Final Report

Geotechnical Investigation Palm Beach County Reconnaissance Vibracores: 2004

Prepared for

Palm Beach County Department of Environmental Resource Management

Revised: November 2004

Submitted By

S.E.A., INC.

Scientific Environmental Applications, Inc.
(S.E.A., Inc.)
5575 Willoughby Dr.
Melbourne, Florida 32934
email seapp1@aol.com

Executive Summary

Palm Beach County has acquired more than 600 sediment cores and jet probe samples in coastal waters over the past 20 years in an effort to identify adequate sand resources for beach nourishment. In 2003, a geotechnical investigation was conducted to characterize the quality of sand resources from previously unexplored potential borrow areas surveyed using sub-bottom high-resolution seismic methods. A total of fifty-six (56) vibracore samples were collected between May 22 and 27, 2004 at three potential borrow areas. Samples were collected at Singer Island, Briny Breezes and Highland Beach areas in water depths ranging from 25 to 70 feet. The objectives of the core sampling were to evaluate the textural and compositional properties of sediment in the project area and to confirm the interpretation of the seismic survey in terms of sediment volume and stratigraphy. Particular attention was paid to the interpretation of sub-bottom seismic reflectors that represent continuous carbonate rock surfaces and carbonate rock rubble scattered throughout unconsolidated sediment. The results of the geotechnical survey indicate that each area of investigation has certain distinctive properties that can be combined with properties common among all three areas to characterize the potential for recoverable beach quality sand. Ground truthing using vibracore samples confirms that a large volume of clean, silt free sand is present in the Briny Breezes, Highland Beach, and Singer Island areas. The vibracores further confirm that unconsolidated sands extend to sub-bottom elevations consistent with the level of the first continuous sub-bottom acoustic reflector in each area.

The Briny Breezes, Highland Beach areas are characterized by clean sub-bottom sand of beach quality having a median diameter larger than 0.2 mm according to core samples taken within 500 feet of the shoreline. The outer core samples closer to exposed reef rocks had finer median grain diameters usually less than 0.2 mm and were characterized by occasional layers of rock rubble composed of coral fragments. The maximum volume of beach quality sand available in Briny Breezes is estimated to be 19 million cubic yards, whereas the maximum volume of beach quality sand in the Highland Beach area is estimated to be approximately 24 million cubic yards. Beach quality sand resources in the Singer Island areas are estimated to be approximately 4.2 million cubic yards. Here the median sediment diameter was found to be larger than 0.24 mm in cores taken from the offshore portion of the survey area. The Singer Island cores were largely free of rock rubble to core depths of 10 feet due to the relatively large distance from reef rock exposures further offshore.

The occurrence of the relatively coarse sand close to the shoreline in the Briny Breezes and Highland Beach areas indicates that other nearshore areas at depths of between 25 to 30 feet below could hold significant resources for Palm Beach County. However, few cores and samples collected in previous surveys were obtained at relatively shallow depths. If the pattern of coarser sands in shallow water found in the Briny Breeezes and Highland Beach surveys is also present in other areas of the County south of Lake Worth Inlet, several million cubic yards of beach quality sand may be recoverable from nearshore waters not previously considered as potential borrow sites.

Table of Contents

1.0 Introduction and Goals

In order to assess the potential for nearshore beach quality sand resources, a high-resolution geophysical survey was conducted in 2003 in three areas of the coastal ocean within one mile of the Palm Beach County shoreline. The areas selected for study were located between other survey areas that were not previously evaluated for potential beach quality sand deposits. The geophysical survey was followed by a geotechnical investigation in 2004 to characterize the quality of sand resources from potential borrow areas. Figure 1 shows the location of the three survey areas with respect to features of the Palm Beach County shoreline, the Lake Worth Lagoon, and tidal inlets. The color-coded figure background shows the regional bathymetry. Results of the sub-bottom seismic survey were used to guide the selection of core boring sites (SEA, Inc. 2003). A total of fifty-six (56) vibracore samples were collected between May 22 and 27, 2004 at three potential borrow areas. Samples were collected at Singer Island, Briny Breezes and Highland Beach areas in water depths ranging from 25 to 70 feet. The goal of the reconnaissance level core sample was to evaluate the textural and compositional properties of sediment in the project area and to confirm the interpretation of the seismic survey in terms of sediment volume and stratigraphy. Particular attention was paid to the interpretation of sub-bottom seismic reflectors that represent continuous carbonate rock surfaces and carbonate rock rubble scattered throughout unconsolidated sediment.

2.0 Geologic Setting

The geology setting of the Palm Beach area of South Florida is dominated by geologic and geomorphic characteristics of the carbonate platform that forms the eastern edge of the continental shelf. North of Miami the width of the continental shelf severely narrows such that the edge of the upper continental slope approaches the shoreline in the vicinity of Palm Beach. South of this area the continental shelf remains a very narrow carbonate platform extending only a few thousand yards seaward of the shoreline. The veneer of unconsolidated sediment over this

narrow shelf is very thin and composed predominately of sub-equal mixtures of carbonate and terrigenous sand sediments in the Palm Beach area.

Several formations of carbonate rock and sediment have been identified from the lithology of the onshore portion of the carbonate platform. This lithology also forms the shallow submerged portion of the continental shelf off Palm Beach County, as well as deep-water areas

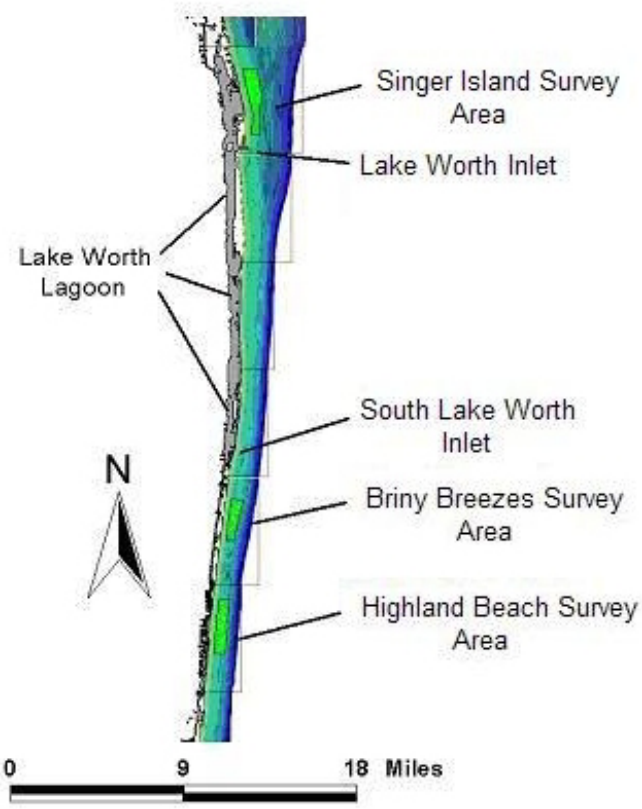


Figure 1. Survey areas in Palm Beach County coastal waters. Color background from LADS bathymetric data set.

of the continental slope explored during this project. The major formation that forms the "basement" or "bedrock" in the Palm Beach area is the Anastasia Formation. This formation was originally created from shallow marine and shoreface sediments as well as coral reef debris. The Anastasia can include small amounts of terrigenous quartz in sand size fractions. Consistency of these units ranges from unconsolidated to weakly lithified, and in some areas to well lithified

limestone. The Anastasia Formation outcrops in many areas along Palm Beach County beaches where it may display features common to modern beach sands including stratification and burrow structures (Figures 2 and 3). The Anastasia also outcrops offshore and is contiguous with the well-known rock reefs that begin to outcrop at distances approximately 1 mile offshore in depths of 60 to 80 feet. The seaward sloping Anastasia Formation having irregular topography provided the most significant sub-bottom reflector in the nearshore areas surveyed during the sub-bottom survey completed in 2003 (SEA, Inc. 2003).

The Anastasia and related formations in South Florida are all Pleistocene in age dating from at least 30,000 years before present and were produced by a combination of deposition in shallow marine waters at multiple high stands of sea level, followed by periods of erosion, dissolution, and karstification during lower stands of sea level driven by climatic fluctuations. Potential sand resources of beach quality found both on the shallow inter-reef flats and deeper water in the Palm Beach County area are likely to be weathered products of these older formations in combination with modern shoreface sands.

Figure 2. Outcrop of Pleistocene limestone on the beach landward of the Singer Island survey area.

Figure 3. Fossilized vertical burrows in outcrop of Pleistocene Anastasia Formation on the beach in Ocean Reef Park, north Palm Beach County.

3.0 Methods

3.1 Survey Vessel and Positioning

The coring platform was the R/V Atlantic Twin, a 90 foot steel catamaran hull research vessel with a 7-foot draft owned and operated by Alpine Ocean Seismic Survey, Inc. of Norwood, New Jersey. The vessel has laboratory and deck space, an anchoring system, hydraulic crane, deck winches and A-frame capability for vibracoring.

A Trimble NT300D Differential GPS Navigation System was used throughout the coring operation. The DGPS system consisted of a 12-channel satellite receiver and a built-in dual-channel radio beacon receiver, which obtained differential correction signals from the United States Coast Guard GPS transmitters at Cape Canaveral and Miami, Florida.

The sub-bottom geophysical survey was conducted in combination with high precision GPS navigation and a bathymetric survey in each of the three study areas combining high-resolution sub-bottom profiling, side scan sonar, and precision navigation. Results of the seismic survey helped to guide the selection of core sites as well as provide the basis for estimating the volume of borrow sands available in the project area. Within the survey areas shown in Figure 1 all positioning data and subsequent data analysis for both the bathymetric survey and sub-bottom seismic survey were recorded in Florida State Plane Coordinates (NAD 1983, Florida East Zone).

National Geodetic Survey benchmark (NGS #S-402) was used. Eighty DGPS fixes were acquired at 15-second intervals in order to test the accuracy of the system. Recorded fixes were compared to the published position of the benchmark. The mean error of the fixes collected was 0.41m (Std. Dev. 0.560). A temporary dockside benchmark was established at Riviera Beach Municipal Marina, where the R/V Atlantic Twin berthed during the project. Calibration marks were painted on one of the dock pilings and along the port side of the coring vessel. With the calibration marks lined up and the vessel tied securely to the dock, DPGS fixes were taken twice daily, once in the morning before leaving the dock and again in the evening upon returning from coring.

The WGS-84 Geographic positions obtained by the GPS navigation system were logged on the shipboard core logs and were converted into Florida East State Plane (NAD 83) grid coordinates (U.S. Survey feet) using a computer and Hypack Max navigation software, version 2.12A.

3.2 Vibracore Methods

A model 271 B Alpine Pneumatic Vibracore configured to take cores up to 20 feet in length was used on this project. The model 271 B is a self-contained, freestanding pneumatic vibracore unit. The unit consists of: an air-driven vibratory hammer assembly; an aluminum H-beam acting as the vertical guide for the vibrator; a set of four steel support pads and legs which hold the beam upright on the sea bottom; a steel coring pipe; a cutting edge; a core retainer; a clear PVC core liner; and a penetrometer that records time and depth of penetration of the core pipe into the sea bottom. An air hose array provides passage of compressed air from the

compressor on deck to drive the vibracore. Whenever refusal occurred resulting in less than acceptable penetration, or recovery was less than 80% of penetration, the sampled portion was removed from the pipe, a new liner inserted, and a jet pump hose was attached just below the vibracore head. The rig was lowered to the bottom and jetted to refusal depth. The jet was then turned off and the hydraulic vibrator turned on taking an additional part of the core.

Immediately upon removal of the plastic liner from the core pipe the sediment filled liners were measured, marked and cut into manageable five-foot sections and sealed. Shipboard descriptions were made at this time and the heading data was entered into the shipboard log sheet. These data included date, time, location, water depth, core penetration, and recovery information. Coordinates, penetration depths, and recovery length of all cores are listed by area in Appendix B. Penetration graphs generated with each core show the time of vibration for each foot of progress within the sediments. This information was useful in estimating the comparative in-situ density of the sediments and the location of rock layers.

4.0 Sample Analyses

4.1 Core Logging

Vibracores were split, visually inspected, and logged in detail according to the ASTM D2488 the standard practice for visual descriptions of the stratigraphic soil layers. Results of the logging procedure were coded into the gINT^{tm} software customized for the newly developed Florida Department of Environmental Protection (FDEP) ROSS database. The gINT^{tm} software includes Engineering Form 1836 commonly used by the U.S. Army Corps of Engineers for core log presentation. The results for each survey area are discussed under separate sections of this report. A list of the core logs is provided under separate cover. During the logging procedure, particular attention was paid to lithology, texture, silt and clay content, shell content, and Munsell color. Samples for grain-size analysis were taken at intervals warranted by changes in lithology. A composite sample of each core was also taken to represent the interval that corresponds to any beach quality sand. Results of the grain-size analysis procedure described below were compared with the core logs to insure consistency between the soil classification listed on the core logs and the classification of individual samples. Images of both core halves

were recorded with a digital camera to provide a record of the core material at 2-foot intervals. The images are provided as part of the overall core descriptions under separate cover. Approximately 10% of the core material was archived in wax cardboard boxes for delivery to Palm Beach County. The wax cardboard boxes hold 10 feet of an archive core sample, thus two boxes per core were provided.

4.2 Sediment Analysis

Grain size analysis of sediment samples followed ASTM standard D-422 for mechanical (sieve) particle size analysis of soils. Textural classification was according to the Unified Soils Classification System described under the American Society for Testing Materials (ASTM) standard D-2487. Textural analysis results were reported using the gINT^{tm} software on Engineering Form 2087. The analysis began with the splitting of each sample into sub-samples, one sample used for the sieve analysis and the other sample for carbonate analysis.

For bulk fine (Silt and Clay fraction) and coarse content procedures ASTM D1140 and the Wentworth procedure of determining percent fine fraction were followed. The sieve sub-sample was washed over through a #230 mesh screen (.062 mm opening). The coarse fraction remaining on the #230 screen was dried and mechanically sieved in half phi intervals. The percent fine passing through the #200 sieve was used in a gravimetric analysis to determine the fine fraction percentage. The mechanical sieving recorded in the gINT^{tm} software also used the #200 mesh (0.071 mm opening) screen. Thus the percentage of fine material was reported according to both the Wentworth (0.062 mm) and ASTM (0.071 mm) boundaries.

A high temperature burn method was used to determine the carbonate content of each discrete and composite sample. This is a method involves igniting a pre-weighed sample at 1080 C° for 8 hours. During ignition, the carbonate (calcite) crystal lattice is broken down, carbon dioxide released, and only the calcium atoms remain. Thus, the weight percent carbonate can be easily calculated knowing the atomic weights of the atoms forming the calcite lattice.

5.0 Briny Breezes

The north boundary of Briny Breezes survey area is located approximately 2.65 miles south of South Lake Worth Inlet. Figure 4 shows the vibracore locations with respect to the isopach or overburden of unconsolidated sediment above the continuous reflector identified in 2003 (SEA, Inc. 2003). In nearly all cases core samples were taken on survey track lines in order to allow calibration of acoustic sub-bottom reflectors with the lithology found in the vibracores. A listing of the coordinates, core recovery length, and elevation at the top of each core can be found in Appendix B. The detailed listing of the core logs and associated sediment data is provided under separate cover also in electronic format.

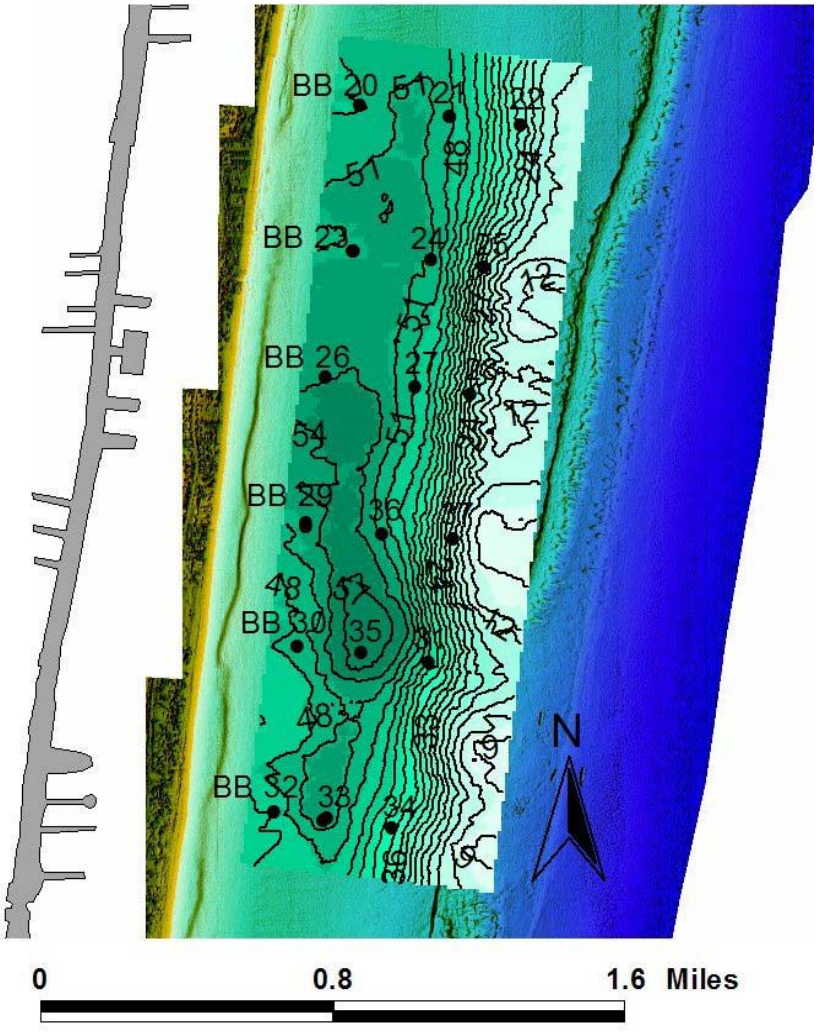


Figure 4. Location of vibracores with respect to sediment isopach in the Briny Breezes survey area.

Results of the sub-bottom acoustic survey (SEA, Inc. 2003) showed that a single prominent reflector persists throughout the Briny Breezes survey area. The subsurface reflector is generally well below the 20 foot maximum of core recovery depth until reaching the east boundary of the survey area where the sediment cover is nearly absent. Figure 5 shows a spatial array of the 18 vibracores acquired in the Briny Breezes area. Most of the material recovered consisted of a mixture of fine quartz sand and medium to fine carbonate sand. Sediment color ranged from light gray to a darker gray. Most core material was classified as a medium gray on the Munsell color scale. A total of 96 samples were analyzed from the Briny Breezes area including 17 composite samples assembled from core intervals that were considered to be beach quality sand. Samples statistics and carbonate percentages for each of the 96 samples are listed in Appendix A. The median grain size of composite samples ranges from 0.15 to 0.51 mm and averaged 0.33 mm (See Appendix A1). Figure 6 shows the core locations and the median grain diameter of the composite samples. The median grain size decreases with distance offshore and that recoverable sand having a median diameter of 0.25 mm or larger is located in areas of greater isopach closer to the shoreline. Figure 7 compares the grain size distribution of the composite samples from cores BB04-26 and BB04-28. This exemplifies the textural differences between nearshore material and the sediment found in cores obtained further offshore. The composite sample of Core BB04-26 had a median diameter of 0.3 mm and a standard deviation of 1.26. This is in contrast to a finer median diameter of 0.16 mm and smaller standard deviation of 0.69 found in core BB04-28. The wider grain size distribution of the composite sample from Core BB04-26 was due to a larger percentage of carbonate sand in this core extending into the medium to coarse sand range. Appendix A1 provides a listing of sample statistics and carbonate percentages for all discrete and composite samples analyzed in the Briny Breezes area.

The carbonate analysis showed that the carbonate content, including sand sized material to large shell fragments in the gravel fraction was in the range of 23% to 61% for an average of 36%. There was a trend of increasing carbonate content with increasing depth in the cores. A comparison of carbonate percentages with median grain diameter shows that the coarse median size correlates well with increasing carbonate content (Figure 8). The gravel fraction of all samples is 100% shell fragments, whole shells and other carbonate material. Any coarse sand

and much of the medium sand range of the samples were predominantly carbonate shell fragments.

All of the Briny Breezes cores were free of intercalated rock fragments and rubble, with the exceptions of Core BB04-24, which contained rock fragments of coral and lithified sand at a core depth of 6.6 to 6.9 feet (elevation -43.3 – 43.6 ft. NGVD). Cores collected in water depths of 50 feet and greater and in areas where the isopach of unconsolidated sediments was less than 25 feet, included significant occurrences of coral rock fragments in the lower section of the cores.

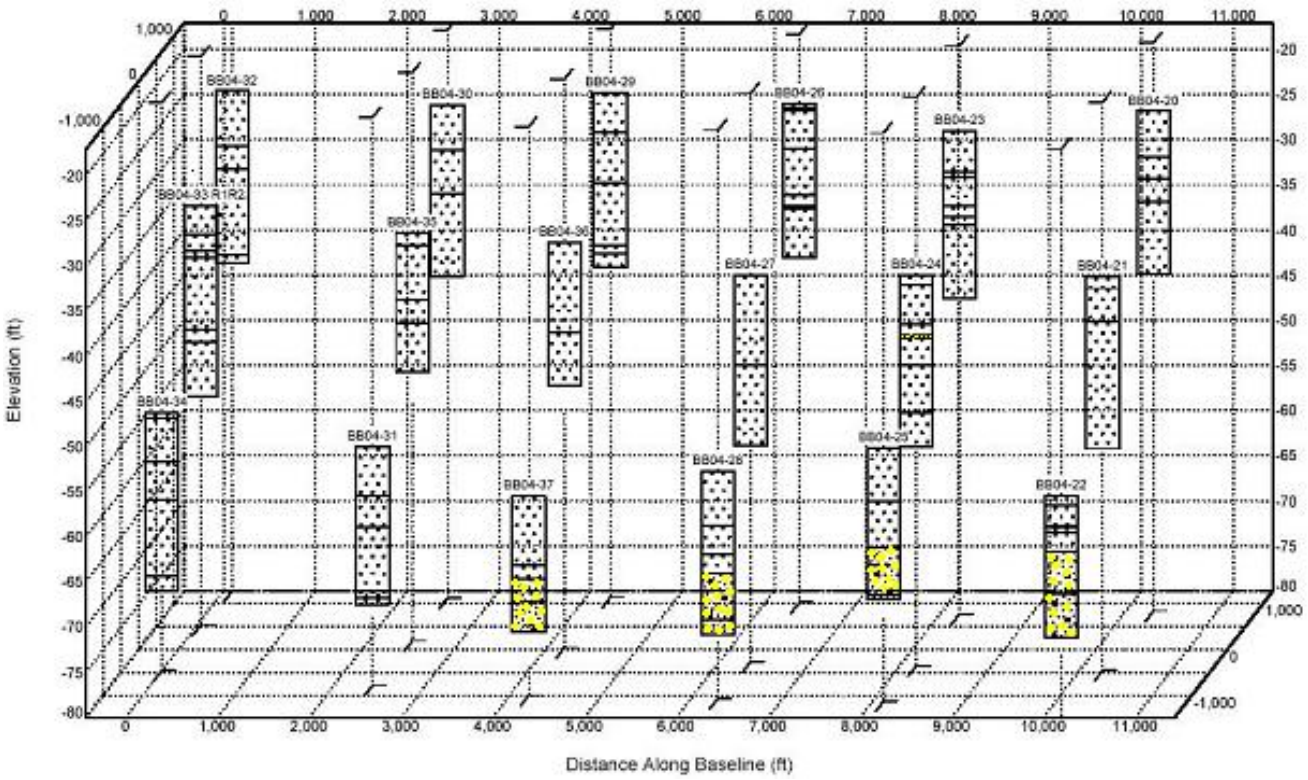


Figure 5. Spatial array of cores from the Briny Breezes survey area. Fragments of coral rock in outer cores at elevations below -65 ft. NGVD are shown in the yellow pattern.

Rock fragments occurred at down-core depths greater than 10 feet corresponding with elevations below -65 ft. NGVD. The occurrence of rock fragments in these outer cores correlated well with the elevation of the acoustic reflectors found in the sub-bottom seismic records. In the offshore area where water depths are 50 feet and greater this reflector begins to slope upward towards the surface and merges with the outcrops of reef rock that occur about a mile offshore in the Briny Breezes area. The details of the sub-bottom seismic reflection survey were presented in a report to Palm Beach County by SEA, Inc. (2003). Figure 9 shows the core locations with respect to the elevation of the sub-bottom reflecting surface. Figure 10 shows the location of rock fragments in Core BB04-28. In this core, along with Cores 22, 25, 28 and 37, rock fragments begin to occur in the core at elevations of about -66 feet NGVD and extend to the bottom of the core. The elevation of the acoustic reflector on the seismic records is at depths of about -75 feet or greater or just beyond the bottom elevation of the cores. Thus, according to these results it is likely that rock rubble in unconsolidated sediments can occur at elevations approximately 10 feet above the hard surface represented by the acoustic reflector.

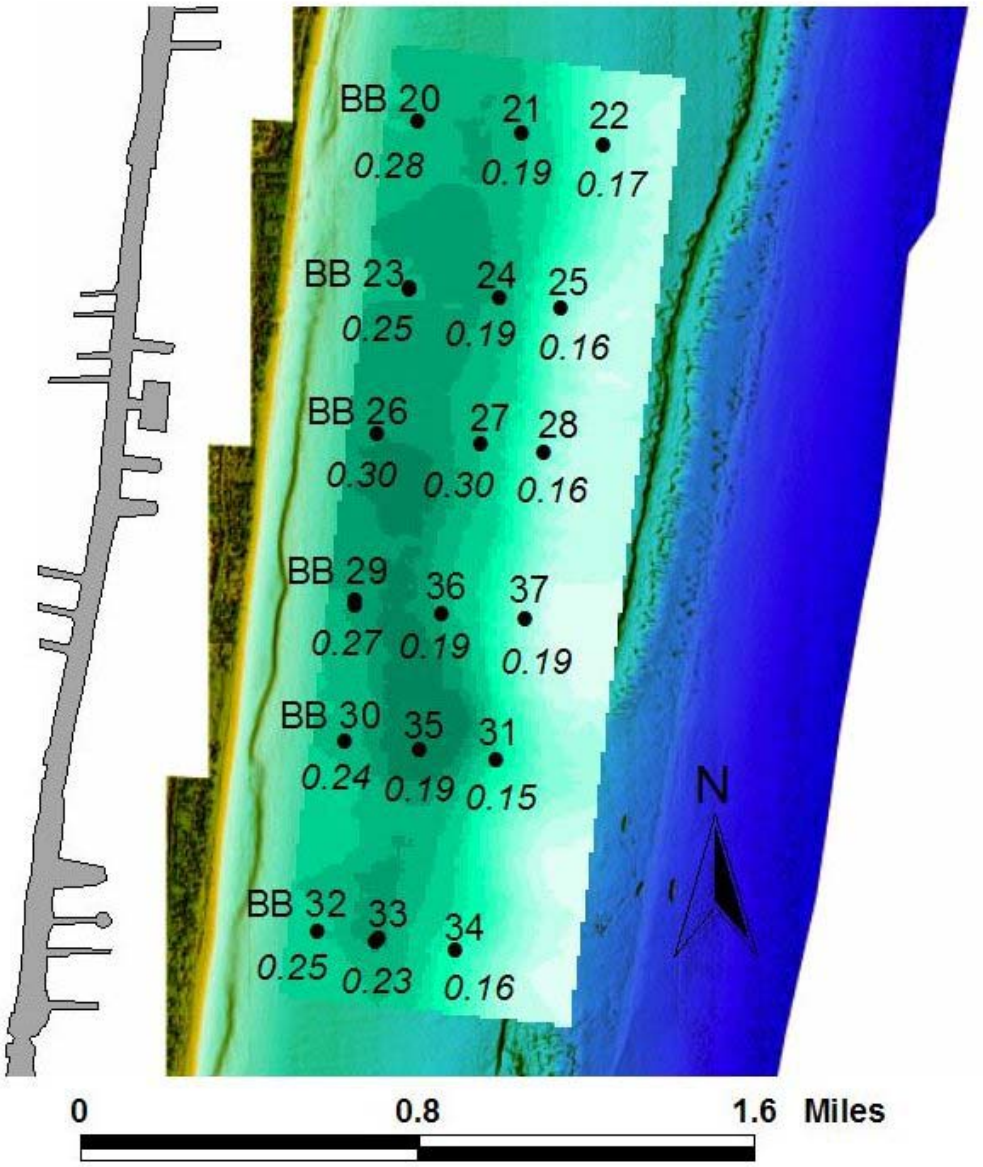


Figure 6. Median sediment diameter is shown in italics for composite vibracore samples. Background images are the isopach pattern and LADS bathymetric data.

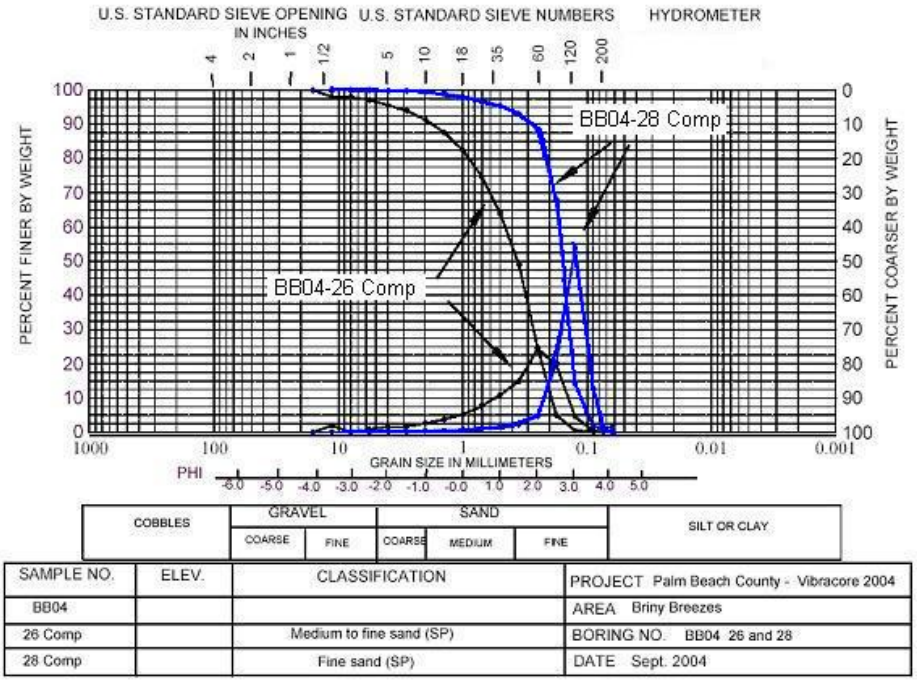


Figure 7. Comparison of textural properties of composite samples from core BB04-26 (black) with those of core BB04-28 (blue).

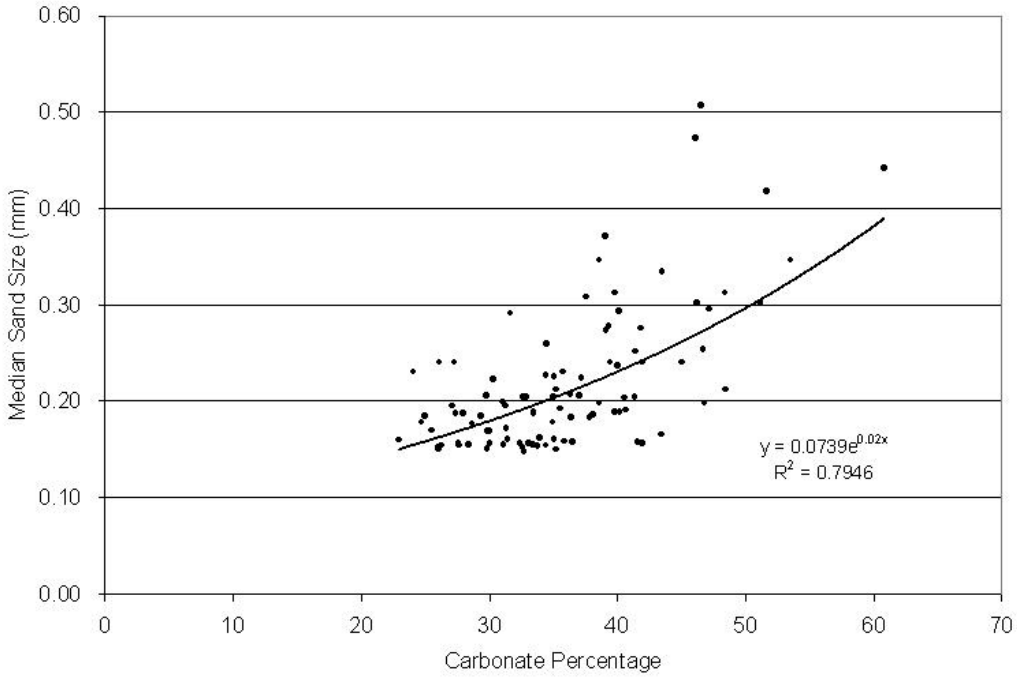


Figure 8. Correlation between carbonate content and median sediment diameter in the Briny Breezes survey area.

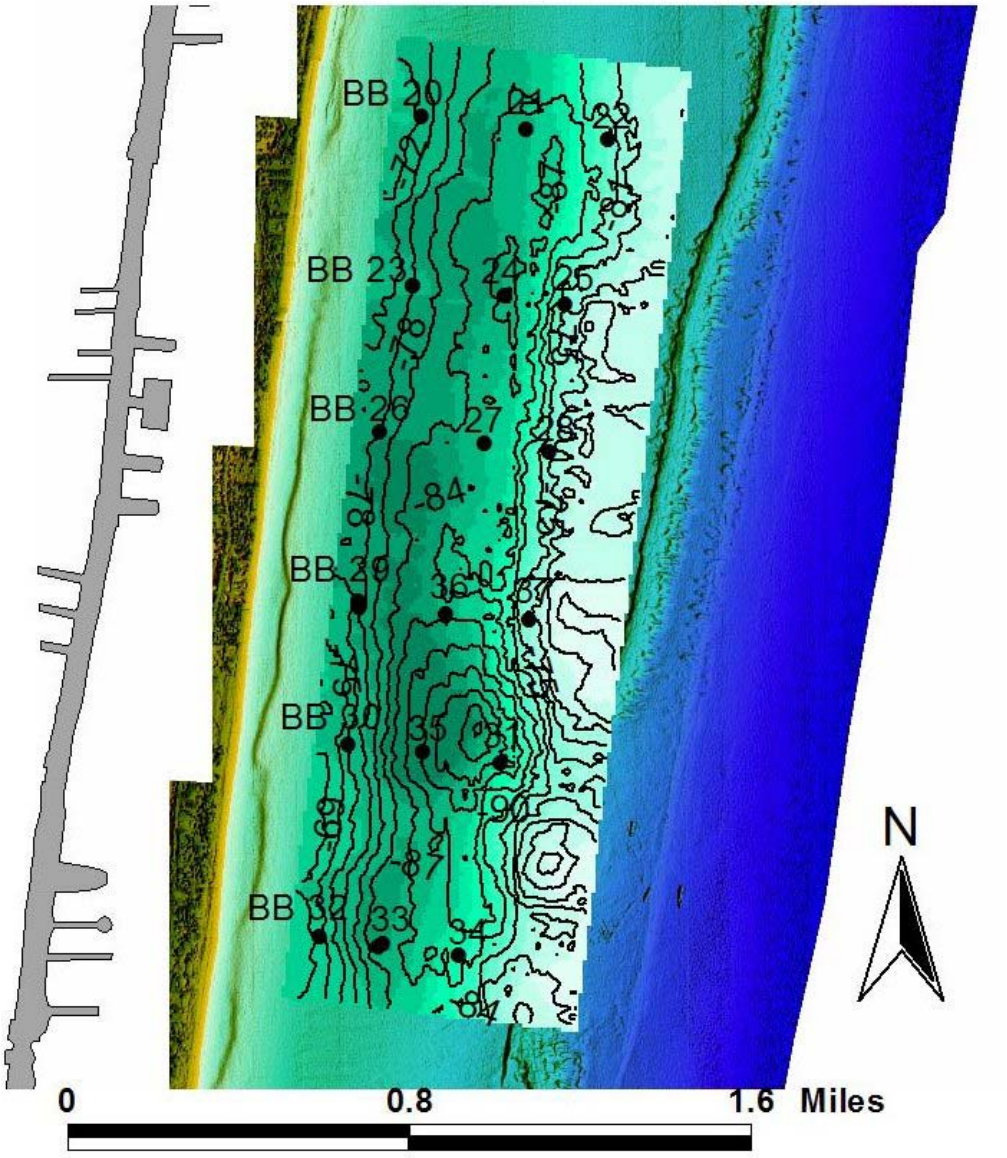


Figure 9. Location of vibrcores with respect to the elevation of the continuous acoustic reflector in the Briny Breezes area. Elevations are in feet NGVD.

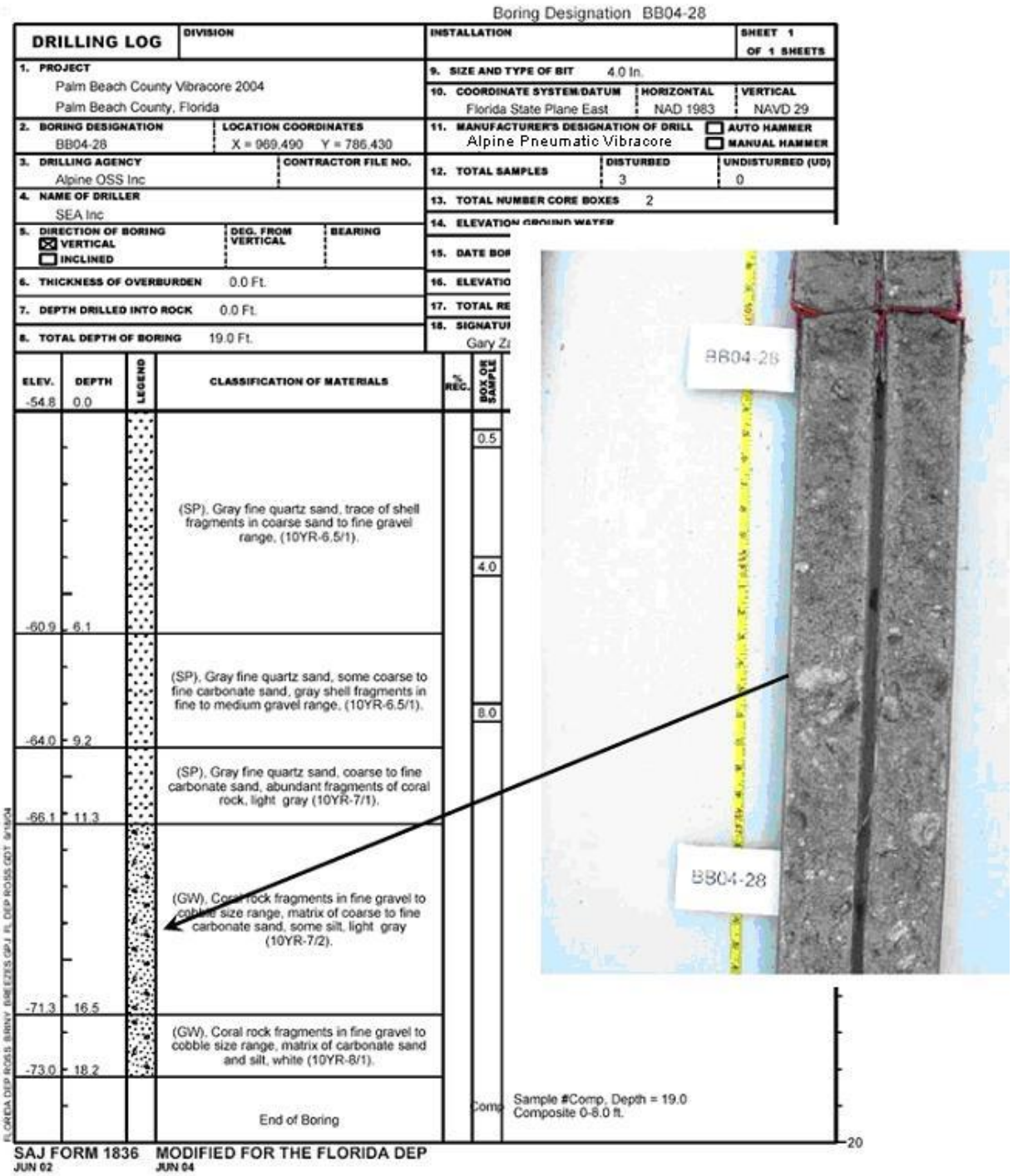


Figure 10. Occurrence of coral rock fragments in the lower sections of Briny Breezes Core BB04-28. See Figure 4 for core location.

6.0 Highland Beach

The Highland Beach survey area is the southernmost site included in the project and begins approximately 7.8 miles south of the entrance of South Lake Worth Inlet. Figure 11 shows the topography and location of 19 vibracores completed in May 2004. The cores were obtained at elevations between -25 and approximately -60 feet NGVD. Figure 12 shows a spatial array of the cores in the Highland Beach area. The patterns in the array designating soil type illustrate that the sediment above the first acoustic reflector is clean sand that can be described using the SP class (sand well sorted) under the ASTM scheme. A total of 104 samples were taken from the vibracore material including 19 composite samples from depth intervals that included clean sand of potential beach quality. The results of laboratory analysis show that the median grain size of core composite samples ranged from 0.16 to 0.36 mm. Figure 13 shows the core locations along with the median grain size of each core composite in millimeters. The fine fraction of these samples averaged less than 1%. Similarly to the Briny Breezes area the median sand size decreases with distance offshore. Figure 14 compares the sediment texture properties found in nearshore Core HB04-47 with those of Core HB04-49 taken further offshore. Similar to the textural patterns found in the Briny Breezes, area the larger median diameter and standard deviation typical of nearshore samples is due to carbonate sand distributed through the medium sand range. Sample statistics and carbonate percentages for all of the Highland Beach samples can be found in Appendix A2. Carbonate content of all discrete and composite samples ranges from approximately 36% to 85% for an average of 53% carbonate. As in the other survey areas included in this project there is a good correlation between median sediment diameter and carbonate content (Figure 15).

The location of the cores with respect to the isopach between the bottom elevation and the continuous sub-bottom reflector is shown in Figure 16. In all areas the acoustic reflector is at least a few feet below the 20-foot maximum penetration depth of the cores. However, rubble consisting of coral rock fragments was found in the offshore cores at elevations generally below 70 feet NGVD. Thin layers of rubble and large coral fragments were found in Cores 40, 43, 45, 49, 52, 54, and 56. Some of this rock material was found at higher levels within the cores as well as near the base of the cores.

Figure 11. Location of vibracores with respect to bottom elevation in the Highland Beach survey area. Elevation is in feet NGVD.

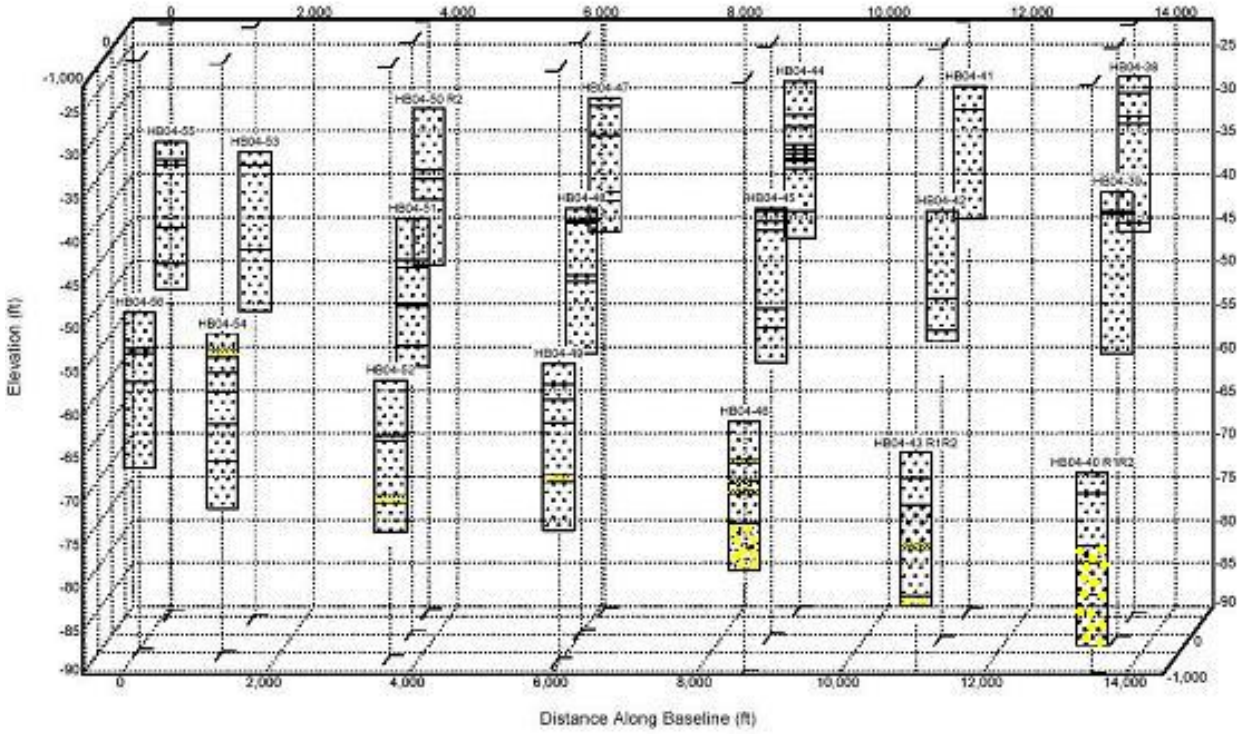


Figure 12. Spatial array of cores from the Highland Beach area. Fragments of coral rock in outer cores at elevations below -50 ft. NGVD are shown in the yellow pattern.

Figure 17 shows the log for Core HB04-46 and a digital image of layers within this core that contained rock rubble. It is likely that rock fragments found in these cores were derived from erosion and landward transport of material from the outcrops of reef rock located seaward of the survey area. No rock fragments were found in the landward row of cores, although the base of these cores was generally less than 10 feet above the acoustic reflector marking the buried reef limestone in this area.

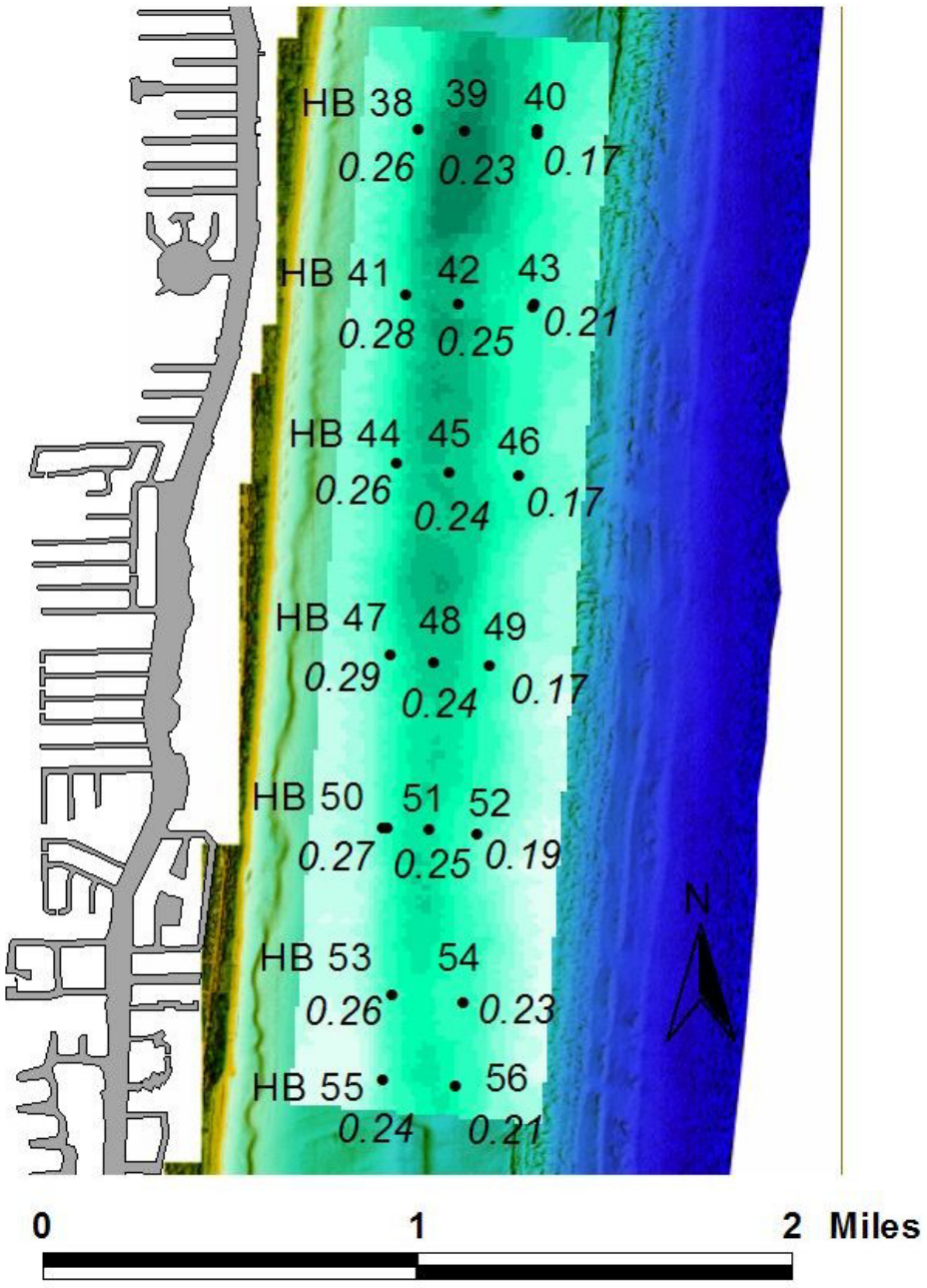


Figure 13. Median sediment diameter is shown in italics for composite vibracore samples. Background images are the isopach pattern and LADS bathymetric data.

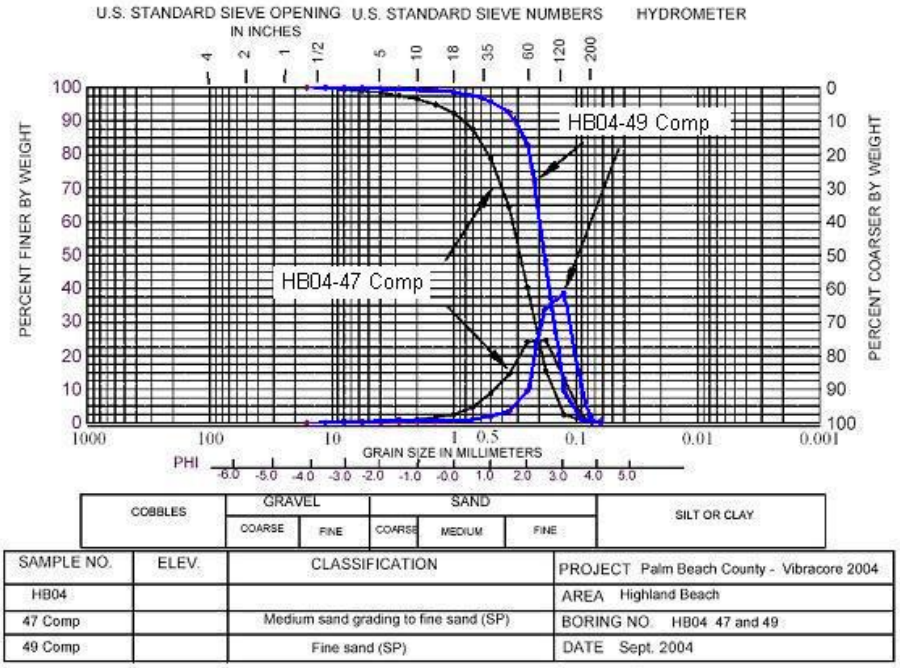


Figure 14. Comparison between textural properties of composite samples from Core HB04-47 (black) and Core BB04-49 (blue).

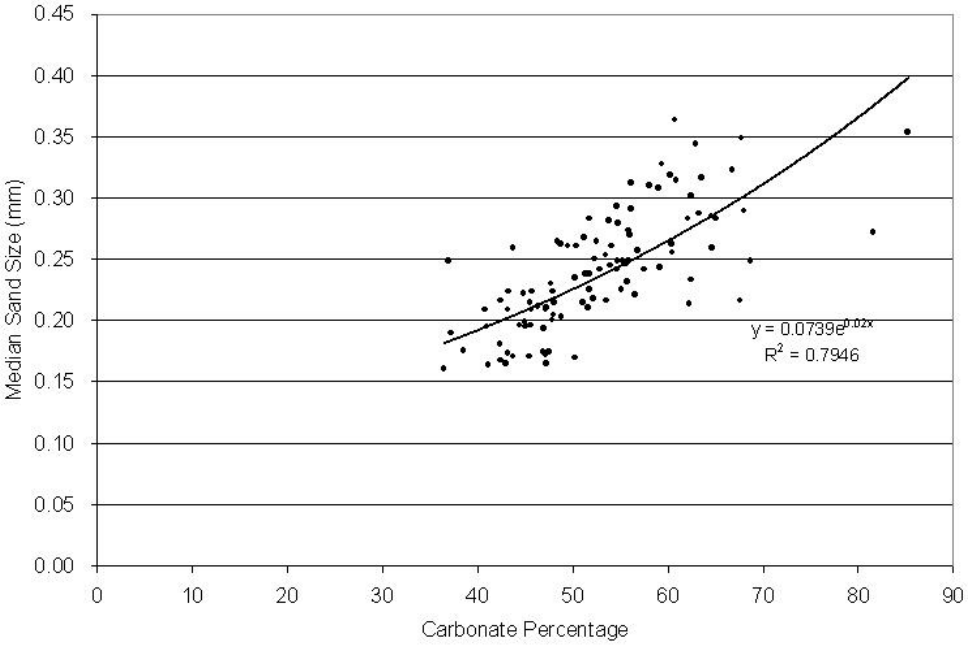


Figure 15. Correlation between carbonate content and median sediment diameter in the Highland Beach survey area.

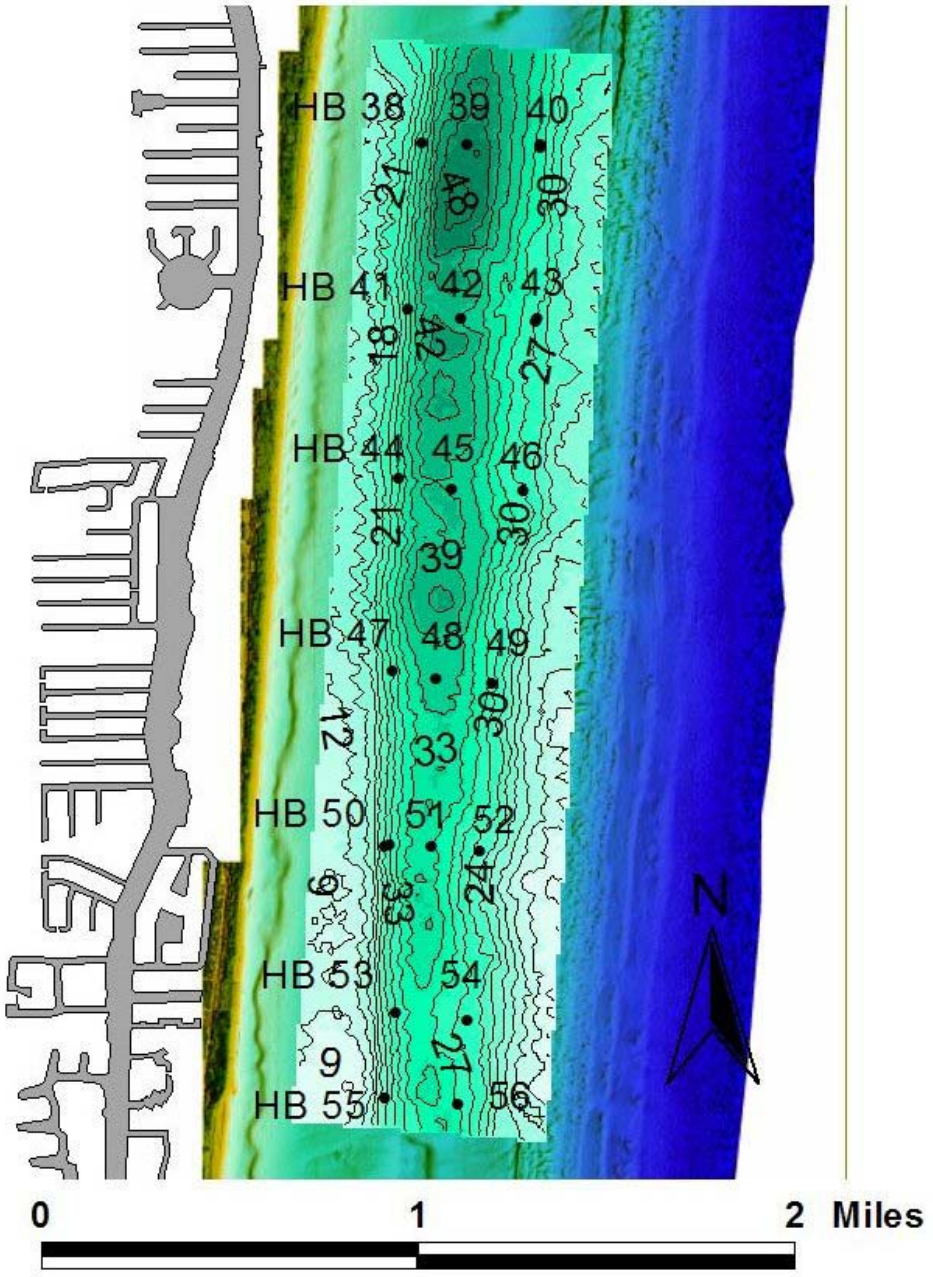


Figure 16. Location of vibracores with respect to sediment isopach in the Highland Beach survey area.

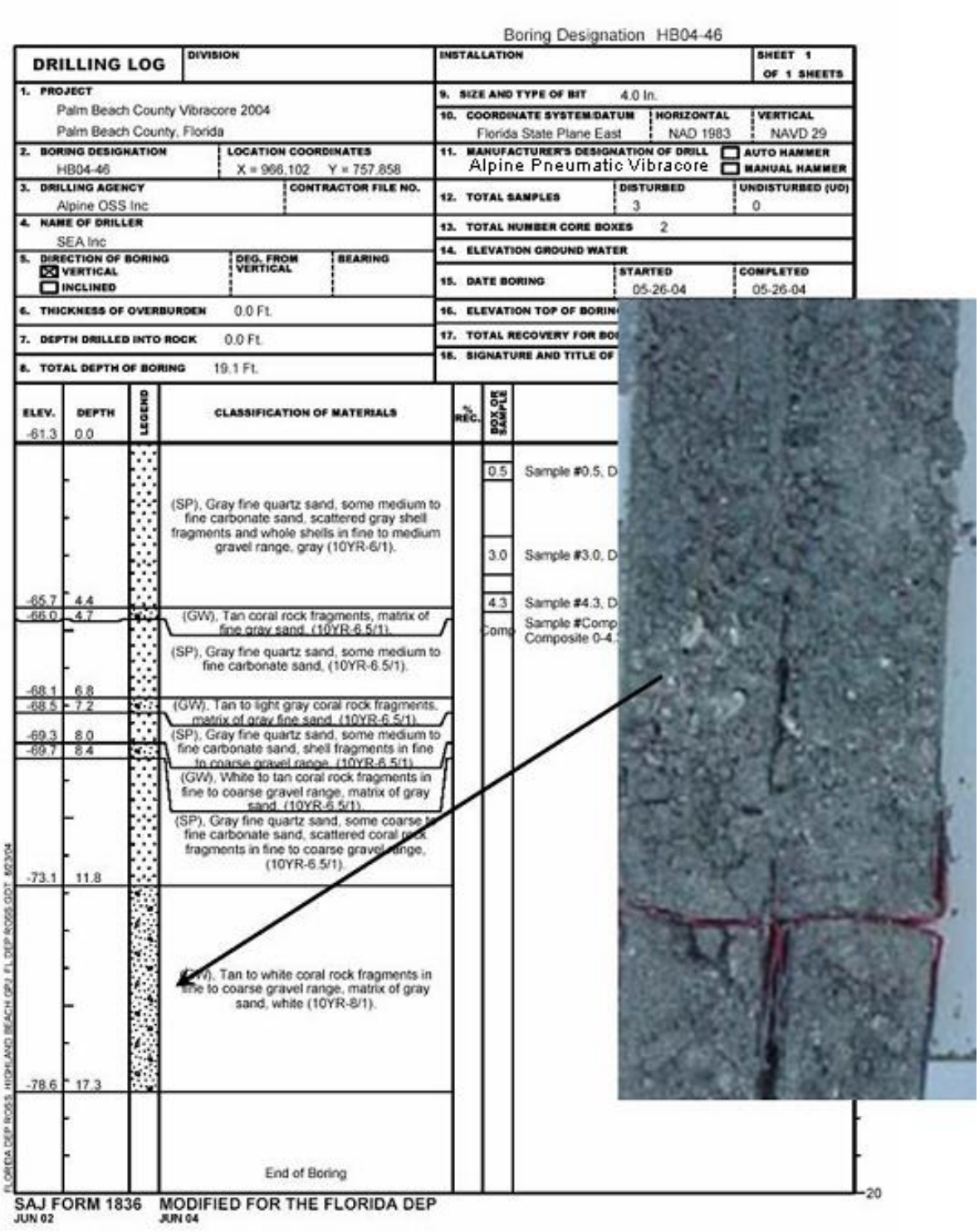


Figure 17. Coral rock fragments in the lower sections of Highland Beach Core HB04-46. See Figure 11 for core location.

7.0 Singer Island

The Singer Island site begins less than 1 mile north of Lake Worth Inlet. The contoured bottom topography is shown in Figure 18 along with the location of the 19 vibracores obtained from this area. The cores were obtained in water depths between approximately -22 and -65 feet NGVD. The seaward most core locations are approximately 5,700 feet from the Palm Beach County shoreline, but at least 2,000 feet to the west of the nearest outcrop of reef rock. Figure 19 shows a spatial array of the cores in the Singer Island area. Figure 20 shows the core locations with respect to the isopach between the bottom elevation and the first major acoustic reflector below. One hundred samples were taken from the vibracore material including 20 composite samples from intervals that contained beach quality sand. Results of the laboratory analysis show that the median grain size of core composite samples ranged from 0.11 to 0.54 mm. A complete listing of sample statistics and textural composition is provided in Appendix A. Figure 21 shows the core locations along with the median grain size of each core composite in millimeters. The fine fraction of these samples averaged about less than 1%. Median sediment diameter larger than 0.25 mm was characteristic of composite samples of cores taken in the central to outer portions of the survey area. Figure 22 compares the texture of composite samples from Cores SI04-8 and SI04-9. The offshore composite sample from SI04-9 has a larger median diameter of 0.29 mm compared to a median diameter of 0.17 mm for the SI04-8 composite. Similar to the other survey areas the coarser sample included a large carbonate fraction grading into the upper part of the medium sand range giving the sample a greater median diameter

The Carbonate content of all discrete and composite samples ranges from approximately 20% to 88%. Within the individual cores the percentage of carbonate material increases with depth. A comparison of the median grain diameter and carbonate content for all samples collected from the Singer Island vibracores shows that there is a good correlation between sand size and carbonate content. Nearly all samples having carbonate content above 60% also had a median diameter larger than 0.2 mm (see Figure 23). Visual inspection of samples indicates that sand size carbonate particles dominate the size classes in the medium to coarse sand range and compose 100% of any gravel fraction.

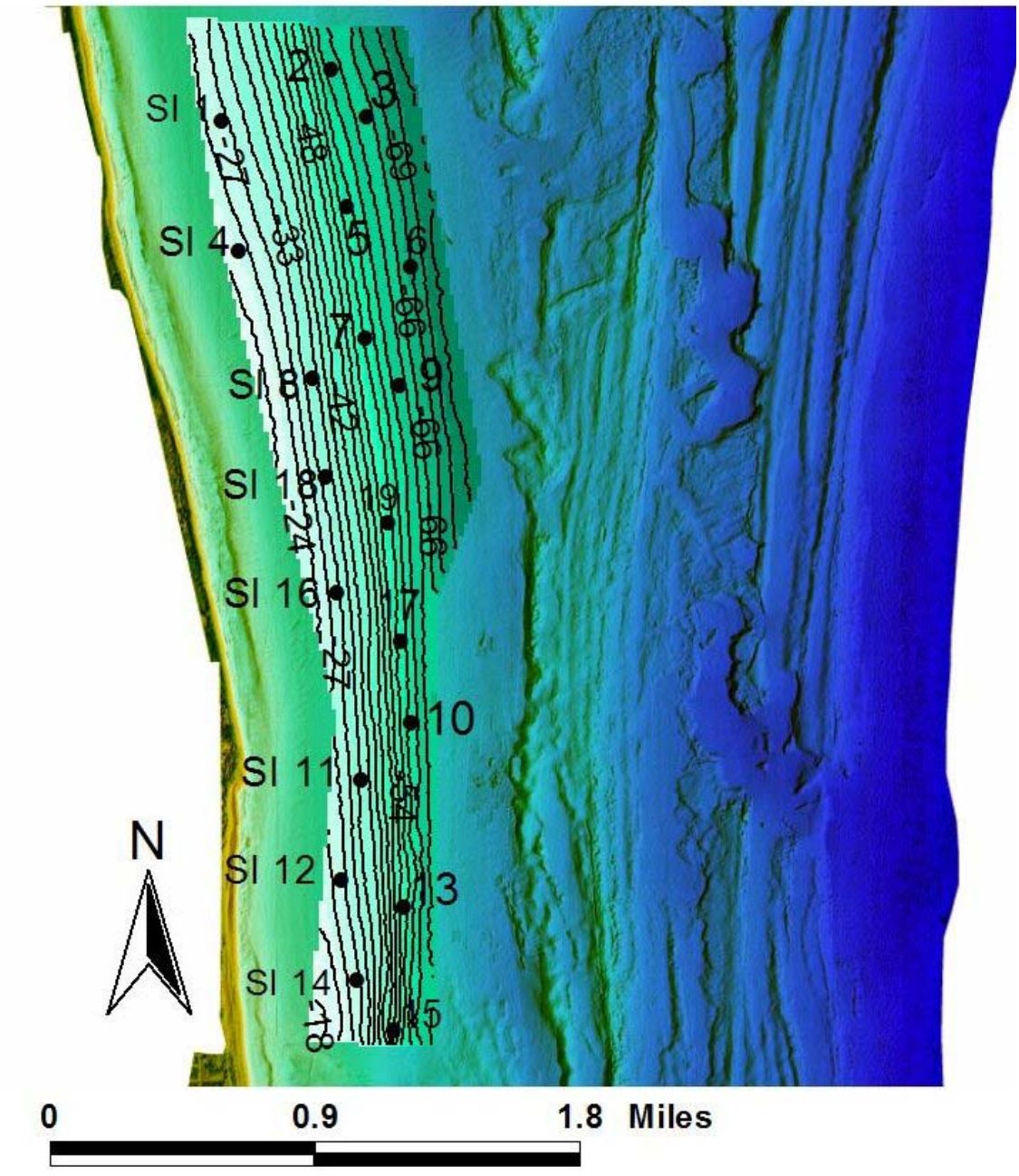


Figure 18. Location of Singer Island area vibracores with respect to bottom elevations.

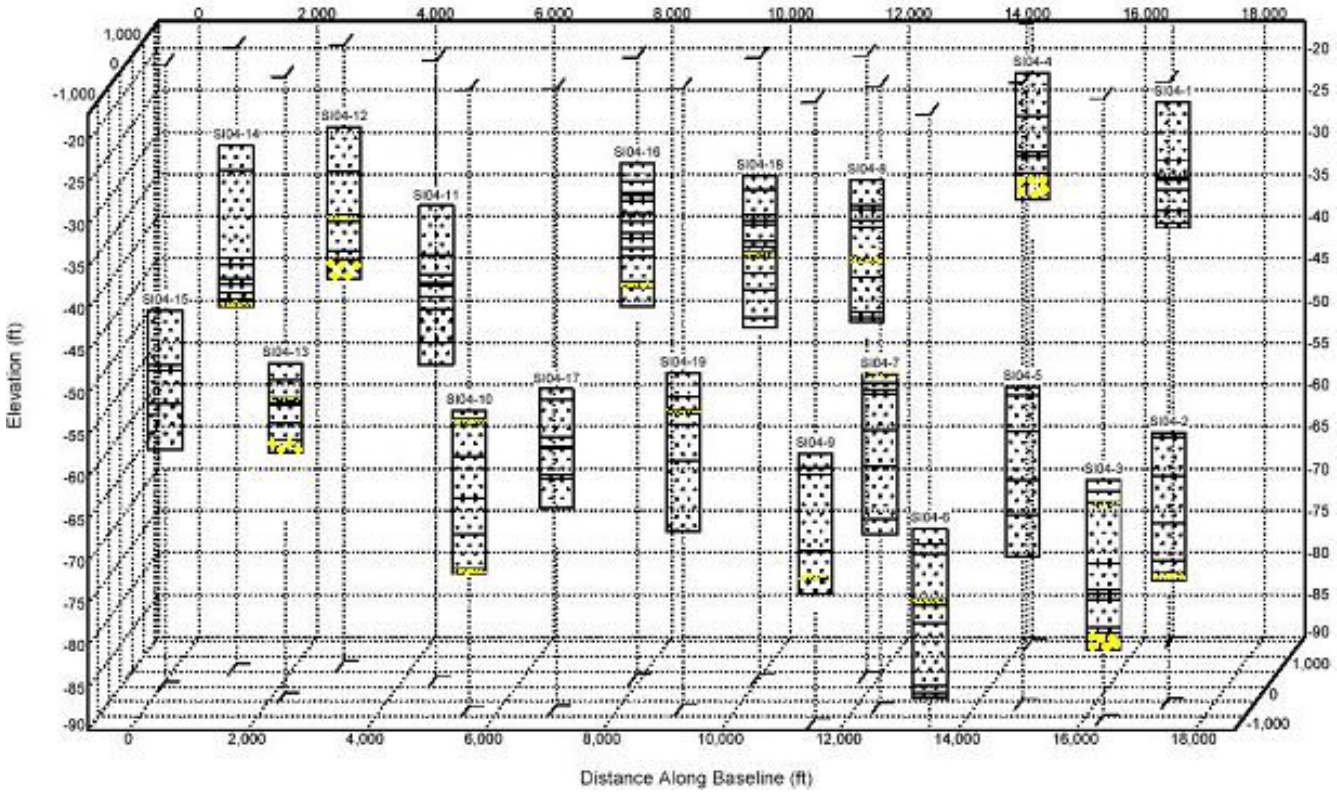


Figure 19. Spatial array of cores from the Singer Island survey area. The occurrence of scattered rock rubble in some cores is shown in the yellow pattern.

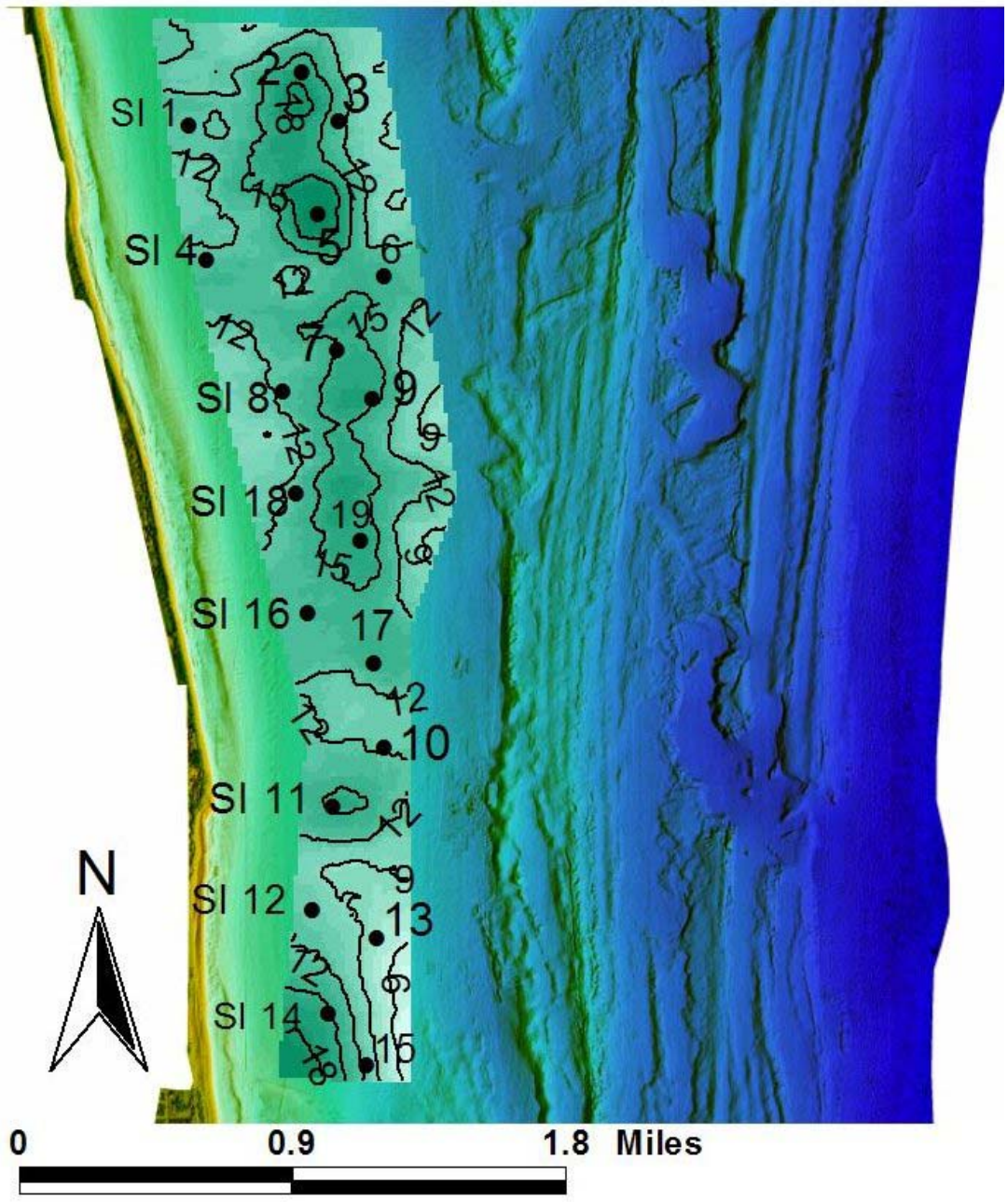


Figure 20. Location of vibracores with respect to sediment isopach. Most cores terminated in a layer of rock fragments due to the relatively thin sediment overburden.

The overburden above the upper acoustic reflector in the Singer Island survey area is generally thinner than 15 feet and in the outer reaches of the survey areas can be 10 feet or less (Figure 20). Thus most of the vibracores collected in this area terminate in an interval

containing rock fragments or terminating in the underlying carbonate rock. Figure 24 shows the log for Core SI04-14 and an example of rock fragments near the base of the core. Most of the rock fragments in the Singer Island vibracores cores were found in the lower portions of the cores at elevations 10 feet or more below the surface.

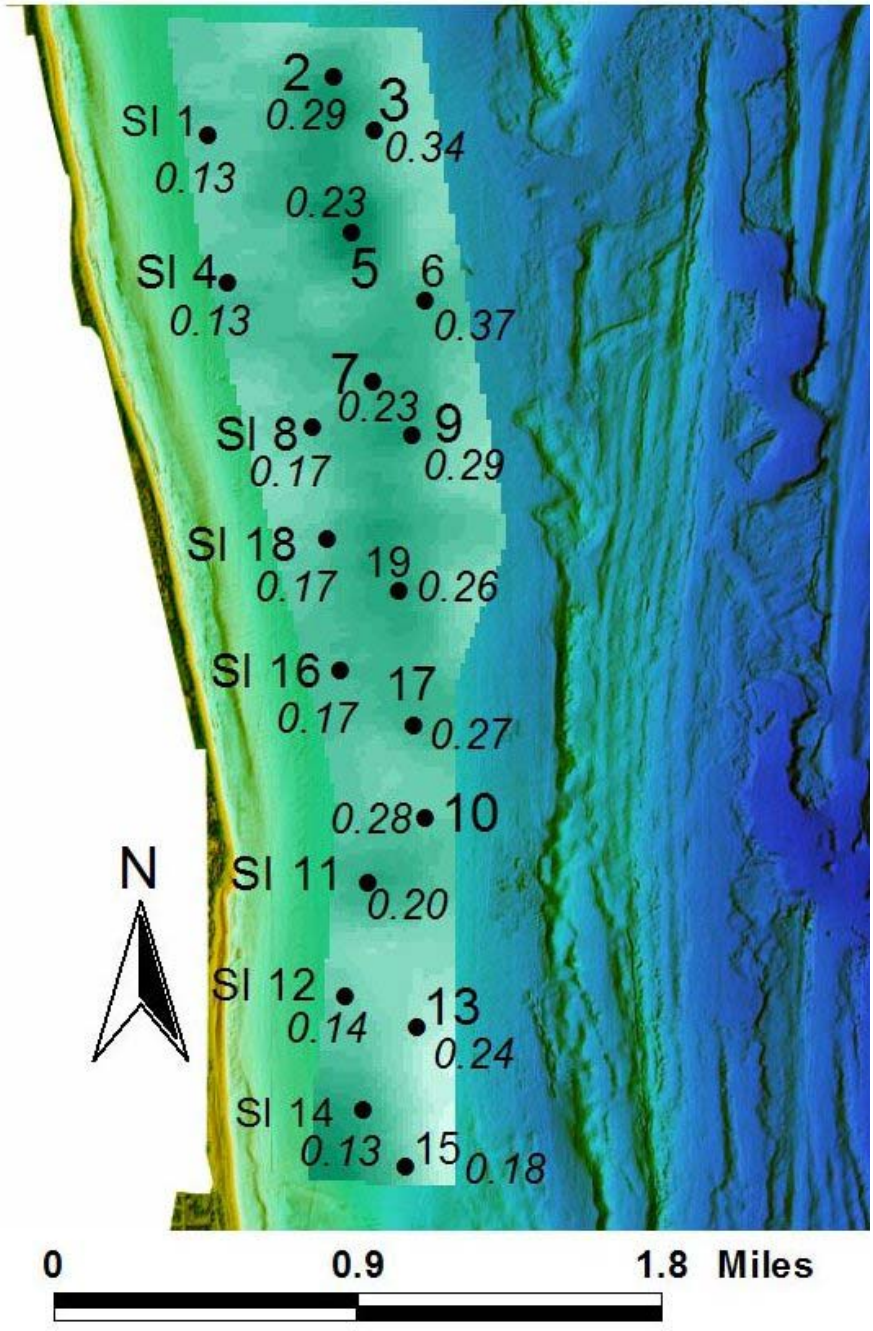


Figure 21. Median sediment diameter is shown in italics for composite samples of vibracore material.

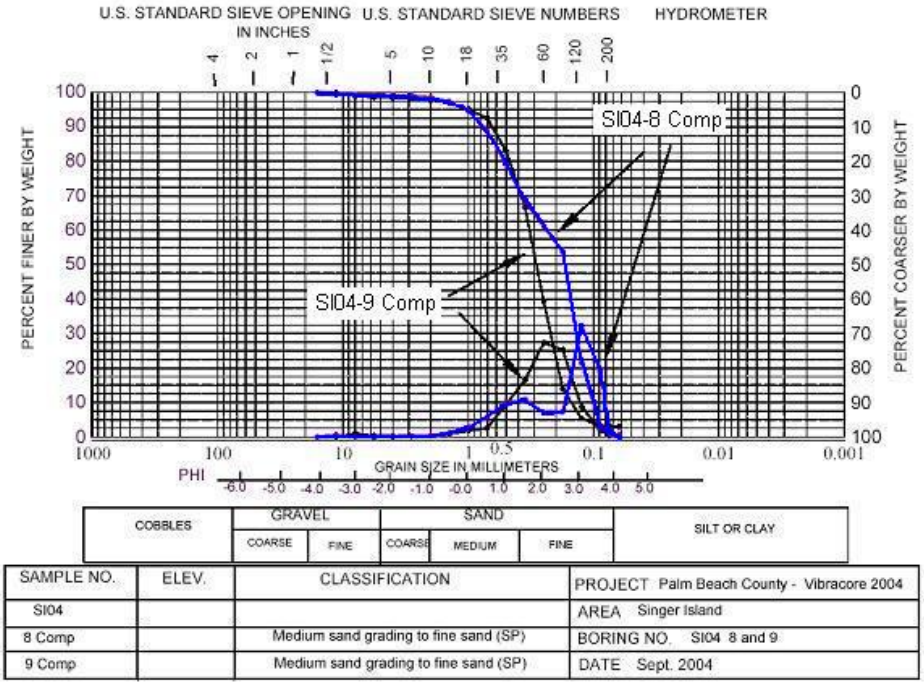


Figure 22. Comparison between textural properties of composite samples from Core SI04-9 (black) and Core SI04-8 (blue).

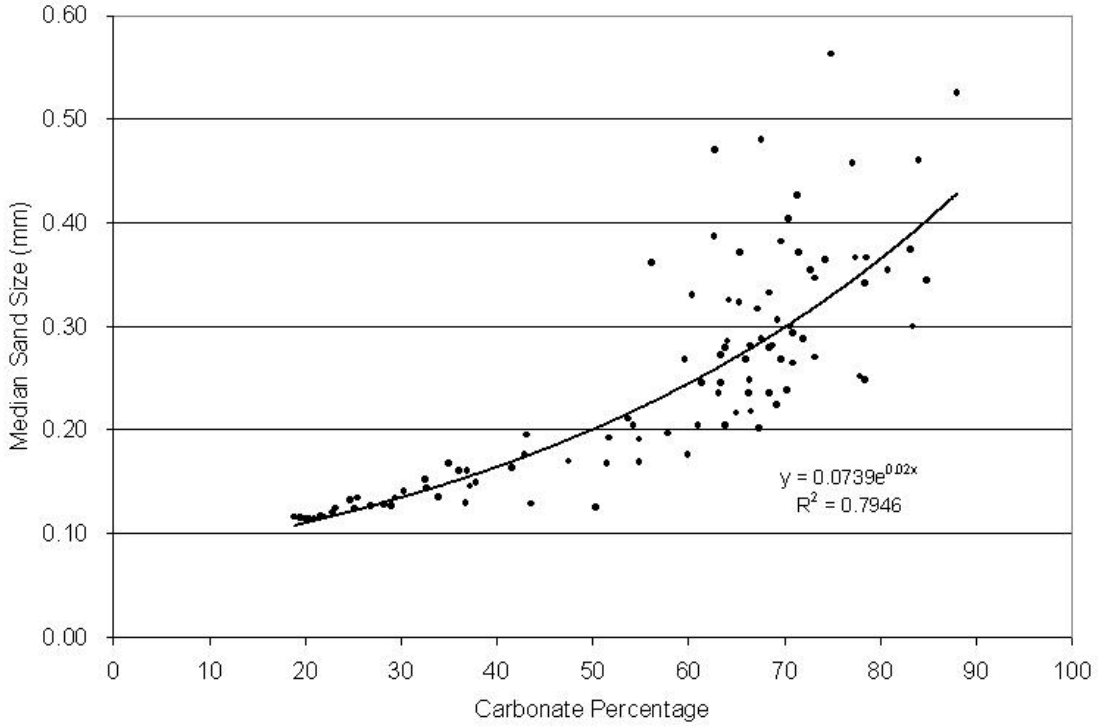


Figure 23. Correlation between carbonate content and median sediment diameter in the Singer Island survey area.

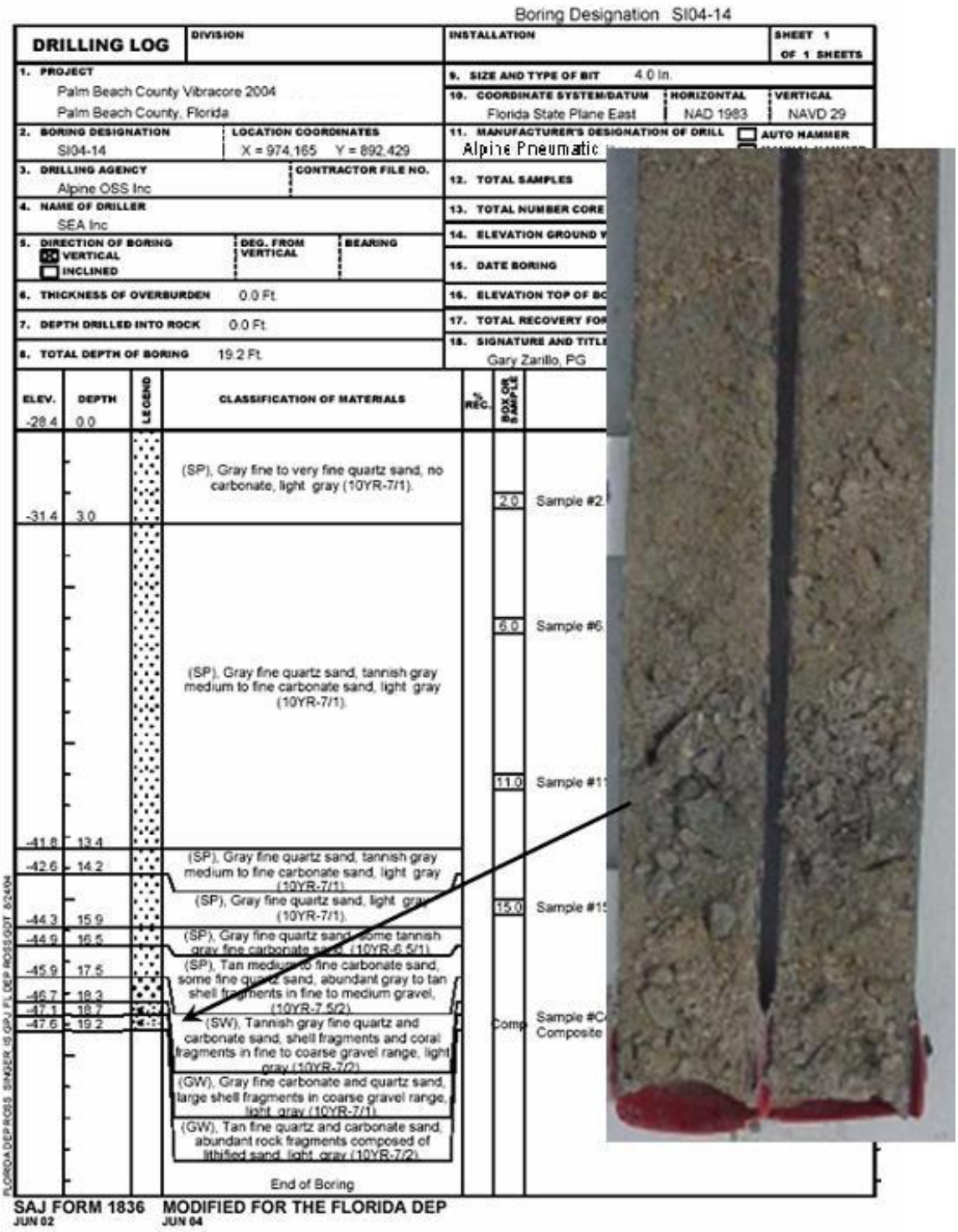


Figure 24. Rock fragments in the lower sections of Singer Island Core SI04-14. See Figure 18 for core locations.

8.0 Conclusions and Recommendations

The results of the geotechnical survey indicate that each area of investigation has certain distinctive properties that can be combined with properties common among all three areas to characterize the potential for recoverable beach quality sand. Ground truthing using vibracore samples confirms that a large volume of clean, silt free sand is present in the Briny Breezes, Highland Beach, and Singer Island areas. The vibracores further confirm that unconsolidated sands extend to sub-bottom elevations consistent with the level of the first continuous sub-bottom acoustic reflector in each area. Good agreement was found between the thickness or ispopach of unconsolidated sand determined from the sub-bottom seismic records and the penetration of the vibracores. In zones where the overburden was estimated to be relatively thin in the Singer Island area the vibracore repeatedly penetrated the over burden and terminated in lithified to semi-lithified carbonate rock. The agreement between the elevations of acoustic reflectors and the elevation of rock material in the lower portion of the Singer Island cores was usually within 2 feet.

The silt and clay content in nearly all of the vibracore material that was sampled averaged well below 2% and was usually on the order of 1% or less in most samples. Low percentages of silt and clay were consistent across all three survey areas. The color of most sediment observed in the cores was a medium gray and occasionally a light gray. The most frequent Munsell color code assigned to samples was a 10YR7/1 or 6.5/1.

The median grain size of al1 samples ranged from a minimum of about 0.13 mm to a maximum of approximately 0.56 mm. A good correlation between carbonate content and median grain size was found in all three areas. In all cases higher percentages of carbonate correlated with larger median grain diameter among the samples. The carbonate fraction is largely in the medium sand range and to a limited degree in the coarse sand range. The gravel fraction (coarser than 4 mm in diameter) of discrete and composite samples averaged less than 1% among all 56 vibracores. The spatial trend of median grain size and carbonate concentration within each of the individual areas provides an important feature that defines the potential for

recovering beach quality sand. This trend along with the elevation of the acoustic reflectors and occurrence of rock fragments in the core material provides the boundaries for defining the areas of beach quality sand having a median diameter well above 0.2 mm, but minimal content of shell material in the gravel range, and minimal inclusion of rock fragments.

In the Briny Breezes area the median grain size decreases with distance offshore. Sediment having a median grain size of 0.2 mm and larger occurred within 3,000 feet of the shoreline. The area characterized by larger median grain size also corresponds with the zone of greatest overburden. The sediment isopach reached more than 50 feet in some sections. Further offshore beyond approximately 3,500 feet from the beach, the overburden thins, and the underlying carbonate rock begins to slope upward towards the surface. In this area, which includes the seaward row of cores, material recovered from the cores frequently included large rock fragments either in thin discrete layers or distributed to elevations as much as 10 feet above the base of the core. This finding, along with the small median size of the sand fraction found in the offshore cores eliminates the offshore area from consideration for sand recovery. However, the thinner sediment overburden in this area limits the impact on overall recoverable sand volume in the Briny Breezes area.

The overall results of the geotechnical investigation of the Highland Beach survey area were similar to those of Briny Breezes. Composite samples of cores within approximately 2,500 feet of the Highland Beach shoreline were characterized by sediments having a relatively large median grain size. The inner composite samples were 0.2 mm or larger in median grain diameter. The outer row of cores at a distance of more than 3,500 feet from the shoreline included sediment that was distinctly finer in median grain size. Offshore, the median diameter of core composite samples ranged from 0.23 to 0.17 mm. The seaward row of cores contained thin layers of rock rubble in the form of coral fragments. For both the offshore portions of the Highland Beach and Briny Breezes survey areas, the inclusion of rock rubble within some cores is likely due to the proximity of rock reef outcrops. There are frequent and shallow rock outcrops within 500 to 1,000 feet of the outermost cores. Breaking waves and storm-generated currents may transport rock fragments landward from the reef where they can mix with sands that are partially mobilized and re-worked during severe storms.

Reef rock outcrops occur more than 1,500 feet seaward of the Singer Island survey area. Thus, the inclusion of rock rubble in the Singer Island cores is scattered among a few discrete thin layers rather than dominating large sections of the cores as found in the two survey areas further to the south, which are closer to rock outcrops. Thus, even though the overburden of sand above multiple shallow acoustic reflectors is relatively thin, the Singer Island cores are relatively free of extensive layers of rock fragments. However the base of many of the cores terminated in either rock fragments or penetrated completely through unconsolidated sand and terminated in a lithified carbonate surface. The pattern of median grain size in composite samples indicated that the coarsest material is in the central to outer portions of the survey areas. Here, the median diameter of composite samples of nearly all cores was larger than 0.24 mm. The nearshore cores recovered in water depths of less than 35 feet were characterized by clean sands having a median diameter of less than 0.2 mm.

The results of this reconnaissance level geotechnical survey provide some clear guidelines for recovering beach quality sand. In order to define the precise geometry and sand volume of borrow cuts in the three survey areas, it is recommended that additional cores be positioned in each area to provide a maximum spacing among the cores of approximately 1,000 to 1,500 feet. Figure 25 shows the zone within the Briny Breezes survey area where additional cores should be placed to fully characterize beach quality sands. The criterion for establishing this zone includes a median sediment size greater than 0.2 mm, an overburden of clean sand of 10 feet or more and minimal occurrence of rock rubble. The total volume of clean sand in this zone is approximately 19 million cubic yards. The practical recovery potential from this volume is expected to be approximately 9 million cubic yards given the constraints of dredging and the occurrence of scattered rock fragments. Figure 26 shows the optimal zone within the Highland Beach area recommended for additional cores for the purpose of defining one or more specific borrow sites. The volume of sand in this zone is 24 million cubic yards. The recovery potential from this volume is expected to be approximately 9 million cubic yards of sand. Figure 27 show the zone of best potential beach quality sand within the Singer Island Survey area. The volume of beach quality sand is expected to be approximately 4.2 million cubic yards in this area. Most of this volume can be recovered for beach nourishment since it is within 10 feet of the sediment

surface. Similarly to the other areas additional cores should be placed to confirm the sediment size pattern and ensure that the material is largely free of rock fragments.

The occurrence of the relatively coarse sand close to the shoreline in the Briny Breezes and Highland Beach areas indicates that other nearshore areas at depths of between 25 to 30 feet below the NGVD datum could hold significant resources for Palm Beach County. The County has obtained more than 600 cores and jet probes over the past twenty years. However, few of these cores and probes were obtained at relatively shallow depths similar to the nearshore areas surveyed at Briny Breezes and Highland Beach. If the same pattern found in these two areas, coarse material at shallow depths is also present in other areas of the County south of Lake Worth Inlet; several million cubic yards of additional beach quality sand may be recoverable from nearshore waters.

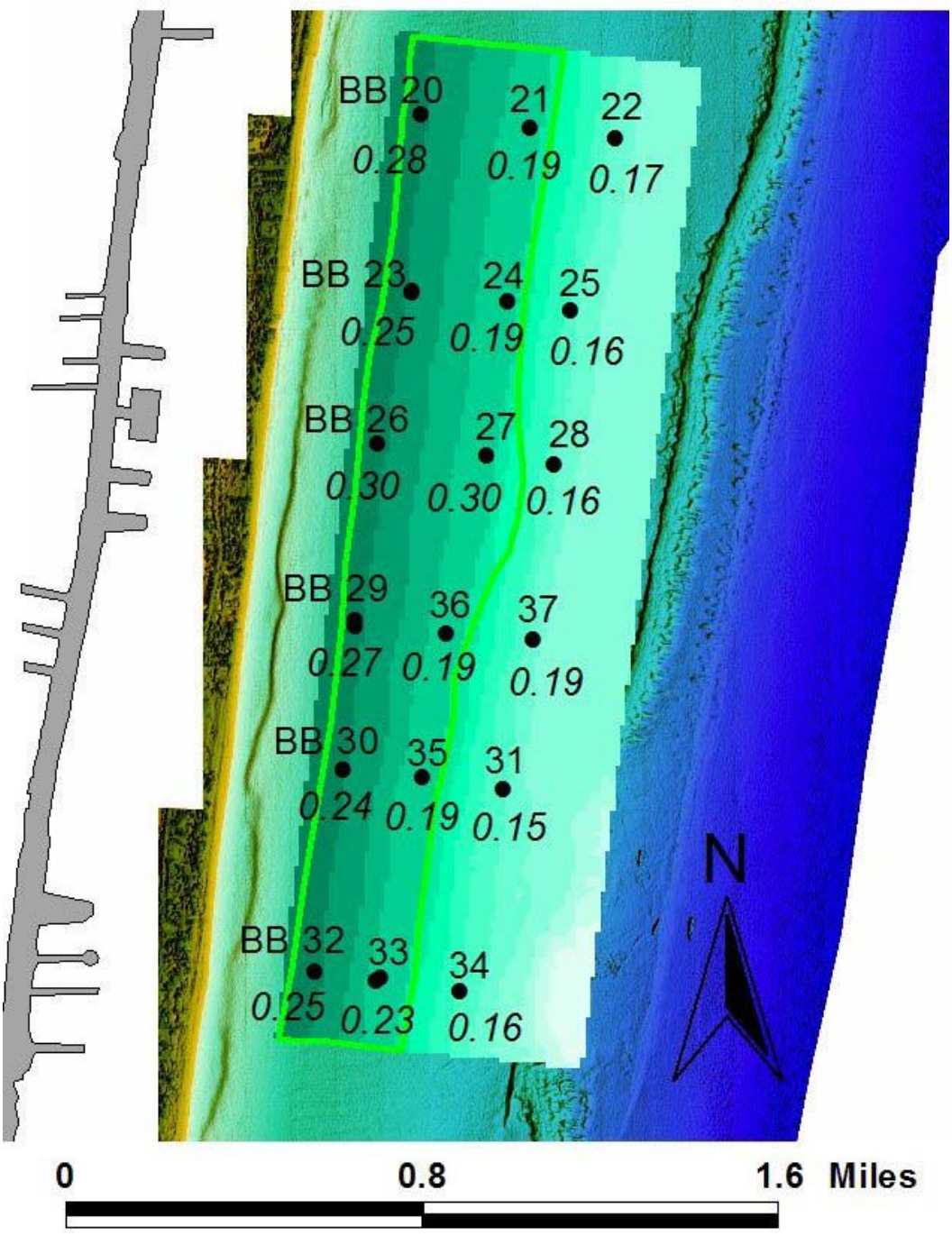


Figure 25. Boundary of the recommended Briny Breezes borrow area.

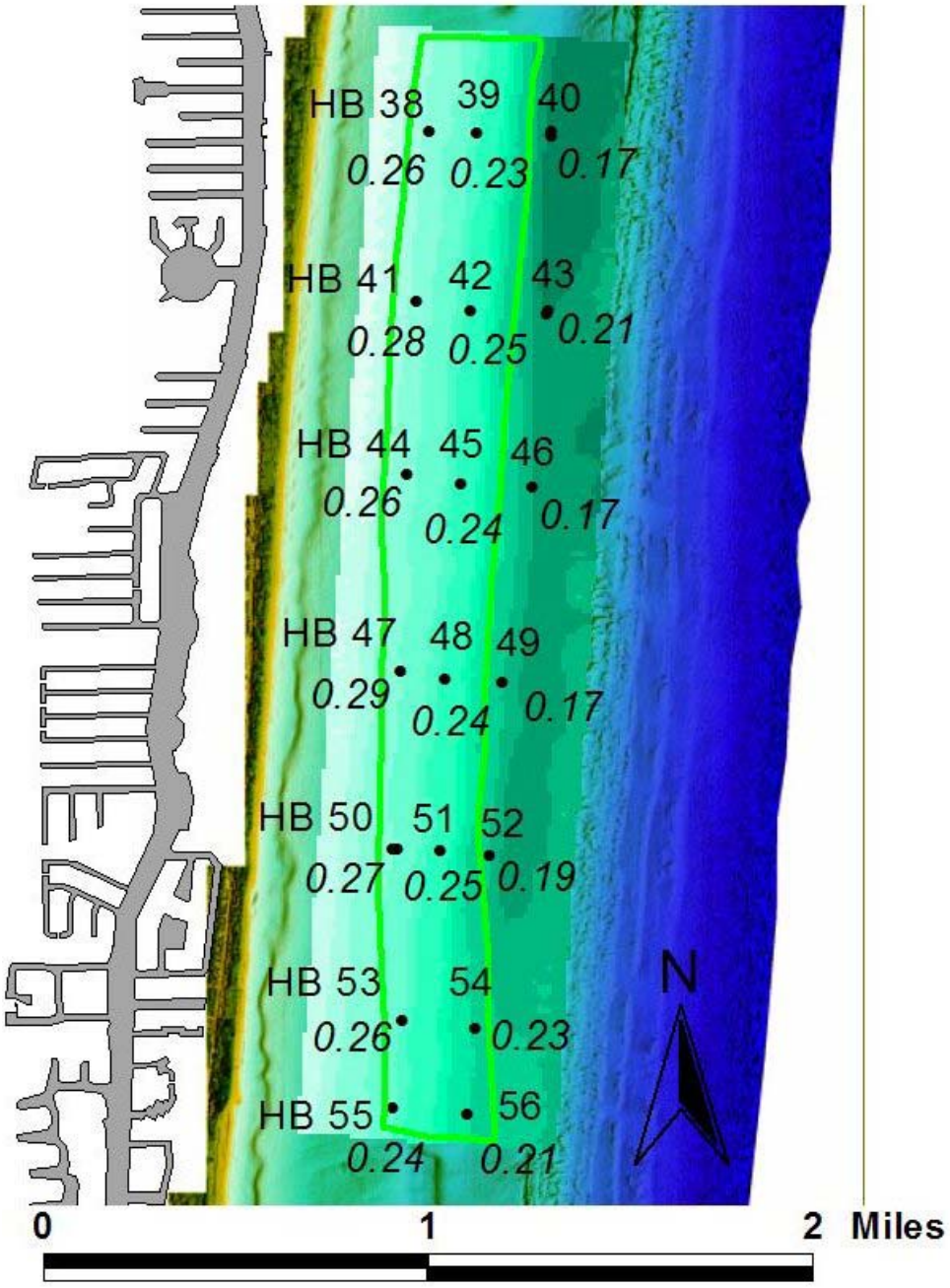


Figure 26. Boundary of the recommended Highland Beach borrow area.

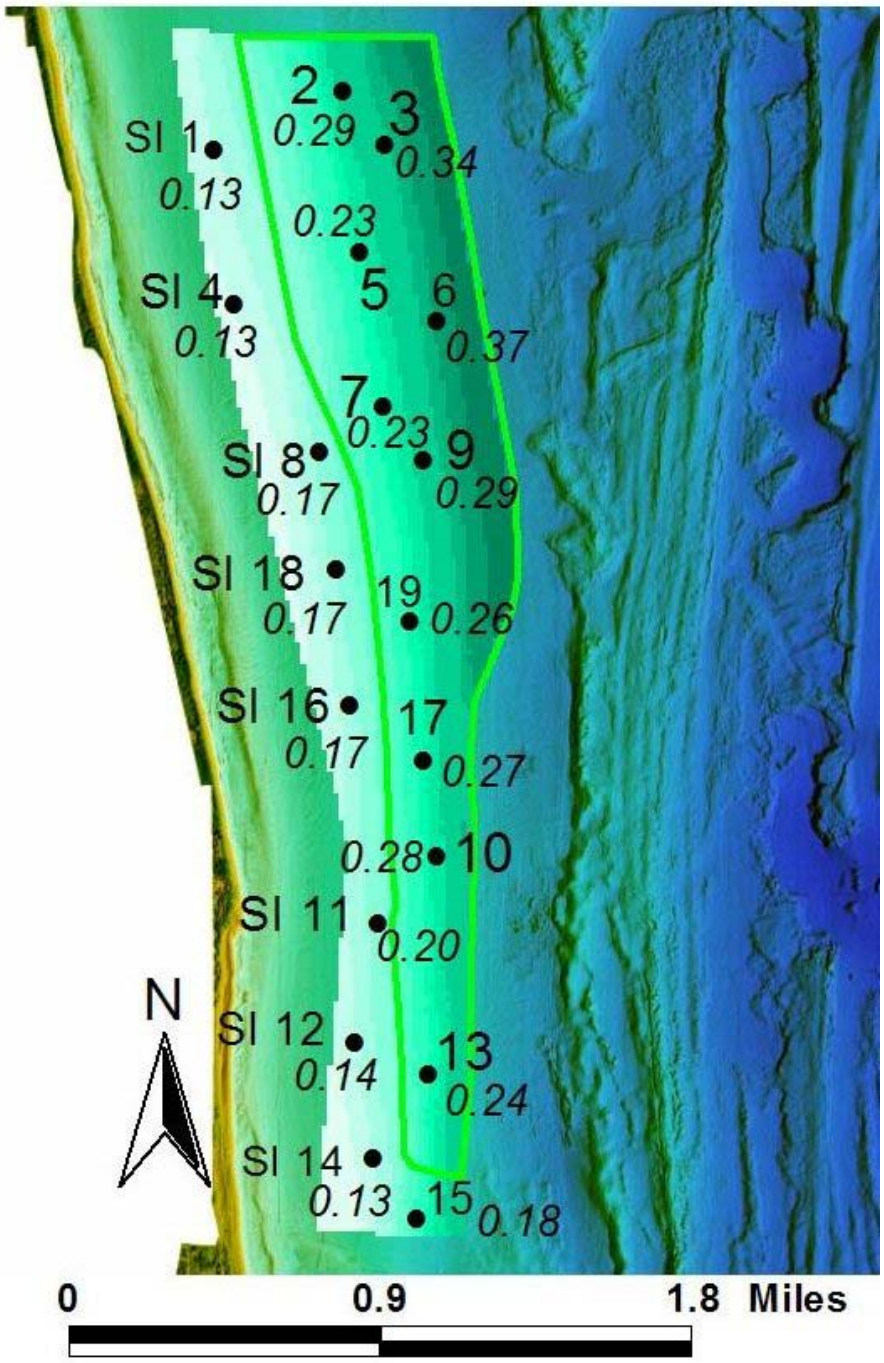


Figure 27. Boundary of the recommended Singer Island borrow area.

9.0 References

Scientific Environmental Applications, Inc., 2003. Seismic Profiling to Determine Sand Source Potential of Three Offshore Areas: Final Report prepared for Applied Technology and Management, Inc. and Palm Beach County Department of Environmental Resource Management. 42 p.

Appendix A1. Briny Breezes Sample Description

Core	Depth	Class	Fine %	Mean (mm)	Md (mm)	St Dev	Skew	Kurt	Carbonate %
BB04-20	0.5	SP	1.24	0.21	0.19	0.77	-1.44	5.98	33.47
BB04-20	4	SP	0.77	0.39	0.33	1.14	-0.65	2.77	43.48
BB04-20	8	SP	1.00	0.54	0.51	0.96	-0.38	3.00	46.51
BB04-20	12	SP	0.18	0.23	0.22	0.6	-0.86	4.84	37.20
BB04-20	16	SP	0.09	0.25	0.24	0.72	-1.02	5.24	39.99
BB04-20	**Comp**	**SP**	**1.13**	**0.32**	**0.28**	**1.04**	**-1.22**	**4.77**	**41.83**
BB04-21	0.5	SP	0.49	0.19	0.17	0.73	-3.11	18.74	31.33
BB04-21	4	SP	0.89	0.22	0.21	0.66	-1.58	7.76	36.34
BB04-21	8	SP	0.77	0.20	0.19	0.52	-1.26	7.55	35.57
BB04-21	12	SP	0.96	0.23	0.21	0.78	-1.88	8.02	37.04
BB04-21	16	SP	0.75	0.19	0.18	0.47	-1.6	10.51	34.97
BB04-21	**Comp**	**SP**	**1.59**	**0.20**	**0.19**	**0.64**	**-2.08**	**11.00**	**39.78**
BB04-22	0.5	SP	0.75	0.25	0.19	1.31	-2.11	8.03	38.09
BB04-22	3	SP	0.92	0.17	0.16	0.52	-3.03	20.04	35.05
BB04-23	0.5	SP	0.94	0.23	0.20	0.85	-1.47	5.99	32.60
BB04-23	4	SP	0.97	0.33	0.31	0.91	-0.81	3.99	37.56
BB04-23	8	SP	0.70	0.46	0.42	1.15	-0.62	3.10	51.65
BB04-23	12	SP	0.92	0.23	0.20	0.93	-1.14	4.04	46.81
BB04-23	16	SP	0.93	0.25	0.24	0.67	-1.02	5.04	45.02
BB04-23	**Comp**	**SP**	**1.13**	**0.30**	**0.25**	**1.03**	**-1.01**	**3.81**	**46.70**
BB04-24	0.5	SP	0.53	0.22	0.20	0.74	-1.41	6.49	32.85
BB04-24	4	SP	0.79	0.22	0.21	0.77	-2.29	11.65	29.78
BB04-24	8	SP	0.18	0.21	0.20	0.53	-1.36	9.26	41.36
BB04-24	12	SP	0.57	0.19	0.18	0.57	-1.78	9.84	28.66
BB04-24	16	SP	0.43	0.30	0.26	0.99	-1.29	4.97	34.50
BB04-24	**Comp**	**SP**	**0.67**	**0.20**	**0.19**	**0.79**	**-3.07**	**17.56**	27.98
BB04-25	0.5	SP	0.21	0.16	0.15	0.52	-3.58	27.05	26.23
BB04-25	4	SP	0.67	0.17	0.16	0.72	-3.15	15.78	32.40
BB04-25	8	SP	2.75	0.17	0.16	0.68	-2.69	13.31	41.94
BB04-25	**Comp**	**SP**	**1.73**	**0.17**	**0.16**	**0.62**	**-2.82**	**14.79**	**41.58**
BB04-26	0.5	SP	0.42	0.26	0.23	0.98	-0.88	3.53	24.07
BB04-26	4	SP	0.85	0.33	0.31	0.86	-0.46	3.32	39.81
BB04-26	8	SP	1.16	0.51	0.44	1.36	-0.55	2.65	60.81
BB04-26	12	SP	1.00	0.34	0.30	0.92	-0.77	3.32	51.16
BB04-26	16	SP	1.16	0.39	0.35	1.26	-0.46	2.53	53.52
BB04-26	**Comp**	**SP**	**0.23**	**0.36**	**0.30**	**1.26**	**-1.11**	**4.06**	**46.23**

Core	Depth	Class	Fine %	Mean (mm)	Md (mm)	St Dev	Skew	Kurt	Carbonate %
BB04-27	0.5	SP	.08	0.20	0.18	0.75	-2.13	9.51	24.96
BB04-27	4	SP	0.18	0.20	0.18	0.63	-1.81	10.21	29.37
BB04-27	8	SP	0.83	0.19	0.19	0.53	-1.57	9.09	33.46
BB04-27	12	SP	0.37	0.19	0.19	0.49	-1.51	9.98	27.38
BB04-27	**Comp**	**SP**	**1.35**	**0.20**	**0.18**	**0.62**	**-1.72**	**8.51**	**36.42**
BB04-28	0.5	SP	1.32	0.16	0.15	0.53	-2.62	16.41	32.60
BB04-28	4	SP	1.01	0.16	0.15	0.49	-2.4	14.20	31.12
BB04-28	8	SP	1.83	0.19	0.16	0.91	-2.34	8.99	35.87
BB04-28	**Comp**	**SP**	**1.42**	**0.18**	**0.16**	**0.69**	**-2.56**	**11.80**	**36.48**
BB04-29	0.5	SP	0.93	0.19	0.17	0.69	-0.97	3.88	29.82
BB04-29	4	SP	1.01	0.21	0.19	0.69	-1.12	5.24	31.29
BB04-29	8	SP	0.78	0.51	0.47	1.15	-0.44	2.64	46.14
BB04-29	12	SP	0.30	0.23	0.20	0.73	-1.24	5.02	35.02
BB04-29	15	SP	0.56	0.31	0.28	1.01	-1.02	4.07	39.31
BB04-29	**Comp**	**SP**	**0.87**	**0.31**	**0.27**	**1.08**	**-1.15**	**4.63**	**39.11**
BB04-30	0.5	SP	0.09	0.18	0.17	0.62	-1.28	6.10	25.49
BB04-30	4	SP	0.03	0.41	0.37	1.03	-0.82	3.91	39.06
BB04-30	8	SP	1.23	0.26	0.24	0.79	-1.26	5.99	41.95
BB04-30	12	SP	1.13	0.23	0.20	0.79	-1.76	8.35	40.59
BB04-30	16	SP	0.67	0.36	0.31	1.03	-1.04	4.06	48.41
BB04-30	**Comp**	**SP**	**0.55**	**0.27**	**0.24**	**0.87**	**-1.16**	**4.90**	**39.44**
BB04-31	1	SP	0.41	0.15	0.15	0.5	-2.6	16.49	26.01
BB04-31	5	SP	0.68	0.17	0.15	0.65	-2.93	15.76	27.63
BB04-31	8	SP	1.28	0.16	0.15	0.68	-2.55	12.05	35.23
BB04-31	12	SP	1.00	0.18	0.16	0.74	-1.95	7.90	33.05
BB04-31	16	SP	1.65	0.21	0.16	0.97	-1.87	7.41	43.44
BB04-31	**Comp**	**SP**	**1.05**	**0.18**	**0.15**	**0.85**	**-2.67**	**12.01**	**33.37**
BB04-32	1	SP	0.38	0.20	0.18	0.71	-1.3	5.83	24.69
BB04-32	5	SP	0.26	0.30	0.29	0.77	-0.53	3.75	31.63
BB04-32	8	SP	0.64	0.33	0.29	1.05	-0.93	3.67	40.11
BB04-32	12	SP	0.87	0.31	0.30	0.77	-0.79	4.80	47.16
BB04-32	16	SP	0.76	0.25	0.21	1.05	-1.73	6.49	48.44
BB04-32	**Comp**	**SP**	**0.78**	**0.29**	**0.25**	**1**	**-1.22**	**4.90**	**41.39**
BB04-33 R1R2	1	SP	0.15	0.25	0.24	0.71	-0.78	4.60	27.26
BB04-33 R1R2	4	SP	0.31	0.25	0.22	0.9	-1.28	4.87	30.31
BB04-33 R1R2	8	SP	1.02	0.24	0.23	0.77	-1.36	6.69	35.08
BB04-33 R1R2	12	SP	1.55	0.22	0.21	0.63	-0.87	4.68	35.24

Core	Depth	Class	Fine %	Mean (mm)	Md (mm)	St Dev	Skew	Kurt	Carbonate %
BB04-33 R1R2	16	SP	0.37	0.24	0.23	0.63	-0.88	4.65	34.42
BB04-33 R1R2	**Comp**	**SP**	**0.47**	**0.26**	**0.23**	**0.9**	**-1.28**	**5.25**	**35.74**
BB04-34	0.5	SP	0.20	0.17	0.16	0.5	-2.36	16.16	22.92
BB04-34	4	SP	0.46	0.16	0.16	0.48	-2.08	13.65	27.60
BB04-34	8	SP	1.08	0.16	0.15	0.55	-2.47	14.41	28.36
BB04-34	12	SP	1.66	0.17	0.16	0.6	-2.56	16.35	31.44
BB04-34	17	SP	2.13	0.18	0.16	0.74	-2.37	11.43	33.92
BB04-34	**Comp**	**SP**	**1.34**	**0.17**	**0.16**	**0.64**	**-3.08**	**18.98**	**30.05**
BB04-35	0.5	SP	0.54	0.26	0.24	0.8	-0.77	3.84	26.07
BB04-35	4	SP	1.06	0.22	0.20	0.86	-2.38	11.80	31.05
BB04-35	8	SP	0.73	0.42	0.35	1.32	-1.15	4.39	38.57
BB04-35	13	SP	2.33	0.18	0.17	0.54	-1.51	9.58	29.98
BB04-35	**Comp**	**SP**	**0.91**	**0.22**	**0.19**	**0.82**	**-1.63**	**6.94**	**27.10**
BB04-36	0.5	SP	0.25	0.16	0.15	0.45	-1.68	10.03	26.06
BB04-36	4	SP	0.15	0.21	0.19	0.66	-1.48	7.01	40.72
BB04-36	8	SP	0.30	0.20	0.18	0.64	-2.19	12.11	37.83
BB04-36	12	SP	0.21	0.20	0.20	0.56	-1.34	7.94	38.56
BB04-36	16	SP	1.20	0.20	0.19	0.61	-1.49	7.28	40.17
BB04-36	**Comp**	**SP**	**0.81**	**0.21**	**0.19**	**0.73**	**-1.54**	**6.57**	**40.61**
BB04-37	0.5	SP	1.29	0.16	0.15	0.5	-2.75	17.50	29.84
BB04-37	4	SP	0.50	0.16	0.15	0.52	-2.51	13.57	33.77
BB04-37	6	SP	0.63	0.16	0.15	0.61	-2.45	11.59	32.71
BB04-37	**Comp**	**SP**	**0.79**	**0.17**	**0.15**	**0.65**	**-3.01**	**15.89**	**34.43**

Appendix A2. Highland Beach Sample Description

Core	Depth	Class	Fine %	mean (mm)	med (mm)	St Dev	Skew	Kurt	Carbonate %
HB04-38	0.5	SP	0.96	0.27	0.25	0.77	-0.68	3.68	36.94
HB04-38	4	SP	0.44	0.23	0.21	0.74	-1.57	6.87	43.15
HB04-38	8	SP	0.69	0.28	0.26	0.78	-0.83	4.06	48.40
HB04-38	12	SP	0.75	0.28	0.26	0.75	-1.22	5.31	49.49
HB04-38	16	SP	0.62	0.26	0.24	0.68	-1.39	7.12	54.65
HB04-38	**Comp**	**SP**	**1.51**	**0.30**	**0.26**	**0.93**	**-1.25**	**5.12**	**50.36**
HB04-39	0.5	SP	0.15	0.24	0.20	1.02	-1.51	4.98	44.96
HB04-39	4	SP	2.17	0.24	0.21	0.86	-1.63	6.56	45.47
HB04-39	8	SP	0.58	0.23	0.22	0.64	-0.97	5.37	43.24
HB04-39	12	SP	0.54	0.26	0.24	0.76	-1	4.75	51.31
HB04-39	16	SP	0.64	0.30	0.28	0.8	-1.19	5.77	53.77
HB04-39	**Comp**	**SP**	**0.70**	**0.26**	**0.23**	**0.86**	**-1.59**	**7.08**	**47.67**
HB04-40 R1R2	0.5	SP	1.06	0.18	0.16	0.73	-2.38	12.22	36.41
HB04-40 R1R2	4	SP	1.02	0.19	0.16	0.87	-2.28	9.67	41.09
HB04-40 R1R2	8	SP	2.63	0.21	0.16	1.09	-1.74	5.82	47.23
HB04-40 R1R2	**Comp**	**SP**	**2.94**	**0.22**	**0.17**	**1.19**	**-1.95**	**7.06**	**50.20**
HB04-41	0.5	SP	1.07	0.20	0.19	0.7	-1.41	6.44	37.21
HB04-41	4	SP	1.09	0.37	0.35	0.87	-0.66	3.94	85.25
HB04-41	8	SP	0.51	0.31	0.29	0.68	-0.66	3.7	54.61
HB04-41	12	SP	0.18	0.31	0.31	0.66	-0.46	3.82	58.97
HB04-41	16	SP	0.42	0.26	0.25	0.67	-0.67	4.07	53.46
HB04-41	**Comp**	**SP**	**0.70**	**0.31**	**0.28**	**0.88**	**-1.11**	**4.77**	**54.78**
HB04-42	0.5	SP	0.17	0.28	0.26	0.69	-0.75	4.42	52.50
HB04-42	4	SP	0.40	0.29	0.27	0.79	-0.9	4.56	81.60
HB04-42	8	SP	0.26	0.26	0.25	0.65	-0.74	4.3	52.32
HB04-42	12	SP	0.56	0.27	0.25	0.75	-1.15	5.56	68.67
HB04-42	16	SP	0.09	0.33	0.32	0.69	-0.5	3.51	60.22
HB04-42	**Comp**	**SP**	**0.56**	**0.27**	**0.25**	**0.75**	**-1.15**	**5.56**	**55.82**
HB04-43 R1R2	0.5	SP	0.20	0.21	0.19	0.67	-1.39	6.42	40.95
HB04-43 R1R2	5	SP	0.58	0.21	0.19	0.71	-1.46	6.08	46.92
HB04-43 R1R2	**Comp**	**SP**	**0.18**	**0.25**	**0.21**	**0.97**	**-1.41**	**4.9**	**47.13**
HB04-44	0.5	SP	0.47	0.24	0.22	0.8	-1.04	4.43	44.83
HB04-44	4	SP	0.55	0.30	0.29	0.62	-1.06	6.16	56.16
HB04-44	8	SP	2.11	0.26	0.22	1.12	-1.19	4.24	67.61
HB04-44	12	SP	0.70	0.31	0.28	0.81	-0.9	4.08	62.11
HB04-44	16	SP	0.67	0.36	0.35	0.7	-0.41	3.69	67.70
HB04-44	**Comp**	**SP**	**0.58**	**0.30**	**0.26**	**1.02**	**-1.14**	**4.71**	**60.28**
HB04-45	0.5	SP	0.78	0.22	0.20	0.86	-1.48	5.84	45.58
HB04-45	4	SP	0.52	0.35	0.33	0.84	-0.59	3.18	59.38

Core	Depth	Class	Fine %	mean (mm)	med (mm)	St Dev	Skew	Kurt	Carbonate %
HB04-45	8	SP	0.28	0.25	0.23	0.66	-1.02	5.29	50.20
HB04-45	12	SP	1.04	0.33	0.30	0.82	-0.75	3.67	62.43
HB04-45	16	SP	0.77	0.23	0.21	0.7	-1.71	8.17	51.63
HB04-45	**Comp**	**SP**	**0.39**	**0.27**	**0.24**	**0.84**	**-1.13**	**4.55**	**53.93**
HB04-46	0.5	SP	0.86	0.19	0.17	0.7	-1.87	8.59	43.72
HB04-46	3	SP	1.08	0.19	0.17	0.74	-1.99	9.08	47.50
HB04-46	4	SP	1.14	0.19	0.17	0.79	-2.61	13.97	47.15
HB04-46	**Comp**	**SP**	**0.54**	**0.19**	**0.17**	**0.75**	**-2**	**8.76**	**46.89**
HB04-47	0.5	SP	0.44	0.29	0.26	0.8	-0.94	3.96	48.75
HB04-47	4	SP	0.12	0.34	0.32	0.87	-0.63	3.28	63.51
HB04-47	8	SP	0.40	0.35	0.32	0.86	-0.78	3.85	66.76
HB04-47	12	SP	0.57	0.30	0.29	0.75	-0.84	4.08	64.58
HB04-47	16	SP	0.73	0.31	0.29	0.85	-0.93	4.35	67.98
HB04-47	**Comp**	**SP**	**0.64**	**0.33**	**0.29**	**1.01**	**-1.37**	**5.58**	**63.26**
HB04-48	0.5	SP	0.14	0.25	0.21	1.04	-1.67	5.94	45.64
HB04-48	4	SP	0.66	0.28	0.25	0.82	-1	4.24	55.61
HB04-48	8	SP	0.67	0.29	0.27	0.78	-0.99	4.96	55.88
HB04-48	12	SP	0.74	0.32	0.31	0.72	-0.54	3.83	58.02
HB04-48	16	SP	0.97	0.25	0.23	0.76	-1.51	6.82	51.76
HB04-48	**Comp**	**SP**	**1.13**	**0.27**	**0.24**	**0.84**	**-1.28**	**5.46**	**52.81**
HB04-49	0.5	SP	0.02	0.19	0.18	0.65	-1.97	9.78	42.33
HB04-49	6	SP	0.63	0.18	0.17	0.64	-2.56	14.29	42.38
HB04-49	8	SP	1.02	0.18	0.16	0.6	-2.23	12.4	42.92
HB04-49	11	SP	0.89	0.19	0.17	0.76	-2.41	11.32	45.41
HB04-49	**Comp**	**SP**	**0.57**	**0.19**	**0.17**	**0.84**	**-3.05**	**16.18**	**43.14**
HB04-50 R2	1	SP	0.27	0.29	0.26	0.79	-1.09	4.52	43.73
HB04-50 R2	4	SP	0.84	0.24	0.22	0.78	-1.28	5.29	42.41
HB04-50 R2	8	SP	0.37	0.38	0.36	0.81	-0.5	3.5	60.71
HB04-50 R2	12	SP	1.37	0.31	0.27	0.92	-1.18	4.58	56.00
HB04-50 R2	16	SP	0.06	0.23	0.22	0.64	-1.16	5.6	56.57
HB04-50 R2	**Comp**	**SP**	**0.86**	**0.31**	**0.27**	**0.98**	**-1.84**	**8.51**	**51.18**
HB04-51	0.5	SP	0.13	0.19	0.18	0.55	-1.44	7.61	38.49
HB04-51	4	SP	0.54	0.40	0.34	1.08	-0.6	2.65	62.90
HB04-51	8	SP	0.59	0.26	0.24	0.7	-1.3	6.64	51.71
HB04-51	12	SP	0.42	0.34	0.31	0.79	-1.02	5.26	60.85
HB04-51	16	SP	0.55	0.31	0.28	0.83	-1.16	4.96	65.05
HB04-51	**Comp**	**SP**	**1.27**	**0.29**	**0.25**	**0.97**	**-1.57**	**6.51**	**54.69**
HB04-52	0.5	SP	0.38	0.28	0.22	1.05	-1.18	3.91	47.87
HB04-52	4	SP	0.64	0.24	0.20	1.02	-1.74	6.09	44.42
HB04-52	8	SP	1.16	0.24	0.21	0.87	-1.62	6.89	47.23
HB04-52	12	SP	1.03	0.24	0.21	0.8	-1.46	6.32	48.06
HB04-52	**Comp**	**SP**	**1.09**	**0.23**	**0.19**	**0.92**	**-1.9**	**7.43**	**45.02**
HB04-53	0.5	SP	0.71	0.22	0.21	0.66	-1.37	6.28	40.79
HB04-53	4	SP	0.58	0.34	0.31	0.81	-0.75	4.03	56.13
HB04-53	8	SP	0.77	0.30	0.28	0.69	-0.82	4.17	51.76
HB04-53	12	SP	1.28	0.28	0.26	0.64	-1.41	6.87	56.83
HB04-53	16	SP	1.40	0.24	0.23	0.57	-0.94	5.28	55.73
HB04-53	**Comp**	**SP**	**0.88**	**0.29**	**0.26**	**0.81**	**-1.24**	**5.29**	**54.08**

Core	Depth	Class	Fine %	mean (mm)	med (mm)	St Dev	Skew	Kurt	Carbonate %
HB04-54	0.5	SP	0.25	0.22	0.20	0.73	-1.78	7.87	47.98
HB04-54	4	SP	0.32	0.21	0.20	0.65	-1.66	8.03	47.80
HB04-54	8	SP	1.10	0.28	0.24	0.91	-1.31	5.21	57.50
HB04-54	12	SP	1.07	0.29	0.26	0.9	-1.34	5.69	60.44
HB04-54	**Comp**	**SP**	**0.21**	**0.26**	**0.23**	**0.94**	**-1.63**	**6.31**	**55.12**
HB04-55	0.5	SP	0.33	0.24	0.22	0.67	-1.28	5.9	45.69
HB04-55	4	SP	0.30	0.27	0.25	0.72	-0.98	4.44	55.24
HB04-55	8	SP	0.65	0.29	0.26	0.79	-1.12	4.38	60.39
HB04-55	12	SP	0.97	0.31	0.26	1.01	-1.71	5.74	64.62
HB04-55	16	SP	0.96	0.22	0.21	0.59	-1.29	6.72	62.24
HB04-55	**Comp**	**SP**	**1.03**	**0.27**	**0.24**	**0.82**	**-1.41**	**5.7**	**59.13**
HB04-56	0.5	SP	0.32	0.23	0.21	0.69	-1.43	6.24	46.32
HB04-56	4	SP	0.41	0.22	0.20	0.78	-1.82	8.28	48.80
HB04-56	8	SP	0.40	0.24	0.22	0.84	-1.88	7.91	53.54
HB04-56	12	SP	1.14	0.24	0.22	0.83	-2.12	10.11	52.14
HB04-56	16	SP	2.09	0.28	0.23	1.05	-1.83	6.73	62.45
HB04-56	**Comp**	**SP**	**1.21**	**0.25**	**0.21**	**0.93**	**-2.14**	**9.06**	**51.09**

Appendix A3. Singer Island Sample Description

Core	Sample	Class	Fine %	Mean (mm)	Med (mm)	St Dev	Skew	Kurt	Carbonate %
SI04-1	1	SP	0.57	0.12	0.11	0.45	-3.24	20.82	20.38
SI04-1	4	SP	0.51	0.13	0.12	0.56	-2.8	13.69	22.85
SI04-1	8	SP	1.44	0.18	0.15	0.97	-1.6	5.28	37.25
SI04-1	14	SP	1.35	0.15	0.13	0.84	-2.46	9.39	50.35
SI04-1	**Comp**	**SP**	**2.26**	**0.16**	**0.13**	**1.01**	**-1.99**	**7.10**	**36.74**
SI04-2	0.5	SP	0.24	0.42	0.37	1.31	-1.35	5.92	71.49
SI04-2	4	SP	1.28	0.30	0.28	0.76	-0.53	3.96	68.72
SI04-2	9	SP	1	0.31	0.28	0.82	-1.07	4.88	63.82
SI04-2	14	SP	1.71	0.39	0.30	1.38	-1.34	4.68	83.42
SI04-2	**Comp**	**SP**	**1.96**	**0.33**	**0.29**	**0.91**	**-1.14**	**5.43**	**70.9**
SI04-3	1	SP	0.37	0.21	0.19	0.75	-1.47	6.18	54.9
SI04-3	4	SP	0.74	0.32	0.31	0.71	-0.59	4.08	69.31
SI04-3	8	SP	1.58	0.30	0.29	0.73	-0.45	3.93	72.02
SI04-3	11	SP	3.13	0.54	0.46	1.4	-0.53	2.78	84.02
SI04-3	**Comp**	**SP**	**1.01**	**0.39**	**0.34**	**1.18**	**-1.02**	**4.84**	**78.43**
SI04-4	1	SP	0.23	0.12	0.11	0.52	-3.31	18.29	19.97
SI04-4	4	SP	0.84	0.14	0.12	0.64	-2.74	12.97	25.14
SI04-4	7	SP	0.66	0.14	0.13	0.55	-1.93	8.59	28.2
SI04-4	11	SP	0.56	0.31	0.33	1.12	-0.18	2.09	60.39
SI04-4	**Comp**	**SP**	**1.39**	**0.17**	**0.13**	**1.02**	**-1.65**	**4.96**	**33.88**
SI04-5	2	SP	1.59	0.27	0.25	0.79	-0.67	3.65	66.37
SI04-5	8	SP	0.64	0.21	0.20	0.58	-0.89	4.91	63.84
SI04-5	13	SP	1.77	0.26	0.23	0.78	-1.09	5.32	63.16
SI04-5	18	SP	1.11	0.29	0.25	0.92	-1.7	7.99	77.9
SI04-5	**Comp**	**SP**	**1.77**	**0.26**	**0.23**	**0.78**	**-1.09**	**5.32**	**68.42**
SI04-6	2	SP	0.8	0.37	0.35	0.75	-0.59	3.46	73.16
SI04-6	7	SP	0.74	0.41	0.35	1.18	-1.29	5.23	80.82
SI04-6	13	SP	0.25	0.55	0.52	1	-0.49	2.98	88.05
SI04-6	18	SP	0.48	0.36	0.34	0.88	-0.48	3.46	84.91
SI04-6	**Comp 1**	SP	1.43	0.40	0.37	1.03	-1.12	5.26	77.43
SI04-6	**Comp 2**	**SP**	**0.94**	**0.43**	**0.37**	**1.13**	**-0.83**	**3.55**	**83.16**
SI04-7	0.5	SP	0.46	0.40	0.39	1.37	-0.73	3.19	62.69
SI04-7	1	SP	0.92	0.34	0.24	1.46	-1.1	3.73	63.42
SI04-7	4	SP	0.84	0.38	0.36	0.94	-0.46	3.33	74.31
SI04-7	9	SP	1.13	0.23	0.22	0.64	-1.13	5.95	64.98
SI04-7	14	SP	1.1	0.21	0.20	0.57	-1.13	7.51	60.98
SI04-7	**Comp**	**SP**	**0.79**	**0.27**	**0.23**	**0.89**	**-1.02**	**4.19**	**66.32**
SI04-8	0.5	SP	0.86	0.13	0.12	0.46	-2.64	15.29	23.21
SI04-8	5	SP	0.47	0.42	0.48	1.12	0.24	2.39	67.62
SI04-8	7	SP	1.6	0.17	0.15	0.74	-1.68	6.43	37.81
SI04-8	11	SP	1.22	0.26	0.20	1.05	-0.65	2.38	57.84
SI04-8	14	SP	0.96	0.34	0.37	1.11	-0.21	2.26	65.4
SI04-8	**Comp**	**SP**	**0.63**	**0.23**	**0.17**	**1.13**	**-0.86**	**2.95**	**47.5**

Core	Sample	Class	Fine %	Mean (mm)	Med (mm)	St Dev	Skew	Kurt	Carbonate %
SI04-9	11	SP	0.8	0.35	0.33	0.79	-0.71	4.02	64.23
SI04-9	1	SP	1	0.32	0.30	0.79	-0.47	3.35	70.59
SI04-9	4	SP	0.6	0.29	0.27	0.62	-0.68	4.07	63.38
SI04-9	7	SP	2.22	0.30	0.27	0.83	-0.71	3.45	73.23
SI04-9	13	SP	1.12	0.30	0.29	0.82	-0.81	4.47	64.11
SI04-9	**Comp**	**SP**	**3.11**	**0.31**	**0.29**	**0.86**	**-1.39**	**7.24**	**67.63**
SI04-10	1	SP	0.72	0.37	0.32	1.14	-1.75	7.55	65.28
SI04-10	4	SP	0.36	0.48	0.46	1.04	-0.38	2.95	77.09
SI04-10	8	SP	0.9	0.22	0.20	0.75	-1.04	4.38	67.34
SI04-10	12	SP	0.82	0.23	0.22	0.66	-1.11	5.71	66.52
SI04-10	**Comp**	**SP**	**0.82**	**0.31**	**0.28**	**0.97**	**-0.84**	**3.74**	**68.47**
SI04-11	1	SP	0.43	0.14	0.13	0.59	-2.29	10.73	26.86
SI04-11	4	SP	0.37	0.37	0.36	0.94	-0.26	2.61	56.2
SI04-11	8	SP	0.64	0.37	0.40	1.05	0.01	2.44	70.44
SI04-11	12	SP	1.22	0.38	0.38	1.28	-0.83	4.35	69.67
SI04-11	**Comp**	**SP**	**0.66**	**0.26**	**0.20**	**1.25**	**-1.1**	**4.09**	**54.24**
SI04-12	1	SP	0.26	0.12	0.12	0.32	-1.3	8.23	18.85
SI04-12	4	SP	0.54	0.13	0.12	0.52	-3.07	16.83	21.62
SI04-12	8	SP	0.53	0.17	0.16	0.65	-1.2	5.34	36.11
SI04-12	13	SP	0.74	0.58	0.56	0.97	-0.59	4.37	74.88
SI04-12	**Comp**	**SP**	**0.91**	**0.17**	**0.14**	**0.89**	**-1.76**	**6.74**	**32.72**
SI04-13	1	SP	1.35	0.17	0.16	0.53	-1.57	8.85	36.9
SI04-13	4	SP	0.81	0.35	0.32	1.06	-0.72	3.56	67.2
SI04-13	7	SP	1.71	0.29	0.25	1.19	-0.55	2.51	78.44
SI04-13	**Comp**	**SP**	**1.81**	**0.29**	**0.24**	**1.15**	**-1.32**	**5.14**	**61.4**
SI04-14	2	SP	1.18	0.12	0.11	0.33	-2.65	22.40	20.98
SI04-14	6	SP	0.4	0.13	0.13	0.38	-1.88	13.11	25.44
SI04-14	11	SP	0.25	0.13	0.13	0.44	-2.23	13.46	24.72
SI04-14	15	SP	0.45	0.15	0.14	0.48	-1.58	7.79	30.33
SI04-14	**Comp**	**SP**	**2.3**	**0.14**	**0.13**	**0.62**	**-3.5**	**20.22**	**28.98**
SI04-15	1	SP	0.75	0.16	0.15	0.5	-1.11	5.72	32.56
SI04-15	4	SP	0.19	0.20	0.19	0.56	-0.83	5.01	43.18
SI04-15	7	SP	1.33	0.23	0.18	1.36	-2.2	8.05	59.91
SI04-15	10	SP	0.91	0.22	0.21	0.79	-0.82	4.43	53.75
SI04-15	**Comp**	**SP**	**1.33**	**0.23**	**0.18**	**1.36**	**-2.2**	**8.05**	**42.93**
SI04-16	1	SP	0.59	0.12	0.12	0.37	-2.2	14.26	19.53
SI04-16	4	SP	1.13	0.41	0.47	1.39	-0.15	2.39	62.82
SI04-16	8	SP	1.06	0.15	0.13	0.77	-2.26	8.46	43.59
SI04-16	13	SP	0.68	0.29	0.24	1.33	-0.45	2.07	70.31
SI04-16	**Comp**	**SP**	**1.37**	**0.24**	**0.17**	**1.21**	**-0.76**	**2.54**	**54.89**
SI04-17	0.5	SP	1.27	0.31	0.28	1.02	-0.76	3.66	66.49
SI04-17	4	SP	1.6	0.29	0.27	0.85	-0.62	3.23	66.03
SI04-17	8	SP	0.87	0.36	0.35	0.92	-0.21	2.60	72.7
SI04-17	12	SP	0.83	0.29	0.27	0.88	-0.5	2.90	69.74
SI04-17	**Comp**	**SP**	**1.6**	**0.29**	**0.27**	**0.85**	**-0.62**	**3.23**	**69.64**
SI04-18	1	SP	0.6	0.12	0.12	0.44	-2.79	16.85	21.98
SI04-18	4	SP	0.03	0.20	0.16	0.9	-1.22	4.02	41.62
SI04-18	7	SP	1.17	0.14	0.13	0.44	-1.97	12.09	29.37

Core	Sample	Class	Fine %	Mean (mm)	Med (mm)	St Dev	Skew	Kurt	Carbonate %
SI04-18	11	SP	0.33	0.37	0.43	1.07	0.14	2.16	71.39
SI04-18	15	SP	1.38	0.24	0.17	1.21	-0.75	2.48	35.02
SI04-18	**Comp**	**SP**	**1.38**	**0.24**	**0.17**	**1.21**	**-0.75**	**2.48**	**51.51**
SI04-19	0.5	SP	1.2	0.24	0.19	1.03	-1.24	4.26	51.76
SI04-19	4	SP	1.13	0.39	0.37	1.02	-0.34	2.52	78.61
SI04-19	8	SP	1.41	0.36	0.33	0.89	-0.48	3.03	68.46
SI04-19	12	SP	1.13	0.28	0.27	0.64	-0.5	3.53	59.66
SI04-19	16	SP	0.8	0.24	0.22	0.75	-0.71	3.34	69.23
SI04-19	**Comp**	**SP**	**0.96**	**0.30**	**0.26**	**0.9**	**-0.69**	**3.21**	**70.87**

Appendix B1: Vibracore Summary Table – Singer Island

Singer Island Core ID	Run	Date	State Plane Florida-East (NAD-83) Easting	Northing	Depth (ft.) NGVD	WGS-84 Latitude			Longitude			Penet. (ft.)	Recov. (ft.)
SI04-01	Run1	5/23/2004	971747.87	907751.04	-26.48	26	49.6634'	N	80	01.9396'	W	18.51	14.6
SI04-02	Run1	5/22/2004	973708.26	908658.73	-58.48	26	49.8107'	N	80	01.5777'	W	19.47	17.0
SI04-03	Run1	5/22/2004	974350.12	907825.98	-62.12	26	49.6725'	N	80	01.4608'	W	18.68	20.0
SI04-04	Run1	5/23/2004	972047.74	905419.16	-22.68	26	49.2781'	N	80	01.8877'	W	18.34	14.7
SI04-05	Run1	5/22/2004	973976.99	906211.31	-52.95	26	49.4064'	N	80	01.5317'	W	18.94	19.2
SI04-06	Run1	5/22/2004	975132.37	905150.93	-66.07	26	49.2300'	N	80	01.3206'	W	18.68	20.0
SI04-07	Run1	5/22/2004	974318.04	903865.16	-51.02	26	49.0188'	N	80	01.4723'	W	19.16	18.7
SI04-08	Run1	5/23/2004	973362.67	903156.18	-31.61	26	48.9030'	N	80	01.6490'	W	16.46	16.9
SI04-09	Run1	5/22/2004	974939.81	903031.77	-58.60	26	48.8805'	N	80	01.3591'	W	18.91	16.6
SI04-10	Run1	5/23/2004	975129.17	897020.48	-54.92	26	47.8881'	N	80	01.3327'	W	18.45	18.7
SI04-11	Run1	5/23/2004	974241.87	895996.15	-34.00	26	47.7202'	N	80	01.4974'	W	18.86	18.3
SI04-12	Run1	5/23/2004	973897.88	894195.22	-26.48	26	47.4234'	N	80	01.5632'	W	18.87	18.0
SI04-13	Run1	5/23/2004	974999.89	893708.77	-50.88	26	47.3417'	N	80	01.3612'	W	9.83	10.6
SI04-14	Run1	5/23/2004	974165.21	892428.67	-28.37	26	47.1315'	N	80	01.5165'	W	18.50	18.5
SI04-15	Run1	5/23/2004	974841.55	891513.66	-45.85	26	46.9797'	N	80	01.3934'	W	15.49	16.2
SI04-16	Run1	5/22/2004	973808.06	899323.66	-29.36	26	48.2699'	N	80	01.5725'	W	4.54*	16.6
SI04-17	Run1	5/22/2004	974944.44	898465.62	-52.45	26	48.1269'	N	80	01.3647'	W	13.01	13.5
SI04-18	Run1	5/22/2004	973610.97	901388.32	-30.85	26	48.6109'	N	80	01.6058'	W	19.15	17.9
SI04-19	Run1	5/22/2004	974725.53	900588.70	-50.54	26	48.4775'	N	80	01.4019'	W	16.93	18.3

* Penetrometer malfunction

Appendix B2: Vibracore Summary Table – Briny Breezes

Briney Breezes			State Plane												
			Florida-East (NAD-83)		Depth (ft.)		WGS-84							Penet.	Recov.
Core ID	Run	Date	Easting	Northing	NGVD		Latitude			Longitude				(ft.)	(ft.)
BB04-20	Run1	5/24/2004	967908.80	790576.41	-24.65	26	30.3292'	N	80	02.8068'	W			18.66	18.0
BB04-21	Run1	5/24/2004	969200.39	790421.40	-36.35	26	30.3021'	N	80	02.5700'	W			18.10	19.0
BB04-22	Run1	5/24/2004	970217.20	790286.55	-55.46	26	30.2786'	N	80	02.3837'	W			17.83	15.6
BB04-23	Run1	5/24/2004	967798.57	788477.41	-26.49	26	29.9829'	N	80	02.8298'	W			6.33	0.0
BB04-23	Run2	5/24/2004	967807.13	788490.86	-26.49	26	29.9851'	N	80	02.8282'	W			18.52	18.3
BB04-24	Run1	5/24/2004	968931.29	788367.14	-36.71	26	29.9633'	N	80	02.6222'	W			18.16	19.0
BB04-25	Run1	5/24/2004	969689.95	788249.07	-51.98	26	29.9429'	N	80	02.4832'	W			18.97	16.2
BB04-26	Run1	5/24/2004	967404.36	786675.19	-24.76	26	29.6860'	N	80	02.9046'	W			18.16	16.9
BB04-27	Run1	5/24/2004	968689.05	786539.80	-37.14	26	29.6620'	N	80	02.6691'	W			18.05	18.7
BB04-28	Run1	5/24/2004	969489.98	786430.22	-54.77	26	29.6430'	N	80	02.5224'	W			18.63	17.8
BB04-29	Run1	5/25/2004	967129.55	784588.91	-24.10	26	29.3420'	N	80	02.9578'	W			14.87	0.0
BB04-29	Run2	5/25/2004	967130.19	784525.54	-24.10	26	29.3315'	N	80	02.9578'	W			18.50	19.3
BB04-30	Run1	5/25/2004	966998.52	782823.30	-25.36	26	29.0507'	N	80	02.9843'	W			18.62	19.0
BB04-31	Run1	5/25/2004	968890.21	782593.77	-53.52	26	29.0105'	N	80	02.6376'	W			18.80	17.4
BB04-32	Run1	5/25/2004	966652.85	780438.17	-24.58	26	28.6575'	N	80	03.0509'	W			18.46	19.1
BB04-33	Run1	5/25/2004	967376.21	780325.62	-33.66	26	28.6380'	N	80	02.9184'	W			15.88	14.1
BB04-33	Run2	5/25/2004	967428.76	780356.48	-33.66	26	28.6430'	N	80	02.9087'	W			19.83	6.1
BB04-34	Run1	5/25/2004	968368.86	780206.96	-51.40	26	28.6172'	N	80	02.7365'	W			18.42	19.1
BB04-35	Run1	5/25/2004	967923.24	782726.00	-34.86	26	29.0335'	N	80	02.8148'	W			18.07	15.4
BB04-36	Run1	5/25/2004	968211.11	784423.28	-35.10	26	29.3133'	N	80	02.7597'	W			18.96	18.8
BB04-37	Run1	5/25/2004	969245.66	784354.58	-57.94	26	29.3007'	N	80	02.5700'	W			18.18	14.9

Appendix B3: Vibracore Summary Table – Highland Beach

Highland Beach			State Plane												
Island			Florida-East (NAD-83)		Depth (ft.)				WGS-84					Penet.	Recov.
Core ID	Run	Date	Easting	Northing	NGVD		Latitude				Longitude			(ft.)	(ft.)
HB04-38	Run1	5/27/2004	964685.43	762737.88	-28.12	26	25.7384'	N	80	03.4355'	W			19.24	17.8
HB04-39	Run1	5/27/2004	965332.26	762724.02	-38.75	26	25.7354'	N	80	03.3170'	W			19.20	18..5
HB04-40	Run2	5/27/2004	966356.90	762679.32	-66.85	26	25.7268'	N	80	03.1292'	W			18.50	11.8
HB04-40	Run1	5/27/2004	966358.14	762726.71	-66.85	26	25.7346'	N	80	03.1289'	W			20.00	8..8
HB04-41	Run1	5/26/2004	964504.10	760413.19	-29.67	26	25.3550'	N	80	03.4719'	W			18.56	17.8
HB04-42	Run1	5/27/2004	965248.39	760281.23	-40.87	26	25.3323'	N	80	03.3356'	W			19.20	18.0
HB04-43	Run2	5/27/2004	966295.24	760222.52	-64.40	26	25.3213'	N	80	03.1438'	W			18.74	12.4
HB04-43	Run1	5/27/2004	966313.24	760281.90	-64.40	26	25.3311'	N	80	03.1404'	W			20.00	7.8
HB04-44	Run1	5/26/2004	964361.85	758037.48	-29.33	26	24.9630'	N	80	03.5011'	W			18.54	18.0
HB04-45	Run1	5/26/2004	965106.11	757886.73	-40.81	26	24.9373'	N	80	03.3649'	W			18.92	17.4
HB04-46	Run1	5/26/2004	966101.57	757857.81	-61.27	26	24.9313'	N	80	03.1825'	W			19.08	16.6
HB04-47	Run1	5/26/2004	964287.98	755329.22	-31.14	26	24.5161'	N	80	03.5183'	W			19.28	18.2
HB04-48	Run1	5/26/2004	964893.75	755208.35	-41.27	26	24.4954'	N	80	03.4074'	W			18.64	16.7
HB04-49	Run1	5/26/2004	965678.60	755160.73	-55.92	26	24.4866'	N	80	03.2636'	W			18.07	18.7
HB04-50	Run1	5/26/2004	964179.36	752871.23	-32.19	26	24.1106'	N	80	03.5415'	W			18.78	14.2
HB04-50	Run2	5/26/2004	964239.20	752887.12	-32.19	26	24.1131'	N	80	03.5305'	W			19.48	17.8
HB04-51	Run1	5/26/2004	964829.84	752864.36	-42.42	26	24.1086'	N	80	03.4223'	W			19.44	16.9
HB04-52	Run1	5/26/2004	965503.91	752787.02	-58.25	26	24.0951'	n	80	03.2989'	W			19.50	16.9
HB04-53	Run1	5/26/2004	964314.26	750522.82	-36.48	26	23.7228'	N	80	03.5199'	W			18.54	18.4
HB04-54	Run1	5/26/2004	965314.60	750410.29	-53.29	26	23.7030'	N	80	03.3367'	W			19.14	20.0
HB04-55	Run1	5/26/2004	964169.16	749321.22	-35.79	26	23.5246'	N	80	03.5481'	W			18.86	16.9
HB04-56	Run1	5/26/2004	965196.53	749231.91	-51.17	26	23.5087'	N	80	03.3600'	W			17.78	17.8

Appendix: C Penetration Graphs

Penetration Graph for Core No. SI04-18, Run 1

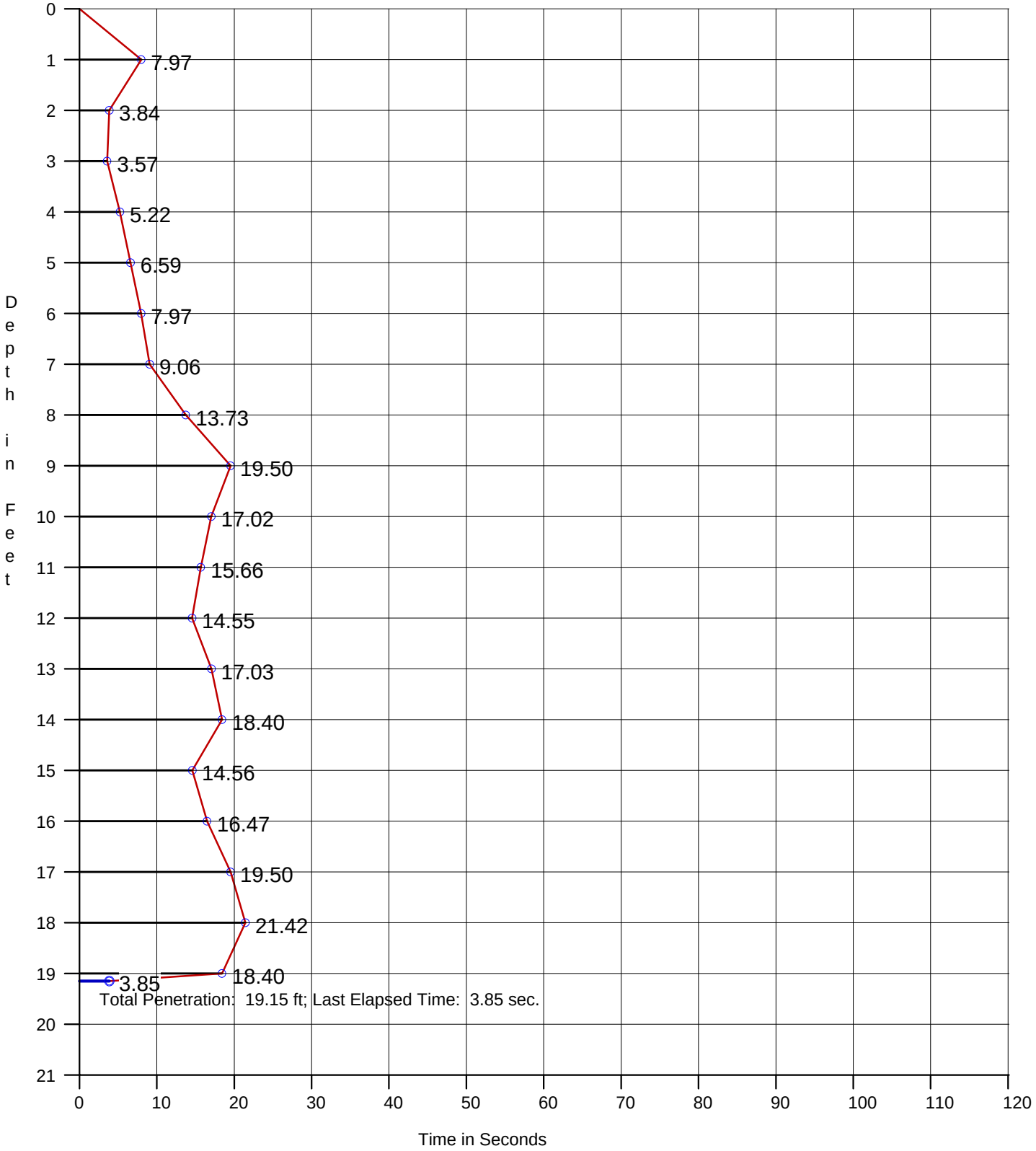
Date: 5/22/04
Start Time: 12:07:37 PM
End Time: 12:11:51 PM

Penetration: 19.15 ft
Recovery: 17.4 ft
W. D. Corrected: 0 ft
W. D. Raw: 31.7 ft

Easting: 973610.97
Northing: 901388.32
Coord. System: SP-FL East

Lat: 26 48.6109' N
Long: 080 01.6058' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. SI04-17, Run 1

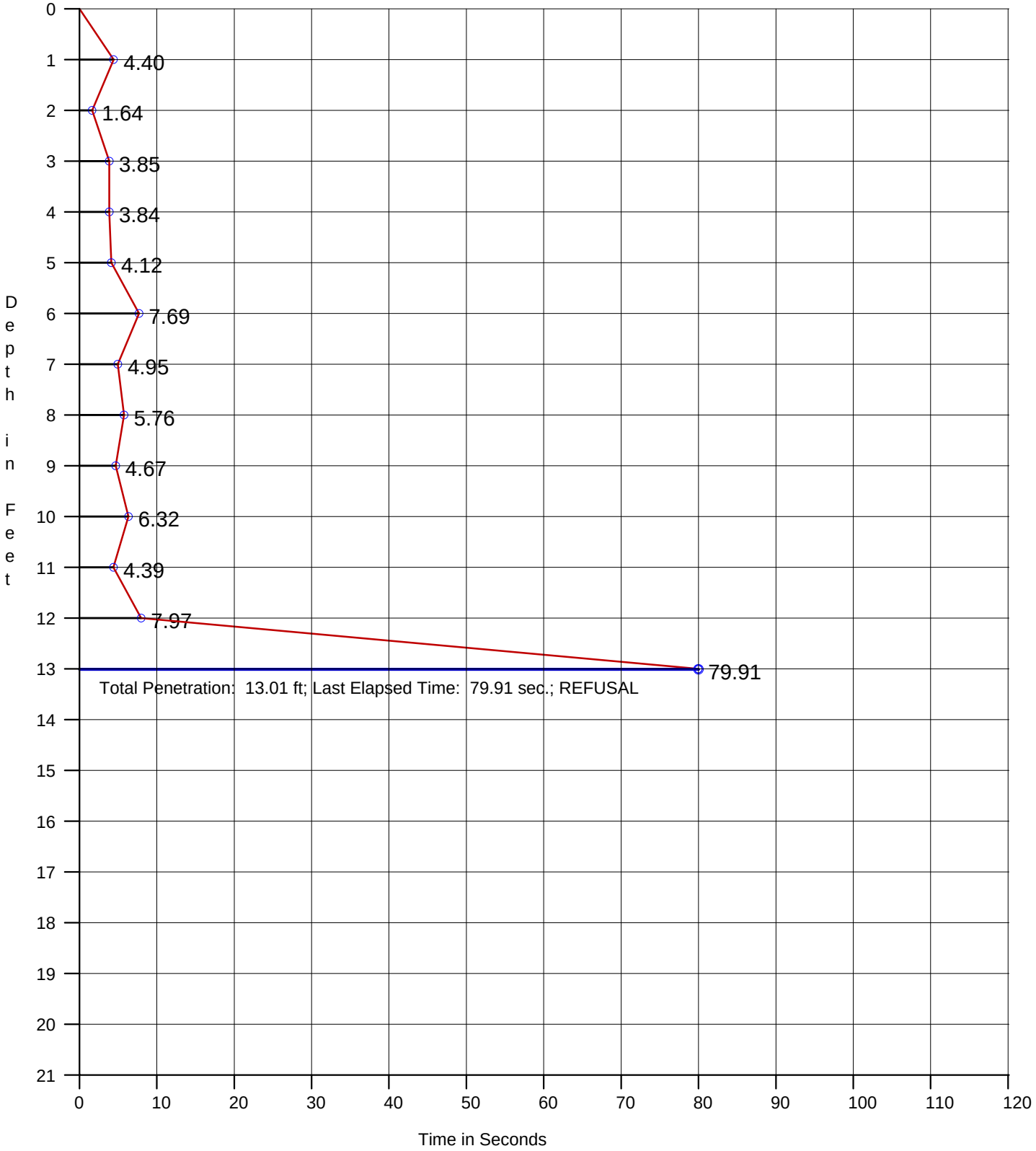
Date: 5/22/04
Start Time: 8:12:28 AM
End Time: 8:16:03 AM

Penetration: 13.01 ft
Recovery: 13.5 ft
W. D. Corrected: 0 ft
W. D. Raw: 52.6 ft

Easting: 974944.44
Northing: 898465.62
Coord. System: SP-FL East

Lat: 26 48.1269' N
Long: 080 01.3647' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. SI04-16, Run 1

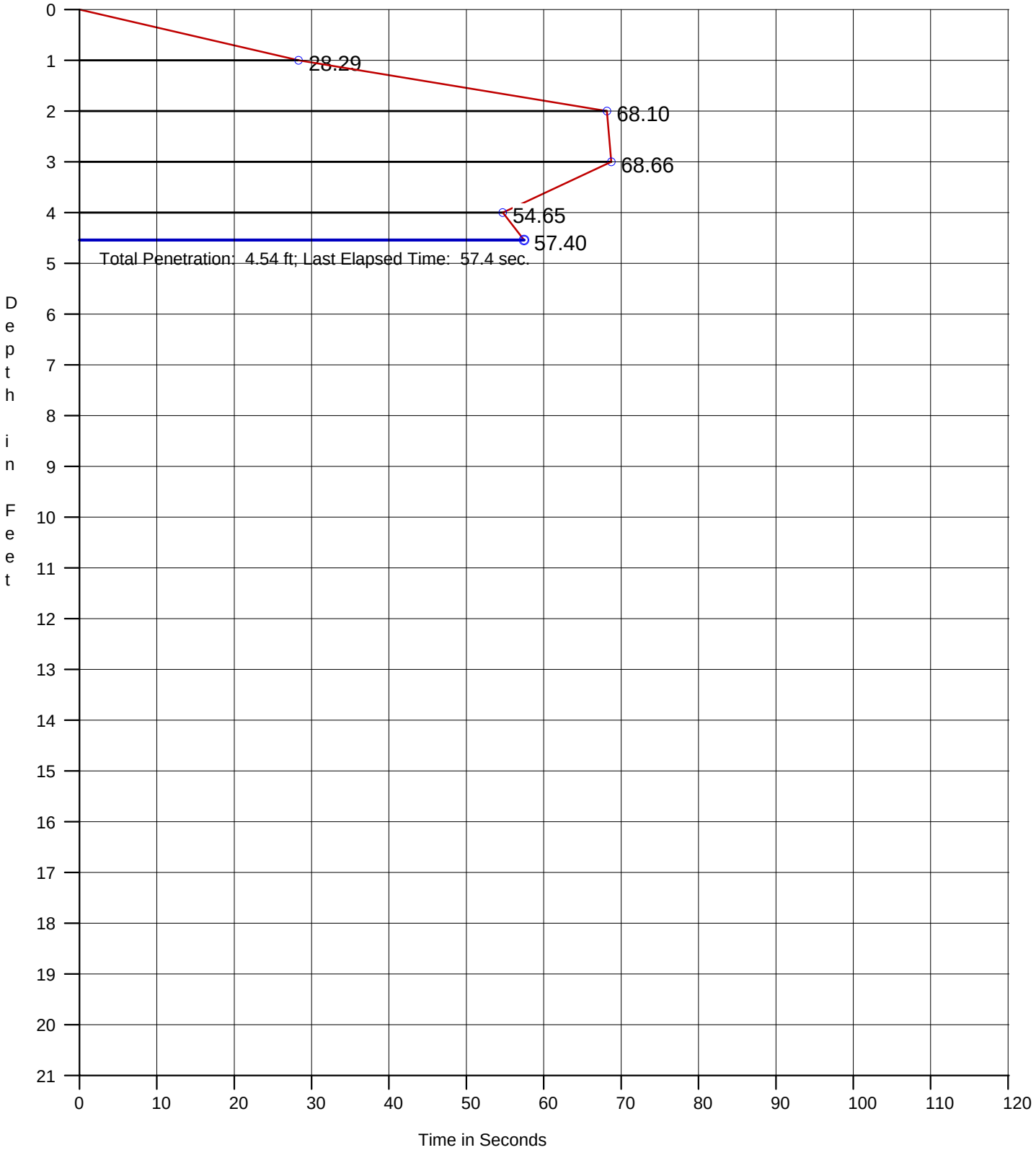
Date: 5/22/04
Start Time: 10:21:24 AM
End Time: 10:26:01 AM

Penetration: 4.54 ft
Recovery: 16.6 ft
W. D. Corrected: 0 ft
W. D. Raw: 30.2 ft

Easting: 973808.06
Northing: 899323.66
Coord. System: SP-FL East

Lat: 26 48.2699' N
Long: 080 01.5725' W
Datum: NAD-83

Comment: Penetrometer malfunction. Head visually observed >15' down support tower. Client approved recovery.



Penetration Graph for Core No. SI04-15, Run 1

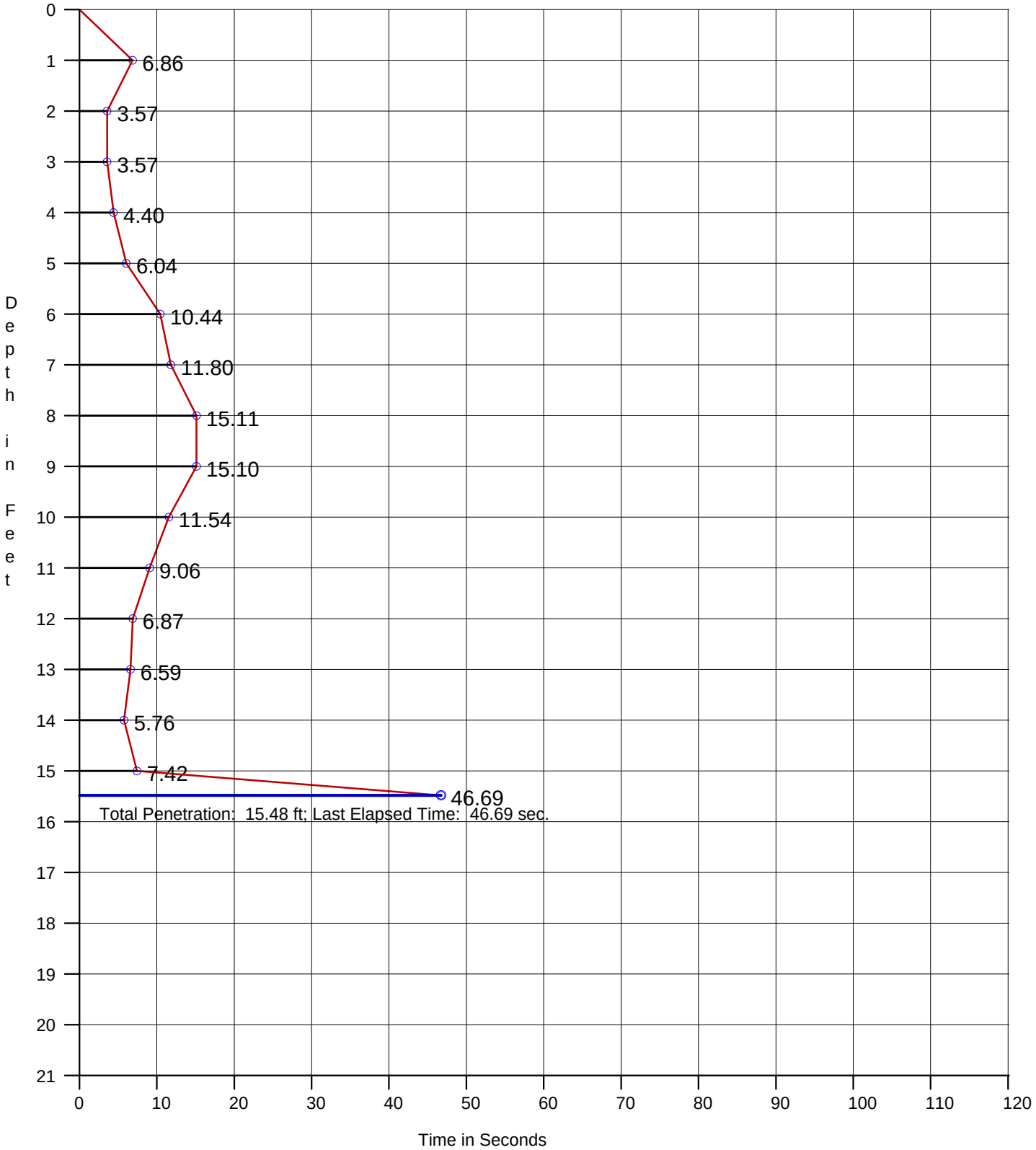
Date: 5/23/04
Start Time: 8:26:32 AM
End Time: 8:29:23 AM

Penetration: 15.48 ft
Recovery: 16.2 ft
W. D. Corrected: 0 ft
W. D. Raw: 46.0 ft

Easting: 974841.55
Northing: 891513.66
Coord. System: SP-FL East

Lat: 26 46.9797' N
Long: 080 01.3934' W
Datum: NAD-83

Comment: Client determined refusal at 15.48'. Cobbles of coquina at bottom of sample.



Penetration Graph for Core No. SI04-14, Run 1

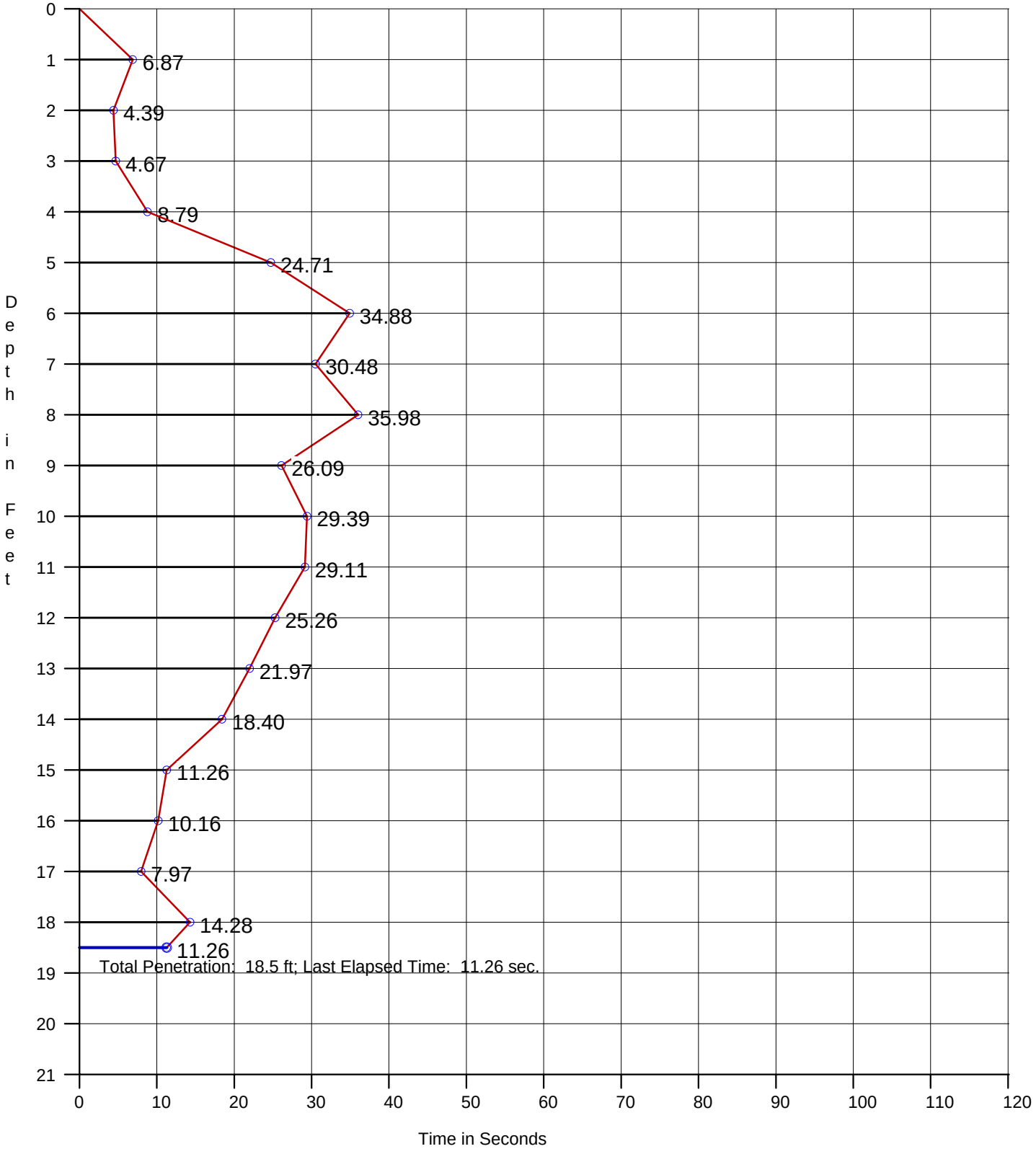
Date: 5/23/04
Start Time: 9:33:13 AM
End Time: 9:39:09 AM

Penetration: 18.50 ft
Recovery: 18.5 ft
W. D. Corrected: 0 ft
W. D. Raw: 26.8 ft

Easting: 974165.21
Northing: 892428.67
Coord. System: SP-FL East

Lat: 26 47.1315' N
Long: 080 01.5165' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. SI04-13, Run 1

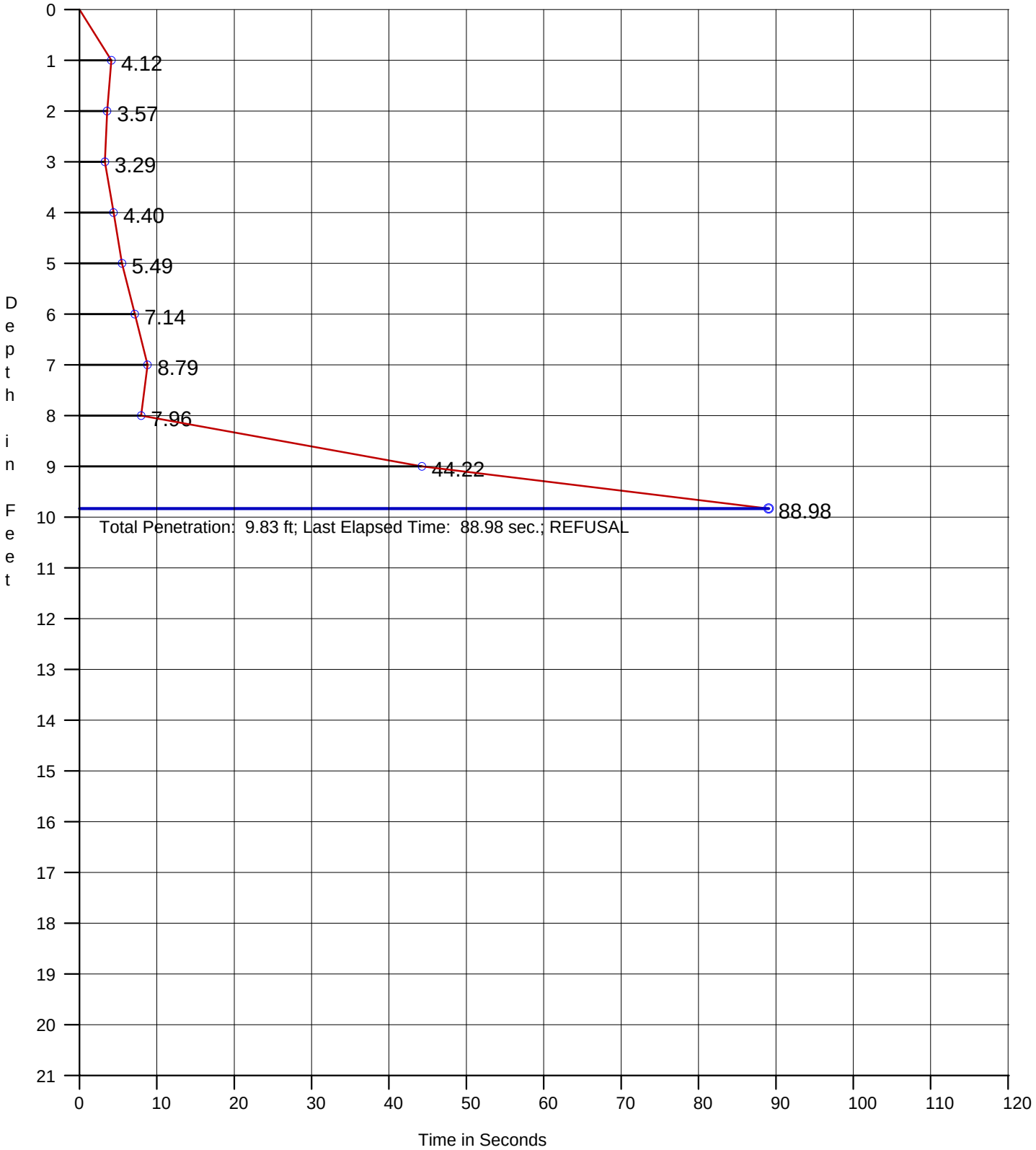
Date: 5/23/04
Start Time: 10:01:19 AM
End Time: 10:04:17 AM

Penetration: 9.83 ft
Recovery: 10.6 ft
W. D. Corrected: 0 ft
W. D. Raw: 49.5 ft

Easting: 974999.89
Northing: 893708.77
Coord. System: SP-FL East

Lat: 26 47.3417' N
Long: 080 01.3612' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. SI04-12, Run 1

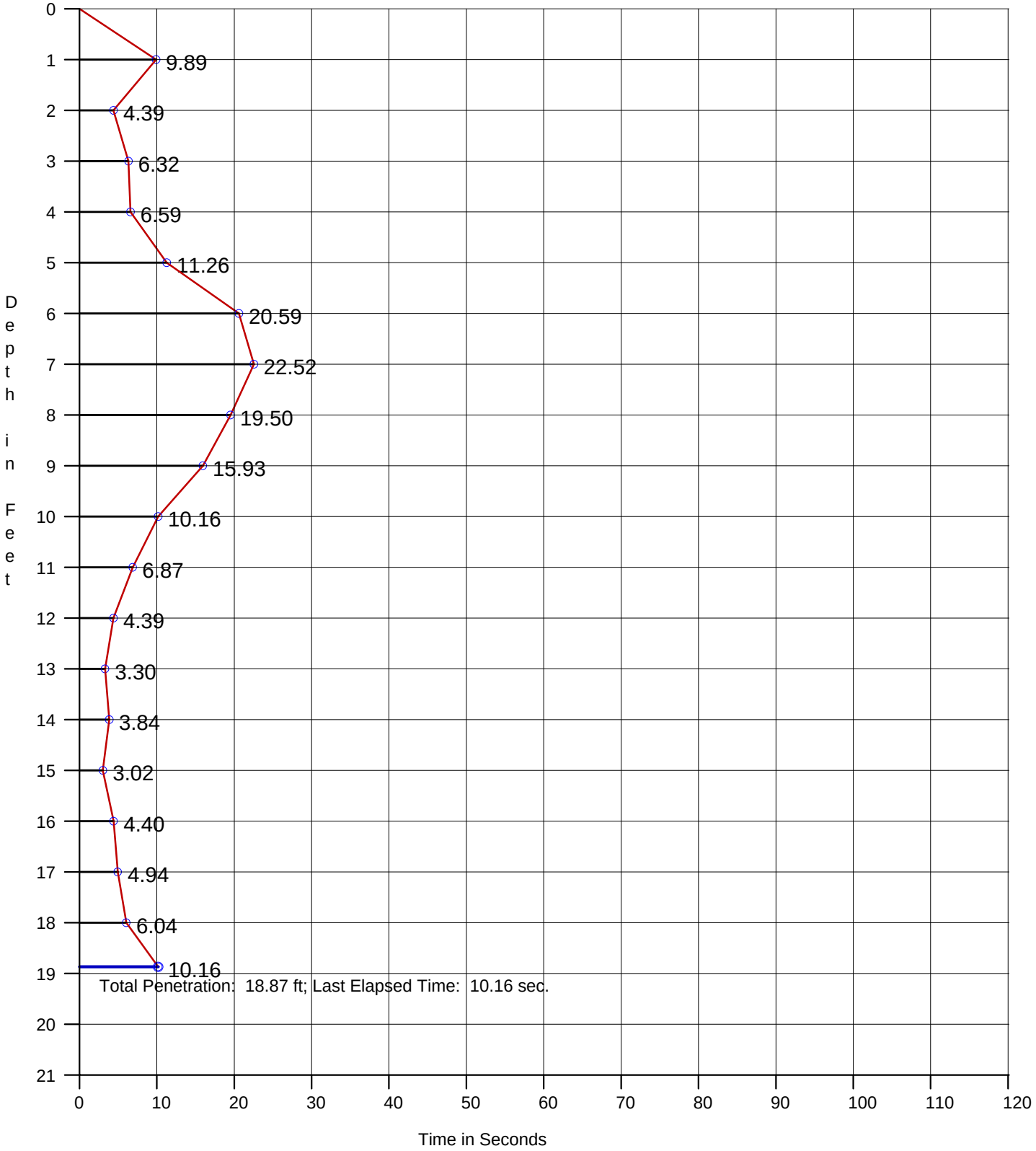
Date: 5/23/04
Start Time: 10:29:44 AM
End Time: 10:32:38 AM

Penetration: 18.87 ft
Recovery: 18.0 ft
W. D. Corrected: 0 ft
W. D. Raw: 27.4 ft

Easting: 973897.88
Northing: 894195.22
Coord. System: SP-FL East

Lat: 26 47.4234' N
Long: 080 01.5632' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. SI04-11, Run 1

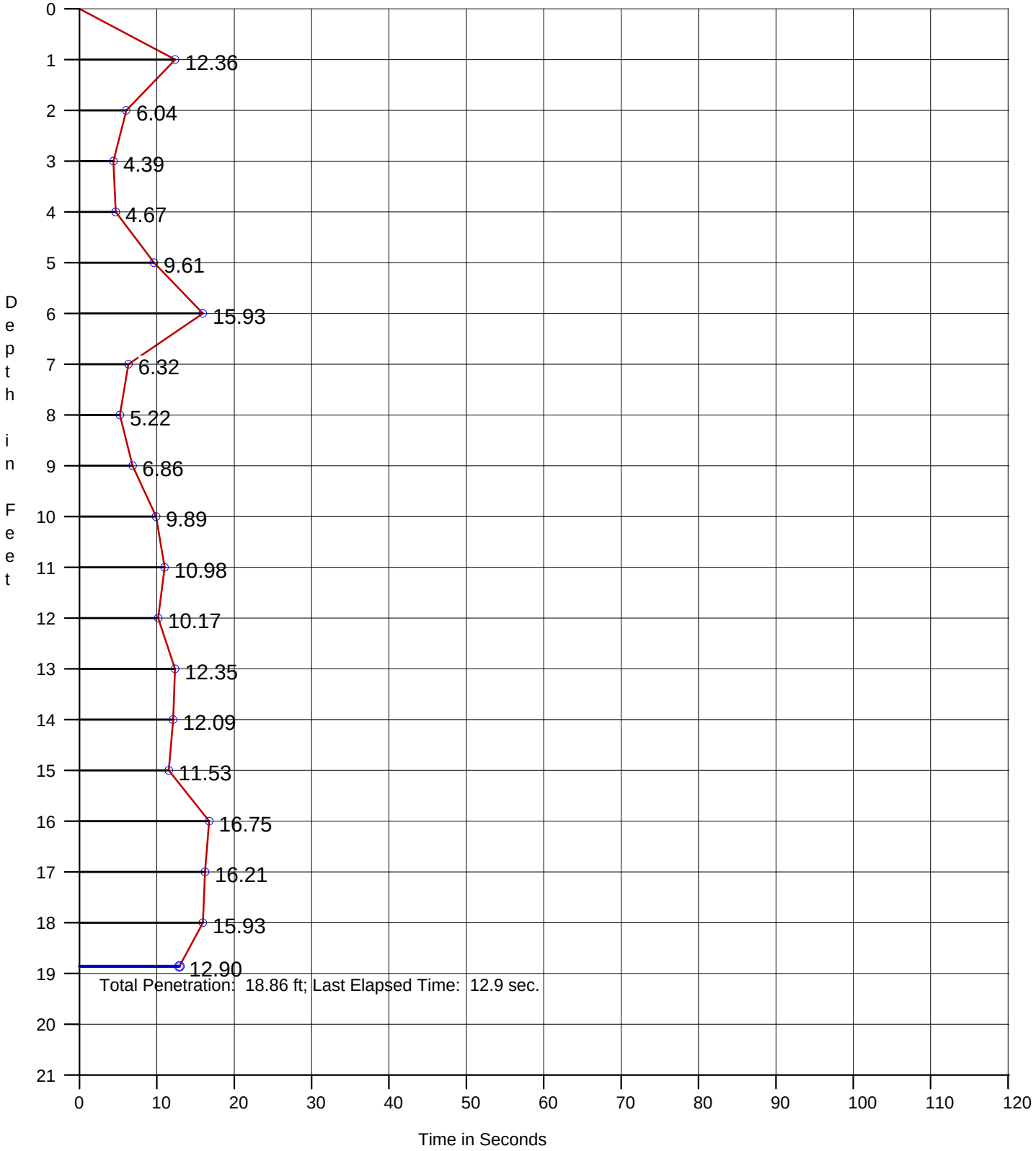
Date: 5/23/04
Start Time: 12:54:10 PM
End Time: 12:57:30 PM

Penetration: 18.86 ft
Recovery: 18.3 ft
W. D. Corrected: 0 ft
W. D. Raw: 34.1 ft

Easting: 974241.87
Northing: 895996.15
Coord. System: SP-FL East

Lat: 26 47.7202' N
Long: 080 01.4974' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. SI04-10, Run 1

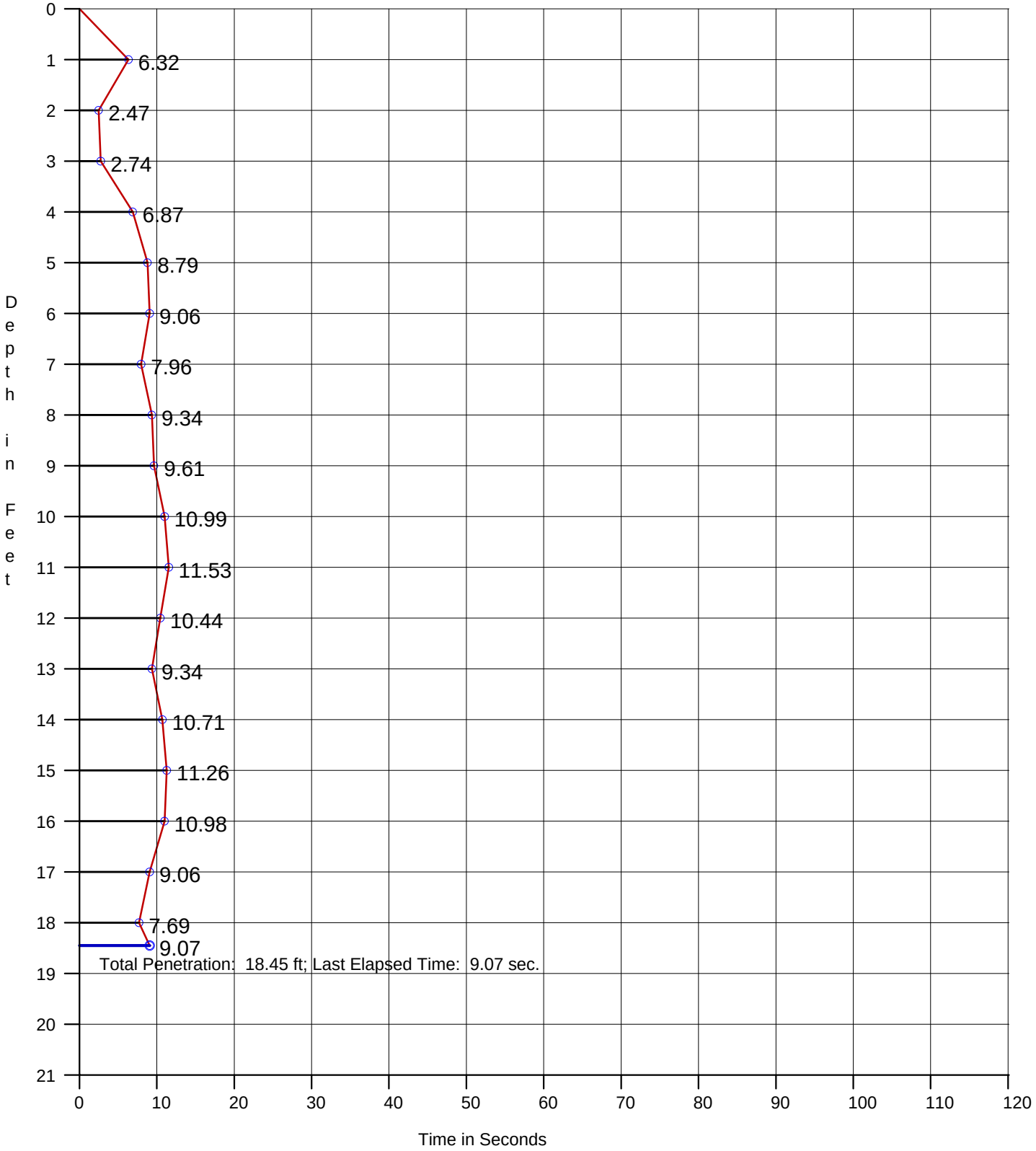
Date: 5/23/04
Start Time: 11:23:55 AM
End Time: 11:26:39 AM

Penetration: 18.45 ft
Recovery: 18.7 ft
W. D. Corrected: 0 ft
W. D. Raw: 55.5 ft

Easting: 975129.17
Northing: 897020.48
Coord. System: SP-FL East

Lat: 26 47.8881' N
Long: 080 01.3327' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. SI04-09, Run 1

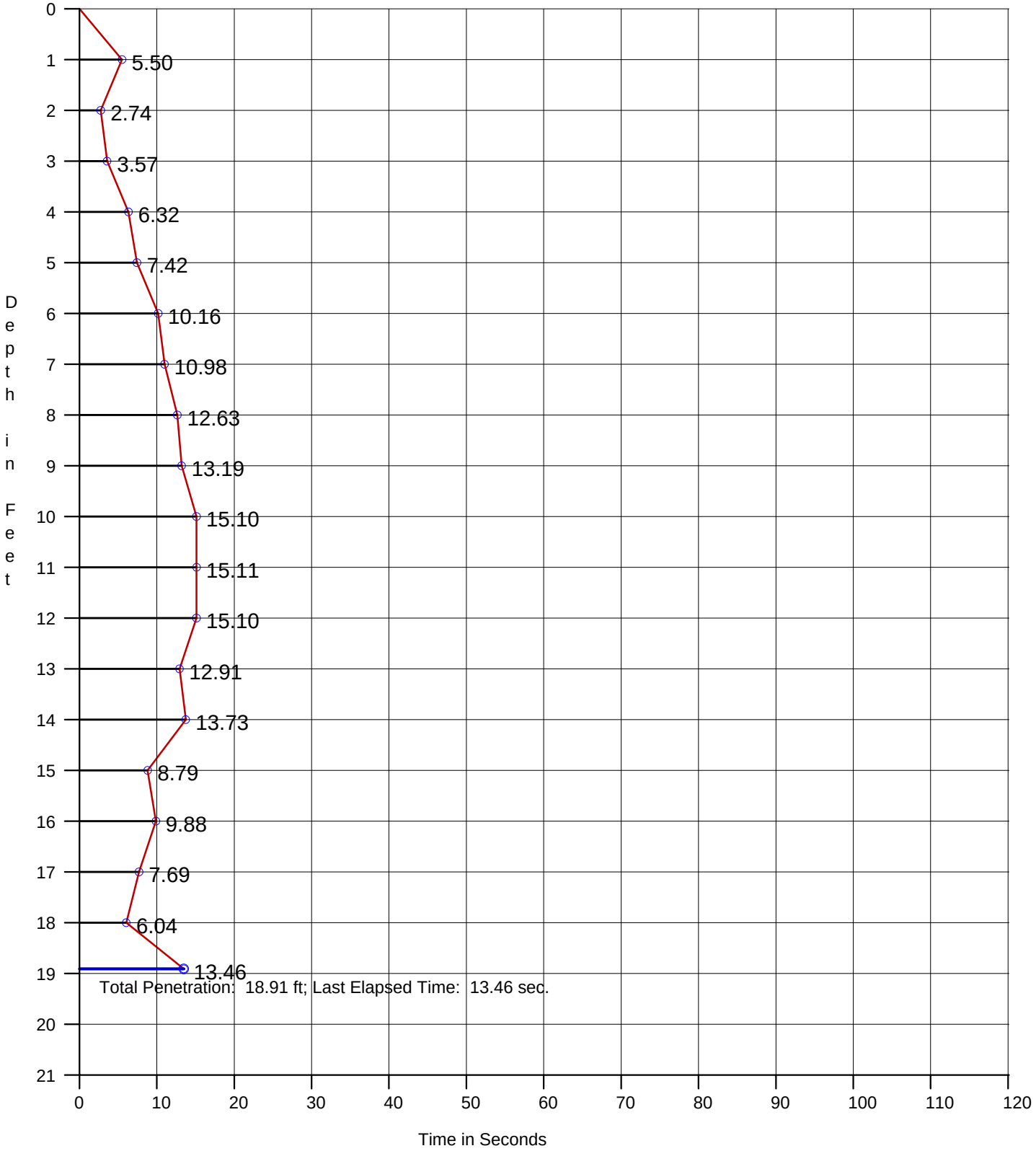
Date: 5/22/04
Start Time: 1:17:01 PM
End Time: 1:20:11 PM

Penetration: 18.91 ft
Recovery: 16.6 ft
W. D. Corrected: 0 ft
W. D. Raw: 58.5 ft

Easting: 974939.81
Northing: 903031.77
Coord. System: SP-FL East

Lat: 26 48.8805' N
Long: 080 01.3591' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. SI04-08, Run 1

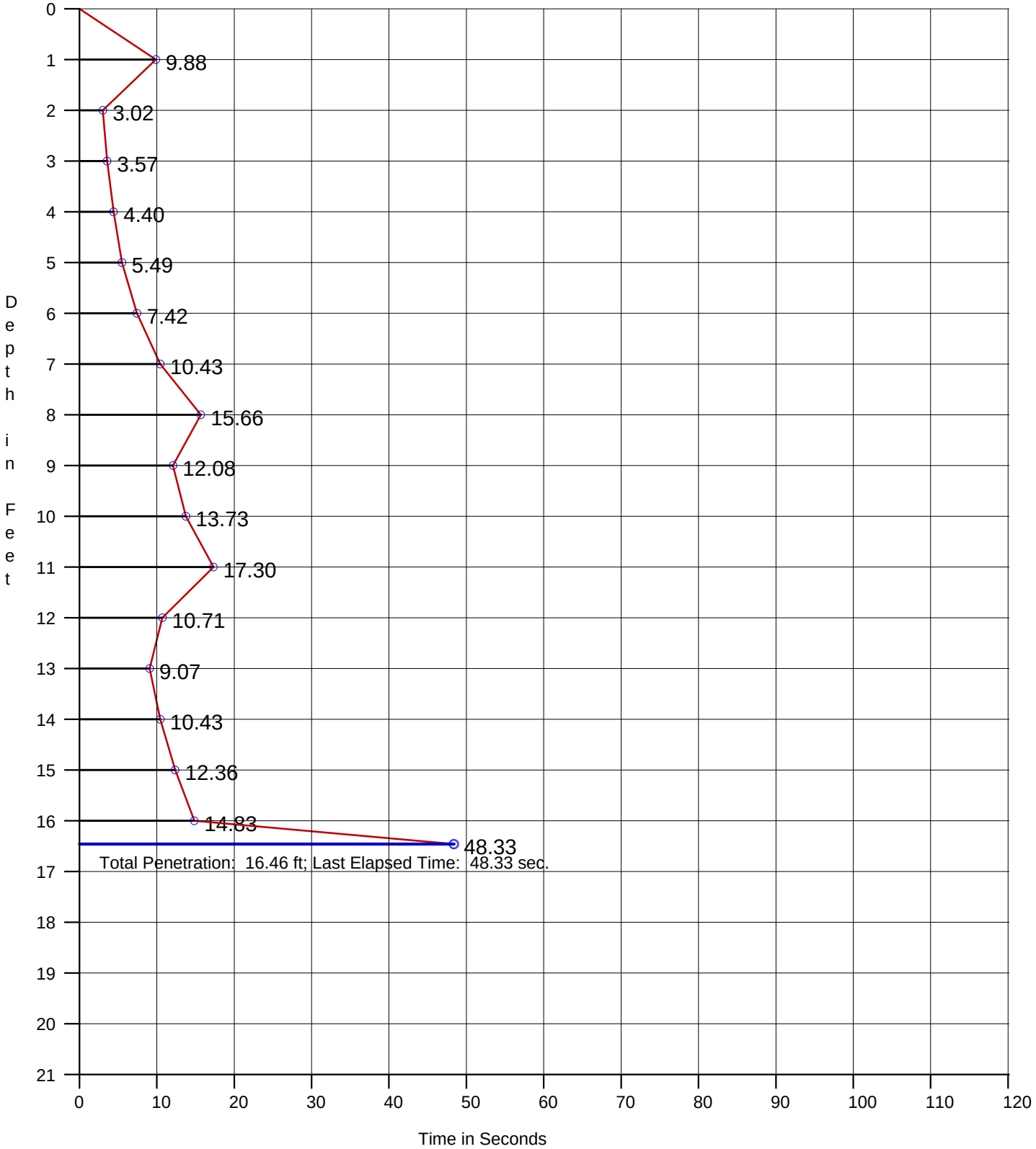
Date: 5/23/04
Start Time: 1:57:21 PM
End Time: 2:00:50 PM

Penetration: 16.46 ft
Recovery: 16.9 ft
W. D. Corrected: 0 ft
W. D. Raw: 31.9 ft

Easting: 973362.67
Northing: 903156.18
Coord. System: SP-FL East

Lat: 26 48.9030' N
Long: 080 01.6490' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. SI04-07, Run 1

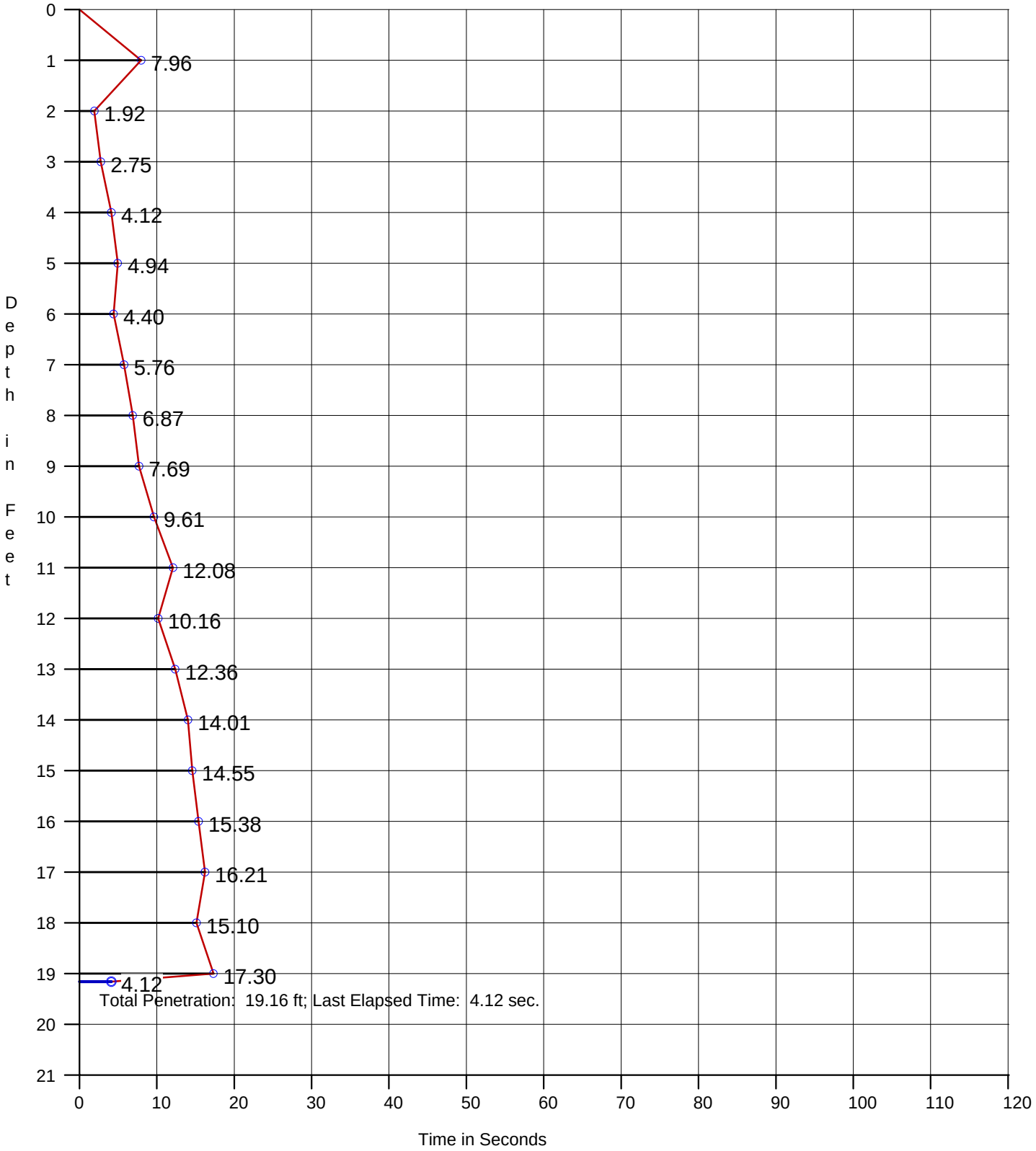
Date: 5/22/04
Start Time: 1:48:42 PM
End Time: 1:51:50 PM

Penetration: 19.16 ft
Recovery: 18.7 ft
W. D. Corrected: 0 ft
W. D. Raw: 51.5 ft

Easting: 974318.04
Northing: 903865.16
Coord. System: SP-FL East

Lat: 26 49.0188' N
Long: 080 01.4723' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. SI04-06, Run 1

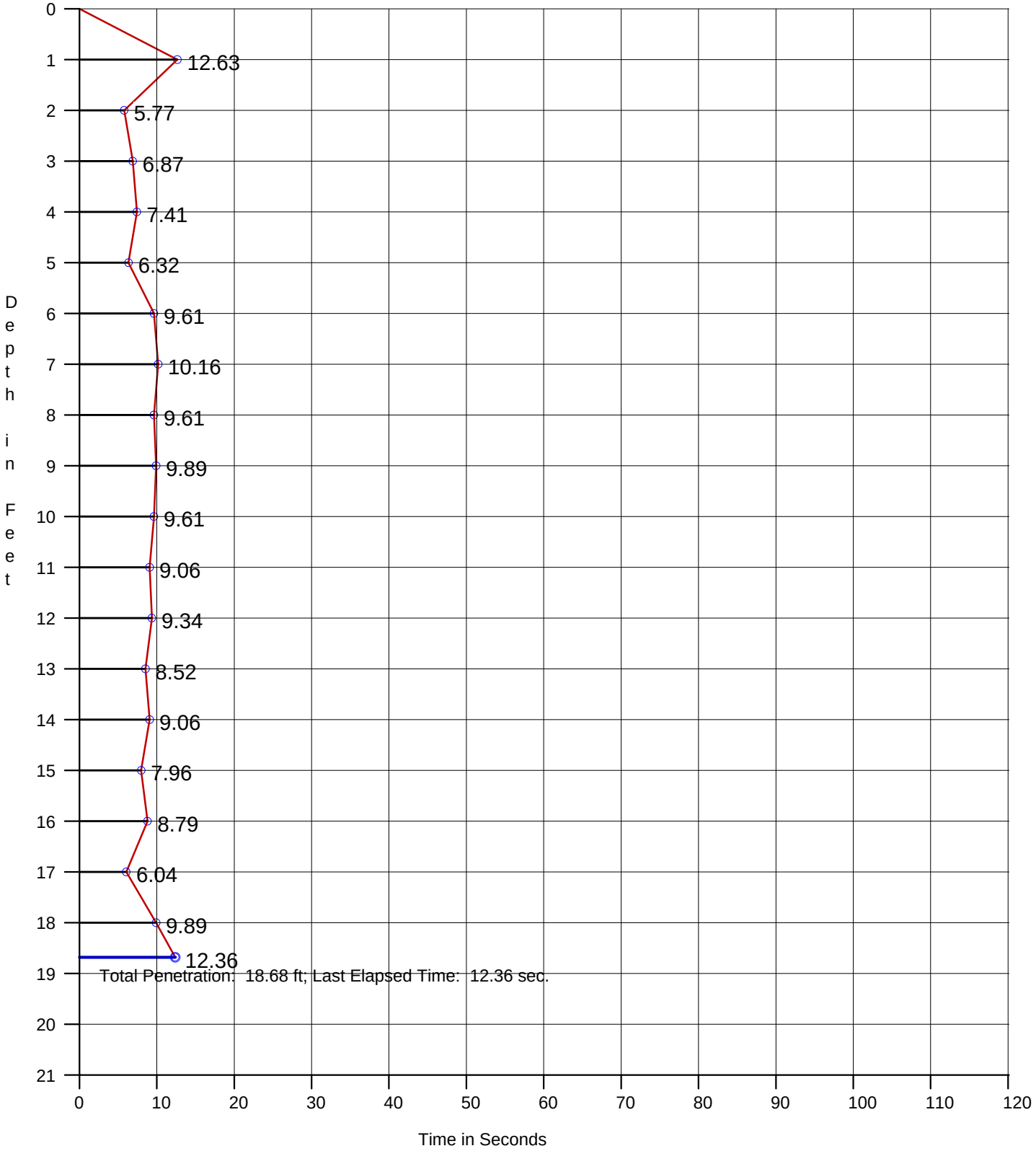
Date: 5/22/04
Start Time: 2:18:04 PM
End Time: 2:20:53 PM

Penetration: 18.68 ft
Recovery: 20.0 ft
W. D. Corrected: 0 ft
W. D. Raw: 64.0 ft

Easting: 975132.37
Northing: 905150.93
Coord. System: SP-FL East

Lat: 26 49.2300' N
Long: 080 01.3206' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. SI04-05, Run 1

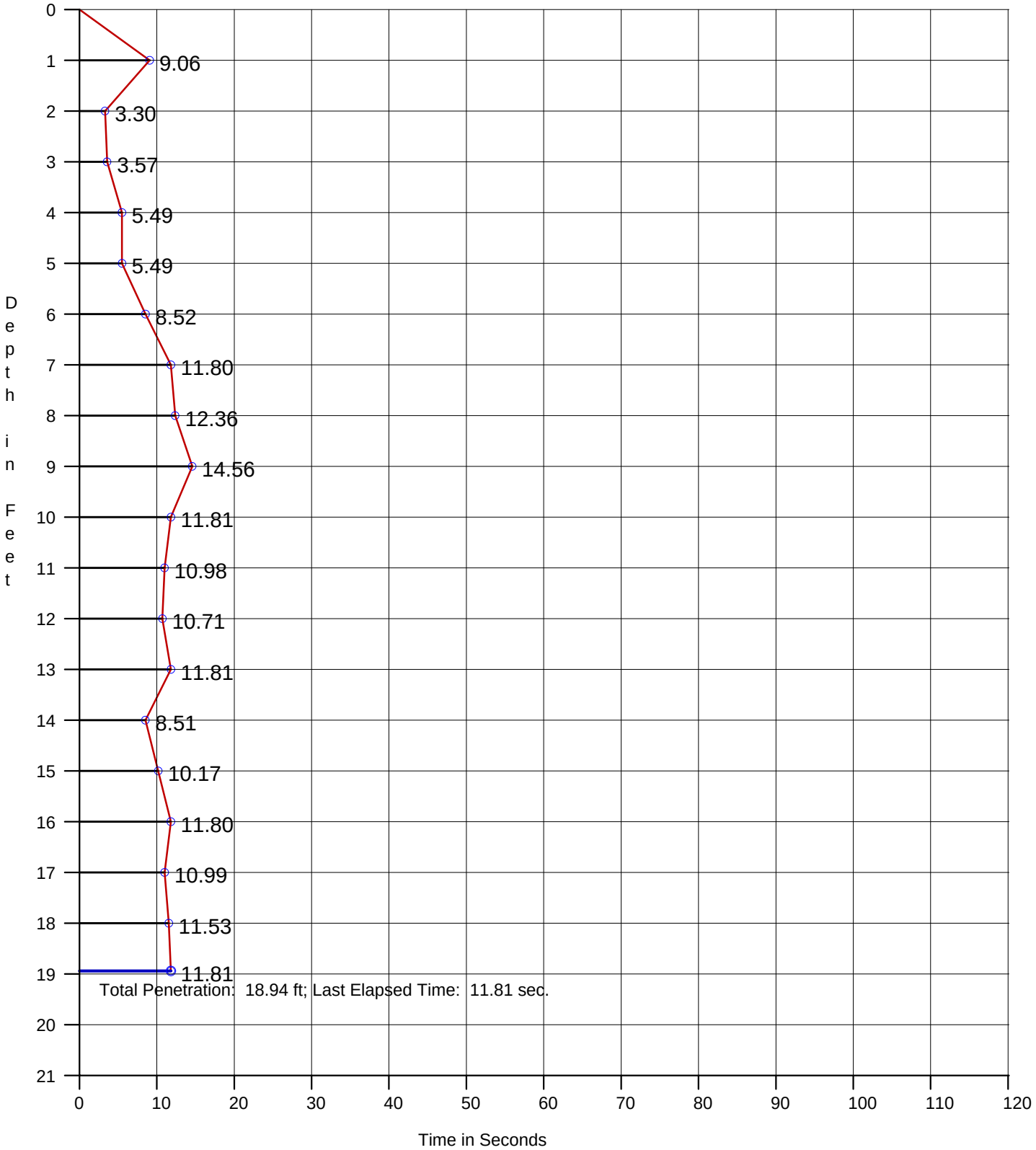
Date: 5/22/04
Start Time: 2:50:32 PM
End Time: 2:53:37 PM

Penetration: 18.94 ft
Recovery: 19.2 ft
W. D. Corrected: 0 ft
W. D. Raw: 51.9 ft

Easting: 973976.99
Northing: 906211.31
Coord. System: SP-FL East

Lat: 26 49.4064' N
Long: 080 01.5317' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. SI04-04, Run 1

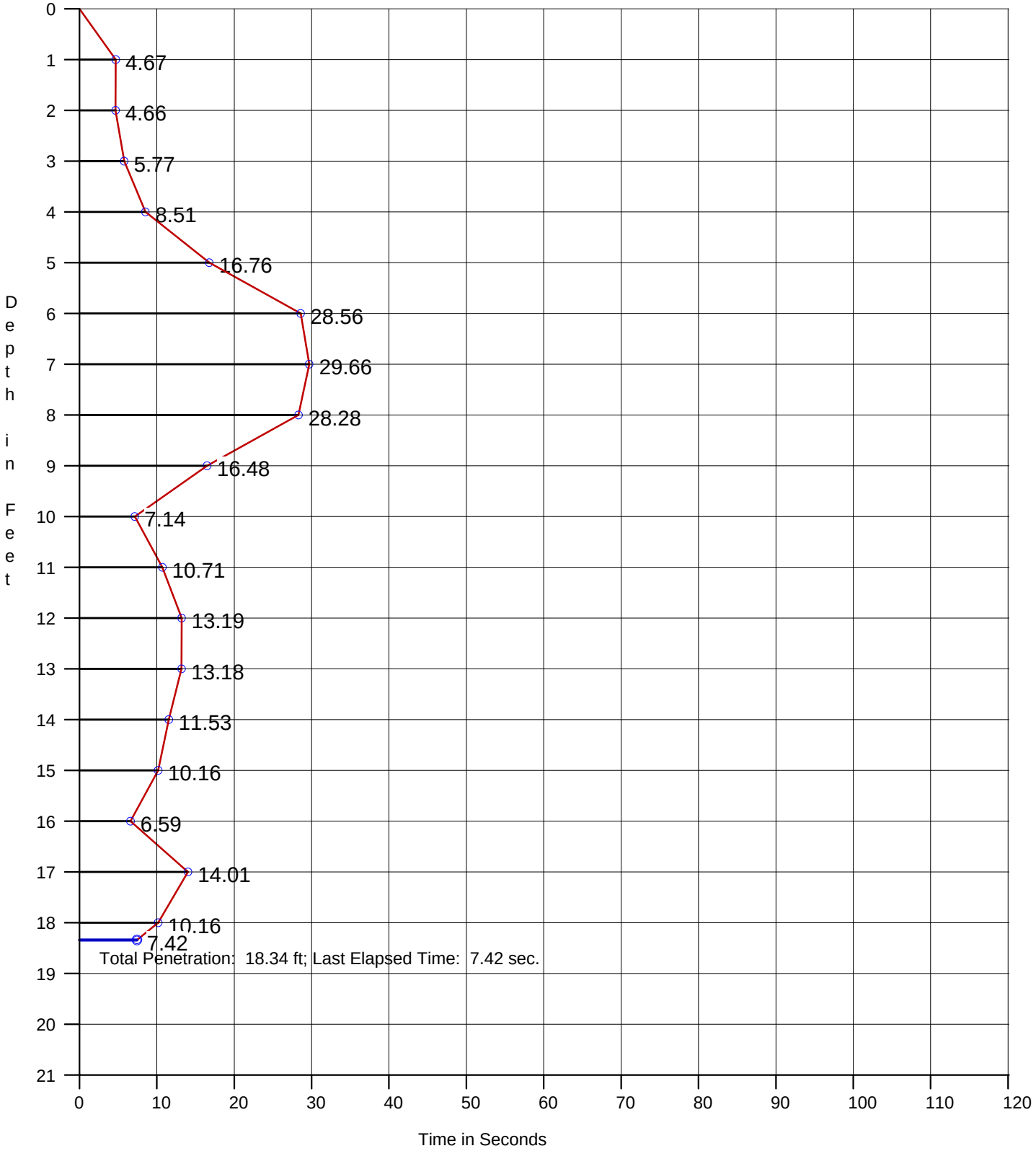
Date: 5/23/04
Start Time: 2:42:30 PM
End Time: 2:46:38 PM

Penetration: 18.34 ft
Recovery: 14.7 ft
W. D. Corrected: 0 ft
W. D. Raw: 22.7 ft

Easting: 972047.74
Northing: 905419.16
Coord. System: SP-FL East

Lat: 26 49.2781' N
Long: 080 01.8877' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. SI04-03, Run 1

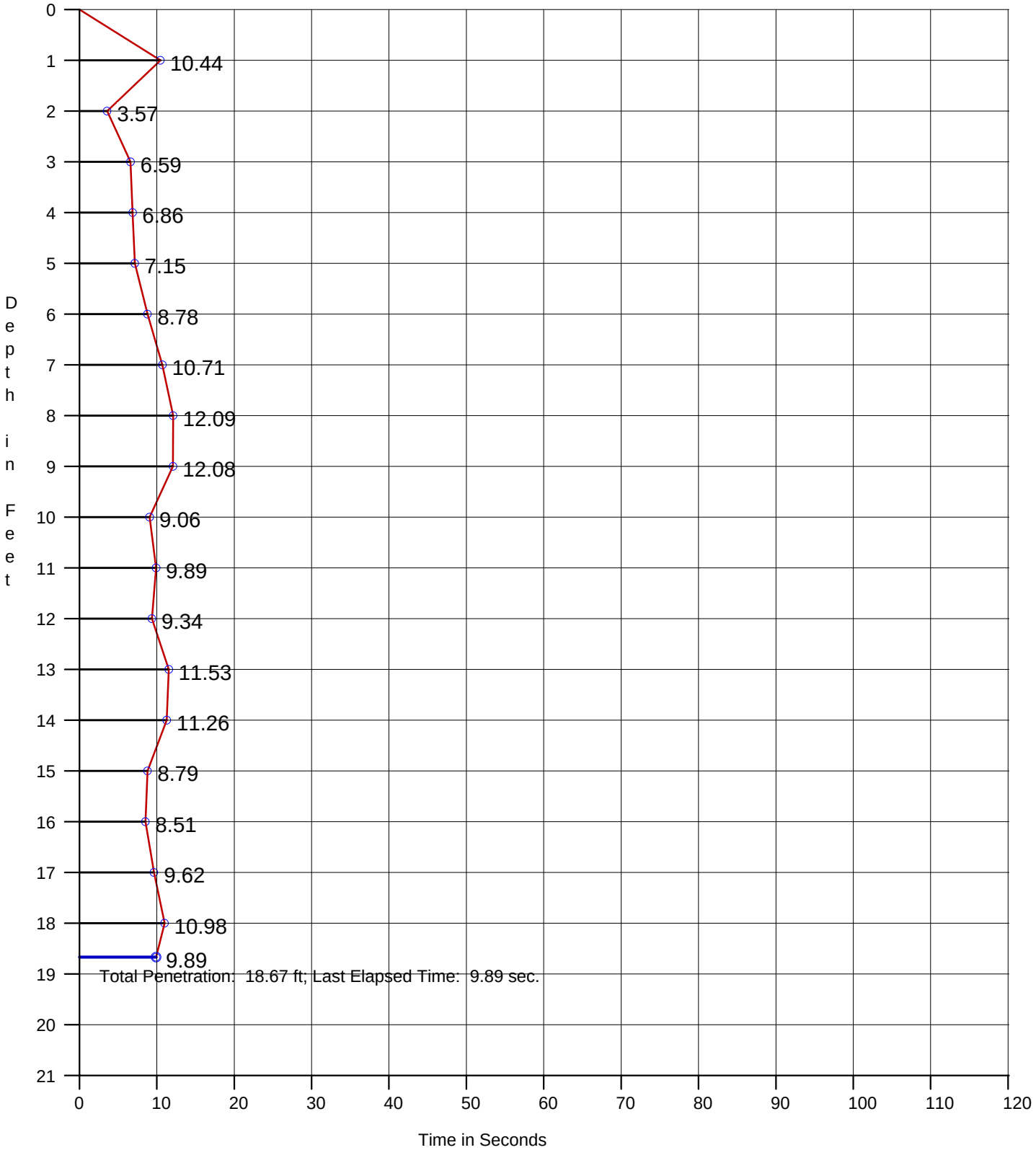
Date: 5/22/04
Start Time: 3:19:36 PM
End Time: 3:22:34 PM

Penetration: 18.67 ft
Recovery: 20.0 ft
W. D. Corrected: 0 ft
W. D. Raw: 60.7 ft

Easting: 974350.12
Northing: 907825.98
Coord. System: SP-FL East

Lat: 26 49.6725' N
Long: 080 01.4608' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. SI04-02, Run 1

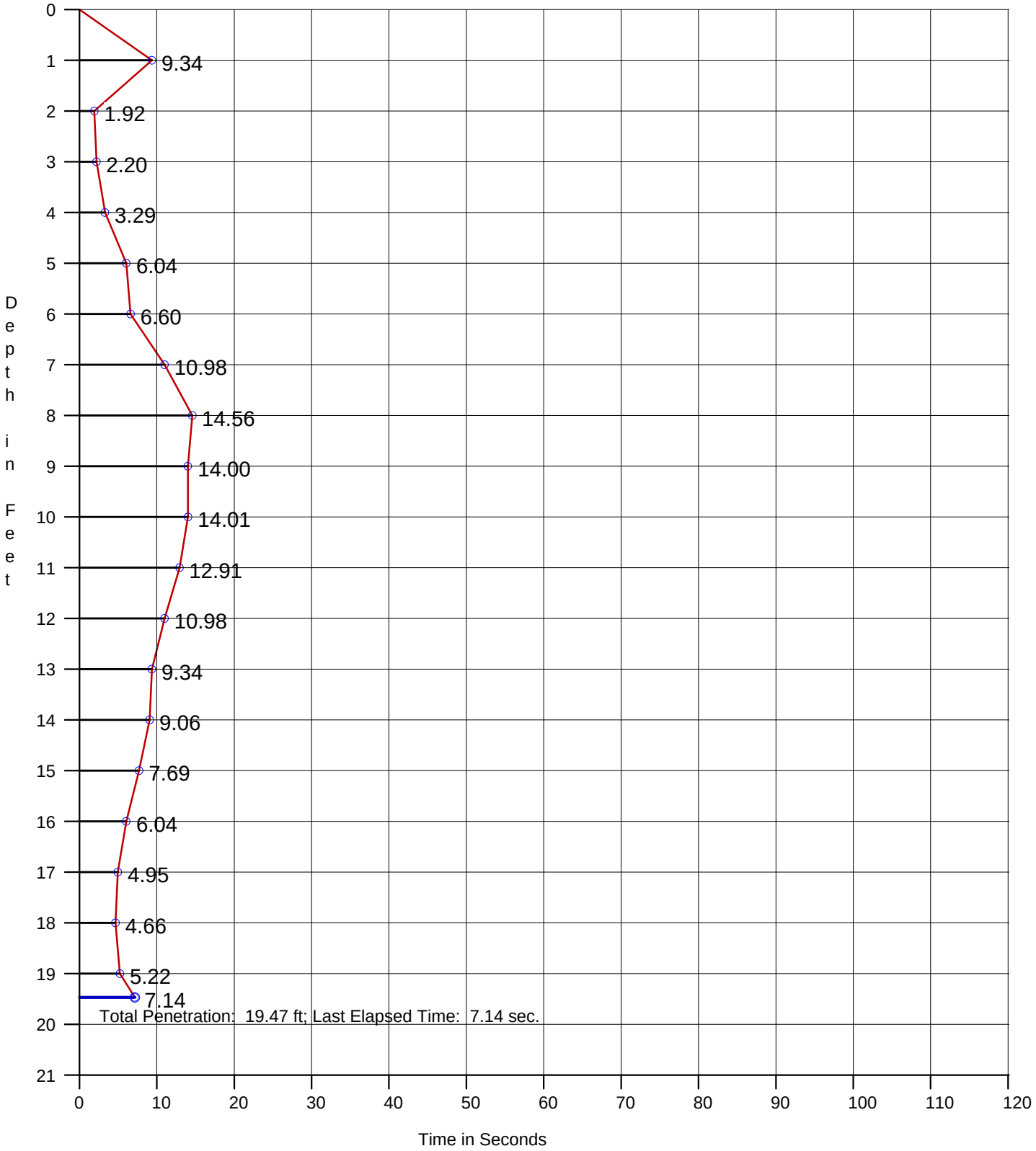
Date: 5/22/04
Start Time: 4:12:13 PM
End Time: 4:14:53 PM

Penetration: 19.47 ft
Recovery: 17.0 ft
W. D. Corrected: 0 ft
W. D. Raw: 56.9 ft

Easting: 973708.26
Northing: 908658.73
Coord. System: SP-FL East

Lat: 26 49.8107' N
Long: 080 01.5777' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. SI04-01, Run 1

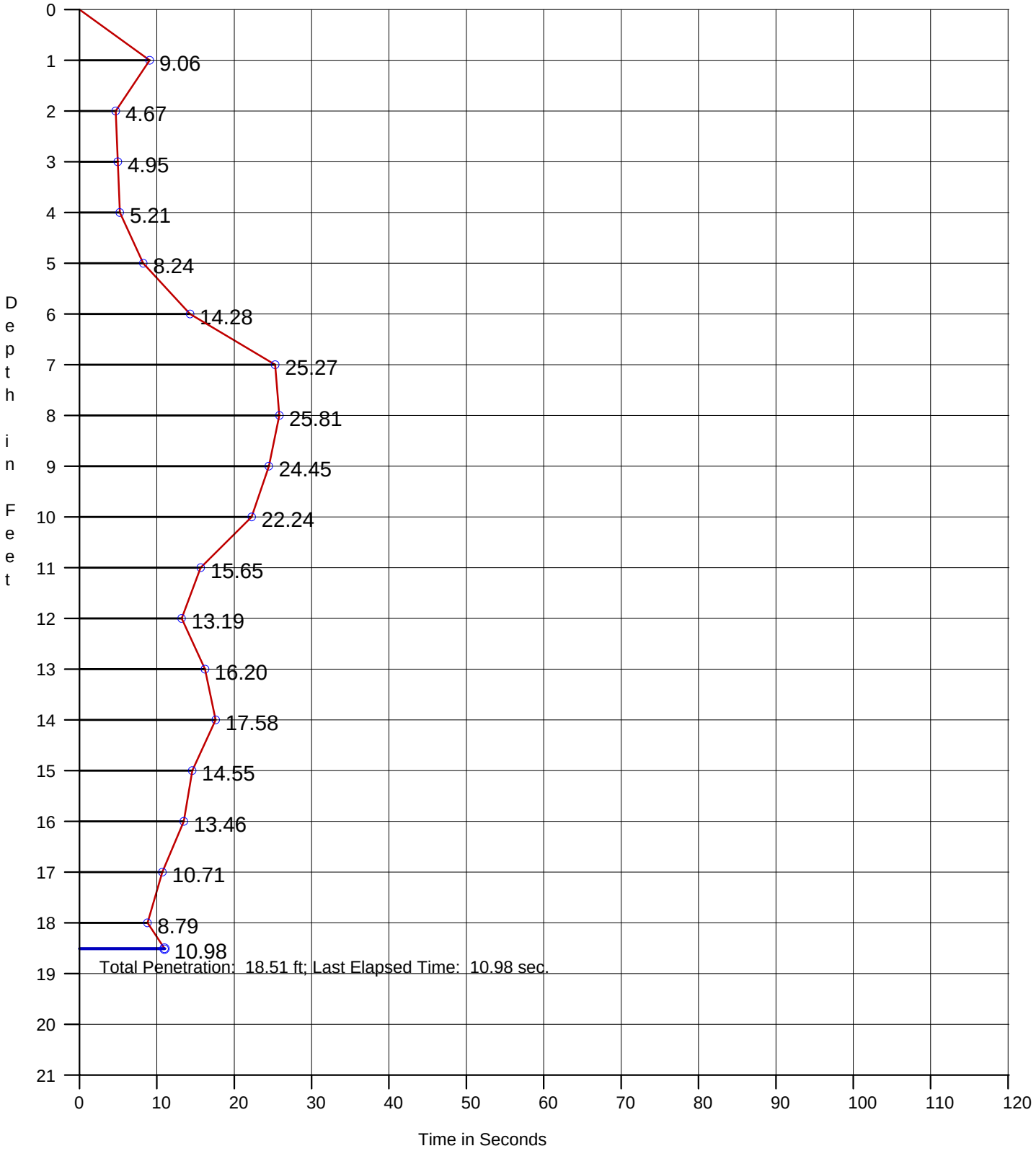
Date: 5/23/04
Start Time: 3:23:11 PM
End Time: 3:27:36 PM

Penetration: 18.51 ft
Recovery: 14.6 ft
W. D. Corrected: 0 ft
W. D. Raw: 25.6 ft

Easting: 971747.87
Northing: 907751.04
Coord. System: SP-FL East

Lat: 26 49.6634' N
Long: 080 01.9396' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. SI04-19, Run 1

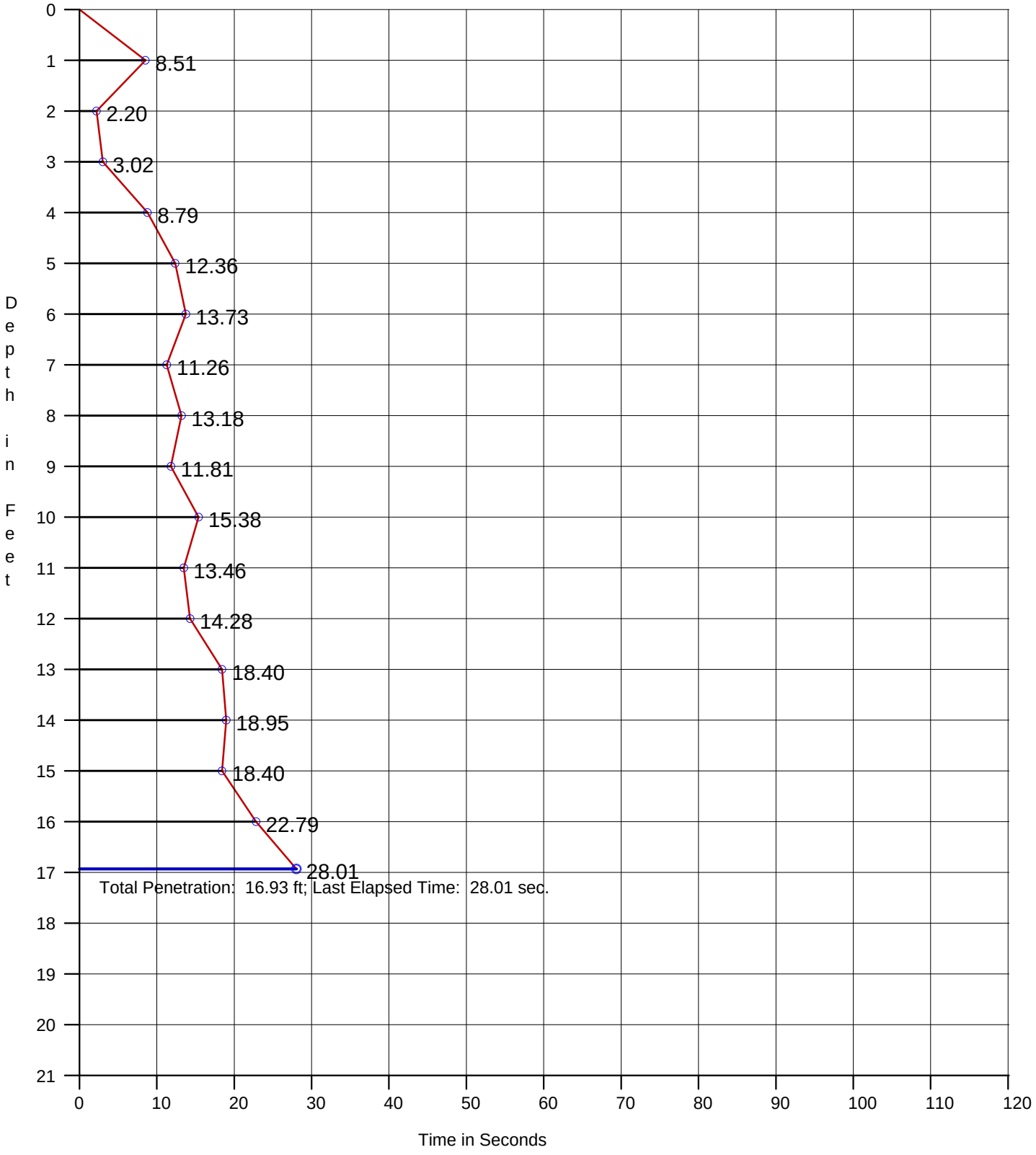
Date: 5/22/04
Start Time: 10:58:51 AM
End Time: 11:02:46 AM

Penetration: 16.93 ft
Recovery: 18.3 ft
W. D. Corrected: 0 ft
W. D. Raw: 51.1 ft

Easting: 974725.53
Northing: 900588.70
Coord. System: SP-FL East

Lat: 26 48.4775' N
Long: 080 01.4019' W
Datum: NAD-83

Comment: Aborted due to blown air hose.



Penetration Graph for Core No. HB04-56, Run 1

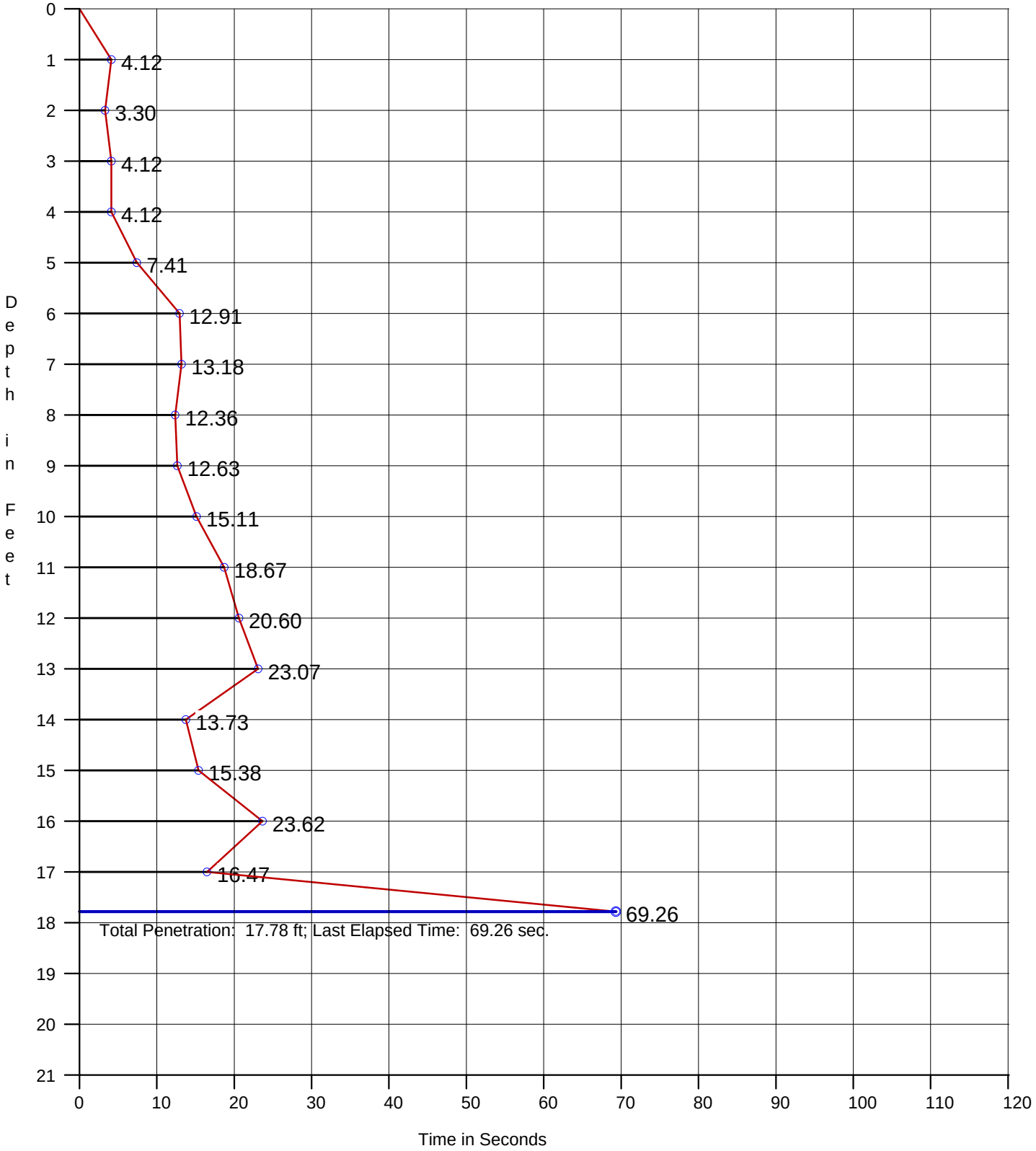
Date: 5/26/04
Start Time: 9:27:50 AM
End Time: 9:32:40 AM

Penetration: 17.78 ft
Recovery: 17.8 ft
W. D. Corrected: 0 ft
W. D. Raw: 53.3 ft

Easting: 965196.53
Northing: 749231.91
Coord. System: SP-FL East

Lat: 26 23.5087' N
Long: 080 03.3600' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. HB04-55, Run 1

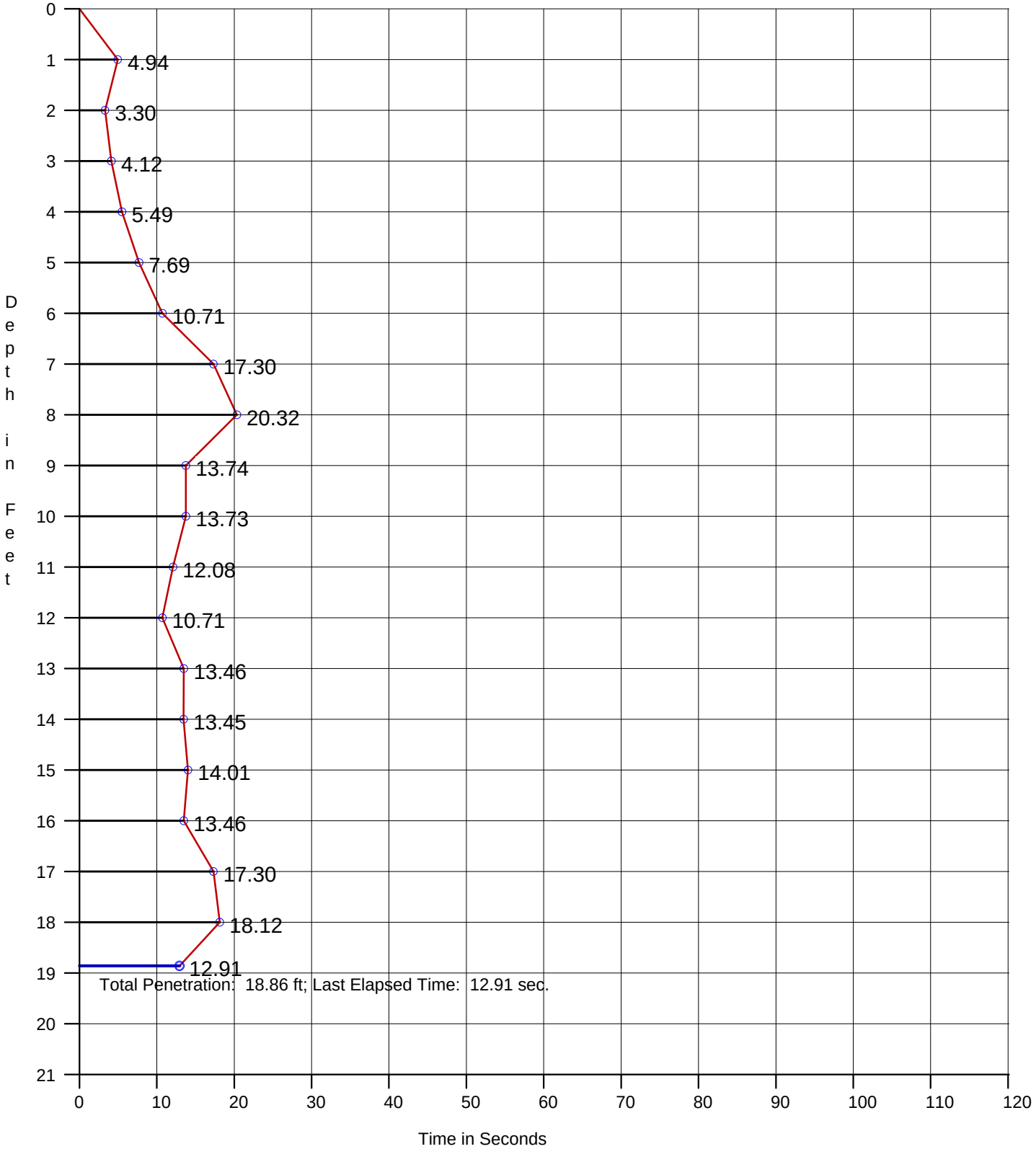
Date: 5/26/04
Start Time: 9:55:24 AM
End Time: 9:59:11 AM

Penetration: 18.86 ft
Recovery: 16.9 ft
W. D. Corrected: 0 ft
W. D. Raw: 33.9 ft

Easting: 964169.16
Northing: 749321.22
Coord. System: SP-FL East

Lat: 26 23.5246' N
Long: 080 03.5481' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. HB04-54, Run 1

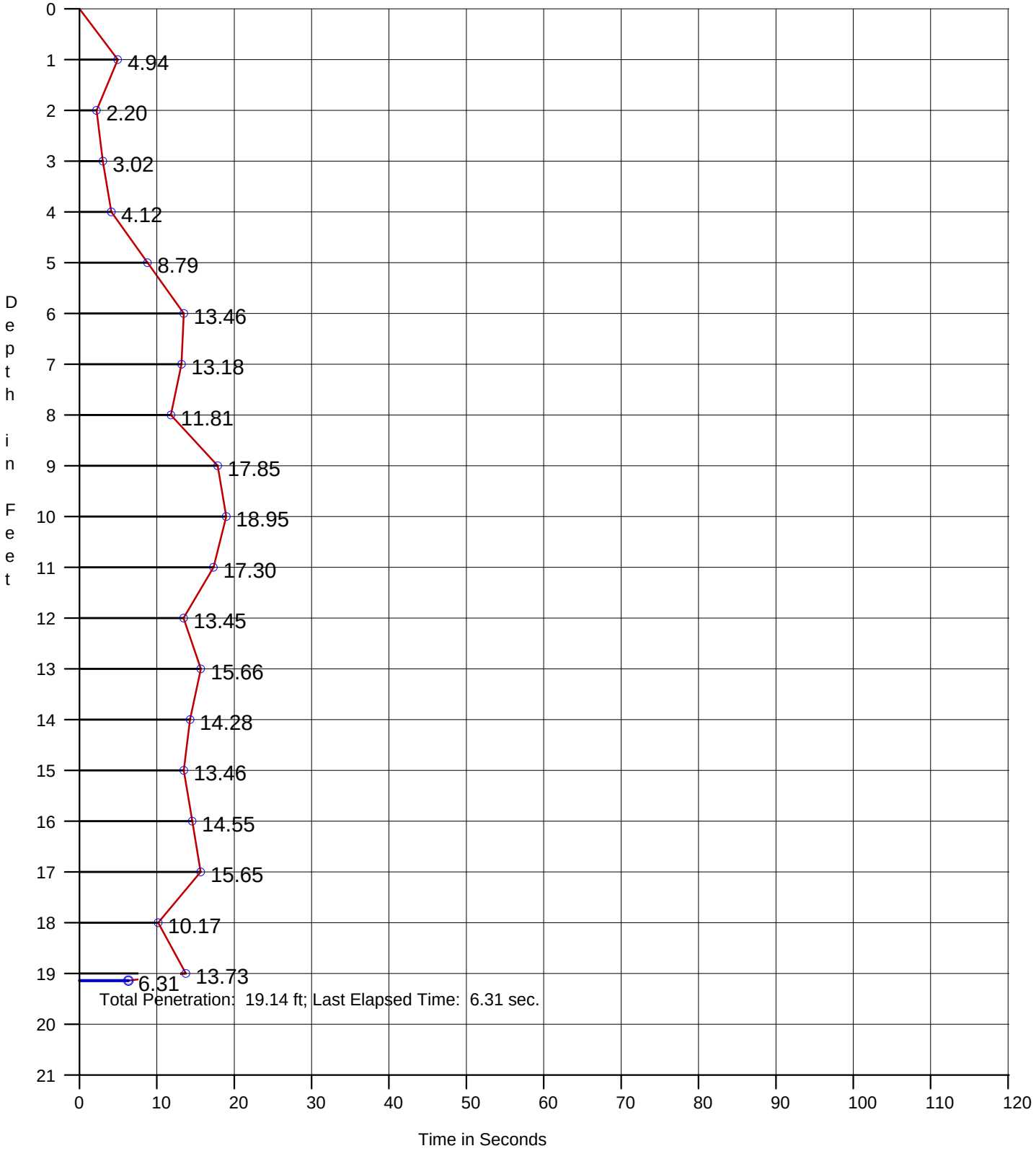
Date: 5/26/04
Start Time: 10:47:40 AM
End Time: 10:51:33 AM

Penetration: 19.14 ft
Recovery: 20.0 ft
W. D. Corrected: 0 ft
W. D. Raw: 54.4 ft

Easting: 965314.60
Northing: 750410.29
Coord. System: SP-FL East

Lat: 26 23.7030' N
Long: 080 03.3367' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. HB04-53, Run 1

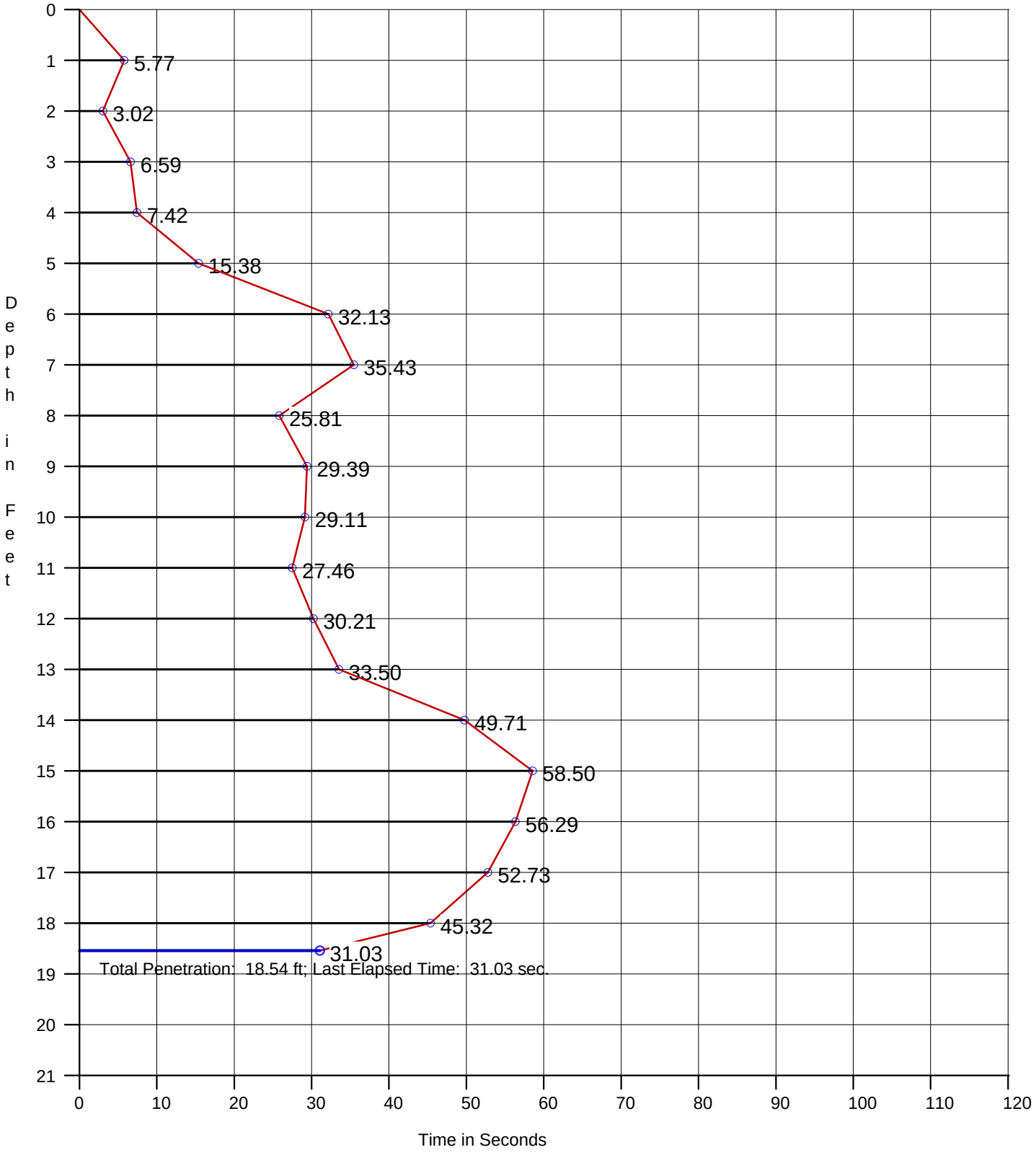
Date: 5/26/04
Start Time: 10:17:02 AM
End Time: 10:26:37 AM

Penetration: 18.54 ft
Recovery: 18.4 ft
W. D. Corrected: 0 ft
W. D. Raw: 34.7 ft

Easting: 964314.26
Northing: 750522.82
Coord. System: SP-FL East

Lat: 26 23.7228' N
Long: 080 03.5199' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. HB04-52, Run 1

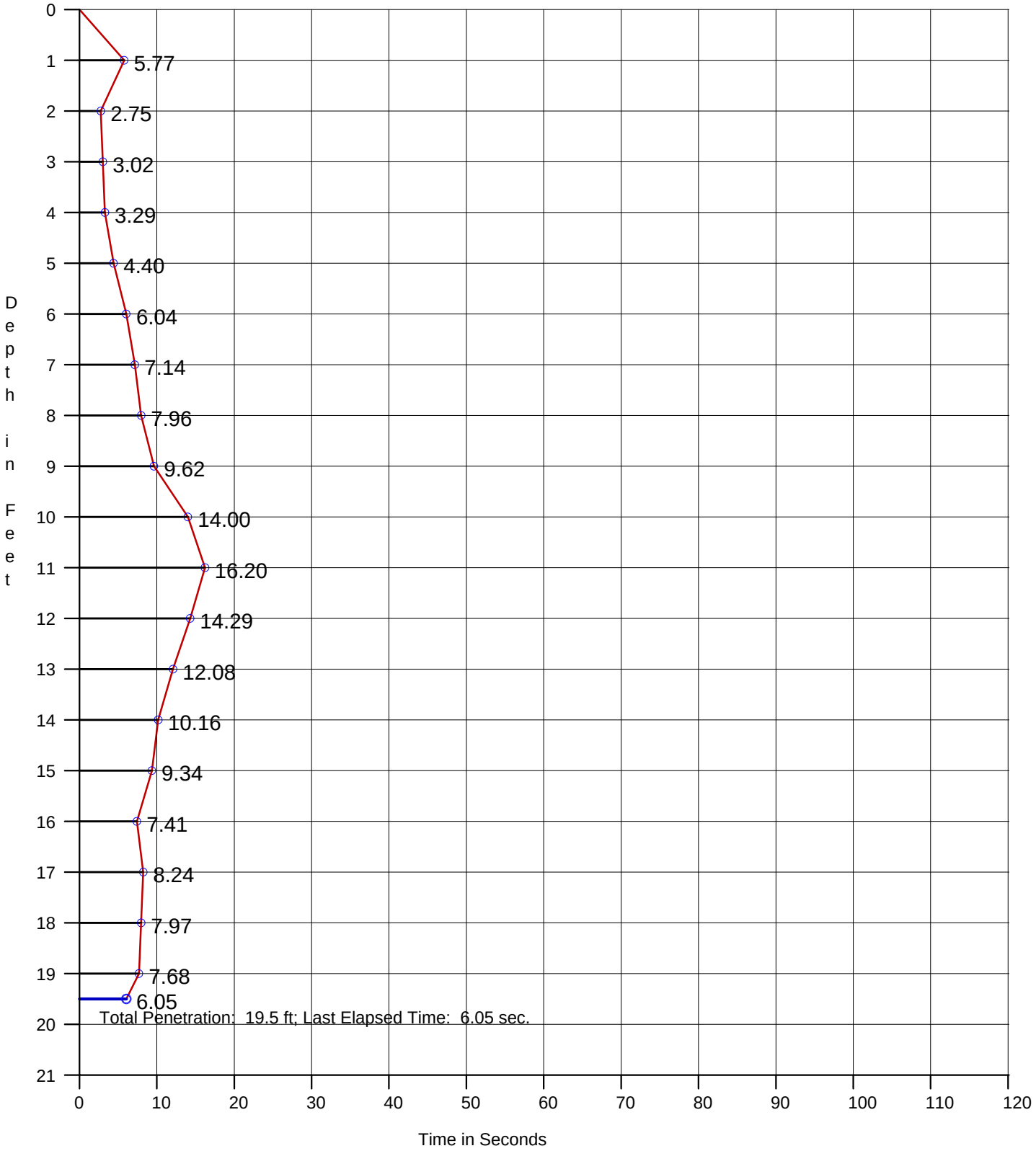
Date: 5/26/04
Start Time: 11:13:22 AM
End Time: 11:16:06 AM

Penetration: 19.50 ft
Recovery: 16.9 ft
W. D. Corrected: 0 ft
W. D. Raw: 58.4 ft

Easting: 965503.91
Northing: 752787.02
Coord. System: SP-FL East

Lat: 26 24.0951' N
Long: 080 03.2989' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. HB04-51, Run 1

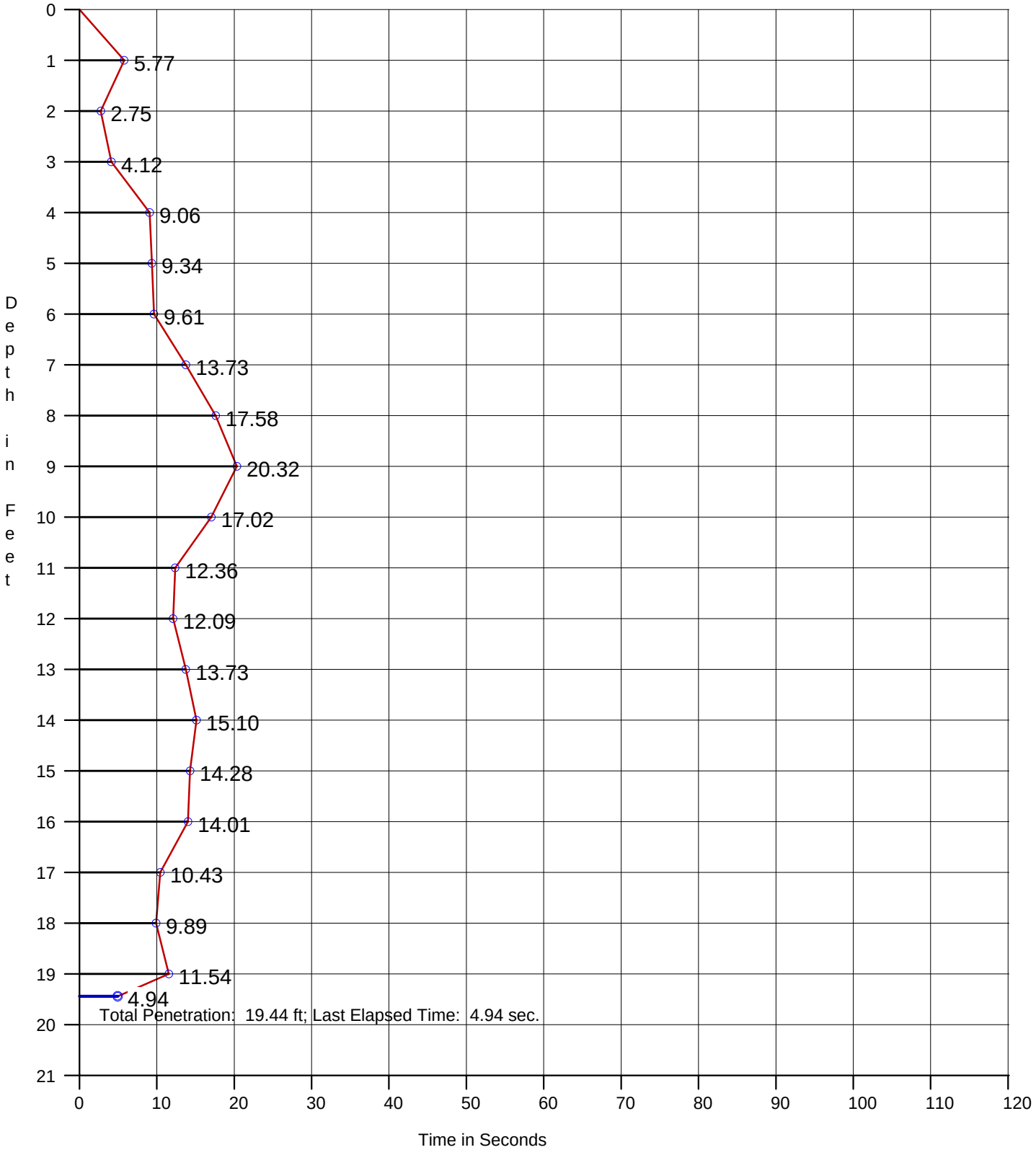
Date: 5/26/04
Start Time: 11:40:36 AM
End Time: 11:44:23 AM

Penetration: 19.44 ft
Recovery: 16.9 ft
W. D. Corrected: 0 ft
W. D. Raw: 42.0 ft

Easting: 964829.84
Northing: 752864.36
Coord. System: SP-FL East

Lat: 26 24.1086' N
Long: 080 03.4223' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. HB04-50, Run 2

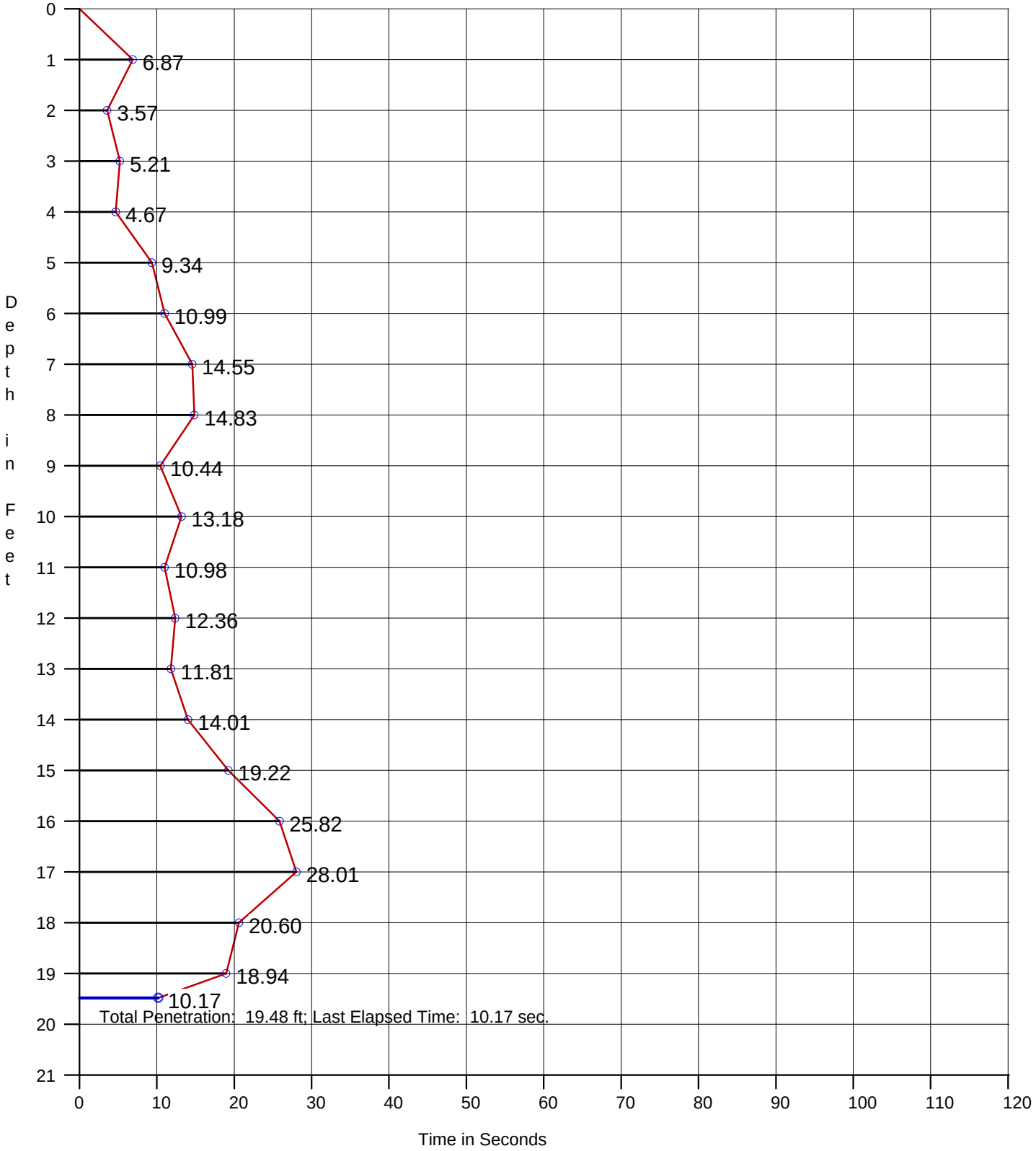
Date: 5/26/04
Start Time: 1:18:03 PM
End Time: 1:22:28 PM

Penetration: 19.48 ft
Recovery: 17.8 ft
W. D. Corrected: 0 ft
W. D. Raw: 32.1 ft

Easting: 964239.20
Northing: 752887.12
Coord. System: SP-FL East

Lat: 26 24.1131' N
Long: 080 03.5305' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. HB04-50, Run 1

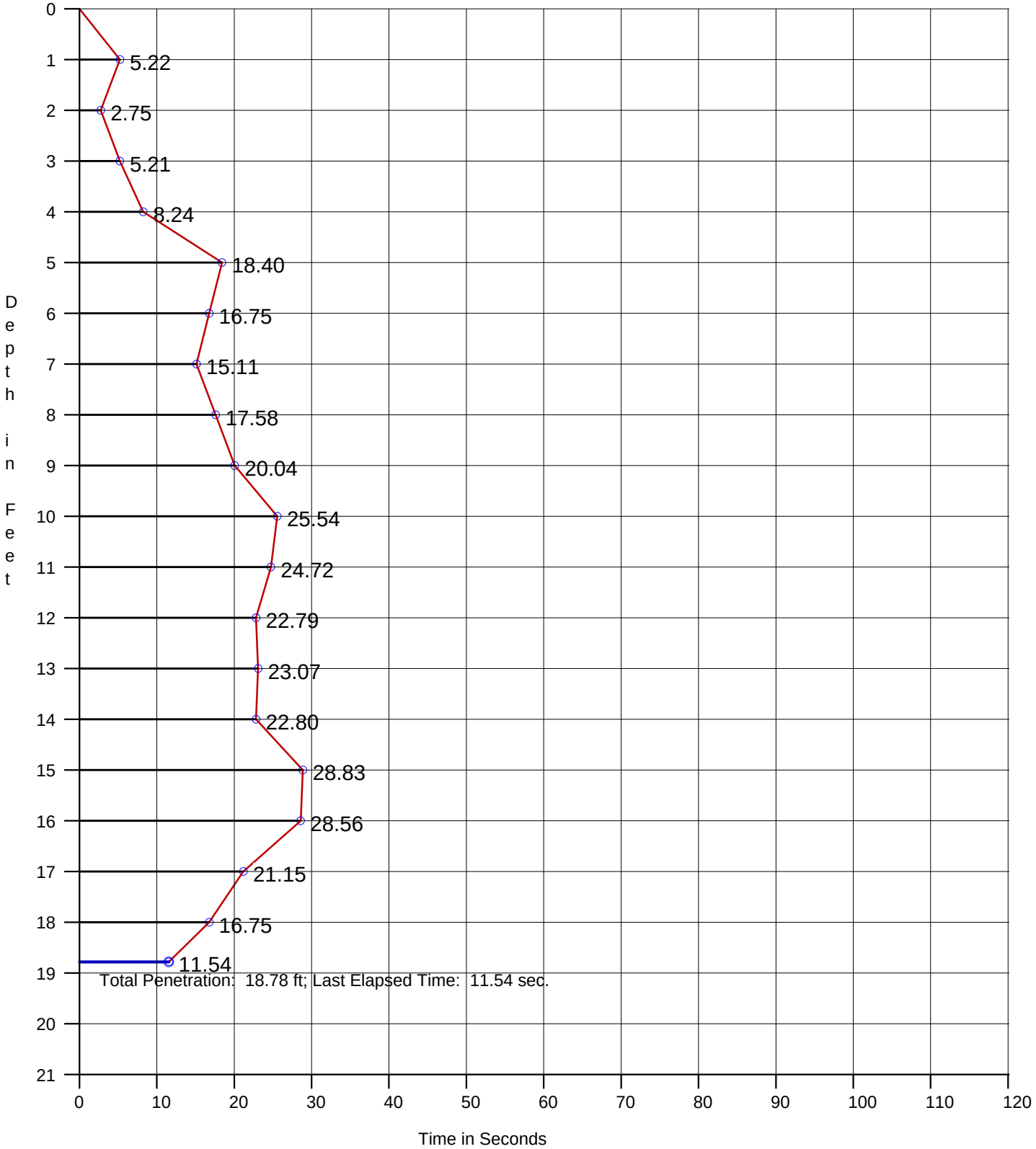
Date: 5/26/04
Start Time: 12:02:51 PM
End Time: 12:08:26 PM

Penetration: 18.78 ft
Recovery: 14.2 ft
W. D. Corrected: 0 ft
W. D. Raw: 31.2 ft

Easting: 964179.36
Northing: 752871.23
Coord. System: SP-FL East

Lat: 26 24.1106' N
Long: 080 03.5415' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. HB04-49, Run 1

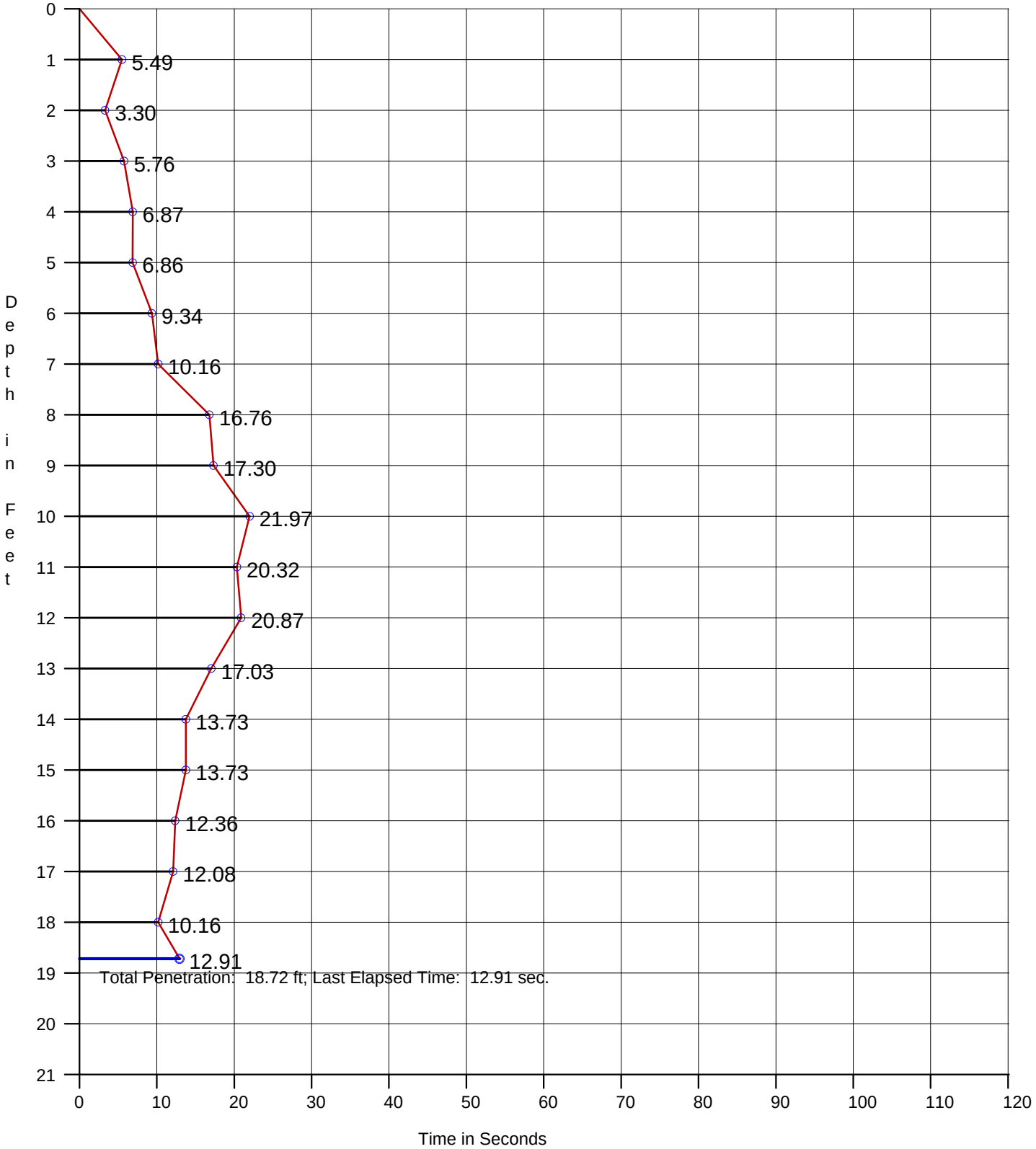
Date: 5/26/04
Start Time: 3:03:37 PM
End Time: 3:07:34 PM

Penetration: 18.72 ft
Recovery: 18.7 ft
W. D. Corrected: 0 ft
W. D. Raw: 58.0 ft

Easting: 965678.60
Northing: 755160.73
Coord. System: SP-FL East

Lat: 26 24.4866' N
Long: 080 03.2636' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. HB04-48, Run 1

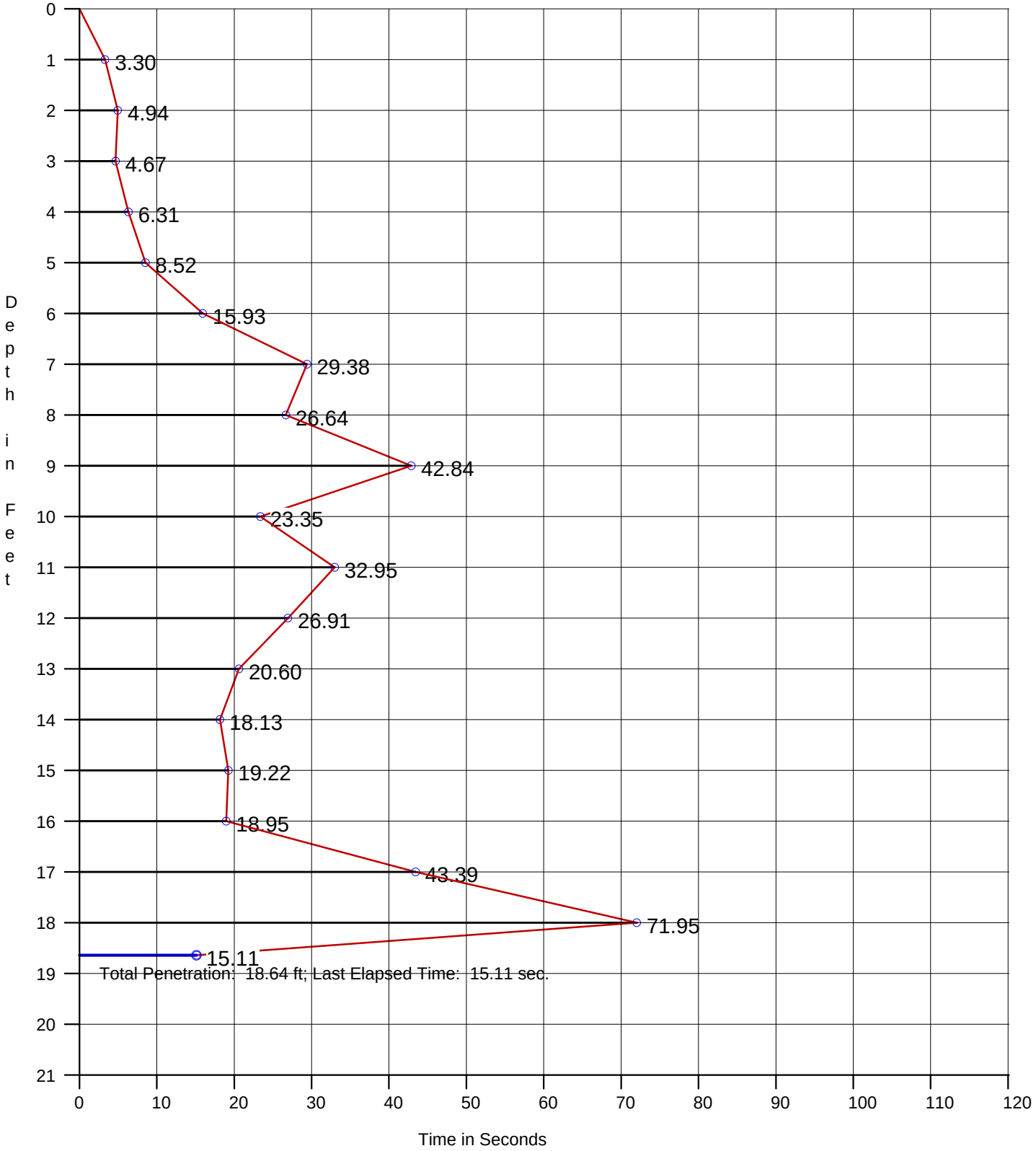
Date: 5/26/04
Start Time: 2:23:58 PM
End Time: 2:31:11 PM

Penetration: 18.64 ft
Recovery: 16.7 ft
W. D. Corrected: 0 ft
W. D. Raw: 41.2 ft

Easting: 964893.75
Northing: 755208.35
Coord. System: SP-FL East

Lat: 26 24.4954' N
Long: 080 03.4074' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. HB04-47, Run 1

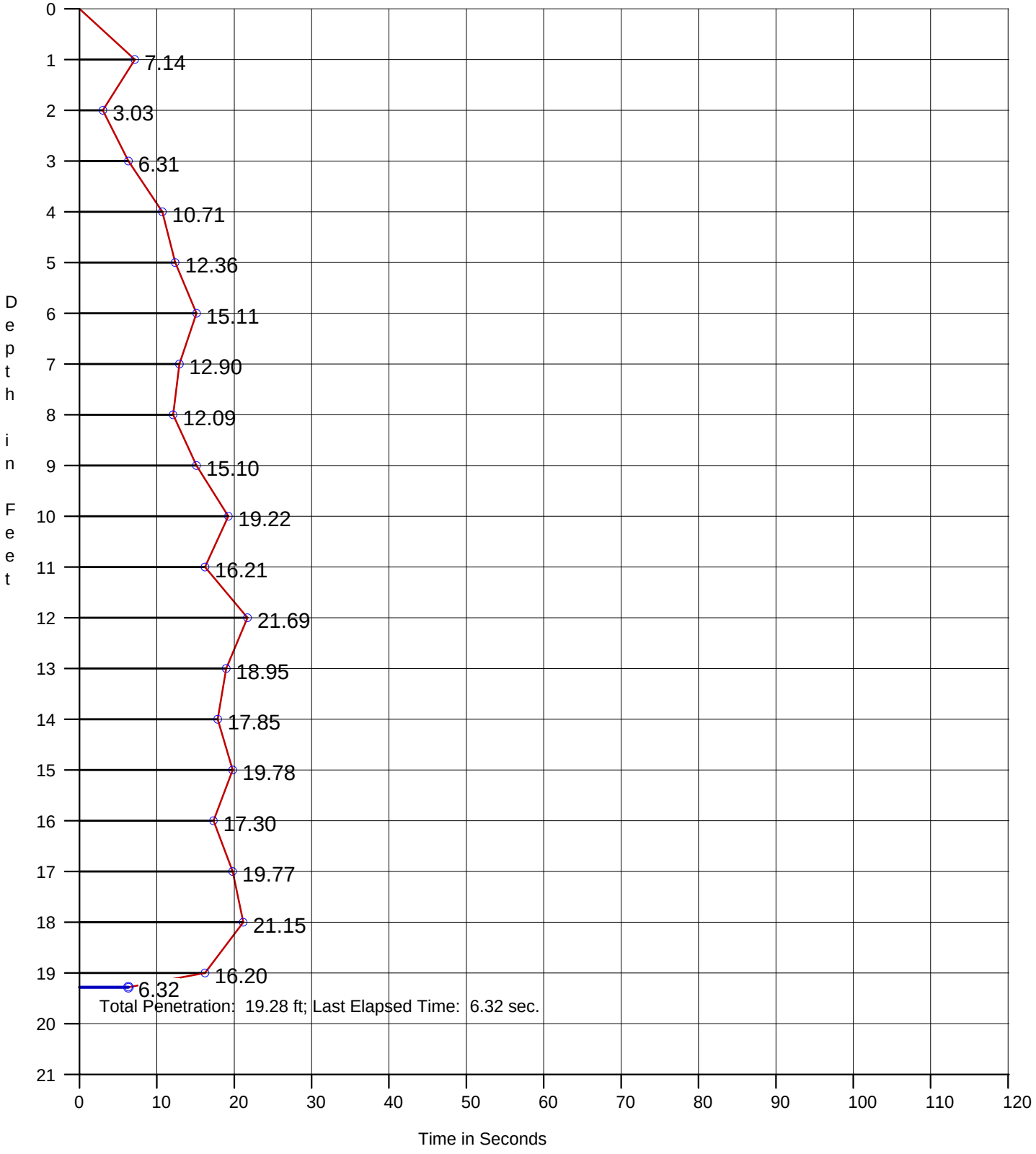
Date: 5/26/04
Start Time: 1:48:40 PM
End Time: 1:53:29 PM

Penetration: 19.28 ft
Recovery: 18.2 ft
W. D. Corrected: 0 ft
W. D. Raw: 31.9 ft

Easting: 964287.98
Northing: 755329.22
Coord. System: SP-FL East

Lat: 26 24.5161' N
Long: 080 03.5183' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. HB04-46, Run 1

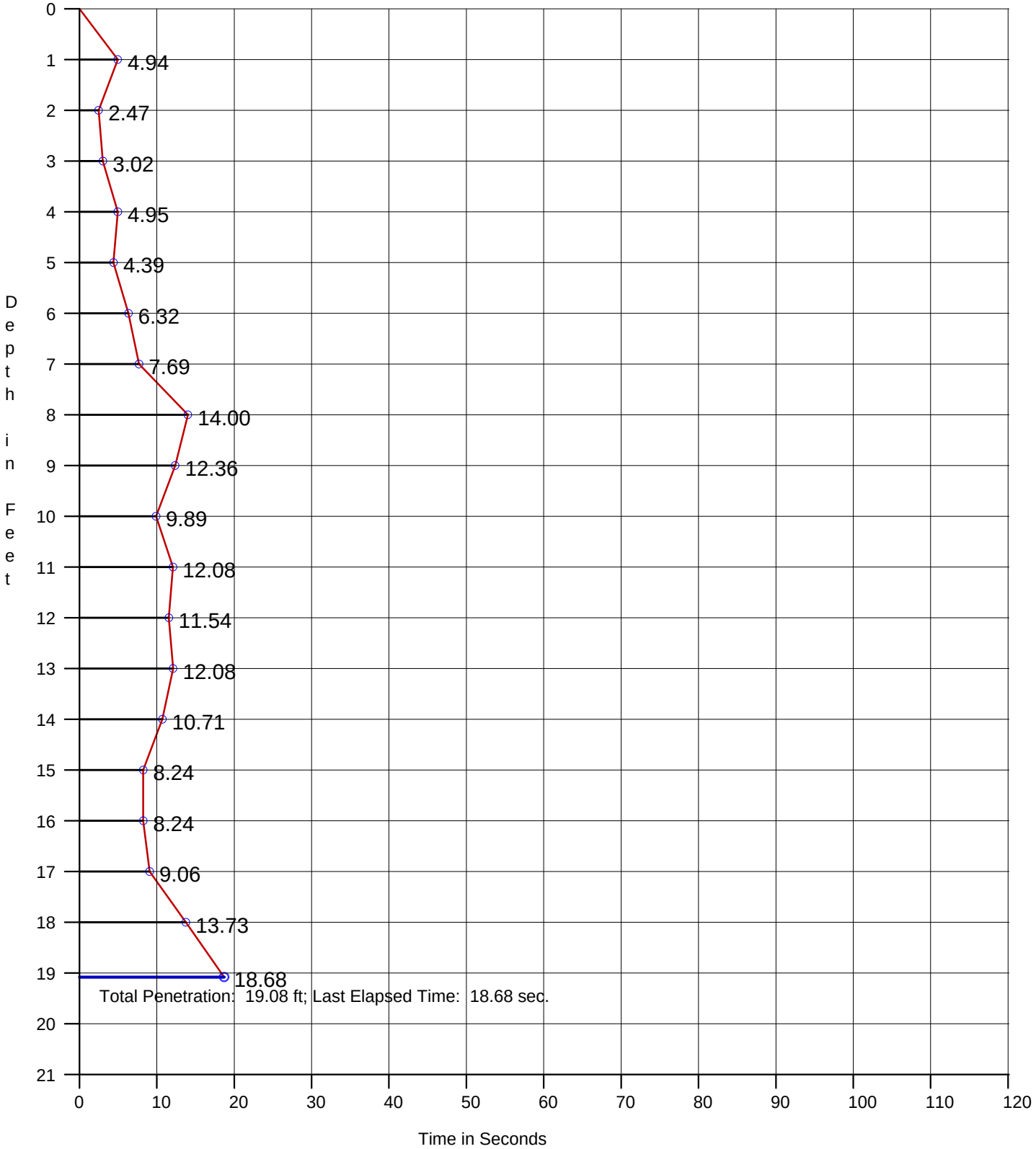
Date: 5/26/04
Start Time: 3:36:51 PM
End Time: 3:39:46 PM

Penetration: 19.08 ft
Recovery: 16.6 ft
W. D. Corrected: 0 ft
W. D. Raw: 60.6 ft

Easting: 966101.57
Northing: 757857.81
Coord. System: SP-FL East

Lat: 26 24.9313' N
Long: 080 03.1825' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. HB04-45, Run 1

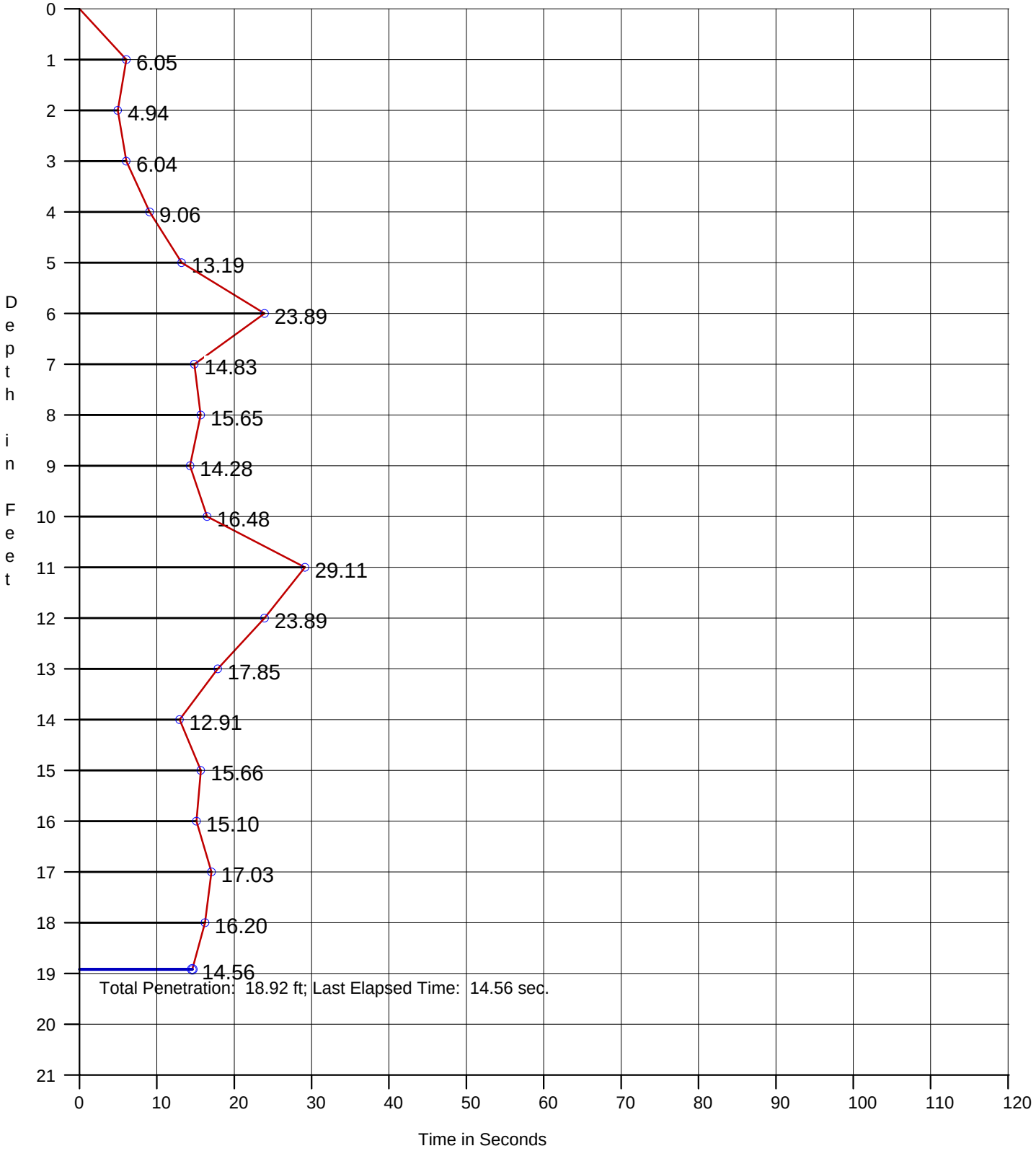
Date: 5/26/04
Start Time: 4:02:39 PM
End Time: 4:07:25 PM

Penetration: 18.92 ft
Recovery: 17.4 ft
W. D. Corrected: 0 ft
W. D. Raw: 40.0 ft

Easting: 965106.11
Northing: 757886.73
Coord. System: SP-FL East

Lat: 26 24.9373' N
Long: 080 03.3649' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. HB04-44, Run 1

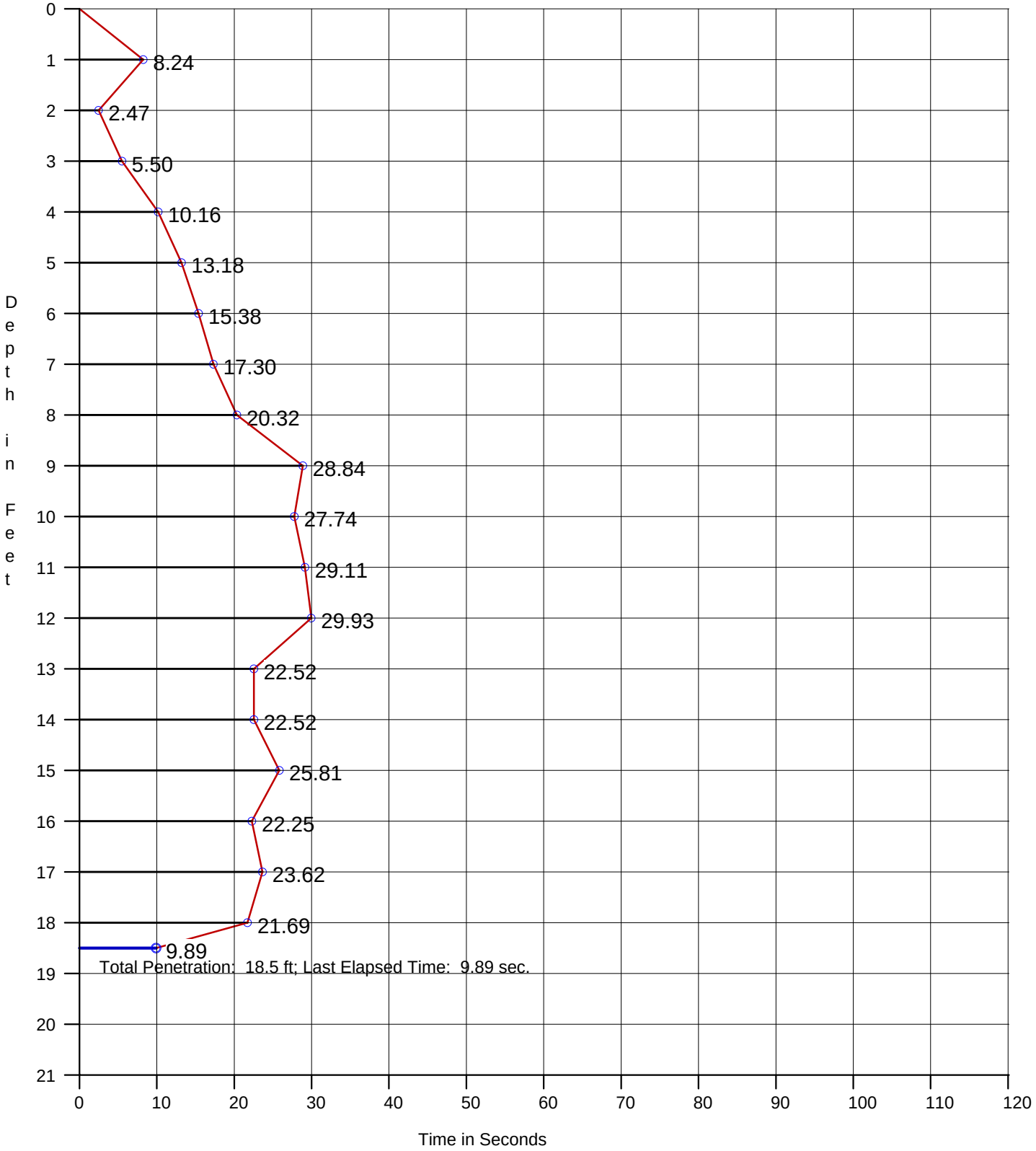
Date: 5/26/04
Start Time: 4:46:54 PM
End Time: 4:52:50 PM

Penetration: 18.50 ft
Recovery: 18.0 ft
W. D. Corrected: 0 ft
W. D. Raw: 30.6 ft

Easting: 964361.85
Northing: 758037.48
Coord. System: SP-FL East

Lat: 26 24.9630' N
Long: 080 03.5011' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. HB04-43, Run 2

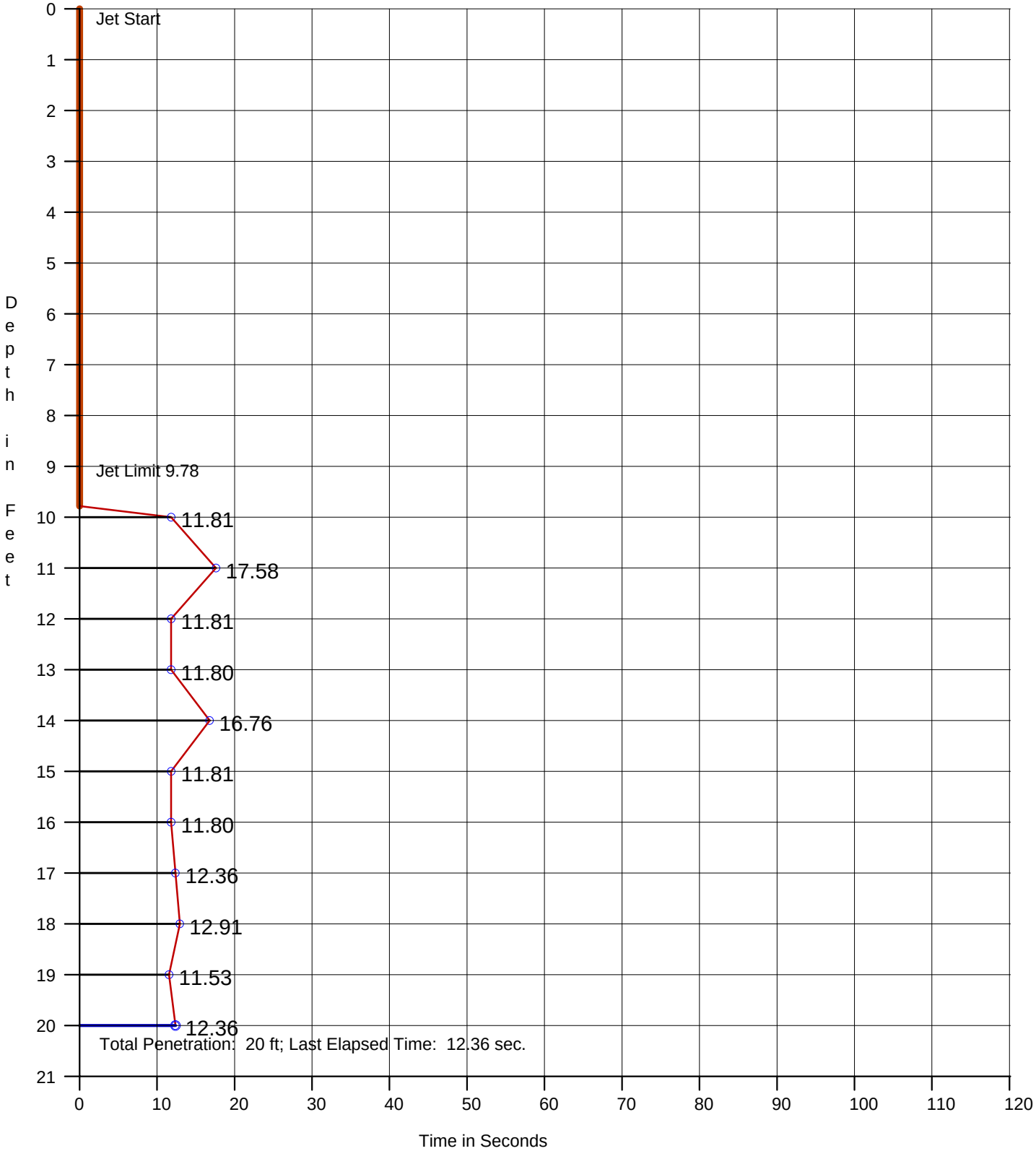
Date: 5/27/04
Start Time: 8:55:30 AM
End Time: 8:58:42 AM

Penetration: 20.00 ft
Recovery: 7.8 ft
W. D. Corrected: 0 ft
W. D. Raw: 64.1 ft

Easting: 966295.24
Northing: 760222.52
Coord. System: SP-FL East

Lat: 26 25.3213' N
Long: 080 03.1438' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. HB04-43, Run 1

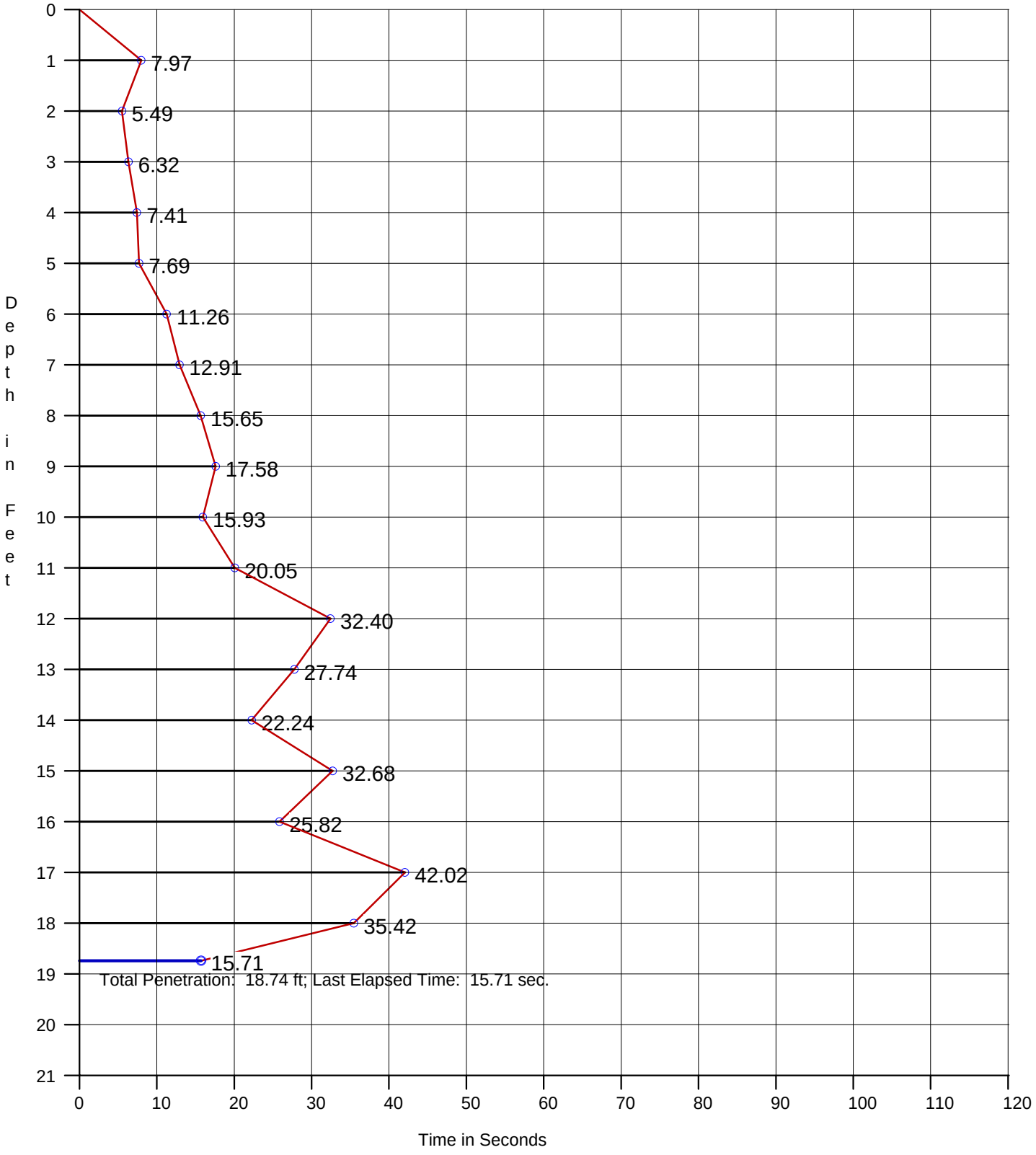
Date: 5/27/04
Start Time: 7:54:16 AM
End Time: 8:00:18 AM

Penetration: 18.74 ft
Recovery: 12.4 ft
W. D. Corrected: 0 ft
W. D. Raw: 64.4 ft

Easting: 966313.24
Northing: 760281.90
Coord. System: SP-FL East

Lat: 26 25.3311' N
Long: 080 03.1404' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. HB04-42, Run 1

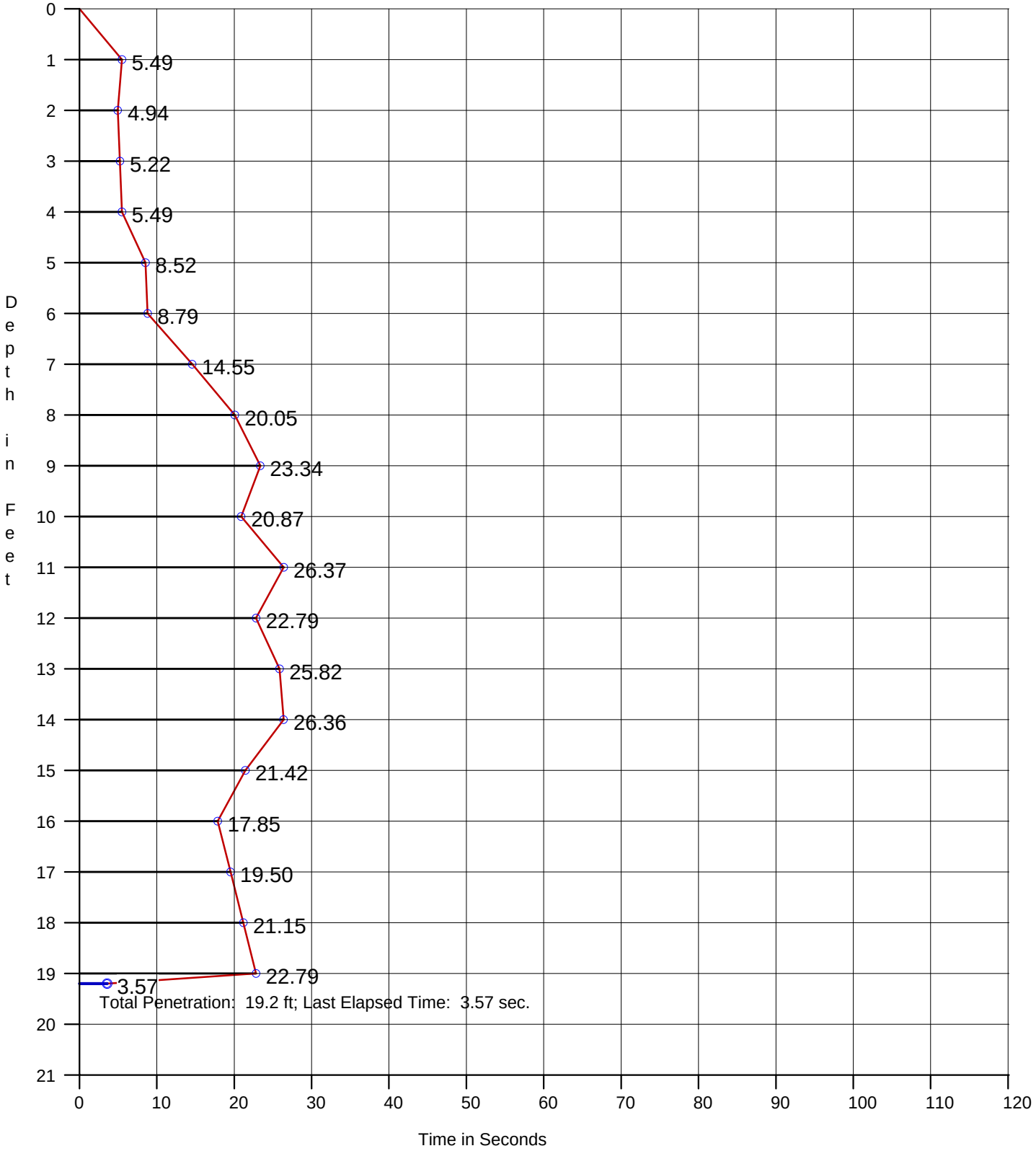
Date: 5/27/04
Start Time: 9:20:02 AM
End Time: 9:25:27 AM

Penetration: 19.20 ft
Recovery: 18.0 ft
W. D. Corrected: 0 ft
W. D. Raw: 40.6 ft

Easting: 965248.39
Northing: 760281.23
Coord. System: SP-FL East

Lat: 26 25.3323' N
Long: 080 03.3356' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. HB04-41, Run 1

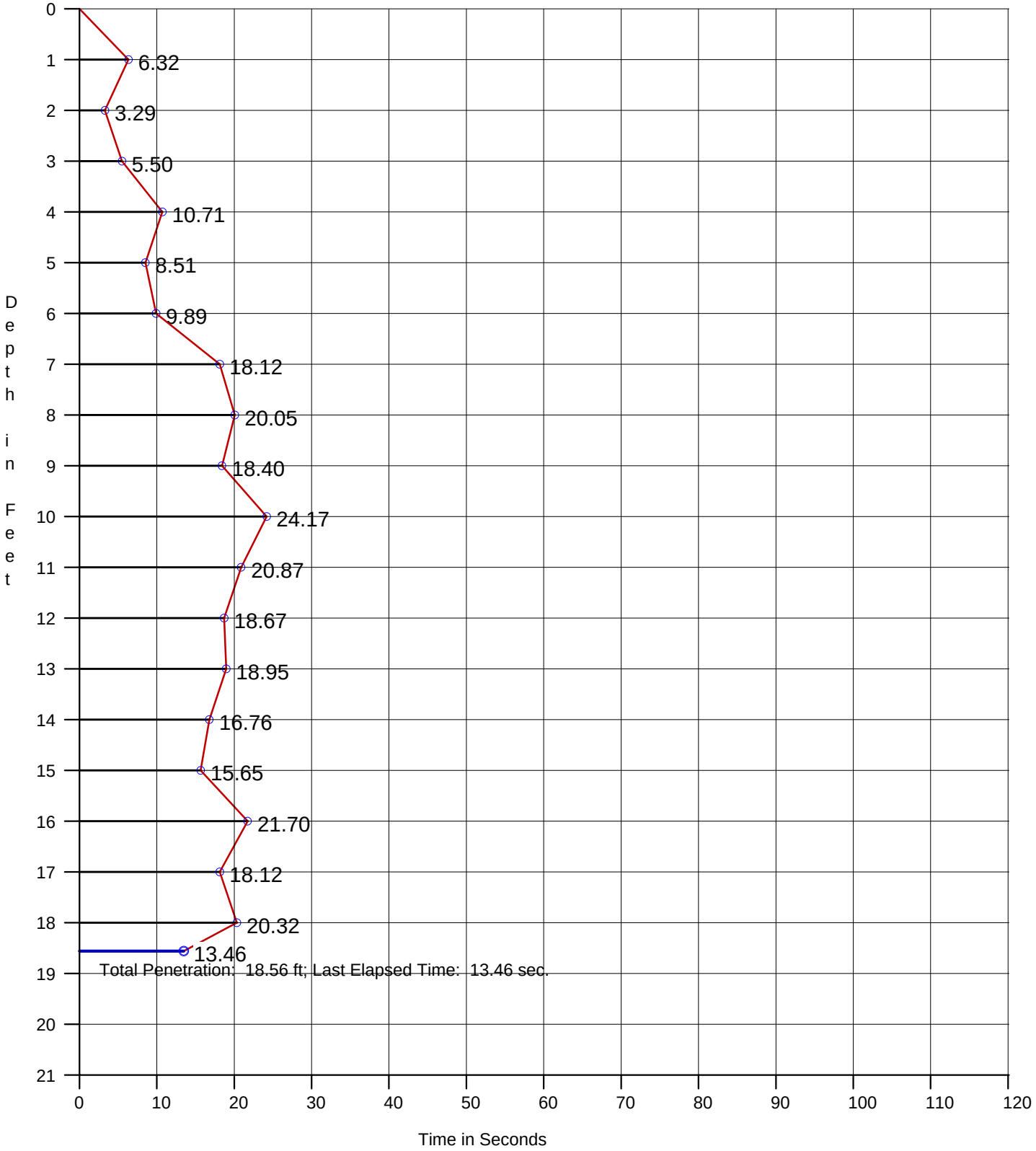
Date: 5/26/04
Start Time: 5:13:59 PM
End Time: 5:18:49 PM

Penetration: 18.56 ft
Recovery: 17.8 ft
W. D. Corrected: 0 ft
W. D. Raw: 29.8 ft

Easting: 964504.10
Northing: 760413.19
Coord. System: SP-FL East

Lat: 26 25.3550' N
Long: 080 03.4719' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. HB04-40, Run 2

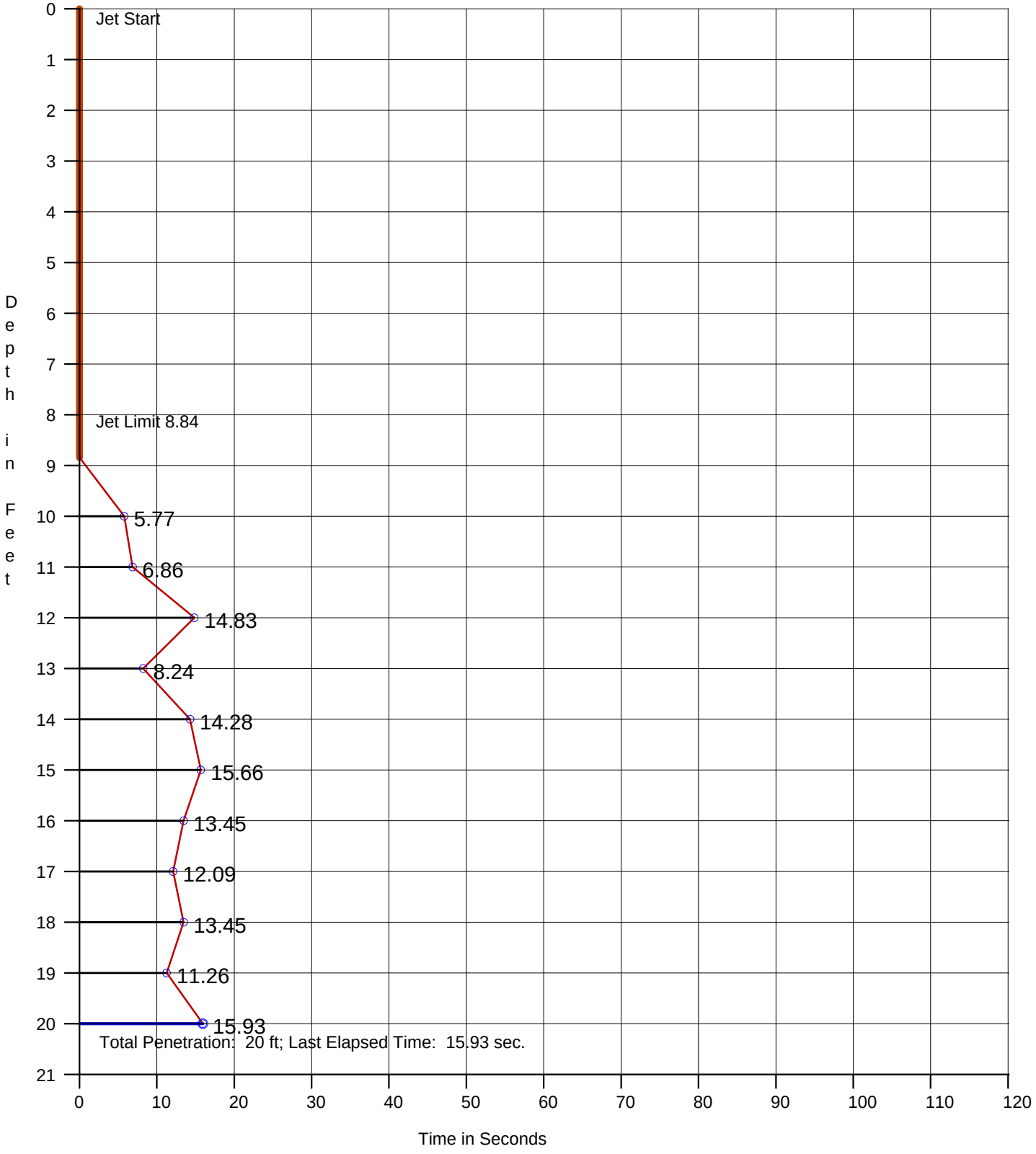
Date: 5/27/04
Start Time: 11:30:58 AM
End Time: 11:33:10 AM

Penetration: 20.00 ft
Recovery: 8.8 ft
W. D. Corrected: 0 ft
W. D. Raw: 65.6 ft

Easting: 966356.90
Northing: 762679.32
Coord. System: SP-FL East

Lat: 26 25.7268' N
Long: 080 03.1292' W
Datum: NAD-83

Comment: CoreLog counter restarted at jet limit of 8.84'.



Penetration Graph for Core No. HB04-40, Run 1

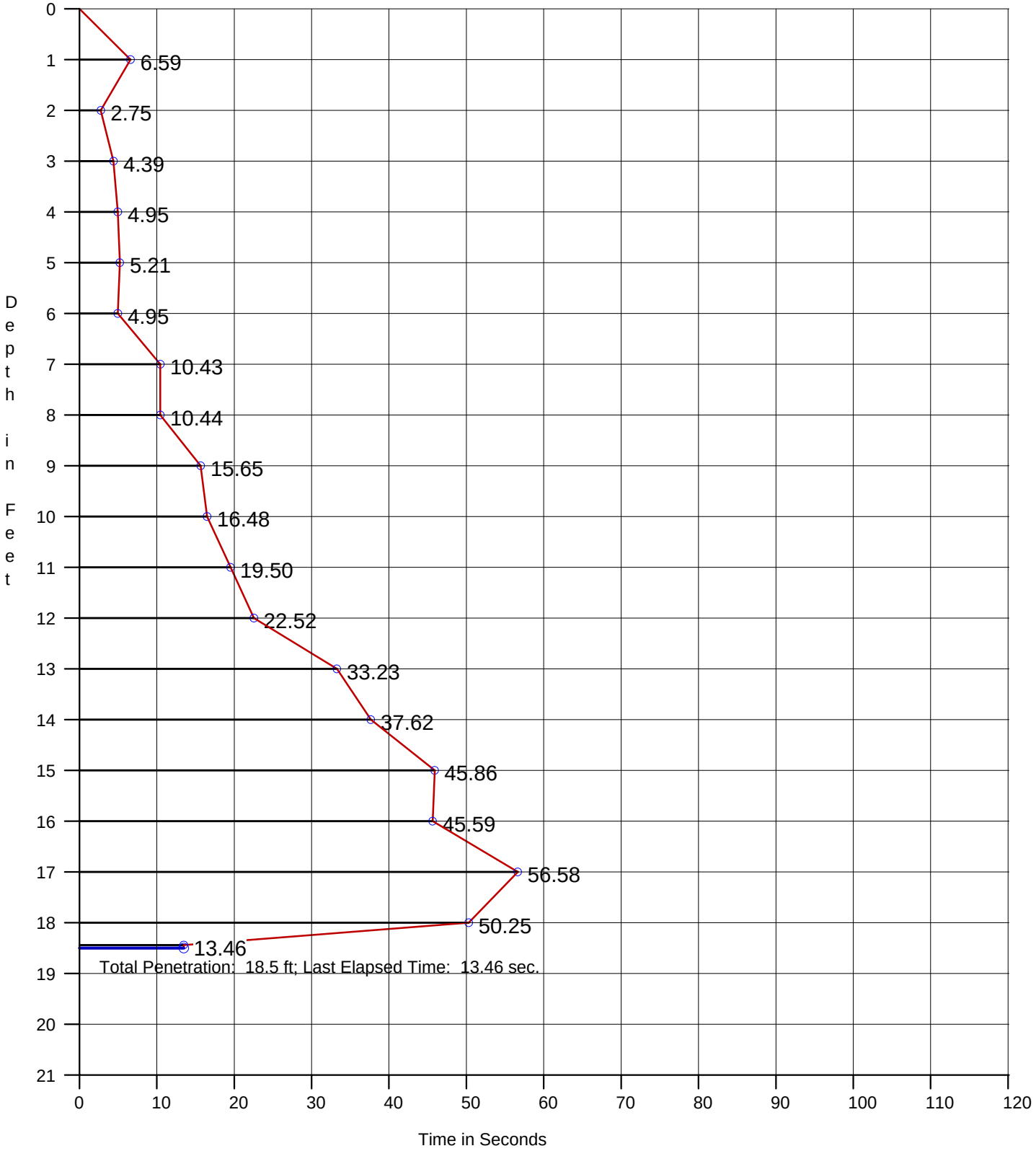
Date: 5/27/04
Start Time: 10:56:42 AM
End Time: 11:03:28 AM

Penetration: 18.50 ft
Recovery: 11.8 ft
W. D. Corrected: 0 ft
W. D. Raw: 66.8 ft

Easting: 966358.14
Northing: 762726.71
Coord. System: SP-FL East

Lat: 26 25.7346' N
Long: 080 03.1289' W
Datum: NAD-83

Comment: Bottom section of sample slid out when bringing rig onboard.



Penetration Graph for Core No. HB04-39, Run 1

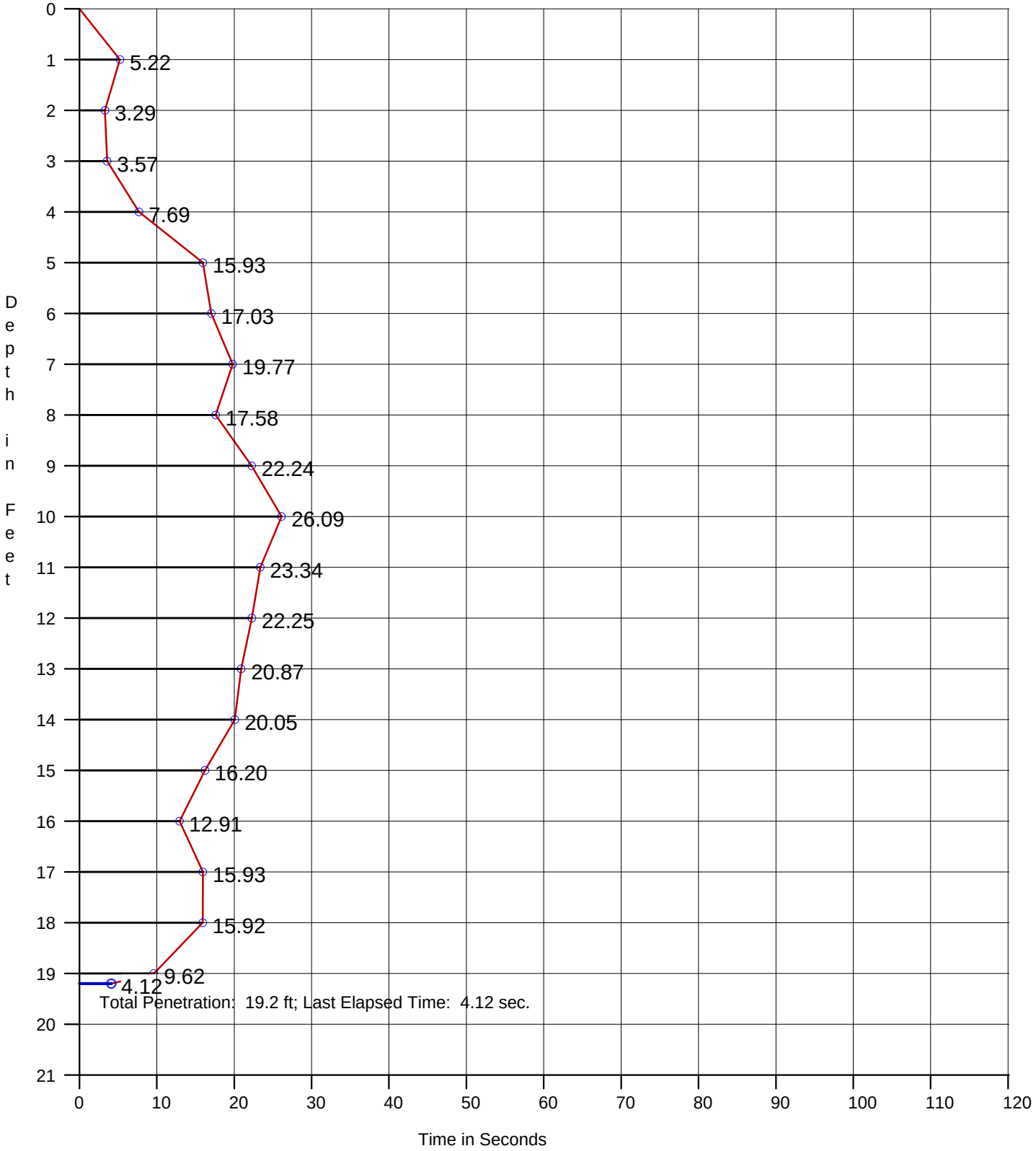
Date: 5/27/04
Start Time: 10:25:57 AM
End Time: 10:30:57 AM

Penetration: 19.20 ft
Recovery: 18.5 ft
W. D. Corrected: 0 ft
W. D. Raw: 38.7 ft

Easting: 965332.26
Northing: 762724.02
Coord. System: SP-FL East

Lat: 26 25.7354' N
Long: 080 03.3170' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. HB04-38, Run 1

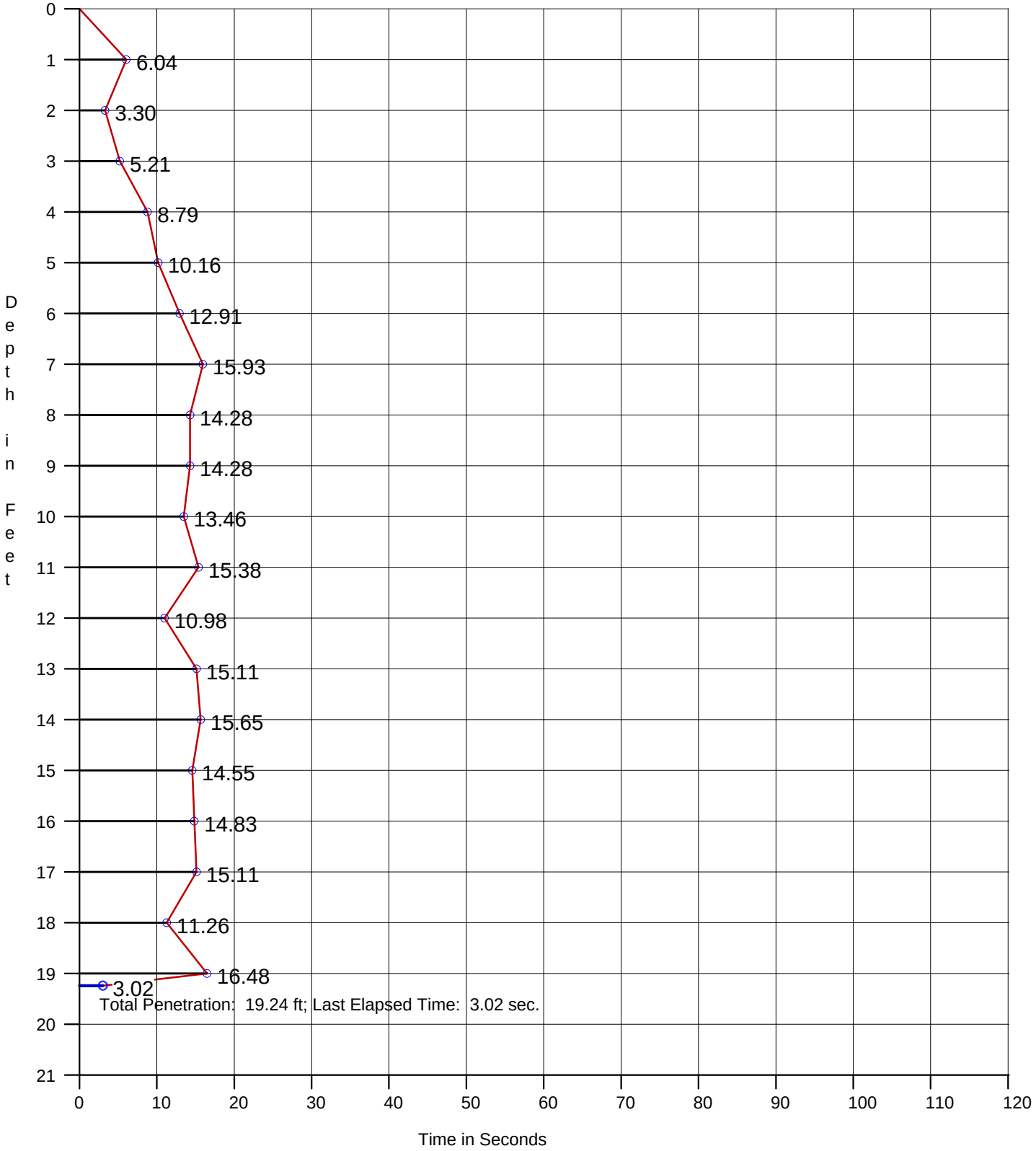
Date: 5/27/04
Start Time: 9:56:31 AM
End Time: 10:00:28 AM

Penetration: 19.24 ft
Recovery: 17.8 ft
W. D. Corrected: 0 ft
W. D. Raw: 28.4 ft

Easting: 964685.43
Northing: 762737.88
Coord. System: SP-FL East

Lat: 26 25.7384' N
Long: 080 03.4355' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. BB04-37, Run 1

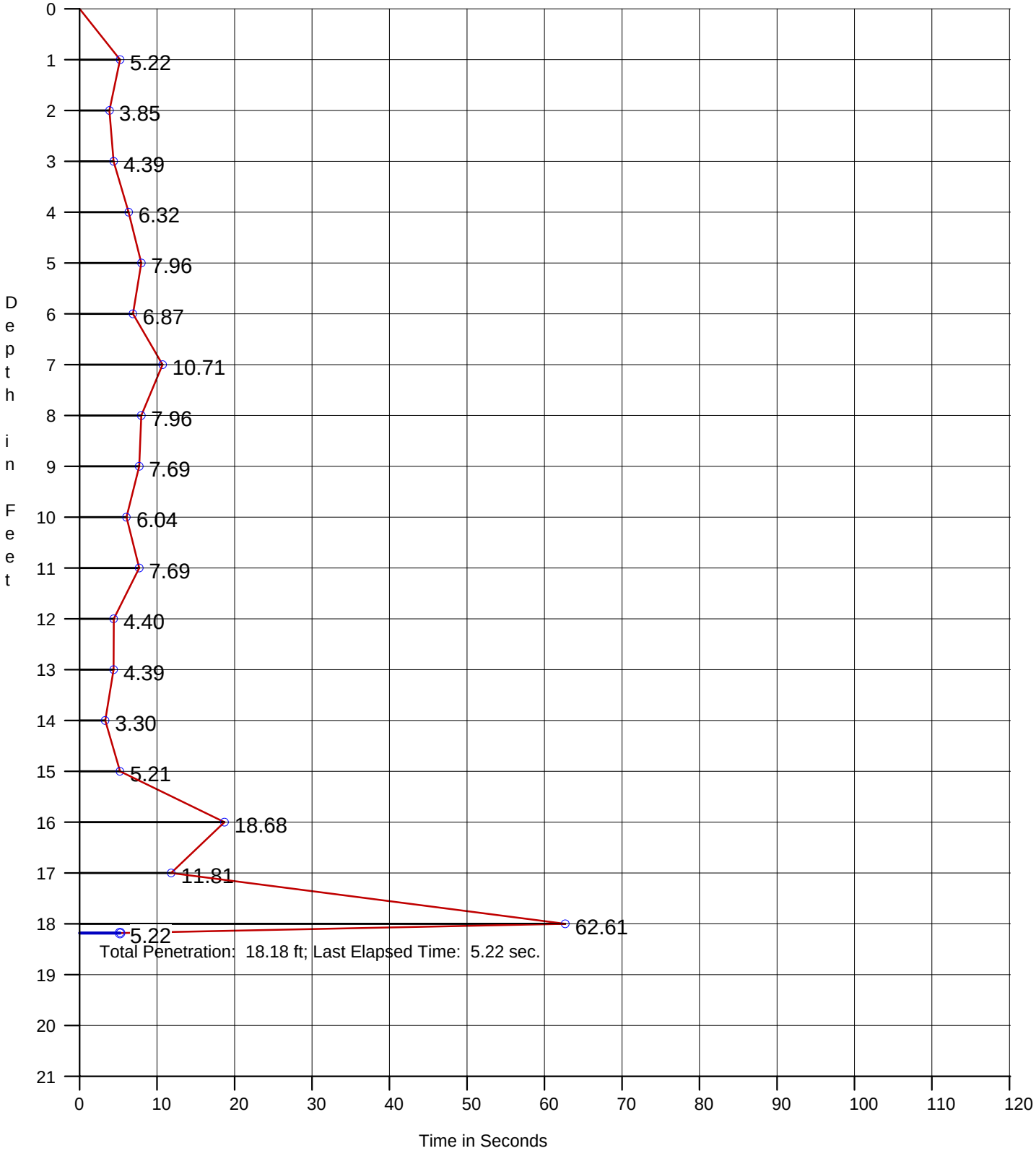
Date: 5/25/04
Start Time: 3:48:20 PM
End Time: 3:51:30 PM

Penetration: 18.18 ft
Recovery: 14.9 ft
W. D. Corrected: 0 ft
W. D. Raw: 55.9 ft

Easting: 969245.66
Northing: 784354.58
Coord. System: SP-FL East

Lat: 26 29.3007' N
Long: 080 02.5700' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. BB04-36, Run 1

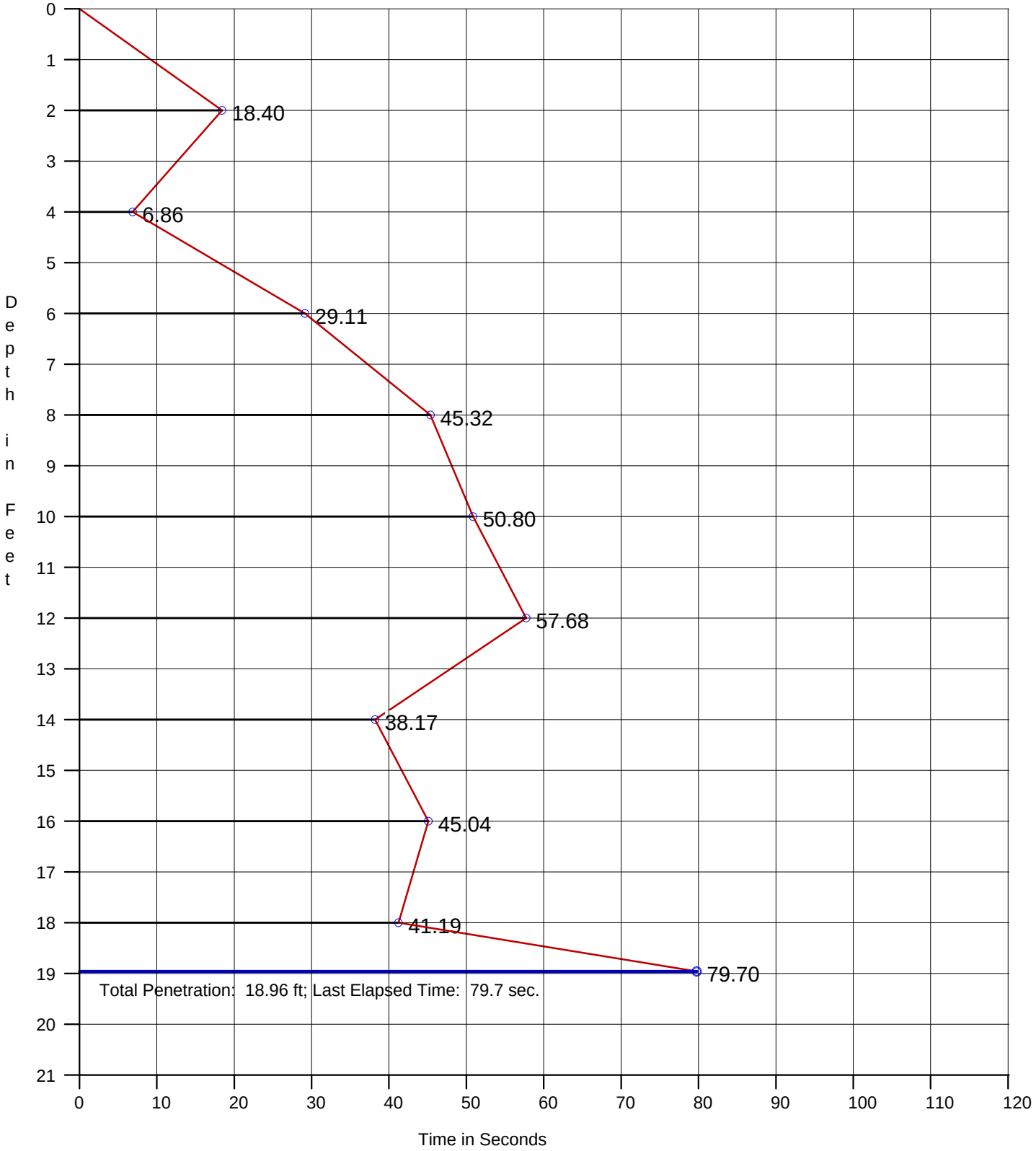
Date: 5/25/04
Start Time: 3:13:30 PM
End Time: 3:20:23 PM

Penetration: 18.96 ft
Recovery: 18.8 ft
W. D. Corrected: 0 ft
W. D. Raw: 35.2 ft

Easting: 968211.11
Northing: 784423.28
Coord. System: SP-FL East

Lat: 26 29.3133' N
Long: 080 02.7597' W
Datum: NAD-83

Comment: New penetrometer off by factor of 2. Depths multiplied by 2 to correct. Counter re-programmed.



Penetration Graph for Core No. BB04-35, Run 1

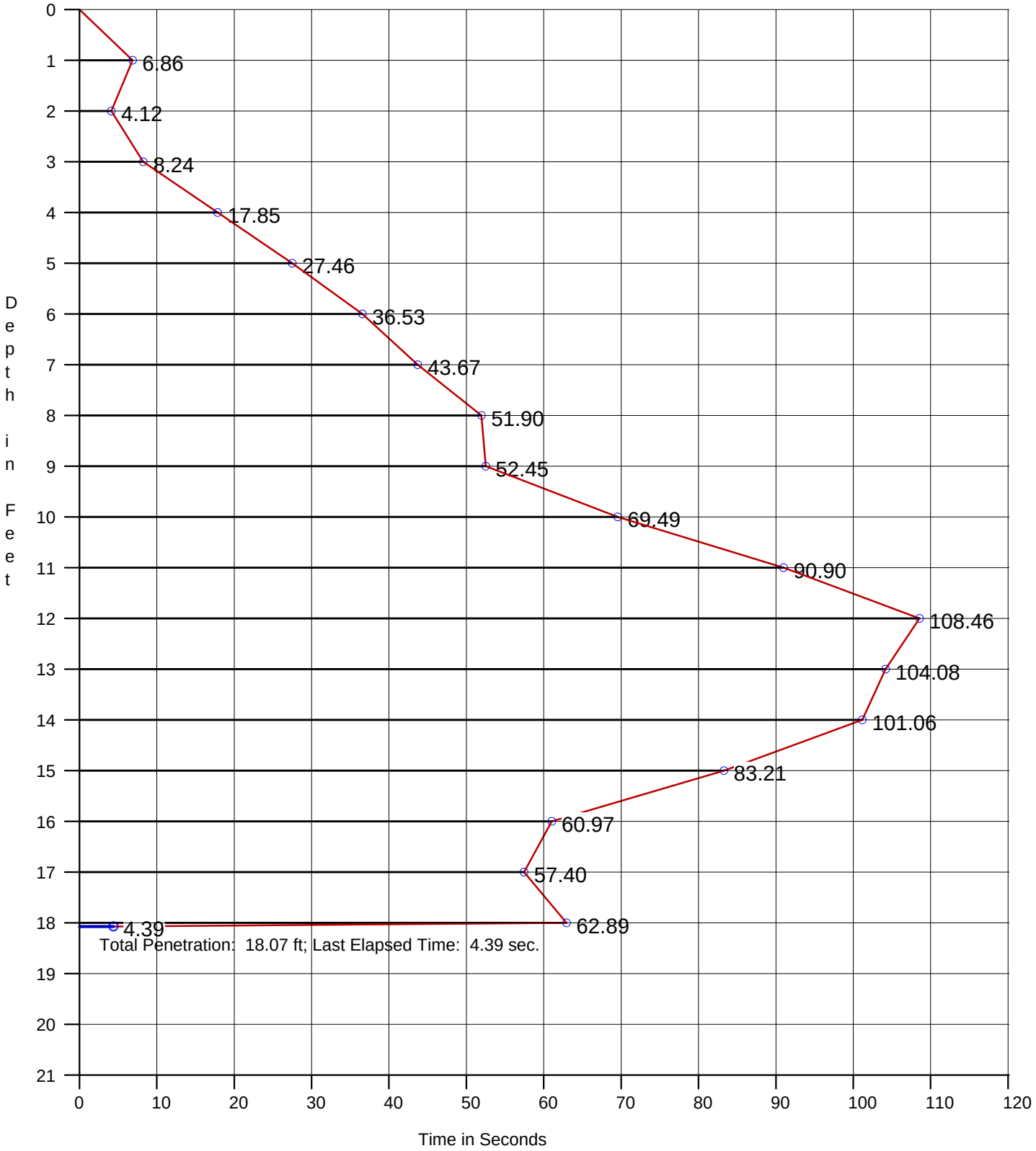
Date: 5/25/04
Start Time: 12:02:50 PM
End Time: 12:19:22 PM

Penetration: 18.07 ft
Recovery: 15.4 ft
W. D. Corrected: 0 ft
W. D. Raw: 35.9 ft

Easting: 967923.24
Northing: 782726.00
Coord. System: SP-FL East

Lat: 26 29.0335' N
Long: 080 02.8148' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. BB04-34, Run 1

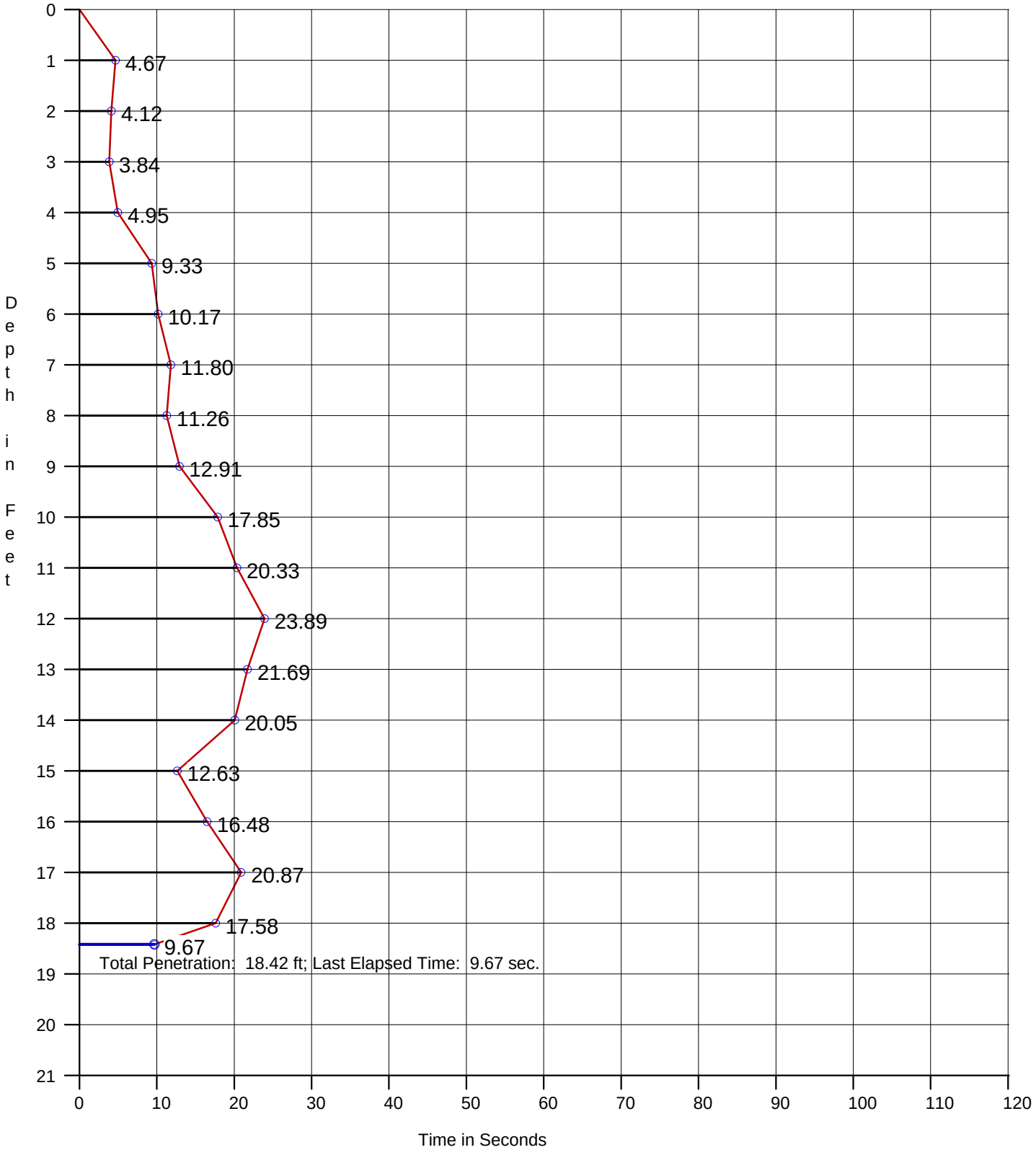
Date: 5/25/04
Start Time: 9:38:59 AM
End Time: 9:43:13 AM

Penetration: 18.42 ft
Recovery: 19.1 ft
W. D. Corrected: 0 ft
W. D. Raw: 49.8 ft

Easting: 968368.86
Northing: 780206.96
Coord. System: SP-FL East

Lat: 26 28.6172' N
Long: 080 02.7365' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. BB04-33, Run 2

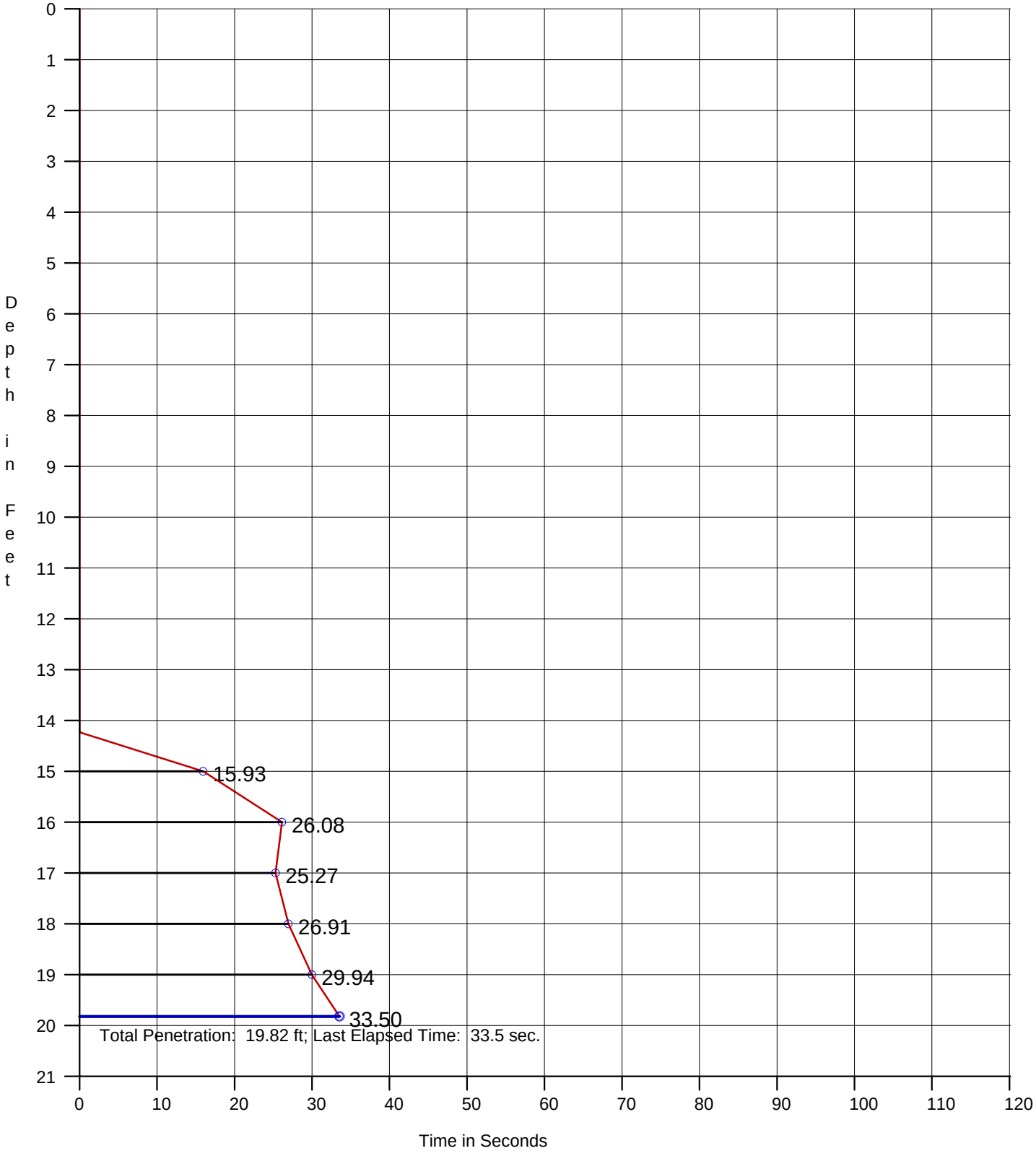
Date: 5/25/04
Start Time: 10:40:05 AM
End Time: 10:43:20 AM

Penetration: 19.82 ft
Recovery: 6.1 ft
W. D. Corrected: 0 ft
W. D. Raw: 33.9 ft

Easting: 967428.76
Northing: 780356.48
Coord. System: SP-FL East

Lat: 26 28.6430' N
Long: 080 02.9087' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. BB04-33, Run 1

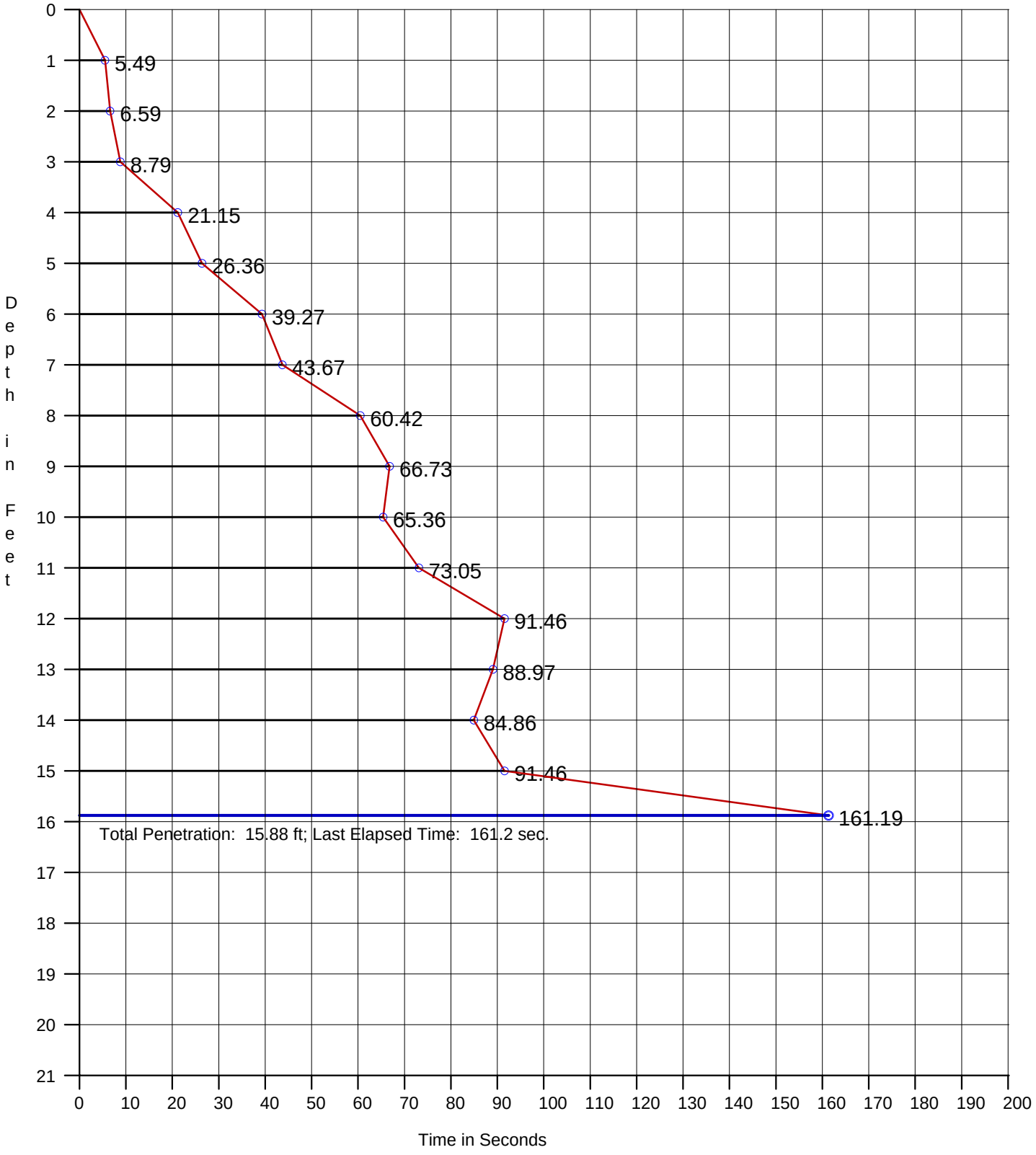
Date: 5/25/04
Start Time: 10:04:59 AM
End Time: 10:20:34 AM

Penetration: 15.88 ft
Recovery: ft
W. D. Corrected: 0 ft
W. D. Raw: 32.9 ft

Easting: 967376.21
Northing: 780325.62
Coord. System: SP-FL East

Lat: 26 28.6380' N
Long: 080 02.9184' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. BB04-32, Run 1

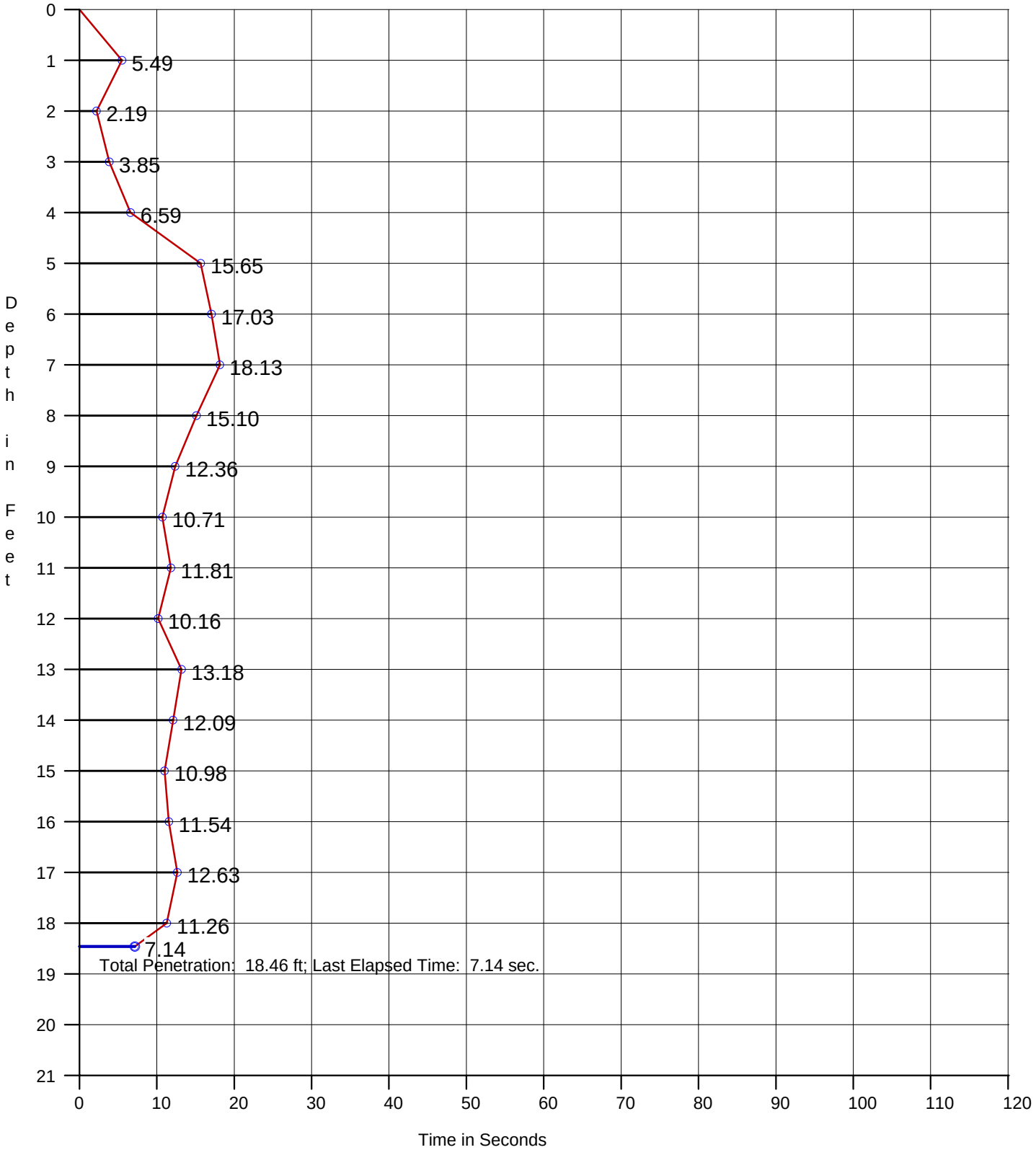
Date: 5/25/04
Start Time: 11:05:22 AM
End Time: 11:08:50 AM

Penetration: 18.46 ft
Recovery: 19.1 ft
W. D. Corrected: 0 ft
W. D. Raw: 25.4 ft

Easting: 966652.85
Northing: 780438.17
Coord. System: SP-FL East

Lat: 26 28.6575' N
Long: 080 03.0509' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. BB04-31, Run 1

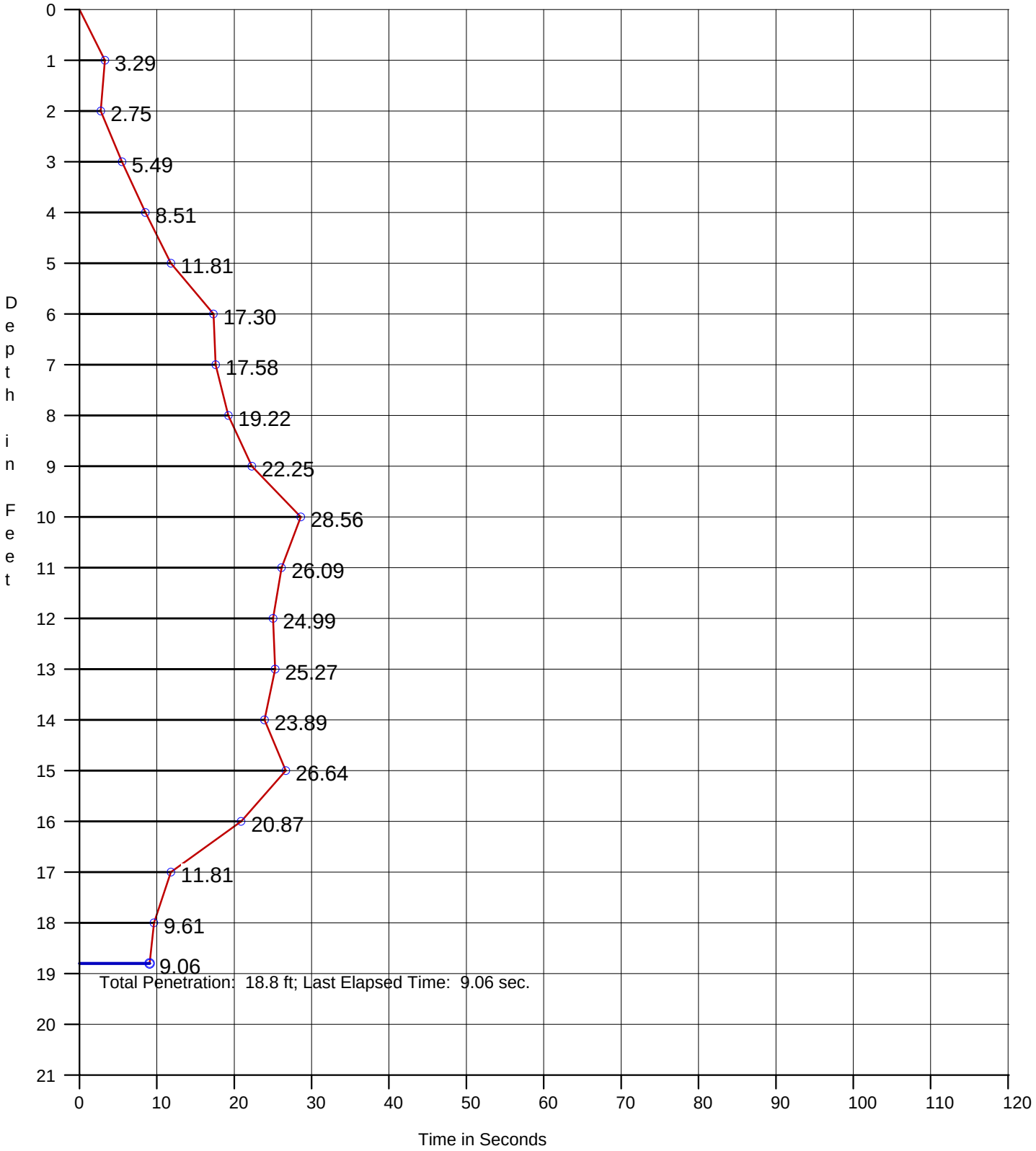
Date: 5/25/04
Start Time: 11:35:31 AM
End Time: 11:40:46 AM

Penetration: 18.80 ft
Recovery: 17.4 ft
W. D. Corrected: 0 ft
W. D. Raw: 54.7 ft

Easting: 968890.21
Northing: 782593.77
Coord. System: SP-FL East

Lat: 26 29.0105' N
Long: 080 02.6376' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. BB04-30, Run 1

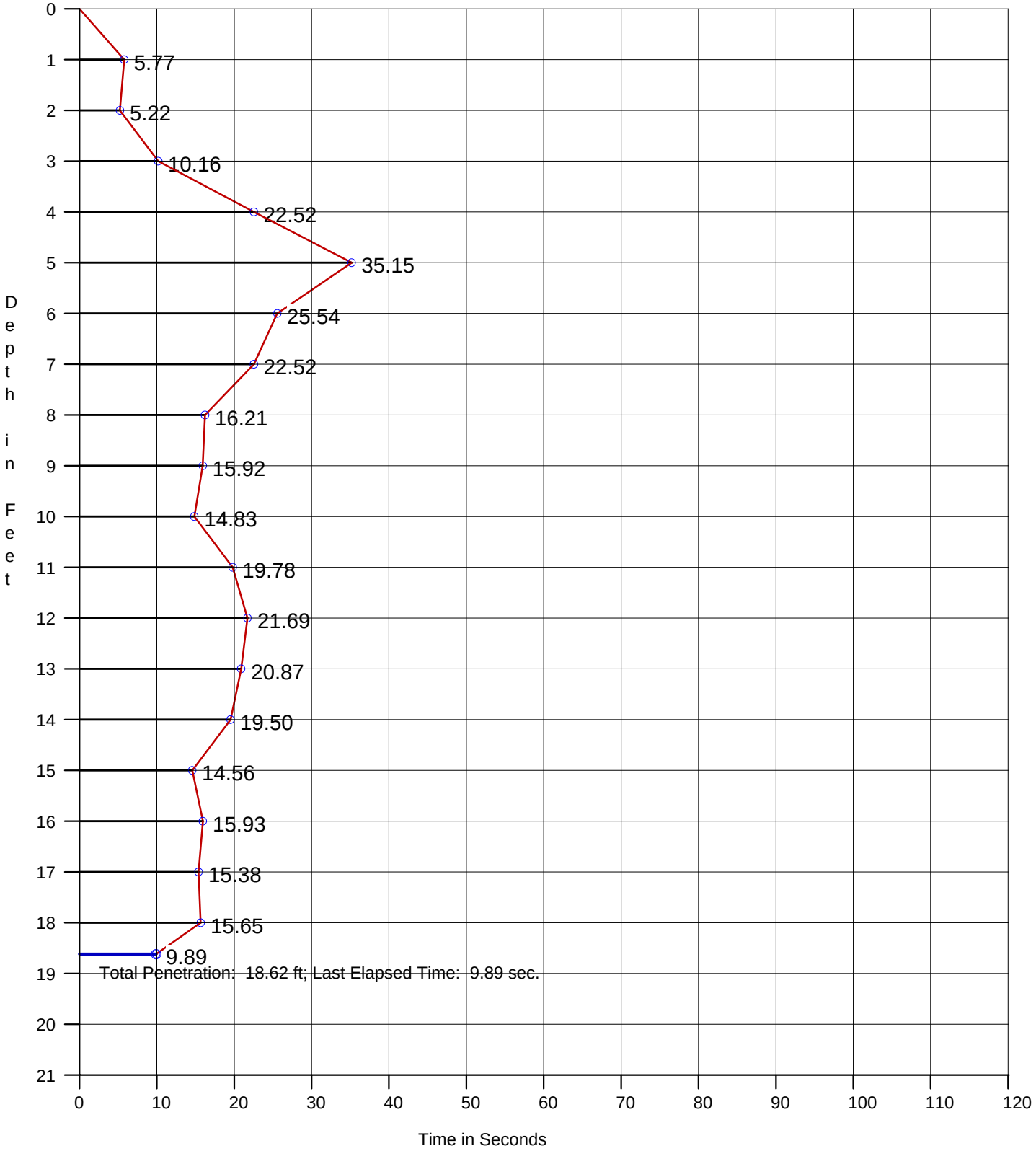
Date: 5/25/04
Start Time: 12:36:32 PM
End Time: 12:41:59 PM

Penetration: 18.62 ft
Recovery: 19.0 ft
W. D. Corrected: 0 ft
W. D. Raw: 26.7 ft

Easting: 966998.52
Northing: 782823.30
Coord. System: SP-FL East

Lat: 26 29.0507' N
Long: 080 02.9843' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. BB04-29, Run 2

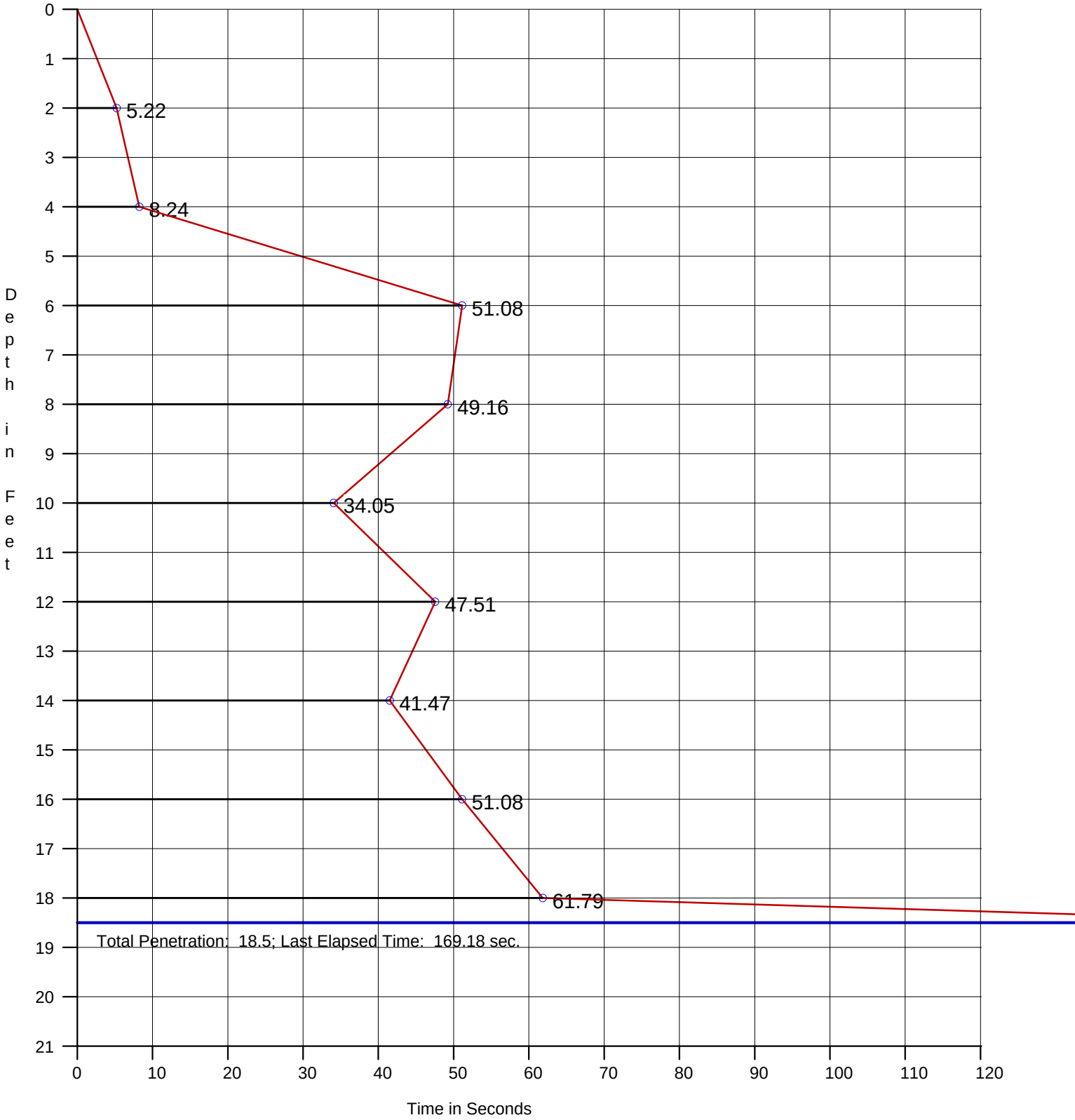
Date: 5/25/04
Start Time: 2:37:38 PM
End Time: 2:46:16 PM

Penetration: 18.50
Recovery: 19.3 ft
W. D. Corrected: 0 ft
W. D. Raw: 25.2 ft

Easting: 967130.19
Northing: 784525.54
Coord. System: SP-FL East

Lat: 26 29.3315' N
Long: 080 02.9578' W
Datum: NAD-83

Comment: New penetrometer potentiometer off by factor of 2. Penetration depths multiplied by 2 to correct.



Penetration Graph for Core No. BB04-29, Run 1

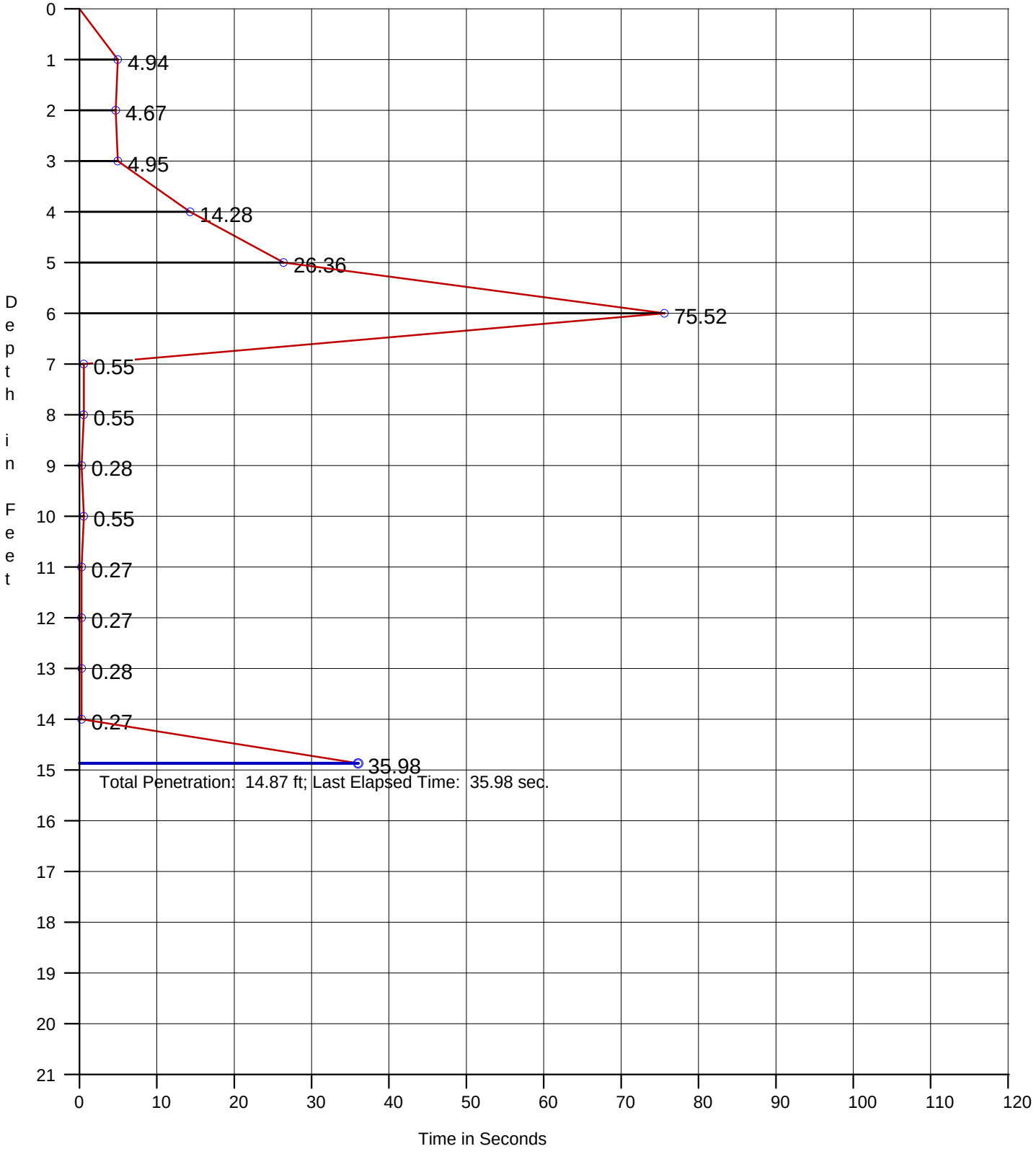
Date: 5/25/04
Start Time: 1:56:53 PM
End Time: 1:59:42 PM

Penetration: 14.87 ft
Recovery: 0
W. D. Corrected: 0 ft
W. D. Raw: 25.1 ft

Easting: 967129.55
Northing: 784588.91
Coord. System: SP-FL East

Lat: 26 29.3420' N
Long: 080 02.9578' W
Datum: NAD-83

Comment: Plug on penetrometer pot damaged. Replaced pot. No sample retained.



Penetration Graph for Core No. BB04-28, Run 1

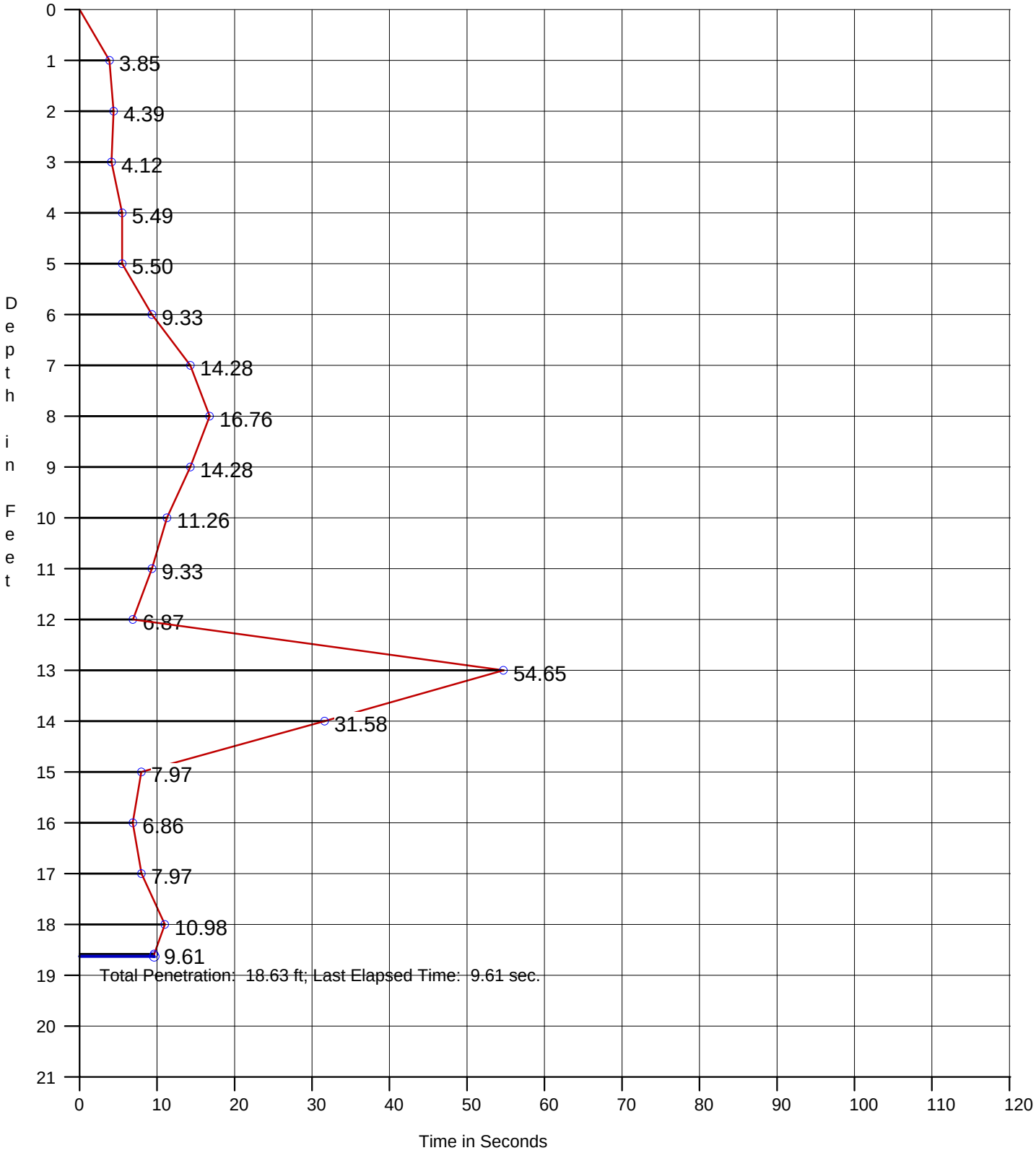
Date: 5/24/04
Start Time: 2:33:21 PM
End Time: 2:37:16 PM

Penetration: 18.63 ft
Recovery: 17.8 ft
W. D. Corrected: 0 ft
W. D. Raw: ft

Easting: 969489.98
Northing: 786430.22
Coord. System: SP-FL East

Lat: 26 29.6430' N
Long: 080 02.5224' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. BB04-27, Run 1

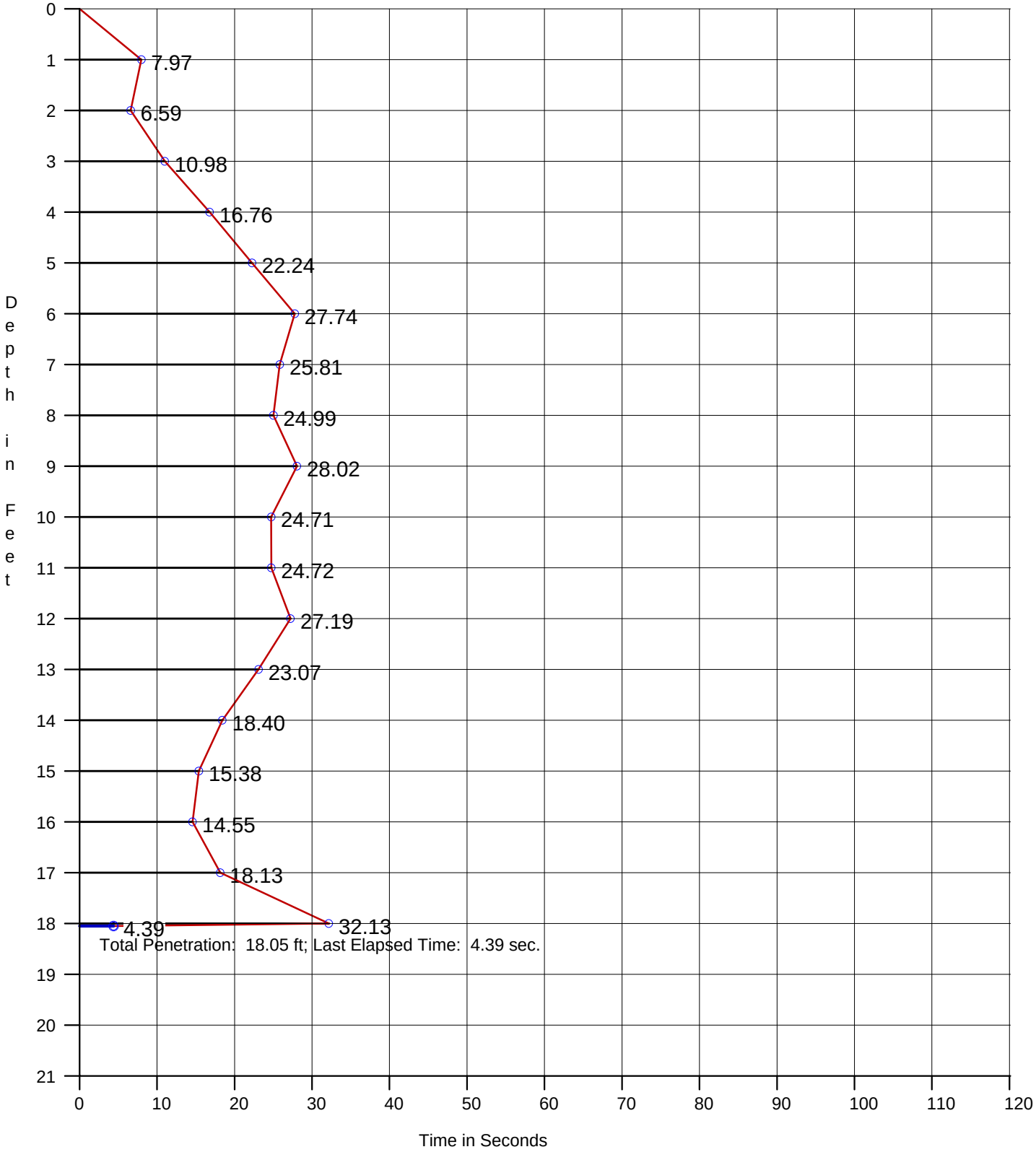
Date: 5/24/04
Start Time: 3:01:17 PM
End Time: 3:07:30 PM

Penetration: 18.05 ft
Recovery: 18.7 ft
W. D. Corrected: 0 ft
W. D. Raw: 37.1 ft

Easting: 968689.05
Northing: 786539.80
Coord. System: SP-FL East

Lat: 26 29.6620' N
Long: 080 02.6691' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. BB04-26, Run 1

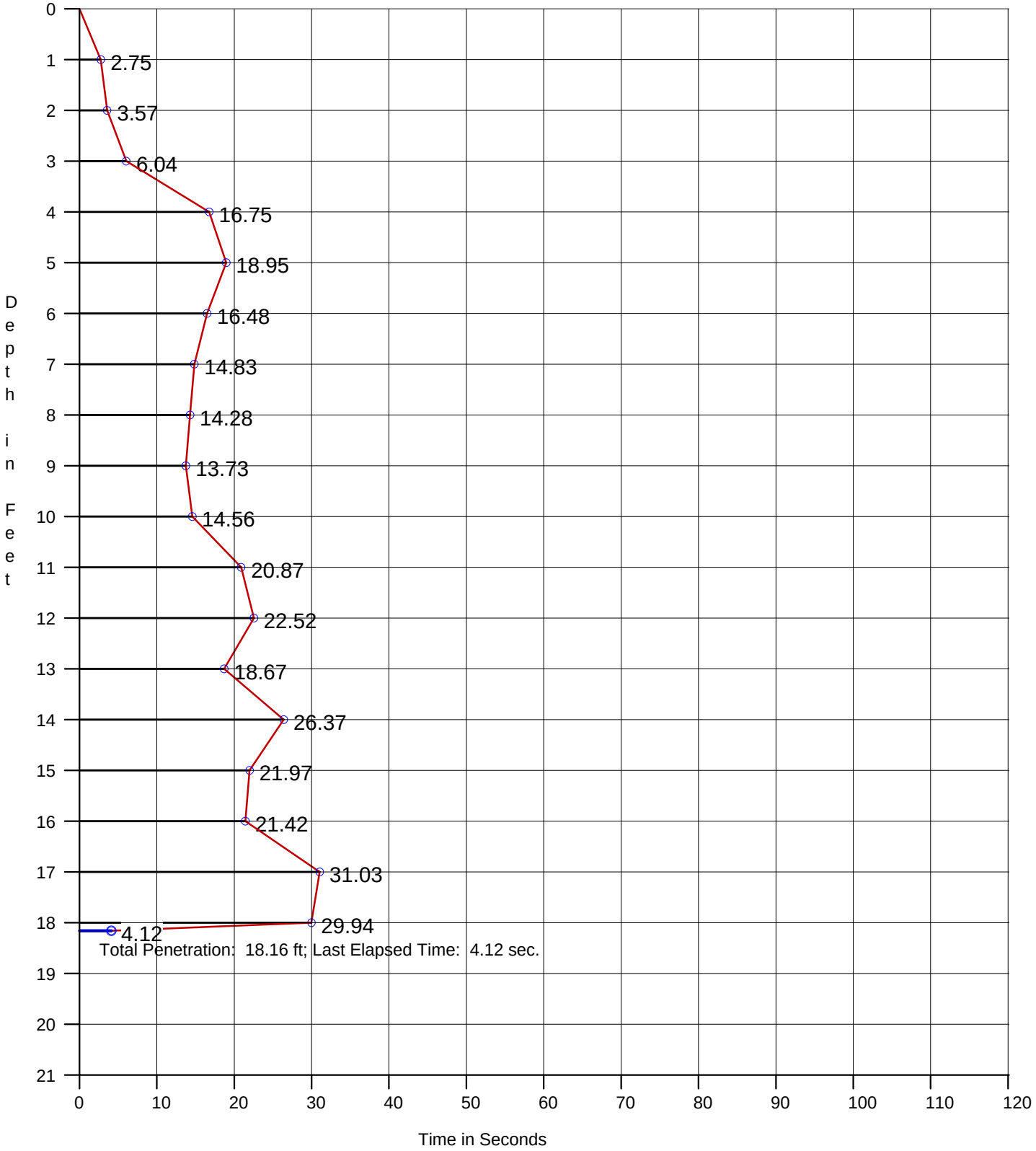
Date: 5/24/04
Start Time: 3:29:10 PM
End Time: 3:34:29 PM

Penetration: 18.16 ft
Recovery: 16.9 ft
W. D. Corrected: 0 ft
W. D. Raw: 25.2 ft

Easting: 967404.36
Northing: 786675.19
Coord. System: SP-FL East

Lat: 26 29.6860' N
Long: 080 02.9046' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. BB04-25, Run 1

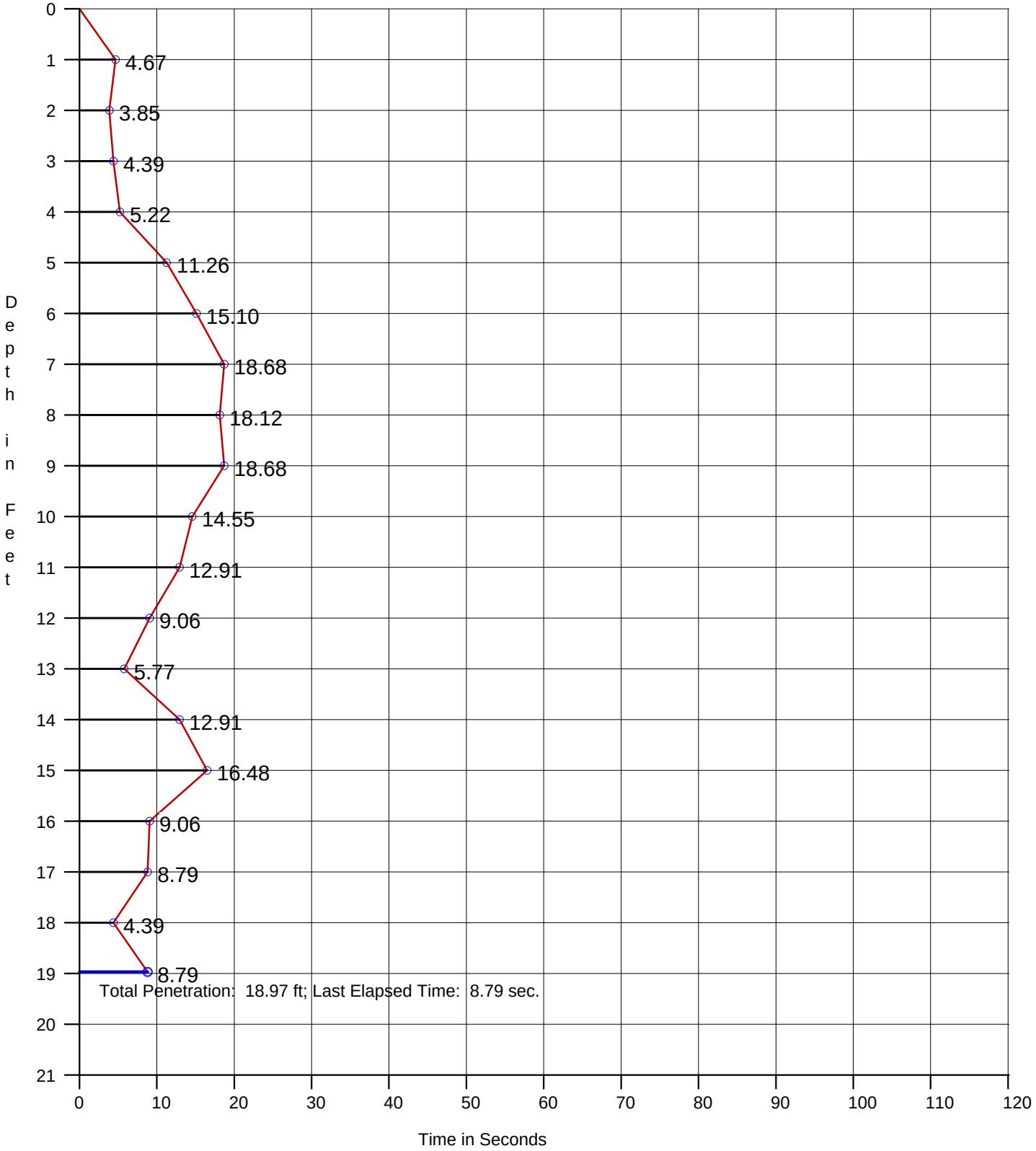
Date: 5/24/04
Start Time: 11:37:16 AM
End Time: 11:40:39 AM

Penetration: 18.97 ft
Recovery: 16.2 ft
W. D. Corrected: 0 ft
W. D. Raw: 52.7 ft

Easting: 969689.95
Northing: 788249.07
Coord. System: SP-FL East

Lat: 26 29.9429' N
Long: 080 02.4832' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. BB04-24, Run 1

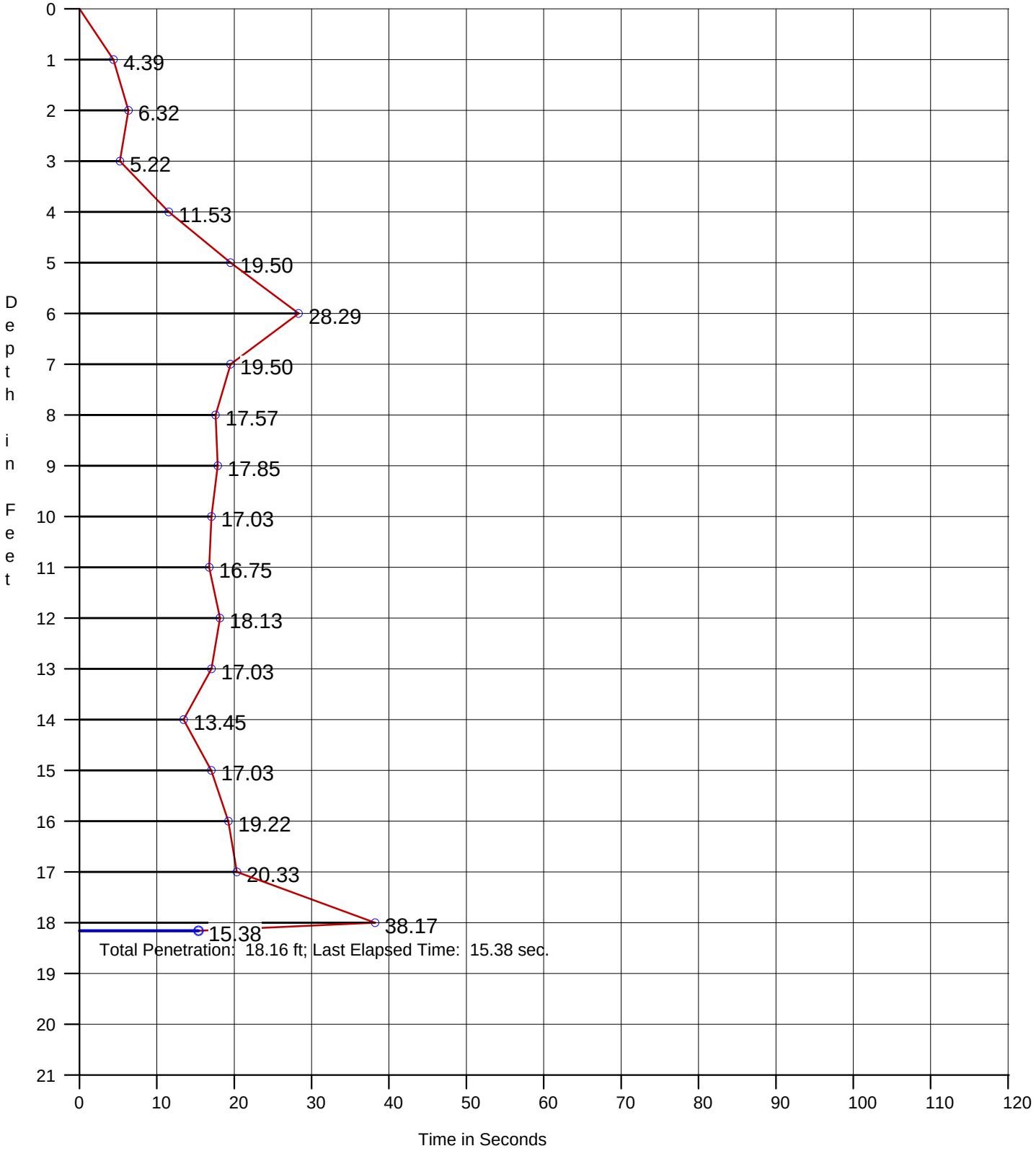
Date: 5/24/04
Start Time: 12:02:48 PM
End Time: 12:08:11 PM

Penetration: 18.16 ft
Recovery: 19.0 ft
W. D. Corrected: 0 ft
W. D. Raw: 37.4 ft

Easting: 968931.29
Northing: 788367.14
Coord. System: SP-FL East

Lat: 26 29.9633' N
Long: 080 02.6222' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. BB04-23, Run 2

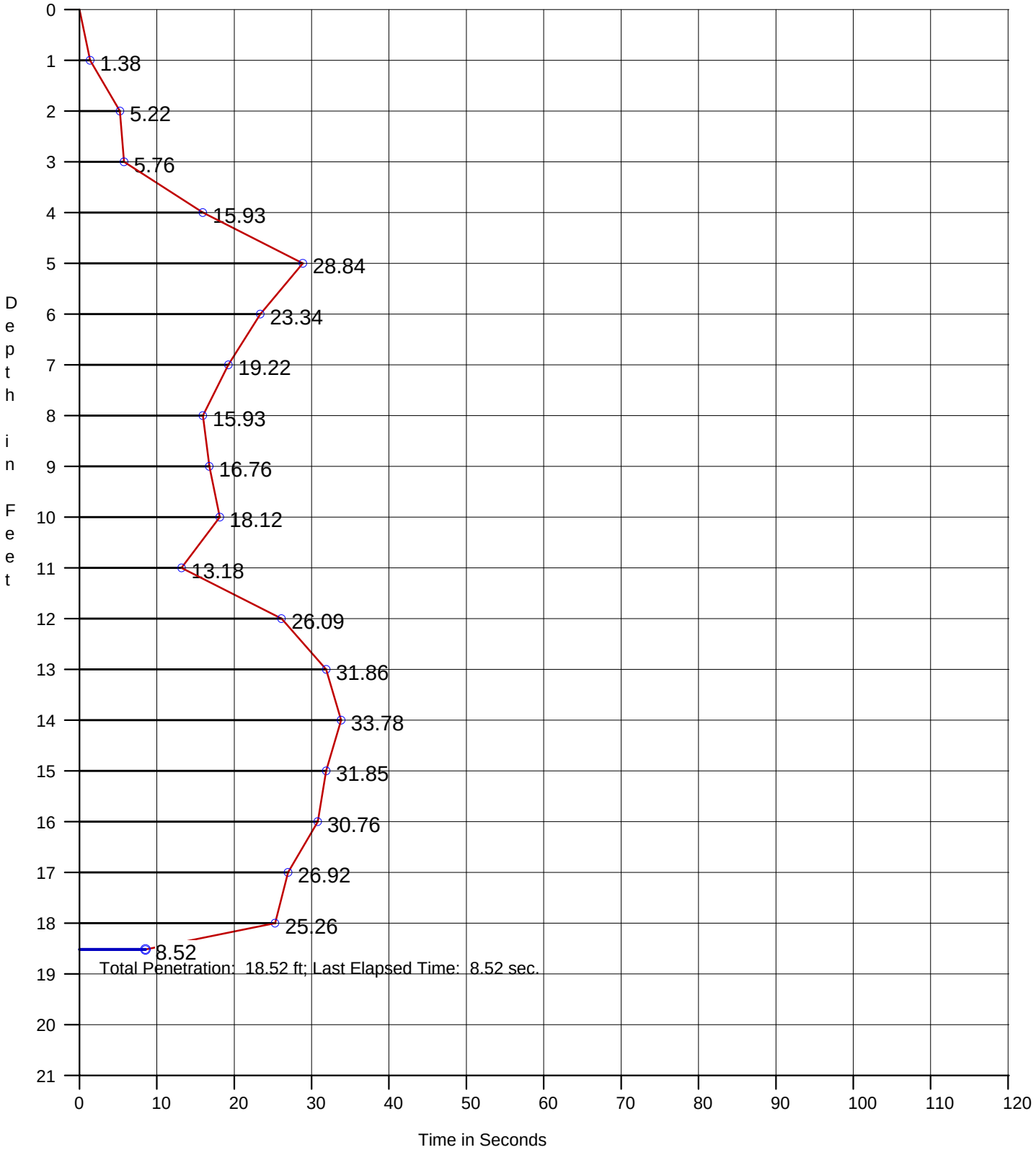
Date: 5/24/04
Start Time: 1:36:33 PM
End Time: 1:42:52 PM

Penetration: 18.52 ft
Recovery: 18.3 ft
W. D. Corrected: 0 ft
W. D. Raw: 28.2 ft

Easting: 967807.13
Northing: 788490.86
Coord. System: SP-FL East

Lat: 26 29.9851' N
Long: 080 02.8282' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. BB04-23, Run 1

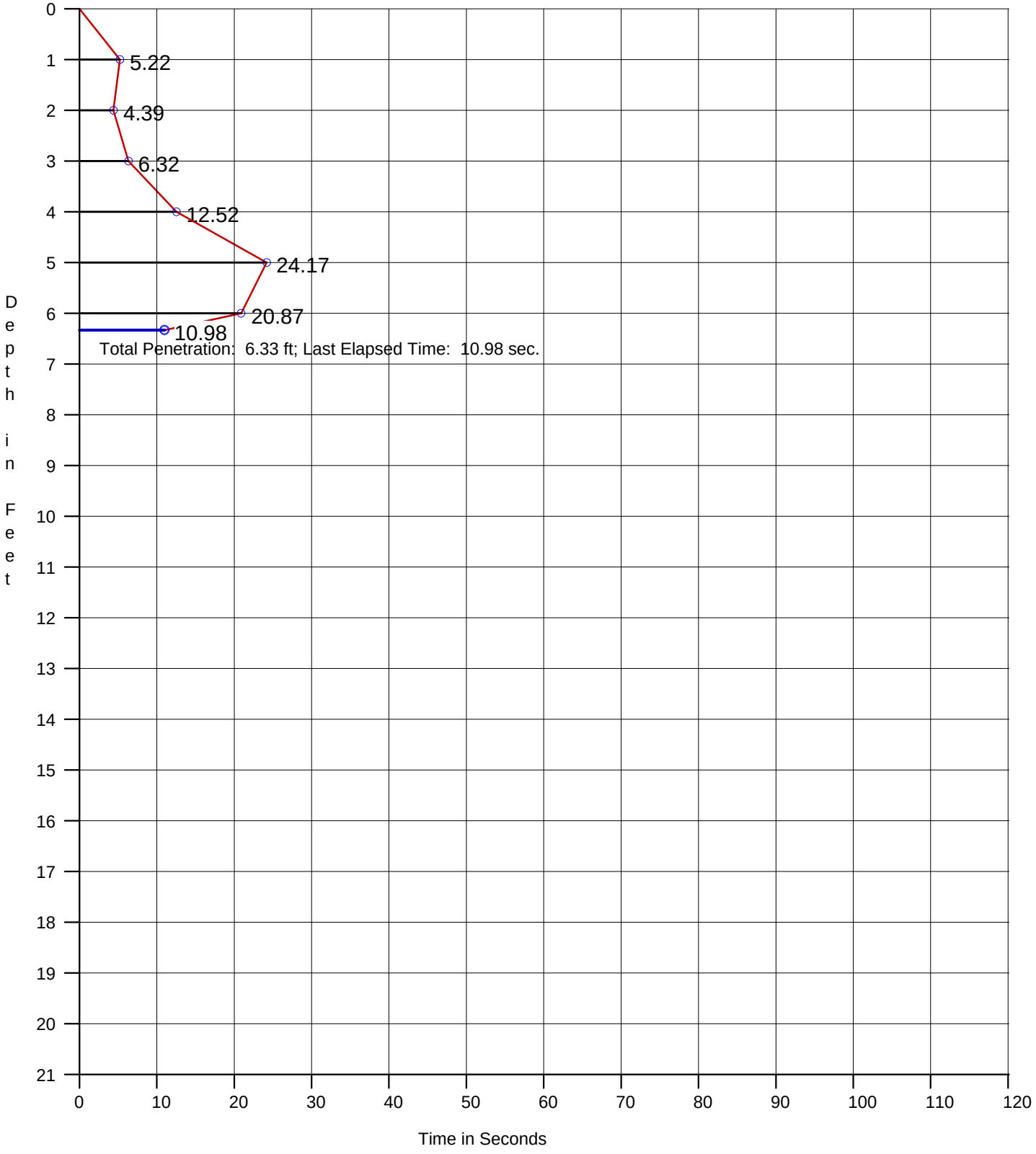
Date: 5/24/04
Start Time: 12:31:50 PM
End Time: 12:33:15 PM

Penetration: 6.33 ft
Recovery: na
W. D. Corrected: 0 ft
W. D. Raw: 27.7 ft

Easting: 967798.57
Northing: 788477.41
Coord. System: SP-FL East

Lat: 26 29.9829' N
Long: 080 02.8298' W
Datum: NAD-83

Comment: High pressure hose blew. Coring aborted. No sample retained.



Penetration Graph for Core No. BB04-22, Run 1

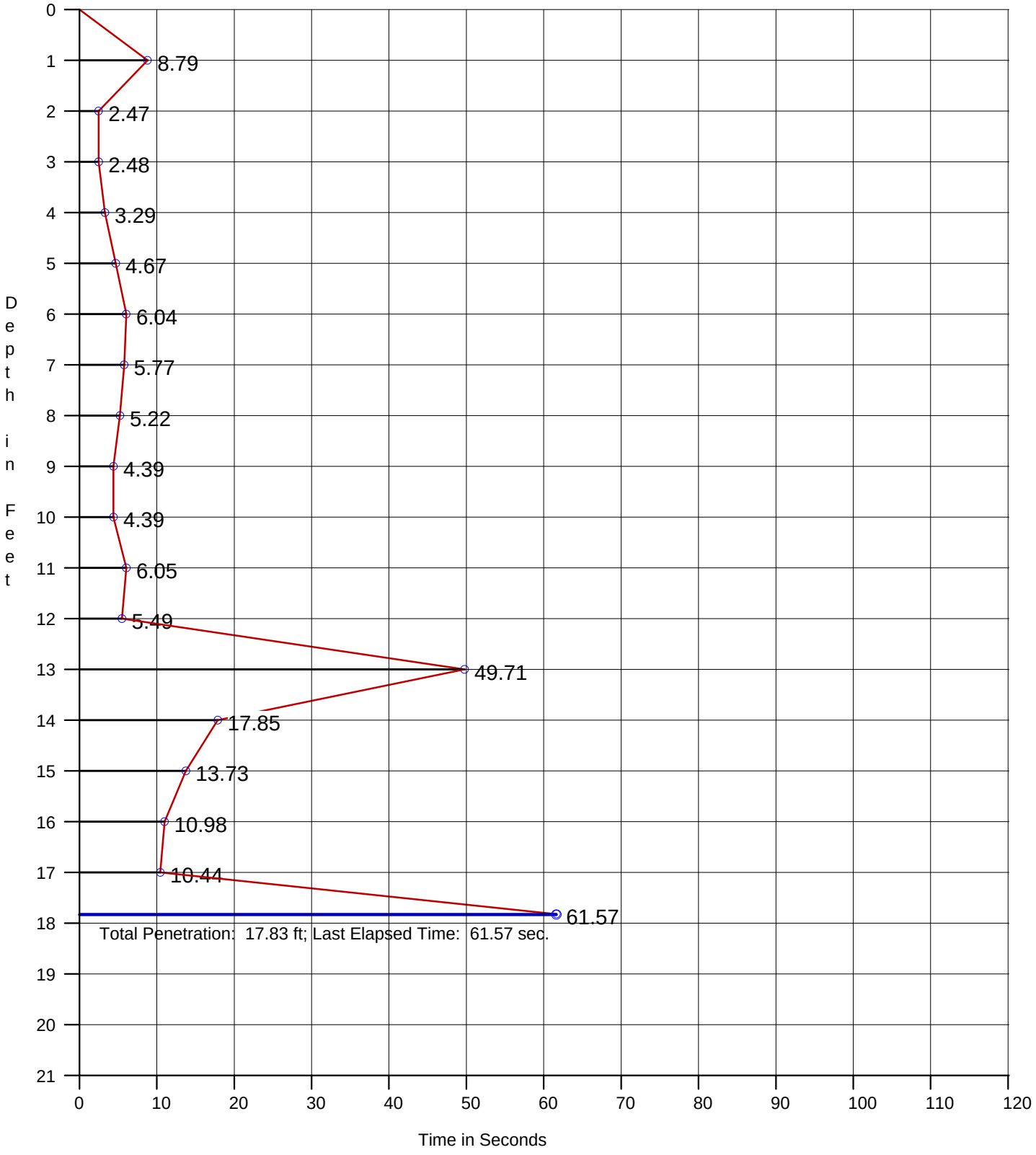
Date: 5/24/04
Start Time: 10:03:42 AM
End Time: 10:07:25 AM

Penetration: 17.83 ft
Recovery: 15.6 ft
W. D. Corrected: 0 ft
W. D. Raw: 56.4 ft

Easting: 970217.20
Northing: 790286.55
Coord. System: SP-FL East

Lat: 26 30.2786' N
Long: 080 02.3837' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. BB04-21, Run 1

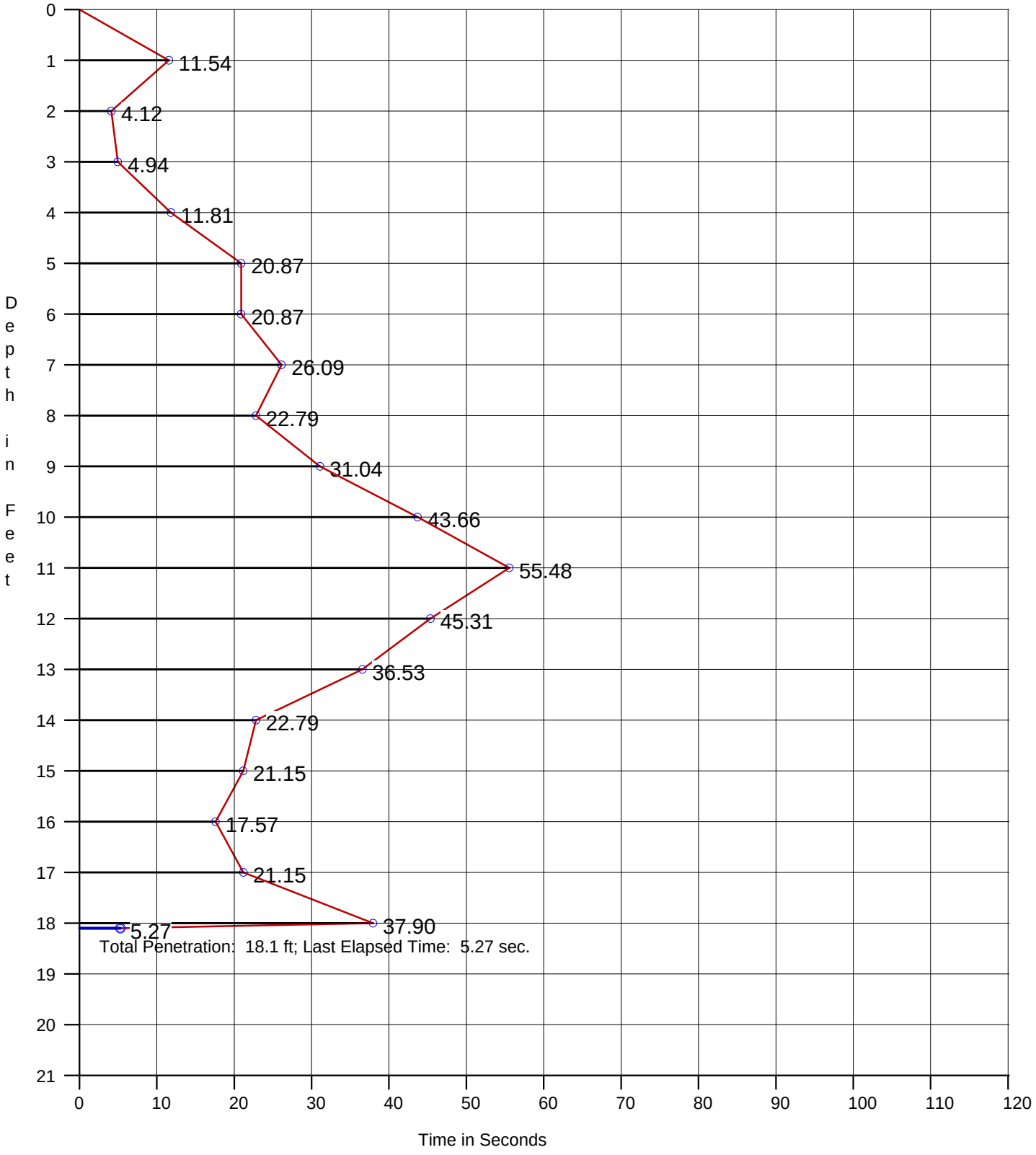
Date: 5/24/04
Start Time: 10:33:43 AM
End Time: 10:41:24 AM

Penetration: 18.10 ft
Recovery: 19.0 ft
W. D. Corrected: 0 ft
W. D. Raw: 36.9 ft

Easting: 969200.39
Northing: 790421.40
Coord. System: SP-FL East

Lat: 26 30.3021' N
Long: 080 02.5700' W
Datum: NAD-83

Comment:



Penetration Graph for Core No. BB04-20, Run 1

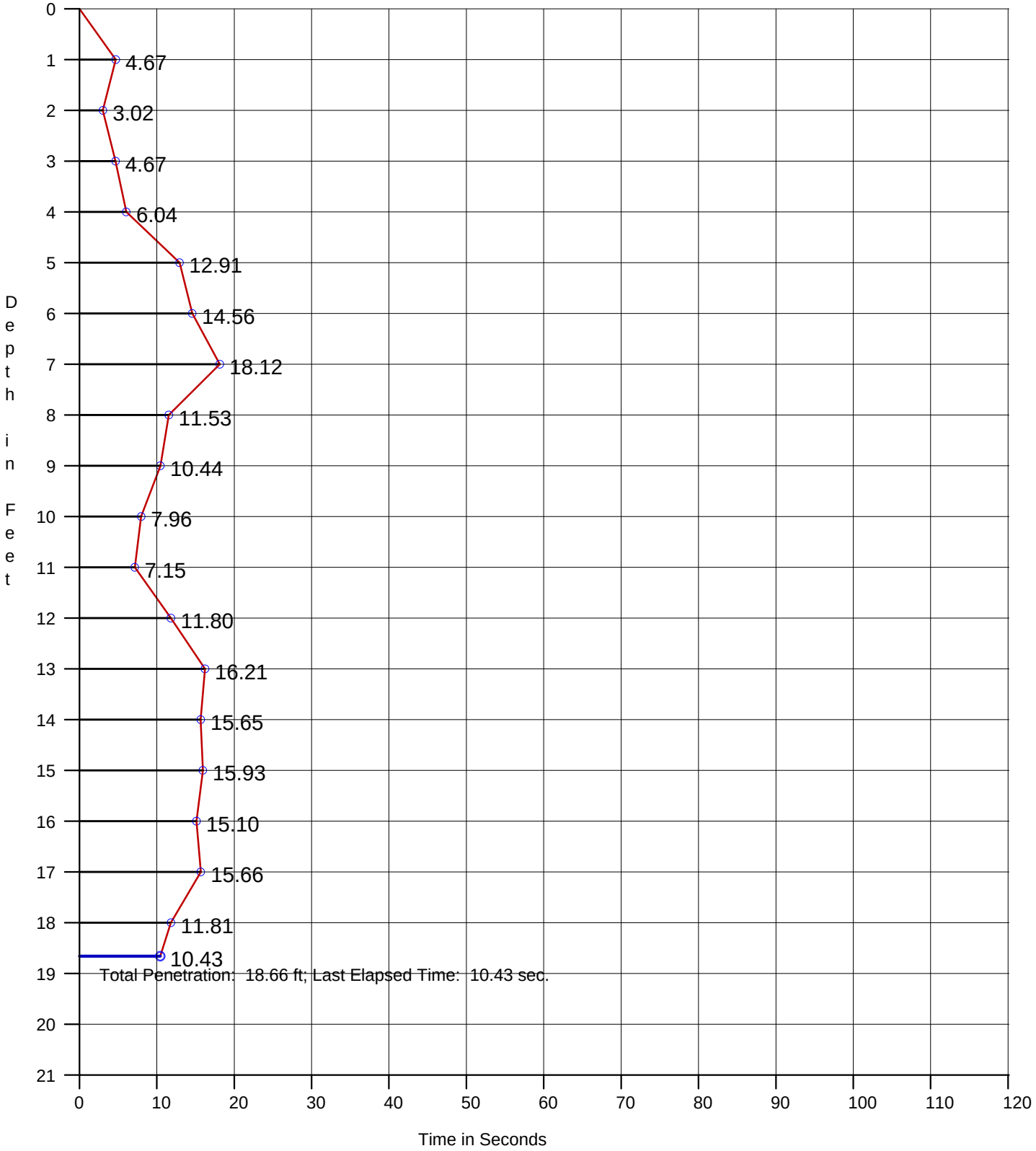
Date: 5/24/04
Start Time: 11:02:31 AM
End Time: 11:06:04 AM

Penetration: 18.66 ft
Recovery: 18.0 ft
W. D. Corrected: 0 ft
W. D. Raw: 25.9 ft

Easting: 967908.80
Northing: 790576.41
Coord. System: SP-FL East

Lat: 26 30.3292' N
Long: 080 02.8068' W
Datum: NAD-83

Comment:



Appendix: D Daily Reports

DAILY REPORT LOG

Project: Palm Beach County - #1472
Daily Report No.: 1
Date: 8-May-04
Vessel Name: R/V Atlantic Twin
Prepared By: G. Wiegman

A. VESSEL LOCATION AT MIDNIGHT

Latitude: 26º 46.440' N (Riviera Beach Municipal Marina)
Longtitude (or Location): 080º 03.048' W
Shipboard Personnel: Capt. R. Dunzelman, Capt. Beck, Wiegman, Layenbeck, M. Dunzelman, Bise, Busby. G. Zarillo (SEA)
Safety Incidents: None

B. WEATHER

			Wind (Beaufort Scale)	
Time	Barometer (mb)	Sea State (m)	Direction	Force
0600	30.14		E	3
1200	30.22		ESE	4
1800	30.17		E	3
2400	30.14		E	3

Forecast for Survey Area: Winds E 15-20, seas 4'-6'.

C. SURVEY OPERATIONS SUMMARY

# of Planned Cores	Cores Complete Last 24 Hrs.	Total Cores Taken	Cores Remaining	Comments
56	0	0	56	

D. PLANNED ACTIVITY FOR THE NEXT 24 HOURS

Begin coring at Singer Island work area.

E. ESTIMATED COMPLETION DATES

F. DAILY CHRONOLOGY OF EVENTS

VESSEL (ACTIVITIES IN LAST 24 HOURS)

Time:	Code:	Activity:
6:00	MOB	R/V Atlantic Twin mobilizing at Riviera Beach Marina.
14:00	MOB	Loaded 138 core liners.
15:30	MOB	Alpine geologist G. Wiegman embarked.
15:48	CAL	Located N.G.S. benchmark #S-402 for DGPS check.
16:20	CAL	Set up Trimble antennae. Collected 80 fixes to verify
		horizontal positioning accuracy of navigation system.
17:30	MOB	Set up and tested Hypack Max navigation and CoreLog
		penetrometer software.
18:00	MOB	Entered, previewed and plotted proposed core locations.
		Ready for coring operations.

G. OVERALL DATA TRACKING

Equipment Type	Data Roll #s	Disk #	Fix Range for Day	Cores for Day
Navigation	na	1	1-10	
Echosounder	1	1		
Vibracore	na	1		

H. DETAILED DATA TRACKING (Vibracoring)

Core Name	Penetration/ Recovery	Fix Number	Raw Depth	Graph Located on Disk Number

I. OPERATIONAL SUMMARY

Operation	Code	Today	Brought Forward	To Date
Mob/Demob	**MOB**	10.30	0.00	10.30
Transit	**TRA**	0.00	0.00	0.00
Calibration	**CAL**	1.70	0.00	1.70
Operational Vibracoring	**OVI**	0.00	0.00	0.00
Operational - Additional	**AVI**	0.00	0.00	0.00
Standby Client Request	**SVC**	0.00	0.00	0.00
Standby Weather During	**SVW**	0.00	0.00	0.00
Standby During	**SBA**	0.00	0.00	0.00
Equipment Downtime	**EQD**	0.00	0.00	0.00
Vessel Downtime	**VED**	0.00	0.00	0.00
Totals		12.00	0.00	12.00

Note: Summary reflects a 12 hour/day operation. Night time is not included in totals.

J. ALPINE'S REMARKS

K. CLIENT'S REMARKS

Signed:

Party Chief
Alpine Ocean Seismic Survey, Inc.

Client Representative

DAILY PROGRESS REPORT

Project: Palm Beach County - #1472
Daily Report No.: 2
Date: 9-May-04
Vessel Name: R/V Atlantic Twin
Prepared By: G. Wiegman

A. VESSEL LOCATION AT MIDNIGHT

Latitude: 26º 46.440' N (Riviera Beach Municipal Marina)
Longtitude (or Location): 080º 03.048' W
Shipboard Personnel: Capt. R. Dunzelman, Capt. Beck, Wiegman, Layenbeck M. Dunzelman, Bise, Busby. G. Zarillo (SEA)
Safety Incidents: None

B. WEATHER

			Wind (Beaufort Scale)	
Time	Barometer (mb)	Sea State (ft)	Direction	Force
0600	30.15	3-5	E	5
1200	30.11	3-5	E	4
1800	30.18	4-6	E	5
2400	30.14	4-6	E	4

Forecast for Survey Area: Winds E 10-15 knots, seas 3'-5'.

C. SURVEY OPERATIONS SUMMARY

# of Planned Cores	Cores Complete Last 24 Hrs.	Total Cores Taken	Cores Remaining	Comments
56	0	0	56	

D. PLANNED ACTIVITY FOR THE NEXT 24 HOURS

Begin coring at Singer Island work area.

E. ESTIMATED COMPLETION DATES

F. DAILY CHRONOLOGY OF EVENTS

VESSEL (ACTIVITIES IN LAST 24 HOURS)

Time:	Code:	Activity:
6:00	AVI	Reveille.
6:45	AVI	S.E.A. geologist Gary Zarillo embarked.
7:00	TRA	Departed marina, enroute to Singer Island work area.
7:30	TRA	Too rough to core. Winds E ~17kts., seas 3'-5'.
8:00	SBW	Alongside and secured at marina. Stand-by for weather.
8:45	SBW	S.E.A. geologist Gary Zarillo disembarked.
11:12	CAL	Established temporary dockside benchmark.
11:42	CAL	Took DGPS fix at dockside benchmark. (Fix #11)
18:00	SBW	Continued to standby for weather.

G. OVERALL DATA TRACKING

Equipment Type	Data Roll #s	Disk #	Fix Range for Day	Cores for Day
Navigation	na	1	1-10	
Echosounder	1	1		
Vibracore	na	1		

H. DETAILED DATA TRACKING (Vibracoring)

Core Name	Penetration/ Recovery	Fix Number	Raw Depth	Graph Located on Disk Number

I. OPERATIONAL SUMMARY

Operation	Code	Today	Brought Forward	To Date
Mob/Demob	**MOB**	0.00	10.30	10.30
Transit	**TRA**	1.00	0.00	1.00
Calibration	**CAL**	0.50	1.70	2.20
Operational Vibracoring	**OVI**	0.00	0.00	0.00
Operational - Additional	**AVI**	0.75	0.00	0.75
Standby Client Request	**SBC**	0.00	0.00	0.00
Standby Weather During	**SBW**	9.75	0.00	9.75
Equipment Downtime	**EQD**	0.00	0.00	0.00
Vessel Downtime	**VED**	0.00	0.00	0.00
Totals		12.00	12.00	24.00

Note: Summary reflects a 12 hour/day operation. Night time is not included in totals.

J. ALPINE'S REMARKS

K. CLIENT'S REMARKS

Signed:

Party Chief
Alpine Ocean Seismic Survey, Inc.

Client Representative

DAILY PROGRESS REPORT

Project:	Palm Beach County - #1472
Daily Report No.:	3
Date:	22-May-04
Vessel Name:	R/V Atlantic Twin
Prepared By:	G. Wiegman

A. VESSEL LOCATION AT MIDNIGHT

Latitude:	26º 46.440' N (Riviera Beach Municipal Marina)
Longtitude (or Location):	080º 03.048' W
Shipboard Personnel:	Capt. R. Dunzelman, Wiegman, Hernandez, M. Dunzelman, Bise, Eschenberg, Busby. G. Zarillo (SEA)

Safety Incidents: None

B. WEATHER

			Wind (Beaufort Scale)	
Time	Barometer (in)	Sea State (ft)	Direction	Force
0000	30.13	2-3	ENE	4
0600	30.10	2-3	E	3
1200	30.09	2-3	ESE	3
1800	30.07	2-3	E	3

Forecast for Survey Area: East winds 10-15 knots, seas 3-4 feet. Chance of a.m. showers.

C. SURVEY OPERATIONS SUMMARY

# of Planned Cores	Cores Complete Last 24 Hrs.	Total Cores Taken	Cores Remaining	Comments
56	10	0	46	

D. PLANNED ACTIVITY FOR THE NEXT 24 HOURS

Continue coring at Singer Island work area.

E. ESTIMATED COMPLETION DATES

29-May-04

F. DAILY CHRONOLOGY OF EVENTS

VESSEL (ACTIVITIES IN LAST 24 HOURS)

Time:	Code:	Activity:
06:00	AVI	Reveille.
06:20	CAL	Took DGPS fix at temporary dockside benchmark.
06:30	AVI	S.E.A. geologist Gary Zarillo embarked.
06:54	TRA	Departed marina, enroute to Singer Island work area.
07:24	CAL	Conducted Echosounde barcheck.
07:30	OVI	Set-up rig.
08:12	OVI	Collected core SI04-17.
08:30	EQD	Head wire rope wrapped in head. Freed.
09:30	OVI	Repairs completed.
10:21	OVI	Collected core SI04-16.
10:30	EQD	Changed and tested faulty penetrometer pot.
10:58	OVI	Collected core SI04-19.
11:00	EQD	High pressure air hose blew.
11:30	OVI	Air hose spliced.
12:07	OVI	Collected core SI04-18.
13:17	OVI	Collected core SI04-09.
13:48	OVI	Collected core SI04-07.
14:18	OVI	Collected core SI04-06.
14:50	OVI	Collected core SI04-05.
15:19	OVI	Collected core SI04-03.
15:24	EQD	Penetrometer cable parted during rig retrieval.
15:36	OVI	Cable replaced with spare.
16:12	OVI	Collected core SI04-02.
16:36	OVI	Secured rig on deck.
16:48	TRA	Transitted to marina.
17:30	TRA	Alongside and secured at marina
17:36	CAL	Took DGPS fix at temporary dockside benchmark.
18:00	AVI	S.E.A. geologist G. Zarillo disembarked.

G. DATA TRACKING

Equipment Type	Data Roll #s	Disk #	Fix Range for Day	Cores for Day
Navigation	na	1	27-70	na
Echosounder	1	1	39-63	na
Vibracore	na	1	39-63	10

H. DETAILED VIBRACORE DATA

Core Name	Fix #	Raw Depth (ft)	Penetration (ft)	Recovery (ft)
SI04-17	39	52.6	13.01	13.5
SI04-16	41	30.2	4.54*	16.6
SI04-19	43	51.1	16.93	18.3
SI04-18	45	31.7	19.15	17.9
SI04-09	51	58.5	18.91	16.6
SI04-07	53	51.5	19.16	18.7
SI04-06	55	64.0	18.68	20.0
SI04-05	59	51.9	18.94	19.2
SI04-03	61	60.7	18.68	20.0
SI04-02	63	56.9	19.47	17.0

I. OPERATIONAL SUMMARY

Operation	Code	Today	Brought Forward	To Date
Mob/Demob	**MOB**	0.00	10.30	10.30
Transit	**TRA**	1.20	1.00	2.20
Calibration	**CAL**	0.35	2.20	2.55
Operational Vibracoring	**OVI**	7.15	0.00	7.15
Operational - Additional	**AVI**	1.10	0.75	1.85
Standby Client Request	**SBC**	0.00	0.00	0.00
Standby Weather During	**SBW**	0.00	153.75	153.75
Equipment Downtime	**EQD**	2.20	0.00	2.20
Vessel Downtime	**VED**	0.00	0.00	0.00
Totals		12.00	0.00	180.00

Note: Summary reflects a 12 hour/day operation. Night time is not included in totals.

J. ALPINE'S REMARKS

* Penetrometer data for vibracore SI04-16 indicated only 4.54 ft. However due to excellent water clarity, the vibracore head was observed to have traveled at least 15 feet down the vibracore tower. 16.6 feet of sample was recovered. The penetrometer pot was replaced with a spare and tested.

K. CLIENT'S REMARKS

Signed:

Party Chief
Alpine Ocean Seismic Survey, Inc.

Client Representative

DAILY PROGRESS REPORT

Project:	Palm Beach County - #1472
Daily Report No.:	4
Date:	23-May-04
Vessel Name:	R/V Atlantic Twin
Prepared By:	G. Wiegman

A. VESSEL LOCATION AT MIDNIGHT

Latitude:	26º 46.440' N (Riviera Beach Municipal Marina)
Longtitude (or Location):	080º 03.048' W
Shipboard Personnel:	Capt. R. Dunzelman, Wiegman, Hernandez, M. Dunzelman, Bise, Eschenberg, Busby. G. Zarillo (SEA)

Safety Incidents: None

B. WEATHER

			Wind (Beaufort Scale)	
Time	Barometer (in)	Sea State (ft)	Direction	Force
0000	30.07	2-3	ESE	4
0600	30.05	3-4	ESE	4
1200	30.10	2-3	ESE	3
1800	30.05	2-3	E	3

Forecast for Survey Area: East winds 10 knots, seas 2 feet.

C. SURVEY OPERATIONS SUMMARY

# of Planned Cores	Cores Complete Last 24 Hrs.	Total Cores Taken	Cores Remaining	Comments
56	9	19	37	

D. PLANNED ACTIVITY FOR THE NEXT 24 HOURS

Depending on sea conditions, begin coring at one of the two southern work areas.

E. ESTIMATED COMPLETION DATES

29-May-04

F. DAILY CHRONOLOGY OF EVENTS

VESSEL (ACTIVITIES IN LAST 24 HOURS)

Time:	Code:	Activity:
0600	AVI	Reveille.
0630	CAL	Took DGPS fix at temporary dockside benchmark.
0645	AVI	S.E.A. geologist Gary Zarillo embarked.
0715	TRA	Departed marina, enroute to Singer Island work area.
0742	CAL	Conducted Echosounder barcheck.
0754	OVI	Set-up rig.
0826	OVI	Collected core SI04-15.
0910	EQD	Penetrometer cable bungee snapped. Core aborted.
0922	OVI	Cable reattached.
0933	OVI	Collected core SI04-14.
1001	OVI	Collected core SI04-13.
1029	OVI	Collected core SI04-12.
1123	OVI	Collected core SI04-10.
1254	OVI	Collected core SI04-11.
1318	EQD	Re-welded safety plate over vibracore head bolts.
1336	OVI	Welding completed.
1357	OVI	Collected core SI04-08.
1442	OVI	Collected core SI04-04.
1523	OVI	Collected core SI04-01.
1542	OVI	Secured rig on deck.
1548	TRA	Transitted to marina.
1648	TRA	Alongside and secured at marina
1654	CAL	Took DGPS fix at temporary dockside benchmark.
1730	AVI	S.E.A. geologist G. Zarillo disembarked.

G. DATA TRACKING

Equipment Type	Data Roll #s	Disk #	Fix Range for Day	Cores for Day
Navigation	na	1	71-105	na
Echosounder	1	1	76-98	na
Vibracore	na	1	76-98	9

H. DETAILED VIBRACORE DATA

Core Name	Fix #	Raw Depth (ft)	Penetration (ft)	Recovery (ft)
SI04-15	76	46.0	15.49	16.2
SI04-14	80	26.8	18.50	18.5
SI04-13	82	49.5	9.83	10.6
SI04-12	88	27.4	18.87	18.0
SI04-10	90	55.5	18.45	18.7
SI04-11	92	34.1	18.86	18.3
SI04-08	94	31.9	16.46	16.9
SI04-04	96	22.7	18.34	14.7
SI04-01	98	25.6	18.51	14.6

I. OPERATIONAL SUMMARY

Operation	Code	Today	Brought Forward	To Date
Mob/Demob	**MOB**	0.00	10.30	10.30
Transit	**TRA**	1.45	2.20	3.65
Calibration	**CAL**	0.45	2.55	3.00
Operational Vibracoring	**OVI**	7.40	7.15	14.55
Operational - Additional	**AVI**	2.20	1.85	4.05
Standby Client Request	**SBC**	0.00	0.00	0.00
Standby Weather During	**SBW**	0.00	153.75	153.75
Equipment Downtime	**EQD**	0.50	2.20	2.70
Vessel Downtime	**VED**	0.00	0.00	0.00
Totals		12.00	180.00	192.00

Note: Summary reflects a 12 hour/day operation. Night time is not included in totals.

J. ALPINE'S REMARKS

K. CLIENT'S REMARKS

Signed:

Party Chief
Alpine Ocean Seismic Survey, Inc.

Client Representative

DAILY PROGRESS REPORT

Project:	Palm Beach County - #1472
Daily Report No.:	8
Date:	27-May-04
Vessel Name:	R/V Atlantic Twin
Prepared By:	G. Wiegman

A. VESSEL LOCATION AT MIDNIGHT

Latitude:	26º 46.440' N (Riviera Beach Municipal Marina)
Longtitude (or Location):	080º 03.048' W
Shipboard Personnel:	Capt. R. Dunzelman, Capt. Beck, Wiegman, Hernandez, M. Dunzelman, Bise, Busby. G. Zarillo (SEA)

Safety Incidents: None

B. WEATHER

			Wind (Beaufort Scale)	
Time	Barometer (in)	Sea State (ft)	Direction	Force
0000				
0600				
1200				
1800				

Forecast for Survey Area: South winds 10 knots, becoming SE. Seas less than 2 feet.

C. SURVEY OPERATIONS SUMMARY

# of Planned Cores	Cores Complete Last 24 Hrs.	Total Cores Taken	Cores Remaining	Comments
56	5	56	0	

D. PLANNED ACTIVITY FOR THE NEXT 24 HOURS

Coring operations completed 27-May-04.

E. ESTIMATED COMPLETION DATES

27-May-04

F. DAILY CHRONOLOGY OF EVENTS

VESSEL (ACTIVITIES IN LAST 24 HOURS)

Time:	Code:	Activity:
0600	AVI	Reveille.
0648	CAL	Conducted Echosounder barcheck.
0700	OVI	Weighed anchor and prepared for coring.
0754	OVI	Collected core HB04-43 R1.
0836	EQD	Repaired jet hose connection.
0855	OVI	Collected core HB04-43 R2.
0920	OVI	Collected core HB04-42.
0956	OVI	Collected core HB04-38.
1025	OVI	Collected core HB04-39.
1056	OVI	Collected core HB04-40 R1.
1130	OVI	Collected core HB04-40 R2.
1148	OVI	End of coring project. Secured rig on deck.
1200	TRA	Transitted to marina.
	TRA	Alongside & secured, Riviera Beach Municipal Marina.
	CAL	Took p.m. DGPS fix at temporary dockside benchmark.
	MOB	Began demobilization.
	MOB	S.E.A. geologist G. Zarillo disembarked.

G. DATA TRACKING

Equipment Type	Data Roll #s	Disk #	Fix Range for Day	Cores for Day
Navigation	na	1	211-	na
Echosounder	1	1	212-219	na
Vibracore	na	1	212-219	5

H. DETAILED VIBRACORE DATA

Core Name	Fix #	Raw Depth (ft)	Penetration (ft)	Recovery (ft)
HB04-43 R1	211	64.4	18.74	12.4
HB04-43 R2	212	64.1	20.00	7.8
HB04-42	214	40.6	19.20	18.0
HB04-38	215	28.4	19.24	17.8
HB04-39	216	38.7	19.20	18.5
HB04-40 R1	219	66.8	18.50	11.8
HB04-40 R2	220	65.6	20.00	8.8

I. OPERATIONAL SUMMARY

Operation	Code	Today	Brought Forward	To Date
Mob/Demob	**MOB**	0.00	10.30	10.30
Transit	**TRA**	0.00	15.85	15.85
Calibration	**CAL**	0.30	3.80	4.10
Operational Vibracoring	**OVI**	4.50	36.05	40.55
Operational - Additional	**AVI**	0.80	5.05	5.85
Standby Client Request	**SBC**	0.00	0.00	0.00
Standby Weather During	**SBW**	0.00	153.75	153.75
Equipment Downtime	**EQD**	0.30	3.20	3.50
Vessel Downtime	**VED**	0.00	0.00	0.00
Totals		5.90	228.00	233.90

Note: Summary reflects a 12 hour/day operation. Night time is not included in totals.

J. ALPINE'S REMARKS

K. CLIENT'S REMARKS

Signed:

Party Chief
Alpine Ocean Seismic Survey, Inc.

Client Representative

DAILY PROGRESS REPORT

Project:	Palm Beach County - #1472
Daily Report No.:	7
Date:	26-May-04
Vessel Name:	R/V Atlantic Twin
Prepared By:	G. Wiegman

A. VESSEL LOCATION AT MIDNIGHT

Latitude:	26º 25.464' N
Longtitude (or Location):	080º 03.000' W (Highland Beach work area)
Shipboard Personnel:	Capt. R. Dunzelman, Capt. Beck, Wiegman, Hernandez, M. Dunzelman, Bise, Busby. G. Zarillo (SEA)

Safety Incidents: None

B. WEATHER

			Wind (Beaufort Scale)	
Time	Barometer (in)	Sea State (ft)	Direction	Force
0000	30.06	2-3	E	3
0600	30.03	<2	W	2
1200	30.08	<2	ESE	3
1800	30.01	<2	SE	3

Forecast for Survey Area:

C. SURVEY OPERATIONS SUMMARY

# of Planned Cores	Cores Complete Last 24 Hrs.	Total Cores Taken	Cores Remaining	Comments
56	14	51	5	

D. PLANNED ACTIVITY FOR THE NEXT 24 HOURS

Complete coring at Highland Beach work area.

E. ESTIMATED COMPLETION DATES

27-May-04

F. DAILY CHRONOLOGY OF EVENTS

VESSEL (ACTIVITIES IN LAST 24 HOURS)

Time:	Code:	Activity:
0500	AVI	Reveille.
0524	CAL	Took DGPS fix at temporary dockside benchmark.
0530	AVI	G. Zarillo embarked.
0545	TRA	Departed marina, enroute to Highland Beach work area.
0906	CAL	Conducted Echosounder barcheck.
0912	OVI	Set-up rig.
0927	OVI	Collected core HB04-56
0956	OVI	Collected core HB04-55.
1017	OVI	Collected core HB04-53.
1047	OVI	Collected core HB04-54.
1113	OVI	Collected core HB04-52.
1140	OVI	Collected core HB04-51.
1202	OVI	Collected core HB04-50 R1.
1318	OVI	Collected core HB04-50 R2.
1348	OVI	Collected core HB04-47.
1423	OVI	Collected core HB04-48.
1503	OVI	Collected core HB04-49.
1536	OVI	Collected core HB04-46.
1602	OVI	Collected core HB04-45.
1646	OVI	Collected core HB04-44.
1713	OVI	Collected core HB04-41.
1730	OVI	Secured rig on deck.
1742	TRA	Anchored at H.B. work area. 26º25.46'N, 080º 03.00'W.

G. DATA TRACKING

Equipment Type	Data Roll #s	Disk #	Fix Range for Day	Cores for Day
Navigation	na	1	170-210	na
Echosounder	1	1	178-206	na
Vibracore	na	1	178-206	14

H. DETAILED VIBRACORE DATA

Core Name	Fix #	Raw Depth (ft)	Penetration (ft)	Recovery (ft)
HB04-56	178	53.3	17.78	17.8
HB04-55	180	33.9	18.86	16.9
HB04-53	182	34.7	18.54	18.4
HB04-54	184	54.4	19.14	20.0
HB04-52	186	58.4	19.50	16.9
HB04-51	188	42.0	19.44	16.9
HB04-50 R1	190	31.2	18.78	14.2
HB04-50 R2	192	32.1	19.48	17.8
HB04-47	194	31.9	19.28	18.2
HB04-48	196	41.2	18.64	16.7
HB04-49	198	58.0	18.72	18.7
HB04-46	200	60.6	19.08	16.6
HB04-45	202	40.0	18.92	17.4
HB04-44	204	30.6	18.54	18.0
HB04-41	206	29.8	18.56	17.8

I. OPERATIONAL SUMMARY

Operation	Code	Today	Brought Forward	To Date
Mob/Demob	**MOB**	0.00	10.30	10.30
Transit	**TRA**	3.30	12.55	15.85
Calibration	**CAL**	0.20	3.60	3.80
Operational Vibracoring	**OVI**	8.50	27.55	36.05
Operational - Additional	**AVI**	0.00	5.05	5.05
Standby Client Request	**SBC**	0.00	0.00	0.00
Standby Weather During	**SBW**	0.00	153.75	153.75
Equipment Downtime	**EQD**	0.00	3.20	3.20
Vessel Downtime	**VED**	0.00	0.00	0.00
Totals		12.00	216.00	228.00

Note: Summary reflects a 12 hour/day operation. Night time is not included in totals.

J. ALPINE'S REMARKS

K. CLIENT'S REMARKS

Signed:

Party Chief
Alpine Ocean Seismic Survey, Inc.

Client Representative

DAILY PROGRESS REPORT

Project: Palm Beach County - #1472
Daily Report No.: 6
Date: 25-May-04
Vessel Name: R/V Atlantic Twin
Prepared By: G. Wiegman

A. VESSEL LOCATION AT MIDNIGHT

Latitude: 26º 46.440' N (Riviera Beach Municipal Marina)
Longtitude (or Location): 080º 03.048' W
Shipboard Personnel: Capt. R. Dunzelman, Capt. Beck, Wiegman, Hernandez, M. Dunzelman, Bise, Busby. G. Zarillo (SEA)
Safety Incidents: None

B. WEATHER

			Wind (Beaufort Scale)	
Time	Barometer (in)	Sea State (ft)	Direction	Force
0000	30.04	2-3	ENE	4
0600	29.99	2-3	E	2
1200	30.06	2-3	NE	3
1800	30.02	2-3	NE	3

Forecast for Survey Area: Southeast winds 5-10 knots. Seas <2 feet.

C. SURVEY OPERATIONS SUMMARY

# of Planned Cores	Cores Complete Last 24 Hrs.	Total Cores Taken	Cores Remaining	Comments
56	9	37	19	

D. PLANNED ACTIVITY FOR THE NEXT 24 HOURS

Begin coring at Highland Beach work area.

E. ESTIMATED COMPLETION DATES

28-May-04

F. DAILY CHRONOLOGY OF EVENTS

VESSEL (ACTIVITIES IN LAST 24 HOURS)

Time:	Code:	Activity:
0600	AVI	Reveille.
0630	CAL	Took DGPS fix at temporary dockside benchmark.
0645	AVI	G. Zarillo embarked.
0654	TRA	Departed marina, enroute to Briny Breezes work area.
0918	CAL	Conducted Echosounder barcheck.
0924	OVI	Set-up rig.
0938	OVI	Collected core BB04-34.
1004	OVI	Collected core BB04-33 R1.
1040	OVI	Collected core BB04-33 R2.
1105	OVI	Collected core BB04-32.
1135	OVI	Collected core BB04-31.
1202	OVI	Collected core BB04-35.
1236	OVI	Collected core BB04-30.
1356	OVI	Collected core BB04-29 R1.
1412	EQD	Plug on penetrometer pot damaged. Replaced pot.
1437	OVI	Collected core BB04-29 R2.
1513	OVI	Collected core BB04-36.
1530	OVI	Penetrometer counter off by factor of 2. Reset counter.*
1548	OVI	Collected core BB04-37. End of coring - Briny Breezes.
1600	OVI	Secured rig on deck.
1612	TRA	Transitted to marina.
1818	TRA	Alongside and secured at marina
1824	CAL	Took DGPS fix at temporary dockside benchmark.
1830	CAL	S.E.A. geologist G. Zarillo disembarked.
* See Section J		

G. DATA TRACKING

Equipment Type	Data Roll #s	Disk #	Fix Range for Day	Cores for Day
Navigation	na	1	140-169	na
Echosounder	1	1	144-164	na
Vibracore	na	1	144-164	9

H. DETAILED VIBRACORE DATA

Core Name	Fix #	Raw Depth (ft)	Penetration (ft)	Recovery (ft)
BB04-34	144	49.8	18.42	19.1
BB04-33 R1	146	32.9	15.88	14.1
BB04-33 R2	148	33.9	14.23	6.1
BB04-32	150	25.4	18.46	19.1
BB04-31	152	54.7	18.80	17.4
BB04-35	154	35.9	18.07	15.4
BB04-30	156	26.7	18.62	19.0
BB04-29 R1	158	25.1	14.87	0.0
BB04-29 R2	160	25.2	18.50*	19.3
BB04-36	162	35.2	19.96*	18.8
BB04-37	164	55.9	18.18	14.9
* See Section J				

I. OPERATIONAL SUMMARY

Operation	Code	Today	Brought Forward	To Date
Mob/Demob	**MOB**	0.00	10.30	10.30
Transit	**TRA**	4.50	8.05	12.55
Calibration	**CAL**	0.30	3.30	3.60
Operational Vibracoring	**OVI**	6.60	20.95	27.55
Operational - Additional	**AVI**	0.30	4.75	5.05
Standby Client Request	**SBC**	0.00	0.00	0.00
Standby Weather During	**SBW**	0.00	153.75	153.75
Equipment Downtime	**EQD**	0.30	2.90	3.20
Vessel Downtime	**VED**	0.00	0.00	0.00
Totals		12.00	204.00	216.00

Note: Summary reflects a 12 hour/day operation. Night time is not included in totals.

J. ALPINE'S REMARKS

* The spare penetrometer potentiometer which was installed at 1412 read 9.25' and 9.48' for cores BB04-29 R2 and BB04-36, respectively. Sample recoveries of 19.3' and 18.8' indicated that the potentiometer was off by a factor of 0.5. The penetrometer counter was recalibrated and penetration values for these two cores were multiplied by a factor of 2 to account for the offset.

K. CLIENT'S REMARKS

Signed:

Party Chief
Alpine Ocean Seismic Survey, Inc.

Client Representative

DAILY PROGRESS REPORT

Project: Palm Beach County - #1472
Daily Report No.: 6
Date: 25-May-04
Vessel Name: R/V Atlantic Twin
Prepared By: G. Wiegman

A. VESSEL LOCATION AT MIDNIGHT

Latitude: 26º 46.440' N (Riviera Beach Municipal Marina)
Longtitude (or Location): 080º 03.048' W
Shipboard Personnel: Capt. R. Dunzelman, Capt. Beck, Wiegman, Hernandez, M. Dunzelman, Bise, Busby. G. Zarillo (SEA)
Safety Incidents: None

B. WEATHER

			Wind (Beaufort Scale)	
Time	Barometer (in)	Sea State (ft)	Direction	Force
0000	30.04	2-3	ENE	4
0600	29.99	2-3	E	2
1200	30.06	2-3	NE	3
1800	30.02	2-3	NE	3

Forecast for Survey Area: Southeast winds 5-10 knots. Seas <2 feet.

C. SURVEY OPERATIONS SUMMARY

# of Planned Cores	Cores Complete Last 24 Hrs.	Total Cores Taken	Cores Remaining	Comments
56	9	37	19	

D. PLANNED ACTIVITY FOR THE NEXT 24 HOURS

Begin coring at Highland Beach work area.

E. ESTIMATED COMPLETION DATES

28-May-04

F. DAILY CHRONOLOGY OF EVENTS

VESSEL (ACTIVITIES IN LAST 24 HOURS)

Time:	Code:	Activity:
0600	AVI	Reveille.
0630	CAL	Took DGPS fix at temporary dockside benchmark.
0645	AVI	G. Zarillo embarked.
0654	TRA	Departed marina, enroute to Briny Breezes work area.
0918	CAL	Conducted Echosounder barcheck.
0924	OVI	Set-up rig.
0938	OVI	Collected core BB04-34.
1004	OVI	Collected core BB04-33 R1.
1040	OVI	Collected core BB04-33 R2.
1105	OVI	Collected core BB04-32.
1135	OVI	Collected core BB04-31.
1202	OVI	Collected core BB04-35.
1236	OVI	Collected core BB04-30.
1356	OVI	Collected core BB04-29 R1.
1412	EQD	Plug on penetrometer pot damaged. Replaced pot.
1437	OVI	Collected core BB04-29 R2.
1513	OVI	Collected core BB04-36.
1530	OVI	Penetrometer counter off by factor of 2. Reset counter.*
1548	OVI	Collected core BB04-37. End of coring - Briny Breezes.
1600	OVI	Secured rig on deck.
1612	TRA	Transitted to marina.
1818	TRA	Alongside and secured at marina
1824	CAL	Took DGPS fix at temporary dockside benchmark.
1830	CAL	S.E.A. geologist G. Zarillo disembarked.
* See Section J		

G. DATA TRACKING

Equipment Type	Data Roll #s	Disk #	Fix Range for Day	Cores for Day
Navigation	na	1	140-169	na
Echosounder	1	1	144-164	na
Vibracore	na	1	144-164	9

H. DETAILED VIBRACORE DATA

Core Name	Fix #	Raw Depth (ft)	Penetration (ft)	Recovery (ft)
BB04-34	144	49.8	18.42	19.1
BB04-33 R1	146	32.9	15.88	14.1
BB04-33 R2	148	33.9	14.23	6.1
BB04-32	150	25.4	18.46	19.1
BB04-31	152	54.7	18.80	17.4
BB04-35	154	35.9	18.07	15.4
BB04-30	156	26.7	18.62	19.0
BB04-29 R1	158	25.1	14.87	0.0
BB04-29 R2	160	25.2	18.50*	19.3
BB04-36	162	35.2	19.96*	18.8
BB04-37	164	55.9	18.18	14.9
* See Section J				

I. OPERATIONAL SUMMARY

Operation	Code	Today	Brought Forward	To Date
Mob/Demob	**MOB**	0.00	10.30	10.30
Transit	**TRA**	4.50	8.05	12.55
Calibration	**CAL**	0.30	3.30	3.60
Operational Vibracoring	**OVI**	6.60	20.95	27.55
Operational - Additional	**AVI**	0.30	4.75	5.05
Standby Client Request	**SBC**	0.00	0.00	0.00
Standby Weather During	**SBW**	0.00	153.75	153.75
Equipment Downtime	**EQD**	0.30	2.90	3.20
Vessel Downtime	**VED**	0.00	0.00	0.00
Totals		12.00	204.00	216.00

Note: Summary reflects a 12 hour/day operation. Night time is not included in totals.

J. ALPINE'S REMARKS

* The spare penetrometer potentiometer which was installed at 1412 read 9.25' and 9.48' for cores BB04-29 R2 and BB04-36, respectively. Sample recoveries of 19.3' and 18.8' indicated that the potentiometer was off by a factor of 0.5. The penetrometer counter was recalibrated and penetration values for these two cores were multiplied by a factor of 2 to account for the offset.

K. CLIENT'S REMARKS

Signed:

Party Chief
Alpine Ocean Seismic Survey, Inc.

Client Representative

DAILY PROGRESS REPORT

Project:	Palm Beach County - #1472
Daily Report No.:	5
Date:	24-May-04
Vessel Name:	R/V Atlantic Twin
Prepared By:	G. Wiegman

A. VESSEL LOCATION AT MIDNIGHT

Latitude:	26º 46.440' N (Riviera Beach Municipal Marina)
Longtitude (or Location):	080º 03.048' W
Shipboard Personnel:	Capt. R. Dunzelman, Capt. Beck, Wiegman, Hernandez, M. Dunzelman, Bise, Eschenberg, Busby. G. Zarillo (SEA)

Safety Incidents: None

B. WEATHER

			Wind (Beaufort Scale)	
Time	Barometer (in)	Sea State (ft)	Direction	Force
0000	30.08	2-3	ESE	3
0600	30.03	2-3	E	4
1200	30.09	2-3	ENE	3
1800	30.07	2-3	E	3

Forecast for Survey Area: East winds 10-15 knots, seas 2-4 feet, becoming 3-5 feet in p.m.

C. SURVEY OPERATIONS SUMMARY

# of Planned Cores	Cores Complete Last 24 Hrs.	Total Cores Taken	Cores Remaining	Comments
56	9	28	28	

D. PLANNED ACTIVITY FOR THE NEXT 24 HOURS

Continue coring at Briny Breezes work area.

E. ESTIMATED COMPLETION DATES

29-May-04

F. DAILY CHRONOLOGY OF EVENTS

VESSEL (ACTIVITIES IN LAST 24 HOURS)

Time:	Code:	Activity:
0600	AVI	Reveille.
0630	AVI	G. Zarillo embarked.
0642	CAL	Took DGPS fix at temporary dockside benchmark.
0648	TRA	Departed marina, enroute to work area.
0912	CAL	Conducted Echosounder barcheck.
0918	OVI	Set-up rig.
1003	OVI	Collected core BB04-22.
1033	OVI	Collected core BB04-21.
1102	OVI	Collected core BB04-20.
1137	OVI	Collected core BB04-25.
1202	OVI	Collected core BB04-24.
1231	EQD	Air hose blew coring BB04-23. Repaired during lunch.
1336	OVI	Collected core BB04-23 R2.
1433	OVI	Collected core BB04-28.
1501	OVI	Collected core BB04-27.
1529	OVI	Collected core BB04-26.
1542	OVI	Secured rig on deck.
1554	TRA	Transitted to marina.
1754	TRA	Alongside and secured at marina
1800	CAL	Took DGPS fix at temporary dockside benchmark.
1800	CAL	S.E.A. geologist G. Zarillo disembarked.

G. DATA TRACKING

Equipment Type	Data Roll #s	Disk #	Fix Range for Day	Cores for Day
Navigation	na	1	106-138	na
Echosounder	1	1	116-138	na
Vibracore	na	1	116-134	9

H. DETAILED VIBRACORE DATA

Core Name	Fix #	Raw Depth (ft)	Penetration (ft)	Recovery (ft)
BB04-22	116	56.4	17.83	15.6
BB04-21	118	36.9	18.10	19.0
BB04-20	120	25.9	18.66	18.0
BB04-25	122	52.7	18.97	16.2
BB04-24	124	37.4	18.16	19.0
BB04-23 R1	126	27.7	6.33	0.0
BB04-23 R2	128	28.2	18.52	18.3
BB04-28	130	53.5	18.63	17.8
BB04-27	132	37.1	18.05	18.7
BB04-26	134	25.2	18.16	16.9

I. OPERATIONAL SUMMARY

Operation	Code	Today	Brought Forward	To Date
Mob/Demob	**MOB**	0.00	10.30	10.30
Transit	**TRA**	4.40	3.65	8.05
Calibration	**CAL**	0.30	3.00	3.30
Operational Vibracoring	**OVI**	6.40	14.55	20.95
Operational - Additional	**AVI**	0.70	4.05	4.75
Standby Client Request	**SBC**	0.00	0.00	0.00
Standby Weather During	**SBW**	0.00	153.75	153.75
Equipment Downtime	**EQD**	0.20	2.70	2.90
Vessel Downtime	**VED**	0.00	0.00	0.00
Totals		12.00	192.00	204.00

Note: Summary reflects a 12 hour/day operation. Night time is not included in totals.

J. ALPINE'S REMARKS

K. CLIENT'S REMARKS

Signed:

Party Chief
Alpine Ocean Seismic Survey, Inc.

Client Representative