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HYDROGEOLOGY REPORT ONLY

PART 2
PERMIT TO CONSTRUCT APPLICATION

Engineering Design and Detailed Hydrogeological Report

Prepared for

C&D Landfill, Inc.

Economical Disposal Solutions

802 Recycling Lane

Greenville, North Carolina 27834

March 2001

SCANNED 4/2/18 Cameron Johnson

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Part 2 – Permit to Construct Application
Detailed Hydrogeological Investigation – Draft

Construction & Demolition Debris Landfill
Pitt County, North Carolina

Prepared for:

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To the Attention of:

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Part 2 – Permit to Construct Application

C&D Landfill, Inc. – Phases 1A and 1B
(A Private Facility in Pitt County, North Carolina)

Detailed Hydrogeological Report

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This report accompanies the Design and Engineering Report prepared by John Tucker, P.E.

For C&D landfills, the applicable NC DWM rules (Title 15 NCAC 13B .0503 and .0504) provide no specific guidelines for the content of the Detailed Hydrogeological Report. Thus the content and format for lined landfill reports has been followed. Tables and relevant data from the Site Suitability Application Report have been included.

1.0 Project Description

This report provides a detailed hydrogeological evaluation for a proposed new Construction and Demolition Debris Landfill (CDLF), Phases 1A and 1B, to be located in eastern Pitt County, North Carolina. This detailed hydrogeology evaluation, which accompanies the second of a two-part application package prepared by John Tucker, P.E., follows a format typically used for lined landfill facilities, because applicable rules for the permitting of CDLFs (Title 15 NCAC 13B .0503 and .0504) provide no specific guidelines for the content of the Detailed Hydrogeological Report. This report was prepared in accordance with NC DWM policy for approving new facilities.

Past work on the site include a site characterization study, prepared by David Garrett, P.G., P.E., and a preliminary facility plan, prepared by John Tucker, P.E. The site has received a favorable Site Suitability determination by NC DWM and has met applicable local government approval criteria. Relevant portions of the facility design, e.g. construction plans and specifications, operations plan, sedimentation and erosion control plan, final closure plan, and specific calculations on drainage, settlement and slope stability, prepared by (or for) Mr. Tucker are presented elsewhere in this document. This report includes a detailed discussion of the geology and the ground water flow characteristics, including contaminant transport analysis and a revised water quality monitoring plan.

2.0 Local and Regional Geology

The site is located in the eastern or "lower" Coastal Plain physiographic and geologic province of North Carolina. Available geologic mapping[1] places the site within the Miocene-age Yorktown Formation, approximately twenty miles west of the Suffolk Scarp – the dividing line between Quaternary age surficial deposits (to the east) and Tertiary age surface deposits (to the west), located at approximately 25 feet above mean sea level. The site is also located approximately twenty-four miles east of the Surry Scarp, which separates major units of the underlying Cretaceous units exposed south of Pitt County. The site is located entirely within the Tar-Pamlico River basin, draining via two small perennial streams to Grindle Creek.

Published literature indicates upland areas throughout the region are underlain by relatively thin Quaternary surficial deposits (not mapped on the state-wide map).[2] The regional surficial aquifer has been characterized in the literature as stratified fluvial deposits, containing interlayered low permeability and high permeability horizons. The thickness of the aquifer ranges from 3 to 180 feet, thickening eastward (average thickness of 35 feet), with an estimated average hydraulic conductivity of 29 feet per day *(sic)*. They surficial aquifer was also characterized as exhibiting less than 50 percent sand, hence lower hydraulic conductivity, west of a line that roughly coincides with the Suffolk Scarp. These observations were confirmed by the local area study and site specific reconnaissance, whereas the surficial deposits (deemed the uppermost aquifer) consist of poorly stratified sand and clay layers, which were found to exhibit an average thickness of 12 feet, underlain by the Yorktown (here with a distinct fossil-marker bed of turritellas and a color change). On-site field hydraulic conductivity values were measured in the range of 0.028 ft/day to 0.667 ft/day.

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1 North Carolina Geological Map, Scale 1:62,500, NC Geological Survey, 1985.

2 Hydrogeologic Framework of the North Carolina Coastal Plain Aquifer System, U.S. Geological Survey Open File Report 87-690, USGS.

The major regional aquifers beneath the Coastal Plain, near the City of Greenville, NC, include the Yorktown, the deeper Eocene-age Castle Hayne Formation (limestone) and underlying Cretaceous-age units, i.e. the Pee Dee and Black Creek Formations.[3] The Yorktown is characterized as marine sediments varying in thickness to 60 feet (thickest within Pitt County is in the northwest corner). The Castle-Hayne is localized to the southern and eastern portions of Pitt County (and further east) but is represented to be less than 30 feet in thickness everywhere in the county.

The Paleocene-age Beaufort Formation is mentioned in the literature, stratigraphically located between the Castle-Hayne and the deeper Cretaceous units, but the Beaufort does not outcrop. The Pee Dee and Black Creek Formations outcrop along the Tar River approximately eight miles west of the site (in Greenville, NC), and the Cretaceous-age Cape Fear Formation outcrops approximately eight miles further upstream (west of the site). Based on region data,[4] typical depths of the Cretaceous units in proximity to the site are in excess of 90 feet (see Table 1B). All are considered to be viable aquifers with variable water quality.

Basement rocks in the region consist of pre-Mesozoic crystalline rocks of igneous and metamorphic origin, which underlie the sediments of the Coastal Plain near the site at depths in excess of 1000 feet, based on available water well data (see Footnote 4) and published data.[5] West of the Suffolk Scarp the projected surface of the crystalline basement slopes at 0.4% (2000 feet in 90 miles), east of the Suffolk Scarp the surface of the basement slopes at 1.4% (8000 feet in 110 miles), with a maximum depth of 10,000 feet at Hatteras. The basement complex likely resembles the crystalline rocks exposed in the Piedmont, complete with various contacts, jointing, and other tecto-structural features, e.g. folds and faults. Several transform faults in the basement complex have been recognized by characteristic deformation features within the overlying late-Mesozoic and early Tertiary sediments.[6]

These relicts of Triassic-age tectonism (active throughout the Mesozoic era) are strike-slip faults with vertical rotation, oriented approximately with the alignments of the Tar, Neuse and Cape Fear Rivers. The most conspicuous feature produced by these faults, visible on the North Carolina Geologic Map, is the "up-thrown block" that occurs between the Cape Fear and Neuse Rivers (well south of the site). Within this area, the Yorktown has been all but eroded away, exposing the older Tertiary and Cretaceous sediments much further east than observed south of the Cape Fear or north of the Neuse. These faults are not active, and the region is not within a Seismic Impact Zone[7].

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3 Brown, P.M., Geology and Ground Water Resources in the Greenville Area, North Carolina, Bulletin Number 73, prepared cooperatively by the North Carolina Department of Conservation and Development and the United States Geological Survey, 1959.

4 DENR Monitoring Well Database (interactive), North Carolina DENR Division of Water Resources, Ground Water Branch, viewed at web site http://www.dwr.ehnr.state.nc.us.

5 Lawrence and Hoffman, Geology of the Basement Rocks Beneath the North Carolina Coastal Plain, Bulletin 95, North Carolina Geological Survey, 1993.

6 Brown, P.M., and others, Wrench-style Deformation of Rocks of Cretaceous and Paleocene Age, North Carolina Coastal Plain, Special Publication 5, NCGS, Raleigh, NC, 1977.

7 EPA/600/R-95/051, RCRA Subtitle D (258) Seismic Design Guidance for Municipal Solid Waste Landfill Facilities, 1995, including Seismic Intensity Capable Faults Map, See Appendix II

Heavy ground water extraction by water supply wells in the region has been considered as a probable cause for lowered potentiometric levels within the regional aquifers (noticeable over several decades) and localized ground subsidence.[8] Geodetic survey data for the period from 1935 to 1979 compared subsidence at 86 monuments located along a tract following the Neuse River from Raleigh to New Bern, including Kinston and Cove City, passing south of Greenville (see Appendix E).

The data show nearly equal rates of subsidence in the vicinity of Goldsboro and New Bern over the 44-year period, at approximately 0.18 inches/year and 0.16 inches/year, respectively. However, in the vicinity of Cove City, where new production wells were activated in the late 1960's, the rate of subsidence increased from approximately 0.17 inches/year for pre-1968 to 0.25 inches/year for post-1968. Another plot shows total ground subsidence between 1935 and 1979 on the order of 3.5 inches in the vicinity of Goldsboro, 7 inches near Kinston, and 6 to 8 inches near Cove City and New Bern. Most of the ground water extraction occurred in the Cretaceous aquifers.

High capacity wells are used to supply drinking for the cities of Greenville and Washington. The Division of Water Resources data do not indicate how far the zone of influence around the wells extends with respect to subsidence, but the subsidence probably extends not more than a few miles from the respective wells. There are no high capacity production wells located within two miles of the subject site, based on the findings of the local area study. It is not anticipated that the extraction of ground water in either Greenville or Washington would affect ground subsidence at the site.

Daniels, et. al., discusses drainage characteristics and ground water movement within the surficial deposits of the Coastal Plain.[9] By examining in numerous soil samples for the presence of iron-oxide staining (various hues of red and yellow, e.g. goethite) and gley coloration (gray, blue-gray or green-gray pigmentation resulting from reduced iron compounds contained in water-logged soils beneath the surface, often accompanied by the formation of a sticky clay layer), along with various geochemical and pedologic properties, water movement characteristics within certain near surface soil horizons can be determined. Gleyed sands and sand-clay horizons were observed in the drilling and test pits for the subject site, typically at depths of 7 to 12 feet, usually with a sharp near horizontal demarcation with the overlying iron-oxide pigmented soils.

This work suggests that the presence of gley colors relatively near the surface within the lower Coastal Plain (as in other areas) results from very slow to no movement of water, i.e. "stagnant" ground water conditions. Conditions that produce gleyed beds, whether sand or clay, do not often change, as would be expected with the introduction of oxygen-rich meteoric water from the surface. The implications are that surficial aquifers function independently as reservoirs of infiltrated meteoric water, with relatively shallow discharge to streams and little recharge to the deeper aquifers. As discussed in the Site Suitability Report, the subject site is isolated hydraulically and from human activities. It is not likely that the planned landfill will affect (or be affected by) regional activities.

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8 Land Subsidence Information, NC DENR Division of Water Resources - Ground Water Branch, unpublished, reviewed on-line at www.dwr.ehnr.state.nc.us

9 Daniels, R.B., and E.E. Gamble, W.H. Wheeler, J.W. Gilliam, E.H. Whiser, C.W. Welby, Water Movement Surficial Coastal Plain Sediments, Inferred from Sediment Morphology, Technical Bulletin No. 243, North Carolina Agricultural Experiment Station, North Carolina State University, Raleigh, NC, December 1978.

3.0 Site Reconnaissance

3.1 Topographic Setting and Drainage

Site topographic mapping shown on Drawings F1 and F4 shows a subtle drainage divide (the term "ridge" conveys too steep a topography for this context) oriented to the northeast. This feature slopes gently and divides surface drainage to small perennial streams located within linear drainage features that flank the northwest and southeast sides of the site. The ground slopes abruptly into these features. Maximum ground elevations within the Phase 1A and 1B footprint are at El. 20 near test boring B-5. The high ground extends along the northwest side of the diamond-shaped site toward B-13 and B-3. Ground elevations along the steam to the northwest of the footprint vary from El. 15 near B-1 to El. 10 near the exit of the northwest stream at the west corner of the site.

Southeast of the divide the ground within the footprint slopes to El. 16 near B-4 and El. 18 near B-2 and B-12. A second drainage feature along the southeast side of the site exists from approximately El. 12 at the east corner of the site to approximately El. 8 at the south corner. Along the northeast side of the site, near the north corner of the site, a third, relatively flat drainage feature exists near El. 15, but without abrupt slopes. This feature converges with the perennial stream on the northwest side of the site, but there is no discernable channel and this feature exhibits closed topographic contours (see Section 3.2) Yet a fourth drainage feature begins along the southwest property line. All surface drainage eventually flows southwest toward Grindle Creek, located about 1000 feet from the property boundary. Grindle Creek is a regional drainage feature that flows southeast to the Tar River.

Stream gradients near the site and within the region are generally flat. Streams are generally slow moving and there are swamps and marshes in close proximity to the site. The basic topography is typical of the region, except that the high ground on which the site is located is somewhat unique within the immediate surroundings. The site is located along the south flank of a broad dissected ridge, i.e. an inter-stream divide between Grindle Creek to the south and Tranters Creek to the north (see Appendix D), separating the creeks by at least a mile. Grindle Creek is the larger of the two creeks, existing between El. 5 and El. 10. Tranters Creek exists between approximately El. 10 and El. 15. The regional ridge is oriented to the northwest-southeast, approximately along the alignment of both Grindle and Tranters Creeks. Mean elevations on the broad ridge are between El. 15 and El. 20, with highest elevations along U.S. 264 of El. 25 or more.

Evidently, the regional land surface was sculpted by moving water at some distant time past, probably due to shoreline migrations associated with sea level changes or meandering of either Grindle Creek or Tar River. The resulting elevated "knoll" on which the subject site is located is surrounded by drainage features. Other such subtle "knolls" exist to the north of Grindle Creek, approximately equidistant from the creek banks. A wide plain exists between Grindle Creek and the Tar River, and for some distance on either side of both streams, suggesting that the current stream channels may have evolved from a common meandering river or former estuary. Tar River exists below El. 5. Within a few miles downstream, at the Suffolk Scarp, the Tar broadens and flattens considerably as it enters the estuary of the Pamlico River.

3.2 Springs, Seeps and Ground Water Discharge Features

Two on-site streams are fed by ground water discharge from the uppermost aquifer. Both streams originate less than a mile east of tbe site, but the streams are fed in part by seeps and springs located along the banks of these features within the property boundary, many of which are too small to discern. Two identified springs are shown on the ground water contour map (Drawing F4). One of these is located at the head of the drainage feature one the southeast side of the site, near B-4. Based on topographic relationships, this spring is recbarged by a fairly small watershed area and could be prone to seasonality. Above this spring is a wet season conveyance, which is fed in part by a man-made drainage ditch located within the nortbeast portion of the site.

The other on-site spring is an apparent seasonal feature, located at the east end of an area of elevated wetlands, termed a "pocosin" (see Footnote 8). The feature is located in the northeast side of the site, between test borings B-10 and B-19. This heavily wooded feature exhibits numerous pools of standing water during the wet portion of tbe year. However, there is no definite channel and no discernable outlet to the stream in the northwest side of the site (the presumed drainage direction). In fact, closed topographic contours are visible on the topographic map. There is an area of marginally higher ground to the east of the site, from which there appears to be ground water recharge to the upper aquifer and surface water "run-on" which is intercepted by the pocosin.

Based on the topography and clayey substrata in the upper aquifer, it is conceivable that the pocosin is seasonal, e.g. the wetlands could be influenced by a relatively shallow "perched" water table that fluctuates periodically, or recharge from deeper aquifers could occur. It also appears that the feature collects surface water runoff within a small watershed area and serves as a ground water recharge feature. The potentiometric relationships among the nearby piezometers and surface streams (Drawing F4) support this finding.

An upward vertical gradient exists within the regional aquifer beneath the site (Yorktown formation), as seen by the piezometer couplet at B-2s and B-2d (see Table 6). Other piezometers are in sufficiently close proximity to be considered as couplets, as well. These data indicate upward gradients within the surficial aquifer in portions of the Pbase 1A and 1B footprint, which could be driven by recharge from the pocosin or from off-site locations to the east. The upward gradient in the surficial aquifer could be a seasonal feature that affects the flow at the seeps and springs.

Even though there is on-site discharge from the uppermost aquifer, the southwest side of the site exhibits flow that is not intercepted by the on-site streams. Grindle Creek is the regional ground water discharge feature. At its closest point, the creek is located approximately 1000 feet away from the site boundary. The ground water potentiometric map for the site indicates a split flow coinciding approximately with the topographic divide, with a portion of the uppermost aquifer discharge occurring at the on-site streams. However, a southerly component of the ground water flow beneath the site does flow to the south property boundary, without an on-site discharge feature between the site and Grindle Creek. This situation results in the need for more detailed evaluation of ground water flow, with respect to potential contaminant migration (see Section 10.0).

4.0 Geotechnical Investigation

4.1 Test Boring Program

Test borings and test pits performed in September-November 2000 are shown on Figure F1. The test borings, labeled as the "B" series borings on the site map, were extended to depths varying from 15 to 70 feet, penetrating the several of the major lithologic and hydrologic units mapped in the region. Test boring data are summarized on Table 1A. The deeper subsurface data were supplemented by three relatively shallow hand auger borings. Figure F1 also shows existing site topography and the locations of the hydrogeologic cross sections discussed later in this text.

All of the B-series borings were converted to standpipe piezometers for long-term ground water level observation. Several test borings, e.g., B-1, B-2s/2d, B-3 and B-4, were completed as monitoring wells for future monitoring of the site. There are 19 ground water observation points within and near the 15-acre footprint (Phases 1A and 1B), plus the surface streams. A ground water potentiometric map has been prepared from these data. Test boring records are presented in Appendix C.

4.2 Laboratory Analysis

Table 2 presents a summary of laboratory test data for the recently completed test borings. The laboratory test program consists of the following:

Triaxial Shear Strength, CU - undisturbed	D4767-95	1
Triaxial Shear Strength, CU - remolded	D4767-95	2
Flexible wall permeability - undisturbed	D5084	2
Flexible wall permeability - remolded	D5084	1
Standard Proctor Compaction	D698	1
Grain Size w/Hydrometer	D422, D1140	9
Atterberg Limits	D4318	11
Natural Moisture	D2216	12
One-Dimensional Consolidation	D2435	1

The soils were classified in the laboratory according the Unified Soil Classification System (USCS). These descriptions were matched to the boring logs to verify the visual soil classifications. Laboratory data is presented in Appendix IV. Based on the laboratory data, a majority of the on-site soils generally classify as silty sands (SM), poorly graded relatively clean sands (SP), or silt-clay (CL and CL-ML). A deeper horizon within the Yorktown exhibited fairly high plasticity, based on visual observation, but these soils too classified as CL (B-2d, Sample #6). The near surface aquifer exhibited both sand and clay horizons, as indicated by samples from the test pits (TP-series samples).

Relatively undisturbed samples from depths of 18 to 20 feet and 24 to 26 feet, acquired at B-2s, exhibit laboratory hydraulic conductivity test values ranging from 2.16×10^{-6} cm/sec to 3.47×10^{-7} cm/sec. Remolded samples acquired from TP-3 at a depth of 1.5 to 6 feet exhibit laboratory hydraulic conductivity test on the order of 1.94×10^{-9} cm/sec. These samples are believed to be representative of the lower permeability stratigraphy on the site. Undisturbed samples of relatively sandy soils are difficult to obtain, thus field hydraulic conductivity measurements were acquired.

Shear strength values are such that stable embankments can be constructed. The remolded soils exhibit effective internal friction angles of 30 degrees and effective cohesion values in excess of 200 psf. In-situ soils (worst case saturated clayey silt) exhibit effective internal friction angles in excess of 30 degrees and effective cohesion values in the range of 100 to 200 psf.

4.3 Formation Descriptions

The various geologic formations have been discussed in Section 2.0. See Section 4.5 for a discussion of the physical characteristics of the various layers, including conductivity. This section focuses on the Yorktown Formation, a regional aquifer with interlayered confining units that plays an important role in the hydrogeology of the site.

The Yorktown is described in classic literature as "...predominant(ly)...thick, massive marine clays interbedded with lenticular sands, shell beds, and indurated shell limestones" (see Footnote 3). The Yorktown is a moderately prolific aquifer, under slight artesian pressure (i.e. upward vertical gradients), with discontinuous water-bearing units occurring throughout the formation, unlike the Castle Hayne, a high yielding regional aquifer (important further east) under high artesian pressure. The Yorktown is recharged directly by precipitation and is considered important for its high storage capacity and as a source of recharge to the deeper aquifers in the region, according to Brown, et. al. Based on the Water Resources Database (Footnote 4), the Yorktown is present in nearly all recorded borings drilled in the vicinity, varying in depth from 0 to 28 feet beneath the surface and with thicknesses which vary from 25 to 42 feet (average of 35 feet).

The Yorktown Formation is present in all of the early test borings (B-1 through 13), at nearly consistent depths of 12.5 to 14 feet (this may have been influenced by the sample interval), except at B-1, where a depth of 7.5 feet was recorded. The later test borings B-17 through B-19 sought to place a piezometer within the overlying sand aquifer, just touching the top of the Yorktown, which was found to vary from 9 to 11 feet below the surface. The Yorktown formation consists of a layered clayey silt and plastic clay that serves as a confining layer beneath the site. The top contours of the Yorktown are shown in Figure F5. The map shows that the upper surface of the confining layer slopes gently to the southeast (in contrast to the southwest direction of the potentiometric surface), and the contours appear to show a trough or relict channel that parallels the major streams in the region, including Grindle Creek and Tar River.

It is likely that the contours reflect a former erosional surface within the top of the Yorktown. Fossils found in the upper Yorktown (clams and turritellas) suggest a relatively shallow marine environment with reducing conditions, indicated by the dark green colors. Taken into consideration with the apparent erosional sculpturing along the top of the Yorktown, a regressive marine sequence occurred in the late Miocene, followed by possible surface exposure and erosion. Later the region was reinundated and deposition of shallow fluvial or near-shore yellow sands and clays occurred in an oxidizing environment. This sequence is consistent with the depositional history of the region.

Based on the test boring data, the Yorktown confining layer varies between 14 and 24 feet in thickness. Regional water well construction data (see Footnote 3) indicates that the Yorktown is continuous throughout the region and exhibits an average total thickness of 35 feet. Site specific hydraulic conductivity data indicate permeability values on the order of 10^{-5} cm/sec (Section 4.4).

The upper Yorktown is considered a confining layer for the site. The contoured map of the top of the Yorktown (Figure F5) suggest that a ground water flow component could migrate toward the southeast side of the site, which emphasizes the need for monitoring in the southeast direction. The Water Quality Monitoring Plan (Appendix F) includes at least one well to be constructed at the location of test boring B-4, within the southeast corner of the site.

4.4 Field Hydrologic Testing

Table 3 presents a summary of field hydrogeological properties, based on falling head slug tests. Values of assumed total and effective porosity, aquifer thickness and descriptions of the various hydrogeological units based on the laboratory classification data are also presented in Table 3, along with calculated conductivity values. Each piezometer was developed prior to testing using a down hole pump or bailer until clear water was obtained. Static water level measurements were made at the beginning of each slug test. Table 7 presents hydraulic conductivity values, along witb calculated ground water gradients and velocities at each piezometer.

The slug tests were conducted by placing a pressure transducer at the hottom of the piezometer and allowing a buoyant plastic "slug" of a known volume, placed below the water level in the bore hole casing, to come to equilibrium. The change in piezometric head in response to the "slug" was measured until static equilibrium was re-estahlished. A Hermit 1000C data logger was used to measure the rate of influx until water level equilibrium was achieved. The slug test data was analyzed according to both the Hvorslev and the Bouwer-Rice procedures, using commercially available software. The slug test data and permeability calculations are presented in Appendix II.

On Table 7, the field hydraulic conductivity values (Bouwer-Rice) are shown relative to the hydrogeologic units defined for the site. The data for three piezometers (B-10 through B-12) were re-evaluated since the Site Suitability Report was issued and are no longer considered representative of the upper Yorktown (these were originally intended to represent the upper aquifer but encountered Yorktown sediments in the last sample interval). These borings were supplanted by three later piezometers (B-17 through B-19). Based on the data of Table 7, the representative field hydraulic conductivity values relative to each unit vary as follows:

Unit	Unit Description	Representative Hydraulic Conductivity (cm/sec)	(ft/day)
AU-1	Surficial Aquifer (Quaternary deposits)	2.39E-04 to 1.00E-04	0.666 to 0.028 Average 0.350
CU-1	Soft Silt-Clay (Yorktown)	3.81E-05 to 7.09E-06	0.106 to 0.020 Average 0.063
AU-2	Dense Silty Sand (Yorktown or Castle Hayne)	1.04E-04 to 1.22E-05	0.290 to 0.034 Average 0.162
CU-2	Dense Clayey Sand (Beaufort)	5.25E-06	0.015

From these data an order of magnitude difference in conductivity between Aquifer Unit 1 and Confining Unit 1 can be seen. Likewise, an order of magnitude difference can be seen between the lower units. While the difference in conductivity is not large, is considered significant for modeling the site. The data can he biased due, in part, to the tendency for slug tests to measure hydraulic properties within a relatively narrow zone of influence around the piezometer.

All units exhibit variability with respect to clay content, and it is likely that the upper fluvial sediments are cross-bedded, which potentially leads to "dead-end" pore volumes and decreased effective porosity. Conversely, tbe upper reaches of the Yorktown have been reworked, which might lead to inconsistencies in measured properties. The "slug" tests used to characterize the various formations are prone to influence by localized subsurface conditions, e.g. sand pockets, and piezometer construction, these tests are industry-standard and considered to yield reasonable representative results, sufficient for aquifer characterization and ground water modeling.

5.0 Stratigraphic and Hydrogeologic Units

Hydrogeologic profiles are presented on Drawing X1 and X2. The stratigraphy at the site have been assigned to hydrogeologic units as follows: two aquifers, upper and lower (Units 1 and 2 Aquifers) and two confining layers, upper and lower (Units 1 and 2 Confining Layers). Typical of the coastal plain, the site stratigraphy within the upper 25 feet beneath the surface is defined by a distinct boundary between recent fluvial sediments (tan-yellow and white cross-bedded sands and clays) and deeper marine sediments (dark green silty sands and clays, often with cemented zones and shell hash).

The uppermost marine sediments have been identified as the Miocene-age Yorktown formation based on the fossil assemblage, yet the presence of glauconite (a dark green-black mica, related to biotite, which forms in deep marine environments)[10] in the deeper sediments suggests other possible formations mapped in the region, e.g., Castle Hayne, Beaufort, Pee Dee, or the Black Creek. Specific studies of index fossils were not performed to distinguish these formations, but a comparative study of water well data in the region (see Footnote 4) indicates that the on-site borings likely encountered the Castle Hayne and/or the Beaufort, in addition to the Yorktown.

Unit 1 Aquifer – The soils within the upper 8 to 12 feet below the surface consist of recent to Pliocene-age fluvial sediments, likely associated with former shorelines and/or estuaries of the Tar River and/or Grindle Creek. These soils are tan-yellow to buff-white in color. Occasional pockets of clean well graded sand (SW) were encountered, sometimes with apparent thicknesses of 15 feet. Based on the test pit descriptions (Appendix V) the clay layer is found at depths between 16 to 24 inches and extends to deptbs of 36 to 48 inches.

Cross-bedding is likely within the upper strata, as the clay layer is present at most (but not all) test locations. Typical thickness of the upper clay layer is 24 to 36 inches. Although this clay layer exhibits a permeability of 10^{-7} cm/sec, this layer is not a true confining layer, but its presence helps to limit vertical percolation into the deeper strata.

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[10]Hurlbut, Jr., C.S., and C. Klein, Manual of Mineralogy (after J.D. Dana), 19th ed., J.W. Wiley & Sons, New York, 1977.

The silty sands and clean sands within the upper 10 to 14 feet are considered to be the uppermost aquifer at the site. The water table typically occurs at depths of 4 to 7 feet below the ground surface within this unit. Three machine-drilled piezometers (B-17, B-18, and B-19) were completed to depths of 8 to 12 feet in the upper sand aquifer. Earlier attempts to install shallow piezometers within three hand auger borings (B-14, B-15, and B-16) encountered raveling sands below depths of 5 to 7 feet, consistent with the water table.

The hydraulic conductivity values (Section 4.4) are slightly lower than expected, considering the clean sand layer encountered in most borings, but poor grading and the occasional silt and clay layers and lenses contained within the uppermost aquifer evidently reduce the permeability. This is positive from a ground water monitoring standpoint, as the contaminant modeling (Section xx) indicates more advective-dispersive spreading due to the slower ground water velocities influenced, in part, by the lower hydraulic conductivity.

Unit 1 Confining Layer – Below a depth of 12 to 17 feet exists a sandy silt, grading downward to a plastic clay, which collectively vary in thickness from approximately 15 to 25 feet. The top of this layer is distinguished by a dark green-gray color, characteristic of marine sediments, and heavy shell hash, including whole turritellas (a snail-like marine mollusk). This strata represents the top of the Yorktown formation. The clay layer is present in every boring and exhibits a stiff, moist "gumbo" consistency, that is, the clay is easily molded into a thread of less than 1/8-inch diameter and maintains this level of plasticity for repeated remolding.

Laboratory permeability testing (Table 2) on relatively undisturbed samples and field conductivity tests in the confining layer (Section 4.4) are indicative of a relatively low conductivity within this unit. Considering the flat potentiometric gradient and upward vertical gradients (Section 4.7), downward ground water migration potential relative to the surface aquifer is limited by this lower permeability layer. These results are consistent with the findings of Daniels, et. al. (Footnote 8).

Unit 2 Aquifer – Below depths of 35 to 45 feet exist relatively dense silty sands and clayey sands (SM and SM-ML), which locally are cemented. These soils contain variable amounts of glauconite (a type of mica found in deep marine sediments), distinguished by a green-black "speckled" color, and scattered pelecypod shell hash (including modern-type clams). The deeper sediments were often cemented, giving firm resistance to the drilling equipment. Occasional cemented shell hash concretions were encountered in the split spoon sampling, some of which resemble the distinctive pelecypod-mold structure of the Castle-Hayne formation. The concretions were not widely encountered and might represent reworked sediments within the Yorktown derived from the older formation.

The Yorktown is a confined regional aquifer with upward vertical gradient (artesian pressure) relative to overlying confining layer. Field conductivity data (Section 4.4) indicate a relatively low but variable permeability. While this unit is characterized as an aquifer based on the conductivity and the regional geologic framework, the combination of variable clay content and low hydraulic gradients, upward gradients, and the presence of the overlying confining layer indicates this aquifer may not play an important role in potential contaminant transport. This unit is 25 to 30 feet thick, based on the plotted profiles.

Unit 2 Confining Layer – The deeper sediments (possible Castle-Hayne or Beaufort) became very clayey below depths of approximately 50 feet, but otherwise resembled the soils described in the overlying "aquifer." This unit was encountered in each of three borings extended to a depth of 70 feet. While the actual thickness cannot be determined, piezometer "slug test" data (Section 4.4) indicate a relatively low hydraulic conductivity. This unit may or may not be a true confining layer.

Published data indicates confining units exist between the Yorktown and Castle Hayne formations and between the Castle Hayne and the underlying Beaufort formation. Based on the projected depth of the Castle Hayne in this region, and the observation of pelecypod-mold concretions in the split spoon samples, it is possible that the test borings encountered this confining layer. The literature suggest that the Castle Hayne pinches out south of this portion of Pitt County (see Footnote 3). The presence of glauconite in the test boring samples (absent in the literature descriptions for the Castle Hayne) suggest that the deeper borings may have encountered the Beaufort formation.

6.0 Water Table Information

6.1 Short-Term Water Levels

Table 4 presents a summary of short-term ground water levels observed at the end of drilling of the B-series piezometers and stabilized readings obtained after a period of one to fourteen days after completion of the piezometers. Typically, the relatively short-term stabilized water levels are the highest recorded. This is due, in part, to elasticity effects (i.e., alleviation of non-recoverable pore pressures) near the piezometers soon after drilling. In this case, relatively dry climatic conditions prevailed during the months preceding the investigation, completed in early November 2000. Thus, water levels observed a month later in December 2000 were slightly higher.

6.2 Long-Term Water Levels

Table 5 presents a summary of long-term water level observations at the piezometers and nearby monitoring wells. Data for the B-series piezometers go back to November 2000. The highest recorded water levels observed in the piezometers occurred in December 2000, a traditionally wetter period of the year. Appendix V contains historical information for regional climatic conditions and water level observation s in a network of local wells (see Footnote 4). These water levels are of limited use, since the wells are associated with ground water extraction and may be influenced by pumping. In addition, the water levels at many of the wells show the effects of aquifer depression, which is not likely to influence water levels at the relatively isolated site.

Historical climate data from the National Weather Service,[11] on the other hand, in conjunction with on-site observations at piezometers and test pits, does provide useful information. These data were used in the Site Suitability Application Report (dated December 2000) to estimate maximum seasonal

[11] Time Bias Corrected Divisional Temperature-Precipitation-Drought Index, (TD-9640) March 1994, National Oceanic and Atmospheric Administration, periodic updates available on-line at www.ncdc.noaa.gov.

high water levels. Two key parameters of interest are the Palmer Modified Drought Severity Index (PMDI) and Palmer Z-Index (Z), compiled for 105 years of weather records.

The PMDI represents an overall moisture balance within a region of interest. Pitt County is located in Region 7 of the North Carolina climate network, which includes the eastern Coastal Plain. The PMDI is compiled from multiple weather stations for average precipitation, temperature (PET effects), leaf indices (growing season), wind velocities, and solar radiation. The cyclical data are shown on a time line (Appendix V), with times of drought shown as negative values and wet times shown as positive. The relative duration of a drought or wet cycle correlates to the availability of moisture to recharge the ground water. The Z-Index shows a similar plot that represents the amount of precipitation in a time period relative to "normal" conditions. Relatively high rainfall can occur in short durations during times of drought, which is useful in evaluating aquifer response times.

The PMDI data indicate that climatic moisture conditions were near normal to wet or the last several years. Exceptions occur during the latter portion of 1993 and 1994, which experienced prolonged dry spells that classify as moderate drought conditions. Brief dry spells occurred during the latter part of 1997 and the early part of 1999. Mild to moderate wet conditions were experienced during the period from mid-1996 through early 1997, in part contributed to Hurricane Fran and generally high precipitation patterns during that time.

Moderate to severe wet conditions were experienced resulting from the well documented "El Nino" winter of 1997-98, when record warm temperatures and high rainfall was recorded throughout the southeastern United States.[12] Most of 1998 was a wet period in Region 7, as was much of North Carolina. Record high water levels were recorded at other monitored sites in North Carolina during the spring of 1998.[13] Pitt County and most of the Coastal Plain region experienced severe wet conditions in the latter part of 1999, due largely to record rainfall associated with Hurricane Floyd (refer to the Z-index which clearly marks this precipitation event). Conditions during 2000 prior to the investigation were on the slightly dry side of normal.

Conditions at the site are conducive to high infiltration of surface water (upper aquifer recharge) and poor evapotranspiration characteristics. The site is nearly flat and cultivated. Surface depressions cause surface water ponding, necessitating the use of shallow drainage ditches to facilitate the former agricultural activities. In addition, high ground water conditions persisting into the autumn months are not unusual due to low ET, caused by poor vegetative cover and cover crop wilting. A discussion was presented in the Site Suitability Application Report that pointed to test pit data (color mottling of iron-oxide pigments) within the uppermost units as an indication of the position of the maximum seasonal high water table. The test pit data are presented again in Appendix V.

Table 5 shows fairly consistent water levels at the on-site piezometers from November 2000 through March 2001. Most observed piezometer levels have varied less than 0.25 feet, although those that have varied more can be tied to the standing surface water in the pocosin.

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12 National Oceanic and Atmospheric Administration, NESDIS Press Release, March 9, 1998.

13 Site Suitability Application Report, Kersey Valley MSW Landfill Phase 3, High Point, North Carolina, March 1999, reported by G.N. Richardson & Associates, Raleigh, NC.

6.3 Estimated Seasonal High Water Table

Test pits performed in September 2000 revealed evidence of periodic ground water fluctuation at the site in the form of soil chroma or mottling, i.e. the migration of soluble iron-oxide pigments that lodge in the soils when the water table position is stable for a period of time. This coloration provides a tell-tale indication of the water table position in relatively recent history, perhaps months or years. The position of the water table observed in September 2000 has been correlated with regional climatic data and historical fluctuation of selected wells within the DENR Database. Based on this work, it was concluded that the likely position of the seasonal high water table varies to 24 inches above the levels observed in the test pits. The data were used to interpret the piezometer data to maintain vertical separation between the waste and water table.

Another concern for monitoring a shallow unconfined surficial (water table) aquifer is the seasonal low fluctuation. The range of screen intervals used in monitoring well construction (typically 10 to 15 feet) placed near the surface could sometimes experience water levels below the screen interval. Based on the climatic data, ambient moisture conditions have been more or less "normal" prior to the site investigation, thus water levels are likely at a mean level. Prolonged periods of drought will likely decrease water elevations by perhaps 4 to 5 feet, considering the historical range of fluctuation observed at the nearby Division of Water Resources well network. The anticipated water level fluctuation will be considered in the formulation of the Water Quality Monitoring Plan (Appendix F).

Water levels were observed periodically from November 2000 to March 2001, as shown on Table 5. The March 2001 water levels are believed to represent the maximum seasonal high at many locations on the site, with relatively little variation at other locations. A summary of the estimated maximum seasonal high water levels based on the period of record follows:

B-1	12.01
B-2D	9.90
B-2S	9.78
B-3	10.73
B-4	12.10
B-5	11.66
B-6	12.37
B-7	11.11
B-8	10.72
B-9	11.08
B-10	15.28
B-11	13.20
B-12	10.70
B-13	11.73
B-14	11.58
B-15	11.26
B-16	13.77
B-17	11.33
B-18	13.61
B-19	14.14

6.4 Factors That Influence Water Table

The site experiences some surface water "run-on" from upland recharge areas to the north. A combination of off-site ground water migration from the north and surface water recharge to the uppermost aquifer from the pocosin are natural factors that affect ground water within the Phase 1A and 1B footprint. Gently sloping topography and former cultivation within the Phase 1A and 1B footprint tends to increase surface water infiltration within these areas. The small pocosin located near the north end of the site appears to contribute to recharge to the upper aquifer, while an upward vertical gradient from the regional aquifer ("leaky" aquifer conditions) may contribute to the balance of water in the upper most aquifer. Minor man-made influences include shallow drainage ditches in the center and northeast sides of the Phase 1A and 1B footprint. Perennial streams serve as on-site ground water discharge features for the uppermost aquifer, which tend to stabilize water levels.

7.0 Horizontal and Vertical Ground Water Flow Dimensions

Drawings X-1 and X-2 present generalized hydrogeologic cross-sections that show the horizontal and vertical extent of the upper most aquifer and ground water flow characteristics. Ground water movement through this formation is unconfined porous media. Recharge within the Phase 1A and 1B footprint occurs along most of the surface, with off-site ground water migration from the north and direct surface water recharge from "ponding' in the pocosin and near-surface soils. A relatively slow horizontal flow (0.003 to 0.010 ft/day) occurs toward the drainage features flanking the central divide within the uppermost aquifer. Discharge from the surficial aquifer occurs at the on-site streams, except in the southeast direction where a portion of the ground water flow leaves the site.

Based on water level data at the piezometer couplet (B-2s/2d) artesian pressures exist within the lower aquifer unit (AQ2). Relatively close pairs of piezometers (B16 and B-18, B-15 and B-17) show both upward and downward vertical gradients within the surficial aquifer in the Phase 1A and 1B footprint, but these conditions are likely to revers with seasonal trends. The artesian pressures of the deeper regional aquifer further limit potential contaminant migration. These results are presented on Table 6. The cross sections show a horizontal flow within the regional aquifer.

Table 7 presents horizontal ground water gradient data and velocity calculations for various piezometers, arranged according to Hydrogeologic Units: Aquifer Units (A.U.) And Confining Units (C.U.). Calculated horizontal ground water flow velocities are based on field hydraulic conductivity data at the various piezometers (Appendix B) and the horizontal gradients developed from the potentiometric contours shown on Drawing F3. Ground water velocities vary somewhat within the various Hydrogeologic Units, as follows:

Hydrogeologic Unit	Average Horizontal Ground Water Velocity, ft/day
A.U. 1	0.0084
C.U. 1	0.0011
A.U. 2	0.0012
C.U. 2	0.0003

8.0 Ground Water Contour Mapping

Drawing F3 shows ground water potentiometric contours based on water level observations made in March 2001. Ground water flow is generally toward the south, toward Grindle Creek and its tributaries that flank the higher ground of the site. A local divide surface drainage and ground water flow between the southeast and southwest directions. The potentiometric contours reflect a subdued expression of the surface topography, characteristic of the Coastal Plain. The potentiometric contours make a smooth transition to the unnamed tributaries. There are localized "high areas" in which the water levels are elevated due to variation in subsurface conditions and/or artesian pressure. These areas are reflected as closed contours on the potentiometric map.

9.0 Investigation Records

Appendix C contains test boring and piezometer installation records for this investigation. Relevant data are summarized on Table 1.

10.0 Other Geologic/Hydrogeologic Considerations

Other sections of this report address the presence of streams, springs/seeps, ground water recharge/discharge areas and the influence of local and regional aquifer characteristics on ground water flow. No unusual geologic features have been determined which would affect the ground water flow or the ability to effectively monitor the site. Site conditions appear typical of the North Carolina Coastal Plain region.

Dispersivity – One consideration regarding the ability to effectively monitor the site is the nature of the surficial aquifer – shallow and relatively sandy. The concern is that, should a release of contaminants occur, how much dispersion would take place in the uppermost aquifer and how closely spaced must the monitoring wells be to detect such a release. This concern is of significance because the southwest property boundary does not include the regional discharge feature (Grindle Creek).

Appendix A presents a discussion of contaminant transport characteristics, along with an analytical solution to the two-dimensional advection-dispersion equation.[14] This solution assumes uniform, isotropic, and homogenous conditions within the flow regime (Darcy's law applies). At a given point in space within the flow field (the prospective monitoring well location) and at time zero, the concentration of a solute of interest is assumed to be zero. The mathematical solution assumes no sorption, retardation, or degradation of the solute, e.g. the solute is "conservative" by not reacting with the host media or other solutes in the aquifer system. The model does consider aquifer thickness, porosity, and both longitudinal and transverse diffusion/dispersivity coefficients.

This aquifer system is characterized by lower hydraulic conductivity values than would be expected for a sandy aquifer (10^{-5} cm/sec) and low ground water velocities (0.008 ft/day). The effective hydraulic conductivity is due to cross-bedding and clayey horizons contained within the surficial aquifer. Low velocities are caused by the low conductivity and fairly flat ground water gradients.

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[14] Walton, W.C., Principles of Ground Water Engineering, Lewis Publishers, Inc., Chelsea, Michigan, 1991.

According to published literature, these conditions place the system in a regime where molecular diffusion is the controlling factor in contaminant transport, rather than mechanical dispersion.[15] While this could affect up gradient concentrations of certain solutes, as well as down gradient, there is ample room in the up gradient direction to place additional wells in the future if the site ever requires assessment. In the down gradient direction, the analytical solution verifies that an approximate monitoring well spacing of 300 feet is adequate to detect a potential plume of ground water contaminants if such were released from the landfill. The Water Quality Monitoring Plan presented in Appendix F reflects this analytical solution.

Background metals – Another factor that potentially complicates the ground water monitoring program, at least for the detection of metals, is background geochemistry. A near-surface soil sample was procured from an area north and west of the Phase 1A and 1B footprint, within a prospective borrow site. That area had undergone agricultural and silvicultural activities in the past. Low concentrations of metals were detected within the surficial soils, namely chromium (3 ppm), lead (5 ppm), and mercury (0.02 ppm). These data are presented in Appendix E. Organic constituents were not analyzed, but the typical organic contaminants of concern are not usually found in nature. While these constituents are not necessarily in a "mobile" form – the lab analysis consisted of total metals, not TCLP – the data suggest that background metals could on present that might show up in the monitoring program. These conditions are not unusual and do not preclude the ability to monitor the site. Rather, these conditions are a factor that must be considered when evaluating the results of the monitoring program.

11.0 Summary Report

The C&D Landfill, Inc., site is viewed as a short segmented, closed-loop hydrologic cycle, with recharge occurring over a majority of the site and on-site discharge occurring at local streams. Ground water flow from the site to the regional discharge feature occurs beyond the property line in one direction (southwest). There is currently no development or ground water users in the down gradient direction. The site contains a surficial aquifer consisting of mixed sand and clay layers, with an average thickness of 12 feet (saturated thickness is 5 to 8 feet). An underlying confining layer of silt and clay, with an average thickness in excess of 15 feet, separates the uppermost aquifer from a deeper regional aquifer (contained in the Yorktown formation). The regional aquifer exhibits mildly artesian pressure that exerts an upward vertical gradient beneath the site.

Conditions at the site are typical of the Coastal Plain region, except that ground water levels are deeper than would be expected based on local topography. The surficial aquifer is recharged through normal precipitation, ground water migration from the east, and direct recharge from a closed topographic depression in the higher elevations of the project site. This feature, termed a "pocosin" in the literature, is mapped as a wetlands but has no discernable channel or outlet to the surrounding surface streams. Based on an analytical solution to the two-dimensional advection-dispersion equation for contaminant transport, the site can be effectively monitored by a 300-foot well spacing in the uppermost aquifer. Both upper and lower aquifers need to be monitored, although the deeper regional aquifer can be monitored at a reduced frequency.

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15 Fetter, C.W., Contaminant Hydrogeology, Macmillian Publishing Company, New York, 1993.

Tables

Table 1A
Test Boring/Piezometer Data

Elevation Data				Test Boring Data								Piezometer Construction Data				
Boring	Boring	PVC Pipe	Ground	Drilling	Total	Yorktown Fm.		Castle Hayne Fm.		Beaufort Fm.		Top of Piez. Screen		Bot. of Piez. Screen		Stickup
Number	Date	Elev.	Elev.	Method	Depth, ft.	Depth, ft.	Elev.	Depth, ft.	Elev.	Depth, ft.	Elev.	Depth, ft.	Elev.	Depth, ft.	Elev.	ft.
B-1	10/12/00	21.14	17.40	HSA	50.0	7.5	**9.9**	30.5	**-13.1**			40.0	**-22.6**	50.0	**-32.6**	3.74
B-2D	10/09/00	21.80	17.97	Rotary	70.0	12.5	**5.5**	33.5	**-15.5**	61.5	**-43.5**	39.0	**-21.0**	49.0	**-31.0**	3.83
B-2S	10/10/00	21.73	17.97	HSA	35.0	12.5	**5.5**	33.5	**-15.5**			25.0	**-7.0**	35.0	**-17.0**	3.76
B-3	10/12/00	22.83	19.37	HSA	50.0	14.0	**5.4**	27.5	**-8.1**			40.0	**-20.6**	50.0	**-30.6**	3.46
B-4	10/13/00	20.10	16.04	HSA	50.0	13.5	**2.5**	26.0	**-10.0**			40.0	**-24.0**	50.0	**-34.0**	4.06
B-5	10/17/00	20.46	18.61	HSA	35.0	12.5	**6.1**	32.5	**-13.9**			33.0	**-14.4**	35.0	**-16.4**	1.85
B-6	10/16/00	18.31	16.45	HSA	35.0	12.5	**3.9**	29.5	**-13.1**			33.0	**-16.6**	35.0	**-18.6**	1.86
B-7	10/17/00	19.36	17.64	HSA	35.0	12.5	**5.1**	29.5	**-11.9**			33.0	**-15.4**	35.0	**-17.4**	1.72
B-8	10/17/00	19.15	17.48	HSA	35.0	12.5	**5.0**	30.0	**-12.5**			33.0	**-15.5**	35.0	**-17.5**	1.67
B-9	10/10/00	20.40	18.46	Rotary	70.0	13.5	**5.0**	32.0	**-13.5**	51.0	**-32.5**	65.0	**-46.5**	70.0	**-51.5**	1.94
B-10	10/17/00	18.88	17.17	HSA	15.0	12.5	**4.7**					13.0	**4.2**	15.0	**2.2**	1.71
B-11	10/17/00	19.77	17.83	HSA	15.0	12.5	**5.3**					13.0	**4.8**	15.0	**2.8**	1.94
B-12	10/17/00	19.90	18.07	HSA	15.0	12.5	**5.6**					13.0	**5.1**	15.0	**3.1**	1.83
B-13	10/17/00	21.69	19.80	HSA	15.0	12.5	**7.3**					13.0	**6.8**	15.0	**4.8**	1.89
B-14	11/16/00	20.70	18.56	Hand Auger	8.0							3.0	**15.6**	8.0	**10.6**	2.14
B-15	11/16/00	19.83	18.13	Hand Auger	8.0							3.0	**15.1**	8.0	**10.1**	1.70
B-16	11/16/00	16.74	16.13	Hand Auger	4.5							0.0	**16.1**	4.5	**11.6**	0.61
B-17	02/06/01	22.73	18.80	HSA	12.0	11.0						6.0	**12.8**	11.0	**7.8**	3.93
B-18	02/06/01	17.58	16.40	HSA	8.0							3.0	**13.4**	8.0	**8.4**	1.18
B-19	02/06/01	19.87	16.64	HSA	10.0	9.0						4.5	**12.1**	9.5	**7.1**	3.23

Notes:
1. No rock or partially weathered rock was encountered, although 100+ bpf material (cemented layers) was encountered
2. Some of the formation depths are estimated as near as possible based on the sampling interval
3. Hand Auger borings could not be advanced into the water table due to borehole collapse (raveling sands)

Table 1B
Supplemental Data for Selected Regional Water Wells

Based on NC DENR Monitoring Well Database

All dimensions given in feet, elevations refenced to mean sea level

Test Boring Data			Data on Specific Geologic Formations								
Boring	Ground	Total	Yorktown Fm.			Castle Hayne Fm.			Beaufort Fm.		
Number	Elev.	Depth, ft.	Depth, ft.	Elev.	Thickness	Depth, ft.	Elev.	Thickness	Depth, ft.	Elev.	Thickness
M21Q *	15	730	0	15	37	37	-22	10	47	-32	-32
N22I *	42	250	8	34	42	50	-8	37	87	-45	-45
N23B	62	440	26	36	**				58	4	4
N23D	56	432	18	38	**				40	16	16
N23G *	68	456	12	56	**				37	31	31
N23O	67	480	20	47	**				43	24	24
O23A	50	514	14	36	**				78	-28	-28
M24R	49	754	19	30	**						
M24B *	26	502	8	18	**						
O23L	42	1092	10	32	25	35	7	33	68	-26	-26
O22H	46	470	20	26	28	48	-2	18	66	-20	-20
N23P	70	802	10	60	**				38	32	32
M24U *	65	711	21	44	**						
M18I	40	1526				113	-73	149	262	-222	-222
M20E *	45	516	28	17	26	54	-9	106	160	-115	-115

* Relatively close to site (see Map, Appx. V)

** Interface not clearly identified – deeper unit may have been absent.

Average formation thickness for closest borings: 35 | 24 | 45

Pee Dee Fm.			Black Creek Fm.			Cape Fear Fm.			Basement	
Depth, ft.	Elev.	Thickness	Depth, ft.	Elev.	Thickness	Depth, ft.	Elev.	Thickness	Depth, ft.	Elev.
86	-71	117	203	-188	624	522	-507			
146	-104									
102	-40	73	175	-113						
64	-8	320	384	-328						
90	-22	45	135	-67	371	394	-326			
72	-5	66	138	-71	441	442	-375			
144	-94	110	254	-204	540	480	-430			
48	1	30	78	-28	316	335	-286	-286	754	-705
32	-6	14	46	-20	255	267	-241			
90	-48	90	180	-138	500	452	-410	-410	1092	-1050
160	-114	120	280	-234						
78	-8	70	148	-78	414	414	-344			
66	-1	48	114	-49	380	397	-332			
388	-348	105	493	-453	752	687	-647			
190	-145	120	310	-265						

Average 70 | 270 | 530

Test Boring Data			Data on Specific Geologic Formations								
Boring	Ground	Total	Yorktown Fm.			Castle Hayne Fm.			Beaufort Fm.		
Number	Elev.	Depth, ft.	Depth, ft.	Elev.	Thickness	Depth, ft.	Elev.	Thickness	Depth, ft.	Elev.	Thickness
M21Q *	15	730	0	15	37	37	-22	10	47	-32	39
N22I *	42	250	8	34	42	50	-8	37	87	-45	59
N23B	62	440	26	36	**				58	4	44
N23D	56	432	18	38	**				40	16	24
N23G *	68	456	12	56	**				37	31	53
N23O	67	480	20	47	**				43	24	29
O23A	50	514	14	36	**				78	-28	66
M24R	49	754	19	30	**						
M24B *	26	502	8	18	**						
O23L	42	1092	10	32	25	35	7	33	68	-26	22
O22H	46	470	20	26	28	48	-2	18	66	-20	94
N23P	70	802	10	60	**				38	32	40
M24U *	65	711	21	44	**						
M18I	40	1526				113	-73	149	262	-222	126
M20E *	45	516	28	17	26	54	-9	106	160	-115	30

Table 2
Geotechnical Laboratory Data

Grain Size Distribubtion and Soil Classification

S = Split Spoon Sample
B = Bulk Sample (Remolded)
U = Shelby Tube (Undisturbed)
G = Grab Sample

Boring Number	Sample Number	Sample Depth, ft.	Grain Size Distribution % F. Gravel	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	Liquid Limit	Plasticity Limit	Plasticity Index	USCS Class.	Natural Moisture	Hydrogeologic Description
			> 5 5 mm	5.5 - 2 0 mm	2 0 - 0 4 mm	0 4 - 0.074 mm	0 074 - 0.005 mm	< 0.005 mm					%	
TP-8	G1	24" - 48"	0	0	8	42	37	13	21	14	7	ML	16 0	Clayey Fine to Medium Sandy SILT
TP-4	G1	39" - 72"	0	3	31	48	9	9	NP	NP	NP	CL-ML	13 3	Slightly Fine Sandy Clayey SILT
TP-4	G2	39" - 72"	0	0	9	32	49	10	37	18	19	CL-ML	18 0	Clayey Fine Sandy SILT
TP-4	G3	8" - 39"	0	0	2	25	62	11	45	19	27	SM	17 4	Slightly Clayey Silty Fine to Medium SAND
TP-3	B1	16" - 72"	0	0	3	32	28	37	36	21	15	CL	21 8	Fine Sandy Silty CLAY
B-2D	S1	3 5 - 5 0	0	0	3	51	41	5	NP	NP	NP	SM	14 0	Slightly Clayey Silty Fine to Medium SAND
B-2D	S2	8 5 - 10 0	0	12	56	20	12	0	NP	NP	NP	SP-SM	13.2	Slightly Silty Fine to Coarse SAND
B-2D	S3	13.5 - 15 0	21	10	7	22	36	4	NP	NP	NP	SM *	26 0	Silty Fine SAND w/ Shell HASH
B-2D	S6	28 5 - 30 0	0	1	2	25	64	8	46	17	29	CL	29 4	Slightly Clayey Fine Sandy SILT
B-2D	S7	33 5 - 35 0	0	1	6	55	34	4	37	25	12	SM	27 3	Silty Fine to Medium SAND
B-2S	U1	18 0 - 20 0	0	4	2	46	12	36	42	16	26	ML-CL	31 5	Silty Clayey Fine SAND
B-2S	U2	24 0 -26 0	0	3	2	25	32	38	38	16	22	CL	28 6	Fine Sandy Silty CLAY
B-2S	U3	33 0 - 34 0	1	1	2	28	31	37	45	19	26	CL	--	Fine Sandy Silty CLAY w/Shell Fragments

Notes to Above:

Moisture Contents are Dry Unit Weight Based

* Shells throw off the weight distribution, should be silt-clay based on soil matrix

Moisture data for bulk samples acquired from individual jar samples collected with the bulk sample Samples were oven-dried
These data are considered representative of in-situ moisture conditions for earth work considerations

Data for Shelby Tube samples not complete at time of reporting (will be included in the Part 2 Detailed Hydrogeological Report)

Samples tested by Geotechnologies Inc , Raleigh, NC

Table 2 - Continued
Geotechnical Laboratory Data

Compaction Data – Bulk Samples

Boring Number	Sample Number	Sample Depth, ft.	Max. Dry Density, pcf	Optimum Moisture, %
TP-3	B1	16 - 72"	110.0	17.8

Hydraulic Conductivity Data – Remolded Bulk Samples

Boring Number	Sample Number	Sample Depth, ft.	Porosity %	Sat'd Conductivity cm/sec
TP-3	B1	16 - 72"	38.1%	1.94E-07

Hydraulic Conductivity Data – Undisturbed Samples

Boring Number	Sample Number	Sample Depth, ft.	Porosity %	Sat'd Conductivity cm/sec
B-2s	U1	18.0 - 20.0	42.6%	2.16E-06
B-2s	U2	24.0 -26.0	48.2%	3.47E-07

Triaxial Shear Strength Data

Boring Number	Sample Number	Sample Depth, ft.	Total Strength Parameters		Effective Strength Parameters	
			c (psf)	phi (degrees)	c' (psf)	phi' (degrees)
TP-3	B1	16" - 72"	210	13	220	30
B-2s	U1	18.0 - 20.0	130	20	120	32
B-2s	U2	24.0 -26.0	50	33	200	35

Consolidation Test Data

Boring Number	Sample Number	Sample Depth, ft.	* Max. Past Pressure, psf	Compression Ratio **	Consolidation Coefficient***	% Initial Consol***
B-2s	U1	18.0 - 20.0	800	0.037	1.562	80.3

Notes to Above:

* estimated as intersection of apparent virgin compression curve and recompression curve, sample exhibits smooth transition (sand-like behavior)

** based on less than one full log cycle, steepest part of virgin compression curve

*** value taken at 2000 psf

All Moisture Contents are Dry Unit Weight Based

Moisture data for bulk samples acquired from individual jar samples collected with the bulk sample.

Table 3
Summary of Hydrogeological Properties

Conductivity Values Based on Falling Head Slug Tests, Evaluated by Two Methods: Hvorslev Bouwer-Rice

Piezometer No.	Hydrological Unit	Hydrogeological Description	Aquifer Thickness	Effective Porosity	Total Porosity	Conductivity k (cm/sec)	Conductivity k (cm/sec)	Representative Grain Size Distribution			
								% Gravel	% Sand	% Silt	% Clay
B-10	Aquifer Unit 1	Loose Variably Silty F-C Sand	10	0.50	0.50	1.19E-04	2.84E-04	0	82	9	9
B-11		with Occ. Clay Layers		0.50	0.50	1.35E-04	3.09E-04	0	88	12	0
B-12				0.50	0.50	7.04E-05	1.56E-04	Soil data from test pits and B-2d			
B-17						4.83E-06	1.00E-05				
B-18						1.06E-04	1.25E-04				
B-19						2.13E-04	2.39E-04				
B-2s	Confining Unit 1	Soft to Med. Stiff Clayey Silt	20	0.50	0.50	2.53E-06	7.09E-06	0	50	37	13
B-13		and Silty Clay (ML-CL and CH)		0.50	0.50	1.90E-05	3.81E-05	0	41	49	10
		variably sandy						Soil data from test pit sample			
B-1	Aquifer Unit 2	Dense Silty Sand and Hard	30	0.40	0.40	3.10E-06	9.65E-06				
B-2d		Silt (SM-ML), partly cemented		0.40	0.40	1.98E-05	5.96E-05	0	62	34	4
B-3				0.40	0.40	3.51E-05	1.04E-04				
B-4				0.40	0.40	4.84E-05	1.40E-04				
B-5				0.40	0.40	1.22E-05	3.55E-05				
B-6				0.40	0.40	1.44E-05	6.92E-05				
B-7				0.40	0.40	1.02E-05	1.22E-05				
B-8				0.40	0.40	1.42E-05	6.73E-05				
				0.40	0.40						
B-9	Confining Unit 2	Med. Stiff to Very Hard Sandy	60	0.35	0.35	1.32E-06	5.25E-06				
		Clay and Clayey Sand (CL/ML)							Data not acquired		

Effective and total porosity values taken from Groundwater and Wells (Driscoll, 1986), p. 67.

Aquifer thickness values assumed based on hydrogeologic cross sections

Thickness of saturated zone in Aquifer Unit 1 varies from 3 to 8 feet

Table 4
Short-Term Ground Water Observations

Boring Number	Boring Date	PVC Pipe Elev.	Ground Elev.	Piezometer Stickup, ft.	Time of Boring Levels, BGS Depth, ft.		Elev.	Stabilized Levels, BGS (24 hr) Depth, ft.	Elev.	Stabilized Levels (7+ day), TOC Depth, ft.	bgs	Elev.	Date
B-1	10/12/00	21.14	17.40	3.74	NA	1		4.8	**12.6**	9.26	5.52	**11.88**	11/06/00
B-2D	10/09/00	21.80	17.97	3.83	6.6		**11.4**	7.9	**10.1**	11.94	8.11	**9.86**	11/06/00
B-2S	10/10/00	21.73	17.97	3.76	9.5		**8.5**	8.0	**10.0**	11.99	8.23	**9.74**	11/06/00
B-3	10/12/00	22.83	19.37	3.46	3.0	2	**16.4**	4.5	**14.8**	12.14	8.68	**10.69**	11/06/00
B-4	10/13/00	20.10	16.04	4.06	2.8	2	**13.2**	8.4	**7.6**	8.89	4.83	**11.21**	11/06/00
B-5	10/17/00	20.46	18.61	1.85	6.0		**12.6**	NA		8.91	7.06	**11.55**	11/06/00
B-6	10/16/00	18.31	16.45	1.86	5.7		**10.8**	NA		6.59	4.73	**11.72**	11/06/00
B-7	10/17/00	19.36	17.64	1.72	5.4		**12.2**	NA		8.34	6.62	**11.02**	11/06/00
B-8	10/17/00	19.15	17.48	1.67	5.0		**12.5**	NA		8.48	6.81	**10.67**	11/06/00
B-9	10/10/00	20.40	18.46	1.94	4.3		**14.2**	7.3	**11.2**	9.32	7.38	**11.08**	11/06/00
B-10	10/17/00	18.88	17.17	1.71	3.7		**13.5**	NA		5.73	4.02	**13.15**	11/06/00
B-11	10/17/00	19.77	17.83	1.94	7.7		**10.1**	NA		7.25	5.31	**12.52**	11/06/00
B-12	10/17/00	19.90	18.07	1.83	7.7		**10.4**	NA		9.23	7.40	**10.67**	11/06/00
B-13	10/17/00	21.69	19.80	1.89	8.1		**11.7**	NA		9.96	8.07	**11.73**	11/06/00
B-14	11/16/00	20.70	18.56	2.14	7.2	3	**11.4**	NA		NA			
B-15	11/16/00	19.83	18.13	1.70	7.0	3	**11.1**	NA		NA			
B-16	11/16/00	16.74	16.13	0.61	4.0	3	**12.1**	NA		NA			
B-17	02/06/01	22.73	18.80	3.93	7.8		**11.0**	NA		11.84	7.91	**10.89**	02/06/01
B-18	02/06/01	17.58	16.40	1.18	3.5		**12.9**	NA		4.75	3.57	**12.83**	02/06/01
B-19	02/06/01	19.87	16.64	3.23	3.8		**12.8**	NA		6.90	3.67	**12.97**	02/06/01

1 NA in depth column means water level was "Not Acquired."

2 Depth at which borehole caved when augers extracted. Not necessarily the depth of ground water.

3 Hand auger boring, completed in running sands, water levels considered representative of stabilized conditions

BGS data referenced "below ground surface." TOC data referenced from "top of casing."

Table 5
Long-Term Ground Water Level Observations

All water levels referenced from top of casing (TOC)

Boring Number	PVC Pipe Elev.	November 6 - 16, 2000 Depth, ft.		Elev.	December 12, 2000 Depth, ft.	Elev.	January 24, 2001 Depth, ft.	Elev.	March 23, 2001 Depth, ft.	Elev.	Depth, ft.	Elev.
		See Notes										
B-1	21.14	9.26		**11.88**	9.13	**12.01**	9.38	**11.76**	9.21	**11.93**		
B-2D	21.80	11.94		**9.86**	11.92	**9.88**	12.18	**9.62**	11.90	**9.90**		
B-2S	21.73	11.99		**9.74**	11.97	**9.76**	12.25	**9.48**	11.95	**9.78**		
B-3	22.83	12.14		**10.69**	12.10	**10.73**	12.39	**10.44**	12.11	**10.72**		
B-4	20.10	8.00		**12.10**	8.83	**11.27**	9.02	**11.08**	8.85	**11.25**		
B-5	20.46	8.89		**11.57**	8.80	**11.66**	9.05	**11.41**	8.87	**11.59**		
B-6	18.31	6.59		**11.72**	6.07	**12.24**	6.51	**11.80**	5.94	**12.37**		
B-7	19.36	8.34		**11.02**	8.25	**11.11**	8.52	**10.84**	8.29	**11.07**		
B-8	19.15	8.48		**10.67**	8.43	**10.72**	8.71	**10.44**	8.45	**10.70**		
B-9	20.40	9.32		**11.08**	9.38	**11.02**	9.61	**10.79**	9.42	**10.98**		
B-10	18.88	5.73		**13.15**	4.12	**14.76**	4.46	**14.42**	3.60	**15.28**		
B-11	19.77	7.25		**12.52**	6.81	**12.96**	7.26	**12.51**	6.57	**13.20**		
B-12	19.90	9.23		**10.67**	9.49	**10.41**	9.55	**10.35**	9.20	**10.70**		
B-13	21.69	9.96		**11.73**	10.24	**11.45**	10.34	**11.35**	10.00	**11.69**		
B-14	20.70	9.29	1	**11.41**	9.37	**11.33**	9.50	**11.20**	9.12	**11.58**		
B-15	19.83	8.71	1	**11.12**	8.80	**11.03**	8.97	**10.86**	8.57	**11.26**		
B-16	16.74	4.58	1	**12.16**	3.25	**13.49**	3.89	**12.85**	2.97	**13.77**		
B-17	22.73					**	11.84	**10.89**	11.40	**11.33**		
B-18	17.58					**	4.75	**12.83**	3.97	**13.61**		
B-19	19.87					**	6.90	**12.97**	5.73	**14.14**		

Notes: 1 Time of completion water level ** Water levels for B-17, 18 and 19 observed on 2/24/01

Table 6
Vertical Ground Water Gradient Calculations

Selected Ground Water Observation Dates

Nested Piezometers: **B-2s** Confining Unit 1 – Low Permeability Silt-Clay
B-2d Aquifer Unit 2 – Silty Sand, Partly Cemented

Piezometer No.	Top of Screen, El.	Bottom of Screen, El.	delta-Screen Interval, ft *	11/06/00 W.T.E.	12/12/00 W.T.E.	01/24/01 W.T.E.	03/23/01 W.T.E.	W.T.E.
B-2s	-7.0	-17.0	4	9.74	9.76	9.48	9.78	
B-2d	-21.0	-31.0		9.86	9.88	9.62	9.90	
	delta-W.T.E. (see Note 1)			-0.12	-0.12	-0.14	-0.12	0
	Vertical Gradient (see Note 2)			**-0.0300 Up**	**-0.0300 Up**	**-0.0350 Up**	**-0.0300 Up**	**0.0000**

Nested Piezometers: **B-16** Aquifer Unit 1 – Silty and clayey sand strata (upper 6 feet)
B-18 Aquifer Unit 1 – Sandy strata (deeper 6 feet)

Piezometer No.	Top of Screen, El.	Bottom of Screen, El.	delta-Screen Interval, ft *	03/23/01 W.T.E.	W.T.E.	W.T.E.	W.T.E.	W.T.E.
B-16	16.1	11.6	-1.8	13.77				
B-18	13.4	8.4		13.61				
	delta-W.T.E. (see Note 1)			0.16	0	0	0	0
	Vertical Gradient (see Note 2)			**0.0400 Down**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Nested Piezometers: **B-15** Aquifer Unit 1 – Silty and clayey sand strata (upper 6 feet)
B-17 Aquifer Unit 1 – Sandy strata (deeper 6 feet)

Piezometer No.	Top of Screen, El.	Bottom of Screen, El.	delta-Screen Interval, ft *	03/23/01 W.T.E.	W.T.E.	W.T.E.	W.T.E.	W.T.E.
B-15	15.1	10.1	-2.7	11.26				
B-17	12.8	7.8		11.33				
	delta-W.T.E. (see Note 1)			-0.07	0	0	0	0
	Vertical Gradient (see Note 2)			**-0.0175 Up**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Notes to Above:

* Difference between bottom of upper screen and top of deeper screen

1 delta-W.T.E. = difference in water level (shallow well minus deep well)

2 Vertical Gradient = delta-W.T.E / delta-Screen Interval

3 **Negative vertical gradients are upward, positive gradients are downward.**

The vertical gradients can change with time due to seasonal fluctuation of the potentiometric levels between the upper, unconfined aquifer and the deeper, partly confined aquifer

Table 7
Horizontal Ground Water Gradient and Velocity Calculations

Based on Bouwer-Rice Solutions (Table 3)

Hydr. Unit	Well / Piez. No.	Hydraulic Conductivity (k)		Average Conductivity	Hydraulic Gradient (I)	Effective Porosity (n)	Ground Water Velocity (V), ft/day	Average Velocity
		cm/sec	ft/day					
Aquifer 1	B-10	2.84E-04	0.791		0.0050	0.50	7.91E-03	
	B-11	3.09E-04	0.862		0.0080	0.50	1.38E-02	
	B-12	1.56E-04	0.435		0.0056	0.50	4.87E-03	
	B-17	1.00E-05	0.028		0.0390	0.40	2.72E-03	
	B-18	1.25E-04	0.348		0.0150	0.40	1.31E-02	
	B-19	2.39E-04	0.666	0.522	0.0050	0.40	8.32E-03	8.44E-03
C.U. 1	B-2s	7.09E-06	0.020		0.0020	0.50	7.90E-05	
	B-13	3.81E-05	0.106	0.063	0.0104	0.50	2.21E-03	1.14E-03
Aquifer 2	B-1	9.65E-06	0.027		0.0020	0.40	1.34E-04	
	B-2d	5.96E-05	0.166		0.0011	0.40	4.56E-04	
	B-3	1.04E-04	0.291		0.0044	0.40	3.20E-03	
	B-4	1.40E-04	0.391		0.0025	0.40	2.44E-03	
	B-5	3.55E-05	0.099		0.0048	0.40	1.19E-03	
	B-6	6.92E-05	0.193		0.0018	0.40	8.67E-04	
	B-7	1.22E-05	0.034		0.0010	0.40	8.50E-05	
	B-8	6.73E-05	0.187	0.173	0.0019	0.40	8.90E-04	1.16E-03
C.U. 2	B-9	5.25E-06	0.015	0.015	0.0080	0.35	3.34E-04	3.34E-04

Notes: Ground Water Velocity Calculated from Equation:

$V=KI/n$ where K = Hydraulic Gradient in units of ft/ft
n = Effective Porosity is unitless
V = Ground Water Velocity in ft/day

Hydraulic Conductivity Conversion Factor: 1 ft/day = 3.59E-04 cm/sec

Hydrualic conductivity data taken from slug test data, Table 3

Hydraulic Gradient values were calculated from the potentiometric surface map.

Effective Porosity values from published literature (see footnote on Table 3).

Table 8
Hand Auger Boring Data

Logged by Bruce Lefler

Boring	Depth	Stratigraphy
B-14	0 - 1'	Tan-Yellow Fine Sand
	1 - 1.5'	Tan-Orange Fine Sand w/ Clay
	1.5 - 3'	Orange Fine Sand w/Clay
	3 - 4.5'	Orange Fine to Medium Sand
	4.5 - 7'	Tan Fine to Medium Sand
	7 - 8'	Tan Fine to Coarse Sand (wet)

Boring caved at 7 '
Piezometer set from 2 to 7 feet with 2.1' stickup

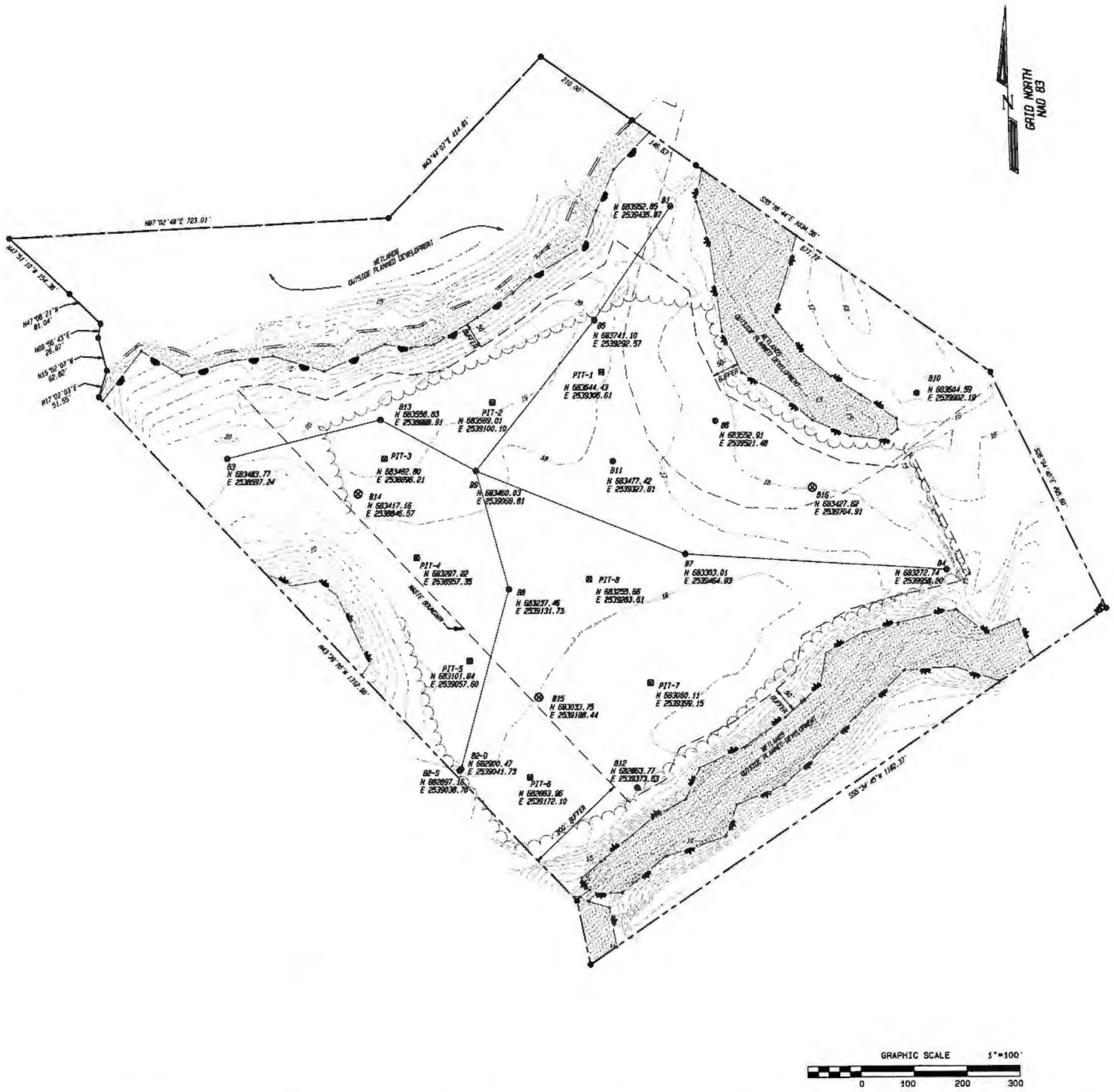
Boring	Depth	Stratigraphy
B-15	0 - 1'	Light Brown Fine Sand
	1 - 1.5'	Tan-Orange Fine Sand w/ Clay
	1.5 - 2.5'	Orange-Tan Clayey Fine Sand
	2.5 - 3'	Tan-Orange Fine Sand w/ Clay
	3 - 4'	Tan-Orange Fine Sand w/ Clay
	4 - 6.5'	Tan Fine Sand
	6.5 - 8'	Tan Fine to Coarse Sand (wet)

Boring caved at 7.5'
Piezometer set from 2.5 to 7.5 feet with 1.7' stickup

Boring	Depth	Stratigraphy
B-16	0 - 0.75'	Brown Fine Sand
	0.75 - 1.75'	Tan Fine Sand w/ Clay
	1.75 - 2'	Tan Clayey Fine Sand
	2 - 3'	Light Gray Clayey Fine Sand
	3 - 4.5'	Light Gray Fine to Medium Sand

Moist at 3.5', wet at 4'
Boring Caved at 4'
Piezometer set from 0 to 4.5' with 0.7' stickup

Drawings



NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 25462 G. DAVID GARRETT

DATE 12/15/00

David Garrett, P.G., P.E.
Engineering and Geology
1406 Rock Drive, Raleigh, North Carolina 27610
Telephone/Fax (919) 231-1818

C&D LANDFILL INC.

CONSTRUCTION AND DEMOLITION LANDFILL

BORING LOCATIONS

PACTOLUS — PITT COUNTY — NORTH CAROLINA

SCALE	JOB NO.	SHEET
1" = 100'	0023	F 1

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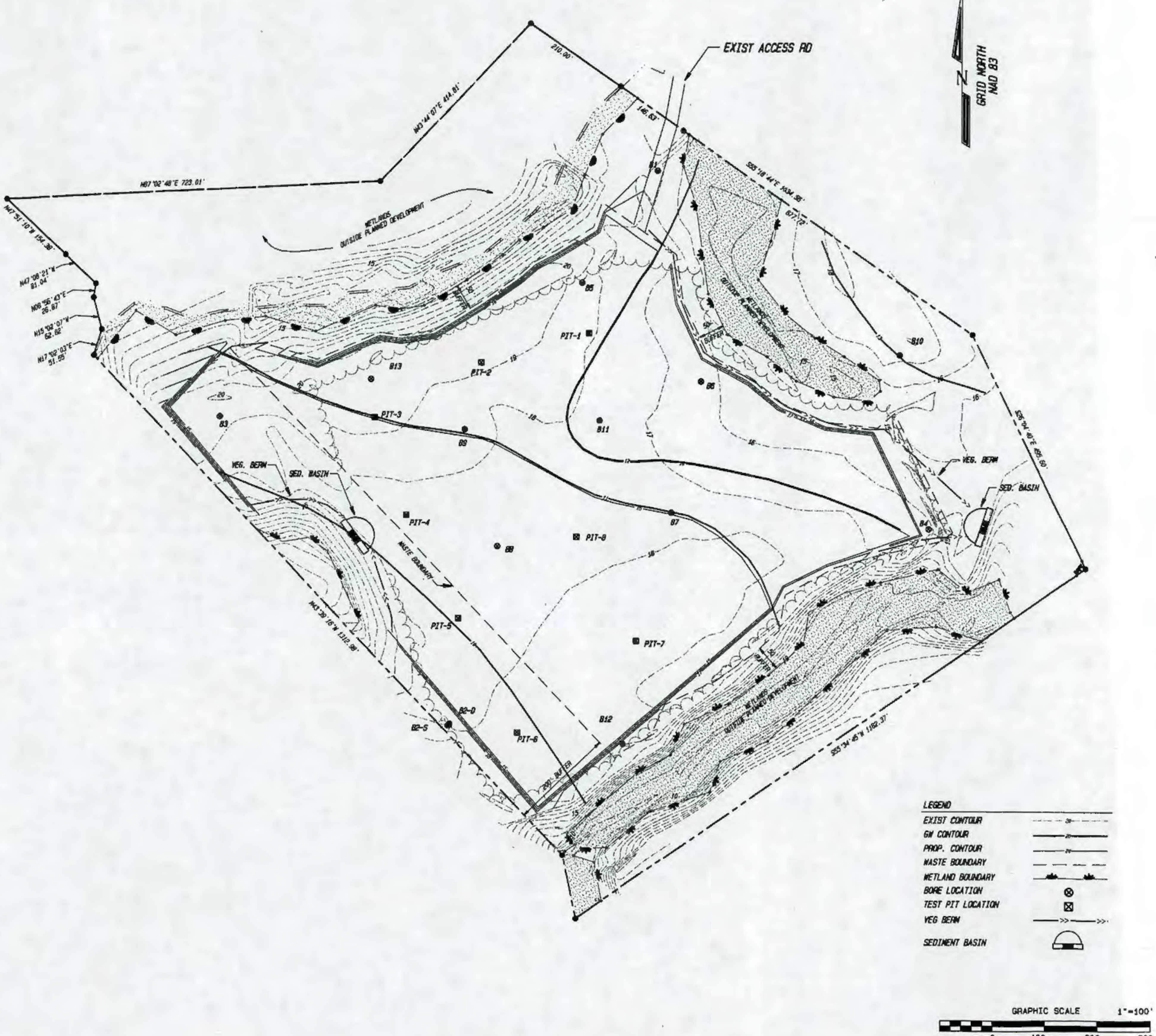
DATE 12/15/2000



GENERAL NOTES:

1. Boundary, topographic
P.O. Box 881, Greenvi

2. All work shall be in a

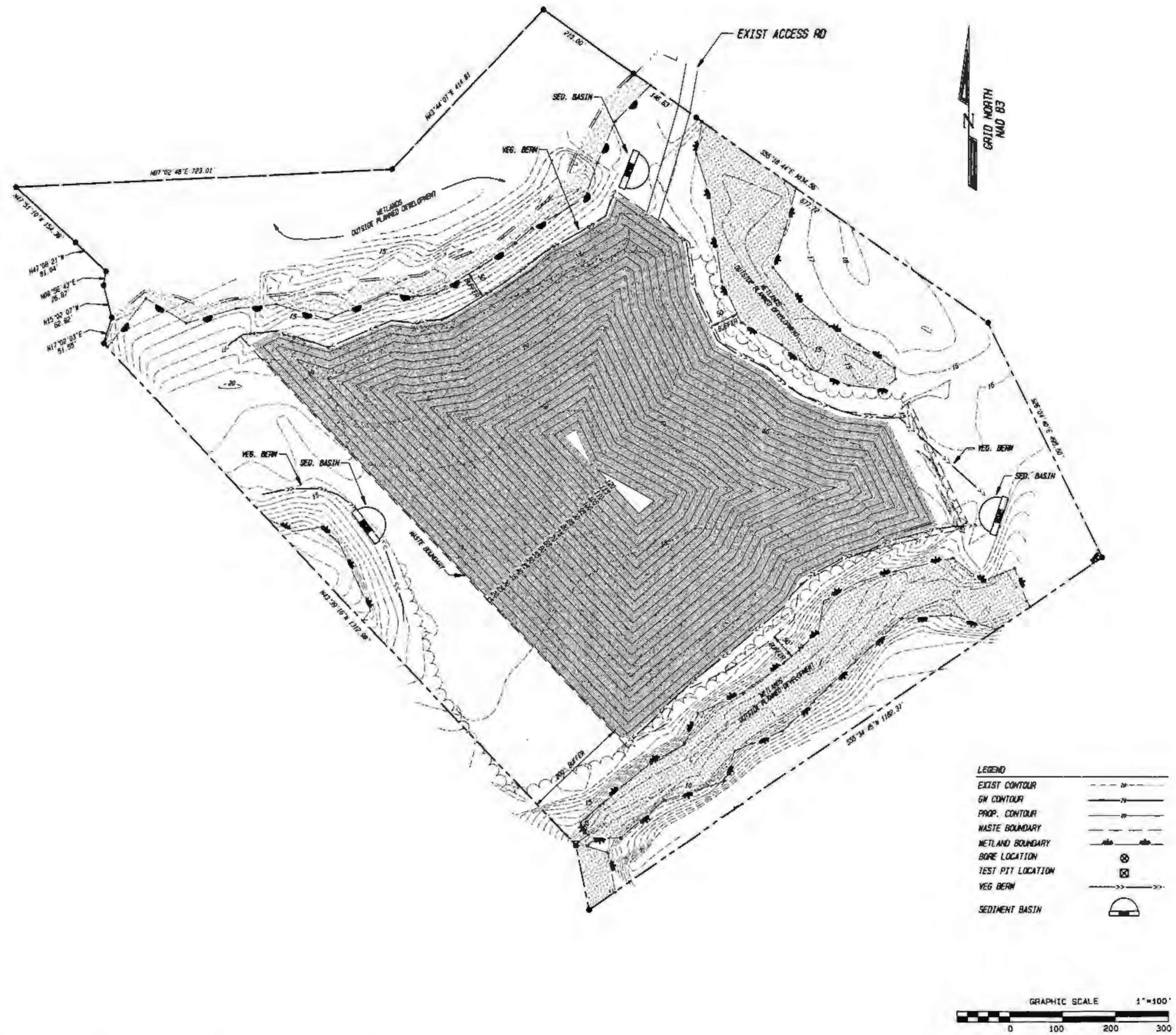
3. Contractor shall at al
barricades, for the pr
ALL CONSTRUCTION OPERA
REGULATIONS OF THE OCC
LABOR.

Contractor shall be re
trenches and excavatio
Contractor shall be re
and bracing, and the p

NORTH CARO
PROFESSIONA
SEAL
15895
ENGINEER
JOHN A.K. TU

DATE 12/15

SURVEY
BURGESS LAND SU



GENERAL NOTES

1. Boundary, topographic and wetland information take from maps prepared by James A. Burgess, PLS, P.O. Box 881, Greenville, NC 27834, 252-758-4900

2. All work shall be in accordance with applicable Federal, State and Local regulations.

3. Contractor shall at all times maintain adequate safety measures, activities, and barricades, for the protection of all persons on or about the site.
ALL CONSTRUCTION OPERATIONS SHALL BE ACCOMPLISHED IN ACCORDANCE WITH THE APPLICABLE REGULATIONS OF THE OCCUPATIONAL SAFETY AND HEALTH DIVISION OF THE NC DEPARTMENT OF LABOR.

Contractor shall be responsible for the design of adequate shoring and bracing in all trenches and excavations that are a part of the construction operations of this project. Contractor shall be responsible for installation and maintenance of adequate shoring and bracing, and the protection of all persons and property on or about the site.

NORTH CAROLINA PROFESSIONAL SEAL 15895 ENGINEER JOHN A.K. TUCKER

DATE 12/15/00

JOHN A.K. TUCKER, P.E.
CONSULTING ENGINEER
P.O. BOX 297, FUQUAY-VARINA, NC 27526 919-557-0482 FAX 919-567-3611

C&D LANDFILL INC.

CONSTRUCTION AND DEMOLITION LANDFILL

PROPOSED TOP OF WASTE CONTOURS

SURVEY	SCALE	JOB NO.	SHEET
BURGESS LAND SURVEYING	1" = 100'	0023	F-3

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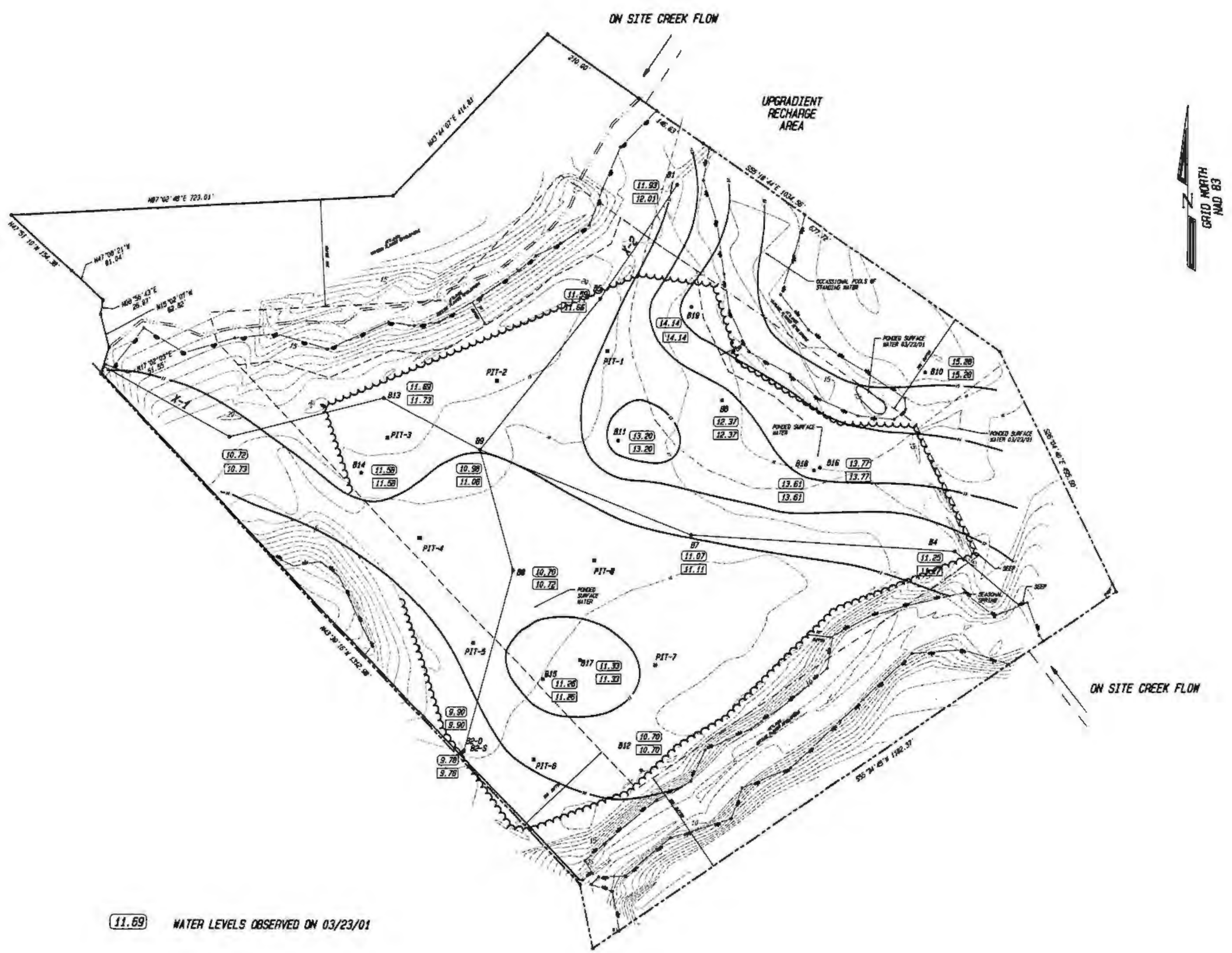
DATE 12/11/2000



(11.69) WATER LEVELS OBSERVED ON 03/23/01

[11.69] HIGHEST WATER LEVEL OBSERVED
BEYOND 7-D EQUALIZATION PERIOD
(SEE TABLES 4 AND 5 OF TEXT)

GRAPHIC SCALE 1"=100'
0 100 200 300

WATER LEVELS OBSERVED
MARCH 23, 2001

DATE

David Garrett, P.G., P.E.
Engineering and Geology
1408 Rock Drive, Raleigh, North Carolina 27610 Telephone/Fax (919) 231-1818

C&D LANDFILL INC.

CONSTRUCTION AND DEMOLITION LANDFILL

GROUND WATER MAP

PACTOLUS PITT COUNTY NORTH CAROLINA

SCALE	JOB NO.	SHEET
1" = 100'	0023	F 4

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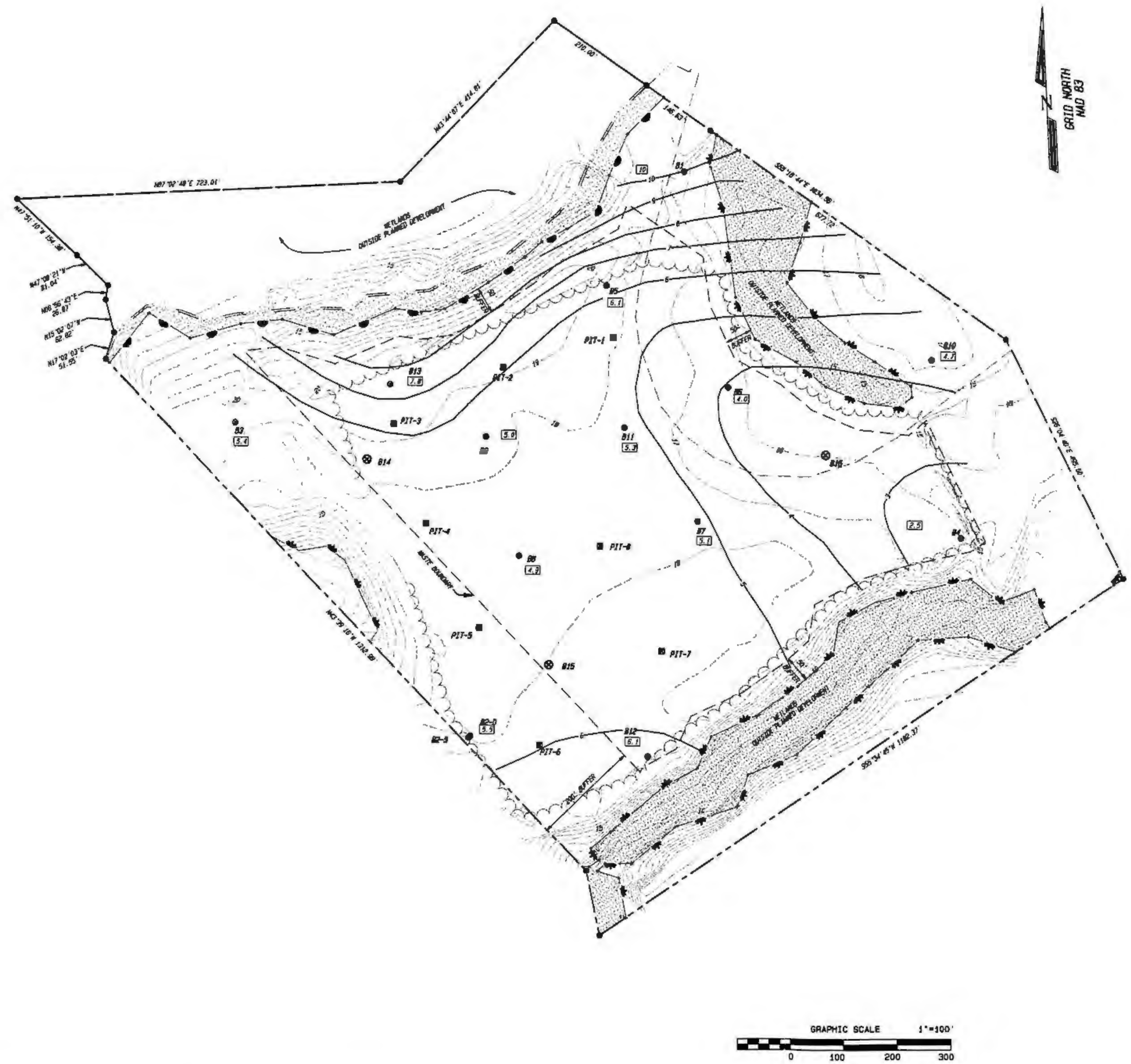
DATE 3/30/2001



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NORTH CAROLINA LICENSED SEAL 983 GEOLOGIST G. DAVID GARRETT

DATE 12/15/00

C&D LANDFILL INC.

CONSTRUCTION AND DEMOLITION LANDFILL

MAP OF CONFINING UNIT

PACTOLUS — PITT COUNTY — NORTH CAROLINA

SCALE	JOB NO.	SHEET
1" = 100'	0023	F 5

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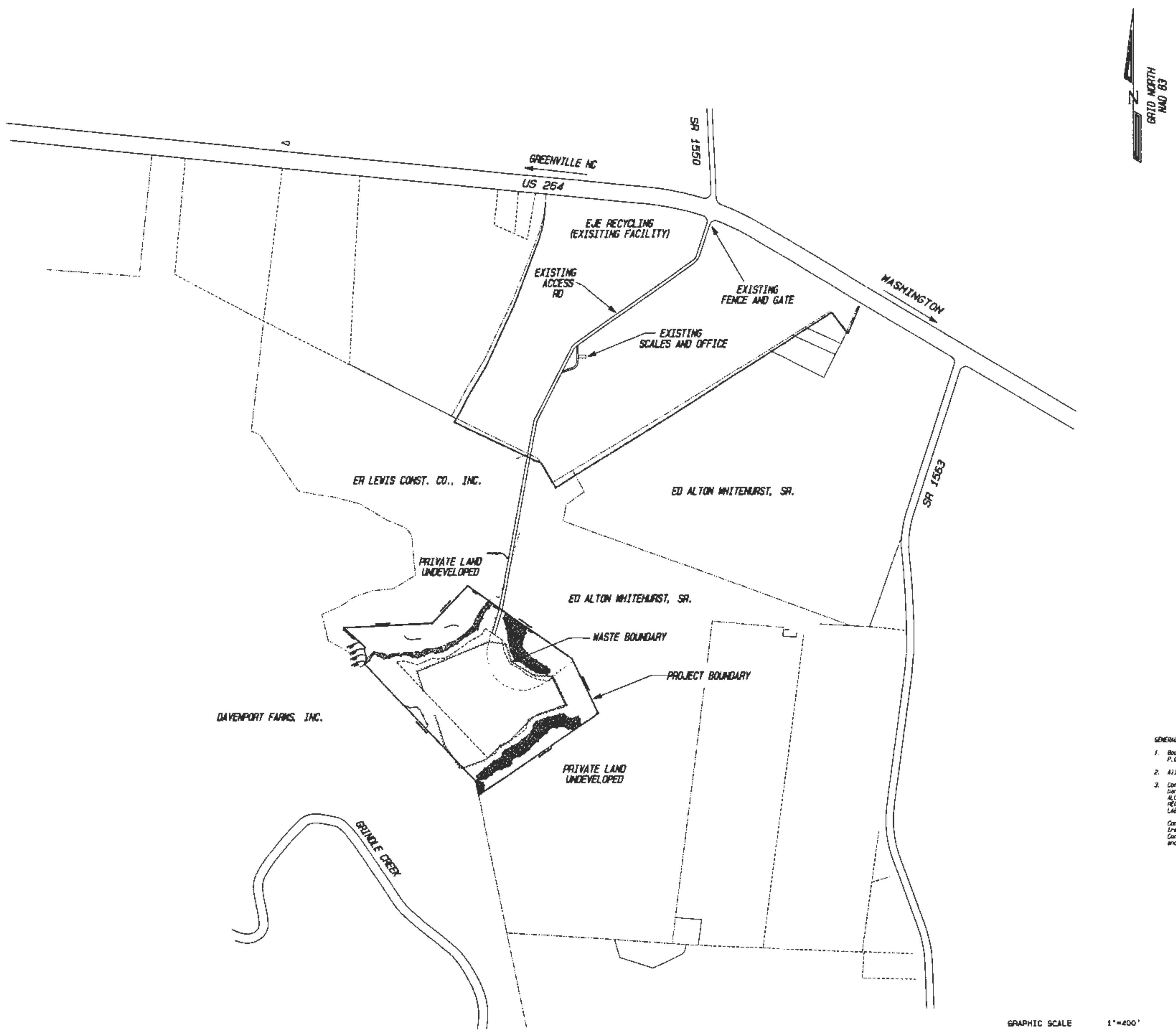
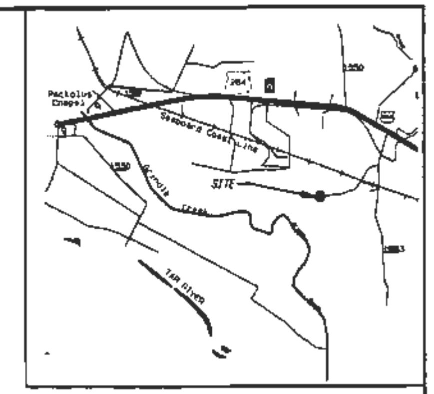
DATE 12/15/2000





VICINITY MAP
(NTS)

GENERAL NOTES:

1. Boundary, topographic and wetland information take from maps prepared by James A. Burgess, PLS. P.O. Box 881, Greenville, NC 27834, 252-758-4900
2. All work shall be in accordance with applicable Federal, State and Local regulations.
3. Contractor shall at all times maintain adequate safety measures, activities, and barricades, for the protection of all persons on or about the site. ALL CONSTRUCTION OPERATIONS SHALL BE ACCOMPLISHED IN ACCORDANCE WITH THE APPLICABLE REGULATIONS OF THE OCCUPATIONAL SAFETY AND HEALTH DIVISION OF THE NC DEPARTMENT OF LABOR.

   Contractor shall be responsible for the design of adequate shoring and bracing in all trenches and excavations that are a part of the construction operations of this project. Contractor shall be responsible for installation and maintenance of adequate shoring and bracing, and the protection of all persons and property on or about the site.

NORTH CAROLINA PROFESSIONAL SEAL 15895 ENGINEER JOHN A.K. TUCKER

DATE 12/15/00

JOHN A.K.TUCKER, P.E.
CONSULTING ENGINEER
P.O. BOX 297, FUQUAY-VARINA, NC 27526 919-567-0482 FAX 919-567-3611

C&D LANDFILL INC.

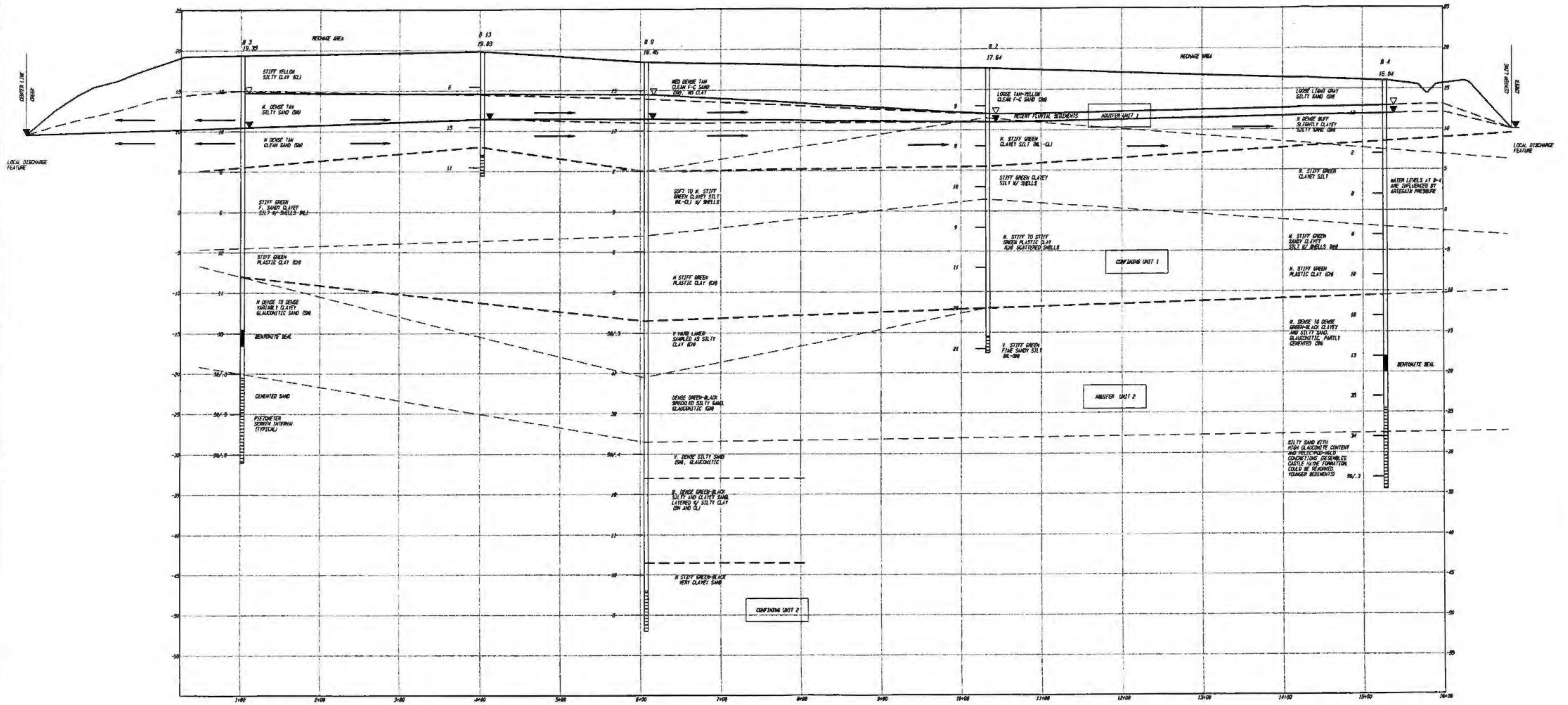
CONSTRUCTION AND DEMOLITION LANDFILL

GENERAL SITE PLAN

PACTOLUS — PITT COUNTY — NORTH CAROLINA

SURVEY	SCALE	JOB NO.	SHEET
BURGESS LAND SURVEYING	1" = 400'	0023	1-6

FILE C:\company\2000-proj\0023 - EJE Recycle\drawings\CONCEPTPLAN03.pro
DATE 12/15/2000



GRAPHIC SCALE 1"=60'

0 60 120 180

LEGEND

WATER LEVEL AT 24 HRS., OR LESS (PROBABLE MAX. HIGH WATER TABLE)	open triangle on line
WATER LEVEL AT 7 DAYS, OR MORE MASURE ON 11/6/2000	solid triangle on line
STANDARD PENETRATION RESISTANCE VALUE	38 (tick mark on boring)

David Garrett, P.G., P.E.
Engineering and Geology

1408 Rock Drive, Raleigh, North Carolina 27610 — Telephone/Fax (919) 231-1818

C&D LANDFILL INC.

CONSTRUCTION AND DEMOLITION LANDFILL

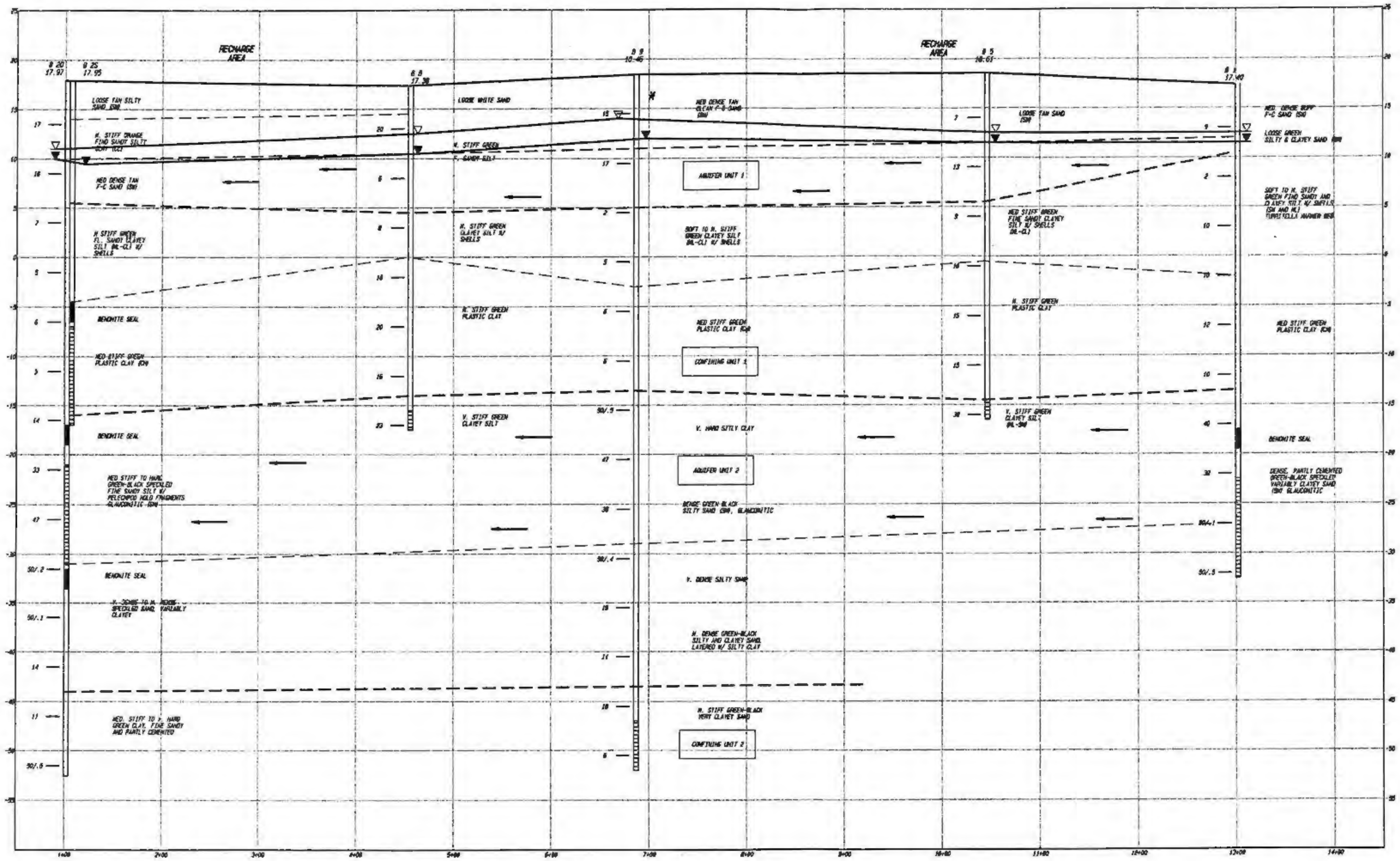
CROSS SECTION X-1

PACTOLUS — PITT COUNTY — NORTH CAROLINA

SCALE	JOB NO.	SHEET
1" = 60' H 1" = 6' V	0023	X - 1

DATE ____________

FILE C:\company\2000-proj\0023 - EJE Recycle\drawings\constdwg04.pro
DATE 3/25/2001



LEGEND

WATER LEVEL AT 24 HRS., OR LESS (PROBABLE MAX. HIGH WATER TABLE) ▽

WATER LEVEL AT 7 DAYS, OR MORE MEASURED ON 11/6/2000 ▼

STANDARD PENETRATION RESISTANCE VALUE 36

GRAPHIC SCALE 1"=60'

0 60 120 180

David Garrett, P.G., P.E.
Engineering and Geology
1408 Rock Drive, Raleigh, North Carolina 27610 Telephone/Fax (919) 231-1818

CGD LANDFILL INC.

CONSTRUCTION AND DEMOLITION LANDFILL

CROSS SECTION X-2

PACTOLUS PITT COUNTY NORTH CAROLINA

DATE	SCALE 1" = 60' H 1" = 6' V	JOB NO. 0023	SHEET X-2

FILE C:\company\2000-proj\0023 - EJE Recycle\drawings\constdwg04.pro
DATE 3/29/2001

APPENDIX A
Contam. Transport

Appendix A

Error Function Values

Values of the error function, erf(x), and the complementary error function, erfc(x), for positive values of x

x	erf(x)	erfc(x)	x	erf(x)	erfc(x)
0	0	1.0	1.1	0.880205	0.119795
0.05	0.056372	0.943628	1.2	0.910314	0.089686
0.1	0.112463	0.887537	1.3	0.934008	0.065992
0.15	0.167996	0.832004	1.4	0.952285	0.047715
0.2	0.222703	0.777297	1.5	0.966105	0.033895
0.25	0.276326	0.723674	1.6	0.976348	0.023652
0.3	0.328627	0.671373	1.7	0.983790	0.016210
0.35	0.379382	0.620618	1.8	0.989091	0.010909
0.4	0.428392	0.571608	1.9	0.992790	0.007210
0.45	0.475482	0.524518	2.0	0.995322	0.004678
0.5	0.520500	0.479500	2.1	0.997021	0.002979
0.55	0.563323	0.436677	2.2	0.998137	0.001863
0.6	0.603856	0.396144	2.3	0.998857	0.001143
0.65	0.642029	0.357971	2.4	0.999311	0.000689
0.7	0.677801	0.322199	2.5	0.999593	0.000407
0.75	0.711156	0.288844	2.6	0.999764	0.000236
0.8	0.742101	0.257899	2.7	0.999866	0.000134
0.85	0.770668	0.229332	2.8	0.999925	0.000075
0.9	0.796908	0.203092	2.9	0.999959	0.000041
0.95	0.820891	0.179109	3.0	0.999978	0.000022
1.0	0.842701	0.157299			

Appendix B

Bessel Functions

Modified Bessel functions of the second kind and zero order, $K_0(x)$

x	$K_0(x)$	x	$K_0(x)$	x	$K_0(x)$
0.010	4.721	0.040	3.336	0.070	2.780
0.011	4.626	0.041	3.312	0.071	2.766
0.012	4.539	0.042	3.288	0.072	2.752
0.013	4.459	0.043	3.264	0.073	2.738
0.014	4.385	0.044	3.241	0.074	2.725
0.015	4.316	0.045	3.219	0.075	2.711
0.016	4.251	0.046	3.197	0.076	2.698
0.017	4.191	0.047	3.176	0.077	2.685
0.018	4.134	0.048	3.155	0.078	2.673
0.019	4.080	0.049	3.134	0.079	2.660
0.020	4.028	0.050	3.114	0.080	2.647
0.021	3.980	0.051	3.094	0.081	2.635
0.022	3.933	0.052	3.075	0.082	2.623
0.023	3.889	0.053	3.056	0.083	2.611
0.024	3.846	0.054	3.038	0.084	2.599
0.025	3.806	0.055	3.019	0.085	2.587
0.026	3.766	0.056	3.001	0.086	2.576
0.027	3.729	0.057	2.984	0.087	2.564
0.028	3.692	0.058	2.967	0.088	2.553
0.029	3.657	0.059	2.950	0.089	2.542
0.030	3.623	0.060	2.933	0.090	2.531
0.031	3.591	0.061	2.916	0.091	2.520
0.032	3.559	0.062	2.900	0.092	2.509
0.033	3.528	0.063	2.884	0.093	2.499
0.034	3.499	0.064	2.869	0.094	2.488
0.035	3.470	0.065	2.853	0.095	2.478
0.036	3.442	0.066	2.838	0.096	2.467
0.037	3.414	0.067	2.823	0.097	2.457
0.038	3.388	0.068	2.809	0.098	2.447
0.039	3.362	0.069	2.794	0.099	2.437

Source: Adapted from M. S. Hantush, "Analysis of Data From Pumping Tests in Leaky Aquifers," *Transactions, American Geophysical Union* 37 (1956):702–14.

Modified Bessel functions of the second kind and zero order, $K_0(x)$

x	$K_0(x)$	x	$K_0(x)$	x	$K_0(x)$
0.10	2.427	0.60	0.777	1.0	0.421
0.11	2.333	0.61	0.765	1.1	0.366
0.12	2.248	0.62	0.752	1.2	0.318
0.13	2.169	0.63	0.740	1.3	0.278
0.14	2.097	0.64	0.728	1.4	0.244
0.15	2.030	0.65	0.716	1.5	0.214
0.16	1.967	0.66	0.704	1.6	0.188
0.17	1.909	0.67	0.693	1.7	0.165
0.18	1.854	0.68	0.682	1.8	0.146
0.19	1.802	0.69	0.671	1.9	0.129
0.20	1.753	0.70	0.660	2.0	0.114
0.21	1.706	0.71	0.650	2.1	0.101
0.22	1.662	0.72	0.640	2.2	0.0893
0.23	1.620	0.73	0.630	2.3	0.0791
0.24	1.580	0.74	0.620	2.4	0.0702
0.25	1.541	0.75	0.611	2.5	0.0623
0.26	1.505	0.76	0.601	2.6	0.0554
0.27	1.470	0.77	0.592	2.7	0.0493
0.28	1.436	0.78	0.583	2.8	0.0438
0.29	1.404	0.79	0.574	2.9	0.0390
0.30	1.372	0.80	0.565	3.0	0.0347
0.31	1.342	0.81	0.557	3.1	0.0310
0.32	1.314	0.82	0.548	3.2	0.0276
0.33	1.286	0.83	0.540	3.3	0.0246
0.34	1.259	0.84	0.532	3.4	0.0220
0.35	1.233	0.85	0.524	3.5	0.0196
0.36	1.207	0.86	0.516	3.6	0.0175
0.37	1.183	0.87	0.509	3.7	0.0156
0.38	1.160	0.88	0.501	3.8	0.0140
0.39	1.137	0.89	0.494	3.9	0.0125
0.40	1.114	0.90	0.487	4.0	0.0112
0.41	1.093	0.91	0.480	4.1	0.0100
0.42	1.072	0.92	0.473	4.2	0.0089
0.43	1.052	0.93	0.466	4.3	0.0080
0.44	1.032	0.94	0.459	4.4	0.0071
0.45	1.013	0.95	0.452	4.5	0.0064
0.46	0.994	0.96	0.446	4.6	0.0057
0.47	0.976	0.97	0.440	4.7	0.0051
0.48	0.958	0.98	0.433	4.8	0.0046
0.49	0.941	0.99	0.427	4.9	0.0041
0.50	0.924			5.0	0.0037
0.51	0.908				
0.52	0.892				
0.53	0.877				
0.54	0.861				
0.55	0.847				
0.56	0.832				
0.57	0.818				
0.58	0.804				
0.59	0.791				

Appendix C

W(*t*, *B*) Values

Values of the function *W*(*t*,*B*) for various values of *t*

t \ *B*	0.002	0.004	0.006	0.008	0.01	0.02	0.04	0.06	0.08
0	12.7	11.3	10.5	9.89	9.44	8.06	6.67	5.87	5.29
0.000002	12.1	11.2	10.5	9.89	9.44	8.06	6.67	5.87	5.29
0.000004	11.6	11.1	10.4	9.88	9.44	8.06	6.67	5.87	5.29
0.000006	11.3	10.9	10.4	9.87	9.44	8.06	6.67	.87	5.29
0.000008	11.0	10.7	10.3	9.84	9.43	8.06	6.67	5.87	5.29
0.00001	10.8	10.6	10.2	9.80	9.42	8.06	6.67	5.87	5.29
0.00002	10.2	10.1	9.84	9.58	9.30	8.06	6.67	5.87	5.29
0.00004	9.52	9.45	9.34	9.19	9.01	8.03	6.67	5.87	5.29
0.00006	9.13	9.08	9.00	8.89	8.77	7.98	6.67	5.87	5.29
0.00008	8.84	8.81	8.75	8.67	8.57	7.91	6.67	5.87	5.29
0.0001	8.62	8.59	8.55	8.48	8.40	7.84	6.67	5.87	5.29
0.0002	7.94	7.92	7.90	7.86	7.82	7.50	6.62	5.86	5.29
0.0004	7.24	7.24	7.22	7.21	7.19	7.01	6.45	5.83	5.29
0.0006	6.84	6.84	6.83	6.82	6.80	6.68	6.27	5.77	5.27
0.0008	6.55	6.55	6.54	6.53	6.52	6.43	6.11	5.69	5.25
0.001	6.33	6.33	6.32	6.32	6.31	6.23	5.97	5.61	5.21
0.002	5.64	5.64	5.63	5.63	5.63	5.59	5.45	5.24	4.98
0.004	4.95	4.95	4.95	4.94	4.94	4.92	4.85	4.74	4.59
0.006	4.54	4.54	4.54	4.54	4.54	4.53	4.48	4.41	4.30
0.008	4.26	4.26	4.26	4.26	4.26	4.25	4.21	4.15	4.08
0.01	4.04	4.04	4.04	4.04	4.04	4.03	4.00	3.95	3.89
0.02	3.35	3.35	3.35	3.35	3.35	3.35	3.34	3.31	3.28
0.04	2.68	2.68	2.68	2.68	2.68	2.68	2.67	2.66	2.65
0.06	2.30	2.30	2.30	2.30	2.30	2.29	2.29	2.28	2.27
0.08	2.03	2.03	2.03	2.03	2.03	2.03	2.02	2.02	2.01
0.1	1.82	1.82	1.82	1.82	1.82	1.82	1.82	1.82	1.81
0.2	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22
0.4	0.702	0.702	0.702	0.702	0.702	0.702	0.702	0.702	0.701
0.6	0.454	0.454	0.454	0.454	0.454	0.454	0.454	0.454	0.454
0.8	0.311	0.311	0.311	0.311	0.311	0.311	0.311	0.310	0.310
1	0.219	0.219	0.219	0.219	0.219	0.219	0.219	0.219	0.219
2	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049
4	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038
6	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004
8	0	0	0	0	0	0	0	0	0

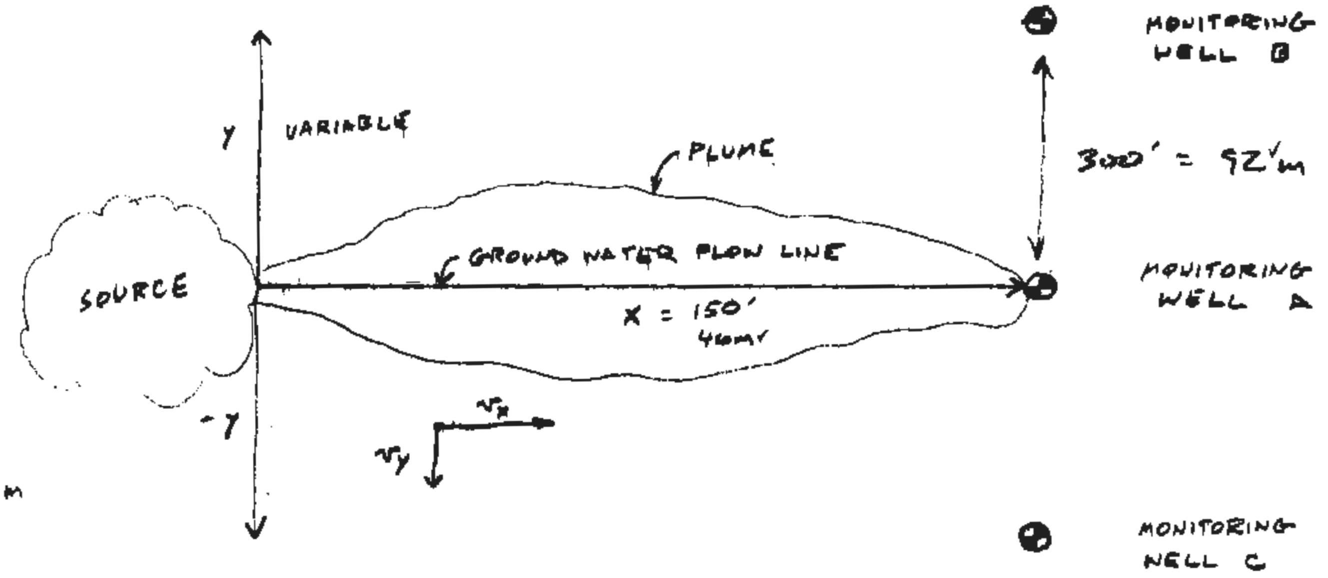
Source: After M. S. Hantush, "Analysis of data from Pumping Tests in Leaky Aquifers," *Transactions, American Geophysical Union*, 37 (1956):702–14.

t
0
0.000002
0.000004
0.000006
0.000008
0.00001
0.00002
0.00004
0.00006
0.00008
0.0001
0.0002
0.0004
0.0006
0.0008
0.001
0.002
0.004
0.006
0.008
0.01
0.02
0.04
0.06
0.08
0.1
0.2
0.4
0.6
0.8
1
2
4
6
8

t \ B	0.1	0.2	0.4	0.6	0.8	1	2	4	6	8
0	4.85	3.51	2.23	1.55	1.13	0.842	0.228	0.0223	0.0025	0.0003
0.000002	4.85	3.51	2.23	1.55	1.13	0.842	0.228	0.0223	0.0025	0.0003
0.000004	4.85	3.51	2.23	1.55	1.13	0.842	0.228	0.0223	0.0025	0.0003
0.000006	4.85	3.51	2.23	1.55	1.13	0.842	0.228	0.0223	0.0025	0.0003
0.000008	4.85	3.51	2.23	1.55	1.13	0.842	0.228	0.0223	0.0025	0.0003
0.00001	4.85	3.51	2.23	1.55	1.13	0.842	0.228	0.0223	0.0025	0.0003
0.00002	4.85	3.51	2.23	1.55	1.13	0.842	0.228	0.0223	0.0025	0.0003
0.00004	4.85	3.51	2.23	1.55	1.13	0.842	0.228	0.0223	0.0025	0.0003
0.00006	4.85	3.51	2.23	1.55	1.13	0.842	0.228	0.0223	0.0025	0.0003
0.00008	4.85	3.51	2.23	1.55	1.13	0.842	0.228	0.0223	0.0025	0.0003
0.0001	4.85	3.51	2.23	1.55	1.13	0.842	0.228	0.0223	0.0025	0.0003
0.0002	4.85	3.51	2.23	1.55	1.13	0.842	0.228	0.0223	0.0025	0.0003
0.0004	4.85	3.51	2.23	1.55	1.13	0.842	0.228	0.0223	0.0025	0.0003
0.0006	4.85	3.51	2.23	1.55	1.13	0.842	0.228	0.0223	0.0025	0.0003
0.0008	4.84	3.51	2.23	1.55	1.13	0.842	0.228	0.0223	0.0025	0.0003
0.001	4.83	3.51	2.23	1.55	1.13	0.842	0.228	0.0223	0.0025	0.0003
0.002	4.71	3.50	2.23	1.55	1.13	0.842	0.228	0.0223	0.0025	0.0003
0.004	4.42	3.48	2.23	1.55	1.13	0.842	0.228	0.0223	0.0025	0.0003
0.006	4.18	3.43	2.23	1.55	1.13	0.842	0.228	0.0223	0.0025	0.0003
0.008	3.98	3.36	2.23	1.55	1.13	0.842	0.228	0.0223	0.0025	0.0003
0.01	3.81	3.29	2.23	1.55	1.13	0.842	0.228	0.0223	0.0025	0.0003
0.02	3.24	2.95	2.18	1.55	1.13	0.842	0.228	0.0223	0.0025	0.0003
0.04	2.63	2.48	2.02	1.52	1.13	0.842	0.228	0.0223	0.0025	0.0003
0.06	2.26	2.17	1.85	1.46	1.11	0.839	0.228	0.0223	0.0025	0.0003
0.08	2.00	1.94	1.69	1.39	1.08	0.832	0.228	0.0223	0.0025	0.0003
0.1	1.80	1.75	1.56	1.31	1.05	0.819	0.228	0.0223	0.0025	0.0003
0.2	1.22	1.19	1.11	0.996	0.857	0.715	0.227	0.0223	0.0025	0.0003
0.4	0.700	0.693	0.665	0.621	0.565	0.502	0.210	0.0223	0.0025	0.0003
0.6	0.453	0.450	0.436	0.415	0.387	0.354	0.177	0.0222	0.0025	0.0003
0.8	0.310	0.308	0.301	0.289	0.273	0.254	0.144	0.0218	0.0025	0.0003
1	0.219	0.218	0.213	0.206	0.197	0.185	0.114	0.0207	0.0025	0.0003
2	0.049	0.049	0.048	0.047	0.046	0.044	0.034	0.011	0.0021	0.0003
4	0.0038	0.0038	0.0038	0.0037	0.0037	0.0036	0.0031	0.0016	0.0006	0.0002
6	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0003	0.0002	0.0001	0
8	0	0	0	0	0	0	0	0	0	0

HOW FAR APART SHOULD THE WELLS BE PLACED ?

IE, HOW FAR IN THE TRANSVERSE DIRECTION CAN REPRESENTATIVE SOLUTE CONCENTRATIONS BE DETECTED IN THE UPPER AQUIFER ?



325 Ft = 1 m

PITT COUNTY DATA - UPPER MOST AQUIFER

1. AQUIFER IS SILTY SAND
   $K_{SAT} = 7 \times 10^{-4}$ cm/s — 1×10^{-5} cm/s
   (6×10^{-5} m/day — 3.1×10^{-6} m/day)
   HYDR. GRADIENT = 0.02 AVG.
   n_e = 0.4
   $\bar{v}_x$ = 0.008 ft/day = 0.0025 m/d
   d_{50} = 0.35 mm = .00035 m (average of 5)

2. MODEL CHLORIDE (Cl^- ion)
   $D_d = 2 \times 10^{-7}$ m²/s × 1440 s/day = 2.9×10^{-4} m²/day ← F&C, P.103; Fetter, P.67; Walton, P.176
   C_0 = 1 mg/l = 1 kg/m³
   Q = 14 ac × 0.21"/day precip ← 6.5"/30 days
   57K m² × .002 m/day
   122 m³/day

10,164 ft³/day

ANALYTICAL SOLUTION FOR CONTINUOUS FLOW

Ⓐ BEAR 1972 $t = \infty$: $C(x,y) = \frac{C_0 Q}{2\pi (D_L D_T)^{1/2}} \exp\left(\frac{v_x x}{2 D_L D_T}\right) K_0\left[\left(\frac{v_x^2}{4 D_L}\left(\frac{x^2}{D_L} + \frac{y^2}{D_T}\right)\right)^{1/2}\right]$

WHERE K_0 = MODIFIED BESSEL FUNCTION, 2^{ND} KIND, ZERO ORD.

Ⓑ FRIED 1975 : $C(x,y,t) = \frac{C_0 Q}{4\pi (D_L D_T)^{1/2}} \exp \frac{v_x x}{2 D_L} \left[W(0,B) - W(t,B) \right]$

WHERE C_0 : CONCENTRATION OF SOLUTE INJECTION (mg/l)

CONVERT ALL UNITS TO S.I. ?

Q : RATE OF SOLUTE INJECTION (gal/ac/day) → m³/day

D_L : LONGITUDINAL = $\alpha_L v_i + D^*$

D_T : TRANSVERSE = $\alpha_T v_i + D^*$

v_i → v_x : GROUND WATER FLOW VELOCITY (m/day)

x = DISTANCE TO MONITORING WELL FROM WASTE BOUNDARY (VECTOR IN M)

y = OFFSET (PERPENDICULAR) FROM VECTOR LINE IN M

D^* = EFFECTIVE DIFFUSION FACTOR = ωD_d (m²/s)

ω = TORTUOSITY FACTOR = 0.7

D_d = DIFFUSION COEFFICIENT (m²/s)

P_e : PECLET # = $\frac{v_x d}{D_d}$ ✓ (DIMENSIONLESS)

d = AVERAGE GRAIN SIZE, d_{50} (mm)

t = TIME

$W[t,B]$ = LEAKY WELL FUNCTION

$B = \left[\frac{(v_x x)^2}{4 D_L^2} + \frac{(v_y y)^2}{4 D_L D_T}\right]^{1/2}$

α_L = 0.1 x meters

α_T = VARIES FROM 6-20 meters

Ⓐ see calculated values of D_L, D_T in Section Ⓑ

1. CALCULATE $K_0\left[\left(\frac{v_x^2}{4D_L}\left(\frac{x^2}{D_L}+\frac{y^2}{D_T}\right)\right)^{1/2}\right]$

$$\left[\left(\frac{(.0025\ m/d)^2}{4(0.012\ m^2/d)}\left(\frac{(46m)^2}{0.012\ m^2/d}+\frac{(92.5m)^2}{0.002\ m^2/d}\right)\right)^{1/2}\right]$$

.00013   170,333   1,058,000

$K_0[57]$ (~~24~~) — off the scale

USE $K_0[5] = 0.0037$

Fetter pg 62

2. APPLY BEAR'S EQUATION

$$C_{(x,y)\ t\to\infty} = \frac{C_0\ Q}{2\pi(D_L D_T)^{1/2}}\ \exp\ \frac{v_x\ x}{2D_L D_T}\ K_0[\ldots\ldots]$$

$$= \frac{.01\ kg/l\ (122\ m^3/d)}{2\pi\sqrt{(.012)(.002)}}\ \exp\ \frac{(.0025)(46)}{2(.012)(.002)} * .0037$$

$$\left(\frac{1.22}{.031}\right)\ e^{8.86}$$

TOO HIGH

$$39.5 * 7076$$

NOT A VALID SOLUTION

SEE Ⓑ AND Ⓒ

(B)

1. CALCULATE $P_e = \frac{v_x d}{D_d}$

8.75×10^{-7}

$v_x = 0.0025$ m/d

VERY SENSITIVE TO Dd →

$= \frac{0.0025 \text{ m/d} (.00035 \text{ m})}{0.00029 \text{ m}^2/\text{day}} = 0.003$

THIS IS THE LOWER LIMIT OF DATA ON FIGURE 2.7 (FETTER)

∴ DIFFUSION CONTROLS SPREAD OF PLUME, DUE TO LOW VELOCITY, RATHER THAN ADVECTION

2. CALCULATE D^*, α_L, α_T, D_L and D_T

NOT SENSITIVE TO Dd

$D^* = \omega D_d = 0.7 (0.00029 \text{ m}^2/\text{d}) = \underline{.0002} \text{ m}^2/\text{d}$

$\alpha_L = 0.1x = 0.1(46 \text{ m}) = \underline{4.6 \text{ m}}$

SET $\alpha_T = \underline{0.76 \text{m}}$ SUCH THAT $\alpha_L/\alpha_T = 6.0$

(α VALUES ARE CONSISTENT W/ WALTON, APPX B)

$D_L = \alpha_L \, \cancel{v_i}^{\,v_x} + D^* = 4.6\text{m}(.0025 \text{ m/d}) + .0002 \text{ m}^2/\text{d}$
$= \underline{0.012} \text{ m}^2/\text{d}$

$D_T = \alpha_T \, \cancel{v_i}^{\,v_x} + D^* = 0.76(.0025) + .0002 = \underline{0.002} \text{ m}^2/\text{d}$

3. CALCULATE $B = \left[\frac{(v_x x)^2}{4 D_L^2} + \frac{(v_x y)^2}{4 D_L D_T}\right]^{1/2}$

$x = 46$m
$y = 300' = 92.3$m

$= \left[\frac{((.0025)(46))^2}{4(0.012)^2} + \frac{((.0025)(92.3))^2}{4(0.012)(0.002)}\right]^{1/2}$

$= \left[\frac{.0132}{.00058} + \frac{.0532}{.0001}\right]^{1/2} = \cancel{23.1}\ 24$

22.9   534

4. LOOK UP W[t, B] IN APPENDIX C (FETTER, 1993)

UNITLESS WELL FUNCTION

NOTE B = 24 CALCULATED ABOVE IS OFF THE SCALE

W[0, 24] = .0003 USE VALUE FOR W[0, 8]

W[t, B] = 0 FOR ANY t > 8 units

5. APPLY FRIED'S EQUATION

$$C(x,y,t) = \frac{C_0 Q}{4\pi (D_L D_T)^{1/2}} \exp\left(\frac{V_x X}{2D_L}\right)\left[W[0,B] - W[t,B]\right]$$

$W[t,B] \rightarrow 0$, $t \geq 8$ days

use Chloride

$$= \frac{0.01\ mg/l \,(293\ m^3/d)}{4\pi\left((0.012\ m^2/d)(0.002\ m^2/d)\right)^{1/2}} \exp\frac{(0.0025)(46)}{2(0.012)}\left[0.0003\right]$$

(122 written above 293; units: m/d, m over m^2/d)

mg/l - m over m^2/d

$\frac{kg\text{-}m}{l}$

$$= \left(\frac{1.22}{.062}\right) e^{0.0014}$$

$$(19.8)(1)$$

$$= 19.8\ mg/l \qquad OK$$

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

TWO- DIMENSIONAL MASS TRANSPORT

(C) REF. WALTON, 1991

1. WIDELY USED CONTINUOUS POINT SOURCE EQ. FOR 2-D CONTAMINANT MIGRATION IN UNIFORM POROUS AQUIFER (WILSON & MILLER, 1978; HUNT, 1978, 1983)

$$c = M \exp\left(\frac{x}{B}\right) W[a,b] / \left[4\pi n_e m (D_L D_T)^{1/2}\right]$$

WHERE $M = C_o Q$ $\quad$ m = AQUIFER THICKNESS

u_x = AVG. PORE VELOCITY $\approx v_x$

$$B = \frac{2D_L}{u_x}$$

$$b = R/B$$

$$R^2 = x^2 + y^2(D_L/D_T)$$

$$a = R^2/(4 D_L t)$$

$$D_L = \alpha_L u_x$$

$$D_T = \alpha_T u_x$$

2. SET INITIAL CONDITIONS

$x = 150' = 46 m$

$2y = 300' = 92 m$ (trial value) $\rightarrow y = 46m$

$u_x = v_x = 0.0025$ m/d

$0.001 > C_o = 0.01$ kg/m³ $= 1$ mg/l

$Q = 0.2$ cm/ac/day $= 122$ m³/day $\rightarrow M = C_o Q$ 1.22 kg/day

$n_e = 0.4$

$m = 12' = 3.7 m$

$t = 1$ year $= 365$ days

Two-Dimensional Analytical Solution for Continuous Source Contaminant Transport

Reference Walton, 1991 (after Wilson and Miller, 1978)

The purpose is to find the appropriate monitoring well spacing in the transverse direction, y, to provide early detection of contaminant migration

The trial well spacing, 2y, will be 300 feet

The solution to the general advection-dispersion equation takes the form: C = M exp (x/B) W[a,b] / [4*pi*ne*m*(DL*DT)^0.5] where C = concentration at point x,y at time, t in units of mg/l or kg/m^3 (ppm)

with the following input values: and the following calculated values:

						Sensitivity:				
	Area =	14	acres, or	57,750	m^2					
	Infiltrn =	2.5	in/mo, or	0.00212	m/day	assume long-term aquifer recharge equals precipitation	sensitive	Q =	122 m^3/day	constant source input rate
	Co =	0.01	mg/l			initial solute concentration at source	sensitive	M =	1.22236 kg/day	mass flux, product of Co and Q
	vx =	0.008	ft/day, or	0.00246	m/day	ground water velocity	sensitive	alpha-L =	4.61538 m	longitudinal dispersivity factor
	x =	150	feet, or	46.15385	m	longitudinal distance from source along flow path	sensitive	alpha-T =	0.76923 m	transverse dispersivity factor
	y =	150	feet, or	46.15385	m	tranverse distance from source normal to flow path	NS	D* =	1.9585E-06 m/day	effective diffusion coefficient
	ne =	0.4				aquifer porosity (unitless)	sensitive	DL =	0.0114 m^2/day	longitudinal hydrodynamic dispersion
	m =	3.7	m			aquifer thickness	sensitive	DT =	0.0019 m^2/day	transverse hydrodynamic dispersion
	t =	365	days			time since flow started	NS	R^2 =	14,900.24 m^2	
chloride:	Dd =	2.03E-05	cm^2/sec, or	2.92E-06	m^/day	molecular diffusion coefficient	NS	a =	898.15	
	omega =	0.67				tortuosity factor, dimensionless	NS	B =	9.23236055	
	alpha-L/alpha	6				typ. range 6 to 20 (more spreading at lower values)	sensitive	b =	13.2215845	

W[a,b] = [pi/2b]^0.5 exp(-b) erf[-[(b-2a)/(2a^0.5)]] = 0.345 exp -13.22 erf 29.75 > 3.0, thus erf goes to 1

= 6.2408E-07

C = M exp (x/B) W[a,b] / [4*pi*ne*m*(DL*DT)^0.5] = 14.16943 exp 3.12E-06

Thus, the concentration at x, y and time, t is 1.42E+01 mg/liter (ppm) The equation predicts that the well spacing of 300 feet will be effective.

3. CALCULATE WELL FUNCTION

PREVIOUSLY, $D_L = 0.012\ m^2/d$ LONGITUDINAL COEFF.

$D_T = 0.002\ m^2/d$ TRANSVERSE COEFF.

$$R^2 = x^2 + y^2 (D_L/D_T) = (46m)^2 + (92m)^2 [(.012 \frac{m^2}{d}) / (.002 \frac{m^2}{d})]$$

(40)

(14812) (122)

$$R^2 = 12,604\ m^2 \quad R = 112\ m$$

$$a = \frac{R^2}{4 D_L t} = \frac{12,604\ m^2}{4(.012\ m^2/d)\,365\ d} = 719$$

$\frac{x}{B} = \frac{46}{9.6}$

$4.8 < 50$

$$B = \frac{2 D_L}{u_x} = \frac{2(0.012)\ m^2/d}{0.0025\ m/d} = 9.6\ m$$

$$b = R/B = 112/9.6 = 11.6$$

$$W[a,b] = \left(\frac{\pi}{2b}\right)^{\frac{1}{2}} \exp(-b)\ \mathrm{erf}\left\{-[(b-2a)/(2a^{1/2})]\right\}$$

See Fetter Appx C

$W(a,b) = 0$

$a = 719 > 8$

$b = 11.6 > 8$

$$= \left(\frac{\pi}{2(11.6)}\right)^{\frac{1}{2}} \exp(-11.6)\ \mathrm{erf}\left\{\frac{-(11.6 - 2(719))}{2(719)^{1/2}}\right\}$$

1426

57.0

$26.6 > 3.0$

erf = 1

$$= (0.368)\, e^{-11.6}$$

$$W[a,b] = 3.37 \times 10^{-6}$$

4. APPLY WILSON & MILLER EQUATION

$$c = \frac{C_o Q}{4\pi\, n_e\, m\, (D_L D_T)^{1/2}} \exp\left(\frac{x}{B}\right) W[a,b]$$

← all this goes to 1

$$= \frac{1.22\ kg/day}{4\pi(0.4)(3.7m)[(0.012)(0.002)]^{\frac{1}{2}}\ m^2/d} \exp\left(\frac{46}{9.6}\right)(3.37 \times 10^{-6})$$

$$= (13.4)(e^{1.6\times10^{-5}}) = 13.4\ mg/kg \qquad \text{OK}$$

A sensitivity analysis was performed by varying a single parameter at a time. Sensitive parameters are so noted above. NS means not sensitive.

Although the equation is not sensitive to well spacing at these ground water velocities, professional judgement must be exercised in establishing the spacing based on site geometry.

Walton (p. 191) states that this equation is in wide usage within the profession.

The advection-dispersion model assumes uniform flow within an isotropic, homogeneous aquifer (Darcy's law applies).

The initial concentration of the solute of interest is assumed to be zero at x,y and time t=0.

The concentration at x,y and time, t cannot exceed the initial source concentration, Co.

The model assumes no sorption, retardation, or degradation of the solute.

Per Fetter, 1993, and others, diffusion is the controling factor in solute transport at low velocities, rather than mechanical dispersion.

Based on the Peclet Number, vx*d/Dd, calculated as 0.295 assuming an avg. soil grain size, d50, of 0.00035 m.

The Peclet Number places the flow system nearly in the mid-range of the combination diffusion-dispersion regime (see Fetter, Fig. 2.7).

David Garrett, P.G., P.E.

Engineering and Geology

The following is a brief description of a two-dimensional analytical solution to the advection-dispersion contaminant transport model used for this project. The analysis is a hand calculation based on published literature (see references) and site conditions determined in the permitting investigation. Our goal is to determine the correct horizontal spacing of ground water wells in the down gradient direction (that is, verify that the assumed well spacing is correct). The analysis is divided into the following sections:

1. Contaminant Transport Principles – a summary of the important aspects of advection-dispersion processes and analytical techniques.

2. Useful tables such as error functions, Bessel functions, and well functions, required for the calculation (from the published literature).

3. The site model and three hand calculations using different referenced work for a two-dimensional, analytical solution to the advection-dispersion equation for a continuous source of contaminants.

4. Spreadsheet model of Wilson and Miller's equation, including a sensitivity analysis to test the spacing of the wells relative to varied aquifer and contaminant parameters.

For this model it was assumed that chloride is the contaminant of concern (the diffusion coefficient is well known), and it is assumed that the entire landfill footprint is the source of a steady state mass flux of the contaminant of concern (uniform concentration). The uppermost aquifer is modeled as a uniform-flow, isotropic, homogeneous porous media.

Section 3 includes equations presented by Bear (1972), Fried (1975), and Wilson and Miller (1978). Each of the equations works basically the same way: for a given ground water velocity (a function of hydraulic conductivity, aquifer porosity and potentiometric gradient), a well spaced at a given distance in X and Y coordinates from the source will exhibit a finite concentration of the contaminant of concern after a given time frame. For this model, the time frame is one year and the X and Y coordinates correspond to 150 feet down gradient and 300 feet spacing between the wells.

The equations presented by Fried and by Wilson and Miller produced similar results. The equation by Bear may have been outside the practical range of the data, or an undetected mathematical error may have occurred. Based on the workable models, a well spacing of 300 feet appears appropriate. This site has a relatively low ground water velocity, which results in a higher contribution of molecular diffusion to the contaminant transport model than would be experienced at sites with higher velocity (hence higher mechanical dispersion). The equation was found to be suitably sensitive to initial contaminant concentration, mass flux, aquifer porosity and thickness, down gradient well spacing, and the ratio of longitudinal to transverse dispersivity.

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Selected References

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2. Fetter, C.W., Contaminant Hydrogeology, Macmillian Publishing Company, New York, 1993.

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5. Freeze, R.A., and Cherry, J.A., Groundwater, Prentice-Hall, Inc., Englewood Cliffs, NJ, 1979.

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CONTAMINANT TRANSPORT PRINCIPLES

REF. FETTER, C.W., CONTAMINANT HYDROGEOLOGY, MACMILLAN PUBLISHING COMPANY, NEW YORK, 1993.

1.) THREE MECHANISMS EXIST FOR CONTAMINANT (SOLUTE) TRANSPORT IN G.W.: ADVECTION, DISPERSION, DIFFUSION

A. ADVECTION IS MOVEMENT OF DISSOLVED SOLIDS WITH THE FLOW OF GROUND WATER

1. IN ONE DIMENSIONAL FLOW, THE AVERAGE LINEAR VELOCITY, V_x, IS EXPRESSED BY THE EQUATION

$$v_x = \frac{K}{n_e}\frac{dh}{dl} = \frac{Ki}{n_e}$$

WHERE K = HYDRAULIC CONDUCTIVITY (L/T)
FIELD OR LAB TESTS

n_e = EFFECTIVE POROSITY, DIMENSIONLESS
TYPICALLY USE EMPIRICAL VALUES

$i = \frac{dh}{dl}$ = HYDRAULIC GRADIENT (L/L)
FROM POTENTIOMETRIC MAP

2. THE ONE DIMENSIONAL MASS FLUX, F, IS GIVEN BY

$$F = V_x n_e C$$

WHERE C = SOLUTE CONCENTRATION (M/L^3)

3. THE ONE DIMENSIONAL ADVECTIVE TRANSPORT EQUATION IS

$$\frac{\partial C}{\partial t} = -v_x \frac{\partial C}{\partial x}$$

WHERE $\frac{\partial C}{\partial t}$ = CHANGE IN CONCENTRATION $(M/L^3/T)$
AT A GIVEN POINT IN TIME, SPACE

$-\frac{\partial C}{\partial x}$: CONCENTRATION GRADIENT $(M/L^3/L)$
NEG. MEANS GRADIENT FROM GREATER TO LESSER

NOTE; THESE EQUATIONS CAN BE MODIFIED FOR 2-D, 3-D FLOW

B. DISPERSION

1. THIS IS MECHANICAL MIXING OF THE SOLUTE WITH CONTACT GROUND WATER WHICH OCCURS DUE TO VARIATION IN VELOCITY ALONG THE DIRECTION OF TRAVEL, IE, TORTUOSITY AROUND SOIL PARTICLES

2. TWO FORMS OF DISPERSION INCLUDE LONGITUDINAL (IE, DIRECTION OF FLOW) AND TRANSVERSE (IE, NORMAL TO FLOW PATH)

3. THE COEFFICIENTS FOR LONGITUDINAL AND TRANSVERSE DISPERSION ARE $v_L \alpha_L$ AND $v_T \alpha_T$ (L^2/T)

WHERE α = DISPERSIVITY FACTOR (L)

C. DIFFUSION

1. THIS IS A MOLECULAR TRANSPORT PROCESS BY WHICH INDIVIDUAL SOLUTE PARTICLES WILL DISTRIBUTE THROUGH A SOLUTION TO PRODUCE A CONCENTRATION GRADIENT EVEN IF SOLVENT (WATER) IS NOT MOVING

2. CONSIDER A VOLATILE VAPOR (EG, PERFUME, GASOLINE) DISTRIBUTING FROM A POINT SOURCE THROUGH STILL AIR AS AN ANOLOGY TO SOLUTE DIFFUSION IN GROUND WATER

3. FICK'S FIRST LAW OF DIFFUSIVITY IS

$$F = -D_d \left(\frac{dC}{dx}\right)$$

WHERE F = MASS FLUX PER AREA PER TIME

D_d = DIFFUSION COEFFICENT (L^2/T) *

$-\frac{dC}{dx}$ = CONCENTRATION GRADIENT $(M/L^3/T)$
NEGATIVE MEANS GRADIENT FROM GREATER TO LESSER CONCENTRATION

PROBABLY ORGANICS → *NOTE: FETTER GIVES A TYPICAL RANGE OF VALUES AS 1×10^{-9} m²/sec TO 2×10^{-9} m²/sec AT 25°C
(DEPENDENT ON PARTICLE SIZE PER CRC HANDBOOK - SILTS)

4. FICK'S SECOND LAW FOR CHANGING CONCENTRATION W/TIME

$$\frac{\partial C}{\partial t} = D_d \frac{\partial C}{\partial x^2}$$

CONTINUED

5. IONIC SOLUTE TRANSPORT IN POROUS MEDIA RATES ARE LESS THAN WATER BECAUSE OF TORTUOSITY (VARIABLE TRAVEL PATH LENGTHS AROUND SOIL GRAINS)

6. AN EFFECTIVE DIFFUSION COEFFICIENT, D^* FOLLOWS

$$D^* = \omega D_d$$

WHERE ω = TORTUOSITY FACTOR

7. FETTER PROVIDES EXPERIMENTAL VALUES OF ω

ω = 0.7 UNIFORM SAND (PERKINS & JOHNSON, 1963)

= 0.5 TO 0.01 VARIOUS GEOLOGIC MATERIALS (FREEZE & CHERRY, 1979)

8. STATISTICALLY SPEAKING, A SOLUTE CONCENTRATION INFLUENCED ONLY BY DIFFUSION FOLLOWS A NORMAL DISTRIBUTION (BELL-SHAPED CURVE), THAT IS AT A GIVEN POINT OF MAXIMUM CONCENTRATION, THE DISTRIBUTION OF CONCENTRATION DECREASES ON EITHER SIDE BY SOME FUNCTION, RESULTING IS SOME MEAN CONCENTRATION THAT COULD BE MEASURED AT A POINT IN TIME AND SPACE

9. THE STATISTICAL EXPRESSIONS FORM THE BASIS OF NUMERICAL MODELS, BEYOND THE SCOPE OF THIS SUMMARY, BUT FOR ANALYTICAL MODELS PURSUED HERE, THE EFFECTIVE DIFFUSION COEFF. HAS RELEVANCE

10. A SOLUTION TO FICK'S SECOND LAW (CRANK, 1956) PROVIDES A VALUE OF SOLUTE CONCENTRATION AT A GIVEN POINT IN TIME AND SPACE AS FOLLOWS

$$C_i(x,t) = C_0 \operatorname{erfc} \frac{x}{2(D^* t)^{0.5}}$$

WHERE C_i = CONCENTRATION AT DISTANCE, x, AND AT TIME, t, FROM SOURCE

C_0 = CONSTANT SOURCE CONCENTRATION

erfc = COMPLEMENTARY ERROR FUNCTION RELATED TO THE NORMAL OR GAUSSIAN DISTRIBUTION

NOTE: $\operatorname{erfc}(B) = 0$ FOR ALL $B > 3.0$
$\operatorname{erfc}(B) = 1$ FOR $B = 0$; $\operatorname{erfc}(-B) = 1 - \operatorname{erf}(B)$

2.) MOLECULAR DIFFUSION AND MECHANICAL DISPERSION WORK IN COMBINATION, RESULTING IN A COMBINED PARAMETER, IE, HYDRODYNAMIC DISPERSION COEFFICIENT

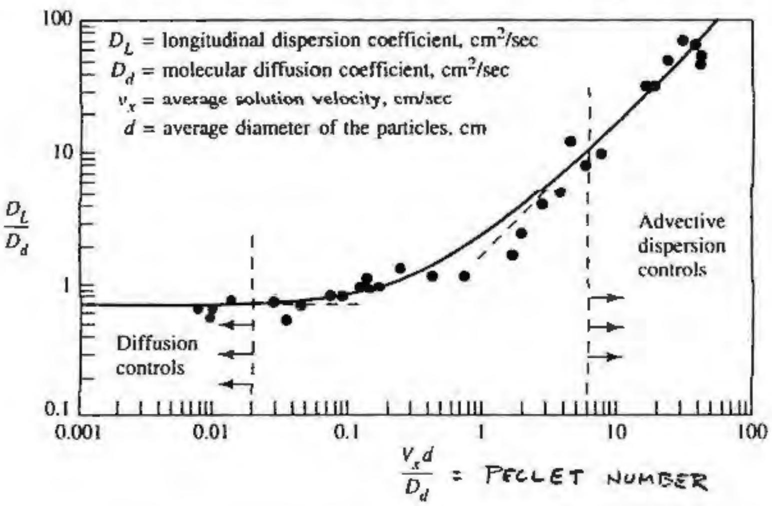
LONGITUDINAL $D_L = \alpha_L v_i + D^*$

TRANSVERSE $D_T = \alpha_T v_i + D^*$

WHERE v_i IS THE DIRECTION VELOCITY VECTOR.

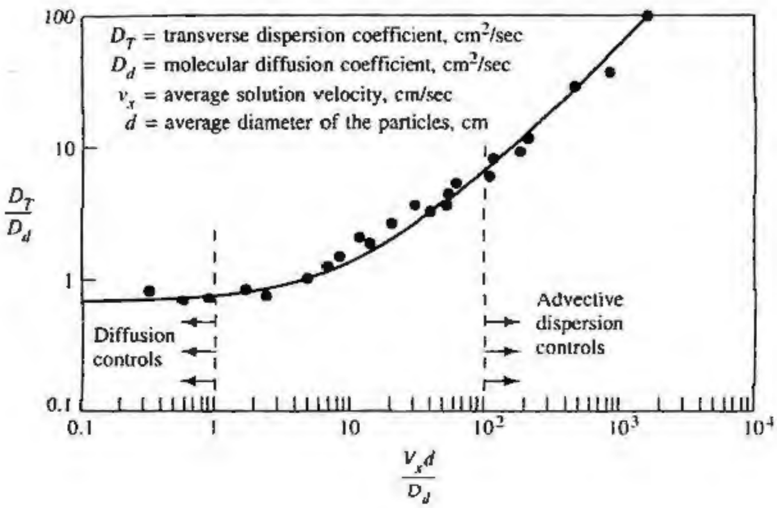
3.) AT LOW VELOCITIES, DIFFUSION PREVAILS; AT HIGH GROUND WATER VELOCITY DISPERSION CONTROLS SOLUTE CONCENTRATION AT A GIVEN POINT IN SPACE AND TIME. A RELATIONSHIP BETWEEN DIMENSIONLESS PARAMETERS OF EITHER LONGITUDINAL OR TRANSVERSE HYDRODYNAMIC DISPERSION COEFFICIENTS DIVIDED BY THE DIFFUSION COEFFICIENT, D_L/D_d OR D_T/D_d, AND

4.) A DIMENSIONLESS EXPRESSION OF VELOCITY-DISTANCE DIVIDED BY THE DIFFUSION COEFFICIENT (PECLET #) FOLLOWS:



(a)

SOURCE: FETTER FIG. 2.7, AFTER PERKINS & JOHNSON, SOC. PETR. ENGRS, 1963.



5.) ADVECTION - DISPERSION EQUATION *

TWO-D FORM $D_L \frac{\partial^2 C}{\partial x^2} + D_T \frac{\partial^2 C}{\partial y^2} - v_x \frac{\partial C}{\partial x} = \frac{\partial C}{\partial t}$

ASSUMPTIONS : SATURATED, ISOTROPIC, HOMOGENEOUS POROUS MEDIA, NON-REACTIVE SOLUTE W/O BIOLOGICAL, RADIOACTIVE DECAY, DARCY'S LAW APPLIES

A. BOUNDARY CONDITIONS

1. FIXED CONCENTRATION : $C(x,t) = C(t)$
   WHERE C, x, and t CAN BE DEFINED (SLUG INJECTION)
2. FIXED GRADIENT : $\left.\frac{dC}{dx}\right|_{x=0} = f(t)$
   WHERE f IS A KNOWN FUNCTION (CONTINUOUS INJECTION)
3. VARIABLE FLUX : $\left.\left(-D\frac{dC}{dx} + vC\right)\right|_{x=0} = vC_0$
   WHERE FLUX PER UNIT AREA AND INPUT CONCENTRATION ARE CONSTANT, BUT CONCENTRATION GRADIENT IS FINITE

B. LEAKING LANDFILL / LAGOON SCENARIOS ARE ANALYZED FOR SEVERAL BOUNDARY CONDITIONS AS CONTINUOUS INJECTION INTO UNIFORM, 2-D FLOW (BEAR, 1972)

$$C(x,y) = \frac{C_0 Q}{2\pi(D_L D_T)^{1/2}} \exp\left(\frac{v_x X}{2 D_L D_T}\right) K_0\left[\left(\frac{v_x^2}{4D_L}\left(\frac{x^2}{D_L} + \frac{y^2}{D_T}\right)\right)^{1/2}\right]$$

WHERE K_0 = MODIFIED BESSEL FUNCTION, 2ND KIND, ZERO ORDER

Q = RATE OF SOLUTE INJECTION

$t = \infty$ PLUME STABILIZED

C. THE GROWTH OF THE PLUME OVER TIME BY THE FOLLOWING (FRIED, 1975, AFTER Y. EMSELLEM)

$$C(x,y,t) = \frac{C_0 Q}{4\pi(D_L D_T)^{1/2}} \exp\left(\frac{v_x X}{2D_L}\right)\left[W(0,B) - W(t,B)\right]$$

WHERE $B = \left[\frac{(v_x x)^2}{4 D_L^2} + \frac{(v_y y)^2}{4 D_L D_T}\right]^{1/2}$

t : time

$W(t,B)$ = LEAKY WELL FUNCTION (HANTUSH, 1956)

* REF. FREEZE & CHERRY (1979), BEAR (1972), OGATA (1970) GIVEN IN FETTER

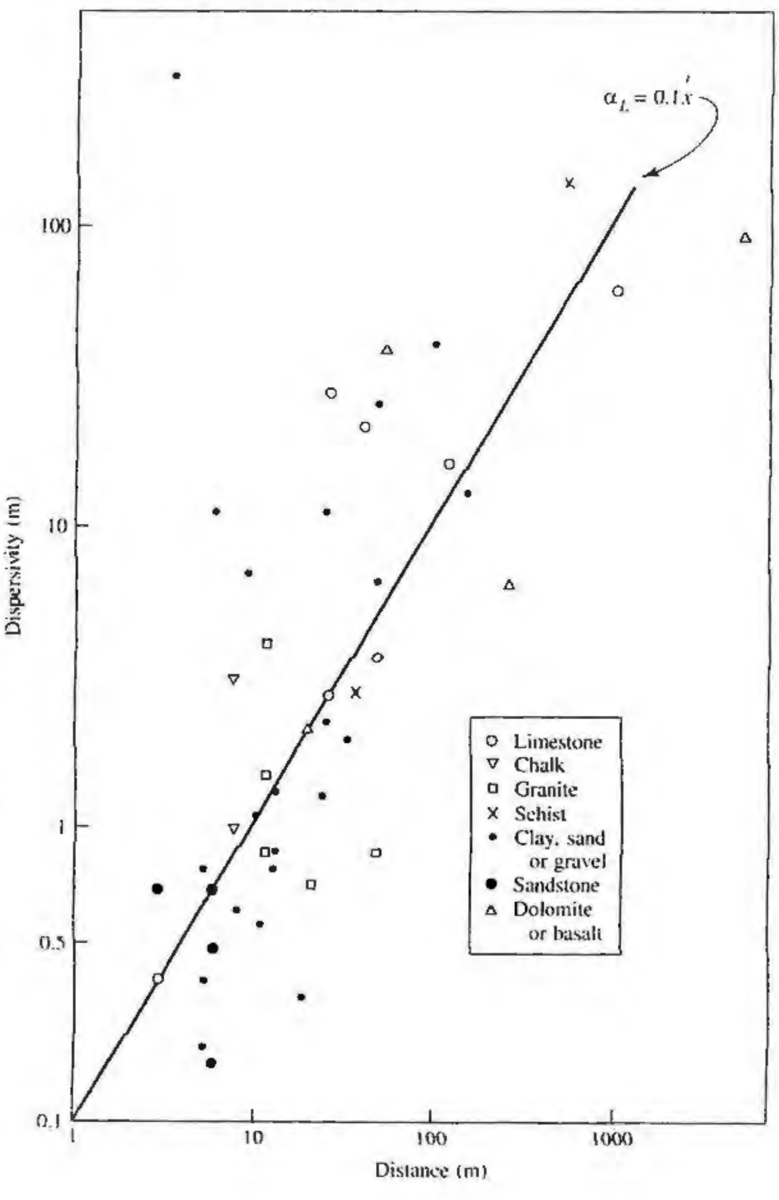
D. FOR A "SLUG" INJECTION INTO A UNIFORM, 2-D FLOW (EG., CHEMICAL SPILL OR SHORT-DURATION LANDFILL DISCHARGE) THE SOLUTION TO THE ADVECTION-DISPERSION EQUATION TAKES THE FORM (DE JOSSELIN DE JONG, 1956)

$$C(x,y,t) = \frac{C_0 A}{4\pi t (D_L D_T)^{1/2}} \exp\left[-\frac{(x-(x_0 - v_x t))^2}{4 D_L t} - \frac{(y-y_0)^2}{4 D_T t} \right]$$

NOTE: EITHER THE CONTINUOUS INJECTION OR SLUG INJECTION SOLUTION COULD HAVE APPLICABILITY TO LANDFILLS

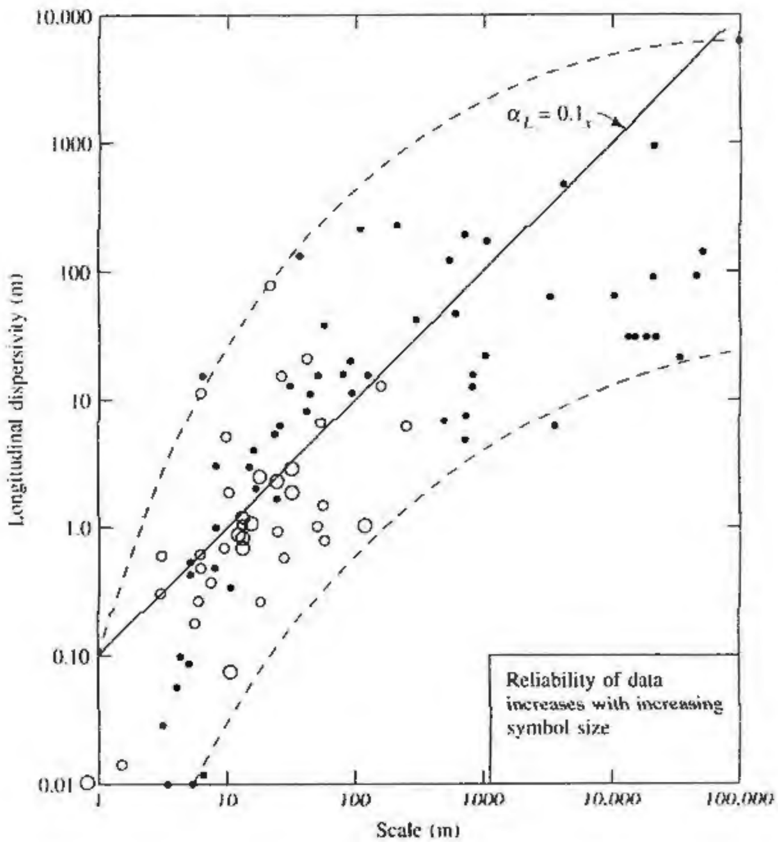
6.) DISPERSION EFFECTS

A. HISTORICAL FIELD DATA SUGGEST A "LINEAR" RELATIONSHIP BETWEEN LONGITUDINAL DISPERSIVITY, α_L, AND DISTANCE AS FOLLOWS:



SOURCE: FETTER FIG 2.17, AFTER LALLEMANDE-BARRÉS & PEAUDECERF, 1978

B. THE RELATIONSHIP BETWEEN DISPERSIVITY AND DISTANCE IS A COMPLEX RELATIONSHIP AND VARIES W/ SCALE DUE TO VARIATIONS IN HYDRAULIC CONDUCTIVITY. VARIOUS WORKERS SUGGEST THAT DISPERSIVITY APPROACHES AN ASSYMPTOTIC LIMIT AT LARGE TRAVEL DISTANCES AND TIME, BUT PLUMES CONTINUE TO SPREAD BY ADVECTION.



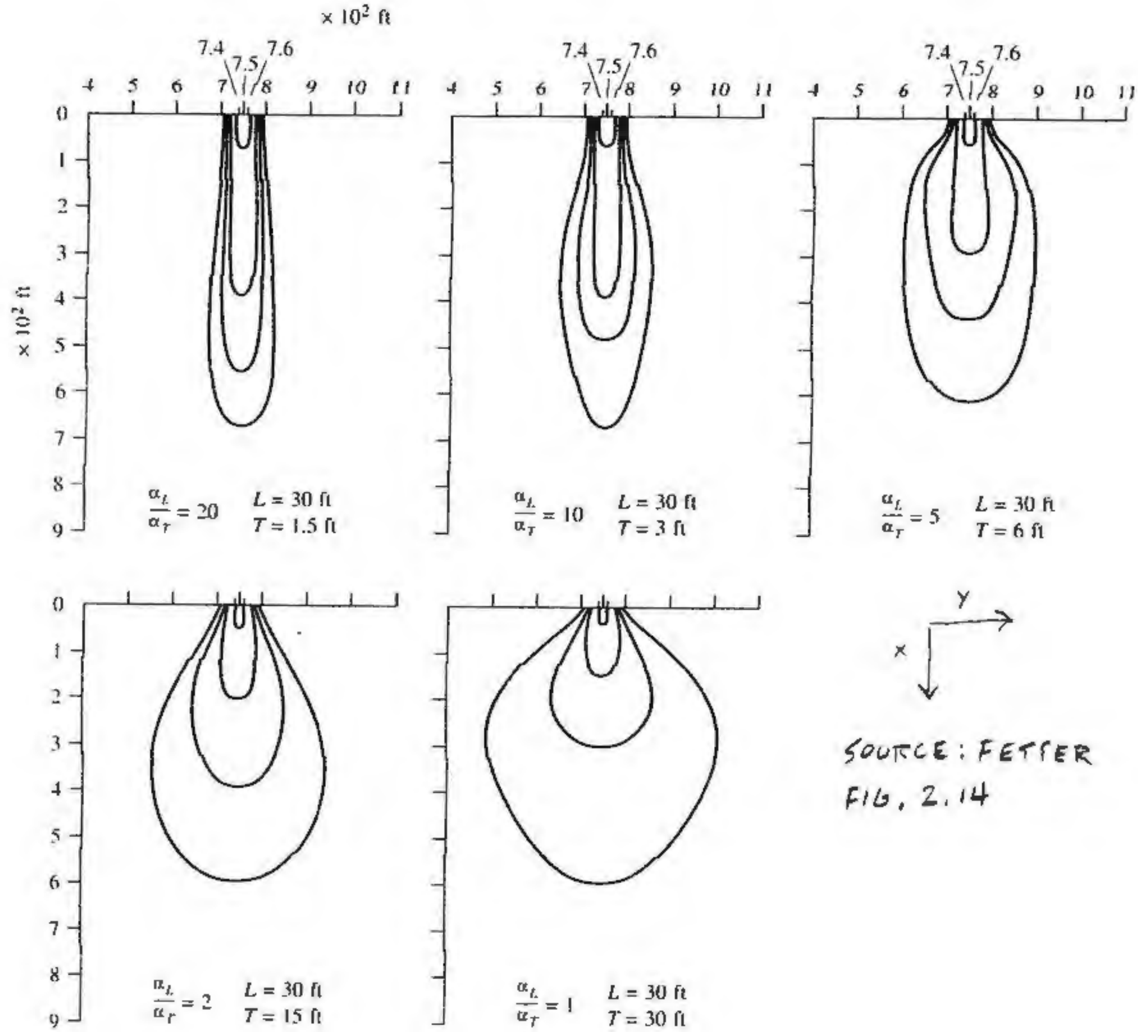
SOURCE: FETTER, FIGURE 2.10, AFTER GELHAR, 1986

C. FOR TRANSVERSE DISPERSION, INTRINSIC UNCERTANTIES EXIST BECAUSE AQUIFER AND SOLUTE CHARACTERISTICS COME INTO PLAY.

1. FETTER IMPLIES THAT MUCH WORK REMAINS TO BE DONE TO COMPILE (OR GENERATE) EMPIRICAL DATA FROM THE FIELD

2. THE LITERATURE SUGGESTS A RANGE OF α_L/α_T RATIOS OF 6-20 (ANDERSON, 1979, KLOTZ, & AL., 1980)

3. THE SENSITIVITY OF THE SPREADING OF A PLUME TO THE α_L/α_T RATIO IN A 2-D FLOW IS ILLUSTRATED AS FOLLOWS



SOURCE: FETTER
FIG. 2.14

D. REFERING BACK TO FIG. 2.7, FETTER HAS POINTED OUT THAT AT LOW VELOCITIES DIFFUSION HAS MORE CONTROL OVER TRANSVERSE DISPERSION (HENCE SPREADING OF THE PLUME) THAN IT DOES FOR LONGITUDINAL DISPERSION.

E. HIGHER PECLET NUMBERS (HIGHER VELOCITIES, LONGER FLOW PATHS) RESULT IN MORE MECHANICAL DISPERSION AND DIFFUSION EFFECTS CAN BE IGNORED (PERKINS & JOHNSON, 1963, BEAR, 1972, BEAR & VERRUIJT, 1987).

F. IT FOLLOWS THEN AT LOW PECLET NUMBERS, MECHANICAL DISPERSION CAN BE DISCOUNTED AND MOLECULAR DIFFUSIVITY WILL CONTROL PLUME SPREAD.

PARTICLE DIFUSSION COEFFICENTS

REF. CRC HANDBOOK, 54^{TH} EDITION, CRC PRESS, CLEVELAND, OHIO, 1973

VALUES GIVEN IN WATER AT 25°C (77°F)
(AVG. TEMPERATURE OF G.W. ≈ 55°F)

SIZE	PARTICLE DESCRIPTION	RANGE OF DIFFUSIVITY COEFFICENTS, cm^2/s
1-10 μ	SILTS	5×10^{-9} TO 5×10^{-8}
0.1-1 μ	CLAYS	5×10^{-8} TO 5×10^{-7}
0.01-0.1 μ	SMOKE & COMBUSTION PRODUCTS, COLLOIDAL SILICA, METALLURGICAL DUSTS & FUMES	5×10^{-7} TO 5×10^{-6}
0.0001-0.01 μ (↑ 1Å)	VARIOUS GASES	5×10^{-4} TO 5×10^{-6}

TABLE F-249

ION SPECIES	RADIUS	
Ag^{+2}	1.26 Å * 0.0001 = 1.26×10^{-4} μ	
As^{+3}	0.58	
Ba^{+1}	1.53	
Be^{+2}	0.35 * 0.0001 = 3.50×10^{-5} μ	
Cd^{+2}	0.97	
Cl^{-1}	1.81 * = 1.8×10^{-4} μ	
Cu^{+2}	0.72	
Hg^{+2}	1.10	
NH_4^{+1}	1.43	
Ni^{+2}	0.69	
Pb^{+2}	1.20	
Th^{+4}	1.02	
Zn^{+1}	0.88	

$D_d \approx 10^{-4}-10^{-5}\ cm^2/s$ may be more appropriate for these inorganic constituents

$10^{-6}-10^{-7}\ m^2/s$

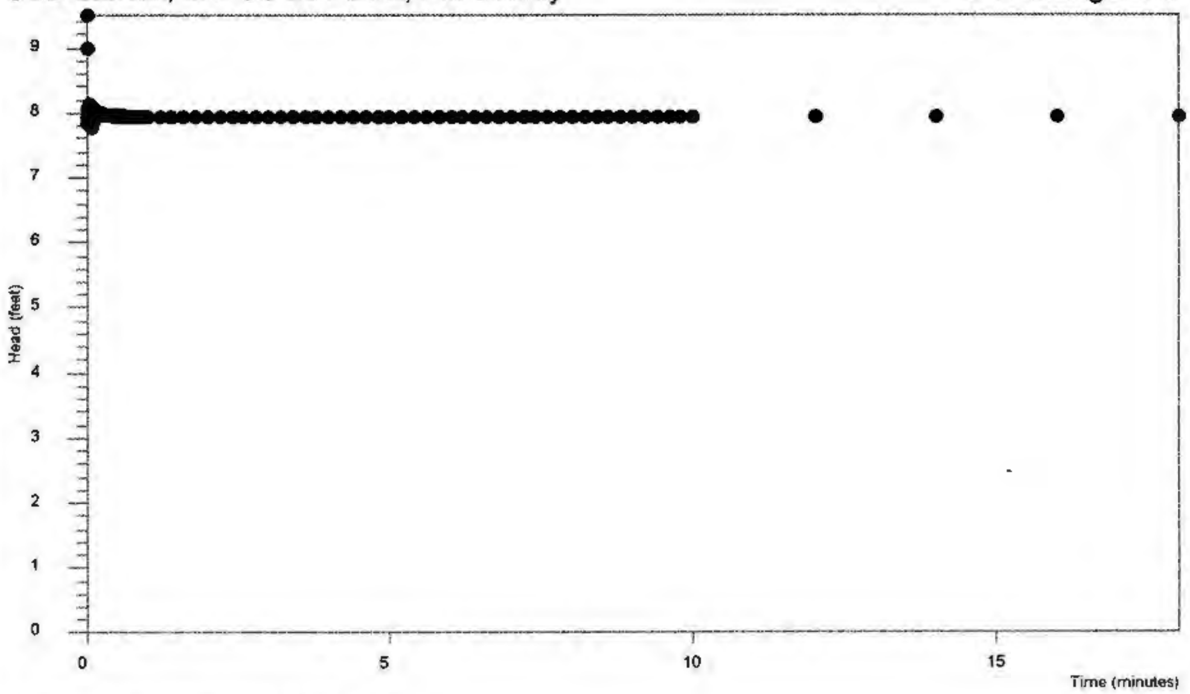
APPENDIX B
Hydrologic Testing

91	0.3	0.2434	-0.119	10.08	0.8344
92	0.3033	0.2467	-0.119	10.08	0.8344
93	0.3066	0.25	-0.119	10.08	0.8344
94	0.31	0.2534	-0.112	10.07	0.8338
95	0.3133	0.2567	-0.112	10.07	0.8338
96	0.3166	0.26	-0.112	10.07	0.8338
97	0.32	0.2634	-0.112	10.07	0.8338
98	0.3233	0.2667	-0.106	10.07	0.8333
99	0.3266	0.27	-0.106	10.07	0.8333
100	0.33	0.2734	-0.106	10.07	0.8333
101	0.3333	0.2767	-0.106	10.07	0.8333
102	0.35	0.2934	-0.1	10.06	0.8329
103	0.3666	0.31	-9.4e-002	10.05	0.8324
104	0.3833	0.3267	-8.7e-002	10.05	0.8318
105	0.4	0.3434	-8.7e-002	10.05	0.8318
106	0.4166	0.36	-8.1e-002	10.04	0.8313
107	0.4333	0.3767	-8.1e-002	10.04	0.8313
108	0.45	0.3934	-7.5e-002	10.04	0.8308
109	0.4666	0.41	-7.5e-002	10.04	0.8308
110	0.4833	0.4267	-7.5e-002	10.04	0.8308
111	0.5	0.4434	-6.8e-002	10.03	0.8302
112	0.5166	0.46	-6.8e-002	10.03	0.8302
113	0.5333	0.4767	-6.8e-002	10.03	0.8302
114	0.55	0.4934	2.5e-002	9.935	0.8225
115	0.5666	0.51	-0.194	10.15	0.8406
116	0.5833	0.5267	-7.5e-002	10.04	0.8308
117	0.6	0.5434	-6.8e-002	10.03	0.8302
118	0.6166	0.56	-6.2e-002	10.02	0.8297
119	0.6333	0.5767	-6.2e-002	10.02	0.8297
120	0.65	0.5934	-5.6e-002	10.02	0.8292
121	0.6666	0.61	-5.6e-002	10.02	0.8292
122	0.6833	0.6267	-5.6e-002	10.02	0.8292
123	0.7	0.6434	-5.6e-002	10.02	0.8292
124	0.7166	0.66	-5.6e-002	10.02	0.8292
125	0.7333	0.6767	-5.e-002	10.01	0.8287
126	0.75	0.6934	-5.e-002	10.01	0.8287
127	0.7666	0.71	-5.e-002	10.01	0.8287
128	0.7833	0.7267	-5.e-002	10.01	0.8287
129	0.8	0.7434	-5.e-002	10.01	0.8287
130	0.8166	0.76	-5.e-002	10.01	0.8287
131	0.8333	0.7767	-5.6e-002	10.02	0.8292
132	0.85	0.7934	-5.6e-002	10.02	0.8292
133	0.8666	0.81	-5.6e-002	10.02	0.8292
134	0.8833	0.8267	-5.e-002	10.01	0.8287
135	0.9	0.8434	-5.e-002	10.01	0.8287
136	0.9166	0.86	-5.e-002	10.01	0.8287
137	0.9333	0.8767	-4.3e-002	10.	0.8281
138	0.95	0.8934	-4.3e-002	10.	0.8281
139	0.9666	0.91	-4.3e-002	10.	0.8281
140	0.9833	0.9267	-4.3e-002	10.	0.8281
141	1.	0.9434	-4.3e-002	10.	0.8281
142	1.2	1.143	-3.1e-002	9.991	0.8271
143	1.4	1.343	-2.5e-002	9.985	0.8266
144	1.6	1.543	-2.5e-002	9.985	0.8266
145	1.8	1.743	-1.8e-002	9.978	0.8261
146	2.	1.943	-1.8e-002	9.978	0.8261
147	2.2	2.143	-1.8e-002	9.978	0.8261

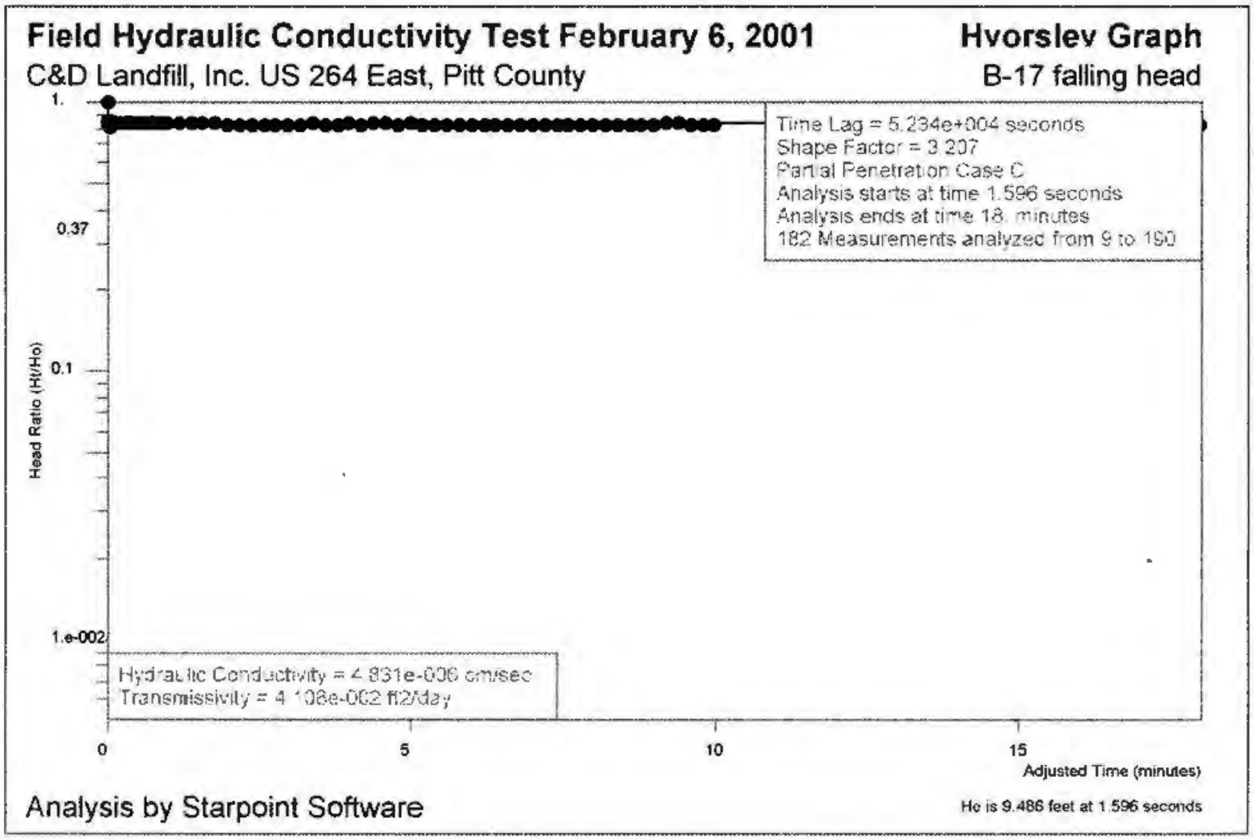
148	2.4	2.343	-1.2e-002	9.972	0.8256
149	2.6	2.543	-1.2e-002	9.972	0.8256
150	2.8	2.743	-1.2e-002	9.972	0.8256
151	3.	2.943	-1.2e-002	9.972	0.8256
152	3.2	3.143	-1.2e-002	9.972	0.8256
153	3.4	3.343	-1.2e-002	9.972	0.8256
154	3.6	3.543	-1.2e-002	9.972	0.8256
155	3.8	3.743	-1.2e-002	9.972	0.8256
156	4.	3.943	-1.2e-002	9.972	0.8256
157	4.2	4.143	-1.2e-002	9.972	0.8256
158	4.4	4.343	-1.2e-002	9.972	0.8256
159	4.6	4.543	-1.2e-002	9.972	0.8256
160	4.8	4.743	-1.2e-002	9.972	0.8256
161	5.	4.943	-1.2e-002	9.972	0.8256
162	5.2	5.143	-1.2e-002	9.972	0.8256
163	5.4	5.343	-1.2e-002	9.972	0.8256
164	5.6	5.543	-1.2e-002	9.972	0.8256
165	5.8	5.743	-1.2e-002	9.972	0.8256
166	6.	5.943	-1.2e-002	9.972	0.8256
167	6.2	6.143	-1.2e-002	9.972	0.8256
168	6.4	6.343	-1.2e-002	9.972	0.8256
169	6.6	6.543	-1.2e-002	9.972	0.8256
170	6.8	6.743	-1.2e-002	9.972	0.8256
171	7.	6.943	-1.2e-002	9.972	0.8256
172	7.2	7.143	-1.2e-002	9.972	0.8256
173	7.4	7.343	-1.2e-002	9.972	0.8256
174	7.6	7.543	-1.2e-002	9.972	0.8256
175	7.8	7.743	-1.2e-002	9.972	0.8256
176	8.	7.943	-1.2e-002	9.972	0.8256
177	8.2	8.143	-1.2e-002	9.972	0.8256
178	8.4	8.343	-1.2e-002	9.972	0.8256
179	8.6	8.543	-1.2e-002	9.972	0.8256
180	8.8	8.743	-1.2e-002	9.972	0.8256
181	9.	8.943	-1.2e-002	9.972	0.8256
182	9.2	9.143	-1.2e-002	9.972	0.8256
183	9.4	9.343	-1.2e-002	9.972	0.8256
184	9.6	9.543	-1.2e-002	9.972	0.8256
185	9.8	9.743	-1.2e-002	9.972	0.8256
186	10.	9.943	-1.2e-002	9.972	0.8256
187	11.	10.94	-1.2e-002	9.972	0.8256
188	12.	11.94	-1.2e-002	9.972	0.8256
189	13.	12.94	-6.e-003	9.966	0.8251

Field Hydraulic Conductivity Test February 6, 2001 **Arithmetic Graph**

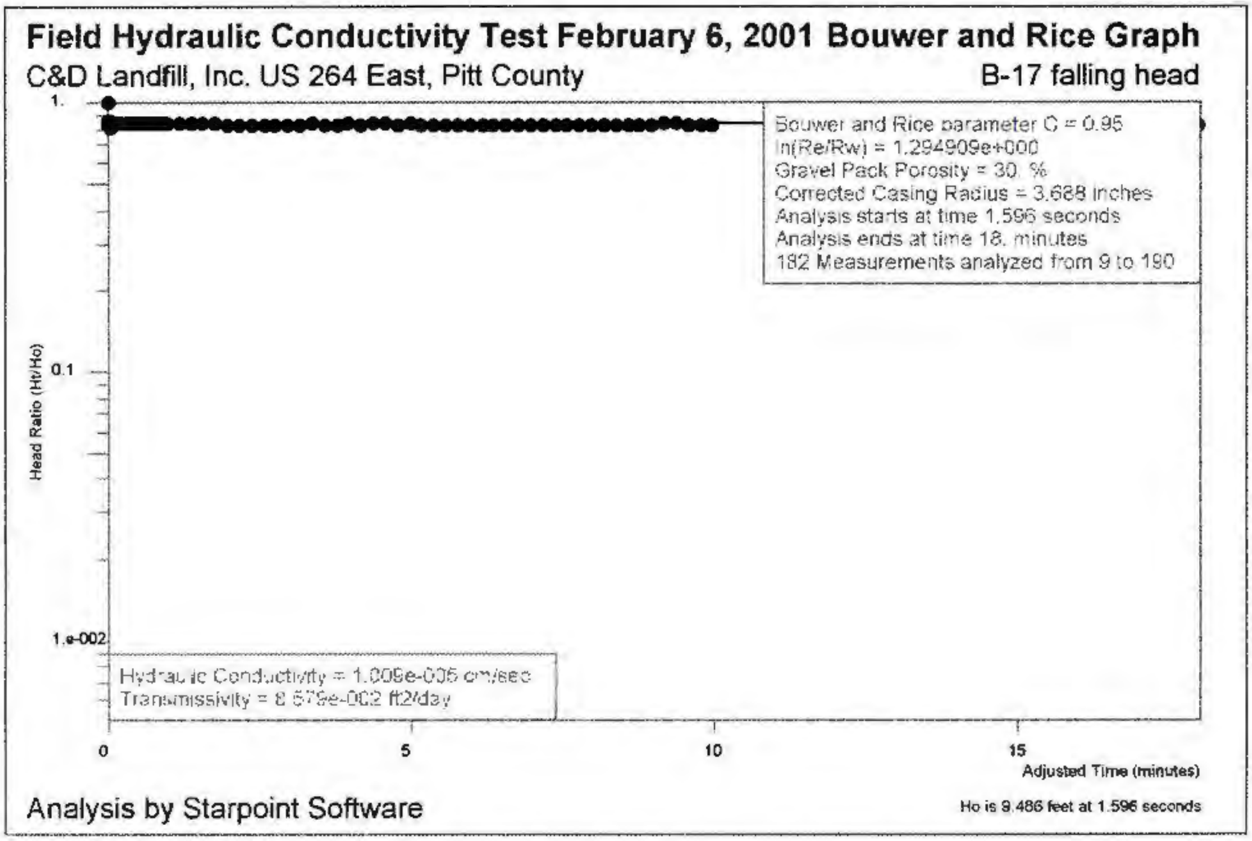
C&D Landfill, Inc. US 264 East, Pitt County B-17 falling head



Analysis by Starpoint Software



Field Hydraulic Conductivity Test February 6, 2001
Hvorslev Graph
C&D Landfill, Inc. US 264 East, Pitt County
B-17 falling head
Time Lag = 5.234e+004 seconds
Shape Factor = 3.207
Partial Penetration Case C
Analysis starts at time 1.596 seconds
Analysis ends at time 18. minutes
182 Measurements analyzed from 9 to 190
Head Ratio (Ht/Ho)
1.
0.37
0.1
1.e-002
Hydraulic Conductivity = 4.831e-006 cm/sec
Transmissivity = 4.108e-002 ft2/day
0
5
10
15
Adjusted Time (minutes)
Analysis by Starpoint Software
Ho is 9.486 feet at 1.596 seconds


Field Hydraulic Conductivity Test February 6, 2001 Bouwer and Rice Graph
C&D Landfill, Inc. US 264 East, Pitt County
B-17 falling head
Bouwer and Rice parameter C = 0.95
ln(Re/Rw) = 1.294909e+000
Gravel Pack Porosity = 30. %
Corrected Casing Radius = 3.688 inches
Analysis starts at time 1.596 seconds
Analysis ends at time 18. minutes
182 Measurements analyzed from 9 to 190
1.
0.1
1.e-002
Head Ratio (Ht/Ho)
Hydraulic Conductivity = 1.009e-005 cm/sec
Transmissivity = 8.579e-002 ft2/day
0
5
10
15
Adjusted Time (minutes)
Analysis by Starpoint Software
Ho is 9.486 feet at 1.596 seconds

Field Hydraulic Conductivity Test

Site Name:	C&D Landfill, Inc.
Location:	US 264 East, Pitt County
Test Date:	February 6, 2001
Import File:	A:\pitt\Pitt17s0

Well Label:	B-17 falling head
Aquifer Thickness:	3. feet
Screen Length:	5. feet
Casing Radius:	2. inches
Effective Radius:	6. inches
Gravel Pack Porosity:	30. %
Corrected Casing Radius:	3.688 inches
Static Water Level:	7.9 feet
Water Table to Screen Bottom:	3. feet
Anisotropy Ratio:	1.
Time Adjustment:	1.596 Seconds

Test starts with trial 8

There are 190 time and drawdown measurements

Maximum head is 9.486 feet

Minimum head is 0. feet

Trial	Time (minutes)	Adjusted Time (minutes)	Drawdown (feet)	Head (feet)	Head Ratio
1	0.	-2.66e-002	-9.e-003	7.909	0.8338
2	3.3e-003	-2.33e-002	-1.4e-002	7.914	0.8343
3	6.6e-003	-2.e-002	-1.4e-002	7.914	0.8343
4	1.e-002	-1.66e-002	-1.4e-002	7.914	0.8343
5	1.33e-002	-1.33e-002	-1.4e-002	7.914	0.8343
6	1.66e-002	-1.e-002	-1.4e-002	7.914	0.8343
7	2.e-002	-6.6e-003	-2.3e-002	7.923	0.8352
8	2.33e-002	-3.3e-003	-1.087	8.987	0.9474
9	2.66e-002	0.	-1.586	9.486	1.
10	3.e-002	3.4e-003	6.1e-002	7.839	0.8264
11	3.33e-002	6.7e-003	-0.15	8.05	0.8486
12	3.66e-002	1.e-002	-0.207	8.107	0.8546
13	4.e-002	1.34e-002	-0.216	8.116	0.8556
14	4.33e-002	1.67e-002	-0.216	8.116	0.8556
15	4.66e-002	2.e-002	-0.211	8.111	0.855
16	5.e-002	2.34e-002	-0.202	8.102	0.8541
17	5.33e-002	2.67e-002	-0.202	8.102	0.8541
18	5.66e-002	3.e-002	-0.193	8.093	0.8532
19	6.e-002	3.34e-002	-0.193	8.093	0.8532
20	6.33e-002	3.67e-002	-0.188	8.088	0.8526
21	6.66e-002	4.e-002	-0.136	8.036	0.8471
22	7.e-002	4.34e-002	0.127	7.773	0.8194
23	7.33e-002	4.67e-002	-0.122	8.022	0.8457
24	7.66e-002	5.e-002	-3.7e-002	7.937	0.8367
25	8.e-002	5.34e-002	-9.8e-002	7.998	0.8431
26	8.33e-002	5.67e-002	-0.131	8.031	0.8466
27	8.66e-002	6.e-002	-0.136	8.036	0.8471
28	9.e-002	6.34e-002	-0.131	8.031	0.8466
29	9.33e-002	6.67e-002	-0.103	8.003	0.8437
30	9.66e-002	7.e-002	2.3e-002	7.877	0.8304
31	0.1	7.34e-002	-0.16	8.06	0.8497
32	0.1033	7.67e-002	3.7e-002	7.863	0.8289
33	0.1066	8.e-002	-4.2e-002	7.942	0.8372

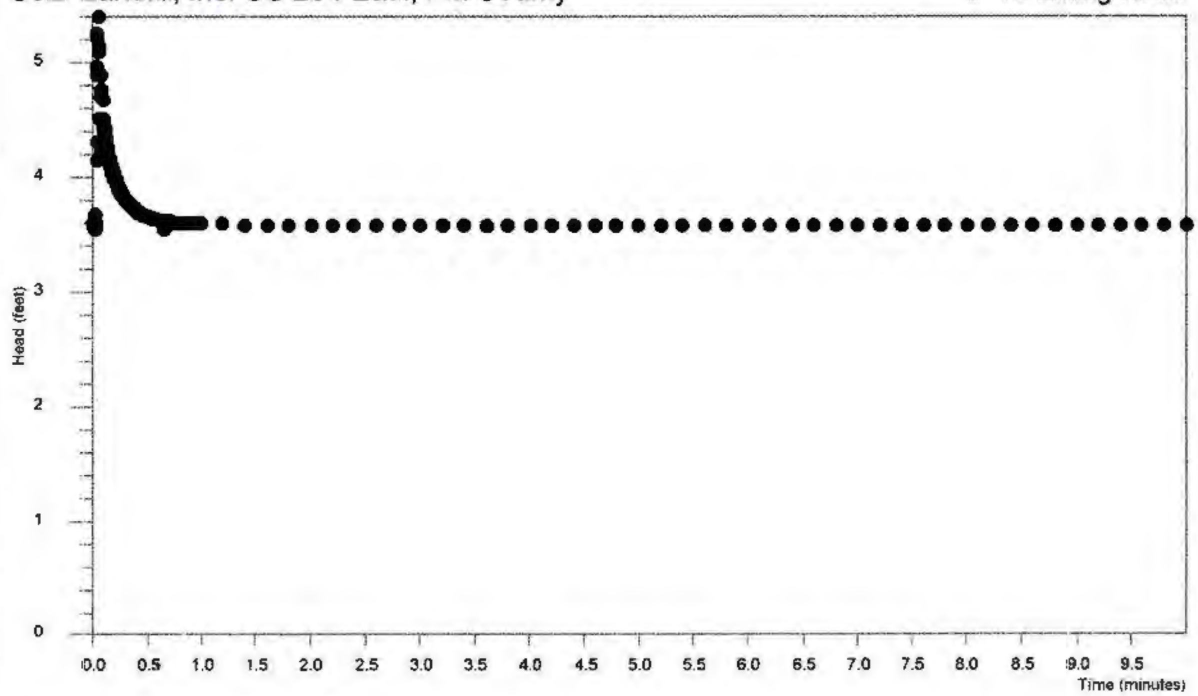
34	0.11	8.34e-002	-0.164	8.064	0.8501
35	0.1133	8.67e-002	-6.1e-002	7.961	0.8392
36	0.1166	9.e-002	-0.108	8.008	0.8442
37	0.12	9.34e-002	-0.103	8.003	0.8437
38	0.1233	9.67e-002	-0.108	8.008	0.8442
39	0.1266	1.e-001	-0.108	8.008	0.8442
40	0.13	0.1034	-0.108	8.008	0.8442
41	0.1333	0.1067	-0.108	8.008	0.8442
42	0.1366	0.11	-0.103	8.003	0.8437
43	0.14	0.1134	-9.8e-002	7.998	0.8431
44	0.1433	0.1167	-0.103	8.003	0.8437
45	0.1466	0.12	-9.8e-002	7.998	0.8431
46	0.15	0.1234	-9.8e-002	7.998	0.8431
47	0.1533	0.1267	-0.103	8.003	0.8437
48	0.1566	0.13	-9.8e-002	7.998	0.8431
49	0.16	0.1334	-9.8e-002	7.998	0.8431
50	0.1633	0.1367	-9.8e-002	7.998	0.8431
51	0.1666	0.14	-0.112	8.012	0.8446
52	0.17	0.1434	-9.4e-002	7.994	0.8427
53	0.1733	0.1467	-9.4e-002	7.994	0.8427
54	0.1766	0.15	-9.4e-002	7.994	0.8427
55	0.18	0.1534	-9.4e-002	7.994	0.8427
56	0.1833	0.1567	-8.9e-002	7.989	0.8422
57	0.1866	0.16	-8.9e-002	7.989	0.8422
58	0.19	0.1634	-8.9e-002	7.989	0.8422
59	0.1933	0.1667	-8.9e-002	7.989	0.8422
60	0.1966	0.17	-8.4e-002	7.984	0.8417
61	0.2	0.1734	-8.4e-002	7.984	0.8417
62	0.2033	0.1767	-8.4e-002	7.984	0.8417
63	0.2066	0.18	-8.4e-002	7.984	0.8417
64	0.21	0.1834	-8.4e-002	7.984	0.8417
65	0.2133	0.1867	-8.4e-002	7.984	0.8417
66	0.2166	0.19	-8.4e-002	7.984	0.8417
67	0.22	0.1934	-8.e-002	7.98	0.8412
68	0.2233	0.1967	-8.e-002	7.98	0.8412
69	0.2266	0.2	-8.e-002	7.98	0.8412
70	0.23	0.2034	-8.e-002	7.98	0.8412
71	0.2333	0.2067	-8.e-002	7.98	0.8412
72	0.2366	0.21	-8.4e-002	7.984	0.8417
73	0.24	0.2134	-8.e-002	7.98	0.8412
74	0.2433	0.2167	-8.e-002	7.98	0.8412
75	0.2466	0.22	-8.e-002	7.98	0.8412
76	0.25	0.2234	-8.e-002	7.98	0.8412
77	0.2533	0.2267	-7.5e-002	7.975	0.8407
78	0.2566	0.23	-7.5e-002	7.975	0.8407
79	0.26	0.2334	-8.e-002	7.98	0.8412
80	0.2633	0.2367	-8.e-002	7.98	0.8412
81	0.2666	0.24	-7.e-002	7.97	0.8402
82	0.27	0.2434	-7.e-002	7.97	0.8402
83	0.2733	0.2467	-7.5e-002	7.975	0.8407
84	0.2766	0.25	-7.e-002	7.97	0.8402
85	0.28	0.2534	-7.e-002	7.97	0.8402
86	0.2833	0.2567	-7.e-002	7.97	0.8402
87	0.2866	0.26	-7.e-002	7.97	0.8402
88	0.29	0.2634	-7.e-002	7.97	0.8402
89	0.2933	0.2667	-7.e-002	7.97	0.8402
90	0.2966	0.27	-7.e-002	7.97	0.8402

91	0.3	0.2734	-7.e-002	7.97	0.8402
92	0.3033	0.2767	-6.5e-002	7.965	0.8397
93	0.3066	0.28	-6.1e-002	7.961	0.8392
94	0.31	0.2834	-7.5e-002	7.975	0.8407
95	0.3133	0.2867	-7.e-002	7.97	0.8402
96	0.3166	0.29	-6.5e-002	7.965	0.8397
97	0.32	0.2934	-6.5e-002	7.965	0.8397
98	0.3233	0.2967	-6.5e-002	7.965	0.8397
99	0.3266	0.3	-6.5e-002	7.965	0.8397
100	0.33	0.3034	-6.5e-002	7.965	0.8397
101	0.3333	0.3067	-6.5e-002	7.965	0.8397
102	0.35	0.3234	-7.e-002	7.97	0.8402
103	0.3666	0.34	-7.e-002	7.97	0.8402
104	0.3833	0.3567	-6.1e-002	7.961	0.8392
105	0.4	0.3734	-6.1e-002	7.961	0.8392
106	0.4166	0.39	-5.6e-002	7.956	0.8387
107	0.4333	0.4067	-5.6e-002	7.956	0.8387
108	0.45	0.4234	-5.6e-002	7.956	0.8387
109	0.4666	0.44	-4.2e-002	7.942	0.8372
110	0.4833	0.4567	-5.1e-002	7.951	0.8382
111	0.5	0.4734	-5.1e-002	7.951	0.8382
112	0.5166	0.49	-5.1e-002	7.951	0.8382
113	0.5333	0.5067	-5.1e-002	7.951	0.8382
114	0.55	0.5234	-4.7e-002	7.947	0.8378
115	0.5666	0.54	-4.7e-002	7.947	0.8378
116	0.5833	0.5567	-4.7e-002	7.947	0.8378
117	0.6	0.5734	-5.1e-002	7.951	0.8382
118	0.6166	0.59	-5.1e-002	7.951	0.8382
119	0.6333	0.6067	-4.7e-002	7.947	0.8378
120	0.65	0.6234	-4.7e-002	7.947	0.8378
121	0.6666	0.64	-4.7e-002	7.947	0.8378
122	0.6833	0.6567	-4.7e-002	7.947	0.8378
123	0.7	0.6734	-4.2e-002	7.942	0.8372
124	0.7166	0.69	-4.2e-002	7.942	0.8372
125	0.7333	0.7067	-4.2e-002	7.942	0.8372
126	0.75	0.7234	-4.2e-002	7.942	0.8372
127	0.7666	0.74	-4.2e-002	7.942	0.8372
128	0.7833	0.7567	-4.2e-002	7.942	0.8372
129	0.8	0.7734	-4.2e-002	7.942	0.8372
130	0.8166	0.79	-4.2e-002	7.942	0.8372
131	0.8333	0.8067	-4.2e-002	7.942	0.8372
132	0.85	0.8234	-4.2e-002	7.942	0.8372
133	0.8666	0.84	-4.2e-002	7.942	0.8372
134	0.8833	0.8567	-4.2e-002	7.942	0.8372
135	0.9	0.8734	-3.7e-002	7.937	0.8367
136	0.9166	0.89	-3.7e-002	7.937	0.8367
137	0.9333	0.9067	-3.7e-002	7.937	0.8367
138	0.95	0.9234	-3.7e-002	7.937	0.8367
139	0.9666	0.94	-3.7e-002	7.937	0.8367
140	0.9833	0.9567	-3.7e-002	7.937	0.8367
141	1.	0.9734	-3.7e-002	7.937	0.8367
142	1.2	1.173	-3.7e-002	7.937	0.8367
143	1.4	1.373	-3.2e-002	7.932	0.8362
144	1.6	1.573	-3.2e-002	7.932	0.8362
145	1.8	1.773	-3.2e-002	7.932	0.8362
146	2.	1.973	-2.8e-002	7.928	0.8358
147	2.2	2.173	-2.8e-002	7.928	0.8358

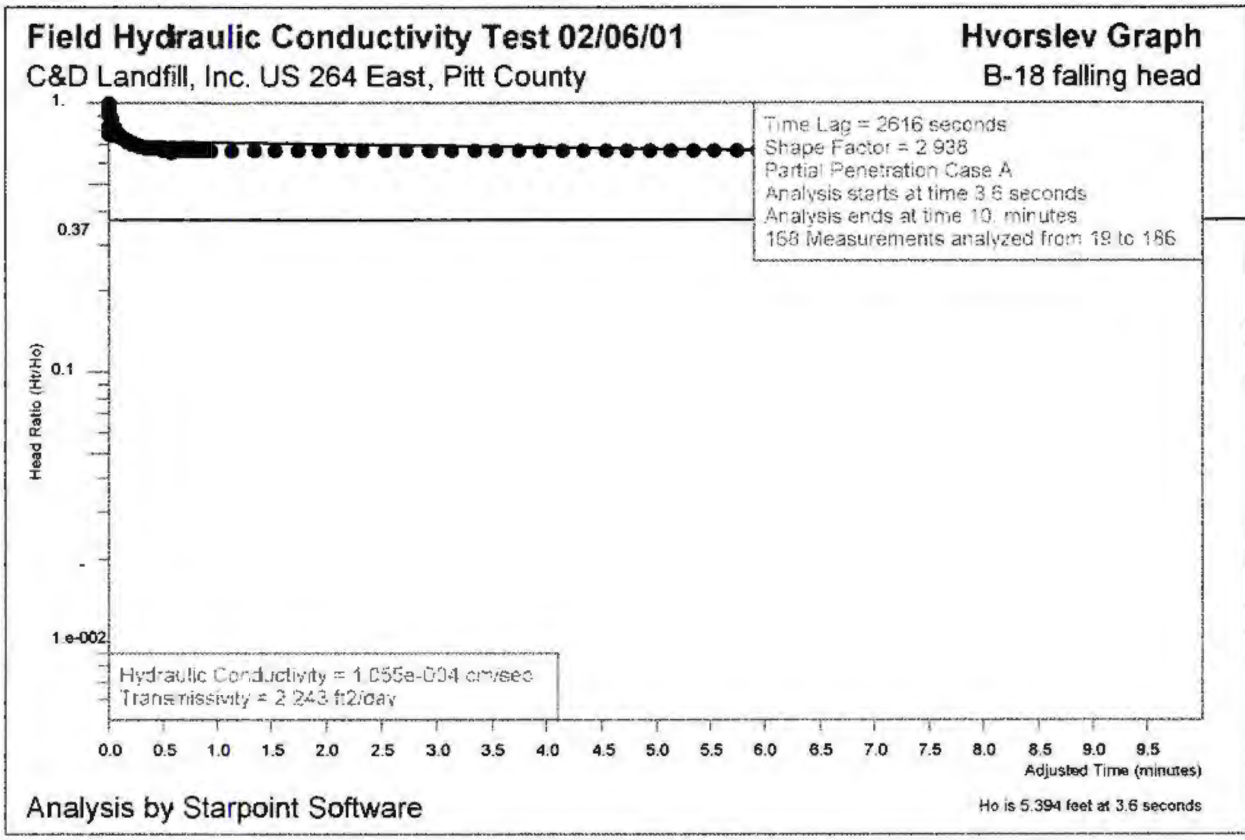
148	2.4	2.373	-2.8e-002	7.928	0.8358
149	2.6	2.573	-2.8e-002	7.928	0.8358
150	2.8	2.773	-2.8e-002	7.928	0.8358
151	3.	2.973	-2.8e-002	7.928	0.8358
152	3.2	3.173	-2.8e-002	7.928	0.8358
153	3.4	3.373	-3.2e-002	7.932	0.8362
154	3.6	3.573	-2.8e-002	7.928	0.8358
155	3.8	3.773	-2.8e-002	7.928	0.8358
156	4.	3.973	-3.2e-002	7.932	0.8362
157	4.2	4.173	-2.8e-002	7.928	0.8358
158	4.4	4.373	-3.2e-002	7.932	0.8362
159	4.6	4.573	-3.2e-002	7.932	0.8362
160	4.8	4.773	-2.8e-002	7.928	0.8358
161	5.	4.973	-3.2e-002	7.932	0.8362
162	5.2	5.173	-2.8e-002	7.928	0.8358
163	5.4	5.373	-2.8e-002	7.928	0.8358
164	5.6	5.573	-2.8e-002	7.928	0.8358
165	5.8	5.773	-2.8e-002	7.928	0.8358
166	6.	5.973	-2.8e-002	7.928	0.8358
167	6.2	6.173	-2.8e-002	7.928	0.8358
168	6.4	6.373	-2.8e-002	7.928	0.8358
169	6.6	6.573	-2.8e-002	7.928	0.8358
170	6.8	6.773	-2.8e-002	7.928	0.8358
171	7.	6.973	-2.8e-002	7.928	0.8358
172	7.2	7.173	-2.8e-002	7.928	0.8358
173	7.4	7.373	-2.8e-002	7.928	0.8358
174	7.6	7.573	-2.8e-002	7.928	0.8358
175	7.8	7.773	-2.8e-002	7.928	0.8358
176	8.	7.973	-2.8e-002	7.928	0.8358
177	8.2	8.173	-2.8e-002	7.928	0.8358
178	8.4	8.373	-2.8e-002	7.928	0.8358
179	8.6	8.573	-2.8e-002	7.928	0.8358
180	8.8	8.773	-2.8e-002	7.928	0.8358
181	9.	8.973	-2.8e-002	7.928	0.8358
182	9.2	9.173	-3.2e-002	7.932	0.8362
183	9.4	9.373	-3.2e-002	7.932	0.8362
184	9.6	9.573	-2.8e-002	7.928	0.8358
185	9.8	9.773	-2.8e-002	7.928	0.8358
186	10.	9.973	-2.8e-002	7.928	0.8358
187	12.	11.97	-2.3e-002	7.923	0.8352
188	14.	13.97	-2.8e-002	7.928	0.8358
189	16.	15.97	-2.3e-002	7.923	0.8352
190	18.	17.97	-2.3e-002	7.923	0.8352

Field Hydraulic Conductivity Test 02/06/01 **Arithmetic Graph**

C&D Landfill, Inc. US 264 East, Pitt County B-18 falling head



Analysis by Starpoint Software

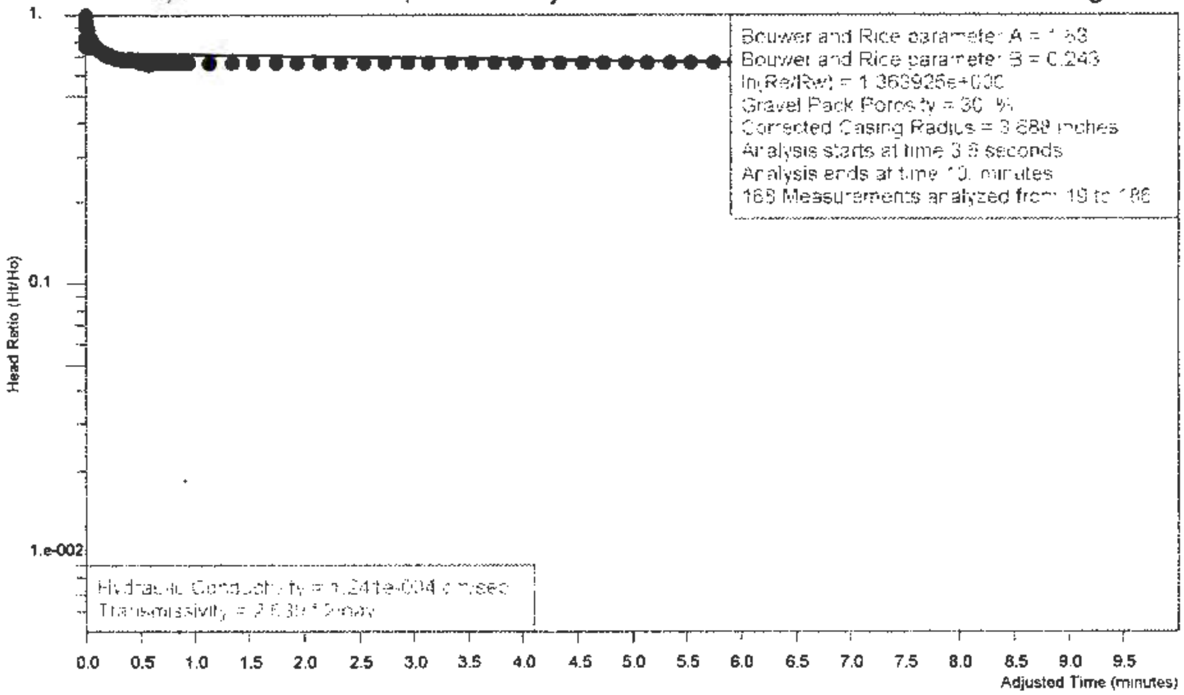

Field Hydraulic Conductivity Test 02/06/01
Hvorslev Graph
C&D Landfill, Inc. US 264 East, Pitt County
B-18 falling head
Time Lag = 2616 seconds
Shape Factor = 2.938
Partial Penetration Case A
Analysis starts at time 3.6 seconds
Analysis ends at time 10. minutes
168 Measurements analyzed from 19 to 186
Head Ratio (Ht/Ho)
1.
0.37
0.1
1.e-002
Hydraulic Conductivity = 1.055e-004 cm/sec
Transmissivity = 2.243 ft2/day
0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5
Adjusted Time (minutes)
Analysis by Starpoint Software
Ho is 5.394 feet at 3.6 seconds

Field Hydraulic Conductivity Test 02/06/01

C&D Landfill, Inc. US 264 East, Pitt County

Bouwer and Rice Graph

B-18 falling head



Analysis by Starpoint Software

Ho is 5.394 feet at 3.6 seconds

Field Hydraulic Conductivity Test

Site Name:	C&D Landfill, Inc.
Location:	US 264 East, Pitt County
Test Date:	02/06/01
Import File:	A:\pitt\Pitt18s0

Well Label:	B-18 falling head
Aquifer Thickness:	7.5 feet
Screen Length:	5. feet
Casing Radius:	2. inches
Effective Radius:	6. inches
Gravel Pack Porosity:	30. %
Corrected Casing Radius:	3.688 inches
Static Water Level:	3.57 feet
Water Table to Screen Bottom:	4.4 feet
Anisotropy Ratio:	1.
Time Adjustment:	3.6 Seconds

Test starts with trial 18
There are 186 time and drawdown measurements
Maximum head is 5.394 feet
Minimum head is 0. feet

Trial	Time (minutes)	Adjusted Time (minutes)	Drawdown (feet)	Head (feet)	Head Ratio
1	0.	-6.e-002	-1.4e-002	3.584	0.6644
2	3.3e-003	-5.67e-002	-1.4e-002	3.584	0.6644
3	6.6e-003	-5.34e-002	-2.3e-002	3.593	0.6661
4	1.e-002	-5.e-002	-1.8e-002	3.588	0.6652
5	1.33e-002	-4.67e-002	-2.3e-002	3.593	0.6661
6	1.66e-002	-4.34e-002	-1.4e-002	3.584	0.6644
7	2.e-002	-4.e-002	-1.4e-002	3.584	0.6644
8	2.33e-002	-3.67e-002	-2.3e-002	3.593	0.6661
9	2.66e-002	-3.34e-002	2.3e-002	3.547	0.6576
10	3.e-002	-3.e-002	-9.e-003	3.579	0.6635
11	3.33e-002	-2.67e-002	-4.7e-002	3.617	0.6706
12	3.66e-002	-2.34e-002	-9.8e-002	3.668	0.68
13	4.e-002	-2.e-002	-1.324	4.894	0.9073
14	4.33e-002	-1.67e-002	-0.579	4.149	0.7692
15	4.66e-002	-1.34e-002	-0.74	4.31	0.799
16	5.e-002	-1.e-002	-1.4	4.97	0.9214
17	5.33e-002	-6.7e-003	-1.65	5.22	0.9677
18	5.66e-002	-3.4e-003	-1.692	5.262	0.9755
19	6.e-002	0.	-1.824	5.394	1.
20	6.33e-002	3.3e-003	-1.527	5.097	0.9449
21	6.66e-002	6.6e-003	-1.574	5.144	0.9537
22	7.e-002	1.e-002	-0.603	4.173	0.7736
23	7.33e-002	1.33e-002	-0.933	4.503	0.8348
24	7.66e-002	1.66e-002	-1.315	4.885	0.9056
25	8.e-002	2.e-002	-1.173	4.743	0.8793
26	8.33e-002	2.33e-002	-0.655	4.225	0.7833
27	8.66e-002	2.66e-002	-1.117	4.687	0.8689
28	9.e-002	3.e-002	-1.202	4.772	0.8847
29	9.33e-002	3.33e-002	-1.188	4.758	0.8821
30	9.66e-002	3.66e-002	-1.098	4.668	0.8654
31	0.1	4.e-002	-0.744	4.314	0.7998
32	0.1033	4.33e-002	-0.857	4.427	0.8207
33	0.1066	4.66e-002	-0.938	4.508	0.8357

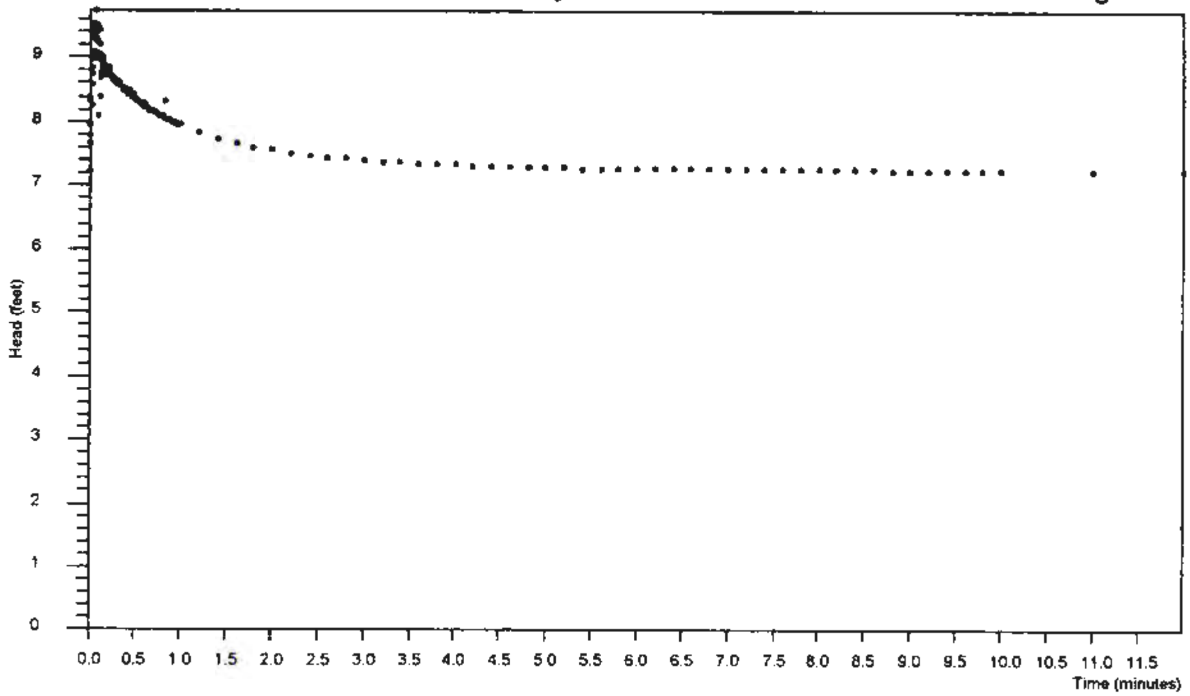
34	0.11	5.e-002	-0.905	4.475	0.8296
35	0.1133	5.33e-002	-0.876	4.446	0.8242
36	0.1166	5.66e-002	-0.853	4.423	0.82
37	0.12	6.e-002	-0.843	4.413	0.8181
38	0.1233	6.33e-002	-0.801	4.371	0.8103
39	0.1266	6.66e-002	-0.754	4.324	0.8016
40	0.13	7.e-002	-0.73	4.3	0.7972
41	0.1333	7.33e-002	-0.707	4.277	0.7929
42	0.1366	7.66e-002	-0.692	4.262	0.7901
43	0.14	8.e-002	-0.674	4.244	0.7868
44	0.1433	8.33e-002	-0.655	4.225	0.7833
45	0.1466	8.66e-002	-0.636	4.206	0.7798
46	0.15	9.e-002	-0.622	4.192	0.7772
47	0.1533	9.33e-002	-0.603	4.173	0.7736
48	0.1566	9.66e-002	-0.589	4.159	0.771
49	0.16	0.1	-0.575	4.145	0.7684
50	0.1633	0.1033	-0.56	4.13	0.7657
51	0.1666	0.1066	-0.546	4.116	0.7631
52	0.17	0.11	-0.537	4.107	0.7614
53	0.1733	0.1133	-0.523	4.093	0.7588
54	0.1766	0.1166	-0.509	4.079	0.7562
55	0.18	0.12	-0.499	4.069	0.7544
56	0.1833	0.1233	-0.485	4.055	0.7518
57	0.1866	0.1266	-0.476	4.046	0.7501
58	0.19	0.13	-0.466	4.036	0.7482
59	0.1933	0.1333	-0.461	4.031	0.7473
60	0.1966	0.1366	-0.443	4.013	0.744
61	0.2	0.14	-0.433	4.003	0.7421
62	0.2033	0.1433	-0.428	3.998	0.7412
63	0.2066	0.1466	-0.419	3.989	0.7395
64	0.21	0.15	-0.41	3.98	0.7379
65	0.2133	0.1533	-0.4	3.97	0.736
66	0.2166	0.1566	-0.405	3.975	0.7369
67	0.22	0.16	-0.386	3.956	0.7334
68	0.2233	0.1633	-0.377	3.947	0.7317
69	0.2266	0.1666	-0.367	3.937	0.7299
70	0.23	0.17	-0.362	3.932	0.729
71	0.2333	0.1733	-0.353	3.923	0.7273
72	0.2366	0.1766	-0.344	3.914	0.7256
73	0.24	0.18	-0.339	3.909	0.7247
74	0.2433	0.1833	-0.334	3.904	0.7238
75	0.2466	0.1866	-0.325	3.895	0.7221
76	0.25	0.19	-0.32	3.89	0.7212
77	0.2533	0.1933	-0.315	3.885	0.7202
78	0.2566	0.1966	-0.306	3.876	0.7186
79	0.26	0.2	-0.301	3.871	0.7176
80	0.2633	0.2033	-0.296	3.866	0.7167
81	0.2666	0.2066	-0.287	3.857	0.7151
82	0.27	0.21	-0.282	3.852	0.7141
83	0.2733	0.2133	-0.278	3.848	0.7134
84	0.2766	0.2166	-0.273	3.843	0.7125
85	0.28	0.22	-0.263	3.833	0.7106
86	0.2833	0.2233	-0.263	3.833	0.7106
87	0.2866	0.2266	-0.254	3.824	0.7089
88	0.29	0.23	-0.249	3.819	0.708
89	0.2933	0.2333	-0.249	3.819	0.708
90	0.2966	0.2366	-0.245	3.815	0.7073

91	0.3	0.24	-0.24	3.81	0.7063
92	0.3033	0.2433	-0.235	3.805	0.7054
93	0.3066	0.2466	-0.23	3.8	0.7045
94	0.31	0.25	-0.226	3.796	0.7037
95	0.3133	0.2533	-0.221	3.791	0.7028
96	0.3166	0.2566	-0.216	3.786	0.7019
97	0.32	0.26	-0.212	3.782	0.7011
98	0.3233	0.2633	-0.212	3.782	0.7011
99	0.3266	0.2666	-0.207	3.777	0.7002
100	0.33	0.27	-0.202	3.772	0.6993
101	0.3333	0.2733	-0.197	3.767	0.6984
102	0.35	0.29	-0.174	3.744	0.6941
103	0.3666	0.3066	-0.164	3.734	0.6923
104	0.3833	0.3233	-0.15	3.72	0.6897
105	0.4	0.34	-0.136	3.706	0.6871
106	0.4166	0.3566	-0.127	3.697	0.6854
107	0.4333	0.3733	-0.113	3.683	0.6828
108	0.45	0.39	-0.108	3.678	0.6819
109	0.4666	0.4066	-9.8e-002	3.668	0.68
110	0.4833	0.4233	-8.9e-002	3.659	0.6783
111	0.5	0.44	-8.4e-002	3.654	0.6774
112	0.5166	0.4566	-8.e-002	3.65	0.6767
113	0.5333	0.4733	-7.5e-002	3.645	0.6758
114	0.55	0.49	-7.e-002	3.64	0.6748
115	0.5666	0.5066	-6.5e-002	3.635	0.6739
116	0.5833	0.5233	-6.1e-002	3.631	0.6732
117	0.6	0.54	-5.6e-002	3.626	0.6722
118	0.6166	0.5566	-5.6e-002	3.626	0.6722
119	0.6333	0.5733	-5.1e-002	3.621	0.6713
120	0.65	0.59	2.3e-002	3.547	0.6576
121	0.6666	0.6066	-5.1e-002	3.621	0.6713
122	0.6833	0.6233	-4.7e-002	3.617	0.6706
123	0.7	0.64	-4.2e-002	3.612	0.6696
124	0.7166	0.6566	-4.2e-002	3.612	0.6696
125	0.7333	0.6733	-3.7e-002	3.607	0.6687
126	0.75	0.69	-3.7e-002	3.607	0.6687
127	0.7666	0.7066	-3.7e-002	3.607	0.6687
128	0.7833	0.7233	-3.2e-002	3.602	0.6678
129	0.8	0.74	-3.2e-002	3.602	0.6678
130	0.8166	0.7566	-3.2e-002	3.602	0.6678
131	0.8333	0.7733	-2.8e-002	3.598	0.667
132	0.85	0.79	-2.8e-002	3.598	0.667
133	0.8666	0.8066	-2.8e-002	3.598	0.667
134	0.8833	0.8233	-2.3e-002	3.593	0.6661
135	0.9	0.84	-2.3e-002	3.593	0.6661
136	0.9166	0.8566	-2.3e-002	3.593	0.6661
137	0.9333	0.8733	-2.3e-002	3.593	0.6661
138	0.95	0.89	-2.3e-002	3.593	0.6661
139	0.9666	0.9066	-2.3e-002	3.593	0.6661
140	0.9833	0.9233	-2.3e-002	3.593	0.6661
141	1.	0.94	-2.3e-002	3.593	0.6661
142	1.2	1.14	-2.3e-002	3.593	0.6661
143	1.4	1.34	-1.8e-002	3.588	0.6652
144	1.6	1.54	-1.8e-002	3.588	0.6652
145	1.8	1.74	-1.8e-002	3.588	0.6652
146	2.	1.94	-1.8e-002	3.588	0.6652
147	2.2	2.14	-1.8e-002	3.588	0.6652

148	2.4	2.34	-1.8e-002	3.588	0.6652
149	2.6	2.54	-1.4e-002	3.584	0.6644
150	2.8	2.74	-1.4e-002	3.584	0.6644
151	3.	2.94	-9.e-003	3.579	0.6635
152	3.2	3.14	-9.e-003	3.579	0.6635
153	3.4	3.34	-9.e-003	3.579	0.6635
154	3.6	3.54	-9.e-003	3.579	0.6635
155	3.8	3.74	-9.e-003	3.579	0.6635
156	4.	3.94	-9.e-003	3.579	0.6635
157	4.2	4.14	-9.e-003	3.579	0.6635
158	4.4	4.34	-9.e-003	3.579	0.6635
159	4.6	4.54	-1.4e-002	3.584	0.6644
160	4.8	4.74	-1.4e-002	3.584	0.6644
161	5.	4.94	-9.e-003	3.579	0.6635
162	5.2	5.14	-9.e-003	3.579	0.6635
163	5.4	5.34	-9.e-003	3.579	0.6635
164	5.6	5.54	-9.e-003	3.579	0.6635
165	5.8	5.74	-1.4e-002	3.584	0.6644
166	6.	5.94	-9.e-003	3.579	0.6635
167	6.2	6.14	-9.e-003	3.579	0.6635
168	6.4	6.34	-1.4e-002	3.584	0.6644
169	6.6	6.54	-1.4e-002	3.584	0.6644
170	6.8	6.74	-1.4e-002	3.584	0.6644
171	7.	6.94	-1.4e-002	3.584	0.6644
172	7.2	7.14	-1.4e-002	3.584	0.6644
173	7.4	7.34	-1.4e-002	3.584	0.6644
174	7.6	7.54	-9.e-003	3.579	0.6635
175	7.8	7.74	-9.e-003	3.579	0.6635
176	8.	7.94	-9.e-003	3.579	0.6635
177	8.2	8.14	-1.4e-002	3.584	0.6644
178	8.4	8.34	-9.e-003	3.579	0.6635
179	8.6	8.54	-9.e-003	3.579	0.6635
180	8.8	8.74	-1.4e-002	3.584	0.6644
181	9.	8.94	-1.4e-002	3.584	0.6644
182	9.2	9.14	-1.4e-002	3.584	0.6644
183	9.4	9.34	-1.8e-002	3.588	0.6652
184	9.6	9.54	-1.4e-002	3.584	0.6644
185	9.8	9.74	-1.4e-002	3.584	0.6644
186	10.	9.94	-1.4e-002	3.584	0.6644

Field Hydraulic Conductivity Test November 8, 2000 **Arithmetic Graph**

C&D Landfill, Inc. US 264 East, Pitt County B-11 falling head



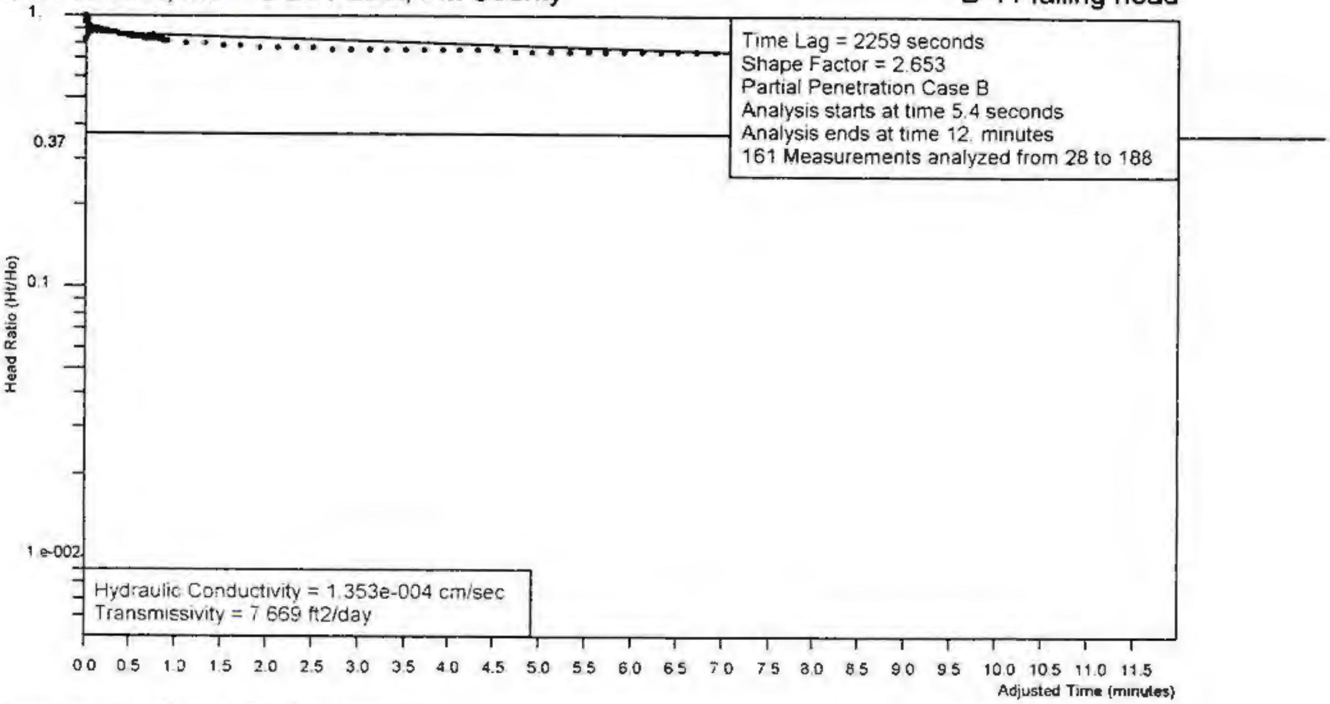
Analysis by Starpoint Software

Field Hydraulic Conductivity Test November 8, 2000

C&D Landfill, Inc. US 264 East, Pitt County

Hvorslev Graph

B-11 falling head



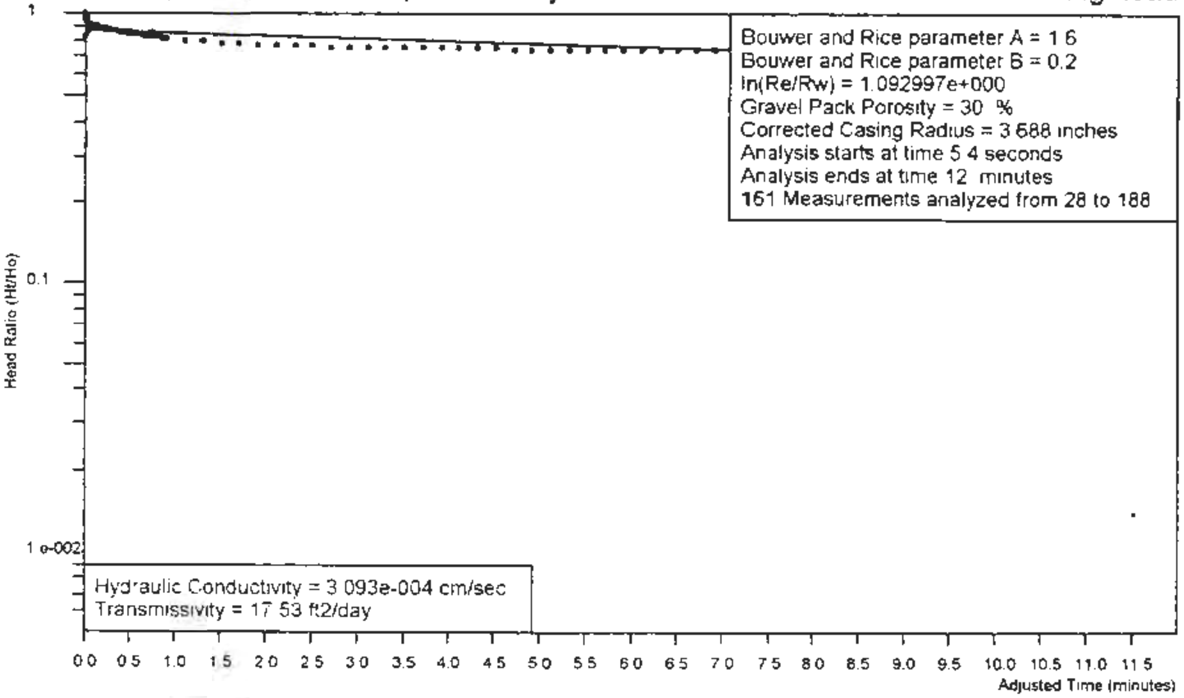
Analysis by Starpoint Software

Ho is 9.715 feet at 5.4 seconds

Field Hydraulic Conductivity Test November 8, 2000Bouwer and Rice Graph

C&D Landfill, Inc. US 264 East, Pitt County

B-11 falling head



Analysis by Starpoint Software

Ho is 9.715 feet at 5.4 seconds

11/28/2000

Field Hydraulic Conductivity Test

Site Name: C&D Landfill, Inc.
Location: US 264 East, Pitt County
Test Date: November 8, 2000
Import File: C:\hermit datalogger\Pitt11s0

Well Label: B-11 falling head
Aquifer Thickness: 20. feet
Screen Length: 2. feet
Casing Radius: 2. inches
Effective Radius: 6. inches
Gravel Pack Porosity: 30. %
Corrected Casing Radius: 3.688 inches
Static Water Level: 7.25 feet
Water Table to Screen Bottom: 10.12 feet
Anisotropy Ratio: 1.
Time Adjustment: 5.4 Seconds
Test starts with trial 27
There are 188 time and drawdown measurements
Maximum head is 9.715 feet
Minimum head is 0. feet

Trial	Time (minutes)	Adjusted Time (minutes)	Drawdown (feet)	Head (feet)	Head Ratio
1	0.	-9.e-002	6.e-003	7.244	0.7457
2	3.3e-003	-8.67e-002	0.	7.25	0.7463
3	6.6e-003	-8.34e-002	-0.551	7.801	0.803
4	1.e-002	-8.e-002	-0.413	7.663	0.7888
5	1.33e-002	-7.67e-002	-0.708	7.958	0.8191
6	1.66e-002	-7.34e-002	-1.091	8.341	0.8586
7	2.e-002	-7.e-002	-1.066	8.316	0.856
8	2.33e-002	-6.67e-002	-0.997	8.247	0.8489
9	2.66e-002	-6.34e-002	-1.335	8.585	0.8837
10	3.e-002	-6.e-002	-1.586	8.836	0.9095
11	3.33e-002	-5.67e-002	-1.511	8.761	0.9018
12	3.66e-002	-5.34e-002	-1.505	8.755	0.9012
13	4.e-002	-5.e-002	-1.737	8.987	0.9251
14	4.33e-002	-4.67e-002	-1.831	9.081	0.9347
15	4.66e-002	-4.34e-002	-2.095	9.345	0.9619
16	5.e-002	-4.e-002	-1.724	8.974	0.9237
17	5.33e-002	-3.67e-002	-1.812	9.062	0.9328
18	5.66e-002	-3.34e-002	-2.157	9.407	0.9683
19	6.e-002	-3.e-002	-2.201	9.451	0.9728
20	6.33e-002	-2.67e-002	-2.057	9.307	0.958
21	6.66e-002	-2.34e-002	-2.295	9.545	0.9825
22	7.e-002	-2.e-002	-2.057	9.307	0.958
23	7.33e-002	-1.67e-002	-2.038	9.288	0.956
24	7.66e-002	-1.34e-002	-1.825	9.075	0.9341
25	8.e-002	-1.e-002	-2.164	9.414	0.969
26	8.33e-002	-6.7e-003	-2.22	9.47	0.9748
27	8.66e-002	-3.4e-003	-2.164	9.414	0.969
28	9.e-002	0.	-2.465	9.715	1.
29	9.33e-002	3.3e-003	-2.189	9.439	0.9716
30	9.66e-002	6.6e-003	-2.226	9.476	0.9754
31	0.1	1.e-002	-2.151	9.401	0.9677
32	0.1033	1.33e-002	-2.251	9.501	0.978
33	0.1066	1.66e-002	-2.	9.25	0.9521

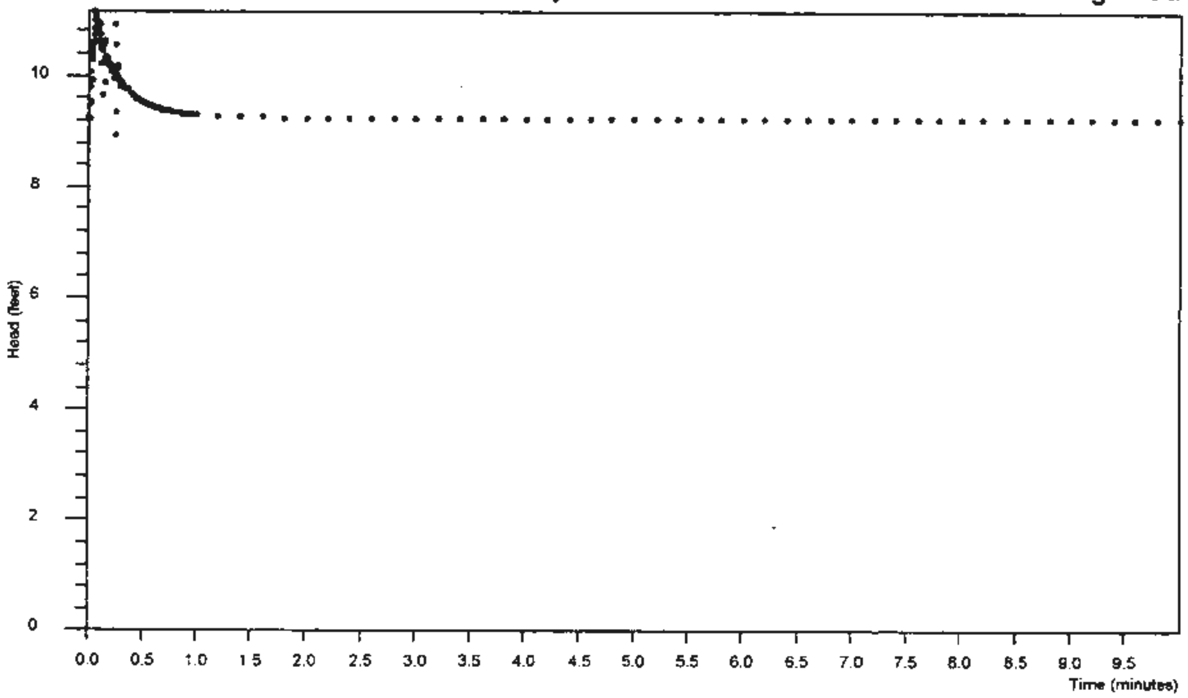
34	0.11	2.e-002	-0.834	8.084	0.8321
35	0.1133	2.33e-002	-1.712	8.962	0.9225
36	0.1166	2.66e-002	-1.486	8.736	0.8992
37	0.12	3.e-002	-1.135	8.385	0.8631
38	0.1233	3.33e-002	-1.956	9.206	0.9476
39	0.1266	3.66e-002	-2.201	9.451	0.9728
40	0.13	4.e-002	-1.806	9.056	0.9322
41	0.1333	4.33e-002	-1.43	8.68	0.8935
42	0.1366	4.66e-002	-1.473	8.723	0.8979
43	0.14	5.e-002	-1.593	8.843	0.9102
44	0.1433	5.33e-002	-1.655	8.905	0.9166
45	0.1466	5.66e-002	-1.699	8.949	0.9212
46	0.15	6.e-002	-1.756	9.006	0.927
47	0.1533	6.33e-002	-1.718	8.968	0.9231
48	0.1566	6.66e-002	-1.586	8.836	0.9095
49	0.16	7.e-002	-1.586	8.836	0.9095
50	0.1633	7.33e-002	-1.555	8.805	0.9063
51	0.1666	7.66e-002	-1.618	8.868	0.9128
52	0.17	8.e-002	-1.605	8.855	0.9115
53	0.1733	8.33e-002	-1.568	8.818	0.9077
54	0.1766	8.66e-002	-1.549	8.799	0.9057
55	0.18	9.e-002	-1.605	8.855	0.9115
56	0.1833	9.33e-002	-1.542	8.792	0.905
57	0.1866	9.66e-002	-1.58	8.83	0.9089
58	0.19	0.1	-1.555	8.805	0.9063
59	0.1933	0.1033	-1.542	8.792	0.905
60	0.1966	0.1066	-1.542	8.792	0.905
61	0.2	0.11	-1.511	8.761	0.9018
62	0.2033	0.1133	-1.461	8.711	0.8967
63	0.2066	0.1166	-1.611	8.861	0.9121
64	0.21	0.12	-1.542	8.792	0.905
65	0.2133	0.1233	-1.48	8.73	0.8986
66	0.2166	0.1266	-1.505	8.755	0.9012
67	0.22	0.13	-1.505	8.755	0.9012
68	0.2233	0.1333	-1.492	8.742	0.8998
69	0.2266	0.1366	-1.486	8.736	0.8992
70	0.23	0.14	-1.48	8.73	0.8986
71	0.2333	0.1433	-1.48	8.73	0.8986
72	0.2366	0.1466	-1.473	8.723	0.8979
73	0.24	0.15	-1.461	8.711	0.8967
74	0.2433	0.1533	-1.461	8.711	0.8967
75	0.2466	0.1566	-1.455	8.705	0.896
76	0.25	0.16	-1.448	8.698	0.8953
77	0.2533	0.1633	-1.442	8.692	0.8947
78	0.2566	0.1666	-1.436	8.686	0.8941
79	0.26	0.17	-1.43	8.68	0.8935
80	0.2633	0.1733	-1.423	8.673	0.8927
81	0.2666	0.1766	-1.423	8.673	0.8927
82	0.27	0.18	-1.417	8.667	0.8921
83	0.2733	0.1833	-1.411	8.661	0.8915
84	0.2766	0.1866	-1.404	8.654	0.8908
85	0.28	0.19	-1.398	8.648	0.8902
86	0.2833	0.1933	-1.392	8.642	0.8896
87	0.2866	0.1966	-1.392	8.642	0.8896
88	0.29	0.2	-1.386	8.636	0.8889
89	0.2933	0.2033	-1.379	8.629	0.8882
90	0.2966	0.2066	-1.373	8.623	0.8876

91	0.3	0.21	-1.367	8.617	0.887
92	0.3033	0.2133	-1.367	8.617	0.887
93	0.3066	0.2166	-1.361	8.611	0.8864
94	0.31	0.22	-1.354	8.604	0.8856
95	0.3133	0.2233	-1.348	8.598	0.885
96	0.3166	0.2266	-1.342	8.592	0.8844
97	0.32	0.23	-1.342	8.592	0.8844
98	0.3233	0.2333	-1.335	8.585	0.8837
99	0.3266	0.2366	-1.335	8.585	0.8837
100	0.33	0.24	-1.354	8.604	0.8856
101	0.3333	0.2433	-1.317	8.567	0.8818
102	0.35	0.26	-1.304	8.554	0.8805
103	0.3666	0.2766	-1.273	8.523	0.8773
104	0.3833	0.2933	-1.248	8.498	0.8747
105	0.4	0.31	-1.26	8.51	0.876
106	0.4166	0.3266	-1.204	8.454	0.8702
107	0.4333	0.3433	-1.179	8.429	0.8676
108	0.45	0.36	-1.235	8.485	0.8734
109	0.4666	0.3766	-1.147	8.397	0.8643
110	0.4833	0.3933	-1.154	8.404	0.8651
111	0.5	0.41	-1.097	8.347	0.8592
112	0.5166	0.4266	-1.085	8.335	0.858
113	0.5333	0.4433	-1.066	8.316	0.856
114	0.55	0.46	-1.047	8.297	0.854
115	0.5666	0.4766	-1.034	8.284	0.8527
116	0.5833	0.4933	-1.016	8.266	0.8508
117	0.6	0.51	-1.053	8.303	0.8547
118	0.6166	0.5266	-0.984	8.234	0.8476
119	0.6333	0.5433	-0.965	8.215	0.8456
120	0.65	0.56	-0.953	8.203	0.8444
121	0.6666	0.5766	-0.94	8.19	0.843
122	0.6833	0.5933	-0.921	8.171	0.8411
123	0.7	0.61	-0.909	8.159	0.8398
124	0.7166	0.6266	-0.896	8.146	0.8385
125	0.7333	0.6433	-0.878	8.128	0.8366
126	0.75	0.66	-0.865	8.115	0.8353
127	0.7666	0.6766	-0.852	8.102	0.834
128	0.7833	0.6933	-0.84	8.09	0.8327
129	0.8	0.71	-0.827	8.077	0.8314
130	0.8166	0.7266	-0.815	8.065	0.8302
131	0.8333	0.7433	-1.059	8.309	0.8553
132	0.85	0.76	-0.783	8.033	0.8269
133	0.8666	0.7766	-0.783	8.033	0.8269
134	0.8833	0.7933	-0.771	8.021	0.8256
135	0.9	0.81	-0.758	8.008	0.8243
136	0.9166	0.8266	-0.752	8.002	0.8237
137	0.9333	0.8433	-0.74	7.99	0.8224
138	0.95	0.86	-0.721	7.971	0.8205
139	0.9666	0.8766	-0.714	7.964	0.8198
140	0.9833	0.8933	-0.702	7.952	0.8185
141	1.	0.91	-0.696	7.946	0.8179
142	1.2	1.11	-0.57	7.82	0.8049
143	1.4	1.31	-0.482	7.732	0.7959
144	1.6	1.51	-0.413	7.663	0.7888
145	1.8	1.71	-0.351	7.601	0.7824
146	2.	1.91	-0.307	7.557	0.7779
147	2.2	2.11	-0.263	7.513	0.7733

148	2.4	2.31	-0.225	7.475	0.7694
149	2.6	2.51	-0.2	7.45	0.7669
150	2.8	2.71	-0.175	7.425	0.7643
151	3.	2.91	-0.15	7.4	0.7617
152	3.2	3.11	-0.131	7.381	0.7598
153	3.4	3.31	-0.112	7.362	0.7578
154	3.6	3.51	-0.1	7.35	0.7566
155	3.8	3.71	-8.7e-002	7.337	0.7552
156	4.	3.91	-7.5e-002	7.325	0.754
157	4.2	4.11	-6.8e-002	7.318	0.7533
158	4.4	4.31	-6.2e-002	7.312	0.7527
159	4.6	4.51	-5.e-002	7.3	0.7514
160	4.8	4.71	-4.3e-002	7.293	0.7507
161	5.	4.91	-3.7e-002	7.287	0.7501
162	5.2	5.11	-3.7e-002	7.287	0.7501
163	5.4	5.31	-3.1e-002	7.281	0.7495
164	5.6	5.51	-2.5e-002	7.275	0.7488
165	5.8	5.71	-2.5e-002	7.275	0.7488
166	6.	5.91	-2.5e-002	7.275	0.7488
167	6.2	6.11	-1.8e-002	7.268	0.7481
168	6.4	6.31	-1.8e-002	7.268	0.7481
169	6.6	6.51	-1.8e-002	7.268	0.7481
170	6.8	6.71	-1.2e-002	7.262	0.7475
171	7.	6.91	-1.2e-002	7.262	0.7475
172	7.2	7.11	-1.2e-002	7.262	0.7475
173	7.4	7.31	-6.e-003	7.256	0.7469
174	7.6	7.51	-6.e-003	7.256	0.7469
175	7.8	7.71	-6.e-003	7.256	0.7469
176	8.	7.91	-6.e-003	7.256	0.7469
177	8.2	8.11	-6.e-003	7.256	0.7469
178	8.4	8.31	-6.e-003	7.256	0.7469
179	8.6	8.51	-6.e-003	7.256	0.7469
180	8.8	8.71	0.	7.25	0.7463
181	9.	8.91	0.	7.25	0.7463
182	9.2	9.11	0.	7.25	0.7463
183	9.4	9.31	0.	7.25	0.7463
184	9.6	9.51	0.	7.25	0.7463
185	9.8	9.71	0.	7.25	0.7463
186	10.	9.91	0.	7.25	0.7463
187	11.	10.91	0.	7.25	0.7463
188	12.	11.91	6.e-003	7.244	0.7457

Field Hydraulic Conductivity Test November 7, 2000 **Arithmetic Graph**

C&D Landfill, Inc. US 264 East, Pitt County B-12 falling head



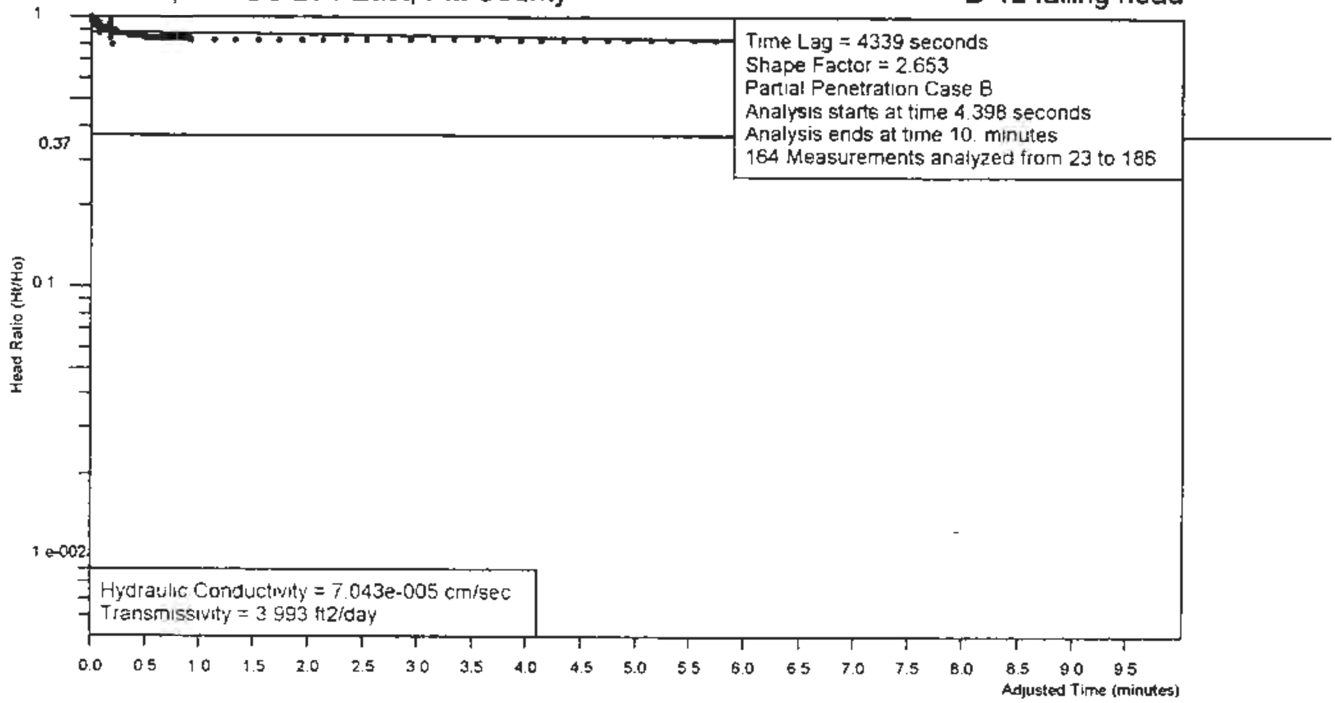
Analysis by Starpoint Software

Field Hydraulic Conductivity Test November 7, 2000

Hvorslev Graph

C&D Landfill, Inc. US 264 East, Pitt County

B-12 falling head



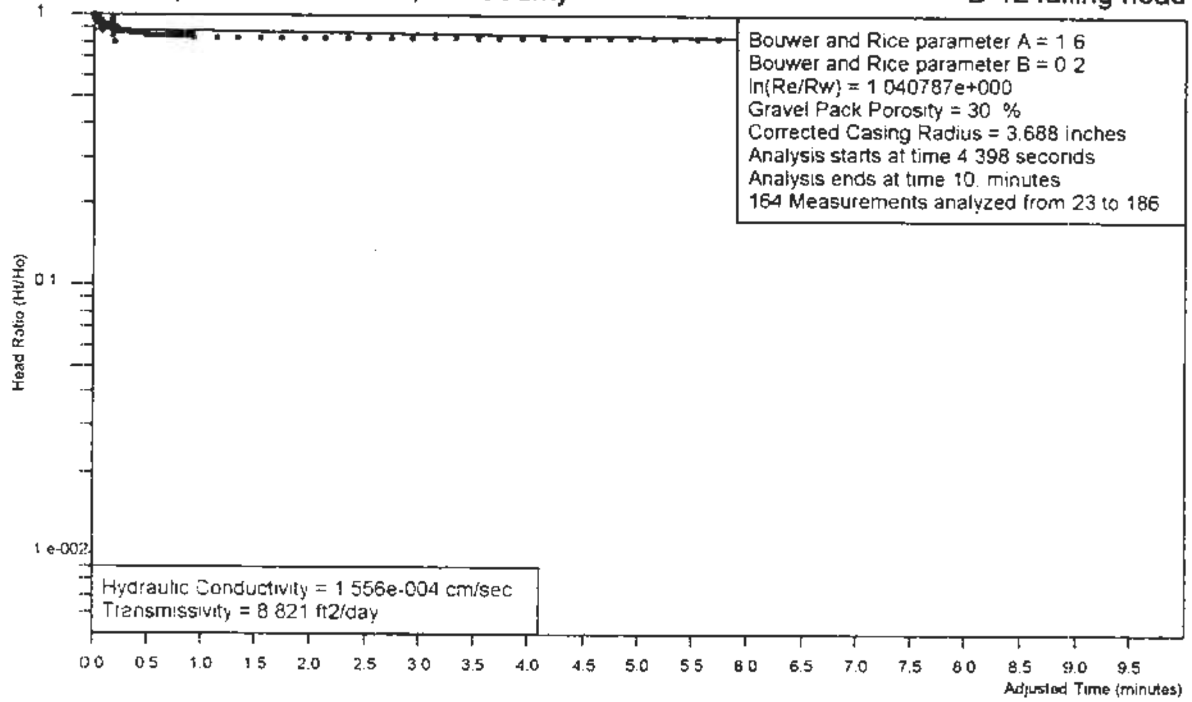
Analysis by Starpoint Software

Ho is 11.14 feet at 4.398 seconds

Field Hydraulic Conductivity Test November 7, 2000 Bouwer and Rice Graph

C&D Landfill, inc. US 264 East, Pitt County

B-12 falling head



Analysis by Starpoint Software

Ho is 11 14 feet at 4.398 seconds

Field Hydraulic Conductivity Test

Site Name:	C&D Landfill, Inc.
Location:	US 264 East, Pitt County
Test Date:	November 7, 2000
Import File:	C:\hermit datalogger\Pitt12s0

Well Label:	B-12 falling head
Aquifer Thickness:	20. feet
Screen Length:	2. feet
Casing Radius:	2. inches
Effective Radius:	6. inches
Gravel Pack Porosity:	30. %
Corrected Casing Radius:	3.688 inches
Static Water Level:	9.23 feet
Water Table to Screen Bottom:	7.77 feet
Anisotropy Ratio:	1.
Time Adjustment:	4.398 Seconds

Test starts with trial 22
There are 186 time and drawdown measurements
Maximum head is 11.14 feet
Minimum head is 0. feet

Trial	Time (minutes)	Adjusted Time (minutes)	Drawdown (feet)	Head (feet)	Head Ratio
1	0.	-7.33e-002	-6.e-003	9.236	0.8294
2	3.3e-003	-7.e-002	-6.e-003	9.236	0.8294
3	6.6e-003	-6.67e-002	-6.e-003	9.236	0.8294
4	1.e-002	-6.33e-002	-1.2e-002	9.242	0.8299
5	1.33e-002	-6.e-002	-1.2e-002	9.242	0.8299
6	1.66e-002	-5.67e-002	-1.2e-002	9.242	0.8299
7	2.e-002	-5.33e-002	-1.2e-002	9.242	0.8299
8	2.33e-002	-5.e-002	-1.8e-002	9.248	0.8305
9	2.66e-002	-4.67e-002	-0.294	9.524	0.8552
10	3.e-002	-4.33e-002	-0.57	9.8	0.88
11	3.33e-002	-4.e-002	-0.288	9.518	0.8547
12	3.66e-002	-3.67e-002	-0.852	10.08	0.9054
13	4.e-002	-3.33e-002	-1.059	10.29	0.9239
14	4.33e-002	-3.e-002	-0.689	9.919	0.8907
15	4.66e-002	-2.67e-002	-1.122	10.35	0.9296
16	5.e-002	-2.33e-002	-1.254	10.48	0.9415
17	5.33e-002	-2.e-002	-1.36	10.59	0.951
18	5.66e-002	-1.67e-002	-1.31	10.54	0.9465
19	6.e-002	-1.33e-002	-1.617	10.85	0.974
20	6.33e-002	-1.e-002	-1.404	10.63	0.9549
21	6.66e-002	-6.7e-003	-1.511	10.74	0.9645
22	7.e-002	-3.3e-003	-1.762	10.99	0.9871
23	7.33e-002	0.	-1.906	11.14	1.
24	7.66e-002	3.3e-003	-1.705	10.94	0.982
25	8.e-002	6.7e-003	-1.806	11.04	0.991
26	8.33e-002	1.e-002	-1.849	11.08	0.9949
27	8.66e-002	1.33e-002	-1.755	10.99	0.9864
28	9.e-002	1.67e-002	-1.799	11.03	0.9904
29	9.33e-002	2.e-002	-1.843	11.07	0.9943
30	9.66e-002	2.33e-002	-1.724	10.95	0.9837
31	0.1	2.67e-002	-1.574	10.8	0.9702
32	0.1033	3.e-002	-1.649	10.88	0.9769
33	0.1066	3.33e-002	-1.561	10.79	0.969

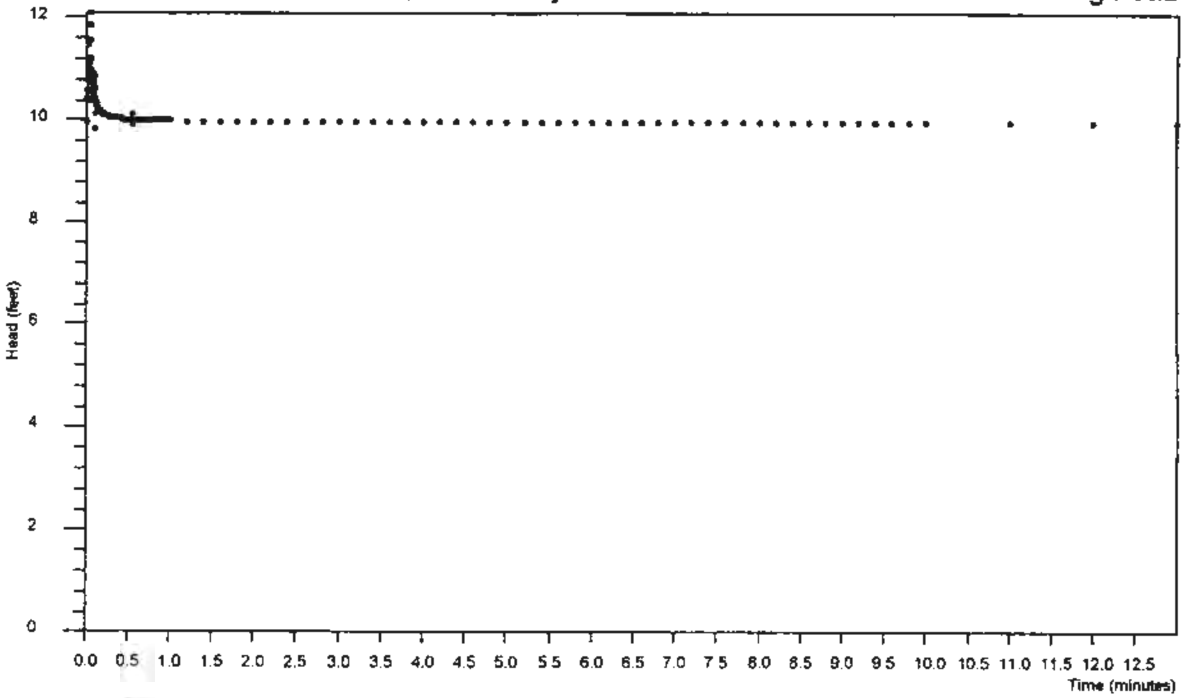
34	0.11	3.67e-002	-1.398	10.63	0.9544
35	0.1133	4.e-002	-1.561	10.79	0.969
36	0.1166	4.33e-002	-1.699	10.93	0.9814
37	0.12	4.67e-002	-1.31	10.54	0.9465
38	0.1233	5.e-002	-1.279	10.51	0.9437
39	0.1266	5.33e-002	-1.511	10.74	0.9645
40	0.13	5.67e-002	-1.229	10.46	0.9392
41	0.1333	6.e-002	-0.984	10.21	0.9172
42	0.1366	6.33e-002	-1.316	10.55	0.947
43	0.14	6.67e-002	-1.247	10.48	0.9408
44	0.1433	7.e-002	-1.222	10.45	0.9386
45	0.1466	7.33e-002	-1.197	10.43	0.9363
46	0.15	7.67e-002	-0.426	9.656	0.8671
47	0.1533	8.e-002	-0.633	9.863	0.8857
48	0.1566	8.33e-002	-1.348	10.58	0.9499
49	0.16	8.67e-002	-1.348	10.58	0.9499
50	0.1633	9.e-002	-1.404	10.63	0.9549
51	0.1666	9.33e-002	-1.047	10.28	0.9229
52	0.17	9.67e-002	-1.084	10.31	0.9262
53	0.1733	0.1	-1.078	10.31	0.9256
54	0.1766	0.1033	-1.04	10.27	0.9222
55	0.18	0.1067	-1.084	10.31	0.9262
56	0.1833	0.11	-1.059	10.29	0.9239
57	0.1866	0.1133	-1.003	10.23	0.9189
58	0.19	0.1167	-1.009	10.24	0.9195
59	0.1933	0.12	-0.997	10.23	0.9184
60	0.1966	0.1233	-0.984	10.21	0.9172
61	0.2	0.1267	-0.965	10.2	0.9155
62	0.2033	0.13	-0.953	10.18	0.9144
63	0.2066	0.1333	-0.94	10.17	0.9133
64	0.21	0.1367	-0.846	10.08	0.9048
65	0.2133	0.14	-0.965	10.2	0.9155
66	0.2166	0.1433	-0.928	10.16	0.9122
67	0.22	0.1467	-0.877	10.11	0.9076
68	0.2233	0.15	-0.871	10.1	0.9071
69	0.2266	0.1533	-0.865	10.1	0.9065
70	0.23	0.1567	-0.852	10.08	0.9054
71	0.2333	0.16	-0.84	10.07	0.9043
72	0.2366	0.1633	-0.827	10.06	0.9031
73	0.24	0.1667	-0.84	10.07	0.9043
74	0.2433	0.17	-0.877	10.11	0.9076
75	0.2466	0.1733	-0.714	9.944	0.893
76	0.25	0.1767	-0.758	9.988	0.8969
77	0.2533	0.18	-0.79	10.02	0.8998
78	0.2566	0.1833	-1.335	10.57	0.9487
79	0.26	0.1867	-1.699	10.93	0.9814
80	0.2633	0.19	-0.119	9.349	0.8395
81	0.2666	0.1933	0.313	8.917	0.8007
82	0.27	0.1967	-0.902	10.13	0.9098
83	0.2733	0.2	-0.677	9.907	0.8896
84	0.2766	0.2033	-0.708	9.938	0.8924
85	0.28	0.2067	-0.752	9.982	0.8964
86	0.2833	0.21	-0.946	10.18	0.9138
87	0.2866	0.2133	-0.702	9.932	0.8919
88	0.29	0.2167	-0.57	9.8	0.88
89	0.2933	0.22	-0.664	9.894	0.8885
90	0.2966	0.2233	-0.696	9.926	0.8913

91	0.3	0.2267	-0.645	9.875	0.8868
92	0.3033	0.23	-0.639	9.869	0.8862
93	0.3066	0.2333	-0.633	9.863	0.8857
94	0.31	0.2367	-0.627	9.857	0.8851
95	0.3133	0.24	-0.614	9.844	0.884
96	0.3166	0.2433	-0.608	9.838	0.8834
97	0.32	0.2467	-0.595	9.825	0.8823
98	0.3233	0.25	-0.589	9.819	0.8817
99	0.3266	0.2533	-0.583	9.813	0.8812
100	0.33	0.2567	-0.576	9.806	0.8806
101	0.3333	0.26	-0.57	9.8	0.88
102	0.35	0.2767	-0.526	9.756	0.8761
103	0.3666	0.2933	-0.551	9.781	0.8783
104	0.3833	0.31	-0.463	9.693	0.8704
105	0.4	0.3267	-0.432	9.662	0.8676
106	0.4166	0.3433	-0.407	9.637	0.8654
107	0.4333	0.36	-0.382	9.612	0.8631
108	0.45	0.3767	-0.363	9.593	0.8614
109	0.4666	0.3933	-0.338	9.568	0.8592
110	0.4833	0.41	-0.319	9.549	0.8575
111	0.5	0.4267	-0.3	9.53	0.8558
112	0.5166	0.4433	-0.288	9.518	0.8547
113	0.5333	0.46	-0.269	9.499	0.853
114	0.55	0.4767	-0.257	9.487	0.8519
115	0.5666	0.4933	-0.244	9.474	0.8508
116	0.5833	0.51	-0.232	9.462	0.8497
117	0.6	0.5267	-0.219	9.449	0.8485
118	0.6166	0.5433	-0.213	9.443	0.848
119	0.6333	0.56	-0.194	9.424	0.8463
120	0.65	0.5767	-0.188	9.418	0.8457
121	0.6666	0.5933	-0.181	9.411	0.8451
122	0.6833	0.61	-0.169	9.399	0.844
123	0.7	0.6267	-0.163	9.393	0.8435
124	0.7166	0.6433	-0.156	9.386	0.8429
125	0.7333	0.66	-0.15	9.38	0.8423
126	0.75	0.6767	-0.144	9.374	0.8418
127	0.7666	0.6933	-0.137	9.367	0.8411
128	0.7833	0.71	-0.131	9.361	0.8406
129	0.8	0.7267	-0.119	9.349	0.8395
130	0.8166	0.7433	-0.112	9.342	0.8389
131	0.8333	0.76	-0.106	9.336	0.8384
132	0.85	0.7767	-0.106	9.336	0.8384
133	0.8666	0.7933	-0.1	9.33	0.8378
134	0.8833	0.81	-9.4e-002	9.324	0.8373
135	0.9	0.8267	-9.4e-002	9.324	0.8373
136	0.9166	0.8433	-8.7e-002	9.317	0.8367
137	0.9333	0.86	-8.7e-002	9.317	0.8367
138	0.95	0.8767	-8.7e-002	9.317	0.8367
139	0.9666	0.8933	-8.1e-002	9.311	0.8361
140	0.9833	0.91	-8.1e-002	9.311	0.8361
141	1.	0.9267	-7.5e-002	9.305	0.8356
142	1.2	1.127	-4.3e-002	9.273	0.8327
143	1.4	1.327	-3.7e-002	9.267	0.8322
144	1.6	1.527	-2.5e-002	9.255	0.8311
145	1.8	1.727	-1.8e-002	9.248	0.8305
146	2.	1.927	-1.2e-002	9.242	0.8299
147	2.2	2.127	-1.2e-002	9.242	0.8299

148	2.4	2.327	-1.2e-002	9.242	0.8299
149	2.6	2.527	-6.e-003	9.236	0.8294
150	2.8	2.727	-6.e-003	9.236	0.8294
151	3.	2.927	-6.e-003	9.236	0.8294
152	3.2	3.127	-6.e-003	9.236	0.8294
153	3.4	3.327	-6.e-003	9.236	0.8294
154	3.6	3.527	-6.e-003	9.236	0.8294
155	3.8	3.727	0.	9.23	0.8288
156	4.	3.927	0.	9.23	0.8288
157	4.2	4.127	0.	9.23	0.8288
158	4.4	4.327	0.	9.23	0.8288
159	4.6	4.527	0.	9.23	0.8288
160	4.8	4.727	0.	9.23	0.8288
161	5.	4.927	0.	9.23	0.8288
162	5.2	5.127	0.	9.23	0.8288
163	5.4	5.327	6.e-003	9.224	0.8283
164	5.6	5.527	6.e-003	9.224	0.8283
165	5.8	5.727	6.e-003	9.224	0.8283
166	6.	5.927	6.e-003	9.224	0.8283
167	6.2	6.127	6.e-003	9.224	0.8283
168	6.4	6.327	6.e-003	9.224	0.8283
169	6.6	6.527	6.e-003	9.224	0.8283
170	6.8	6.727	6.e-003	9.224	0.8283
171	7.	6.927	6.e-003	9.224	0.8283
172	7.2	7.127	6.e-003	9.224	0.8283
173	7.4	7.327	6.e-003	9.224	0.8283
174	7.6	7.527	6.e-003	9.224	0.8283
175	7.8	7.727	6.e-003	9.224	0.8283
176	8.	7.927	6.e-003	9.224	0.8283
177	8.2	8.127	6.e-003	9.224	0.8283
178	8.4	8.327	6.e-003	9.224	0.8283
179	8.6	8.527	6.e-003	9.224	0.8283
180	8.8	8.727	6.e-003	9.224	0.8283
181	9.	8.927	6.e-003	9.224	0.8283
182	9.2	9.127	6.e-003	9.224	0.8283
183	9.4	9.327	1.2e-002	9.218	0.8278
184	9.6	9.527	6.e-003	9.224	0.8283
185	9.8	9.727	1.2e-002	9.218	0.8278
186	10.	9.927	6.e-003	9.224	0.8283

Field Hydraulic Conductivity Test November 7, 2000 **Arithmetic Graph**

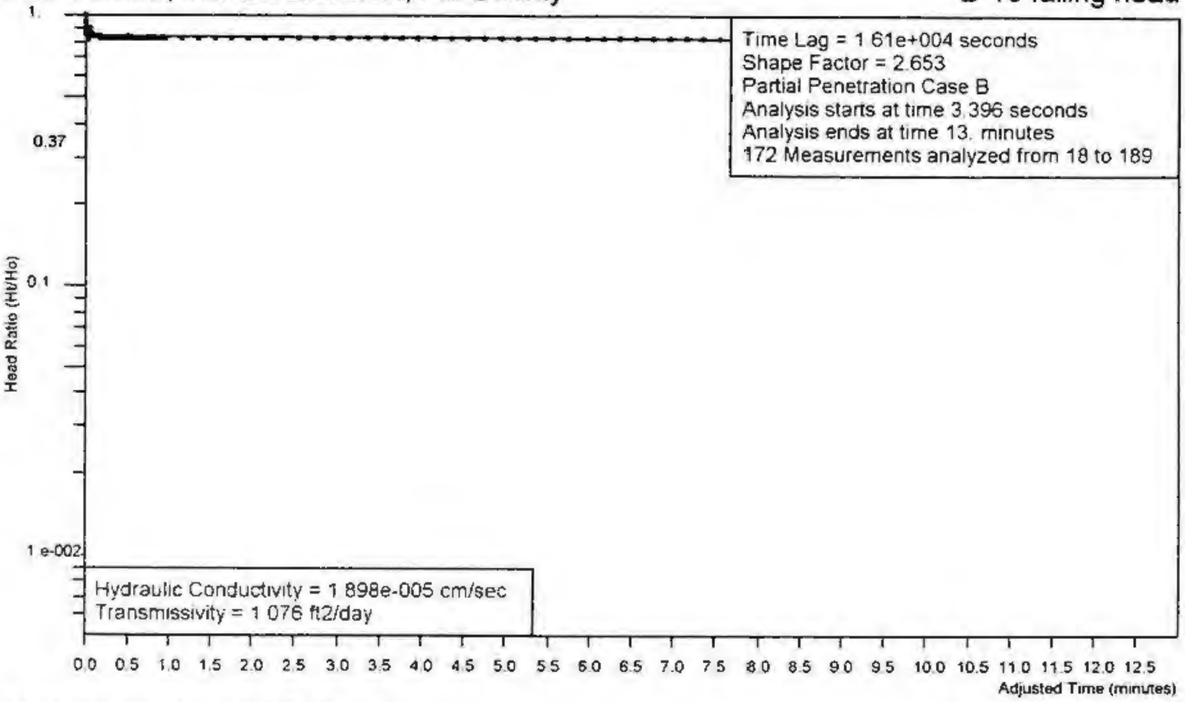
C&D Landfill, Inc. US 264 East, Pitt County B-13 falling head



Analysis by Starpoint Software

Field Hydraulic Conductivity Test November 7, 2000 **Hvorslev Graph**

C&D Landfill, Inc. US 264 East, Pitt County B-13 falling head

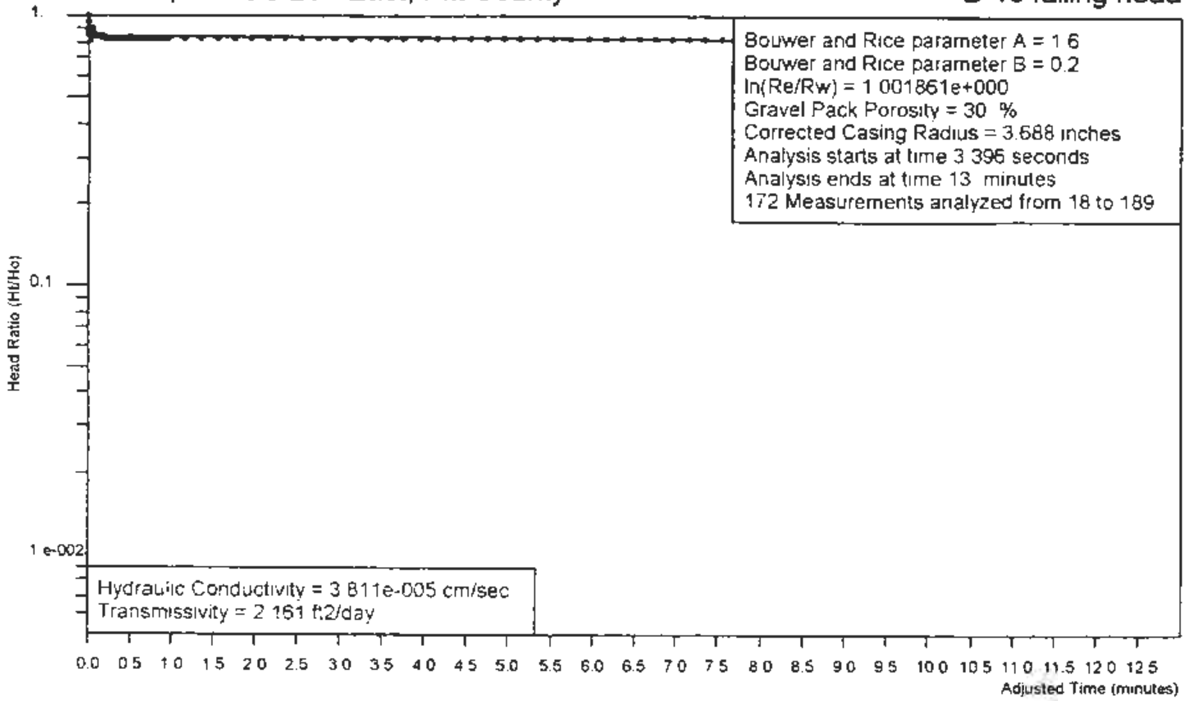


Analysis by Starpoint Software

Ho is 12.08 feet at 3.396 seconds

Field Hydraulic Conductivity Test November 7, 2000Bouwer and Rice Graph

C&D Landfill, Inc. US 264 East, Pitt County — B-13 falling head



Analysis by Starpoint Software

Ho is 12.08 feet at 3 396 seconds

Field Hydraulic Conductivity Test

Site Name:	C&D Landfill, Inc.
Location:	US 264 East, Pitt County
Test Date:	November 7, 2000
Import File:	C:\hermit datalogger\Pitt13s0

Well Label:	B-13 falling head
Aquifer Thickness:	20. feet
Screen Length:	2. feet
Casing Radius:	2. inches
Effective Radius:	6. inches
Gravel Pack Porosity:	30. %
Corrected Casing Radius:	3.688 inches
Static Water Level:	9.96 feet
Water Table to Screen Bottom:	6.35 feet
Anisotropy Ratio:	1.
Time Adjustment:	3.396 Seconds

Test starts with trial 17

There are 189 time and drawdown measurements

Maximum head is 12.08 feet

Minimum head is 0. feet

Trial	Time (minutes)	Adjusted Time (minutes)	Drawdown (feet)	Head (feet)	Head Ratio
1	0.	-5.66e-002	0.	9.96	0.8246
2	3.3e-003	-5.33e-002	0.	9.96	0.8246
3	6.6e-003	-5.e-002	-6.e-003	9.966	0.8251
4	1.e-002	-4.66e-002	0.	9.96	0.8246
5	1.33e-002	-4.33e-002	0.	9.96	0.8246
6	1.66e-002	-4.e-002	-0.457	10.42	0.8624
7	2.e-002	-3.66e-002	-0.463	10.42	0.8629
8	2.33e-002	-3.33e-002	-0.626	10.59	0.8764
9	2.66e-002	-3.e-002	-0.808	10.77	0.8915
10	3.e-002	-2.66e-002	-0.94	10.9	0.9024
11	3.33e-002	-2.33e-002	-1.14	11.1	0.919
12	3.66e-002	-2.e-002	-1.26	11.22	0.9289
13	4.e-002	-1.66e-002	-1.529	11.49	0.9512
14	4.33e-002	-1.33e-002	-0.871	10.83	0.8967
15	4.66e-002	-1.e-002	-1.26	11.22	0.9289
16	5.e-002	-6.6e-003	-1.234	11.19	0.9267
17	5.33e-002	-3.3e-003	-1.899	11.86	0.9818
18	5.66e-002	0.	-2.119	12.08	1.
19	6.e-002	3.4e-003	-1.604	11.56	0.9574
20	6.33e-002	6.7e-003	-0.419	10.38	0.8593
21	6.66e-002	1.e-002	-0.62	10.58	0.8759
22	7.e-002	1.34e-002	-0.971	10.93	0.905
23	7.33e-002	1.67e-002	-1.046	11.01	0.9112
24	7.66e-002	2.e-002	-0.959	10.92	0.904
25	8.e-002	2.34e-002	-0.852	10.81	0.8951
26	8.33e-002	2.67e-002	-0.814	10.77	0.892
27	8.66e-002	3.e-002	-0.783	10.74	0.8894
28	9.e-002	3.34e-002	-0.752	10.71	0.8868
29	9.33e-002	3.67e-002	-0.727	10.69	0.8848
30	9.66e-002	4.e-002	-0.564	10.52	0.8713
31	0.1	4.34e-002	0.125	9.835	0.8142
32	0.1033	4.67e-002	-0.426	10.39	0.8598
33	0.1066	5.e-002	-0.908	10.87	0.8997

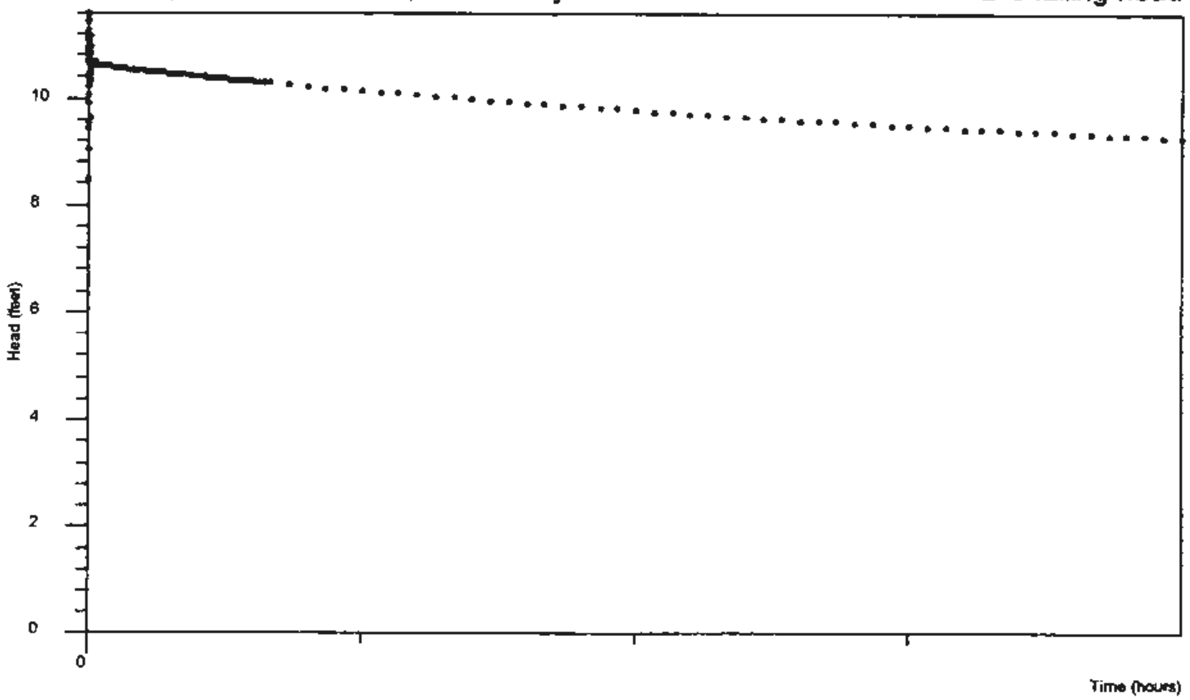
34	0.11	5.34e-002	-0.664	10.62	0.8795
35	0.1133	5.67e-002	-0.344	10.3	0.8531
36	0.1166	6.e-002	-0.188	10.15	0.8401
37	0.12	6.34e-002	-0.351	10.31	0.8536
38	0.1233	6.67e-002	-0.482	10.44	0.8645
39	0.1266	7.e-002	-0.269	10.23	0.8468
40	0.13	7.34e-002	-0.275	10.23	0.8473
41	0.1333	7.67e-002	-0.376	10.34	0.8557
42	0.1366	8.e-002	-0.319	10.28	0.851
43	0.14	8.34e-002	-0.288	10.25	0.8484
44	0.1433	8.67e-002	-0.275	10.23	0.8473
45	0.1466	9.e-002	-0.275	10.23	0.8473
46	0.15	9.34e-002	-0.263	10.22	0.8463
47	0.1533	9.67e-002	-0.256	10.22	0.8458
48	0.1566	1.e-001	-0.25	10.21	0.8453
49	0.16	0.1034	-0.238	10.2	0.8443
50	0.1633	0.1067	-0.231	10.19	0.8437
51	0.1666	0.11	-0.225	10.19	0.8432
52	0.17	0.1134	-0.219	10.18	0.8427
53	0.1733	0.1167	-0.219	10.18	0.8427
54	0.1766	0.12	-0.206	10.17	0.8416
55	0.18	0.1234	-0.206	10.17	0.8416
56	0.1833	0.1267	-0.2	10.16	0.8411
57	0.1866	0.13	-0.2	10.16	0.8411
58	0.19	0.1334	-0.188	10.15	0.8401
59	0.1933	0.1367	-0.188	10.15	0.8401
60	0.1966	0.14	-0.181	10.14	0.8396
61	0.2	0.1434	-0.181	10.14	0.8396
62	0.2033	0.1467	-0.175	10.14	0.8391
63	0.2066	0.15	-0.175	10.14	0.8391
64	0.21	0.1534	-0.169	10.13	0.8386
65	0.2133	0.1567	-0.169	10.13	0.8386
66	0.2166	0.16	-0.162	10.12	0.838
67	0.22	0.1634	-0.156	10.12	0.8375
68	0.2233	0.1667	-0.156	10.12	0.8375
69	0.2266	0.17	-0.156	10.12	0.8375
70	0.23	0.1734	-0.156	10.12	0.8375
71	0.2333	0.1767	-0.15	10.11	0.837
72	0.2366	0.18	-0.15	10.11	0.837
73	0.24	0.1834	-0.144	10.1	0.8365
74	0.2433	0.1867	-0.144	10.1	0.8365
75	0.2466	0.19	-0.144	10.1	0.8365
76	0.25	0.1934	-0.137	10.1	0.8359
77	0.2533	0.1967	-0.137	10.1	0.8359
78	0.2566	0.2	-0.137	10.1	0.8359
79	0.26	0.2034	-0.137	10.1	0.8359
80	0.2633	0.2067	-0.131	10.09	0.8354
81	0.2666	0.21	-0.131	10.09	0.8354
82	0.27	0.2134	-0.131	10.09	0.8354
83	0.2733	0.2167	-0.125	10.09	0.8349
84	0.2766	0.22	-0.125	10.09	0.8349
85	0.28	0.2234	-0.125	10.09	0.8349
86	0.2833	0.2267	-0.125	10.09	0.8349
87	0.2866	0.23	-0.125	10.09	0.8349
88	0.29	0.2334	-0.119	10.08	0.8344
89	0.2933	0.2367	-0.119	10.08	0.8344
90	0.2966	0.24	-0.119	10.08	0.8344

148	2.4	2.343	-2.109	10.45	0.9417
149	2.6	2.543	-2.103	10.44	0.9411
150	2.8	2.743	-2.097	10.44	0.9406
151	3.	2.943	-2.097	10.44	0.9406
152	3.2	3.143	-2.091	10.43	0.9401
153	3.4	3.343	-2.084	10.42	0.9394
154	3.6	3.543	-2.078	10.42	0.9389
155	3.8	3.743	-2.072	10.41	0.9384
156	4.	3.943	-2.072	10.41	0.9384
157	4.2	4.143	-2.065	10.4	0.9377
158	4.4	4.343	-2.059	10.4	0.9372
159	4.6	4.543	-2.053	10.39	0.9366
160	4.8	4.743	-2.047	10.39	0.9361
161	5.	4.943	-2.047	10.39	0.9361
162	5.2	5.143	-2.04	10.38	0.9355
163	5.4	5.343	-2.034	10.37	0.9349
164	5.6	5.543	-2.028	10.37	0.9344
165	5.8	5.743	-2.028	10.37	0.9344
166	6.	5.943	-2.021	10.36	0.9338
167	6.2	6.143	-2.015	10.36	0.9332
168	6.4	6.343	-2.009	10.35	0.9327
169	6.6	6.543	-2.009	10.35	0.9327
170	6.8	6.743	-2.003	10.34	0.9321
171	7.	6.943	-1.996	10.34	0.9315
172	7.2	7.143	-1.996	10.34	0.9315
173	7.4	7.343	-1.99	10.33	0.931
174	7.6	7.543	-1.984	10.32	0.9304
175	7.8	7.743	-1.984	10.32	0.9304
176	8.	7.943	-1.977	10.32	0.9298
177	8.2	8.143	-1.971	10.31	0.9293
178	8.4	8.343	-1.965	10.31	0.9287
179	8.6	8.543	-1.965	10.31	0.9287
180	8.8	8.743	-1.959	10.3	0.9282
181	9.	8.943	-1.952	10.29	0.9275
182	9.2	9.143	-1.946	10.29	0.927
183	9.4	9.343	-1.946	10.29	0.927
184	9.6	9.543	-1.94	10.28	0.9265
185	9.8	9.743	-1.934	10.27	0.9259
186	10.	9.943	-1.934	10.27	0.9259
187	11.	10.94	-1.915	10.25	0.9242
188	12.	11.94	-1.883	10.22	0.9213
189	13.	12.94	-1.864	10.2	0.9196
190	14.	13.94	-1.846	10.19	0.918
191	15.	14.94	-1.827	10.17	0.9163
192	16.	15.94	-1.808	10.15	0.9146
193	17.	16.94	-1.789	10.13	0.9129
194	18.	17.94	-1.77	10.11	0.9111
195	19.	18.94	-1.751	10.09	0.9094
196	20.	19.94	-1.733	10.07	0.9078
197	21.	20.94	-1.714	10.05	0.9061
198	22.	21.94	-1.695	10.04	0.9044
199	23.	22.94	-1.676	10.02	0.9027
200	24.	23.94	-1.663	10.	0.9015
201	25.	24.94	-1.638	9.978	0.8992
202	26.	25.94	-1.626	9.966	0.8982
203	27.	26.94	-1.607	9.947	0.8964
204	28.	27.94	-1.588	9.928	0.8947

205	29.	28.94	-1.576	9.916	0.8937
206	30.	29.94	-1.557	9.897	0.8919
207	31.	30.94	-1.538	9.878	0.8902
208	32.	31.94	-1.525	9.865	0.8891
209	33.	32.94	-1.506	9.846	0.8873
210	34.	33.94	-1.494	9.834	0.8863
211	35.	34.94	-1.475	9.815	0.8846
212	36.	35.94	-1.463	9.803	0.8835
213	37.	36.94	-1.444	9.784	0.8818
214	38.	37.94	-1.431	9.771	0.8806
215	39.	38.94	-1.412	9.752	0.8789
216	40.	39.94	-1.4	9.74	0.8778
217	41.	40.94	-1.387	9.727	0.8766
218	42.	41.94	-1.368	9.708	0.8749
219	43.	42.94	-1.356	9.696	0.8738
220	44.	43.94	-1.343	9.683	0.8727
221	45.	44.94	-1.324	9.664	0.8709
222	46.	45.94	-1.312	9.652	0.8699
223	47.	46.94	-1.299	9.639	0.8687
224	48.	47.94	-1.287	9.627	0.8676
225	49.	48.94	-1.274	9.614	0.8664
226	50.	49.94	-1.255	9.595	0.8647
227	51.	50.94	-1.243	9.583	0.8636
228	52.	51.94	-1.23	9.57	0.8625
229	53.	52.94	-1.218	9.558	0.8614
230	54.	53.94	-1.205	9.545	0.8602
231	55.	54.94	-1.192	9.532	0.859
232	56.	55.94	-1.18	9.52	0.858
233	57.	56.94	-1.174	9.514	0.8574
234	58.	57.94	-1.161	9.501	0.8563
235	59.	58.94	-1.142	9.482	0.8545
236	60.	59.94	-1.13	9.47	0.8535

Field Hydraulic Conductivity Test November 7, 2000 **Arithmetic Graph**

C&D Landfill, Inc. US 264 East, Pitt County B-8 falling head



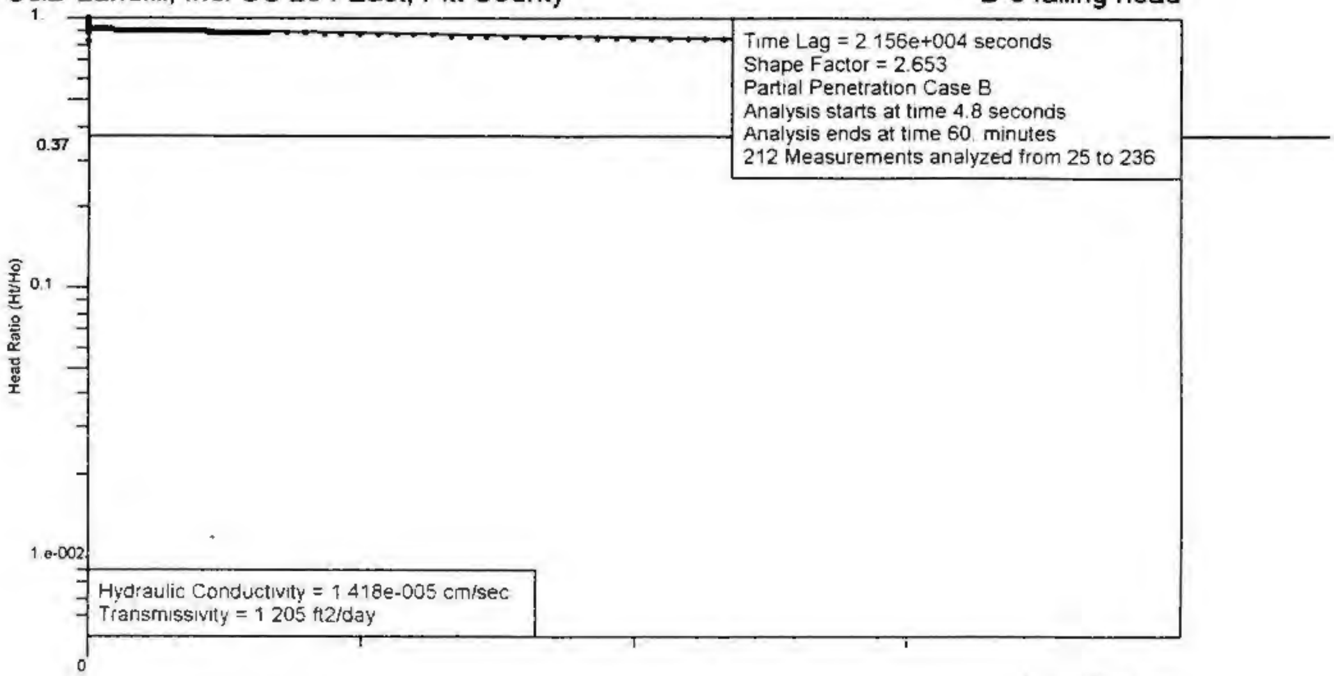
Analysis by Starpoint Software

Field Hydraulic Conductivity Test November 7, 2000

Hvorslev Graph

C&D Landfill, Inc. US 264 East, Pitt County

B-8 falling head



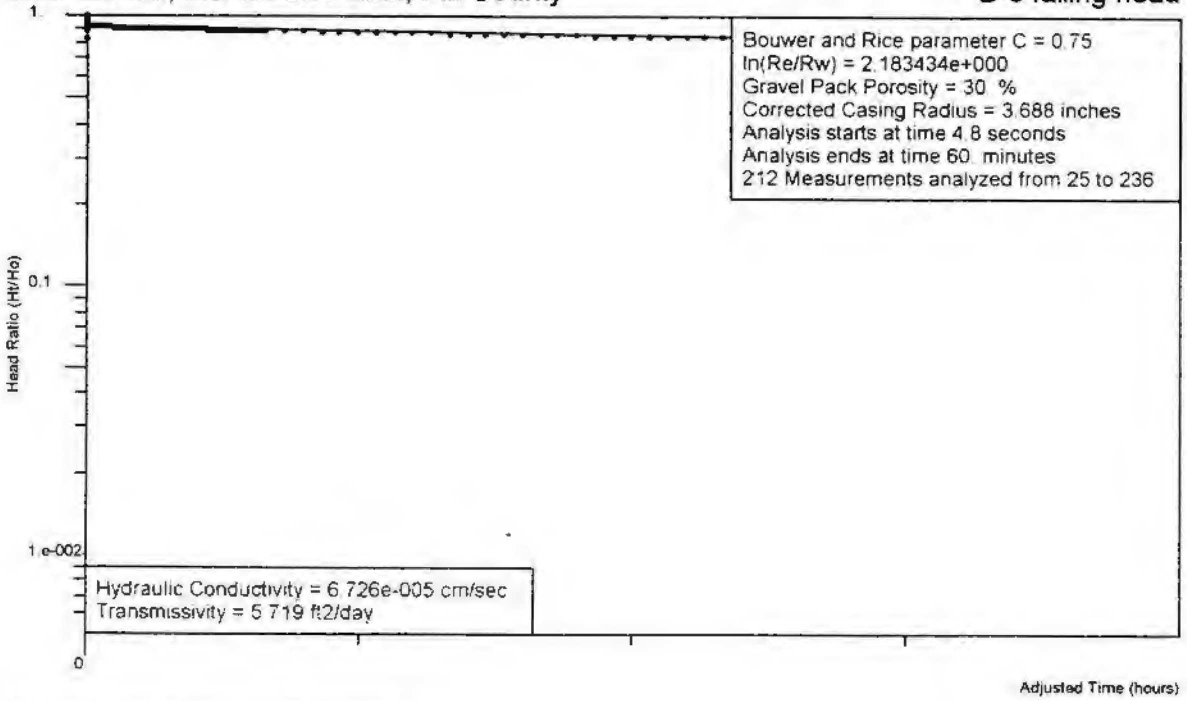
Analysis by Starpoint Software

Ho is 11.56 feet at 4.8 seconds

Field Hydraulic Conductivity Test November 7, 2000Bouwer and Rice Graph

C&D Landfill, Inc. US 264 East, Pitt County

B-8 falling head



Analysis by Starpoint Software

Ho is 11.56 feet at 4.8 seconds

Field Hydraulic Conductivity Test

Site Name: C&D Landfill, Inc.
Location: US 264 East, Pitt County
Test Date: November 7, 2000
Import File: C:\hermit datalogger\Pitt8s0

Well Label: B-8 falling head
Aquifer Thickness: 30. feet
Screen Length: 2. feet
Casing Radius: 2. inches
Effective Radius: 6. inches
Gravel Pack Porosity: 30. %
Corrected Casing Radius: 3.688 inches
Static Water Level: 8.48 feet
Water Table to Screen Bottom: 29.18 feet
Anisotropy Ratio: 1.
Time Adjustment: 4.8 Seconds
Test starts with trial 24
There are 236 time and drawdown measurements
Maximum head is 11.56 feet
Minimum head is 0. feet

Trial	Time (minutes)	Adjusted Time (minutes)	Drawdown (feet)	Head (feet)	Head Ratio
1	0.	-8.e-002	6.e-003	8.474	0.7328
2	3.3e-003	-7.67e-002	0.	8.48	0.7333
3	6.6e-003	-7.34e-002	-6.e-003	8.486	0.7338
4	1.e-002	-7.e-002	-0.565	9.045	0.7822
5	1.33e-002	-6.67e-002	-0.954	9.434	0.8158
6	1.66e-002	-6.34e-002	-1.061	9.541	0.8251
7	2.e-002	-6.e-002	-1.08	9.56	0.8267
8	2.33e-002	-5.67e-002	-1.413	9.893	0.8555
9	2.66e-002	-5.34e-002	-1.57	10.05	0.8691
10	3.e-002	-5.e-002	-1.752	10.23	0.8848
11	3.33e-002	-4.67e-002	-1.972	10.45	0.9038
12	3.66e-002	-4.34e-002	-2.16	10.64	0.9201
13	4.e-002	-4.e-002	-1.903	10.38	0.8979
14	4.33e-002	-3.67e-002	-2.148	10.63	0.9191
15	4.66e-002	-3.34e-002	-2.261	10.74	0.9288
16	5.e-002	-3.e-002	-2.644	11.12	0.962
17	5.33e-002	-2.67e-002	-2.713	11.19	0.9679
18	5.66e-002	-2.34e-002	-2.393	10.87	0.9402
19	6.e-002	-2.e-002	-2.613	11.09	0.9593
20	6.33e-002	-1.67e-002	-2.946	11.43	0.9881
21	6.66e-002	-1.34e-002	-2.952	11.43	0.9886
22	7.e-002	-1.e-002	-2.939	11.42	0.9875
23	7.33e-002	-6.7e-003	-2.983	11.46	0.9913
24	7.66e-002	-3.4e-003	-2.983	11.46	0.9913
25	8.e-002	0.	-3.084	11.56	1.
26	8.33e-002	3.3e-003	-3.059	11.54	0.9978
27	8.66e-002	6.6e-003	-2.789	11.27	0.9745
28	9.e-002	1.e-002	-2.575	11.06	0.956
29	9.33e-002	1.33e-002	-1.79	10.27	0.8881
30	9.66e-002	1.66e-002	-1.764	10.24	0.8859
31	0.1	2.e-002	-1.972	10.45	0.9038
32	0.1033	2.33e-002	-2.33	10.81	0.9348
33	0.1066	2.66e-002	-2.38	10.86	0.9391

34	0.11	3.e-002	-2.493	10.97	0.9489
35	0.1133	3.33e-002	-2.657	11.14	0.9631
36	0.1166	3.66e-002	-2.003	10.48	0.9065
37	0.12	4.e-002	-1.161	9.641	0.8337
38	0.1233	4.33e-002	-2.041	10.52	0.9098
39	0.1266	4.66e-002	-2.663	11.14	0.9636
40	0.13	5.e-002	-2.493	10.97	0.9489
41	0.1333	5.33e-002	-1.966	10.45	0.9033
42	0.1366	5.66e-002	-1.846	10.33	0.8929
43	0.14	6.e-002	-2.198	10.68	0.9234
44	0.1433	6.33e-002	-2.38	10.86	0.9391
45	0.1466	6.66e-002	-2.217	10.7	0.925
46	0.15	7.e-002	-2.041	10.52	0.9098
47	0.1533	7.33e-002	-2.104	10.58	0.9153
48	0.1566	7.66e-002	-2.204	10.68	0.9239
49	0.16	8.e-002	-2.217	10.7	0.925
50	0.1633	8.33e-002	-2.16	10.64	0.9201
51	0.1666	8.66e-002	-2.129	10.61	0.9174
52	0.17	9.e-002	-2.198	10.68	0.9234
53	0.1733	9.33e-002	-2.173	10.65	0.9212
54	0.1766	9.66e-002	-2.185	10.67	0.9223
55	0.18	0.1	-2.123	10.6	0.9169
56	0.1833	0.1033	-2.135	10.62	0.9179
57	0.1866	0.1066	-2.173	10.65	0.9212
58	0.19	0.11	-2.173	10.65	0.9212
59	0.1933	0.1133	-2.16	10.64	0.9201
60	0.1966	0.1166	-2.16	10.64	0.9201
61	0.2	0.12	-2.16	10.64	0.9201
62	0.2033	0.1233	-2.16	10.64	0.9201
63	0.2066	0.1266	-2.16	10.64	0.9201
64	0.21	0.13	-2.16	10.64	0.9201
65	0.2133	0.1333	-2.16	10.64	0.9201
66	0.2166	0.1366	-2.16	10.64	0.9201
67	0.22	0.14	-2.16	10.64	0.9201
68	0.2233	0.1433	-2.16	10.64	0.9201
69	0.2266	0.1466	-2.16	10.64	0.9201
70	0.23	0.15	-2.16	10.64	0.9201
71	0.2333	0.1533	-2.16	10.64	0.9201
72	0.2366	0.1566	-2.16	10.64	0.9201
73	0.24	0.16	-2.16	10.64	0.9201
74	0.2433	0.1633	-2.16	10.64	0.9201
75	0.2466	0.1666	-2.16	10.64	0.9201
76	0.25	0.17	-2.16	10.64	0.9201
77	0.2533	0.1733	-2.16	10.64	0.9201
78	0.2566	0.1766	-2.16	10.64	0.9201
79	0.26	0.18	-2.16	10.64	0.9201
80	0.2633	0.1833	-2.16	10.64	0.9201
81	0.2666	0.1866	-2.16	10.64	0.9201
82	0.27	0.19	-2.16	10.64	0.9201
83	0.2733	0.1933	-2.167	10.65	0.9207
84	0.2766	0.1966	-2.141	10.62	0.9185
85	0.28	0.2	-2.16	10.64	0.9201
86	0.2833	0.2033	-2.16	10.64	0.9201
87	0.2866	0.2066	-2.154	10.63	0.9196
88	0.29	0.21	-2.16	10.64	0.9201
89	0.2933	0.2133	-2.16	10.64	0.9201
90	0.2966	0.2166	-2.154	10.63	0.9196

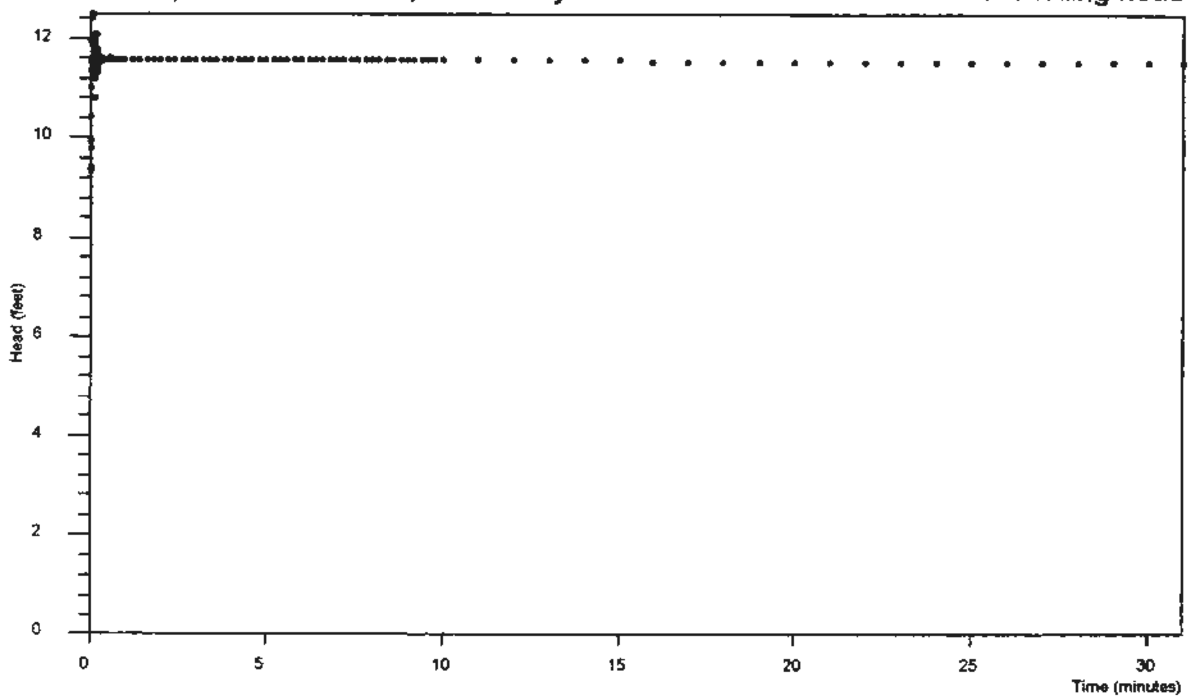
91	0.3	0.22	-2.154	10.63	0.9196
92	0.3033	0.2233	-2.154	10.63	0.9196
93	0.3066	0.2266	-2.16	10.64	0.9201
94	0.31	0.23	-2.16	10.64	0.9201
95	0.3133	0.2333	-2.154	10.63	0.9196
96	0.3166	0.2366	-2.154	10.63	0.9196
97	0.32	0.24	-2.154	10.63	0.9196
98	0.3233	0.2433	-2.154	10.63	0.9196
99	0.3266	0.2466	-2.154	10.63	0.9196
100	0.33	0.25	-2.154	10.63	0.9196
101	0.3333	0.2533	-2.154	10.63	0.9196
102	0.35	0.27	-2.154	10.63	0.9196
103	0.3666	0.2866	-2.217	10.7	0.925
104	0.3833	0.3033	-2.148	10.63	0.9191
105	0.4	0.32	-2.148	10.63	0.9191
106	0.4166	0.3366	-2.148	10.63	0.9191
107	0.4333	0.3533	-2.148	10.63	0.9191
108	0.45	0.37	-2.148	10.63	0.9191
109	0.4666	0.3866	-2.148	10.63	0.9191
110	0.4833	0.4033	-2.148	10.63	0.9191
111	0.5	0.42	-2.148	10.63	0.9191
112	0.5166	0.4366	-2.141	10.62	0.9185
113	0.5333	0.4533	-2.148	10.63	0.9191
114	0.55	0.47	-2.141	10.62	0.9185
115	0.5666	0.4866	-2.141	10.62	0.9185
116	0.5833	0.5033	-2.141	10.62	0.9185
117	0.6	0.52	-2.141	10.62	0.9185
118	0.6166	0.5366	-2.141	10.62	0.9185
119	0.6333	0.5533	-2.141	10.62	0.9185
120	0.65	0.57	-2.141	10.62	0.9185
121	0.6666	0.5866	-2.135	10.62	0.9179
122	0.6833	0.6033	-2.135	10.62	0.9179
123	0.7	0.62	-2.135	10.62	0.9179
124	0.7166	0.6366	-2.135	10.62	0.9179
125	0.7333	0.6533	-2.135	10.62	0.9179
126	0.75	0.67	-2.135	10.62	0.9179
127	0.7666	0.6866	-2.135	10.62	0.9179
128	0.7833	0.7033	-2.135	10.62	0.9179
129	0.8	0.72	-2.135	10.62	0.9179
130	0.8166	0.7366	-2.135	10.62	0.9179
131	0.8333	0.7533	-2.129	10.61	0.9174
132	0.85	0.77	-2.129	10.61	0.9174
133	0.8666	0.7866	-2.129	10.61	0.9174
134	0.8833	0.8033	-2.129	10.61	0.9174
135	0.9	0.82	-2.129	10.61	0.9174
136	0.9166	0.8366	-2.129	10.61	0.9174
137	0.9333	0.8533	-2.129	10.61	0.9174
138	0.95	0.87	-2.129	10.61	0.9174
139	0.9666	0.8866	-2.123	10.6	0.9169
140	0.9833	0.9033	-2.123	10.6	0.9169
141	1.	0.92	-2.123	10.6	0.9169
142	1.2	1.12	-2.11	10.59	0.9158
143	1.4	1.32	-2.104	10.58	0.9153
144	1.6	1.52	-2.091	10.57	0.9141
145	1.8	1.72	-2.085	10.57	0.9136
146	2.	1.92	-2.079	10.56	0.9131
147	2.2	2.12	-2.066	10.55	0.912

148	2.4	2.32	-2.06	10.54	0.9114
149	2.6	2.52	-2.053	10.53	0.9108
150	2.8	2.72	-2.041	10.52	0.9098
151	3.	2.92	-2.035	10.52	0.9093
152	3.2	3.12	-2.028	10.51	0.9087
153	3.4	3.32	-2.022	10.5	0.9082
154	3.6	3.52	-2.016	10.5	0.9076
155	3.8	3.72	-2.009	10.49	0.907
156	4.	3.92	-1.997	10.48	0.906
157	4.2	4.12	-1.991	10.47	0.9055
158	4.4	4.32	-1.984	10.46	0.9049
159	4.6	4.52	-1.978	10.46	0.9044
160	4.8	4.72	-1.972	10.45	0.9038
161	5.	4.92	-1.966	10.45	0.9033
162	5.2	5.12	-1.959	10.44	0.9027
163	5.4	5.32	-1.953	10.43	0.9022
164	5.6	5.52	-1.94	10.42	0.9011
165	5.8	5.72	-1.94	10.42	0.9011
166	6.	5.92	-1.928	10.41	0.9
167	6.2	6.12	-1.921	10.4	0.8994
168	6.4	6.32	-1.915	10.4	0.8989
169	6.6	6.52	-1.909	10.39	0.8984
170	6.8	6.72	-1.903	10.38	0.8979
171	7.	6.92	-1.896	10.38	0.8973
172	7.2	7.12	-1.89	10.37	0.8967
173	7.4	7.32	-1.884	10.36	0.8962
174	7.6	7.52	-1.878	10.36	0.8957
175	7.8	7.72	-1.871	10.35	0.8951
176	8.	7.92	-1.865	10.35	0.8946
177	8.2	8.12	-1.859	10.34	0.8941
178	8.4	8.32	-1.852	10.33	0.8935
179	8.6	8.52	-1.846	10.33	0.8929
180	8.8	8.72	-1.84	10.32	0.8924
181	9.	8.92	-1.834	10.31	0.8919
182	9.2	9.12	-1.827	10.31	0.8913
183	9.4	9.32	-1.821	10.3	0.8908
184	9.6	9.52	-1.815	10.3	0.8903
185	9.8	9.72	-1.808	10.29	0.8897
186	10.	9.92	-1.802	10.28	0.8891
187	11.	10.92	-1.777	10.26	0.887
188	12.	11.92	-1.739	10.22	0.8837
189	13.	12.92	-1.714	10.19	0.8815
190	14.	13.92	-1.683	10.16	0.8788
191	15.	14.92	-1.658	10.14	0.8767
192	16.	15.92	-1.633	10.11	0.8745
193	17.	16.92	-1.607	10.09	0.8723
194	18.	17.92	-1.582	10.06	0.8701
195	19.	18.92	-1.557	10.04	0.868
196	20.	19.92	-1.532	10.01	0.8658
197	21.	20.92	-1.507	9.987	0.8636
198	22.	21.92	-1.482	9.962	0.8615
199	23.	22.92	-1.457	9.937	0.8593
200	24.	23.92	-1.432	9.912	0.8571
201	25.	24.92	-1.413	9.893	0.8555
202	26.	25.92	-1.388	9.868	0.8533
203	27.	26.92	-1.369	9.849	0.8517
204	28.	27.92	-1.344	9.824	0.8495

205	29.	28.92	-1.331	9.811	0.8484
206	30.	29.92	-1.3	9.78	0.8457
207	31.	30.92	-1.281	9.761	0.8441
208	32.	31.92	-1.262	9.742	0.8424
209	33.	32.92	-1.243	9.723	0.8408
210	34.	33.92	-1.224	9.704	0.8392
211	35.	34.92	-1.199	9.679	0.837
212	36.	35.92	-1.18	9.66	0.8354
213	37.	36.92	-1.168	9.648	0.8343
214	38.	37.92	-1.143	9.623	0.8322
215	39.	38.92	-1.13	9.61	0.831
216	40.	39.92	-1.111	9.591	0.8294
217	41.	40.92	-1.092	9.572	0.8277
218	42.	41.92	-1.073	9.553	0.8261
219	43.	42.92	-1.055	9.535	0.8245
220	44.	43.92	-1.036	9.516	0.8229
221	45.	44.92	-1.023	9.503	0.8218
222	46.	45.92	-1.004	9.484	0.8201
223	47.	46.92	-0.992	9.472	0.8191
224	48.	47.92	-0.973	9.453	0.8175
225	49.	48.92	-0.96	9.44	0.8163
226	50.	49.92	-0.942	9.422	0.8148
227	51.	50.92	-0.929	9.409	0.8136
228	52.	51.92	-0.91	9.39	0.812
229	53.	52.92	-0.898	9.378	0.811
230	54.	53.92	-0.879	9.359	0.8093
231	55.	54.92	-0.866	9.346	0.8082
232	56.	55.92	-0.854	9.334	0.8072
233	57.	56.92	-0.835	9.315	0.8055
234	58.	57.92	-0.822	9.302	0.8044
235	59.	58.92	-0.81	9.29	0.8034
236	60.	59.92	-0.803	9.283	0.8027

Field Hydraulic Conductivity Test November 7, 2000 **Arithmetic Graph**

C&D Landfill, Inc. US 264 East, Pitt County B-9 falling head



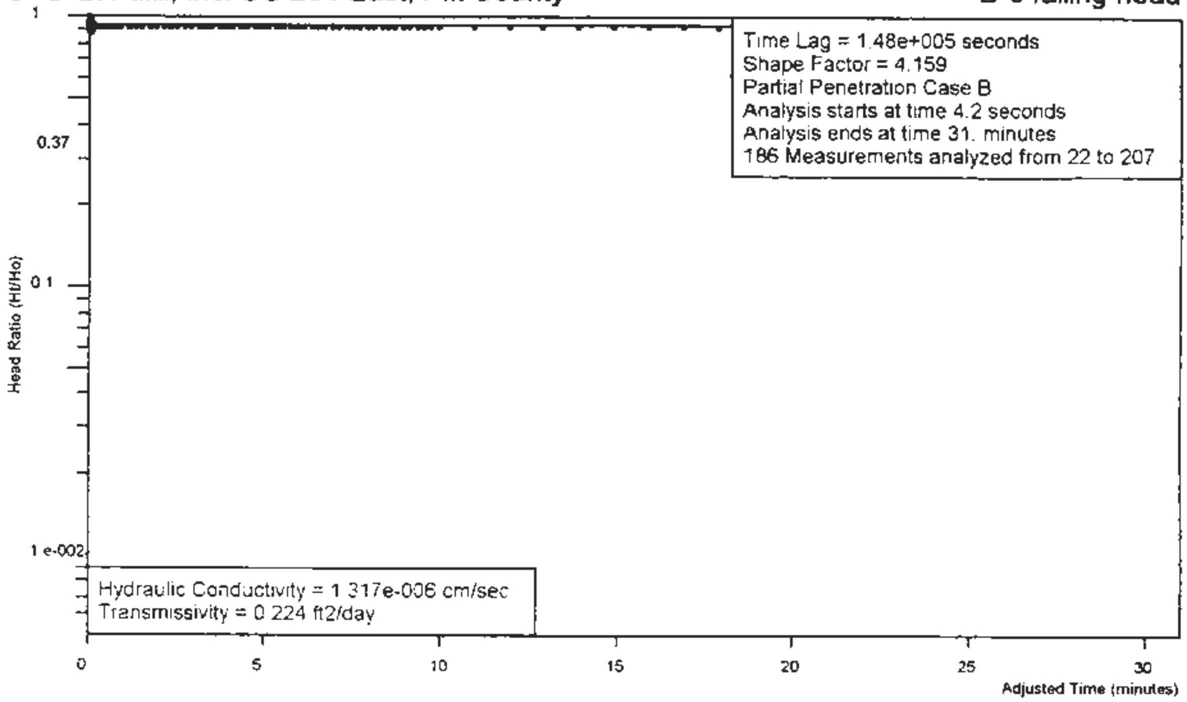
Analysis by Starpoint Software

Field Hydraulic Conductivity Test November 7, 2000

C&D Landfill, Inc. US 264 East, Pitt County

Hvorslev Graph

B-9 falling head

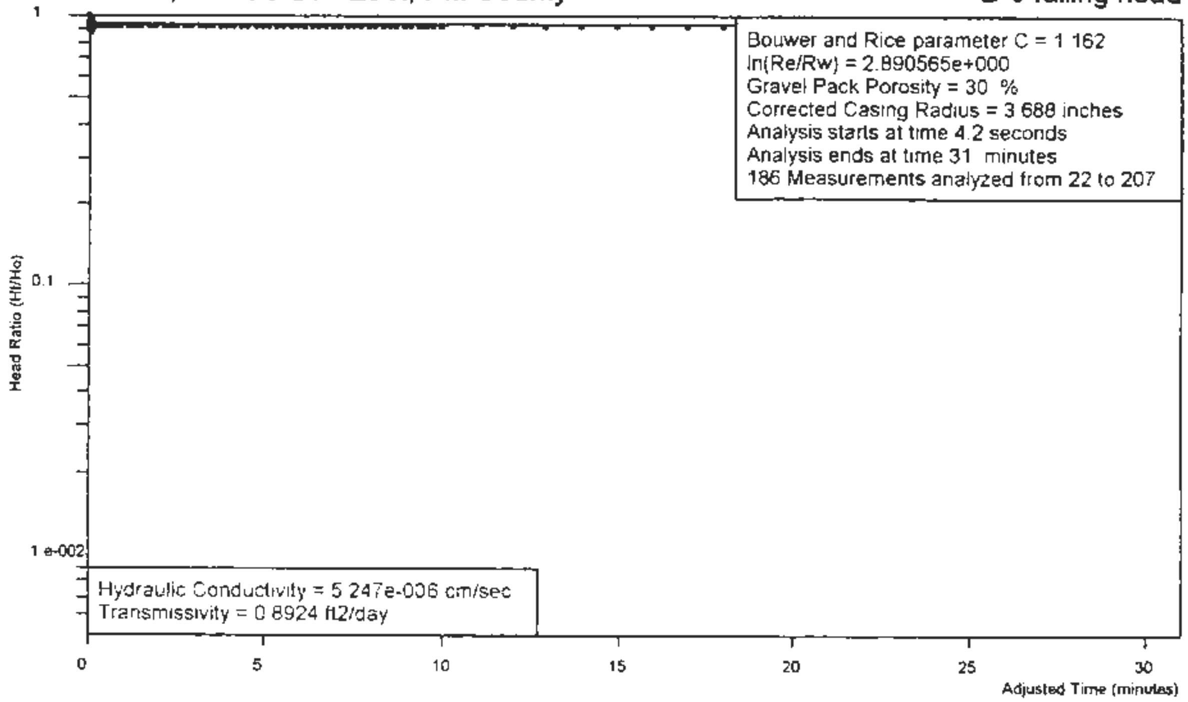


Analysis by Starpoint Software

Ho is 12.47 feet at 4.2 seconds

Field Hydraulic Conductivity Test November 7, 2000Bouwer and Rice Graph

C&D Landfill, Inc. US 264 East, Pitt County B-9 falling head



Analysis by Starpoint Software

Ho is 12.47 feet at 4.2 seconds

Field Hydraulic Conductivity Test

Site Name:	C&D Landfill, Inc.
Location:	US 264 East, Pitt County
Test Date:	November 7, 2000
Import File:	C:\hermit datalogger\Pitt9s0

Well Label:	B-9 falling head
Aquifer Thickness:	60. feet
Screen Length:	5. feet
Casing Radius:	2. inches
Effective Radius:	6. inches
Gravel Pack Porosity:	30. %
Corrected Casing Radius:	3.688 inches
Static Water Level:	9.32 feet
Water Table to Screen Bottom:	62.04 feet
Anisotropy Ratio:	1.
Time Adjustment:	4.2 Seconds

Test starts with trial 21
There are 207 time and drawdown measurements
Maximum head is 12.47 feet
Minimum head is 0. feet

Trial	Time (minutes)	Adjusted Time (minutes)	Drawdown (feet)	Head (feet)	Head Ratio
1	0.	-7.e-002	-6.9e-002	9.389	0.7527
2	3.3e-003	-6.67e-002	-6.2e-002	9.382	0.7521
3	6.6e-003	-6.34e-002	0.	9.32	0.7472
4	1.e-002	-6.e-002	-6.9e-002	9.389	0.7527
5	1.33e-002	-5.67e-002	-0.119	9.439	0.7567
6	1.66e-002	-5.34e-002	-7.5e-002	9.395	0.7532
7	2.e-002	-5.e-002	-1.2e-002	9.332	0.7481
8	2.33e-002	-4.67e-002	-2.5e-002	9.345	0.7492
9	2.66e-002	-4.34e-002	-5.6e-002	9.376	0.7516
10	3.e-002	-4.e-002	-0.483	9.803	0.7859
11	3.33e-002	-3.67e-002	-0.647	9.967	0.799
12	3.66e-002	-3.34e-002	-0.59	9.91	0.7945
13	4.e-002	-3.e-002	-1.13	10.45	0.8377
14	4.33e-002	-2.67e-002	-1.721	11.04	0.8851
15	4.66e-002	-2.34e-002	-2.186	11.51	0.9224
16	5.e-002	-2.e-002	-2.236	11.56	0.9264
17	5.33e-002	-1.67e-002	-2.054	11.37	0.9118
18	5.66e-002	-1.34e-002	-2.607	11.93	0.9561
19	6.e-002	-1.e-002	-2.475	11.8	0.9456
20	6.33e-002	-6.7e-003	-2.708	12.03	0.9642
21	6.66e-002	-3.4e-003	-3.104	12.42	0.996
22	7.e-002	0.	-3.154	12.47	1.
23	7.33e-002	3.3e-003	-2.5	11.82	0.9476
24	7.66e-002	6.6e-003	-2.394	11.71	0.9391
25	8.e-002	1.e-002	-2.387	11.71	0.9385
26	8.33e-002	1.33e-002	-2.123	11.44	0.9173
27	8.66e-002	1.66e-002	-2.324	11.64	0.9335
28	9.e-002	2.e-002	-2.551	11.87	0.9517
29	9.33e-002	2.33e-002	-2.595	11.92	0.9552
30	9.66e-002	2.66e-002	-2.519	11.84	0.9491
31	0.1	3.e-002	-2.538	11.86	0.9506
32	0.1033	3.33e-002	-2.727	12.05	0.9658
33	0.1066	3.66e-002	-2.72	12.04	0.9652

34	0.11	4.e-002	-2.243	11.56	0.927
35	0.1133	4.33e-002	-2.563	11.88	0.9526
36	0.1166	4.66e-002	-2.092	11.41	0.9149
37	0.12	5.e-002	-1.991	11.31	0.9068
38	0.1233	5.33e-002	-1.878	11.2	0.8977
39	0.1266	5.66e-002	-2.324	11.64	0.9335
40	0.13	6.e-002	-2.544	11.86	0.9511
41	0.1333	6.33e-002	-2.695	12.02	0.9632
42	0.1366	6.66e-002	-2.155	11.48	0.9199
43	0.14	7.e-002	-2.35	11.67	0.9355
44	0.1433	7.33e-002	-1.853	11.17	0.8957
45	0.1466	7.66e-002	-1.979	11.3	0.9058
46	0.15	8.e-002	-2.5	11.82	0.9476
47	0.1533	8.33e-002	-2.513	11.83	0.9486
48	0.1566	8.66e-002	-2.614	11.93	0.9567
49	0.16	9.e-002	-2.733	12.05	0.9662
50	0.1633	9.33e-002	-2.664	11.98	0.9607
51	0.1666	9.66e-002	-2.306	11.63	0.932
52	0.17	0.1	-1.897	11.22	0.8992
53	0.1733	0.1033	-1.507	10.83	0.868
54	0.1766	0.1066	-2.312	11.63	0.9325
55	0.18	0.11	-2.746	12.07	0.9673
56	0.1833	0.1133	-2.444	11.76	0.9431
57	0.1866	0.1166	-1.979	11.3	0.9058
58	0.19	0.12	-2.048	11.37	0.9113
59	0.1933	0.1233	-2.4	11.72	0.9396
60	0.1966	0.1266	-2.469	11.79	0.9451
61	0.2	0.13	-2.255	11.57	0.9279
62	0.2033	0.1333	-2.111	11.43	0.9164
63	0.2066	0.1366	-2.236	11.56	0.9264
64	0.21	0.14	-2.375	11.7	0.9376
65	0.2133	0.1433	-2.324	11.64	0.9335
66	0.2166	0.1466	-2.211	11.53	0.9244
67	0.22	0.15	-2.224	11.54	0.9254
68	0.2233	0.1533	-2.293	11.61	0.931
69	0.2266	0.1566	-2.306	11.63	0.932
70	0.23	0.16	-2.274	11.59	0.9295
71	0.2333	0.1633	-2.249	11.57	0.9274
72	0.2366	0.1666	-2.268	11.59	0.929
73	0.24	0.17	-2.287	11.61	0.9305
74	0.2433	0.1733	-2.274	11.59	0.9295
75	0.2466	0.1766	-2.274	11.59	0.9295
76	0.25	0.18	-2.268	11.59	0.929
77	0.2533	0.1833	-2.274	11.59	0.9295
78	0.2566	0.1866	-2.268	11.59	0.929
79	0.26	0.19	-2.268	11.59	0.929
80	0.2633	0.1933	-2.274	11.59	0.9295
81	0.2666	0.1966	-2.268	11.59	0.929
82	0.27	0.2	-2.274	11.59	0.9295
83	0.2733	0.2033	-2.274	11.59	0.9295
84	0.2766	0.2066	-2.274	11.59	0.9295
85	0.28	0.21	-2.274	11.59	0.9295
86	0.2833	0.2133	-2.274	11.59	0.9295
87	0.2866	0.2166	-2.268	11.59	0.929
88	0.29	0.22	-2.274	11.59	0.9295
89	0.2933	0.2233	-2.262	11.58	0.9285
90	0.2966	0.2266	-2.287	11.61	0.9305

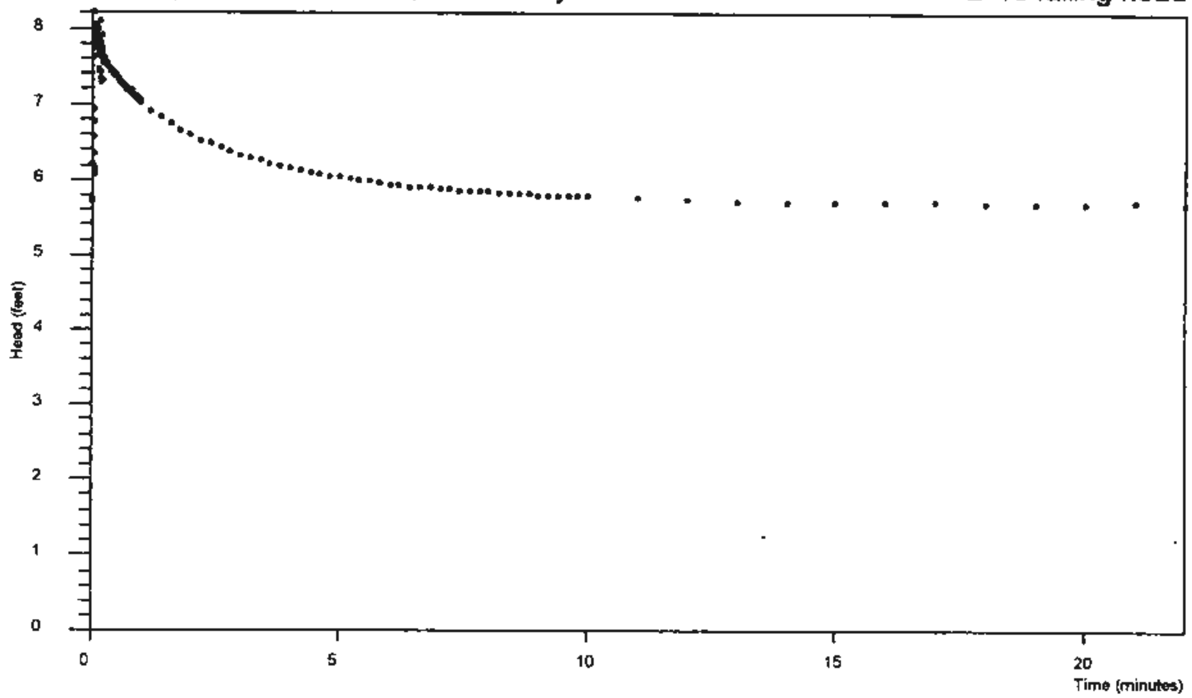
91	0.3	0.23	-2.287	11.61	0.9305
92	0.3033	0.2333	-2.224	11.54	0.9254
93	0.3066	0.2366	-2.287	11.61	0.9305
94	0.31	0.24	-2.274	11.59	0.9295
95	0.3133	0.2433	-2.262	11.58	0.9285
96	0.3166	0.2466	-2.281	11.6	0.93
97	0.32	0.25	-2.249	11.57	0.9274
98	0.3233	0.2533	-2.268	11.59	0.929
99	0.3266	0.2566	-2.274	11.59	0.9295
100	0.33	0.26	-2.262	11.58	0.9285
101	0.3333	0.2633	-2.268	11.59	0.929
102	0.35	0.28	-2.274	11.59	0.9295
103	0.3666	0.2966	-2.268	11.59	0.929
104	0.3833	0.3133	-2.268	11.59	0.929
105	0.4	0.33	-2.268	11.59	0.929
106	0.4166	0.3466	-2.268	11.59	0.929
107	0.4333	0.3633	-2.268	11.59	0.929
108	0.45	0.38	-2.268	11.59	0.929
109	0.4666	0.3966	-2.268	11.59	0.929
110	0.4833	0.4133	-2.268	11.59	0.929
111	0.5	0.43	-2.268	11.59	0.929
112	0.5166	0.4466	-2.268	11.59	0.929
113	0.5333	0.4633	-2.274	11.59	0.9295
114	0.55	0.48	-2.274	11.59	0.9295
115	0.5666	0.4966	-2.274	11.59	0.9295
116	0.5833	0.5133	-2.268	11.59	0.929
117	0.6	0.53	-2.268	11.59	0.929
118	0.6166	0.5466	-2.268	11.59	0.929
119	0.6333	0.5633	-2.268	11.59	0.929
120	0.65	0.58	-2.268	11.59	0.929
121	0.6666	0.5966	-2.268	11.59	0.929
122	0.6833	0.6133	-2.268	11.59	0.929
123	0.7	0.63	-2.268	11.59	0.929
124	0.7166	0.6466	-2.268	11.59	0.929
125	0.7333	0.6633	-2.268	11.59	0.929
126	0.75	0.68	-2.268	11.59	0.929
127	0.7666	0.6966	-2.268	11.59	0.929
128	0.7833	0.7133	-2.268	11.59	0.929
129	0.8	0.73	-2.268	11.59	0.929
130	0.8166	0.7466	-2.268	11.59	0.929
131	0.8333	0.7633	-2.268	11.59	0.929
132	0.85	0.78	-2.268	11.59	0.929
133	0.8666	0.7966	-2.268	11.59	0.929
134	0.8833	0.8133	-2.268	11.59	0.929
135	0.9	0.83	-2.268	11.59	0.929
136	0.9166	0.8466	-2.268	11.59	0.929
137	0.9333	0.8633	-2.268	11.59	0.929
138	0.95	0.88	-2.268	11.59	0.929
139	0.9666	0.8966	-2.268	11.59	0.929
140	0.9833	0.9133	-2.268	11.59	0.929
141	1.	0.93	-2.268	11.59	0.929
142	1.2	1.13	-2.268	11.59	0.929
143	1.4	1.33	-2.268	11.59	0.929
144	1.6	1.53	-2.268	11.59	0.929
145	1.8	1.73	-2.268	11.59	0.929
146	2.	1.93	-2.262	11.58	0.9285
147	2.2	2.13	-2.262	11.58	0.9285

148	2.4	2.33	-2.262	11.58	0.9285
149	2.6	2.53	-2.262	11.58	0.9285
150	2.8	2.73	-2.262	11.58	0.9285
151	3.	2.93	-2.262	11.58	0.9285
152	3.2	3.13	-2.262	11.58	0.9285
153	3.4	3.33	-2.262	11.58	0.9285
154	3.6	3.53	-2.262	11.58	0.9285
155	3.8	3.73	-2.262	11.58	0.9285
156	4.	3.93	-2.262	11.58	0.9285
157	4.2	4.13	-2.255	11.57	0.9279
158	4.4	4.33	-2.255	11.57	0.9279
159	4.6	4.53	-2.255	11.57	0.9279
160	4.8	4.73	-2.255	11.57	0.9279
161	5.	4.93	-2.255	11.57	0.9279
162	5.2	5.13	-2.255	11.57	0.9279
163	5.4	5.33	-2.255	11.57	0.9279
164	5.6	5.53	-2.255	11.57	0.9279
165	5.8	5.73	-2.255	11.57	0.9279
166	6.	5.93	-2.255	11.57	0.9279
167	6.2	6.13	-2.255	11.57	0.9279
168	6.4	6.33	-2.249	11.57	0.9274
169	6.6	6.53	-2.249	11.57	0.9274
170	6.8	6.73	-2.249	11.57	0.9274
171	7.	6.93	-2.249	11.57	0.9274
172	7.2	7.13	-2.249	11.57	0.9274
173	7.4	7.33	-2.249	11.57	0.9274
174	7.6	7.53	-2.249	11.57	0.9274
175	7.8	7.73	-2.249	11.57	0.9274
176	8.	7.93	-2.249	11.57	0.9274
177	8.2	8.13	-2.249	11.57	0.9274
178	8.4	8.33	-2.243	11.56	0.927
179	8.6	8.53	-2.243	11.56	0.927
180	8.8	8.73	-2.243	11.56	0.927
181	9.	8.93	-2.243	11.56	0.927
182	9.2	9.13	-2.243	11.56	0.927
183	9.4	9.33	-2.243	11.56	0.927
184	9.6	9.53	-2.243	11.56	0.927
185	9.8	9.73	-2.243	11.56	0.927
186	10.	9.93	-2.243	11.56	0.927
187	11	10.93	-2.236	11.56	0.9264
188	12.	11.93	-2.236	11.56	0.9264
189	13.	12.93	-2.23	11.55	0.9259
190	14.	13.93	-2.23	11.55	0.9259
191	15.	14.93	-2.23	11.55	0.9259
192	16.	15.93	-2.224	11.54	0.9254
193	17.	16.93	-2.224	11.54	0.9254
194	18.	17.93	-2.218	11.54	0.925
195	19.	18.93	-2.218	11.54	0.925
196	20.	19.93	-2.218	11.54	0.925
197	21.	20.93	-2.211	11.53	0.9244
198	22.	21.93	-2.211	11.53	0.9244
199	23.	22.93	-2.205	11.53	0.9239
200	24.	23.93	-2.205	11.53	0.9239
201	25.	24.93	-2.199	11.52	0.9234
202	26.	25.93	-2.199	11.52	0.9234
203	27.	26.93	-2.199	11.52	0.9234
204	28	27.93	-2.192	11.51	0.9229

205	29.	28.93	-2.192	11.51	0.9229
206	30.	29.93	-2.192	11.51	0.9229
207	31.	30.93	-2.186	11.51	0.9224

Field Hydraulic Conductivity Test November 8, 2000 **Arithmetic Graph**

C&D Landfill, Inc. US 264 East, Pitt County B-10 falling head



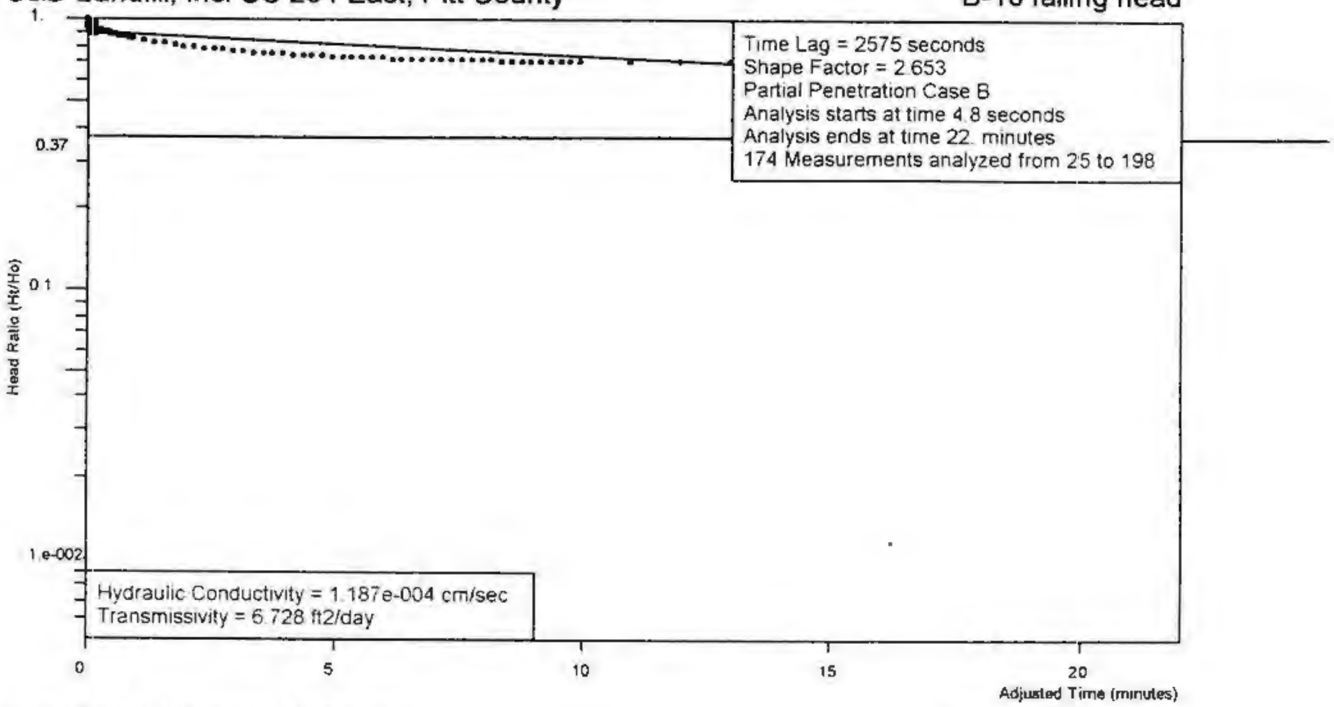
Analysis by Starpoint Software

Field Hydraulic Conductivity Test November 8, 2000

C&D Landfill, Inc. US 264 East, Pitt County

Hvorslev Graph

B-10 falling head



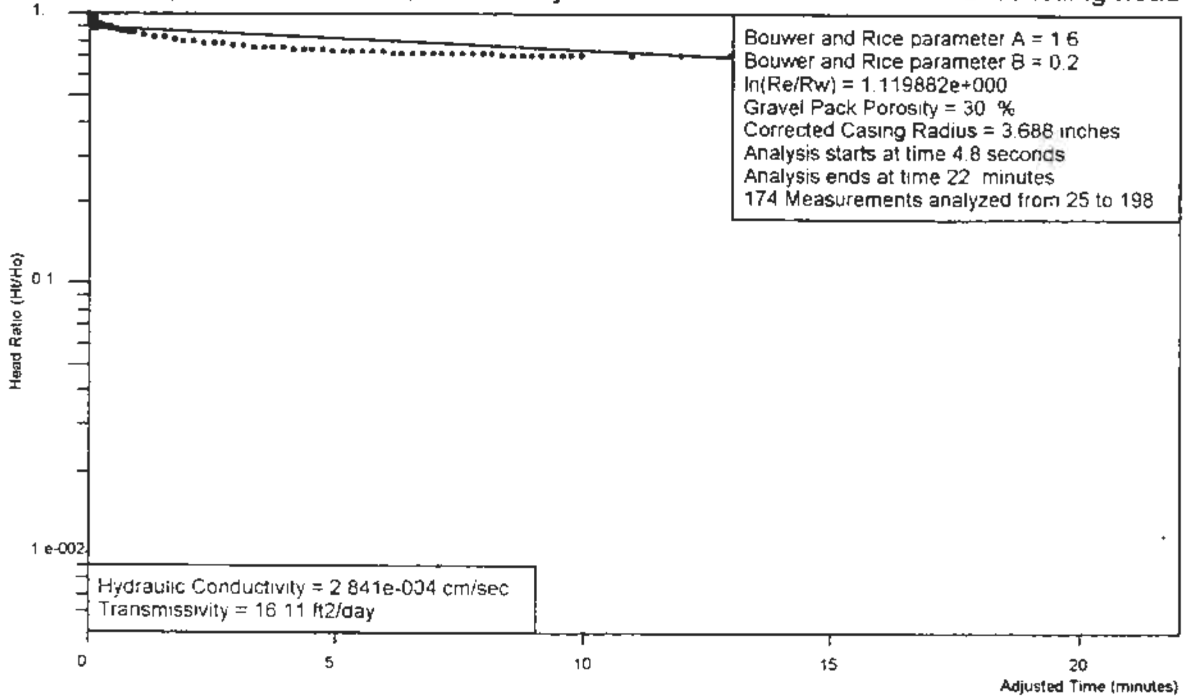
Analysis by Starpoint Software

Ho is 8.194 feet at 4.8 seconds

Field Hydraulic Conductivity Test November 8, 2000Bouwer and Rice Graph

C&D Landfill, Inc. US 264 East, Pitt County

B-10 falling head



Analysis by Starpoint Software

Ho is 8 194 feet at 4.8 seconds

Field Hydraulic Conductivity Test

Site Name: C&D Landfill, Inc.
Location: US 264 East, Pitt County
Test Date: November 8, 2000
Import File: C:\hermit datalogger\Pitt10s0

Well Label: B-10 falling head
Aquifer Thickness: 20. feet
Screen Length: 2. feet
Casing Radius: 2. inches
Effective Radius: 6. inches
Gravel Pack Porosity: 30. %
Corrected Casing Radius: 3.688 inches
Static Water Level: 5.73 feet
Water Table to Screen Bottom: 11.47 feet
Anisotropy Ratio: 1.
Time Adjustment: 4.8 Seconds
Test starts with trial 24
There are 198 time and drawdown measurements
Maximum head is 8.194 feet
Minimum head is 0. feet

Trial	Time (minutes)	Adjusted Time (minutes)	Drawdown (feet)	Head (feet)	Head Ratio
1	0.	-8.e-002	-6.e-003	5.736	0.7
2	3.3e-003	-7.67e-002	-6.e-003	5.736	0.7
3	6.6e-003	-7.34e-002	-6.e-003	5.736	0.7
4	1.e-002	-7.e-002	-6.e-003	5.736	0.7
5	1.33e-002	-6.67e-002	0.	5.73	0.6993
6	1.66e-002	-6.34e-002	-6.e-003	5.736	0.7
7	2.e-002	-6.e-002	0.	5.73	0.6993
8	2.33e-002	-5.67e-002	0.	5.73	0.6993
9	2.66e-002	-5.34e-002	6.e-003	5.724	0.6986
10	3.e-002	-5.e-002	-2.5e-002	5.755	0.7023
11	3.33e-002	-4.67e-002	0.	5.73	0.6993
12	3.66e-002	-4.34e-002	0.	5.73	0.6993
13	4.e-002	-4.e-002	-0.482	6.212	0.7581
14	4.33e-002	-3.67e-002	-0.338	6.068	0.7405
15	4.66e-002	-3.34e-002	-0.426	6.156	0.7513
16	5.e-002	-3.e-002	-0.413	6.143	0.7497
17	5.33e-002	-2.67e-002	-0.407	6.137	0.749
18	5.66e-002	-2.34e-002	-0.633	6.363	0.7765
19	6.e-002	-2.e-002	-0.852	6.582	0.8033
20	6.33e-002	-1.67e-002	-1.047	6.777	0.8271
21	6.66e-002	-1.34e-002	-1.028	6.758	0.8247
22	7.e-002	-1.e-002	-1.191	6.921	0.8446
23	7.33e-002	-6.7e-003	-1.906	7.636	0.9319
24	7.66e-002	-3.4e-003	-2.27	8.	0.9763
25	8.e-002	0.	-2.464	8.194	1.
26	8.33e-002	3.3e-003	-2.176	7.906	0.9649
27	8.66e-002	6.6e-003	-2.	7.73	0.9434
28	9.e-002	1.e-002	-2.307	8.037	0.9808
29	9.33e-002	1.33e-002	-2.314	8.044	0.9817
30	9.66e-002	1.66e-002	-2.201	7.931	0.9679
31	0.1	2.e-002	-2.194	7.924	0.967
32	0.1033	2.33e-002	-2.207	7.937	0.9686
33	0.1066	2.66e-002	-2.157	7.887	0.9625

34	0.11	3.e-002	-2.163	7.893	0.9633
35	0.1133	3.33e-002	-2.113	7.843	0.9572
36	0.1166	3.66e-002	-2.144	7.874	0.9609
37	0.12	4.e-002	-2.05	7.78	0.9495
38	0.1233	4.33e-002	-2.119	7.849	0.9579
39	0.1266	4.66e-002	-2.107	7.837	0.9564
40	0.13	5.e-002	-2.082	7.812	0.9534
41	0.1333	5.33e-002	-2.094	7.824	0.9548
42	0.1366	5.66e-002	-1.718	7.448	0.909
43	0.14	6.e-002	-1.737	7.467	0.9113
44	0.1433	6.33e-002	-2.038	7.768	0.948
45	0.1466	6.66e-002	-2.006	7.736	0.9441
46	0.15	7.e-002	-1.705	7.435	0.9074
47	0.1533	7.33e-002	-1.912	7.642	0.9326
48	0.1566	7.66e-002	-2.27	8.	0.9763
49	0.16	8.e-002	-2.125	7.855	0.9586
50	0.1633	8.33e-002	-2.038	7.768	0.948
51	0.1666	8.66e-002	-1.705	7.435	0.9074
52	0.17	9.e-002	-1.906	7.636	0.9319
53	0.1733	9.33e-002	-1.937	7.667	0.9357
54	0.1766	9.66e-002	-1.624	7.354	0.8975
55	0.18	0.1	-1.693	7.423	0.9059
56	0.1833	0.1033	-2.088	7.818	0.9541
57	0.1866	0.1066	-2.358	8.088	0.9871
58	0.19	0.11	-2.069	7.799	0.9518
59	0.1933	0.1133	-1.555	7.285	0.8891
60	0.1966	0.1166	-1.893	7.623	0.9303
61	0.2	0.12	-2.	7.73	0.9434
62	0.2033	0.1233	-1.906	7.636	0.9319
63	0.2066	0.1266	-1.906	7.636	0.9319
64	0.21	0.13	-1.9	7.63	0.9312
65	0.2133	0.1333	-1.937	7.667	0.9357
66	0.2166	0.1366	-2.	7.73	0.9434
67	0.22	0.14	-2.176	7.906	0.9649
68	0.2233	0.1433	-1.818	7.548	0.9212
69	0.2266	0.1466	-1.605	7.335	0.8952
70	0.23	0.15	-1.887	7.617	0.9296
71	0.2333	0.1533	-1.893	7.623	0.9303
72	0.2366	0.1566	-1.875	7.605	0.9281
73	0.24	0.16	-1.862	7.592	0.9265
74	0.2433	0.1633	-1.862	7.592	0.9265
75	0.2466	0.1666	-1.856	7.586	0.9258
76	0.25	0.17	-1.856	7.586	0.9258
77	0.2533	0.1733	-1.856	7.586	0.9258
78	0.2566	0.1766	-1.849	7.579	0.9249
79	0.26	0.18	-1.843	7.573	0.9242
80	0.2633	0.1833	-1.843	7.573	0.9242
81	0.2666	0.1866	-1.843	7.573	0.9242
82	0.27	0.19	-1.837	7.567	0.9235
83	0.2733	0.1933	-1.837	7.567	0.9235
84	0.2766	0.1966	-1.831	7.561	0.9227
85	0.28	0.2	-1.831	7.561	0.9227
86	0.2833	0.2033	-1.824	7.554	0.9219
87	0.2866	0.2066	-1.824	7.554	0.9219
88	0.29	0.21	-1.818	7.548	0.9212
89	0.2933	0.2133	-1.818	7.548	0.9212
90	0.2966	0.2166	-1.818	7.548	0.9212

91	0.3	0.22	-1.812	7.542	0.9204
92	0.3033	0.2233	-1.806	7.536	0.9197
93	0.3066	0.2266	-1.806	7.536	0.9197
94	0.31	0.23	-1.806	7.536	0.9197
95	0.3133	0.2333	-1.799	7.529	0.9188
96	0.3166	0.2366	-1.799	7.529	0.9188
97	0.32	0.24	-1.793	7.523	0.9181
98	0.3233	0.2433	-1.793	7.523	0.9181
99	0.3266	0.2466	-1.787	7.517	0.9174
100	0.33	0.25	-1.787	7.517	0.9174
101	0.3333	0.2533	-1.78	7.51	0.9165
102	0.35	0.27	-1.768	7.498	0.9151
103	0.3666	0.2866	-1.749	7.479	0.9127
104	0.3833	0.3033	-1.737	7.467	0.9113
105	0.4	0.32	-1.724	7.454	0.9097
106	0.4166	0.3366	-1.711	7.441	0.9081
107	0.4333	0.3533	-1.699	7.429	0.9066
108	0.45	0.37	-1.686	7.416	0.9051
109	0.4666	0.3866	-1.668	7.398	0.9029
110	0.4833	0.4033	-1.655	7.385	0.9013
111	0.5	0.42	-1.642	7.372	0.8997
112	0.5166	0.4366	-1.63	7.36	0.8982
113	0.5333	0.4533	-1.617	7.347	0.8966
114	0.55	0.47	-1.605	7.335	0.8952
115	0.5666	0.4866	-1.586	7.316	0.8928
116	0.5833	0.5033	-1.573	7.303	0.8913
117	0.6	0.52	-1.561	7.291	0.8898
118	0.6166	0.5366	-1.548	7.278	0.8882
119	0.6333	0.5533	-1.536	7.266	0.8867
120	0.65	0.57	-1.523	7.253	0.8852
121	0.6666	0.5866	-1.511	7.241	0.8837
122	0.6833	0.6033	-1.498	7.228	0.8821
123	0.7	0.62	-1.486	7.216	0.8806
124	0.7166	0.6366	-1.473	7.203	0.8791
125	0.7333	0.6533	-1.461	7.191	0.8776
126	0.75	0.67	-1.448	7.178	0.876
127	0.7666	0.6866	-1.442	7.172	0.8753
128	0.7833	0.7033	-1.429	7.159	0.8737
129	0.8	0.72	-1.442	7.172	0.8753
130	0.8166	0.7366	-1.404	7.134	0.8706
131	0.8333	0.7533	-1.392	7.122	0.8692
132	0.85	0.77	-1.385	7.115	0.8683
133	0.8666	0.7866	-1.373	7.103	0.8669
134	0.8833	0.8033	-1.366	7.096	0.866
135	0.9	0.82	-1.354	7.084	0.8645
136	0.9166	0.8366	-1.341	7.071	0.8629
137	0.9333	0.8533	-1.335	7.065	0.8622
138	0.95	0.87	-1.323	7.053	0.8608
139	0.9666	0.8866	-1.316	7.046	0.8599
140	0.9833	0.9033	-1.304	7.034	0.8584
141	1.	0.92	-1.298	7.028	0.8577
142	1.2	1.12	-1.172	6.902	0.8423
143	1.4	1.32	-1.084	6.814	0.8316
144	1.6	1.52	-1.003	6.733	0.8217
145	1.8	1.72	-0.928	6.658	0.8125
146	2.	1.92	-0.865	6.595	0.8049
147	2.2	2.12	-0.802	6.532	0.7972

148	2.4	2.32	-0.752	6.482	0.7911
149	2.6	2.52	-0.702	6.432	0.785
150	2.8	2.72	-0.652	6.382	0.7789
151	3.	2.92	-0.608	6.338	0.7735
152	3.2	3.12	-0.57	6.3	0.7689
153	3.4	3.32	-0.532	6.262	0.7642
154	3.6	3.52	-0.495	6.225	0.7597
155	3.8	3.72	-0.463	6.193	0.7558
156	4.	3.92	-0.432	6.162	0.752
157	4.2	4.12	-0.401	6.131	0.7482
158	4.4	4.32	-0.376	6.106	0.7452
159	4.6	4.52	-0.351	6.081	0.7421
160	4.8	4.72	-0.332	6.062	0.7398
161	5.	4.92	-0.307	6.037	0.7368
162	5.2	5.12	-0.288	6.018	0.7344
163	5.4	5.32	-0.269	5.999	0.7321
164	5.6	5.52	-0.25	5.98	0.7298
165	5.8	5.72	-0.238	5.968	0.7283
166	6.	5.92	-0.219	5.949	0.726
167	6.2	6.12	-0.206	5.936	0.7244
168	6.4	6.32	-0.194	5.924	0.723
169	6.6	6.52	-0.181	5.911	0.7214
170	6.8	6.72	-0.169	5.899	0.7199
171	7.	6.92	-0.156	5.886	0.7183
172	7.2	7.12	-0.15	5.88	0.7176
173	7.4	7.32	-0.137	5.867	0.716
174	7.6	7.52	-0.131	5.861	0.7153
175	7.8	7.72	-0.125	5.855	0.7145
176	8.	7.92	-0.119	5.849	0.7138
177	8.2	8.12	-0.106	5.836	0.7122
178	8.4	8.32	-0.1	5.83	0.7115
179	8.6	8.52	-9.4e-002	5.824	0.7108
180	8.8	8.72	-8.7e-002	5.817	0.7099
181	9.	8.92	-8.1e-002	5.811	0.7092
182	9.2	9.12	-7.5e-002	5.805	0.7084
183	9.4	9.32	-6.8e-002	5.798	0.7076
184	9.6	9.52	-6.2e-002	5.792	0.7069
185	9.8	9.72	-6.2e-002	5.792	0.7069
186	10.	9.92	-5.6e-002	5.786	0.7061
187	11.	10.92	-3.7e-002	5.767	0.7038
188	12.	11.92	-1.2e-002	5.742	0.7008
189	13.	12.92	0.	5.73	0.6993
190	14.	13.92	6.e-003	5.724	0.6986
191	15.	14.92	1.2e-002	5.718	0.6978
192	16.	15.92	1.8e-002	5.712	0.6971
193	17.	16.92	2.5e-002	5.705	0.6962
194	18.	17.92	3.1e-002	5.699	0.6955
195	19.	18.92	3.1e-002	5.699	0.6955
196	20.	19.92	3.7e-002	5.693	0.6948
197	21.	20.92	2.5e-002	5.705	0.6962
198	22.	21.92	3.1e-002	5.699	0.6955

91	0.3	-0.25	-2.124	11.03	0.9281
92	0.3033	-0.2467	-2.149	11.06	0.9302
93	0.3066	-0.2434	-2.142	11.05	0.9296
94	0.31	-0.24	-2.142	11.05	0.9296
95	0.3133	-0.2367	-2.142	11.05	0.9296
96	0.3166	-0.2334	-2.142	11.05	0.9296
97	0.32	-0.23	-2.142	11.05	0.9296
98	0.3233	-0.2267	-2.142	11.05	0.9296
99	0.3266	-0.2234	-2.142	11.05	0.9296
100	0.33	-0.22	-2.142	11.05	0.9296
101	0.3333	-0.2167	-2.142	11.05	0.9296
102	0.35	-0.2	-2.136	11.05	0.9291
103	0.3666	-0.1834	-2.136	11.05	0.9291
104	0.3833	-0.1667	-2.136	11.05	0.9291
105	0.4	-0.15	-2.136	11.05	0.9291
106	0.4166	-0.1334	-2.136	11.05	0.9291
107	0.4333	-0.1167	-2.136	11.05	0.9291
108	0.45	-0.1	-2.136	11.05	0.9291
109	0.4666	-8.34e-002	-2.136	11.05	0.9291
110	0.4833	-6.67e-002	-2.13	11.04	0.9286
111	0.5	-5.e-002	-2.13	11.04	0.9286
112	0.5166	-3.34e-002	-2.13	11.04	0.9286
113	0.5333	-1.67e-002	-2.136	11.05	0.9291
114	0.55	0.	-2.979	11.89	1.
115	0.5666	1.66e-002	-2.325	11.23	0.945
116	0.5833	3.33e-002	-2.111	11.02	0.927
117	0.6	5.e-002	-2.13	11.04	0.9286
118	0.6166	6.66e-002	-2.13	11.04	0.9286
119	0.6333	8.33e-002	-2.13	11.04	0.9286
120	0.65	0.1	-2.13	11.04	0.9286
121	0.6666	0.1166	-2.124	11.03	0.9281
122	0.6833	0.1333	-2.124	11.03	0.9281
123	0.7	0.15	-2.124	11.03	0.9281
124	0.7166	0.1666	-2.124	11.03	0.9281
125	0.7333	0.1833	-2.124	11.03	0.9281
126	0.75	0.2	-2.124	11.03	0.9281
127	0.7666	0.2166	-2.124	11.03	0.9281
128	0.7833	0.2333	-2.13	11.04	0.9286
129	0.8	0.25	-2.117	11.03	0.9275
130	0.8166	0.2666	-2.117	11.03	0.9275
131	0.8333	0.2833	-2.117	11.03	0.9275
132	0.85	0.3	-2.117	11.03	0.9275
133	0.8666	0.3166	-2.117	11.03	0.9275
134	0.8833	0.3333	-2.117	11.03	0.9275
135	0.9	0.35	-2.117	11.03	0.9275
136	0.9166	0.3666	-2.117	11.03	0.9275
137	0.9333	0.3833	-2.111	11.02	0.927
138	0.95	0.4	-2.111	11.02	0.927
139	0.9666	0.4166	-2.111	11.02	0.927
140	0.9833	0.4333	-2.111	11.02	0.927
141	1.	0.45	-2.111	11.02	0.927
142	1.2	0.65	-2.105	11.02	0.9265
143	1.4	0.85	-2.092	11.	0.9254
144	1.6	1.05	-2.086	11.	0.9249
145	1.8	1.25	-2.08	10.99	0.9244
146	2.	1.45	-2.067	10.98	0.9233
147	2.2	1.65	-2.061	10.97	0.9228

148	2.4	1.85	-2.054	10.96	0.9222
149	2.6	2.05	-2.048	10.96	0.9217
150	2.8	2.25	-2.042	10.95	0.9212
151	3.	2.45	-2.036	10.95	0.9207
152	3.2	2.65	-2.029	10.94	0.9201
153	3.4	2.85	-2.017	10.93	0.9191
154	3.6	3.05	-2.011	10.92	0.9186
155	3.8	3.25	-2.004	10.91	0.918
156	4.	3.45	-1.998	10.91	0.9175
157	4.2	3.65	-1.992	10.9	0.917
158	4.4	3.85	-1.985	10.9	0.9164
159	4.6	4.05	-1.979	10.89	0.9159
160	4.8	4.25	-1.973	10.88	0.9154
161	5.	4.45	-1.967	10.88	0.9149
162	5.2	4.65	-1.96	10.87	0.9143
163	5.4	4.85	-1.954	10.86	0.9138
164	5.6	5.05	-1.948	10.86	0.9133
165	5.8	5.25	-1.941	10.85	0.9127
166	6.	5.45	-1.935	10.85	0.9122
167	6.2	5.65	-1.929	10.84	0.9117
168	6.4	5.85	-1.922	10.83	0.9111
169	6.6	6.05	-1.904	10.81	0.9096
170	6.8	6.25	-1.91	10.82	0.9101
171	7.	6.45	-1.904	10.81	0.9096
172	7.2	6.65	-1.897	10.81	0.909
173	7.4	6.85	-1.891	10.8	0.9085
174	7.6	7.05	-1.885	10.8	0.908
175	7.8	7.25	-1.878	10.79	0.9074
176	8.	7.45	-1.872	10.78	0.9069
177	8.2	7.65	-1.866	10.78	0.9064
178	8.4	7.85	-1.86	10.77	0.9059
179	8.6	8.05	-1.853	10.76	0.9053
180	8.8	8.25	-1.847	10.76	0.9048
181	9.	8.45	-1.841	10.75	0.9043
182	9.2	8.65	-1.841	10.75	0.9043
183	9.4	8.85	-1.834	10.74	0.9037
184	9.6	9.05	-1.828	10.74	0.9032
185	9.8	9.25	-1.822	10.73	0.9027
186	10.	9.45	-1.816	10.73	0.9022
187	11.	10.45	-1.791	10.7	0.9001
188	12.	11.45	-1.759	10.67	0.8974
189	13.	12.45	-1.728	10.64	0.8948
190	14.	13.45	-1.703	10.61	0.8927
191	15.	14.45	-1.677	10.59	0.8905
192	16.	15.45	-1.652	10.56	0.8884
193	17.	16.45	-1.627	10.54	0.8863
194	18.	17.45	-1.602	10.51	0.8842
195	19.	18.45	-1.577	10.49	0.8821
196	20.	19.45	-1.552	10.46	0.88
197	21.	20.45	-1.527	10.44	0.8779
198	22.	21.45	-1.508	10.42	0.8763
199	23.	22.45	-1.483	10.39	0.8742
200	24.	23.45	-1.457	10.37	0.872
201	25.	24.45	-1.439	10.35	0.8705
202	26.	25.45	-1.413	10.32	0.8683
203	27.	26.45	-1.395	10.31	0.8668
204	28.	27.45	-1.369	10.28	0.8646

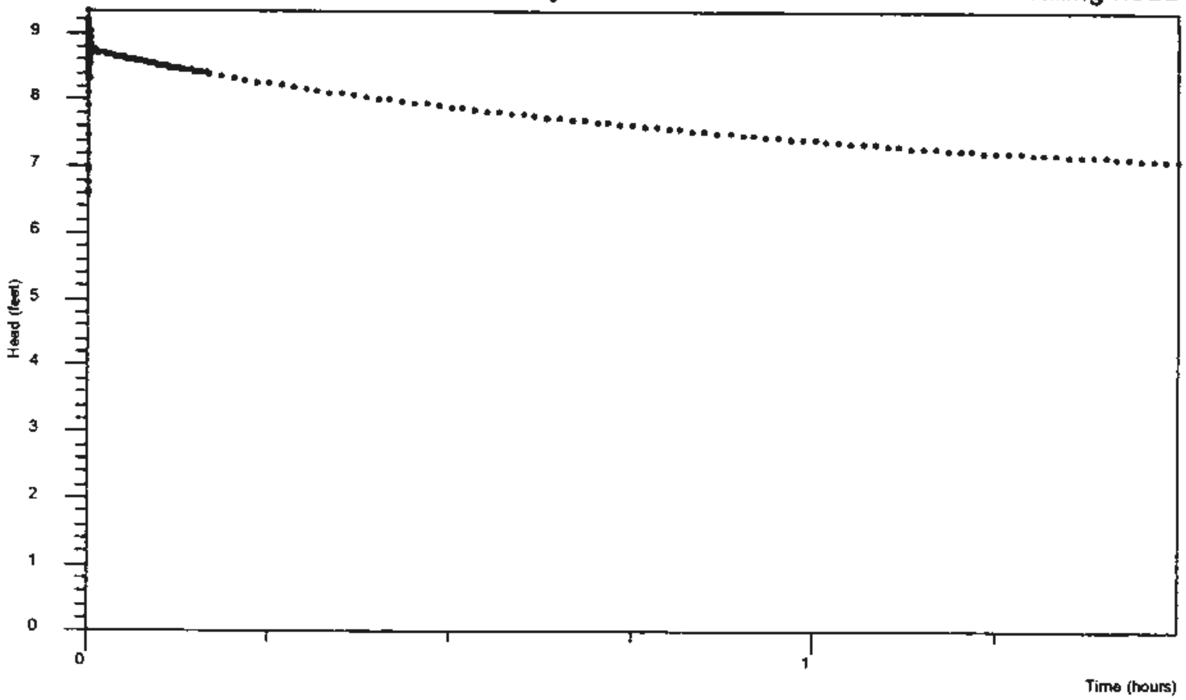
205	29.	28.45	-1.351	10.26	0.8631
206	30.	29.45	-1.332	10.24	0.8615
207	31.	30.45	-1.313	10.22	0.8599
208	32.	31.45	-1.288	10.2	0.8578
209	33.	32.45	-1.269	10.18	0.8562
210	34.	33.45	-1.25	10.16	0.8546
211	35.	34.45	-1.231	10.14	0.853
212	36.	35.45	-1.212	10.12	0.8514
213	37.	36.45	-1.193	10.1	0.8498
214	38.	37.45	-1.175	10.09	0.8483
215	39.	38.45	-1.156	10.07	0.8467
216	40.	39.45	-1.137	10.05	0.8451
217	41.	40.45	-1.118	10.03	0.8435
218	42.	41.45	-1.105	10.02	0.8424
219	43.	42.45	-1.087	9.997	0.8409
220	44.	43.45	-1.068	9.978	0.8393
221	45.	44.45	-1.049	9.959	0.8377
222	46.	45.45	-1.036	9.946	0.8366
223	47.	46.45	-1.017	9.927	0.835
224	48.	47.45	-1.005	9.915	0.834
225	49.	48.45	-0.986	9.896	0.8324
226	50.	49.45	-0.98	9.89	0.8319
227	51.	50.45	-0.955	9.865	0.8298
228	52.	51.45	-0.942	9.852	0.8287
229	53.	52.45	-0.923	9.833	0.8271
230	54.	53.45	-0.911	9.821	0.8261
231	55.	54.45	-0.898	9.808	0.825
232	56.	55.45	-0.879	9.789	0.8234
233	57.	56.45	-0.867	9.777	0.8224
234	58.	57.45	-0.854	9.764	0.8213
235	59.	58.45	-0.848	9.758	0.8208
236	60.	59.45	-0.829	9.739	0.8192
237	61.	60.45	-0.81	9.72	0.8176
238	62.	61.45	-0.798	9.708	0.8166
239	63.	62.45	-0.785	9.695	0.8155
240	64.	63.45	-0.772	9.682	0.8144
241	65.	64.45	-0.76	9.67	0.8134

Field Hydraulic Conductivity Test November 8, 2000

C&D Landfill, Inc. US 264 East, Pitt County

Arithmetic Graph

B-6 falling head



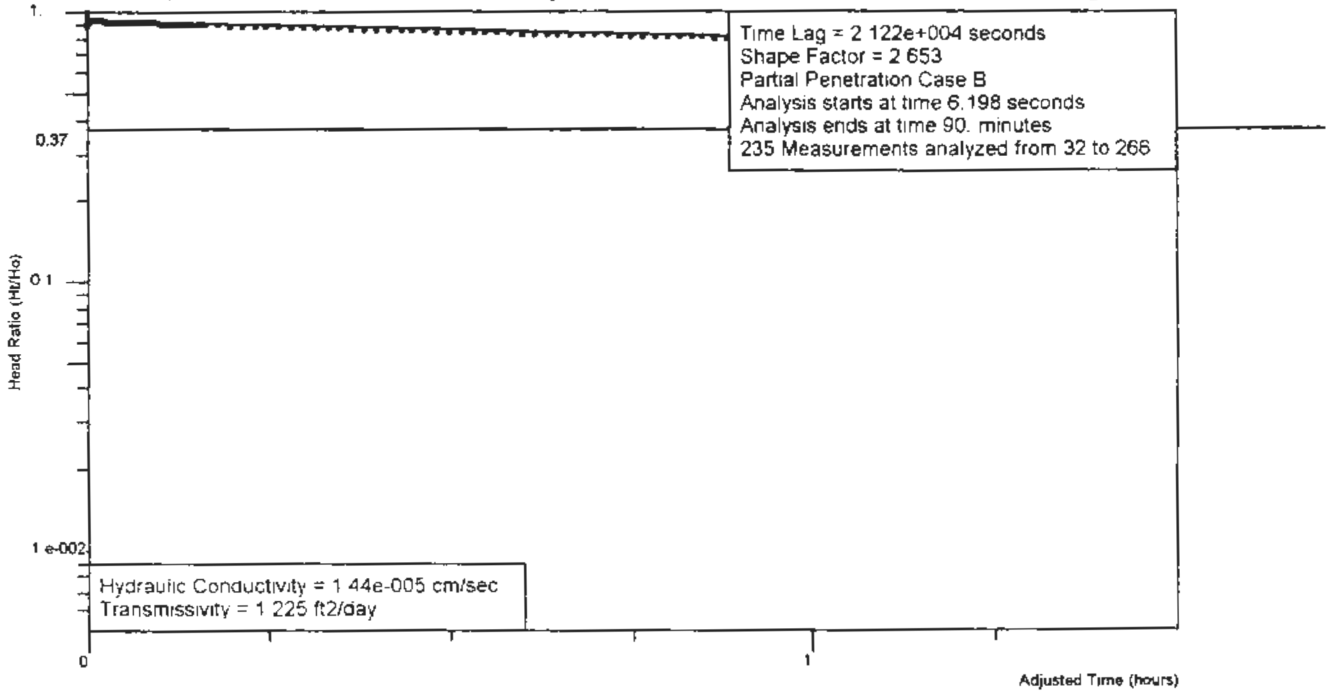
Analysis by Starpoint Software

Field Hydraulic Conductivity Test November 8, 2000

C&D Landfill, Inc. US 264 East, Pitt County

Hvorslev Graph

B-6 falling head



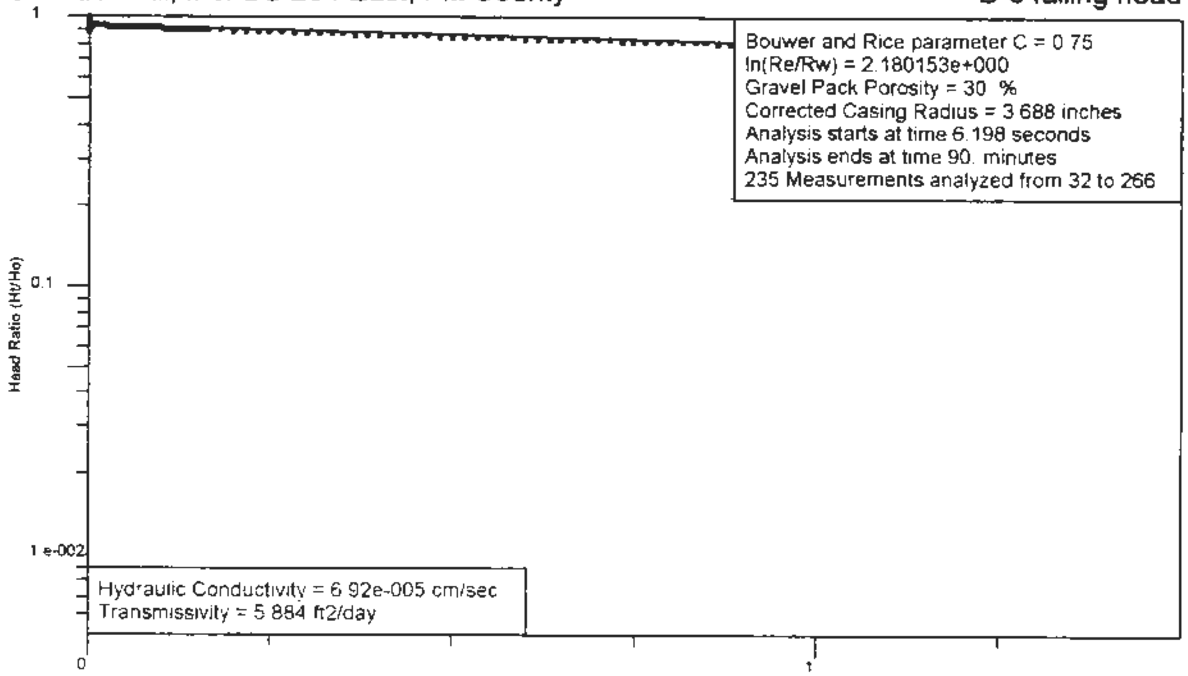
Analysis by Starpoint Software

Ho is 9.322 feet at 6.198 seconds

Field Hydraulic Conductivity Test November 8, 2000Bouwer and Rice Graph

C&D Landfill, Inc. US 264 East, Pitt County

B-6 falling head



Analysis by Starpoint Software

Ho is 9.322 feet at 6.198 seconds

Field Hydraulic Conductivity Test

Site Name: C&D Landfill, Inc.
Location: US 264 East, Pitt County
Test Date: November 8, 2000
Import File: C:\hermit datalogger\Pitt6s0

Well Label: B-6 falling head
Aquifer Thickness: 30. feet
Screen Length: 2. feet
Casing Radius: 2. inches
Effective Radius: 6. inches
Gravel Pack Porosity: 30. %
Corrected Casing Radius: 3.688 inches
Static Water Level: 6.59 feet
Water Table to Screen Bottom: 28.88 feet
Anisotropy Ratio: 1.
Time Adjustment: 6.198 Seconds
Test starts with trial 31
There are 266 time and drawdown measurements
Maximum head is 9.322 feet
Minimum head is 0. feet

Trial	Time (minutes)	Adjusted Time (minutes)	Drawdown (feet)	Head (feet)	Head Ratio
1	0.	-0.1033	-1.2e-002	6.602	0.7082
2	3.3e-003	-0.1	-1.8e-002	6.608	0.7089
3	6.6e-003	-9.67e-002	0.	6.59	0.7069
4	1.e-002	-9.33e-002	-4.4e-002	6.634	0.7116
5	1.33e-002	-9.e-002	-3.7e-002	6.627	0.7109
6	1.66e-002	-8.67e-002	-2.5e-002	6.615	0.7096
7	2.e-002	-8.33e-002	-0.157	6.747	0.7238
8	2.33e-002	-8.e-002	-0.402	6.992	0.7501
9	2.66e-002	-7.67e-002	-0.358	6.948	0.7453
10	3.e-002	-7.33e-002	-0.621	7.211	0.7735
11	3.33e-002	-7.e-002	-0.898	7.488	0.8033
12	3.66e-002	-6.67e-002	-1.507	8.097	0.8686
13	4.e-002	-6.33e-002	-1.771	8.361	0.8969
14	4.33e-002	-6.e-002	-1.997	8.587	0.9212
15	4.66e-002	-5.67e-002	-1.947	8.537	0.9158
16	5.e-002	-5.33e-002	-1.714	8.304	0.8908
17	5.33e-002	-5.e-002	-1.834	8.424	0.9037
18	5.66e-002	-4.67e-002	-2.054	8.644	0.9273
19	6.e-002	-4.33e-002	-2.355	8.945	0.9596
20	6.33e-002	-4.e-002	-2.607	9.197	0.9866
21	6.66e-002	-3.67e-002	-2.538	9.128	0.9792
22	7.e-002	-3.33e-002	-2.468	9.058	0.9717
23	7.33e-002	-3.e-002	-2.588	9.178	0.9846
24	7.66e-002	-2.67e-002	-1.319	7.909	0.8484
25	8.e-002	-2.33e-002	-2.293	8.883	0.9529
26	8.33e-002	-2.e-002	-2.431	9.021	0.9677
27	8.66e-002	-1.67e-002	-2.456	9.046	0.9704
28	9.e-002	-1.33e-002	-2.236	8.826	0.9468
29	9.33e-002	-1.e-002	-1.815	8.405	0.9016
30	9.66e-002	-6.7e-003	-1.884	8.474	0.909
31	0.1	-3.3e-003	-2.443	9.033	0.969
32	0.1033	0.	-2.732	9.322	1.
33	0.1066	3.3e-003	-2.293	8.883	0.9529

34	0.11	6.7e-003	-2.249	8.839	0.9482
35	0.1133	1.e-002	-2.355	8.945	0.9596
36	0.1166	1.33e-002	-2.45	9.04	0.9697
37	0.12	1.67e-002	-2.293	8.883	0.9529
38	0.1233	2.e-002	-1.871	8.461	0.9076
39	0.1266	2.33e-002	-2.091	8.681	0.9312
40	0.13	2.67e-002	-1.878	8.468	0.9084
41	0.1333	3.e-002	-2.299	8.889	0.9536
42	0.1366	3.33e-002	-2.337	8.927	0.9576
43	0.14	3.67e-002	-2.047	8.637	0.9265
44	0.1433	4.e-002	-2.123	8.713	0.9347
45	0.1466	4.33e-002	-2.28	8.87	0.9515
46	0.15	4.67e-002	-2.167	8.757	0.9394
47	0.1533	5.e-002	-2.148	8.738	0.9374
48	0.1566	5.33e-002	-2.179	8.769	0.9407
49	0.16	5.67e-002	-2.173	8.763	0.94
50	0.1633	6.e-002	-2.173	8.763	0.94
51	0.1666	6.33e-002	-2.173	8.763	0.94
52	0.17	6.67e-002	-2.167	8.757	0.9394
53	0.1733	7.e-002	-2.173	8.763	0.94
54	0.1766	7.33e-002	-2.173	8.763	0.94
55	0.18	7.67e-002	-2.173	8.763	0.94
56	0.1833	8.e-002	-2.173	8.763	0.94
57	0.1866	8.33e-002	-2.167	8.757	0.9394
58	0.19	8.67e-002	-2.167	8.757	0.9394
59	0.1933	9.e-002	-2.167	8.757	0.9394
60	0.1966	9.33e-002	-2.173	8.763	0.94
61	0.2	9.67e-002	-2.179	8.769	0.9407
62	0.2033	0.1	-2.173	8.763	0.94
63	0.2066	0.1033	-2.173	8.763	0.94
64	0.21	0.1067	-2.167	8.757	0.9394
65	0.2133	0.11	-2.324	8.914	0.9562
66	0.2166	0.1133	-2.236	8.826	0.9468
67	0.22	0.1167	-2.016	8.606	0.9232
68	0.2233	0.12	-2.022	8.612	0.9238
69	0.2266	0.1233	-2.475	9.065	0.9724
70	0.23	0.1267	-2.374	8.964	0.9616
71	0.2333	0.13	-2.324	8.914	0.9562
72	0.2366	0.1333	-1.966	8.556	0.9178
73	0.24	0.1367	-1.727	8.317	0.8922
74	0.2433	0.14	-2.274	8.864	0.9509
75	0.2466	0.1433	-2.424	9.014	0.967
76	0.25	0.1467	-2.022	8.612	0.9238
77	0.2533	0.15	-2.06	8.65	0.9279
78	0.2566	0.1533	-2.318	8.908	0.9556
79	0.26	0.1567	-2.161	8.751	0.9387
80	0.2633	0.16	-2.091	8.681	0.9312
81	0.2666	0.1633	-2.192	8.782	0.9421
82	0.27	0.1667	-2.179	8.769	0.9407
83	0.2733	0.17	-2.148	8.738	0.9374
84	0.2766	0.1733	-2.167	8.757	0.9394
85	0.28	0.1767	-2.173	8.763	0.94
86	0.2833	0.18	-2.167	8.757	0.9394
87	0.2866	0.1833	-2.167	8.757	0.9394
88	0.29	0.1867	-2.167	8.757	0.9394
89	0.2933	0.19	-2.167	8.757	0.9394
90	0.2966	0.1933	-2.161	8.751	0.9387

91	0.3	0.1967	-2.091	8.681	0.9312
92	0.3033	0.2	-2.211	8.801	0.9441
93	0.3066	0.2033	-2.06	8.65	0.9279
94	0.31	0.2067	-2.11	8.7	0.9333
95	0.3133	0.21	-2.142	8.732	0.9367
96	0.3166	0.2133	-2.167	8.757	0.9394
97	0.32	0.2167	-2.161	8.751	0.9387
98	0.3233	0.22	-2.161	8.751	0.9387
99	0.3266	0.2233	-2.161	8.751	0.9387
100	0.33	0.2267	-2.154	8.744	0.938
101	0.3333	0.23	-2.148	8.738	0.9374
102	0.35	0.2467	-2.148	8.738	0.9374
103	0.3666	0.2633	-2.154	8.744	0.938
104	0.3833	0.28	-2.154	8.744	0.938
105	0.4	0.2967	-2.154	8.744	0.938
106	0.4166	0.3133	-2.154	8.744	0.938
107	0.4333	0.33	-2.148	8.738	0.9374
108	0.45	0.3467	-2.148	8.738	0.9374
109	0.4666	0.3633	-2.148	8.738	0.9374
110	0.4833	0.38	-2.148	8.738	0.9374
111	0.5	0.3967	-2.148	8.738	0.9374
112	0.5166	0.4133	-2.148	8.738	0.9374
113	0.5333	0.43	-2.148	8.738	0.9374
114	0.55	0.4467	-2.148	8.738	0.9374
115	0.5666	0.4633	-2.148	8.738	0.9374
116	0.5833	0.48	-2.142	8.732	0.9367
117	0.6	0.4967	-2.179	8.769	0.9407
118	0.6166	0.5133	-2.135	8.725	0.936
119	0.6333	0.53	-2.142	8.732	0.9367
120	0.65	0.5467	-2.142	8.732	0.9367
121	0.6666	0.5633	-2.142	8.732	0.9367
122	0.6833	0.58	-2.135	8.725	0.936
123	0.7	0.5967	-2.135	8.725	0.936
124	0.7166	0.6133	-2.135	8.725	0.936
125	0.7333	0.63	-2.135	8.725	0.936
126	0.75	0.6467	-2.135	8.725	0.936
127	0.7666	0.6633	-2.135	8.725	0.936
128	0.7833	0.68	-2.135	8.725	0.936
129	0.8	0.6967	-2.135	8.725	0.936
130	0.8166	0.7133	-2.129	8.719	0.9353
131	0.8333	0.73	-2.129	8.719	0.9353
132	0.85	0.7467	-2.129	8.719	0.9353
133	0.8666	0.7633	-2.129	8.719	0.9353
134	0.8833	0.78	-2.129	8.719	0.9353
135	0.9	0.7967	-2.129	8.719	0.9353
136	0.9166	0.8133	-2.129	8.719	0.9353
137	0.9333	0.83	-2.129	8.719	0.9353
138	0.95	0.8467	-2.123	8.713	0.9347
139	0.9666	0.8633	-2.123	8.713	0.9347
140	0.9833	0.88	-2.123	8.713	0.9347
141	1.	0.8967	-2.123	8.713	0.9347
142	1.2	1.097	-2.11	8.7	0.9333
143	1.4	1.297	-2.104	8.694	0.9326
144	1.6	1.497	-2.098	8.688	0.932
145	1.8	1.697	-2.085	8.675	0.9306
146	2.	1.897	-2.079	8.669	0.93
147	2.2	2.097	-2.073	8.663	0.9293

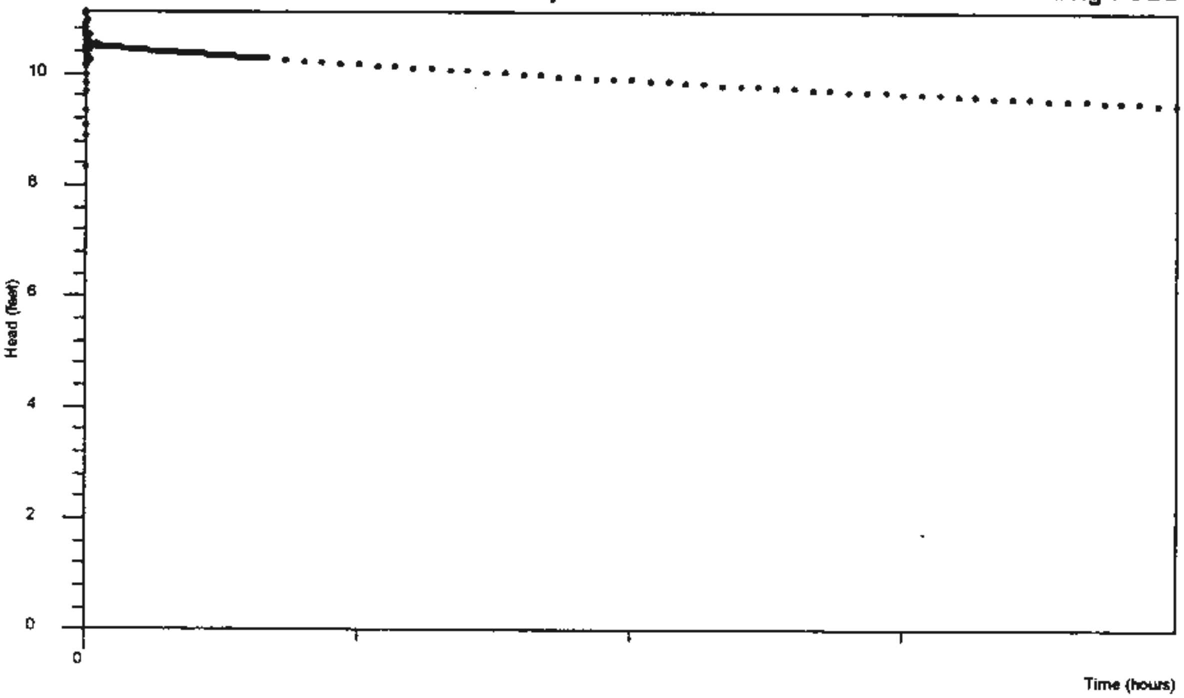
148	2.4	2.297	-2.066	8.656	0.9286
149	2.6	2.497	-2.06	8.65	0.9279
150	2.8	2.697	-2.047	8.637	0.9265
151	3.	2.897	-2.041	8.631	0.9259
152	3.2	3.097	-2.035	8.625	0.9252
153	3.4	3.297	-2.029	8.619	0.9246
154	3.6	3.497	-2.016	8.606	0.9232
155	3.8	3.697	-2.01	8.6	0.9225
156	4.	3.897	-2.003	8.593	0.9218
157	4.2	4.097	-1.997	8.587	0.9212
158	4.4	4.297	-1.991	8.581	0.9205
159	4.6	4.497	-1.985	8.575	0.9199
160	4.8	4.697	-1.978	8.568	0.9191
161	5.	4.897	-1.972	8.562	0.9185
162	5.2	5.097	-1.966	8.556	0.9178
163	5.4	5.297	-1.953	8.543	0.9164
164	5.6	5.497	-1.947	8.537	0.9158
165	5.8	5.697	-1.941	8.531	0.9151
166	6.	5.897	-1.934	8.524	0.9144
167	6.2	6.097	-1.928	8.518	0.9138
168	6.4	6.297	-1.922	8.512	0.9131
169	6.6	6.497	-1.915	8.505	0.9124
170	6.8	6.697	-1.909	8.499	0.9117
171	7.	6.897	-1.903	8.493	0.9111
172	7.2	7.097	-1.897	8.487	0.9104
173	7.4	7.297	-1.89	8.48	0.9097
174	7.6	7.497	-1.884	8.474	0.909
175	7.8	7.697	-1.878	8.468	0.9084
176	8.	7.897	-1.871	8.461	0.9076
177	8.2	8.097	-1.865	8.455	0.907
178	8.4	8.297	-1.859	8.449	0.9064
179	8.6	8.497	-1.853	8.443	0.9057
180	8.8	8.697	-1.846	8.436	0.905
181	9.	8.897	-1.84	8.43	0.9043
182	9.2	9.097	-1.84	8.43	0.9043
183	9.4	9.297	-1.834	8.424	0.9037
184	9.6	9.497	-1.827	8.417	0.9029
185	9.8	9.697	-1.821	8.411	0.9023
186	10.	9.897	-1.815	8.405	0.9016
187	11.	10.9	-1.784	8.374	0.8983
188	12.	11.9	-1.746	8.336	0.8942
189	13.	12.9	-1.721	8.311	0.8915
190	14.	13.9	-1.689	8.279	0.8881
191	15.	14.9	-1.664	8.254	0.8854
192	16.	15.9	-1.639	8.229	0.8828
193	17.	16.9	-1.608	8.198	0.8794
194	18.	17.9	-1.582	8.172	0.8766
195	19.	18.9	-1.557	8.147	0.874
196	20.	19.9	-1.532	8.122	0.8713
197	21.	20.9	-1.507	8.097	0.8686
198	22.	21.9	-1.482	8.072	0.8659
199	23.	22.9	-1.457	8.047	0.8632
200	24.	23.9	-1.438	8.028	0.8612
201	25.	24.9	-1.413	8.003	0.8585
202	26.	25.9	-1.394	7.984	0.8565
203	27.	26.9	-1.369	7.959	0.8538
204	28.	27.9	-1.35	7.94	0.8517

205	29.	28.9	-1.325	7.915	0.8491
206	30.	29.9	-1.306	7.896	0.847
207	31.	30.9	-1.287	7.877	0.845
208	32.	31.9	-1.268	7.858	0.843
209	33.	32.9	-1.25	7.84	0.841
210	34.	33.9	-1.224	7.814	0.8382
211	35.	34.9	-1.206	7.796	0.8363
212	36.	35.9	-1.193	7.783	0.8349
213	37.	36.9	-1.168	7.758	0.8322
214	38.	37.9	-1.155	7.745	0.8308
215	39.	38.9	-1.136	7.726	0.8288
216	40.	39.9	-1.118	7.708	0.8269
217	41.	40.9	-1.099	7.689	0.8248
218	42.	41.9	-1.086	7.676	0.8234
219	43.	42.9	-1.067	7.657	0.8214
220	44.	43.9	-1.055	7.645	0.8201
221	45.	44.9	-1.036	7.626	0.8181
222	46.	45.9	-1.023	7.613	0.8167
223	47.	46.9	-1.004	7.594	0.8146
224	48.	47.9	-0.992	7.582	0.8133
225	49.	48.9	-0.973	7.563	0.8113
226	50.	49.9	-0.961	7.551	0.81
227	51.	50.9	-0.942	7.532	0.808
228	52.	51.9	-0.929	7.519	0.8066
229	53.	52.9	-0.917	7.507	0.8053
230	54.	53.9	-0.904	7.494	0.8039
231	55.	54.9	-0.885	7.475	0.8019
232	56.	55.9	-0.873	7.463	0.8006
233	57.	56.9	-0.86	7.45	0.7992
234	58.	57.9	-0.841	7.431	0.7971
235	59.	58.9	-0.829	7.419	0.7959
236	60.	59.9	-0.816	7.406	0.7945
237	61.	60.9	-0.803	7.393	0.7931
238	62.	61.9	-0.791	7.381	0.7918
239	63.	62.9	-0.778	7.368	0.7904
240	64.	63.9	-0.766	7.356	0.7891
241	65.	64.9	-0.753	7.343	0.7877
242	66.	65.9	-0.741	7.331	0.7864
243	67.	66.9	-0.728	7.318	0.785
244	68.	67.9	-0.716	7.306	0.7837
245	69.	68.9	-0.703	7.293	0.7823
246	70.	69.9	-0.697	7.287	0.7817
247	71.	70.9	-0.684	7.274	0.7803
248	72.	71.9	-0.672	7.262	0.779
249	73.	72.9	-0.659	7.249	0.7776
250	74.	73.9	-0.653	7.243	0.777
251	75.	74.9	-0.646	7.236	0.7762
252	76.	75.9	-0.64	7.23	0.7756
253	77.	76.9	-0.628	7.218	0.7743
254	78.	77.9	-0.615	7.205	0.7729
255	79.	78.9	-0.602	7.192	0.7715
256	80.	79.9	-0.596	7.186	0.7709
257	81.	80.9	-0.584	7.174	0.7696
258	82.	81.9	-0.571	7.161	0.7682
259	83.	82.9	-0.565	7.155	0.7675
260	84.	83.9	-0.559	7.149	0.7669
261	85.	84.9	-0.546	7.136	0.7655

262	86.	85.9	-0.54	7.13	0.7649
263	87.	86.9	-0.527	7.117	0.7635
264	88.	87.9	-0.521	7.111	0.7628
265	89.	88.9	-0.508	7.098	0.7614
266	90.	89.9	-0.502	7.092	0.7608

Field Hydraulic Conductivity Test November 8, 2000 **Arithmetic Graph**

C&D Landfill, Inc. US 264 East, Pitt County B-7 falling head



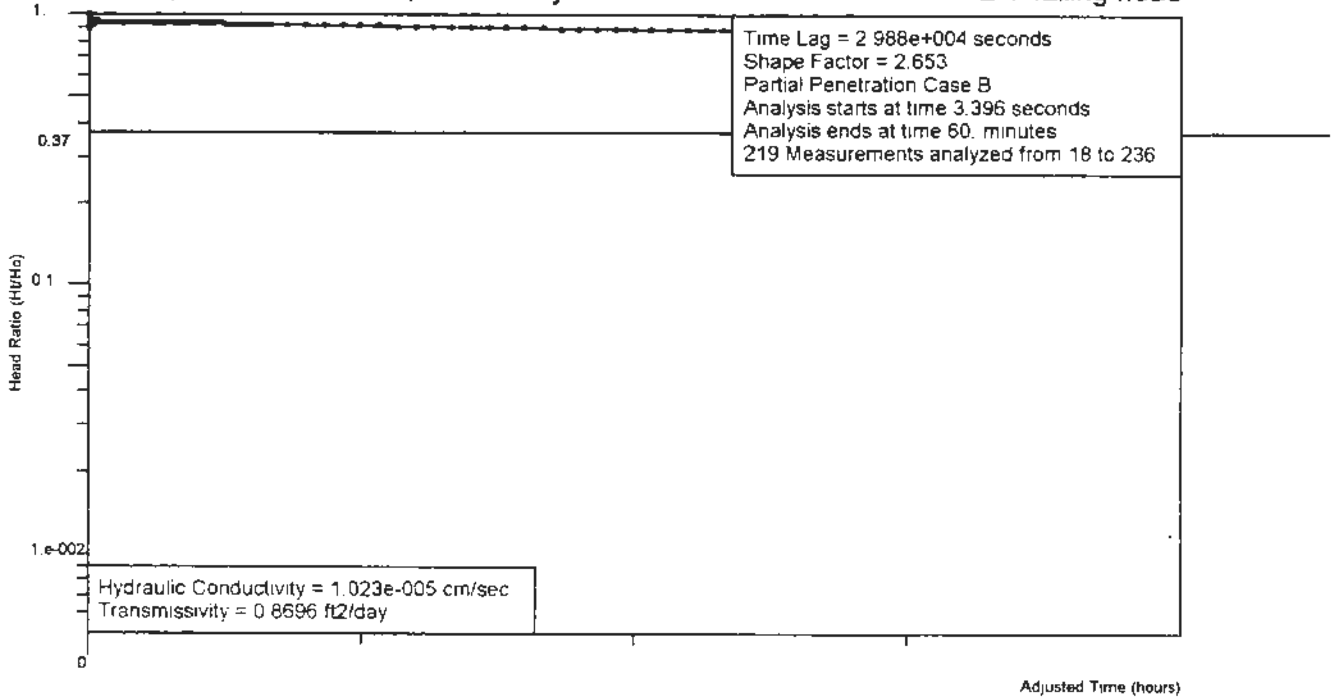
Analysis by Starpoint Software

Field Hydraulic Conductivity Test November 8, 2000

C&D Landfill, Inc. US 264 East, Pitt County

Hvorslev Graph

B-7 falling head



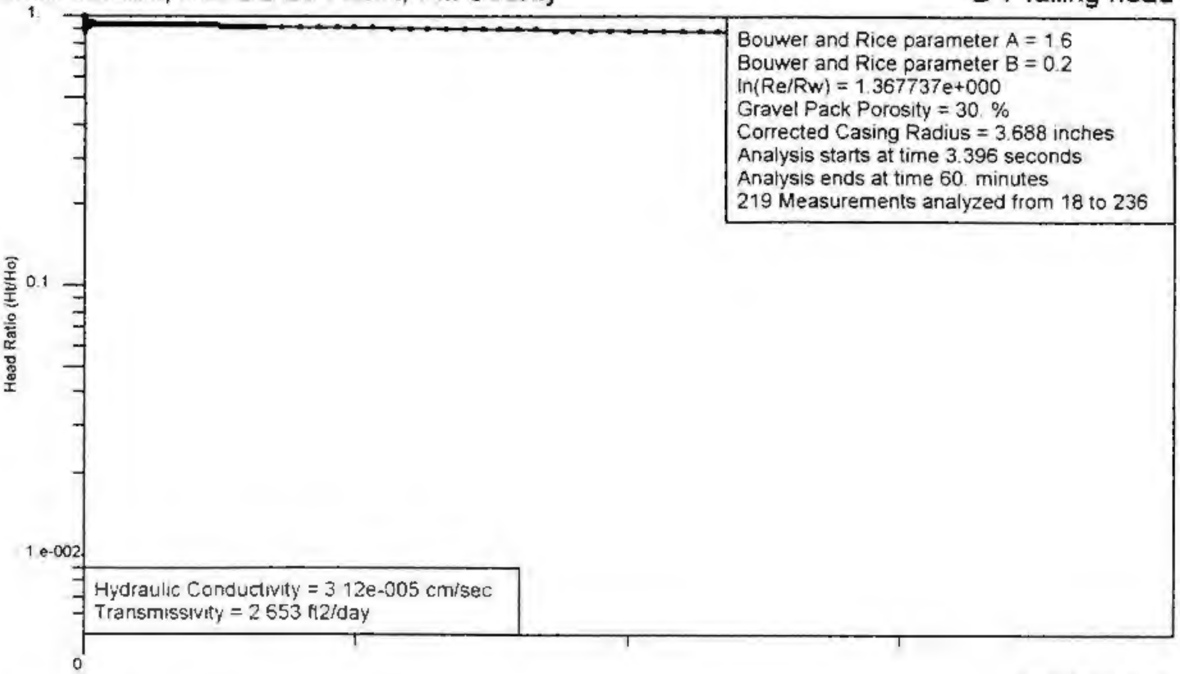
Analysis by Starpoint Software

Ho is 11.1 feet at 3.396 seconds

Field Hydraulic Conductivity Test November 8, 2000Bouwer and Rice Graph

C&D Landfill, Inc. US 264 East, Pitt County

B-7 falling head



Analysis by Starpoint Software

Ho is 11.1 feet at 3.396 seconds

Field Hydraulic Conductivity Test

Site Name: C&D Landfill, Inc.
Location: US 264 East, Pitt County
Test Date: November 7, 2000
Import File: C:\hermit datalogger\Pitt7s0

Well Label: B-7 falling head
Aquifer Thickness: 30. feet
Screen Length: 2. feet
Casing Radius: 2. inches
Effective Radius: 6. inches
Gravel Pack Porosity: 30. %
Corrected Casing Radius: 3.688 inches
Static Water Level: 8.34 feet
Water Table to Screen Bottom: 28.38 feet
Anisotropy Ratio: 1.
Time Adjustment: 3.396 Seconds
Test starts with trial 17
There are 236 time and drawdown measurements
Maximum head is 11.1 feet
Minimum head is 0. feet

Trial	Time (minutes)	Adjusted Time (minutes)	Drawdown (feet)	Head (feet)	Head Ratio
1	0.	-5.66e-002	-6.e-003	8.346	0.7522
2	3.3e-003	-5.33e-002	-6.e-003	8.346	0.7522
3	6.6e-003	-5.e-002	-1.8e-002	8.358	0.7532
4	1.e-002	-4.66e-002	-0.546	8.886	0.8008
5	1.33e-002	-4.33e-002	-0.74	9.08	0.8183
6	1.66e-002	-4.e-002	-1.029	9.369	0.8444
7	2.e-002	-3.66e-002	-1.362	9.702	0.8744
8	2.33e-002	-3.33e-002	-1.789	10.13	0.9129
9	2.66e-002	-3.e-002	-1.488	9.828	0.8857
10	3.e-002	-2.66e-002	-1.839	10.18	0.9174
11	3.33e-002	-2.33e-002	-2.185	10.53	0.9485
12	3.66e-002	-2.e-002	-2.436	10.78	0.9712
13	4.e-002	-1.66e-002	-2.574	10.91	0.9836
14	4.33e-002	-1.33e-002	-2.292	10.63	0.9582
15	4.66e-002	-1.e-002	-2.568	10.91	0.9831
16	5.e-002	-6.6e-003	-2.549	10.89	0.9813
17	5.33e-002	-3.3e-003	-2.348	10.69	0.9632
18	5.66e-002	0.	-2.756	11.1	1.
19	6.e-002	3.4e-003	-2.581	10.92	0.9842
20	6.33e-002	6.7e-003	-2.543	10.88	0.9808
21	6.66e-002	1.e-002	-2.392	10.73	0.9672
22	7.e-002	1.34e-002	-1.494	9.834	0.8863
23	7.33e-002	1.67e-002	-2.499	10.84	0.9768
24	7.66e-002	2.e-002	-2.348	10.69	0.9632
25	8.e-002	2.34e-002	-2.574	10.91	0.9836
26	8.33e-002	2.67e-002	-2.744	11.08	0.9989
27	8.66e-002	3.e-002	-2.405	10.74	0.9684
28	9.e-002	3.34e-002	-1.965	10.31	0.9287
29	9.33e-002	3.67e-002	-1.638	9.978	0.8992
30	9.66e-002	4.e-002	-2.015	10.36	0.9332
31	0.1	4.34e-002	-2.379	10.72	0.966
32	0.1033	4.67e-002	-2.235	10.57	0.953
33	0.1066	5.e-002	-2.072	10.41	0.9384

34	0.11	5.34e-002	-1.952	10.29	0.9275
35	0.1133	5.67e-002	-2.153	10.49	0.9457
36	0.1166	6.e-002	-2.103	10.44	0.9411
37	0.12	6.34e-002	-2.637	10.98	0.9893
38	0.1233	6.67e-002	-2.103	10.44	0.9411
39	0.1266	7.e-002	-1.99	10.33	0.931
40	0.13	7.34e-002	-2.229	10.57	0.9525
41	0.1333	7.67e-002	-2.254	10.59	0.9548
42	0.1366	8.e-002	-2.128	10.47	0.9434
43	0.14	8.34e-002	-2.329	10.67	0.9615
44	0.1433	8.67e-002	-2.21	10.55	0.9508
45	0.1466	9.e-002	-2.178	10.52	0.9479
46	0.15	9.34e-002	-1.883	10.22	0.9213
47	0.1533	9.67e-002	-2.191	10.53	0.9491
48	0.1566	1.e-001	-2.31	10.65	0.9598
49	0.16	0.1034	-2.153	10.49	0.9457
50	0.1633	0.1067	-2.116	10.46	0.9423
51	0.1666	0.11	-2.204	10.54	0.9503
52	0.17	0.1134	-2.178	10.52	0.9479
53	0.1733	0.1167	-2.166	10.51	0.9468
54	0.1766	0.12	-2.178	10.52	0.9479
55	0.18	0.1234	-2.172	10.51	0.9474
56	0.1833	0.1267	-2.172	10.51	0.9474
57	0.1866	0.13	-2.172	10.51	0.9474
58	0.19	0.1334	-2.172	10.51	0.9474
59	0.1933	0.1367	-2.172	10.51	0.9474
60	0.1966	0.14	-2.172	10.51	0.9474
61	0.2	0.1434	-2.172	10.51	0.9474
62	0.2033	0.1467	-2.172	10.51	0.9474
63	0.2066	0.15	-2.172	10.51	0.9474
64	0.21	0.1534	-2.172	10.51	0.9474
65	0.2133	0.1567	-2.172	10.51	0.9474
66	0.2166	0.16	-2.172	10.51	0.9474
67	0.22	0.1634	-2.172	10.51	0.9474
68	0.2233	0.1667	-2.172	10.51	0.9474
69	0.2266	0.17	-2.172	10.51	0.9474
70	0.23	0.1734	-2.172	10.51	0.9474
71	0.2333	0.1767	-2.172	10.51	0.9474
72	0.2366	0.18	-2.172	10.51	0.9474
73	0.24	0.1834	-2.172	10.51	0.9474
74	0.2433	0.1867	-2.172	10.51	0.9474
75	0.2466	0.19	-2.172	10.51	0.9474
76	0.25	0.1934	-2.172	10.51	0.9474
77	0.2533	0.1967	-2.172	10.51	0.9474
78	0.2566	0.2	-2.172	10.51	0.9474
79	0.26	0.2034	-2.178	10.52	0.9479
80	0.2633	0.2067	-2.166	10.51	0.9468
81	0.2666	0.21	-2.172	10.51	0.9474
82	0.27	0.2134	-2.172	10.51	0.9474
83	0.2733	0.2167	-2.172	10.51	0.9474
84	0.2766	0.22	-2.166	10.51	0.9468
85	0.28	0.2234	-2.21	10.55	0.9508
86	0.2833	0.2267	-2.348	10.69	0.9632
87	0.2866	0.23	-1.908	10.25	0.9236
88	0.29	0.2334	-2.109	10.45	0.9417
89	0.2933	0.2367	-2.348	10.69	0.9632
90	0.2966	0.24	-2.153	10.49	0.9457

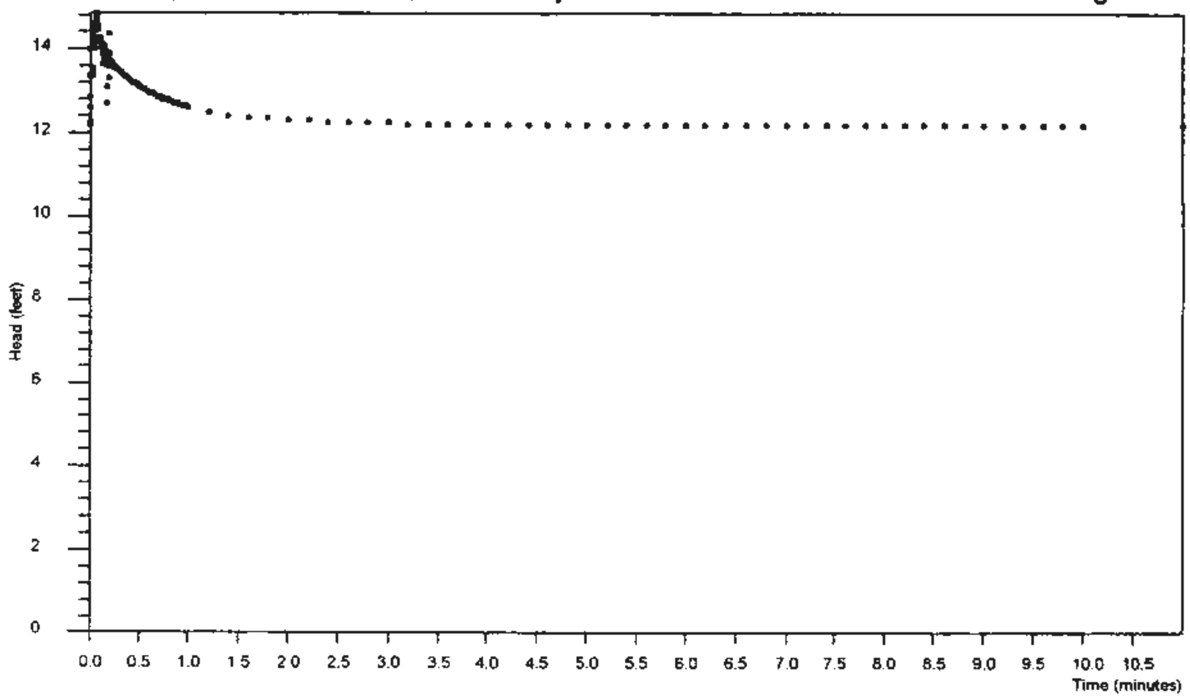
91	0.3	0.2434	-2.091	10.43	0.9401
92	0.3033	0.2467	-2.197	10.54	0.9496
93	0.3066	0.25	-2.178	10.52	0.9479
94	0.31	0.2534	-2.16	10.5	0.9463
95	0.3133	0.2567	-2.172	10.51	0.9474
96	0.3166	0.26	-2.166	10.51	0.9468
97	0.32	0.2634	-2.166	10.51	0.9468
98	0.3233	0.2667	-2.166	10.51	0.9468
99	0.3266	0.27	-2.166	10.51	0.9468
100	0.33	0.2734	-2.166	10.51	0.9468
101	0.3333	0.2767	-2.166	10.51	0.9468
102	0.35	0.2934	-2.166	10.51	0.9468
103	0.3666	0.31	-2.166	10.51	0.9468
104	0.3833	0.3267	-2.166	10.51	0.9468
105	0.4	0.3434	-2.166	10.51	0.9468
106	0.4166	0.36	-2.166	10.51	0.9468
107	0.4333	0.3767	-2.166	10.51	0.9468
108	0.45	0.3934	-2.166	10.51	0.9468
109	0.4666	0.41	-2.16	10.5	0.9463
110	0.4833	0.4267	-2.166	10.51	0.9468
111	0.5	0.4434	-2.172	10.51	0.9474
112	0.5166	0.46	-2.166	10.51	0.9468
113	0.5333	0.4767	-2.166	10.51	0.9468
114	0.55	0.4934	-2.166	10.51	0.9468
115	0.5666	0.51	-2.166	10.51	0.9468
116	0.5833	0.5267	-2.197	10.54	0.9496
117	0.6	0.5434	-2.166	10.51	0.9468
118	0.6166	0.56	-2.166	10.51	0.9468
119	0.6333	0.5767	-2.16	10.5	0.9463
120	0.65	0.5934	-2.166	10.51	0.9468
121	0.6666	0.61	-2.16	10.5	0.9463
122	0.6833	0.6267	-2.16	10.5	0.9463
123	0.7	0.6434	-2.16	10.5	0.9463
124	0.7166	0.66	-2.16	10.5	0.9463
125	0.7333	0.6767	-2.16	10.5	0.9463
126	0.75	0.6934	-2.16	10.5	0.9463
127	0.7666	0.71	-2.16	10.5	0.9463
128	0.7833	0.7267	-2.153	10.49	0.9457
129	0.8	0.7434	-2.153	10.49	0.9457
130	0.8166	0.76	-2.16	10.5	0.9463
131	0.8333	0.7767	-2.153	10.49	0.9457
132	0.85	0.7934	-2.153	10.49	0.9457
133	0.8666	0.81	-2.153	10.49	0.9457
134	0.8833	0.8267	-2.153	10.49	0.9457
135	0.9	0.8434	-2.153	10.49	0.9457
136	0.9166	0.86	-2.153	10.49	0.9457
137	0.9333	0.8767	-2.153	10.49	0.9457
138	0.95	0.8934	-2.153	10.49	0.9457
139	0.9666	0.91	-2.153	10.49	0.9457
140	0.9833	0.9267	-2.147	10.49	0.9451
141	1.	0.9434	-2.147	10.49	0.9451
142	1.2	1.143	-2.141	10.48	0.9446
143	1.4	1.343	-2.135	10.48	0.944
144	1.6	1.543	-2.128	10.47	0.9434
145	1.8	1.743	-2.128	10.47	0.9434
146	2.	1.943	-2.122	10.46	0.9429
147	2.2	2.143	-2.116	10.46	0.9423

148	2.4	2.317	-2.148	14.14	0.9267
149	2.6	2.517	-2.142	14.13	0.9263
150	2.8	2.717	-2.142	14.13	0.9263
151	3.	2.917	-2.135	14.13	0.9258
152	3.2	3.117	-2.129	14.12	0.9254
153	3.4	3.317	-2.129	14.12	0.9254
154	3.6	3.517	-2.123	14.11	0.925
155	3.8	3.717	-2.123	14.11	0.925
156	4.	3.917	-2.116	14.11	0.9246
157	4.2	4.117	-2.11	14.1	0.9242
158	4.4	4.317	-2.11	14.1	0.9242
159	4.6	4.517	-2.104	14.09	0.9238
160	4.8	4.717	-2.098	14.09	0.9234
161	5.	4.917	-2.098	14.09	0.9234
162	5.2	5.117	-2.091	14.08	0.9229
163	5.4	5.317	-2.085	14.07	0.9225
164	5.6	5.517	-2.085	14.07	0.9225
165	5.8	5.717	-2.079	14.07	0.9221
166	6.	5.917	-2.079	14.07	0.9221
167	6.2	6.117	-2.073	14.06	0.9217
168	6.4	6.317	-2.066	14.06	0.9213
169	6.6	6.517	-2.066	14.06	0.9213
170	6.8	6.717	-2.06	14.05	0.9209
171	7.	6.917	-2.06	14.05	0.9209
172	7.2	7.117	-2.054	14.04	0.9205
173	7.4	7.317	-2.054	14.04	0.9205
174	7.6	7.517	-2.047	14.04	0.92
175	7.8	7.717	-2.041	14.03	0.9196
176	8.	7.917	-2.041	14.03	0.9196
177	8.2	8.117	-2.035	14.03	0.9193
178	8.4	8.317	-2.035	14.03	0.9193
179	8.6	8.517	-2.029	14.02	0.9189
180	8.8	8.717	-2.029	14.02	0.9189
181	9.	8.917	-2.022	14.01	0.9184
182	9.2	9.117	-2.022	14.01	0.9184
183	9.4	9.317	-2.016	14.01	0.918
184	9.6	9.517	-2.016	14.01	0.918
185	9.8	9.717	-2.01	14.	0.9176
186	10.	9.917	-2.003	13.99	0.9172
187	11.	10.92	-1.991	13.98	0.9164
188	12.	11.92	-1.972	13.96	0.9151
189	13.	12.92	-1.959	13.95	0.9143
190	14.	13.92	-1.941	13.93	0.9131
191	15.	14.92	-1.922	13.91	0.9118
192	16.	15.92	-1.903	13.89	0.9106
193	17.	16.92	-1.89	13.88	0.9097
194	18.	17.92	-1.871	13.86	0.9085
195	19.	18.92	-1.859	13.85	0.9077
196	20.	19.92	-1.846	13.84	0.9069
197	21.	20.92	-1.834	13.82	0.9061
198	22.	21.92	-1.815	13.81	0.9048
199	23.	22.92	-1.796	13.79	0.9036
200	24.	23.92	-1.783	13.77	0.9027
201	25.	24.92	-1.771	13.76	0.9019
202	26.	25.92	-1.758	13.75	0.9011
203	27.	26.92	-1.74	13.73	0.8999
204	28.	27.92	-1.727	13.72	0.8991

205	29.	28.92	-1.714	13.7	0.8982
206	30.	29.92	-1.702	13.69	0.8974
207	31.	30.92	-1.689	13.68	0.8966
208	32.	31.92	-1.677	13.67	0.8958
209	33.	32.92	-1.664	13.65	0.8949
210	34.	33.92	-1.645	13.64	0.8937
211	35.	34.92	-1.633	13.62	0.8929
212	36.	35.92	-1.62	13.61	0.892
213	37.	36.92	-1.608	13.6	0.8913
214	38.	37.92	-1.595	13.59	0.8904
215	39.	38.92	-1.582	13.57	0.8896
216	40.	39.92	-1.57	13.56	0.8888
217	41.	40.92	-1.557	13.55	0.8879
218	42.	41.92	-1.545	13.54	0.8871
219	43.	42.92	-1.532	13.52	0.8863
220	44.	43.92	-1.52	13.51	0.8855
221	45.	44.92	-1.507	13.5	0.8846
222	46.	45.92	-1.501	13.49	0.8842
223	47.	46.92	-1.488	13.48	0.8834
224	48.	47.92	-1.476	13.47	0.8826
225	49.	48.92	-1.463	13.45	0.8818
226	50.	49.92	-1.451	13.44	0.881
227	51.	50.92	-1.438	13.43	0.8801
228	52.	51.92	-1.425	13.41	0.8793
229	53.	52.92	-1.419	13.41	0.8789
230	54.	53.92	-1.406	13.4	0.878
231	55.	54.92	-1.394	13.38	0.8772
232	56.	55.92	-1.381	13.37	0.8764
233	57.	56.92	-1.369	13.36	0.8756
234	58.	57.92	-1.363	13.35	0.8752
235	59.	58.92	-1.35	13.34	0.8744
236	60.	59.92	-1.344	13.33	0.874
237	61.	60.92	-1.331	13.32	0.8731
238	62.	61.92	-1.319	13.31	0.8723
239	63.	62.92	-1.306	13.3	0.8715
240	64.	63.92	-1.293	13.28	0.8706
241	65.	64.92	-1.287	13.28	0.8702
242	66.	65.92	-1.275	13.27	0.8694
243	67.	66.92	-1.268	13.26	0.869
244	68.	67.92	-1.256	13.25	0.8682

Field Hydraulic Conductivity Test November 7, 2000 **Arithmetic Graph**

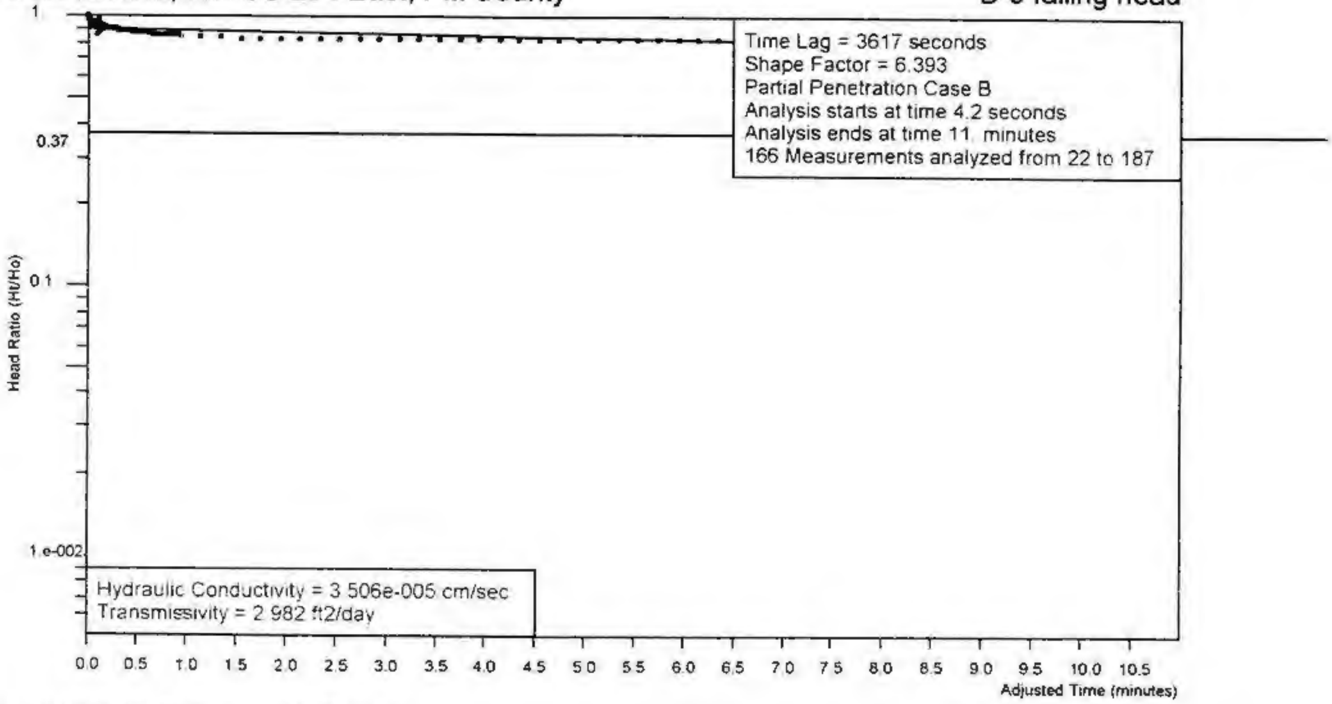
C&D Landfill, Inc. US 264 East, Pitt County B-3 falling head



Analysis by Starpoint Software

Field Hydraulic Conductivity Test November 7, 2000 **Hvorslev Graph**

C&D Landfill, Inc. US 264 East, Pitt County B-3 falling head



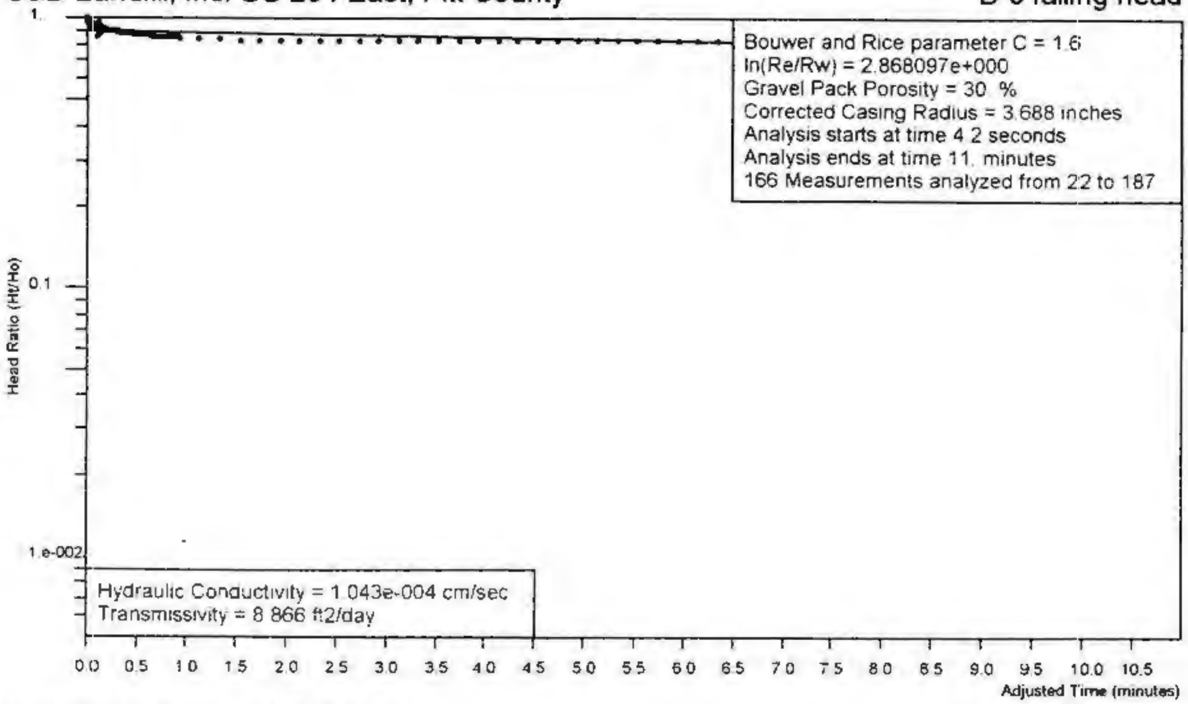
Analysis by Starpoint Software

Ho is 14.82 feet at 4.2 seconds

Field Hydraulic Conductivity Test November 7, 2000Bouwer and Rice Graph

C&D Landfill, Inc. US 264 East, Pitt County

B-3 falling head



Analysis by Starpoint Software

Ho is 14.82 feet at 4.2 seconds

Field Hydraulic Conductivity Test

Site Name: C&D Landfill, Inc.
Location: US 264 East, Pitt County
Test Date: November 7, 2000
Import File: C:\hermit datalogger\Pitt3s0

Well Label: B-3 falling head
Aquifer Thickness: 30. feet
Screen Length: 10. feet
Casing Radius: 2. inches
Effective Radius: 6. inches
Gravel Pack Porosity: 30. %
Corrected Casing Radius: 3.688 inches
Static Water Level: 12.14 feet
Water Table to Screen Bottom: 40.24 feet
Anisotropy Ratio: 1.
Time Adjustment: 4.2 Seconds
Test starts with trial 21
There are 187 time and drawdown measurements
Maximum head is 14.82 feet
Minimum head is 0. feet

Trial	Time (minutes)	Adjusted Time (minutes)	Drawdown (feet)	Head (feet)	Head Ratio
1	0.	-7.e-002	-3.7e-002	12.18	0.8216
2	3.3e-003	-6.67e-002	-0.119	12.26	0.8271
3	6.6e-003	-6.34e-002	-0.477	12.62	0.8513
4	1.e-002	-6.e-002	-1.186	13.33	0.8991
5	1.33e-002	-5.67e-002	-1.23	13.37	0.9021
6	1.66e-002	-5.34e-002	-1.864	14.	0.9449
7	2.e-002	-5.e-002	-0.715	12.86	0.8674
8	2.33e-002	-4.67e-002	-1.349	13.49	0.9101
9	2.66e-002	-4.34e-002	-1.236	13.38	0.9025
10	3.e-002	-4.e-002	-1.356	13.5	0.9106
11	3.33e-002	-3.67e-002	-1.381	13.52	0.9123
12	3.66e-002	-3.34e-002	-1.205	13.35	0.9004
13	4.e-002	-3.e-002	-2.455	14.6	0.9848
14	4.33e-002	-2.67e-002	-1.877	14.02	0.9458
15	4.66e-002	-2.34e-002	-1.984	14.12	0.953
16	5.e-002	-2.e-002	-2.254	14.39	0.9712
17	5.33e-002	-1.67e-002	-2.103	14.24	0.961
18	5.66e-002	-1.34e-002	-2.116	14.26	0.9619
19	6.e-002	-1.e-002	-2.417	14.56	0.9822
20	6.33e-002	-6.7e-003	-2.631	14.77	0.9966
21	6.66e-002	-3.4e-003	-2.675	14.82	0.9996
22	7.e-002	0.	-2.681	14.82	1.
23	7.33e-002	3.3e-003	-2.662	14.8	0.9987
24	7.66e-002	6.6e-003	-2.549	14.69	0.9911
25	8.e-002	1.e-002	-2.518	14.66	0.989
26	8.33e-002	1.33e-002	-2.43	14.57	0.9831
27	8.66e-002	1.66e-002	-2.392	14.53	0.9805
28	9.e-002	2.e-002	-2.342	14.48	0.9771
29	9.33e-002	2.33e-002	-2.379	14.52	0.9796
30	9.66e-002	2.66e-002	-2.291	14.43	0.9737
31	0.1	3.e-002	-2.291	14.43	0.9737
32	0.1033	3.33e-002	-2.116	14.26	0.9619
33	0.1066	3.66e-002	-1.99	14.13	0.9534

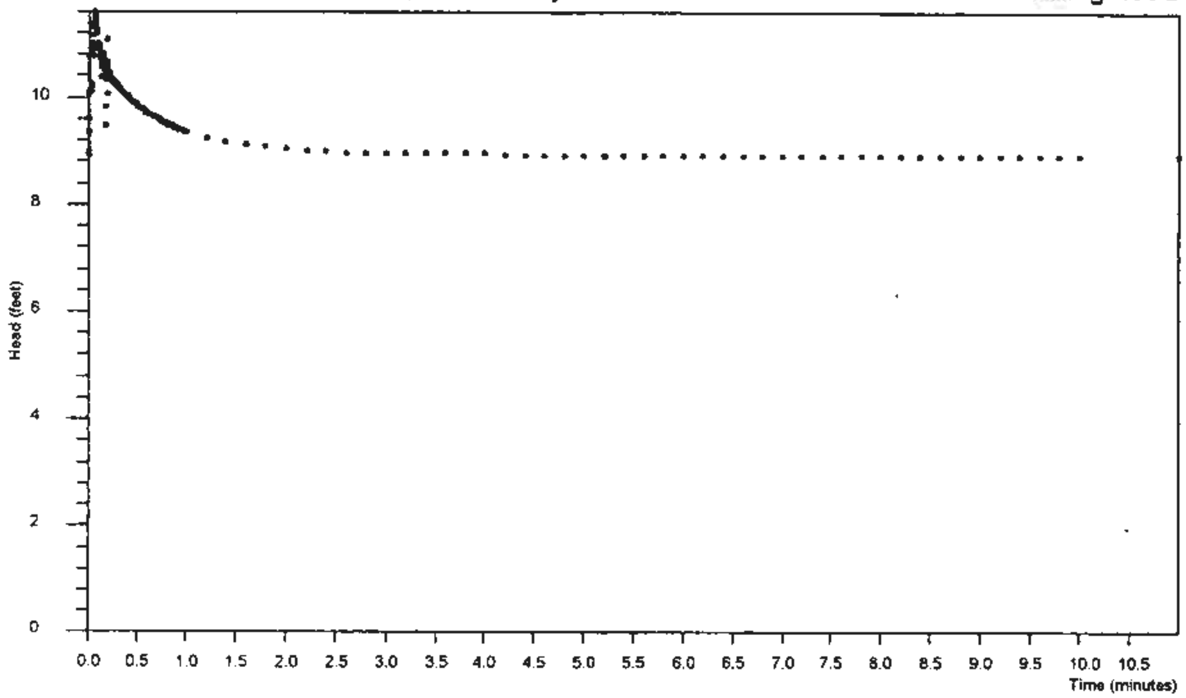
34	0.11	4.e-002	-1.984	14.12	0.953
35	0.1133	4.33e-002	-2.04	14.18	0.9568
36	0.1166	4.66e-002	-1.889	14.03	0.9466
37	0.12	5.e-002	-2.109	14.25	0.9614
38	0.1233	5.33e-002	-1.977	14.12	0.9525
39	0.1266	5.66e-002	-1.858	14.	0.9445
40	0.13	6.e-002	-1.701	13.84	0.9339
41	0.1333	6.33e-002	-1.864	14.	0.9449
42	0.1366	6.66e-002	-1.481	13.62	0.919
43	0.14	7.e-002	-1.802	13.94	0.9407
44	0.1433	7.33e-002	-1.726	13.87	0.9356
45	0.1466	7.66e-002	-1.933	14.07	0.9495
46	0.15	8.e-002	-1.626	13.77	0.9288
47	0.1533	8.33e-002	-1.915	14.06	0.9483
48	0.1566	8.66e-002	-1.839	13.98	0.9432
49	0.16	9.e-002	-1.846	13.99	0.9437
50	0.1633	9.33e-002	-1.789	13.93	0.9398
51	0.1666	9.66e-002	-1.764	13.9	0.9381
52	0.17	0.1	-0.577	12.72	0.858
53	0.1733	0.1033	-1.469	13.61	0.9182
54	0.1766	0.1066	-1.613	13.75	0.9279
55	0.18	0.11	-1.456	13.6	0.9173
56	0.1833	0.1133	-0.935	13.08	0.8822
57	0.1866	0.1166	-1.55	13.69	0.9237
58	0.19	0.12	-2.191	14.33	0.9669
59	0.1933	0.1233	-1.745	13.89	0.9368
60	0.1966	0.1266	-1.167	13.31	0.8978
61	0.2	0.13	-1.601	13.74	0.9271
62	0.2033	0.1333	-1.701	13.84	0.9339
63	0.2066	0.1366	-1.444	13.58	0.9165
64	0.21	0.14	-1.481	13.62	0.919
65	0.2133	0.1433	-1.557	13.7	0.9242
66	0.2166	0.1466	-1.494	13.63	0.9199
67	0.22	0.15	-1.481	13.62	0.919
68	0.2233	0.1533	-1.488	13.63	0.9195
69	0.2266	0.1566	-1.475	13.62	0.9186
70	0.23	0.16	-1.469	13.61	0.9182
71	0.2333	0.1633	-1.462	13.6	0.9178
72	0.2366	0.1666	-1.456	13.6	0.9173
73	0.24	0.17	-1.444	13.58	0.9165
74	0.2433	0.1733	-1.437	13.58	0.9161
75	0.2466	0.1766	-1.431	13.57	0.9157
76	0.25	0.18	-1.418	13.56	0.9148
77	0.2533	0.1833	-1.418	13.56	0.9148
78	0.2566	0.1866	-1.406	13.55	0.914
79	0.26	0.19	-1.4	13.54	0.9136
80	0.2633	0.1933	-1.393	13.53	0.9131
81	0.2666	0.1966	-1.387	13.53	0.9127
82	0.27	0.2	-1.381	13.52	0.9123
83	0.2733	0.2033	-1.374	13.51	0.9118
84	0.2766	0.2066	-1.368	13.51	0.9114
85	0.28	0.21	-1.362	13.5	0.911
86	0.2833	0.2133	-1.349	13.49	0.9101
87	0.2866	0.2166	-1.343	13.48	0.9097
88	0.29	0.22	-1.337	13.48	0.9093
89	0.2933	0.2233	-1.331	13.47	0.9089
90	0.2966	0.2266	-1.324	13.46	0.9084

91	0.3	0.23	-1.318	13.46	0.908
92	0.3033	0.2333	-1.312	13.45	0.9076
93	0.3066	0.2366	-1.299	13.44	0.9068
94	0.31	0.24	-1.305	13.45	0.9072
95	0.3133	0.2433	-1.28	13.42	0.9055
96	0.3166	0.2466	-1.28	13.42	0.9055
97	0.32	0.25	-1.274	13.41	0.9051
98	0.3233	0.2533	-1.268	13.41	0.9047
99	0.3266	0.2566	-1.261	13.4	0.9042
100	0.33	0.26	-1.255	13.4	0.9038
101	0.3333	0.2633	-1.249	13.39	0.9034
102	0.35	0.28	-1.218	13.36	0.9013
103	0.3666	0.2966	-1.18	13.32	0.8987
104	0.3833	0.3133	-1.155	13.3	0.897
105	0.4	0.33	-1.123	13.26	0.8949
106	0.4166	0.3466	-1.079	13.22	0.8919
107	0.4333	0.3633	-1.061	13.2	0.8907
108	0.45	0.38	-1.035	13.18	0.8889
109	0.4666	0.3966	-1.01	13.15	0.8873
110	0.4833	0.4133	-0.985	13.13	0.8856
111	0.5	0.43	-0.96	13.1	0.8839
112	0.5166	0.4466	-0.935	13.08	0.8822
113	0.5333	0.4633	-0.91	13.05	0.8805
114	0.55	0.48	-0.885	13.03	0.8788
115	0.5666	0.4966	-0.866	13.01	0.8775
116	0.5833	0.5133	-0.841	12.98	0.8759
117	0.6	0.53	-0.822	12.96	0.8746
118	0.6166	0.5466	-0.803	12.94	0.8733
119	0.6333	0.5633	-0.784	12.92	0.872
120	0.65	0.58	-0.765	12.91	0.8707
121	0.6666	0.5966	-0.747	12.89	0.8695
122	0.6833	0.6133	-0.728	12.87	0.8682
123	0.7	0.63	-0.709	12.85	0.8669
124	0.7166	0.6466	-0.696	12.84	0.8661
125	0.7333	0.6633	-0.678	12.82	0.8649
126	0.75	0.68	-0.665	12.81	0.864
127	0.7666	0.6966	-0.646	12.79	0.8627
128	0.7833	0.7133	-0.634	12.77	0.8619
129	0.8	0.73	-0.615	12.76	0.8606
130	0.8166	0.7466	-0.602	12.74	0.8597
131	0.8333	0.7633	-0.59	12.73	0.8589
132	0.85	0.78	-0.577	12.72	0.858
133	0.8666	0.7966	-0.564	12.7	0.8572
134	0.8833	0.8133	-0.552	12.69	0.8564
135	0.9	0.83	-0.539	12.68	0.8555
136	0.9166	0.8466	-0.527	12.67	0.8547
137	0.9333	0.8633	-0.514	12.65	0.8538
138	0.95	0.88	-0.502	12.64	0.853
139	0.9666	0.8966	-0.489	12.63	0.8521
140	0.9833	0.9133	-0.483	12.62	0.8517
141	1.	0.93	-0.47	12.61	0.8508
142	1.2	1.13	-0.351	12.49	0.8428
143	1.4	1.33	-0.276	12.42	0.8377
144	1.6	1.53	-0.225	12.37	0.8343
145	1.8	1.73	-0.188	12.33	0.8318
146	2.	1.93	-0.156	12.3	0.8296
147	2.2	2.13	-0.138	12.28	0.8284

148	2.4	2.33	-0.119	12.26	0.8271
149	2.6	2.53	-0.1	12.24	0.8259
150	2.8	2.73	-9.4e-002	12.23	0.8255
151	3.	2.93	-8.7e-002	12.23	0.825
152	3.2	3.13	-7.5e-002	12.22	0.8242
153	3.4	3.33	-6.9e-002	12.21	0.8238
154	3.6	3.53	-6.9e-002	12.21	0.8238
155	3.8	3.73	-6.2e-002	12.2	0.8233
156	4.	3.93	-6.2e-002	12.2	0.8233
157	4.2	4.13	-5.6e-002	12.2	0.8229
158	4.4	4.33	-5.6e-002	12.2	0.8229
159	4.6	4.53	-5.e-002	12.19	0.8225
160	4.8	4.73	-5.e-002	12.19	0.8225
161	5.	4.93	-5.e-002	12.19	0.8225
162	5.2	5.13	-5.e-002	12.19	0.8225
163	5.4	5.33	-5.e-002	12.19	0.8225
164	5.6	5.53	-4.3e-002	12.18	0.822
165	5.8	5.73	-4.3e-002	12.18	0.822
166	6.	5.93	-4.3e-002	12.18	0.822
167	6.2	6.13	-4.3e-002	12.18	0.822
168	6.4	6.33	-4.3e-002	12.18	0.822
169	6.6	6.53	-4.3e-002	12.18	0.822
170	6.8	6.73	-3.7e-002	12.18	0.8216
171	7.	6.93	-4.3e-002	12.18	0.822
172	7.2	7.13	-3.7e-002	12.18	0.8216
173	7.4	7.33	-3.7e-002	12.18	0.8216
174	7.6	7.53	-3.7e-002	12.18	0.8216
175	7.8	7.73	-3.7e-002	12.18	0.8216
176	8.	7.93	-3.7e-002	12.18	0.8216
177	8.2	8.13	-3.7e-002	12.18	0.8216
178	8.4	8.33	-3.7e-002	12.18	0.8216
179	8.6	8.53	-3.7e-002	12.18	0.8216
180	8.8	8.73	-3.7e-002	12.18	0.8216
181	9.	8.93	-3.7e-002	12.18	0.8216
182	9.2	9.13	-3.7e-002	12.18	0.8216
183	9.4	9.33	-3.7e-002	12.18	0.8216
184	9.6	9.53	-3.1e-002	12.17	0.8212
185	9.8	9.73	-3.7e-002	12.18	0.8216
186	10.	9.93	-3.7e-002	12.18	0.8216
187	11.	10.93	-3.1e-002	12.17	0.8212

Field Hydraulic Conductivity Test November 7, 2000 **Arithmetic Graph**

C&D Landfill, Inc. US 264 East, Pitt County B-4 falling head



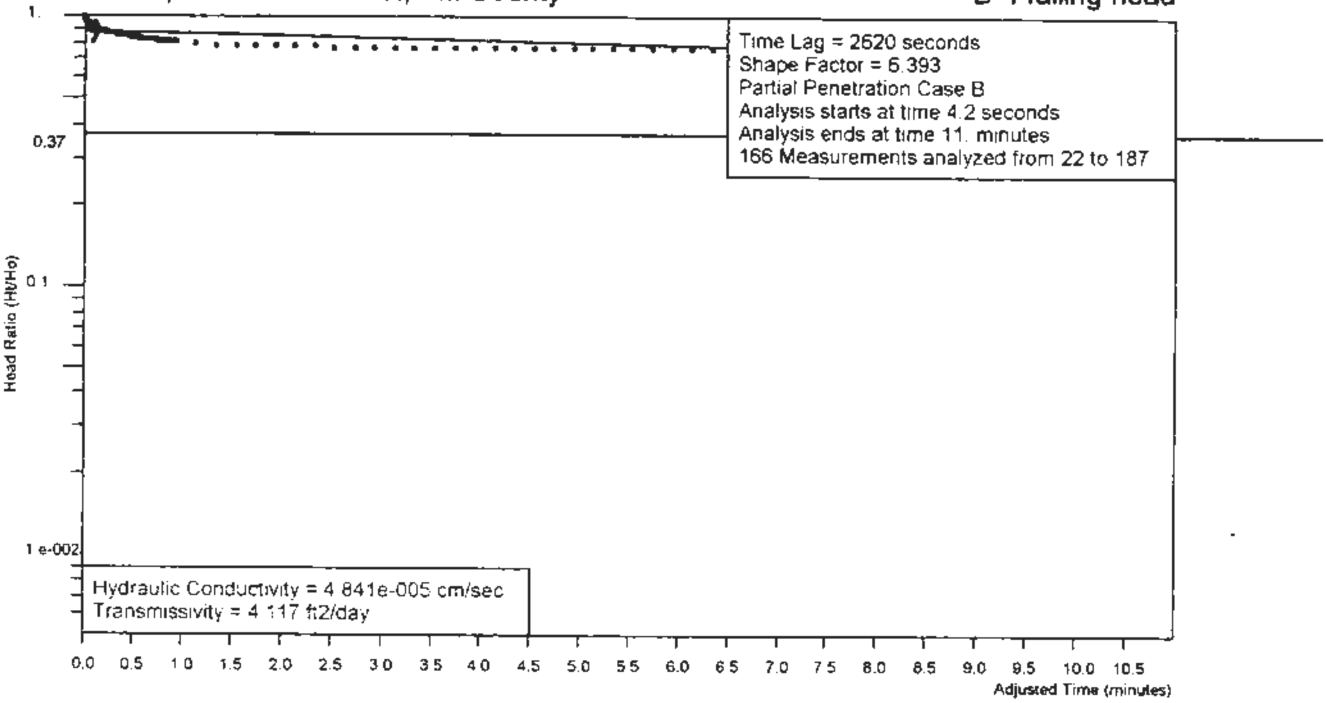
Analysis by Starpoint Software

Field Hydraulic Conductivity Test November 7, 2000

C&D Landfill, Inc. US 264 East, Pitt County

Hvorslev Graph

B-4 falling head



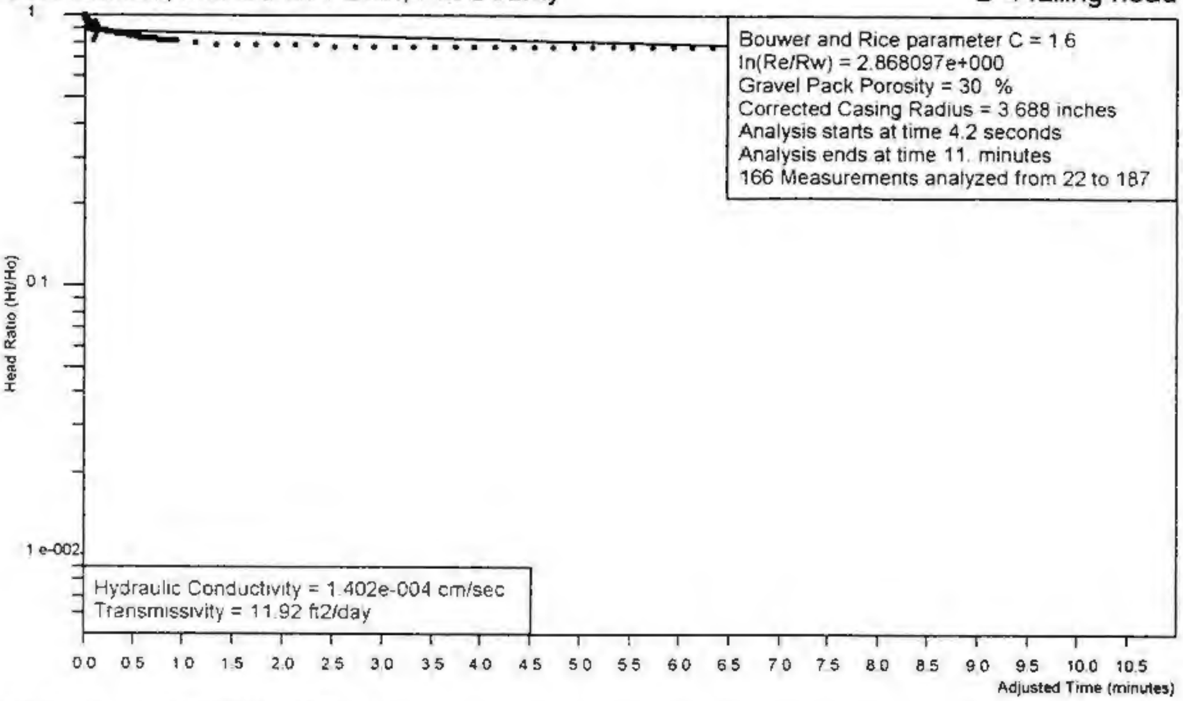
Analysis by Starpoint Software

Ho is 11.57 feet at 4.2 seconds

Field Hydraulic Conductivity Test November 7, 2000Bouwer and Rice Graph

C&D Landfill, Inc. US 264 East, Pitt County

B-4 falling head



Analysis by Starpoint Software

Ho is 11.57 feet at 4.2 seconds

Field Hydraulic Conductivity Test

Site Name: C&D Landfill, Inc.
Location: US 264 East, Pitt County
Test Date: November 7, 2000
Import File: C:\hermit datalogger\Pitt3s0

Well Label: B-4 falling head
Aquifer Thickness: 30. feet
Screen Length: 10. feet
Casing Radius: 2. inches
Effective Radius: 6. inches
Gravel Pack Porosity: 30. %
Corrected Casing Radius: 3.688 inches
Static Water Level: 8.89 feet
Water Table to Screen Bottom: 44.74 feet
Anisotropy Ratio: 1.
Time Adjustment: 4.2 Seconds
Test starts with trial 21
There are 187 time and drawdown measurements
Maximum head is 11.57 feet
Minimum head is 0. feet

Trial	Time (minutes)	Adjusted Time (minutes)	Drawdown (feet)	Head (feet)	Head Ratio
1	0.	-7.e-002	-3.7e-002	8.927	0.7715
2	3.3e-003	-6.67e-002	-0.119	9.009	0.7786
3	6.6e-003	-6.34e-002	-0.477	9.367	0.8095
4	1.e-002	-6.e-002	-1.186	10.08	0.8708
5	1.33e-002	-5.67e-002	-1.23	10.12	0.8746
6	1.66e-002	-5.34e-002	-1.864	10.75	0.9294
7	2.e-002	-5.e-002	-0.715	9.605	0.8301
8	2.33e-002	-4.67e-002	-1.349	10.24	0.8849
9	2.66e-002	-4.34e-002	-1.236	10.13	0.8751
10	3.e-002	-4.e-002	-1.356	10.25	0.8855
11	3.33e-002	-3.67e-002	-1.381	10.27	0.8877
12	3.66e-002	-3.34e-002	-1.205	10.1	0.8724
13	4.e-002	-3.e-002	-2.455	11.35	0.9805
14	4.33e-002	-2.67e-002	-1.877	10.77	0.9305
15	4.66e-002	-2.34e-002	-1.984	10.87	0.9398
16	5.e-002	-2.e-002	-2.254	11.14	0.9631
17	5.33e-002	-1.67e-002	-2.103	10.99	0.95
18	5.66e-002	-1.34e-002	-2.116	11.01	0.9512
19	6.e-002	-1.e-002	-2.417	11.31	0.9772
20	6.33e-002	-6.7e-003	-2.631	11.52	0.9957
21	6.66e-002	-3.4e-003	-2.675	11.57	0.9995
22	7.e-002	0.	-2.681	11.57	1.
23	7.33e-002	3.3e-003	-2.662	11.55	0.9984
24	7.66e-002	6.6e-003	-2.549	11.44	0.9886
25	8.e-002	1.e-002	-2.518	11.41	0.9859
26	8.33e-002	1.33e-002	-2.43	11.32	0.9783
27	8.66e-002	1.66e-002	-2.392	11.28	0.975
28	9.e-002	2.e-002	-2.342	11.23	0.9707
29	9.33e-002	2.33e-002	-2.379	11.27	0.9739
30	9.66e-002	2.66e-002	-2.291	11.18	0.9663
31	0.1	3.e-002	-2.291	11.18	0.9663
32	0.1033	3.33e-002	-2.116	11.01	0.9512
33	0.1066	3.66e-002	-1.99	10.88	0.9403

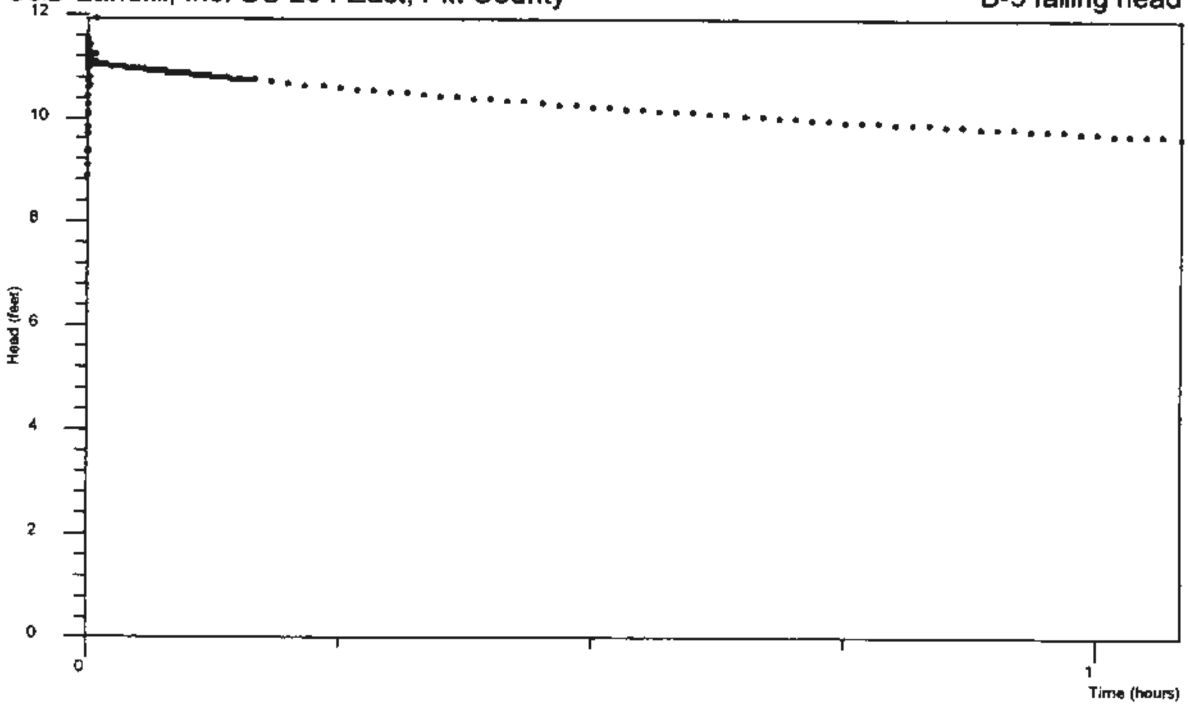
34	0.11	4.e-002	-1.984	10.87	0.9398
35	0.1133	4.33e-002	-2.04	10.93	0.9446
36	0.1166	4.66e-002	-1.889	10.78	0.9316
37	0.12	5.e-002	-2.109	11.	0.9506
38	0.1233	5.33e-002	-1.977	10.87	0.9392
39	0.1266	5.66e-002	-1.858	10.75	0.9289
40	0.13	6.e-002	-1.701	10.59	0.9153
41	0.1333	6.33e-002	-1.864	10.75	0.9294
42	0.1366	6.66e-002	-1.481	10.37	0.8963
43	0.14	7.e-002	-1.802	10.69	0.924
44	0.1433	7.33e-002	-1.726	10.62	0.9175
45	0.1466	7.66e-002	-1.933	10.82	0.9354
46	0.15	8.e-002	-1.626	10.52	0.9088
47	0.1533	8.33e-002	-1.915	10.81	0.9338
48	0.1566	8.66e-002	-1.839	10.73	0.9272
49	0.16	9.e-002	-1.846	10.74	0.9278
50	0.1633	9.33e-002	-1.789	10.68	0.9229
51	0.1666	9.66e-002	-1.764	10.65	0.9208
52	0.17	0.1	-0.577	9.467	0.8182
53	0.1733	0.1033	-1.469	10.36	0.8953
54	0.1766	0.1066	-1.613	10.5	0.9077
55	0.18	0.11	-1.456	10.35	0.8941
56	0.1833	0.1133	-0.935	9.825	0.8491
57	0.1866	0.1166	-1.55	10.44	0.9023
58	0.19	0.12	-2.191	11.08	0.9577
59	0.1933	0.1233	-1.745	10.64	0.9191
60	0.1966	0.1266	-1.167	10.06	0.8692
61	0.2	0.13	-1.601	10.49	0.9067
62	0.2033	0.1333	-1.701	10.59	0.9153
63	0.2066	0.1366	-1.444	10.33	0.8931
64	0.21	0.14	-1.481	10.37	0.8963
65	0.2133	0.1433	-1.557	10.45	0.9029
66	0.2166	0.1466	-1.494	10.38	0.8974
67	0.22	0.15	-1.481	10.37	0.8963
68	0.2233	0.1533	-1.488	10.38	0.8969
69	0.2266	0.1566	-1.475	10.37	0.8958
70	0.23	0.16	-1.469	10.36	0.8953
71	0.2333	0.1633	-1.462	10.35	0.8947
72	0.2366	0.1666	-1.456	10.35	0.8941
73	0.24	0.17	-1.444	10.33	0.8931
74	0.2433	0.1733	-1.437	10.33	0.8925
75	0.2466	0.1766	-1.431	10.32	0.892
76	0.25	0.18	-1.418	10.31	0.8908
77	0.2533	0.1833	-1.418	10.31	0.8908
78	0.2566	0.1866	-1.406	10.3	0.8898
79	0.26	0.19	-1.4	10.29	0.8893
80	0.2633	0.1933	-1.393	10.28	0.8887
81	0.2666	0.1966	-1.387	10.28	0.8882
82	0.27	0.2	-1.381	10.27	0.8877
83	0.2733	0.2033	-1.374	10.26	0.887
84	0.2766	0.2066	-1.368	10.26	0.8865
85	0.28	0.21	-1.362	10.25	0.886
86	0.2833	0.2133	-1.349	10.24	0.8849
87	0.2866	0.2166	-1.343	10.23	0.8844
88	0.29	0.22	-1.337	10.23	0.8838
89	0.2933	0.2233	-1.331	10.22	0.8833
90	0.2966	0.2266	-1.324	10.21	0.8827

91	0.3	0.23	-1.318	10.21	0.8822
92	0.3033	0.2333	-1.312	10.2	0.8817
93	0.3066	0.2366	-1.299	10.19	0.8806
94	0.31	0.24	-1.305	10.2	0.8811
95	0.3133	0.2433	-1.28	10.17	0.8789
96	0.3166	0.2466	-1.28	10.17	0.8789
97	0.32	0.25	-1.274	10.16	0.8784
98	0.3233	0.2533	-1.268	10.16	0.8779
99	0.3266	0.2566	-1.261	10.15	0.8773
100	0.33	0.26	-1.255	10.15	0.8768
101	0.3333	0.2633	-1.249	10.14	0.8762
102	0.35	0.28	-1.218	10.11	0.8736
103	0.3666	0.2966	-1.18	10.07	0.8703
104	0.3833	0.3133	-1.155	10.05	0.8681
105	0.4	0.33	-1.123	10.01	0.8654
106	0.4166	0.3466	-1.079	9.969	0.8616
107	0.4333	0.3633	-1.061	9.951	0.86
108	0.45	0.38	-1.035	9.925	0.8577
109	0.4666	0.3966	-1.01	9.9	0.8556
110	0.4833	0.4133	-0.985	9.875	0.8534
111	0.5	0.43	-0.96	9.85	0.8513
112	0.5166	0.4466	-0.935	9.825	0.8491
113	0.5333	0.4633	-0.91	9.8	0.8469
114	0.55	0.48	-0.885	9.775	0.8448
115	0.5666	0.4966	-0.866	9.756	0.8431
116	0.5833	0.5133	-0.841	9.731	0.841
117	0.6	0.53	-0.822	9.712	0.8393
118	0.6166	0.5466	-0.803	9.693	0.8377
119	0.6333	0.5633	-0.784	9.674	0.8361
120	0.65	0.58	-0.765	9.655	0.8344
121	0.6666	0.5966	-0.747	9.637	0.8329
122	0.6833	0.6133	-0.728	9.618	0.8312
123	0.7	0.63	-0.709	9.599	0.8296
124	0.7166	0.6466	-0.696	9.586	0.8285
125	0.7333	0.6633	-0.678	9.568	0.8269
126	0.75	0.68	-0.665	9.555	0.8258
127	0.7666	0.6966	-0.646	9.536	0.8241
128	0.7833	0.7133	-0.634	9.524	0.8231
129	0.8	0.73	-0.615	9.505	0.8215
130	0.8166	0.7466	-0.602	9.492	0.8203
131	0.8333	0.7633	-0.59	9.48	0.8193
132	0.85	0.78	-0.577	9.467	0.8182
133	0.8666	0.7966	-0.564	9.454	0.817
134	0.8833	0.8133	-0.552	9.442	0.816
135	0.9	0.83	-0.539	9.429	0.8149
136	0.9166	0.8466	-0.527	9.417	0.8138
137	0.9333	0.8633	-0.514	9.404	0.8127
138	0.95	0.88	-0.502	9.392	0.8117
139	0.9666	0.8966	-0.489	9.379	0.8106
140	0.9833	0.9133	-0.483	9.373	0.81
141	1.	0.93	-0.47	9.36	0.8089
142	1.2	1.13	-0.351	9.241	0.7986
143	1.4	1.33	-0.276	9.166	0.7922
144	1.6	1.53	-0.225	9.115	0.7877
145	1.8	1.73	-0.188	9.078	0.7845
146	2.	1.93	-0.156	9.046	0.7818
147	2.2	2.13	-0.138	9.028	0.7802

148	2.4	2.33	-0.119	9.009	0.7786
149	2.6	2.53	-0.1	8.99	0.7769
150	2.8	2.73	-9.4e-002	8.984	0.7764
151	3.	2.93	-8.7e-002	8.977	0.7758
152	3.2	3.13	-7.5e-002	8.965	0.7748
153	3.4	3.33	-6.9e-002	8.959	0.7743
154	3.6	3.53	-6.9e-002	8.959	0.7743
155	3.8	3.73	-6.2e-002	8.952	0.7737
156	4.	3.93	-6.2e-002	8.952	0.7737
157	4.2	4.13	-5.6e-002	8.946	0.7731
158	4.4	4.33	-5.6e-002	8.946	0.7731
159	4.6	4.53	-5.e-002	8.94	0.7726
160	4.8	4.73	-5.e-002	8.94	0.7726
161	5.	4.93	-5.e-002	8.94	0.7726
162	5.2	5.13	-5.e-002	8.94	0.7726
163	5.4	5.33	-5.e-002	8.94	0.7726
164	5.6	5.53	-4.3e-002	8.933	0.772
165	5.8	5.73	-4.3e-002	8.933	0.772
166	6.	5.93	-4.3e-002	8.933	0.772
167	6.2	6.13	-4.3e-002	8.933	0.772
168	6.4	6.33	-4.3e-002	8.933	0.772
169	6.6	6.53	-4.3e-002	8.933	0.772
170	6.8	6.73	-3.7e-002	8.927	0.7715
171	7.	6.93	-4.3e-002	8.933	0.772
172	7.2	7.13	-3.7e-002	8.927	0.7715
173	7.4	7.33	-3.7e-002	8.927	0.7715
174	7.6	7.53	-3.7e-002	8.927	0.7715
175	7.8	7.73	-3.7e-002	8.927	0.7715
176	8.	7.93	-3.7e-002	8.927	0.7715
177	8.2	8.13	-3.7e-002	8.927	0.7715
178	8.4	8.33	-3.7e-002	8.927	0.7715
179	8.6	8.53	-3.7e-002	8.927	0.7715
180	8.8	8.73	-3.7e-002	8.927	0.7715
181	9.	8.93	-3.7e-002	8.927	0.7715
182	9.2	9.13	-3.7e-002	8.927	0.7715
183	9.4	9.33	-3.7e-002	8.927	0.7715
184	9.6	9.53	-3.1e-002	8.921	0.771
185	9.8	9.73	-3.7e-002	8.927	0.7715
186	10.	9.93	-3.7e-002	8.927	0.7715
187	11.	10.93	-3.1e-002	8.921	0.771

Field Hydraulic Conductivity Test November 8, 2000 **Arithmetic Graph**

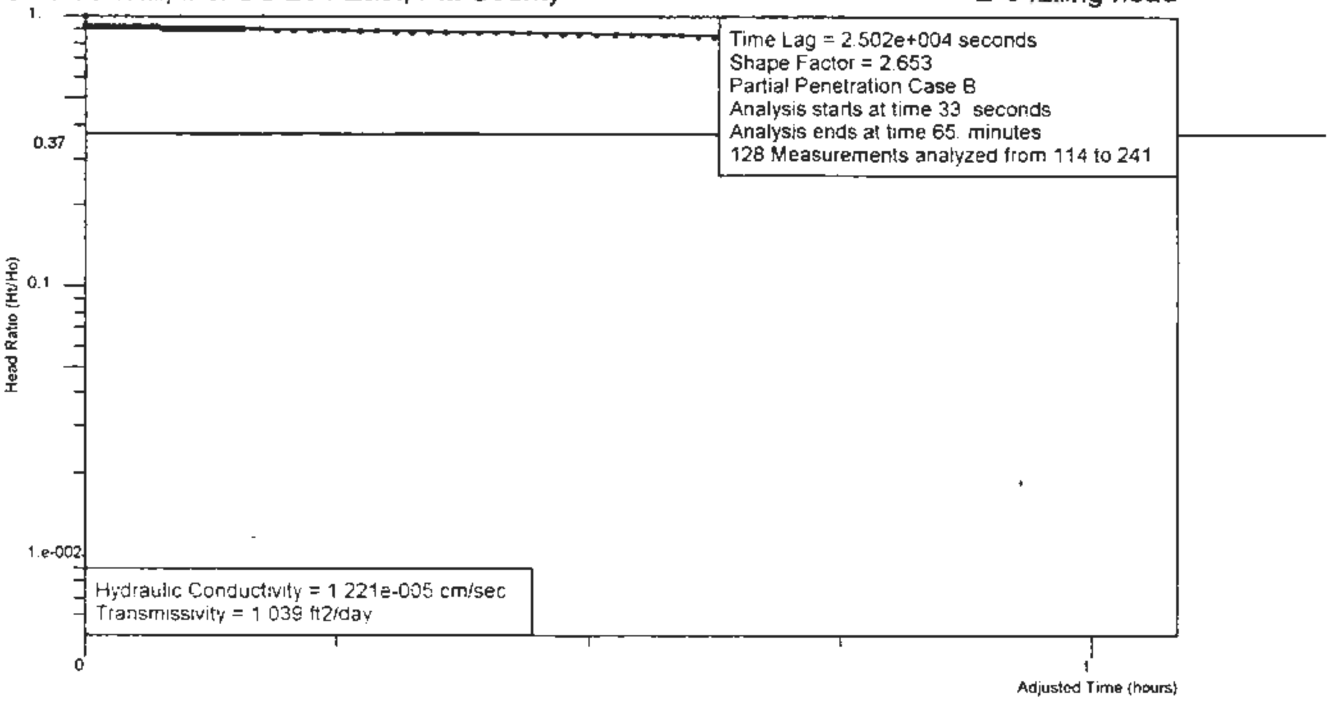
C&D Landfill, Inc. US 264 East, Pitt County B-5 falling head



Analysis by Starpoint Software

Field Hydraulic Conductivity Test November 8, 2000 **Hvorslev Graph**

C&D Landfill, Inc. US 264 East, Pitt County B-5 falling head



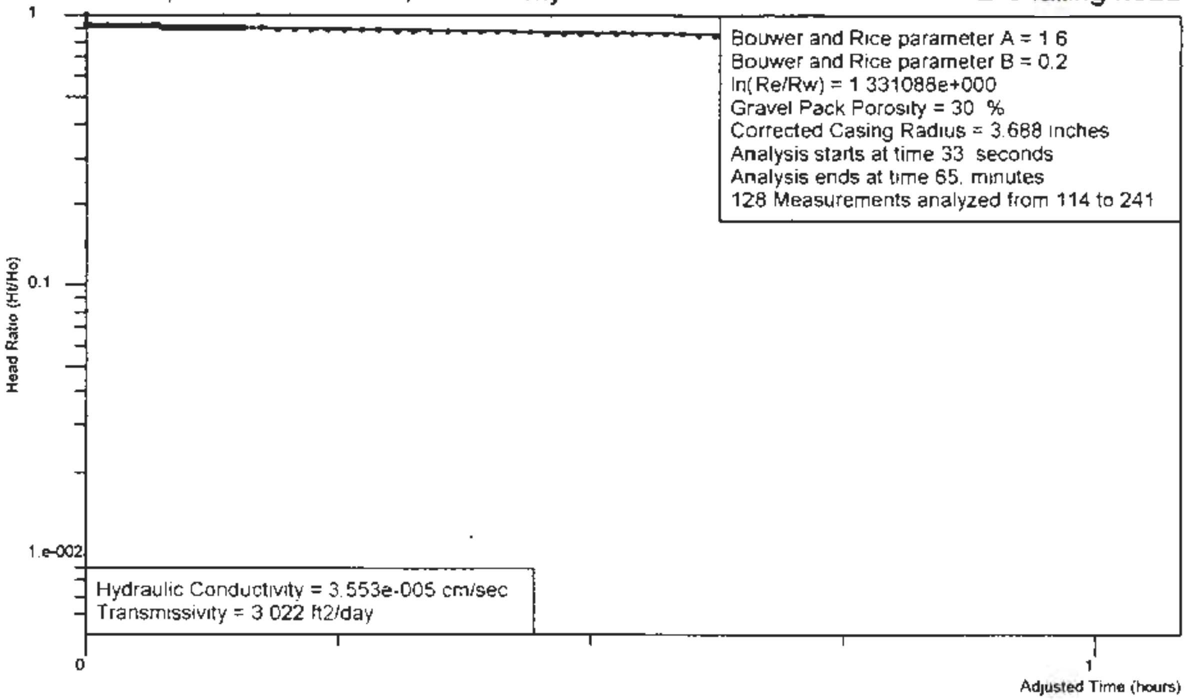
Analysis by Starpoint Software

Ho is 11.89 feet at 33. seconds

Field Hydraulic Conductivity Test November 8, 2000Bouwer and Rice Graph

C&D Landfill, Inc. US 264 East, Pitt County

B-5 falling head



Analysis by Starpoint Software

Ho is 11 89 feet at 33 seconds

Field Hydraulic Conductivity Test

Site Name: C&D Landfill, Inc.
Location: US 264 East, Pitt County
Test Date: November 8, 2000
Import File: C:\hermit datalogger\Pitt5s0

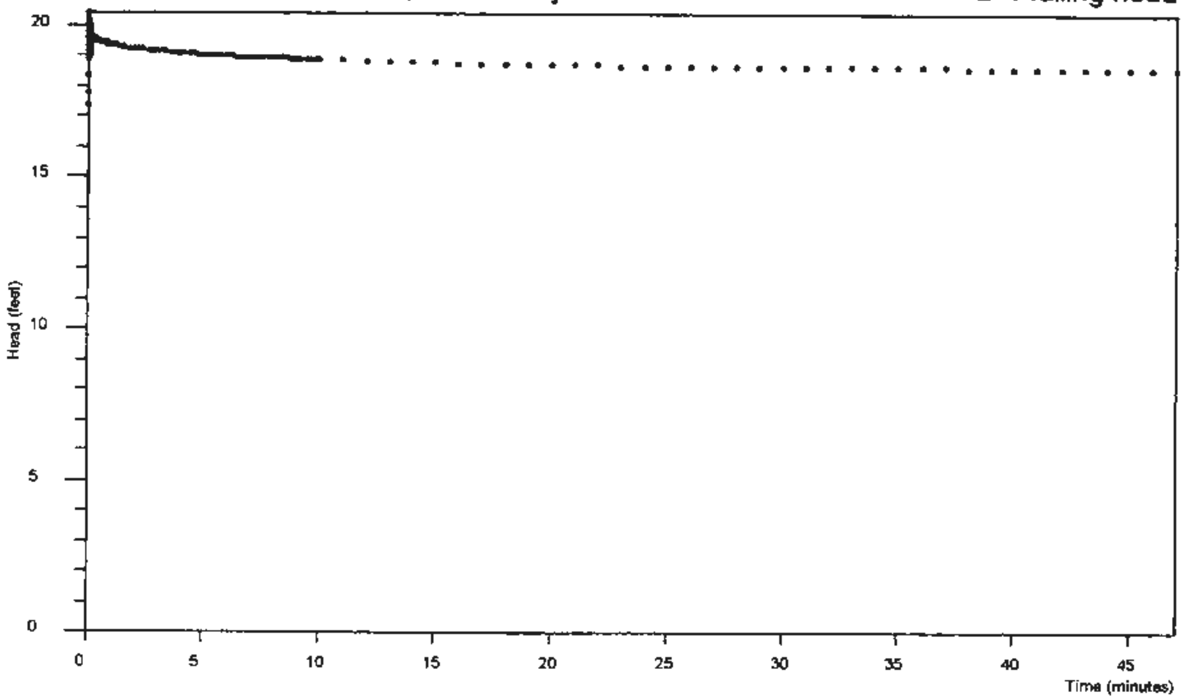
Well Label: B-5 falling head
Aquifer Thickness: 30. feet
Screen Length: 2. feet
Casing Radius: 2. inches
Effective Radius: 6. inches
Gravel Pack Porosity: 30. %
Corrected Casing Radius: 3.688 inches
Static Water Level: 8.91 feet
Water Table to Screen Bottom: 27.66 feet
Anisotropy Ratio: 1.
Time Adjustment: 33. Seconds
Test starts with trial 113
There are 241 time and drawdown measurements
Maximum head is 11.89 feet
Minimum head is 0. feet

Trial	Time (minutes)	Adjusted Time (minutes)	Drawdown (feet)	Head (feet)	Head Ratio
1	0.	-0.55	0.	8.91	0.7494
2	3.3e-003	-0.5467	-6.e-003	8.916	0.7499
3	6.6e-003	-0.5434	-0.201	9.111	0.7663
4	1.e-002	-0.54	-0.439	9.349	0.7864
5	1.33e-002	-0.5367	-0.477	9.387	0.7896
6	1.66e-002	-0.5334	-0.892	9.802	0.8245
7	2.e-002	-0.53	-0.791	9.701	0.816
8	2.33e-002	-0.5267	-1.168	10.08	0.8477
9	2.66e-002	-0.5234	-1.175	10.09	0.8483
10	3.e-002	-0.52	-1.338	10.25	0.862
11	3.33e-002	-0.5167	-1.677	10.59	0.8905
12	3.66e-002	-0.5134	-1.527	10.44	0.8779
13	4.e-002	-0.51	-1.822	10.73	0.9027
14	4.33e-002	-0.5067	-2.168	11.08	0.9318
15	4.66e-002	-0.5034	-2.413	11.32	0.9524
16	5.e-002	-0.5	-2.589	11.5	0.9672
17	5.33e-002	-0.4967	-2.212	11.12	0.9355
18	5.66e-002	-0.4934	-2.337	11.25	0.946
19	6.e-002	-0.49	-2.256	11.17	0.9392
20	6.33e-002	-0.4867	-2.583	11.49	0.9667
21	6.66e-002	-0.4834	-2.608	11.52	0.9688
22	7.e-002	-0.48	-2.551	11.46	0.964
23	7.33e-002	-0.4767	-2.482	11.39	0.9582
24	7.66e-002	-0.4734	-2.092	11.	0.9254
25	8.e-002	-0.47	-2.205	11.12	0.9349
26	8.33e-002	-0.4667	-2.048	10.96	0.9217
27	8.66e-002	-0.4634	-2.218	11.13	0.936
28	9.e-002	-0.46	-2.136	11.05	0.9291
29	9.33e-002	-0.4567	-2.124	11.03	0.9281
30	9.66e-002	-0.4534	-1.803	10.71	0.9011
31	0.1	-0.45	-2.218	11.13	0.936
32	0.1033	-0.4467	-2.275	11.19	0.9408
33	0.1066	-0.4434	-2.187	11.1	0.9334

34	0.11	-0.44	-2.124	11.03	0.9281
35	0.1133	-0.4367	-2.023	10.93	0.9196
36	0.1166	-0.4334	-2.325	11.23	0.945
37	0.12	-0.43	-2.067	10.98	0.9233
38	0.1233	-0.4267	-2.18	11.09	0.9328
39	0.1266	-0.4234	-2.161	11.07	0.9312
40	0.13	-0.42	-2.142	11.05	0.9296
41	0.1333	-0.4167	-2.495	11.41	0.9593
42	0.1366	-0.4134	-2.488	11.4	0.9587
43	0.14	-0.41	-2.243	11.15	0.9381
44	0.1433	-0.4067	-2.369	11.28	0.9487
45	0.1466	-0.4034	-1.703	10.61	0.8927
46	0.15	-0.4	-1.696	10.61	0.8921
47	0.1533	-0.3967	-2.482	11.39	0.9582
48	0.1566	-0.3934	-2.256	11.17	0.9392
49	0.16	-0.39	-1.866	10.78	0.9064
50	0.1633	-0.3867	-2.35	11.26	0.9471
51	0.1666	-0.3834	-2.124	11.03	0.9281
52	0.17	-0.38	-2.099	11.01	0.926
53	0.1733	-0.3767	-2.199	11.11	0.9344
54	0.1766	-0.3734	-2.13	11.04	0.9286
55	0.18	-0.37	-2.155	11.07	0.9307
56	0.1833	-0.3667	-2.13	11.04	0.9286
57	0.1866	-0.3634	-2.174	11.08	0.9323
58	0.19	-0.36	-2.149	11.06	0.9302
59	0.1933	-0.3567	-2.142	11.05	0.9296
60	0.1966	-0.3534	-2.155	11.07	0.9307
61	0.2	-0.35	-2.142	11.05	0.9296
62	0.2033	-0.3467	-2.149	11.06	0.9302
63	0.2066	-0.3434	-2.149	11.06	0.9302
64	0.21	-0.34	-2.117	11.03	0.9275
65	0.2133	-0.3367	-2.092	11.	0.9254
66	0.2166	-0.3334	-2.268	11.18	0.9402
67	0.22	-0.33	-2.142	11.05	0.9296
68	0.2233	-0.3267	-2.099	11.01	0.926
69	0.2266	-0.3234	-2.193	11.1	0.9339
70	0.23	-0.32	-2.124	11.03	0.9281
71	0.2333	-0.3167	-2.155	11.07	0.9307
72	0.2366	-0.3134	-2.142	11.05	0.9296
73	0.24	-0.31	-2.149	11.06	0.9302
74	0.2433	-0.3067	-2.149	11.06	0.9302
75	0.2466	-0.3034	-2.142	11.05	0.9296
76	0.25	-0.3	-2.149	11.06	0.9302
77	0.2533	-0.2967	-2.142	11.05	0.9296
78	0.2566	-0.2934	-2.142	11.05	0.9296
79	0.26	-0.29	-2.149	11.06	0.9302
80	0.2633	-0.2867	-2.142	11.05	0.9296
81	0.2666	-0.2834	-2.149	11.06	0.9302
82	0.27	-0.28	-2.142	11.05	0.9296
83	0.2733	-0.2767	-2.142	11.05	0.9296
84	0.2766	-0.2734	-2.142	11.05	0.9296
85	0.28	-0.27	-2.142	11.05	0.9296
86	0.2833	-0.2667	-2.142	11.05	0.9296
87	0.2866	-0.2634	-2.142	11.05	0.9296
88	0.29	-0.26	-2.142	11.05	0.9296
89	0.2933	-0.2567	-2.142	11.05	0.9296
90	0.2966	-0.2534	-2.155	11.07	0.9307

Field Hydraulic Conductivity Test November 6, 2000 **Arithmetic Graph**

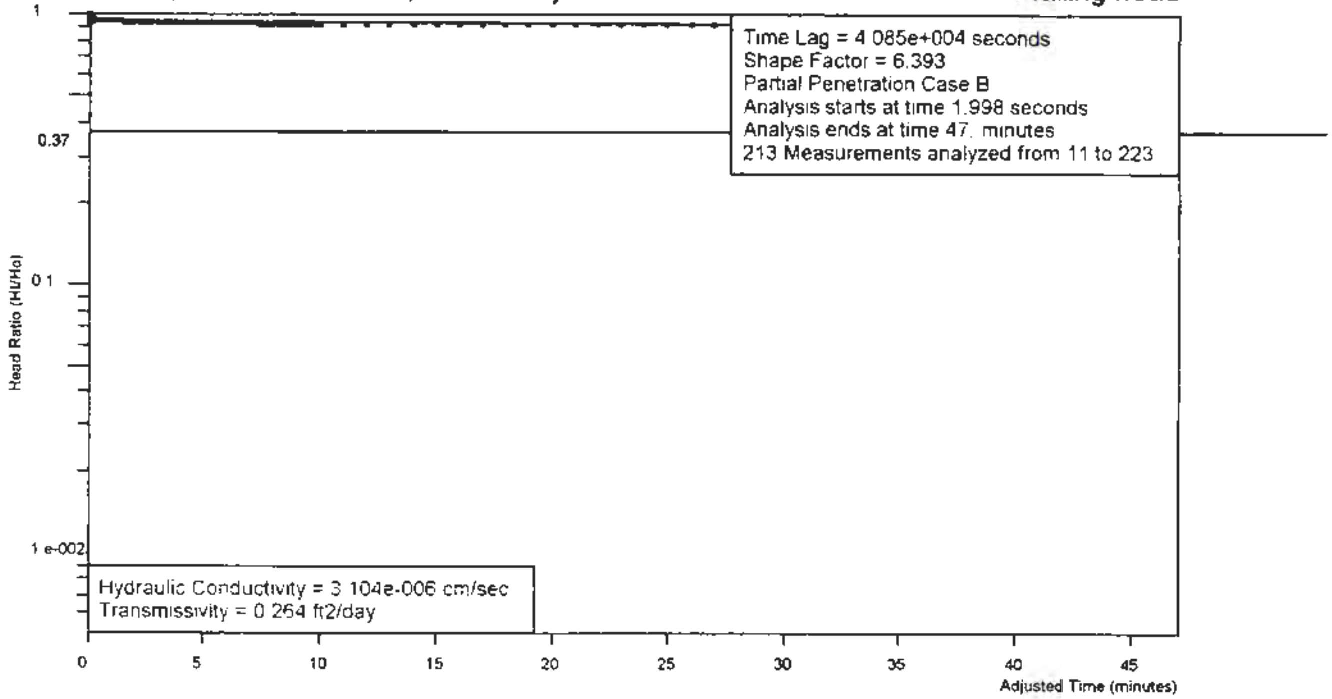
C&D Landfill, Inc. US 264 East, Pitt County B-1 falling head



Analysis by Starpoint Software

Field Hydraulic Conductivity Test November 6, 2000 **Hvorslev Graph**

C&D Landfill, Inc. US 264 East, Pitt County B-1 falling head



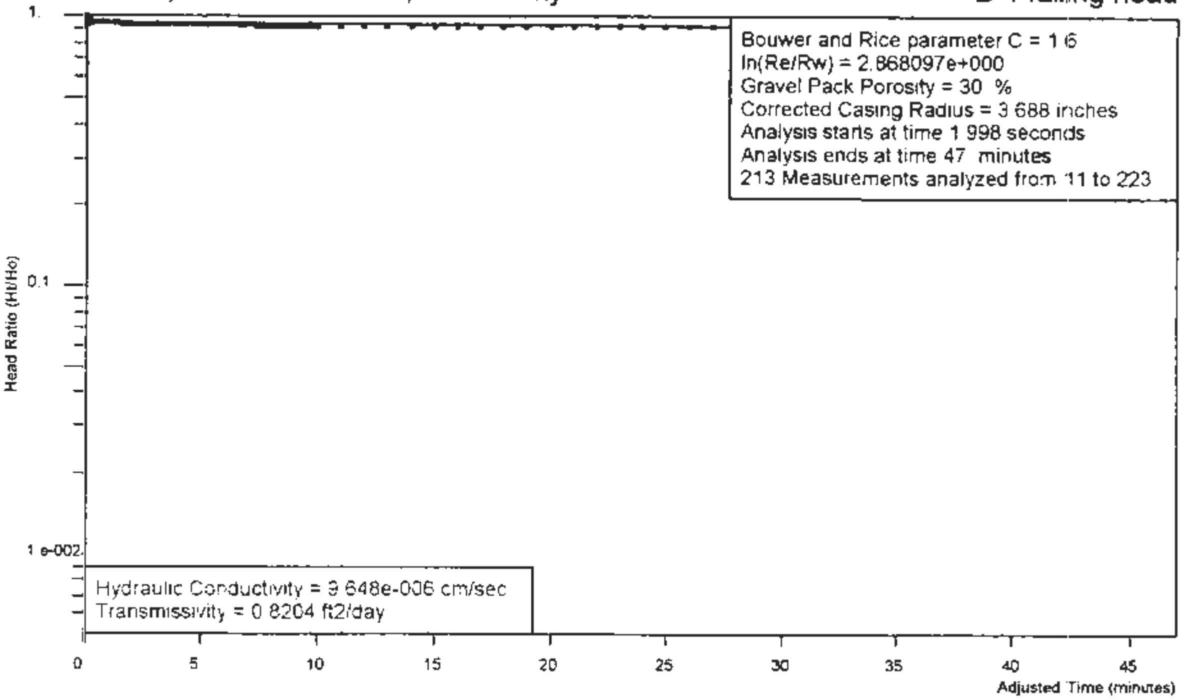
Analysis by Starpoint Software

Ho is 20.37 feet at 1.998 seconds

Field Hydraulic Conductivity Test November 6, 2000Bouwer and Rice Graph

C&D Landfill, Inc. US 264 East, Pitt County

B-1 falling head



Analysis by Starpoint Software

Ho is 20.37 feet at 1.998 seconds

Field Hydraulic Conductivity Test

Site Name: C&D Landfill, Inc.
Location: US 264 East, Pitt County
Test Date: November 6, 2000
Import File: C:\hermit datalogger\Pitt1s0

Well Label: B-1 falling head
Aquifer Thickness: 30. feet
Screen Length: 10. feet
Casing Radius: 2. inches
Effective Radius: 6. inches
Gravel Pack Porosity: 30. %
Corrected Casing Radius: 3.688 inches
Static Water Level: 17.4 feet
Water Table to Screen Bottom: 32.6 feet
Anisotropy Ratio: 1.
Time Adjustment: 1.998 Seconds
Test starts with trial 10
There are 223 time and drawdown measurements
Maximum head is 20.37 feet
Minimum head is 0. feet

Trial	Time (minutes)	Adjusted Time (minutes)	Drawdown (feet)	Head (feet)	Head Ratio
1	0.	-3.33e-002	0.	17.4	0.8544
2	3.3e-003	-3.e-002	-6.e-003	17.41	0.8547
3	6.6e-003	-2.67e-002	-1.495	18.89	0.9278
4	1.e-002	-2.33e-002	-0.923	18.32	0.8997
5	1.33e-002	-2.e-002	-0.383	17.78	0.8732
6	1.66e-002	-1.67e-002	-1.772	19.17	0.9414
7	2.e-002	-1.33e-002	-1.753	19.15	0.9404
8	2.33e-002	-1.e-002	-1.91	19.31	0.9481
9	2.66e-002	-6.7e-003	-1.998	19.4	0.9525
10	3.e-002	-3.3e-003	-2.513	19.91	0.9778
11	3.33e-002	0.	-2.966	20.37	1.
12	3.66e-002	3.3e-003	-2.438	19.84	0.9741
13	4.e-002	6.7e-003	-2.18	19.58	0.9614
14	4.33e-002	1.e-002	-2.765	20.16	0.9901
15	4.66e-002	1.33e-002	-2.62	20.02	0.983
16	5.e-002	1.67e-002	-2.639	20.04	0.9839
17	5.33e-002	2.e-002	-2.576	19.98	0.9809
18	5.66e-002	2.33e-002	-2.551	19.95	0.9796
19	6.e-002	2.67e-002	-2.633	20.03	0.9836
20	6.33e-002	3.e-002	-2.507	19.91	0.9775
21	6.66e-002	3.33e-002	-2.595	19.99	0.9818
22	7.e-002	3.67e-002	-2.545	19.94	0.9793
23	7.33e-002	4.e-002	-2.558	19.96	0.98
24	7.66e-002	4.33e-002	-2.488	19.89	0.9765
25	8.e-002	4.67e-002	-2.495	19.89	0.9769
26	8.33e-002	5.e-002	-2.495	19.89	0.9769
27	8.66e-002	5.33e-002	-2.394	19.79	0.9719
28	9.e-002	5.67e-002	-1.891	19.29	0.9472
29	9.33e-002	6.e-002	-2.444	19.84	0.9744
30	9.66e-002	6.33e-002	-2.193	19.59	0.962
31	0.1	6.67e-002	-1.985	19.38	0.9518
32	0.1033	7.e-002	-2.293	19.69	0.967
33	0.1066	7.33e-002	-2.174	19.57	0.9611

34	0.11	7.67e-002	-2.237	19.64	0.9642
35	0.1133	8.e-002	-2.325	19.72	0.9685
36	0.1166	8.33e-002	-2.13	19.53	0.959
37	0.12	8.67e-002	-1.828	19.23	0.9441
38	0.1233	9.e-002	-2.237	19.64	0.9642
39	0.1266	9.33e-002	-2.293	19.69	0.967
40	0.13	9.67e-002	-2.086	19.49	0.9568
41	0.1333	0.1	-1.734	19.13	0.9395
42	0.1366	0.1033	-1.602	19.	0.933
43	0.14	0.1067	-2.601	20.	0.9821
44	0.1433	0.11	-2.614	20.01	0.9827
45	0.1466	0.1133	-2.155	19.55	0.9602
46	0.15	0.1167	-1.954	19.35	0.9503
47	0.1533	0.12	-2.425	19.82	0.9734
48	0.1566	0.1233	-2.029	19.43	0.954
49	0.16	0.1267	-2.199	19.6	0.9623
50	0.1633	0.13	-2.243	19.64	0.9645
51	0.1666	0.1333	-2.061	19.46	0.9556
52	0.17	0.1367	-2.243	19.64	0.9645
53	0.1733	0.14	-2.161	19.56	0.9605
54	0.1766	0.1433	-2.155	19.55	0.9602
55	0.18	0.1467	-2.187	19.59	0.9617
56	0.1833	0.15	-2.161	19.56	0.9605
57	0.1866	0.1533	-2.168	19.57	0.9608
58	0.19	0.1567	-2.168	19.57	0.9608
59	0.1933	0.16	-2.168	19.57	0.9608
60	0.1966	0.1633	-2.168	19.57	0.9608
61	0.2	0.1667	-2.168	19.57	0.9608
62	0.2033	0.17	-2.161	19.56	0.9605
63	0.2066	0.1733	-2.161	19.56	0.9605
64	0.21	0.1767	-2.161	19.56	0.9605
65	0.2133	0.18	-2.161	19.56	0.9605
66	0.2166	0.1833	-2.161	19.56	0.9605
67	0.22	0.1867	-2.161	19.56	0.9605
68	0.2233	0.19	-2.155	19.55	0.9602
69	0.2266	0.1933	-2.155	19.55	0.9602
70	0.23	0.1967	-2.155	19.55	0.9602
71	0.2333	0.2	-2.155	19.55	0.9602
72	0.2366	0.2033	-2.155	19.55	0.9602
73	0.24	0.2067	-2.155	19.55	0.9602
74	0.2433	0.21	-2.149	19.55	0.9599
75	0.2466	0.2133	-2.149	19.55	0.9599
76	0.25	0.2167	-2.149	19.55	0.9599
77	0.2533	0.22	-2.149	19.55	0.9599
78	0.2566	0.2233	-2.149	19.55	0.9599
79	0.26	0.2267	-2.149	19.55	0.9599
80	0.2633	0.23	-2.143	19.54	0.9596
81	0.2666	0.2333	-2.143	19.54	0.9596
82	0.27	0.2367	-2.143	19.54	0.9596
83	0.2733	0.24	-2.143	19.54	0.9596
84	0.2766	0.2433	-2.143	19.54	0.9596
85	0.28	0.2467	-2.143	19.54	0.9596
86	0.2833	0.25	-2.143	19.54	0.9596
87	0.2866	0.2533	-2.136	19.54	0.9592
88	0.29	0.2567	-2.136	19.54	0.9592
89	0.2933	0.26	-2.136	19.54	0.9592
90	0.2966	0.2633	-2.136	19.54	0.9592

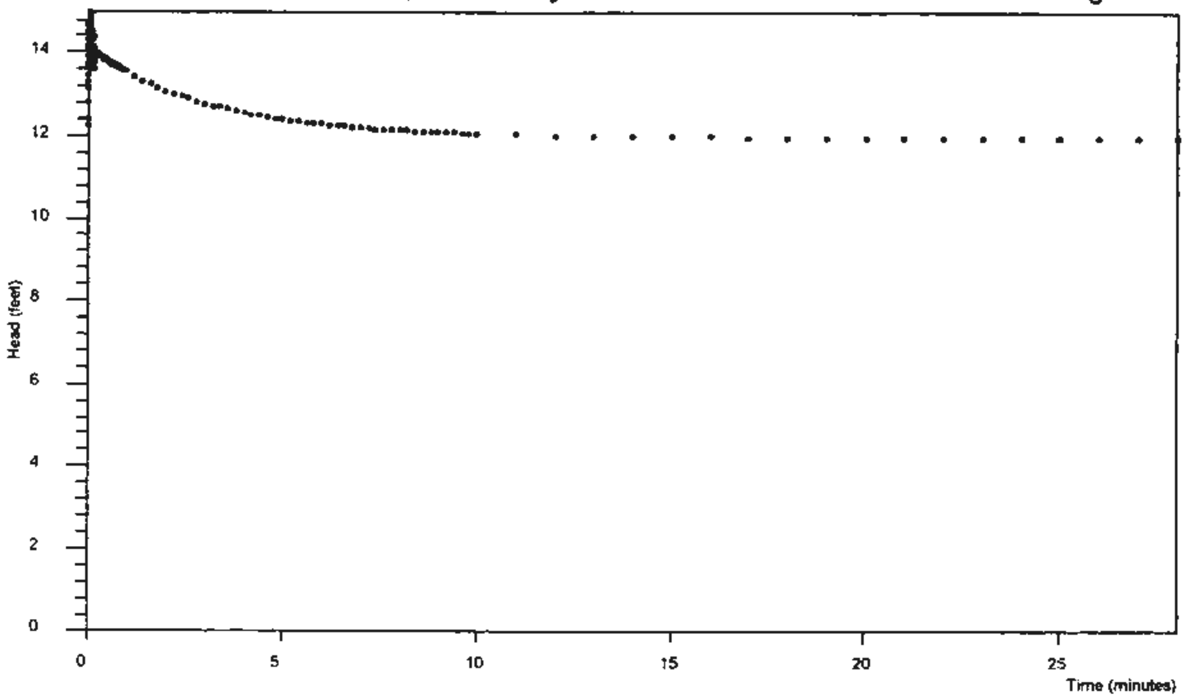
91	0.3	0.2667	-2.136	19.54	0.9592
92	0.3033	0.27	-2.136	19.54	0.9592
93	0.3066	0.2733	-2.136	19.54	0.9592
94	0.31	0.2767	-2.13	19.53	0.959
95	0.3133	0.28	-2.13	19.53	0.959
96	0.3166	0.2833	-2.13	19.53	0.959
97	0.32	0.2867	-2.13	19.53	0.959
98	0.3233	0.29	-2.13	19.53	0.959
99	0.3266	0.2933	-2.124	19.52	0.9587
100	0.33	0.2967	-2.124	19.52	0.9587
101	0.3333	0.3	-2.124	19.52	0.9587
102	0.35	0.3167	-2.117	19.52	0.9583
103	0.3666	0.3333	-2.117	19.52	0.9583
104	0.3833	0.35	-2.111	19.51	0.958
105	0.4	0.3667	-2.105	19.5	0.9577
106	0.4166	0.3833	-2.105	19.5	0.9577
107	0.4333	0.4	-2.099	19.5	0.9574
108	0.45	0.4167	-2.092	19.49	0.9571
109	0.4666	0.4333	-2.092	19.49	0.9571
110	0.4833	0.45	-2.086	19.49	0.9568
111	0.5	0.4667	-2.08	19.48	0.9565
112	0.5166	0.4833	-2.08	19.48	0.9565
113	0.5333	0.5	-2.073	19.47	0.9562
114	0.55	0.5167	-2.067	19.47	0.9559
115	0.5666	0.5333	-2.067	19.47	0.9559
116	0.5833	0.55	-2.061	19.46	0.9556
117	0.6	0.5667	-2.055	19.45	0.9553
118	0.6166	0.5833	-2.055	19.45	0.9553
119	0.6333	0.6	-2.048	19.45	0.9549
120	0.65	0.6167	-2.042	19.44	0.9546
121	0.6666	0.6333	-2.042	19.44	0.9546
122	0.6833	0.65	-2.036	19.44	0.9543
123	0.7	0.6667	-2.036	19.44	0.9543
124	0.7166	0.6833	-2.029	19.43	0.954
125	0.7333	0.7	-2.029	19.43	0.954
126	0.75	0.7167	-2.023	19.42	0.9537
127	0.7666	0.7333	-2.017	19.42	0.9534
128	0.7833	0.75	-2.017	19.42	0.9534
129	0.8	0.7667	-2.011	19.41	0.9531
130	0.8166	0.7833	-2.036	19.44	0.9543
131	0.8333	0.8	-2.004	19.4	0.9528
132	0.85	0.8167	-2.004	19.4	0.9528
133	0.8666	0.8333	-1.998	19.4	0.9525
134	0.8833	0.85	-1.998	19.4	0.9525
135	0.9	0.8667	-1.998	19.4	0.9525
136	0.9166	0.8833	-1.992	19.39	0.9522
137	0.9333	0.9	-1.985	19.38	0.9518
138	0.95	0.9167	-1.985	19.38	0.9518
139	0.9666	0.9333	-1.979	19.38	0.9515
140	0.9833	0.95	-1.979	19.38	0.9515
141	1.	0.9667	-1.973	19.37	0.9512
142	1.2	1.167	-1.935	19.34	0.9494
143	1.4	1.367	-1.91	19.31	0.9481
144	1.6	1.567	-1.885	19.28	0.9469
145	1.8	1.767	-1.86	19.26	0.9457
146	2.	1.967	-1.841	19.24	0.9448
147	2.2	2.167	-1.816	19.22	0.9435

148	2.4	2.367	-1.797	19.2	0.9426
149	2.6	2.567	-1.784	19.18	0.942
150	2.8	2.767	-1.772	19.17	0.9414
151	3.	2.967	-1.753	19.15	0.9404
152	3.2	3.167	-1.74	19.14	0.9398
153	3.4	3.367	-1.728	19.13	0.9392
154	3.6	3.567	-1.715	19.11	0.9386
155	3.8	3.767	-1.703	19.1	0.938
156	4.	3.967	-1.696	19.1	0.9376
157	4.2	4.167	-1.684	19.08	0.9371
158	4.4	4.367	-1.671	19.07	0.9364
159	4.6	4.567	-1.665	19.06	0.9361
160	4.8	4.767	-1.652	19.05	0.9355
161	5.	4.967	-1.646	19.05	0.9352
162	5.2	5.167	-1.633	19.03	0.9345
163	5.4	5.367	-1.627	19.03	0.9343
164	5.6	5.567	-1.621	19.02	0.934
165	5.8	5.767	-1.615	19.02	0.9337
166	6.	5.967	-1.602	19.	0.933
167	6.2	6.167	-1.596	19.	0.9327
168	6.4	6.367	-1.589	18.99	0.9324
169	6.6	6.567	-1.583	18.98	0.9321
170	6.8	6.767	-1.577	18.98	0.9318
171	7.	6.967	-1.571	18.97	0.9315
172	7.2	7.167	-1.564	18.96	0.9312
173	7.4	7.367	-1.558	18.96	0.9309
174	7.6	7.567	-1.552	18.95	0.9306
175	7.8	7.767	-1.545	18.94	0.9302
176	8.	7.967	-1.539	18.94	0.9299
177	8.2	8.167	-1.533	18.93	0.9296
178	8.4	8.367	-1.533	18.93	0.9296
179	8.6	8.567	-1.527	18.93	0.9293
180	8.8	8.767	-1.52	18.92	0.929
181	9.	8.967	-1.514	18.91	0.9287
182	9.2	9.167	-1.508	18.91	0.9284
183	9.4	9.367	-1.508	18.91	0.9284
184	9.6	9.567	-1.501	18.9	0.9281
185	9.8	9.767	-1.495	18.89	0.9278
186	10.	9.967	-1.489	18.89	0.9275
187	11.	10.97	-1.47	18.87	0.9265
188	12.	11.97	-1.445	18.84	0.9253
189	13.	12.97	-1.426	18.83	0.9244
190	14.	13.97	-1.413	18.81	0.9237
191	15.	14.97	-1.395	18.79	0.9229
192	16.	15.97	-1.382	18.78	0.9222
193	17.	16.97	-1.369	18.77	0.9216
194	18.	17.97	-1.357	18.76	0.921
195	19.	18.97	-1.351	18.75	0.9207
196	20.	19.97	-1.338	18.74	0.9201
197	21.	20.97	-1.332	18.73	0.9198
198	22.	21.97	-1.319	18.72	0.9191
199	23.	22.97	-1.313	18.71	0.9188
200	24.	23.97	-1.307	18.71	0.9185
201	25.	24.97	-1.3	18.7	0.9182
202	26.	25.97	-1.294	18.69	0.9179
203	27.	26.97	-1.288	18.69	0.9176
204	28.	27.97	-1.281	18.68	0.9173

205	29	28.97	-1.275	18.67	0.917
206	30.	29.97	-1.275	18.67	0.917
207	31	30.97	-1.269	18.67	0.9167
208	32.	31.97	-1.269	18.67	0.9167
209	33.	32.97	-1.263	18.66	0.9164
210	34.	33.97	-1.263	18.66	0.9164
211	35.	34.97	-1.256	18.66	0.916
212	36.	35.97	-1.25	18.65	0.9157
213	37.	36.97	-1.25	18.65	0.9157
214	38.	37.97	-1.244	18.64	0.9154
215	39.	38.97	-1.244	18.64	0.9154
216	40.	39.97	-1.237	18.64	0.9151
217	41.	40.97	-1.237	18.64	0.9151
218	42.	41.97	-1.231	18.63	0.9148
219	43.	42.97	-1.231	18.63	0.9148
220	44.	43.97	-1.231	18.63	0.9148
221	45.	44.97	-1.225	18.62	0.9145
222	46.	45.97	-1.225	18.62	0.9145
223	47.	46.97	-1.225	18.62	0.9145

Field Hydraulic Conductivity Test November 6, 2000 **Arithmetic Graph**

C&D Landfill, Inc. US 264 East, Pitt County B-2d falling head



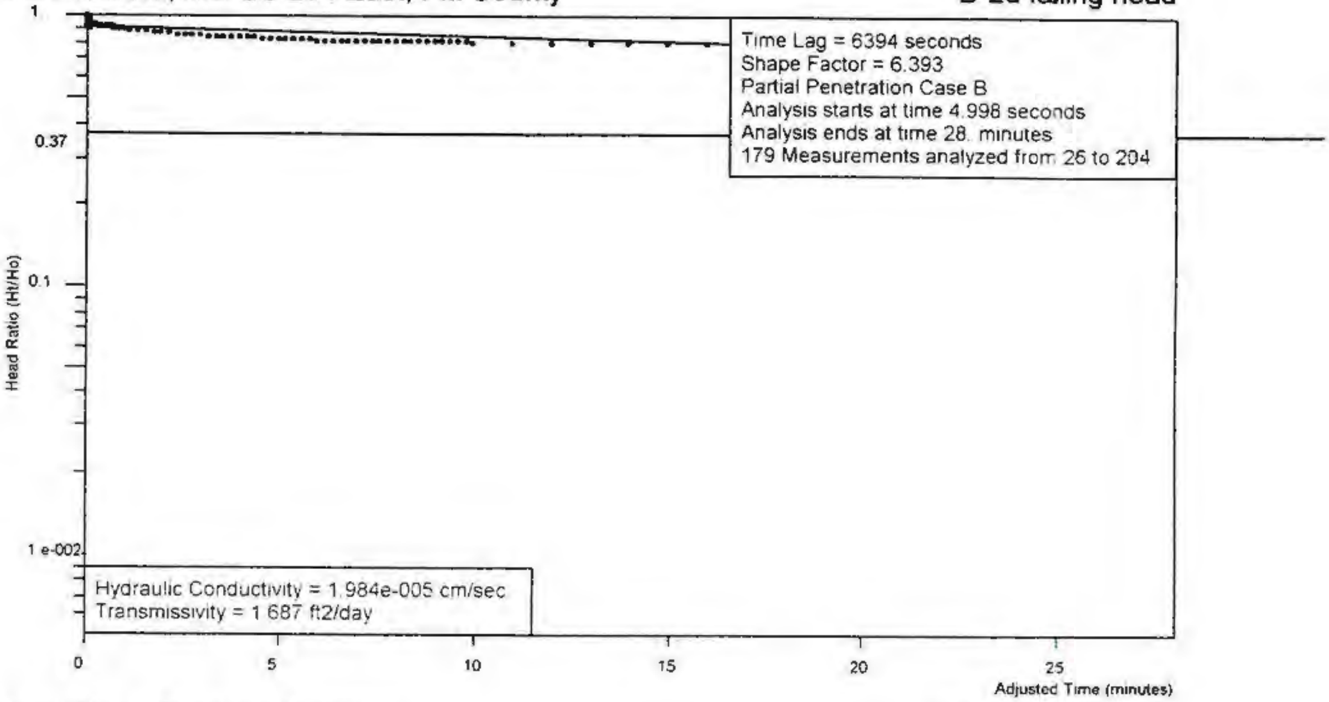
Analysis by Starpoint Software

Field Hydraulic Conductivity Test November 6, 2000

C&D Landfill, Inc. US 264 East, Pitt County

Hvorslev Graph

B-2d falling head

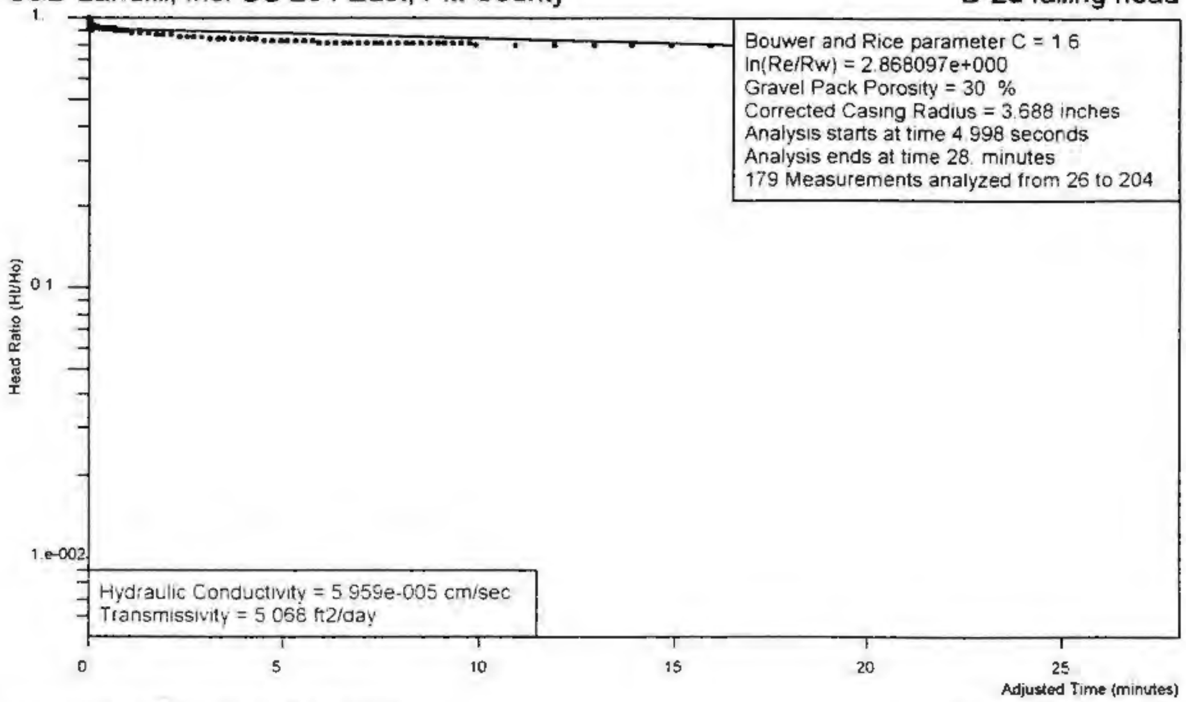


Analysis by Starpoint Software

Ho is 14.95 feet at 4.998 seconds

Field Hydraulic Conductivity Test November 6, 2000Bouwer and Rice Graph

C&D Landfill, Inc. US 264 East, Pitt County   B-2d falling head



Analysis by Starpoint Software   Ho is 14.95 feet at 4.998 seconds

Field Hydraulic Conductivity Test

Site Name: C&D Landfill, Inc.
Location: US 264 East, Pitt County
Test Date: November 6, 2000
Import File: C:\hermit datalogger\Pitt2ds0

Well Label: B-2d falling head
Aquifer Thickness: 30. feet
Screen Length: 10. feet
Casing Radius: 2. inches
Effective Radius: 6. inches
Gravel Pack Porosity: 30. %
Corrected Casing Radius: 3.688 inches
Static Water Level: 11.94 feet
Water Table to Screen Bottom: 40.53 feet
Anisotropy Ratio: 1.
Time Adjustment: 4.998 Seconds
Test starts with trial 25
There are 204 time and drawdown measurements
Maximum head is 14.95 feet
Minimum head is 0. feet

Trial	Time (minutes)	Adjusted Time (minutes)	Drawdown (feet)	Head (feet)	Head Ratio
1	0.	-8.33e-002	-0.313	12.25	0.8194
2	3.3e-003	-8.e-002	-0.451	12.39	0.8287
3	6.6e-003	-7.67e-002	-0.841	12.78	0.8547
4	1.e-002	-7.33e-002	-0.841	12.78	0.8547
5	1.33e-002	-7.e-002	-1.242	13.18	0.8816
6	1.66e-002	-6.67e-002	-1.362	13.3	0.8896
7	2.e-002	-6.33e-002	-1.544	13.48	0.9018
8	2.33e-002	-6.e-002	-1.713	13.65	0.9131
9	2.66e-002	-5.67e-002	-1.82	13.76	0.9202
10	3.e-002	-5.33e-002	-2.128	14.07	0.9408
11	3.33e-002	-5.e-002	-2.373	14.31	0.9572
12	3.66e-002	-4.67e-002	-2.605	14.55	0.9727
13	4.e-002	-4.33e-002	-1.99	13.93	0.9316
14	4.33e-002	-4.e-002	-2.222	14.16	0.9471
15	4.66e-002	-3.67e-002	-2.58	14.52	0.971
16	5.e-002	-3.33e-002	-2.718	14.66	0.9803
17	5.33e-002	-3.e-002	-2.712	14.65	0.9799
18	5.66e-002	-2.67e-002	-2.58	14.52	0.971
19	6.e-002	-2.33e-002	-2.712	14.65	0.9799
20	6.33e-002	-2.e-002	-2.894	14.83	0.992
21	6.66e-002	-1.67e-002	-2.869	14.81	0.9904
22	7.e-002	-1.33e-002	-2.75	14.69	0.9824
23	7.33e-002	-1.e-002	-2.982	14.92	0.9979
24	7.66e-002	-6.7e-003	-2.944	14.88	0.9954
25	8.e-002	-3.3e-003	-2.982	14.92	0.9979
26	8.33e-002	0.	-3.013	14.95	1.
27	8.66e-002	3.3e-003	-2.969	14.91	0.9971
28	9.e-002	6.7e-003	-3.013	14.95	1.
29	9.33e-002	1.e-002	-3.013	14.95	1.
30	9.66e-002	1.33e-002	-2.768	14.71	0.9836
31	0.1	1.67e-002	-2.479	14.42	0.9643
32	0.1033	2.e-002	-2.68	14.62	0.9777
33	0.1066	2.33e-002	-1.958	13.9	0.9294

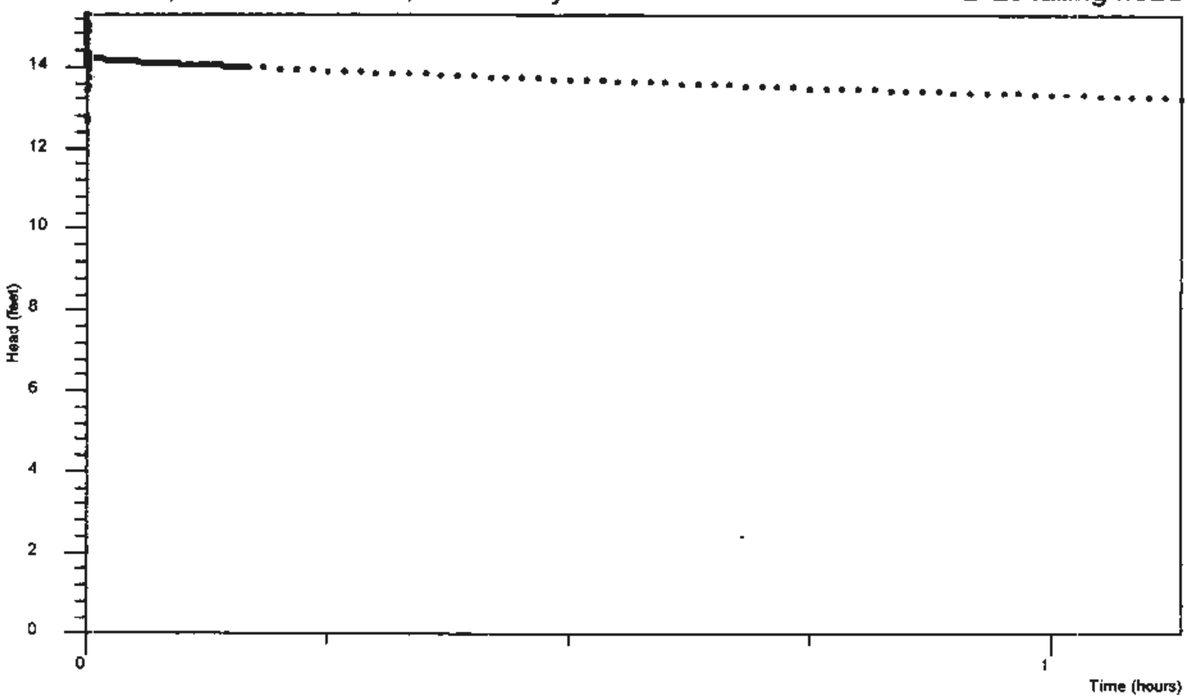
34	0.11	2.67e-002	-2.253	14.19	0.9492
35	0.1133	3.e-002	-1.927	13.87	0.9274
36	0.1166	3.33e-002	-2.002	13.94	0.9324
37	0.12	3.67e-002	-1.808	13.75	0.9194
38	0.1233	4.e-002	-2.385	14.32	0.958
39	0.1266	4.33e-002	-1.814	13.75	0.9198
40	0.13	4.67e-002	-2.235	14.17	0.948
41	0.1333	5.e-002	-2.134	14.07	0.9412
42	0.1366	5.33e-002	-2.109	14.05	0.9395
43	0.14	5.67e-002	-2.115	14.06	0.9399
44	0.1433	6.e-002	-2.096	14.04	0.9387
45	0.1466	6.33e-002	-1.864	13.8	0.9232
46	0.15	6.67e-002	-1.663	13.6	0.9097
47	0.1533	7.e-002	-2.605	14.55	0.9727
48	0.1566	7.33e-002	-2.473	14.41	0.9639
49	0.16	7.67e-002	-1.663	13.6	0.9097
50	0.1633	8.e-002	-2.159	14.1	0.9429
51	0.1666	8.33e-002	-2.159	14.1	0.9429
52	0.17	8.67e-002	-2.41	14.35	0.9597
53	0.1733	9.e-002	-1.833	13.77	0.9211
54	0.1766	9.33e-002	-1.933	13.87	0.9278
55	0.18	9.67e-002	-2.134	14.07	0.9412
56	0.1833	0.1	-2.046	13.99	0.9353
57	0.1866	0.1033	-2.084	14.02	0.9379
58	0.19	0.1067	-2.065	14.	0.9366
59	0.1933	0.11	-2.071	14.01	0.937
60	0.1966	0.1133	-2.065	14.	0.9366
61	0.2	0.1167	-2.065	14.	0.9366
62	0.2033	0.12	-2.065	14.	0.9366
63	0.2066	0.1233	-2.059	14.	0.9362
64	0.21	0.1267	-2.059	14.	0.9362
65	0.2133	0.13	-2.052	13.99	0.9357
66	0.2166	0.1333	-2.052	13.99	0.9357
67	0.22	0.1367	-2.052	13.99	0.9357
68	0.2233	0.14	-2.052	13.99	0.9357
69	0.2266	0.1433	-2.046	13.99	0.9353
70	0.23	0.1467	-2.046	13.99	0.9353
71	0.2333	0.15	-2.04	13.98	0.9349
72	0.2366	0.1533	-2.04	13.98	0.9349
73	0.24	0.1567	-2.04	13.98	0.9349
74	0.2433	0.16	-2.034	13.97	0.9345
75	0.2466	0.1633	-2.034	13.97	0.9345
76	0.25	0.1667	-2.034	13.97	0.9345
77	0.2533	0.17	-2.027	13.97	0.9341
78	0.2566	0.1733	-2.027	13.97	0.9341
79	0.26	0.1767	-2.027	13.97	0.9341
80	0.2633	0.18	-2.027	13.97	0.9341
81	0.2666	0.1833	-2.021	13.96	0.9337
82	0.27	0.1867	-2.021	13.96	0.9337
83	0.2733	0.19	-2.015	13.95	0.9333
84	0.2766	0.1933	-2.015	13.95	0.9333
85	0.28	0.1967	-2.015	13.95	0.9333
86	0.2833	0.2	-2.008	13.95	0.9328
87	0.2866	0.2033	-2.008	13.95	0.9328
88	0.29	0.2067	-2.008	13.95	0.9328
89	0.2933	0.21	-2.002	13.94	0.9324
90	0.2966	0.2133	-2.002	13.94	0.9324

91	0.3	0.2167	-2.002	13.94	0.9324
92	0.3033	0.22	-2.002	13.94	0.9324
93	0.3066	0.2233	-1.996	13.94	0.932
94	0.31	0.2267	-1.996	13.94	0.932
95	0.3133	0.23	-1.99	13.93	0.9316
96	0.3166	0.2333	-1.99	13.93	0.9316
97	0.32	0.2367	-1.99	13.93	0.9316
98	0.3233	0.24	-1.99	13.93	0.9316
99	0.3266	0.2433	-1.983	13.92	0.9311
100	0.33	0.2467	-1.983	13.92	0.9311
101	0.3333	0.25	-1.983	13.92	0.9311
102	0.35	0.2667	-1.971	13.91	0.9303
103	0.3666	0.2833	-1.958	13.9	0.9294
104	0.3833	0.3	-1.946	13.89	0.9286
105	0.4	0.3167	-1.939	13.88	0.9282
106	0.4166	0.3333	-1.927	13.87	0.9274
107	0.4333	0.35	-1.914	13.85	0.9265
108	0.45	0.3667	-1.908	13.85	0.9261
109	0.4666	0.3833	-1.895	13.83	0.9252
110	0.4833	0.4	-1.883	13.82	0.9244
111	0.5	0.4167	-1.877	13.82	0.924
112	0.5166	0.4333	-1.864	13.8	0.9232
113	0.5333	0.45	-1.858	13.8	0.9228
114	0.55	0.4667	-1.845	13.79	0.9219
115	0.5666	0.4833	-1.839	13.78	0.9215
116	0.5833	0.5	-1.826	13.77	0.9206
117	0.6	0.5167	-1.814	13.75	0.9198
118	0.6166	0.5333	-1.808	13.75	0.9194
119	0.6333	0.55	-1.795	13.73	0.9185
120	0.65	0.5667	-1.789	13.73	0.9181
121	0.6666	0.5833	-1.776	13.72	0.9173
122	0.6833	0.6	-1.77	13.71	0.9169
123	0.7	0.6167	-1.757	13.7	0.916
124	0.7166	0.6333	-1.745	13.69	0.9152
125	0.7333	0.65	-1.738	13.68	0.9147
126	0.75	0.6667	-1.732	13.67	0.9143
127	0.7666	0.6833	-1.72	13.66	0.9135
128	0.7833	0.7	-1.713	13.65	0.9131
129	0.8	0.7167	-1.701	13.64	0.9123
130	0.8166	0.7333	-1.694	13.63	0.9118
131	0.8333	0.75	-1.682	13.62	0.911
132	0.85	0.7667	-1.676	13.62	0.9106
133	0.8666	0.7833	-1.669	13.61	0.9101
134	0.8833	0.8	-1.657	13.6	0.9093
135	0.9	0.8167	-1.65	13.59	0.9088
136	0.9166	0.8333	-1.638	13.58	0.908
137	0.9333	0.85	-1.632	13.57	0.9076
138	0.95	0.8667	-1.625	13.57	0.9072
139	0.9666	0.8833	-1.613	13.55	0.9064
140	0.9833	0.9	-1.607	13.55	0.906
141	1.	0.9167	-1.6	13.54	0.9055
142	1.2	1.117	-1.475	13.41	0.8971
143	1.4	1.317	-1.387	13.33	0.8913
144	1.6	1.517	-1.299	13.24	0.8854
145	1.8	1.717	-1.217	13.16	0.8799
146	2.	1.917	-1.142	13.08	0.8749
147	2.2	2.117	-1.073	13.01	0.8703

148	2.4	2.317	-1.01	12.95	0.866
149	2.6	2.517	-0.947	12.89	0.8618
150	2.8	2.717	-0.891	12.83	0.8581
151	3.	2.917	-0.834	12.77	0.8543
152	3.2	3.117	-0.784	12.72	0.8509
153	3.4	3.317	-0.74	12.68	0.848
154	3.6	3.517	-0.696	12.64	0.845
155	3.8	3.717	-0.652	12.59	0.8421
156	4.	3.917	-0.615	12.56	0.8396
157	4.2	4.117	-0.577	12.52	0.8371
158	4.4	4.317	-0.583	12.52	0.8375
159	4.6	4.517	-0.514	12.45	0.8329
160	4.8	4.717	-0.483	12.42	0.8308
161	5.	4.917	-0.458	12.4	0.8291
162	5.2	5.117	-0.426	12.37	0.827
163	5.4	5.317	-0.401	12.34	0.8253
164	5.6	5.517	-0.382	12.32	0.824
165	5.8	5.717	-0.357	12.3	0.8224
166	6.	5.917	-0.338	12.28	0.8211
167	6.2	6.117	-0.32	12.26	0.8199
168	6.4	6.317	-0.301	12.24	0.8186
169	6.6	6.517	-0.288	12.23	0.8178
170	6.8	6.717	-0.269	12.21	0.8165
171	7.	6.917	-0.257	12.2	0.8157
172	7.2	7.117	-0.244	12.18	0.8148
173	7.4	7.317	-0.232	12.17	0.814
174	7.6	7.517	-0.219	12.16	0.8131
175	7.8	7.717	-0.207	12.15	0.8123
176	8.	7.917	-0.194	12.13	0.8115
177	8.2	8.117	-0.188	12.13	0.8111
178	8.4	8.317	-0.175	12.12	0.8102
179	8.6	8.517	-0.169	12.11	0.8098
180	8.8	8.717	-0.156	12.1	0.8089
181	9.	8.917	-0.15	12.09	0.8085
182	9.2	9.117	-0.144	12.08	0.8081
183	9.4	9.317	-0.138	12.08	0.8077
184	9.6	9.517	-0.131	12.07	0.8073
185	9.8	9.717	-0.125	12.07	0.8069
186	10.	9.917	-0.119	12.06	0.8065
187	11.	10.92	-9.4e-002	12.03	0.8048
188	12.	11.92	-7.5e-002	12.01	0.8035
189	13.	12.92	-6.2e-002	12.	0.8026
190	14.	13.92	-5.e-002	11.99	0.8018
191	15.	14.92	-4.3e-002	11.98	0.8014
192	16.	15.92	-3.7e-002	11.98	0.801
193	17.	16.92	-3.1e-002	11.97	0.8006
194	18.	17.92	-3.1e-002	11.97	0.8006
195	19.	18.92	-3.1e-002	11.97	0.8006
196	20.	19.92	-2.5e-002	11.97	0.8002
197	21.	20.92	-2.5e-002	11.97	0.8002
198	22.	21.92	-2.5e-002	11.97	0.8002
199	23.	22.92	-3.1e-002	11.97	0.8006
200	24.	23.92	-2.5e-002	11.97	0.8002
201	25.	24.92	-2.5e-002	11.97	0.8002
202	26.	25.92	-1.8e-002	11.96	0.7997
203	27.	26.92	-2.5e-002	11.97	0.8002
204	28.	27.92	-2.5e-002	11.97	0.8002

Field Hydraulic Conductivity Test November 6, 2000 **Arithmetic Graph**

C&D Landfill, Inc. US 264 East, Pitt County B-2s falling head



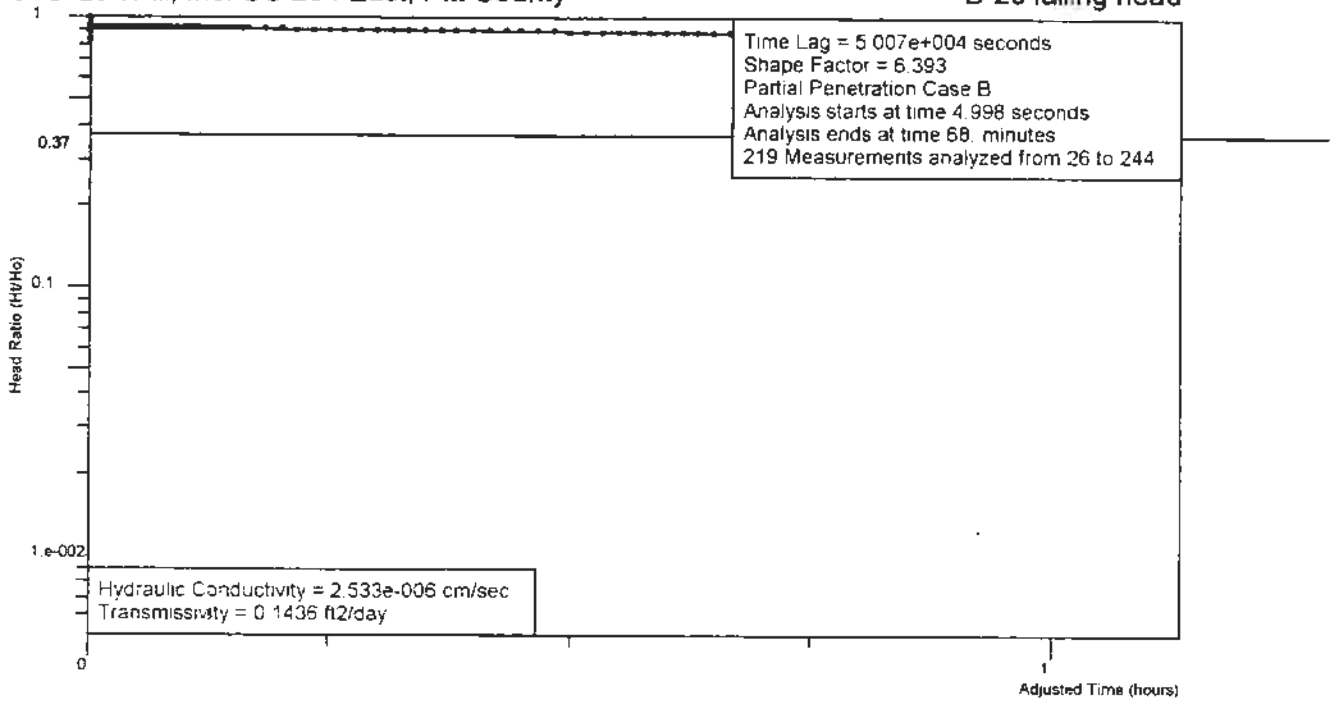
Analysis by Starpoint Software

Field Hydraulic Conductivity Test November 6, 2000

C&D Landfill, Inc. US 264 East, Pitt County

Hvorslev Graph

B-2s falling head



Analysis by Starpoint Software

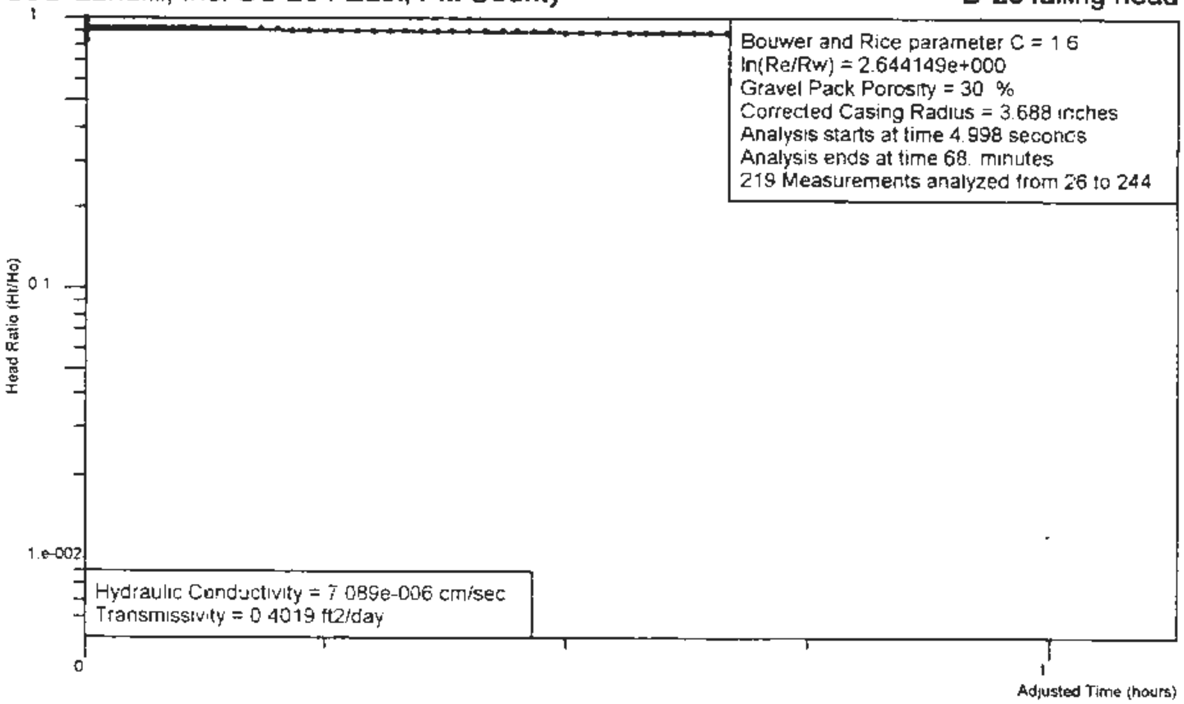
Ho is 15.26 feet at 4.998 seconds

11/28/2000

Field Hydraulic Conductivity Test November 6, 2000Bouwer and Rice Graph

C&D Landfill, Inc. US 264 East, Pitt County

B-2s falling head



Analysis by Starpoint Software

Ho is 15 26 feet at 4.998 seconds

Field Hydraulic Conductivity Test

Site Name:	C&D Landfill, Inc.
Location:	US 264 East, Pitt County
Test Date:	November 6, 2000
Import File:	C:\hermit datalogger\Pitt2ss0

Well Label:	B-2s falling head
Aquifer Thickness:	20. feet
Screen Length:	10. feet
Casing Radius:	2. inches
Effective Radius:	6. inches
Gravel Pack Porosity:	30. %
Corrected Casing Radius:	3.688 inches
Static Water Level:	11.99 feet
Water Table to Screen Bottom:	26.62 feet
Anisotropy Ratio:	1.
Time Adjustment:	4.998 Seconds

Test starts with trial 25
There are 244 time and drawdown measurements
Maximum head is 15.26 feet
Minimum head is 0. feet

Trial	Time (minutes)	Adjusted Time (minutes)	Drawdown (feet)	Head (feet)	Head Ratio
1	0.	-8.33e-002	-1.444	13.43	0.8805
2	3.3e-003	-8.e-002	-2.211	14.2	0.9308
3	6.6e-003	-7.67e-002	-2.757	14.75	0.9666
4	1.e-002	-7.33e-002	-2.764	14.75	0.967
5	1.33e-002	-7.e-002	-2.695	14.69	0.9625
6	1.66e-002	-6.67e-002	-2.116	14.11	0.9246
7	2.e-002	-6.33e-002	-2.808	14.8	0.9699
8	2.33e-002	-6.e-002	-2.801	14.79	0.9695
9	2.66e-002	-5.67e-002	-2.695	14.69	0.9625
10	3.e-002	-5.33e-002	-2.695	14.69	0.9625
11	3.33e-002	-5.e-002	-2.72	14.71	0.9641
12	3.66e-002	-4.67e-002	-2.864	14.85	0.9736
13	4.e-002	-4.33e-002	-3.015	15.01	0.9835
14	4.33e-002	-4.e-002	-2.688	14.68	0.9621
15	4.66e-002	-3.67e-002	-3.179	15.17	0.9942
16	5.e-002	-3.33e-002	-2.877	14.87	0.9744
17	5.33e-002	-3.e-002	-2.783	14.77	0.9683
18	5.66e-002	-2.67e-002	-3.254	15.24	0.9991
19	6.e-002	-2.33e-002	-2.877	14.87	0.9744
20	6.33e-002	-2.e-002	-3.147	15.14	0.9921
21	6.66e-002	-1.67e-002	-2.908	14.9	0.9765
22	7.e-002	-1.33e-002	-2.406	14.4	0.9436
23	7.33e-002	-1.e-002	-2.669	14.66	0.9608
24	7.66e-002	-6.7e-003	-3.003	14.99	0.9827
25	8.e-002	-3.3e-003	-2.129	14.12	0.9254
26	8.33e-002	0.	-3.267	15.26	1.
27	8.66e-002	3.3e-003	-2.255	14.25	0.9337
28	9.e-002	6.7e-003	-2.896	14.89	0.9757
29	9.33e-002	1.e-002	-2.569	14.56	0.9543
30	9.66e-002	1.33e-002	-2.167	14.16	0.9279
31	0.1	1.67e-002	-2.707	14.7	0.9633
32	0.1033	2.e-002	-2.575	14.57	0.9546
33	0.1066	2.33e-002	-3.015	15.01	0.9835

34	0.11	2.67e-002	-2.412	14.4	0.944
35	0.1133	3.e-002	-2.908	14.9	0.9765
36	0.1166	3.33e-002	-0.665	12.65	0.8295
37	0.12	3.67e-002	-2.38	14.37	0.9419
38	0.1233	4.e-002	-2.663	14.65	0.9604
39	0.1266	4.33e-002	-0.772	12.76	0.8365
40	0.13	4.67e-002	-2.292	14.28	0.9361
41	0.1333	5.e-002	-1.972	13.96	0.9151
42	0.1366	5.33e-002	-3.015	15.01	0.9835
43	0.14	5.67e-002	-1.532	13.52	0.8863
44	0.1433	6.e-002	-2.368	14.36	0.9411
45	0.1466	6.33e-002	-2.085	14.07	0.9225
46	0.15	6.67e-002	-2.871	14.86	0.974
47	0.1533	7.e-002	-1.765	13.75	0.9016
48	0.1566	7.33e-002	-2.349	14.34	0.9398
49	0.16	7.67e-002	-2.186	14.18	0.9291
50	0.1633	8.e-002	-2.324	14.31	0.9382
51	0.1666	8.33e-002	-2.01	14.	0.9176
52	0.17	8.67e-002	-2.311	14.3	0.9373
53	0.1733	9.e-002	-2.204	14.19	0.9303
54	0.1766	9.33e-002	-2.198	14.19	0.9299
55	0.18	9.67e-002	-2.148	14.14	0.9267
56	0.1833	0.1	-2.267	14.26	0.9345
57	0.1866	0.1033	-2.173	14.16	0.9283
58	0.19	0.1067	-2.204	14.19	0.9303
59	0.1933	0.11	-2.198	14.19	0.9299
60	0.1966	0.1133	-2.211	14.2	0.9308
61	0.2	0.1167	-2.198	14.19	0.9299
62	0.2033	0.12	-2.198	14.19	0.9299
63	0.2066	0.1233	-2.204	14.19	0.9303
64	0.21	0.1267	-2.198	14.19	0.9299
65	0.2133	0.13	-2.204	14.19	0.9303
66	0.2166	0.1333	-2.198	14.19	0.9299
67	0.22	0.1367	-2.204	14.19	0.9303
68	0.2233	0.14	-2.198	14.19	0.9299
69	0.2266	0.1433	-2.204	14.19	0.9303
70	0.23	0.1467	-2.198	14.19	0.9299
71	0.2333	0.15	-2.198	14.19	0.9299
72	0.2366	0.1533	-2.204	14.19	0.9303
73	0.24	0.1567	-2.198	14.19	0.9299
74	0.2433	0.16	-2.198	14.19	0.9299
75	0.2466	0.1633	-2.198	14.19	0.9299
76	0.25	0.1667	-2.198	14.19	0.9299
77	0.2533	0.17	-2.198	14.19	0.9299
78	0.2566	0.1733	-2.198	14.19	0.9299
79	0.26	0.1767	-2.198	14.19	0.9299
80	0.2633	0.18	-2.198	14.19	0.9299
81	0.2666	0.1833	-2.198	14.19	0.9299
82	0.27	0.1867	-2.198	14.19	0.9299
83	0.2733	0.19	-2.198	14.19	0.9299
84	0.2766	0.1933	-2.198	14.19	0.9299
85	0.28	0.1967	-2.198	14.19	0.9299
86	0.2833	0.2	-2.198	14.19	0.9299
87	0.2866	0.2033	-2.198	14.19	0.9299
88	0.29	0.2067	-2.198	14.19	0.9299
89	0.2933	0.21	-2.198	14.19	0.9299
90	0.2966	0.2133	-2.198	14.19	0.9299

91	0.3	0.2167	-2.198	14.19	0.9299
92	0.3033	0.22	-2.192	14.18	0.9295
93	0.3066	0.2233	-2.198	14.19	0.9299
94	0.31	0.2267	-2.198	14.19	0.9299
95	0.3133	0.23	-2.198	14.19	0.9299
96	0.3166	0.2333	-2.198	14.19	0.9299
97	0.32	0.2367	-2.192	14.18	0.9295
98	0.3233	0.24	-2.198	14.19	0.9299
99	0.3266	0.2433	-2.198	14.19	0.9299
100	0.33	0.2467	-2.198	14.19	0.9299
101	0.3333	0.25	-2.192	14.18	0.9295
102	0.35	0.2667	-2.198	14.19	0.9299
103	0.3666	0.2833	-2.198	14.19	0.9299
104	0.3833	0.3	-2.198	14.19	0.9299
105	0.4	0.3167	-2.198	14.19	0.9299
106	0.4166	0.3333	-2.198	14.19	0.9299
107	0.4333	0.35	-2.198	14.19	0.9299
108	0.45	0.3667	-2.198	14.19	0.9299
109	0.4666	0.3833	-2.198	14.19	0.9299
110	0.4833	0.4	-2.198	14.19	0.9299
111	0.5	0.4167	-2.198	14.19	0.9299
112	0.5166	0.4333	-2.198	14.19	0.9299
113	0.5333	0.45	-2.198	14.19	0.9299
114	0.55	0.4667	-2.192	14.18	0.9295
115	0.5666	0.4833	-2.198	14.19	0.9299
116	0.5833	0.5	-2.192	14.18	0.9295
117	0.6	0.5167	-2.192	14.18	0.9295
118	0.6166	0.5333	-2.198	14.19	0.9299
119	0.6333	0.55	-2.192	14.18	0.9295
120	0.65	0.5667	-2.192	14.18	0.9295
121	0.6666	0.5833	-2.192	14.18	0.9295
122	0.6833	0.6	-2.192	14.18	0.9295
123	0.7	0.6167	-2.192	14.18	0.9295
124	0.7166	0.6333	-2.192	14.18	0.9295
125	0.7333	0.65	-2.192	14.18	0.9295
126	0.75	0.6667	-2.192	14.18	0.9295
127	0.7666	0.6833	-2.192	14.18	0.9295
128	0.7833	0.7	-2.192	14.18	0.9295
129	0.8	0.7167	-2.186	14.18	0.9291
130	0.8166	0.7333	-2.186	14.18	0.9291
131	0.8333	0.75	-2.192	14.18	0.9295
132	0.85	0.7667	-2.186	14.18	0.9291
133	0.8666	0.7833	-2.186	14.18	0.9291
134	0.8833	0.8	-2.186	14.18	0.9291
135	0.9	0.8167	-2.186	14.18	0.9291
136	0.9166	0.8333	-2.186	14.18	0.9291
137	0.9333	0.85	-2.186	14.18	0.9291
138	0.95	0.8667	-2.186	14.18	0.9291
139	0.9666	0.8833	-2.186	14.18	0.9291
140	0.9833	0.9	-2.186	14.18	0.9291
141	1.	0.9167	-2.186	14.18	0.9291
142	1.2	1.117	-2.179	14.17	0.9287
143	1.4	1.317	-2.173	14.16	0.9283
144	1.6	1.517	-2.167	14.16	0.9279
145	1.8	1.717	-2.167	14.16	0.9279
146	2.	1.917	-2.16	14.15	0.9274
147	2.2	2.117	-2.154	14.14	0.927

APPENDIX C

Test Boring Records

David Garrett, P.G., P.E.
Engineering and Geology

Test Boring No. B-1

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Collar Elevation	**17.40**
Equipment	**CME 750**	Drilling Method	**3-1/4" Hollow Auger**	Water Level, TOB	**NA**
Date Started	**10/12/00**	Date Ended	**10/13/00**	Water Level, 24 Hr.	**4.8**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**4.8**
Comments	**Plowed field, cool sunny weather**	Total Depth	**50.0**	Date of Observation	**10/16/00**

All depths are given in feet and referenced b.g.s.

Depth and Elev.	SPT Value and Plot	Soil Description and USCS Symbol		Piezometer Constuction Data
0 – 2 (16.00)		SAND: Medium dense buff-white, slightly silty, moist		
4 (14.00 – 12.00)	3 4 5	SAND: Loose, green-gray, silty and clayey, wet.	SM	
8 – 10 (10.00 – 8.00)	2 1 1	SILT: Medium stiff, gray-green, fine sandy and clayey, with heavy shell hash (turritellas) wet, medium plasticity	SM	
14 (4.00)	3 4 6		ML-CL	
18 – 20 (0.00 – -2.00)	4 4 6	CLAY: Medium stiff, gray-green, plastic gumbo clay, moist	CL	
24 (-6.00)	4 5 7		CL	Bentonite-Cement Grout
28 – 30 (-10.00 – -12.00)	3 3 7		CL	
32 – 36 (-14.00 – -18.00)	6 22 18	SILTY SAND: Dense, partly cemented, black-green speckled, variably clayey, silty, moist, hard layer at 36 to 38 feet, very hard below 45 feet	SM	Bentonite Seal

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36

Elevation scale: 16.00, 14.00, 12.00, 10.00, 8.00, 6.00, 4.00, 2.00, 0.00, -2.00, -4.00, -6.00, -8.00, -10.00, -12.00, -14.00, -16.00, -18.00

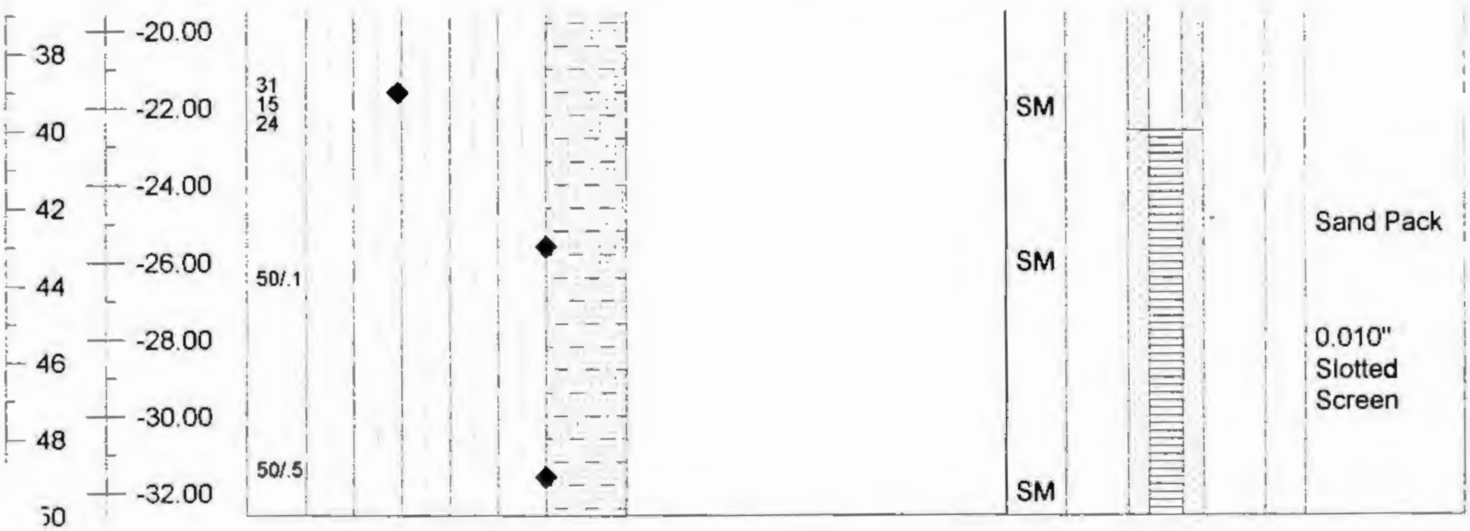
David Garrett, P.G., P.E.

Engineering and Geology

Test Boring No. B-1

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Collar Elevation	**17.40**
Equipment	**CME 750**	Drilling Method	**3-1/4" Hollow Auger**	Water Level, TOB	**NA**
Date Started	**10/12/00**	Date Ended	**10/13/00**	Water Level, 24 Hr.	**4.8**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**4.8**
Comments	**Plowed field, cool sunny weather**	Total Depth	**50.0**	Date of Observation	**10/16/00**
	All depths are given in feet and referenced b.g.s.				

Depth and Elev.	SPT Value and Plot	Soil Description and USCS Symbol	Piezometer Constuction Data



David Garrett, P.G., P.E.

Engineering and Geology

Test Boring No. B-2d

Client and Project	C&D Landfill, Inc. (Pitt County)			Collar Elevation	17.97
Equipment	CME 750	Drilling Method	3-7/8" rotary-mud	Water Level, TOB	6.6
Date Started	10/9/00	Date Ended	10/11/00	Water Level, 24 Hr.	7.9
Drilling Firm	Bore & Core, Inc.	Logged by	David Garrett	Stabilized Level	7.9
Comments	Plowed field, cool sunny weather	Total Depth	70.0	Date of Observation	10/16/00

All depths are given in feet and referenced b.g.s.

Depth and Elev.	SPT Value and Plot	Soil Description and USCS Symbol		Piezometer Constuction Data
0 – 2 (16.00)		SAND: Loose, tan-yellow, variably silty sand		Bentonite-Cement Grout
4 (14.00) – 6 (12.00)	16 8 9	CLAY: Medium stiff, tan-orange, very sandy, silty, slightly plastic, moist, crumbly	CL & SM	
8 (10.00) – 12 (6.00)	5 8 8	SAND: Medium dense, tan, subangular, f - c well graded (boring collapsed at 13.6 feet when casing pulled, redrilled with 4-1/4" hollow stem auger)	SP-SM	
14 (4.00) – 22 (-4.00)	3 3 4; 2 2 3	CLAYEY SILT: Medium stiff, gray-green, fine sandy, with heavy shell hash (whole turritellas), moist, moderately plastic (Undisturbed sample taken 18 - 20 feet)	CL-ML; CL-ML	
24 (-6.00) – 32 (-14.00)	2 2 4; 2 2 3	CLAY: Medium stiff, gray-green, plastic gumbo clay, moist (Undisturbed sample taken 24 - 26 feet)	CL; CL	
34 (-16.00) – 36 (-18.00)	1 6 8	SILT: Stiff, gray-green, fine sandy, clayey, interlayered with sand	SM	Bentonite Seal

Depth scale: 0; 2 – 16.00; 4 – 14.00; 6 – 12.00; 8 – 10.00; 10 – 8.00; 12 – 6.00; 14 – 4.00; 16 – 2.00; 18 – 0.00; 20 – -2.00; 22 – -4.00; 24 – -6.00; 26 – -8.00; 28 – -10.00; 30 – -12.00; 32 – -14.00; 34 – -16.00; 36 – -18.00

David Garrett, P.G., P.E.

Engineering and Geology

Test Boring No. B-2d

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Collar Elevation	**17.97**
Equipment	**CME 750**	Drilling Method	**3-7/8" rotary-mud**	Water Level, TOB	**6.6**
Date Started	**10/9/00**	Date Ended	**10/11/00**	Water Level, 24 Hr.	**7.9**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**7.9**
Comments	**Plowed field, cool sunny weather**	Total Depth	**70.0**	Date of Observation	**10/16/00**

All depths are given in feet and referenced b.g.s.

Depth	Elev.
38	-20.00
40	-22.00
42	-24.00
44	-26.00
46	-28.00
48	-30.00
50	-32.00
52	-34.00
54	-36.00
56	-38.00
58	-40.00
60	-42.00
62	-44.00
64	-46.00
66	-48.00
68	-50.00
70	-52.00

Approx. Depth	SPT Value
39	5 4 29
44	10 20 27
49.5	22 38 50/.2
54	50/.1
59	6 7 7
64	5 6 5
69.5	40 38 50/.5

Soil Description	USCS Symbol
SILT: Hard, black-green speckled, clayey, fine sandy, moist, moderately plastic, scattered pelecypod shell hash	ML, ML
SAND: Very dense (partly cemented), black-green speckled, clayey, silty, fine glauconite nodules	SM, SM
SAND: Medium dense, green-black speckled, silty, clayey, fine grained, wet	SC
CLAY: Medium stiff to very hard, gray-green, fine sandy, silty, moderately plastic	CL, CL

Piezometer Constuction Data:

- Sand Pack
- 0.010" Slotted Screen
- Bentonite Seal

David Garrett, P.G., P.E.

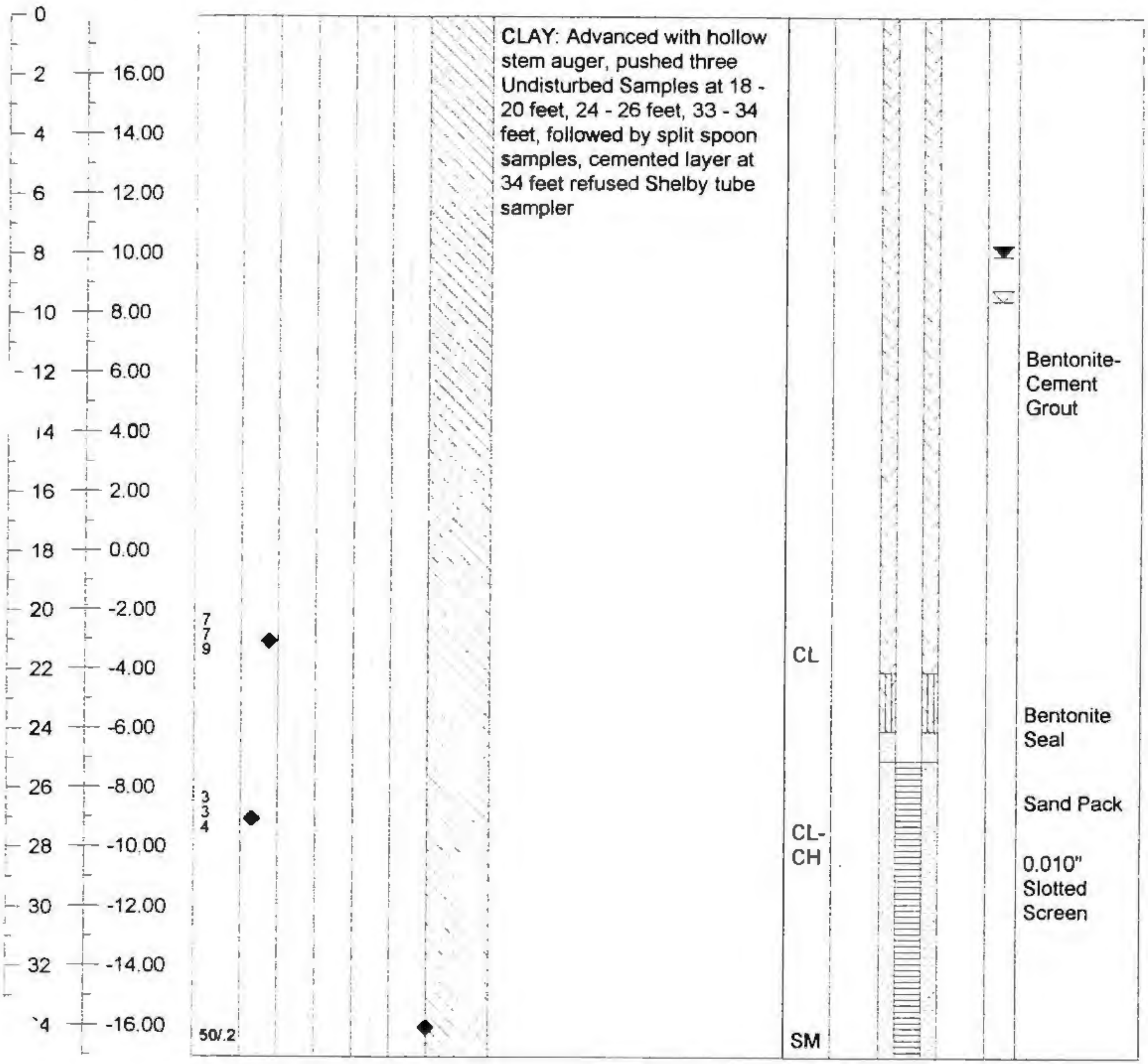
Engineering and Geology

Test Boring No. B-2s

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Collar Elevation	**17.95**
Equipment	**CME 750**	Drilling Method	**4-1/4" Hollow Auger**	Water Level, TOB	**9.5**
Date Started	**10/10/00**	Date Ended	**10/11/00**	Water Level, 24 Hr.	**8.0**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**8.0**
Comments	**Plowed field, cool sunny weather**	Total Depth	**35.0**	Date of Observation	**10/16/00**

All depths are given in feet and referenced b.g.s.

Depth and Elev.	SPT Value and Plot	Soil Description and USCS Symbol	Piezometer Constuction Data



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Test Boring No. B-3

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Collar Elevation	**19.37**
Equipment	**CME 750**	Drilling Method	**4-1/4" Hollow Auger**	Water Level, TOB	**3.0 caved**
Date Started	**10/12/00**	Date Ended	**10/13/00**	Water Level, 24 Hr.	**4.5**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**4.5**
Comments	**Plowed field, cool sunny weather**	Total Depth	**50.0**	Date of Observation	**10/16/00**
	All depths are given in feet and referenced b.g.s.				

Depth and Elev.		SPT Value and Plot	Soil Description and USCS Symbol		Piezometer Constuction Data
0			CLAY: Stiff, bright yellow-orange, fine sandy, silty, moist	CL	
2	18.00				
4	16.00	4 4 6 ◆	SAND: Medium dense, tan-yellow, silty, trace of clay, moist		Caved
6	14.00				
8	12.00		SAND: Medium dense, tan-buff, well graded fine to coarse, wet	SW	
10	10.00	4 5 5 ◆			
12	8.00				
14	6.00	2 4 4 ◆	SILT: Stiff, gray-green, fine sandy and clayey, with heavy shell hash (turritellas) wet, medium plasticity	ML-CL	
16	4.00				
18	2.00				
20	0.00	2 2 4 ◆		CL	
22	-2.00				
24	-4.00	2 5 7 ◆	CLAY: Medium stiff, gray-green, plastic gumbo clay, moist	CL	
26	-6.00				Bentonite-Cement Grout
28	-8.00		SILTY SAND: Medium dense to dense, partly cemented, black-green speckled, variably clayey, silty, moist, very hard drilling (cemented) below 38 feet, glauconitic		
30	-10.00	3 6 5 ◆		SM	
32	-12.00				
34	-14.00	5 18 20 ◆		SM	
36	-16.00				Bentonite Seal

David Garrett, P.G., P.E.
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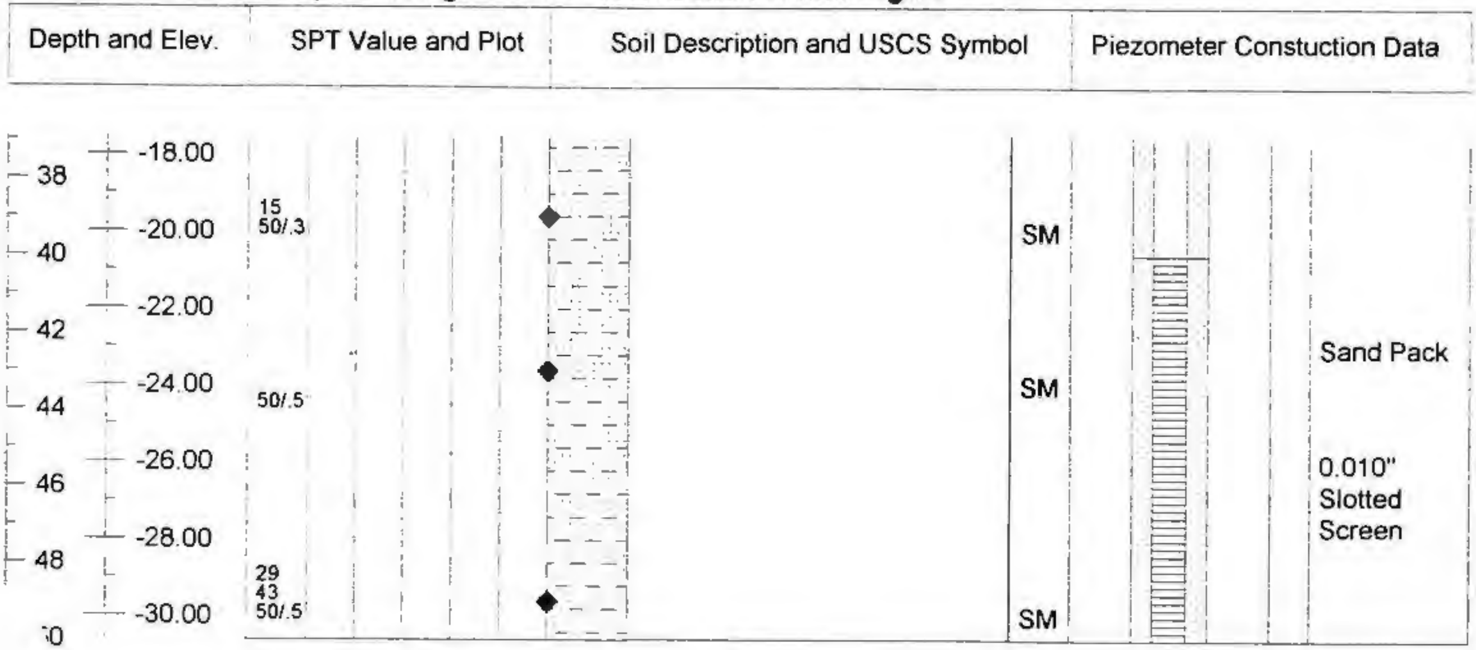
Test Boring No. B-3

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Collar Elevation	**19.37**
Equipment	**CME 750**	Drilling Method	**4-1/4" Hollow Auger**	Water Level, TOB	**3.0 caved**
Date Started	**10/12/00**	Date Ended	**10/13/00**	Water Level, 24 Hr.	**4.5**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**4.5**
Comments	**Plowed field, cool sunny weather**	Total Depth	**50.0**	Date of Observation	**10/16/00**
	All depths are given in feet and referenced b.g.s.				



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Test Boring No. B-4

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Collar Elevation	**16.04**
Equipment	**CME 750**	Drilling Method	**4-1/4" Hollow Auger**	Water Level, TOB	**2.8 caved**
Date Started	**10/12/00**	Date Ended	**10/13/00**	Water Level, 24 Hr.	**8.4**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**8.4**
Comments	**Plowed field, cool sunny weather**	Total Depth	**50.0**	Date of Observation	**10/16/00**

All depths are given in feet and referenced b.g.s.

Depth	Elev.	SPT Value	Soil Description	USCS Symbol	Piezometer Constuction Data
0	16.00		SAND: Loose, light gray, variably silty sand, dry to moist		
2	14.00				Caved
4	12.00	4 6 7	SAND: Medium dense, buff, slightly clayey, silty, wet in spoon	SM	
6	10.00				
8	8.00				
10	6.00	3 1 1	SILT: Medium stiff, gray-green, fine sandy and clayey, wet, medium plasticity	MH-CH	
12	4.00				
14	2.00	5 4 4	CLAYEY SILT: Medium stiff, gray-green, fine sandy, with heavy shell hash (turritellas), moist, plastic	ML	
16	0.00				
18	-2.00		CLAY: Medium stiff, gray-green, plastic gumbo clay, moist		
20	-4.00	3 3 5		CL	
22	-6.00				
24	-8.00	6 8 10		CL	
26	-10.00				Bentonite-Cement Grout
28	-12.00		SILTY SAND: Medium dense to dense, partly cemented, black-green speckled, variably clayey, silty, moist, hard layer encountered at 31.5 to 33 feet		
30	-14.00	16 7 11		SM	
32	-16.00				
34	-18.00	8 5 8		SM	
36	-20.00				Bentonite Seal

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Client and Project	**C&D Landfill, Inc. (Pitt County)**			Collar Elevation	**16.04**
Equipment	**CME 750**	Drilling Method	**4-1/4" Hollow Auger**	Water Level, TOB	**2.8 caved**
Date Started	**10/12/00**	Date Ended	**10/13/00**	Water Level, 24 Hr.	**8.4**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**8.4**
Comments	**Plowed field, cool sunny weather**	Total Depth	**50.0**	Date of Observation	**10/16/00**
	All depths are given in feet and referenced b.g.s.				

Depth and Elev.		SPT Value and Plot	Soil Description and USCS Symbol		Piezometer Constuction Data
38	-22.00				
		14 17 18		SM	
40	-24.00				
42	-26.00				Sand Pack
44	-28.00	13 18 16	SILTY SAND: same as above with high glauconite content (fine sand fraction) and sand-pelecypod mold concretions (possibly derived from Castle Hayne formation), very dense below 48 feet	SM	
46	-30.00				0.010" Slotted Screen
48	-32.00	32 43 50/.3			
50				SM	

David Garrett, P.G., P.E.

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Test Boring No. B-5

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Collar Elevation	**18.61**
Equipment	**CME 75**	Drilling Method	**3-1/4" Hollow Auger**	Water Level, TOB	**6.0**
Date Started	**10/17/00**	Date Ended	**10/17/00**	Water Level, 24 Hr.	**NA**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**7.1**
Comments	**Plowed field, cool sunny weather**	Total Depth	**35.0**	Date of Observation	**11/6/00**
	All depths are given in feet and referenced b.g.s.				

Depth and Elev.	SPT Value and Plot	Soil Description and USCS Symbol		Piezometer Constuction Data
0 / 18.00		SAND: Loose, tan-yellow, well graded, fine to medium, moist, trace of silt		
4 / 14.00	3 3 4		SW	
8 / 10.00	9 8 5		SW	
13 / 5.00		SILT: Medium stiff, gray-green, fine sandy and clayey, with heavy shell hash (turritellas) wet, medium plasticity		
14 / 4.00	3 4 5		ML-CL	
18 / 0.00	4 3 7	CLAY: Medium stiff, gray-green, slightly fine sandy, plastic gumbo clay, moist	CL	Soil Backfill
24 / -6.00	6 7 8		CL	
28 / -10.00	5 7 8		CL	
34 / -16.00	12 17 22	CLAYEY SILT: Very stiff, fine sandy, slightly moist	ML-SM	0.010" Slotted Screen

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Test Boring No. B-6

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Collar Elevation	**16.45**
Equipment	**CME 75**	Drilling Method	**3-1/4" Hollow Auger**	Water Level, TOB	**5.7**
Date Started	**10/16/00**	Date Ended	**10/16/00**	Water Level, 24 Hr.	**NA**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**4.7**
Comments	**Plowed field, cool sunny weather**	Total Depth	**35.0**	Date of Observation	**11/6/00**

All depths are given in feet and referenced b.g.s.

Depth and Elev.		SPT Value and Plot	Soil Description and USCS Symbol		Piezometer Constuction Data
0	16.00		SAND: Loose, tan-yellow, well graded, fine to medium, moist, trace of silt	SW	Soil Backfill
2	14.00				
4	12.00	9 11 13			
6	10.00		SILT: Medium stiff, gray-green, fine sandy, clayey, wet	ML-CL	
8	8.00	1 3 4			
10	6.00				
12	4.00		SILT: Medium stiff, gray-green, fine sandy and clayey, with heavy shell hash (turritellas) wet, medium plasticity (strata boundaries uncertain)	ML-CL	
14	2.00	3 5 5			
16	0.00				
18	-2.00	4 4 6	CLAY: Medium stiff, gray-green, slightly fine sandy, plastic gumbo clay, moist	CL	
20	-4.00				
22	-6.00				
24	-8.00	4 5 7		CL	
26	-10.00				
28	-12.00	10 9 3		CL	
30	-14.00		CLAYEY SILT: Very stiff, fine sandy, slightly moist		
32	-16.00				
34	-18.00	20 15 6		ML-SM	0.010" Slotted Screen

David Garrett, P.G., P.E.
Engineering and Geology

Test Boring No. B-7

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Collar Elevation	**17.64**
Equipment	**CME 75**	Drilling Method	**3-1/4" Hollow Auger**	Water Level, TOB	**5.4**
Date Started	**10/17/00**	Date Ended	**10/17/00**	Water Level, 24 Hr.	**NA**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**6.6**
Comments	**Plowed field, cool sunny weather**	Total Depth	**35.0**	Date of Observation	**11/6/00**

All depths are given in feet and referenced b.g.s.

Depth and Elev.		SPT Value and Plot	Soil Description and USCS Symbol		Piezometer Constuction Data
0			SAND: Loose, tan-yellow, well graded, fine to medium, moist, trace of silt	SW	Soil Backfill
2	16.00				
4	14.00	4 4 5			
6	12.00		SILT: Medium stiff, gray-green, fine sandy, clayey, wet	ML-CL	
8	10.00				
10	8.00	1 4 5			
12	6.00				
14	4.00	3 5 5	SILT: Medium stiff, gray-green, fine sandy and clayey, with heavy shell hash (turritellas) wet, medium	ML-CL	
16	2.00		CLAY: Medium stiff, gray-green, slightly fine sandy, plastic gumbo clay, moist		
18	0.00				
20	-2.00	4 4 5		CL	
22	-4.00				
24	-6.00	5 5 6		CL	
26	-8.00				
28	-10.00				
30	-12.00	3 5 21		CL	
30	-12.00		CLAYEY SILT: Very stiff, fine sandy, slightly moist		
32	-14.00				
34	-16.00	10 12 9		ML-SM	0.010" Slotted Screen

David Garrett, P.G., P.E.

Engineering and Geology

Test Boring No. B-8

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Collar Elevation	**17.48**
Equipment	**CME 75**	Drilling Method	**3-1/4" Hollow Auger**	Water Level, TOB	**5.0**
Date Started	**10/17/00**	Date Ended	**10/17/00**	Water Level, 24 Hr.	**NA**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**6.8**
Comments	**Plowed field, cool sunny weather**	Total Depth	**35.0**	Date of Observation	**11/6/00**

All depths are given in feet and referenced b.g.s.

Depth and Elev.	SPT Value and Plot	Soil Description and USCS Symbol		Piezometer Constuction Data
0 – 3 (17.48 – 14.48)		SAND: Loose, white, well graded, fine to coarse, moist	SW	Soil Backfill
3 – 12.5	8, 10, 10 (4 ft); 1, 3, 3 (9 ft)	SILT: Medium stiff, gray-green, fine sandy, clayey, wet	ML-CL	Soil Backfill
12.5 – 17	6, 5, 3 (14 ft)	SILT: Medium stiff, gray-green, fine sandy and clayey, with heavy shell hash (turritellas) wet, medium plasticity	ML-CL	Soil Backfill
17 – 31	4, 4, 6 (19 ft); 7, 9, 11 (24 ft); 7, 8, 8 (29 ft)	CLAY: Medium stiff, gray-green, slightly fine sandy, highly plastic gumbo clay, moist	CL	Soil Backfill
31 – 35	9, 11, 12 (34 ft)	CLAYEY SILT: Very stiff, fine sandy, with cemented ledges	ML-SM	0.010" Slotted Screen

Depth	Elev.
0	
2	16.00
4	14.00
6	12.00
8	10.00
10	8.00
12	6.00
14	4.00
16	2.00
18	0.00
20	-2.00
22	-4.00
24	-6.00
26	-8.00
28	-10.00
30	-12.00
32	-14.00
34	-16.00

David Garrett, P.G., P.E.

Engineering and Geology

Test Boring No. B-9

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Collar Elevation	**18.46**
Equipment	**CME 750**	Drilling Method	**3-7/8" rotary-mud**	Water Level, TOB	**4.3**
Date Started	**10/10/00**	Date Ended	**10/10/00**	Water Level, 24 Hr.	**7.3**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**7.3**
Comments	**Plowed field, sunny, cool weather**	Total Depth **70.0**		Date of Observation	**10/16/00**
	All depths are given in feet and referenced b.g.s.				

Depth and Elev.	SPT Value and Plot	Soil Description and USCS Symbol		Piezometer Constuction Data
0 / 18.00 to 12 / 6.00	5-6-9 (at 4 ft); 8-8-9 (at 9 ft)	SAND: Medium dense, tan-yellow, well graded fine to medium, subangular quartz with 15% feldspar, moist, coarse at 8.5 feet (did not detect clay layer seen in nearby Test Pit 2)	SW; SW	Bentonite-Cement Grout
13.5 to 21 / 4.00 to -2.00	2-1-1 (at 14 ft); 2-2-3 (at 19 ft)	CLAYEY SILT: Soft to medium stiff, gray-green, fine sandy, with heavy shell hash (whole turritellas), moist, moderately plastic	ML-CL; CL	
21 to 32 / -4.00 to -14.00	3-3-3 (at 24 ft); 1-2-4 (at 29 ft)	CLAY: Medium stiff, gray-green, slightly fine sandy, silty clay, transitions to plastic gumbo clay by 23.5 feet	CL; CL; CL	Soil Backfilll
32 to 36 / -14.00 to -18.00	50/.5 (at 34 ft)	SILTY CLAY: Hard to very hard (partly cemented) fine sandy, silty, wet, sticky	CL-CH	

David Garrett, P.G., P.E.

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Test Boring No. B-9

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Collar Elevation	**18.46**
Equipment	**CME 750**	Drilling Method	**3-7/8" rotary-mud**	Water Level, TOB	**4.3**
Date Started	**10/10/00**	Date Ended	**10/10/00**	Water Level, 24 Hr.	**7.3**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**7.3**
Comments	**Plowed field, sunny, cool weather**	Total Depth	**70.0**	Date of Observation	**10/16/00**

All depths are given in feet and referenced b.g.s.

Depth and Elev.		SPT Value and Plot	Soil Description and USCS Symbol		Piezometer Constuction Data
38	-20.00				
40	-22.00	6 30 17	SAND: Dense, green-black speckled, very silty, fine grained, wet, fine glauconite nodules (this layer and following layers)	CL-CH	
42	-24.00				
44	-26.00	38 18 20		SM-SC	
46	-28.00				Soil Backfill
48	-30.00	26 50/.4	SAND: Very dense, green-black speckled, slightly silty	SM	
50	-32.00				
52	-34.00		CLAYEY SAND: Medium dense to dense, green-black, silty, clayey, varies from clayey silt at 58.5 feet to plastic sandy clay at 63.5 feet		
54	-36.00	10 10 9		SC	
56	-38.00				
58	-40.00	7 5 6			
60	-42.00			ML-CL	
62	-44.00				
64	-46.00	16 9 9		CL	
66	-48.00				0.010" Slotted Screen
68	-50.00	3 3 3			Soil Backfill
70				SC	

David Garrett, P.G., P.E.

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Test Boring No. B-10

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Collar Elevation	**17.17**
Equipment	**CME 75**	Drilling Method	**3-1/4" Hollow Auger**	Water Level, TOB	**3.7**
Date Started	**10/17/00**	Date Ended	**10/17/00**	Water Level, 24 Hr.	**NA**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**4.0**
Comments	**Plowed field, cool sunny weather**	Total Depth	**15.0**	Date of Observation	**11/6/00**
	All depths are given in feet and referenced b.g.s.				

Depth and Elev.	SPT Value and Plot	Soil Description and USCS Symbol		Piezometer Constuction Data
0 – 16.00 – 2 – 14.00 – 4 – 12.00 – 6 – 10.00 – 8	6 8 7 ◆	SAND: Loose, tan-brown, well graded, fine to coarse, occ. gravel, wet	SW	▼ Soil Backfill
8.00 – 10 – 6.00 – 12	1 1 1 ◆	SAND: Very loose, gray, fine to coarse with wood debris	SW	
4.00 – 14	2 5 5 ◆	SILT: Med. stiff, gray-green, f. sandy, clayey, turritellas, wet	ML-CL	0.010" Slotted Screen

David Garrett, P.G., P.E.

Engineering and Geology

Test Boring No. B-11

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Collar Elevation	**17.83**
Equipment	**CME 75**	Drilling Method	**3-1/4" Hollow Auger**	Water Level, TOB	**7.7**
Date Started	**10/17/00**	Date Ended	**10/17/00**	Water Level, 24 Hr.	**NA**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**5.3**
Comments	**Plowed field, cool sunny weather**	Total Depth	**15.0**	Date of Observation	**11/6/00**

All depths are given in feet and referenced b.g.s.

Depth and Elev.	SPT Value and Plot	Soil Description and USCS Symbol		Piezometer Constuction Data
0 – 7 (Elev. 17.83 – 10.00)	9 / 7 / 5 (at 4 ft)	SAND: Loose, tan-brown, well graded, fine to coarse, occ. gravel, wet	SW	Soil Backfill
7 – 12.5 (Elev. 10.00 – 6.00)	1 / 2 / 2 (at 9 ft)	CLAYEY SILT: Soft, gray-green, moist, with shell hash	ML-CL	
12.5 – 15 (Elev. 6.00 – 4.00)	4 / 5 / 5 (at 14 ft)	SILT: Med. stiff, gray-green, f. sandy, clayey, turritellas, wet	ML-CL	0.010" Slotted Screen

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14

Elevation scale: 16.00, 14.00, 12.00, 10.00, 8.00, 6.00, 4.00

David Garrett, P.G., P.E.

Engineering and Geology

Test Boring No. B-12

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Collar Elevation	**18.07**
Equipment	**CME 75**	Drilling Method	**3-1/4" Hollow Auger**	Water Level, TOB	**7.7**
Date Started	**10/17/00**	Date Ended	**10/17/00**	Water Level, 24 Hr.	**NA**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**7.4**
Comments	**Plowed field, cool sunny weather**	Total Depth	**15.0**	Date of Observation	**11/6/00**

All depths are given in feet and referenced b.g.s.

Depth and Elev.	SPT Value and Plot	Soil Description and USCS Symbol		Piezometer Constuction Data
0 — 18.00 2 — 16.00 4 — 14.00 6 — 12.00	5 7 7	SAND: Medium dense, tan, fine to medium, trace of silt, moist	SW	
8 — 10.00 10 — 8.00	6 7 4	CLAYEY SILT: Medium dense, tan-gray, fine to coarse, wet	SW	Soil Backfill
12 — 6.00 14 — 4.00	5 4 3	SILT: Med. stiff, gray-green, f. sandy, clayey, turritellas, wet	ML-CL	0.010" Slotted Screen

David Garrett, P.G., P.E.

Engineering and Geology

Test Boring No. B-13

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Collar Elevation	**19.83**
Equipment	**CME 75**	Drilling Method	**3-1/4" Hollow Auger**	Water Level, TOB	**8.1**
Date Started	**10/17/00**	Date Ended	**10/17/00**	Water Level, 24 Hr.	**NA**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**8.1**
Comments	**Plowed field, cool sunny weather**	Total Depth	**15.0**	Date of Observation	**11/6/00**
	All depths are given in feet and referenced b.g.s.				

Depth	Elev.	SPT Value	Soil Description	USCS Symbol	Piezometer Construction Data
0			SAND: Loose, tan-orange, silty f-m sand, moist, trace of clay	SM	
2	18.00				
4	16.00	3 3 3			
6	14.00		SAND: Medium dense, tan-gray, fine to coarse, wet (upper boundary uncertain)		
8	12.00				Soil Backfill
10	10.00	4 6 9		SW	
12	8.00		SILT: Med. stiff, gray-green, f. sandy, clayey, turritellas, wet	ML-CL	0.010" Slotted Screen
14	6.00	3 5 6			

Column headings as printed: Depth and Elev. | SPT Value and Plot | Soil Description and USCS Symbol | Piezometer Constuction Data

David Garrett, P.G., P.E.

Engineering and Geology

Test Boring No. B-17

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Collar Elevation	**18.8**
Equipment	**CME 75**	Drilling Method	**4-1/4" Hollow Auger**	Water Level, TOB	**7.8**
Date Started	**02/02/01**	Date Ended	**02/02/01**	Water Level, 24 Hr.	**NA**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**7.9**
Comments	**Plowed field, cool cloudy weather**	Total Depth	**12.0**	Date of Observation	**02/06/01**

All depths are given in feet and referenced b.g.s.

Depth and Elev.	SPT Value and Plot	Soil Description and USCS Symbol		Piezometer Constuction Data
0 – 3.5 (Elev. 18.00, 16.00)		CLAY AND SAND: Medium stiff, orange-tan, silty f-m sandy, moist	CL	Grout
3.5 – 7 (Elev. 14.00, 12.00)		SAND: Loose, orange-tan, fine to medium, trace of silt, slightly damp	SW	Bentonite Seal
7 – 11 (Elev. 10.00, 8.00)		SAND: Loose, tan-yellow, clean, fine to coarse	SW	0.010" Slotted Screen
11 – 12		SILT: Medium stiff, green, clayey		

Depth scale: 0, 2, 4, 6, 8, 10, 12

Elevation scale: 18.00, 16.00, 14.00, 12.00, 10.00, 8.00

David Garrett, P.G., P.E.
Engineering and Geology

Test Boring No. B-18

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Collar Elevation	**16.4**
Equipment	**CME 75**	Drilling Method	**4-1/4" Hollow Auger**	Water Level, TOB	**3.5**
Date Started	**02/02/01**	Date Ended	**02/02/01**	Water Level, 24 Hr.	**NA**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**3.6**
Comments	**Plowed field, cool cloudy weather**	Total Depth	**8.0**	Date of Observation	**02/06/01**

All depths are given in feet and referenced b.g.s.

Depth and Elev.	SPT Value and Plot	Soil Description and USCS Symbol		Piezometer Constuction Data
0 – 3.5 (16.00, 14.00)		SAND: Loose, tan-buff, silty f-m, very clayey, moist	SC	Grout; Bentonite Seal
3.5 – 8 (12.00, 10.00)		SAND: Loose, wet, clean, fine to medium	SW	0.010" Slotted Screen

Depth scale: 0, 2, 4, 6, 8. Elevation scale: 16.00, 14.00, 12.00, 10.00.

David Garrett, P.G., P.E.

Engineering and Geology

Test Boring No. B-19

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Collar Elevation	**16.6**
Equipment	**CME 75**	Drilling Method	**4-1/4" Hollow Auger**	Water Level, TOB	**3.8**
Date Started	**02/02/01**	Date Ended	**02/02/01**	Water Level, 24 Hr.	**NA**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**3.7**
Comments	**Plowed field, cool cloudy weather**	Total Depth	**10.0**	Date of Observation	**02/06/01**

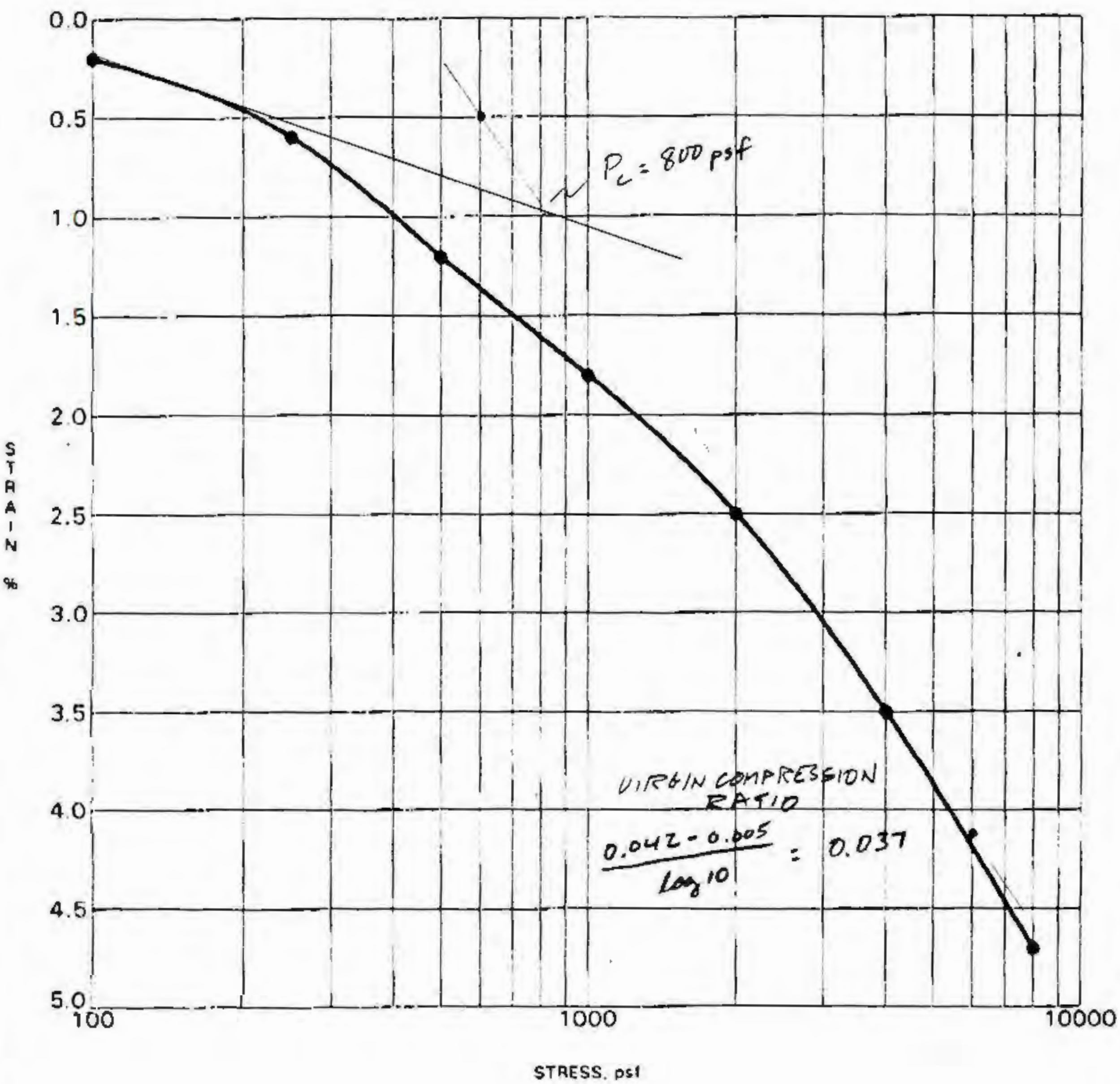
All depths are given in feet and referenced b.g.s.

Depth and Elev.	SPT Value and Plot	Soil Description and USCS Symbol		Piezometer Constuction Data
0 – 5.0 (Elev. 16.00, 14.00, 12.00)		SAND: Loose, tan-buff, silty f-m sand, moist, trace of clay	SM	Grout; Bentonite Seal
5.0 – 9.0 (Elev. 10.00, 8.00)		SAND: Loose, buff, wet, fine to medium, trace of silt	SW	0.010" Slotted Screen
9.0 – 10		SILTY SAND: Loose, green, slightly clayey		

Depth scale: 0, 2, 4, 6, 8, 10

Elevation scale: 16.00, 14.00, 12.00, 10.00, 8.00

APPENDIX D
Geotechnical Data



Specimen Identification	Classification	DD	MC%
●	[redacted]	101	14

PROJECT Pitt County Landfill - Greenville, North Carolina

JOB NO. 1-00-1100-CA
DATE 12/14/00

CONSOLIDATION TEST

GeoTechnologies, Inc. P.A.
Greenville, North Carolina

GeoTechnologies, Inc.

CONSOLIDATION TEST

Job Name: Pitt County Landfill- EJE Recycling Date. 11/21/00

Job Number: 1-00-1100-CA

Sample I.D. B-2 Depth: 18 - 20ft

Soil Description. [redacted]

Notes Saturate \ Undisturbed Sample

RING PROPERTIES		
Diameter	2.5	inches
Height	1	inches
Volume	0.00284	cu.ft.
Weight	110.41	grams
Ring + Soil	258.94	grams

SOIL PROPERTIES		
Init. Moisture	13.9	%
Soil Weight.	148.5	grams
Wet Density	115.3	lbs./cu ft.
Dry Density	101.2	lbs./cu ft.
Specific Gravity	2.75	Apparent
Final Moisture	17.6	%

Initial Reading	0000
Preload Rebound Reading	

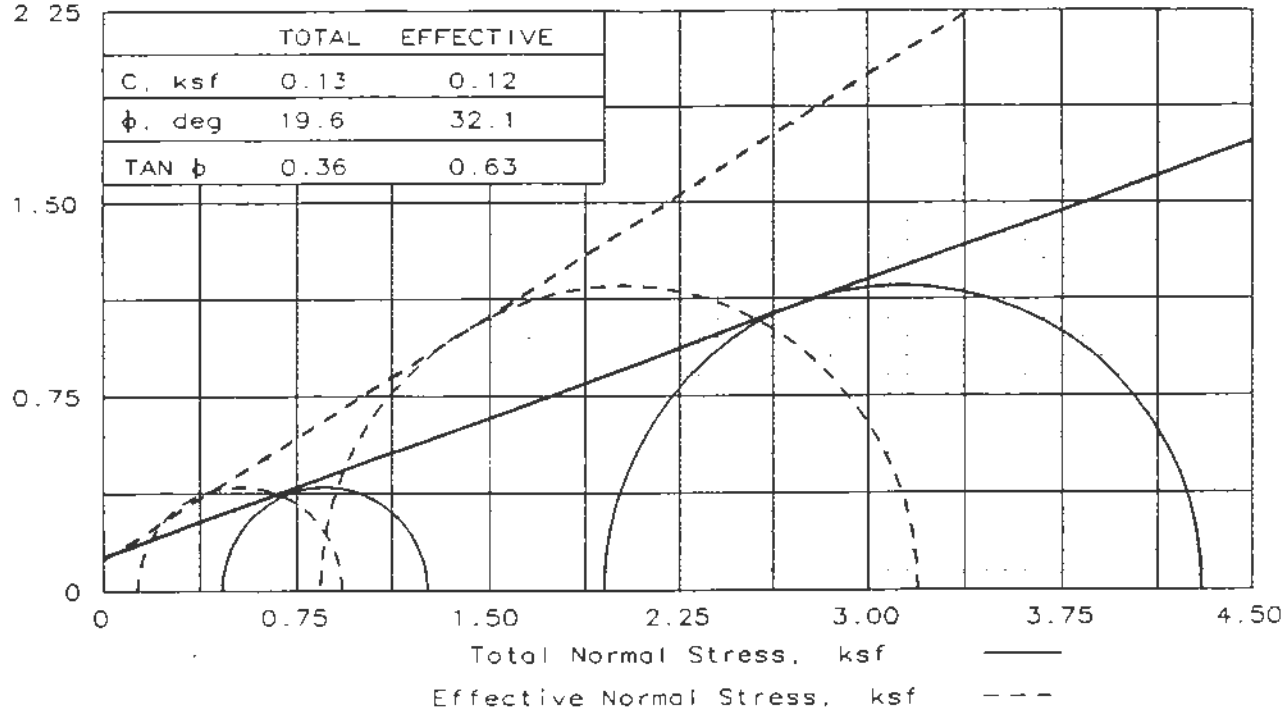
LOAD / psf	R0	R5	R100	T50	R50
100	0000	0017	0024		
250	.0024	0050	.0057		
500	.0057	0113	0120	0.3	0.0115
1000	.0120	0168	.0183	0.5	0.0174
2000	0183	.0240	.0254	0 3	0.0245
4000	.0245	0330	.0347	0 4	0.0336
8000	0347	.0450	.0468	0 25	0.0458

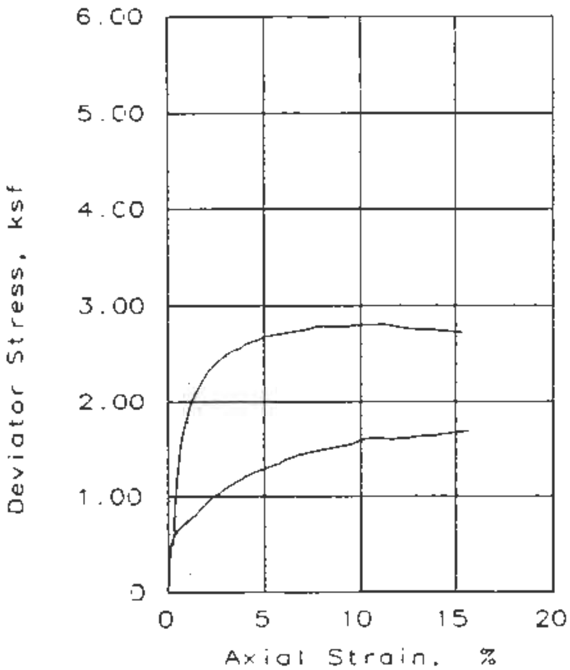
LOAD / psf	%E	Con. Coef.	%IC
100	0 2		70.8
250	0.6		78.8
500	1.2	1.604	88.9
1000	1 8	0.951	76.2
2000	2 5	1.562	80 3
4000	3.5	1.150	83.3
8000	4.7	1.794	85 1

NOTE. Consolidation Coefficient in Square Feet Per Day

Initial Void Ratio	0 698
Final Void Ratio	0.617
Initial Saturation, %	54 9
Final Saturation, %	100 0

72.3 %,theoretical





SAMPLE NO.		1	2
INITIAL	WATER CONTENT, %	21.9	31.5
	DRY DENSITY, pcf	95.2	87.9
	SATURATION, %	78.6	94.6
	VOID RATIO	0.738	0.883
	DIAMETER, in	2.89	2.89
	HEIGHT, in	5.94	6.00
AT TEST	WATER CONTENT, %	27.0	29.7
	DRY DENSITY, pcf	96.6	92.8
	SATURATION, %	100.5	100.4
	VOID RATIO	0.713	0.783
	DIAMETER, in	2.87	2.84
	HEIGHT, in	5.91	5.89
Strain rate, in/min		0.004	0.004
BACK PRESSURE, ksf		10.05	10.08
CELL PRESSURE, ksf		10.51	12.02
FAILURE STRESS, ksf		0.80	2.35
PORE PRESSURE, ksf		10.38	11.19
ULTIMATE STRESS, ksf		0.80	2.35
PORE PRESSURE, ksf		10.38	11.19
$\bar{\sigma}_1$ FAILURE, ksf		0.93	3.19
$\bar{\sigma}_3$ FAILURE, ksf		0.13	0.84

TYPE OF TEST:
CU with pore pressures
SAMPLE TYPE: Undisturbed
DESCRIPTION: Gray Silty Clayey Fine SAND (SC-CL)
LL= 42 PL= 16 PI= 26
SPECIFIC GRAVITY= 2.65
REMARKS:

FIG. NO. 1

CLIENT: David Garrett, P.E.

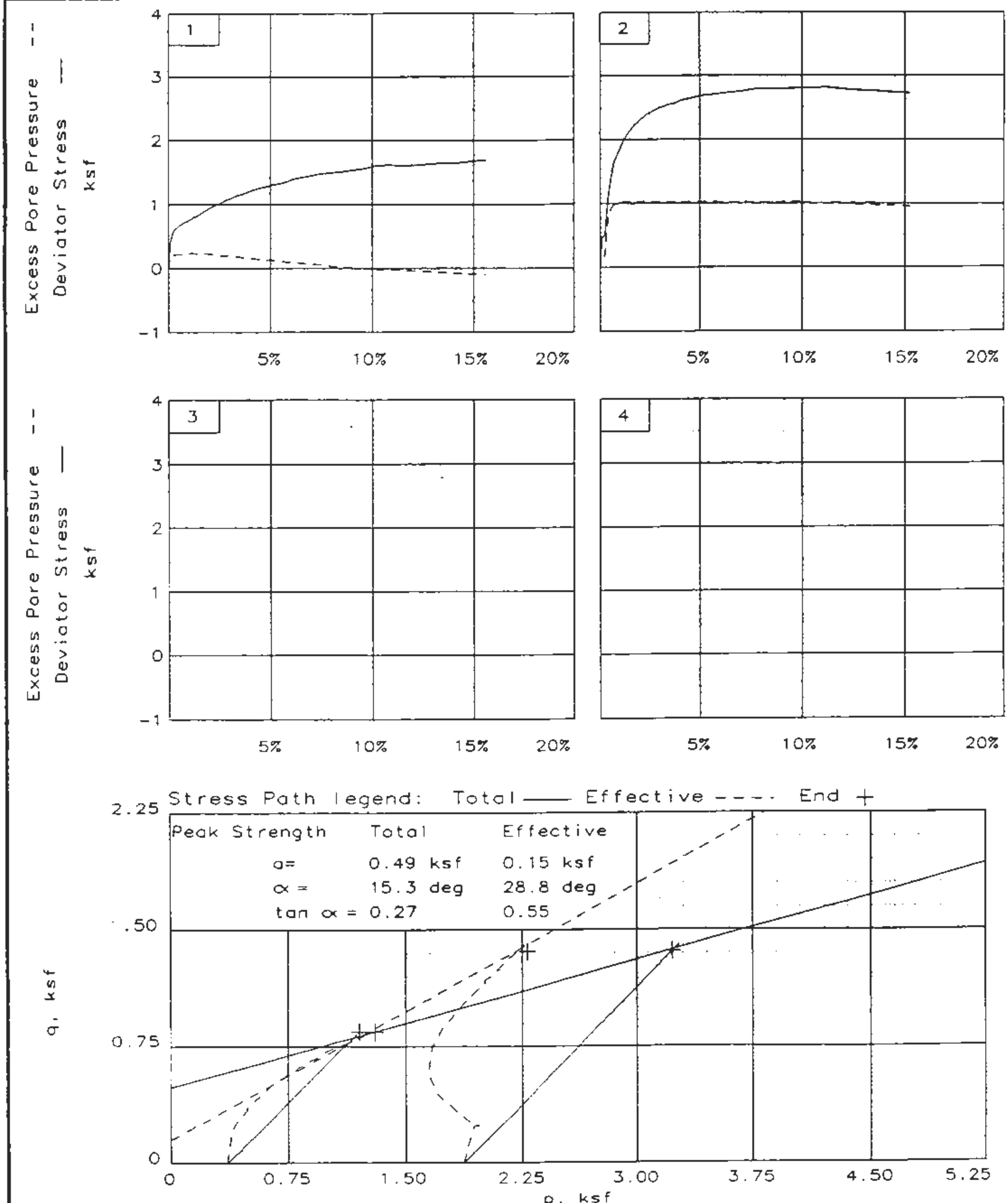
PROJECT: Pitt County Landfill

SAMPLE LOCATION: B-2 U1 18' - 20'

PROJ. NO.: 1-00-1100EA DATE: 12-5-00

TRIAXIAL SHEAR TEST REPORT

GEOTECHNOLOGIES, INC., P.A.



Client: David Garrett, P.E.

Project: Pitt County Landfill

Location: B-2 U1 18' - 20'

File: PIT1820 Project No.: 1-00-1100EA Page 2/2 Fig. No. 1

TRIAXIAL COMPRESSION TEST — 12-06-1900
CU with pore pressures — 9:36 am

Project Data

Project No.: 1-00-1100EA   Date: 12-5-00   Data file: PIT1820
Client: David Garrett, P.E.
Project: Pitt County Landfill
Sample location: B-2 U1   18' - 20'
Sample description: Gray Silty Clayey Fine SAND (SC-CL)
Remarks:
Fig No. 1

Sample No. 1 Data

Type of sample: Undisturbed
Specific Gravity= 2.65   LL= 42   PL= 16   PI= 26

Sample Parameters	Before Test	At Testing	After Test
Diameter, in	2.89	2.87	
Height change, in		0.03	
Height, in	5.94	5.91	
Weight, grams	1183.6		
Moisture, %	21.9	27.0	27.0
Wet density, pcf	116.0	122.7	
Dry density, pcf	95.2	96.6	
Saturation, %	78.6	100.5	
Void ratio	0.738	0.713	

Test Data

Deformation dial constant= 0.001 in per input unit
Primary load ring constant= 0.4545 lbs. per input unit
Secondary load ring constant= 0 lbs. per input unit
Crossover reading for secondary load ring= 0 input units
Strain rate, in/min = 0.004
Consolidation cell pressure = 73 psi = 10.512 ksf
Consolidation back pressure = 69.8 psi = 10.0512 ksf
Consolidation effective confining stress = 0.4608 ksf
Peak deviator stress = 1.69 ksf at reading no. 53
Ult. deviator stress = 0.80 ksf at reading no. 15

No.	Def. Dial Units	Def. in	Load Dial Units	Load lbs.	Strain %	Deviator Stress ksf	Effective Stresses Minor ksf	Major ksf	1:3 Ratio	Pore Pres. psi	P ksf	Q ksf
0	0.0	0.000	0.0	0.0	0.0	0.00	0.36	0.36	1.00	70.5	0.36	0.00
1	5.0	0.005	40.0	18.2	0.1	0.40	0.19	0.59	3.15	71.7	0.39	0.20
2	10.0	0.010	51.0	23.2	0.2	0.51	0.16	0.67	4.24	71.9	0.42	0.26
3	15.0	0.015	57.0	25.9	0.3	0.57	0.14	0.72	4.99	72.0	0.43	0.29
4	20.0	0.020	61.0	27.7	0.3	0.61	0.14	0.76	5.26	72.0	0.45	0.31
5	25.0	0.025	63.0	28.6	0.4	0.63	0.14	0.78	5.40	72.0	0.46	0.32
	30.0	0.030	66.0	30.0	0.5	0.66	0.14	0.81	5.60	72.0	0.48	0.33

No.	Def. Dial Units	Def. in	Load Dial Units	Load lbs.	Strain %	Deviator Stress ksf	Effective Stresses Minor ksf	Effective Stresses Major ksf	1:3 Ratio	Pore Pres. psi	P ksf	Q ksf
	35.0	0.035	67.0	30.5	0.6	0.67	0.14	0.82	5.67	72.0	0.48	0.34
	40.0	0.040	69.0	31.4	0.7	0.69	0.14	0.84	5.80	72.0	0.49	0.35
9	45.0	0.045	71.0	32.3	0.8	0.71	0.13	0.84	6.49	72.1	0.49	0.36
10	50.0	0.050	72.0	32.7	0.8	0.72	0.13	0.85	6.56	72.1	0.49	0.36
11	55.0	0.055	74.0	33.6	0.9	0.74	0.13	0.87	6.71	72.1	0.50	0.37
12	60.0	0.060	76.0	34.5	1.0	0.76	0.13	0.89	6.86	72.1	0.51	0.38
13	65.0	0.065	77.0	35.0	1.1	0.77	0.13	0.90	6.93	72.1	0.51	0.38
14	70.0	0.070	79.0	35.9	1.2	0.79	0.13	0.92	7.08	72.1	0.52	0.39
15	75.0	0.075	80.0	36.4	1.3	0.80	0.13	0.93	7.15	72.1	0.53	0.40
16	80.0	0.080	81.0	36.8	1.4	0.81	0.13	0.94	7.22	72.1	0.53	0.40
17	85.0	0.085	83.0	37.7	1.4	0.83	0.13	0.96	7.37	72.1	0.54	0.41
18	90.0	0.090	85.0	38.6	1.5	0.84	0.14	0.99	6.87	72.0	0.57	0.42
19	95.0	0.095	87.0	39.5	1.6	0.86	0.13	0.99	7.67	72.1	0.56	0.43
20	100.0	0.100	89.0	40.5	1.7	0.88	0.13	1.01	7.81	72.1	0.57	0.44
21	110.0	0.110	92.0	41.8	1.9	0.91	0.13	1.04	8.03	72.1	0.59	0.46
22	120.0	0.120	96.0	43.6	2.0	0.95	0.14	1.09	7.59	72.0	0.62	0.47
23	130.0	0.130	99.0	45.0	2.2	0.98	0.14	1.12	7.79	72.0	0.63	0.49
24	140.0	0.140	102.0	46.4	2.4	1.01	0.14	1.15	7.98	72.0	0.65	0.50
25	150.0	0.150	104.0	47.3	2.5	1.02	0.16	1.18	7.46	71.9	0.67	0.51
26	160.0	0.160	107.0	48.6	2.7	1.05	0.16	1.21	7.63	71.9	0.68	0.53
27	170.0	0.170	110.0	50.0	2.9	1.08	0.16	1.24	7.81	71.9	0.70	0.54
28	180.0	0.180	112.0	50.9	3.0	1.10	0.17	1.27	7.34	71.8	0.72	0.55
29	190.0	0.190	115.0	52.3	3.2	1.12	0.17	1.30	7.50	71.8	0.73	0.56
30	200.0	0.200	117.0	53.2	3.4	1.14	0.17	1.31	7.60	71.8	0.74	0.57
31	220.0	0.220	121.0	55.0	3.7	1.18	0.20	1.38	6.83	71.6	0.79	0.59
[illegible]	240.0	0.240	126.0	57.3	4.1	1.22	0.20	1.42	7.05	71.6	0.81	0.61
	260.0	0.260	130.0	59.1	4.4	1.25	0.22	1.47	6.81	71.5	0.84	0.63
[illegible]	280.0	0.280	133.0	60.4	4.7	1.28	0.23	1.51	6.55	71.4	0.87	0.64
35	300.0	0.300	136.0	61.8	5.1	1.30	0.23	1.53	6.66	71.4	0.88	0.65
36	320.0	0.320	139.0	63.2	5.4	1.33	0.24	1.57	6.42	71.3	0.91	0.66
37	340.0	0.340	142.0	64.5	5.8	1.35	0.26	1.61	6.21	71.2	0.93	0.68
38	360.0	0.360	147.0	66.8	6.1	1.39	0.26	1.65	6.38	71.2	0.96	0.70
39	380.0	0.380	150.0	68.2	6.4	1.42	0.27	1.69	6.18	71.1	0.98	0.71
40	400.0	0.400	153.0	69.5	6.8	1.44	0.29	1.73	6.00	71.0	1.01	0.72
41	440.0	0.440	158.0	71.8	7.4	1.48	0.30	1.78	5.88	70.9	1.04	0.74
42	480.0	0.480	162.0	73.6	8.1	1.50	0.33	1.83	5.54	70.7	1.08	0.75
43	520.0	0.520	166.0	75.4	8.8	1.53	0.35	1.87	5.42	70.6	1.11	0.76
44	560.0	0.560	170.0	77.3	9.5	1.55	0.36	1.91	5.31	70.5	1.14	0.78
45	600.0	0.600	177.0	80.4	10.2	1.61	0.37	1.98	5.29	70.4	1.18	0.80
46	640.0	0.640	180.0	81.8	10.8	1.62	0.39	2.01	5.17	70.3	1.20	0.81
47	680.0	0.680	180.0	81.8	11.5	1.61	0.39	2.00	5.13	70.3	1.19	0.80
48	720.0	0.720	182.0	82.7	12.2	1.61	0.40	2.02	5.00	70.2	1.21	0.81
49	780.0	0.780	187.0	85.0	13.2	1.64	0.42	2.06	4.92	70.1	1.24	0.82
50	820.0	0.820	189.0	85.9	13.9	1.64	0.43	2.07	4.80	70.0	1.25	0.82
51	860.0	0.860	193.0	87.7	14.6	1.66	0.45	2.11	4.73	69.9	1.28	0.83
52	900.0	0.900	197.0	89.5	15.2	1.69	0.45	2.13	4.78	69.9	1.29	0.84
53	920.0	0.920	198.0	90.0	15.6	1.69	0.46	2.15	4.66	69.8	1.30	0.84

TRIAXIAL COMPRESSION TEST
CU with pore pressures

12-06-1900
9:36 am

Project Data

Project No.: 1-00-1100EA   Date: 12-5-00   Data file: PIT1820
Client: David Garrett, P.E.
Project: Pitt County Landfill
Sample location: B-2 U1   18' - 20'
Sample description: Gray Silty Clayey Fine SAND (SC-CL)
Remarks:
Fig No. 1

Sample No. 2 Data

Type of sample: Undisturbed
Specific Gravity= 2.65   LL= 42   PL= 16   PI= 26

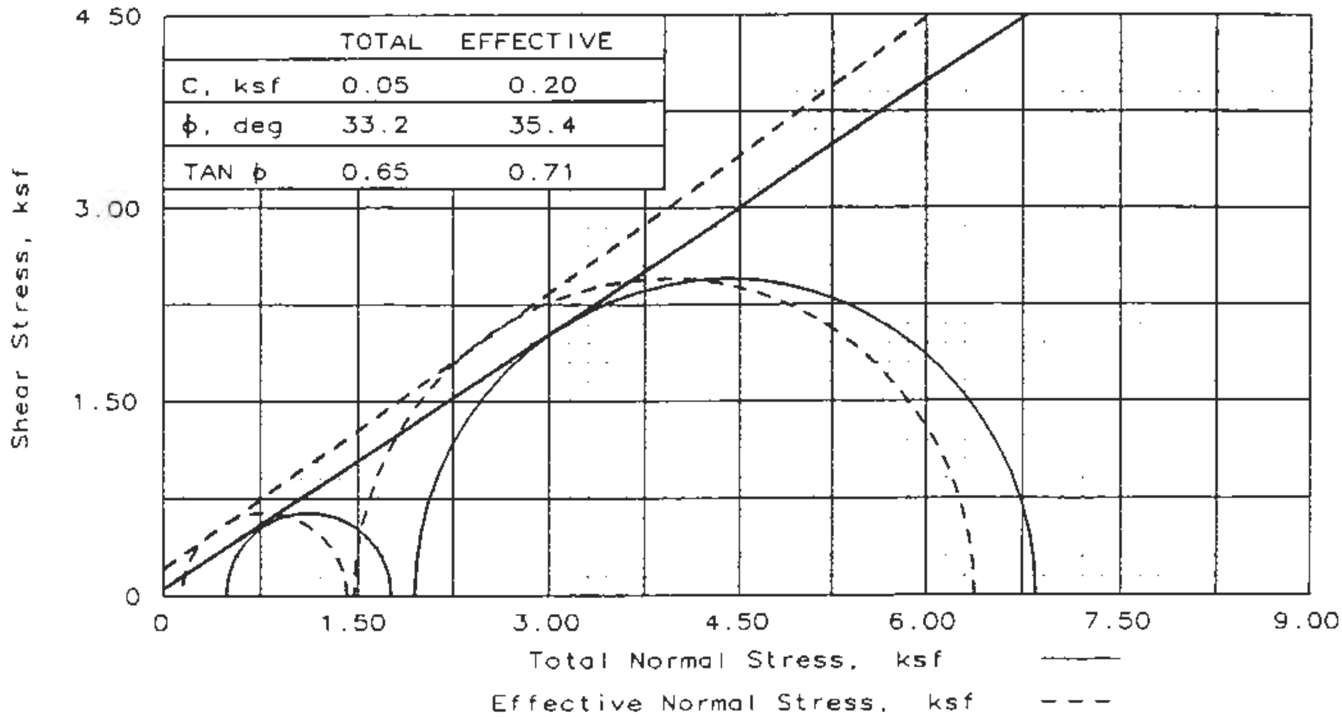
Sample Parameters	Before Test	At Testing	After Test
Diameter, in	2.89	2.84	
Height change, in		0.11	
Height, in	6.00	5.89	
Weight, grams	1192.0		
Moisture, %	31.5	29.7	29.7
Wet density, pcf	115.5	120.3	
Dry density, pcf	87.9	92.8	
Saturation, %	94.6	100.4	
Void ratio	0.883	0.783	

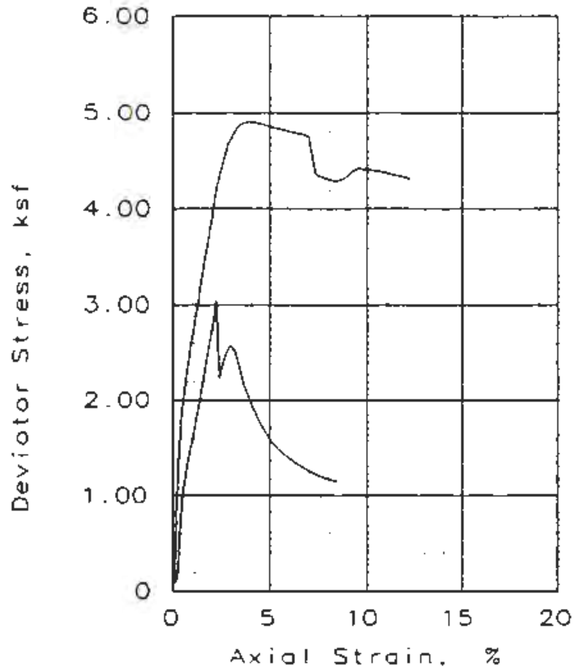
Test Data

Deformation dial constant= 0.001 in per input unit
Primary load ring constant= 0.4545 lbs. per input unit
Secondary load ring constant= 0 lbs. per input unit
Crossover reading for secondary load ring= 0 input units
Strain rate, in/min = 0.004
Consolidation cell pressure = 83.5 psi = 12.024 ksf
Consolidation back pressure = 70 psi = 10.08 ksf
Consolidation effective confining stress = 1.944 ksf
Peak deviator stress = 2.81 ksf at reading no. 44
Ult. deviator stress = 2.35 ksf at reading no. 23

No.	Def. Dial Units	Def. in	Load Dial Units	Load lbs.	Strain %	Deviator Stress ksf	Effective Stresses Minor ksf	Effective Stresses Major ksf	1:3 Ratio	Pore Pres. psi	P ksf	Q ksf
0	0.0	0.000	0.0	0.0	0.0	0.00	1.87	1.87	1.00	70.5	1.87	0.00
1	5.0	0.005	46.0	20.9	0.1	0.48	1.70	2.18	1.28	71.7	1.94	0.24
2	10.0	0.010	47.0	21.4	0.2	0.49	1.73	2.21	1.28	71.5	1.97	0.24
3	15.0	0.015	49.0	22.3	0.3	0.51	1.67	2.18	1.30	71.9	1.92	0.25
4	20.0	0.020	86.0	39.1	0.3	0.89	1.25	2.14	1.71	74.8	1.70	0.44
5	25.0	0.025	112.0	50.9	0.4	1.16	1.07	2.22	2.08	76.1	1.64	0.58
	30.0	0.030	131.0	59.5	0.5	1.35	0.98	2.33	2.38	76.7	1.65	0.68

No.	Def. Dial Units	Def. in	Load Dial Units	Load lbs.	Strain %	Deviator Stress ksf	Effective Stresses Minor ksf	Major ksf	1:3 Ratio	Pore Pres. psi	P ksf	Q ksf
	35.0	0.035	145.0	65.9	0.6	1.49	0.92	2.42	2.62	77.1	1.67	0.75
	40.0	0.040	157.0	71.4	0.7	1.62	0.89	2.51	2.81	77.3	1.70	0.81
9	45.0	0.045	164.0	74.5	0.8	1.69	0.88	2.57	2.92	77.4	1.72	0.84
10	50.0	0.050	171.0	77.7	0.8	1.76	0.86	2.62	3.03	77.5	1.74	0.88
11	55.0	0.055	176.0	80.0	0.9	1.81	0.86	2.67	3.09	77.5	1.77	0.90
12	60.0	0.060	183.0	83.2	1.0	1.88	0.86	2.74	3.17	77.5	1.80	0.94
13	65.0	0.065	189.0	85.9	1.1	1.94	0.85	2.79	3.28	77.6	1.82	0.97
14	70.0	0.070	194.0	88.2	1.2	1.99	0.85	2.84	3.34	77.6	1.84	0.99
15	75.0	0.075	198.5	90.2	1.3	2.03	0.85	2.88	3.39	77.6	1.87	1.02
16	80.0	0.080	203.0	92.3	1.4	2.08	0.85	2.92	3.44	77.6	1.89	1.04
17	85.0	0.085	207.0	94.1	1.4	2.11	0.85	2.96	3.49	77.6	1.91	1.06
18	90.0	0.090	210.0	95.4	1.5	2.14	0.85	2.99	3.52	77.6	1.92	1.07
19	95.0	0.095	213.0	96.8	1.6	2.17	0.85	3.02	3.56	77.6	1.94	1.09
20	100.0	0.100	217.0	98.6	1.7	2.21	0.85	3.06	3.60	77.6	1.96	1.11
21	110.0	0.110	222.0	100.9	1.9	2.26	0.85	3.11	3.66	77.6	1.98	1.13
22	120.0	0.120	228.0	103.6	2.0	2.31	0.85	3.16	3.72	77.6	2.01	1.16
23	130.0	0.130	232.0	105.4	2.2	2.35	0.84	3.19	3.82	77.7	2.01	1.18
24	140.0	0.140	237.0	107.7	2.4	2.40	0.85	3.25	3.82	77.6	2.05	1.20
25	150.0	0.150	240.0	109.1	2.5	2.42	0.85	3.27	3.85	77.6	2.06	1.21
26	160.0	0.160	243.0	110.4	2.7	2.45	0.85	3.30	3.88	77.6	2.07	1.23
27	170.0	0.170	246.0	111.8	2.9	2.48	0.85	3.33	3.91	77.6	2.09	1.24
28	180.0	0.180	249.0	113.2	3.1	2.50	0.85	3.35	3.94	77.6	2.10	1.25
29	190.0	0.190	251.0	114.1	3.2	2.52	0.85	3.37	3.96	77.6	2.11	1.26
30	200.0	0.200	254.0	115.4	3.4	2.54	0.85	3.39	3.99	77.6	2.12	1.27
31	220.0	0.220	256.0	116.4	3.7	2.55	0.85	3.40	4.01	77.6	2.13	1.28
	240.0	0.240	262.0	119.1	4.1	2.60	0.85	3.45	4.07	77.6	2.15	1.30
	260.0	0.260	266.0	120.9	4.4	2.64	0.85	3.48	4.10	77.6	2.17	1.32
34	280.0	0.280	269.0	122.3	4.8	2.66	0.85	3.51	4.13	77.6	2.18	1.33
35	300.0	0.300	273.0	124.1	5.1	2.69	0.85	3.53	4.16	77.6	2.19	1.34
36	340.0	0.340	277.0	125.9	5.8	2.71	0.85	3.55	4.18	77.6	2.20	1.35
37	380.0	0.380	282.0	128.2	6.4	2.73	0.86	3.60	4.16	77.5	2.23	1.37
38	420.0	0.420	286.0	130.0	7.1	2.75	0.85	3.60	4.24	77.6	2.23	1.38
39	460.0	0.460	292.0	132.7	7.8	2.79	0.86	3.65	4.23	77.5	2.26	1.40
40	500.0	0.500	294.0	133.6	8.5	2.79	0.86	3.65	4.23	77.5	2.26	1.39
41	540.0	0.540	296.0	134.5	9.2	2.79	0.85	3.64	4.28	77.6	2.24	1.39
42	580.0	0.580	300.0	136.4	9.8	2.80	0.85	3.65	4.30	77.6	2.25	1.40
43	620.0	0.620	302.0	137.3	10.5	2.80	0.88	3.68	4.19	77.4	2.28	1.40
44	660.0	0.660	305.0	138.6	11.2	2.81	0.88	3.69	4.20	77.4	2.28	1.40
45	700.0	0.700	305.0	138.6	11.9	2.79	0.88	3.66	4.17	77.4	2.27	1.39
46	740.0	0.740	305.0	138.6	12.6	2.76	0.89	3.66	4.10	77.3	2.27	1.38
47	780.0	0.780	307.0	139.5	13.2	2.76	0.89	3.65	4.09	77.3	2.27	1.38
48	820.0	0.820	308.0	140.0	13.9	2.75	0.91	3.66	4.03	77.2	2.28	1.37
49	860.0	0.860	309.0	140.4	14.6	2.74	0.91	3.64	4.01	77.2	2.27	1.37
50	900.0	0.900	310.0	140.9	15.3	2.72	0.92	3.64	3.95	77.1	2.28	1.36





SAMPLE NO.		1	2
INITIAL	WATER CONTENT, %	28.6	31.4
	DRY DENSITY, pcf	91.0	87.4
	SATURATION, %	92.6	93.2
	VOID RATIO	0.818	0.893
	DIAMETER, in	2.89	2.89
	HEIGHT, in	6.01	5.94
AT TEST	WATER CONTENT, %	29.1	26.1
	DRY DENSITY, pcf	93.4	97.8
	SATURATION, %	100.0	100.2
	VOID RATIO	0.772	0.691
	DIAMETER, in	2.86	2.78
	HEIGHT, in	5.96	5.72
Strain rate, in/min		0.004	0.004
BACK PRESSURE, ksf		10.12	10.07
CELL PRESSURE, ksf		10.61	12.01
FAILURE STRESS, ksf		1.27	4.90
PORE PRESSURE, ksf		10.47	10.54
ULTIMATE STRESS, ksf		1.27	3.54
PORE PRESSURE, ksf		10.47	10.54
$\bar{\sigma}_1$ FAILURE, ksf		1.42	6.37
$\bar{\sigma}_3$ FAILURE, ksf		0.14	1.47

TYPE OF TEST:
CU with pore pressures

SAMPLE TYPE: Undisturbed

DESCRIPTION: Gray Fine Sandy Silty CLAY (CL)

LL= 38 PL= 16 PI= 22

SPECIFIC GRAVITY= 2.65

REMARKS:

FIG. NO. 1

CLIENT: David Garrett, P.E.

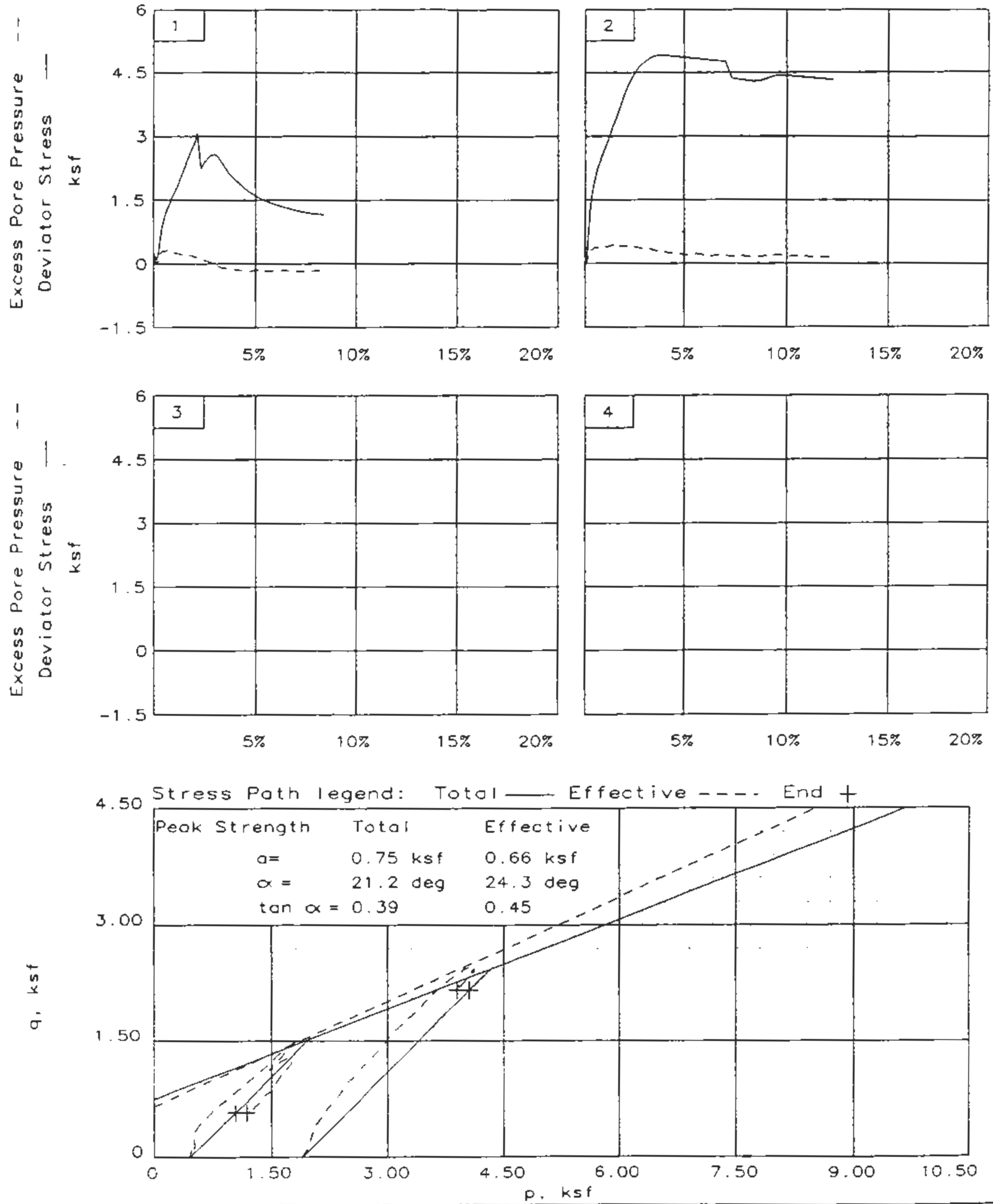
PROJECT: Pitt County Landfill

SAMPLE LOCATION: B-2 U-1 24' - 26'

PROJ. NO.: 1-00-1100EA DATE: 12-5-00

TRIAXIAL SHEAR TEST REPORT

GEOTECHNOLOGIES, INC., P.A.



Client: David Garrett, P.E.

Project: Pitt County Landfill

Location: B-2 U-1 24' - 26'

File: PITT2426 Project No.: 1-00-1100EA Page 2/2 Fig. No. 1

TRIAXIAL COMPRESSION TEST 12-06-1900
CU with pore pressures 8:25 am

Project Data

Project No.: 1-00-1100EA Date: 12-5-00 Data file: PITT2426
Client: David Garrett, P.E.
Project: Pitt County Landfill
Sample location: B-2 U-1 24' - 26'
Sample description: Gray Fine Sandy Silty CLAY (CL)
Remarks:
Fig No. 1

Sample No. 1 Data

Type of sample: Undisturbed
Specific Gravity= 2.65 LL= 38 PL= 16 PI= 22

Sample Parameters	Before Test	At Testing	After Test
Diameter, in	2.89	2.86	
Height change, in		0.05	
Height, in	6.01	5.96	
Weight, grams	1208.2		
Moisture, %	28.6	29.1	29.1
Wet density, pcf	117.0	120.6	
Dry density, pcf	91.0	93.4	
Saturation, %	92.6	100.0	
Void ratio	0.818	0.772	

Test Data

Deformation dial constant= 0.001 in per input unit
Primary load ring constant= 0.4545 lbs. per input unit
Secondary load ring constant= 0 lbs. per input unit
Crossover reading for secondary load ring= 0 input units
Strain rate, in/min = 0.004
Consolidation cell pressure = 73.7 psi = 10.6128 ksf
Consolidation back pressure = 70.3 psi = 10.1232 ksf
Consolidation effective confining stress = 0.4896 ksf
Peak deviator stress = 1.27 ksf at reading no. 8
Ult. deviator stress = 1.27 ksf at reading no. 8

No.	Def. Dial Units	Def. in	Load Dial Units	Load lbs.	Strain %	Deviator Stress ksf	Effective Stresses Minor ksf	Effective Stresses Major ksf	1:3 Ratio	Pore Pres. psi	P ksf	Q ksf
0	0.0	0.000	0.0	0.0	0.0	0.00	0.46	0.46	1.00	70.5	0.46	0.00
1	5.0	0.005	19.0	8.6	0.1	0.19	0.39	0.58	1.50	71.0	0.49	0.10
2	10.0	0.010	10.0	4.5	0.2	0.10	0.42	0.52	1.24	70.8	0.47	0.05
3	15.0	0.015	24.0	10.9	0.3	0.24	0.40	0.65	1.60	70.9	0.52	0.12
4	20.0	0.020	59.0	26.8	0.3	0.60	0.22	0.81	3.77	72.2	0.52	0.30
-	25.0	0.025	86.0	39.1	0.4	0.87	0.16	1.03	6.50	72.6	0.59	0.44
	30.0	0.030	102.0	46.4	0.5	1.03	0.16	1.19	7.52	72.6	0.67	0.52

No.	Def. Dial Units	Def. in	Load Dial Units	Load lbs.	Strain %	Deviator Stress ksf	Effective Stresses Minor ksf	Major ksf	1:3 Ratio	Pore Pres. psi	P ksf	Q ksf
	35.0	0.035	115.0	52.3	0.6	1.16	0.16	1.32	8.34	72.6	0.74	0.58
	40.0	0.040	126.0	57.3	0.7	1.27	0.14	1.42	9.84	72.7	0.78	0.64
9	45.0	0.045	136.0	61.8	0.8	1.37	0.16	1.53	9.67	72.6	0.85	0.69
10	50.0	0.050	145.0	65.9	0.8	1.46	0.17	1.64	9.47	72.5	0.90	0.73
11	55.0	0.055	153.0	69.5	0.9	1.54	0.19	1.73	9.24	72.4	0.96	0.77
12	60.0	0.060	161.0	73.2	1.0	1.62	0.19	1.81	9.66	72.4	1.00	0.81
13	65.0	0.065	170.0	77.3	1.1	1.71	0.20	1.91	9.49	72.3	1.06	0.86
14	70.0	0.070	179.0	81.4	1.2	1.80	0.22	2.02	9.33	72.2	1.12	0.90
15	75.0	0.075	190.0	86.4	1.3	1.91	0.22	2.12	9.84	72.2	1.17	0.95
16	80.0	0.080	199.0	90.4	1.3	2.00	0.23	2.23	9.67	72.1	1.23	1.00
17	85.0	0.085	210.0	95.4	1.4	2.11	0.24	2.35	9.60	72.0	1.30	1.05
18	90.0	0.090	219.0	99.5	1.5	2.19	0.24	2.44	9.96	72.0	1.34	1.10
19	95.0	0.095	231.0	105.0	1.6	2.31	0.26	2.57	9.92	71.9	1.42	1.16
20	100.0	0.100	242.0	110.0	1.7	2.42	0.26	2.68	10.34	71.9	1.47	1.21
21	110.0	0.110	264.0	120.0	1.8	2.64	0.26	2.90	11.17	71.9	1.58	1.32
22	120.0	0.120	282.0	128.2	2.0	2.81	0.29	3.10	10.76	71.7	1.69	1.41
23	130.0	0.130	308.0	140.0	2.2	3.07	0.32	3.38	10.68	71.5	1.85	1.53
24	140.0	0.140	226.0	102.7	2.3	2.25	0.35	2.59	7.50	71.3	1.47	1.12
25	150.0	0.150	241.0	109.5	2.5	2.39	0.37	2.76	7.38	71.1	1.57	1.20
26	160.0	0.160	252.0	114.5	2.7	2.50	0.39	2.88	7.42	71.0	1.64	1.25
27	170.0	0.170	260.0	118.2	2.9	2.57	0.43	3.00	6.95	70.7	1.72	1.28
28	180.0	0.180	261.0	118.6	3.0	2.58	0.46	3.04	6.59	70.5	1.75	1.29
29	190.0	0.190	256.0	116.4	3.2	2.52	0.50	3.03	6.00	70.2	1.76	1.26
30	200.0	0.200	244.0	110.9	3.4	2.40	0.55	2.95	5.38	69.9	1.75	1.20
31	220.0	0.220	219.0	99.5	3.7	2.15	0.56	2.71	4.82	69.8	1.63	1.07
[illegible]	240.0	0.240	202.0	91.8	4.0	1.97	0.59	2.56	4.34	69.6	1.58	0.99
	260.0	0.260	187.0	85.0	4.4	1.82	0.62	2.44	3.94	69.4	1.53	0.91
[illegible]	280.0	0.280	175.0	79.5	4.7	1.70	0.63	2.33	3.68	69.3	1.48	0.85
35	300.0	0.300	164.0	74.5	5.0	1.58	0.60	2.19	3.62	69.5	1.40	0.79
36	340.0	0.340	150.0	68.2	5.7	1.44	0.63	2.07	3.27	69.3	1.35	0.72
37	380.0	0.380	140.0	63.6	6.4	1.33	0.62	1.95	3.15	69.4	1.29	0.67
38	420.0	0.420	132.0	60.0	7.0	1.25	0.63	1.88	2.97	69.3	1.26	0.62
39	460.0	0.460	127.0	57.7	7.7	1.19	0.63	1.83	2.88	69.3	1.23	0.60
40	500.0	0.500	124.0	56.4	8.4	1.16	0.60	1.76	2.91	69.5	1.18	0.58

TRIAXIAL COMPRESSION TEST 12-06-1900
CU with pore pressures 8:35 am

Project Data

Project No.: 1-00-1100EA Date: 12-5-00 Data file: PITT2426
Client: David Garrett, P.E.
Project: Pitt County Landfill
Sample location: B-2 U-1 24' - 26'
Sample description: Gray Fine Sandy Silty CLAY (CL)
Remarks:
Fig No. 1

Sample No. 2 Data

Type of sample: Undisturbed
Specific Gravity= 2.65 LL= 38 PL= 16 PI= 22

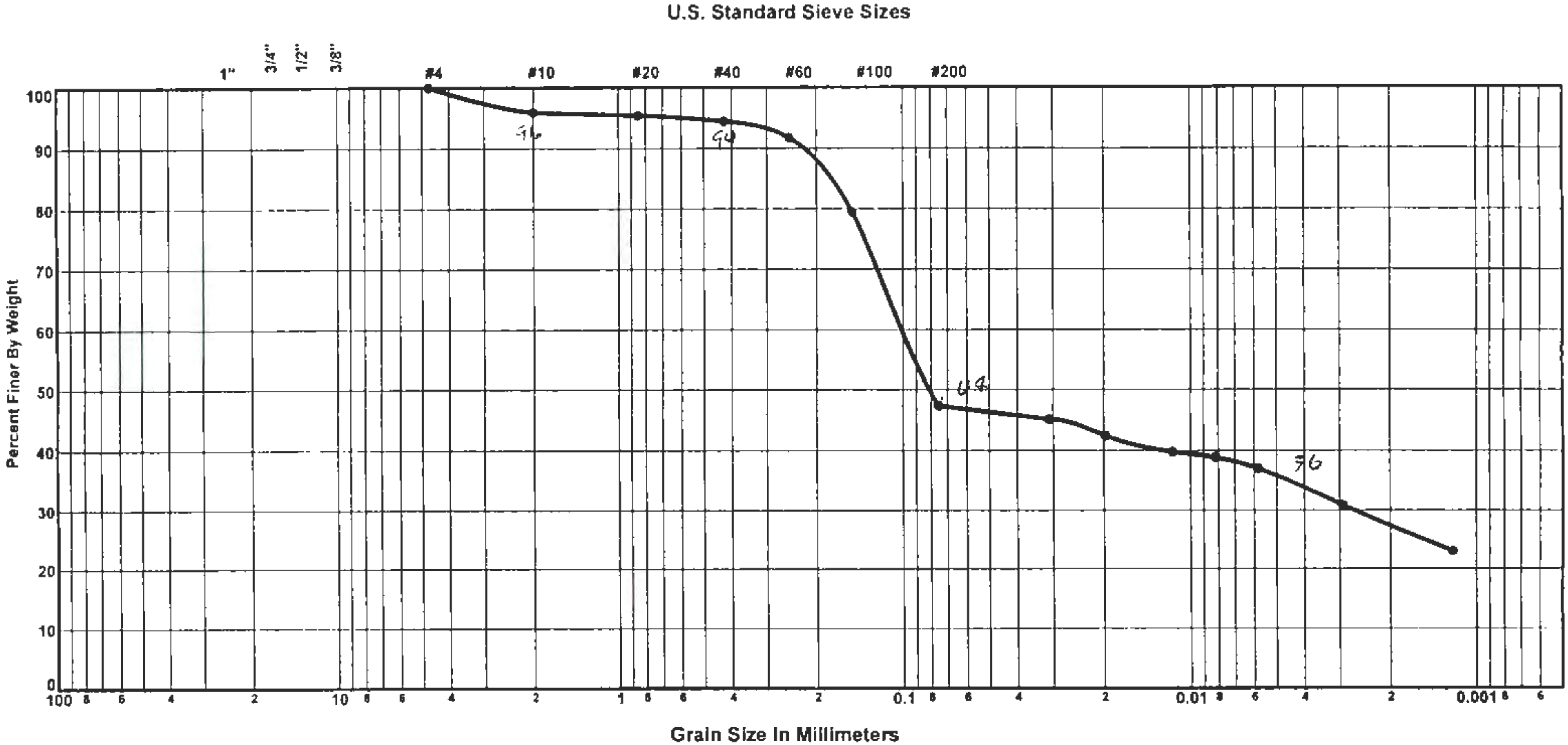
Sample Parameters	Before Test	At Testing	After Test
Diameter, in	2.89	2.78	
Height change, in		0.22	
Height, in	5.94	5.72	
Weight, grams	1171.6		
Moisture, %	31.4	26.1	26.1
Wet density, pcf	114.9	123.4	
Dry density, pcf	87.4	97.8	
Saturation, %	93.2	100.2	
Void ratio	0.893	0.691	

Test Data

Deformation dial constant= 0.001 in per input unit
Primary load ring constant= 0.4545 lbs. per input unit
Secondary load ring constant= 0 lbs. per input unit
Crossover reading for secondary load ring= 0 input units
Strain rate, in/min = 0.004
Consolidation cell pressure = 83.4 psi = 12.0096 ksf
Consolidation back pressure = 69.9 psi = 10.0656 ksf
Consolidation effective confining stress = 1.944 ksf
Peak deviator stress = 4.90 ksf at reading no. 30
Ult. deviator stress = 3.54 ksf at reading no. 18

No.	Def. Dial Units	Def. in	Load Dial Units	Load lbs.	Strain %	Deviator Stress ksf	Effective Stresses Minor ksf	Major ksf	1:3 Ratio	Pore Pres. psi	P ksf	Q ksf
0	0.0	0.000	0.0	0.0	0.0	0.00	1.90	1.90	1.00	70.2	1.90	0.00
1	5.0	0.005	20.0	9.1	0.1	0.22	1.86	2.07	1.12	70.5	1.97	0.11
2	10.0	0.010	70.0	31.8	0.2	0.75	1.67	2.42	1.45	71.8	2.05	0.38
3	15.0	0.015	125.0	56.8	0.3	1.34	1.58	2.93	1.85	72.4	2.26	0.67
4	20.0	0.020	154.0	70.0	0.3	1.65	1.57	3.22	2.05	72.5	2.40	0.83
5	25.0	0.025	173.0	78.6	0.4	1.86	1.53	3.38	2.22	72.8	2.46	0.93
	35.0	0.035	204.0	92.7	0.6	2.19	1.53	3.71	2.43	72.8	2.62	1.09

No.	Def. Dial Units	Def. in	Load Dial Units	Load lbs.	Strain %	Deviator Stress ksf	Effective Stresses Minor ksf	Major ksf	1:3 Ratio	Pore Pres. psi	P ksf	Q ksf
	40.0	0.040	216.0	98.2	0.7	2.31	1.51	3.82	2.53	72.9	2.67	1.16
[illegible]	45.0	0.045	227.0	103.2	0.8	2.43	1.51	3.94	2.61	72.9	2.73	1.21
9	50.0	0.050	239.0	108.6	0.9	2.55	1.51	4.07	2.69	72.9	2.79	1.28
10	55.0	0.055	250.0	113.6	1.0	2.67	1.51	4.18	2.77	72.9	2.85	1.33
11	60.0	0.060	259.0	117.7	1.0	2.76	1.51	4.28	2.83	72.9	2.89	1.38
12	65.0	0.065	269.0	122.3	1.1	2.87	1.50	4.37	2.91	73.0	2.93	1.43
13	70.0	0.070	279.0	126.8	1.2	2.97	1.50	4.47	2.98	73.0	2.98	1.49
14	75.0	0.075	291.0	132.3	1.3	3.10	1.47	4.57	3.11	73.2	3.02	1.55
15	80.0	0.080	303.0	137.7	1.4	3.22	1.47	4.69	3.19	73.2	3.08	1.61
16	85.0	0.085	313.0	142.3	1.5	3.32	1.47	4.79	3.26	73.2	3.13	1.66
17	90.0	0.090	323.0	146.8	1.6	3.43	1.47	4.90	3.33	73.2	3.18	1.71
18	95.0	0.095	334.0	151.8	1.7	3.54	1.47	5.01	3.41	73.2	3.24	1.77
19	100.0	0.100	345.0	156.8	1.7	3.66	1.48	5.14	3.46	73.1	3.31	1.83
20	110.0	0.110	365.0	165.9	1.9	3.86	1.48	5.34	3.60	73.1	3.41	1.93
21	120.0	0.120	386.0	175.4	2.1	4.07	1.48	5.56	3.75	73.1	3.52	2.04
22	130.0	0.130	405.0	184.1	2.3	4.27	1.48	5.75	3.88	73.1	3.62	2.13
23	140.0	0.140	420.0	190.9	2.4	4.42	1.50	5.92	3.95	73.0	3.71	2.21
24	150.0	0.150	433.0	196.8	2.6	4.55	1.51	6.06	4.01	72.9	3.79	2.27
25	160.0	0.160	444.0	201.8	2.8	4.65	1.53	6.18	4.05	72.8	3.85	2.33
26	170.0	0.170	452.0	205.4	3.0	4.73	1.56	6.28	4.04	72.6	3.92	2.36
27	180.0	0.180	459.0	208.6	3.1	4.79	1.57	6.36	4.05	72.5	3.97	2.40
28	190.0	0.190	465.0	211.3	3.3	4.85	1.56	6.40	4.12	72.6	3.98	2.42
29	200.0	0.200	469.0	213.2	3.5	4.88	1.58	6.46	4.08	72.4	4.02	2.44
30	220.0	0.220	473.0	215.0	3.8	4.90	1.61	6.52	4.04	72.2	4.06	2.45
31	240.0	0.240	474.0	215.4	4.2	4.90	1.64	6.54	3.98	72.0	4.09	2.45
[illegible]	260.0	0.260	474.0	215.4	4.5	4.88	1.64	6.52	3.97	72.0	4.08	2.44
	280.0	0.280	474.0	215.4	4.9	4.86	1.68	6.55	3.89	71.7	4.12	2.43
34	300.0	0.300	474.0	215.4	5.2	4.84	1.70	6.54	3.85	71.6	4.12	2.42
35	320.0	0.320	474.0	215.4	5.6	4.83	1.67	6.50	3.89	71.8	4.08	2.41
36	340.0	0.340	474.0	215.4	5.9	4.81	1.70	6.51	3.83	71.6	4.10	2.40
37	360.0	0.360	474.0	215.4	6.3	4.79	1.73	6.52	3.77	71.4	4.12	2.39
38	380.0	0.380	474.0	215.4	6.6	4.77	1.70	6.47	3.81	71.6	4.08	2.39
39	400.0	0.400	474.0	215.4	7.0	4.75	1.71	6.47	3.77	71.5	4.09	2.38
40	420.0	0.420	436.0	198.2	7.3	4.36	1.74	6.10	3.50	71.3	3.92	2.18
41	440.0	0.440	435.0	197.7	7.7	4.33	1.71	6.04	3.53	71.5	3.88	2.16
42	460.0	0.460	434.0	197.3	8.0	4.30	1.73	6.03	3.49	71.4	3.88	2.15
43	480.0	0.480	434.0	197.3	8.4	4.29	1.74	6.03	3.46	71.3	3.89	2.14
44	500.0	0.500	438.0	199.1	8.7	4.31	1.73	6.04	3.49	71.4	3.88	2.15
45	540.0	0.540	453.0	205.9	9.4	4.42	1.70	6.12	3.60	71.6	3.91	2.21
46	580.0	0.580	455.0	206.8	10.1	4.41	1.73	6.14	3.55	71.4	3.93	2.20
47	620.0	0.620	456.0	207.3	10.8	4.38	1.73	6.11	3.54	71.4	3.92	2.19
48	660.0	0.660	456.0	207.3	11.5	4.35	1.76	6.11	3.48	71.2	3.93	2.17
49	700.0	0.700	456.0	207.3	12.2	4.32	1.74	6.06	3.48	71.3	3.90	2.16



GRAVEL		SAND			FINES	
COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

Boring No.	Elev./Depth	Nat. W.C.	L.L.	P.L.	P.I.	Soil Description or Classification
B-2 UD-1	18' - 20'		42.0	16.0	26.0	Gray Silty Clayey Fine SAND

Project:

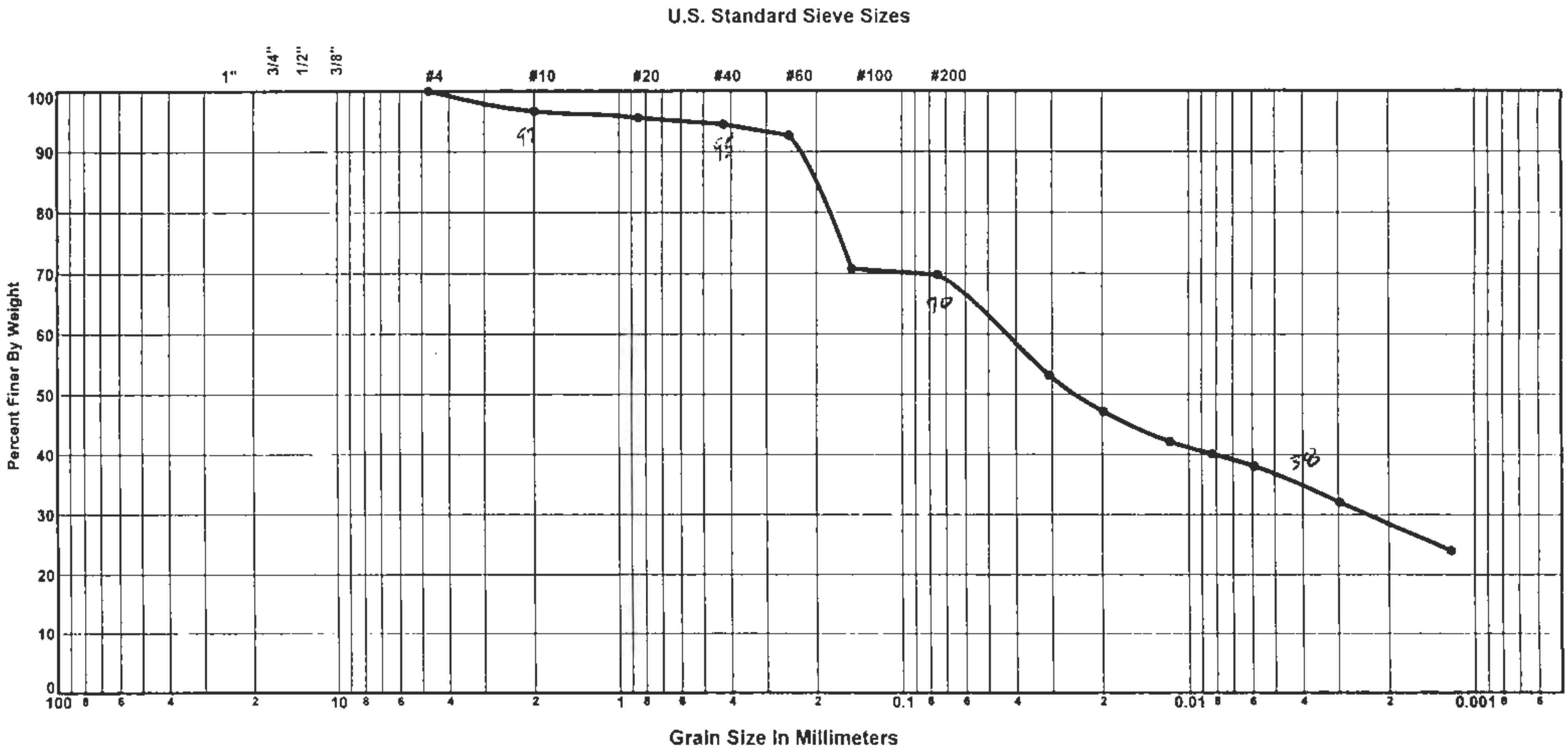
Pitt County Landfill
Pitt County, North Carolina

Job No.: 1-00-1100-CA

Date: 12/6/00

GRAIN SIZE DISTRIBUTION

GeoTechnologies Inc.



GRAVEL		SAND			FINES	
COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

Boring No.	Elev./Depth	Nat. W.C.	L.L.	P.L.	P.I.	Soil Description or Classification
B- 2 UD-2	24' - 26'		38.0	16.0	22.0	Tan Sandy Silty CLAY

Project:

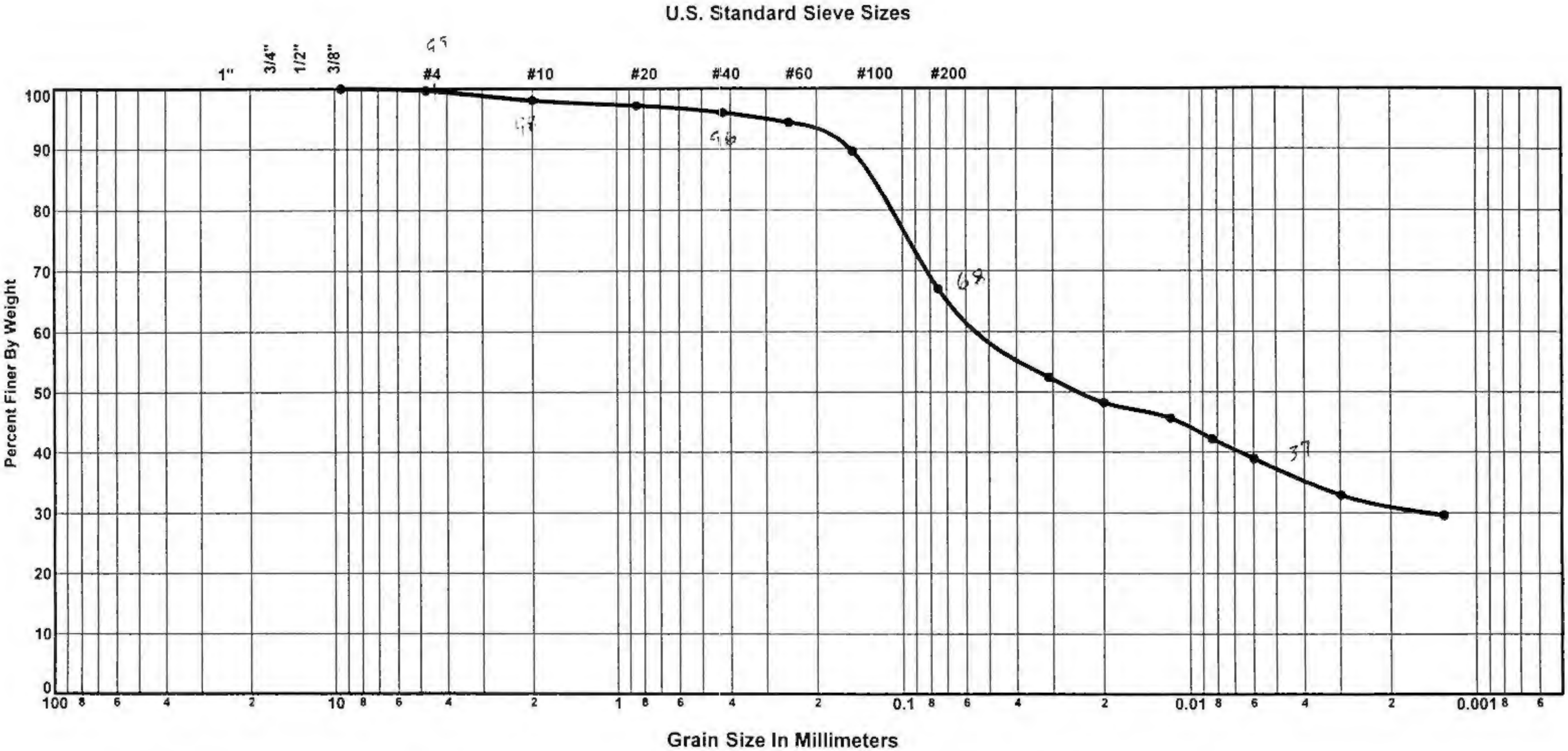
Pitt County Landfill
Pitt County, North Carolina

Job No.: 1-00-1100-CA

Date: 12/6/00

GRAIN SIZE DISTRIBUTION

GeoTechnologies, Inc.



GRAVEL		SAND			FINES	
COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

Boring No.	Elev./Depth	Nat. W.C.	L.L.	P.L.	P.I.	Soil Description or Classification
B-2S UD 3	33'-34'		45.0	19.0	26.0	Gray Fine Sandy Silty CLAY w/Shell Fragments

GRAIN SIZE DISTRIBUTION

GeoTechnologies, Inc.

Project:

Pitt County Landfill
Pitt County, North Carolina

Job No.: 1-00-1100-CA

Date: 12/14/00

GeoTechnologies, Inc.

PERMEABILITY TEST

Job Number:		**Job Name:**	Pitt County Landfill		
Date:	14-Dec-00	**Sample I.D.**	B-2 U-1	**Depth:**	18' - 20'

Soil Description: Gray Silty Clayey Fine SAND

SAMPLE DATA

12/14/00

Remolded (X)

Undisturbed ()

Standard Proctor (ASTM D-698)

Maximum Dry Density		lbs/cu.ft.
Opt. Moisture Content		%
Compaction		%

	Inches	cm.			
			Actual Moisture Content	**21.9**	%
			Wet Density	**117.9**	lbs./cu.ft.
Length	**5.910**	**15.011**	Dry Density	**96.7**	lbs./cu.ft.
Diameter	**2.870**	**7.290**	Initial Saturation	**79.7**	%
Area	**6.469**	**41.737**	Final Saturation	**100.0**	%
Volume	**38.233**	**626.531**	Initial Void Ratio	**0.74**	
Wet Mass	**2.609**	**1183.59** grams	Porosity	**42.6**	%
Dry Mass	**2.1405**	**971.0** grams	Specific Gravity	**2.7**	apparent

TEST DATA

hi = inflow burette

ho = outflow burette

t = time

L = 15.01 cm. length of sample

A = 41.737 sq.cm. area of sample

a = 0.852 sq.cm. area of burettes

h1 = head loss across specimen at t1

h2 = head loss across specimen at t2

t1	t2	ho1	hi1	h1	ho2	hi2	h2
0	**1980**	93.8	0.6	**93.2**	92.7	1.7	**91**
0	**2100**	92.7	1.7	**91**	91.4	3.0	**88.4**
0	**2100**	91.4	3.0	**88.4**	89.9	4.5	**85.4**

ASTM D 5084

k = ((aaL/(At(a+a)))*ln(h1/h2)

				Percent Deviation
NOTE:	1	k =	1.85E-06	14.45%
5 PSI Confining Pressure	2	k =	2.11E-06	2.12%
1 PSI Driving Head	3	k =	2.52E-06	16.58%

Average k= 2.16E-06 cm/sec

GeoTechnologies, Inc.

PERMEABILITY TEST

Job Number:		Job Name:	Pitt County Landfill		
Date:	14-Dec-00	Sample I.D.	B-2 U-2	Depth:	24' - 26'

Soil Description: Tan Fine Sandy Silty CLAY

SAMPLE DATA

12/14/00

Remolded (X)

Undisturbed ()

Standard Proctor (ASTM D-698)	
Maximum Dry Density	lbs/cu.ft.
Opt. Moisture Content	%
Compaction	%

	Inches	cm.	
Length	**6.010**	**15.265**	
Diameter	**2.890**	**7.341**	
Area	**6.560**	**42.321**	
Volume	**39.424**	**646.043**	
Wet Mass	**2.564**	**1162.9**	grams
Dry Mass	**1.9936**	**904.3**	grams

Actual Moisture Content	**28.6**	%
Wet Density	**112.4**	lbs./cu.ft.
Dry Density	**87.4**	lbs./cu.ft.
Initial Saturation	**83.1**	%
Final Saturation	**100.0**	%
Initial Void Ratio	**0.93**	
Porosity	**48.2**	%
Specific Gravity	**2.7**	apparent

TEST DATA

hi = inflow burette

ho = outflow burette

t = time

L = 15.27 cm. length of sample

A = 42.321 sq.cm. area of sample

a = 0.852 sq.cm. area of burettes

h1 = head loss across specimen at t1

h2 = head loss across specimen at t2

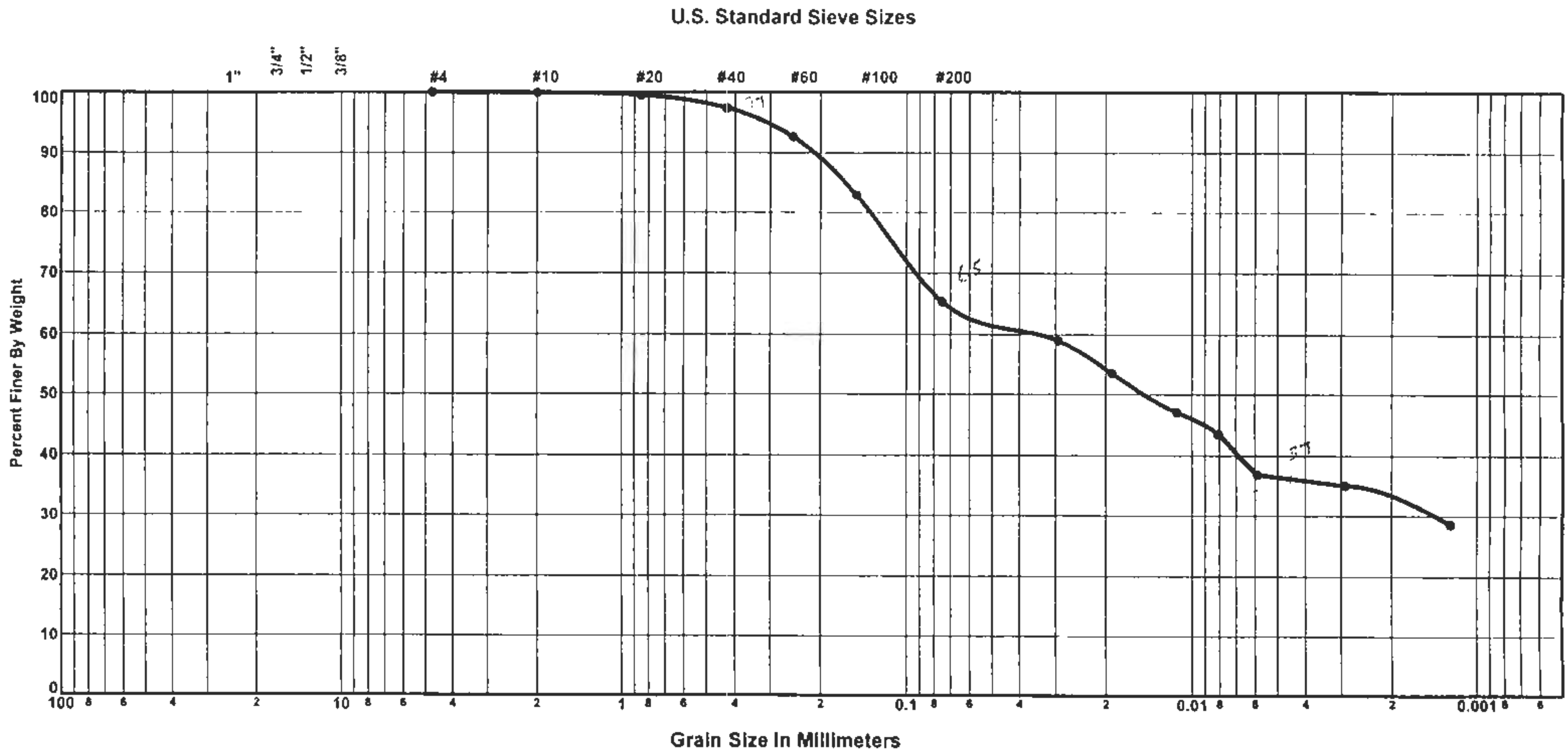
t1	t2	ho1	hi1	h1	ho2	hi2	h2
0	**3960**	93.1	0.9	**92.2**	92.7	1.3	**91.4**
0	**4440**	92.7	1.3	**91.4**	92.2	1.8	**90.4**
0	**4260**	92.2	1.8	**90.4**	91.8	2.2	**89.6**

ASTM D 5084

k = ((aaL/(At(a+a))*ln(h1/h2)

				Percent Deviation
NOTE:	1	k =	3.38E-07	2.41%
5 PSI Confining Pressure	2	k =	3.81E-07	9.88%
1 PSI Driving Head	3	k =	3.21E-07	7.47%

Average k= 3.47E-07 cm/sec



GRAVEL		SAND			FINES	
COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

Boring No.	Elev./Depth	Nat. W.C.	L.L.	P.L.	P.I.	Soil Description or Classification
TP-3	16' - 32' BULK		36.0	21.0	15.0	Orange-Tan Fine Sandy Silty CLAY

GRAIN SIZE DISTRIBUTION

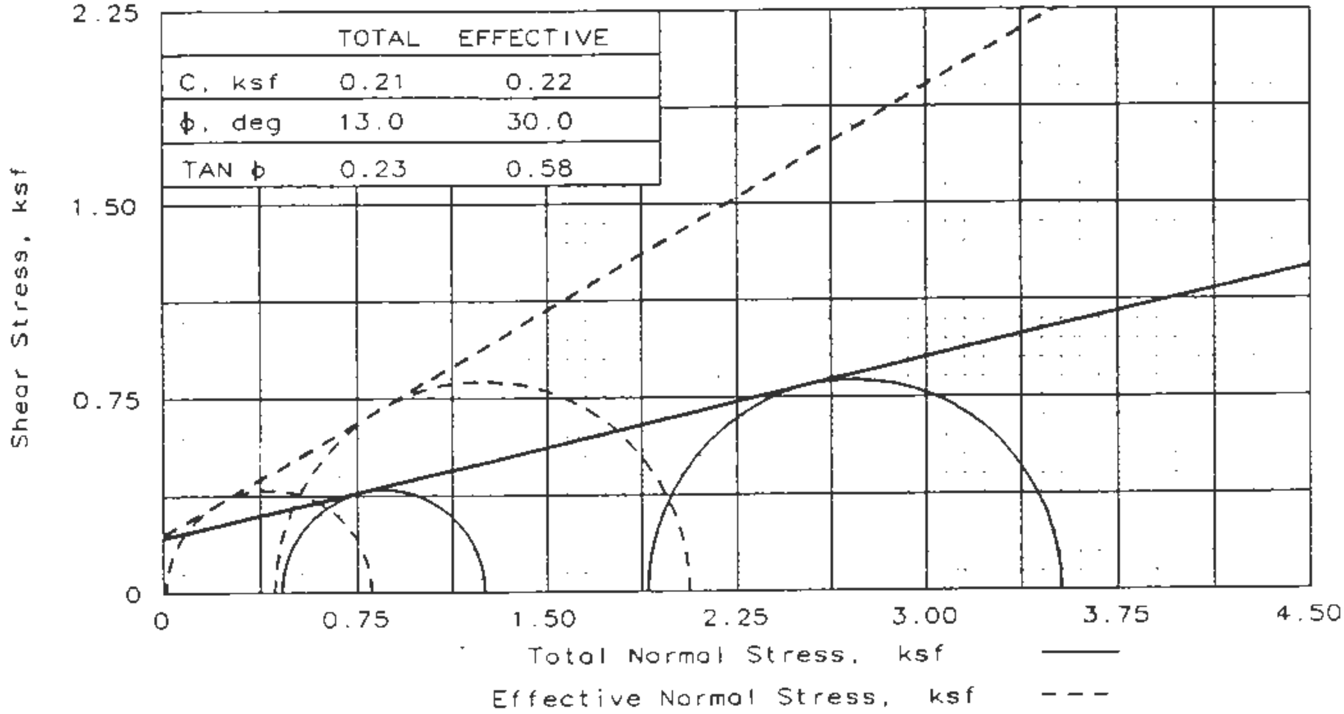
GeoTechnologies Inc

Project:

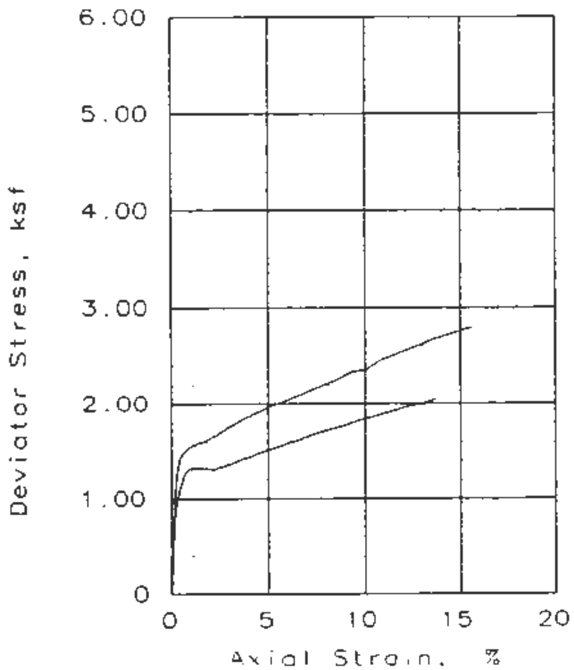
Pitt County Landfill
Pitt County, North Carolina

Job No.: 1-00-1100-CA

Date: 12/6/00



	TOTAL	EFFECTIVE
C, ksf	0.21	0.22
ϕ, deg	13.0	30.0
TAN ϕ	0.23	0.58



SAMPLE NO.		1	2
INITIAL	WATER CONTENT, %	17.1	17.1
	DRY DENSITY, pcf	104.8	105.5
	SATURATION, %	78.2	79.8
	VOID RATIO	0.579	0.568
	DIAMETER, in	2.89	2.89
	HEIGHT, in	5.86	5.86
AT TEST	WATER CONTENT, %	21.4	19.3
	DRY DENSITY, pcf	105.7	109.6
	SATURATION, %	100.4	100.3
	VOID RATIO	0.565	0.510
	DIAMETER, in	2.88	2.85
	HEIGHT, in	5.84	5.78
Strain rate, in/min		0.004	0.004
BACK PRESSURE, ksf		9.94	10.01
CELL PRESSURE, ksf		10.40	11.91
FAILURE STRESS, ksf		0.79	1.63
PORE PRESSURE, ksf		10.38	11.48
ULTIMATE STRESS, ksf		0.79	1.63
PORE PRESSURE, ksf		10.38	11.48
$\bar{\sigma}_1$ FAILURE, ksf		0.81	2.06
$\bar{\sigma}_3$ FAILURE, ksf		0.01	0.43

TYPE OF TEST:
CU with pore pressures
SAMPLE TYPE: Remolded
DESCRIPTION: Orange-Tan Fine Sandy Silty CLAY (CL)
LL= 36 PL= 21 PI= 15
SPECIFIC GRAVITY= 2.65
REMARKS:

FIG. NO. 1

CLIENT: David Garrett, P.E.

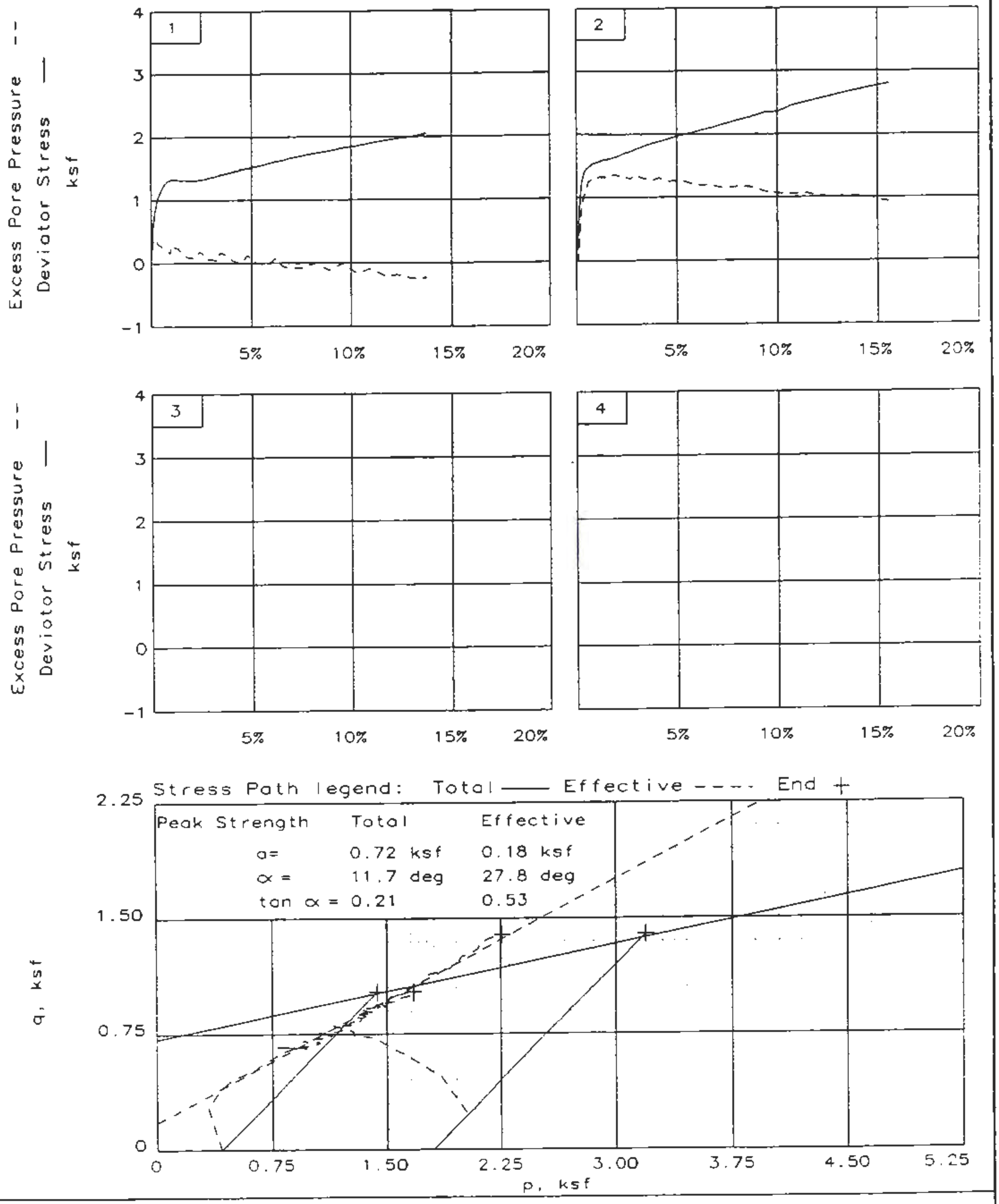
PROJECT: Pitt County Landfill

SAMPLE LOCATION: TP-3 Bulk 16" - 32"

PROJ. NO.: 1-00-1100EA DATE: 12-5-00

TRIAXIAL SHEAR TEST REPORT

GEOTECHNOLOGIES, INC., P.A.



Peak Strength	Total	Effective
a=	0.72 ksf	0.18 ksf
α =	11.7 deg	27.8 deg
tan α =	0.21	0.53

Client: David Garrett, P.E.

Project: Pitt County Landfill

Location: TP-3 Bulk 16" - 32"

File: PITTTP3 Project No.: 1-00-1100EA Page 2/2 Fig. No. 1

TRIAXIAL COMPRESSION TEST 12-06-1900
CU with pore pressures 10:50 am

Project Data

Project No.: 1-00-1100EA   Date: 12-5-00   Data file: PITTTP3
Client: David Garrett, P.E.
Project: Pitt County Landfill
Sample location: TP-3 Bulk 16" - 32"
Sample description: Orange-Tan Fine Sandy Silty CLAY (CL)
Remarks:
Fig No. 1

Sample No. 1 Data

Type of sample: Remolded
Specific Gravity= 2.65   LL= 36   PL= 21   PI= 15

Sample Parameters	Before Test	At Testing	After Test
Diameter, in	2.89	2.88	
Height change, in		0.02	
Height, in	5.86	5.84	
Weight, grams	1232.7		
Moisture, %	17.1	21.4	21.4
Wet density, pcf	122.7	128.4	
Dry density, pcf	104.8	105.7	
Saturation, %	78.2	100.4	
Void ratio	0.579	0.565	

Test Data

Deformation dial constant= 0.001 in per input unit
Primary load ring constant= 0.4545 lbs. per input unit
Secondary load ring constant= 0 lbs. per input unit
Crossover reading for secondary load ring= 0 input units
Strain rate, in/min = 0.004
Consolidation cell pressure = 72.2 psi = 10.3968 ksf
Consolidation back pressure = 69 psi = 9.936 ksf
Consolidation effective confining stress = 0.4608 ksf
Peak deviator stress = 2.04 ksf at reading no. 49
Ult. deviator stress = 0.79 ksf at reading no. 2

No.	Def. Dial Units	Def. in	Load Dial Units	Load lbs.	Strain %	Deviator Stress ksf	Effective Stresses Minor ksf	Effective Stresses Major ksf	1:3 Ratio	Pore Pres. psi	P ksf	Q ksf
0	0.0	0.000	0.0	0.0	0.0	0.00	0.42	0.42	1.00	69.3	0.42	0.00
1	5.0	0.005	55.0	25.0	0.1	0.55	0.06	0.61	10.61	71.8	0.33	0.28
2	10.0	0.010	79.0	35.9	0.2	0.79	0.01	0.81	56.17	72.1	0.41	0.40
3	15.0	0.015	93.0	42.3	0.3	0.93	0.04	0.98	22.63	71.9	0.51	0.47
4	20.0	0.020	103.0	46.8	0.3	1.03	0.12	1.15	9.98	71.4	0.63	0.52
	25.0	0.025	110.0	50.0	0.4	1.10	0.13	1.23	9.51	71.3	0.68	0.55
	30.0	0.030	116.0	52.7	0.5	1.16	0.16	1.32	8.34	71.1	0.74	0.58

No.	Def. Dial Units	Def. in	Load Dial Units	Load lbs.	Strain %	Deviator Stress ksf	Effective Stresses Minor ksf	Effective Stresses Major ksf	1:3 Ratio	Pore Pres. psi	P ksf	Q ksf
	35.0	0.035	122.0	55.4	0.6	1.22	0.17	1.39	8.07	71.0	0.78	0.61
[illegible]	40.0	0.040	126.0	57.3	0.7	1.26	0.19	1.45	7.73	70.9	0.82	0.63
9	45.0	0.045	129.0	58.6	0.8	1.29	0.22	1.51	6.97	70.7	0.86	0.64
10	50.0	0.050	131.0	59.5	0.9	1.31	0.23	1.54	6.68	70.6	0.88	0.65
11	55.0	0.055	132.0	60.0	0.9	1.32	0.26	1.58	6.08	70.4	0.92	0.66
12	60.0	0.060	133.0	60.4	1.0	1.33	0.12	1.44	12.51	71.4	0.78	0.66
13	65.0	0.065	133.0	60.4	1.1	1.32	0.14	1.47	10.20	71.2	0.81	0.66
14	70.0	0.070	133.0	60.4	1.2	1.32	0.17	1.50	8.66	71.0	0.83	0.66
15	75.0	0.075	133.0	60.4	1.3	1.32	0.17	1.50	8.65	71.0	0.83	0.66
16	80.0	0.080	133.0	60.4	1.4	1.32	0.19	1.51	8.06	70.9	0.85	0.66
17	85.0	0.085	133.0	60.4	1.5	1.32	0.22	1.54	7.11	70.7	0.88	0.66
18	90.0	0.090	133.0	60.4	1.5	1.32	0.26	1.58	6.09	70.4	0.92	0.66
19	95.0	0.095	133.0	60.4	1.6	1.32	0.30	1.62	5.36	70.1	0.96	0.66
20	100.0	0.100	133.0	60.4	1.7	1.32	0.30	1.62	5.35	70.1	0.96	0.66
21	110.0	0.110	133.0	60.4	1.9	1.31	0.33	1.65	4.97	69.9	0.99	0.66
22	130.0	0.130	133.0	60.4	2.2	1.31	0.33	1.64	4.96	69.9	0.99	0.65
23	140.0	0.140	135.0	61.4	2.4	1.33	0.23	1.56	6.76	70.6	0.89	0.66
24	150.0	0.150	136.0	61.8	2.6	1.33	0.26	1.59	6.15	70.4	0.93	0.67
25	160.0	0.160	137.0	62.3	2.7	1.34	0.35	1.69	4.88	69.8	1.02	0.67
26	170.0	0.170	139.0	63.2	2.9	1.36	0.36	1.72	4.78	69.7	1.04	0.68
27	180.0	0.180	140.0	63.6	3.1	1.37	0.36	1.73	4.80	69.7	1.04	0.68
28	190.0	0.190	142.0	64.5	3.3	1.38	0.37	1.76	4.70	69.6	1.07	0.69
29	200.0	0.200	144.0	65.4	3.4	1.40	0.24	1.65	6.72	70.5	0.95	0.70
30	220.0	0.220	147.0	66.8	3.8	1.43	0.29	1.71	5.95	70.2	1.00	0.71
31	240.0	0.240	150.0	68.2	4.1	1.45	0.39	1.84	4.73	69.5	1.11	0.72
[illegible]	260.0	0.260	154.0	70.0	4.5	1.48	0.40	1.89	4.68	69.4	1.14	0.74
	280.0	0.280	157.0	71.4	4.8	1.51	0.29	1.79	6.23	70.2	1.04	0.75
34	300.0	0.300	160.0	72.7	5.1	1.53	0.40	1.93	4.79	69.4	1.17	0.76
35	320.0	0.320	163.0	74.1	5.5	1.55	0.43	1.98	4.59	69.2	1.21	0.78
36	340.0	0.340	166.0	75.4	5.8	1.57	0.45	2.02	4.53	69.1	1.23	0.79
37	360.0	0.360	170.0	77.3	6.2	1.61	0.35	1.95	5.65	69.8	1.15	0.80
38	380.0	0.380	172.0	78.2	6.5	1.62	0.46	2.08	4.52	69.0	1.27	0.81
39	400.0	0.400	176.0	80.0	6.9	1.65	0.49	2.14	4.37	68.8	1.32	0.83
40	440.0	0.440	182.0	82.7	7.5	1.70	0.49	2.18	4.46	68.8	1.34	0.85
41	480.0	0.480	188.0	85.4	8.2	1.74	0.42	2.16	5.16	69.3	1.29	0.87
42	520.0	0.520	193.0	87.7	8.9	1.77	0.53	2.30	4.32	68.5	1.42	0.89
43	560.0	0.560	200.0	90.9	9.6	1.82	0.42	2.24	5.36	69.3	1.33	0.91
44	600.0	0.600	205.0	93.2	10.3	1.85	0.58	2.43	4.22	68.2	1.50	0.93
45	640.0	0.640	211.0	95.9	11.0	1.89	0.50	2.40	4.76	68.7	1.45	0.95
46	680.0	0.680	217.0	98.6	11.6	1.93	0.62	2.55	4.12	67.9	1.58	0.97
47	720.0	0.720	223.0	101.4	12.3	1.97	0.60	2.57	4.26	68.0	1.59	0.98
48	760.0	0.760	228.0	103.6	13.0	2.00	0.66	2.66	4.02	67.6	1.66	1.00
49	800.0	0.800	235.0	106.8	13.7	2.04	0.65	2.69	4.15	67.7	1.67	1.02

TRIAXIAL COMPRESSION TEST
CU with pore pressures

12-06-1900
10:50 am

Project Data

Project No.: 1-00-1100EA   Date: 12-5-00   Data file: PITTTP3
Client: David Garrett, P.E.
Project: Pitt County Landfill
Sample location: TP-3 Bulk 16" - 32"
Sample description: Orange-Tan Fine Sandy Silty CLAY (CL)
Remarks:
Fig No. 1

Sample No. 2 Data

Type of sample: Remolded
Specific Gravity= 2.65   LL= 36   PL= 21   PI= 15

Sample Parameters	Before Test	At Testing	After Test
Diameter, in	2.89	2.85	
Height change, in		0.07	
Height, in	5.86	5.78	
Weight, grams	1241.6		
Moisture, %	17.1	19.3	19.3
Wet density, pcf	123.6	130.7	
Dry density, pcf	105.5	109.6	
Saturation, %	79.8	100.3	
Void ratio	0.568	0.510	

Test Data

Deformation dial constant= 0.001 in per input unit
Primary load ring constant= 0.4545 lbs. per input unit
Secondary load ring constant= 0 lbs. per input unit
Crossover reading for secondary load ring= 0 input units
Strain rate, in/min = 0.004
Consolidation cell pressure = 82.7 psi = 11.9088 ksf
Consolidation back pressure = 69.5 psi = 10.008 ksf
Consolidation effective confining stress = 1.9008 ksf
Peak deviator stress = 2.79 ksf at reading no. 49
Ult. deviator stress = 1.63 ksf at reading no. 21

No.	Def. Dial Units	Def. in	Load Dial Units	Load lbs.	Strain %	Deviator Stress ksf	Effective Stresses Minor ksf	Effective Stresses Major ksf	1:3 Ratio	Pore Pres. psi	P ksf	Q ksf
0	0.0	0.000	0.0	0.0	0.0	0.00	1.80	1.80	1.00	70.2	1.80	0.00
1	5.0	0.005	45.0	20.5	0.1	0.46	1.80	2.26	1.26	70.2	2.03	0.23
2	10.0	0.010	92.0	41.8	0.2	0.94	1.38	2.33	1.68	73.1	1.85	0.47
3	15.0	0.015	121.0	55.0	0.3	1.24	0.98	2.22	2.27	75.9	1.60	0.62
4	20.0	0.020	132.0	60.0	0.3	1.35	0.82	2.17	2.65	77.0	1.50	0.68
	25.0	0.025	139.0	63.2	0.4	1.42	0.73	2.16	2.93	77.6	1.44	0.71
	30.0	0.030	143.0	65.0	0.5	1.46	0.65	2.11	3.25	78.2	1.38	0.73

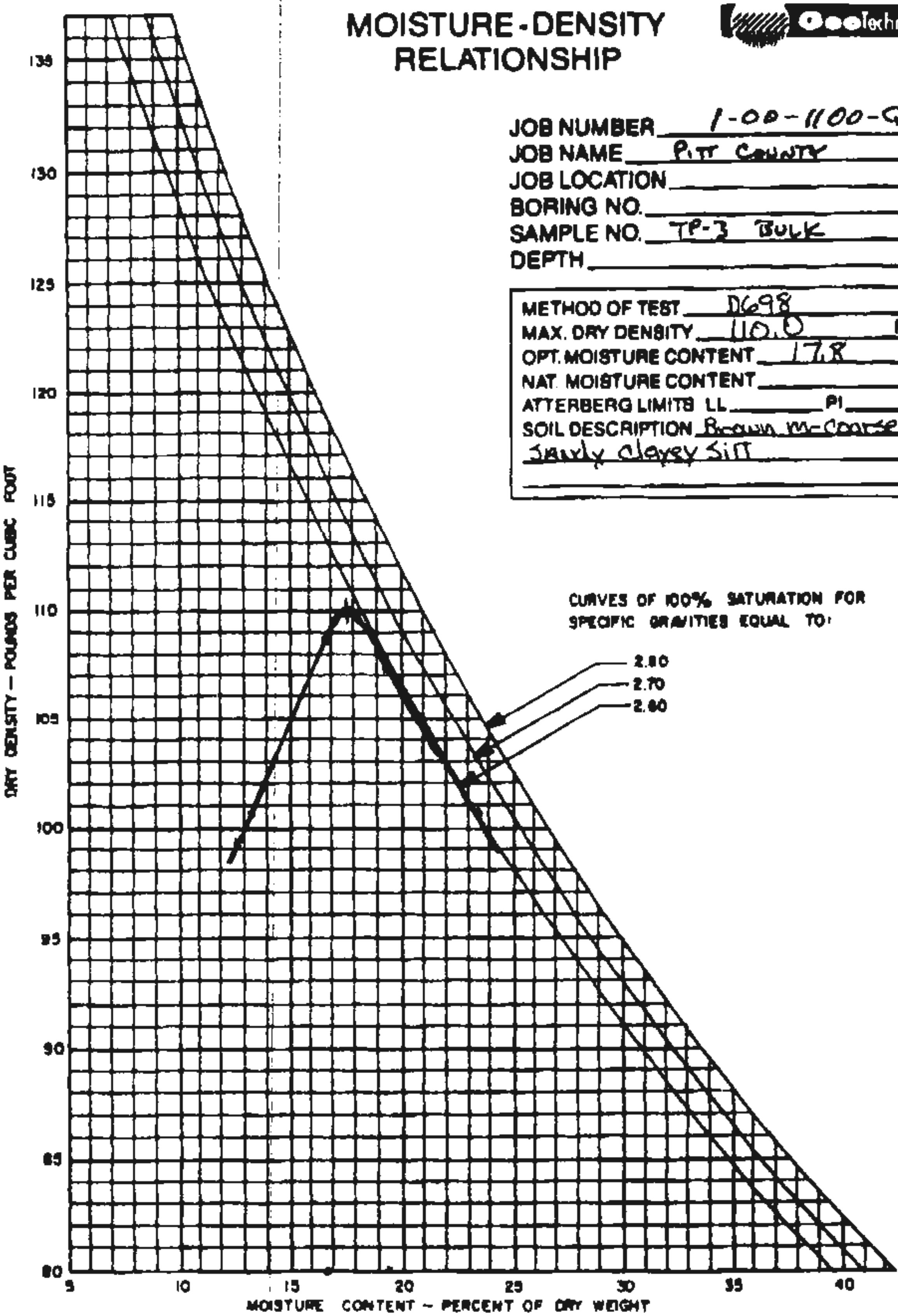
No.	Def. Dial Units	Def. in	Load Dial Units	Load lbs.	Strain %	Deviator Stress ksf	Effective Stresses Minor ksf	Major ksf	1:3 Ratio	Pore Pres. psi	P ksf	Q ksf
	35.0	0.035	145.0	65.9	0.6	1.48	0.55	2.03	3.70	78.9	1.29	0.74
	40.0	0.040	148.0	67.3	0.7	1.51	0.53	2.04	3.83	79.0	1.29	0.75
9	45.0	0.045	150.0	68.2	0.8	1.53	0.52	2.05	3.95	79.1	1.28	0.76
10	50.0	0.050	151.0	68.6	0.9	1.54	0.50	2.04	4.05	79.2	1.27	0.77
11	55.0	0.055	152.0	69.1	1.0	1.55	0.49	2.04	4.16	79.3	1.26	0.77
12	60.0	0.060	153.0	69.5	1.0	1.55	0.49	2.04	4.18	79.3	1.27	0.78
13	65.0	0.065	154.0	70.0	1.1	1.56	0.48	2.04	4.29	79.4	1.26	0.78
14	70.0	0.070	155.0	70.4	1.2	1.57	0.48	2.05	4.31	79.4	1.26	0.79
15	75.0	0.075	156.0	70.9	1.3	1.58	0.48	2.06	4.33	79.4	1.27	0.79
16	80.0	0.080	157.0	71.4	1.4	1.59	0.48	2.06	4.35	79.4	1.27	0.79
17	85.0	0.085	158.0	71.8	1.5	1.60	0.48	2.07	4.36	79.4	1.27	0.80
18	90.0	0.090	158.0	71.8	1.6	1.60	0.48	2.07	4.36	79.4	1.27	0.80
19	95.0	0.095	159.0	72.3	1.6	1.61	0.48	2.08	4.38	79.4	1.28	0.80
20	100.0	0.100	160.0	72.7	1.7	1.61	0.46	2.08	4.50	79.5	1.27	0.81
21	110.0	0.110	162.0	73.6	1.9	1.63	0.43	2.06	4.78	79.7	1.25	0.82
22	120.0	0.120	164.0	74.5	2.1	1.65	0.45	2.10	4.69	79.6	1.27	0.82
23	130.0	0.130	166.0	75.4	2.2	1.67	0.46	2.13	4.62	79.5	1.29	0.83
24	140.0	0.140	169.0	76.8	2.4	1.69	0.48	2.17	4.56	79.4	1.32	0.85
25	150.0	0.150	171.0	77.7	2.6	1.71	0.49	2.20	4.49	79.3	1.34	0.86
26	160.0	0.160	173.0	78.6	2.8	1.73	0.50	2.23	4.43	79.2	1.37	0.86
27	170.0	0.170	176.0	80.0	2.9	1.75	0.43	2.19	5.06	79.7	1.31	0.88
28	180.0	0.180	178.0	80.9	3.1	1.77	0.46	2.23	4.84	79.5	1.35	0.89
29	190.0	0.190	180.0	81.8	3.3	1.79	0.49	2.28	4.65	79.3	1.38	0.89
30	200.0	0.200	183.0	83.2	3.5	1.81	0.50	2.32	4.60	79.2	1.41	0.91
31	220.0	0.220	187.0	85.0	3.8	1.85	0.53	2.38	4.47	79.0	1.46	0.92
	240.0	0.240	191.0	86.8	4.2	1.88	0.49	2.37	4.84	79.3	1.43	0.94
	260.0	0.260	195.0	88.6	4.5	1.91	0.55	2.46	4.49	78.9	1.50	0.96
34	300.0	0.300	203.0	92.3	5.2	1.98	0.53	2.51	4.71	79.0	1.52	0.99
35	340.0	0.340	210.0	95.4	5.9	2.03	0.60	2.63	4.36	78.5	1.62	1.01
36	380.0	0.380	218.0	99.1	6.6	2.09	0.60	2.70	4.46	78.5	1.65	1.05
37	420.0	0.420	226.0	102.7	7.3	2.15	0.65	2.80	4.32	78.2	1.72	1.08
38	460.0	0.460	234.0	106.4	8.0	2.21	0.63	2.85	4.49	78.3	1.74	1.11
39	500.0	0.500	242.0	110.0	8.6	2.27	0.63	2.90	4.58	78.3	1.77	1.13
40	540.0	0.540	251.0	114.1	9.3	2.34	0.71	3.04	4.31	77.8	1.87	1.17
41	580.0	0.580	255.0	115.9	10.0	2.36	0.73	3.09	4.21	77.6	1.91	1.18
42	620.0	0.620	267.0	121.4	10.7	2.45	0.75	3.20	4.27	77.5	1.97	1.22
43	660.0	0.660	275.0	125.0	11.4	2.50	0.73	3.24	4.41	77.6	1.99	1.25
44	700.0	0.700	283.0	128.6	12.1	2.55	0.78	3.33	4.28	77.3	2.05	1.28
45	740.0	0.740	291.0	132.3	12.8	2.61	0.79	3.40	4.29	77.2	2.09	1.30
46	780.0	0.780	300.0	136.4	13.5	2.66	0.78	3.44	4.43	77.3	2.11	1.33
47	840.0	0.840	311.0	141.3	14.5	2.73	0.79	3.52	4.45	77.2	2.16	1.36
48	880.0	0.880	319.0	145.0	15.2	2.78	0.85	3.63	4.27	76.8	2.24	1.39
49	900.0	0.900	322.0	146.3	15.6	2.79	0.86	3.66	4.23	76.7	2.26	1.40

MOISTURE - DENSITY RELATIONSHIP

GeoTechnologies Inc

JOB NUMBER 1-00-1100-GA
JOB NAME Pitt County
JOB LOCATION
BORING NO.
SAMPLE NO. TP-3 Bulk
DEPTH

METHOD OF TEST D698
MAX. DRY DENSITY 110.0 PCF
OPT. MOISTURE CONTENT 17.8 %
NAT. MOISTURE CONTENT %
ATTERBERG LIMITS LL PI
SOIL DESCRIPTION Brown M-Coarse Sandy clayey Silt



11-18-2000 06:59 919 9541428

GeoTechnologies, Inc.

PERMEABILITY TEST

Job Number:		Job Name:	Pitt County Landfill		
Date:	12-Nov-00	Sample I.D.	TP-3	Depth:	16" - 32"

Soil Description:

SAMPLE DATA

Type
Remolded (X)
Undisturbed ()

Standard Proctor (ASTM D-698)		
Maximum Dry Density	110.0	lbs/cu.ft.
Opt. Moisture Content	17.8	%
Compaction	94.8	%

	Inches	cm				
				Actual Moisture Content	20.6	%
				Wet Density	125.7	lbs./cu.ft.
Length	3.107	7.892		Dry Density	104.3	lbs./cu.ft.
Diameter	2.874	7.300		Initial Saturation	89.9	%
Area	6.487	41.853		Final Saturation	100.0	%
Volume	20.156	330.298		Initial Void Ratio	0.62	
Wet Mass	1.466	664.98	grams	Porosity	38.1	%
Dry Mass	1.2166	551.9	grams	Specific Gravity	2.7	apparent

TEST DATA

hi = inflow burette
ho = outflow burette
t = time

L = 7.89 cm. length of sample
A = 41.853 sq.cm. area of sample
a = 0.852 sq.cm. area of burettes
h1 = head loss across specimen at t1
h2 = head loss across specimen at t2

t1	t2	ho1	hi1	h1	ho2	hi2	h2
0	53220	93.7	0.6	93.1	88.5	5.8	82.7
0	14280	88.5	5.8	82.7	87.3	7	80.3
0	22620	93.6	0.5	93.1	90.6	3.5	87.1

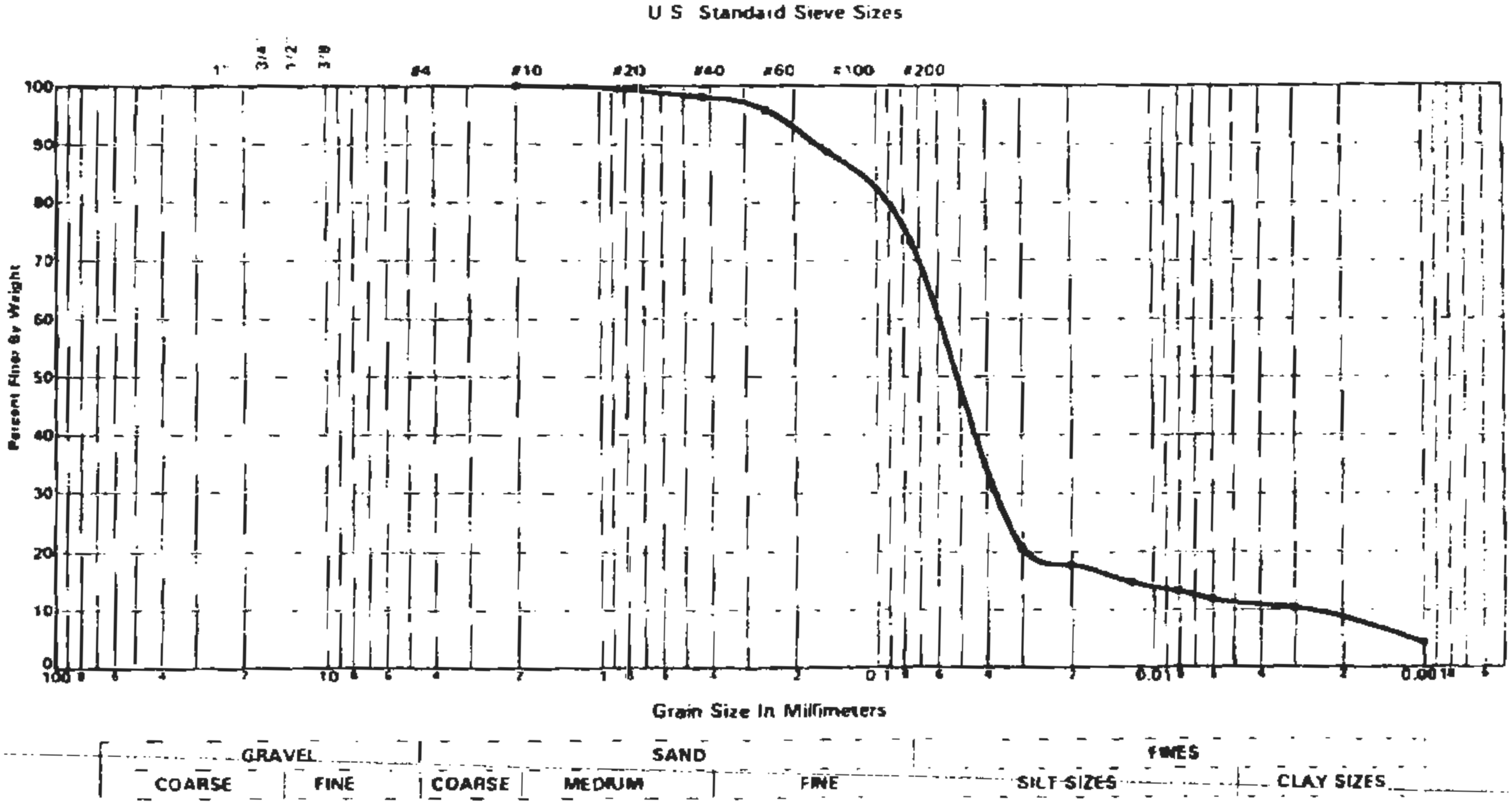
ASTM D 5084

k = ((aaL/(At(a+a)))*ln(h1/h2)

NOTE:
5 PSI Confining Pressure
1 PSI Driving Head

			Percent Deviation
1	k =	1.79E-07	7.69%
2	k =	1.66E-07	14.46%
3	k =	2.37E-07	22.15%

Average k= 1.94E-07 cm/sec



Boring No.	Elev./Depth	Nat. W.C.	L.L.	P.L.	P.I.	Soil Description or Classification
TP-4 (1)	35'-72'	17.4	46.1	19.1	27.0	Yellow Orange Slightly Fine Sandy Clayey SILT (CL-ML)

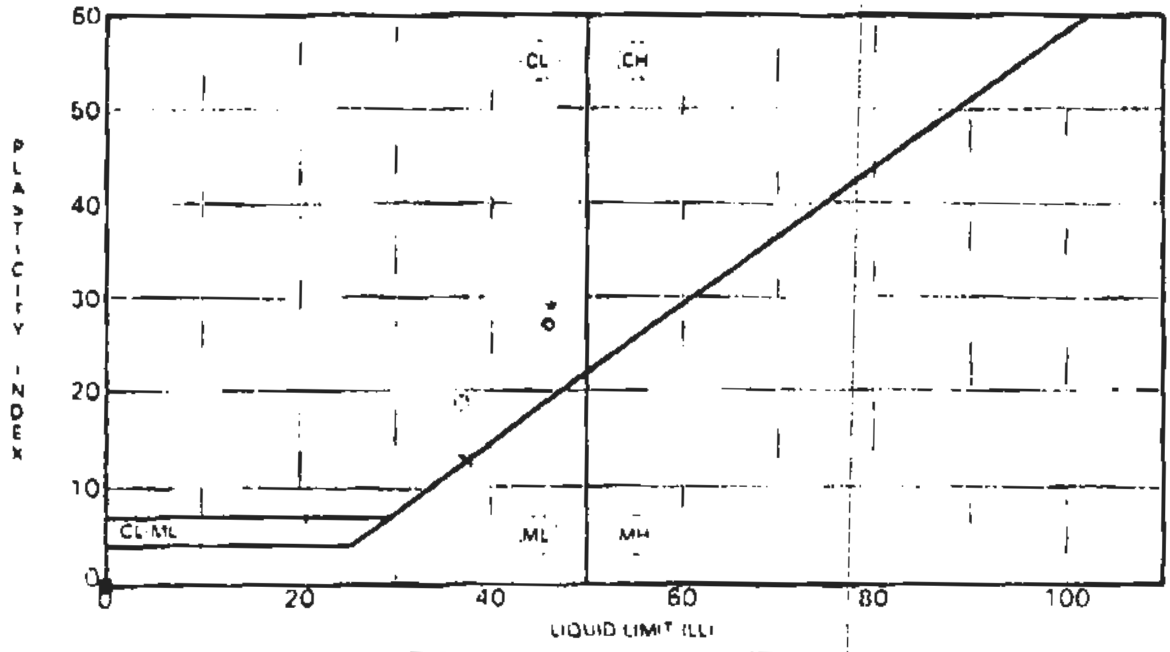
Project:
Pitt County Landfill
Greenville, North Carolina

Job No.: 1-00-1100-CA

Date: 11/17/00

GRAIN SIZE DISTRIBUTION

GeoTechnologies Inc



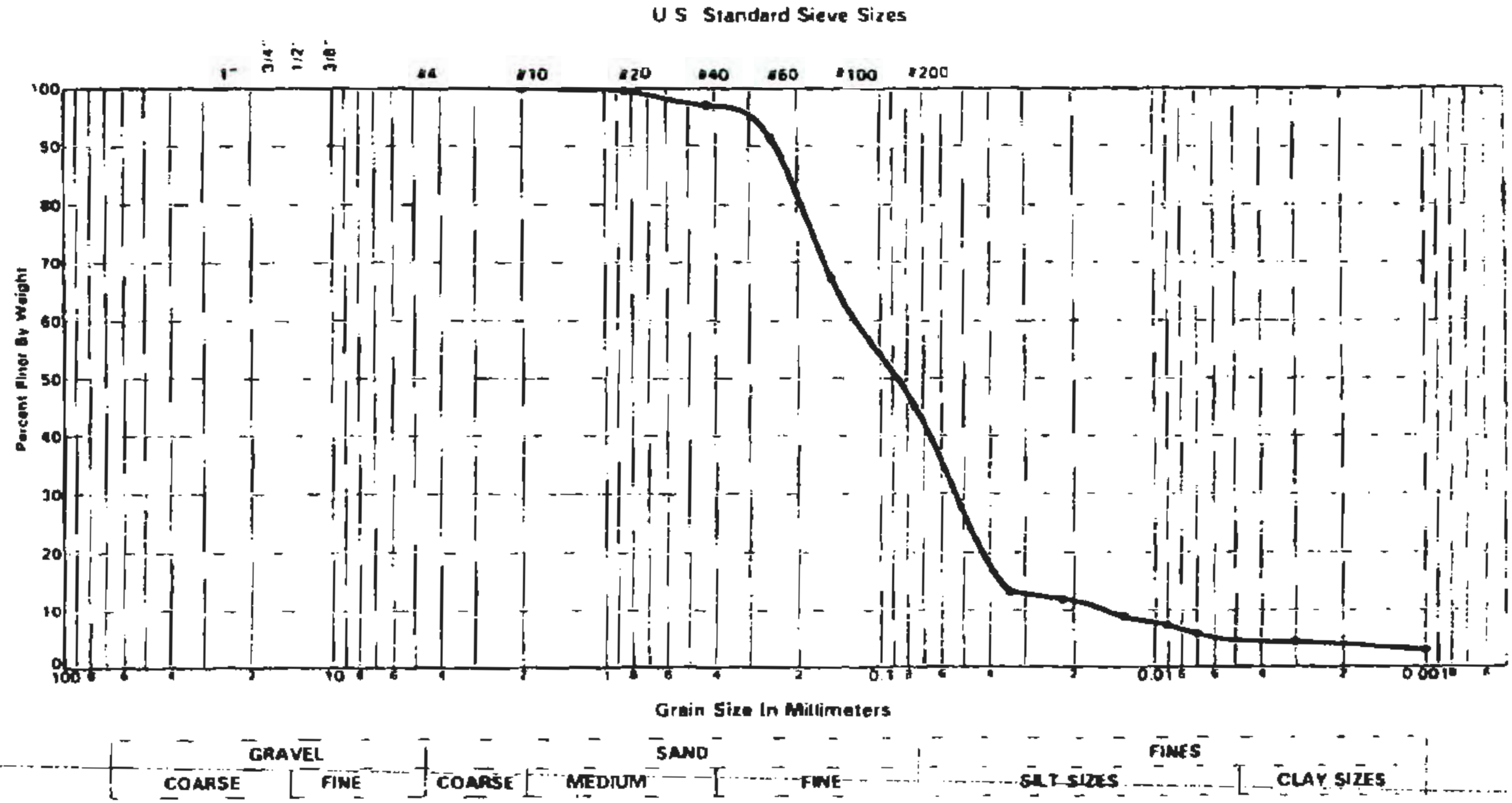
Specimen Identification			LL	PL	PI	Fines	Classification
●	B-2 (1)	3.5'-10.0'	NP	NP	NP	45.2	Tan Orange Slightly Clayey Silty Fine to Medium SAND (SM)
⊠	B-2 (2)	8.5'-10.0'	NP	NP	NP	12.6	Tan Slightly Silty Fine to Coarse SAND (SP-SM)
▶	B-2 (3)	13.5'-15.0'	NP	NP	NP	40.1	Dark Gray Silty Fine SAND with Shells and Shell Hash (SM)
★	B-2 (6)	28.5'-30.0'	46	17	29	72.9	Dark Gray Slightly Clayey Fine Sandy SILT (ML) CL
X	B-2 (7)	33.5'-35.0'	37	25	13	38.4	Dark Grey Silty Fine to Medium SAND (SM)
O	TP-4 (1)	39"-72	48	19	27	73.3	Yellow Orange Slightly Fine Sandy Clayey SILT (CL-ML)
	TP-4 (2)	39"-72	37	18	19	58.8	Yellow Orange Clayey Fine Sandy SILT (CL-ML)
△	TP-4 (3)	8"-39"	NP	NP	NP	17.5	Tan Yellow Slightly Clayey Silty Fine to Medium SAND (SM)
⊡	TP-8Orub	24"-48"	21	14	7	50.1	Tan Gray-Reddish Brown Clayey Fine to Medium Sandy SILT (ML)

PROJECT Pitt County Landfill - Greenville, North Carolina

JOB NO 1-00-1100-CA
DATE 11/17/00

ATTERBERG LIMITS' RESULTS

GeoTechnologies, Inc. P.A.
Greenville, North Carolina



Boring No	Elev./Depth	Nat W C	L.L	P.L	P.I.	Soil Description or Classification
B-2 (1)	3.5'-10.0'	14.0	NP	NP	NP	Tan Orange Slightly Clayey Silty Fine to Medium SAND (SM)

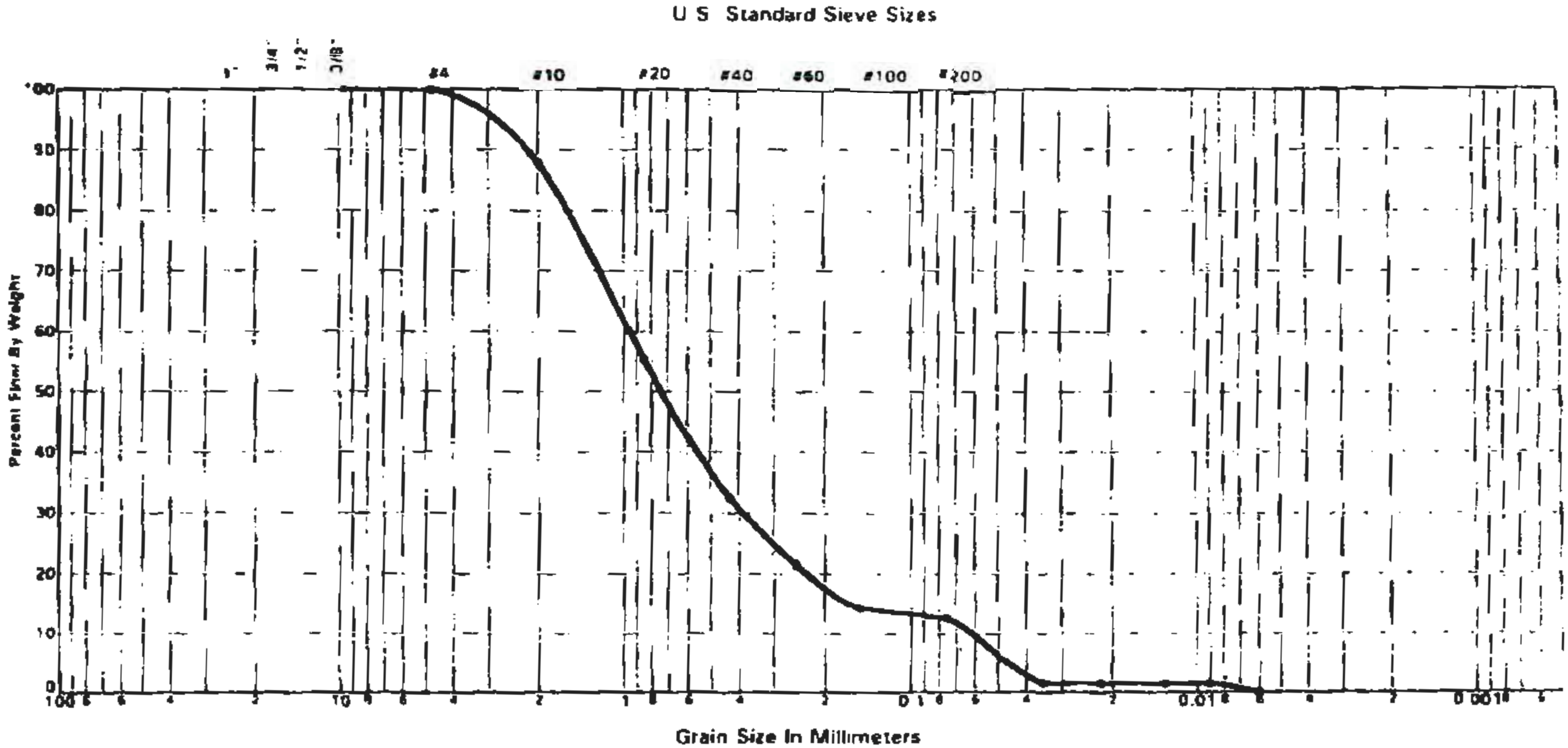
Project:
Pitt County Landfill
Greenville, North Carolina

Job No.: 1-00-1100-CA

Date: 11/17/00

GRAIN SIZE DISTRIBUTION

Geo



GRAVEL		SAND			FINES	
COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

Boring No.	Elev./Depth	Nat. W.C.	L.L.	P.L.	P.I.	Soil Description or Classification
B-2 (2)	8.5'-10.0'	13.2	NP	NP	NP	Tan Slightly Silty Fine to Coarse SAND (SP-SM)

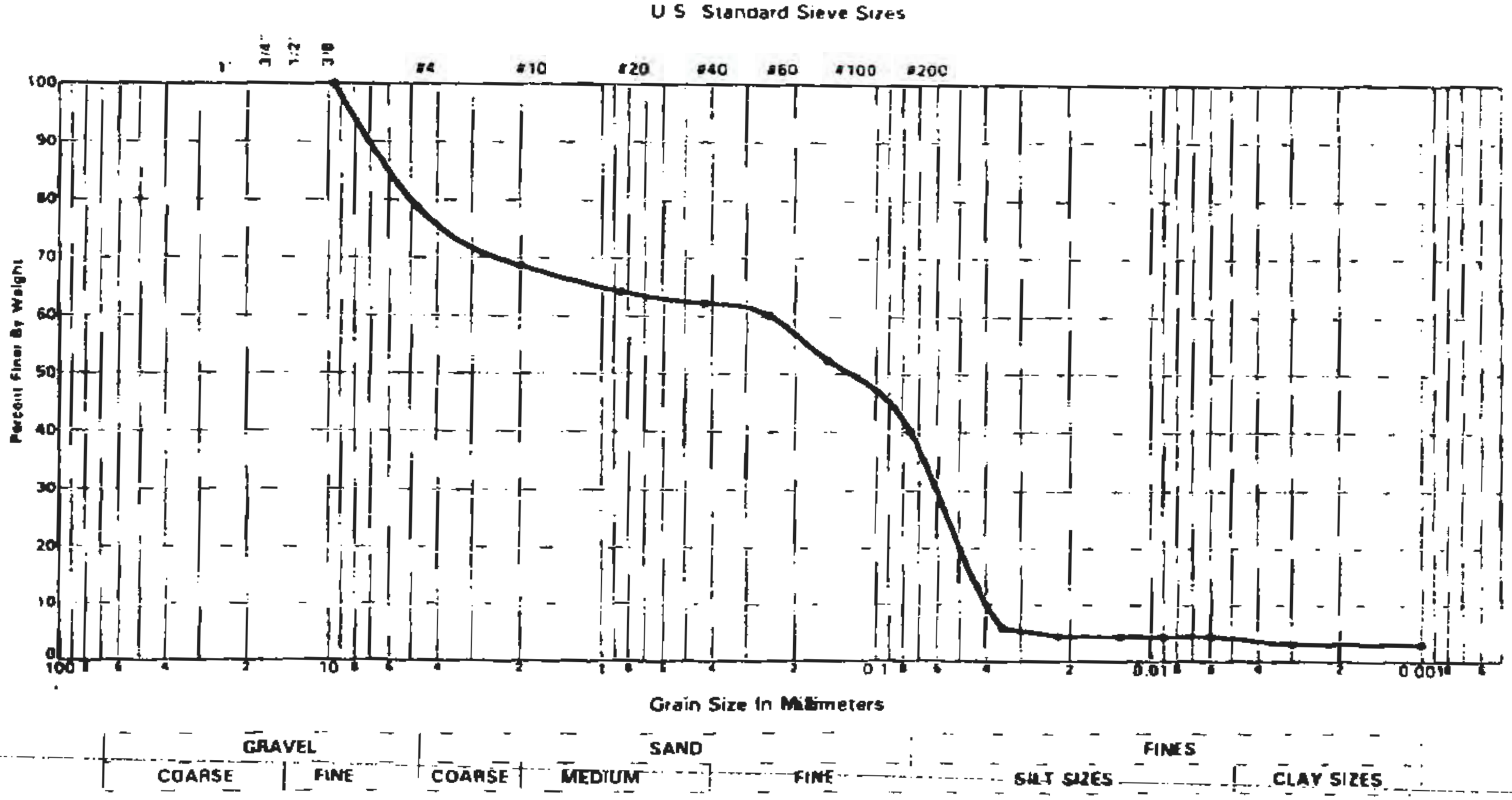
GRAIN SIZE DISTRIBUTION

GeoTechnologies, Inc.

Project:
Pitt County Landfill
Greenville, North Carolina

Job No.: 1-00-1100-CA

Date: 11/17/00



Boring No	Elev /Depth	Nat. W. C.	L L	P L	P I	Soil Description or Classification
B-2 (3)	13.5' 15.0	26.0	NP	NP	NP	Dark Gray Silty Fine SAND with Shells and Shell Hash (SM)

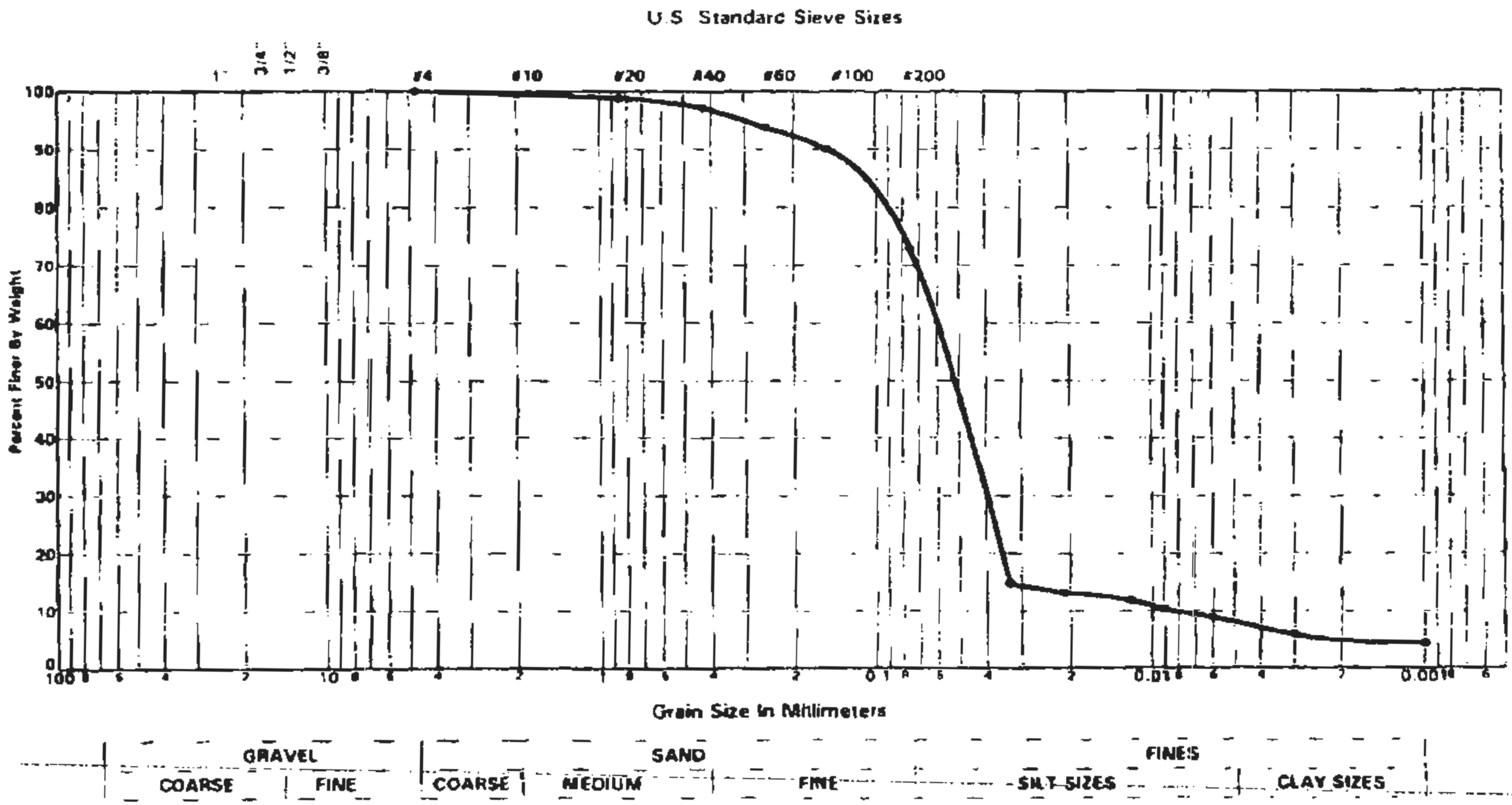
Project:
Pitt County Landfill
Greenville, North Carolina

Job No.: 1-00-1100-CA

Date: 11/17/00

GRAIN SIZE DISTRIBUTION

GeoTechnologies Inc



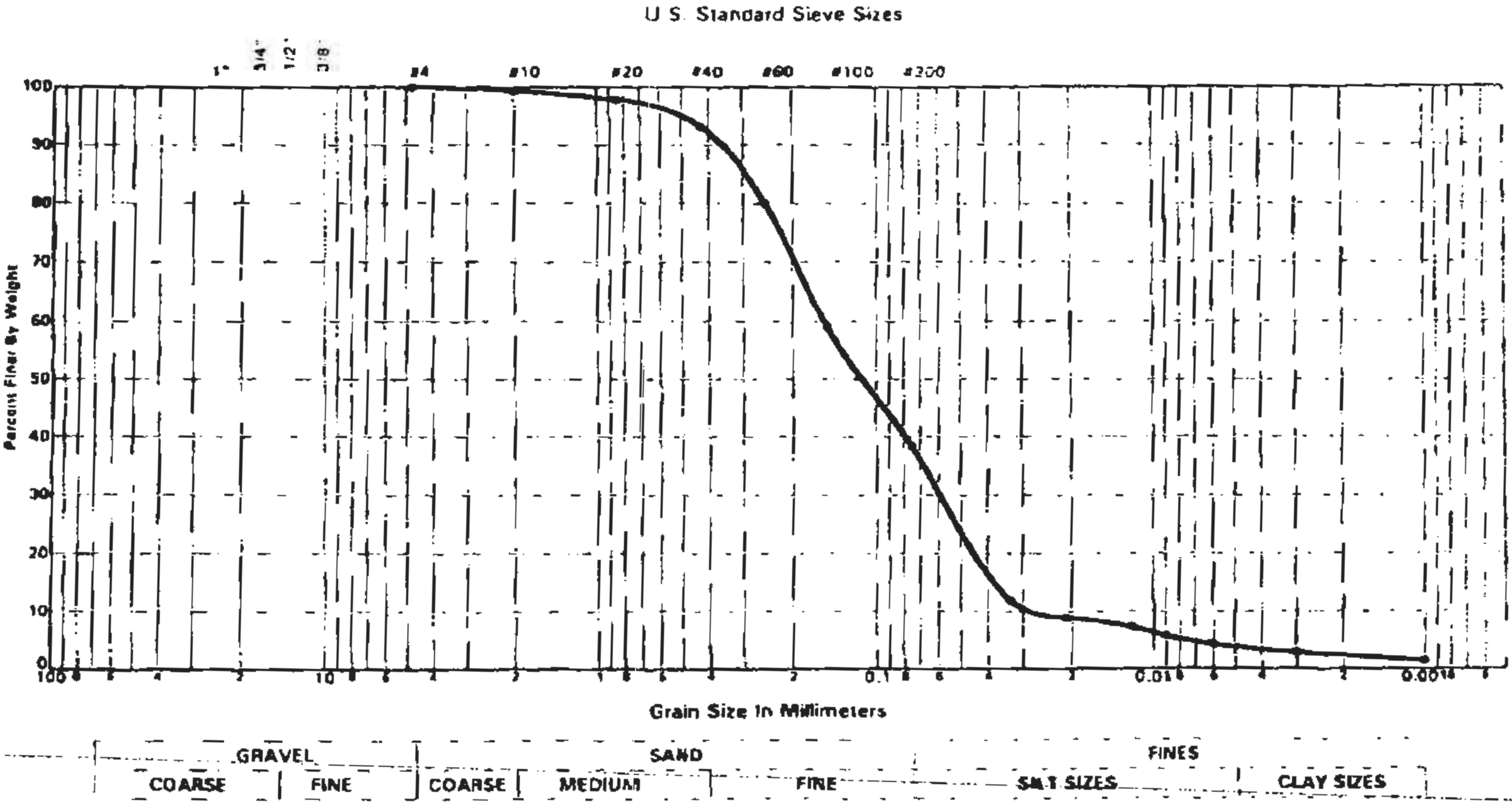
Boring No.	Elev./Depth	Nat. W.C.	L.L.	P.L.	P.I.	Soil Description or Classification
B-2 (6)	28.5'-30.0'	29.4	[illegible]	[illegible]	[illegible]	Dark Gray Slightly Clayey Fine Sandy SILT (ML)

GRAIN SIZE DISTRIBUTION

Project:
Pitt County Landfill
Greenville, North Carolina

Job No.: 1-00-1100-CA

Date: 11/17/00



Boring No.	Elev./Depth	Nat. W.C.	L.L.	P.L.	P.I.	Soil Description or Classification
B-2 (7)	33.5'-35.0'	27.3	37.4	24.6	12.8	Dark Gray Silty Fine to Medium SAND (SM)

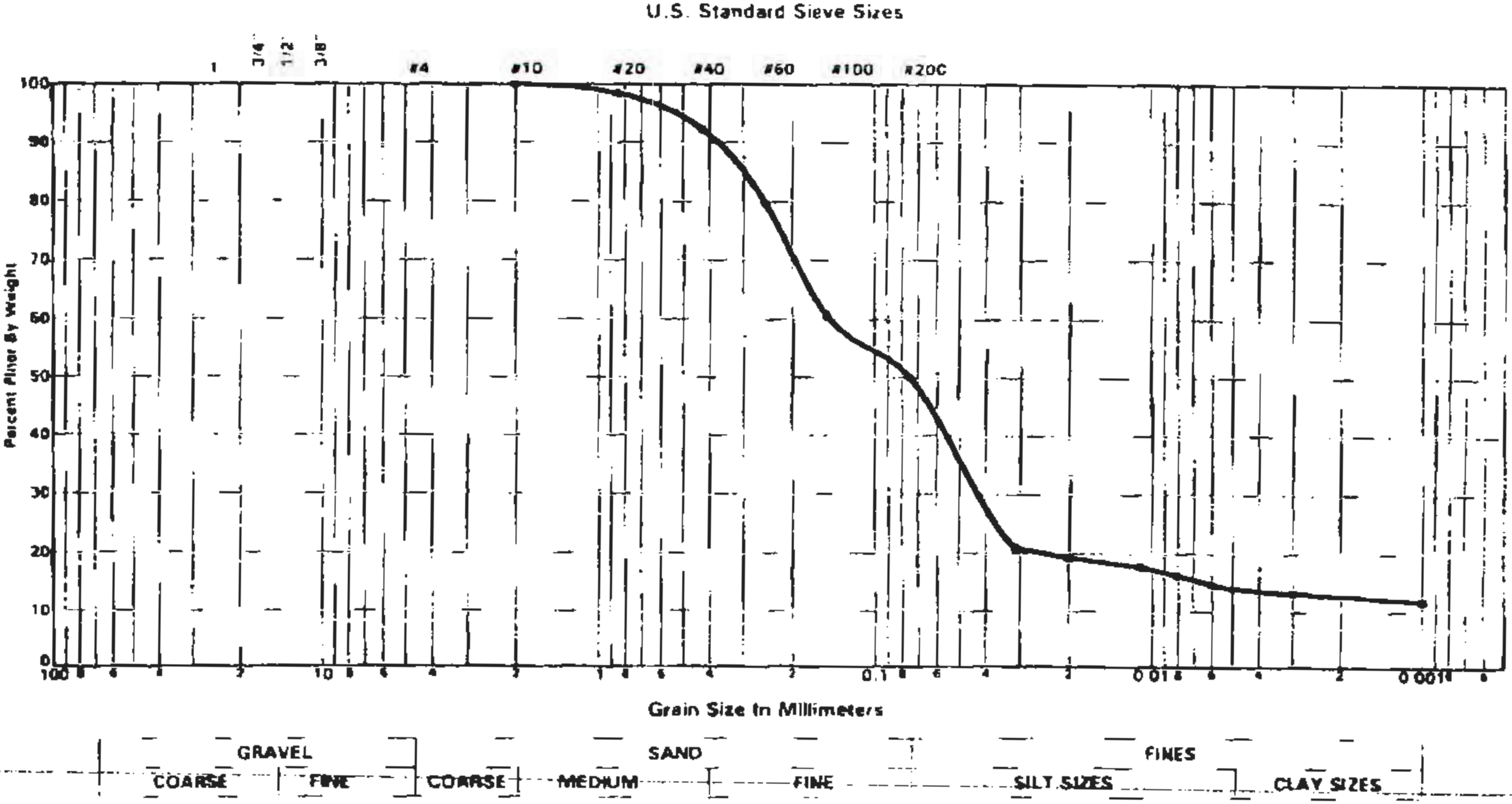
Project:
Pitt County Landfill
Greenville, North Carolina

Job No.: 1-00-1100-CA

Date: 11/17/00

GRAIN SIZE DISTRIBUTION

GeoTechnologies, Inc.



Boring No.	Elev./Depth	Nat. W.C.	L.L.	P.L.	P.I.	Soil Description or Classification
TP-8Grab	24"-48"	16.0	21.2	14.3	6.9	Tan Gray-Reddish Brown Clayey Fine to Medium Sandy SILT (ML)

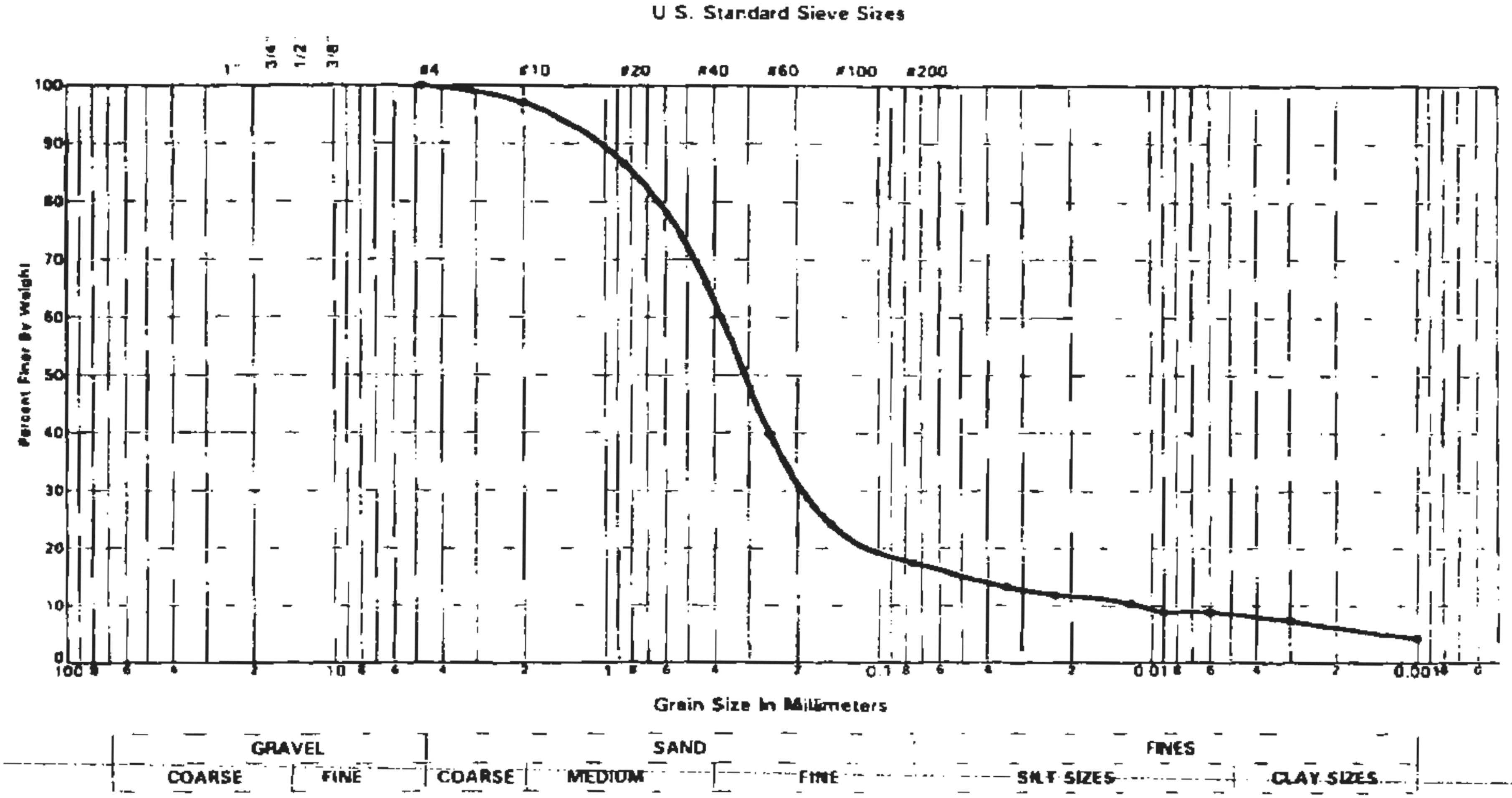
Project:
Pitt County Landfill
Greenville, North Carolina

Job No.: 1-00-1100-CA

Date: 11/17/00

GRAIN SIZE DISTRIBUTION

GeoTechnologies, Inc.



Boring No	Elev./Depth	Nat. W.C.	L.L.	P.L.	P.I.	Soil Description or Classification
TP-4 (3)	8"-39"	13.3	NP	NP	NP	Tan Yellow Slightly Clayey Silty Fine to Medium SAND (SM)

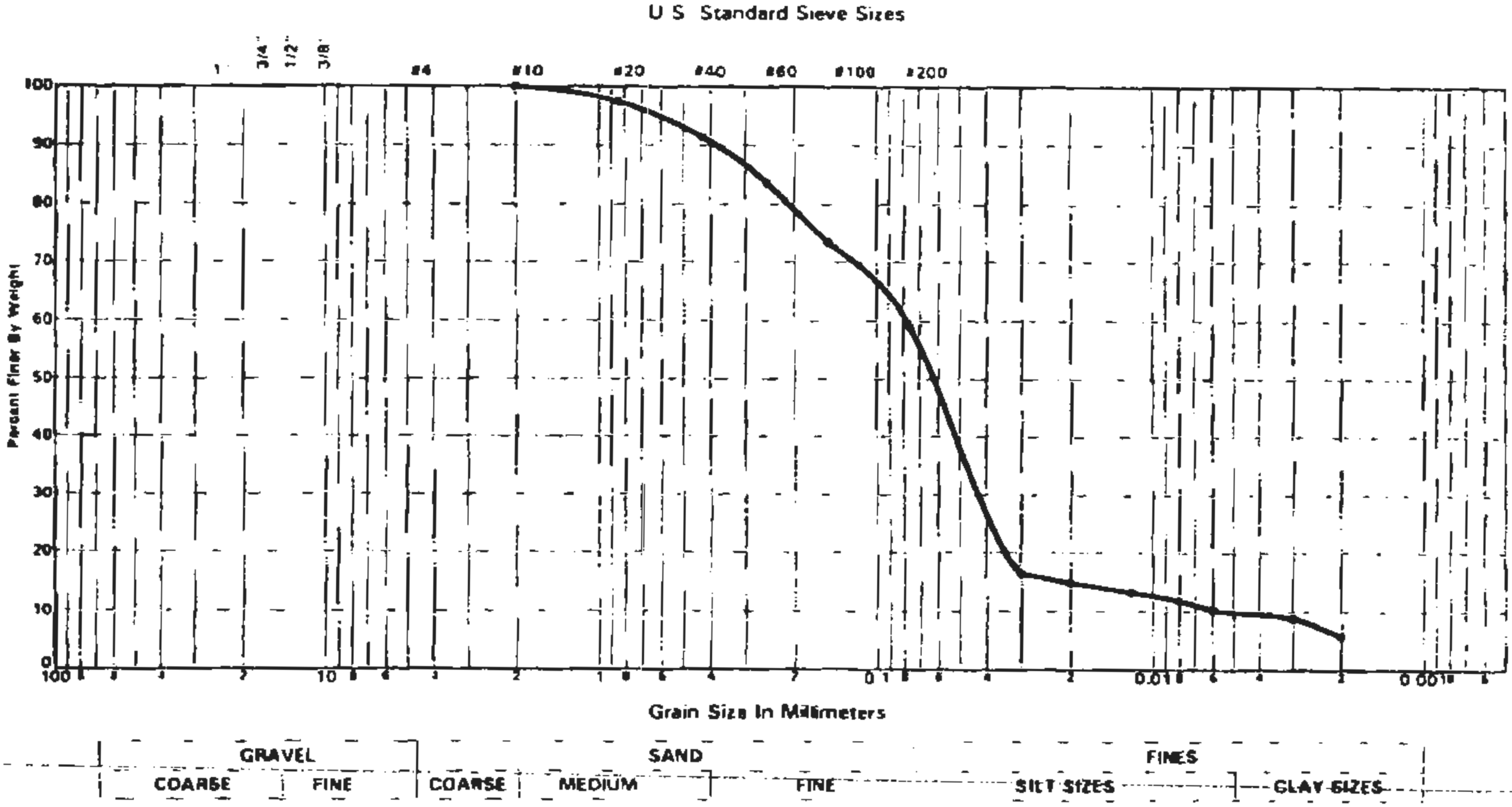
Project:
Pitt County Landfill
Greenville, North Carolina

Job No.: 1-00-1100-CA

Date: 11/17/00

GRAIN SIZE DISTRIBUTION

GeoTechnologies Inc



Boring No	Elev /Depth	Nat W C	L L	P L	P I	Soil Description or Classification
TP-4 (2)	39'-72	18.0	36.9	18.1	18.8	Yellow Orange Clayey Fine Sandy SILT (CL-ML)

Project:
Pitt County Landfill
Greenville, North Carolina

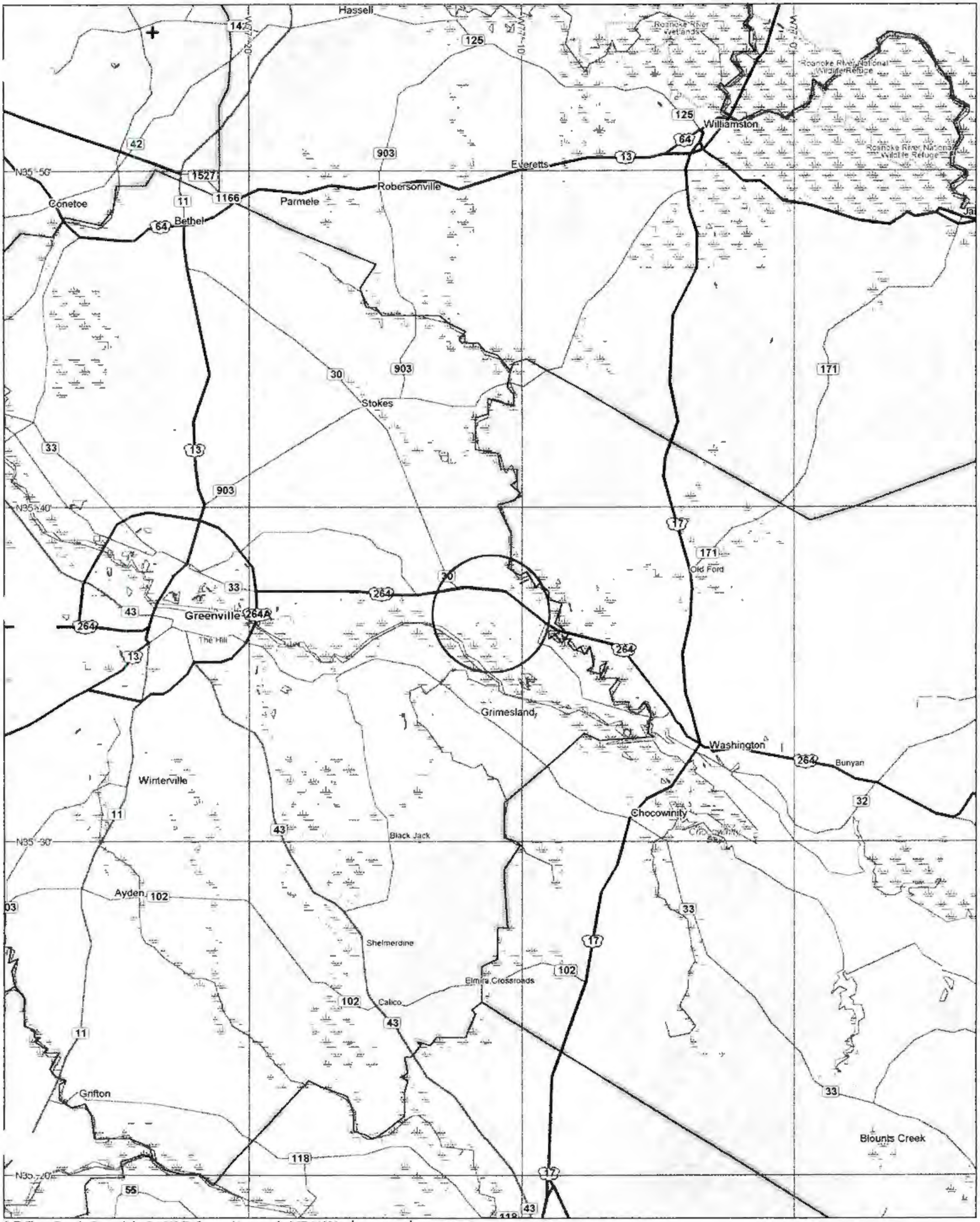
Job No.: 1-00-1100-CA

Date: 11/17/00

GRAIN SIZE DISTRIBUTION

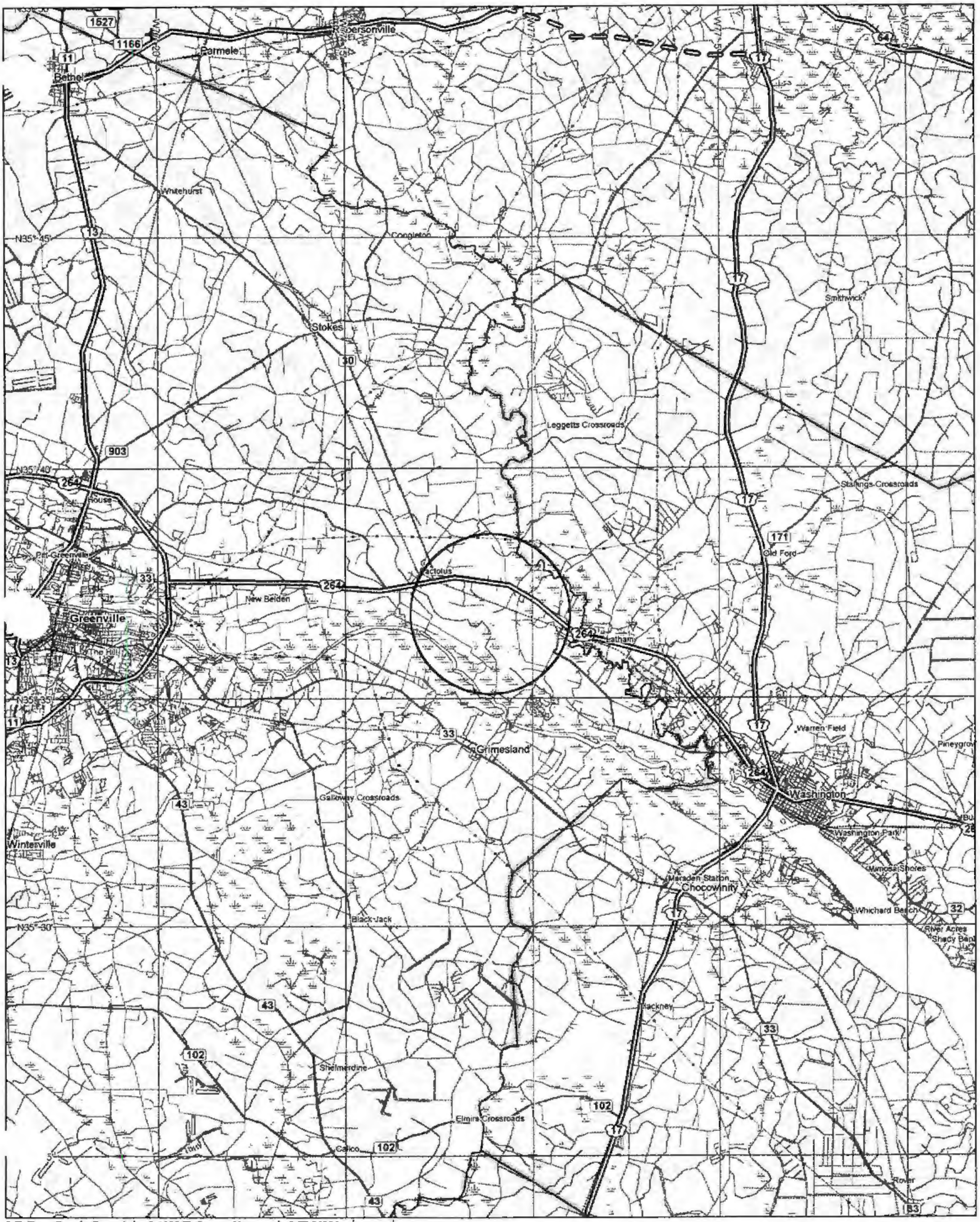
GeoTechnologies Inc

APPENDIX E
Supplemental Info.

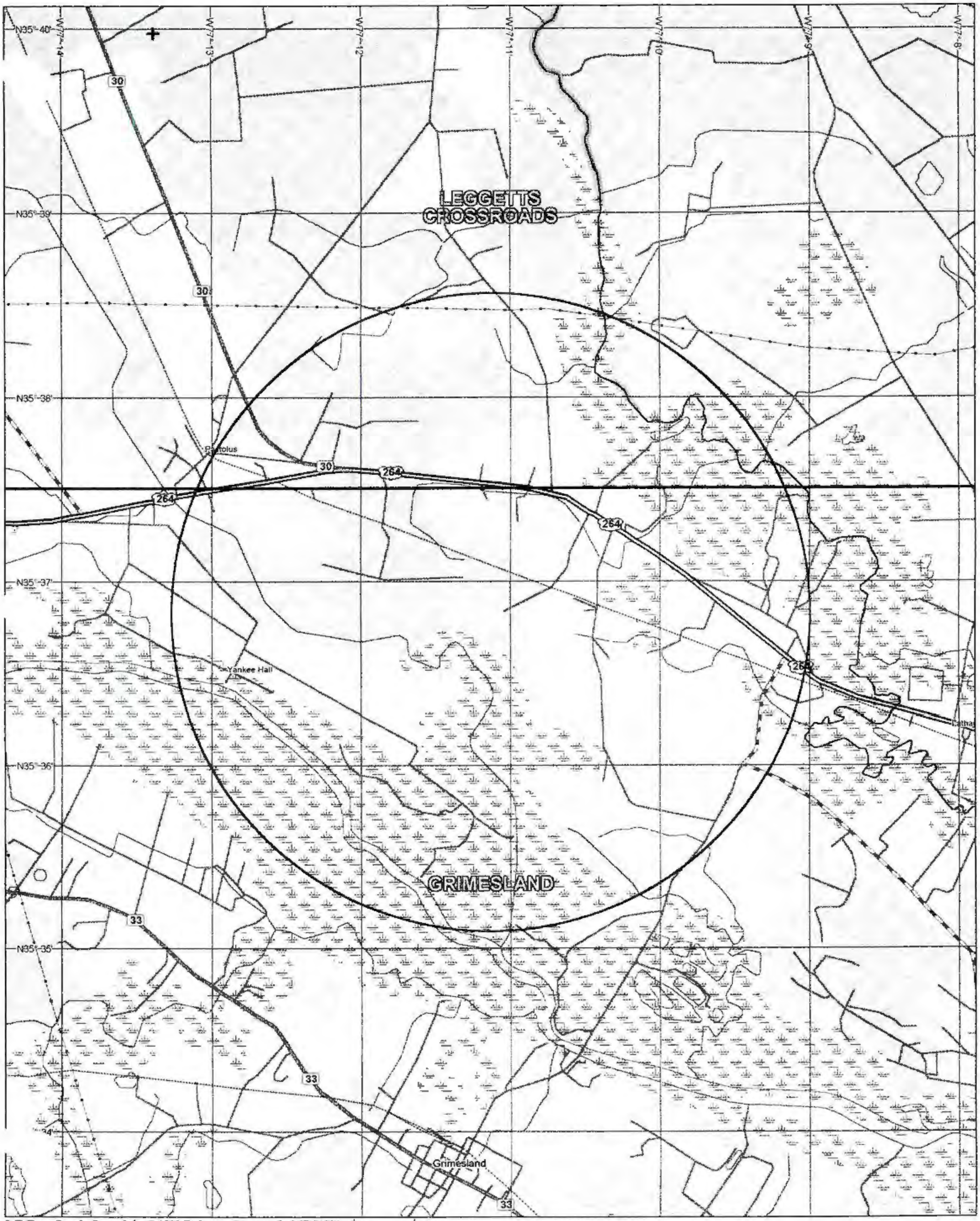


Hassell
Roanoke River Wetlands
Roanoke River National Wildlife Refuge
Williamston
Everetts
Robersonville
Parmele
Conetoe
Bethel
Stokes
Old Ford
Greenville
The Hill
Grimesland
Washington
Bunyan
Winterville
Chocowinity
Black Jack
Ayden
Shelmerdine
Elmira Crossroads
Calico
Grifton
Blounts Creek
N35°50'
N35°40'
N35°30'
N35°20'

1" = 2 mi


Robersonville
Parmele
Bethel
1527
1166
11
13
17
64
Whitehurst
Congleton
Stokes
30
Smithwick
Leggetts Crossroads
903
264
N35°45'
N35°40'
N35°35'
N35°30'
Pactolus
New Belden
Greenville
Latham
Old Ford
171
Stallings Crossroads
33
Grimesland
Warren Field
Piney grov
Washington
Washington Park
Galloway Crossroads
43
Winterville
Marsden Station
Chocowinity
Mimosa Shores
Whichard Beach
32
River Acres
Shady Ben
Black Jack
Blackney
102
Shelmerdine
Elmira Crossroads
Calico
Rover
The Hill

1" = 1 mile



N35°-40'
N35°-39'
N35°-38'
N35°-37'
N35°-36'
N35°-35'
W77°-14'
W77°-13'
W77°-12'
W77°-11'
W77°-10'
W77°-9'
W77°-8'
LEGGETTS CROSSROADS
GRIMESLAND
Grimesland
Yankee Hall
30
33
264

1" = 2000'


W77°12.5'
W77°12'
W77°11.5'
W77°11'
W77°10.5'
N35°38'
N35°37.5'
N35°37'
N35°36.5'
N35°36'
N35°35.5'
Pocoson
Cem
Tranters
Sandpits
1550
30
264
Cem
SEABOARD
COAST
GRINDLE
CREEK
RIVER
1560
15
20
25
10
5

1" = 1000'

David Garrett, P.G., P.E.
Engineering and Geology

September 14, 2000

John Tucker, P.E.
Consulting Engineer
P.O. Box 297
Fuquay-Varina, North Carolina 27526

**RE: Report of Preliminary Site Evaluation
Proposed C&D Landfill at EJE Recycling, Inc.
Pitt County, North Carolina**

Dear John:

I am pleased to present this summary of findings from a site reconnaissance and test pit investigation performed September 7, 2000 at the referenced project site. On that date, you and I were met and assisted by Mr. Judson Whitehurst of EJE Recycling, Inc., and his staff. This report confirms the verbal information discussed in recent telephone conversations.

The test pits were dug with a large, ruhber-tire excavator within a fallow field, estimated at approximately 27 acres. Eight test pits were dug at locations determined with a hand-held GPS unit. The test pits were situated around the north, west and south perimeter of the field, with one placed approximately in the middle. The field slopes gently to the northeast (toward the entrance road and TP-1). North of this location is a swampy tributary to Grindle Creek. The tributary drains to the southwest; Grindle Creek is located south of the proposed CDLF site. Surface elevations within the proposed CDLF site vary from approximately El. 12 to El. 16, based on verbal information relayed to me. Beyond the clearing, the land drops abruptly several feet onto a flood plain or old terrace to Grindle Creek. The creek is a tributary to the Tar River. Test pit data are attached.

The purpose of the investigation was to determine evidence of the seasonal ground water fluctuation. Often this can be determined by observing soil chroma, e.g. streaks or mottling in the soil pigment. Iron oxide pigments can migrate with and concentrate in the soils along the top of a water table, often leaving distinct bands, blotches or streaks. Such mottling was observed a most of the test pit locations, but it is not entirely clear (except in a couple of cases) whether the mottling represents recent or past water table migration. Whereas the entire area has uplifted relative to sea level over the past many millennia, past water table fluctuations recorded by soil mottling might not be representative of recent trends.

In addition, potentiometric surfaces within the regional deep aquifers have decreased significantly over the last few decades due to heavy ground water extraction. This deep aquifer pumping should not, however, have a significant effect on relatively shallow unconfined aquifers. The close proximity of ground water discharge features and climate are the controlling factors for seasonal water table positions within undeveloped tracts in this region. As such, we need to correlate the on-site observations with historic trends in nearby ground water observation wells [1] and climate [2]. While the deeper wells in the region may reflect a generalized trend in the overall availability of ground water through recharge and withdrawal, the influences of pumping and confining layers will not be entirely appropriate for determining the probable trends in the shallow aquifer at the site, except that the seasonal fluctuation of water levels in the shallower wells may be representative.

Based on the topography and current land use, the CDLF site likely experiences relatively high ground water recharge through surface water infiltration. The shallow unconfined aquifer is characterized as a short-segmented closed-loop hydrologic cycle, that is, recharge occurs over most of the site, feeding mainly lateral ground water movement toward discharge points located along Grindle Creek and its tributaries. The water table is considered to "mound" in the wet season, influenced by deeper confining layers identified in the regional geologic framework that limit vertical percolation. Seasonal fluctuation in the water table "mound" results from the balance of available moisture through precipitation, soil drainage (anticipated to occur readily within the on-site sands) and evapotranspiration.

Considering water balance, the site has a low surface gradient and is underlain by a porous surface soil. The natural vegetative cover (formerly a mature forest) has been removed (the current vegetation is shallow-rooted weeds), along with the fact that the fields are plowed (which inherently increases surface water infiltration), evaporative water uptake is limited on this site, even the summer months. The test pits indicate that the soils are relatively coarse sands (except for a discontinuous clay layer), which limits the available capillary rise relative to finer grained soils [3]. Typically, the water table rises beneath a site when the trees and other large vegetation are removed.

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[1]The North Carolina Division of Water Resources maintains a data base for regional ground water trends, available on-line at http://dwr32.enhr.state.nc.us. The site also presents geologic information collected in several water well logs, many of which extend hundreds of feet in depth. From these records, one can determine the major regional aquifers and confining layers, which will assist in planning an investigation for the proposed landfill.

[2]The National Climatic Data Center, a division of the National Oceanic and Atmospheric Administration, maintains regional climatic data for multi-county areas throughout the United States. These data include regional rainfall and mean temperature data, in additional to the Palmer hydrologic indices, and are available on-line at http://www.ncdc.noaa.gov.

[3]Skaggs, R.W., 1992, unpublished notes for university course BAE 671, Advanced Drainage and Saturated Flow, N.C. State University, Dept. of Bioagricultural Engineering, referencing the following:

Childs, E.C. 1969. The Physical Basis of Soil Water Phenomena. John Wiley and Sons, New York, pp. 115-152.

Freeze, A., and J.A. Cherry. 1979. Groundwater. Prentice-Hall, Inc., Englewood Cliffs, N.J., pp. 36-38.

Kirkham, D. and W.L. Powers. 1972. Advance Soil Physics. Willey-Interscience, New York.

Klute, A. 1964. Water Capacity. In Methods of Soil Analysis, Part I. C.A. Black et.al. (Eds.) Agronomy Monograph No. 9, American Society of Agronomy, Madison, WI, pp. 273-278.

Raats, P.A.C., and W.R. Gardner. 1974. Movement of water in saturated zone near a water table. Chapter 13 in Drainage for Agriculture, J. van Schilfgaarde, Ed., Agronomy Monograph No. 17, American Society of Agronomy, Madison, WI, pp. 331-357.

The clay layer, where present, could be considered a confining layer that further limits the vertical flux of water in both directions. Thus, the ground water is considered to be in a "steady state" condition, meaning that the position of the water table is directly responsive to precipitation. Given the recent rainfall trends and limited upflux, the water table is not expected to vary much at the site except in times of prolonged drought. The climatic data do not indicate drought conditions. All available data indicate that while the water table may not be at the seasonal high, conditions are not likely to cause the water table to rise much higher than it is presently.

Test Pit Data

A summary table of data for eight test pits within the proposed CDLF footprint is presented as Attachment 1. The test pits reveal that the current position of the water table varies from 4 feet below the surface at TP-1 (located near the entrance road at the north corner of the diamond-shaped clearing) to 8 feet below the surface at TP-6 (in the south corner). Ground elevations have not been precisely measured, but the change in depth to ground water approximately reflects the slope of the surface toward the north side of the clearing. Thus, the water surface is fairly flat. Without ground elevations it cannot be determined which direction the water table slopes (presumably, it would slope toward Grindle Creek, located south of the clearing).

Nearly all test pits exhibit strong color mottling, often as large splotches, sometimes as distinct horizontal bands. Faint mottling was observed beginning about 30 inches below the surface at TP-1 and at other locations, while strongly colored mottles were observed within 12 to 24 inches above the water surface at most other locations, e.g., TP-4 (see photograph). It cannot be precisely determined when the faint coloration occurred. However, the strong coloration at TP-4 appears fresh and it can be concluded that the water movements that caused the mottling just above the water table at TP-4 and other locations occurred more recently. Presumably, the current water table should represent a seasonal low or near average depth at this time of year, although the maximum fluctuation might be no more than a couple of feet this close to a major discharge feature and due to the recharge and evaporative conditions. Based on these observations, it appears that recent ground water fluctuations have been on the order of 24 inches, or less.

Regional Climatic Data

A summary of climatic trends for North Carolina Division 7 is presented as Attachment 2. The yearly data show precipitation and several of the Palmer indices, notably the Palmer Modified Drought Severity Index (PMDI) and Z Index. The PMDI reflects a relative moisture balance averaged over time and from a number of weather recording stations throughout the region. This index considers the complex interaction of precipitation, temperature, leaf development (in the growing season), winds and solar radiation on the moisture ambient balance, calculated on a periodic interval (monthly). The Z Index shows the deviation of precipitation from "normal" conditions within that same period. While the Palmer indices are not a numerical tool that can predict ground water recharge and evaporative losses, *per se*, they are useful for a qualitative determination of what probable conditions were for a period of interest, relative to observed water levels. Thus, the observed trends in ground water level data can be correlated to the Palmer Indices to extrapolate outside the period of record for establishing the maximum seasonal high water level.

The Division 7 data indicate that four out of the past six months have experienced normal to slightly below normal moisture, with both PMDI and Z Index values dipping slightly below zero some months. Rainfall tallied for August 2000 was nearly 8 inches, which brought the Z Index to a positive value (upper range of "normal") but the PMDI remained negative, indicating high evaporative losses (but still within the "normal" range). Other Palmer indices (Hydrological Drought Index and Drought Severity Index) indicate normal conditions with slightly positive values within the past few months and reflect the slightly wetter conditions experience in August. Data for 1999 show conditions on the dry side of normal (mild drought conditions) until September, when the area received high rainfall due to the hurricane, after which the climate remained wet for the duration of the year, even though the rainfall turned below normal for the last two months of 1999.

Looking back through the historical data (over 105 years) the rainfall experienced in September 1999 was record setting for a monthly total. However, this event was relatively short-lived, as the PMDI record did not record September 1999 as all that unusual – while a wet spell was recorded during September through October, the data are consistent with long-term trends, showing more or less normal average PMDI values over a several month period in either direction. What this means to the analysis of ground water trends is that ambient conditions have been more or less normal with respect to rainfall and evaporative losses during the last several months, discounting the hurricane event. *Site personnel indicated that while proposed the CDLF site did receive high rainfall, as did the region, the immediate area did not flood.* As such, since the area has not experienced recent drought conditions, ground water levels at the site should reflect normal conditions for this time of year. Also, data from nearby ground water observation wells should reflect mostly normal conditions and a representative trend in the aquifer response to the climatic trends.

Regional Ground Water Data

The North Carolina Division of Water Resources maintains an extensive network of ground water observation wells, in part through inter-agency cooperation. Selected ground water data and a location map (presented as Attachment 3) show numerous wells within 10 miles of the subject site, most of which monitor draw down trends in the deeper regional aquifers due to ground water pumping near Greenville, Washington, Aurora and other locales. Two such wells are owned by the Town of Grimesland (DWR designation N22I), located about two miles south of the site, and a pilot well for the City of Washington (M21Q2), located a mile or two east. The latter serves as an observation well for a deeper production well (730 feet deep).

These wells, typical of the region, extend to depths of 250 and 158 feet, respectively, and both encountered confining units in the Castle Hayne, Beaufort, Pee Dee and/or Black Creek Formations, as well as capable units within these formations. The top of the Castle Hayne confining unit occurs at El. -8 at N22I, with a thickness of 25 feet (the confining layer was not encountered at M21Q2). Presumably, this confining unit (though probably not the silt-clay unit encountered in the test pits on the CDLF site) serves to isolate the hydraulic of the aquifers above and below the confining unit. Regardless, the seasonal aquifer trend at M21Q2, based on data that extend to 1965, shows an average variation of less than 24 inches, with a maximum of nearly 3 feet in 1977. The downward trend in the water table is due to prolonged pumping, and these effect should not affect the relatively isolated near-surface aquifer at the CDLF site. However, the seasonal variation shown in this well is relevant, despite the depth at which the well is screened (150 to 155 feet). This is not a substitute for on-site piezometer data, but the trend fits with the mottling pattern observed at the test pits.

Summary and Closing

Based on the strong color mottling observed in the test pits, it appears that the typical seasonal fluctuation in the unconfined near-surface aquifer is on the order of 24 inches. The estimated high water table should be no more than 24 inches above the observations of September 7, 2000. Faint mottling makes evident past water table movement, but it cannot be determined when this occurred relative to the complex geologic history of the region. The climatic data indicate that mostly normal average moisture conditions have been experienced (arguably, on the wet side of "normal") within the region during the past several months – at least, the area has not been in a severe drought, which would be expected to cause lower than normal water levels. Conditions on the flat, denuded site are optimal to experience high surface water infiltration (ground water recharge) and relatively low evaporative losses.

Nearby monitoring wells observations indicate that the estimated 2-foot ground water fluctuation is typical of the nearby region. Based on past experience, the surficial aquifer on this site is not expected to fluctuate significantly, due to the close proximity of the discharge feature. What has not been discussed, to this point, is the possibility that another confining unit exists a relatively shallow depths beneath the bottom of the test pits – the water levels observed could be perched, but we must assume the relatively unconfined sands encountered in the test pits represents the shallowest aquifer by regulatory definition.

While it cannot be said that current conditions represent the seasonal high water table, I believe this preliminary data indicates a positive trend relative to pending plans for site development. A thorough hydrogeological investigation is required, including the installation of long-term ground water observation devices. The regional data suggest that a few borings and piezometers should be extended to depths of approximately 70 feet to encounter a deeper confining unit within either the Beaufort or the deeper Pee Dee Formation, while most of the test borings could justifiably terminate within the confining unit of either the Beaufort or the overlying Castle Hayne Formation, depending on the depth of these units.

It should be noted that the site vicinity is within the recharge zone of the Castle Hayne, a regional aquifer that is highly developed as a water supply further east. This unit may or may not be present at the site. The deeper aquifers, including the Black Creek and Cape Fear Formations, are very deep and isolated by numerous confining layers – these units should not be affected by development of the site and I can see no need to characterize the site to the depth of these formations.

I appreciate the opportunity to be of service on this project. Please do not hesitate to contact me if I can be of further service.

Sincerely,

NORTH CAROLINA LICENSED SEAL 983

9/14/00

G. David Garrett, P.E., P.E.
NC Licensed Geologist No. 983

ATTACHMENT 1

Preliminary Test Pit Investigation
Pitt County Site (EJE Recycling, Inc.)

September 7, 2000

Eight test pits (Nos. 1 - 8) were dug within the proposed CDLF footprint at the following locations (determined by GPS). Four additional test pits (9 - 12) were dug in proposed soil borrow area further west. The CDLF is situated on higher ground than surrounding areas, with an approximate elevation change of 5 feet over the 27-acre tract, sloping gently northeast to a drainage feature that flows west and south toward Grindle Creek. The creek is located south of the proposed CDLF site and borrow area. The CDLF site is a cultivated field, now fallow, with a plow line extending approximately 12 inches below the surface. The proposed borrow areas appear to have been recently timbered.

Test Pit No.	Latitude	Longitude	UTM Easting	UTM Northing
TP-1	35°36.892	77°11.119	302073	3943427
TP-2	35°36.881	77°11.162	302008	3943412
TP-3	35°36.870	77°11.203	301946	3943394
TP-4	35°36.839	77°11.182	301977	3943337
TP-5	35°36.809	77°11.192	301960	3943280
TP-6	35°36.775	77°11.152	302019	3943216
TP-7	35°36.802	77°11.104	302093	3943265
TP-8	35°36.826	77°11.127	302060	3943310
TP-9	35°37.305	77°11.867	300962	3944221
TP-10	35°37.242	77°11.789	301077	3944101
TP-11	35°37.137	77°11.235	301910	3943870
TP-12	35°37.175	77°11.372	301704	3943963

Photo #

TP-1 Located nearest the entrance road, lowest elevation (P9070028) (P9070029)

0 - 8" Brown silty sand (topsoil)
8 - 30" Tan slightly silty sand (SW)
30 - 48" Light orange silty sand (not mottled)

Ground water encountered at 48", estimated seasonal high water level suspected at 30" at this location

TP-2 (P9070030)

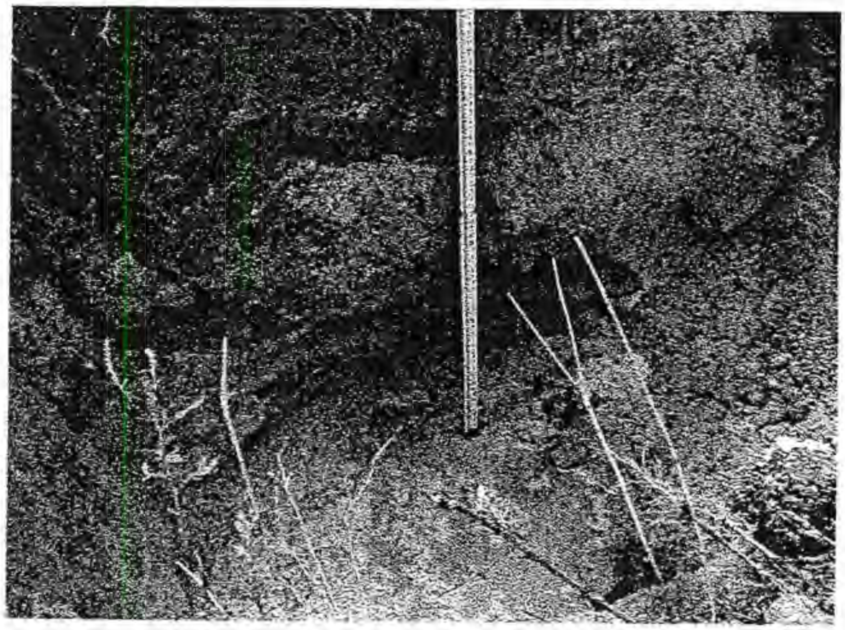
0 - 12"	Brown silty sand (topsoil)
12 - 32"	Tan slightly silty sand
32 - 60"	Tan and brown mottled sand, distinct color banding

Damp, but no water encountered to 60" (pit collapsed in about one hour)

TP-3 (P9070031)

0 - 16"	Brown silty sand (topsoil)
16 - 32"	Red-orange silty clay, moist, plastic (CL)
32 - 84"	Tan and red-orange blotched slightly silty sand

Ground water encountered at 84", distinct mottling about 12 inches above water, estimated seasonal high water about 72", caving at 64" within capillary fringe, bulk sample taken from clay layer



TP-4 See Above (black clip on gauge stick is 3.2 feet from bottom) (P9070032) (P9070033)

0 - 8"	Topsoil
8 - 39"	Red-orange moist silty clay with occ. sand lenses
39 - 72"	Buff-tan blotched slightly silty sand with clay balls

Ground water encountered at 72"
Grab samples taken of clay layer, slightly silty sand and clayey sand

TP-5 (P9070034)
(P9070035)

0 - 12"	Topsoil
12 - 32"	Red-orange silty clay (CL or ML)
32 - 72"	Buff-tan mottled sand, layered coloring

Ground water encountered at 72", mottling pronounced ±12 inches above water

TP-6 (P9070036)

0 - 12"	Sandy topsoil
12 - 24"	Buff silty sand
24 - 48"	red-orange sandy silt with clay
48 - 96"	tan-brown slightly silty sand with layered mottling

Ground water encountered at 96"

TP-7 (P9070037)

0 - 12:	Topsoil
12 - 24"	Buff silty sand
24 - 46"	Red-orange clayey silt or silty clay
46 - 84"	Buff and orange-brown blotched sand

Ground water encountered at 84"

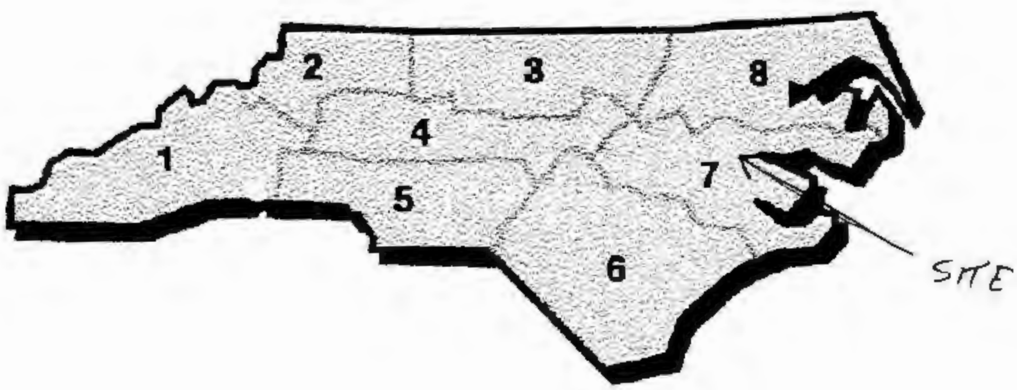
TP-8 (P9070038)

0 - 12"	Topsoil
12 - 24"	Orange clayey silt
24 - 48"	Buff-light gray clayey silt with sand lenses, faint pink mottling
48 - 72"	Buff-light gray sand with faint orange mottling

Ground water encountered at 72", grab sample taken from the clayey silt

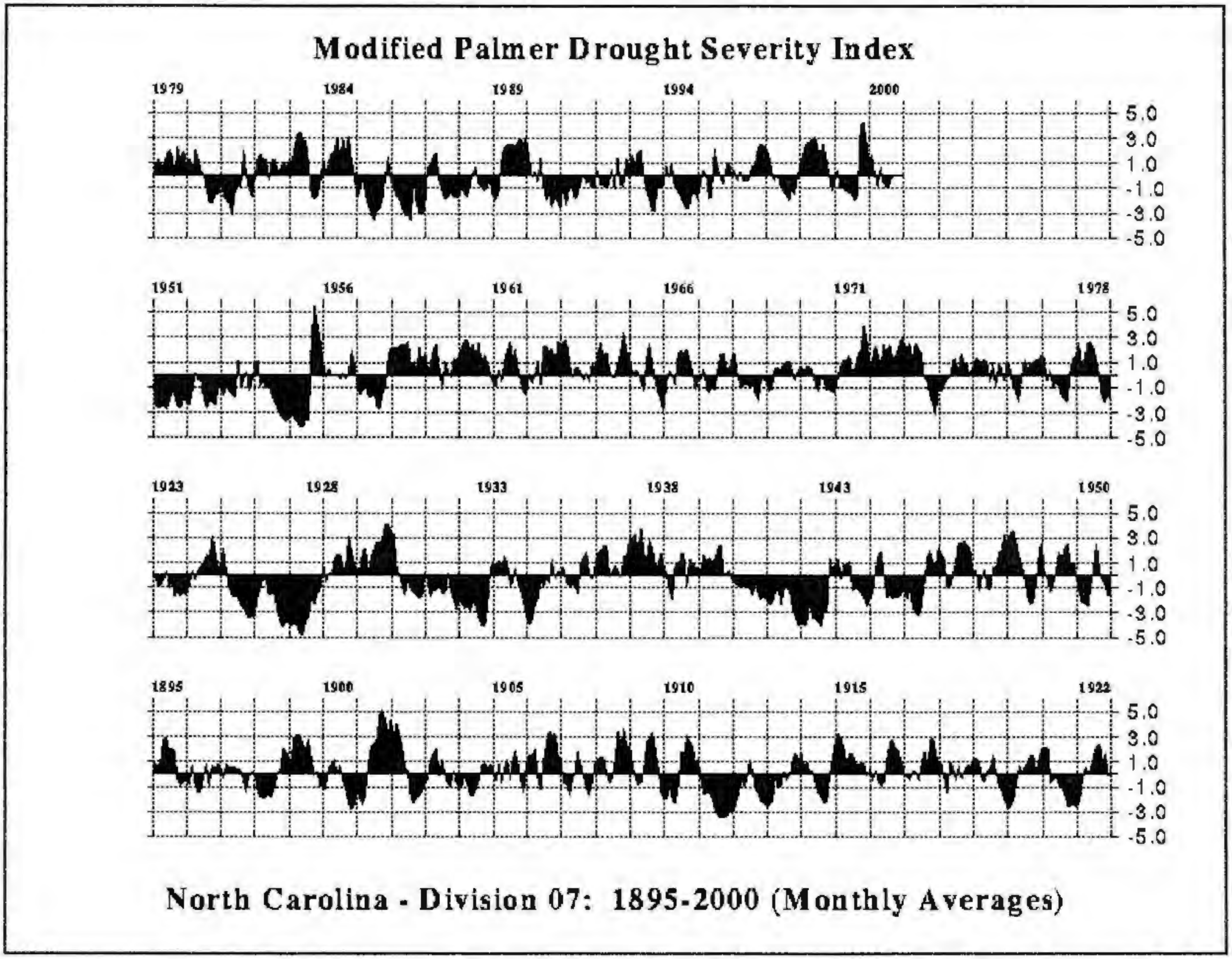
Supplemental Test Pits for Proposed Borrow Area

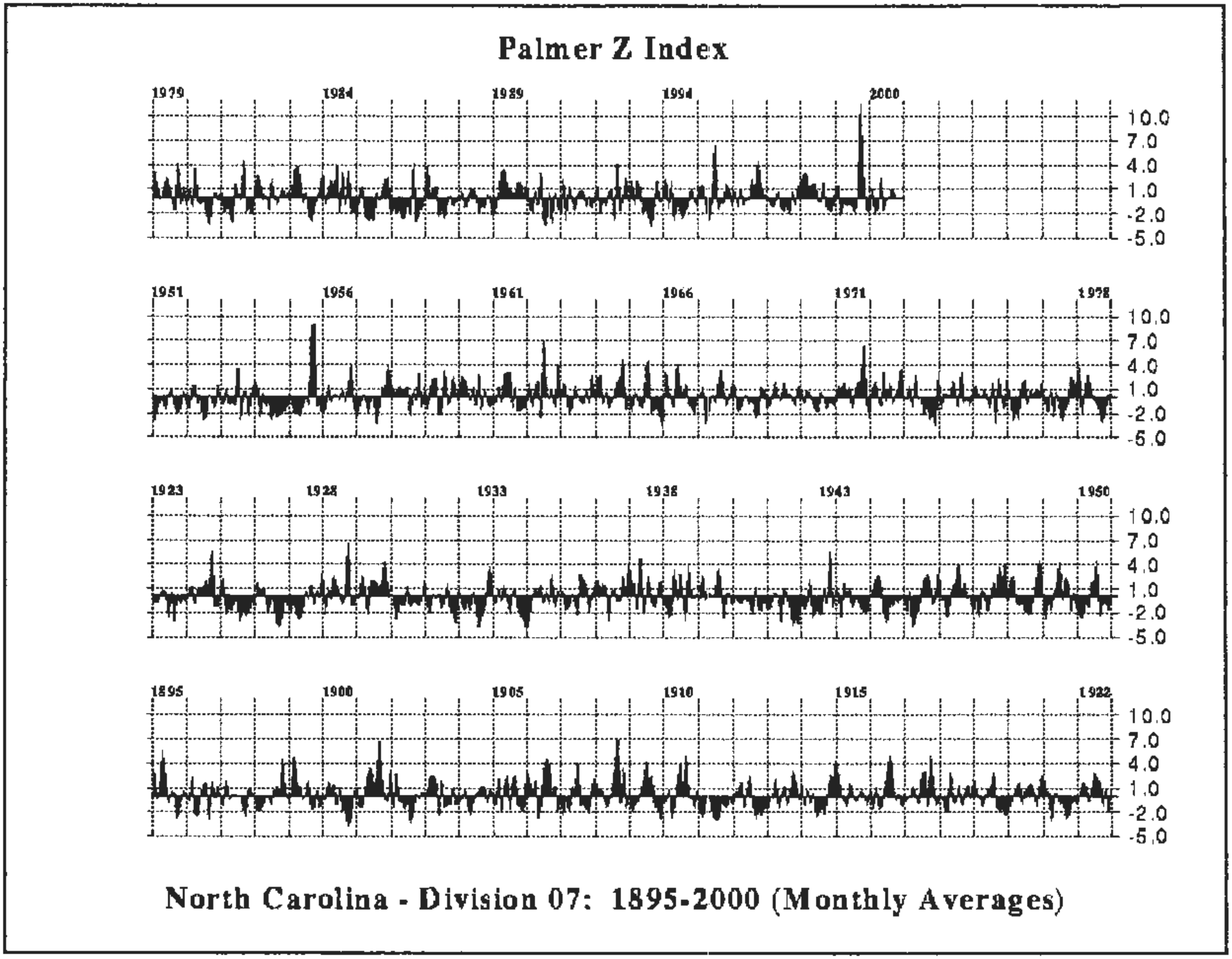
TP-9	Located just off access road crossing of rail bed, near standing water
0 - 18"	Black organic sand
18 - 36"	Gray sand, no clay
	Ground water encountered at approximately 2 feet
TP-10	Edge of new cornfield, slightly elevated area, recently timbered, adjacent to low area with marginal drainage, 200' from access road
0 - 36"	Tan moist sand, no clay or water
TP-11	Along rail bed, approximately 1000' from CDLF entrance road
0 - 48"	Buff sand, no clay or water
TP-12	Further west along rail bed (about 1000 feet back toward cornfield access road), elevated area with recently planted young pines, rail bed in 2 -3 foot cut
0 - 48"	Buff-brown sand, no clay or water


1
2
3
4
5
6
7
8
SITE

Explanation of Palmer Index Values

Range PMDI			Range Z	
3.00	3.99	Severe Wetness	2.5	3.49
1.50	2.99	Mild to Moderate Wetness	1	2.49
-1.49	1.49	Near Normal	-1.24	0.99
-1.50	-2.99	Mild to Moderate Drought	-1.25	-1.99
-3.00	-3.99	Severe Drought	-2	-2.74
<4.00		Extreme Drought	<-2.75	


Modified Palmer Drought Severity Index
1979
1984
1989
1994
2000
1951
1956
1961
1966
1971
1978
1923
1928
1933
1938
1943
1950
1895
1900
1905
1910
1915
1922
5.0
3.0
1.0
-1.0
-3.0
-5.0
North Carolina - Division 07: 1895-2000 (Monthly Averages)

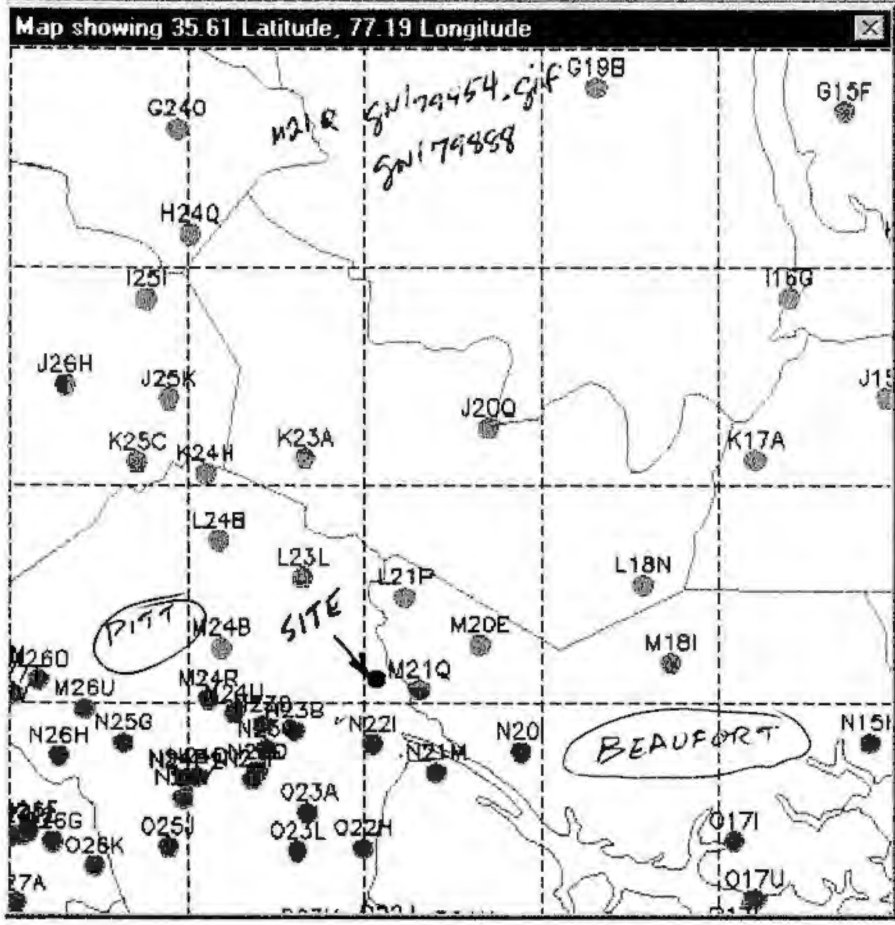

Palmer Z Index
1979
1984
1989
1994
2000
10.0
7.0
4.0
1.0
-2.0
-5.0
1951
1956
1961
1966
1971
1978
1923
1928
1933
1938
1943
1950
1895
1900
1905
1910
1915
1922
North Carolina - Division 07: 1895-2000 (Monthly Averages)

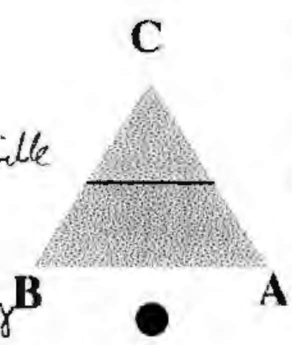
NOT PRINT { L23L Stokes Sch
L24B ENR Bethel } EHNR Chocowinity
N21M N21M2.lev.
M21Q M21Q2.lev.
N22I Town of Grimesland
N23B
D
City of Washington G
D } Eastern Pines Water Assoc.

FrameWork Query Results

M20E
M18I
My Documents GW Levels
M24B
R
U } City of Greenville
O23A
O23L1 / O23L2 .lev → O23L ENR-Chicod
O22H US Info Agency

0.2 degree grid





Boreholes

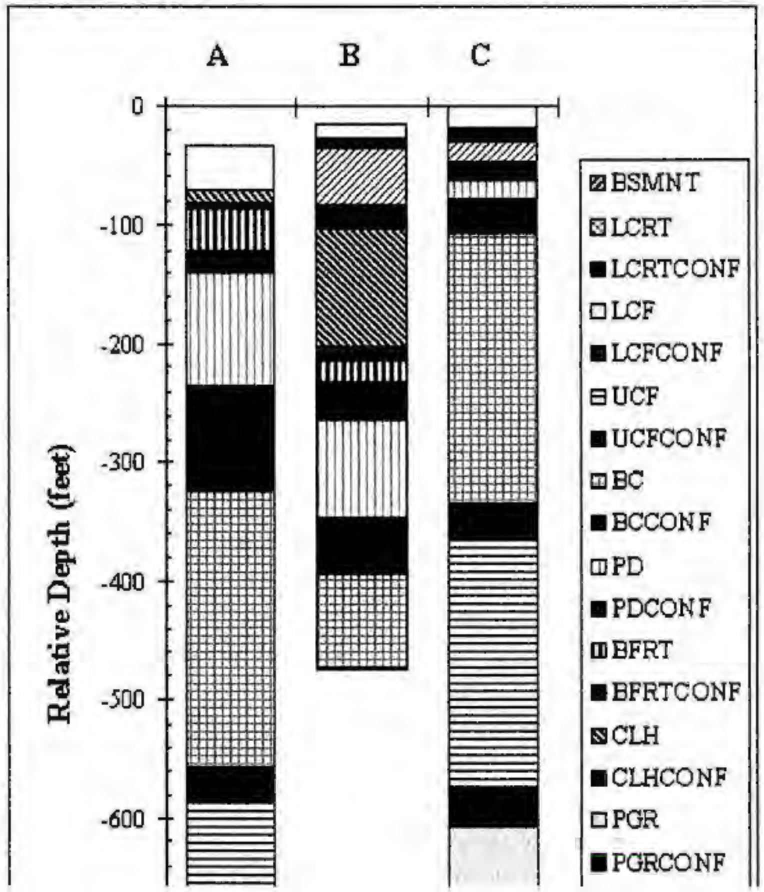
A: City of Washington Test 2, M 21Q, land surface: 15.00 feet

B: EHNR Chocowinity, N 21M, land surface: 33.00 feet

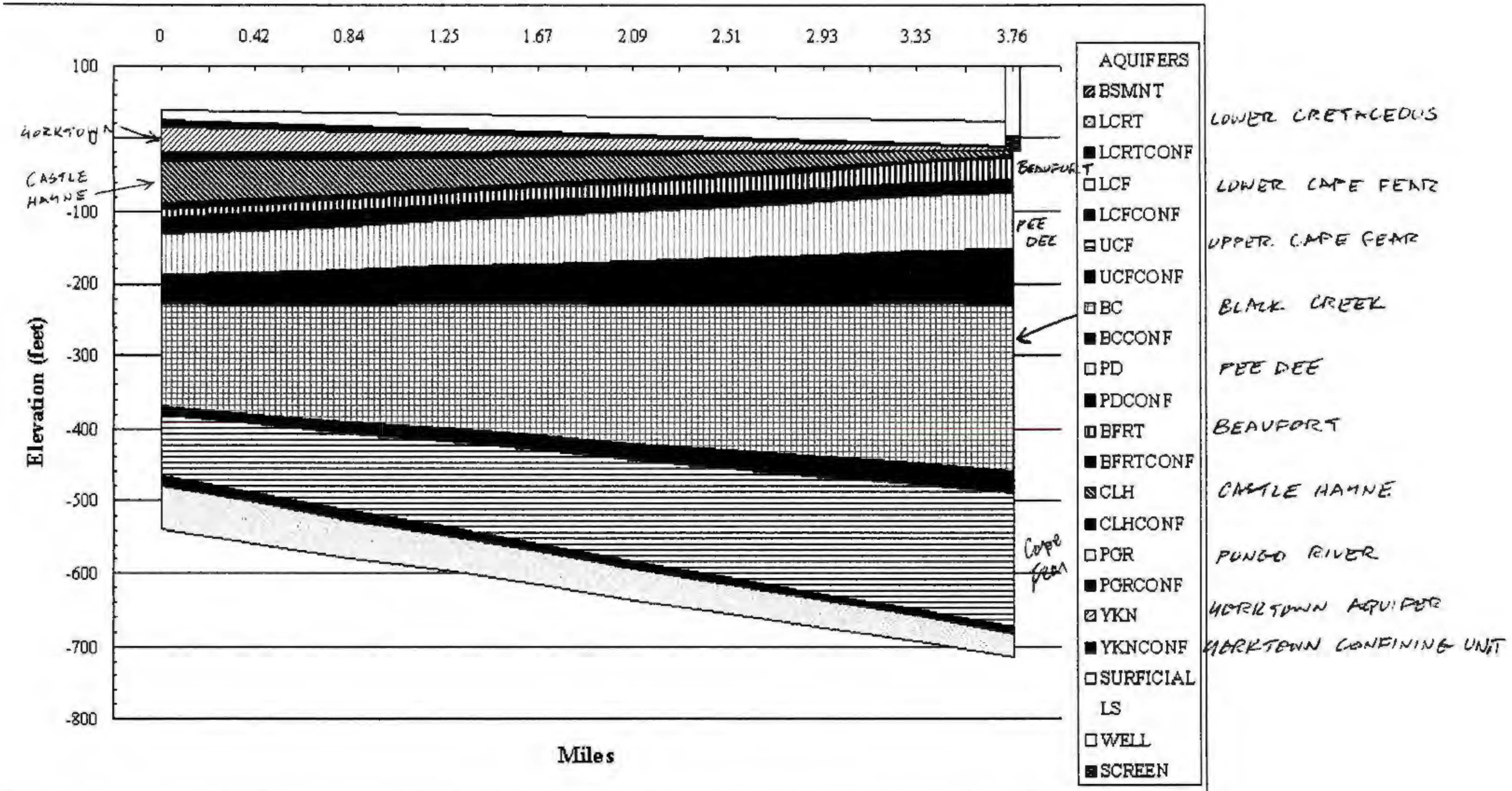
C: City of Greenville 2, M 24R, land surface: 49.00 feet

Direction that cross-section line is oriented:
SSW-NNE

Borehole Hydrology



:alculated Cross-Section



Aquifer Framework Database

Resstafr.dbf Contents

County	Quad	Name	Depth
Pamlico	Q 15U	EHNR Hobucken	1003
Pamlico	S 15Y	EHNR Whortonsville	1521
Pamlico	S 16W	E. Edwards	234
Pamlico	S 17I	Bayboro Chevrolet Co	210
Pamlico	S 18U	EHNR Arapahoe	1050
Pamlico	T 15D	Carolina Petroleum Co (API# 32-137-1)	3666
Pasquotank	C 12P	PA-T1-62	700
Pasquotank	C 12W	NCDENR Morgans Corner	1530
Pasquotank	D 11V	NCDENR Elizabeth City Forest Srv.	500
Pasquotank	D 12V	Waldorf #1 (API# 32-139-1)	2714
Pasquotank	E 10U	NCDENR Elizabeth City CGS	200
Pasquotank	E 11I	Elizabeth City RO Test	898
Pasquotank	E 11Q	NCDENR Okiska	200
Pasquotank	F 10K	NCDENR Weeksville	221
Pasquotank	F 10Q	PA-T2-62	704
Pasquotank	F 11I	NCDENR Halls Creek	199
Pasquotank	G 9C	NCDENR Big Flatty Creek	731
Pender	AA 26X	NC Oil and Gas Corp. (API# 32-141-4)	1462
Pender	AA 27W	NC Oil and Gas Corp. (API# 32-141-5) Mac	1421
Pender	AA 33L	Moores Creek National Park Test	650
Pender	BB 28J	EHNR Topsail	1348
Pender	BB 28N	NC Oil and Gas Corp. (API# 32-141-6)	1253
Pender	X 28W	NC Oil and Gas Corp. (API# 32-141-5) Cow	1000
Pender	Y 30S	NCDENR Burgaw	931
Perquimans	E 13M	EHNR Parkville	1210
Perquimans	F 13W	DWR Perquimans Test	1143
Pitt	K 24H	Town of Bethel	523
Pitt	L 23L	Stokes School	85
Pitt	L 24B	EHNR Bethel	690
Pitt	L 27X	Town of Fountain	269
Pitt	M 24B	City of Greenville 1	502
Pitt	M 24R	City of Greenville 2	754

Pitt	M 24U	City of Greenville 3	711
Pitt	M 26O	Town of Farmville 1	396
Pitt	M 26U	Bell Arthur Water Association 1	497
Pitt	M 27M	Town of Farmville 3	396
Pitt	M 27T	Town of Farmville 2	514
Pitt	M 27V	Town of Farmville 4	392
Pitt	M 27X	Town of Farmville 5	335
Pitt	N 22I	Town of Grimesland	250
Pitt	N 23B	Eastern Pines Water Association 1	440
Pitt	N 23D	Eastern Pines Water Association 2	432
Pitt	N 23G	Eastern Pines Water Association 3	456
Pitt	N 23O	Eastern Pines Water Association 4	480
Pitt	N 23P	EHNR Conley	802
Pitt	N 24P1	Town of Winterville 1	400
Pitt	N 24P2	Town of Winterville 2	654
Pitt	N 24Q	Town of Winterville 3	444
Pitt	N 24Y	Town of Winterville 4	440
Pitt	N 25G	Bell Arthur Water Association 2	408
Pitt	N 26H	Town of Farmville 6	440
Pitt	O 22H	U.S. Information Agency 2	470
Pitt	O 23A	Eastern Pines Water Association 5	514
Pitt	O 23L	EHNR Gardner-Chicod	1092
Pitt	O 25J	Town of Ayden	570
Pitt	P 23K	R.P. Gaskins	308
Pitt	P 25L	Town of Grifton	600

Aquifer Framework Database Detail for M 20E

Resstafr.dbf

Field	Data
County	Beaufort
Latitude	35.653889
Longitude	-77.070278
Location Accuracy	
Quad	M 20E
Name	City of Washington Test 1
Complete	Y
Depth	516.00
Land Surface	45.00
Yorktown CU	10000
Yorktown	17
Pungo River CU	10000
Pungo River	10000
Castle Hayne CU	-9
Castle Hayne	-29
Beaufort CU	-115
Beaufort	-134
Peedee CU	-145
Peedee	-155
Black Creek CU	-265
Black Creek	-303
Upper Cape Fear CU	10000

Upper Cape Fear	10000
Lower Cape Fear CU	10000
Lower Cape Fear	10000
Lower Cretaceous CU	10000
Lower Cretaceous	10000
Basement	10000

Aquifer Framework Database Detail for M 18I

Resstafr.dbf

Field	Data
County	Beaufort
Latitude	35.637500
Longitude	-76.854167
Location Accuracy	
Quad	M 18I
Name	Coastal Plains Oil Co. (API# 32-013-5)
Complete	Y
Depth	1526.00
Land Surface	40.00
Yorktown CU	10000
Yorktown	10000
Pungo River CU	10000
Pungo River	-63
Castle Hayne CU	-73
Castle Hayne	-90
Beaufort CU	-222
Beaufort	-245
Peedee CU	-348
Peedee	-367
Black Creek CU	-453
Black Creek	-570
Upper Cape Fear CU	-647
Upper Cape Fear	-692

Lower Cape Fear CU		-1173
Lower Cape Fear		-1243
Lower Cretaceous CU		10000
Lower Cretaceous		10000
Basement		10000

Aquifer Framework Database Detail for N 23B

Resstafr.dbf

Field	Data
County	Pitt
Latitude	35.575000
Longitude	-77.278611
Location Accuracy	
Quad	N 23B
Name	Eastern Pines Water Association 1
Complete	Y
Depth	440.00
Land Surface	62.00
Yorktown CU	36
Yorktown	28
Pungo River CU	10000
Pungo River	10000
Castle Hayne CU	10000
Castle Hayne	10000
Beaufort CU	4
Beaufort	-26
Peedee CU	-40
Peedee	-52
Black Creek CU	-113
Black Creek	-182
Upper Cape Fear CU	10000
Upper Cape Fear	10000
Lower Cape Fear CU	10000
Lower Cape Fear	10000
Lower Cretaceous CU	10000
Lower Cretaceous	10000
Basement	10000

Aquifer Framework Database Detail for N 23D

Resstafr.dbf

Field	Data
County	Pitt
Latitude	35.580278
Longitude	-77.314722
Location Accuracy	
Quad	N 23D
Name	Eastern Pines Water Association 2
Complete	Y
Depth	432.00
Land Surface	56.00
Yorktown CU	38
Yorktown	28
Pungo River CU	10000
Pungo River	10000
Castle Hayne CU	10000
Castle Hayne	10000
Beaufort CU	16
Beaufort	2
Peedee CU	-8
Peedee	-26
Black Creek CU	-54
Black Creek	-98
Upper Cape Fear CU	-328
Upper Cape Fear	-360
Lower Cape Fear CU	10000
Lower Cape Fear	10000
Lower Cretaceous CU	10000
Lower Cretaceous	10000
Basement	10000

Aquifer Framework Database Detail for N 23G

Resstafr.dbf

Field	Data
County	Pitt
Latitude	35.557778
Longitude	-77.310556
Location Accuracy	
Quad	N 23G
Name	Eastern Pines Water Association 3
Complete	Y
Depth	456.00
Land Surface	68.00
Yorktown CU	56
Yorktown	40
Pungo River CU	10000
Pungo River	10000
Castle Hayne CU	10000
Castle Hayne	10000
Beaufort CU	31
Beaufort	3
Peedee CU	-22
Peedee	-40
Black Creek CU	-67
Black Creek	-120
Upper Cape Fear CU	-326
Upper Cape Fear	-345
Lower Cape Fear CU	10000
Lower Cape Fear	10000
Lower Cretaceous CU	10000
Lower Cretaceous	10000
Basement	10000

Aquifer Framework Database Detail for N 23O

Resstafr.dbf

Field	Data
County	Pitt
Latitude	35.536667
Longitude	-77.320833
Location Accuracy	
Quad	N 23O
Name	Eastern Pines Water Association 4
Complete	Y
Depth	480.00
Land Surface	67.00
Yorktown CU	47
Yorktown	37
Pungo River CU	10000
Pungo River	10000
Castle Hayne CU	10000
Castle Hayne	10000
Beaufort CU	24
Beaufort	15
Peedee CU	-5
Peedee	-17
Black Creek CU	-71
Black Creek	-111
Upper Cape Fear CU	-347
Upper Cape Fear	-375
Lower Cape Fear CU	10000
Lower Cape Fear	10000
Lower Cretaceous CU	10000
Lower Cretaceous	10000
Basement	10000

Aquifer Framework Database Detail for O 23A

Resstafr.dbf

Field	Data
County	Pitt
Latitude	35.499444
Longitude	-77.263611
Location Accuracy	
Quad	O 23A
Name	Eastern Pines Water Association 5
Complete	Y
Depth	514.00
Land Surface	50.00
Yorktown CU	36
Yorktown	28
Pungo River CU	10000
Pungo River	10000
Castle Hayne CU	10000
Castle Hayne	10000
Beaufort CU	-28
Beaufort	-39
Peedee CU	-94
Peedee	-116
Black Creek CU	-204
Black Creek	-218
Upper Cape Fear CU	-430
Upper Cape Fear	10000
Lower Cape Fear CU	10000
Lower Cape Fear	10000
Lower Cretaceous CU	10000
Lower Cretaceous	10000
Basement	10000

Aquifer Framework Database
Detail for M 24R

Resstafr.dbf

Field	Data
County	Pitt
Latitude	35.604167
Longitude	-77.376944
Location Accuracy	
Quad	M 24R
Name	City of Greenville 2
Complete	Y
Depth	754.00
Land Surface	49.00
Yorktown CU	30
Yorktown	19
Pungo River CU	10000
Pungo River	10000
Castle Hayne CU	10000
Castle Hayne	10000
Beaufort CU	10000
Beaufort	10000
Peedee CU	1
Peedee	-14
Black Creek CU	-29
Black Creek	-56
Upper Cape Fear CU	-286
Upper Cape Fear	-316
Lower Cape Fear CU	-524
Lower Cape Fear	-559
Lower Cretaceous CU	10000
Lower Cretaceous	10000
Basement	-705

Aquifer Framework Database
Detail for M 24B

Resstafr.dbf

Field	Data
County	Pitt
Latitude	35.651111
Longitude	-77.361944
Location Accuracy	
Quad	M 24B
Name	City of Greenville 1
Complete	Y
Depth	502.00
Land Surface	26.00
Yorktown CU	18
Yorktown	6
Pungo River CU	10000
Pungo River	10000
Castle Hayne CU	10000
Castle Hayne	10000
Beaufort CU	10000
Beaufort	10000
Peedee CU	-6
Peedee	-12
Black Creek CU	-20
Black Creek	-51
Upper Cape Fear CU	-241
Upper Cape Fear	-254
Lower Cape Fear CU	10000
Lower Cape Fear	10000
Lower Cretaceous CU	10000
Lower Cretaceous	10000
Basement	10000

Aquifer Framework Database Detail
for O 23L

Resstafr.dbf

Field	Data
County	Pitt
Latitude	35.463889
Longitude	-77.275556
Location Accuracy	
Quad	O 23L
Name	EHNR Gardner-Chicod
Complete	Y
Depth	1092.00
Land Surface	42.00
Yorktown CU	32
Yorktown	24
Pungo River CU	10000
Pungo River	10000
Castle Hayne CU	7
Castle Hayne	-2
Beaufort CU	-26
Beaufort	-32
Peedee CU	-48
Peedee	-76
Black Creek CU	-138
Black Creek	-178
Upper Cape Fear CU	-410
Upper Cape Fear	-446
Lower Cape Fear CU	-690
Lower Cape Fear	-726
Lower Cretaceous CU	10000
Lower Cretaceous	10000
Basement	-1050

Aquifer Framework Database Detail for O 22H

Resstafr.dbf

Field	Data
County	Pitt
Latitude	35.466944
Longitude	-77.200833
Location Accuracy	
Quad	O 22H
Name	U.S. Information Agency 2
Complete	Y
Depth	470.00
Land Surface	46.00
Yorktown CU	26
Yorktown	10
Pungo River CU	10000
Pungo River	10000
Castle Hayne CU	-2
Castle Hayne	-14
Beaufort CU	-20
Beaufort	-60
Peedee CU	-114
Peedee	-152
Black Creek CU	-234
Black Creek	-265
Upper Cape Fear CU	10000
Upper Cape Fear	10000
Lower Cape Fear CU	10000
Lower Cape Fear	10000
Lower Cretaceous CU	10000
Lower Cretaceous	10000
Basement	10000

Aquifer Framework Database
Detail for N 23P

Resstafr.dbf

Field	Data
County	Pitt
Latitude	35.529964
Longitude	-77.326652
Location Accuracy	G
Quad	N 23P
Name	EHNR Conley
Complete	Y
Depth	802.00
Land Surface	70.00
Yorktown CU	60
Yorktown	48
Pungo River CU	10000
Pungo River	10000
Castle Hayne CU	10000
Castle Hayne	10000
Beaufort CU	32
Beaufort	10
Peedee CU	-8
Peedee	-20
Black Creek CU	-78
Black Creek	-116
Upper Cape Fear CU	-344
Upper Cape Fear	-386
Lower Cape Fear CU	-584
Lower Cape Fear	-610
Lower Cretaceous CU	10000
Lower Cretaceous	10000
Basement	10000

Aquifer Framework Database
Detail for M 24U

Resstafr.dbf

Field	Data
County	Pitt
Latitude	35.590556
Longitude	-77.347500
Location Accuracy	
Quad	M 24U
Name	City of Greenville 3
Complete	Y
Depth	711.00
Land Surface	65.00
Yorktown CU	44
Yorktown	25
Pungo River CU	10000
Pungo River	10000
Castle Hayne CU	10000
Castle Hayne	10000
Beaufort CU	10000
Beaufort	10000
Peedee CU	-1
Peedee	-21
Black Creek CU	-49
Black Creek	-65
Upper Cape Fear CU	-332
Upper Cape Fear	-355
Lower Cape Fear CU	-528
Lower Cape Fear	-564
Lower Cretaceous CU	10000
Lower Cretaceous	10000
Basement	10000

DENR Monitoring Database Detail
for M 21Q2 in ehnr.dbf

Field	Data
County	Beaufort
USGS ID	
Latitude	35.604722
Longitude	-77.140000
Location Accuracy	
Quad	M 21Q2
Name	Washington RSq
Aquifer	Castle Hayne
Land Surface	16.02
Date Constructed	/ /
Original Stickup	1.00
Most Recent Stickup, / /	1.00
Depth	155.00
Diameter	2.00
Yield	10.00
Exists?	n
Recorder Box?	
Top of Screen	150.00
Bottom of Screen	155.00
Number of Water Levels Ehnr-watlev.dbf data (ft below land surface) tab delimited ascii 01/07/1966 to 01/14/1987	117
Number of Chlorides Ehnr-chlor.dbf (mg/l)	[illegible]

Aquifer Framework Database
Detail for N 22I

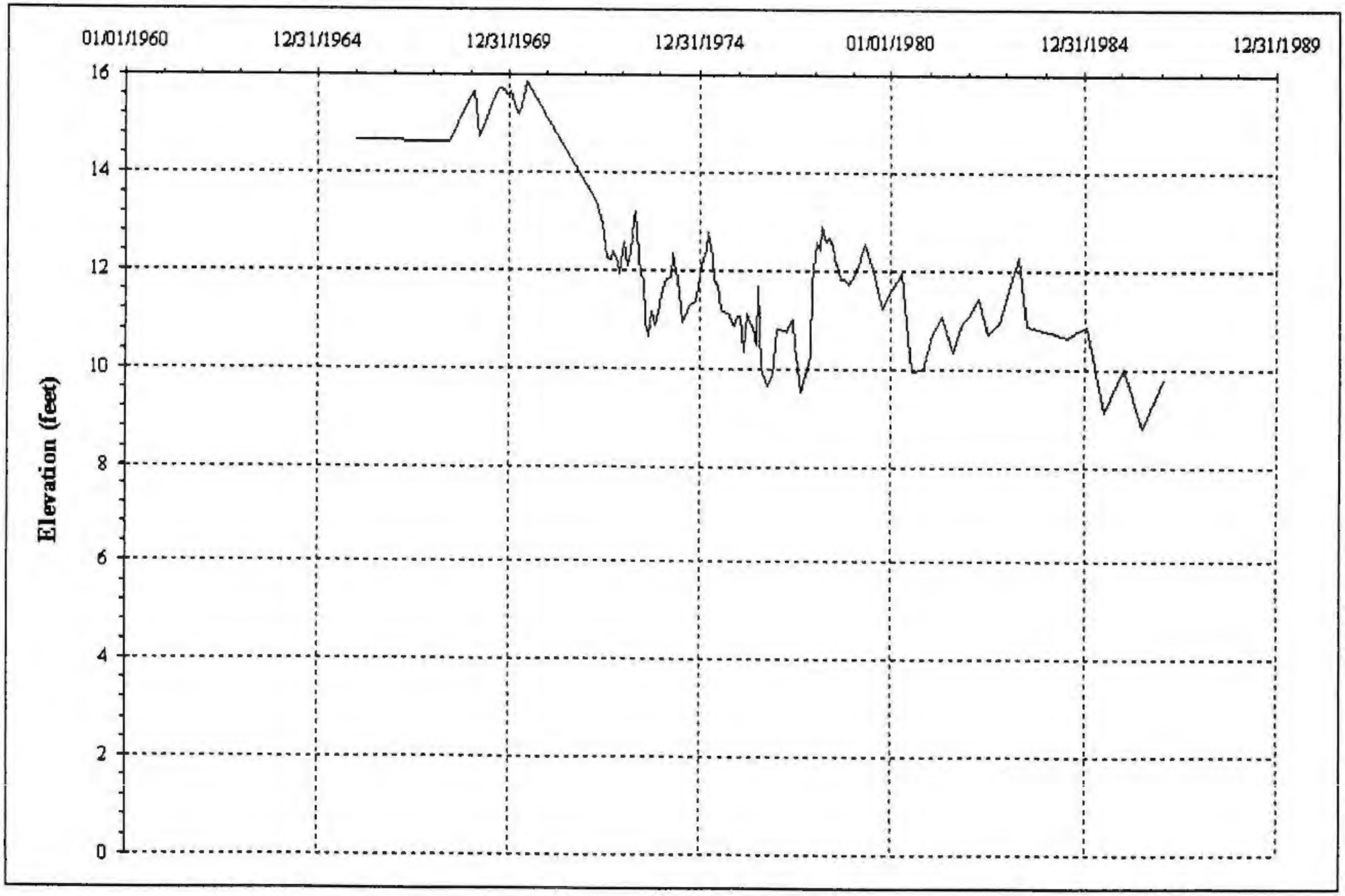
Resstafr.dbf

Field	Data
County	Pitt
Latitude	35.562222
Longitude	-77.190556
Location Accuracy	
Quad	N 22I
Name	Town of Grimesland
Complete	Y
Depth	250.00
Land Surface	42.00
Yorktown CU	34
Yorktown	18
Pungo River CU	10000
Pungo River	10000
Castle Hayne CU	-8
Castle Hayne	-33
Beaufort CU	-45
Beaufort	-90
Peedee CU	-104
Peedee	-124
Black Creek CU	10000
Black Creek	10000
Upper Cape Fear CU	10000
Upper Cape Fear	10000
Lower Cape Fear CU	10000
Lower Cape Fear	10000
Lower Cretaceous CU	10000
Lower Cretaceous	10000
Basement	10000

M21Q2

tab delimited ascii text {date, chlorppm, spcond_us, salin_ppt}	40

117 data points plotted



ATTACHMENT 3

Aquifer Framework Database Detail for M 21Q

Resstafr.dbf

Field	Data
County	Beaufort
Latitude	35.612500
Longitude	-77.137778
Location Accuracy	
Quad	M 21Q
Name	City of Washington Test 2
Complete	Y
Depth	730.00
Land Surface	15.00
Yorktown CU	10000
Yorktown	10000
Pungo River CU	10000
Pungo River	10000
Castle Hayne CU	10000
Castle Hayne	-22
Beaufort CU	-32
Beaufort	-37
Peedee CU	-71
Peedee	-90
Black Creek CU	-188
Black Creek	-275
Upper Cape Fear CU	-507

← This is not M21Q2

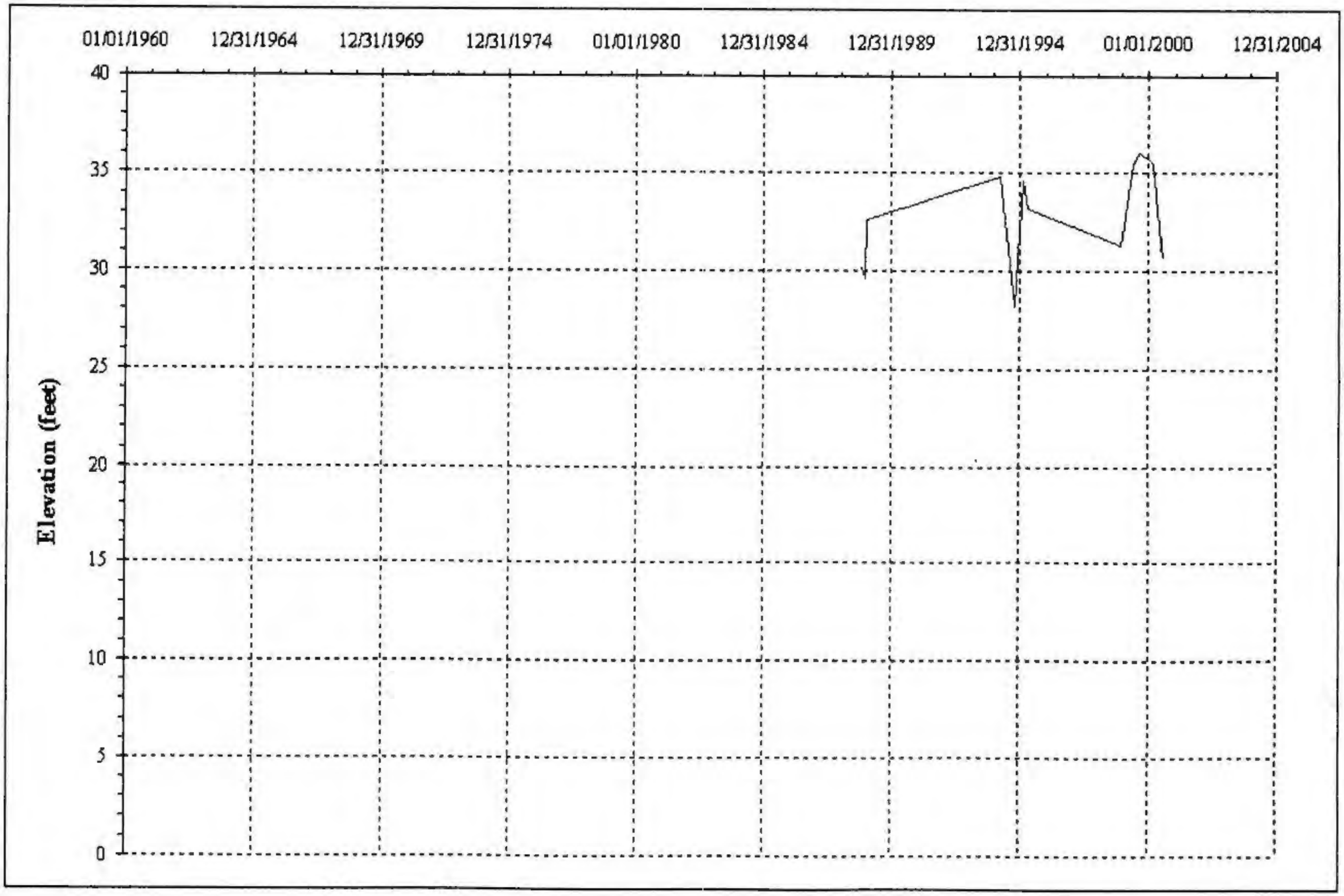
Upper Cape Fear	-538
Lower Cape Fear CU	10000
Lower Cape Fear	10000
Lower Cretaceous CU	10000
Lower Cretaceous	10000
Basement	10000

DENR Monitoring Database Detail for O 23L2 in ehnr.dbf

Field	Data
County	Pitt
USGS ID	
Latitude	35.463640
Longitude	-77.275232
Location Accuracy	G
Quad	O 23L2
Name	Chicod
Aquifer	Surficial
Land Surface	39.00
Date Constructed	04/30/1986
Original Stickup	1.80
Most Recent Stickup, 07/13/2000	1.37
Depth	12.00
Diameter	4.00
Yield	0.25
Exists?	y
Recorder Box?	n
Top of Screen	7.00
Bottom of Screen	12.00
Number of Water Levels Ehnr-watlev.dbf data (ft bellow land surface) tab delimited ascii 11/08/1988 to 07/13/2000	12
Number of Chlorides Ehnr-chlor.dbf (mg/l)	

tab delimited ascii text
{date, chlorppm, spcond_us, salin_ppt}

12 data points plotted

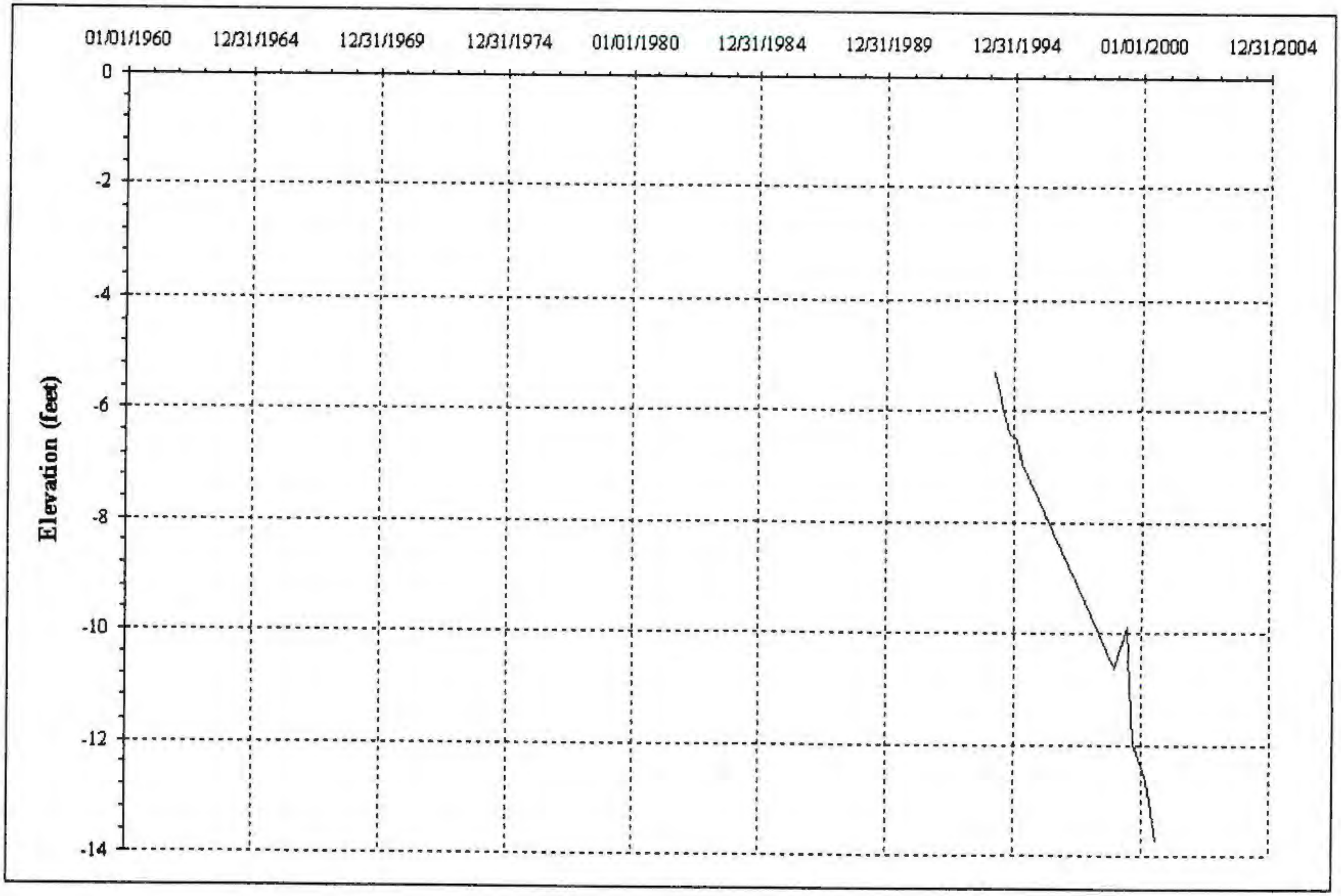


DENR Monitoring Database Detail for O 23L1 in ehnr.dbf

Field	Data
County	Pitt
USGS ID	
Latitude	35.463640
Longitude	-77.275232
Location Accuracy	G
Quad	O 23L1
Name	Chicod
Aquifer	Lower Cape Fear
Land Surface	39.00
Date Constructed	04/24/1986
Original Stickup	1.90
Most Recent Stickup, 07/13/2000	1.47
Depth	831.00
Diameter	4.00
Yield	5.00
Exists?	y
Recorder Box?	n
Top of Screen	821.00
Bottom of Screen	831.00
Number of Water Levels Ehnr-watlev.dbf data (ft below land surface) tab delimited ascii 03/23/1994 to 07/13/2000	9
Number of Chlorides Ehnr-chlor.dbf (mg/l)	[illegible]

tab delimited ascii text {date, chlorppm, spcond_us, salin_ppt}	

9 data points plotted

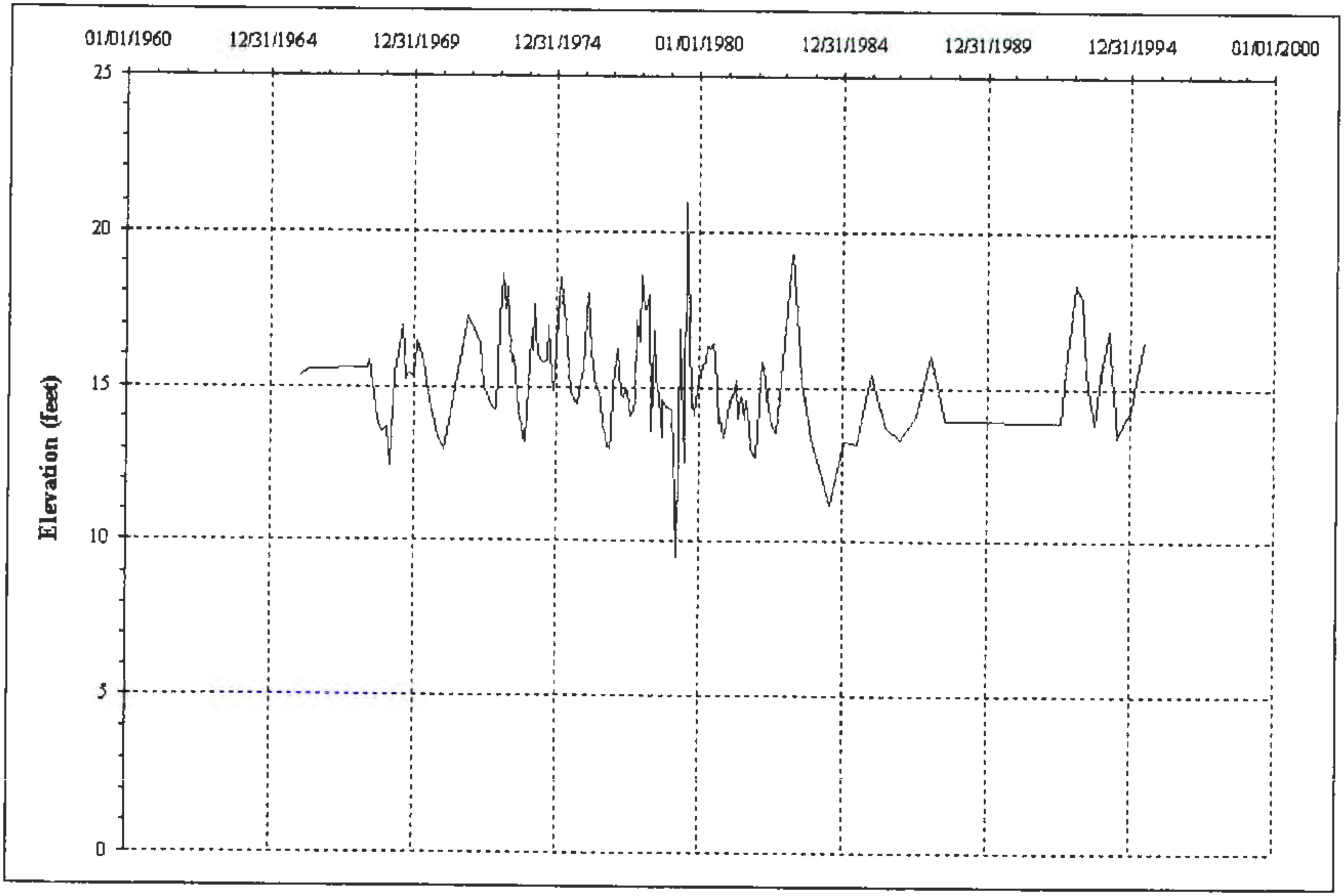


DENR Monitoring Database Detail
for N 21M1 in ehnr.dbf

Field	Data
County	Beaufort
USGS ID	
Latitude	35.536399
Longitude	-77.119290
Location Accuracy	G
Quad	N 21M1
Name	Chocowinity
Aquifer	Castle Hayne
Land Surface	28.34
Date Constructed	01/01/1961
Original Stickup	1.00
Most Recent Stickup, 01/01/1961	1.00
Depth	192.00
Diameter	4.00
Yield	90.00
Exists?	y
Recorder Box?	
Top of Screen	90.00
Bottom of Screen	192.00
Number of Water Levels Ehnr-watlev.dbf data (ft below land surface) tab delimited ascii 02/07/1966 to 07/10/1995	167
Number of Chlorides Ehnr-chlor.dbf (mg/l)	0

tab delimited ascii text
{date, chlorppm, spcond_us, salin_ppt}

167 data points plotted



Aquifer Framework Database
Detail for N 21M

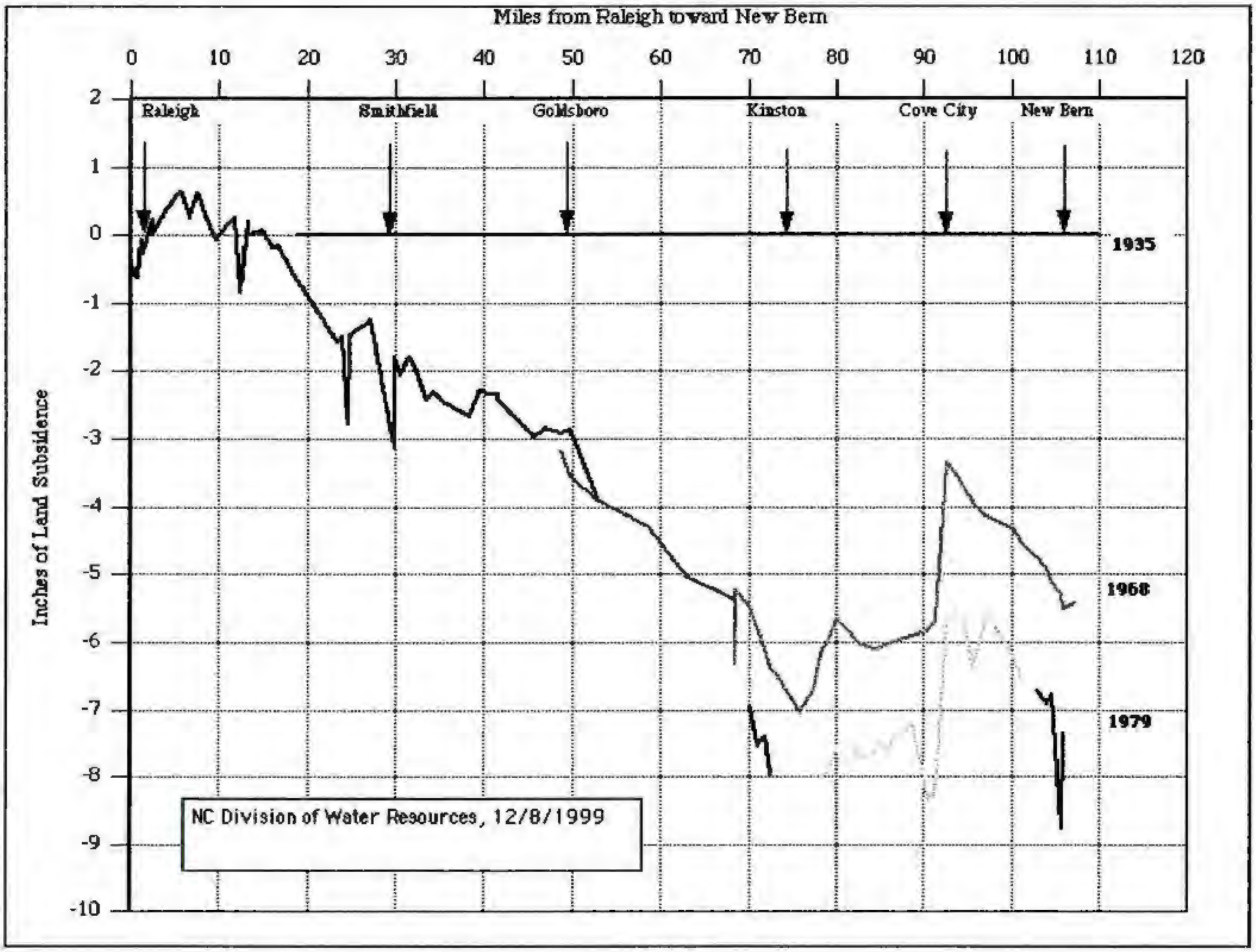
Resstafr.dbf

Field	Data
County	Beaufort
Latitude	35.536399
Longitude	-77.119290
Location Accuracy	
Quad	N 21M
Name	EHNR Chocowinity
Complete	Y
Depth	458.00
Land Surface	33.00
Yorktown CU	21
Yorktown	13
Pungo River CU	10000
Pungo River	10000
Castle Hayne CU	-34
Castle Hayne	-55
Beaufort CU	-153
Beaufort	-166
Peedee CU	-185
Peedee	-214
Black Creek CU	-299
Black Creek	-344
Upper Cape Fear CU	10000

Upper Cape Fear	10000
Lower Cape Fear CU	10000
Lower Cape Fear	10000
Lower Cretaceous CU	10000
Lower Cretaceous	10000
Basement	10000

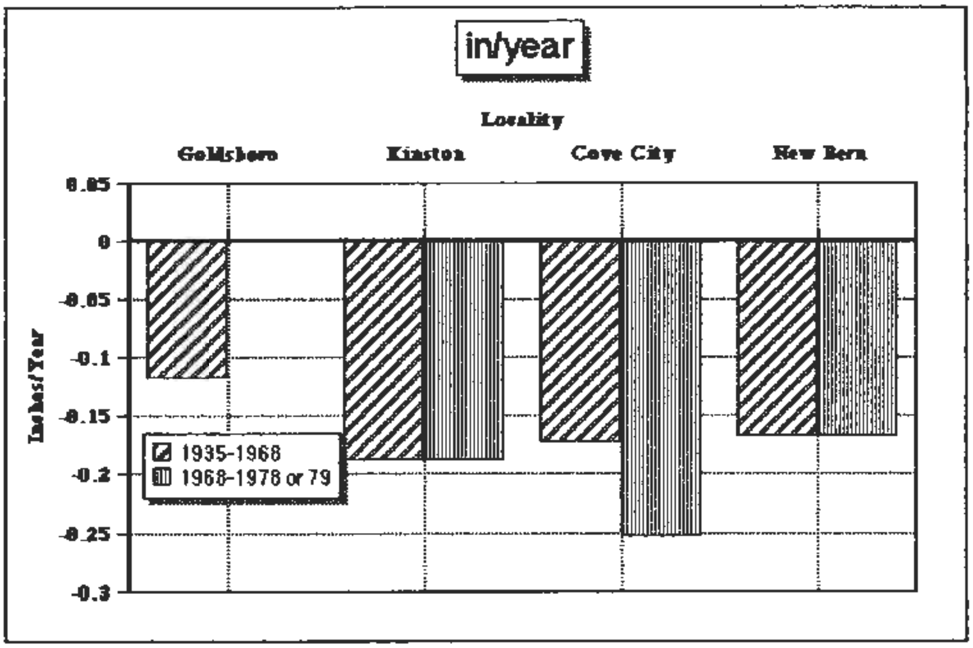
Land Subsidence Information

In 1993, GWB personnel contacted Emery Balazs of the National Geodetic Survey. Emery sent what he called a "Profile" of the land surface elevation data along a transect from Raleigh to New Bern. The plot showed the terrain on that transect as represented by 86 geodetic monuments. In general the terrain dropped off from about 328 feet elevation in Raleigh to near sea level in New Bern. Also plotted on the graph are the differences between elevations from the 1968 leveling and the nine other first-order levelings. The differences begin to deviate from zero (the expected outcome) starting about 10 miles from Raleigh. They reach their greatest deviation in the Kinston to New Bern interval. The graph below replots the data received from Emery Balazs with a slightly different format:



To construct this plot we assume that one end of the profile has been stable. So, Emery, held Raleigh stable so other land surface elevations could change. Here is a map of the geodetic monuments used in this plot.

Example rates of subsidence are shown below:



It is a pretty good bet that land subsidence in the North Carolina coastal plain is due to heavy pumping of ground water from aquifers referred to in various places in these web pages, namely the Black Creek and Upper Cape Fear aquifers. This last plot has some very interesting testimony to that theory. The rate of subsidence at Cove City increased in the second interval covered in the leveling runs (from 1968 to 1978) from 0.17 to 0.25 inches per year. This can be explained by New Bern bringing their Cove City water supply wells on-line in the late 1960s. Higher rates of land subsidence are associated with higher ground water withdrawal rates.

David Garrett, P.G., P.E.
Engineering and Geology

February 23, 2001

MEMORANDUM

TO: Judson Whitehurst – EJE REcycling

RE: Background Geochemistry Testing

Per your request, I sampled natural soils within a potential temporary C&D waste stockpile area, located along the former railroad corridor, west of the access road to the planned C&D landfill. Although you informed me this area may not be used for a stockpile, the lab testing had progressed too far to cancel completely. We did cancel the scan for organic compounds (EPA 8280), but the inorganic samples had already been completed when I called the lab.

The attached data will be useful, however, in establishing background values of key inorganic constituents for the future water quality monitoring program for the C&D landfill. The analyzed constituents are among those that are typically analyzed in a ground water monitoring program at C&D landfills. Now, please note what the data show:

Chromium	3	ppm
Lead	5	ppm
Mercury	0.02	ppm.

Such concentrations in natural soil could indicate potentially high background levels of these constituents, all heavy metals, which could potentially affect water quality in the region. While there is no cause for alarm, it should be realized that these compounds do occur in nature at variably abundant concentrations, unlike the organic compounds that are typically analyzed at landfills. Further, this is not to say that the ground water will show anywhere near these concentrations of these or other inorganic constituents, but we might expect to see some detection of these constituents in the ground water samples.

Actually, knowing in advance that these constituents are present in the background is favorable to constructing an effective ground water monitoring program for the C&D landfill. These data in no manner harm the suitability of the site, but we will need to pay particular attention to these metals in our monitoring program. Please call me at your earliest convenience if you have any questions or concerns. Thank you.

1408 Rock Drive, Raleigh, North Carolina 27610
E-mail: david_garrett_pg@mindspring.com **919-231-1818** (Office and Fax) **919-418-4375** (Mobile)

Environment 1, Incorporated

P.O. BOX 7085, 114 OAKMONT DRIVE
GREENVILLE, N.C. 27835-7085

PHONE (252) 756-6208
FAX (252) 756-0633
Drinking Water ID: 37715
Wastewater ID: 10

ID#: 521

DAVID GARRETT/EJE
1408 ROCK DRIVE
RALEIGH ,NC 27610

TEMP. STOCKPILE AREA

DATE COLLECTED: 02/02/01
DATE REPORTED : 02/21/01

REVIEWED BY:

PARAMETERS	Sample #1	Analysis Date	Analyst	Method Code
Arsenic (dry wt. basis), mg/kg	<2.5	02/12/01	MLH	EPA7060
Cobalt (dry wt. basis), mg/kg	<5.0	02/06/01	LFJ	EPA6010B
Copper (dry wt. basis), mg/kg	<5	02/14/01	WTH	EPA7210
Chromium, T.(dry wt. basis),mg/kg	3	02/06/01	LFJ	EPA6010B
Lead (dry weight basis), mg/kg	5	02/14/01	MLH	EPA7421
Mercury (dry wt. basis), mg/kg	0.02	02/06/01	WTH	EPA7470
Nickel (dry wt. basis), mg/kg	<5.0	02/06/01	LFJ	EPA6010B
Silver (dry wt. basis), mg/kg	<2.5	02/14/01	LFJ	EPA6010B
Zinc (dry wt. basis), mg/kg	<5.0	02/06/01	LFJ	EPA6010B
Total Solids, %	85.13	02/02/01	TRB	SM2540G

Environment 1
P.O. Box 708 · Oakmont Dr.
Greenville, NC _7858

Phone (252) 756-6208 • Fax (252) 756-0633

CHAIN OF CU DY RECORD

Page _____ of _____

CLIENT: 521
David Garrett / ESE
1408 Rock Dr.
Raleigh, NC 27610
919-231-1818 (P&F)

DISINFECTION
- [ ] CHLORINE
- [ ] UV
- [x] NONE
- [ ] ______

CHLORINE NEUTRALIZED AT COLLECTION								
pH CHECK (LAB)								
CONTAINER TYPE, P/G	G	G			G			
CHEMICAL PRESERVATION	A	A			A			

CHEMICAL PRESERVATION: A - NONE; B - HNO_3; C - H_2SO_4; D - NAOH; E - HCL; F - ZINC ACETATE; G - NA THIOSULFATE

SAMPLE LOCATION	COLLECTION DATE	COLLECTION TIME	TOTAL CHLORINE, mg/l AT COLLECTION	TEMPERATURE, °C AT COLLECTION	# OF CONTAINERS	8260	Metals	Pb, Cd, Cu, Cr	Pb, Ni, Zn, As, Hg	9075
Sample 1 (Soil)	2/2/01	2:00PM			4	G	G			G

PARAMETERS

CLASSIFICATION:
- [ ] WASTEWATER (NPDES)
- [ ] DRINKING WATER
- [ ] DWQ/GW
- [ ] SOLID WASTE SECTION
- [ ] OTHER

SAMPLES COLLECTED BY: (Please Print) David Garrett

SAMPLES RECEIVED IN LAB AT 14.1 °C

RELINQUISHED BY (SIG.)	DATE/TIME	RECEIVED BY (SIG.)	DATE/TIME
(SAMPLER) [signature]	2/2/01 2:25PM	Deedee Woolard	2/2/01 2:25PM

COMMENTS: Temporary Stockpile Area
Per my phone conversation w/ David Garrett on 2-13-01 - cancel all testing that has not been completed. Done 2-13-01 at 4:50PM. DW
Per David - cancel 8260 only - per phone conversation at 4:56PM.

Sampler must place a "C" for composite sample or a "G" for Grab sample in the blocks above for each parameter requested.

Instructions for completing this form are on the reverse side.

FORM #5

№ 37252

APPENDIX F
WQMP

WATER QUALITY MONITORING PLAN

C&D LANDFILL – A Private Disposal Facility
Pitt County, North Carolina

Prepared for

C&D Landfill, Inc.
802 Recycling Lane
Greenville, North Carolina 27834

March 29, 2001
This document supercedes all previous versions of this plan.

David Garrett, P.G., P.E.
Engineering and Geology

1408 Rock Drive, Raleigh, North Carolina 27610 Telephone/Fax (919) 231-1818

TABLE OF CONTENTS

Tables

Figures

1.0 Introduction

1.1 Background

The C&D Landfill, Inc., facility ("Site") is located 15 miles east of Greenville, North Carolina, in rural Pitt County. This Water Quality Monitoring Plan (WQMP) has been prepared to meet the field sampling and laboratory analysis requirements for the Site. The WQMP details field and laboratory protocols that shall be followed to meet the data objectives of the ground water monitoring program.

1.2 Purpose & Scope

This WQMP has been designed to insure accurate and representative field and laboratory results are obtained for all-round 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 the following Sections 3.0 through 6.0 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 through 9.0.

Strict adherence to these procedures stipulated in this plan is required. Any variation from these procedures should be thoroughly documented in the assessment report.

1.3 New Well Location Criteria

Based on a review of the site topography and hydrogeologic conditions, a monitoring network for Phase 1A will consist of six (6) ground water monitoring locations within the uppermost aquifer. The network will be expanded with five (5) additional wells prior to activation of Phase 1B. The shallower wells will be sampled semi-annually. Three (3) deep wells, existing piezometers, will monitor the deeper regional aquifer. The deep wells will be sampled on a bi-annual basis. The well locations, shown on Figure 1, were chosen to provide early detection of a release from the landfill into the two uppermost aquifers. Wells MW-1 and MW-1A are located up gradient of the proposed cell and will be used as the background wells. Refer to Table 1 at the end of this text.

Three surface water sampling points will be monitored. SW-1 is located up gradient of the landfill along the southeast stream, at the east corner of the site. SW-3 is down gradient on that same stream., located at the south corner. SW-2 is located down gradient along the northwest stream. near the property line. Each sampling location will be clearly marked in the field with a permanent post.

2.0 Ground Water Sample Collection

This section presents details of the procedures and equipment required to perform sampling from monitoring wells for each ground water monitoring event. Monitoring wells and surface sampling locations are shown on the attached map and are described in the Tables following this text.

For this discussion, it is assumed that well evacuation and sampling will be accomplished by bailing. A suitable alternative will be the use of dedicated sampling equipment, including low-flow purging and sampling techniques.

2.1 Water Level Measurements

Static water level and total depth to the bottom shall 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 shall be donned. New gloves shall be when taking, water level measurements at each well. Appropriate measures shall 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 shall be used to accurately measure depth to ground water in each well and/or piezometer. Ground water depths shall measured to a vertical accuracy of 0.01 feet relative to established wellhead elevations. Each well shall have a permanent, easily identified reference point on the lip of the well riser from which all water level measurements shall be taken. The elevation of the reference point shall be established by a Registered Land Surveyor.

The electronic water level indicator shall be constructed of inert materials such as stainless steel and Teflon. Between well measurements the device shall be thoroughly decontaminated by washing, with non-phosphate soap and triple rinsing with de-ionized water to prevent cross contamination from one well to another. Te following measurements shall be recorded in a dedicated field book prior to sample collection:

- 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 ensure that fresh formation water is sampled. Each well will be purged of standing water following the measurement of the static water level.

New latex or nitrile surgical gloves shall be donned for all well purging and sampling activities and whenever handling decontaminated field equipment. Appropriate measures shall 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 the equipment.

The volume of standing water in the well riser and screen shall be calculated immediately before well evacuation during each monitoring event. A standing water volume shall be calculated for each well using measured static water level, well depth and well casing diameter according to the equation:

$$V = (TD - SWL) \times C$$

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 and C = 0.653 gal/ft for four-inch wells.

After the volume of standing water within the casing, is established, a minimum of three and a maximum of five well casing, volumes of water shall be evacuated from each well. New, disposable bailers with either double or bottom check-valve shall be used to purge each well. Disposable purge bailers shall be constructed of fluorocarbon resin (Teflon) or inert plastic suitable for the well and ground conditions. Each bailer shall be factory-clean and remain sealed in a plastic sleeve until use. A new Teflon-coated stainless steel, inert mono-filament line or nylon cord shall be used for each well to retrieve the bailers. **Dedicated purging and sampling equipment may be used.**

Wells shall 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 pureed from each well and the relative rate of recharge shall be documented in sampling field notes Wells which are of very low recharge rates shall be purged once until dry. Damaged, dry or low yielding, and high turbidity wells shall noted for reconsideration before the next sampling event. Purge water shall be managed to prevent possible soil and surface water contamination. Well site management options may include temporary containment and disposal or portable activated carbon filtration.

Durable, non-dedicated equipment to be lowered into the well or which may contact the water shall 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. Sampling shall 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 shall not be sampled. High turbidity wells (>1000 units/ml) shall be noted and scheduled for redevelopment following the sampling event.

Field measurements of temperature, pH, specific conductivity and turbidity shall be made immediately prior to sampling each monitoring point. The field test specimens shall be collected with the sampling bailer acid placed in a clean, non-conductive glass or plastic container for observation. The calibration of tbe pH, temperature, conductivity and turbidity meters shall be completed according to tbe 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 shall be sampled using, a new, factory-cleaned, disposable Teflon bailer with bottom check-valve and sample discharge mecbanism. A new segment of Teflon-coated stainless steel wire, inert mono-filament line or nylon cord shall be used to lower and retrieve eacb bailer. The bailer will be lowered into each well to the point of ground water contact, then allowed to fill as it is sinks below the water table. Bottom contact will be avoided in order to avoid suspending sediment in the samples. The hailer will be retrieved and emptied in a manner which minimizes sample agitation.

Samples shall 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 with the bailer shall be used to transfer samples from bailer to sample container. The Generation of air bubbles and sample agitation will be minimized during bailer discbarge.

Ground water samples shall be collected and contained in the order of volatilization sensitivity. Initially, only purgeable organics and total metals specimens shall be collected for laboratory analysis. Subsequently, other analytical methods may required. When collected, the following order of sampling, shall be observed:

- Initial measurements of pH, temperature, conductivity and turbidity
- Volatile and Purgeable Organics
- Base Neutral and Acid Extractable Organics
- Total Metals
- Dissolved Metals
- Final measurements of pH, temperature, conductivity and turbidity

All samples shall be collected and analyzed in an unfiltered state during initial sampling event. If excessively silty ground water conditions persist, analyses of dissolved metal analysis may be proposed to the DWM. Any optional dissolved metals sampling, which can be performed in addition, shall be completed on samples prepared by field filtration using a decontaminated peristaltic pump and a disposable 0.45 micron filter cartridge specifically manufactured for this purpose.

All reusable sampling equipment including water level probes, pH/conductivity meters, interface probes, and filtering, pumps which might contact aquifer water or samples shall be thoroughly decontaminated between wells by washing with non-pbospbate soapy, de-ionized water and triple rinsing, with de-ionized water. Equipment decontamination procedures are detailed in Section 2.6.

2.4 Field Quality Assurance

Field and trip blanks shall 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, shall 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 shall be created in the field at the time of sampling to ensure that the field conditions, equipment, and handling during sampling collection bave not affected the quality of the samples. A duplicate ground water sample may be collected from a single well as a cbeck of laboratory accuracy. Blanks and duplicate containers, preservatives, handling, and transport procedures for surface water samples shall be identical to those noted for around water samples.

2.5 Sample Containers

Sample containers shall be provided by the laboratory for eacb 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 shall be based on the bottle type and analyte of interest. Metal containers are thoroughly washed with non-phosphate detergent and tap water, and rinsed witb 1:1 nitric acid, tap water, 1:1 hydrochloric acid, tap water, and de-ionized water, in that order. Organic sample containers are thoroughly washed with non-phospbate detergent in hot water and rinsed with tap water, distilled water, acetone, and pesticide-quality bexane, in that order. Other sample containers are tboroughly washed with non-pbosphate detergent and tap water, rinsed with tap water, and rinsed with de-ionized water. The laboratory shall provide proper preservatives in the sample containers prior to shipment (see Section 7.0).

2.6 Equipment Decontamination

All non-dedicated equipment that shall come in contact with the well casing and water shall be decontaminated. The procedure for decontaminating non-dedicated equipment is as follows:

1. Clean item with tap water and phosphate-free laboratory detergent (Liquinox or equivalent), using, a brush if necessary to remove particulate matter and surface films.

2. Rinse thoroughly with tap water

3. Rinse thoroughly with de-ionized or distilled water and allow to air dry

4. Rinse thoroughly with high grade isopropanol and allow to air dry

5. Wrap with aluminum foil to prevent contamination of equipment during storage or transport.

2.7 Detection of Immiscible Layers

The detection of non-aqueous phase liquids (fluids that are immiscible in water and vary in density from 1.0 g/ml) is highly unlikely. Should organic constituents be detected that suggest the presence of immiscible liquids, a plan for the detection of these liquids shall be submitted to DWM.

3.0 Surface Water Sample Collection

This section presents details of the procedures and equipment required to perform surface water field measurements and sampling. The surface water monitoring station locations are shown in Figure 1.

Surface water samples shall be obtained from areas of minimal turbulence and aeration. New latex or nitrile surgical gloves shall be donned prior to sample collection. The following procedure shall 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 shall 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 shall 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 shall be recorded for all surface water samples. The calibration of the pH, temperature, conductivity, and turbidity meters shall 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 shall be collected and contained in the order of volatilization sensitivity of the parameters as follows:

1. Measurements of pH, temperature, conductivity and Turbidity

2. Volatile and Purgeable Organics

3. Base Neutral and Acid Extractable Organics

4. Total Metals

5. Dissolved Metals

All surface water samples shall be collected unfiltered in each sampling event. If future dissolved metal analysis is required, samples shall be prepared by field filtration using a decontaminated peristaltic pump, hand-operated filtering pump (or equivalent) and a disposable 0.45 micron filter cartridge specifically manufactured for this purpose. All field meters which might contact surface water samples shall be thoroughly decontaminated between stations by washing with non-phosphate soapy, de-ionized water and triple rinsing with de-ionized water.

Samples shall be collected directly from the station in the container that has been specifically prepared for the preservation and storage of compatible parameters. Samples shall be collected in a manner that assures minimum agitation. Sample containers shall be prepared and provided by the analytical laboratory, following the procedures presented in Section 2.5, for each surface water sampling event.

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 bandling process bas not affected the quality of the samples. Any contaminants found in the trip blanks could be attributed to:

- interaction between the sample and the container,
- contaminated source water, or
- a bandling, procedure that alters the sample.

The laboratory shall prepare a trip blank by filling eacb type of sample bottle with distilled or de-ionized water. Trip blanks shall 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 eacb -round water sampling event. Trip blanks shall be taken prior to the sampling event and transported witb the empty bottle packs. The blanks shall be analyzed for volatile and purgeable organics only.

The concentration levels of any contaminants found in the trip blank shall be reported but shall 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 instruments utilized in the field to measure ground water characteristics shall be calibrated prior to entering tbe 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 shall 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 specimens between collection and analysis. Ice and cbemical cold packs shall be used to cool and preserves 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 shall be provided in the sample containers provided by the analytical laboratory. Hydrochloric acid shall be used as a chemical stabilizer and preservative for volatile and purgeable organic specimens. Nitric acid shall be used as the preservative for samples for metals analysis.

Upon collection, samples shall be placed on ice in high impact polystyrene coolers and cooled to a temperature of 4° C. Samples shall be packed and/or wrapped in plastic bubble wrap to inhibit breakage or accidental spills. Chain-of-Custody control documents shall be placed in a waterproof pouch and sealed inside the cooler with the shipped samples. Tape and/or custody seals shall be placed on the outside of the shipping coolers to prevent and aid in the detection tampering.

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 shall be coordinated with the laboratory.

Chain-of-Custody control shall be maintained from sampling through analysis to prevent tampering with analytical specimens. Chain-of-Custody control procedures for all samples shall consist of the following:

1. Chain-of-Custody shall originate at the laboratory with the shipment of prepared sample bottles and a sealed trip blank. Identical container kits shall 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 shall 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 shall be completed in the field, indicating the site, time of sampling, date of sampling, sample location/well number, and preservation methods used.

4. Collected specimens shall be placed in the iced coolers and shall 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 shall be temporarily sealed and placed in a secured area.

5. Upon delivery to the laboratory, samples are 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 shall sign the Chain-of-Custody control forms and formally receive the samples. The field technician, project manager and the laboratory director shall work together to insure that proper refrigeration of the samples is maintained.

6. Copies of the complete Chain-of-Custody forms shall be placed in the laboratory's analytical project file and attached results of laboratory analysis report upon completion.

Chain-of-Custody forms shall 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 shall keep an up-to-date logbook documenting important information pertaining to the technician's field activities. The field logbook shall 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 shall be those specified by DWM for detection monitoring purposes. These shall include field indicators of water quality (pH, conductivity, temperature and turbidity) and selected purgeable organic and metals constituents listed in RCRA Subtitle-D, Appendix I of 40 CFR 258. 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 DWM's policies regarding analytical methods and practical quantitation limits (PQLs). Table 2 presents a summary of proposed analytical methods. Analysis shall 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 cbecks shall be undertaken regularly by the lab to assess the precision and accuracy of analytical procedures.

The internal quality control checks include the use of calibration standards, standard references, duplicate samples and spiked or fortified samples. Calibration standards shall be verified against a standard reference obtained from an outside source. Calibration curves shall be developed using at least one blank and three standards. Samples shall be diluted if necessary to insure that analytical measurements fall on the linear portion of the calibration curve. Duplicate samples shall be processed at an average frequency of 10 percent to assess the precision of testing methods, and standard references shall be processed monthly to assess accuracy of analytical procedures. Spiked or fortified samples shall be carried through all stages of sample preparation and measurement to validate the accuracy of the analysis.

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 and Statistical Analysis

Copies of all laboratory results and water quality reports for this facility shall be kept at the facility office. Reports summarizing all ground water quality results and data evaluation shall he submitted to the DWM for each sampling event. Upon receipt of each monitoring event's data, the water quality database of analyses shall be updated.

Methods to evaluate the data are taken from *North Carolina Solid Waste Rules* and the EPA's *RCRA Ground Water Monitoring Technical Guidance Document*. The goal of the statistical analysis is to determine whether statistically sicnificant evidence of contamination exists and to identify the constituents and points of concern. The *North Carolina Solid Waste Rules* provide several methods for statistical analysis of ground water data. These methods are:

1. Parametric analysis of variance (ANOVA)

2. Rank-based (non-parametric) ANOVA with multiple comparisons

3. Tolerance prediction interval

4. Control chart

5. Test of Proportions

6. Alternative statistical test method that meets the 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 tbat are below detection limits. The statistical analysis would be conducted separately for eacb 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)*. All statistical analyses shall 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 shall be forwarded tbe DWM within 45 calendar days of the sample collection date. The analytical data submitted shall specify the date of sample collection, the sampling, point identification and include a map of the sampling, locations. Should significant concentrations of contaminants be detected in ground and surface water during monitoring (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 shall 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 shall 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 shall 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 assessment data shall be analyzed to verify the correct placement of assessment wells and determine locations for future assessment monitoring wells. Any additional well installations shall 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 shall be submitted to the DWM for approval.

All monitoring wells shall be installed under the supervision of a qualified geologist or engineer who is registered in North Carolina and who shall 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 shall he submitted by the registered geologist or engineer within 30 days after well construction.

9.4 Implementation Schedule

The Ground Water Quality Monitoring Program shall be implemented upon approval. Analyses shall be performed on a semi-annual basis.

9.5 Modifications

At some future time it may be appropriate to modify this plan, e.g. add or delete sampling locations or analytical parameters. Such changes require approval from DWM.

10. Certification

The water quality monitoring plan for this facility has heen prepared by a qualified geologist who is licensed to practice in the State of North Carolina. The plan has been prepared based on first-hand knowledge of site conditions and familiarity with North Carolina solid waste rules and industry standard protocol. In accordance with North Carolina Solid Waste Regulations, this Water Quality Monitoring Plan should provide early detection of any release of hazardous constituents to the uppermost aquifer, so as to be protective of public health and the environment. No other warranties, expressed or implied, are made.

Signed ______________________

Printed March 29, 2001

Date G. DAVID GARRETT

NORTH CAROLINA LICENSED SEAL 983 GEOLOGIST G. DAVID GARRETT

Not valid unless this document bears the seal of the above-named licensed professional.

Table 1

Monitoring Well and Surface Water Sampling Location Data

C&D Landfill, Inc.
Pitt County, North Carolina

Monitoring Location	Top of Casing (TOC) Elevation	Ground Elevation	Depth of Well (bgs)	Screened Interval (bgs)	Estimated Water Level [1]
MW-1d (B-1) [2,4]	21.14	17.4	50	40-50	5.52
MW-1s [2]	TBD	Est'd 17.4	15	5 - 15	5.52
MW-2d (B-2d) [4]	21.80	17.97	49	39 - 49	8.11
MW-2s	TBD	Est'd 18	15	5 - 15	8.23
MW-3d (B-3) [3,4]	22.83	19.37	50	40 - 50	8.68
MW-3s [3]	TBD	Est'd 19	15	5 - 15	8
MW-4	TBD	Est'd 15	15	5 - 15	Est'd 5
MW-5 [3]	TBD	Est'd 15	15	5 - 15	Est'd 8.5
MW-6	TBD	Est'd 15	15	5 - 15	Est'd 8.5
MW-7	TBD	Est'd 15	15	5 - 15	Est'd 7.4
MW-8 [3]	TBD	Est'd 15	15	5 - 15	Est'd 7.4

Notes: 1. BGS based on earlier water level observations
2. Up Gradient Background Wells, separate aquifers
3. Activate for Phase 1B
4. Sample bi-annually; all others to be sampled semi-annually
5. All depths are given in feet and referenced below ground surface (bgs)

Monitoring Location	Description of Monitoring Location
SW-1	Background on stream near north property line (near culvert crosing)
SW-2 [3]	Down gradient on "north" stream near property line (west corner)
SW-3	Down gradient on "south" stream at property line (south corner)

Table 2

Ground And Surface Water Analysis Methodology

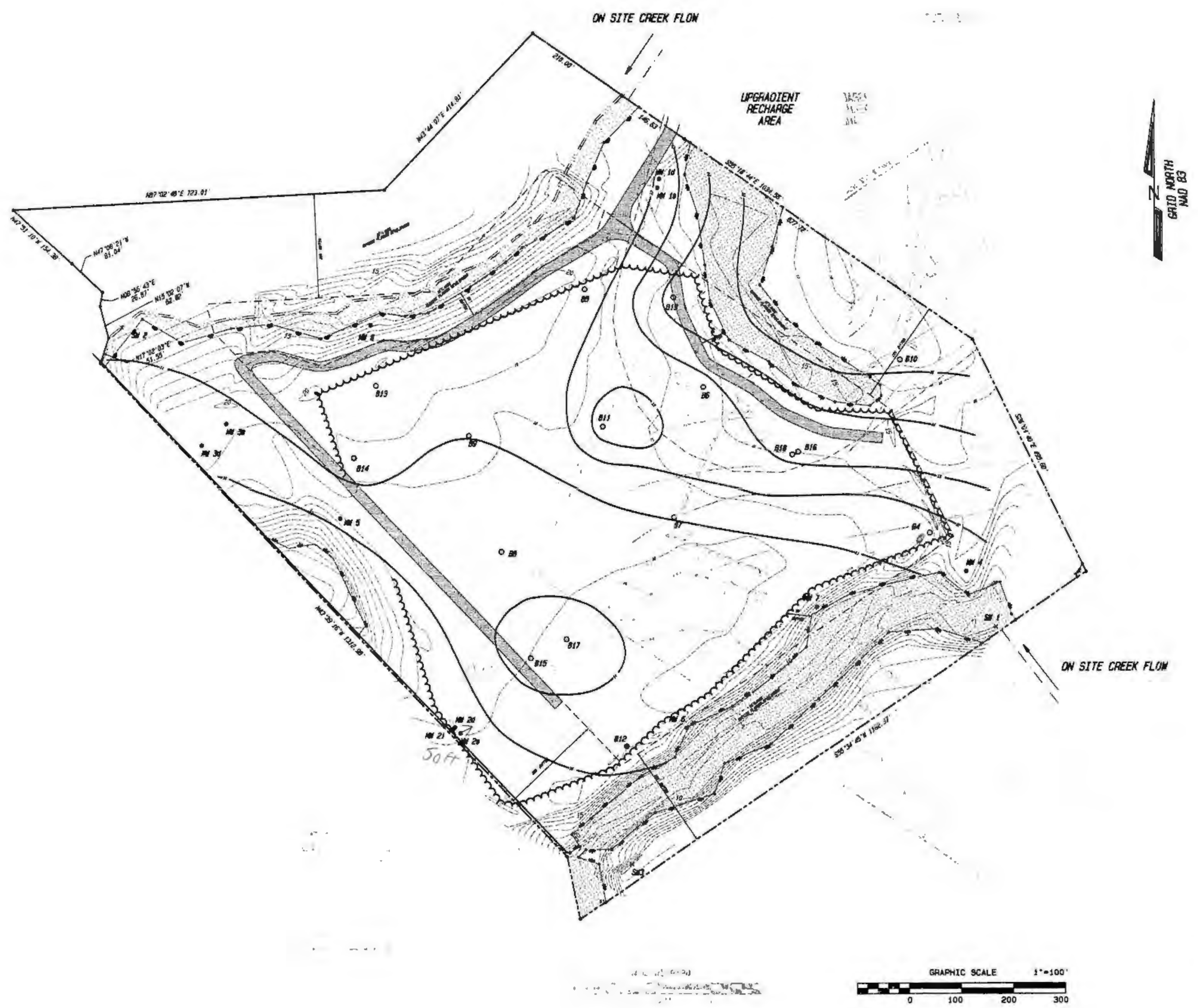
C&D Landfill, Inc.
Pitt County, North Carolina

Inorganic Constituent	Test Method	Equipment	PQL (ug/1)
Antimony	Low Level	GF	30
Arsenic	Low Level	GF	10
Barium	Regular Level	ICP	500
Beryllium	Low Level	GF	2
Cadmium	Low Level	GF	1
Chromium	Low Level	GF	10
Cobalt	Low Level	GF	1.0
Copper	Regular Level	ICP	200
Lead	Low Level	GF	10
Mercury	Low Level	CVE	0.5
Nickel	Regular Level	ICP	50
Selenium	Low Level	GF	20
Silver	Regular Level	ICP	10
Thallium	Low Level	GF	10
Vanadium	Low Level	GF	40
Zinc	Regular Level	ICP	50

Organic Constituent	Test Method	Equipment	POL (ug/1)
Acetone	EPA 8240/8260	GC/MS	100
Acrylonitrile	EPA 8240/8260	GC/MS	200
Benzene	EPA 8240/8260	GC/MS	5
Bromochloromethane	EPA 8240/8260	GC/MS	5
Bromodichlorometbane	EPA 8240/8260	GC/MS	5
Bromoform	EPA 8240/8260	GC/MS	5
Carbon Disulfide	EPA 8240/8260	GC/MS	100
Carbon Tetrachloride	EPA 8240/8260	GC/MS	10
Chlorobenzene	EPA 8240/8260	GC/MS	5
Chloroethane	EPA 8240/8260	GC/MS	10
Chloroform	EPA 8240/8260	GC/MS	5
Dibromochloromethane	EPA 8240/8260	GC/MS	5
1,2-Dibromo-3 chloropropane	EPA 8240/8260	GC/MS	25
1,2-Dibromomethane	EPA 8240/8260	GC/MS	5
1,2-Dichlorobenzene	EPA 8240/8260	GC/MS	5
1,4-Dichlorobenzene	EPA 8240/8260	GC/MS	5
Trans-1,4-dichloro-2-butene	EPA 8240/8260	GC/MS	100
1,1-Dichloroetbane	EPA 8240/8260	GC/MS	5
1,2-Dichloroethane	EPA 8240/8260	GC/MS	5

Organic Constituent	Test Method	Equipment	PQL (ug/l)
1,1-Dichloroethylene	EPA 8240/8260	GC/MS	5
Cis-1,2-dichloroethylene	EPA 8240/8260	GC/MS	5
Trans-1,2-dichloroethylene	EPA 8240/8260	GC/MS	5
1,2 Dichloropropane	EPA 8240/8260	GC/MS	5
Cis-1,3-dichloropropene	EPA 8240/8260	GC/MS	10
Trans-1,3-dichloropropene	EPA 8240/8260	GC/MS	10
Ethylbenzene	EPA 8240/8260	GC/MS	5
2-Hexanone	EPA 8240/8260	GC/MS	50
Methyl bromide	EPA 8240/8260	GC/MS	10
Methyl chloride	EPA 8240/8260	GC/MS	10
Methylene bromide	EPA 8240/8260	GC/MS	10
Methylene chloride	EPA 8240/8260	GC/MS	10
Methyl ethyl ketone	EPA 8240/8260	GC/MS	100
Methyl iodide	EPA 8240/8260	GC/MS	10
4-Methyl-2-pentanone	EPA 8240/8260	GC/MS	100
Styrene	EPA 8240/8260	GC/MS	10
1,1,1,2-Tetrachloroethane	EPA 8240/8260	GC/MS	5
1,1,2,2-Tetrachloroethane	EPA 8240/8260	GC/MS	5
Tetrachloroethylene	EPA 8240/8260	GC/MS	5
Toluene	EPA 8240/8260	GC/MS	5
1,1,1-Trichloroethane	EPA 8240/8260	GC/MS	5
1,1,2-Trichloroethane	EPA 8240/8260	GC/MS	5
Trichloroethylene	EPA 8240/8260	GC/MS	5
Trichloroflouromethane	EPA 8240/8260	GC/MS	5
1,2,3-Trichloropropane	EPA 8240/8260	GC/MS	15
Vinyl acetate	EPA 8240/8260	GC/MS	50
Vinyl chloride	EPA 8240/8260	GC/1\4S	10
Xylenes	EPA 8240/8260	GC/MS	5

The foregoing constitutes the NC Appendix I list of monitoring parameters for Solid Waste Landfills.



ALL PIZOMETERS NOT CONVERTED TO MONITORING WELLS SHALL BE ABANDONED IN ACCORDANCE WITH SOLID WASTE RULES

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C&D LANDFILL INC. CONSTRUCTION AND DEMOLITION LANDFILL WATER QUALITY MONITORING PLAN - SAMPLING LOCATIONS PACTOLUS PITT COUNTY NORTH CAROLINA		
SCALE 1" = 100'	JOB NO. 0023	SHEET M-1

DATE________

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