

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION

JAN 30 2006

SOUTHWEST DISTRICT
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**Hillsborough County
Report of
Geotechnical Exploration,
Leachate Treatment Plant and
Borrow Pit, Southeast Landfill
County Road 672
Hillsborough County, Florida**



Ardaman & Associates, Inc.

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FILE*



Ardaman & Associates, Inc.

Consultants in Soils, Hydrogeology,
Foundations and Materials Testing

November 30, 1990
File Number 90-9684

Hillsborough County
Department of Solid Waste
Post Office Box 1110
Tampa, Florida 33601

Attn: John Johnson

Subject: Report of Geotechnical Exploration, Proposed Leachate Treatment Plant and Borrow Pit, Southeast Landfill, C.R. 672, Hillsborough County, Florida

Gentlemen:

Pursuant to your authorization given by Work Order No. TI-41-89-573, and in general accordance with our proposal of August 23, 1990, our firm has completed the exploration of subsurface soil conditions beneath the proposed leachate treatment plant area, and the borrow area, at the referenced site. The purpose of this exploration was to determine the stratification and engineering properties of subsurface soils, and to provide recommendations for foundation design and site preparation. This study covers foundation soils well within the influence of building loads, including the first rigid surface of underlying bedrock strata.

This report was prepared for the exclusive use of Hillsborough County, Department of Solid Waste, and their consultants for use in the design of a foundation system for the proposed leachate plant structures, in accordance with generally accepted geotechnical engineering practices. No other warranty, expressed or implied, is made.

SCOPE

The scope of our services has included the following items:

1. Reconnaissance of the site by a geotechnical engineer, using the site plan provided by the design consultant, SCS Engineers, to document surficial conditions at the time of our exploration;
2. Performance of six (6) Standard Penetration Test borings (SPT), to determine the stratification and engineering properties of subsurface soils at the proposed borrow pit location;

3. Performance of two (2) SPT borings, to determine the stratification of soils, as a check on a previous exploration;
4. Performance of ten (10) Standard Penetration Test borings (SPT), to determine the stratification and engineering properties of subsurface soils at the leachate plant location;
5. Performance of eight (8) mechanical auger (MA) borings, along the access roadway, to determine the stratification of soils proposed for use as structural fill;
6. Review of each soil sample obtained in our field testing program, by a soils engineer in our laboratory, for verification of classification and assignment of laboratory tests, as required;
7. Performance of routine laboratory soils classification tests, to aid in confirming the classification of soils returned to our laboratory, and to provide data necessary to estimate engineering parameters;
8. Analysis of the existing building site soil and groundwater conditions, as they relate to the proposed construction;
9. Preparation of this report, to document the results of our field testing program, engineering analysis, and foundation design and site earthwork recommendations.

SITE LOCATION AND CONDITIONS

The proposed leachate plant site is located within a tract of land situated in the southeast one-quarter of the southeast one-quarter of Section 14, Township 31 S., Range 21 E., Hillsborough County, and more specifically, north of the access roadway, in the vicinity of Florida plane coordinates N 1252200, E 444300. The proposed borrow pit is located within a tract of land situated in the southwest one-quarter of the southwest one-quarter of Section 13, Township 31 S., Range 21 E., Hillsborough County, Florida. This proposed borrow area lies approximately 500.0 feet east of the proposed leachate plant site. The access roadway flanks the leachate plant on the south, and continues east-southeast towards the main paved roadway of the landfill.

The treatment plant site was bare of trees and covered with weeds at the time of our exploration. The borrow pit site was densely wooded, but paths were cleared for access by our drilling equipment. The treatment plant site lies on flat, south sloping topography, which allows moderately good drainage. Conversely, the borrow pit area is located in a low-lying basin, where water will tend to collect.

FIELD EXPLORATION

Our field operations consisted of conducting eighteen (18) SPT borings, using procedures similar to those outlined in ASTM D-1586, and eight (8) MA borings, at the locations indicated on the attached Figure 1. Test locations and depths of the proposed borings were specified by previous arrangement, between SCS Engineers and our firm, and were performed to determine the stratification and engineering properties of the subsurface soils, to a maximum depth of 74.17 feet below the existing ground surface. A continuous drilling and sampling procedure was performed within the upper 10.5 feet of the SPT boring, to detect subtle changes in soil stratigraphy, and pertinent engineering properties within this critical depth. Furthermore, borings were located in the field by survey crews from Hillsborough County. Original staking of the borings was performed by SCS Engineers. The accuracy of the boring locations is that implied by the measurement method used. Upon completion, each borehole was filled in with local soil, and sealed with cement slurry, if necessary, in accordance with SWFWMD. A brief summary of the drilling and testing procedures utilized in the SPT and MA borings, is included in the attached Appendix I.

LABORATORY TESTING

The field soil boring logs and recovered soil samples were returned to our Tampa office. At our soils laboratory, each soil sample was examined by a soils engineer, to obtain an accurate definition of the soil profile, and to assign pertinent laboratory tests. The visual classification of the samples was performed in accordance with the current Unified Soil Classification System (ASTM D-2487).

Twenty-three (23) moisture content, and twenty-three (23) percent fines tests (the percent by dry weight finer than the U.S. No. 200 sieve) were performed on selected soil samples, obtained from selected borings. These indices are useful in estimating compressibility characteristics of the clayey soils, and in confirming our visual classification of the soils. The results of the tests are plotted adjacent to the final soil boring logs, in the attached Appendix II, at the depth of the individually tested soil sample.

Four (4) Atterberg Limits test sets were performed on selected cohesive soil samples, obtained from borings TH-7, TH-10, TH-14 and TH-17. The tests were performed in general accordance with the procedures contained in ASTM Standard D-4318. The results of these tests are useful in establishing the classification of cohesive soils. Furthermore, correlations have been developed, which enable estimates to be made for shear strength, and consolidation characteristics of these soils. The results of the Atterberg Limits test sets are plotted on the boring logs, at the depth of the associated sample, in Appendix II.

SOIL CONDITIONS

Delineation of soil strata, engineering properties, where applicable, and soil descriptions, are given in the final soil boring logs, contained in the attached Appendix II. The final logs were prepared by a geotechnical engineer, after review of the field logs, and examination and classification of the recovered soil samples, and analysis of laboratory test data. The stratification lines shown are used to indicate a transition from one soil type to another; however, they are in no way intended to designate a depth of exact geological change. Furthermore, the recommendations contained in this report, are based on the contents of the final logs. While the borings are representative of subsurface conditions at their respective locations and vertical reaches, local variations characteristic of the subsurface materials of the region may be encountered.

The subsurface soil profile, based on the data obtained from eighteen (18) SPT borings and eight (8) MA borings, is generally described below:

Borrow Pit Area

Figure 2 shows a linear profile, through borings TH-1 through TH-6, which were drilled in the proposed borrow pit area. In summary, the top 3.5 to 26.0 feet consists of a deposit of waste phosphatic clay soils. The thicker deposits of this material are located in the vicinity of borings TH-1, TH-5 and TH-6. A review of the topography shows that TH-6 is near the center of the depressed basin area on the site. In our judgement, this is near the center of the previously existing waste pond of the mine. Considering that the slopes of the surrounding cast spoil dikes were probably steep, during the operation of the mine, we conclude that the probable average thickness of phosphatic waste clay soils, in this basin, is between 10.0 to 15.0 feet. The waste clay soils are, commonly, extremely soft in consistency, below a surficial crust of more consolidated or desiccated waste clay soils. Penetration of this material generally required only the weight of the sampler, and drill rods, to accomplish.

A series of variably shaded sand, to sand with silt layers underlies the waste clay soils, to elevations ranging from 94.0 to 98.0 feet NGVD. These sands vary from very loose to very dense, in consistency. Most SPT values, however, were less than 20 blows per foot. A confining layer of bluish-gray to grayish-brown clayey sand, with phosphate, was discovered below the above described sand layers, to elevations of 84.0 to 85.5 feet, and was found to be loose to medium dense in consistency.

The surface of the bedrock layer was penetrated below the clayey sands, in borings TH-1 and TH-3. In general, this material consists of a relic rock matrix, weathered to resemble an indurated elastic silt. Hard rock inclusions are contained throughout this matrix, in random locations.

Leachate Treatment Plant Area

Borings TH-7 through TH-16 were drilled in the area proposed to contain the leachate treatment plant, and storage tanks. Figures 3, 4, and 5 show cross-sections through this area. While this area was also used in the mining operation, to contain waste phosphate clays, the clays are situated below a surficial layer of light brown to light grayish-brown fine sand, which is tailings from a separate operation of the mine. As a result, the waste clay soils in this area are somewhat consolidated from the weight of the overlying sands. Penetration resistance values, in the tailings sands, typically range from 11 to 16 blows per foot, while the phosphatic waste clays have been consolidated to a consistency corresponding to an SPT value of 1 to 3 blows per foot.

The base of the previously existing waste clay basin, is judged to have existed at elevation 115.0 to 120.0 feet NGVD. The cast spoil dikes, which surrounded the basin, are thought to begin east of borings TH-12, 14 and 15, and south of boring TH-15. Borings TH-7, 8, 9, and boring TH-16, were drilled in the vicinity of the cast spoil dikes, as shown by the abrupt change in stratigraphy from TH-10 to TH-16, in Figure 3. Essentially, the cast spoil pile consists of light brown to grayish-brown clayey sand, at about the same elevation of the phosphatic waste clay layer, as shown in borings TH-7, 8, 9 and 16.

The soils that underlie the waste clay basin, and cast spoil dike soils, consist of native, loose to dense, variably shaded sand, to sand with silt soil layers. This soil extends to the surface of the underlying light gray to greenish-gray, or bluish-gray clayey sand with phosphate layer, which was found at elevations ranging from 88.9 to 103.5 feet NGVD. This is essentially the same layer that overlies the bedrock in the borrow pit area, described previously. Penetration resistance values indicate that it is generally loose in consistency.

The bedrock unit was discovered at elevations ranging from 82.6 to 86.1 feet NGVD. The higher rock surface is located near the southeast corner of the study area, and appears to slope uniformly towards the northeast. The rock unit consists of a light gray elastic silt matrix, with indurated rock fragments. It is variably weathered by the action of acidic water, which results in a randomly hard rock unit.

Confirmation Borings

Borings TH-17 and TH-18 were drilled, as directed, at locations where previous explorations were performed, as an independent check. Based on the results of the borings, TH-17 is located within a cast spoil area, consisting of cohesive sand, above a layer of light brown sand at 9.0 feet. In our judgement, the native soils begin at a depth of 23.0 feet, at this location.

Approximately 6.5 feet of very dense sand tailings, or cast spoil overlies the top of waste phosphatic clays in TH-18. The waste clay soils were found to be extremely soft, and extended to a depth of 18.0 feet in this boring. The native sandy soils were penetrated below a depth of 18.0 feet.

Roadway Borings

Borings AB-3 through AB-10, were performed at selected locations, along the access road. Preliminary plans called for the mining of the sand tailings in the leachate plant area, and replacing the mined clean sand soils with roadway soils, for structural fill beneath the plant structures.

The stratigraphy, revealed by these borings, indicate that a variety of soils was deposited here, in a random fashion. In general, about 50 percent of the soils consist of clean sands, which are free of significant amounts of clay or silt. The remaining half of the soils are generally composed of clayey sand soil, with some instances of waste phosphatic clays in borings AB-3, 4, 7, and 8.

GROUNDWATER CONDITIONS

The groundwater level readings were obtained in the borehole, upon completion of testing, where possible, and are plotted adjacent to the final logs. If a water table is not indicated, it does not necessarily mean that groundwater does not exist within the vertical reach of the borehole. It must be noted that fluctuations in the groundwater level may occur, due to variations in rainfall and other environmental or physical factors, at the time measurements are made.

The measured borehole groundwater table level ranged from 8.67 to 12.67 feet below land surface at the time of the field exploration. The level of the surficial aquifer in this area is very complex, since perched water levels exist above the waste clays, and flow through the more permeable cast spoil area.

EVALUATION AND RECOMMENDATIONS

Proposed Development

Based on information provided by SCS Engineers, it is our understanding that the proposed development will consist of the construction of a prefabricated metal building, with miscellaneous tanks, pumps, and blowers, a 45-foot diameter PACT unit (weighing 1,700 kips), a 70-foot diameter leachate storage tank (weighing 4,500 kips), and an enclosed tank containment area.

Preliminary plans included excavation of the existing tailings sands, for use in the landfill operations, and replacement of that material with structural fill, obtained from regrading and excavation of the south perimeter roadway embankment.

Lastly, the proposed development included the establishment of a borrow pit, east of the proposed plant, to provide daily cover for the landfill.

Foundation loads for the metal building are expected to be light to moderate. Individual columns, supporting up to 60 kips, were considered for our analysis. Moreover, we have assumed that the existing grades at this site, will remain essentially the same as during this exploration.

Soil Evaluation - Proposed Borrow Pit

Our exploration shows that phosphatic waste clays exist, in this area, from the surface, to an average of 10.0 to 15.0 feet below the ground surface. Native sand, and sand with silt soils, underlie the phosphatic waste clay soils, which, in turn, overlie native phosphatic clayey sand soils.

By and large, the phosphatic clay soils are extremely soft. This material would be very difficult to handle in any earthwork operation, without mixing the soil with the underlying sand soils. If you desire to use this material in the landfill operations, we recommend that the clay soils be mixed with the clean sand soils, which were found below the clay soils, or with similar, off-site soils. The mixture proportions should be established to attain a workable soil, which has the consistency of a clayey sand soil. A fifty-fifty mixture of these materials is suggested, with the addition or deletion of sand, as necessary, to achieve a workable material.

Alternatively, if mixing of the soils is not economical, the sand soils, located below the phosphatic clays, can be used, directly, for daily fill cover. Excavation of this material will be below the surficial aquifer level. Consequently, provision for dewatering of the excavation should be anticipated, or wet excavation techniques should be used. If dewatering will be used, we recommend that the dewatering system be designed, assuming no flow will occur through the native bluish-gray clayey sand stratum. Moreover, ³well point spacings should be based on an assumed permeability of 1×10^{-3} cm/sec.

Soil Evaluation - Proposed Leachate Treatment Plant

Much of the plant area is underlain by a layer of highly compressible waste clay soils. The thickness of this soil increases from a few inches, near the perimeter berms, to as much as 14.5 feet, in the vicinity of boring TH-10. Our analysis shows that, if the leachate storage tank were placed directly above boring TH-10, settlement in excess of 2.5 feet is predicted to occur, below the center of the tank. Conversely, if the tank is placed near boring TH-9, the estimated maximum settlement is slightly under 6.0 inches.

Notwithstanding the predicted settlement at boring TH-10, the possibility of a bearing capacity failure (tank rotation), is possible because of the very low shear strength of the phosphatic waste clays. Therefore, in developing our recommendations, we concluded that, in the event that tanks, and the other structures must be located over areas containing phosphatic waste clays, both the compressibility and the shear strength of this material, must be improved. The alternatives for the foundations for this plant, including the tanks, building, and miscellaneous structures are as follows:

1. Installation of piles, tipped on the surface of the bedrock formation. Based on an installed cost of \$15.00/linear foot, for a light capacity pile, and on an average pile spacing of 7.0 feet, we calculate that the cost of pile installation will be approximately \$ 95,000.00, for the leachate tank;
2. Removal of phosphatic clays by over-excavation, and replacement with granular fill soils. Based on a construction cost of \$ 5.00 to \$ 10.00 per cubic yard, the cost of this alternative would range from \$ 19,000.00 to \$ 38,000.00, for the excavation of the leachate tank;
3. Relocation of the plant to areas not underlain by phosphatic clay soils. This would be the least expensive alternative, since no special site preparation would be necessary. Within the explored area, the best chance of finding such a location is close to the east side berm;
4. Improvement of the phosphatic clay soils, by low slump grout injection. Discussions with a specialty grouting contractor indicate that this method of improvement would be advisable for a clay thickness of 4.0 feet, or less. The degree of improvement is largely indeterminate, however, past experience in similar situations shows that settlement can be reduced by about 1/2 to 2/3 of that settlement expected, before improvement. The cost of such a technique is estimated to be \$ 30,000.00 to \$ 50,000.00, for the leachate tank.

Soil Evaluation - Roadway Borings

As indicated in the summary of subsurface conditions, earlier, the soils in the roadway areas are a random mixture of sand, clayey sand, and phosphatic waste clay layers. The use of this material as structural fill is not recommended, unless the clean sand soils can be easily segregated from the remaining material. The information revealed in the borings indicates that it can not be easily segregated.

Soil Evaluation - System Recommendations

Of the four alternatives presented above, the most desirable is to relocate the plant to a stable soil area. The extreme east side of the explored basin, appears to show the most promise. If this alternative is selected, confirmatory borings should be performed, to assure that

the plant area, and tanks, are not underlain by these clay soils. A series of borings, spaced not greater than 50.0 feet apart, along the western perimeter of the relocated area, should be performed. In addition, if possible, the plant area should cut into the eastern berm, where soil conditions are likely to be favorable.

The second-best alternative is the use of over-excavation, to remove the phosphatic clay soils below the plant area. If the plant must be located in the basin, this alternative provides a very positive, direct method of eliminating the troublesome soils. Backfill may consist of the on-site tailings sands, which are plentiful in this area.

In our judgement, the use of piles should not be considered, unless our estimate of the cost of excavation is grossly underestimated. The piles, if considered, should be driven to the surface of the bedrock unit. We recommend that concrete piles be used, with a minimum design axial capacity of 30 tons. Twelve-inch square piles should be adequate for this purpose.

Lastly, because of the potentially highly variable cost, and because the success of grout injection is not as certain as the other alternatives, we recommend that the fourth alternative be discarded.

Site Preparation Recommendations

The following site preparation recommendations were developed for the case of over-excavation of the phosphatic clay soils. If the first alternative is successful, the portions concerning over-excavation and dewatering may be deleted from that described below:

The existing natural, and fill surficial soils, should be prepared prior to placement of engineered fill, and foundation construction on the soils, in accordance with the following site preparation recommendations. The recommended procedures should be covered in the project specifications, and completed prior to construction of the foundation system.

1. The building area, plus a margin of 5.0 feet beyond the perimeter of the foundation system, should be cleared and grubbed of any vegetation, stumps, tree root systems, and sod. Organic topsoil should be excavated and removed. Strippings, debris, and organic soils should be disposed in accordance with the owner's instructions. Any hole larger than 3.0 feet in diameter, resulting from the removal of any tree, should be ramped, to aid in the compaction of the bottom and sides, with mechanical equipment, prior to filling;
2. It is our opinion that the natural and fill soils encountered at the site, with the exception of buried phosphatic waste clay strata, are capable of supporting the anticipated loads on a conventionally designed, shallow foundation system, provided that surface re-working, phosphatic waste clay soil removal and replacement, and compaction are performed.

Complete removal of the unsuitable phosphatic waste clay strata, and replacement with compacted granular fill in the buried phosphatic waste clay areas, will be necessary, in order to allow safe structure support, by a conventional shallow foundation system. The phosphatic waste clay material should be removed from beneath the entire structures area, and any other area that will be adversely affected by differential settlement, caused by consolidation of the highly compressible phosphatic waste clay layer under the weight of new fill, and applied surface loads. Excavation limits should include a suitable margin beyond the perimeter of the foundation system, that will be dependent upon the excavation depth. As a minimum, the excavation margin should extend 5.0 feet beyond the edge of structure or footing, or a horizontal distance of 1.0 foot for every 2.0 feet of vertical cut below the foundation, as measured from the outer edge of the footing bottom, whichever is greater. A portion of the existing soil cover, if any, removed from above the phosphatic waste clay stratum, may be stockpiled and reused as engineered fill, under the direction of the soils engineer or his representative;

Based on the groundwater table levels encountered during the field exploration, it should be assumed that dewatering will be required in any excavation, penetrating a depth of 8.0 feet below existing grade. This can be accomplished with a rim ditch and sump pump, in excavations that penetrate 2.0 feet, or less, into the water table. Deeper excavations should not proceed until dewatering, to a depth of 2.0 feet below the bottom of the excavation, is accomplished with well points. The permeable soil strata₃ should be considered as having a permeability coefficient of 1×10^{-3} cm/sec.

3. After clearing, grubbing and organic topsoil removal, the entire building area, plus a margin of at least 5 feet beyond the foundation limit, as measured at the bottom of the cut, should be excavated to the base of the phosphatic waste clay layer, as described above. The exposed soils within the construction area, plus the margin, should be compacted with a steel-wheeled, self-propelled, vibratory roller having a minimum drum centrifugal force of 25,000 pounds, to a depth of 12.0 inches below stripped grade, to a minimum of 98 percent of the Standard Proctor (ASTM D-698) maximum dry density. This density level should be measured by a qualified soils technician, using procedures described by ASTM D-2937 or an approved equal, prior to commencement of subsequent procedures. A minimum of six (6) overlapping passes of the self-propelled, vibratory roller shall be applied in the compaction process. In the event that initial rolling results in unstable yielding or pumping conditions, the soils engineer shall be contacted to determine the cause of the problem, and make recommendations for remediation. As a minimum, soft, yielding, excessively wet, or otherwise unsuitable material shall be cut, out and replaced with compacted clean sand. In the event that applied water does not

penetrate sufficiently deep into natural soils, to act as a lubricant in the compaction process, it will be necessary to disk or otherwise break up the soils before and during application of water.

The steel-wheeled, vibratory roller should be operated at a forward speed not greater than one (1) mile per hour. Furthermore, this roller should not be operated within 25.0 feet of any existing structure. In the event that the equipment vibrations result in incipient instability of the excavation sides or base, a static method of site compaction shall be substituted, at no extra charge to the owner;

4. Continuous wall footing trenches and individual footing pits should be excavated to footing line and bottom grade. Foundation soils should be moisture conditioned with water, and compacted with suitable mechanical equipment, to achieve the specified level of density to the required depth. Foundation bottom grade should be tested to confirm that a minimum density of 98 percent of the Standard Proctor maximum dry density, exists to a depth of 24.0 inches below footing bottom. If necessary, the bottom of the footing excavation shall be over-excavated, refilled, and re-compacted with mechanical equipment, to achieve the necessary minimum field density to the required depth;
5. Foundation backfill on sides of formed footings, and building slab subgrade fill, should consist of clean sand, free of roots and debris, which is placed in 12-inch lifts, and compacted to 98 percent of the Standard Proctor maximum dry density;
6. Ardaman & Associates, Inc., Tampa office, should be engaged by the owner prior to site preparation to provide field observation of site preparation steps, compaction operations on natural and fill soils, and conduct field in-place density testing to confirm that the specified requirements are met.

If the cost to dewater the excavation becomes prohibitively large, minimal dewatering (i.e., by perimeter ditches and sumps) can be accomplished, and the initial backfill placed in a wet condition. In this event, the initial backfill should consist of granular soil, having less than 5 percent fines content, by weight, to facilitate compaction of thicker, saturated soils. Compaction should commence as soon as it is practical to operate a vibratory roller in the excavation.

Foundation Recommendations

For miscellaneous building foundations, placed on the soils prepared as previously recommended, using either the over-excavation technique, or by relocating the plant, the foundations may be proportioned for a maximum net allowable soil bearing pressure of 2,500 pounds per square foot. We anticipate the maximum settlement to be on the order of 0.5 inches for the continuous wall footings, and 1.0 inch for the individual pad footings, supporting up to 60 kips. We also anticipate that the

settlement would occur almost immediately as the loads are applied, due to the granular nature of the modified foundation soils. Settlement of the storage tanks is estimated to be 6.0 inches at the center of the leachate tank, and 4.0 inches at the perimeter.

A soil cover of 18.0 inches, as measured from the bottom of the foundation system to finished grade, should be provided. Spread footings should be at least 2.5 feet wide. Also, for any continuous wall foundations, a minimum lateral dimension of 18.0 inches should be provided. The foundation should be designed for equal dead-load distribution, in accordance with Standard Building Code requirements.

Tank Containment Area

We recommend that the tank containment area be constructed of earthen, or synthetic liner materials, to reduce the potential impacts of differential settlement of a concrete slab for this use. Moreover, the use of a liner, rather than a concrete slab-and-parapet wall, will allow for a reduced excavation volume for the foundations. The liner should be keyed into both the tank structures, and the perimeter berms, to prevent seepage into the underlying soils.

Field Observations

Site preparation, including preparation of foundation bearing surfaces and compaction of any structural fill, should be observed by a soils engineer or his representative from Ardaman & Associates, Inc., to verify that conditions are as anticipated in the design, and completed in accordance with the recommendations contained in this report.

Closure

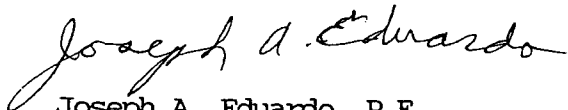
The analyses and recommendations submitted in this report are based on the data obtained from eighteen (18) SPT borings and eight (8) MA borings, performed at the locations indicated on the attached Figure 1. This report does not reflect any variation which may occur in-between the borings. The nature and extent of variations may not become evident, until during the course of construction. If variations then appear evident, it will be necessary for a re-evaluation of the recommendations of this report, to be made after performing on-site observations during the construction period, and noting the characteristics of any variations.

When the final design and specifications are completed, we would like the opportunity to review them, in order to determine whether changes in the original concept may have affected the validity of our recommendations, and whether these recommendations have been implemented in the design and specifications.

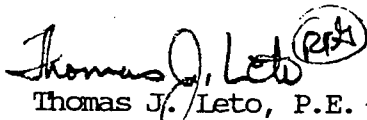
The recovered soil samples are available for examination at our Tampa office. Unless otherwise instructed in writing, the soil samples will be discarded 60 days after issuing this report.

It has been a pleasure assisting you with this phase of your project. If there are any questions, or when we may be of further assistance, please contact the undersigned at 813/654-2336.

Very truly yours,
ARDAMAN & ASSOCIATES, INC.



Joseph A. Eduardo, P.E.
Senior Project Engineer
Florida Registration No. 33318



Thomas J. Leto, P.E.
Principal
Florida Registration No. 12458
JAE/TJL:paw Enclosures
sse19/90-9684.sse

FIGURES

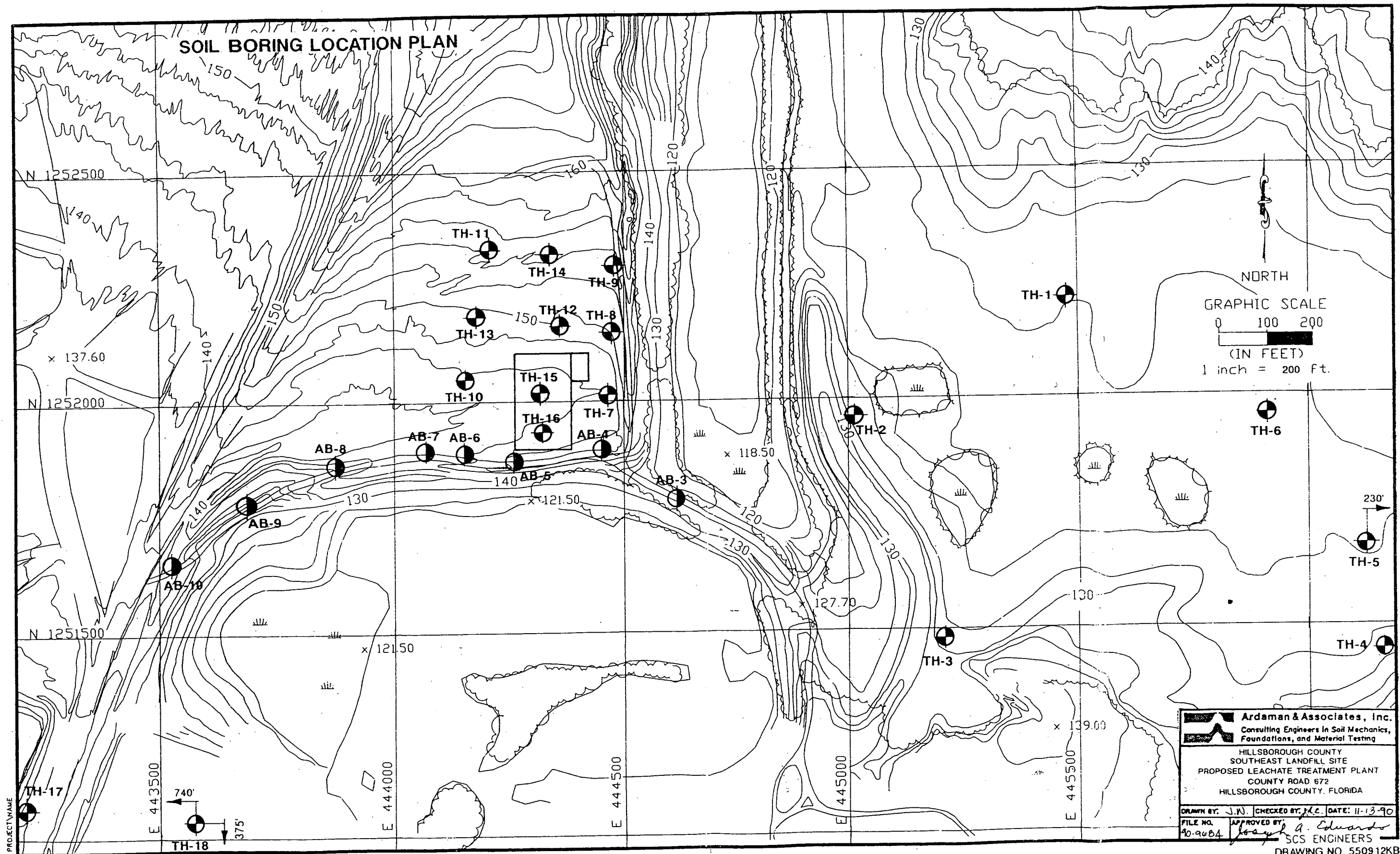


FIGURE 1

ELEVATION - FEET

DISTANCE - FEET

TH-11 **TH-13** **TH-10** **TH-18**

SAND WITH TRACES OF PHOSPHATE (PROCESSING TAILINGS)

LIGHT GRAY TO LIGHT BROWN SILTY SAND WITH TRACE OF CLAY

GRAYISH-BROWN SILTY CLAY (PHOSPHATE MINING WASTE)

DARK BROWN OR DARK GRAY TO BLACK SAND WITH SILT OCCASIONALLY WITH CEMENTED SAND FRAGMENTS

REDDISH-BROWN SAND WITH SILT

LIGHT BROWN TO BROWN SAND

GRADES TO CLAYEY SILT

DARK BROWN SAND WITH SILT WITH GRAYISH-BROWN SILTY CLAY LENSE

LIGHT BROWN CLAYEY SAND

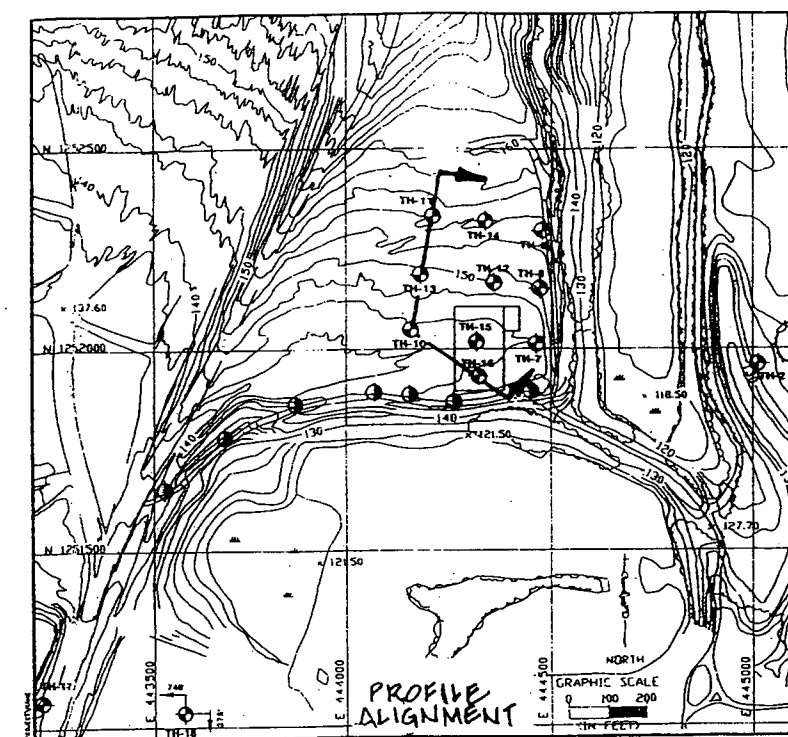
DARK BROWN TO BLACK SAND WITH SILT

CLAYEY SAND WITH PHOSPHATE

LIMITS OF EXPLORATION

HORIZONTAL SCALE: 1"=50'

APPROX. VERTICAL SCALE: 1"=10'




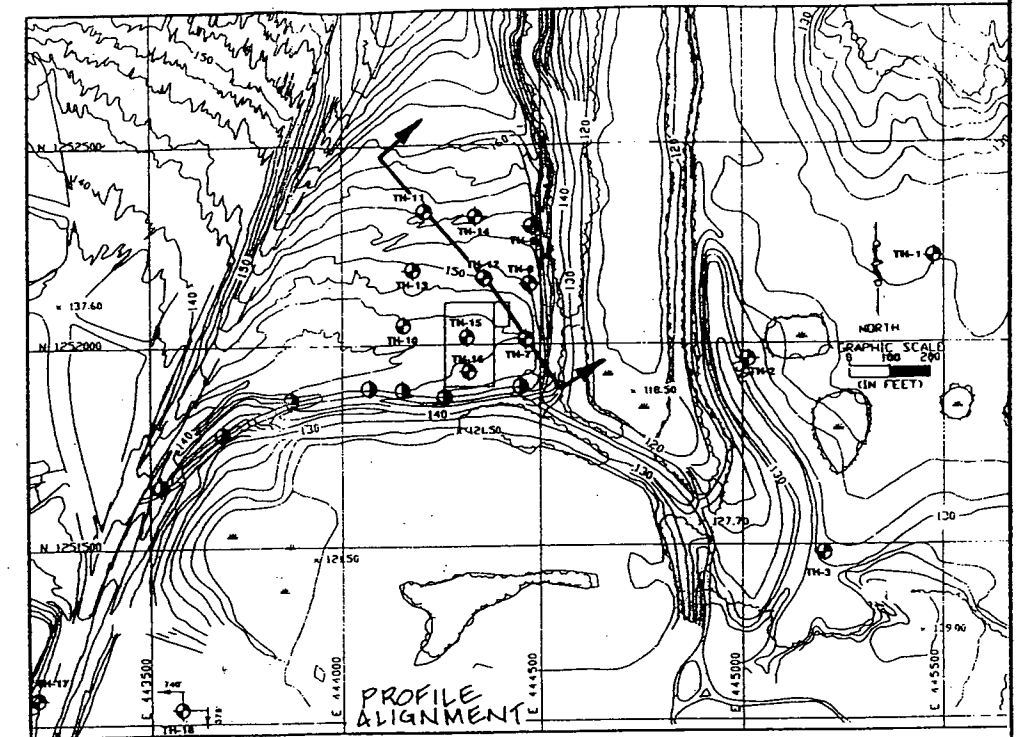
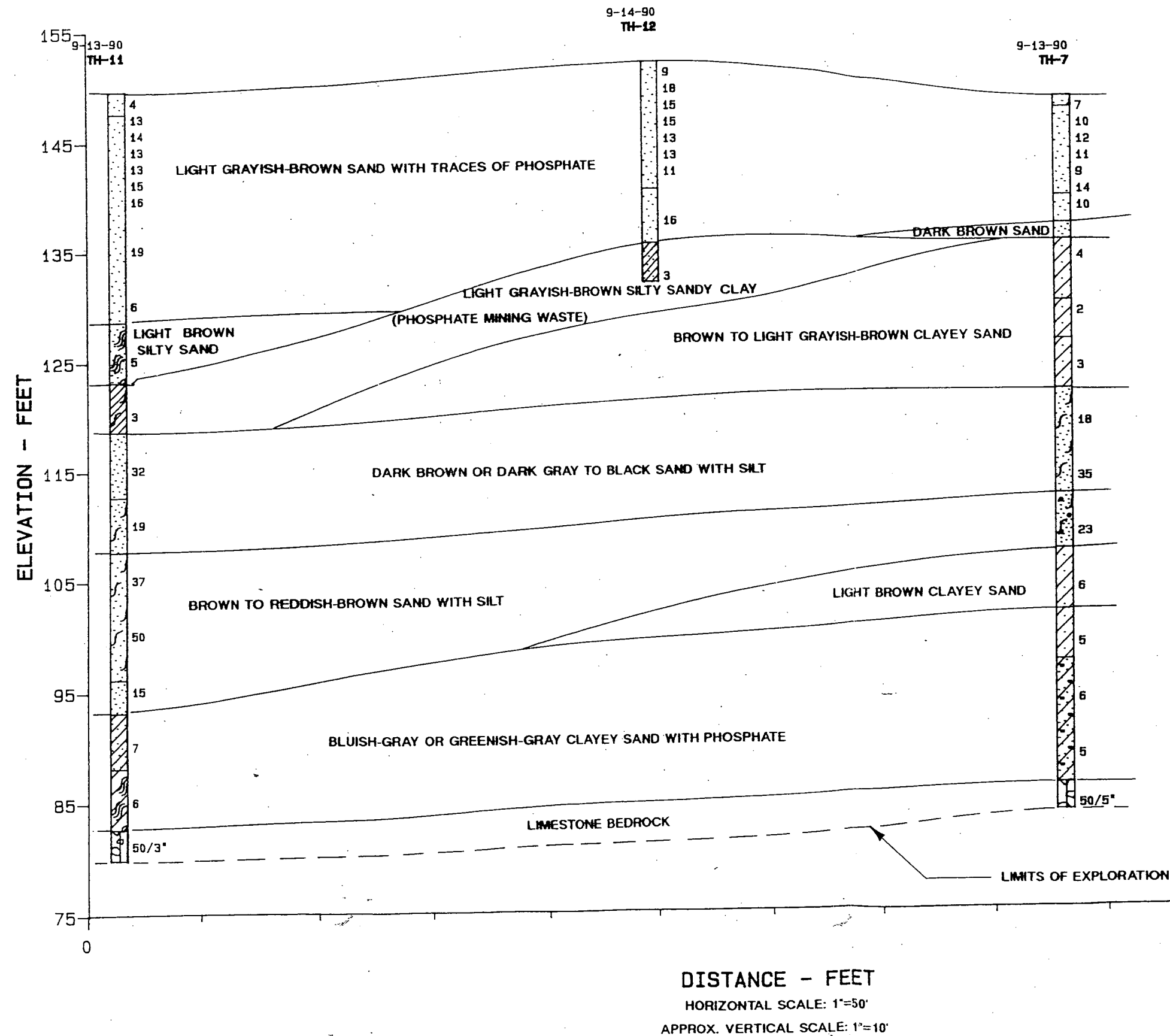
	Ardaman & Associates, Inc.		
	Consulting Engineers in Soils, Hydrogeology, Foundations, and Materials Testing		
<p>HILLSBOROUGH COUNTY SOUTHEAST LANDFILL SITE PROPOSED LEACHATE TREATMENT PLANT COUNTY ROAD 672 HILLSBOROUGH COUNTY, FLORIDA</p>			
DRAWN BY	J.W.	CHECKED BY	JAE
FILE NO.	90-9604	DATE	11-29-90
APPROVED BY:		Joseph A. Edwards	

FIGURE 3

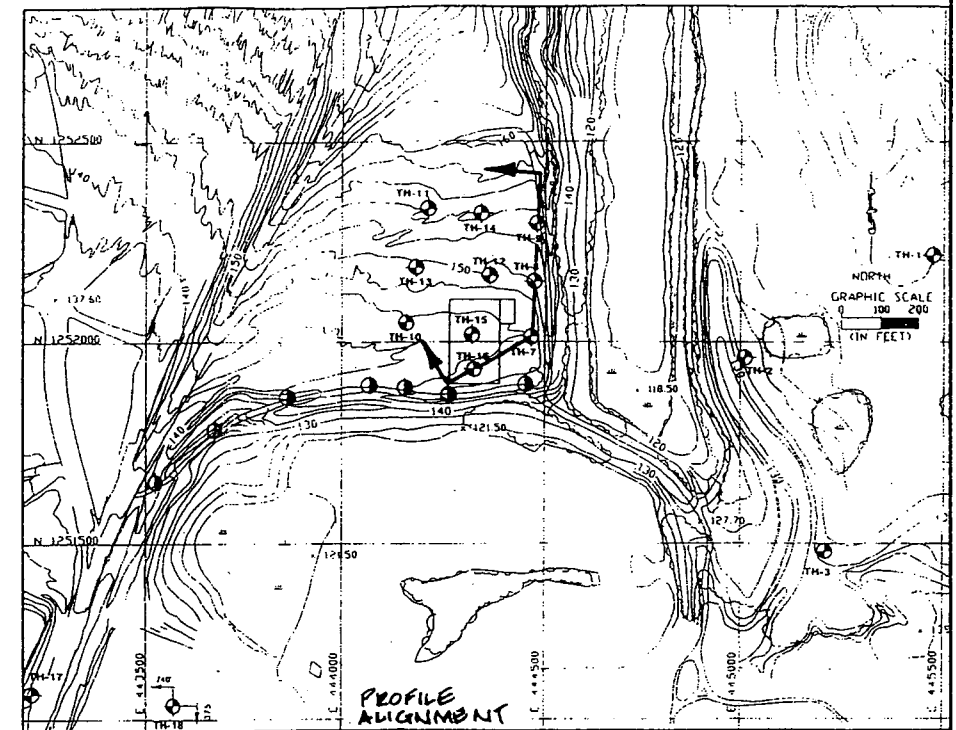
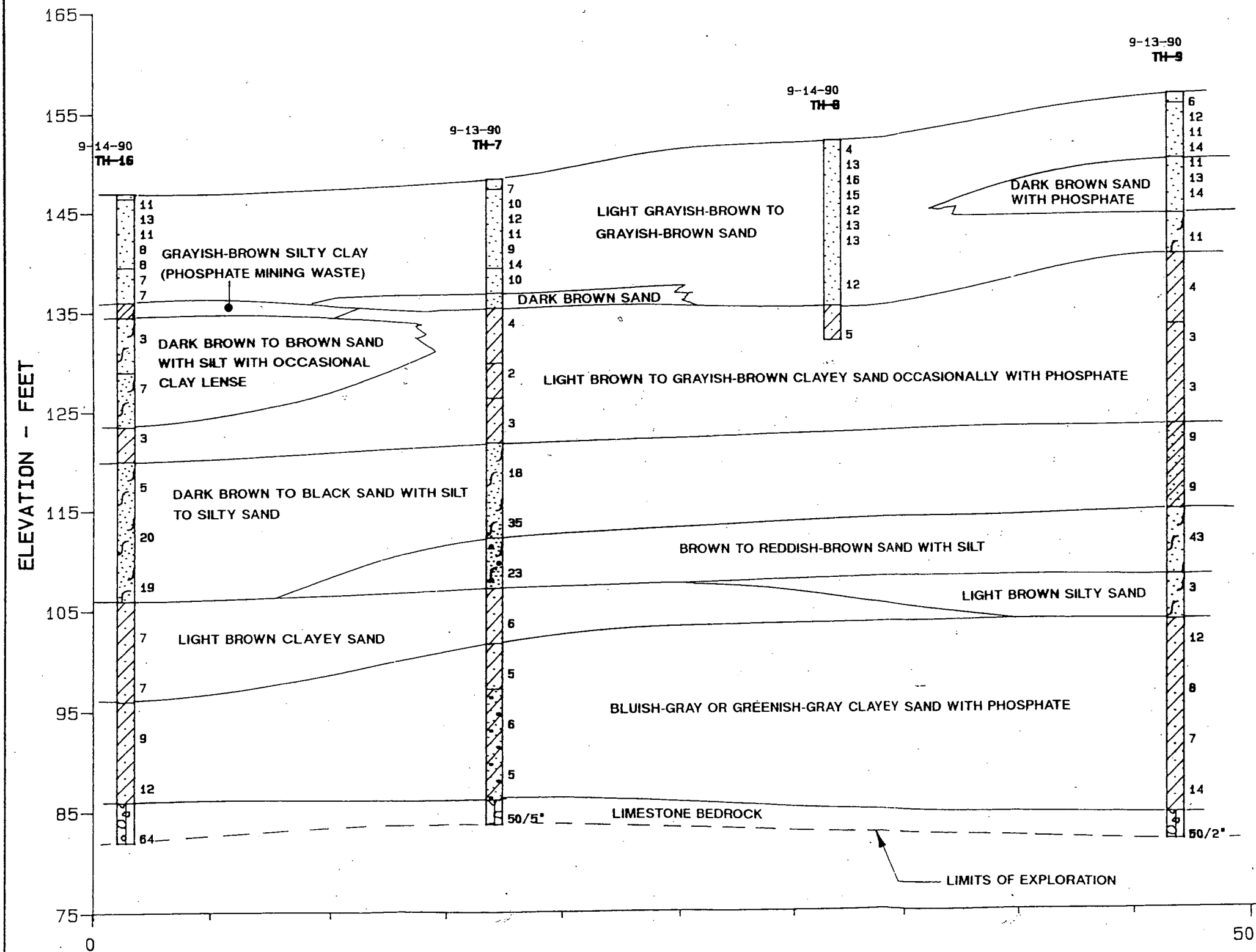
CROSS SECTION B-B



Ardaman & Associates, Inc. Consulting Engineers in Soils, Hydrogeology, Foundations, and Materials Testing			
HILLSBOROUGH COUNTY SOUTHEAST LANDFILL SITE PROPOSED LEACHATE TREATMENT PLANT COUNTY ROAD 672 HILLSBOROUGH COUNTY, FLORIDA			
DRAWN BY: J.W. FILE NO.: 90-9684	CHECKED BY: J.A. APPROVED BY: Joseph A. Edwards	DATE: 11-29-90	

FIGURE 4

CROSS SECTION C-C



Ardaman & Associates, Inc. Consulting Engineers in Soils, Hydrogeology, Foundations, and Materials Testing			
HILLSBOROUGH COUNTY SOUTHEAST LANDFILL SITE PROPOSED LEACHATE TREATMENT PLANT COUNTY ROAD 672 HILLSBOROUGH COUNTY, FLORIDA			
DRAWN BY	CHECKED BY	DATE	FILE NO.
J.W.	JAC	11-29-90	90-9004
APPROVED BY			
Joseph A. Edwards			

FIGURE 5

APPENDIX II

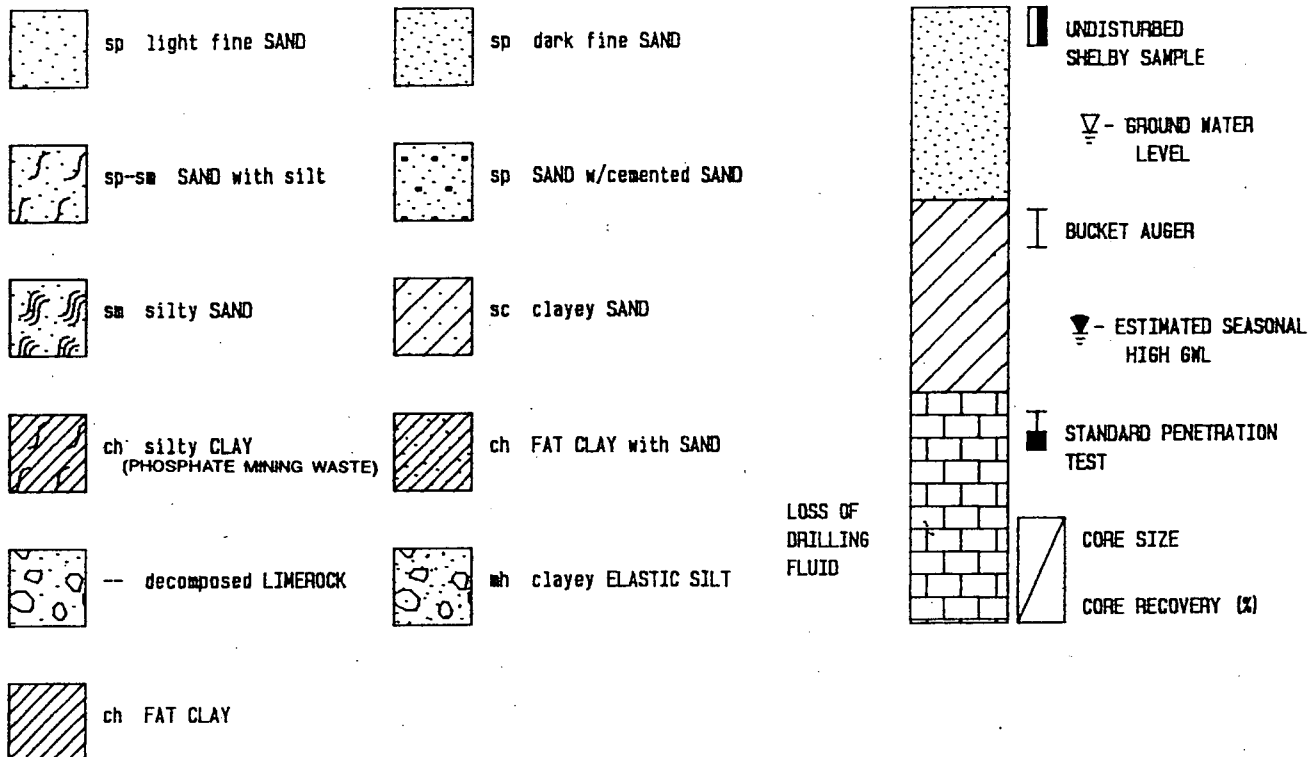
BORING LOGS

LEGEND

PROJECT: Southeast Landfill

FILE NO.: 90-9684

GEOLOGICAL SYMBOLS



ENGINEERING CLASSIFICATION

CONSISTENCY

COHESIONLESS SOIL

VERY LOOSE	0-4 BLOWS PER FOOT
LOOSE	4-10 BLOWS PER FOOT
FIRM	10-30 BLOWS PER FOOT
DENSE	30-50 BLOWS PER FOOT
VERY DENSE	50-UP BLOWS PER FOOT

COHESIVE SOIL

VERY SOFT	0-2 BLOWS PER FOOT
SOFT	2-4 BLOWS PER FOOT
FIRM	4-8 BLOWS PER FOOT
STIFF	8-15 BLOWS PER FOOT
VERY STIFF	15-30 BLOWS PER FOOT
HARD	30-UP BLOWS PER FOOT

GRAIN SIZE IDENTIFICATION

BOULDERS	LARGER THAN 6"
COBBLES	2" TO 6"
GRAVEL	2mm TO 2"
SAND	0.074mm TO 2mm
SILT	0.002mm TO 0.074mm
CLAY	SMALLER THAN 0.002mm

FINAL BORING LOG

SHEET 1 OF 1

PROJECT Southeast Landfill

BORING NUMBER TH-1

CLIENT Hillsborough County

BORING LOCATION As Per Plan

FILE NO. 90-9684

DATE STARTED 9-11-90

COUNTY/CITY Hillsborough

COMPLETED 9-11-90

STATE Florida

125.23

DEPTH IN FEET	SAMPLES SAMPLE NO.	BLOW COUNT	N-VALUE	GRAPHIC LOG	USCS CLASS	DESCRIPTION	NATURAL MOISTURE %	-200 WASH %	ORGANIC CONTENT %	ATTERBURG LIMITS		
										LIQUID LIMIT	PLAST. INDEX	INDEX
0	1	1-2-2	4		ch	light brown silty CLAY (phosphate mining waste)						
1	2	1-1/12"	1		ch							
2		1/18"	0									
3		WOR	WOR									
4		WOR	WOR									
5		WOR	WOR									
6		WOR	WOR									
7		WOR	WOR									
8		WOR	WOR									
9		WOR	WOR									
10		WOR	WOR									
11		WOR	WOR									
12		WOR	WOR									
13		WOR	WOR									
14		WOR	WOR									
15		WOR	WOR									
16		WOR	WOR									
17		WOR	WOR									
18		WOR	WOR									
19		WOR	WOR									
20	3	1-1-2	3		sp	brown SAND with cemented SAND inclusions						
21												
22												
23												
24												
25	4	1/18"	0		sp sm	very dark brown SAND with silt						
26												
27												
28												
29												
30	5	1-1-2	3		sp sm	dark brown SAND with silt and cemented SAND fragments						
31												
32												
33												
34												
35	6	1-1-2	3		sc	light grayish-brown clayey SAND with cemented SAND fragments						
36												
37												
38												
39												
40	7	9-2-3	5									
41												
42												
43												
44												
45	8	4-6-50/5"	50/5"		mh	light gray elastic SILT with limestone fragments						
46												
47												
48												
49												
50												

TOC 125.23
BOC 109.23

Notes:
1. Boring terminated at 44.92 feet

DRILLER/RIG D. Baker

WATER TABLE DEPTH:

BORING TYPE SPT

1st 9'9"

DATE TIME 9-11-90

LENGTH/TYPE CASING None

2nd

DATE TIME

FINAL BORING LOG

SHEET 1 OF 1

PROJECT Southeast Landfill

BORING NUMBER TH-2

CLIENT Hillsborough County

BORING LOCATION As Per Plan

FILE NO. 90-9684

DATE STARTED 9-12-90

COUNTY/CITY Hillsborough

COMPLETED 9-12-90

STATE Florida

127.40

DEPTH IN FEET	SAMPLES SAMPLE NO.	BLOW COUNT	N-VALUE	GRAPHIC LOG	USCS CLASS	DESCRIPTION	NATURAL MOISTURE %	-200 WASH %	ORGANIC CONTENT %	ATTERBURG LIMITS		
										LIQUID LIMIT	PLAST. INDEX	
0	1	1-2-2	4		ch	light grayish-brown silty CLAY (phosphate mining waste)						
	2	2-2-2	4									
	3	2-2-3	5									
5	4	3-5-7	12		sp	gray SAND with roots						
	5	7-8-8	16		sp	light gray SAND						
10	6	5-7-11	18		sp sm	dark brown SAND with silt						
Notes: 1. Boring terminated at 10.5 feet												
15												
20												
25												
30												
35												
40												
45												
50												

DRILLER/RIG D. Baker

WATER TABLE DEPTH:

BORING TYPE SPT

1st 9' 4"

DATE TIME 9-12-90

LENGTH/TYPE CASING None

2nd

DATE TIME

FINAL BORING LOG

SHEET 1 OF 1

PROJECT Southeast Landfill

BORING NUMBER TH-3

CLIENT Hillsborough County

BORING LOCATION As Per Plan

FILE NO. 90-9684

DATE STARTED 9-11-90

COUNTY/CITY Hillsborough

PLET 9-11-90

STATE Florida

127.27

DEPTH IN FEET	SAMPLES SAMPLE NO.	BLOW COUNT	N-VALUE	GRAPHIC LOG	USCS CLASS	DESCRIPTION	NATURAL MOISTURE %	-200 WASH %	ORGANIC CONTENT %	ATTERBURG LIMITS		
										LIQUID LIMIT	PLAST. INDEX	INDEX
0	1	1-1-2	3		ch	very light brown CLAY (phosphate mining waste)						
		2-1-3	4									
	2	4-5-9	14		sp	brown SAND with silt - fill						
5	3	9-8-10	18		sm							
		10-7-8	15		sp	gray and light gray mottled SAND						
	4	5-2-3	5		sp sm							
10		1-1/12"	1			dark brown and brown mottled SAND with silt						
	5	50/4"	50/4"		sp sm	dark brown SAND with silt and cemented sand nodules						
15					sp sm							
	6	10-16-13	29			very dark brown silty SAND with cemented SAND nodules						
20												
	7	2-1-3	4		sm	light brown silty SAND with trace of CLAY						
25												
	8	4-4-6	10		sc							
30												
	9	1-1-1	2			bluish-gray clayey SAND with phosphate						
35												
	10	2-1-2	3									
40												
	11	50/4"	50/4"		mh	light gray sandy elastic SILT with limestone fragments - weathered bedrock						
45												
						Notes: 1. Boring terminated at 43.83 feet 2. 30% fluid loss @ 43.0 feet						
50												

DRILLER/RIG D. Baker

WATER TABLE DEPTH:

BORING TYPE SPT

1st 8'9"

DATE TIME 9-11-90

LENGTH/TYPE CASING None

2nd



DATE TIME

FINAL BORING LOG

SHEET 1 OF 1

PROJECT Southeast Landfill
 CLIENT Hillsborough County
 FILE NO. 90-9684
 COUNTY/CITY Hillsborough
 STATE Florida

BORING NUMBER TH-4
 BORING LOCATION As Per Plan
 DATE STARTED 9-12-90
 DATE COMPLETED 9-12-90
 ELEVATION 124.82

DEPTH IN FEET	SAMPLES SAMPLE NO.	BLOW COUNT	N-VALUE	GRAPHIC LOG	USCS CLASS	SOIL DESCRIPTION	NATURAL MOISTURE %	-200 WASH %	ORGANIC CONTENT %	ATTERBURG LIMITS		
										LIQUID LIMIT	PLAST. LIMIT	INDEX
0	1	1-2-1	3		ch	light grayish-brown silty CLAY (phosphate mining waste)						
	2	1-1-1	2									
		WOR	WOR									
5	3	WOR	WOR									
		WOR	WOR									
		WOR	WOR									
10		WOR	WOR									
15	4	3-4-3	7		sp sm	dark brown SAND with silt and cemented sand nodules						
						Notes: 1. Boring terminated at 14.5 feet						
20												
25												
30												
35												
40												
45												
50												

DRILLER/RIG D. Baker
 BORING TYPE SPT
 LENGTH/TYPE CASING None

WATER TABLE DEPTH:
 1st None DATE TIME 9-12-90
 2nd DATE TIME

FINAL BORING LOG

SHEET 1 OF 1

PROJECT Southeast Landfill

BORING NUMBER TH-5

CLIENT Hillsborough County

BORING LOCATION As Per Plan

FILE NO. 90-9684



DATE STARTED 9-12-90

COUNTY/CITY Hillsborough

TESTED 9-12-90

STATE Florida

125.42

DEPTH IN FEET	SAMPLES SAMPLE NO.	BLOW COUNT	N-VALUE	GRAPHIC LOG	USCS CLASS		NATURAL MOISTURE %	-200 WASH %	ORGANIC CONTENT %	ATTERBURG LIMITS	
										LIQUID LIMIT	PLAST. INDEX
0	1	1-1/12"	1		ch	light grayish-brown silty CLAY					
1	2	1/18"	0								
2		WOR	WOR								
3		WOR	WOR								
4		WOR	WOR								
5		WOR	WOR								
10		WOR	WOR								
15		WOR	WOR								
20	4	4-2-3	5		sp sm	dark brown SAND with silt and cemented sand nodules					
Notes: 1. Boring terminated at 20.0 feet											
25											
30											
35											
40											
45											
50											

DRILLER/RIG D. Baker

WATER TABLE DEPTH:

BORING TYPE SPT

1st None DATE TIME 9-12-90

LENGTH/TYPE CASING None

2nd _____ DATE TIME _____

FINAL BORING LOG

SHEET 1 OF 1

PROJECT Southeast Landfill

BORING NUMBER TH-6

CLIENT Hillsborough County

BORING LOCATION As Per Plan

FILE NO. 90-9684



DATE STARTED 9-12-90

COUNTY/CITY Hillsborough

ETED 9-12-90

STATE Florida

124.29

DEPTH IN FEET	SAMPLES SAMPLE NO.	BLOW COUNT	N-VALUE	GRAPHIC LOG	USCS CLASS		NATURAL MOISTURE %	-200 WASH %	ORGANIC CONTENT %	ATTERBURG LIMITS	
										LIQUID LIMIT	PLAST. INDEX
0	1	2-2-1	3		ch	light grayish-brown silty CLAY					
	2	1-1-1	2								
		WOR	WOR								
5		1-0-1	1								
	3	1-1-0	1								
		WOR	WOR								
10		WOR	WOR								
15		WOR	WOR								
20		WOR	WOR								
25	5	WOR	WOR								
30	6	2-2-3	5		sp sm	dark brown silty SAND with cemented sand nodules					
35						Notes: 1. Boring terminated at 30.0 feet					
40											
45											
50											

TOC = 124.29
BOC = 98.29

DRILLER/RIG D. Baker

WATER TABLE DEPTH:

BORING TYPE SPT

1st None

DATE TIME 9-12-90

LENGTH/TYPE CASING None

2nd

DATE TIME

FINAL BORING LOG

SHEET 1 OF 2

JECT Southeast Landfill BORING NUMBER TH-7
 CLIENT Hillsborough County BORING LOCATION As Per Plan
 FILE NO. 90-9684 DATE STARTED 9-13-90
 COUNTY/CITY Hillsborough DATE COMPLETED 9-13-90
 STATE Florida ELEVATION 148.07

DEPTH IN FEET	SAMPLES SAMPLE NO.	BLOW COUNT	N-VALUE	GRAPHIC LOG	USCS CLASS	SOIL DESCRIPTION				
0	1	3-3-4	7		sp	light brown SAND with silt				
	2	5-5-5	10		sm	light grayish-brown SAND				
		6-6-6	12		sp					
5		5-5-6	11							
		5-4-5	9							
		6-6-8	14			light gray SAND with phosphate				
10	3	6-5-5	10		sp					
					sp	dark brown SAND				
					sc	brown clayey SAND				
15	4	2-1-3	4		sc	gray and light brown mottled clayey SAND with phosphate				
20	5	1/12"-2	2		sc	light grayish-brown clayey SAND				
					sc	(with chemical odor)				
25	6	1-2-1	3		sp	dark brown SAND with silt				
30	7	7-8-10	18		sm	with strong chemical odor in sample 8				
35	8	6-13-22	35		sp	brown SAND with silt and cemented SAND nodules				
					sm					
40	9	13-11-12	23		sc	light brown clayey SAND with cemented SAND nodules				
45	10	2-3-3	6		sc	greenish-gray clayey SAND				
0	11	2-2-3	5				36.4	30.5	48	26

TH-7

TH-16

LEACHATE
TREATMENT
PLANT

DRILLER/RIG D. Baker

WATER TABLE DEPTH:

BORING TYPE SPT

1st None DATE TIME 9-13-90

LENGTH/TYPE CASING None

2nd DATE TIME

PROJECT Southeast Landfill

CLIENT Hillsborough County

COUNTY Hillsborough

FILE NO. 90-9684



STATE Florida

[illegible]

FINAL BORING LOG

SHEET 1 OF 1

PROJECT Southeast Landfill BORING NUMBER TH-8
 CLIENT Hillsborough County BORING LOCATION As Per Plan
 FILE NO. 90-9684 DATE STARTED 9-14-90
 COUNTY/CITY Hillsborough DATE COMPLETED 9-14-90
 STATE Florida ELEVATION 151.59

DEPTH IN FEET	SAMPLES SAMPLE NO.	BLOW COUNT	N-VALUE	GRAPHIC LOG	USCS CLASS	SOIL DESCRIPTION	NATURAL MOISTURE %	-200 WASH %	ORGANIC CONTENT %	ATTERBURG LIMITS			
										LIQUID LIMIT	PLAST. LIMIT	INDEX	
0	1	1-2-2	4		sp	light brown SAND with trace of phosphate							
		4-6-7	13										
		7-9-7	16										
5		9-7-8	15										
		6-5-7	12										
		7-5-8	13										
10		6-5-8	13										
15	2	6-5-7	12		sc	light brown clayey SAND							
20	3	2-2-3	5										
						Notes: 1. Boring terminated at 20.0 feet							
25													
30													
35													
40													
45													
50													

DRILLER/RIG D. Baker
 BORING TYPE SPT
 LENGTH/TYPE CASING None

WATER TABLE DEPTH:
 1st None DATE TIME 9-14-90
 2nd DATE TIME

FINAL BORING LOG

SHEET 1 OF 2

PROJECT Southeast Landfill

BORING NUMBER TH-9

CLIENT Hillsborough County

BORING LOCATION As Per Plan

FILE NO. 90-9684

DATE STARTED 9-13-90

COUNTY/CITY Hillsborough

DATE COMPLETED 9-13-90

STATE Florida

ELEVATION 156.05

DEPTH IN FEET	SAMPLES SAMPLE NO.	BLOW COUNT	N-VALUE	GRAPHIC LOG	USCS CLASS	SOIL DESCRIPTION	NATURAL MOISTURE %	-200 WASH %	ORGANIC CONTENT %	ATTERBURG LIMITS		
										LIQUID LIMIT	PLAST. INDEX	
0	1	2-3-3	6		sp	light brown SAND						
	2	5-6-6	12		sp							
		6-5-6	11			light grayish-brown SAND with phosphate						
5		5-7-7	14									
	3	6-5-6	11		sp							
		6-6-7	13			dark brown SAND with phosphate						
10		6-6-8	14									
					sp sm	light brown and dark brown mottled SAND with silt						
15	4	1-4-7	11		sc							
						very light brown clayey SAND						
20	5	1-2-2	4									
					sc							
25	6	1-2-1	3			light brown clayey SAND with phosphate						
30	7	2-1-2	3									
					sp sc	dark gray SAND with clay						
35	8	2-3-6	9									
40		4-5-4	9									
					sp sm	reddish-brown SAND with silt						
45	9	13-27-16	43									
					sp sm	light brown silty SAND						
50	10	2-1-2	3									

DRILLER/RIG D. Baker

WATER TABLE DEPTH:

BORING TYPE SPT

1st None

DATE TIME 9-13-90

LENGTH/TYPE CASING None

2nd

DATE TIME

PROJECT Southeast Landfill

CLIENT Hillsborough County

FILE NO. 90-9684

STATE Florida

[illegible]

FINAL BORING LOG

SHEET 1 OF 2

PROJECT Southeast Landfill
 CLIENT Hillsborough County
 FILE NO. 90-9684
 COUNTY/CITY Hillsborough
 STATE Florida




BORING NUMBER TH-10
 BORING LOCATION As Per Plan
 DATE STARTED 9-13-90
 DATE COMPLETED 9-13-90
 ELEVATION 146.43

DEPTH IN FEET	SAMPLES SAMPLE NO.	BLOW COUNT	N-VALUE	GRAPHIC LOG	USCS CLASS	SOIL DESCRIPTION	NATURAL MOISTURE %	-200 WASH %	ORGANIC CONTENT %	ATTERBURG LIMITS	INDEX
0	1	4-4-5	9		sp	light brown SAND					
5	2	5-6-7	13		sp						
		7-7-8	15								
		7-7-7	14								
	3	7-7-7	14			light grayish-brown SAND with phosphate					
		5-4-5	9								
10		3-4-6	10								
15	4	1-1/12"	1		ch	TOC 133.93 BOC 119.43					
20	5	1-1/12"	1			very light grayish-brown silty CLAY (phosphate mining waste)	75.7	84.8			
25	6	1-1/12"	1				81.9	90.4			
30	7	6-9-11	20		sp sm	black SAND with silt cemented SAND fragments					
35	8	13-22-34	56		sp sm	↑ EL 119.43 BOTTOM WASTE CLAY					
40	9	12-22-41	63			reddish-brown SAND with silt					
45	10	22-29-36	65		sp sm	dark brown SAND with silt					
50	11	1-2-2	4		sp	light brown SAND with trace of phosphate					

DRILLER/RIG D. Baker
 BORING TYPE SPT
 LENGTH/TYPE CASING None

WATER TABLE DEPTH:
 1st 8'8" DATE TIME 9-13-90
 2nd _____ DATE TIME _____

STATE Florida

DEPTH IN FEET	SAMPLES SAMPLE NO.	BLOW COUNT	N-VALUE	GRAPHIC LOG	USCS CLASS	SOIL DESCRIPTION	NATURAL MOISTURE	-200 WASH	ORGANIC CONTENT	ATTENBURG LIMITS		
							%	%	%	LIQUID LIMIT	PLAST. INDEX	
50					sp							
55	■	2-1-1	2			light brown SAND with trace of phosphate						
60	■ 12	10-9-13	22		sc							
65	■	7-9-14	23			light gray clayey SAND with phosphate						
70	13	50/0*	50/0*	7 d	mh	light brown and light gray clayey elastic SILT (weathered rock) with limestone fragments						
75						Notes: 1. Boring terminated at 68.5 feet						
80												
85												
90												
95												
100												

FINAL BORING LOG

SHEET 1 OF 2

PROJECT Southeast Landfill
 CLIENT Hillsborough County
 FILE NO. 90-9684
 COUNTY/CITY Hillsborough
 STATE Florida

BORING NUMBER TH-11
 BORING LOCATION As Per Plan
 DATE STARTED 9-13-90
 DATE COMPLETED 9-13-90
 ELEVATION 149.66

DEPTH IN FEET	SAMPLES SAMPLE NO.	BLOW COUNT	N-VALUE	GRAPHIC LOG	USCS CLASS	SOIL DESCRIPTION	NATURAL MOISTURE %	-200 WASH %	ORGANIC CONTENT %	ATTERBURG LIMITS		
										LIQUID LIMIT	PLAST. INDEX	
0	1	1-2-2	4		sp	light gray SAND with trace of phosphate						
	2	3-5-8	13		sp							
		6-7-7	14									
5		5-6-7	13									
	3	5-7-6	13									
		6-7-8	15									
10		7-7-9	16			light grayish-brown SAND with trace of phosphate						
15	4	6-9-10	19									
20	5	3-4-2	6									
					sm	light brown silty SAND with trace of clay						
25	6	3-3-2	5			TOC 123.16 BOC 118.66	47.2	45.9				
					ch	light grayish-brown silty CLAY (phosphate mining waste)	67.4	92.7				
30	7	1-1-2	3									
					sp	dark gray SAND ↑ BOTTOM WASTE CLAY EL 118.66						
35	8	11-12-20	32									
					sp sm	black SAND with silt						
40	9	13-10-9	19									
					sp sm	reddish-brown SAND with silt						
45	10	13-18-19	37									
50	11	16-24-26	50									

DRILLER/RIG D. Baker
 BORING TYPE SPT
 LENGTH/TYPE CASING None

WATER TABLE DEPTH:
 1st None DATE TIME 9-13-90
 2nd DATE TIME

PROJECT Southeast Landfill

CLIENT Hillsborough County

FILE NO. 90-9684

COUNTY Hillsborough

STATE Florida




DEPTH IN FEET	SAMPLES SAMPLE NO.	BLON COUNT	N-VALUE	GRAPHIC LOG	USCS CLASS	SOIL DESCRIPTION	NATURAL MOISTURE	-200 WASH	ORGANIC CONTENT	ATTEBURG LIMITS		
							%	%	%	LIQUID LIMIT	PLAST. INDEX	
50					sp sm	reddish-brown SAND with silt						
55	■	4-6-9	15		sp	brown SAND						
60	■ 12	5-3-4	7		sp sc	light gray SAND with clay and phosphate						
65	■	4-3-3	6		ml	light gray clayey SILT with phosphate						
70	■ 13	17-29- 50/3"	50/3"		mh	light brown and light gray clayey elastic SILT (weathered rock) with limestone fragments and phosphate						
						Notes: 1. Boring terminated at 69.75 feet						
75												
80												
85												
90												
95												
100												

FINAL BORING LOG

SHEET 1 OF 1

PROJECT Southeast Landfill
 CLIENT Hillsborough County
 FILE NO. 90-9684
 COUNTY/CITY Hillsborough
 STATE Florida

BORING NUMBER TH-12
 BORING LOCATION As Per Plan
 DATE STARTED 9-14-90
 DATE COMPLETED 9-14-90
 ELEVATION 151.66

DEPTH IN FEET	SAMPLES SAMPLE NO.	BLOW COUNT	N-VALUE	GRAPHIC LOG	USCS CLASS	SOIL DESCRIPTION	NATURAL MOISTURE %	-200 WASH %	ORGANIC CONTENT %	ATTERBURG LIMITS			
										LIQUID LIMIT	PLAST. INDEX		
0	1	4-4-5	9		sp	very light grayish-brown SAND with trace of phosphate	90.4	53.4					
		6-9-9	18										
		8-7-8	15										
5		7-7-8	15										
		8-6-7	13										
		7-7-6	13										
10		6-5-6	11		sp	light grayish-brown SAND with trace of phosphate	90.4	53.4					
15	2	7-8-8	16										
20	3	2-1-2	3		ch	light grayish-brown sandy CLAY (phosphate mining waste) with chemical odor							
						Notes: 1. Boring terminated at 20.0 feet							
25													
30													
35													
40													
45													
50													

DRILLER/RIG D. Baker
 BORING TYPE SPT
 LENGTH/TYPE CASING None

WATER TABLE DEPTH:
 1st None DATE TIME 9-14-90
 2nd None DATE TIME None

FINAL BORING LOG

SHEET 1 OF 1

PROJECT Southeast Landfill

BORING NUMBER TH-13

CLIENT Hillsborough County

BORING LOCATION As Per Plan

FILE NO. 90-9684

DATE STARTED 9-14-90

COUNTY/CITY Hillsborough

DATE COMPLETED 9-14-90

STATE Florida

ELEVATION 148.96

DEPTH IN FEET	SAMPLES SAMPLE NO.	BLOW COUNT	N-VALUE	GRAPHIC LOG	USCS CLASS	SOIL DESCRIPTION	NATURAL MOISTURE %	-200 WASH %	ORGANIC CONTENT %	ATTERBURG LIMITS	INDEX
0	1	4-5-4	9		sp						
		6-6-6	12								
		5-6-7	13								
5		7-7-6	13								
		6-7-7	14								
		7-9-8	17			light grayish-brown SAND with trace of phosphate					
10		8-7-7	14								
15	2	9-7-8	15								
					sm	light gray silty SAND with trace of clay					
20	3	2-2-2	4				52.2	27.1			
						Notes: 1. Boring terminated at 20.0 feet					
25											
30											
35											
40											
45											
50											

DRILLER/RIG D. Baker

WATER TABLE DEPTH:

BORING TYPE SPT

1st None

DATE TIME 9-14-90

LENGTH/TYPE CASING None

2nd

DATE TIME

FINAL BORING LOG

SHEET 1 OF 1

PROJECT Southeast Landfill
 CLIENT Hillsborough County
 FILE NO. 90-9684
 COUNTY/CITY Hillsborough
 STATE Florida

BORING NUMBER TH-14
 BORING LOCATION As Per Plan
 DATE STARTED 9-14-90
 DATE COMPLETED 9-14-90
 ELEVATION 156.31

DEPTH IN FEET	SAMPLES SAMPLE NO.	BLOW COUNT	N-VALUE	GRAPHIC LOG	USCS CLASS	SOIL DESCRIPTION	NATURAL MOISTURE %	-200 WASH %	ORGANIC CONTENT %	ATTERBURG LIMITS		
										LIQUID LIMIT	PLAST. LIMIT	INDEX
0	1	5-4-4	8		sp	light gray SAND with trace of phosphate						
	2	3-6-6	12		sp							
		7-6-6	12									
5		7-8-9	17									
		9-9-7	16									
		9-8-9	17									
10		7-6-6	12									
15	3	lost										
20	4	lost			ch	light grayish-brown silty CLAY (phosphate mining waste)	106	776.3		119	98	
25						Notes: 1. Boring terminated at 20.0 feet 2. Samples lost at 14.0 and 19.0 feet						
30												
35												
40												
45												
50												

*Bottom of
CLAY ?*

*TOC = 138.31
BOC = 136.31*

DRILLER/RIG D. Baker
 BORING TYPE SPT
 LENGTH/TYPE CASING None

WATER TABLE DEPTH:
 1st None DATE TIME 9-14-90
 2nd DATE TIME

FINAL BORING LOG

SHEET 1 OF 1

PROJECT Southeast Landfill
 CLIENT Hillsborough County
 FILE NO. 90-9684
 COUNTY/CITY Hillsborough
 STATE Florida

BORING NUMBER TH-15
 BORING LOCATION As Per Plan
 DATE STARTED 9-14-90
 DATE COMPLETED 9-14-90
 ELEVATION 147.48

DEPTH IN FEET	SAMPLES SAMPLE NO.	BLOW COUNT	N-VALUE	GRAPHIC LOG	USCS CLASS	SOIL DESCRIPTION	NATURAL MOISTURE %	-200 WASH %	ORGANIC CONTENT %	ATTERBURG LIMITS		
										LIQUID LIMIT	PLAST. INDEX	
0	1	4-5-6	11		sp	 TOC = 134.98 POC = 132.48 trace of phosphate						
		6-7-7	14									
		7-8-6	14									
5		6-8-8	16									
		8-9-7	16									
		6-8-7	15									
10		7-7-5	12									
15	2	1-2-1	3		ch	light grayish-brown silty CLAY (phosphate mining waste)	99.8	86.4				
20						Notes: 1. Boring terminated at 15.0 feet						
25												
30												
35												
40												
45												
50												

*Bottom of
CLAY ?*

DRILLER/RIG D. Baker
 BORING TYPE SPT
 LENGTH/TYPE CASING None

WATER TABLE DEPTH:
 1st None DATE TIME 9-14-90
 2nd DATE TIME

FINAL BORING LOG

SHEET 1 OF 2

PROJECT Southeast Landfill

BORING NUMBER TH-16

CLIENT Hillsborough County

BORING LOCATION As Per Plan

FILE NO. 90-9684

DATE STARTED 9-14-90

COUNTY/CITY Hillsborough

DATE COMPLETED 9-14-90

STATE Florida

ELEVATION 146.89

DEPTH IN FEET	SAMPLES SAMPLE NO.	BLOW COUNT	N-VALUE	GRAPHIC LOG	USCS CLASS	SOIL DESCRIPTION	NATURAL MOISTURE %	-200 WASH %	ORGANIC CONTENT %	ATTERBURG LIMITS		
										LIQUID LIMIT	PLAST. INDEX	
0	1	5-5-6	11	sm		phosphate						
	2	6-6-7	13	sp								
5		5-5-6	11			face of phosphate						
		5-4-4	8									
	3	4-4-4	8									
	4	5-4-3	7	sp								
10	5	3-4-3	7	ch		grayish-brown silty CLAY (phosphate mining waste)						
15	6	1-2-1				ld brown SAND with silt interbedded -brown silty clay lenses						
20	7	3-3-4				SAND with silt	23.7	11.0				
25	8	1-2-1				clayey SAND						
30		3-2-3										
35	9	5-7-13				ith silt	26.3	6.1				
40		7-8-11	19									
45	10	3-4-3	7	sc		light brown clayey SAND						
50	11	4-3-4	7									

DRILLER/RIG D. Baker

WATER TABLE DEPTH:

BORING TYPE SPT

1st None

DATE TIME 9-14-90

LENGTH/TYPE CASING None

2nd

DATE TIME

CLIENT Hillsborough County

COUNTY Hillsborough

STATE Florida[illegible]

FINAL BORING LOG

SHEET 1 OF 1

PROJECT Southeast Landfill
 CLIENT Hillsborough County
 FILE NO. 90-9684
 COUNTY/CITY Hillsborough
 STATE Florida

BORING NUMBER TH-17
 BORING LOCATION As Per Plan
 DATE STARTED 9-14-90
 DATE COMPLETED 9-14-90
 ELEVATION 134.51

DEPTH IN FEET	SAMPLES SAMPLE NO.	BLOW COUNT	N-VALUE	GRAPHIC LOG	USCS CLASS	SOIL DESCRIPTION	NATURAL MOISTURE %	-200 WASH %	ORGANIC CONTENT %	ATTERBURG LIMITS		
										LIQUID LIMIT	PLAST. INDEX	
0												
	1	13-13-16	29		sp	brown SAND with cemented sand nodules						
	2	6-8-9	17		sc	light brown clayey SAND						
	3	6-5-6	11		sp	light brown SAND with clay						
5		2-3-3	6		sc							
		3-3-2	5									
		3-3-2	5									
10	4	2-1-2	3		sp	light brown SAND						
15		1-1-3	4									
20	5	1-1/12"	1		sc	light grayish-brown clayey SAND	36.6	33.8		42	20	
					sp	very dark brown SAND with silt						
25	6	7-12-18	30		sm							
						Notes: 1. Boring terminated at 25.0 feet						
30												
35												
40												
45												
50												

DRILLER/RIG D. Baker
 BORING TYPE SPT
 LENGTH/TYPE CASING None

WATER TABLE DEPTH:
 1st None DATE TIME 9-14-90
 2nd DATE TIME

FINAL BORING LOG

SHEET 1 OF 1

PROJECT Southeast Landfill
 CLIENT Hillsborough County
 FILE NO. 90-9684
 COUNTY/CITY Hillsborough
 STATE Florida

BORING NUMBER TH-18
 BORING LOCATION As Per Plan
 DATE STARTED 9-14-90
 DATE COMPLETED 9-14-90
 ELEVATION 136.18

DEPTH IN FEET	SAMPLES SAMPLE NO.	BLOW COUNT	N-VALUE	GRAPHIC LOG	USCS CLASS		NATURAL MOISTURE %	-200 WASH %	ORGANIC CONTENT %	ATTERBURG LIMITS	
										LIQUID LIMIT	PLAST. INDEX
0	1	11-12-15	27		sp	DN TOC = 129.68 BOC = 118.18 trace of phosphate of phosphate					
	2	24-23-25	48		sp						
		15-15-14	29								
5	3	7-7-6	13		sp						
		3-1/12"	1		ch						
10	4	NOR	NOR			light grayish-brown silty CLAY (phosphate mining waste) with chemical odor in sample 4	138.4	50.6			
		NOR	NOR								
15	5	NOR	NOR				74.9	98.2			
20	6	NOR 12"-3	3		sp sm	very dark gray SAND with silt and lenses of grayish-brown clay Notes: 1. Boring terminated at 20.0 feet	34.0	5.6			
25											
30											
35											
40											
45											
50											

DRILLER/RIG D. Baker
 BORING TYPE SPT
 LENGTH/TYPE CASING None

WATER TABLE DEPTH:
 1st None DATE TIME 9-14-90
 2nd DATE TIME

FINAL BORING LOG

SHEET 1 OF 1

PROJECT Southeast Landfill

BORING NUMBER AB-3

CLIENT Hillsborough County

BORING LOCATION As Per Plan

FILE NO. 90-9684

DATE STARTED 9-12-90

COUNTY/CITY Hillsborough

DATE COMPLETED 9-12-90

STATE Florida

N/A

130.45 FB TN

DEPTH IN FEET	SAMPLES SAMPLE NO.	BLOW COUNT	N-VALUE	GRAPHIC LOG	USCS CLASS						BURG ITS	FLAT. INDEX
0	1			sp								
2	2			ch								
5												
	3			sc								
10	4			bc								
15	5			sc								
20	6			sp								
25												
30												
35												
40												
45												
50												

TOC = 134.45
BOC 129.45

grayish-brown sandy FAT CLAY with trace of phosphate

64.7 66.3

brown clayey SAND

light brown clayey SAND with gravel

26.9 25.6

greenish-gray clayey SAND with phosphate

gray SAND

Notes:
1. Boring terminated at 20.0 feet

DRILLER/RIG D. Baker

WATER TABLE DEPTH:

BORING TYPE Mechanical Auger

1st None

DATE TIME 9-12-90

LENGTH/TYPE CASING None

2nd

DATE TIME

FINAL BORING LOG

SHEET 1 OF 1

PROJECT Southeast Landfill
 CLIENT Hillsborough County
 FILE NO. 90-9684
 COUNTY/CITY Hillsborough
 STATE Florida

BORING NUMBER AB-4
 BORING LOCATION As Per Plan
 DATE STARTED 9-12-90
 DATE COMPLETED 9-1
 ELEVATION N/A 149.97 FR. TIN

DEPTH IN FEET	SAMPLES SAMPLE NO.	BLOW COUNT	N-VALUE	GRAPHIC LOG	USCS CLASS		NATURAL MOISTURE x	-200 WASH x	ORGANIC CONTENT x	ATTENBURG LIMITS		
										LIQUID LIMIT	PLAST. INDEX	
0	1			sm	sm							
	2			sp	sp							
5	3			ch	ch							
	4					grayish-brown sandy FAT CLAY with traces of phosphate						
10	5			sc	sc							
	6					light gray clayey SAND with shell fragments						
15				sp sm	sp sm	very dark brown SAND with silt						
20						Notes: 1. Boring terminated at 20.0 feet						
25												
30												
35												
40												
45												
50												

DRILLER/RIG D. Baker

WATER TABLE DEPTH:

BORING TYPE Mechanical Auger

1st None DATE TIME 9-12-90

LENGTH/TYPE CASING None

2nd _____ DATE TIME _____

FINAL BORING LOG

SHEET 1 OF 1

PROJECT Southeast Landfill
 CLIENT Hillsborough County
 FILE NO. 90-9684
 COUNTY/CITY Hillsborough
 STATE Florida

BORING NUMBER AB-5
 BORING LOCATION As Per Plan
 DATE STARTED 9-12-90
 DATE COMPLETED 9-
 ELEVATION N/A 149.95 FR. TIN

DEPTH IN FEET	SAMPLES SAMPLE NO.	BLOW COUNT	N-VALUE	GRAPHIC LOG	USCS CLASS	SOIL DESCRIPTION	NATURAL MOISTURE %	-200 WASH %	ORGANIC CONTENT %	ATTERBURG LIMITS		
										LIQUID LIMIT	PLAST. INDEX	
0	1				sp	dark brown SAND with silt						
	2				sp	brown SAND with silt						
5	3				sp	dark brown SAND with silt						
					sp	dark brown SAND with silt	7.4	5.9				
10	4				sp	dark brown SAND						
15	5				sp	gray SAND						
20						Notes: 1. Boring terminated at 20.0 feet						
25												
30												
35												
40												
45												
50												

DRILLER/RIG D. Baker
 BORING TYPE Mechanical Auger
 LENGTH/TYPE CASING None

WATER TABLE DEPTH:
 1st 12'8" DATE TIME 9-12-90
 2nd _____ DATE TIME _____

FINAL BORING LOG

SHEET 1 OF 1

PROJECT Southeast Landfill

BORING NUMBER AB-6

CLIENT Hillsborough County

BORING LOCATION As Per Plan

FILE NO. 90-9684

DATE STARTED 9-12-90







COUNTY/CITY Hillsborough

DATE COMPLETED 9-12-90

STATE Florida

ELEVATION N/A

149.19 FT. T.I.N.

DEPTH IN FEET	SAMPLES SAMPLE NO.	BLOW COUNT	N-VALUE	GRAPHIC LOG	USCS CLASS	SOIL DESCRIPTION	NATURAL MOISTURE %	-200 WASH %	ORGANIC CONTENT %	ATTERBURG LIMITS		
										LIQUID	PLAST.	INDEX
0	H 1				sc	grayish-brown clayey SAND with phosphate						
	H 2				sp	brown SAND						
5	H 3				sc	brown clayey SAND with shell fragments	14.3	19.5				
10	H 4				sp sm	dark brown SAND with silt						
15	H 5				sp	light gray SAND						
	H 6				sp sm	dark brown SAND with silt						
20						Notes: 1. Boring terminated at 20.0 feet						
25												
30												
35												
40												
45												
50												

DRILLER/RIG D. Baker

WATER TABLE DEPTH:

BORING TYPE Mechanical Auger

1st 12'6"

DATE TIME 9-12-90

LENGTH/TYPE CASING None

2nd

DATE TIME

FINAL BORING LOG

SHEET 1 OF 1

PROJECT Southeast Landfill

BORING NUMBER AB-7

CLIENT Hillsborough County

BORING LOCATION As Per Plan

FILE NO. 90-9684

DATE STARTED 9-12-

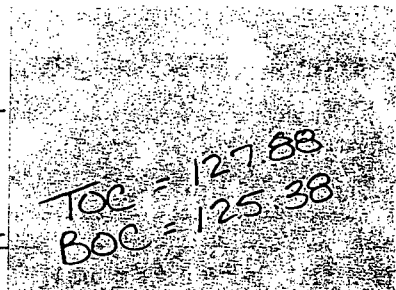
COUNTY/CITY Hillsborough

DATE COMPLETED 9-1-

STATE Florida

ELEVATION N/A

145.38 ft. Tin

DEPTH IN FEET	SAMPLES SAMPLE NO.	BLOW COUNT	N-VALUE	GRAPHIC LOG	USCS CLASS	SOIL DESCRIPTION	NATURAL MOISTURE %	-200 WASH %	ORGANIC CONTENT %	ATTERBURG LIMITS			
										LIQUID LIMIT	PLAST. INDEX		
0	1				sp	grayish-brown SAND with clayey sand lenses							
	2				sp								
					sm								
5													
10	3												
15	4				sm								
	5				ch	light grayish-brown silty CLAY (phosphate mining waste)							
20						Notes: 1. Boring terminated at 20.0 feet							
25													
30													
35													
40													
45													
50													

DRILLER/RIG D. Baker

WATER TABLE DEPTH:

BORING TYPE Mechanical Auger

1st 11'0"

DATE TIME 9-12-90

LENGTH/TYPE CASING None

2nd _____ DATE TIME _____

FINAL BORING LOG

SHEET 1 OF 1

PROJECT Southeast Landfill

BORING NUMBER AB-8

CLIENT Hillsborough County

BORING LOCATION As Per Plan

FILE NO. 90-9684

DATE STARTED 9-12-90

COUNTY/CITY Hillsborough

DATE COMPLETED 9-12-90

STATE Florida

ELEVATION N/A

143.05 FR TIN

DEPTH IN FEET	SAMPLES SAMPLE NO.	BLOW COUNT	N-VALUE	GRAPHIC LOG	USCS CLASS	SOIL DESCRIPTION	NATURAL MOISTURE %	-200 WASH %	ORGANIC CONTENT %	ATTERBURG LIMITS			
										LIQUID LIMIT	PLAST. INDEX		
0	H 1				sp	brown SAND							
5	H 2				sp sm	light brown SAND with silt							
10													
15	H 3				sp sm	light brown SAND with silt and trace of phosphate	22.9	8.2					
20	H 4				ch	light grayish-brown silty CLAY (phosphate mining waste)							
25						Notes: 1. Boring terminated at 20.0 feet							
30													
35													
40													
45													
50													

TOC 127.55
BOC 123.05

DRILLER/RIG D. Baker

WATER TABLE DEPTH:

BORING TYPE Mechanical Auger

1st 12'2"

DATE TIME 9-12-90

LENGTH/TYPE CASING None

2nd

DATE TIME

FINAL BORING LOG

SHEET 1 OF 1

PROJECT Southeast Landfill

BORING NUMBER AB-9

CLIENT Hillsborough County

BORING LOCATION As Per Plan

FILE NO. 90-9684

DATE STARTED 9-12-90

COUNTY/CITY Hillsborough

DATE COMPLETED 9-12-90

STATE Florida

ELEVATION N/A

136.08 Fr. Tin

DEPTH IN FEET	SAMPLES SAMPLE NO.	BLOW COUNT	N-VALUE	GRAPHIC LOG	USCS CLASS	SOIL DESCRIPTION	NATURAL MOISTURE %	-200 WASH %	ORGANIC CONTENT %	ATTERBURG LIMITS			
										LIQUID	LIMIT	PLAST.	INDEX
0	1				sp	reddish-brown SAND with silt							
	2				sm								
					sp	grayish-brown SAND with shell fragments							
5	3				sc	dark brown clayey SAND							
	4				sc	light brown clayey SAND with phosphate							
10	5				sm	dark brown silty SAND							
	6				sp	reddish-brown SAND with silt and cemented sand nodules							
	7				sm								
15	8				sc	light grayish-brown clayey SAND							
	9				sp	yellowish-brown SAND with clayey sand lenses							
					sc	light brown clayey SAND							
20						Notes: 1. Boring terminated at 20.0 feet							
25													
30													
35													
40													
45													
50													

DRILLER/RIG D. Baker

WATER TABLE DEPTH:

BORING TYPE Mechanical Auger

1st None

DATE TIME 9-12-90

LENGTH/TYPE CASING None

2nd

DATE TIME

FINAL BORING LOG

SHEET 1 OF 1

PROJECT Southeast Landfill

BORING NUMBER AB-10

CLIENT Hillsborough County

BORING LOCATION As Per Plan

FILE NO. 90-9684

DATE STARTED 9-12-90

COUNTY/CITY Hillsborough

DATE COMPLETED 9-12-90

STATE Florida

ELEVATION N/A

136.43 FR. TIN

DEPTH IN FEET	SAMPLES SAMPLE NO.	BLOW COUNT	N-VALUE	GRAPHIC LOG	USCS CLASS	SOIL DESCRIPTION	NATURAL MOISTURE %	-200 WASH %	ORGANIC CONTENT %	ATTERBURG LIMITS	
										LIQUID LIMIT	PLAST. INDEX
0	1				sp sm	dark brown SAND with silt					
2	2				sp	brown SAND					
5											
3	3				sp sm	dark brown SAND with silt and gray clay layer					
10											
4	4				sp sm	dark brown SAND with silt					
15	5				sc	brown and orangish-brown clayey SAND					
20						Notes: 1. Boring terminated at 20.0 feet					
25											
30											
35											
40											
45											
50											

DRILLER/RIG D. Baker

WATER TABLE DEPTH:

BORING TYPE Mechanical Auger

1st None

DATE TIME 9-12-90

LENGTH/TYPE CASING None

2nd

DATE TIME