NUMBER	MOISTURE	CONSISTANCY	SAMPLE RECOVERY	DRILL METHOD	LITHOLOGY DESCRIPTION
0.0							HS	CLAYEY SAND: Moist tan-orange clayey fine sand; layers of white-grey clayey silty sand;
5.0	3 2 6	Ss	S1			10"		5-6.5' Laboratory classification SP-SM;
								7' Water encountered.
10.0	3 3 3	Ss	S2			18"		SILTY CLAYEY SAND: Wet tan-orange silty clayey sand; tan-white layers, SM-SC;
								boring terminated 15'.

DEPTH | LITHOLOGY | WELL INSTALLATION



FIELD BOREHOLE LOG

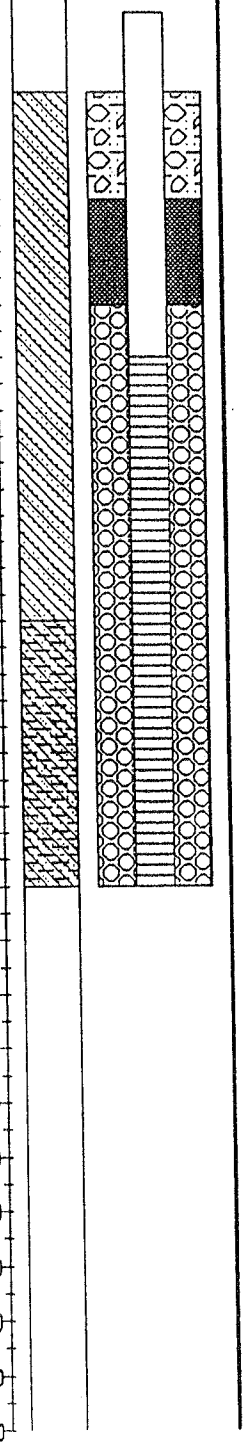
BOREHOLE NUMBER: PZ-1

PROJECT NUMBER: Johnston-4
PROJECT NAME: Johnston County Landfill
LOCATION: Smithfield, North Carolina
DRILLING COMPANY: Engineering Tectonics
RIG TYPE & NUMBER: Mobile B-57
DRILLING METHOD: Hollow Stem Auger
WEATHER: Sunny 70 degrees
FIELD PARTY: David Barron
GEOLOGIST: Philip May
DATE BEGUN: 12-8-98 DATE COMPLETED: 12-8-98

TOP OF CASING ELEVATION: 178.87
TOTAL DEPTH: 15.0
GROUND SURFACE ELEVATION 176.7
SHEET: 1 OF: 1

STATIC WATER LEVEL (BLS)		
WD=While Drilling AB=After Boring		
Depth(ft)	7.0	2.02
Time	3:30 pm	1:00 pm
Date:	12-8-98	12-10-98

DEPTH	BLOW COUNTS	SAMPLING METHOD	SAMPLE NUMBER	MOISTURE	CONSISTANCY	SAMPLE RECOVERY	DRILL METHOD	LITHOLOGY DESCRIPTION
1.0								
0.0							HS	CLAYEY SAND: Moist tan-orange clayey fine sand; layers of white-grey clayey silty sand;
1.0								
2.0								
3.0								
4.0								
5.0	3	Ss	S1			10"		5-6.5' Laboratory classification SP-SM;
	2							
6.0	6							
7.0								
8.0								7' Water encountered.
9.0								
10.0	3	Ss	S2			18"		SILTY CLAYEY SAND: Wet tan-orange silty clayey sand; tan-white layers, SM-SC;
	3							
11.0	3							
12.0								
13.0								
14.0								
15.0								boring terminated 15'.
16.0								
17.0								
18.0								
19.0								
20.0								
21.0								
22.0								
23.0								
24.0								
25.0								



G. N. Richardson & Associates, Inc.
14 North Boylan Avenue, Raleigh NC 27603
(919) 828-0577

FIELD BOREHOLE LOG

BOREHOLE NUMBER **PZ-1A**

PROJECT NAME: **Johnston County C&D Area**
LOCATION: **Smithfield, NC**
DRILLING CO: **Engineering Tectonics, P.A.**
DRILLING METHOD: **HSA**
FIELD PARTY: **R. Barron**
GEOLOGIST: **J. Smyth**
DATE BEGUN: **6/23/03** DATE COMPLETED: **6/23/03**

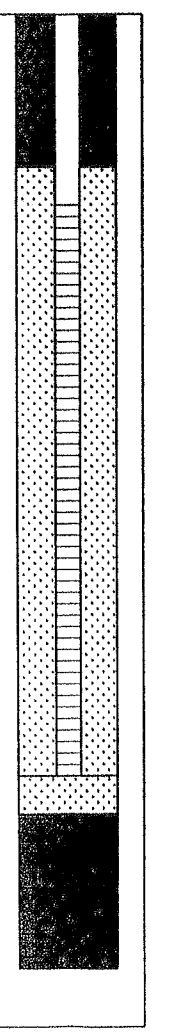
TOTAL DEPTH: **25**
GROUND SURFACE ELEVATION: **na**
TOP OF CASING ELEVATION: **178.93**

STATIC WATER LEVEL (BLS)		
Depth (ft)	2.18	2.24
Time	4:30pm	4:30pm
Date	6/24/03	6/25/03

DEPTH	BLOW COUNT	SAMPLING METHOD	RECOVERY	DRILL METHOD	DESCRIPTION	LITHOLOGY
0.0	2,1,2		16"	HSA	CLAYEY SAND: Red brown slightly moist clayey sand.	
5.0	1,4,7	SS	14"		SILTY SAND: Red brown slightly moist silty sand	
10.0	4,5,4	SS	14"		SILTY SAND: Wet red brown silty sand.	
15.0	4,2,7	SS	12"		CLAYEY SILTY SAND: Wet red brown clayey silty sand.	
20.0	22,44,50/6	SS	9"		SANDY SILTY CLAY: Dry white sandy silty clay. Boring terminated at 25 feet. Well set at a depth of 21 feet.	
25.0	15,28,50/4	SS	8"			

DEPTH: 0.0, 1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 9.0, 10.0, 11.0, 12.0, 13.0, 14.0, 15.0, 16.0, 17.0, 18.0, 19.0, 20.0, 21.0, 22.0, 23.0, 24.0, 25.0, 26.0

WELL INSTALLATION



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FIELD BOREHOLE LOG

BOREHOLE NUMBER **PZ-2**

PROJECT NAME: **Johnston County C&D Area**
LOCATION: **Smithfield, NC**
DRILLING CO: **Engineering Tectonics, P.A.**
DRILLING METHOD: **HSA**
FIELD PARTY: **R. Barron**
GEOLOGIST: **J. Smyth**
DATE BEGUN: **6/24/03** DATE COMPLETED: **6/24/03**

TOTAL DEPTH: **20**
GROUND SURFACE ELEVATION: **na**
TOP OF CASING ELEVATION: **175.27**

STATIC WATER LEVEL (BLS)		
Depth (ft)	10	4.78
Time	na	4:30pm
Date	6/24/03	6/25/03

DEPTH	BLOW COUNT	SAMPLING METHOD	RECOVERY	DRILL METHOD	DESCRIPTION	LITHOLOGY	DEPTH	WELL INSTALLATION
0.0	1,1,1	SS	17"	HSA	SILTY SAND: Red brown moist silty clay.		0.0	
1.0							1.0	
2.0							2.0	
3.0							3.0	
4.0							4.0	
5.0	7,10,14	SS	15"		CLAYEY SILTY SAND: Red brown moist clayey silty sand.		5.0	
6.0							6.0	
7.0							7.0	
8.0							8.0	
							9.0	
10.0	2,4,5	SS	17"		SILTY CLAYEY SAND: Red brown wet silty clayey sand to sandy clay		10.0	
11.0							11.0	
12.0							12.0	
13.0							13.0	
14.0							14.0	
15.0	7,7,12	SS	13"		CLAY: White gray moist clay. Boring terminated at 20 feet.		15.0	
16.0							16.0	
17.0							17.0	
18.0							18.0	
19.0							19.0	
20.0							20.0	

FIELD BOREHOLE LOG

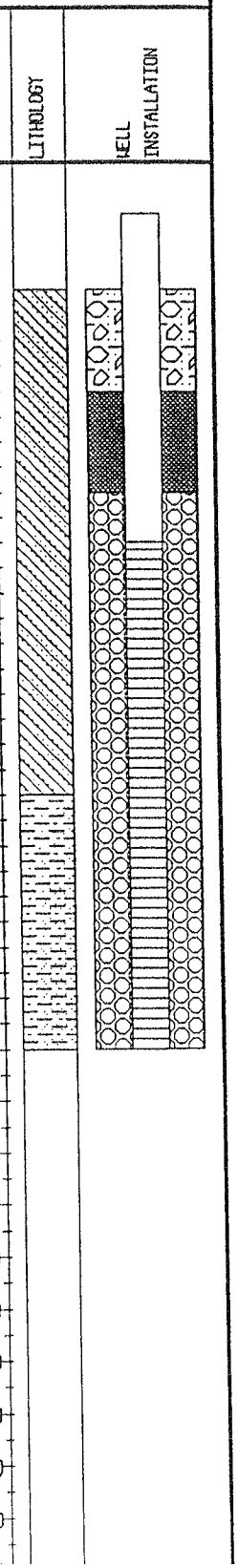
BOREHOLE NUMBER: PZ-3

PROJECT NUMBER: Johnston-4
PROJECT NAME: Johnston County Landfill
LOCATION: Smithfield, North Carolina
DRILLING COMPANY: Engineering Tectonics
RIG TYPE & NUMBER: Mobile B-57
DRILLING METHOD: Hollow Stem Auger
WEATHER: Sunny 70 degrees
FIELD PARTY: David Barron
GEOLOGIST: Philip May
DATE BEGUN: 12-8-98 DATE COMPLETED: 12-8-98

TOP OF CASING ELEVATION: 194.91
TOTAL DEPTH: 15.0
GROUND SURFACE ELEVATION: 192.38
SHEET: 1 OF: 1

STATIC WATER LEVEL (BLS)		
WD=While Drilling AB=After Boring		
Depth(ft)	7.0	6.63
Time	3:30 pm	1:00 pm
Date:	12-8-98	12-10-98

DEPTH	BLOW COUNTS	SAMPLING METHOD	SAMPLE NUMBER	MOISTURE	CONSISTANCY	SAMPLE RECOVERY	DRILL METHOD	LITHOLOGY DESCRIPTION
0.0							HS	SANDY CLAY: Tan moist fine sandy clay; some ribbon & cast; 30% grey & 10% pink-orange mottling, SC;
5.0	4 6 7	Ss	S1			14"		
7.0								7' Water encountered.
10.0	1 1 2	Ss	S2			14"		SILTY SAND: Wet tan-yellow silty sand, SM; 10-11.5' Lab classification SM;
15.0								boring terminated 15'.



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FIELD BOREHOLE LOG

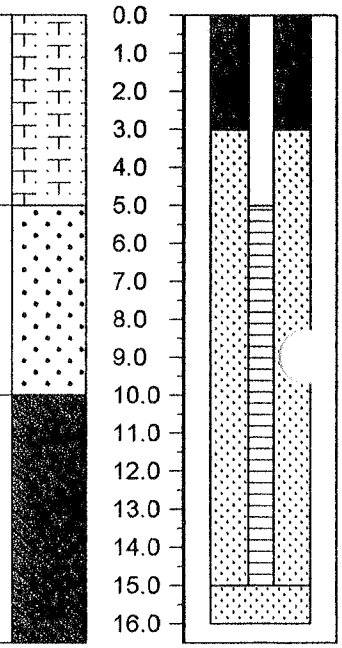
BOREHOLE NUMBER **PZ-3A**

PROJECT NAME: **Johnston County C&D Area**
LOCATION: **Smithfield, NC**
DRILLING CO: **Engineering Tectonics, P.A.**
DRILLING METHOD: **HSA**
FIELD PARTY: **R. Barron**
GEOLOGIST: **J. Smyth**
DATE BEGUN: **6/24/03** DATE COMPLETED: **6/24/03**

TOTAL DEPTH: **16**
GROUND SURFACE ELEVATION: **na**
TOP OF CASING ELEVATION: **171.04**

STATIC WATER LEVEL (BLS)		
Depth (ft)	5	5.76
Time	na	4:30pm
Date	6/24/03	6/25/03

DEPTH	BLOW COUNT	SAMPLING METHOD	RECOVERY	DRILL METHOD	DESCRIPTION	LITHOLOGY
0.0	2,3,3	SS	14"	HSA	SILTY CLAYEY SAND: Tan to red brown moist silty clayey sand.	
5.0	2,4,4	SS	9"		SAND: Red brown to tan wet medium to coarse sand.	
10.0	7,13,15	SS	8"		CLAY: Tan moist to dry slick clay with some silt. Boring terminated at 15 feet.	
15.0	36,50/4	SS	8"			



DEPTH | WELL INSTALLATION

G. N. Richardson & Associates, Inc.
14 North Boylan Avenue, Raleigh NC 27603
(919) 828-0577

FIELD BOREHOLE LOG

BOREHOLE NUMBER **PZ-4**

PROJECT NAME: **Johnston County C&D Area**
LOCATION: **Smithfield, NC**
DRILLING CO: **Engineering Tectonics, P.A.**
DRILLING METHOD: **HSA**
FIELD PARTY: **R. Barron**
GEOLOGIST: **J. Smyth**
DATE BEGUN: **6/24/03** DATE COMPLETED: **6/24/03**

TOTAL DEPTH: **20**
GROUND SURFACE ELEVATION: **na**
TOP OF CASING ELEVATION: **155.77**

STATIC WATER LEVEL (BLS)		
Depth (ft)	18	3.875
Time	na	4:30pm
Date	6/24/03	6/25/03

DEPTH	BLOW COUNT	SAMPLING METHOD	RECOVERY	DRILL METHOD	DESCRIPTION	LITHOLOGY	DEPTH	WELL INSTALLATION
0.0	8,12,14	SS	15"	HSA	SANDY SILT: Dark gray hard sandy silt.		0.0	
1.0							1.0	
2.0							2.0	
3.0							3.0	
4.0							4.0	
5.0	10,27,50/3	SS	16"		CLAY: Gray green dry greasy micaceous clay. Very wet soil being removed by the augers at ~18 feet.		5.0	
6.0							6.0	
7.0							7.0	
8.0							8.0	
							9.0	
10.0	15,50/4	SS	9"				10.0	
11.0							11.0	
12.0							12.0	
13.0							13.0	
14.0							14.0	
15.0	25,25,44	SS	9"				15.0	
16.0							16.0	
17.0							17.0	
18.0							18.0	
19.0							19.0	
20.0	6,40,50/1	SS	18"		GRAVELLY CLAY: Green gray black wet clay. Gravelly clay in upper 8-inches of sample. Boring terminated at 20 feet.		20.0	
21.0							21.0	

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(919) 828-0577

FIELD BOREHOLE LOG

BOREHOLE NUMBER **PZ-5**

PROJECT NAME: **Johnston County C&D Area**
LOCATION: **Smithfield, NC**
DRILLING CO: **Engineering Tectonics, P.A.**
DRILLING METHOD: **HSA**
FIELD PARTY: **R. Barron**
GEOLOGIST: **J. Smyth**
DATE BEGUN: **6/24/03** DATE COMPLETED: **6/24/03**

TOTAL DEPTH: **18**
GROUND SURFACE ELEVATION: **na**
TOP OF CASING ELEVATION: **155.82**

STATIC WATER LEVEL (BLS)		
Depth (ft)	5	3.40
Time	na	4:30pm
Date	6/24/03	6/25/03

DEPTH	BLOW COUNT	SAMPLING METHOD	RECOVERY	DRILL METHOD	DESCRIPTION	LITHOLOGY	DEPTH	WELL INSTALLATION
0.0	1,2,2	SS	9"	HSA	CLAY: Yellow tan slightly moist clay.		0.0	
1.0							1.0	
2.0							2.0	
3.0							3.0	
4.0							4.0	
5.0	8,10,14	SS	13"				5.0	
6.0							6.0	
7.0							7.0	
8.0							8.0	
							9.0	
10.0	38,50/4	SS	9"		SILTY CLAY: Light gray dry silty clay. Very wet soil being removed by the augers at ~12 feet.		10.0	
11.0							11.0	
12.0							12.0	
13.0							13.0	
14.0							14.0	
15.0	14,26,32	SS	9"		SANDY CLAYEY SILT: Yellow tan and gray banded moist fine sandy clayey silt with Mn staining. Boring Terminated at 18 feet.		15.0	
16.0							16.0	
17.0							17.0	
18.0							18.0	

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(919) 828-0577

FIELD BOREHOLE LOG

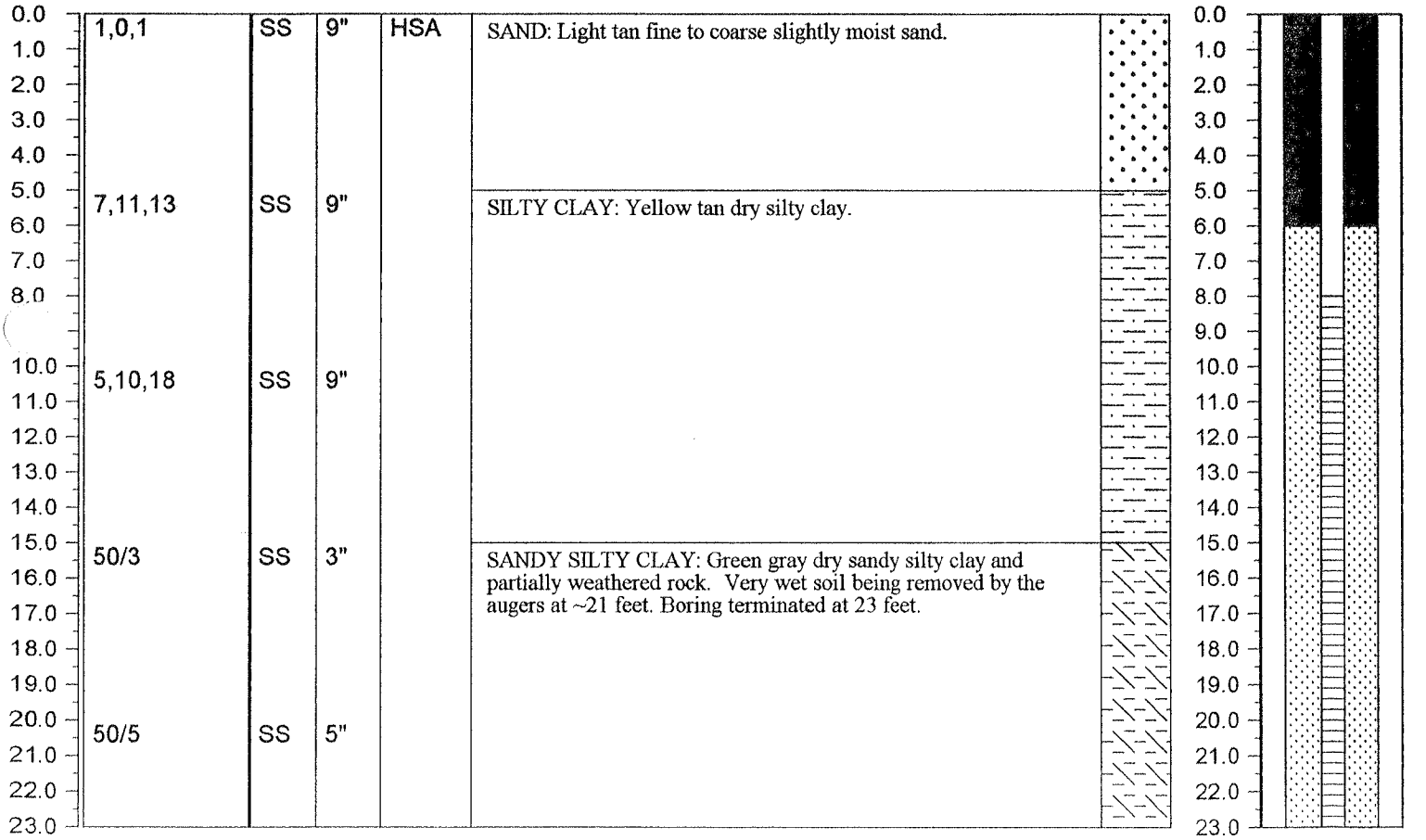
BOREHOLE NUMBER **PZ-6**

PROJECT NAME: **Johnston County C&D Area**
LOCATION: **Smithfield, NC**
DRILLING CO: **Engineering Tectonics, P.A.**
DRILLING METHOD: **HSA**
FIELD PARTY: **R. Barron**
GEOLOGIST: **J. Smyth**
DATE BEGUN: **6/24/03** DATE COMPLETED: **6/24/03**

TOTAL DEPTH: **23**
GROUND SURFACE ELEVATION: **na**
TOP OF CASING ELEVATION: **161.22**

STATIC WATER LEVEL (BLS)		
Depth (ft)	21	7.02
Time	na	4:30pm
Date	6/24/03	6/25/03

DEPTH	BLOW COUNT	SAMPLING METHOD	RECOVERY	DRILL METHOD	DESCRIPTION	LITHOLOGY
0.0	1,0,1	SS	9"	HSA	SAND: Light tan fine to coarse slightly moist sand.	
5.0	7,11,13	SS	9"		SILTY CLAY: Yellow tan dry silty clay.	
10.0	5,10,18	SS	9"			
15.0	50/3	SS	3"		SANDY SILTY CLAY: Green gray dry sandy silty clay and partially weathered rock. Very wet soil being removed by the augers at ~21 feet. Boring terminated at 23 feet.	
20.0	50/5	SS	5"			



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(919) 828-0577

FIELD BOREHOLE LOG

BOREHOLE NUMBER PZ-7

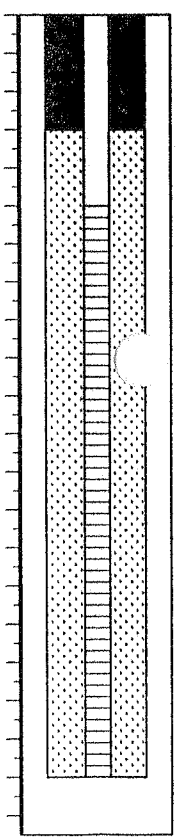
PROJECT NAME: **Johnston County C&D Area**
LOCATION: **Smithfield, NC**
DRILLING CO: **Engineering Tectonics, P.A.**
DRILLING METHOD: **HSA**
FIELD PARTY: **R. Barron**
GEOLOGIST: **J. Smyth**
DATE BEGUN: **6/25/03** DATE COMPLETED: **6/25/03**

TOTAL DEPTH: **20**
GROUND SURFACE ELEVATION: **na**
TOP OF CASING ELEVATION: **168.82**

STATIC WATER LEVEL (BLS)		
Depth (ft)	5	5.71
Time	na	4:30pm
Date	6/25/03	7/1/03

DEPTH	BLOW COUNT	SAMPLING METHOD	RECOVERY	DRILL METHOD	DESCRIPTION	LITHOLOGY
0.0	1,2,1	SS	18"	HSA	SILTY SAND: Dry reddish tan silty sand.	
5.0	2,3,2	SS	16"		CLAYEY SILTY SAND: Wet clayey silty coarse sand.	
10.0	11,23,25	SS	14"		SANDY SILTY CLAY: Moist reddish brown slightly sandy silty clay.	
15.0	10,24,30	SS	12"		SILTY SAND: Moist silty red brown medium sand.	
20.0	15,30,50/5	SS	12"		SANDY SILTY CLAY: Dry to moist red brown sandy silty clay. Boring terminated at 20 feet.	

WELL INSTALLATION



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(919) 828-0577

FIELD BOREHOLE LOG

BOREHOLE NUMBER **PZ-8**

PROJECT NAME: **Johnston County C&D Area**
LOCATION: **Smithfield, NC**
DRILLING CO: **Engineering Tectonics, P.A.**
DRILLING METHOD: **HSA**
FIELD PARTY: **R. Barron**
GEOLOGIST: **J. Smyth**
DATE BEGUN: **6/25/03** DATE COMPLETED: **6/25/03**

TOTAL DEPTH: **18.5**
GROUND SURFACE ELEVATION: **na**
TOP OF CASING ELEVATION: **168.01**

STATIC WATER LEVEL (BLS)		
Depth (ft)	5	4.17
Time	na	4:30pm
Date	6/25/03	7/1/03

DEPTH	BLOW COUNT	SAMPLING METHOD	RECOVERY	DRILL METHOD	DESCRIPTION	LITHOLOGY	DEPTH	WELL INSTALLATION
0.0	2,2,3	SS	18"	HSA	SILTY SAND: Moist tan silty medium sand.		0.0	
1.0							1.0	
2.0							2.0	
3.0							3.0	
4.0							4.0	
5.0	1,1,2	SS	16"		SILTY SAND: Wet reddish tan silty medium to coarse sand.		5.0	
6.0							6.0	
7.0							7.0	
8.0							8.0	
							9.0	
10.0	9,18,25	SS	14"		SILTY CLAY: Moist sandy silty clay to clayey silt.		10.0	
11.0							11.0	
12.0							12.0	
13.0							13.0	
14.0							14.0	
15.0	14,19,40	SS	15"		CLAYEY SILT: Dry reddish tan clayey silt to silty clay. Boring terminated at 18.5 feet.		15.0	
16.0							16.0	
17.0							17.0	
18.0							18.0	

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FIELD BOREHOLE LOG

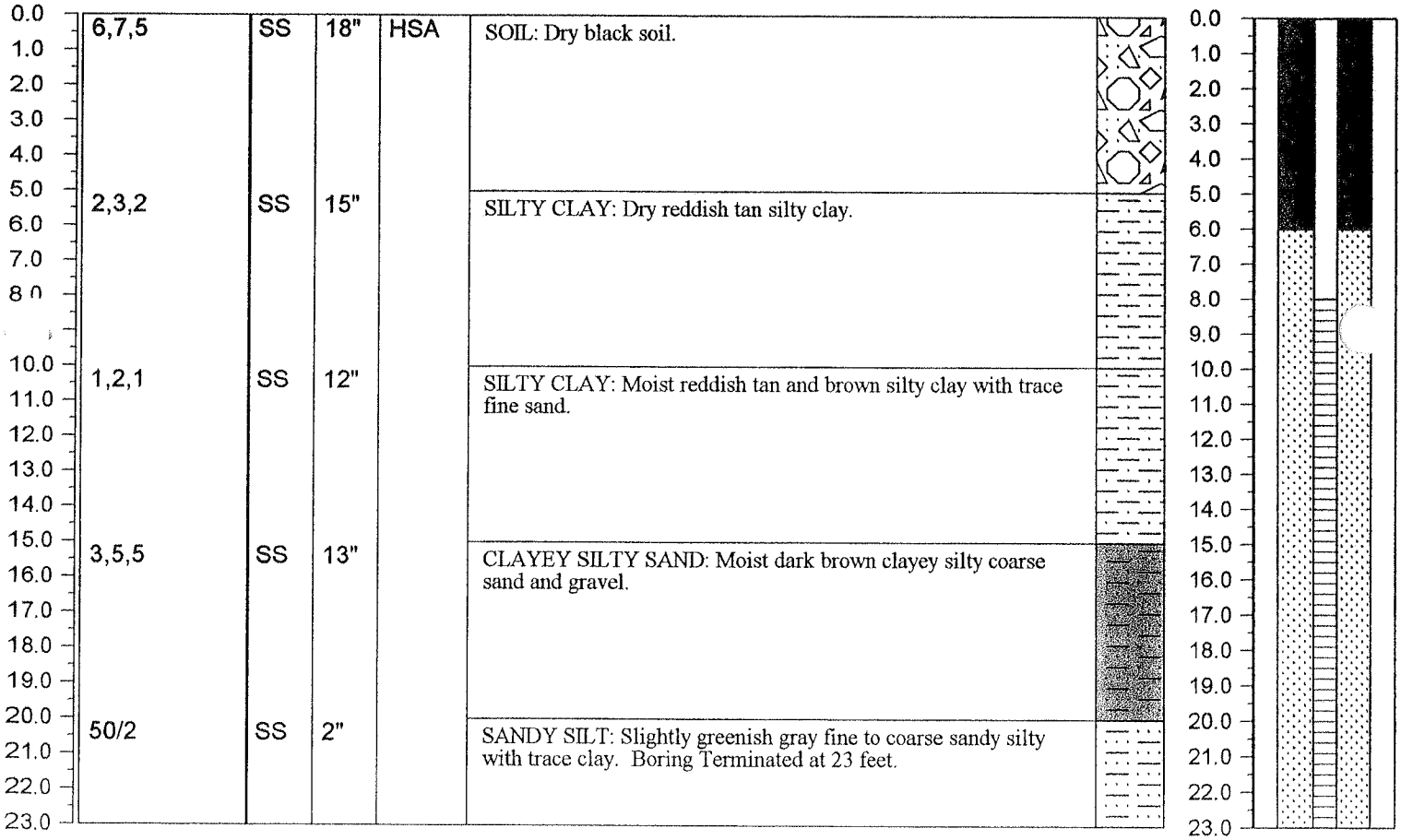
BOREHOLE NUMBER **PZ-9**

PROJECT NAME: **Johnston County C&D Area**
LOCATION: **Smithfield, NC**
DRILLING CO: **Engineering Tectonics, P.A.**
DRILLING METHOD: **HSA**
FIELD PARTY: **R. Barron**
GEOLOGIST: **J. Smyth**
DATE BEGUN: **6/25/03** DATE COMPLETED: **6/25/03**

TOTAL DEPTH: **23**
GROUND SURFACE ELEVATION: **na**
TOP OF CASING ELEVATION: **160.50**

STATIC WATER LEVEL (BLS)		
Depth (ft)	15	14.64
Time	na	4:30pm
Date	6/25/03	7/1/03

DEPTH	BLOW COUNT	SAMPLING METHOD	RECOVERY	DRILL METHOD	DESCRIPTION	LITHOLOGY
0.0	6,7,5	SS	18"	HSA	SOIL: Dry black soil.	
5.0	2,3,2	SS	15"		SILTY CLAY: Dry reddish tan silty clay.	
10.0	1,2,1	SS	12"		SILTY CLAY: Moist reddish tan and brown silty clay with trace fine sand.	
15.0	3,5,5	SS	13"		CLAYEY SILTY SAND: Moist dark brown clayey silty coarse sand and gravel.	
20.0	50/2	SS	2"		SANDY SILT: Slightly greenish gray fine to coarse sandy silty with trace clay. Boring Terminated at 23 feet.	



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FIELD BOREHOLE LOG

BOREHOLE NUMBER **PZ-9d**

PROJECT NAME: **Johnston County C&D Area**
LOCATION: **Smithfield, NC**
DRILLING CO: **Engineering Tectonics, P.A.**
DRILLING METHOD: **HSA/RC/AH**
FIELD PARTY: **R. Barron**
GEOLOGIST: **J. Smyth**
DATE BEGUN: **7/7/03** DATE COMPLETED: **7/8/03**

TOTAL DEPTH: **45**
GROUND SURFACE ELEVATION: **na**
TOP OF CASING ELEVATION: **160.71**

STATIC WATER LEVEL (BLS)		
Depth (ft)	na	na
Time	na	na
Date	na	na

DEPTH	BLOW COUNT	SAMPLING METHOD	RECOVERY	DRILL METHOD	DESCRIPTION	LITHOLOGY	DEPTH	WELL INSTALLATION
0.0				HSA	SOIL: Dry black soil.		0.0	
1.0							1.0	
2.0							2.0	
3.0							3.0	
4.0							4.0	
5.0					SILTY CLAY: Dry reddish tan silty clay.		5.0	
6.0							6.0	
7.0							7.0	
8.0							8.0	
							9.0	
10.0					SILTY CLAY: Moist reddish tan and brown silty clay with trace fine sand.		10.0	
11.0							11.0	
12.0							12.0	
13.0							13.0	
14.0							14.0	
15.0					CLAYEY SILTY SAND: Moist dark brown clayey silty coarse sand and gravel.		15.0	
16.0							16.0	
17.0							17.0	
18.0							18.0	
19.0							19.0	
20.0					SANDY SILT: Slightly greenish gray fine to coarse sandy silty with trace clay.		20.0	
21.0							21.0	
22.0							22.0	
23.0							23.0	
24.0							24.0	
25.0	50/0.5"	SS	0"		PWR: Partially weathered rock. No recovery from samples at 25 and 30 feet. Auger Refusal at 32.5 feet. Set outer casing at 32.5 feet.		25.0	
26.0							26.0	
27.0							27.0	
28.0							28.0	
29.0							29.0	
							30.0	
31.0	50/0	SS	0"				31.0	

G. N. Richardson & Associates, Inc.
14 North Boylan Avenue, Raleigh NC 27603
(919) 828-0577

FIELD BOREHOLE LOG

BOREHOLE NUMBER **PZ-9d**

PROJECT NAME: **Johnston County C&D Area**
LOCATION: **Smithfield, NC**
DRILLING CO: **Engineering Tectonics, P.A.**
DRILLING METHOD: **HSA/RC/AH**
FIELD PARTY: **R. Barron**
GEOLOGIST: **J. Smyth**
DATE BEGUN: **7/7/03** DATE COMPLETED: **7/8/03**

TOTAL DEPTH: **45**
GROUND SURFACE ELEVATION: **na**
TOP OF CASING ELEVATION: **160.71**

STATIC WATER LEVEL (BLS)		
Depth (ft)	na	na
Time	na	na
Date	na	na

DEPTH	BLOW COUNT	SAMPLING METHOD	RECOVERY	DRILL METHOD	DESCRIPTION	LITHOLOGY	DEPTH	WELL INSTALLATION
32.0							32.0	
33.0				RC/AH	METAMUDSTONE: Light gray metamudstone with minor pyrite. Rock cored from 33 to 43 feet. 9.75 feet of recovery from 10 foot core. RQD = 74%. Water bearing seam noted at 41.5', boring terminated at 45 feet.		33.0	
34.0							34.0	
35.0							35.0	
36.0							36.0	
37.0							37.0	
38.0							38.0	
39.0							39.0	
40.0							40.0	
41.0							41.0	
42.0							42.0	
43.0							43.0	
44.0							44.0	
45.0							45.0	

G. N. Richardson & Associates, Inc.
14 North Boylan Avenue, Raleigh NC 27603
(919) 828-0677

FIELD BOREHOLE LOG

BOREHOLE NUMBER **PZ-10**

PROJECT NAME: **Johnston County C&D Area**
LOCATION: **Smithfield, NC**
DRILLING CO: **Engineering Tectonics, P.A.**
DRILLING METHOD: **HSA**
FIELD PARTY: **R. Barron**
GEOLOGIST: **J. Smyth**
DATE BEGUN: **7/8/03** DATE COMPLETED: **7/8/03**

TOTAL DEPTH: **14..5**
GROUND SURFACE ELEVATION: **na**
TOP OF CASING ELEVATION: **177.07**

STATIC WATER LEVEL (BLS)		
Depth (ft)	5	na
Time	na	na
Date	7/8/03	na

DEPTH	BLOW COUNT	SAMPLING METHOD	RECOVERY	DRILL METHOD	DESCRIPTION	LITHOLOGY	DEPTH	WELL INSTALLATION
0.0	1,1,2	SS	8"	HSA	SAND: Moist brown medium to coarse sand.		0.0	
1.0							1.0	
2.0							2.0	
3.0							3.0	
4.0							4.0	
5.0	2,2,3	SS	14"		CLAYEY SILTY SAND: Wet tan and golden clayey silty medium to coarse sand. A gray clay lense was noted at 5.75 feet. From 10-15 feet the sand is more coarse.		5.0	
6.0							6.0	
7.0							7.0	
8.0							8.0	
							9.0	
10.0	5,5,3	SS	12"				10.0	
11.0							11.0	
12.0							12.0	
13.0							13.0	
14.0							14.0	

REC'D JUL 14 2003

WELL CONSTRUCTION RECORD

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

WELL CONTRACTOR (INDIVIDUAL) NAME (print) Ronald Barron CERTIFICATION # 2091

WELL CONTRACTOR COMPANY NAME Engineering Tectonics PHONE # (336) 724-6884

STATE WELL CONSTRUCTION PERMIT# _____ (if applicable) ASSOCIATED WQ Permit # _____ (if applicable)

1. WELL USE (Check Applicable Box): Residential ☐ Municipal/Public ☐ Industrial ☐ Agricultural ☐ Monitoring ☒ Recovery ☐ Heat Pump water Injection ☐ other ☐ If other, list use: PZ-1A

2. WELL LOCATION:
Nearest Town: Smithfield County Johnston
680 County Home Road, 27577
(Street Name, Numbers, Community, Subdivision, Lot No., Zip Code)

Topographic/ Land setting
☐ Ridge ☐ slope ☐ valley ☒ Flat
(check appropriate box)
Latitude/Longitude of well location
n/a
(degrees/minutes/seconds)
Latitude/Longitude source: ☐ GPS ☐ Topographic map
(check box)

3. OWNER Johnston Co. Utility Department
Address 680 County Home Road
(Street or Route No)
Smithfield N.C. 27577
City or Town State Zip code
( ) - 919-934-4576
Area Code- Phone number

4. DATE DRILLED 6-23-03
5. TOTAL DEPTH 25.0
6. DOES WELL REPLACE EXISTING WELL? YES ☐ NO ☒
7. STATIC WATER LEVEL Below Top of Casing: ___ FT. (Use "+" if Above Top of Casing)
8. TOP OF CASING IS 3.0+- FT. Above Land Surface
Top of casing terminated at/or below land surface requires a variance in accordance with 15A NCAC 2C.0118.
9. YIELD (gpm): n/a METHOD OF TEST n/a
10. WATER ZONES (depth): n/a

DEPTH From	To	DRILLING LOG Formation Description
see attached log		

11. DISINFECTION: Type n/a Amount n/a
12. CASING:

	Depth		Diameter	Wall Thickness or Weight/Ft.	Material
From 3+-	To 3.0	Ft	2"	sch.40	PVC
From	To	Ft			
From	To	Ft			

13. GROUT:

	Depth		Material	Method
From 0	To 0	Ft	Portland	trimie
From	TO	Ft.		

14. SCREEN

	Depth		Diameter	Slot Size	Material
From 3.0	To 18.0	Ft.	2 in.	.010 in.	PVC
From	To	Ft.	in.	in.	

15. SAND/GRAVEL PACK

	Depth		Size	Material
From 2.0	To 19.0	Ft	#3	Sand
From 25-2.0	To 19-0.0	Ft	3/8	Bentonite

LOCATION SKETCH
Show direction and distance in miles from at least two State Roads or County Roads. Include the road numbers and common road names.

16. REMARKS _____

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

Ronald F. Barron For Engineering Tectonics 6-23-03

SIGNATURE OF PERSON CONSTRUCTING THE WELL DATE

Submit the original to the Division of Water Quality, Groundwater Section, 1636 Mail Service Center - Raleigh, NC 27699-1636 Phone No. (919) 133-3221, within 30 days.

GW-1 REV. 07/2001

WELL CONSTRUCTION RECORD

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

WELL CONTRACTOR (INDIVIDUAL) NAME (print) Ronald Barron CERTIFICATION # 2091

WELL CONTRACTOR COMPANY NAME Engineering Tectonics PHONE # (336) 724-6994

STATE WELL CONSTRUCTION PERMIT# _____ (if applicable) ASSOCIATED WQ Permit # _____ (if applicable)

1. WELL USE (Check Applicable Box): Residential ☐ Municipal/Public ☐ Industrial ☐ Agricultural ☐ Monitoring ☒ Recovery ☐ Heat Pump water Injection ☐ other ☐ If other, list use: PZ-2

2. WELL LOCATION:
Nearest Town: Smithfield County Johnston
680 County Home Road, 27577
(Street Name, Numbers, Community, Subdivision, Lot No., Zip Code)

Topographic/ Land setting
☐ Ridge ☐ slope ☐ valley ☒ Flat
(check appropriate box)
Latitude/Longitude of well location
n/a
(degrees/minutes/seconds)
Latitude/Longitude source: ☐ GPS ☐ Topographic map
(check box)

3. OWNER Johnston Co. Utility Department
Address 680 County Home Road
(Street or Route No)
Smithfield N.C. 27577
City or Town State Zip code
(___)-919-934-4576
Area Code- Phone number

4. DATE DRILLED 6-24-03
5. TOTAL DEPTH 20.0
6. DOES WELL REPLACE EXISTING WELL? YES ☐ NO ☒
7. STATIC WATER LEVEL Below Top of Casing: ___ FT.
(Use "+" if Above Top of Casing)
8. TOP OF CASING IS 3.0+- FT. Above Land Surface
Top of casing terminated at/or below land surface requires a variance in accordance with 15A NCAC 2C.0118.
9. YIELD (gpm): n/a METHOD OF TEST n/a
10. WATER ZONES (depth): n/a

DEPTH From	To	DRILLING LOG Formation Description
see attached log		

11. DISINFECTION: Type n/a Amount n/a
12. CASING:

	Depth		Diameter	Wall Thickness or Weight/Ft.	Material
From 3+-	To 3.0	Ft	2"	sch.40	PVC
From	To	Ft			
From	To	Ft			

13. GROUT:

	Depth		Material	Method
From 0	To 0	Ft	Portland	trimie
From	TO	Ft		

14. SCREEN

	Depth		Diameter	Slot Size	Material
From 3.0	To 18.0	Ft	2 in.	.010 in.	PVC
From	To	Ft	in.	in.	

15. SAND/GRAVEL PACK

	Depth		Size	Material
From 2.0	To 20.0	Ft	#3	Sand
From 0.0	To 2.0	Ft	3/8	Bentonite

LOCATION SKETCH
Show direction and distance in miles from at least two State Roads or County Roads. Include the road numbers and common road names.

16. REMARKS _____

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

Ronald T. Barron For Engineering Tectonics 6-24-03

SIGNATURE OF PERSON CONSTRUCTING THE WELL DATE

Submit the original to the Division of Water Quality, Groundwater Section, 1636 Mail Service Center - Raleigh, NC 27699-1636 Phone No. (919) 133-3221, within 30 days.

GW-1 REV. 07/2001

WELL CONSTRUCTION RECORD

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

WELL CONTRACTOR (INDIVIDUAL) NAME (print) Ronald Barron CERTIFICATION # 2091

WELL CONTRACTOR COMPANY NAME Engineering Tectonics PHONE # (336) 724-6994

STATE WELL CONSTRUCTION PERMIT# _____ (if applicable) ASSOCIATED WQ Permit # _____ (if applicable)

1. WELL USE (Check Applicable Box): Residential ☐ Municipal/Public ☐ Industrial ☐ Agricultural ☐ Monitoring ☒ Recovery ☐ Heat Pump water Injection ☐ other ☐ If other, list use: PZ-3

2. WELL LOCATION:
Nearest Town: Smithfield County Johnston
680 County Home Road, 27577
(Street Name, Numbers, Community, Subdivision, Lot No., Zip Code)

Topographic/ Land setting
☐ Ridge ☐ slope ☐ valley ☒ Flat
(check appropriate box)
Latitude/Longitude of well location
n/a
(degrees/minutes/seconds)
Latitude/Longitude source: ☐ GPS ☐ Topographic map
(check box)

3. OWNER Johnston Co. Utility Department
Address 680 County Home Road
(Street or Route No)
Smithfield N.C. 27577
City or Town State Zip code
( ) - 919-934-4576
Area Code- Phone number

4. DATE DRILLED 6-24-03
5. TOTAL DEPTH 16.0
6. DOES WELL REPLACE EXISTING WELL? YES ☐ NO ☒
7. STATIC WATER LEVEL Below Top of Casing: ___ FT. (Use "+" if Above Top of Casing)
8. TOP OF CASING IS 3.0+- FT. Above Land Surface
Top of casing terminated at/or below land surface requires a variance in accordance with 15A NCAC 2C.0118.
9. YIELD (gpm): n/a METHOD OF TEST n/a
10. WATER ZONES (depth): n/a

DEPTH From	To	DRILLING LOG Formation Description
see attached log		

11. DISINFECTION: Type n/a Amount n/a
12. CASING:

	Depth		Diameter	Wall Thickness or Weight/Ft.	Material
From 3+-	To 5.0	Ft	2"	sch.40	PVC
From	To	Ft			
From	To	Ft			

13. GROUT:

	Depth		Material	Method
From 0	To 0	Ft	Portland	trimie
From	TO	Ft		

14. SCREEN

	Depth		Diameter		Slot Size		Material
From 5.0	To 15.0	Ft.	2	in.	.010	in.	PVC
From	To	Ft.		in.		in.	

15. SAND/GRAVEL PACK

	Depth		Size	Material
From 3.0	To 16.0	Ft	#3	Sand
From 0.0	To 3.0	Ft	3/8	Bentonite

LOCATION SKETCH
Show direction and distance in miles from at least two State Roads or County Roads. Include the road numbers and common road names.

16. REMARKS _____

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

Ronald T. Barron For Engineering Tectonics 6-24-03

SIGNATURE OF PERSON CONSTRUCTING THE WELL DATE

Submit the original to the Division of Water Quality, Groundwater Section, 1636 Mail Service Center - Raleigh, NC 27699-1636 Phone No. (919) 133-3221, within 30 days.

GW-1 REV. 07/2001

WELL CONSTRUCTION RECORD

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

WELL CONTRACTOR (INDIVIDUAL) NAME (print) Ronald Barron CERTIFICATION # 2091

WELL CONTRACTOR COMPANY NAME Engineering Tectonics PHONE # (336)724-6894

STATE WELL CONSTRUCTION PERMIT# _____ (if applicable) ASSOCIATED WQ Permit # _____ (if applicable)

1. WELL USE (Check Applicable Box): Residential ☐ Municipal/Public ☐ Industrial ☐ Agricultural ☐ Monitoring ☒ Recovery ☐ Heat Pump water Injection ☐ other ☐ If other, list use: PZ-4

2. WELL LOCATION:
Nearest Town: Smithfield County Johnston
680 County Home Road, 27577
(Street Name, Numbers, Community, Subdivision, Lot No., Zip Code)

Topographic/ Land setting
☐ Ridge ☐ slope ☐ valley ☒ Flat
(check appropriate box)
Latitude/Longitude of well location
n/a
(degrees/minutes/seconds)
Latitude/Longitude source: ☐ GPS ☐ Topographic map
(check box)

3. OWNER Johnston Co. Utility Department
Address 680 County Home Road
(Street or Route No)
Smithfield N.C. 27577
City or Town State Zip code
( ) 919-934-4576
Area Code- Phone number

4. DATE DRILLED 6-24-03
5. TOTAL DEPTH 20.0
6. DOES WELL REPLACE EXISTING WELL? YES ☐ NO ☒
7. STATIC WATER LEVEL Below Top of Casing: ___ FT.
(Use "+" if Above Top of Casing)
8. TOP OF CASING IS 3.0+- FT. Above Land Surface
Top of casing terminated at/or below land surface requires a variance in accordance with 15A NCAC 2C.0118.
9. YIELD (gpm): n/a METHOD OF TEST n/a
10. WATER ZONES (depth): n/a

DEPTH From	To	DRILLING LOG Formation Description
see attached log		

11. DISINFECTION: Type n/a Amount n/a
12. CASING:

	Depth		Diameter	Wall Thickness or Weight/Ft.	Material
From 3+-	To 5.0	Ft	2"	sch.40	PVC
From	To	Ft			
From	To	Ft			

13. GROUT:

	Depth		Material	Method
From 0	To 0	Ft	Portland	trimie
From	TO	Ft		

14. SCREEN

	Depth		Diameter	Slot Size	Material
From 5.0	To 20.0	Ft	2 in.	.010 in.	PVC
From	To	Ft	in.	in.	

15. SAND/GRAVEL PACK

	Depth		Size	Material
From 4.0	To 20.0	Ft	#3	Sand
From 0.0	To 4.0	Ft	3/8	Bentonite

LOCATION SKETCH
Show direction and distance in miles from at least two State Roads or County Roads. Include the road numbers and common road names.

16. REMARKS _____

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

Ronald T. Barron For Engineering Tectonics 6-24-03

SIGNATURE OF PERSON CONSTRUCTING THE WELL DATE

Submit the original to the Division of Water Quality, Groundwater Section, 1636 Mail Service Center - Raleigh, NC 27699-1636 Phone No. (919) 133-3221, within 30 days.

GW-1 REV. 07/2001

WELL CONSTRUCTION RECORD

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

WELL CONTRACTOR (INDIVIDUAL) NAME (print) Ronald Barron CERTIFICATION # 2091

WELL CONTRACTOR COMPANY NAME Engineering Tectonics PHONE # (336)724-6554

STATE WELL CONSTRUCTION PERMIT# _____ (if applicable) ASSOCIATED WQ Permit # _____ (if applicable)

1. WELL USE (Check Applicable Box): Residential ☐ Municipal/Public ☐ Industrial ☐ Agricultural ☐ Monitoring ☒ Recovery ☐ Heat Pump water Injection ☐ other ☐ If other, list use: PZ-5

2. WELL LOCATION:
Nearest Town: Smithfield County Johnston
680 County Home Road, 27577
(Street Name, Numbers, Community, Subdivision, Lot No., Zip Code)

Topographic/ Land setting
☐ Ridge ☐ slope ☐ valley ☒ Flat
(check appropriate box)
Latitude/Longitude of well location
n/a
(degrees/minutes/seconds)
Latitude/Longitude source: ☐ GPS ☐ Topographic map
(check box)

3. OWNER Johnston Co. Utility Department
Address 680 County Home Road
(Street or Route No)
Smithfield N.C. 27577
City or Town State Zip code
( ) 919-934-4576
Area Code- Phone number

4. DATE DRILLED 6-24-03
5. TOTAL DEPTH 18.0
6. DOES WELL REPLACE EXISTING WELL? YES ☐ NO ☒
7. STATIC WATER LEVEL Below Top of Casing: ___ FT. (Use "+" if Above Top of Casing)
8. TOP OF CASING IS 3.0+- FT. Above Land Surface
Top of casing terminated at/or below land surface requires a variance in accordance with 15A NCAC 2C.0118.
9. YIELD (gpm): n/a METHOD OF TEST n/a
10. WATER ZONES (depth): n/a

DEPTH From	To	DRILLING LOG Formation Description
see attached log		

11. DISINFECTION: Type n/a Amount n/a
12. CASING:

	Depth		Diameter	Wall Thickness or Weight/Ft.	Material
From 3+-	To 3.0	Ft	2"	sch.40	PVC
From	To	Ft			
From	To	Ft			

13. GROUT:

	Depth		Material	Method
From 0	To 0	Ft	Portland	trimie
From	TO	Ft		

14. SCREEN

	Depth		Diameter	Slot Size	Material
From 3.0	To 18.0	Ft.	2 in.	.010 in.	PVC
From	To	Ft.	in.	in.	

15. SAND/GRAVEL PACK

	Depth		Size	Material
From 2.0	To 18.0	Ft	#3	Sand
From 0.0	To 2.0	Ft	3/8	Bentonite

LOCATION SKETCH
Show direction and distance in miles from at least two State Roads or County Roads. Include the road numbers and common road names.

16. REMARKS _____

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

Ronald T. Barron For Engineering Tectonics 6-24-03

SIGNATURE OF PERSON CONSTRUCTING THE WELL DATE

Submit the original to the Division of Water Quality, Groundwater Section, 1636 Mail Service Center - Raleigh, NC 27699-1636 Phone No. (919) 133-3221, within 30 days.

GW-1 REV. 07/2001

WELL CONSTRUCTION RECORD

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

WELL CONTRACTOR (INDIVIDUAL) NAME (print) Ronald Barron CERTIFICATION # 2091

WELL CONTRACTOR COMPANY NAME Engineering Tectonics PHONE # (336) 724-6384

STATE WELL CONSTRUCTION PERMIT# _____ (if applicable) ASSOCIATED WQ Permit # _____ (if applicable)

1. WELL USE (Check Applicable Box): Residential ☐ Municipal/Public ☐ Industrial ☐ Agricultural ☐ Monitoring ☒ Recovery ☐ Heat Pump water Injection ☐ other ☐ If other, list use: PZ-6

2. WELL LOCATION:
Nearest Town: Smithfield County Johnston
680 County Home Road 27577
(Street Name, Numbers, Community, Subdivision, Lot No., Zip Code)

Topographic/ Land setting
☐ Ridge ☐ slope ☐ valley ☒ Flat
(check appropriate box)
Latitude/Longitude of well location
n/a
(degrees/minutes/seconds)
Latitude/Longitude source: ☐ GPS ☐ Topographic map
(check box)

3. OWNER Johnston Co. Utility Department
Address 680 County Home Road
(Street or Route No)
Smithfield N.C. 27577
City or Town State Zip code
( )- 919-934-4576
Area Code- Phone number

4. DATE DRILLED 6-24-03
5. TOTAL DEPTH 23.0
6. DOES WELL REPLACE EXISTING WELL? YES ☐ NO ☒
7. STATIC WATER LEVEL Below Top of Casing: ___ FT.
(Use "+" if Above Top of Casing)
8. TOP OF CASING IS 3.0+- FT. Above Land Surface
Top of casing terminated at/or below land surface requires a variance in accordance with 15A NCAC 2C.0118.
9. YIELD (gpm): n/a METHOD OF TEST n/a
10. WATER ZONES (depth): n/a

DEPTH From	To	DRILLING LOG Formation Description
see attached log		

11. DISINFECTION: Type n/a Amount n/a
12. CASING:

	Depth		Diameter	Wall Thickness or Weight/Ft.	Material
From 3+-	To 8.0	Ft	2"	sch.40	PVC
From	To	Ft			
From	To	Ft			

13. GROUT:

	Depth		Material	Method
From 0	To 0	Ft	Portland	trimie
From	TO	Ft		

14. SCREEN

	Depth		Diameter	Slot Size	Material
From 8.0	To 23.0	Ft.	2 in.	.010 in.	PVC
From	To	Ft.	in.	in.	

15. SAND/GRAVEL PACK

	Depth		Size	Material
From 6.0	To 23.0	Ft	#3	Sand
From 0.0	To 6.0	Ft	3/8	Bentonite

LOCATION SKETCH
Show direction and distance in miles from at least two State Roads or County Roads. Include the road numbers and common road names.

16. REMARKS _____

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

Ronald F. Barron For Engineering Tectonics 6-24-03

SIGNATURE OF PERSON CONSTRUCTING THE WELL DATE

Submit the original to the Division of Water Quality, Groundwater Section, 1636 Mail Service Center - Raleigh, NC 27699-1636 Phone No. (919) 133-3221, within 30 days.

GW-1 REV. 07/2001

WELL CONSTRUCTION RECORD

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

WELL CONTRACTOR (INDIVIDUAL) NAME (print) Ronald Barron CERTIFICATION # 2091

WELL CONTRACTOR COMPANY NAME Engineering Tectonics PHONE # 336 724-6894

STATE WELL CONSTRUCTION PERMIT# _____ (if applicable) ASSOCIATED WQ Permit # _____ (if applicable)

1. WELL USE (Check Applicable Box): Residential ☐ Municipal/Public ☐ Industrial ☐ Agricultural ☐ Monitoring ☒ Recovery ☐ Heat Pump water Injection ☐ other ☐ If other, list use: PZ-7

2. WELL LOCATION:
Nearest Town: Smithfield County Johnston
680 County Home Road, 27577
(Street Name, Numbers, Community, Subdivision, Lot No., Zip Code)

Topographic/ Land setting
☐ Ridge ☐ slope ☐ valley ☒ Flat
(check appropriate box)
Latitude/Longitude of well location
n/a
(degrees/minutes/seconds)
Latitude/Longitude source: ☐ GPS ☐ Topographic map
(check box)

3. OWNER Johnston Co. Utility Department
Address 680 County Home Road
(Street or Route No)
Smithfield N.C. 27577
City or Town State Zip code
( ) 919-934-4576
Area Code- Phone number

4. DATE DRILLED 6-25-03
5. TOTAL DEPTH 20.0
6. DOES WELL REPLACE EXISTING WELL? YES ☐ NO ☒
7. STATIC WATER LEVEL Below Top of Casing: ___ FT. (Use "+" if Above Top of Casing)
8. TOP OF CASING IS 3.0+- FT. Above Land Surface
Top of casing terminated at/or below land surface requires a variance in accordance with 15A NCAC 2C.0118.
9. YIELD (gpm): n/a METHOD OF TEST n/a
10. WATER ZONES (depth): n/a

DEPTH From	To	DRILLING LOG Formation Description
see attached log		

11. DISINFECTION: Type n/a Amount n/a
12. CASING:

	Depth		Diameter	Wall Thickness or Weight/Ft.	Material
From 3+-	To 5.0	Ft	2"	sch.40	PVC
From	To	Ft			
From	To	Ft			

13. GROUT:

	Depth		Material	Method
From 0	To 0	Ft	Portland	trimie
From	TO	Ft		

14. SCREEN

	Depth		Diameter	Slot Size	Material
From 5.0	To 20.0	Ft	2 in.	.010 in.	PVC
From	To	Ft	in.	in.	

15. SAND/GRAVEL PACK

	Depth		Size	Material
From 3.0	To 20.0	Ft	#3	Sand
From 0.0	To 3.0	Ft	3/8	Bentonite

LOCATION SKETCH
Show direction and distance in miles from at least two State Roads or County Roads. Include the road numbers and common road names.

16. REMARKS _____

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

Ronald F. Barron For Engineering Tectonics 6-25-03

SIGNATURE OF PERSON CONSTRUCTING THE WELL DATE

Submit the original to the Division of Water Quality, Groundwater Section, 1636 Mail Service Center - Raleigh, NC 27699-1636 Phone No. (919) 133-3221, within 30 days.

GW-1 REV. 07/2001

WELL CONSTRUCTION RECORD

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

WELL CONTRACTOR (INDIVIDUAL) NAME (print) Ronald Barron CERTIFICATION # 2091

WELL CONTRACTOR COMPANY NAME Engineering Tectonics PHONE # (336) 724-6884

STATE WELL CONSTRUCTION PERMIT# _____ (if applicable) ASSOCIATED WQ Permit # _____ (if applicable)

1. WELL USE (Check Applicable Box): Residential ☐ Municipal/Public ☐ Industrial ☐ Agricultural ☐ Monitoring ☒ Recovery ☐ Heat Pump water Injection ☐ other ☐ If other, list use: PZ-8

2. WELL LOCATION:
Nearest Town: Smithfield County Johnston
680 County Home Road, 27577
(Street Name, Numbers, Community, Subdivision, Lot No., Zip Code)

Topographic/ Land setting
☐ Ridge ☐ slope ☐ valley ☒ Flat
(check appropriate box)
Latitude/Longitude of well location
n/a
(degrees/minutes/seconds)
Latitude/Longitude source: ☐ GPS ☐ Topographic map
(check box)

3. OWNER Johnston Co. Utility Department
Address 680 County Home Road
(Street or Route No)
Smithfield N.C. 27577
City or Town State Zip code
( )- 919-934-4576
Area Code- Phone number

4. DATE DRILLED 6-25-03
5. TOTAL DEPTH 18.5
6. DOES WELL REPLACE EXISTING WELL? YES ☐ NO ☒
7. STATIC WATER LEVEL Below Top of Casing: ___ FT.
(Use "+" if Above Top of Casing)
8. TOP OF CASING IS 3.0+- FT. Above Land Surface
Top of casing terminated at/or below land surface requires a variance in accordance with 15A NCAC 2C.0118.
9. YIELD (gpm): n/a METHOD OF TEST n/a
10. WATER ZONES (depth): n/a

DEPTH From	To	DRILLING LOG Formation Description
see attached log		

11. DISINFECTION: Type n/a Amount n/a
12. CASING:

	Depth		Diameter	Wall Thickness or Weight/Ft.	Material
From 3+-	To 3.5	Ft	2"	sch.40	PVC
From	To	Ft			
From	To	Ft			

13. GROUT:

	Depth		Material	Method
From 0	To 0	Ft	Portland	trimie
From	TO	Ft.		

14. SCREEN

	Depth		Diameter	Slot Size	Material
From 3.5	To 18.5	Ft.	2 in.	.010 in.	PVC
From	To	Ft.	in.	in.	

15. SAND/GRAVEL PACK

	Depth		Size	Material
From 2.0	To 18.5	Ft.	#3	Sand
From 0.0	To 2.0	Ft.	3/8	Bentonite

LOCATION SKETCH
Show direction and distance in miles from at least two State Roads or County Roads. Include the road numbers and common road names.

16. REMARKS _____

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

Ronald F. Barron For Engineering Tectonics. 6-25-03

SIGNATURE OF PERSON CONSTRUCTING THE WELL DATE

Submit the original to the Division of Water Quality, Groundwater Section, 1636 Mail Service Center - Raleigh, NC 27699-1636 Phone No. (919) 133-3221, within 30 days.

GW-1 REV. 07/2001

WELL CONSTRUCTION RECORD

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

WELL CONTRACTOR (INDIVIDUAL) NAME (print) Ronald Barron CERTIFICATION # 2091

WELL CONTRACTOR COMPANY NAME Engineering Tectonics PHONE # (336) 724-6984

STATE WELL CONSTRUCTION PERMIT# _____ (if applicable) ASSOCIATED WQ Permit # _____ (if applicable)

1. WELL USE (Check Applicable Box): Residential ☐ Municipal/Public ☐ Industrial ☐ Agricultural ☐ Monitoring ☒ Recovery ☐ Heat Pump water Injection ☐ other ☐ If other, list use: PZ-9

2. WELL LOCATION:
Nearest Town: Smithfield County Johnston
680 County Home Road, 27577
(Street Name, Numbers, Community, Subdivision, Lot No., Zip Code)

Topographic/ Land setting
☐ Ridge ☐ slope ☐ valley ☒ Flat
(check appropriate box)
Latitude/Longitude of well location
n/a
(degrees/minutes/seconds)
Latitude/Longitude source: ☐ GPS ☐ Topographic map
(check box)

3. OWNER Johnston Co. Utility Department
Address 680 County Home Road
(Street or Route No)
Smithfield N.C. 27577
City or Town State Zip code
( ) - 919-934-4576
Area Code- Phone number

4. DATE DRILLED 6-25-03
5. TOTAL DEPTH 23.0
6. DOES WELL REPLACE EXISTING WELL? YES ☐ NO ☒
7. STATIC WATER LEVEL Below Top of Casing: ___ FT.
(Use "+" if Above Top of Casing)
8. TOP OF CASING IS 3.0+- FT. Above Land Surface
Top of casing terminated at/or below land surface requires a variance in accordance with 15A NCAC 2C.0118.
9. YIELD (gpm): n/a METHOD OF TEST n/a
10. WATER ZONES (depth): n/a

DEPTH From	To	DRILLING LOG Formation Description
see attached log		

11. DISINFECTION: Type n/a Amount n/a
12. CASING:

	Depth		Diameter	Wall Thickness or Weight/Ft.	Material
From 3+-	To 8.0	Ft	2"	sch.40	PVC
From	To	Ft			
From	To	Ft			

13. GROUT:

	Depth		Material	Method
From 0	To 0	Ft	Portland	trimie
From	TO	Ft.		

14. SCREEN

	Depth		Diameter	Slot Size	Material
From 8.0	To 23.0	Ft.	2 in.	.010 in.	PVC
From	To	Ft.	in.	in.	

15. SAND/GRAVEL PACK

	Depth		Size	Material
From 6.0	To 23.0	Ft	#3	Sand
From 0.0	To 6.0	Ft	3/8	Bentonite

LOCATION SKETCH
Show direction and distance in miles from at least two State Roads or County Roads. Include the road numbers and common road names.

16. REMARKS _____

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

Ronald F. Barron For Engineering Tectonics 6-25-03

SIGNATURE OF PERSON CONSTRUCTING THE WELL DATE

Submit the original to the Division of Water Quality, Groundwater Section, 1636 Mail Service Center - Raleigh, NC 27699-1636 Phone No. (919) 133-3221, within 30 days.

GW-1 REV. 07/2001

WELL CONSTRUCTION RECORD

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

WELL CONTRACTOR (INDIVIDUAL) NAME (print) Ronald Barron CERTIFICATION # 2091

WELL CONTRACTOR COMPANY NAME Engineering Tectonics PHONE # (336)724-6894

STATE WELL CONSTRUCTION PERMIT# _____ (if applicable) ASSOCIATED WQ Permit # _____ (if applicable)

1. WELL USE (Check Applicable Box): Residential ☐ Municipal/Public ☐ Industrial ☐ Agricultural ☐ Monitoring ☒ Recovery ☐ Heat Pump water Injection ☐ other ☐ If other, list use: PZ-9D

2. WELL LOCATION:
Nearest Town: Smithfield County Johnston
680 County Home Road, 27577
(Street Name, Numbers, Community, Subdivision, Lot No., Zip Code)

Topographic/ Land setting
☐ Ridge ☐ slope ☐ valley ☒ Flat
(check appropriate box)
Latitude/Longitude of well location
n/a
(degrees/minutes/seconds)
Latitude/Longitude source: ☐ GPS ☐ Topographic map
(check box)

3. OWNER Johnston Co. Utility Department
Address 680 County Home Road
(Street or Route No)
Smithfield N.C. 27577
City or Town State Zip code
(___)-919-934-4576
Area Code- Phone number

4. DATE DRILLED 7-8-03
5. TOTAL DEPTH 45.0
6. DOES WELL REPLACE EXISTING WELL? YES ☐ NO ☒
7. STATIC WATER LEVEL Below Top of Casing: ___ FT. (Use "+" if Above Top of Casing)
8. TOP OF CASING IS 3.0+- FT. Above Land Surface
Top of casing terminated at/or below land surface requires a variance in accordance with 15A NCAC 2C.0118.
9. YIELD (gpm): n/a METHOD OF TEST n/a
10. WATER ZONES (depth): n/a

DEPTH From	To	DRILLING LOG Formation Description
see attached log		

11. DISINFECTION: Type n/a Amount n/a
12. CASING:

	Depth		Diameter	Wall Thickness or Weight/Ft.	Material
From 3+-	To 40.0	Ft	2"	sch.40	PVC
From +1	To 32.5	Ft	4"	sch.40	PVC
From	To	Ft			

13. GROUT:

	Depth		Material	Method
From 0	To 36.0	Ft	Portland	trimie
From	TO	Ft		

14. SCREEN

	Depth		Diameter	Slot Size	Material
From 40.0	To 45.0	Ft	2 in.	.010 in.	PVC
From	To	Ft	in.	in.	

15. SAND/GRAVEL PACK

	Depth		Size	Material
From 38.0	To 45.0	Ft	#3	Sand
From 36.0	To 38.0	Ft	3/8	Bentonite

LOCATION SKETCH
Show direction and distance in miles from at least two State Roads or County Roads. Include the road numbers and common road names.

16. REMARKS _____

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

Ronald F. Barron For Engineering Tectonics 7-8-03

SIGNATURE OF PERSON CONSTRUCTING THE WELL DATE

Submit the original to the Division of Water Quality, Groundwater Section, 1636 Mail Service Center - Raleigh, NC 27699-1636 Phone No. (919) 133-3221, within 30 days.

GW-1 REV. 07/2001

WELL CONSTRUCTION RECORD

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

WELL CONTRACTOR (INDIVIDUAL) NAME (print) Ronald Barron CERTIFICATION # 2091

WELL CONTRACTOR COMPANY NAME Engineering Tectonics PHONE # (336)724-6994

STATE WELL CONSTRUCTION PERMIT# _____ (if applicable) ASSOCIATED WQ Permit # _____ (if applicable)

1. WELL USE (Check Applicable Box): Residential ☐ Municipal/Public ☐ Industrial ☐ Agricultural ☐ Monitoring ☒ Recovery ☐ Heat Pump water Injection ☐ other ☐ If other, list use: PZ-10

2. WELL LOCATION:
Nearest Town: Smithfield County Johnston
680 County Home Road, 27577
(Street Name, Numbers, Community, Subdivision, Lot No., Zip Code)

Topographic/ Land setting
☐ Ridge ☐ slope ☐ valley ☒ Flat
(check appropriate box)
Latitude/Longitude of well location
n/a
(degrees/minutes/seconds)
Latitude/Longitude source: ☐ GPS ☐ Topographic map
(check box)

3. OWNER Johnston Co. Utility Department
Address 680 County Home Road
(Street or Route No)
Smithfield N.C. 27577
City or Town State Zip code
( )- 919-934-4576
Area Code- Phone number

4. DATE DRILLED 7-8-03
5. TOTAL DEPTH 15.0
6. DOES WELL REPLACE EXISTING WELL? YES ☐ NO ☒
7. STATIC WATER LEVEL Below Top of Casing: ___ FT.
(Use "+" if Above Top of Casing)
8. TOP OF CASING IS 3.0+- FT. Above Land Surface
Top of casing terminated at/or below land surface requires a variance in accordance with 15A NCAC 2C.0118.
9. YIELD (gpm): n/a METHOD OF TEST n/a
10. WATER ZONES (depth): n/a

DEPTH From	To	DRILLING LOG Formation Description
see attached log		

11. DISINFECTION: Type n/a Amount n/a
12. CASING:

	Depth		Diameter	Wall Thickness or Weight/Ft.	Material
From 3+-	To 4.5	Ft	2"	sch.40	PVC
From	To	Ft			
From	To	Ft			

13. GROUT:

	Depth		Material	Method
From 0	To 0	Ft	Portland	trimie
From	TO	Ft.		

14. SCREEN

	Depth		Diameter		Slot Size		Material
From 4.5	To 14.5	Ft.	2	in.	.010	in.	PVC
From	To	Ft.		in.		in.	

15. SAND/GRAVEL PACK

	Depth		Size	Material
From 3.0	To 15.0	Ft	#3	Sand
From 0.0	To 3.0	Ft	3/8	Bentonite

LOCATION SKETCH
Show direction and distance in miles from at least two State Roads or County Roads. Include the road numbers and common road names.

16. REMARKS _____

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

Ronald T. Barron for Engineering Tectonics 7-8-03

SIGNATURE OF PERSON CONSTRUCTING THE WELL DATE

Submit the original to the Division of Water Quality, Groundwater Section, 1636 Mail Service Center - Raleigh, NC 27699-1636 Phone No. (919) 133-3221, within 30 days.

GW-1 REV. 07/2001

North Carolina - Department of Environment, Health, and Natural Resources
Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

FOR OFFICE USE ONLY
QUAD. NO. _____ SERIAL NO. _____
Lat _____ Long. _____ RO _____
Minor Basin _____
Basin Code _____
Header Ent. _____ GW-1 Ent. _____

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: PATTERSON EXPLORATION SERVICES

DRILLER REGISTRATION NUMBER: 351

STATE WELL CONSTRUCTION PERMIT NUMBER: _____

MW - 13

1. WELL LOCATION: (Show sketch of the location below)
Nearest Town: SMITHFIELD County: JOHNSTON
NC HWY 210 JOHNSTON COUNTY LANDFILL
(Road, Community, or Subdivision and Lot No.)

2. OWNER JOHNSTON COUNTY
ADDRESS P.O. BOX 2263
(Street or Route No.)
SMITHFIELD NC 27577
City or Town State Zip Code

3. DATE DRILLED 9-15-94 USE OF WELL MONITORING
4. TOTAL DEPTH 20
5. CUTTINGS COLLECTED YES [ ] NO [X]
6. DOES WELL REPLACE EXISTING WELL? YES [ ] NO [X]
7. STATIC WATER LEVEL Below Top of Casing: 8 FT.
(Use "+" if Above Top of Casing)
8. TOP OF CASING IS 2 FT. Above Land Surface*
* Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118
9. YIELD (gpm): 41.0 METHOD OF TEST BAILING
10. WATER ZONES (depth): 10' - 20'

CHLORINATION: Type _____ Amount _____

DEPTH From	DEPTH To	DRILLING LOG Formation Description
0	20	SILTY SAND & GRAVEL

If additional space is needed use back of form

12. CASING:

From	To	Diameter	Wall Thickness or Weight/Ft.	Material
0	9	2"	SCH 40	PVC

13. GROUT:

From	To	Material	Method
0	7	NEAT CEMENT	
7	8	BENTONITE	

14. SCREEN:

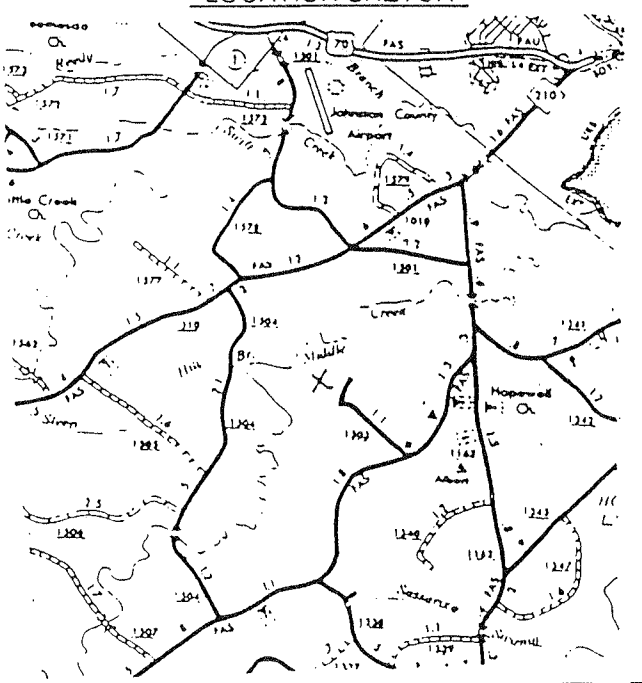
From	To	Diameter	Slot Size	Material
9	19	2 in.	.010 in.	PVC

15. SAND/GRAVEL PACK:

From	To	Size	Material
8	20		SAND

16. REMARKS:

LOCATION SKETCH



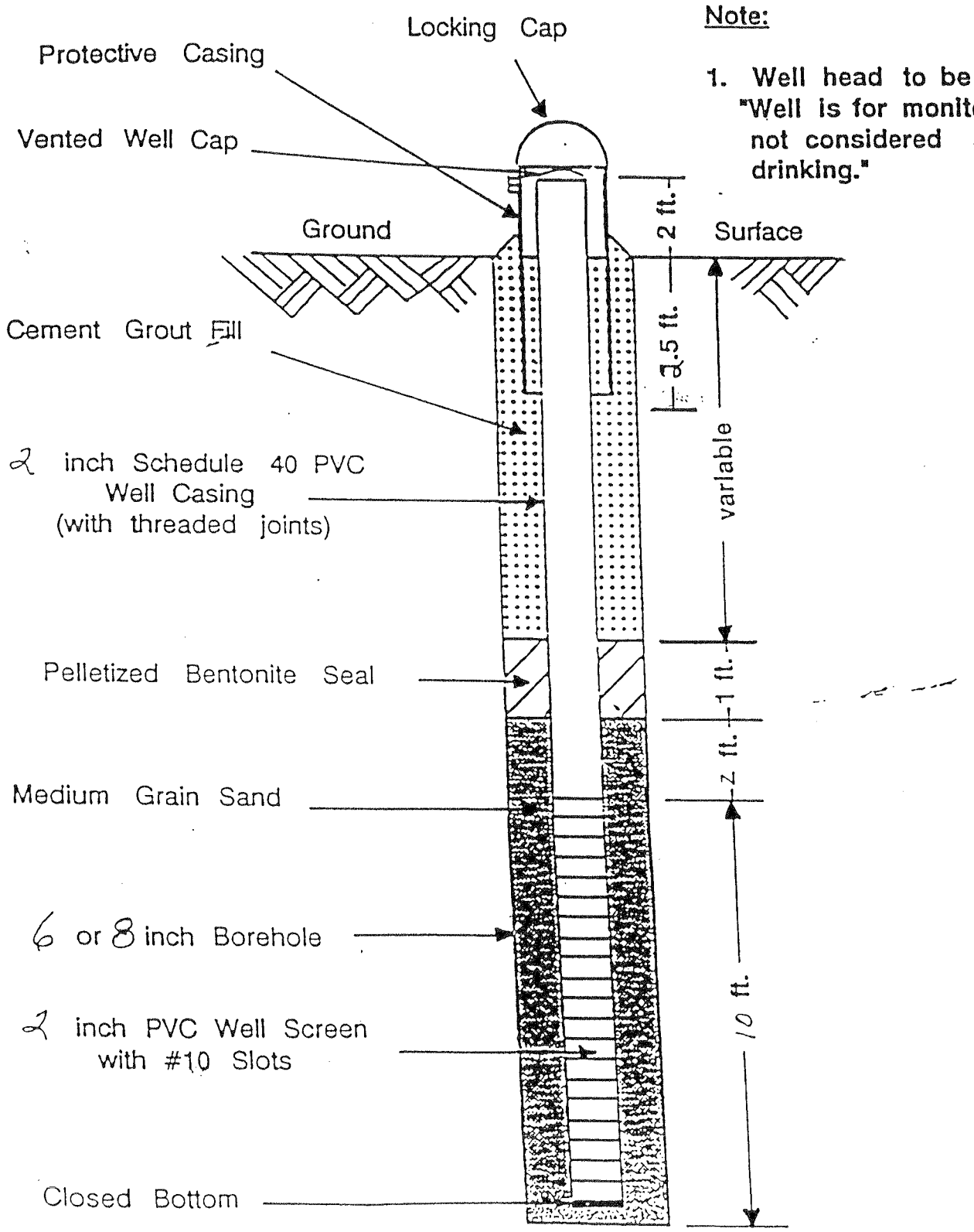
I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

[signature] 9-29-94

MW-13

MONITORING WELL CONSTRUCTION

JOHNSTON COUNTY LANDFILL (TYP.)



Note:

1. **Well head to be labeled: "Well is for monitoring and not considered safe for drinking."**

Well Construction Log

Well ID: PSW-1 (MW-19)

Total Depth: 10'

The Hutchinson Group, Ltd.

PROJECT INFORMATION

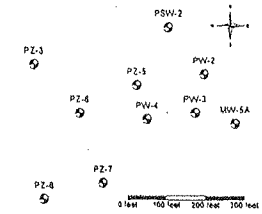
Site Name:	Johnston County Landfill
Site Location:	Smithfield, NC
Elevation:	133.88' TOC
Logged By:	E. Itle
Date(s) Drilled:	6/17/04
Drilling Co.:	Engineering Tectonics
Drilling Method:	HSA, Split Spoon
Rig Type:	Mobil B-57
Sample Method:	Split spoon
Notes:	WL 4.26' 6/18/04

SITE LOCATION

Northing: 644,509

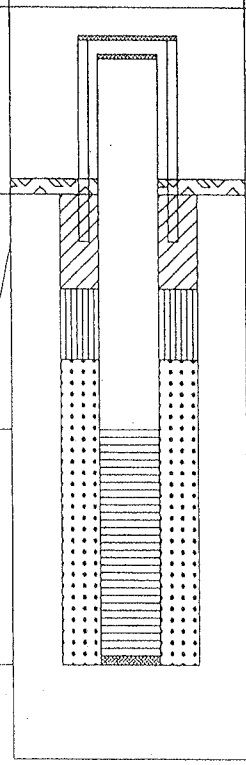
Easting: 2,171,743

Local System



▽ Water level during drilling (below ground)

▼ Water level in completed well (below ground)

DEPTH	SOIL SYMBOLS	USCS	FORMATION	LITHOLOGY	WELL COMPLETION	WELL CONSTRUCTION
0		SC		SILTY SAND: grayish brown silty very fine SAND, wet, abundant organic material		4" Steel protective cover with lock 2" expandable cap 2' x 2' x 4.0" Concrete pad 0' to -2'; Grout
				SILTY SAND: yellowish orange silty v.f. SAND with clay, moist		-2' to -3.5'; Bentonite: 3/8" Shur-plug pellets/chips
-5				SILTY SAND: light gray fine to medium silty SAND with clay, moist, loose, micaceous, some iron staining		-5 to 3; Riser: 2" Sch. 40 Type I PVC -3.5' to -10'; Gravel: #3 DSI filter sand -10' to -5'; Screen: 2" Sch. 40 Type I PVC 0.010" slot
-10						End Cap: 2" Sch. 40 PVC

THE HUTCHINSON GROUP, LTD.

LOG OF BORING NO. PSW-01 (MW-19)

COORDINATES
N _____ E _____
SURFACE EL: _____

ELEV. (FEET M.S.L.)	DEPTH (FEET)	SAMPLE NO. AND TYPE	BLOWS PER 6-INCH INCREMENTS	SAMPLE RECOVERY (IN.)	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
					1'	grayish brown, silty SAND, wet, abundant organic mtrl.	1'	
						yellowish brown silty v.f. sand w/ clay, moist,		
	5	S-1	2-2-3	1.5		light gray, f. to med. silty SAND w/ CLAY, moist, loose, micaceous, some iron staining		
	10					T.O.R. @ 10'		difficult drilling @ 9'
	15							
	20							
	25							
	30							
	35							

PROJECT NO.: 2948
DATE BEGAN: 6/17/04
DATE COMPLETED: 6/17/04
FIELD GEOLOGIST: EAJ
CHECKED BY: _____

GWL: DEPTH 4.26 DATE/TIME 6/18/04 @ 0708
GWL: DEPTH _____ DATE/TIME _____
DRILLING METHOD: 6" auger w/ split spoon

NOTES:

F-188 (BLS-B2)

DEC. 92 BORING NO. PSW-1
SHEET 1 OF 1

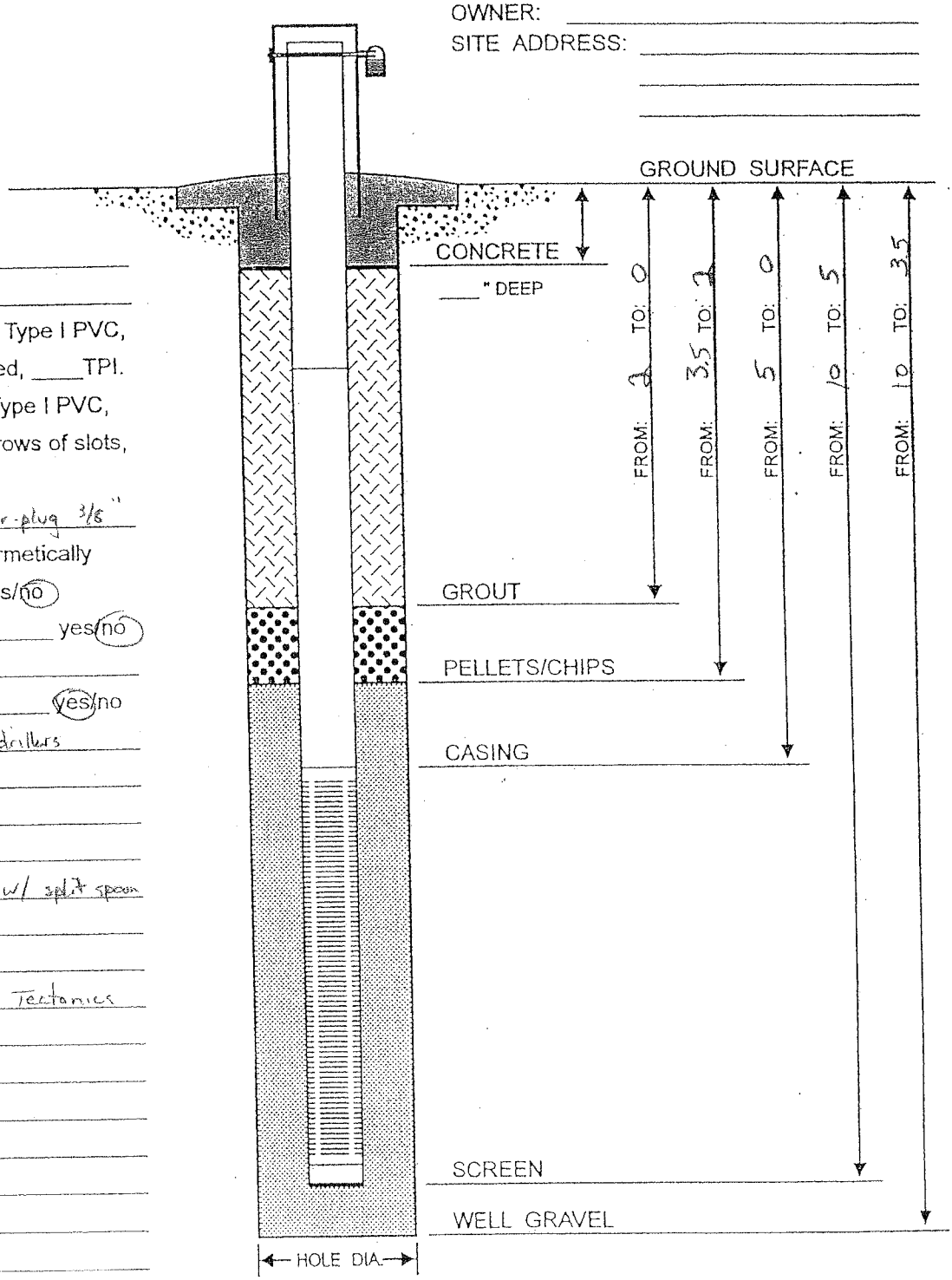
FRONT

THE HUTCHINSON GROUP, LTD
4280 Old William Penn Highway
Murrysville, Pennsylvania 15668
Office 724-325-3996 -- Fax 724-733-7901
www.geo-image.com

DATE DRILLED: 6/17/04
WELL TYPE:
WELL #: PSW-1 DEPTH: 10' ELEV.:
PERMIT #: MW-19
JOB #:
PADLOCK KEY #:
OWNER:
SITE ADDRESS:

Well Protector: +3.3'
Well top: +3.0'
Casing: 2" Sch. 40 Type I PVC, Flush Joint Threaded, ____TPI.
Screen: 2" Sch. 40 Type I PVC, 0.010 slot, ____ rows of slots, ____" spacing.
Pellets/Chips: DSI Shur-plug 3/8"
Screens & casings were hermetically sealed: ____ yes/no
Centralizers installed: ____ yes/no
Material:
Well developed: ____ yes/no
Method: surge by drillers
Duration:
Well gravel: DSI #3
Grout mix:
Drilling method: 6" auger w/ split spoon
Well driller: Ron Barron
License #:
Drilling co.: Engineering Tectonics
Phone: ( )
Address:

Engineer:
Eng. firm:
Phone: ( )
Address:



Well Construction Log

Well ID: PW-1 (mw-19d)

Total Depth: -30.0'

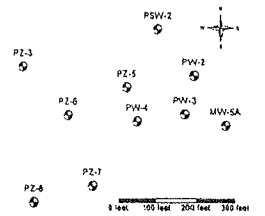
The Hutchinson Group, Ltd.

PROJECT INFORMATION

Site Name: Johnston County Landfill
Site Location: Smithfield, NC
Elevation:
Logged By: E. Itle
Date(s) Drilled: 6/17/04-6/21/04
Drilling Co.: Engineering Tectonics
Drilling Method: HSA, air rotary
Rig Type: Mobil B-57
Sample Method: Split spoon
Notes:

SITE LOCATION

Northing: 643,756
Easting: 2,171,831
Local System



Water level during drilling (below ground)
Water level in completed well (below ground)

DEPTH	SOIL SYMBOLS	USCS	FORMATION	LITHOLOGY	WELL COMPLETION	WELL CONSTRUCTION
0		sm		SILTY SAND: See PSW-1 for boring description and blow counts		4" Steel protective cover with lock 2" expandable cap 2' x 2' x 4.0" Concrete pad 4" Sch. 40 PVC casing set to -11.0 ft
-5						
-10			-11.0', bedrock	MUDSTONE: light gray silty mudstone, fresh, with a soft seam at -26 ft (water productive).		-25 to 3; Riser: 2" Sch. 40 Type I PVC
-15						0' to -19'; Grout
-20						-23' to -19'; Bentonite: Shur-pel pellets/chips --30' to -23'; Gravel: #3 DSI filter sand
-25						-30' to -25'; Screen: 2" Sch. 40 Type I PVC 0.010" slot
-30						

THE HUTCHINSON GROUP, LTD.

LOG OF BORING NO. PW-1 (MW-19d)

COORDINATES
N _____ E _____
SURFACE EL: _____

ELEV. (FEET M.S.L.)	DEPTH (FEET)	SAMPLE NO. AND TYPE	BLOWS PER 6-INCH INCREMENTS	SAMPLE RECOVERY (IN.)	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
						No samples taken; See PSW-1		4" PVC casing set to 14'
	5							
	10						11'	
						TOR @ 11'		
	15							
	20							
	25					Seam @ 26'		
	30						30	
						B.O.B. @ 30		
	35							

PROJECT NO.: 2948
DATE BEGAN: 3/17/04
DATE COMPLETED:
FIELD GEOLOGIST: EAS
CHECKED BY:

GWL: DEPTH _____ DATE/TIME _____
GWL: DEPTH _____ DATE/TIME _____
DRILLING METHOD: 6" auger to rock
3 1/8" hammer air rotary
to BOB

NOTES:

F-188 (BLS-B2)

DEC. 92 BORING NO.
SHEET 1 OF 2

FRONT

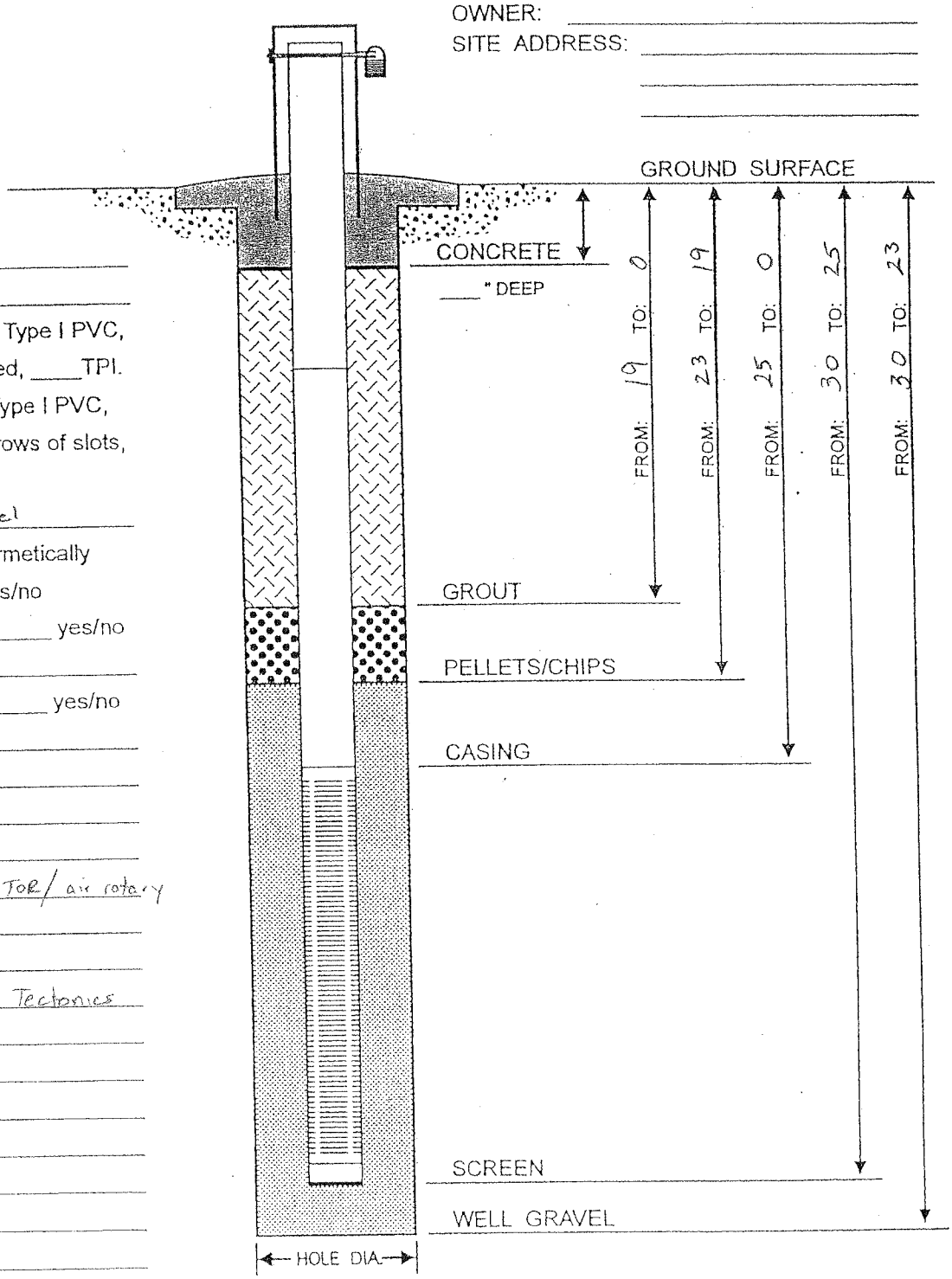
THE HUTCHINSON GROUP, LTD
4280 Old William Penn Highway
Murrysville, Pennsylvania 15668
ffice 724-325-3996 -- Fax 724-733-7901
www.geo-image.com

DATE DRILLED: 6/17/04-6/21/04
WELL TYPE:
WELL #: PW-19 DEPTH: 30' ELEV.:
PERMIT #:
JOB #:
PADLOCK KEY #:
OWNER:
SITE ADDRESS:

4" PVC casing set to 11'

Well Protector:
Well top: 3'
Casing: 2" Sch. 40 Type I PVC,
Flush Joint Threaded, ____TPI.
Screen: 2" Sch. 40 Type I PVC,
____ slot, ____ rows of slots,
____" spacing.
Pellets/Chips: DSI Shur-pel
Screens & casings were hermetically
sealed: ____ yes/no
Centralizers installed: ____ yes/no
Material:
Well developed: ____ yes/no
Method:
Duration:
Well gravel: DSI #3
Grout mix:
Drilling method: 6" auger to TOR/ air rotary
Well driller: Ron Barren
License #:
Drilling co.: Engineering Tectonics
Phone: ( )
Address:

Engineer:
Eng. firm:
Phone: ( )
Address:



Well Construction Log

Well ID: PW-2 (MW-20)

Total Depth: 31.5'

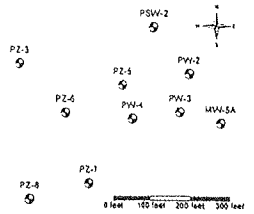
The Hutchinson Group, Ltd.

PROJECT INFORMATION

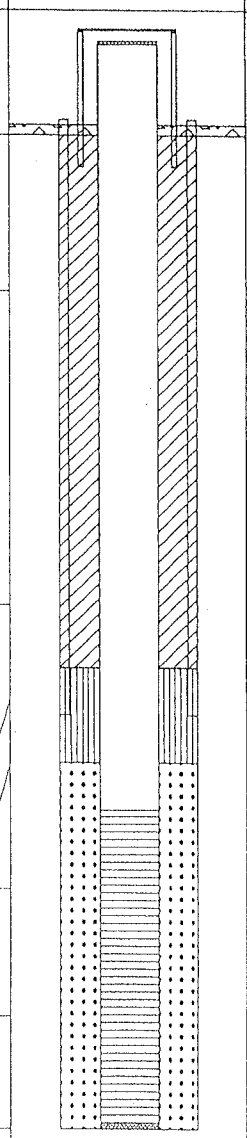
Site Name: Johnston County Landfill
Site Location: Smithfield, NC
Elevation: 161.62' TOC
Logged By: E. Itle
Date(s) Drilled: 6/15/04-6/16/04
Drilling Co.: Engineering Tectonics
Drilling Method: HSA, air rotary
Rig Type: Mobil B-57
Sample Method: Split spoon
Notes: WL 5.59' 6/17/04

SITE LOCATION

Northing: 643,871
Easting: 2,171,978
Local System



▽ Water level during drilling (below ground)
▼ Water level in completed well (below ground)

DEPTH	SOIL SYMBOLS	USCS	FORMATION	LITHOLOGY	WELL COMPLETION	WELL CONSTRUCTION
0		sc		SAND: yellowish orange, dry.		4" Steel protective cover with lock 2" expandable cap 2' x 2' x 4.0" Concrete pad 4" Sch. 40 PVC casing set to 18.5 ft
-5		sm		SILTY SAND: yellowish orange fine SAND with clay, dry, dense to very dense, slightly micaceous		-21.5 to 3; Riser: 2" Sch. 40 Type I PVC 0' to -17'; Grout
-10						
-15			-18'; Bedrock	SILTY SAND: yellowish orange and light gray fine SAND with clay, slightly moist, very dense, few fragments of rock at 17 ft.		
-20				MUDSTONE: light gray silty mudstone, fresh MUDSTONE: brown muddy weathered zone 20-21 ft.		-20' to -17'; Bentonite: Shur-pel pellets/chips -31.5' to -20'; Gravel: #3 DSI filter sand
-25				MUDSTONE: brown muddy seam 24-28; producing minimal water		-31.5' to -21.5'; Screen: 2" Sch. 40 Type I PVC 0.010" slot
-30				MUDSTONE: light gray silty mudstone, fresh		

THE HUTCHINSON GROUP, LTD.

LOG OF BORING NO. PW-2 (MW-20)

COORDINATES
N _____ E _____
SURFACE EL: _____

ELEV. (FEET M.S.L.)	DEPTH (FEET)	SAMPLE NO. AND TYPE	BLOWS PER 6-INCH INCREMENTS	SAMPLE RECOVERY (IN.)	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
						SAND, yellowish orange, dry		11" PVC casing set to 0-18.5'
	5	S-1	9-17-23	1.5		yellowish orange fine SAND w/ CLAY, dry, dense		
	10	S-2	8-27-50	1.5		yellowish orange fine SAND w/ CLAY, dry, very dense, sl. micaceous		
	15	S-3	8-21-50/3"	1.2		yellowish orange or light gray fine SAND w/ CLAY, slightly moist, very dense		difficult drilling @ 17'
						few fragments of light gray f.g. sandstone @ 17'		
					18'			TOR @ 18
	20					mudstone w/ silt, light gray, fresh		
						soft zone 20-21', getting brown mud		
	25					mud seam 24-29' producing minimal water 2-3 gpm		
	30					harder drilling at 29' → fresh, lt. gray silty mudstone		
							31.5	
						BOB @ 31.5		
	35							

PROJECT NO.: 2948
DATE BEGAN: 6/15/04
DATE COMPLETED: 6/16/04
FIELD GEOLOGIST: EAI
CHECKED BY: _____

GWL: DEPTH 5.59 DATE/TIME 6/17/04 @ 1128
GWL: DEPTH _____ DATE/TIME _____
DRILLING METHOD: 6" auger w/ split spoon
3 7/8" air rotary hammer in rock

NOTES:

F-188 (BLS-B2)

DEC. 92 BORING NO.
SHEET OF

FRONT

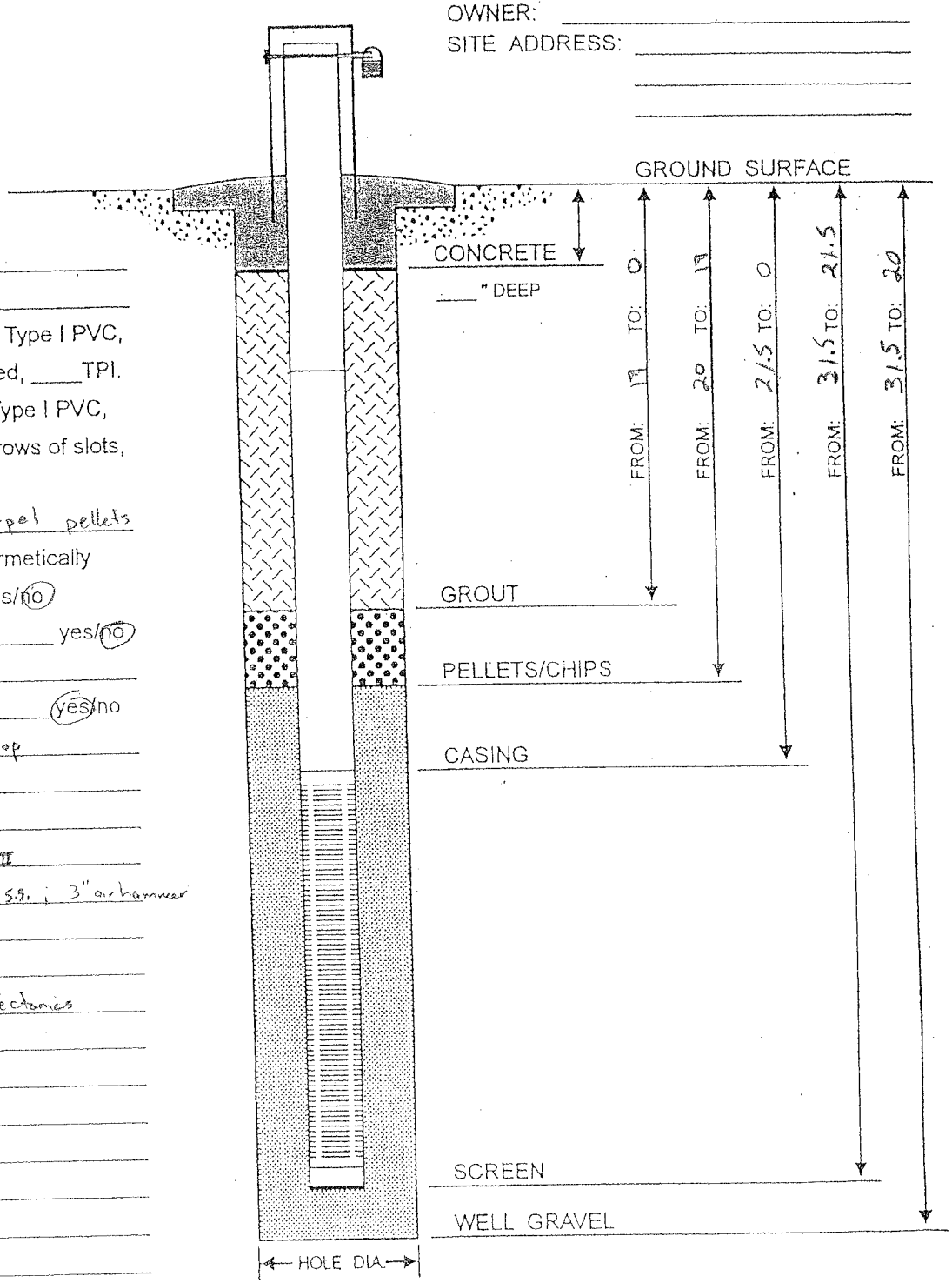
THE HUTCHINSON GROUP, LTD
4280 Old William Penn Highway
Murrysville, Pennsylvania 15668
Office 724-325-3996 -- Fax 724-733-7901
www.geo-image.com

4" Sch 40 PVC casing 0-18.5'

DATE DRILLED: 6/15/04
WELL TYPE:
WELL #: PW-2 DEPTH: 31.5 ELEV.:
PERMIT #:
JOB #:
PADLOCK KEY #:
OWNER:
SITE ADDRESS:

Well Protector:
Well top: +2.83'
Casing: 2" Sch. 40 Type I PVC,
Flush Joint Threaded, ____TPI.
Screen: 2" Sch. 40 Type I PVC,
0.010 slot, ____ rows of slots,
____" spacing.
Pellets/Chips: DSI Shur-pel pellets
Screens & casings were hermetically
sealed: ____ yes/no
Centralizers installed: ____ yes/no
Material:
Well developed: ____ yes/no
Method: air develop
Duration: 10 min
Well gravel: DSI #3
Grout mix: Portland Type I/II
Drilling method: 6" auger w/ s.s. ; 3" air hammer
Well driller: Ron Barren
License #:
Drilling co.: Engineering Tectonics
Phone: ( )
Address:

Engineer:
Eng. firm:
Phone: ( )
Address:



Well Construction Log

Well ID: PW-3 (MW-21)

Total Depth: 45.0'

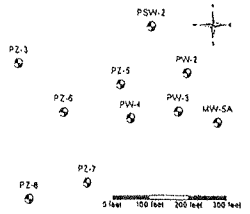
The Hutchinson Group, Ltd.

PROJECT INFORMATION

Site Name: Johnston County Landfill
Site Location: Smithfield, NC
Elevation: 165.89' TOC
Logged By: E. Itle
Date(s) Drilled: 6/14/04-6/16/04
Drilling Co.: Engineering Tectonics
Drilling Method: HSA, air rotary
Rig Type: Mobil B-57
Sample Method: Split spoon
Notes: WL 9.65' 6/17/04

SITE LOCATION

Northing: 643,774
Easting: 2,171,955
Local System



Water level during drilling (below ground)
Water level in completed well (below ground)

DEPTH	SOIL SYMBOLS	USCS	FORMATION	LITHOLOGY	WELL COMPLETION	WELL CONSTRUCTION
0		sm		SILTY SAND: yellowish orange fine SAND with clay, dry, dense		6" Steel protective cover with lock 4" expandable cap 2' x 2' x 4.0" Concrete pad 6" Sch. 40 PVC casing set to 25 ft
-5						
-10				SILTY SAND: yellowish orange and light gray fine SAND with clay, dry, very dense, few rock fragments at 19 ft.		0' to -28'; Grout
-15						
-20				SILTY SAND: highly weathered silty mudstone, very hard drilling		-35 to 3; Riser: 4" Sch. 40 Type I PVC
-25			-25', bedrock	MUDSTONE: silty mudstone, light gray, fresh, fracture at 26.5 producing minimal water		
-30				MUDSTONE: brown muddy seam 37 ft; producing minimal water		-33' to -28'; Bentonite: Shur-pel pellets/chips
-35						-45' to -33'; Gravel: #3 DSI filter sand
-40						-45' to -35'; Screen: 4" Sch. 40 Type I PVC 0.010" slot
-45						

THE HUTCHINSON GROUP, LTD.

LOG OF BORING NO. PW-3 (MW-21)

COORDINATES: N 643850.14151 E 2172030.262

SURFACE EL: _____

ELEV. (FEET M.S.L.)	DEPTH (FEET)	SAMPLE NO. AND TYPE	BLOWS PER 6-INCH INCREMENTS	SAMPLE RECOVERY (IN.)	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
						~~Sme~~ ~~medium~~ SAND, w/clay, yellowish orange, dry.	SW	6" PVC casing 0-25' (grouted in place)
	5	S-1	18-23 24	1.1		~~Gray~~ ~~medium~~ SAND, yellowish orange, dry, dense		
6.5								
	10	S-2	20-35 38	1.5		~~fine~~ SAND, yellowish orange & lt. gray dry, very dense		
11.5								
	15	S-3	27-50/5"	1.5'		fine SAND, with clay, yellowish orange, dry, very dense	SC	
16.5								
						rock fragments at 19'		very hard drilling at 18'
	20	S-4	50/6"	0.2		moist at 20'		
21.5								
	25				25'	T.O.B.	25'	
						Fracture at 26.5' → producing water		
	30					mudstone, light gray, some silt, fresh		
	35							

PROJECT NO.: 2948

DATE BEGAN: 6/14/04

DATE COMPLETED: 6/16/04

FIELD GEOLOGIST: EAI

CHECKED BY: _____

GWL: DEPTH 9.65 DATE/TIME 6/17/04 @ 1130

GWL: DEPTH _____ DATE/TIME _____

DRILLING METHOD: 6" auger to rock
split spoon sampling
air rotary 5¾ hammer in rock

NOTES:

F-188 (BLS-B2)

DEC. 92 BORING NO. PW-3
SHEET 1 OF 2

FRONT

THE HUTCHINSON GROUP, LTD.

LOG OF BORING NO. PW-3 (MW-21)

ELEV. (FEET M.S.L.)	DEPTH (FEET)	SAMPLE NO. AND TYPE	BLOWS PER 6-INCH INCREMENTS	SAMPLE RECOVERY (IN.)	PROFILE	COORDINATES N ____ E ____ SURFACE EL: ____ DESCRIPTION	USCS SYMBOL	REMARKS
						Soft zone at 37', producing ~10 gpm		
	40							
	45					B.O.B. @ 45'	45'	
	50							
	55							
	60							
	65							
	70							

PROJECT NO.: 2948
DATE BEGAN: 6/14/04
DATE COMPLETED: 6/16/04
FIELD GEOLOGIST: EAE
CHECKED BY: ____

GWL: DEPTH ____ DATE/TIME ____
GWL: DEPTH ____ DATE/TIME ____
DRILLING METHOD: ____

NOTES:

F-188 (BLS-82)

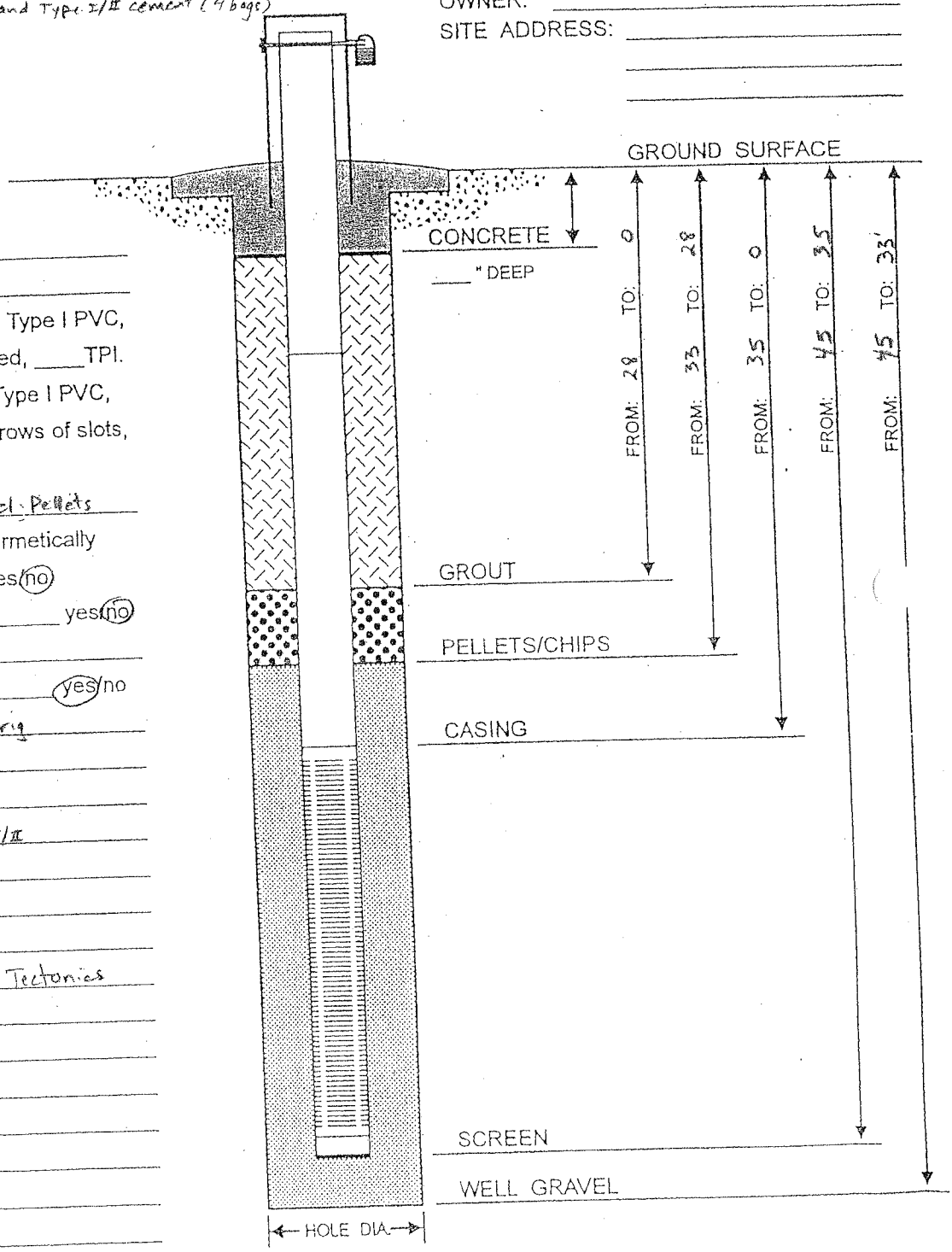
DEC. 92 BORING NO. PW-3
SHEET 2 OF 2

FRONT

THE HUTCHINSON GROUP, LTD
4280 Old William Penn Highway
Murrysville, Pennsylvania 15668
Office 724-325-3996 -- Fax 724-733-7901
www.geo-image.com

DATE DRILLED: 6-14-04
WELL TYPE:
WELL #: PW-3 / MW-21 DEPTH: 42' ELEV.:
PERMIT #:
JOB #:
PADLOCK KEY #:
OWNER:
SITE ADDRESS:

6" PVC Casing 0-25'
(grouted in place)
Portland Type I/II cement (4 bags)



Well Protector: +3.2'
Well top: +2.75'
Casing: 4 " Sch. 40 Type I PVC,
Flush Joint Threaded, ____TPI.
Screen: 4 " Sch. 40 Type I PVC,
0.020 slot, ____ rows of slots,
____" spacing.
Pellets/Chips: DSI Shur-Pel Pellets
Screens & casings were hermetically
sealed: ____ yes/no
Centralizers installed: ____ yes/no
Material:
Well developed: ____ yes/no
Method: air rotary rig
Duration: 5 min
Well gravel: DSI # 3
Grout mix: Portland Type I/II
Drilling method: 6" auger
Well driller: Ron Barren
License #:
Drilling co.: Engineering Tectonics
Phone: (____)
Address:

Engineer:
Eng. firm:
Phone: (____)
Address:

Well Construction Log

Well ID: PW-4

Total Depth: 32.0'

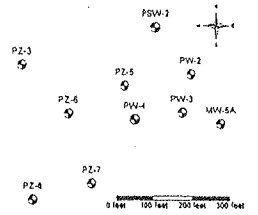
The Hutchinson Group, Ltd.

PROJECT INFORMATION

Site Name: Johnston County Landfill
Site Location: Smithfield, NC
Elevation: 156.57' TOC
Logged By: E. Itle
Date(s) Drilled: 6/15/04-6/17/04
Drilling Co.: Engineering Tectonics
Drilling Method: HSA, air rotary
Rig Type: Mobil B-57
Sample Method: Split spoon
Notes: WL 5.61' 6/17/04

SITE LOCATION

Northing: 643,756
Easting: 2,171,831
Local System



Water level during drilling (below ground)
Water level in completed well (below ground)

DEPTH	SOIL SYMBOLS	USCS	FORMATION	LITHOLOGY	WELL COMPLETION	WELL CONSTRUCTION
0		sm		SILTY SAND: yellowish orange to light gray fine SAND with clay, dry, very dense		4" Steel protective cover with lock 2" expandable cap 2' x 2' x 4.0" Concrete pad 4" Sch. 40 PVC casing set to 16.5 ft
-5						
-10				SILTY SAND: yellowish orange and light gray fine SAND with clay, dry, very dense, highly weathered rock		-35 to 3; Riser: 2" Sch. 40 Type I PVC
-15			-16.6', bedrock	SILTY SAND: greenish gray silty mudstone, highly weathered, very dense, dry, few rock fragments		0' to -28'; Grout
-20				MUDSTONE: silty mudstone, light gray, fresh		-33' to -28'; Bentonite: Shur-pel pellets/chips
-25				MUDSTONE: brown muddy seam 22-24 ft; producing minimal water MUDSTONE: fresh mudstone with a soft weathered zone 26.5-27.5 ft and fractures at 26 and 31 ft.		-45' to -33'; Gravel: #3 DSI filter sand -45' to -35'; Screen: 2" Sch. 40 Type I PVC 0.010" slot
-30						

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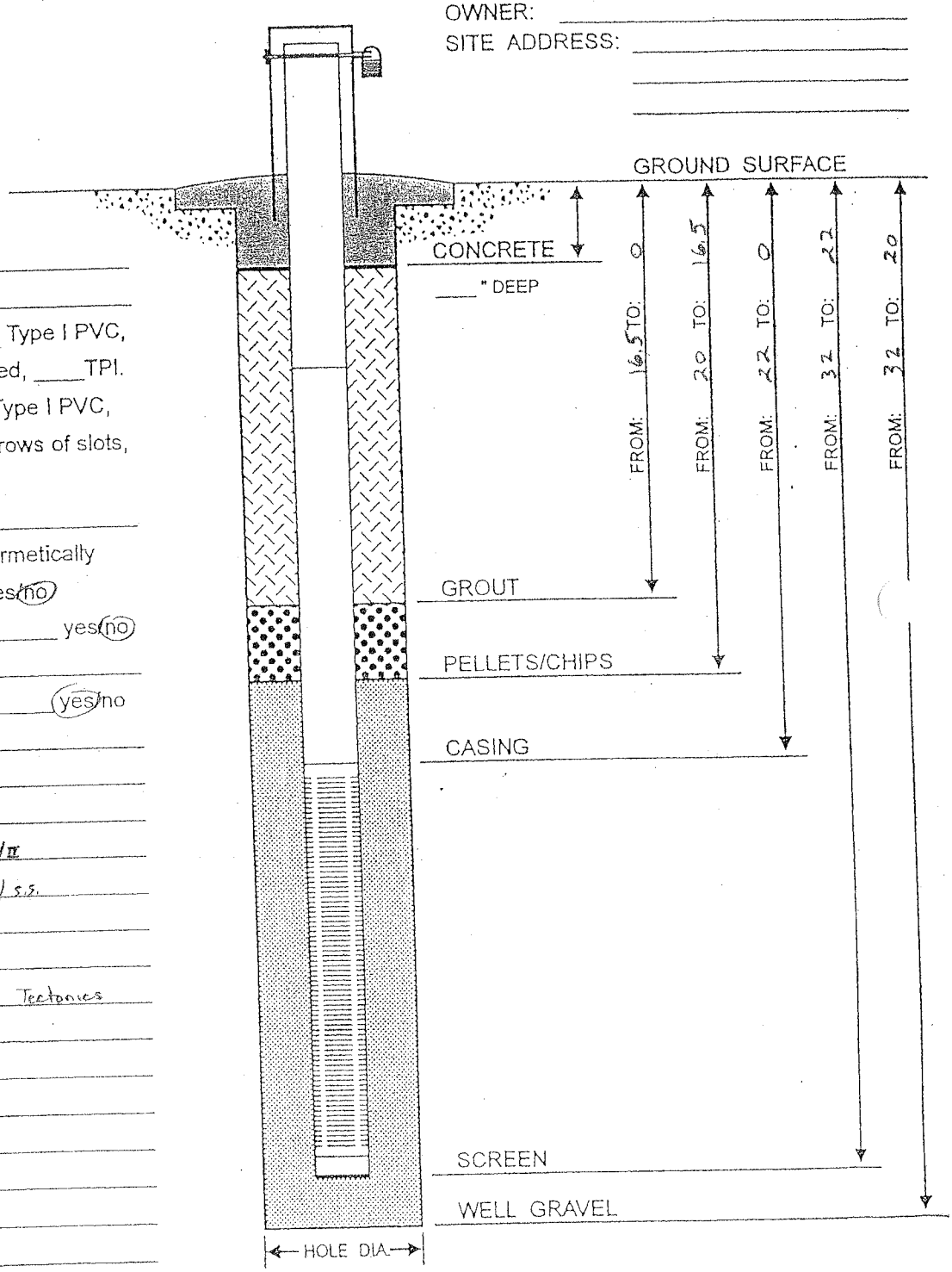
4280 Old William Penn Highway
Murrysville, Pennsylvania 15668
Office 724-325-3996 -- Fax 724-733-7901
www.geo-image.com

4" PVC Casing Sch. 40 to 0 - 16.5'

DATE DRILLED: 6/15/04 - 6/17/04
WELL TYPE:
WELL #: PW-4 DEPTH: 32 ELEV.:
PERMIT #:
JOB #:
PADLOCK KEY #:
OWNER:
SITE ADDRESS:

Well Protector:
Well top:
Casing: 2" Sch. 40 Type I PVC, Flush Joint Threaded, ____TPI.
Screen: 2" Sch. 40 Type I PVC, 0.010 slot, ____ rows of slots, ____" spacing.
Pellets/Chips: bSI Shur-Pel
Screens & casings were hermetically sealed: ____ yes/no
Centralizers installed: ____ yes/no
Material:
Well developed: ____ yes/no
Method: purge/bail
Duration:
Well gravel: bSI #3
Grout mix: Portland Type I/II
Drilling method: 6" auger w/ s.s.
Well driller: Ron Barren
License #:
Drilling co.: Engineering Tectonics
Phone: ( )
Address:

Engineer:
Eng. firm:
Phone: ( )
Address:



THE HUTCHINSON GROUP, LTD.

LOG OF BORING NO. PW-4

COORDINATES: N 643832.91 E 2171905.21

SURFACE EL: _____

ELEV. (FEET M.S.L.)	DEPTH (FEET)	SAMPLE NO. AND TYPE	BLOWS PER 6-INCH INCREMENTS	SAMPLE RECOVERY (IN.)	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
						yellowish orange SAND w/ Clay, dry.		4" PVC Sch. 40 casing 0-16.5'
	5	S-1	34-50/5"	0.9		yellowish orange, lt gray SAND w/ CLAY, dry, very dense.		Saprolite material
	10	S-2	50/6"	0.5'		highly weathered Rock, yellowish orange or light gray, very dense, dry, some clay		
						brown at 13'		
	15	S-3	50/3"	0.3		greenish gray ~~sand~~ weathered Rock, very dense, dry, few rock fragments		difficult drilling at 15.5'
						TOR @ 16.5'		
	20					Silty Mudstone, light gray, fresh, dry		
						medium brown weathered zone 22-24' dainimal water production		
	25					fracture @ 26'		producing ~1 gpm
						soft weathered zone 26.5-27.5'		
	30					fracture at 31'		
							32'	
						B.O.B. @ 32'		
	35							

PROJECT NO.: 2948

DATE BEGAN: 6/15/04 @

DATE COMPLETED: 6/17/04

FIELD GEOLOGIST: EAS

CHECKED BY: _____

GWL: DEPTH 5.61 DATE/TIME 6/17/04 @ 1134

GWL: DEPTH _____ DATE/TIME _____

DRILLING METHOD: 6" auger with split spoon air rotary in rock

NOTES:

F-188 (BLS-B2)

DEC. 92 BORING NO. PW-4
SHEET 1 OF 2

FRONT

Well Construction Log

Well ID: PSW-2

Total Depth: 35'

The Hutchinson Group, Ltd.

PROJECT INFORMATION

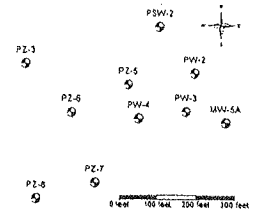
Site Name:	Johnston County Landfill
Site Location:	Smithfield, NC
Elevation:	163.71' TOC
Logged By:	E. Itle
Date(s) Drilled:	6/16/04
Drilling Co.:	Engineering Tectonics
Drilling Method:	HSA, Split Spoon
Rig Type:	Mobil B-57
Sample Method:	Split spoon
Notes:	WL 11.20' 6/16/04

SITE LOCATION

Northing: 643,990

Easting: 2,171,888

Local System



▽ Water level during drilling (below ground)

▼ Water level in completed well (below ground)

DEPTH	SOIL SYMBOLS	USCS	FORMATION	LITHOLOGY	WELL COMPLETION	WELL CONSTRUCTION
0		sm		SILTY SAND: yellowish orange silty fine SAND, dry		4" Steel protective cover with lock 2" expandable cap 2' x 2' x 4.0" Concrete pad 0' to -16'; Grout
-5				SILTY SAND: yellowish orange silty very fine SAND with clay, medium dense to dense, greasy feel		-20 to 3; Riser: 2" Sch. 40 Type I PVC
-10						
-15				SILTY SAND: reddish brown silty very fine sand with clay, very dense, dry, relict layering; few rock fragments at 20 ft.		-18' to -16'; Bentonite: 3/8" Shur-plug pellets/chips
-20						-35' to -18'; Gravel: #3 DSI filter sand
-25				SILTY SAND: light brown and olive green silty very fine sand with clay, dry, relict layering moist at 33 ft.		-35' to -20'; Screen: 2" Sch. 40 Type I PVC 0.010" slot
-30						
-35						End Cap: 2" Sch. 40 PVC

THE HUTCHINSON GROUP, LTD.

LOG OF BORING NO. BW-2

COORDINATES
N _____ E _____
SURFACE EL: _____

ELEV. (FEET M.S.L.)	DEPTH (FEET)	SAMPLE NO. AND TYPE	BLOWS PER 6-INCH INCREMENTS	SAMPLE RECOVERY (IN.)	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
						yellowish orange fine SAND, dry		
	5	S-1	7-8-11	1.5		yellowish orange v. fine SAND w/ CLAY, dry, medium dense, greasy feel		
	10	S-2	12-14-18	1.5		dense, dry, yellowish orange SILTY v.f. SAND w/ clay		
	15	S-3	21-50/6"	1.0		color change to reddish brown, very dense, dry, relict layering, silty v.f. SAND w/ CLAY		
	20	S-4	10-12-33	1.5		few rock fragments		more prominent texture
	25	S-5	49-50/3"	0.8		lt. brown olive green, silty v.f. SAND w/ clay, relict layering, dry		difficult drilling at 26'
	30	S-6	50/5"	0.4		dry @ 30		
						v. moist at 33'		
	35					BOB @ 35		

PROJECT NO.: 2948
DATE BEGAN: 6/16/04
DATE COMPLETED: 6/16/04
FIELD GEOLOGIST: EAS
CHECKED BY: _____

GWL: DEPTH 11.20 DATE/TIME 6/16/04 1124
GWL: DEPTH _____ DATE/TIME _____
DRILLING METHOD: 6" auger w/ split spoon

NOTES:

F-188 (BLS-B2)

DEC. 92 BORING NO.
SHEET 1 OF 2

FRONT

THE HUTCHINSON GROUP, LTD.

LOG OF BORING NO. PSW-2

COORDINATES
N _____ E _____
SURFACE EL: _____

ELEV. (FEET M.S.L.)	DEPTH (FEET)	SAMPLE NO. AND TYPE	BLOWS PER 6-INCH INCREMENTS	SAMPLE RECOVERY (IN.)	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
85		S7	50/5"					
	40							

PROJECT NO.: 2948
DATE BEGAN: 6/16/04
DATE COMPLETED: 6/16/04
FIELD GEOLOGIST: EAB
CHECKED BY: _____

GWL: DEPTH _____ DATE/TIME _____
GWL: DEPTH _____ DATE/TIME _____
DRILLING METHOD: _____

NOTES:

F-188 (BLS-B2)

DEC. 92 BORING NO.
SHEET 2 OF 2

FRONT

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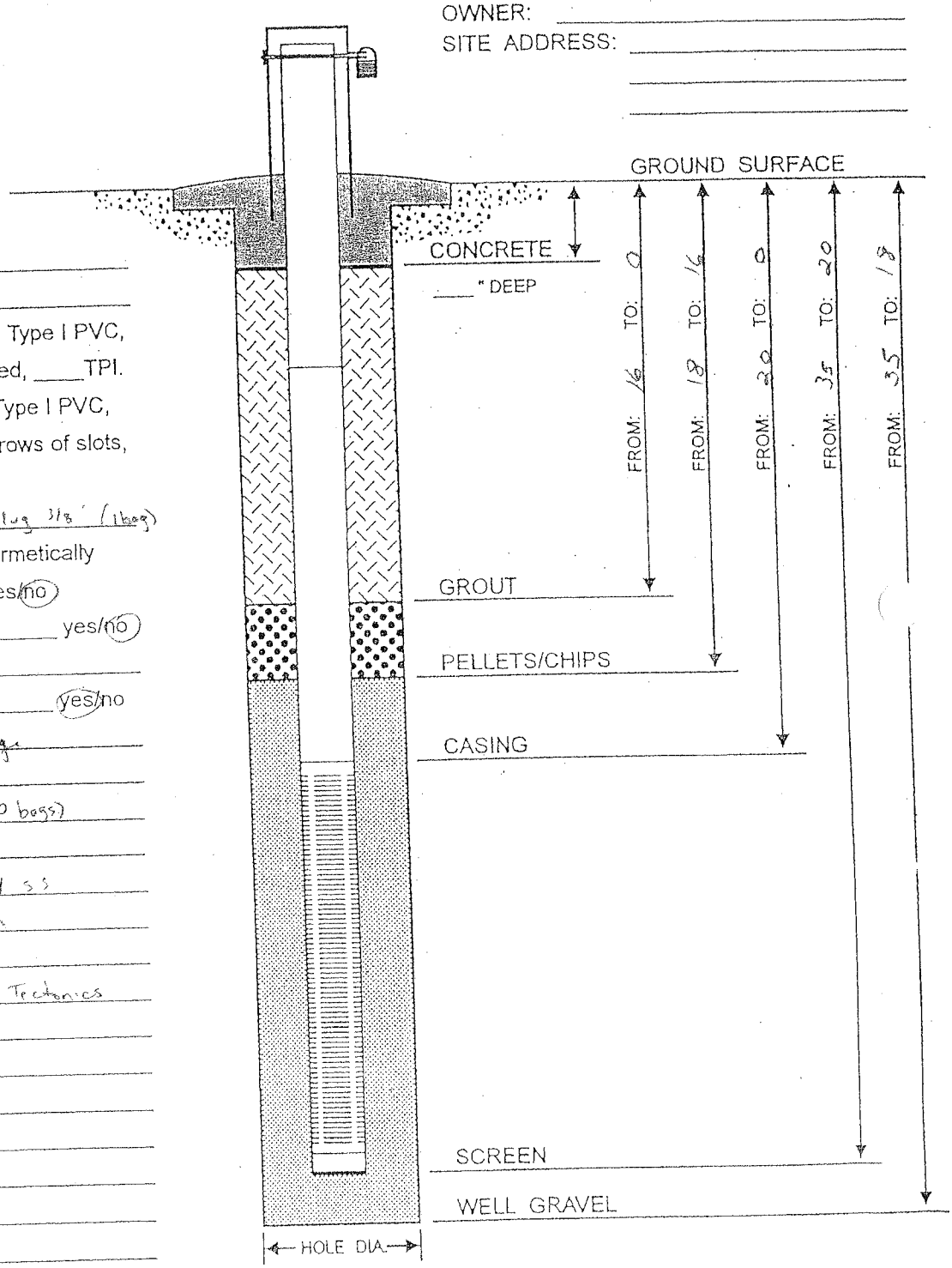
4280 Old William Penn Highway
Murrysville, Pennsylvania 15668
Office 724-325-3996 -- Fax 724-733-7901
www.geo-image.com

DATE DRILLED: 6/16/04
WELL TYPE:
WELL #: PSW-2 DEPTH: 35 ELEV.:
PERMIT #:
JOB #:
PADLOCK KEY #: 0536
OWNER:
SITE ADDRESS:

Well Protector:
Well top:
Casing: 2" Sch. 40 Type I PVC,
Flush Joint Threaded, ____TPI.
Screen: 2" Sch. 40 Type I PVC,
____ slot, ____ rows of slots,
____" spacing.
Pellets/Chips: DSI Shur-Plug 3/8" (1 bag)
Screens & casings were hermetically
sealed: ____ yes/no
Centralizers installed: ____ yes/no
Material:
Well developed: ____ yes/no
Method: bail/purge
Duration:
Well gravel: DSI #3 (10 bags)
Grout mix:
Drilling method: 6" Auger w/ SS
Well driller: Ron Barreen
License #:
Drilling co.: Engineering Tectonics
Phone: (____)
Address:

Engineer:
Eng. firm:
Phone: (____)
Address:



Well Construction Log

Well ID: PSW-3

Total Depth: 28'

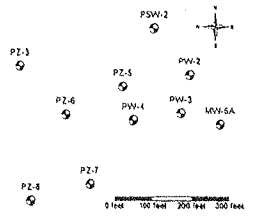
The Hutchinson Group, Ltd.

PROJECT INFORMATION

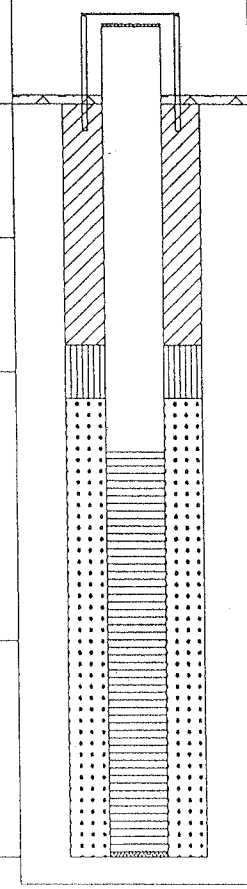
Site Name: Johnston County Landfill
Site Location: Smithfield, NC
Elevation: 174.52' TOC
Logged By: E. Itle
Date(s) Drilled: 6/16/04
Drilling Co.: Engineering Tectonics
Drilling Method: HSA, Split Spoon
Rig Type: Mobil B-57
Sample Method: Split spoon
Notes: WL 20.91' 6/16/04

SITE LOCATION

Northing: 643,454
Easting: 2,171,724
Local System



Water level during drilling (below ground)
Water level in completed well (below ground)

DEPTH	SOIL SYMBOLS	USCS	FORMATION	LITHOLOGY	WELL COMPLETION	WELL CONSTRUCTION
0		sm		SAND: medium SAND with clay, yellowish bro9wn, loose, wet.		4" Steel protective cover with lock 2" expandable cap 2' x 2' x 4.0" Concrete pad
-5				SILTY SAND: yellowish brown medium SAND with clay, loose, wet		-13 to 3; Riser: 2" Sch. 40 Type I PVC 0' to -9'; Grout
-10		ml		SILT: greenish white to yellowish orange clayey SILT, moist, low plasticity		-11' to -9'; Bentonite: 3/8" Shur-plug pellets/chips
-15						-28' to -11'; Gravel: #3 DSI filter sand
-20		sm		SILTY SAND: yellowish orange silty very fine SAND, dense, dry to moist, relict layering with rock fragments at 27 ft.		
-25						-28' to -13'; Screen: 2" Sch. 40 Type I PVC 0.010" slot End Cap: 2" Sch. 40

THE HUTCHINSON GROUP, LTD.

LOG OF BORING NO. PSW-3

COORDINATES
N _____ E _____
SURFACE EL: _____

ELEV. (FEET M.S.L.)	DEPTH (FEET)	SAMPLE NO. AND TYPE	BLOWS PER 6-INCH INCREMENTS	SAMPLE RECOVERY (IN.)	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
	5	S-1	3-4-3	1.2		medium SAND w/ clay, yellowish brown loose, wet		
	10	S-2	9-14-17	1.5		CLAYEY SILT, very light greenish white, moist, low plasticity		has greasy feel
	15	S-3	13-19-27	1.5		color change to yellowish orange		
	20	S-4	21-32-50/5"	1.5		SILTY, v. fine SAND, yellowish orange, very dense, dry to moist, relict layering		
	25	S-5	50/3"	0.3'		dry to slightly moist, rock fragments at 27'		hard drilling @ 26.5'
	30					B.O.B. @ 28'		
	35							

PROJECT NO.: 2948
DATE BEGAN: 6/15/04
DATE COMPLETED: 6/15/04
FIELD GEOLOGIST: EAS
CHECKED BY: _____

GWL: DEPTH 20.91 DATE/TIME 6/16/04 0700
GWL: DEPTH _____ DATE/TIME _____
DRILLING METHOD: 6" auger w/ split spoon

NOTES:

F-188 (BLS-B2)

DEC. 92 BORING NO.
SHEET OF

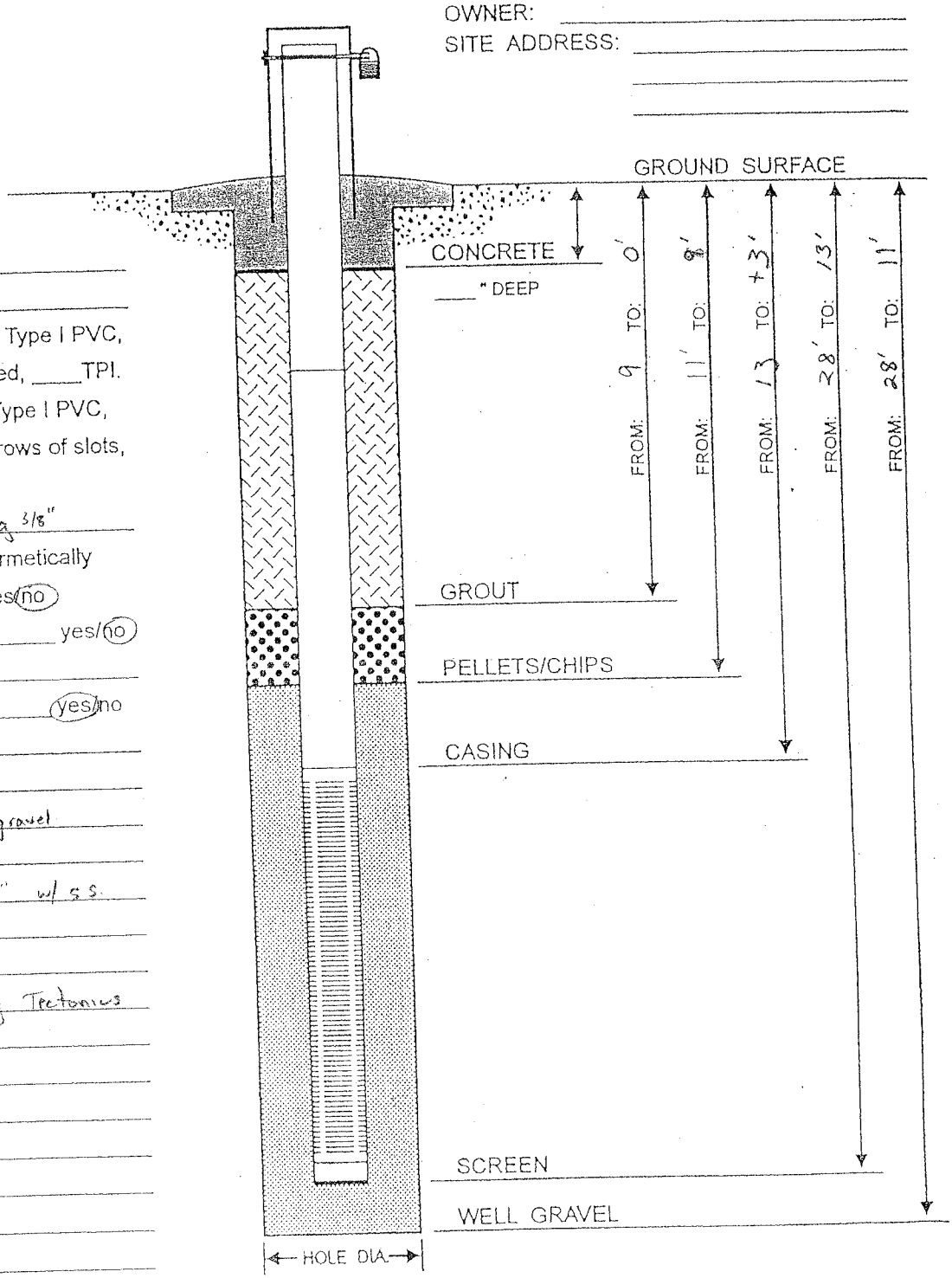
FRONT

THE HUTCHINSON GROUP, LTD
4280 Old William Penn Highway
Murrysville, Pennsylvania 15668
Office 724-325-3996 -- Fax 724-733-7901
www.geo-image.com

DATE DRILLED: 6/15/04
WELL TYPE:
WELL #: PSW-3 DEPTH: 28' ELEV.:
PERMIT #:
JOB #:
PADLOCK KEY #: 0536
OWNER:
SITE ADDRESS:

Well Protector:
Well top: +3'
Casing: 2" Sch. 40 Type I PVC, Flush Joint Threaded, ____TPI.
Screen: 2" Sch. 40 Type I PVC, 0.01 slot, ____ rows of slots, ____" spacing.
Pellets/Chips: DSI Shur-plug 3/8"
Screens & casings were hermetically sealed: ____ yes/no
Centralizers installed: ____ yes/no
Material:
Well developed: ____ yes/no
Method: purge/bail
Duration:
Well gravel: DSI #3 gravel
Grout mix:
Drilling method: auger 6" w/ s.s.
Well driller: Ron Barren
License #:
Drilling co.: Engineering Tectonics
Phone: ( )
Address:

Engineer:
Eng. firm:
Phone: ( )
Address:



WELL CONSTRUCTION RECORD

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

WELL CONTRACTOR (INDIVIDUAL) NAME (print) Ronald Barron CERTIFICATION # 2091

WELL CONTRACTOR COMPANY NAME Engineering Tectonics PHONE # (336) 724-6884

STATE WELL CONSTRUCTION PERMIT# _____ (if applicable) ASSOCIATED WQ Permit # _____ (if applicable)

1. WELL USE (Check Applicable Box): Residential ☐ Municipal/Public ☐ Industrial ☐ Agricultural ☐ Monitoring ☒ Recovery ☐ Heat Pump water Injection ☐ other ☐ If other, list use: ~~PSd~~ (PSW-1)

2. WELL LOCATION:
Nearest Town: Smithfield County Johnston
680 County Home Road,27577
(Street Name, Numbers, Community, Subdivision, Lot No., Zip Code)

Topographic/ Land setting
☐ Ridge ☐ slope ☐ valley ☒ Flat
(check appropriate box)
Latitude/Longitude of well location
_____
(degrees/minutes/seconds)
Latitude/Longitude source: ☐ GPS ☐ Topographic map
(check box)

3. OWNER Johnston Co. Utility Department
Address 680 County Home Road
(Street or Route No)
Smithfield N.C. 27577
City or Town State Zip code
(___)-919-934-4576
Area Code- Phone number

4. DATE DRILLED 6-17-04
5. TOTAL DEPTH 10.0
6. DOES WELL REPLACE EXISTING WELL? YES ☐ NO ☒
7. STATIC WATER LEVEL Below Top of Casing: ___ FT.
(Use "+" if Above Top of Casing)
8. TOP OF CASING IS 3.0 FT. Above Land Surface
Top of casing terminated at/or below land surface requires a variance in accordance with 15A NCAC 2C.0118.
9. YIELD (gpm): n/a METHOD OF TEST n/a
10. WATER ZONES (depth): Unconfined Aquifer

DEPTH From	To	DRILLING LOG Formation Description
see attached log		

11. DISINFECTION: Type n/a Amount n/a
12. CASING:

	Depth		Diameter	Wall Thickness or Weight/Ft.	Material
From +3.0	To 5.0	Ft	2"	sch.40	PVC
From	To	Ft			
From	To	Ft			

13. GROUT:

	Depth		Material	Method
From 0	To 2.0	Ft	Portland	Tremie
From	TO	Ft.		

14. SCREEN

	Depth		Diameter		Slot Size		Material
From 5.0	To 10.0	Ft.	2"	in.	.010	in.	PVC
From	To	Ft.		in.		in.	

15. SAND/GRAVEL PACK

	Depth		Size	Material
From 3.5	To 10.0	Ft	#3	Sand
From 2.0	To 3.5	Ft	3/8	Bentonite

LOCATION SKETCH
Show direction and distance in miles from at least two State Roads or County Roads. Include the road numbers and common road names.

16. REMARKS _____

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

Ronald T. Barron for Engineering Tectonics 6-22-04

SIGNATURE OF PERSON CONSTRUCTING THE WELL DATE

Submit the original to the Division of Water Quality, Groundwater Section, 1636 Mail Service Center - Raleigh, NC 27699-1636 Phone No. (919) 133-3221, within 30 days.

GW-1 REV. 07/2001

WELL CONSTRUCTION RECORD

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

WELL CONTRACTOR (INDIVIDUAL) NAME (print) Ronald Barron CERTIFICATION # 2091

WELL CONTRACTOR COMPANY NAME Engineering Tectonics PHONE # (336)724-4994

STATE WELL CONSTRUCTION PERMIT# _____ (if applicable) ASSOCIATED WQ Permit # _____ (if applicable)

1. WELL USE (Check Applicable Box): Residential ☐ Municipal/Public ☐ Industrial ☐ Agricultural ☐ Monitoring ☒ Recovery ☐ Heat Pump water Injection ☐ other ☐ If other, list use: PSW-2

2. WELL LOCATION:
Nearest Town: Smithfield County Johnston
680 County Home Road,27577
(Street Name, Numbers, Community, Subdivision, Lot No., Zip Code)

Topographic/ Land setting
☐ Ridge ☐ slope ☐ valley ☒ Flat
(check appropriate box)
Latitude/Longitude of well location
_____ (degrees/minutes/seconds)
Latitude/Longitude source: ☐ GPS ☐ Topographic map (check box)

3. OWNER Johnston Co. Utility Department
Address 680 County Home Road (Street or Route No)
Smithfield N.C. 27577
City or Town State Zip code
( ) 919-934-4576
Area Code- Phone number

4. DATE DRILLED 6-16-04
5. TOTAL DEPTH 35.0
6. DOES WELL REPLACE EXISTING WELL? YES ☐ NO ☒
7. STATIC WATER LEVEL Below Top of Casing: ___ FT. (Use "+" if Above Top of Casing)
8. TOP OF CASING IS 3.0 FT. Above Land Surface
Top of casing terminated at/or below land surface requires a variance in accordance with 15A NCAC 2C.0118.
9. YIELD (gpm): n/a METHOD OF TEST n/a
10. WATER ZONES (depth): Unconfined Aquifer
11. DISINFECTION: Type n/a Amount n/a
12. CASING:

	Depth		Diameter	Wall Thickness or Weight/Ft.	Material
From +3.0	To 20.0	Ft	2"	sch.40	PVC
From	To	Ft			
From	To	Ft			

13. GROUT:

	Depth		Material	Method
From 0	To 16.0	Ft.	Portland	Tremie
From	TO	Ft.		

14. SCREEN

	Depth		Diameter		Slot Size		Material
From 20.0	To 35.0	Ft.	2"	in.	.010	in.	PVC
From	To	Ft.		in.		in.	

15. SAND/GRAVEL PACK

	Depth		Size	Material
From 18.0	To 35.0	Ft	#3	Sand
From 16.0	To 18.0	Ft	3/8	Bentonite

16. REMARKS _____

DEPTH From	To	DRILLING LOG Formation Description
see attached log		

LOCATION SKETCH
Show direction and distance in miles from at least two State Roads or County Roads. Include the road numbers and common road names.

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

Ronald T. Barron For Engineering Tectonics 6-22-04

SIGNATURE OF PERSON CONSTRUCTING THE WELL DATE

Submit the original to the Division of Water Quality, Groundwater Section, 1636 Mail Service Center - Raleigh, NC 27699-1636 Phone No. (919) 133-3221, within 30 days.

GW-1 REV. 07/2001

WELL CONSTRUCTION RECORD

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

WELL CONTRACTOR (INDIVIDUAL) NAME (print) Ronald Barron CERTIFICATION # 2091

WELL CONTRACTOR COMPANY NAME Engineering Tectonics PHONE # (336) 724-6994

STATE WELL CONSTRUCTION PERMIT# _____ (if applicable) ASSOCIATED WQ Permit # _____ (if applicable)

1. WELL USE (Check Applicable Box): Residential ☐ Municipal/Public ☐ Industrial ☐ Agricultural ☐ Monitoring ☒ Recovery ☐ Heat Pump water Injection ☐ other ☐ If other, list use: PSW-3

2. WELL LOCATION:
Nearest Town: Smithfield County Johnston
680 County Home Road, 27577
(Street Name, Numbers, Community, Subdivision, Lot No., Zip Code)

Topographic/ Land setting
☐ Ridge ☐ slope ☐ valley ☒ Flat
(check appropriate box)
Latitude/Longitude of well location
_____
(degrees/minutes/seconds)
Latitude/Longitude source: ☐ GPS ☐ Topographic map
(check box)

3. OWNER Johnston Co. Utility Department
Address 680 County Home Road
(Street or Route No)
Smithfield N.C. 27577
City or Town State Zip code
( ) - 919-934-4576
Area Code- Phone number

4. DATE DRILLED 6-16-04
5. TOTAL DEPTH 28.0
6. DOES WELL REPLACE EXISTING WELL? YES ☐ NO ☒
7. STATIC WATER LEVEL Below Top of Casing: ___ FT. (Use "+" if Above Top of Casing)
8. TOP OF CASING IS 3.0 FT. Above Land Surface
Top of casing terminated at/or below land surface requires a variance in accordance with 15A NCAC 2C.0118.
9. YIELD (gpm): n/a METHOD OF TEST n/a
10. WATER ZONES (depth): Unconfined Aquifer

DEPTH From	To	DRILLING LOG Formation Description
see attached log		

11. DISINFECTION: Type n/a Amount n/a
12. CASING:

	Depth		Diameter	Wall Thickness or Weight/Ft.	Material
From +3.0	To 13.0	Ft	2"	sch.40	PVC
From	To	Ft			
From	To	Ft			

13. GROUT:

	Depth		Material	Method
From 0	To 9.0	Ft	Portland	Tremie
From	TO	Ft.		

14. SCREEN

	Depth		Diameter		Slot Size		Material
From 13.0	To 28.0	Ft.	2"	in.	.010	in.	PVC
From	To	Ft.		in.		in.	

15. SAND/GRAVEL PACK

	Depth		Size	Material
From 11.0	To 28.0	Ft	#3	Sand
From 9.0	To 11.0	Ft	3/8	Bentonite

LOCATION SKETCH
Show direction and distance in miles from at least two State Roads or County Roads. Include the road numbers and common road names.

16. REMARKS _____

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

Ronald F. Barron For Engineering Tectonics 6-22-04

SIGNATURE OF PERSON CONSTRUCTING THE WELL DATE

Submit the original to the Division of Water Quality, Groundwater Section, 1636 Mail Service Center - Raleigh, NC 27699-1636 Phone No. (919) 133-3221, within 30 days.

GW-1 REV. 07/2001

WELL CONSTRUCTION RECORD

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

WELL CONTRACTOR (INDIVIDUAL) NAME (print) Ronald Barron CERTIFICATION # 2091

WELL CONTRACTOR COMPANY NAME Engineering Tectonics PHONE # (336)724-6988

STATE WELL CONSTRUCTION PERMIT# _____ (if applicable) ASSOCIATED WQ Permit # _____ (if applicable)

1. WELL USE (Check Applicable Box): Residential ☐ Municipal/Public ☐ Industrial ☐ Agricultural ☐ Monitoring ☒ Recovery ☐ Heat Pump water Injection ☐ other ☐ If other, list use: PW-1

2. WELL LOCATION:
Nearest Town: Smithfield County Johnston
680 County Home Road, 27577
(Street Name, Numbers, Community, Subdivision, Lot No., Zip Code)

Topographic/ Land setting
☐ Ridge ☐ slope ☐ valley ☒ Flat
(check appropriate box)
Latitude/Longitude of well location
_____ (degrees/minutes/seconds)
Latitude/Longitude source: ☐ GPS ☐ Topographic map (check box)

3. OWNER Johnston Co. Utility Department
Address 680 County Home Road (Street or Route No)
Smithfield N.C. 27577
City or Town State Zip code
( ) - 919-934-4576
Area Code- Phone number

4. DATE DRILLED 6-17/21-04
5. TOTAL DEPTH 30.0
6. DOES WELL REPLACE EXISTING WELL? YES ☐ NO ☒
7. STATIC WATER LEVEL Below Top of Casing: ___ FT. (Use "+" if Above Top of Casing)
8. TOP OF CASING IS 3.0 FT. Above Land Surface
Top of casing terminated at/or below land surface requires a variance in accordance with 15A NCAC 2C.0118.
9. YIELD (gpm): n/a METHOD OF TEST n/a
10. WATER ZONES (depth): 26.0

DEPTH From	To	DRILLING LOG Formation Description
see attached log		

11. DISINFECTION: Type n/a Amount n/a
12. CASING:

	Depth		Diameter	Wall Thickness or Weight/Ft.	Material
From +3.0	To 30.0	Ft	2"	sch.40	PVC
From 0.0	To 11.0	Ft	4"	sch.40	PVC
From	To	Ft			

13. GROUT:

	Depth		Material	Method
From 0	To 20.0	Ft.	Portland	Tremie
From	TO	Ft.		

14. SCREEN

	Depth		Diameter		Slot Size		Material
From 25.0	To 30.0	Ft.	2"	in.	.010	in.	PVC
From	To	Ft.		in.		in.	

15. SAND/GRAVEL PACK

	Depth		Size	Material
From 23.0	To 30.0	Ft.	#3	Sand
From 20.0	To 23.0	Ft.	3/8	Bentonite

LOCATION SKETCH
Show direction and distance in miles from at least two State Roads or County Roads. Include the road numbers and common road names.

16. REMARKS _____

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

Ronald F. Barron For Engineering Tectonics 6-22-04

SIGNATURE OF PERSON CONSTRUCTING THE WELL DATE

Submit the original to the Division of Water Quality, Groundwater Section, 1636 Mail Service Center - Raleigh, NC 27699-1636 Phone No. (919) 133-3221, within 30 days.

GW-1 REV. 07/2001

WELL CONSTRUCTION RECORD

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

WELL CONTRACTOR (INDIVIDUAL) NAME (print) Ronald Barron CERTIFICATION # 2091

WELL CONTRACTOR COMPANY NAME Engineering Tectonics PHONE # (336)724-6884

STATE WELL CONSTRUCTION PERMIT# _____ (if applicable) ASSOCIATED WQ Permit # _____ (if applicable)

1. WELL USE (Check Applicable Box): Residential ☐ Municipal/Public ☐ Industrial ☐ Agricultural ☐ Monitoring ☒ Recovery ☐ Heat Pump water Injection ☐ other ☐ If other, list use: PW-4

2. WELL LOCATION:
Nearest Town: Smithfield County Johnston
680 County Home Road, 27577
(Street Name, Numbers, Community, Subdivision, Lot No., Zip Code)

Topographic/ Land setting
☐ Ridge ☐ slope ☐ valley ☒ Flat
(check appropriate box)
Latitude/Longitude of well location
_____ (degrees/minutes/seconds)
Latitude/Longitude source: ☐ GPS ☐ Topographic map (check box)

3. OWNER Johnston Co. Utility Department
Address 680 County Home Road (Street or Route No)
Smithfield N.C. 27577
City or Town State Zip code
( ) 919-934-4576
Area Code- Phone number

4. DATE DRILLED 6-15/17-04
5. TOTAL DEPTH 32.0'
6. DOES WELL REPLACE EXISTING WELL? YES ☐ NO ☒
7. STATIC WATER LEVEL Below Top of Casing: ___ FT. (Use "+" if Above Top of Casing)
8. TOP OF CASING IS 3.0 FT. Above Land Surface
Top of casing terminated at/or below land surface requires a variance in accordance with 15A NCAC 2C.0118.
9. YIELD (gpm): n/a METHOD OF TEST n/a
10. WATER ZONES (depth): seam@22-23.5,26-27

DEPTH From	To	DRILLING LOG Formation Description
see attached log		

11. DISINFECTION: Type n/a Amount n/a
12. CASING:

	Depth To	Ft	Diameter	Wall Thickness or Weight/Ft.	Material
From +3.0	To 22.0	Ft	2"	sch.40	PVC
From 0.0	To 16.5'	Ft	4"	sch.40	PVC
From	To	Ft			

13. GROUT:

	Depth To	Ft	Material	Method
From 0	To 16.5	Ft	Portland	Tremie
From	TO	Ft		

14. SCREEN

	Depth To	Ft	Diameter	Slot Size	Material
From 22.0	To 32.0	Ft	2" in.	.010 in.	PVC
From	To	Ft	in.	in.	

15. SAND/GRAVEL PACK

	Depth To	Ft	Size	Material
From 20.0	To 32.0	Ft	#3	Sand
From 20.0	To 16.5	Ft	3/8	Bentonite

LOCATION SKETCH
Show direction and distance in miles from at least two State Roads or County Roads. Include the road numbers and common road names.

16. REMARKS _____

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

Ronald F. Barron For Engineering Tectonics 6-22-04

SIGNATURE OF PERSON CONSTRUCTING THE WELL DATE

Submit the original to the Division of Water Quality, Groundwater Section, 1636 Mail Service Center - Raleigh, NC 27699-1636 Phone No. (919) 133-3221, within 30 days.

GW-1 REV. 07/2001

WELL CONSTRUCTION RECORD

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

WELL CONTRACTOR (INDIVIDUAL) NAME (print) Ronald Barron CERTIFICATION # 2091

WELL CONTRACTOR COMPANY NAME Engineering Tectonics PHONE # 336724-6994

STATE WELL CONSTRUCTION PERMIT# _____ (if applicable) ASSOCIATED WQ Permit # _____ (if applicable)

1. WELL USE (Check Applicable Box): Residential ☐ Municipal/Public ☐ Industrial ☐ Agricultural ☐ Monitoring ☒ Recovery ☐ Heat Pump water Injection ☐ other ☐ If other, list use: PW-2

2. WELL LOCATION:
Nearest Town: Smithfield County Johnston
680 County Home Road, 27577
(Street Name, Numbers, Community, Subdivision, Lot No., Zip Code)

Topographic/ Land setting
☐ Ridge ☐ slope ☐ valley ☒ Flat
(check appropriate box)
Latitude/Longitude of well location
_____
(degrees/minutes/seconds)
Latitude/Longitude source: ☐ GPS ☐ Topographic map
(check box)

3. OWNER Johnston Co. Utility Department
Address 680 County Home Road
(Street or Route No)
Smithfield N.C. 27577
City or Town State Zip code
(___)-919-934-4576
Area Code- Phone number

4. DATE DRILLED 6-15/16-04
5. TOTAL DEPTH 31.5'
6. DOES WELL REPLACE EXISTING WELL? YES ☐ NO ☒
7. STATIC WATER LEVEL Below Top of Casing: ___ FT. (Use "+" if Above Top of Casing)
8. TOP OF CASING IS 3.0 FT. Above Land Surface
Top of casing terminated at/or below land surface requires a variance in accordance with 15A NCAC 2C.0118.
9. YIELD (gpm): n/a METHOD OF TEST n/a
10. WATER ZONES (depth): 24,26

DEPTH From	To	DRILLING LOG Formation Description
see attached log		

11. DISINFECTION: Type n/a Amount n/a
12. CASING:

	Depth To	Ft	Diameter	Wall Thickness or Weight/Ft.	Material
From +3.0	To 21.5'	Ft	2"	sch.40	PVC
From 0.0	To 18.5'	Ft	4"	sch.40	PVC
From	To	Ft			

13. GROUT:

	Depth To	Ft	Material	Method
From 0	To 17.0	Ft	Portland	Tremie
From	TO	Ft.		

14. SCREEN

	Depth To	Ft	Diameter	Slot Size	Material
From 21.5	To 31.5	Ft.	2" in.	.010 in.	PVC
From	To	Ft.	in.	in.	

15. SAND/GRAVEL PACK

	Depth To	Ft	Size	Material
From 20.0	To 31.5	Ft	#3	Sand
From 17.0	To 20.0	Ft	3/8	Bentonite

LOCATION SKETCH
Show direction and distance in miles from at least two State Roads or County Roads. Include the road numbers and common road names.

16. REMARKS _____

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

Ronald F. Barron For Engineering Tectonics 6-22-04

SIGNATURE OF PERSON CONSTRUCTING THE WELL DATE

Submit the original to the Division of Water Quality, Groundwater Section, 1636 Mail Service Center - Raleigh, NC 27699-1636 Phone No. (919) 133-3221, within 30 days.

GW-1 REV. 07/2001

WELL CONSTRUCTION RECORD

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

WELL CONTRACTOR (INDIVIDUAL) NAME (print) Ronald Barron CERTIFICATION # 2091

WELL CONTRACTOR COMPANY NAME Engineering Tectonics PHONE # 336 724-6984

STATE WELL CONSTRUCTION PERMIT# _____ (if applicable) ASSOCIATED WQ Permit # _____ (if applicable)

1. WELL USE (Check Applicable Box): Residential ☐ Municipal/Public ☐ Industrial ☐ Agricultural ☐ Monitoring ☒ Recovery ☐ Heat Pump water Injection ☐ other ☐ If other, list use: PW-3

2. WELL LOCATION:
Nearest Town: Smithfield County Johnston
680 County Home Road, 27577
(Street Name, Numbers, Community, Subdivision, Lot No., Zip Code)

Topographic/ Land setting
☐ Ridge ☐ slope ☐ valley ☒ Flat
(check appropriate box)
Latitude/Longitude of well location
_____
(degrees/minutes/seconds)
Latitude/Longitude source: ☐ GPS ☐ Topographic map
(check box)

3. OWNER Johnston Co. Utility Department
Address 680 County Home Road
(Street or Route No)
Smithfield N.C. 27577
City or Town State Zip code
(___)-919-934-4576
Area Code- Phone number

4. DATE DRILLED 6-15/16-04
5. TOTAL DEPTH 45.0'
6. DOES WELL REPLACE EXISTING WELL? YES ☐ NO ☒
7. STATIC WATER LEVEL Below Top of Casing: ___ FT.
(Use "+" if Above Top of Casing)
8. TOP OF CASING IS 3.0 FT. Above Land Surface
Top of casing terminated at/or below land surface requires a variance in accordance with 15A NCAC 2C.0118.
9. YIELD (gpm): n/a METHOD OF TEST n/a
10. WATER ZONES (depth): 37',seam @ 40'

DEPTH From	To	DRILLING LOG Formation Description
see attached log		

11. DISINFECTION: Type n/a Amount n/a
12. CASING:

	Depth		Diameter	Wall Thickness or Weight/Ft.	Material
From +3.0	To 35.0	Ft	4"	sch.40	PVC
From 0.0	To 25.0	Ft	6"	sch.40	PVC
From	To	Ft			

13. GROUT:

	Depth		Material	Method
From 0	To 28.0	Ft.	Portland	Tremie
From	TO	Ft.		

14. SCREEN

	Depth		Diameter	Slot Size	Material
From 35.0	To 45.0	Ft.	4" in.	.020 in.	PVC
From	To	Ft.	in.	in.	

15. SAND/GRAVEL PACK

	Depth		Size	Material
From 33.0	To 45.0	Ft.	#3	Sand
From 28.0	To 33.0	Ft.	3/8	Bentonite

LOCATION SKETCH
Show direction and distance in miles from at least two State Roads or County Roads. Include the road numbers and common road names.

16. REMARKS _____

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

Ronald F. Barron For Engineering Tectonics 6-22-04

SIGNATURE OF PERSON CONSTRUCTING THE WELL DATE

Submit the original to the Division of Water Quality, Groundwater Section, 1636 Mail Service Center - Raleigh, NC 27699-1636 Phone No. (919) 133-3221, within 30 days.

GW-1 REV. 07/2001

6/23/03 Johnston Co.

Future C+D area Former Borrow

9:30am on-site to locate wells.

1:00pm drillers on-site + ready to drill

P2-1A

Depth	SPT	LITH.	REC
0-1.5	2,1,2	Red brown slightly moist clayey sand.	16"
5-6.5'	1,4,7	Red brown slightly moist silty sand	14"
10-11.5'	4,5,4	wet red brown silty sand	14"
15-16.5'	4,2,7	wet Red brown Clayey silty sand	12"
20-21.5	22,44,50/6	dry white sandy silty clay feldspar	9"
25-26.5	15,28,50/4	Same, B.T. 25'	8" bent

Screen ~~25-10'~~ 20'-5'

Sand ~~25~~ 21'-4'

bent. 4'-0'

6/24/03 Johnston Co.

P2-2

Depth	SPT	Litho.	REC
0-1.5	1,1,1	Red brown moist silty Sand.	17"
5-6.5	7,10,14	Red brown moist Clayey Silty Sand	15"
10-11.5	2,4,5	Red brown wet silty clayey sand to tan wet Sandy Clay	17"
15-16.5'	7,7,12	white gray clay moist.	13"
20-21.5	4,7,11	gray clay moist	8"

B.T. 20'

Screen 18'-3'

Sand 20'-2'

bent. 2-0'

Johnston Co.

PZ-3

Depth	SPT	Lith	REC.
0-1.5	2,3,3	moist tan to Red brown silty clayey Sand.	14"
5-6.5	2,4,4	wet Red brown to tan med-coarse Sand	9"
10-11.5'	7,13,15	tan moist dry slick clay w/ Some silt	8"
15-16.5'	36,50/4	tan dry silty Clay	8"

B.T. 16'

Screen 15'-5'
Sand 16'-3'
bent 3'-0'

Johnston Co.

PZ-4

Depth	SPT	Lith	REC.
0-1.5	8,12,14	dk. gray hard Sandy silt	15"
5-6.5	10,27,50/3	gray green dry greasy feeling clay no odor micaceous	16"
10-11.5	15,50/4	Same	9"
15-16.5	25,25,44	Same	9"
20-21.5'	6,40,50/1	wet green gray-black Clay gravelly in upper 8" of Spoon.	18"

Water coming up out of augers at 18'

B.T. 20'

Screen 20-5'
Sand 20-3'
bent. 3'-0'

6/24/03 Johnston Co.

P2-5

Depth	SPT	Litho.	Rec.
0-1.5	1,2,2	yellow tan slightly moist clay	9"
5-6.5'	8,10,14	Same	13"
10-11.5'	38, 50/4	dry lt. gray silty clay	9"
		water coming out of augers @ 12'	
15-16.5	14,26,32	moist yellow tan + gray banded	9"
		Mn stained Fine sandy clayey silt outside of spoon is wet.	

B.T. = 18'

Screen 18'-3'
Sand 18'-2'
Bent. 2'-

6/24/03 Johnston Co.
3:35pm set-up on:

P2-6

Depth	SPT	LITH	REC
0-1.5	1,0,1	Light tan F-C Sand. Slightly moist	9"
5-6.5	7,11,13	yellow tan dry silty clay	9"
10-11.5	5,10,18	Same	9"
15-16.5	50/3	Green gray dry sandy silty clay plug	3"
20-21.5'	50/5	Same	5"
		water coming up out of augers at ~~22~~ ~21'	

B.T. = 23'

Screen 23'-8'
Sand 23'-6'

6/24/03

H_2O level PZ-1 = 2.18 (TOC)

6/25/03 PZ	(TOC) Depth to water
PZ-1	2.24
PZ-2	4.78
PZ-3	5.76
PZ-4	6.00
PZ-5	3.40
PZ-6	7.02
PZ-7	10.05
PZ-8	5.74
PZ-9	14.64

TOC is 5.00 ft Above grade

☆ drillers steam cleaned all equipment between each borehole in the project.

6/25/03 Johnston Co.

PZ-7

Depth	SPT	Lith	REC
0-1.5	1,2,1	dry reddish tan silty sand	18"
5-6.5'	2,3,2	WET Clayey silty Coarse Sand	16"
10-11.5	11,23,25	moist reddish brown slightly sandy silty clay	14"
15-16.5	10,24,30	moist silty red brown med. Sand	12"
20-21.5	15,30,50/5	dry to moist red brown sandy silty Clay	12"

BT = 20

Screen 20 - 5

Sand 20 - 3

bent: 3 - 1

6/25/03 Johnston Co.

PZ-8

Depth	SPT	Lith	REC.
0-1.5	2,2,3	moist tan silty med. sand	18"
5-6.5'	1,1,2	wet reddish tan silty med-coarse sand	16"
10-11.5'	9,18,25	moist sandy silty clay to clayey silt	14"
15-16.5'	14,19,40	dry clayey silt to silty clay red tan.	15"

B.T. = 18'6"

Screen 18.5 - 3.5
Sand 18.5 - 2
bent. 2 - 1

6/25/03 Johnston Co.

PZ-9

Depth	SPT	Lith.	Rec.
0-1.5'	9,7,5	dry black soil	18"
5-6.5'	2,3,2	dry reddish tan silty clay	15"
10-11.5'	1,2,1	moist reddish tan & brown silty clay with trace fine sand.	12"
15-16.5'	3,5,5	moist dk. brown clayey silty coarse sand & gravel	13"
20-21.5'	50/2	slightly greenish gray F-C sandy silt with some clay	2"

B.T. = 23'
Screen 23 - 8'
Sand 23 - 6
bent 6 - 4'

6/26/03 Johnston Co.

MW ~~RZ~~-14d

Depth	SPT	Lith	REC.
0-1.5	1,2,2	dk brown moist Clayey silt	18"
5-6.5'	5,8,9	dk brown wet clayey silt	16"
10'-11.5'	50/3	gray PWR	3"
15-16.5	50/0	NO SAMPLE RECOVERED	

Augered to 18' 9" (Refusal) to set outer pit casing grouting in pit casing at 8:45 am

6/30/03 Started coring rock at 18' 9".
1st core run 7'. We got 7' recovery
2nd core run 3'. We got 3' recovery.
Apparent H_2O bearing fracture between 25 & 26'. Drill to ~~30~~ 31'
Screen ~~30~~ 31' - ~~26~~ 25'
Sand ~~31~~ 30' - 24'
Bent. 24' - 22' 19.5'
grout ~~22~~ 19.5' - 0

6/26/03 Johnston Co.

MW-15d

Depth	SPT	Lith	REC
0-1.5	2,3,3	lt. brown glazed moist silty clay has ribbon & cast	9"
5-6.5'	6,12,20	upper 10" same as above, lower 6" of sample contain several rose quartz lg. gravel sized pieces & PWR	16"
10-11.5	50/3	wet rock fragments ~~possible drainage~~ Metavolcanic	3"

wet auger cuttings at 7.5'

14' 4"

A.R. = 15' Set outer pit casing at 14' 4" 15' @ 11:15 am

7/1/03 cored hole. 1st run 4' 9" Recovered 4' 9". 2nd Core run 4' 8" recove from ~~5'~~ run 5' 3" run. 2nd run came out in a solid pieces

Screen 24' - 19' Sand 24' - 18'
Bent. 18' - 16'

6/26/03 Johnston Co.

1:35pm Start drilling MW-16d

MW-16d

Depth	SPT	Lith.	REC
No surface sample taken as site is on 2' of fill dirt.			
5-6.5'	1,1,1	wet split spoon no recovery clayey silt traces	0
10-11.5'	3,50/3	dk gray weathered Rock 13'8"	6"

A.R. = ~~14~~ Set pit casing @ 2:30pm

7/1/03 coring. Void noted between 16' + 16'2"

Rock cored from 13'8" to 23'8"

Screen 23-18

Sand 24-16

bent. 16-15

grout - 15-0

6/30/03 Johnston Co.

10:30am on-site preparing to ream out MW-14d + rock core

12:30pm finished rock core of MW-14d

1:30pm return from lunch, set up to air hammer hole (MW-14d)

2:30pm-3:00 Set MW-14d.

3:00-4:00 Get water + steam clean rods, + set up over MW-15.

4:00 begin drilling MW-15d to air hammer the cement out of the pit casing. Air hammered down to 14' when a hydraulic line broke. Only a small amount of oil sprayed on the rig. Borehole was covered with a tarp @ the time.

4:30 moving off hole to fix rig.

5:00 leave site.

7/1/03 Johnston Co.

7:30am Fixing + Steam cleaning rig at the Shop.

9am Drill rig fixed. Begin Coring mw-15d

core run from 14' 4" to 24' 4"

10:00am Finish coring. Start reaming out borehole with air hammer.

10:30am Air hammer down to ~24'
it appears from the rock core that the main water bearing fractures are at ~19' so we will set the screen from 24'-19'.
Borehole is making a lot of water during air hammer drilling.

11:00 mobilizing to ~~mw-16d~~
Steam clean. Then on to mw-16d.

11:30 setting up on mw-16d

11:50 coring mw-16d
10' core run. 9' 10" recovered.
7 fractures in the entire core
overall will have high RQD
9' 3" of core in pieces >4" long.

1:10 air hammering out hole

7/1/03

mw-16d drilling

1:30 air hammer to 24'. Slight odor detected at 16' void. In order to capture the water from this void we're setting the screen from 23'-18' + Sand from 24'-16'.

7/1/03 3:30pm water levels from

mw-14d	6.03'	
mw-15d	5.75'	
mw-16d	6.75'	
PZ 1	2.43	
PZ-	8.04	cup on mound from previous drilling
PZ-2	5.43	
PZ-3	3.59	
PZ-8	4.17	
PZ-7	5.71	
PZ-6	2.71	
PZ-4	4.12	25.5" removed from casing prior to measurement.
PZ-5	3.58	
PZ-9s	14.64	

7/8/03 Johnston Co.

7:15 am on-site need dozer to grade a path to PZ-10 by borrow area haul road Xing.

8:15 am Setting up on PZ-10

9:00 am PZ-10 set moving drill Rig.

10:30 am setting up on PZ-9d to ream out outer pit casing + core into rock

1:10 Collect water levels

PZ-1	2.79'
PZ-2	4.97'
PZ-3	4.74
PZ-4	3.72
PZ-	7.85 on mound
PZ-5	3.39
PZ-6	6.97
PZ-7	5.38
PZ-8	5.07
PZ-9s	14.72

4:35 pm PZ-9d 14.75

1:15 drillers reaming + coring PZ-9d

7/8/03 Johnston Co.

PZ-10

Depth	SPT	Lith	REC
0-1.5	4,1,2	brown moist med-coarse Sand	8"
5'-6.5'	2,2,3	wet tan + golden Clayey silty med-coarse Sand a 3" band of gray clay between 7'-10' in spoon (from bottom)	14"
10'-11.5'	5,5,3	wet tan brown Clayey silty coarse Sand	12"
15-16.5'	5,7,7	bottom 10" of spoon is light gray clay (trace sand) above that is tan clay.	15"

14.5 BS = 15' 14.5'

Screen 15' - 5'

Sand 14.5' - 3'

Bent. 3'-0'

7/7/03

9:30am drillers on-site drilled PZ-9d to bedrock. Set pit casing at 32.5' at noon.

PZ-9d

Depth	SPT	Litho	REC.
25-26.5'	50/0.5	NO RECOVERY	
30'-31.5'	50/0	No Recovery	

~~B.H~~ A.R = 32.5'

Remainder of day spent developing Piezometers & setting outer Steel casings on MW's & PZ-9s

7/8/03

1:50pm PZ-9d rock core will be from 33' - 43' Recovered 9' 9"
There appears to be a water bearing seam @ 41.5'
Will air hammer to 45' & set well.
Screen 45 - 40'
Sand 45' - 38'
Bent. 38' - 36'
Grout

Rock appears to be a felsic meta volcanic with a slight phyllitic sheen in parts

3pm air hammering bore hole
3:30pm well set with Sand + bentonite
4:00 mixing grout for PZ-9d

Geotechnics

.....GEOTECHNICAL, GEOENVIRONMENTAL, AND GEOSYNTHETIC LABORATORIES

November 22, 2005

Project No. 2005-594-01

Ms. Joan Smyth
G.N. Richardson & Associates
14 N. Boylan Ave.
Raleigh, NC 27603

REC'D NOV 28 2005

Transmittal
Laboratory Test Results
Johnston Co. -23

Please find attached the laboratory test results for the above referenced project. The tests were outlined on the Project Verification Form that was faxed to your firm prior to the testing. The testing was performed in general accordance with the methods listed on the enclosed data sheets. The test results are believed to be representative of the samples that were submitted for testing and are indicative only of the specimens which were evaluated. We have no direct knowledge of the origin of the samples and imply no position with regard to the nature of the test results, i.e. pass/fail and no claims as to the suitability of the material for its intended use.

The test data and all associated project information provided shall be held in strict confidence and disclosed to other parties only with authorization by our Client. The test data submitted herein is considered integral with this report and is not to be reproduced except in whole and only with the authorization of the Client and Geotechnics. The remaining sample materials for this project will be retained for a minimum of 90 days as directed by the Geotechnics' Quality Program.

We are pleased to provide these testing services. Should you have any questions or if we may be of further assistance, please contact our office.

Respectively submitted,
Geotechnics, Inc.

Michael P. Smith
Regional Manager

We understand that you have a choice in your laboratory services and we thank you for choosing Geotechnics.

DCN: Data Transmittal Letter Date: 1/28/05 Rev.: 1

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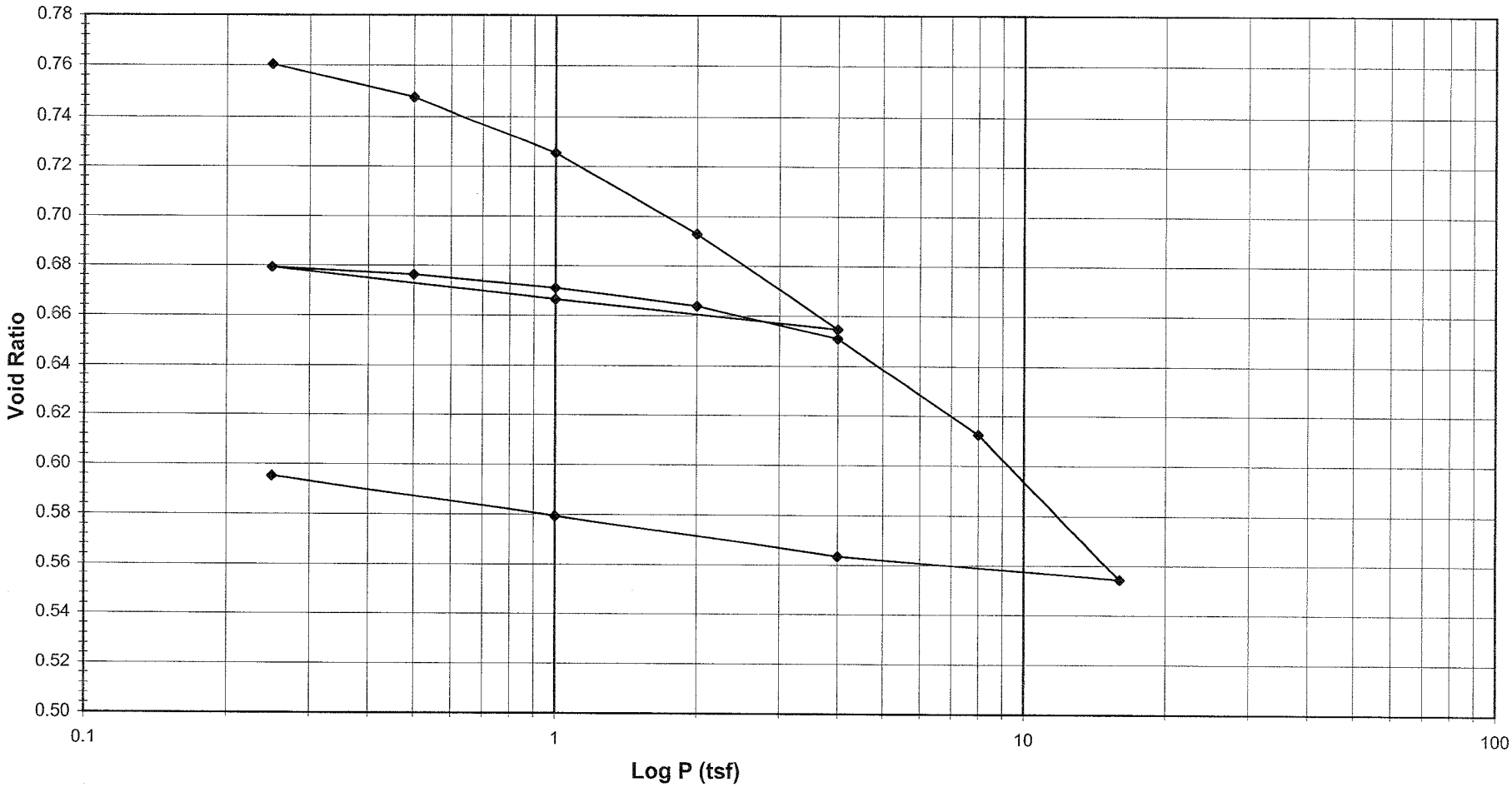
ONE DIMENSIONAL CONSOLIDATION

ASTM D 2435-96 (SOP-S24)

Client	G.N. RICHARDSON & ASSOC.	Boring No.	PZ-5
Client Reference	JOHNSTON CO. -23	Depth (ft)	7
Project No.	2005-594-01	Sample No.	2
Lab ID	2005-594-01-02	Visual Description	LIGHT BROWN SANDY SILT

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Tested By MCW *Date* 10/28/2005 *Approved By* DB *Date* 11-22-05

DCN: CT-S24F Date: 11/9/00 Revision: 4

\\Lab1\c\2005 Projects\2005-594 GNRA\2005-594-01-02 REVISED CONSOLS\[2005-594-01-02FNLPLT.xls]Sheet1

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ONE DIMENSIONAL CONSOLIDATION

ASTM D 2435-96 (SOP-S24)

Client	G.N. RICHARDSON & ASSOC.	Boring No.	PZ-5
Client Reference	JOHNSTON CO. -23	Depth (ft)	7
Project No.	2005-594-01	Sample No.	2
Lab ID	2005-594-01-02	Visual Description	LIGHT BROWN SANDY SILT

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED
Consolidometer No. 276
1 Division = 0.0001 (in)

Sample Properties	Initial	Final
Water Content		
Tare Number	213	317
Wt. Tare & WS (gm)	235.41	241.96
Wt. Tare & DS (gm)	207.91	209.44
Wt. Water (gm)	27.50	32.52
Wt. Tare (gm)	110.51	84.11
Wt. DS (gm)	97.40	125.33
Water Content (%)	28.23	25.95
Sample Parameters		
Sample Diameter (in)	2.5	2.5
Sample Height (in)	1.000	0.897
Sample Volume (cc)	80.44	72.17
Wt. Wet Sample + Ring (gm)	369.26	366.47
Wt. of Ring (gm)	212.61	212.61
Wt. of Wet Sample (gm)	156.65	153.86
Wet Density (pcf)	121.52	133.02
Wet Density (g/cc)	1.95	2.13
Water Content (%)	28.23	25.95
Wt. of Dry Sample (gm)	122.16	122.16
Dry Density (pcf)	94.76	105.62
Dry Density (g/cc)	1.52	1.69
Void Ratio	0.7779	0.5952
Saturation (%)	98.00	117.70
Specific Gravity	2.70	*Assumed*

Test Data Summary

Applied Pressure (tsf)	Final Dial Reading (div)	Machine Deflection (div)	Corrected Reading (div)	Height of Sample (mm)	Volume (cc)	Dry Density (g/cc)	Void Ratio
Seating	0	0	0	25.400	80.440	1.51864	**0.77790**
0.25	110.6	12.1	98.5	25.150	79.647	1.53375	**0.76039**
0.5	194.3	23.2	171.1	24.965	79.063	1.54508	**0.74748**
1	335.2	39.8	295.4	24.650	78.064	1.56487	**0.72538**
2	536.8	59.5	477.3	24.188	76.600	1.59476	**0.69304**
4	766.8	73.2	693.6	23.638	74.861	1.63183	**0.65459**
1	690.5	62.6	627.9	23.805	75.389	1.62039	**0.66627**
0.25	599.5	44.3	555.2	23.990	75.974	1.60792	**0.67919**
0.5	611.6	39.6	572.0	23.947	75.839	1.61078	**0.67621**
1	649.0	47.4	601.6	23.872	75.601	1.61585	**0.67094**
2	702.5	60.5	642.0	23.769	75.276	1.62283	**0.66376**
4	796.2	81.7	714.5	23.585	74.692	1.63550	**0.65087**
8	1033.4	103.3	930.1	23.038	72.958	1.67438	**0.61254**
16	1384.4	126.5	1257.9	22.205	70.321	1.73716	**0.55426**
4	1307.7	101.7	1206.0	22.337	70.739	1.72691	**0.56349**
1	1184.7	67.6	1117.1	22.563	71.454	1.70963	**0.57929**
0.25	1069.7	42.1	1027.6	22.790	72.174	1.69257	**0.59521**

Tested By MCW *Date* 10/28/2005 *Input Checked By* DB *Date* 11-22-05

DCN: CT-S24F Date: 11/9/00 Revision: 4

\\Lab1\c\2005 Projects\2005-594 GNRA\2005-594-01-02 REVISED CONSOLS\[2005-594-01-02FNLPLT.xls]Sheet1

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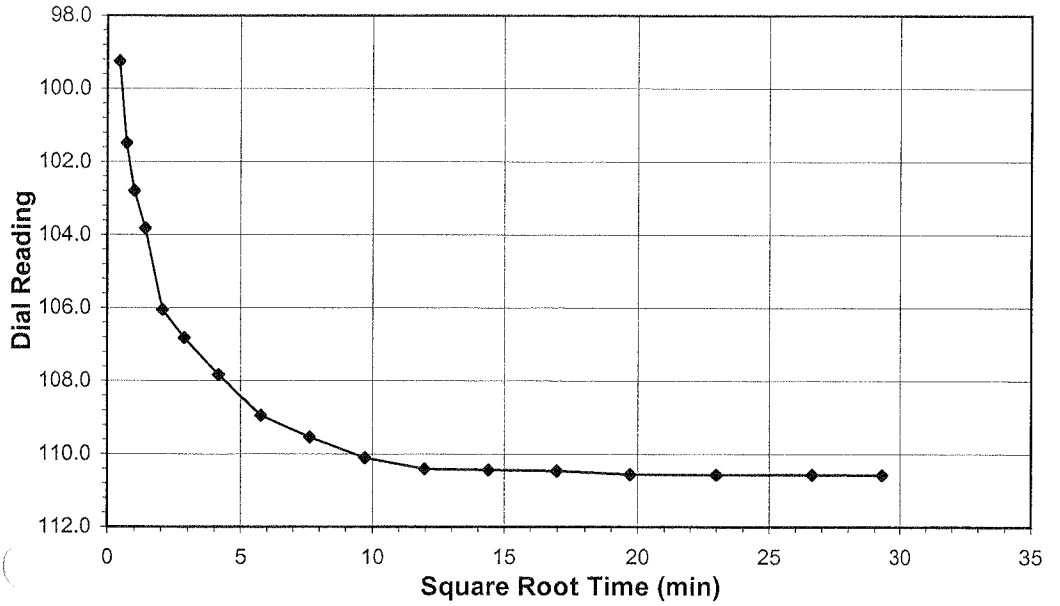
INTEGRITY IN TESTING

ONE DIMENSIONAL CONSOLIDATION

ASTM D 2435-96 (SOP-S24A)

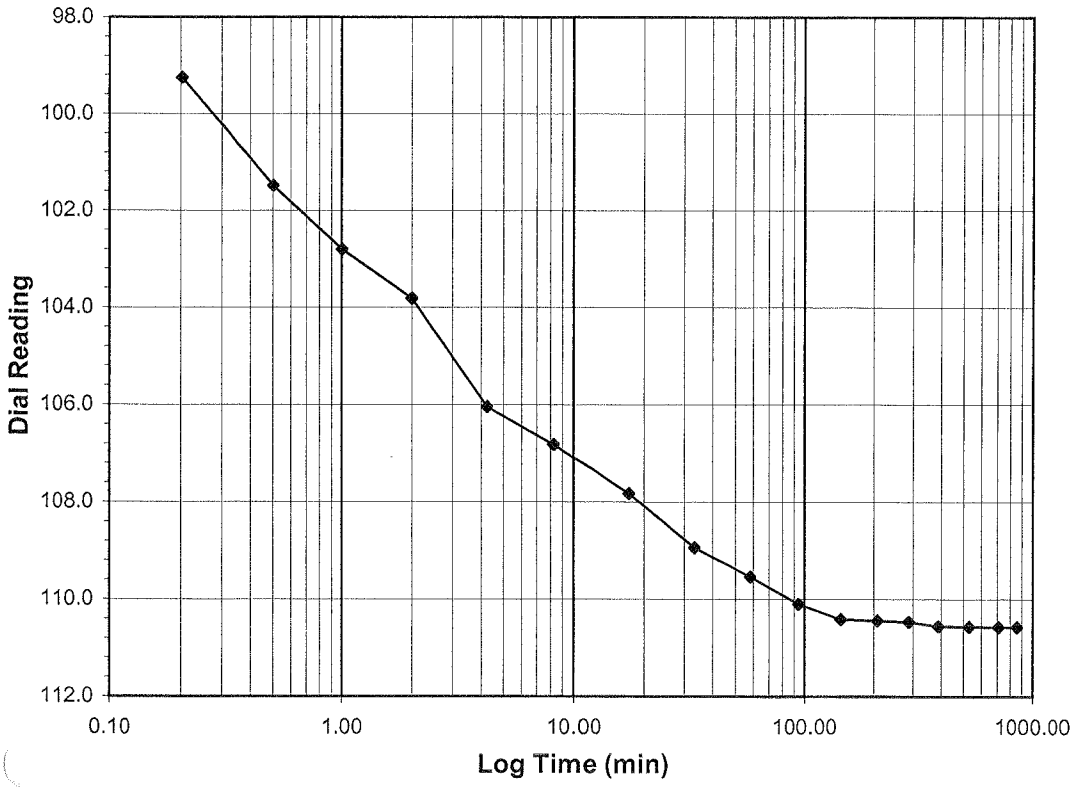
Client	G.N. RICHARDSON & ASSOC.	Boring No.	PZ-5
Client Project	JOHNSTON CO.-23	Depth (ft)	7'
Project No.	2005-594-01	Sample No.	2
Lab ID	2005-594-01-02	Visual Description	LIGHT BROWN SANDY SILT

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**0-0.25**
Final Reading	**(div)**	**110.6**
Consolidometer No.		5
1 Division	(in)	0.0001
Start Date		10/28/2005
Start Time		17:24:21

Elapsed Time (min)	Dial Reading (div)
Initial	**0.0**
0.20	99.2
0.50	101.5
1.00	102.8
2.00	103.8
4.25	106.0
8.25	106.8
17.25	107.8
33.25	108.9
58.25	109.5
94.25	110.1
143.25	110.4
207.25	110.4
288.25	110.5
388.25	110.6
528.25	110.6
708.25	110.6
857.59	110.6



Tested By MCW *Date* 10/28/2005 *Checked By* DB *Date* 11-22-05

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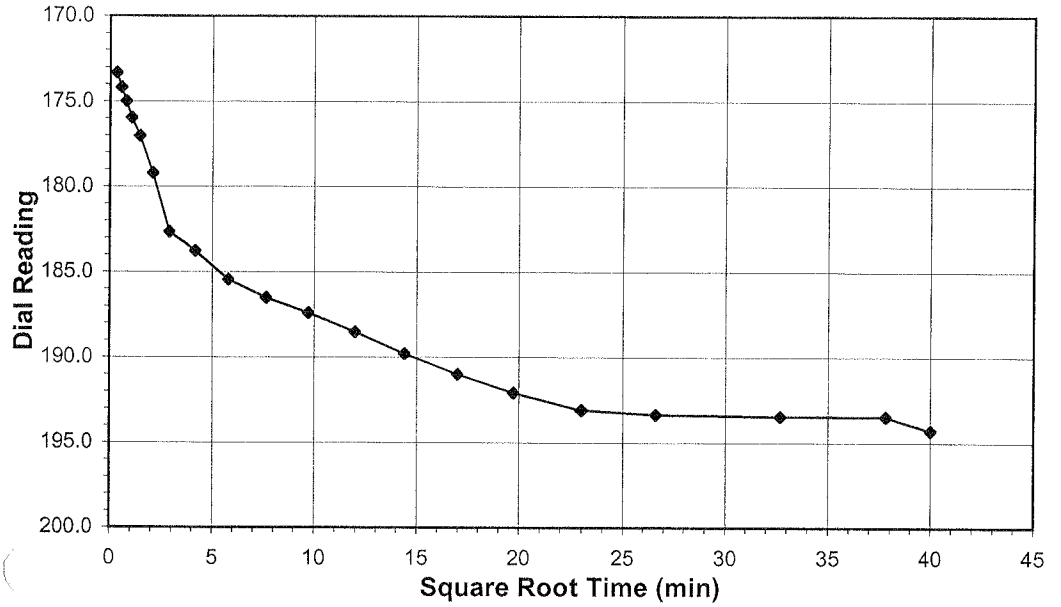
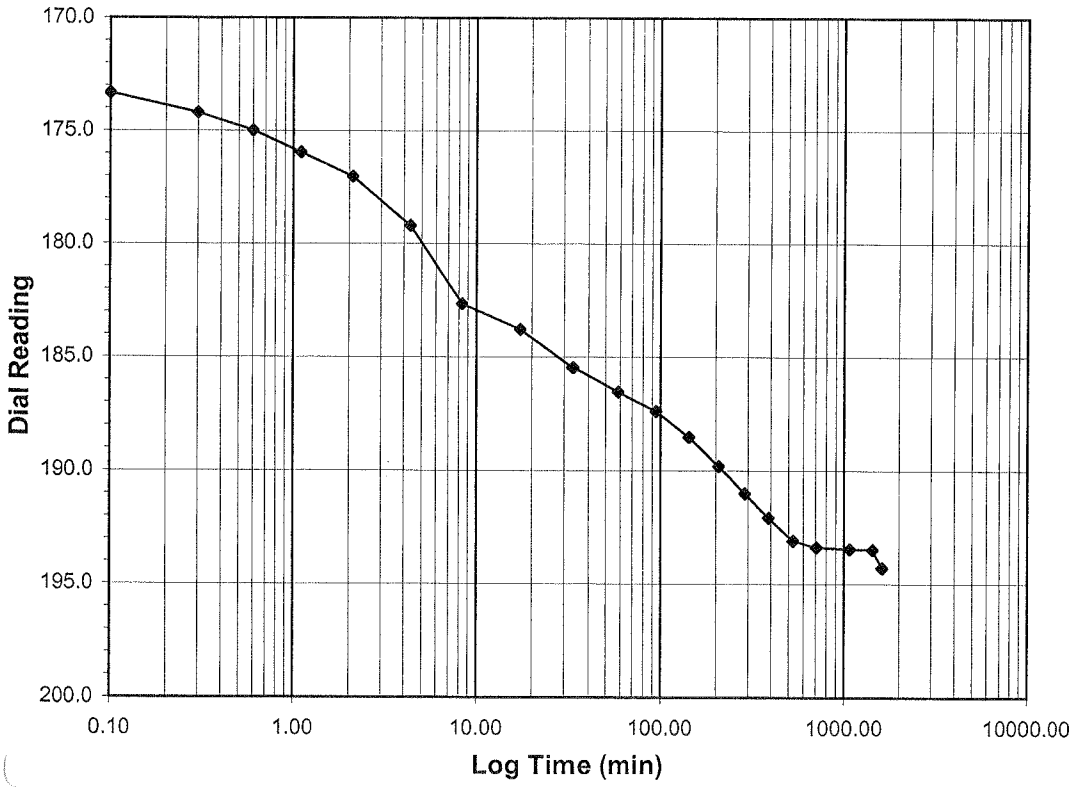
ASTM D 2435-96 (SOP-S24A)

Client	G.N. RICHARDSON & ASSOC.	Boring No.	PZ-5
Client Project	JOHNSTON CO. -23	Depth (ft)	7'
Project No.	2005-594-01	Sample No.	2
Lab ID	2005-594-01-02	Visual Description	LIGHT BROWN SANDY SILT

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED





Test Load	**(tsf)**	**0.25-0.5**
Final Reading	**(div)**	**194.3**
Consolidometer No.		5
1 Division	(in)	0.0001
Start Date		10/29/2005
Start Time		7:46:06

Elapsed Time (min)	Dial Reading (div)
Initial	**110.6**
0.10	173.3
0.30	174.2
0.60	175.0
1.10	176.0
2.10	177.0
4.35	179.2
8.35	182.7
17.35	183.8
33.35	185.5
58.35	186.5
94.35	187.4
143.35	188.5
207.35	189.8
288.35	191.0
388.35	192.1
528.35	193.1
708.35	193.4
1068.35	193.5
1428.35	193.5
1599.90	194.3

Tested By MCW *Date* 10/29/2005 *Checked By* DB *Date* 11-22-05

DCN: CT-24E Date: 3/2/98 Revision: 2 *\\Lab1\c\2005 Projects\2005-594 GNRA\2005-594-01-02 REVISED CONSOLS\[2005-594-01-02-02 CONSOL.xls]Sheet1 (2)*

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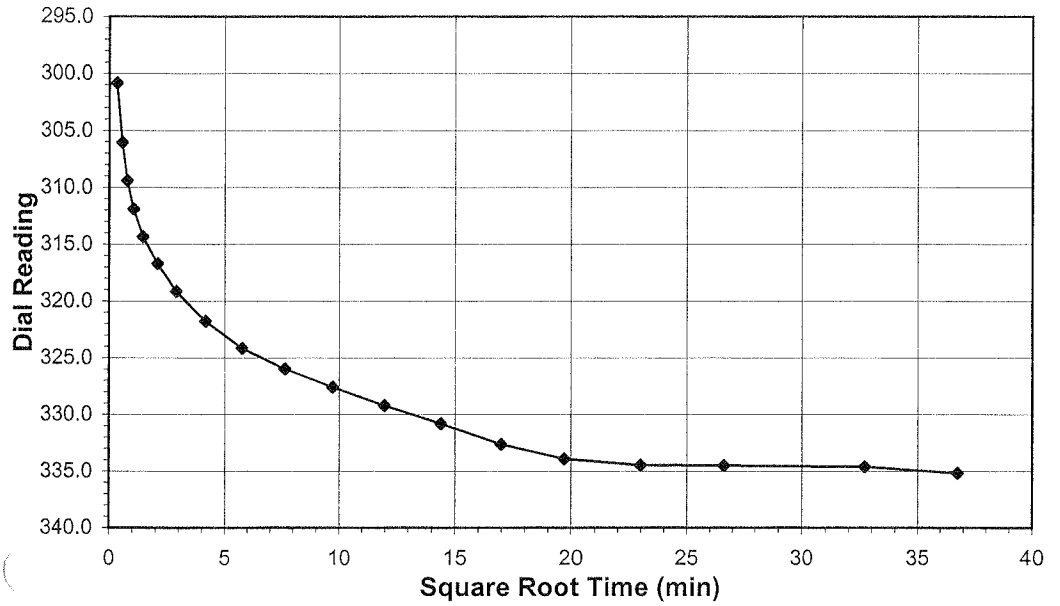
ASTM D 2435-96 (SOP-S24A)

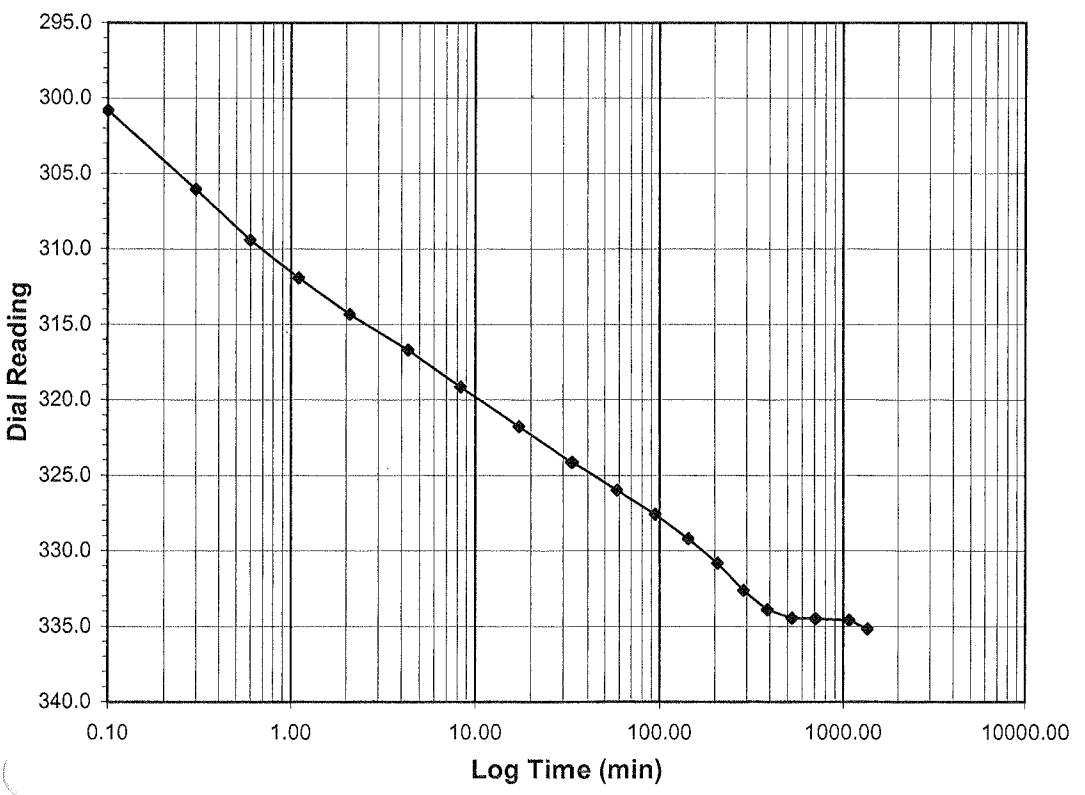
Client	G.N. RICHARDSON & ASSOC.	Boring No.	PZ-5
Client Project	JOHNSTON CO.-23	Depth (ft)	7'
Project No.	2005-594-01	Sample No.	2
Lab ID	2005-594-01-02	Visual Description	LIGHT BROWN SANDY SILT

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**0.5-1.0**
Final Reading	**(div)**	**335.2**
Consolidometer No.		5
1 Division	(in)	0.0001
Start Date		10/30/2005
Start Time		10:30:39

Elapsed Time (min)	Dial Reading (div)
Initial	**194.3**
0.10	300.8
0.30	306.0
0.60	309.4
1.10	311.9
2.10	314.3
4.35	316.7
8.35	319.2
17.35	321.8
33.35	324.1
58.35	326.0
94.35	327.6
143.35	329.2
207.35	330.8
288.35	332.6
388.35	333.9
528.35	334.5
708.35	334.5
1068.35	334.6
1348.95	335.2



Tested By *MCW* *Date* *10/30/2005* *Checked By* DB *Date* 11-22-05

 DCN: CT-24E Date: 3/2/98 Revision: 2 *\\Lab1\c\2005 Projects\2005-594 GNRA\2005-594-01-02 REVISED CONSOLS\[2005-594-01-02-03 CONSOL.xls]Sheet1 (2)*

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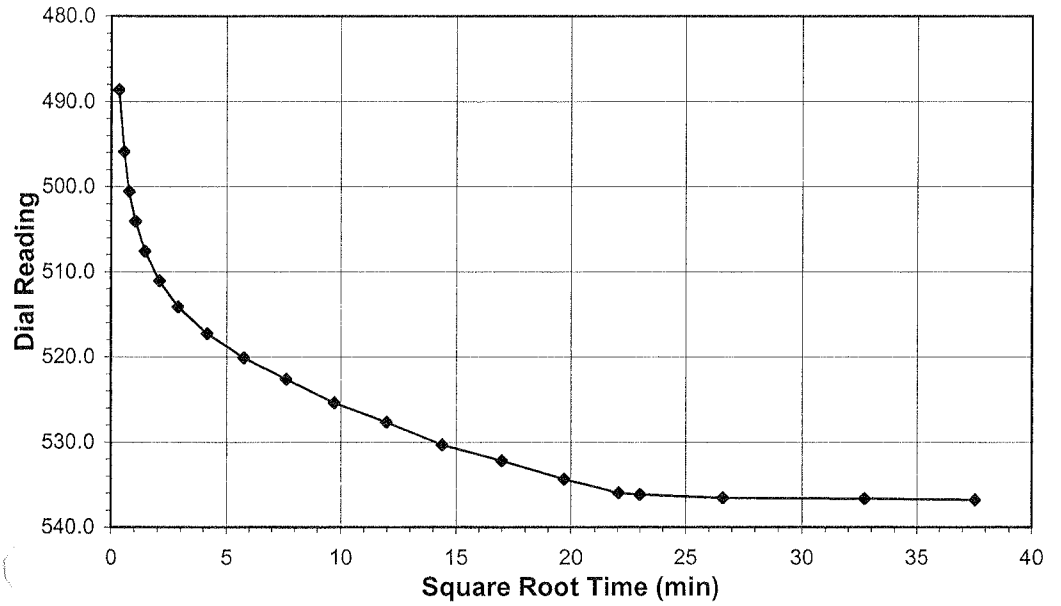
ASTM D 2435-96 (SOP-S24A)

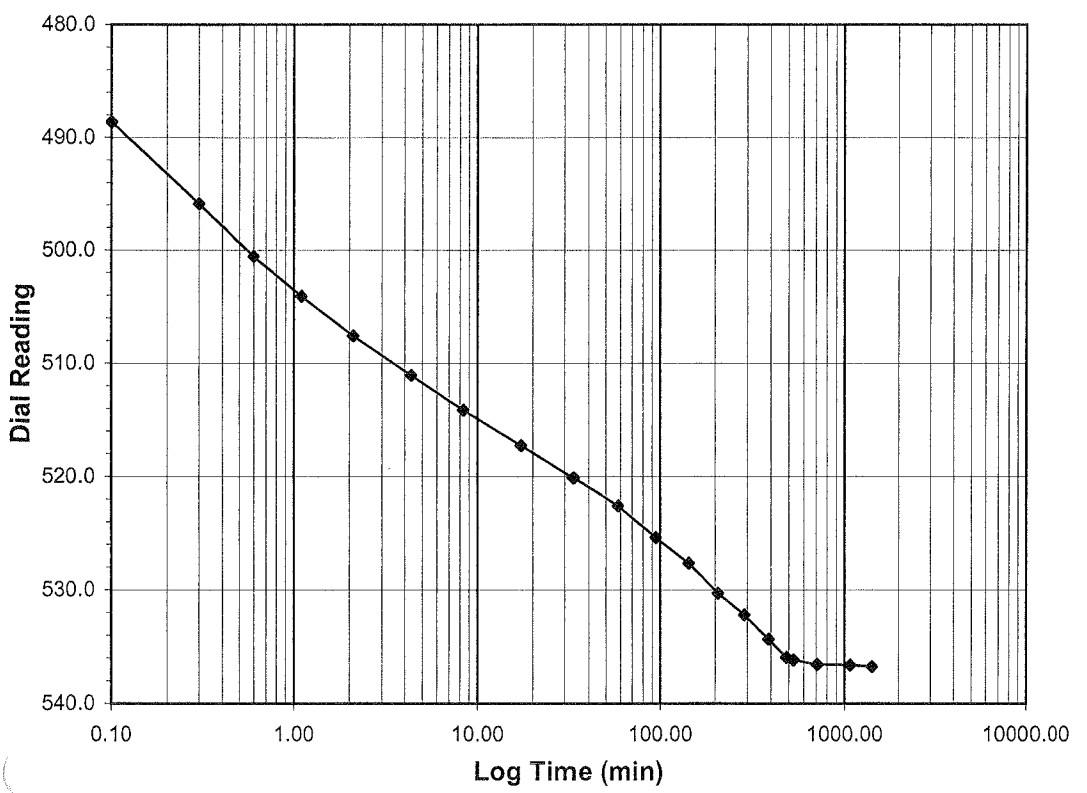
Client	G.N. RICHARDSON & ASSOC.	Boring No.	PZ-5
Client Project	JOHNSTON CO. -23	Depth (ft)	7'
Project No.	2005-594-01	Sample No.	2
Lab ID	2005-594-01-02	Visual Description	LIGHT BROWN SANDY SILT

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**1.0-2.0**
Final Reading	**(div)**	**536.8**
Consolidometer No.		5
1 Division	(in)	0.0001
Start Date		10/31/2005
Start Time		9:03:12

Elapsed Time (min)	Dial Reading (div)
Initial	**335.2**
0.10	488.6
0.30	495.9
0.60	500.6
1.10	504.1
2.10	507.6
4.35	511.1
8.35	514.1
17.35	517.3
33.35	520.1
58.35	522.6
94.35	525.4
143.35	527.6
207.35	530.3
288.35	532.2
388.35	534.3
485.97	535.9
528.35	536.2
708.35	536.6
1068.35	536.6
1408.68	536.8



Tested By MCW *Date* 10/31/2005 *Checked By* DB *Date* 11-22-05

 DCN: CT-24E Date: 3/2/98 Revision: 2 *\\Lab1\c\2005 Projects\2005-594 GNRA\2005-594-01-02 REVISED CONSOLS\[2005-594-01-02-04 CONSOL.xls]Sheet1 (2)*

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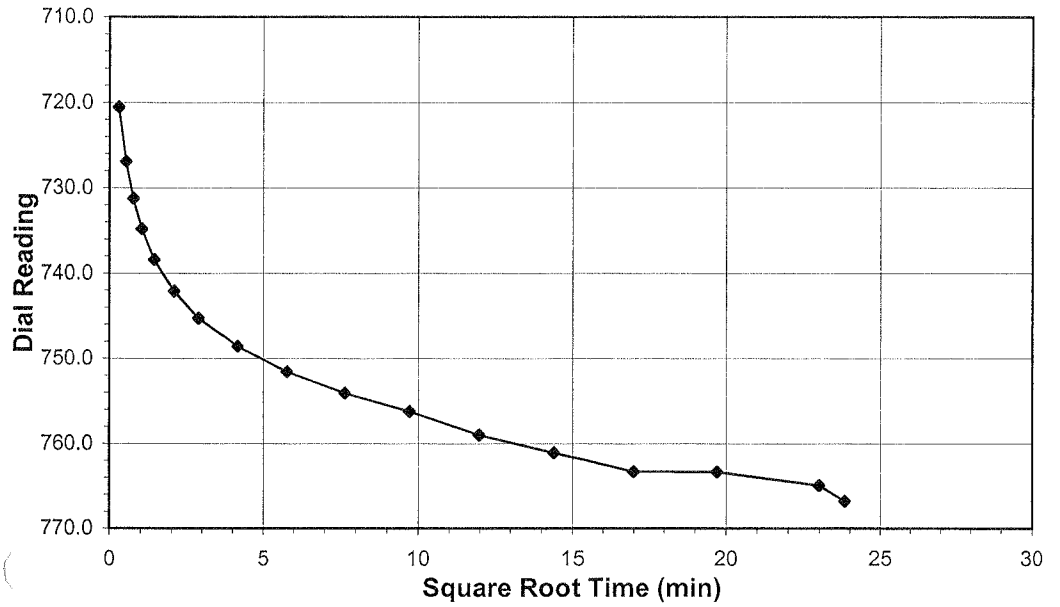
ASTM D 2435-96 (SOP-S24A)

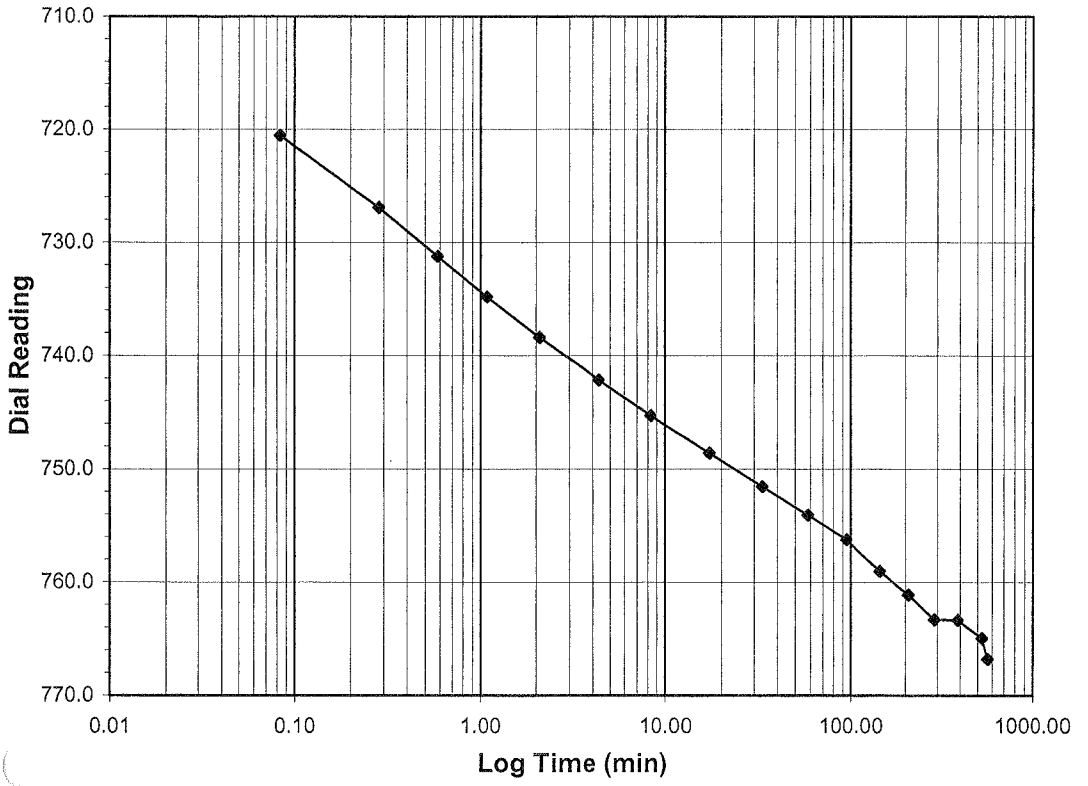
Client	G.N. RICHARDSON & ASSOC.	Boring No.	PZ-5
Client Project	JOHNSTON CO. -23	Depth (ft)	7'
Project No.	2005-594-01	Sample No.	2
Lab ID	2005-594-01-02	Visual Description	LIGHT BROWN SANDY SILT

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**2.0-4.0**
Final Reading	**(div)**	**766.8**
Consolidometer No.		5
1 Division	(in)	0.0001
Start Date		11/1/2005
Start Time		8:36:09

Elapsed Time (min)	Dial Reading (div)
Initial	**536.8**
0.08	720.5
0.28	726.9
0.58	731.2
1.08	734.8
2.08	738.4
4.33	742.1
8.33	745.3
17.33	748.6
33.33	751.6
58.33	754.1
94.33	756.2
143.33	759.0
207.33	761.1
288.33	763.3
388.33	763.3
528.33	765.0
567.32	766.8



Tested By MCW *Date* 11/1/2005 *Checked By* DB *Date* 11-22-05

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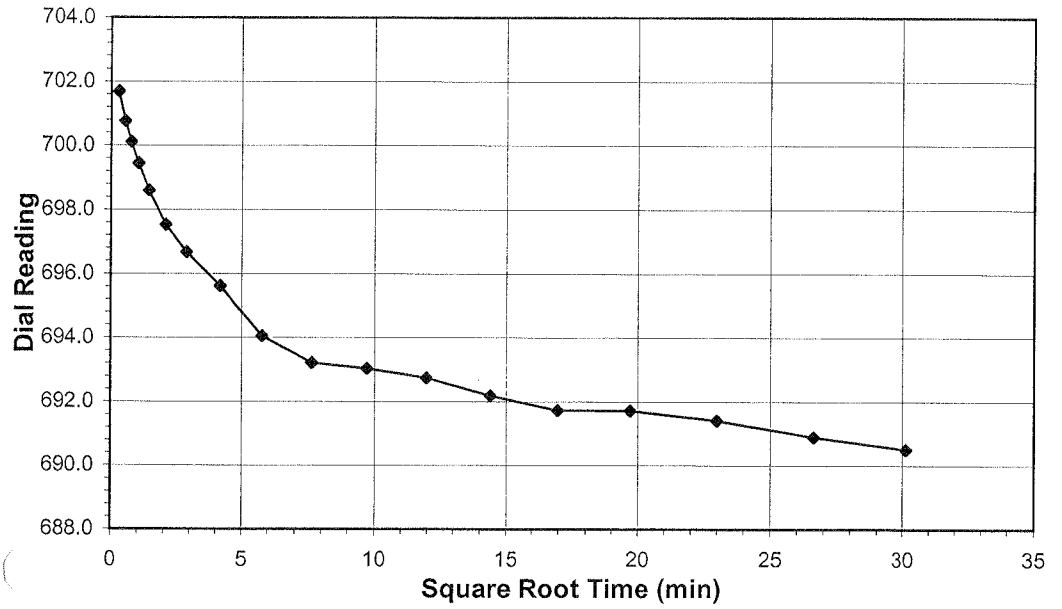
INTEGRITY IN TESTING

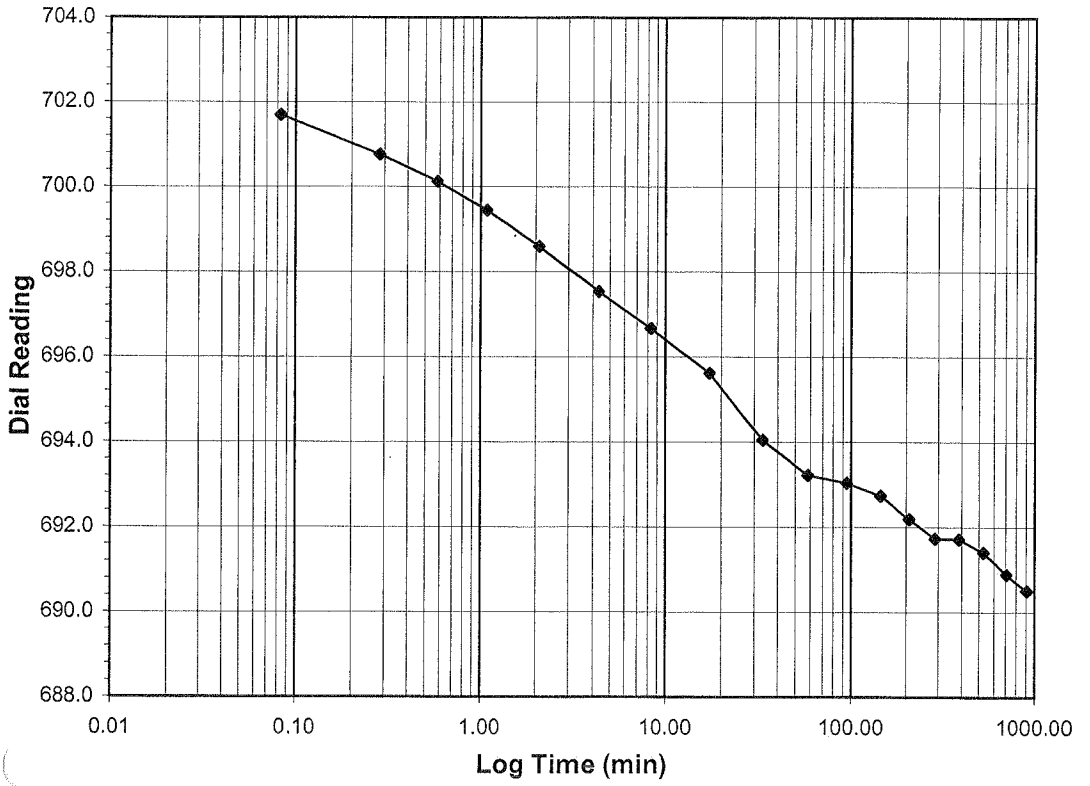
ONE DIMENSIONAL CONSOLIDATION

ASTM D 2435-96 (SOP-S24A)

Client	G.N. RICHARDSON & ASSOC.	Boring No.	PZ-5
Client Project	JOHNSTON CO.-23	Depth (ft)	7'
Project No.	2005-594-01	Sample No.	2
Lab ID	2005-594-01-02	Visual Description	LIGHT BROWN SANDY SILT

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED





Test Load	**(tsf)**	**4.0-1.0**
Final Reading	**(div)**	**690.5**
Consolidometer No.		5
1 Division	(in)	0.0001
Start Date		11/1/2005
Start Time		18:06:08

Elapsed Time (min)	Dial Reading (div)
Initial	**768.8**
0.08	701.7
0.28	700.8
0.58	700.1
1.08	699.4
2.08	698.6
4.33	697.5
8.33	696.7
17.33	695.6
33.33	694.0
58.33	693.2
94.33	693.0
143.33	692.7
207.33	692.2
288.33	691.7
388.33	691.7
528.33	691.4
708.33	690.9
908.27	690.5

Tested By *MCW* *Date* *11/1/2005* *Checked By* DB *Date* 11-22-05

DCN: CT-24E Date: 3/2/98 Revision: 2 *\\Lab1\c\2005 Projects\2005-594 GNRA\2005-594-01-02 REVISED CONSOLS\[2005-594-01-02-06 CONSOL.xls]Sheet1 (2)*

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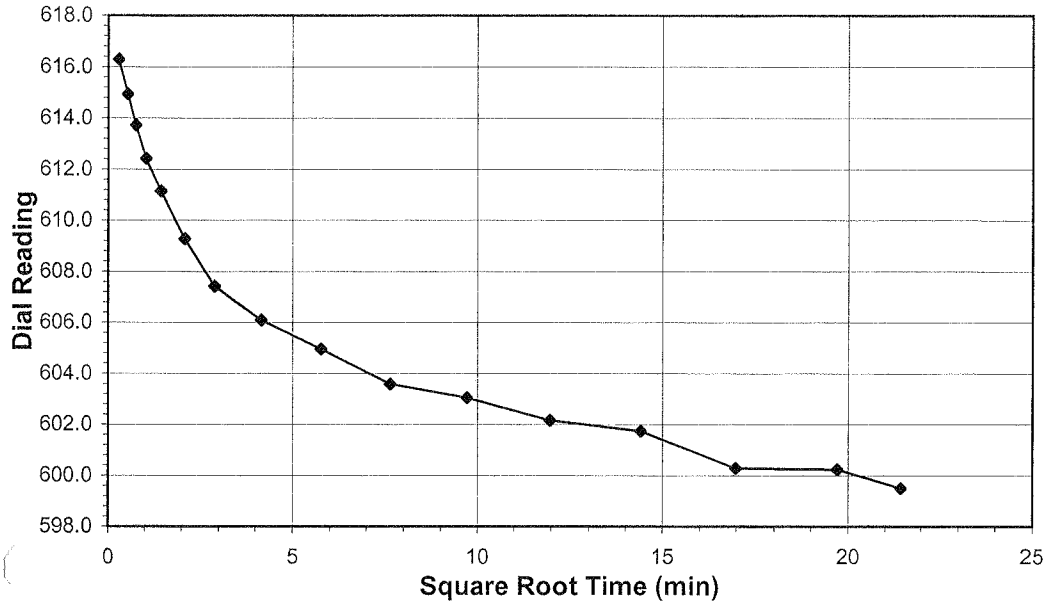
INTEGRITY IN TESTING

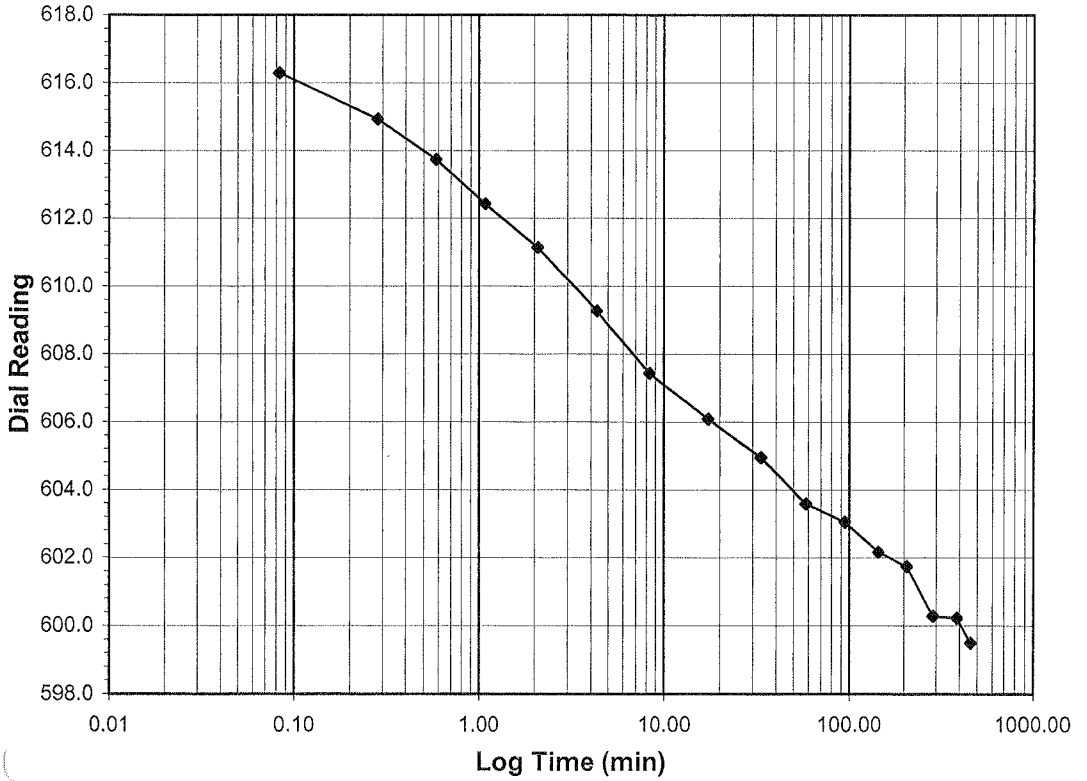
ONE DIMENSIONAL CONSOLIDATION

ASTM D 2435-96 (SOP-S24A)

Client	G.N. RICHARDSON & ASSOC.	Boring No.	PZ-5
Client Project	JOHNSTON CO.-23	Depth (ft)	7'
Project No.	2005-594-01	Sample No.	2
Lab ID	2005-594-01-02	Visual Description	LIGHT BROWN SANDY SILT

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED





Test Load	**(tsf)**	**1.0-0.25**
Final Reading	**(div)**	**599.5**
Consolidometer No.		5
1 Division	(in)	0.0001
Start Date		11/2/2005
Start Time		9:18:37

Elapsed Time (min)	Dial Reading (div)
Initial	**690.8**
0.08	616.3
0.28	614.9
0.58	613.7
1.08	612.4
2.08	611.1
4.33	609.3
8.33	607.4
17.33	606.1
33.33	604.9
58.33	603.6
94.33	603.0
143.33	602.2
207.33	601.7
288.33	600.3
388.33	600.2
459.78	599.5

Tested By MCW *Date* 11/2/2005 *Checked By* DB *Date* 11-22-05

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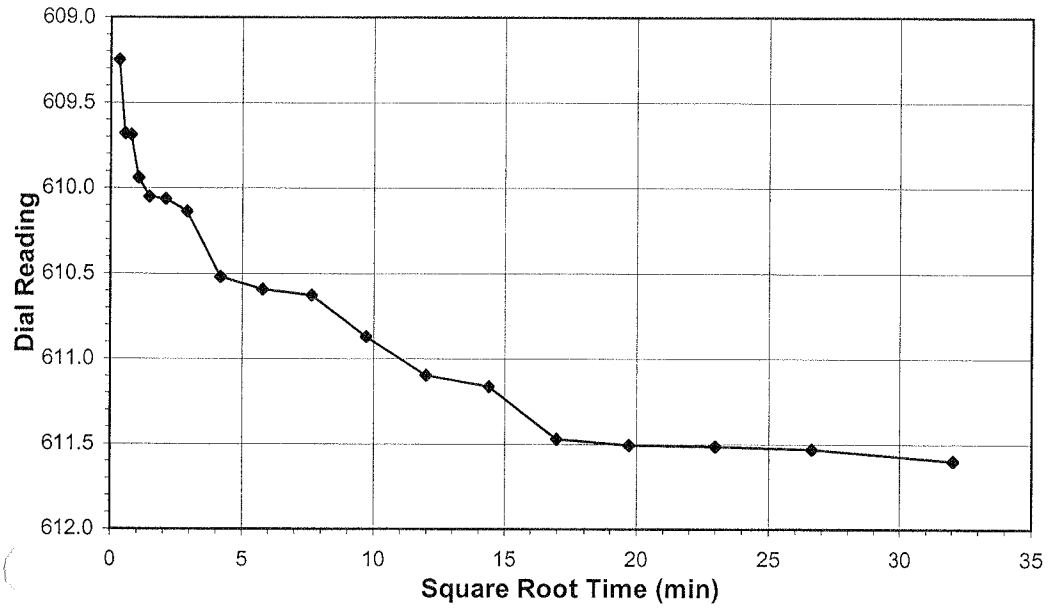
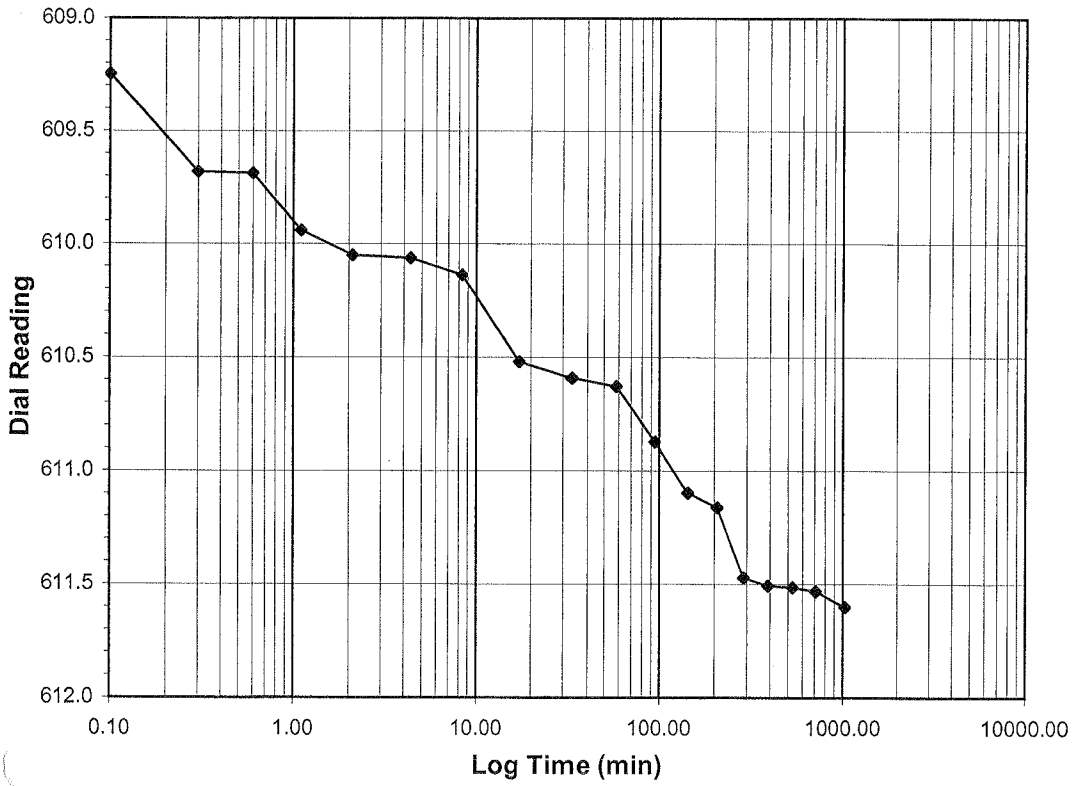
ASTM D 2435-96 (SOP-S24A)

Client	G.N. RICHARDSON & ASSOC.	Boring No.	PZ-5
Client Project	JOHNSTON CO.-23	Depth (ft)	7'
Project No.	2005-594-01	Sample No.	2
Lab ID	2005-594-01-02	Visual Description	LIGHT BROWN SANDY SILT

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED





Test Load	**(tsf)**	**0.25-0.5**
Final Reading	**(div)**	**611.6**
Consolidometer No.		5
1 Division	(in)	0.0001
Start Date		11/2/2005
Start Time		17:02:28

Elapsed Time (min)	Dial Reading (div)
Initial	**599.5**
0.10	609.2
0.30	609.7
0.60	609.7
1.10	609.9
2.10	610.1
4.35	610.1
8.35	610.1
17.35	610.5
33.35	610.6
58.35	610.6
94.35	610.9
143.35	611.1
207.35	611.2
288.35	611.5
388.35	611.5
528.35	611.5
708.35	611.5
1026.47	611.6

Tested By MCW *Date* 11/2/2005 *Checked By* DB *Date* 11-22-05

DCN: CT-24E Date: 3/2/98 Revision: 2 *\\Lab1\c\2005 Projects\2005-594 GNRA\2005-594-01-02 REVISED CONSOLS\[2005-594-01-02-08 CONSOL.xls]Sheet1 (2)*

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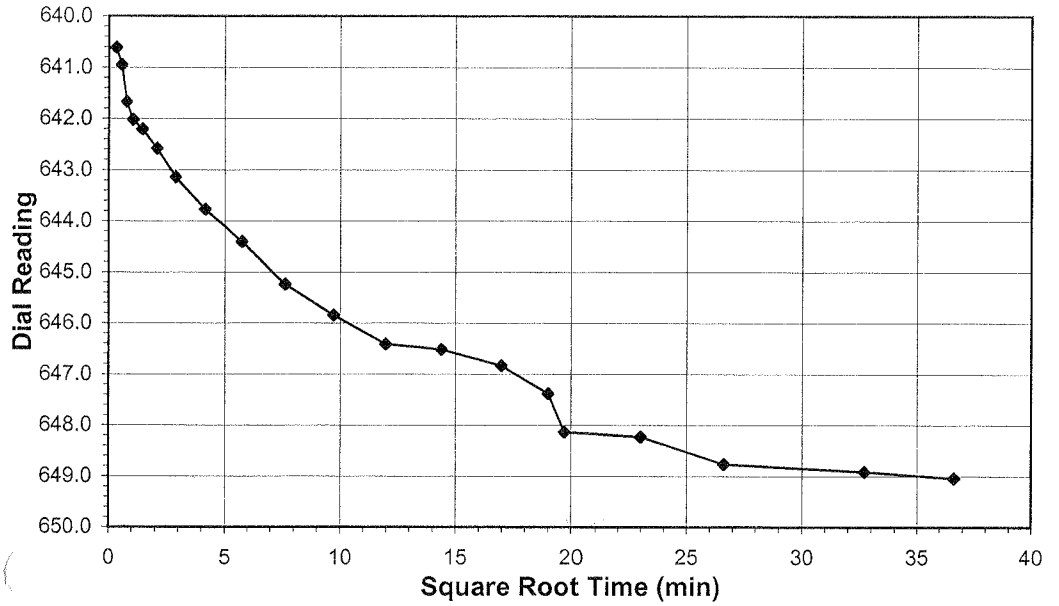
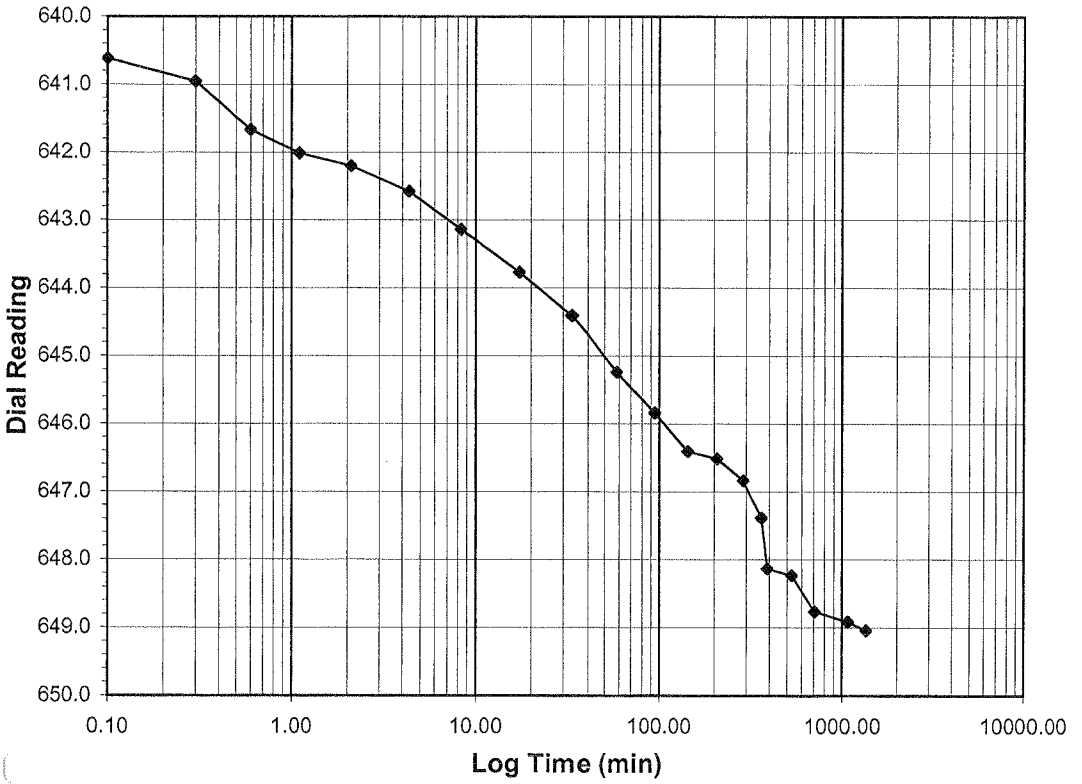
ASTM D 2435-96 (SOP-S24A)

Client	G.N. RICHARDSON & ASSOC.	Boring No.	PZ-5
Client Project	JOHNSTON CO.-23	Depth (ft)	7'
Project No.	2005-594-01	Sample No.	2
Lab ID	2005-594-01-02	Visual Description	LIGHT BROWN SANDY SILT

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED





Test Load	**(tsf)**	**0.5-1.0**
Final Reading	**(div)**	**649.0**
Consolidometer No.		5
1 Division	(in)	0.0001
Start Date		11/3/2005
Start Time		10:22:42

Elapsed Time (min)	Dial Reading (div)
Initial	**611.6**
0.10	640.6
0.30	641.0
0.60	641.7
1.10	642.0
2.10	642.2
4.35	642.6
8.35	643.1
17.35	643.8
33.35	644.4
58.35	645.2
94.35	645.8
143.35	646.4
207.35	646.5
288.35	646.8
361.32	647.4
388.35	648.1
528.35	648.2
708.35	648.8
1068.35	648.9
1341.60	649.0

Tested By *MCW* *Date* *11/3/2005* *Checked By* DB *Date* 11-22-05

DCN: CT-24E Date: 3/2/98 Revision: 2 *\\Lab1\c\2005 Projects\2005-594 GNRA\2005-594-01-02 REVISED CONSOLS\[2005-594-01-02-09 CONSOL.xls]Sheet1 (2)*

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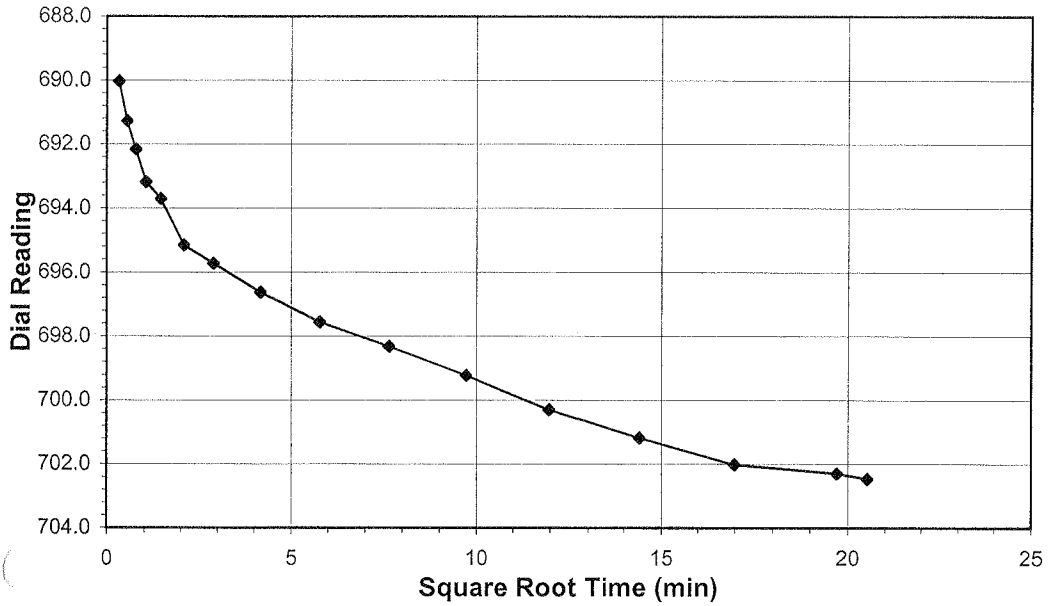
ASTM D 2435-96 (SOP-S24A)

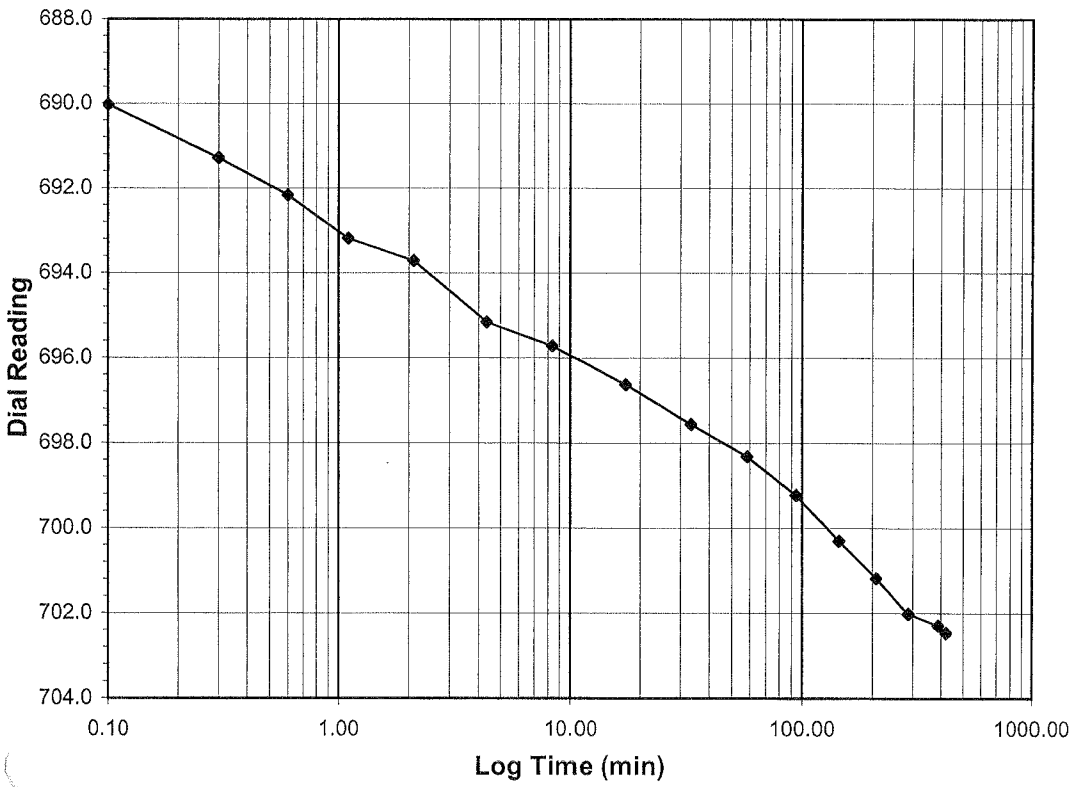
Client	G.N. RICHARDSON & ASSOC.	Boring No.	PZ-5
Client Project	JOHNSTON CO. -23	Depth (ft)	7'
Project No.	2005-594-01	Sample No.	2
Lab ID	2005-594-01-02	Visual Description	LIGHT BROWN SANDY SILT

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**1.0-2.0**
Final Reading	**(div)**	**702.5**
Consolidometer No.		5
1 Division	(in)	0.0001
Start Date		11/4/2005
Start Time		8:45:56

Elapsed Time (min)	Dial Reading (div)
Initial	**649.0**
0.10	690.0
0.30	691.3
0.60	692.2
1.10	693.2
2.10	693.7
4.35	695.2
8.35	695.7
17.35	696.6
33.35	697.6
58.35	698.3
94.35	699.2
143.35	700.3
207.35	701.2
288.35	702.0
388.35	702.3
420.98	702.5



Tested By MCW *Date* 11/4/2005 *Checked By* DB *Date* 11-22-05

 DCN: CT-24E Date: 3/2/98 Revision: 2 *\\Lab1\c\2005 Projects\2005-594 GNRA\2005-594-01-02 REVISED CONSOLS\[2005-594-01-02-10 CONSOL.xls]Sheet1 (2)*

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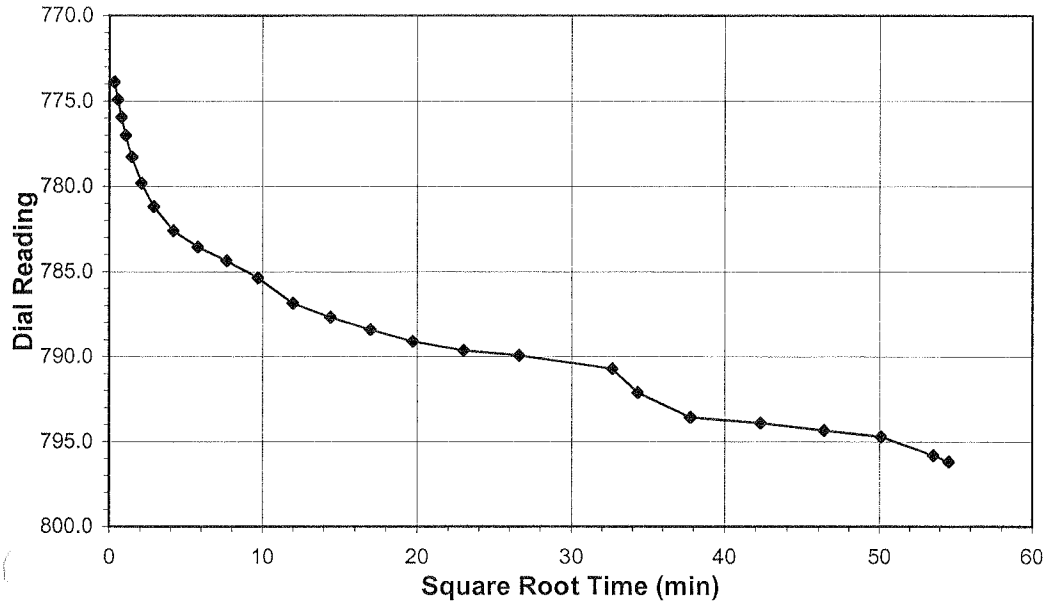
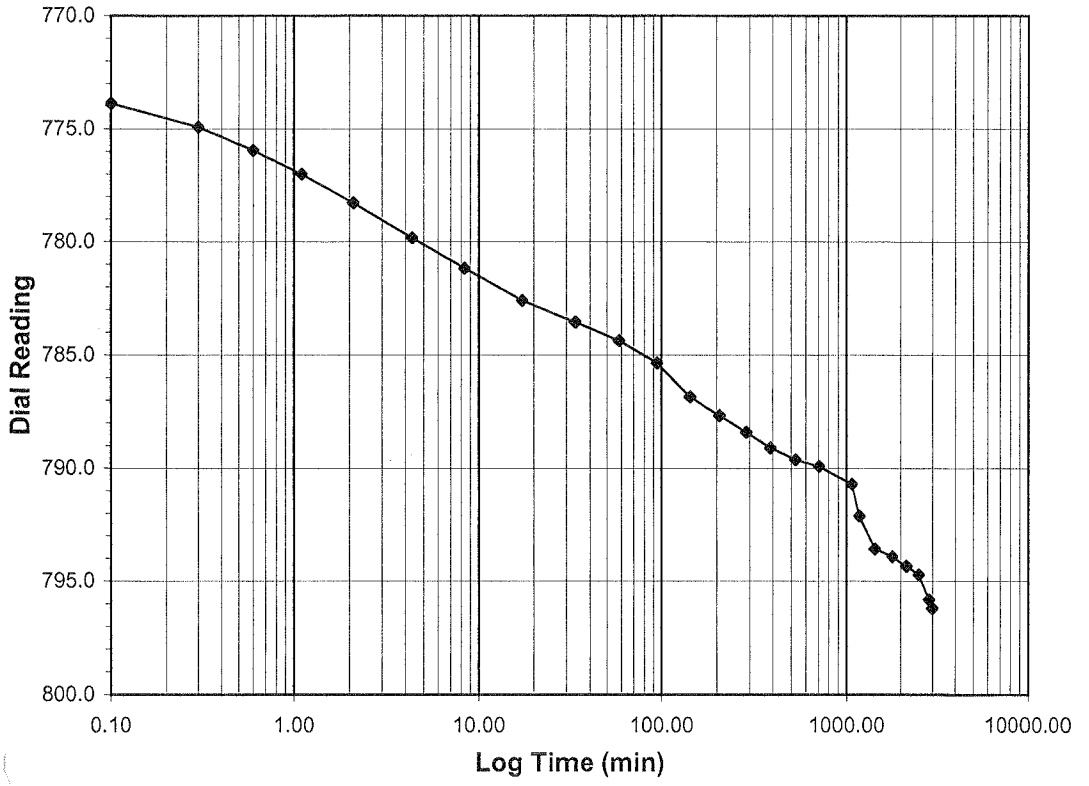
ASTM D 2435-96 (SOP-S24A)

Client	G.N. RICHARDSON & ASSOC.	Boring No.	PZ-5
Client Project	JOHNSTON CO. -23	Depth (ft)	7'
Project No.	2005-594-01	Sample No.	2
Lab ID	2005-594-01-02	Visual Description	LIGHT BROWN SANDY SILT

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED





Test Load	**(tsf)**	**2.0-4.0**
Final Reading	**(div)**	**796.2**
Consolidometer No.		5
1 Division	(in)	0.0001
Start Date		11/4/2005
Start Time		15:50:09

Elapsed Time (min)	Dial Reading (div)
Initial	**702.5**
0.10	773.9
0.30	774.9
0.60	775.9
1.10	777.0
2.10	778.3
4.35	779.8
8.35	781.2
17.35	782.6
33.35	783.6
58.35	784.4
94.35	785.4
143.35	786.9
207.35	787.7
288.35	788.4
388.35	789.1
528.35	789.6
708.35	789.9
1068.35	790.7
1179.45	792.1
1428.35	793.6
1788.35	793.9
2148.35	794.3
2508.35	794.7
2868.35	795.8
2978.88	796.2

Tested By MCW *Date* 11/4/2005 *Checked By* DJ *Date* 11-22-05

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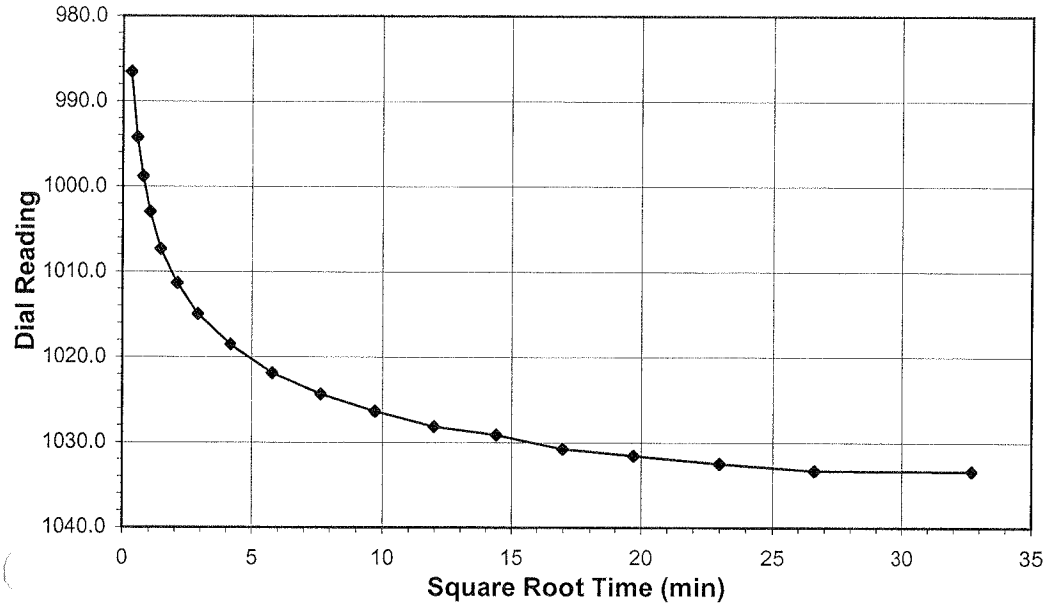
ASTM D 2435-96 (SOP-S24A)

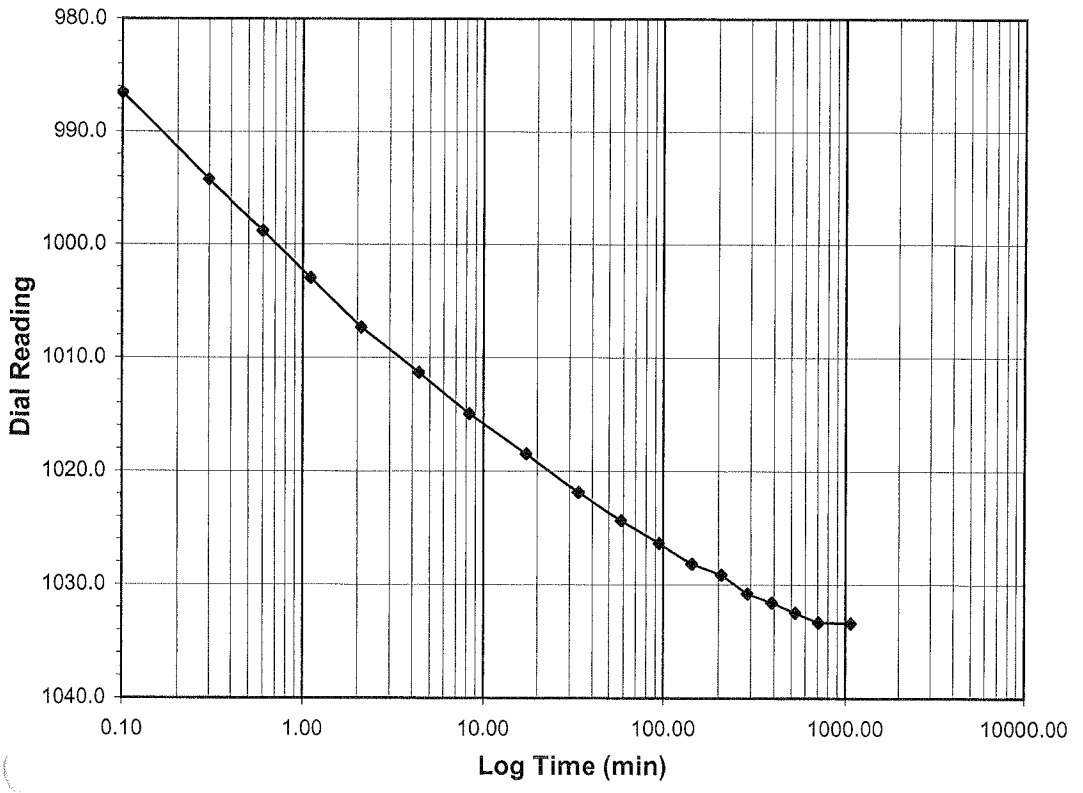
Client	G.N. RICHARDSON & ASSOC.	Boring No.	PZ-5
Client Project	JOHNSTON CO.-23	Depth (ft)	7'
Project No.	2005-594-01	Sample No.	2
Lab ID	2005-594-01-02	Visual Description	LIGHT BROWN SANDY SILT

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**4.0-8.0**
Final Reading	**(div)**	**1033.4**
Consolidometer No.		5
1 Division	(in)	0.0001
Start Date		11/6/2005
Start Time		17:34:35

Elapsed Time (min)	Dial Reading (div)
Initial	**796.2**
0.10	986.5
0.30	994.2
0.60	998.8
1.10	1003.0
2.10	1007.3
4.35	1011.3
8.35	1015.0
17.35	1018.5
33.35	1021.9
58.35	1024.3
94.35	1026.3
143.35	1028.2
207.35	1029.1
288.35	1030.8
388.35	1031.6
528.35	1032.5
708.35	1033.3
1068.35	1033.4



Tested By MCW *Date* 11/6/2005 *Checked By* DB *Date* 11-22-05

DCN: CT-24E Date: 3/2/98 Revision: 2 *\\Lab1\c\2005 Projects\2005-594 GNRA\2005-594-01-02 REVISED CONSOLS\[2005-594-01-02-12 CONSOL.xls]Sheet1 (2)*

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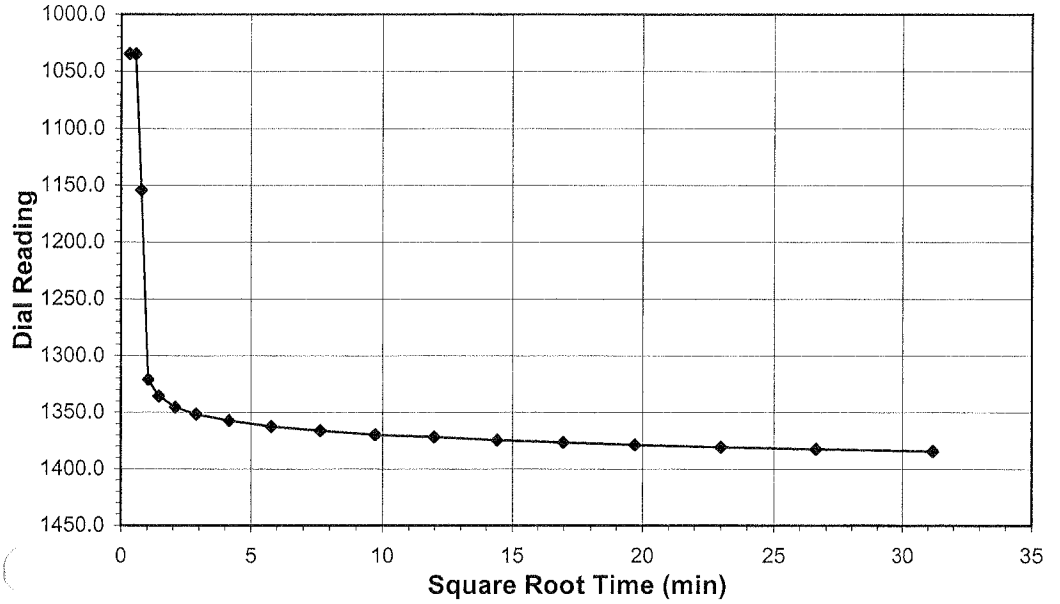
ASTM D 2435-96 (SOP-S24A)

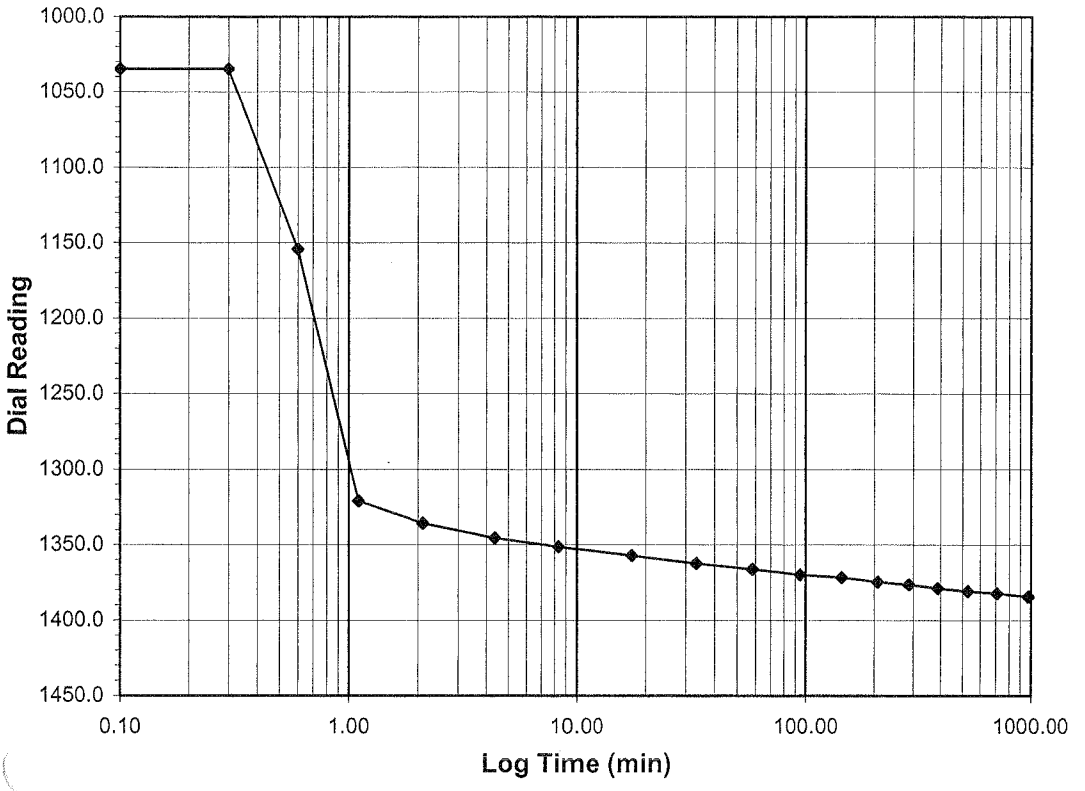
Client	G.N. RICHARDSON & ASSOC.	Boring No.	PZ-5
Client Project	JOHNSTON CO.-23	Depth (ft)	7'
Project No.	2005-594-01	Sample No.	2
Lab ID	2005-594-01-02	Visual Description	LIGHT BROWN SANDY SILT

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**8.0-16.0**
Final Reading	**(div)**	**1384.4**
Consolidometer No.		5
1 Division	(in)	0.0001
Start Date		11/7/2005
Start Time		16:21:44

Elapsed Time (min)	Dial Reading (div)
Initial	**1033.4**
0.10	1034.6
0.30	1034.7
0.60	1154.1
1.10	1320.9
2.10	1335.7
4.35	1345.4
8.35	1351.6
17.35	1357.1
33.35	1362.5
58.35	1366.2
94.35	1369.8
143.35	1371.7
207.35	1374.7
288.35	1376.5
388.35	1378.9
528.35	1380.8
708.35	1382.4
972.00	1384.4
972.05	1384.4
973.03	1384.4



Tested By *MCW* *Date* *11/7/2005* *Checked By* DB *Date* 11-22-05

 DCN: CT-24E Date: 3/2/98 Revision: 2 *\\Lab1\c\2005 Projects\2005-594 GNRA\2005-594-01-02 REVISED CONSOLS\[2005-594-01-02-13 CONSOL.xls]Sheet1 (2)*

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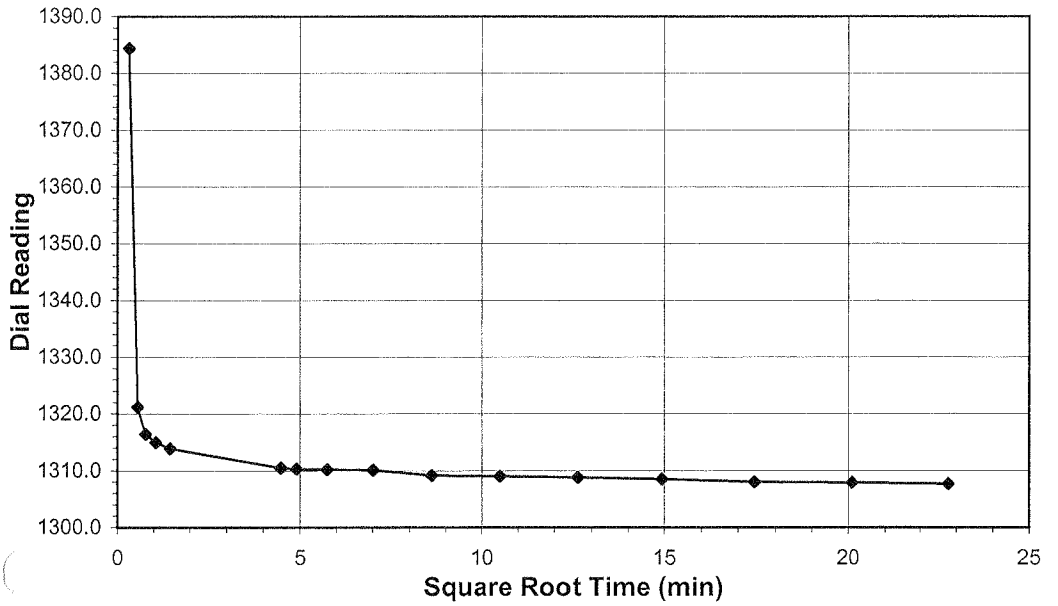
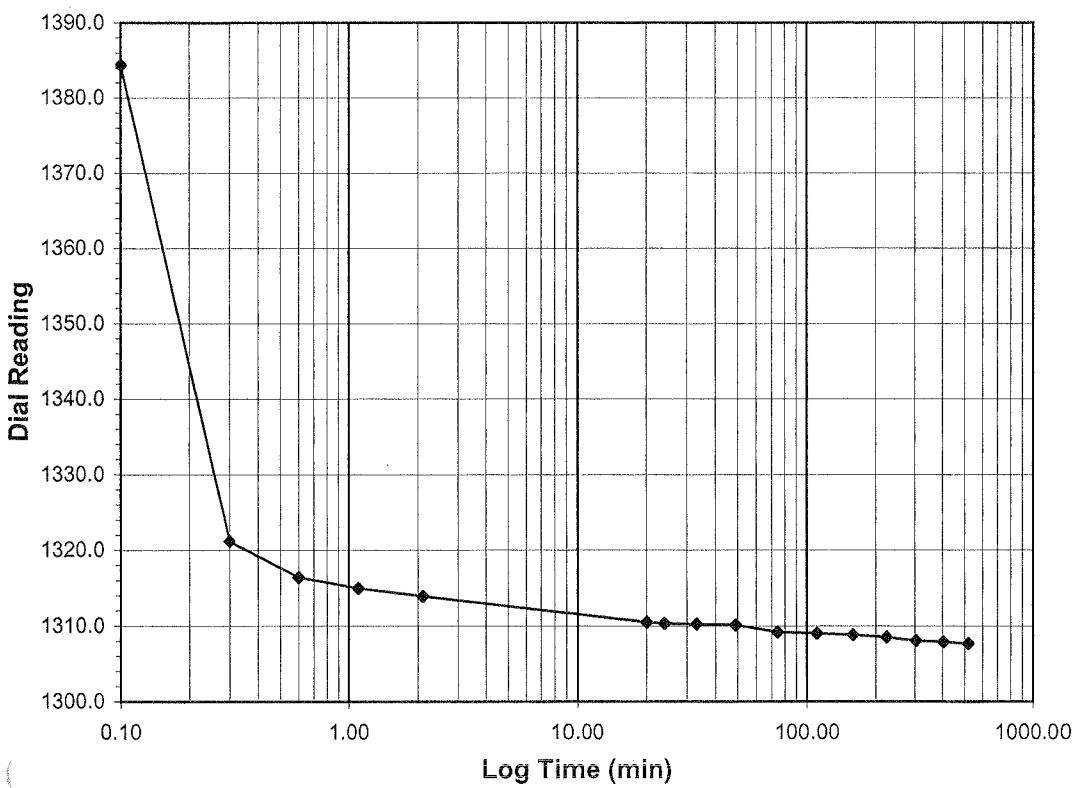
ASTM D 2435-96 (SOP-S24A)

Client	G.N. RICHARDSON & ASSOC.	Boring No.	PZ-5
Client Project	JOHNSTON CO. -23	Depth (ft)	7'
Project No.	2005-594-01	Sample No.	2
Lab ID	2005-594-01-02	Visual Description	LIGHT BROWN SANDY SILT

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED





Test Load	**(tsf)**	**16.0-4.0**
Final Reading	**(div)**	**1307.7**
Consolidometer No.		5
1 Division	(in)	0.0001
Start Date		11/8/2005
Start Time		8:38:34

Elapsed Time (min)	Dial Reading (div)
Initial	**1384.4**
0.10	1384.4
0.30	1321.2
0.60	1316.4
1.10	1315.0
2.10	1313.9
20.08	1310.5
24.08	1310.3
33.08	1310.2
49.08	1310.1
74.08	1309.2
110.08	1309.0
159.08	1308.8
223.08	1308.5
304.08	1308.0
404.08	1307.9
519.25	1307.7

Tested By *MCW* *Date* *11/8/2005* *Checked By* DB *Date* 11-22-05

 DCN: CT-24E Date: 3/2/98 Revision: 2 *\\Lab1\c\2005 Projects\2005-594 GNRA\2005-594-01-02 REVISED CONSOLS\[2005-594-01-02-14 CONSOL.xls]Sheet1 (2)*

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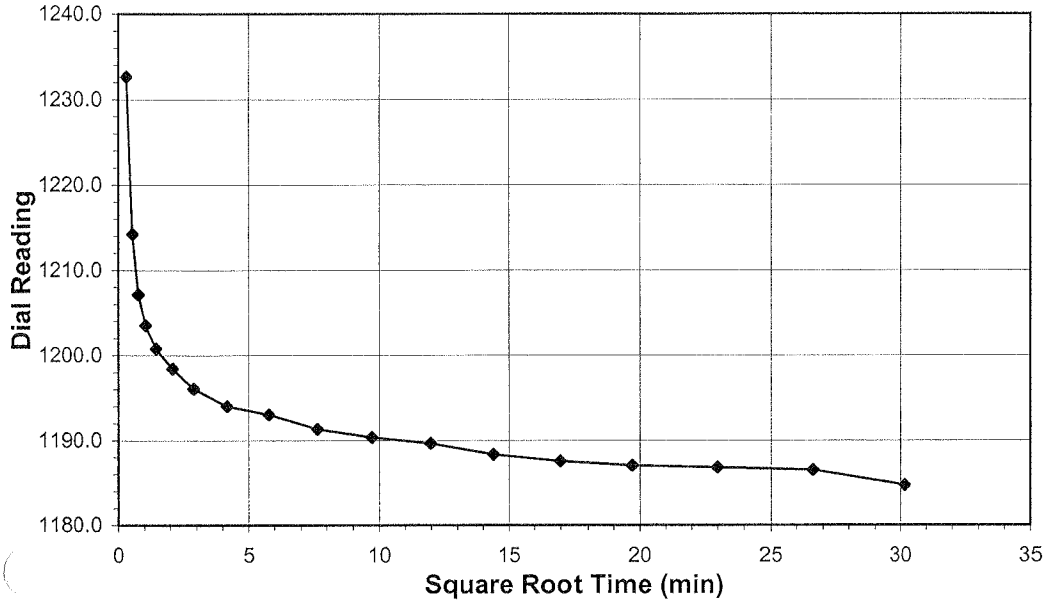
ASTM D 2435-96 (SOP-S24A)

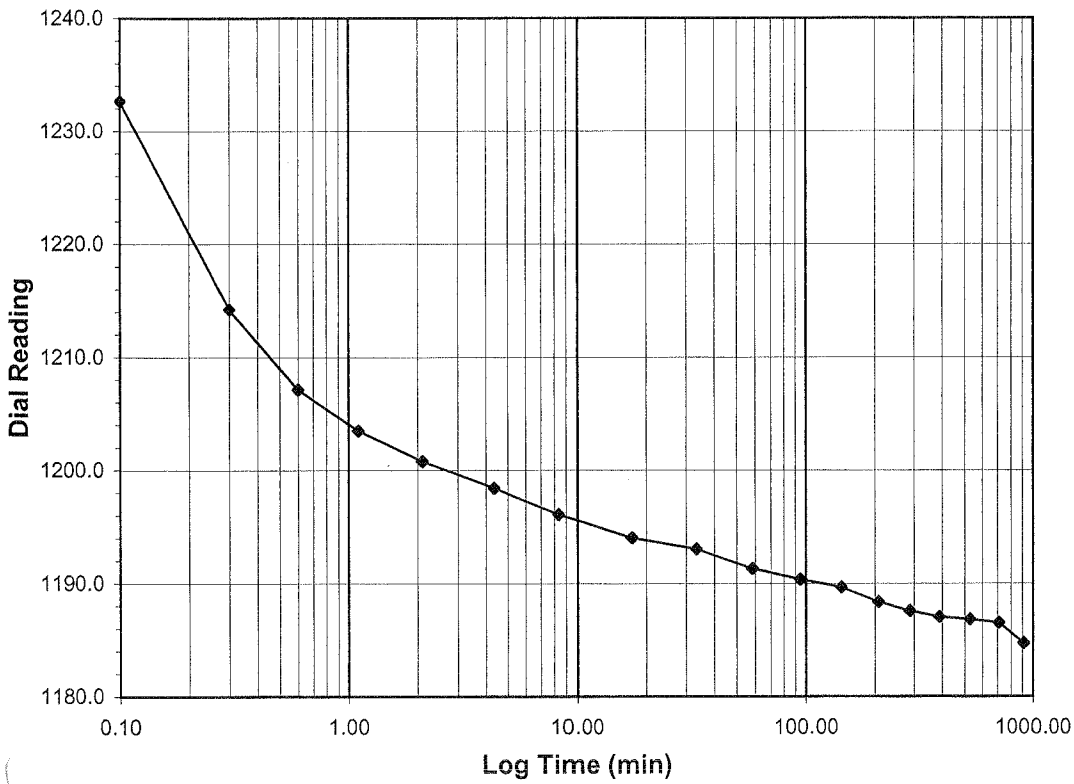
Client	G.N. RICHARDSON & ASSOC.	Boring No.	PZ-5
Client Project	JOHNSTON CO.-23	Depth (ft)	7'
Project No.	2005-594-01	Sample No.	2
Lab ID	2005-594-01-02	Visual Description	LIGHT BROWN SANDY SILT

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**4.0-1.0**
Final Reading	**(div)**	**1184.7**
Consolidometer No.		5
1 Division	(in)	0.0001
Start Date		11/8/2005
Start Time		17:20:18

Elapsed Time (min)	Dial Reading (div)
Initial	**1307.7**
0.10	1232.6
0.30	1214.2
0.60	1207.1
1.10	1203.5
2.10	1200.8
4.35	1198.4
8.35	1196.1
17.35	1194.0
33.35	1193.0
58.35	1191.3
94.35	1190.4
143.35	1189.6
207.35	1188.3
288.35	1187.6
388.35	1187.0
528.35	1186.8
708.35	1186.5
909.73	1184.7



Tested By *MCW* *Date* *11/8/2005* *Checked By* DB *Date* 11-22-05

 DCN: CT-24E Date: 3/2/98 Revision: 2 *\\Lab1\c\2005 Projects\2005-594 GNRA\2005-594-01-02 REVISED CONSOLS\[2005-594-01-02-15 CONSOL.xls]Sheet1 (2)*

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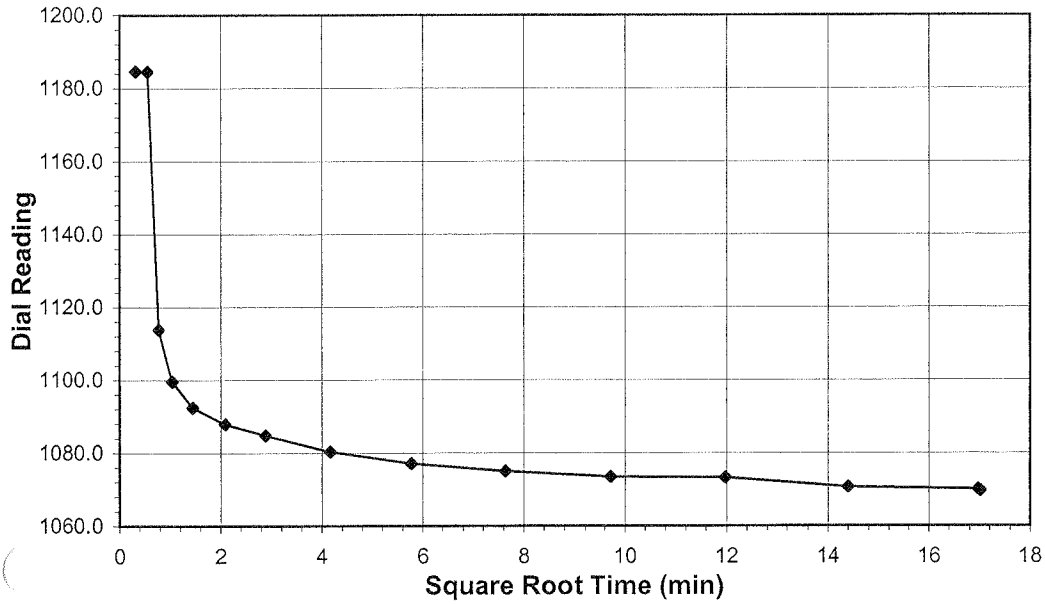
ASTM D 2435-96 (SOP-S24A)

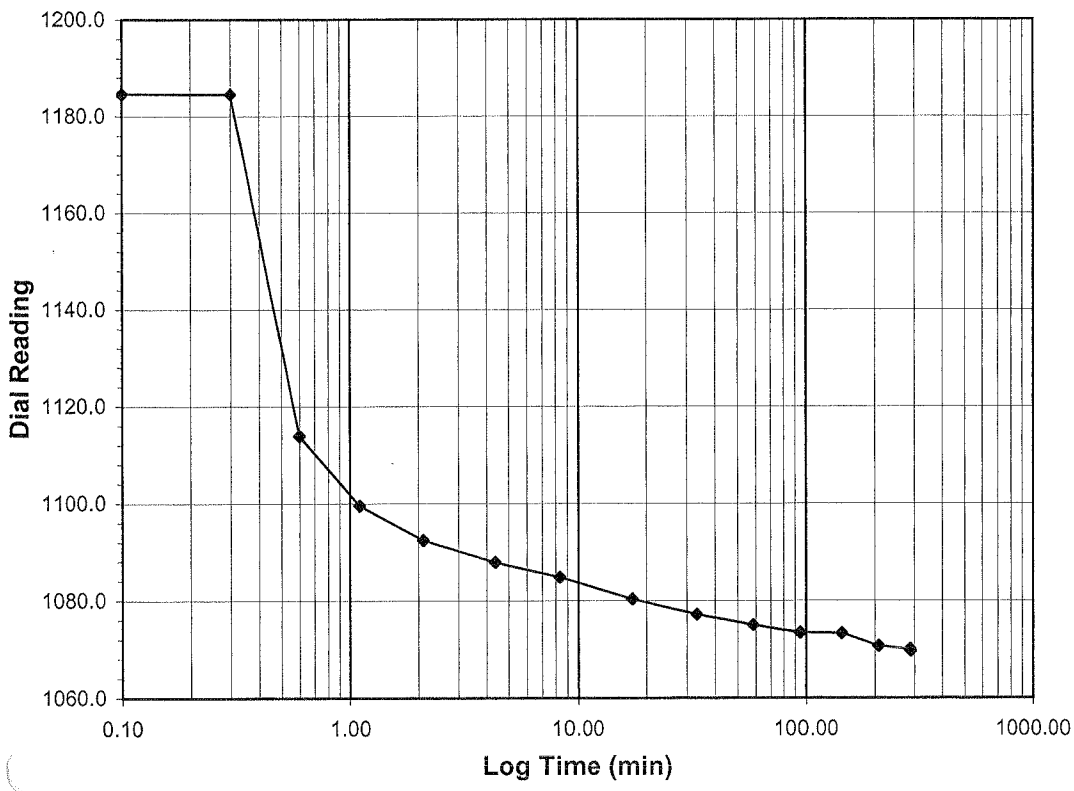
Client	G.N. RICHARDSON & ASSOC.	Boring No.	PZ-5
Client Project	JOHNSTON CO.-23	Depth (ft)	7'
Project No.	2005-594-01	Sample No.	2
Lab ID	2005-594-01-02	Visual Description	LIGHT BROWN SANDY SILT

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**1.0-0.25**
Final Reading	**(div)**	**1069.7**
Consolidometer No.		5
1 Division	(in)	0.0001
Start Date		11/9/2005
Start Time		8:33:33

Elapsed Time (min)	Dial Reading (div)
Initial	**1184.7**
0.10	1184.6
0.30	1184.5
0.60	1113.9
1.10	1099.6
2.10	1092.4
4.35	1087.9
8.35	1084.8
17.35	1080.3
33.35	1077.1
58.35	1075.0
94.35	1073.4
143.35	1073.3
207.35	1070.7
288.35	1070.0
289.78	1069.7



Tested By MCW *Date* 11/9/2005 *Checked By* DB *Date* 11-22-05

DCN: CT-24E Date: 3/2/98 Revision: 2 *\\Lab1\c\2005 Projects\2005-594 GNRA\2005-594-01-02 REVISED CONSOLS\[2005-594-01-02-16 CONSOL.xls]Sheet1 (2)*

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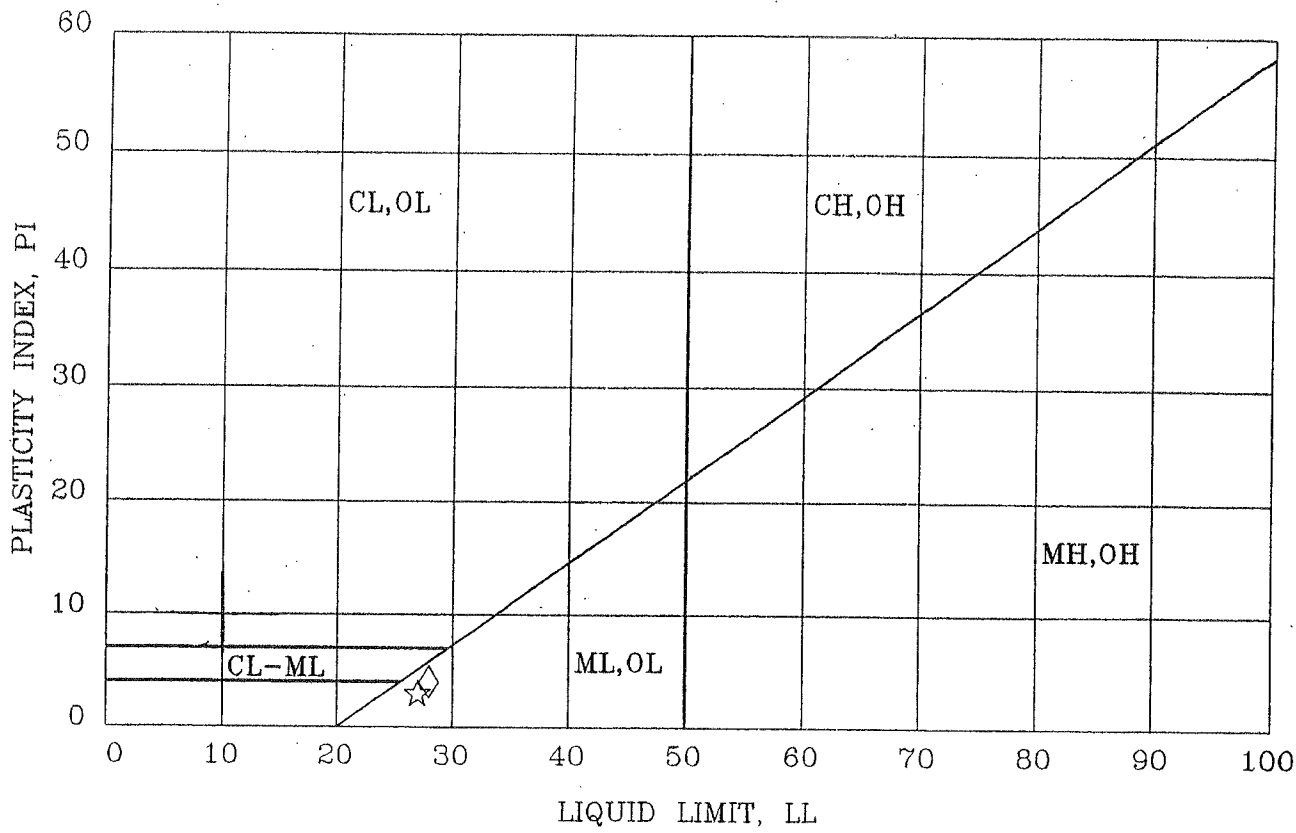
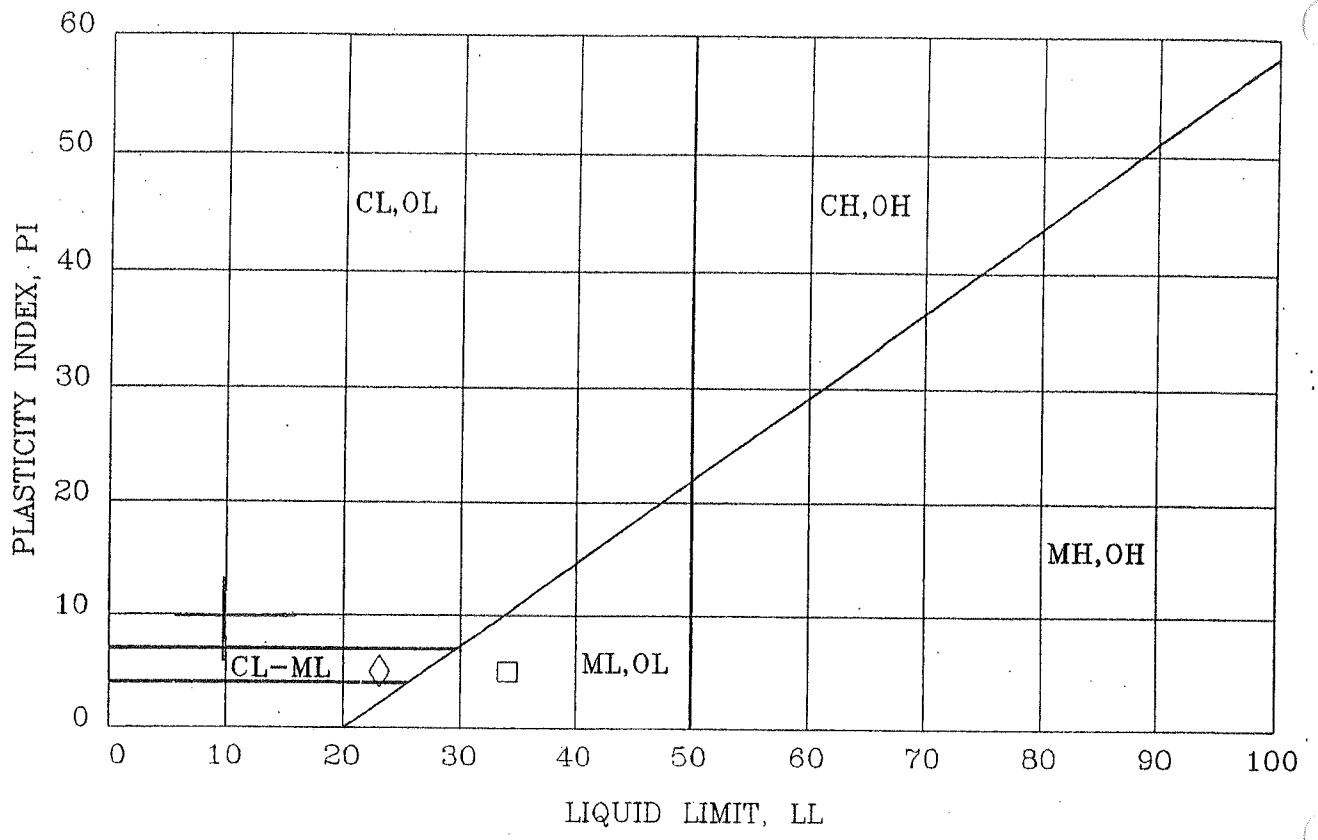


SYMBOL	SAMPLE	DEPTH (ft)	MC (%)	LL (%)	PL (%)	PI (%)	LI (-)	DESCRIPTION
○	PZ-1A	10-11.5	21.0	9			2.23	Tan Sand
□	PZ-2	10-11.5	23.7	15			1.60	Brown Sand
△	PZ-3	5-6.5	21.0	10			2.02	Tan Coarse Sand
◇	PZ-4	20-21.5	22.9	28	24	4	-.39	Gray Sandy Silt
☆	PZ-5	15-16.5	11.7	27	24	3	-4.08	Tan Sandy Silt
●	PZ-6	20-21.5	5.0	8			.61	Gray Rocky Silty Sand
■	PZ-7	5-6.5	16.7	12			1.37	Brown Sand

Remark :

Project No.03-516D	Johnston County Landfill
Engineering Tectonics	PLASTICITY CHART Figure No.1

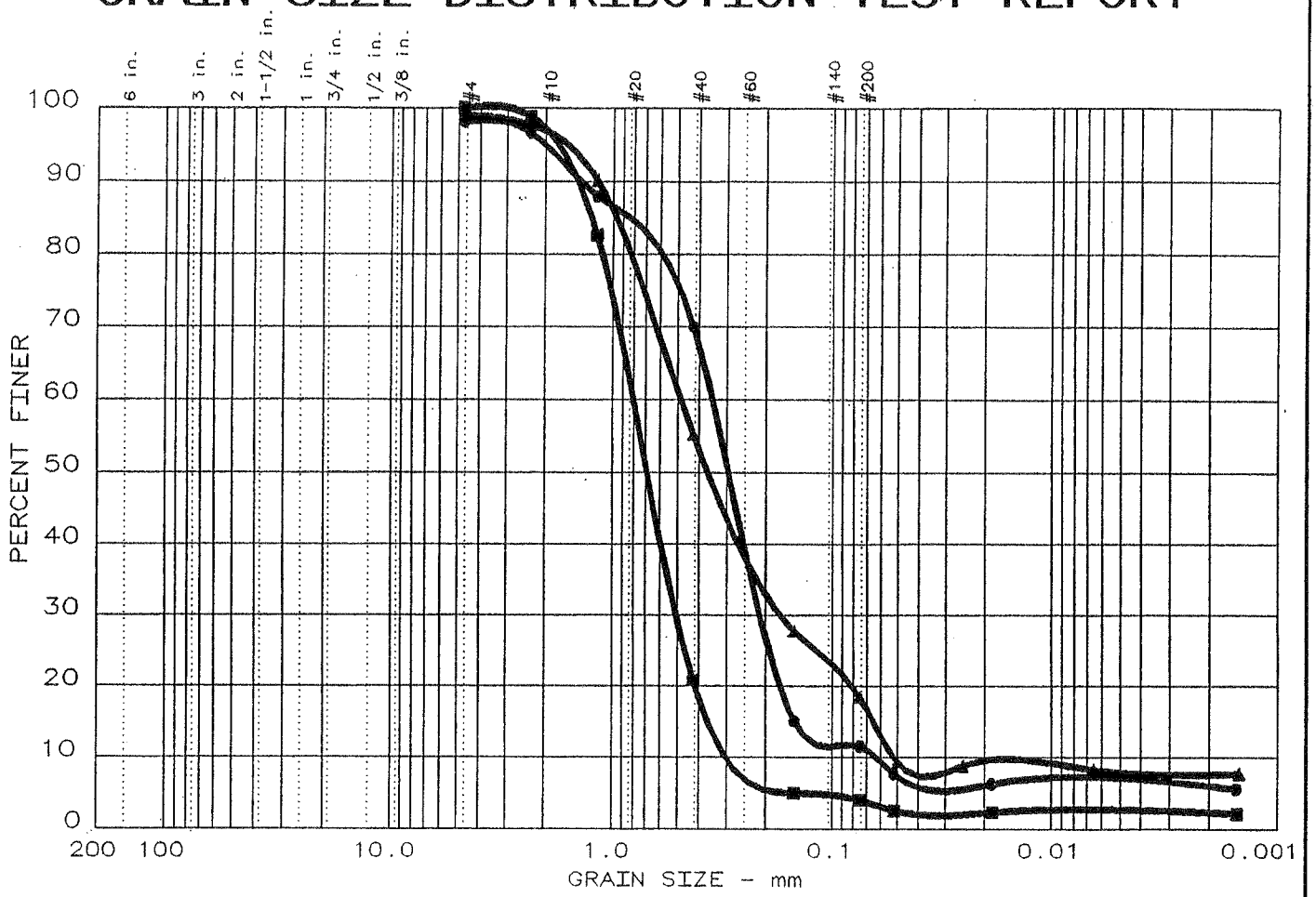


SYMBOL	SAMPLE	DEPTH (ft)	MC (%)	LL (%)	PL (%)	PI (%)	LI (-)	DESCRIPTION
○	P7-8	5-6.5	21.4	17			1.23	Tan Silty Sand
□	PZ-9	10-11.5	23.9	34	29	5	-1.16	Brown Sandy Silt
△	PZ-10	10-11.5	20.4	17			1.23	Brown Gravely Sand
◇	MW-14D	5-6.5	19.9	23	18	5	.37	Gray Mic.Sandy Silt
☆	MW-15D	5-6.5	14.2	10			1.40	Gray/Tan Gravely Silty Sand
●	MW-16D	10-11.5	10.0	9			1.11	Gray Gravely Silty Sand

Remark :

Project No.03-516D	Johnston County Landfill
Engineering Tectonics	PLASTICITY CHART Figure No.2

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	2	0.0	1.8	86.6	4.4	7.2
▲	3	0.0	0.9	80.6	10.6	7.9
■	4	0.0	0.0	96.0	1.3	2.7

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	15	NP	0.832	0.349	0.295	0.212	0.148	0.0626	2.06	5.6
▲	9	NP	0.966	0.483	0.366	0.171	0.0643	0.0517	1.17	9.3
■	10	NP	1.24	0.801	0.689	0.505	0.366	0.303	1.05	2.6

MATERIAL DESCRIPTION	USCS	AASHTO
● Tan Sand	SP-SM	A-2-4(0.0)
▲ Brown Sand	SM	A-2-4(0.0)
■ Tan Coarse Sand	SP	A-1-b

Project No.: 03-516D

Project: Johnston County Landfill

● Location: PZ-1A@ 10-11.5 ft.

▲ Location: PZ-2 @ 10-11.5 ft.

■ Location: PZ-3 @ 5-6.5 ft.

ate: 07-20-03

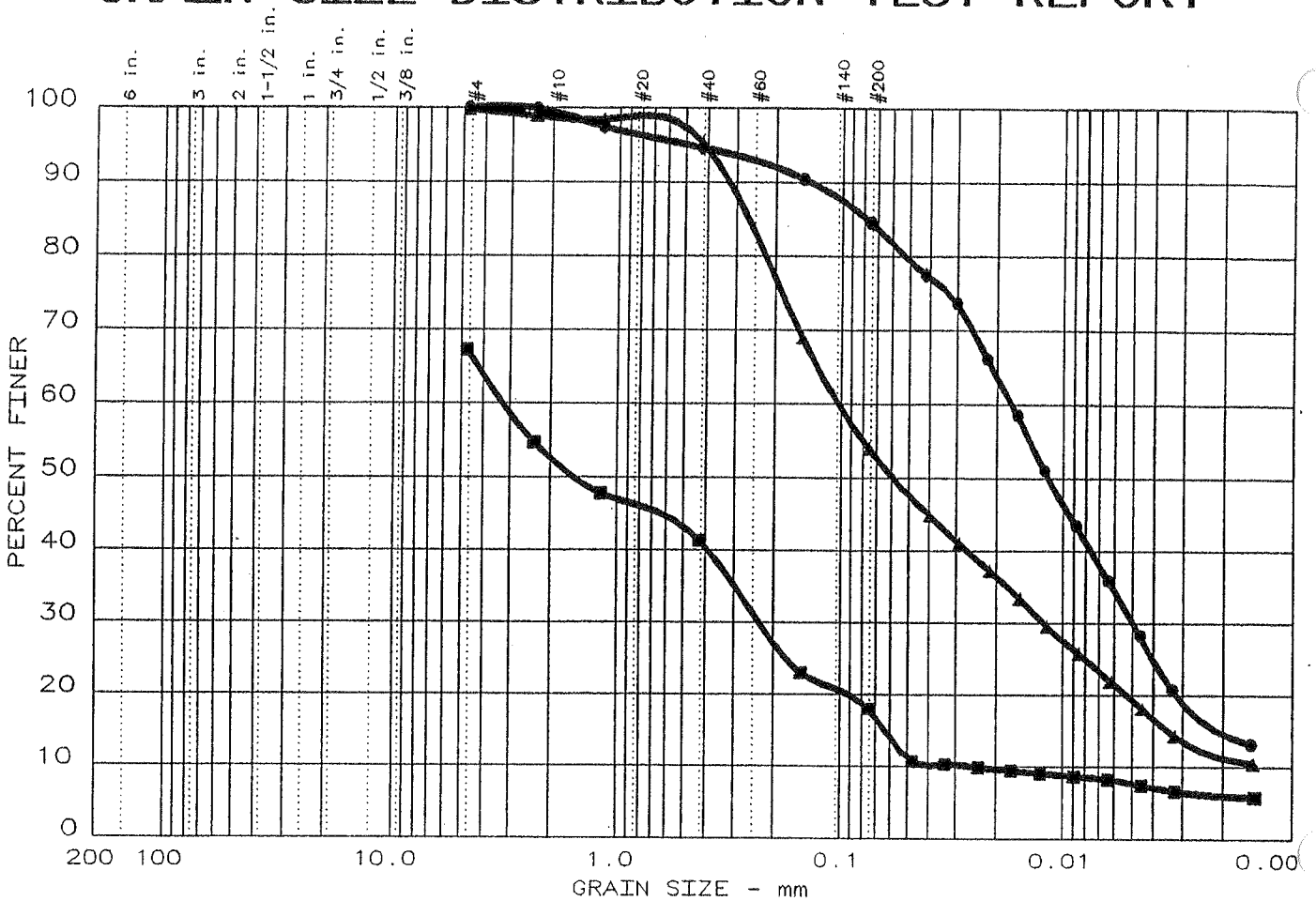
Remarks:

GRAIN SIZE DISTRIBUTION TEST REPORT

ENGINEERING TECTONICS

Fig. No.: 3

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	5	0.0	0.0	15.5	54.4	30.1
▲	6	0.0	0.2	45.8	34.6	19.4
■	7	0.0	32.8	49.2	10.3	7.7

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	28	4	0.0776		0.0116	0.0050	0.0021			
▲	27	3	0.263	0.102	0.0582	0.0122	0.0035			
■	8	NP	4.75	3.21	1.59	0.233	0.0626	0.0252	0.67	127.4

MATERIAL DESCRIPTION	USCS	AASHTO
● Gray Sandy Silt	ML	A-4(2.8)
▲ Tan Sandy Silt	ML	A-4(0.0)
■ Gray Rocky Silty Sand	SM	A-1-b

Project No.: 03-516D

Project: Johnston County Landfill

● Location: PZ-4 @ 20-21.5 ft.

▲ Location: PZ-5 @ 15-16.5 ft.

■ Location: PZ-6 @ 20-21.5 ft.

ate: 07-20-03

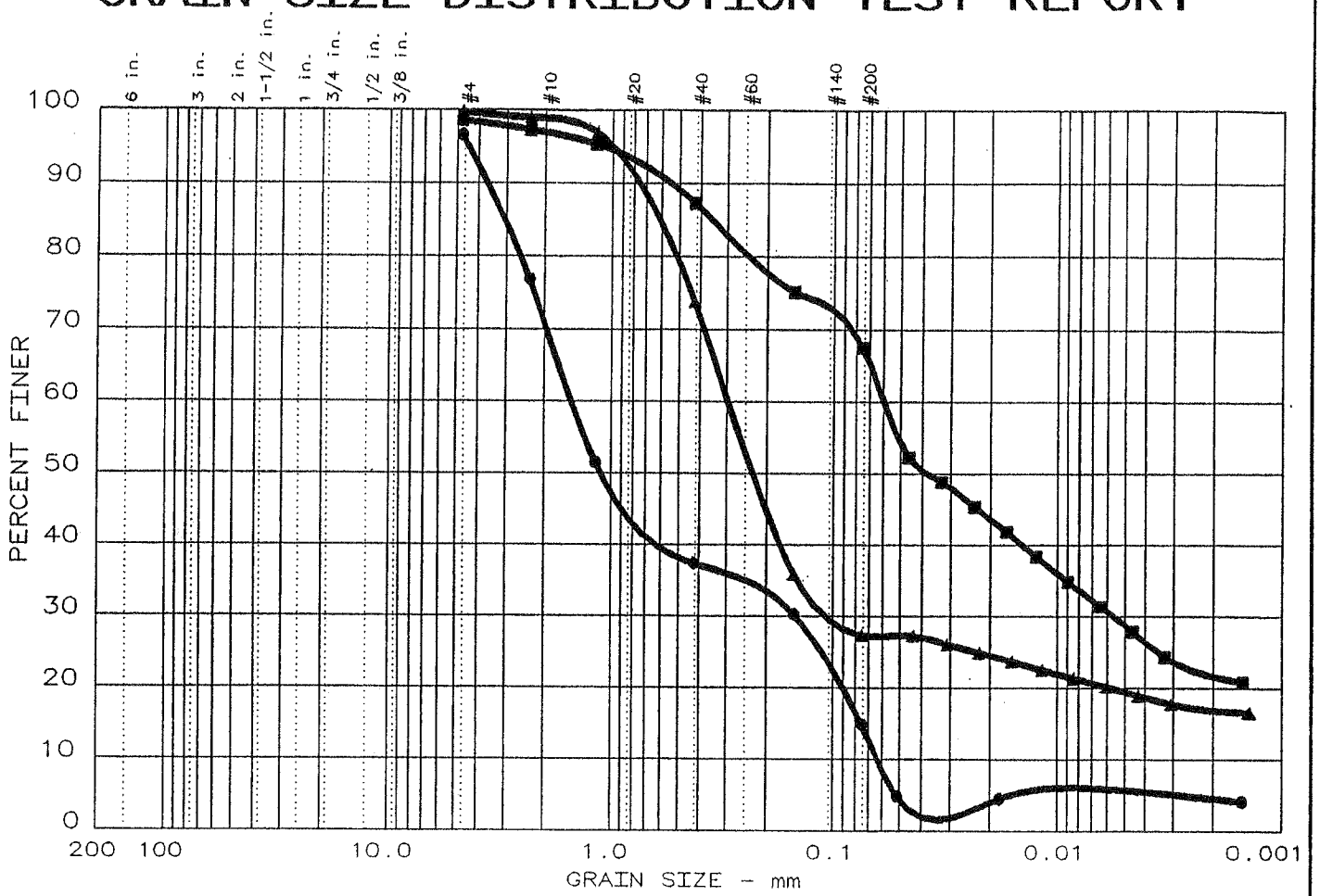
Remarks:

GRAIN SIZE DISTRIBUTION TEST REPORT

ENGINEERING TECTONICS

Fig. No.: 4

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	8	0.0	3.4	81.7	9.2	5.7
▲	9	0.0	0.3	72.3	7.9	19.5
■	10	0.0	1.4	31.0	38.9	28.7

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	12	NP	3.05	1.51	1.12	0.146	0.0748	0.0630	0.22	24.0
▲	17	NP	0.607	0.297	0.230	0.109				
■	34	5	0.355		0.0389	0.0056				

MATERIAL DESCRIPTION	USCS	AASHTO
● Brown Sand	SM	A-1-b
▲ Tan Silty Sand	SM	A-2-4(0.0)
■ Brown Silty Sand	ML	A-4(3.0)

Project No.: 03-516D
Project: Johnston County Landfill
● Location: PZ-7 @ 5-6.0 ft.
▲ Location: PZ-8 @ 5-6.5 ft.
■ Location: PZ-9 @ 10-11.5 ft.
ate: 07-20-03

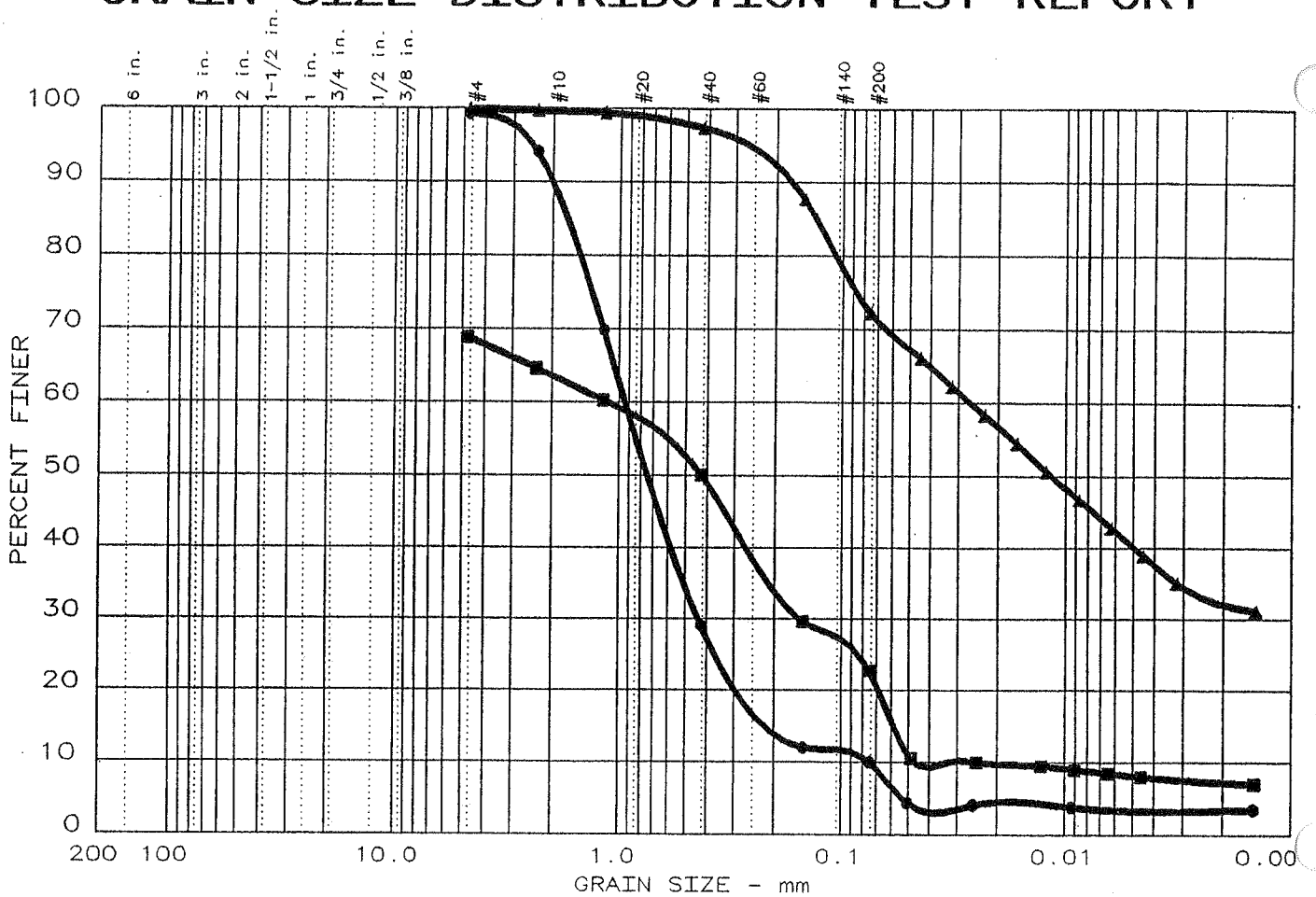
Remarks:

GRAIN SIZE DISTRIBUTION TEST REPORT

ENGINEERING TECTONICS

Fig. No.: 5

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	11	0.0	0.7	89.3	6.8	3.2
▲	12	0.0	0.2	27.6	32.1	40.1
■	13	0.0	31.1	46.2	14.6	8.1

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	17	NP	1.72	0.939	0.744	0.438	0.219	0.0743	2.74	12.6
▲	23	5	0.132		0.0116					
■	10	NP	4.75	1.11	0.423	0.155	0.0584	0.0470	0.46	23.7

MATERIAL DESCRIPTION	USCS	AASHTO
● Brown Gravely Sand	SW-SM	A-1-b
▲ Gray Mic. Sandy Silt	CL-ML	A-4(1.4)
■ Gray/Tan Gravely Silty Sand	SM	A-1-b

Project No.: 03-516D
Project: Johnston County Landfill
● Location: PZ-10 @ 10-11.5 ft.
▲ Location: MW-14D @ 5-6.5 ft.
■ Location: MW-15D @ 5-6.5 ft.
ate: 07-20-03

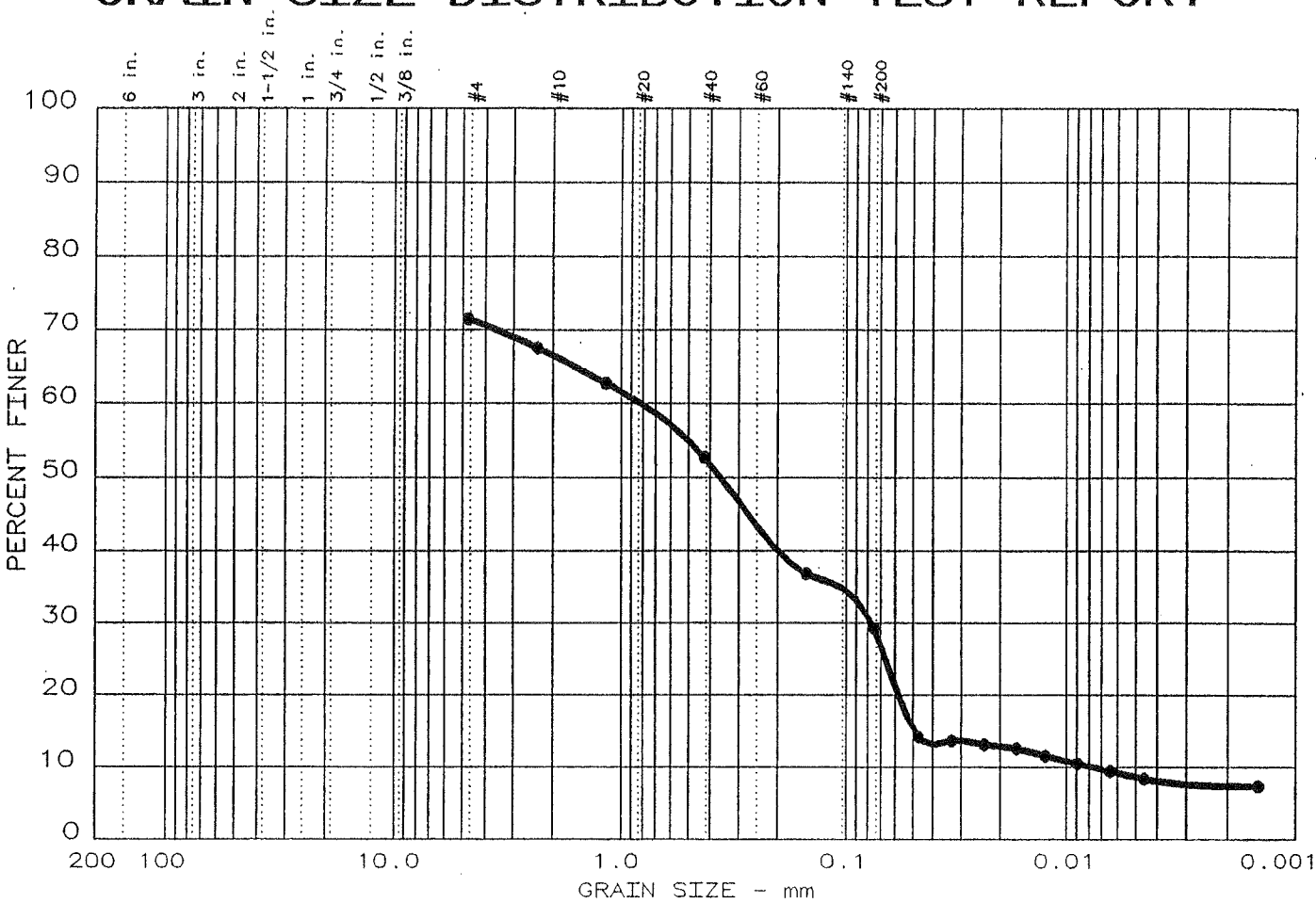
Remarks:

GRAIN SIZE DISTRIBUTION TEST REPORT

ENGINEERING TECTONICS

Fig. No.: 6

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	14	0.0	28.5	42.3	20.6	8.6

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	9	NP	4.75	0.816	0.356	0.0770	0.0486	0.0075	0.97	108.4

MATERIAL DESCRIPTION	USCS	AASHTO
● Gray Gravely Silty Sand	SM	A-2-4(0.0)

Project No.: 03-516D
Project: Johnston County Landfill
● Location: MW-16D @ 10-11.5 ft.

Date: 07-20-03

Remarks:

GRAIN SIZE DISTRIBUTION TEST REPORT

ENGINEERING TECTONICS

Fig. No.: 7

Geotechnics
INTEGRITY IN TESTING

ATTERBERG LIMITS

ASTM D 4318-98 / AASHTO T89 (SOP - S4A)

Client	G.N. RICHARDSON & ASSOC.	Boring No.	PZ-5
Client Reference	JOHNSTON CO. - 23	Depth (ft)	5'
Project No.	2005-594-01	Sample No.	1
Lab ID	2005-594-01-01	Soil Description	**LIGHT BROWN SILT**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

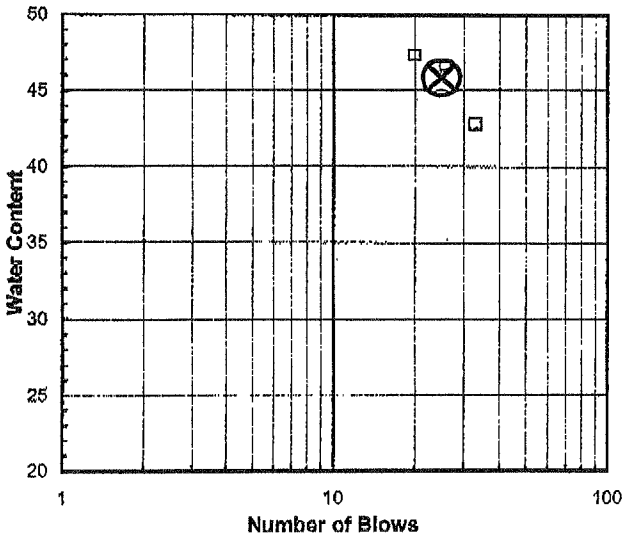
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	A-N	A-U	W	MULTIPOINT
Wt. of Tare & WS (gm)	34.14	34.38	32.74	
Wt. of Tare & DS (gm)	28.14	28.43	27.47	
Wt. of Tare (gm)	15.46	15.67	15.16	
Wt. of Water (gm)	6.0	6.0	5.3	
Wt. of DS (gm)	12.7	12.8	12.3	
Moisture Content (%)	**47.3**	**46.6**	**42.8**	
Number of Blows	**20**	**26**	**33**	

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	I	G	
Wt. of Tare & WS (gm)	22.65	23.49	
Wt. of Tare & DS (gm)	20.88	21.56	
Wt. of Tare (gm)	15.26	15.08	
Wt. of Water (gm)	1.8	1.9	
Wt. of DS (gm)	5.6	6.5	
Moisture Content (%)	**31.5**	**29.8**	**1.7**

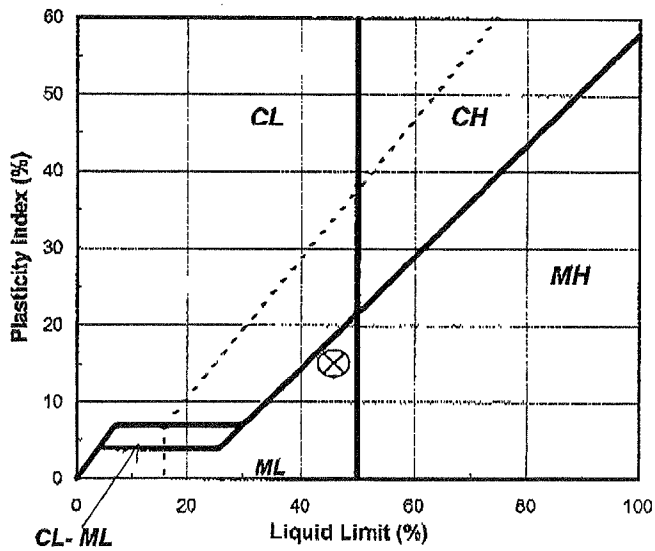
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**46**
Plastic Limit (%)	**31**
Plasticity Index (%)	**15**
USCS Symbol	**ML**

Flow Curve



Plasticity Chart



Tested By JDR *Date* 10/19/05 *Checked By* CEM *Date* 10-20-05

page 1 of 1 **DCN:** CT-S4B **DATE:** 10/08/01 **REVISION:** 2

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INTEGRITY IN TESTING

ATTERBERG LIMITS

ASTM D 4318-98 / AASHTO T89 (SOP - S4A)

Client	G.N. RICHARDSON & ASSOC.	Boring No.	PZ-5
Client Reference	JOHNSTON CO. - 23	Depth (ft)	7'
Project No.	2005-594-01	Sample No.	2
Lab ID	2005-594-01-02	Soil Description	**ORANGE BROWN SILT**

***Note:** The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description.*

(Minus No. 40 sieve material, Airdried)

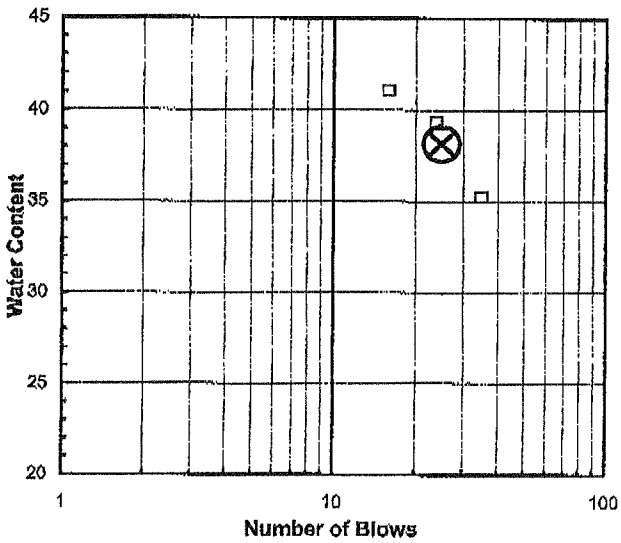
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	A-M	A-Q	A-V	MULTIPOINT
Wt. of Tare & WS (gm)	25.65	27.72	25.64	
Wt. of Tare & DS (gm)	22.66	24.29	23.05	
Wt. of Tare (gm)	15.38	15.56	15.70	
Wt. of Water (gm)	3.0	3.4	2.6	
Wt. of DS (gm)	7.3	8.7	7.4	
Moisture Content (%)	**41.1**	**39.3**	**35.2**	
Number of Blows	**16**	**24**	**35**	

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	S	X	
Wt. of Tare & WS (gm)	21.68	22.29	
Wt. of Tare & DS (gm)	20.26	20.77	
Wt. of Tare (gm)	15.21	15.23	
Wt. of Water (gm)	1.4	1.5	
Wt. of DS (gm)	5.1	5.5	
Moisture Content (%)	**28.1**	**27.4**	**0.7**

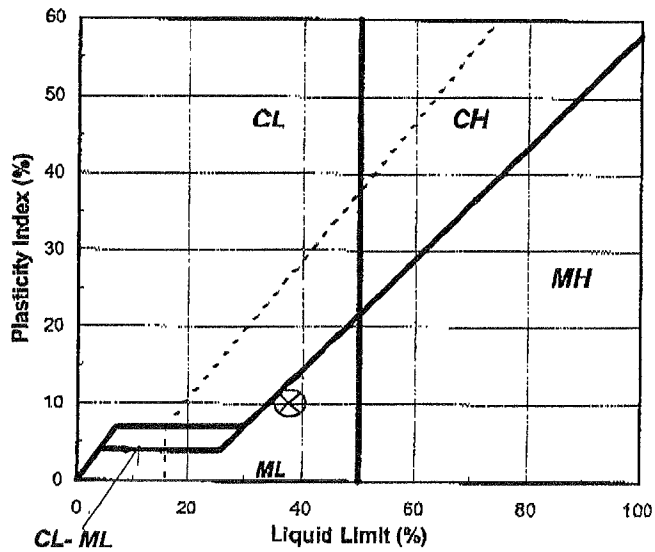
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**38**
Plastic Limit (%)	**28**
Plasticity Index (%)	**10**
USCS Symbol	**ML**

Flow Curve



Plasticity Chart



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INTEGRITY IN TESTING

ATTERBERG LIMITS

ASTM D 4318-98 / AASHTO T89 (SOP - S4A)

Client	G.N. RICHARDSON & ASSOC.	Boring No.	PZ-7
Client Reference	JOHNSTON CO. -23	Depth (ft)	5'
Project No.	2005-594-01	Sample No.	3
Lab ID	2005-594-01-03	Soil Description	**LIGHT BROWN LEAN CLAY**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

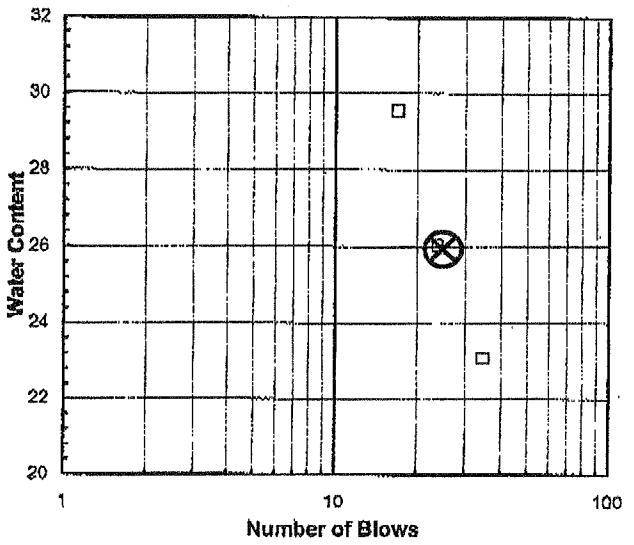
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	C-2	A-1	F-1	MULTIPOINT
Wt. of Tare & WS (gm)	44.40	43.43	43.63	
Wt. of Tare & DS (gm)	39.28	38.98	39.58	
Wt. of Tare (gm)	21.95	21.88	22.03	
Wt. of Water (gm)	5.1	4.5	4.1	
Wt. of DS (gm)	17.3	17.1	17.6	
Moisture Content (%)	**29.5**	**26.0**	**23.1**	
Number of Blows	**17**	**24**	**35**	

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	H-2	I-1	
Wt. of Tare & WS (gm)	32.50	33.20	
Wt. of Tare & DS (gm)	31.03	31.67	
Wt. of Tare (gm)	22.09	22.09	
Wt. of Water (gm)	1.5	1.5	
Wt. of DS (gm)	8.9	9.6	
Moisture Content (%)	**16.4**	**16.0**	**0.5**

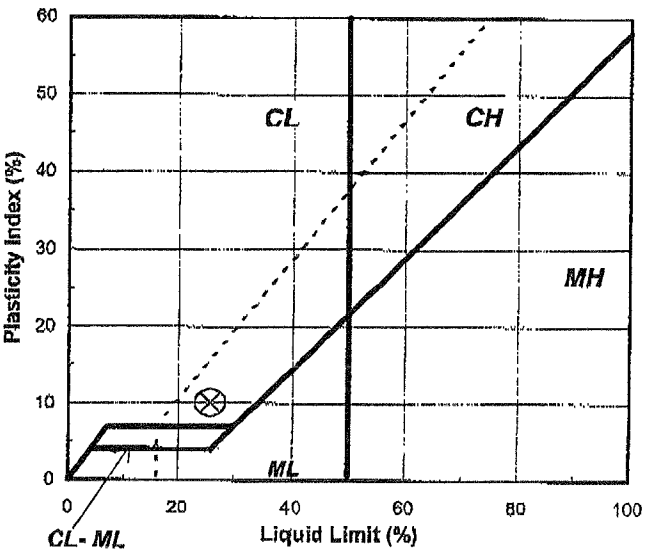
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**26**
Plastic Limit (%)	**16**
Plasticity Index (%)	**10**
USCS Symbol	**CL**

Flow Curve



Plasticity Chart



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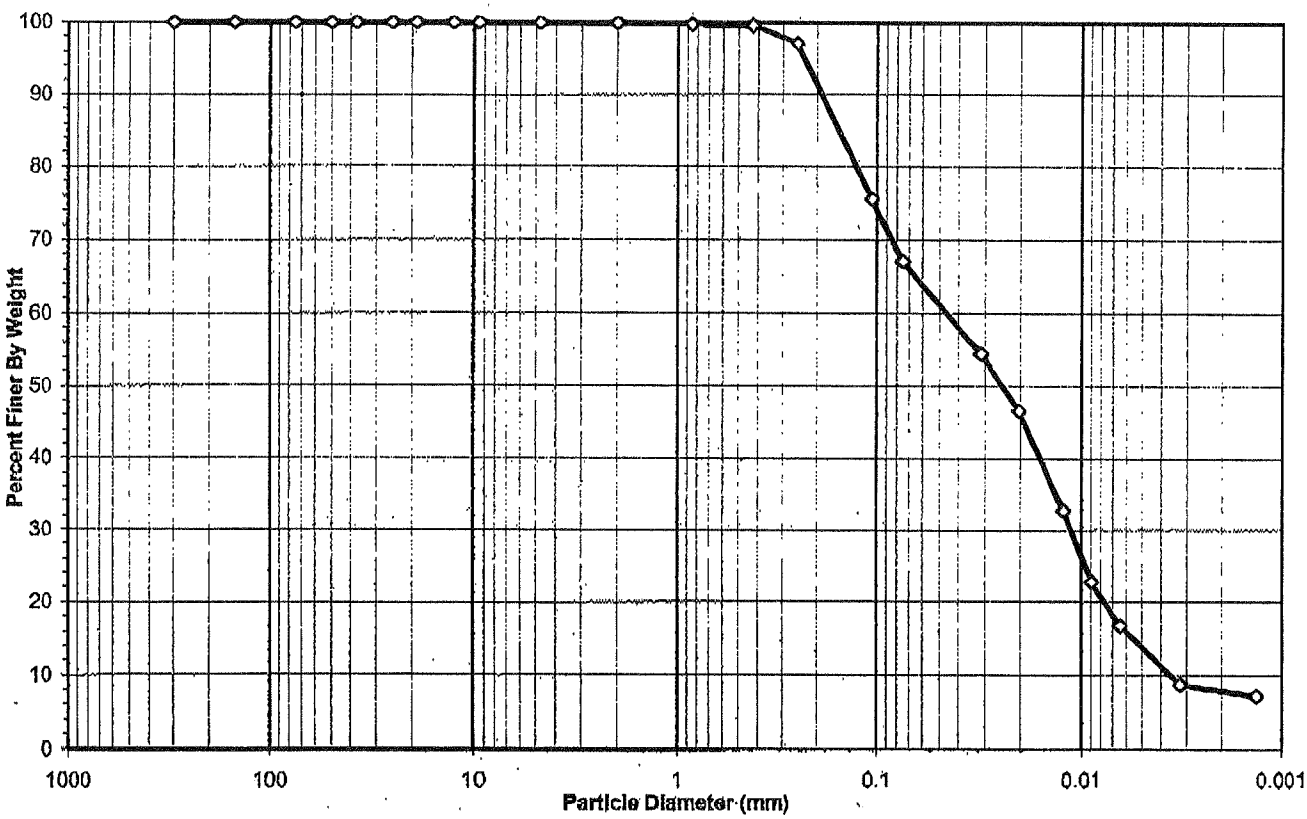
SIEVE AND HYDROMETER ANALYSIS

ASTM D 422-63 (SOP-S3)

Client	G.N. RICHARDSON & ASSOCIATES	Boring No.	PZ-5
Client Reference	JOHNSTON CO. - 23	Depth (ft)	5'
Project No.	2005-594-01	Sample No.	1
Lab ID	2005-594-01-01	Soil Color	**LIGHT BROWN**

	SIEVE ANALYSIS					HYDROMETER
USCS	cobbles	gravel	sand			silt and clay fraction
USDA	cobbles	gravel	sand		silt	clay

12" 6" 3" 3/4" 3/8" #4 #10 #20 #40 #140 #200



USCS Summary

Sieve Sizes (mm)		Percentage
Greater Than #4	*Gravel*	0.00
#4 To #200	*Sand*	32.84
Finer Than #200	*Silt & Clay*	67.16

USCS Symbol ***ML, TESTED***

USCS Classification ***SANDY SILT***

DCN: CT-S3P DATE:02/15/05 REVISION:8

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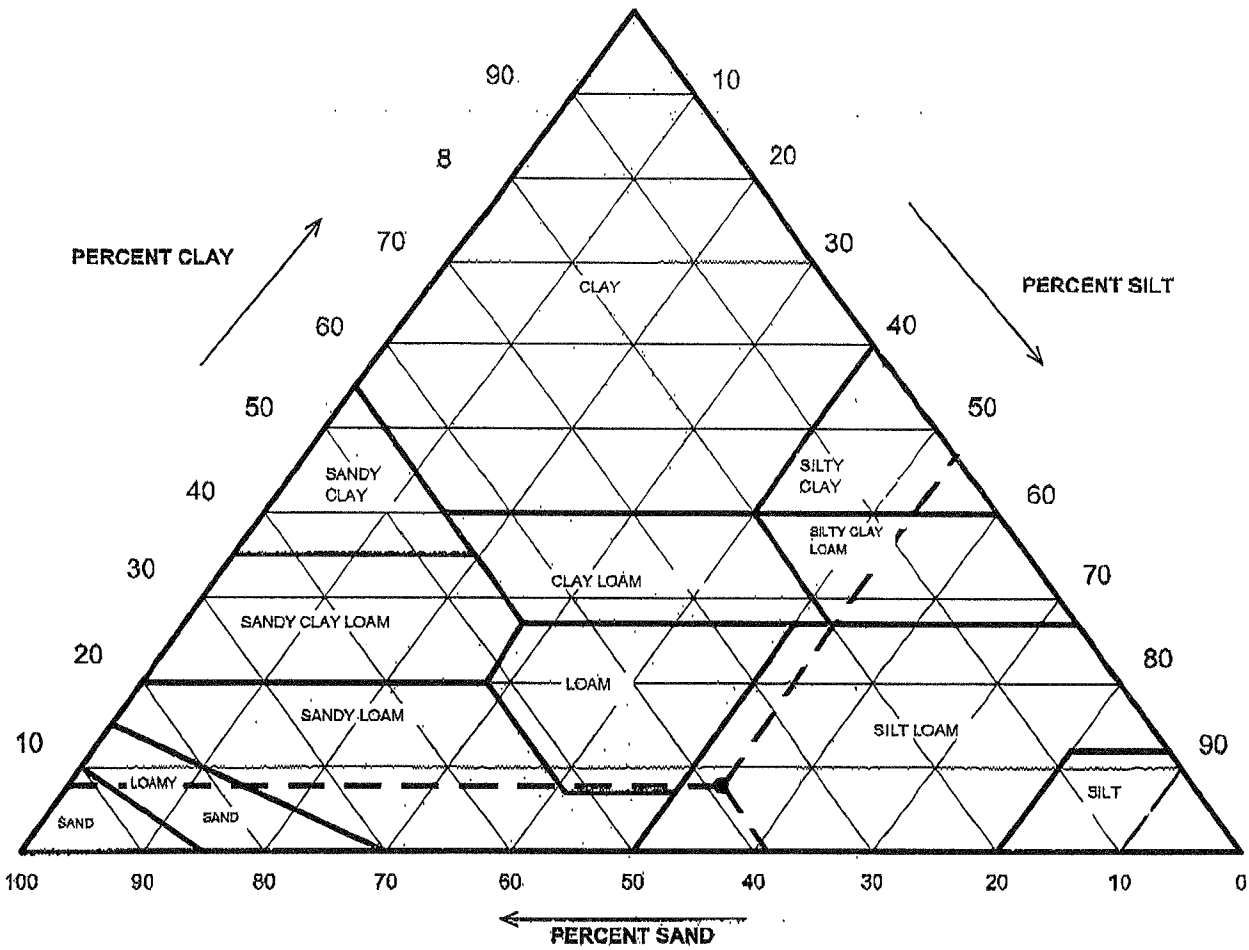
INTEGRITY IN TESTING

USDA CLASSIFICATION CHART

Client	G.N. RICHARDSON & ASSOCIATES	Boring No.	PZ-5
Client Reference	JOHNSTON CO. - 23	Depth (ft)	5'
Project No.	2005-594-01	Sample No.	1
Lab ID	2005-594-01-01	Soil Color	LIGHT BROWN



Particle Size (mm)	Percent Finer	USDA SUMMARY	Actual Percentage	Corrected % of Minus 2.0 mm material for USDA Classificat.
		Gravel	0.00	**0.00**
2	100.00	*Sand*	38.75	**38.75**
0.05	61.25	*Silt*	53.37	**53.37**
0.002	7.87	*Clay*	7.87	**7.87**

USDA Classification: ***SILT LOAM***

DCN: CT-S3P DATE:02/15/05 REVISION:8 C:\2005 Projects\2005-594 GNRA\[2005-594-01-01 SPLIT HYDRO.xls]Sheet1

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INTEGRITY IN TESTING

WASH SIEVE ANALYSIS #10 SPLIT

ASTM D 422-63 (SOP-S3)

Client	G.N. RICHARDSON & ASSOCIATES	Boring No.	PZ-5
Client Reference	JOHNSTON CO. - 23	Depth (ft)	5'
Project No.	2005-594-01	Sample No.	1
Lab ID	2005-594-01-01	Soil Color	**LIGHT BROWN**

Moisture Content/sieve +10 Material		Moisture Content for Hydrometer Portion	
Tare No.	212	Tare No.	S-1
Wgt.Tare + Wet Soil (gm)	379.74	Wgt.Tare + Wet Soil (gm)	37.58
Wgt.Tare + Dry Soil (gm)	333.12	Wgt.Tare + Dry Soil (gm)	37.39
Weight of Tare (gm)	171.61	Weight of Tare (gm)	21.87
Weight of Water (gm)	46.62	Weight of Water (gm)	0.19
Weight of Dry Soil (gm)	161.51	Weight of Dry Soil (gm)	15.52
Moisture Content (%)	**28.9**	**Moisture Content (%)**	**1.2**

Soil Specimen Data			
Wet Weight +#10 Material (gm)	208.13	Weight of the Dry Sample (gm)	211.29
Dry Weight +#10 Material(gm)	161.5	Weight of minus #200 material (gm)	33.43
Wet Weight Hydro. Material.(gm)	50.39	Weight of plus #200 material (gm)	177.86
Dry Weight Hydro. Material (gm)	49.78		
Total Dry Weight Sample (gm)	211.29	**J-FACTOR (%FINER THAN #10)**	**1.0000**

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.5	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.00	0.00	0.00	100.00	**100.00**
#10	2.00	0.00	0.00	0.00	100.00	**100.00**
#20	0.85	0.11	0.22	0.22	99.78	**99.78**
#40	0.425	0.06	0.12	0.34	99.66	**99.66**
#60	0.250	1.26	2.53	2.87	97.13	**97.13**
#140	0.106	10.68	21.45	24.33	75.67	**75.67**
#200	0.075	4.24	8.52	32.84	67.16	**67.16**
Pan	-	33.43	67.16	100.00	-	-

Notes :

Tested By MCW Date 10/17/05 Checked By KAW Date 10-24-05

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INTEGRITY IN TESTING

HYDROMETER ANALYSIS

ASTM D 422-63 (SOP-S3)

Client	G.N. RICHARDSON & ASSOCIATES	Boring No.	PZ-5
Client Reference	JOHNSTON CO. - 23	Depth (ft)	5'
Project No.	2005-594-01	Sample No.	1
Lab ID	2005-594-01-01	Soil Color	**LIGHT BROWN**

Elapsed Time (min)		R Measured	Temp. (°C)	Composite Correction	R Corrected	N (%)	K Factor	Diameter (mm)	N' (%)
0	NA	NA	NA	NA	NA	NA	NA	NA	NA
2	32.0	32.0	21.3	4.58	27.4	54.5	0.01324	0.0311	**54.5**
5		28.0	21.3	4.58	23.4	46.6	0.01324	0.0203	**46.6**
15		21.0	21.3	4.58	16.4	32.7	0.01324	0.0123	**32.7**
30		16.0	21.5	4.52	11.5	22.8	0.01321	0.0089	**22.8**
60		13.0	21.4	4.55	8.5	16.8	0.01322	0.0064	**16.8**
250		9.0	21.2	4.61	4.4	8.7	0.01325	0.0032	**8.7**
1440		8.0	22.0	4.37	3.6	7.2	0.01313	0.0013	**7.2**

Soil Specimen Data		**Other Corrections**	
Tare + Dry Material (gm)	49.78	a - Factor	0.99
Weight of Tare (gm)	0		
Weight of Deflocculant (gm)	5.0	Percent Finer than # 10	100.00
Weight of Dry Material (gm)	49.78		
		Specific Gravity	2.7 Assumed

Note:

Tested By MCW Date 10/17/05 Checked By KAW Date 10-24-05

DCN: GT-S3P DATE:02/15/05 REVISION:8 C:\2005 Projects\2005-594 GNRA\(2005-594-01-01 SPLIT HYDRO.xls)Sheet1

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SIEVE AND HYDROMETER ANALYSIS
ASTM D 422-63 (SOP-S3)

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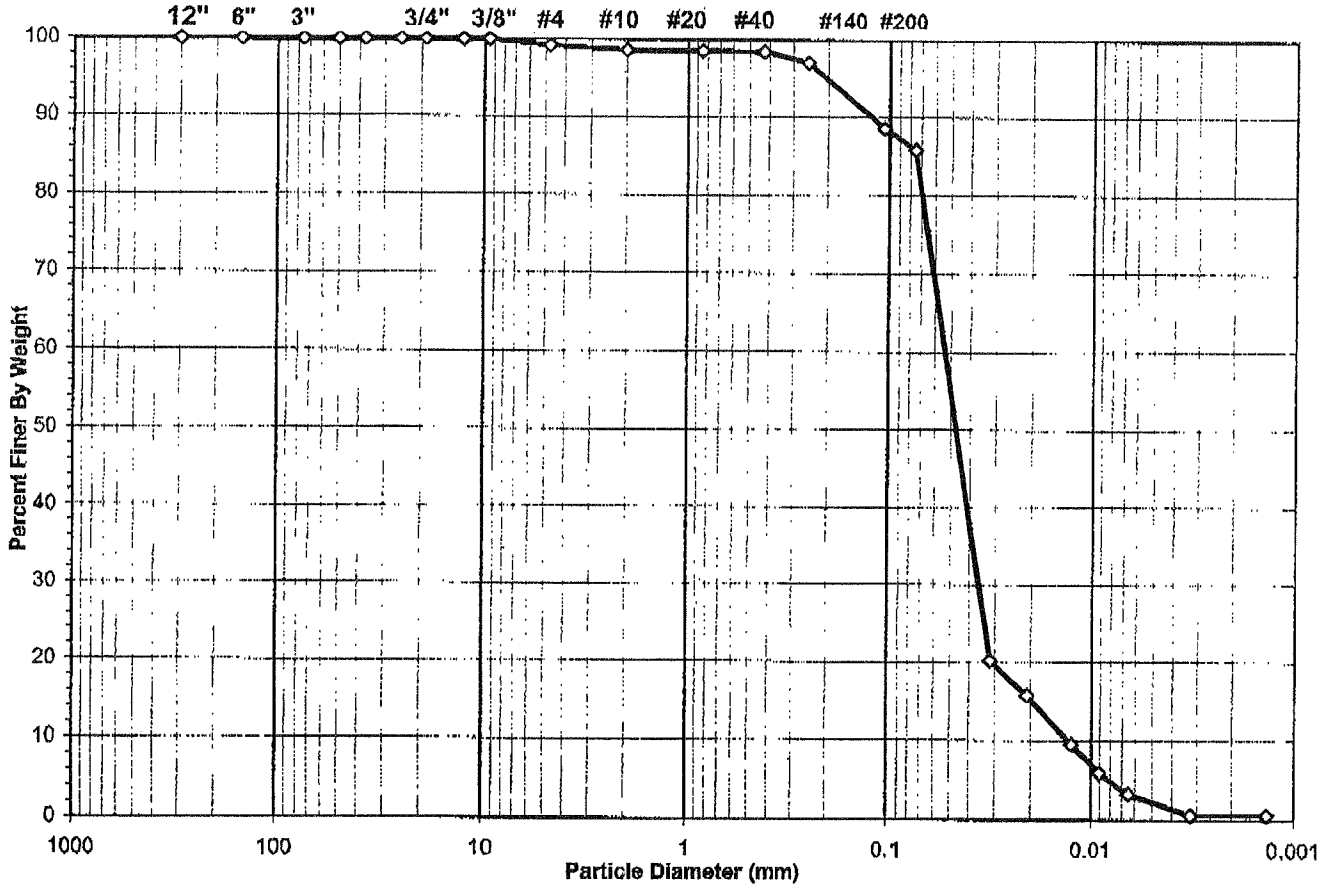
Client	G N RICHARDSON & ASSOC.	Boring No.	PZ
Client Reference	JOHNSTON CO. -23	Depth (ft)	7'
Project No.	2005-594-01	Sample No.	2
Lab ID	2005-594-01-02	Soil Color	LIGHT BROWN

	SIEVE ANALYSIS			HYDROMETER	
USCS	cobbles	gravel	sand	silt and clay fraction	
USDA	cobbles	gravel	sand	silt	clay



USCS Summary

Sieve Sizes (mm)		Percentage
Greater Than #4	*Gravel*	0.80
#4 To #200	*Sand*	13.36
Finer Than #200	*Silt & Clay*	85.85

USCS Symbol ***ML, TESTED***

USCS Classification ***SILT***

DCN: CT-S3B DATE: 6-23-99 REVISION: 3 *\\Lab1\c\2005 Projects\2005-594 GNRA\[2005-594-01-02 SIEVE HYDRO.xls]Sheet1*

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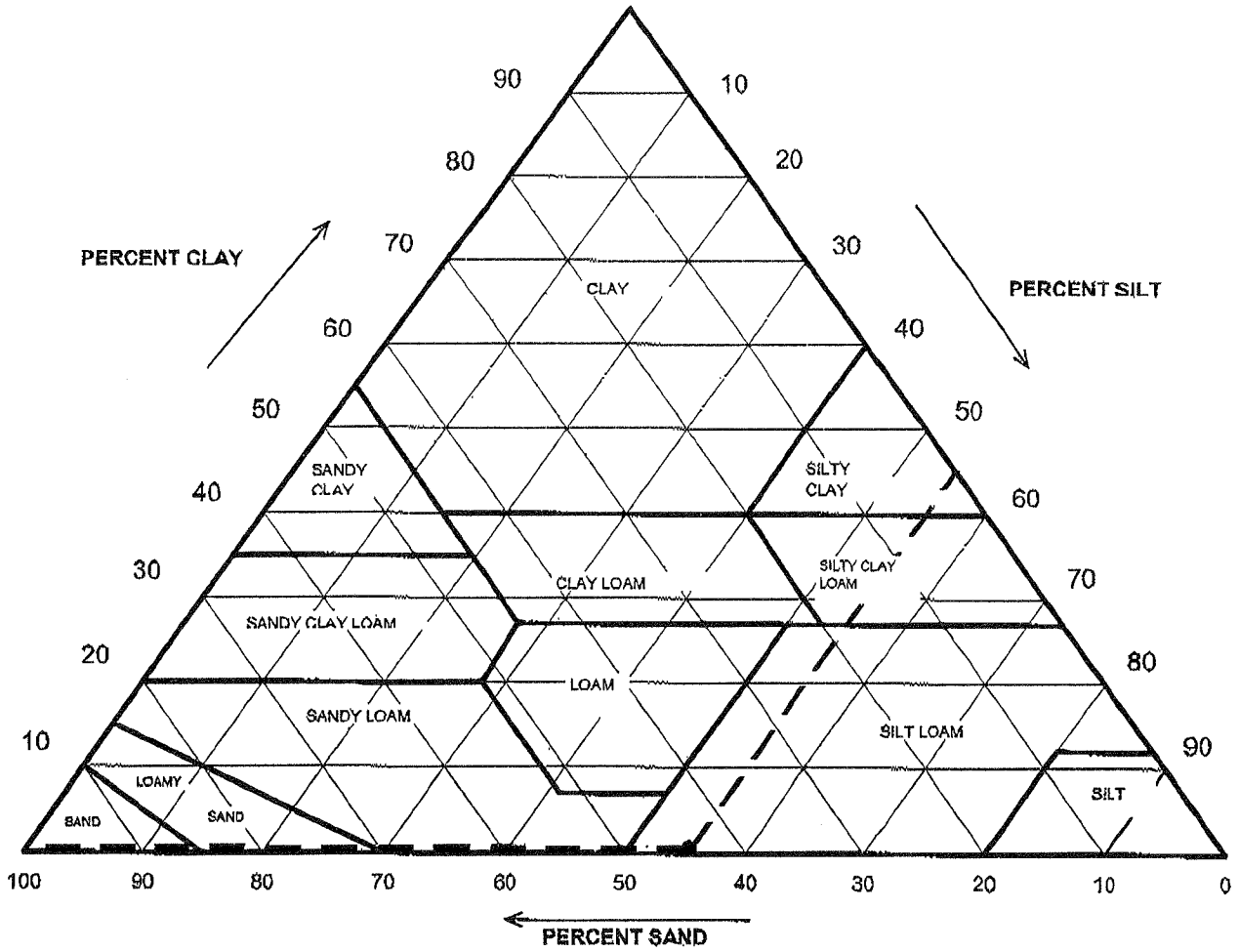
USDA CLASSIFICATION CHART

Client	G N RICHARDSON & ASSOC.	Boring No.	PZ-5
Client Reference	JOHNSTON CO. -23	Depth (ft)	7'
Project No.	2005-594-01	Sample No.	2
Lab ID	2005-594-01-02	Soil Color	LIGHT BROWN



Particle Size (mm)	Percent Finer	USDA SUMMARY	Actual Percentage	Corrected % of Minus 2.0 mm material for USDA Classificat.
		Gravel	1.37	**0.00**
2	98.63	*Sand*	43.74	**44.34**
0.05	54.90	*Silt*	54.33	**55.08**
0.002	0.57	*Clay*	0.57	**0.58**

USDA Classification: ***SILT LOAM***

DCN: CT-S3B DATE: 6-23-99 REVISION: 3 *\\Lab1\c\2005 Projects\2005-594 GNRA\[2005-594-01-02 SIEVE HYDRO.xls]Sheet1*

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WASH SIEVE ANALYSIS

ASTM D 422-63 (SOP-S3)

Client	G N RICHARDSON & ASSOC.	Boring No.	PZ-5
Client Reference	JOHNSTON CO. -23	Depth (ft)	7'
Project No.	2005-594-01	Sample No.	2
Lab ID	2005-594-01-02	Soil Color	**LIGHT BROWN**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	216	Tare No.	A-2
Wgt.Tare + Wet Specimen (gm)	346.27	Wgt.Tare + Wet Specimen (gm)	37.24
Wgt.Tare + Dry Specimen (gm)	319.28	Wgt.Tare + Dry Specimen (gm)	37.04
Weight of Tare (gm)	170.90	Weight of Tare (gm)	22.05
Weight of Water (gm)	26.99	Weight of Water (gm)	0.20
Weight of Dry Soil (gm)	148.38	Weight of Dry Soil (gm)	14.99
Moisture Content (%)	**18.2**	**Moisture Content (%)**	**1.3**

Wet Weight -3/4" Sample (gm)	50.82	Weight of the Dry Specimen (gm)	148.38
Dry Weight - 3/4" Sample (gm)	43.0	Weight of minus #200 material (gm)	127.38
Wet Weight +3/4" Sample (gm)	0.00	Weight of plus #200 material (gm)	21.00
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	43.0	**J - Factor (Percent Finer than 3/4")**	**1.0000**

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated **Percent Finer (%)**
12"	300	0.00	0	0	100	**100**
6"	150	0.00	0	0	100	**100**
3"	75	0.00	0	0	100	**100**
2"	50	0.00	0	0	100	**100**
1 1/2"	37.5	0.00	0	0	100	**100**
1"	25.0	0.00	0	0	100	**100**
3/4"	19.0	0.00	0	0	100	**100**
1/2"	12.5	0.00	0	0	100	**100**
3/8"	9.50	0.00	0	0	100	**100**
#4	4.75	1.18	1	1	99	**99**
#10	2.00	0.85	1	1	99	**99**
#20	0.85	0.12	0	1	99	**99**
#40	0.425	0.18	0	2	98	**98**
#60	0.250	2.01	1	3	97	**97**
#140	0.106	12.55	8	11	89	**89**
#200	0.075	4.11	3	14	86	**86**
Pan	-	127.38	86	100	-	-

Notes : *(*) The + 3/4" sieve analysis is based on the Total Dry Weight of the Sample*
*(**) The - 3/4" sieve analysis is based on the Weight of the Dry Specimen*

Tested By MCW Date 10/18/2005 Checked By Gem Date 10-26-05

DCN: CT-S3B DATE: 5-23-99 REVISION: 3 \\Lab1\c\2005 Projects\2005-594 GNRA\[2005-594-01-02 SIEVE HYDRO.xls]Sheet1

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HYDROMETER ANALYSIS
ASTM D 422-63 (SOP-S3)

Client	G N RICHARDSON & ASSOC.	Boring No.	PZ-5
Client Reference	JOHNSTON CO. -23	Depth (ft)	7'
Project No.	2005-594-01	Sample No.	2
Lab ID	2005-594-01-02	Soil Color	**LIGHT BROWN**

Elapsed Time (min)		R Measured	Temp. (°C)	R Corrected	N (%)	K Factor	Diameter (mm)	N' (%)
0	NA	NA	NA	NA	NA	NA	NA	NA
2	30.0	30.0	20.8	22.6	23.6	0.01332	0.0318	**20.3**
5		25.0	20.8	17.6	18.4	0.01332	0.0208	**15.8**
15		18.0	21	10.6	11.1	0.01328	0.0125	**9.5**
30		14.0	20.8	6.6	6.9	0.01332	0.0091	**5.9**
60		11.0	20.7	3.6	3.8	0.01333	0.0066	**3.3**
250		8.0	22	0.6	0.7	0.01313	0.0032	**0.6**
1440		8.0	21.5	0.6	0.7	0.01321	0.0013	**0.6**

Soil Specimen Data		**Other Corrections**	
Tare No.	1641		
Tare + Dry Material (gm)	150	a - Factor	0.99
Weight of Tare (gm)	50	Composite Correction	7.36
Weight of Deflocculant (gm)	5.0	Percent Finer than # 200	85.85
Weight of Dry Material (gm)	95		
		Specific Gravity	2.7 Assumed

Note: *Hydrometer test is performed on - # 200 sieve material.*

Tested By MCW Date 10/19/2005 Checked By GEM Date 10-26-05

DCN: CT-S3B DATE: 6-23-99 REVISION: 3 \\Lab1\c\2005 Projects\2005-594 GNRA\[2005-594-01-02 SIEVE HYDRO.xls]Sheet1

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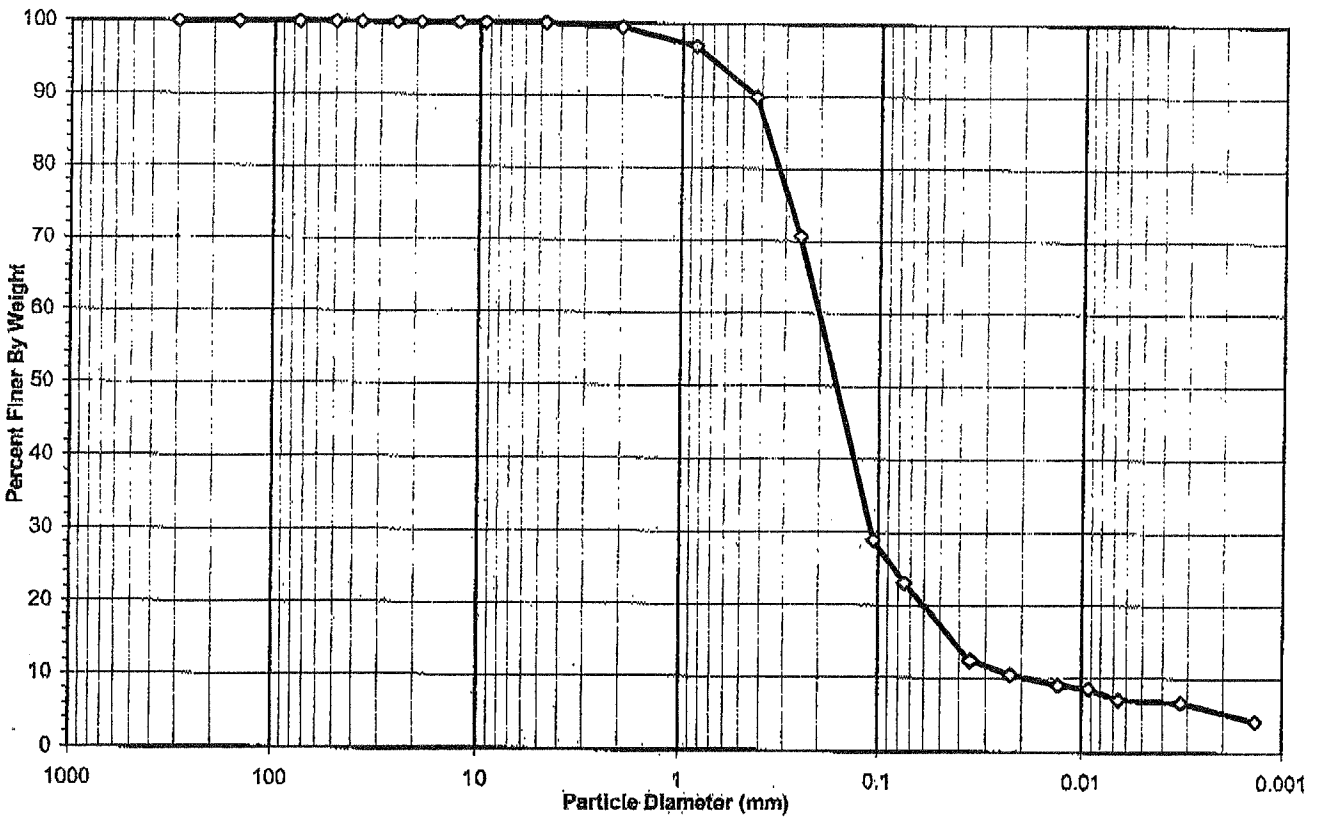
SIEVE AND HYDROMETER ANALYSIS
ASTM D 422-63 (SOP-S3)

Client	G.N. RICHARDSON & ASSOCIATES	Boring No.	PZ-7
Client Reference	JOHNSTON CO. - 23	Depth (ft)	5'
Project No.	2005-594-01	Sample No.	3
Lab ID	2005-594-01-03	Soil Color	**LIGHT BROWN**

	SIEVE ANALYSIS			HYDROMETER	
USCS	cobbles	gravel	sand	silt and clay fraction	
USDA	cobbles	gravel	sand	silt	clay

12" 6" 3" 3/4" 3/8" #4 #10 #20 #40 #140 #200



USCS Summary

Sieve Sizes (mm)		Percentage
Greater Than #4	*Gravel*	0.00
#4 To #200	*Sand*	76.89
Finer Than #200	*Silt & Clay*	23.11

USCS Symbol ***SC, TESTED***

USCS Classification ***CLAYEY SAND***

DCN: CT-S3P DATE:02/15/05 REVISION:8

C:\2005 Projects\2005-594 GNRA\[2005-594-01-03 SPLIT HYDRO.xls]Sheet1

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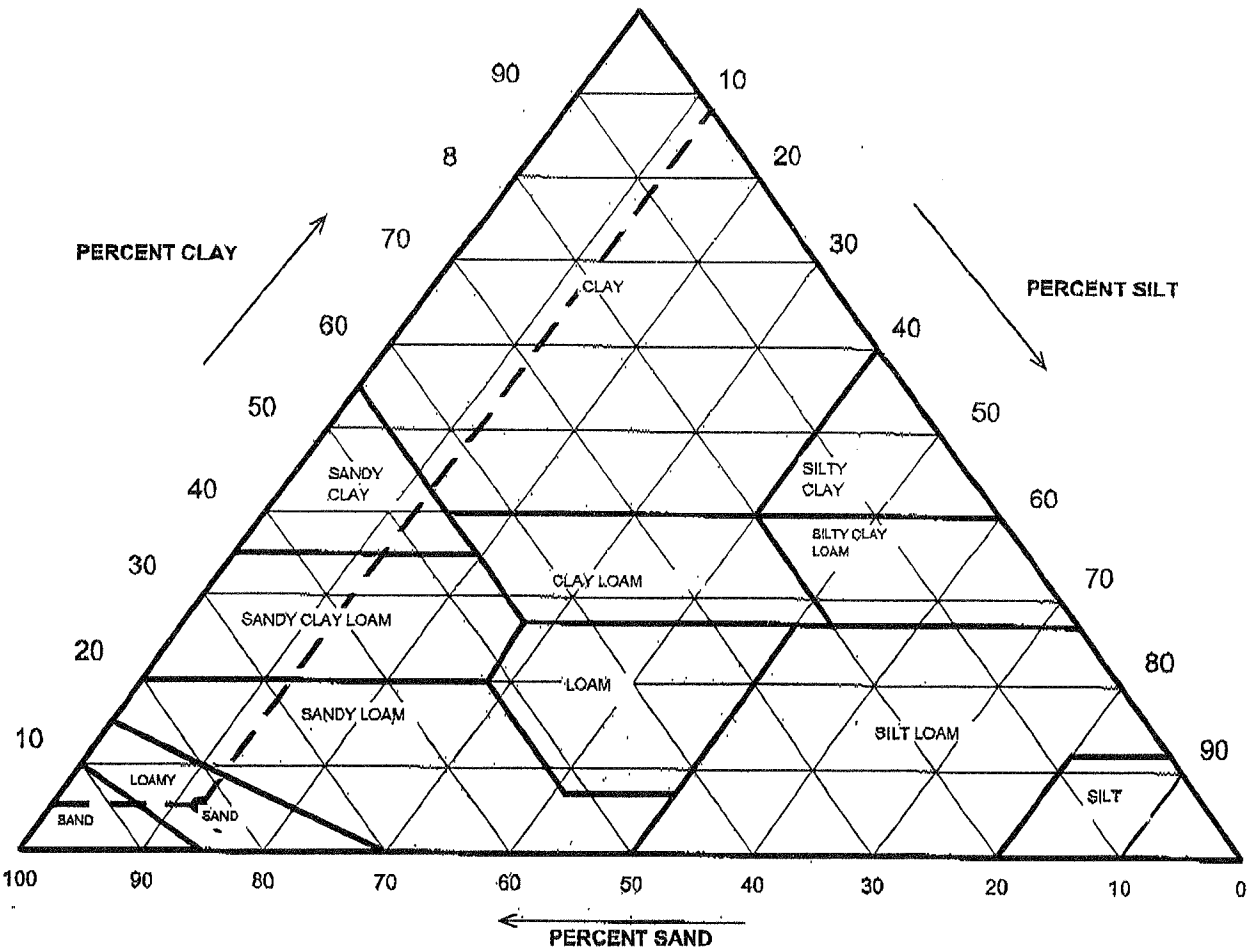
USDA CLASSIFICATION CHART

Client	G.N. RICHARDSON & ASSOCIATES	Boring No.	PZ-7
Client Reference	JOHNSTON CO. - 23	Depth (ft)	5'
Project No.	2005-594-01	Sample No.	3
Lab ID	2005-594-01-03	Soil Color	LIGHT BROWN



Particle Size (mm)	Percent Finer	USDA SUMMARY	Actual Percentage	Corrected % of Minus 2.0 mm material for USDA Classificat.
		Gravel	0.58	**0.00**
2	99.42	*Sand*	82.11	**82.59**
0.05	17.31	*Silt*	12.02	**12.09**
0.002	5.29	*Clay*	5.29	**5.32**

USDA Classification: ***LOAMY SAND***

QCN: GT-S3P DATE:02/15/05 REVISION:8 C:\2005 Projects\2005-594 GNRA\[2005-594-01-03 SPLIT HYDRO.xls]Sheet1

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WASH SIEVE ANALYSIS #10 SPLIT

ASTM D 422-63 (SOP-S3)

Client	G.N. RICHARDSON & ASSOCIATES	Boring No.	PZ-7
Client Reference	JOHNSTON CO. - 23	Depth (ft)	5'
Project No.	2005-594-01	Sample No.	3
Lab ID	2005-594-01-03	Soil Color	**LIGHT BROWN**

Moisture Content/sieve +10 Material		Moisture Content for Hydrometer Portion	
Tare No.	209	Tare No.	H-1
Wgt.Tare + Wet Soil (gm)	419.93	Wgt.Tare + Wet Soil (gm)	38.94
Wgt.Tare + Dry Soil (gm)	371.92	Wgt.Tare + Dry Soil (gm)	38.87
Weight of Tare (gm)	171.77	Weight of Tare (gm)	21.97
Weight of Water (gm)	48.01	Weight of Water (gm)	0.07
Weight of Dry Soil (gm)	200.15	Weight of Dry Soil (gm)	16.90
Moisture Content (%)	**24.0**	**Moisture Content (%)**	**0.4**

Soil Specimen Data			
Wet Weight +#10 Material (gm)	248.16	Weight of the Dry Sample (gm)	250.78
Dry Weight +#10 Material(gm)	200.2	Weight of minus #200 material (gm)	11.77
Wet Weight Hydro. Material.(gm)	50.84	Weight of plus #200 material (gm)	239.01
Dry Weight Hydro. Material (gm)	50.63		
Total Dry Weight Sample (gm)	250.78	**J-FACTOR (%FINER THAN #10)**	**0.9942**

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.5	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.00	0.00	0.00	100.00	**100.00**
#10	2.00	1.17	0.58	0.58	99.42	**99.42**
#20	0.85	1.26	2.49	2.49	97.51	**96.94**
#40	0.425	3.57	7.05	9.54	90.46	**89.93**
#60	0.250	9.80	19.36	28.90	71.10	**70.69**
#140	0.106	21.23	41.93	70.83	29.17	**29.00**
#200	0.075	3.00	5.93	76.75	23.25	**23.11**
Pan	-	11.77	23.25	100.00	-	-

Notes :

Tested By MCW Date 10/17/05 Checked By KAW Date 10-24-05

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HYDROMETER ANALYSIS

ASTM D 422-63 (SOP-S3)

Client	G.N. RICHARDSON & ASSOCIATES	Boring No.	PZ-7
Client Reference	JOHNSTON CO. - 23	Depth (ft)	5'
Project No.	2005-594-01	Sample No.	3
Lab ID	2005-594-01-03	Soil Color	**LIGHT BROWN**

Elapsed Time (min)		R Measured	Temp. (°C)	Composite Correction	R Corrected	N (%)	K Factor	Diameter (mm)	N' (%)
0	NA	NA	NA	NA	NA	NA	NA	NA	NA
2	11.0	11.0	21.2	4.61	6.4	12.5	0.01325	0.0357	**12.4**
5		10.0	21.2	4.61	5.4	10.5	0.01325	0.0227	**10.5**
15		9.3	21.3	4.58	4.7	9.1	0.01324	0.0131	**9.1**
30		9.0	21.3	4.58	4.4	8.6	0.01324	0.0093	**8.6**
60		8.3	21.3	4.58	3.7	7.2	0.01324	0.0066	**7.1**
250		8.0	21.4	4.55	3.5	6.7	0.01322	0.0032	**6.7**
1440		7.0	20.4	4.84	2.2	4.2	0.01338	0.0014	**4.2**

Soil Specimen Data		**Other Corrections**	
Tare + Dry Material (gm)	50.63	a - Factor	0.99
Weight of Tare (gm)	0		
Weight of Deflocculant (gm)	5.0	Percent Finer than # 10	99.42
Weight of Dry Material (gm)	50.63		
		Specific Gravity	2.7 Assumed

Note:

Tested By MCW Date 10/19/05 Checked By RAW Date 10-24-05

DCN: CT-S3P DATE:02/15/05 REVISION:8 C:\2005 Projects\2005-594 GNRA\(2005-594-01-03 SPLIT HYDRO.xls)Sheet1

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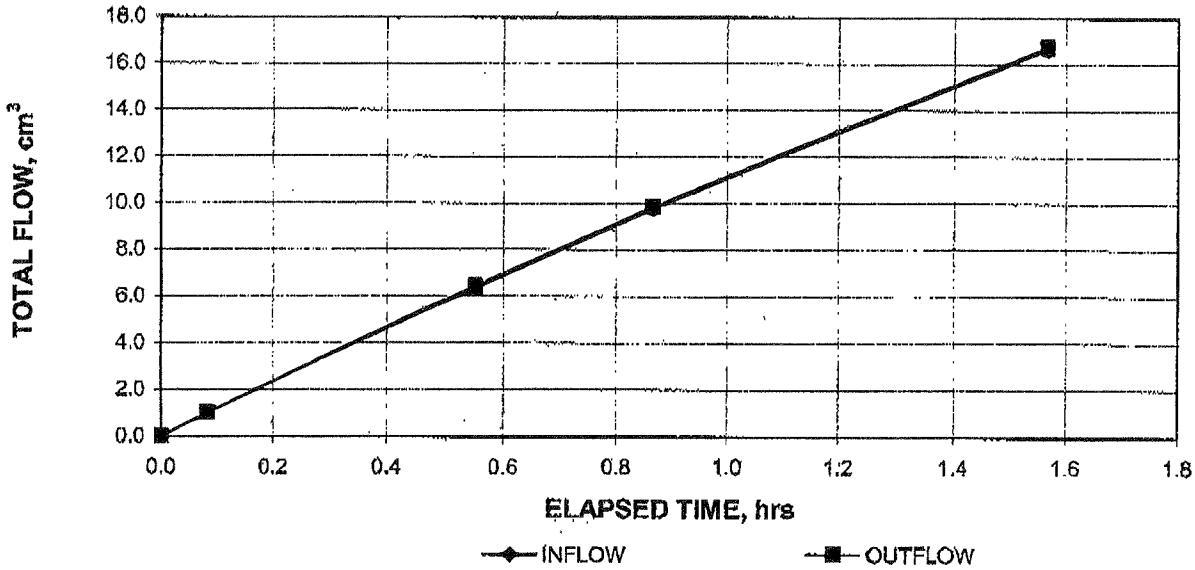
PERMEABILITY TEST

ASTM D 5084-90(Reapproved 1997)
(SOP-S22A & S22B)

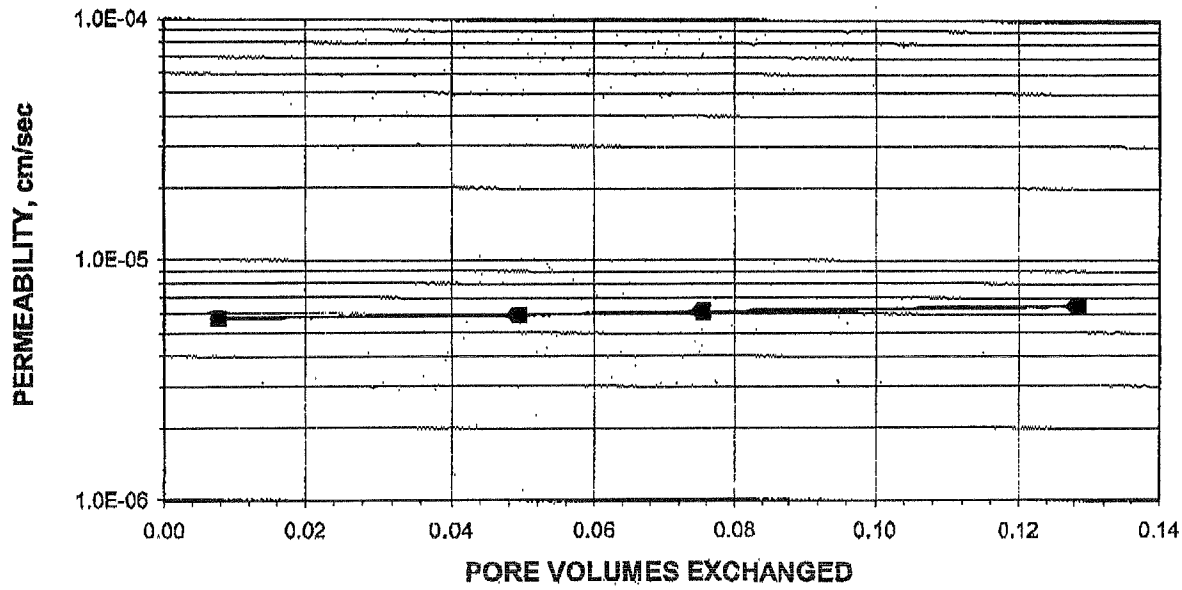
Client	G.N. RICHARDSON & ASSOC.	Boring No.	PZ-5
Client Project	JOHNSTON CO.-23	Depth (ft.)	5.5'-6.0'
Project No.	2005-594-01	Sample No.	1
Lab ID No.	2005-594-01-01		

AVERAGE PERMEABILITY = 6.1E-06 cm/sec @ 20°C
AVERAGE PERMEABILITY = 6.1E-08 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By: KAW Date: 10/21/05 Checked By: GEM Date: 10-26-05

DCN: CT-22 DATE: 01-08-99 REVISION:2 C:\2005 Projects\2005-594 GNRA\[2005-594-01-01 PERM.xls]Sheet1

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PERMEABILITY TEST

ASTM D 5084-90(Reapproved 1997)
(SOP-S22A & S22B)

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Client	G.N. RICHARDSON & ASSOC.	Boring No.	PZ-5
Client Project	JOHNSTON CO.-23	Depth (ft.)	5.5'-6.0'
Project No.	2005-594-01	Sample No.	1
Lab ID No.	2005-594-01-01		
		Specific Gravity	2.70 Assumed
		Sample Condition	Undisturbed

Visual Description: LIGHT BROWN SILTY SAND

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	315	304
Wt. of Tare & WS (gm.)	383.15	469.46
Wt. of Tare & DS (gm.)	329.94	394.24
Wt. of Tare (gm.)	110.52	110.38
Wt. of Water (gm.)	53.21	75.22
Wt. of DS (gm.)	219.42	283.86
Moisture Content (%)	**24.3**	**26.5**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	665.01	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (gm.)	665.01	677.05
Length 1 (in.)	3.138	3.122
Length 2 (in.)	3.163	3.127
Length 3 (in.)	3.159	3.147
Top Diameter (in.)	2.840	2.853
Middle Diameter (in.)	2.853	2.848
Bottom Diameter (in.)	2.847	2.864
Average Length (in.)	3.15	3.13
Average Area (in.^{2})	6.36	6.40
Sample Volume (cm^3)	328.88	328.57
Unit Wet Wt. (gm./ cm^3)	2.02	2.06
Unit Wet Wt. (pcf)	126.2	128.6
Unit Dry Wt. (pcf)	101.6	101.7
Unit Dry Wt. (gm./ cm^3)	1.63	1.63
Void Ratio, e	0.66	0.66
Porosity, n	0.40	0.40
Pore Volume (cm^3)	130.6	130.3

Tested By: KAW Date: 10/21/05 Checked By: GEM Date: 10-26-05

DCN: CT-22 DATE: 01-08-99 REVISION:2 C:\2005 Projects\2005-594 GNRA\[2005-594-01-01 PERM.xls]Sheet1

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PERMEABILITY TEST

ASTM D 5084-90(Reapproved 1997)
(SOP-S22A & S22B)

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INTEGRITY IN TESTING

Client	G.N. RICHARDSON & ASSOC.	Boring No.	PZ-5
Client Project	JOHNSTON CO.-23	Depth (ft.)	5.5'-6.0'
Project No.	2005-594-01	Sample No.	1
Lab ID No.	2005-594-01-01		

Pressure Heads (Constant)		Final Sample Dimensions	
Top Cap (psi)	38.8	Sample Length (cm), L	7.96
Bottom Cap (psi)	40.0	Sample Diameter (cm)	7.25
Cell (psi)	45.0	Sample Area (cm^2), A	41.30
Total Pressure Head (cm)	84.4	Inflow Burette Area (cm^2), a-in	0.882
Hydraulic Gradient	10.60	Outflow Burette Area (cm^2), a-out	0.880
		B Parameter (%)	98

AVERAGE PERMEABILITY = 6.1E-06 cm/sec @ 20°C
AVERAGE PERMEABILITY = 6.1E-08 m/sec @ 20°C

DATE (mm/dd/yy)	TIME (hr)	TIME (min)	ELAPSED TIME t (hr)	TOTAL INFLOW (cm^3)	TOTAL OUTFLOW (cm^3)	TOTAL HEAD h (cm)	FLOW (0 flow) (1 stop)	TEMP. (°C)	INCREMENTAL PERMEABILITY @ 20°C (cm/sec)
10/25/05	13	25	0.0	0.0	0.0	108.0	0	21.6	NA
10/25/05	13	30	0.1	1.0	1.0	105.7	0	21.6	5.8E-06
10/25/05	13	58	0.6	6.4	6.5	93.5	0	21.6	6.0E-06
10/25/05	14	17	0.9	9.8	9.9	85.8	0	21.7	6.1E-06
10/25/05	14	59	1.6	16.7	16.8	70.2	1	21.8	6.5E-06

Tested By: KAW Date: 10/21/05 Checked By: GEM Date: 10-26-05

DCN: CT-22 DATE: 01-08-99 REVISION:2 C:\2005 Projects\2005-594 GNRA\[2005-594-01-01 PERM.xls]Sheet1

2200 Westinghouse Boulevard • Suite 105 • Raleigh, NC 27604 • Phone (919) 876-0405 • Fax (919) 876-0460

FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

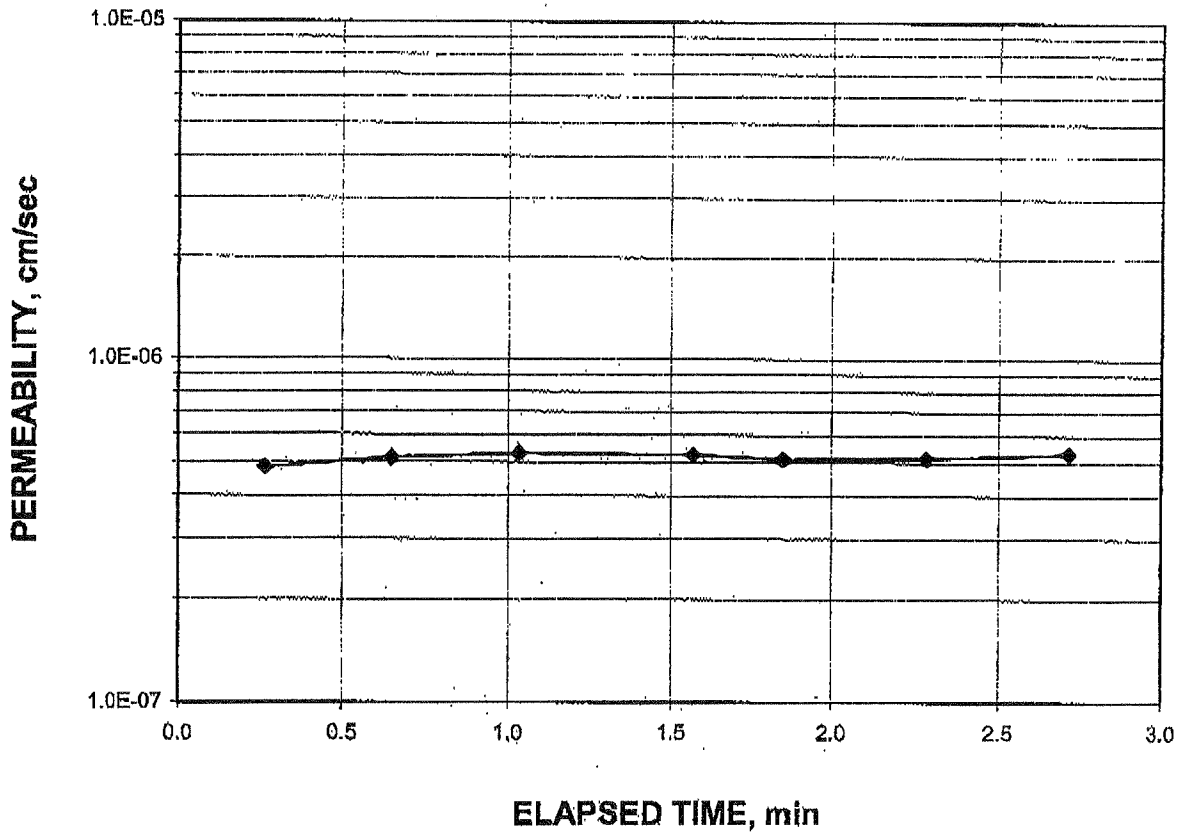
ASTM D 5084-97
(SOP-S22C)

Client	G. N. RICHARDSON & ASSOC.	Boring No.	PZ-7
Client Project	JOHNSTON CO.-23	Depth (ft.)	5.5'-6.0'
Project No.	2005-594-01	Sample No.	3
Lab ID No.	2005-594-01-03		

Visual Description: LIGHT BROWN CLAYEY SAND

AVERAGE PERMEABILITY = 5.2E-07 cm/sec @ 20°C
AVERAGE PERMEABILITY = 5.2E-09 m/sec @ 20°C

PERMEABILITY vs. TIME



Tested By: KAW Date: 10/21/05 Checked By: GEM Date: 10-28-05

FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-97
(SOP-S22A & B)

Client	G. N. RICHARDSON & ASSOC.	Boring No.	PZ-7
Client Project	JOHNSTON CO.-23	Depth (ft.)	5.5'-6.0'
Project No.	2005-594-01	Sample No.	3
Lab ID No.	2005-594-01-03		

Specific Gravity	2.70	Assumed
Sample Condition		Undisturbed

Visual Description: LIGHT BROWN CLAYEY SAND

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	301	K-7
Wt. of Tare & WS (gm.)	413.80	468.03
Wt. of Tare & DS (gm.)	354.16	405.68
Wt. of Tare (gm.)	83.97	109.88
Wt. of Water (gm.)	59.64	62.35
Wt. of DS (gm.)	270.19	295.80
Moisture Content (%)	**22.1**	**21.1**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	635.54	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (gm.)	635.54	630.36
Length 1 (in.)	2.914	2.913
Length 2 (in.)	2.956	2.934
Length 3 (in.)	2.960	2.906
Top Diameter (in.)	2.879	2.850
Middle Diameter (in.)	2.861	2.842
Bottom Diameter (in.)	2.882	2.877
Average Length (in.)	2.94	2.92
Average Area (in.^{2})	6.49	6.41
Sample Volume (cm^3)	312.90	306.37
Unit Wet Wt. (gm./ cm^3)	2.031	2.058
Unit Wet Wt. (pcf)	126.8	128.4
Unit Dry Wt. (pcf)	103.9	106.1
Unit Dry Wt. (gm./ cm^3)	1.664	1.699
Void Ratio, e	0.623	0.589
Porosity, n	0.384	0.371
Pore Volume (cm^3)	120.1	113.5

Tested By: KAW Date: 10/21/05 Checked By: BEM Date: 10-26-05

FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-97
(SOP-S22A & B)

Client	G. N. RICHARDSON & ASSOC.	Boring No.	PZ-7
Client Project	JOHNSTON CO.-23	Depth (ft.)	5.5'-6.0'
Project No.	2005-594-01	Sample No.	3
Lab ID No.	2005-594-01-03		

Test Pressures		Final Sample Dimensions	
Cell Pressure(psi)	50.0	Sample Length (cm), L	7.41
Back Pressure(psi)	45.0	Sample Area (cm^2), A	41.34
Eff. Cons. Pressure(psi)	5.0	Pipette Area (cm^2), a_p	0.03142
Response (%)	98	Annulus Area (cm^2), a_a	0.76712
		Equilibrium Level (cm), R_{eq}	1.75

AVERAGE PERMEABILITY = 5.2E-07 cm/sec @ 20°C
AVERAGE PERMEABILITY = 5.2E-09 m/sec @ 20°C

DATE (mm/dd/yy)	TIME (hr)	TIME (min)	ELAPSED TIME t (min)	PIPETTE READING R_p (cm)	INCREMENT GRADIENT I (cm/cm)	FLOW CONDITION (0 flow) (1 stop)	TEMP. (°C)	INCREMENTAL PERMEABILITY @ 20°C (cm/sec)
10/25/05	13	27	0	12.6	19.1	0	21.6	NA
10/25/05	13	27.2	0	12.4	18.8	0	21.6	4.8E-07
10/25/05	13	27.6	1	12.1	18.2	0	21.6	5.2E-07
10/25/05	13	28	1	11.8	17.7	0	21.6	5.3E-07
10/25/05	13	28.5	2	11.4	17.0	0	21.6	5.3E-07
10/25/05	13	28.8	2	11.2	16.7	0	21.6	5.1E-07
10/25/05	13	29.3	2	10.9	16.1	0	21.6	5.1E-07
10/25/05	13	29.7	3	10.6	15.6	1	21.6	5.3E-07

Tested By: KAW Date: 10/21/05 Checked By: GEM Date: 10-26-05

The Hutchinson Group, Ltd.
Geophysical and Environmental Services

August 23, 2003

Ms. Joan Smyth, PG
G. N. Richardson & Assoc., Inc.
14 N Boylan Ave
Raleigh, North Carolina, 27603

RE: Geophysical Investigation
Johnston County Landfill Facility

Dear Ms. Smyth:

The Hutchinson Group, Ltd. (THG) geophysically imaged the subsurface at Johnston County Landfill Facility in Smithfield, North Carolina on August 13, 2003 using a proton precession magnetometer. The survey was performed to determine the presence and location of any diabase dikes in a proposed C&D area (Figure 1).

TOTAL MAGNETIC FIELD SURVEY

Magnetic measurements are commonly used to locate buried metal objects such as drums, utilities, and trenches, and also as a mineral exploration device. A magnetometer measures the intensity of the earth's magnetic field. The presence of a buried ferrous metal object creates localized variations in that magnetic field. Additionally, the magnetometer's response to a ferrous metal object is proportional to the size and depth of the object; a single drum can only be detected at a few feet below the surface while piles of drums can be detected much deeper.

The effectiveness of a magnetometer can be reduced by interference from time-variable changes in the earth's magnetic field and spatial variations caused by magnetic minerals in the soil, or iron and steel debris, ferrous pipes, reinforced concrete or any surficial metal (Benson et al., 1988).

THEORY

A magnetometer measures the intensity of the earth's magnetic field. Variations in this field may be caused by the natural distribution of iron oxides within the soil and rock or by the presence of buried iron or steel objects. The magnetometer does not respond to nonferrous metals such as aluminum, copper, tin, and brass. The earth s magnetic field behaves much as if there were a large bar magnet embedded in the earth. Although the earth's field intensity varies considerably throughout the United States, its average value is approximately 50,000 nanoTeslas (nT). The angle of the magnetic field with respect to the earth s surface also varies. In the U.S., this angle of inclination ranges approximately 60 to 75 degrees from the horizontal.

The intensity of the earth's magnetic field changes daily with sunspots and ionospheric conditions that can cause large and sometimes rapid variations. With time, these variations produce unwanted signals (noise) and can substantially affect magnetic measurements. If the magnetic properties of the soil and rock were perfectly uniform, there would he no local magnetic anomalies; however, a concentration of natural iron minerals, or a buried iron object, will cause a local magnetic anomaly which can be detected at the surface (Benson et al., 1988).

SURVEY

A proton precession magnetometer was deployed for this survey. The proton precession magnetometer has a sensor that consists of a coil in a bottle containing a small amount of proton-

rich liquid (n-Decane) that is connected to the measuring device. The proton precession magnetometer gives a direct readout of the field strength in nanoTeslas and data is automatically output to a datalogger to be later downloaded into a computer (Reynolds, 1997).

ANALYSIS

A proton precession magnetometer survey was conducted to determine the presence and/or location of any diabase dikes in a proposed C&D area. Nine magnetometer survey lines were collected across the future C&D area totaling approximately 4,850 linear feet. The survey lines varied from 100-ft to 200-ft apart covering a total area of approximately 15 acres. Survey lines were located using a Trimble ProXRS global positioning system set to 1983 NAD North Carolina US State Plane coordinate system in feet.

CONCLUSIONS

A magnetometer survey was conducted at Johnston County Landfill Facility, Smithfield, North Carolina to determine the presence of any diabase dikes. The findings and conclusions in this report are stated with a reasonable degree of scientific certainty.

THG's findings and conclusions are as follows:

- The geophysical survey area consisted of a sediment basin to the north and a lightly vegetated apparent borrow area totaling approximately 15 acres;
- Two metallic anomalies exist at this site (Lines B, C, D, and E, Figure 2);
- The two anomalies could potentially be diabase dikes.

Geophysical investigations are a non-invasive method of interpreting physical properties of the shallow earth using electrical, electromagnetic, or mechanical energy. This document contains geophysical interpretations of responses to induced or real-world phenomena. As such, the measured phenomenon may be impacted by variables not readily identified in the field that can result in a false-positive interpretation. THG makes no representations or warranties as to the accuracy of the interpretations other than what is specifically set forth herein.

Should you have any questions or require additional information, please contact our office at (724) 325-3996 or via e-mail lsb@geo-image.com.

Sincerely,
The Hutchinson Group, Ltd.

Laura Barta

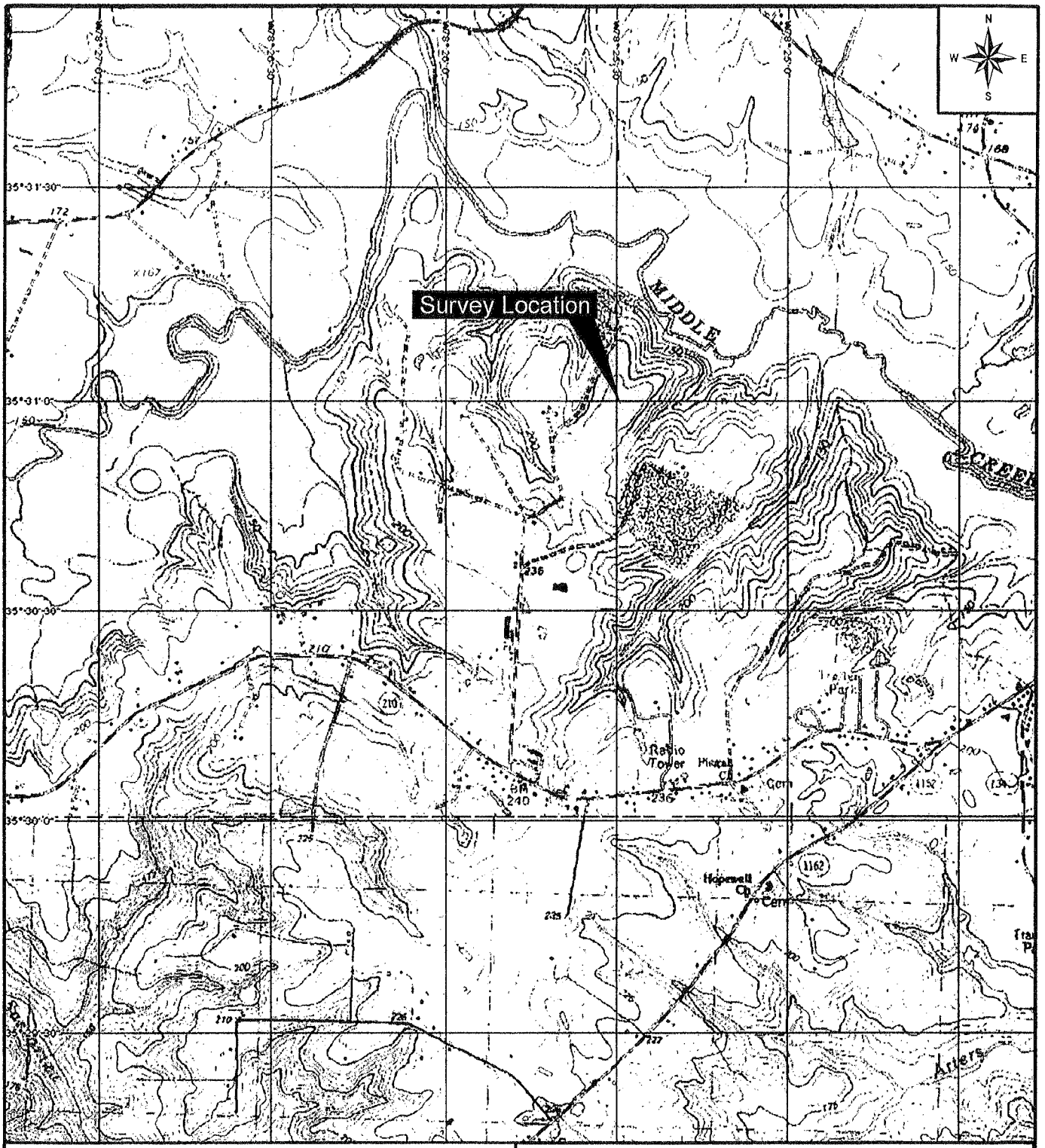
Laura Barta
Senior Geophysicist

Attachments

REFERENCES

Benson, R., R. A. Glaccum and M. R. Noel (1988) Geophysical Techniques for Sensing Buried Wastes and Waste Migration. National Water Well Association, Dublin, Ohio. 236 p.

Reynolds, J. M., 1997, An Introduction to Applied and Environmental Geophysics: New York, NY, Wiley, 796 p.



The Hutchinson Group, Ltd.
Geophysical and Environmental Services

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Murrysville, Pennsylvania 15668
(724) 325-3996 Fax: (724) 733-7901

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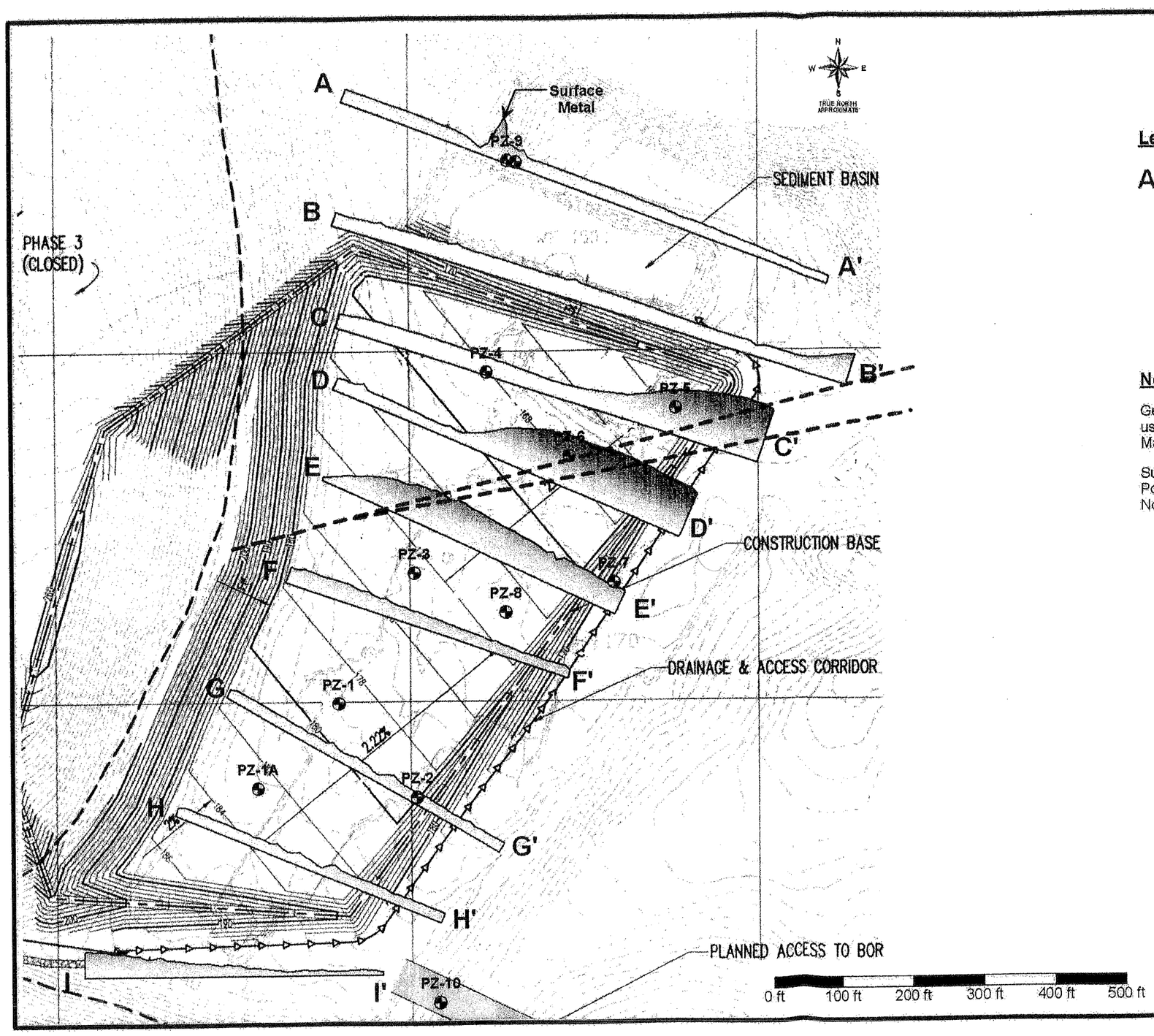
Contour Interval = 5 feet

0 ft 1000 ft 2000 ft 3000 ft 4000 ft 5000 ft

FIGURE 1
SITE LOCATION MAP

Geophysical Investigation
Johnston County Landfill Facility

SCALE: 1:24,000	PROJECT NO.: 198-2798	DRAWING NO.: DWG2798F1
DATE : 8/22/03		
DRAWN BY: LSB	SOURCE: 1988 Powhatan, NC USGS 7.5 Minute Quadrangle	
CHECKED BY: PJH		



Legend

A — A' Magnetometer Profile Line (Elevated Readings in Red)

Potential Diabase Dike

MW-1 Existing Monitoring Well

Notes

Geophysical survey conducted August 13, 2003 using Geometrics 856 Proton Precession Magnetometer.

Survey locations from Trimble ProXRS Global Positioning System set to 1983 US State Plane North Carolina coordinate system in feet.

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DES	LSB	8/22/03
DRN	LSB	8/22/03
CHK	PJH	8/23/03
REV	LSB	1/8/04
PROJ. MGR.	PJH	

PROJECT:

Geophysical Investigation
Johnston County Landfill Facility
Smithfield, North Carolina

SCALE: 1 in = 150 ft

SOURCE: Base map provided by GNRA. Piezometer locations approximate.

SHEET TITLE:

Figure 2
Magnetometer Survey

PREPARED FOR:

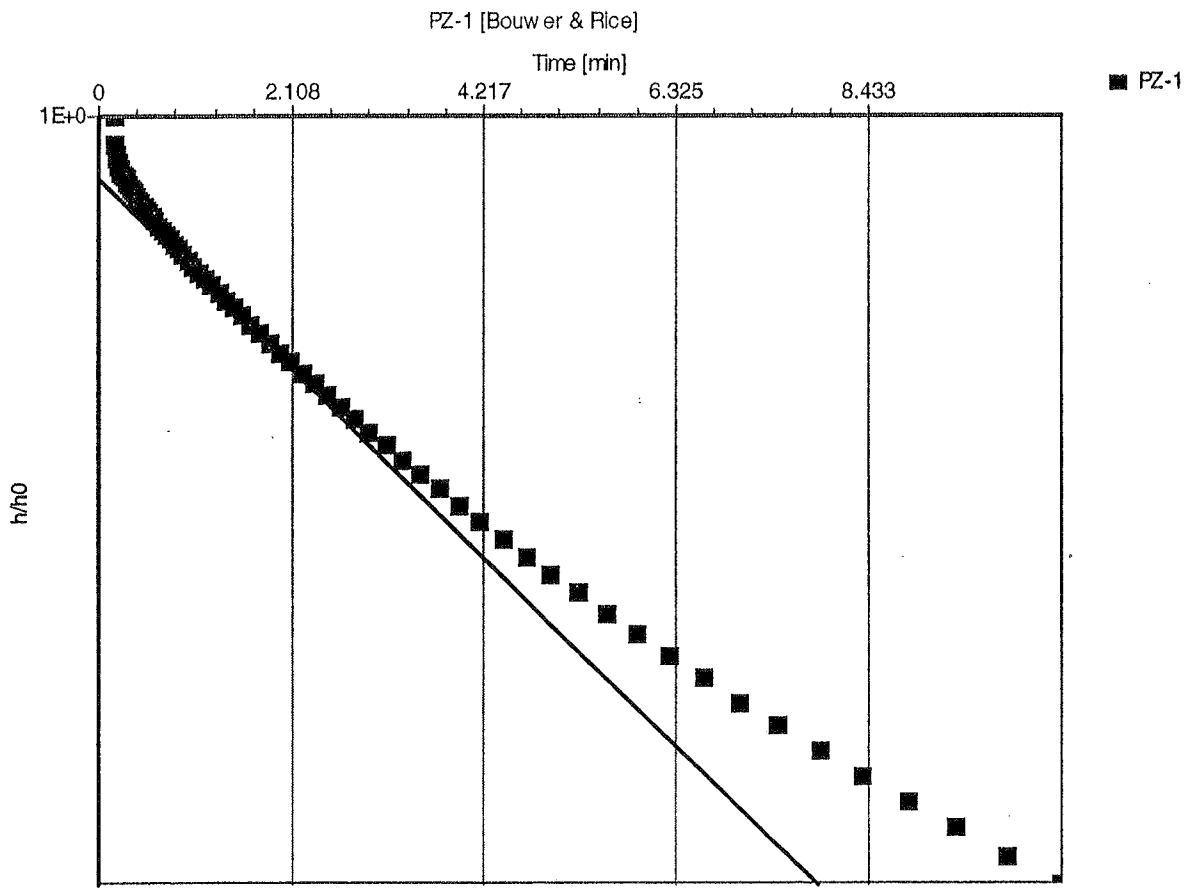
G.N. Richardson & Associates, Inc.
Raleigh, North Carolina

PROJECT NO.: 198-2798

DRAWING NO.: DWG2798F2

G. N. Richardson and Assoc.
14 N. Boylan Avenue
Raleigh, North Carolina 27603
ph: 919-828-0577

Slug Test Analysis Report	
Project:	Johnston County Landfill
Number:	
Client:	



Slug Test: **PZ-1**

Analysis Method: **Bouwer & Rice**

Analysis Results:			Conductivity:	1.41E-4 [ft/min]

Test parameters:	Test Well:	PZ-1	Aquifer Thickness:	30 [ft]
	Casing radius:	0.083 [ft]	Gravel Pack Porosity (%)	25
	Screen length:	15 [ft]		
	Boring radius:	0.1667 [ft]		
	r(eff):	0.110 [ft]		

Comments:

Evaluated by:

Evaluation Date: 9/3/2003

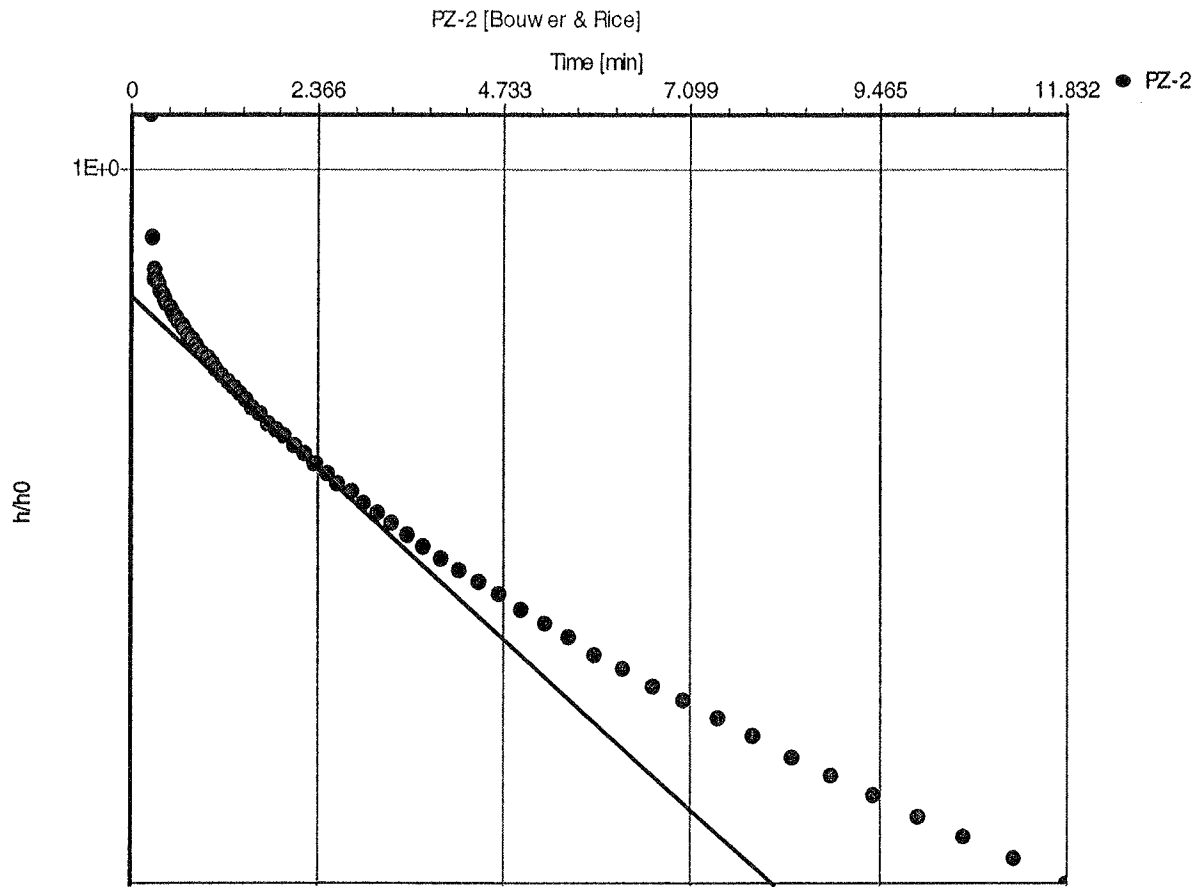
G. N. Richardson and Assoc.
14 N. Boylan Avenue
Raleigh, North Carolina 27603
ph: 919-828-0577

Slug Test Analysis Report

Project: Johnston County Landfill

Number:

Client:



Slug Test: **PZ-2**

Analysis Method: **Bouwer & Rice**

Analysis Results:

Conductivity: 3.43E-5 [ft/min]

Test parameters:				
	Test Well:	PZ-2	Aquifer Thickness:	30 [ft]
	Casing radius:	0.083 [ft]	Gravel Pack Porosity (%)	25
	Screen length:	15 [ft]		
	Boring radius:	0.1667 [ft]		
	r(eff):	0.110 [ft]		

Comments:

Evaluated by:

Evaluation Date: 9/3/2003

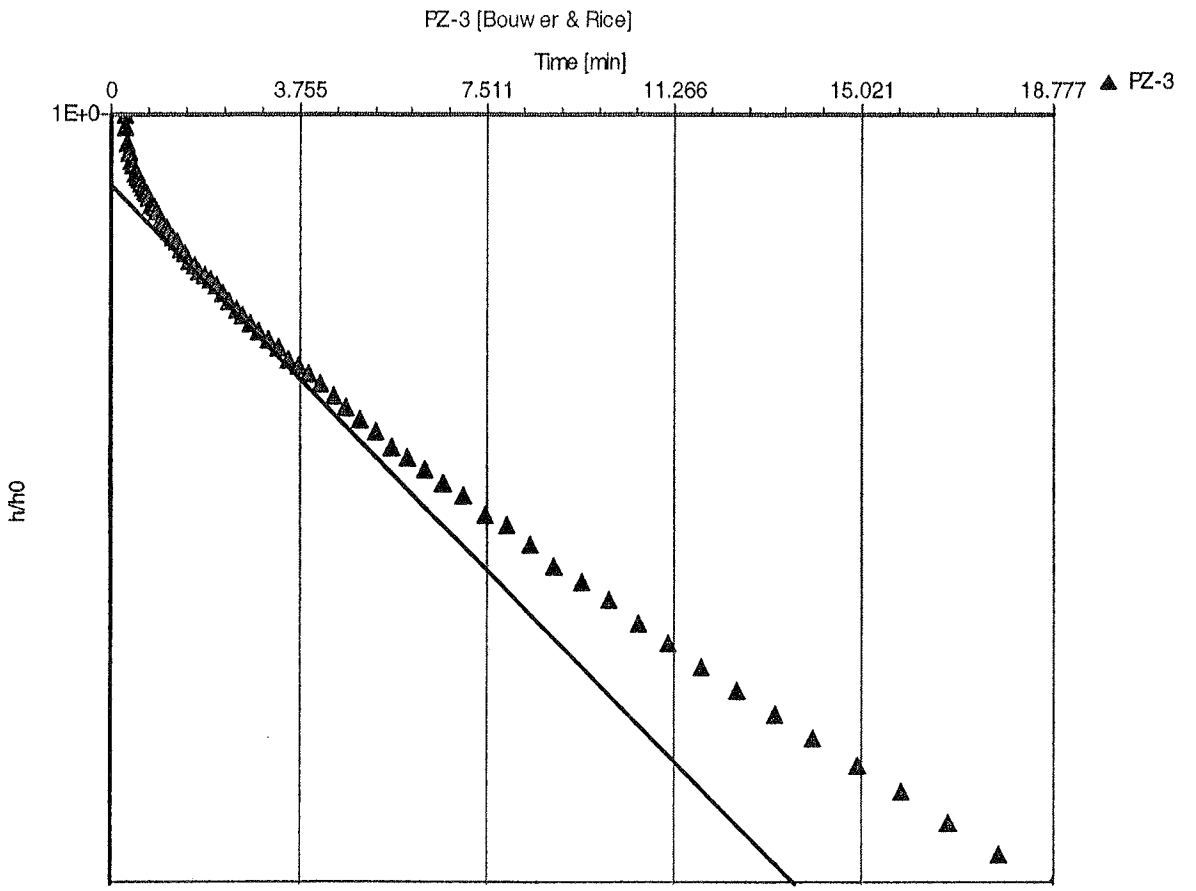
G. N. Richardson and Assoc.
14 N. Boylan Avenue
Raleigh, North Carolina 27603
ph: 919-828-0577

Slug Test Analysis Report

Project: Johnston County Landfill

Number:

Client:



Slug Test: **PZ-3**

Analysis Method: **Bouwer & Rice**

Analysis Results:

Conductivity: 1.10E-5 [ft/min]

Test parameters:

Test Well:	PZ-3	Aquifer Thickness:	30 [ft]
Casing radius:	0.083 [ft]	Gravel Pack Porosity (%)	25
Screen length:	10 [ft]		
Boring radius:	0.1667 [ft]		
r(eff):	0.110 [ft]		

Comments:

Evaluated by:

Evaluation Date: 9/3/2003

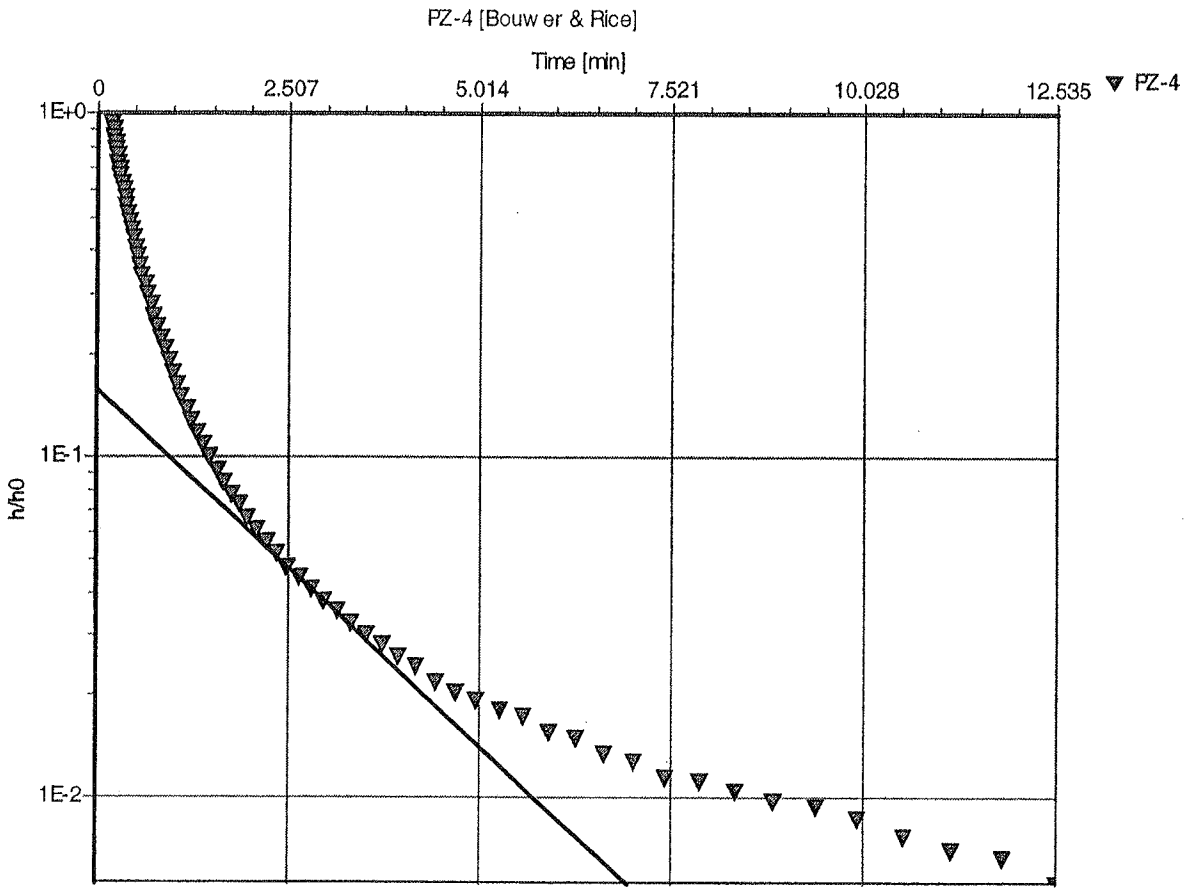
G. N. Richardson and Assoc.
14 N. Boylan Avenue
Raleigh, North Carolina 27603
ph: 919-828-0577

Slug Test Analysis Report

Project: Johnston County Landfill

Number:

Client:



Slug Test: **PZ-4**

Analysis Method: **Bouwer & Rice**

Analysis Results:

Conductivity: 3.60E-4 [ft/min]

Test parameters:

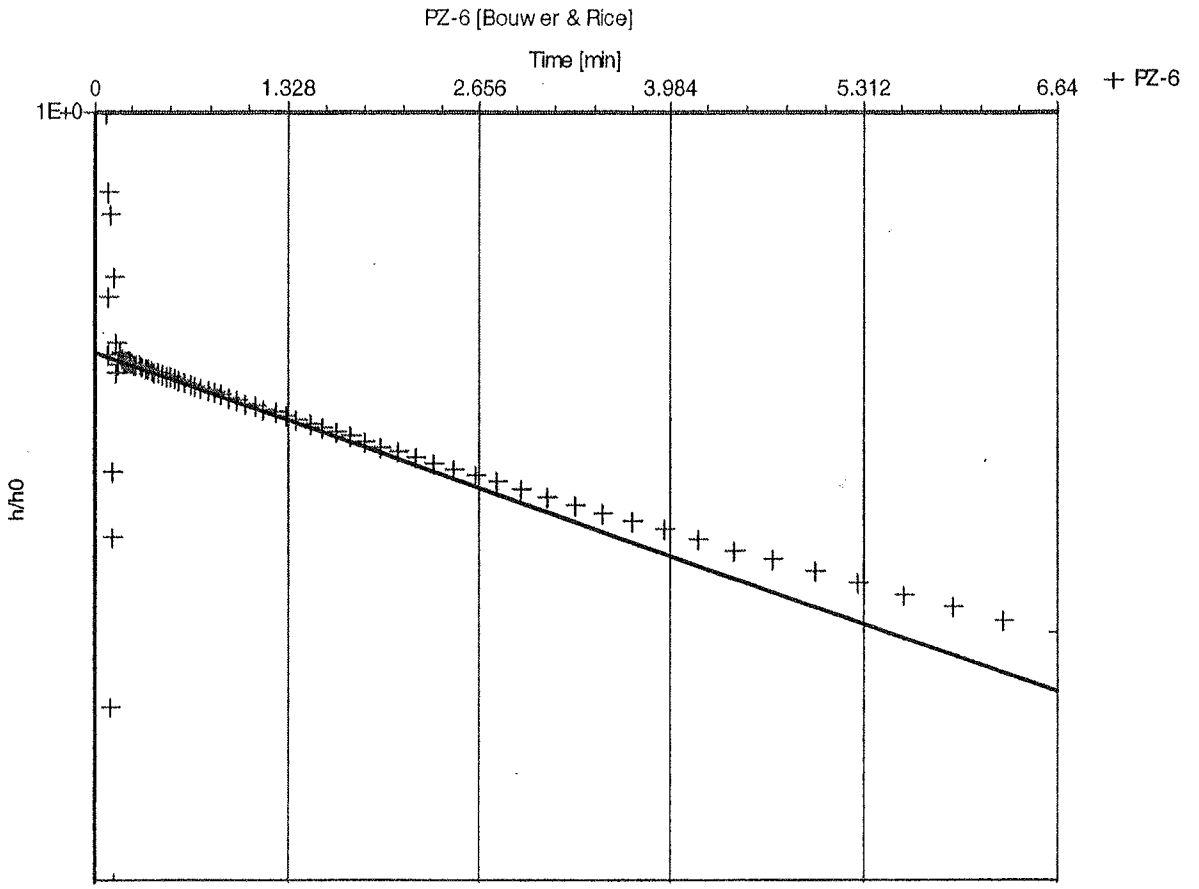
Test Well:	PZ-4	Aquifer Thickness:	30 [ft]
Casing radius:	0.083 [ft]	Gravel Pack Porosity (%)	25
Screen length:	15 [ft]		
Boring radius:	0.1667 [ft]		
r(eff):	0.110 [ft]		

Comments:

Evaluated by:

Evaluation Date: 9/3/2003

G. N. Richardson and Assoc. 14 N. Boylan Avenue Raleigh, North Carolina 27603 ph: 919-828-0577	**Slug Test Analysis Report**	
	Project: Johnston County Landfill	
	Number:	
	Client:	



Slug Test: **PZ-6**

Analysis Method: **Bouwer & Rice**

Analysis Results: Conductivity: 6.05E-5 [ft/min]

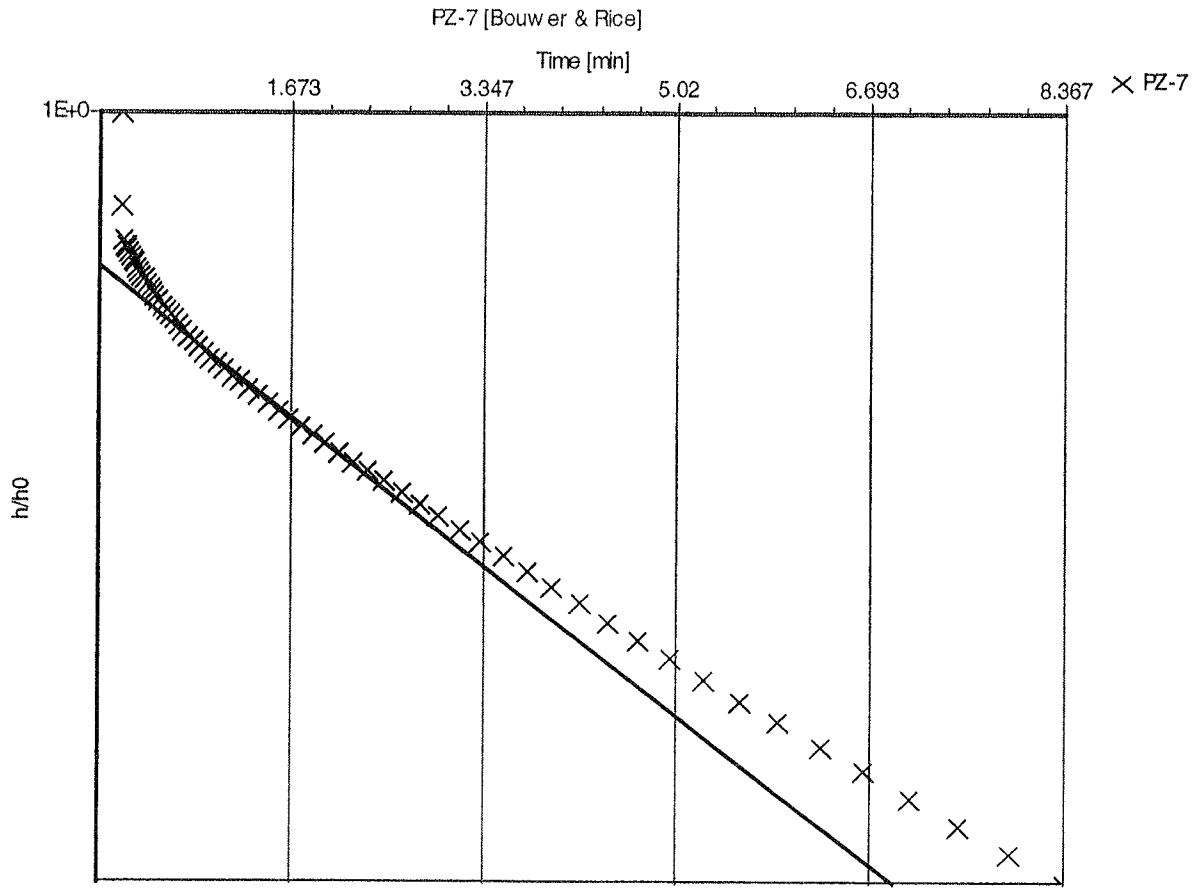
Test parameters:				
	Test Well:	PZ-6	Aquifer Thickness:	30 [ft]
	Casing radius:	0.083 [ft]	Gravel Pack Porosity (%)	25
	Screen length:	15 [ft]		
	Boring radius:	0.1667 [ft]		
	r(eff):	0.110 [ft]		

Comments:

Evaluated by:

Evaluation Date: 9/3/2003

G. N. Richardson and Assoc.	Slug Test Analysis Report
14 N. Boylan Avenue	Project: Johnston County Landfill
Raleigh, North Carolina 27603	Number:
ph: 919-828-0577	Client:



Slug Test: **PZ-7**

Analysis Method: **Bouwer & Rice**

Analysis Results:

Conductivity: 5.67E-5 [ft/min]

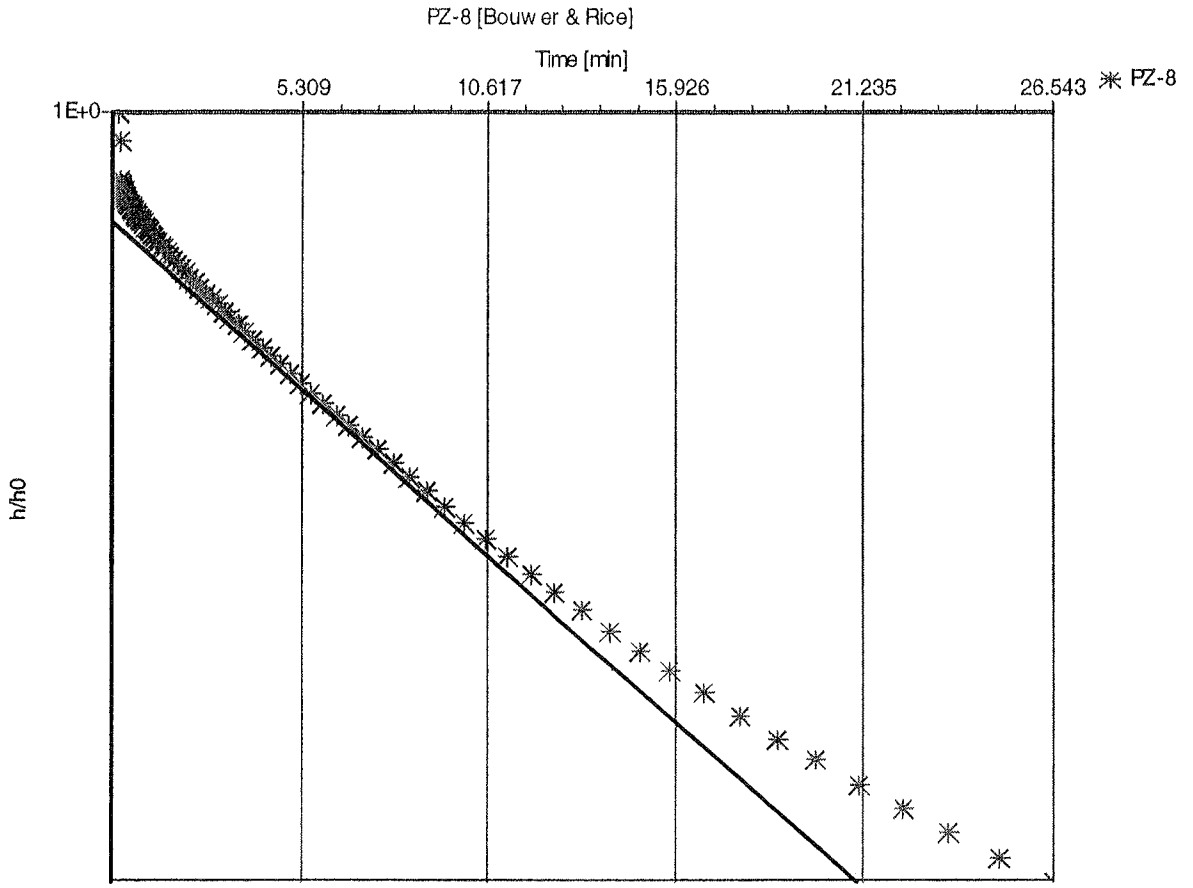
Test parameters:				
	Test Well:	PZ-7	Aquifer Thickness:	30 [ft]
	Casing radius:	0.083 [ft]	Gravel Pack Porosity (%)	25
	Screen length:	15 [ft]		
	Boring radius:	0.1667 [ft]		
	r(eff):	0.110 [ft]		

Comments:

Evaluated by:

Evaluation Date: 9/3/2003

G. N. Richardson and Assoc. 14 N. Boylan Avenue Raleigh, North Carolina 27603 ph: 919-828-0577	**Slug Test Analysis Report**	
	Project: Johnston County Landfill	
	Number:	
	Client:	



Slug Test: **PZ-8**

Analysis Method: **Bouwer & Rice**

Analysis Results:

Conductivity: 3.93E-5 [ft/min]

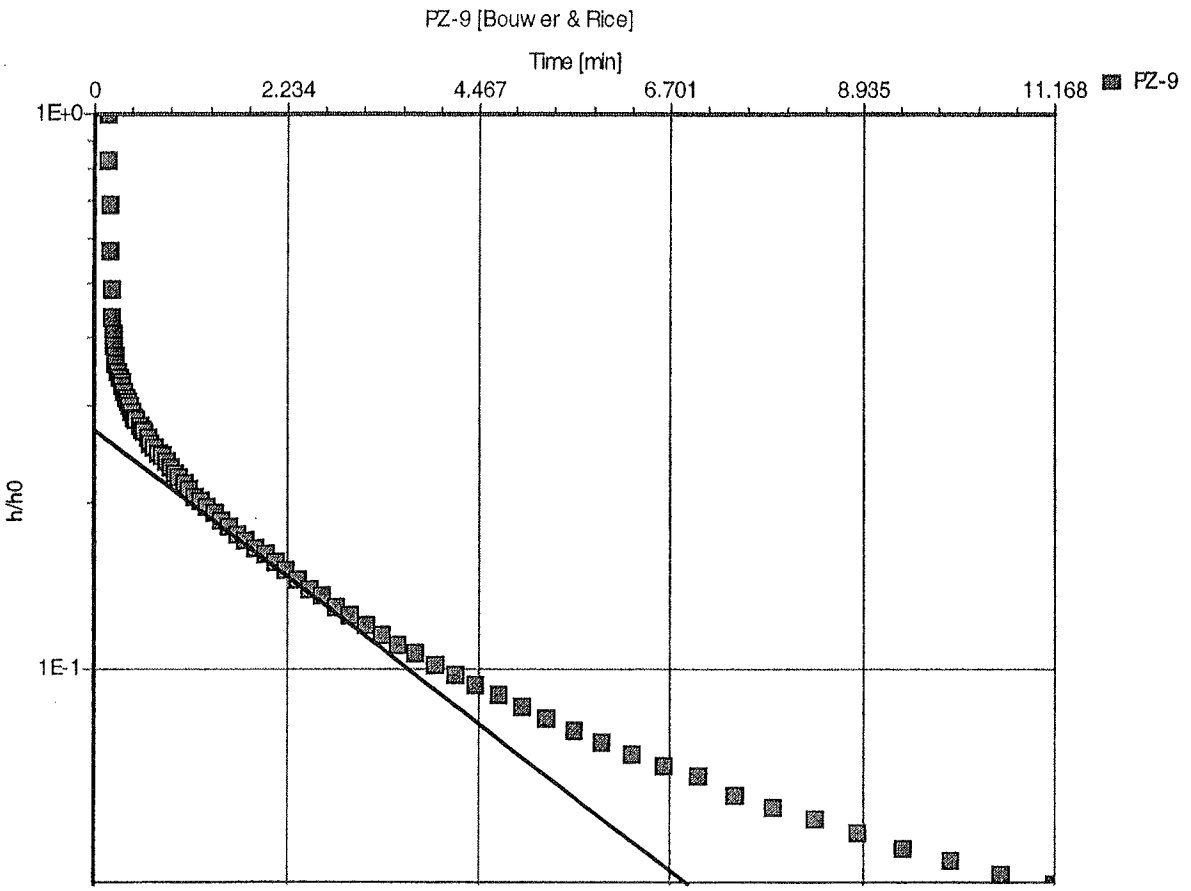
Test parameters:				
	Test Well:	PZ-8	Aquifer Thickness:	30 [ft]
	Casing radius:	0.083 [ft]	Gravel Pack Porosity (%)	25
	Screen length:	15 [ft]		
	Boring radius:	0.1667 [ft]		
	r(eff):	0.110 [ft]		

Comments:

Evaluated by:

Evaluation Date 9/3/2003

G. N. Richardson and Assoc. 14 N. Boylan Avenue Raleigh, North Carolina 27603 ph: 919-828-0577	**Slug Test Analysis Report** Project: Johnston County Landfill Number: Client:



Slug Test: **PZ-9**

Analysis Method: **Bouwer & Rice**

Analysis Results: Conductivity: 1.80E-4 [ft/min]

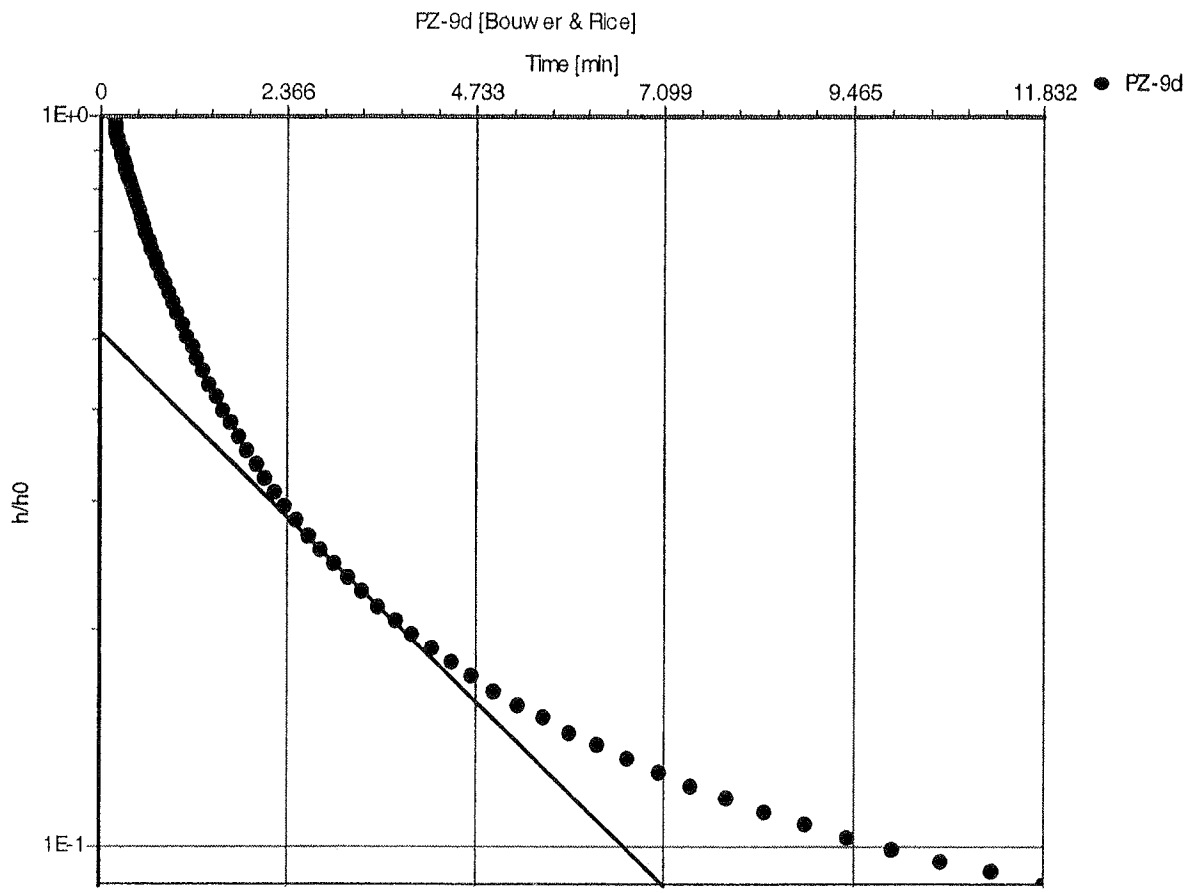
Test parameters:				
	Test Well:	PZ-9	Aquifer Thickness:	30 [ft]
	Casing radius:	0.083 [ft]	Gravel Pack Porosity (%)	25
	Screen length:	15 [ft]		
	Boring radius:	0.1667 [ft]		
	r(eff):	0.110 [ft]		

Comments:

Evaluated by:

Evaluation Date: 9/3/2003

G. N. Richardson and Assoc.	Slug Test Analysis Report
14 N. Boylan Avenue	Project: Johnston County Landfill
Raleigh, North Carolina 27603	Number:
ph: 919-828-0577	Client:



Slug Test: **PZ-9d**

Analysis Method: **Bouwer & Rice**

Analysis Results:

Conductivity: 4.91E-4 [ft/min]

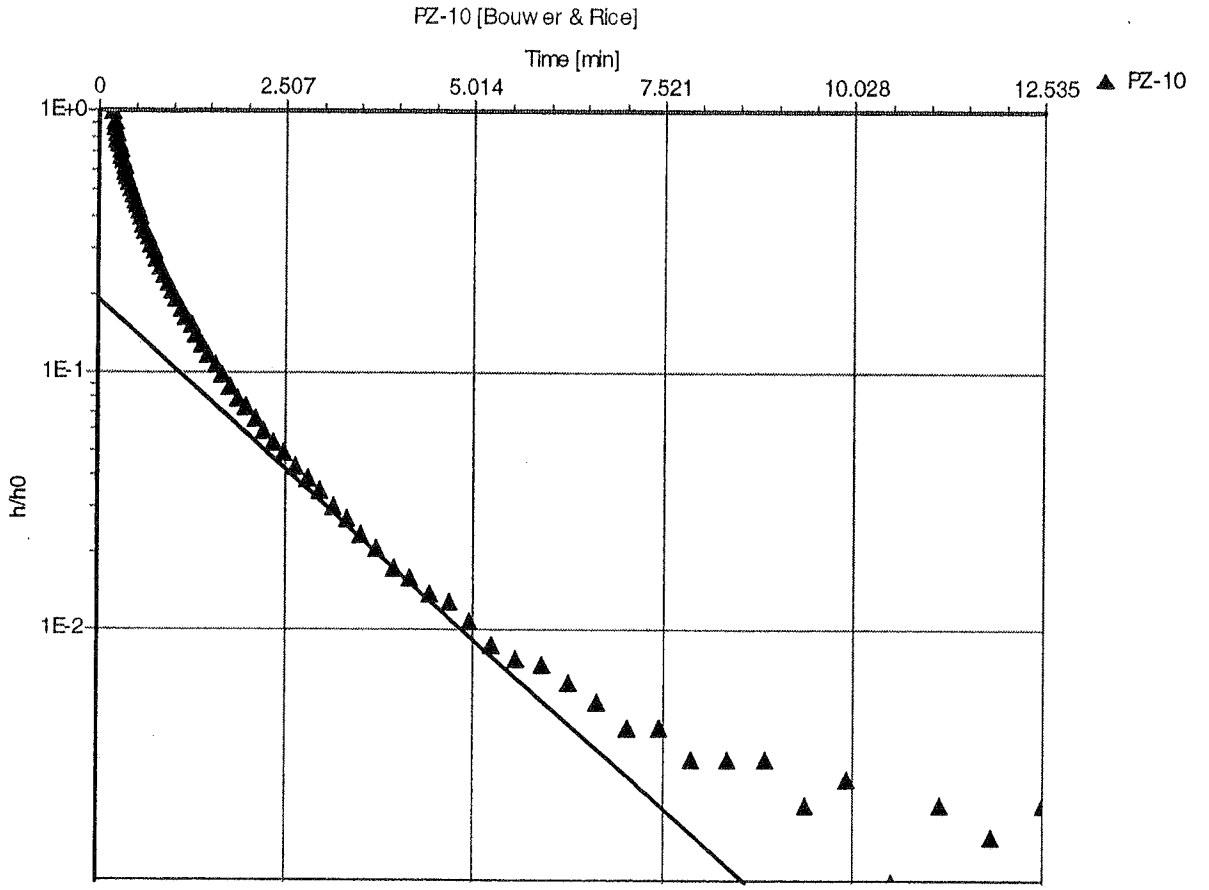
Test parameters:				
	Test Well:	PZ-9d	Aquifer Thickness:	50 [ft]
	Casing radius:	0.083 [ft]	Gravel Pack Porosity (%)	25
	Screen length:	5 [ft]		
	Boring radius:	0.1667 [ft]		
	r(eff):	0.110 [ft]		

Comments:

Evaluated by:

Evaluation Date: 9/3/2003

G. N. Richardson and Assoc. 14 N. Boylan Avenue Raleigh, North Carolina 27603 ph: 919-828-0577	**Slug Test Analysis Report**	
	Project: Johnston County Landfill	
	Number:	
	Client:	



Slug Test: **PZ-10**

Analysis Method: **Bouwer & Rice**

Analysis Results:

Conductivity: 5.93E-4 [ft/min]

Test parameters:

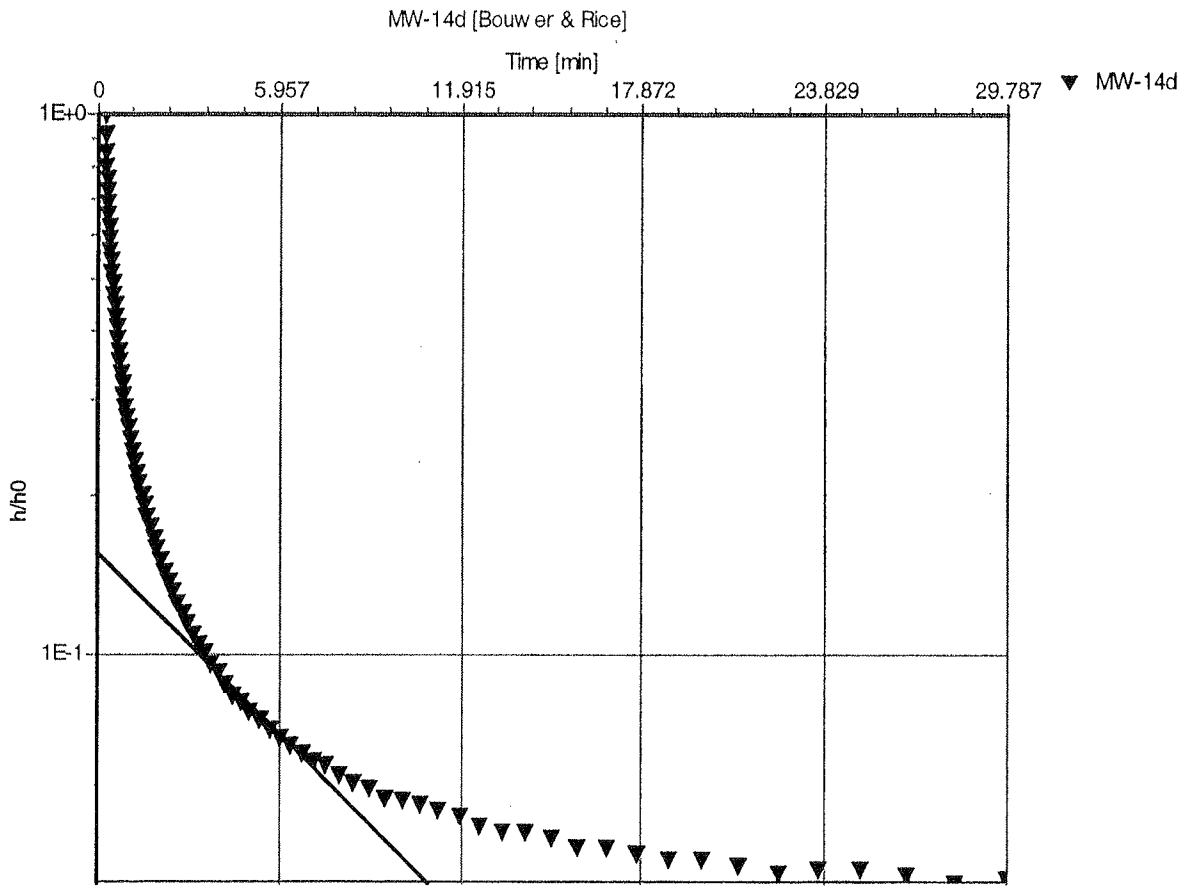
Test Well:	PZ-10	Aquifer Thickness:	30 [ft]
Casing radius:	0.083 [ft]	Gravel Pack Porosity (%)	25
Screen length:	10 [ft]		
Boring radius:	0.1667 [ft]		
r(eff):	0.110 [ft]		

Comments:

Evaluated by:

Evaluation Date: 9/3/2003

G. N. Richardson and Assoc. 14 N. Boylan Avenue Raleigh, North Carolina 27603 ph: 919-828-0577	**Slug Test Analysis Report** Project: Johnston County Landfill Number: Client:



Slug Test: **MW-14d**

Analysis Method: **Bouwer & Rice**

Analysis Results:

Conductivity: 2.56E-4 [ft/min]

Test parameters:

Test Well:	MW-14d	Aquifer Thickness:	50 [ft]
Casing radius:	0.083 [ft]	Gravel Pack Porosity (%)	25
Screen length:	5 [ft]		
Boring radius:	0.1667 [ft]		
r(eff):	0.110 [ft]		

Comments:

Evaluated by:

Evaluation Date: 9/3/2003

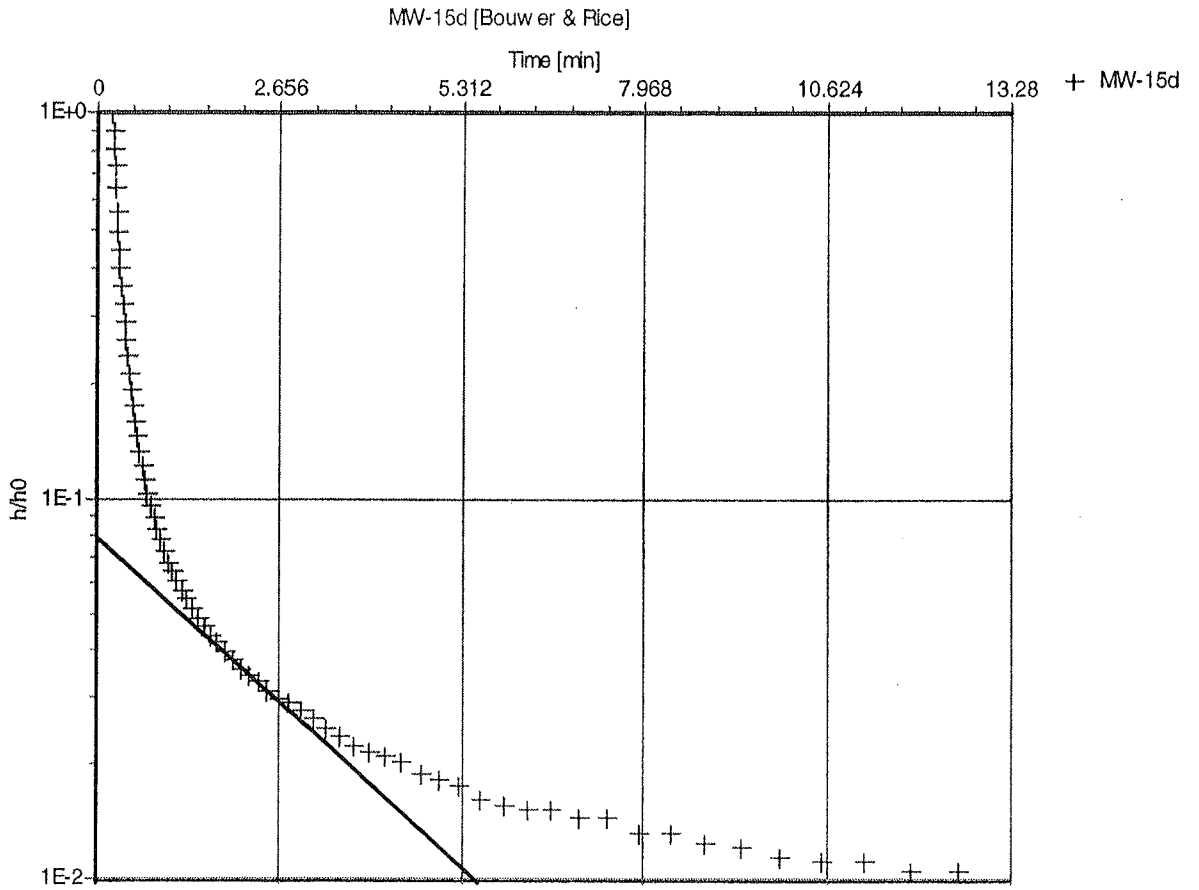
G. N. Richardson and Assoc.
14 N. Boylan Avenue
Raleigh, North Carolina 27603
ph: 919-828-0577

Slug Test Analysis Report

Project: Johnston County Landfill

Number:

Client:



Slug Test: **MW-15d**

Analysis Method: **Bouwer & Rice**

Analysis Results:

Conductivity: 6.88E-4 [ft/min]

Test parameters:

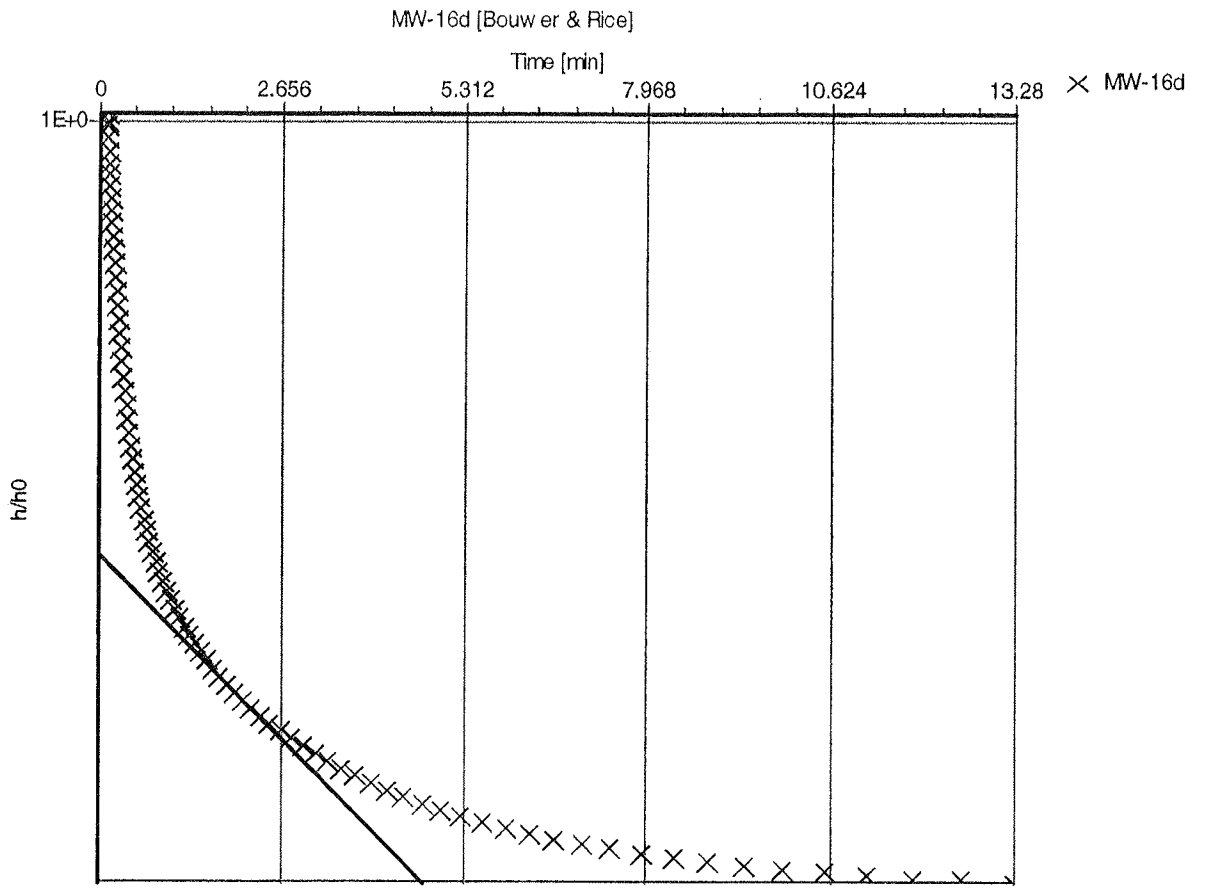
Test Well:	MW-15d	Aquifer Thickness:	50 [ft]
Casing radius:	0.083 [ft]	Gravel Pack Porosity (%)	25
Screen length:	5 [ft]		
Boring radius:	0.1667 [ft]		
r(eff):	0.110 [ft]		

Comments:

Evaluated by:

Evaluation Date: 9/3/2003

G. N. Richardson and Assoc. 14 N. Boylan Avenue Raleigh, North Carolina 27603 ph: 919-828-0577	**Slug Test Analysis Report** Project: Johnston County Landfill Number: Client:



Slug Test: **MW-16d**

Analysis Method: **Bouwer & Rice**

Analysis Results:

Conductivity: 1.97E-4 [ft/min]

Test parameters:

Test Well:	MW-16d	Aquifer Thickness:	50 [ft]
Casing radius:	0.083 [ft]	Gravel Pack Porosity (%)	25
Screen length:	5 [ft]		
Boring radius:	0.1667 [ft]		
r(eff):	0.110 [ft]		

Comments:

Evaluated by:

Evaluation Date: 9/3/2003

The Hutchinson Group, Ltd.
Geophysical and Environmental Services

WATER TABLE AQUIFER STRESS TEST

JOHNSTON COUNTY LANDFILL
Smithfield, North Carolina

Prepared for:

G.N. Richardson & Associates
14 North Boylan Avenue
Raleigh, North Carolina 27603
June 30, 2004

Prepared by:

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THG Project No. 198-3068

TABLE OF CONTENTS

1.0 Introduction 2
- 1.1 Background 2
- 1.2 Work Scope 2

2.0 Geology 3

3.0 Hydrogeology 4
- 3.1 Background 4
- 3.2 Well Installation 4
- 3.3 Pump Test 4
  - 3.3.1 Design 4
  - 3.3.2 Preliminary Tests 4
  - 3.3.3 Equipment 5
- 3.4 Hydraulic Parameters 5
- 3.5 Pump Test Technique 5
- 3.6 Pump Test Unconfined Aquifer Theory 5

4.0 Analysis 9

5.0 Conclusions 10

6.0 References 11

TABLES

1. Groundwater Well Construction Information
2. Proposed C&D Cell Hydraulic Properties

FIGURES

1. Location Map
2. Maximum Drawdown Map

APPENDICES

A. WELL LOGS

B. PUMPING TEST ANALYSIS

1.0 INTRODUCTION

1.1 Background

Johnston County Landfill (JCL) located in Smithfield, Johnston County, North Carolina, is located at the northern end of County Home Rd., Smithfield, North Carolina. JCL consists of 4 waste cells; Phases 1, 2, and 3 are closed municipal waste cells and Phase 4 is the active waste cell. JCL is proposing to install a C&D cell on the east side of closed Phase 3. An earlier geophysical investigation identified a magnetite-rich mafic dike that trends N70°E. Initial concerns indicate that this dike may be a preferential pathway for potential landfill leachate. Consequently, a pump test was conducted in the location of the proposed C&D cell to determine the physical properties of the shallow and deep aquifers.

1.2 Work Scope

The work scope consisted of installing groundwater monitoring wells into the area of the dike to determine the orientation of maximum drawdown (i.e., cone of depression) and orientation of flow pathways in the shallow and deep aquifers. A pump test was proposed in PW-3 with pump rate determined by a quick step test.

2.0 GEOLOGY

The JCL is located within Raleigh portion of the Eastern Slate Belt, possibly within the amphibolite facies (kyanite-staurolite) of Butler (1991). The Eastern Slate Belt is characterized by low grade metamorphism and grades from the amphibolite facies to the greenschist facies. Stoddard, et al. (1991) refer to the subsurface unit as the Smithfield formation, that is characterized by meta-volcanic, meta-graywacke, meta-siltstone, and meta-mudstone. Well logs indicate that mudstone predominates the rock type in this area.

The low grade metamorphism has been dated to the Alleghanian Orogeny (315 to 285 Ma or possibly younger) (Butler, 1991). Magnetite-rich diabase dikes intruded this area during the Mesozoic, possibly in the 195 to 205 Ma period (Sutter, 1985, 1988). These mafic dikes have near vertical attitudes and mostly north-south orientation (in the Eastern Slate Belt) (Ragland, 1991). While reports do exist of east-west oriented mafic dikes (Ragland, 1991), this orientation is considered to be a local phenomenon, possibly related to the exploitation of a radial fracture from an emplaced pluton to the west (Rolesville, NC pluton of McSween et al., 1991). The geophysical examination of the area shows that the dike located within the proposed C&D cell has an orientation of N70°E and a near vertical attitude (THG, 2003).

3.0 HYDROGEOLOGY

3.1 BACKGROUND

The JCL in the area of proposed C&D cell has a water-table type aquifer and possibly a vertically separated deeper aquifer within the meta-mudstones. Wells were installed to water-table type aquifer and the bedrock aquifer (i.e., cased through the shallow water-table type aquifer) to determine the vertical connection between the 2 hydrostratigraphic units. Within the area of the pump test these units appear to be in full communication. Groundwater monitoring wells MW-9 and MW-9D show not vertical separation between the deep and the shallow portions of the water-table type aquifer. Further, the pump well PW-3 was in full hydraulic communication with the shallow wells and the deep wells.

3.2 WELL INSTALLATION

Six 2-inch piezometers and 1 4-inch pump well were installed in the area of the sump the week of June 14 - 18, 2004. Three wells (PSW-1, PSW-2, and PSW-3) were dug to the top of bedrock (Smithfield formation). Four wells (PW-1, PW-2, PW-3, and PW-4)were cased through the saprolite that overlies the Smithfield formation, and installed into the Smithfield formation. The wells were constructed with a 2-inch Schedule 40 PVC, 5- to 15-foot 10-slot screen and casing except for the 4-inch production well (Table 1; Appendix A). The wells were developed and given 1 week to recover.

3.3 PUMP TEST

3.3.1 Design - The multiple-well pump test consisted of 1 production well and 11 observation wells. Pressure transducers were installed in 7 of the observation wells (PW-2, PW-4, PZ-5, PZ-6, PZ-7, PSW-2, and MW-5A) and the remaining wells were monitored through an electric water-level meter ((PZ-9, PZ-9D, PZ-4, PZ-8, and PZ-3).

The observation well pattern included 3-dimensional spread of wells to better judge the orientation of the cone of depression. The wells ranged from 101 feet to a maximum of 600 feet from the production well. The eastern portion of the well field was not well represented by monitoring wells; however, the proposed C&D cell is located predominantly to the west of the production well.

3.3.2 Preliminary Tests - A step-test was performed on the production well (PW-3) and indicated that this well could produce no more than 1.5 gallons/minute of production without damage to the pump from exposure to air and showed preliminary hydraulic conductivities of approximately 1 feet per day.

These preliminary tests were used to help define the pump test parameters and, to keep this report brief, were not included herein, since only the pump test results will be used for the determination of the cone of depression.

3.3.3 Equipment - A centripetal pump (Meyers Pumps Ohio) was inserted into the production well to a depth of approximately 45 feet and connected to a digital flow meter (GPI Electronic Digital Meter Model No. 04N30GM) for instantaneous flow rates and total flow. Seven transducers (10 PSI; InSitu, Inc., Laramie, WY) were installed into 7 observation wells to a depth of approximately 10 feet of water and connected to a Hermit 3000 Datalogger (InSitu, Laramie, WY). Recovered water was discharged downgradient, approximately 200 feet from the production well

The pump test was conducted at 1.255 gallons per minute for approximately 62.3 hours (2.6 days) and until steady-state conditions prevailed within most of the wells.

3.4 HYDRAULIC PARAMETERS

The specific capacity is an expression of the productivity of a well and is obtained by dividing the rate of discharge of water from the well by the drawdown of water level in the well (Fetter 1988). In general, specific capacity decreases with time (i.e., governed by recharge) and is a measure of the aquifer's ability to yield water to the well bore. Transmissivity (***T***) is the ability of water to move through a porous media and is the product of the saturated thickness (***b***) of the aquifer and the hydraulic conductivity (***K***):

$$T = K * b \qquad \textbf{(1)}$$

Hydraulic conductivity describes the rate at which water can move through a permeable media and can be derived from the drawdown associated with a pump test.

3.5 PUMP TEST TECHNIQUE

No sooner than 24 hours prior to the initiation of a pump test, a short-term pump test (similar to a step test) was performed to determine the flow rate and duration of the pump test. The short-term testing proved that useful data can be collected and that steady-state conditions can be acquired during a pump test within 72 hours. No data were saved from the short-term tests.

Water levels were recorded prior to the initiation of the pump test (June 19, 2004). The test started with the activation of the data logger and completion of the electric circuit to the submersible pump. Data were reduced and interpreted through the *AquiferTest* computer program (Waterloo Hydrogeologic, Inc., Waterloo, Ontario). At the conclusion of the pumping phase of the pump test the datalogger was reset, the pump shutdown, and well was allowed to recover for the time period of the drawdown phase of the test.

3.6 PUMP TEST UNCONFINED AQUIFER THEORY

Theis (1935) was the first to develop an unsteady-state formula governing groundwater properties from heat-flow equations of Thiem (1906) that included a time factor and the concept of aquifer storage. Theis (1935) assumed that:

- The aquifer has infinite areal extent;
- The aquifer is homogeneous, isotropic and of uniform thickness;
- The aquifer potentiometric surface is initially horizontal;
- The pumping well is fully penetrating;
- Flow to the pumping well is horizontal;
- The aquifer is confined;
- Flow is unsteady;
- Water is released instantaneously from storage with decline of hydraulic head; and,
- The diameter of the pumping well is very small so that storage in the well is minimal.

The Theis assumption that water released from storage is discharged instantaneously with the decline in hydraulic head does not apply to unconfined aquifers. Specific storage (S_s) is the amount of water per unit volume of a saturated formation and the value is very small (L^{-1});

$$S_s = \rho g \ (C) \qquad \textbf{(2)}$$

Where, ρ is the density of water, g is the acceleration of gravity, and C is a function of the compressibility of water and the grain skeleton. The coefficient of storage (S) of a confined aquifer is the product of the specific storage and the aquifer thickness. In an unconfined aquifer, the declining water table also yields water as it drains under the influence of gravity and is referred to as the specific yield (S_y or effective porosity). S, in an unconfined aquifer, is essentially equal to S_y since the product of the head loss and specific storage is negligible compared to the S_y.

Consequently, the flow equation in an unconfined aquifer where drawdown is small compared to the saturated thickness of the aquifer is:

$$\frac{\partial^2 h}{\partial x^2} + \frac{\partial^2 h}{\partial y^2} = \left(\frac{S_y}{Kb}\right)\left(\frac{\partial h}{\partial t}\right) \qquad \textbf{(3)}$$

Where, **x** and **y** are spatial orientations, h is head and t is time. Consequently, drawdown of a significant portion of the saturated thickness of the unconfined aquifer is represented by the three phases of the time-drawdown behavior.

Pumping from a well completed in an unconfined aquifer results in drawdown of the water table and dewatering of the aquifer within the cone of depression; unlike in confined aquifers, where the potentiometric surface lies above the top of the aquifer. Consequently, water discharged by a well in a confined aquifer is released from storage instantly by expansion of the water as pressure is reduced and by compaction of the aquifer skeleton. However, in an unconfined aquifer, water discharge by a well is derived from gravity drainage of pore spaces, compaction of the aquifer skeleton and expansion of the water (Bair, 1990).

Newman (1974 and Moench, 1993) observed that flow to a pumping well in an unconfined aquifer, occurs in 3 phases. In the initial stage of pumping, the aquifer behaves like a confined aquifer and follow a Theis-type drawdown (Type A curve). During this phase water is released from storage by compaction of the aquifer skeleton and the expansion of water and trapped air. This phase is short lived and was not observed during the drawdown of any well except PZ-3, the closest well.

During the second phase of pumping there is a delayed yield from storage, where water remaining in the pores drains by gravity (specific yield, S_y). Gravity drainage replenishes that portion of the aquifer supplying water to the well resulting in a reduction in the rate of drawdown. Consequently there is a flattening of the time-drawdown curve in response to this secondary source of water (Neuman, 1972).

The third phase (Theis Type B curve) is produced when an equilibrium is reached between the rate of growth of the cone of depression and the amount of gravity drainage. Water is released from storage from the compaction of the aquifer skeleton and expansion of the water; consequently, the time-drawdown response behaves in a manner predicted by the equation from Theis (1935).

The duration of the first 2 phases is a function of the ratio of storage (S) to specific yield (S_y). If this ratio is in the range of 10^{-1} to 10^{-2}, then S is large and that the first phase will be long. Clayey silts to very fine-grained sands exhibit this response to pumping. In general though, specific yield increases with grain size.

Unconfined aquifers are traditionally evaluated using the Neuman method; however, Cooper and Jacob (1946), Theis (1935) and Theis and Jacob (Anonymous 1996) methods for confined aquifers have been modified to account for storage in unconfined aquifers and will calculate transmissivity and hydraulic conductivity. Jacob (1944) proposed the following correction to drawdown for the Theis, Cooper and Jacob Straight Line, and Theis and Jacob Recovery methods to approximate unconfined conditions:

$$s_{cor} = s - \left(\frac{s^2}{2b}\right) \qquad (4)$$

Where, s_{cor} is the corrected drawdown, s is the measured drawdown, and b is the original aquifer thickness.

Nevertheless, all four methods (Theis Curve Matching, Neuman Unconfined Solution, Cooper and Jacob Straight Line, and Theis and Jacob Recovery Methods) assume the following:

- The aquifer has infinite areal extent;
- The aquifer is homogeneous and of uniform thickness;
- The aquifer potentiometric surface is initially horizontal;
- The aquifer is unconfined;

- Flow is unsteady; and,
- The diameter of the pumping well is very small so that storage in the well is minimal.

The geometry of the time-drawdown graph can also be affected by the distance of the observation wells to the pump well. As the distance increases the effects of storage diminish. Consequently, a clean, well-sorted, medium-grained aquifer will have very short first phase and second phase.

4.0 ANALYSIS

The efficacy of a pump test to determine the hydraulic properties of an aquifer is usually determined by ability of each observation well to generate similar aquifer properties (Table 2). Further, the recovery test is an additional tool for checking the hydraulic properties, since the recovery test is a passive test, and not impacted by vagaries of the pumping process. The recovery test data were not reduced herein, since the determination of the size and orientation of the cone of depression is the goal of this project and not the hydraulic conductivity.

In general the hydraulic properties measured in the 11 observation wells agree well with each other. The measured hydraulic conductivities ranged from 0.4 ft/day to 6.08 ft/day. The 2 closest observation wells, PW-2 and MW-5A, produced the lowest hydraulic conductivities (0.54 ft/day and 0.4 ft/day) and several of the distant observation wells (PZ-9, PZ-9D, PZ-7, and PZ-3) from the pump well produced the highest hydraulic conductivities.

Drawdown in the observation wells ranged from 0.16 feet to 4.44 feet. The cone of depression created from the maximum drawdown (assuming steady state conditions prevailed) shows a N70°E orientation, consistent with the mafic dike (Figure 2). The cone of depression orientation strongly suggests that fracture flow dominates the subsurface. This is further supported by the pump test data (Appendix B) which shows that steady state conditions were difficult to achieve as the pump test established communication with additional fractures (i.e., changes in the Cooper and Jacob straight line during the course of the test). Nevertheless, th fracture trend parallel and adjacent to the mafic dike is the predominant and preferred pathway for groundwater flow.

The specific capacity of the 4-inch pumping well is calculated to be 0.043 gpm/ft (Fetter 1988).

5.0 CONCLUSION

A multiple well pumping test (1 pumping well and 11 observation wells) showed that the water table- type aquifer includes the saprolite overlying the Smithfield formation and the Smithfield formation at Johnston County Landfill has an average hydraulic conductivity of 2.7 ft/day and an average transmissivity of 135 ft^2/day. Further, these values are very realistic considering the fine-grained properties of the aquifer. The repeatability of each test demonstrates that these tests are very defensible and represent the aquifer conditions.

The cone of depression at a pump rate of 1.26 gallons per minute created a cone of depression that reached effectively over 1,500 feet (at 1 foot of drawdown) in the N70°E direction and only 180 feet in the N20°W direction.

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TABLE 1

GROUNDWATER WELL CONSTRUCTION INFORMATION

JOHNSTON COUNTY LANDFILL
SMITHFIELD, NORTH CAROLINA

WELL		NORTHING	EASTING	TOC ELEVATION (ft msl)	DATE INSTALLATION COMPLETE	WELL DEPTH (ft bg)	CASING STICK UP HEIGHT (inches)	DEPTH TO WATER (6/19/04) (ft)	BORING DEPTH (ft bg)	BORING DIAMETER (inches)	AIRROTARY DIAMETER (inches)	WELL CASING (inches)	PROTECTIVE CASING (inches)	DEPTH INTERVAL				WATER LEVEL ELEVATION (9/25/02) (ft msl)
														SCREEN INTERVAL[2]		BENTONITE PLUG (ft bg)	GROUTED INTERVAL (ft bg)	
														Interval (ft bg)	Length (ft)			
MW-5A	x	643745.9	2172057.3			30.4												0.00
PSW-1		644509.0	2171743.0	133.88	06/18/04	10.0	36	4.26	10	6		2		5.0-10.0	5	2.0-3.5	0.0-2.0	97.88
PSW-2	x	643990.1	2171888.1	163.71	06/16/04	35.0	36	11.20	35	6	3.875	2	4	18.0-35.0	17	16.0-18.0	0.0-16.0	127.71
PSW-3		643454.0	2171724.0	174.52	06/16/04	28.0	36	20.91	28	6		2		11.0-28.0	17	9.0-11.0	0.0-9.0	138.52
PW-1		643756.0	2171831.0			30.0												0.00
PW-2	x	643871.4	2171978.2	161.62	06/16/04	31.5	36	5.59	31.5	6	3.875	2	4	20.0-31.5	11.5	17.0-20	0.0-17.0	125.62
PW-3	x	643773.6	2171954.7	165.89	06/17/04	45.0	36	9.65	45	6	5.875	4	6	33.0-45.0	12	28.0-33.0	0.0-28	129.89
PW-4	x	643756.1	2171830.8	156.57	06/17/04	32.0	36	5.61	32	6	3.875	2	4	33.0-45.0	12	28.0-33.0	0.0-28.0	120.57
PZ-3	x	643895.0	2171534.8															0.00
PZ-4	x	643606.5	2171431.1															0.00
PZ-5	x	643842.3	2171804.7															0.00
PZ-6	x	643771.6	2171652.8															0.00
PZ-7	x	643592.7	2171713.2															0.00
PZ-8	x	643550.7	2171559.7															0.00
PZ-9	x	644191.8	2171565.6															0.00
PZ-9D	x	644189.4	2171578.0															0.00

Footnote:

[1] Schedule 40 PVC

[2] Screen consists of sand pack and 20-foot manufactured 0.010 Sch 40 PVC screen.

[3] Production well

Legend:

TOC = top of 2" PVC Casing

ft msl = feet below mean sea level

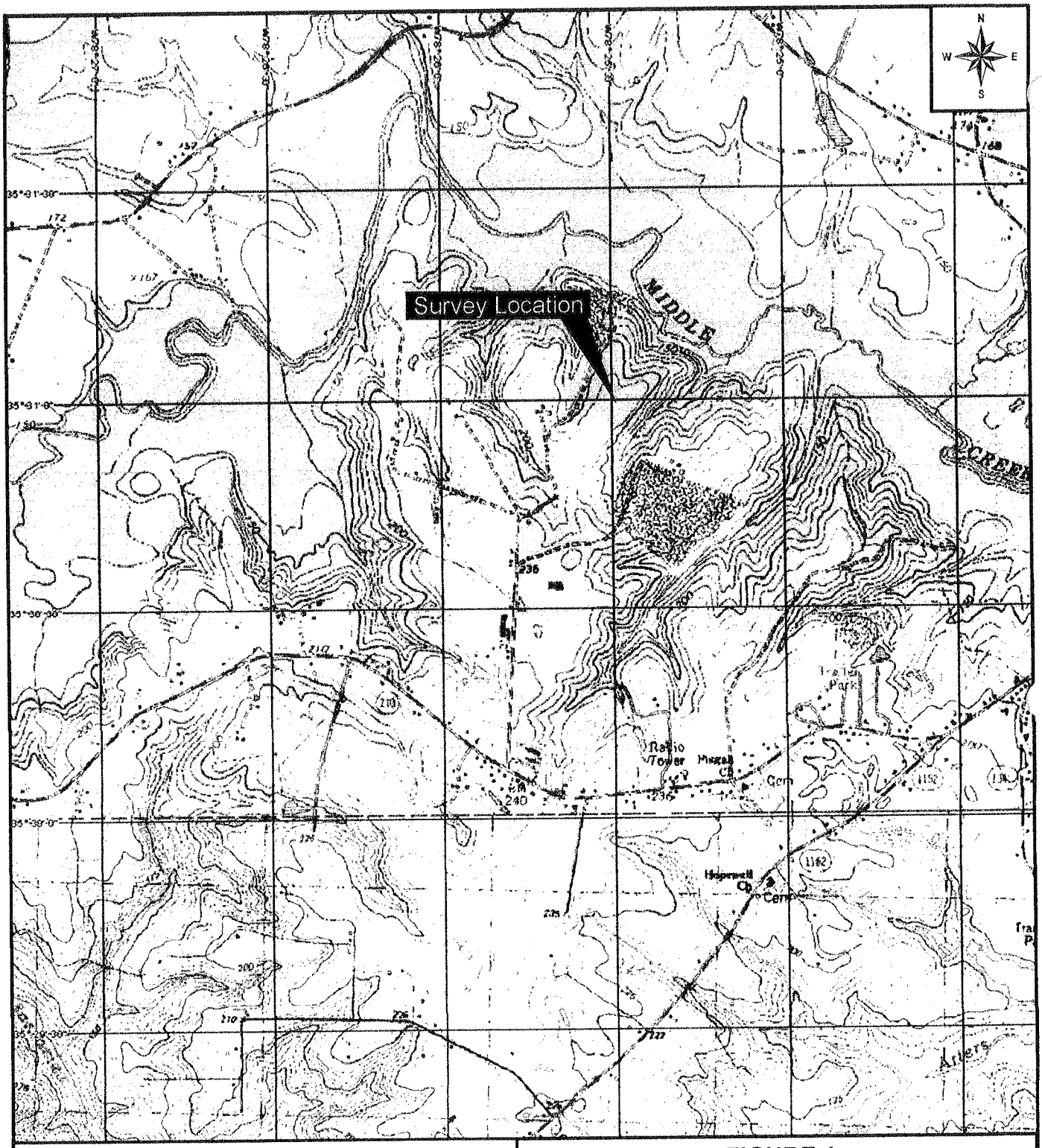
ft bg = feet below grade

TABLE 2

JOHNSON COUNTY LANDFILL
PROPOSED C&D CELL HYDRAULIC PROPERTIES
PUMP TEST PW-3
Conducted June 19 - 23, 2004

WELL	DISTANCE TO PUMPING WELL (ft)	MAXIMUM DRAWDOWN (ft)	HYDRAULIC CONDUCTIVITY (feet/day)	TRANSMISSIVITY (feet²/minute)
MW-5A	109	4.44	0.40	0.014
PSW-2	226	0.61	2.77	0.096
PW-2	101	3.09	0.54	0.019
PW-4	126	1.30	1.21	0.042
PZ-3	450	0.51	2.97	0.103
PZ-4	560	0.53	2.81	0.098
PZ-5	164	0.70	2.35	0.082
PZ-6	302	0.70	2.71	0.094
PZ-7	300	0.16	6.08	0.211
PZ-8	475	0.25	2.95	0.102
PZ-9	590	0.23	5.40	0.187
PZ-9D	600	0.31	2.25	0.078
		AVERAGE	**2.70**	**0.094**

[1] Analyses performed using Cooper and Jacob, 1946.



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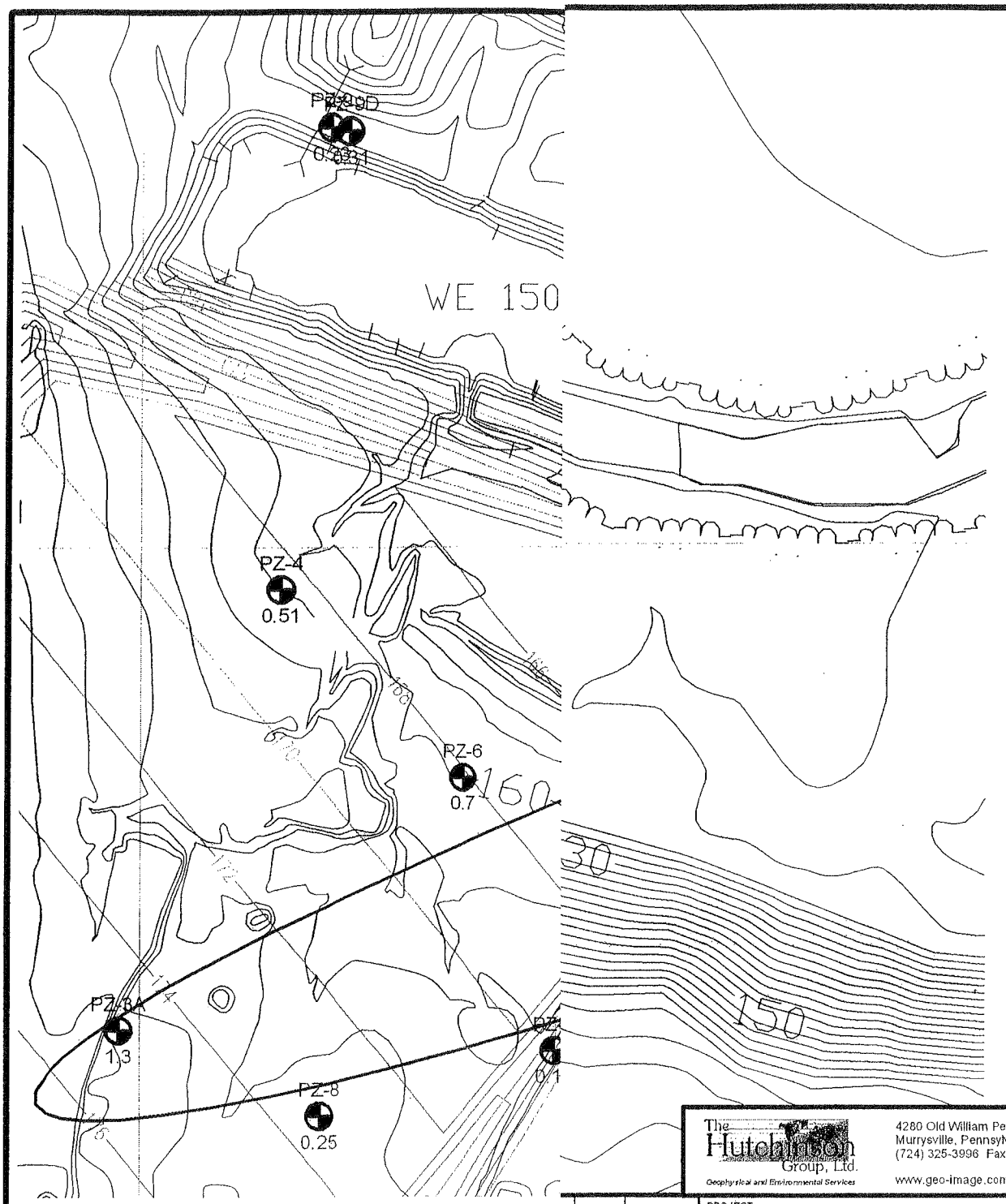
Contour Interval = 5 feet

0 ft 1000 ft 2000 ft 3000 ft 4000 ft 5000 ft

FIGURE 1
SITE LOCATION MAP

Pump Test
Johnston County Landfill Facility

SCALE: 1:24,000	PROJECT NO.: 198-2948	DRAWING NO.: DWG2948F1
DATE : 8/22/03		
DRAWN BY: LSB	SOURCE: 1988 Powhatan, NC USGS 7.5 Minute Quadrangle	
CHECKED BY: PJH		



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	LSB	6/30/04
	LSB	6/30/04
	PJH	6/30/04
	PJH	6/30/04

1" = 100'

ıp from Geodata Co.,
NC, March 8, 2001.

PROJECT:

Johnston County Landfill
Proposed C & D Cell
Smithton, NC

SHEET TITLE:

Figure 2
Maximum Drawdown Map
PW-3 Pump Well

Notes

Pump test performed in well PW-3, June 19-2
at a rate of 1.25 gallons/minute for 2.6 days (3R.

Note: Maximum drawdown (cone of depressio
not displayed linearly for clarity of presentatior

ɔR:

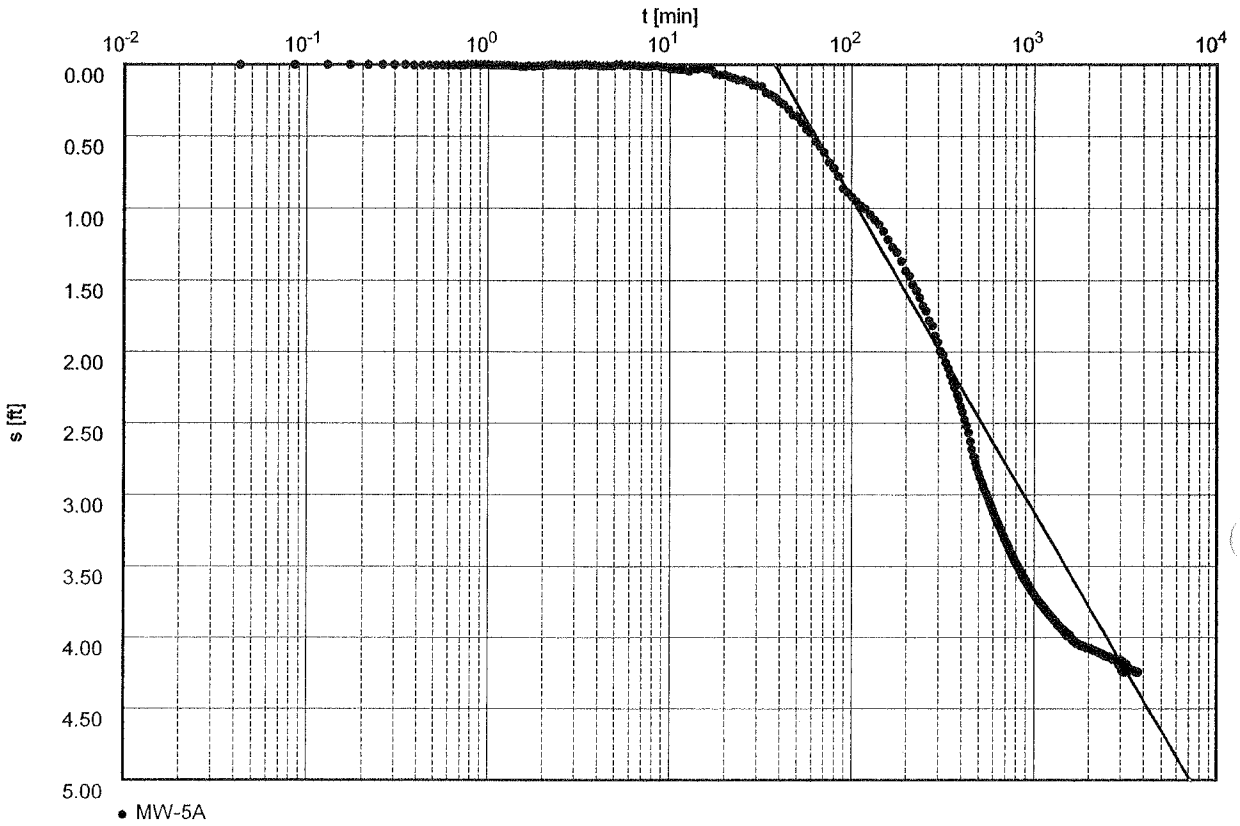
. Richardson and Associates, Inc.
Raleigh, NC

PROJECT NO.:
329-2948

DRAWING NO.:
DWG2948F2

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 1
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
MW-5A	
Discharge 1.26 U.S.gal/min	



Transmissivity [ft²/min]: 1.40×10^{-2}

Hydraulic conductivity [ft/min]: 2.80×10^{-4}

Aquifer thickness [ft]: 50.00

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 2
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
MW-5A	MW-5A
Discharge 1.26 U.S.gal/min	Distance from the pumping well 109.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
2	0.04	0.00	0.00	0.00
3	0.09	0.00	0.00	0.00
4	0.13	0.00	0.00	0.00
5	0.17	0.00	0.00	0.00
6	0.21	0.00	0.00	0.00
7	0.26	0.00	0.00	0.00
8	0.30	0.00	0.00	0.00
9	0.34	0.00	0.00	0.00
10	0.39	0.00	0.00	0.00
11	0.43	0.00	0.00	0.00
12	0.47	0.00	0.00	0.00
13	0.52	0.00	0.00	0.00
14	0.56	0.00	0.00	0.00
15	0.60	0.01	0.01	0.01
16	0.65	0.00	0.00	0.00
17	0.69	0.00	0.00	0.00
18	0.73	0.00	0.00	0.00
19	0.77	0.00	0.00	0.00
20	0.82	0.00	0.00	0.00
21	0.86	0.00	0.00	0.00
22	0.90	0.00	0.00	0.00
23	0.95	0.00	0.00	0.00
24	1.00	0.00	0.00	0.00
25	1.05	0.00	0.00	0.00
26	1.11	0.00	0.00	0.00
27	1.17	0.00	0.00	0.00
28	1.23	0.00	0.00	0.00
29	1.30	0.00	0.00	0.00
30	1.37	0.01	0.01	0.01
31	1.44	0.01	0.01	0.01
32	1.52	0.01	0.01	0.01
33	1.61	0.01	0.01	0.01
34	1.69	0.01	0.01	0.01
35	1.79	0.01	0.01	0.01
36	1.89	0.01	0.01	0.01
37	1.99	0.01	0.01	0.01
38	2.10	0.00	0.00	0.00
39	2.22	0.00	0.00	0.00
40	2.35	0.00	0.00	0.00
41	2.48	0.00	0.00	0.00
42	2.62	0.00	0.00	0.00
43	2.77	0.00	0.00	0.00
44	2.93	0.01	0.01	0.01
45	3.09	0.00	0.00	0.00
46	3.27	0.00	0.00	0.00
47	3.46	0.00	0.00	0.00
48	3.66	0.00	0.00	0.00
49	3.87	0.01	0.01	0.01
50	4.09	0.01	0.01	0.01

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 3
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
MW-5A	MW-5A
Discharge 1.26 U.S.gal/min	Distance from the pumping well 109.00 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
51	4.32	0.01	0.01	0.01
52	4.57	0.01	0.01	0.01
53	4.84	0.01	0.01	0.01
54	5.12	0.00	0.00	0.00
55	5.42	0.00	0.00	0.00
56	5.73	0.01	0.01	0.01
57	6.06	0.00	0.00	0.00
58	6.42	0.00	0.00	0.00
59	6.79	0.01	0.01	0.01
60	7.19	0.01	0.01	0.01
61	7.61	0.01	0.01	0.01
62	8.05	0.01	0.01	0.01
63	8.52	0.01	0.01	0.01
64	9.02	0.02	0.02	0.02
65	9.55	0.02	0.02	0.02
66	10.11	0.03	0.03	0.03
67	10.70	0.03	0.03	0.03
68	11.33	0.04	0.04	0.04
69	11.99	0.03	0.03	[illegible]
70	12.70	0.04	0.04	0.04
71	13.44	0.03	0.03	0.03
72	14.23	0.03	0.03	0.03
73	15.07	0.02	0.02	0.02
74	15.95	0.03	0.03	0.03
75	16.89	0.04	0.04	0.04
76	17.89	0.07	0.07	0.07
77	18.94	0.07	0.07	0.07
78	20.06	0.07	0.07	0.07
79	21.24	0.09	0.09	0.09
80	22.49	0.09	0.09	0.09
81	23.82	0.11	0.11	0.11
82	25.22	0.11	0.11	0.11
83	26.71	0.12	0.12	0.12
84	28.29	0.14	0.14	0.14
85	29.96	0.15	0.15	0.15
86	31.73	0.15	0.15	0.15
87	33.60	0.20	0.20	0.20
88	35.59	0.21	0.21	0.21
89	37.69	0.23	0.23	0.23
90	39.91	0.26	0.26	0.26
91	42.27	0.28	0.28	0.27
92	44.77	0.31	0.31	0.31
93	47.42	0.35	0.35	0.35
94	50.22	0.36	0.36	0.36
95	53.19	0.41	0.41	0.41
96	56.34	0.45	0.45	[illegible]
97	59.67	0.48	0.48	0.47
98	63.20	0.53	0.53	0.53
99	66.94	0.57	0.57	0.57
100	70.90	0.61	0.61	0.61

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 4
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
MW-5A	MW-5A
Discharge 1.26 U.S.gal/min	Distance from the pumping well 109.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
101	75.09	0.69	0.69	0.68
102	79.54	0.73	0.73	0.72
103	84.24	0.78	0.78	0.78
104	89.23	0.87	0.87	0.86
105	94.51	0.90	0.90	0.89
106	100.10	0.93	0.93	0.92
107	106.03	0.96	0.96	0.95
108	112.30	0.99	0.99	0.98
109	118.95	1.01	1.01	1.00
110	126.00	1.06	1.06	1.05
111	133.45	1.09	1.09	1.08
112	141.36	1.12	1.12	1.11
113	149.73	1.18	1.18	1.16
114	158.59	1.23	1.23	1.22
115	167.98	1.29	1.29	1.27
116	177.93	1.32	1.32	1.31
117	187.93	1.39	1.39	1.37
118	197.93	1.45	1.45	1.43
119	207.93	1.49	1.49	1.47
120	217.93	1.56	1.56	1.53
121	227.93	1.60	1.60	1.57
122	237.93	1.65	1.65	1.62
123	247.93	1.71	1.71	1.68
124	257.93	1.75	1.75	1.72
125	267.93	1.81	1.81	1.78
126	277.93	1.85	1.85	1.82
127	287.93	1.93	1.93	1.89
128	297.93	1.97	1.97	1.93
129	307.93	2.04	2.04	2.00
130	317.93	2.06	2.06	2.02
131	327.93	2.12	2.12	2.08
132	337.93	2.16	2.16	2.12
133	347.93	2.21	2.21	2.16
134	357.93	2.26	2.26	2.21
135	367.93	2.30	2.30	2.25
136	377.93	2.35	2.35	2.30
137	387.93	2.39	2.39	2.33
138	397.93	2.44	2.44	2.38
139	407.93	2.49	2.49	2.42
140	417.93	2.54	2.54	2.47
141	427.93	2.58	2.58	2.51
142	437.93	2.63	2.63	2.57
143	447.93	2.70	2.70	2.63
144	457.93	2.76	2.76	2.69
145	467.93	2.81	2.81	2.73
146	477.93	2.86	2.86	2.78
147	487.93	2.90	2.90	2.81
148	497.93	2.93	2.93	2.85
149	507.93	2.97	2.97	2.88
150	517.93	3.00	3.00	2.91

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 5
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
MW-5A	MW-5A
Discharge 1.26 U.S.gal/min	Distance from the pumping well 109.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
151	527.93	3.03	3.03	2.94
152	537.93	3.06	3.06	2.97
153	547.93	3.09	3.09	2.99
154	557.93	3.11	3.11	3.02
155	567.93	3.14	3.14	3.04
156	577.93	3.16	3.16	3.06
157	587.93	3.19	3.19	3.09
158	597.93	3.21	3.21	3.11
159	607.93	3.24	3.24	3.13
160	617.93	3.26	3.26	3.15
161	627.93	3.28	3.28	3.18
162	637.93	3.31	3.31	3.20
163	647.93	3.33	3.33	3.22
164	657.93	3.35	3.35	3.24
165	667.93	3.37	3.37	3.26
166	677.93	3.39	3.39	3.28
167	687.93	3.41	3.41	3.30
168	697.93	3.43	3.43	3.32
169	707.93	3.45	3.45	[illegible]
170	717.93	3.47	3.47	3.35
171	727.93	3.49	3.49	3.37
172	737.93	3.51	3.51	3.39
173	747.93	3.53	3.53	3.40
174	757.93	3.54	3.54	3.42
175	767.93	3.56	3.56	3.44
176	777.93	3.58	3.58	3.45
177	787.93	3.60	3.60	3.47
178	797.93	3.61	3.61	3.48
179	807.93	3.63	3.63	3.49
180	817.93	3.64	3.64	3.51
181	827.93	3.65	3.65	3.52
182	837.93	3.67	3.67	3.53
183	847.93	3.68	3.68	3.54
184	857.93	3.69	3.69	3.56
185	867.93	3.70	3.70	3.57
186	877.93	3.72	3.72	3.58
187	887.93	3.73	3.73	3.59
188	897.93	3.74	3.74	3.60
189	907.93	3.75	3.75	3.61
190	917.93	3.76	3.76	3.62
191	927.93	3.78	3.78	3.63
192	937.93	3.79	3.79	3.64
193	947.93	3.80	3.80	3.65
194	957.93	3.81	3.81	3.66
195	967.93	3.82	3.82	3.67
196	977.93	3.83	3.83	[illegible]
197	987.93	3.84	3.84	3.69
198	997.93	3.85	3.85	3.70
199	1007.93	3.86	3.86	3.71
200	1017.93	3.86	3.86	3.71

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 6
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
MW-5A	MW-5A
Discharge 1.26 U.S.gal/min	Distance from the pumping well 109.00 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
201	1027.93	3.87	3.87	3.72
202	1037.93	3.88	3.88	3.73
203	1047.93	3.89	3.89	3.74
204	1057.93	3.90	3.90	3.75
205	1067.93	3.90	3.90	3.75
206	1077.93	3.91	3.91	3.76
207	1087.93	3.92	3.92	3.77
208	1097.93	3.92	3.92	3.77
209	1107.93	3.93	3.93	3.78
210	1117.93	3.94	3.94	3.78
211	1127.93	3.95	3.95	3.79
212	1137.93	3.95	3.95	3.79
213	1147.93	3.96	3.96	3.80
214	1157.93	3.96	3.96	3.81
215	1167.93	3.97	3.97	3.81
216	1177.93	3.98	3.98	3.82
217	1187.93	3.98	3.98	3.83
218	1197.93	3.99	3.99	3.83
219	1207.93	4.00	4.00	3.84
220	1217.93	4.00	4.00	3.84
221	1227.93	4.00	4.00	3.84
222	1237.93	4.01	4.01	3.85
223	1247.93	4.02	4.02	3.86
224	1257.93	4.03	4.03	3.86
225	1267.93	4.03	4.03	3.87
226	1277.93	4.04	4.04	3.87
227	1287.93	4.04	4.04	3.88
228	1297.93	4.05	4.05	3.88
229	1307.93	4.05	4.05	3.89
230	1317.93	4.06	4.06	3.89
231	1327.93	4.07	4.07	3.90
232	1337.93	4.07	4.07	3.91
233	1347.93	4.08	4.08	3.91
234	1357.93	4.08	4.08	3.91
235	1367.93	4.09	4.09	3.92
236	1377.93	4.10	4.10	3.93
237	1387.93	4.09	4.09	3.93
238	1397.93	4.10	4.10	3.93
239	1407.93	4.10	4.10	3.93
240	1417.93	4.11	4.11	3.94
241	1427.93	4.11	4.11	3.94
242	1437.93	4.12	4.12	3.95
243	1447.93	4.11	4.11	3.94
244	1457.93	4.14	4.14	3.96
245	1467.93	4.12	4.12	3.95
246	1477.93	4.13	4.13	3.95
247	1487.93	4.13	4.13	3.96
248	1497.93	4.16	4.16	3.98
249	1507.93	4.15	4.15	3.98
250	1517.93	4.14	4.14	3.97

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 7
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
MW-5A	MW-5A
Discharge 1.26 U.S.gal/min	Distance from the pumping well 109.00 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
251	1527.93	4.15	4.15	3.98
252	1537.93	4.16	4.16	3.99
253	1547.93	4.15	4.15	3.98
254	1557.93	4.16	4.16	3.99
255	1567.93	4.17	4.17	4.00
256	1577.93	4.15	4.15	3.98
257	1587.93	4.17	4.17	3.99
258	1597.93	4.18	4.18	4.00
259	1607.93	4.18	4.18	4.01
260	1617.93	4.18	4.18	4.01
261	1627.93	4.19	4.19	4.02
262	1637.93	4.20	4.20	4.02
263	1647.93	4.20	4.20	4.02
264	1657.93	4.20	4.20	4.02
265	1667.93	4.20	4.20	4.02
266	1677.93	4.21	4.21	4.03
267	1687.93	4.21	4.21	4.04
268	1697.93	4.21	4.21	4.03
269	1707.93	4.22	4.22	[illegible]
270	1717.93	4.22	4.22	4.03
271	1727.93	4.22	4.22	4.04
272	1737.93	4.21	4.21	4.04
273	1747.93	4.22	4.22	4.04
274	1757.93	4.22	4.22	4.04
275	1767.93	4.23	4.23	4.05
276	1777.93	4.23	4.23	4.05
277	1787.93	4.23	4.23	4.05
278	1797.93	4.23	4.23	4.05
279	1807.93	4.24	4.24	4.06
280	1817.93	4.23	4.23	4.05
281	1827.93	4.24	4.24	4.06
282	1837.93	4.24	4.24	4.06
283	1847.93	4.24	4.24	4.06
284	1857.93	4.24	4.24	4.06
285	1867.93	4.24	4.24	4.06
286	1877.93	4.25	4.25	4.07
287	1887.93	4.25	4.25	4.07
288	1897.93	4.25	4.25	4.06
289	1907.93	4.24	4.24	4.06
290	1917.93	4.25	4.25	4.07
291	1927.93	4.25	4.25	4.07
292	1937.93	4.25	4.25	4.07
293	1947.93	4.25	4.25	4.07
294	1957.93	4.25	4.25	4.07
295	1967.93	4.25	4.25	4.07
296	1977.93	4.25	4.25	[illegible]
297	1987.93	4.25	4.25	4.07
298	1997.93	4.25	4.25	4.07
299	2007.93	4.26	4.26	4.08
300	2017.93	4.26	4.26	4.08

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 8
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
MW-5A	MW-5A
Discharge 1.26 U.S.gal/min	Distance from the pumping well 109.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
301	2027.93	4.26	4.26	4.08
302	2037.93	4.26	4.26	4.08
303	2047.93	4.26	4.26	4.08
304	2057.93	4.26	4.26	4.08
305	2067.93	4.26	4.26	4.08
306	2077.93	4.26	4.26	4.08
307	2087.93	4.27	4.27	4.08
308	2097.93	4.27	4.27	4.08
309	2107.93	4.27	4.27	4.09
310	2117.93	4.27	4.27	4.09
311	2127.93	4.27	4.27	4.09
312	2137.93	4.27	4.27	4.09
313	2147.93	4.27	4.27	4.09
314	2157.93	4.27	4.27	4.09
315	2167.93	4.28	4.28	4.09
316	2177.93	4.28	4.28	4.09
317	2187.93	4.28	4.28	4.09
318	2197.93	4.28	4.28	4.09
319	2207.93	4.28	4.28	4.09
320	2217.93	4.28	4.28	4.10
321	2227.93	4.28	4.28	4.10
322	2237.93	4.28	4.28	4.10
323	2247.93	4.28	4.28	4.10
324	2257.93	4.29	4.29	4.10
325	2267.93	4.29	4.29	4.10
326	2277.93	4.29	4.29	4.10
327	2287.93	4.29	4.29	4.11
328	2297.93	4.29	4.29	4.11
329	2307.93	4.29	4.29	4.11
330	2317.93	4.29	4.29	4.11
331	2327.93	4.29	4.29	4.11
332	2337.93	4.30	4.30	4.11
333	2347.93	4.30	4.30	4.11
334	2357.93	4.30	4.30	4.11
335	2367.93	4.30	4.30	4.11
336	2377.93	4.30	4.30	4.12
337	2387.93	4.30	4.30	4.12
338	2397.93	4.31	4.31	4.12
339	2407.93	4.31	4.31	4.12
340	2417.93	4.31	4.31	4.12
341	2427.93	4.31	4.31	4.12
342	2437.93	4.31	4.31	4.12
343	2447.93	4.31	4.31	4.13
344	2457.93	4.31	4.31	4.13
345	2467.93	4.31	4.31	4.13
346	2477.93	4.32	4.32	4.13
347	2487.93	4.32	4.32	4.13
348	2497.93	4.32	4.32	4.13
349	2507.93	4.32	4.32	4.13
350	2517.93	4.32	4.32	4.13

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 9
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
MW-5A	MW-5A
Discharge 1.26 U.S.gal/min	Distance from the pumping well 109.00 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
351	2527.93	4.32	4.32	4.13
352	2537.93	4.32	4.32	4.13
353	2547.93	4.32	4.32	4.13
354	2557.93	4.32	4.32	4.14
355	2567.93	4.32	4.32	4.14
356	2577.93	4.32	4.32	4.14
357	2587.93	4.32	4.32	4.14
358	2597.93	4.32	4.32	4.14
359	2607.93	4.33	4.33	4.14
360	2617.93	4.33	4.33	4.14
361	2627.93	4.33	4.33	4.14
362	2637.93	4.33	4.33	4.14
363	2647.93	4.33	4.33	4.14
364	2657.93	4.33	4.33	4.14
365	2667.93	4.33	4.33	4.14
366	2677.93	4.33	4.33	4.14
367	2687.93	4.33	4.33	4.15
368	2697.93	4.33	4.33	4.14
369	2707.93	4.33	4.33	[illegible]
370	2717.93	4.34	4.34	[illegible]
371	2727.93	4.35	4.35	4.16
372	2737.93	4.34	4.34	4.15
373	2747.93	4.33	4.33	4.15
374	2757.93	4.34	4.34	4.15
375	2767.93	4.34	4.34	4.15
376	2777.93	4.35	4.35	4.16
377	2787.93	4.34	4.34	4.15
378	2797.93	4.34	4.34	4.15
379	2807.93	4.34	4.34	4.15
380	2817.93	4.34	4.34	4.16
381	2827.93	4.34	4.34	4.16
382	2837.93	4.35	4.35	4.16
383	2847.93	4.35	4.35	4.16
384	2857.93	4.35	4.35	4.16
385	2867.93	4.35	4.35	4.16
386	2877.93	4.36	4.36	4.17
387	2887.93	4.36	4.36	4.17
388	2897.93	4.36	4.36	4.17
389	2907.93	4.35	4.35	4.16
390	2917.93	4.38	4.38	4.19
391	2927.93	4.38	4.38	4.19
392	2937.93	4.35	4.35	4.16
393	2947.93	4.36	4.36	4.17
394	2957.93	4.36	4.36	4.17
395	2967.93	4.35	4.35	4.16
396	2977.93	4.39	4.39	[illegible]
397	2987.93	4.34	4.34	[illegible]
398	2997.93	4.39	4.39	4.20
399	3007.93	4.38	4.38	4.19
400	3017.93	4.39	4.39	4.20

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 10
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
MW-5A	MW-5A
Discharge 1.26 U.S.gal/min	Distance from the pumping well 109.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
401	3027.93	4.35	4.35	4.16
402	3037.93	4.39	4.39	4.20
403	3047.93	4.43	4.43	4.23
404	3057.93	4.40	4.40	4.21
405	3067.93	4.36	4.36	4.17
406	3077.93	4.38	4.38	4.19
407	3087.93	4.43	4.43	4.23
408	3097.93	4.39	4.39	4.20
409	3107.93	4.38	4.38	4.19
410	3117.93	4.38	4.38	4.19
411	3127.93	4.38	4.38	4.19
412	3137.93	4.39	4.39	4.20
413	3147.93	4.44	4.44	4.24
414	3157.93	4.40	4.40	4.20
415	3167.93	4.40	4.40	4.20
416	3177.93	4.41	4.41	4.21
417	3187.93	4.39	4.39	4.20
418	3197.93	4.44	4.44	4.24
419	3207.93	4.40	4.40	4.21
420	3217.93	4.38	4.38	4.18
421	3227.93	4.42	4.42	4.23
422	3237.93	4.41	4.41	4.22
423	3247.93	4.43	4.43	4.23
424	3257.93	4.41	4.41	4.22
425	3267.93	4.41	4.41	4.22
426	3277.93	4.41	4.41	4.22
427	3287.93	4.39	4.39	4.20
428	3297.93	4.43	4.43	4.24
429	3307.93	4.42	4.42	4.22
430	3317.93	4.42	4.42	4.22
431	3327.93	4.41	4.41	4.21
432	3337.93	4.43	4.43	4.23
433	3347.93	4.43	4.43	4.23
434	3357.93	4.43	4.43	4.23
435	3367.93	4.42	4.42	4.23
436	3377.93	4.43	4.43	4.23
437	3387.93	4.42	4.42	4.23
438	3397.93	4.42	4.42	4.23
439	3407.93	4.42	4.42	4.23
440	3417.93	4.42	4.42	4.23
441	3427.93	4.42	4.42	4.23
442	3437.93	4.42	4.42	4.23
443	3447.93	4.42	4.42	4.22
444	3457.93	4.42	4.42	4.22
445	3467.93	4.42	4.42	4.22
446	3477.93	4.42	4.42	4.23
447	3487.93	4.42	4.42	4.23
448	3497.93	4.42	4.42	4.23
449	3507.93	4.43	4.43	4.23
450	3517.93	4.43	4.43	4.23

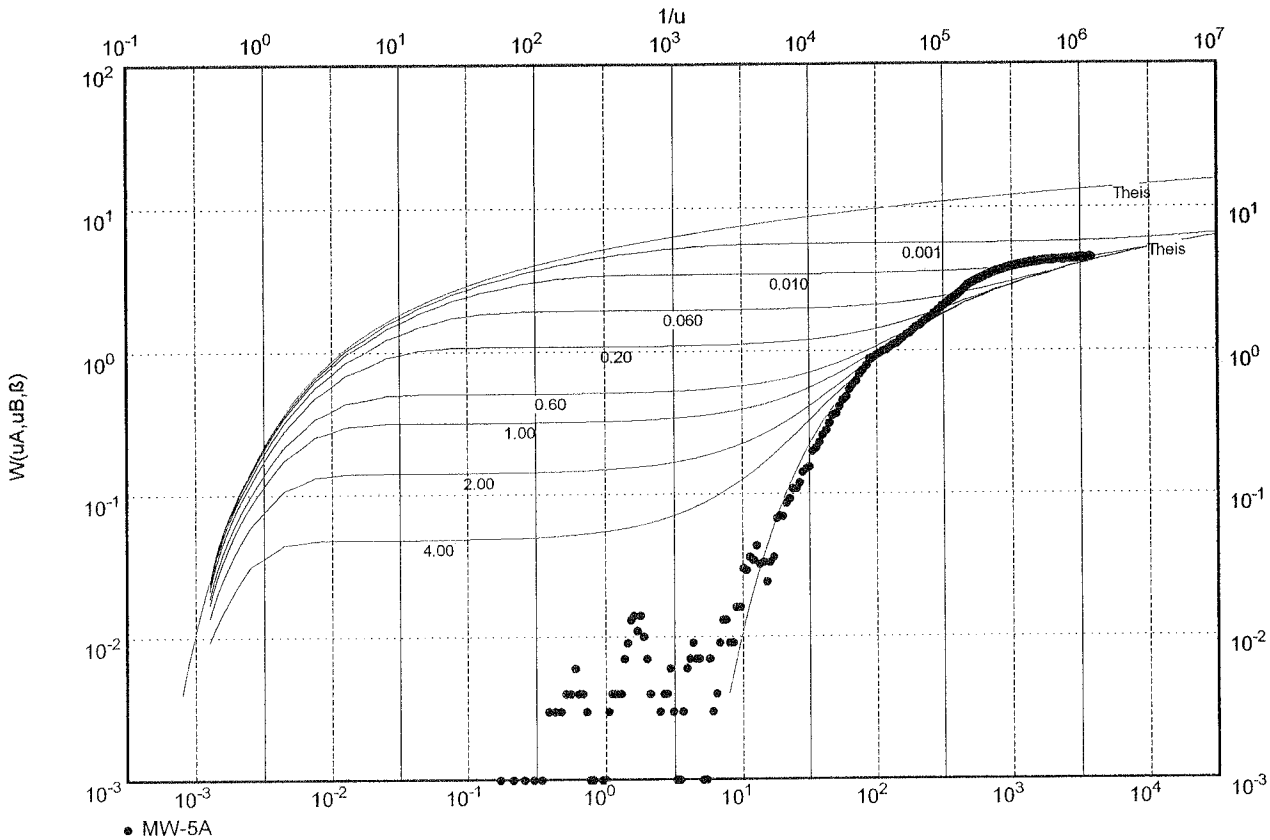
The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 11
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
MW-5A	MW-5A
Discharge 1.26 U.S.gal/min	Distance from the pumping well 109.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
451	3527.93	4.43	4.43	4.23
452	3537.93	4.43	4.43	4.23
453	3547.93	4.43	4.43	4.23
454	3557.93	4.43	4.43	4.23
455	3567.93	4.43	4.43	4.23
456	3577.93	4.43	4.43	4.23
457	3587.93	4.43	4.43	4.23
458	3597.93	4.43	4.43	4.23
459	3607.93	4.43	4.43	4.23
460	3617.93	4.43	4.43	4.24
461	3627.93	4.43	4.43	4.24
462	3637.93	4.43	4.43	4.24
463	3647.93	4.44	4.44	4.24
464	3657.93	4.44	4.44	4.24
465	3667.93	4.44	4.44	4.24
466	3677.93	4.44	4.44	4.24
467	3687.93	4.44	4.44	4.24
468	3697.93	4.44	4.44	4.24
469	3707.93	4.44	4.44	[illegible]
470	3717.93	4.44	4.44	4.25
471	3727.93	4.44	4.44	4.25
472	3737.93	4.44	4.44	4.24

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis NEUMAN's method Unconfined aquifer with delayed watertable response	Date: June 30, 2004	Page 1
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
MW-5A	
Discharge 1.26 U.S.gal/min	



Transmissivity [ft²/min]: 1.33×10^{-2}

Hydraulic conductivity [ft/min]: 2.67×10^{-4}

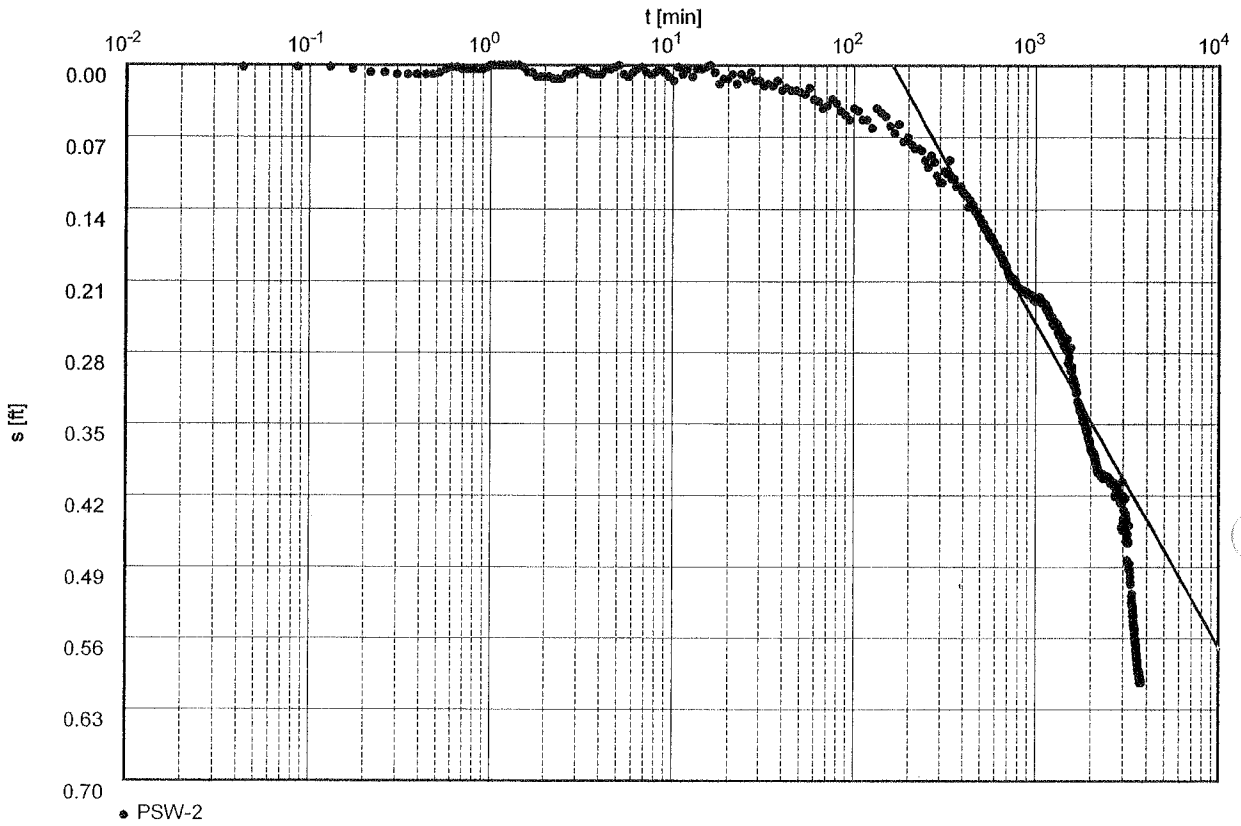
Aquifer thickness [ft]: 50.00

Storativity: 1.42×10^{-8}

Specific yield: 1.42×10^{-4}

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 1
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PSW-2	
Discharge 1.26 U.S.gal/min	



Transmissivity [ft²/min]: 9.60×10^{-2}

Hydraulic conductivity [ft/min]: 1.92×10^{-3}

Aquifer thickness [ft]: 50.00

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 2
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PSW-2	PSW-2
Discharge 1.26 U.S.gal/min	Distance from the pumping well 226.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
2	0.04	0.00	0.00	0.00
3	0.09	0.00	0.00	0.00
4	0.13	0.00	0.00	0.00
5	0.17	0.00	0.00	0.00
6	0.21	0.01	0.01	0.01
7	0.26	0.01	0.01	0.01
8	0.30	0.01	0.01	0.01
9	0.34	0.01	0.01	0.01
10	0.39	0.01	0.01	0.01
11	0.43	0.01	0.01	0.01
12	0.47	0.01	0.01	0.01
13	0.52	0.01	0.01	0.01
14	0.56	0.00	0.00	0.00
15	0.60	0.00	0.00	0.00
16	0.65	0.00	0.00	0.00
17	0.69	0.00	0.00	0.00
18	0.73	0.00	0.00	0.00
19	0.77	0.00	0.00	0.00
20	0.82	0.00	0.00	0.00
21	0.86	0.00	0.00	0.00
22	0.90	0.00	0.00	0.00
23	0.95	0.00	0.00	0.00
24	1.00	0.00	0.00	0.00
25	1.05	0.00	0.00	0.00
26	1.11	0.00	0.00	0.00
27	1.17	0.00	0.00	0.00
28	1.23	0.00	0.00	0.00
29	1.30	0.00	0.00	0.00
30	1.37	0.00	0.00	0.00
31	1.44	0.00	0.00	0.00
32	1.52	0.00	0.00	0.00
33	1.61	0.01	0.01	0.01
34	1.69	0.01	0.01	0.01
35	1.79	0.01	0.01	0.01
36	1.89	0.01	0.01	0.01
37	1.99	0.01	0.01	0.01
38	2.10	0.01	0.01	0.01
39	2.22	0.01	0.01	0.01
40	2.35	0.01	0.01	0.01
41	2.48	0.01	0.01	0.01
42	2.62	0.01	0.01	0.01
43	2.77	0.01	0.01	0.01
44	2.93	0.01	0.01	0.01
45	3.09	0.00	0.00	0.00
46	3.27	0.00	0.00	0.00
47	3.46	0.01	0.01	0.01
48	3.66	0.01	0.01	0.01
49	3.87	0.01	0.01	0.01
50	4.09	0.01	0.01	0.01

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 3
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PSW-2	PSW-2
Discharge 1.26 U.S.gal/min	Distance from the pumping well 226.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
51	4.32	0.00	0.00	0.00
52	4.57	0.00	0.00	0.00
53	4.84	0.00	0.00	0.00
54	5.12	0.00	0.00	0.00
55	5.42	0.01	0.01	0.01
56	5.73	0.01	0.01	0.01
57	6.06	0.01	0.01	0.01
58	6.42	0.00	0.00	0.00
59	6.79	0.00	0.00	0.00
60	7.19	0.01	0.01	0.01
61	7.61	0.01	0.01	0.01
62	8.05	0.01	0.01	0.01
63	8.52	0.00	0.00	0.00
64	9.02	0.01	0.01	0.01
65	9.55	0.01	0.01	0.01
66	10.11	0.02	0.02	0.01
67	10.70	0.00	0.00	0.00
68	11.33	0.01	0.01	0.01
69	11.99	0.00	0.00	[illegible]
70	12.70	0.01	0.01	0.01
71	13.44	0.00	0.00	0.00
72	14.23	0.00	0.00	0.00
73	15.07	0.00	0.00	0.00
74	15.95	0.00	0.00	0.00
75	16.89	0.01	0.01	0.01
76	17.89	0.02	0.02	0.02
77	18.94	0.01	0.01	0.01
78	20.06	0.01	0.01	0.01
79	21.24	0.01	0.01	0.01
80	22.49	0.02	0.02	0.02
81	23.82	0.01	0.01	0.01
82	25.22	0.01	0.01	0.01
83	26.71	0.01	0.01	0.01
84	28.29	0.02	0.02	0.01
85	29.96	0.02	0.02	0.01
86	31.73	0.02	0.02	0.02
87	33.60	0.02	0.02	0.02
88	35.59	0.02	0.02	0.02
89	37.69	0.02	0.02	0.01
90	39.91	0.02	0.02	0.02
91	42.27	0.02	0.02	0.02
92	44.77	0.02	0.02	0.02
93	47.42	0.02	0.02	0.02
94	50.22	0.03	0.03	0.03
95	53.19	0.03	0.03	0.03
96	56.34	0.02	0.02	[illegible]
97	59.67	0.03	0.03	0.03
98	63.20	0.04	0.04	0.03
99	66.94	0.04	0.04	0.04
100	70.90	0.04	0.04	0.04

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 4
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PSW-2	PSW-2
Discharge 1.26 U.S.gal/min	Distance from the pumping well 226.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
101	75.09	0.03	0.03	0.03
102	79.54	0.04	0.04	0.04
103	84.24	0.04	0.04	0.04
104	89.23	0.05	0.05	0.05
105	94.51	0.05	0.05	0.05
106	100.10	0.04	0.04	0.04
107	106.03	0.04	0.04	0.04
108	112.30	0.05	0.05	0.05
109	118.95	0.05	0.05	0.05
110	126.00	0.06	0.06	0.06
111	133.45	0.04	0.04	0.04
112	141.36	0.05	0.05	0.05
113	149.73	0.05	0.05	0.05
114	158.59	0.06	0.06	0.06
115	167.98	0.07	0.07	0.07
116	177.93	0.06	0.06	0.06
117	187.93	0.07	0.07	0.07
118	197.93	0.07	0.07	0.07
119	207.93	0.08	0.08	0.08
120	217.93	0.08	0.08	0.08
121	227.93	0.08	0.08	0.08
122	237.93	0.08	0.08	0.08
123	247.93	0.09	0.09	0.09
124	257.93	0.10	0.10	0.10
125	267.93	0.09	0.09	0.09
126	277.93	0.09	0.09	0.09
127	287.93	0.11	0.11	0.11
128	297.93	0.11	0.11	0.11
129	307.93	0.11	0.11	0.11
130	317.93	0.10	0.10	0.10
131	327.93	0.11	0.11	0.10
132	337.93	0.09	0.09	0.09
133	347.93	0.11	0.11	0.11
134	357.93	0.11	0.11	0.11
135	367.93	0.12	0.12	0.12
136	377.93	0.12	0.12	0.12
137	387.93	0.12	0.12	0.12
138	397.93	0.12	0.12	0.12
139	407.93	0.13	0.13	0.12
140	417.93	0.13	0.13	0.13
141	427.93	0.14	0.14	0.14
142	437.93	0.13	0.13	0.13
143	447.93	0.14	0.14	0.14
144	457.93	0.14	0.14	0.14
145	467.93	0.14	0.14	0.14
146	477.93	0.14	0.14	0.14
147	487.93	0.15	0.15	0.15
148	497.93	0.15	0.15	0.15
149	507.93	0.15	0.15	0.15
150	517.93	0.15	0.15	0.15

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 5
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PSW-2	PSW-2
Discharge 1.26 U.S.gal/min	Distance from the pumping well 226.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
151	527.93	0.16	0.16	0.16
152	537.93	0.16	0.16	0.16
153	547.93	0.16	0.16	0.16
154	557.93	0.17	0.17	0.17
155	567.93	0.17	0.17	0.17
156	577.93	0.17	0.17	0.17
157	587.93	0.17	0.17	0.17
158	597.93	0.17	0.17	0.17
159	607.93	0.18	0.18	0.18
160	617.93	0.18	0.18	0.18
161	627.93	0.18	0.18	0.18
162	637.93	0.18	0.18	0.18
163	647.93	0.18	0.18	0.18
164	657.93	0.19	0.19	0.19
165	667.93	0.19	0.19	0.19
166	677.93	0.19	0.19	0.19
167	687.93	0.19	0.19	0.19
168	697.93	0.20	0.20	0.20
169	707.93	0.20	0.20	[illegible]
170	717.93	0.21	0.21	0.21
171	727.93	0.21	0.21	0.21
172	737.93	0.21	0.21	0.21
173	747.93	0.21	0.21	0.21
174	757.93	0.21	0.21	0.21
175	767.93	0.21	0.21	0.21
176	777.93	0.21	0.21	0.21
177	787.93	0.21	0.21	0.21
178	797.93	0.21	0.21	0.21
179	807.93	0.22	0.22	0.22
180	817.93	0.22	0.22	0.22
181	827.93	0.22	0.22	0.22
182	837.93	0.22	0.22	0.22
183	847.93	0.22	0.22	0.22
184	857.93	0.22	0.22	0.22
185	867.93	0.22	0.22	0.22
186	877.93	0.22	0.22	0.22
187	887.93	0.22	0.22	0.22
188	897.93	0.22	0.22	0.22
189	907.93	0.22	0.22	0.22
190	917.93	0.22	0.22	0.22
191	927.93	0.22	0.22	0.22
192	937.93	0.22	0.22	0.22
193	947.93	0.22	0.22	0.22
194	957.93	0.23	0.23	0.23
195	967.93	0.23	0.23	0.23
196	977.93	0.23	0.23	[illegible]
197	987.93	0.23	0.23	0.23
198	997.93	0.23	0.23	0.23
199	1007.93	0.23	0.23	0.23
200	1017.93	0.23	0.23	0.23

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 6
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PSW-2	PSW-2
Discharge 1.26 U.S.gal/min	Distance from the pumping well 226.00 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
201	1027.93	0.23	0.23	0.23
202	1037.93	0.23	0.23	0.23
203	1047.93	0.23	0.23	0.23
204	1057.93	0.23	0.23	0.23
205	1067.93	0.23	0.23	0.23
206	1077.93	0.23	0.23	0.23
207	1087.93	0.23	0.23	0.23
208	1097.93	0.23	0.23	0.23
209	1107.93	0.23	0.23	0.23
210	1117.93	0.23	0.23	0.23
211	1127.93	0.23	0.23	0.23
212	1137.93	0.24	0.24	0.24
213	1147.93	0.24	0.24	0.24
214	1157.93	0.24	0.24	0.24
215	1167.93	0.24	0.24	0.24
216	1177.93	0.24	0.24	0.24
217	1187.93	0.24	0.24	0.24
218	1197.93	0.24	0.24	0.24
219	1207.93	0.24	0.24	0.24
220	1217.93	0.24	0.24	0.24
221	1227.93	0.24	0.24	0.24
222	1237.93	0.25	0.25	0.25
223	1247.93	0.25	0.25	0.25
224	1257.93	0.25	0.25	0.25
225	1267.93	0.25	0.25	0.25
226	1277.93	0.25	0.25	0.25
227	1287.93	0.25	0.25	0.25
228	1297.93	0.25	0.25	0.25
229	1307.93	0.25	0.25	0.25
230	1317.93	0.26	0.26	0.26
231	1327.93	0.26	0.26	0.26
232	1337.93	0.26	0.26	0.26
233	1347.93	0.26	0.26	0.26
234	1357.93	0.26	0.26	0.26
235	1367.93	0.26	0.26	0.26
236	1377.93	0.26	0.26	0.26
237	1387.93	0.26	0.26	0.26
238	1397.93	0.27	0.27	0.27
239	1407.93	0.26	0.26	0.26
240	1417.93	0.27	0.27	0.27
241	1427.93	0.27	0.27	0.27
242	1437.93	0.27	0.27	0.27
243	1447.93	0.27	0.27	0.27
244	1457.93	0.28	0.28	0.28
245	1467.93	0.28	0.28	0.28
246	1477.93	0.28	0.28	0.28
247	1487.93	0.27	0.27	0.27
248	1497.93	0.29	0.29	0.29
249	1507.93	0.29	0.29	0.29
250	1517.93	0.28	0.28	0.28

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 7
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PSW-2	PSW-2
Discharge 1.26 U.S.gal/min	Distance from the pumping well 226.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
251	1527.93	0.28	0.28	0.28
252	1537.93	0.29	0.29	0.29
253	1547.93	0.30	0.30	0.30
254	1557.93	0.28	0.28	0.28
255	1567.93	0.30	0.30	0.30
256	1577.93	0.29	0.29	0.29
257	1587.93	0.30	0.30	0.30
258	1597.93	0.30	0.30	0.30
259	1607.93	0.31	0.31	0.31
260	1617.93	0.31	0.31	0.31
261	1627.93	0.31	0.31	0.31
262	1637.93	0.31	0.31	0.31
263	1647.93	0.31	0.31	0.31
264	1657.93	0.32	0.32	0.32
265	1667.93	0.32	0.32	0.32
266	1677.93	0.32	0.32	0.32
267	1687.93	0.33	0.33	0.33
268	1697.93	0.33	0.33	0.33
269	1707.93	0.33	0.33	[illegible]
270	1717.93	0.33	0.33	0.33
271	1727.93	0.33	0.33	0.33
272	1737.93	0.33	0.33	0.33
273	1747.93	0.34	0.34	0.34
274	1757.93	0.34	0.34	0.33
275	1767.93	0.34	0.34	0.34
276	1777.93	0.34	0.34	0.34
277	1787.93	0.34	0.34	0.34
278	1797.93	0.34	0.34	0.34
279	1807.93	0.35	0.35	0.35
280	1817.93	0.34	0.34	0.34
281	1827.93	0.34	0.34	0.34
282	1837.93	0.35	0.35	0.35
283	1847.93	0.35	0.35	0.35
284	1857.93	0.35	0.35	0.35
285	1867.93	0.35	0.35	0.35
286	1877.93	0.36	0.36	0.35
287	1887.93	0.36	0.36	0.36
288	1897.93	0.36	0.36	0.36
289	1907.93	0.36	0.36	0.35
290	1917.93	0.36	0.36	0.36
291	1927.93	0.36	0.36	0.36
292	1937.93	0.37	0.37	0.36
293	1947.93	0.37	0.37	0.36
294	1957.93	0.37	0.37	0.37
295	1967.93	0.37	0.37	0.37
296	1977.93	0.37	0.37	[illegible]
297	1987.93	0.37	0.37	[illegible]
298	1997.93	0.38	0.38	0.37
299	2007.93	0.38	0.38	0.38
300	2017.93	0.38	0.38	0.38

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 8
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PSW-2	PSW-2
Discharge 1.26 U.S.gal/min	Distance from the pumping well 226.00 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
301	2027.93	0.38	0.38	0.38
302	2037.93	0.38	0.38	0.38
303	2047.93	0.38	0.38	0.38
304	2057.93	0.38	0.38	0.38
305	2067.93	0.38	0.38	0.38
306	2077.93	0.38	0.38	0.38
307	2087.93	0.38	0.38	0.38
308	2097.93	0.38	0.38	0.38
309	2107.93	0.39	0.39	0.38
310	2117.93	0.39	0.39	0.38
311	2127.93	0.39	0.39	0.39
312	2137.93	0.39	0.39	0.39
313	2147.93	0.39	0.39	0.39
314	2157.93	0.39	0.39	0.39
315	2167.93	0.39	0.39	0.39
316	2177.93	0.40	0.40	0.40
317	2187.93	0.40	0.40	0.40
318	2197.93	0.40	0.40	0.40
319	2207.93	0.40	0.40	0.40
320	2217.93	0.40	0.40	0.40
321	2227.93	0.40	0.40	0.40
322	2237.93	0.40	0.40	0.40
323	2247.93	0.40	0.40	0.40
324	2257.93	0.40	0.40	0.40
325	2267.93	0.40	0.40	0.40
326	2277.93	0.40	0.40	0.40
327	2287.93	0.40	0.40	0.40
328	2297.93	0.40	0.40	0.40
329	2307.93	0.40	0.40	0.40
330	2317.93	0.40	0.40	0.40
331	2327.93	0.41	0.41	0.40
332	2337.93	0.41	0.41	0.40
333	2347.93	0.41	0.41	0.40
334	2357.93	0.41	0.41	0.40
335	2367.93	0.40	0.40	0.40
336	2377.93	0.40	0.40	0.40
337	2387.93	0.40	0.40	0.40
338	2397.93	0.41	0.41	0.40
339	2407.93	0.41	0.41	0.40
340	2417.93	0.41	0.41	0.40
341	2427.93	0.40	0.40	0.40
342	2437.93	0.41	0.41	0.40
343	2447.93	0.41	0.41	0.40
344	2457.93	0.40	0.40	0.40
345	2467.93	0.40	0.40	0.40
346	2477.93	0.40	0.40	0.40
347	2487.93	0.40	0.40	0.40
348	2497.93	0.40	0.40	0.40
349	2507.93	0.41	0.41	0.40
350	2517.93	0.41	0.41	0.40

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 9
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PSW-2	PSW-2
Discharge 1.26 U.S.gal/min	Distance from the pumping well 226.00 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
351	2527.93	0.41	0.41	0.40
352	2537.93	0.41	0.41	0.40
353	2547.93	0.41	0.41	0.41
354	2557.93	0.41	0.41	0.41
355	2567.93	0.41	0.41	0.41
356	2577.93	0.41	0.41	0.41
357	2587.93	0.41	0.41	0.41
358	2597.93	0.41	0.41	0.41
359	2607.93	0.41	0.41	0.41
360	2617.93	0.41	0.41	0.41
361	2627.93	0.41	0.41	0.41
362	2637.93	0.41	0.41	0.41
363	2647.93	0.41	0.41	0.41
364	2657.93	0.41	0.41	0.41
365	2667.93	0.41	0.41	0.41
366	2677.93	0.41	0.41	0.41
367	2687.93	0.41	0.41	0.41
368	2697.93	0.41	0.41	0.41
369	2707.93	0.41	0.41	[illegible]
370	2717.93	0.42	0.42	0.42
371	2727.93	0.42	0.42	0.42
372	2737.93	0.41	0.41	0.41
373	2747.93	0.41	0.41	0.41
374	2757.93	0.42	0.42	0.42
375	2767.93	0.42	0.42	0.42
376	2777.93	0.42	0.42	0.42
377	2787.93	0.41	0.41	0.41
378	2797.93	0.42	0.42	0.42
379	2807.93	0.42	0.42	0.42
380	2817.93	0.42	0.42	0.42
381	2827.93	0.42	0.42	0.42
382	2837.93	0.42	0.42	0.42
383	2847.93	0.42	0.42	0.42
384	2857.93	0.42	0.42	0.42
385	2867.93	0.42	0.42	0.42
386	2877.93	0.43	0.43	0.43
387	2887.93	0.42	0.42	0.42
388	2897.93	0.43	0.43	0.43
389	2907.93	0.42	0.42	0.42
390	2917.93	0.45	0.45	0.45
391	2927.93	0.42	0.42	0.42
392	2937.93	0.42	0.42	0.42
393	2947.93	0.43	0.43	0.42
394	2957.93	0.43	0.43	0.43
395	2967.93	0.42	0.42	0.42
396	2977.93	0.46	0.46	[illegible]
397	2987.93	0.41	0.41	[illegible]
398	2997.93	0.45	0.45	0.45
399	3007.93	0.45	0.45	0.44
400	3017.93	0.44	0.44	0.43

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 10
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PSW-2	PSW-2
Discharge 1.26 U.S.gal/min	Distance from the pumping well 226.00 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
401	3027.93	0.42	0.42	0.42
402	3037.93	0.45	0.45	0.45
403	3047.93	0.46	0.46	0.45
404	3057.93	0.45	0.45	0.45
405	3067.93	0.43	0.43	0.42
406	3077.93	0.45	0.45	0.44
407	3087.93	0.47	0.47	0.46
408	3097.93	0.44	0.44	0.44
409	3107.93	0.45	0.45	0.45
410	3117.93	0.45	0.45	0.44
411	3127.93	0.46	0.46	0.46
412	3137.93	0.46	0.46	0.46
413	3147.93	0.49	0.49	0.48
414	3157.93	0.46	0.46	0.46
415	3167.93	0.46	0.46	0.46
416	3177.93	0.47	0.47	0.47
417	3187.93	0.47	0.47	0.46
418	3197.93	0.49	0.49	0.49
419	3207.93	0.47	0.47	0.47
420	3217.93	0.45	0.45	0.45
421	3227.93	0.49	0.49	0.49
422	3237.93	0.49	0.49	0.49
423	3247.93	0.49	0.49	0.49
424	3257.93	0.49	0.49	0.49
425	3267.93	0.51	0.51	0.51
426	3277.93	0.50	0.50	0.50
427	3287.93	0.50	0.50	0.49
428	3297.93	0.51	0.51	0.51
429	3307.93	0.51	0.51	0.51
430	3317.93	0.51	0.51	0.51
431	3327.93	0.52	0.52	0.52
432	3337.93	0.53	0.53	0.53
433	3347.93	0.52	0.52	0.52
434	3357.93	0.53	0.53	0.53
435	3367.93	0.52	0.52	0.52
436	3377.93	0.54	0.54	0.53
437	3387.93	0.53	0.53	0.53
438	3397.93	0.54	0.54	0.54
439	3407.93	0.54	0.54	0.54
440	3417.93	0.55	0.55	0.54
441	3427.93	0.55	0.55	0.55
442	3437.93	0.55	0.55	0.55
443	3447.93	0.55	0.55	0.55
444	3457.93	0.55	0.55	0.55
445	3467.93	0.56	0.56	0.56
446	3477.93	0.56	0.56	0.56
447	3487.93	0.56	0.56	0.56
448	3497.93	0.57	0.57	0.56
449	3507.93	0.57	0.57	0.56
450	3517.93	0.57	0.57	0.57

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 11
		Project: Johnston County Landfill	
		Evaluated by: PJH	

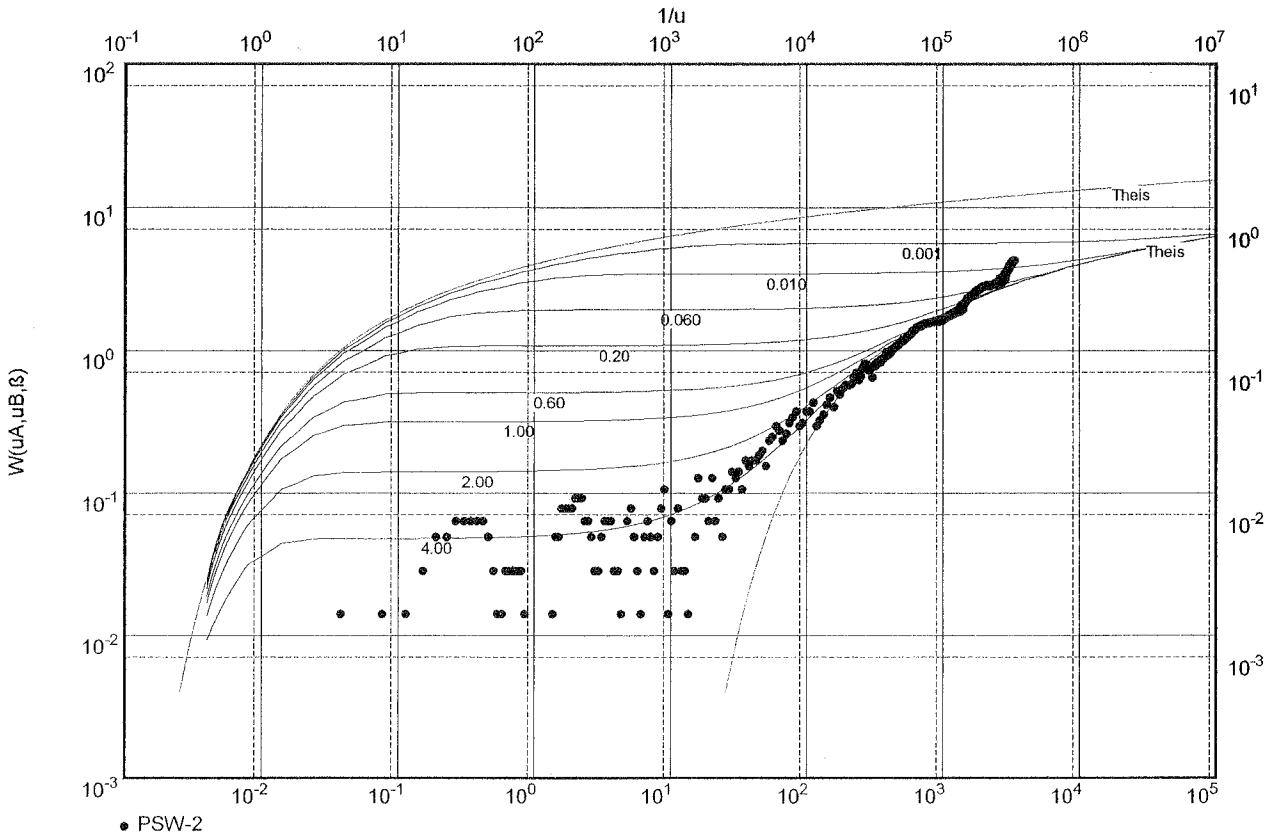
Pumping Test No. 1	Test conducted on: June 19, 2004
PSW-2	PSW-2
Discharge 1.26 U.S.gal/min	Distance from the pumping well 226.00 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
451	3527.93	0.57	0.57	0.57
452	3537.93	0.58	0.58	0.57
453	3547.93	0.58	0.58	0.57
454	3557.93	0.58	0.58	0.58
455	3567.93	0.58	0.58	0.58
456	3577.93	0.59	0.59	0.58
457	3587.93	0.59	0.59	0.58
458	3597.93	0.59	0.59	0.59
459	3607.93	0.59	0.59	0.59
460	3617.93	0.59	0.59	0.59
461	3627.93	0.60	0.60	0.59
462	3637.93	0.60	0.60	0.59
463	3647.93	0.60	0.60	0.59
464	3657.93	0.60	0.60	0.59
465	3667.93	0.60	0.60	0.59
466	3677.93	0.60	0.60	0.60
467	3687.93	0.60	0.60	0.60
468	3697.93	0.60	0.60	0.60
469	3707.93	0.61	0.61	
470	3717.93	0.61	0.61	0.60
471	3727.93	0.61	0.61	0.60
472	3737.93	0.60	0.60	0.60

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis NEUMAN's method Unconfined aquifer with delayed watertable response	Date: June 30, 2004	Page 1
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PSW-2	
Discharge 1.26 U.S.gal/min	



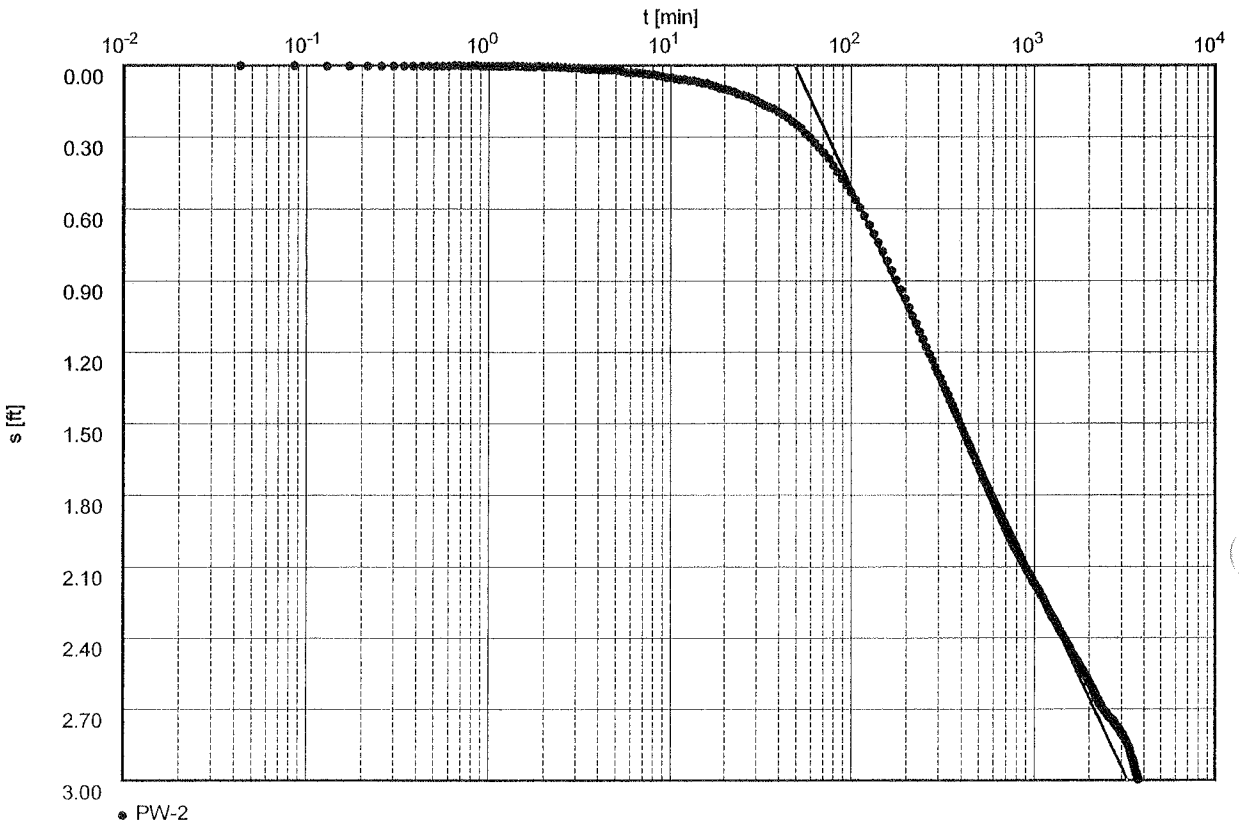
Transmissivity [ft²/min]: 9.45×10^{-2}

Hydraulic conductivity [ft/min]: 1.89×10^{-3}

Aquifer thickness [ft]: 50.00

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 1
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PW-2	
Discharge 1.26 U.S.gal/min	



Transmissivity [ft²/min]: 1.86×10^{-2}

Hydraulic conductivity [ft/min]: 3.72×10^{-4}

Aquifer thickness [ft]: 50.00

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 2
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PW-2	PW-2
Discharge 1.26 U.S.gal/min	Distance from the pumping well 101.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
2	0.04	0.00	0.00	0.00
3	0.09	0.00	0.00	0.00
4	0.13	0.00	0.00	0.00
5	0.17	0.00	0.00	0.00
6	0.21	0.00	0.00	0.00
7	0.26	0.00	0.00	0.00
8	0.30	0.00	0.00	0.00
9	0.34	0.00	0.00	0.00
10	0.39	0.00	0.00	0.00
11	0.43	0.00	0.00	0.00
12	0.47	0.00	0.00	0.00
13	0.52	0.00	0.00	0.00
14	0.56	0.00	0.00	0.00
15	0.60	0.00	0.00	0.00
16	0.65	0.00	0.00	0.00
17	0.69	0.00	0.00	0.00
18	0.73	0.00	0.00	0.00
19	0.77	0.00	0.00	0.00
20	0.82	0.00	0.00	0.00
21	0.86	0.00	0.00	0.00
22	0.90	0.00	0.00	0.00
23	0.95	0.00	0.00	0.00
24	1.00	0.00	0.00	0.00
25	1.05	0.00	0.00	0.00
26	1.11	0.00	0.00	0.00
27	1.17	0.00	0.00	0.00
28	1.23	0.00	0.00	0.00
29	1.30	0.00	0.00	0.00
30	1.37	0.00	0.00	0.00
31	1.44	0.00	0.00	0.00
32	1.52	0.00	0.00	0.00
33	1.61	0.01	0.01	0.00
34	1.69	0.01	0.01	0.01
35	1.79	0.01	0.01	0.00
36	1.89	0.00	0.00	0.00
37	1.99	0.01	0.01	0.00
38	2.10	0.01	0.01	0.01
39	2.22	0.01	0.01	0.01
40	2.35	0.01	0.01	0.01
41	2.48	0.01	0.01	0.01
42	2.62	0.01	0.01	0.01
43	2.77	0.01	0.01	0.01
44	2.93	0.01	0.01	0.01
45	3.09	0.01	0.01	0.01
46	3.27	0.01	0.01	0.01
47	3.46	0.02	0.02	0.01
48	3.66	0.02	0.02	0.02
49	3.87	0.02	0.02	0.02
50	4.09	0.02	0.02	0.02

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 3
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PW-2	PW-2
Discharge 1.26 U.S.gal/min	Distance from the pumping well 101.00 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
51	4.32	0.02	0.02	0.02
52	4.57	0.02	0.02	0.02
53	4.84	0.02	0.02	0.02
54	5.12	0.02	0.02	0.02
55	5.42	0.03	0.03	0.02
56	5.73	0.03	0.03	0.03
57	6.06	0.03	0.03	0.03
58	6.42	0.03	0.03	0.03
59	6.79	0.03	0.03	0.03
60	7.19	0.03	0.03	0.03
61	7.61	0.04	0.04	0.04
62	8.05	0.04	0.04	0.04
63	8.52	0.04	0.04	0.04
64	9.02	0.05	0.05	0.04
65	9.55	0.05	0.05	0.05
66	10.11	0.05	0.05	0.05
67	10.70	0.06	0.06	0.05
68	11.33	0.06	0.06	0.06
69	11.99	0.06	0.06	[illegible]
70	12.70	0.07	0.07	0.06
71	13.44	0.07	0.07	0.06
72	14.23	0.07	0.07	0.07
73	15.07	0.07	0.07	0.07
74	15.95	0.08	0.08	0.07
75	16.89	0.08	0.08	0.08
76	17.89	0.09	0.09	0.09
77	18.94	0.10	0.10	0.09
78	20.06	0.10	0.10	0.10
79	21.24	0.11	0.11	0.10
80	22.49	0.11	0.11	0.11
81	23.82	0.12	0.12	0.12
82	25.22	0.13	0.13	0.13
83	26.71	0.13	0.13	0.13
84	28.29	0.14	0.14	0.14
85	29.96	0.15	0.15	0.15
86	31.73	0.16	0.16	0.16
87	33.60	0.17	0.17	0.17
88	35.59	0.17	0.17	0.17
89	37.69	0.18	0.18	0.18
90	39.91	0.19	0.19	0.19
91	42.27	0.21	0.21	0.21
92	44.77	0.22	0.22	0.22
93	47.42	0.23	0.23	0.23
94	50.22	0.25	0.25	0.25
95	53.19	0.26	0.26	0.26
96	56.34	0.28	0.28	[illegible]
97	59.67	0.30	0.30	0.30
98	63.20	0.32	0.32	0.32
99	66.94	0.35	0.35	0.34
100	70.90	0.37	0.37	0.37

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 4
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PW-2	PW-2
Discharge 1.26 U.S.gal/min	Distance from the pumping well 101.00 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
101	75.09	0.39	0.39	0.39
102	79.54	0.42	0.42	0.42
103	84.24	0.45	0.45	0.44
104	89.23	0.48	0.48	0.47
105	94.51	0.51	0.51	0.50
106	100.10	0.53	0.53	0.53
107	106.03	0.57	0.57	0.56
108	112.30	0.60	0.60	0.59
109	118.95	0.63	0.63	0.63
110	126.00	0.67	0.67	0.67
111	133.45	0.71	0.71	0.70
112	141.36	0.75	0.75	0.74
113	149.73	0.78	0.78	0.78
114	158.59	0.82	0.82	0.82
115	167.98	0.87	0.87	0.86
116	177.93	0.91	0.91	0.90
117	187.93	0.95	0.95	0.94
118	197.93	0.99	0.99	0.98
119	207.93	1.02	1.02	1.01
120	217.93	1.06	1.06	1.05
121	227.93	1.09	1.09	1.08
122	237.93	1.13	1.13	1.12
123	247.93	1.16	1.16	1.15
124	257.93	1.19	1.19	1.18
125	267.93	1.22	1.22	1.21
126	277.93	1.25	1.25	1.24
127	287.93	1.28	1.28	1.26
128	297.93	1.31	1.31	1.29
129	307.93	1.33	1.33	1.31
130	317.93	1.35	1.35	1.33
131	327.93	1.38	1.38	1.36
132	337.93	1.40	1.40	1.38
133	347.93	1.42	1.42	1.40
134	357.93	1.44	1.44	1.42
135	367.93	1.47	1.47	1.44
136	377.93	1.49	1.49	1.47
137	387.93	1.51	1.51	1.49
138	397.93	1.53	1.53	1.51
139	407.93	1.55	1.55	1.53
140	417.93	1.57	1.57	1.54
141	427.93	1.59	1.59	1.56
142	437.93	1.61	1.61	1.58
143	447.93	1.62	1.62	1.59
144	457.93	1.64	1.64	1.61
145	467.93	1.66	1.66	1.63
146	477.93	1.67	1.67	1.65
147	487.93	1.69	1.69	1.66
148	497.93	1.71	1.71	1.68
149	507.93	1.73	1.73	1.70
150	517.93	1.74	1.74	1.71

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 5
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PW-2	PW-2
Discharge 1.26 U.S.gal/min	Distance from the pumping well 101.00 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
151	527.93	1.76	1.76	1.73
152	537.93	1.77	1.77	1.74
153	547.93	1.79	1.79	1.76
154	557.93	1.80	1.80	1.77
155	567.93	1.82	1.82	1.78
156	577.93	1.83	1.83	1.79
157	587.93	1.84	1.84	1.81
158	597.93	1.85	1.85	1.82
159	607.93	1.87	1.87	1.83
160	617.93	1.88	1.88	1.84
161	627.93	1.89	1.89	1.86
162	637.93	1.91	1.91	1.87
163	647.93	1.92	1.92	1.88
164	657.93	1.93	1.93	1.89
165	667.93	1.94	1.94	1.91
166	677.93	1.95	1.95	1.92
167	687.93	1.96	1.96	1.92
168	697.93	1.98	1.98	1.94
169	707.93	1.99	1.99	[illegible]
170	717.93	2.00	2.00	1.96
171	727.93	2.01	2.01	1.97
172	737.93	2.02	2.02	1.98
173	747.93	2.03	2.03	1.99
174	757.93	2.04	2.04	2.00
175	767.93	2.05	2.05	2.01
176	777.93	2.06	2.06	2.02
177	787.93	2.07	2.07	2.03
178	797.93	2.08	2.08	2.03
179	807.93	2.09	2.09	2.04
180	817.93	2.10	2.10	2.05
181	827.93	2.11	2.11	2.06
182	837.93	2.11	2.11	2.07
183	847.93	2.12	2.12	2.07
184	857.93	2.13	2.13	2.08
185	867.93	2.13	2.13	2.09
186	877.93	2.14	2.14	2.09
187	887.93	2.15	2.15	2.10
188	897.93	2.15	2.15	2.11
189	907.93	2.16	2.16	2.11
190	917.93	2.17	2.17	2.12
191	927.93	2.17	2.17	2.12
192	937.93	2.18	2.18	2.13
193	947.93	2.19	2.19	2.14
194	957.93	2.19	2.19	2.14
195	967.93	2.20	2.20	2.15
196	977.93	2.21	2.21	[illegible]
197	987.93	2.21	2.21	2.15
198	997.93	2.22	2.22	2.17
199	1007.93	2.23	2.23	2.18
200	1017.93	2.23	2.23	2.18

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 6
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PW-2	PW-2
Discharge 1.26 U.S.gal/min	Distance from the pumping well 101.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
201	1027.93	2.24	2.24	2.19
202	1037.93	2.24	2.24	2.19
203	1047.93	2.24	2.24	2.19
204	1057.93	2.25	2.25	2.20
205	1067.93	2.26	2.26	2.21
206	1077.93	2.26	2.26	2.21
207	1087.93	2.27	2.27	2.22
208	1097.93	2.28	2.28	2.22
209	1107.93	2.28	2.28	2.23
210	1117.93	2.28	2.28	2.23
211	1127.93	2.29	2.29	2.24
212	1137.93	2.30	2.30	2.25
213	1147.93	2.31	2.31	2.25
214	1157.93	2.31	2.31	2.26
215	1167.93	2.32	2.32	2.26
216	1177.93	2.32	2.32	2.27
217	1187.93	2.33	2.33	2.28
218	1197.93	2.34	2.34	2.29
219	1207.93	2.34	2.34	2.29
220	1217.93	2.35	2.35	2.29
221	1227.93	2.35	2.35	2.30
222	1237.93	2.36	2.36	2.30
223	1247.93	2.36	2.36	2.31
224	1257.93	2.37	2.37	2.31
225	1267.93	2.37	2.37	2.32
226	1277.93	2.37	2.37	2.32
227	1287.93	2.38	2.38	2.32
228	1297.93	2.39	2.39	2.33
229	1307.93	2.39	2.39	2.33
230	1317.93	2.40	2.40	2.34
231	1327.93	2.40	2.40	2.34
232	1337.93	2.41	2.41	2.35
233	1347.93	2.41	2.41	2.36
234	1357.93	2.42	2.42	2.36
235	1367.93	2.42	2.42	2.37
236	1377.93	2.43	2.43	2.37
237	1387.93	2.43	2.43	2.37
238	1397.93	2.43	2.43	2.37
239	1407.93	2.44	2.44	2.38
240	1417.93	2.44	2.44	2.38
241	1427.93	2.45	2.45	2.39
242	1437.93	2.45	2.45	2.39
243	1447.93	2.46	2.46	2.40
244	1457.93	2.46	2.46	2.40
245	1467.93	2.46	2.46	2.40
246	1477.93	2.46	2.46	2.40
247	1487.93	2.47	2.47	2.41
248	1497.93	2.48	2.48	2.42
249	1507.93	2.48	2.48	2.42
250	1517.93	2.48	2.48	2.42

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 7
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PW-2	PW-2
Discharge 1.26 U.S.gal/min	Distance from the pumping well 101.00 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
251	1527.93	2.49	2.49	2.43
252	1537.93	2.49	2.49	2.43
253	1547.93	2.49	2.49	2.43
254	1557.93	2.50	2.50	2.43
255	1567.93	2.50	2.50	2.44
256	1577.93	2.50	2.50	2.44
257	1587.93	2.51	2.51	2.45
258	1597.93	2.52	2.52	2.45
259	1607.93	2.52	2.52	2.46
260	1617.93	2.53	2.53	2.46
261	1627.93	2.53	2.53	2.46
262	1637.93	2.53	2.53	2.47
263	1647.93	2.53	2.53	2.47
264	1657.93	2.54	2.54	2.47
265	1667.93	2.54	2.54	2.48
266	1677.93	2.54	2.54	2.48
267	1687.93	2.55	2.55	2.48
268	1697.93	2.55	2.55	2.49
269	1707.93	2.56	2.56	[illegible]
270	1717.93	2.56	2.56	2.49
271	1727.93	2.56	2.56	2.50
272	1737.93	2.57	2.57	2.50
273	1747.93	2.57	2.57	2.51
274	1757.93	2.58	2.58	2.51
275	1767.93	2.58	2.58	2.51
276	1777.93	2.58	2.58	2.51
277	1787.93	2.59	2.59	2.52
278	1797.93	2.59	2.59	2.52
279	1807.93	2.59	2.59	2.53
280	1817.93	2.59	2.59	2.53
281	1827.93	2.60	2.60	2.53
282	1837.93	2.60	2.60	2.53
283	1847.93	2.60	2.60	2.54
284	1857.93	2.61	2.61	2.54
285	1867.93	2.61	2.61	2.54
286	1877.93	2.62	2.62	2.55
287	1887.93	2.62	2.62	2.55
288	1897.93	2.62	2.62	2.55
289	1907.93	2.62	2.62	2.56
290	1917.93	2.63	2.63	2.56
291	1927.93	2.63	2.63	2.56
292	1937.93	2.63	2.63	2.56
293	1947.93	2.64	2.64	2.57
294	1957.93	2.64	2.64	2.57
295	1967.93	2.64	2.64	2.57
296	1977.93	2.65	2.65	[illegible]
297	1987.93	2.65	2.65	[illegible]
298	1997.93	2.65	2.65	2.58
299	2007.93	2.66	2.66	2.59
300	2017.93	2.66	2.66	2.59

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 8
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PW-2	PW-2
Discharge 1.26 U.S.gal/min	Distance from the pumping well 101.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
301	2027.93	2.66	2.66	2.59
302	2037.93	2.67	2.67	2.59
303	2047.93	2.67	2.67	2.60
304	2057.93	2.67	2.67	2.60
305	2067.93	2.68	2.68	2.61
306	2077.93	2.68	2.68	2.61
307	2087.93	2.68	2.68	2.61
308	2097.93	2.69	2.69	2.61
309	2107.93	2.69	2.69	2.62
310	2117.93	2.69	2.69	2.62
311	2127.93	2.70	2.70	2.62
312	2137.93	2.70	2.70	2.63
313	2147.93	2.70	2.70	2.63
314	2157.93	2.71	2.71	2.64
315	2167.93	2.72	2.72	2.64
316	2177.93	2.72	2.72	2.65
317	2187.93	2.72	2.72	2.65
318	2197.93	2.73	2.73	2.65
319	2207.93	2.73	2.73	2.66
320	2217.93	2.73	2.73	2.66
321	2227.93	2.73	2.73	2.66
322	2237.93	2.73	2.73	2.66
323	2247.93	2.74	2.74	2.66
324	2257.93	2.74	2.74	2.67
325	2267.93	2.74	2.74	2.67
326	2277.93	2.75	2.75	2.67
327	2287.93	2.75	2.75	2.68
328	2297.93	2.75	2.75	2.68
329	2307.93	2.75	2.75	2.68
330	2317.93	2.76	2.76	2.68
331	2327.93	2.76	2.76	2.69
332	2337.93	2.76	2.76	2.69
333	2347.93	2.77	2.77	2.69
334	2357.93	2.77	2.77	2.69
335	2367.93	2.77	2.77	2.69
336	2377.93	2.77	2.77	2.70
337	2387.93	2.78	2.78	2.70
338	2397.93	2.78	2.78	2.70
339	2407.93	2.78	2.78	2.70
340	2417.93	2.78	2.78	2.71
341	2427.93	2.78	2.78	2.71
342	2437.93	2.78	2.78	2.71
343	2447.93	2.79	2.79	2.71
344	2457.93	2.79	2.79	2.71
345	2467.93	2.79	2.79	2.71
346	2477.93	2.79	2.79	2.71
347	2487.93	2.79	2.79	2.71
348	2497.93	2.79	2.79	2.71
349	2507.93	2.80	2.80	2.72
350	2517.93	2.80	2.80	2.72

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 9
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PW-2	PW-2
Discharge 1.26 U.S.gal/min	Distance from the pumping well 101.00 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
351	2527.93	2.80	2.80	2.72
352	2537.93	2.80	2.80	2.72
353	2547.93	2.81	2.81	2.73
354	2557.93	2.81	2.81	2.73
355	2567.93	2.81	2.81	2.73
356	2577.93	2.81	2.81	2.73
357	2587.93	2.81	2.81	2.73
358	2597.93	2.81	2.81	2.73
359	2607.93	2.81	2.81	2.73
360	2617.93	2.81	2.81	2.74
361	2627.93	2.81	2.81	2.74
362	2637.93	2.82	2.82	2.74
363	2647.93	2.82	2.82	2.74
364	2657.93	2.82	2.82	2.74
365	2667.93	2.82	2.82	2.74
366	2677.93	2.82	2.82	2.74
367	2687.93	2.82	2.82	2.74
368	2697.93	2.83	2.83	2.75
369	2707.93	2.83	2.83	[illegible]
370	2717.93	2.83	2.83	2.75
371	2727.93	2.83	2.83	2.75
372	2737.93	2.83	2.83	2.75
373	2747.93	2.83	2.83	2.75
374	2757.93	2.84	2.84	2.76
375	2767.93	2.84	2.84	2.76
376	2777.93	2.84	2.84	2.76
377	2787.93	2.85	2.85	2.77
378	2797.93	2.85	2.85	2.77
379	2807.93	2.85	2.85	2.77
380	2817.93	2.85	2.85	2.77
381	2827.93	2.85	2.85	2.77
382	2837.93	2.85	2.85	2.77
383	2847.93	2.86	2.86	2.77
384	2857.93	2.86	2.86	2.77
385	2867.93	2.86	2.86	2.78
386	2877.93	2.86	2.86	2.78
387	2887.93	2.86	2.86	2.78
388	2897.93	2.86	2.86	2.78
389	2907.93	2.86	2.86	2.78
390	2917.93	2.87	2.87	2.79
391	2927.93	2.87	2.87	2.79
392	2937.93	2.87	2.87	2.79
393	2947.93	2.87	2.87	2.79
394	2957.93	2.88	2.88	2.80
395	2967.93	2.88	2.88	2.80
396	2977.93	2.89	2.89	[illegible]
397	2987.93	2.88	2.88	[illegible]
398	2997.93	2.88	2.88	2.80
399	3007.93	2.89	2.89	2.81
400	3017.93	2.89	2.89	2.81

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 10
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PW-2	PW-2
Discharge 1.26 U.S.gal/min	Distance from the pumping well 101.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
401	3027.93	2.89	2.89	2.80
402	3037.93	2.90	2.90	2.81
403	3047.93	2.90	2.90	2.81
404	3057.93	2.89	2.89	2.81
405	3067.93	2.89	2.89	2.81
406	3077.93	2.90	2.90	2.81
407	3087.93	2.90	2.90	2.82
408	3097.93	2.90	2.90	2.82
409	3107.93	2.90	2.90	2.82
410	3117.93	2.90	2.90	2.82
411	3127.93	2.91	2.91	2.82
412	3137.93	2.91	2.91	2.82
413	3147.93	2.92	2.92	2.83
414	3157.93	2.91	2.91	2.83
415	3167.93	2.91	2.91	2.83
416	3177.93	2.92	2.92	2.83
417	3187.93	2.92	2.92	2.83
418	3197.93	2.92	2.92	2.84
419	3207.93	2.92	2.92	2.84
420	3217.93	2.92	2.92	2.84
421	3227.93	2.93	2.93	2.84
422	3237.93	2.93	2.93	2.85
423	3247.93	2.94	2.94	2.85
424	3257.93	2.94	2.94	2.85
425	3267.93	2.94	2.94	2.85
426	3277.93	2.94	2.94	2.85
427	3287.93	2.94	2.94	2.85
428	3297.93	2.94	2.94	2.86
429	3307.93	2.94	2.94	2.86
430	3317.93	2.94	2.94	2.86
431	3327.93	2.95	2.95	2.86
432	3337.93	2.96	2.96	2.87
433	3347.93	2.96	2.96	2.87
434	3357.93	2.96	2.96	2.88
435	3367.93	2.97	2.97	2.88
436	3377.93	2.97	2.97	2.88
437	3387.93	2.97	2.97	2.88
438	3397.93	2.98	2.98	2.89
439	3407.93	2.98	2.98	2.89
440	3417.93	2.99	2.99	2.90
441	3427.93	2.99	2.99	2.90
442	3437.93	2.99	2.99	2.91
443	3447.93	3.00	3.00	2.91
444	3457.93	3.00	3.00	2.91
445	3467.93	3.00	3.00	2.91
446	3477.93	3.00	3.00	2.91
447	3487.93	3.01	3.01	2.92
448	3497.93	3.01	3.01	2.92
449	3507.93	3.01	3.01	2.92
450	3517.93	3.01	3.01	2.92

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 11
		Project: Johnston County Landfill	
		Evaluated by: PJH	

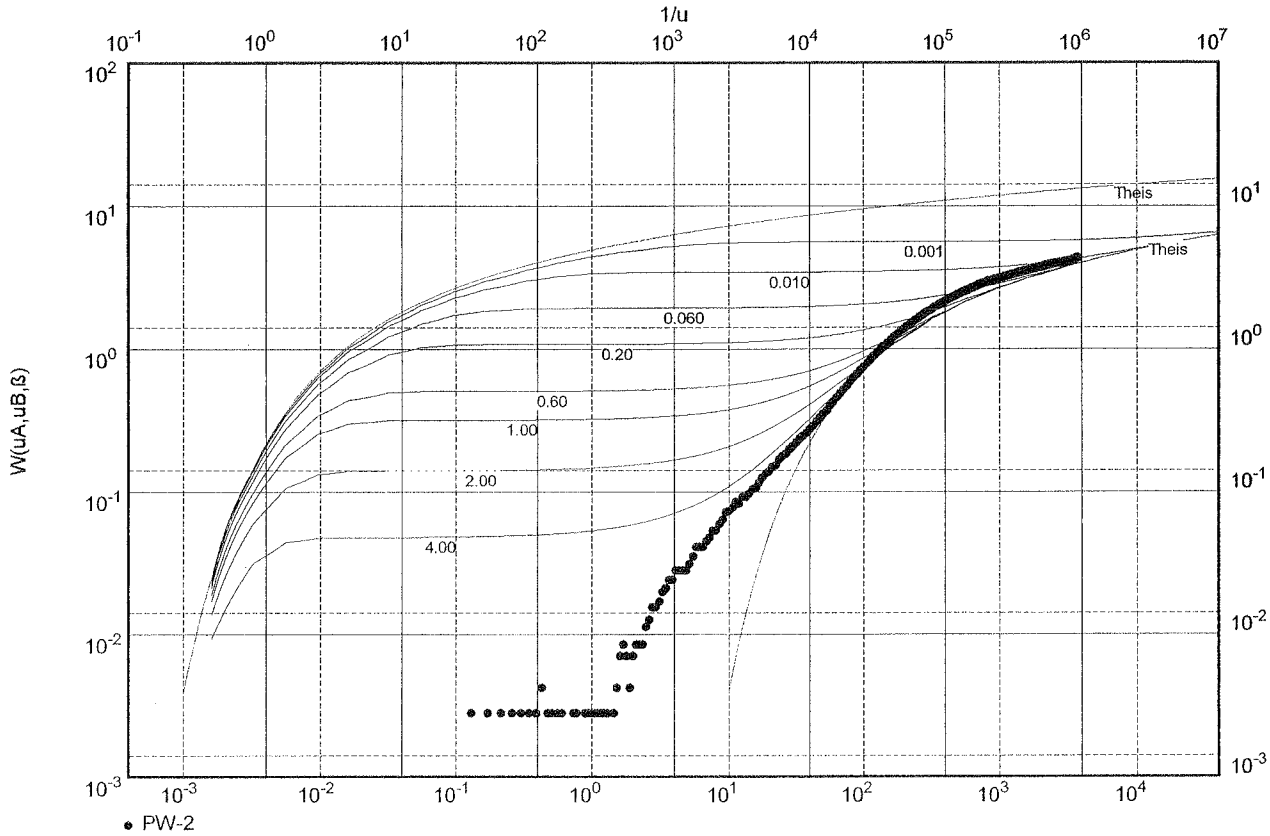
Pumping Test No. 1	Test conducted on: June 19, 2004
PW-2	PW-2
Discharge 1.26 U.S.gal/min	Distance from the pumping well 101.00 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
451	3527.93	3.02	3.02	2.93
452	3537.93	3.02	3.02	2.93
453	3547.93	3.03	3.03	2.93
454	3557.93	3.03	3.03	2.94
455	3567.93	3.03	3.03	2.94
456	3577.93	3.04	3.04	2.95
457	3587.93	3.04	3.04	2.95
458	3597.93	3.05	3.05	2.95
459	3607.93	3.06	3.06	2.96
460	3617.93	3.06	3.06	2.96
461	3627.93	3.06	3.06	2.97
462	3637.93	3.06	3.06	2.97
463	3647.93	3.07	3.07	2.97
464	3657.93	3.07	3.07	2.97
465	3667.93	3.07	3.07	2.97
466	3677.93	3.07	3.07	2.98
467	3687.93	3.08	3.08	2.98
468	3697.93	3.08	3.08	2.99
469	3707.93	3.08	3.08	[illegible]
470	3717.93	3.09	3.09	2.99
471	3727.93	3.09	3.09	2.99
472	3737.93	3.09	3.09	2.99

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis NEUMAN's method Unconfined aquifer with delayed watertable response	Date: June 30, 2004	Page 1
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PW-2	
Discharge 1.26 U.S.gal/min	



Transmissivity [ft²/min]: 1.88×10^{-2}

Hydraulic conductivity [ft/min]: 3.77×10^{-4}

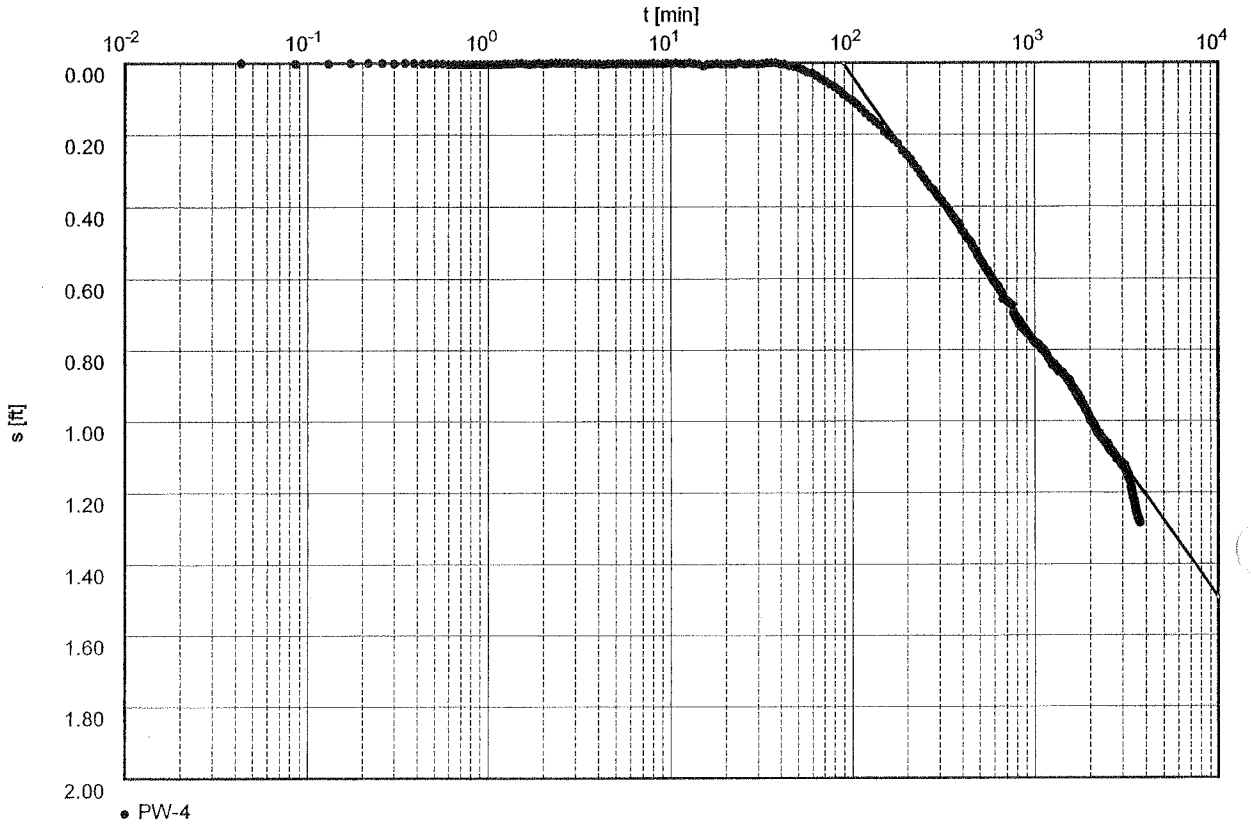
Aquifer thickness [ft]: 50.00

Storativity: 2.94×10^{-8}

Specific yield: 2.94×10^{-4}

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 1
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PW-4	
Discharge 1.26 U.S.gal/min	



Transmissivity [ft²/min]: 4.21×10^{-2}

Hydraulic conductivity [ft/min]: 8.42×10^{-4}

Aquifer thickness [ft]: 50.00

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 2
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PW-4	PW-4
Discharge 1.26 U.S.gal/min	Distance from the pumping well 126.00 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
2	0.04	0.00	0.00	0.00
3	0.09	0.00	0.00	0.00
4	0.13	0.00	0.00	0.00
5	0.17	0.00	0.00	0.00
6	0.21	0.00	0.00	0.00
7	0.26	0.00	0.00	0.00
8	0.30	0.00	0.00	0.00
9	0.34	0.00	0.00	0.00
10	0.39	0.00	0.00	0.00
11	0.43	0.00	0.00	0.00
12	0.47	0.00	0.00	0.00
13	0.52	0.00	0.00	0.00
14	0.56	0.00	0.00	0.00
15	0.60	0.00	0.00	0.00
16	0.65	0.00	0.00	0.00
17	0.69	0.00	0.00	0.00
18	0.73	0.00	0.00	0.00
19	0.77	0.00	0.00	0.00
20	0.82	0.00	0.00	0.00
21	0.86	0.00	0.00	0.00
22	0.90	0.00	0.00	0.00
23	0.95	0.00	0.00	0.00
24	1.00	0.00	0.00	0.00
25	1.05	0.00	0.00	0.00
26	1.11	0.00	0.00	0.00
27	1.17	0.00	0.00	0.00
28	1.23	0.00	0.00	0.00
29	1.30	0.00	0.00	0.00
30	1.37	0.00	0.00	0.00
31	1.44	0.00	0.00	0.00
32	1.52	0.00	0.00	0.00
33	1.61	0.00	0.00	0.00
34	1.69	0.00	0.00	0.00
35	1.79	0.00	0.00	0.00
36	1.89	0.00	0.00	0.00
37	1.99	0.00	0.00	0.00
38	2.10	0.00	0.00	0.00
39	2.22	0.00	0.00	0.00
40	2.35	0.00	0.00	0.00
41	2.48	0.00	0.00	0.00
42	2.62	0.00	0.00	0.00
43	2.77	0.00	0.00	0.00
44	2.93	0.00	0.00	0.00
45	3.09	0.00	0.00	0.00
46	3.27	0.00	0.00	0.00
47	3.46	0.00	0.00	0.00
48	3.66	0.00	0.00	0.00
49	3.87	0.00	0.00	0.00
50	4.09	0.00	0.00	0.00

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 3
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PW-4	PW-4
Discharge 1.26 U.S.gal/min	Distance from the pumping well 126.00 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
51	4.32	0.00	0.00	0.00
52	4.57	0.00	0.00	0.00
53	4.84	0.00	0.00	0.00
54	5.12	0.00	0.00	0.00
55	5.42	0.00	0.00	0.00
56	5.73	0.00	0.00	0.00
57	6.06	0.00	0.00	0.00
58	6.42	0.00	0.00	0.00
59	6.79	0.00	0.00	0.00
60	7.19	0.00	0.00	0.00
61	7.61	0.00	0.00	0.00
62	8.05	0.00	0.00	0.00
63	8.52	0.00	0.00	0.00
64	9.02	0.00	0.00	0.00
65	9.55	0.00	0.00	0.00
66	10.11	0.00	0.00	0.00
67	10.70	0.00	0.00	0.00
68	11.33	0.00	0.00	0.00
69	11.99	0.00	0.00	[illegible]
70	12.70	0.00	0.00	0.00
71	13.44	0.00	0.00	0.00
72	14.23	0.00	0.00	0.00
73	15.07	0.01	0.01	0.01
74	15.95	0.00	0.00	0.00
75	16.89	0.00	0.00	0.00
76	17.89	0.00	0.00	0.00
77	18.94	0.00	0.00	0.00
78	20.06	0.00	0.00	0.00
79	21.24	0.00	0.00	0.00
80	22.49	0.00	0.00	0.00
81	23.82	0.00	0.00	0.00
82	25.22	0.00	0.00	0.00
83	26.71	0.00	0.00	0.00
84	28.29	0.00	0.00	0.00
85	29.96	0.00	0.00	0.00
86	31.73	0.00	0.00	0.00
87	33.60	0.00	0.00	0.00
88	35.59	0.00	0.00	0.00
89	37.69	0.00	0.00	0.00
90	39.91	0.00	0.00	0.00
91	42.27	0.00	0.00	0.00
92	44.77	0.01	0.01	0.01
93	47.42	0.01	0.01	0.01
94	50.22	0.02	0.02	0.01
95	53.19	0.02	0.02	0.02
96	56.34	0.03	0.03	[illegible]
97	59.67	0.03	0.03	[illegible]
98	63.20	0.04	0.04	0.03
99	66.94	0.04	0.04	0.04
100	70.90	0.05	0.05	0.05

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 4
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PW-4	PW-4
Discharge 1.26 U.S.gal/min	Distance from the pumping well 126.00 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
101	75.09	0.06	0.06	0.06
102	79.54	0.07	0.07	0.07
103	84.24	0.08	0.08	0.08
104	89.23	0.09	0.09	0.09
105	94.51	0.10	0.10	0.10
106	100.10	0.11	0.11	0.10
107	106.03	0.12	0.12	0.11
108	112.30	0.13	0.13	0.13
109	118.95	0.14	0.14	0.14
110	126.00	0.15	0.15	0.15
111	133.45	0.16	0.16	0.16
112	141.36	0.17	0.17	0.17
113	149.73	0.19	0.19	0.19
114	158.59	0.20	0.20	0.20
115	167.98	0.21	0.21	0.21
116	177.93	0.22	0.22	0.22
117	187.93	0.24	0.24	0.24
118	197.93	0.26	0.26	0.26
119	207.93	0.27	0.27	0.27
120	217.93	0.28	0.28	0.28
121	227.93	0.30	0.30	0.30
122	237.93	0.31	0.31	0.31
123	247.93	0.32	0.32	0.32
124	257.93	0.34	0.34	0.33
125	267.93	0.35	0.35	0.35
126	277.93	0.36	0.36	0.35
127	287.93	0.36	0.36	0.36
128	297.93	0.38	0.38	0.37
129	307.93	0.38	0.38	0.38
130	317.93	0.39	0.39	0.39
131	327.93	0.40	0.40	0.40
132	337.93	0.41	0.41	0.41
133	347.93	0.42	0.42	0.42
134	357.93	0.43	0.43	0.43
135	367.93	0.44	0.44	0.44
136	377.93	0.45	0.45	0.44
137	387.93	0.46	0.46	0.45
138	397.93	0.47	0.47	0.47
139	407.93	0.47	0.47	0.47
140	417.93	0.48	0.48	0.48
141	427.93	0.49	0.49	0.49
142	437.93	0.50	0.50	0.49
143	447.93	0.50	0.50	0.50
144	457.93	0.51	0.51	0.51
145	467.93	0.52	0.52	0.52
146	477.93	0.53	0.53	0.53
147	487.93	0.54	0.54	0.54
148	497.93	0.55	0.55	0.54
149	507.93	0.55	0.55	0.55
150	517.93	0.56	0.56	0.56

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 5
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PW-4	PW-4
Discharge 1.26 U.S.gal/min	Distance from the pumping well 126.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
151	527.93	0.57	0.57	0.56
152	537.93	0.57	0.57	0.57
153	547.93	0.58	0.58	0.58
154	557.93	0.59	0.59	0.59
155	567.93	0.59	0.59	0.59
156	577.93	0.60	0.60	0.60
157	587.93	0.61	0.61	0.60
158	597.93	0.61	0.61	0.61
159	607.93	0.62	0.62	0.61
160	617.93	0.62	0.62	0.62
161	627.93	0.63	0.63	0.62
162	637.93	0.63	0.63	0.63
163	647.93	0.64	0.64	0.63
164	657.93	0.64	0.64	0.64
165	667.93	0.66	0.66	0.66
166	677.93	0.66	0.66	0.66
167	687.93	0.66	0.66	0.66
168	697.93	0.67	0.67	0.66
169	707.93	0.67	0.67	[illegible]
170	717.93	0.67	0.67	0.67
171	727.93	0.67	0.67	0.67
172	737.93	0.68	0.68	0.67
173	747.93	0.68	0.68	0.67
174	757.93	0.70	0.70	0.70
175	767.93	0.70	0.70	0.70
176	777.93	0.71	0.71	0.71
177	787.93	0.72	0.72	0.71
178	797.93	0.72	0.72	0.72
179	807.93	0.73	0.73	0.72
180	817.93	0.73	0.73	0.73
181	827.93	0.74	0.74	0.73
182	837.93	0.74	0.74	0.74
183	847.93	0.74	0.74	0.74
184	857.93	0.74	0.74	0.74
185	867.93	0.75	0.75	0.74
186	877.93	0.75	0.75	0.75
187	887.93	0.75	0.75	0.75
188	897.93	0.76	0.76	0.75
189	907.93	0.76	0.76	0.75
190	917.93	0.76	0.76	0.76
191	927.93	0.76	0.76	0.76
192	937.93	0.77	0.77	0.76
193	947.93	0.77	0.77	0.76
194	957.93	0.77	0.77	0.77
195	967.93	0.78	0.78	0.77
196	977.93	0.78	0.78	[illegible]
197	987.93	0.78	0.78	[illegible]
198	997.93	0.78	0.78	0.78
199	1007.93	0.79	0.79	0.78
200	1017.93	0.79	0.79	0.78

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 6
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PW-4	PW-4
Discharge 1.26 U.S.gal/min	Distance from the pumping well 126.00 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
201	1027.93	0.79	0.79	0.78
202	1037.93	0.79	0.79	0.78
203	1047.93	0.79	0.79	0.78
204	1057.93	0.79	0.79	0.79
205	1067.93	0.80	0.80	0.79
206	1077.93	0.80	0.80	0.79
207	1087.93	0.80	0.80	0.80
208	1097.93	0.81	0.81	0.80
209	1107.93	0.81	0.81	0.80
210	1117.93	0.81	0.81	0.80
211	1127.93	0.81	0.81	0.80
212	1137.93	0.81	0.81	0.81
213	1147.93	0.82	0.82	0.81
214	1157.93	0.82	0.82	0.81
215	1167.93	0.82	0.82	0.81
216	1177.93	0.82	0.82	0.82
217	1187.93	0.83	0.83	0.82
218	1197.93	0.83	0.83	0.83
219	1207.93	0.83	0.83	0.83
220	1217.93	0.84	0.84	0.83
221	1227.93	0.84	0.84	0.83
222	1237.93	0.84	0.84	0.84
223	1247.93	0.85	0.85	0.84
224	1257.93	0.84	0.84	0.84
225	1267.93	0.85	0.85	0.84
226	1277.93	0.85	0.85	0.84
227	1287.93	0.85	0.85	0.84
228	1297.93	0.85	0.85	0.85
229	1307.93	0.86	0.86	0.85
230	1317.93	0.86	0.86	0.85
231	1327.93	0.86	0.86	0.85
232	1337.93	0.86	0.86	0.86
233	1347.93	0.87	0.87	0.86
234	1357.93	0.87	0.87	0.86
235	1367.93	0.87	0.87	0.86
236	1377.93	0.87	0.87	0.86
237	1387.93	0.87	0.87	0.86
238	1397.93	0.87	0.87	0.86
239	1407.93	0.87	0.87	0.86
240	1417.93	0.87	0.87	0.87
241	1427.93	0.87	0.87	0.86
242	1437.93	0.88	0.88	0.87
243	1447.93	0.88	0.88	0.87
244	1457.93	0.88	0.88	0.87
245	1467.93	0.88	0.88	0.88
246	1477.93	0.88	0.88	0.88
247	1487.93	0.88	0.88	0.88
248	1497.93	0.89	0.89	0.88
249	1507.93	0.89	0.89	0.88
250	1517.93	0.89	0.89	0.88

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 7
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PW-4	PW-4
Discharge 1.26 U.S.gal/min	Distance from the pumping well 126.00 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
251	1527.93	0.89	0.89	0.89
252	1537.93	0.89	0.89	0.89
253	1547.93	0.90	0.90	0.89
254	1557.93	0.89	0.89	0.88
255	1567.93	0.90	0.90	0.89
256	1577.93	0.90	0.90	0.89
257	1587.93	0.90	0.90	0.89
258	1597.93	0.91	0.91	0.90
259	1607.93	0.91	0.91	0.91
260	1617.93	0.92	0.92	0.91
261	1627.93	0.91	0.91	0.91
262	1637.93	0.91	0.91	0.91
263	1647.93	0.92	0.92	0.91
264	1657.93	0.92	0.92	0.92
265	1667.93	0.92	0.92	0.92
266	1677.93	0.93	0.93	0.92
267	1687.93	0.93	0.93	0.92
268	1697.93	0.93	0.93	0.92
269	1707.93	0.93	0.93	[illegible]
270	1717.93	0.93	0.93	0.93
271	1727.93	0.94	0.94	0.93
272	1737.93	0.94	0.94	0.93
273	1747.93	0.94	0.94	0.94
274	1757.93	0.95	0.95	0.94
275	1767.93	0.95	0.95	0.94
276	1777.93	0.95	0.95	0.94
277	1787.93	0.95	0.95	0.94
278	1797.93	0.96	0.96	0.95
279	1807.93	0.96	0.96	0.95
280	1817.93	0.96	0.96	0.95
281	1827.93	0.96	0.96	0.95
282	1837.93	0.96	0.96	0.95
283	1847.93	0.97	0.97	0.96
284	1857.93	0.97	0.97	0.96
285	1867.93	0.97	0.97	0.96
286	1877.93	0.98	0.98	0.97
287	1887.93	0.98	0.98	0.97
288	1897.93	0.98	0.98	0.97
289	1907.93	0.98	0.98	0.97
290	1917.93	0.98	0.98	0.97
291	1927.93	0.98	0.98	0.97
292	1937.93	0.99	0.99	0.98
293	1947.93	0.99	0.99	0.98
294	1957.93	0.99	0.99	0.98
295	1967.93	0.99	0.99	0.99
296	1977.93	0.99	0.99	[illegible]
297	1987.93	1.00	1.00	[illegible]
298	1997.93	1.00	1.00	0.99
299	2007.93	1.01	1.01	1.00
300	2017.93	1.01	1.01	1.00

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 8
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PW-4	PW-4
Discharge 1.26 U.S.gal/min	Distance from the pumping well 126.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
301	2027.93	1.01	1.01	1.00
302	2037.93	1.01	1.01	1.00
303	2047.93	1.01	1.01	1.00
304	2057.93	1.01	1.01	1.00
305	2067.93	1.02	1.02	1.01
306	2077.93	1.02	1.02	1.01
307	2087.93	1.02	1.02	1.01
308	2097.93	1.02	1.02	1.01
309	2107.93	1.02	1.02	1.01
310	2117.93	1.02	1.02	1.01
311	2127.93	1.03	1.03	1.02
312	2137.93	1.03	1.03	1.02
313	2147.93	1.03	1.03	1.02
314	2157.93	1.03	1.03	1.02
315	2167.93	1.04	1.04	1.03
316	2177.93	1.04	1.04	1.03
317	2187.93	1.04	1.04	1.03
318	2197.93	1.05	1.05	1.03
319	2207.93	1.05	1.05	1.03
320	2217.93	1.05	1.05	1.03
321	2227.93	1.04	1.04	1.03
322	2237.93	1.04	1.04	1.03
323	2247.93	1.05	1.05	1.04
324	2257.93	1.05	1.05	1.04
325	2267.93	1.05	1.05	1.04
326	2277.93	1.06	1.06	1.04
327	2287.93	1.06	1.06	1.04
328	2297.93	1.06	1.06	1.04
329	2307.93	1.06	1.06	1.05
330	2317.93	1.06	1.06	1.05
331	2327.93	1.06	1.06	1.05
332	2337.93	1.06	1.06	1.05
333	2347.93	1.06	1.06	1.05
334	2357.93	1.07	1.07	1.05
335	2367.93	1.07	1.07	1.05
336	2377.93	1.07	1.07	1.05
337	2387.93	1.07	1.07	1.06
338	2397.93	1.07	1.07	1.06
339	2407.93	1.07	1.07	1.06
340	2417.93	1.07	1.07	1.06
341	2427.93	1.07	1.07	1.06
342	2437.93	1.07	1.07	1.06
343	2447.93	1.08	1.08	1.06
344	2457.93	1.07	1.07	1.06
345	2467.93	1.07	1.07	1.06
346	2477.93	1.08	1.08	1.06
347	2487.93	1.08	1.08	1.07
348	2497.93	1.08	1.08	1.07
349	2507.93	1.08	1.08	1.07
350	2517.93	1.09	1.09	1.08

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 9
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PW-4	PW-4
Discharge 1.26 U.S.gal/min	Distance from the pumping well 126.00 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
351	2527.93	1.09	1.09	1.08
352	2537.93	1.09	1.09	1.08
353	2547.93	1.09	1.09	1.08
354	2557.93	1.09	1.09	1.08
355	2567.93	1.10	1.10	1.08
356	2577.93	1.09	1.09	1.08
357	2587.93	1.10	1.10	1.08
358	2597.93	1.10	1.10	1.08
359	2607.93	1.09	1.09	1.08
360	2617.93	1.10	1.10	1.08
361	2627.93	1.10	1.10	1.08
362	2637.93	1.10	1.10	1.09
363	2647.93	1.10	1.10	1.09
364	2657.93	1.10	1.10	1.09
365	2667.93	1.10	1.10	1.09
366	2677.93	1.10	1.10	1.09
367	2687.93	1.11	1.11	1.09
368	2697.93	1.11	1.11	1.09
369	2707.93	1.11	1.11	[illegible]
370	2717.93	1.11	1.11	1.10
371	2727.93	1.11	1.11	1.10
372	2737.93	1.11	1.11	1.10
373	2747.93	1.11	1.11	1.10
374	2757.93	1.11	1.11	1.10
375	2767.93	1.12	1.12	1.11
376	2777.93	1.12	1.12	1.11
377	2787.93	1.12	1.12	1.10
378	2797.93	1.12	1.12	1.11
379	2807.93	1.12	1.12	1.11
380	2817.93	1.12	1.12	1.11
381	2827.93	1.12	1.12	1.11
382	2837.93	1.12	1.12	1.11
383	2847.93	1.12	1.12	1.11
384	2857.93	1.12	1.12	1.11
385	2867.93	1.12	1.12	1.11
386	2877.93	1.12	1.12	1.11
387	2887.93	1.12	1.12	1.11
388	2897.93	1.12	1.12	1.11
389	2907.93	1.12	1.12	1.11
390	2917.93	1.13	1.13	1.12
391	2927.93	1.13	1.13	1.12
392	2937.93	1.13	1.13	1.12
393	2947.93	1.13	1.13	1.12
394	2957.93	1.13	1.13	1.12
395	2967.93	1.13	1.13	1.12
396	2977.93	1.14	1.14	[illegible]
397	2987.93	1.13	1.13	[illegible]
398	2997.93	1.14	1.14	1.12
399	3007.93	1.13	1.13	1.12
400	3017.93	1.14	1.14	1.13

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 10
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PW-4	PW-4
Discharge 1.26 U.S.gal/min	Distance from the pumping well 126.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
401	3027.93	1.13	1.13	1.12
402	3037.93	1.14	1.14	1.13
403	3047.93	1.14	1.14	1.13
404	3057.93	1.14	1.14	1.12
405	3067.93	1.14	1.14	1.12
406	3077.93	1.14	1.14	1.13
407	3087.93	1.15	1.15	1.13
408	3097.93	1.15	1.15	1.13
409	3107.93	1.15	1.15	1.13
410	3117.93	1.15	1.15	1.13
411	3127.93	1.15	1.15	1.14
412	3137.93	1.15	1.15	1.14
413	3147.93	1.16	1.16	1.14
414	3157.93	1.16	1.16	1.14
415	3167.93	1.16	1.16	1.14
416	3177.93	1.16	1.16	1.14
417	3187.93	1.16	1.16	1.14
418	3197.93	1.16	1.16	1.15
419	3207.93	1.16	1.16	1.15
420	3217.93	1.16	1.16	1.15
421	3227.93	1.17	1.17	1.15
422	3237.93	1.17	1.17	1.16
423	3247.93	1.18	1.18	1.16
424	3257.93	1.17	1.17	1.16
425	3267.93	1.18	1.18	1.16
426	3277.93	1.18	1.18	1.17
427	3287.93	1.18	1.18	1.17
428	3297.93	1.18	1.18	1.17
429	3307.93	1.18	1.18	1.17
430	3317.93	1.18	1.18	1.17
431	3327.93	1.20	1.20	1.18
432	3337.93	1.20	1.20	1.19
433	3347.93	1.20	1.20	1.19
434	3357.93	1.21	1.21	1.19
435	3367.93	1.21	1.21	1.20
436	3377.93	1.21	1.21	1.20
437	3387.93	1.22	1.22	1.20
438	3397.93	1.22	1.22	1.21
439	3407.93	1.22	1.22	1.21
440	3417.93	1.23	1.23	1.21
441	3427.93	1.23	1.23	1.22
442	3437.93	1.24	1.24	1.22
443	3447.93	1.24	1.24	1.22
444	3457.93	1.24	1.24	1.22
445	3467.93	1.24	1.24	1.22
446	3477.93	1.24	1.24	1.23
447	3487.93	1.24	1.24	1.23
448	3497.93	1.25	1.25	1.23
449	3507.93	1.25	1.25	1.24
450	3517.93	1.25	1.25	1.24

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 11
		Project: Johnston County Landfill	
		Evaluated by: PJH	

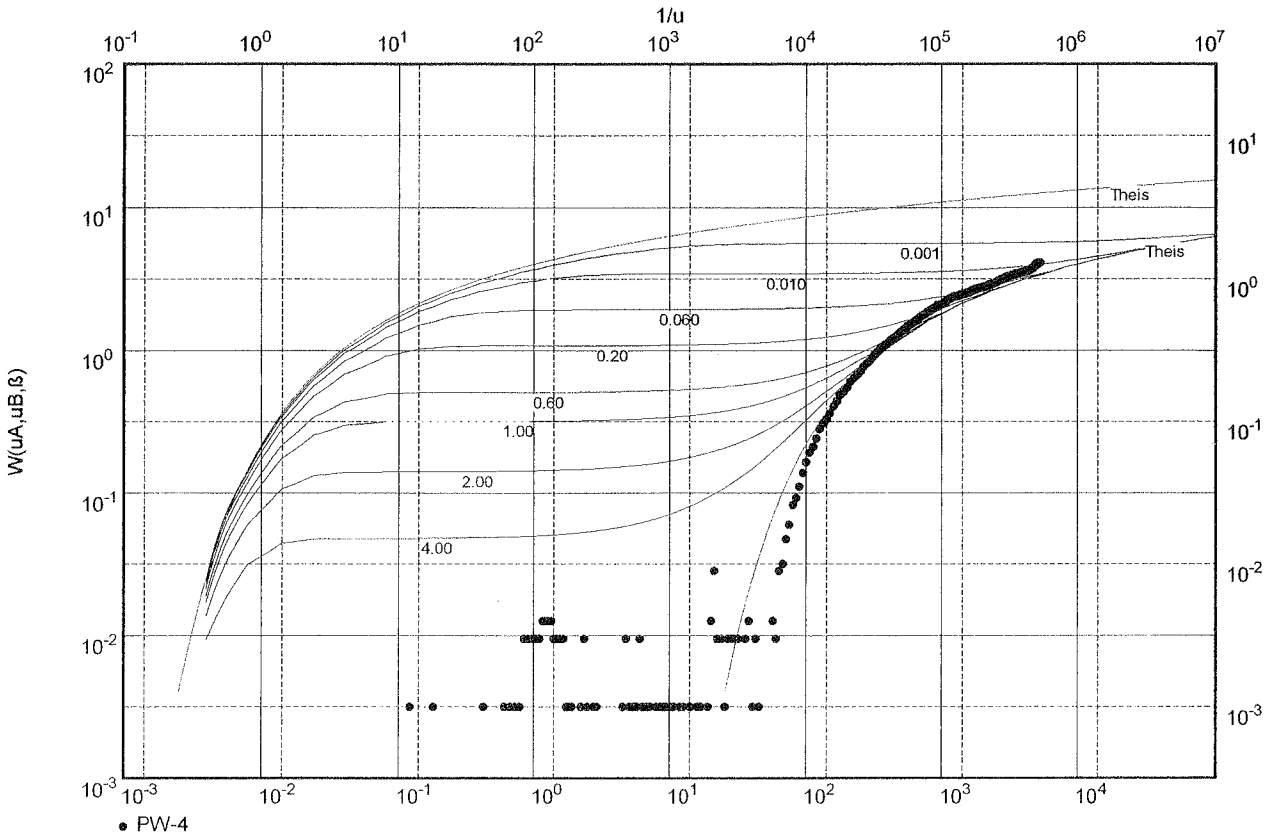
Pumping Test No. 1	Test conducted on: June 19, 2004
PW-4	PW-4
Discharge 1.26 U.S.gal/min	Distance from the pumping well 126.00 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
451	3527.93	1.26	1.26	1.24
452	3537.93	1.26	1.26	1.24
453	3547.93	1.26	1.26	1.25
454	3557.93	1.27	1.27	1.25
455	3567.93	1.27	1.27	1.25
456	3577.93	1.27	1.27	1.26
457	3587.93	1.28	1.28	1.26
458	3597.93	1.28	1.28	1.26
459	3607.93	1.28	1.28	1.27
460	3617.93	1.28	1.28	1.27
461	3627.93	1.28	1.28	1.27
462	3637.93	1.29	1.29	1.27
463	3647.93	1.29	1.29	1.27
464	3657.93	1.29	1.29	1.27
465	3667.93	1.29	1.29	1.27
466	3677.93	1.29	1.29	1.28
467	3687.93	1.30	1.30	1.28
468	3697.93	1.30	1.30	1.28
469	3707.93	1.30	1.30	[illegible]
470	3717.93	1.30	1.30	1.28
471	3727.93	1.30	1.30	1.28
472	3737.93	1.30	1.30	1.29

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis NEUMAN's method Unconfined aquifer with delayed watertable response	Date: June 30, 2004	Page 1
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PW-4	
Discharge 1.26 U.S.gal/min	



Transmissivity [ft²/min]: 4.22×10^{-2}

Hydraulic conductivity [ft/min]: 8.44×10^{-4}

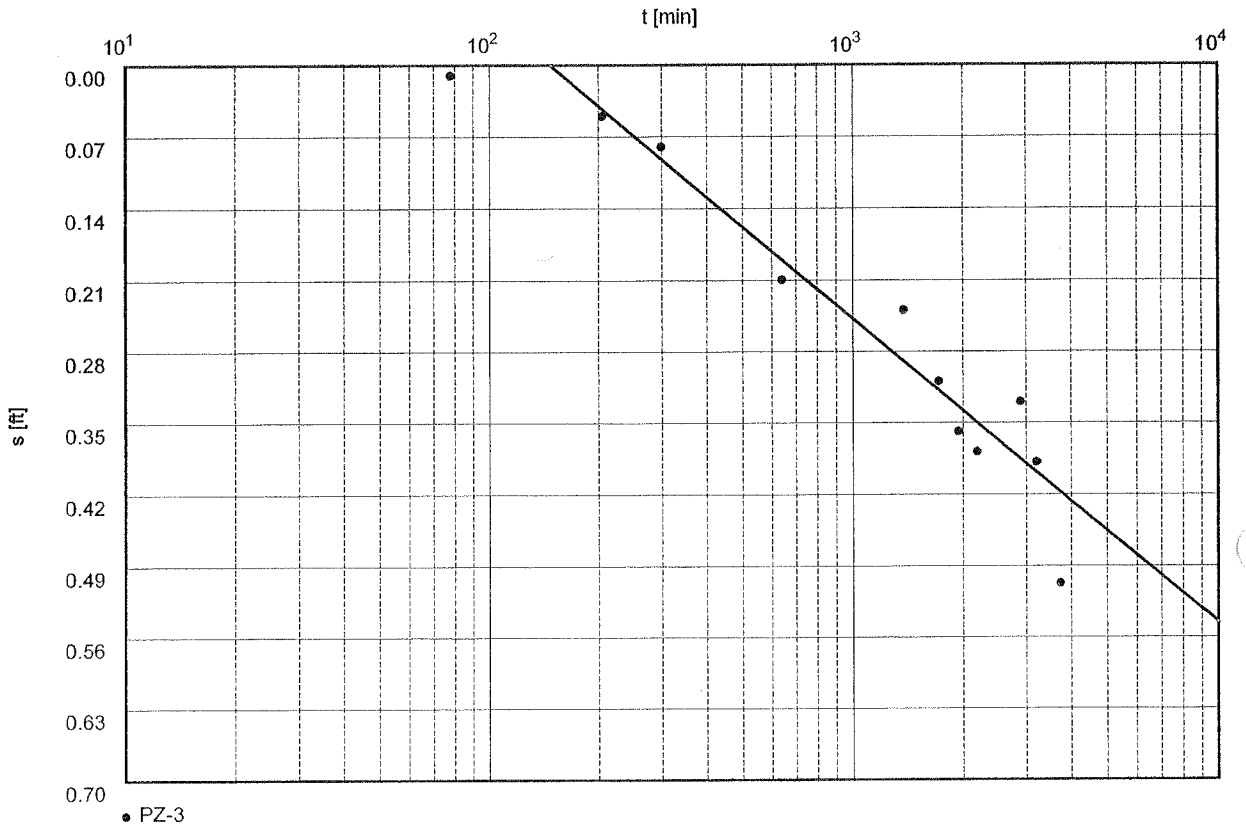
Aquifer thickness [ft]: 50.00

Storativity: 7.53×10^{-8}

Specific yield: 7.53×10^{-4}

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 1
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PZ-3	
Discharge 1.26 U.S.gal/min	



Transmissivity [ft²/min]: 1.03×10^{-1}

Hydraulic conductivity [ft/min]: 2.06×10^{-3}

Aquifer thickness [ft]: 50.00

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 2
		Project: Johnston County Landfill	
		Evaluated by: PJH	

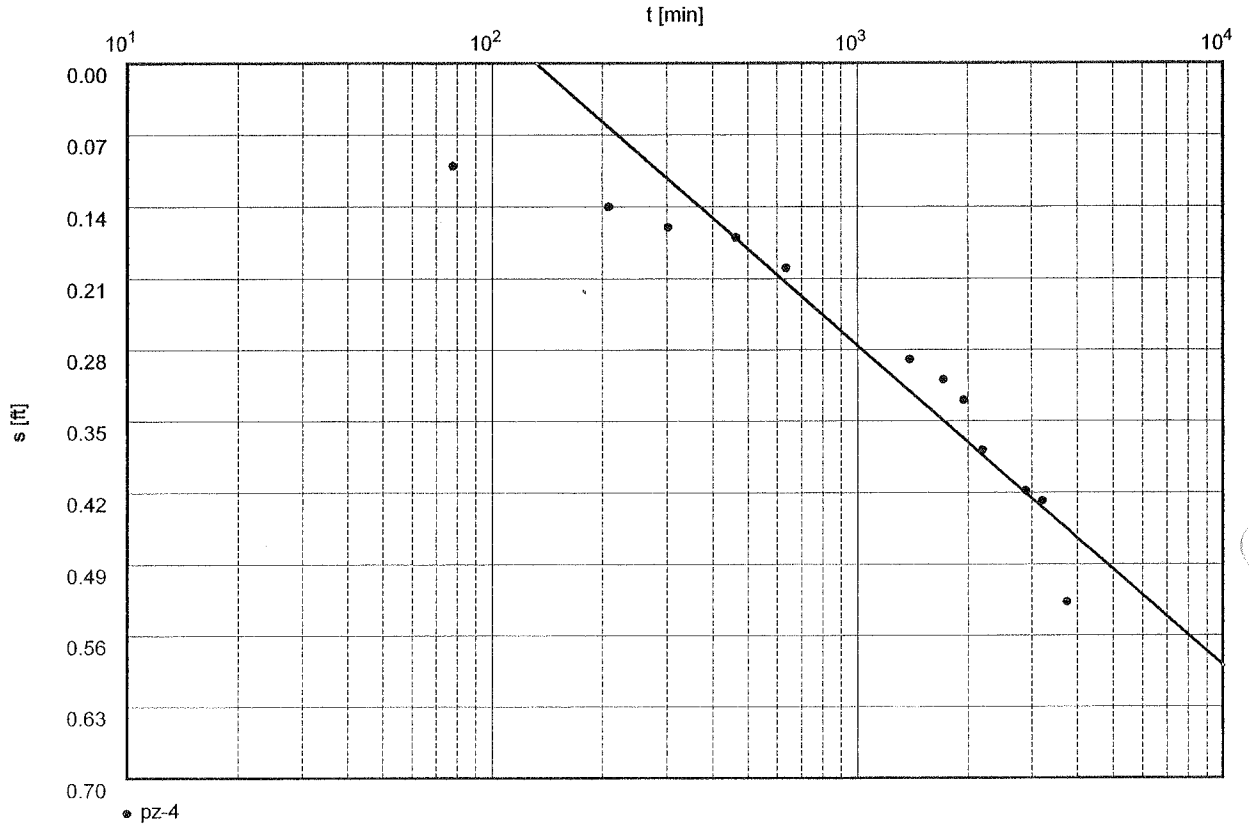
Pumping Test No. 1	Test conducted on: June 19, 2004
PZ-3	PZ-3
Discharge 1.26 U.S.gal/min	Distance from the pumping well 450.00 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
2	78.00	0.01	0.01	0.01
3	205.00	0.05	0.05	0.05
4	299.00	0.08	0.08	0.08
5	642.00	0.21	0.21	0.21
6	1380.00	0.24	0.24	0.24
7	1720.00	0.31	0.31	0.31
8	1946.00	0.36	0.36	0.36
9	2194.00	0.38	0.38	0.38
10	2888.00	0.33	0.33	0.33
11	3197.00	0.39	0.39	0.39
12	3718.00	0.51	0.51	0.51

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 1
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PZ-4	
Discharge 1.26 U.S.gal/min	



Transmissivity [ft²/min]: 9.78×10^{-2}

Hydraulic conductivity [ft/min]: 1.95×10^{-3}

Aquifer thickness [ft]: 50.00

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 2
		Project: Johnston County Landfill	
		Evaluated by: PJH	

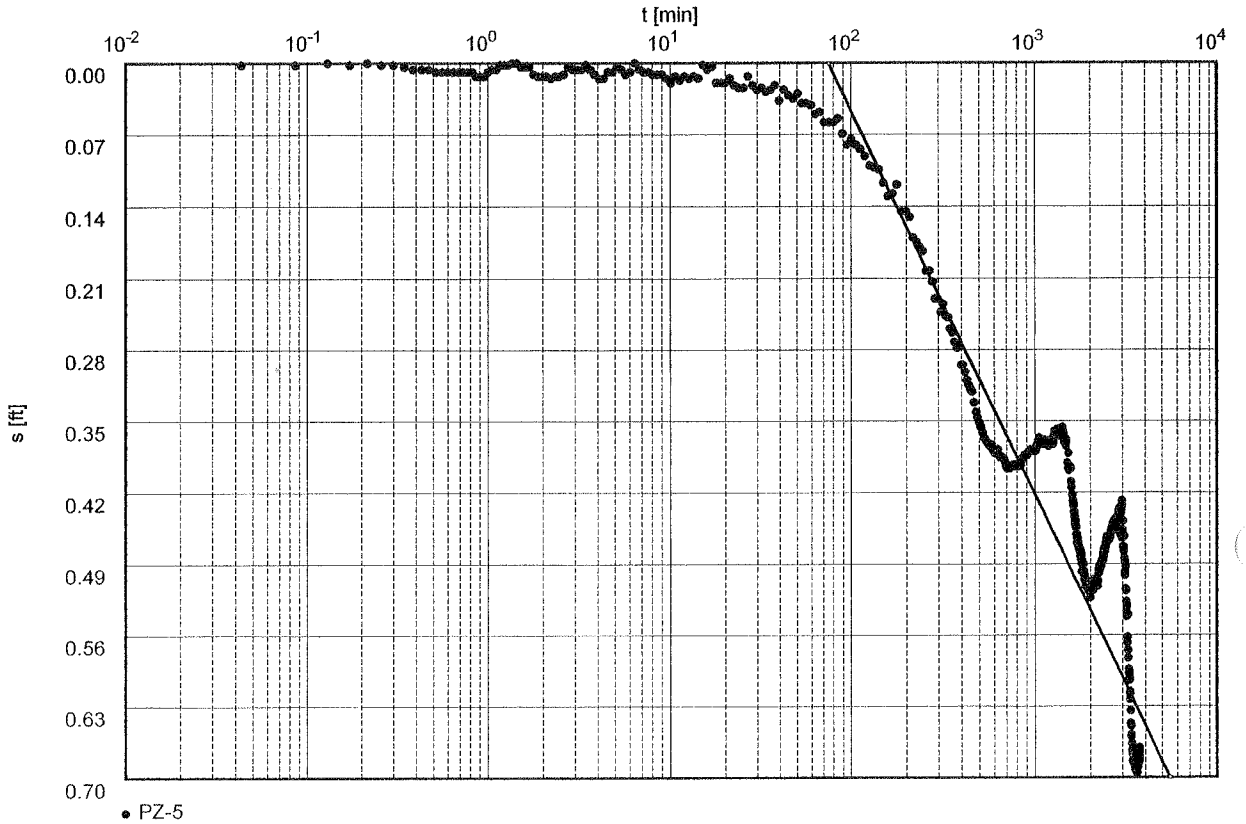
Pumping Test No. 1	Test conducted on: June 19, 2004
PZ-4	pz-4
Discharge 1.26 U.S.gal/min	Distance from the pumping well 560.00 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
2	78.00	0.10	0.10	0.10
3	209.00	0.14	0.14	0.14
4	302.00	0.16	0.16	0.16
5	462.00	0.17	0.17	0.17
6	636.00	0.20	0.20	0.20
7	1386.00	0.29	0.29	0.29
8	1708.00	0.31	0.31	0.31
9	1951.00	0.33	0.33	0.33
10	2199.00	0.38	0.38	0.38
11	2892.00	0.42	0.42	0.42
12	3200.00	0.43	0.43	0.43
13	3728.00	0.53	0.53	0.53

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 1
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PZ-5	
Discharge 1.26 U.S.gal/min	



Transmissivity [ft²/min]: 8.19×10^{-2}

Hydraulic conductivity [ft/min]: 1.63×10^{-3}

Aquifer thickness [ft]: 50.00

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 2
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PZ-5	PZ-5
Discharge 1.26 U.S.gal/min	Distance from the pumping well 164.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
2	0.04	0.00	0.00	0.00
3	0.09	0.00	0.00	0.00
4	0.13	0.00	0.00	0.00
5	0.17	0.00	0.00	0.00
6	0.21	0.00	0.00	0.00
7	0.26	0.00	0.00	0.00
8	0.30	0.00	0.00	0.00
9	0.34	0.00	0.00	0.00
10	0.39	0.01	0.01	0.01
11	0.43	0.01	0.01	0.01
12	0.47	0.01	0.01	0.01
13	0.52	0.01	0.01	0.01
14	0.56	0.01	0.01	0.01
15	0.60	0.01	0.01	0.01
16	0.65	0.01	0.01	0.01
17	0.69	0.01	0.01	0.01
18	0.73	0.01	0.01	0.01
19	0.77	0.01	0.01	0.01
20	0.82	0.01	0.01	0.01
21	0.86	0.01	0.01	0.01
22	0.90	0.01	0.01	0.01
23	0.95	0.01	0.01	0.01
24	1.00	0.01	0.01	0.01
25	1.05	0.01	0.01	0.01
26	1.11	0.01	0.01	0.01
27	1.17	0.00	0.00	0.00
28	1.23	0.00	0.00	0.00
29	1.30	0.00	0.00	0.00
30	1.37	0.00	0.00	0.00
31	1.44	0.00	0.00	0.00
32	1.52	0.00	0.00	0.00
33	1.61	0.00	0.00	0.00
34	1.69	0.00	0.00	0.00
35	1.79	0.01	0.01	0.01
36	1.89	0.01	0.01	0.01
37	1.99	0.01	0.01	0.01
38	2.10	0.01	0.01	0.01
39	2.22	0.02	0.02	0.01
40	2.35	0.01	0.01	0.01
41	2.48	0.01	0.01	0.01
42	2.62	0.01	0.01	0.01
43	2.77	0.00	0.00	0.00
44	2.93	0.01	0.01	0.01
45	3.09	0.01	0.01	0.01
46	3.27	0.01	0.01	0.01
47	3.46	0.00	0.00	0.00
48	3.66	0.01	0.01	0.01
49	3.87	0.01	0.01	0.01
50	4.09	0.02	0.02	0.01

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 3
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PZ-5	PZ-5
Discharge 1.26 U.S.gal/min	Distance from the pumping well 164.00 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
51	4.32	0.02	0.02	0.01
52	4.57	0.01	0.01	0.01
53	4.84	0.01	0.01	0.01
54	5.12	0.00	0.00	0.00
55	5.42	0.01	0.01	0.01
56	5.73	0.01	0.01	0.01
57	6.06	0.01	0.01	0.01
58	6.42	0.00	0.00	0.00
59	6.79	0.01	0.01	0.01
60	7.19	0.01	0.01	0.01
61	7.61	0.01	0.01	0.01
62	8.05	0.01	0.01	0.01
63	8.52	0.01	0.01	0.01
64	9.02	0.01	0.01	0.01
65	9.55	0.02	0.02	0.01
66	10.11	0.02	0.02	0.02
67	10.70	0.01	0.01	0.01
68	11.33	0.02	0.02	0.02
69	11.99	0.01	0.01	[illegible]
70	12.70	0.02	0.02	[illegible]
71	13.44	0.01	0.01	0.01
72	14.23	0.02	0.02	0.01
73	15.07	0.00	0.00	0.00
74	15.95	0.01	0.01	0.01
75	16.89	0.00	0.00	0.00
76	17.89	0.02	0.02	0.02
77	18.94	0.02	0.02	0.02
78	20.06	0.02	0.02	0.02
79	21.24	0.02	0.02	0.01
80	22.49	0.02	0.02	0.02
81	23.82	0.02	0.02	0.02
82	25.22	0.02	0.02	0.02
83	26.71	0.01	0.01	0.01
84	28.29	0.02	0.02	0.02
85	29.96	0.03	0.03	0.03
86	31.73	0.02	0.02	0.02
87	33.60	0.03	0.03	0.03
88	35.59	0.03	0.03	0.03
89	37.69	0.02	0.02	0.02
90	39.91	0.04	0.04	0.04
91	42.27	0.03	0.03	0.03
92	44.77	0.03	0.03	0.03
93	47.42	0.04	0.04	0.03
94	50.22	0.03	0.03	0.03
95	53.19	0.04	0.04	0.04
96	56.34	0.04	0.04	[illegible]
97	59.67	0.04	0.04	[illegible]
98	63.20	0.05	0.05	0.05
99	66.94	0.05	0.05	0.05
100	70.90	0.06	0.06	0.06

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 4
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PZ-5	PZ-5
Discharge 1.26 U.S.gal/min	Distance from the pumping well 164.00 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
101	75.09	0.06	0.06	0.06
102	79.54	0.06	0.06	0.06
103	84.24	0.05	0.05	0.05
104	89.23	0.07	0.07	0.07
105	94.51	0.08	0.08	0.08
106	100.10	0.07	0.07	0.07
107	106.03	0.08	0.08	0.08
108	112.30	0.08	0.08	0.08
109	118.95	0.09	0.09	0.09
110	126.00	0.10	0.10	0.10
111	133.45	0.10	0.10	0.10
112	141.36	0.10	0.10	0.10
113	149.73	0.12	0.12	0.12
114	158.59	0.13	0.13	0.13
115	167.98	0.13	0.13	0.13
116	177.93	0.12	0.12	0.12
117	187.93	0.14	0.14	0.14
118	197.93	0.14	0.14	0.14
119	207.93	0.15	0.15	0.15
120	217.93	0.17	0.17	0.17
121	227.93	0.17	0.17	0.17
122	237.93	0.18	0.18	0.18
123	247.93	0.18	0.18	0.18
124	257.93	0.20	0.20	0.20
125	267.93	0.20	0.20	0.20
126	277.93	0.21	0.21	0.21
127	287.93	0.23	0.23	0.23
128	297.93	0.23	0.23	0.23
129	307.93	0.24	0.24	0.24
130	317.93	0.24	0.24	0.24
131	327.93	0.25	0.25	0.25
132	337.93	0.25	0.25	0.25
133	347.93	0.26	0.26	0.26
134	357.93	0.26	0.26	0.26
135	367.93	0.27	0.27	0.27
136	377.93	0.28	0.28	0.28
137	387.93	0.28	0.28	0.28
138	397.93	0.30	0.30	0.30
139	407.93	0.30	0.30	0.30
140	417.93	0.30	0.30	0.30
141	427.93	0.31	0.31	0.31
142	437.93	0.32	0.32	0.32
143	447.93	0.32	0.32	0.32
144	457.93	0.32	0.32	0.32
145	467.93	0.33	0.33	0.33
146	477.93	0.34	0.34	0.34
147	487.93	0.35	0.35	0.35
148	497.93	0.35	0.35	0.35
149	507.93	0.36	0.36	0.36
150	517.93	0.36	0.36	0.36

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 5
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PZ-5	PZ-5
Discharge 1.26 U.S.gal/min	Distance from the pumping well 164.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
151	527.93	0.37	0.37	0.37
152	537.93	0.37	0.37	0.37
153	547.93	0.37	0.37	0.37
154	557.93	0.37	0.37	0.37
155	567.93	0.38	0.38	0.37
156	577.93	0.37	0.37	0.37
157	587.93	0.38	0.38	0.38
158	597.93	0.38	0.38	0.38
159	607.93	0.38	0.38	0.38
160	617.93	0.38	0.38	0.38
161	627.93	0.38	0.38	0.38
162	637.93	0.39	0.39	0.38
163	647.93	0.39	0.39	0.39
164	657.93	0.39	0.39	0.39
165	667.93	0.39	0.39	0.39
166	677.93	0.39	0.39	0.39
167	687.93	0.39	0.39	0.39
168	697.93	0.40	0.40	0.39
169	707.93	0.40	0.40	[illegible]
170	717.93	0.40	0.40	0.40
171	727.93	0.40	0.40	0.40
172	737.93	0.40	0.40	0.39
173	747.93	0.40	0.40	0.39
174	757.93	0.40	0.40	0.39
175	767.93	0.39	0.39	0.39
176	777.93	0.40	0.40	0.39
177	787.93	0.39	0.39	0.39
178	797.93	0.40	0.40	0.39
179	807.93	0.40	0.40	0.39
180	817.93	0.39	0.39	0.39
181	827.93	0.39	0.39	0.39
182	837.93	0.39	0.39	0.39
183	847.93	0.39	0.39	0.39
184	857.93	0.39	0.39	0.39
185	867.93	0.39	0.39	0.39
186	877.93	0.39	0.39	0.38
187	887.93	0.39	0.39	0.38
188	897.93	0.39	0.39	0.38
189	907.93	0.39	0.39	0.38
190	917.93	0.38	0.38	0.38
191	927.93	0.38	0.38	0.38
192	937.93	0.38	0.38	0.38
193	947.93	0.38	0.38	0.38
194	957.93	0.38	0.38	0.38
195	967.93	0.38	0.38	0.38
196	977.93	0.38	0.38	[illegible]
197	987.93	0.38	0.38	0.38
198	997.93	0.38	0.38	0.38
199	1007.93	0.38	0.38	0.38
200	1017.93	0.38	0.38	0.37

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 6
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PZ-5	PZ-5
Discharge 1.26 U.S.gal/min	Distance from the pumping well 164.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
201	1027.93	0.37	0.37	0.37
202	1037.93	0.37	0.37	0.37
203	1047.93	0.37	0.37	0.37
204	1057.93	0.37	0.37	0.37
205	1067.93	0.37	0.37	0.37
206	1077.93	0.37	0.37	0.37
207	1087.93	0.37	0.37	0.37
208	1097.93	0.37	0.37	0.37
209	1107.93	0.37	0.37	0.37
210	1117.93	0.37	0.37	0.37
211	1127.93	0.37	0.37	0.37
212	1137.93	0.37	0.37	0.37
213	1147.93	0.37	0.37	0.37
214	1157.93	0.37	0.37	0.37
215	1167.93	0.37	0.37	0.37
216	1177.93	0.37	0.37	0.37
217	1187.93	0.38	0.38	0.37
218	1197.93	0.37	0.37	0.37
219	1207.93	0.37	0.37	0.37
220	1217.93	0.37	0.37	0.37
221	1227.93	0.37	0.37	0.37
222	1237.93	0.37	0.37	0.37
223	1247.93	0.37	0.37	0.37
224	1257.93	0.37	0.37	0.37
225	1267.93	0.37	0.37	0.36
226	1277.93	0.36	0.36	0.36
227	1287.93	0.36	0.36	0.36
228	1297.93	0.37	0.37	0.36
229	1307.93	0.36	0.36	0.36
230	1317.93	0.36	0.36	0.36
231	1327.93	0.36	0.36	0.36
232	1337.93	0.36	0.36	0.36
233	1347.93	0.36	0.36	0.36
234	1357.93	0.36	0.36	0.36
235	1367.93	0.37	0.37	0.36
236	1377.93	0.37	0.37	0.36
237	1387.93	0.36	0.36	0.36
238	1397.93	0.36	0.36	0.36
239	1407.93	0.36	0.36	0.36
240	1417.93	0.36	0.36	0.36
241	1427.93	0.36	0.36	0.36
242	1437.93	0.37	0.37	0.37
243	1447.93	0.37	0.37	0.37
244	1457.93	0.37	0.37	0.37
245	1467.93	0.38	0.38	0.37
246	1477.93	0.37	0.37	0.37
247	1487.93	0.37	0.37	0.37
248	1497.93	0.39	0.39	0.39
249	1507.93	0.40	0.40	0.40
250	1517.93	0.38	0.38	0.38

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 7
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PZ-5	PZ-5
Discharge 1.26 U.S.gal/min	Distance from the pumping well 164.00 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
251	1527.93	0.39	0.39	0.39
252	1537.93	0.40	0.40	0.40
253	1547.93	0.40	0.40	0.40
254	1557.93	0.40	0.40	0.39
255	1567.93	0.41	0.41	0.41
256	1577.93	0.40	0.40	0.40
257	1587.93	0.42	0.42	0.42
258	1597.93	0.42	0.42	0.42
259	1607.93	0.43	0.43	0.43
260	1617.93	0.43	0.43	0.43
261	1627.93	0.43	0.43	0.43
262	1637.93	0.44	0.44	0.44
263	1647.93	0.45	0.45	0.44
264	1657.93	0.45	0.45	0.45
265	1667.93	0.45	0.45	0.45
266	1677.93	0.46	0.46	0.45
267	1687.93	0.46	0.46	0.46
268	1697.93	0.47	0.47	0.46
269	1707.93	0.47	0.47	[illegible]
270	1717.93	0.47	0.47	[illegible]
271	1727.93	0.48	0.48	0.47
272	1737.93	0.48	0.48	0.47
273	1747.93	0.48	0.48	0.48
274	1757.93	0.48	0.48	0.48
275	1767.93	0.48	0.48	0.48
276	1777.93	0.49	0.49	0.48
277	1787.93	0.49	0.49	0.49
278	1797.93	0.49	0.49	0.49
279	1807.93	0.50	0.50	0.50
280	1817.93	0.49	0.49	0.49
281	1827.93	0.49	0.49	0.49
282	1837.93	0.49	0.49	0.49
283	1847.93	0.50	0.50	0.50
284	1857.93	0.50	0.50	0.50
285	1867.93	0.51	0.51	0.51
286	1877.93	0.51	0.51	0.51
287	1887.93	0.52	0.52	0.51
288	1897.93	0.52	0.52	0.51
289	1907.93	0.51	0.51	0.51
290	1917.93	0.52	0.52	0.51
291	1927.93	0.51	0.51	0.51
292	1937.93	0.52	0.52	0.51
293	1947.93	0.52	0.52	0.52
294	1957.93	0.52	0.52	0.52
295	1967.93	0.52	0.52	0.52
296	1977.93	0.52	0.52	[illegible]
297	1987.93	0.52	0.52	[illegible]
298	1997.93	0.52	0.52	0.52
299	2007.93	0.53	0.53	0.52
300	2017.93	0.52	0.52	0.51

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 8
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PZ-5	PZ-5
Discharge 1.26 U.S.gal/min	Distance from the pumping well 164.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
301	2027.93	0.52	0.52	0.51
302	2037.93	0.52	0.52	0.51
303	2047.93	0.52	0.52	0.51
304	2057.93	0.52	0.52	0.51
305	2067.93	0.52	0.52	0.52
306	2077.93	0.52	0.52	0.51
307	2087.93	0.52	0.52	0.51
308	2097.93	0.52	0.52	0.51
309	2107.93	0.51	0.51	0.51
310	2117.93	0.51	0.51	0.51
311	2127.93	0.51	0.51	0.51
312	2137.93	0.51	0.51	0.51
313	2147.93	0.51	0.51	0.51
314	2157.93	0.51	0.51	0.51
315	2167.93	0.51	0.51	0.51
316	2177.93	0.51	0.51	0.51
317	2187.93	0.52	0.52	0.51
318	2197.93	0.52	0.52	0.51
319	2207.93	0.51	0.51	0.51
320	2217.93	0.50	0.50	0.50
321	2227.93	0.50	0.50	0.50
322	2237.93	0.50	0.50	0.50
323	2247.93	0.49	0.49	0.49
324	2257.93	0.50	0.50	0.50
325	2267.93	0.50	0.50	0.50
326	2277.93	0.49	0.49	0.49
327	2287.93	0.49	0.49	0.49
328	2297.93	0.49	0.49	0.49
329	2307.93	0.49	0.49	0.49
330	2317.93	0.49	0.49	0.49
331	2327.93	0.49	0.49	0.49
332	2337.93	0.49	0.49	0.48
333	2347.93	0.49	0.49	0.48
334	2357.93	0.48	0.48	0.48
335	2367.93	0.48	0.48	0.48
336	2377.93	0.48	0.48	0.48
337	2387.93	0.48	0.48	0.48
338	2397.93	0.48	0.48	0.48
339	2407.93	0.48	0.48	0.47
340	2417.93	0.48	0.48	0.47
341	2427.93	0.47	0.47	0.47
342	2437.93	0.47	0.47	0.47
343	2447.93	0.47	0.47	0.47
344	2457.93	0.47	0.47	0.46
345	2467.93	0.47	0.47	0.46
346	2477.93	0.47	0.47	0.46
347	2487.93	0.47	0.47	0.46
348	2497.93	0.47	0.47	0.47
349	2507.93	0.47	0.47	0.47
350	2517.93	0.47	0.47	0.47

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 9
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PZ-5	PZ-5
Discharge 1.26 U.S.gal/min	Distance from the pumping well 164.00 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
351	2527.93	0.47	0.47	0.47
352	2537.93	0.47	0.47	0.46
353	2547.93	0.47	0.47	0.46
354	2557.93	0.47	0.47	0.46
355	2567.93	0.47	0.47	0.46
356	2577.93	0.46	0.46	0.46
357	2587.93	0.46	0.46	0.46
358	2597.93	0.46	0.46	0.46
359	2607.93	0.46	0.46	0.45
360	2617.93	0.46	0.46	0.46
361	2627.93	0.46	0.46	0.45
362	2637.93	0.46	0.46	0.45
363	2647.93	0.46	0.46	0.45
364	2657.93	0.46	0.46	0.45
365	2667.93	0.45	0.45	0.45
366	2677.93	0.45	0.45	0.45
367	2687.93	0.46	0.46	0.45
368	2697.93	0.45	0.45	0.45
369	2707.93	0.45	0.45	
370	2717.93	0.46	0.46	
371	2727.93	0.46	0.46	0.46
372	2737.93	0.45	0.45	0.45
373	2747.93	0.45	0.45	0.45
374	2757.93	0.45	0.45	0.45
375	2767.93	0.45	0.45	0.45
376	2777.93	0.45	0.45	0.45
377	2787.93	0.45	0.45	0.44
378	2797.93	0.45	0.45	0.44
379	2807.93	0.45	0.45	0.45
380	2817.93	0.45	0.45	0.45
381	2827.93	0.45	0.45	0.44
382	2837.93	0.45	0.45	0.44
383	2847.93	0.45	0.45	0.44
384	2857.93	0.44	0.44	0.44
385	2867.93	0.44	0.44	0.44
386	2877.93	0.44	0.44	0.44
387	2887.93	0.44	0.44	0.44
388	2897.93	0.44	0.44	0.44
389	2907.93	0.44	0.44	0.44
390	2917.93	0.46	0.46	0.46
391	2927.93	0.44	0.44	0.44
392	2937.93	0.44	0.44	0.44
393	2947.93	0.44	0.44	0.44
394	2957.93	0.44	0.44	0.44
395	2967.93	0.43	0.43	0.43
396	2977.93	0.47	0.47	
397	2987.93	0.43	0.43	
398	2997.93	0.46	0.46	0.46
399	3007.93	0.46	0.46	0.46
400	3017.93	0.48	0.48	0.47

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 10
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PZ-5	PZ-5
Discharge 1.26 U.S.gal/min	Distance from the pumping well 164.00 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
401	3027.93	0.45	0.45	0.45
402	3037.93	0.48	0.48	0.47
403	3047.93	0.48	0.48	0.48
404	3057.93	0.48	0.48	0.48
405	3067.93	0.47	0.47	0.46
406	3077.93	0.49	0.49	0.48
407	3087.93	0.50	0.50	0.50
408	3097.93	0.49	0.49	0.49
409	3107.93	0.50	0.50	0.50
410	3117.93	0.49	0.49	0.49
411	3127.93	0.52	0.52	0.51
412	3137.93	0.52	0.52	0.52
413	3147.93	0.54	0.54	0.54
414	3157.93	0.53	0.53	0.53
415	3167.93	0.53	0.53	0.53
416	3177.93	0.55	0.55	0.54
417	3187.93	0.54	0.54	0.54
418	3197.93	0.57	0.57	0.57
419	3207.93	0.56	0.56	0.56
420	3217.93	0.54	0.54	0.54
421	3227.93	0.58	0.58	0.57
422	3237.93	0.59	0.59	0.58
423	3247.93	0.60	0.60	0.60
424	3257.93	0.60	0.60	0.59
425	3267.93	0.60	0.60	0.60
426	3277.93	0.61	0.61	0.60
427	3287.93	0.61	0.61	0.60
428	3297.93	0.62	0.62	0.62
429	3307.93	0.62	0.62	0.62
430	3317.93	0.63	0.63	0.62
431	3327.93	0.64	0.64	0.63
432	3337.93	0.65	0.65	0.65
433	3347.93	0.65	0.65	0.65
434	3357.93	0.66	0.66	0.66
435	3367.93	0.66	0.66	0.66
436	3377.93	0.67	0.67	0.67
437	3387.93	0.67	0.67	0.67
438	3397.93	0.68	0.68	0.67
439	3407.93	0.68	0.68	0.67
440	3417.93	0.68	0.68	0.68
441	3427.93	0.69	0.69	0.68
442	3437.93	0.69	0.69	0.69
443	3447.93	0.69	0.69	0.68
444	3457.93	0.69	0.69	0.68
445	3467.93	0.69	0.69	0.69
446	3477.93	0.69	0.69	0.69
447	3487.93	0.69	0.69	0.69
448	3497.93	0.69	0.69	0.69
449	3507.93	0.69	0.69	0.69
450	3517.93	0.69	0.69	0.69

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 11
		Project: Johnston County Landfill	
		Evaluated by: PJH	

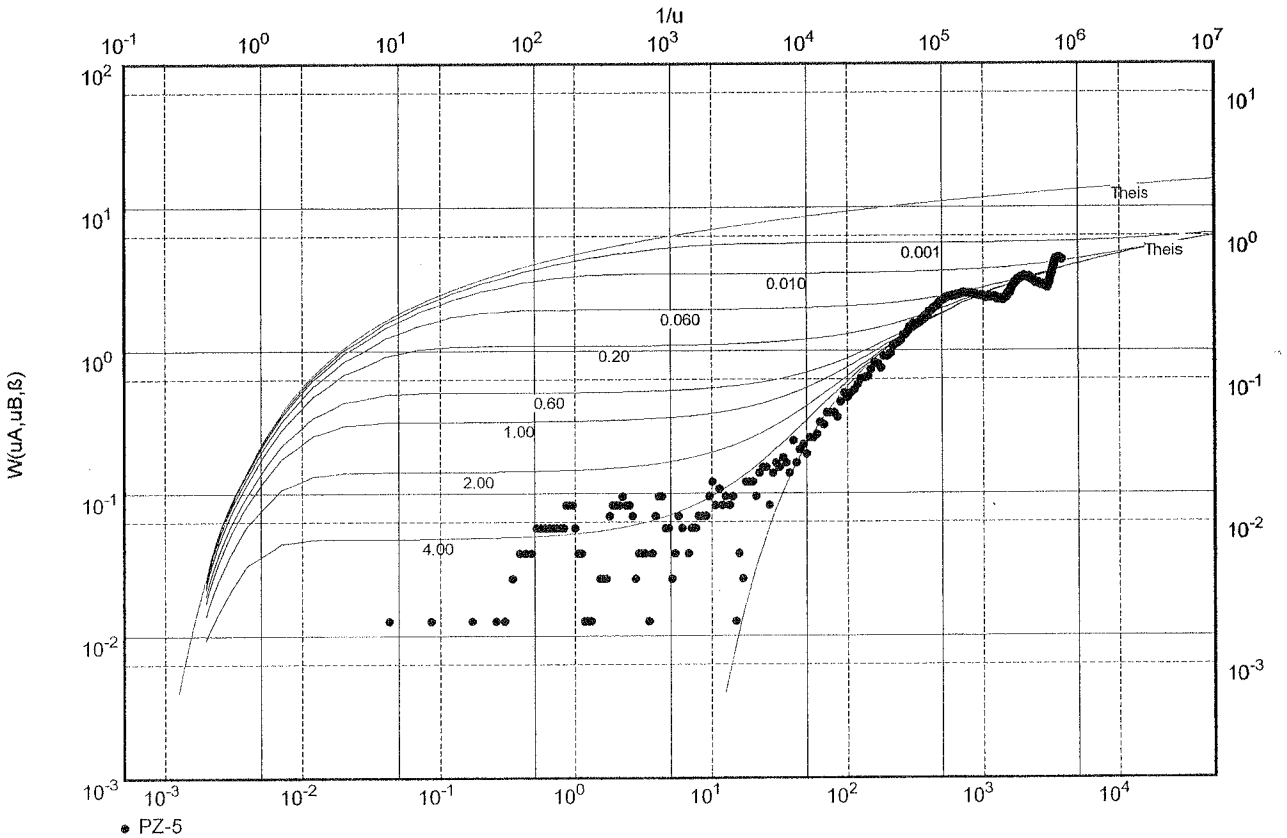
Pumping Test No. 1	Test conducted on: June 19, 2004
PZ-5	PZ-5
Discharge 1.26 U.S.gal/min	Distance from the pumping well 164.00 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
451	3527.93	0.69	0.69	0.69
452	3537.93	0.70	0.70	0.69
453	3547.93	0.69	0.69	0.69
454	3557.93	0.69	0.69	0.69
455	3567.93	0.70	0.70	0.69
456	3577.93	0.70	0.70	0.69
457	3587.93	0.70	0.70	0.69
458	3597.93	0.70	0.70	0.69
459	3607.93	0.70	0.70	0.69
460	3617.93	0.70	0.70	0.69
461	3627.93	0.69	0.69	0.69
462	3637.93	0.69	0.69	0.69
463	3647.93	0.69	0.69	0.69
464	3657.93	0.69	0.69	0.69
465	3667.93	0.68	0.68	0.68
466	3677.93	0.69	0.69	0.68
467	3687.93	0.69	0.69	0.68
468	3697.93	0.69	0.69	0.68
469	3707.93	0.69	0.69	[illegible]
470	3717.93	0.68	0.68	0.68
471	3727.93	0.68	0.68	0.67
472	3737.93	0.68	0.68	0.67

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis NEUMAN's method Unconfined aquifer with delayed watertable response	Date: June 30, 2004	Page 1
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PZ-5	
Discharge 1.26 U.S.gal/min	



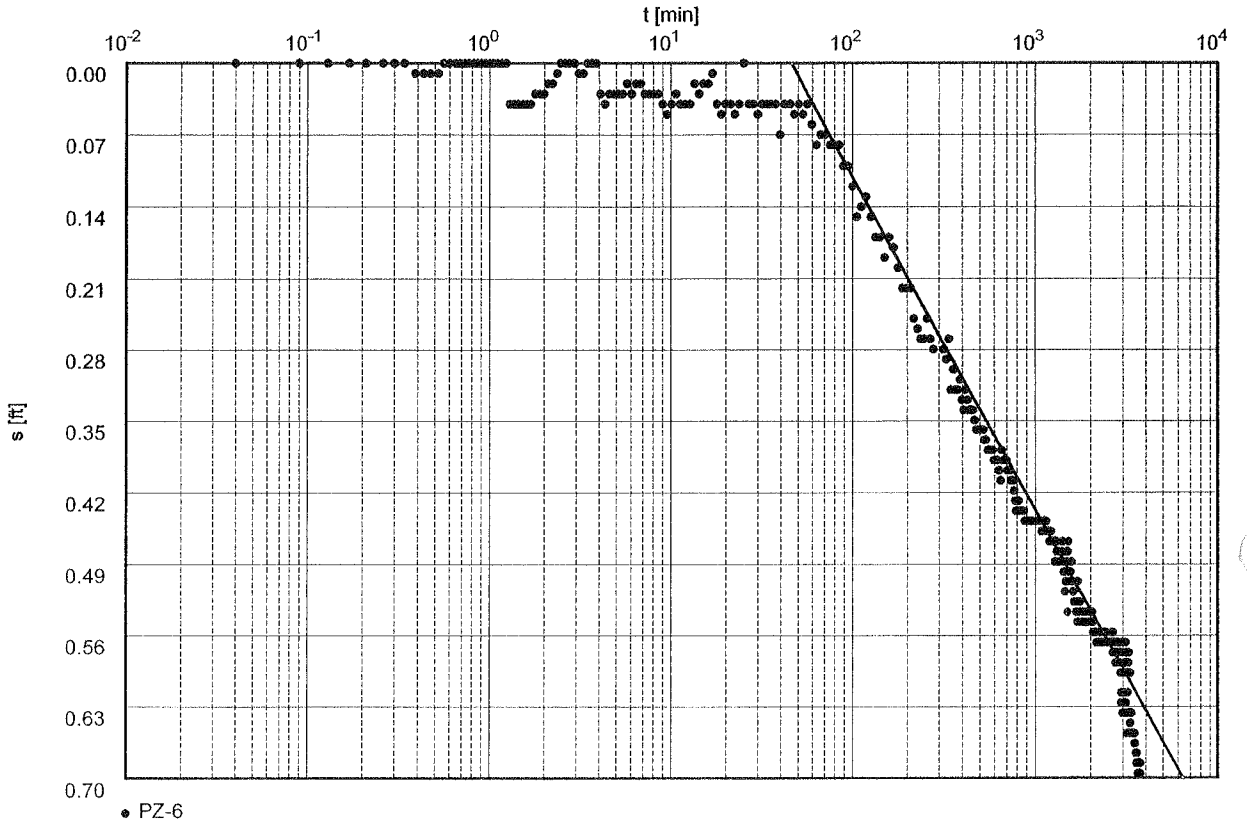
Transmissivity [ft²/min]: 8.42×10^{-2}

Hydraulic conductivity [ft/min]: 1.68×10^{-3}

Aquifer thickness [ft]: 50.00

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 1
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PZ-6	
Discharge 1.26 U.S.gal/min	



Transmissivity [ft²/min]: 9.42×10^{-2}

Hydraulic conductivity [ft/min]: 1.88×10^{-3}

Aquifer thickness [ft]: 50.00

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 2
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PZ-6	PZ-6
Discharge 1.26 U.S.gal/min	Distance from the pumping well 302.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
2	0.04	0.00	0.00	0.00
3	0.09	0.00	0.00	0.00
4	0.13	0.00	0.00	0.00
5	0.17	0.00	0.00	0.00
6	0.21	0.00	0.00	0.00
7	0.26	0.00	0.00	0.00
8	0.30	0.00	0.00	0.00
9	0.34	0.00	0.00	0.00
10	0.39	0.01	0.01	0.01
11	0.43	0.01	0.01	0.01
12	0.47	0.01	0.01	0.01
13	0.52	0.01	0.01	0.01
14	0.56	0.00	0.00	0.00
15	0.60	0.00	0.00	0.00
16	0.65	0.00	0.00	0.00
17	0.69	0.00	0.00	0.00
18	0.73	0.00	0.00	0.00
19	0.77	0.00	0.00	0.00
20	0.82	0.00	0.00	0.00
21	0.86	0.00	0.00	0.00
22	0.90	0.00	0.00	0.00
23	0.95	0.00	0.00	0.00
24	1.00	0.00	0.00	0.00
25	1.05	0.00	0.00	0.00
26	1.11	0.00	0.00	0.00
27	1.17	0.00	0.00	0.00
28	1.23	0.00	0.00	0.00
29	1.30	0.04	0.04	0.04
30	1.37	0.04	0.04	0.04
31	1.44	0.04	0.04	0.04
32	1.52	0.04	0.04	0.04
33	1.61	0.04	0.04	0.04
34	1.69	0.04	0.04	0.04
35	1.79	0.03	0.03	0.03
36	1.89	0.03	0.03	0.03
37	1.99	0.03	0.03	0.03
38	2.10	0.02	0.02	0.02
39	2.22	0.02	0.02	0.02
40	2.35	0.01	0.01	0.01
41	2.48	0.00	0.00	0.00
42	2.62	0.00	0.00	0.00
43	2.77	0.00	0.00	0.00
44	2.93	0.00	0.00	0.00
45	3.09	0.01	0.01	0.01
46	3.27	0.01	0.01	0.01
47	3.46	0.00	0.00	0.00
48	3.66	0.00	0.00	0.00
49	3.87	0.00	0.00	0.00
50	4.09	0.03	0.03	0.03

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 3
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PZ-6	PZ-6
Discharge 1.26 U.S.gal/min	Distance from the pumping well 302.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
51	4.32	0.04	0.04	0.04
52	4.57	0.03	0.03	0.03
53	4.84	0.03	0.03	0.03
54	5.12	0.03	0.03	0.03
55	5.42	0.03	0.03	0.03
56	5.73	0.02	0.02	0.02
57	6.06	0.03	0.03	0.03
58	6.42	0.02	0.02	0.02
59	6.79	0.02	0.02	0.02
60	7.19	0.03	0.03	0.03
61	7.61	0.03	0.03	0.03
62	8.05	0.03	0.03	0.03
63	8.52	0.03	0.03	0.03
64	9.02	0.04	0.04	0.04
65	9.55	0.05	0.05	0.05
66	10.11	0.04	0.04	0.04
67	10.70	0.03	0.03	0.03
68	11.33	0.04	0.04	0.04
69	11.99	0.04	0.04	[illegible]
70	12.70	0.04	0.04	[illegible]
71	13.44	0.02	0.02	0.02
72	14.23	0.03	0.03	0.03
73	15.07	0.02	0.02	0.02
74	15.95	0.02	0.02	0.02
75	16.89	0.01	0.01	0.01
76	17.89	0.04	0.04	0.04
77	18.94	0.05	0.05	0.05
78	20.06	0.04	0.04	0.04
79	21.24	0.04	0.04	0.04
80	22.49	0.05	0.05	0.05
81	23.82	0.04	0.04	0.04
82	25.22	0.00	0.00	0.00
83	26.71	0.04	0.04	0.04
84	28.29	0.04	0.04	0.04
85	29.96	0.05	0.05	0.05
86	31.73	0.04	0.04	0.04
87	33.60	0.04	0.04	0.04
88	35.59	0.04	0.04	0.04
89	37.69	0.04	0.04	0.04
90	39.91	0.07	0.07	0.07
91	42.27	0.04	0.04	0.04
92	44.77	0.04	0.04	0.04
93	47.42	0.05	0.05	0.05
94	50.22	0.04	0.04	0.04
95	53.19	0.05	0.05	0.05
96	56.34	0.04	0.04	[illegible]
97	59.67	0.06	0.06	[illegible]
98	63.20	0.08	0.08	0.08
99	66.94	0.07	0.07	0.07
100	70.90	0.07	0.07	0.07

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 4
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PZ-6	PZ-6
Discharge 1.26 U.S.gal/min	Distance from the pumping well 302.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
101	75.09	0.08	0.08	0.08
102	79.54	0.08	0.08	0.08
103	84.24	0.08	0.08	0.08
104	89.23	0.10	0.10	0.10
105	94.51	0.10	0.10	0.10
106	100.10	0.12	0.12	0.12
107	106.03	0.15	0.15	0.15
108	112.30	0.14	0.14	0.14
109	118.95	0.13	0.13	0.13
110	126.00	0.15	0.15	0.15
111	133.45	0.17	0.17	0.17
112	141.36	0.17	0.17	0.17
113	149.73	0.19	0.19	0.19
114	158.59	0.17	0.17	0.17
115	167.98	0.18	0.18	0.18
116	177.93	0.20	0.20	0.20
117	187.93	0.22	0.22	0.22
118	197.93	0.22	0.22	0.22
119	207.93	0.22	0.22	0.22
120	217.93	0.25	0.25	0.25
121	227.93	0.26	0.26	0.26
122	237.93	0.27	0.27	0.27
123	247.93	0.27	0.27	0.27
124	257.93	0.25	0.25	0.25
125	267.93	0.27	0.27	0.27
126	277.93	0.28	0.28	0.28
127	317.93	0.28	0.28	0.28
128	327.93	0.29	0.29	0.29
129	337.93	0.27	0.27	0.27
130	347.93	0.32	0.32	0.32
131	357.93	0.30	0.30	0.30
132	367.93	0.32	0.32	0.32
133	377.93	0.32	0.32	0.32
134	387.93	0.31	0.31	0.31
135	397.93	0.33	0.33	0.33
136	407.93	0.34	0.34	0.34
137	417.93	0.32	0.32	0.32
138	427.93	0.33	0.33	0.33
139	437.93	0.34	0.34	0.34
140	447.93	0.34	0.34	0.34
141	457.93	0.34	0.34	0.34
142	467.93	0.35	0.35	0.35
143	477.93	0.36	0.36	0.36
144	487.93	0.36	0.36	0.36
145	497.93	0.36	0.36	0.36
146	507.93	0.36	0.36	0.36
147	517.93	0.36	0.36	0.36
148	527.93	0.37	0.37	0.37
149	537.93	0.37	0.37	0.37
150	547.93	0.38	0.38	0.38

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 5
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PZ-6	PZ-6
Discharge 1.26 U.S.gal/min	Distance from the pumping well 302.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
151	557.93	0.38	0.38	0.38
152	567.93	0.38	0.38	0.38
153	577.93	0.38	0.38	0.38
154	587.93	0.38	0.38	0.38
155	597.93	0.39	0.39	0.39
156	607.93	0.39	0.39	0.39
157	617.93	0.39	0.39	0.39
158	627.93	0.39	0.39	0.39
159	637.93	0.40	0.40	0.40
160	647.93	0.41	0.41	0.41
161	657.93	0.38	0.38	0.38
162	667.93	0.39	0.39	0.39
163	677.93	0.39	0.39	0.39
164	687.93	0.39	0.39	0.39
165	697.93	0.39	0.39	0.39
166	707.93	0.40	0.40	0.40
167	717.93	0.40	0.40	0.40
168	727.93	0.40	0.40	0.40
169	737.93	0.41	0.41	[illegible]
170	747.93	0.41	0.41	0.41
171	757.93	0.41	0.41	0.41
172	767.93	0.42	0.42	0.42
173	777.93	0.43	0.43	0.43
174	787.93	0.44	0.44	0.44
175	797.93	0.43	0.43	0.43
176	807.93	0.43	0.43	0.43
177	817.93	0.44	0.44	0.44
178	827.93	0.44	0.44	0.44
179	837.93	0.44	0.44	0.44
180	847.93	0.44	0.44	0.44
181	857.93	0.44	0.44	0.44
182	867.93	0.44	0.44	0.44
183	877.93	0.45	0.45	0.45
184	887.93	0.45	0.45	0.45
185	897.93	0.45	0.45	0.45
186	907.93	0.45	0.45	0.45
187	917.93	0.45	0.45	0.45
188	927.93	0.45	0.45	0.45
189	937.93	0.45	0.45	0.45
190	947.93	0.45	0.45	0.45
191	957.93	0.45	0.45	0.45
192	967.93	0.45	0.45	0.45
193	977.93	0.45	0.45	0.45
194	987.93	0.45	0.45	0.45
195	997.93	0.45	0.45	0.45
196	1007.93	0.45	0.45	[illegible]
197	1017.93	0.45	0.45	0.45
198	1027.93	0.45	0.45	0.45
199	1037.93	0.45	0.45	0.45
200	1047.93	0.45	0.45	0.45

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 6
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PZ-6	PZ-6
Discharge 1.26 U.S.gal/min	Distance from the pumping well 302.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
201	1057.93	0.45	0.45	0.45
202	1067.93	0.45	0.45	0.45
203	1077.93	0.45	0.45	0.45
204	1087.93	0.46	0.46	0.46
205	1097.93	0.45	0.45	0.45
206	1107.93	0.46	0.46	0.46
207	1117.93	0.45	0.45	0.45
208	1127.93	0.45	0.45	0.45
209	1137.93	0.46	0.46	0.46
210	1147.93	0.45	0.45	0.45
211	1157.93	0.46	0.46	0.46
212	1167.93	0.46	0.46	0.46
213	1177.93	0.46	0.46	0.46
214	1187.93	0.46	0.46	0.46
215	1197.93	0.47	0.47	0.47
216	1207.93	0.47	0.47	0.47
217	1217.93	0.46	0.46	0.46
218	1227.93	0.46	0.46	0.46
219	1237.93	0.47	0.47	0.47
220	1247.93	0.47	0.47	0.47
221	1257.93	0.47	0.47	0.47
222	1267.93	0.47	0.47	0.47
223	1277.93	0.47	0.47	0.47
224	1287.93	0.49	0.49	0.49
225	1297.93	0.47	0.47	0.47
226	1307.93	0.47	0.47	0.47
227	1317.93	0.48	0.48	0.48
228	1327.93	0.48	0.48	0.48
229	1337.93	0.49	0.49	0.49
230	1347.93	0.48	0.48	0.48
231	1357.93	0.49	0.49	0.49
232	1367.93	0.49	0.49	0.49
233	1377.93	0.49	0.49	0.49
234	1387.93	0.48	0.48	0.48
235	1397.93	0.49	0.49	0.49
236	1407.93	0.47	0.47	0.47
237	1417.93	0.49	0.49	0.49
238	1427.93	0.50	0.50	0.50
239	1437.93	0.50	0.50	0.50
240	1447.93	0.52	0.52	0.52
241	1457.93	0.51	0.51	0.51
242	1467.93	0.48	0.48	0.48
243	1477.93	0.48	0.48	0.48
244	1487.93	0.49	0.49	0.49
245	1497.93	0.54	0.54	0.54
246	1507.93	0.48	0.48	0.48
247	1517.93	0.47	0.47	0.47
248	1527.93	0.51	0.51	0.51
249	1537.93	0.50	0.50	0.50
250	1547.93	0.51	0.51	0.51

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 7
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PZ-6	PZ-6
Discharge 1.26 U.S.gal/min	Distance from the pumping well 302.00 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
251	1557.93	0.51	0.51	0.51
252	1567.93	0.51	0.51	0.51
253	1577.93	0.50	0.50	0.50
254	1587.93	0.49	0.49	0.49
255	1597.93	0.51	0.51	0.51
256	1607.93	0.51	0.51	0.51
257	1617.93	0.51	0.51	0.51
258	1627.93	0.52	0.52	0.52
259	1637.93	0.53	0.53	0.53
260	1647.93	0.53	0.53	0.53
261	1657.93	0.53	0.53	0.53
262	1667.93	0.53	0.53	0.53
263	1677.93	0.53	0.53	0.53
264	1687.93	0.54	0.54	0.54
265	1697.93	0.51	0.51	0.51
266	1707.93	0.54	0.54	0.54
267	1717.93	0.55	0.55	0.55
268	1727.93	0.54	0.54	0.54
269	1737.93	0.53	0.53	[illegible]
270	1747.93	0.53	0.53	[illegible]
271	1757.93	0.54	0.54	0.54
272	1767.93	0.54	0.54	0.54
273	1777.93	0.54	0.54	0.54
274	1787.93	0.54	0.54	0.54
275	1797.93	0.54	0.54	0.54
276	1807.93	0.55	0.55	0.55
277	1817.93	0.54	0.54	0.54
278	1827.93	0.54	0.54	0.54
279	1837.93	0.54	0.54	0.54
280	1847.93	0.54	0.54	0.54
281	1857.93	0.54	0.54	0.54
282	1867.93	0.54	0.54	0.54
283	1877.93	0.55	0.55	0.55
284	1887.93	0.55	0.55	0.55
285	1897.93	0.55	0.55	0.55
286	1907.93	0.54	0.54	0.54
287	1917.93	0.54	0.54	0.54
288	1927.93	0.54	0.54	0.54
289	1937.93	0.55	0.55	0.55
290	1947.93	0.55	0.55	0.55
291	1957.93	0.55	0.55	0.55
292	1967.93	0.55	0.55	0.55
293	1977.93	0.54	0.54	0.54
294	1987.93	0.55	0.55	0.55
295	1997.93	0.55	0.55	0.55
296	2007.93	0.55	0.55	[illegible]
297	2017.93	0.55	0.55	[illegible]
298	2027.93	0.54	0.54	0.54
299	2037.93	0.55	0.55	0.55
300	2047.93	0.55	0.55	0.55

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 8
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PZ-6	PZ-6
Discharge 1.26 U.S.gal/min	Distance from the pumping well 302.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
301	2057.93	0.55	0.55	0.55
302	2067.93	0.56	0.56	0.56
303	2077.93	0.56	0.56	0.56
304	2087.93	0.56	0.56	0.56
305	2097.93	0.56	0.56	0.56
306	2107.93	0.56	0.56	0.56
307	2117.93	0.56	0.56	0.56
308	2127.93	0.56	0.56	0.56
309	2137.93	0.56	0.56	0.56
310	2147.93	0.57	0.57	0.57
311	2157.93	0.57	0.57	0.57
312	2167.93	0.57	0.57	0.57
313	2177.93	0.57	0.57	0.57
314	2187.93	0.56	0.56	0.56
315	2197.93	0.56	0.56	0.56
316	2207.93	0.57	0.57	0.57
317	2217.93	0.56	0.56	0.56
318	2227.93	0.57	0.57	0.57
319	2237.93	0.57	0.57	0.57
320	2247.93	0.57	0.57	0.57
321	2257.93	0.56	0.56	0.56
322	2267.93	0.57	0.57	0.57
323	2277.93	0.56	0.56	0.56
324	2287.93	0.57	0.57	0.57
325	2297.93	0.57	0.57	0.57
326	2307.93	0.56	0.56	0.56
327	2317.93	0.57	0.57	0.57
328	2327.93	0.56	0.56	0.56
329	2337.93	0.57	0.57	0.57
330	2347.93	0.57	0.57	0.57
331	2357.93	0.57	0.57	0.57
332	2367.93	0.56	0.56	0.56
333	2377.93	0.57	0.57	0.57
334	2387.93	0.57	0.57	0.57
335	2397.93	0.57	0.57	0.57
336	2407.93	0.57	0.57	0.57
337	2417.93	0.56	0.56	0.56
338	2427.93	0.57	0.57	0.57
339	2437.93	0.57	0.57	0.57
340	2447.93	0.57	0.57	0.57
341	2457.93	0.57	0.57	0.57
342	2467.93	0.57	0.57	0.57
343	2477.93	0.57	0.57	0.57
344	2487.93	0.57	0.57	0.57
345	2497.93	0.57	0.57	0.57
346	2507.93	0.57	0.57	0.57
347	2517.93	0.57	0.57	0.57
348	2527.93	0.57	0.57	0.57
349	2537.93	0.57	0.57	0.57
350	2547.93	0.57	0.57	0.57

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 9
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PZ-6	PZ-6
Discharge 1.26 U.S.gal/min	Distance from the pumping well 302.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
351	2557.93	0.57	0.57	0.57
352	2567.93	0.57	0.57	0.57
353	2577.93	0.57	0.57	0.57
354	2587.93	0.57	0.57	0.57
355	2597.93	0.57	0.57	0.57
356	2607.93	0.57	0.57	0.57
357	2617.93	0.56	0.56	0.56
358	2627.93	0.56	0.56	0.56
359	2637.93	0.58	0.58	0.58
360	2647.93	0.57	0.57	0.57
361	2657.93	0.57	0.57	0.57
362	2667.93	0.57	0.57	0.57
363	2677.93	0.57	0.57	0.57
364	2687.93	0.58	0.58	0.58
365	2697.93	0.57	0.57	0.57
366	2707.93	0.57	0.57	0.57
367	2717.93	0.58	0.58	0.58
368	2727.93	0.59	0.59	0.59
369	2737.93	0.58	0.58	[illegible]
370	2747.93	0.57	0.57	[illegible]
371	2757.93	0.57	0.57	0.57
372	2767.93	0.57	0.57	0.57
373	2777.93	0.58	0.58	0.58
374	2787.93	0.57	0.57	0.57
375	2797.93	0.57	0.57	0.57
376	2807.93	0.57	0.57	0.57
377	2817.93	0.57	0.57	0.57
378	2827.93	0.58	0.58	0.58
379	2837.93	0.58	0.58	0.58
380	2847.93	0.58	0.58	0.58
381	2857.93	0.57	0.57	0.57
382	2867.93	0.57	0.57	0.57
383	2877.93	0.59	0.59	0.59
384	2887.93	0.59	0.59	0.59
385	2897.93	0.60	0.60	0.60
386	2907.93	0.58	0.58	0.58
387	2917.93	0.63	0.63	0.63
388	2927.93	0.62	0.62	0.62
389	2937.93	0.57	0.57	0.57
390	2947.93	0.58	0.58	0.58
391	2957.93	0.58	0.58	0.58
392	2977.93	0.64	0.64	0.64
393	2997.93	0.63	0.63	0.63
394	3007.93	0.62	0.62	0.62
395	3017.93	0.60	0.60	0.60
396	3037.93	0.62	0.62	[illegible]
397	3047.93	0.63	0.63	[illegible]
398	3057.93	0.64	0.64	0.64
399	3077.93	0.59	0.59	0.59
400	3087.93	0.63	0.63	0.63

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 10
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PZ-6	PZ-6
Discharge 1.26 U.S.gal/min	Distance from the pumping well 302.00 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
401	3097.93	0.59	0.59	0.59
402	3107.93	0.57	0.57	0.57
403	3117.93	0.58	0.58	0.58
404	3127.93	0.60	0.60	0.60
405	3137.93	0.60	0.60	0.60
406	3147.93	0.66	0.66	0.66
407	3157.93	0.59	0.59	0.59
408	3167.93	0.62	0.62	0.62
409	3177.93	0.60	0.60	0.60
410	3187.93	0.59	0.59	0.59
411	3197.93	0.66	0.66	0.66
412	3207.93	0.64	0.64	0.64
413	3217.93	0.58	0.58	0.58
414	3227.93	0.66	0.66	0.66
415	3237.93	0.64	0.64	0.64
416	3247.93	0.66	0.66	0.66
417	3257.93	0.64	0.64	0.64
418	3267.93	0.65	0.65	0.65
419	3277.93	0.64	0.64	0.64
420	3287.93	0.60	0.60	0.60
421	3297.93	0.66	0.66	0.66
422	3307.93	0.64	0.64	0.64
423	3317.93	0.64	0.64	0.64
424	3327.93	0.64	0.64	0.64
425	3337.93	0.66	0.66	0.66
426	3347.93	0.66	0.66	0.66
427	3357.93	0.66	0.66	0.66
428	3367.93	0.66	0.66	0.66
429	3377.93	0.66	0.66	0.66
430	3387.93	0.66	0.66	0.66
431	3397.93	0.66	0.66	0.66
432	3407.93	0.66	0.66	0.66
433	3417.93	0.66	0.66	0.66
434	3427.93	0.66	0.66	0.66
435	3437.93	0.66	0.66	0.66
436	3447.93	0.66	0.66	0.66
437	3457.93	0.66	0.66	0.66
438	3467.93	0.66	0.66	0.66
439	3477.93	0.67	0.67	0.67
440	3487.93	0.67	0.67	0.67
441	3497.93	0.67	0.67	0.67
442	3507.93	0.67	0.67	0.67
443	3517.93	0.68	0.68	0.68
444	3527.93	0.68	0.68	0.68
445	3537.93	0.68	0.68	0.68
446	3547.93	0.69	0.69	0.69
447	3557.93	0.68	0.68	0.68
448	3567.93	0.69	0.69	0.69
449	3577.93	0.69	0.69	0.69
450	3587.93	0.68	0.68	0.68

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 11
		Project: Johnston County Landfill	
		Evaluated by: PJH	

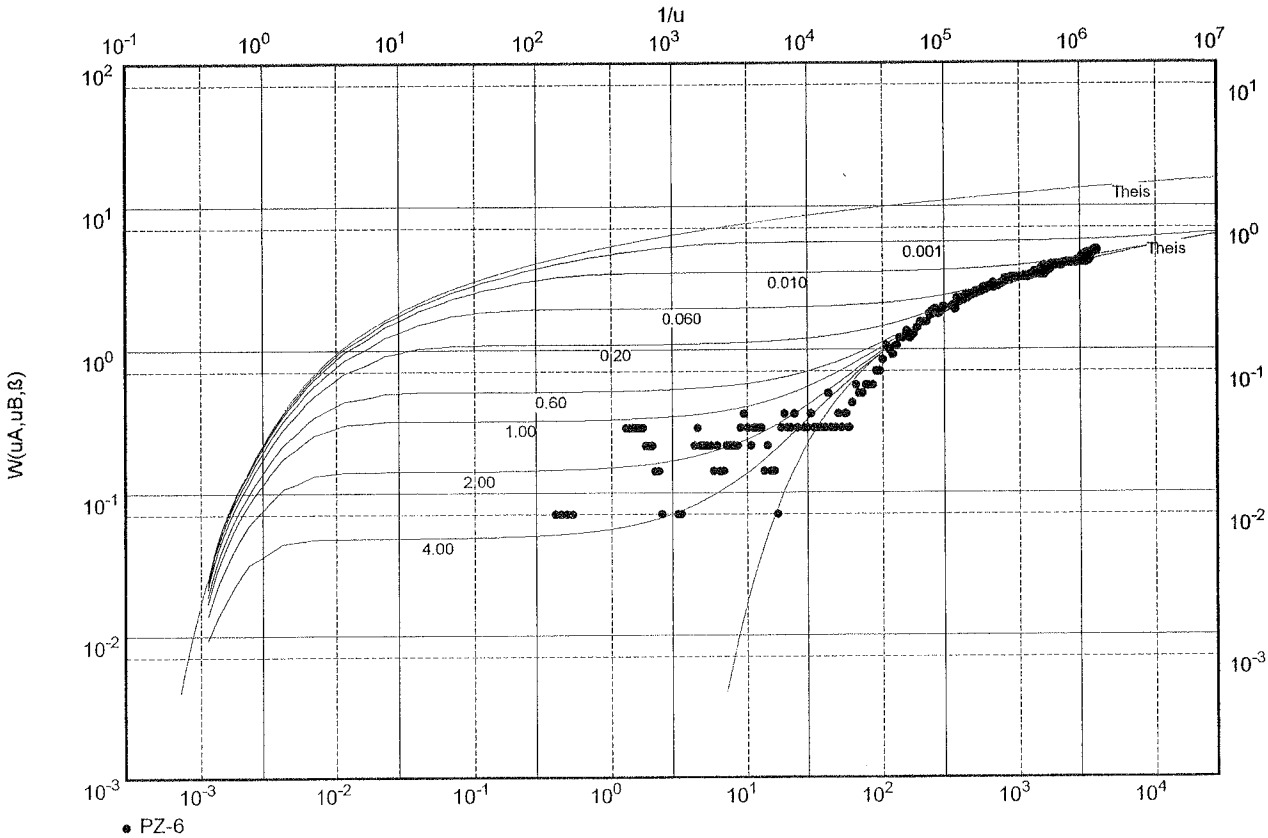
Pumping Test No. 1	Test conducted on: June 19, 2004
PZ-6	PZ-6
Discharge 1.26 U.S.gal/min	Distance from the pumping well 302.00 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
451	3597.93	0.69	0.69	0.69
452	3607.93	0.70	0.70	0.70
453	3617.93	0.69	0.69	0.69
454	3627.93	0.69	0.69	0.69
455	3637.93	0.70	0.70	0.70
456	3647.93	0.70	0.70	0.70
457	3657.93	0.70	0.70	0.70
458	3667.93	0.69	0.69	0.69
459	3677.93	0.69	0.69	0.69
460	3687.93	0.69	0.69	0.69
461	3697.93	0.70	0.70	0.70
462	3707.93	0.70	0.70	0.70
463	3717.93	0.70	0.70	0.70
464	3727.93	0.70	0.70	0.70
465	3737.93	0.69	0.69	0.69

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis NEUMAN's method Unconfined aquifer with delayed watertable response	Date: June 30, 2004	Page 1
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PZ-6	
Discharge 1.26 U.S.gal/min	



Transmissivity [ft²/min]: 9.45×10^{-2}

Hydraulic conductivity [ft/min]: 1.89×10^{-3}

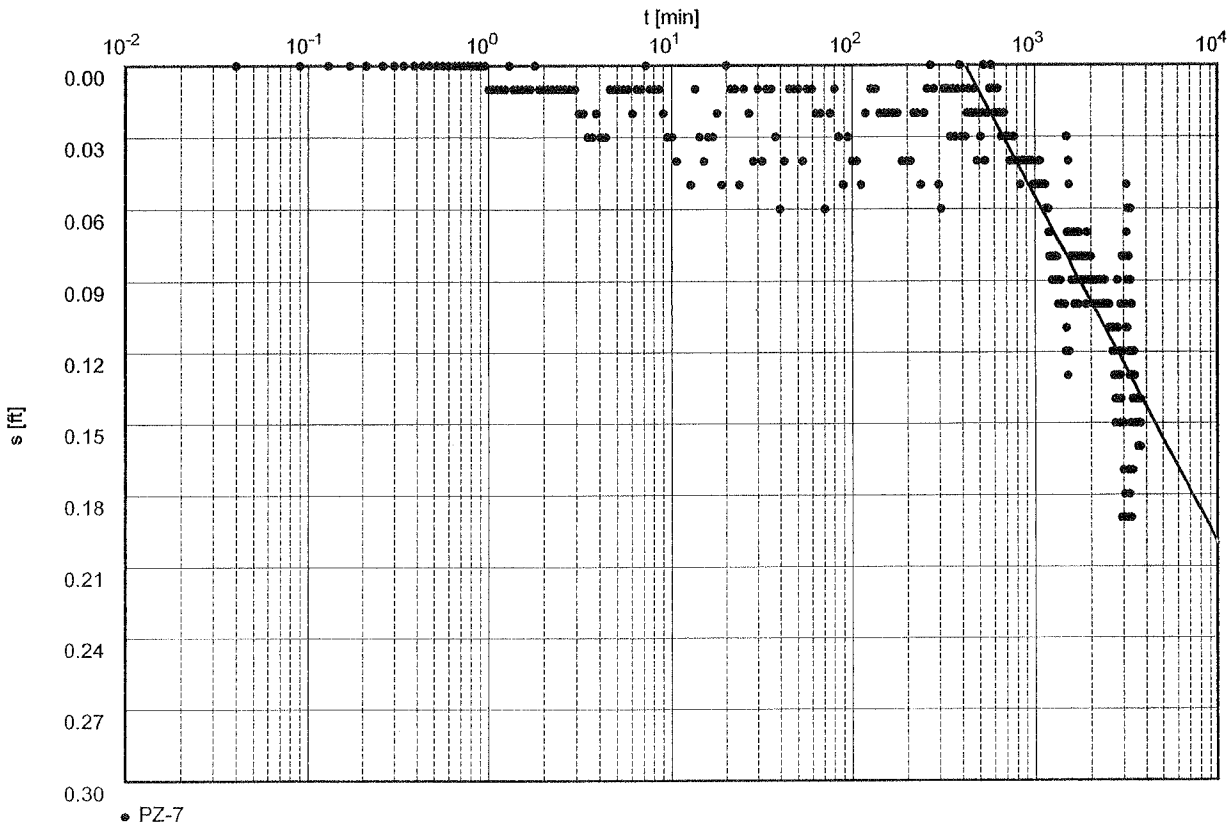
Aquifer thickness [ft]: 50.00

Storativity: 1.16×10^{-8}

Specific yield: 1.16×10^{-4}

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 1
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PZ-7	
Discharge 1.26 U.S.gal/min	



Transmissivity [ft²/min]: 2.11×10^{-1}

Hydraulic conductivity [ft/min]: 4.22×10^{-3}

Aquifer thickness [ft]: 50.00

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 2
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PZ-7	PZ-7
Discharge 1.26 U.S.gal/min	Distance from the pumping well 300.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
2	0.04	0.00	0.00	0.00
3	0.09	0.00	0.00	0.00
4	0.13	0.00	0.00	0.00
5	0.17	0.00	0.00	0.00
6	0.21	0.00	0.00	0.00
7	0.26	0.00	0.00	0.00
8	0.30	0.00	0.00	0.00
9	0.34	0.00	0.00	0.00
10	0.39	0.00	0.00	0.00
11	0.43	0.00	0.00	0.00
12	0.47	0.00	0.00	0.00
13	0.52	0.00	0.00	0.00
14	0.56	0.00	0.00	0.00
15	0.60	0.00	0.00	0.00
16	0.65	0.00	0.00	0.00
17	0.69	0.00	0.00	0.00
18	0.73	0.00	0.00	0.00
19	0.77	0.00	0.00	0.00
20	0.82	0.00	0.00	0.00
21	0.86	0.00	0.00	0.00
22	0.90	0.00	0.00	0.00
23	0.95	0.00	0.00	0.00
24	1.00	0.01	0.01	0.01
25	1.05	0.01	0.01	0.01
26	1.11	0.01	0.01	0.01
27	1.17	0.01	0.01	0.01
28	1.23	0.01	0.01	0.01
29	1.30	0.00	0.00	0.00
30	1.37	0.01	0.01	0.01
31	1.44	0.01	0.01	0.01
32	1.52	0.01	0.01	0.01
33	1.61	0.01	0.01	0.01
34	1.69	0.01	0.01	0.01
35	1.79	0.00	0.00	0.00
36	1.89	0.01	0.01	0.01
37	1.99	0.01	0.01	0.01
38	2.10	0.01	0.01	0.01
39	2.22	0.01	0.01	0.01
40	2.35	0.01	0.01	0.01
41	2.48	0.01	0.01	0.01
42	2.62	0.01	0.01	0.01
43	2.77	0.01	0.01	0.01
44	2.93	0.01	0.01	0.01
45	3.09	0.02	0.02	0.02
46	3.27	0.02	0.02	0.02
47	3.46	0.03	0.03	0.03
48	3.66	0.03	0.03	0.03
49	3.87	0.02	0.02	0.02
50	4.09	0.03	0.03	0.03

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 3
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PZ-7	PZ-7
Discharge 1.26 U.S.gal/min	Distance from the pumping well 300.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
51	4.32	0.03	0.03	0.03
52	4.57	0.01	0.01	0.01
53	4.84	0.01	0.01	0.01
54	5.12	0.01	0.01	0.01
55	5.42	0.01	0.01	0.01
56	5.73	0.01	0.01	0.01
57	6.06	0.02	0.02	0.02
58	6.42	0.01	0.01	0.01
59	6.79	0.01	0.01	0.01
60	7.19	0.00	0.00	0.00
61	7.61	0.01	0.01	0.01
62	8.05	0.01	0.01	0.01
63	8.52	0.01	0.01	0.01
64	9.02	0.02	0.02	0.02
65	9.55	0.03	0.03	0.03
66	10.11	0.03	0.03	0.03
67	10.70	0.04	0.04	0.04
68	12.70	0.05	0.05	0.05
69	13.44	0.01	0.01	[illegible]
70	14.23	0.03	0.03	0.03
71	15.07	0.04	0.04	0.04
72	15.95	0.03	0.03	0.03
73	16.89	0.03	0.03	0.03
74	17.89	0.02	0.02	0.02
75	18.94	0.05	0.05	0.05
76	20.06	0.00	0.00	0.00
77	21.24	0.01	0.01	0.01
78	22.49	0.01	0.01	0.01
79	23.82	0.05	0.05	0.05
80	25.22	0.01	0.01	0.01
81	26.71	0.02	0.02	0.02
82	28.29	0.04	0.04	0.04
83	29.96	0.01	0.01	0.01
84	31.73	0.04	0.04	0.04
85	33.60	0.01	0.01	0.01
86	35.59	0.01	0.01	0.01
87	37.69	0.03	0.03	0.03
88	39.91	0.06	0.06	0.06
89	42.27	0.04	0.04	0.04
90	44.77	0.01	0.01	0.01
91	47.42	0.01	0.01	0.01
92	50.22	0.01	0.01	0.01
93	53.19	0.04	0.04	0.04
94	56.34	0.01	0.01	0.01
95	59.67	0.01	0.01	0.01
96	63.20	0.02	0.02	[illegible]
97	66.94	0.02	0.02	0.02
98	70.90	0.06	0.06	0.06
99	75.09	0.02	0.02	0.02
100	79.54	0.01	0.01	0.01

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 4
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PZ-7	PZ-7
Discharge 1.26 U.S.gal/min	Distance from the pumping well 300.00 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
101	84.24	0.03	0.03	0.03
102	89.23	0.05	0.05	0.05
103	94.51	0.03	0.03	0.03
104	100.10	0.04	0.04	0.04
105	106.03	0.04	0.04	0.04
106	112.30	0.05	0.05	0.05
107	118.95	0.02	0.02	0.02
108	126.00	0.01	0.01	0.01
109	133.45	0.01	0.01	0.01
110	141.36	0.02	0.02	0.02
111	149.73	0.02	0.02	0.02
112	158.59	0.02	0.02	0.02
113	167.98	0.02	0.02	0.02
114	177.93	0.02	0.02	0.02
115	187.93	0.04	0.04	0.04
116	197.93	0.04	0.04	0.04
117	207.93	0.04	0.04	0.04
118	217.93	0.02	0.02	0.02
119	227.93	0.02	0.02	0.02
120	237.93	0.05	0.05	0.05
121	247.93	0.02	0.02	0.02
122	257.93	0.01	0.01	0.01
123	267.93	0.00	0.00	0.00
124	277.93	0.01	0.01	0.01
125	297.93	0.05	0.05	0.05
126	307.93	0.06	0.06	0.06
127	317.93	0.01	0.01	0.01
128	327.93	0.01	0.01	0.01
129	337.93	0.01	0.01	0.01
130	347.93	0.03	0.03	0.03
131	357.93	0.01	0.01	0.01
132	367.93	0.03	0.03	0.03
133	377.93	0.01	0.01	0.01
134	387.93	0.00	0.00	0.00
135	397.93	0.03	0.03	0.03
136	407.93	0.01	0.01	0.01
137	417.93	0.03	0.03	0.03
138	427.93	0.02	0.02	0.02
139	437.93	0.01	0.01	0.01
140	447.93	0.02	0.02	0.02
141	457.93	0.02	0.02	0.02
142	467.93	0.01	0.01	0.01
143	477.93	0.02	0.02	0.02
144	487.93	0.04	0.04	0.04
145	497.93	0.02	0.02	0.02
146	507.93	0.03	0.03	0.03
147	517.93	0.02	0.02	0.02
148	527.93	0.00	0.00	0.00
149	537.93	0.04	0.04	0.04
150	547.93	0.02	0.02	0.02

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 5
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PZ-7	PZ-7
Discharge 1.26 U.S.gal/min	Distance from the pumping well 300.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
151	557.93	0.02	0.02	0.02
152	567.93	0.01	0.01	0.01
153	577.93	0.00	0.00	0.00
154	587.93	0.01	0.01	0.01
155	597.93	0.01	0.01	0.01
156	607.93	0.02	0.02	0.02
157	617.93	0.02	0.02	0.02
158	627.93	0.01	0.01	0.01
159	637.93	0.02	0.02	0.02
160	647.93	0.02	0.02	0.02
161	657.93	0.03	0.03	0.03
162	667.93	0.03	0.03	0.03
163	677.93	0.02	0.02	0.02
164	687.93	0.03	0.03	0.03
165	697.93	0.03	0.03	0.03
166	707.93	0.03	0.03	0.03
167	717.93	0.03	0.03	0.03
168	727.93	0.04	0.04	0.04
169	737.93	0.04	0.04	[illegible]
170	747.93	0.04	0.04	0.04
171	757.93	0.03	0.03	0.03
172	767.93	0.03	0.03	0.03
173	777.93	0.04	0.04	0.04
174	787.93	0.04	0.04	0.04
175	797.93	0.04	0.04	0.04
176	807.93	0.04	0.04	0.04
177	817.93	0.04	0.04	0.04
178	827.93	0.05	0.05	0.05
179	837.93	0.04	0.04	0.04
180	847.93	0.04	0.04	0.04
181	857.93	0.04	0.04	0.04
182	867.93	0.04	0.04	0.04
183	877.93	0.04	0.04	0.04
184	887.93	0.04	0.04	0.04
185	897.93	0.04	0.04	0.04
186	907.93	0.04	0.04	0.04
187	917.93	0.04	0.04	0.04
188	927.93	0.04	0.04	0.04
189	937.93	0.04	0.04	0.04
190	947.93	0.04	0.04	0.04
191	957.93	0.04	0.04	0.04
192	967.93	0.04	0.04	0.04
193	977.93	0.04	0.04	0.04
194	987.93	0.05	0.05	0.05
195	997.93	0.05	0.05	0.05
196	1007.93	0.05	0.05	[illegible]
197	1017.93	0.05	0.05	0.05
198	1027.93	0.05	0.05	0.05
199	1037.93	0.05	0.05	0.05
200	1047.93	0.04	0.04	0.04

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 6
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PZ-7	PZ-7
Discharge 1.26 U.S.gal/min	Distance from the pumping well 300.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
201	1057.93	0.04	0.04	0.04
202	1067.93	0.05	0.05	0.05
203	1077.93	0.05	0.05	0.05
204	1087.93	0.05	0.05	0.05
205	1097.93	0.05	0.05	0.05
206	1107.93	0.05	0.05	0.05
207	1117.93	0.05	0.05	0.05
208	1127.93	0.05	0.05	0.05
209	1137.93	0.06	0.06	0.06
210	1147.93	0.06	0.06	0.06
211	1157.93	0.06	0.06	0.06
212	1167.93	0.06	0.06	0.06
213	1177.93	0.06	0.06	0.06
214	1187.93	0.07	0.07	0.07
215	1197.93	0.08	0.08	0.08
216	1207.93	0.07	0.07	0.07
217	1217.93	0.08	0.08	0.08
218	1227.93	0.08	0.08	0.08
219	1237.93	0.09	0.09	0.09
220	1247.93	0.08	0.08	0.08
221	1257.93	0.08	0.08	0.08
222	1267.93	0.08	0.08	0.08
223	1277.93	0.08	0.08	0.08
224	1287.93	0.09	0.09	0.09
225	1297.93	0.08	0.08	0.08
226	1307.93	0.08	0.08	0.08
227	1317.93	0.09	0.09	0.09
228	1327.93	0.09	0.09	0.09
229	1337.93	0.10	0.10	0.10
230	1347.93	0.09	0.09	0.09
231	1357.93	0.09	0.09	0.09
232	1367.93	0.10	0.10	0.10
233	1377.93	0.10	0.10	0.10
234	1387.93	0.10	0.10	0.10
235	1397.93	0.10	0.10	0.10
236	1407.93	0.10	0.10	0.10
237	1417.93	0.10	0.10	0.10
238	1427.93	0.10	0.10	0.10
239	1437.93	0.10	0.10	0.10
240	1457.93	0.12	0.12	0.12
241	1467.93	0.11	0.11	0.11
242	1477.93	0.03	0.03	0.03
243	1487.93	0.07	0.07	0.07
244	1497.93	0.13	0.13	0.13
245	1507.93	0.04	0.04	0.04
246	1517.93	0.05	0.05	0.05
247	1527.93	0.07	0.07	0.07
248	1537.93	0.12	0.12	0.12
249	1547.93	0.08	0.08	0.08
250	1567.93	0.09	0.09	0.09

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 7
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PZ-7	PZ-7
Discharge 1.26 U.S.gal/min	Distance from the pumping well 300.00 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
251	1587.93	0.07	0.07	0.07
252	1597.93	0.08	0.08	0.08
253	1607.93	0.08	0.08	0.08
254	1617.93	0.07	0.07	0.07
255	1627.93	0.09	0.09	0.09
256	1637.93	0.10	0.10	0.10
257	1647.93	0.09	0.09	0.09
258	1657.93	0.08	0.08	0.08
259	1667.93	0.08	0.08	0.08
260	1677.93	0.08	0.08	0.08
261	1687.93	0.10	0.10	0.10
262	1697.93	0.07	0.07	0.07
263	1707.93	0.09	0.09	0.09
264	1717.93	0.10	0.10	0.10
265	1727.93	0.07	0.07	0.07
266	1737.93	0.08	0.08	0.08
267	1747.93	0.08	0.08	0.08
268	1757.93	0.09	0.09	0.09
269	1767.93	0.09	0.09	[illegible]
270	1777.93	0.08	0.08	0.08
271	1787.93	0.08	0.08	0.08
272	1797.93	0.09	0.09	0.09
273	1807.93	0.09	0.09	0.09
274	1817.93	0.08	0.08	0.08
275	1827.93	0.08	0.08	0.08
276	1837.93	0.08	0.08	0.08
277	1847.93	0.08	0.08	0.08
278	1857.93	0.08	0.08	0.08
279	1867.93	0.09	0.09	0.09
280	1877.93	0.09	0.09	0.09
281	1887.93	0.10	0.10	0.10
282	1897.93	0.08	0.08	0.08
283	1907.93	0.07	0.07	0.07
284	1917.93	0.08	0.08	0.08
285	1927.93	0.08	0.08	0.08
286	1937.93	0.09	0.09	0.09
287	1947.93	0.09	0.09	0.09
288	1957.93	0.09	0.09	0.09
289	1967.93	0.09	0.09	0.09
290	1977.93	0.08	0.08	0.08
291	1987.93	0.08	0.08	0.08
292	1997.93	0.09	0.09	0.09
293	2007.93	0.09	0.09	0.09
294	2017.93	0.09	0.09	0.09
295	2027.93	0.09	0.09	0.09
296	2037.93	0.09	0.09	[illegible]
297	2047.93	0.09	0.09	0.09
298	2057.93	0.09	0.09	0.09
299	2067.93	0.10	0.10	0.10
300	2077.93	0.09	0.09	0.09

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 8
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PZ-7	PZ-7
Discharge 1.26 U.S.gal/min	Distance from the pumping well 300.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
301	2087.93	0.09	0.09	0.09
302	2097.93	0.09	0.09	0.09
303	2107.93	0.09	0.09	0.09
304	2117.93	0.09	0.09	0.09
305	2127.93	0.09	0.09	0.09
306	2137.93	0.10	0.10	0.10
307	2147.93	0.10	0.10	0.10
308	2157.93	0.10	0.10	0.10
309	2167.93	0.09	0.09	0.09
310	2177.93	0.09	0.09	0.09
311	2187.93	0.10	0.10	0.10
312	2197.93	0.09	0.09	0.09
313	2207.93	0.10	0.10	0.10
314	2217.93	0.10	0.10	0.10
315	2227.93	0.09	0.09	0.09
316	2237.93	0.10	0.10	0.10
317	2247.93	0.09	0.09	0.09
318	2257.93	0.09	0.09	0.09
319	2267.93	0.10	0.10	0.10
320	2277.93	0.10	0.10	0.10
321	2287.93	0.10	0.10	0.10
322	2297.93	0.10	0.10	0.10
323	2307.93	0.10	0.10	0.10
324	2317.93	0.10	0.10	0.10
325	2327.93	0.10	0.10	0.10
326	2337.93	0.09	0.09	0.09
327	2347.93	0.10	0.10	0.10
328	2357.93	0.09	0.09	0.09
329	2367.93	0.10	0.10	0.10
330	2377.93	0.09	0.09	0.09
331	2387.93	0.10	0.10	0.10
332	2397.93	0.10	0.10	0.10
333	2407.93	0.10	0.10	0.10
334	2417.93	0.10	0.10	0.10
335	2427.93	0.10	0.10	0.10
336	2437.93	0.10	0.10	0.10
337	2447.93	0.10	0.10	0.10
338	2457.93	0.10	0.10	0.10
339	2467.93	0.10	0.10	0.10
340	2477.93	0.10	0.10	0.10
341	2487.93	0.10	0.10	0.10
342	2497.93	0.10	0.10	0.10
343	2507.93	0.11	0.11	0.11
344	2517.93	0.10	0.10	0.10
345	2527.93	0.11	0.11	0.11
346	2537.93	0.11	0.11	0.11
347	2547.93	0.11	0.11	0.11
348	2557.93	0.11	0.11	0.11
349	2567.93	0.11	0.11	0.11
350	2577.93	0.11	0.11	0.11

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 9
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PZ-7	PZ-7
Discharge 1.26 U.S.gal/min	Distance from the pumping well 300.00 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
351	2587.93	0.11	0.11	0.11
352	2597.93	0.11	0.11	0.11
353	2607.93	0.11	0.11	0.11
354	2617.93	0.11	0.11	0.11
355	2627.93	0.11	0.11	0.11
356	2637.93	0.12	0.12	0.12
357	2647.93	0.11	0.11	0.11
358	2657.93	0.12	0.12	0.12
359	2667.93	0.11	0.11	0.11
360	2677.93	0.13	0.13	0.13
361	2687.93	0.12	0.12	0.12
362	2697.93	0.11	0.11	0.11
363	2707.93	0.11	0.11	0.11
364	2717.93	0.14	0.14	0.14
365	2727.93	0.15	0.15	0.15
366	2737.93	0.11	0.11	0.11
367	2747.93	0.11	0.11	0.11
368	2757.93	0.13	0.13	0.13
369	2767.93	0.13	0.13	[illegible]
370	2777.93	0.14	0.14	0.14
371	2787.93	0.09	0.09	0.09
372	2797.93	0.11	0.11	0.11
373	2807.93	0.13	0.13	0.13
374	2817.93	0.13	0.13	0.13
375	2827.93	0.12	0.12	0.12
376	2837.93	0.13	0.13	0.13
377	2847.93	0.12	0.12	0.12
378	2857.93	0.13	0.13	0.13
379	2867.93	0.12	0.12	0.12
380	2877.93	0.15	0.15	0.15
381	2887.93	0.13	0.13	0.13
382	2897.93	0.14	0.14	0.14
383	2907.93	0.10	0.10	0.10
384	2927.93	0.19	0.19	0.19
385	2937.93	0.10	0.10	0.10
386	2947.93	0.12	0.12	0.12
387	2957.93	0.08	0.08	0.08
388	2967.93	0.08	0.08	0.08
389	2977.93	0.19	0.19	0.19
390	2997.93	0.17	0.17	0.17
391	3007.93	0.12	0.12	0.12
392	3017.93	0.15	0.15	0.15
393	3037.93	0.19	0.19	0.19
394	3057.93	0.18	0.18	0.18
395	3077.93	0.08	0.08	0.08
396	3087.93	0.19	0.19	[illegible]
397	3097.93	0.10	0.10	0.10
398	3107.93	0.11	0.11	0.11
399	3117.93	0.07	0.07	0.07
400	3127.93	0.05	0.05	0.05

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 10
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PZ-7	PZ-7
Discharge 1.26 U.S.gal/min	Distance from the pumping well 300.00 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
401	3137.93	0.11	0.11	0.11
402	3157.93	0.09	0.09	0.09
403	3167.93	0.09	0.09	0.09
404	3177.93	0.06	0.06	0.06
405	3187.93	0.08	0.08	0.08
406	3197.93	0.19	0.19	0.19
407	3207.93	0.09	0.09	0.09
408	3217.93	0.06	0.06	0.06
409	3227.93	0.17	0.17	0.17
410	3237.93	0.12	0.12	0.12
411	3247.93	0.18	0.18	0.18
412	3257.93	0.13	0.13	0.13
413	3267.93	0.13	0.13	0.13
414	3277.93	0.09	0.09	0.09
415	3287.93	0.06	0.06	0.06
416	3297.93	0.15	0.15	0.15
417	3307.93	0.12	0.12	0.12
418	3317.93	0.10	0.10	0.10
419	3327.93	0.10	0.10	0.10
420	3337.93	0.19	0.19	0.19
421	3347.93	0.13	0.13	0.13
422	3357.93	0.15	0.15	0.15
423	3367.93	0.12	0.12	0.12
424	3377.93	0.17	0.17	0.17
425	3387.93	0.14	0.14	0.14
426	3397.93	0.14	0.14	0.14
427	3407.93	0.14	0.14	0.14
428	3417.93	0.14	0.14	0.14
429	3427.93	0.14	0.14	0.14
430	3437.93	0.14	0.14	0.14
431	3447.93	0.12	0.12	0.12
432	3457.93	0.13	0.13	0.13
433	3467.93	0.13	0.13	0.13
434	3477.93	0.14	0.14	0.14
435	3487.93	0.14	0.14	0.14
436	3497.93	0.14	0.14	0.14
437	3507.93	0.15	0.15	0.15
438	3517.93	0.14	0.14	0.14
439	3527.93	0.14	0.14	0.14
440	3537.93	0.15	0.15	0.15
441	3547.93	0.14	0.14	0.14
442	3557.93	0.14	0.14	0.14
443	3567.93	0.14	0.14	0.14
444	3577.93	0.15	0.15	0.15
445	3587.93	0.14	0.14	0.14
446	3597.93	0.15	0.15	0.15
447	3607.93	0.15	0.15	0.15
448	3617.93	0.16	0.16	0.16
449	3627.93	0.16	0.16	0.16
450	3637.93	0.15	0.15	0.15

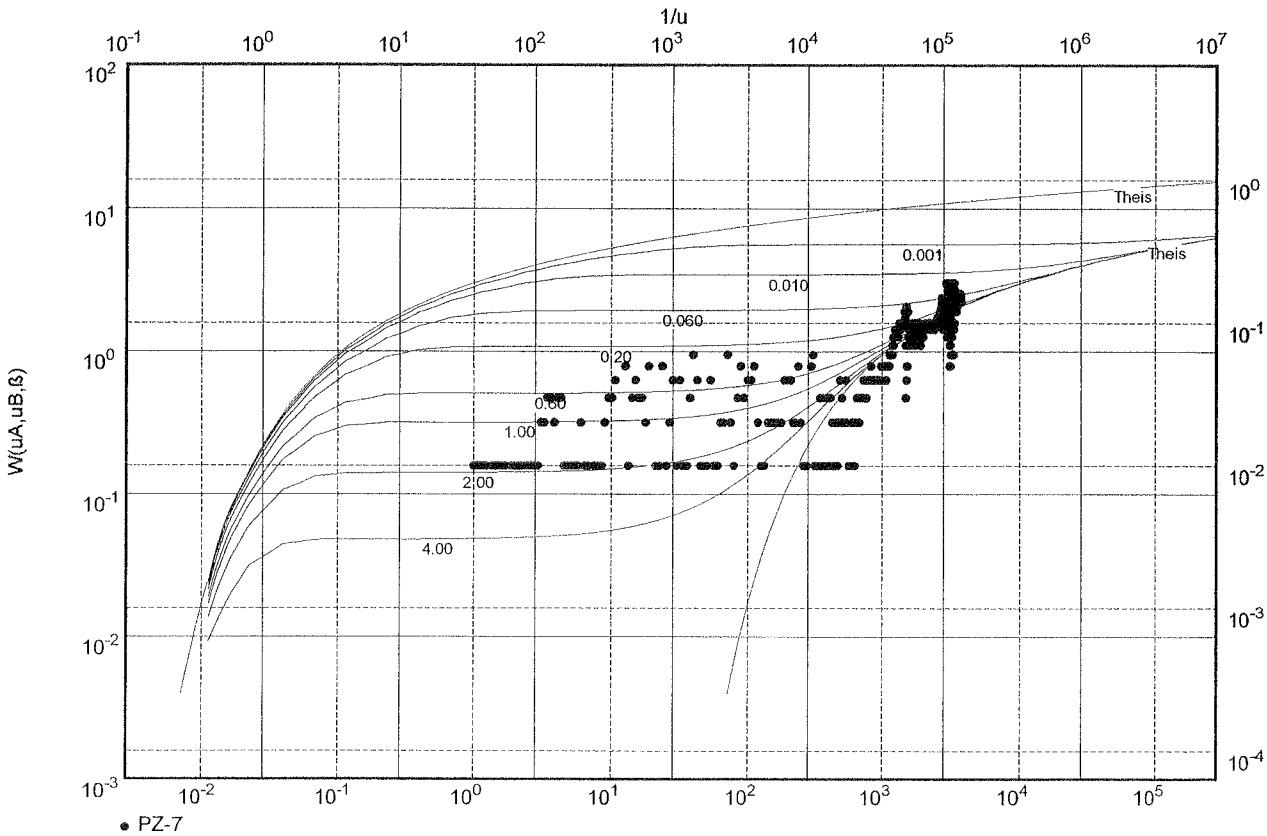
The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 11
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PZ-7	PZ-7
Discharge 1.26 U.S.gal/min	Distance from the pumping well 300.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
451	3647.93	0.16	0.16	0.16
452	3657.93	0.16	0.16	0.16
453	3667.93	0.15	0.15	0.15
454	3677.93	0.15	0.15	0.15
455	3687.93	0.15	0.15	0.15
456	3697.93	0.15	0.15	0.15
457	3707.93	0.15	0.15	0.15
458	3717.93	0.16	0.16	0.16
459	3727.93	0.15	0.15	0.15
460	3737.93	0.14	0.14	0.14

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis NEUMAN's method Unconfined aquifer with delayed watertable response	Date: June 30, 2004	Page 1
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PZ-7	
Discharge 1.26 U.S.gal/min	



Transmissivity [ft²/min]: 2.11×10^{-1}

Hydraulic conductivity [ft/min]: 4.23×10^{-3}

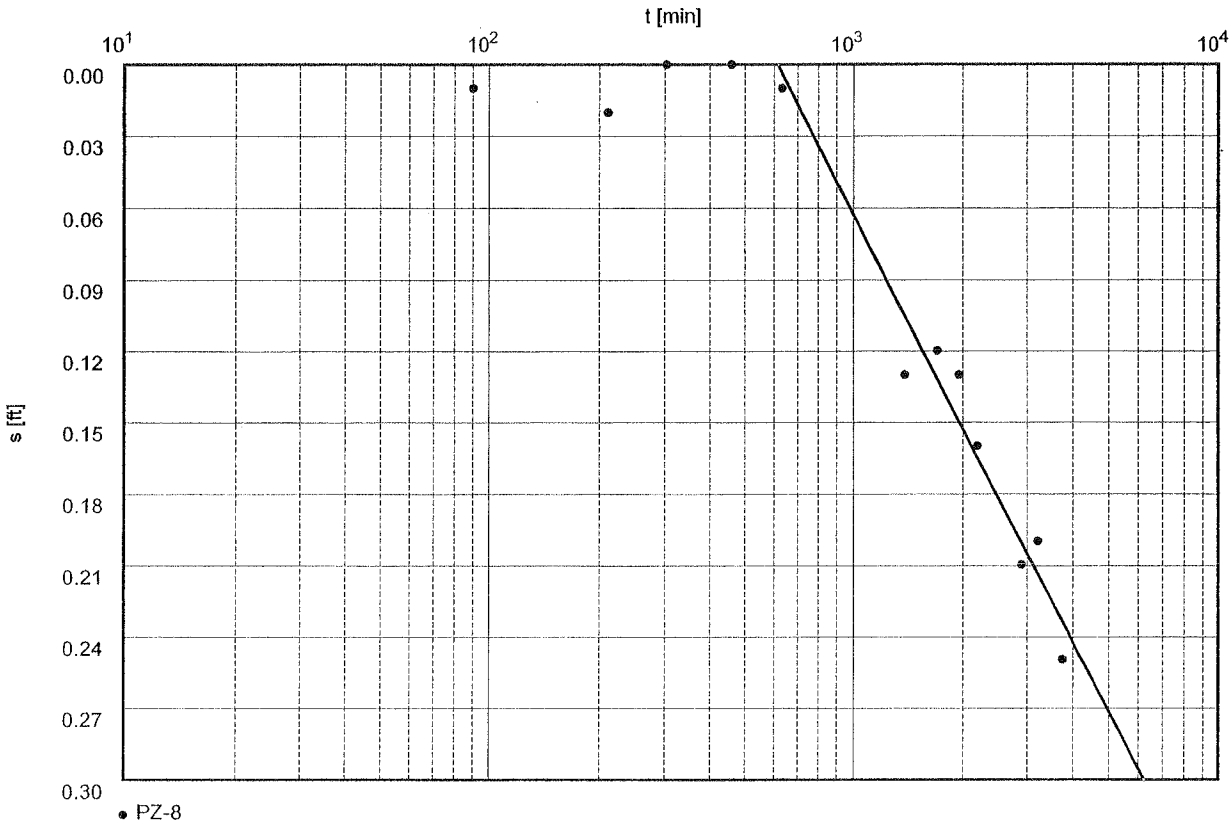
Aquifer thickness [ft]: 50.00

Storativity: 2.65×10^{-7}

Specific yield: 2.65×10^{-3}

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 1
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PZ-8	
Discharge 1.26 U.S.gal/min	



Transmissivity [ft²/min]: 1.02×10^{-1}

Hydraulic conductivity [ft/min]: 2.05×10^{-3}

Aquifer thickness [ft]: 50.00

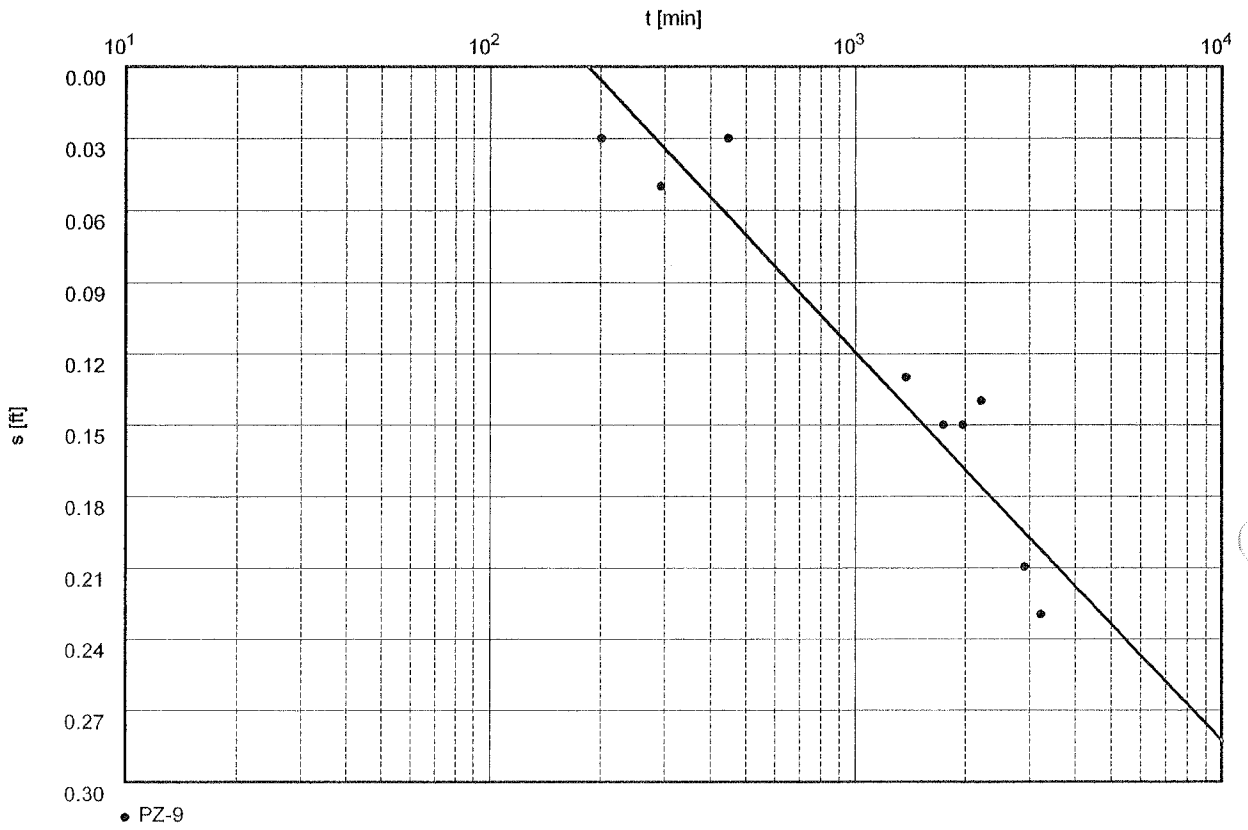
The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 2
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PZ-8	PZ-8
Discharge 1.26 U.S.gal/min	Distance from the pumping well 475.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
2	90.00	0.01	0.01	0.01
3	211.00	0.02	0.02	0.02
4	304.00	0.00	0.00	0.00
5	458.00	0.00	0.00	0.00
6	633.00	0.01	0.01	0.01
7	1389.00	0.13	0.13	0.13
8	1706.00	0.12	0.12	0.12
9	1954.00	0.13	0.13	0.13
10	2202.00	0.16	0.16	0.16
11	2895.00	0.21	0.21	0.21
12	3204.00	0.20	0.20	0.20
13	3729.00	0.25	0.25	0.25

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 1
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PZ-9	
Discharge 1.26 U.S.gal/min	



Transmissivity [ft²/min]: 1.87×10^{-1}

Hydraulic conductivity [ft/min]: 3.75×10^{-3}

Aquifer thickness [ft]: 50.00

The Hutchinson Group, Ltd.	Pumping test analysis	Date: June 30, 2004	Page 2
4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Project: Johnston County Landfill	
		Evaluated by: PJH	

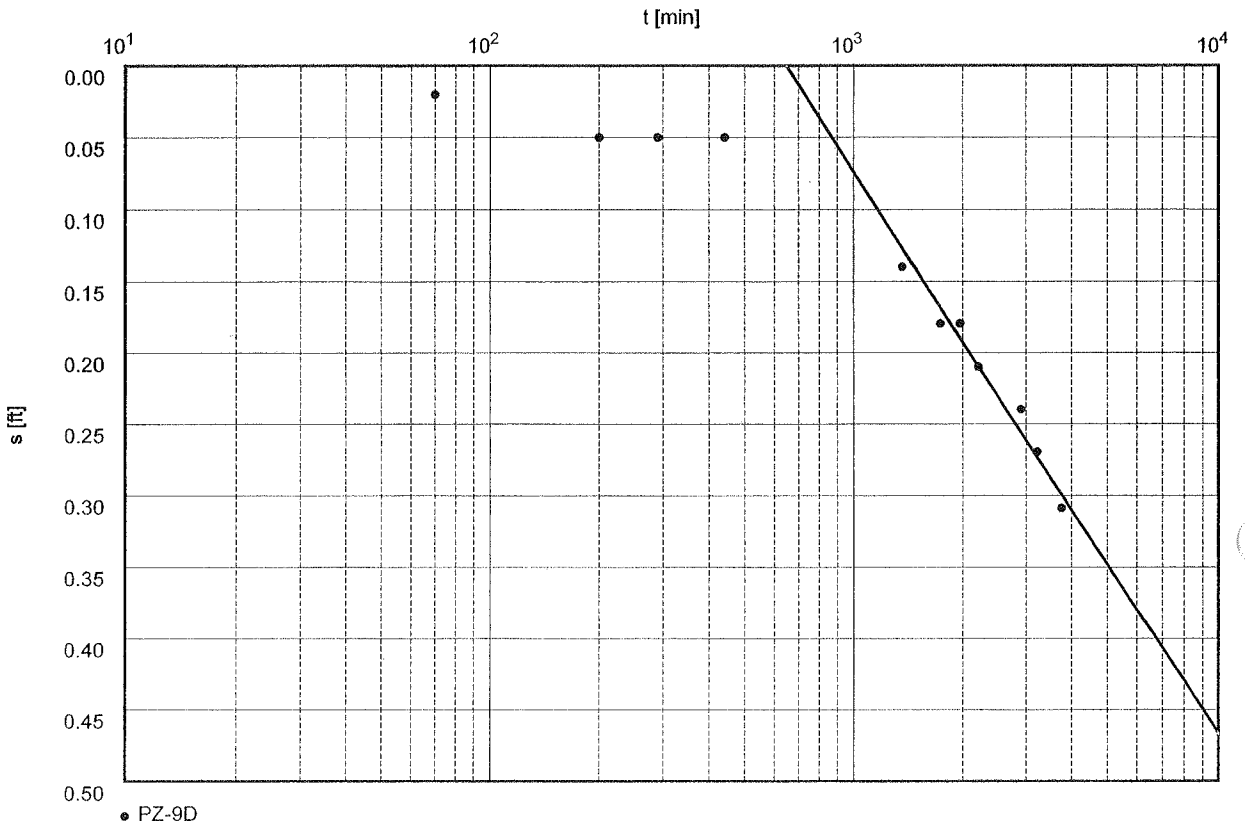
Pumping Test No. 1	Test conducted on: June 19, 2004
PZ-9	PZ-9
Discharge 1.26 U.S.gal/min	Distance from the pumping well 590.00 ft

Static water level: 0.00 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
2	201.00	0.03	0.03	0.03
3	293.00	0.05	0.05	0.05
4	446.00	0.03	0.03	0.03
5	1369.00	0.13	0.13	0.13
6	1739.00	0.15	0.15	0.15
7	1969.00	0.15	0.15	0.15
8	2218.00	0.14	0.14	0.14
9	2907.00	0.21	0.21	0.21
10	3215.00	0.23	0.23	0.23

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 1
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PZ-9D	
Discharge 1.26 U.S.gal/min	



Transmissivity [ft²/min]: 7.81×10^{-2}

Hydraulic conductivity [ft/min]: 1.56×10^{-3}

Aquifer thickness [ft]: 50.00

The Hutchinson Group, Ltd. 4280 Old Wm. Penn Hwy Murrysville, Pennsylvania 15668 (724) 325-3996	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Unconfined aquifer	Date: June 30, 2004	Page 2
		Project: Johnston County Landfill	
		Evaluated by: PJH	

Pumping Test No. 1	Test conducted on: June 19, 2004
PZ-9D	PZ-9D
Discharge 1.26 U.S.gal/min	Distance from the pumping well 600.00 ft
Static water level: 0.00 ft below datum	

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	Corrected drawdown [ft]
2	70.00	0.02	0.02	0.02
3	200.00	0.05	0.05	0.05
4	291.00	0.05	0.05	0.05
5	440.00	0.05	0.05	0.05
6	1366.00	0.14	0.14	0.14
7	1738.00	0.18	0.18	0.18
8	1968.00	0.18	0.18	0.18
9	2217.00	0.21	0.21	0.21
10	2906.00	0.24	0.24	0.24
11	3214.00	0.27	0.27	0.27
12	3741.00	0.31	0.31	0.31

Johnston County Landfill
Proposed C&D Landfill
Water Quality Monitoring Plan

Prepared For:
Johnston County
Department of Public Utilities
Smithfield, North Carolina

The Water Quality Monitoring Plan for this facility has been prepared by a qualified geologist who is licensed to practice in the State of North Carolina. The plan has been prepared based on knowledge of site conditions and familiarity with North Carolina solid waste rules and industry standard protocol. The Plan described herein should provide for the effective detection of a chronic release of hazardous constituents into ground and surface waters of the State, due to, or caused by past activities at the landfill.

Joan A. Smyth 10/27/05

NORTH CAROLINA LICENSED SEAL 1369 GEOLOGIST JOAN A. SMYTH

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Project Hydrogeologist

October 2005

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TABLE OF CONTENTS

1.0 Introduction 1
1.1 Plan Background 1
1.2 Purpose & Scope 2
1.3 Assessment Sampling Program Overview 3

2.0 Ground Water Sample Collection 3
2.1 Water Level Measurements 3
2.2 Monitor Well Evacuation 4
2.3 Ground Water Sample Collection 6
2.4 Field Quality Assurance 8
2.5 Sample Containers 8
2.6 Equipment Decontamination 9

3.0 Surface Water Sample Collection 9
3.1 Surface Water Level Observations 9
3.2 Surface Water Sample Collection 10

4.0 Field QA/QC Program 12

5.0 Sample Preservation and Shipment 13
5.1 Sample Preservation 13

6.0 Field Logbook 15

7.0 Laboratory Analysis 16

8.0 Data Evaluation 17

9.0 Record Keeping and Reporting 18
9.1 Sampling Reports 18
9.2 Well Abandonment/Rehabilitation 18
9.3 Additional Well Installations 18
9.4 Implementation Schedule 19

Tables

Table 1: Ground Water Monitoring Well Locations
Table 2: Surface Water Monitoring Station Locations

Figures

Figure 1: Water Quality Monitoring Locations

Figure 2: Surface Water Monitoring Locations

1.0 Introduction

1.1 Plan Background

Johnston County, North Carolina, owns and has sequentially operated four separate, unlined sanitary landfill units since1973 under Solid Waste Facility Permit #51-01, one lined municipal solid waste landfill (Phase 5) under permit 51-02, and one double-lined MSW landfill (Phase 4A) under permit 51-03. The six distinct municipal solid waste disposal units are located on a single property off State Route 210 in Johnston County.

The lined C&D landfill is proposed as a "piggy-back" landfill being constructed over a portion of the sideslope of the unlined Phase 3 MSW landfill. This lined C&D landfill "piggy-back" design is proposed as a part of the presumptive remedy for the unlined Phase 3 MSW landfill. The liner system of the C&D landfill will prevent rainwater infiltration into the soil covered sideslopes of the unlined Phase 3 MSW landfill. This design, in conjunction with the double-lined Phase 4A MSW landfill will provide significant reduction in leachate generation from the Phase 3 landfill.

The lined C&D landfill is located east of Phase 3 and north of Phases 1 & 2. These three phases of unlined landfills have impacted groundwater in this portion of the site. Therefore, this groundwater monitoring plan is more comprehensive than most for C&D landfills in order to provide for monitorability at the C&D landfill site.

C&D Landfill Monitoring Network

GNRA proposes two groundwater monitoring wells located between unlined MSW landfill Phases 1 & 2, (CDMW-1 and CDMW-2), two wells located adjacent to the diabase dikes located in the C&D area (CDMW-3 and CDMW-4), three downgradient nested pairs (CDMW-5/CDMW-5d, and CDMW-8/CDMW-8d and CDMW-9/CDMW9d), a downgradient shallow well (CDMW-6), a side gradient well (CDMW-7).

Additionally, since this is a lined C&D facility, leachate samples from the leachate collection system will be monitored semi-annually for the same Appendix I constituents that ground water is monitored for.

This Water Quality Monitoring Plan (WQMP) has been prepared to meet the field sampling and laboratory analysis requirements of the site. The WQMP details field and laboratory protocols that must be followed to meet the data objectives for the site.

1.2 Purpose & Scope

This WQMP has been designed to insure that accurate and representative field and laboratory results are obtained for all ground and surface water quality monitoring points. The WQMP addresses the following subjects:

- Ground water sample collection
- Surface water sample collection
- Sample preservation and shipment
- Laboratory analytical procedures
- Sample Chain-of-custody control
- Quality assurance/quality control programs

The methods and procedures described in the following sections are intended to facilitate the collection of true and representative samples and test data. Field procedures are presented in **Sections 3.0 through 7.0** in their general order of implementation. Equipment requirements for each field task are presented within the applicable section. Laboratory procedures, quality assurance methods and record keeping requirements are presented in **Sections 7.0 and 8.0**.

Strict adherence to these procedures stipulated in this plan is required. Any variations from these procedures should be throughly documented in the assessment report.

1.3 Sampling Program Overview

The ground water monitoring well designations, completion type, installation information and analytical requirements are included as **Table 1**. The surface water monitoring station designations, locations, sources and sampling frequency are included as **Table 2**.

2.0 Ground Water Sample Collection

This section presents details of the procedures and equipment required to perform ground water field measurements and sampling from monitoring wells during each monitoring event. A description of proposed ground water monitoring well locations and completion details are presented in **Table 1**. Ground water monitoring well locations for each Phase are shown in **Figure 1**.

2.1 Water Level Measurements

Static water level and total depth to the bottom will be measured in each well prior to any purging or sampling activities. Static water level and well depth measurements are necessary to calculate the volume of stagnant water in the well prior to purging. Additionally these measurements provide a field check on well integrity, degree of siltation, and are used to prepare potentiometric maps, calculate aquifer flow velocities and monitor changes in site hydrogeologic conditions.

Upon opening each well, new latex or nitrile surgical gloves will be donned. New gloves will be worn when taking water level measurements at each well. Appropriate measures will be taken during all measurement activities to prevent soils, decontamination supplies, precipitation, and other potential contaminants from entering the well or contacting clean equipment.

An electronic water level indicator will be used to accurately measure depth to ground water in each well and/or piezometer. Ground water depths will be measured to a vertical accuracy of 0.01 feet relative to established wellhead elevations. Each well will have a permanent, easily identified reference point on the lip of the well riser from which all water level measurements will be taken. The elevation of the reference point will be established by a Registered Land Surveyor.

The electronic water level indicator will be constructed of inert materials such as stainless steel and Teflon. Between well measurements the device will be thoroughly decontaminated by washing with non-phosphate soap and triple rinsing with deionized water to prevent cross contamination from one well to another.

The following measurements will be recorded in a dedicated field book prior to sample collection:

- Well Identification
- Depth to static water level and well bottom (to the nearest 0.01 foot)
- Height of water column in the riser (based upon known depth of well)
- Condition of wellhead protective casing, base pad and riser
- Changes in condition of well and surroundings.

2.2 Monitor Well Evacuation

Water accumulated in each well may be stagnant and unrepresentative of surrounding aquifer conditions, and therefore must be removed to insure that fresh formation water is sampled. Each well will be purged of standing water in the well casing following the measurement of the static water level.

New latex or nitrile surgical gloves will be donned for all well purging and sampling activities and whenever handling decontaminated field equipment. Appropriate measures will be taken during all measurement, purging and sampling activities to prevent surface soils, decontamination supplies, precipitation, and other potential contaminants from entering the well or contacting cleaned equipment.

The volume of standing water in the well riser and screen will be calculated immediately before well evacuation during each monitoring event. A standing water volume will be calculated for each well using measured static water level, well depth and well casing diameter according to the following equation:

$$\mathbf{V = (TD - SWL) \times C}$$

Where: V = One well volume

TD = Total depth of the well (in feet)

SWL = Static water level (in feet)

C = Volume constant for given well diameter (gallons/foot)

C = 0.163 gal/ft for two-inch wells.

C = 0.653 gal/ft for four-inch wells.

After the volume of standing water within the casing is established, a minimum of three to five well casing volumes of water will be evacuated from each well that is not outfitted with a MicroPurge ™ system.

New, disposable bailers with either double or bottom check-valves will be used to purge each well if the MicroPurge system is not used. Disposable purge bailers will be constructed of fluorocarbon resin (Teflon) suitable for the well and ground conditions. Each bailer will be certified factory-cleaned according to approved EPA protocol and remain sealed in a plastic sleeve until use. A new Teflon-coated stainless steel, inert mono-filament line or nylon cord will be used for each well to retrieve the bailers.

Wells will be purged at a rate that will not cause recharge water to be excessively agitated or cascade through the screen. Care will also be taken to minimize disturbance to the well sidewalls and bottom which could result in the suspension of silt and fine particulate matter. The volume of water purged from each well and the relative rate of recharge will be documents in sampling field notes. Wells which are of very low recharge rates will be purged once until dry. Damaged, dry or low yielding, and high turbidity wells will noted for reconsideration before the next sampling event.

Purge water will be managed to prevent possible soil and surface water contamination. Well site management options may include temporary containment and disposal as leachate or portable activated carbon filtration.

There are several wells on-site that are outfitted with MicroPurge™ pumps. All MicroPurge™ pumps are constructed of stainless steel and teflon components and are equipped with teflon lined

tubing from the pump to the surface of the well. These pumps have been installed to maximize pump efficiency and data reliability.

Wells that are outfitted with the MicroPurge™ system T1200M pumps will be developed until the field parameters of temperature, pH and Conductivity stabilize to within 10%. The use of the MicroPurge low-flow system allows a sample to be collected from a discreet interval of the well, thus limiting the amount of purging necessary. The pumps operate at a flowrate of approximately 200 ml/min during purging. The stabilization of field parameters indicates that water from the formation is being removed. A "Flow Cell - FC4000" is used to continuously monitor the field parameters of the purge water. This cell evaluates the pH, temperature, and conductivity on a constant basis and provides an ongoing continuous readout of the parameter levels. Once three readings taken 3 to 5 minutes apart have stabilized to within 10% of each other, a sample may be immediately collected from the pump. The pumping rate during sampling shall be 100 ml/min.

Durable, non-dedicated equipment to be lowered into the well (such as water level indicators) will be thoroughly decontaminated before each use. Equipment shall be disassembled to the degree practical, washed with (non-phosphate) soapy potable tap water, and triple rinsed using de-ionized water. Detailed equipment decontamination procedures are detailed in **Section 2.6**.

2.3 Ground Water Sample Collection

After purging activities are complete, ground water samples will be collected for laboratory analysis. Additional care commensurate with the importance of this stage will be taken. All monitoring wells should be sampled in as short a time period as possible, generally within 48 hours.

Sampling will occur within 24 hours of the purging of each well and as soon after well recovery as possible. Wells which fail to recharge or produce an adequate sample volume within 24 hours of purging will be sampled and a notation as to the amount of elapsed time since purging will be placed in the "notes" section of the chain of custody sheet and in the field notes for future evaluation. If particular wells are consistently slow in recharging, a remedy should be proposed for the problem.

Field measurements of temperature, pH, specific conductivity and turbidity will be made immediately prior to sampling each monitoring point. The field test specimens will be collected with the sampling bailer and placed in a clean, non-conductive glass or plastic container for observation. The calibration of the pH, temperature, conductivity and turbidity meters will be completed according to the manufacturers' specifications and consistent with Test Methods for Evaluating Solid Waste -Physical/Chemical Methods (SW-846). A pocket thermometer and litmus paper will be available in case of meter malfunction.

Each well outfitted with a dedicated MicroPurge™ pump will be sampled using the pump immediately upon completion of purging. Field measurements of pH, temperature and conductivity will be collected at the time of sample collection. The flowrate of pumping at the time of sampling shall be 100 ml/min or less.

Each well without a dedicated pump will be sampled using a new, factory-cleaned, disposable Teflon bailer with bottom check-valve and sample discharge mechanism. A new segment of Teflon-coated stainless steel wire, inert mono-filament line or nylon cord will be used to lower and retrieve each bailer. The bailer will be lowered into each well to the point of ground water contact, then allowed to fill as it sinks below the water table. Bottom contact will be avoided in order to avoid suspending sediment in the samples. The bailer will be retrieved and emptied in a manner which minimizes sample agitation.

Samples will be transferred directly from the Teflon bailer into a sample container that has been specifically prepared for the preservation and storage of compatible parameters. A bottom emptying device provided will be used to transfer samples from bailer to sample container. The generation air bubbles and sample agitation will be minimized during bailer discharge.

Ground water samples will be collected and contained in the order of volatilization sensitivity. Initially, only purgeable organics and total metals specimens will be collected for laboratory analysis. Subsequently, other analytical methods may required. When collected, the following order of sampling will be observed:

- Initial measurements of pH, temperature, conductivity and turbidity
- Volatile and Purgeable Organics
- Base Neutral and Acid Extractable Organics
- Total Metals
- Final measurements of pH, temperature, conductivity and turbidity

All samples will be collected and analyzed in an **unfiltered** state during all sampling events.

All reusable sampling equipment including water level probes, pH/conductivity meters, interface probes, and filtering pumps which might contact aquifer water or samples will be thoroughly decontaminated between wells by washing with non-phosphate soapy, de-ionized water and triple rinsing with deionized water. Detailed equipment decontamination procedures are detailed in Section 2.6.

2.4 Field Quality Assurance

Field and trip blanks will be prepared, handled and analyzed as ground water samples to ensure cross-contamination has not occurred. One set of trip blanks, as described later in this document, will be prepared before leaving the laboratory to ensure that the sample containers or handling processes have not affected the quality of the samples. One set of field (equipment) blanks will be created in the field at the time of sampling to ensure that the field conditions, equipment, and handling during sampling collection have not affected the quality of the samples. A duplicate ground water sample may be collected from a single well as a check of laboratory accuracy. Blanks and duplicate containers, preservatives, handling, and transport procedures for surface water samples will be identical to those noted for ground water samples.

2.5 Sample Containers

Sample containers will be provided by the laboratory for each sampling event. Containers must be either new and factory-certified analytically clean by the manufacturer, or cleaned by the laboratory prior to shipment for sampling. Laboratory cleaning methods will be based on the bottle type and analyte of interest.

2.6 Equipment Decontamination

All non-dedicated equipment (such as water level meter) that will come in contact with the well casing and water will be decontaminated. The procedure for decontaminating non-dedicated equipment is as follows:

1. Phosphate-free soap and tap water wash
2. Deionized or distilled water rinse
3. Isopropyl alcohol rinse
4. Deionized or distilled water rinse and air dry
5. Aluminum foil wrap with shiny side out

3.0 Surface Water Sample Collection

This section present details of the procedures and equipment required to perform surface water field measurements and sampling from springs, streams and ponds during each monitoring event. A description of proposed surface water monitoring station locations is presented in **Table 2**. The proposed surface water monitoring station locations are shown in **Figure 2**.

3.1 Surface Water Level Observations

Surface water quality analyses are particularly sensitive to site hydrologic conditions and recent precipitation events. Water levels may fluctuate drastically in comparison the ground water table and may result in either diluting or increasing contaminant loadings. The scheduling of sampling events and the interpretation surface water data must take into account climatic, recent weather and sampling station conditions.

Surface water level and sampling station conditions will be observed one day prior to, and during each sampling event. Surface water observations will include the flood stage in streams, seasonal base flow conditions, and confirm location and timing for meaningful surface water quality sampling. The following objective observations will be recorded in a dedicated field book prior to sample collection:

- Sample location designation
- Relative stream water level

- Surface water clarity
- Rate of flow and degree of stagnation
- Physical conditions of sampling station
- Changes in surface monitoring station conditions and surroundings.

Modifications to surface sampling station conditions may be required prior to each sampling event. These modifications may include the removal of surface and submerged debris, slightly deepening the station to allow sample container immersion, or channeling/piping to consolidate local discharge. When modifications are required, sufficient time will be allowed for settlement of suspended solids between the disturbance and sample collection. A minimum settling period of four hours prior to sampling will be observed.

3.2 Surface Water Sample Collection

Surface water samples will be obtained from areas of minimal turbulence and aeration. New latex or nitrile surgical gloves will be donned prior to sample collection. The following procedure will be implemented regarding sampling of surface waters:

1. Put on new latex or nitrile surgical gloves.
2. Hold the bottle in the bottom with one hand, and with the other, remove the cap.
3. Push the sample container slowly into the water and tilt up towards the current to fill. A water depth of six inches is generally satisfactory. Care will be taken to avoid breaching the surface or losing sample preservatives while filling the container.
4. If there is little current movement, the container should be moved slowly, in a lateral, side to side direction, with the mouth of the container pointing upstream.

Temperature, pH, specific conductivity and turbidity will be taken at the start of sampling as a measure of field conditions and check on the stability of the water samples over time. Measurements of temperature, pH, specific conductivity and turbidity will be recorded for all surface water samples. The calibration of the pH, temperature, conductivity , and turbidity meters will be completed at the beginning of each sampling event, according to the manufacturers'

specifications and consistent with Test Methods for Evaluating Solid Waste - Physical/Chemical Methods (SW-846).

Surface water samples will be collected and contained in the order of volatilization sensitivity of the parameters as follows:

- Measurements of pH, temperature, conductivity and Turbidity
- Volatile and Purgeable Organics
- Base Neutral and Acid Extractable Organics
- Total Metals

All surface water samples will be collected in an unfiltered state.

All field meters which might contact surface water samples will be thoroughly decontaminated between stations by washing with non-phosphate soapy, de-ionized water and triple rinsing with deionized water.

One surface water samples will be collected at this site (shown on **Figure 2** and listed in **Table 2**). Samples will be collected directly from the station in the container that has been specifically prepared for the preservation and storage of compatible parameters. Samples will be collected in a manner that assures minimum agitation. Additional blanks and duplicate samples will not be taken with the surface water samples.

Sample containers shall be prepared and provided by the laboratory for each surface water sampling event. Each sample containers' preparation and preservatives shall be the same as those utilized for ground water sampling and addressed previously in Section 2.5.

4.0 Field QA/QC Program

Field Quality Assurance/Quality Control (QA/QC) requires the routine collection and analysis of trip blanks to verify that the handling process has not affected the quality of the samples. Any contaminants found in the trip blanks could be attributed to:

1) interaction between the sample and the container,
2) contaminated source water, or
3) a handling procedure that alters the sample.

The laboratory will prepare a trip blank by filling each type of sample bottle with distilled or deionized water. Trip blanks will be placed in bottles of the specific type required for the analyzed parameters and taken from a bottle pack specifically assembled by the laboratory for each ground water sampling event. Trip blanks will be taken prior to the sampling event and transported with the empty bottle packs. The blanks will be analyzed for volatile and purgeable organics only.

The concentration levels of any contaminants found in the trip blank will be reported but will not be used to correct the ground water data. In the event that elevated parameter concentrations are found in a blank, the analysis will be flagged for future evaluation and possible re-sampling.

All field instruments utilized to measure ground water characteristics will be calibrated prior to entering the field, and recalibrated in the field as required, to insure accurate measurement for each sample. The specific conductivity and pH meter shall be recalibrated utilizing two prepared solutions of known concentration in the range of anticipated values (between 4 and 10). A permanent thermometer, calibrated against a National Bureau of Standards Certified thermometer, will be used for temperature meter calibration. The turbidity meter will be calibrated using Lucite standard blocks provided by the manufacturer.

5.0 Sample Preservation and Shipment

Methods of sample preservation, shipment, and chain-of-custody procedures to be observed between sampling and laboratory analysis are presented in the following sections.

5.1 Sample Preservation

Proper storage and transport conditions must be maintained in order to preserve the integrity of samples between collection and analysis. Wet ice will be used to cool and preserve samples, as directed by the analytical laboratory. Samples will be maintained at a temperature of 4° C. Dry ice is not to be used.

Pre-measured chemical preservatives will be provided in the sample containers provided by the analytical laboratory. Hydrochloric acid will be used as a chemical stabilizer and preservative for volatile and purgeable organic specimens. Nitric acid will be used as the preservative for samples for metals analysis.

Upon collection, samples will be placed on ice in high impact polystyrene coolers and cooled to a temperature of 4°C. Samples will be packed and/or wrapped in plastic bubble wrap to inhibit breakage or accidental spills. Chain-of-Custody control documents will be placed in a waterproof pouch and sealed inside the cooler with the samples for shipping. Tape and/or custody seals shall be placed on the outside of the shipping coolers, in a manner to prevent and detect tampering with the samples.

Samples shall be delivered to the analytical laboratory within a 24-hour period in person or using an overnight delivery service to insure holding times are not exceeded. Shipment and receipt of samples will be coordinated with the laboratory.

Chain-of-Custody control will be maintained from sampling through analysis to prevent tampering with analytical specimens. Chain-of-Custody control procedures for all samples will consist of the following:

1. Chain-of-Custody will originate at the laboratory with the shipment of prepared sample bottles and a sealed trip blank. Identical container kits will be shipped by express carrier to the sampler or site or picked up at the laboratory in sealed coolers.

2. Upon receipt of the sample kit, the sampler will inventory the container kit and check its consistency with number and types of containers indicated in the Chain-of-Custody forms and required for the sampling event.

3. Labels for individual sample containers will be completed in the field, indicating the site, time of sampling, date of sampling, sample location/well number, and preservation methods used for the sample.

4. Collected specimens will be placed in the iced coolers and will remain in the continuous possession of the field technician until shipment or transferral as provided by the Chain-of-Custody form has occurred. If continuous possession can not be maintained by the field technician, the coolers will be temporarily sealed and placed in a secured area.

5. Upon delivery to the laboratory, samples will be given laboratory sample numbers and recorded into a logbook indicating client, well number, and date and time of delivery. The laboratory director or his designee will sign the Chain-of-Custody control forms and formally receive the samples. The field technician, project manager and the laboratory director will work together to insure that proper refrigeration of the samples is maintained.

6. Copies of the complete Chain-of-Custody forms will be placed in the laboratory's analytical project file and attached to the laboratory analysis report upon completion.

Chain-of-Custody forms will be used to transfer direct deliveries from the sampler to the laboratory. A coded, express delivery shipping bill shall constitute the Chain-of Custody between the sampler and laboratory for overnight courier deliveries.

6.0 Field Logbook

The field technician will keep an up-to-date logbook documenting important information pertaining to the technician's field activities. The field logbook will document the following:

- Site Name and Location
- Date and Time of Sampling
- Climatic Conditions During Sampling Event
- Sampling Point/Well Identification Number
- Well Static Water Level
- Height of Water Column in Well
- Purged Water Volume and Well Yield (High or Low)
- Presence of Immiscible Layers and Detection Method
- Observations on Purging and Sampling Event
- Time of Sample Collection
- Temperature, pH, Turbidity, and Conductivity Readings
- Signature of Field Technician.

7.0 Laboratory Analysis

The ground and surface water parameters to be analyzed will be those specified in Table 1. These will include field indicators of water quality (pH, conductivity, temperature and turbidity) and selected purgeable organic as listed in Appendix I and Appendix II of 40 CFR.258 and 15 RCRA metals constituents (total metals analysis). All analytical methods are taken from Test Methods For Evaluating Solid Waste - Physical/Chemical Methods (SW-846) or Methods For the Chemical Analysis of Water and Wastes and will be consistent with DSWM's policies regarding analytical methods and PQLs. Analysis will be performed by a laboratory certified by the North Carolina DENR for the analyzed parameters.

Formal environmental laboratory Quality Assurance/Quality Control (QA/QC) procedures are to be utilized at all times. The owner/operator of the landfill is responsible for selecting a laboratory contractor and insuring that the laboratory is utilizing proper QA/QC procedures. The laboratory must have a QA/QC program based upon specific routine procedures outlined in a written laboratory Quality Assurance/Quality Control Manual. The QA/QC procedures listed in the manual shall provide the lab with the necessary assurances and documentation that accuracy and precision goals are achieved in all analytical determinations. Internal quality control checks shall be undertaken regularly by the lab to assess the precision and accuracy of analytical procedures.

During the course of the analyses, quality control data and sample data shall be reviewed by the laboratory manager to identify questionable data and determine if the necessary QA/QC requirements are being followed. If a portion of the lab work is subcontracted, it is the responsibility of the contracted laboratory to verify that all subcontracted work is completed by certified laboratories, using identical QA/QC procedures.

8.0 Data Evaluation

Copies of all laboratory results and water quality reports for the Johnston County Landfill will be kept at the Johnston County Landfill office. Reports summarizing all ground water quality results and data evaluation will be submitted to the DSWM for each sampling event. Upon receipt of each monitoring event's data, the water quality database of analyses will be updated.

Methods to evaluate the data are taken from North Carolina Solid Waste Rules and the EPA RCRA Ground Water Monitoring Technical Guidance Documents. There is existing ground water impact at the site due to unlined MSW Phases 1 & 2 and Phase 3. Therefore, statistical analyses will be performed for this C&D landfill to determine if contaminant levels are increasing due to possible impact from the C&D landfill. As there is existing impact, intra-well statistical analyses will be performed on laboratory data from ground water samples.

The North Carolina Solid Waste Rules provide several methods for statistical analysis of ground water data. These methods are:

1. Parametric Prediction Intervals
2. Non-Parametric Prediction Intervals
3. Tolerance prediction interval
4. Control chart
5. An alternative statistical test method that meets the performance standards of 40 CFR 258.53 (h)

The choice of appropriate methods for data analysis and presentation, including statistical tests, depends on the type of monitoring, the nature of the data, and the proportion of values in the data set that are below detection limits. The statistical analysis will be conducted separately for each detected organic constituent based on the EPA's Statistical Analysis of Ground Water Monitoring Data at RCRA Facilities, Interim Final Guidance Document (1989) and Addendum to the Interim Final Guidance Document (1992). Any statistical analyses will be performed in general accordance methods outlined in the North Carolina State Regulations 15A NCAC 13B.1632.

9.0 Record Keeping and Reporting

9.1 Sampling Reports

Copies of all laboratory analytical data will be forwarded to the DWM within 45 calendar days of the sample collection date. The analytical data submitted will specify the date of sample collection, the sampling point identification and include a map of sampling locations. Should a significant concentration of contaminants be detected in ground and surface water, as defined in North Carolina Solid Waste Rules, Ground Water Quality Standards, or Surface Water Quality Standards, the owner/operator of the landfill shall notify the DWM and will place a notice in the landfill records as to which constituents were detected.

9.2 Well Abandonment/Rehabilitation

Should wells become irreversibly damaged or require rehabilitation, the DWM shall be notified. If monitoring wells and/or piezometers are damaged irreversibly they shall be abandoned under the direction of the DWM. The abandonment procedure in unconsolidated materials will consist of over-drilling and/or pulling the well casing and plugging the well with an impermeable, chemically-inert sealant such as neat cement grout and/or bentonite clay. For bedrock well completions the abandonment will consist of plugging the interior well riser and screen with an impermeable neat cement grout and/or bentonite clay sealant.

9.3 Additional Well Installations

The data will be analyzed to verify the correct placement of wells and determine locations for future monitoring wells, if necessary. Any additional well installations will be carried out in accordance with DWM directives. If the potentiometric maps reveal that the depths, location, or number of wells is insufficient to monitor potential releases of solid waste constituents from the solid waste management area, new well locations and depths will be submitted to the DWM for approval.

All monitoring wells shall be installed under the supervision of a geologist or engineer who is registered in North Carolina and who will certify to the DWM that the installation complies with the North Carolina Regulations. Upon installation of future wells the documentation for the construction of each well will be submitted by the registered geologist or engineer within 30 days

after well construction. Plans to install MicroPurge™ pumps in any additional well installed on-site shall be submitted to DSWM for approval prior to pump installation.

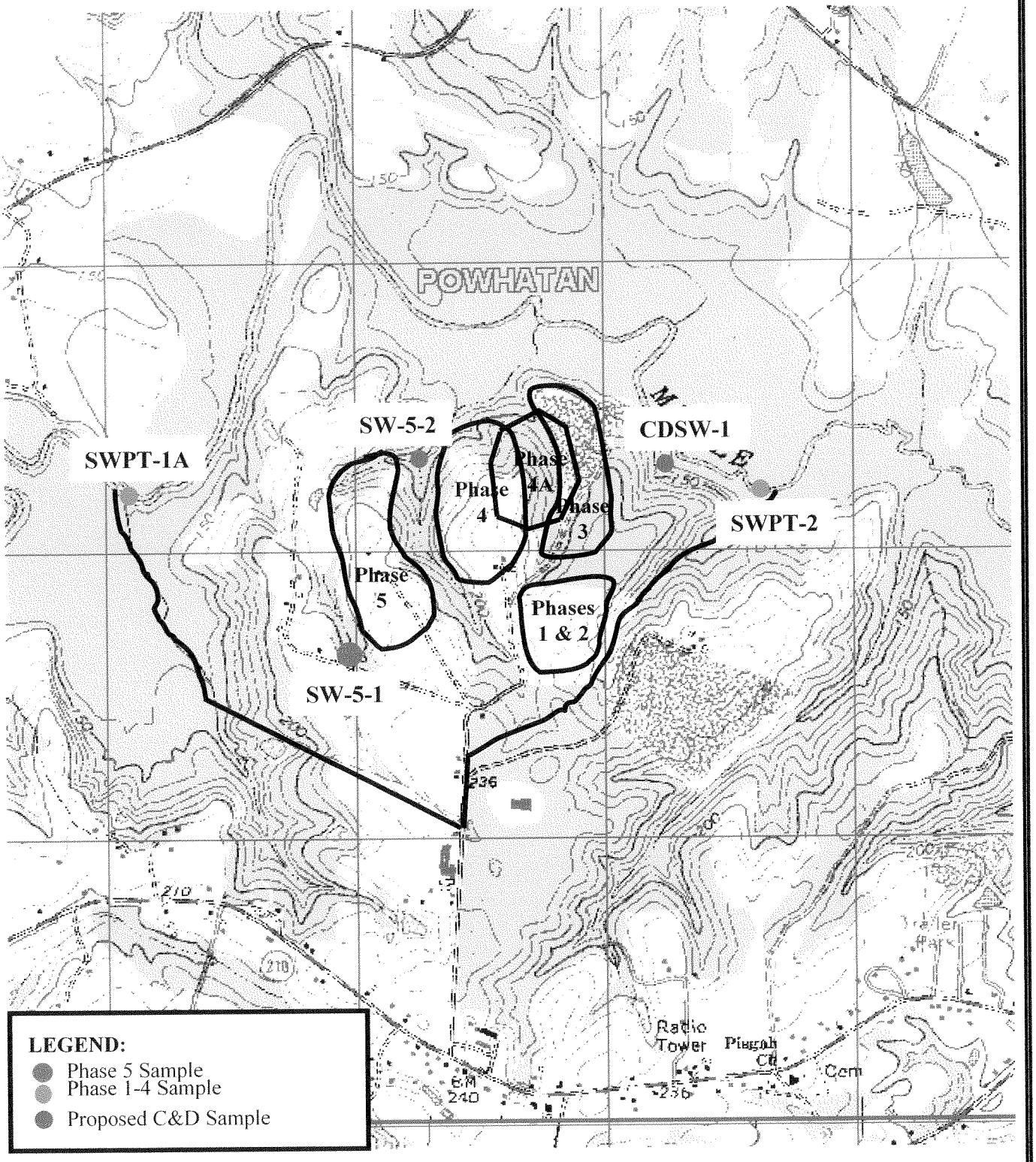
9.4 Implementation Schedule

This program is currently in place and being utilized at the site, with the exception of the addition of MW-8a, MW-14d, MW-15d, MW-16d and MW-17 and the leachate samples. These wells have also been proposed in a letter from GNRA to NCDENR dated July 18, 2001 regarding a recent geophysical evaluation of portions of the site and the proposed installation of additional wells. These well installations will be implemented upon approval from NCDENR.

Table 1
Ground Water Monitoring Well Network
Johnston County Landfill
Johnston County, North Carolina
Proposed C&D Landfill

Monitoring Well	Completion Type	Associated Wells	Screened Interval	Monitoring Program
CDMW-1	Shallow	none	TBD	Appendix I List
CDMW-2	Shallow	none	TBD	Appendix I List
CDMW-3	Shallow	none	TBD	Appendix I List
CDMW-4	Deep	none	TBD	Appendix I List
CDMW-5	Shallow	CDMW-5d	TBD	Appendix I List
CDMW-5d	Shallow	CDMW-5	TBD	Appendix I List
CDMW-6	Shallow	none	TBD	Appendix I List
CDMW-7	Deep	none	TBD	Appendix I List
CDMW-8	Shallow	CDMW-8d	TBD	Appendix I List
CDMW-8d	Deep	CDMW-8	TBD	Appendix I List
CDMW-9	Shallow	CDMW-9d	TBD	Appendix I List
CDMW-9d	Deep	CDMW-9	TBD	Appendix I List

Notes: 1.) Well locations shown on WQMP Figure 1
2.) TBD = To Be Determined



Surface Water Sampling Locations

Johnston County Landfill

Smithfield, North Carolina

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Engineering and Geological Services
14 N. Boylan Ave.
Raleigh, N.C. 27603
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SCALE:	DRAWN BY:	CHECKED BY:	DATE:	PROJECT NO.	FIGURE NO.	FILE NAME
NTS	CJ	JAS	11/3/05	Johnston-23	2	John sw loc.ppt