ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT

SUBSURFACE INVESTIGATION

STATE JOB NO. CA0610

FEDERAL AID PROJECT NO. NHPP-2662(7)

HOT SPRINGS – I-30 (WIDENING) (S)

STATE HIGHWAY 70 **SECTION** 9 & 10

IN GARLAND & SALINE **COUNTY**

LETTING OF DECEMBER 7, 2016

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GEOTECHNICAL INVESTIGATION AHTD 061377 HOT SPRINGS – I-30 (WIDENING) (S) FEDERAL AID PROJECT ("FAP") NO. 9991 GARLAND COUNTY AND SALINE COUNTY, ARKANSAS

INTRODUCTION

Submitted herewith are the final results of the geotechnical investigation performed for AHTD Job No. 061377 Hot Springs-I-30 (Widening) (S). This project consists of the proposed widening of U.S. Highway 70 from State Route 128 to Interstate 30 in Garland and Saline Counties, Arkansas. These services were authorized by the subconsultant agreement dated July 13, 2013. Preliminary results have been provided throughout the course of this study.

We understand the Highway 70 improvement project includes the widening of approximately 18.9 miles of Highway 70 in Garland and Saline Counties to accommodate a five lane section with 8 ft paved shoulder. This larger development plan has been divided into two (2) separate projects. This report addresses the 7.9 mile eastern portion of the Highway 70 widening plan, from about State Route 128 east to Interstate 30, i.e., Job 061377. The geotechnical investigation report for the western portion of the alignment (Job CA0606) will be provided under separate cover.

Within this portion of the proposed roadway widening, two (2) existing bridge structures will also be reconstructed. The new bridges will be composite W-beam structures. The bridges planned for reconstruction include:

- Caney Creek Bridge – AHTD Bridge No. 02932
- Ten Mile Creek Bridge (East) - AHTD Bridge No. 02931

We understand that the Caney Creek Bridge will be about 101 ft long with four (4) bents (two interior bents and two abutments). The new bridge will have pavement grades ranging from about El 349.9 on the east approach to about El 350.6 on the west approach. The Ten Mile Creek Bridge (East) will be about 227 ft long with six (6) bents (four interior and the two bridge end abutments). Pavement grades at the Ten Mile Creek Bridge (East) location will range from about El 359.0 to El 362.0 at the west and east approaches, respectively. We also understand these bridge layouts (length and elevations) are not finalized and may be modified for final design.

It is also understood that the roadway widening will occur on both sides of the existing roadway to minimize the amount of grading needed to modify the crown location. In several locations the widening will only occur on the south side. In these areas the alignment has been established to allow phased construction of the new bridges and to avoid environmental constraints. If the existing pavement is not widened on the north side the existing shoulder will be removed and reconstructed to meet current standards.

The purposes of this study were to explore subsurface conditions in the alignments of the bridges, roadways and cut slopes. The data developed through the field and laboratory studies have been utilized to develop recommendations to guide design and construction of foundations, embankments, roadways, and earthwork. These purposes were achieved by a multi-phased study that included:

- Drilling sample borings and excavating test pits to evaluate subsurface conditions and obtain samples for laboratory testing;
- Performing laboratory tests to evaluate pertinent engineering properties of the foundation and subgrade strata; and
- Analyzing field and laboratory data to develop recommendations for roadway and foundation design, embankment configurations, and construction considerations.

The relationship of these factors to design and construction of the new structures, roadways and embankments has been considered in developing the recommendations and considerations discussed in the following report sections.

SUBSURFACE EXPLORATION

Subsurface conditions in the roadway alignments, structure locations, and embankments were explored by performing a total of 84 sample borings and test pits. The alignment vicinity is shown in Attachment 1. The approximate sample locations are shown on the Plan of Borings and Test Pits provided in Attachment 2.

Roadway Investigation

Subsurface conditions for the proposed roadway widening were investigated by drilling a total of eight (8) sample borings with depths ranging from 8 ft to 10 ft and excavating 45 test pits with depths ranging from 1.5 to 8.5 feet. The steep terrain and dense vegetation precluded access to truck-mounted drilling equipment to all but the eight (8) boring locations. Borings performed along the length of widened alignment can be indentified in this report and the attachments as labeled with "B" (i.e., B-77, B-82, etc). Test pits performed within the alignment are identified with a "TP" label (i.e., TP-11, TP-58, etc).

Logs of the borings and test pits performed for the roadway widening, showing descriptions of the on-site fill, overburden soil, and rock strata encountered and results of the field and laboratory tests are included in Attachment 3.

Bridge Structure Investigation

Subsurface conditions at the two (2) bridge locations were investigated by drilling 11 sample and/or core borings with depths ranging from approximately 8.5 ft to 50 feet. Borings performed at the bridge structure locations can be indentified in this report and the attachments as labeled with "S" (i.e., S6, S7, etc). Borings S6 through S11 were performed at the Ten Mile Creek (East) location. Borings S12 through S16 were drilled at the Caney Creek location.

Logs of the borings including descriptions of fill, soil, and rock strata encountered and results of the field and laboratory tests results performed for the bridge structures over Ten Mile Creek (East) and Caney Creek can be found in Attachments 4 and 5, respectively. Photographs of rock cores are also included in these attachments.

To aid in visualizing subsurface conditions, Generalized Subsurface Profiles for the two (2) bridge structures are presented in Attachment 6. It should be recognized that the stratigraphy illustrated by the profiles has been inferred between discrete boring locations. In view of the natural variations in stratigraphy and conditions, variations from the stratigraphy illustrated by the profiles should be anticipated. Additionally, the natural transition between strata is generally gradual, and the stratigraphy described in the sections above may vary.

Cut Slope Investigation

Subsurface conditions at the proposed embankment cut slopes were investigated by drilling 12 sample borings at selected locations along the existing right-of-ways with boring depths ranging from approximately 15 ft to 40 feet. Borings performed at selected right-of-way cut-slopes can be indentified in this report and the attached appendices as labeled with "CS" (i.e., CS1, CS4, etc). Logs of the borings performed for the embankment cut slopes are provided in Attachment 7.

To develop information for use in evaluation of plan cut slope configurations, areas where cut slopes are planned were visually evaluated by mapping the slope faces. These observations were directed towards observation of rock exposures, if any, consideration of rock bedding plans and joint or fracture patterns, observation of seepage, and evidence of prior movement of the slope face or of hillsides. A summary of our observations of the existing cut slopes is also provided in Attachment 7.

Drilling and Sampling Methodology

The sample locations were selected and located in the field by Grubbs, Hoskyn, Barton, & Wyatt Consulting Engineers (GHBW). Some locations were offset from the planned boring or test pit location to facilitate equipment access. The borings were drilled with a truck-mounted SIMCO 2400 or buggy-mounted Mobile B-53 rotary-drilling rig using continuous flight augers, or a Mobile B-53 or Hilyard Super rotary-drilling rig using a combination of dry-auger and rotary-wash drilling methods. Sampling of the overburden soils and weathered rock was accomplished using a 2-in.-diameter split barrel sampler and Standard Penetration Test (SPT) procedures. The SPT N-values are tabulated on the boring logs in the "Blows Per Ft" column.

Representative samples of the shale bedrock were obtained using an NQ_{WL}-size double-tube core barrel with a diamond bit. For each core run, the percent recovery was determined as the ratio of recovery to total length of core run. Rock Quality Designation (RQD) was also determined for each core run as the sum of intact, sound rock core greater than 4-in. length divided by the total length of the run and expressed in percent. Both these values are presented in the right hand column of the log forms, opposite the corresponding core run. Photographs of the rock cores samples are provided in the appropriate attachment. Where rock was not cored cuttings were collected for visual examination.

The test pits were excavated with a Case CX50B track mini-excavator equipped with a 2-ft bucket and rock teeth. Representative bulk samples were obtained from test pit side walls or excavation spoil. Undrained soil and weathered shale shear strength (cohesion) was estimated using a calibrated hand penetrometer on test pit side walls or intact pieces of excavation spoil. Estimated shear strength values are plotted on the log forms, in tons per sq ft, as circles enclosing an "x".

All samples were removed from samplers in the field. Samples were visually classified and placed in appropriate containers to prevent moisture loss and/or disturbance during transfer to our laboratory for further examination and testing.

Groundwater conditions were observed during and at the completion of drilling of borings or excavation of test pits. Observations regarding groundwater are shown in the lower right-hand portion of the log forms. Groundwater conditions are also discussed in subsequent sections of this report.

The ground surface elevations of the borings and test pits, as surveyed by B&F Engineering Inc., are also shown on the logs. Where specific survey information was not available, the approximate ground surface elevations were inferred from the available topographic and plan alignment information. It must be recognized that these elevations and locations are approximate and actual surface elevations may vary.

Keys to the terms and symbols used on the logs are presented in Attachment 8 for both soil and rock.

LABORATORY TESTING

To evaluate pertinent physical and engineering characteristics of the foundation and subgrade soil and rock, laboratory tests consisting of natural water content determinations and classification tests were performed. A total of 324 natural water content determinations were performed to develop representative soil water content profile for each boring or test pit. The results of these tests are plotted on the logs as solid circles, in accordance with the scale and symbols shown in the legend located in the upper-right corner.

To verify field classification and to evaluate soil plasticity, 94 liquid and plastic (Atterberg) limit determinations and 84 sieve analyses were performed on selected representative samples. The Atterberg limits are plotted on the logs as small pluses inter-connected with a dashed line using the water content scale. The percent of soil passing the No. 200 Sieve is noted in the "No. 200%" column on the log forms. Classification test results, as well as soil classification by the Unified Soil Classification System and AASHTO classification system, are summarized in Attachment 9.

Moisture-Density Relationship (Proctor) tests were performed on three (3) representative samples of potential subgrade soils in accordance with AASHTO T-99 or T-180 methods, depending on the sample gradation. The Proctor test results are presented graphically in Attachment 10.

Pavement subgrade support properties were evaluated by performing three (3) California Bearing Ratio (CBR) tests (AASHTO T-193). For the CBR tests, the specimens were molded at approximately the optimum water content and 95 percent of the maximum dry density as determined by the appropriate laboratory Proctor tests. The CBR test results are also presented graphically in Attachment 10. Classification test results are shown on the test reports. A summary of the Proctor and CBR test results is also provided in Attachment 10.

Rock compressive strength was evaluated by uniaxial compression tests performed on representative rock core samples. A total of 13 compression tests were performed on rock cores. The results of the laboratory compression tests are shown on the logs in lbs per sq in. at the appropriate depth. Compression test results are also summarized in Attachment 11. The total unit weight of intact core samples selected for compression tests was also measured and these data are also shown on the applicable logs.

GENERAL SITE AND SUBSURFACE CONDITIONS

Site Conditions

Roadway Alignment. The existing US 70 is typically a two-lane roadway with some three-lane sections that include an alternating passing lane on either the westbound or eastbound lane. The typical road width is about 46 ft from outside pavement edge to outside pavement edge. The existing pavement grades vary from about El 485 at the Highway 128 interchange, undulating but generally falling to the east to about El 337 at approximate Sta 1293+50 and finally rises to meet Interstate 30 at approximately El 461.

Beyond the asphalt concrete and aggregate shoulders, the right-of-way is typically a surface-water, grass-covered drainage canal. However, portions of the right-of-way varies from grass covered to thickly wooded. The terrain is undulating. The alignment extends through some areas of cut, with some cut slopes which are relatively steep. Shale and some sandstone are typically exposed in the cut slopes. Surface drainage is typically facilitated by roadside ditches.

Ten Mile Creek (East) Bridge - AHTD Bridge No. 02932. The existing Highway 70 Bridge over Ten Mile Creek (East) is a two-lane, nine-span bridge with a total length of approximately 223 ft and a 28-ft-wide deck. The grade of the existing bridge deck varies from approximate El 359.6 on the northwest approach to El 361.9 at the southeast approach.

The Ten Mile Creek channel lies at approximate El 342 to El 344 and flows from southwest to northeast. The main channel flows between the fifth and sixth bents from the northwest. At the time of the field studies (November 2013 and January 2014), Ten Mile Creek had approximately 1 to 2 ft of flowing water in the stream bed at this location.

The north and south end slopes are covered with vegetation and graded to approximate 3-horizontal to 1-vertical (3H:1V) configurations. Between the end slopes (between Bents 3 and 7), the ground surface is predominantly covered with rounded gravel and boulders.

Caney Creek Bridge – AHTD Bridge No. 02931. The existing Highway 70 Bridge over Caney Creek is a two-lane, three-span bridge with a 31-ft-wide deck and a total length of about 101 feet. The existing bridge deck grades range from approximate El 350.6 on the west approach to about El. 349.9 at the east approach.

The Caney Creek channel is at approximately El 334. The stream flows from south to north with the main channel being located between the second and third bents. At the time of the field studies (February and March 2014), Caney Creek had approximately 1 to 2 ft of flowing water in the stream bed.

The north and south end slopes are covered with vegetation and graded to approximate 2-horizontal to 1-vertical (2H:1V) configurations. Between the end slopes, the ground cover at the bridge location is typically rounded gravel and boulders.

Site Geology

The Geologic Map of Arkansas[1] indicates that the two (2) bridge locations and this segment of roadway widening are in the mapped outcropping of the early to middle Ordovician Womble Shale. The Womble Shale typically consists of black, graphitic shale with thin layers of limestone, numerous quartz veins, silty sandstone, and some chert. The shale can often be somewhat slatey. Depending on the extent of weathering, the rock hardness can range from soft to hard. The highly folded and steeply dipping units of the formation contain numerous inactive faults, folds and fractures. The formation is reported to range from 500 to 1200 ft thick. It rests conformably on the Blakely Sandstone.

Seismic Conditions

In light of the subsurface conditions revealed by the borings performed at the two (2) bridge sites and the local geology, a Seismic Site Class C (very dense soil and soft rock profile) is

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[1] Geologic Map of Arkansas, Arkansas Geologic Commission and U.S. Geologic Survey; 1993

considered applicable with respect to the criteria of the 2011 Guide Specifications for Load and Resistance Factor Design (LRFD) Seismic Bridge Design[2].

Based on the bridge locations, the 1.0-sec period spectral acceleration coefficient on Class B rock (S_1) is 0.075. The site coefficient for 1.0-sec period spectral acceleration (F_v) adjusted for Site Class C is 1.70. Accordingly, the calculated design 1.0-sec period spectral acceleration coefficient (S_{D1}) value is 0.128. Utilizing these parameters, Table 3.10.6-1[3] indicates that a Seismic Performance Zone 1 is fitting for both of the bridge sites included in this project.

The 2011 edition of the AASHTO Guide Specifications indicates that the Peak Ground Acceleration (PGA) having a 7 percent chance of exceedance in 75 years (or mean return period of approximately 1000 years) is predicted to be 0.100 for a Seismic Site Class B. For a Seismic Site Class C, the Site Coefficient for the PGA, F_{PGA} is shown to be 1.20. Consequently, a design PGA (A_s) value of 0.120 is considered appropriate for both bridge sites.

Subsurface Conditions

The subsurface conditions over the length of the roadway widening, grade separation structures, and right-of-way embankments can be generally summarized into three (3) primary strata as follows.

Fill: On-site fill was found in 47 sample borings or test pits. The on-site fill varies in thickness from about 0.5 to 8 feet. In general, the on-site fill encountered along the length of road widening consists of silty clay with varying amounts of shale and sandstone fragments. The fill at the two (2) bridge locations extends up to 8.5-ft depth and includes silty clay with shale fragments with some localized areas of sandy silt and silty sand and fine to coarse gravel. The on-site fill also contains quartz fragments, occasional organics, and localized iron-staining. Locally the on-site fill is predominantly shale fragments with only minor amounts of silty clay or silt fines. The on-site fill compaction is variable but in general is considered to be medium compact with low to moderate compressibility. Fill depth, content, and depth are likely to vary along the alignment.

Overburden: The natural soils below the on-site fill or at the surface are generally units of firm to very stiff reddish brown silty clay with variable amounts of shale and sandstone fragments. The predominantly silty clay stratum also contains quartz fragments and trace amounts of organics with iron-staining in parts. Localized areas of dark brown silty fine sand and clayey fine to coarse gravel are found near the Ten Mile Creek (East) and Caney Creek crossings. These granular units represent local alluvium associated with

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[2] Guide Specifications for LRFD Seismic Bridge Design, 2nd Edition, Washington, DC, American Association of State Highway and Transportation Officials, 2011.

[3] AASHTO LRFD Bridge Design Specification, AASHTO; 2012.

the surface water features. The silty clay generally exhibits moderate shear strength with low compressibility. However, localized areas of weak, low-strength soils are present within the overburden stratum.

Shale: The basal stratum found in the borings and test pits is moderately hard to hard dark gray shale. The shale typically contains quartz and sandstone veins and inclusions and may contain silty clay and clay laminations, seams and layers in weathered units. Carbonaceous shale, calcite partings, and muscovite deposits are also found within this stratum. The shale has variable degrees of weathering within the upper 5 to 10 ft; however, weathering generally decreases and rock quality increases with depth. Bedding varies from flat-bedded to steeply dipping with bedding planes inclined greater than 60 degrees. At the Ten Mile Creek (East) bridge location, shale is found at about 6.5 to 13 ft below existing grade and at about 4 to 8 ft below grades at the Caney Creek Bridge location. Weathered shale and shale outcrops are locally apparent in cut slopes and areas of higher terrain. Some sandstone beds and strata are also apparent.

Groundwater Conditions

Groundwater was encountered in the borings at depths ranging from about 6 in. to 14 ft during drilling operations (November 2013 and January, February, March 2014) at the bridge structures. Groundwater was also encountered at 2- to 8-ft depth in two (2) of the roadway sample locations (see B-84 and TP-85) near the Ten Mile Creek (East) bridge location. However, the remainder of the roadway borings and test pits did not encounter groundwater or encountered limited amounts of surface water seepage above the basal weathered shale stratum. Surface seeps and springs are likely to be present, particularly during wet seasons of the year. There is also the potential for shallow perched water to develop, particularly during periods of high seasonal precipitation. Perched water could accumulate in the overburden soils and fractured rock zones. Groundwater levels will vary with seasonal precipitation and surface runoff and infiltration.

Significant Conditions

The significant site and subsurface conditions considered pertinent to design and construction of the grade separation structures, roadway and embankments are summarized below.

1) The existing bridge structures at Ten Mile Creek (East) and Caney Creek.
2) The existing bridge abutment embankments with heights varying from about 9 ft to 15 ft above the creek bottom.
3) The existing pavement roadway and shoulders and roadway embankments.
4) The on-site silty clay with shale fragment fill which is locally 4- to 8-ft thick at the bridge end embankments and extends to 0.5- to 8.5-ft depth along the road widening alignment.

5) The variable silty clay overburden with shale and sandstone fragments extending to 6.5 to 13.5 ft at the bridge locations and to variable depths along the roadway alignment with predominantly moderate shear strength and low compressibility.

6) The basal moderately hard to hard shale below about 6.5- to 13.5-ft depth at the bridge locations and typically found within the upper 10 ft in the roadway alignment and right-of-way.

7) Groundwater at depths ranging from about 0.5- to 14 ft in November 2013 and January, February, and March 2014 and the potential for shallow perched groundwater and seasonal seeps and springs and relatively shallow groundwater elevation near the interior bents of the bridge structures.

The significant conditions above have been considered in developing the conclusions and recommendations discussed in the following report sections.

ANALYSES and RECOMMENDATIONS

Bridge Foundations

Foundations for the replacement bridges must satisfy two (2) basic and independent design criteria. First, foundations must have an acceptable factor of safety against bearing failure under maximum design loads. Secondly, foundation movement due to consolidation or swelling of the underlying strata should not exceed tolerable limits for the structures. Construction factors, such as installation of foundations, excavation procedures and surface and groundwater conditions, must also be considered.

In light of the results of the borings, the anticipated moderate bridge foundation loads, and our understanding of the project, we recommend that foundation loads of the bridges be supported on either piling or footing foundations. Where rock is relatively shallow, supporting the bridge superstructure on footings bearing in rock will be suitable. The interior bents of both the Ten Mile Creek (East) and Caney Creek bridges may be supported on footings bearing in rock. At the bridge ends where the depth to rock precludes economical use of footings, piling is recommended.

Recommendations for foundations are discussed in the following report sections for each structure.

Piling – Bridge Abutments

We recommend that the abutment foundation loads of both the Ten Mile Creek (East) and Caney Creek bridges be supported on steel piles. The piles should extend through the embankment fill and overburden soils to bear in the competent moderately hard to hard dark gray shale. Piles should be driven to practical refusal in the moderately hard to hard dark gray shale. Steel HP12x53 or HP14x73 piles fitted with rock points are recommended. Other pile sizes or types may be evaluated if desired.

Bearing capacities of piles driven to refusal must be determined using the AASHTO Load and Resistance Factor Design (LRFD) structural design procedure[4]. We recommend that nominal (ultimate) resistance (P_n) of steel piles be determined based on the yield strength of steel H piles (f_y) and the net end area (A_{net}) of the section. Given that the piles will be driven to refusal in hard rock with the potential for driving damage, we recommend a maximum allowable stress (σ_{all}) of $0.25\,f_y$. An effective resistance factor (φ) of 0.50 is recommended for end-bearing piles. This effective resistance factor for steel piles has been based on the assumption of difficult driving.

It has been our experience that allowable pile capacities of 70 tons and 96 tons for HP12x53 or HP14x73 piles, respectively, are common for f_y 36 ksi steel. These capacities are based on allowable stress design (ASD). However, the appropriate factored bearing capacity as per LRFD criteria must be confirmed by the Engineer (Michael Baker International). Post-construction settlement of piles driven to refusal will be negligible. Downdrag loads due to long-term embankment settlement are expected to be negligible.

We recommend that all piles extend through the embankment fill and overburden soils to bear in the competent shale. Estimated as-built pile tip elevations are expected to be on the order of El 338 to El 340 at the Ten Mile Creek structure. As-built pile tip elevations at about El 328 to El 335 are anticipated for the Caney Creek structure. Estimated pile lengths at each abutment of the proposed bridges are summarized in the table below. Piles should bear at a minimum tip elevation of 10 ft below the pile cap or 10 ft below natural grade, whichever is deeper. Depending on the embankment height and specific subsurface conditions encountered, preboring could be required to attain the recommended 10 ft minimum pile length.

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[4] Load and Resistance Factor Design (LRFD) for Highway Bridge Substructures, Publication No. FHWA HI-98-032, National Highway Institute, May 2001.

Table 1: Estimated Pile Length (Below Existing Grade)

Bridge	Abutment	Station No	Estimated Minimum Pile Length, ft (below pile cap)	Estimated Tip El, ft
Highway 70 over Ten Mile Creek (East) Bridge No. 02931	Northwest Abutment	1208+29	13	337
	Southeast Abutment	1210+56	14	337
Highway 70 over Caney Creek Bridge No. 02932	West Abutment	1261+72	10*	333
	East Abutment	1262+73	10*	333

*Minimum pile length of 10 ft controls pile length.

Piles should be installed in compliance with AHTD Standard Specifications Section 805. Piles should be carefully examined prior to driving and piles with structural defects should be rejected. Any splices in steel piles should develop the full cross-sectional capacity of un-spliced piles. We recommend a minimum of one (1) test pile be driven at the bridge location prior to driving production piles to confirm estimated pile length and suitability of the pile-hammer system. As a minimum, safe bearing capacity of test piles and production piles should be determined by AHTD Standard Specifications Section 805.09, Method A.

Pile installation should be monitored by qualified personnel to maintain specific and complete driving records and observe pile installation procedures. Driving records should be available for review by the Engineer or the Department (AHTD) during pile installation. We recommend that the steel H-piles be driven with a hammer system capable of delivering at least 20,000 ft-lbs per blow for both the HP 12x53 or HP 14x73 piles driven to refusal in shale. This value is based on the results of a drivability analysis using wave equation analyses (WEAP) methods. The results of the wave equation drivability analysis are provided in Attachment 12.

Blow counts on steel piles should be limited to about 20 blows per inch. Practical pile refusal may be defined as a penetration of 0.5 in. or less for the final 10 blows.

Footings – Interior Bridge Bents

Foundation loads of interior bents of the Ten Mile Creek (East) and Caney Creek bridges may appropriately be supported on footings bearing in the competent moderately hard to hard dark gray shale. Footings should be founded with a minimum embedment of 12 in. into the competent moderately hard to hard dark gray shale. Footings founded as recommended may be sized based on a maximum nominal/ultimate bearing pressure (q_{ult}) of 30 kips per sq foot. The recommended ultimate bearing value has been calculated with respect to competence of the moderately hard to hard shale. A resistance factor (φ) of 0.50 is recommended for footings bearing in competent shale. Accordingly, a factored unit bearing resistance (q_R) of 15 kips per sq ft is considered appropriate. Post-construction settlement of foundations supported in the competent shale as recommended is expected to be negligible.

Uplift resistance of footings will be developed by the weight of the structure and the foundation units. The passive resistance of the overburden soils weathered shale zones should be neglected. Any footing embedment within the anticipated depth of scour should also be neglected. For embedment into the competent moderately hard shale, a maximum nominal/ultimate lateral passive resistance value of 2500 lbs per sq ft may be assumed. A resistance factor (φ) of 0.50 is recommended for passive pressure sliding resistance. Footings must be in hard contact with the shale bearing stratum to utilize the recommended passive resistance value. Where footings are overexcavated and formed, a limiting maximum nominal/ultimate lateral passive resistance value of 500 lbs per sq ft should be utilized. Resistance to sliding may also be evaluated using an ultimate friction value (tan δ) of 0.70 for concrete on the competent shale. A resistance factor (φ) of 0.8 is recommended for sliding resistance.

Footing excavations must extend through the granular overburden soils and all tan, light gray, and dark gray moderately weathered shale zones to bear fully in the competent moderately hard dark gray shale. A minimum embedment of 12 in. into the competent dark gray shale and a minimum footing depth of 6 ft below lowest adjacent grade are recommended. Estimated footing bottoms elevations for each interior bent are provided below.

Table 2: Estimated Footing Bottom Elevations

Structure	Bent No.	Station No.	Estimated Footing Bottom Elevation, ft$^{(1)}$
Highway 70 over Ten Mile Creek (East) Bridge No. 02931	2	1208+75	335
	3	1209+20	335
	4	1209+65	337
	5	1210+10	337
Highway 70 over Caney Creek Bridge No. 02932	2	1262+03	329
	3	1262+42	329

Note: Footing bottom elevations shown above are estimates only based on the results of the borings and information provided on the bridge layout drawings. As-built footing bottom elevation must be field verified by the Engineer or Department.

Any overexcavation of footings must be backfilled with concrete. Weathered zones, silty clay seams and layers, or open fractures exposed in the shale bearing stratum should be excavated, cleaned out, and filled with concrete. Use of dental concrete to level footing bottoms and to repair localized areas which are deficient is suitable.

Footings should have a minimum width of 6 feet. All footing excavations should be observed by the Engineer to verify suitable bearing. Any footing undercuts or overbreaks should be backfilled with concrete.

Wingwall and Abutment Wall Lateral Earth Pressures

We understand that wingwalls and abutment walls will be backfilled with unclassified borrow or select material. Recommendations regarding lateral earth pressures for wingwalls and abutments are summarized below.

- Angle of internal friction (φ) for unclassified backfill: 20°
- Equivalent fluid pressure for unclassified backfill:
  - Active condition for walls that are free to rotate, backfilled with unclassified borrow, and fully drained: 65 lbs per sq ft per ft depth.
  - Active condition for walls that are free to rotate backfilled with unclassified borrow, and with no provision for internal drainage: 95 lbs per sq ft per ft depth.
- Angle of internal friction (φ) for SM-1 backfill: 32°
- Equivalent fluid pressure for SM-1 backfill:
  - Active condition for walls that are free to rotate, backfilled with SM-1 or clean granular backfill, and fully drained: 40 lbs per sq ft per ft depth.

  - Active condition for walls that are free to rotate, backfilled with SM-1 or clean granular backfill, and with no provision for internal drainage: 85 lbs per sq ft per ft depth.
- Ultimate sliding resistance:
  - Interaction friction angle (δ) for concrete on stable bearing stratum: 19°.
  - Interaction friction factor (tan δ) for concrete on stable bearing stratum: 0.34.
  - The sliding resistance values above are nominal/ultimate values.
  - A resistance factor (φ) of 0.8 is recommended for sliding resistance.

To utilize the lower earth pressure values of the "drained" condition, positive and continuous drainage from behind walls must be provided. This may include a clean, free draining crushed stone, gravel, or granular soil zone or a geosynthetic drainage board approved by the Engineer. Drainage zones should be fully isolated from the silty clay and unclassified fill soils by a suitable geotextile complying with the criteria of AHTD Standard Specifications Section 625, Type 2 or an approved equal. Water should be discharged from backfill by a system of regularly-spaced, functioning weep holes or a drain pipe.

Embankments

We understand that minimal amounts of additional embankment fill are expected for the widening project. Consequently, stability considerations related to new bridge embankments have not been evaluated.

Right-of-Way Cut Slopes

With the roadway widening, the existing right-of-way (ROW) cuts will require modification. The site grading plans indicate that most cut slopes will be configured at 3-horizontal to 1-vertical (3H:1V) slopes. However, we understand that some areas along the alignment will utilize 2-horizontal to 1-vertical (2H:1V) cut slopes to stay within the existing ROW.

Michael Baker International provided information indicating areas where cut slopes are planned with configurations steeper than 3H:1V. These locations are summarized in the table below.

Table 3: Planned Cut Slopes at Steeper than 3H:1V Configuration

Approximate Station	Offset	Approximate Steepest Existing Slope*	Proposed Slope Configuration	Proposed Maximum Height, ft
1135+00 to 1138+00	Left	0.8H:1V	2H:1V	23
1173+00 to 1174+00	Left	1.2H:1V	2H:1V	17
1184+00 to 1185+00	Left	1.9H:1V	2H:1V	17
1192+00 to 1193+00	Left	1.7H:1V	2H:1V	17
1219+00 to 1228+00	Left	1.25H:1V	2H:1V	17
1306+00 to 1312+00	Left	1.5H:1V	2H:1V	22
1328+00 to 1331+00	Left	0.9H:1V	2H:1V	19
1370+00 to 1374+00	Left	1.5H:1V	2H:1V	39
1380+00 to 1383+00	Left	1.1H:1V	2H:1V	23
1390+00 to 1396+00	Left and Right	1.4H:1V and 2.1H:1V	2H:1V and 2H:1V	35 and 46
1405+00 to 1418+00	Left	1.1H:1V	2H:1V	43
1426+00 to 1430+00	Left	2.2H:1V	2H:1V	30

* Slope configuration has been estimated from Plan and Profile sheets provided by Michael Baker International.

As noted, cut slope areas were visually evaluated by direct observation and mapping of the cut slope faces in the current configurations. These observations were directed towards observation of rock exposures, if any, consideration of rock bedding plans and joint or fracture patterns, observation of seepage, and evidence of prior movement of the slope face or of hillsides. A summary of our observations of the existing cut slopes is provided in Attachment 7.

No indications of sliding or impending sliding were observed in the variable existing cut slope configurations of 0.8H:1V to 2.2H:1V in April 2014. Some localized and limited surface slumps and indications of prior shallow surface sliding in the weathered shale and thin overburden soils were noted in April 2014. However, no indications of past deep-seated sliding or formation of tension cracks, localized settlement or other indicators of impending sliding were observed in April 2014.

To evaluate the potential stability of the planned cut slope configurations, stability analyses were performed on two (2) representative locations. Because of the relatively deep overburden soils found at the Sta 1136+00 location (see Boring CS1), stability of the plan 21-ft cut at that location was evaluated. In addition, the plan 44-ft cut at Sta 1406+00 location (see Boring CS18) was evaluated. Stability analyses were performed using the computer program PCSTABL Version 5M/si in conjunction with STEDwin 2.85. These analyses were performed using Modified Bishop analyses.

The stability analyses were performed for three (3) loading conditions:

1. End of construction (EOC) condition. This condition utilized total soil and rock stresses (i.e., undrained shear strength).
2. Long-term condition. This condition utilized soil and rock effective stresses (i.e., drained shear strength, cohesion and the angle of internal friction).
3. Seismic condition. These analyses utilized effective stresses (i.e., drained shear strength, cohesion and the angle of internal friction) with a design PGA coefficient (A_s) value of 0.10g.

For the purposes of the stability analyses and to be conservative, soil and rock properties were based on the shear strength of stiff to hard clay. The weathered rock was modeled with a slope of 20° in consideration of the weathered rock bedding planes observed in the slope faces. The results of stability analyses are summarized in Tables 4 and 5 below.

Table 4 - Stability Analysis Results Sta 1136+00, H=21 ft

Design Condition	Calculated Minimum Factor of Safety
End of Construction	8.2
Long Term	1.8
Seismic (A = 0.10g)	1.5

Detailed graphical results of the stability analyses performed for the section at Sta 1136+00 are provided in Attachment 14.

Table 5 - Stability Analysis Results Sta 1406+00, H=44 ft

Design Condition	Calculated Minimum Factor of Safety
End of Construction	4.0
Long Term	1.7
Seismic (A = 0.10g)	1.4

Detailed graphical results of the stability analyses performed for the section at Sta 1406+00 are provided in Attachment 13. The results of the stability analyses indicate acceptable calculated minimum factor of safety values for all cases evaluated.

In light of our observations, the results of the borings, and the results of the stability analyses, the proposed 2H:1V cut slope configurations evaluated for this alignment are considered stable with respect to mass sliding. There are likely to be shallow slides and slumps associated with surface erosion and "pop outs" of exposed weathered shale and sandstone. However, this condition is expected to be a relatively minor maintenance issue similar to that of the current cut slope configurations.

It is expected that the long-term vegetation cover on the exposed 2H:1V cut slopes will be sparse and that erosion will be an on-going occurrence. We recommend that an adequate horizontal area be included at slope toes for rockfall and to facilitate maintenance and removal of accumulated debris. Erosion could be reduced by the incorporation of intermediate horizontal benches in the slopes, though this would increase the horizontal length of the slopes.

Hard rock which would warrant rock excavation methods was not encountered in the 12 borings drilled for this study facet. It must be noted that the steeply-dipping shale units in the area can contain random sandstone bedding and quartz veins. In the event isolated units of these more resistant rock types are encountered in utility trench excavations or other excavations, some heavy ripping or hoeram work may be required. Isolated floating sandstone boulders or hard sandstone seams may also be present within the moderately- to steeply-dipping shale. These units could also warrant rock excavation methods.

Pavement Subgrade Support

Based on the results of borings, the on-site subgrade soils are expected to vary in content and classification. The AASHTO classification of the subgrade soils is expected to include a wide range of classifications from A-1-a to A-7-6. Locally available borrow for use as unclassified embankment fill is expected to be comprised of similar soils. We recommend that soils classifying as A-7-5 or A-7-6 with a plasticity index (PI) in excess of 18 be excluded from use as subgrade within 18 in. of the plan subgrade elevation. The top 18 in. of subgrade soils should have a maximum plasticity index (PI) of 18. The as-built pavement subgrade should be evaluated by the Engineer. Areas of unstable or otherwise unsuitable subgrade should be improved by undercut and replacement.

Based on the results of CBR tests and correlation with the AASHTO classification of the anticipated subgrade soils, subgrade support is considered good. In light of the correlation with good subgrade support and factoring for environmental and serviceability criteria, an effective resilient modulus (M_R) value of 6300 lb per sq in. is recommended. For design of concrete pavements, we recommend a modulus of subgrade reaction (k) value of 210 lbs per cu inch.

Site Grading

We expect that site grading will include some minor cut and fill placement. Subgrade preparation in the new embankment areas should begin with stripping the topsoil and any unsuitable surface soils. The stripping depth is expected to be on the order of 9 to 12 inches. Deeper stripping on the order of 12 to 18 in., more or less, is anticipated for heavily wooded areas.

After stripping and performing any cut, and prior to placing fill, the subgrade should be evaluated by proof-rolling with a loaded tandem-wheel dump truck or similar equipment where accessible. Areas identified to be soft or that exhibit pumping should be undercut, processed and recompacted, stabilized with additives, or replaced with suitable fill, whichever is appropriate. Depending on seasonal site conditions and final grading plans, undercuts on the order of 2 ft below existing grades, more or less, could be warranted to stabilize localized areas of weak surface soils. Undercut requirements must be field verified by the Engineer or Department during the work.

Embankments should be constructed in accordance with AHTD criteria (AHTD Standard Specifications Section 210). Where localized seepage into undercuts or excavations is a problem, undercuts should be backfilled with SM-1 (AHTD Standard Specifications Section 302) or stone backfill (AHTD Standard Specifications Section 207). The granular backfill should be vented to positive discharge if possible.

Fill and backfill should be placed in nominal 6- to 8-in.-thick loose lifts. All fill and backfill must be placed in horizontal lifts. Fills placed against existing slopes should be benched into the existing slope face as new fill is constructed. The in-place density and water content should be determined for each lift of fill and backfill. Each lift of backfill and fill should be tested and approved prior to placing subsequent lifts.

CONSTRUCTION CONSIDERATIONS

Positive surface drainage should be established at the start of the work, be maintained during construction and following completion of the project to prevent surface water ponding and subsequent saturation of subgrade soils. Density and water content of all earthwork should be maintained until the embankments and bridge work are completed. Subgrade soils that become saturated by ponding water or runoff should be excavated to undisturbed soils. The embankment subgrade should be evaluated by the Engineer or Department during subgrade preparation and prior to starting embankment construction.

Shallow groundwater was encountered near the bridge locations in November 2013 and January, February, and March 2014. Seepage into isolated excavations such as footings can probably be controlled by ditching or sump-and-pump methods. If seepage into excavations becomes a problem, backfill should consist of clean sand (AHTD Standard Specifications Section 302, SM-1) or clean, crushed stone (AHTD Standard Specifications Section 207). Sand or stone backfill should be vented to positive discharge at daylight or into storm drainage lines where possible. All bridge foundation undercuts should be backfilled with concrete.

Where surface seeps or springs are encountered during site grading, we recommend the seepage be directed via French drains or blanket drains to positive discharge at daylight or to storm drainage lines. We also recommend that blanket drains be constructed in any existing drainage features to be filled in the grading work. Blanket drains should consist of at least 8 to 12 in. of clean filter stone (AHTD Standard Specifications Section 403, Class 3 Mineral Aggregate or an approved alternate) fully encapsulated by a filter fabric. A fabric complying with AHTD Standard Specifications Section 625, Type 1 or an approved equal is recommended. Drains should direct water to positive discharge at daylight or into storm drain lines.

Piles should be installed in compliance with AHTD Standard Specifications Section 805. Piles should be carefully examined prior to driving and piles with structural defects should be rejected. Any splices in steel piles should develop the full cross-sectional capacity of un-spliced piles.

Pile installation should be monitored by qualified personnel to maintain specific and complete driving records and observe pile installation procedures. Driving records should be available for review by the Engineer during pile installation. We recommend that steel H-piles be driven with a hammer system capable of delivering at least 20,000 ft-lbs per blow for both the HP 12x53 or HP 14x73 piles driven to refusal in shale. Blow counts on steel piles should be limited to about 20 blows per inch. Practical pile refusal may be defined as a penetration of 0.5 in. or less for the final 10 blows.

All footing excavations should be observed by the Engineer or Department to verify suitable bearing, adequate undercut and final cleanup. Footing excavations must be clean and dry at the time of concrete placement. All footing bottoms should be essentially horizontal. The use of stepped footings is suitable. Where footing excavations will remain open for extended periods, we recommend that the bearing stratum be protected with a thin layer of seal concrete. Any overexcavation of footings should be backfilled with concrete.

Rock is expected to be encountered in the footing excavations and could be encountered in other shallow excavations. The weathered shale is generally rippable. However, interbedded sandstone layers and beds, localized massive sandstone, or more resistant hard shale could be encountered at varying depths. Rock excavation methods could be required where more resistant rock is encountered. Some overbreak of excavations advanced into the hard shale or sandstone should be anticipated. All overbreaks in footing excavations should be backfilled with concrete.

CLOSING

The Engineer or the Department should monitor site preparation, grading work and all foundation and pavement construction. Subsurface conditions significantly at variance with those encountered in the borings and test pits should be brought to the attention of the Geotechnical Engineer. The conclusions and recommendations of this report should then be reviewed in light of the new information.

The following illustrations are attached and complete this report.

Attachment 1	Site Vicinity Map
Attachment 2	Plan of Borings
Attachment 3	Roadway Boring and Test Pit Logs
Attachment 4	Ten Mile Creek (East) Boring Logs
Attachment 5	Caney Creek Boring Logs
Attachment 6	Generalized Subsurface Profiles
Attachment 7	Cut Slope Boring Logs
Attachment 8	Keys to Terms and Symbols
Attachment 9	Classification Test Results
Attachment 10	Subgrade Support Laboratory Testing
Attachment 11	Summary of Rock Compression Tests
Attachment 12	Wave Equation Drivability Analysis
Attachment 13	Slope Stability Analyses – Cut Slopes

* * * * *

We appreciate the opportunity to be of service to you on this project. Should you have any questions regarding this report, or if we may be of additional assistance during final design or construction, please call on us.

Sincerely,

GRUBBS, HOSKYN,
BARTON &WYATT, INC.

Matthew R. Satterfield, P.E.
Senior Project Engineer

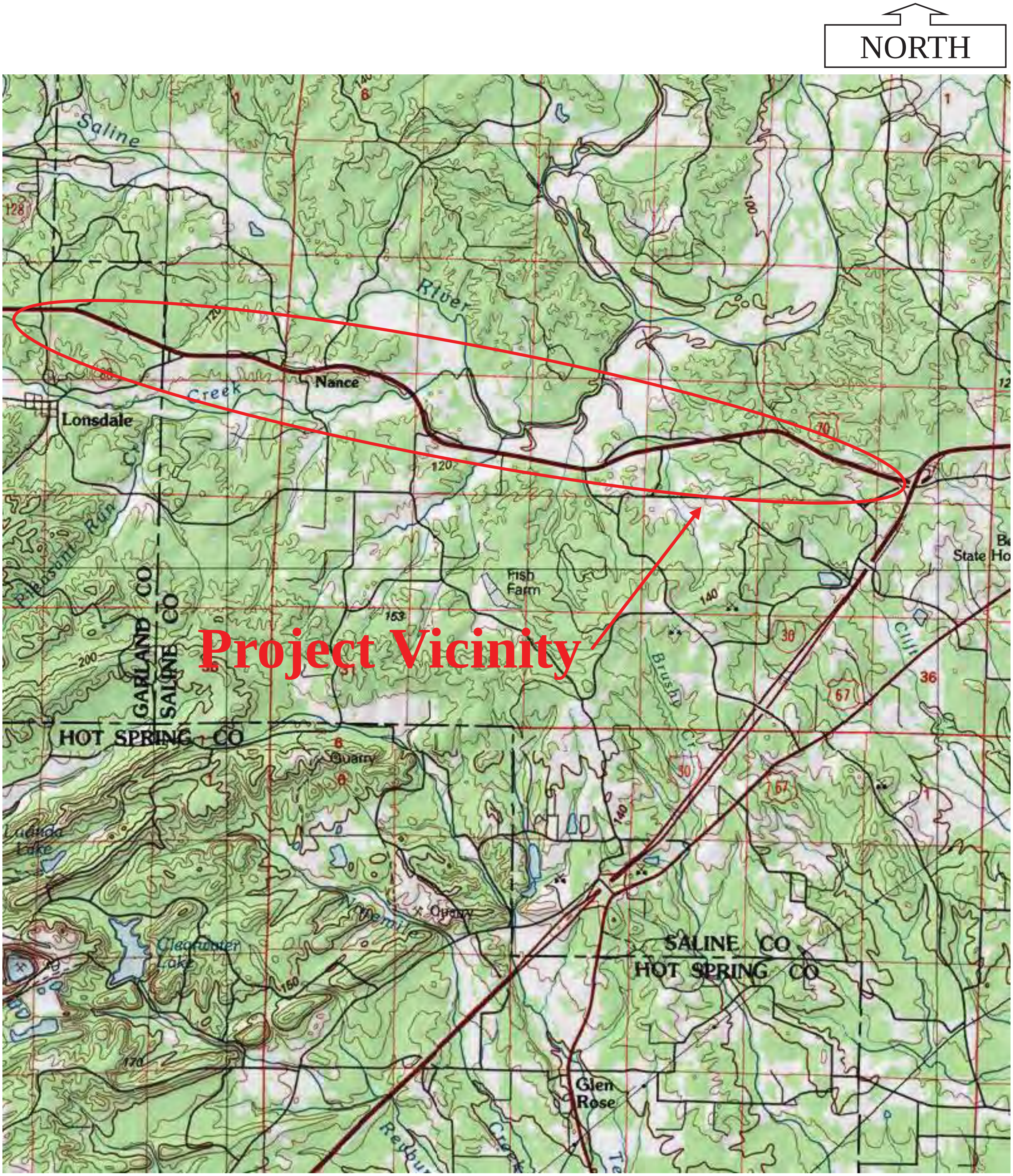
Mark E. Wyatt, P.E.
President

STATE OF ARKANSAS
REGISTERED PROFESSIONAL ENGINEER
No. 7791
MARK E. WYATT

MRS/MEW:jw

Copies Submitted: Michael Baker International
Attn: Mr. Michael H Stengel, P.E. (3+email)
Attn: Mr. Fred Harper, P.E. (1-email)
Attn: Mr. Scott Thornsberry, P.E. (1-email)

ATTACHMENT 1



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PROJECT VICINITY MAP
AHTD 061377: Hot Springs-I-30 (Widening) (S)
Garland and Saline Counties, Arkansas

Job No. 13-203
Not to Scale
Plate 1

ATTACHMENT 2

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PLAN OF BORINGS AND TEST PITS

AHTD 061377: Hot Springs-I-30 (Widening) (S)
Garland County and Saline County, Arkansas

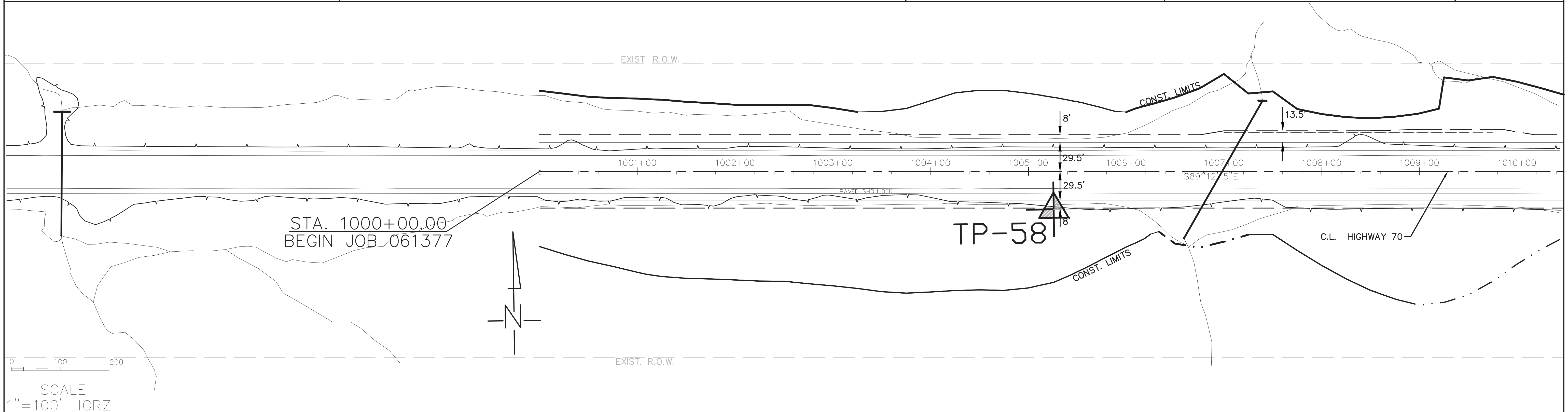
Plan Scale: 1" = 100'

Date: March, 2014

AHTD Job No. 061377

GHBW Job No. 13-203

Plate 1



SCALE
1"=100' HORZ
1"=10' VERT

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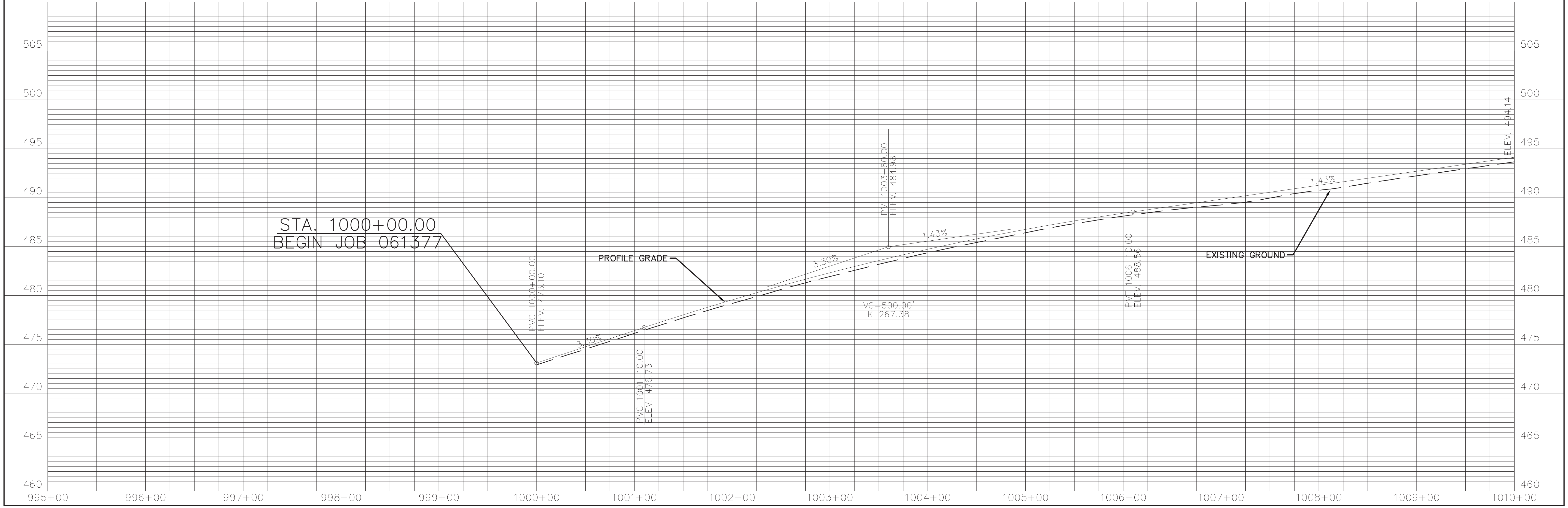

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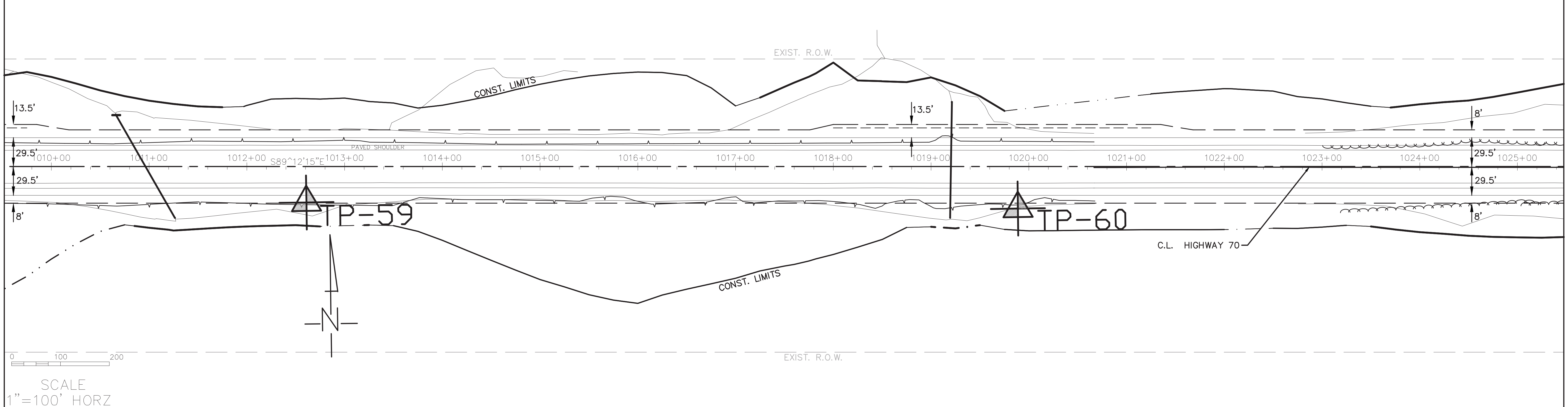
PLAN OF BORINGS AND TEST PITS

AHTD 061377: Hot Springs-I-30 (Widening) (S)
Garland County and Saline County, Arkansas

Plan Scale: 1" = 100'	**AHTD Job No. 061377**	**Plate 2**
Date: March, 2014	**GHBW Job No. 13-203**	



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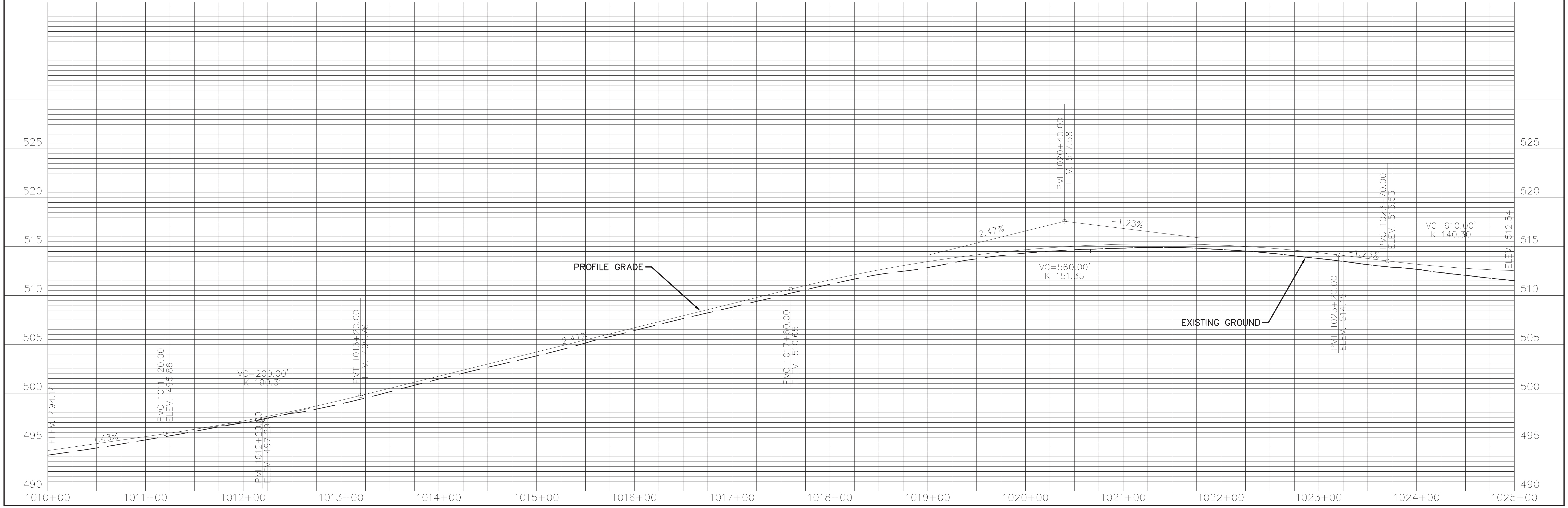

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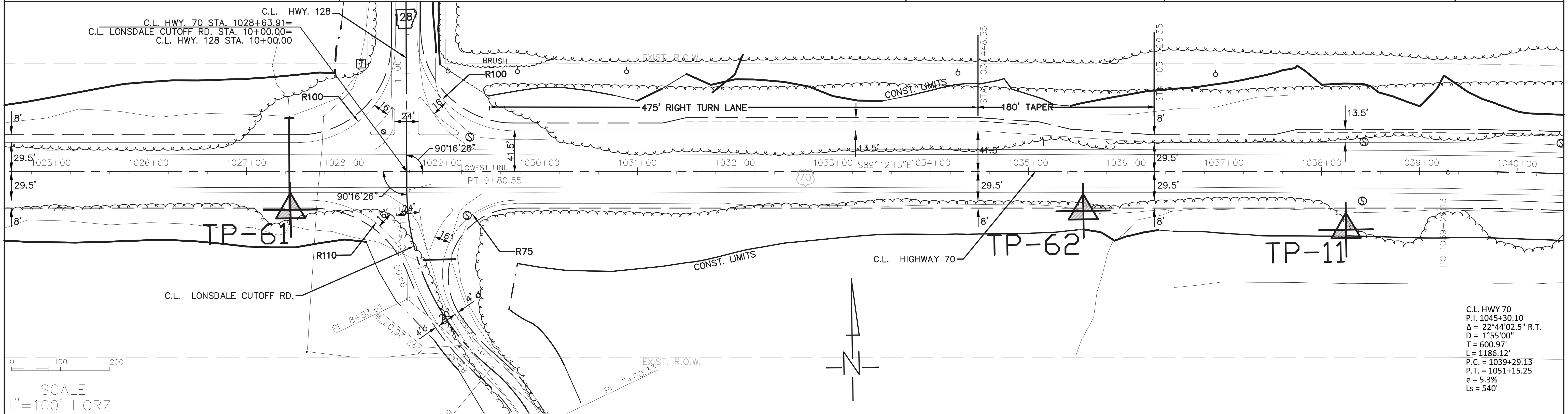
PLAN OF BORINGS AND TEST PITS
AHTD 061377: Hot Springs-I-30 (Widening) (S)
Garland County and Saline County, Arkansas

Plan Scale: 1" = 100'	AHTD Job No. 061377
Date: March, 2014	GHBW Job No. 13-203

Plate 3



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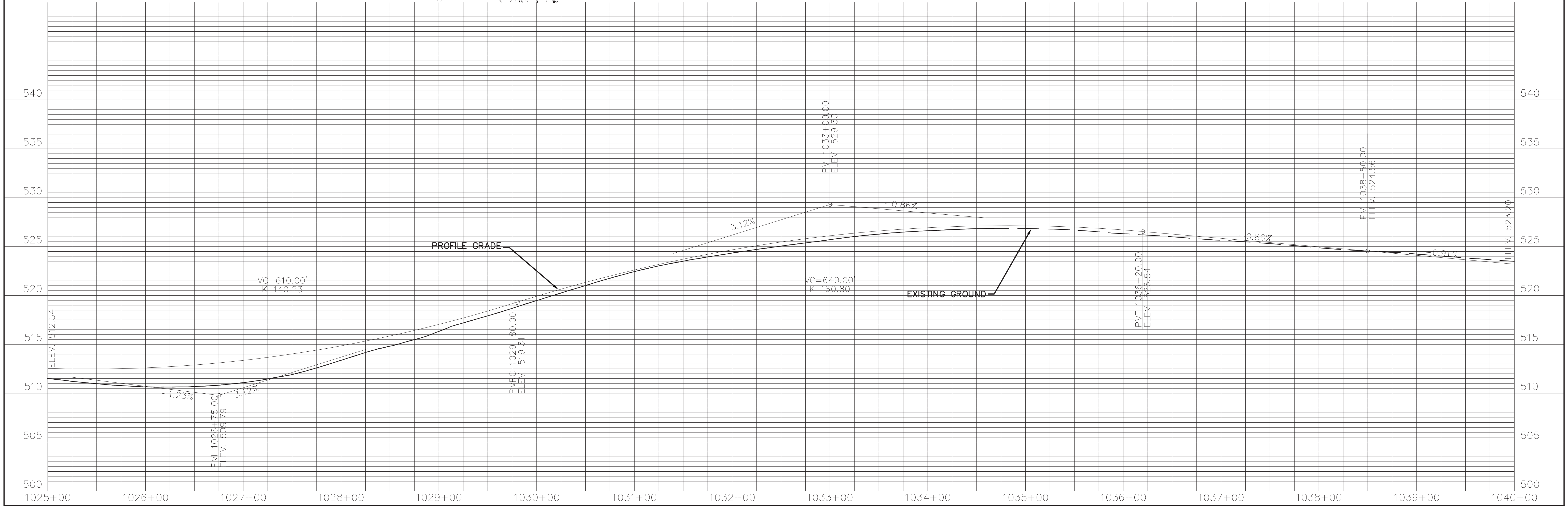

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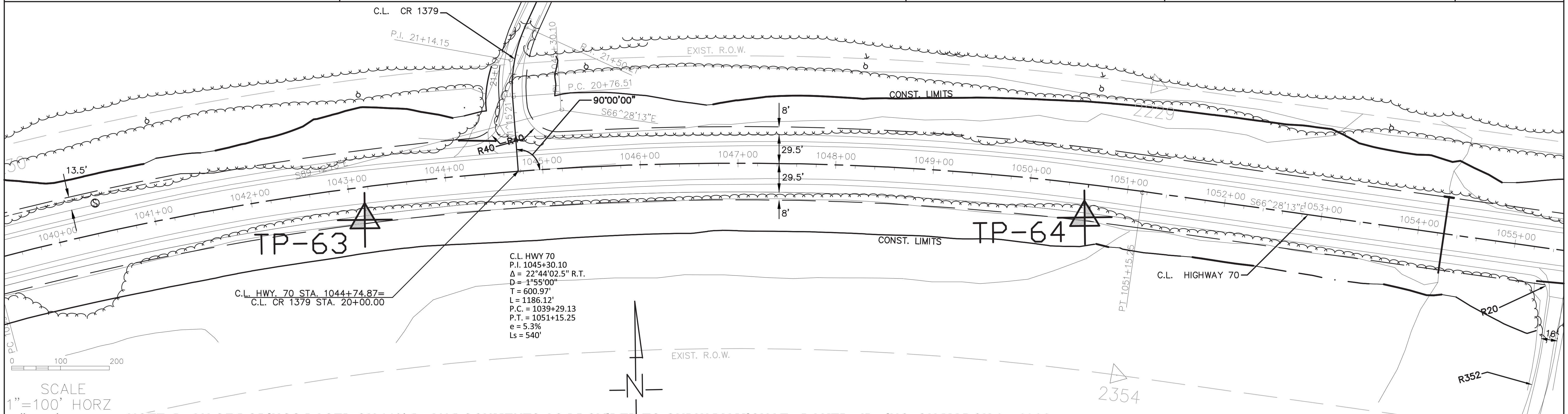
PLAN OF BORINGS AND TEST PITS

AHTD 061377: Hot Springs-I-30 (Widening) (S)
Garland County and Saline County, Arkansas

Plan Scale: 1" = 100'	AHTD Job No. 061377
Date: March, 2014	GHBW Job No. 13-203

Plate 4



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PLAN OF BORINGS AND TEST PITS

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Garland County and Saline County, Arkansas

Plan Scale: 1" = 100'

Date: March, 2014

AHTD Job No. 061377

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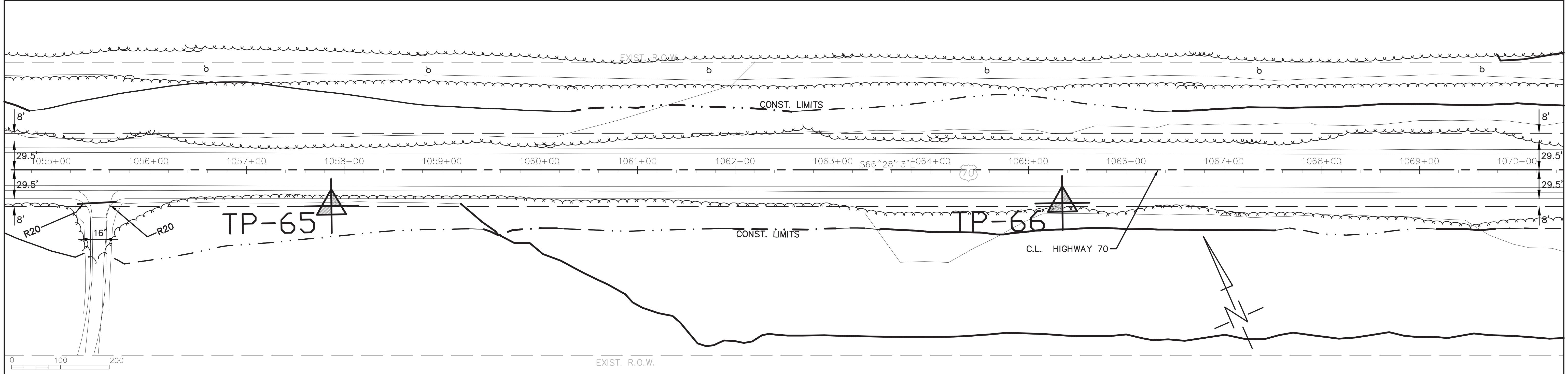
Plate 5



SCALE
1"=100' HORZ
1"=10' VERT

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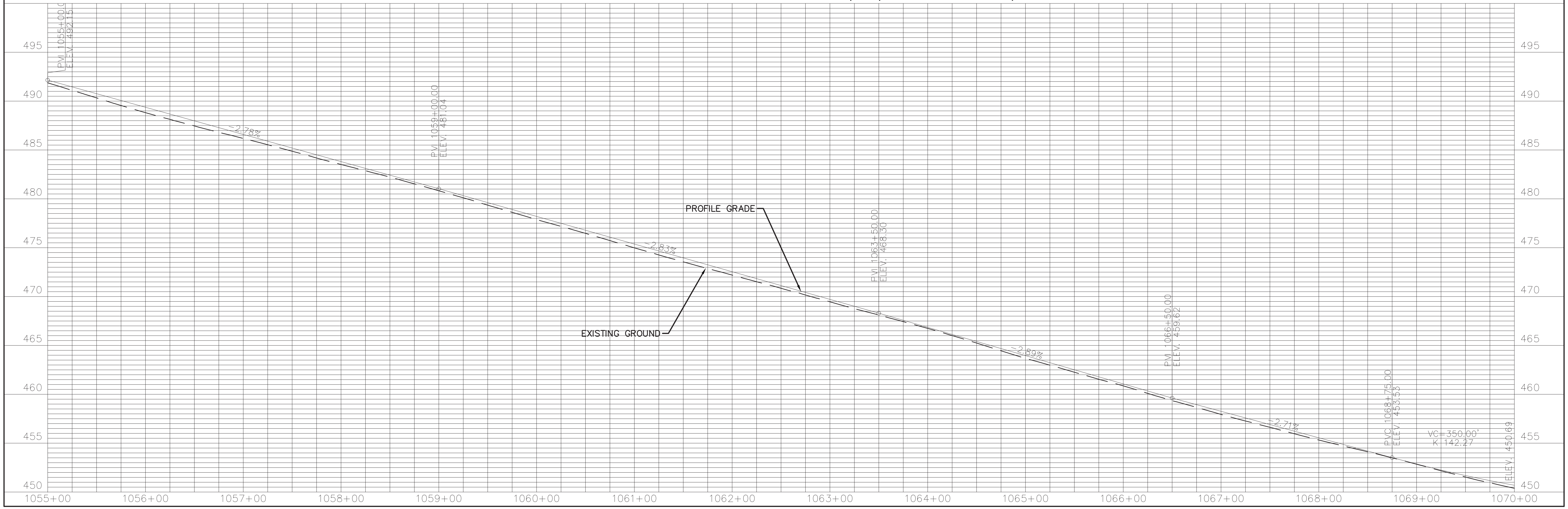

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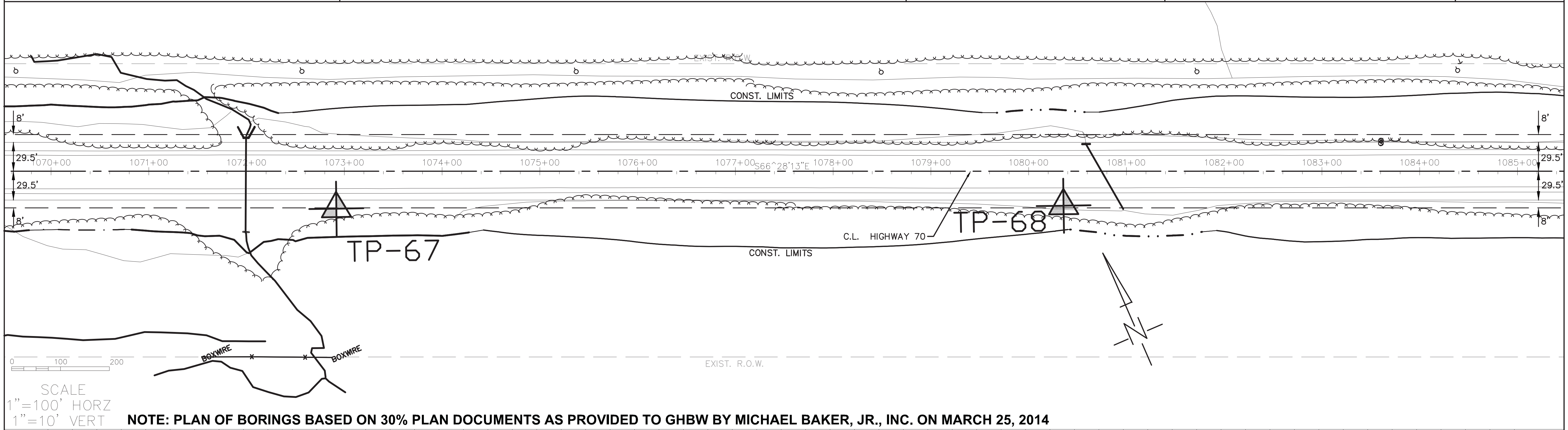
PLAN OF BORINGS AND TEST PITS

AHTD 061377: Hot Springs-I-30 (Widening) (S)
Garland County and Saline County, Arkansas

Plan Scale: 1" = 100'
Date: March, 2014
AHTD Job No. 061377
GHBW Job No. 13-203
Plate 6



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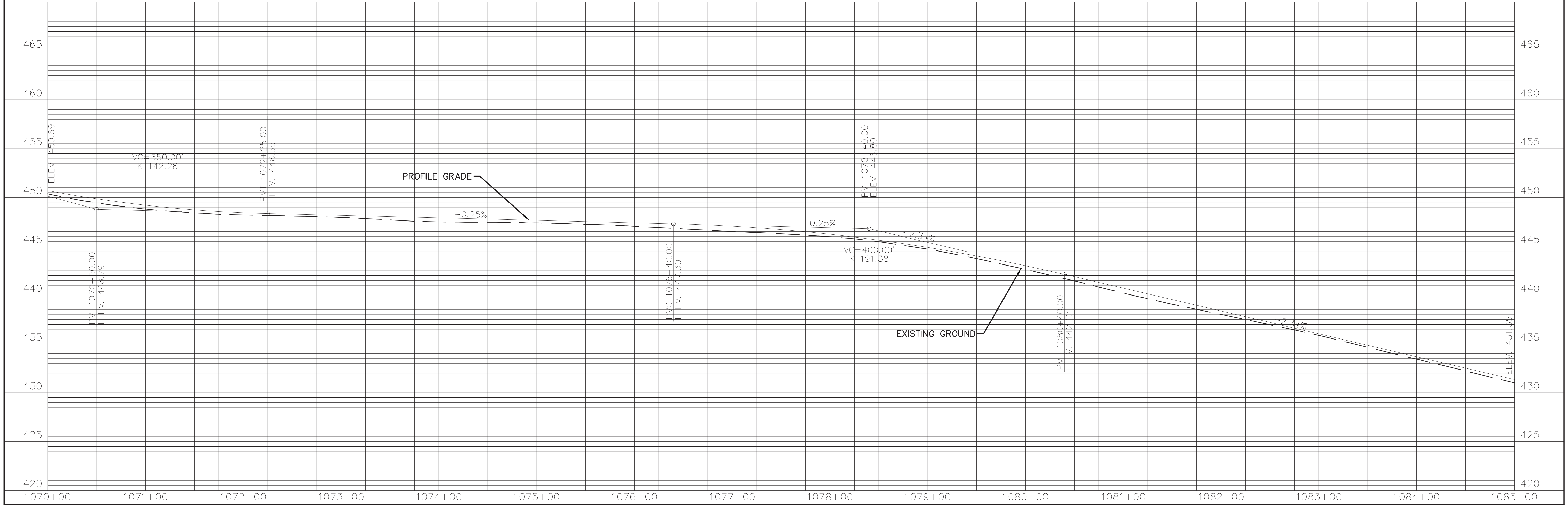

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PLAN OF BORINGS AND TEST PITS

AHTD 061377: Hot Springs-I-30 (Widening) (S)
Garland County and Saline County, Arkansas

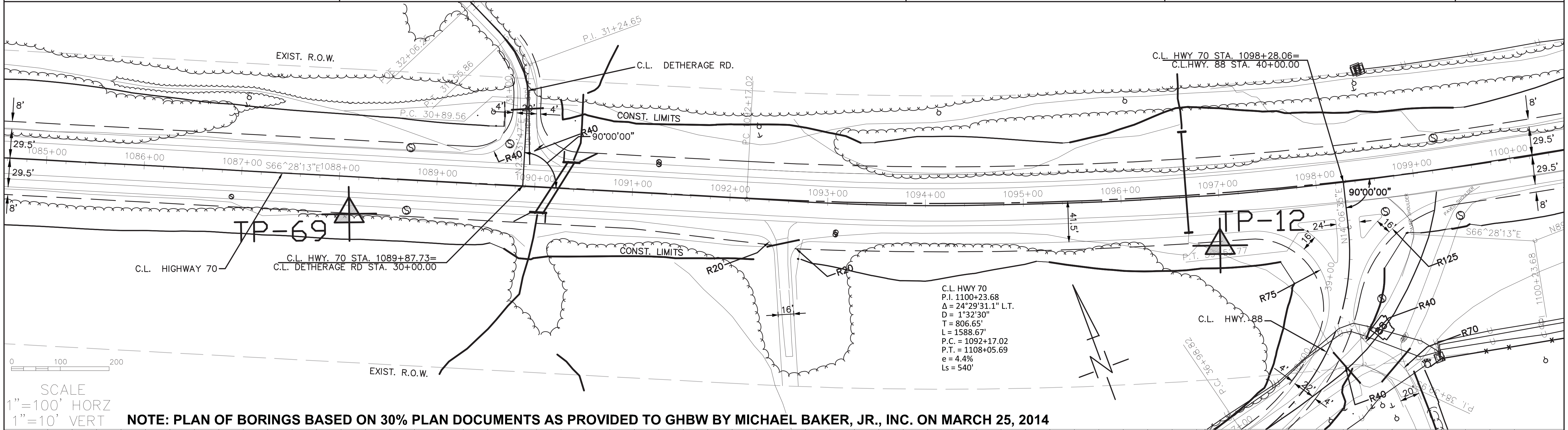
Plan Scale: 1" = 100'

Date: March, 2014

AHTD Job No. 061377

GHBW Job No. 13-203

Plate 7



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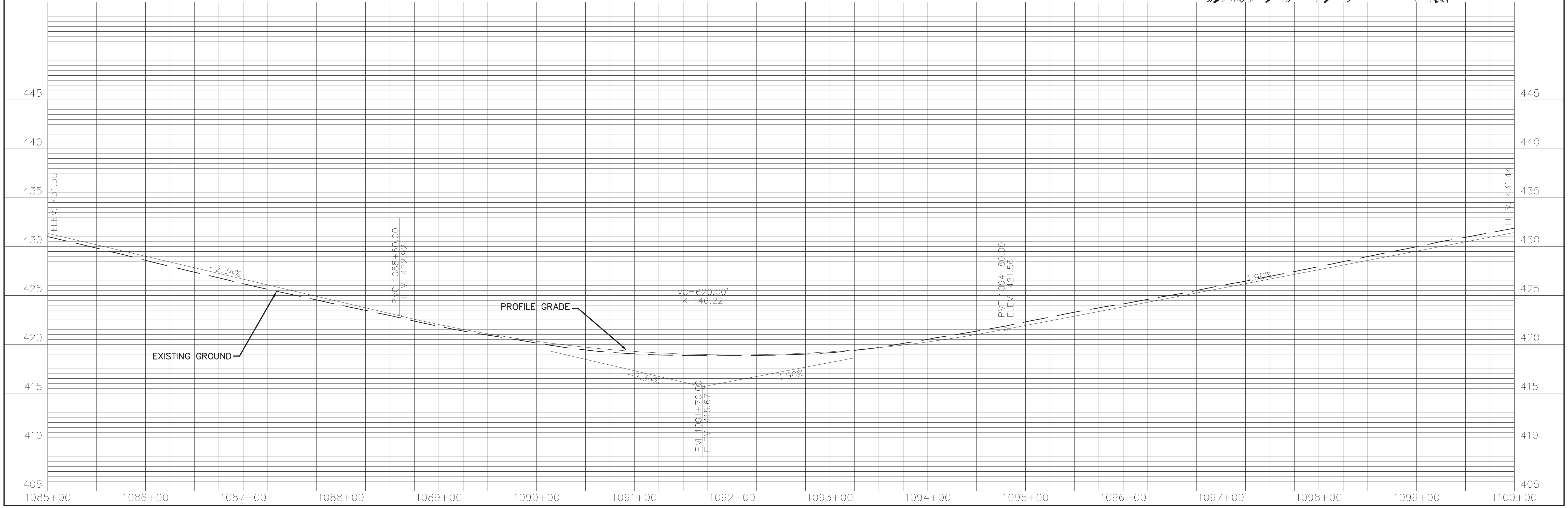

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PLAN OF BORINGS AND TEST PITS

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Garland County and Saline County, Arkansas

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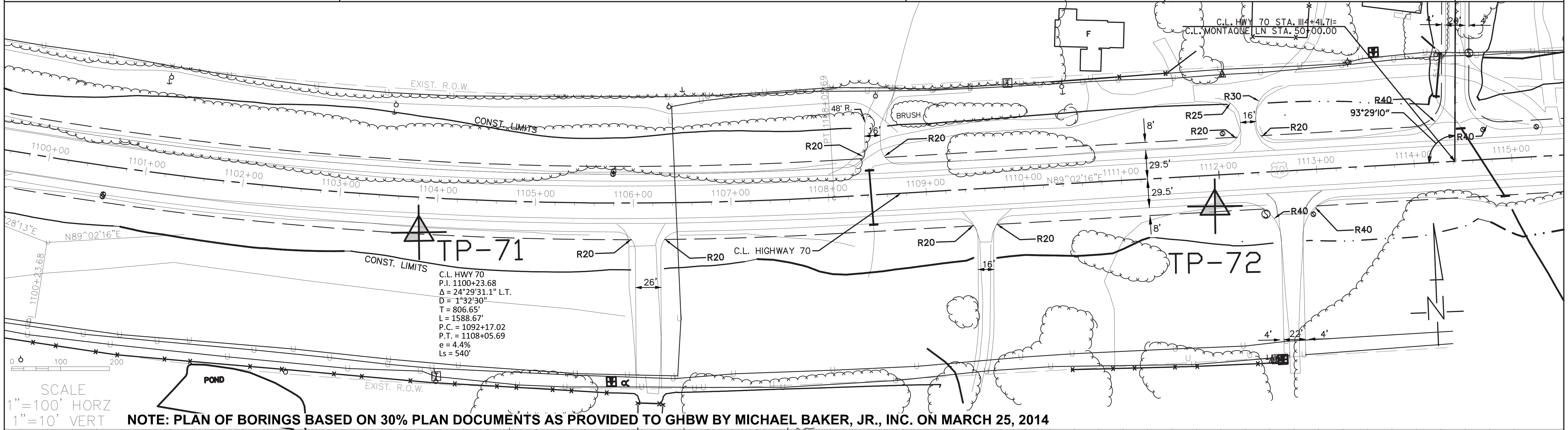
Date: March, 2014

AHTD Job No. 061377
GHBW Job No. 13-203

Plate 8



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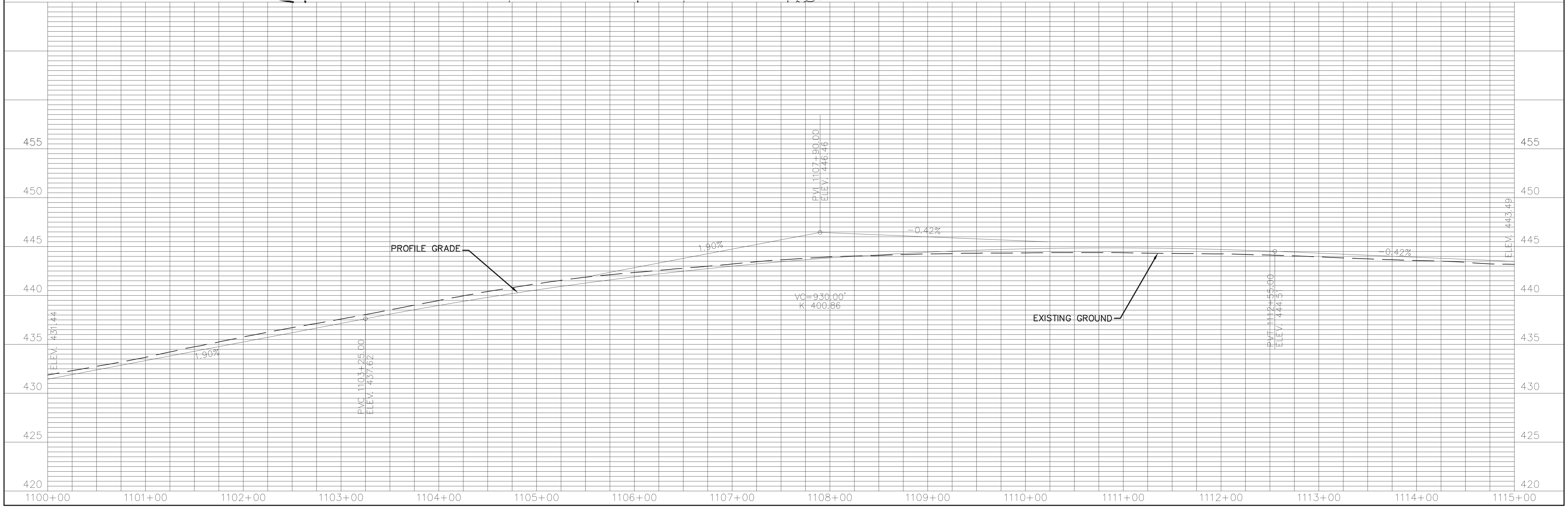

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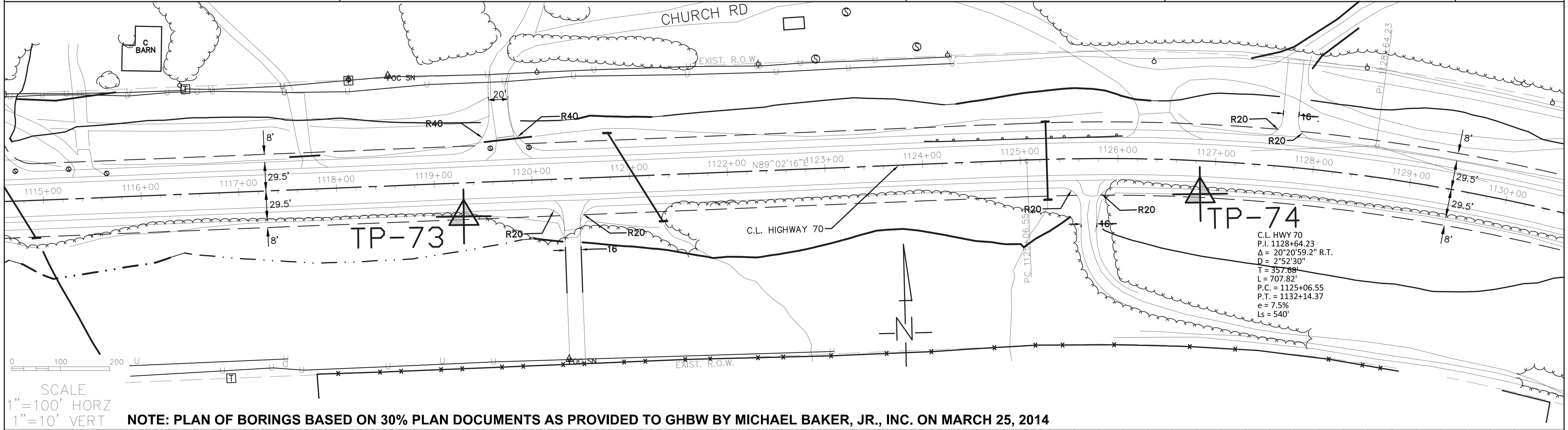
PLAN OF BORINGS AND TEST PITS

AHTD 061377: Hot Springs-I-30 (Widening) (S)
Garland County and Saline County, Arkansas

Plan Scale: 1" = 100'	AHTD Job No. 061377	Plate 9
Date: March, 2014	GHBW Job No. 13-203	



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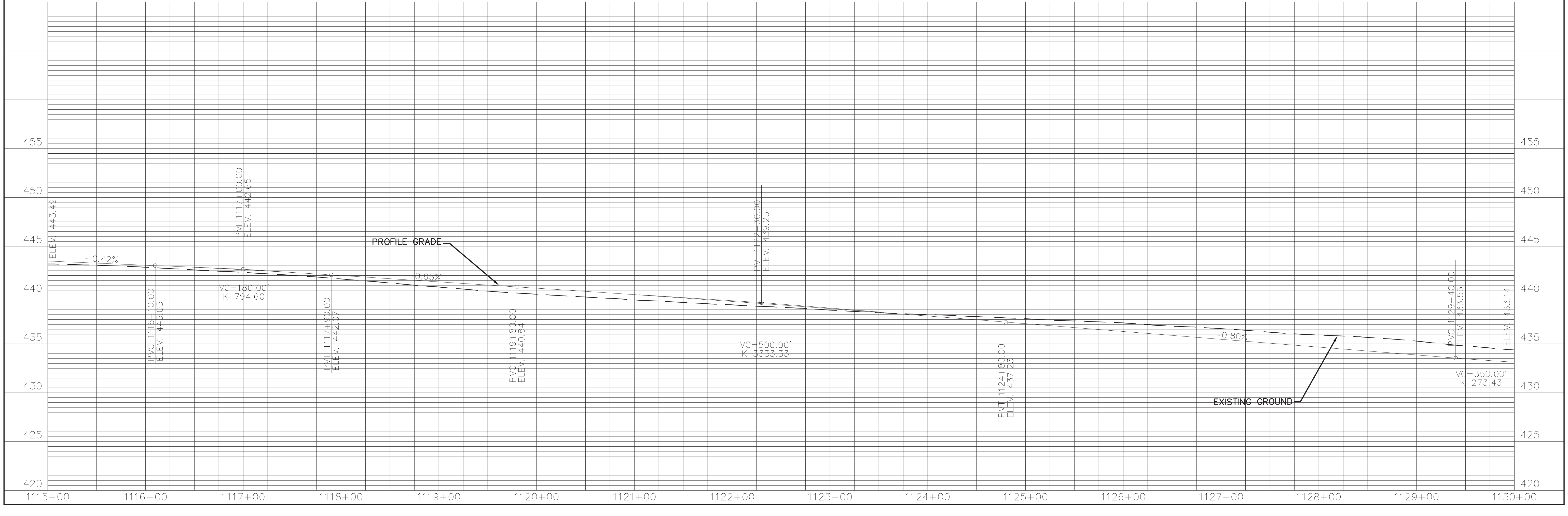

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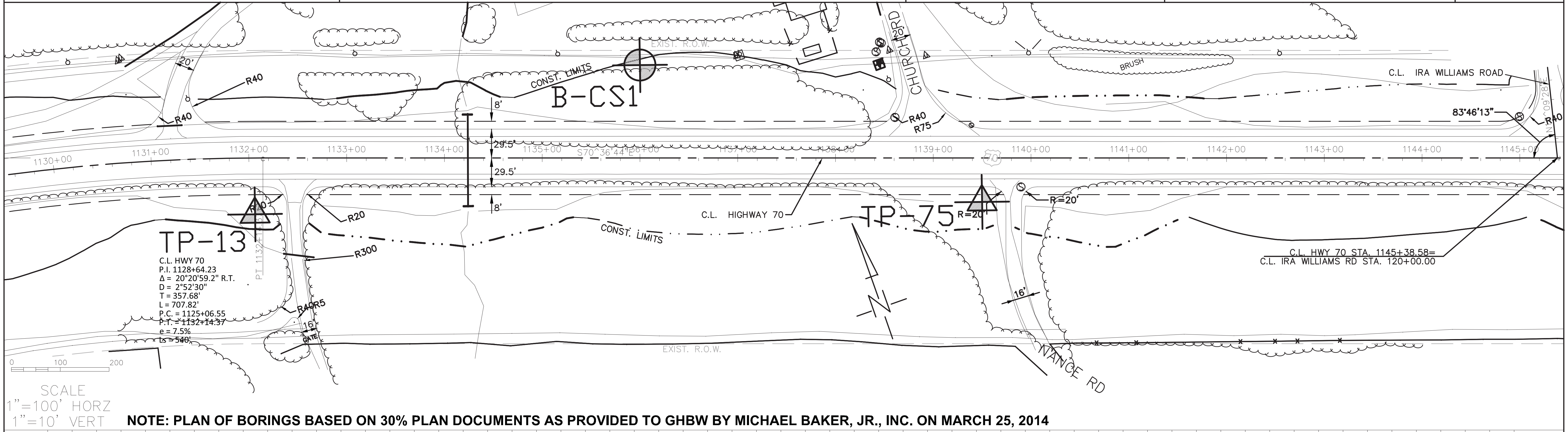
PLAN OF BORINGS AND TEST PITS
AHTD 061377: Hot Springs-I-30 (Widening) (S)
Garland County and Saline County, Arkansas

Plan Scale: 1" = 100'
Date: March, 2014

AHTD Job No. 061377
GHBW Job No. 13-203

Plate 10



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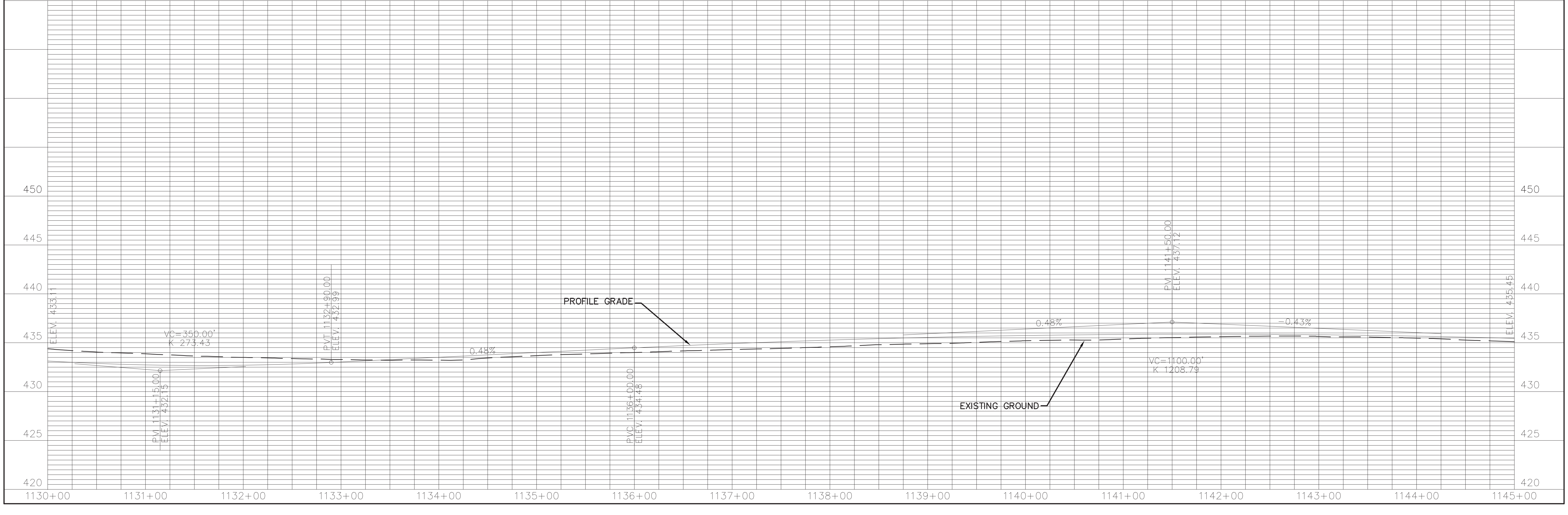

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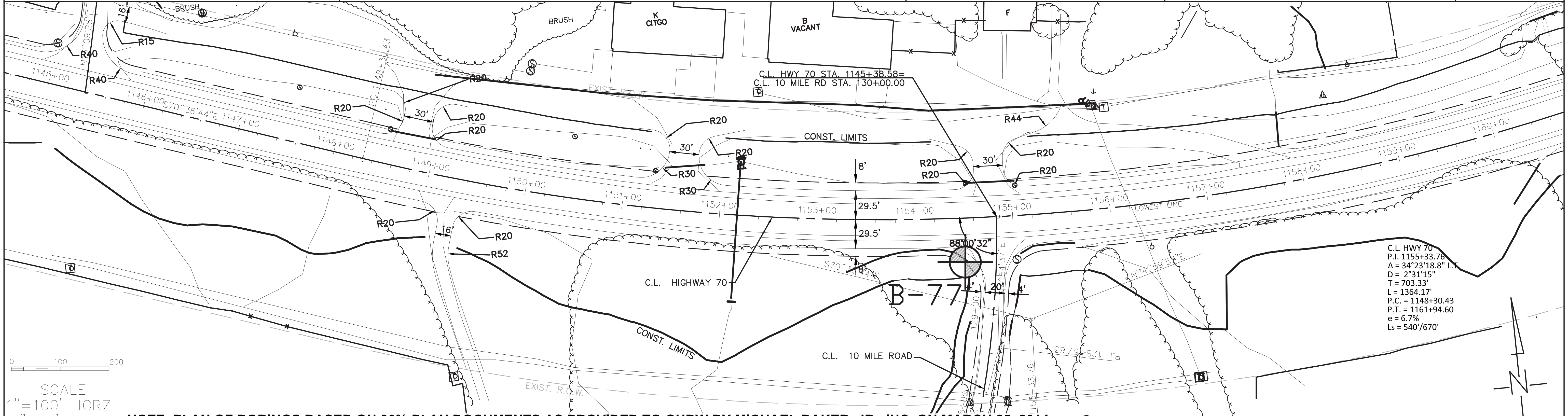
PLAN OF BORINGS AND TEST PITS
AHTD 061377: Hot Springs-I-30 (Widening) (S)
Garland County and Saline County, Arkansas

Plan Scale: 1" = 100'
Date: March, 2014
AHTD Job No. 061377
GHBW Job No. 13-203
Plate 11



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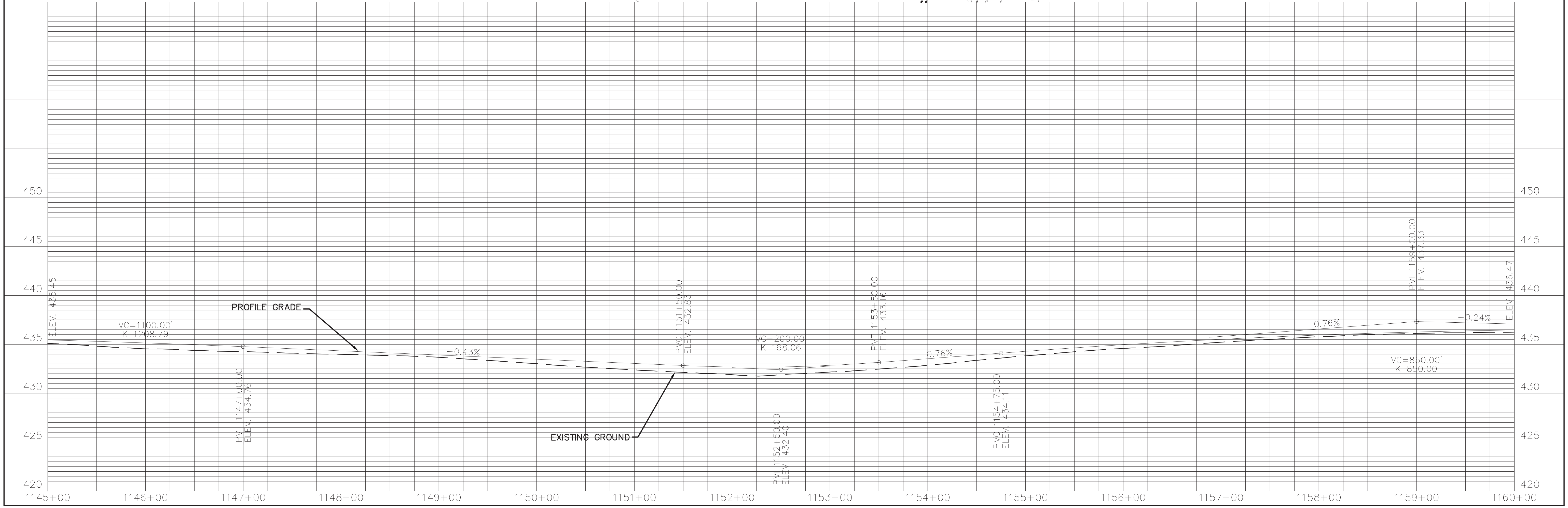

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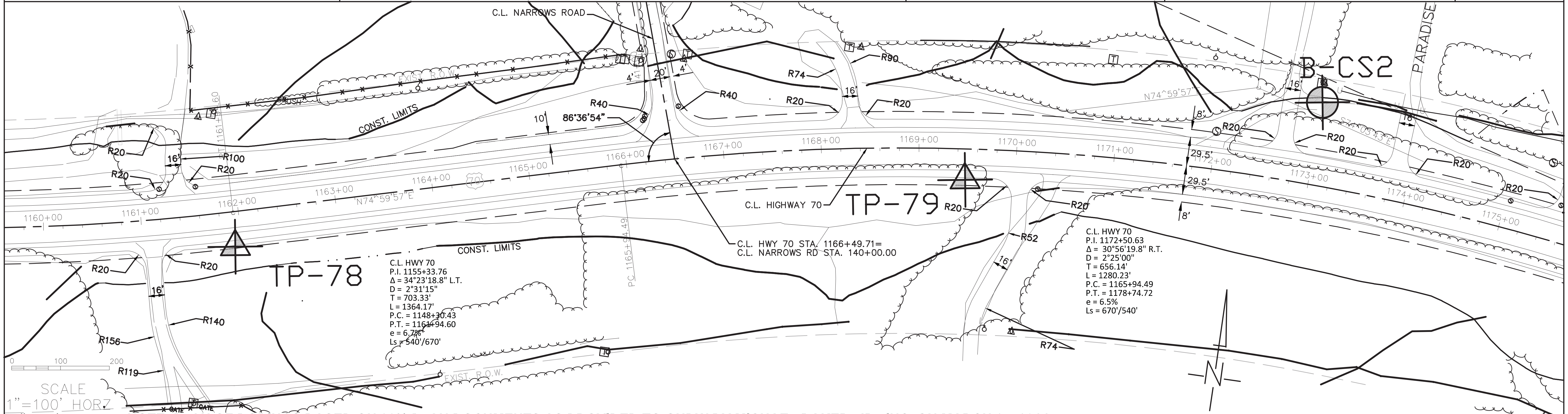
CONSULTING ENGINEERS

PLAN OF BORINGS AND TEST PITS

AHTD 061377: Hot Springs-I-30 (Widening) (S)
Garland County and Saline County, Arkansas

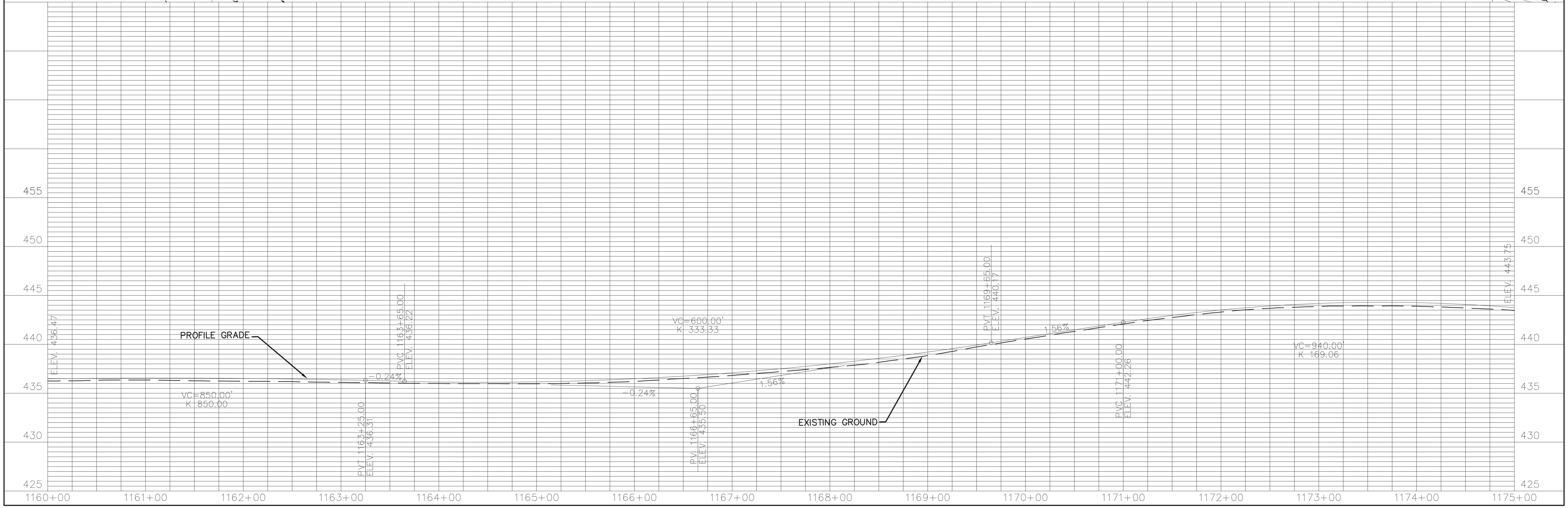
Plan Scale: 1" = 100'
Date: March, 2014
AHTD Job No. 061377
GHBW Job No. 13-203
Plate 12



C.L. HWY 70
P.I. 1155+33.76
Δ = 34°23'18.8" L.T.
D = 2°31'15"
T = 703.33'
L = 1364.17'
P.C. = 1148+30.43
P.T. = 1161+94.60
e = 6.7%
Ls = 540'/670'

C.L. HWY 70
P.I. 1172+50.63
Δ = 30°56'19.8" R.T.
D = 2°25'00"
T = 656.14'
L = 1280.23'
P.C. = 1165+94.49
P.T. = 1178+74.72
e = 6.5%
Ls = 670'/540'

NOTE: PLAN OF BORINGS BASED ON 30% PLAN DOCUMENTS AS PROVIDED TO GHBW BY MICHAEL BAKER, JR., INC. ON MARCH 25, 2014

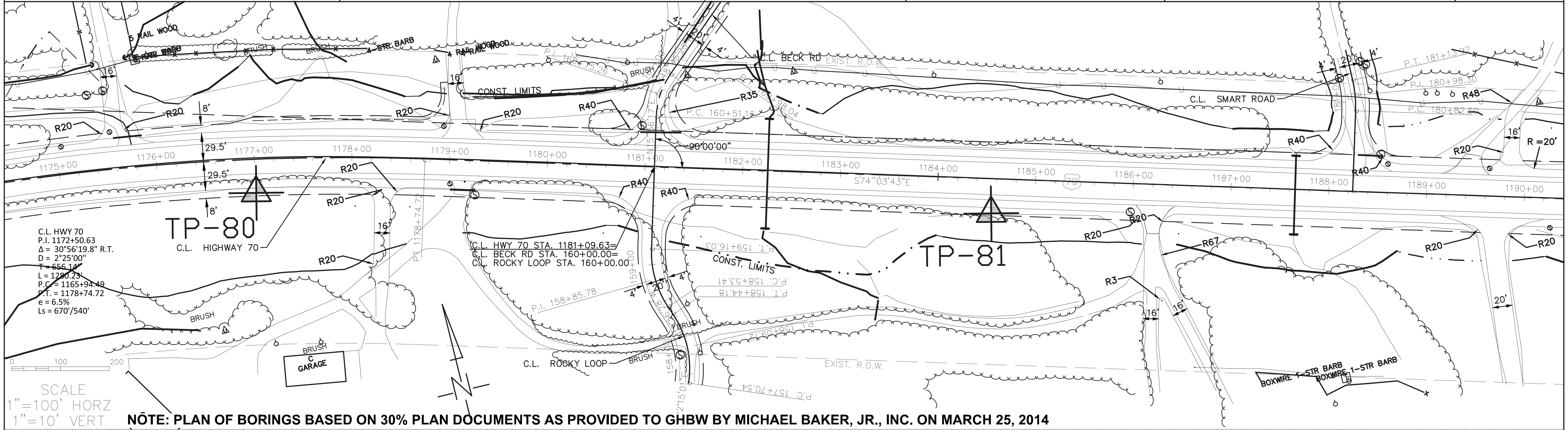


Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

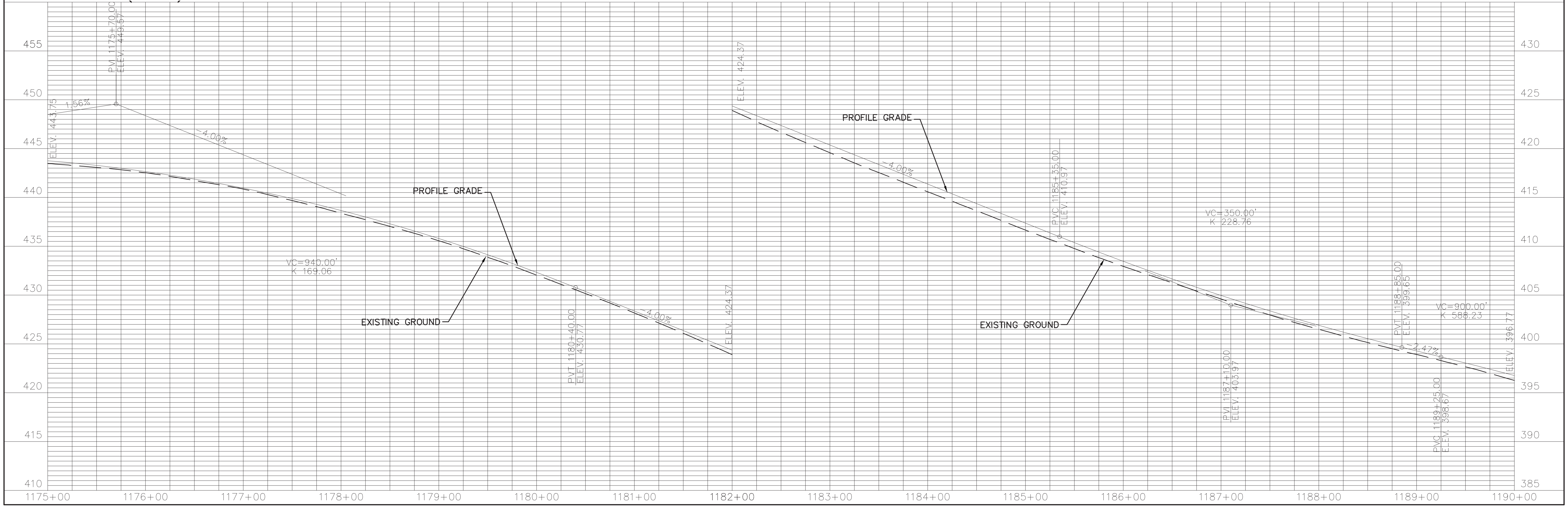
PLAN OF BORINGS AND TEST PITS
AHTD 061377: Hot Springs-I-30 (Widening) (S)
Garland County and Saline County, Arkansas

Plan Scale: 1" = 100'	AHTD Job No. 061377
Date: March, 2014	GHBW Job No. 13-203

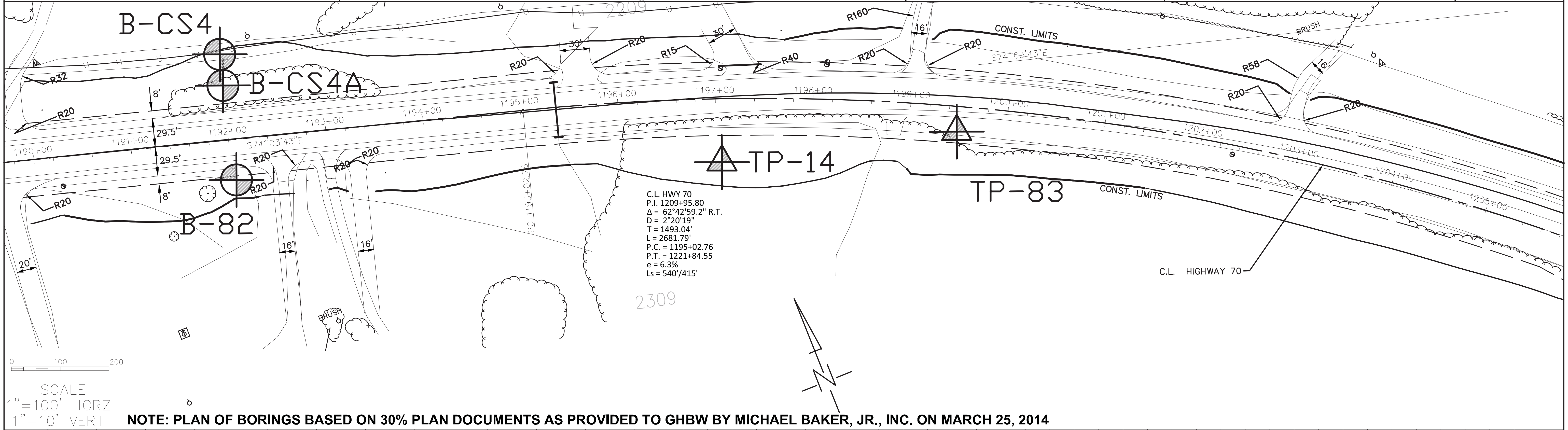
Plate 13



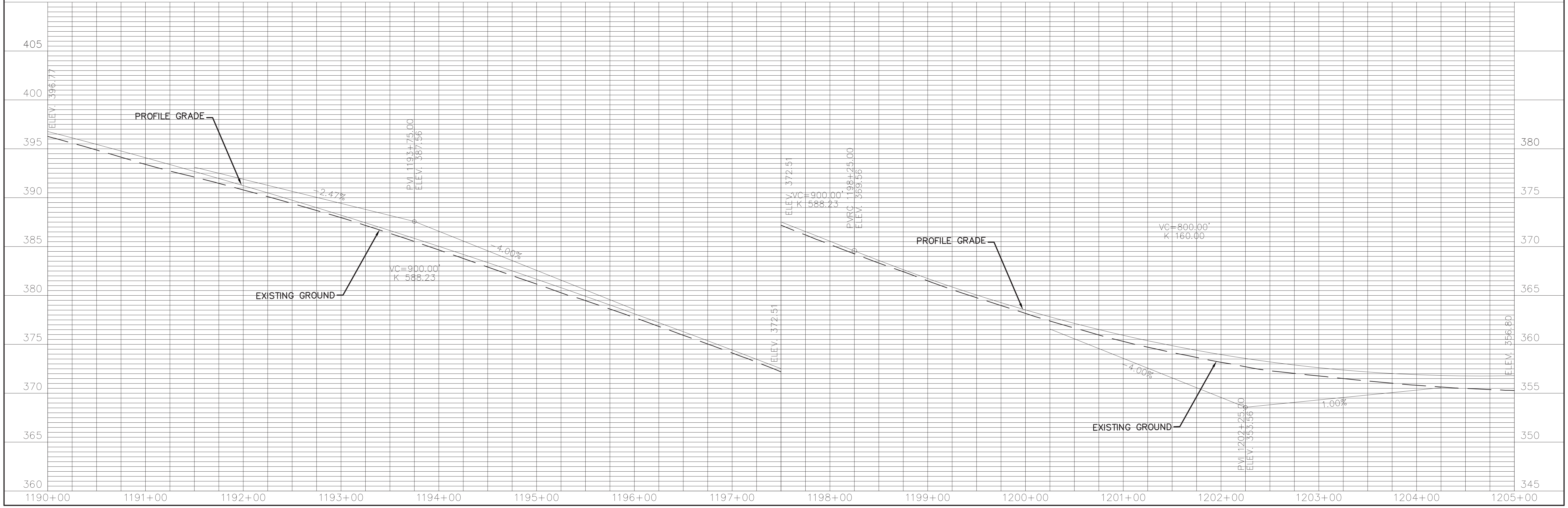
NOTE: PLAN OF BORINGS BASED ON 30% PLAN DOCUMENTS AS PROVIDED TO GHBW BY MICHAEL BAKER, JR., INC. ON MARCH 25, 2014



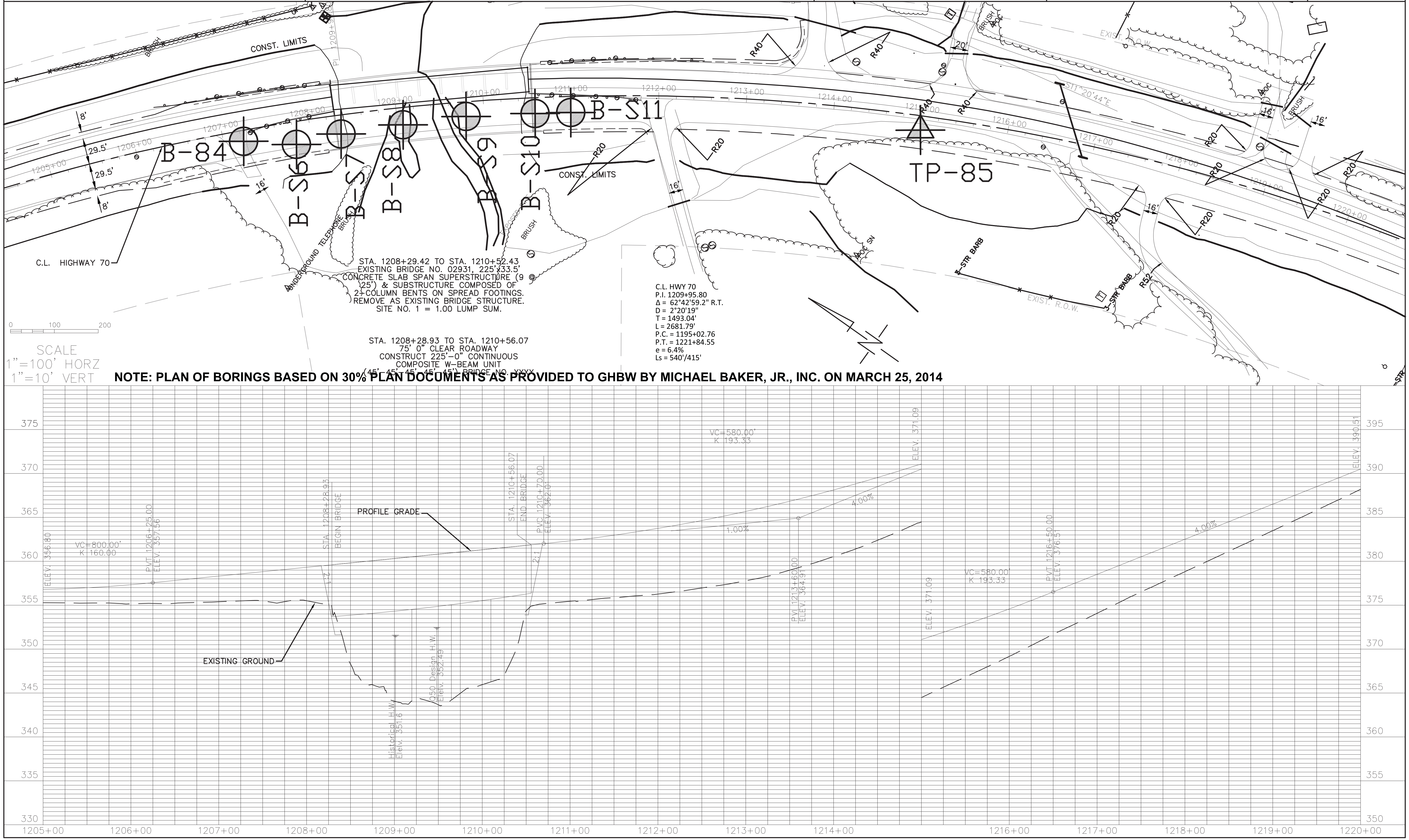
Grubbs, Hoskyn, Barton & Wyatt, INC. CONSULTING ENGINEERS	**PLAN OF BORINGS AND TEST PITS** **AHTD 061377: Hot Springs-I-30 (Widening) (S)** **Garland County and Saline County, Arkansas**	**Plan Scale: 1" = 100'** **Date: March, 2014**	**AHTD Job No. 061377** **GHBW Job No. 13-203**	**Plate 14**



NOTE: PLAN OF BORINGS BASED ON 30% PLAN DOCUMENTS AS PROVIDED TO GHBW BY MICHAEL BAKER, JR., INC. ON MARCH 25, 2014

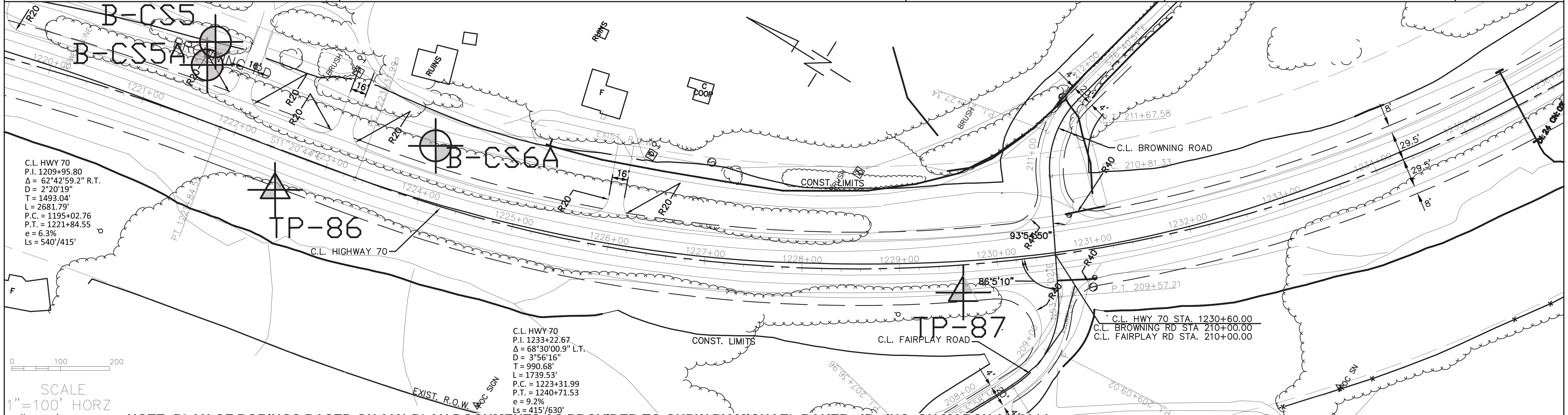


Grubbs, Hoskyn, Barton & Wyatt, INC. CONSULTING ENGINEERS	**PLAN OF BORINGS AND TEST PITS** **AHTD 061377: Hot Springs-I-30 (Widening) (S)** **Garland County and Saline County, Arkansas**	**Plan Scale: 1" = 100'** **Date: March, 2014**	**AHTD Job No. 061377** **GHBW Job No. 13-203**	**Plate 15**

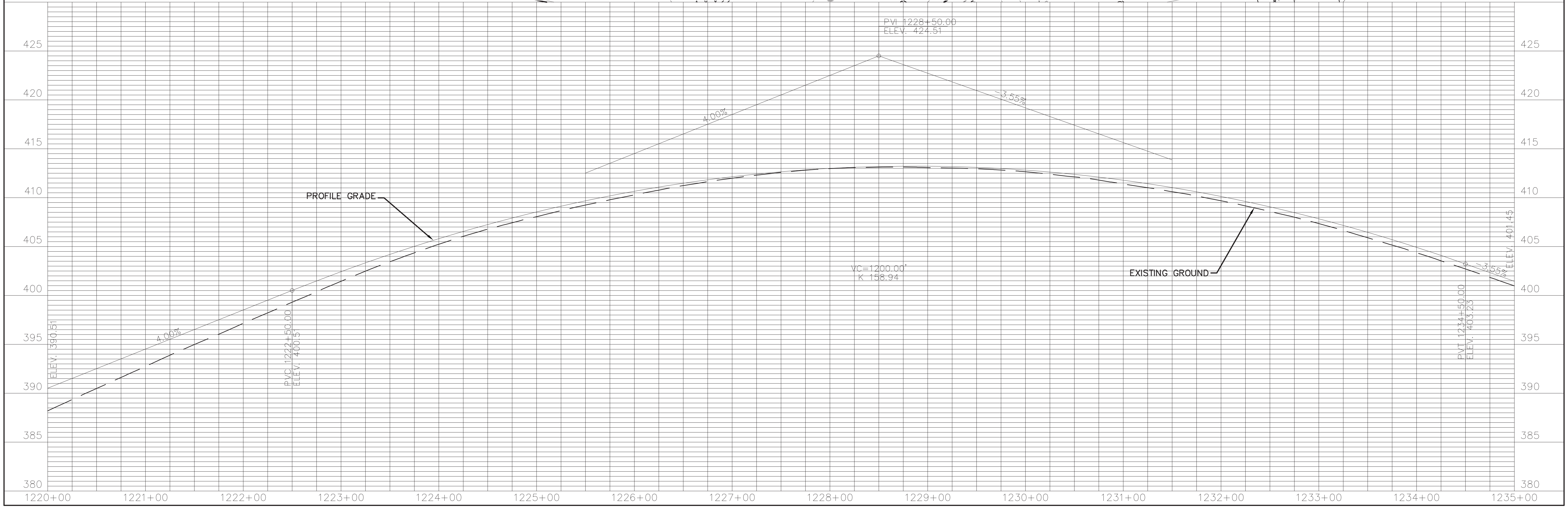


NOTE: PLAN OF BORINGS BASED ON 30% PLAN DOCUMENTS AS PROVIDED TO GHBW BY MICHAEL BAKER, JR., INC. ON MARCH 25, 2014

Grubbs, Hoskyn, Barton & Wyatt, INC. CONSULTING ENGINEERS	PLAN OF BORINGS AND TEST PITS AHTD 061377: Hot Springs-I-30 (Widening) (S) Garland County and Saline County, Arkansas	Plan Scale: 1" = 100' Date: March, 2014	AHTD Job No. 061377 GHBW Job No. 13-203	Plate 16



NOTE: PLAN OF BORINGS BASED ON 30% PLAN DOCUMENTS AS PROVIDED TO GHBW BY MICHAEL BAKER, JR., INC. ON MARCH 25, 2014



Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

PLAN OF BORINGS AND TEST PITS

AHTD 061377: Hot Springs-I-30 (Widening) (S)
Garland County and Saline County, Arkansas

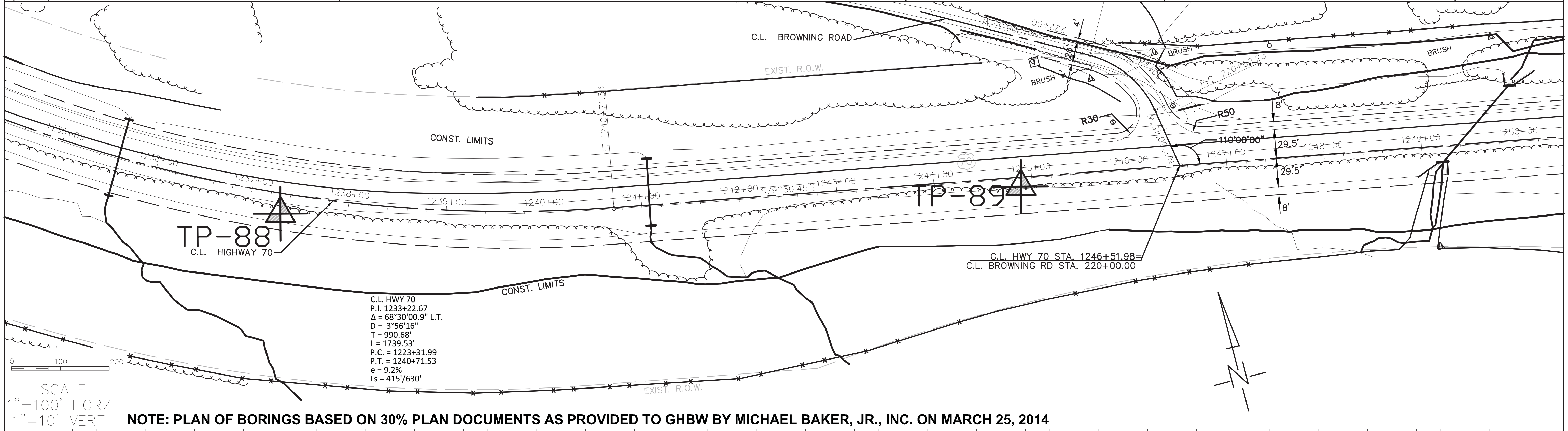
Plan Scale: 1" = 100'

Date: March, 2014

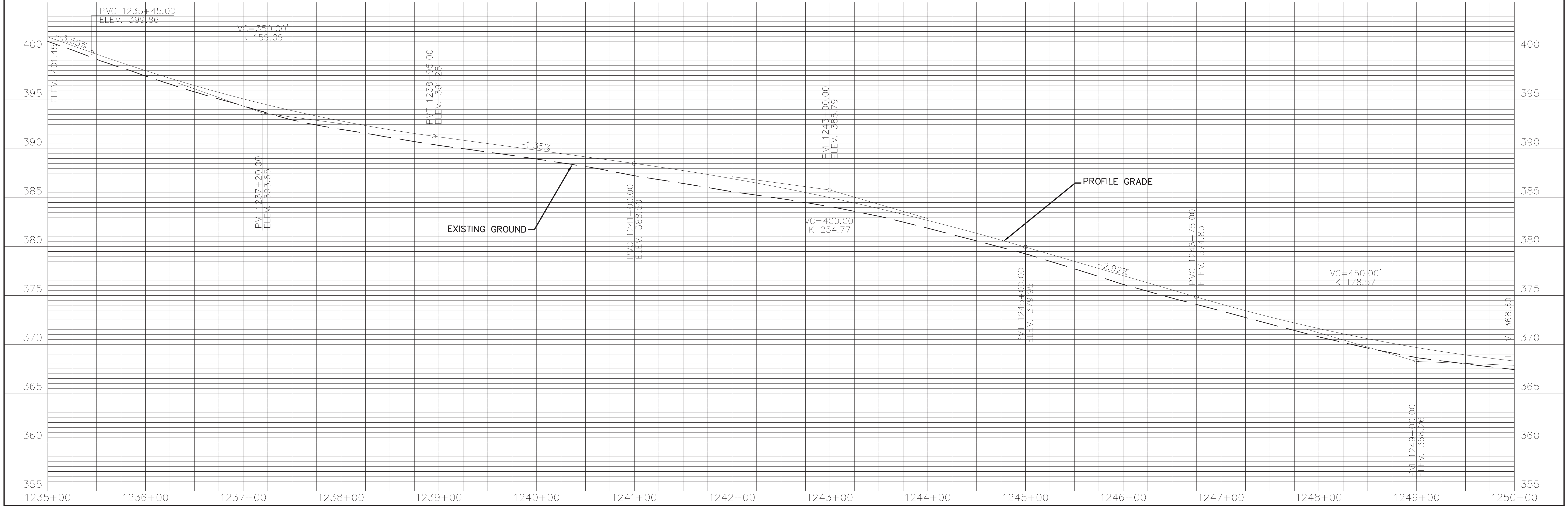
AHTD Job No. 061377

GHBW Job No. 13-203

Plate 17



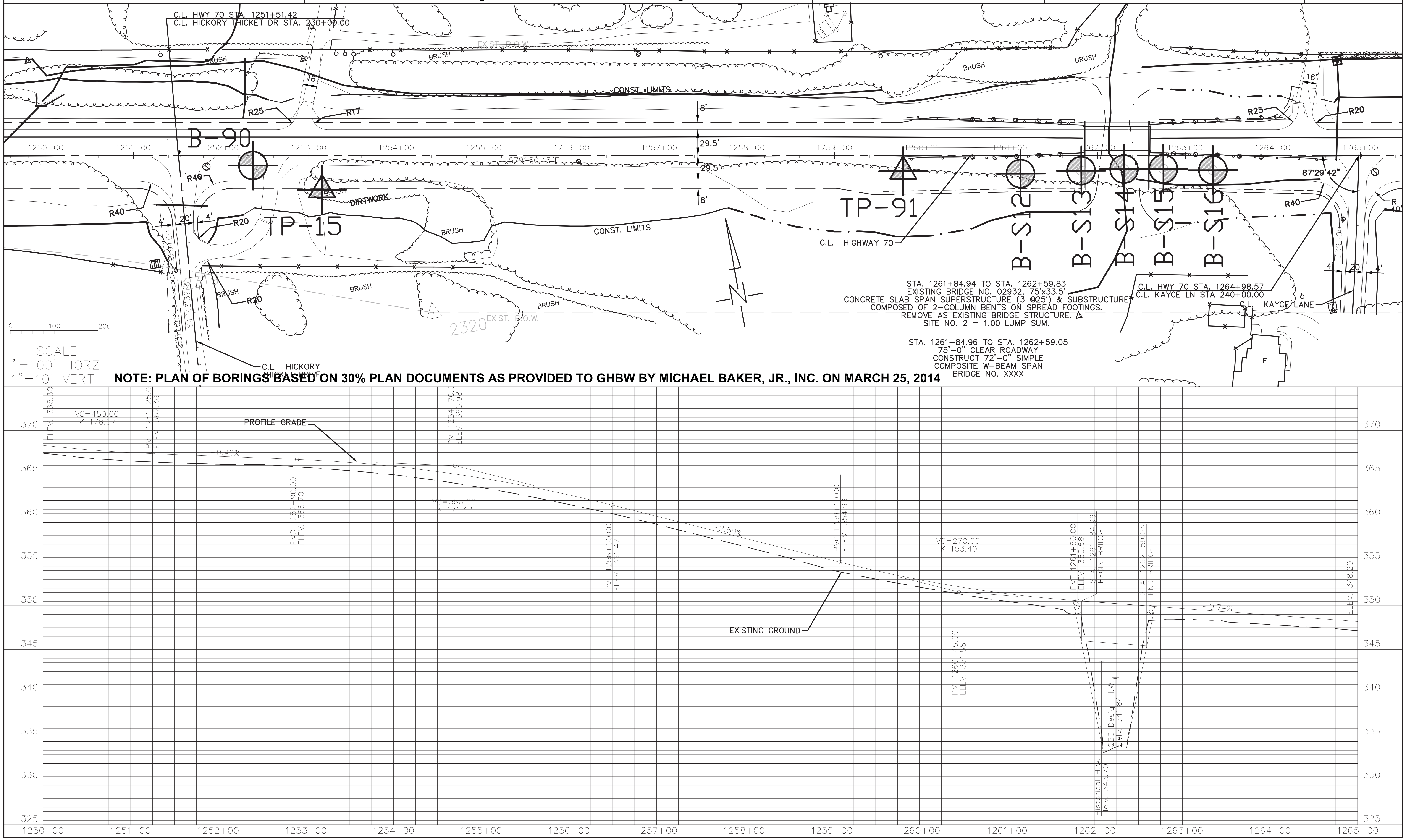
NOTE: PLAN OF BORINGS BASED ON 30% PLAN DOCUMENTS AS PROVIDED TO GHBW BY MICHAEL BAKER, JR., INC. ON MARCH 25, 2014



Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

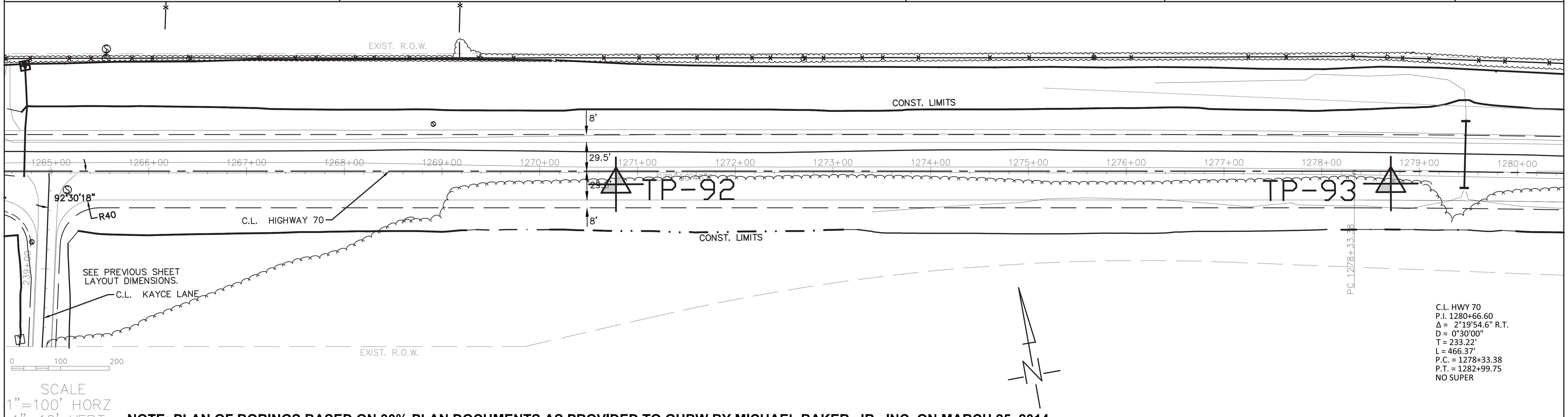
PLAN OF BORINGS AND TEST PITS
AHTD 061377: Hot Springs-I-30 (Widening) (S)
Garland County and Saline County, Arkansas

Plan Scale: 1" = 100'
Date: March, 2014
AHTD Job No. 061377
GHBW Job No. 13-203
Plate 18



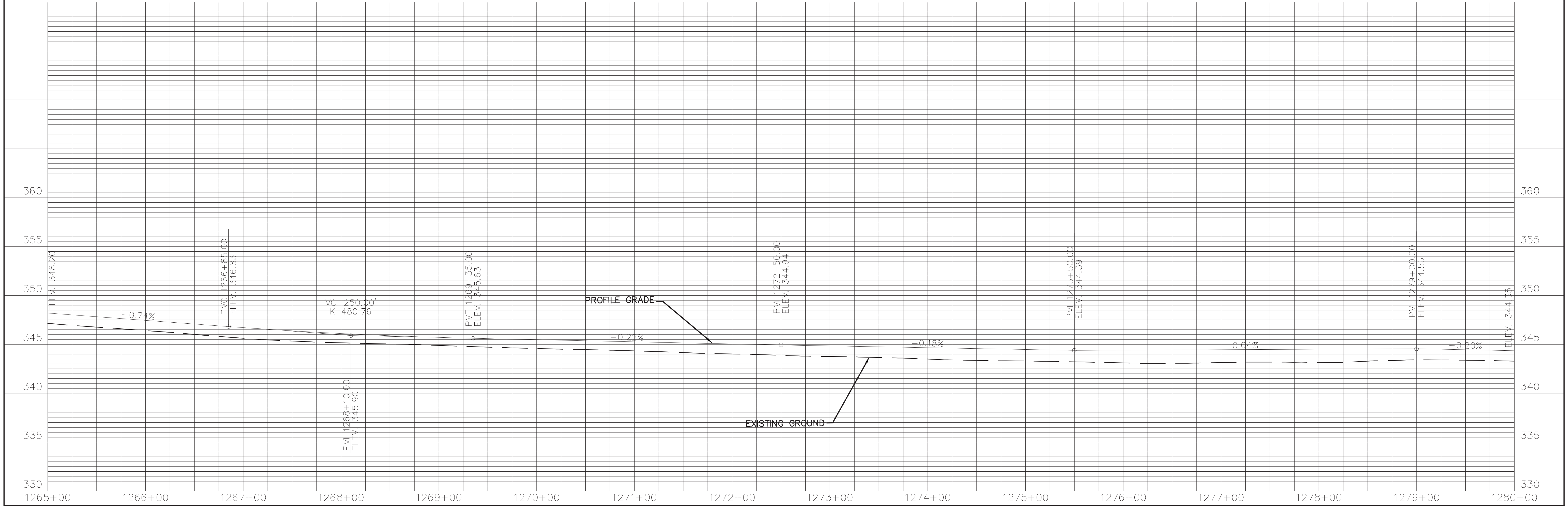
NOTE: PLAN OF BORINGS BASED ON 30% PLAN DOCUMENTS AS PROVIDED TO GHBW BY MICHAEL BAKER, JR., INC. ON MARCH 25, 2014

Grubbs, Hoskyn, Barton & Wyatt, INC. CONSULTING ENGINEERS	**PLAN OF BORINGS AND TEST PITS** **AHTD 061377: Hot Springs-I-30 (Widening) (S)** **Garland County and Saline County, Arkansas**	**Plan Scale: 1" = 100'** **Date: March, 2014**	**AHTD Job No. 061377** **GHBW Job No. 13-203**	**Plate 19**



SCALE
1"=100' HORZ
1"=10' VERT

NOTE: PLAN OF BORINGS BASED ON 30% PLAN DOCUMENTS AS PROVIDED TO GHBW BY MICHAEL BAKER, JR., INC. ON MARCH 25, 2014



Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

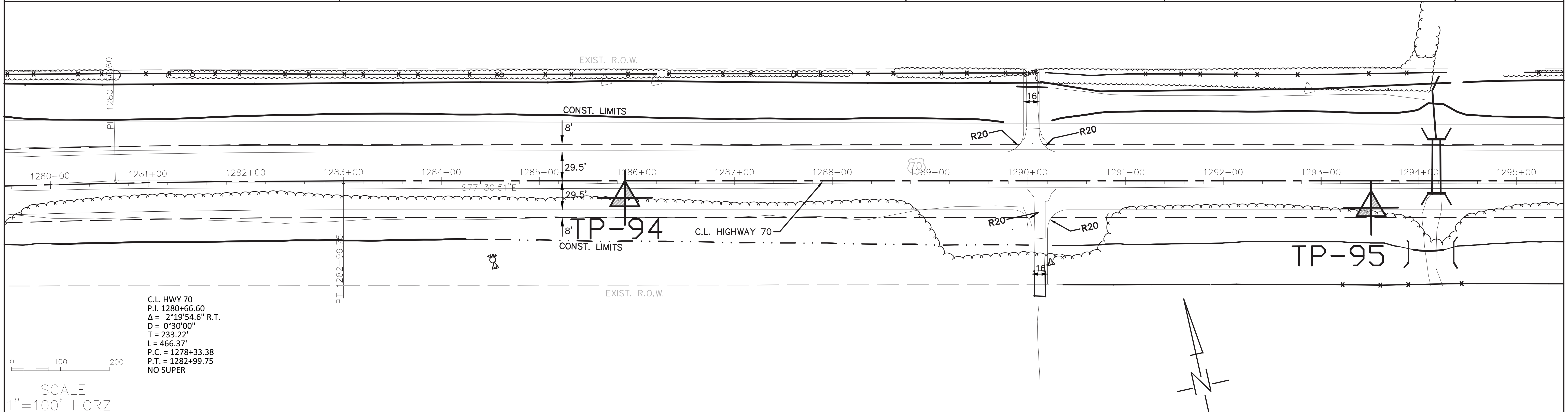
PLAN OF BORINGS AND TEST PITS

AHTD 061377: Hot Springs-I-30 (Widening) (S)
Garland County and Saline County, Arkansas

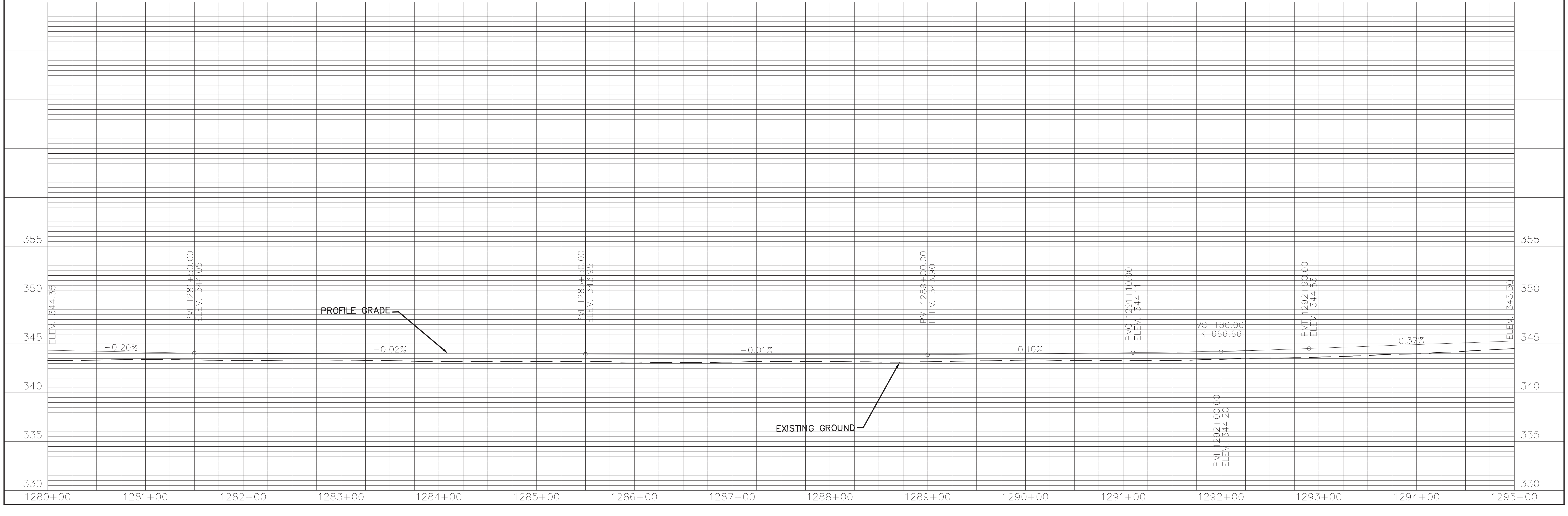
Plan Scale: 1" = 100'
Date: March, 2014

AHTD Job No. 061377
GHBW Job No. 13-203

Plate 20



NOTE: PLAN OF BORINGS BASED ON 30% PLAN DOCUMENTS AS PROVIDED TO GHBW BY MICHAEL BAKER, JR., INC. ON MARCH 25, 2014



Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

PLAN OF BORINGS AND TEST PITS

AHTD 061377: Hot Springs-I-30 (Widening) (S)
Garland County and Saline County, Arkansas

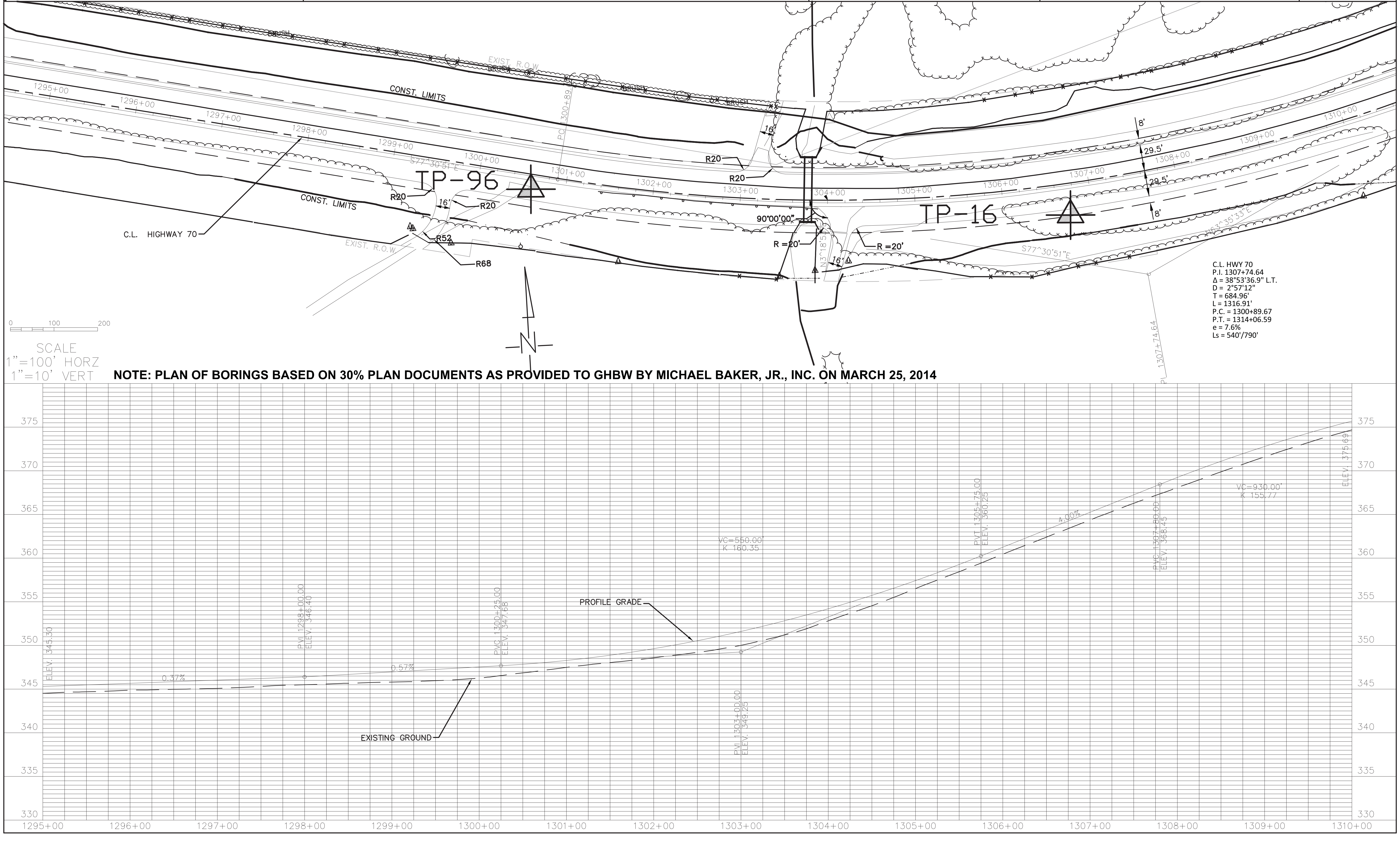
Plan Scale: 1" = 100'

Date: March, 2014

AHTD Job No. 061377

GHBW Job No. 13-203

Plate 21



NOTE: PLAN OF BORINGS BASED ON 30% PLAN DOCUMENTS AS PROVIDED TO GHBW BY MICHAEL BAKER, JR., INC. ON MARCH 25, 2014

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

PLAN OF BORINGS AND TEST PITS
AHTD 061377: Hot Springs-I-30 (Widening) (S)
Garland County and Saline County, Arkansas

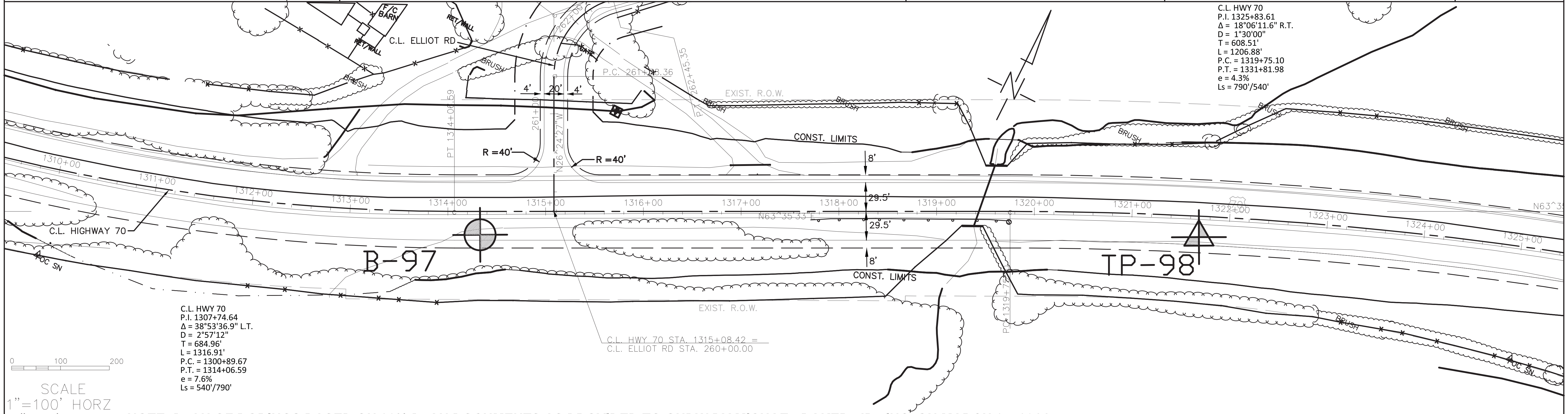
Plan Scale: 1" = 100'

Date: March, 2014

AHTD Job No. 061377

GHBW Job No. 13-203

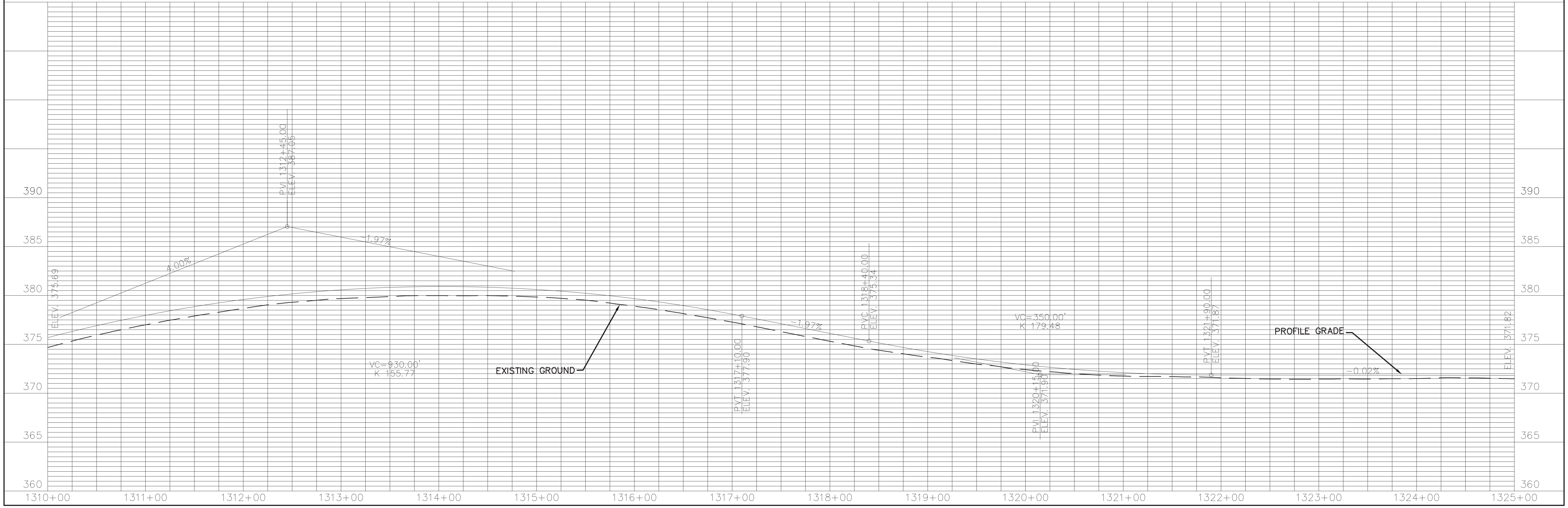
Plate 22



C.L. HWY 70
P.I. 1325+83.61
Δ = 18°06'11.6" R.T.
D = 1°30'00"
T = 608.51'
L = 1206.88'
P.C. = 1319+75.10
P.T. = 1331+81.98
e = 4.3%
Ls = 790'/540'

C.L. HWY 70
P.I. 1307+74.64
Δ = 38°53'36.9" L.T.
D = 2°57'12"
T = 684.96'
L = 1316.91'
P.C. = 1300+89.67
P.T. = 1314+06.59
e = 7.6%
Ls = 540'/790'

NOTE: PLAN OF BORINGS BASED ON 30% PLAN DOCUMENTS AS PROVIDED TO GHBW BY MICHAEL BAKER, JR., INC. ON MARCH 25, 2014



Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

PLAN OF BORINGS AND TEST PITS

AHTD 061377: Hot Springs-I-30 (Widening) (S)
Garland County and Saline County, Arkansas

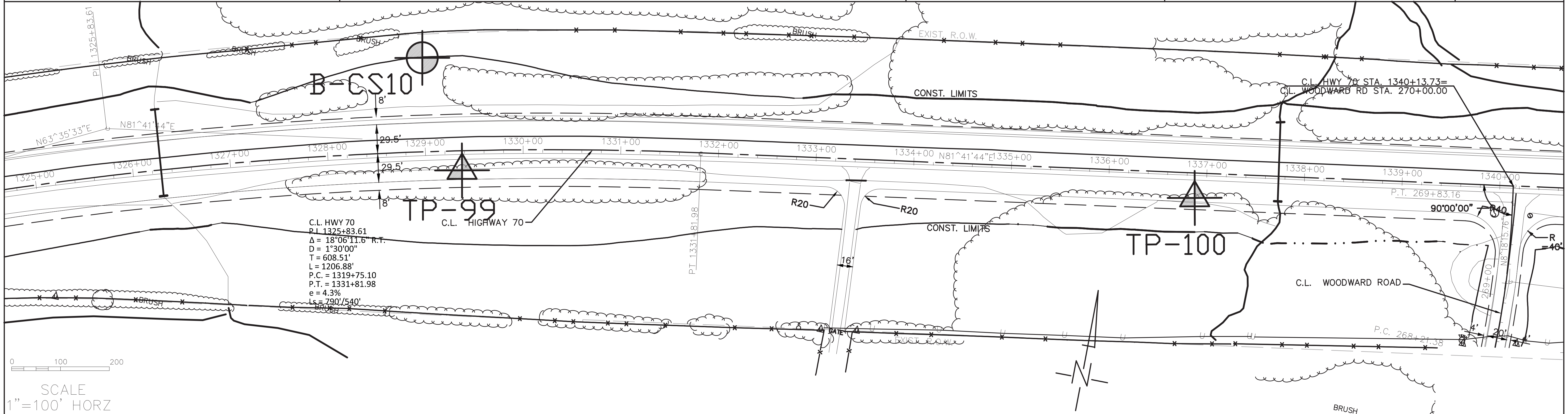
Plan Scale: 1" = 100'

Date: March, 2014

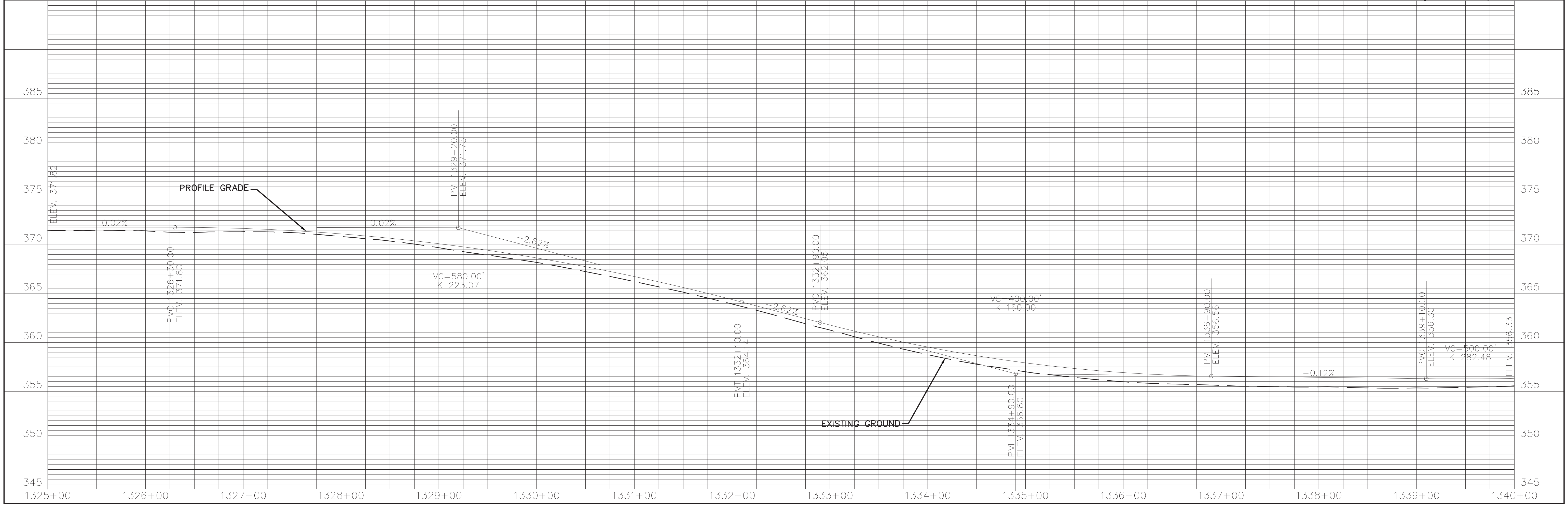
AHTD Job No. 061377

GHBW Job No. 13-203

Plate 23



NOTE: PLAN OF BORINGS BASED ON 30% PLAN DOCUMENTS AS PROVIDED TO GHBW BY MICHAEL BAKER, JR., INC. ON MARCH 25, 2014



Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

PLAN OF BORINGS AND TEST PITS

AHTD 061377: Hot Springs-I-30 (Widening) (S)
Garland County and Saline County, Arkansas

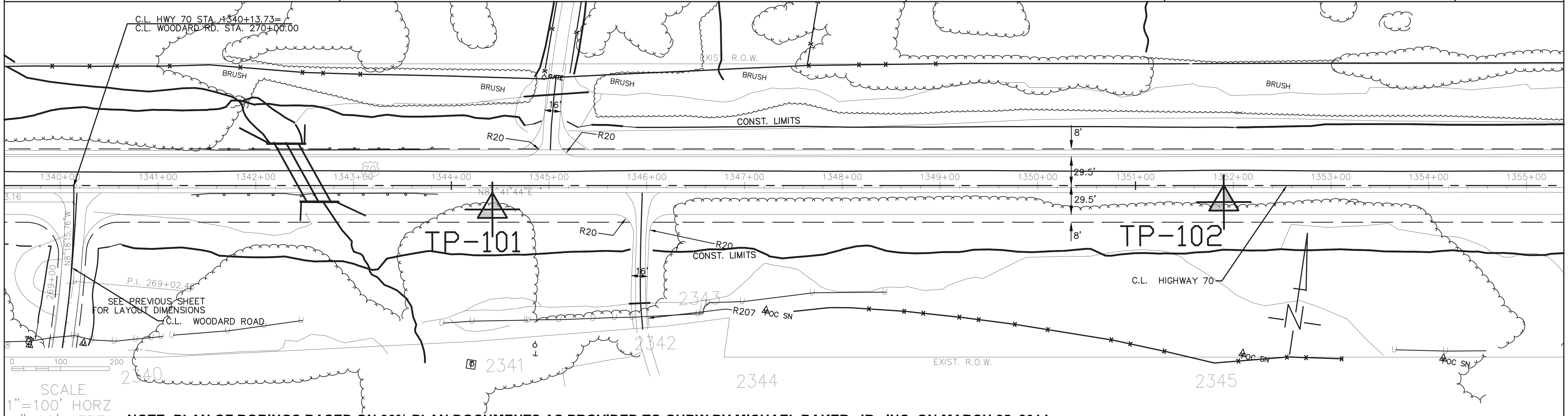
Plan Scale: 1" = 100'

Date: March, 2014

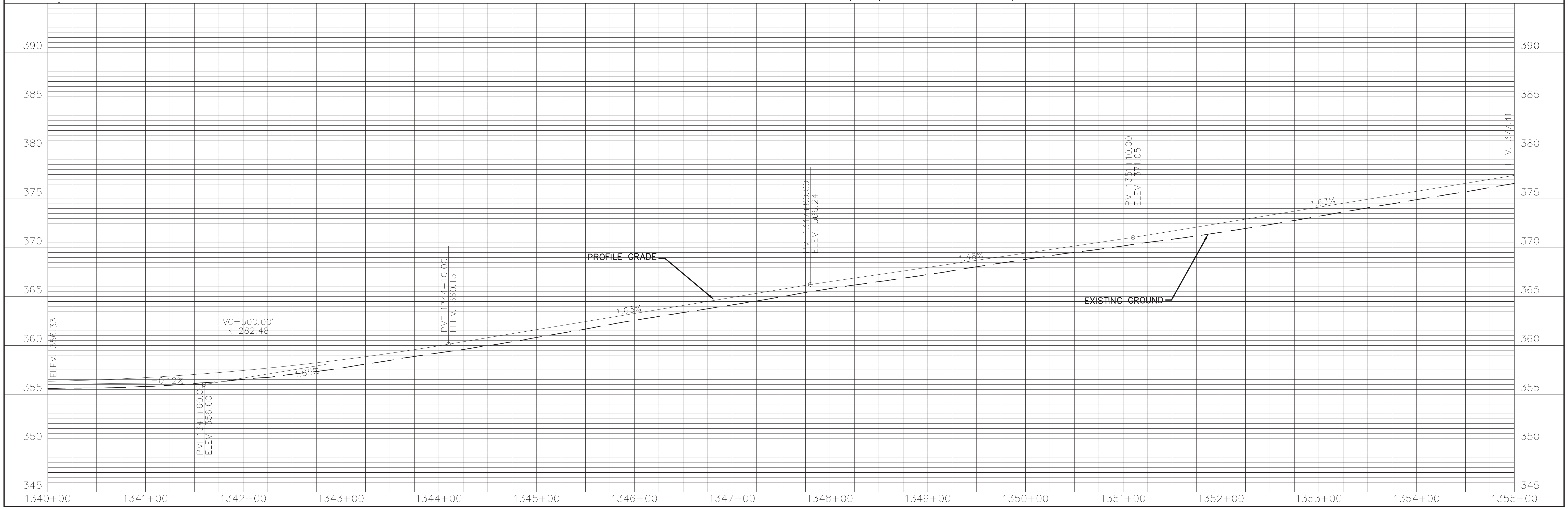
AHTD Job No. 061377

GHBW Job No. 13-203

Plate 24



NOTE: PLAN OF BORINGS BASED ON 30% PLAN DOCUMENTS AS PROVIDED TO GHBW BY MICHAEL BAKER, JR., INC. ON MARCH 25, 2014



Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

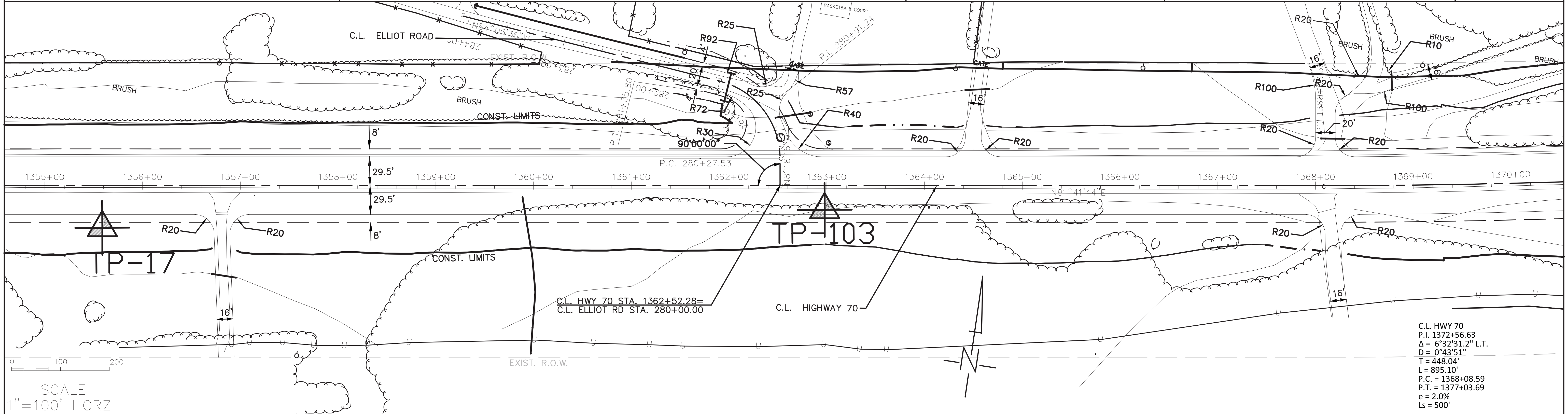
PLAN OF BORINGS AND TEST PITS

AHTD 061377: Hot Springs-I-30 (Widening) (S)
Garland County and Saline County, Arkansas

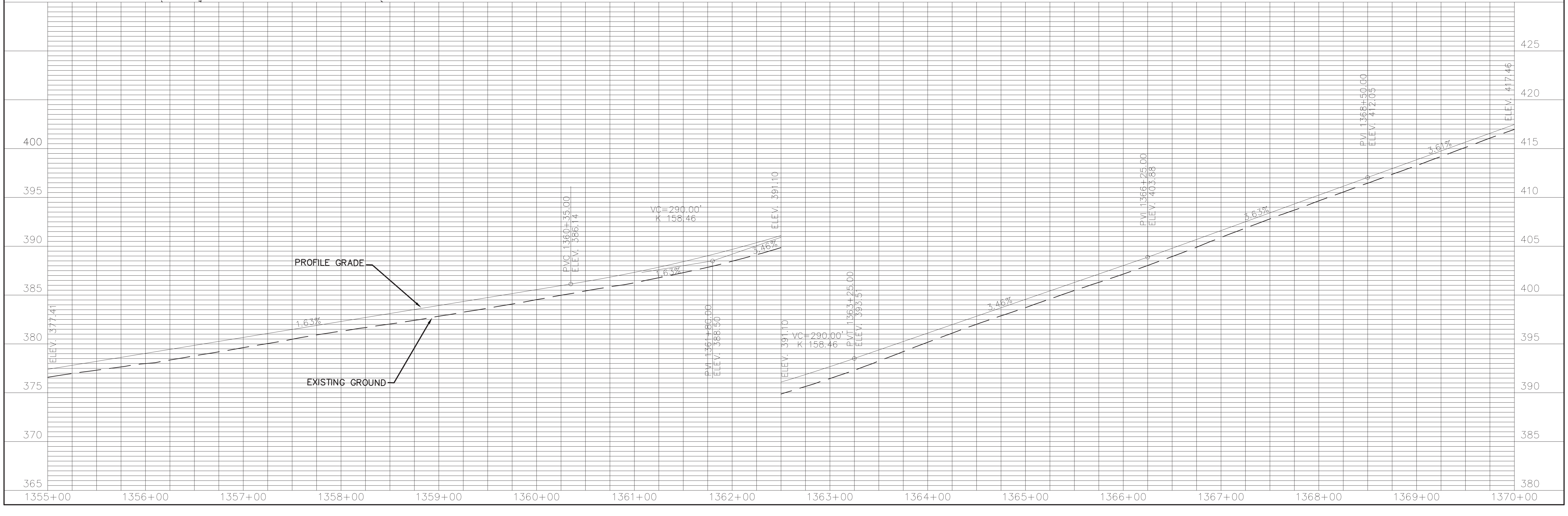
Plan Scale: 1" = 100'
Date: March, 2014

AHTD Job No. 061377
GHBW Job No. 13-203

Plate 25



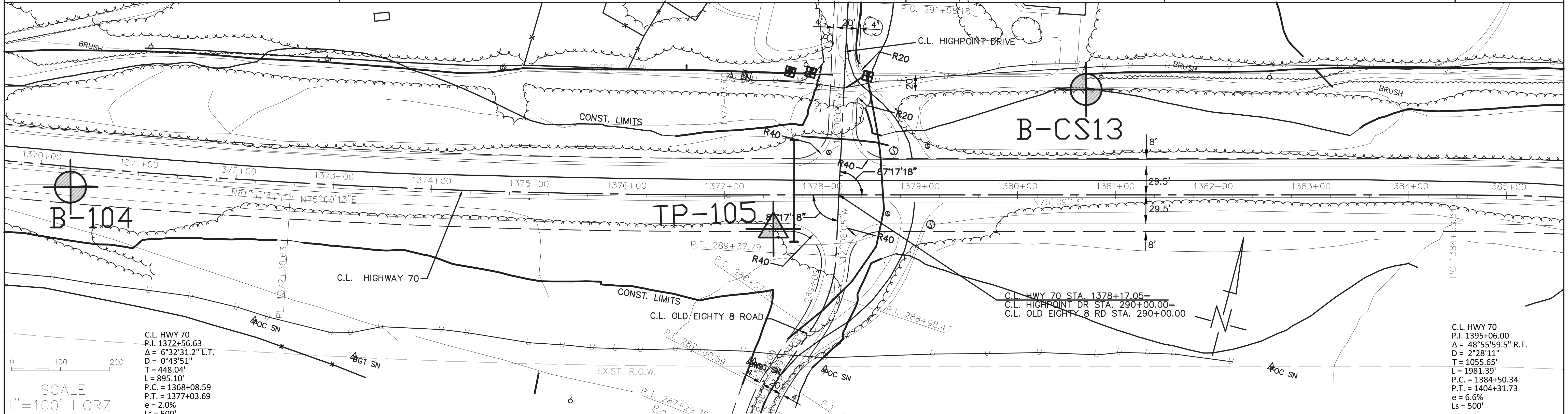
NOTE: PLAN OF BORINGS BASED ON 30% PLAN DOCUMENTS AS PROVIDED TO GHBW BY MICHAEL BAKER, JR., INC. ON MARCH 25, 2014



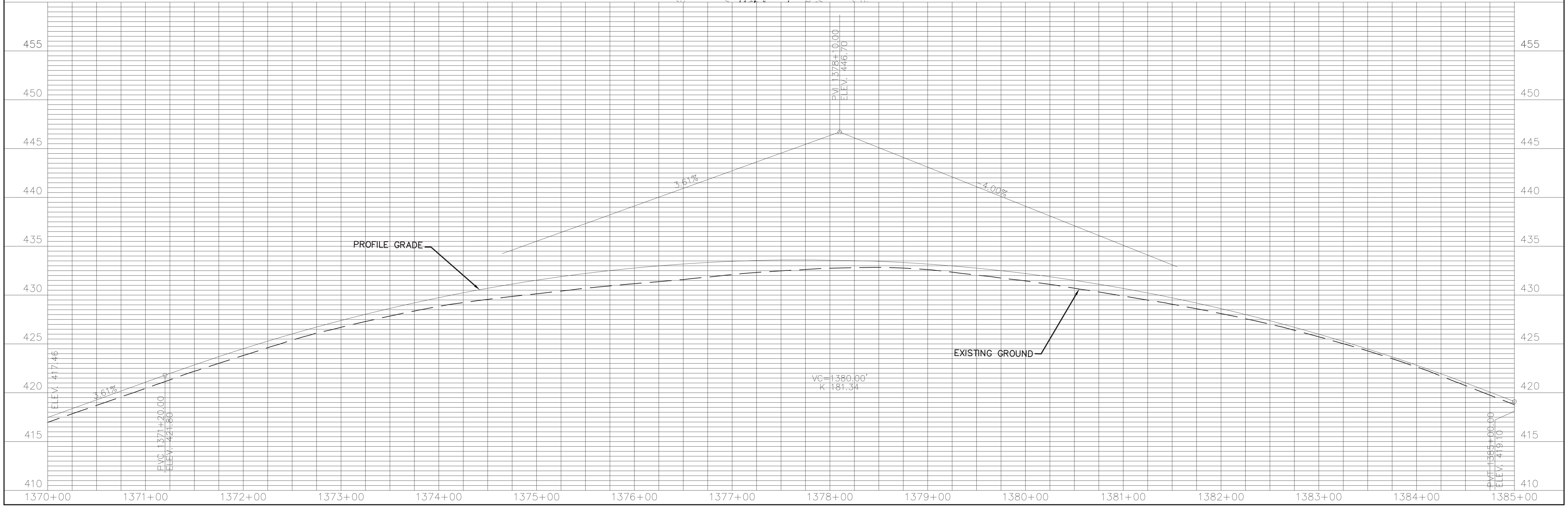
Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

PLAN OF BORINGS AND TEST PITS
AHTD 061377: Hot Springs-I-30 (Widening) (S)
Garland County and Saline County, Arkansas

Plan Scale: 1" = 100'	AHTD Job No. 061377	Plate 26
Date: March, 2014	GHBW Job No. 13-203	



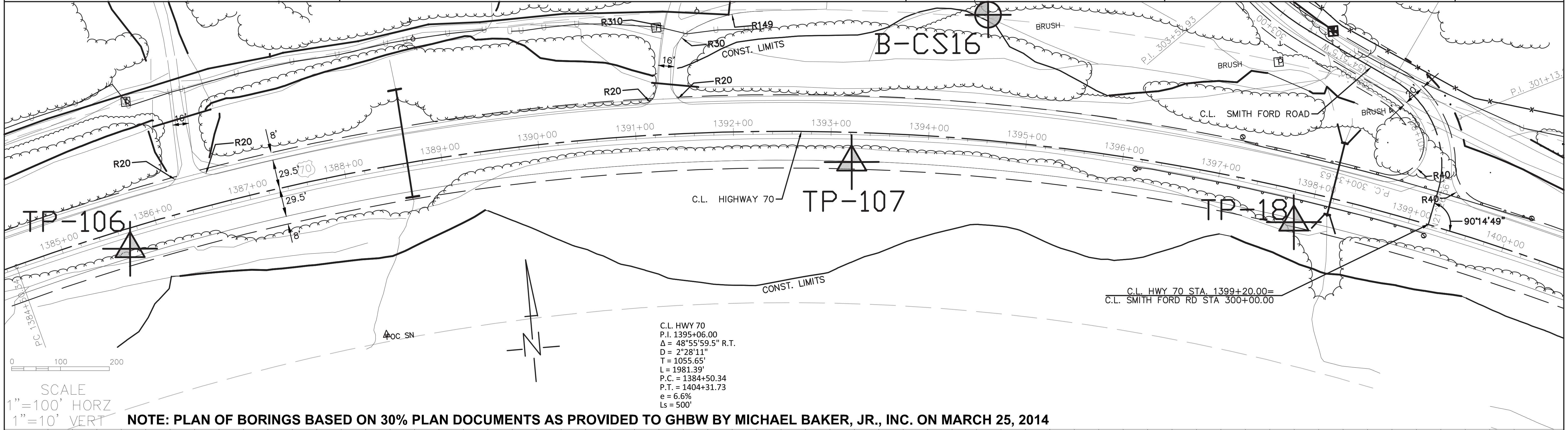
NOTE: PLAN OF BORINGS BASED ON 30% PLAN DOCUMENTS AS PROVIDED TO GHBW BY MICHAEL BAKER, JR., INC. ON MARCH 25, 2014



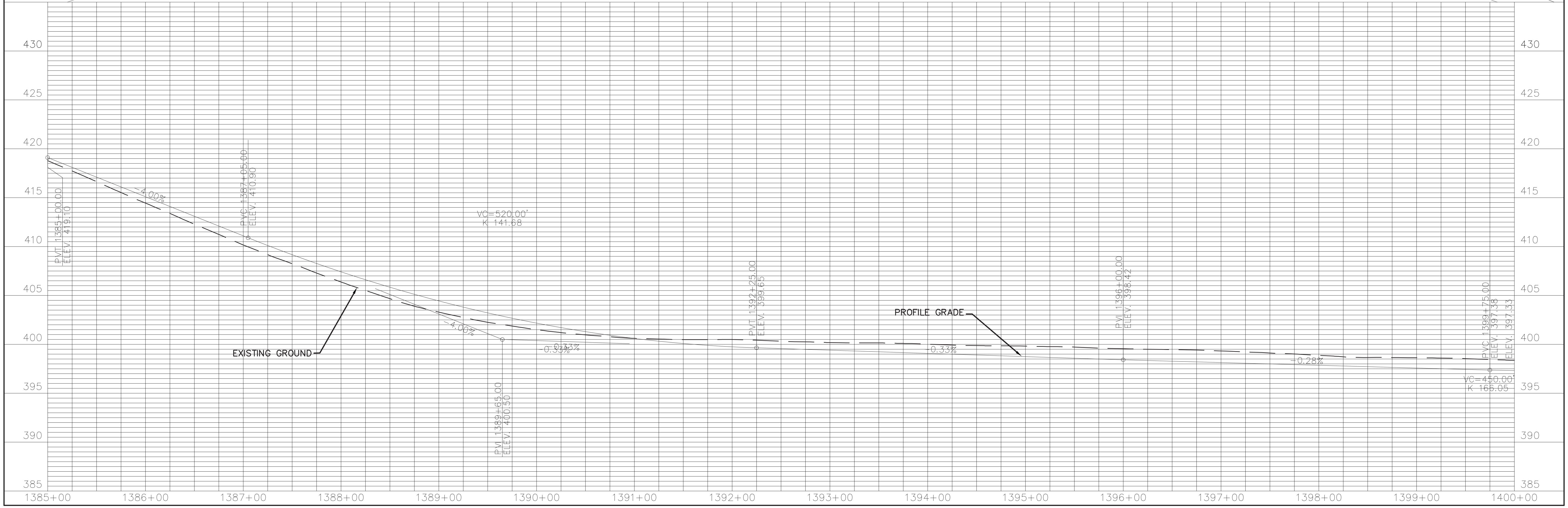
Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

PLAN OF BORINGS AND TEST PITS
AHTD 061377: Hot Springs-I-30 (Widening) (S)
Garland County and Saline County, Arkansas

Plan Scale: 1" = 100'
Date: March, 2014
AHTD Job No. 061377
GHBW Job No. 13-203
Plate 27



NOTE: PLAN OF BORINGS BASED ON 30% PLAN DOCUMENTS AS PROVIDED TO GHBW BY MICHAEL BAKER, JR., INC. ON MARCH 25, 2014



Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

PLAN OF BORINGS AND TEST PITS
AHTD 061377: Hot Springs-I-30 (Widening) (S)
Garland County and Saline County, Arkansas

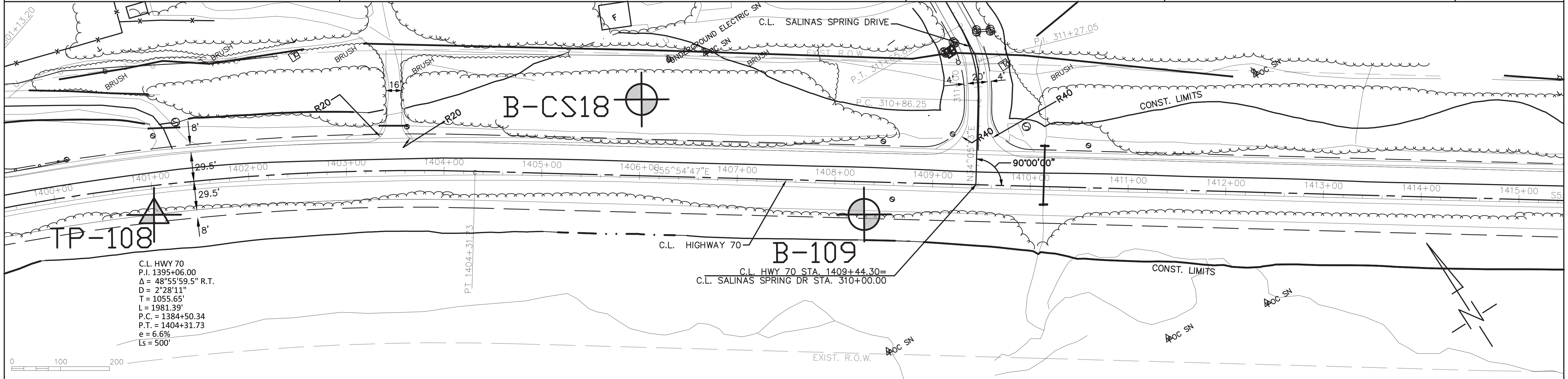
Plan Scale: 1" = 100'

Date: March, 2014

AHTD Job No. 061377

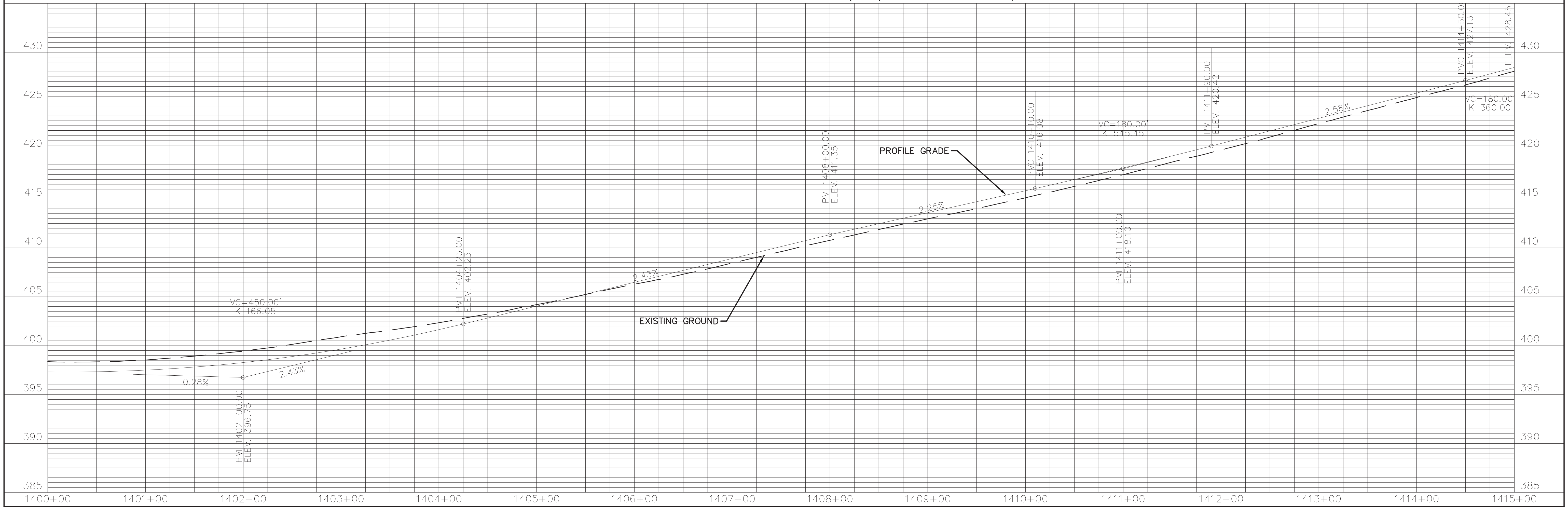
GHBW Job No. 13-203

Plate 28



SCALE
1"=100' HORZ
1"=10' VERT

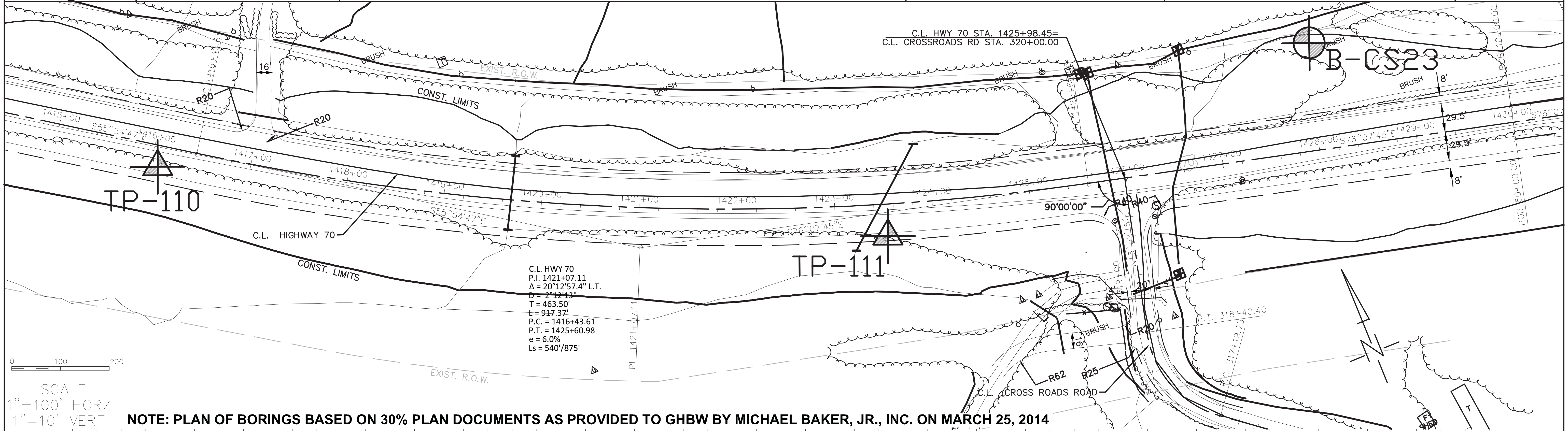
NOTE: PLAN OF BORINGS BASED ON 30% PLAN DOCUMENTS AS PROVIDED TO GHBW BY MICHAEL BAKER, JR., INC. ON MARCH 25, 2014



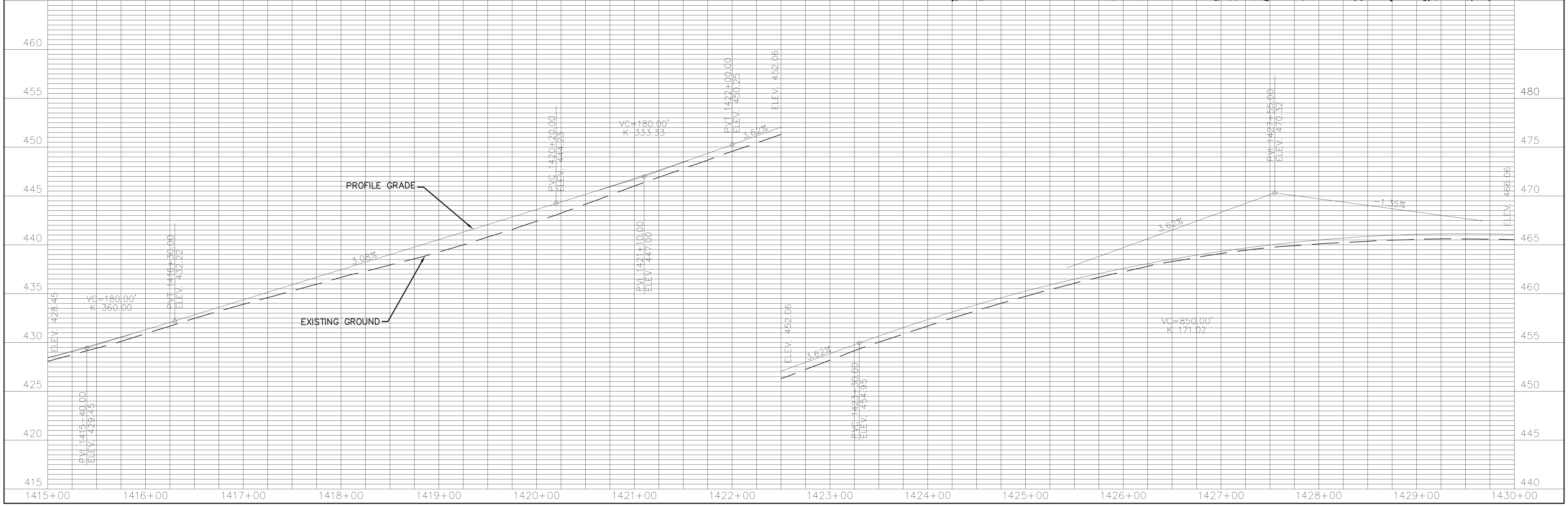
Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

PLAN OF BORINGS AND TEST PITS
AHTD 061377: Hot Springs-I-30 (Widening) (S)
Garland County and Saline County, Arkansas

Plan Scale: 1" = 100'
Date: March, 2014
AHTD Job No. 061377
GHBW Job No. 13-203
Plate 29



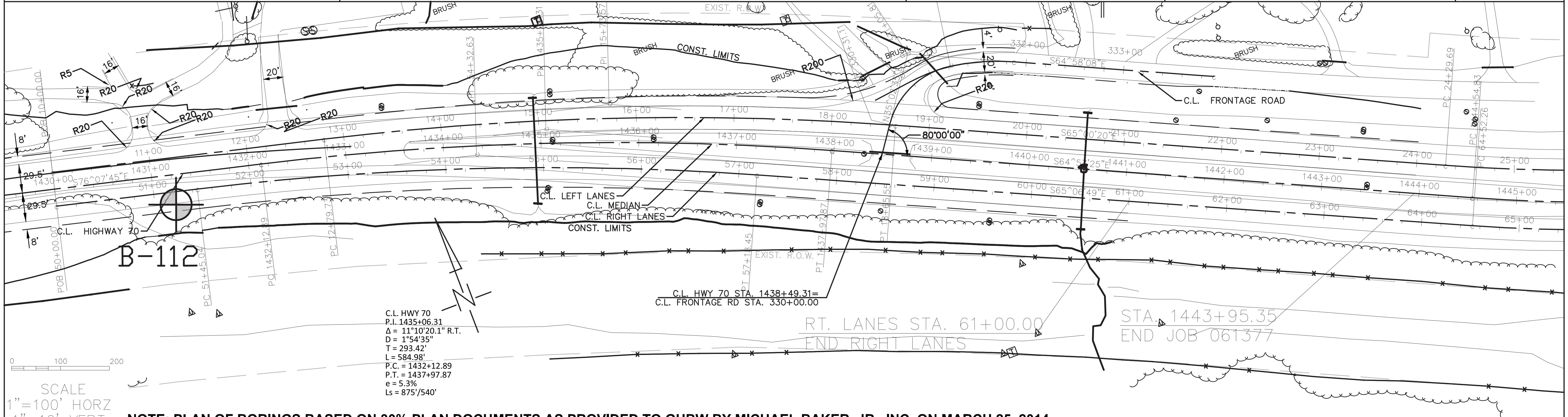
NOTE: PLAN OF BORINGS BASED ON 30% PLAN DOCUMENTS AS PROVIDED TO GHBW BY MICHAEL BAKER, JR., INC. ON MARCH 25, 2014



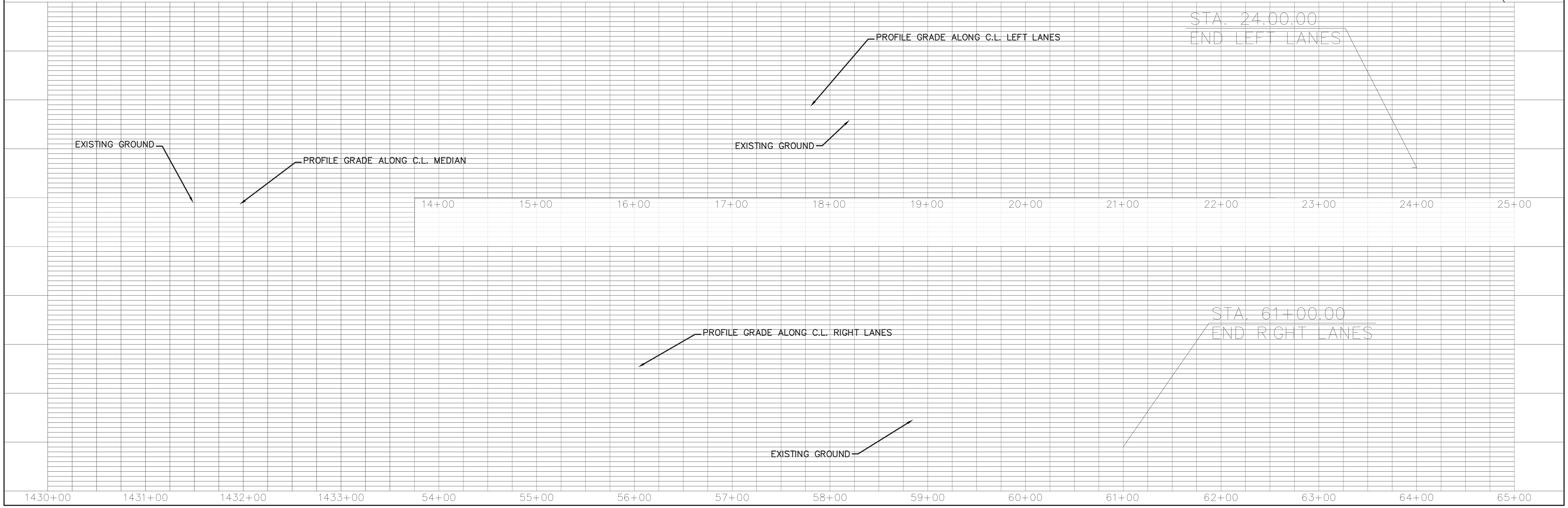
Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

PLAN OF BORINGS AND TEST PITS
AHTD 061377: Hot Springs-I-30 (Widening) (S)
Garland County and Saline County, Arkansas

Plan Scale: 1" = 100'	**AHTD Job No. 061377**	**Plate 30**
Date: March, 2014	**GHBW Job No. 13-203**	



NOTE: PLAN OF BORINGS BASED ON 30% PLAN DOCUMENTS AS PROVIDED TO GHBW BY MICHAEL BAKER, JR., INC. ON MARCH 25, 2014



ATTACHMENT 3

13-203

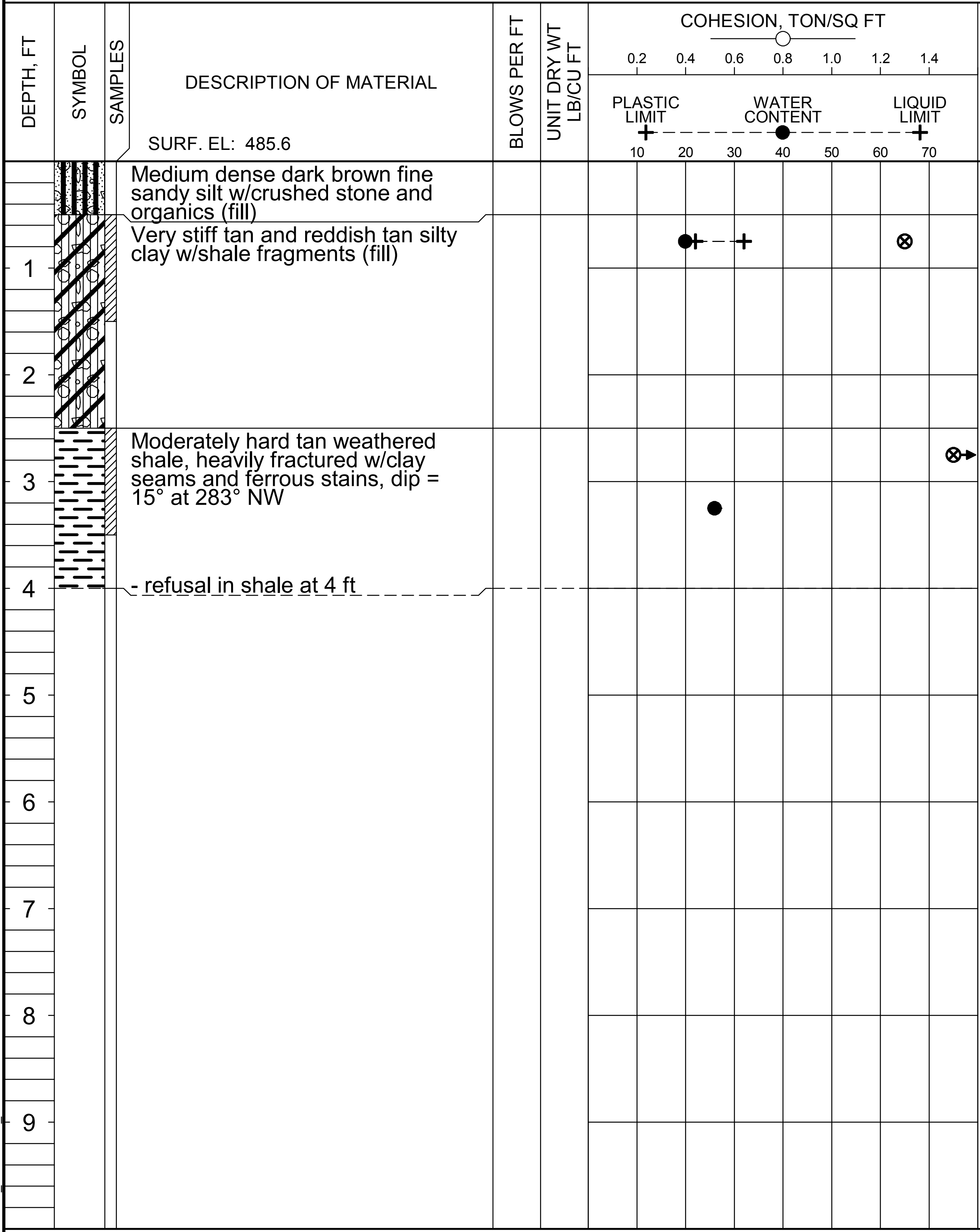
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 58

AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Garland County, Arkansas

TYPE: Mini Excavator
LOCATION: Approx Sta 1005+26, 39 ft Rt

DESCRIPTION OF MATERIAL SURF. EL: 485.6	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
Medium dense dark brown fine sandy silt w/crushed stone and organics (fill)			
Very stiff tan and reddish tan silty clay w/shale fragments (fill)			43
Moderately hard tan weathered shale, heavily fractured w/clay seams and ferrous stains, dip = 15° at 283° NW			
- refusal in shale at 4 ft			



COMPLETION DEPTH: 4.0 ft
DATE: 1-7-14

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 1/7/2014

LTPNEW 13-203_ROADWAY_GARLAND COUNTY.GPJ 7-9-14

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 59

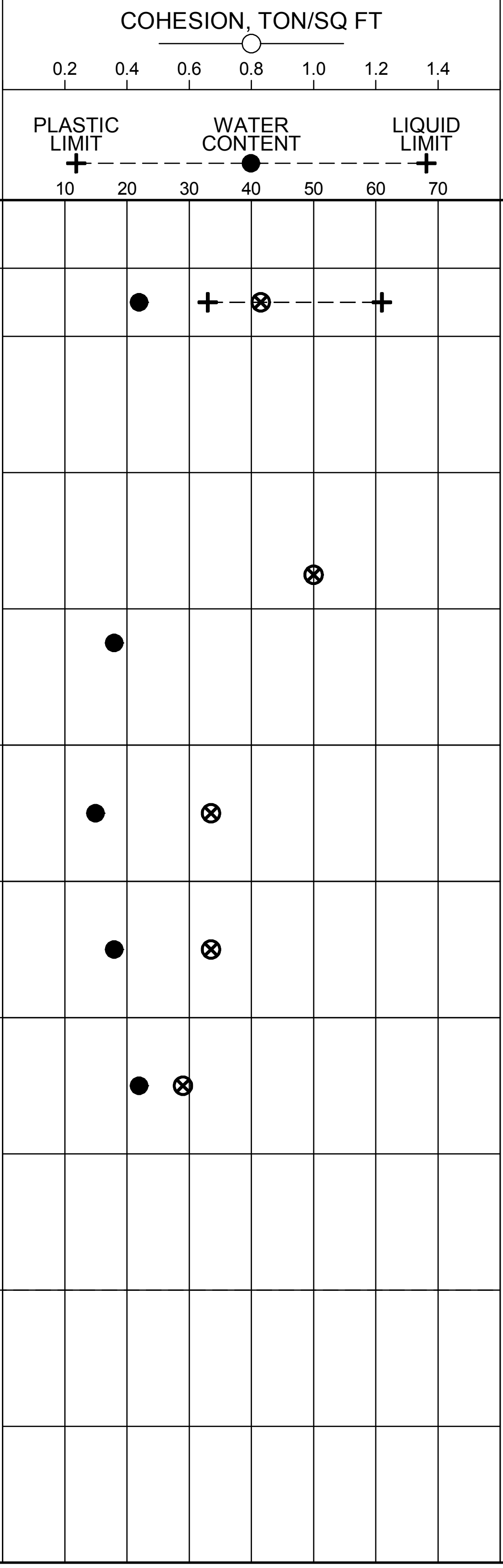
AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Garland County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 1012+61, 37 ft Rt

SURF. EL: 498.1

DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
Medium dense dark brown fine sandy silt w/crushed stone (fill)			
Stiff tan and reddish tan silty clay w/shale fragments (fill)			43
- very stiff below 2.5 ft			
Stiff dark gray clayey silt w/some fine to coarse gravel and decayed organics			
- perched water at 5 ft			
Stiff tan silty clay w/some fine to coarse gravel			
Stiff tan and gray silty clay w/occasional shale fragments and ferrous stains			



COMPLETION DEPTH: 8.0 ft
DATE: 1-7-14

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 1/7/2014

13-203

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 60

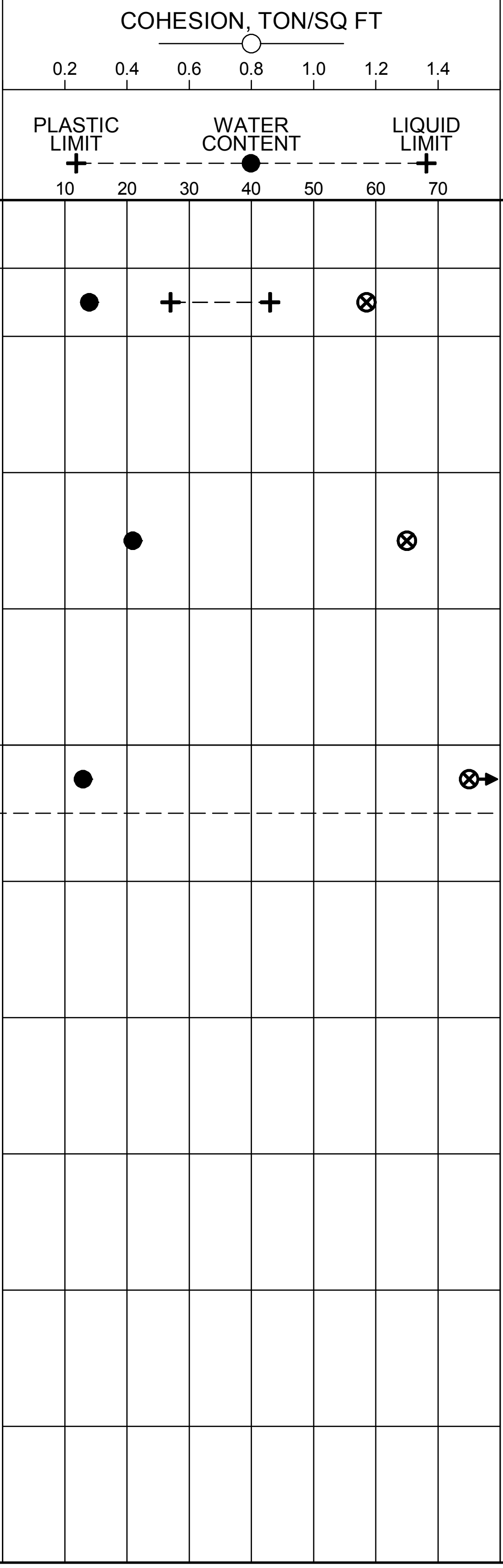
AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Garland County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 1019+89, 43 ft Rt

SURF. EL: 509.7

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
0 - 0.5	Loose dark brown fine sandy silt w/organics			
0.5 - 4	Low hardness gray, reddish tan and tan highly weathered shale w/occasional quartz veins			49
	- completely weathered sandstone layer from 3 - 4 ft			
4 - 4.5	Moderately hard reddish tan and gray weathered shale w/occasional sandstone seams and ferrous stains			
	- refusal at 4.5 ft			



COMPLETION DEPTH: 4.5 ft
DATE: 12-30-13

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 12/30/2013

LTPNEW 13-203_ROADWAY_GARLAND COUNTY.GPJ 7-9-14

13-203

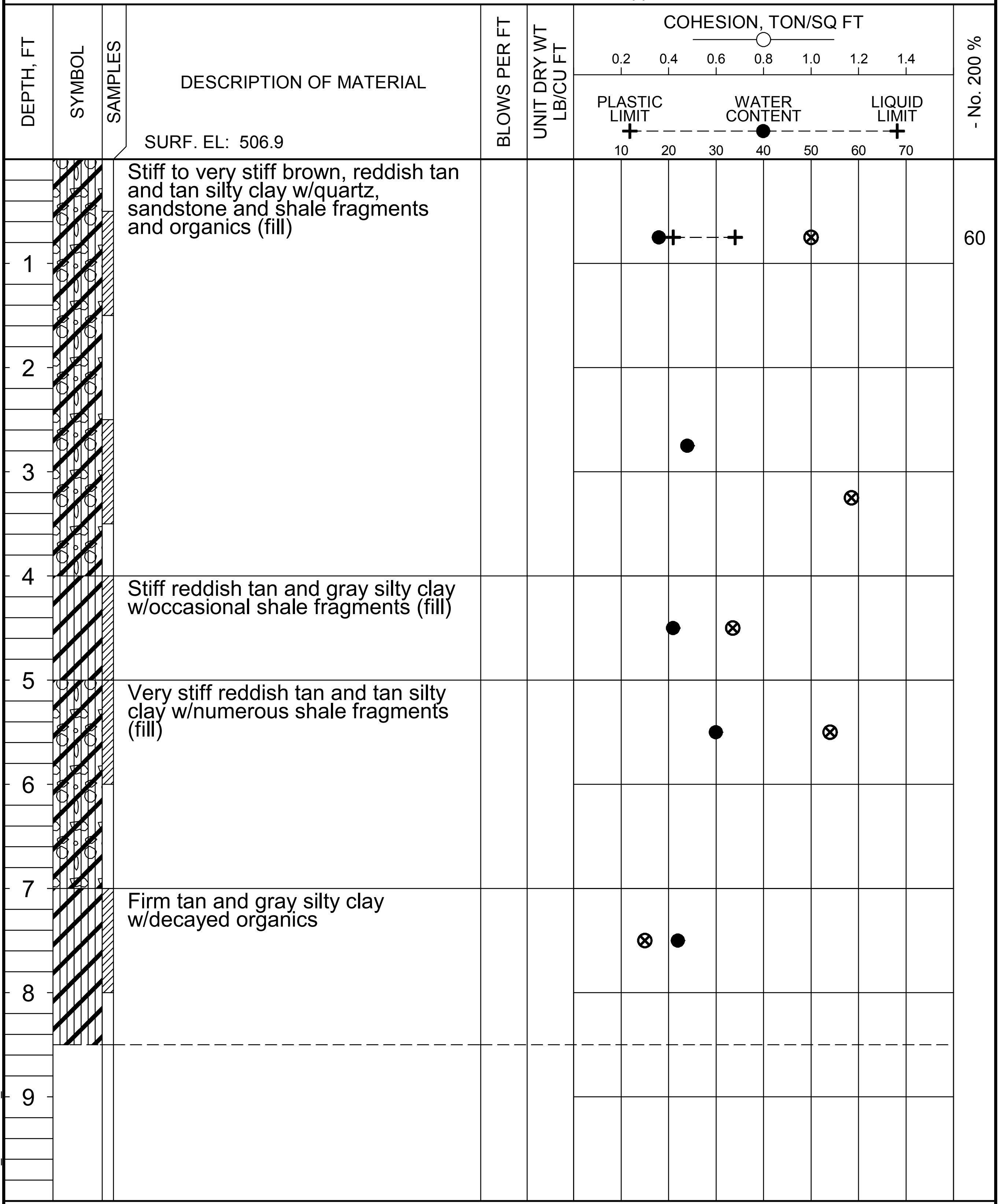
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 61

AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Garland County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 1027+45, 39 ft Rt



Stiff to very stiff brown, reddish tan and tan silty clay w/quartz, sandstone and shale fragments and organics (fill)

Stiff reddish tan and gray silty clay w/occasional shale fragments (fill)

Very stiff reddish tan and tan silty clay w/numerous shale fragments (fill)

Firm tan and gray silty clay w/decayed organics

COMPLETION DEPTH: 8.5 ft
DATE: 12-30-13

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 12/30/2013

LTPNEW 13-203_ROADWAY_GARLAND COUNTY.GPJ 7-9-14

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

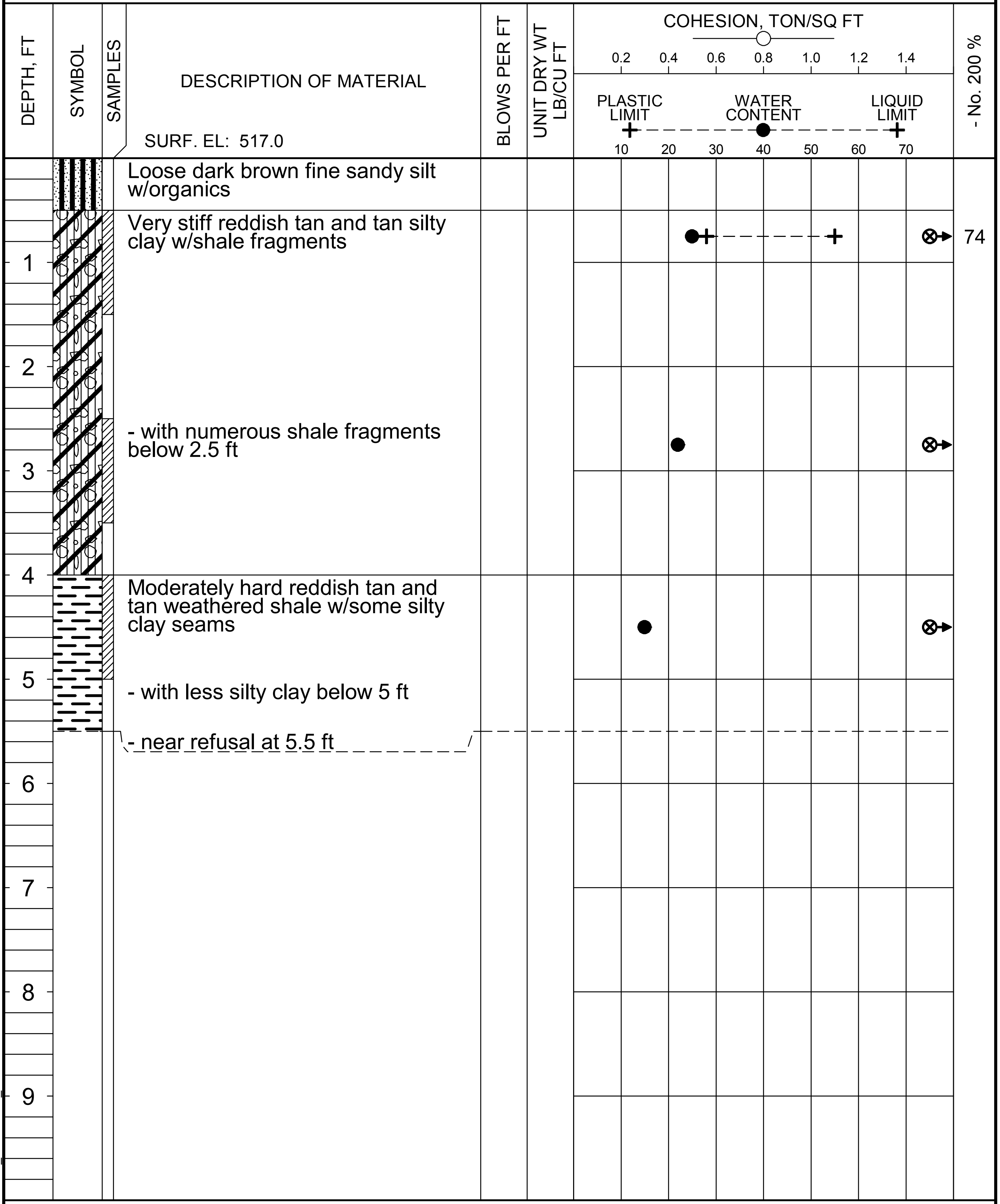
LOG OF TEST PIT NO. 62

AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Garland County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 1035+56, 40 ft Rt

SURF. EL: 517.0



Loose dark brown fine sandy silt w/organics

Very stiff reddish tan and tan silty clay w/shale fragments

- with numerous shale fragments below 2.5 ft

Moderately hard reddish tan and tan weathered shale w/some silty clay seams

- with less silty clay below 5 ft

- near refusal at 5.5 ft

COMPLETION DEPTH: 5.5 ft
DATE: 12-30-13

DEPTH TO WATER
IN TEST PIT: Dry

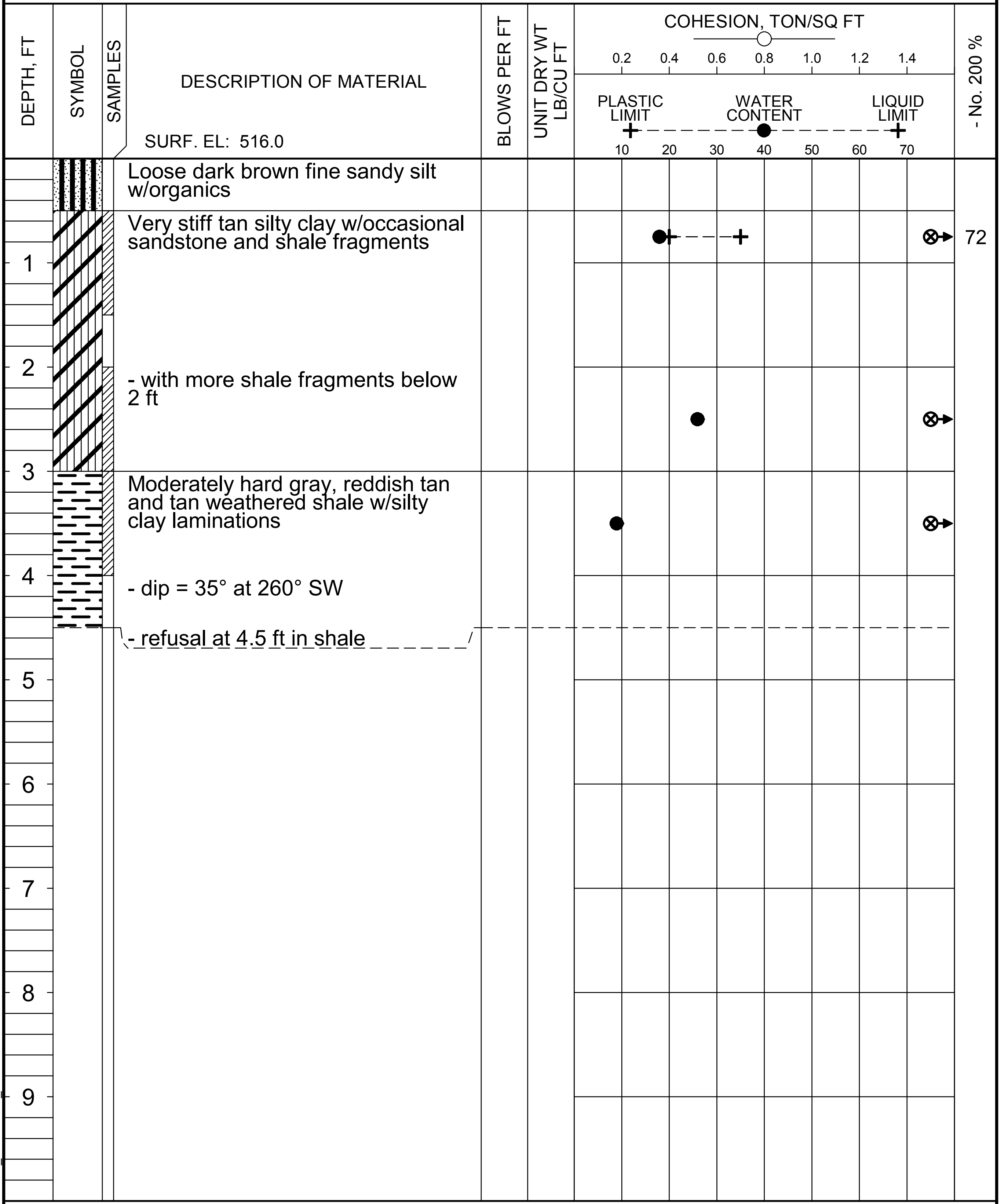
DATE: 12/30/2013

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 63

AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Garland County, Arkansas

TYPE: Mini Excavator
LOCATION: Approx Sta 1043+13, 34 ft Rt



Loose dark brown fine sandy silt w/organics

Very stiff tan silty clay w/occasional sandstone and shale fragments

- with more shale fragments below 2 ft

Moderately hard gray, reddish tan and tan weathered shale w/silty clay laminations

- dip = 35° at 260° SW

- refusal at 4.5 ft in shale

COMPLETION DEPTH: 4.5 ft
DATE: 12-30-13

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 12/30/2013

13-203

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

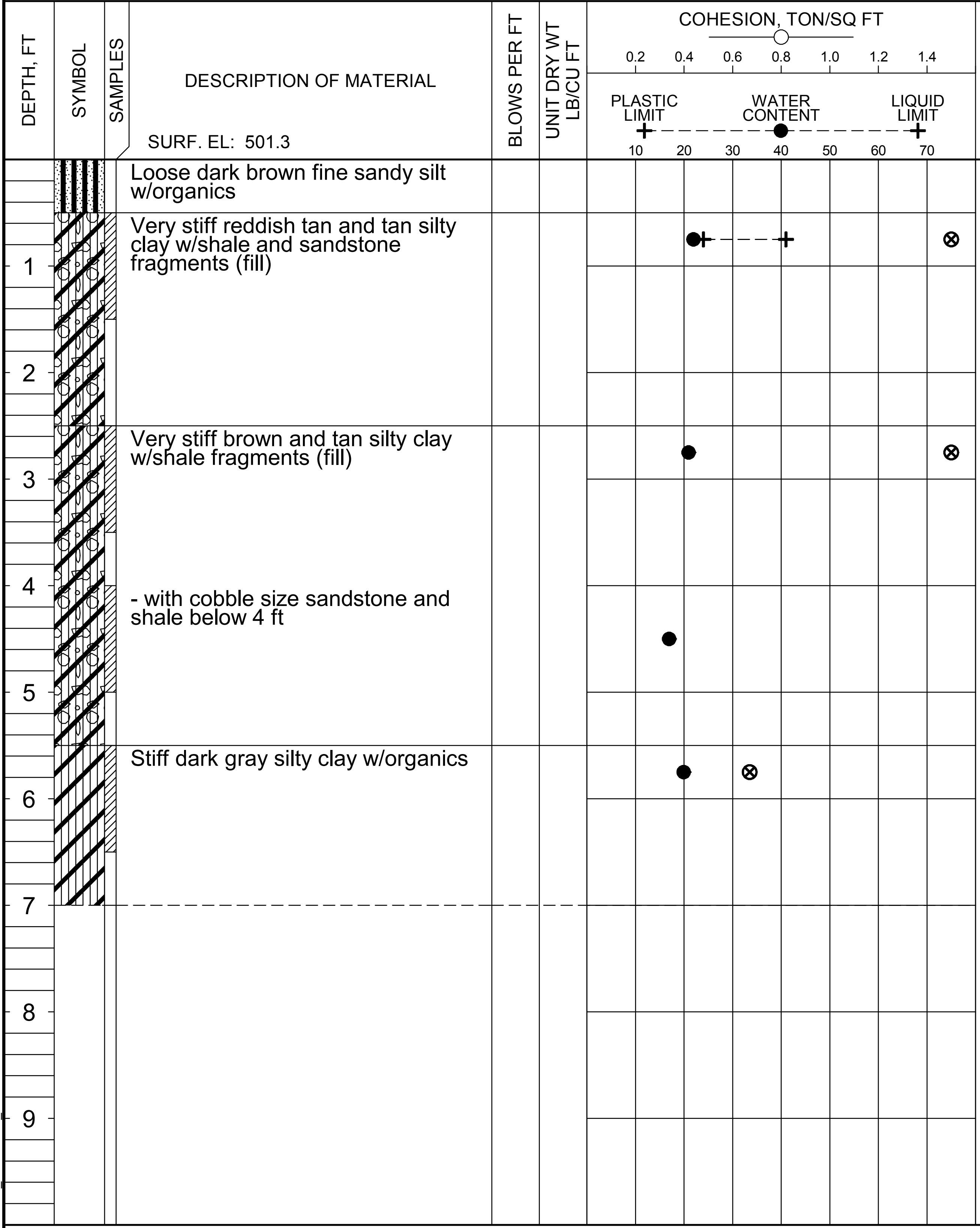
LOG OF TEST PIT NO. 64

AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Garland County, Arkansas

TYPE: Mini Excavator
LOCATION: Approx Sta 1050+60, 34 ft Rt

SURF. EL: 501.3

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
0	Loose dark brown fine sandy silt w/organics			
0.5	Very stiff reddish tan and tan silty clay w/shale and sandstone fragments (fill)			64
2.5	Very stiff brown and tan silty clay w/shale fragments (fill) - with cobble size sandstone and shale below 4 ft			
5.5	Stiff dark gray silty clay w/organics			



COMPLETION DEPTH: 7.0 ft
DATE: 12-30-13

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 12/30/2013

LTPNEW 13-203_ROADWAY_GARLAND COUNTY.GPJ 7-9-14

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

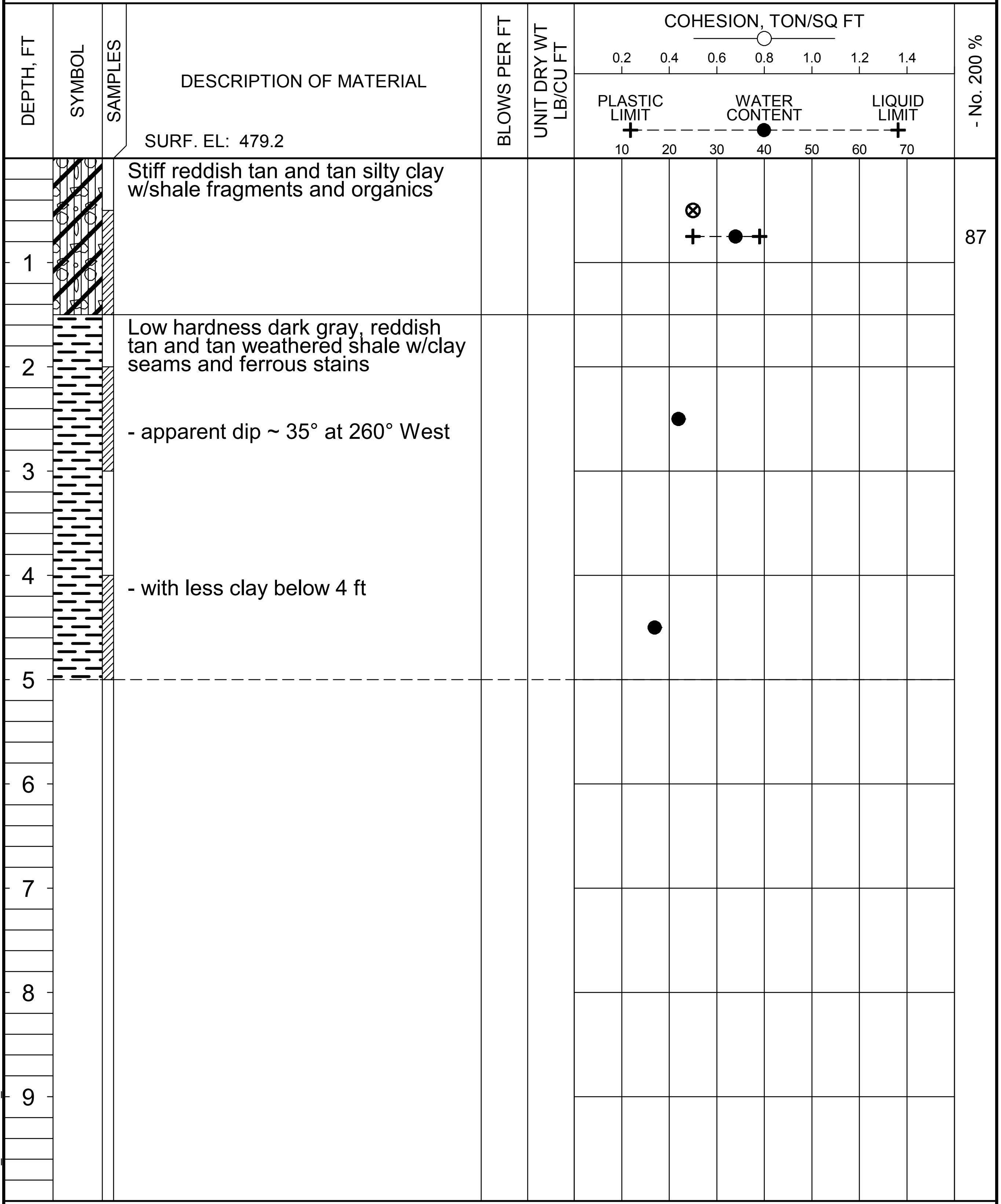
LOG OF TEST PIT NO. 65

AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Garland County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 1057+87, 37 ft Rt

SURF. EL: 479.2



Stiff reddish tan and tan silty clay w/shale fragments and organics

Low hardness dark gray, reddish tan and tan weathered shale w/clay seams and ferrous stains

- apparent dip ~ 35° at 260° West

- with less clay below 4 ft

COMPLETION DEPTH: 5.0 ft
DATE: 12-12-13

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 12/12/2013

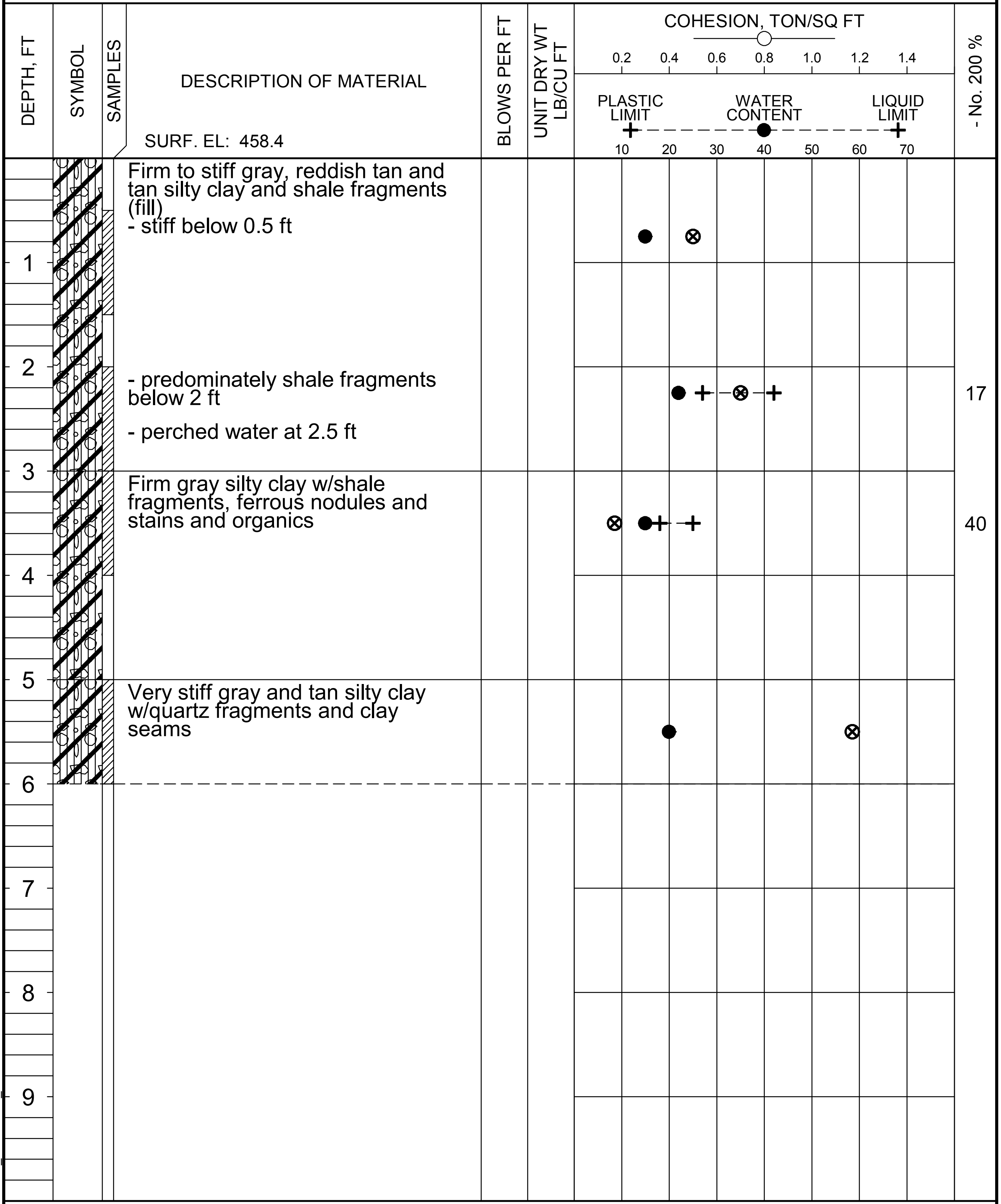
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

L O G O F T E S T P I T N O. 66

AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Garland County, Arkansas

TYPE: Mini Excavator
LOCATION: Approx Sta 1065+35, 34 ft Rt

SURF. EL: 458.4



Depth, ft	Description of Material	- No. 200 %
0–3	Firm to stiff gray, reddish tan and tan silty clay and shale fragments (fill) - stiff below 0.5 ft - predominately shale fragments below 2 ft - perched water at 2.5 ft	17
3–5	Firm gray silty clay w/shale fragments, ferrous nodules and stains and organics	40
5–6	Very stiff gray and tan silty clay w/quartz fragments and clay seams	

COMPLETION DEPTH: 6.5 ft
DATE: 12-12-13

DEPTH TO WATER
IN TEST PIT: Perched Water at 2.5 ft
DATE: 12/12/2013

LTPNEW 13-203_ROADWAY_GARLAND COUNTY.GPJ 7-9-14

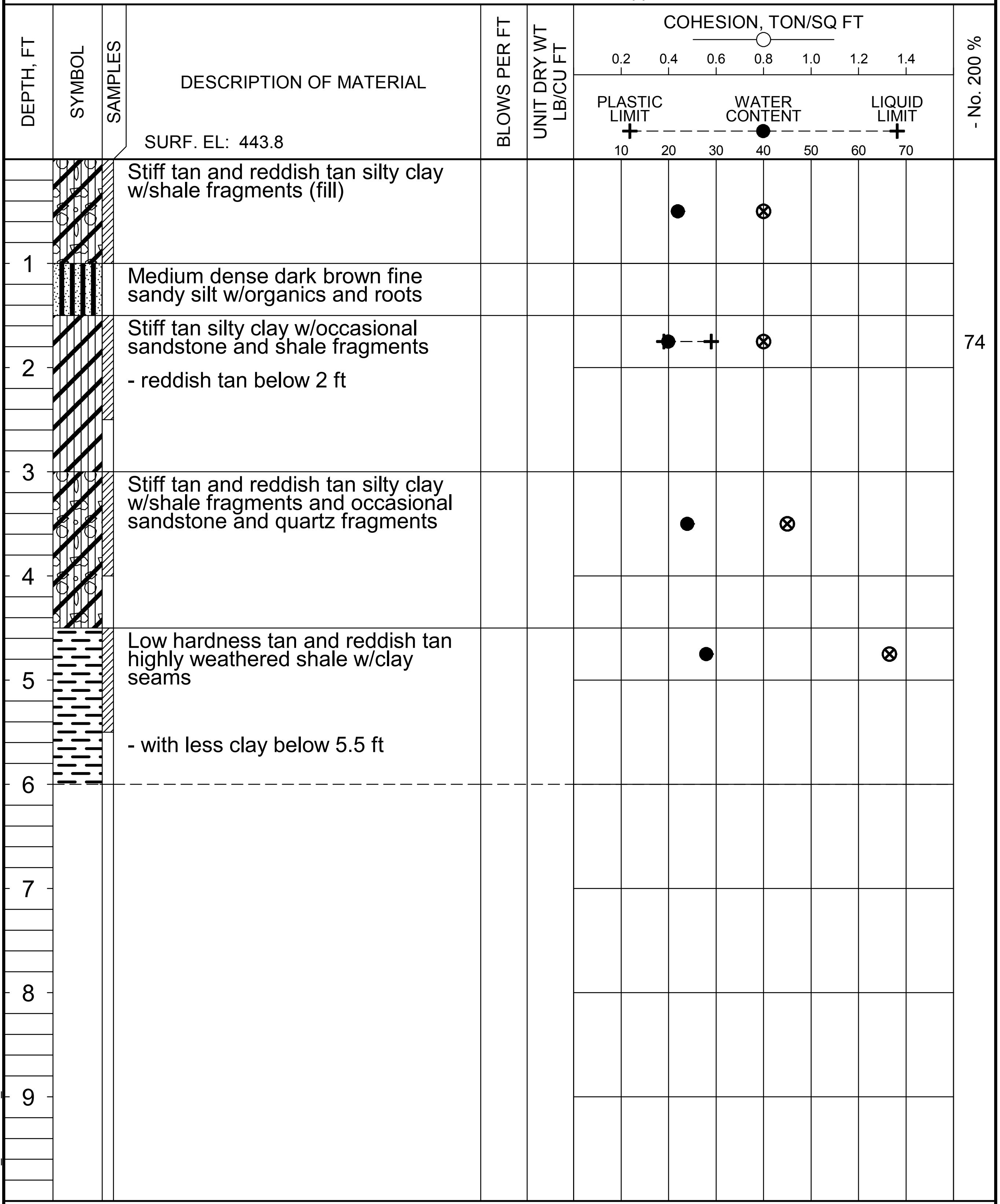
13-203

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 67

AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Garland County, Arkansas

TYPE: Mini Excavator
LOCATION: Approx Sta 1072+92, 38 ft Rt



Stiff tan and reddish tan silty clay w/shale fragments (fill)

Medium dense dark brown fine sandy silt w/organics and roots

Stiff tan silty clay w/occasional sandstone and shale fragments

- reddish tan below 2 ft

Stiff tan and reddish tan silty clay w/shale fragments and occasional sandstone and quartz fragments

Low hardness tan and reddish tan highly weathered shale w/clay seams

- with less clay below 5.5 ft

COMPLETION DEPTH: 6.0 ft
DATE: 12-12-13

DEPTH TO WATER
IN TEST PIT: Dry

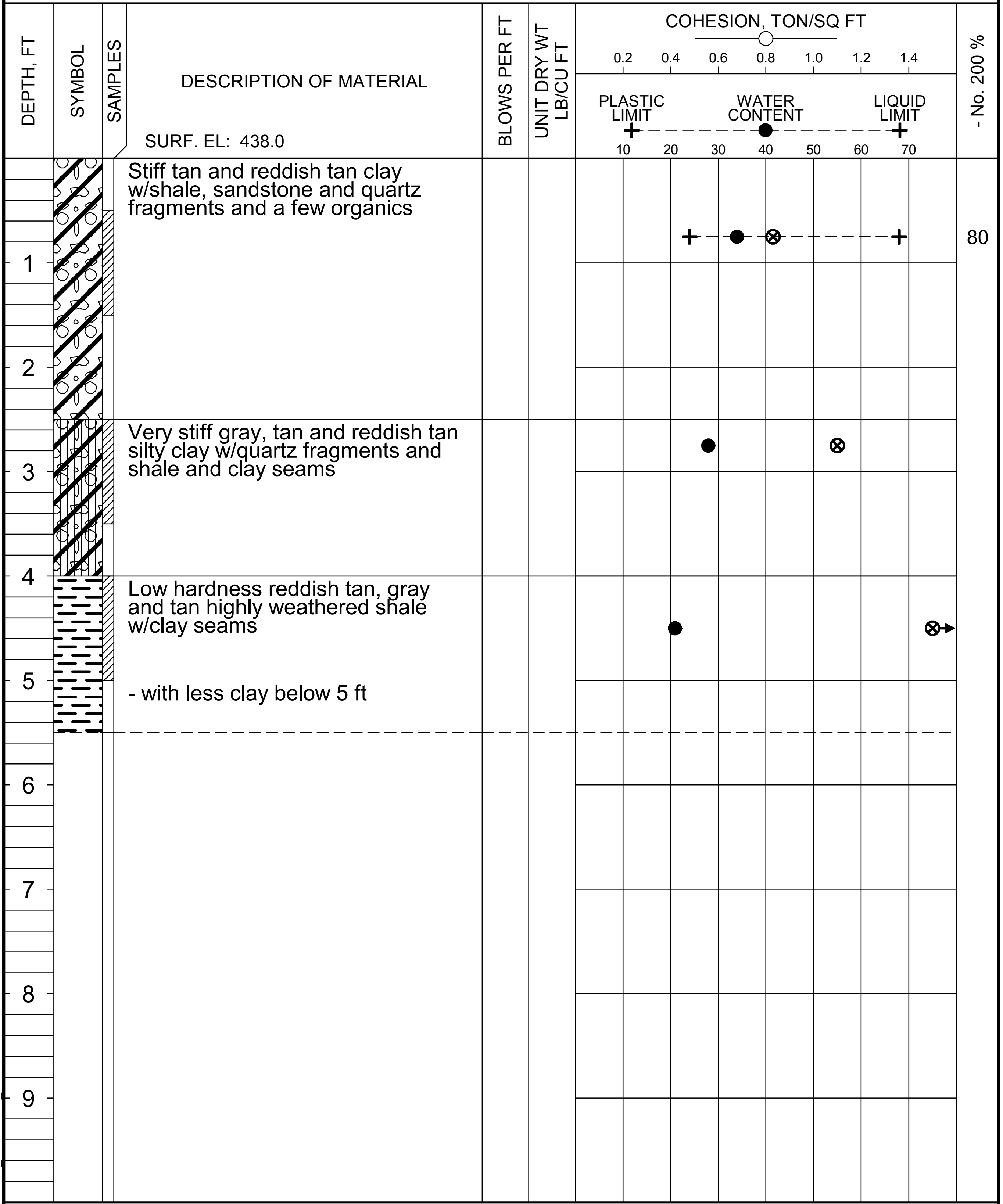
DATE: 12/12/2013

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 68

AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Garland County, Arkansas

TYPE: Mini Excavator
LOCATION: Approx Sta 1080+36, 35 ft Rt



Stiff tan and reddish tan clay w/shale, sandstone and quartz fragments and a few organics

Very stiff gray, tan and reddish tan silty clay w/quartz fragments and shale and clay seams

Low hardness reddish tan, gray and tan highly weathered shale w/clay seams

- with less clay below 5 ft

COMPLETION DEPTH: 5.5 ft
DATE: 12-12-13

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 12/12/2013

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

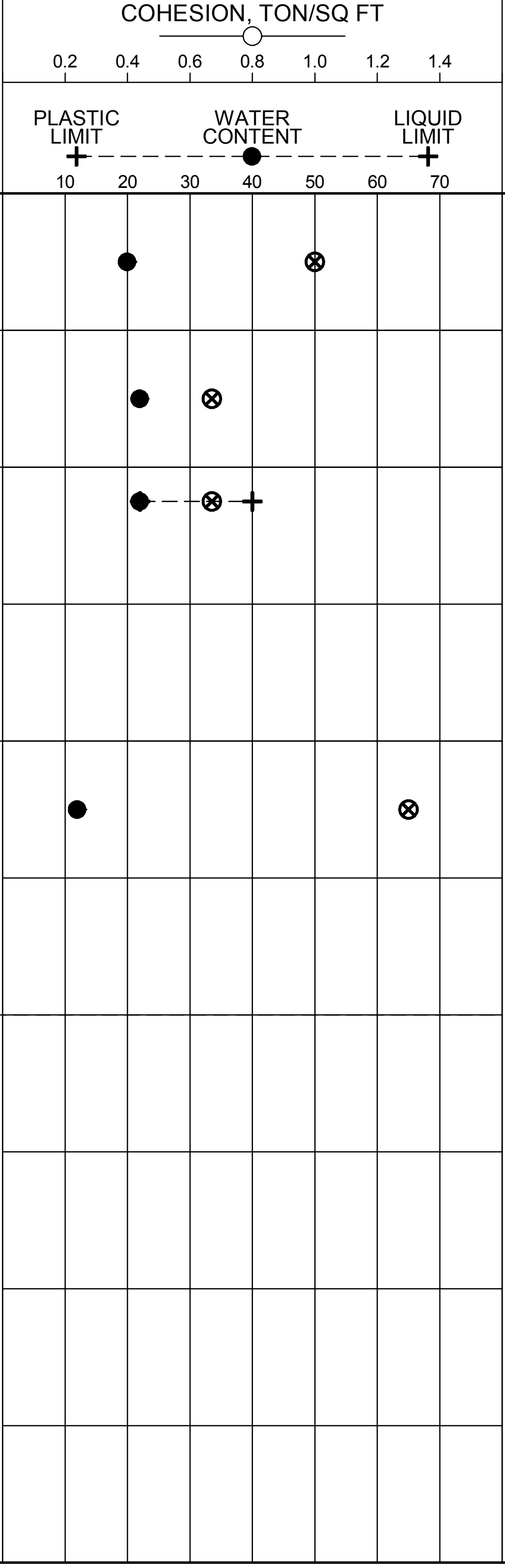
LOG OF TEST PIT NO. 69

AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Garland County, Arkansas

TYPE: Mini Excavator
LOCATION: Approx Sta 1088+12, 38 ft Rt

SURF. EL: 425.4

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
0 – 1	Very stiff reddish tan and tan silty clay w/shale fragments (fill)			
1 – 2	Stiff brown clayey silt w/organics			
2 – 4	Stiff tan silty clay w/occasional quartz cobbles and fragments			81
4 – 6	Very stiff gray and tan silty clay w/numerous ferrous nodules and quartz fragments and some cobbles			



COMPLETION DEPTH: 6.0 ft
DATE: 12-12-13

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 12/12/2013

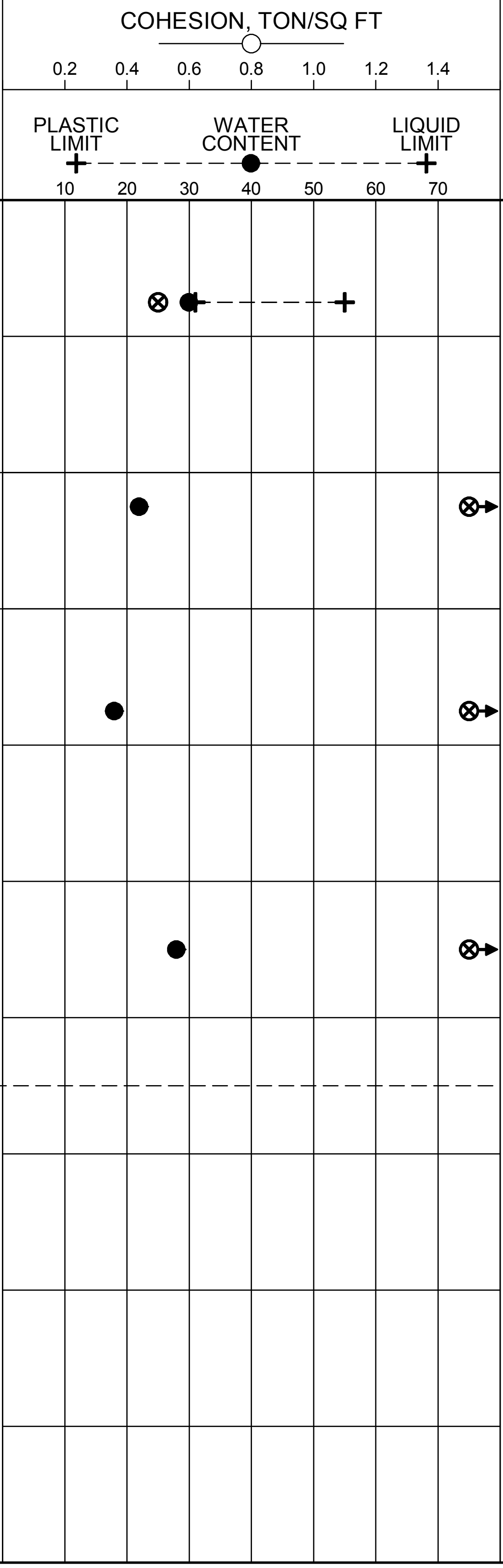
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 71

AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Saline County, Arkansas

TYPE: Mini Excavator
LOCATION: Approx Sta 1103+83, 36 ft Rt

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURF. EL: 438.9	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
			Stiff gray, tan and reddish tan silty clay w/highly weathered shale seams			64
2			Low hardness reddish tan and tan highly weathered shale w/clay seams and occasional quartz veins			
3			Dense dark brown silty fine to coarse sand w/ferrous concretions and muscovite deposits (completely weathered sandstone)			



COMPLETION DEPTH: 6.5 ft
DATE: 12-12-13

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 12/12/2013

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

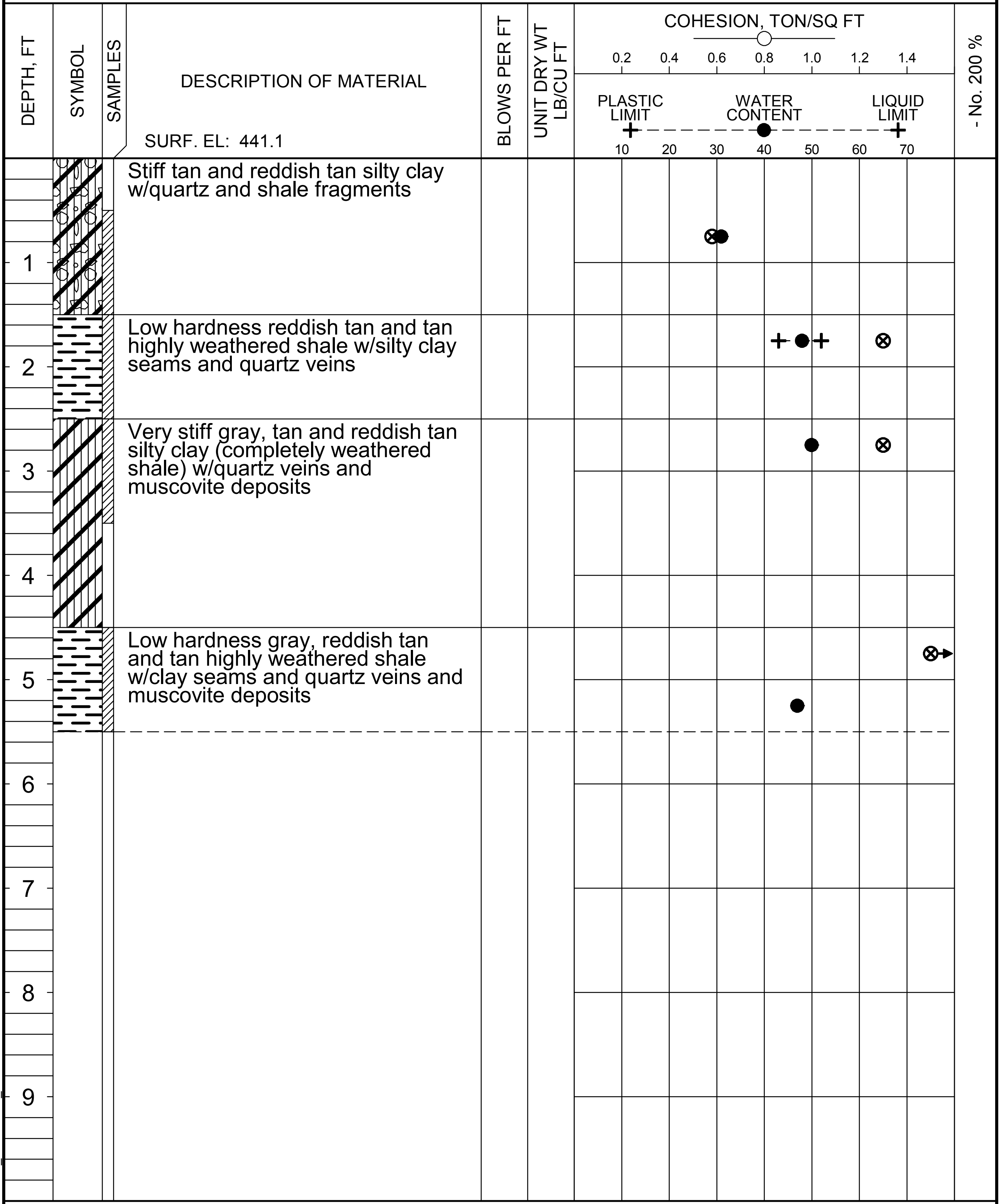
LOG OF TEST PIT NO. 72

AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Saline County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 1111+94, 32 ft Rt

SURF. EL: 441.1



Stiff tan and reddish tan silty clay w/quartz and shale fragments

Low hardness reddish tan and tan highly weathered shale w/silty clay seams and quartz veins

Very stiff gray, tan and reddish tan silty clay (completely weathered shale) w/quartz veins and muscovite deposits

Low hardness gray, reddish tan and tan highly weathered shale w/clay seams and quartz veins and muscovite deposits

COMPLETION DEPTH: 5.5 ft
DATE: 12-12-13

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 12/12/2013

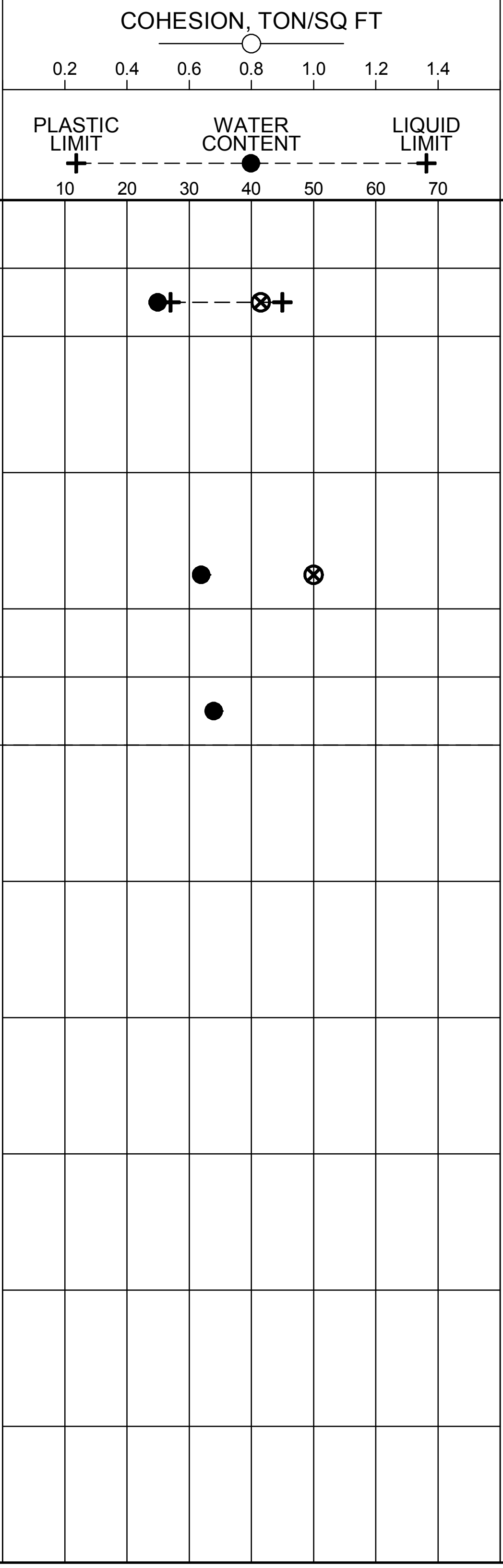
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 73

AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Saline County, Arkansas

TYPE: Mini Excavator
LOCATION: Approx Sta 1119+29, 34 ft Rt

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURF. EL: 436.8	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
0 – 0.5			Loose dark brown fine sandy silt w/organics			
0.5 – 3.5			Stiff gray and tan silty clay w/shale fragments and weathered shale seams			32
			- very stiff with more weathered shale seams below 2.5 ft			
3.5 – 4.0			Moderately hard gray and tan weathered shale w/silty clay seams			



COMPLETION DEPTH: 4.0 ft
DATE: 12-19-13

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 12/19/2013

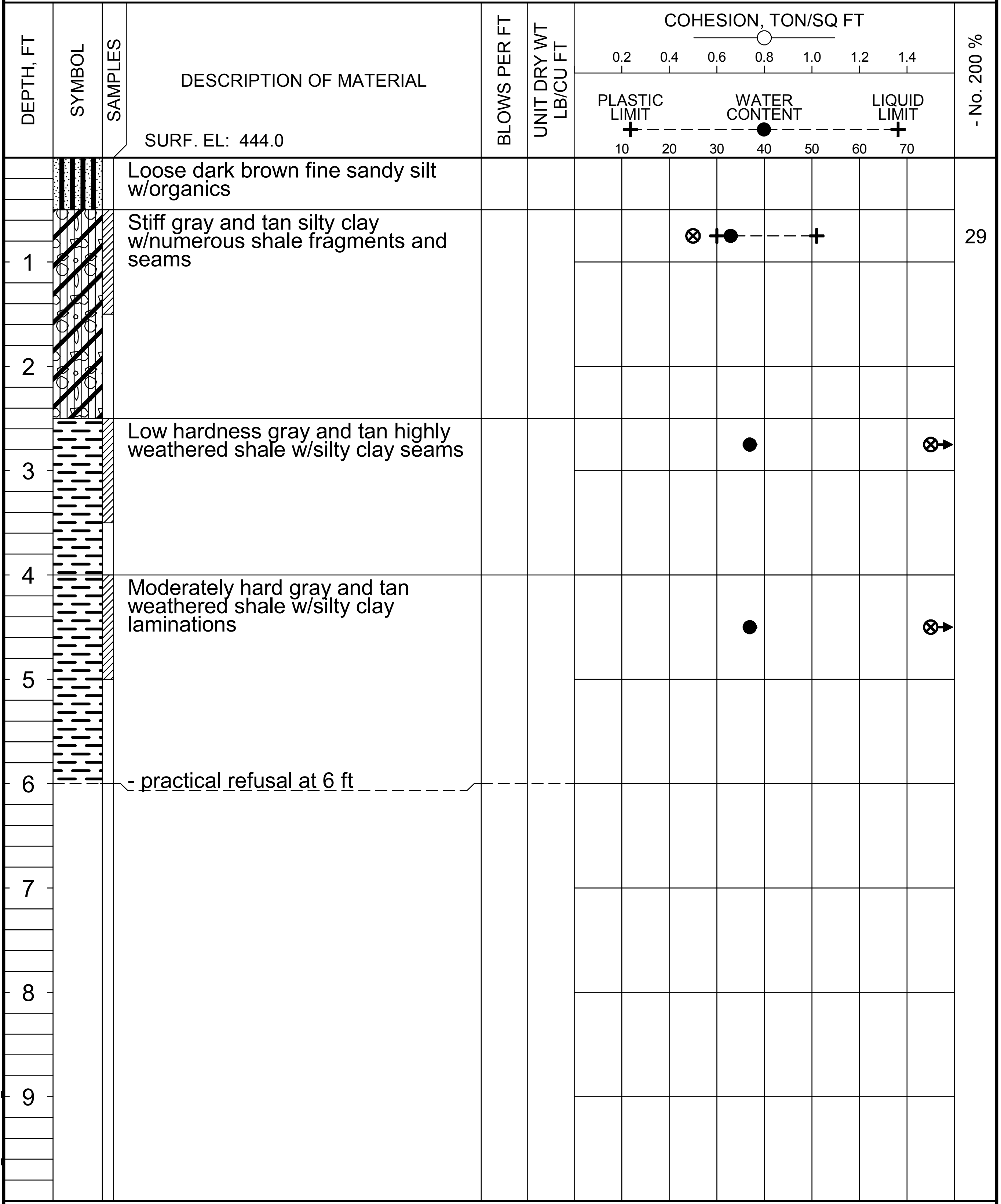
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 74

AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Saline County, Arkansas

TYPE: Mini Excavator
LOCATION: Approx Sta 1126+86, 34 ft Rt

SURF. EL: 444.0



DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
Loose dark brown fine sandy silt w/organics			
Stiff gray and tan silty clay w/numerous shale fragments and seams			29
Low hardness gray and tan highly weathered shale w/silty clay seams			
Moderately hard gray and tan weathered shale w/silty clay laminations			
- practical refusal at 6 ft			

COMPLETION DEPTH: 6.0 ft
DATE: 12-19-13

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 12/19/2013

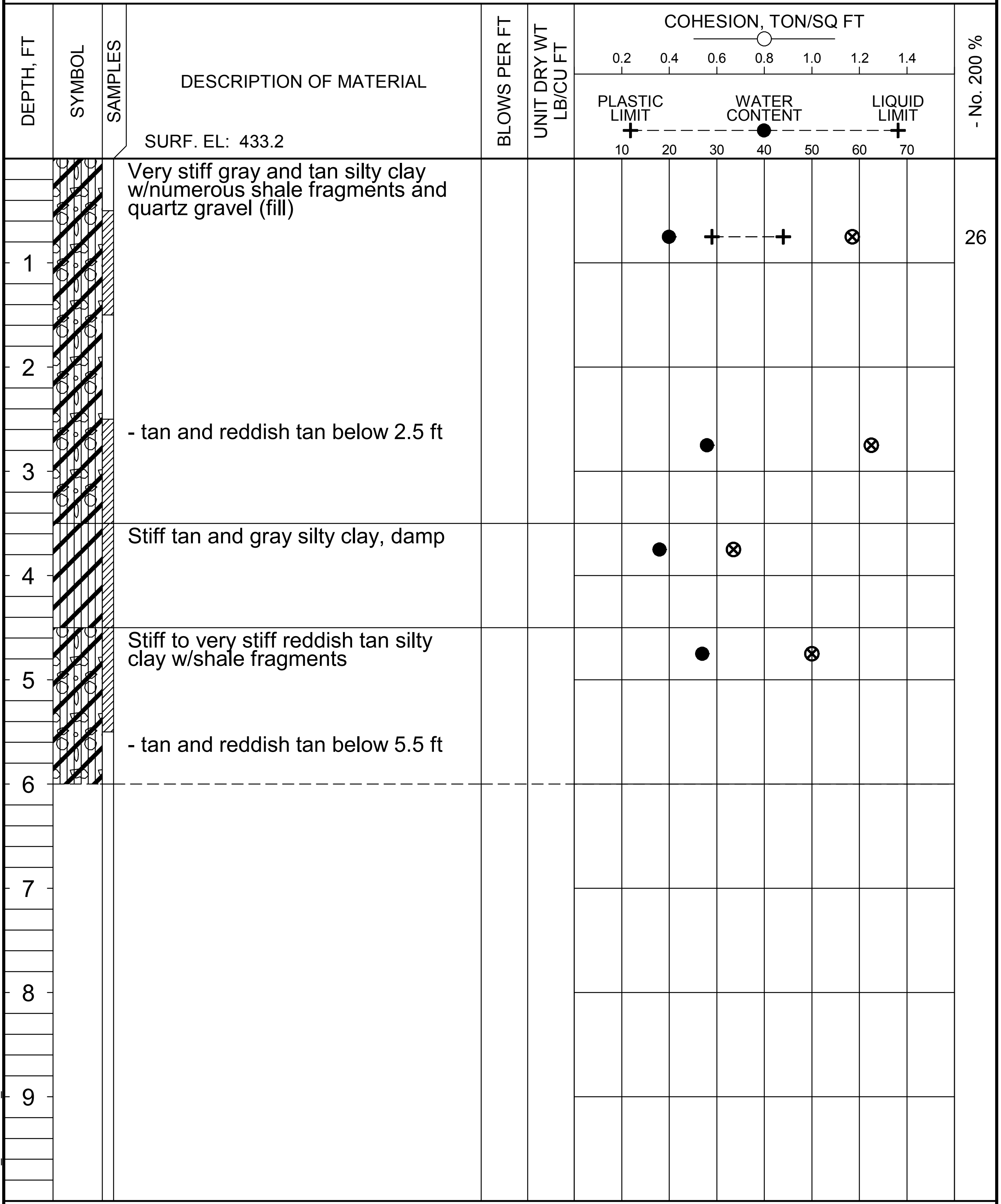
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 75

AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Saline County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 1139+50, 45 ft Rt



Very stiff gray and tan silty clay w/numerous shale fragments and quartz gravel (fill)

- tan and reddish tan below 2.5 ft

Stiff tan and gray silty clay, damp

Stiff to very stiff reddish tan silty clay w/shale fragments

- tan and reddish tan below 5.5 ft

COMPLETION DEPTH: 6.0 ft
DATE: 12-19-13

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 12/19/2013

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 77

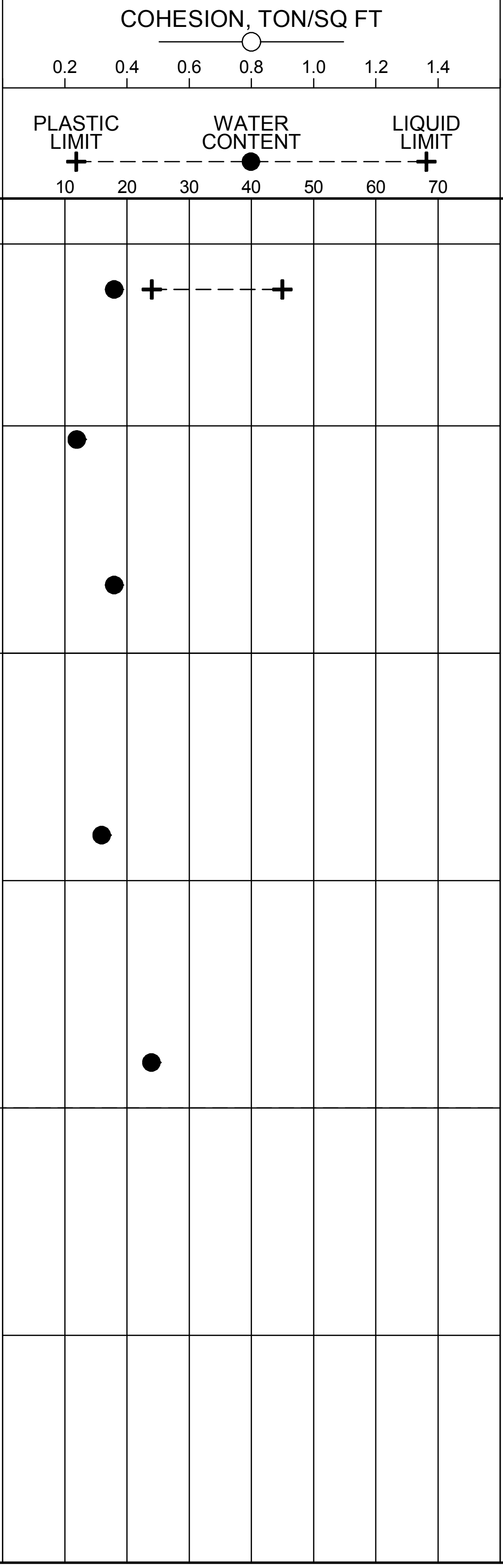
AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Saline County, Arkansas

TYPE: Auger

LOCATION: Approx Sta 1154+50, 45 ft Rt

SURF. EL: 433.2

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
	Loose brown silt w/organics			
	Firm to stiff tan silty clay w/sandstone fragments	10		49
	- very stiff with numerous sandstone and quartz fragments below 2 ft	50/2"		
		50/5"		
5	Moderately hard tan and gray highly weathered shale			
		50/11"		
		50/10"		
10				
15				



COMPLETION DEPTH: 10.0 ft
DATE: 12-13-13

DEPTH TO WATER
IN BORING: Dry

DATE: 12/13/2013

13-203

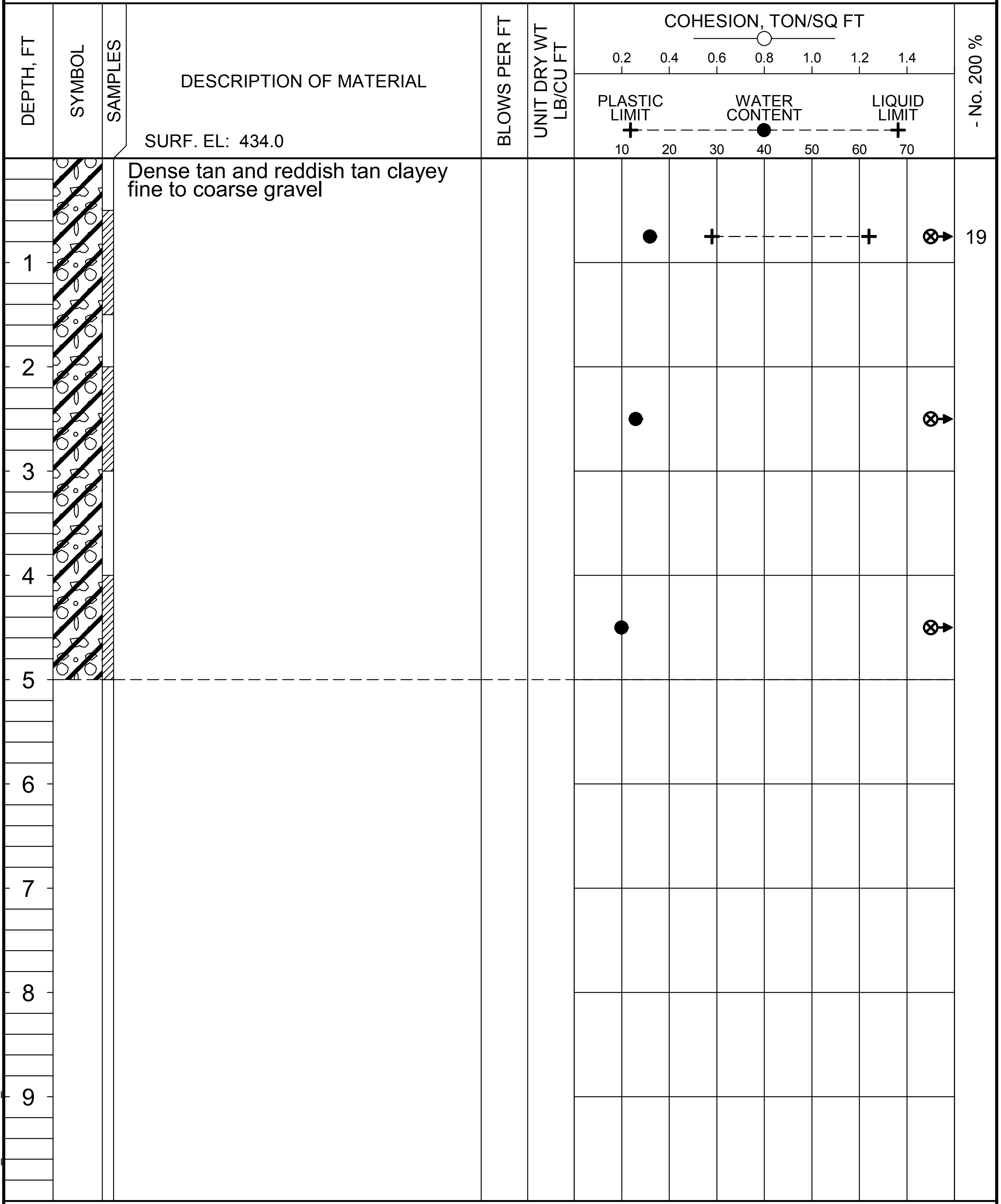
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 78

AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Saline County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 1161+93, 36 ft Rt



Dense tan and reddish tan clayey fine to coarse gravel

COMPLETION DEPTH: 5.0 ft
DATE: 12-19-13

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 12/19/2013

LTPNEW 13-203_ROADWAY_SALINE COUNTY.GPJ 7-9-14

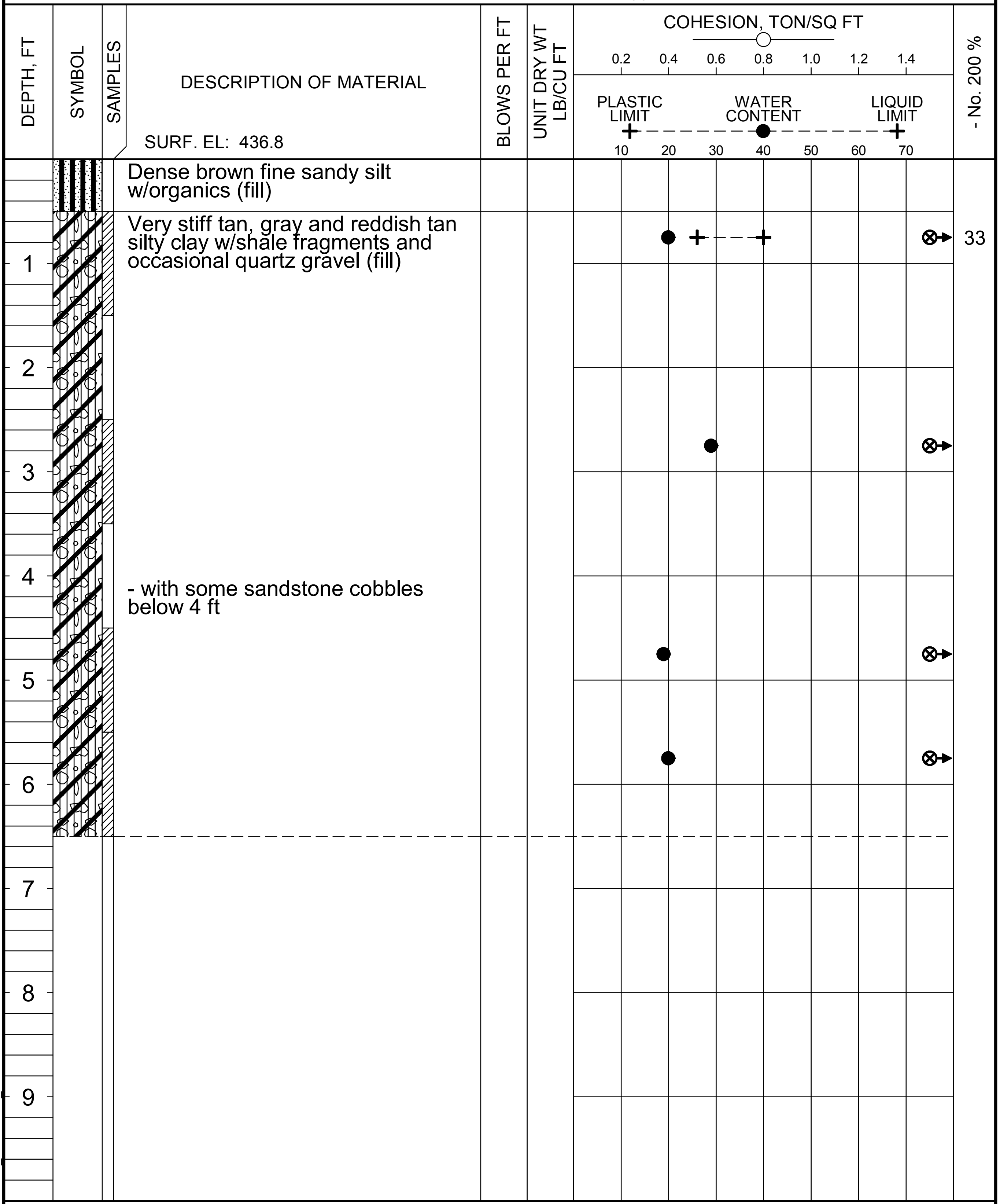
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 79

AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Saline County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 1169+48, 32 ft Rt



Dense brown fine sandy silt w/organics (fill)

Very stiff tan, gray and reddish tan silty clay w/shale fragments and occasional quartz gravel (fill)

- with some sandstone cobbles below 4 ft

COMPLETION DEPTH: 6.5 ft
DATE: 12-19-13

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 12/19/2013

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 80

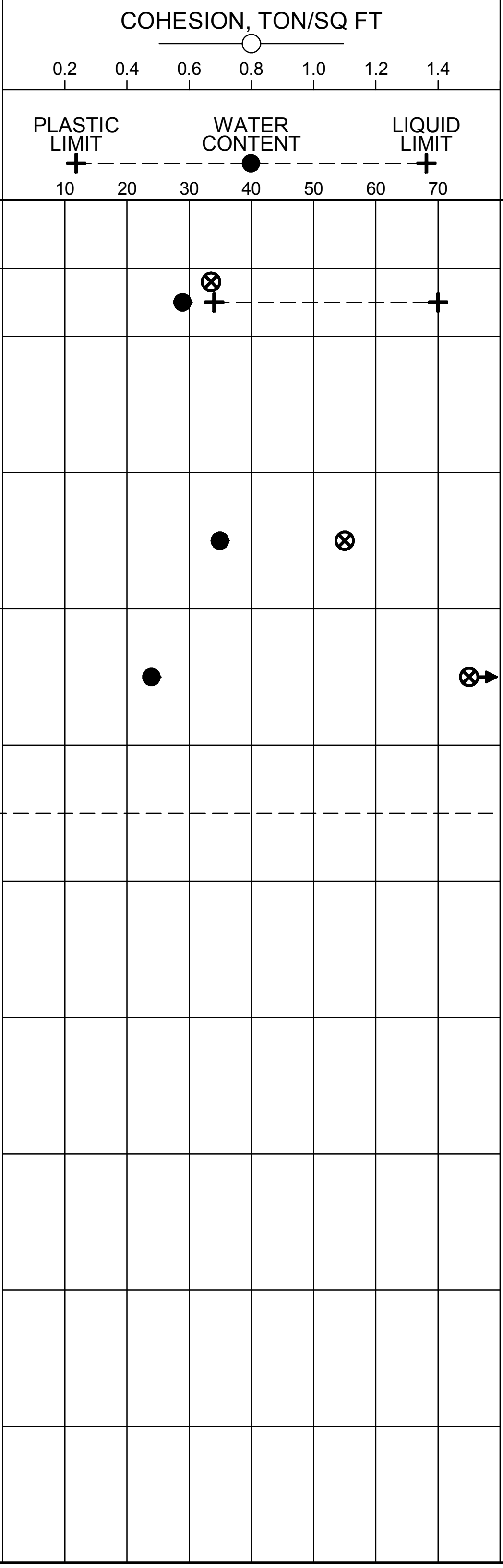
AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Saline County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 1177+01, 34 ft Rt

SURF. EL: 437.3

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
0	Dense brown fine sandy silt w/organics (fill)			
0.5	Stiff tan and reddish tan silty clay w/shale fragments and occasional quartz gravel			43
2	- very stiff with more shale fragments and some cobble size quartz gravel below 2 ft			
3	Low hardness tan and reddish tan weathered shale w/silty clay seams, dip = 60°, 330° NW			
4	- with less silty clay below 4 ft			
4.5	- practical refusal at 4.5 ft			



COMPLETION DEPTH: 4.5 ft
DATE: 12-19-13

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 12/19/2013

LTPNEW 13-203_ROADWAY_SALINE COUNTY.GPJ 7-9-14

13-203

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

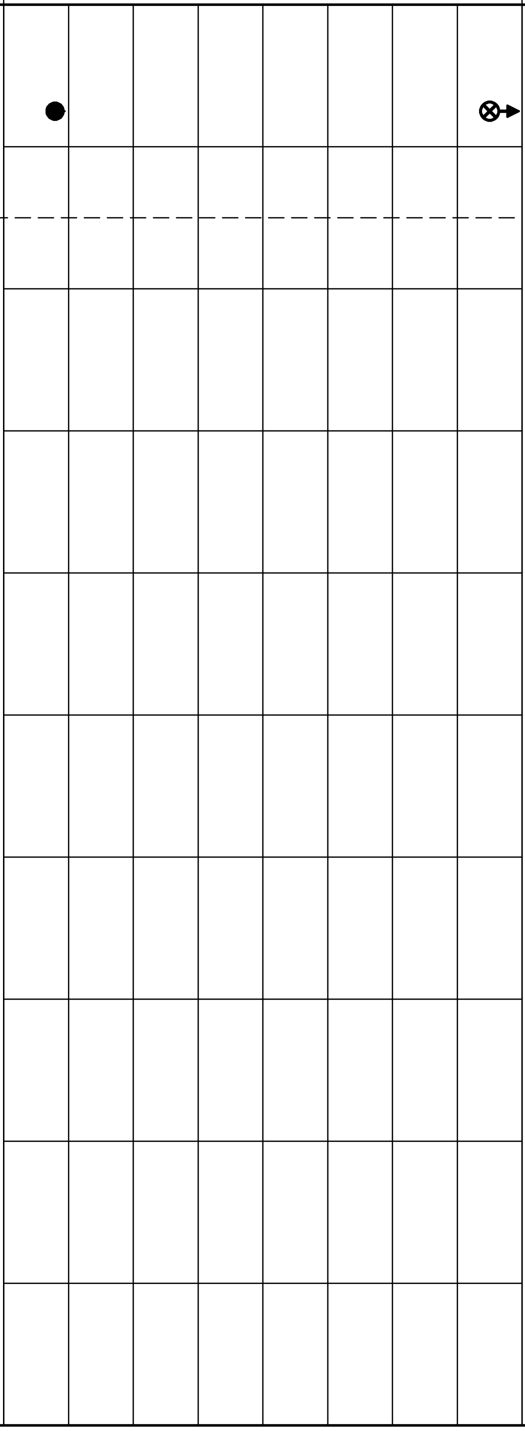
LOG OF TEST PIT NO. 81

AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Saline County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 1184+57, 36 ft Rt

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURF. EL: 409.2	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT (0.2 0.4 0.6 0.8 1.0 1.2 1.4) PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70)	- No. 200 %
0–1.5			Moderately hard tan and dark gray weathered shale - Dip = 30°, 320° NW - refusal at 1.5 ft				



COMPLETION DEPTH: 1.5 ft
DATE: 12-19-13

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 12/19/2013

LTPNEW 13-203_ROADWAY_SALINE COUNTY.GPJ 7-9-14

13-203

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 82

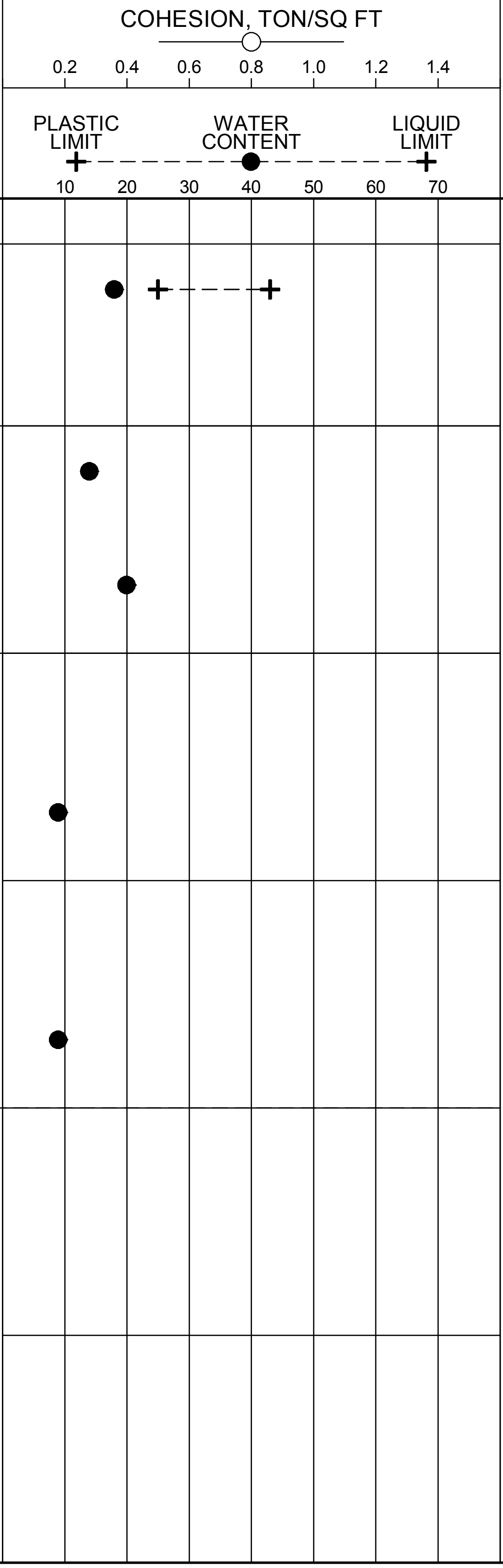
AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Saline County, Arkansas

TYPE: Auger

LOCATION: Approx Sta 1192+04, 42 ft Rt

SURF. EL: 386.7

DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
Loose brown silt w/organics			
Stiff tan and gray silty clay w/quartz and shale fragments	13		47
Moderately hard gray and tan weathered shale	50/9" 50/5"		
Moderately hard dark gray shale	30/0" 30/0"		



DEPTH, FT: 5, 10, 15

COMPLETION DEPTH: 10.0 ft
DATE: 12-13-13

DEPTH TO WATER
IN BORING: Dry

DATE: 12/13/2013

LGBNEW 13-203_ROADWAY_SALINE COUNTY.GPJ 7-9-14

13-203

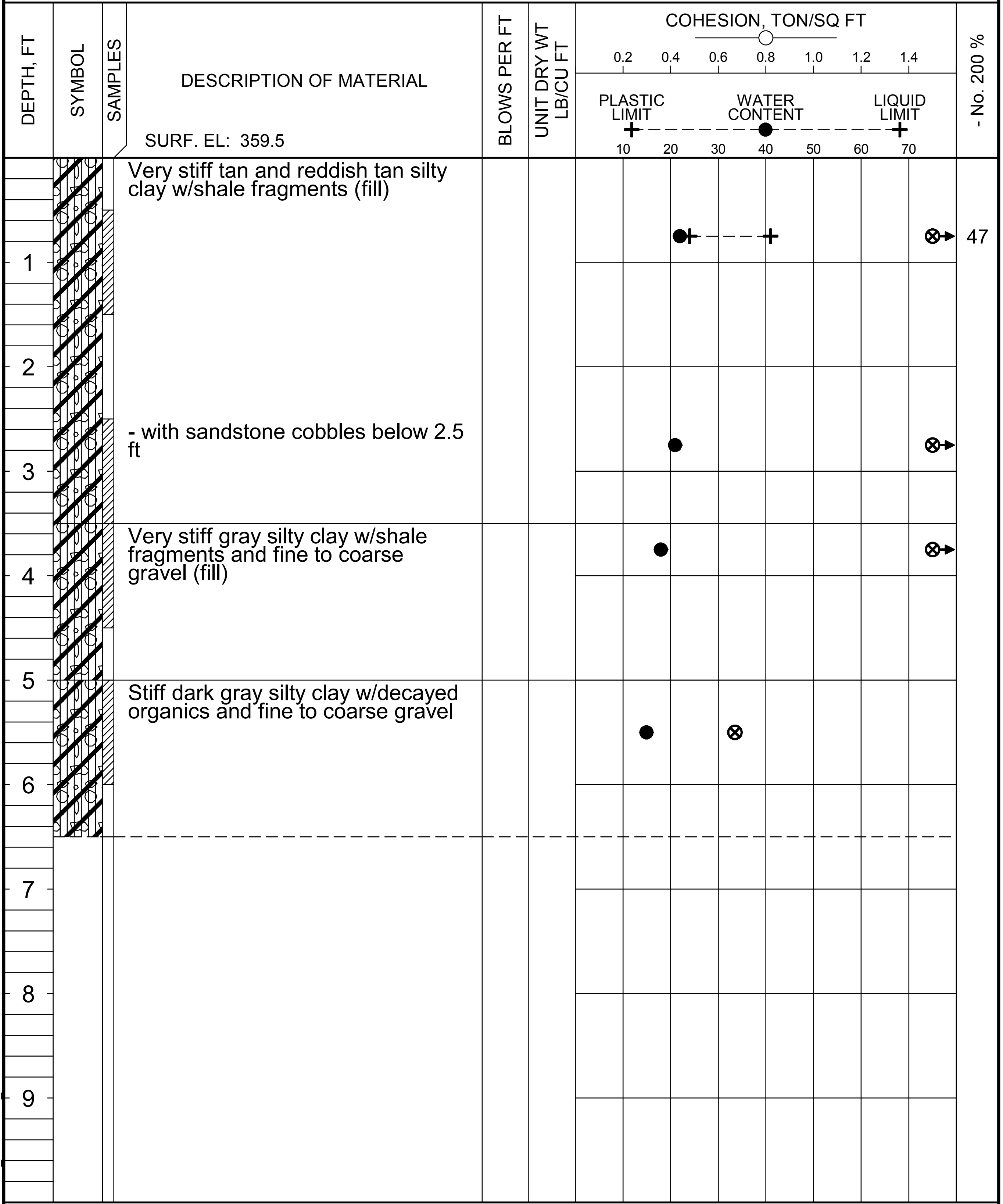
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 83

AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Saline County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 1199+49, 26 ft Rt



Very stiff tan and reddish tan silty clay w/shale fragments (fill)

- with sandstone cobbles below 2.5 ft

Very stiff gray silty clay w/shale fragments and fine to coarse gravel (fill)

Stiff dark gray silty clay w/decayed organics and fine to coarse gravel

COMPLETION DEPTH: 6.5 ft
DATE: 12-19-13

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 12/19/2013

13-203

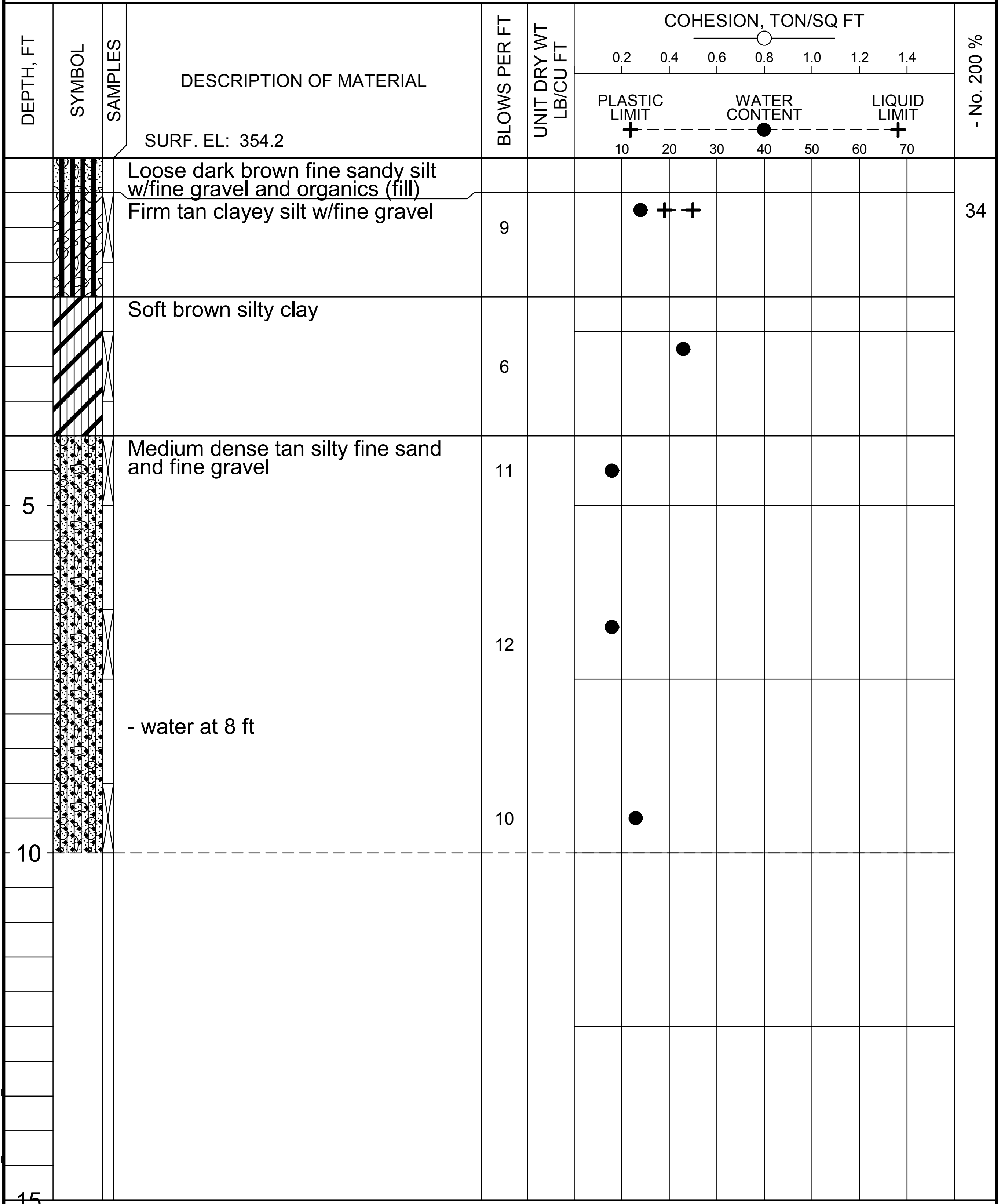
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 84

AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Saline County, Arkansas

TYPE: Auger

LOCATION: Approx Sta 1207+23, 12 ft Rt



DESCRIPTION OF MATERIAL SURF. EL: 354.2	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
Loose dark brown fine sandy silt w/fine gravel and organics (fill)			
Firm tan clayey silt w/fine gravel	9		34
Soft brown silty clay	6		
Medium dense tan silty fine sand and fine gravel	11		
	12		
- water at 8 ft			
	10		

COMPLETION DEPTH: 10.0 ft
DATE: 12-20-13

DEPTH TO WATER
IN BORING: 8 ft

DATE: 12/20/2013

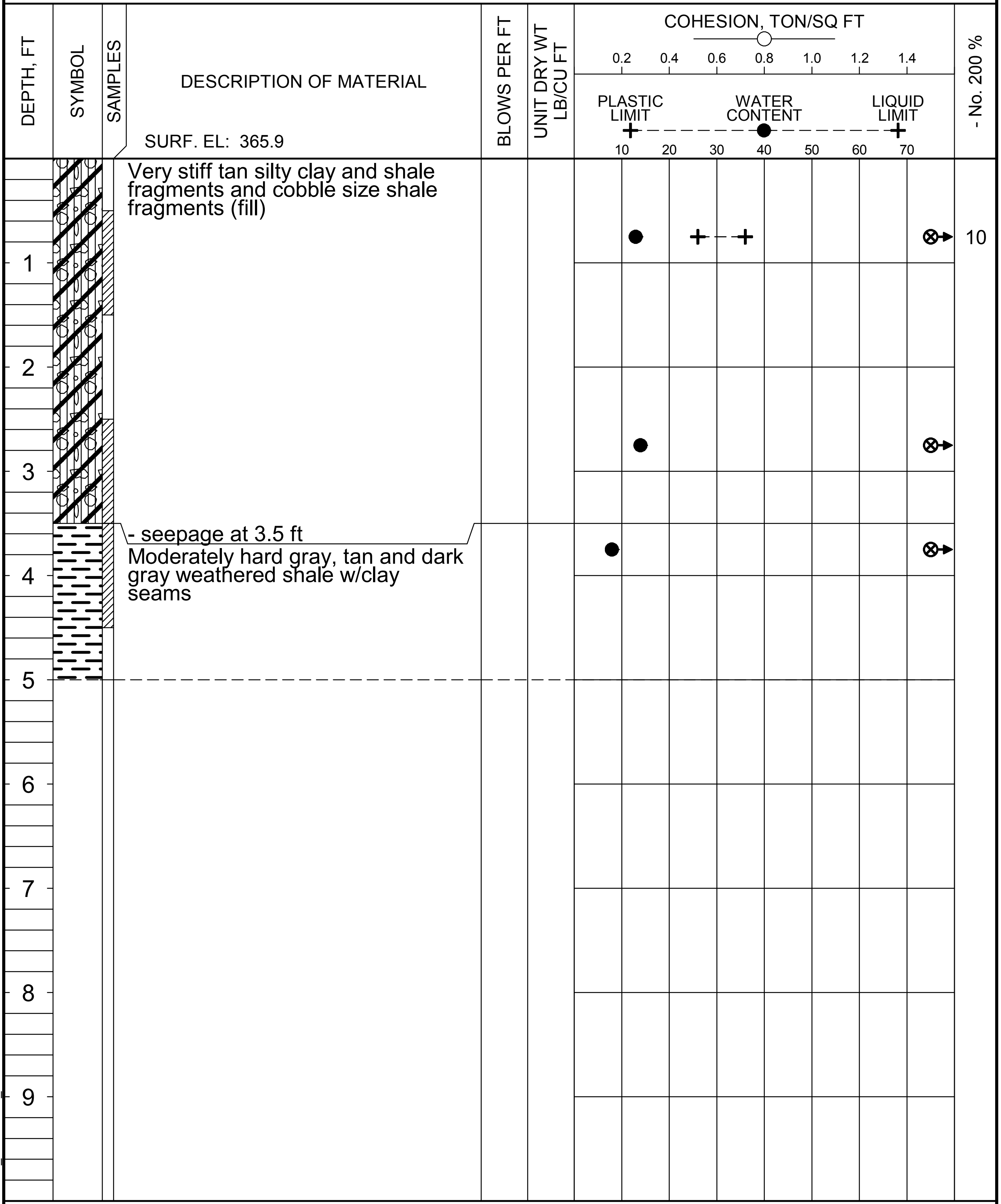
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 85

AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Saline County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 1215+01, 16 ft Rt



SURF. EL: 365.9

Very stiff tan silty clay and shale fragments and cobble size shale fragments (fill)

- seepage at 3.5 ft

Moderately hard gray, tan and dark gray weathered shale w/clay seams

COMPLETION DEPTH: 5.0 ft
DATE: 12-19-13

DEPTH TO WATER
IN TEST PIT: 3.5 ft

DATE: 12/19/2013

13-203

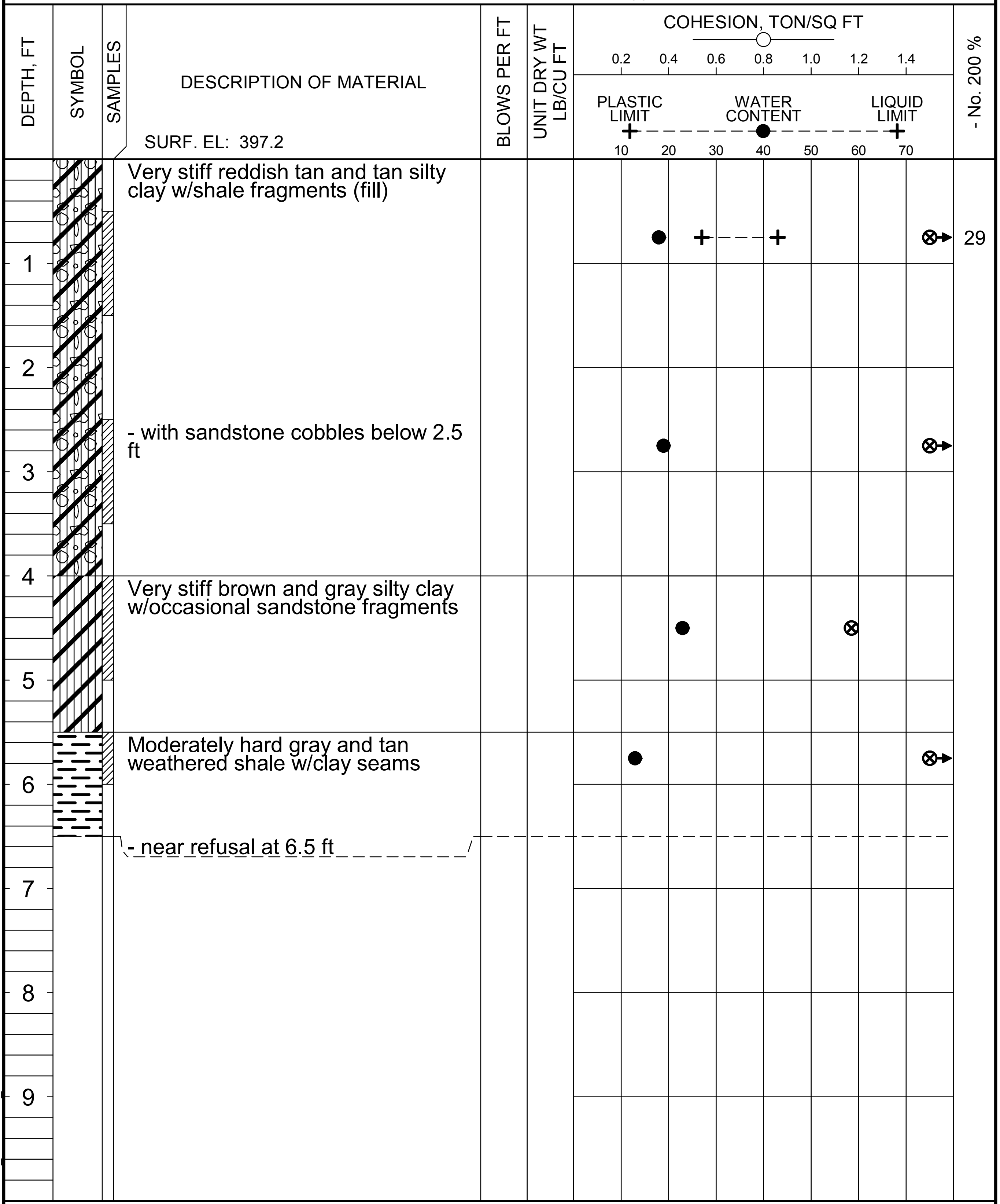
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 86

AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Saline County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 1222+59, 41 ft Rt



Very stiff reddish tan and tan silty clay w/shale fragments (fill)

- with sandstone cobbles below 2.5 ft

Very stiff brown and gray silty clay w/occasional sandstone fragments

Moderately hard gray and tan weathered shale w/clay seams

- near refusal at 6.5 ft

LTPNEW 13-203_ROADWAY_SALINE COUNTY.GPJ 7-9-14

COMPLETION DEPTH: 6.5 ft
DATE: 12-19-13

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 12/19/2013

13-203

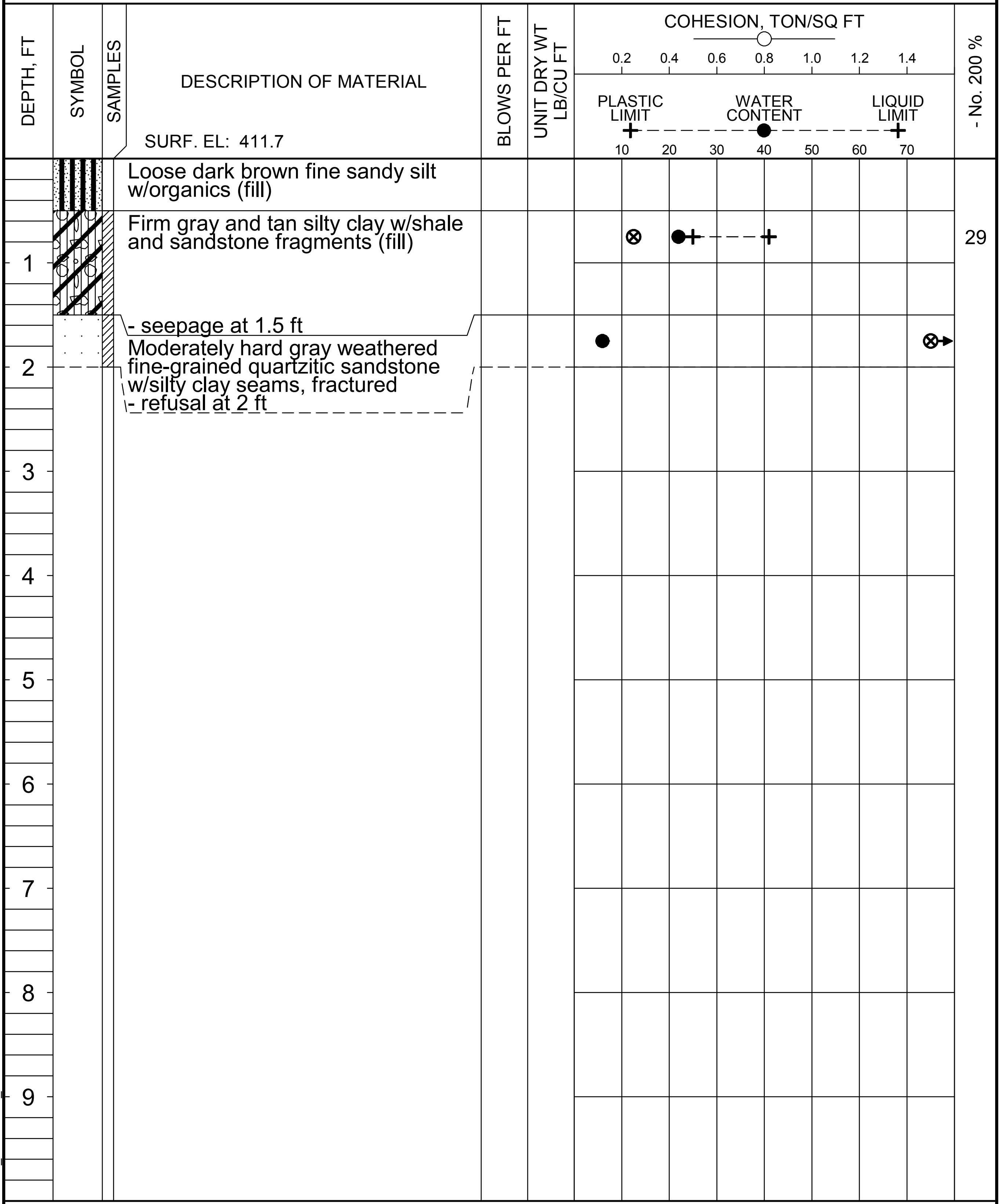
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 87

AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Saline County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 1229+63, 28 ft Rt



Loose dark brown fine sandy silt w/organics (fill)

Firm gray and tan silty clay w/shale and sandstone fragments (fill)

- seepage at 1.5 ft

Moderately hard gray weathered fine-grained quartzitic sandstone w/silty clay seams, fractured

- refusal at 2 ft

COMPLETION DEPTH: 2.0 ft
DATE: 12-19-13

DEPTH TO WATER
IN TEST PIT: 1.5 ft

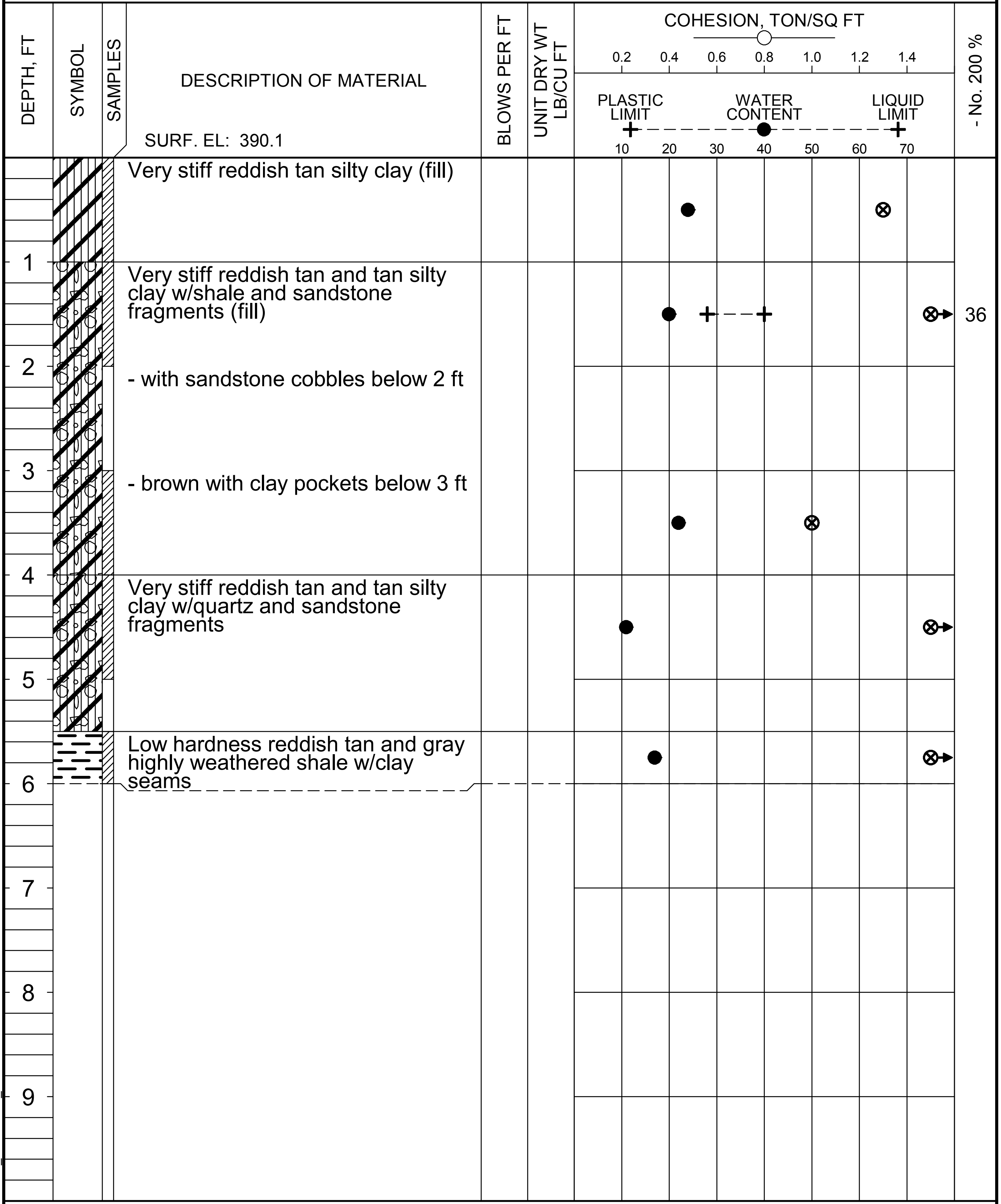
DATE: 12/19/2013

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 88

AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Saline County, Arkansas

TYPE: Mini Excavator
LOCATION: Approx Sta 1237+33, 21 ft Rt



SURF. EL: 390.1

Very stiff reddish tan silty clay (fill)

Very stiff reddish tan and tan silty clay w/shale and sandstone fragments (fill)

- with sandstone cobbles below 2 ft

- brown with clay pockets below 3 ft

Very stiff reddish tan and tan silty clay w/quartz and sandstone fragments

Low hardness reddish tan and gray highly weathered shale w/clay seams

COMPLETION DEPTH: 6.0 ft
DATE: 12-19-13

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 12/19/2013

13-203

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

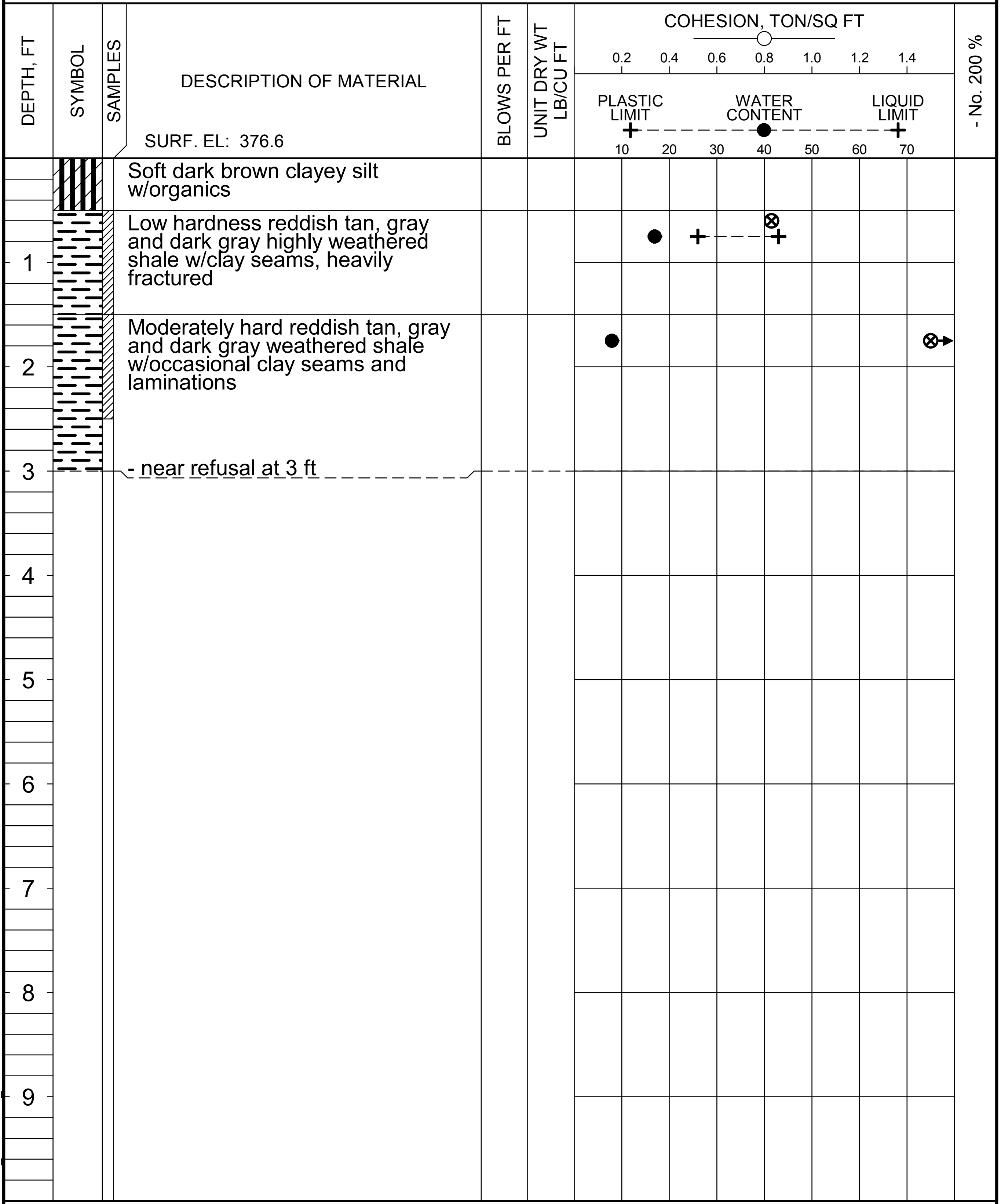
LOG OF TEST PIT NO. 89

AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Saline County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 1244+88, 10 ft Rt

SURF. EL: 376.6



Soft dark brown clayey silt w/organics

Low hardness reddish tan, gray and dark gray highly weathered shale w/clay seams, heavily fractured

Moderately hard reddish tan, gray and dark gray weathered shale w/occasional clay seams and laminations

- near refusal at 3 ft

COMPLETION DEPTH: 3.0 ft
DATE: 12-19-13

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 12/19/2013

LTPNEW 13-203_ROADWAY_SALINE COUNTY.GPJ 7-9-14

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Grubbs, Hoskyn,
Barton & Wyatt, Inc.
Consulting Engineers

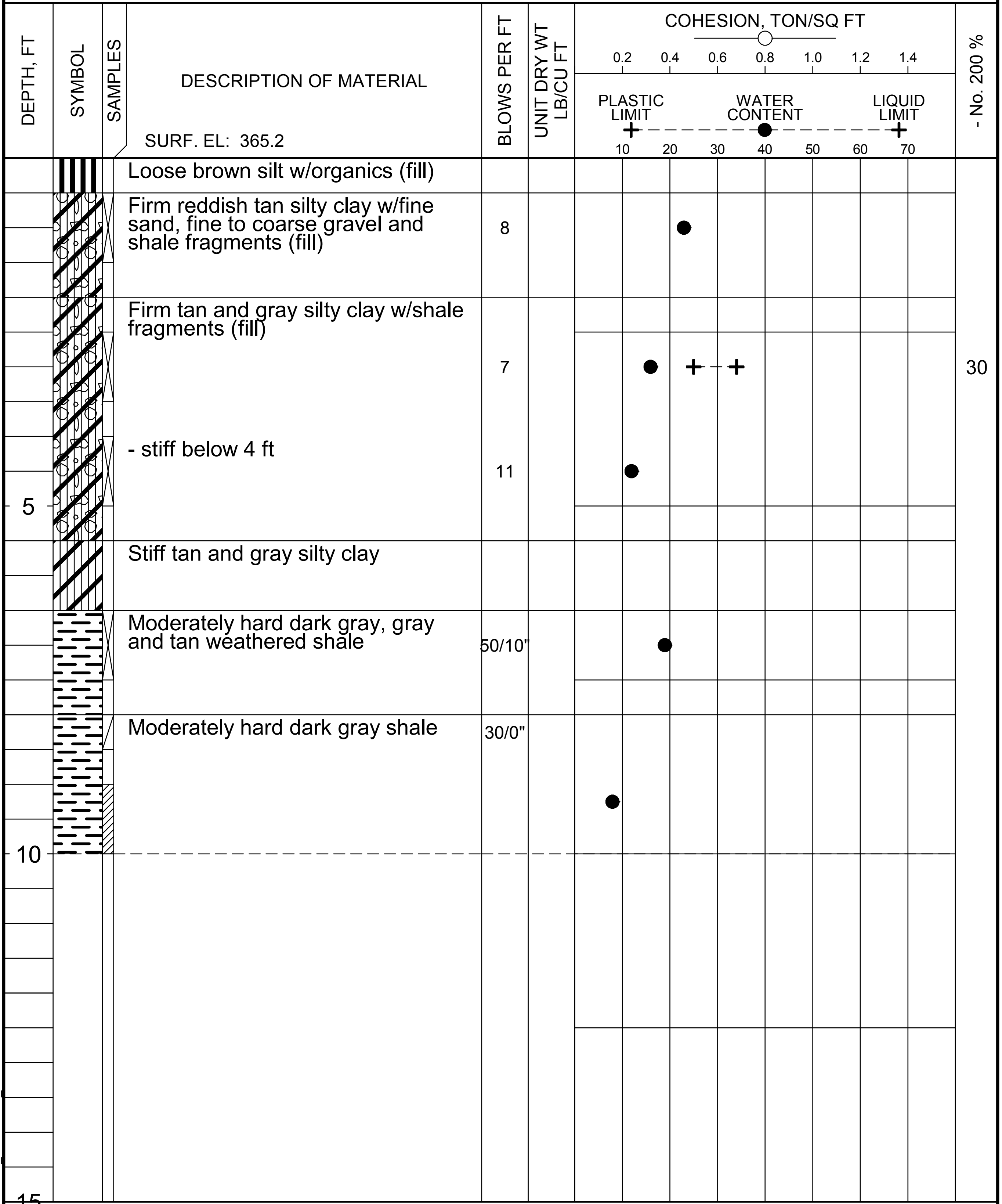
LOG OF BORING NO. 90

AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Saline County, Arkansas

TYPE: Auger

LOCATION: Approx Sta 1252+36, 11 ft Rt

SURF. EL: 365.2



DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
Loose brown silt w/organics (fill)			
Firm reddish tan silty clay w/fine sand, fine to coarse gravel and shale fragments (fill)	8		
Firm tan and gray silty clay w/shale fragments (fill)	7		30
- stiff below 4 ft	11		
Stiff tan and gray silty clay			
Moderately hard dark gray, gray and tan weathered shale	50/10"		
Moderately hard dark gray shale	30/0"		

COMPLETION DEPTH: 10.0 ft
DATE: 12-13-13

DEPTH TO WATER
IN BORING: Dry

DATE: 12/13/2013

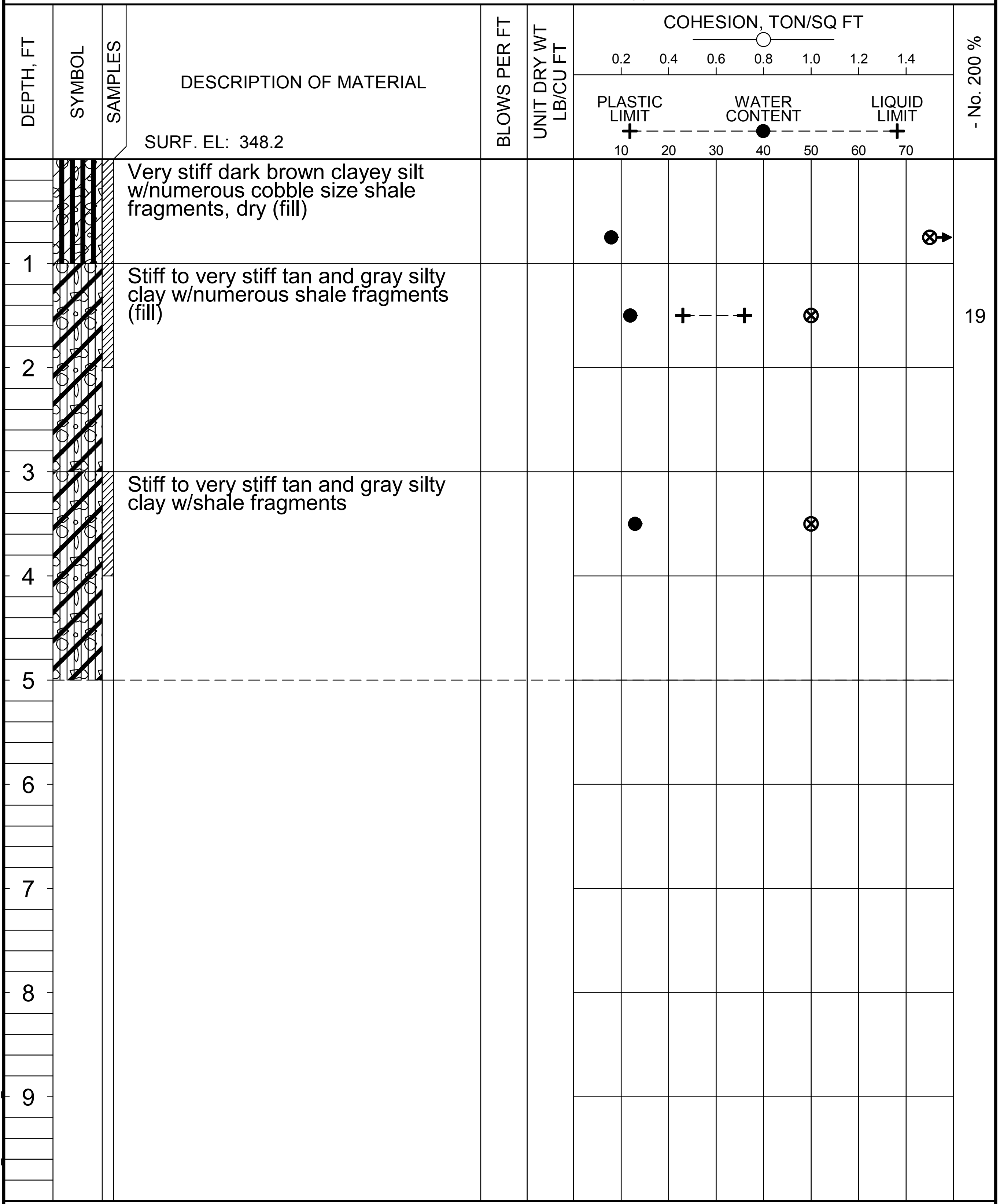
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 91

AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Saline County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 1259+78, 18 ft Rt



DESCRIPTION OF MATERIAL	- No. 200 %
Very stiff dark brown clayey silt w/numerous cobble size shale fragments, dry (fill)	
Stiff to very stiff tan and gray silty clay w/numerous shale fragments (fill)	19
Stiff to very stiff tan and gray silty clay w/shale fragments	

COMPLETION DEPTH: 5.0 ft
DATE: 12-19-13

DEPTH TO WATER
IN TEST PIT: Dry

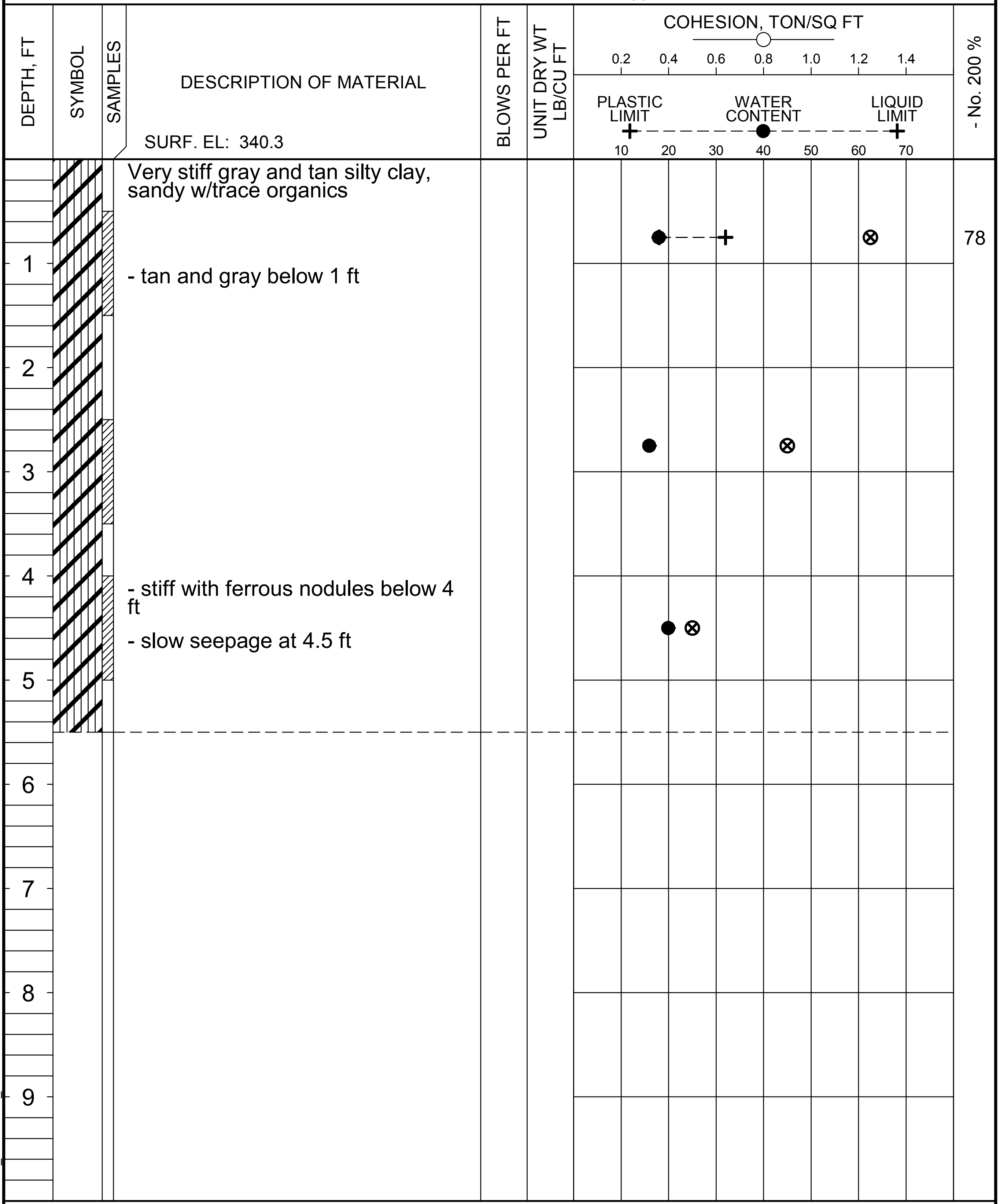
DATE: 12/19/2013

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 92

AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Saline County, Arkansas

TYPE: Mini Excavator
LOCATION: Approx Sta 1270+78, 13 ft Rt



Very stiff gray and tan silty clay, sandy w/trace organics

- tan and gray below 1 ft

- stiff with ferrous nodules below 4 ft

- slow seepage at 4.5 ft

COMPLETION DEPTH: 5.5 ft
DATE: 12-19-13

DEPTH TO WATER
IN TEST PIT: 4.5 ft

DATE: 12/19/2013

LTPNEW 13-203_ROADWAY_SALINE COUNTY.GPJ 7-9-14

13-203

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

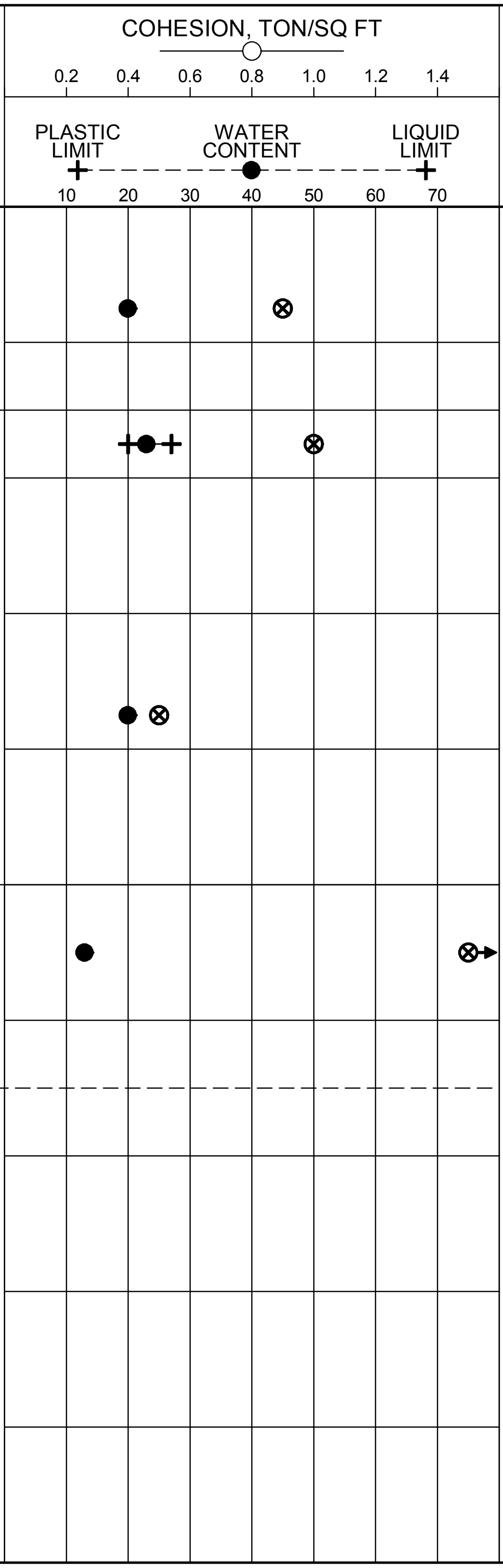
LOG OF TEST PIT NO. 93

AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Saline County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 1278+71, 13 ft Rt

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURF. EL: 339.6	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
			Stiff tan silty clay w/a few shale fragments (fill)			
			Very stiff tan and gray silty clay w/occasional ferrous stains			71
			- stiff below 3.5 ft			
			Very stiff gray and tan silty clay w/numerous quartz fragments, fine to coarse gravel and ferrous concrections			



Depth scale: 1 2 3 4 5 6 7 8 9

COMPLETION DEPTH: 6.5 ft
DATE: 12-19-13

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 12/19/2013

LTPNEW 13-203_ROADWAY_SALINE COUNTY.GPJ 7-9-14

13-203

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

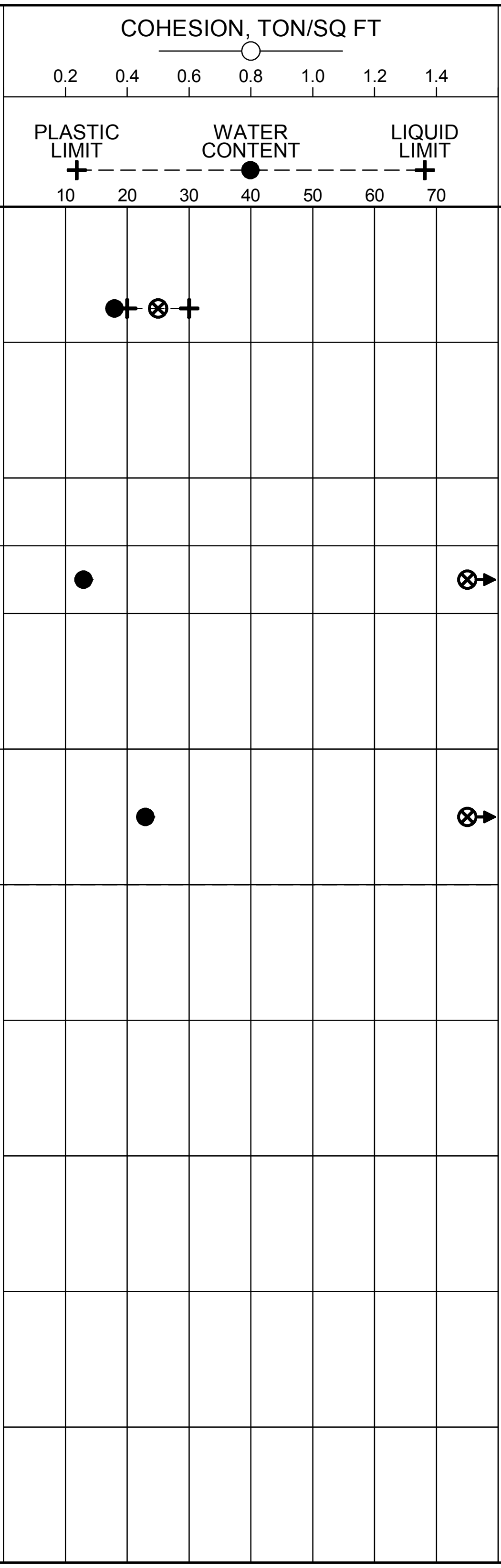
LOG OF TEST PIT NO. 94

AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Saline County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 1285+88, 17 ft Rt

DEPTH, FT	DESCRIPTION OF MATERIAL SURF. EL: 339.4	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
0	Stiff dark brown and tan silty clay w/shale fragments (fill)			44
2.5	- seepage at 2.5 ft Dense dark gray shale fragments w/silty clay (fill)			
4.0	Very stiff tan silty clay w/some fine to coarse gravel			
5.0				



COMPLETION DEPTH: 5.0 ft
DATE: 12-23-13

DEPTH TO WATER
IN TEST PIT: 2.5 ft

DATE: 12/23/2013

LTPNEW 13-203_ROADWAY_SALINE COUNTY.GPJ 7-9-14

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

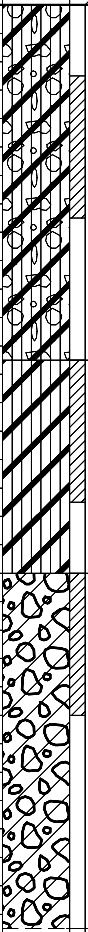
LOG OF TEST PIT NO. 95

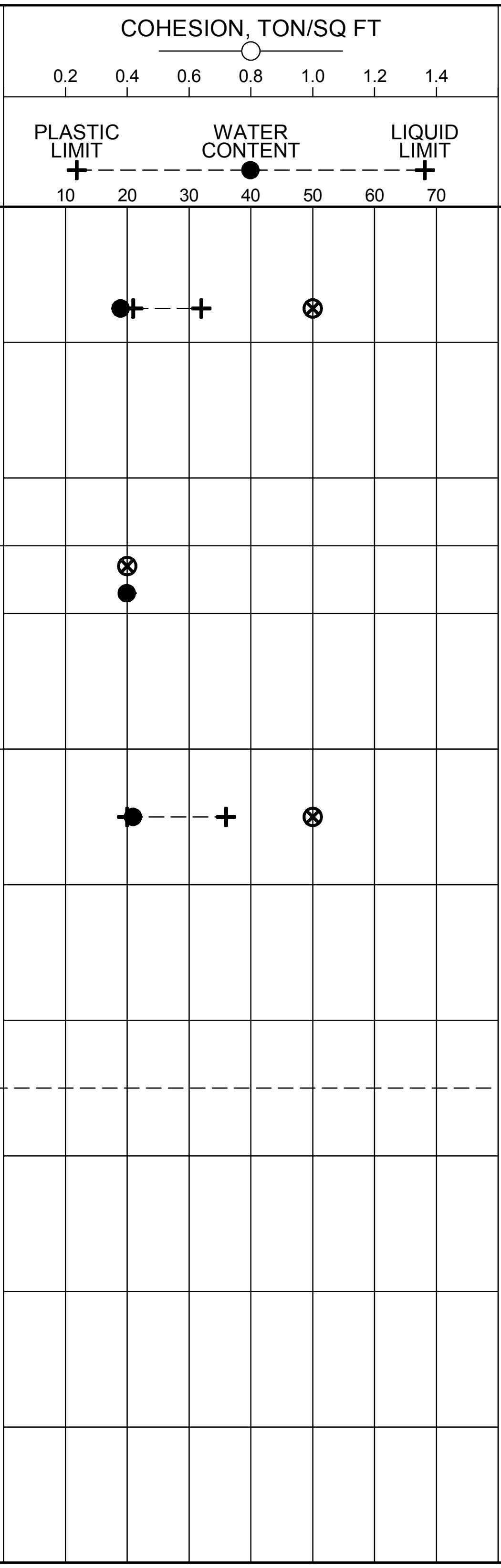
AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Saline County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 1293+51, 27 ft Rt

DEPTH, FT	DESCRIPTION OF MATERIAL SURF. EL: 337.3	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
0 – 2.5	Very stiff brown silty clay w/some shale fragments (fill) - perched water at 2 ft			42
2.5 – 4	Firm gray and brown silty clay w/occasional fine to coarse gravel - water at 3.5 ft			
4 – 6.5	Dense brown clayey fine to coarse gravel			28





COMPLETION DEPTH: 6.5 ft
DATE: 1-15-14

DEPTH TO WATER IN TEST PIT: 3.5 ft

DATE: 1/15/2014

13-203

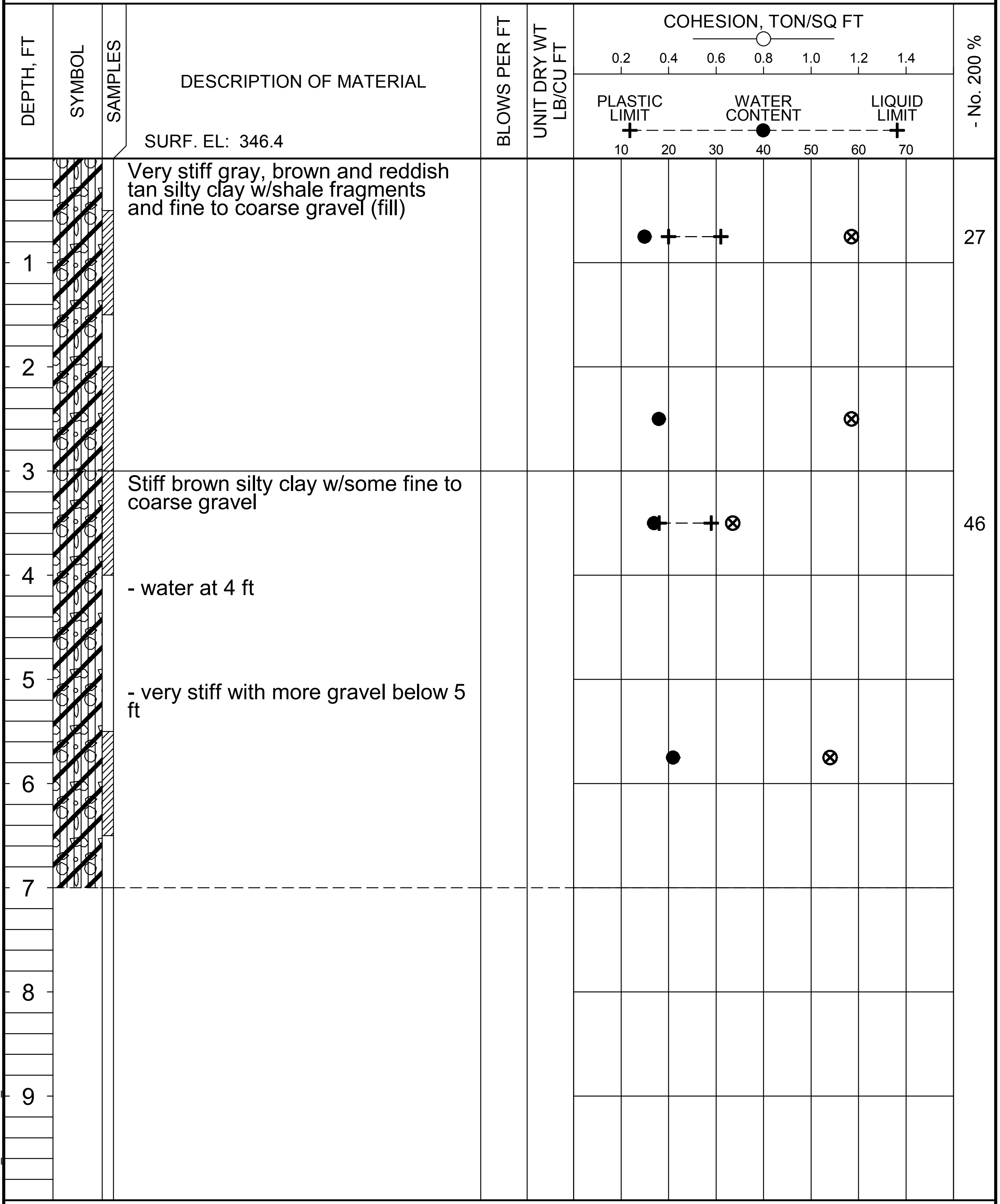
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 96

AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Saline County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 1300+61, 17 ft Rt



Very stiff gray, brown and reddish tan silty clay w/shale fragments and fine to coarse gravel (fill)

Stiff brown silty clay w/some fine to coarse gravel

- water at 4 ft

- very stiff with more gravel below 5 ft

COMPLETION DEPTH: 7.0 ft
DATE: 1-15-14

DEPTH TO WATER
IN TEST PIT: 4 ft

DATE: 1/15/2014

LTPNEW 13-203_ROADWAY_SALINE COUNTY.GPJ 7-9-14

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

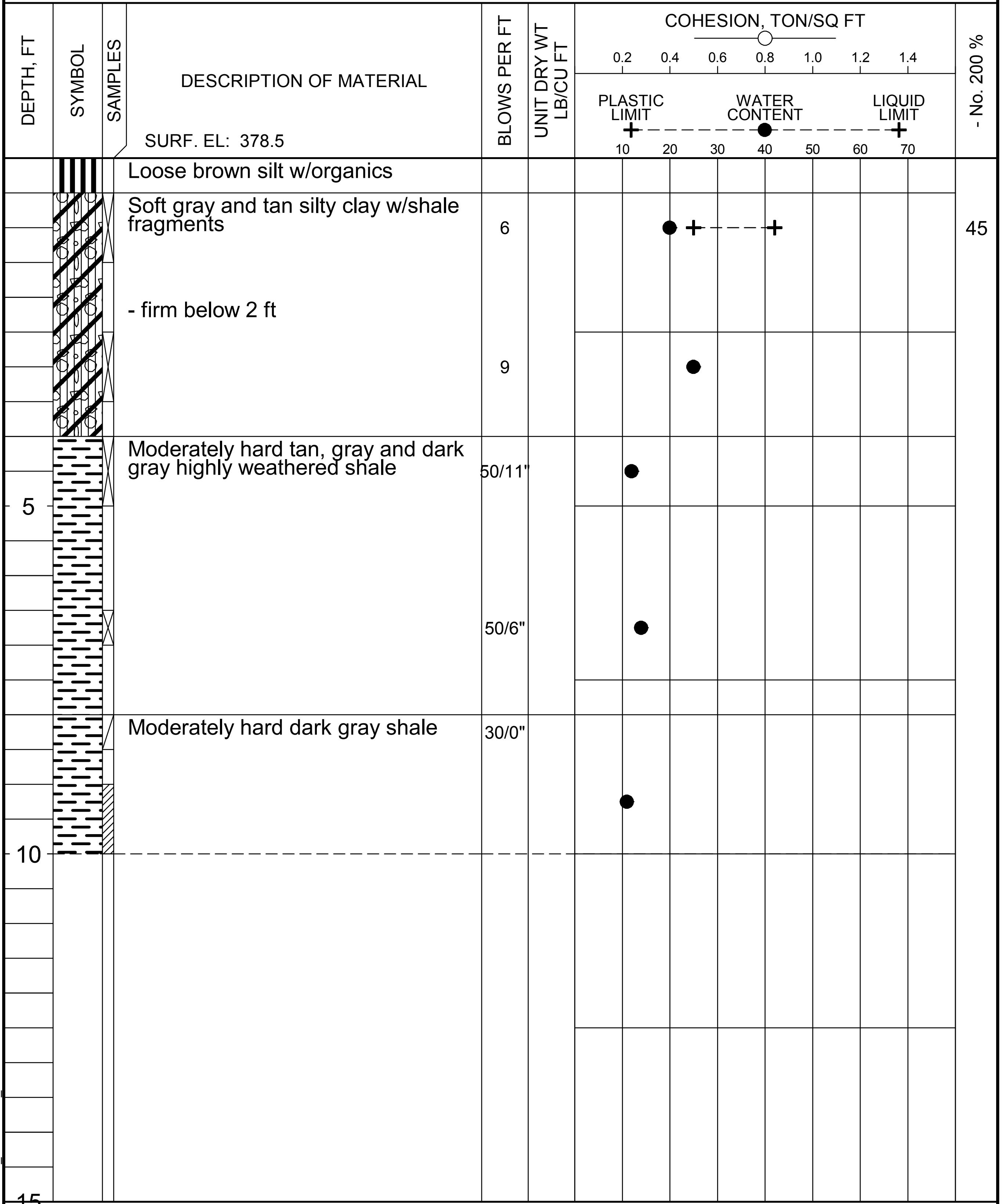
LOG OF BORING NO. 97

AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Saline County, Arkansas

TYPE: Auger

LOCATION: Approx Sta 1314+33, 24 ft Rt

SURF. EL: 378.5



DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
Loose brown silt w/organics			
Soft gray and tan silty clay w/shale fragments	6		45
- firm below 2 ft	9		
Moderately hard tan, gray and dark gray highly weathered shale	50/11"		
	50/6"		
Moderately hard dark gray shale	30/0"		

COMPLETION DEPTH: 10.0 ft
DATE: 12-13-13

DEPTH TO WATER
IN BORING: Dry

DATE: 12/13/2013

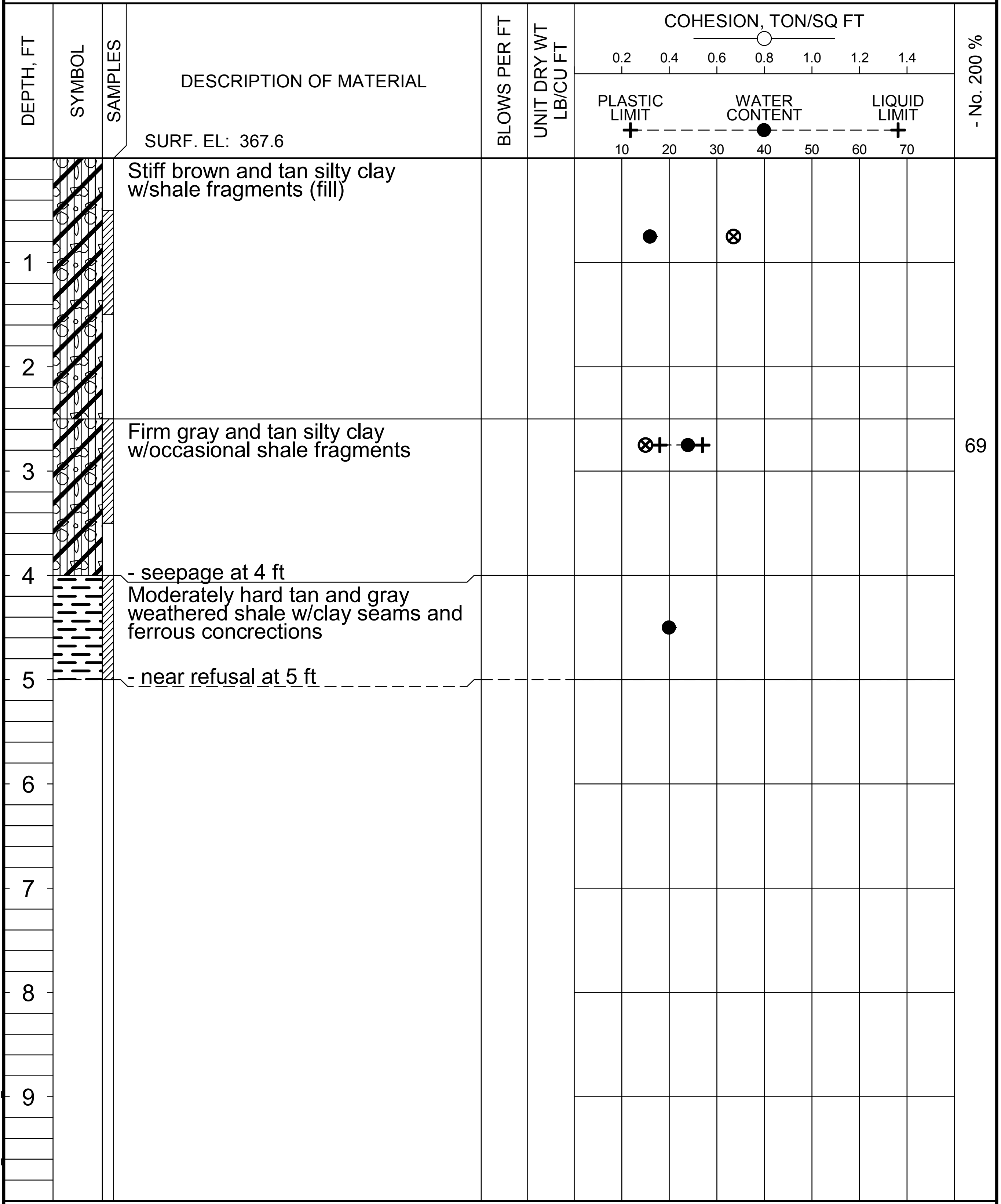
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 98

AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Saline County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 1321+70, 22 ft Rt



Stiff brown and tan silty clay w/shale fragments (fill)

Firm gray and tan silty clay w/occasional shale fragments

- seepage at 4 ft

Moderately hard tan and gray weathered shale w/clay seams and ferrous concrections

- near refusal at 5 ft

COMPLETION DEPTH: 5.0 ft
DATE: 12-23-13

DEPTH TO WATER
IN TEST PIT: 4 ft

DATE: 12/23/2013

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

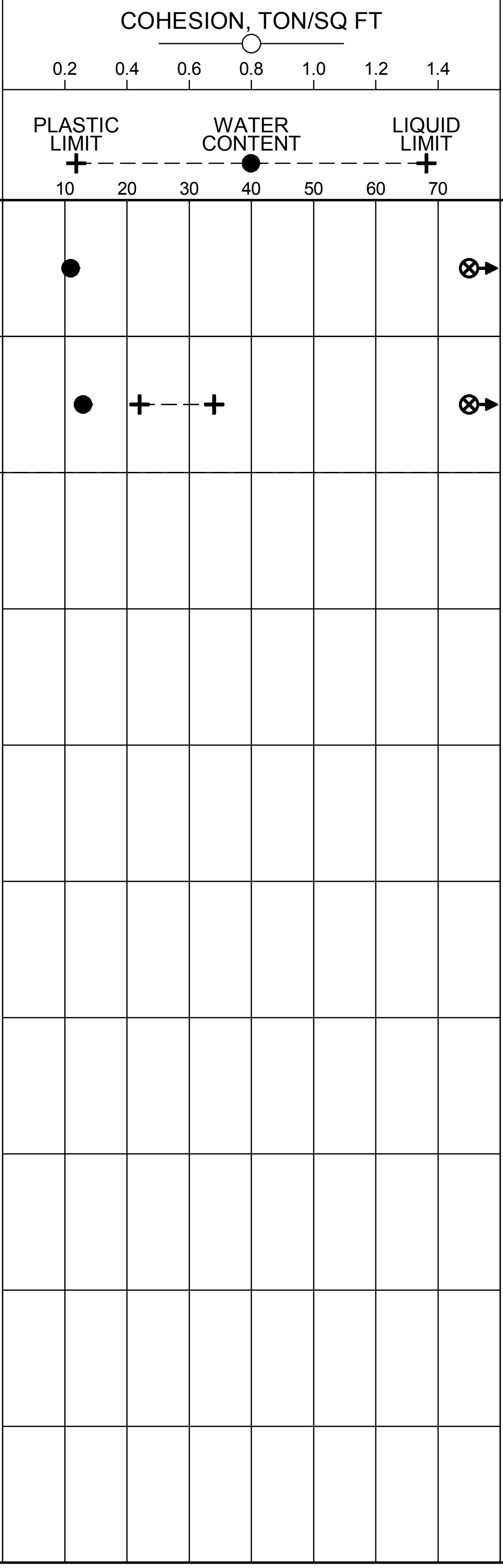
LOG OF TEST PIT NO. 99

AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Saline County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 1329+37, 20 ft Rt

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURF. EL: 367.1	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
0–1			Dense to very dense dark brown fine sandy silt w/crushed stone and shale fragments (fill)			
1–2			Moderately hard tan and dark gray highly weathered shale w/occasional clay laminations, dip = 35° at 220° SW			
2			- seepage at 2 ft - refusal at 2 ft in shale			



COMPLETION DEPTH: 2.0 ft
DATE: 12-23-13

DEPTH TO WATER
IN TEST PIT: 2 ft
DATE: 12/23/2013

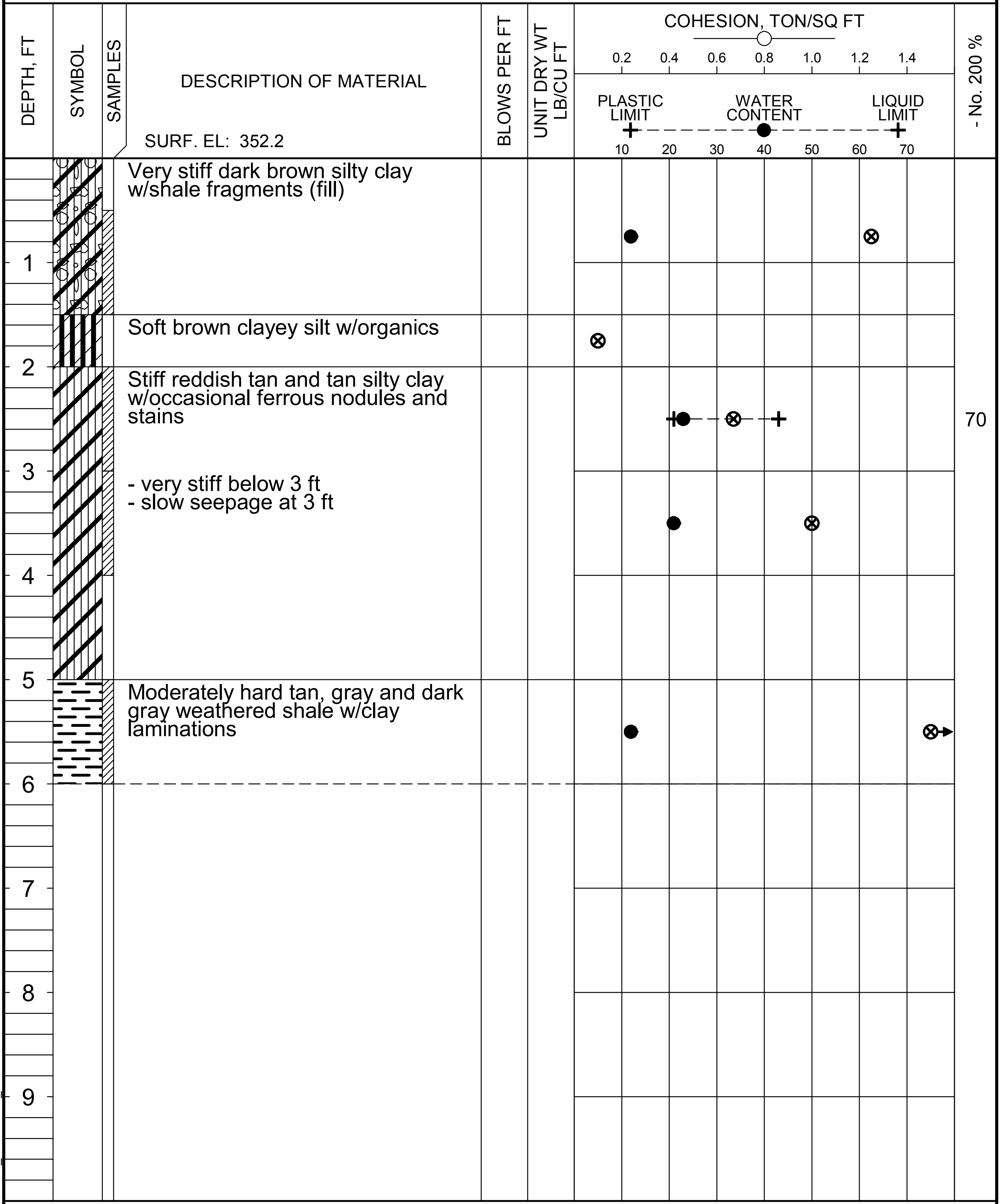
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 100

AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Saline County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 1336+89, 26 ft Rt



Very stiff dark brown silty clay w/shale fragments (fill)

Soft brown clayey silt w/organics

Stiff reddish tan and tan silty clay w/occasional ferrous nodules and stains

- very stiff below 3 ft
- slow seepage at 3 ft

Moderately hard tan, gray and dark gray weathered shale w/clay laminations

COMPLETION DEPTH: 6.0 ft
DATE: 12-23-13

DEPTH TO WATER
IN TEST PIT: 3 ft

DATE: 12/23/2013

13-203

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

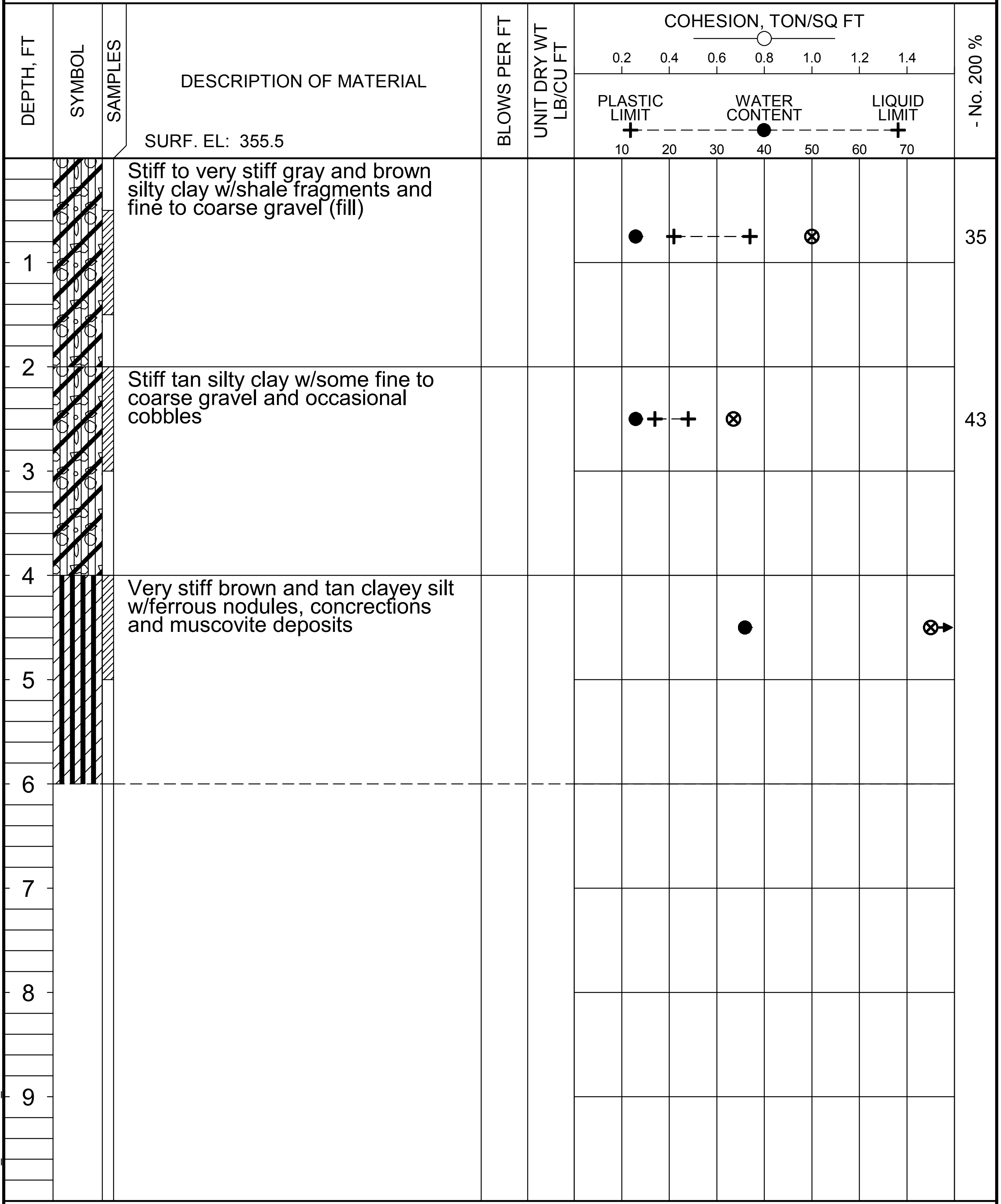
LOG OF TEST PIT NO. 101

AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Saline County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 1344+42, 24 ft Rt

SURF. EL: 355.5



DEPTH, FT	DESCRIPTION OF MATERIAL	- No. 200 %
0 – 2	Stiff to very stiff gray and brown silty clay w/shale fragments and fine to coarse gravel (fill)	35
2 – 4	Stiff tan silty clay w/some fine to coarse gravel and occasional cobbles	43
4 – 6	Very stiff brown and tan clayey silt w/ferrous nodules, concrections and muscovite deposits	

COMPLETION DEPTH: 6.0 ft
DATE: 12-23-13

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 12/23/2013

LTPNEW 13-203_ROADWAY_SALINE COUNTY.GPJ 7-9-14

13-203

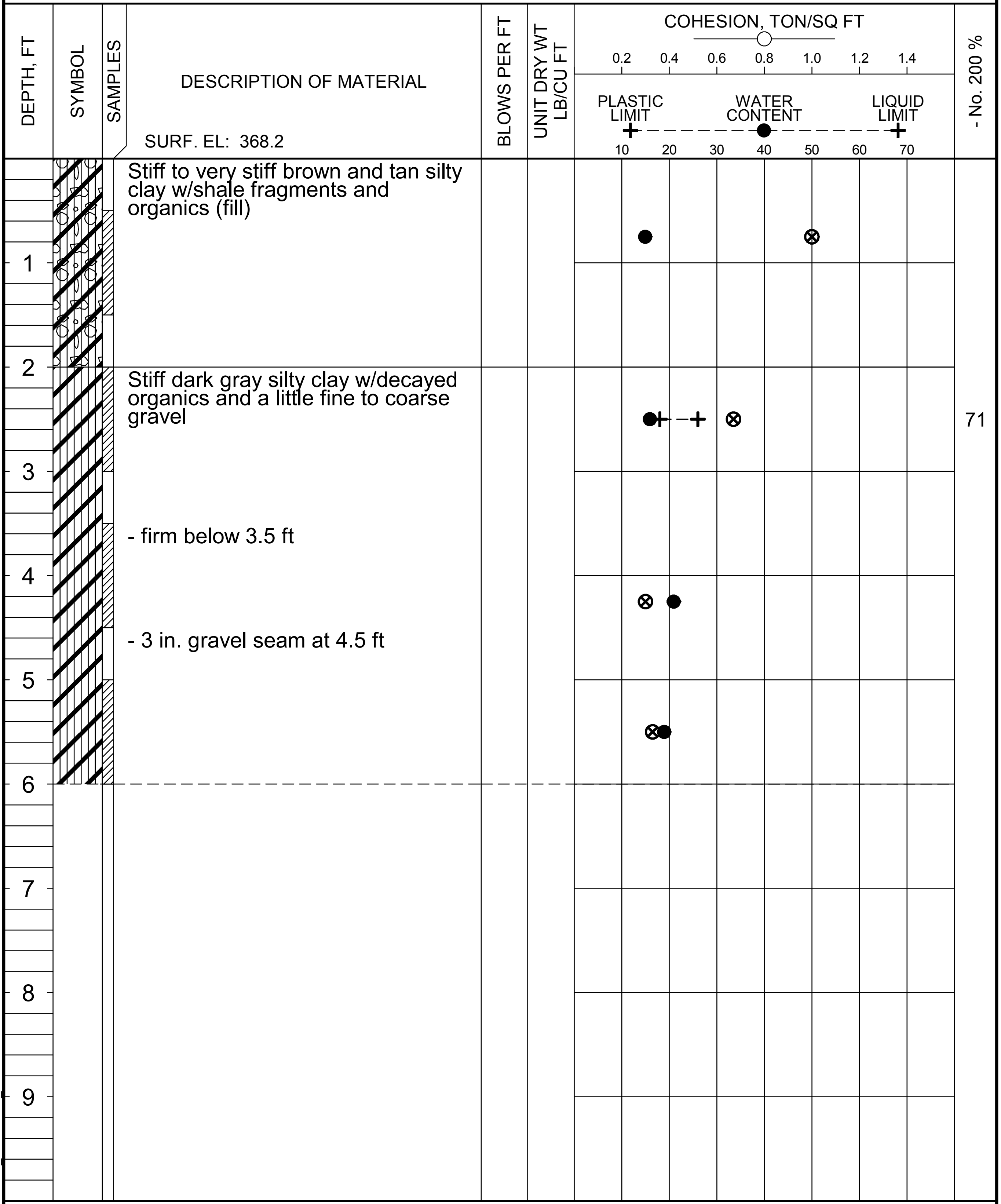
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 102

AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Saline County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 1351+90, 17 ft Rt



Stiff to very stiff brown and tan silty clay w/shale fragments and organics (fill)

Stiff dark gray silty clay w/decayed organics and a little fine to coarse gravel

- firm below 3.5 ft

- 3 in. gravel seam at 4.5 ft

COMPLETION DEPTH: 6.0 ft
DATE: 12-23-13

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 12/23/2013

LTPNEW 13-203_ROADWAY_SALINE COUNTY.GPJ 7-9-14

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

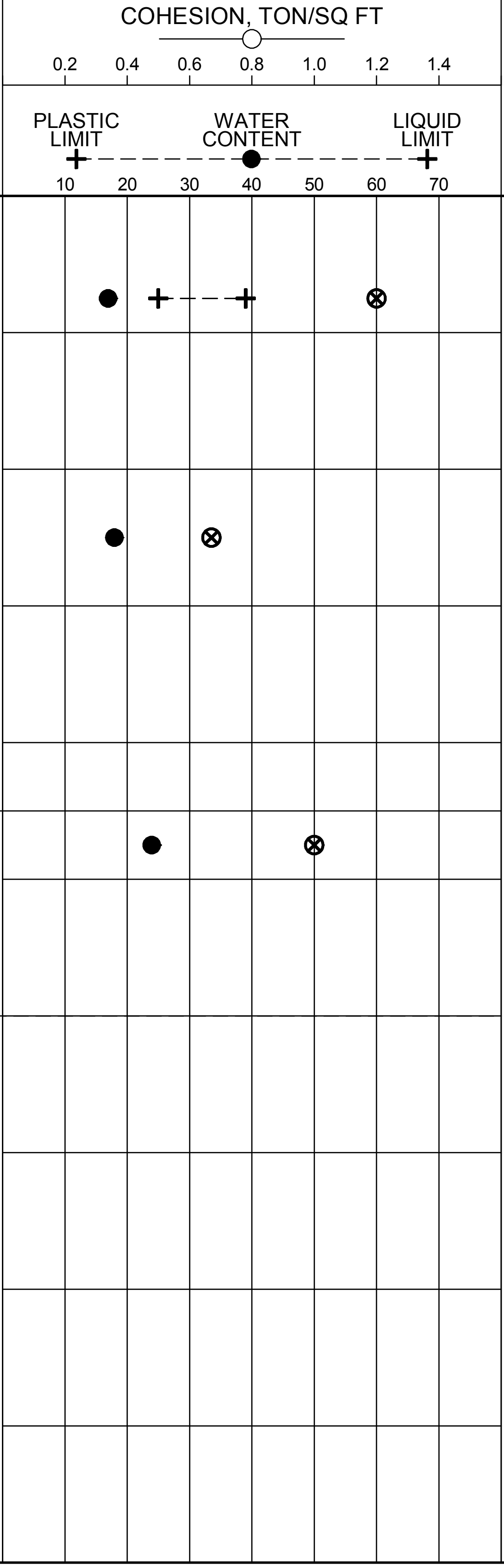
LOG OF TEST PIT NO. 103

AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Saline County, Arkansas

TYPE: Mini Excavator
LOCATION: Approx Sta 1362+98, 24 ft Rt

SURF. EL: 389.2

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
0	Very stiff brown and tan silty clay w/shale fragments and trace organics (fill)			34
2	- stiff below 2 ft			
3.5	- slow seepage at 3.5 ft - with numerous shale fragments at 3.5 ft			
4.5	Stiff to very stiff tan and reddish tan silty clay w/some fine to coarse gravel and occasional cobbles			
6				



COMPLETION DEPTH: 6.0 ft
DATE: 12-23-13

DEPTH TO WATER
IN TEST PIT: 3.5 ft

DATE: 12/23/2013

LTPNEW 13-203_ROADWAY_SALINE COUNTY.GPJ 7-9-14

13-203

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 104

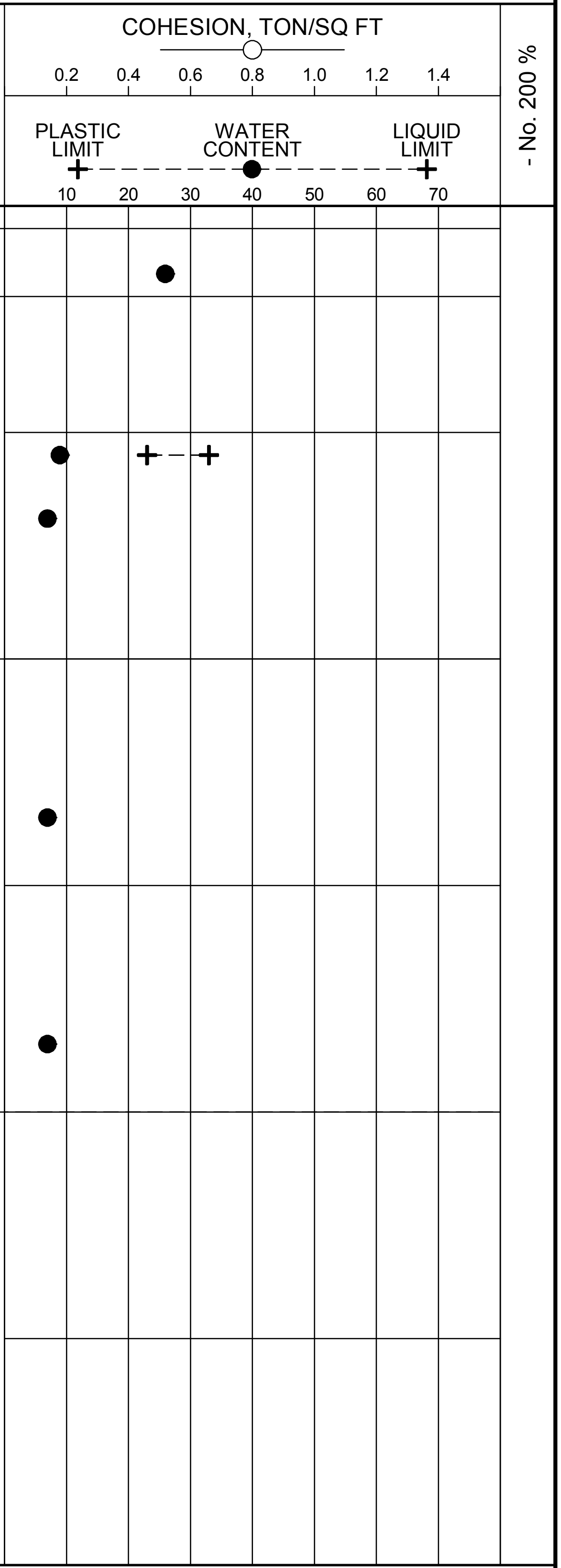
AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Saline County, Arkansas

TYPE: Auger

LOCATION: Approx Sta 1370+32, 21 ft Rt

SURF. EL: 415.3

DESCRIPTION OF MATERIAL	BLOWS PER FT
Loose dark brown fine sandy silt w/organics	
Firm tan and gray silty clay	10
Low hardness gray, tan and dark gray weathered shale	
- moderately hard below 2.5 ft	50/5"
	50/2"
Moderately hard tan and dark gray slightly weathered shale	30/0"
	30/0"



DEPTH, FT: 5, 10, 15

UNIT DRY WT LB/CU FT

COMPLETION DEPTH: 10.0 ft
DATE: 12-19-13

DEPTH TO WATER
IN BORING: Dry

DATE: 12/19/2013

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

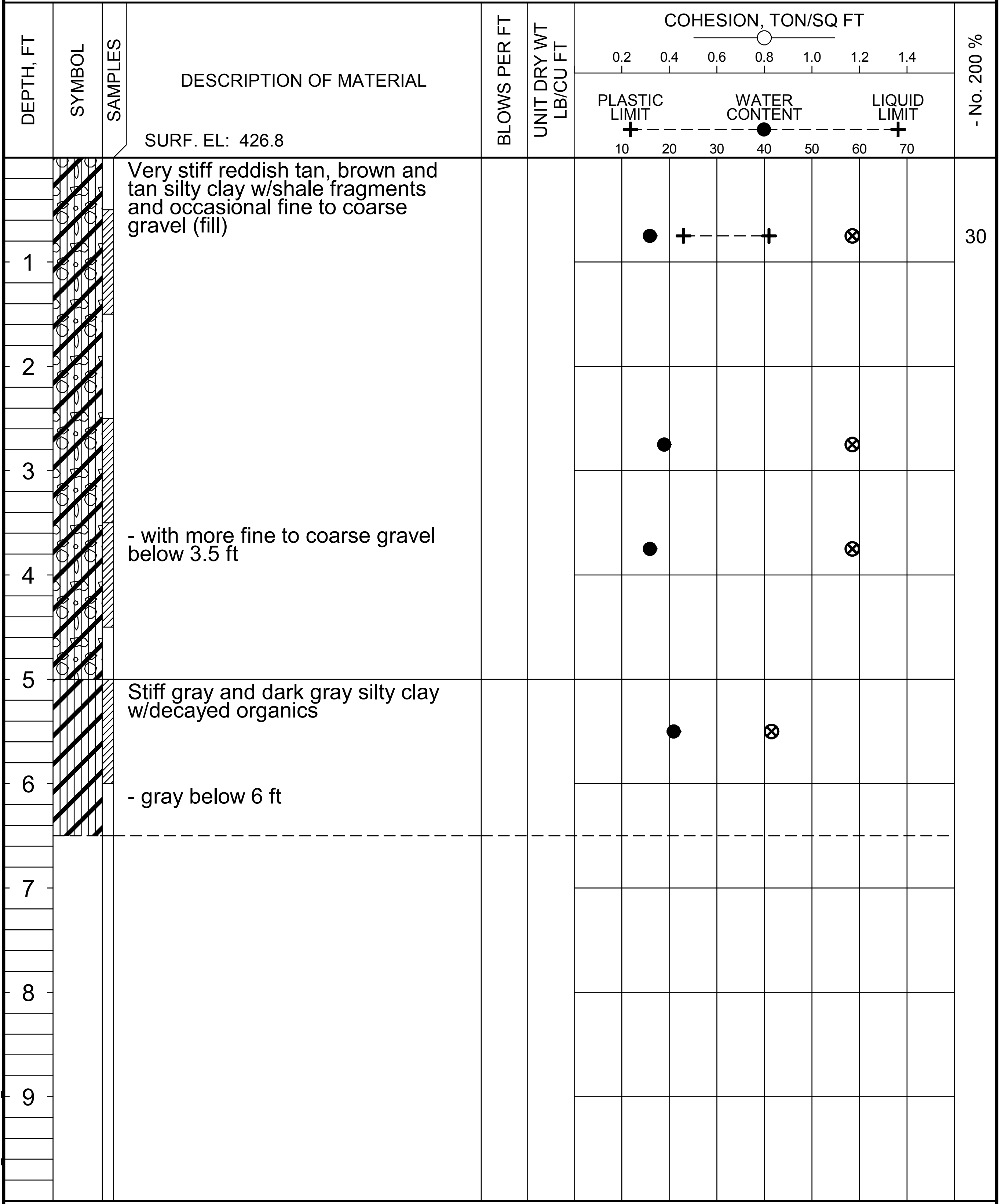
LOG OF TEST PIT NO. 105

AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Saline County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 1378+19, 32 ft Rt

SURF. EL: 426.8



Very stiff reddish tan, brown and tan silty clay w/shale fragments and occasional fine to coarse gravel (fill)

- with more fine to coarse gravel below 3.5 ft

Stiff gray and dark gray silty clay w/decayed organics

- gray below 6 ft

COMPLETION DEPTH: 6.5 ft
DATE: 12-23-13

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 12/23/2013

13-203

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

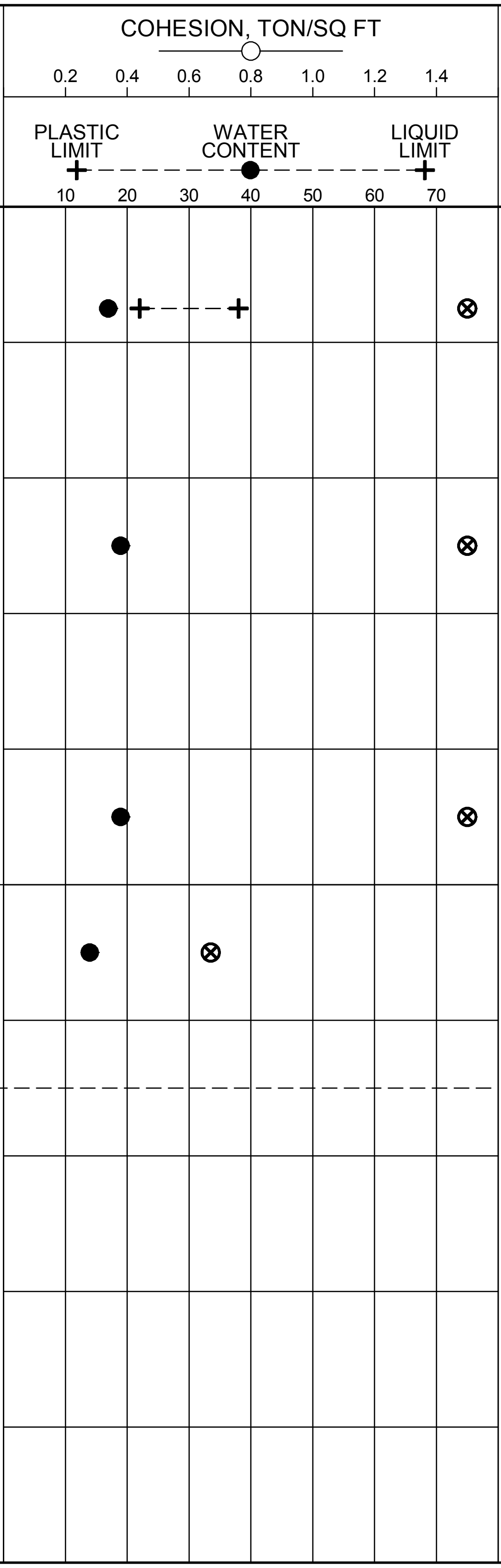
LOG OF TEST PIT NO. 106

AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Saline County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 1385+67, 20 ft Rt

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURF. EL: 412.4	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
0			Very stiff reddish tan, gray and tan silty clay w/numerous shale fragments and occasional organics (fill)			27
5			Stiff gray silty clay w/trace decayed organics			



COMPLETION DEPTH: 6.5 ft
DATE: 12-30-13

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 12/30/2013

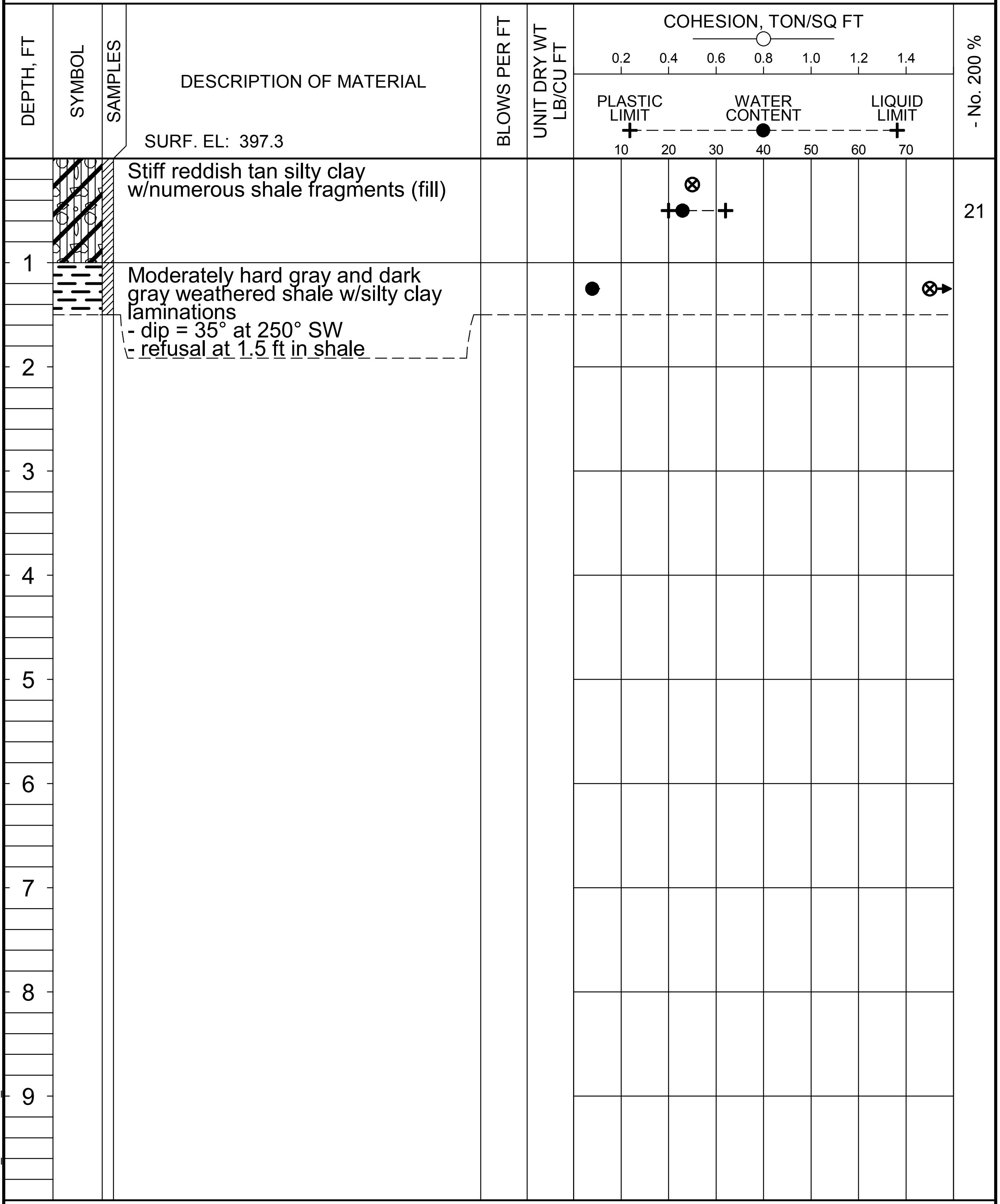
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 107

AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Saline County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 1393+22, 30 ft Rt



SURF. EL: 397.3

Stiff reddish tan silty clay w/numerous shale fragments (fill)

Moderately hard gray and dark gray weathered shale w/silty clay laminations
- dip = 35° at 250° SW
- refusal at 1.5 ft in shale

COMPLETION DEPTH: 1.5 ft
DATE: 12-30-13

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 12/30/2013

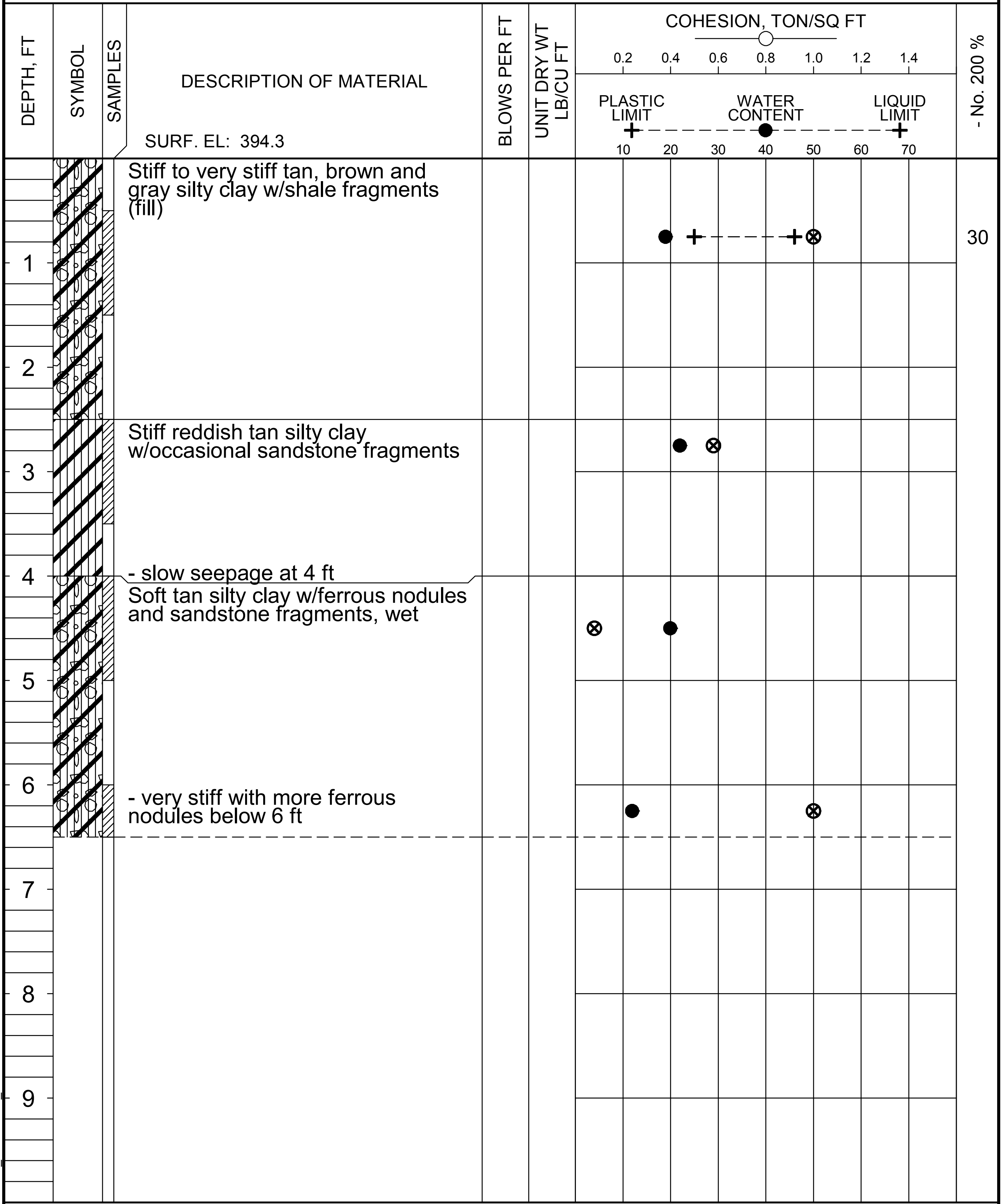
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 108

AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Saline County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 1400+99, 30 ft Rt



Stiff to very stiff tan, brown and gray silty clay w/shale fragments (fill)

Stiff reddish tan silty clay w/occasional sandstone fragments

- slow seepage at 4 ft

Soft tan silty clay w/ferrous nodules and sandstone fragments, wet

- very stiff with more ferrous nodules below 6 ft

COMPLETION DEPTH: 6.5 ft
DATE: 12-30-13

DEPTH TO WATER
IN TEST PIT: 4 ft

DATE: 12/30/2013

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 109

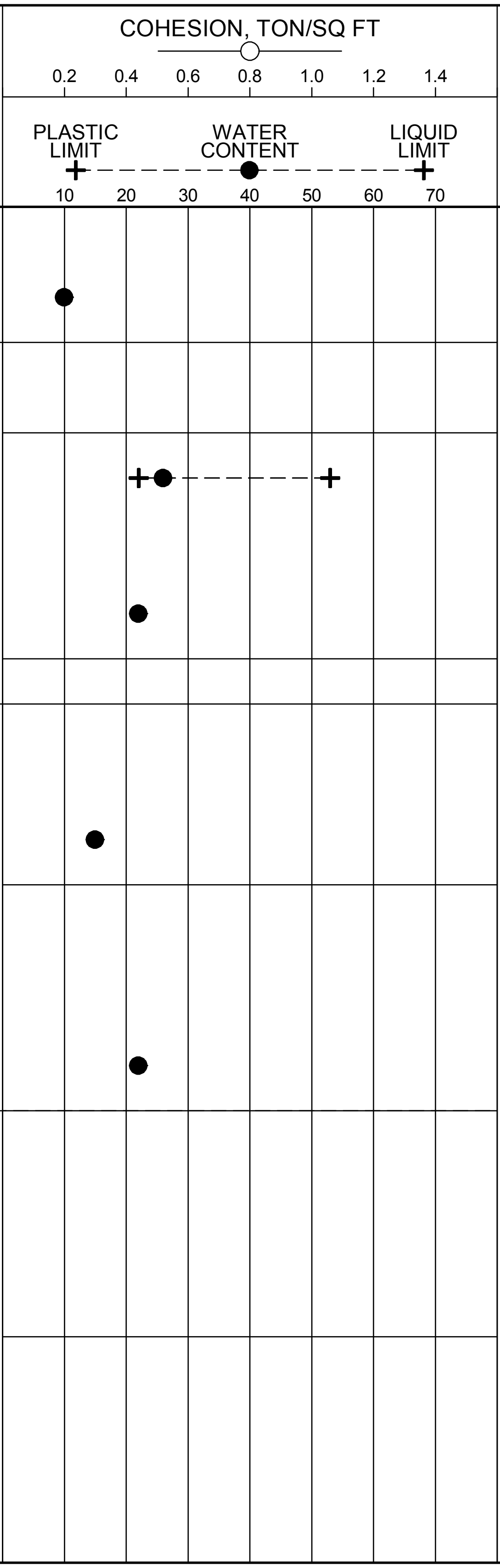
AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Saline County, Arkansas

TYPE: Auger

LOCATION: Approx Sta 1408+31, 33 ft Rt

SURF. EL: 408.7

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
	Loose gray and tan shale fragments w/surface organics (fill)			
		10		
	Firm tan and gray clay w/some shale fragments			
		7		81
	- stiff below 4 ft	11		
5				
	Low hardness tan and gray highly weathered shale w/silty clay seams			
		24		
		18		
10				
15				



COMPLETION DEPTH: 10.0 ft
DATE: 12-19-13

DEPTH TO WATER
IN BORING: Dry

DATE: 12/19/2013

13-203

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

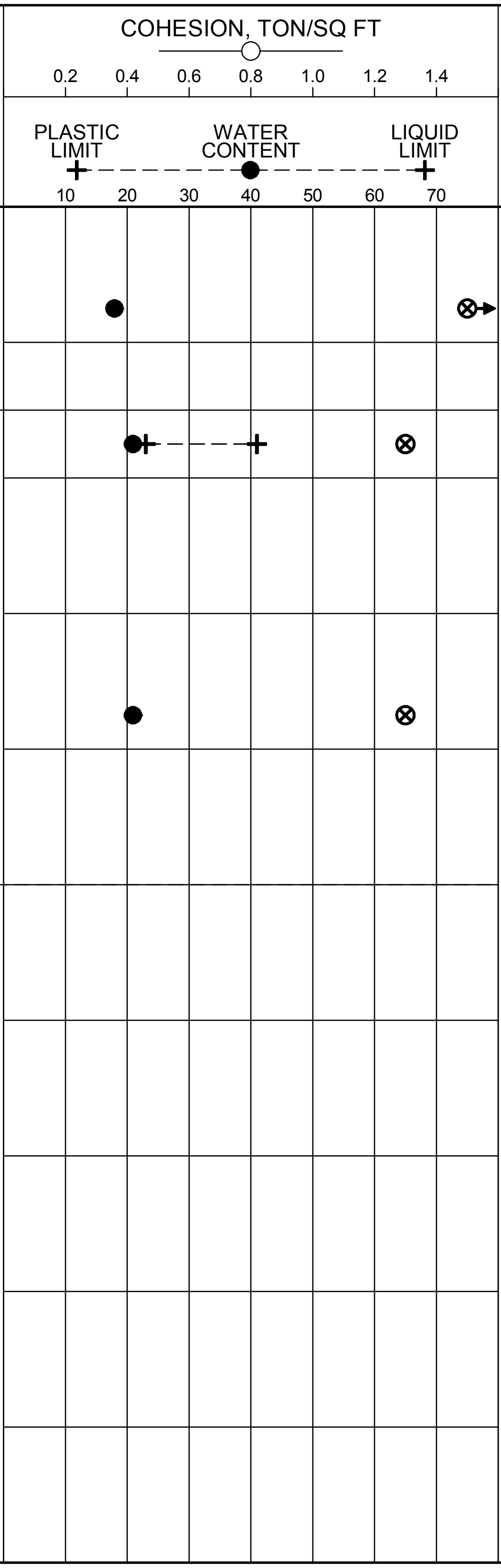
LOG OF TEST PIT NO. 110

AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Saline County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 1416+07, 22 ft Rt

DEPTH, FT	DESCRIPTION OF MATERIAL SURF. EL: 428.9	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
0	Very stiff brown and tan silty clay w/shale fragments and organics (fill)			
1.5	Very stiff reddish tan silty clay, sandy w/occasional ferrous nodules and stains			62
3.5	- tan with more ferrous nodules below 3.5 ft			
5				



COMPLETION DEPTH: 5.0 ft
DATE: 12-30-13

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 12/30/2013

LTPNEW 13-203_ROADWAY_SALINE COUNTY.GPJ 7-9-14

13-203

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 111

AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Saline County, Arkansas

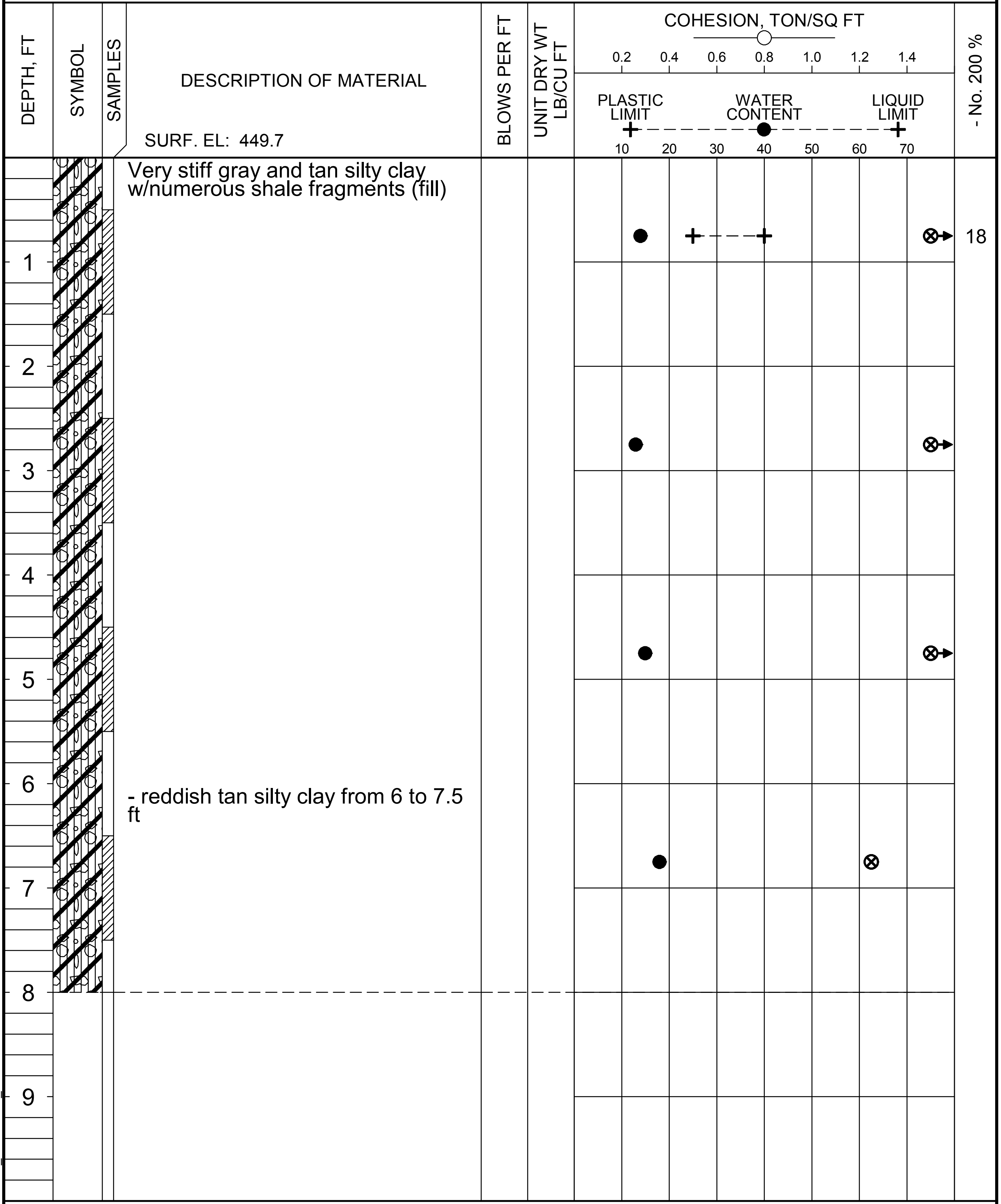
TYPE: Mini Excavator

LOCATION: Approx Sta 1423+53, 33 ft Rt

SURF. EL: 449.7

Very stiff gray and tan silty clay w/numerous shale fragments (fill)

- reddish tan silty clay from 6 to 7.5 ft



COMPLETION DEPTH: 8.0 ft
DATE: 12-30-13

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 12/30/2013

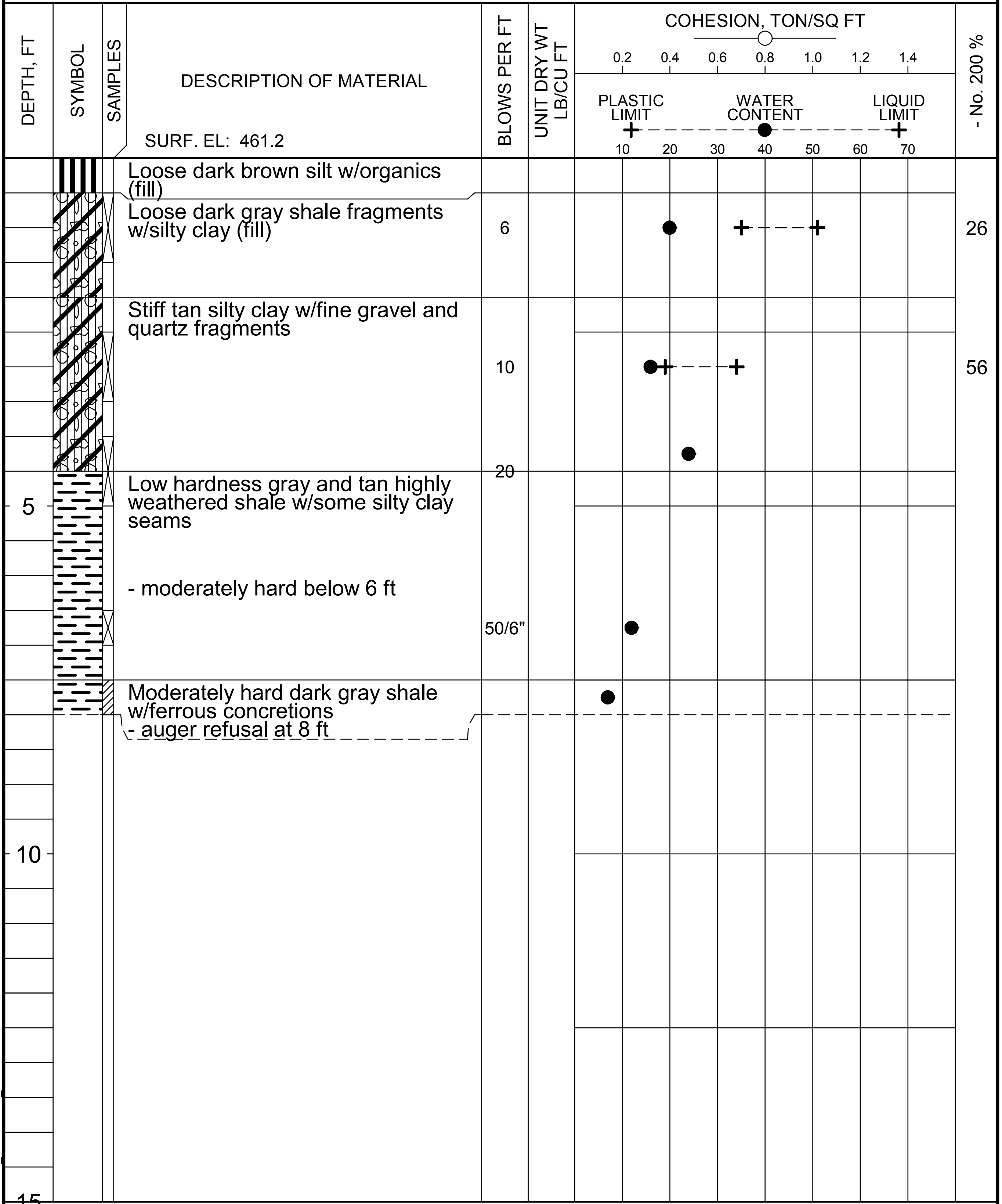
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 112

AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Saline County, Arkansas

TYPE: Auger

LOCATION: Approx Sta 1431+21, 31 ft Rt



DESCRIPTION OF MATERIAL	BLOWS PER FT	- No. 200 %
Loose dark brown silt w/organics (fill)		
Loose dark gray shale fragments w/silty clay (fill)	6	26
Stiff tan silty clay w/fine gravel and quartz fragments	10 20	56
Low hardness gray and tan highly weathered shale w/some silty clay seams - moderately hard below 6 ft	50/6"	
Moderately hard dark gray shale w/ferrous concretions - auger refusal at 8 ft		

COMPLETION DEPTH: 8.0 ft
DATE: 12-20-13

DEPTH TO WATER
IN BORING: Dry

DATE: 12/20/2013

13-203

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

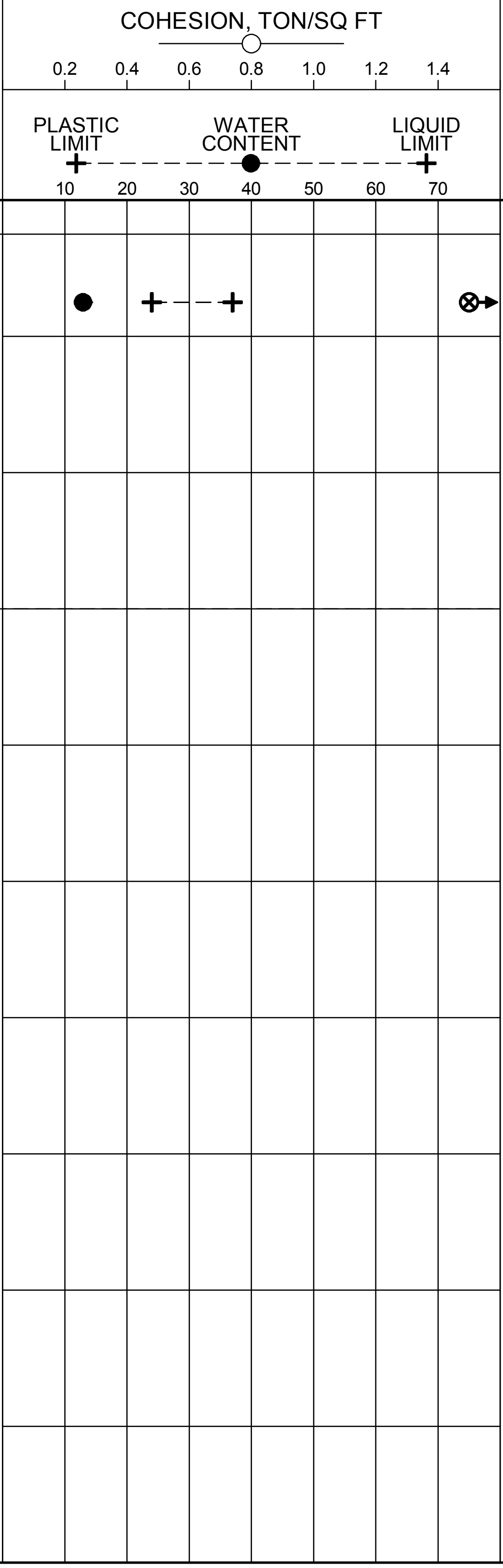
LOG OF TEST PIT NO. 11

AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Garland County, Arkansas

TYPE: Backhoe

LOCATION: Approx Sta 1038+25, 60 ft Rt

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURF. EL: 520±	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
0	▥		Loose Brown silt and organics			
1	☰	▨	Moderately hard reddish tan and tan weathered shale w/sandstone seams and layers, silty clay seams and ferrous stains, apparent dip ~ 10° NE			8
2	☰					
3			- backhoe refusal at 3 ft in shale			
4						
5						
6						
7						
8						
9						



COMPLETION DEPTH: 3.0 ft
DATE: 10-11-13

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 10/11/2013

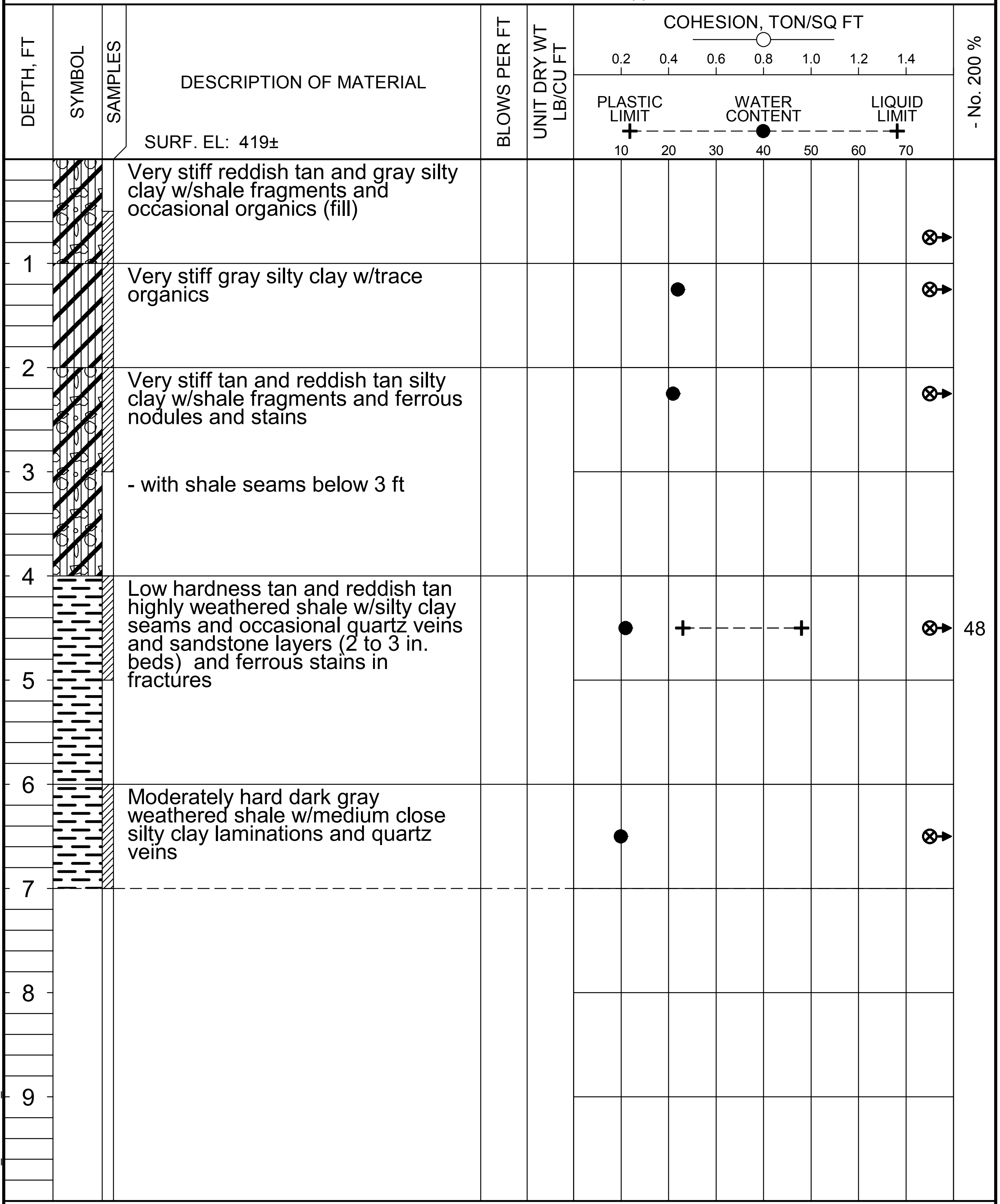
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 12

AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Saline County, Arkansas

TYPE: Backhoe

LOCATION: Approx Sta 1096+97, 54 ft Rt



Very stiff reddish tan and gray silty clay w/shale fragments and occasional organics (fill)

Very stiff gray silty clay w/trace organics

Very stiff tan and reddish tan silty clay w/shale fragments and ferrous nodules and stains

- with shale seams below 3 ft

Low hardness tan and reddish tan highly weathered shale w/silty clay seams and occasional quartz veins and sandstone layers (2 to 3 in. beds) and ferrous stains in fractures

Moderately hard dark gray weathered shale w/medium close silty clay laminations and quartz veins

COMPLETION DEPTH: 7.0 ft
DATE: 10-11-13

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 10/11/2013

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 13

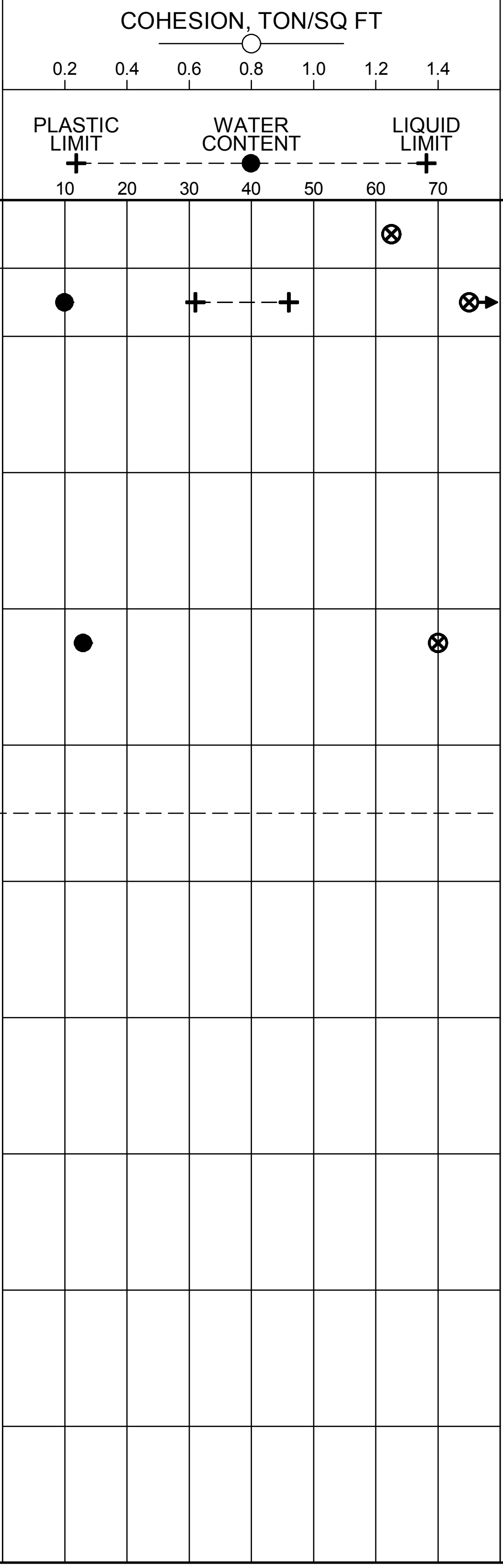
AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Saline County, Arkansas

TYPE: Backhoe

LOCATION: Approx Sta 1132+06, 58 ft Rt

SURF. EL: 425±

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
			Very stiff tan silty clay w/shale fragments and organics			
			Moderately hard tan and reddish tan weathered shale w/sandstone seams and occasional silty clay seams and ferrous stains, apparent dip ~ 65° at 70° NE			8
			- with fewer silty clay seams below 2 ft			
			- backhoe refusal at 4.5 ft in shale			



COMPLETION DEPTH: 4.5 ft
DATE: 10-11-13

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 10/11/2013

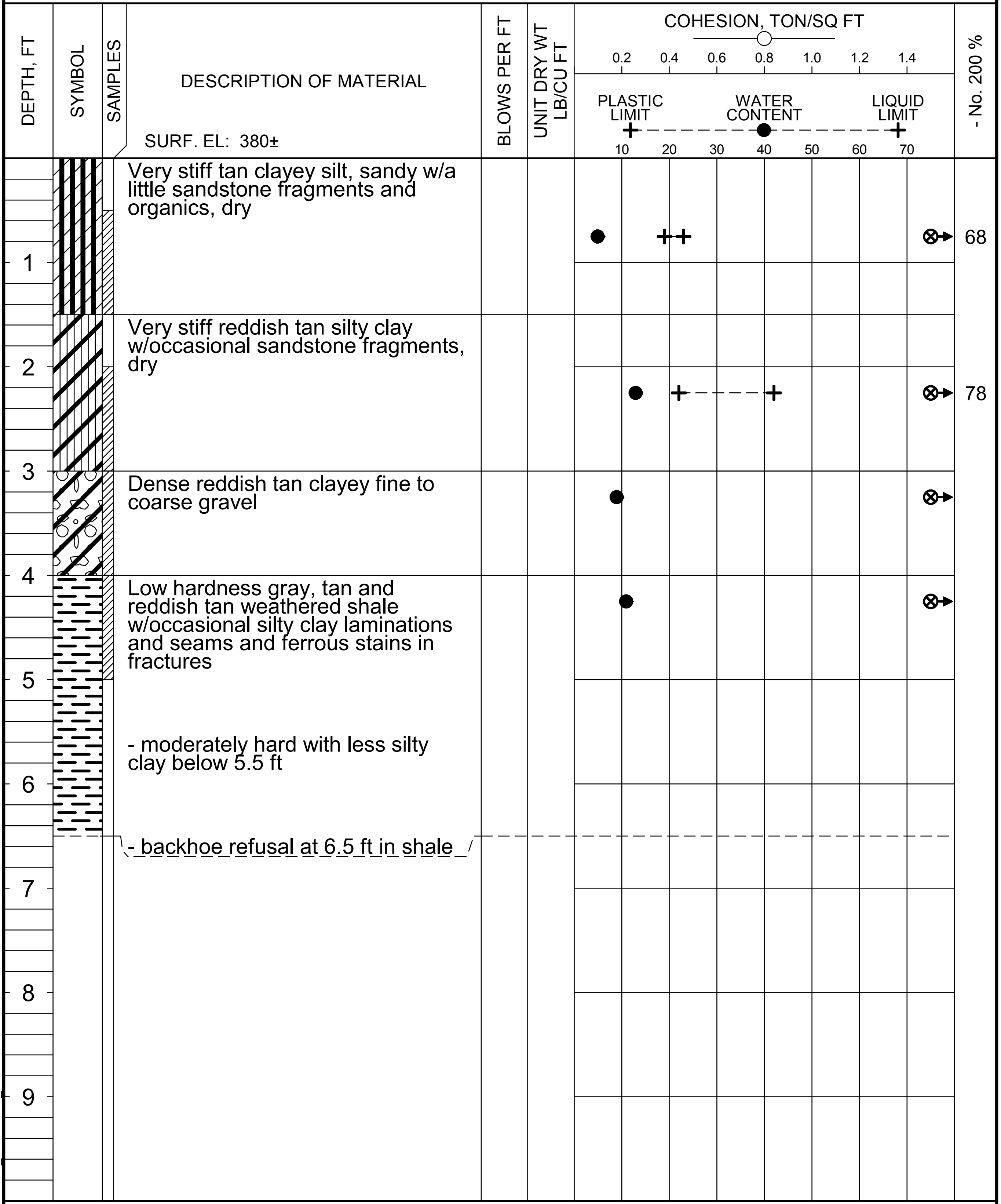
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 14

AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Saline County, Arkansas

TYPE: Backhoe
LOCATION: Approx Sta 1197+06, 65 ft Rt

SURF. EL: 380±



Very stiff tan clayey silt, sandy w/a little sandstone fragments and organics, dry

Very stiff reddish tan silty clay w/occasional sandstone fragments, dry

Dense reddish tan clayey fine to coarse gravel

Low hardness gray, tan and reddish tan weathered shale w/occasional silty clay laminations and seams and ferrous stains in fractures

- moderately hard with less silty clay below 5.5 ft

- backhoe refusal at 6.5 ft in shale

COMPLETION DEPTH: 6.5 ft
DATE: 10-11-13

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 10/11/2013

13-203

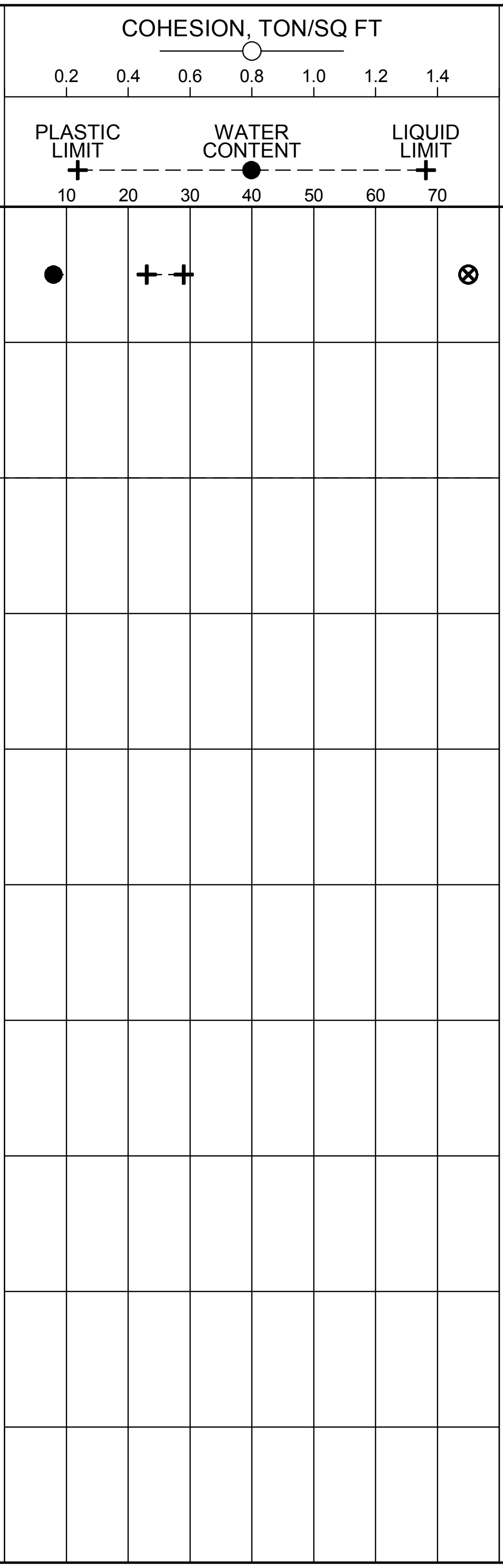
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 15

AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Saline County, Arkansas

TYPE: Backhoe
LOCATION: Approx Sta 1253+15, 39 ft Rt

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURF. EL: 359±	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
0–2			Moderately hard reddish tan and tan weathered shale w/close sandstone seams, thinly bedded w/ferrous stains, fractured, apparent dip ~ 35° at 260° SW			
2			- backhoe refusal at 2 ft in shale			



1
2
3
4
5
6
7
8
9

COMPLETION DEPTH: 2.0 ft
DATE: 10-11-13

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 10/11/2013

13-203

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 16

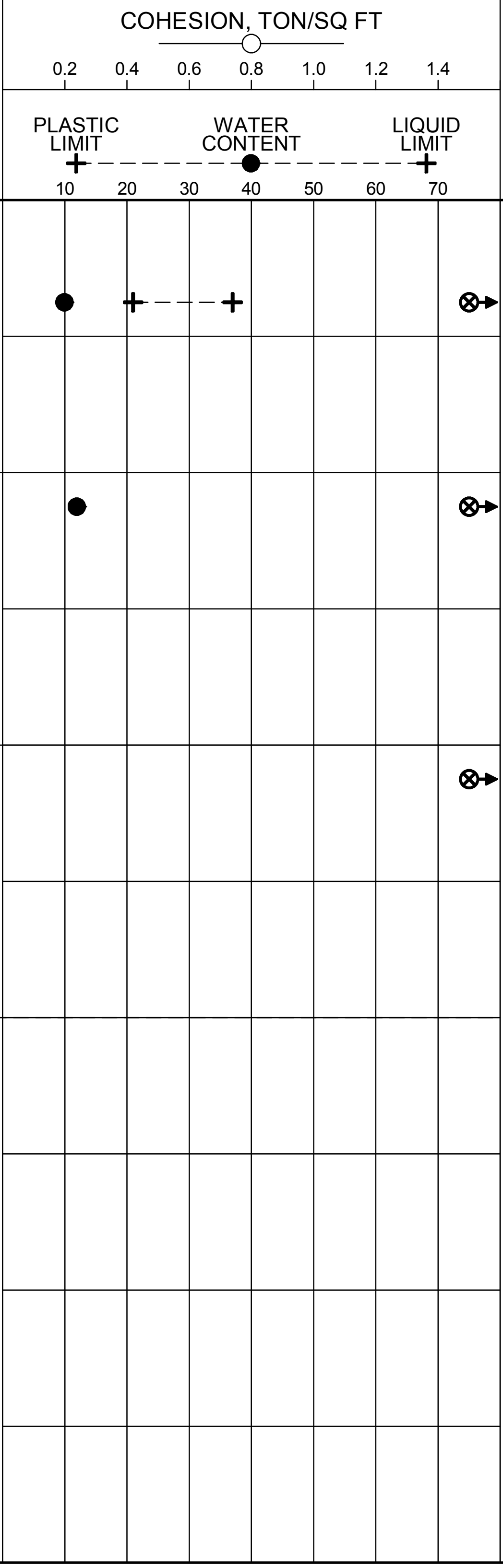
AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Saline County, Arkansas

TYPE: Backhoe

LOCATION: Approx Sta 1306+74, 36 ft Rt

SURF. EL: 366±

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
0 – 2	Very stiff tan clayey silt w/sandstone fragments, occasional cobbles and occasional organics, dry			18
2 – 4	Very stiff reddish tan silty clay w/numerous shale and sandstone fragments, dry			
4 – 6	Moderately hard reddish tan, tan and dark gray weathered shale, very thinly bedded, apparent dip ~ 20° SW			
6	- backhoe refusal at 6 ft in shale			



COMPLETION DEPTH: 6.0 ft
DATE: 10-11-13

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 10/11/2013

LTPNEW 13-203_ROADWAY_SALINE COUNTY.GPJ 7-9-14

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 17

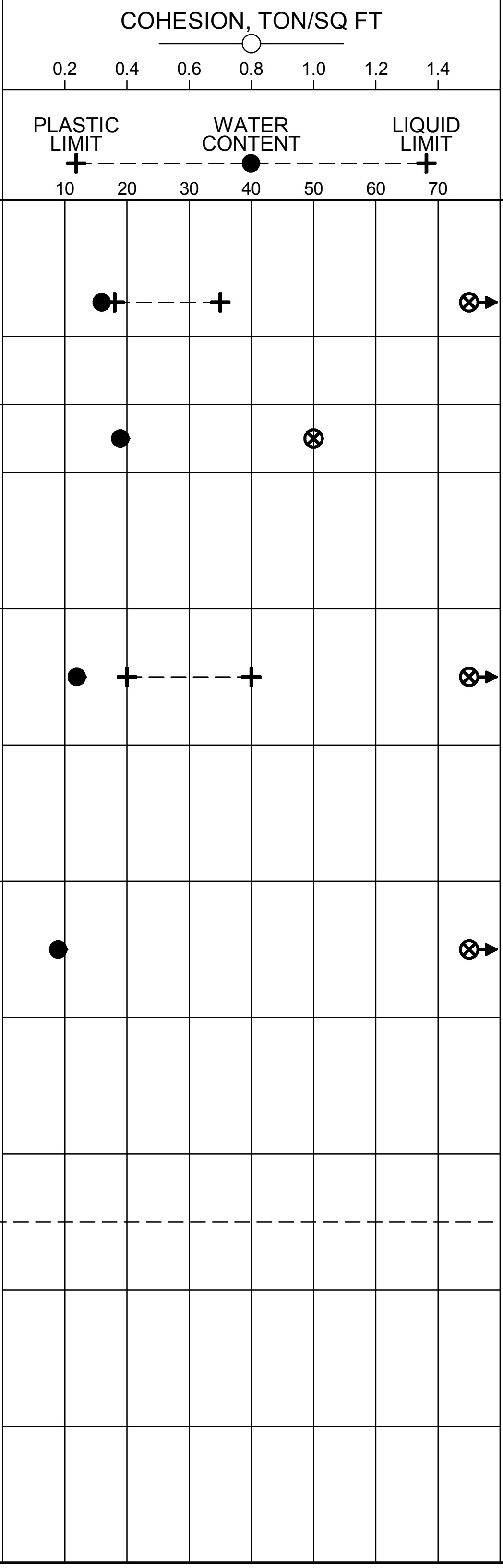
AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Saline County, Arkansas

TYPE: Backhoe

LOCATION: Approx Sta 1355+59, 43 ft Rt

SURF. EL: 372±

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
0–1.5	Very stiff brown and tan silty clay w/sandstone and shale fragments (fill)			80
1.5–3	Stiff to very stiff dark brown silty clay w/occasional sandstone fragments			
3–5	Very stiff gray and tan silty clay w/numerous sandstone, shale and quartz fragments and ferrous nodules and stains			37
5–7.5	Low hardness tan and dark gray weathered shale w/silty clay seams, fractured, very thinly to thinly bedded, apparent dip ~ 20° NE - moderately hard with fewer silty clay seams below 6 ft			
7.5	- practical backhoe refusal at 7.5 ft in shale			



COMPLETION DEPTH: 7.5 ft
DATE: 10-11-13

DEPTH TO WATER IN TEST PIT: Dry

DATE: 10/11/2013

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

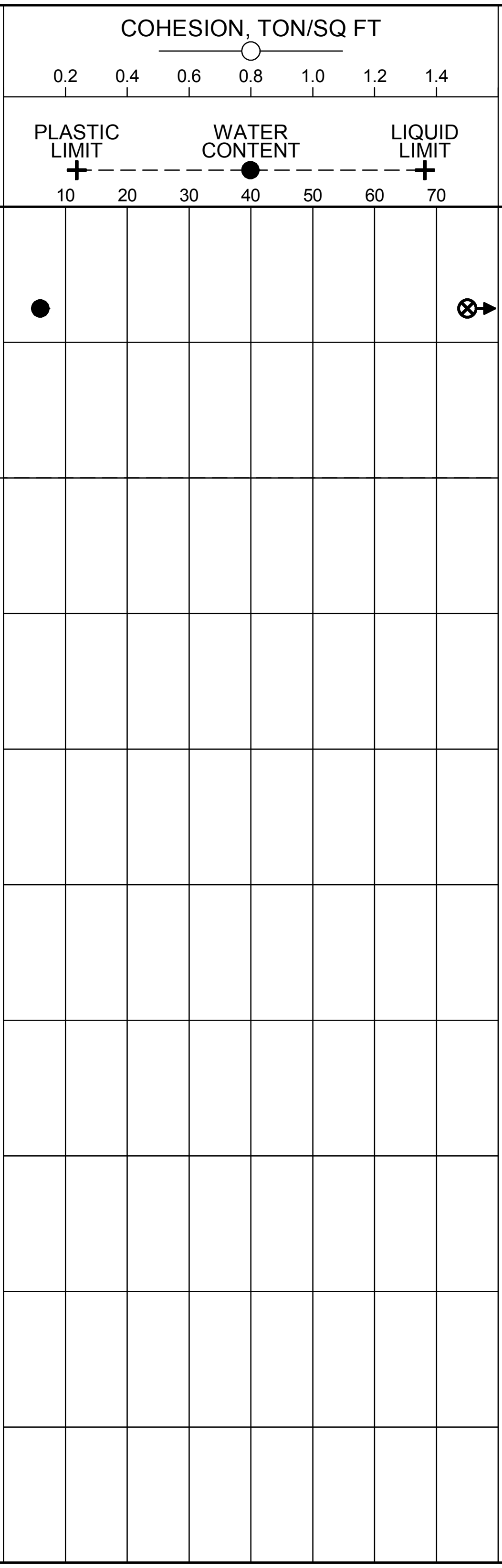
LOG OF TEST PIT NO. 18

AHTD Job 061377: Hot Springs-I-30 (Widening) (S)
Saline County, Arkansas

TYPE: Backhoe

LOCATION: Approx Sta 1397+86, 32 ft Rt

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURF. EL: 390±	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
0–2	▤	▨	Moderately hard gray, dark gray and tan weathered shale, very thinly to thinly bedded w/clay laminations and ferrous stains			
2			- backhoe refusal at 2 ft in shale			



COMPLETION DEPTH: 2.0 ft
DATE: 10-11-13

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 10/11/2013

LTPNEW 13-203_ROADWAY_SALINE COUNTY.GPJ 7-9-14

ATTACHMENT 4

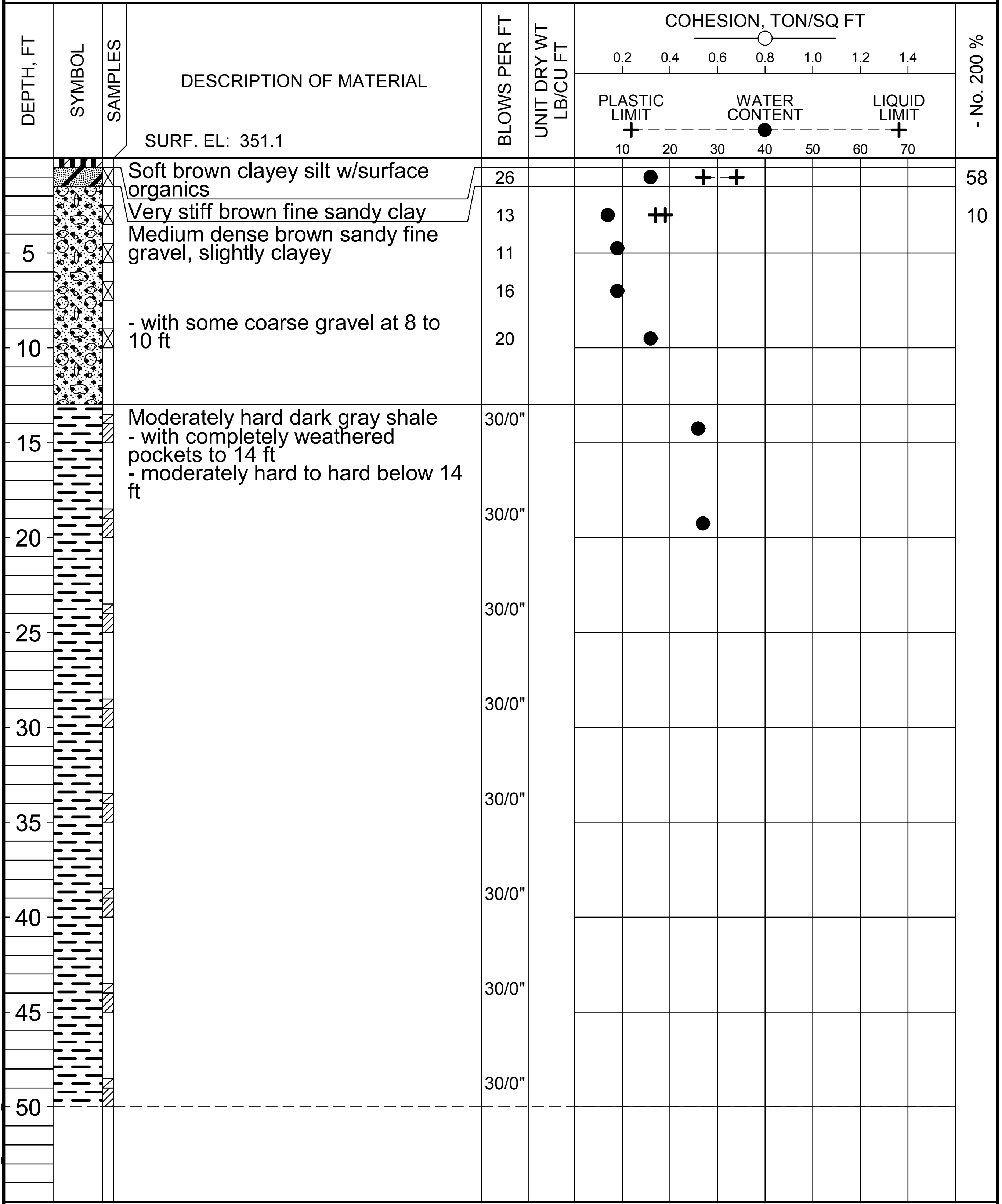
13-203

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

L O G O F B O R I N G N O. S6

AHTD 061377: US 70 over Ten Mile Creek (East)
Saline County, Arkansas

TYPE: Auger to 10 ft /Wash
LOCATION: Approx Sta 1207+82, 26 ft Rt



DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
Soft brown clayey silt w/surface organics	26		58
Very stiff brown fine sandy clay	13		10
Medium dense brown sandy fine gravel, slightly clayey	11		
	16		
- with some coarse gravel at 8 to 10 ft	20		
Moderately hard dark gray shale - with completely weathered pockets to 14 ft - moderately hard to hard below 14 ft	30/0"		
	30/0"		
	30/0"		
	30/0"		
	30/0"		
	30/0"		
	30/0"		
	30/0"		

COMPLETION DEPTH: 50.0 ft
DATE: 11-2-13

DEPTH TO WATER
IN BORING: 10 ft

DATE: 11/2/2013

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

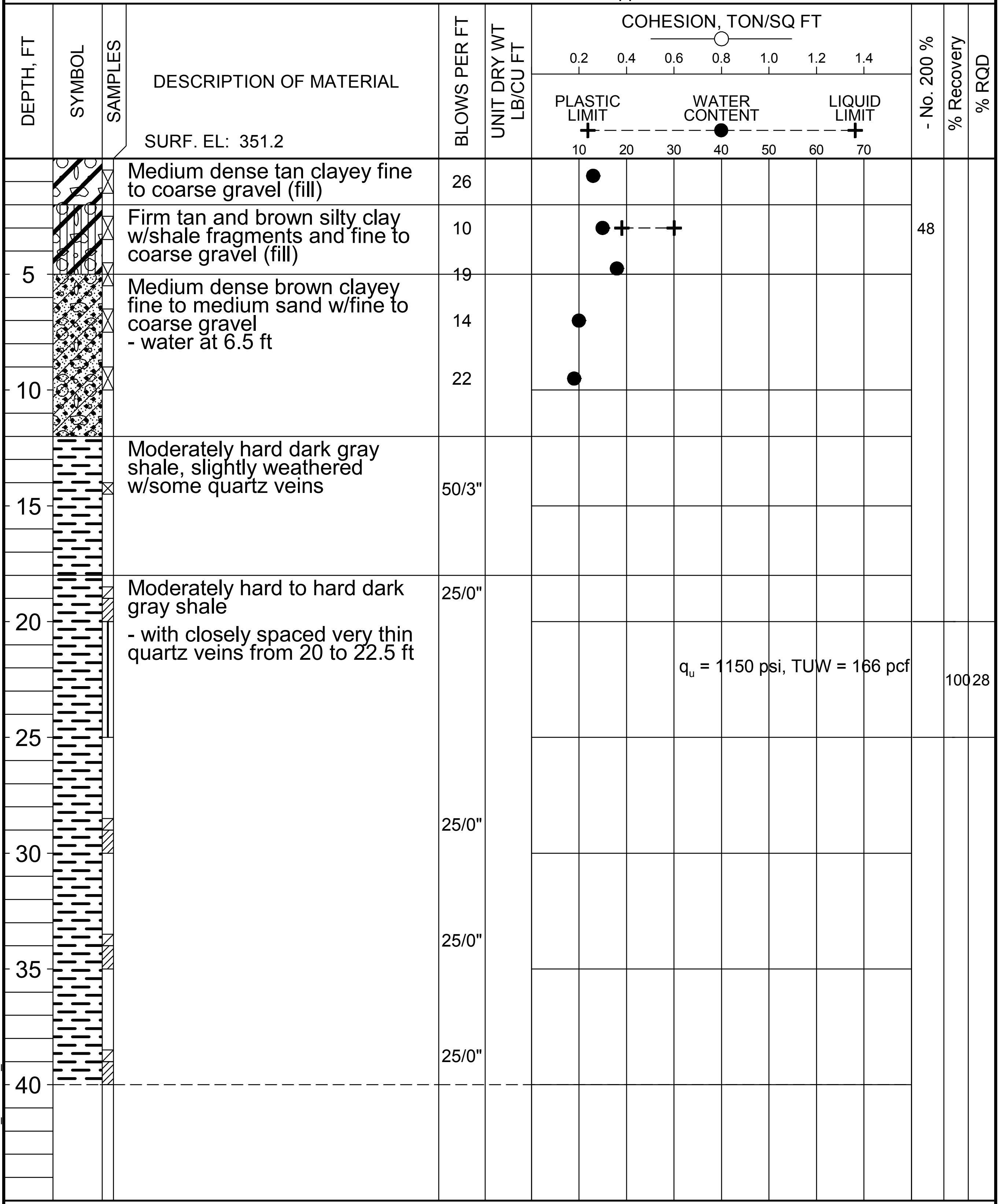
L O G O F B O R I N G N O. S7

AHTD 061377: US 70 over Ten Mile Creek (East)
Saline County, Arkansas

TYPE: Auger to 15 ft /Wash

LOCATION: Approx Sta 1208+34, 22 ft Rt

SURF. EL: 351.2



DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %	% Recovery	% RQD
Medium dense tan clayey fine to coarse gravel (fill)	26				
Firm tan and brown silty clay w/shale fragments and fine to coarse gravel (fill)	10		48		
	19				
Medium dense brown clayey fine to medium sand w/fine to coarse gravel - water at 6.5 ft	14				
	22				
Moderately hard dark gray shale, slightly weathered w/some quartz veins	50/3"				
Moderately hard to hard dark gray shale	25/0"				
- with closely spaced very thin quartz veins from 20 to 22.5 ft				100	28
	25/0"				
	25/0"				
	25/0"				

q_u = 1150 psi, TUW = 166 pcf

COMPLETION DEPTH: 40.0 ft
DATE: 1-20-14

DEPTH TO WATER
IN BORING: 6.5 ft

DATE: 1/20/2014

13-203

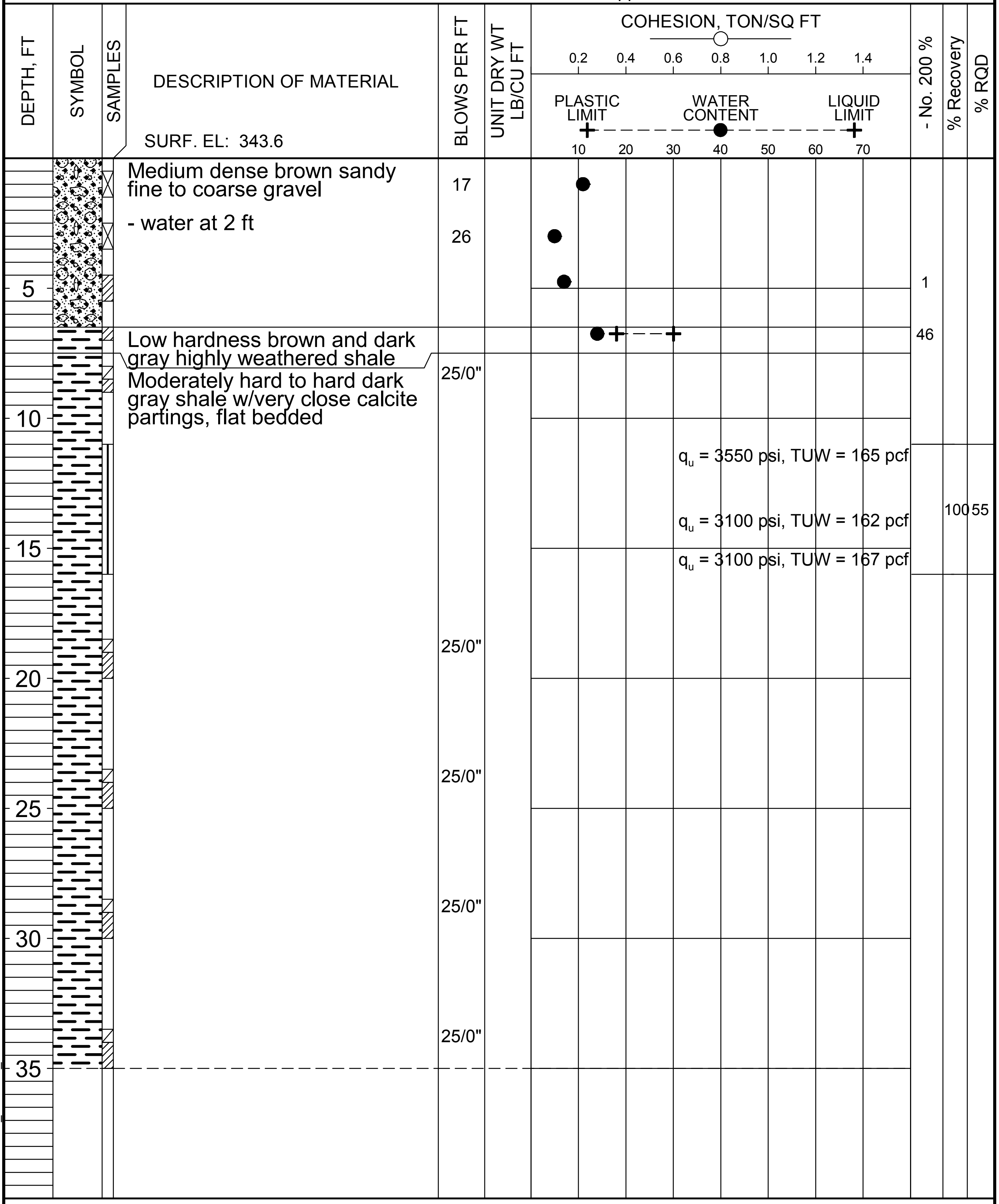
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

L O G O F B O R I N G N O. S8

AHTD 061377: US 70 over Ten Mile Creek (East)
Saline County, Arkansas

TYPE: Auger to 8 ft /Wash

LOCATION: Approx Sta 1209+06, 20 ft Rt



SURF. EL: 343.6

DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %	% Recovery	% RQD
Medium dense brown sandy fine to coarse gravel	17				
- water at 2 ft	26				
			1		
Low hardness brown and dark gray highly weathered shale			46		
Moderately hard to hard dark gray shale w/very close calcite partings, flat bedded	25/0"				
				100	55
	25/0"				
	25/0"				
	25/0"				
	25/0"				

q_u = 3550 psi, TUW = 165 pcf

q_u = 3100 psi, TUW = 162 pcf

q_u = 3100 psi, TUW = 167 pcf

COMPLETION DEPTH: 35.0 ft
DATE: 1-29-14

DEPTH TO WATER
IN BORING: 2 ft

DATE: 1/29/2014

RECRQDN200-2 13-203_HWY 70_TEN MILE CREEK.GPJ 7-9-14

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

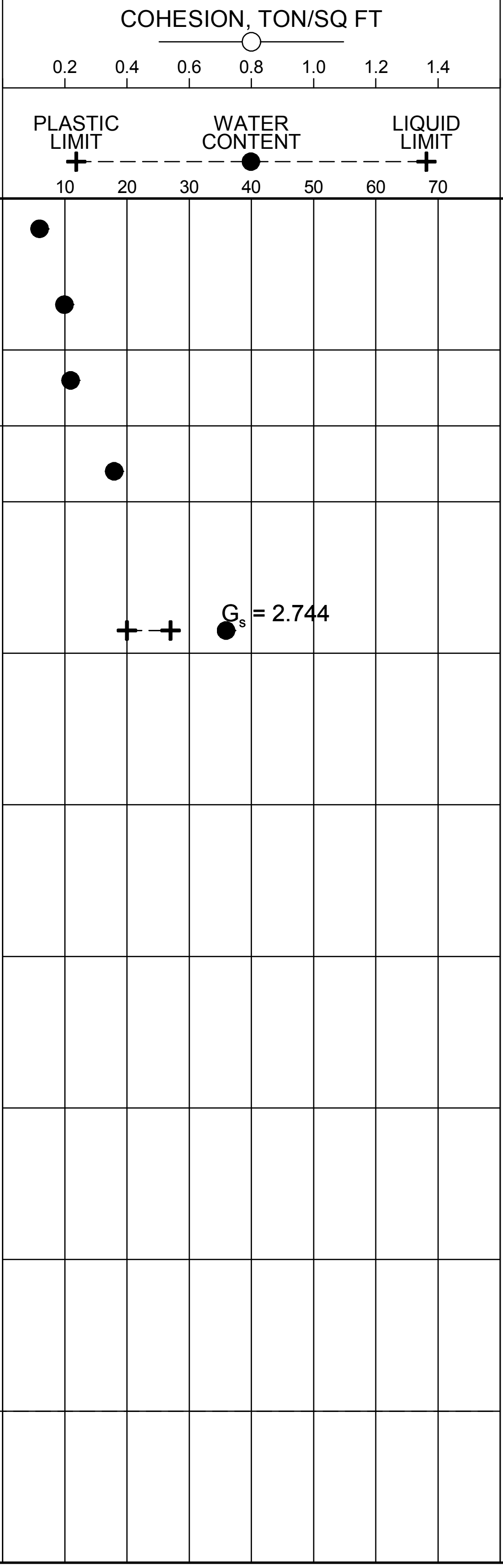
LOG OF BORING NO. S9

AHTD 061377: US 70 over Ten Mile Creek (East)
Saline County, Arkansas

TYPE: Auger to 8 ft /Wash
LOCATION: Approx Sta 1209+79, 17 ft Rt

SURF. EL: 345.5

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
	Medium dense brown sandy fine to coarse gravel, slightly clayey w/occasional cobbles	14		
				8
5				
	- water at 7 ft			
	Moderately hard dark gray shale - with completely weathered zones to 8.5 ft	50/1"		
10				
		30/0"		15
15	- moderately hard to hard below 14 ft			
		30/0"		
20				
		30/0"		
25				
		30/0"		
30				
		30/0"		
35				
		30/0"		
40				



COMPLETION DEPTH: 40.0 ft
DATE: 11-4-13

DEPTH TO WATER
IN BORING: 7 ft

DATE: 11/4/2013

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. S10

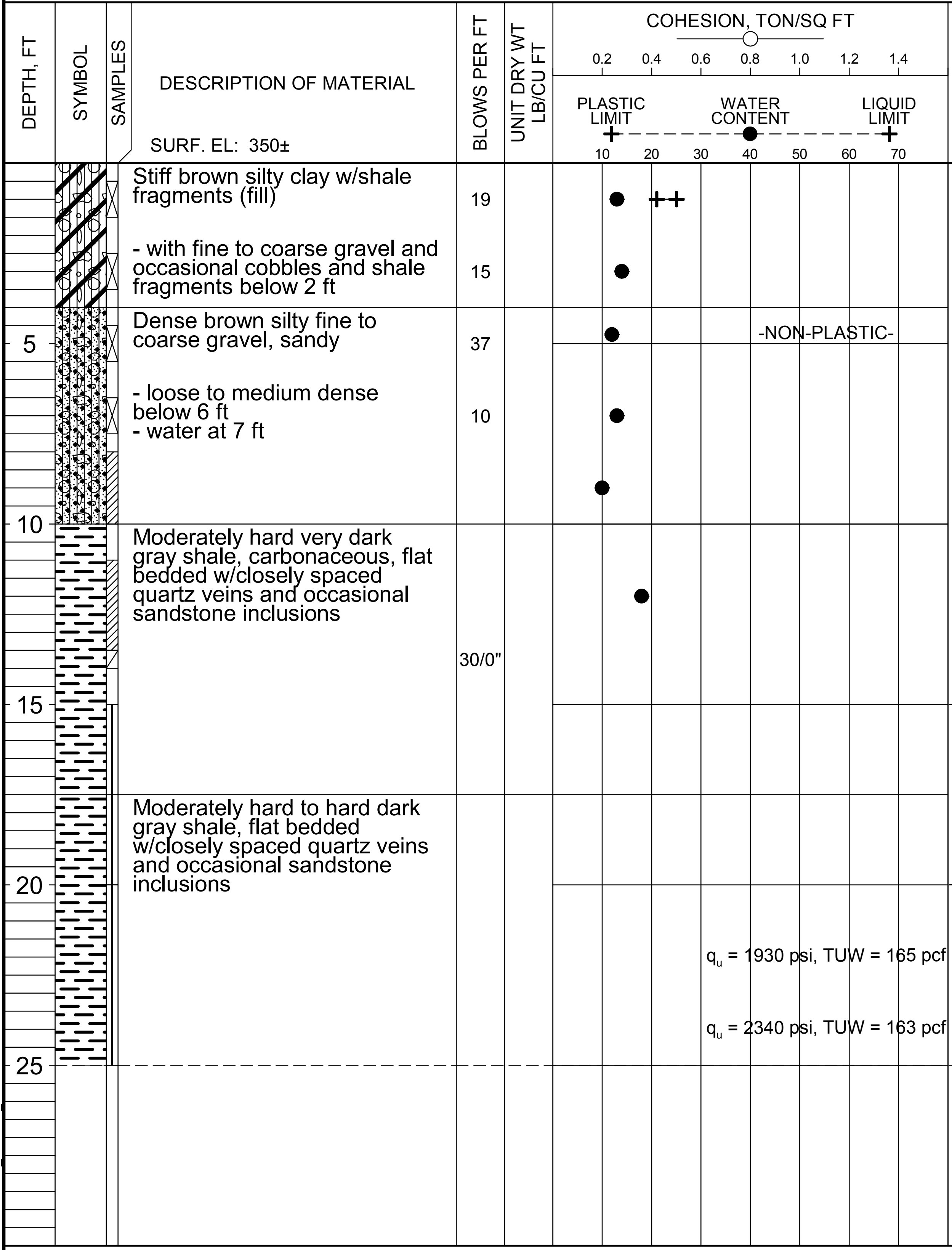
AHTD 061377: US 70 over Ten Mile Creek (East)
Saline County, Arkansas

TYPE: Auger

LOCATION: Approx Sta 1210+53, 23 ft Rt

SURF. EL: 350±

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %	% Recovery	% RQD
0	Stiff brown silty clay w/shale fragments (fill)	19		35		
	- with fine to coarse gravel and occasional cobbles and shale fragments below 2 ft	15				
4	Dense brown silty fine to coarse gravel, sandy	37		14		
	- loose to medium dense below 6 ft - water at 7 ft	10				
10	Moderately hard very dark gray shale, carbonaceous, flat bedded w/closely spaced quartz veins and occasional sandstone inclusions	30/0"				
15					100	95
17.5	Moderately hard to hard dark gray shale, flat bedded w/closely spaced quartz veins and occasional sandstone inclusions					
20					100	95



q_u = 1930 psi, TUW = 165 pcf

q_u = 2340 psi, TUW = 163 pcf

COMPLETION DEPTH: 25.0 ft
DATE: 11-5-13

DEPTH TO WATER
IN BORING: 7 ft

DATE: 11/15/2013

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. S11

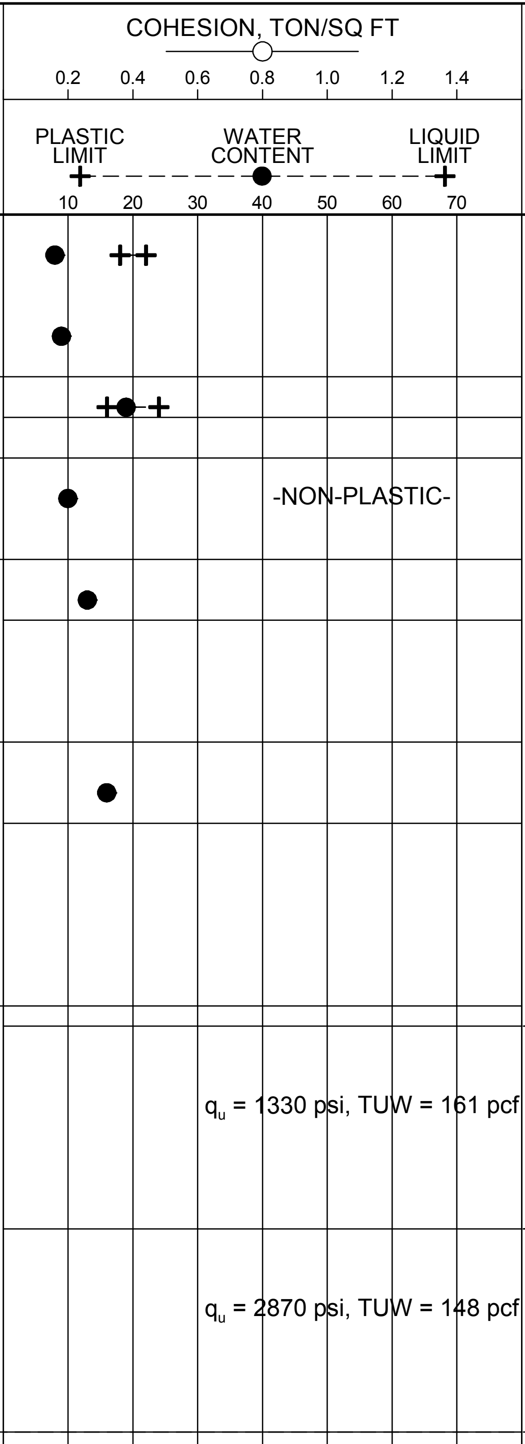
AHTD 061377: US 70 over Ten Mile Creek (East)
Saline County, Arkansas

TYPE: Auger to 10 ft /Wash

LOCATION: Approx Sta 1211+11, 18 ft RT

SURF. EL: 351.0

DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %	% Recovery	% RQD
Medium dense brown clayey fine to coarse gravel, sandy w/occasional shale fragments (fill)	22 15		20		
Firm tan and gray fine sandy clay (fill)	7		58		
Loose gray silty fine to coarse sand w/a little fine gravel (fill)	8		15		
Loose to medium dense brown clayey fine to coarse gravel, sandy	10				
Moderately hard very dark gray shale, carbonaceous, flat bedded w/closely bedded quartz veins and occasional sandstone inclusions	30/0" 30/0"				
Moderately hard to hard dark gray shale, flat bedded w/closely bedded quartz veins and occasional sandstone inclusions				100 100	95 95



q_u = 1330 psi, TUW = 161 pcf

q_u = 2870 psi, TUW = 148 pcf

DEPTH, FT: 5, 10, 15, 20, 25, 30

COMPLETION DEPTH: 30.0 ft
DATE: 11-5-13

DEPTH TO WATER
IN BORING: Dry to 10 ft

DATE: 11/5/2013


Highway 70 Widening – State Rt 128 to I-30
AHTD CA 061377
13-203
Boring S7 @ 19'-24'

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

ROCK CORE PHOTOGRAPH

HWY 70 WIDENING / STATE RT. 128 TO I-30
AHTD JOB NO. CA 061377– GARLAND & SALINE COUNTIES, AR
BORING S7, 19 – 24 FT

Job No. 13-203

Plate

Highway 70 Widening – State Rt 128 to I-30
AHTD CA 061377
13-203
Boring S8 @ 11’-16’

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

ROCK CORE PHOTOGRAPH

HWY 70 WIDENING / STATE RT. 128 TO I-30
AHTD JOB NO. CA 061377– GARLAND & SALINE COUNTIES, AR
BORING S8, 11 – 16 FT

Job No. 13-203

Plate

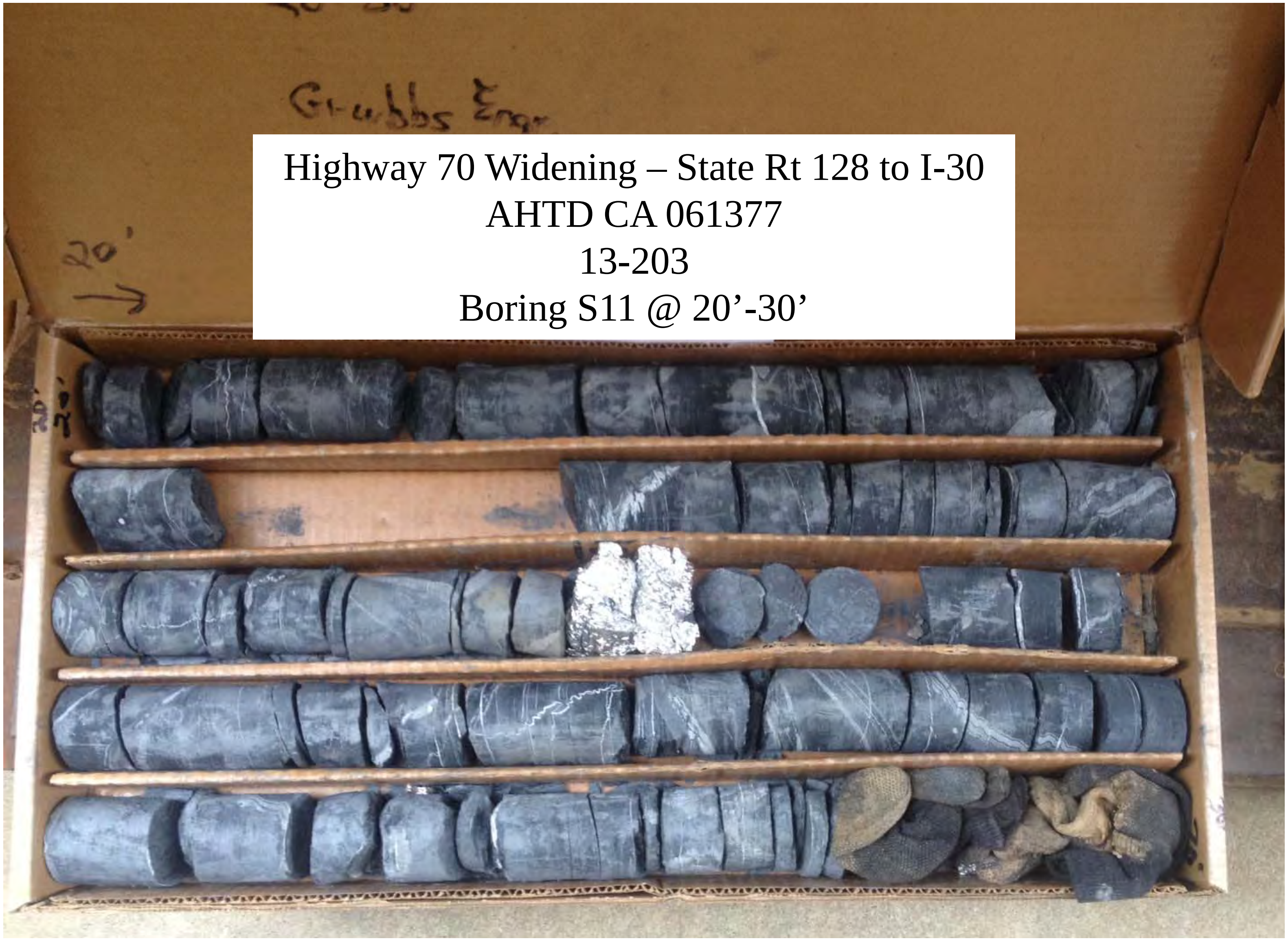
Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

ROCK CORE PHOTOGRAPH

HWY 70 WIDENING / STATE RT. 128 TO I-30
AHTD JOB NO. CA 061377– GARLAND & SALINE COUNTIES, AR
BORING S10, 15 – 25 FT

Job No. 13-203

Plate



Highway 70 Widening – State Rt 128 to I-30
AHTD CA 061377
13-203
Boring S11 @ 20'-30'

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

ROCK CORE PHOTOGRAPH

HWY 70 WIDENING / STATE RT. 128 TO I-30
AHTD JOB NO. CA 061377– GARLAND & SALINE COUNTIES, AR
BORING S11, 20 – 30 FT

Job No. 13-203

Plate

ATTACHMENT 5

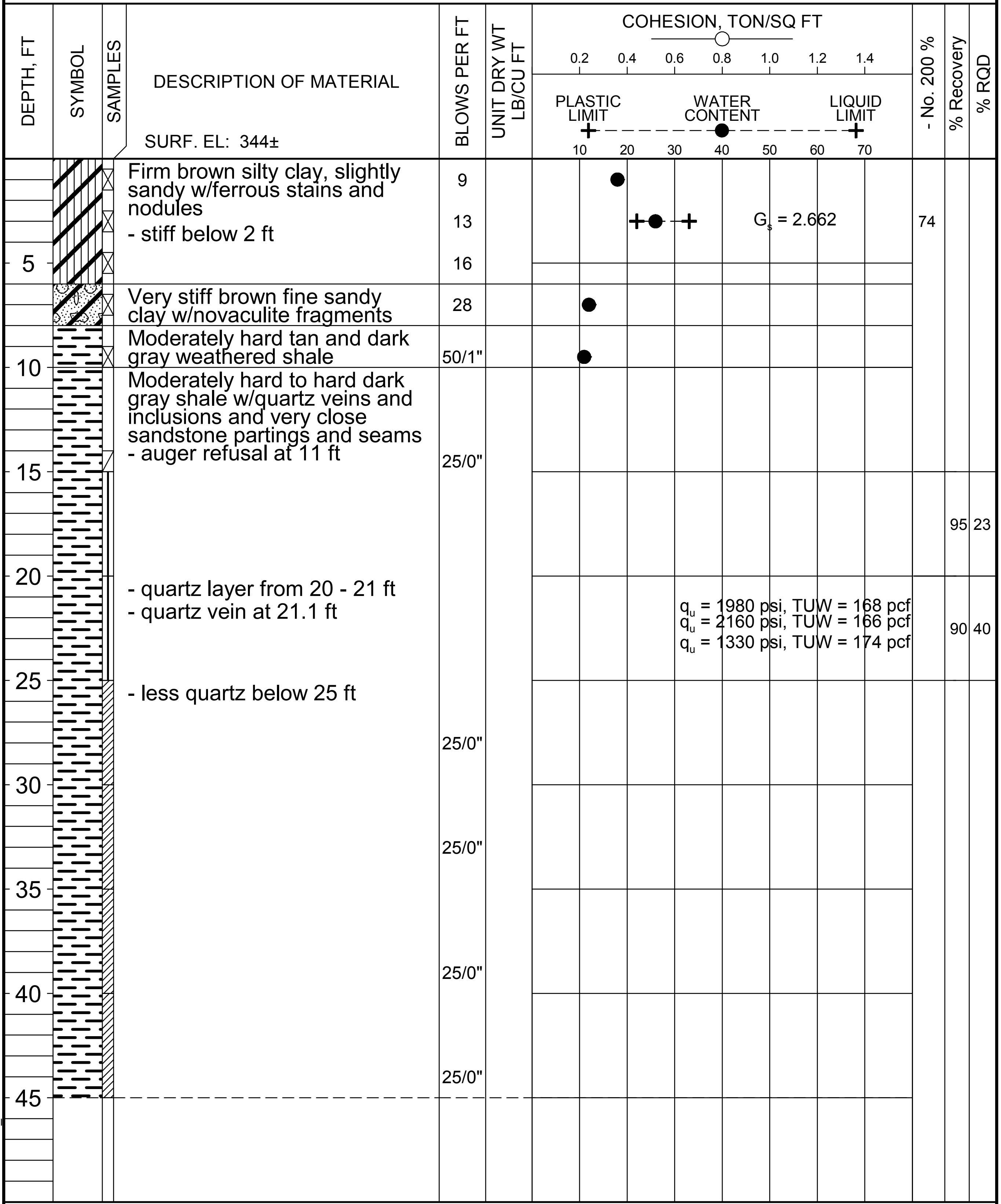
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. S12

AHTD 061377: US 70 over Caney Creek
Saline County, Arkansas

TYPE: Auger to 11 ft /Wash

LOCATION: Sta 1261+12, 45 ft Rt



SURF. EL: 344±

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT		- No. 200 %	% Recovery	% RQD
	Firm brown silty clay, slightly sandy w/ferrous stains and nodules	9					
	- stiff below 2 ft	13		G_s = 2.662	74		
5		16					
	Very stiff brown fine sandy clay w/novaculite fragments	28					
	Moderately hard tan and dark gray weathered shale	50/1"					
10	Moderately hard to hard dark gray shale w/quartz veins and inclusions and very close sandstone partings and seams - auger refusal at 11 ft						
15		25/0"					
						95	23
20	- quartz layer from 20 - 21 ft - quartz vein at 21.1 ft			q_u = 1980 psi, TUW = 168 pcf q_u = 2160 psi, TUW = 166 pcf q_u = 1330 psi, TUW = 174 pcf		90	40
25	- less quartz below 25 ft						
		25/0"					
30							
		25/0"					
35							
		25/0"					
40							
		25/0"					
45							

COMPLETION DEPTH: 45.0 ft
DATE: 3-19-14

DEPTH TO WATER
IN BORING: 5 ft

DATE: 3/19/2014

RECRQDN200-2 13-203_CANEY CREEK.GPJ 7-9-14

13-203

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

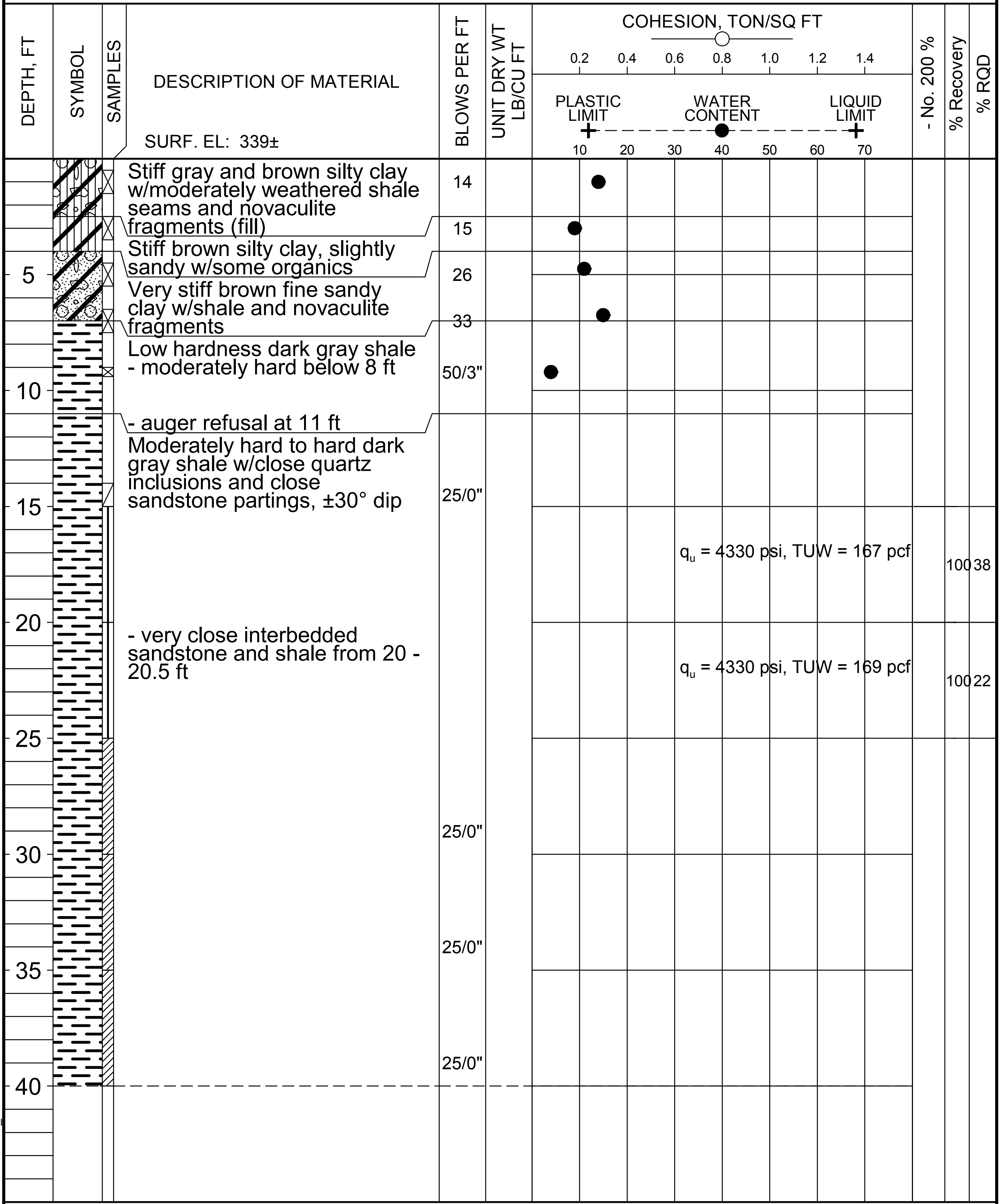
LOG OF BORING NO. S13

AHTD 061377: US 70 over Caney Creek
Saline County, Arkansas

TYPE: Auger to 11 ft /Wash

LOCATION: Sta 1261+81, 37 ft Rt

SURF. EL: 339±



DESCRIPTION OF MATERIAL	BLOWS PER FT		% Recovery	% RQD
Stiff gray and brown silty clay w/moderately weathered shale seams and novaculite fragments (fill)	14			
	15			
Stiff brown silty clay, slightly sandy w/some organics	26			
Very stiff brown fine sandy clay w/shale and novaculite fragments	33			
Low hardness dark gray shale - moderately hard below 8 ft	50/3"			
- auger refusal at 11 ft				
Moderately hard to hard dark gray shale w/close quartz inclusions and close sandstone partings, ±30° dip	25/0"			
		q_u = 4330 psi, TUW = 167 pcf	100	38
- very close interbedded sandstone and shale from 20 - 20.5 ft		q_u = 4330 psi, TUW = 169 pcf	100	22
	25/0"			
	25/0"			
	25/0"			

COMPLETION DEPTH: 40.0 ft
DATE: 3-19-14

DEPTH TO WATER
IN BORING: 5 ft

DATE: 3/19/2014

RECRQDN200-2 13-203_CANEY CREEK.GPJ 7-9-14

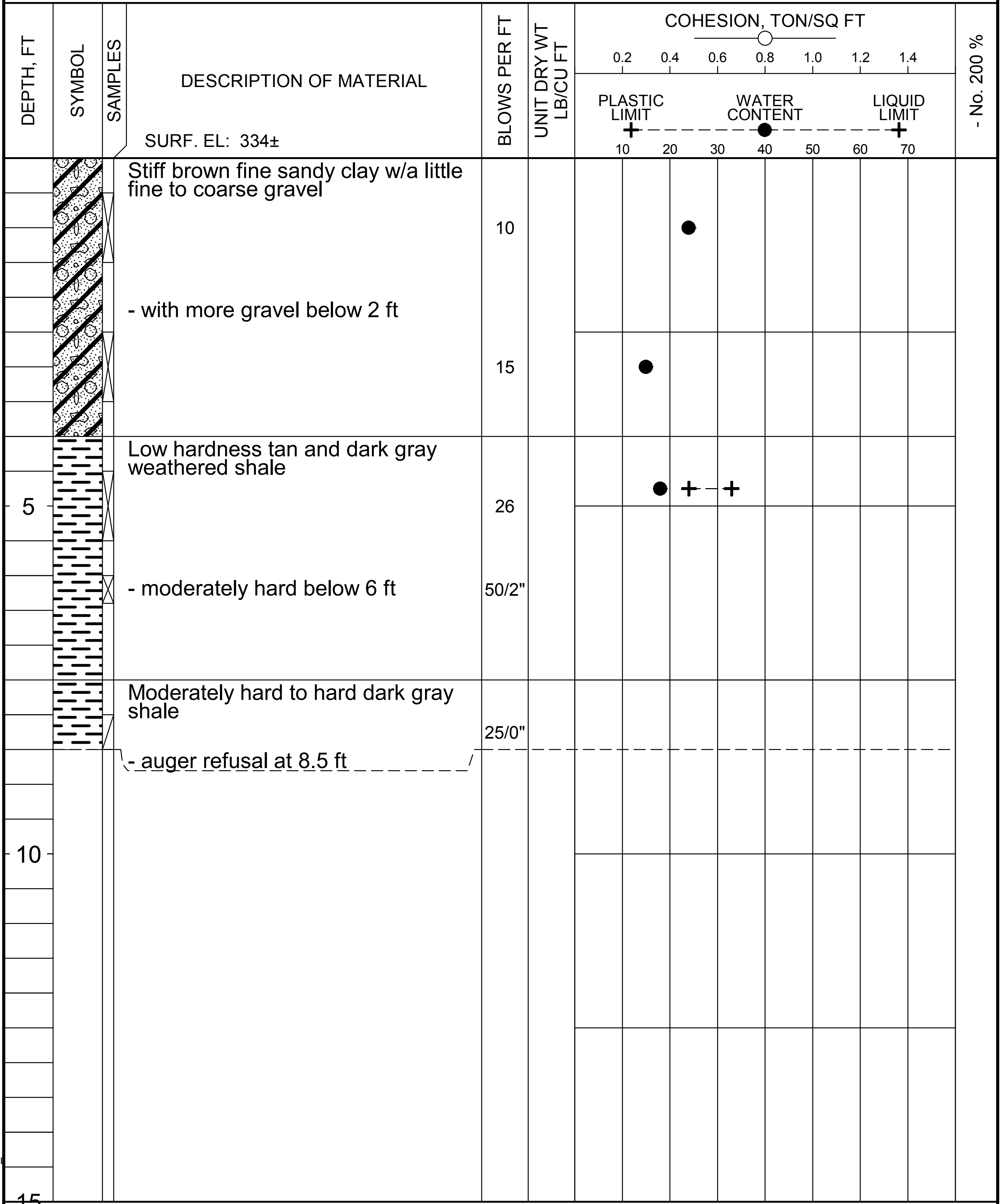
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. S14

AHTD 061377: US 70 over Caney Creek
Saline County, Arkansas

TYPE: Auger
LOCATION: Sta 1262+20, 16 ft Rt

SURF. EL: 334±



DESCRIPTION OF MATERIAL	BLOWS PER FT
Stiff brown fine sandy clay w/a little fine to coarse gravel	
	10
- with more gravel below 2 ft	
	15
Low hardness tan and dark gray weathered shale	
	26
- moderately hard below 6 ft	50/2"
Moderately hard to hard dark gray shale	
	25/0"
- auger refusal at 8.5 ft	

COMPLETION DEPTH: 8.5 ft
DATE: 3-18-14

DEPTH TO WATER
IN BORING: 0.5 ft

DATE: 3/18/2014

13-203

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

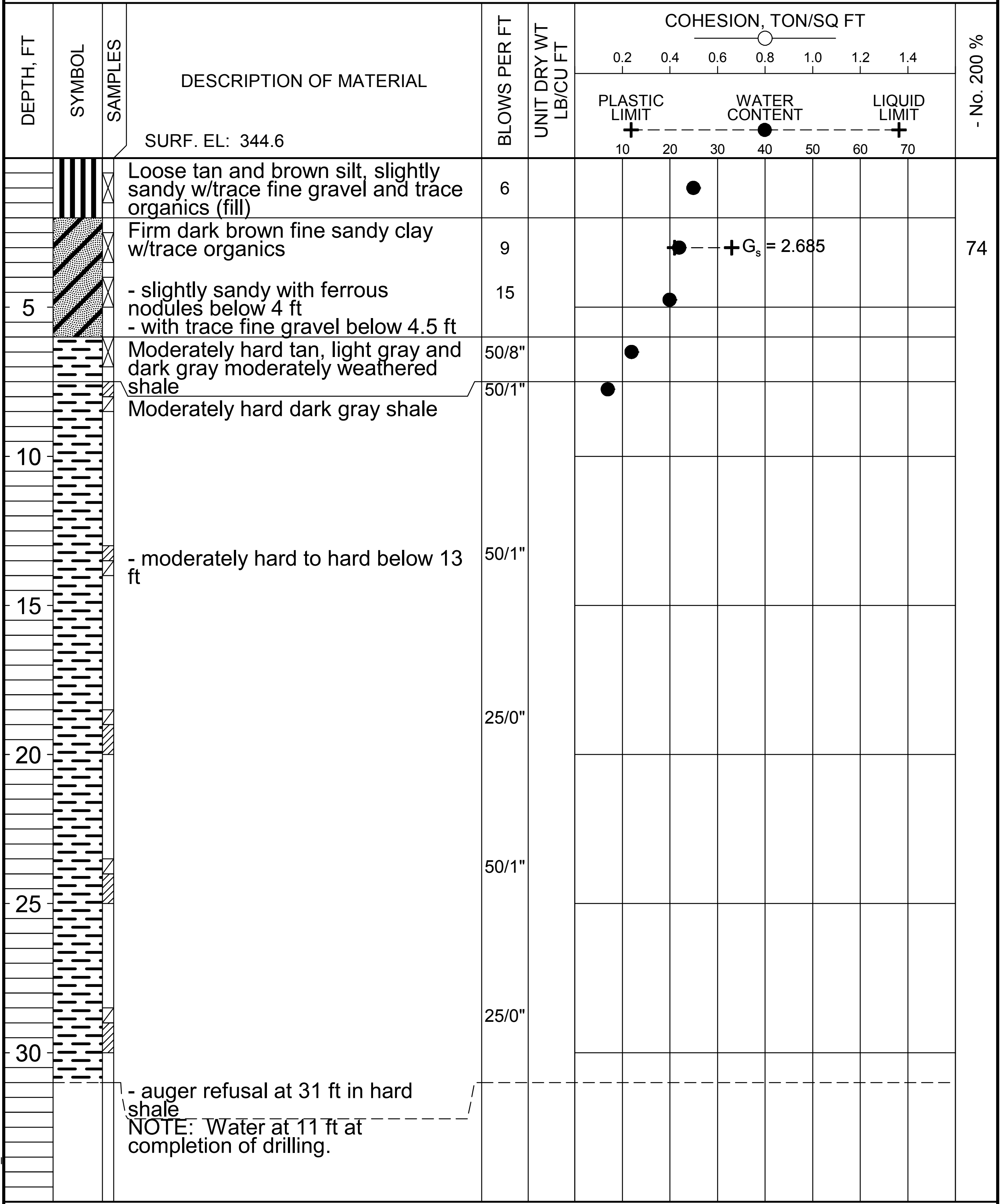
L O G O F B O R I N G N O. S15

AHTD 061377: US 70 over Caney Creek
Saline County, Arkansas

TYPE: Auger

LOCATION: Sta 1262+75, 27 ft Rt

SURF. EL: 344.6



DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
Loose tan and brown silt, slightly sandy w/trace fine gravel and trace organics (fill)	6		
Firm dark brown fine sandy clay w/trace organics	9		74
- slightly sandy with ferrous nodules below 4 ft	15		
- with trace fine gravel below 4.5 ft			
Moderately hard tan, light gray and dark gray moderately weathered shale	50/8"		
Moderately hard dark gray shale	50/1"		
- moderately hard to hard below 13 ft	50/1"		
	25/0"		
	50/1"		
	25/0"		
- auger refusal at 31 ft in hard shale			

NOTE: Water at 11 ft at completion of drilling.

COMPLETION DEPTH: 31.0 ft
DATE: 2-28-14

DEPTH TO WATER
IN BORING: 14 ft
DATE: 2/28/2014

LGBNEW 13-203 CANEY CREEK.GPJ 7-9-14

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

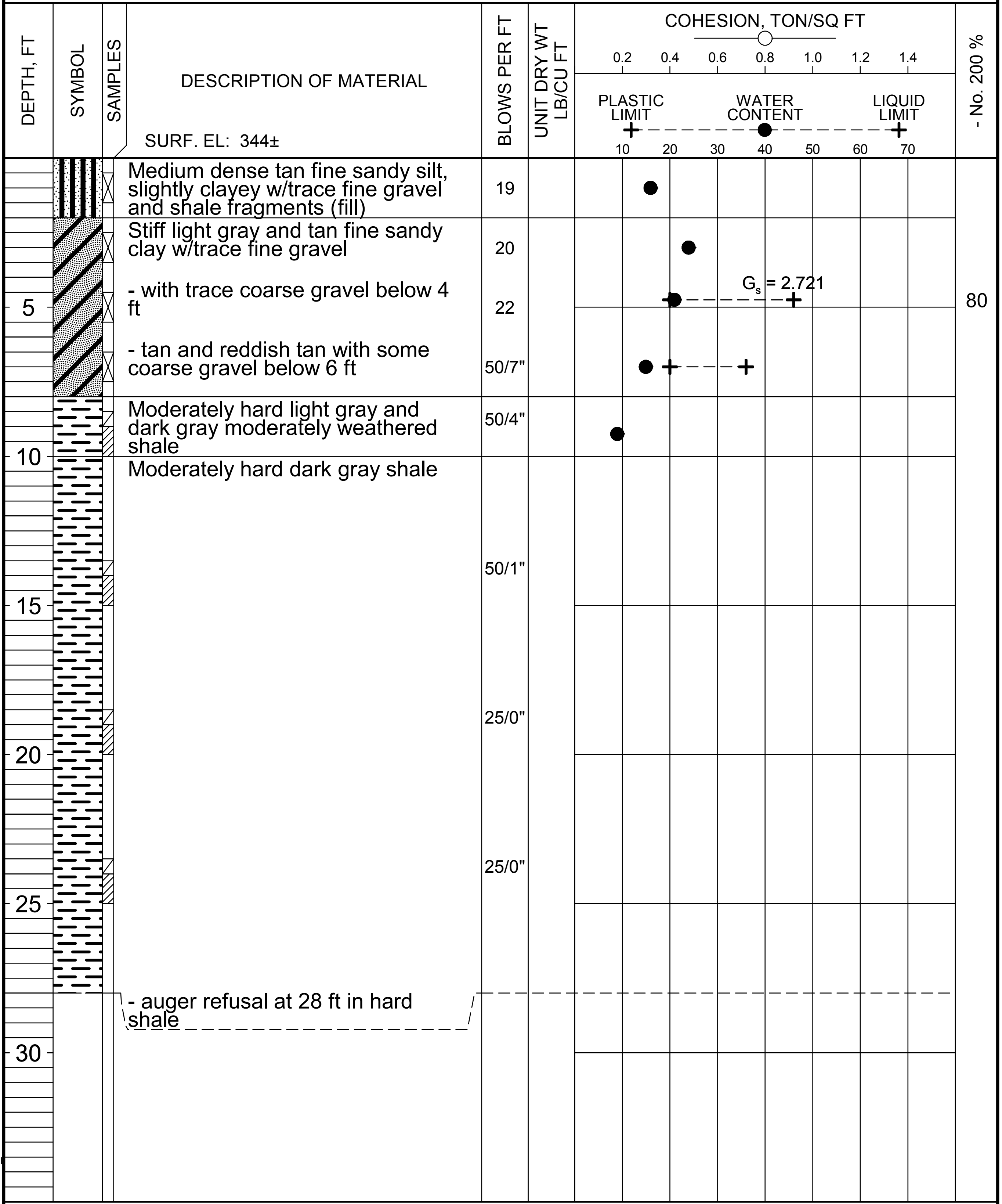
LOG OF BORING NO. S16

AHTD 061377: US 70 over Caney Creek
Saline County, Arkansas

TYPE: Auger

LOCATION: Sta 1263+32, 29 ft Rt

SURF. EL: 344±



DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
Medium dense tan fine sandy silt, slightly clayey w/trace fine gravel and shale fragments (fill)	19		
Stiff light gray and tan fine sandy clay w/trace fine gravel	20		
- with trace coarse gravel below 4 ft	22		80
- tan and reddish tan with some coarse gravel below 6 ft	50/7"		
Moderately hard light gray and dark gray moderately weathered shale	50/4"		
Moderately hard dark gray shale	50/1"		
	25/0"		
	25/0"		
- auger refusal at 28 ft in hard shale			

COMPLETION DEPTH: 28.0 ft
DATE: 2-28-14

DEPTH TO WATER
IN BORING: 14 ft

DATE: 2/28/2014

LGBNEW 13-203_CANEY CREEK.GPJ 7-9-14

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

PICTURE OF CORING SAMPLES
AHTD 061377: US 70 over Caney Creek
SALINE COUNTY, ARKANSAS
BORING S12

Job No. 13-203

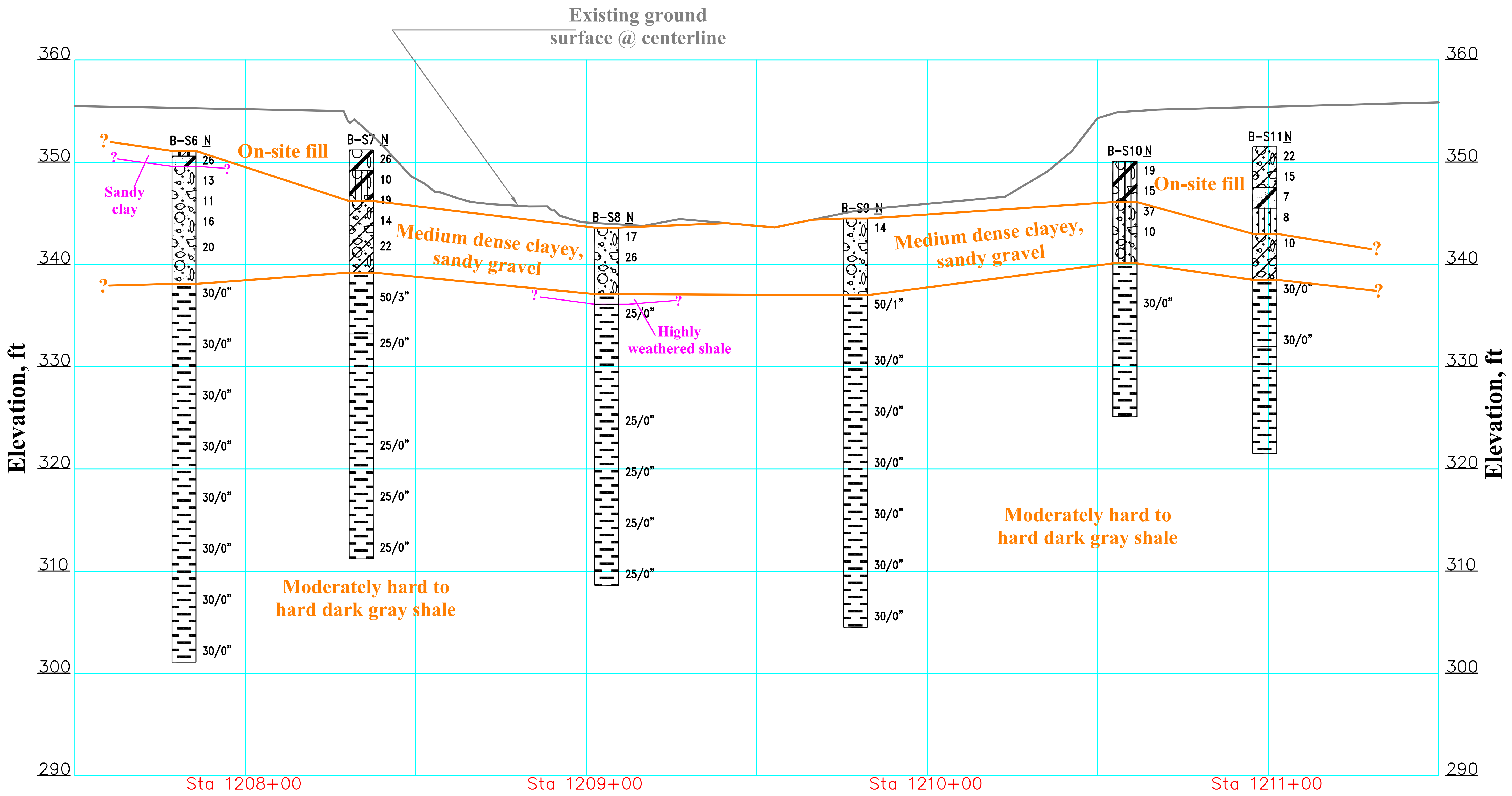
Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

PICTURE OF CORING SAMPLES

AHTD 061377: US 70 over Caney Creek
SALINE COUNTY, ARKANSAS
BORING S13

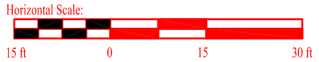
Job No. 13-203

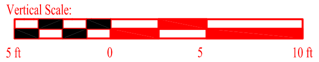
ATTACHMENT 6



Notes:

1. Subsurface conditions have been inferred from discrete boring locations; actual conditions may vary.
2. Ground surface approximate.





Grubbs, Hoskyn,
Barton & Wyatt, Inc.
Consulting Engineers

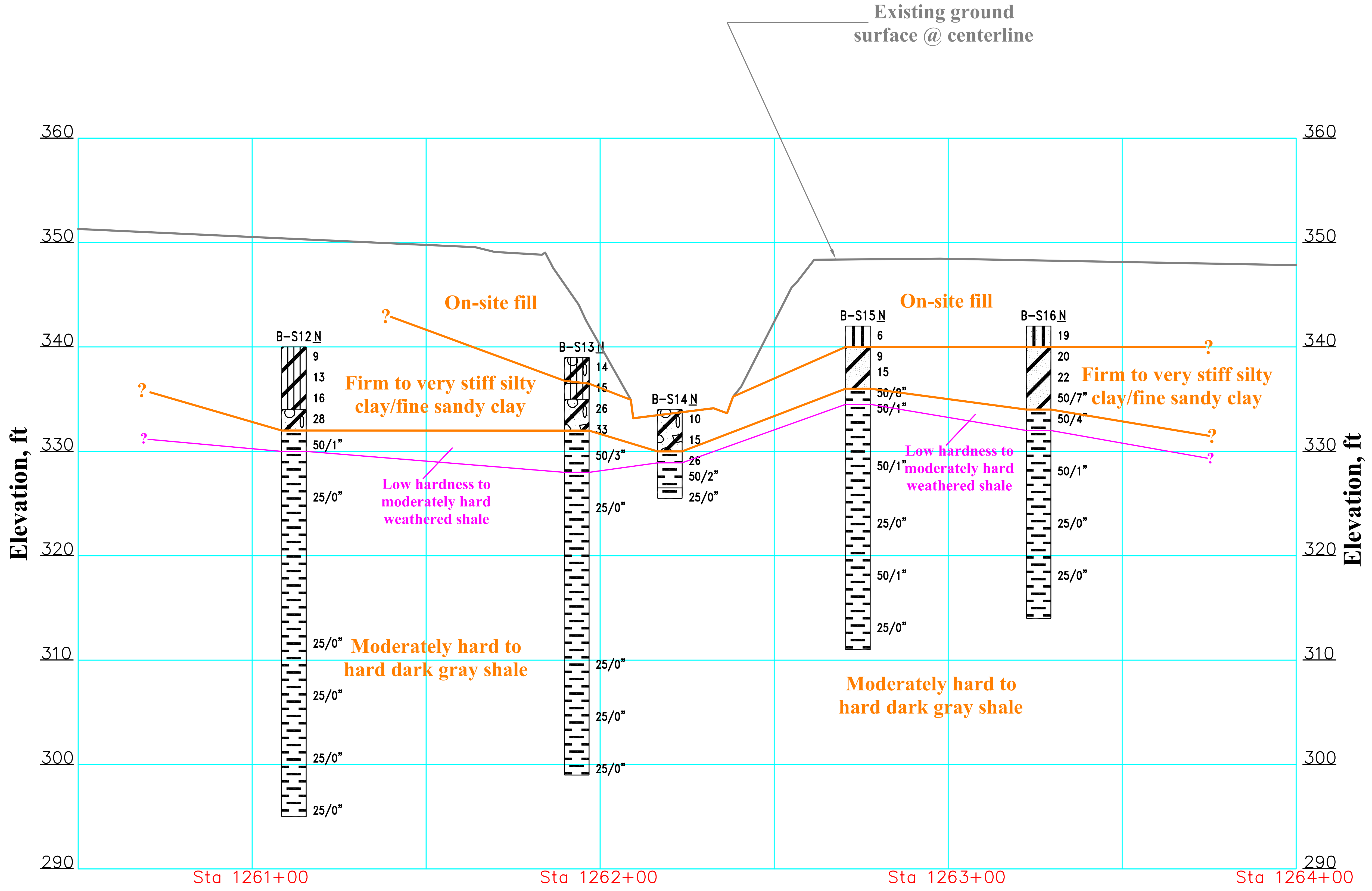
Generalized Subsurface Profile A-A'
AHTD JOB 061377: US 70 over Ten Mile Creek (East)
Saline County, Arkansas

GHBW Job No.: 13-203

Scale: As Shown

June 20, 2014

Plate 1



Notes:

1. Subsurface conditions have been inferred from discrete boring locations; actual conditions may vary.
2. Ground surface approximate.

Horizontal Scale: 15 ft 0 15 30 ft

Vertical Scale: 5 ft 0 5 10 ft

Grubbs, Hoskyn,
Barton & Wyatt, Inc.
Consulting Engineers

Generalized Subsurface Profile B-B'
AHTD JOB 061377: US 70 over Caney Creek
Saline County, Arkansas

GHBW Job No.: 13-203

Scale: As Shown

June 20, 2014

Plate 2

ATTACHMENT 7

13-203

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

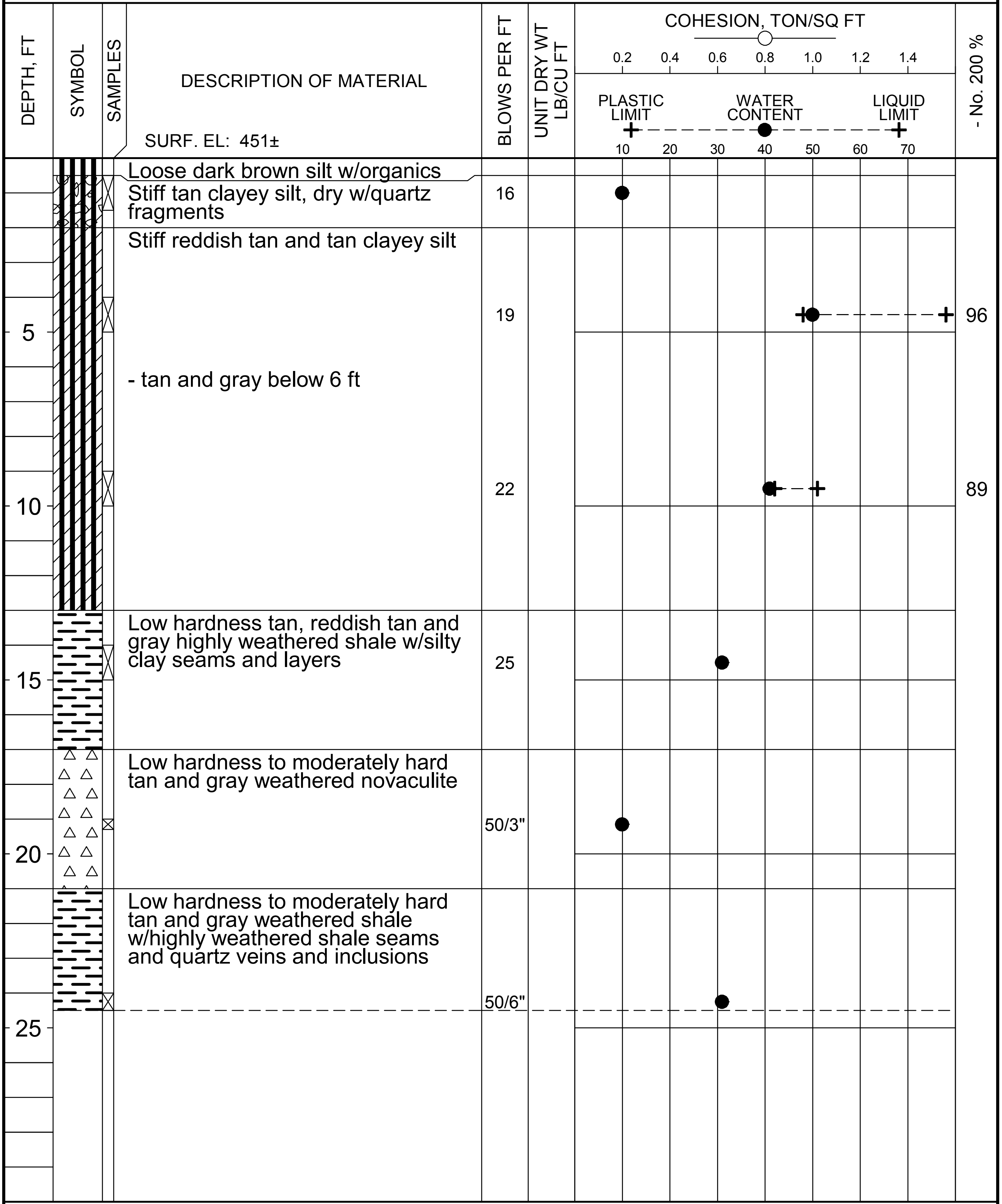
LOG OF BORING NO. CS1

AHTD Job 061377: US 70 - Cut Slopes
Saline County, Arkansas

TYPE: Auger

LOCATION: Approx Sta 1136+00, 95 ft Lt

SURF. EL: 451±



DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
Loose dark brown silt w/organics			
Stiff tan clayey silt, dry w/quartz fragments	16		
Stiff reddish tan and tan clayey silt	19		96
- tan and gray below 6 ft	22		89
Low hardness tan, reddish tan and gray highly weathered shale w/silty clay seams and layers	25		
Low hardness to moderately hard tan and gray weathered novaculite	50/3"		
Low hardness to moderately hard tan and gray weathered shale w/highly weathered shale seams and quartz veins and inclusions	50/6"		

COMPLETION DEPTH: 24.5 ft
DATE: 4-25-14

DEPTH TO WATER
IN BORING: Dry

DATE: 4/25/2014

13-203

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. CS2

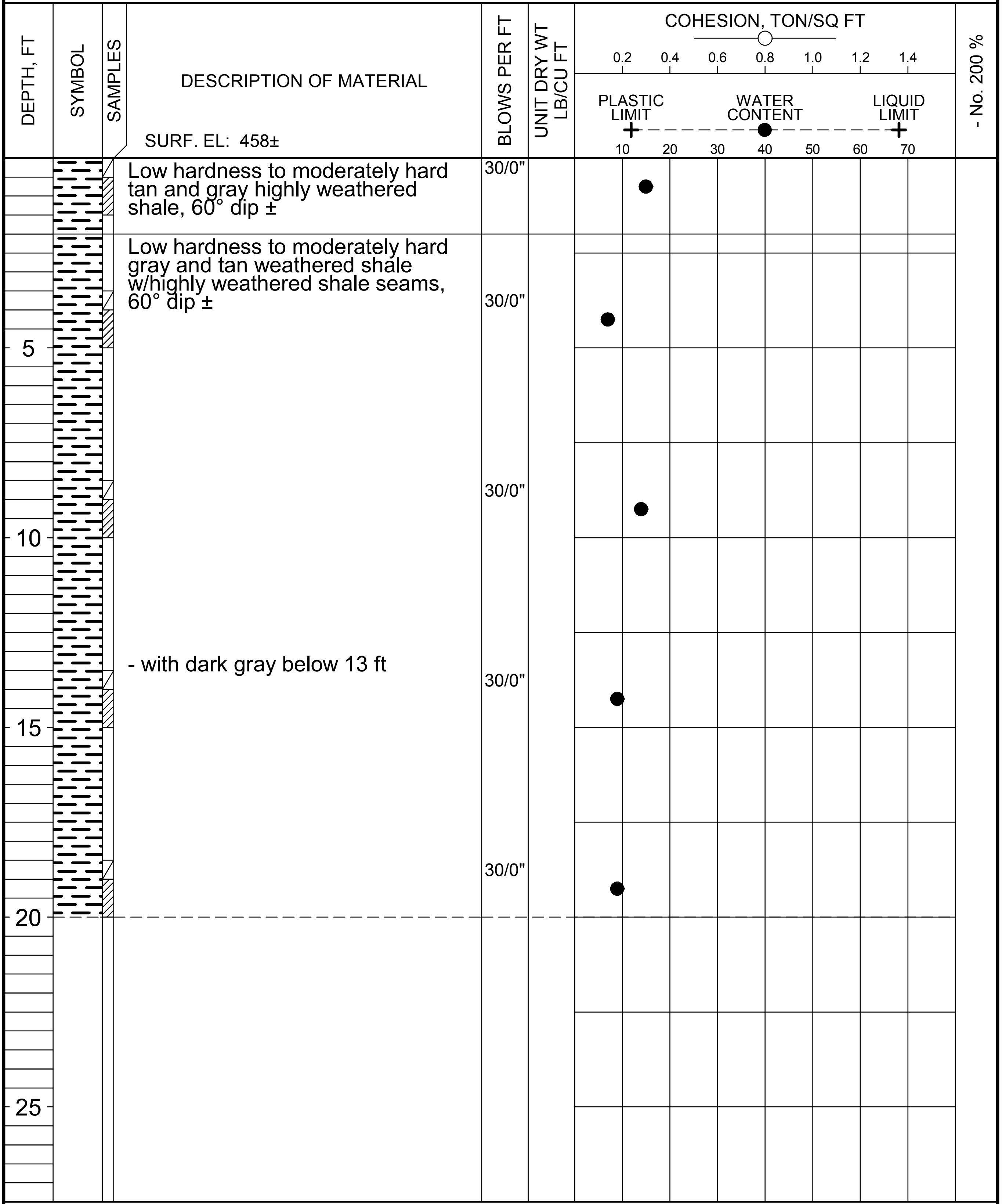
AHTD Job 061377: US 70 - Cut Slopes
Saline County, Arkansas

TYPE: Auger

LOCATION: Approx Sta 1173+00, 85 ft Lt

SURF. EL: 458±

DESCRIPTION OF MATERIAL	BLOWS PER FT
Low hardness to moderately hard tan and gray highly weathered shale, 60° dip ±	30/0"
Low hardness to moderately hard gray and tan weathered shale w/highly weathered shale seams, 60° dip ±	30/0"
	30/0"
- with dark gray below 13 ft	30/0"
	30/0"



COMPLETION DEPTH: 20.0 ft
DATE: 4-25-14

DEPTH TO WATER
IN BORING: Dry

DATE: 4/25/2014

LGBNEW 13-203-CUT SLOPES.GPJ 7-9-14

13-203

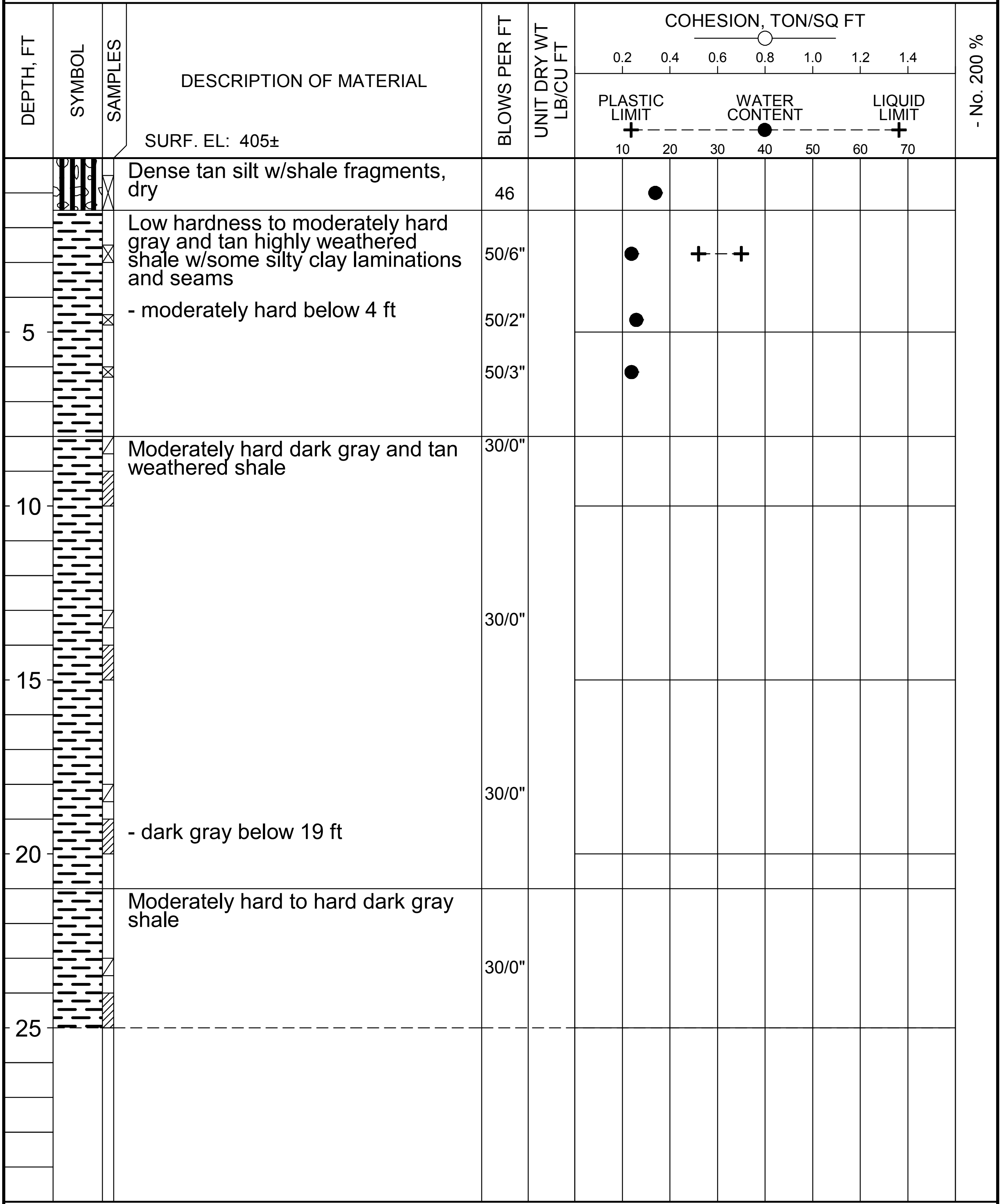
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. CS4

AHTD Job 061377: US 70 - Cut Slopes
Saline County, Arkansas

TYPE: Auger

LOCATION: Approx Sta 1192+00, 88 ft Lt



DESCRIPTION OF MATERIAL SURF. EL: 405±	BLOWS PER FT	UNIT DRY WT LB/CU FT
Dense tan silt w/shale fragments, dry	46	
Low hardness to moderately hard gray and tan highly weathered shale w/some silty clay laminations and seams	50/6"	
- moderately hard below 4 ft	50/2"	
	50/3"	
Moderately hard dark gray and tan weathered shale	30/0"	
	30/0"	
	30/0"	
- dark gray below 19 ft		
Moderately hard to hard dark gray shale	30/0"	

COMPLETION DEPTH: 25.0 ft
DATE: 4-4-14

DEPTH TO WATER
IN BORING: Dry

DATE: 4/4/2014

LGBNEW 13-203-CUT SLOPES.GPJ 7-9-14

PLATE 3

13-203

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

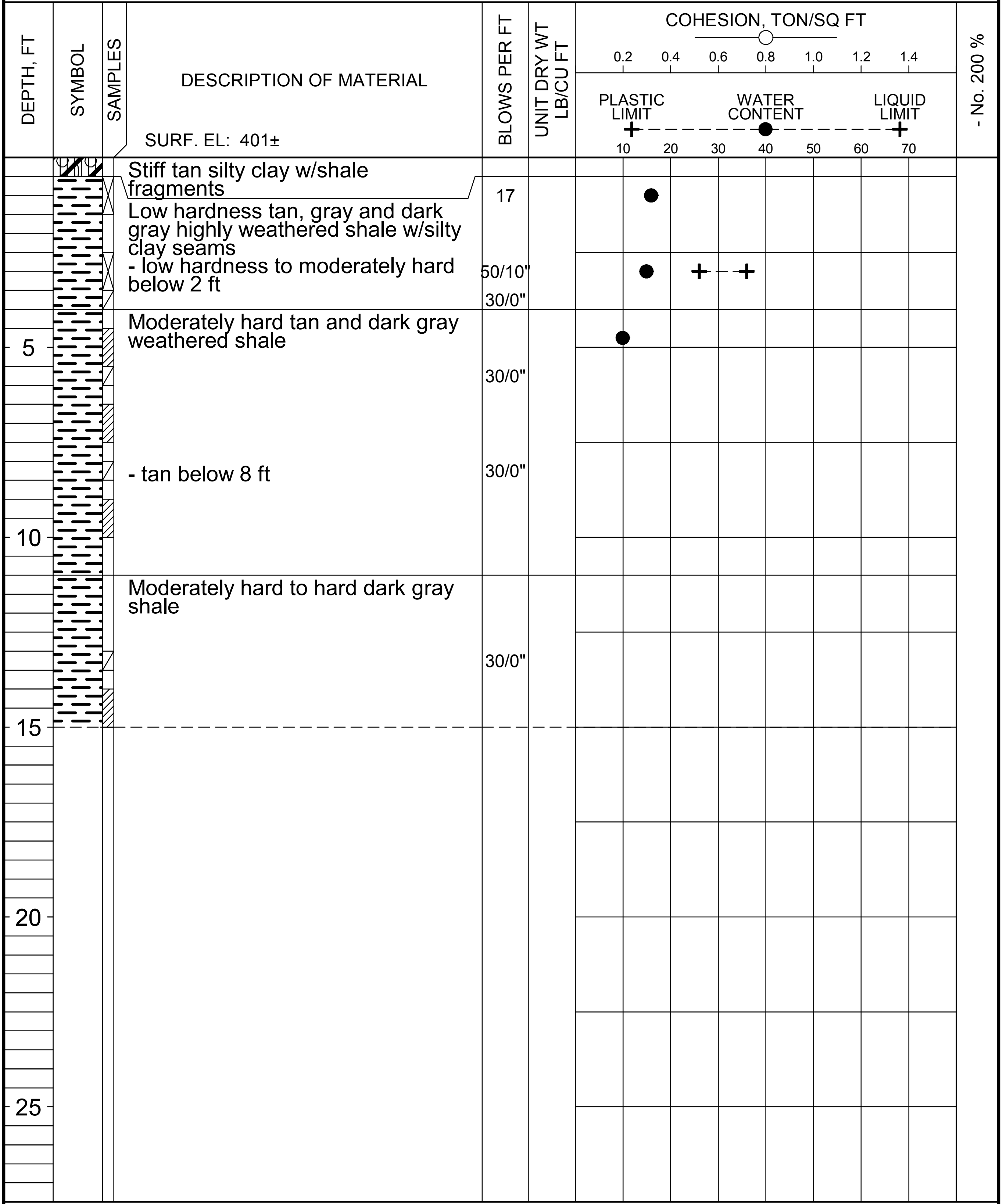
LOG OF BORING NO. CS4A

AHTD Job 061377: US 70 - Cut Slopes
Saline County, Arkansas

TYPE: Auger

LOCATION: Approx Sta 1192+00, 56 ft Lt

SURF. EL: 401±



DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT
Stiff tan silty clay w/shale fragments		
Low hardness tan, gray and dark gray highly weathered shale w/silty clay seams - low hardness to moderately hard below 2 ft	17 50/10" 30/0"	
Moderately hard tan and dark gray weathered shale - tan below 8 ft	30/0" 30/0"	
Moderately hard to hard dark gray shale	30/0"	

COMPLETION DEPTH: 15.0 ft
DATE: 4-4-14

DEPTH TO WATER
IN BORING: Dry

DATE: 4/4/2014

LGBNEW 13-203-CUT SLOPES.GPJ 7-9-14

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

L O G O F B O R I N G N O. CS5

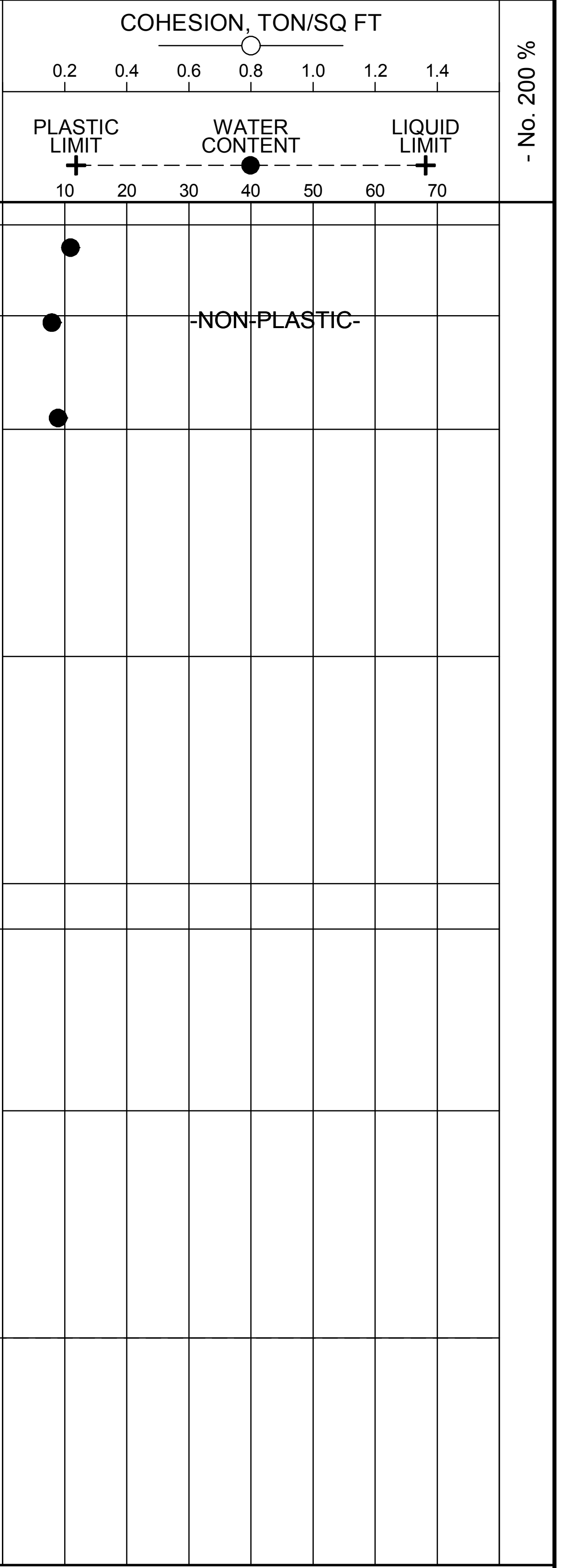
AHTD Job 061377: US 70 - Cut Slopes
Saline County, Arkansas

TYPE: Auger

LOCATION: Approx Sta 1221+50, 80 ft Lt

SURF. EL: 406±

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT
	Loose dark brown silt w/organics		
	Low hardness tan and gray highly weathered shale, fractured w/silty clay seams	22	
	Moderately hard dark gray and tan weathered shale	50/2" 50/1"	
5	- moderately hard to hard below 4.5 ft	30/0" 30/0"	
10			
15			
	Moderately hard to hard dark gray shale	30/0"	
20	- water at 20 ft	30/0"	
25			



COMPLETION DEPTH: 25.0 ft
DATE: 4-4-14

DEPTH TO WATER
IN BORING: 20 ft

DATE: 4/4/2014

LGBNEW 13-203-CUT SLOPES.GPJ 7-9-14

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. CS5A

AHTD Job 061377: US 70 - Cut Slopes
Saline County, Arkansas

TYPE: Auger

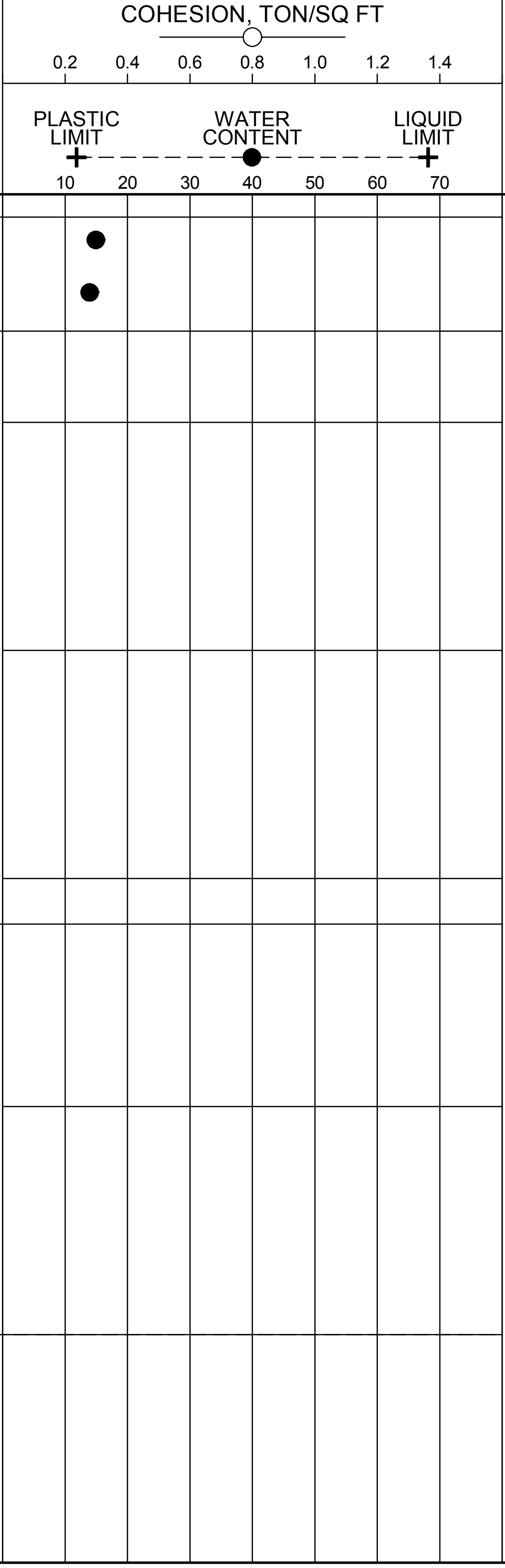
LOCATION: Approx Sta 1221+50, 55 ft Lt

SURF. EL: 405±

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT
	Stiff tan silty clay w/shale and quartz fragments (fill)	
	Low hardness to moderately hard gray and tan highly weathered shale w/occasional silty clay laminations and ferrous stains	50/10" 50/3"
	Moderately hard to hard tan and gray weathered shale	30/0"
5		30/0"
		30/0"
	- tan and dark gray below 9 ft	
10		
		30/0"
15		
	Moderately hard to hard dark gray shale	
		30/0"
20		
	- water at 21 ft	
		30/0"
25		
	NOTE: Water at 10.8 ft at 1.5 hours.	

UNIT DRY WT LB/CU FT

- No. 200 %



COMPLETION DEPTH: 25.0 ft
DATE: 4-4-14

DEPTH TO WATER
IN BORING: 21 ft

DATE: 4/4/2014

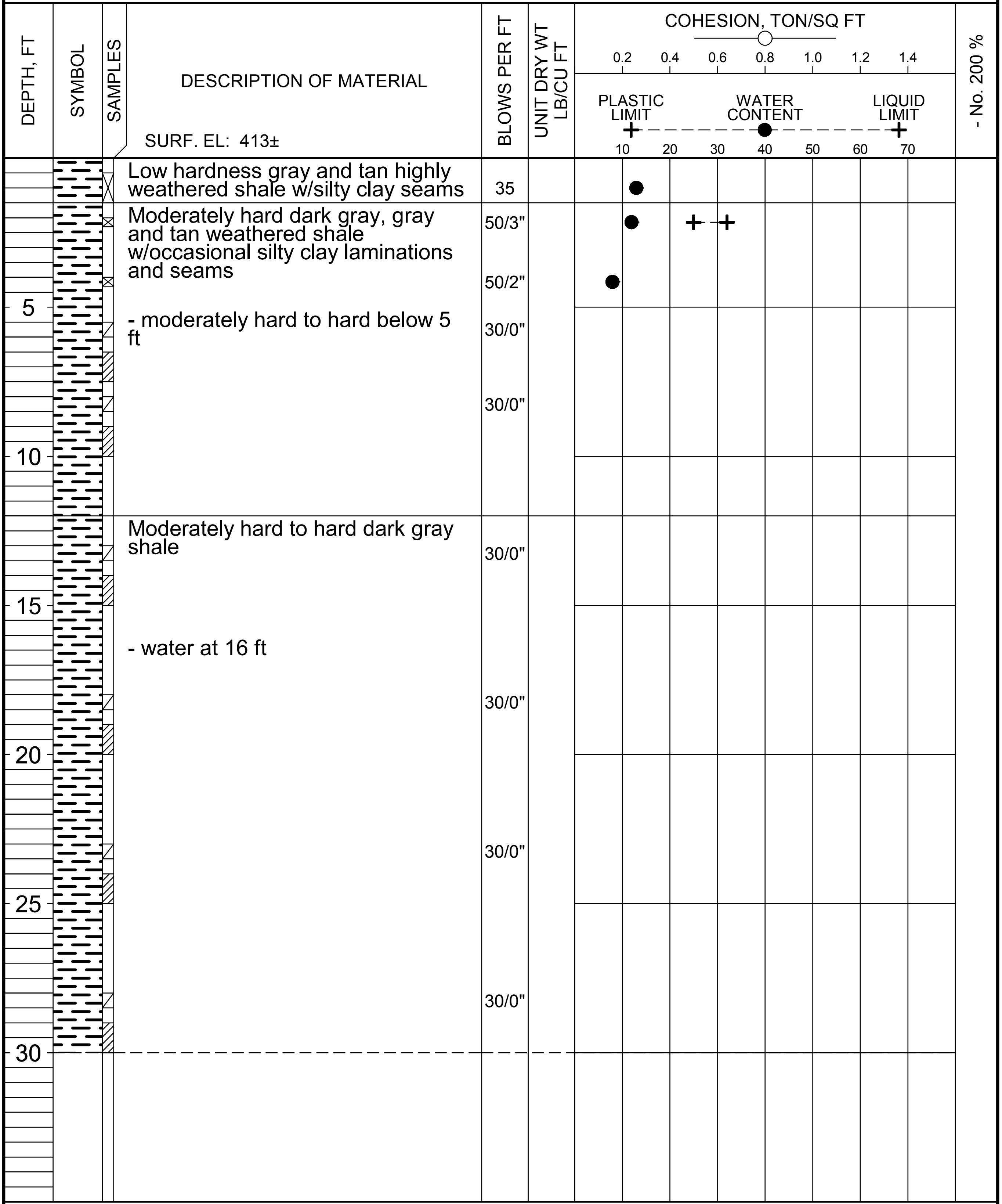
13-203

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. CS6A

AHTD Job 061377: US 70 - Cut Slopes
Saline County, Arkansas

TYPE: Auger
LOCATION: Approx Sta 1224+00, 58 ft Lt



DESCRIPTION OF MATERIAL	BLOWS PER FT
Low hardness gray and tan highly weathered shale w/silty clay seams	35
Moderately hard dark gray, gray and tan weathered shale w/occasional silty clay laminations and seams	50/3" 50/2"
- moderately hard to hard below 5 ft	30/0" 30/0"
Moderately hard to hard dark gray shale	30/0"
- water at 16 ft	30/0" 30/0" 30/0"

COMPLETION DEPTH: 30.0 ft
DATE: 4-4-14

DEPTH TO WATER
IN BORING: 16 ft

DATE: 4/4/2014

LGBNEW 13-203-CUT SLOPES.GPJ 7-9-14

13-203

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. CS10

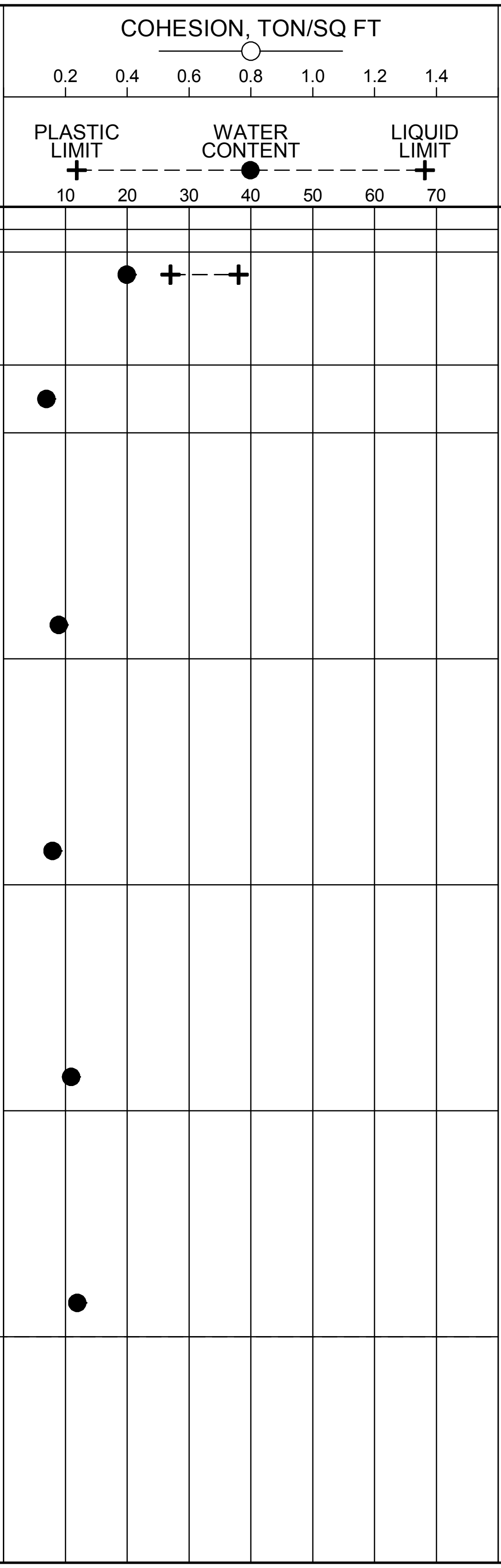
AHTD Job 061377: US 70 - Cut Slopes
Saline County, Arkansas

TYPE: Auger

LOCATION: Approx Sta 1329+00, 96 ft Lt

SURF. EL: 387±

DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
Loose dark brown silt w/organics			
Stiff tan and gray silty clay w/rootlets and shale fragments	9		57
Low hardness tan, gray and dark gray highly weathered shale			
Low hardness to moderately hard gray, dark gray and tan weathered shale	50/1"		
	30/0"		
	30/0"		
- gray and tan with occasional highly weathered shale seams and layers			
	30/0"		
- dark gray and gray below 21 ft			
	30/0"		



DEPTH, FT: 5, 10, 15, 20, 25

COMPLETION DEPTH: 25.0 ft
DATE: 4-25-14

DEPTH TO WATER
IN BORING: Dry

DATE: 4/25/2014

LGBNEW 13-203-CUT SLOPES.GPJ 7-9-14

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. CS13

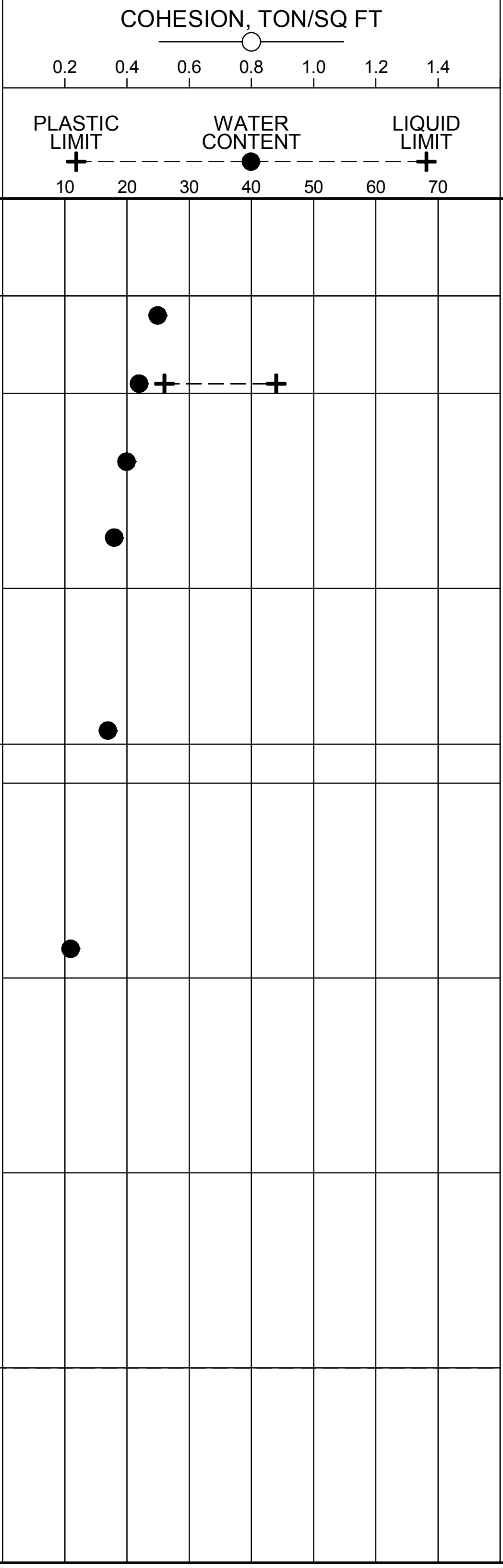
AHTD Job 061377: US 70 - Cut Slopes
Saline County, Arkansas

TYPE: Auger

LOCATION: Approx Sta 1380+70, 105 ft Lt

SURF. EL: 452±

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
	Stiff tan silty clay w/surface organics and trace sandstone fragments	16		
	Low hardness gray, tan and reddish tan shale w/silty clay seams and layers	17		
5	- with medium close sandstone partings and seams below 4 ft	45		
		50/5"		
		50/7"		
10				
		50/2"		
15	Low hardness to moderately hard tan and dark gray weathered shale w/highly weathered shale seams			
		30/0"		
20	- with quartz veins and inclusions below 20 ft			
	- water at 22 ft			
		30/0"		
25	- more quartz below 25 ft			
		30/0"		
30				



COMPLETION DEPTH: 30.0 ft
DATE: 4-24-14

DEPTH TO WATER
IN BORING: 22 ft

DATE: 4/24/2014

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

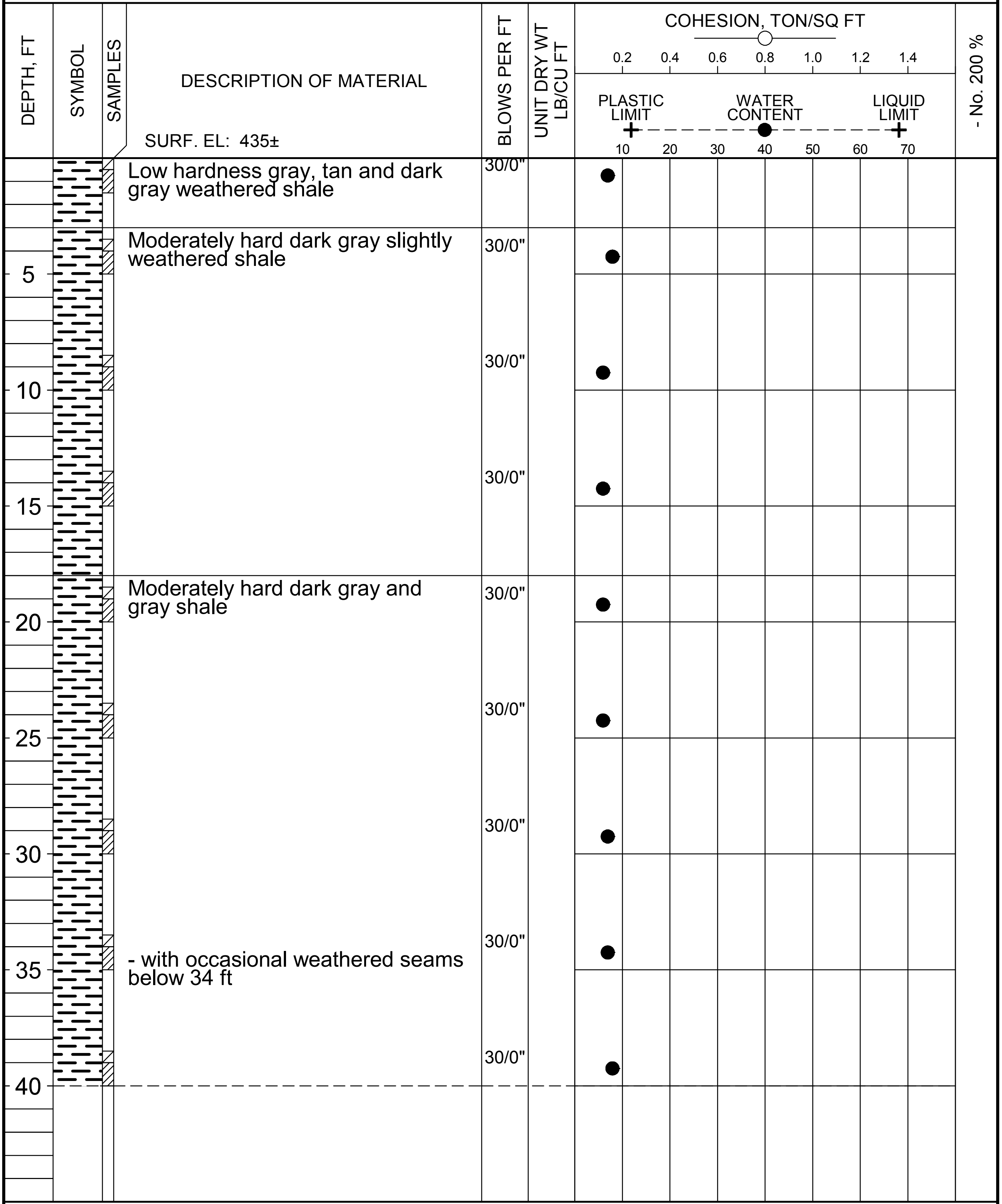
LOG OF BORING NO. CS16

AHTD Job 061377: US 70 - Cut Slopes
Saline County, Arkansas

TYPE: Auger

LOCATION: Approx Sta 1394+50, 128 ft Lt

SURF. EL: 435±



Low hardness gray, tan and dark gray weathered shale

Moderately hard dark gray slightly weathered shale

Moderately hard dark gray and gray shale

- with occasional weathered seams below 34 ft

DEPTH, FT	BLOWS PER FT
0	30/0"
3.5	30/0"
8.5	30/0"
13.5	30/0"
18.5	30/0"
23.5	30/0"
28.5	30/0"
33.5	30/0"
38.5	30/0"

COMPLETION DEPTH: 40.0 ft
DATE: 4-25-14

DEPTH TO WATER
IN BORING: Dry

DATE: 4/25/2014

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

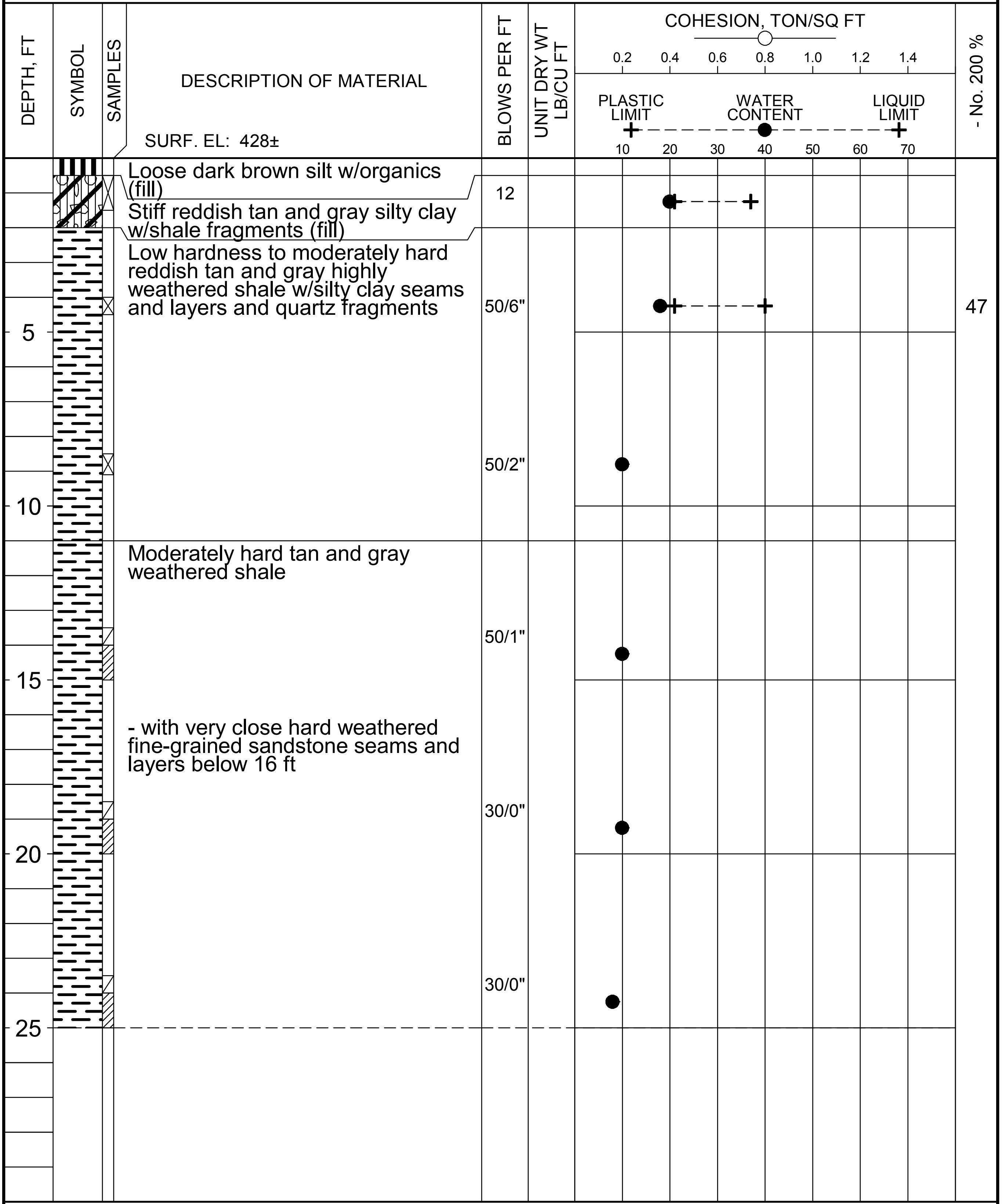
LOG OF BORING NO. CS18

AHTD Job 061377: US 70 - Cut Slopes
Saline County, Arkansas

TYPE: Auger

LOCATION: Approx Sta 1406+00, 78 ft Lt

SURF. EL: 428±



DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
Loose dark brown silt w/organics (fill)			
Stiff reddish tan and gray silty clay w/shale fragments (fill)	12		
Low hardness to moderately hard reddish tan and gray highly weathered shale w/silty clay seams and layers and quartz fragments	50/6" 50/2"		47
Moderately hard tan and gray weathered shale	50/1"		
- with very close hard weathered fine-grained sandstone seams and layers below 16 ft	30/0" 30/0"		

COMPLETION DEPTH: 25.0 ft
DATE: 4-28-14

DEPTH TO WATER
IN BORING: Dry

DATE: 4/28/2014

13-203

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. CS23

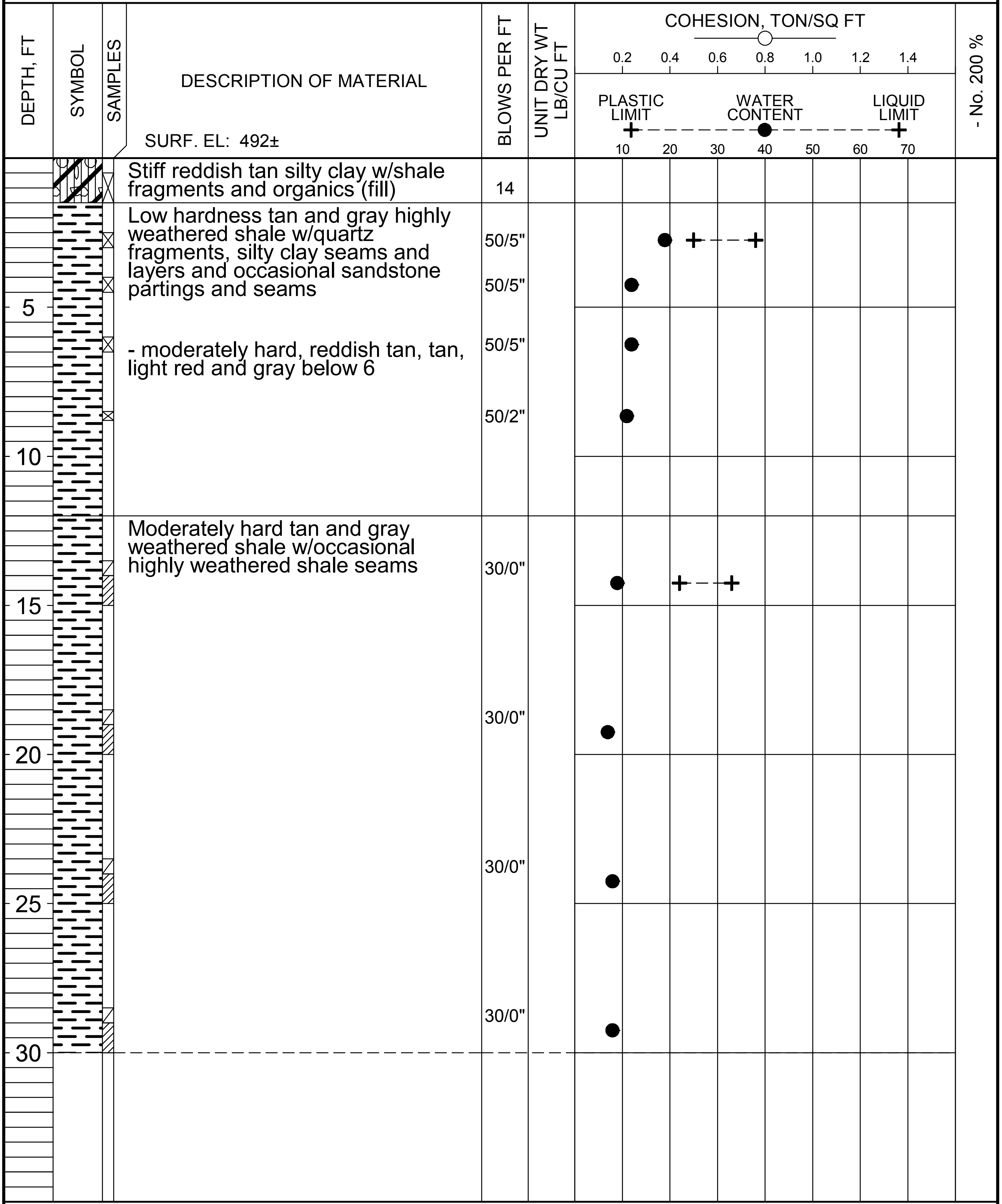
AHTD Job 061377: US 70 - Cut Slopes
Saline County, Arkansas

TYPE: Auger

LOCATION: Approx Sta 1428+5, 110 ft Lt

SURF. EL: 492±

DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT
Stiff reddish tan silty clay w/shale fragments and organics (fill)	14	
Low hardness tan and gray highly weathered shale w/quartz fragments, silty clay seams and layers and occasional sandstone partings and seams	50/5" 50/5"	
- moderately hard, reddish tan, tan, light red and gray below 6	50/5" 50/2"	
Moderately hard tan and gray weathered shale w/occasional highly weathered shale seams	30/0" 30/0" 30/0" 30/0"	



COMPLETION DEPTH: 30.0 ft
DATE: 4-24-14

DEPTH TO WATER
IN BORING: Dry

DATE: 4/24/2014

LGBNEW 13-203-CUT SLOPES.GPJ 7-9-14

SUMMARY OF CUT SLOPE FACE OBSERVATIONS

PROJECT: AHTD 061377 - Hot Springs – I-30 (Widening) (S)
LOCATION: Garland and Saline Counties, Arkansas
GHBW JOB No.: 13-203

Approx Sta	Offset	Plan Cut Config	Approx Steepest Current Config	Slope Face Observations	Comments
1135+00 to 1138+00	Left	2H:1V	0.8H:1V	Moderately weathered shale has apparent dip of 5°-10° south. Shale is highly weathered near surface. Numerous quartz cobbles at top of slope. Minor surface slumps apparent along hillside.	Drilled B-CS1 at El 451± at approx Sta 1136+00, 95 ft Lt
1173+00 to 1174+00	Left	2H:1V	1.2H:1V	Moderately weathered shale exposed in easement access road at top of slope. Weathered shale outcrop approx 2 ft below top of slope with apparent dip 50° south.	Drilled B-CS2 at El 458± at approx Sta 1173+00, 85 ft Lt
1184+00 to 1185+00	Left	2H:1V	1.9H:1V	Moderately weathered shale outcrop at toe of slope. Weathered shale is thinly bedded with apparent dip of 40° south. Numerous shale fragments and quartz cobbles at top of slope.	
1192+00 to 1193+00	Left	2H:1V	1.7H:1V	Moderately weathered shale outcrop approx 10 ft above US70 road grade. Shale has apparent dip of 60° south. Numerous shale fragments at top of slope.	Drilled B-CS4 at El 405± at approx Sta 1192+00, 88 ft Lt and B-CS4A at El 401± at approx Sta 1192+00, 56 ft Lt

SUMMARY OF CUT SLOPE FACE OBSERVATIONS

PROJECT: AHTD 061377 - Hot Springs – I-30 (Widening) (S)
LOCATION: Garland and Saline Counties, Arkansas
GHBW JOB No.: 13-203

Approx Sta	Offset	Plan Cut Config	Approx Steepest Current Config	Slope Face Observations	Comments
1219+00 to 1228+00	Left	2H:1V	1.25H:1V	Moderately weathered shale is exposed in a easement access road at top of slope. Shale outcrops at top and bottom of slope. Weathered shale has apparent dip of 10˚-15˚ southeast. Occasional sandstone seams are exposed. Numerous shale and novaculite fragments are scattered across surface along hillside.	Drilled B-CS5 at El 406± at approx Sta 1221+50, 80 ft Lt and B-CS5A at El 405± at approx Sta 1221+50, 55 ft Lt and B-CS6 at El 413± at approx Sta 1224+00, 58 ft Lt
1306+00 to 1312+00	Left	2H:1V	1.5H:1V	Moderately weathered shale present at approx 5 ft above US70 road grade. Shale is thinly bedded with apparent dip of 10˚-15˚ southwest. Interbedded sandstone layers are exposed near bottom of slope. Numerous shale and quartz fragments scattered across surface at top of slope. Seep in slope face at approx 5 ft above US70 road grade.	

SUMMARY OF CUT SLOPE FACE OBSERVATIONS

PROJECT: AHTD 061377 - Hot Springs – I-30 (Widening) (S)
LOCATION: Garland and Saline Counties, Arkansas
GHBW JOB No.: 13-203

Approx Sta	Offset	Plan Cut Config	Approx Steepest Current Config	Slope Face Observations	Comments
1328+00 to 1331+00	Left	2H:1V	0.9H:1V	Moderately weathered shale exposed at approx 10 ft above US70 road grade. Shale is thinly bedded with apparent dip of 5˚-10˚ southwest. Numerous quartz boulders scattered across top of slope.	Drilled B-CS10 at El 387± at approx Sta 1329+00, 96 ft Lt
1370+00 to 1374+00	Left	2H:1V	1.5H:1V	Moderately weathered shale exposures at top and bottom of slope. Shale is thinly bedded with occasional quartz veins and sandstone seams. Shale has apparent dip of 5˚-10˚ southwest near Sta 1371+00. Highly disturbed shale outcrop exposed at top of slope near Sta 1373+00 with apparent dip of 60˚ southwest. Minor surface slumps apparent along hillside. Numerous quartz cobbles are scattered across surface at top of slope.	

SUMMARY OF CUT SLOPE FACE OBSERVATIONS

PROJECT: AHTD 061377 - Hot Springs – I-30 (Widening) (S)
LOCATION: Garland and Saline Counties, Arkansas
GHBW JOB No.: 13-203

Approx Sta	Offset	Plan Cut Config	Approx Steepest Current Config	Slope Face Observations	Comments
1380+00 to 1383+00	Left and Right	2H:1V	1.1H:1V	Moderately weathered shale outcrops at top of slopes on north and south side of US70. Shale is thinly bedded and slightly undulating, with apparent dip of 5˚- 10˚ southeast. Sandstone boulder with quartz veins and inclusions at top of slope on north side of US70.	Drilled B-CS13 at El 452± at approx Sta 1380+70, 105 ft Lt
1390+00 to 1396+00	Left and Right	2H:1V	1.4H:1 (Left) 2.1H:1 (Right)	Moderately weathered shale outcrop exposed at approx 20 ft above road grade on north side of US70. Shale is thinly bedded with apparent dip of 50˚- 60˚ south near Sta 1392+00. Shale has apparent dip of 20˚ southeast near Sta 1394+50. Highly weathered shale outcrop exposed on south side of US70, near Sta 1395+00, at approx 5 ft above road grade. Shale exposure on north side of US70 has apparent dip of 15˚-20˚ south.	Drilled B-CS16 at El 435± at approx Sta 1394+50, 128 ft Lt

SUMMARY OF CUT SLOPE FACE OBSERVATIONS

PROJECT: AHTD 061377 - Hot Springs – I-30 (Widening) (S)
LOCATION: Garland and Saline Counties, Arkansas
GHBW JOB No.: 13-203

Approx Sta	Offset	Plan Cut Config	Approx Steepest Current Config	Slope Face Observations	Comments
1405+00 to 1418+00	Left	2H:1V	1.1H:1V	Moderately weathered shale outcrop present about 5 ft south of easement access road, approx El 440. Shale has apparent dip of 5˚-15˚ south/southwest. Shale is thinly bedded and slighly undulating with occasional sandstone seams. Minor surface slumps apparent along hillside near Sta 1406+00.	Drilled B-CS18 at El 428± at approx Sta 1406+00, 78 ft Lt
1426+00 to 1430+00	Left	2H:1V	2.2H:1V	Moderately weathered shale exposed in cut face. Shale is thinly bedded with an apparent dip of 20˚ south.	Drilled B-CS23 at El 492± at approx Sta 1428+05, 110 ft Lt

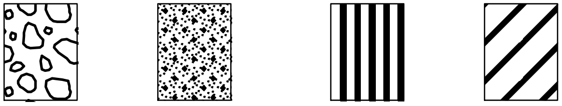
ATTACHMENT 8

Grubbs, Hoskyn,
Barton & Wyatt, Inc.
Consulting Engineers

SYMBOLS AND TERMS USED ON BORING LOGS

SOIL TYPES

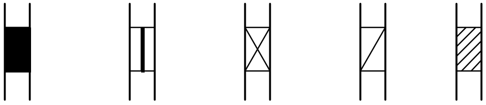
(SHOWN IN SYMBOLS COLUMN)



Predominant type shown heavy

SAMPLER TYPES

(SHOWN ON SAMPLES COLUMN)



TERMS DESCRIBING CONSISTENCY OR CONDITION

COARSE GRAINED SOILS (major portion retained on No. 200 sieve): Includes (I) Clean gravels and sands, and (2) silty or clayey gravels and sands. Condition is rated according to relative density, as determined by laboratory tests.

DESCRIPTIVE TERM	N-VALUE	RELATIVE DENSITY
VERY LOOSE	0-4	0-15%
LOOSE	4-10	15-35%
MEDIUM DENSE	10-30	35-65%
DENSE	30-50	65-85%
VERY DENSE	50 and above	85-100%

FINE GRAINED SOILS (major portion passing No. 200 sieve): Includes (1) Inorganic and organic silts and clays, (2) gravelly, sandy, or silty clays, and (3) clayey silts. Consistency is rated according to shearing strength, as indicated by penetrometer readings or by unconfined compression tests.

DESCRIPTIVE TERM	UNCONFINED COMPRESSIVE STRENGTH TON/SQ. FT.
VERY SOFT	Less than 0.25
SOFT	0.25-0.50
FIRM	0.50-1.00
STIFF	1.00-2.00
VERY STIFF	2.00-4.00
HARD	4.00 and higher

NOTE: Slickensided and fissured clays may have lower unconfined compressive strengths than shown above, because of planes of weakness or cracks in the soil. The consistency ratings of such soils are based on penetrometer readings.

TERMS CHARACTERIZING SOIL STRUCTURE

SLICKENSIDED - having inclined planes of weakness that are slick and glossy in appearance.
FISSURED - containing shrinkage cracks, frequently filled with fine sand or silt; usually more or less vertical.
LAMINATED - composed of thin layers of varying color and texture.
INTERBEDDED - composed of alternate layers of different soil types.
CALCAREOUS - containing appreciable quantities of calcium carbonate.
WELL GRADED - having a wide range in grain sizes and substantial amounts of all intermediate particle sizes.
POORLY GRADED - predominantly of one grain size, or having a range of sizes with some intermediate sizes missing.

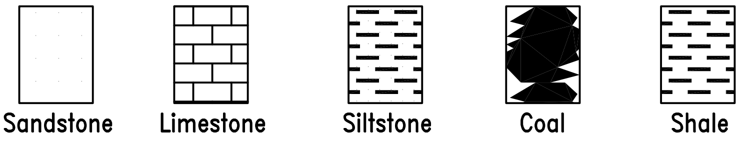
Terms used on this report for describing soils according to their texture or grain size distribution are in accordance with the UNIFIED SOIL CLASSIFICATION SYSTEM, as described in Technical Memorandum No.3-357, Waterways Experiment Station, March 1953

KEY 3-14-12

Grubbs, Hoskyn,
Barton & Wyatt, Inc.
Consulting Engineers

BORING LOG TERMS – ROCK

ROCK TYPES
(SHOWN IN SYMBOLS COLUMN)



Joint Characteristics –

Spacing	
Very Close	0.75 to 2.5 in.
Close	2.5 to 8 in.
Moderately Close	8 to 24 in.
Wide	2 to 6 ft
Very Wide	More than 6 ft

Bedding Characteristics –

Very Thin	0.75 to 2.5 in.
Thin	2.5 to 8 in.
Medium	8 to 24 in.
Thick	2 to 6 ft
Massive	More than 6 ft

Lithologic Characteristics –

- Clayey
- Shaly
- Calcareous (limy)
- Siliceous
- Sandy (Arenaceous)
- Silty
- Plastic Seams

Parting – Less than 1/16 inch
Seam – 1/16 to 1/2 inch
Layer – 1/2 to 12 inches
Stratum – Greater than 12 inches

Hardness–

Soft (S) – Reserved for plastic material alone.

Friable (F) – Easily crumbled by hand, pulverized or reduced to powder and is too soft to be cut with a pocket knife.

Low Hardness (LH) – Can be gouged deeply or carved with a pocket knife.

Moderately Hard (MH) – Can be readily scratched by a knife blade; scratch leaves a heavy trace of dust and scratch is readily visible after the powder has been blown away.

Hard (H) – Can be scratched with difficulty; scratch produces little powder and is often faintly visible; traces of the knife steel may be visible.

Very hard (VH) – Cannot be scratched with a pocket knife. Knife steel marks left on surface.

Texture –

Fine – Barely seen with naked eye
Medium – Barely seen up to 1/8 in.
Coarse – 1/8 in. to 1/4 in.

Structure –

- Bedding
  - Flat – 0° – 5°
  - Gently Dipping – 5° – 35°
  - Moderately Dipping – 55° – 85°
  - Steeply Dipping – 55° – 85°
- Fractures, scattered
  - Open
  - Cemented or Tight
- Fractures, closely spaced
  - Open
  - Cemented or Tight
- Brecciated (Sheared and Fragmented)
  - Open
  - Cemented or Tight
- Joints
  - Faulted
  - Slickensides

Degree of Weathering –

Fresh – No visible signs of decomposition or discoloration. Rings under hammer impact.

Slighty Weathered – Slight discoloration inwards from open fractures, otherwise similar to fresh.

Moderately Weathered – Discoloration throughout. Weaker minerals such as feldspar decomposed. Strength somewhat less than fresh rock, but cores cannot be broken by hand or scraped by knife. Texture preserved.

Highly Weathered – Most minerals somewhat decomposed. Specimens can be broken by hand with effort or shaved with knife. Core stones present in rock mass. Texture becoming indistinct but fabric

Completely Weathered – Minerals decomposed to soil but fabric and structure preserved (Saprolite). Specimens easily crumbled or penetrated.

Residual Soil – Advanced state of decomposition resulting in plastic soils. Rock fabric and structure completely destroyed. Large volume change.

Solution and Void Conditions –

- Solid, contains no voids
- Vuggy (pitted)
- Vesicular (igneous)
- Porous
- Cavities
- Cavernous

Swelling Properties –

- Nonswelling
- Swelling

Slaking Properties –

- Nonslaking
- Slakes slowly on exposure
- Slakes readily on exposure

Rock Quality Designation (RQD) –

RQD (Percent)	Diagnostic Description
Greater than 90	Excellent
75 – 90	Good
50 – 75	Fair
25 – 50	Poor
Less than 25	Very Poor

KEYROCK FHWA 3-2-12

PLATE

ATTACHMENT 9

SUMMARY OF CLASSIFICATION TEST RESULTS

PROJECT: AHTD 061377 - HWY 70 WIDENING - 128 to I-30 (S)
LOCATION: GARLAND AND SALINE COUNTIES, ARKANSAS
JOB NUMBER: 13-203

BORING/TEST PIT No.	SAMPLE DEPTH (ft)	WATER CONTENT (%)	ATTERBERG LIMITS			SIEVE ANALYSIS PERCENT PASSING									UNIFIED CLASS.	AASHTO CLASS.
			LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	3 in.	2 in.	1 in.	3/4 in.	3/8 in.	#4	#10	#40	#200		
TP-58	0.5-1.5	20	32	22	10	---	---	---	---	---	---	---	---	43	GC	A-4
TP-59	0.5-1.5	22	61	33	28	100	100	100	84	72	63	55	48	43	GC	A-7-6
TP-60	0.5-1.5	14	43	27	16	100	100	100	96	84	79	69	58	49	SC	A-7-6
TP-61	0.5-1.5	18	34	21	13	---	---	---	---	---	---	---	---	60	CL	A-6
TP-62	0.5-1.5	25	55	28	27	100	100	100	100	96	92	90	86	74	CH	A-7-6
TP-63	0.5-1.5	18	35	20	15	---	---	---	---	---	---	---	---	72	CL	A-6
TP-64	0.5-1.5	22	41	24	17	100	100	100	100	97	92	87	81	64	CL	A-7-6
TP-65	0.5-1.5	34	39	25	14	100	100	100	100	100	100	98	95	87	CL	A-6
TP-66	2-3	22	42	27	15	100	100	75	67	51	39	31	23	17	GC	A-2-7
TP-66	3-4	15	25	18	7	100	100	100	95	86	77	64	50	40	SC	A-4
TP-67	1.5-2.5	20	29	19	10	---	---	---	---	---	---	---	---	74	CL	A-4
TP-68	0.5-1.5	34	68	24	44	100	100	100	100	100	96	91	85	80	CH	A-7-6
TP-69	2-3	22	40	22	18	---	---	---	---	---	---	---	---	81	CL	A-6

SUMMARY OF CLASSIFICATION TEST RESULTS

PROJECT: AHTD 061377 - HWY 70 WIDENING - 128 to I-30 (S)
LOCATION: GARLAND AND SALINE COUNTIES, ARKANSAS
JOB NUMBER: 13-203

BORING/TEST PIT No.	SAMPLE DEPTH (ft)	WATER CONTENT (%)	ATTERBERG LIMITS			SIEVE ANALYSIS PERCENT PASSING									UNIFIED CLASS.	AASHTO CLASS.
			LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	3 in.	2 in.	1 in.	3/4 in.	3/8 in.	#4	#10	#40	#200		
TP-71	0.5-1.5	30	55	31	24	---	---	---	---	---	---	---	---	64	CH	A-7-6
TP-72	1.5-2.5	48	52	43	9	---	---	---	---	---	---	---	---	---	SHALE	
TP-73	0.5-1.5	25	45	27	18	100	100	100	95	77	60	49	39	32	GC	A-2-7
TP-74	0.5-1.5	33	51	30	21	100	100	100	90	74	62	49	37	29	GC	A-2-7
TP-75	0.5-1.5	20	44	29	15	100	100	100	81	66	55	46	36	26	GC	A-2-7
77	0.5-1.5	18	45	24	21	100	100	100	100	89	79	66	55	49	SC	A-7-6
TP-78	0.5-1.5	16	62	29	33	100	100	70	63	46	35	27	22	19	GC	A-2-7
TP-79	0.5-1.5	20	40	26	14	100	100	100	90	74	66	57	44	33	GC	A-2-6
TP-80	0.5-1.5	29	70	34	36	100	100	95	92	73	63	54	46	43	GC	A-7-6
82	0.5-1.5	18	43	25	18	100	100	100	95	81	69	61	53	47	GC	A-7-6
TP-83	0.5-1.5	22	41	24	17	100	100	100	88	78	68	61	53	47	GC	A-7-6
84	0.5-1.5	14	25	19	6	100	100	100	100	95	80	65	53	34	GC	A-2-4

SUMMARY OF CLASSIFICATION TEST RESULTS

PROJECT: AHTD 061377 - HWY 70 WIDENING - 128 to I-30 (S)
LOCATION: GARLAND AND SALINE COUNTIES, ARKANSAS
JOB NUMBER: 13-203

BORING/TEST PIT No.	**SAMPLE DEPTH (ft)**	**WATER CONTENT (%)**	**ATTERBERG LIMITS**			**SIEVE ANALYSIS PERCENT PASSING**									**UNIFIED CLASS.**	**AASHTO CLASS.**
			LIQUID LIMIT	**PLASTIC LIMIT**	**PLASTICITY INDEX**	**3 in.**	**2 in.**	**1 in.**	**3/4 in.**	**3/8 in.**	**#4**	**#10**	**#40**	**#200**		
TP-85	0.5-1.5	13	36	26	10	---	---	---	---	---	---	---	---	10	GC	A-2-4
TP-86	0.5-1.5	18	43	27	16	---	---	---	---	---	---	---	---	29	GC	A-2-7
TP-87	0.5-1.5	22	41	25	16	100	88	81	77	66	59	50	39	29	GC	A-2-7
TP-88	1-2	20	40	28	12	---	---	---	---	---	---	---	---	36	GC	A-6
TP-89	0.5-1.5	17	43	26	17	---	---	---	---	---	---	---	---	---	SHALE	
90	2.5-3.5	16	34	25	9	100	100	100	83	71	56	46	36	30	GC	A-2-4
TP-91	1-2	12	36	23	13	---	---	---	---	---	---	---	---	19	GC	A-2-6
TP-92	0.5-1.5	18	32	18	14	---	---	---	---	---	---	---	---	78	CL	A-6
TP-93	1.5-2.5	23	27	20	7	---	---	---	---	---	---	---	---	71	CL	A-4
TP-94	0.5-1.5	18	30	20	10	100	100	100	92	88	80	70	57	44	GC	A-4
TP-95	0.5-1.5	19	32	21	11	---	---	---	---	---	---	---	---	42	GC	A-6
TP-95	4-5	21	36	20	16	100	100	100	97	92	76	61	43	28	SC	A-2-6

SUMMARY OF CLASSIFICATION TEST RESULTS

PROJECT: AHTD 061377 - HWY 70 WIDENING - 128 to I-30 (S)
LOCATION: GARLAND AND SALINE COUNTIES, ARKANSAS
JOB NUMBER: 13-203

BORING/TEST PIT No.	SAMPLE DEPTH (ft)	WATER CONTENT (%)	ATTERBERG LIMITS			SIEVE ANALYSIS PERCENT PASSING									UNIFIED CLASS.	AASHTO CLASS.
			LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	3 in.	2 in.	1 in.	3/4 in.	3/8 in.	#4	#10	#40	#200		
TP-96	0.5-1.5	15	31	20	11	---	---	---	---	---	---	---	---	27	GC	A-2-6
TP-96	3-4	17	29	18	11	---	---	---	---	---	---	---	---	46	GC	A-6
97	0.5-1.5	20	42	25	17	100	100	100	100	82	66	58	50	45	GC	A-7-6
TP-98	2.5-3.5	24	27	18	9	---	---	---	---	---	---	---	---	69	CL	A-4
TP-99	1-2	13	34	22	12	---	---	---	---	---	---	---	---	---	SHALE	
TP-100	2-3	23	43	21	22	---	---	---	---	---	---	---	---	70	CL	A-7-6
TP-101	0.5-1.5	13	37	21	16	100	100	86	86	72	61	51	40	35	GC	A-2-6
TP-101	2-3	13	24	17	7	---	---	---	---	---	---	---	---	43	GC	A-4
TP-102	2-3	16	26	18	8	---	---	---	---	---	---	---	---	71	CL	A-4
TP-103	0.5-1.5	17	39	25	14	100	100	100	90	76	65	54	42	34	GC	A-2-6
104	2.5-3	9	33	23	10	---	---	---	---	---	---	---	---	---	SHALE	
TP-105	0.5-1.5	16	41	23	18	100	100	100	94	71	58	48	36	30	GC	A-2-7
TP-106	0.5-1.5	17	38	22	16	---	---	---	---	---	---	---	---	27	GC	A-2-6

SUMMARY OF CLASSIFICATION TEST RESULTS

PROJECT: AHTD 061377 - HWY 70 WIDENING - 128 to I-30 (S)
LOCATION: GARLAND AND SALINE COUNTIES, ARKANSAS
JOB NUMBER: 13-203

BORING/TEST PIT No.	SAMPLE DEPTH (ft)	WATER CONTENT (%)	ATTERBERG LIMITS			SIEVE ANALYSIS PERCENT PASSING									UNIFIED CLASS.	AASHTO CLASS.
			LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	3 in.	2 in.	1 in.	3/4 in.	3/8 in.	#4	#10	#40	#200		
TP-107	0-1	23	32	20	12	---	---	---	---	---	---	---	---	21	GC	A-2-6
TP-108	0.5-1.5	19	46	25	21	100	100	100	89	80	63	50	38	30	GC	A-2-7
109	2.5-3.5	26	53	22	31	100	100	100	100	100	98	90	85	81	CH	A-7-6
TP-110	1.5-2.5	21	41	23	18	---	---	---	---	---	---	---	---	62	CL	A-7-6
TP-111	0.5-1.5	14	40	25	15	100	100	92	78	67	51	39	26	18	GC	A-2-6
112	0.5-1.5	20	51	35	16	---	---	---	---	---	---	---	---	26	GC	A-2-7
112	2.5-3.5	16	34	19	15	100	100	100	100	92	83	74	63	56	CL	A-6
TP-11	0.5-1.5	13	37	24	13	100	100	70	58	32	23	17	11	8	GC-GP	A-2-6
TP-12	4-5	11	48	23	25	100	100	100	100	95	95	73	57	48	SC	A-7-6
TP-13	0.5-1.5	10	46	31	15	100	100	100	75	21	19	15	13	8	GC-GP	A-2-7
TP-14	0.5-1.5	5	23	19	4	---	---	---	---	---	---	---	---	68	CL-ML	A-4
TP-14	2-3	13	42	22	20	---	---	---	---	---	---	---	---	78	CL	A-7-6
TP-15	0-1	8	29	23	6	63	16	4	2	1	0.8	0.5	0.3	0.1	GP	A-1-a

GRUBBS, HOSKYN, BARTON & WYATT, INC.
Consulting Engineers

SUMMARY OF CLASSIFICATION TEST RESULTS

PROJECT: AHTD 061377 - HWY 70 WIDENING - 128 to I-30 (S)
LOCATION: GARLAND AND SALINE COUNTIES, ARKANSAS
JOB NUMBER: 13-203

BORING/TEST PIT No.	SAMPLE DEPTH (ft)	WATER CONTENT (%)	ATTERBERG LIMITS			SIEVE ANALYSIS PERCENT PASSING									UNIFIED CLASS.	AASHTO CLASS.
			LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	3 in.	2 in.	1 in.	3/4 in.	3/8 in.	#4	#10	#40	#200		
TP-16	0.5-1.5	10	37	21	16	100	100	95	87	69	58	42	24	18	GC	A-2-6
TP-17	0.5-1.5	16	35	18	17	---	---	---	---	---	---	---	---	80	CL	A-6
TP-17	3-4	12	40	20	20	100	100	79	74	60	53	45	40	37	GC	A-6
S6	0.5-1.5	16	34	27	7	---	---	---	---	---	---	---	---	58	CL	A-4
S6	2.5-3.5	7	19	17	2	100	100	100	99	79	53	33	19	10	GM-GP	A-4
S7	2.5-3.5	15	30	19	11	100	100	100	100	100	90	81	65	48	SC	A-6
S8	6.5-7	14	30	18	12	---	---	---	---	---	---	---	---	46	SC	A-6
S9	2.5-3.5	10	---	---	---	100	100	89	73	47	36	28	17	8	GM-GP	A-1-a
S9	8-20	---	27	20	7	100	100	100	100	96	78	49	22	15	SC	A-2-4
S10	0.5-1.5	13	25	21	4	---	---	---	---	---	---	---	---	35	GM-GC	A-2-4
S10	4.5-5.5	12	---Non Plastic---			100	100	100	100	70	50	38	26	14	GM	A-1a
S11	0.5-1.5	8	22	18	4	100	100	100	100	80	62	50	36	20	GM-GC	A-1-b
S11	4.5-5.5	19	24	16	8	---	---	---	---	---	---	---	---	58	CL	A-4
S11	6.5-7.5	10	---Non Plastic---			100	100	100	100	95	84	71	33	15	SM-SP	A-1-b
S12	2.5-3.5	26	33	22	11	100	100	100	100	100	100	100	98	74	CL	A-6

GRUBBS, HOSKYN, BARTON & WYATT, INC.
Consulting Engineers

SUMMARY OF CLASSIFICATION TEST RESULTS

PROJECT: AHTD 061377 - HWY 70 WIDENING - 128 to I-30 (S)
LOCATION: GARLAND AND SALINE COUNTIES, ARKANSAS
JOB NUMBER: 13-203

BORING/TEST PIT No.	SAMPLE DEPTH (ft)	WATER CONTENT (%)	ATTERBERG LIMITS			SIEVE ANALYSIS PERCENT PASSING									UNIFIED CLASS.	AASHTO CLASS.
			LIQUID LIMIT	**PLASTIC LIMIT**	**PLASTICITY INDEX**	**3 in.**	**2 in.**	**1 in.**	**3/4 in.**	**3/8 in.**	**#4**	**#10**	**#40**	**#200**		
S14	4.5-5.5	18	33	24	9	---	---	---	---	---	---	---	---	---	SHALE	
S15	2.5-3.5	22	33	21	12	100	100	100	100	100	100	99	96	74	CL	A-6
S16	4.5-5.5	21	46	20	26	100	100	94	94	91	89	85	77	68	CL	A-7-6
S16	6.5-7.5	13	36	20	16	----	----	----	----	----	----	----	----	----	CL	A-6
CS1	4-5	50	78	48	30	---	---	---	---	---	---	---	---	96	MH	A-7-5
CS1	9-10	41	51	42	9	---	---	---	---	---	---	---	---	89	MH	A-5
CS4	2.5-3	12	35	26	9	---	---	---	---	---	---	---	---	---	SHALE	
CS4A	2.5-3.5	15	36	26	10	---	---	---	---	---	---	---	---	---	SHALE	
CS5	2.5-2.7	8	---Non Plastic---			---	---	---	---	---	---	---	---	---	SHALE	
CS6A	2-2.3	12	32	25	7	---	---	---	---	---	---	---	---	---	SHALE	
CS10	0.5-1.5	20	38	27	11	---	---	---	---	---	---	---	---	57	CL	A-6
CS13	4.5-5.5	22	44	26	18	---	---	---	---	---	---	---	---	---	SHALE	
CS18	0.5-1.5	20	37	21	16	---	---	---	---	---	---	---	---	58	CL	A-6
CS18	4-4.5	18	40	21	19	---	---	---	---	---	---	---	---	47	SC	A-6

SUMMARY OF CLASSIFICATION TEST RESULTS

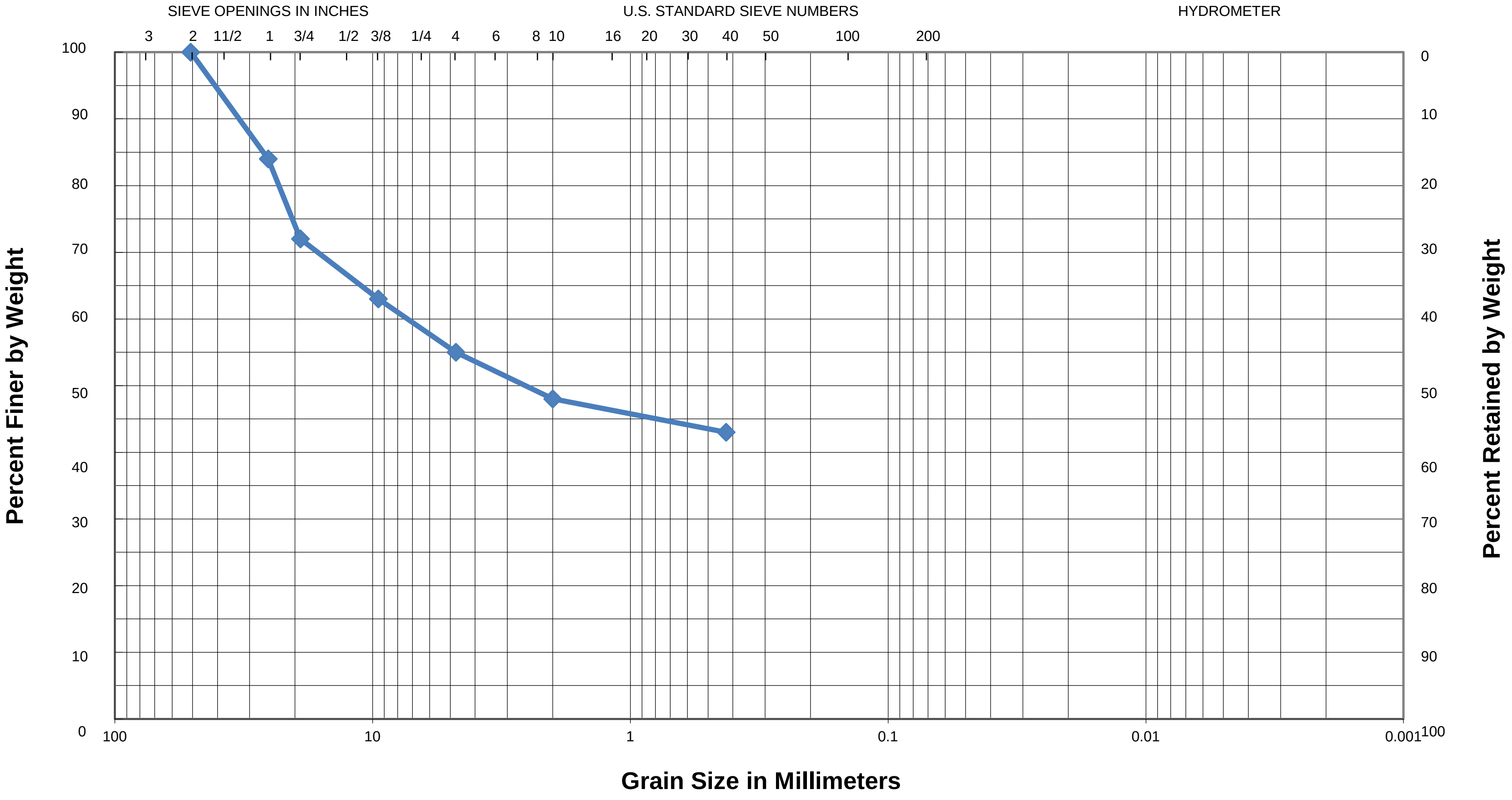
PROJECT: AHTD 061377 - HWY 70 WIDENING - 128 to I-30 (S)
LOCATION: GARLAND AND SALINE COUNTIES, ARKANSAS
JOB NUMBER: 13-203

BORING/TEST PIT No.	SAMPLE DEPTH (ft)	WATER CONTENT (%)	ATTERBERG LIMITS			SIEVE ANALYSIS PERCENT PASSING									UNIFIED CLASS.	AASHTO CLASS.
			LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	3 in.	2 in.	1 in.	3/4 in.	3/8 in.	#4	#10	#40	#200		
CS23	2.5-3	19	38	25	13	---	---	---	---	---	---	---	---	---	SHALE	
CS23	14-15	9	33	22	11	---	---	---	---	---	---	---	---	---	SHALE	

13-203

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

Sample: TP-59, 0.5-1.5 ft
Atterberg Limits: LL = 61, PL = 33, PI = 28

Desciption: Tan and reddish tan silty CLAY w/ shale fragments (fill)
Classification**: USCS = GC; AASHTO = A-7-5**

13-203

GRAIN SIZE CURVE

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

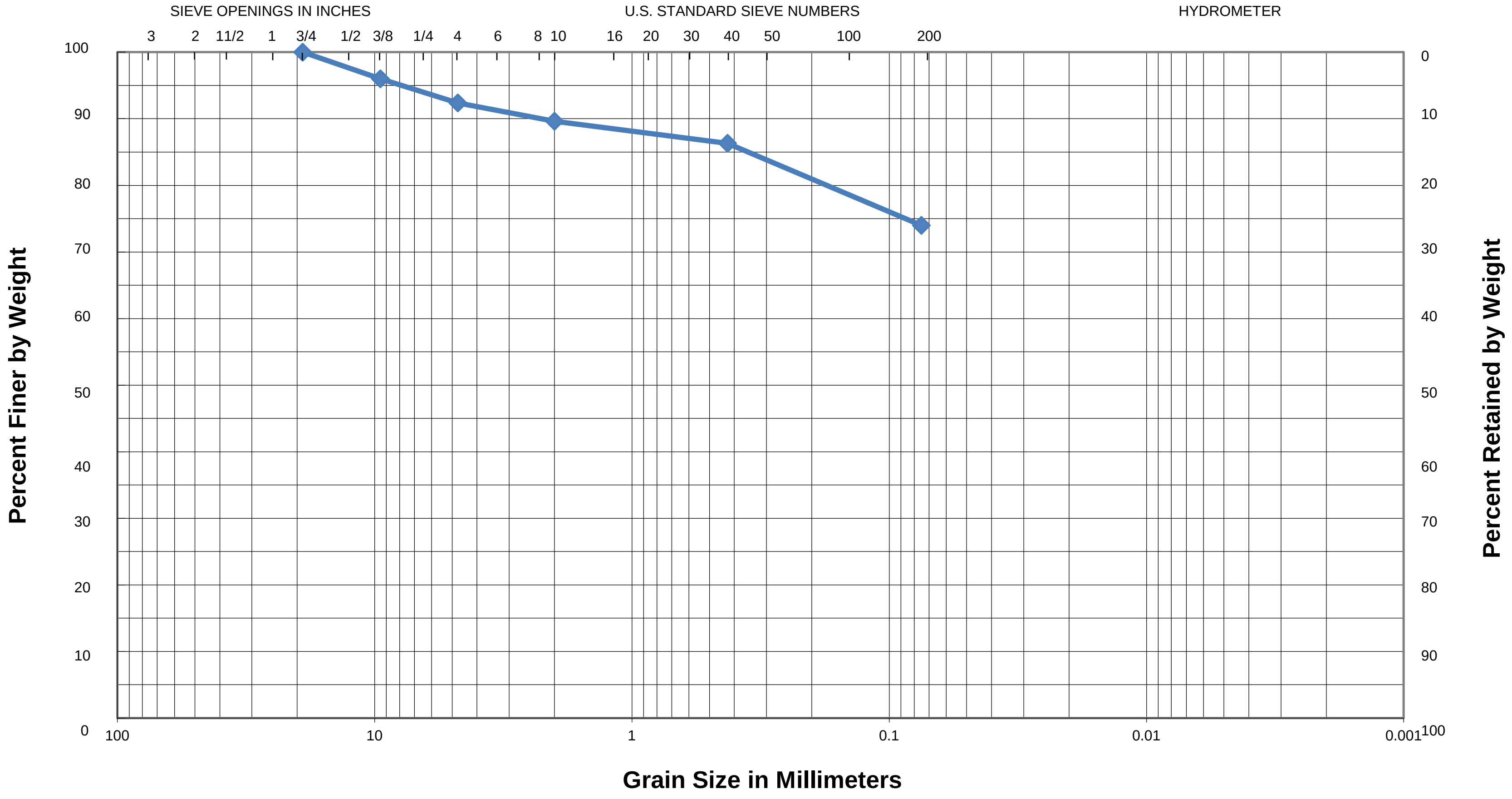
Sample: TP-60, 0.5-1.5 ft
Atterberg Limits: LL = 43, PL = 27, PI = 16

Desciption: Gray, reddish tan and tan highly weathered SHALE
Classification: **USCS = GC; AASHTO = A-7-6**

13-203

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

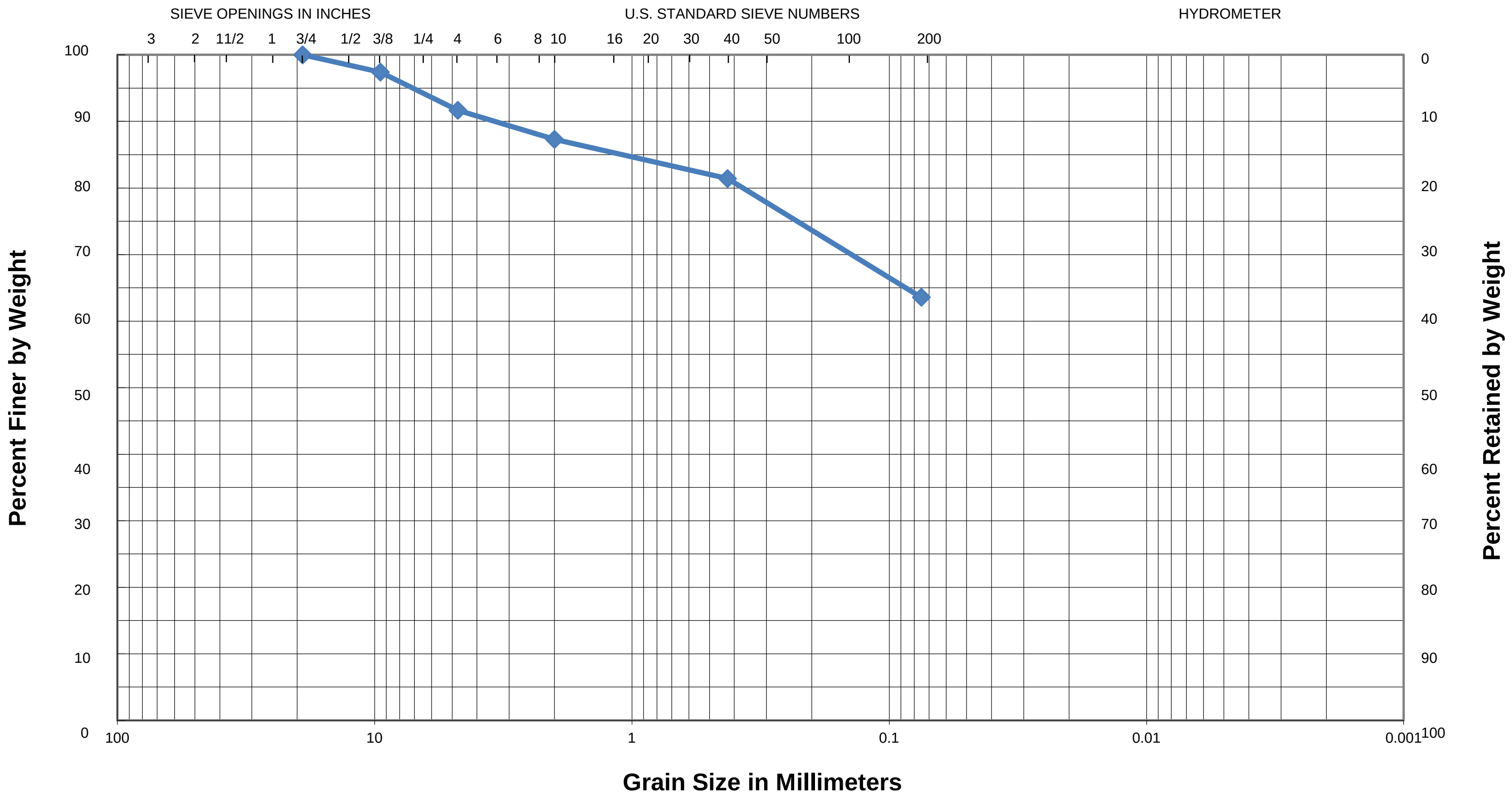
Sample: TP-62, 0.5-1.5 ft
Atterberg Limits: LL = 55, PL = 28, PI = 27

Desciption: Reddish tan adn tan CLAY w/ shale fragments
Classification: **USCS = CH; AASHTO = A-7-6**

13-203

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

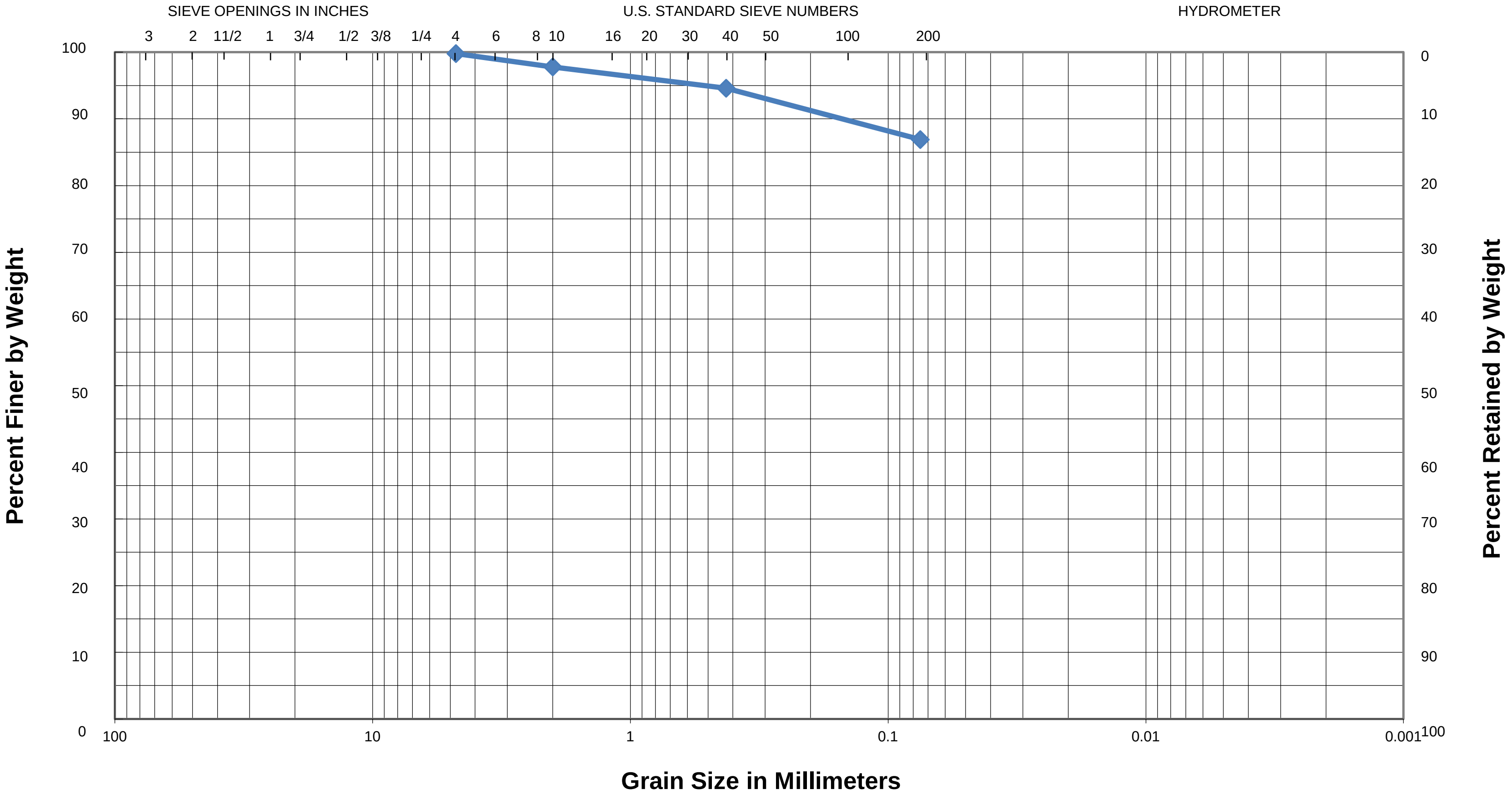
Sample: TP-64, 0.5-1.5 ft
Atterberg Limits: LL = 41, PL = 24, PI = 17

Desciption: Reddish tan and tan silty CLAY w/ shale and sandstone fragments (fill)
Classification: **USCS = CL; AASHTO = A-7-6**

13-203

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

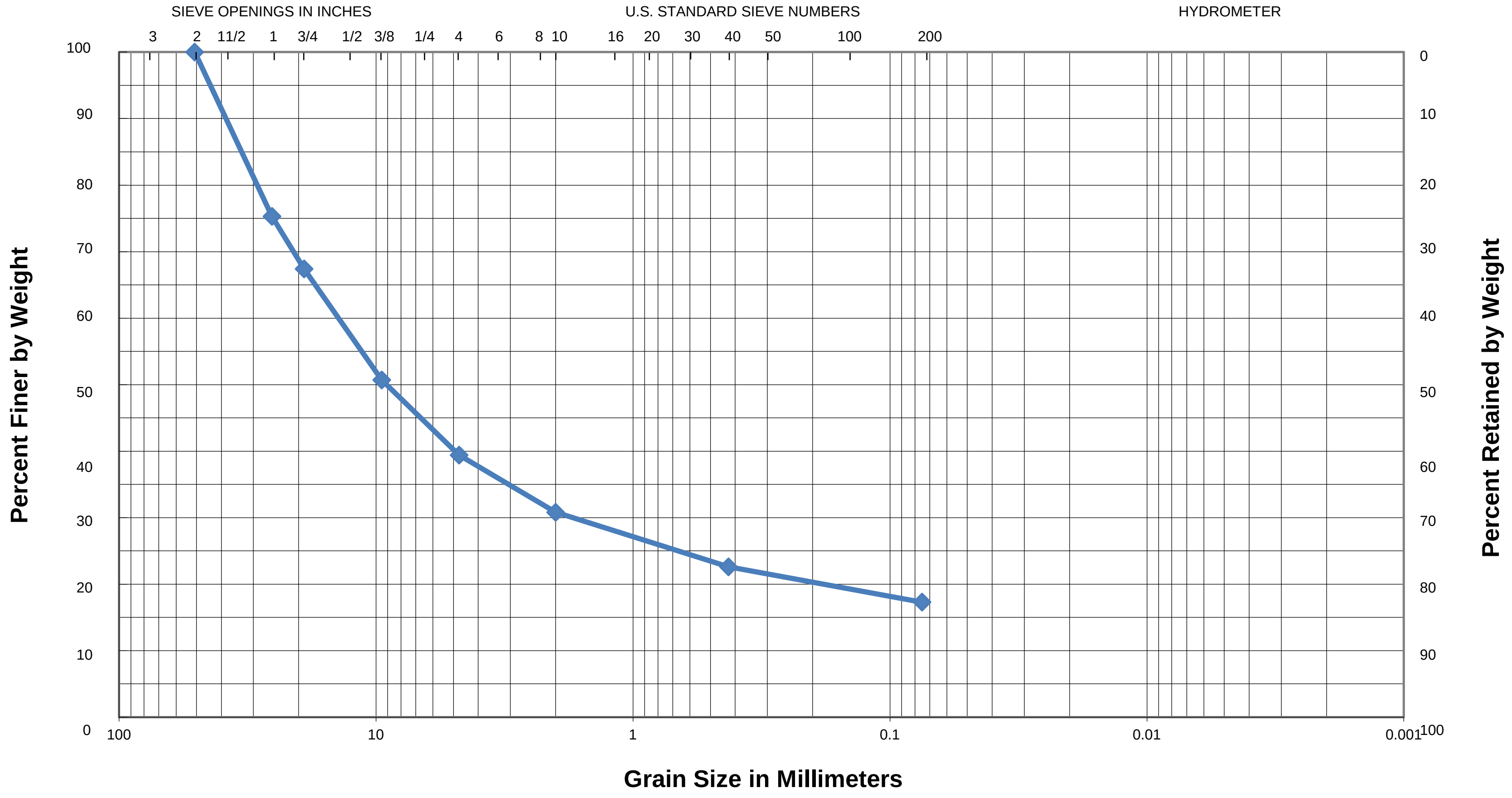
Sample: TP-65, 0.5-1.5 ft
Atterberg Limits: LL = 39, PL = 25, PI = 14

Desciption: reddish tan and tan silty CLAY w/ shale fragments & organics
Classification: **USCS = CL; AASHTO = A-6**

13-203

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

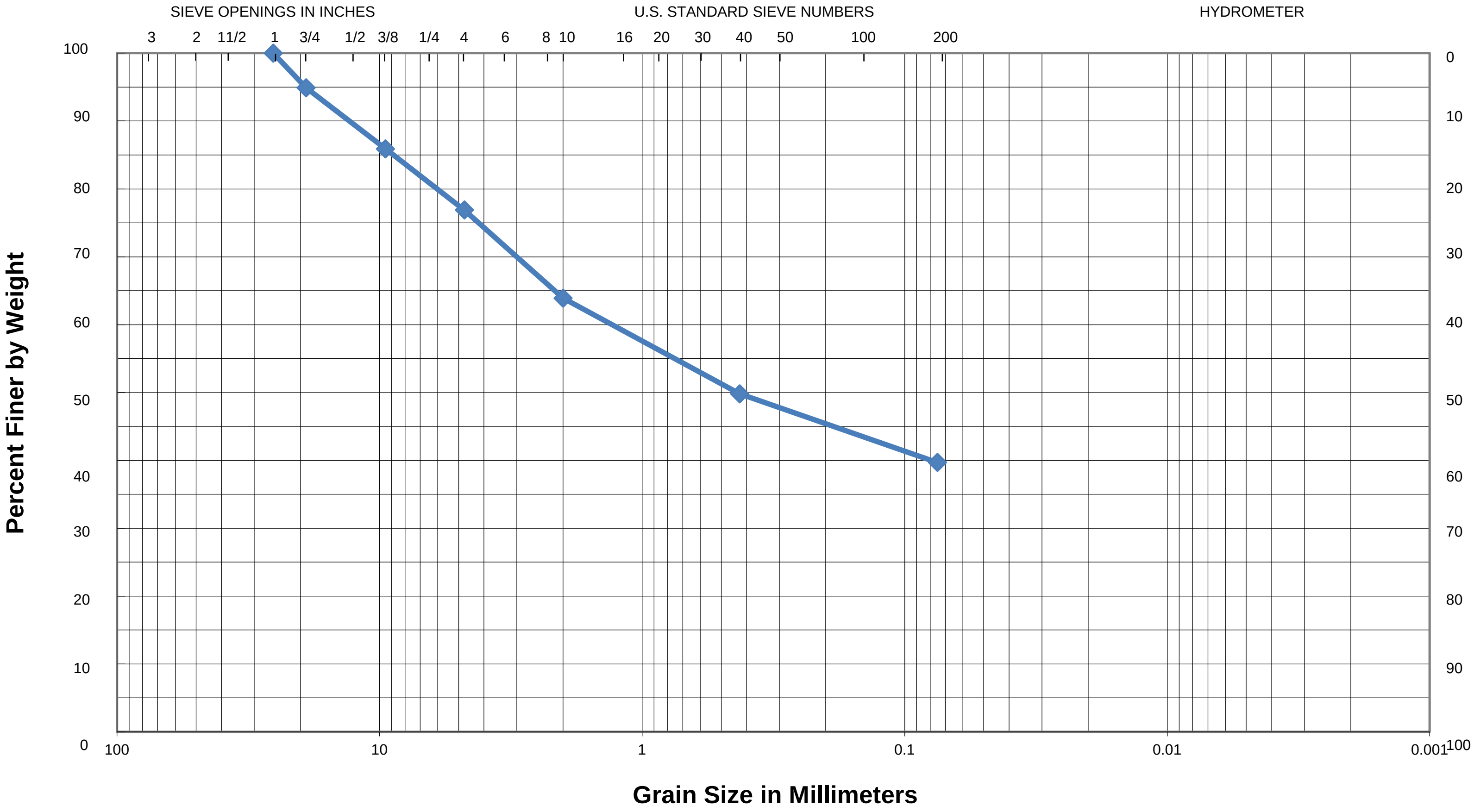
Sample: TP-66, 2-3 ft
Atterberg Limits: LL = 42, PL = 27, PI = 15

Desciption: Gray silty clay with shale fragments and ferrous nodules
Classification: **USCS = GC; AASHTO = A-2-7**

13-203

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

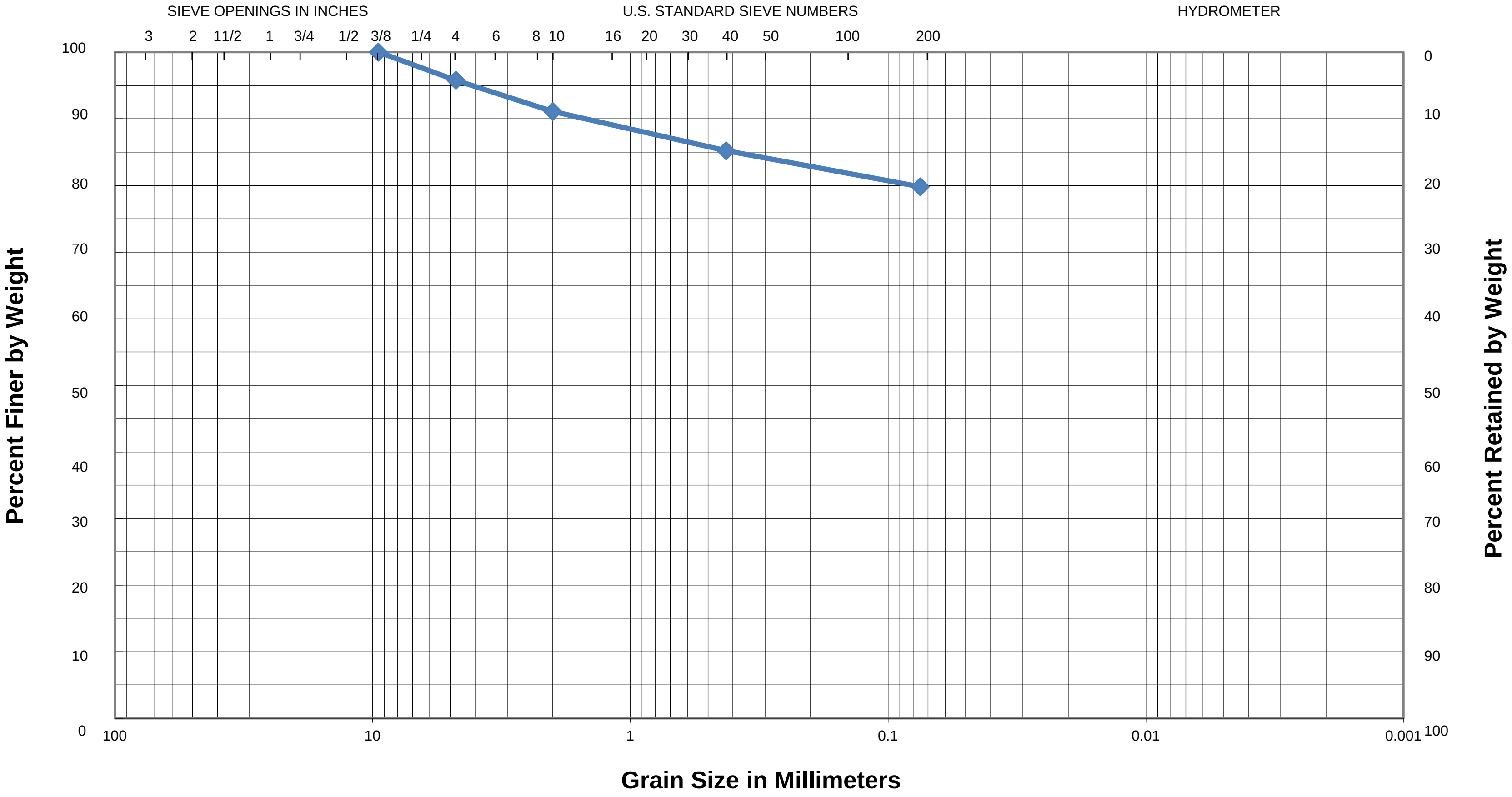


GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

Sample: TP-66, 3-4 ft
Atterberg Limits: LL = 25, PL = 18, PI = 7

Desciption: Gray silty clay with shale fragments and ferrous nodules
Classification: **USCS = GC-GM; AASHTO = A-2-4**

GRAIN SIZE CURVE



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

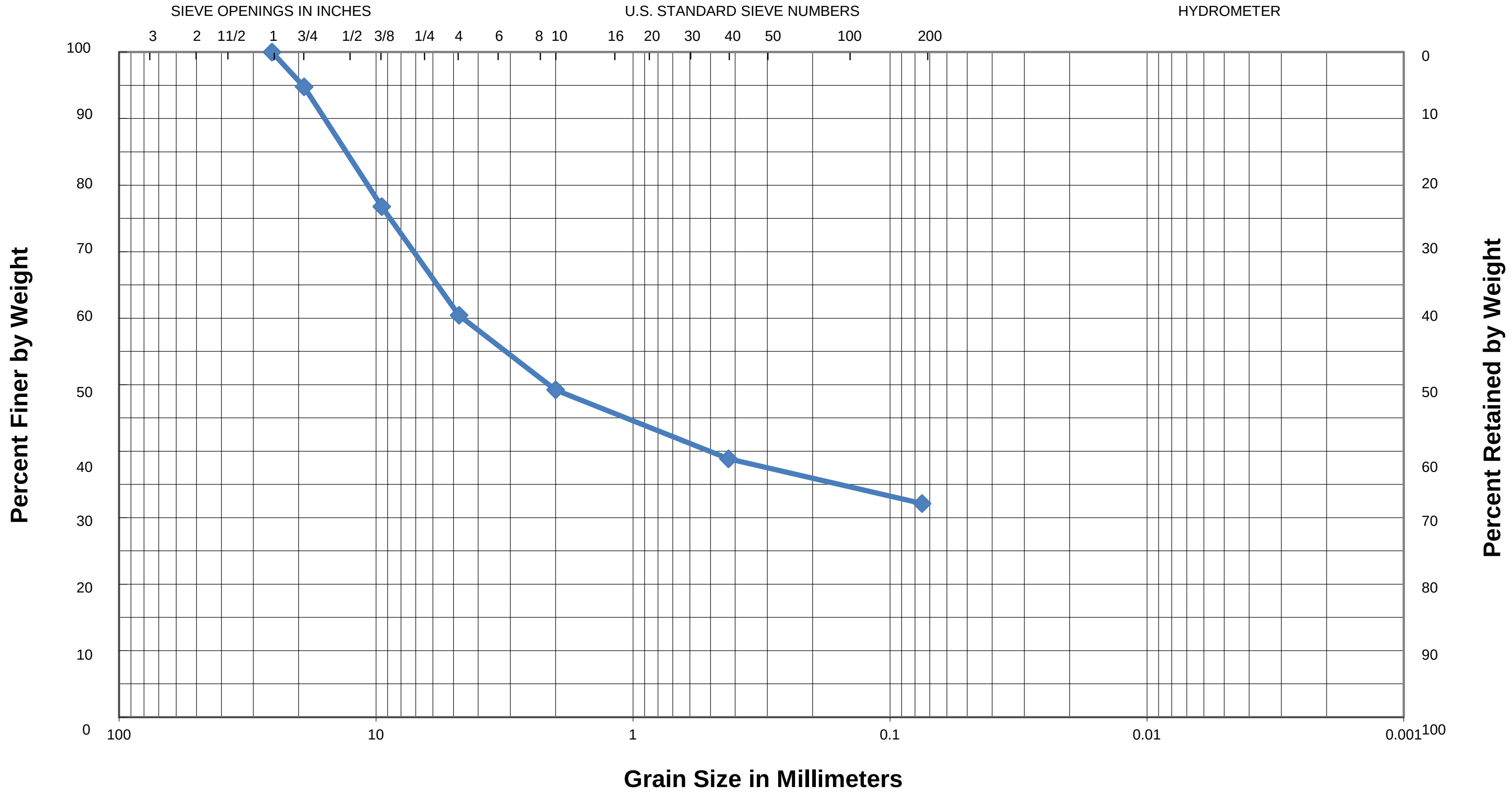
Sample: TP-68, 0.5-1.5 ft
Atterberg Limits: LL = 68, PL = 24, PI = 44

Desciption: Tan and reddish tan CLAY w/ shale, sandstone and quartz fragments and a few organics
Classification: **USCS = CH; AASHTO = A-7-6**

13-203

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

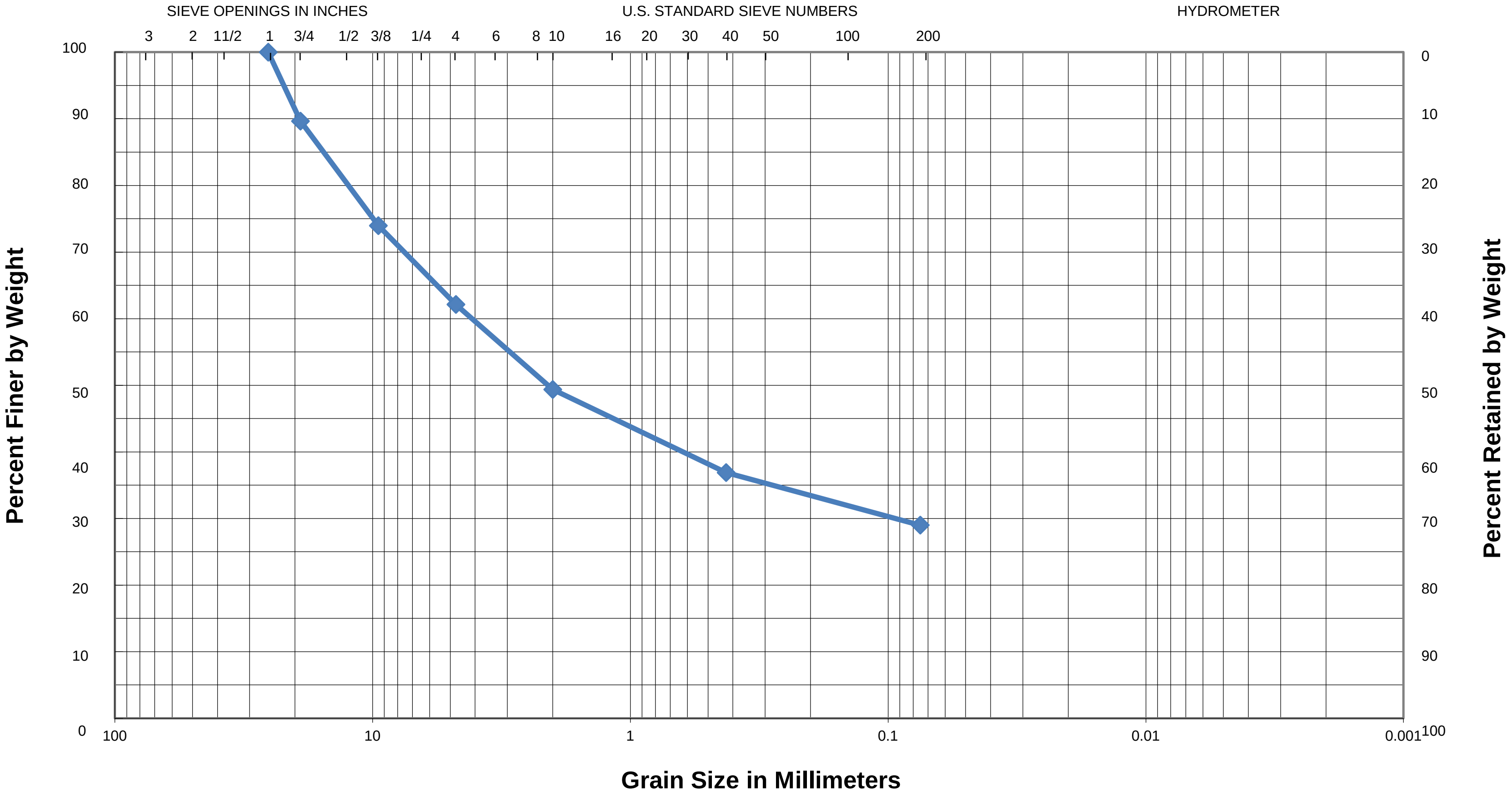
Sample: TP-73, 0.5-1.5 ft
Atterberg Limits: LL = 45, PL = 27, PI = 18

Desciption: Gray and tan silty clay with shale fragments and seams
Classification**: USCS = GC; AASHTO = A-2-7**

13-203

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

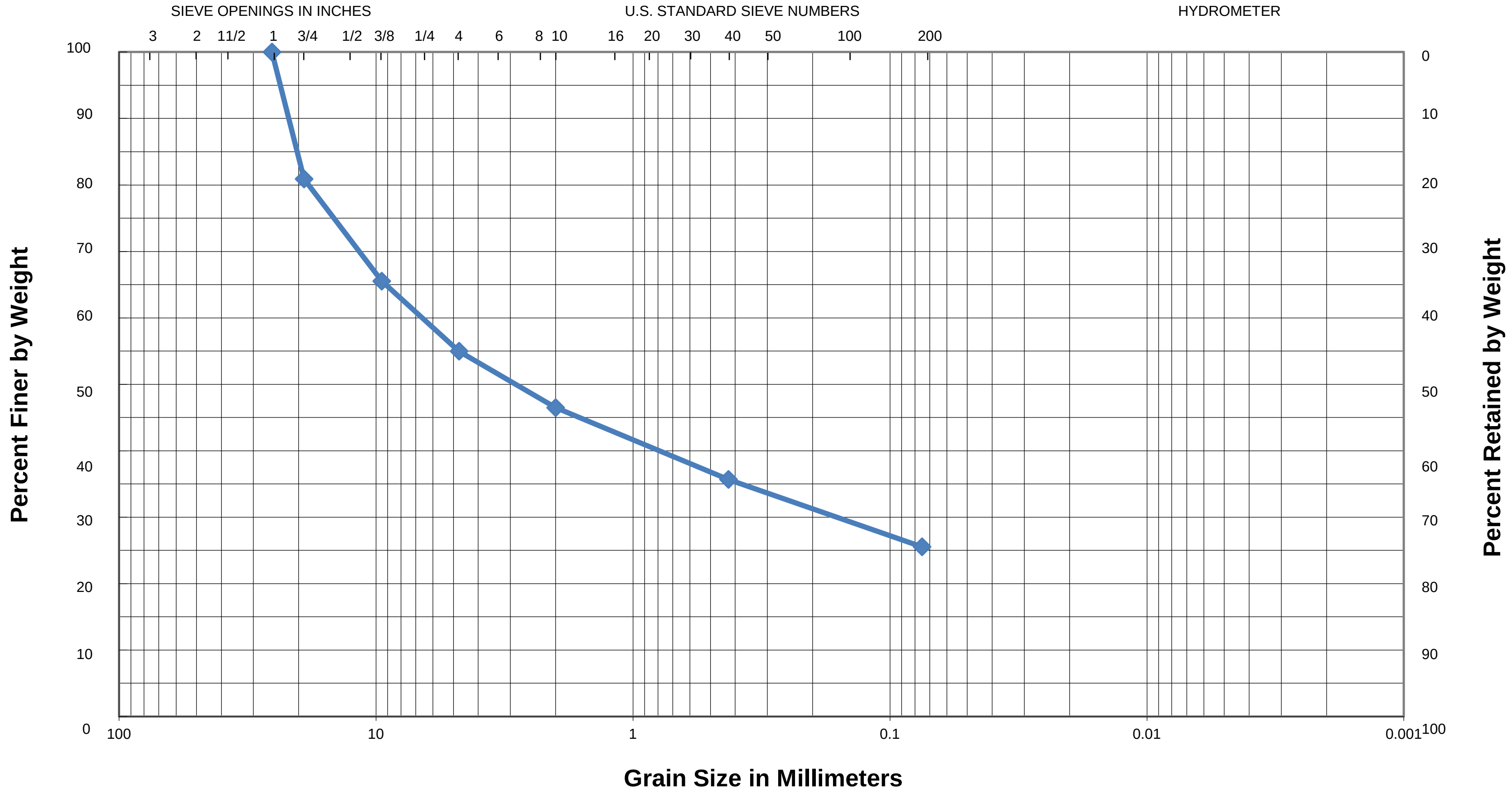
Sample: TP-74, 0.5-1.5 ft
Atterberg Limits: LL = 51, PL = 30, PI = 21

Desciption: Gray and tan clay with numerous shale fragments and seams
Classification**: USCS = GC; AASHTO = A-2-7**

13-203

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

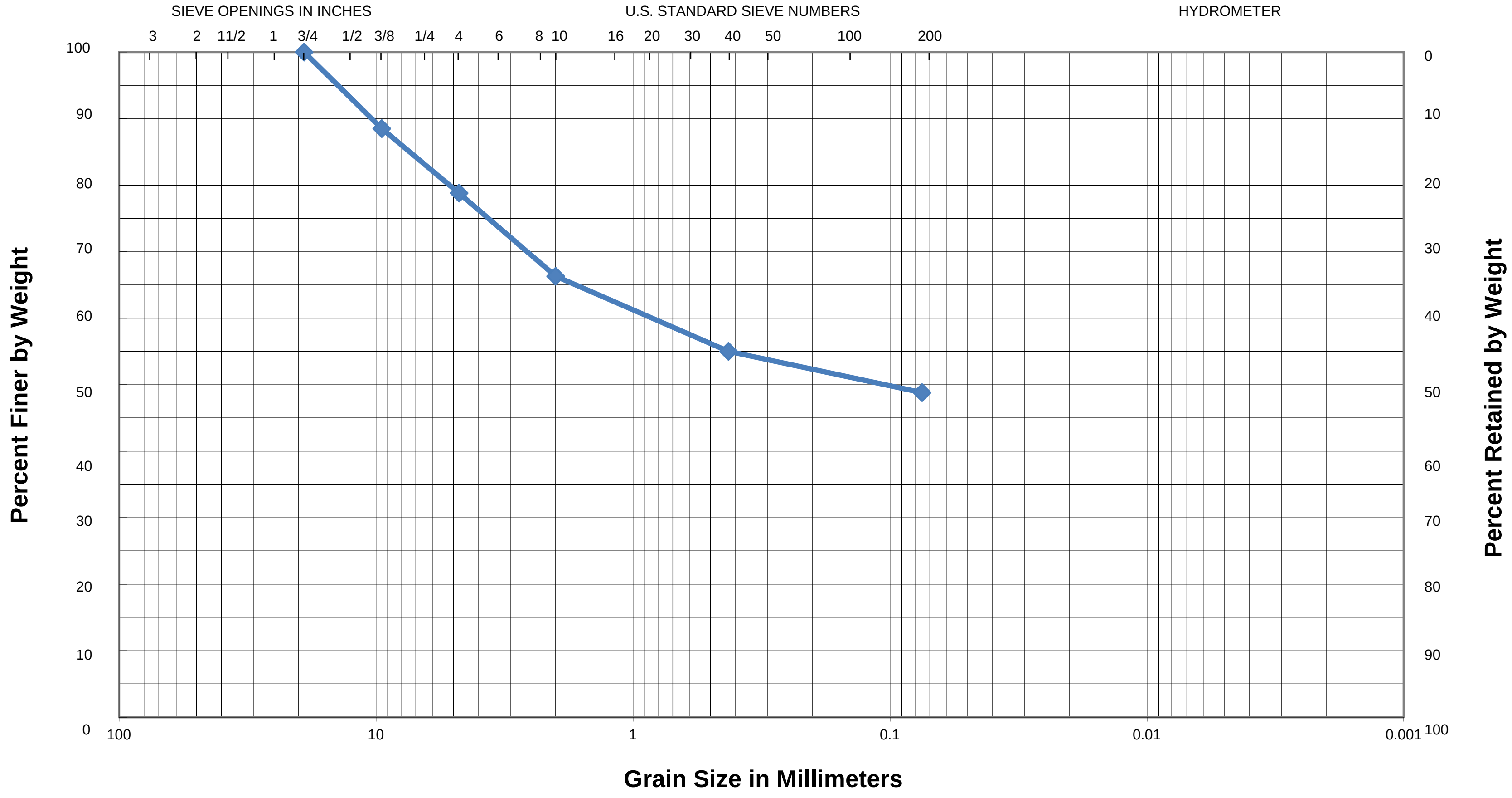
Sample: TP-75, 0.5-1.5 ft
Atterberg Limits: LL = 44, PL = 29, PI = 15

Desciption: Gray and tan silty clay with numerous shale fragments and quartz gravel
Classification: **USCS = GC; AASHTO = A-2-7**

13-203

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

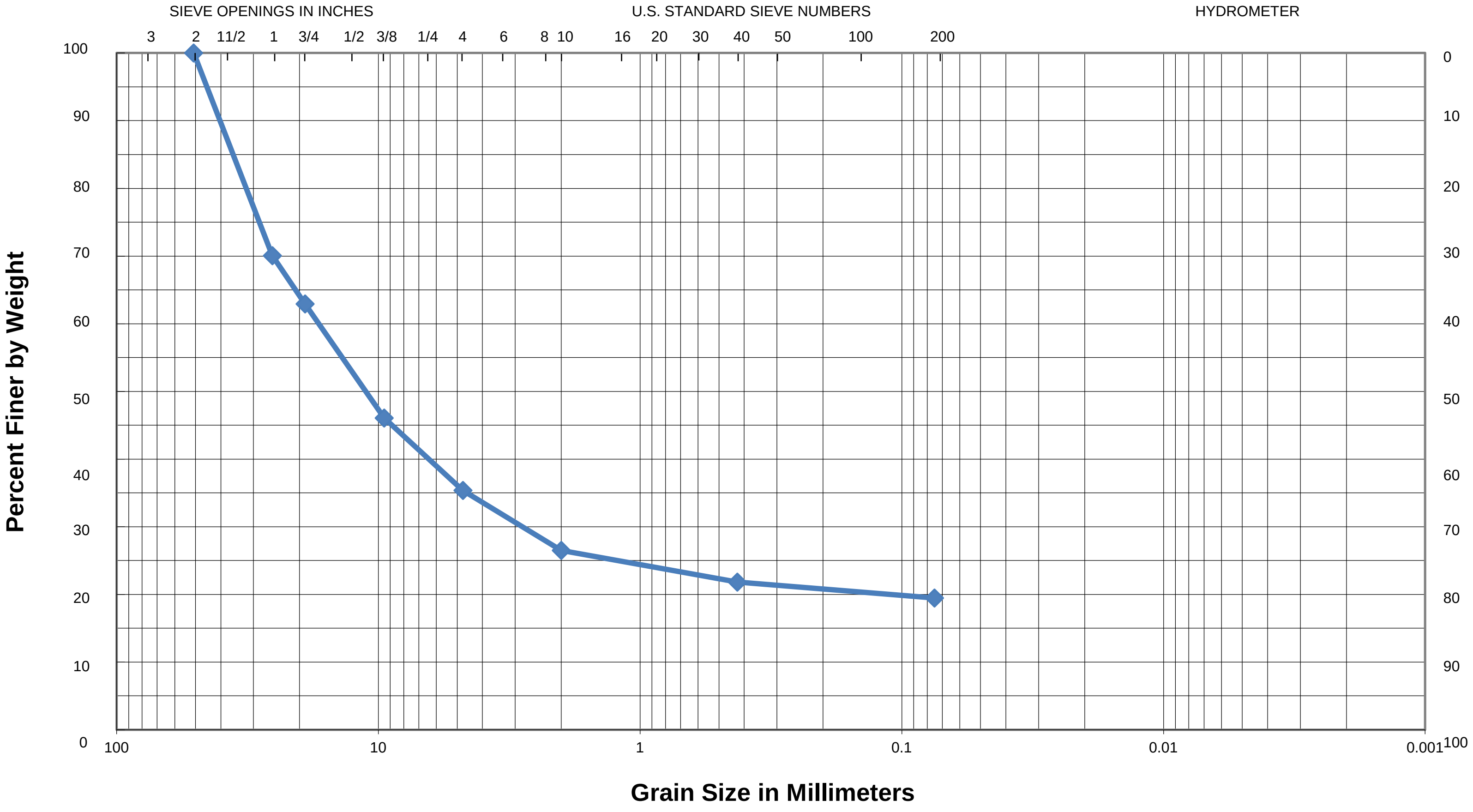
Sample: TP-77, 0.5-1.5 ft
Atterberg Limits: LL = 45, PL = 24, PI = 21

Desciption: Tan silty CLAY with sandstone fragments
Classification: **USCS = SC; AASHTO = A-7-6**

13-203

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

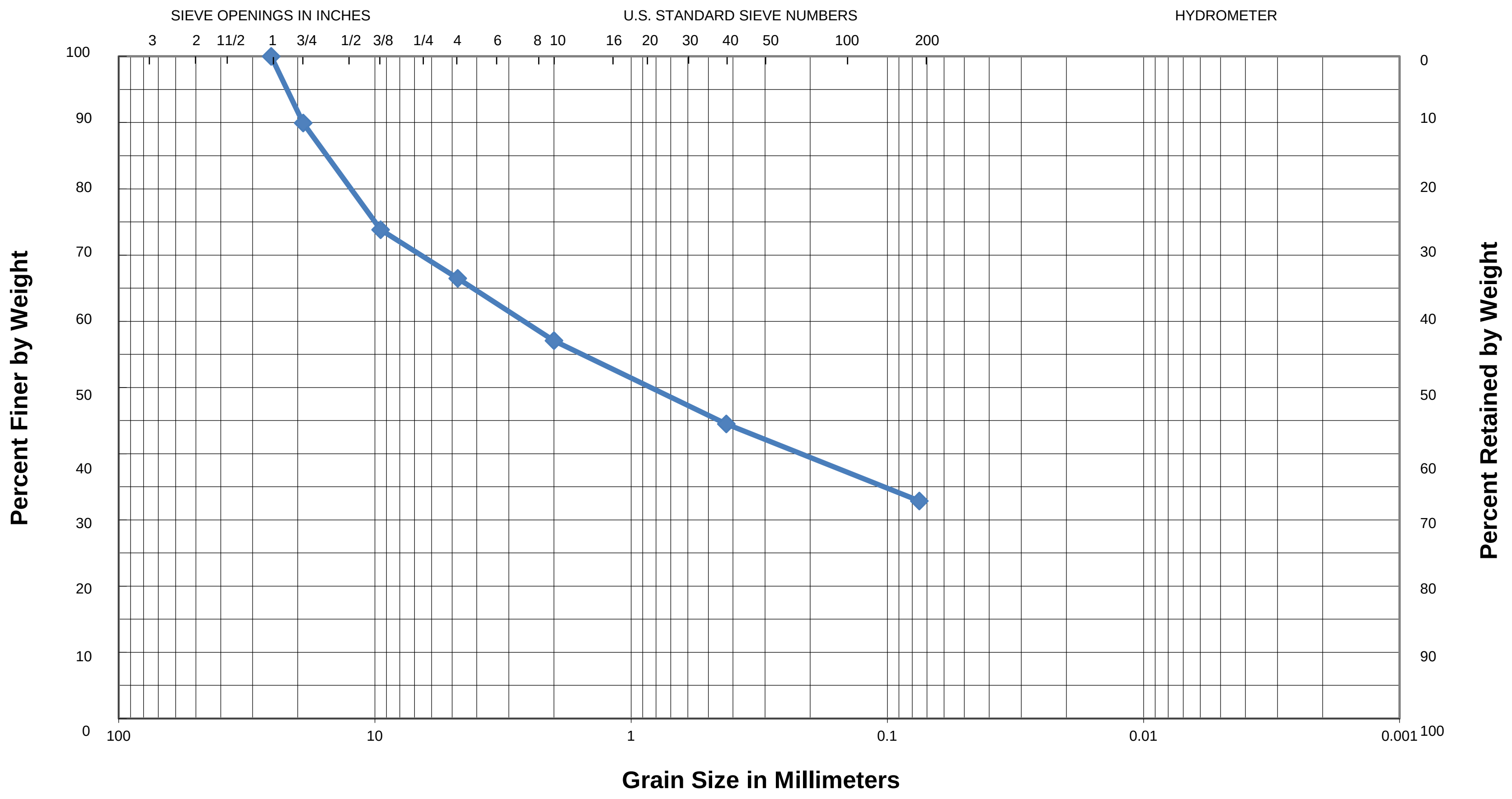
Sample: TP-78, 0.5-1.5 ft
Atterberg Limits: LL = 62, PL = 29, PI = 33

Desciption: Tan and reddish tan clayey fine to coarse gravel
Classification**: USCS = GC; AASHTO = A-2-7**

13-203

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

Sample: TP-79, 0.5-1.5 ft
Atterberg Limits: LL = 40, PL = 26, PI = 14

Desciption: Tan, gray and reddish tan silty CLAY with shale fragments, and occasional quartz gravel (fill)
Classification: **USCS = GC; AASHTO = A-2-6**

13-203

GRAIN SIZE CURVE

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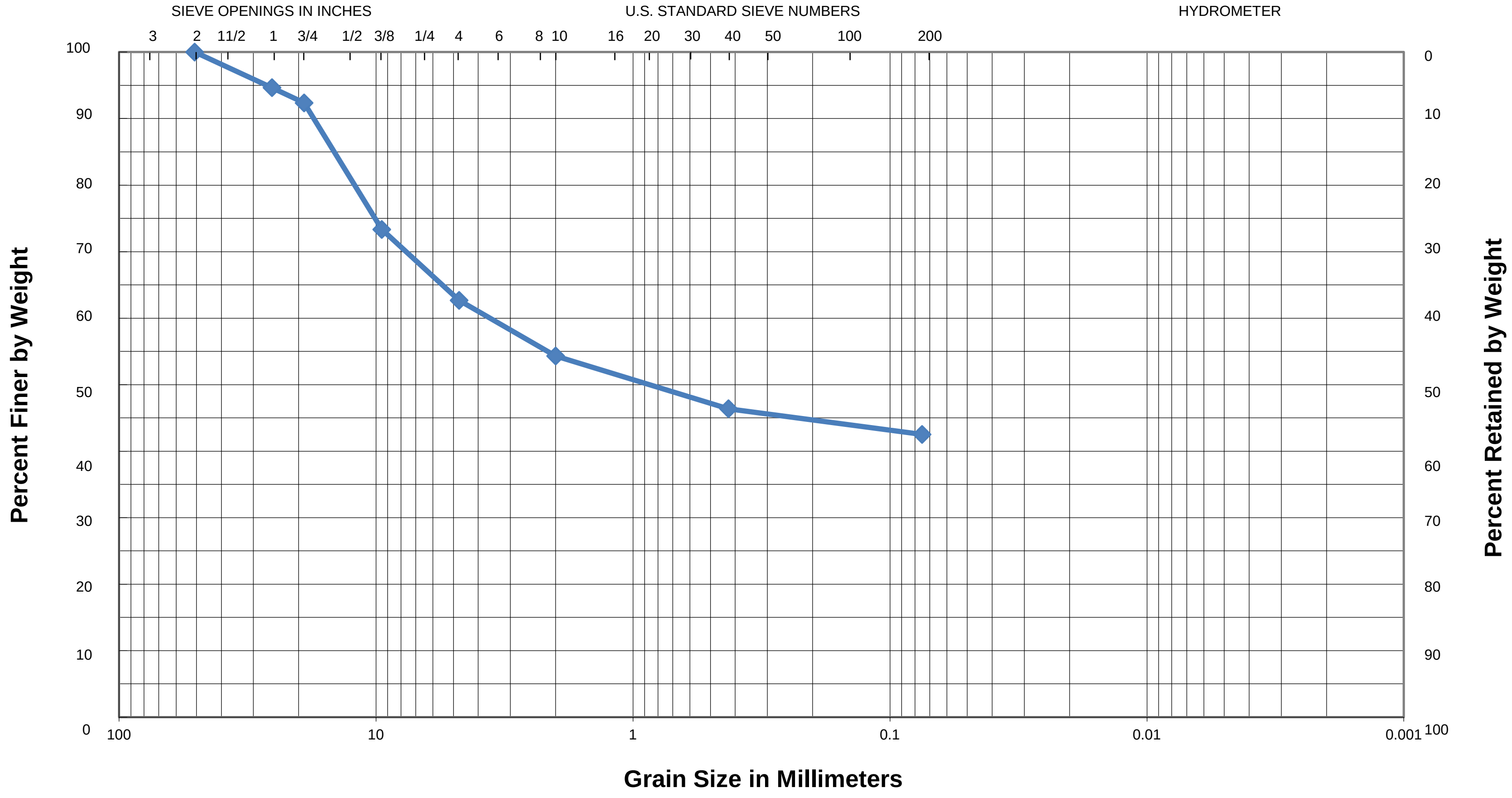
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

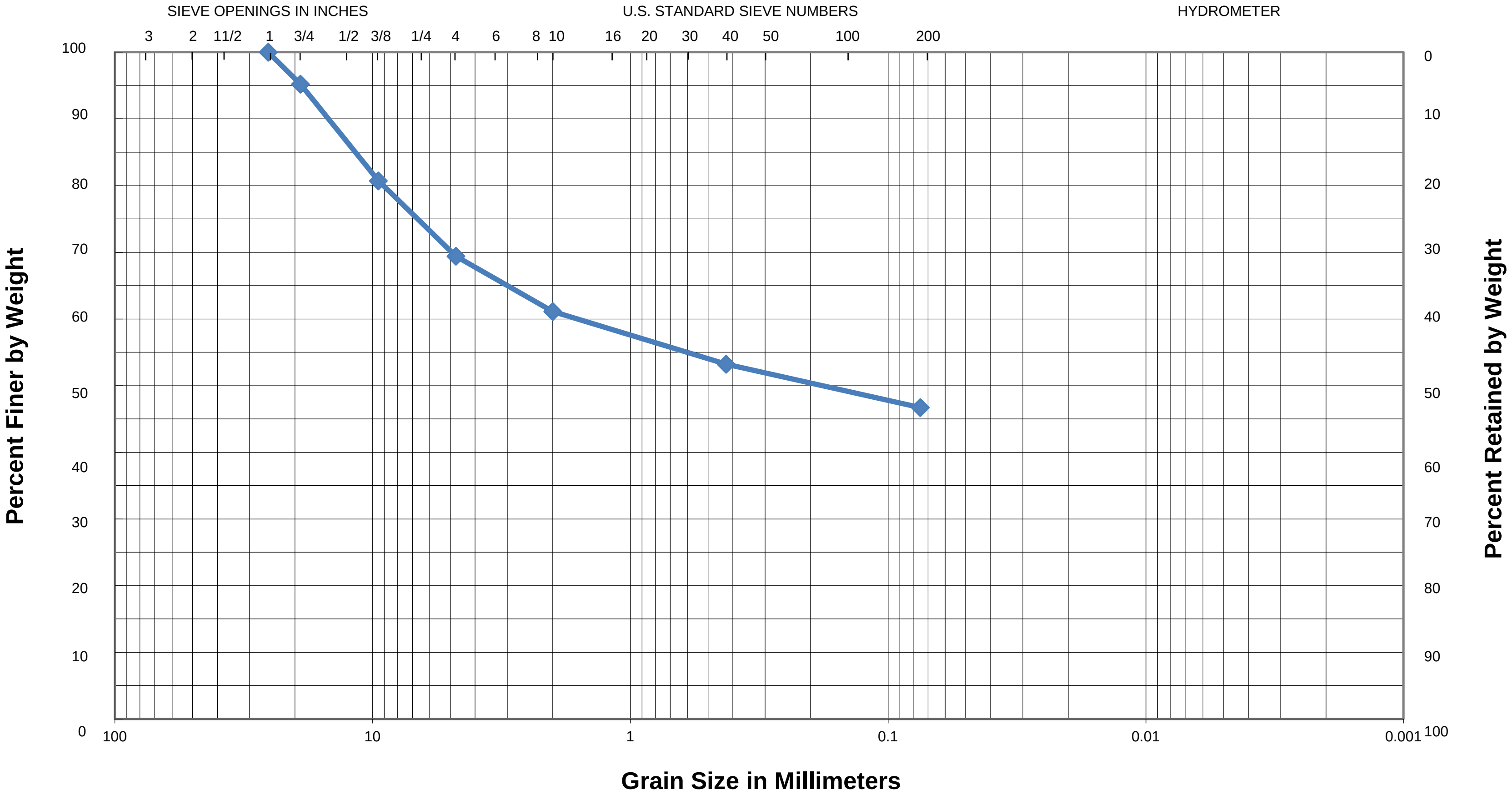
Sample: TP-80, 0.5-1.5 ft
Atterberg Limits: LL = 70, PL = 34, PI = 36

Desciption: Tan and reddish tan CLAY w/ shale fragments
and occasional quartz gravel
Classification: **USCS = GC; AASHTO = A-7-6**

13-203

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

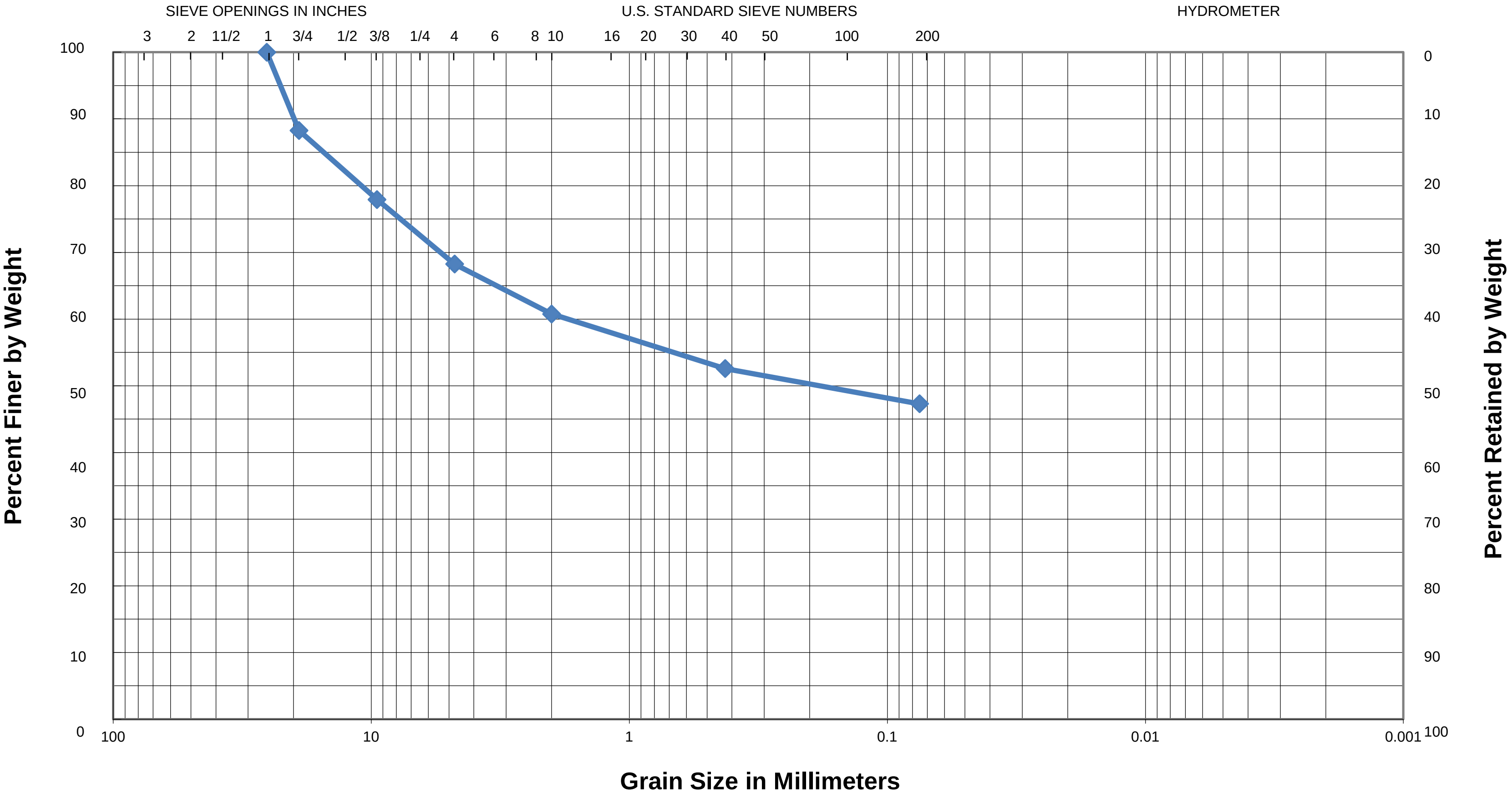
Sample: B-82, 0.5-1.5 ft
Atterberg Limits: LL = 43, PL = 25, PI = 18

Desciption: Tan and gray silty CLAY w/ quartz and shale fragments
Classification: **USCS = GC; AASHTO = A-7-6**

13-203

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

Sample: TP-83, 0.5-1.5 ft
Atterberg Limits: LL = 41, PL = 24, PI = 17

Desciption: Tan and reddish tan silty CLAY with shale fragments (fill)
Classification: **USCS = GC; AASHTO = A-7-6**

13-203

GRAIN SIZE CURVE

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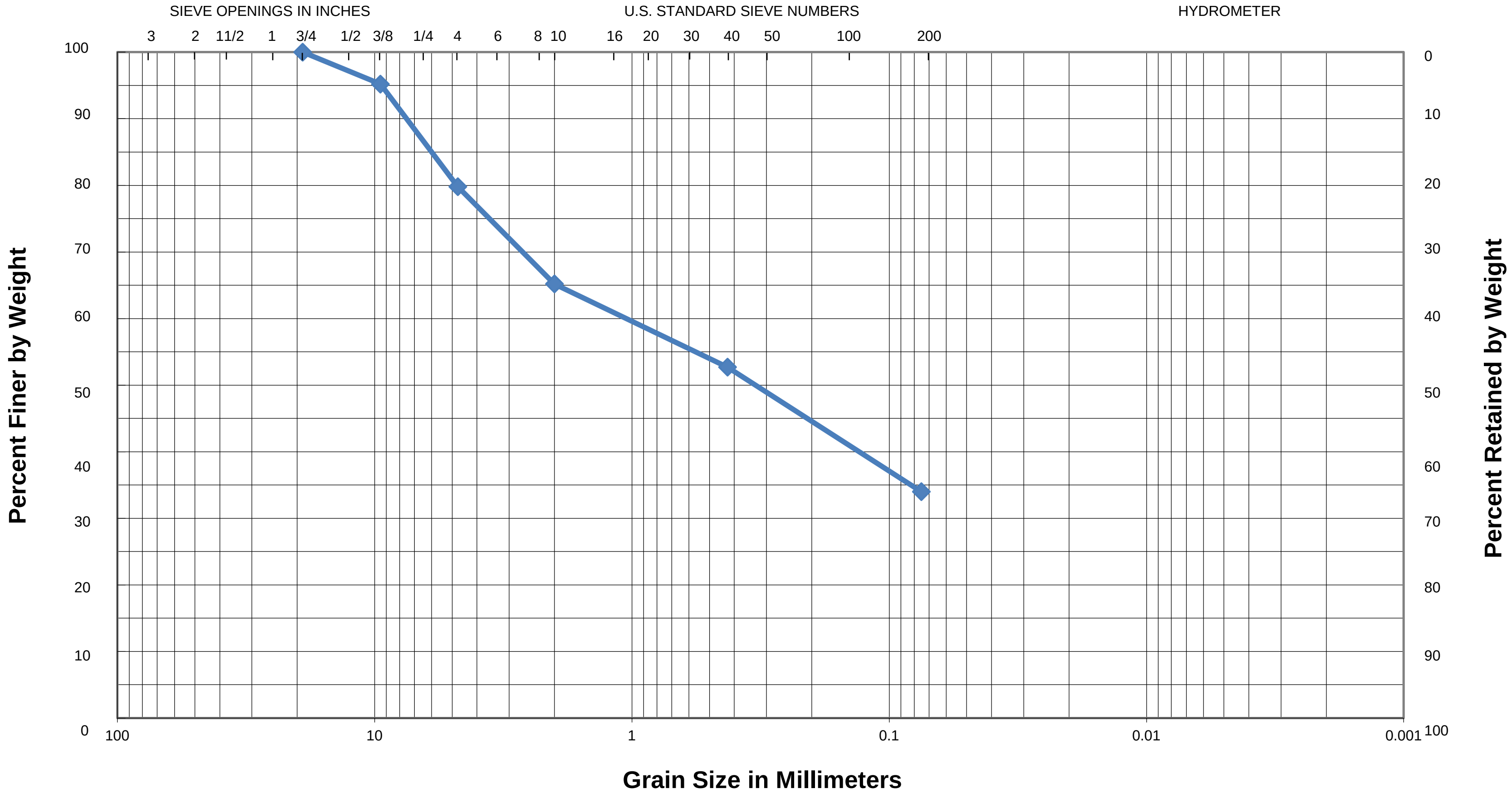

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

Sample: B-84, 0.5-1.5 ft
Atterberg Limits: LL = 25, PL = 19, PI = 6

Desciption: Tan CLAYEY SILT with fine gravel
Classification**: USCS = GC; AASHTO = A-2-4**

13-203

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
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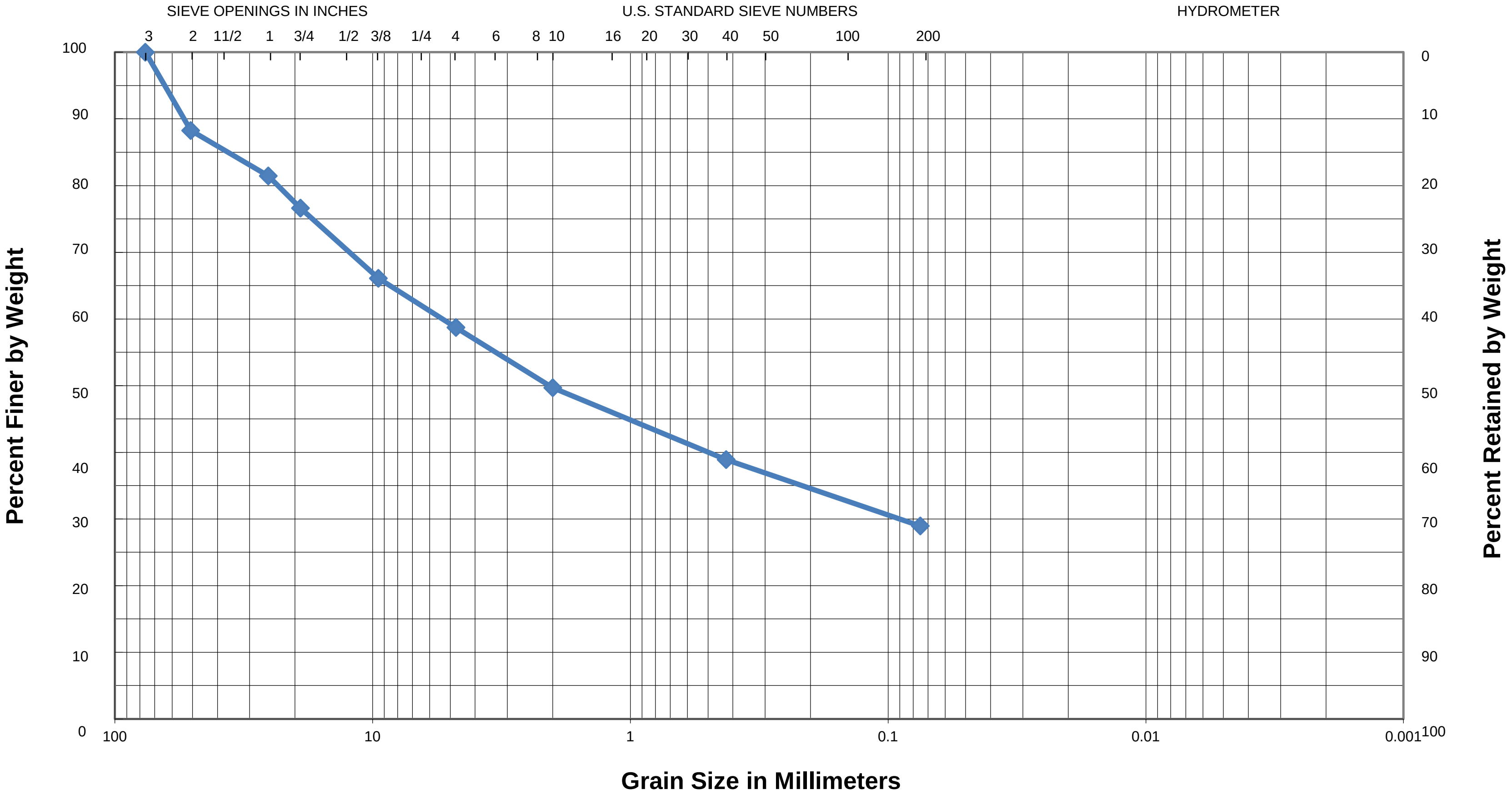


GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

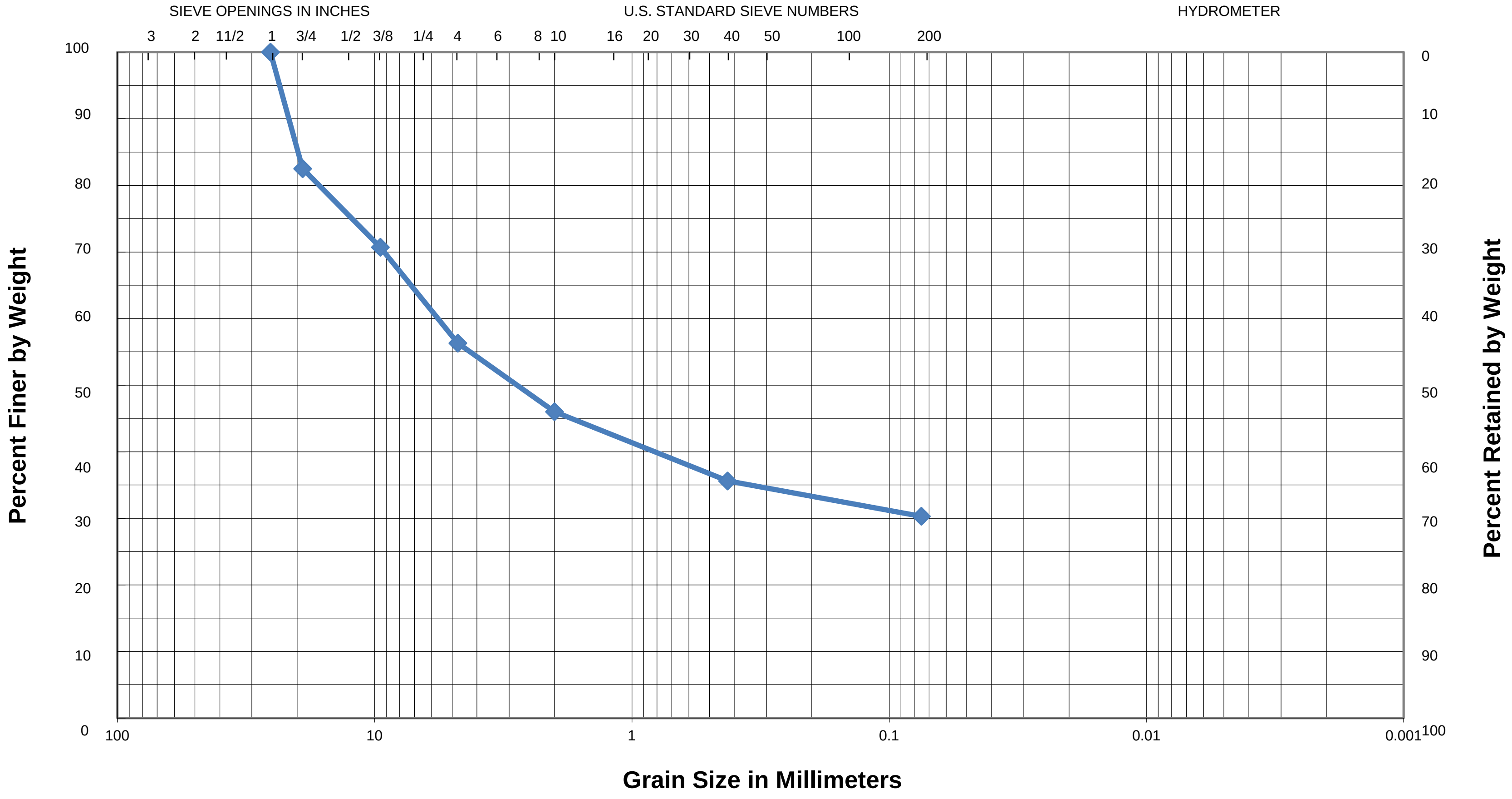
Sample: TP-87, 0.5-1.5 ft
Atterberg Limits: LL = 41, PL = 25, PI = 16

Desciption: Gray and tan silty clay with shale and sandstone fragments (fill)
Classification**: USCS = GC; AASHTO = A-2-6**

13-203

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

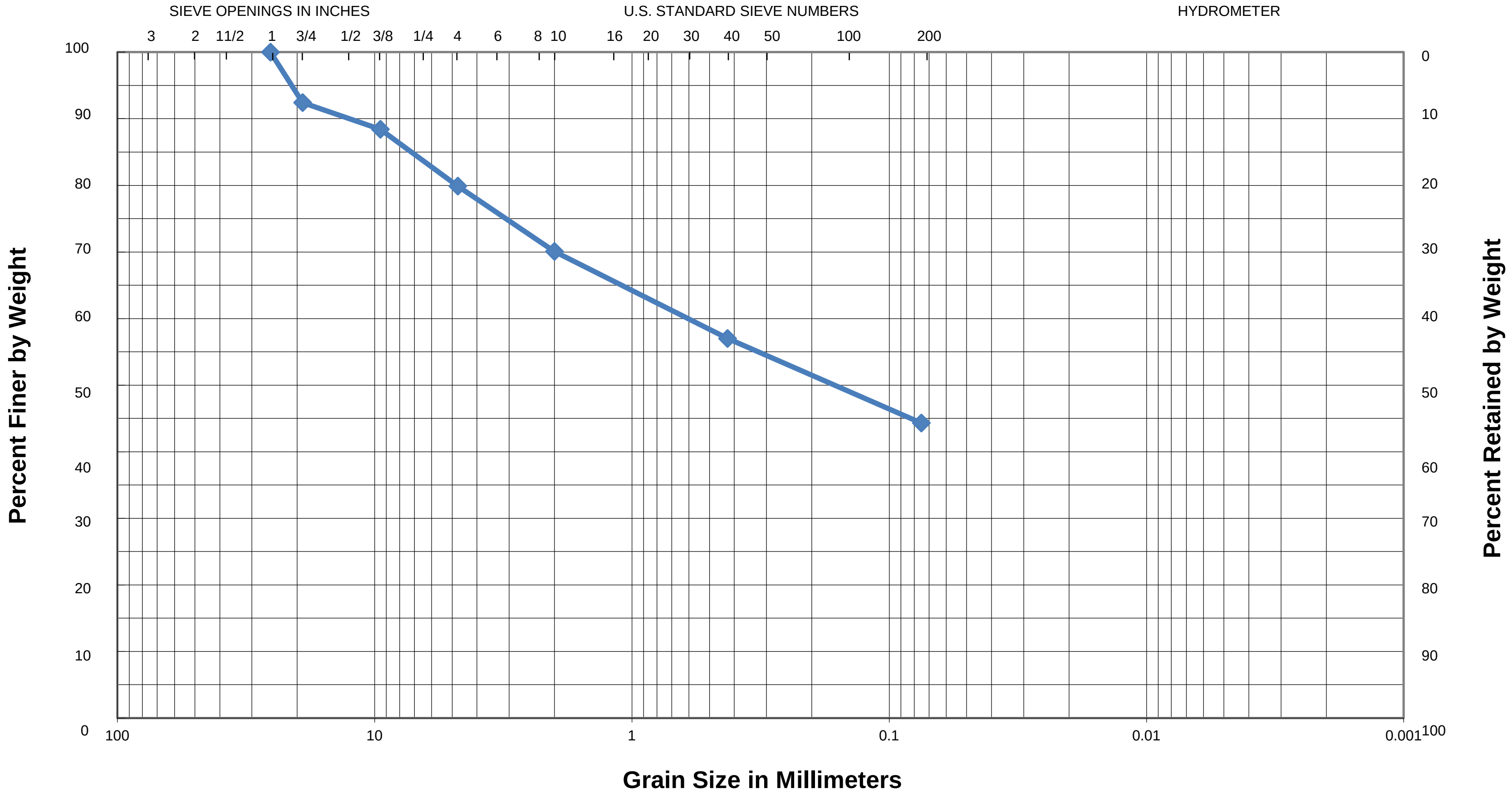
Sample: Boring 90, 2.5-3.5 ft
Atterberg Limits: LL = 34, PL = 25, PI = 9

Desciption: Tan and gray silty clay with shale fragments (fill)
Classification: **USCS = GC; AASHTO = A-2-4**

13-203

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

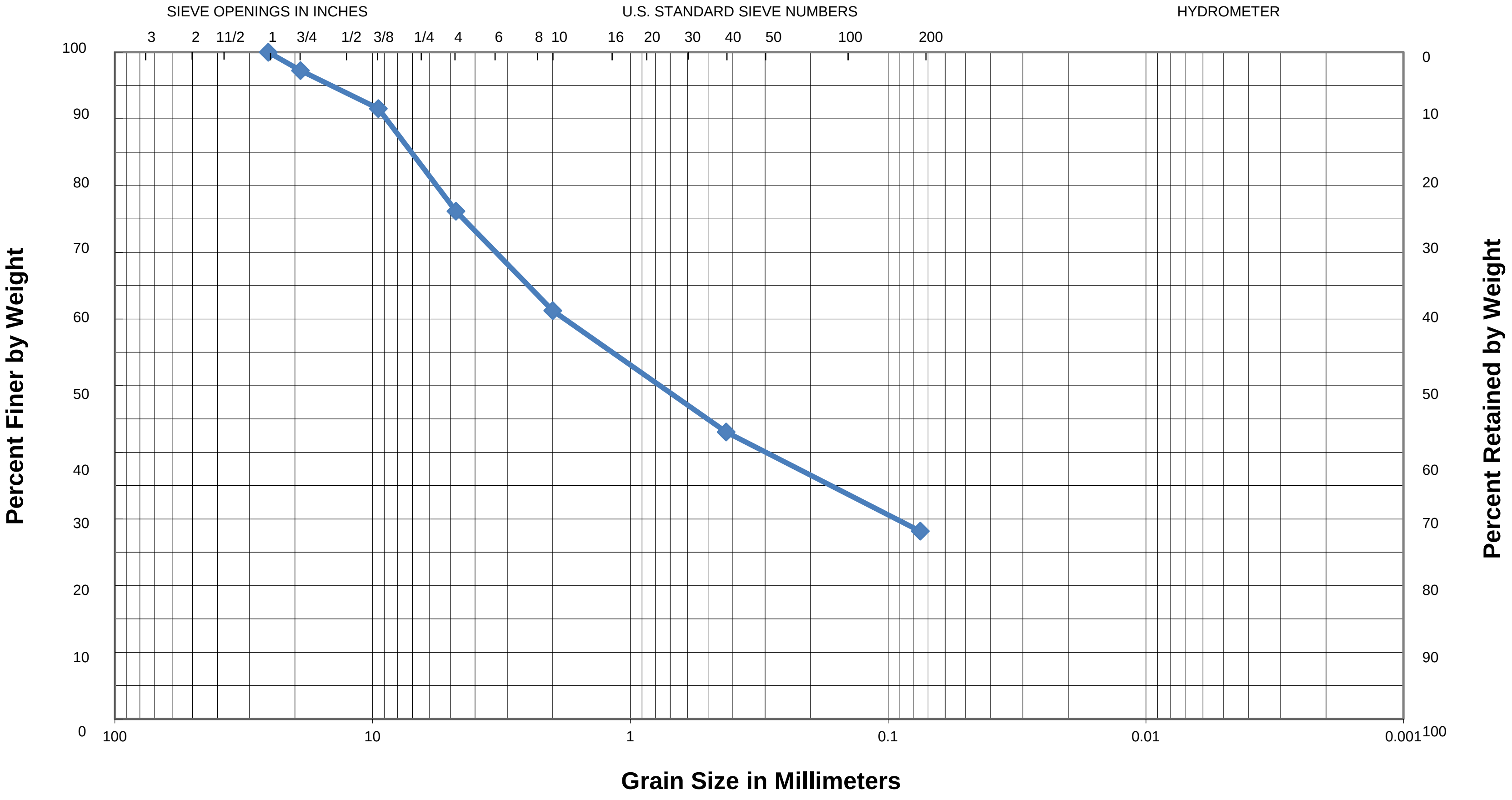
Sample: TP-94, 0.5-1.5 ft
Atterberg Limits: LL = 30, PL = 20, PI = 10

Desciption: Dark brown silty clay with shale fragments (fill)
Classification: **USCS = GC; AASHTO = A-4**

13-203

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

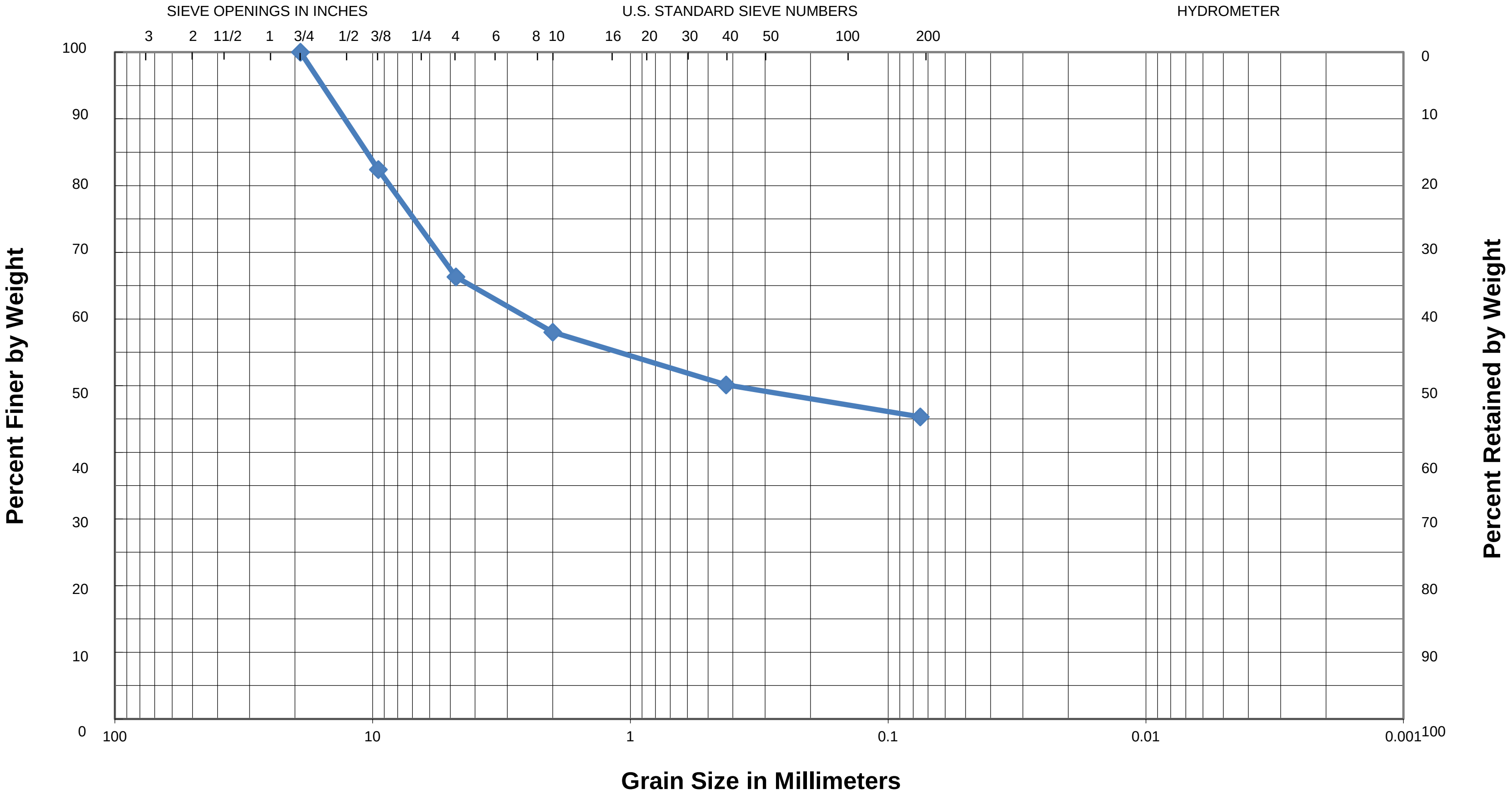
Sample: TP-95, 4-5 ft
Atterberg Limits: LL = 36, PL = 20, PI = 16

Desciption: Brown clayey fine to coarse gravel
Classification**: USCS = GC; AASHTO = A-2-6**

13-203

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

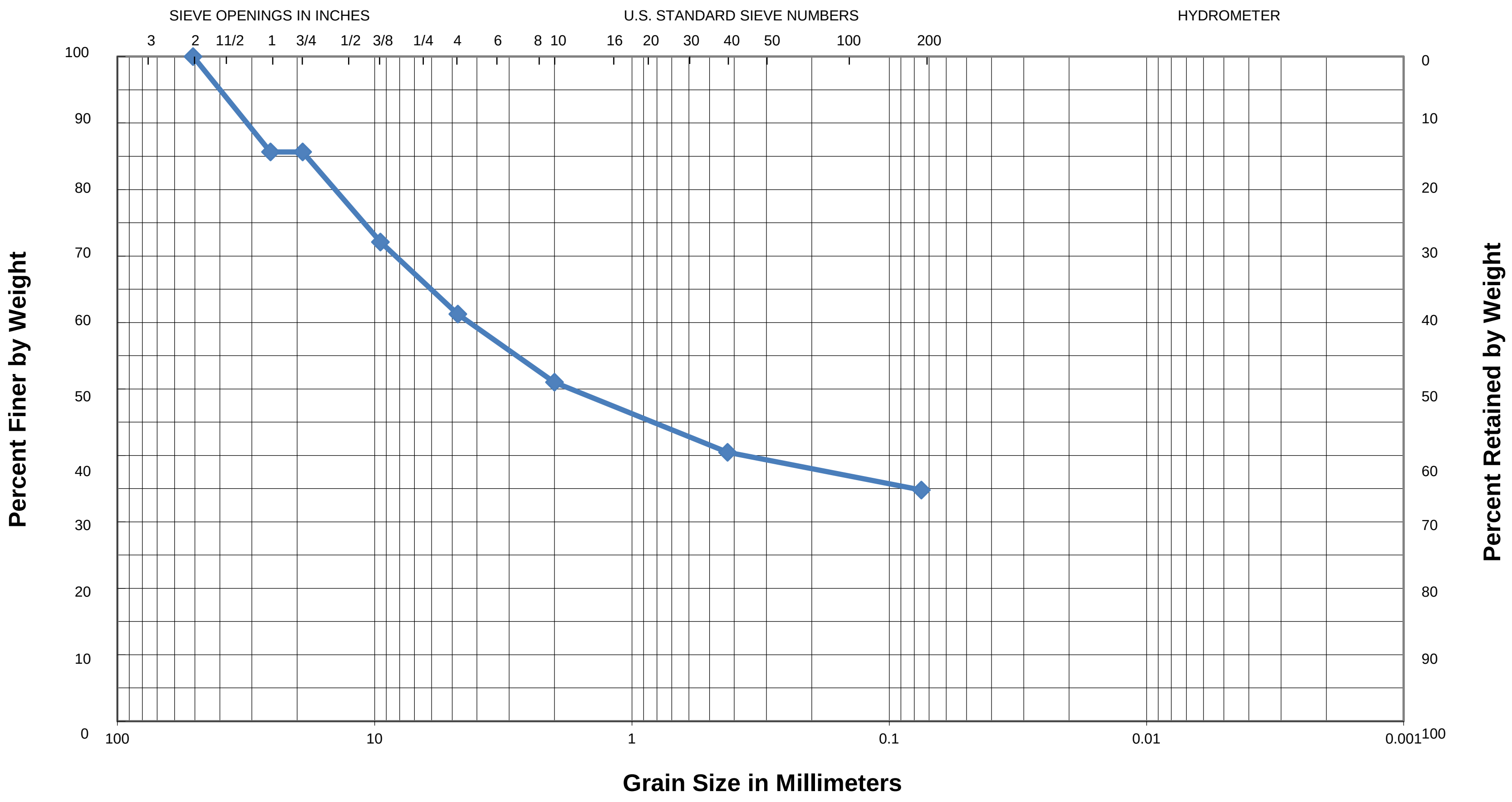
Sample: Boring 97, 0.5-1.5 ft
Atterberg Limits: LL = 42, PL = 25, PI = 17

Desciption: Gray and tan silty clay with shale fragments
Classification**: USCS = GC; AASHTO = A-7-6**

13-203

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

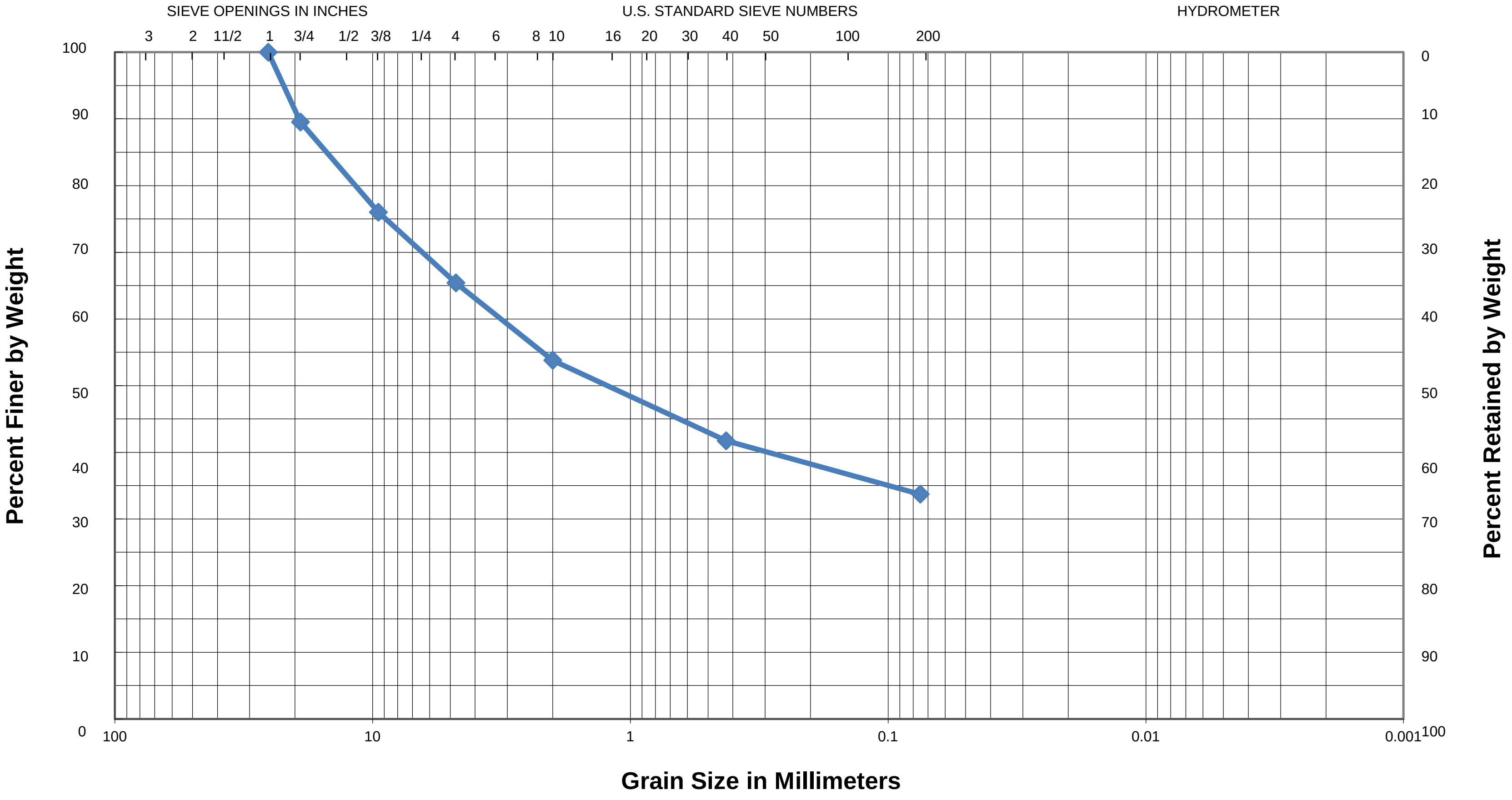
Sample: TP-101, 0.5-1.5 ft
Atterberg Limits: LL = 37, PL = 21, PI = 16

Desciption: Gray and brown silty clay with shale fragments and fine to coarse gravel (fill)
Classification**: USCS = GC; AASHTO = A-2-6**

13-203

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

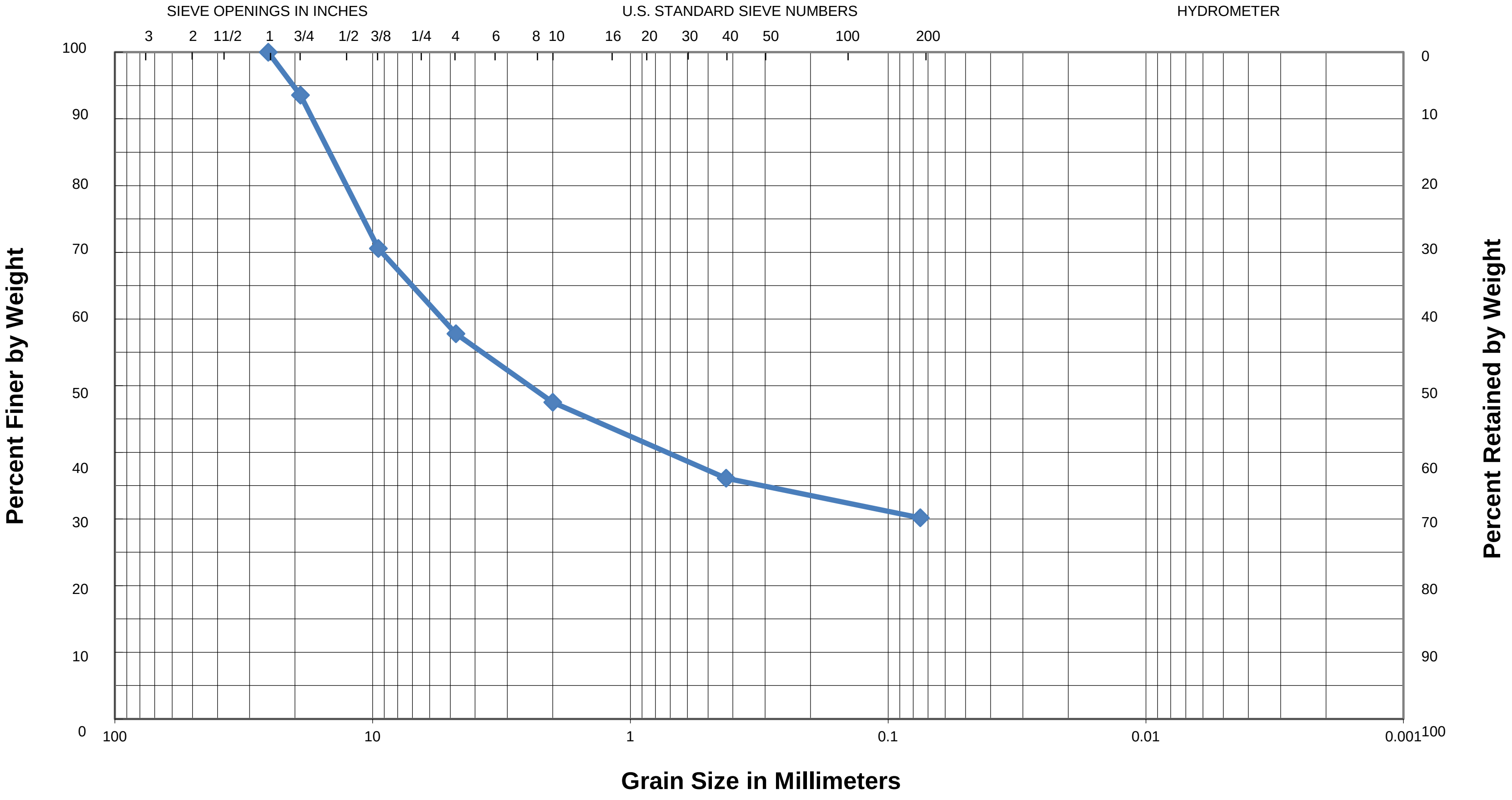
Sample: TP-103, 0.5-1.5 ft
Atterberg Limits: LL = 39, PL = 25, PI = 14

Desciption: Brown and tan silty clay with shale fragments
Classification**: USCS = GC; AASHTO = A-2-6**

13-203

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

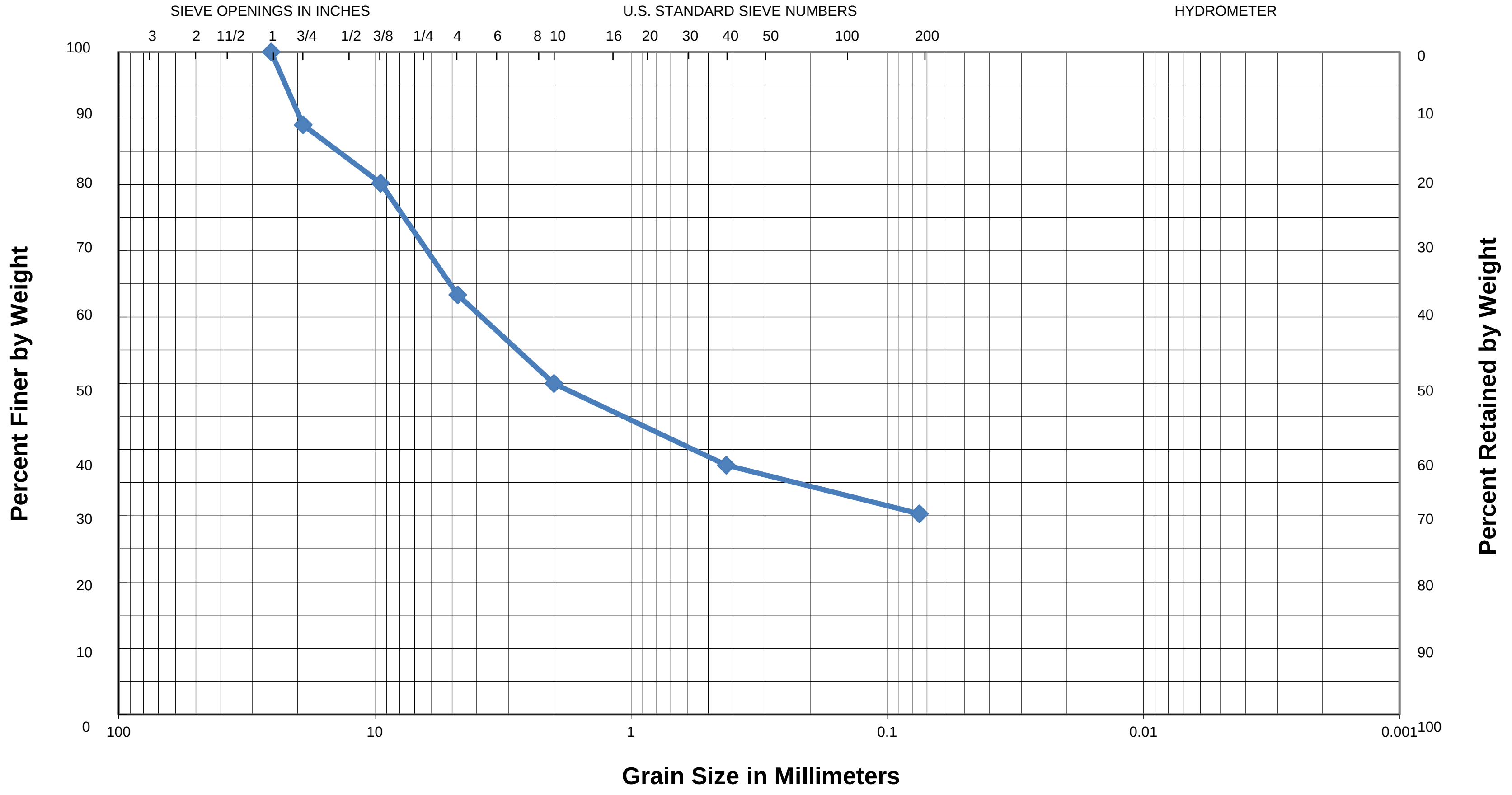


GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

Sample: TP-105, 0.5-1.5 ft
Atterberg Limits: LL = 41, PL = 23, PI = 18

Desciption: Reddish tan, brown and tan silty clay with shale fragments and occasional fine to coarse gravel (fill)
Classification: **USCS = GC; AASHTO = A-2-7**

GRAIN SIZE CURVE



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

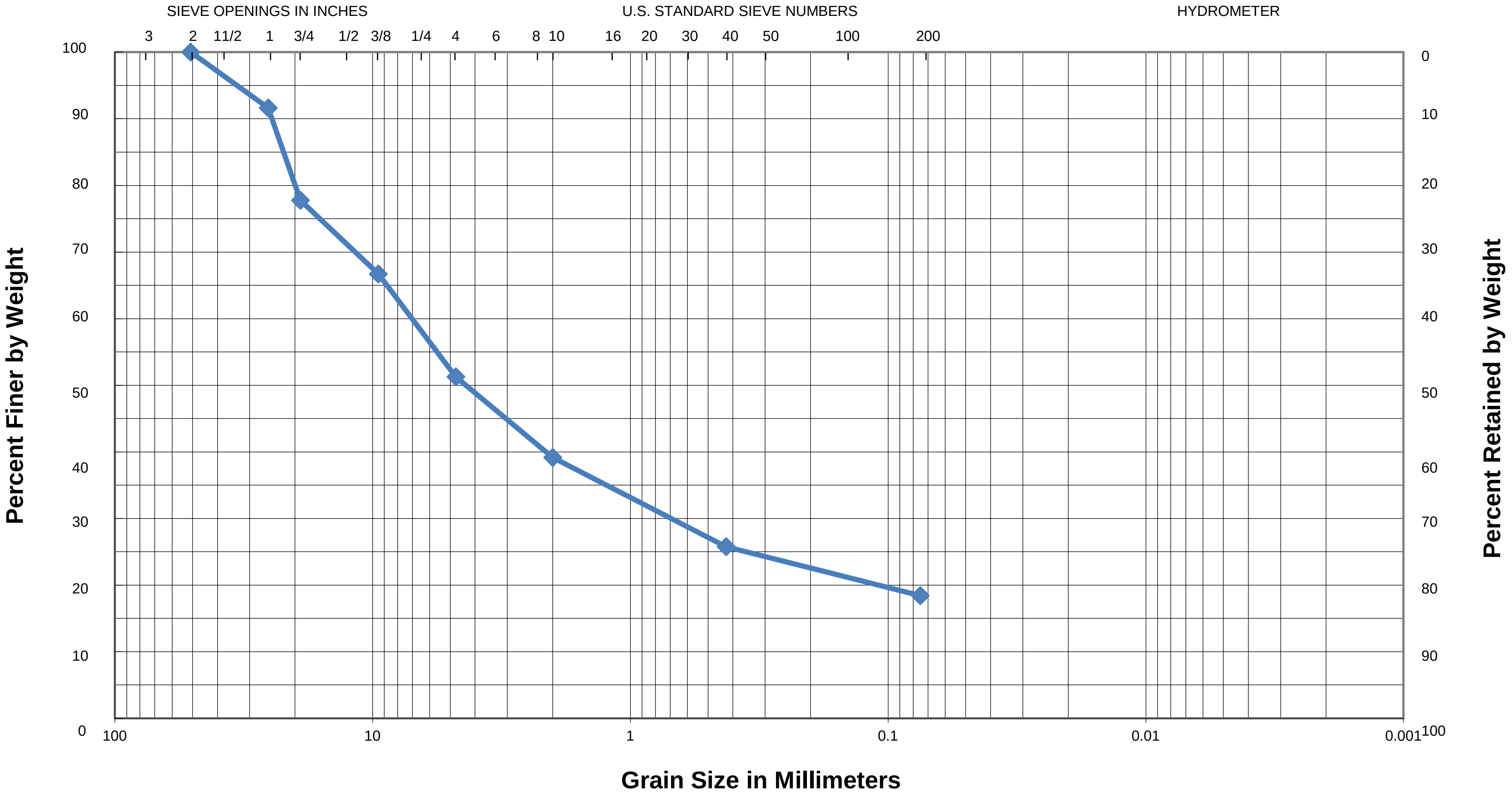
Sample: TP-108, 0.5-1.5 ft
Atterberg Limits: LL = 46, PL = 25, PI = 21

Desciption: Tan, brown and gray silty clay with shale fragments (fill)
Classification: **USCS = GC; AASHTO = A-2-7**

13-203

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

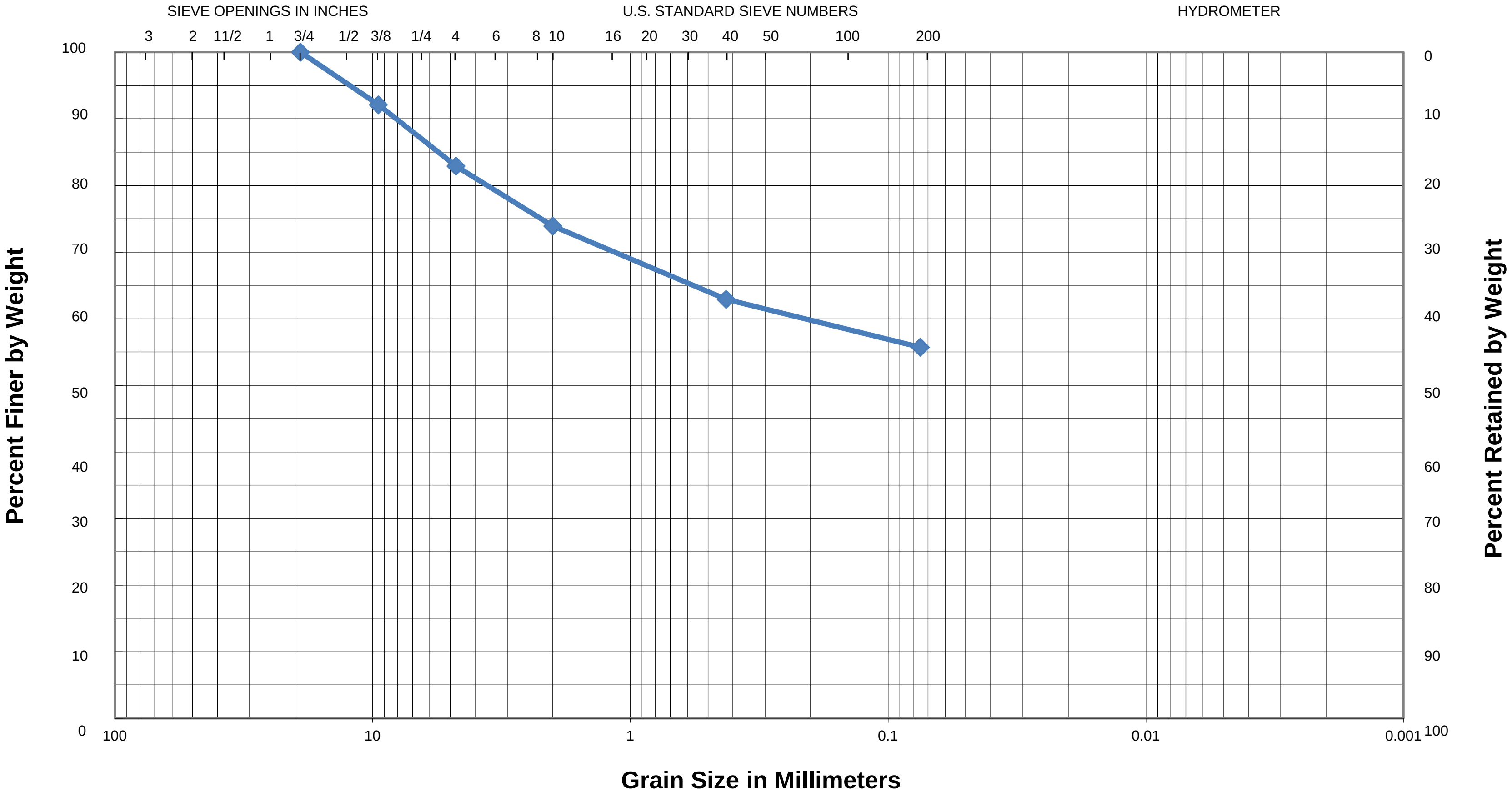
Sample: TP-111, 0.5-1.5 ft
Atterberg Limits: LL = 40, PL = 25, PI = 15

Desciption: Gray and tan silty clay with numerous shale fragments (fill)
Classification: **USCS = GC; AASHTO = A-2-6**

13-203

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

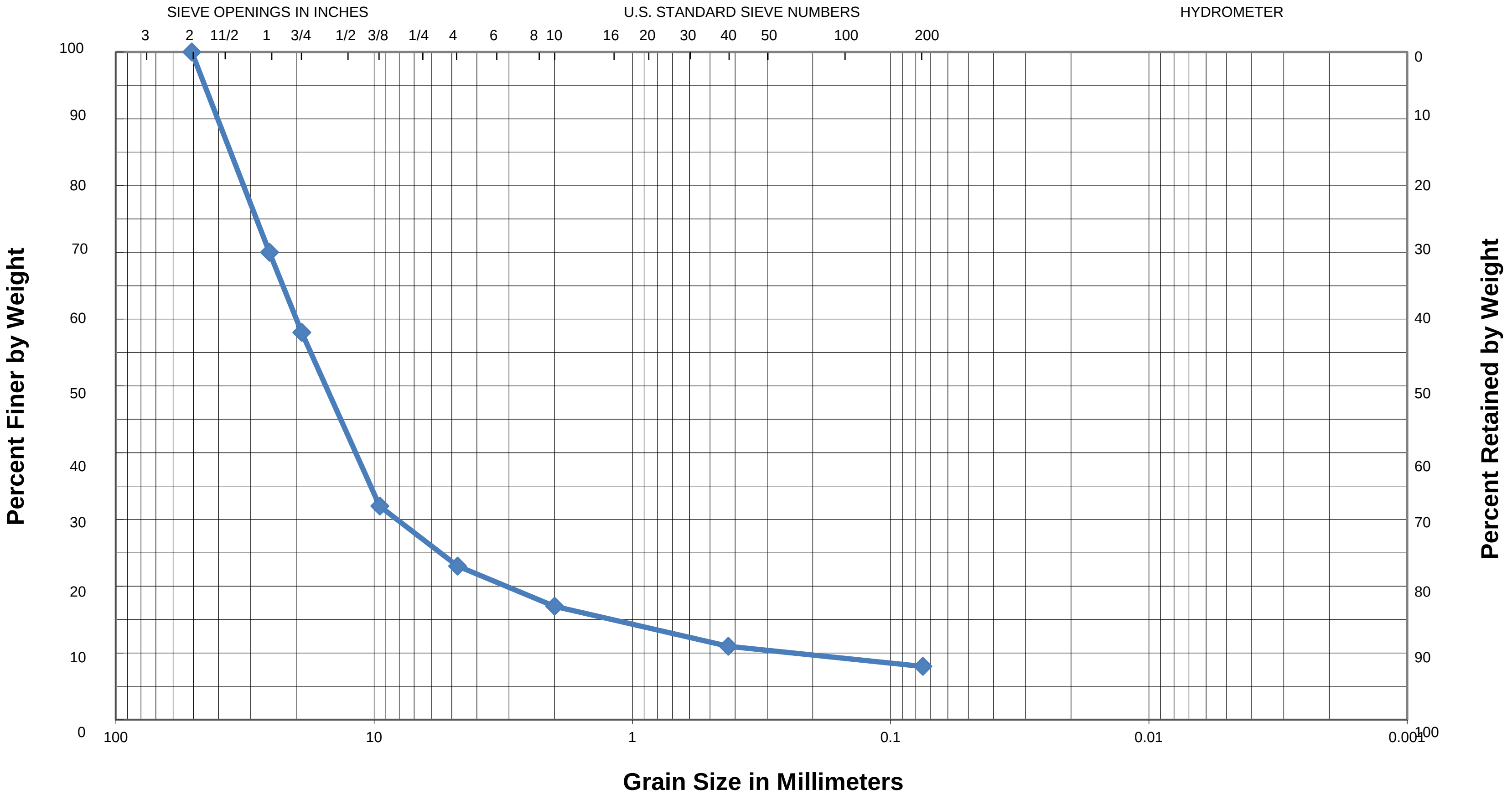
Sample: B-112, 2.5-3.5 ft
Atterberg Limits: LL = 37, PL = 24, PI = 13

Desciption: Tan silty CLAY with fine gravel and quartz fragments
Classification: **USCS = CL; AASHTO = A-6**

13-203

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

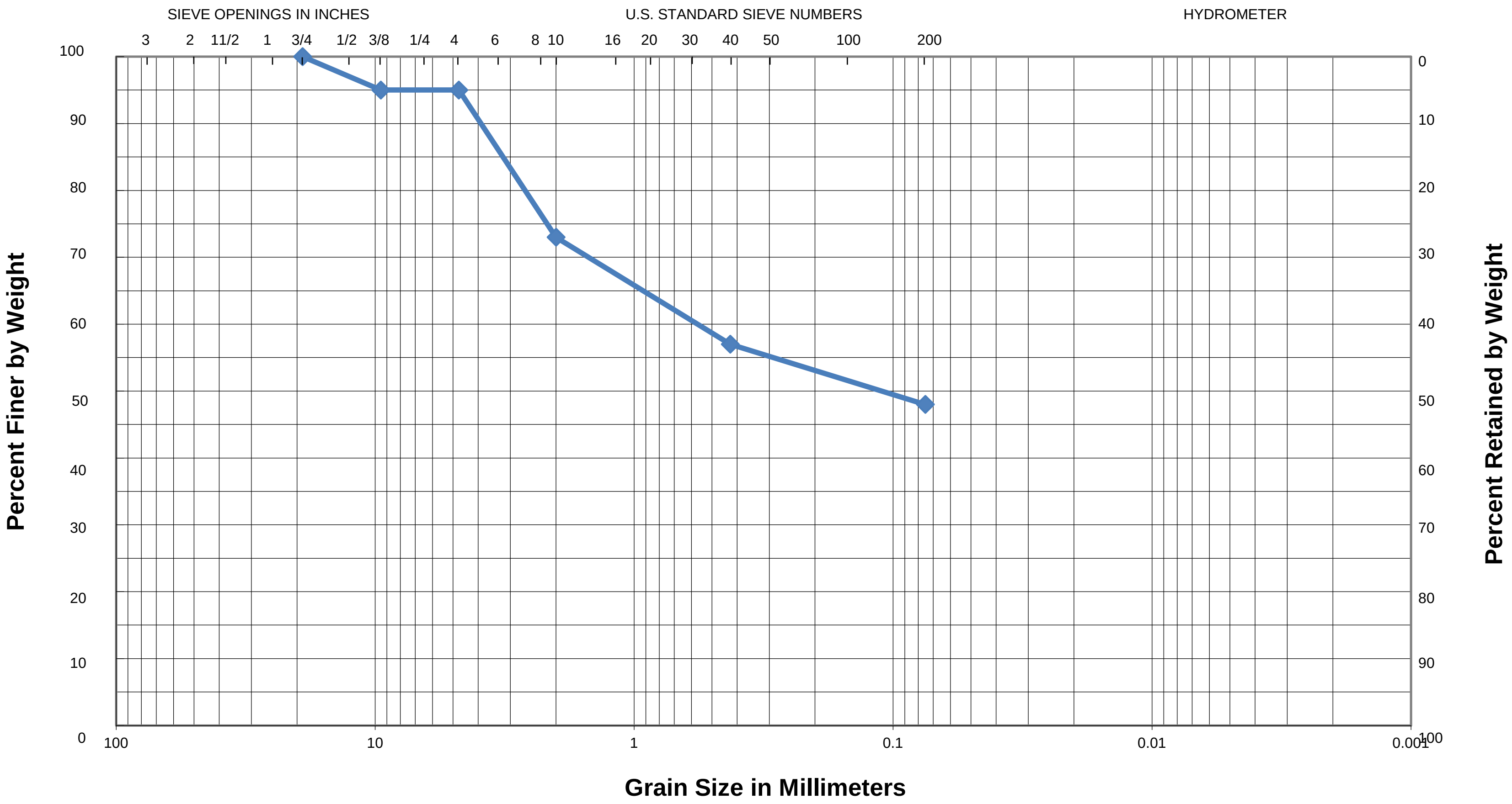
Sample: TP-11, 1-3 ft
Atterberg Limits: LL = 37, PL = 24, PI = 13

Desciption: Reddish tan and tan weathered shale with sandstone fragments and clay
Classification**: USCS = GC; AASHTO = A-2-6**

13-203

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



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<tr><td>COARSE</td><td>FINE</td><td>COARSE</td><td>MEDIUM</td><td>FINE</td></tr>
</table>

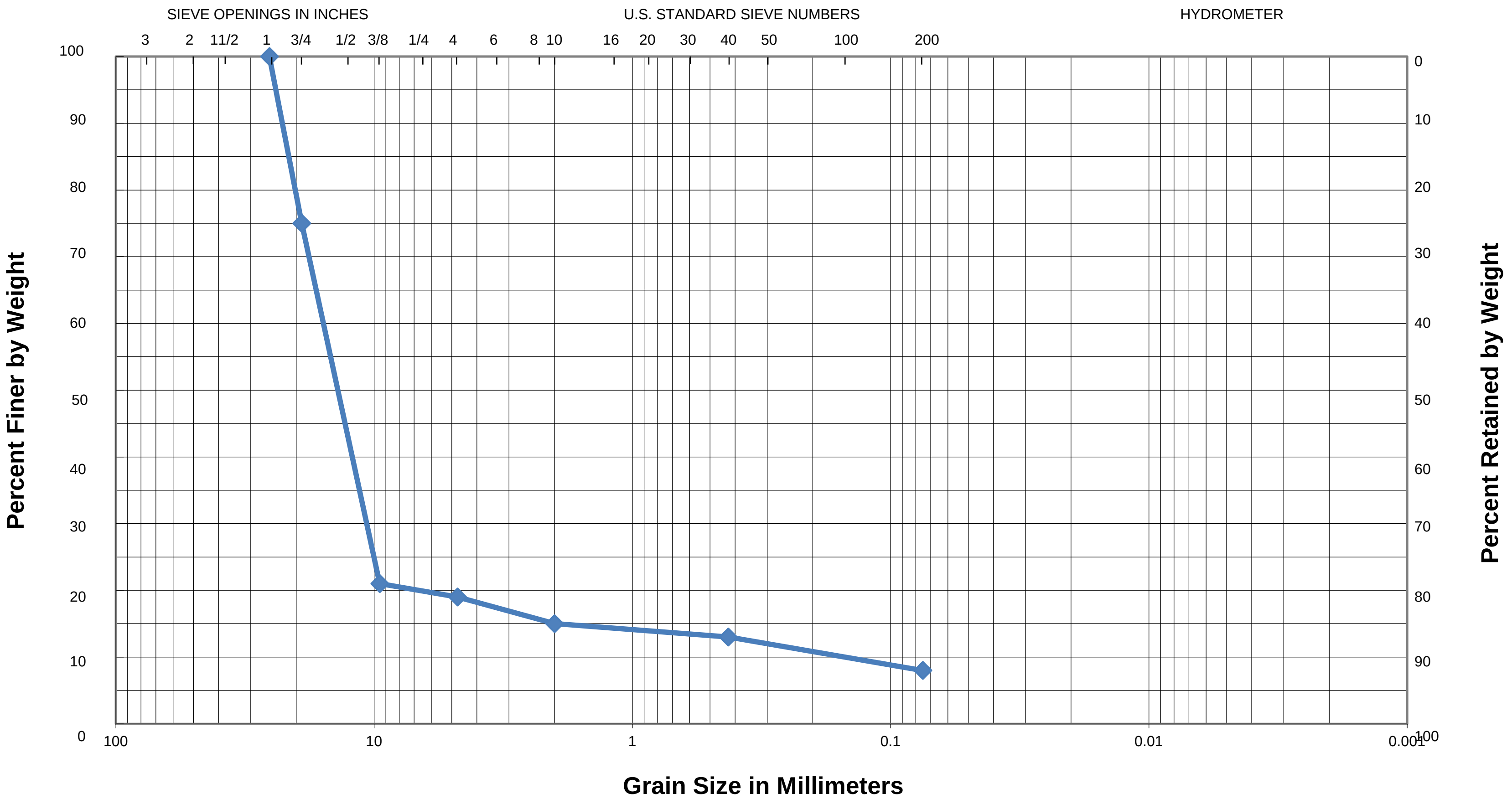
Sample: TP-12, 1-3 ft
Atterberg Limits: LL = 46, PL = 23, PI = 23

Desciption: Gray, reddish tan and tan clay and clayey silt with fragments (composite sample)
Classification: **USCS = CL; AASHTO = A-7-6**

13-203

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

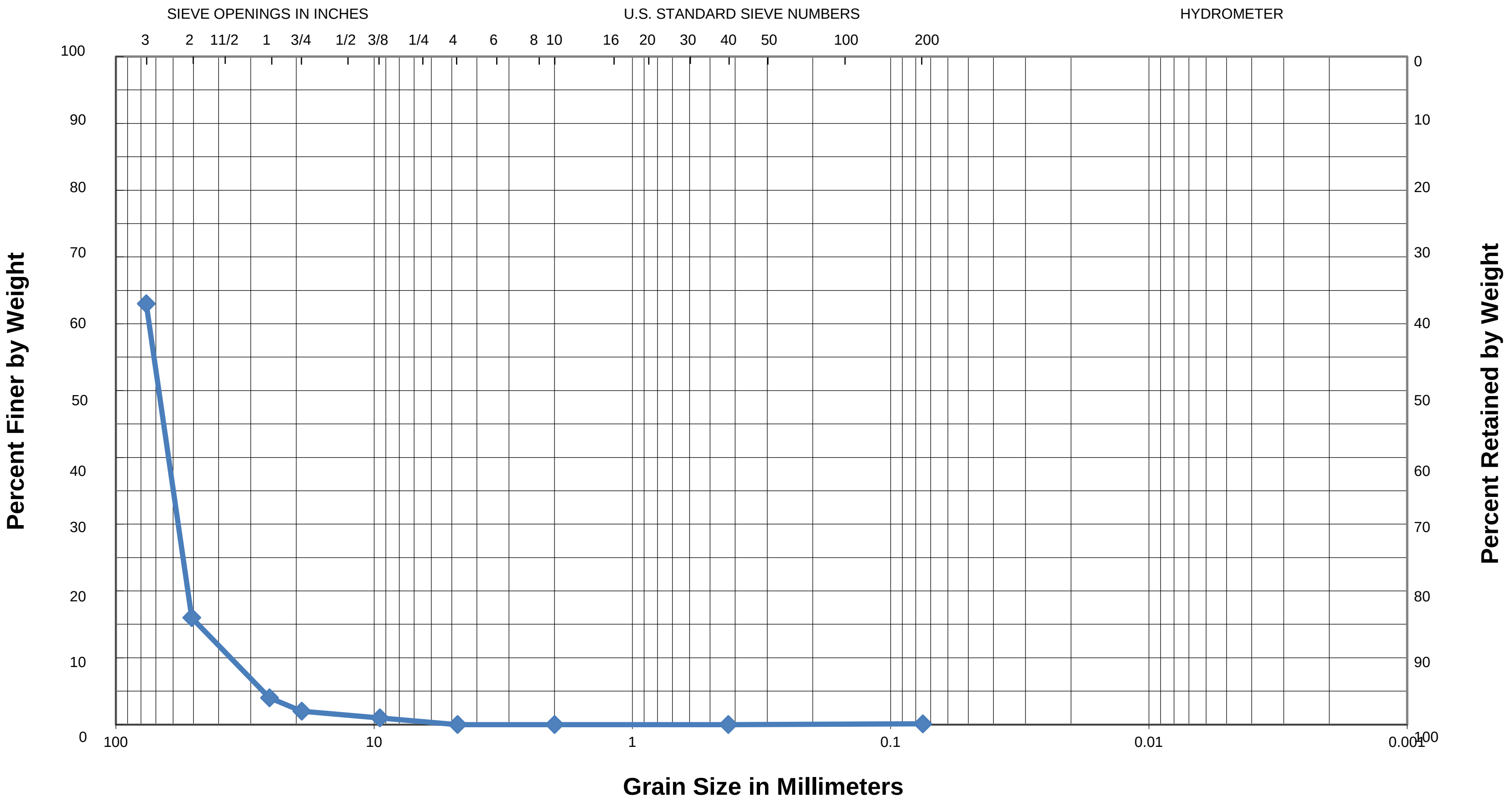
Sample: TP-13, 0.5-1.5 ft;
Atterberg Limits: LL = 46, PL = 31, PI = 15

Description: Tan and reddish tan weathered shale with sandstone fragments
Classification: **USCS = GC; AASHTO = A-2-6**

13-203

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

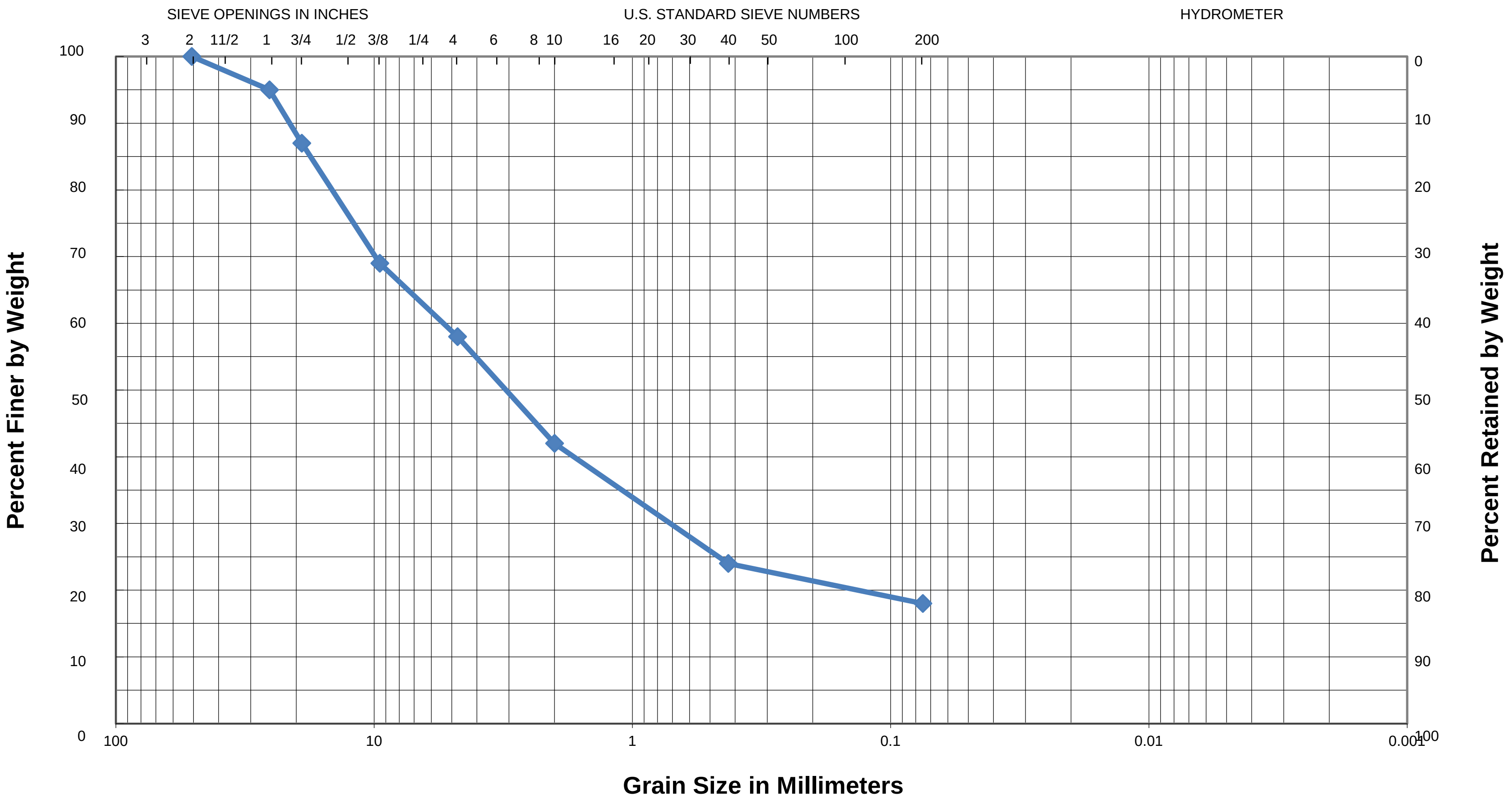
Sample: TP-15, 0.5-1.5 ft;
Atterberg Limits: LL = 29, PL = 23, PI = 6

Description: Reddish tan and tan weathered SHALE w/ close sandstone seams, thinly bedded w/ ferrous stains, fractured
Classification: **USCS = GP; AASHTO = A-1-a**

13-203

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

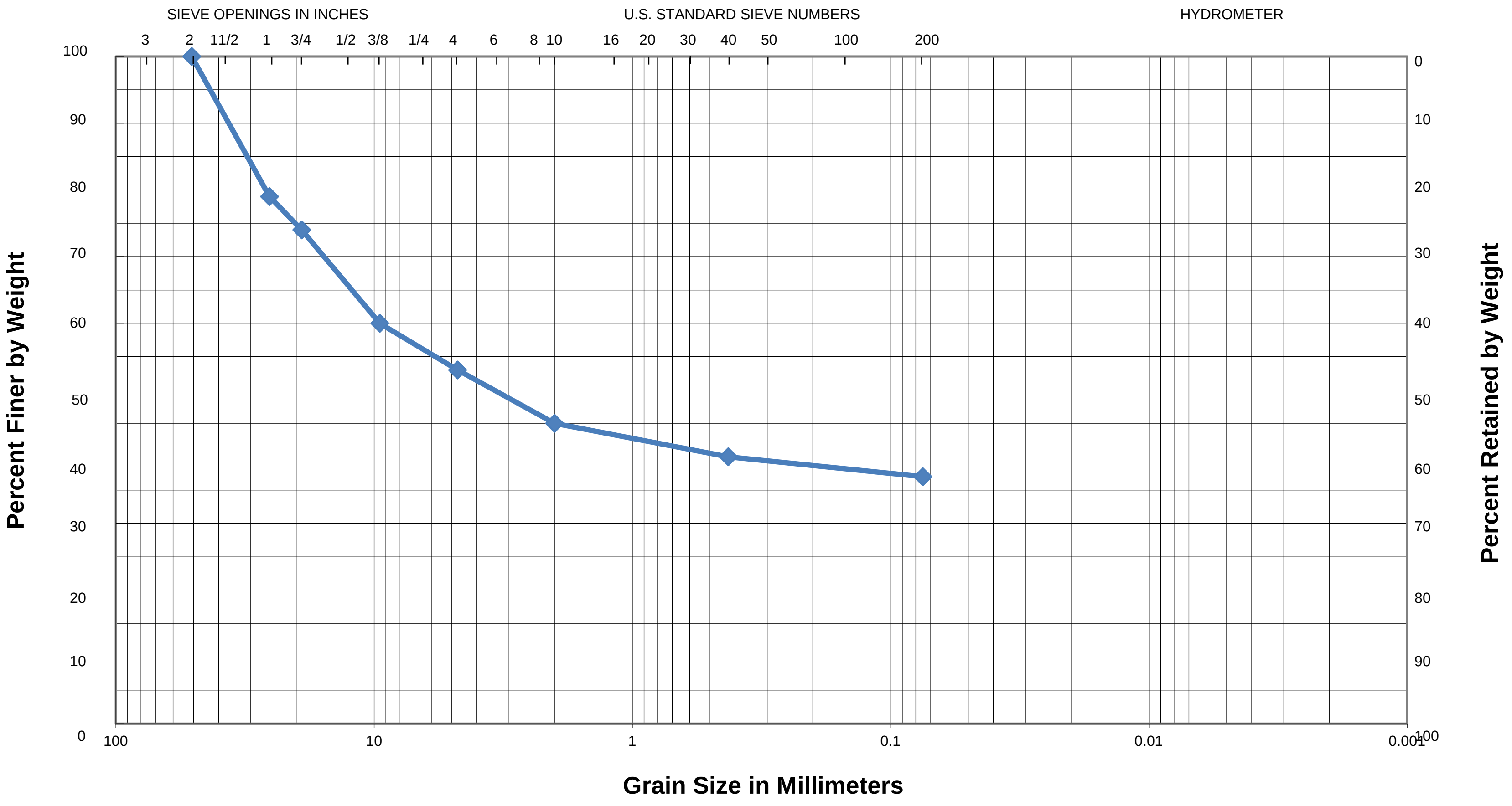
Sample: TP-16, 1-3 ft;
Atterberg Limits: LL = 37, PL = 21, PI = 16

Description: Tan and reddish tan clayey silt and silty clay with shale and sandstone fragments (composite sample)
Classification: **USCS = GC; AASHTO = A-2-4**

13-203

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

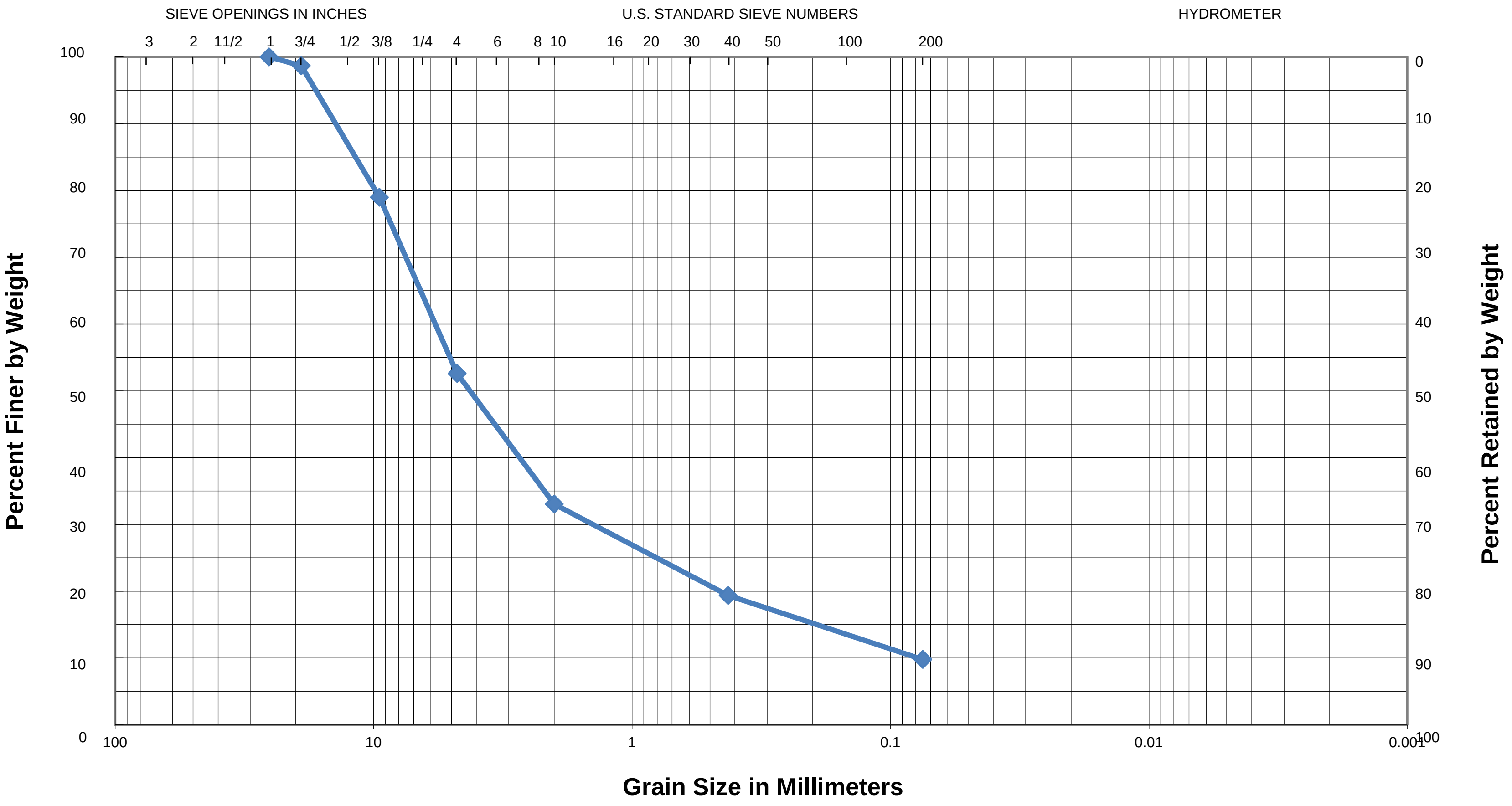
Sample: TP-17, 3-4 ft;
Atterberg Limits: LL = 40, PL = 20, PI = 20

Description: Gray and tan silty clay with numerous sandstone, shale and quartz fragments
Classification: **USCS = GC; AASHTO = A-6**

13-203

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

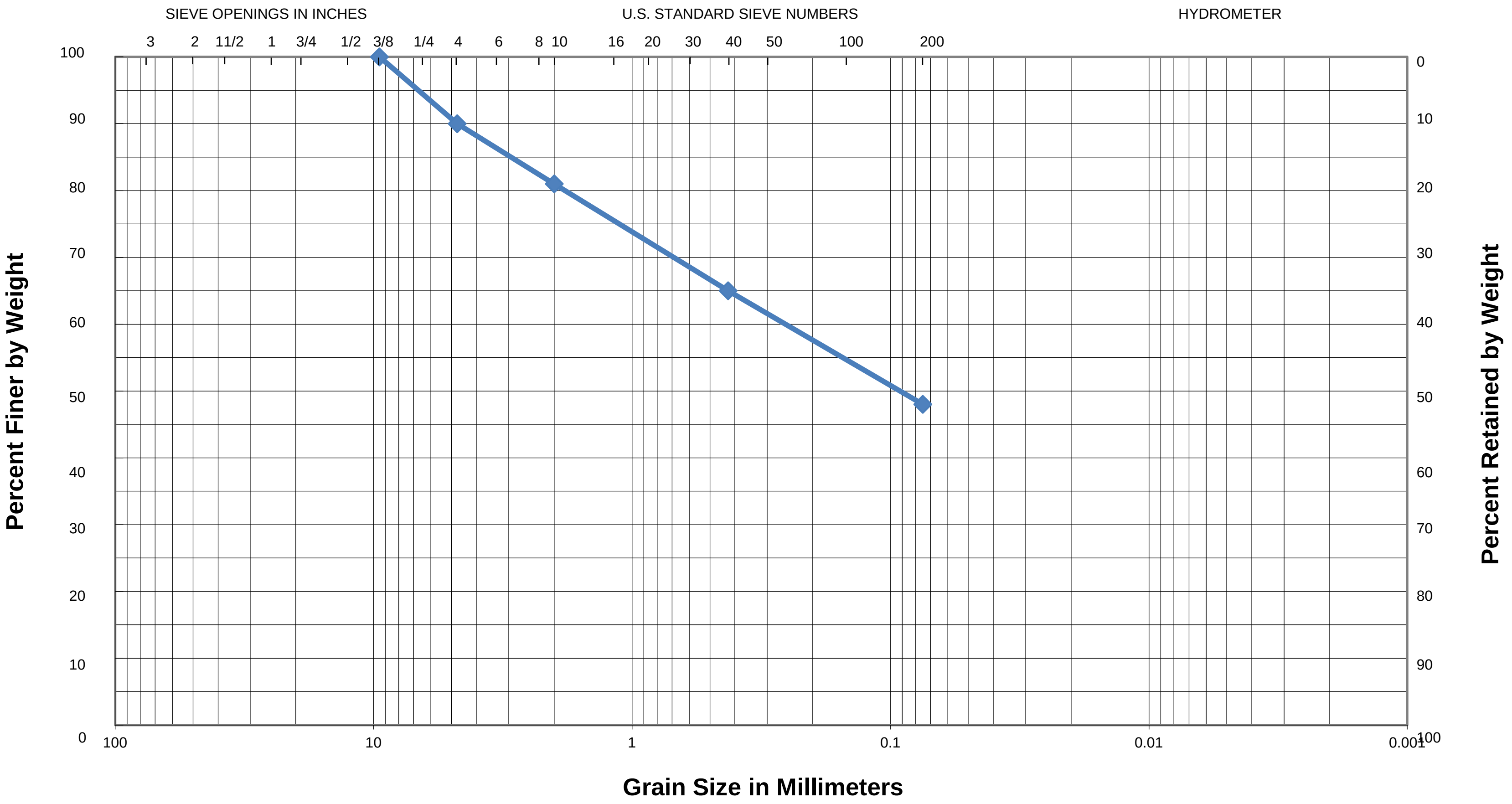
Sample: Boring S-6, 2.5-3.5 ft
Atterberg Limits: LL = 19, PL = 17, PI = 2

Description: Brown sandy fine gravel, slightly clayey
Classification: USCS = **GM-GP; AASHTO = A-2-6**

13-203

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

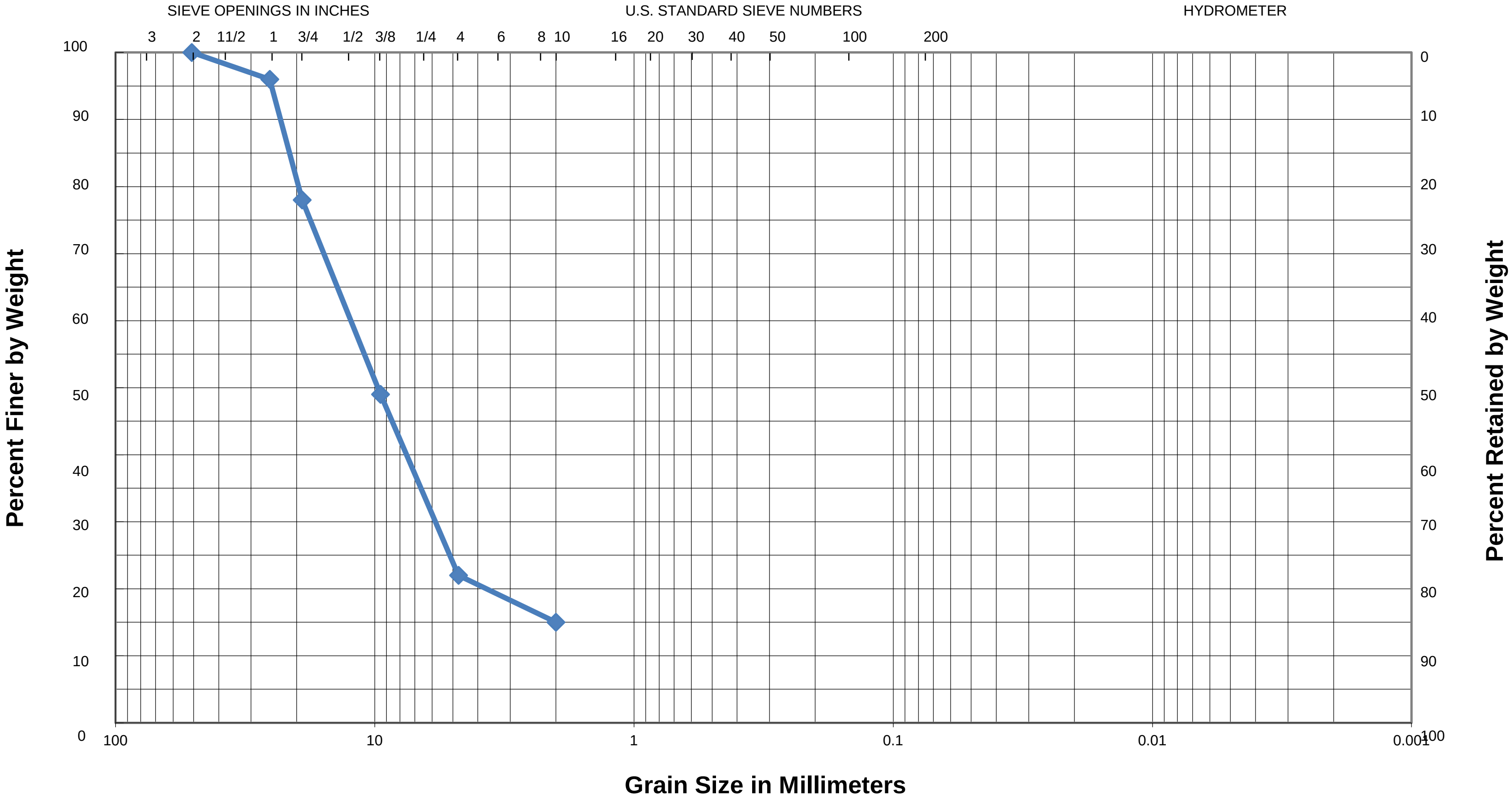
Sample: Boring S-7, 2.5-3.5 ft
Atterberg Limits: LL = 30, PL = 19, PI = 11

Description: Brown sandy fine gravel, slightly clayey
Classification: USCS = **SC; AASHTO = A-6**

13-203

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



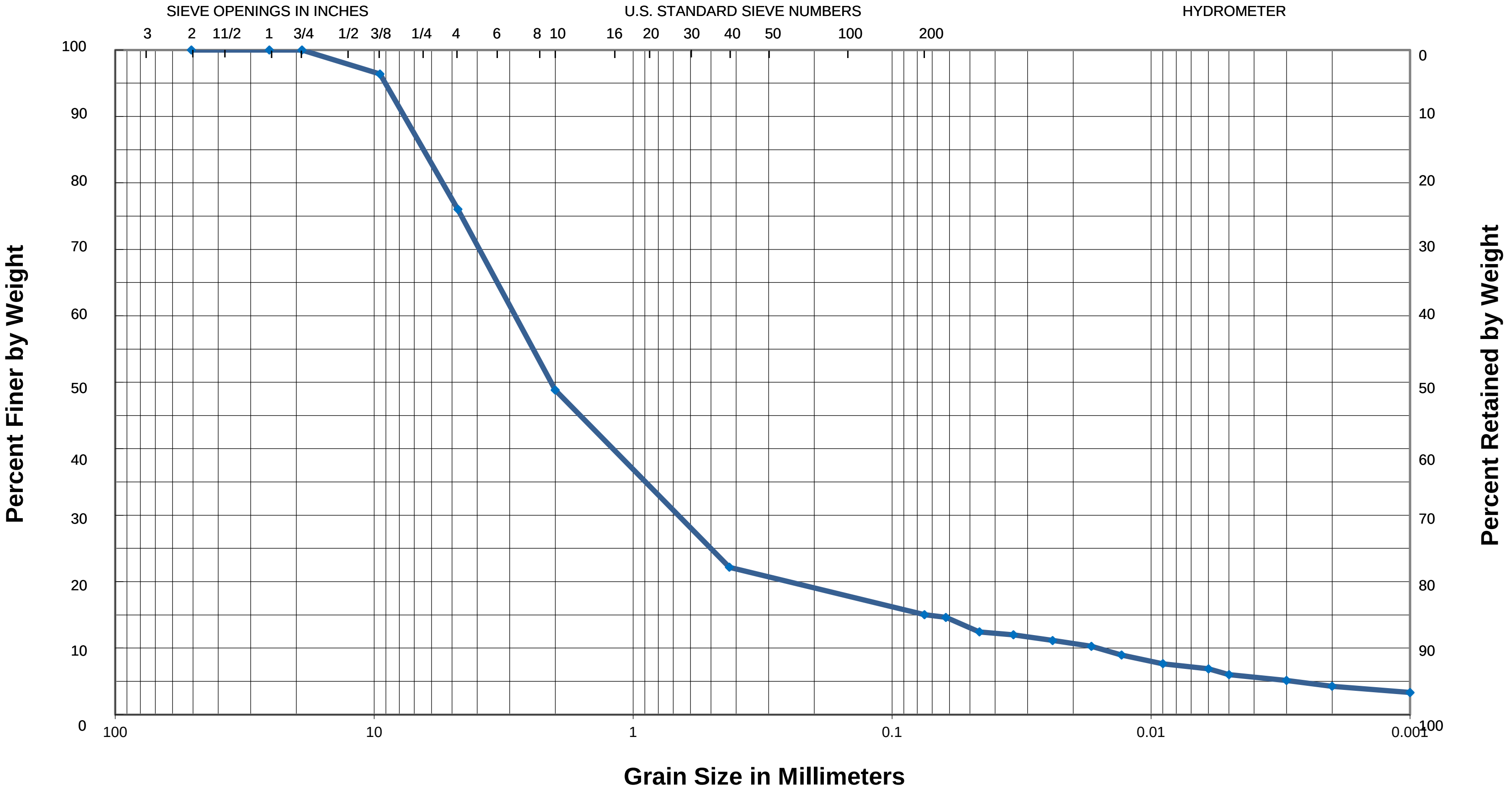
GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

Sample: Boring S-9, 2.5-3.5 ft

Desciption: Brown sandy fine to coarse gravel, slightly clayey
Classification**: USCS = GM-GP; AASHTO = A-1-a**

13-203

GRAIN SIZE CURVE



GRAVEL		SAND			SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE		

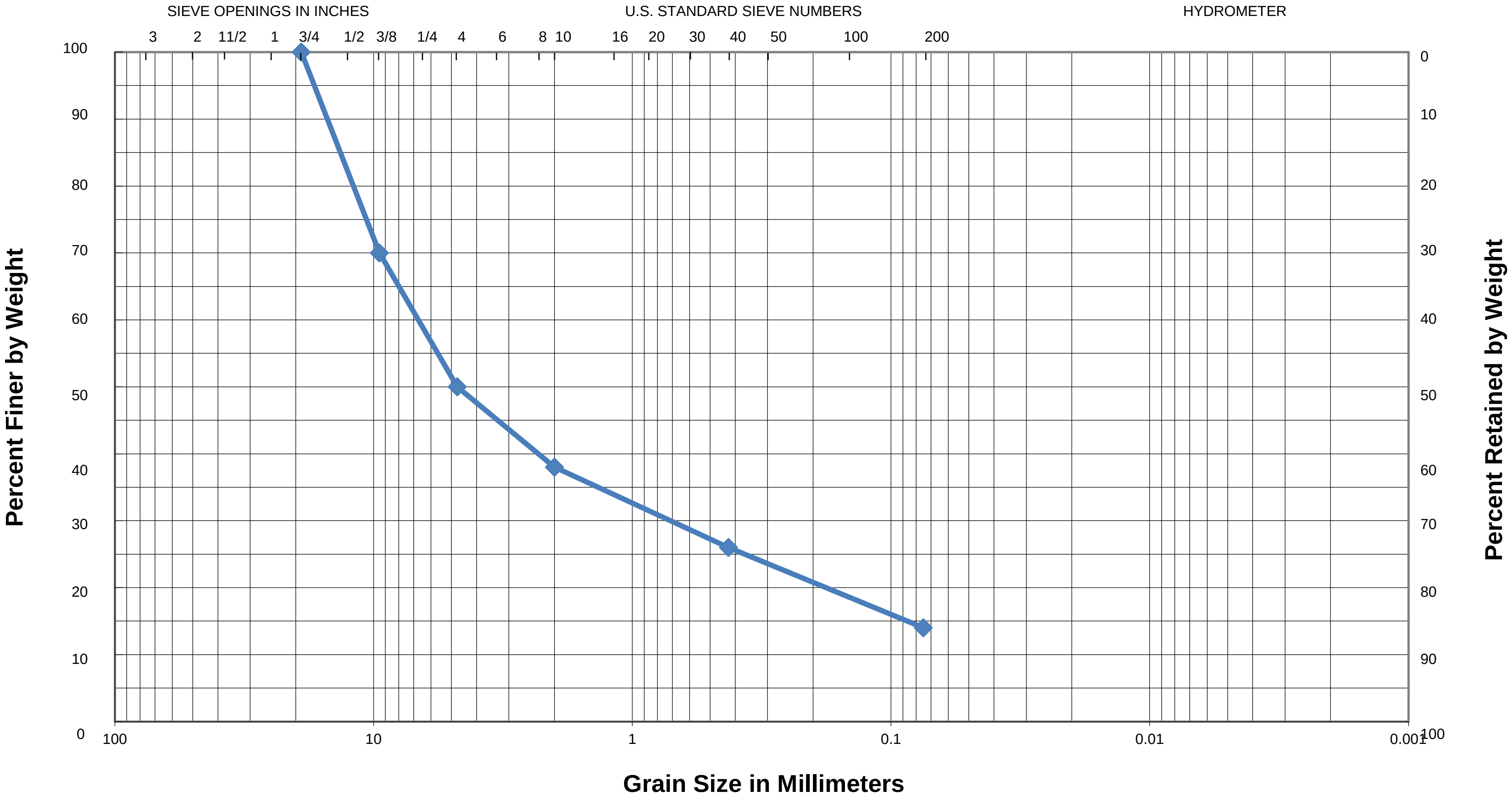
Sample: Boring S9, Composite Sample at 8-20 ft
Properties: G_s = 2.744; LL = 27, PL = 20, PI = 7

Description: Dark gray SHALE with completely weathered shale pockets
Classification**: USCS = SC; AASHTO = A-2-4**

13-203

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

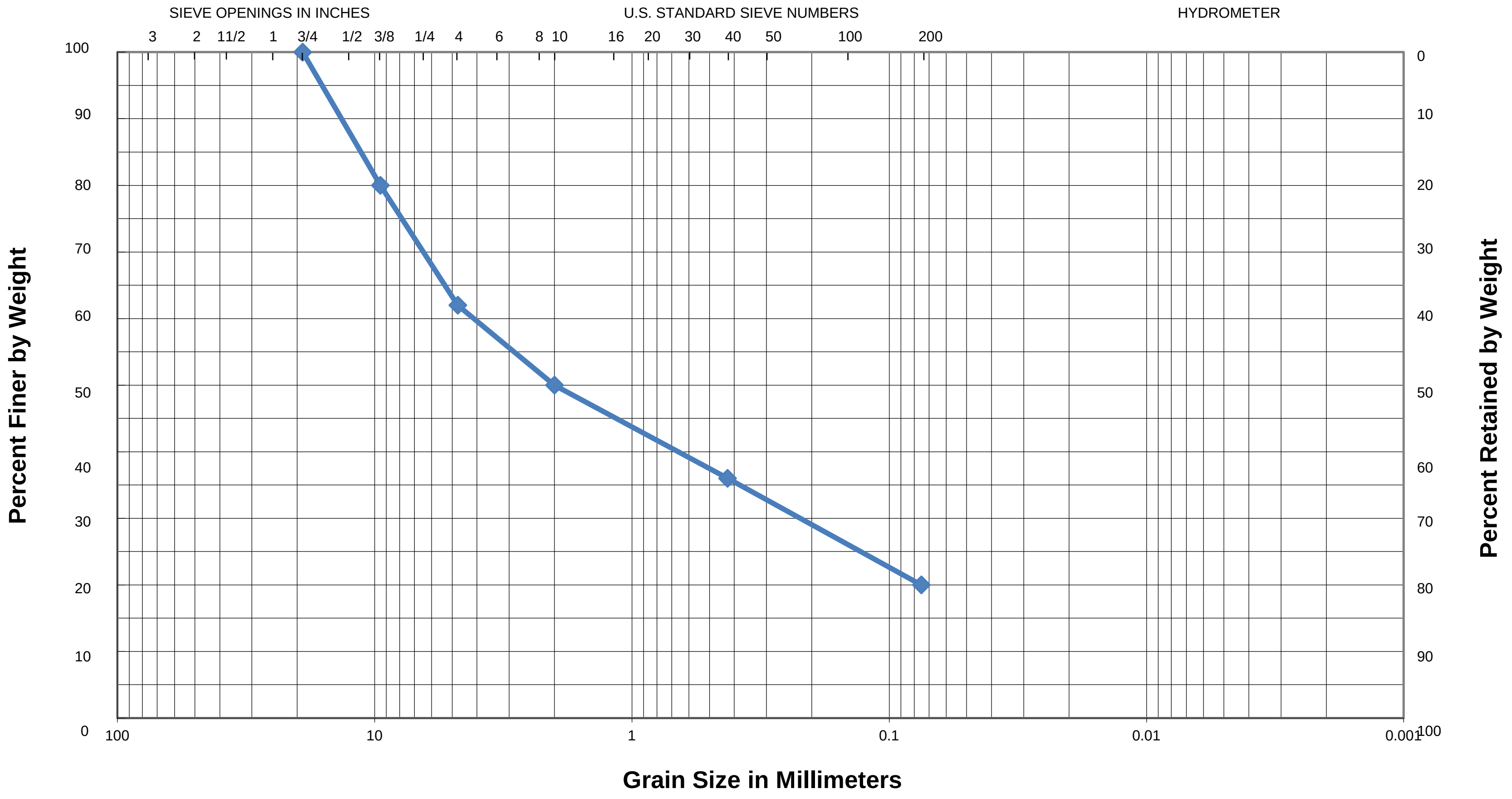
Sample: Boring S-10, 4.5-5.5 ft
Atterberg Limits: Non Plastic

Desciption: Brown silty fine to coarse gravel, sandy
Classification: **USCS = GM; AASHTO = A-1-a**

13-203

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

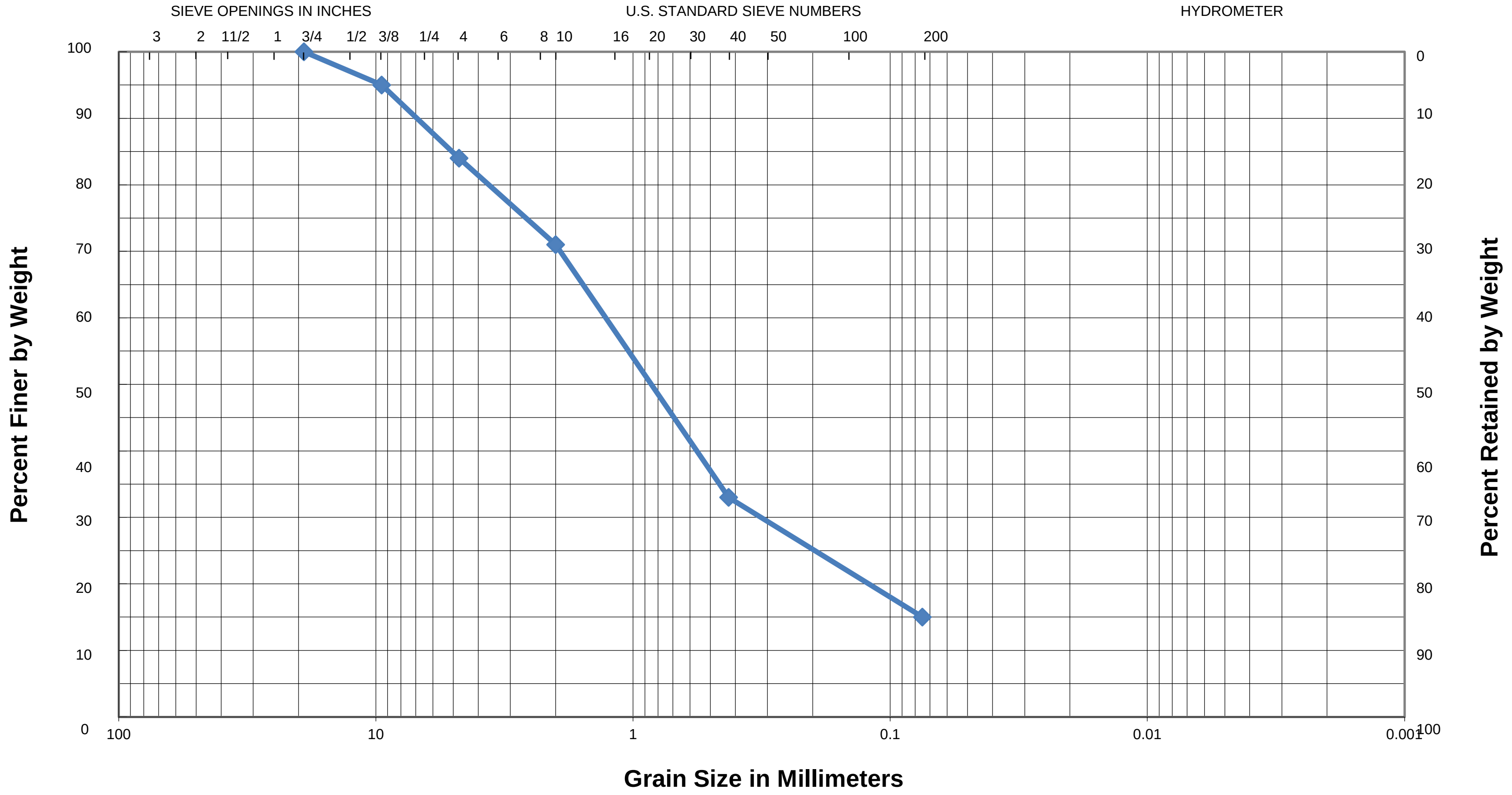
Sample: Boring S-11, 0.5-1.5 ft
Atterberg Limits: LL = 22, PL = 18, PI = 4

Desciption: Brown clayey fine to coarse gravel, sandy with occassional shale fragments (fill)
Classification: **USCS = GM-GC; AASHTO = A-1-b**

13-203

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



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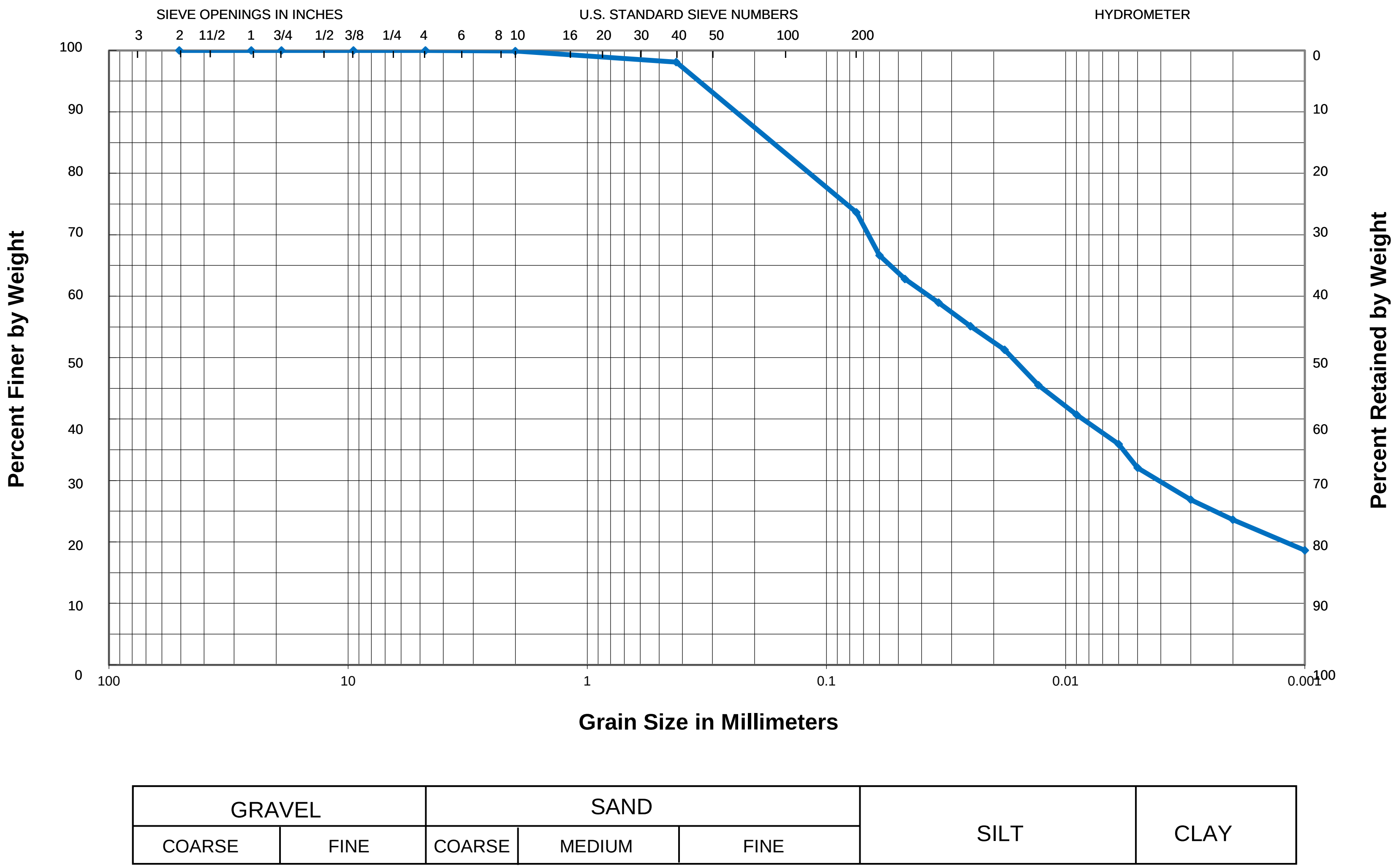
<tr><td>COARSE</td><td>FINE</td><td>COARSE</td><td>MEDIUM</td><td>FINE</td></tr>
</table>

Sample: Boring S-11, 6.5-7.5 ft
Atterberg Limits: Non Plastic

Desciption: Gray silty fine to coarse sand with a little fine gravel (fill)
Classification**: USCS = SM-SP; AASHTO = A-1-b**

13-203

GRAIN SIZE CURVE

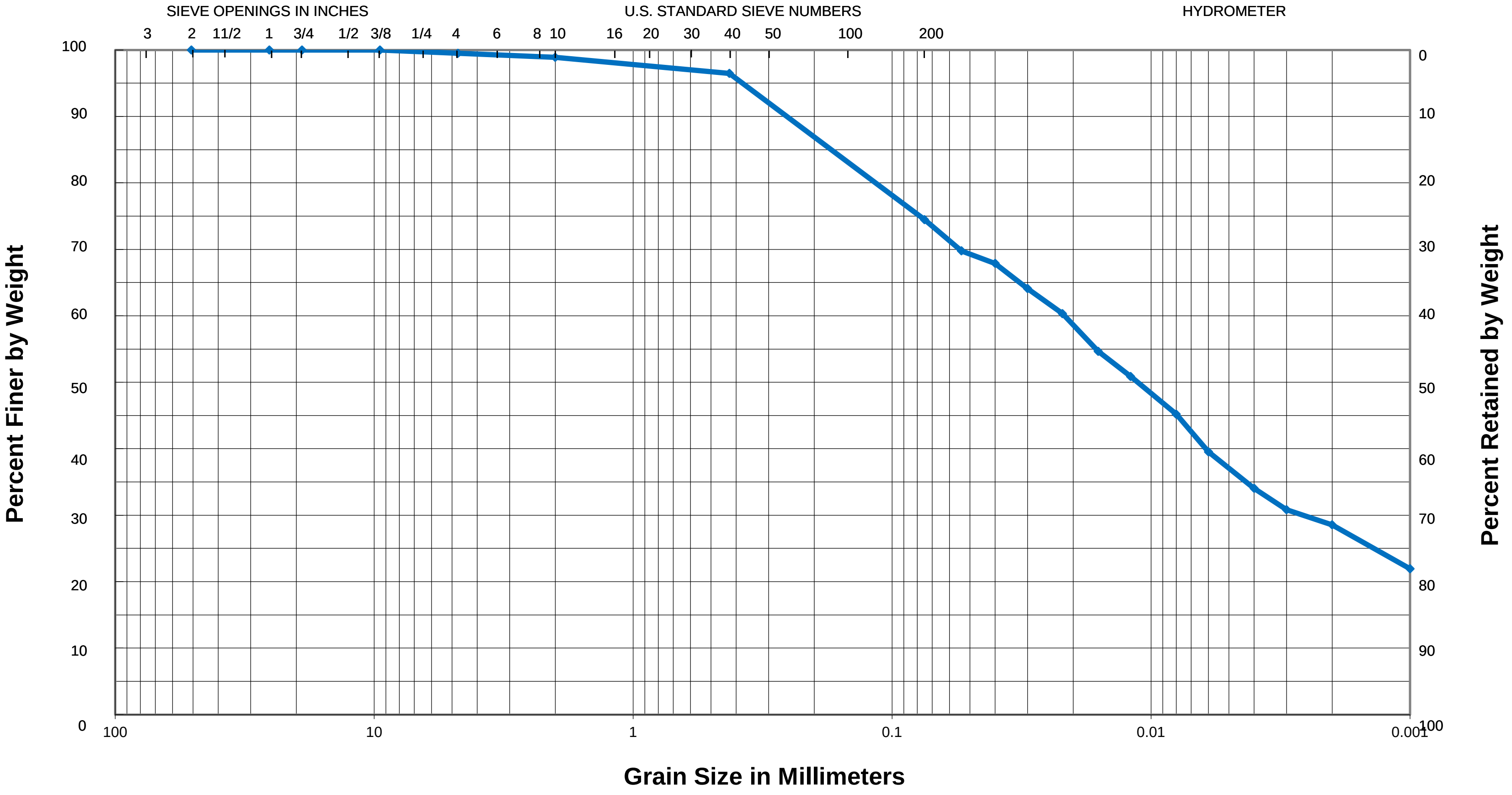


Sample: Boring S12, 2.5-3.5 ft
Properties: G_s = 2.662; LL = 33, PL = 22, PI = 11

Description: Brown silty CLAY, slightly sandy with ferrous stains and nodules
Classification: **USCS = CL; AASHTO = A-6**

13-203

GRAIN SIZE CURVE



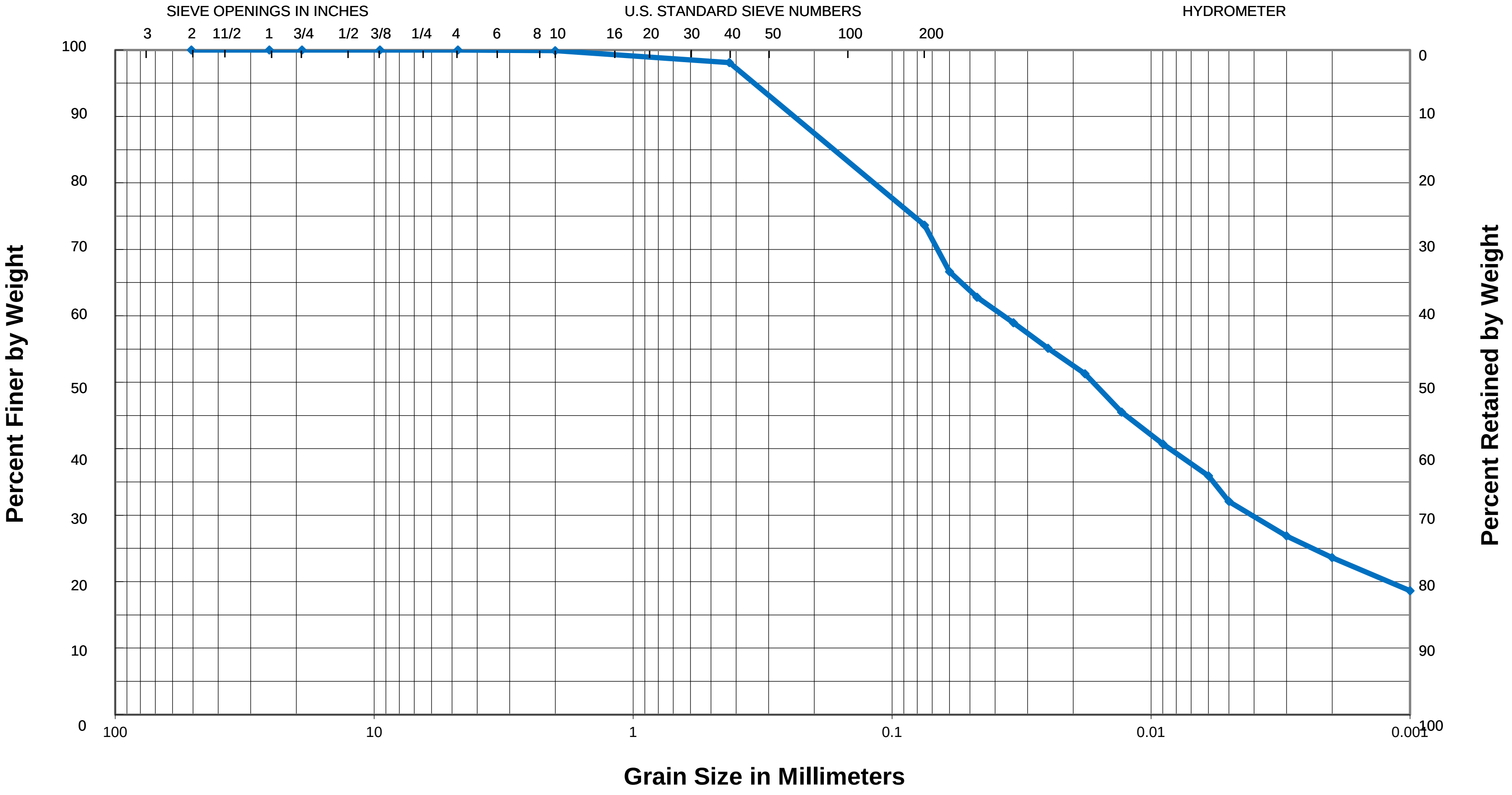
GRAVEL		SAND			SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE		

Sample: Boring S15, 2.5-3.5 ft
Properties: G_s = 2.685; LL = 33, PL = 21, PI = 12

Description: Dark brown fine sandy CLAY with trace organics
Classification: **USCS = CL; AASHTO = A-6**

13-203

GRAIN SIZE CURVE



GRAVEL		SAND			SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE		

Sample: Boring S16, 4.5-5.5 ft
Properties: G_s = 2.721; LL = 46, PL = 20, PI = 26

Description: Light gray and tan fine sandy CLAY with trace fine gravel
Classification: **USCS = CL; AASHTO = A-7-6**

ATTACHMENT 10

SUMMARY of PROCTOR and CBR TEST RESULTS

PROJECT: AHTD 061377 - Hot Springs – I-30 (Widening) (S)
LOCATION: Garland and Saline Counties, AR
GHBW JOB No.: 13-203

																					PROCTOR TEST RESULTS		CBR TEST RESULTS (AASHTO T-193)			
TEST PIT NO.	SAMPLE DEPTH, FT	APPROX STA	APPROX OFFSET, FT	SOIL DESCRIPTION	WATER CONTENT, %	ATTERBERG LIMITS			SIEVE ANALYSIS - PERCENT PASSING									UNIFIED CLASS.	AASHTO CLASS.	AASHTO PROCTOR	MAX DRY UNIT WT, pcf	OPTIMUM MOISTURE, %	MOLDED DRY UNIT WT, pcf	MOLDED WATER CONTENT, %	CBR VALUE	
						LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	3 in.	2 in.	1 in.	3/4 in.	3/8 in.	#4	#10	#40	#200								TOP	BOTTOM
TP-11	1-3	1038+25	60 RT	Reddish tan and tan weathered shale w/ silty clay seams and layers	12	37	24	13	100	100	75	58	32	23	17	11	8	GC	A-7-5	T-99	114.7	14.8	107.8	14.9	19.3	14.8
TP-12	1-3	1096+97	54 RT	Reddish tan and gray silty CLAY w/ shale fragments and clayey silt pockets	15	46	23	23	100	100	95	90	81	75	68	60	55	CL	A-7-6	T-99	105.7	17.1	101.7	16.2	1.7	4.5
TP-16	1-3	1306+74	36 RT	Reddish tan and gray silty CLAY w/ shale and sandstone fragments	10	37	21	16	100	97	92	87	69	58	42	24	18	GC	A-2-6	T-180	120.3	13.0	114.5	13.0	18.6	13.4

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

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Little Rock, Arkansas 72260-0970
#1 Trigon Place 72209
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FAX (501) 455-4137

REPORT OF STANDARD PROCTOR TEST
(AASHTO T-99)

Project: AHTD JOB 061377: Hot Springs-I-30 (Widening)(S) Job No: 13-203
Material Description: Reddish tan and tan weathered SHALE w/silty clay seams and layers
Location Sampled/Source: Test Pit 11
Sample Depth, ft: 1-3
Date Sampled: 10/14/2013
Date Tested: 10/26/2013
Tested By: RSL
Report Date: 11/20/2013

LAB COMPACTION PROCEDURE: AASHTO T-99 Method: C	
Maximum Unit Dry Wt. (pcf):	114.7
Optimum Water Content (%):	14.8

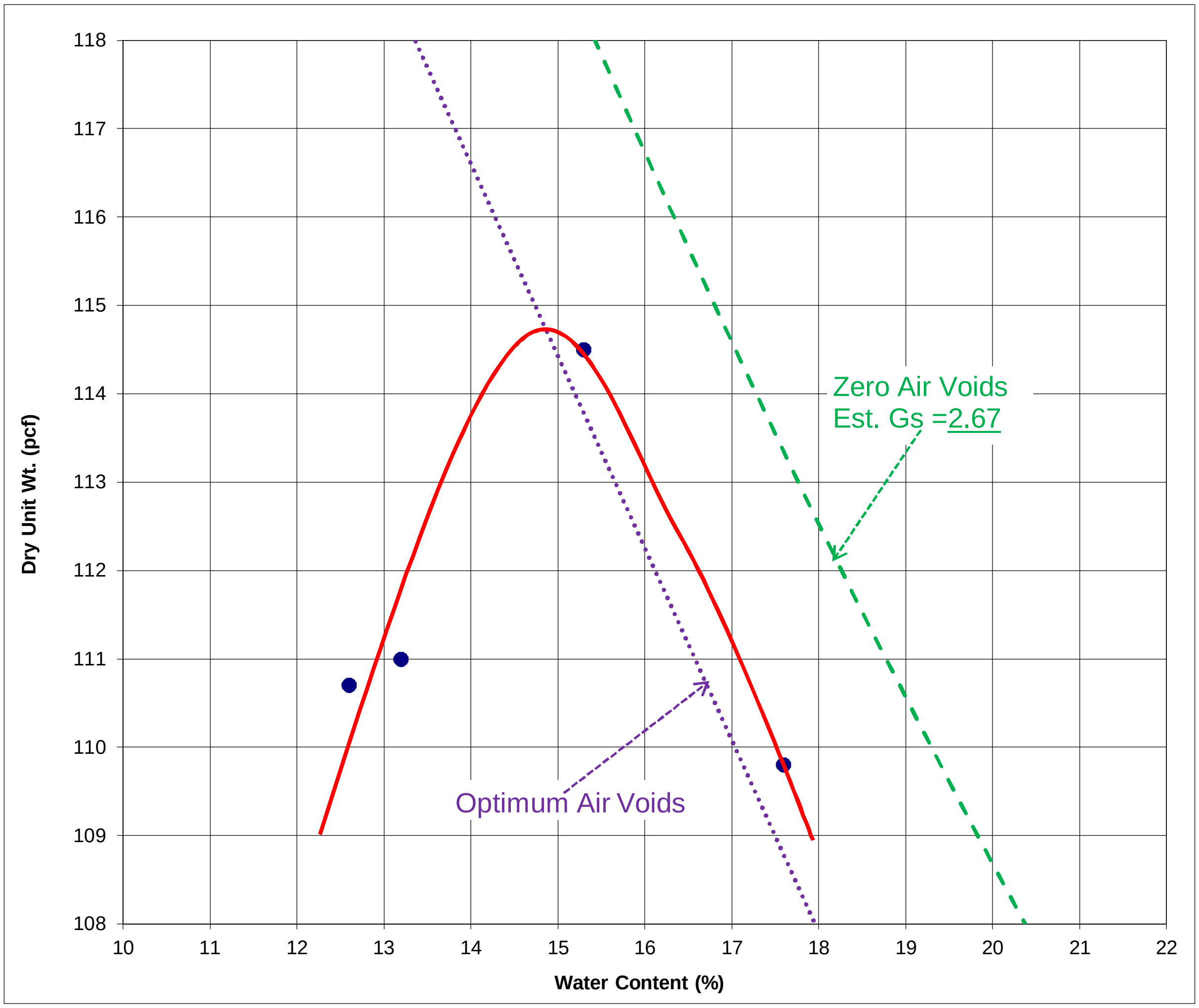
ATTERBERG LIMITS AASHTO T-89 & T-90
Liquid Limit: 37
Plastic Limit: 24
Plasticity Index: 13

AASHTO Classification:
A-2-6

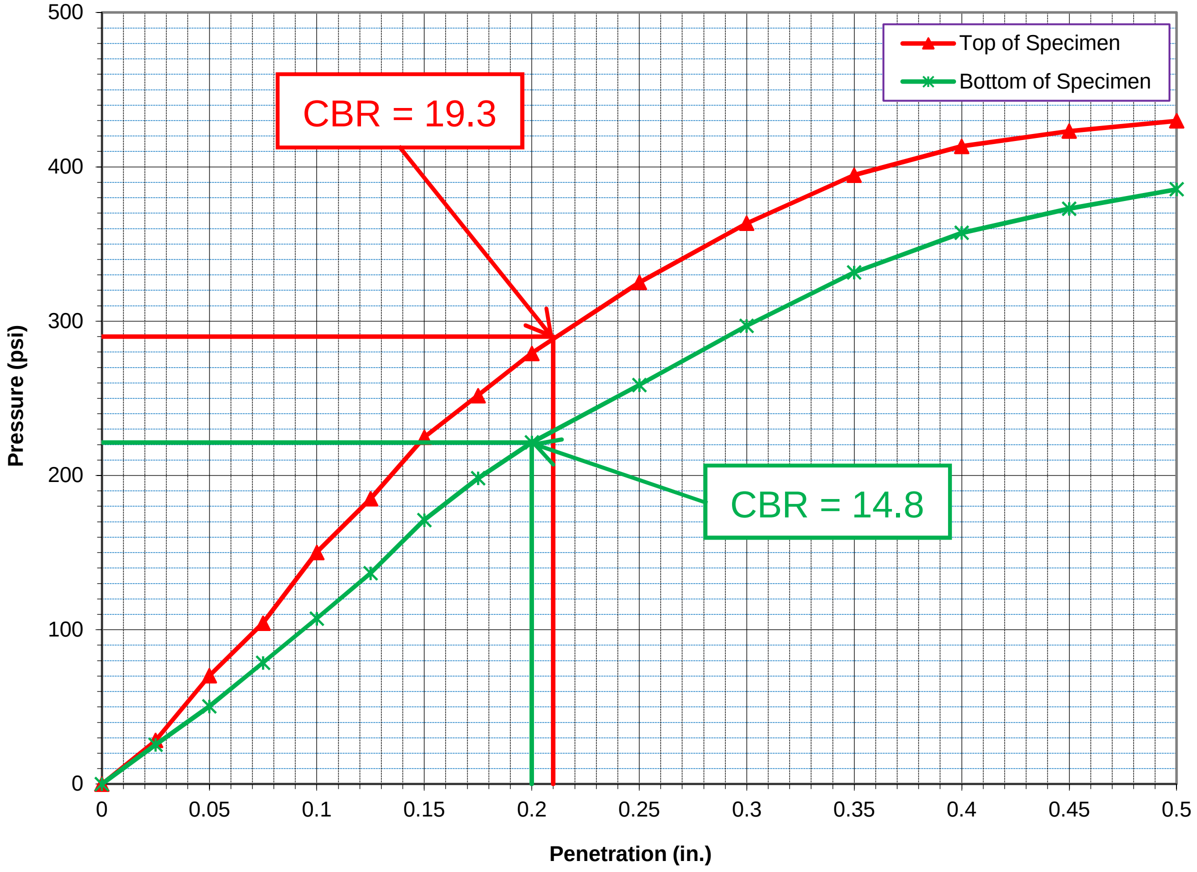
USCS Classification:
GP-GC

GRADATION AASHTO T-88	
Sieve Number	Percent Passing
3 in.	100
2 in.	100
1 in.	75
3/4 in.	58
3/8 in.	32
#4	23
#10	17
#40	11
#200	8

As Processed Water Content: 12.4 %



Laboratory CBR Test Report
(AASHTO T-193)



Test Pit/Depth, ft	Classification		Natural Moisture Content, %	Assumed Specific Gravity	Liquid Limit, %	Plastic Limit, %	% Passing No.4	% Passing No.200
	USCS	AASHTO						
TP-11/1-3	GP-GC	A-2-6	NA	2.67	37	24	23	8

PROCTOR TEST RESULTS (AASHTO T-99)	MATERIAL DESCRIPTION
Optimum Moisture Content = 14.8% Maximum Dry Density = 114.7 pcf	Reddish tan and tan weathered SHALE w/silty clay seams and layers

Remarks:

As molded: Dry Density, γ_d = 107.8 pcf; Moisture Content, w = 14.9%

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

Project: Hot Springs-I-30 (Widening)(S)
GHBW Project No.: 13-203
Location: Garland and Saline County, Arkansas
Sample Date: 10/14/2013
Test Date: 11/14/2013

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CONSULTING ENGINEERS

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FAX (501) 455-4137

REPORT OF STANDARD PROCTOR TEST
(AASHTO T-99)

Project: AHTD JOB 061377: Hot Springs-I-30 (Widening)(S) Job No: 13-203
Material Description: Reddish tan and gray silty clay w/shale fragments and clayey silt pockets
Location Sampled/Source: Test Pit 12
Sample Depth, ft: 1-3
Date Sampled: 10/14/2013
Date Tested: 10/25/2013
Tested By: RSL
Report Date: 11/25/2013

LAB COMPACTION PROCEDURE: AASHTO T-99 Method: C	
Maximum Unit Dry Wt. (pcf):	105.7
Optimum Water Content (%):	17.1

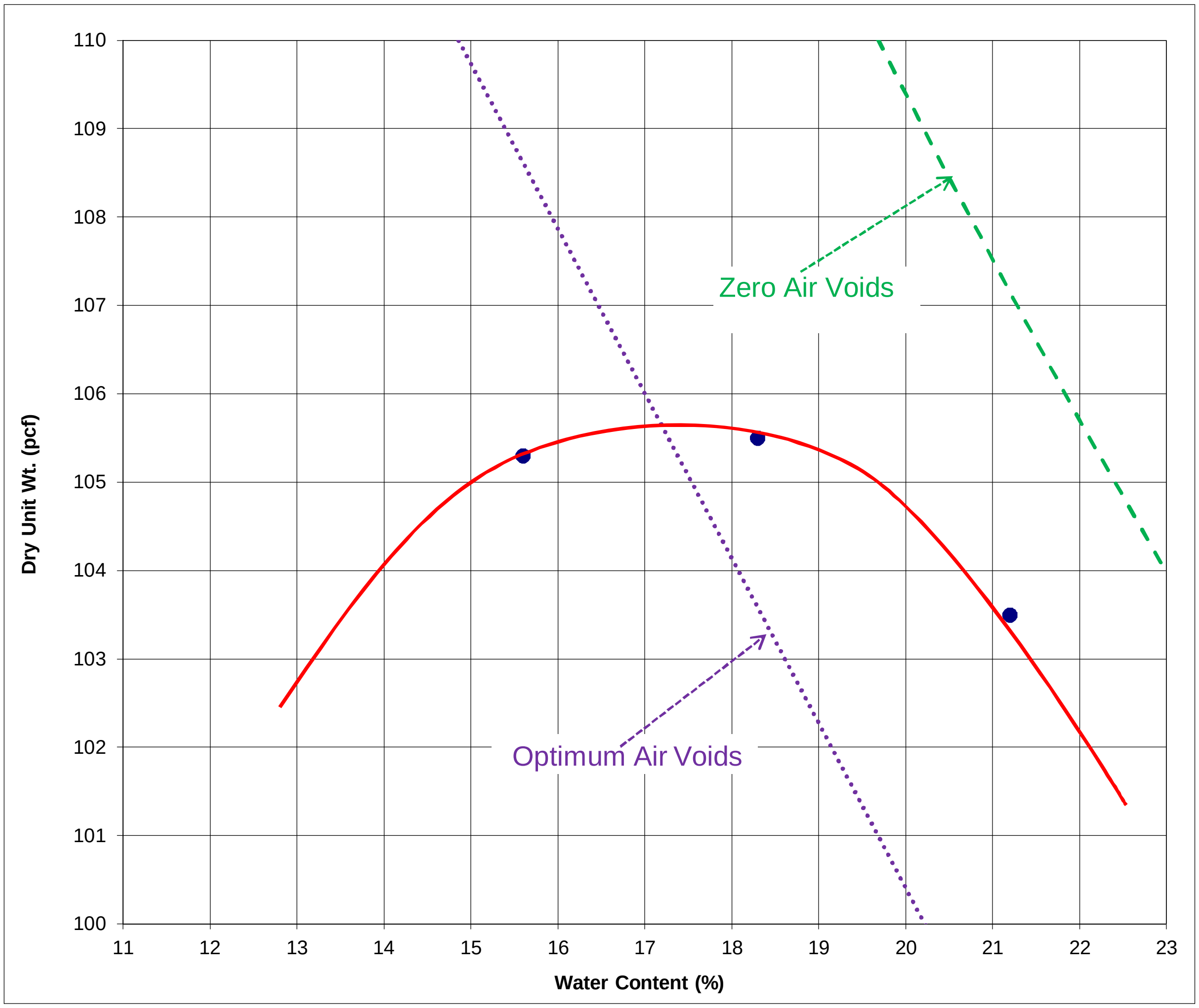
ATTERBERG LIMITS AASHTO T-89 & T-90
Liquid Limit: 46
Plastic Limit: 23
Plasticity Index: 23

AASHTO Classification:
A-7-6

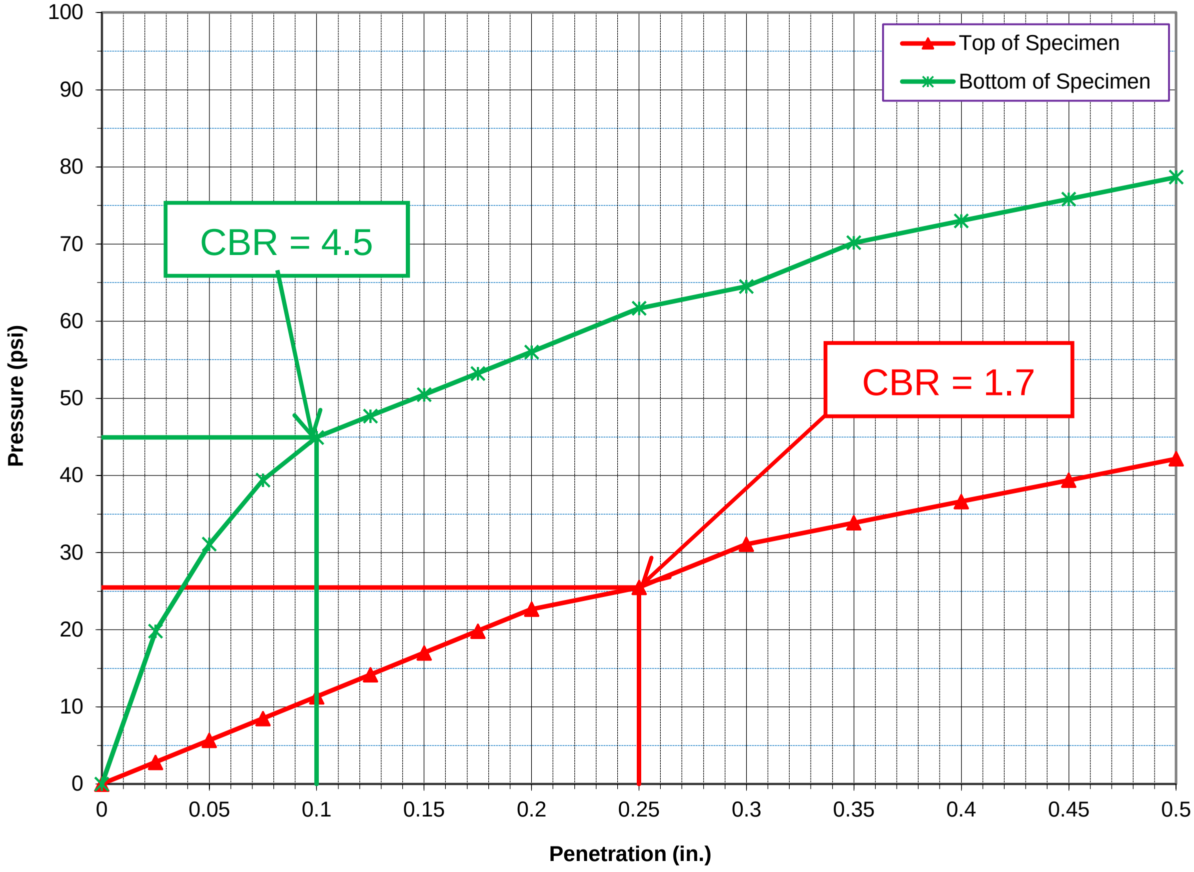
USCS Classification:
CL

GRADATION AASHTO T-88	
Sieve Number	Percent Passing
3 in.	100
2 in.	100
1 in.	95
3/4 in.	90
3/8 in.	81
#4	75
#10	68
#40	60
#200	55

As Processed Water Content: 15.0 %



Laboratory CBR Test Report
(AASHTO T-193)



Test Pit/Depth, ft	Classification		Natural Moisture Content, %	Assumed Specific Gravity	Liquid Limit, %	Plastic Limit, %	% Passing No.4	% Passing No.200
	USCS	AASHTO						
TP-12/1-3	CL	A-7-6	NA	2.7	46	23	90	55

PROCTOR TEST RESULTS (AASHTO T-99)	MATERIAL DESCRIPTION
Optimum Moisture Content = 17.1% Maximum Dry Density = 105.7 pcf	Reddish tan and gray silty clay w/shale fragments and clayey silt pockets

Remarks:

As molded: Dry Density, γ_d = 101.7 pcf; Moisture Content, w = 16.2%

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

Project: Hot Springs-I-30 (Widening)(S)
GHBW Project No.: 13-203
Location: Garland and Saline County, Arkansas
Sample Date: 10/14/2013
Test Date: 11/14/2013

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

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FAX (501) 455-4137

REPORT OF MODIFIED PROCTOR TEST

(AASHTO T-180)

Project: AHTD JOB 061377: Hot Springs-I-30 (Widening)(S)
Job No: 13-203
Material Description: Reddish tan and tan silty CLAY w/shale and sandstone fragments
Location Sampled/Source: Test Pit 16
Sample Depth, ft: 1-3
Date Sampled: 10/14/2013
Date Tested: 10/25/2013
Tested By: RSL
Report Date: 11/25/2013

LAB COMPACTION PROCEDURE: AASHTO T-180 Method: D	
Maximum Unit Dry Wt. (pcf):	120.3
Optimum Water Content (%):	13.0

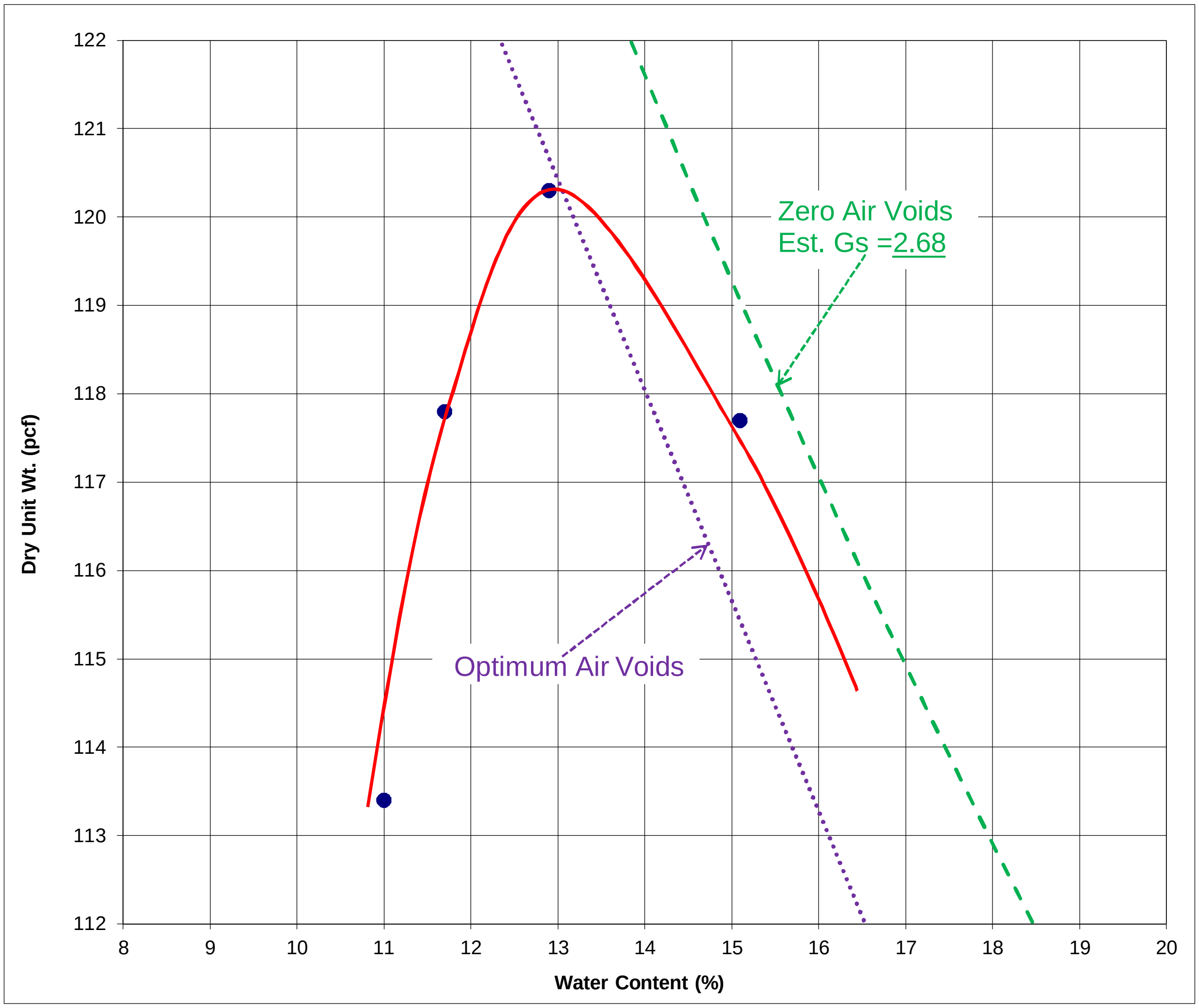
ATTERBERG LIMITS AASHTO T-89 & T-90
Liquid Limit: 37
Plastic Limit: 21
Plasticity Index: 16

AASHTO Classification:
A-2-6

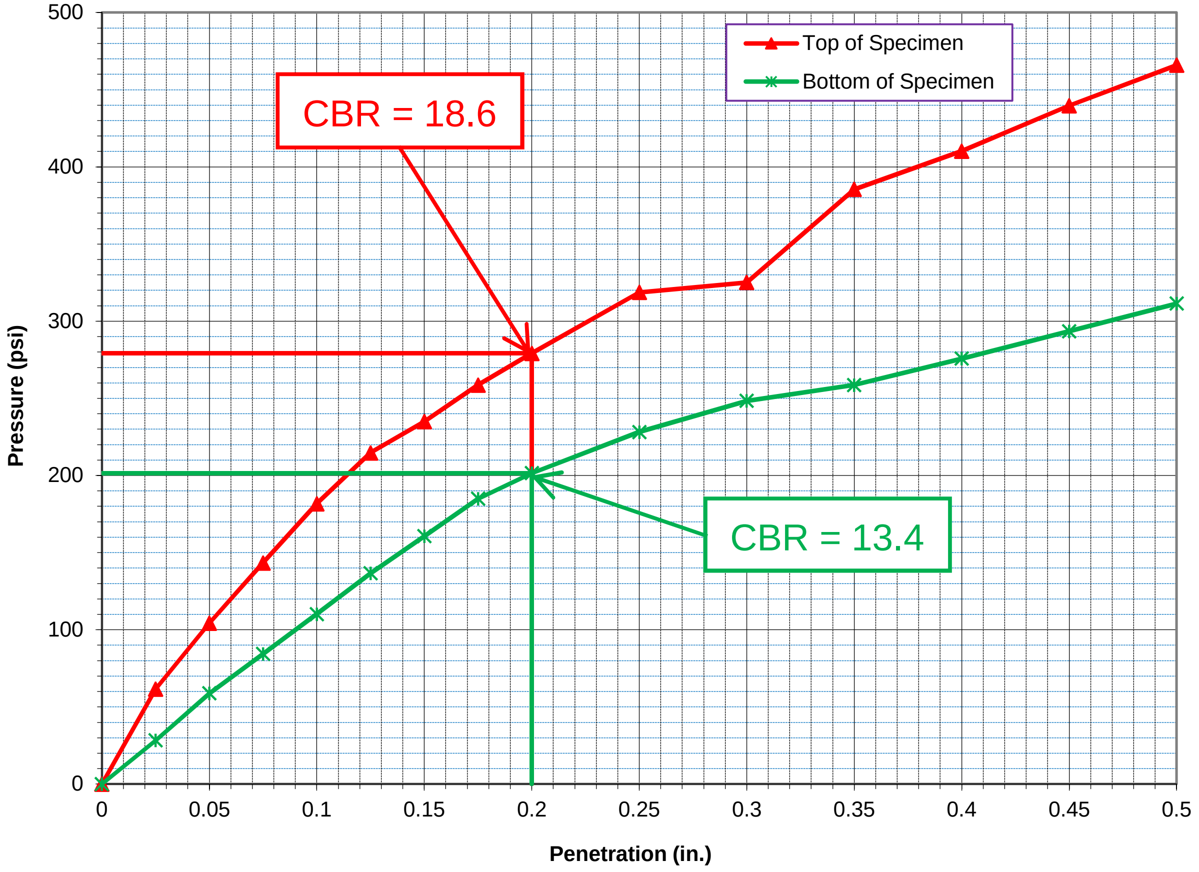
USCS Classification:
GC

GRADATION AASHTO T-88	
Sieve Number	Percent Passing
3 in.	100
2 in.	97
1 in.	92
3/4 in.	87
3/8 in.	69
#4	58
#10	42
#40	24
#200	18

As Processed Water Content: 10.3 %



Laboratory CBR Test Report
(AASHTO T-193)



Test Pit/Depth, ft	Classification		Natural Moisture Content, %	Assumed Specific Gravity	Liquid Limit, %	Plastic Limit, %	% Passing No.4	% Passing No.200
	USCS	AASHTO						
TP-16/1-3	GC	A-2-6	NA	2.68	37	21	58	18

PROCTOR TEST RESULTS (AASHTO T-180)	**MATERIAL DESCRIPTION**
Optimum Moisture Content = 13.0% Maximum Dry Density = 120.3 pcf	Reddish tan and tan silty clay w/shale and sandstone fragments

Remarks:

As molded: Dry Density, γ_d = 114.5 pcf; Moisture Content, w = 13.0%

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

Project: Hot Springs-I-30 (Widening)(S)
GHBW Project No.: 13-203
Location: Garland and Saline County, Arkansas
Sample Date: 10/14/2013
Test Date: 11/14/2013

ATTACHMENT 11

SUMMARY of ROCK COMPRESSION TEST RESULTS

PROJECT: AHTD 061377: Hot Springs-I-30 (Widening) (S)
LOCATION: Garland and Saline Counties, AR
GHBW JOB NO.: 13-203

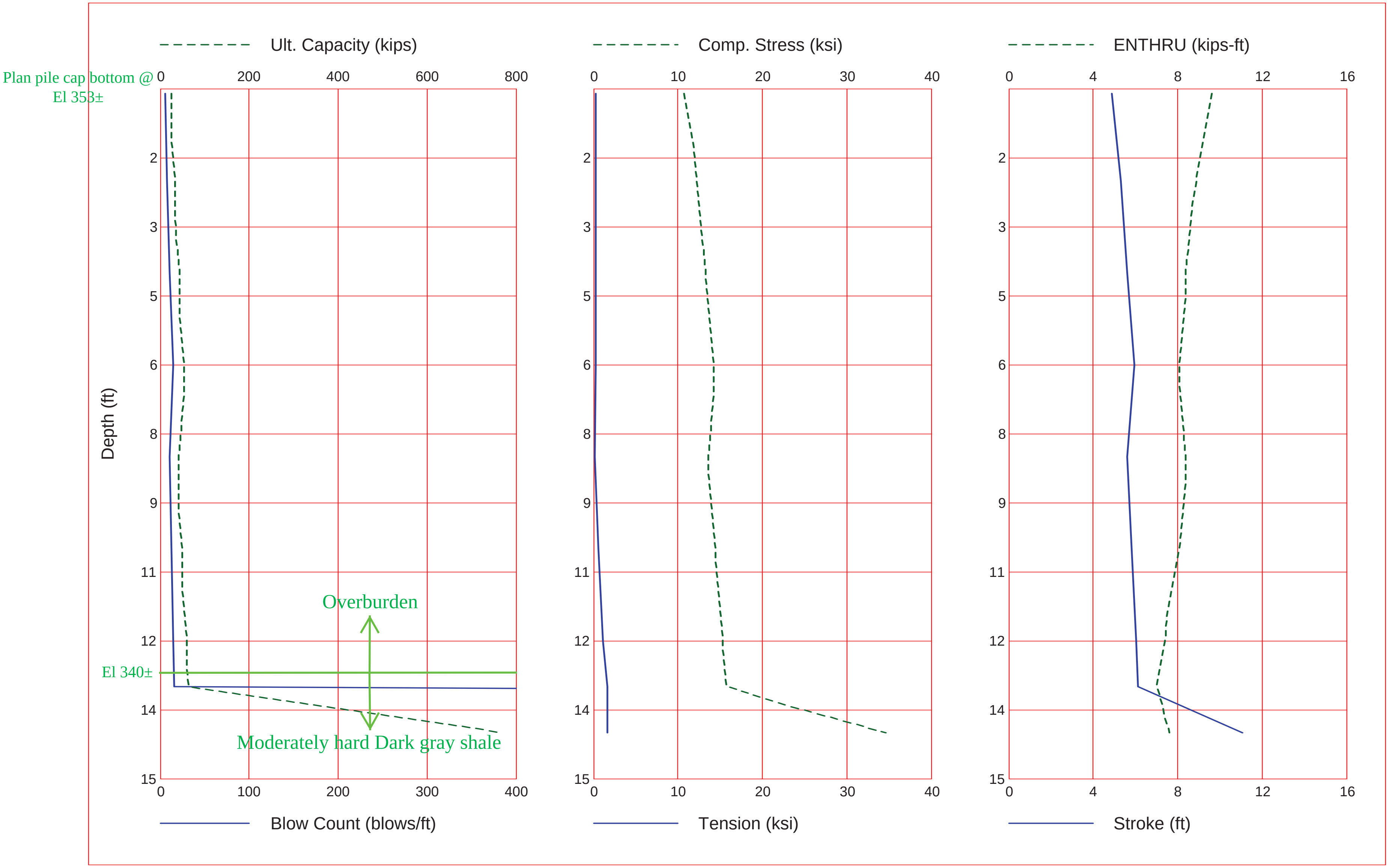
Boring No.	Depth, ft	Project Facet	Rock Type	Rec, %	RQD, %	Total Unit Wt, pcf	Compressive Strength (ASTM D-7012), psi
S7	23-24	Ten Mile Creek (East)	Shale	100	28	166	1150
S8	12-12.5	Ten Mile Creek (East)	Shale	100	55	165	3550
S8	14-14.5	Ten Mile Creek (East)	Shale	100	55	162	3100
S8	15.5-16	Ten Mile Creek (East)	Shale	100	55	167	3100
S10	22-22.5	Ten Mile Creek (East)	Shale	100	95	165	1930
S10	24.5-25	Ten Mile Creek (East)	Shale	100	95	163	2340
S11	22-22.5	Ten Mile Creek (East)	Shale	100	95	161	1330
S11	25-25.5	Ten Mile Creek (East)	Shale	100	95	148	2870
S12	21.5-22.1	Caney Creek	Shale	90	40	169	1980
S12	22.1-22.5	Caney Creek	Shale	90	40	167	2160
S12	23.1-23.7	Caney Creek	Shale	90	40	174	1330
S13	17.2-17.8	Caney Creek	Shale	100	38	167	4330
S13	21.9-22.5	Caney Creek	Shale	100	22	169	4330

ATTACHMENT 12

Grubbs, Hoskyn, Barton & Wyatt, Inc.
13-203_Driveability_Bent 6_HP14x73

Jun 26 2014
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 1.000 / 1.000



Steel HP14×73 @ Bent 6
US 70 over Ten Mile Creek (East)
E = 20.1 ft-kips (DELMAG D 8-12)

Gain/Loss 1 at Shaft and Toe 1.000 / 1.000

Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
0.1	25.0	0.5	24.5	5.2	10.727	-0.269	4.90	9.6
2.0	33.9	9.4	24.5	7.9	12.243	-0.294	5.31	8.9
4.0	43.3	18.8	24.5	11.0	13.285	-0.254	5.62	8.4
6.0	52.7	28.2	24.5	14.4	14.238	-0.285	5.94	8.1
8.0	41.2	36.9	4.3	10.5	13.627	-0.172	5.63	8.4
10.0	50.2	44.8	5.4	12.5	14.416	-0.540	5.84	8.1
12.0	59.2	52.7	6.5	14.6	15.276	-1.131	6.03	7.4
13.0	63.7	56.7	7.0	15.6	15.756	-1.660	6.12	7.0
14.0	770.4	131.9	638.5	9999.0	34.660	-1.611	11.07	7.6

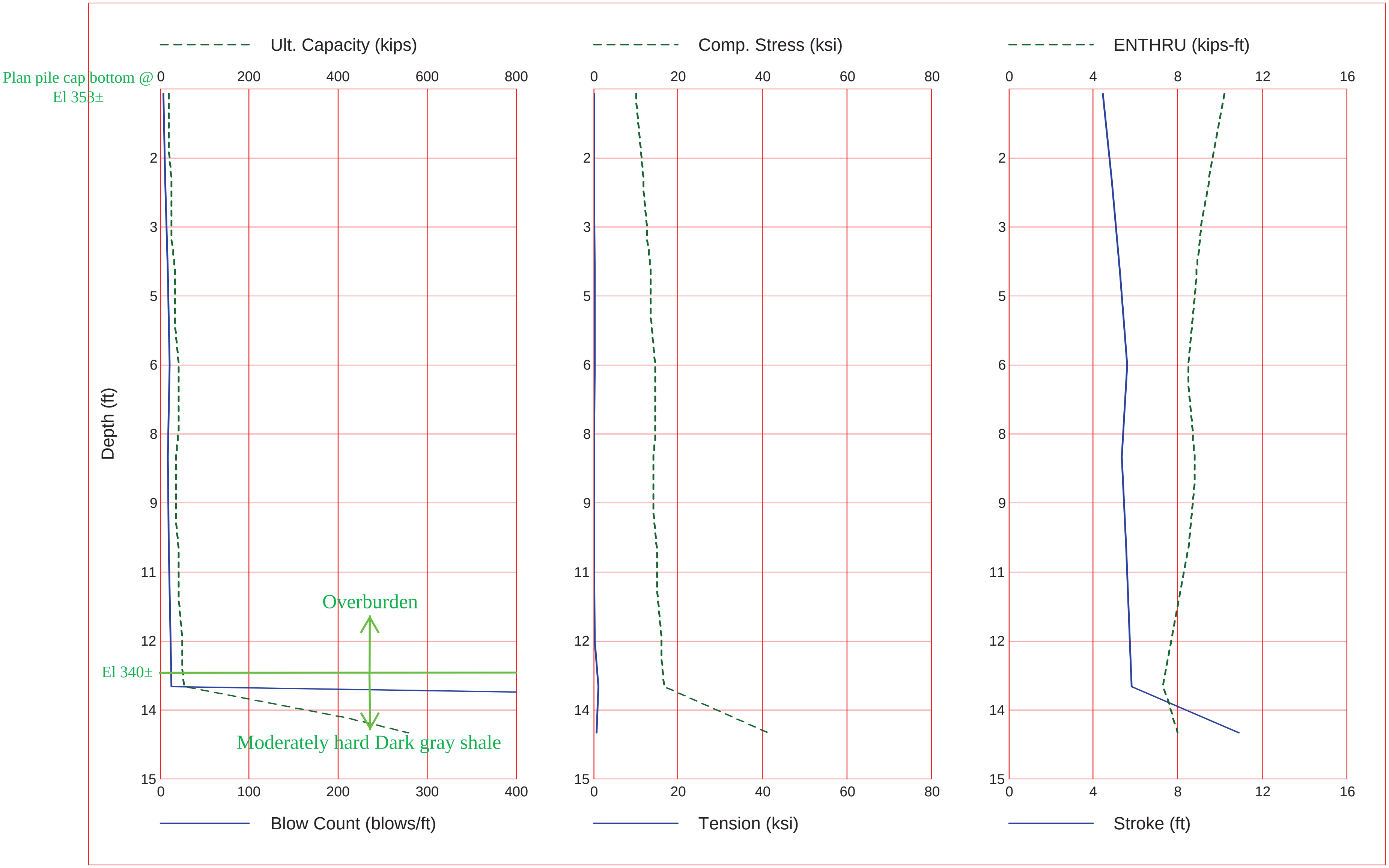
Refusal occurred; no driving time output possible

Steel HP14×73 @ Bent 6
US 70 over Ten Mile Creek (East)
E = 20.1 ft-kips (DELMAG D 8-12)

Grubbs, Hoskyn, Barton & Wyatt, Inc.
13-203_Driveability_Bent 6_HP12x53

Jun 26 2014
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 1.000 / 1.000



Steel HP12×53 @ Bent 6
US 70 over Ten Mile Creek (East)
E = 20.1 ft-kips (DELMAG D 8-12)

Grubbs, Hoskyn, Barton & Wyatt, Inc. Jun 26 2014
13-203_Driveability_Bent 6_HP12x53 GRLWEAP Version 2010

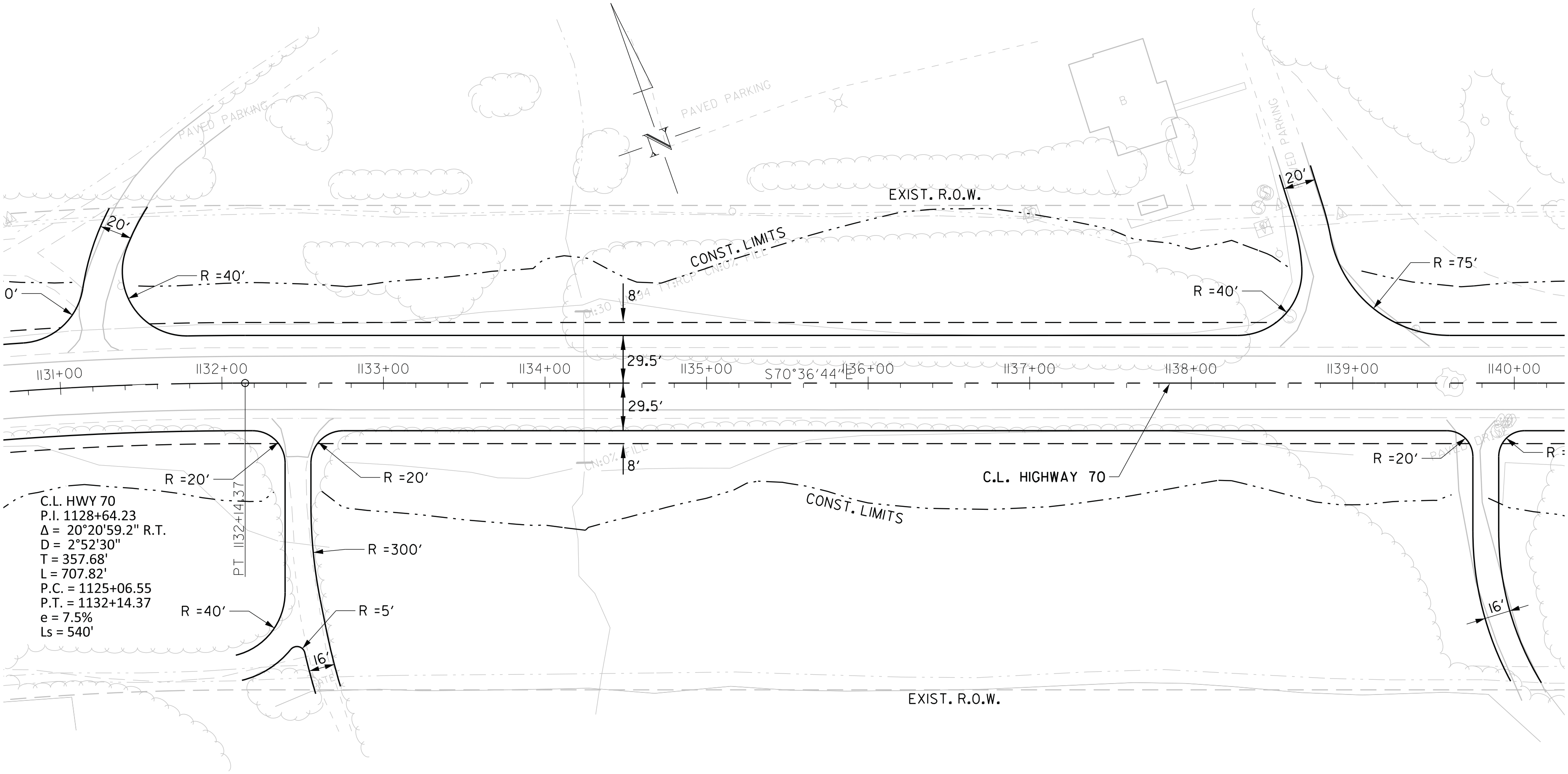
Gain/Loss 1 at Shaft and Toe 1.000 / 1.000

Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
0.1	18.4	0.4	18.0	3.7	10.082	0.000	4.45	10.2
2.0	26.0	8.0	18.0	5.8	11.944	0.000	4.90	9.5
4.0	34.0	16.0	18.0	8.2	13.524	-0.233	5.27	8.9
6.0	42.0	24.0	18.0	10.8	14.625	-0.263	5.59	8.5
8.0	34.5	31.4	3.1	8.5	14.236	-0.156	5.35	8.8
10.0	42.0	38.1	3.9	10.1	15.117	-0.160	5.55	8.5
12.0	49.5	44.9	4.7	11.7	16.183	-0.422	5.72	7.7
13.0	53.3	48.2	5.1	12.6	16.779	-1.129	5.81	7.3
14.0	558.0	112.2	445.8	3326.2	41.394	-0.667	10.88	8.0

Total Continuous Driving Time 48.00 minutes; Total Number of Blows 1783

Steel HP12×53 @ Bent 6
US 70 over Ten Mile Creek (East)
E = 20.1 ft-kips (DELMAG D 8-12)

ATTACHMENT 13

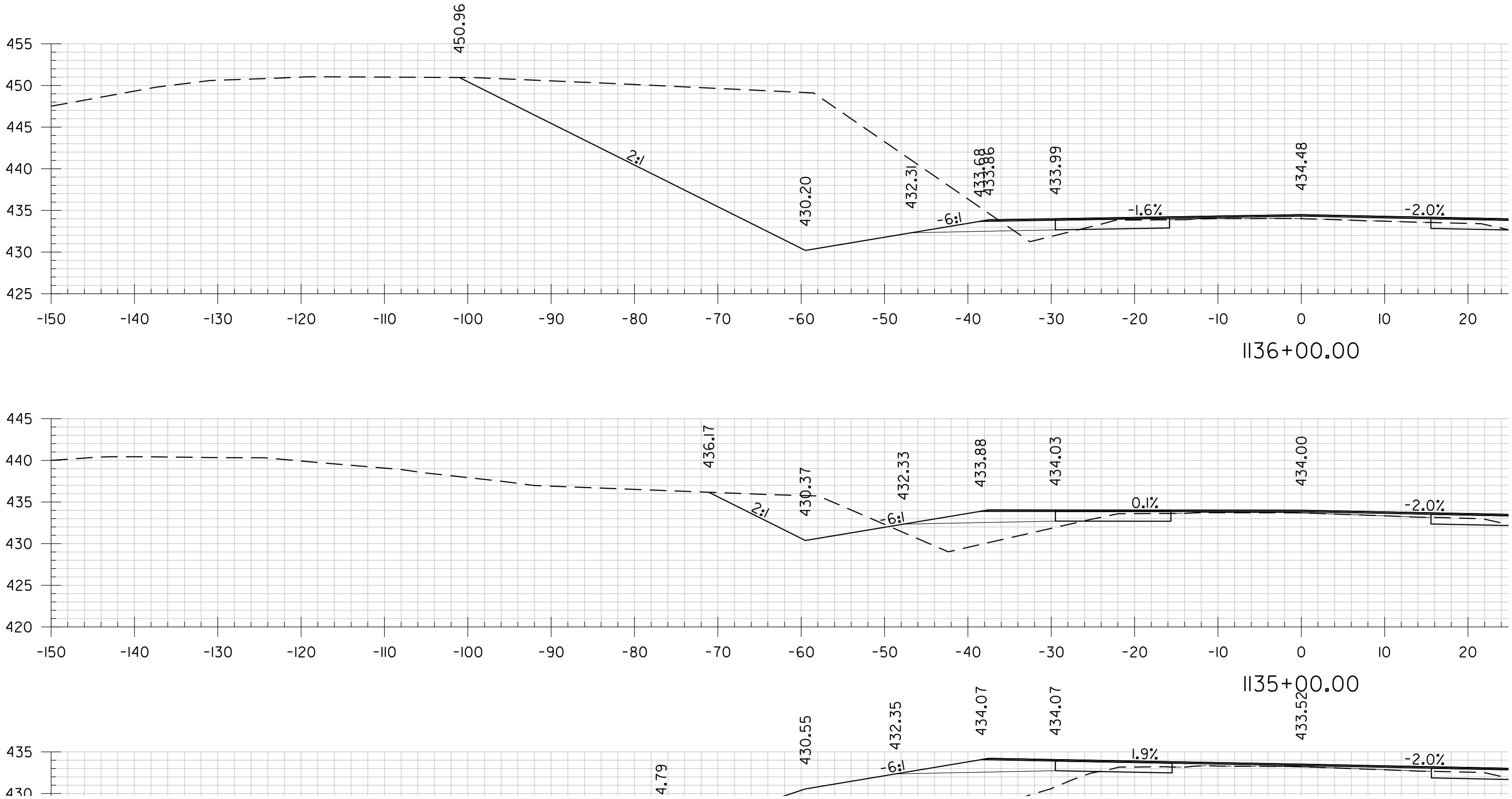


C.L. HWY 70
P.I. 1128+64.23
Δ = 20°20'59.2" R.T.
D = 2°52'30"
T = 357.68'
L = 707.82'
P.C. = 1125+06.55
P.T. = 1132+14.37
e = 7.5%
Ls = 540'

Cut Slope at Sta
1136+00

Cut Slope at Sta
1136+00

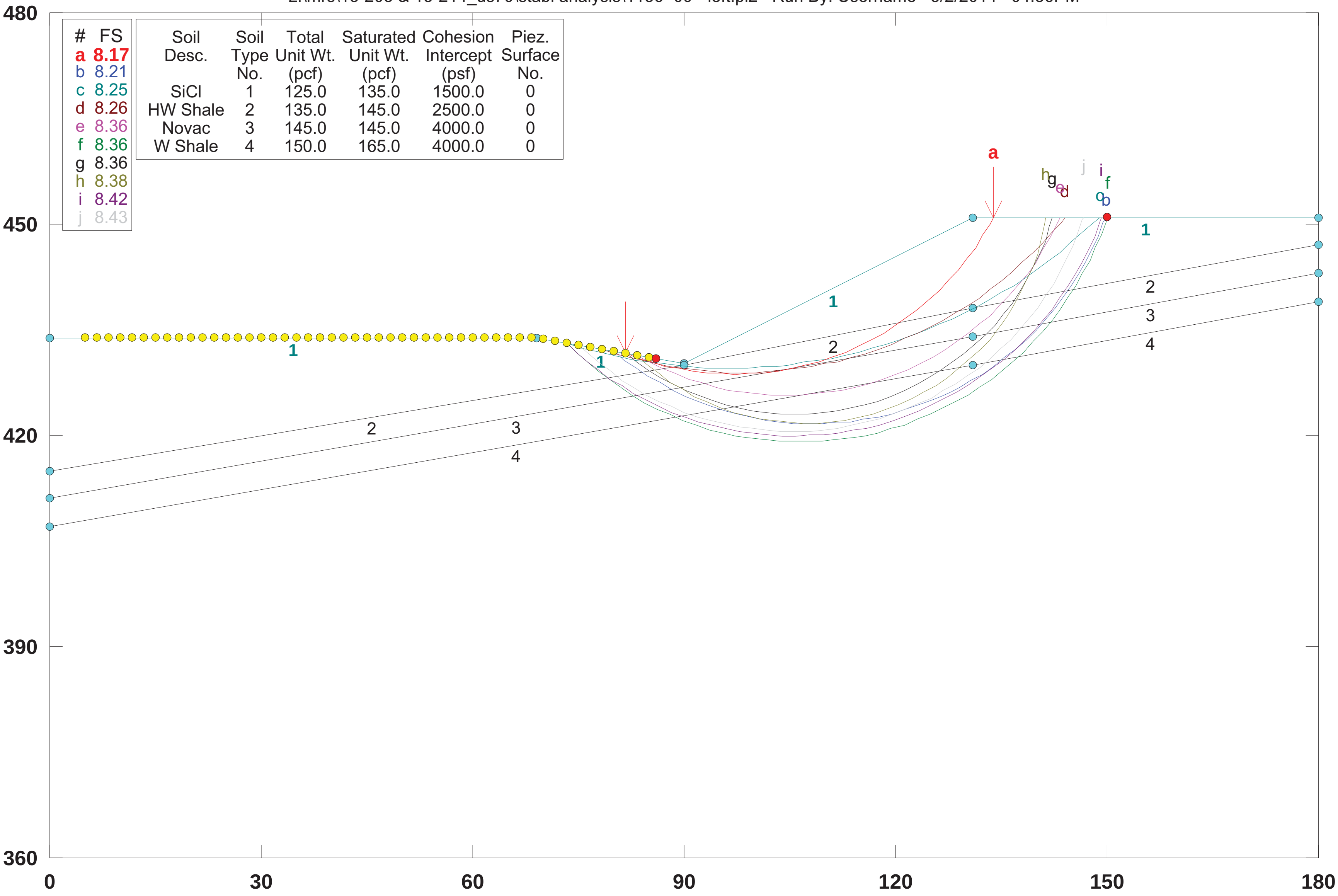
STA. 1132+00 TO STA. 1136+00



70&space;EAST&space;SEGMENT/Roadways/DESIGN/061377_21_CS_MAIN_01.dgn

AHTD Job No. 061377 - Hwy 70 Widening - Approx STA 1136+00, Left Side- EOC

z:\mrs\13-203 & 13-214_us70\stabl analysis\1136+00 - left.pl2 Run By: Username 5/2/2014 04:36PM



#	FS
a	8.17
b	8.21
c	8.25
d	8.26
e	8.36
f	8.36
g	8.36
h	8.38
i	8.42
j	8.43

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Piez. Surface No.
SiCl	1	125.0	135.0	1500.0	0
HW Shale	2	135.0	145.0	2500.0	0
Novac	3	145.0	145.0	4000.0	0
W Shale	4	150.0	165.0	4000.0	0

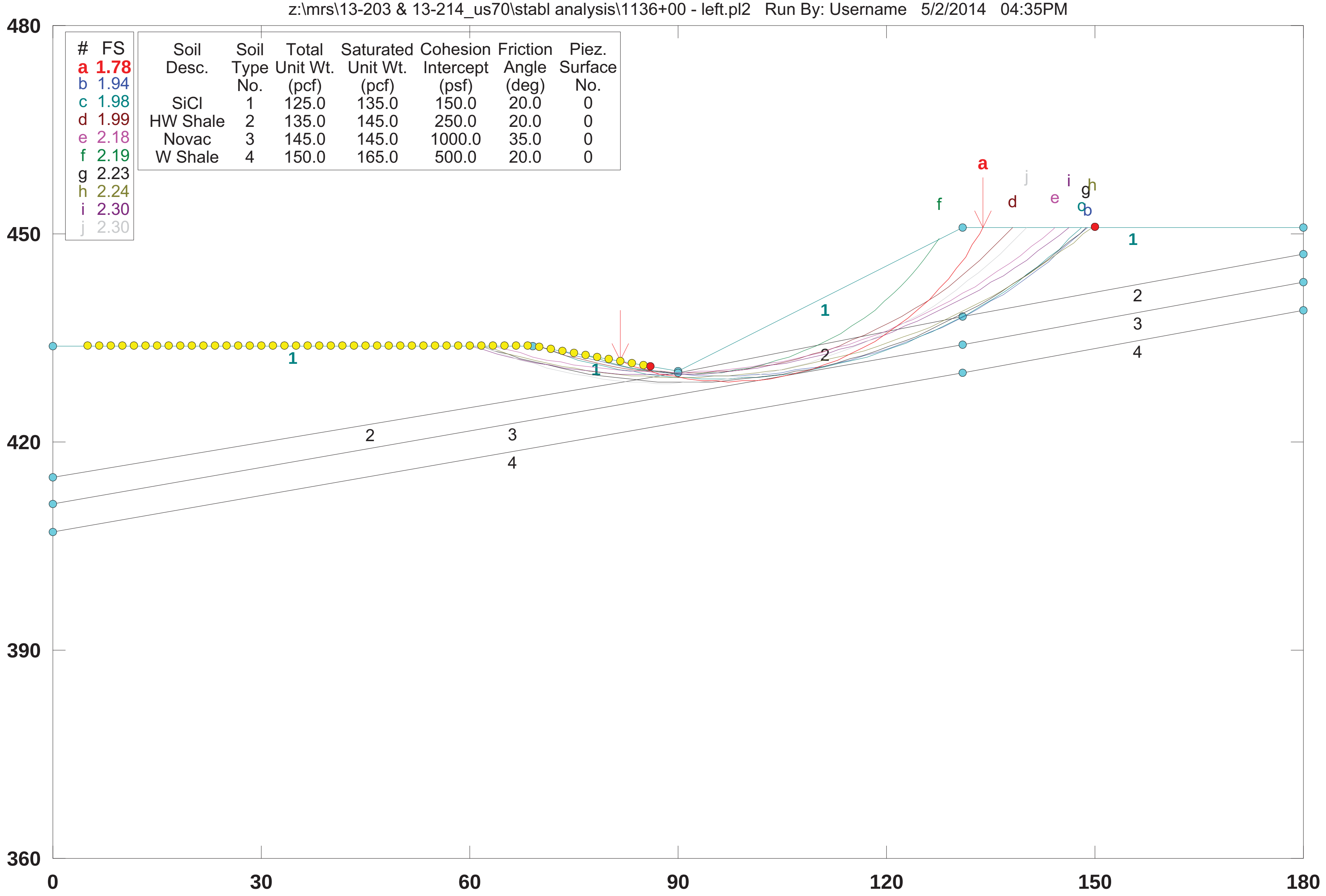
PCSTABL5M/si FSmin=8.17

Safety Factors Are Calculated By The Modified Bishop Method

GHBW

AHTD Job No. 061377 - Hwy 70 Widening - Approx STA 1136+00, Left Side- Long Term

z:\mrs\13-203 & 13-214_us70\stabl analysis\1136+00 - left.pl2   Run By: Username   5/2/2014   04:35PM



#	FS
a	1.78
b	1.94
c	1.98
d	1.99
e	2.18
f	2.19
g	2.23
h	2.24
i	2.30
j	2.30

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
SiCl	1	125.0	135.0	150.0	20.0	0
HW Shale	2	135.0	145.0	250.0	20.0	0
Novac	3	145.0	145.0	1000.0	35.0	0
W Shale	4	150.0	165.0	500.0	20.0	0

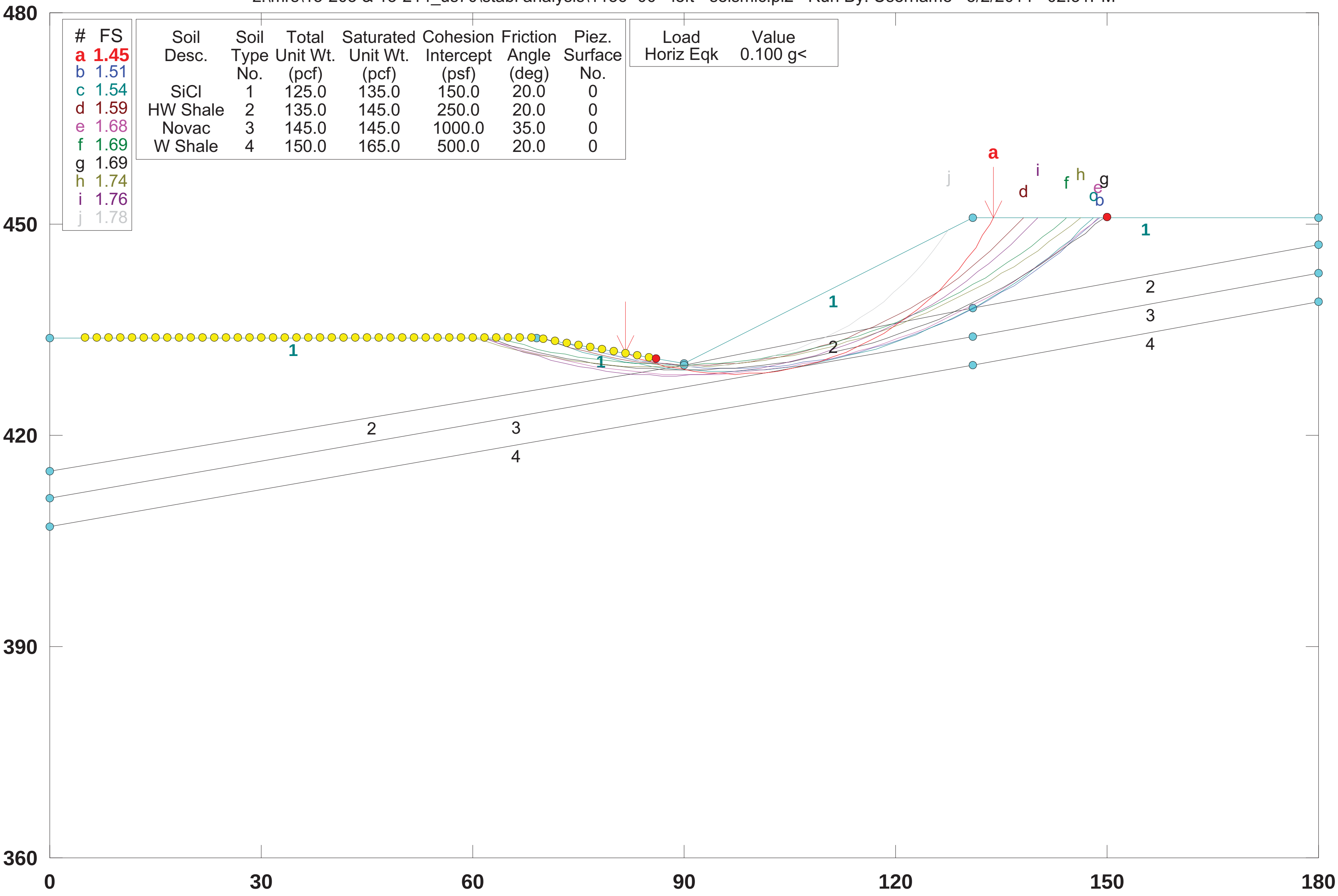
PCSTABL5M/si FSmin=1.78

Safety Factors Are Calculated By The Modified Bishop Method

GHBW

AHTD Job No. 061377 - Hwy 70 Widening - Approx STA 1136+00, Left Side - Seismic

z:\mrs\13-203 & 13-214_us70\stabl analysis\1136+00 - left - seismic.pl2 Run By: Username 5/2/2014 02:31PM



#	FS
a	1.45
b	1.51
c	1.54
d	1.59
e	1.68
f	1.69
g	1.69
h	1.74
i	1.76
j	1.78

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
SiCl	1	125.0	135.0	150.0	20.0	0
HW Shale	2	135.0	145.0	250.0	20.0	0
Novac	3	145.0	145.0	1000.0	35.0	0
W Shale	4	150.0	165.0	500.0	20.0	0

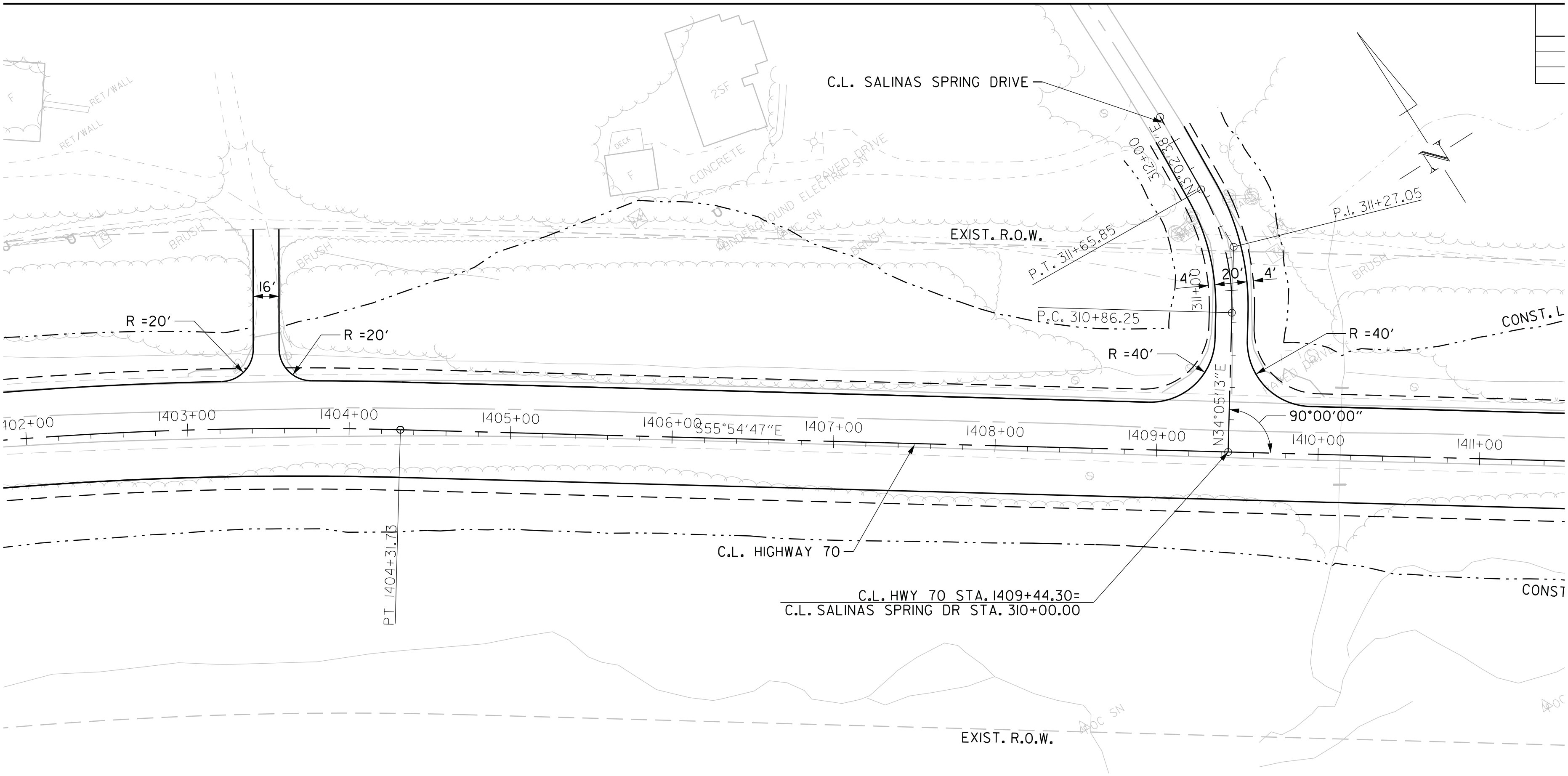
Load	Value
Horiz Eqk	0.100 g<

PCSTABL5M/si FSmin=1.45

Safety Factors Are Calculated By The Modified Bishop Method

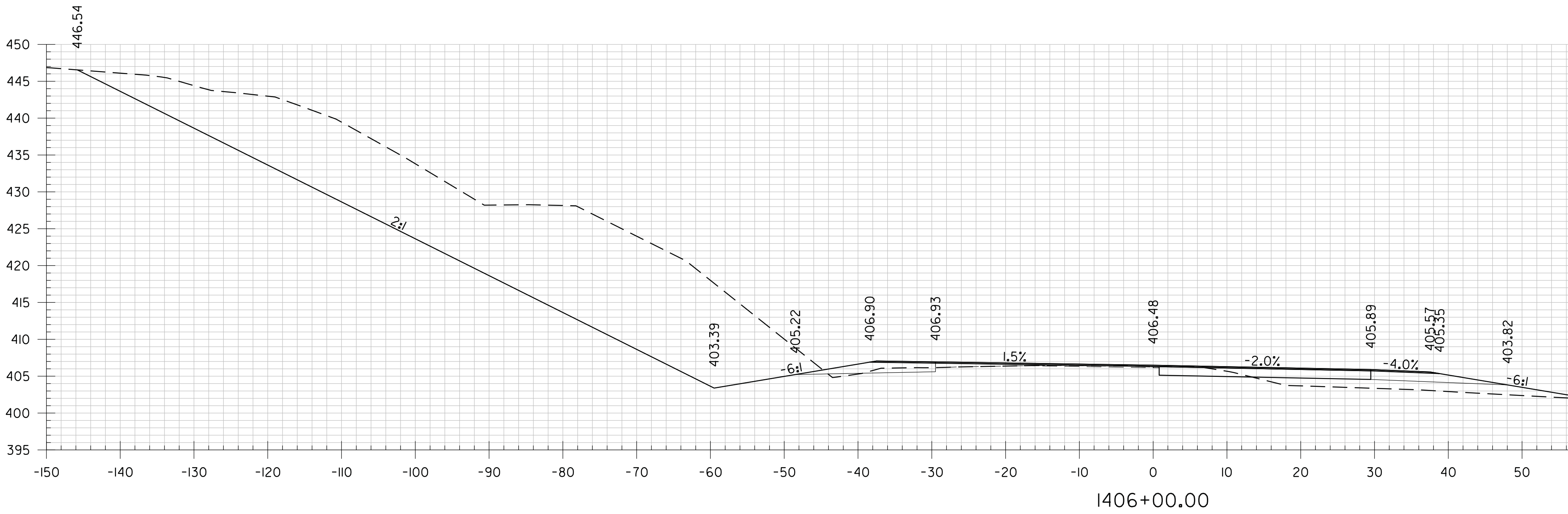
GHBW

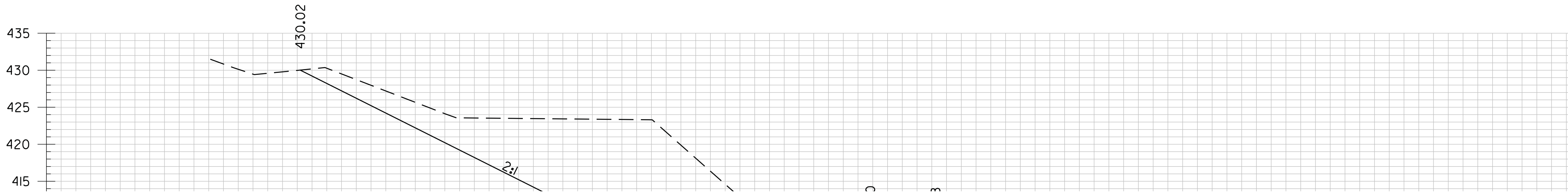
Cut Slope at Sta
1406+00



STA. 1404+00 TO STA. 1406+00

Cut Slope at Sta 1406+00





n/Highway_70_Widening/US&space;70&space;EAST&space;SEGMENT/Roadways/DESIGN/061377_21_CS_MAIN_01.dgn

AHTD Job No. 061377 - Hwy 70 Widening - Approx STA 1406+00, Left Side- EOC

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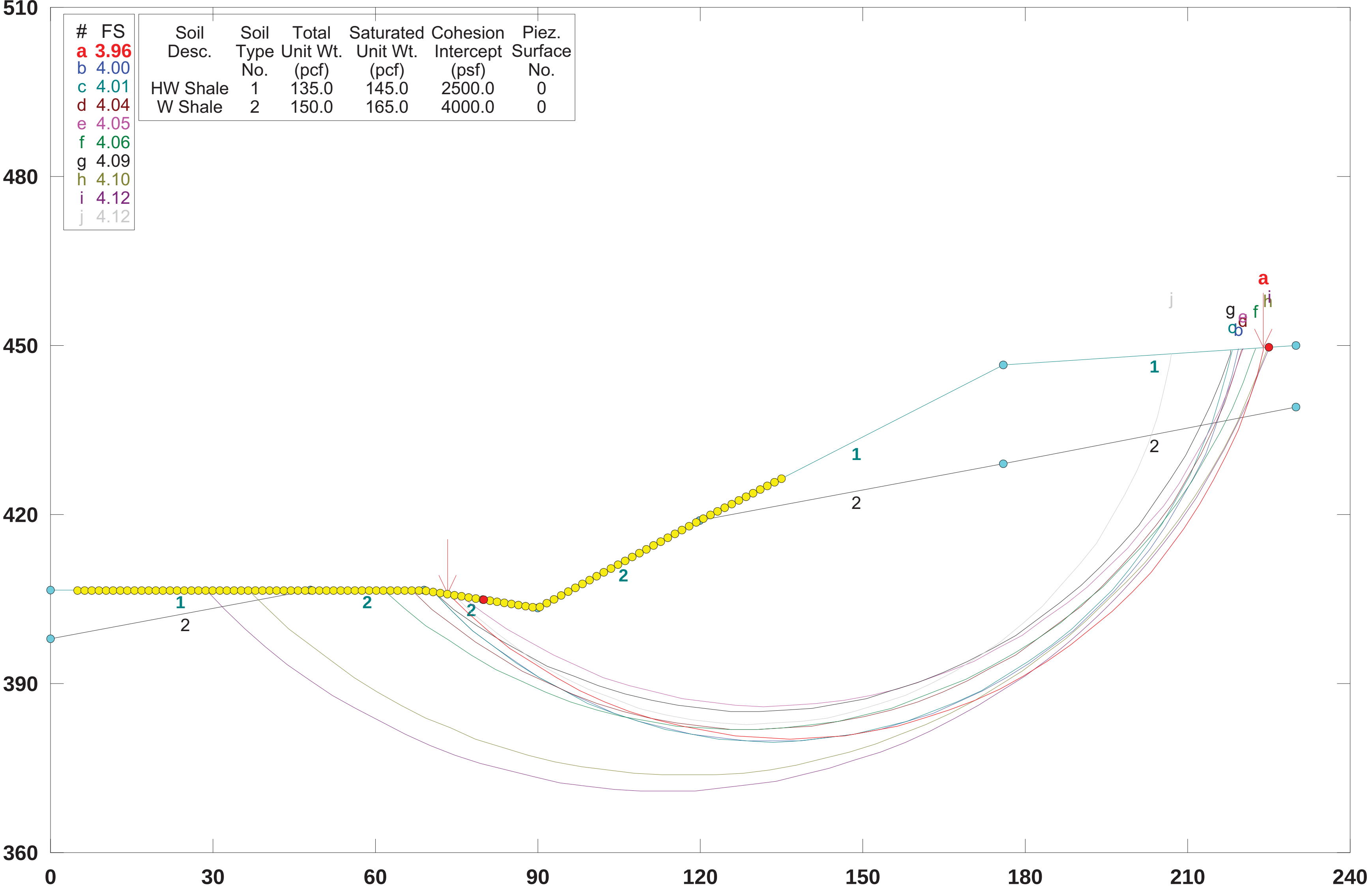

#	FS
a	3.96
b	4.00
c	4.01
d	4.04
e	4.05
f	4.06
g	4.09
h	4.10
i	4.12
j	4.12

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Piez. Surface No.
HW Shale	1	135.0	145.0	2500.0	0
W Shale	2	150.0	165.0	4000.0	0

PCSTABL5M/si FSmin=3.96

Safety Factors Are Calculated By The Modified Bishop Method

GHBW

AHTD Job No. 061377 - Hwy 70 Widening - Approx STA 1406+00, Left Side- Long Term

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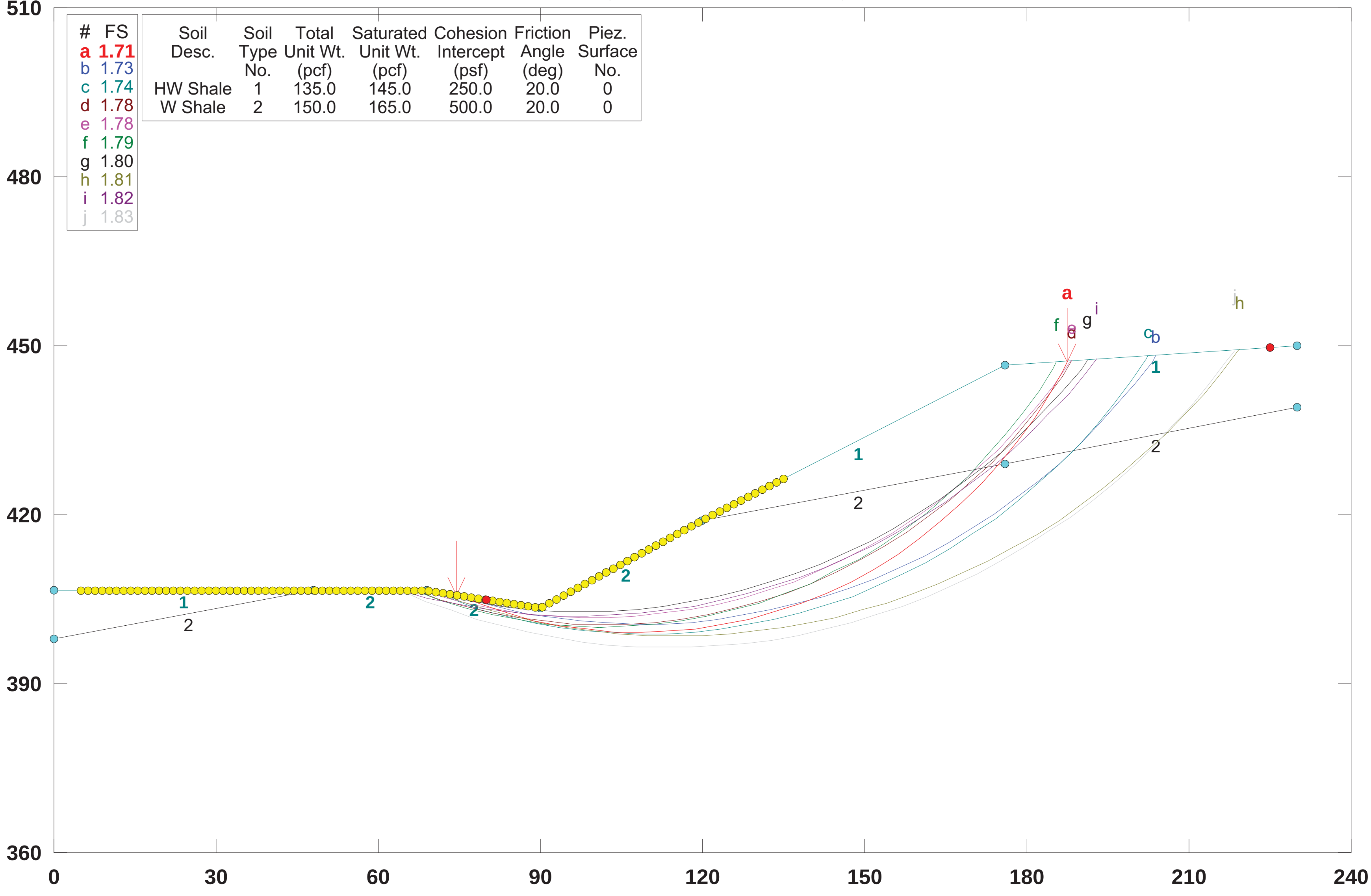


#	FS
a	1.71
b	1.73
c	1.74
d	1.78
e	1.78
f	1.79
g	1.80
h	1.81
i	1.82
j	1.83

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
HW Shale	1	135.0	145.0	250.0	20.0	0
W Shale	2	150.0	165.0	500.0	20.0	0

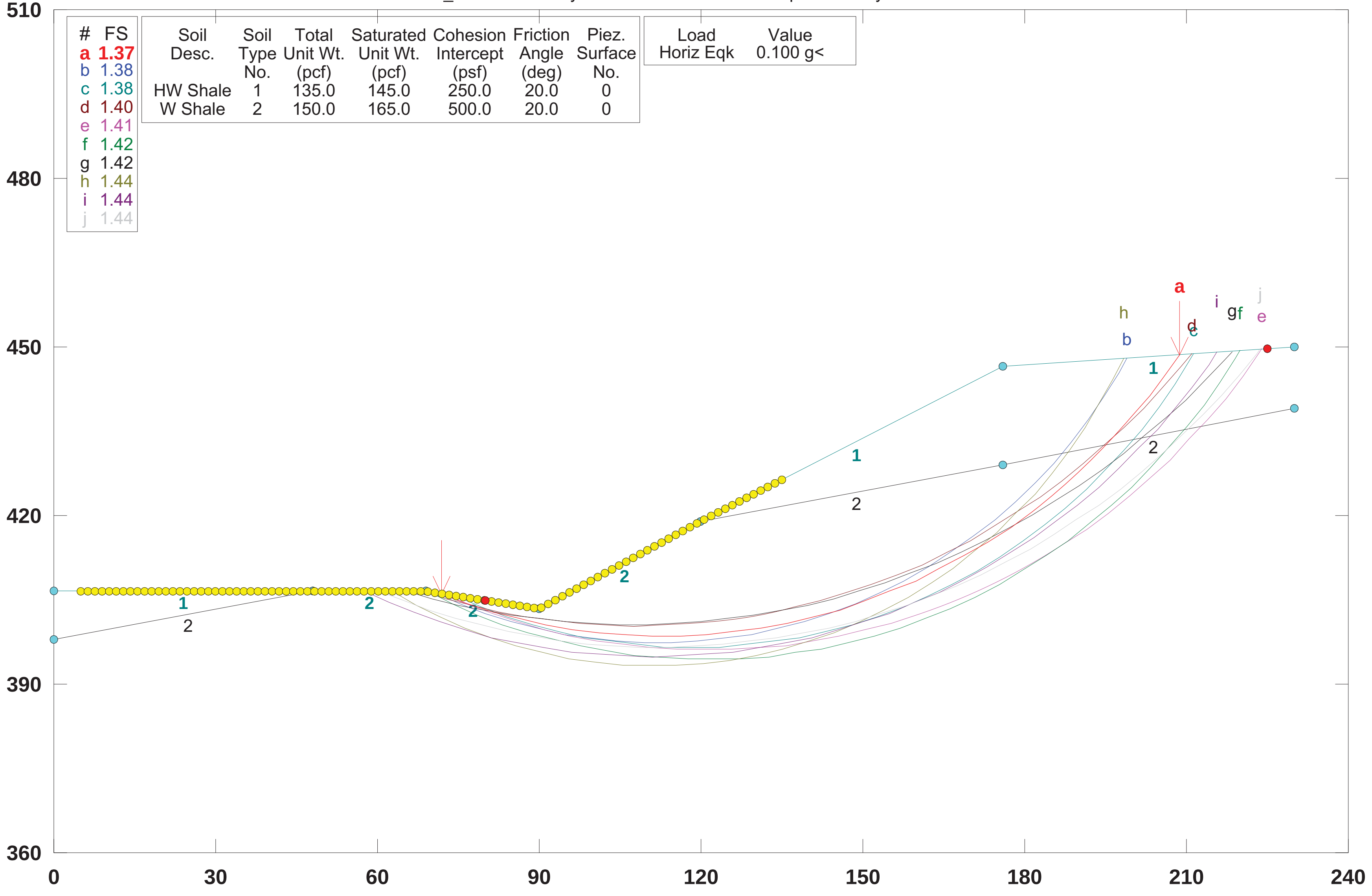
PCSTABL5M/si FSmin=1.71

Safety Factors Are Calculated By The Modified Bishop Method

GHBW

AHTD Job No. 061377 - Hwy 70 Widening - Approx STA 1406+00, Left Side - Seismic

z:\mrs\13-203 & 13-214_us70\stabl analysis\1406+00 - left - seismic.pl2 Run By: Username 5/2/2014 02:30PM



#	FS
a	1.37
b	1.38
c	1.38
d	1.40
e	1.41
f	1.42
g	1.42
h	1.44
i	1.44
j	1.44

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
HW Shale	1	135.0	145.0	250.0	20.0	0
W Shale	2	150.0	165.0	500.0	20.0	0

Load	Value
Horiz Eqk	0.100 g<

PCSTABL5M/si FSmin=1.37

Safety Factors Are Calculated By The Modified Bishop Method

GHBW

Grubbs, Hoskyn,
Barton & Wyatt, INC.
CONSULTING ENGINEERS

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#1 Trigon Place 72209
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FAX (501) 455-4137

May 13, 2016
Job No. 13-214

Michael Baker International
1400 West Markham, Suite 204
Little Rock, Arkansas 72201

Attn: Mr. Michael H. Stengel, P.E.
Vice President

GEOTECHNICAL INVESTIGATION
AHTD CA0606: HOT SPRINGS –HWY 128 (WIDENING) (S)
FEDERAL AID PROJECT ("FAP") NO. 9991
GARLAND COUNTY, ARKANSAS

INTRODUCTION

This revised report presents the results of the geotechnical investigation performed for AHTD Job CA0606: Hot Springs – Hwy 128 (Widening) (S). This project consists of the widening of U.S. Highway 70 from Dr. Martin Luther King Expressway to State Route 128 in Garland County, Arkansas. These services were authorized by the subconsultant agreement dated July 13, 2013. Preliminary results have been provided throughout the course of this study. This report utilizes the revised stationing provided to Grubbs, Hoskyn, Barton, & Wyatt, Inc. (GHBW) on March 30, 2016 for merger of this project during execution with adjoining project 061377. Also included are recommendations for drilled shaft foundations at bridge interior bents. This revised report incorporates the revised alignment stationing and supersedes our submittals of July 31, 2014, November 13, 2015, and February 26, 2016.

We understand the Highway 70 improvement project includes the widening of approximately 18.9 miles of Highway 70 in Garland and Saline Counties to accommodate a five lane section with 8 ft paved shoulder. This larger development plan has been divided into two (2) separate projects: 061377 from Hwy 128 to I-30, and CA0606 from Hot Springs to Hwy 128. This report addresses the 11 mile western portion of the Highway 70 widening alignment, from about Dr. Martin Luther King Expressway east to near Hwy 128, i.e., Job CA0606. The geotechnical investigation report for the eastern portion of the alignment (AHTD Job 061377) has been provided in another volume.

Within this portion of the proposed roadway widening, one (1) existing bridge structure will also be reconstructed. The new bridge will be composite W-beam structures. The bridge planned for reconstruction includes the Ten Mile Creek (West) bridge, AHTD Bridge No. 02945. We understand that the Ten Mile Creek (West) bridge will be about 144 ft long with four (4) bents (two interior bents and abutments at bridge ends). The new bridge will have pavement grades ranging from about El 523.4 on the east approach to about El 524.9 on the west approach.

It is also understood that the roadway widening will occur on both sides of the existing roadway to minimize the amount of grading needed to modify the crown location. For the most part, the existing highway will be incorporated into the westbound directional lane. In several locations the widening will be limited to the south side of the existing highway. In these areas the alignment has been established to allow phased construction of the new bridge and to avoid environmental constraints. If the existing pavement is not widened on the north side, the existing shoulder will be removed and reconstructed to meet current standards.

The purposes of this study were to explore subsurface conditions in the project alignment. The data developed through the field and laboratory studies have been utilized to develop recommendations to guide design and construction of foundations, embankments, roadways, and earthwork. These purposes were achieved by a multi-phased study that included:

- Drilling sample and core borings and excavating test pits to evaluate subsurface conditions and obtain samples for laboratory testing.
- Performing laboratory tests to evaluate pertinent engineering properties of the foundation and subgrade strata.
- Analyzing field and laboratory data to develop recommendations for roadway and foundation design, embankment configurations, and construction considerations.

The relationship of these factors to design and construction of the new structure, roadways and embankments has been considered in developing the recommendations and considerations discussed in the following report sections.

SUBSURFACE EXPLORATION

Subsurface conditions in the roadway widening alignments, structure location, and at selected cut slope locations were explored with a total of 79 sample borings and test pits. The alignment vicinity is shown in Attachment 1. The approximate boring or test pit locations are shown on the Plan of Borings and Test Pits provided in Attachment 2.

Roadway Investigation

Subsurface conditions in the proposed roadway widening alignment were investigated by drilling eight (8) sample borings to 5- to 10-ft depth and excavating 61 test pits to 1.5 to 9 feet. The test pits were utilized since the predominantly steep terrain and dense vegetation in the widening alignment limited access to truck-mounted drilling equipment. The borings performed along the length of the widened alignment are labeled with "B" (i.e., B-1, B-3, etc). The test pits performed within the alignment are identified with a "TP" label (i.e., TP-2, TP-1A, etc).

Logs of the borings and test pits performed for the roadway widening, showing descriptions of the subsurface stratigraphy encountered and results of field and laboratory tests are included in Attachment 3.

Bridge Structure Investigation

Subsurface conditions at the Ten Mile Creek (West) location were investigated by drilling seven (7) sample and/or core borings with depths ranging from approximately 3.5 ft to 40 feet. The borings performed at the bridge location can be indentified in this report and the attachments as labeled with "S" (i.e., S1, S1a, etc).

Logs of the borings which include descriptions of subsurface conditions fill, soil, and rock strata encountered and results of the field and laboratory tests results performed for the bridge structure over Ten Mile Creek (West) can be found in Attachment 4. Photographs of rock cores are also included in Attachment 4.

To aid in visualizing subsurface conditions, a Generalized Subsurface Profile for the Ten Mile Creek (West) location is presented in Attachment 5. It should be recognized that the stratigraphy illustrated by the profile has been inferred between discrete boring locations. In view of the natural variations in stratigraphy and conditions, variations from the stratigraphy illustrated by the profile should be anticipated. Additionally, the natural transition between strata is generally gradual, and the stratigraphy described in the sections above may vary.

Cut Slope Investigation

Subsurface conditions at selected locations where cut slopes are planned were investigated by drilling three (3) sample borings to depths of 12 to 50 feet. The borings performed for cut slopes in the right-of-way are indicated by the designation "ROW" (i.e., ROW1, ROW2, etc). Logs of the borings performed for evaluation of cut slopes are provided in Attachment 6.

To develop information for use in evaluation of selected plan cut slope configurations, areas where cut slopes are planned were visually evaluated by mapping the faces of the existing slopes. These observations were directed towards observation of rock exposures, if any, consideration of rock bedding planes and joint or fracture patterns, observation of seepage, and evidence of prior movement of the slope face or of hillsides. A summary of our observations of existing cut slopes is included in Attachment 6.

Drilling and Sampling Methodology

The sample locations were selected by Grubbs, Hoskyn, Barton, & Wyatt Consulting Engineers (GHBW). The boring or test pit locations were staked by B&F Engineers on behalf of GHBW. Some boring or test pit locations were offset from the planned location to facilitate equipment access. The borings were drilled with a truck-mounted SIMCO 2400 or buggy-mounted Mobile B-53 rotary-drilling rig using continuous flight augers. The deeper borings were drilled with a truck-mounted Mobile B-53 or an all-terrain Hilyard Super rotary-drilling rig using a combination of dry-auger and rotary-wash drilling methods. Sampling of the overburden soils and weathered rock was accomplished using a 2-in.-diameter split barrel sampler and Standard Penetration Test (SPT) procedures. The SPT N-values are tabulated on the boring logs in the "Blows Per Ft" column. Where rock hardness precluded recovery via the SPT, cuttings were obtained for use in visual classification.

Representative samples of the bedrock were obtained using an NQ_{WL}-size double-tube core barrel with a diamond bit. For each core run, the percent recovery was determined as the ratio of recovery to total length of core run. Rock Quality Designation (RQD) was also determined for each core run as the sum of intact, sound rock core greater than 4-in. length divided by the total length of the run and expressed in percent. Both these values are presented in the right hand column of the log forms, opposite the corresponding core run. Photographs of the rock core samples are provided in the appropriate attachment. Where rock was not cored cuttings were collected for visual examination.

The test pits were excavated with a Case CX50B track mini-excavator equipped with a 2-ft bucket and rock teeth. Representative bulk samples were obtained from test pit side walls or excavation spoil. Undrained soil and weathered shale shear strength (cohesion) was estimated using a calibrated hand penetrometer on test pit side walls or intact pieces of excavation spoil. Estimated shear strength values are plotted on the log forms, in tons per sq ft, as circles enclosing an "x".

All samples were removed from samplers in the field. Samples were visually classified and placed in appropriate containers to prevent moisture loss and/or disturbance during transfer to our laboratory for further examination and testing.

Groundwater conditions were observed during and at the completion of drilling of borings or excavation of test pits. Observations regarding groundwater are shown in the lower right-hand portion of the log forms. Groundwater conditions are also discussed in subsequent sections of this report.

The ground surface elevations of the borings and test pits, as provided by Michael Baker International on September 3, 2015, are also shown on the logs. Where specific survey information was not available, the approximate ground surface elevations were inferred from the available topographic and plan alignment information. It must be recognized that these elevations and locations are approximate and actual surface elevations may vary.

Keys to the terms and symbols used on the logs are presented in Attachment 7 for both soil and rock.

LABORATORY TESTING

To evaluate pertinent physical and engineering characteristics of the foundation and subgrade soil and rock, laboratory tests consisting of natural water content determinations and classification tests were performed. A total of 216 natural water content determinations were performed to develop representative soil water content profile for each boring or test pit. The results of these tests are plotted on the logs as solid circles, in accordance with the scale and symbols shown in the legend located in the upper-right corner.

To verify field classification and to evaluate soil plasticity, 74 liquid and plastic (Atterberg) limit determinations and 73 sieve analyses were performed on selected representative samples. The Atterberg limits are plotted on the logs as small pluses inter-connected with a dashed line using the water content scale. The percent of soil passing the No. 200 Sieve is noted in the “No. 200%" column on the log forms. Classification test results, as well as soil classification by the Unified Soil Classification System and AASHTO classification system, are summarized in Attachment 8.

Moisture-Density Relationship (Proctor) tests were performed on four (4) representative samples of potential subgrade soils in accordance with AASHTO T-99 or T-180 methods, depending on the sample gradation. The Proctor test results are presented graphically in Attachment 9.

Pavement subgrade support properties were evaluated by performing four (4) California Bearing Ratio (CBR) tests (AASHTO T-193). For the CBR tests, the specimens were molded at approximately the optimum water content and 95 percent of the maximum dry density as determined by the appropriate laboratory Proctor tests. The CBR test results are also presented graphically in Attachment 9. Classification test results are also shown on the test reports. A summary of the Proctor and CBR test results is also provided in Attachment 9.

GENERAL SITE AND SUBSURFACE CONDITIONS

Site Conditions

Roadway Alignment. The existing US 70 is typically a two-lane roadway with some three-lane sections that include an alternating passing lane on either the westbound or eastbound lane. The typical road width is about 46 ft from outside pavement edge to outside pavement edge. The existing pavement grades vary from about El 445 on the west project limit, undulating but generally rising to the east to about El 706 at approximate Sta 747+00 and falls to approximately El 461 at the eastern project limits, approximate Sta 979+69.

Beyond the asphalt concrete and aggregate shoulders, the right-of-way is typically a surface-water, grass-covered drainage canal. However, portions of the right-of-way vary from grass covered to thickly wooded. The terrain is undulating. The alignment extends through some areas of cut, with some cut slopes which are relatively steep. Shale and some sandstone are typically exposed in the cut slopes. Novaculite is also exposed at several locations within this alignment. Surface drainage is typically facilitated by roadside ditches.

Ten Mile Creek (West) Bridge - AHTD Bridge No. 02945. The existing Highway 70 Bridge over Ten Mile Creek (West) is a two-lane, two-span bridge with a total length of approximately 106 ft and a 30-ft-wide deck. The grade of the existing bridge deck varies from approximate El 525.1 on the west approach to El 523.7 at the east approach.

The Ten Mile Creek channel lies at approximate El 508 to El 510 and flows from north to south. The main channel flows between the second and third bents from the west. At the time of the field studies (March and May 2014), Ten Mile Creek had approximately 1 to 2 ft of flowing water in the stream bed at this location.

The north and south end slopes are covered with vegetation and graded to approximate 3-horizontal to 1-vertical (3H:1V) configurations. Between the end slopes, the ground surface is predominantly covered with rounded gravel and boulders.

Site Geology

The Geologic Map of Arkansas[1] indicates that this segment of roadway widening is within the mapped Upper Mississipian Period Stanley Shale, upper Devonian to early Mississippian Arkansas Novaculite, and early to middle Ordovician Womble Shale.

The western portion of the widening segment, from Sta 480+00 to about Sta 792+00, is in the mapped outcrop of the upper Mississippian Period Stanley Shale. The Stanley Shale consists of dark gray shale interbedded with fine-grained sandstone. The silty sandstone is normally found in thin to massive beds, separated by thick intervals of shale. The total thickness of the Stanley Shale is reported to range from 3500 to more than 10,000 ft. The Stanley Shale rests unconformably on the lower Mississippian Arkansas Novaculite.

The roadway alignment between approximate Sta 792+00 to 811+00 and Sta 842+00 to Sta 892+00 is mapped as being underlain by the upper Devonian to early Mississippian Arkansas Novaculite. The Arkansas Novaculite typically consists of greenish to dark gray shale interbedded with many thin beds of dark gray novaculite. The harder, more resistant novaculite and relatively pure layers of sandstone form the mountains, ridges, and peaks, with the softer shale alongside slopes and valleys. Due to the folded and faulted nature of the formations, prominent cleavage and minor folding and faulting are found locally within the bedrock units. Numerous inactive faults are in the area. In addition, slight metamorphism has resulted in hardening of the underlying bedrock units.

The eastern portion of the widening segment, from approximately Sta 811+00 to Sta 842+00 and from Sta 892+00 through the eastern extent of the alignment is identified as being underlain by early to middle Ordovician Womble Shale. The Womble Shale typically consists of black, graphitic shale with thin layers of limestone, numerous quartz veins, silty sandstone, and some chert. The shale can often be somewhat slatey. Depending on the extent of weathering, the rock hardness can range from soft to hard. The highly folded and steeply dipping units of the formation contain numerous inactive faults, folds and fractures. The formation is reported to range from 500 to 1200 ft thick. It rests conformably on the Blakely Sandstone.

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[1] Geologic Map of Arkansas, Arkansas Geologic Commission and U.S. Geologic Survey; 1993

Seismic Conditions

In light of the subsurface conditions revealed by the borings performed at the Ten Mile Creek (West) bridge site and the local geology, a Seismic Site Class B (rock profile) is considered applicable with respect to the criteria of the 2011 Guide Specifications for Load and Resistance Factor Design (LRFD) Seismic Bridge Design[2].

Based on the bridge location, the 1.0-sec period spectral acceleration coefficient on Class B rock (S_1) is 0.072. The site coefficient for 1.0-sec period spectral acceleration (F_v) adjusted for Site Class C is 1.00. Accordingly, the calculated design 1.0-sec period spectral acceleration coefficient (S_{D1}) value is 0.07. Utilizing these parameters, Table 3.10.6-1[3] indicates that a Seismic Performance Zone 1 is fitting for both of the bridge sites included in this project.

The 2011 edition of the AASHTO Guide Specifications indicates that the Peak Ground Acceleration (PGA) having a 7 percent chance of exceedance in 75 years (or mean return period of approximately 1000 years) is predicted to be 0.095 for a Seismic Site Class B. For a Seismic Site Class B, the Site Coefficient for the PGA, F_{PGA} is shown to be 1.00. Consequently, a design PGA (A_s) value of 0.10 is considered appropriate for the bridge site.

Subsurface Conditions

The subsurface conditions over the length of the roadway widening project can be generally summarized into three (3) primary strata as follows.

Fill:	On-site fill is locally present and is considered to be associated with prior site grading operations for the roadway. The on-site fill extends to variable depths of 0.5 to 8.7 feet. In general, the on-site fill encountered along the length of the road widening consists of silty clay with varying amounts of shale, sandstone, and novaculite fragments. The fill at the bridge location extends up to 8-ft depth at the east approach and includes clayey fine to coarse sand and fine to coarse gravel and shale fragments. The on-site fill also contains quartz fragments, occasional organics, and localized iron-staining. Locally the on-site fill is predominantly shale fragments with only minor amounts of silty clay or silt fines. Compaction of the on-site fill is variable. However, in general the on-site fill is considered to be moderately compact with low to moderate compressibility. Fill depth, content, and compaction are likely to vary along the alignment.
Overburden:	The natural soils below the on-site fill or at the surface are normally units of firm to very stiff reddish brown silty clay with variable amounts of shale, sandstone and novaculite fragments. The predominantly silty clay

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[2] Guide Specifications for LRFD Seismic Bridge Design, 2nd Edition, Washington, DC, American Association of State Highway and Transportation Officials, 2011.

[3] AASHTO LRFD Bridge Design Specification, AASHTO; 2012.

overburden also contains quartz fragments and trace amounts of organics with iron-staining in parts. Localized areas of fine sand and clayey fine to coarse gravel are near the Ten Mile Creek (West) crossing. These granular units represent local alluvium associated with the surface water features. The silty clay generally exhibits moderate shear strength with low compressibility. However, localized areas of weak, low-strength soils are present within the overburden stratum.

Bedrock: The basal stratum found in the borings and test pits is moderately hard to hard dark gray shale and light tan to tan novaculite. The shale typically contains quartz and sandstone veins and inclusions and may contain silty clay and/or clay laminations, seams and layers in weathered units. Carbonaceous shale, calcite partings, and muscovite deposits are also found within predominant shale units. The shale and novaculite have variable degrees of weathering within the upper 5 to 10 feet. However, weathering generally decreases and rock quality increases with depth. Rock bedding varies from flat-bedded to steeply dipping with bedding planes inclined greater than 60 degrees. At the Ten Mile Creek (West) bridge location, shale is at about 3 to 11 ft below existing grades. Weathered shale, shale, and novaculite outcrops are locally apparent in cut slopes and areas of higher terrain along the alignment.

Groundwater Conditions

Groundwater was encountered in the borings at depths ranging from about 1 to 6 ft during drilling operations (March and May 2014) at the bridge location. Groundwater was locally encountered at 2- to 8-ft depth in the roadway test pits near Sta 840+05 to Sta 886+70 (see TP-42, TP-43, TP-45, TP-47), near the Ten Mile Creek (West) bridge location. However, shallow groundwater was not encountered in the remainder of the roadway borings and test pits. Surface seeps and springs are likely to be present in the alignment, particularly during wet seasons of the year. There is also the potential for shallow perched water to develop, particularly during periods of high seasonal precipitation. Perched water could accumulate in the overburden soils and fractured rock zones. Groundwater levels will vary with seasonal precipitation and surface runoff and infiltration.

Significant Conditions

The significant site and subsurface conditions considered pertinent to design and construction of the grade separation structures, roadway and embankments are summarized below.

1) The existing pavement roadway and shoulders and roadway embankments.
2) The existing bridge structure at the Ten Mile Creek crossing with abutment embankments about 14 ft above the creek channel bottom.

3) The on-site silty clay with shale fragment fill which is locally 4- to 8-ft thick at the Ten Mile Creek (West) bridge end embankments and extends to about 0.5 to 9 ft along the road widening alignment.
4) The variable silty clay overburden extending to variable depths along the roadway alignment with predominantly moderate shear strength and low compressibility.
5) The surficial and near-surface sand and sandy fine to coarse gravel in and near the channel at the bridge location.
6) The basal moderately hard to hard shale and novaculite below about 3- to 11-ft depth at the bridge locations and typically found within the upper 10 ft in the roadway alignment and right-of-way.
7) Localized shallow groundwater at depths ranging from about 1 to 6 ft in October 2013 and January, March, and May 2014 and the potential for shallow perched groundwater and seasonal seeps and springs and variations in groundwater levels and amounts.

The significant conditions above have been considered in developing the conclusions and recommendations discussed in the following report sections.

ANALYSES and RECOMMENDATIONS

Bridge Foundations

Foundations for the replacement bridge must satisfy two (2) basic and independent design criteria. First, foundations must have an acceptable factor of safety against bearing failure under maximum design loads. Secondly, foundation movement due to consolidation or swelling of the underlying strata should not exceed tolerable limits for the structures. Construction factors, such as installation of foundations, excavation procedures and surface and groundwater conditions, must also be considered.

In light of the results of the borings, the anticipated moderate bridge foundation loads, and our understanding of the project, we recommend that foundation loads of the bridge be supported on either piling or drilled shaft foundations. Where rock is relatively shallow, supporting the bridge superstructure on drilled shafts bearing in rock will be suitable. The interior bents of the Ten Mile Creek (West) bridge may be supported on drilled shafts bearing in rock. At the bridge ends where the depth to rock is greater, driven piling is recommended.

Recommendations for foundations are discussed in the following report sections for each structure.

Piling – Bridge Abutments

We recommend that the abutment foundation loads of the Ten Mile Creek (West) bridge be supported on steel piles. The piles should extend through the embankment fill and overburden soils to bear in the competent moderately hard to hard dark gray shale. Piles should be driven to practical refusal in the moderately hard to hard dark gray shale. Steel HP12x53 or HP14x73 piles fitted with rock points are recommended. Other pile sizes or types may be evaluated if desired.

Bearing capacities of piles driven to refusal must be determined using the AASHTO Load and Resistance Factor Design (LRFD) structural design procedure[4]. We recommend that nominal (ultimate) resistance (P_n) of steel piles be determined based on the yield strength of steel H piles (f_y) and the net end area (A_{net}) of the section. Given that the piles will be driven to refusal in hard rock with the potential for driving damage, we recommend a maximum allowable stress (σ_{all}) of 0.25 f_y. An effective resistance factor (φ) of 0.50 is recommended for end-bearing piles. This effective resistance factor for steel piles has been based on the assumption of difficult driving.

It has been our experience that allowable pile capacities of 70 tons and 96 tons for HP12x53 or HP14x73 piles, respectively, are common for f_y 36 ksi steel. These capacities are based on allowable stress design (ASD). However, the appropriate factored bearing capacity as per LRFD criteria must be confirmed by the Engineer (Michael Baker International). Post-construction settlement of piles driven to refusal will be negligible. Downdrag loads due to long-term embankment settlement are expected to be negligible.

We recommend that all piles extend through the embankment fill and overburden soils to bear in the competent shale. Estimated as-built pile tip elevations are expected to be on the order of El 505 to El 508. Estimated pile lengths at the abutments of the proposed bridge are summarized in the table below. Piles should bear at a minimum tip elevation of 10 ft below the pile cap or 10 ft below natural grade, whichever is deeper. Depending on the embankment height and specific subsurface conditions encountered, preboring could be required to attain the recommended 10 ft minimum pile length.

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[4] Load and Resistance Factor Design (LRFD) for Highway Bridge Substructures, Publication No. FHWA HI-98-032, National Highway Institute, May 2001.

Table 1: Estimated Pile Length (Below Existing Grade)

Bridge	Abutment	Station No	Estimated Minimum Pile Length, ft (below pile cap)	Estimated Tip El, ft
Highway 70 over Ten Mile Creek (West) Bridge No. 02945	West Abutment	870+87	11-13	507-505
	East Abutment	872+31	10-11	508-507

Piles should be installed in compliance with AHTD Standard Specifications Section 805. Piles should be carefully examined prior to driving and piles with structural defects should be rejected. Any splices in steel piles should develop the full cross-sectional capacity of un-spliced piles. We recommend a minimum of one (1) test pile be driven at the bridge location prior to driving production piles to confirm estimated pile length and suitability of the pile-hammer system. As a minimum, safe bearing capacity of test piles and production piles should be determined by AHTD Standard Specifications Section 805.09, Method A.

Pile installation should be monitored by qualified personnel to maintain specific and complete driving records and observe pile installation procedures. Driving records should be available for review by the Engineer or the Department (AHTD) during pile installation. We recommend that the steel H-piles be driven with a hammer system capable of delivering at least 20,000 ft-lbs per blow for both the HP 12x53 or HP 14x73 piles driven to refusal in shale. This value is based on the results of a drivability analysis using wave equation analyses (WEAP) methods. The results of the wave equation drivability analysis are provided in Attachment 10.

Blow counts on steel piles should be limited to about 20 blows per inch. Practical pile refusal may be defined as a penetration of 0.5 in. or less for the final 10 blows.

Drilled Shafts – Interior Bridge Bents

Drilled shafts are recommended for support of foundation loads for the interior bents of the Ten Mile Creek (West) bridge structure. Drilled shafts should be founded a minimum of two (2) shaft diameters into moderately hard dark gray shale. For drilled shafts founded as recommended, a maximum nominal/ultimate bearing capacity of 150 kips per sq ft is recommended. A resistance factor (ϕ) of 0.50 is recommended for drilled shaft end bearing. Consequently, a maximum factored end-bearing capacity of 75 kips per sq ft is recommended for drilled shafts founded at least two (2) shaft diameters into the moderately hard to hard shale. We recommend that drilled shafts bearing in competent rock be sized for compression loads based on the end-bearing capacity alone. Settlement of properly installed drilled shaft foundations founded in the competent shale should be negligible.

We recommend that the uplift resistance in the cased zone or upper 2 ft of shaft penetration into the shale bearing stratum, whichever is deeper, be neglected. For shaft penetration of at least two (2) shaft diameters into the moderately hard to hard shale, a maximum nominal/ultimate skin resistance value of 9000 lbs per square ft is recommended. For evaluation of skin friction uplift capacity of drilled shafts founded as recommended, a resistance factor (φ) of 0.40 is recommended.

A minimum shaft diameter of 30 in. is recommended for drilled shafts. Based on the results of the borings, the anticipated minimum shaft depths for the interior bents of Ten Mile Creek (West) bridge structure is summarized in Table 2. The estimated shaft length is based on the plan shaft diameter of 30 inches.

Table 2: Estimated Minimum Shaft Lengths

Structure	Bent No.	Proposed Surface Elevation, ft	Estimated Minimum Shaft Length, ft	Estimated Minimum Shaft Tip El, ft
Ten Mile Creek (West)	2	512	9-11	503-501
	3	514	11-12	503-502

The minimum shaft length and estimated shaft tip elevation shown in Table 2 are estimates only based on the results of the borings, the inferred surface elevation at the particular location, and existing grades. Suitable bearing stratum and final shaft lengths must be field verified. Actual shaft lengths and shaft tip elevations must be based on the specific subsurface conditions, actual shaft diameters, and final site grading plans.

As-built drilled shaft lengths will vary with the required penetration into the bearing stratum and specific subsurface conditions. Depending on specific subsurface conditions and rock quality, localized deepening or shortening of shaft depths will be warranted. All drilled shaft excavations should be observed by the Engineer to verify suitable bearing and adequate penetration.

Wingwall and Abutment Wall Lateral Earth Pressures

We understand that wingwalls and abutment walls will be backfilled with unclassified borrow or select material. Recommendations regarding lateral earth pressures for wingwalls and abutments are summarized below.

- Angle of internal friction (φ) for unclassified backfill: 20°
- Equivalent fluid pressure for unclassified backfill:
  - Active condition for walls that are free to rotate, backfilled with unclassified borrow, and fully drained: 65 lbs per sq ft per ft depth.
  - Active condition for walls that are free to rotate backfilled with unclassified borrow, and with no provision for internal drainage: 95 lbs per sq ft per ft depth.
- Angle of internal friction (φ) for SM-1 backfill: 32°
- Equivalent fluid pressure for SM-1 backfill:
  - Active condition for walls that are free to rotate, backfilled with SM-1 or clean granular backfill, and fully drained: 40 lbs per sq ft per ft depth.
  - Active condition for walls that are free to rotate, backfilled with SM-1 or clean granular backfill, and with no provision for internal drainage: 85 lbs per sq ft per ft depth.
- Ultimate sliding resistance:
  - Interaction friction angle (δ) for concrete on stable bearing stratum: 19°.
  - Interaction friction factor (tan δ) for concrete on stable bearing stratum: 0.34.
  - The sliding resistance values above are nominal/ultimate values.
  - A resistance factor (φ) of 0.8 is recommended for sliding resistance.

To utilize the lower earth pressure values of the "drained" condition, positive and continuous drainage from behind walls must be provided. The drainage zone should be backfilled with AHTD Standard Specifications Section 403 Class 3 Mineral Aggregate, AHTD Standard Specifications Section 816 filter blanket, or an alternative clean, free draining crushed stone, gravel, or granular soil zone approved by the Engineer or Department. Drainage zones should be fully isolated from the embankment fill, overburden soils, and shale or novaculite by a suitable geotextile complying with the criteria of AHTD Standard Specifications Section 625, Type 2. Water should be discharged from backfill by a system of regularly-spaced, functioning weep holes or a drain pipe.

Embankments

We understand that minimal amounts of additional embankment fill are expected for the widening project. Consequently, stability considerations related to new bridge embankments have not been evaluated.

Right-of-Way Cut Slopes

With the roadway widening, the existing right-of-way (ROW) cuts will require modification. The site grading plans indicate that most cut slopes will be configured at 3-horizontal to 1-vertical (3H:1V) slopes. However, we understand that some areas along the alignment will utilize cut slopes as steep as 1-horizontal to 1-vertical (1H:1V) to stay within the existing ROW.

The Engineer provided information indicating areas where cut slopes are planned with configurations steeper than 3H:1V. These locations are summarized in the table below.

Table 3: Planned Cut Slopes at Steeper than 3H:1V Configuration

Approximate Station	Offset	Approximate Steepest Existing Slope*	Plan Slope Configuration*	Plan Maximum Height, ft
478+25.20 to 480+79.71	Left	0.8H:1V	1H:1V	16
487+00.00 to 511+40.00	Left	2H:1V	2H:1V	18
516+00.00 to 530+50.00	Left	1H:1V	1H:1V	13
537+00.00 to 546+60.00	Left	1.8H:1V	1H:1V	16
546+60.00 to 595+00.00	Left	1.4H:1V	1H:1V	16
597+58.00 to 613+00.00	Left	1H:1V	1H:1V	39
615+00.00 to 618+00.00	Left	2.3H:1V	2H:1V	12
619+00.00 to 630+00.00	Left	1.2H:1V	1H:1V	25
659+75.00 to 662+60.00	Left	1H:1V	1.67H:1V	25
664+80.00 to 677+50.00	Left	1.5H:1V	1H:1V	20
680+00.00 to 697+00.00	Left	1.5H:1V	2H:1V	17
697+00.00 to 698+00.00	Left	1.3H:1V	2H:1V	20

Approximate Station	Offset	Approximate Steepest Existing Slope*	Plan Slope Configuration*	Plan Maximum Height, ft
698+00.00 to 712+00.00	Left	1.2H:1V	1.33H:1V	22
717+00.00 to 718+12.50	Left	1.7H:1V	2H:1V	6
720+00.00 to 731+00.00	Left	1.6H:1V	1.33H:1V	16
742+00.00 to 746+00.00	Left	1.3H:1V	1.33H:1V	20
790+00.00 to 795+50.00	Right	1.5H:1V	1H:1V	40
797+40.00 to 813+00.00	Left	0.3H:1V	1H:1V	48
820+00.00 to 830+60.00	Left	1.2H:1V	1H:1V	46
833+00.00 to 849+80.00	Right	1.3H:1V	2H:1V	5
850+00.00 to 851+00.00	Right	2.4H:1V	2H:1V	10
856+50.00 to 860+00.00	Right	3.5H:1V	2H:1V	12
860+00.00 to 870+00.00	Right	2.2H:1V	1.33H:1V	35
880+20.00 to 884+00.00	Left	0.9H:1V	1H:1V	51
883+00.00 to 887+60.00	Right	1.4H:1V	1H:1V	17
891+00.00 to 893+00.00	Left	0.9H:1V	2H:1V	23
914+00.00 to 918+00.00	Left	1.5H:1V	2H:1V	15
931+40.00 to 934+00.00	Left	2H:1V	2H:1V	14
945+40.00 to 949+60.00	Left	1.1H:1V	1.33H:1V	30
964+40.00 to 968+00.00	Left	2.1H:1V	2H:1V	25
973+40.00 to 976+00.00	Right	2.7H:1V	2.5H:1V	38

* The information above on the existing and plan slope configurations has been provided by the Engineer, Michael Baker International.

As noted, a portion of cut slope areas were visually evaluated by direct observation and mapping of the cut slope faces in the current configurations. These observations were directed towards observation of rock exposures, if any, consideration of rock bedding planes and joint or fracture patterns, observation of seepage, and evidence of prior movement of the slope face or of hillsides. A summary of our observations of the existing cut slopes evaluated is provided in Attachment 6.

Weathered shale exposures were generally noted on the west and east portions of the alignment. However, massive novaculite outcrops and exposures were noted between approximately Sta 789+00 to Sta 819+00 and approximately Sta 857+00 to Sta 883+00. The existing cuts in novaculite generally have a near-vertical configuration. Novaculite fragments and other debris from the rock face are common at the base of both the near-vertical novaculite cuts and the flatter weathered shale cuts.

No indications of sliding or impending sliding were observed in the variable existing cut slope configurations of 0.5H:1V to 3.7H:1V in May 2014. Some localized and limited surface slumps and indications of prior shallow surface sliding in the weathered shale and thin overburden soils were noted in May 2014. However, no indications of past deep-seated sliding or formation of tension cracks, localized settlement or other indicators of impending sliding were observed in May 2014.

Cut Slopes in Novaculite

There are massive novaculite exposures between approximately Sta 789+00 to Sta 819+00 and approximately Sta 857+00 to Sta 883+00. Our site observations and the information provided on the available cross sections indicate that the existing cut slopes in these areas are generally configured at 0.5H:1V to 1H:1V. Our observations along the alignment also indicate that near-vertical cuts in the novaculite are not unusual. In areas where the cross sections indicate an existing 1H:1V, the actual cut configuration is more commonly a series of near-vertical cuts with irregular benches. Representative photographs of the novaculite exposures are included in Attachment 11.

Because of the orientation of the novaculite cleavage planes and the numerous fractures, we believe that steep slope configurations will be difficult to excavate. Therefore, where massive novaculite is encountered, we recommend a cut slope configuration with cuts at about 0.5-horizontal to 1-vertical (0.5H:1V) with intermediate horizontal benches incorporated at regular vertical intervals. A conceptual cut configuration of 0.5H:1V cut, a 15-ft vertical height, and minimum 9-ft horizontal benches incorporated at 15-ft vertical intervals has been developed to comply with the limits of the plan 1H:1V cut configuration. The horizontal benches could be widened to improve stability and facilitate maintenance of rock fall. A sufficient area should be left at the toe of the cut for accumulation and maintenance of rock fall. This configuration is shown on the sketch provided in Attachment 11.

The stability of a novaculite cut slope with a benched face was evaluated. Additional sections may be evaluated if desired. A typical cut section showing this concept is provided in Attachment 11.

Stability Analyses

To evaluate the stability of the planned cut slope configurations, stability analyses were performed on four (4) representative cut locations. Stability analyses were performed using the computer program PCSTABL Version 5M/si or 6H in conjunction with STEDwin 2.85. These analyses were performed using Modified Bishop and Modified Janbu analyses.

The analyses were performed for three (3) loading conditions:

1. End of construction (EOC) condition. This condition utilized total soil and rock stresses (i.e., undrained shear strength).
2. Long-term condition. This condition utilized soil and rock effective stresses (i.e., drained shear strength, cohesion and the angle of internal friction).
3. Seismic condition. These analyses utilized effective stresses (i.e., drained shear strength, cohesion and the angle of internal friction) with a design PGA coefficient (A_s) value of 0.09g.

The results of the stability analyses are summarized in Attachment 12. Sections showing the geometry of the analyzed cut and detailed graphical results of the stability analyses of the four (4) sections analyzed are also provided in Attachment 12.

The results of the stability analyses indicate acceptable calculated minimum factor of safety values for all cases evaluated. Nevertheless, some skin slides and shallow sloughs should be anticipated, particularly where the overburden soils are cut at configurations steeper than about 2.5H:1V. Over time, relatively minor shallow slides and slumps are likely to develop in the overburden soils above weathered shale and novaculite. In addition, minor rock fall is likely to occur, particularly during freeze-thaw and wet-dry cycles. Rock fall debris will accumulate at slope toes and will periodically require removal or grading.

The results of the stability analyses indicate that shallow slides in the overburden soils could extend 6 to 8 ft back of the slope intercept. Additionally, "pop outs" and rock fall of exposed weathered shale, sandstone, and novaculite should be expected. Regular maintenance will be required to remove accumulated rock fall at cut toes and prevent blocking of drainage structures.

It is expected that the long-term vegetation cover on the plan 1H:1V cut slopes will be sparse. Erosion and shallow slides in the overburden soils can be an on-going occurrence and maintenance issue. As noted, we recommend that an adequate area be included at slope toes for collection of slide debris and rock fall and to facilitate maintenance and removal of accumulated debris. Erosion could be reduced by the incorporation of intermediate horizontal benches in the slopes, though this would increase the horizontal length of the slopes.

Pavement Subgrade Support

Based on the results of borings and test pits, the subgrade soils are expected to vary in content and classification. The AASHTO classification of the subgrade soils is expected to include a wide range of classifications from A-1-a to A-7-6. Locally available borrow for use as unclassified embankment fill is expected to be comprised of similar soils. We recommend that soils classifying as A-7-5 or A-7-6 with a plasticity index (PI) in excess of 18 be excluded from use as subgrade within 18 in. of the plan subgrade elevation. The top 18 in. of subgrade soils should have a maximum plasticity index (PI) of 18. The as-built pavement subgrade should be evaluated by the Engineer. Areas of unstable or otherwise unsuitable subgrade should be improved by undercut and replacement.

Based on the results of CBR tests and correlation with the AASHTO classification of the anticipated subgrade soils, subgrade support is considered good. In light of the correlation with good subgrade support and factoring for environmental and serviceability criteria, an effective resilient modulus (M_R) value of 6300 lb per sq in. is recommended. For design of concrete pavements, we recommend a modulus of subgrade reaction (k) value of 210 lbs per cu inch.

Site Grading

We expect that site grading will include both cut and fill. Subgrade preparation in the new embankment areas should begin with stripping the topsoil and any unsuitable surface soils. The stripping depth is expected to be on the order of 9 to 12 inches. Deeper stripping on the order of 12 to 18 in., more or less, is anticipated for heavily wooded areas.

After stripping and performing any cut, and prior to placing fill, the subgrade should be evaluated by proof-rolling with a loaded tandem-wheel dump truck or similar equipment where accessible. Areas identified to be soft or that exhibit pumping should be undercut, processed and recompacted, stabilized with additives, or replaced with suitable fill, whichever is appropriate.

Depending on seasonal site conditions and final grading plans, undercuts on the order of 2 ft below existing grades, more or less, could be warranted to stabilize localized areas of weak surface soils. Undercut requirements must be field verified by the Engineer or Department during the work.

Embankments should be constructed in accordance with AHTD criteria (AHTD Standard Specifications Section 210). Where localized seepage into undercuts or excavations is a problem, excavations should be backfilled with SM-1 (AHTD Standard Specifications Section 302) or stone backfill (AHTD Standard Specifications Section 207). The granular backfill should be vented to positive discharge if possible.

Fill and backfill should be placed in nominal 6- to 10-in.-thick loose lifts. All fill and backfill must be placed in horizontal lifts. Fills placed against existing slopes should be benched into the existing slope face as new fill is constructed. The in-place density and water content should be determined for each lift of fill and backfill. Each lift of backfill and fill should be tested and approved prior to placing subsequent lifts.

CONSTRUCTION CONSIDERATIONS

Positive surface drainage should be established at the start of the work, be maintained during construction and following completion of the project to prevent surface water ponding and subsequent saturation of subgrade soils. Density and water content of all earthwork should be maintained until the embankments and bridge work are completed. Subgrade soils that become saturated by ponding water or runoff should be excavated to undisturbed soils. The embankment subgrade should be evaluated by the Engineer or Department during subgrade preparation and prior to starting embankment construction.

Shallow groundwater was encountered near the Ten Mile Creek bridge location in October 2013 and January, March and May 2014. Seepage into isolated excavations such as footings can probably be controlled by ditching or sump-and-pump methods. If seepage into excavations becomes a problem, backfill should consist of clean sand (AHTD Standard Specifications Section 302, SM-1) or clean, crushed stone (AHTD Standard Specifications Section 207). Sand or stone backfill should be vented to positive discharge at daylight or into storm drainage lines where possible.

Where surface seeps or springs are encountered during site grading, we recommend the seepage be directed via French drains or blanket drains to positive discharge at daylight or to storm drainage lines. We also recommend that blanket drains be constructed in any existing drainage features to be filled in the grading work. Blanket drains should consist of at least 8 to 12 in. of clean filter stone (AHTD Standard Specifications Section 403, Class 3 Mineral Aggregate, AHTD Standard Specifications Section 816 filter blanket, or an approved alternate) fully encapsulated by a filter fabric. A fabric complying with AHTD Standard Specifications Section 625, Type 2 or an approved equal is recommended. Drains should direct water to positive discharge at daylight or into storm drain lines.

Piles should be installed in compliance with AHTD Standard Specifications Section 805. Piles should be carefully examined prior to driving and piles with structural defects should be rejected. Any splices in steel piles should develop the full cross-sectional capacity of un-spliced piles.

Pile installation should be monitored by qualified personnel to maintain specific and complete driving records and observe pile installation procedures. Driving records should be available for review by the Engineer during pile installation. We recommend that steel H-piles be driven with a hammer system capable of delivering at least 20,000 ft-lbs per blow for both the HP 12x53 or HP 14x73 piles driven to refusal in shale. Blow counts on steel piles should be limited to about 20 blows per inch. Practical pile refusal may be defined as a penetration of 0.5 in. or less for the final 10 blows.

As noted, groundwater was encountered in the bridge boring at about 1 – to 6-ft depth between March and May 2014. Groundwater could be encountered in drilled shaft excavations. Limited seepage into drilled shaft excavations can probably be controlled by close coordination of drilling, cleanup and concrete placement. We recommend that casing be on site in the event it is needed to control seepage and/or caving into shaft excavations. Drilled shaft excavations should essentially be dry at the time of concrete placement. Where more than about 3 in. of water is present in shaft excavations, the excavation should be dewatered prior to concrete placement. Where shaft excavations cannot be dewatered, underwater concrete placement should be performed with a concrete pump fitted with a rigid end extension. A muck bucket or similar tools should be utilized to clean the shaft excavation bottom prior to underwater concrete placement.

Some hard drilling will be experienced when advancing drilled shaft excavations into the moderately hard to hard shale. Heavy-duty drilling equipment and rock drilling tools will be required to advance shaft excavations to the recommended minimum penetration into the dark gray shale. Where more resistant shale units or localized sandstone beds are encountered, coring or other rock excavation methods will be required to achieve the recommended penetration into the rock bearing stratum. All drilled shaft excavations should be observed by the Engineer or Department to verify suitable bearing and adequate penetration.

CLOSING

The Engineer or the Department should monitor site preparation, grading work and all foundation and pavement construction. Subsurface conditions significantly at variance with those encountered in the borings and test pits should be brought to the attention of the Geotechnical Engineer. The conclusions and recommendations of this report should then be reviewed in light of the new information.

The following illustrations are attached and complete this report.

Attachment 1	Site Vicinity Map
Attachment 2	Plan of Borings
Attachment 3	Roadway Boring and Test Pit Logs
Attachment 4	Ten Mile Creek (West) Boring Logs
Attachment 5	Generalized Subsurface Profiles
Attachment 6	Cut Slope Boring Logs
Attachment 7	Keys to Terms and Symbols
Attachment 8	Classification Test Results
Attachment 9	Proctor and CBR Test Results
Attachment 10	Wave Equation Drivability Analysis
Attachment 11	Novaculite Cuts – Photographs and Cut Configuration Concept
Attachment 12	Slope Stability Analyses – Cut Slopes

* * * * *

We appreciate the opportunity to be of service to you on this project. Should you have any questions regarding this report, or if we may be of additional assistance during final design or construction, please call on us.

Sincerely,

GRUBBS, HOSKYN,
BARTON &WYATT, INC.

Blaine M. Orth, P.E.
Senior Project Engineer

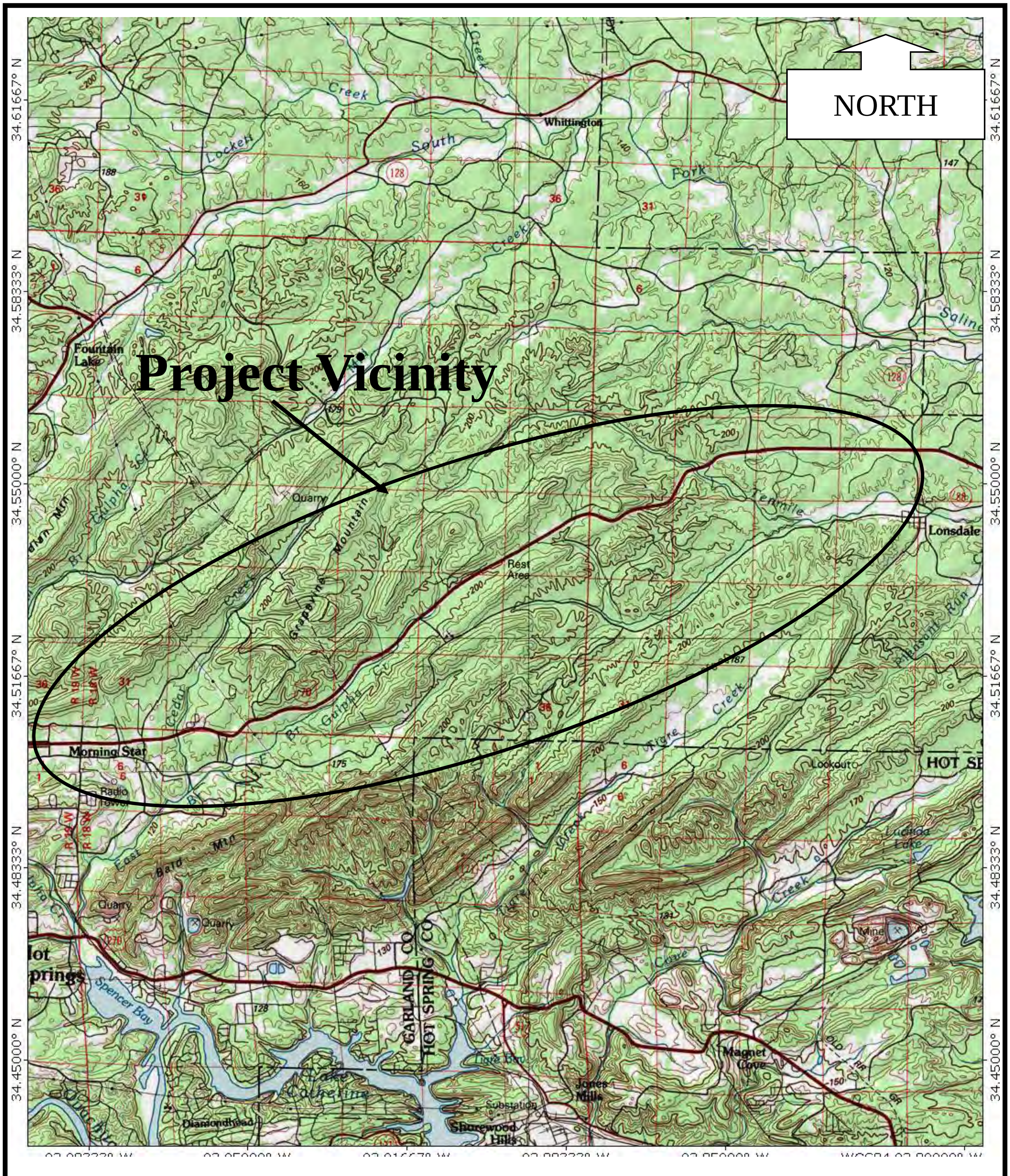
STATE OF
ARKANSAS
REGISTERED
PROFESSIONAL
ENGINEER
No. 7791
MARK E. WYATT

Mark E. Wyatt, P.E.
President

MRS/SS/BMO/MEW:jw

Copies Submitted: Michael Baker International
Attn: Mr. Michael H Stengel, P.E. (1-Electronic)
Attn: Mr. Fred Harper, P.E. (1-Electronic)
Attn: Mr. Scott Thornsberry, P.E. (1-Electronic)

ATTACHMENT 1



Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

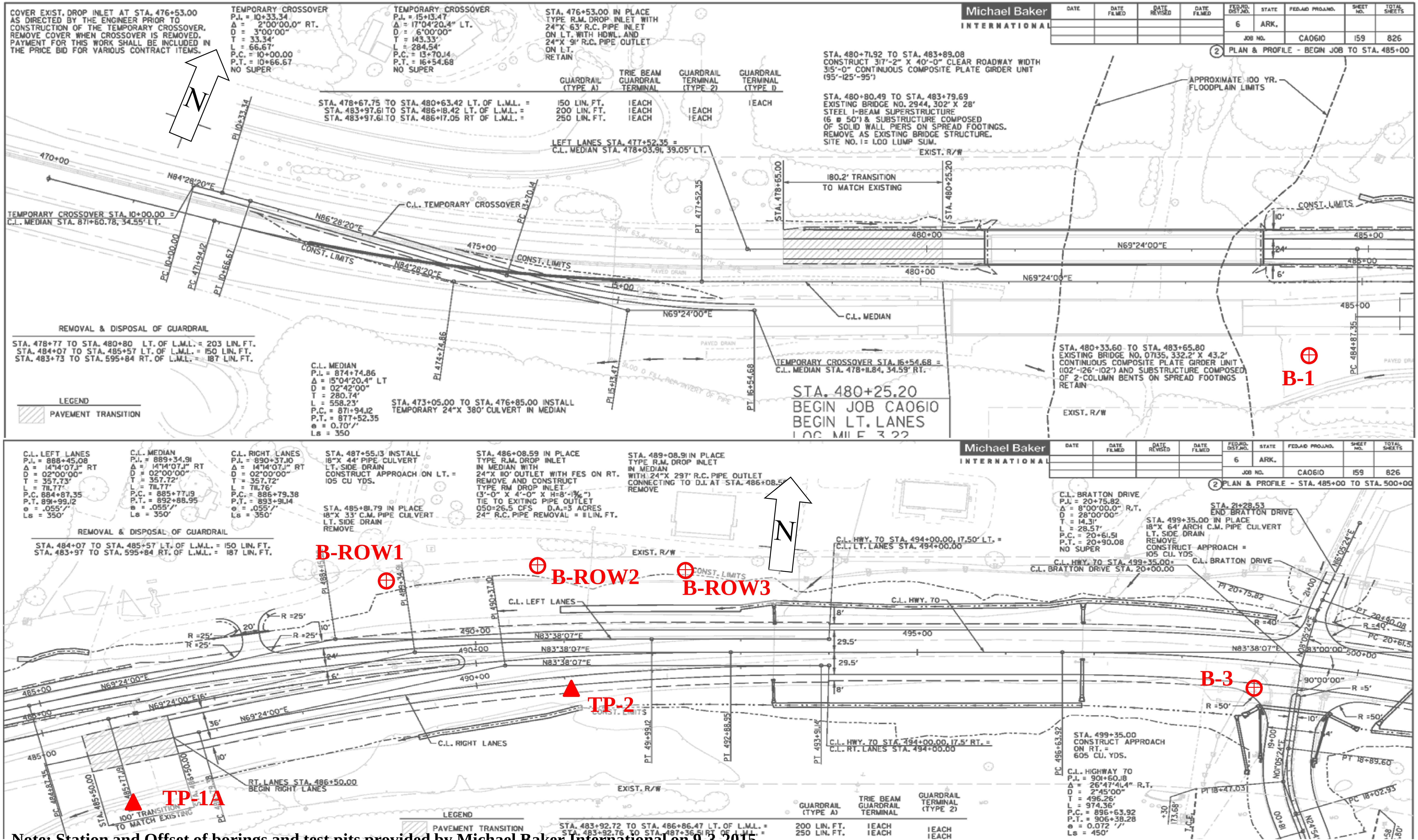
SITE VICINITY MAP

AHTD CA0606: Highway 70
Hot Springs – Hwy 128 (Widening) (S)
Garland County, Arkansas

Job No. 13-214

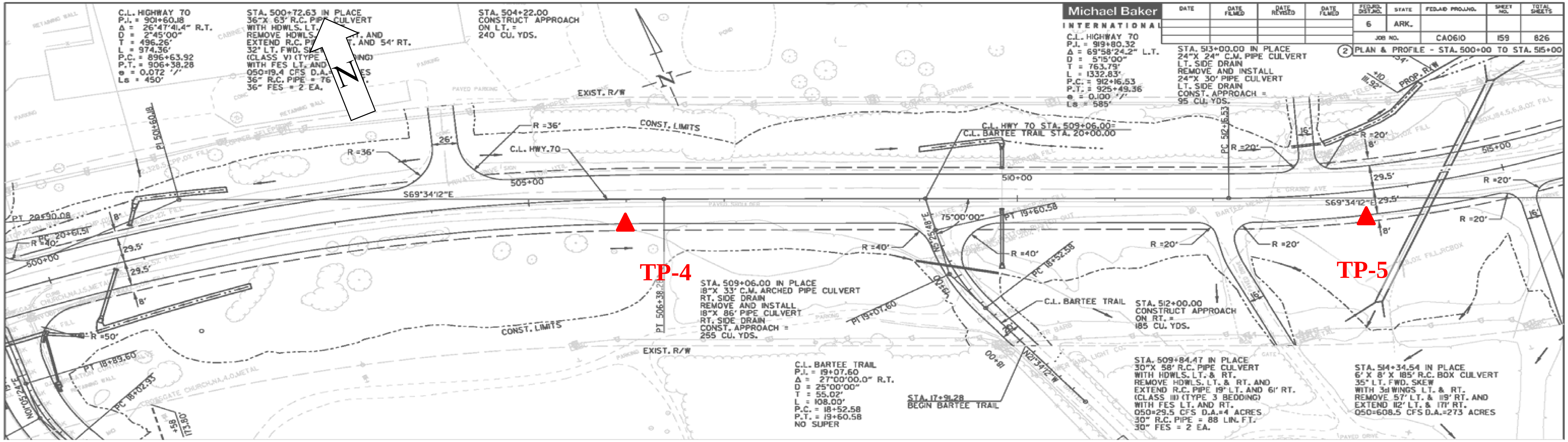
Plate 1

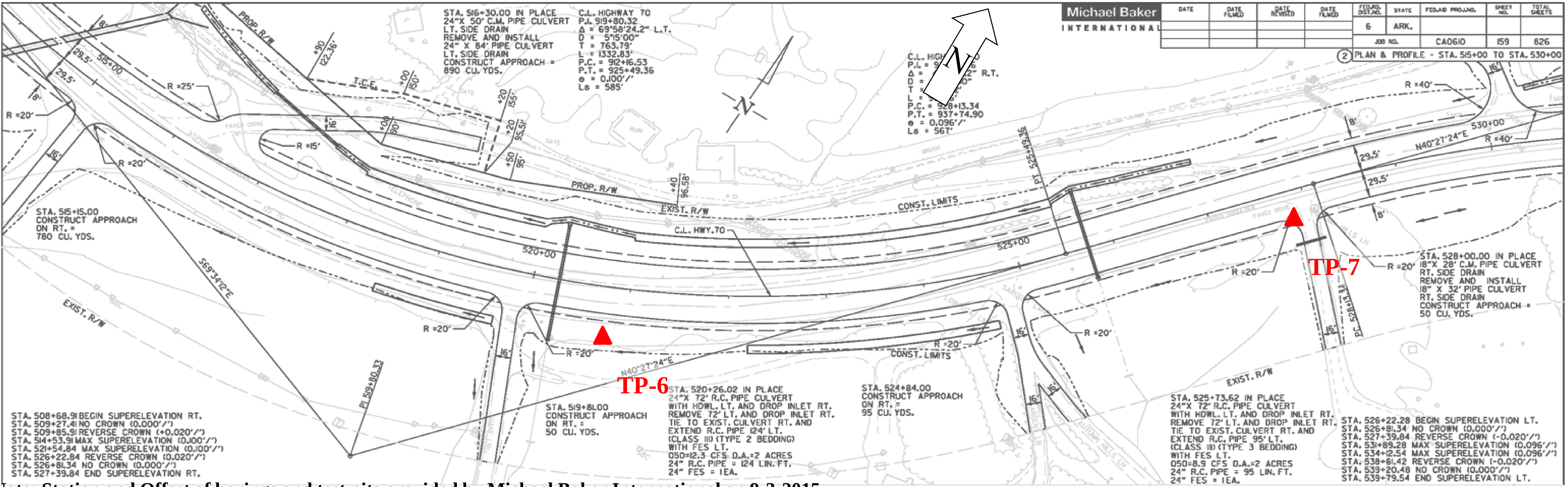
ATTACHMENT 2



Note: Station and Offset of borings and test pits provided by Michael Baker International on 9-3-2015

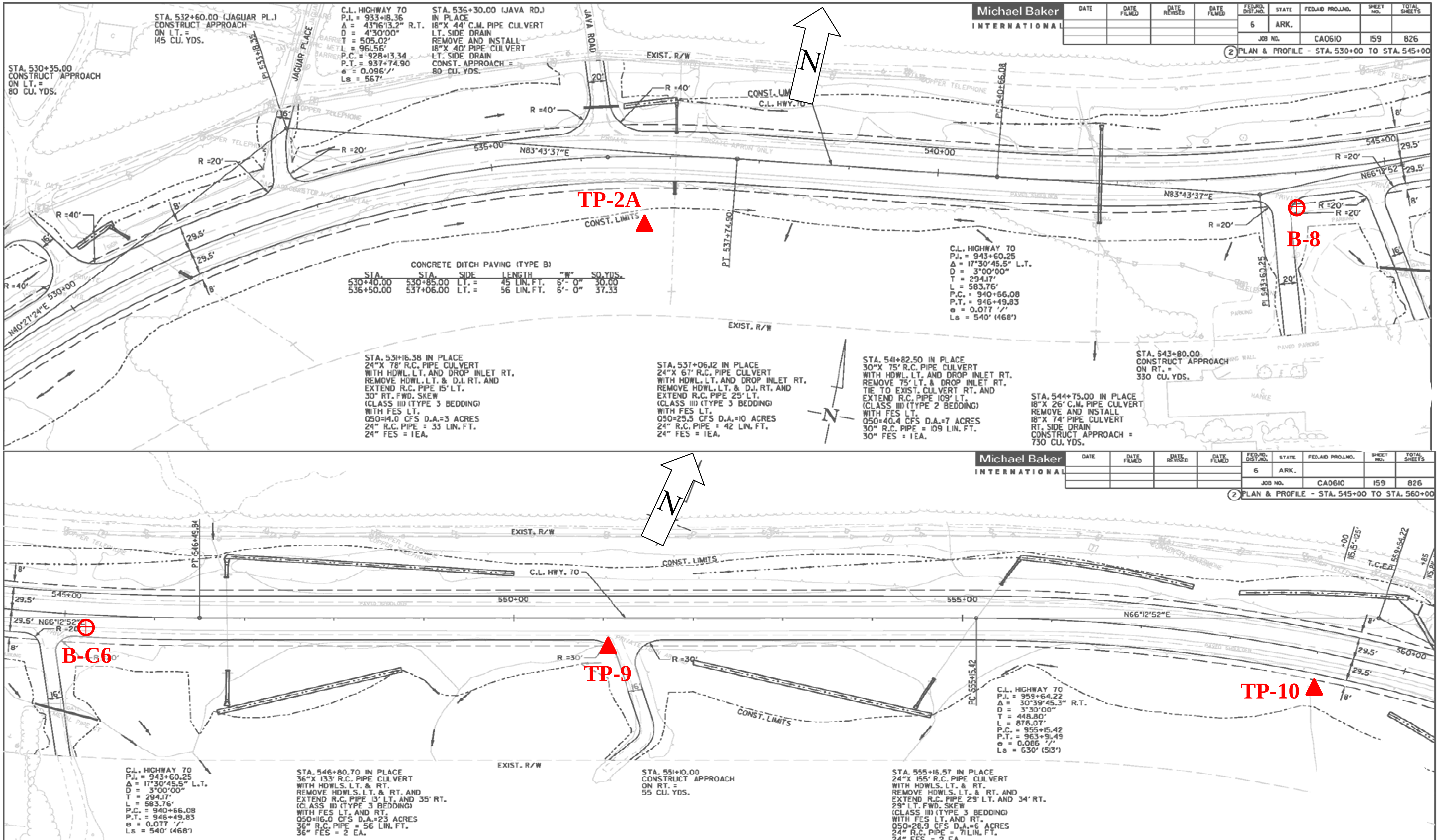
Grubbs, Hoskyn, Barton & Wyatt, INC. CONSULTING ENGINEERS	**PLAN OF BORINGS AND TEST PITS** **AHTD CA0606 – Hwy 70 Widening to Hwy 128** **GARLAND COUNTY, ARKANSAS**	**Date: May 11, 2016**	**Scale: As Shown**	**Job No. 13-214**	**PLATE 1**





Note: Station and Offset of borings and test pits provided by Michael Baker International on 9-3-2015

Grubbs, Hoskyn, Barton & Wyatt, INC. CONSULTING ENGINEERS	**PLAN OF BORINGS AND TEST PITS** **AHTD CA0606 – Hwy 70 Widening to Hwy 128** **GARLAND COUNTY, ARKANSAS**	**Date: May 11, 2016**	**Scale: As Shown**	**Job No. 13-214**	**PLATE 2**



CONCRETE DITCH PAVING (TYPE B)

STA.	STA.	SIDE	LENGTH	"W"	SQ.YDS.
530+40.00	530+85.00	LT. =	45 LIN. FT.	6'- 0"	30.00
536+50.00	537+06.00	LT. =	56 LIN. FT.	6'- 0"	37.33

Note: Station and Offset of borings and test pits provided by Michael Baker International on 9-3-2015

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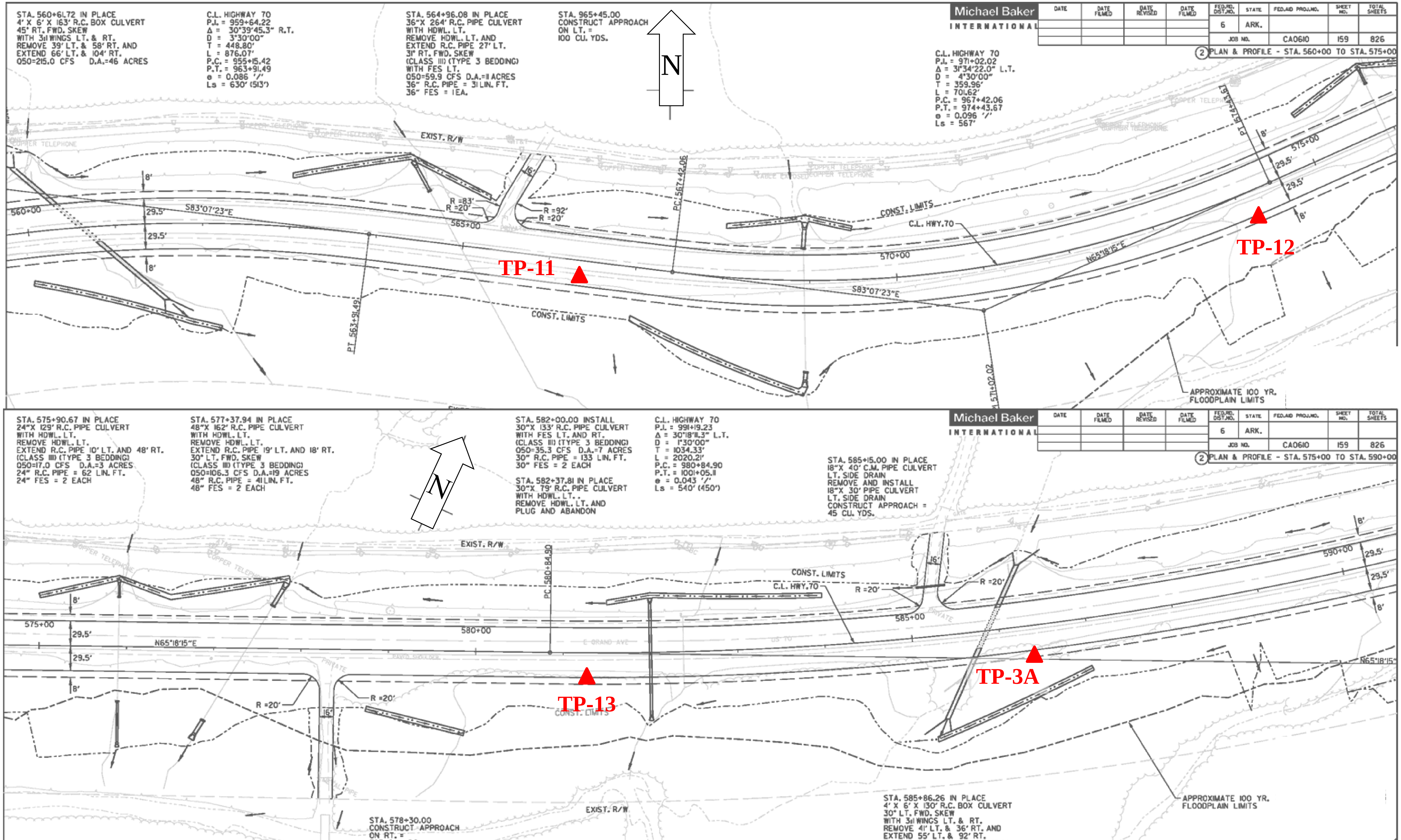
PLAN OF BORINGS AND TEST PITS
AHTD CA0606 – Hwy 70 Widening to Hwy 128
GARLAND COUNTY, ARKANSAS

Date: May 11, 2016

Scale: As Shown

Job No. 13-214

PLATE 3



Note: Station and Offset of borings and test pits provided by Michael Baker International on 9-3-2015

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PLAN OF BORINGS AND TEST PITS

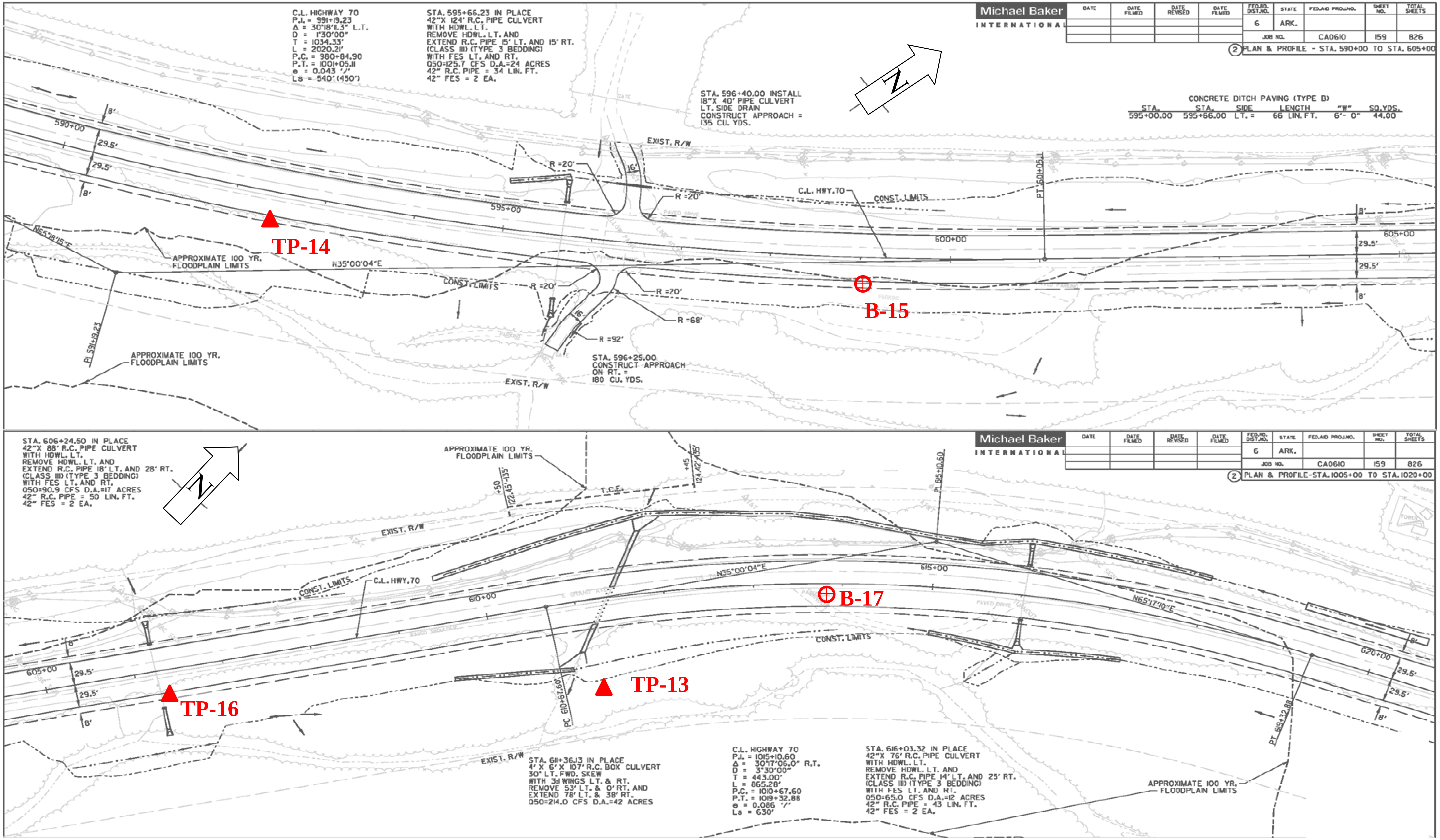
AHTD CA0606 – Hwy 70 Widening to Hwy 128
GARLAND COUNTY, ARKANSAS

Date: May 11, 2016

Scale: As Shown

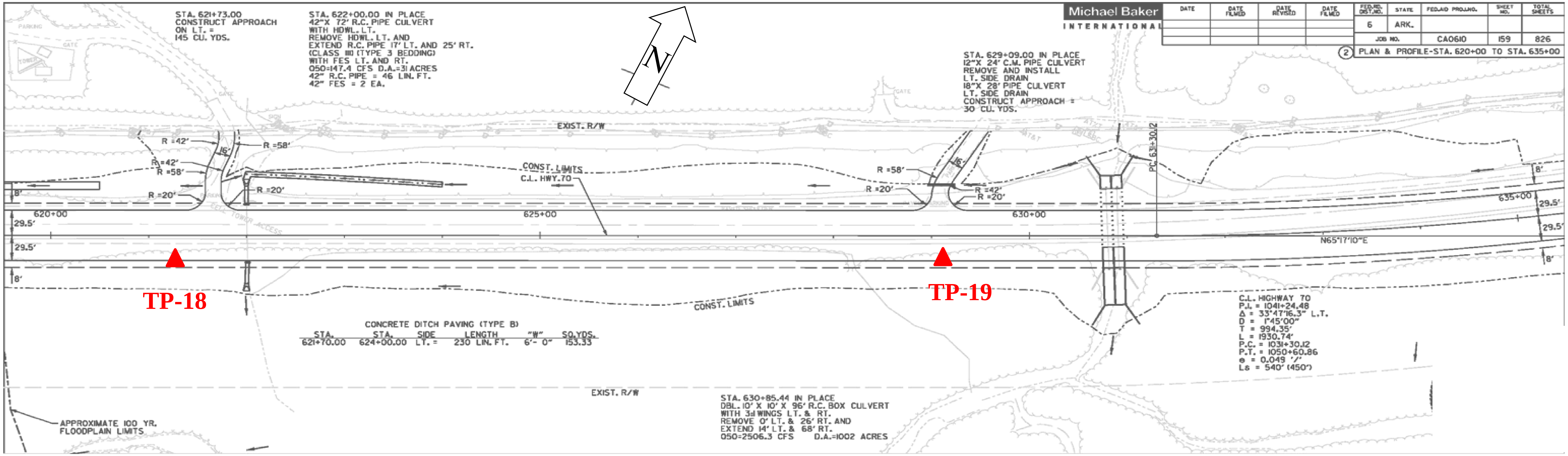
Job No. 13-214

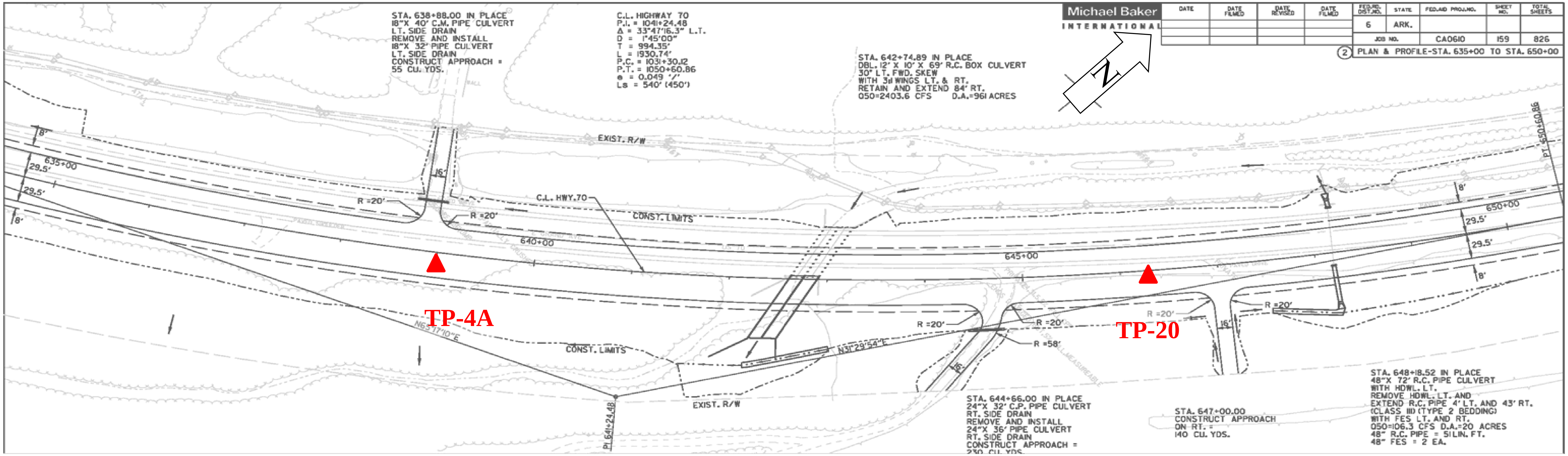
PLATE 4



Note: Station and Offset of borings and test pits provided by Michael Baker International on 9-3-2015

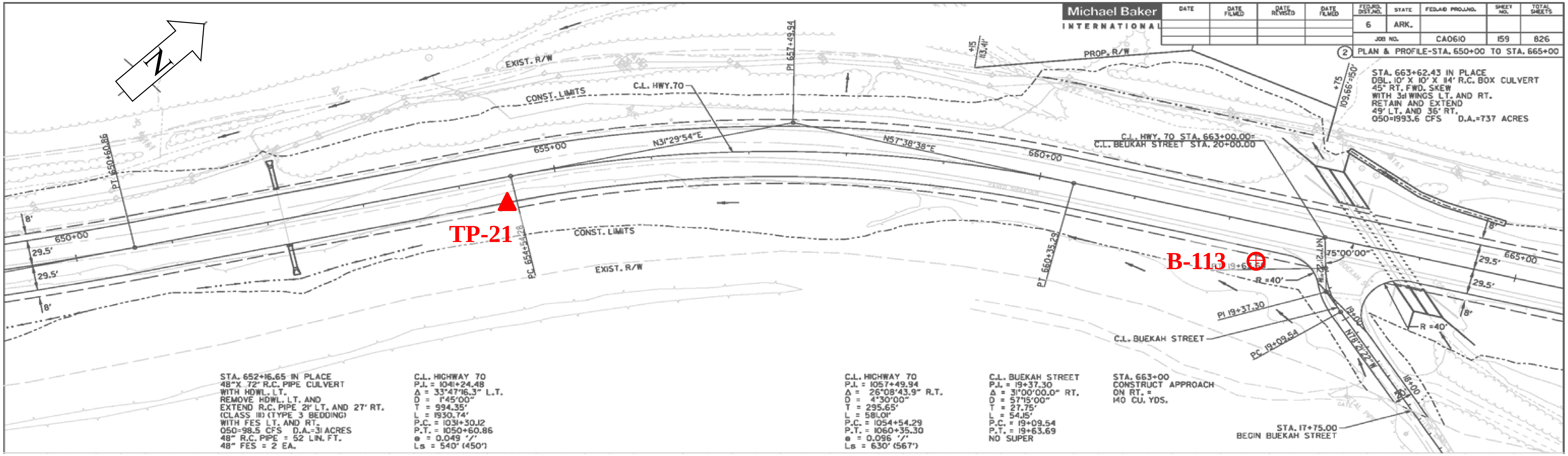
Grubbs, Hoskyn, Barton & Wyatt, INC. CONSULTING ENGINEERS	**PLAN OF BORINGS AND TEST PITS** AHTD CA0606 – Hwy 70 Widening to Hwy 128 GARLAND COUNTY, ARKANSAS	Date: May 11, 2016	Scale: As Shown	Job No. 13-214	PLATE 5

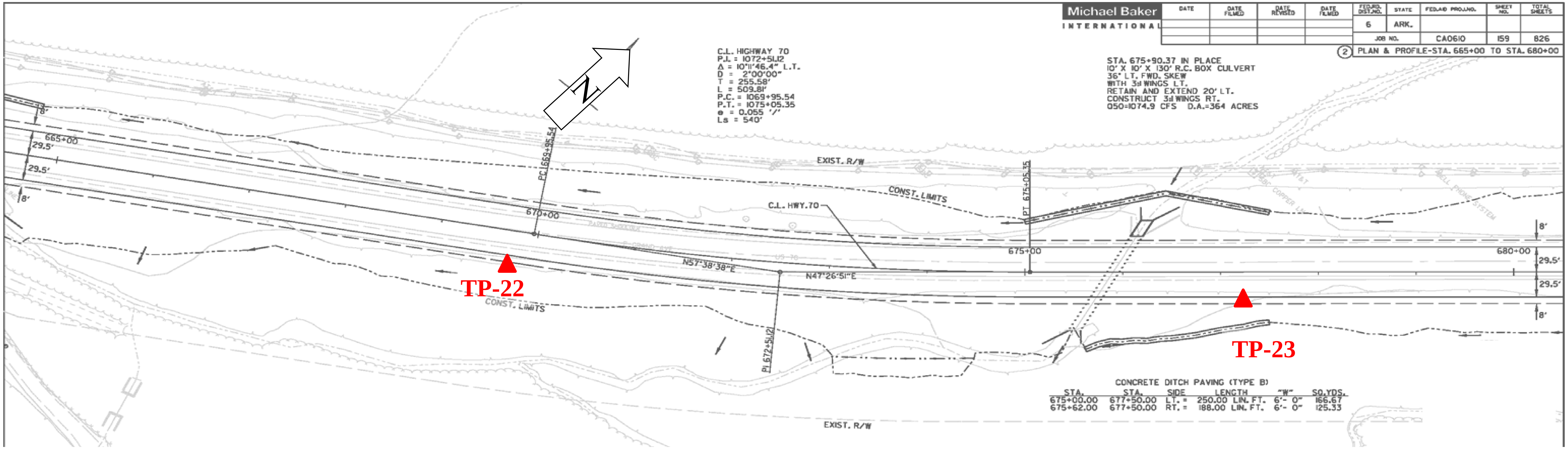




Note: Station and Offset of borings and test pits provided by Michael Baker International on 9-3-2015

Grubbs, Hoskyn, Barton & Wyatt, INC. CONSULTING ENGINEERS	**PLAN OF BORINGS AND TEST PITS** AHTD CA0606 – Hwy 70 Widening to Hwy 128 GARLAND COUNTY, ARKANSAS	Date: May 11, 2016	Scale: As Shown	Job No. 13-214	PLATE 6





Note: Station and Offset of borings and test pits provided by Michael Baker International on 9-3-2015

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

PLAN OF BORINGS AND TEST PITS

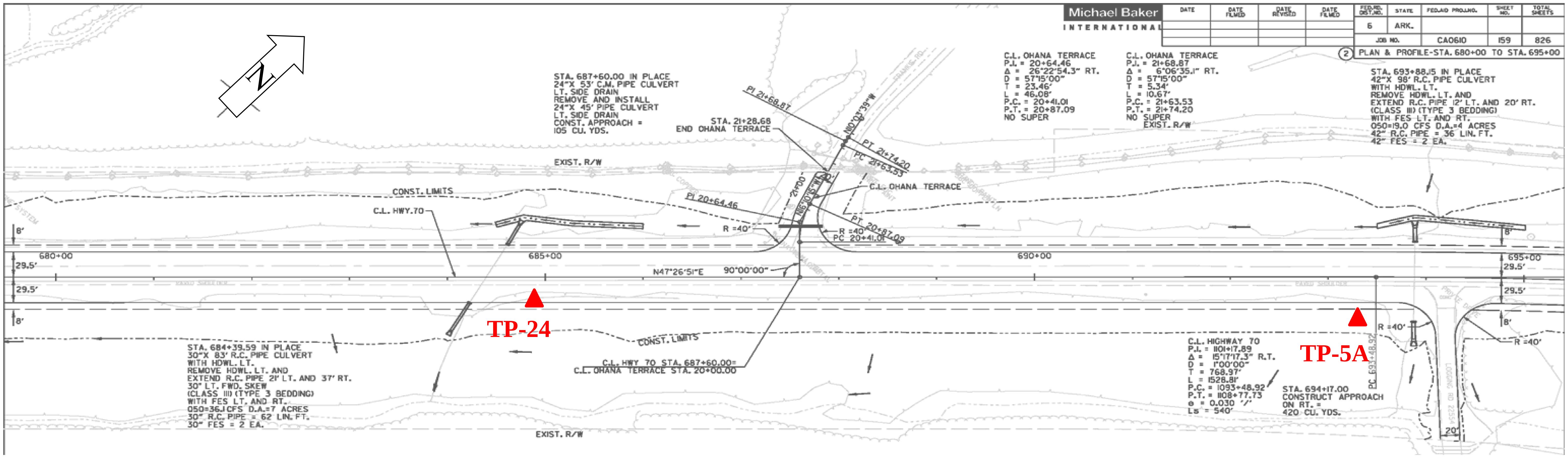
AHTD CA0606 – Hwy 70 Widening to Hwy 128
GARLAND COUNTY, ARKANSAS

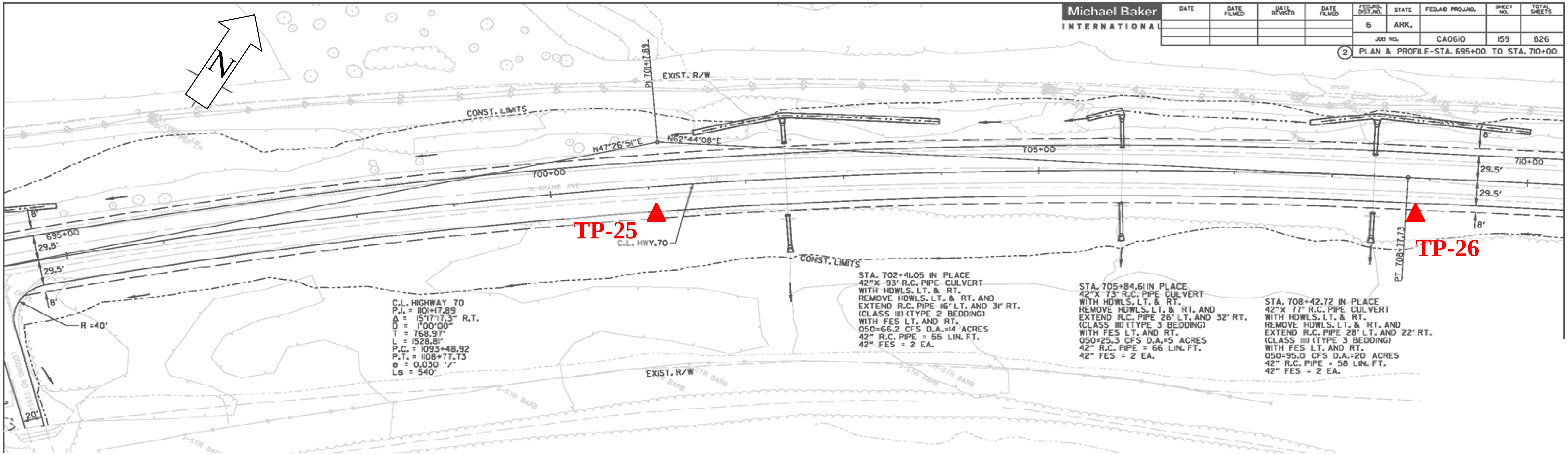
Date: May 11, 2016

Scale: As Shown

Job No. 13-214

PLATE 7





Note: Station and Offset of borings and test pits provided by Michael Baker International on 9-3-2015

Grubbs, Hoskyn,
Barton & Wyatt, INC.
CONSULTING ENGINEERS

PLAN OF BORINGS AND TEST PITS

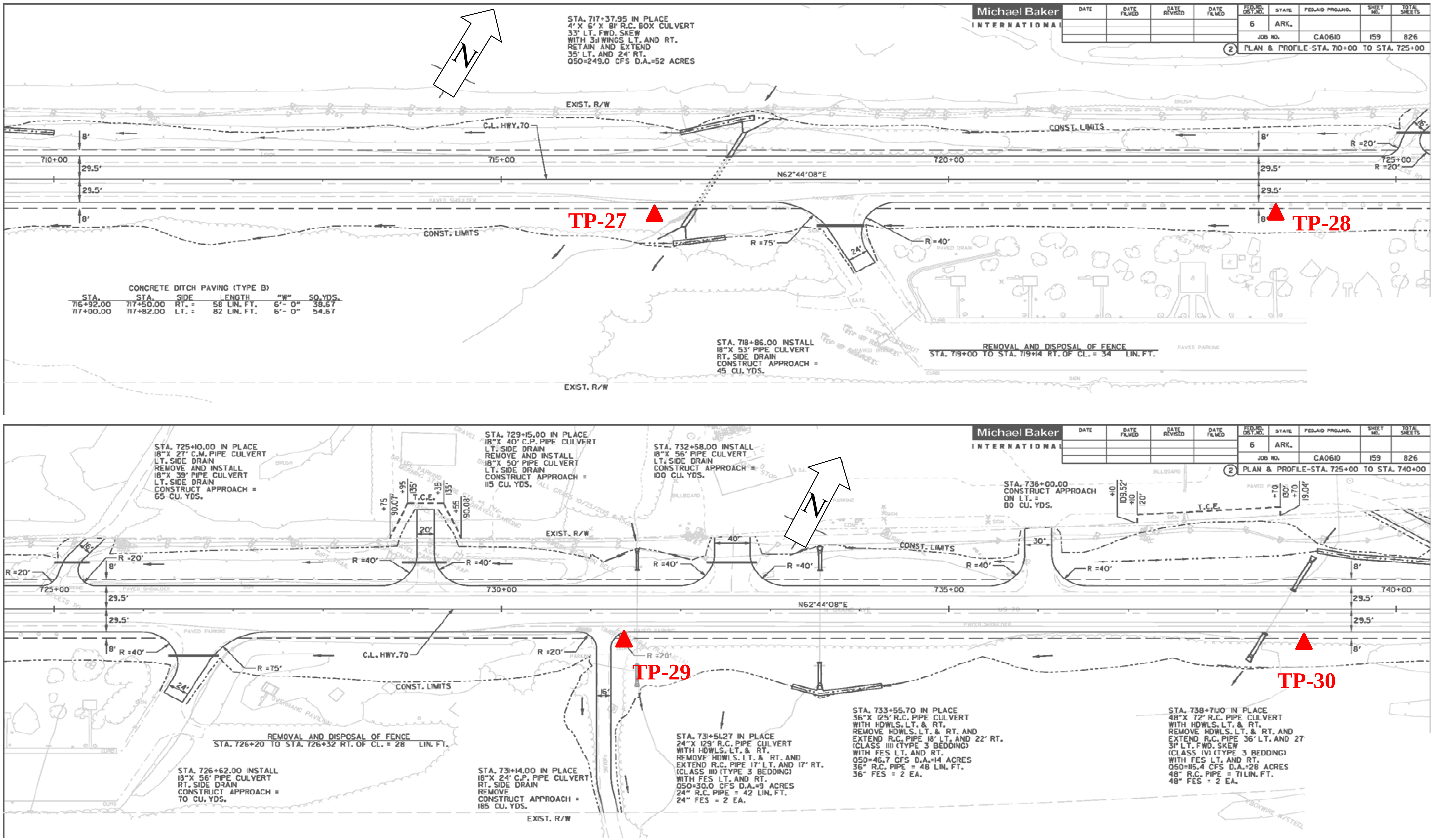
AHTD CA0606 – Hwy 70 Widening to Hwy 128
GARLAND COUNTY, ARKANSAS

Date: May 11, 2016

Scale: As Shown

Job No. 13-214

PLATE 8



Note: Station and Offset of borings and test pits provided by Michael Baker International on 9-3-2015

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

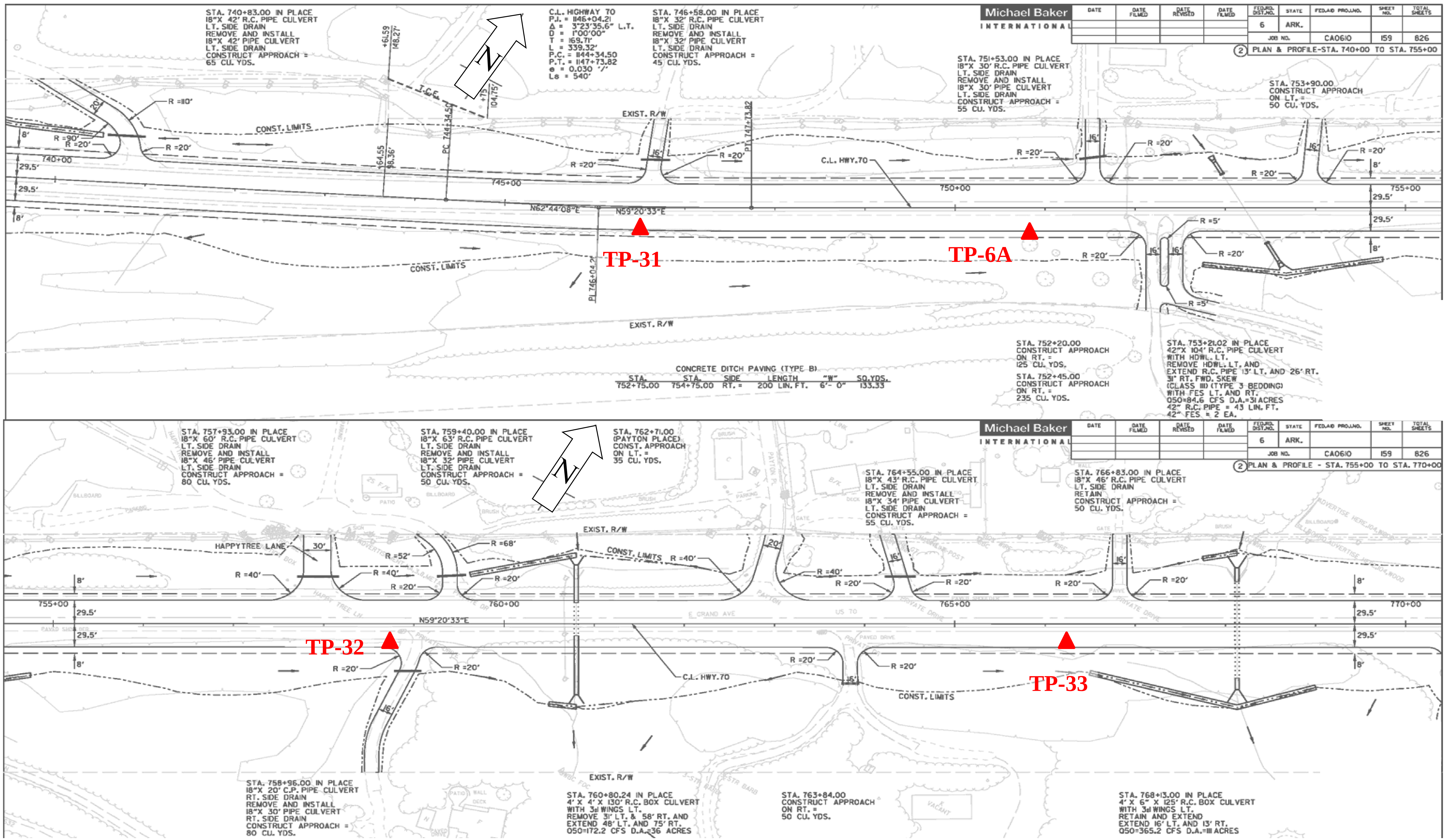
PLAN OF BORINGS AND TEST PITS
AHTD CA0606 – Hwy 70 Widening to Hwy 128
GARLAND COUNTY, ARKANSAS

Date: May 11, 2016

Scale: As Shown

Job No. 13-214

PLATE 9



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Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

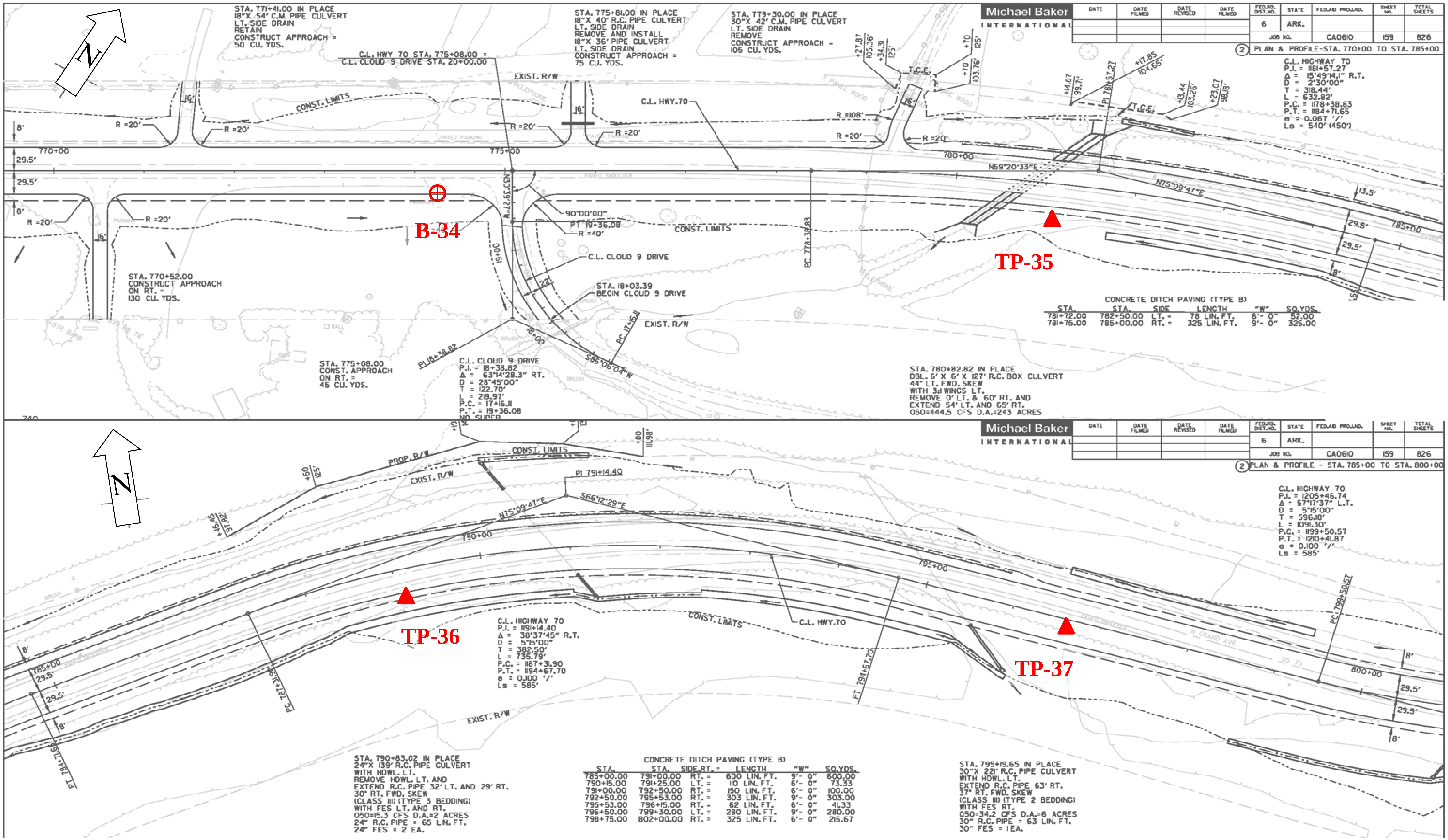
PLAN OF BORINGS AND TEST PITS
AHTD CA0606 – Hwy 70 Widening to Hwy 128
GARLAND COUNTY, ARKANSAS

Date: May 11, 2016

Scale: As Shown

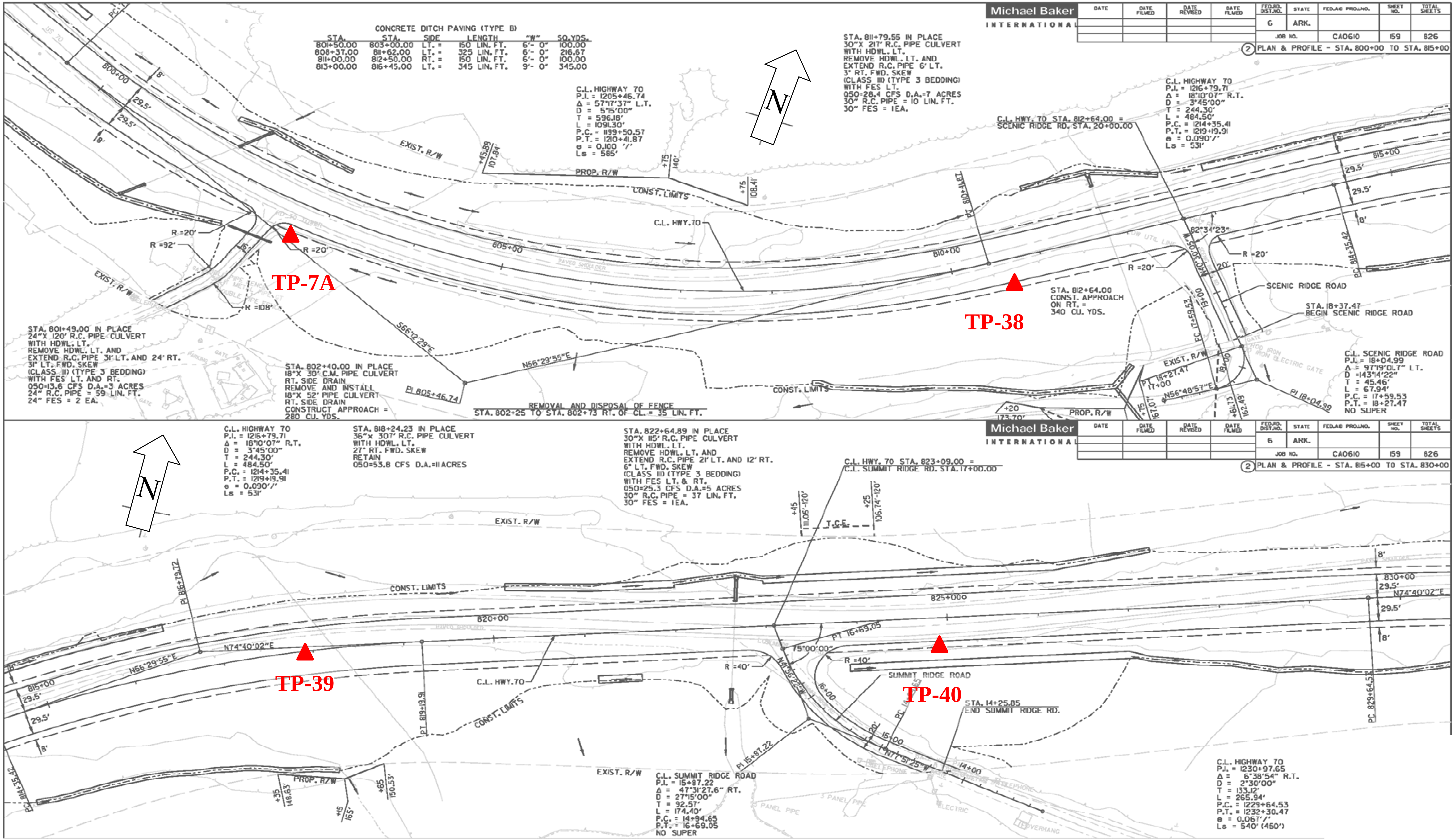
Job No. 13-214

PLATE 10



Note: Station and Offset of borings and test pits provided by Michael Baker International on 9-3-2015

Grubbs, Hoskyn, Barton & Wyatt, INC. CONSULTING ENGINEERS	**PLAN OF BORINGS AND TEST PITS** AHTD CA0606 – Hwy 70 Widening to Hwy 128 GARLAND COUNTY, ARKANSAS	**Date: May 11, 2016**	**Scale: As Shown**	**Job No. 13-214**	**PLATE 11**



Note: Station and Offset of borings and test pits provided by Michael Baker International on 9-3-2015

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

PLAN OF BORINGS AND TEST PITS

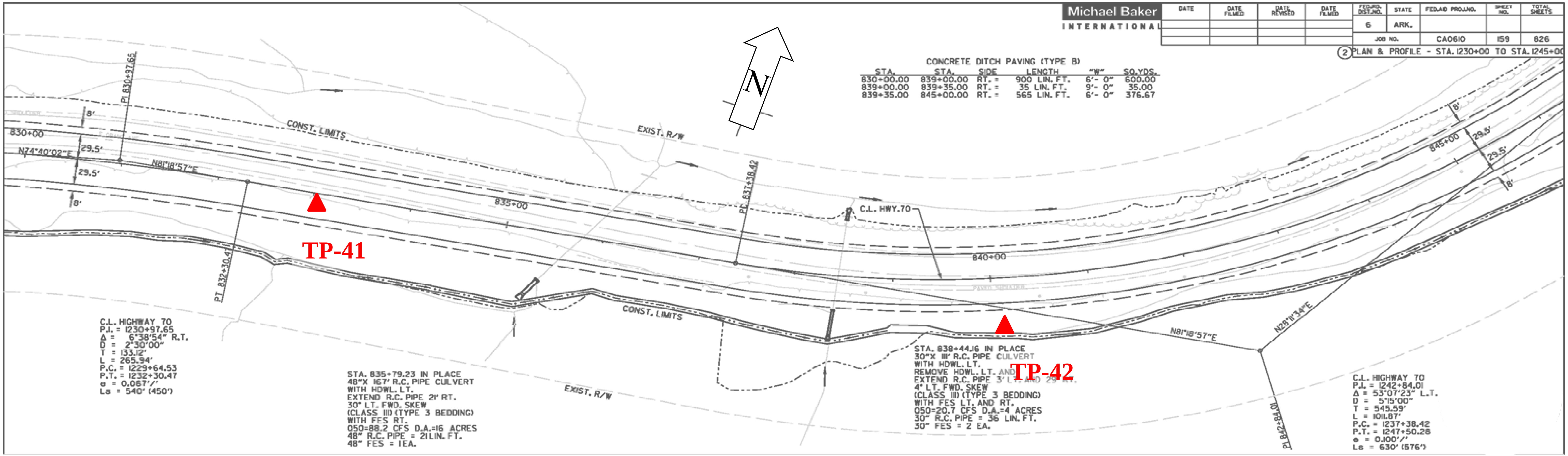
AHTD CA0606 – Hwy 70 Widening to Hwy 128
GARLAND COUNTY, ARKANSAS

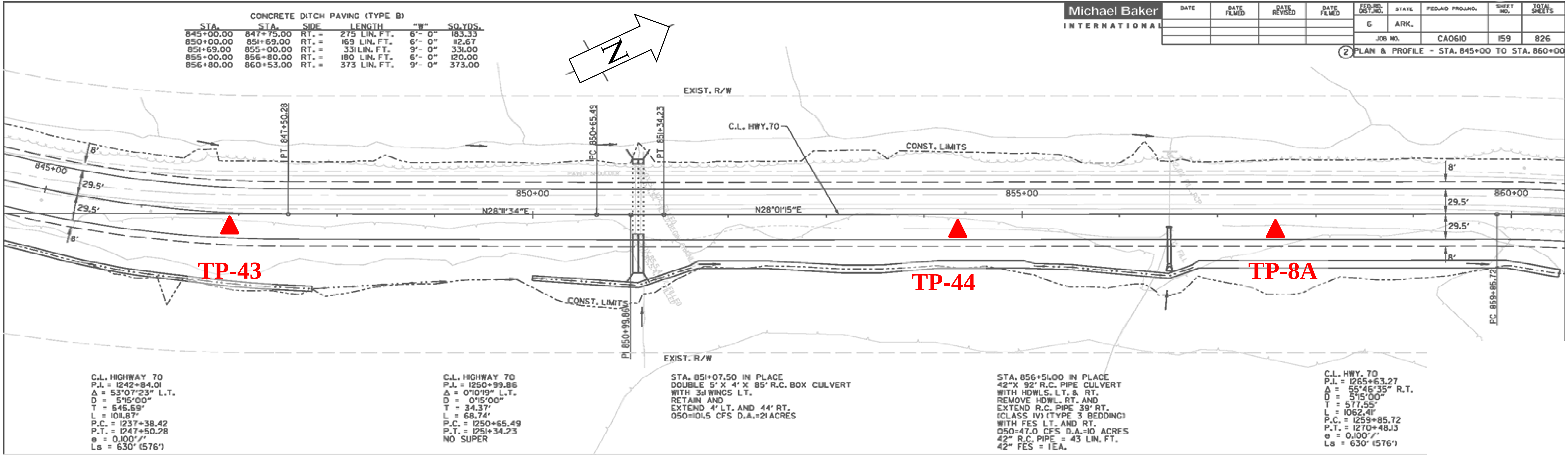
Date: May 11, 2016

Scale: As Shown

Job No. 13-214

PLATE 12





Note: Station and Offset of borings and test pits provided by Michael Baker International on 9-3-2015

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

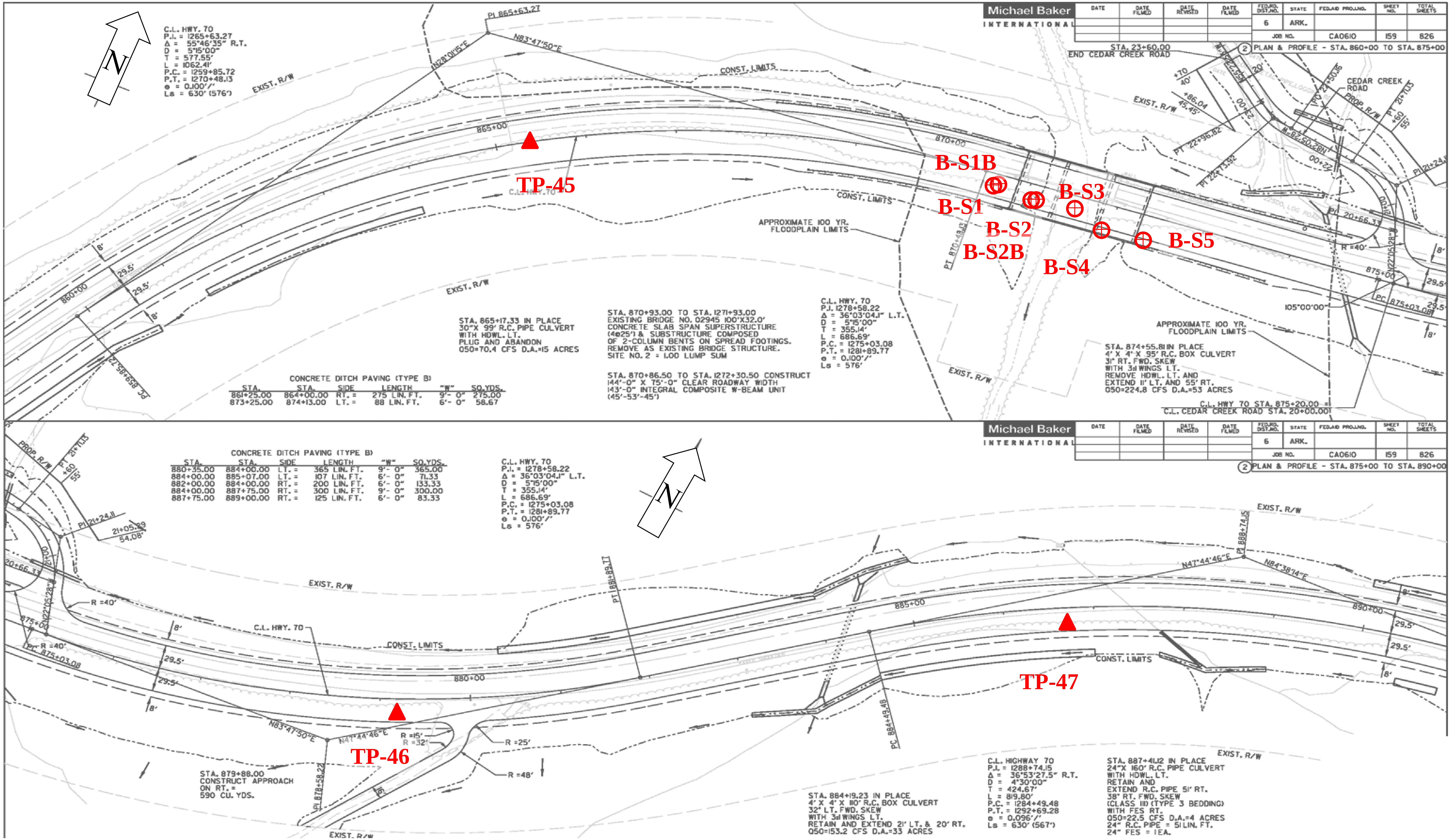
PLAN OF BORINGS AND TEST PITS
AHTD CA0606 – Hwy 70 Widening to Hwy 128
GARLAND COUNTY, ARKANSAS

Date: May 11, 2016

Scale: As Shown

Job No. 13-214

PLATE 13



Note: Station and Offset of borings and test pits provided by Michael Baker International on 9-3-2015

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

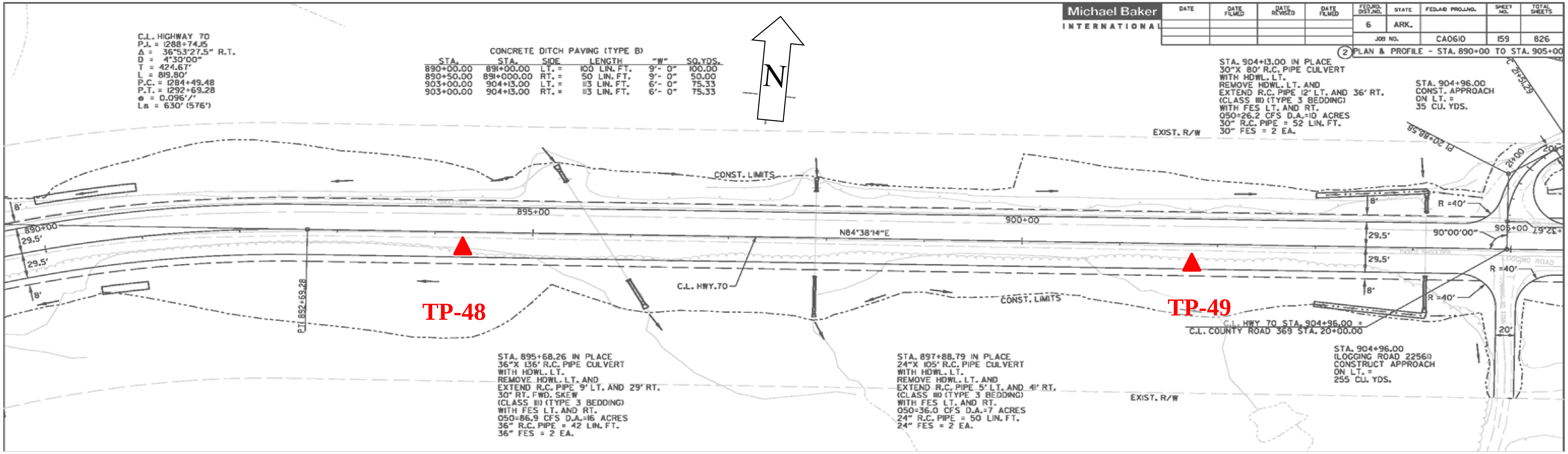
PLAN OF BORINGS AND TEST PITS
AHTD CA0606 – Hwy 70 Widening to Hwy 128
GARLAND COUNTY, ARKANSAS

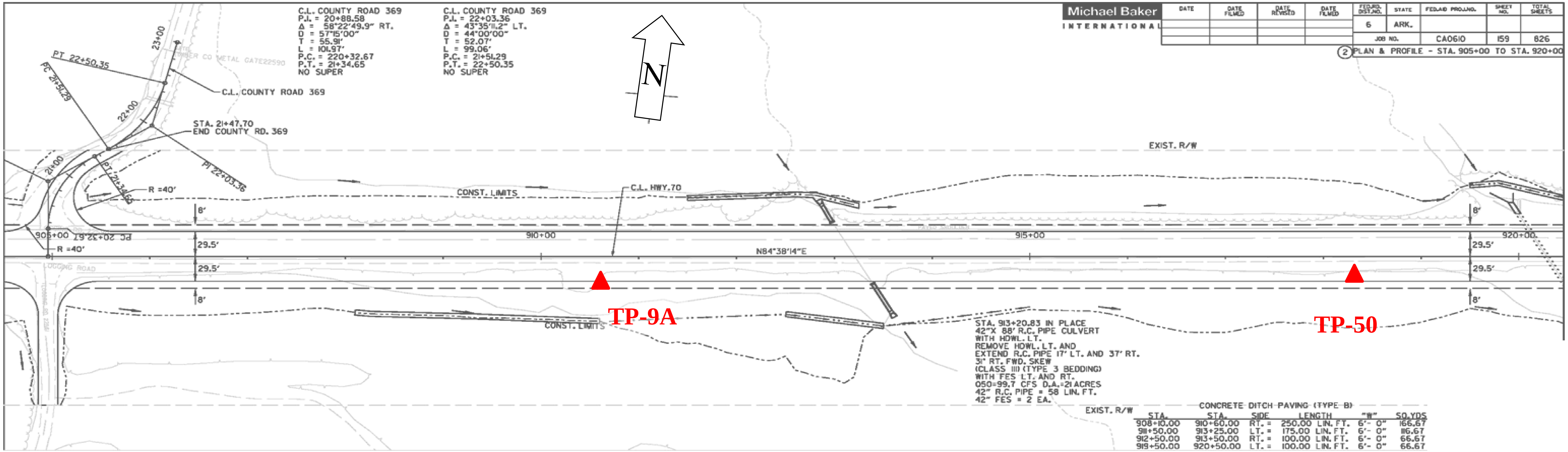
Date: May 11, 2016

Scale: As Shown

Job No. 13-214

PLATE 14





Note: Station and Offset of borings and test pits provided by Michael Baker International on 9-3-2015

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

PLAN OF BORINGS AND TEST PITS

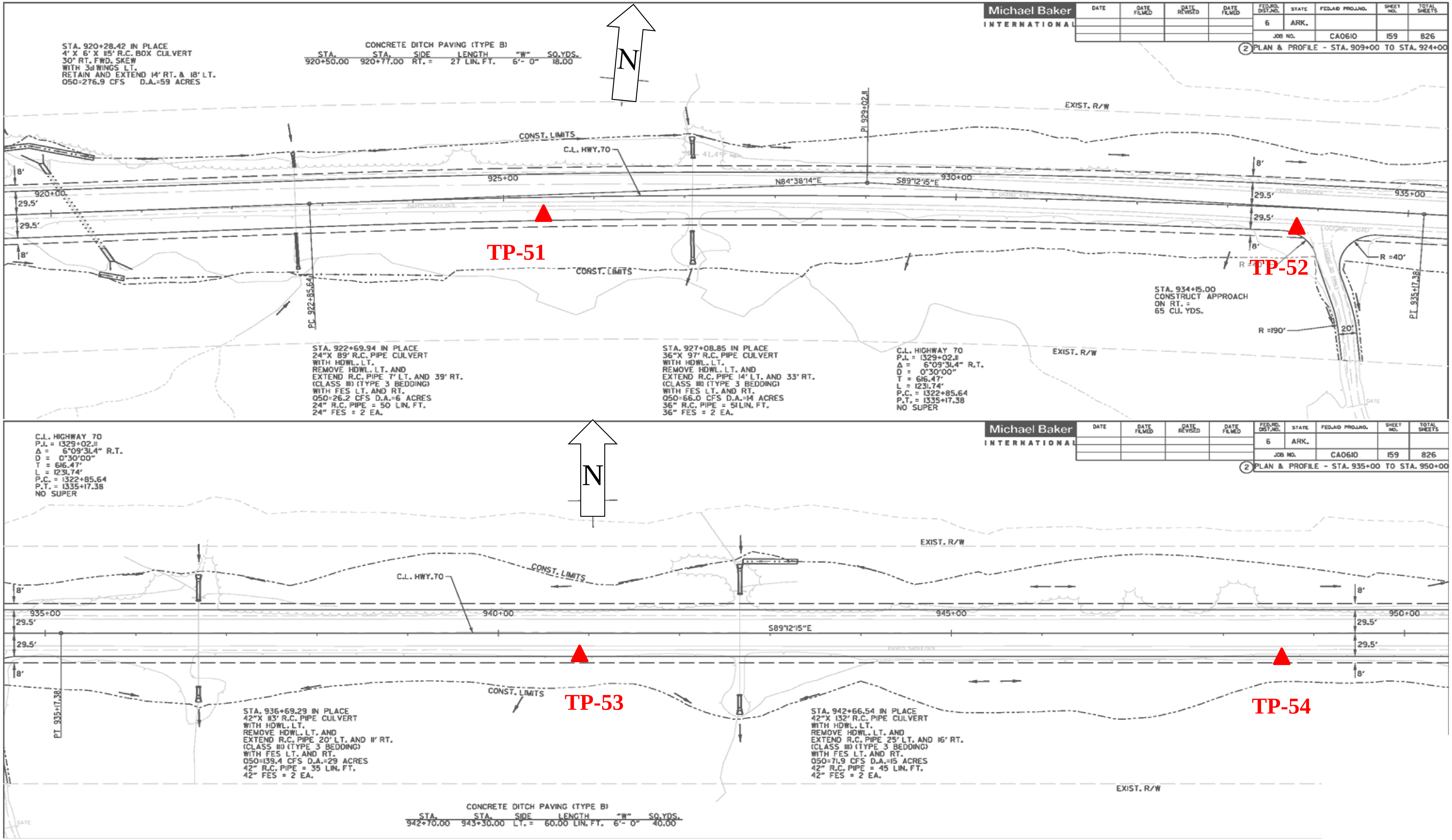
AHTD CA0606 – Hwy 70 Widening to Hwy 128
GARLAND COUNTY, ARKANSAS

Date: May 11, 2016

Scale: As Shown

Job No. 13-214

PLATE 15



Note: Station and Offset of borings and test pits provided by Michael Baker International on 9-3-2015

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

PLAN OF BORINGS AND TEST PITS

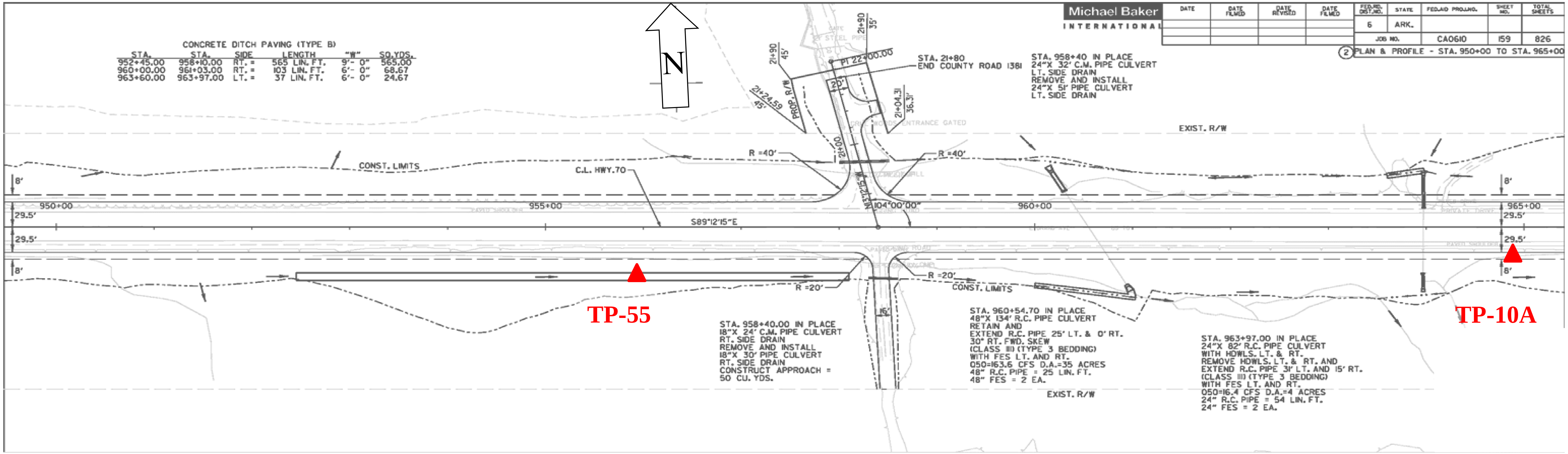
AHTD CA0606 – Hwy 70 Widening to Hwy 128
GARLAND COUNTY, ARKANSAS

Date: May 11, 2016

Scale: As Shown

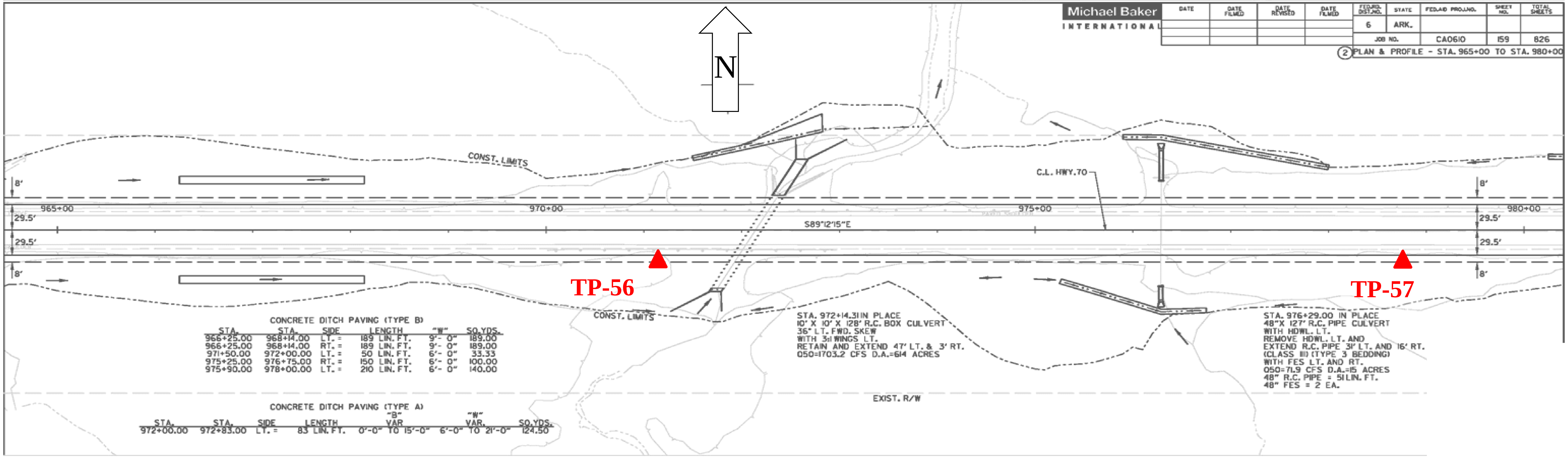
Job No. 13-214

PLATE 16



CONCRETE DITCH PAVING (TYPE B)

STA.	STA.	SIDE	LENGTH	"W"	SQ.YDS.
952+45.00	958+10.00	RT. =	565 LIN. FT.	9'- 0"	565.00
960+00.00	961+03.00	RT. =	103 LIN. FT.	6'- 0"	68.67
963+60.00	963+97.00	LT. =	37 LIN. FT.	6'- 0"	24.67



CONCRETE DITCH PAVING (TYPE B)

STA.	STA.	SIDE	LENGTH	"W"	SQ.YDS.
966+25.00	968+14.00	LT. =	189 LIN. FT.	9'- 0"	189.00
966+25.00	968+14.00	RT. =	189 LIN. FT.	9'- 0"	189.00
971+50.00	972+00.00	LT. =	50 LIN. FT.	6'- 0"	33.33
975+25.00	976+75.00	RT. =	150 LIN. FT.	6'- 0"	100.00
975+90.00	978+00.00	LT. =	210 LIN. FT.	6'- 0"	140.00

CONCRETE DITCH PAVING (TYPE A)

STA.	STA.	SIDE	LENGTH	"B" VAR	"W" VAR.	SQ.YDS.
972+00.00	972+83.00	LT. =	83 LIN. FT.	0'-0" TO 15'-0"	6'-0" TO 21'-0"	124.50

Note: Station and Offset of borings and test pits provided by Michael Baker International on 9-3-2015

Grubbs, Hoskyn, Barton & Wyatt, INC. CONSULTING ENGINEERS	**PLAN OF BORINGS AND TEST PITS** AHTD CA0606 – Hwy 70 Widening to Hwy 128 GARLAND COUNTY, ARKANSAS	Date: May 11, 2016	Scale: As Shown	Job No. 13-214	PLATE 17

ATTACHMENT 3

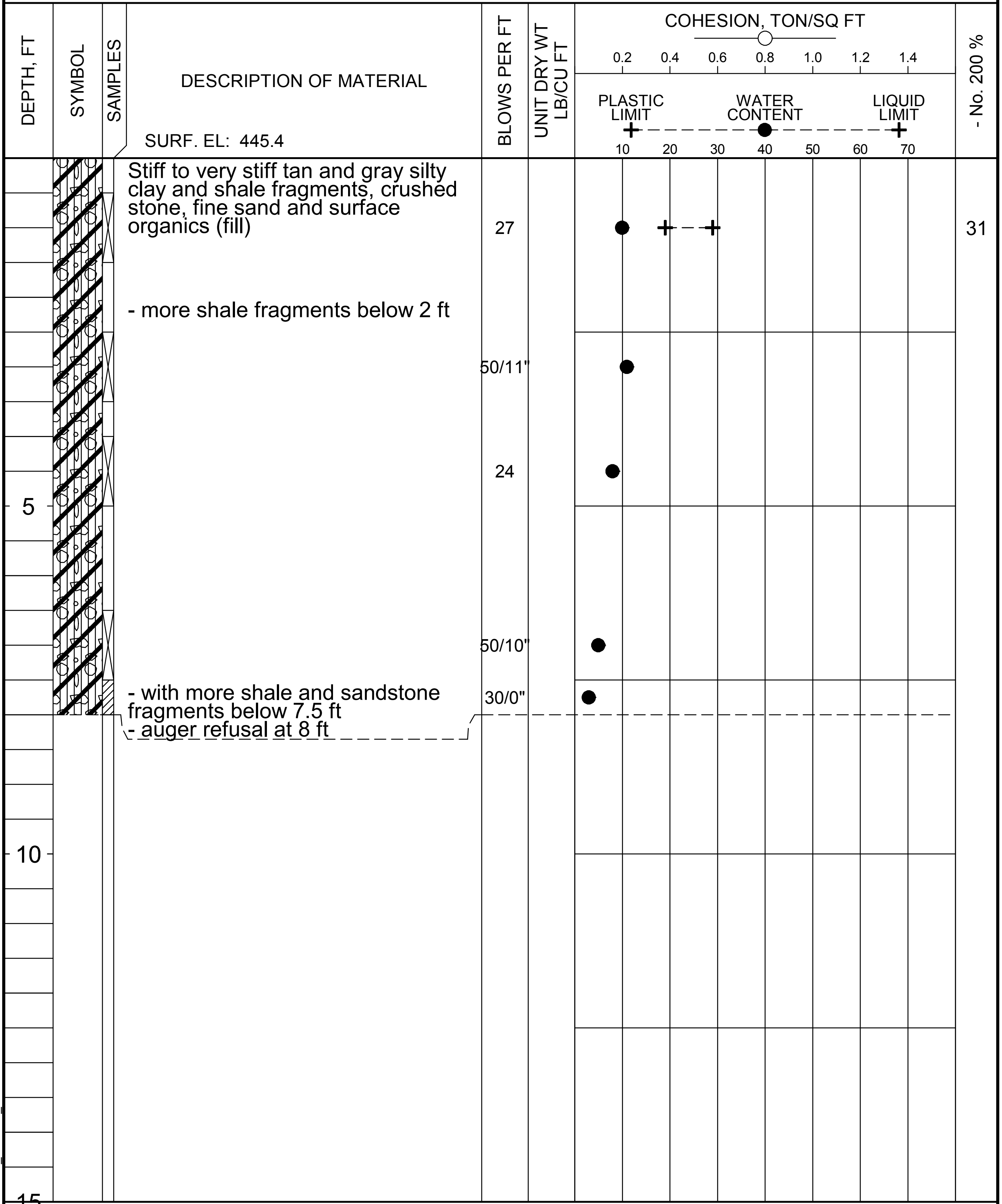
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 1

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Auger

LOCATION: Approx Sta 484+43, 91 ft Rt



Stiff to very stiff tan and gray silty clay and shale fragments, crushed stone, fine sand and surface organics (fill)

- more shale fragments below 2 ft

- with more shale and sandstone fragments below 7.5 ft
- auger refusal at 8 ft

COMPLETION DEPTH: 8.0 ft
DATE: 12-12-13

DEPTH TO WATER
IN BORING: Dry

DATE: 12/12/2013

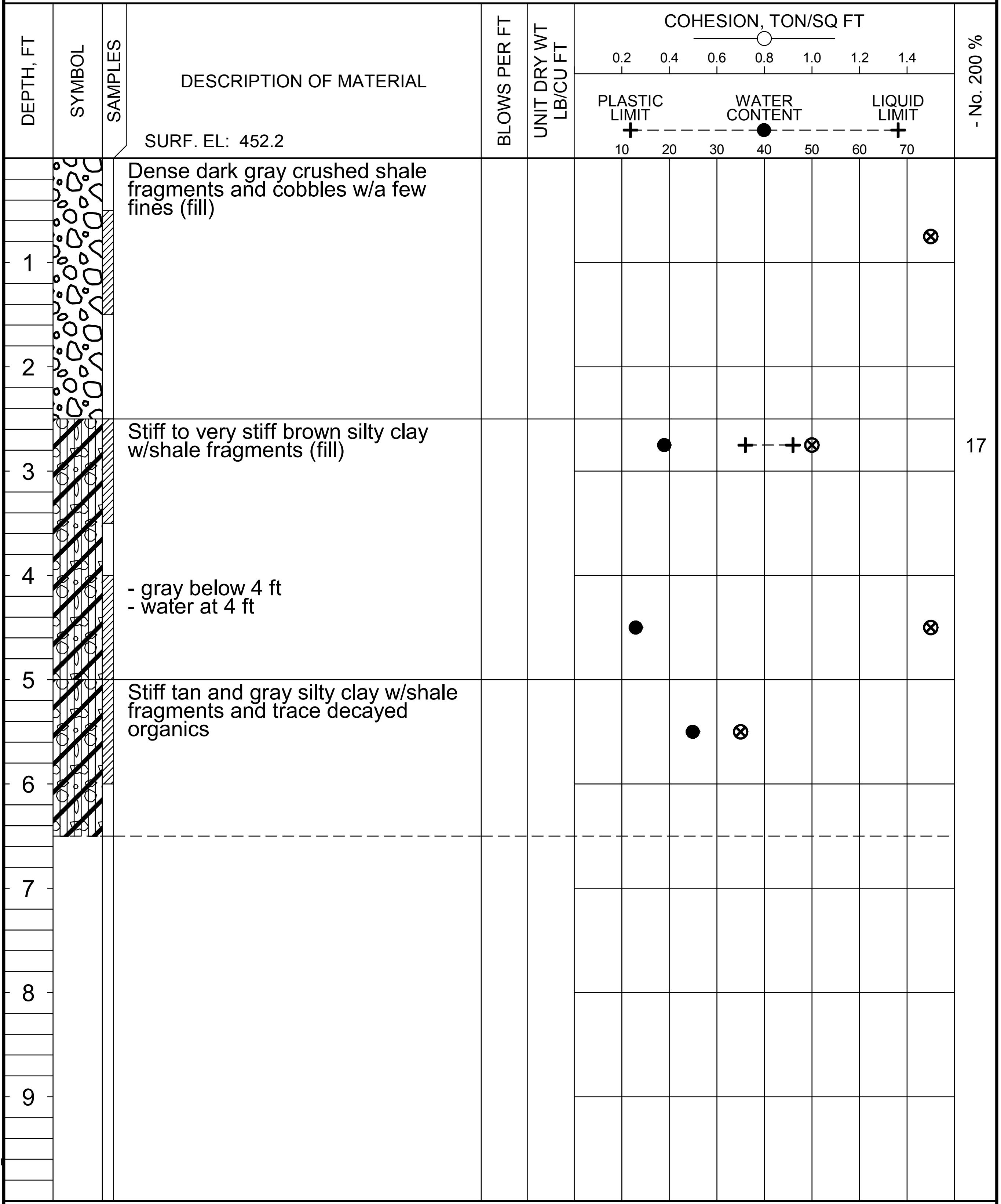
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 2

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 491+16, 40 ft Rt



Dense dark gray crushed shale fragments and cobbles w/a few fines (fill)

Stiff to very stiff brown silty clay w/shale fragments (fill)

- gray below 4 ft
- water at 4 ft

Stiff tan and gray silty clay w/shale fragments and trace decayed organics

COMPLETION DEPTH: 6.5 ft
DATE: 1-8-14

DEPTH TO WATER
IN TEST PIT: 4 ft

DATE: 1/8/2014

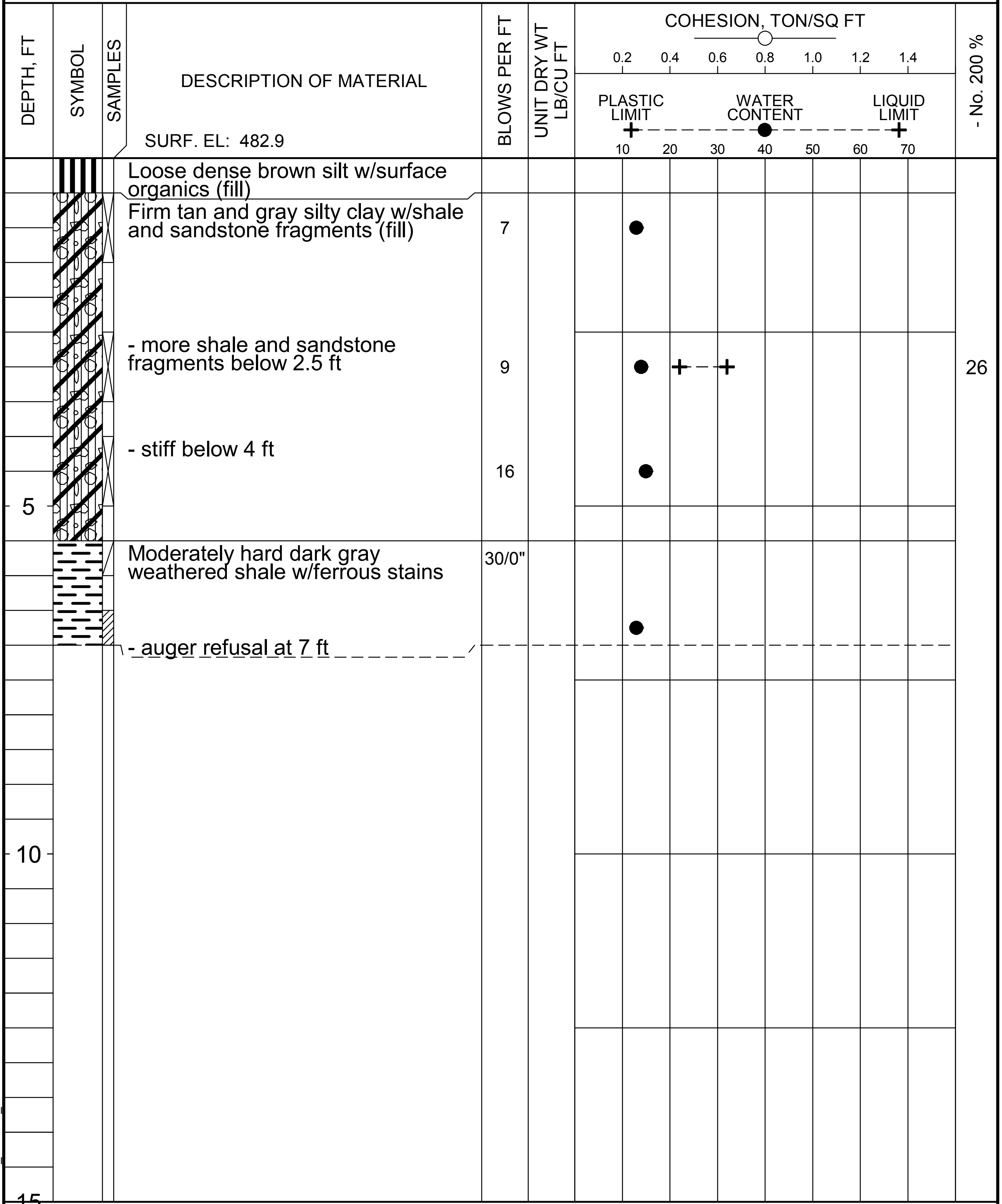
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 3

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Auger

LOCATION: Approx Sta 498+90, 32 ft Rt



SURF. EL: 482.9

DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
Loose dense brown silt w/surface organics (fill)			
Firm tan and gray silty clay w/shale and sandstone fragments (fill)	7		
- more shale and sandstone fragments below 2.5 ft	9		26
- stiff below 4 ft	16		
Moderately hard dark gray weathered shale w/ferrous stains	30/0"		
- auger refusal at 7 ft			

COMPLETION DEPTH: 7.0 ft
DATE: 12-12-13

DEPTH TO WATER
IN BORING: Dry

DATE: 12/12/2013

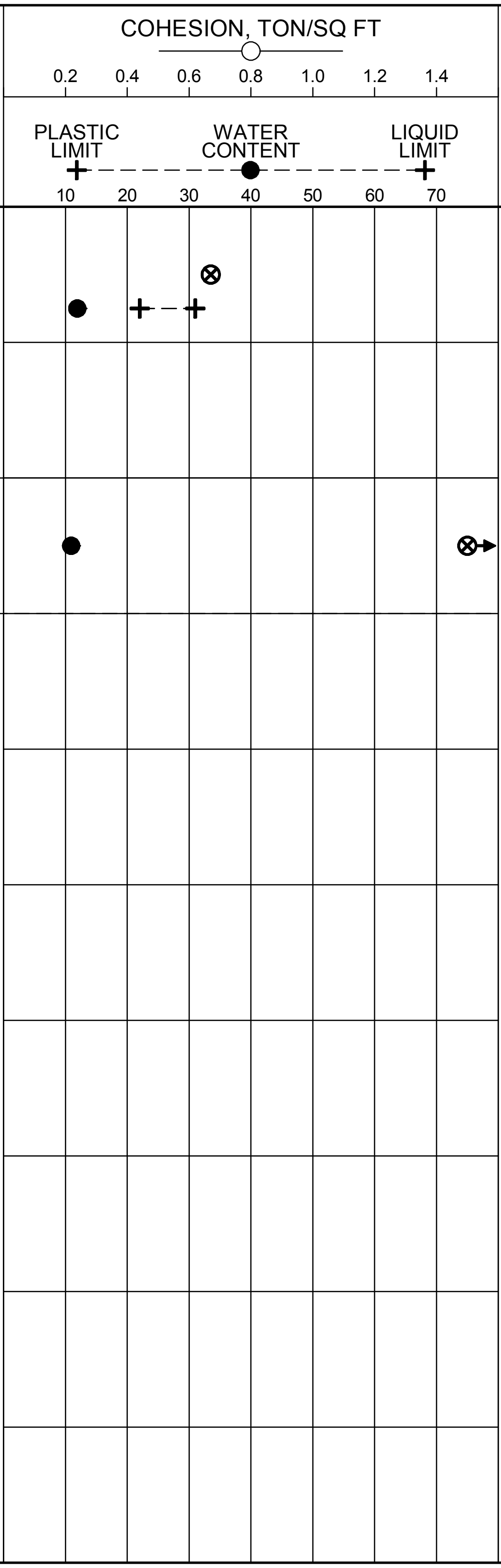
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 4

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Mini Excavator
LOCATION: Approx Sta 506+01, 21 ft Rt

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURF. EL: 485.9	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
0–2		▨	Stiff brown silty clay w/shale fragments and cobbles (fill)			16
2–3		▨	Moderately hard tan and dark gray weathered shale, heavily fractured, thickly bedded, dip = 15° at 290° - less fractured below 3 ft - refusal in shale at 3 ft			



COMPLETION DEPTH: 3.0 ft
DATE: 1-8-14
DEPTH TO WATER
IN TEST PIT: Dry
DATE: 1/8/2014

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

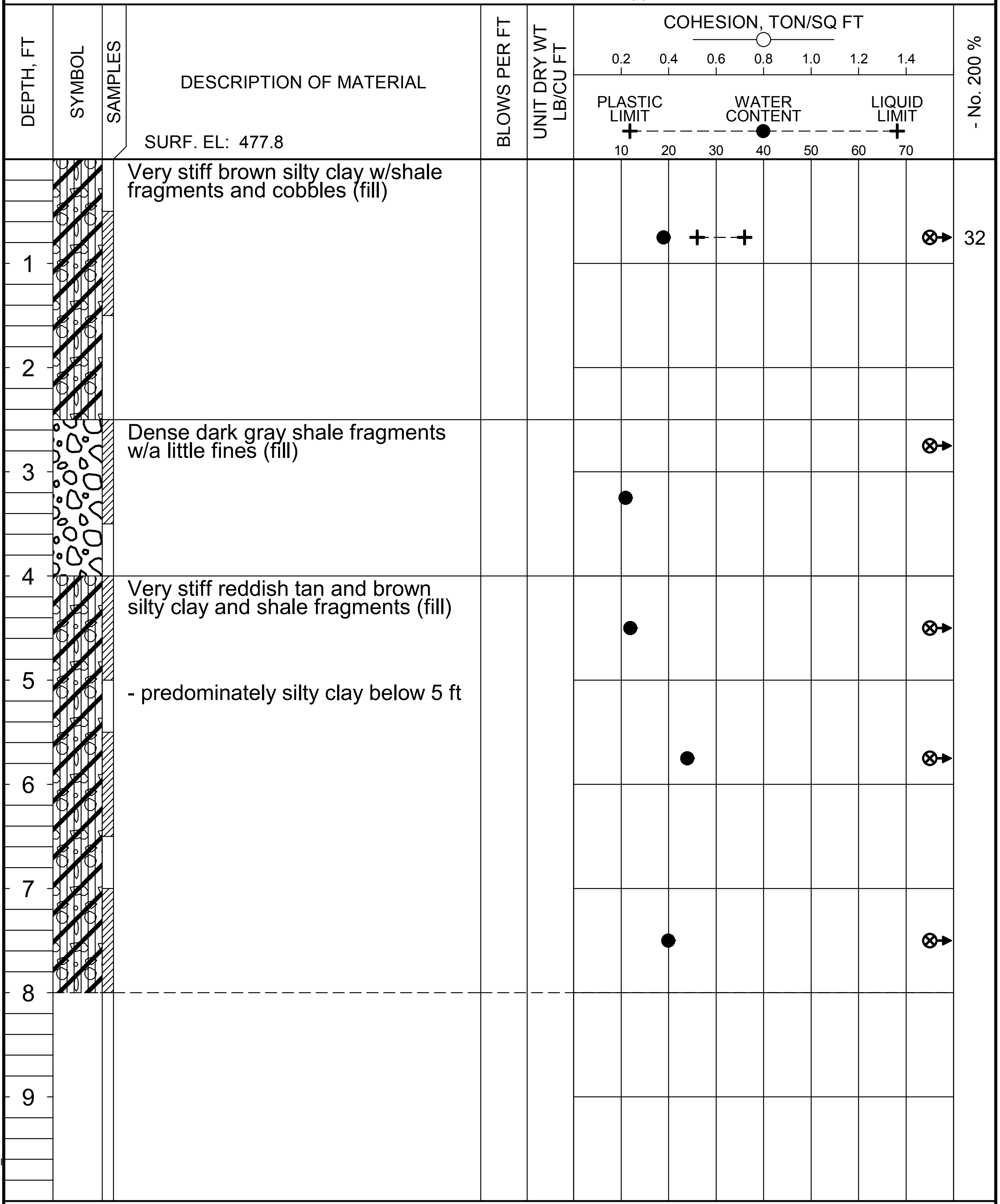
LOG OF TEST PIT NO. 5

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 513+65, 34 ft Rt

SURF. EL: 477.8



Very stiff brown silty clay w/shale fragments and cobbles (fill)

Dense dark gray shale fragments w/a little fines (fill)

Very stiff reddish tan and brown silty clay and shale fragments (fill)

- predominately silty clay below 5 ft

COMPLETION DEPTH: 8.0 ft
DATE: 1-8-14

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 1/8/2014

13-214

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 6

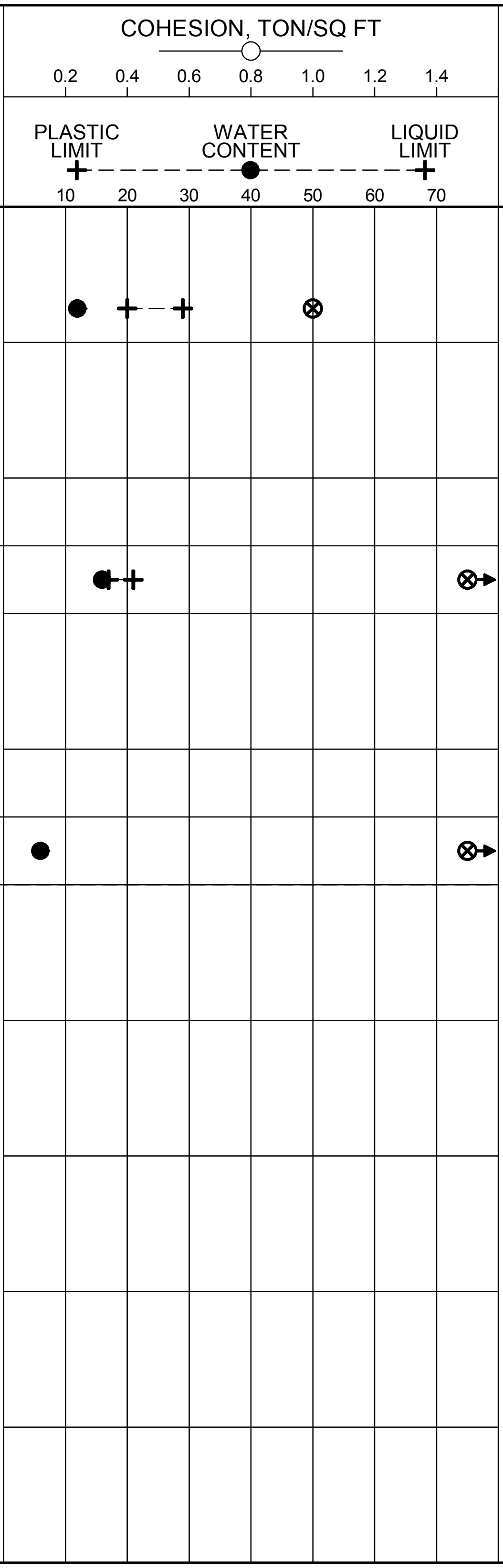
AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 520+86, 53 ft Rt

SURF. EL: 510.2

DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
Very stiff reddish tan and brown silty clay w/shale and sandstone fragments, cobbles and occasional boulders (fill)			20
Very stiff reddish tan clayey silt w/sandstone and shale fragments			48
Moderately hard tan and reddish tan weathered fine-grained sandstone, moderately fractured w/silty clay seams and ferrous stains, dip = 15° at 280° W - refusal in sandstone at 5 ft			



COMPLETION DEPTH: 5.0 ft
DATE: 1-8-14

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 1/8/2014

LTPNEW 13-214_TEST PITS.GPJ 5-11-16

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 7

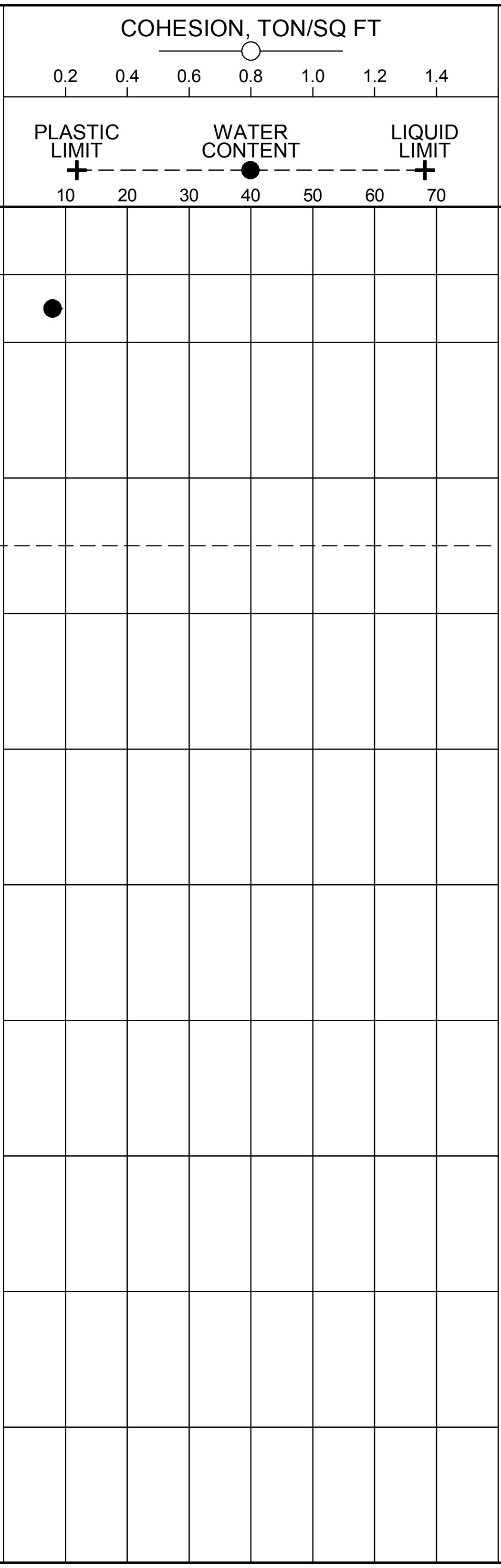
AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 527+90, 30 ft Rt

SURF. EL: 533.3

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
0 – 0.5			Stiff reddish tan and brown silty clay w/shale fragments and organics (fill)			
0.5 – 2.5			Moderately hard dark gray and tan weathered shale w/interbedded tan weathered fine-grained sandstone, moderately fractured with occasional silty clay laminations, dip = 20° at 290° NW			
2.5			- refusal in sandstone at 2.5 ft			



COMPLETION DEPTH: 2.5 ft
DATE: 1-8-14

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 1/8/2014

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

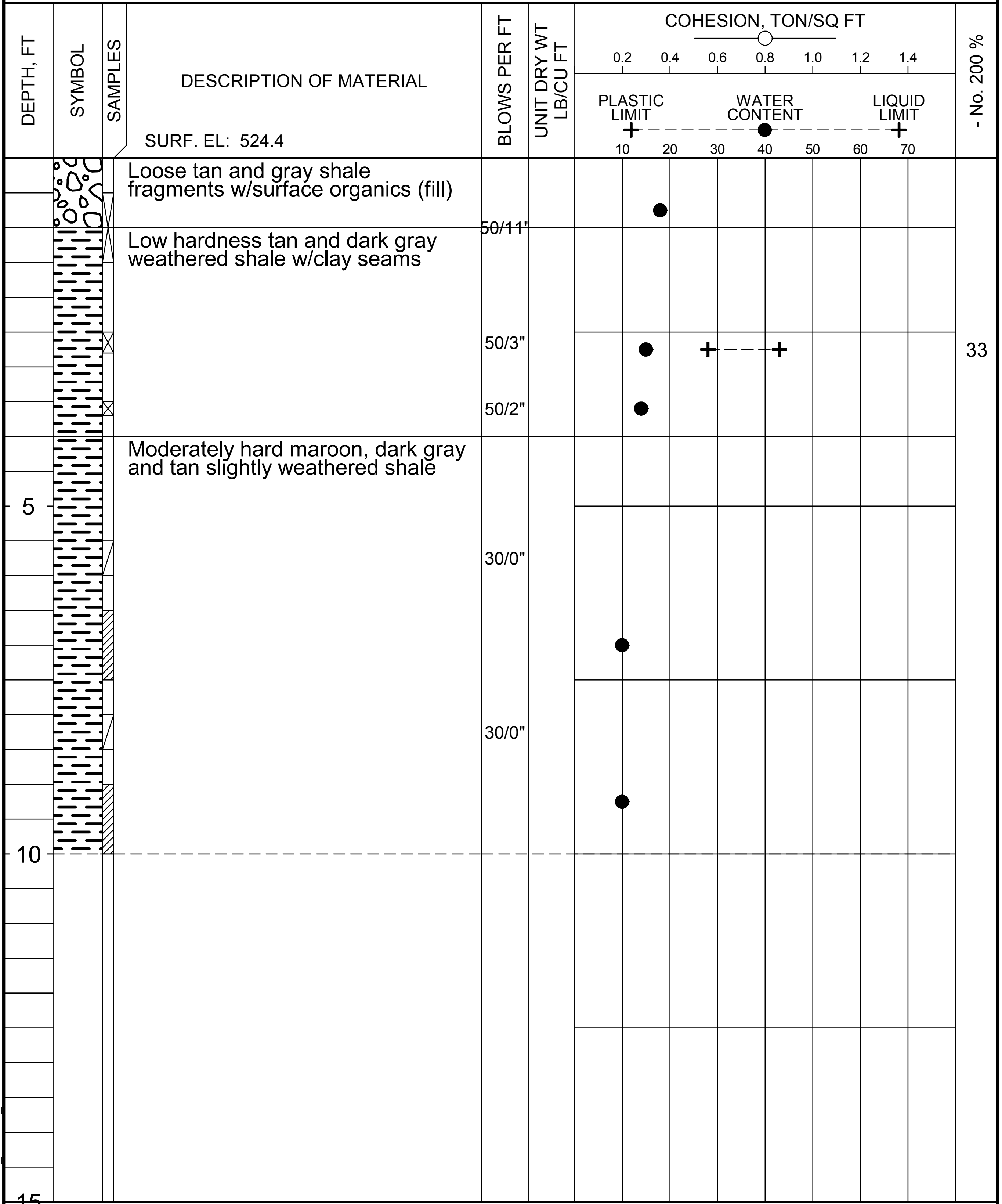
LOG OF BORING NO. 8

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Auger

LOCATION: Approx Sta 544+00, 43 ft Rt

SURF. EL: 524.4



DESCRIPTION OF MATERIAL	BLOWS PER FT	- No. 200 %
Loose tan and gray shale fragments w/surface organics (fill)	50/11"	
Low hardness tan and dark gray weathered shale w/clay seams	50/3"	33
	50/2"	
Moderately hard maroon, dark gray and tan slightly weathered shale	30/0"	
	30/0"	

COMPLETION DEPTH: 10.0 ft
DATE: 12-12-13

DEPTH TO WATER
IN BORING: Dry

DATE: 12/12/2013

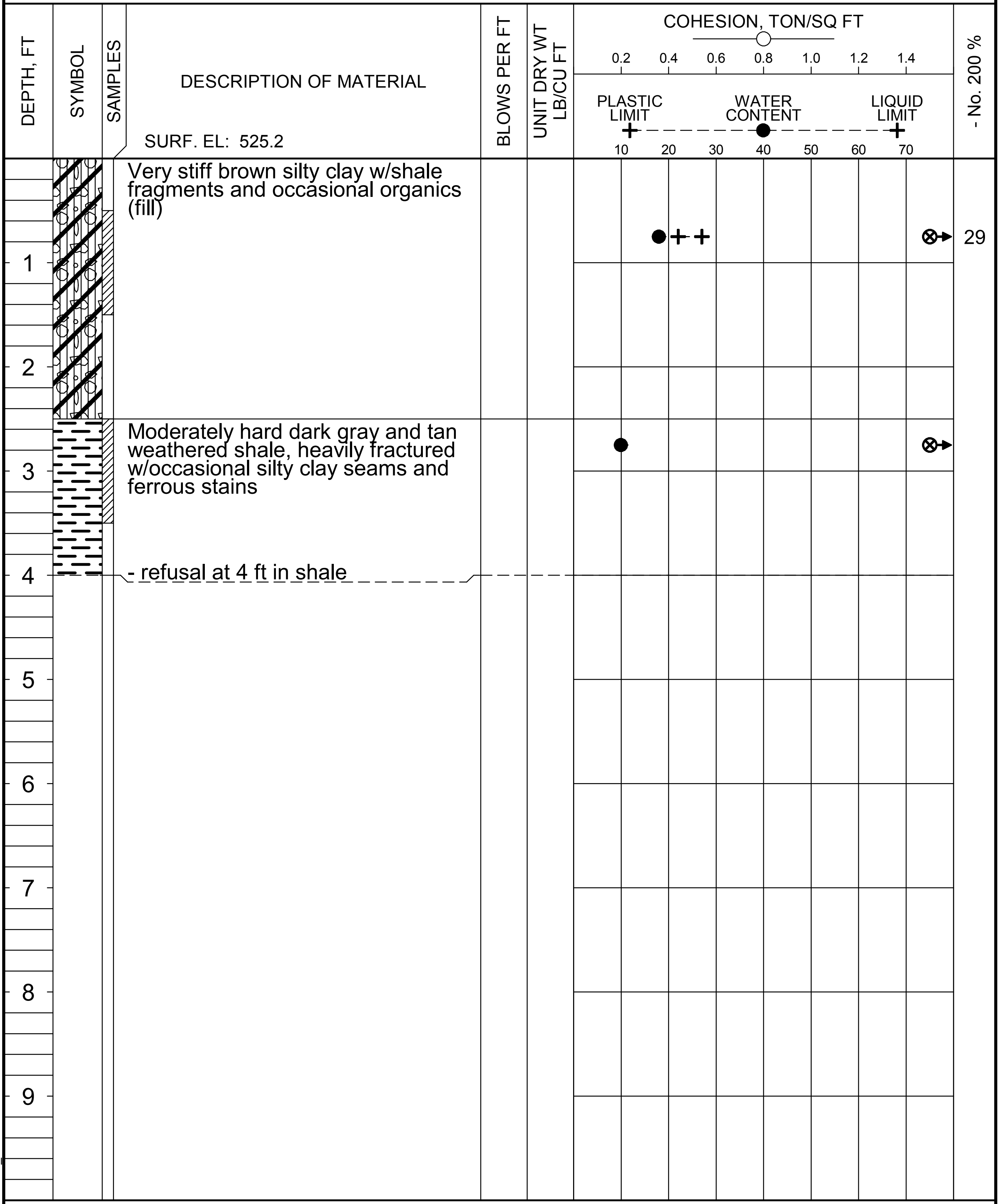
13-214

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 9

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Mini Excavator
LOCATION: Approx Sta 551+10, 42 ft Rt



Very stiff brown silty clay w/shale fragments and occasional organics (fill)

Moderately hard dark gray and tan weathered shale, heavily fractured w/occasional silty clay seams and ferrous stains

- refusal at 4 ft in shale

COMPLETION DEPTH: 4.0 ft
DATE: 1-2-14

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 1/2/2014

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13-214

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

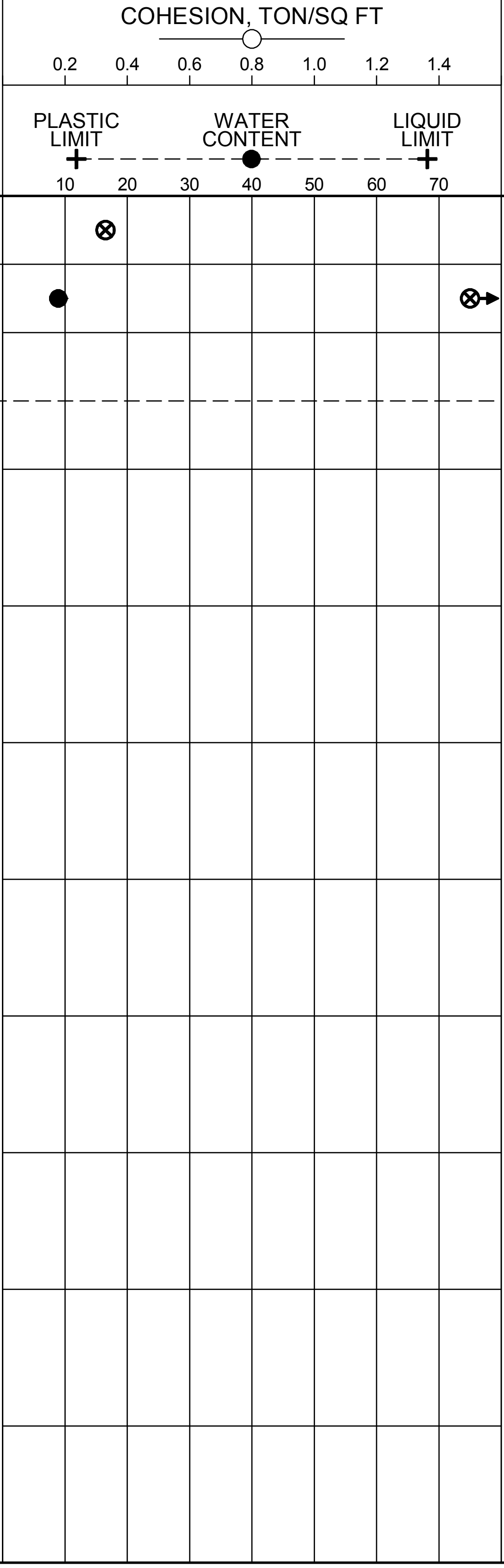
L O G O F T E S T P I T N O. 10

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 559+31, 47 ft Rt

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURF. EL.: 527.4	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT	- No. 200 %
			Firm brown silty clay w/sandstone and shale fragments (fill)				
1			Moderately hard tan and dark gray weathered shale w/sandstone seams and ferrous stains; dip = 30° at 260° W				
			- refusal at 1.5 ft in sandstone and shale				
2							
3							
4							
5							
6							
7							
8							
9							



COMPLETION DEPTH: 1.5 ft
DATE: 1-2-14

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 1/2/2014

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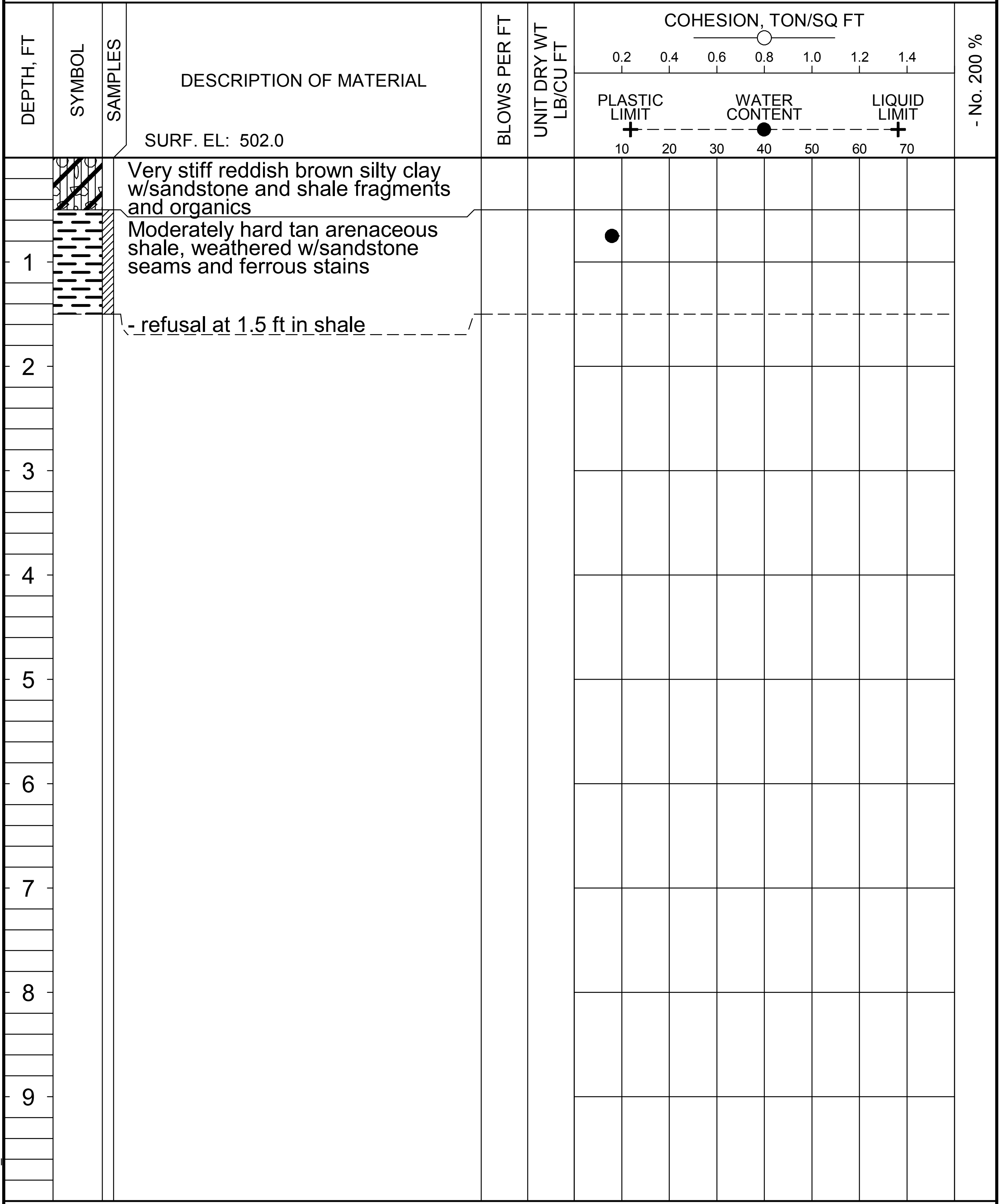
Consulting Engineers

L O G O F T E S T P I T N O. 11

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 566+61, 28 ft Lt



Very stiff reddish brown silty clay w/sandstone and shale fragments and organics

Moderately hard tan arenaceous shale, weathered w/sandstone seams and ferrous stains

- refusal at 1.5 ft in shale

COMPLETION DEPTH: 1.5 ft
DATE: 1-2-14

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 1/2/2014

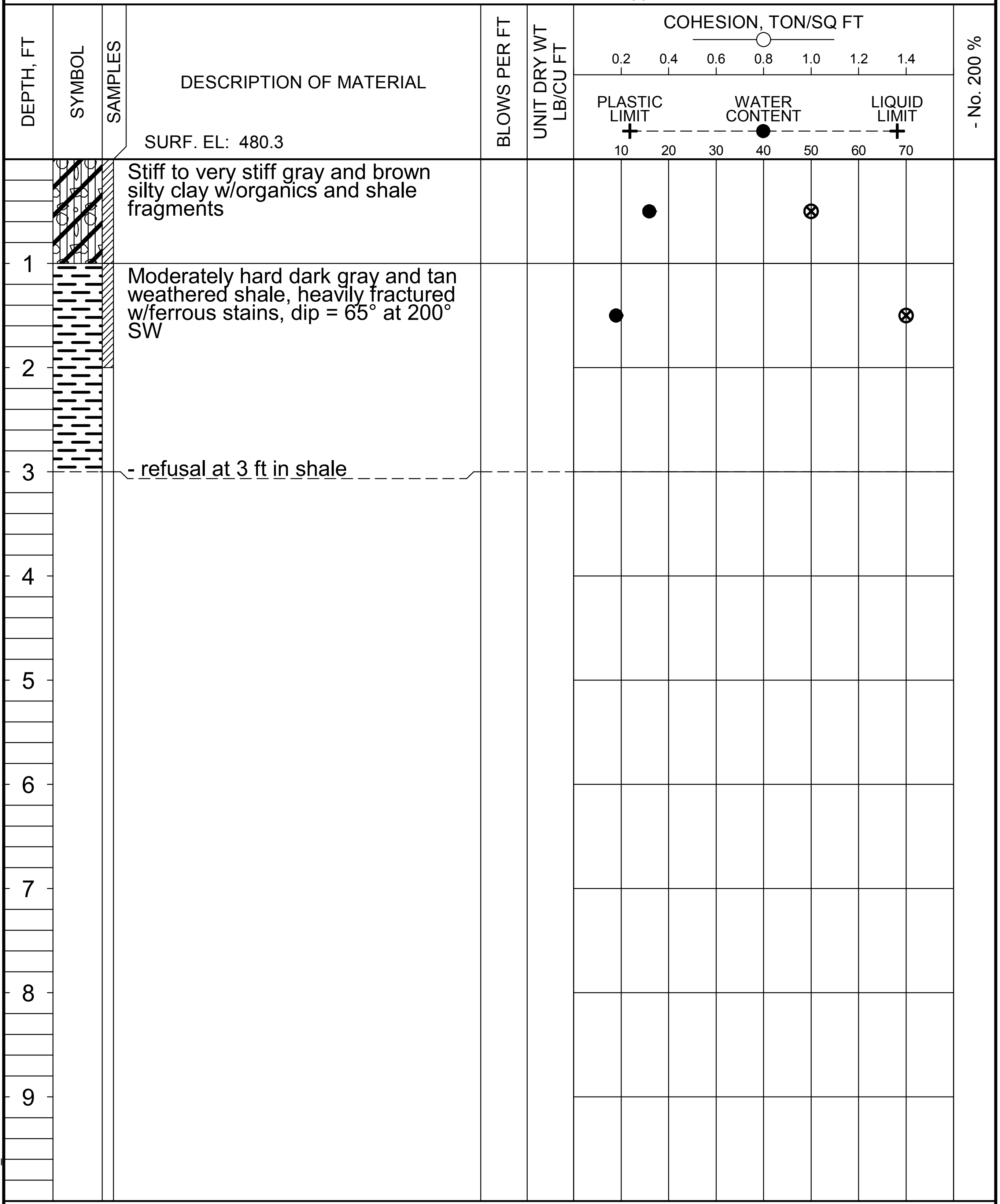
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 12

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 574+00, 29 ft Rt



Stiff to very stiff gray and brown silty clay w/organics and shale fragments

Moderately hard dark gray and tan weathered shale, heavily fractured w/ferrous stains, dip = 65° at 200° SW

- refusal at 3 ft in shale

COMPLETION DEPTH: 3.0 ft
DATE: 1-2-14

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 1/2/2014

13-214

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

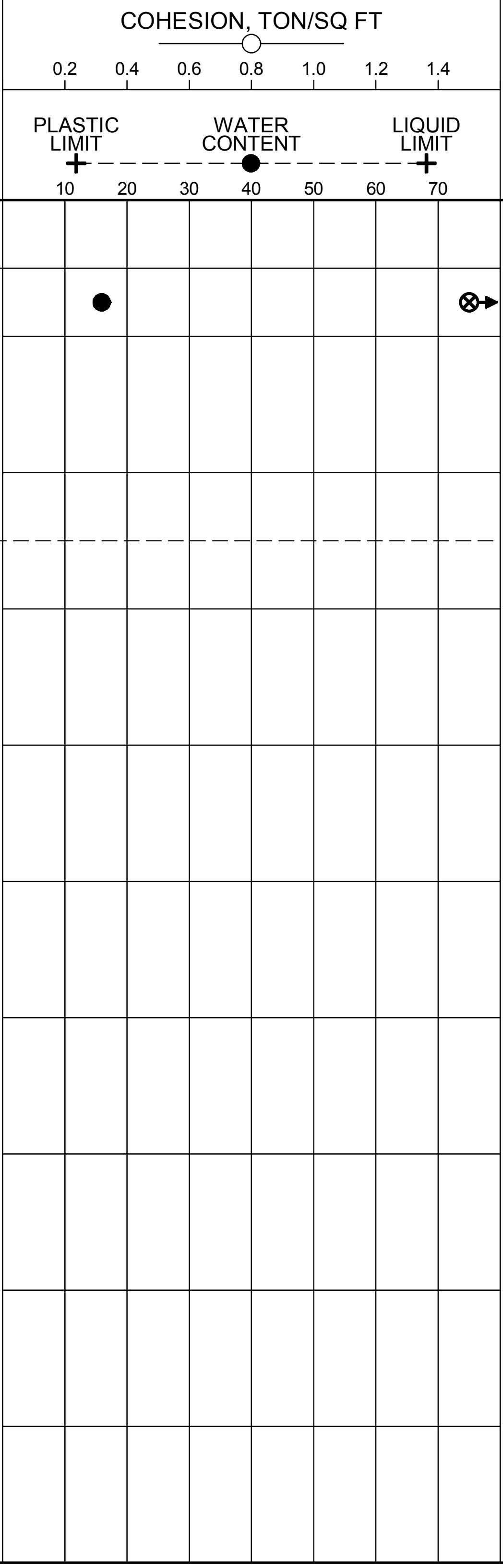
LOG OF TEST PIT NO. 13

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 581+23, 29 ft Rt

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURF. EL: 485.2	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
0 – 0.5			Soft dark brown clayey silt w/organics and shale fragments			
0.5 – 2.5			Moderately hard dark gray, reddish tan and tan weathered shale, moderately fractured w/occasional clay laminations and ferrous stains, dip = 60° at 190° S			
2.5			- refusal at 2.5 ft in shale			



COMPLETION DEPTH: 2.5 ft
DATE: 1-2-14

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 1/2/2014

LTPNEW 13-214_TEST PITS.GPJ 5-11-16

PLATE 13

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 14

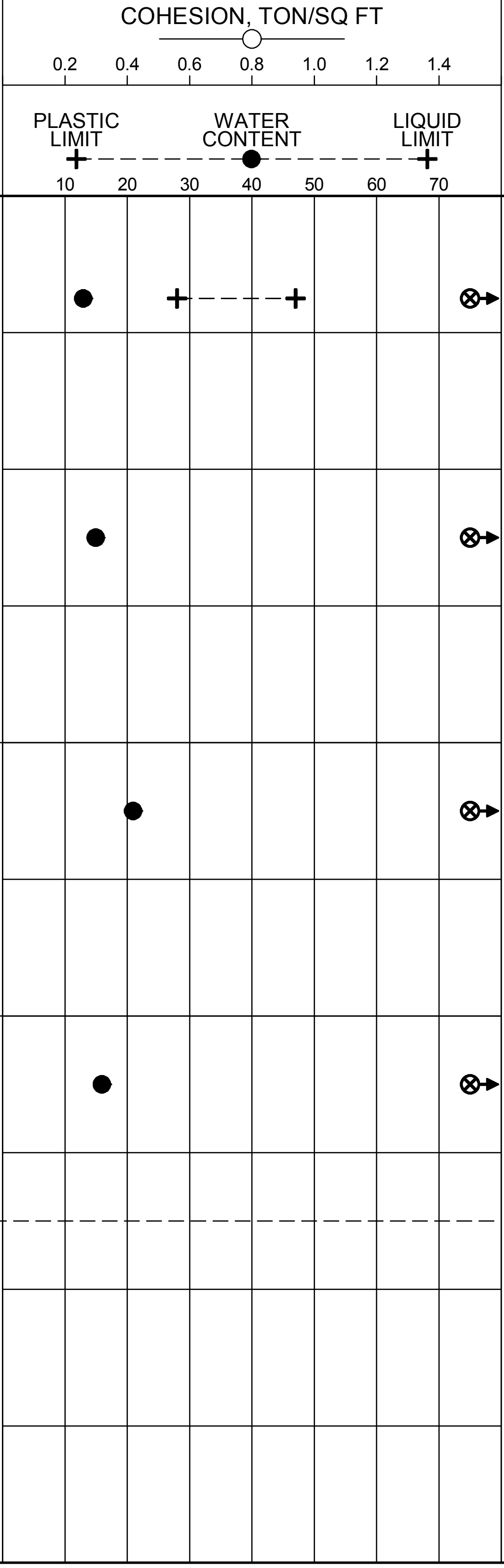
AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 592+76, 36 ft Rt

SURF. EL: 487.5

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
			Very stiff reddish brown clayey fine to coarse gravel w/sandstone fragments and quartz cobbles (fill)			18
4			Very stiff brown and gray silty clay w/shale fragments (fill)			
6			Very stiff gray and tan silty clay w/shale fragments and trace decayed organics (fill)			



COMPLETION DEPTH: 7.5 ft
DATE: 1-2-14

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 1/2/2014

Form 108-6(74) Job No. 13-214

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 15

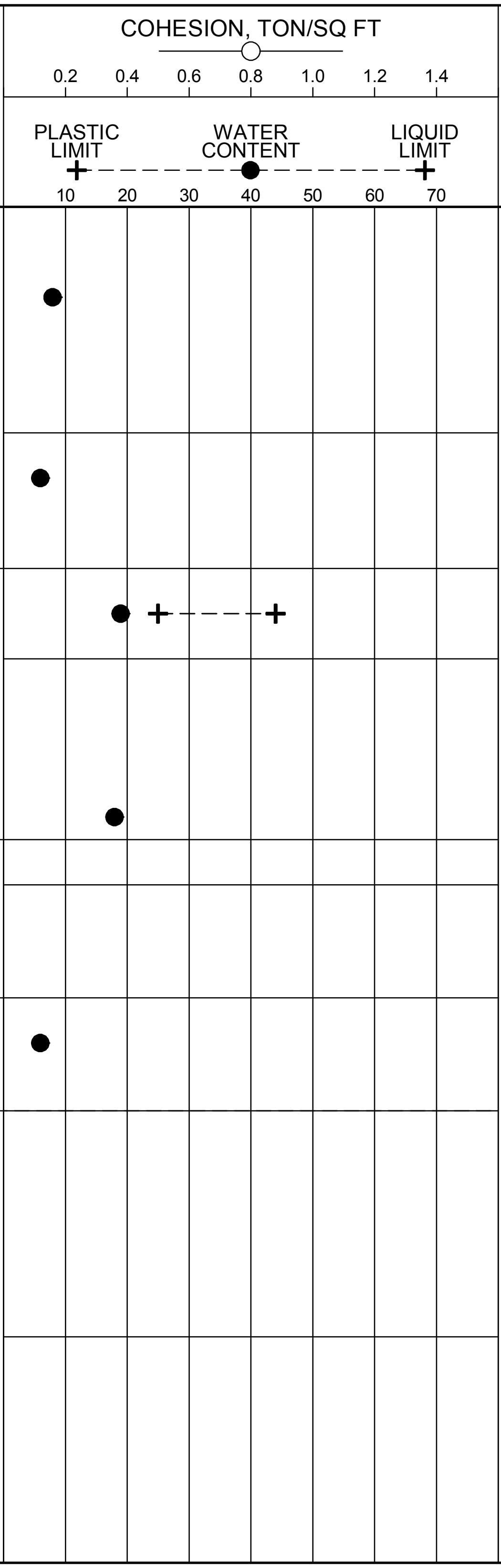
AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Auger

LOCATION: Approx Sta 599+07, 30 ft Rt

SURF. EL: 490.7

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
	Dense gray shale fragments w/some silty clay (fill)	32		13
	- medium dense below 2.5 ft	17		
5	Stiff gray, tan and reddish tan silty clay w/shale and sandstone fragments (fill)	14		41
	- tan below 5.5 ft			
	Stiff tan and gray silty clay w/shale and sandstone fragments (fill)	21		
	Moderately hard dark gray shale	50/2"		
10				
15				



COMPLETION DEPTH: 10.0 ft
DATE: 12-12-13

DEPTH TO WATER
IN BORING: Dry

DATE: 12/12/2013

LGBNEW 13-214_HWY 70_BORINGS.GPJ 5-11-16

13-214

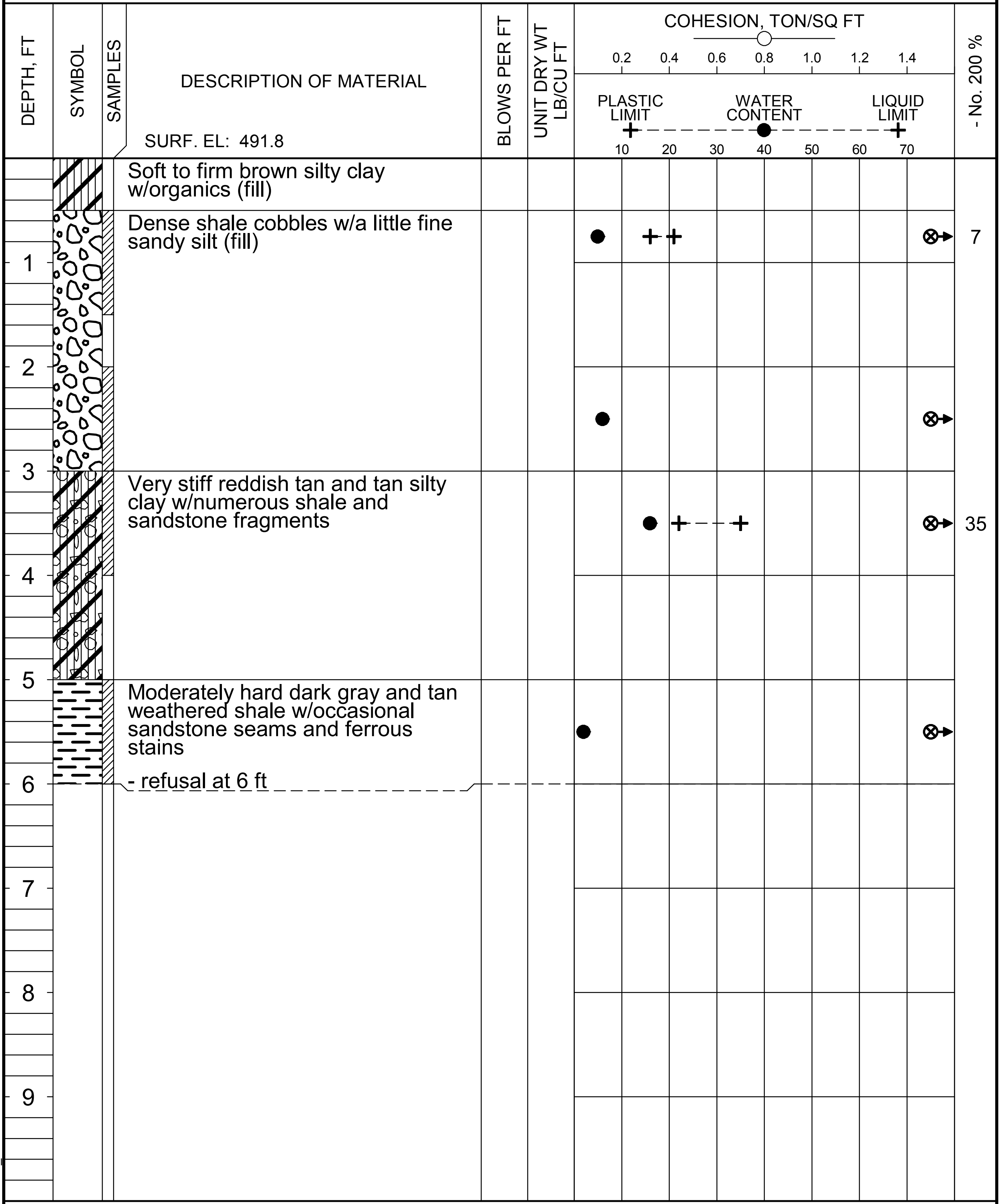
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 16

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 606+35, 37 ft Rt



DESCRIPTION OF MATERIAL	- No. 200 %
SURF. EL: 491.8	
Soft to firm brown silty clay w/organics (fill)	
Dense shale cobbles w/a little fine sandy silt (fill)	7
Very stiff reddish tan and tan silty clay w/numerous shale and sandstone fragments	35
Moderately hard dark gray and tan weathered shale w/occasional sandstone seams and ferrous stains	
- refusal at 6 ft	

COMPLETION DEPTH: 6.0 ft
DATE: 1-2-14

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 1/2/2014

LTPNEW 13-214_TEST PITS.GPJ 5-11-16

Grubbs, Hoskyn, Barton & Wyatt, Inc.
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LOG OF BORING NO. 17

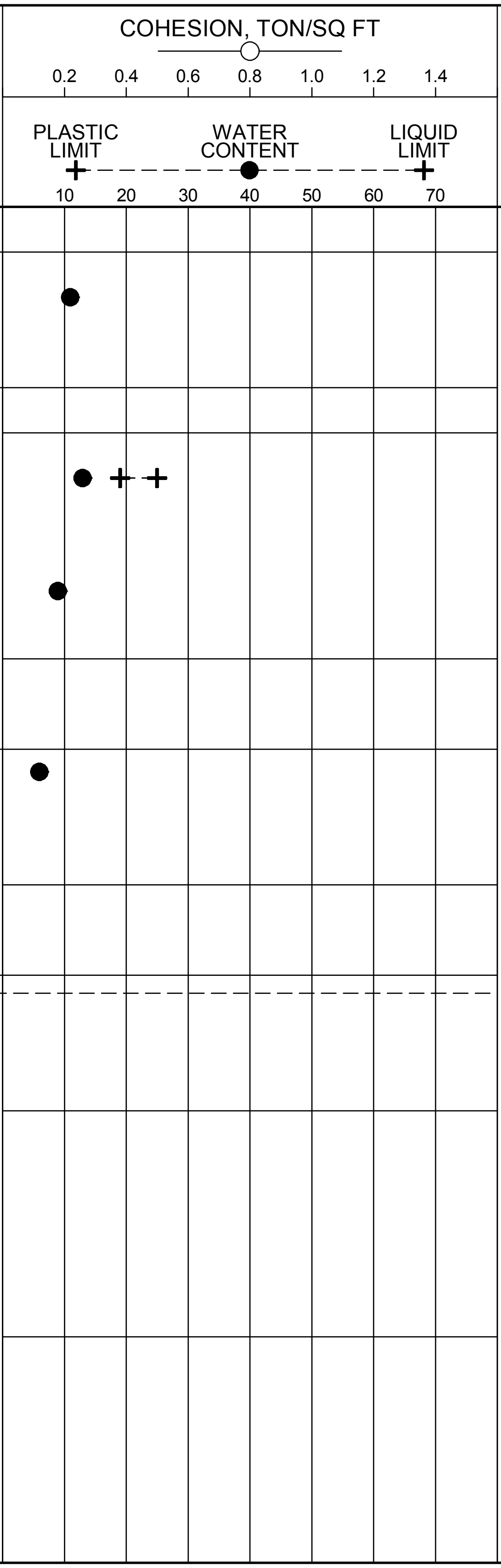
AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Auger

LOCATION: Approx Sta 613+76, 17 ft Lt

SURF. EL: 497.7

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
	Loose brown silt w/organics (fill)			
	Medium dense dark gray shale fragments (fill)	18		
	Stiff tan silty clay w/fine sand and some fine to coarse gravel and shale fragments (fill)	15		35
5	- firm to stiff, brown, predominately gravel and shale fragments below 4 ft	10		
	Dense crushed shale fragments w/silty clay (fill)	50/5" 30/0"		
	Moderately hard tan fine-grained sandstone - auger refusal at 8.7 ft			
10				
15				



COMPLETION DEPTH: 8.7 ft
DATE: 12-12-13

DEPTH TO WATER
IN BORING: Dry

DATE: 12/12/2013

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 18

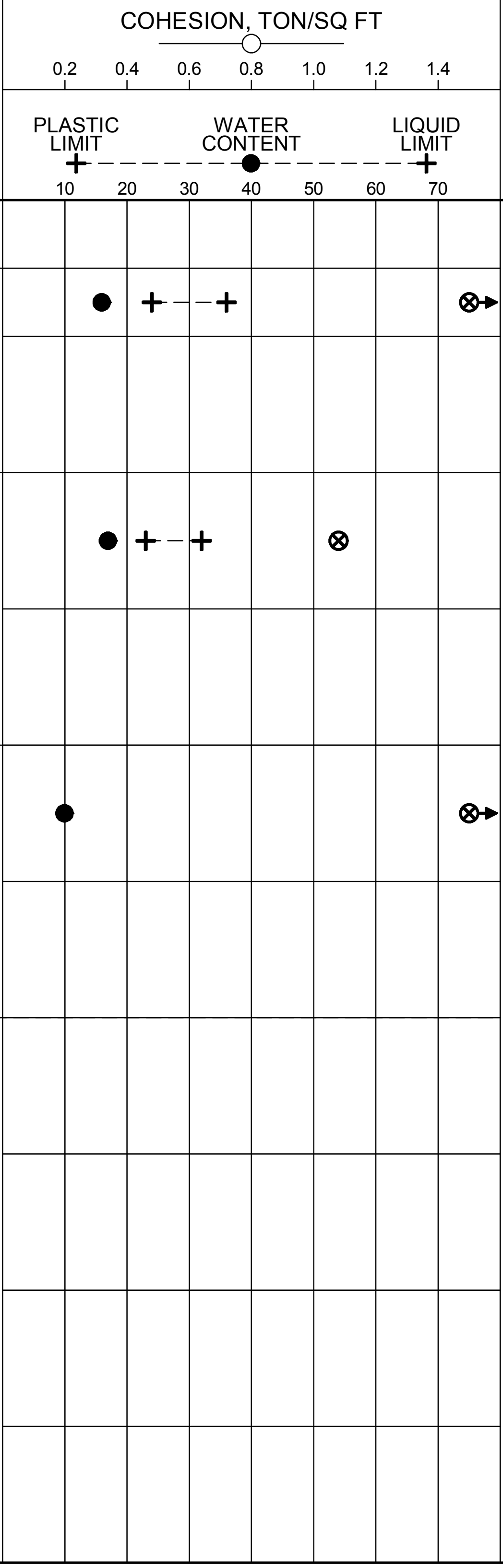
AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 621+46, 30 ft Rt

SURF. EL: 511.0

DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
Soft to firm dark brown clayey silt w/organics (fill)			
Very stiff brown and tan silty clay w/shale fragments (fill)			32
Very stiff reddish brown silty clay w/sandstone and shale fragments			33
Very stiff tan silty clay w/numerous shale fragments			



COMPLETION DEPTH: 6.0 ft
DATE: 1-2-14

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 1/2/2014

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Consulting Engineers

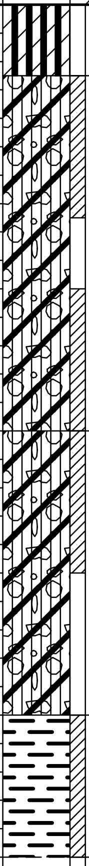
LOG OF TEST PIT NO. 19

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

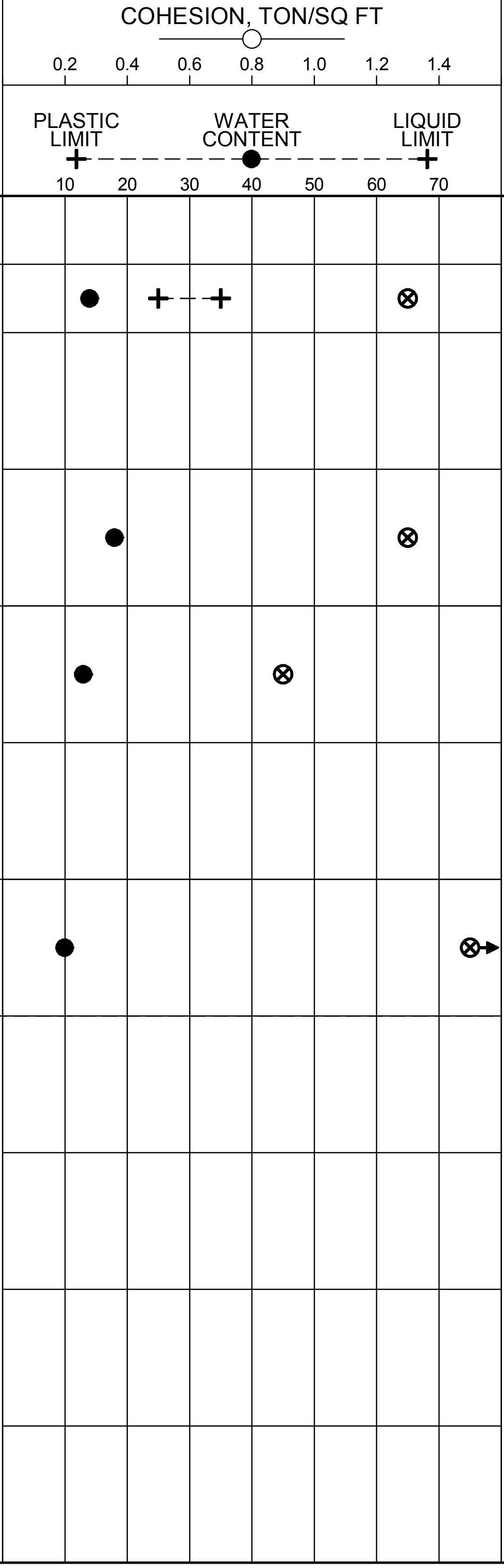
TYPE: Mini Excavator

LOCATION: Approx Sta 629+13, 22 ft Lt

SURF. EL: 522.0



DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
Soft to firm dark brown clayey silt w/organics (fill)			
Very stiff reddish brown and tan silty clay w/shale and sandstone fragments and some cobbles (fill)			15
Stiff reddish brown silty clay w/sandstone fragments and cobbles			
Moderately hard dark gray and tan weathered shale w/interbedded sandstone layers and ferrous stains, apparent dip ~ 40° W			
- refusal in sandstone and shale at 6 ft			



DEPTH, FT: 1 2 3 4 5 6 7 8 9

COMPLETION DEPTH: 6.0 ft
DATE: 1-2-14

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 1/2/2014

13-214

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 20

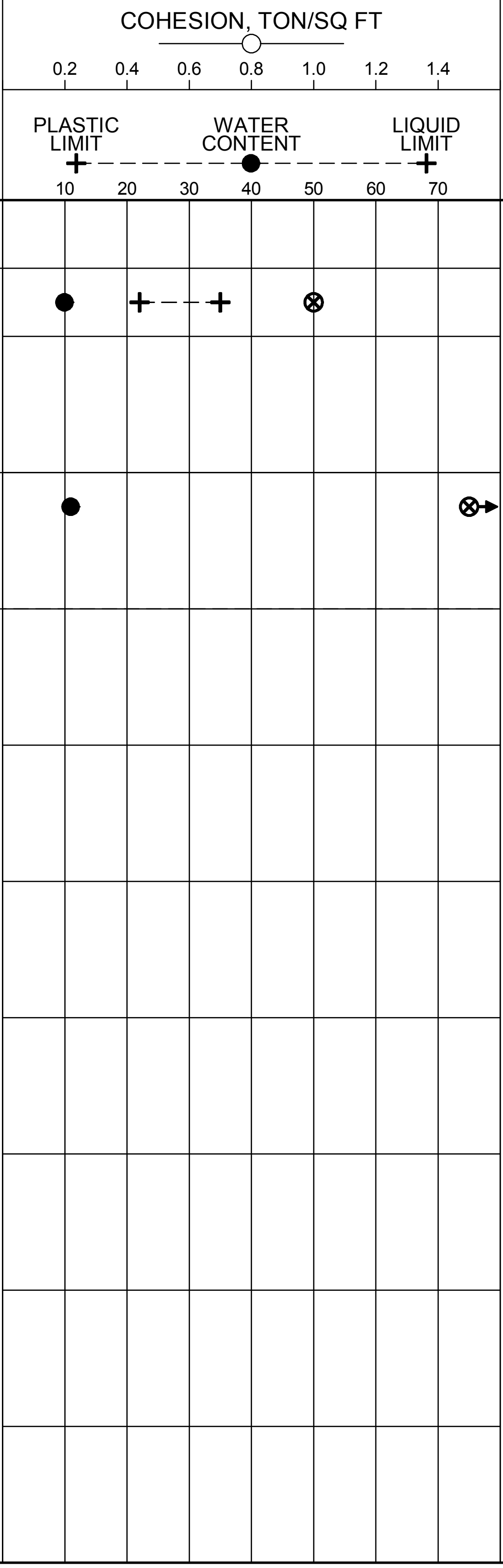
AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 646+33, 12 ft Rt

SURF. EL: 538.8

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
0	Soft to firm dark brown clayey silt w/organics			
0.5	Stiff to very stiff reddish brown silty clay and sandstone and shale fragments			13
2	Moderately hard tan and dark gray weathered shale, moderately fractured w/silty clay laminations and ferrous stains, dip + 80° at 190° S			
3	- refusal in shale at 3 ft			



COMPLETION DEPTH: 3.0 ft
DATE: 1-2-14

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 1/2/2014

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Grubbs, Hoskyn, Barton & Wyatt, Inc.
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LOG OF TEST PIT NO. 21

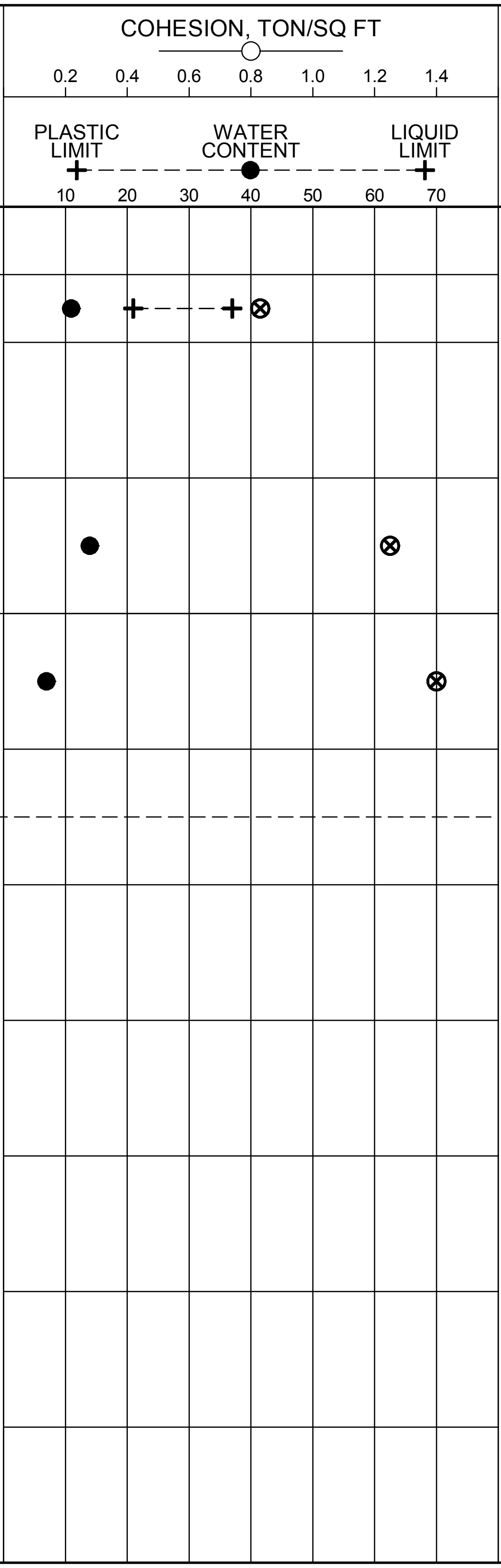
AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 654+49, 31 ft Rt

SURF. EL: 546.6

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
0	Firm dark brown clayey silt w/organics			
	Stiff reddish brown silty clay and sandstone and shale fragments			15
2	- very stiff with more shale fragments below 2 ft			
3	Moderately hard tan and dark gray weathered shale, moderately fractured w/occasional silty clay laminations and ferrous stains, dip = 60° at 240° SW			
4.5	- refusal at 4.5 ft in shale			



COMPLETION DEPTH: 4.5 ft
DATE: 1-2-14

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 1/2/2014

LTPNEW 13-214_TEST PITS.GPJ 5-11-16

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

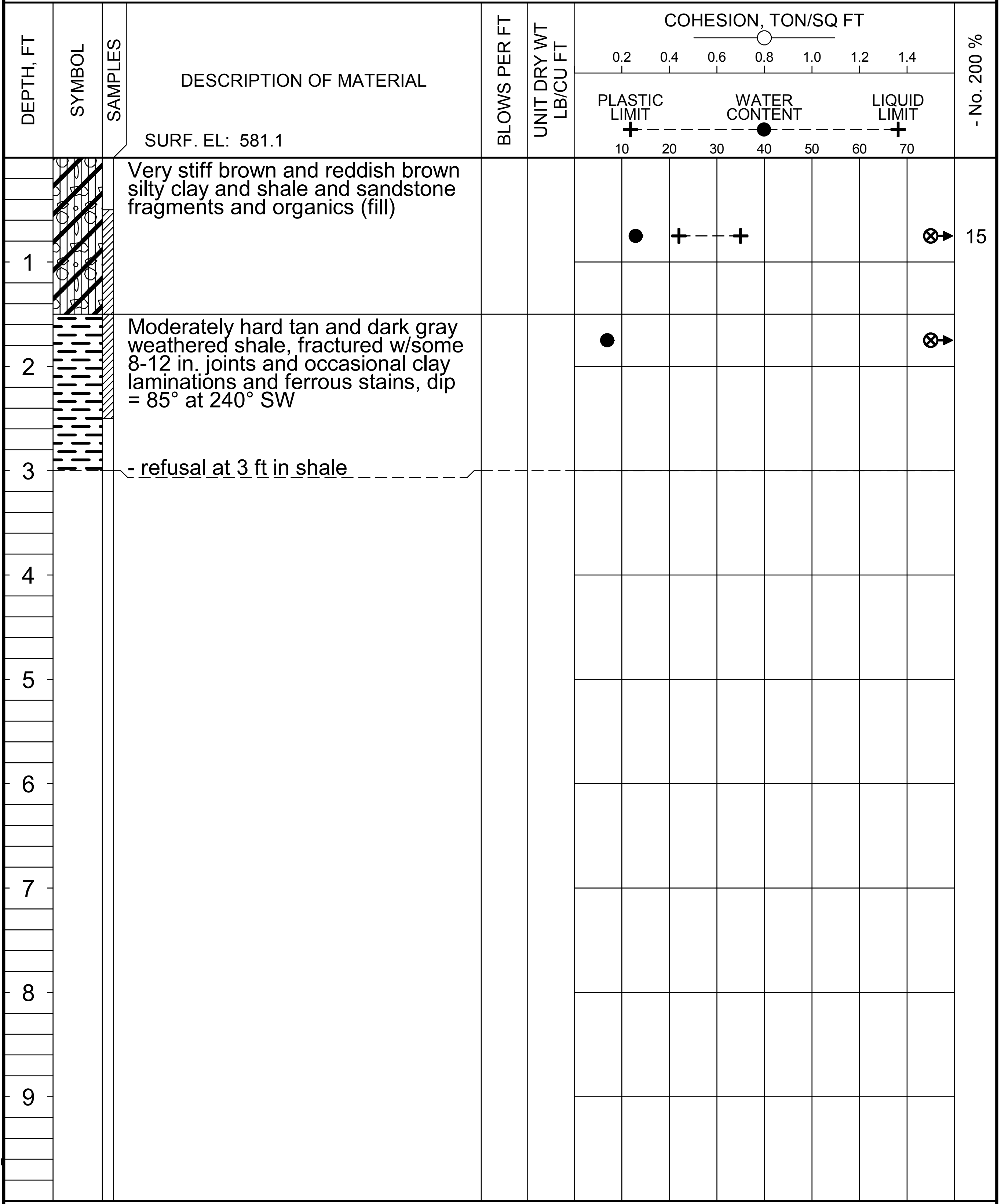
LOG OF TEST PIT NO. 22

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 669+73, 34 ft Rt

SURF. EL: 581.1



Very stiff brown and reddish brown silty clay and shale and sandstone fragments and organics (fill)

Moderately hard tan and dark gray weathered shale, fractured w/some 8-12 in. joints and occasional clay laminations and ferrous stains, dip = 85° at 240° SW

- refusal at 3 ft in shale

COMPLETION DEPTH: 3.0 ft
DATE: 1-2-14

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 1/2/2014

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

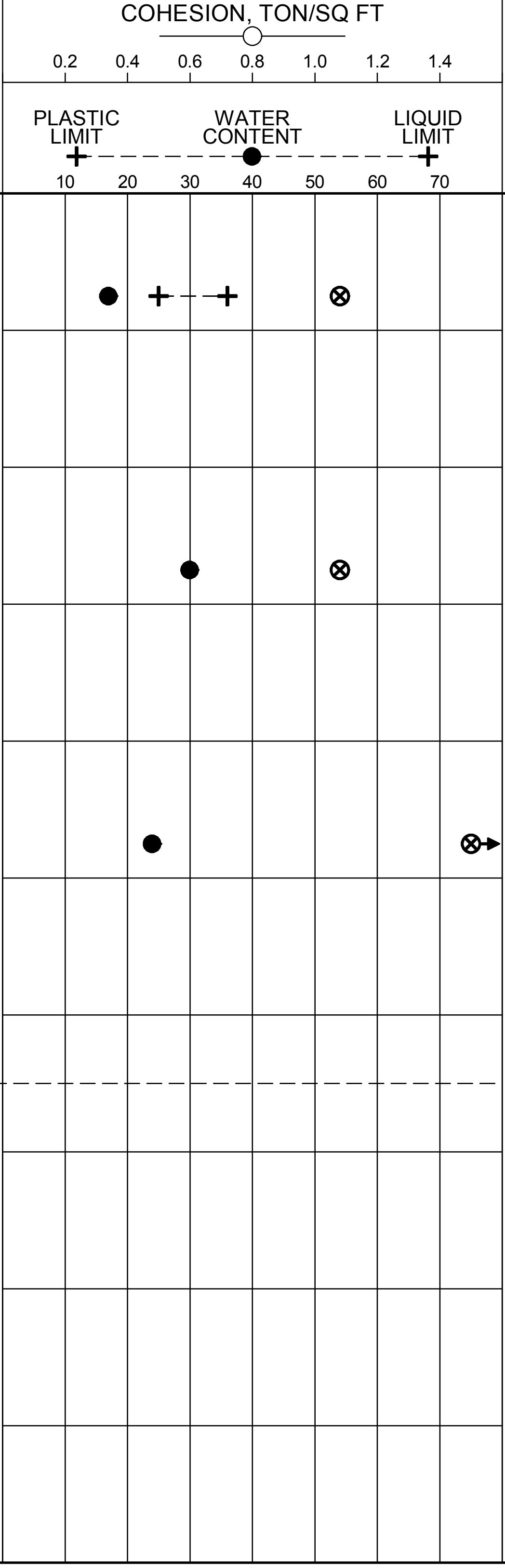
LOG OF TEST PIT NO. 23

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 677+14, 28 ft Rt

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURF. EL: 592.1	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
0 – 6.5			Very stiff dark brown and tan silty clay and shale and sandstone fragments (fill)			22



COMPLETION DEPTH: 6.5 ft
DATE: 1-2-14

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 1/2/2014

13-214

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

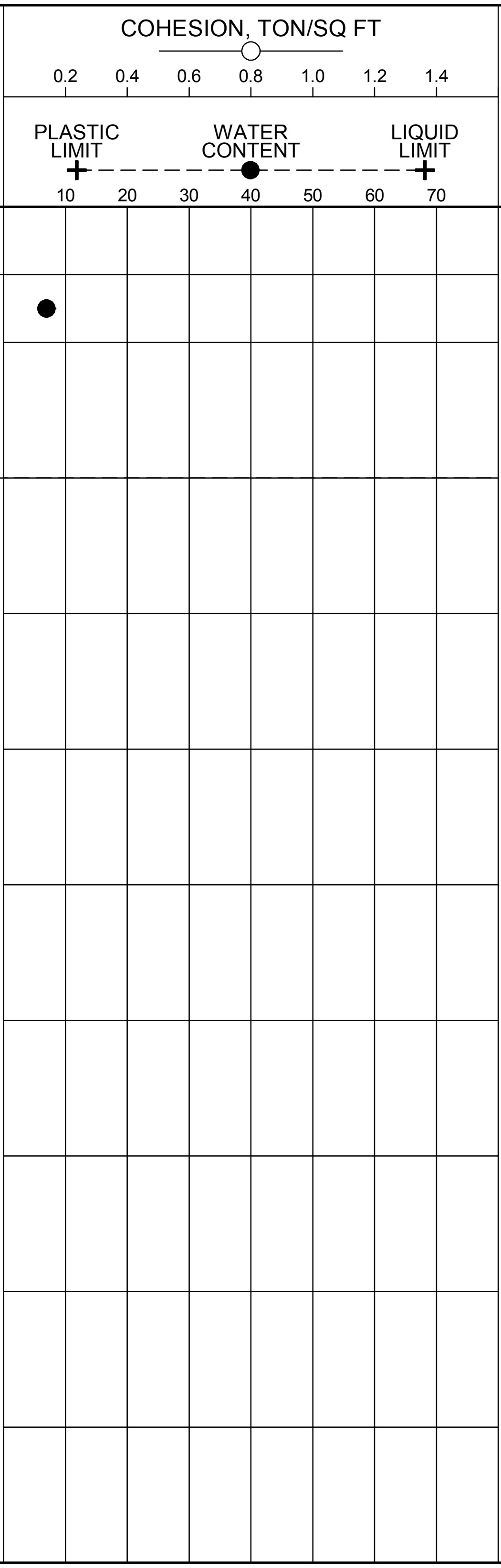
LOG OF TEST PIT NO. 24

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 684+87, 29 ft Rt

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURF. EL: 608.2	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
0			Very stiff reddish brown silty clay w/organics and shale fragments			
1			Moderately hard reddish tan, tan and dark gray weathered shale, fractured w/some 8-12 in. joints, clay laminations and ferrous stains, dip = 80° at 260° W			
2			- refusal in shale at 2 ft			



COMPLETION DEPTH: 2.0 ft
DATE: 1-2-14

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 1/2/2014

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Grubbs, Hoskyn, Barton & Wyatt, Inc.
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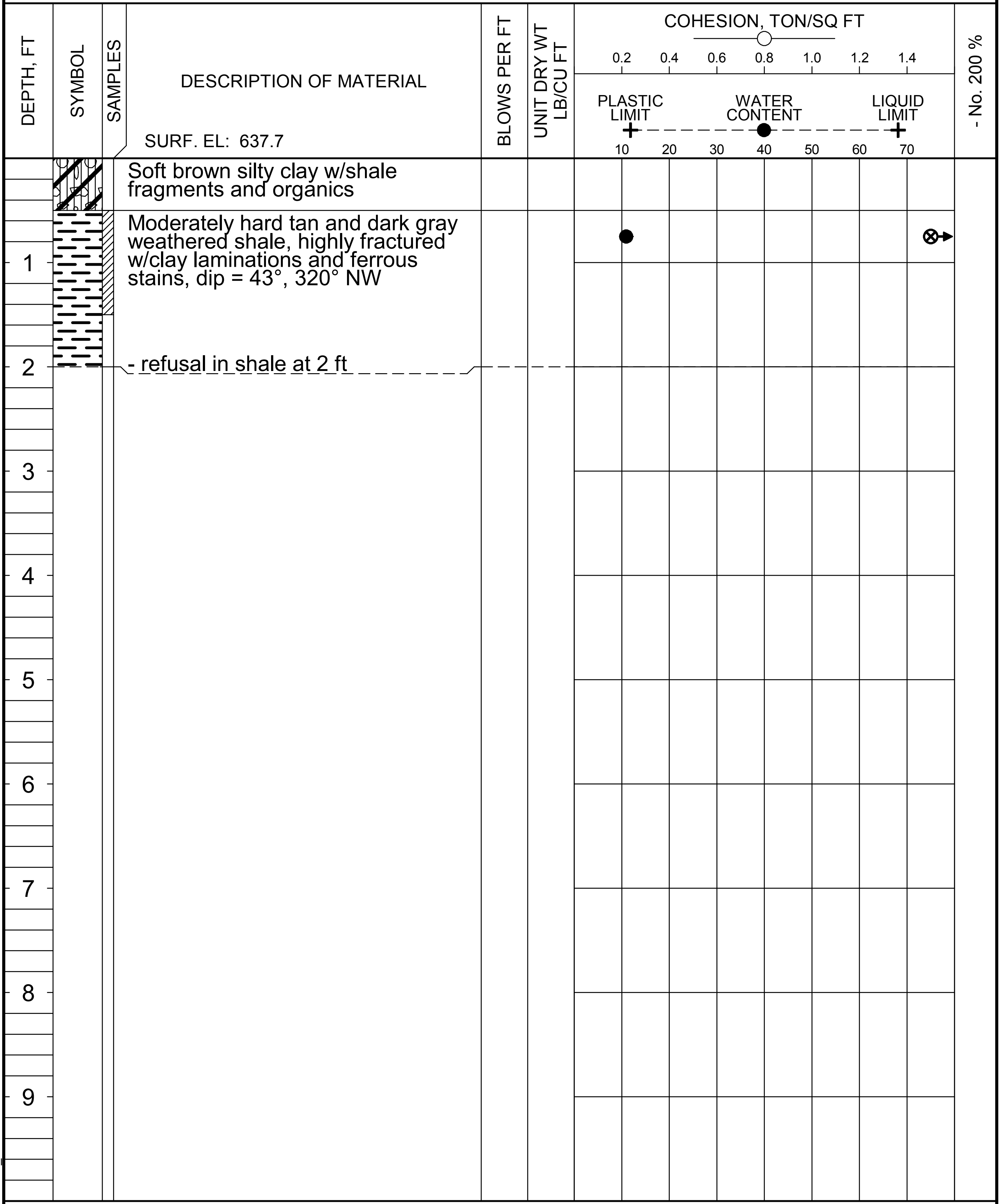
LOG OF TEST PIT NO. 25

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 611+16, 28 ft Rt



Soft brown silty clay w/shale fragments and organics

Moderately hard tan and dark gray weathered shale, highly fractured w/clay laminations and ferrous stains, dip = 43°, 320° NW

- refusal in shale at 2 ft

COMPLETION DEPTH: 2.0 ft
DATE: 1-3-14

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 1/3/2014

LTPNEW 13-214_TEST PITS.GPJ 5-11-16

13-214

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 26

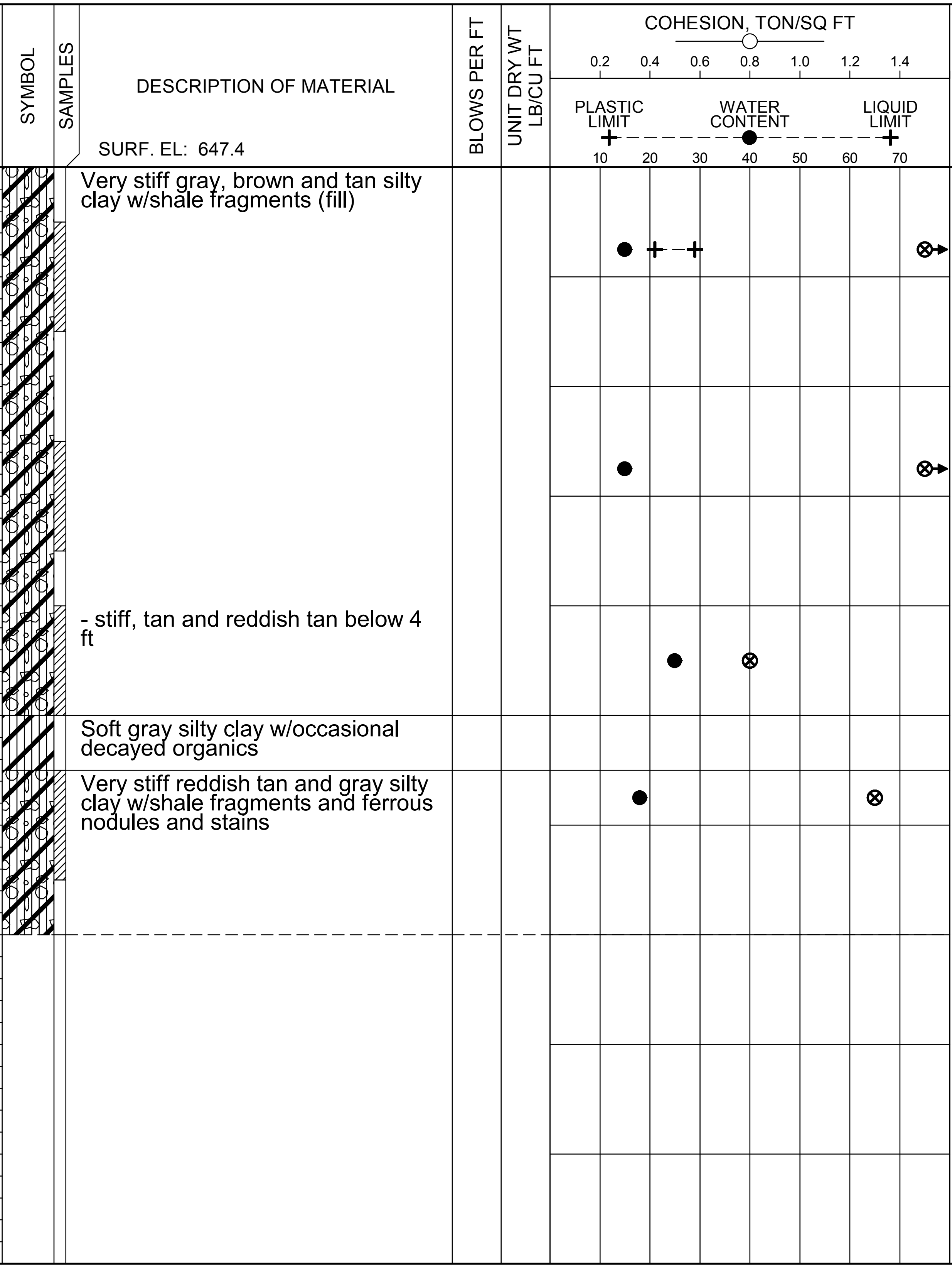
AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 708+73, 38 ft Rt

SURF. EL: 647.4

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
0	Very stiff gray, brown and tan silty clay w/shale fragments (fill)			24
4	- stiff, tan and reddish tan below 4 ft			
5	Soft gray silty clay w/occasional decayed organics			
5.5	Very stiff reddish tan and gray silty clay w/shale fragments and ferrous nodules and stains			
7				



COMPLETION DEPTH: 7.0 ft
DATE: 1-3-14

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 1/3/2014

13-214

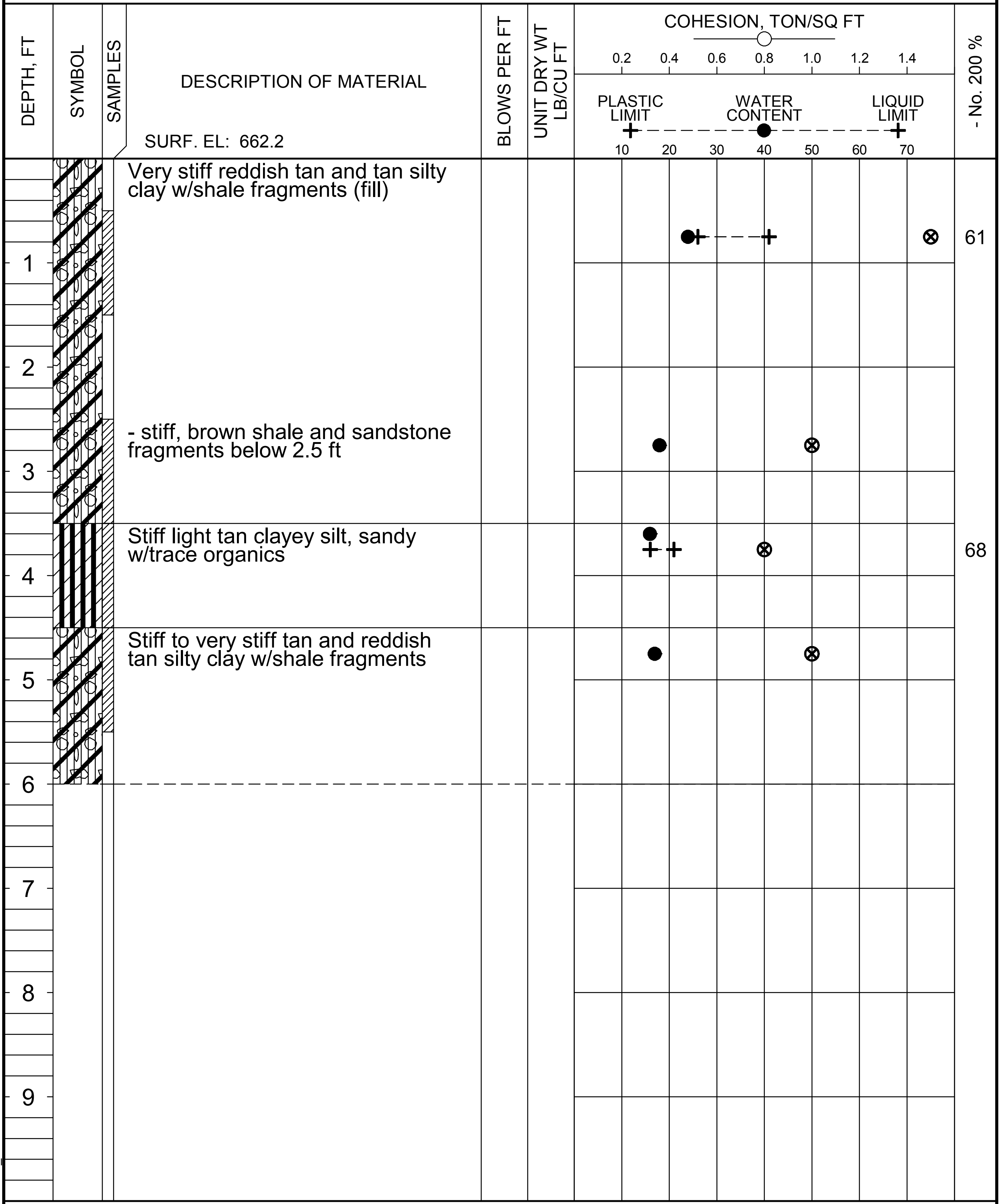
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 27

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 716+61, 43 ft Rt



Very stiff reddish tan and tan silty clay w/shale fragments (fill)

- stiff, brown shale and sandstone fragments below 2.5 ft

Stiff light tan clayey silt, sandy w/trace organics

Stiff to very stiff tan and reddish tan silty clay w/shale fragments

COMPLETION DEPTH: 6.0 ft
DATE: 1-3-14

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 1/3/2014

LTPNEW 13-214_TEST PITS.GPJ 5-11-16

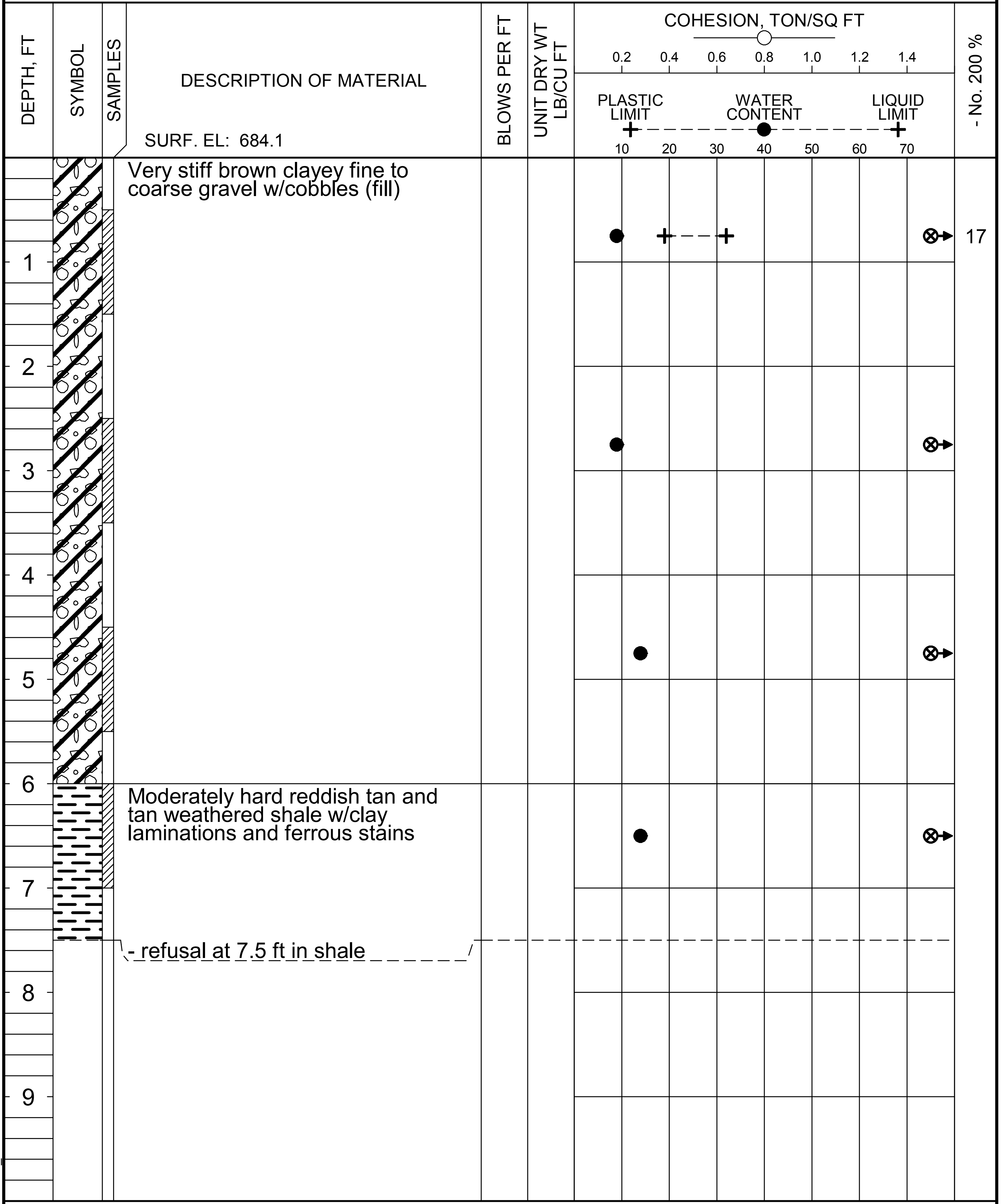
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 28

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 723+70, 42 ft Rt



Very stiff brown clayey fine to coarse gravel w/cobbles (fill)

Moderately hard reddish tan and tan weathered shale w/clay laminations and ferrous stains

- refusal at 7.5 ft in shale

COMPLETION DEPTH: 7.5 ft
DATE: 1-3-14

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 1/3/2014

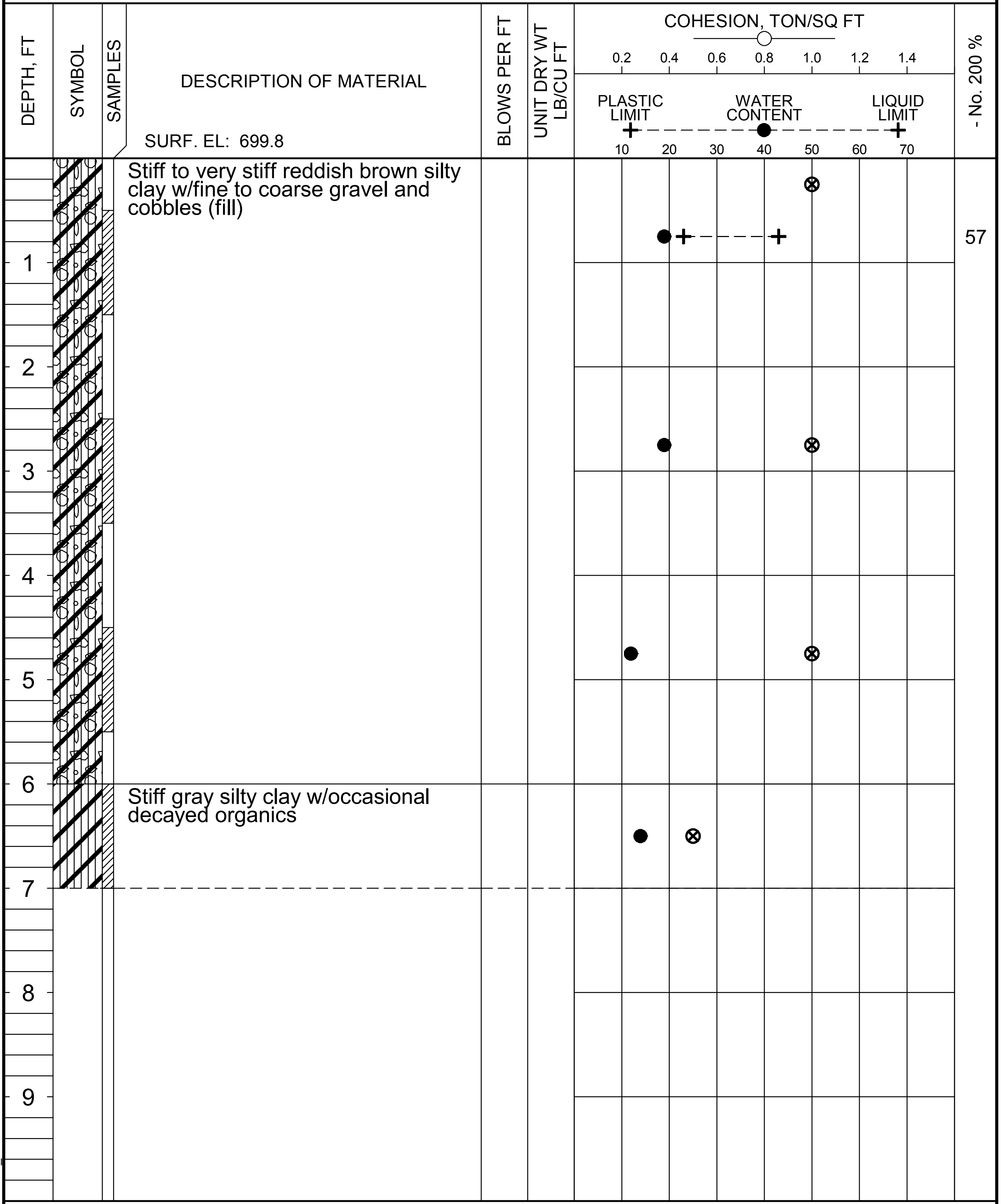
13-214

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 29

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Mini Excavator
LOCATION: Approx Sta 731+36, 38 ft Rt



Stiff to very stiff reddish brown silty clay w/fine to coarse gravel and cobbles (fill)

Stiff gray silty clay w/occasional decayed organics

COMPLETION DEPTH: 7.0 ft
DATE: 1-3-14

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 1/3/2014

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

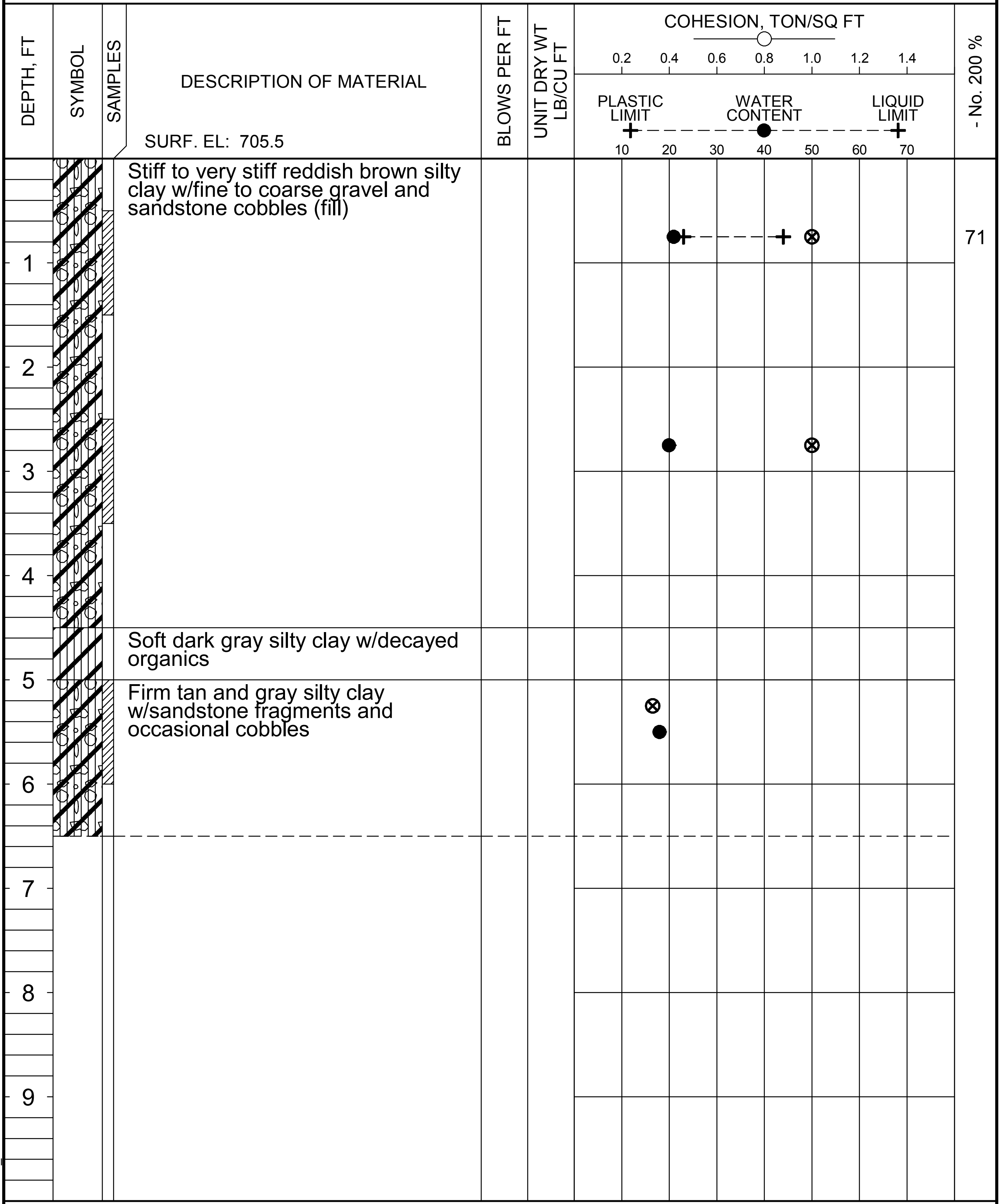
LOG OF TEST PIT NO. 30

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 738+90, 37 ft Rt

SURF. EL: 705.5



Stiff to very stiff reddish brown silty clay w/fine to coarse gravel and sandstone cobbles (fill)

Soft dark gray silty clay w/decayed organics

Firm tan and gray silty clay w/sandstone fragments and occasional cobbles

COMPLETION DEPTH: 6.5 ft
DATE: 1-3-14

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 1/3/2014

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

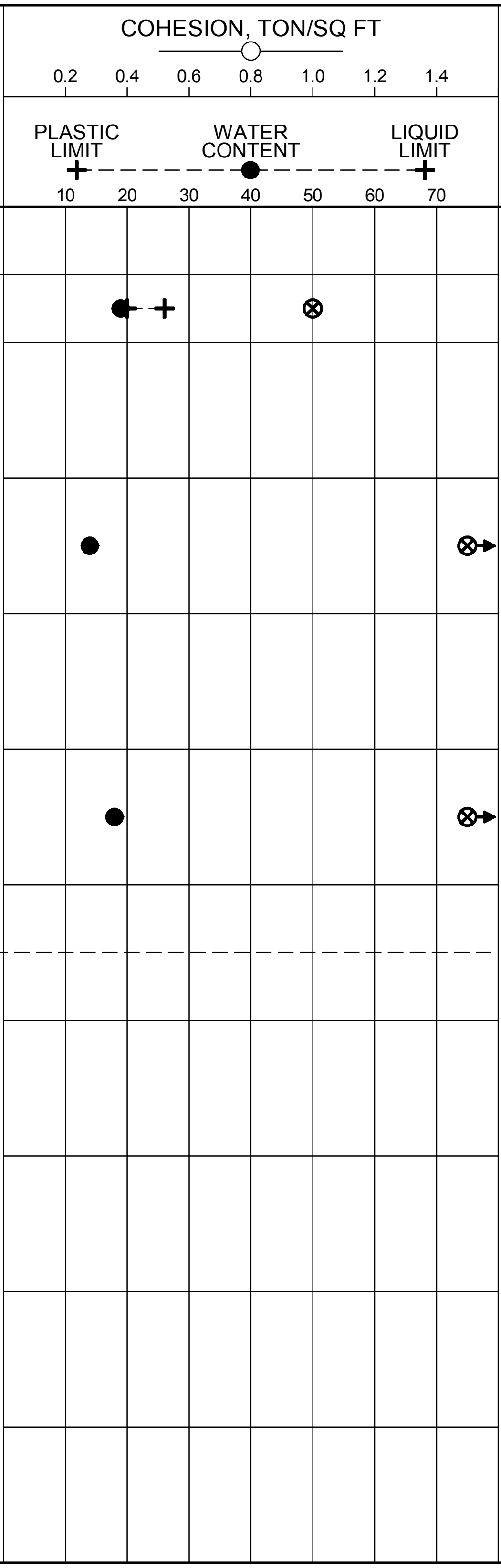
LOG OF TEST PIT NO. 31

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Mini Excavator
LOCATION: Approx Sta 746+53, 23 ft Rt

SURF. EL: 706.5

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
0 - 0.5	Soft reddish tan silty clay w/sandstone fragments and organics			
0.5 - 5.5	Stiff to very stiff reddish tan and gray silty clay w/occasional sandstone fragments and some cobbles and ferrous stains			59
	- very stiff below 2 ft			



COMPLETION DEPTH: 5.5 ft
DATE: 1-3-14

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 1/3/2014

LTPNEW 13-214_TEST PITS.GPJ 5-11-16

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

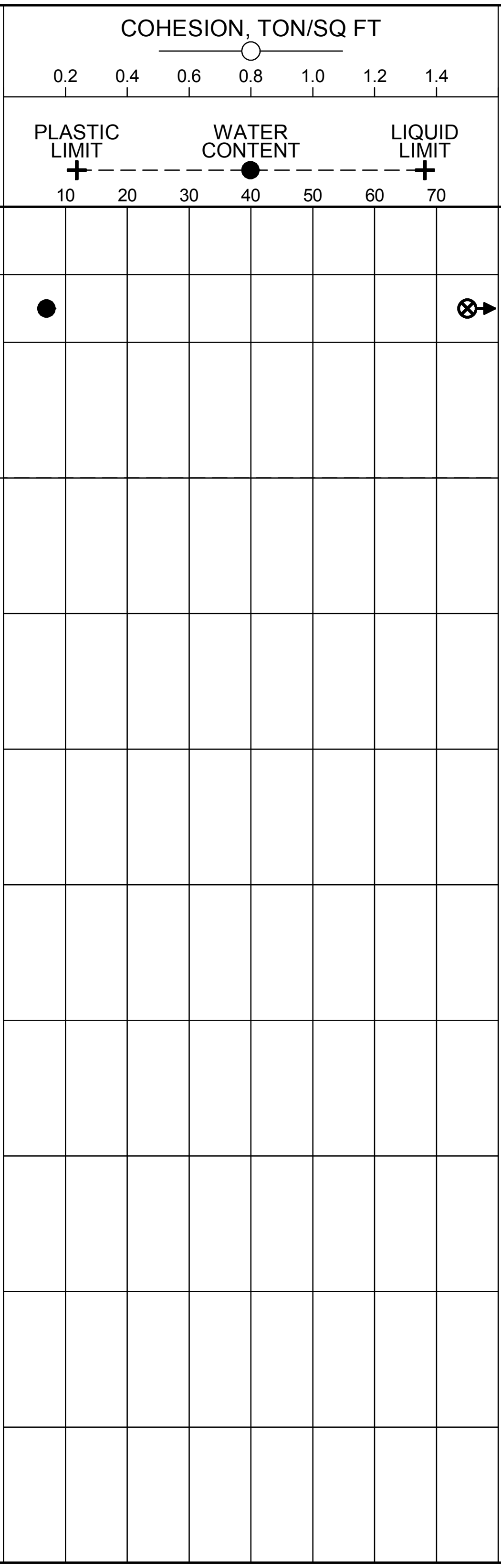
LOG OF TEST PIT NO. 32

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 758+68, 23 ft Rt

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURF. EL: 690.4	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
			Stiff brown silty clay w/crushed stone and shale fragments (fill)			
1			Moderately hard tan, gray and dark gray weathered shale w/clay laminations and ferrous stains, dip = 50° at 264° W			
2			- refusal in shale at 2 ft			
3						
4						
5						
6						
7						
8						
9						



COMPLETION DEPTH: 2.0 ft
DATE: 1-3-14

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 1/3/2014

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

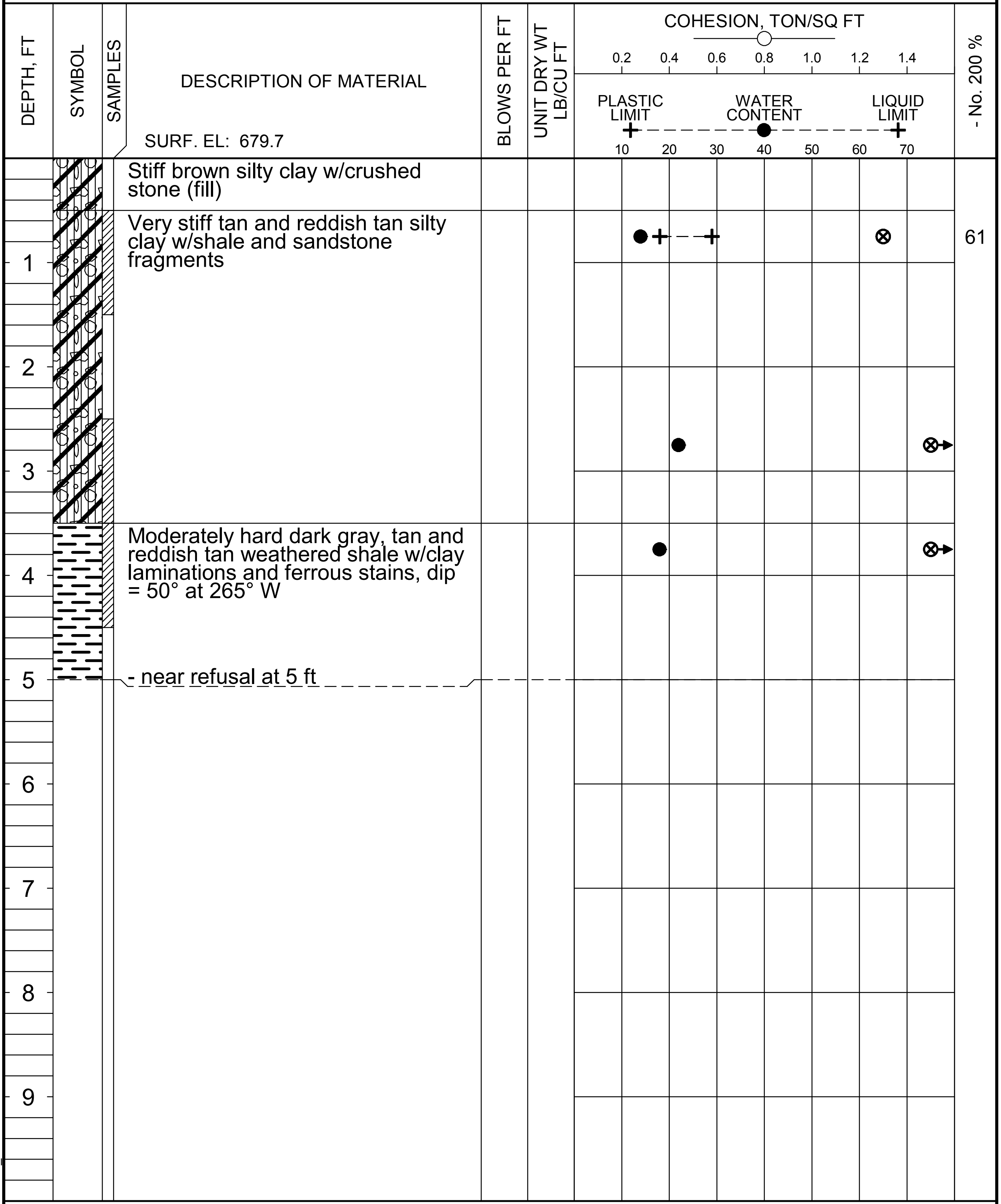
LOG OF TEST PIT NO. 33

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 766+20, 24 ft Rt

SURF. EL: 679.7



Stiff brown silty clay w/crushed stone (fill)

Very stiff tan and reddish tan silty clay w/shale and sandstone fragments

Moderately hard dark gray, tan and reddish tan weathered shale w/clay laminations and ferrous stains, dip = 50° at 265° W

- near refusal at 5 ft

COMPLETION DEPTH: 5.0 ft
DATE: 1-3-14

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 1/3/2014

Form 108-6(74) Job No. 13-214

13-214

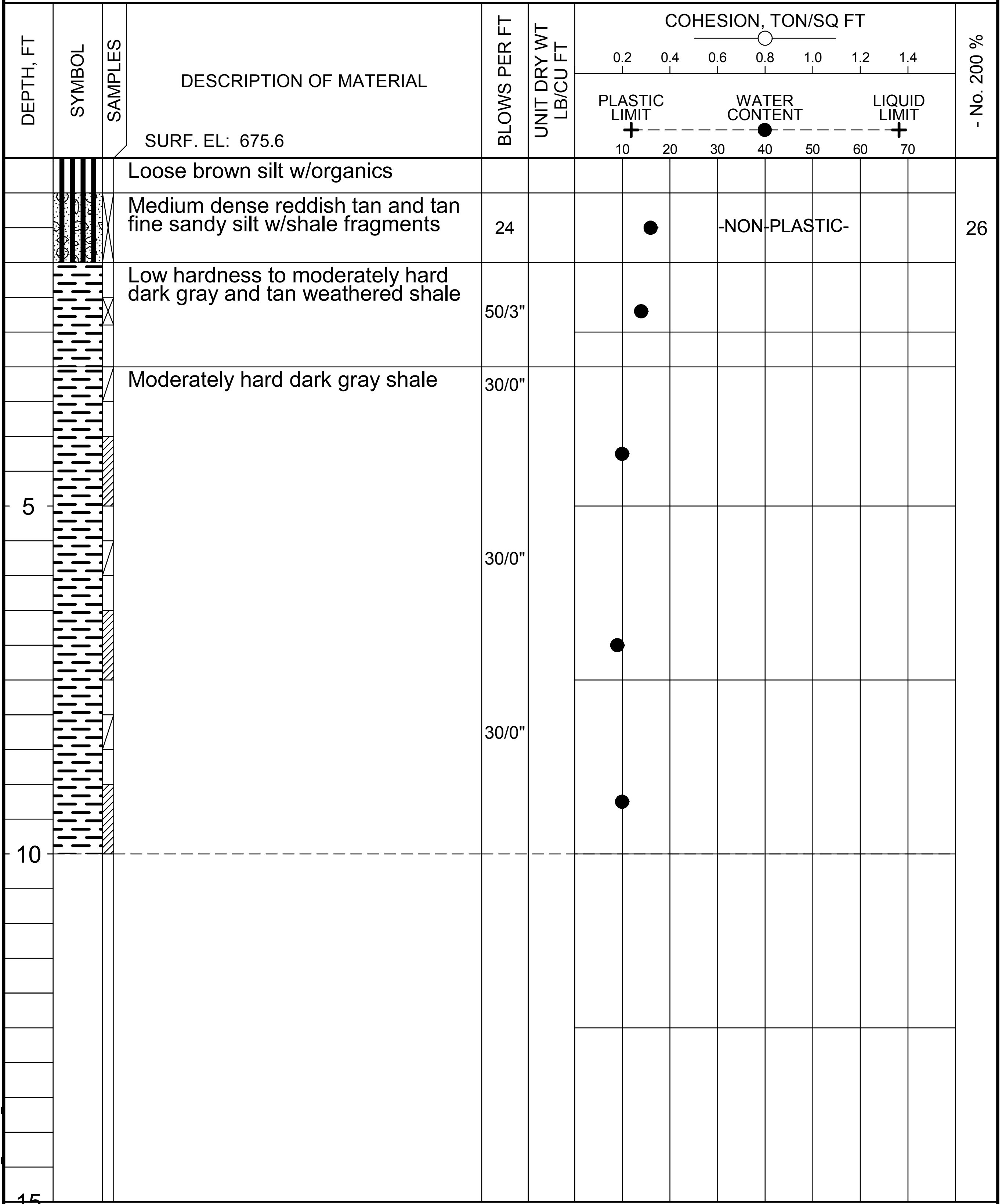
Grubbs, Hoskyn,
Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 34

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Auger

LOCATION: Approx Sta 774+29, 26 ft Rt



SURF. EL: 675.6

DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT		- No. 200 %
Loose brown silt w/organics				
Medium dense reddish tan and tan fine sandy silt w/shale fragments	24		-NON-PLASTIC-	26
Low hardness to moderately hard dark gray and tan weathered shale	50/3"			
Moderately hard dark gray shale	30/0"			
	30/0"			
	30/0"			

COMPLETION DEPTH: 10.0 ft
DATE: 12-13-13

DEPTH TO WATER
IN BORING: Dry

DATE: 12/13/2013

LGBNEW 13-214_HWY 70_BORINGS.GPJ 5-11-16

PLATE 34

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 35

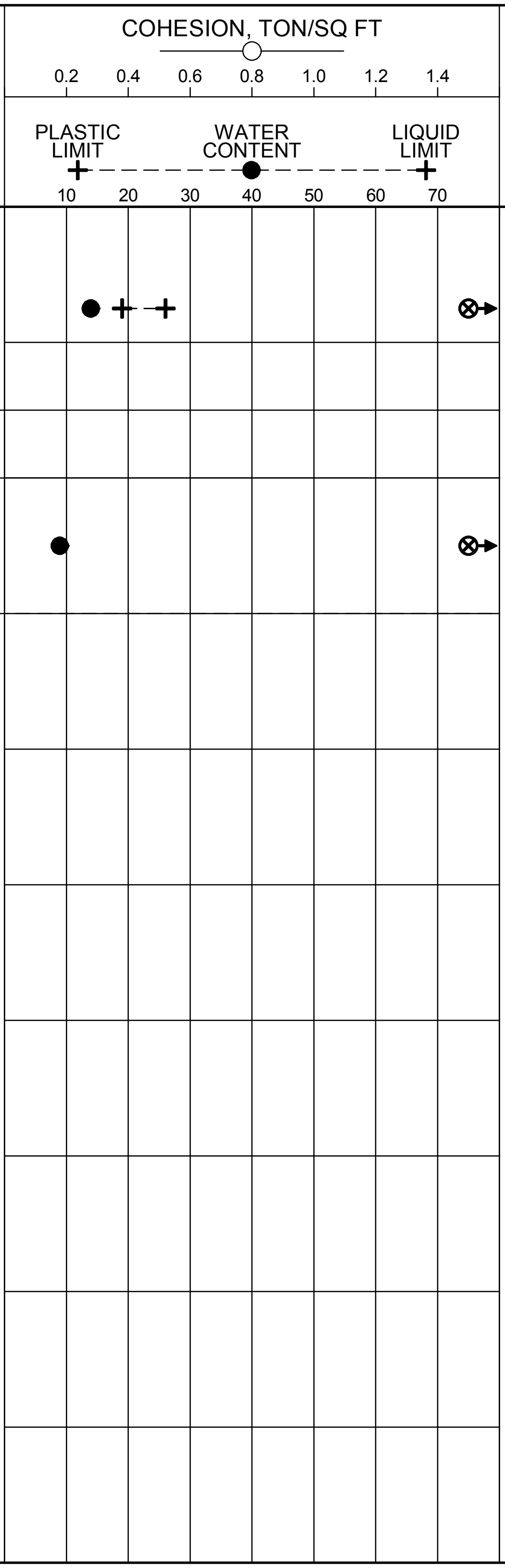
AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Mini Excavator
LOCATION: Approx Sta 781+14, 36 ft Rt

DEPTH, FT | SYMBOL | SAMPLES | DESCRIPTION OF MATERIAL | BLOWS PER FT | UNIT DRY WT LB/CU FT | - No. 200 %

SURF. EL: 678.1

Very stiff gray, dark brown and tan silty clay w/fine to coarse gravel and shale fragments (fill)	48
Soft dark gray silty clay w/shale fragments	
Moderately hard tan and dark gray weathered shale, slightly fractured w/clay laminations and ferrous stains, dip = 30° at 275° W	
- refusal in shale at 3 ft	



COMPLETION DEPTH: 3.0 ft
DATE: 1-6-14

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 1/6/2014

13-214

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 36

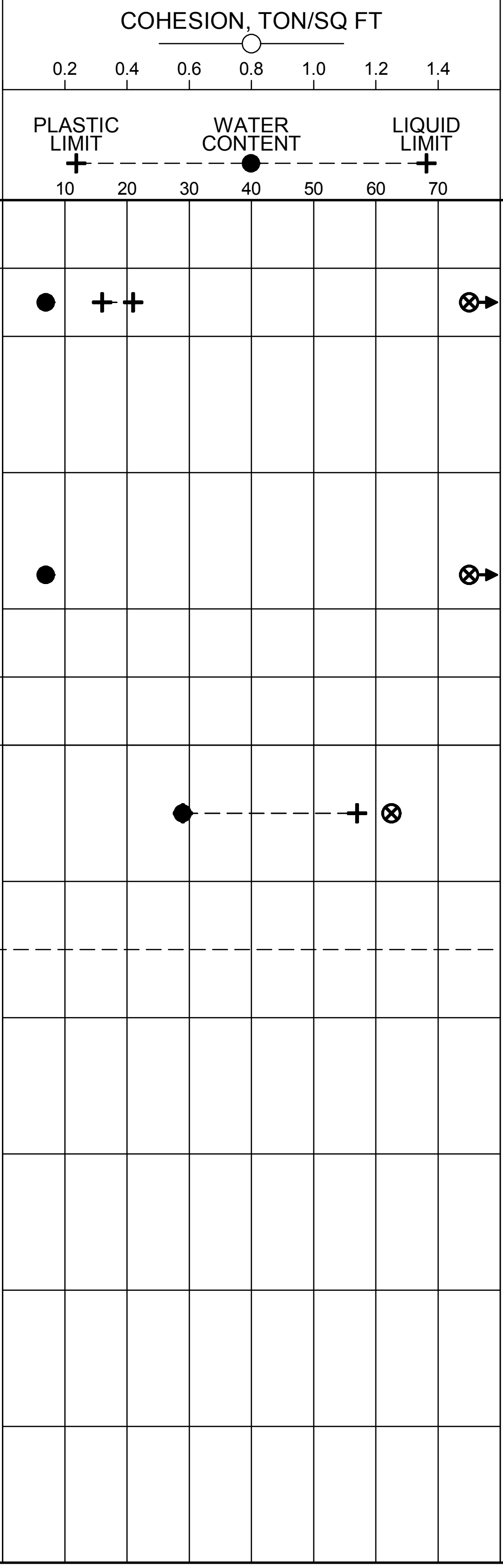
AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 789+07, 34 ft Rt

SURF. EL: 709.0

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
			Stiff to very stiff dark brown fine sandy silt w/crushed stone and organics (fill)			
1			Dense tan novaculite fragments w/a little silty clay (fill)			11
2						
3						
			Soft dark brown clayey silt w/trace organics			
4			Very stiff gray and reddish tan silty clay w/shale fragments			87
5						
6						
7						
8						
9						



COMPLETION DEPTH: 5.5 ft
DATE: 1-6-14

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 1/6/2014

LTPNEW 13-214_TEST PITS.GPJ 5-11-16

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

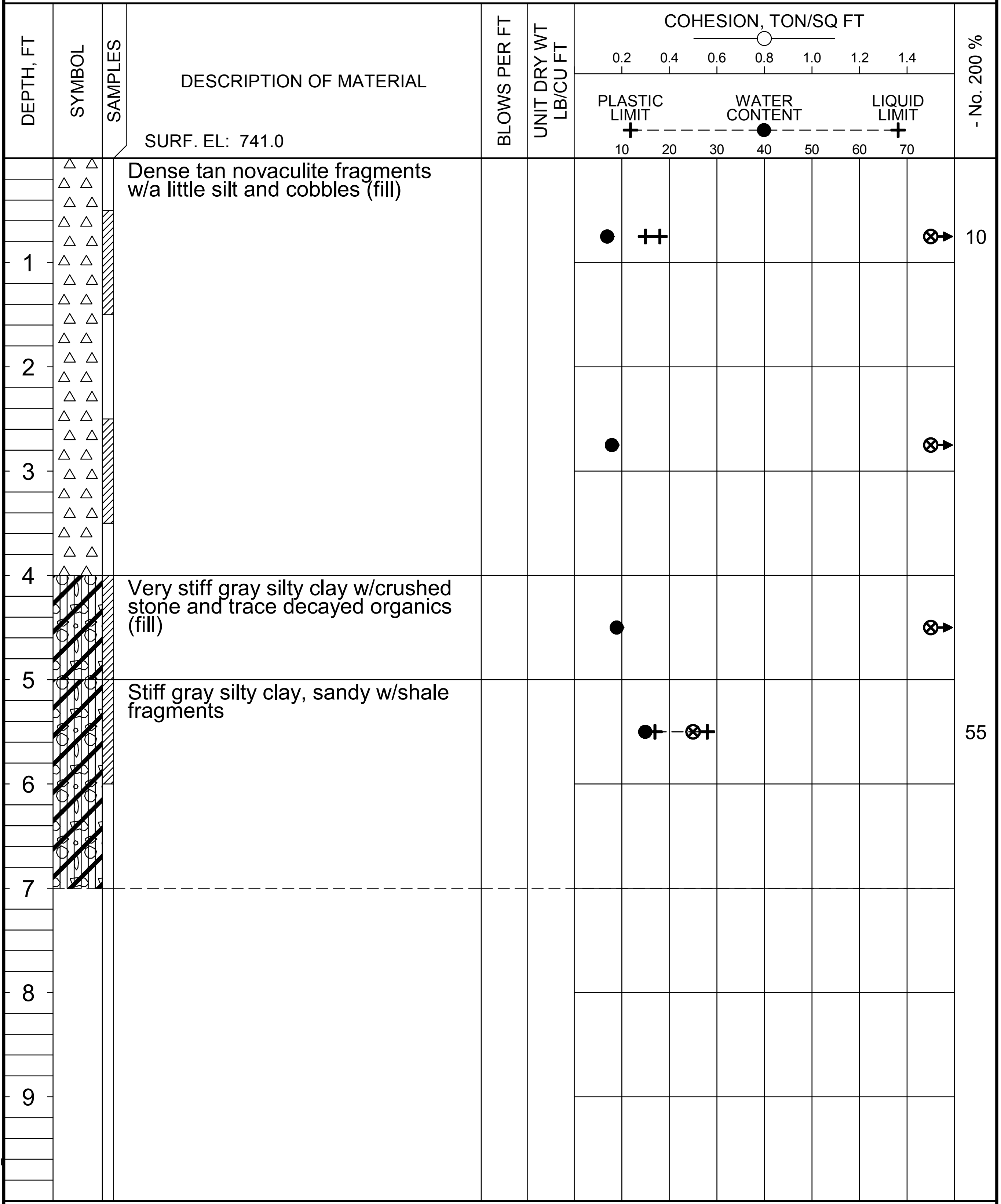
LOG OF TEST PIT NO. 37

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 796+65, 11 ft Rt

SURF. EL: 741.0



Dense tan novaculite fragments w/a little silt and cobbles (fill)

Very stiff gray silty clay w/crushed stone and trace decayed organics (fill)

Stiff gray silty clay, sandy w/shale fragments

COMPLETION DEPTH: 7.0 ft
DATE: 1-6-14

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 1/6/2014

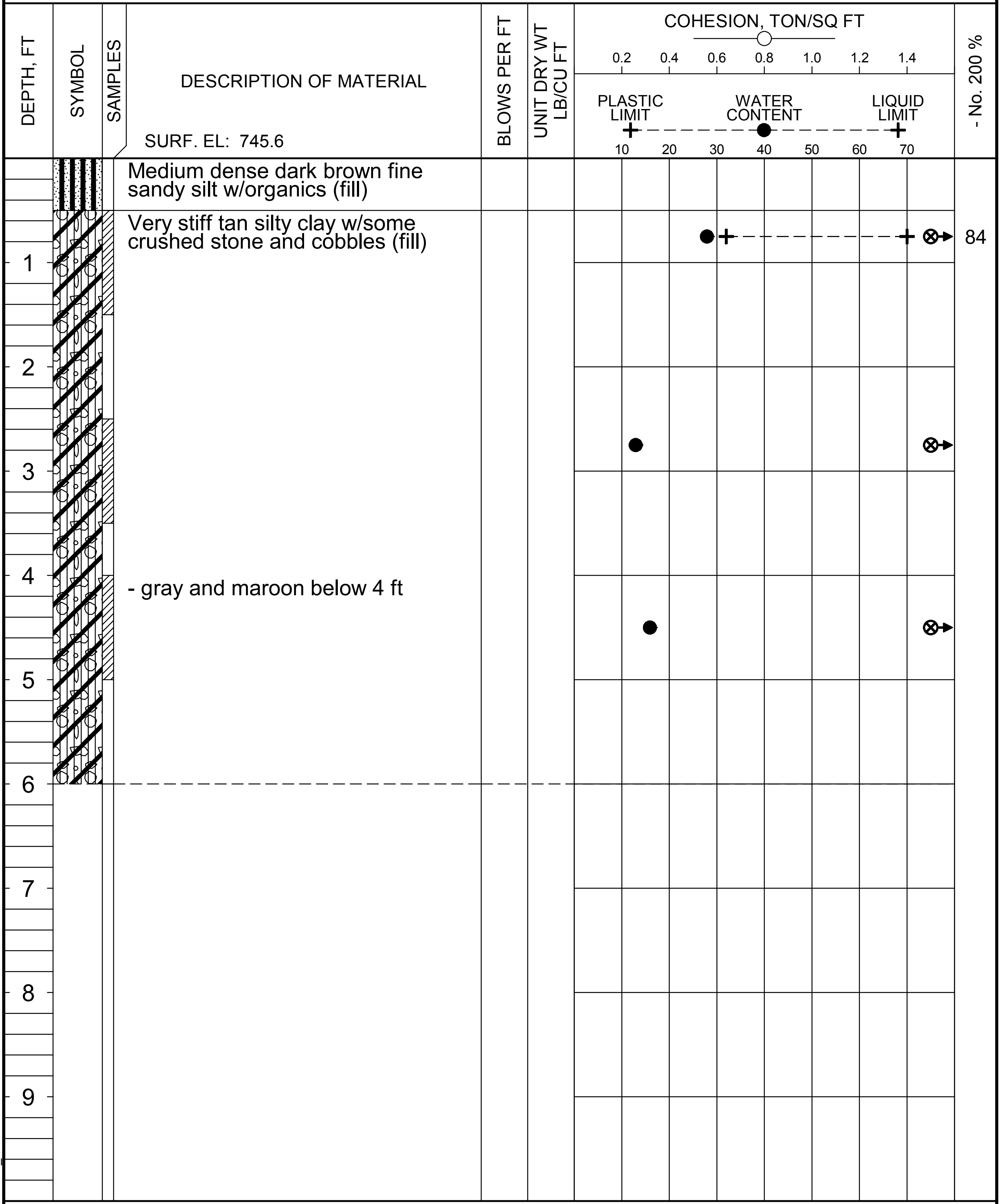
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 38

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 810+68, 26 ft Rt



SURF. EL: 745.6

Medium dense dark brown fine sandy silt w/organics (fill)

Very stiff tan silty clay w/some crushed stone and cobbles (fill)

- gray and maroon below 4 ft

COMPLETION DEPTH: 6.0 ft
DATE: 1-6-14

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 1/6/2014

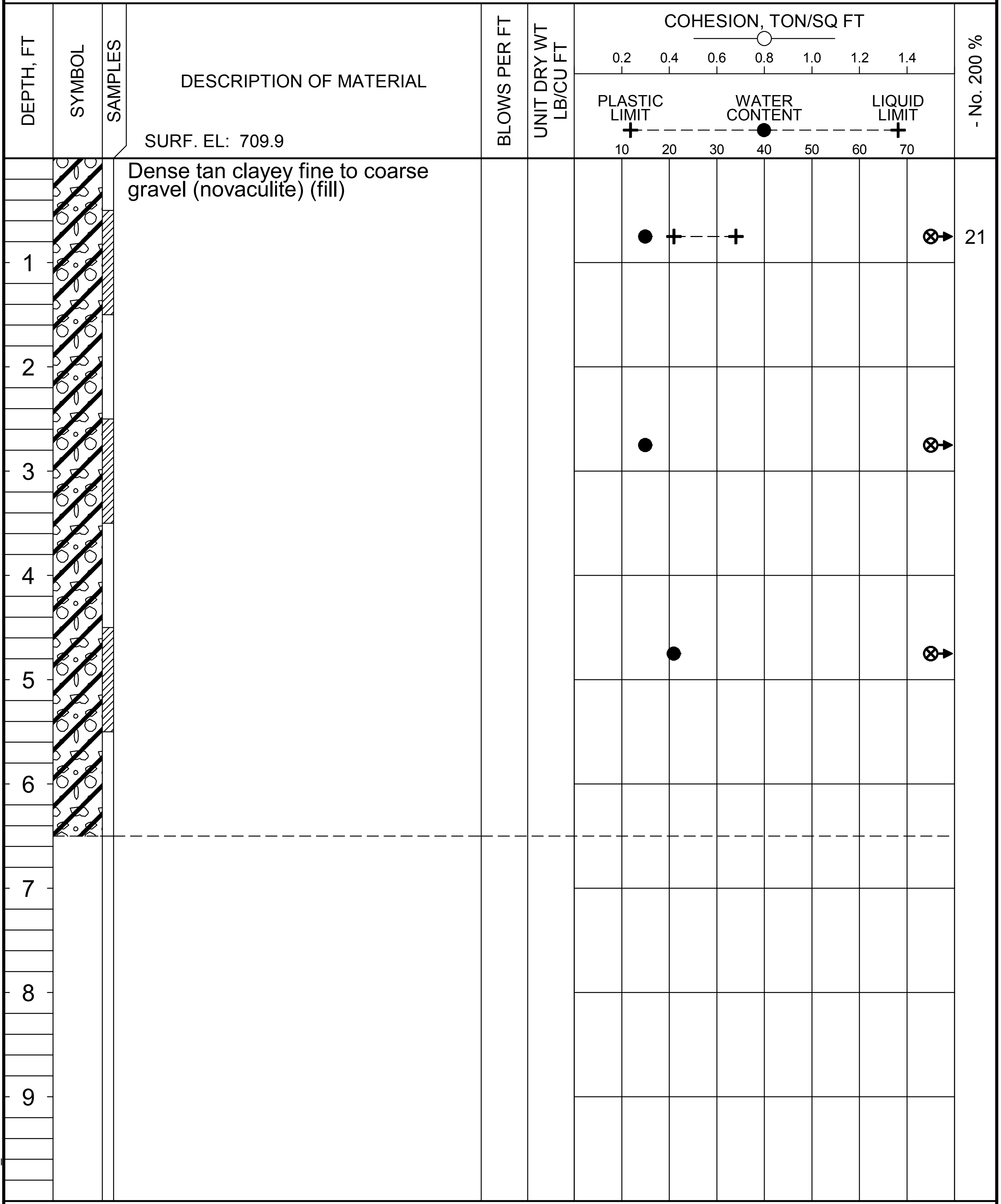
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 39

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 817+90, CL



COMPLETION DEPTH: 6.5 ft
DATE: 1-6-14

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 1/6/2014

13-214

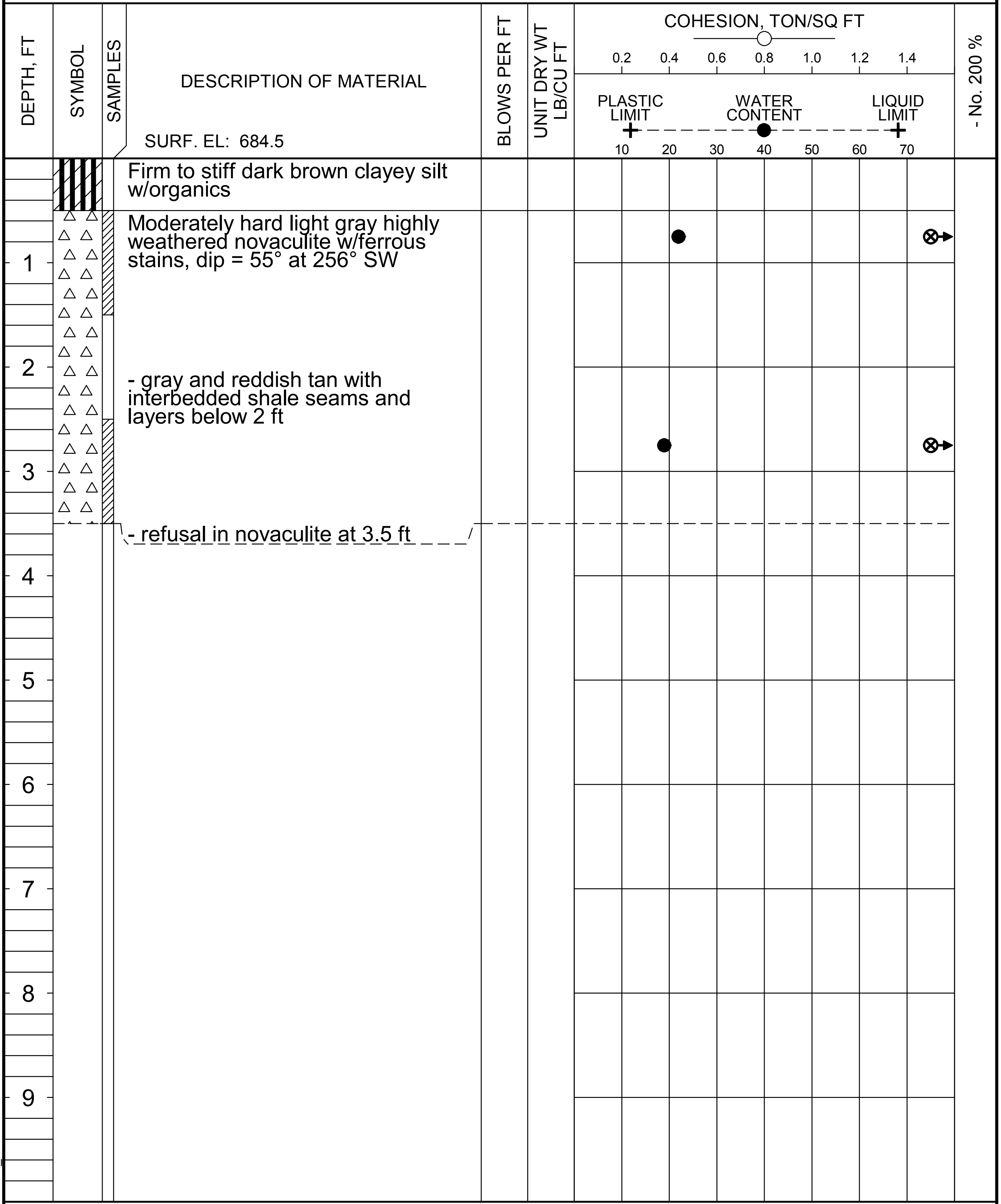
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 40

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 824+88, 43 ft Rt



Firm to stiff dark brown clayey silt w/organics

Moderately hard light gray highly weathered novaculite w/ferrous stains, dip = 55° at 256° SW

- gray and reddish tan with interbedded shale seams and layers below 2 ft

- refusal in novaculite at 3.5 ft

COMPLETION DEPTH: 3.5 ft
DATE: 1-6-14

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 1/6/2014

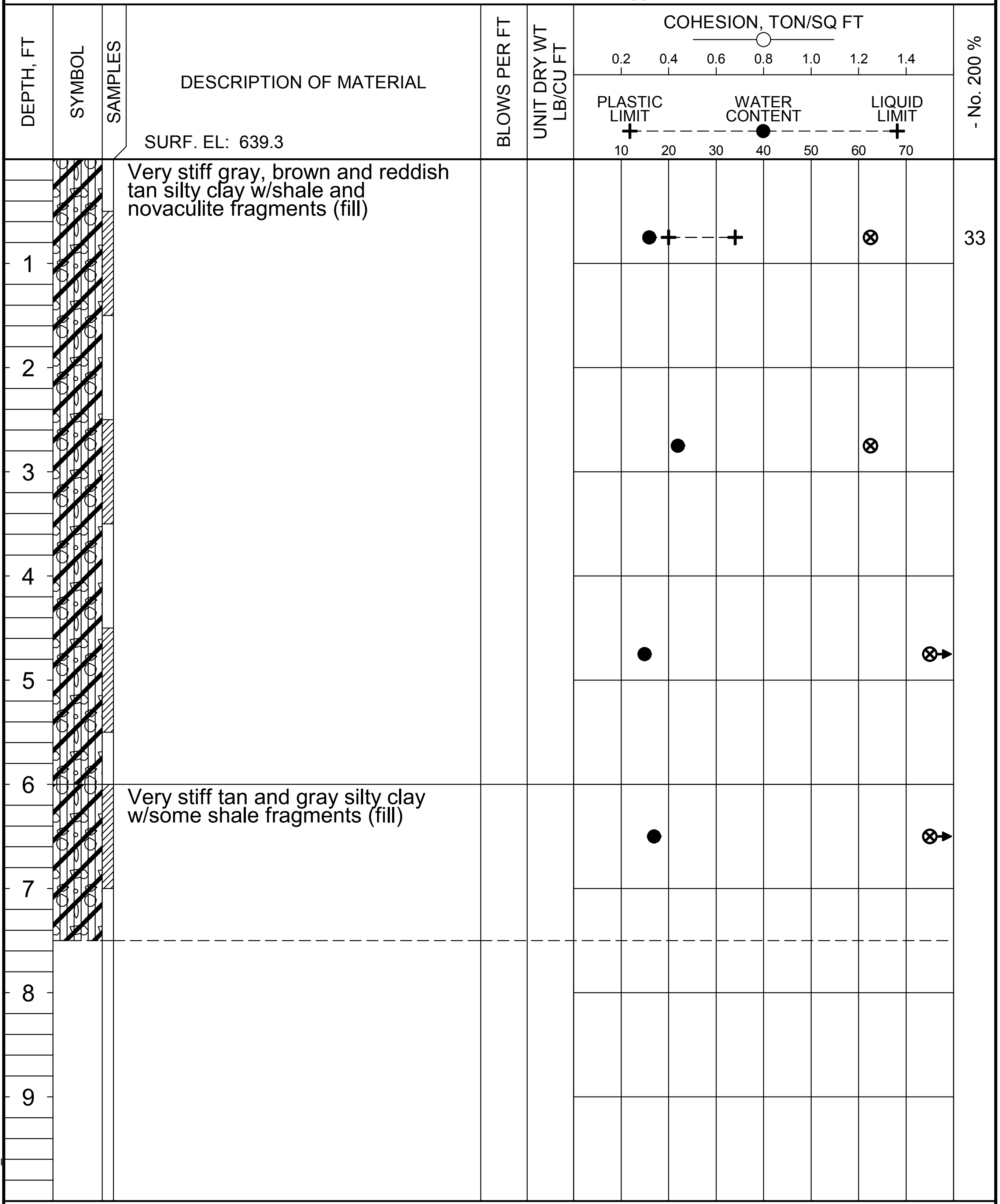
LTPNEW 13-214_TEST PITS.GPJ 5-11-16

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 41

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Mini Excavator
LOCATION: Approx Sta 833+04, 7 ft Rt



Very stiff gray, brown and reddish tan silty clay w/shale and novaculite fragments (fill)

Very stiff tan and gray silty clay w/some shale fragments (fill)

COMPLETION DEPTH: 7.5 ft
DATE: 1-6-14

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 1/6/2014

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 42

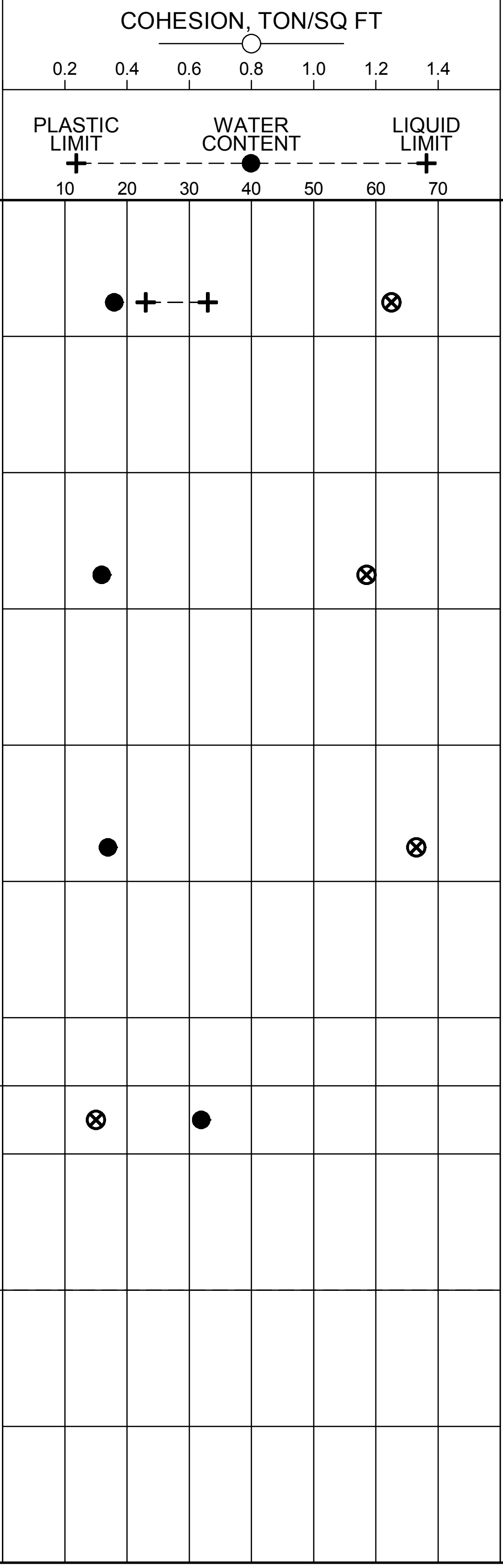
AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 840+07, 32 ft Rt

SURF. EL.: 606.3

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
	Very stiff gray, tan and reddish brown silty clay w/shale and novaculite fragments (fill)			31
1				
2	- with occasional cobbles below 2 ft			
3				
4				
5				
6				
	- water at 6.5 ft			
7	Stiff dark gray and reddish tan silty clay w/novaculite fragments, wet			
8				
9				



COMPLETION DEPTH: 8.0 ft
DATE: 1-6-14

DEPTH TO WATER
IN TEST PIT: 6.5 ft

DATE: 1/6/2014

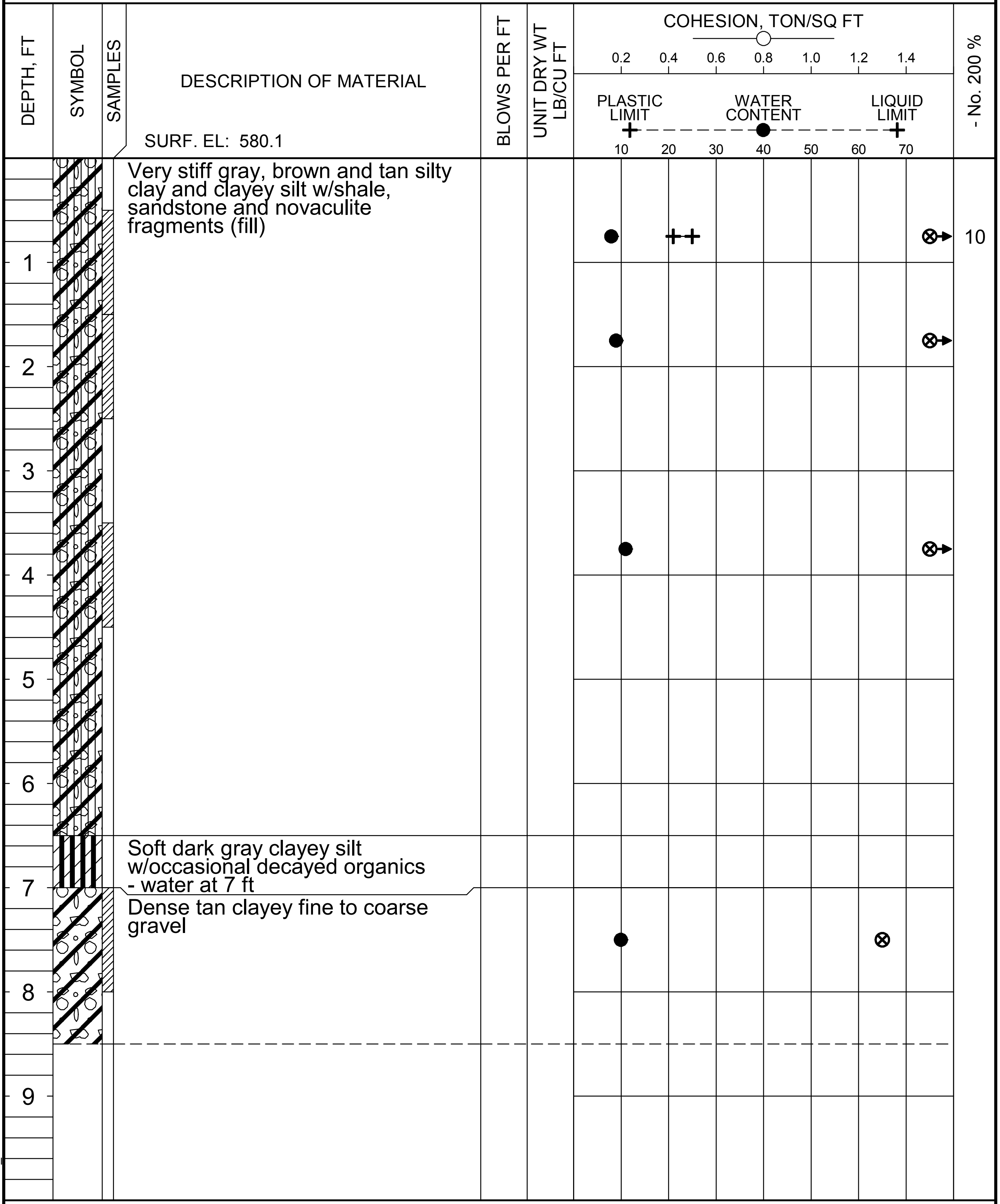
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 43

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Mini Excavator
LOCATION: Approx Sta 847+02, 14 ft Rt

SURF. EL: 580.1



Depth, ft	Description of Material
0	Very stiff gray, brown and tan silty clay and clayey silt w/shale, sandstone and novaculite fragments (fill)
6.5	Soft dark gray clayey silt w/occasional decayed organics - water at 7 ft
7	Dense tan clayey fine to coarse gravel

COMPLETION DEPTH: 8.5 ft
DATE: 1-6-14

DEPTH TO WATER
IN TEST PIT: 7 ft

DATE: 1/6/2014

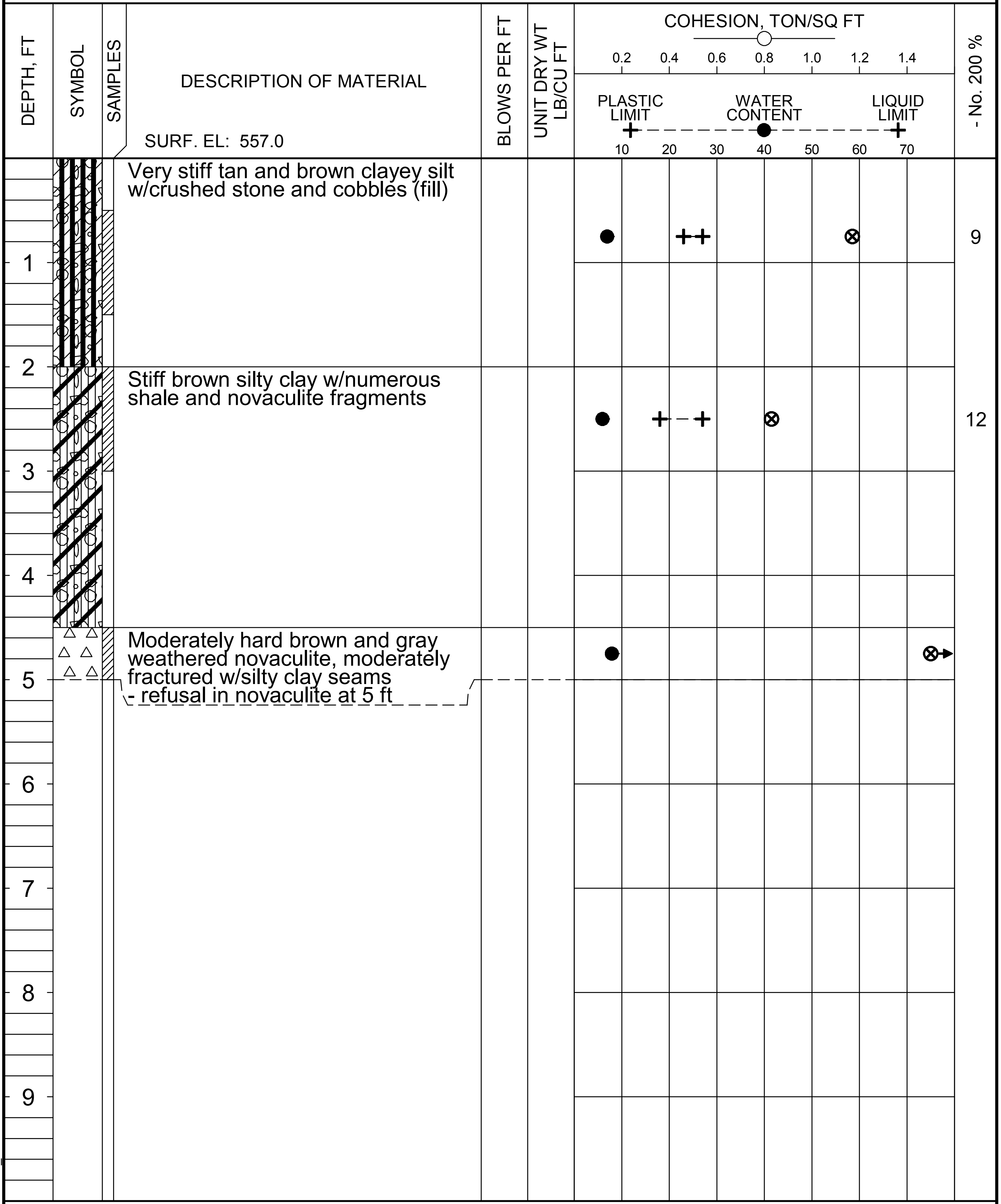
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

L O G O F T E S T P I T N O. 44

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Mini Excavator
LOCATION: Approx Sta 854+39, 13 ft Rt

SURF. EL: 557.0



DESCRIPTION OF MATERIAL	- No. 200 %
Very stiff tan and brown clayey silt w/crushed stone and cobbles (fill)	9
Stiff brown silty clay w/numerous shale and novaculite fragments	12
Moderately hard brown and gray weathered novaculite, moderately fractured w/silty clay seams - refusal in novaculite at 5 ft	

COMPLETION DEPTH: 5.0 ft
DATE: 1-6-14

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 1/6/2014

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Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 45

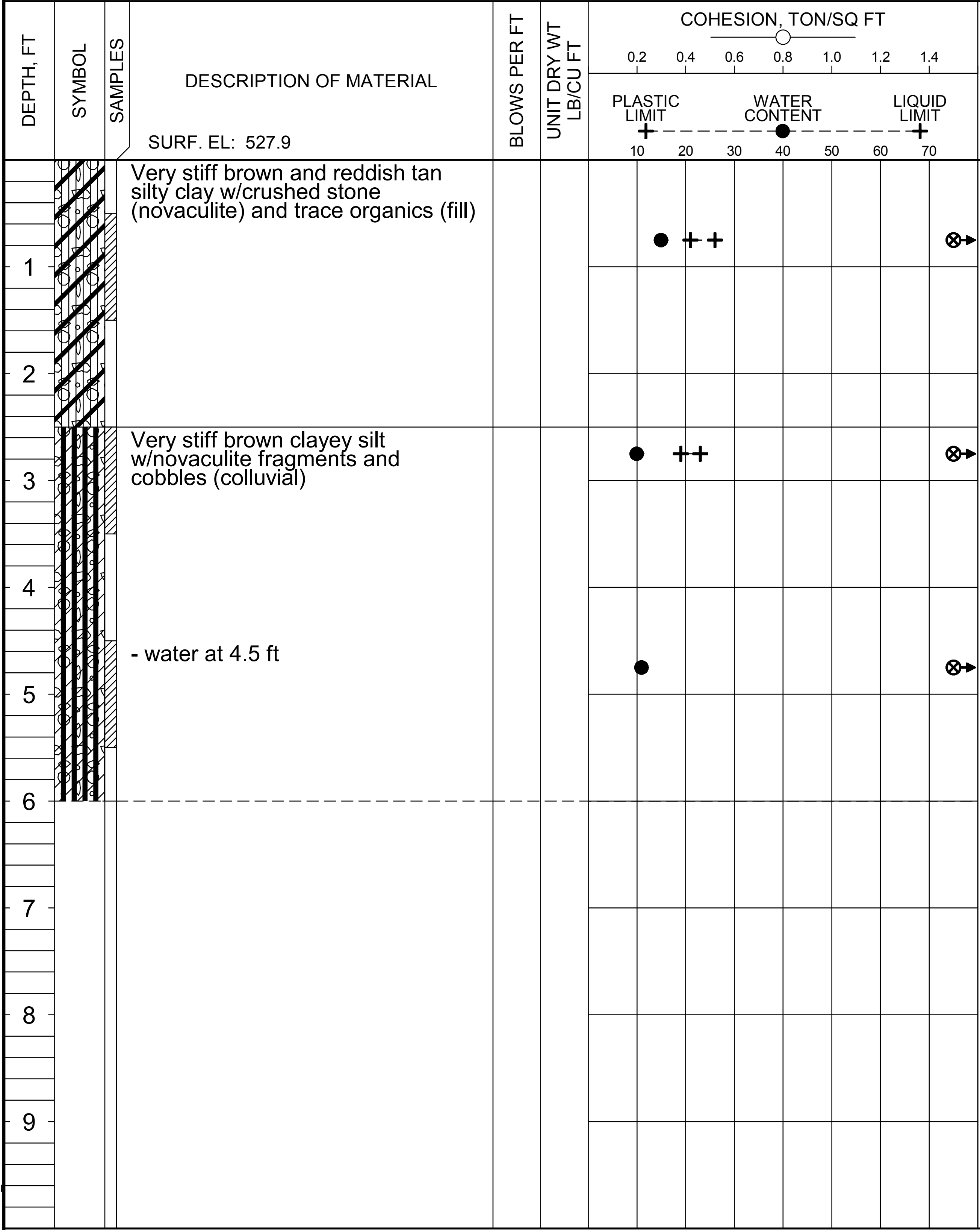
AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 865+45, 2 ft Lt

SURF. EL: 527.9

DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
Very stiff brown and reddish tan silty clay w/crushed stone (novaculite) and trace organics (fill)			37
Very stiff brown clayey silt w/novaculite fragments and cobbles (colluvial)			14
- water at 4.5 ft			



COMPLETION DEPTH: 6.0 ft
DATE: 1-6-14

DEPTH TO WATER
IN TEST PIT: 4.5 ft

DATE: 1/6/2014

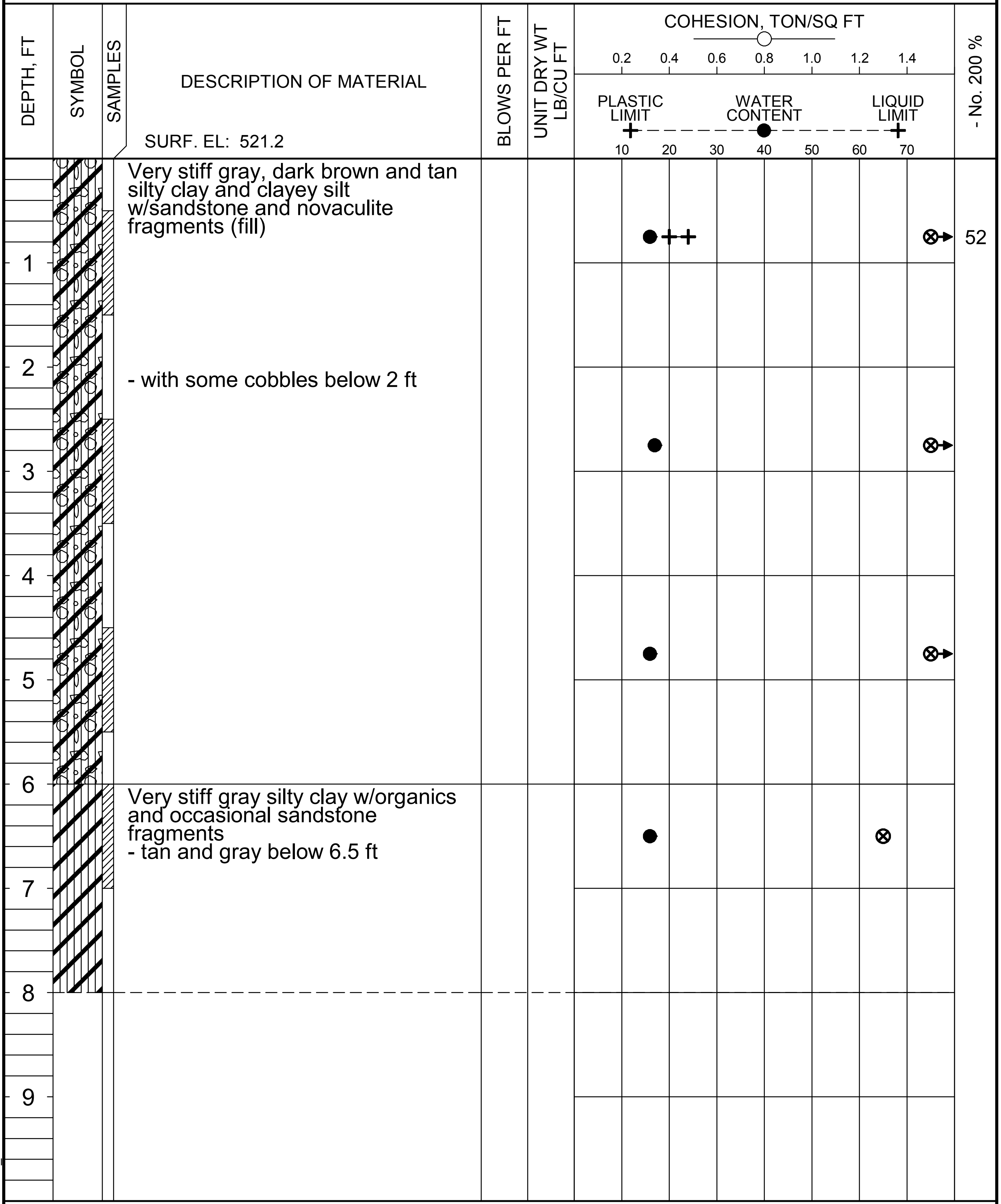
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 46

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 879+17, 20 ft Rt



Very stiff gray, dark brown and tan silty clay and clayey silt w/sandstone and novaculite fragments (fill)

- with some cobbles below 2 ft

Very stiff gray silty clay w/organics and occasional sandstone fragments
- tan and gray below 6.5 ft

COMPLETION DEPTH: 8.0 ft
DATE: 1-6-14

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 1/6/2014

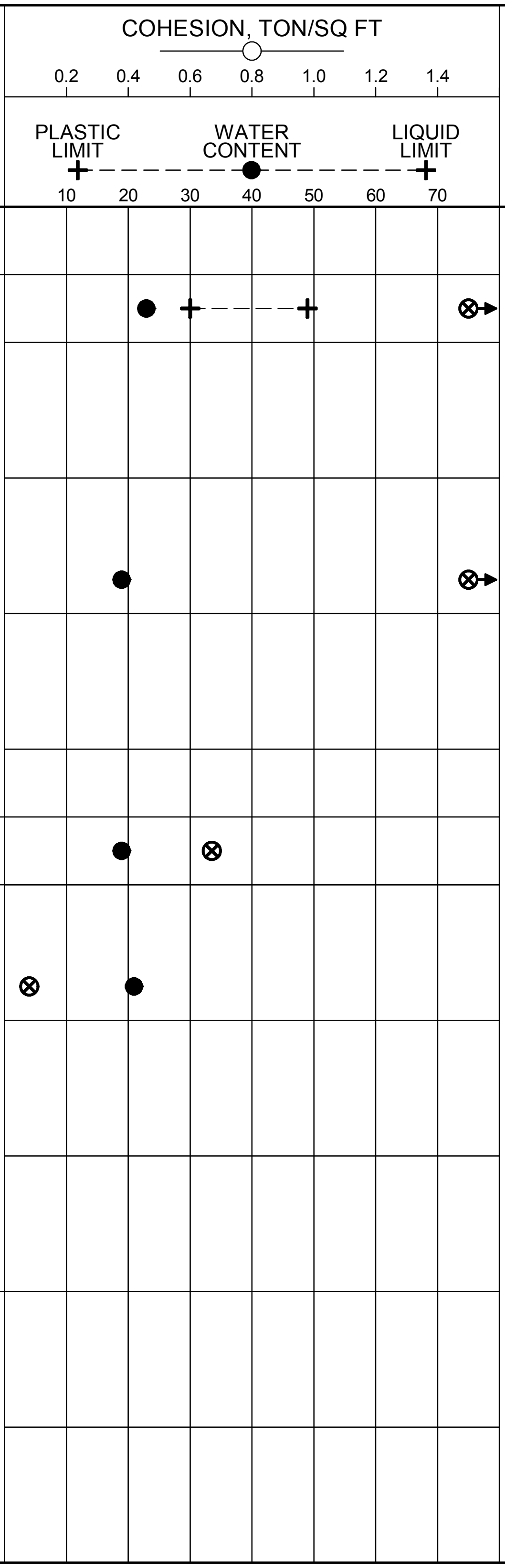
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 47

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Mini Excavator
LOCATION: Approx Sta 886+68, 26 ft Rt

DEPTH, FT	DESCRIPTION OF MATERIAL SURF. EL: 545.2	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
0	Medium dense dark brown fine sandy silt w/crushed stone and organics (fill)			
0.5	Very stiff gray, tan and reddish brown silty clay w/crushed stone and shale fragments and occasional cobbles (fill)			49
4.5	Stiff dark gray silty clay w/crushed stone and trace organics			
5	Soft tan and gray silty clay w/novaculite fragments - water at 6 ft			
8				



COMPLETION DEPTH: 8.0 ft
DATE: 1-7-14

DEPTH TO WATER
IN TEST PIT: 6 ft
DATE: 1/7/2014

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

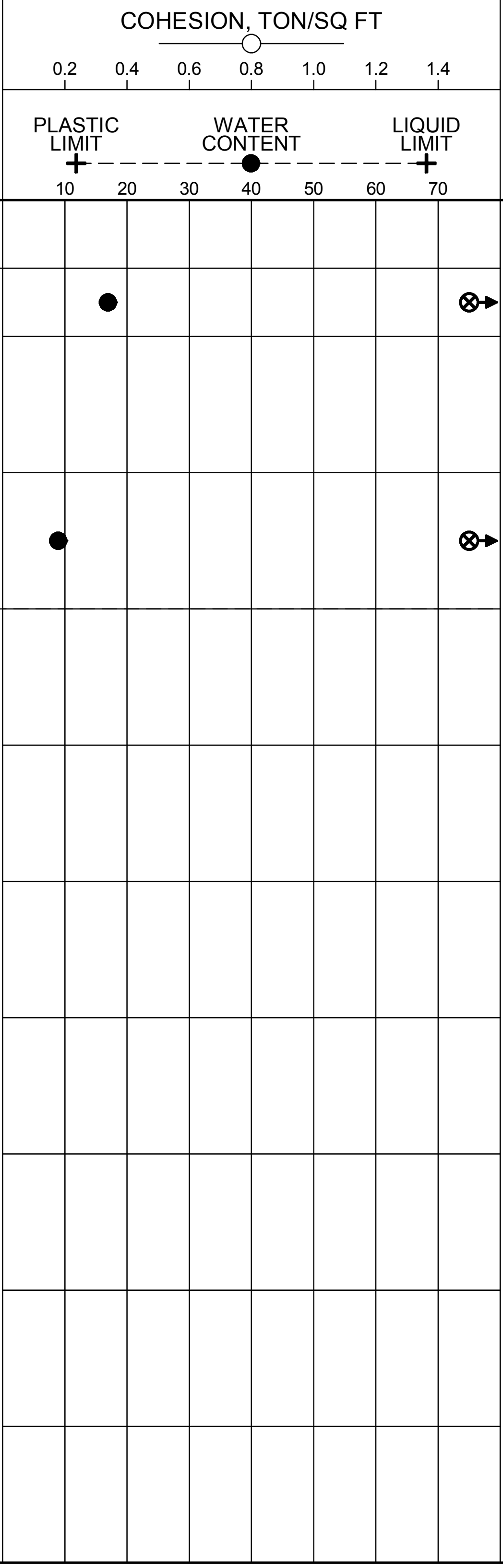
LOG OF TEST PIT NO. 48

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 894+23, 23 ft Rt

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURF. EL: 571.9	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
0			Stiff tan and dark brown silty clay w/sandstone and shale fragments (fill)			
0.5			Moderately hard gray, reddish tan and tan weathered shale w/interbedded weathered novaculite layers and ferrous stains, dip = 20° at 195° SW			
3			- refusal in shale/novaculite at 3 ft			



Depth scale: 1, 2, 3, 4, 5, 6, 7, 8, 9

COMPLETION DEPTH: 3.0 ft
DATE: 1-7-14

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 1/7/2014

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

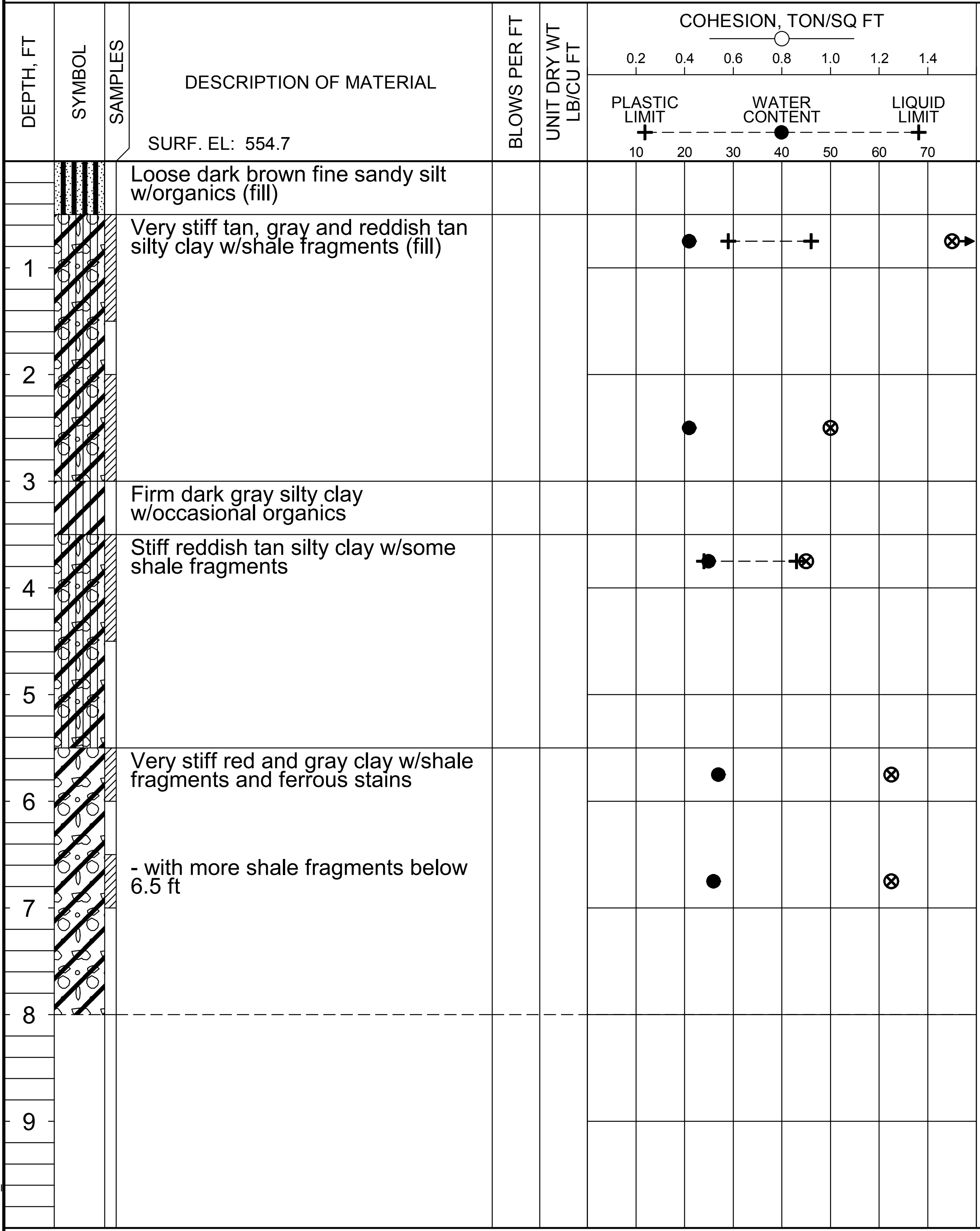
LOG OF TEST PIT NO. 49

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Mini Excavator
LOCATION: Approx Sta 901+65, 24 ft Rt

SURF. EL: 554.7

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
0	Loose dark brown fine sandy silt w/organics (fill)			
0.5	Very stiff tan, gray and reddish tan silty clay w/shale fragments (fill)			41
3	Firm dark gray silty clay w/occasional organics			
3.5	Stiff reddish tan silty clay w/some shale fragments			79
5.5	Very stiff red and gray clay w/shale fragments and ferrous stains - with more shale fragments below 6.5 ft			
8				



COMPLETION DEPTH: 8.0 ft
DATE: 1-7-14

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 1/7/2014

13-214

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

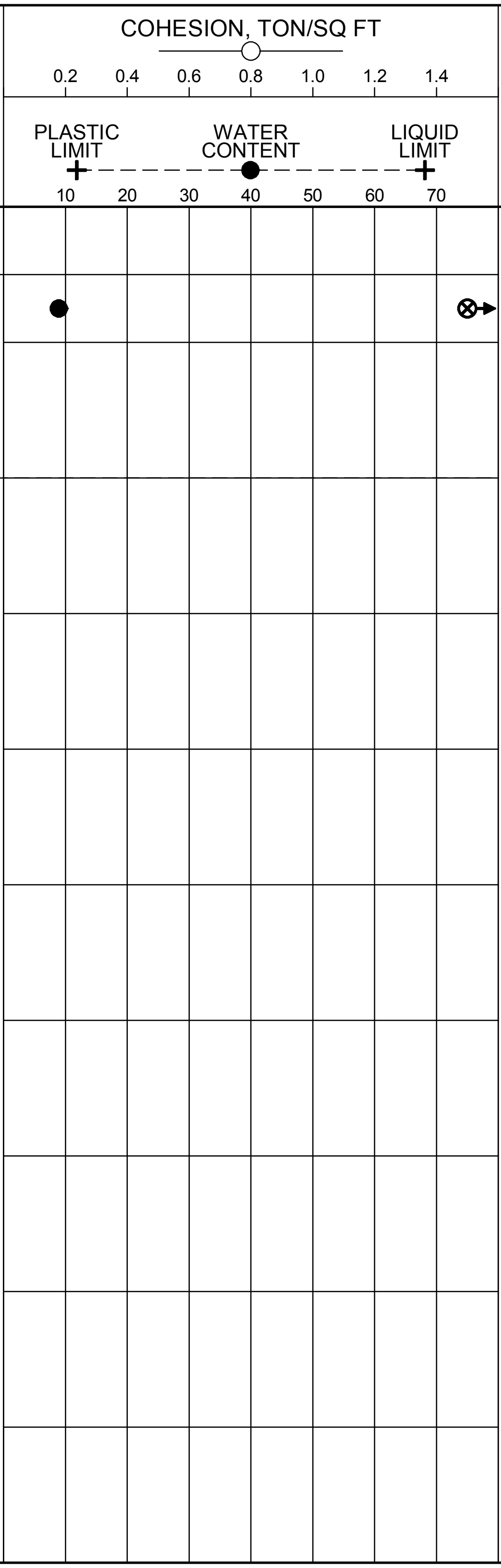
L O G O F T E S T P I T N O. 50

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Mini Excavator
LOCATION: Approx Sta 918+21, 24 ft Rt

SURF. EL: 516.4

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
0	Firm brown silty clay w/shale fragments and organics			
0.5	Moderately hard dark gray shale, slightly weathered w/ferrous stains, dip = 15° at 193° SW			
2	- refusal at 2 ft in shale			



COMPLETION DEPTH: 2.0 ft
DATE: 1-7-14

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 1/7/2014

LTPNEW 13-214_TEST PITS.GPJ 5-11-16

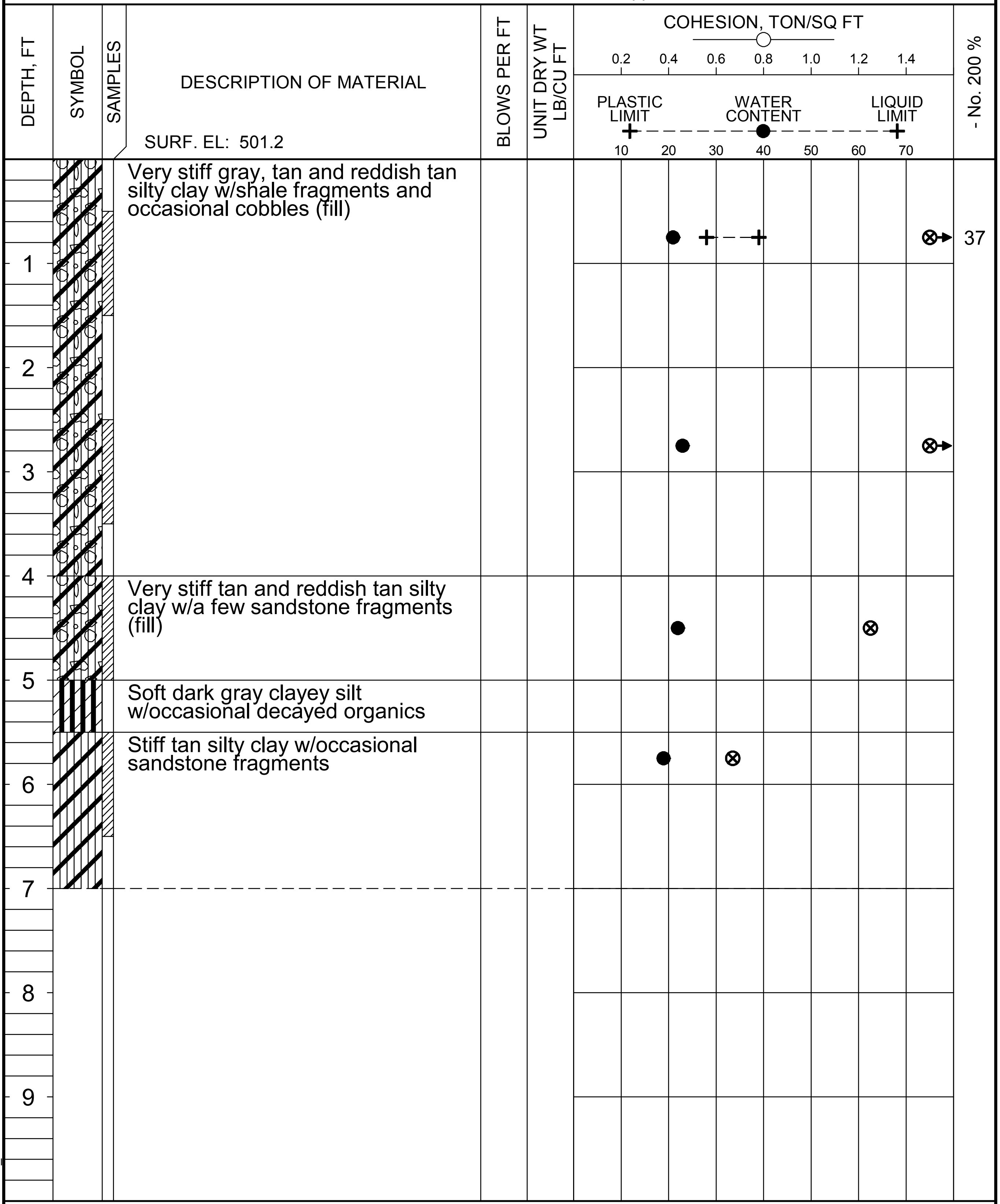
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 51

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 925+53, 26 ft Rt



Very stiff gray, tan and reddish tan silty clay w/shale fragments and occasional cobbles (fill)

Very stiff tan and reddish tan silty clay w/a few sandstone fragments (fill)

Soft dark gray clayey silt w/occasional decayed organics

Stiff tan silty clay w/occasional sandstone fragments

COMPLETION DEPTH: 7.0 ft
DATE: 1-7-14

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 1/7/2014

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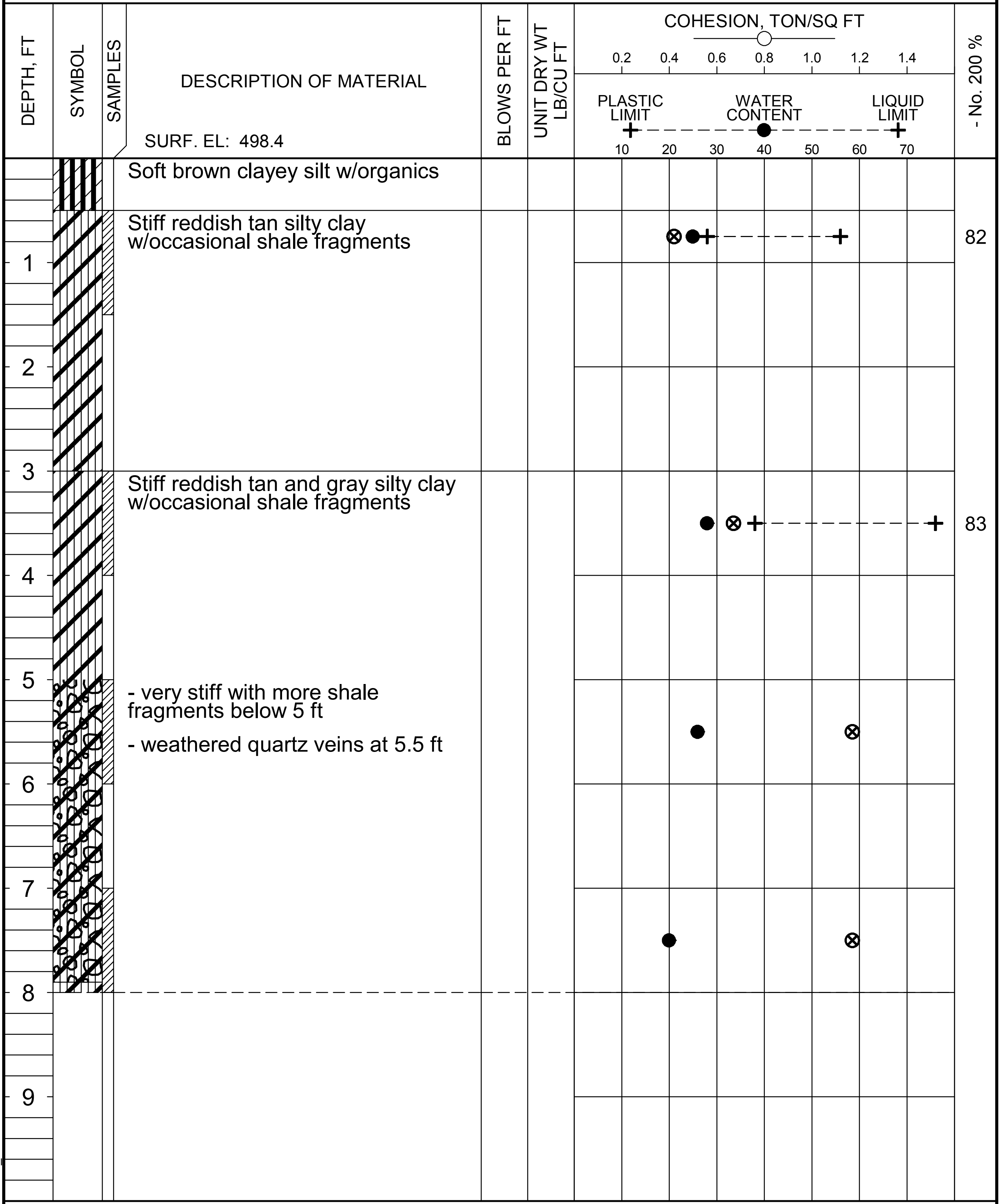
Consulting Engineers

LOG OF TEST PIT NO. 52

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Mini Excavator
LOCATION: Approx Sta 933+74, 31 ft Rt



Soft brown clayey silt w/organics

Stiff reddish tan silty clay w/occasional shale fragments

Stiff reddish tan and gray silty clay w/occasional shale fragments

- very stiff with more shale fragments below 5 ft

- weathered quartz veins at 5.5 ft

COMPLETION DEPTH: 8.0 ft
DATE: 1-7-14

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 1/7/2014

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

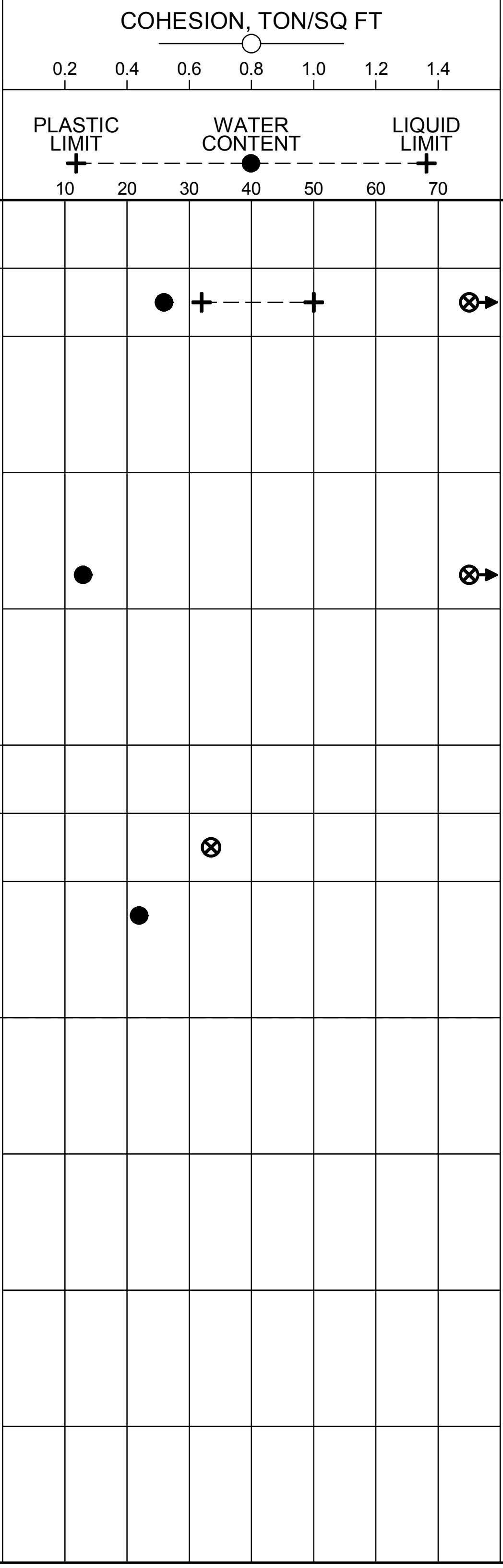
LOG OF TEST PIT NO. 53

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Mini Excavator
LOCATION: Approx Sta 941+00, 32 ft Rt

SURF. EL: 505.1

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
0 – 0.5	Soft dark brown clayey silt w/organics and occasional crushed stone (fill)			
0.5 – 4	Very stiff gray, reddish tan and tan silty clay w/shale fragments and some cobbles (fill)			58
4 – 4.5	Soft dark gray clayey silt w/occasional organics			
4.5 – 6	Stiff tan silty clay w/occasional sandstone and shale fragments			



COMPLETION DEPTH: 6.0 ft
DATE: 1-7-14

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 1/7/2014

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

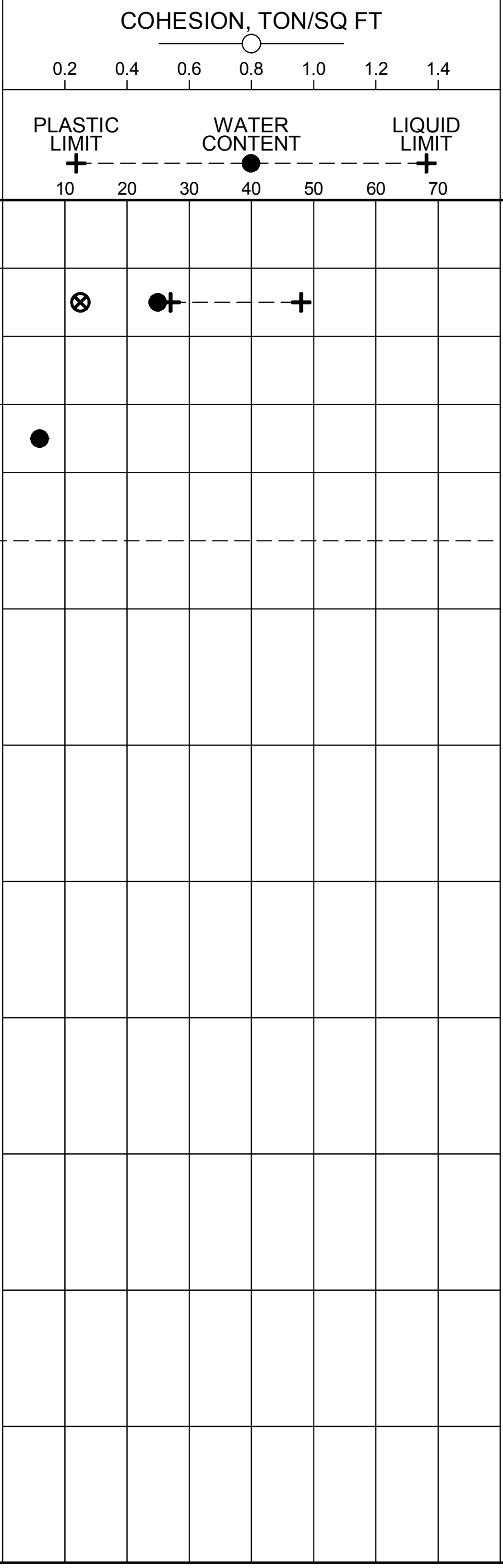
LOG OF TEST PIT NO. 54

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 948+55, 32 ft Rt

DEPTH, FT	DESCRIPTION OF MATERIAL SURF. EL: 508.2	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
0	Soft dark brown clayey silt w/organics (fill)			
1	Firm reddish tan silty clay w/shale fragments (fill)			61
2	Moderately hard gray, reddish tan and dark gray weathered shale, very thinly bedded, heavily fractured w/novaculite seams and ferrous stains, dip = 32° at 320° NW			
2.5	- refusal at 2.5 ft in shale			



COMPLETION DEPTH: 2.5 ft
DATE: 1-7-14

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 1/7/2014

13-214

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 55

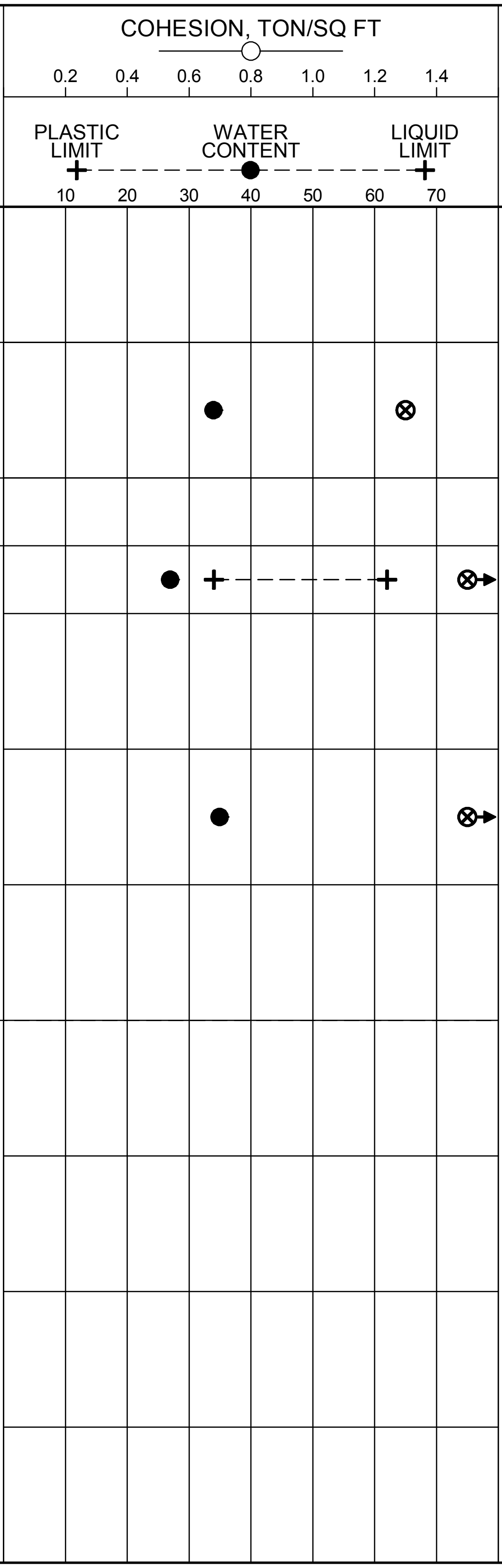
AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 956+11, 38 ft Rt

SURF. EL: 484.3

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
0 – 1	Medium dense dark brown fine sandy silt w/numerous crushed stone and organics (fill)			
1 – 2	Very stiff tan and reddish tan silty clay w/shale fragments (fill)			
2 – 2.5	Soft gray clayey silt w/occasional organics			
2.5 – 6	Very stiff tan and reddish tan silty clay w/trace shale and sandstone fragments			94



COMPLETION DEPTH: 6.0 ft
DATE: 1-7-14

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 1/7/2014

LTPNEW 13-214_TEST PITS.GPJ 5-11-16

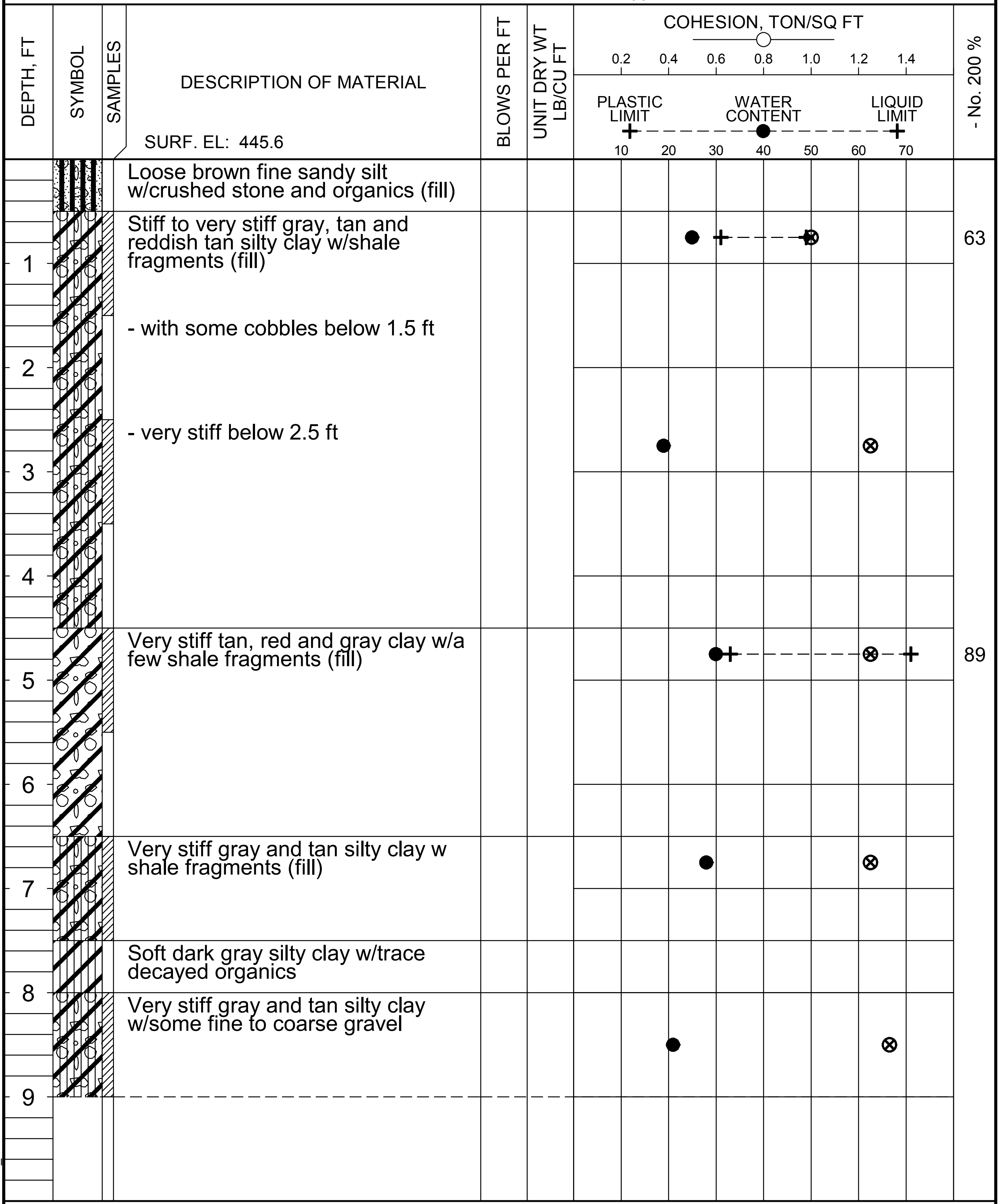
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 56

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Mini Excavator

LOCATION: Approx Sta 971+08, 35 ft Rt



DESCRIPTION OF MATERIAL SURF. EL: 445.6	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
Loose brown fine sandy silt w/crushed stone and organics (fill)			
Stiff to very stiff gray, tan and reddish tan silty clay w/shale fragments (fill)			63
- with some cobbles below 1.5 ft			
- very stiff below 2.5 ft			
Very stiff tan, red and gray clay w/a few shale fragments (fill)			89
Very stiff gray and tan silty clay w shale fragments (fill)			
Soft dark gray silty clay w/trace decayed organics			
Very stiff gray and tan silty clay w/some fine to coarse gravel			

COMPLETION DEPTH: 9.0 ft
DATE: 1-7-14

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 1/7/2014

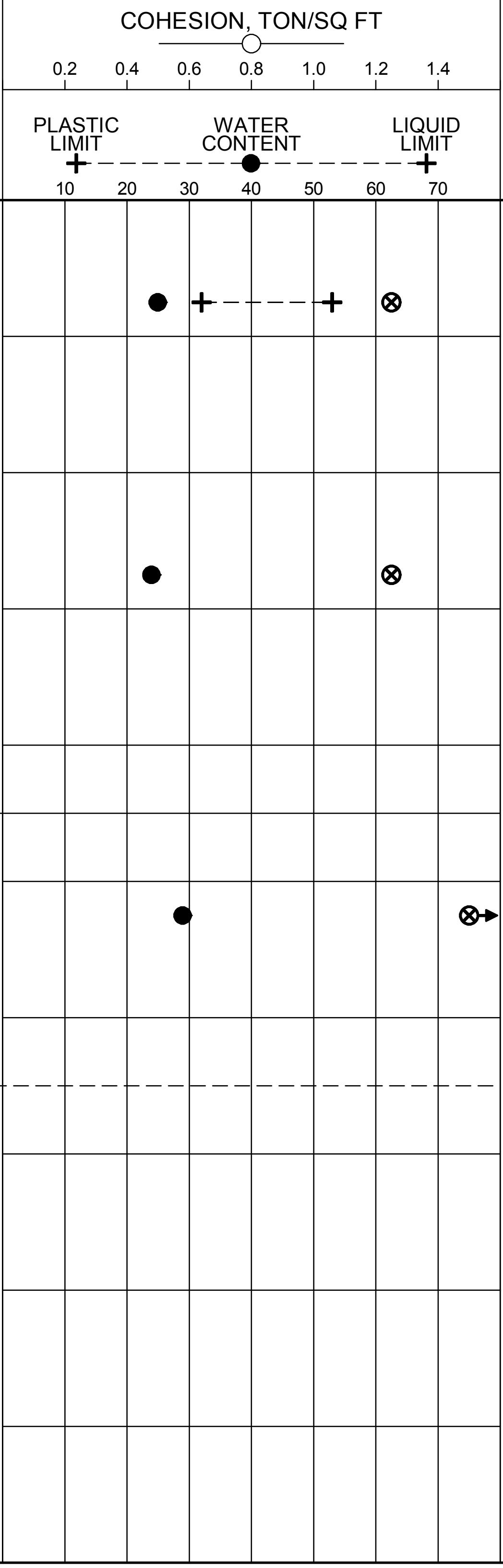
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 57

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Mini Excavator
LOCATION: Approx Sta 978+70, 40 ft Rt

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURF. EL: 459.5	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
0 – 4.5			Very stiff gray, tan and reddish tan silty clay w/shale fragments and occasional cobbles (fill)			63
4.5 – 6.5			Very stiff tan and gray silty clay w/shale fragments and ferrous stains			



COMPLETION DEPTH: 6.5 ft
DATE: 1-7-14

DEPTH TO WATER
IN TEST PIT: Dry
DATE: 1/7/2014

13-214

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 113

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

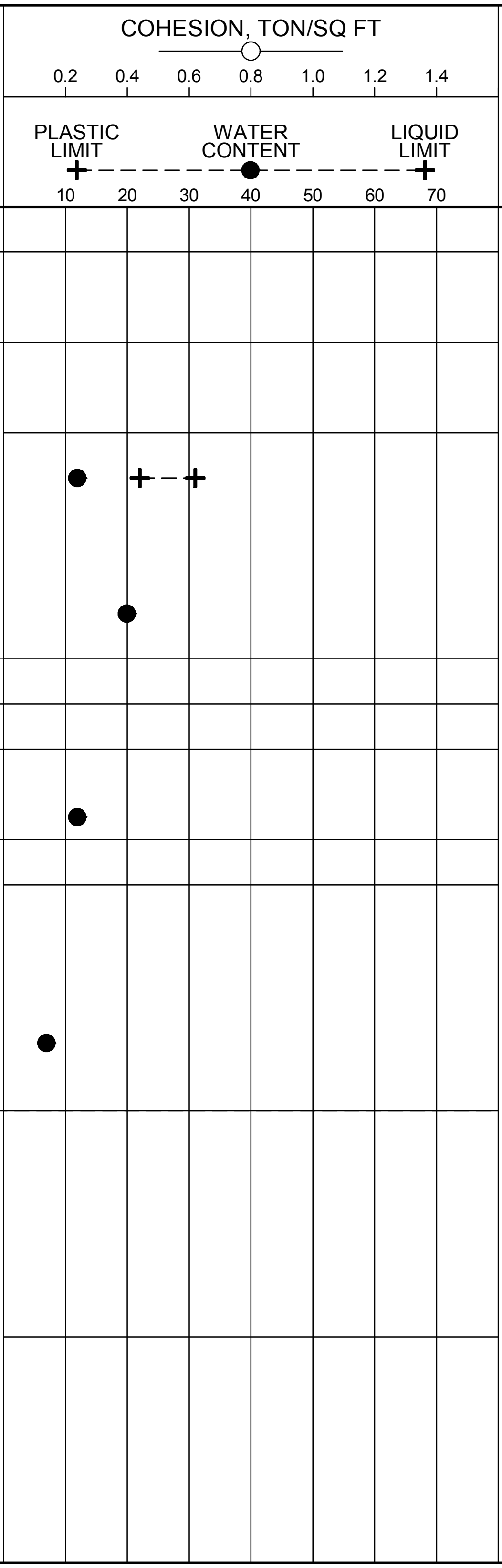
TYPE: Auger

LOCATION: Approx Sta 662+36, 40 ft Rt

SURF. EL: 563.5

DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
Loose brown silt w/decayed organics			
Stiff tan silty clay w/fine sand, gravel and shale fragments (fill)	17		
Medium dense dark gray, tan and gray shale fragments w/silty clay (fill)	13 12		13
Loose brown silt w/occasional decayed organics			
Stiff tan and gray silty clay			
Low hardness to moderately hard tan and dark gray weathered shale	50/3"		
Moderately hard dark gray shale	30/0"		

DEPTH, FT: 5, 10, 15



COMPLETION DEPTH: 10.0 ft
DATE: 12-13-13

DEPTH TO WATER
IN BORING: Dry

DATE: 12/13/2013

13-214

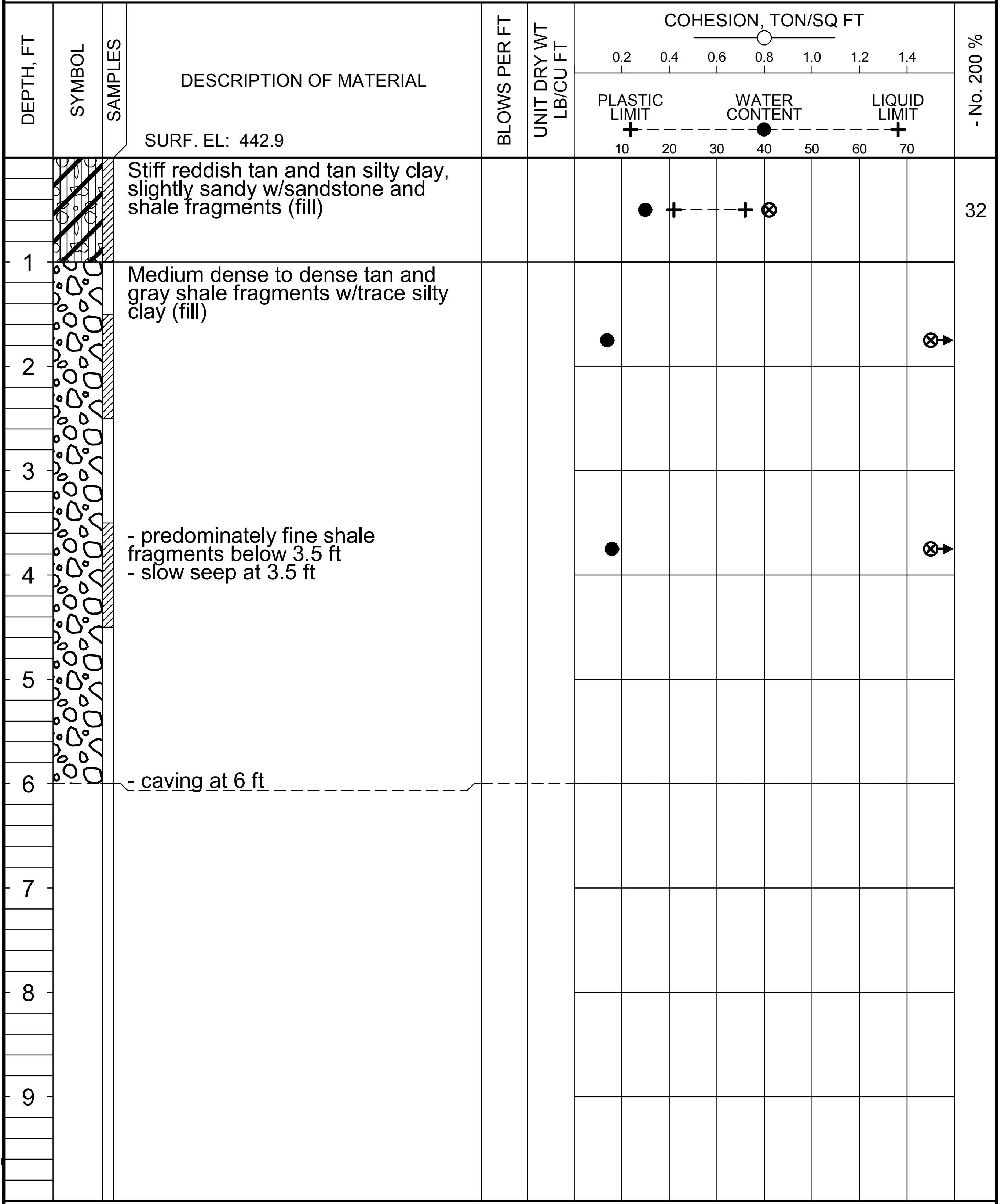
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 1A

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Backhoe

LOCATION: Approx Sta 485+69, 91 ft Rt



DEPTH, FT	DESCRIPTION OF MATERIAL	- No. 200 %
0 - 1	Stiff reddish tan and tan silty clay, slightly sandy w/sandstone and shale fragments (fill)	32
1 - 6	Medium dense to dense tan and gray shale fragments w/trace silty clay (fill) - predominately fine shale fragments below 3.5 ft - slow seep at 3.5 ft - caving at 6 ft	

COMPLETION DEPTH: 6.0 ft
DATE: 10-14-13

DEPTH TO WATER
IN TEST PIT: 3.5 ft

DATE: 10/14/2013

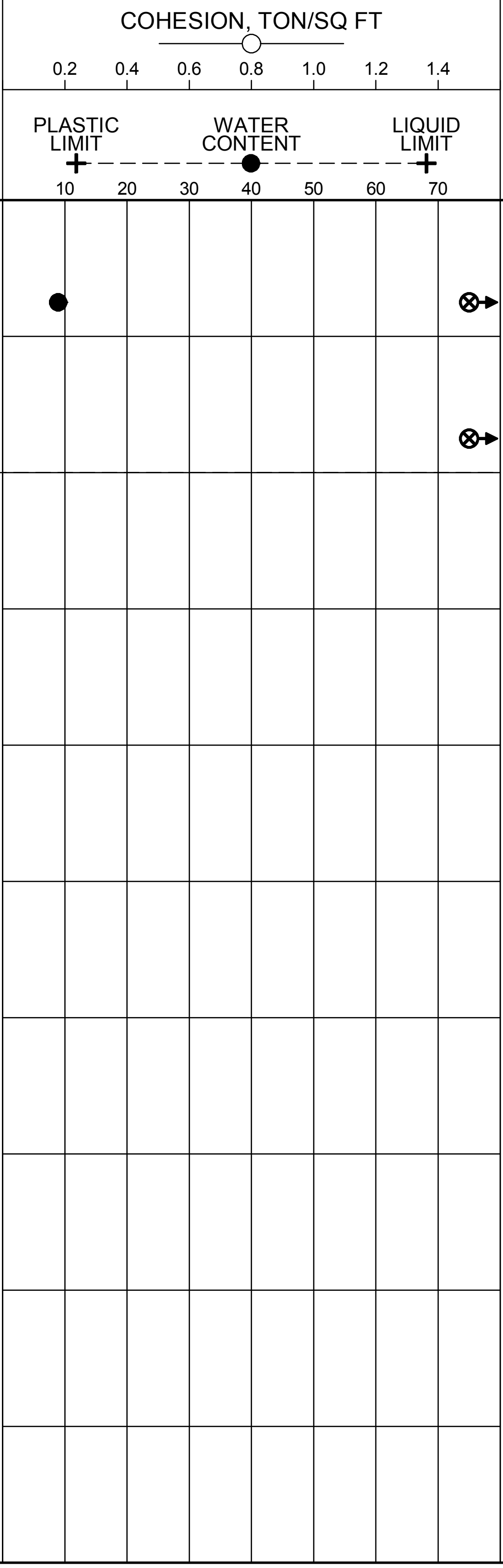
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 2A

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Backhoe
LOCATION: Approx Sta 536+77, 77 ft Rt

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURF. EL: 525.9	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
0–2			Friable reddish tan, tan and gray weathered fine-grained sandstone w/some silty clay laminations, highly fractured			
2			- backhoe refusal at 2 ft in sandstone			



Depth scale: 1, 2, 3, 4, 5, 6, 7, 8, 9

COMPLETION DEPTH: 2.0 ft
DATE: 10-14-13

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 10/14/2013

Grubbs, Hoskyn,
Barton & Wyatt, Inc.
Consulting Engineers

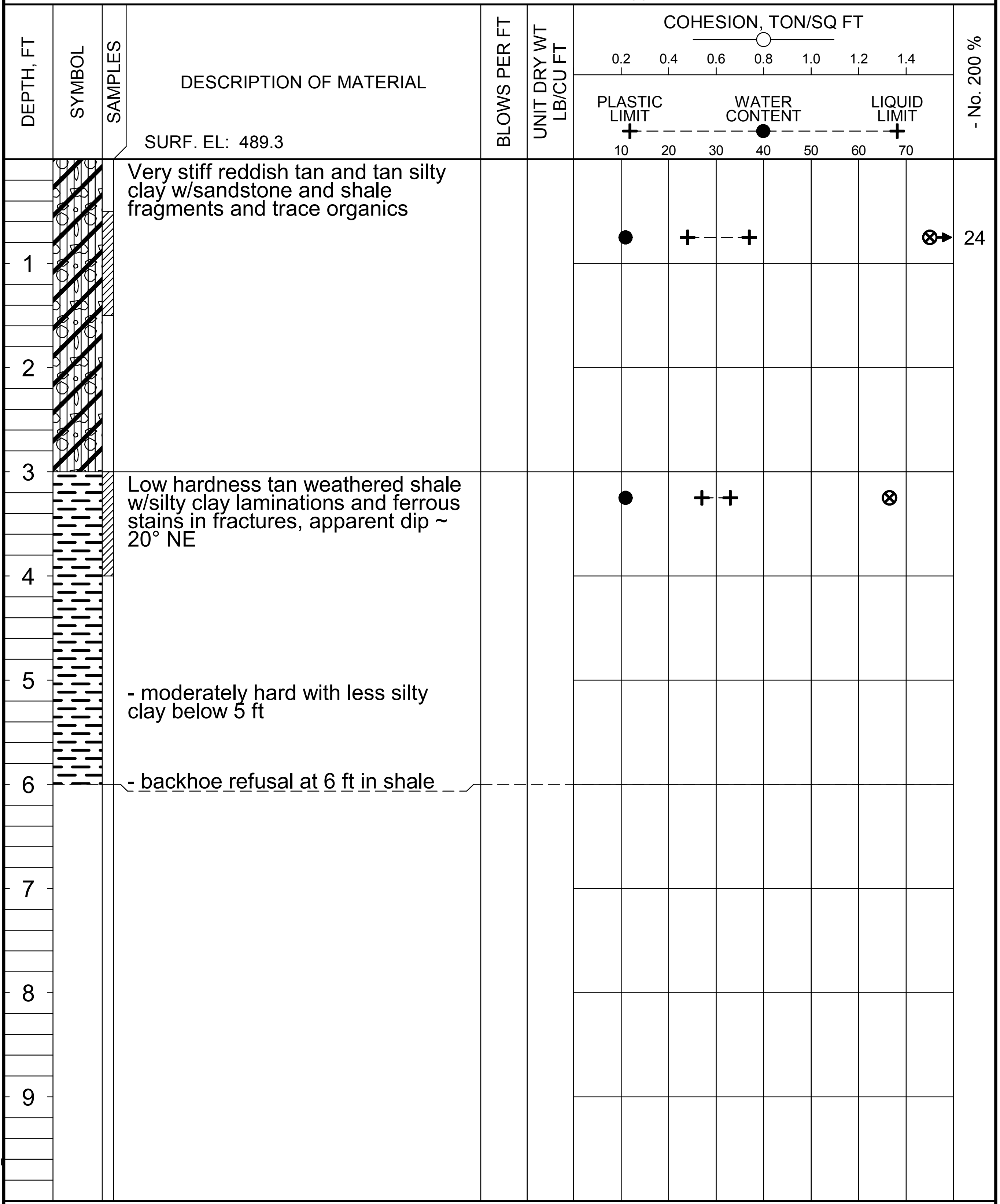
LOG OF TEST PIT NO. 3A

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Backhoe

LOCATION: Approx Sta 586+28, 45 ft Rt

SURF. EL: 489.3



Very stiff reddish tan and tan silty clay w/sandstone and shale fragments and trace organics

Low hardness tan weathered shale w/silty clay laminations and ferrous stains in fractures, apparent dip ~ 20° NE

- moderately hard with less silty clay below 5 ft

- backhoe refusal at 6 ft in shale

COMPLETION DEPTH: 6.0 ft
DATE: 10-14-13

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 10/14/2013

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

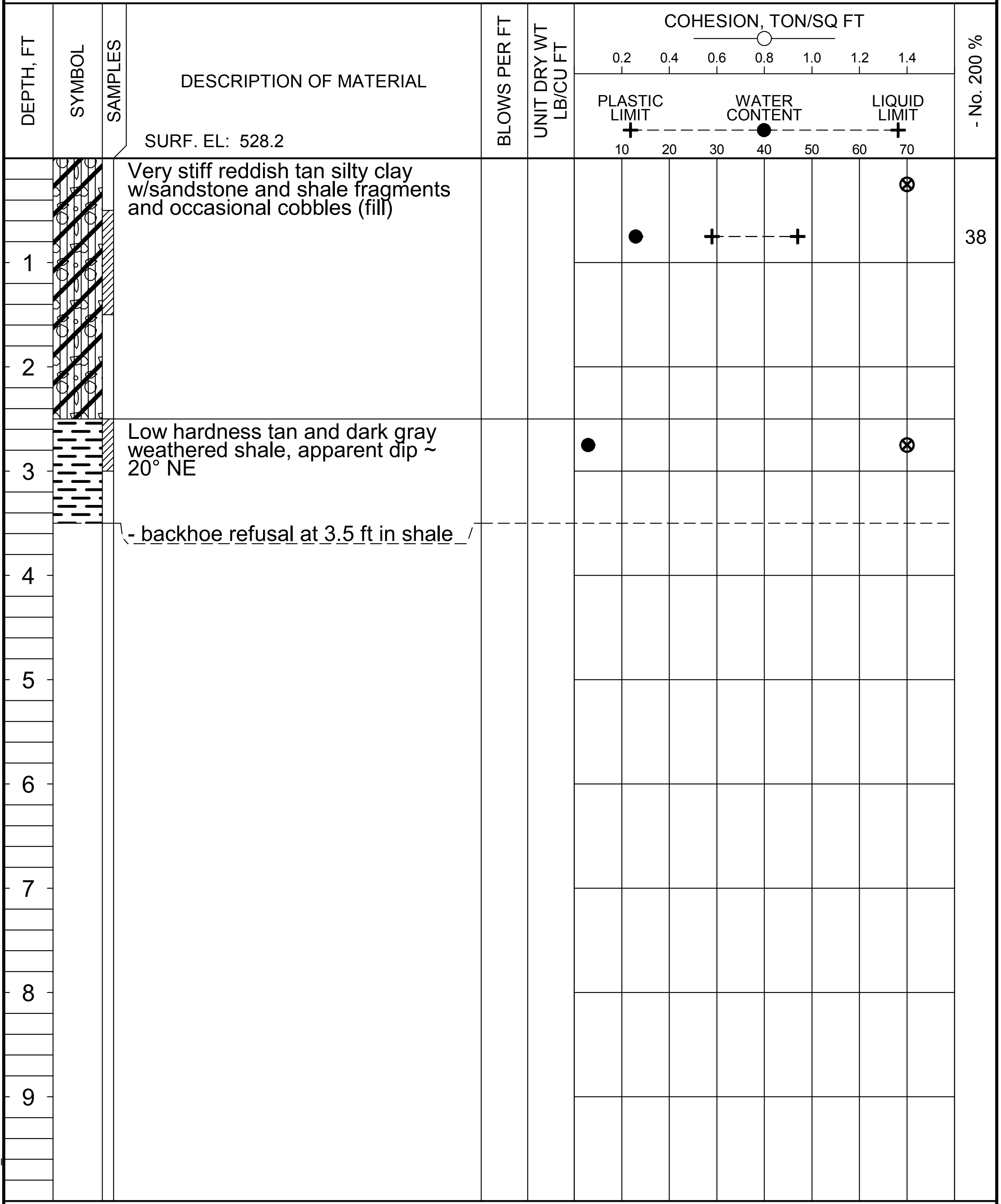
LOG OF TEST PIT NO. 4A

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Backhoe

LOCATION: Approx Sta 639+04, 11 ft Lt

SURF. EL: 528.2



Very stiff reddish tan silty clay w/sandstone and shale fragments and occasional cobbles (fill)

Low hardness tan and dark gray weathered shale, apparent dip ~ 20° NE

- backhoe refusal at 3.5 ft in shale

COMPLETION DEPTH: 3.5 ft
DATE: 10-14-13

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 10/14/2013

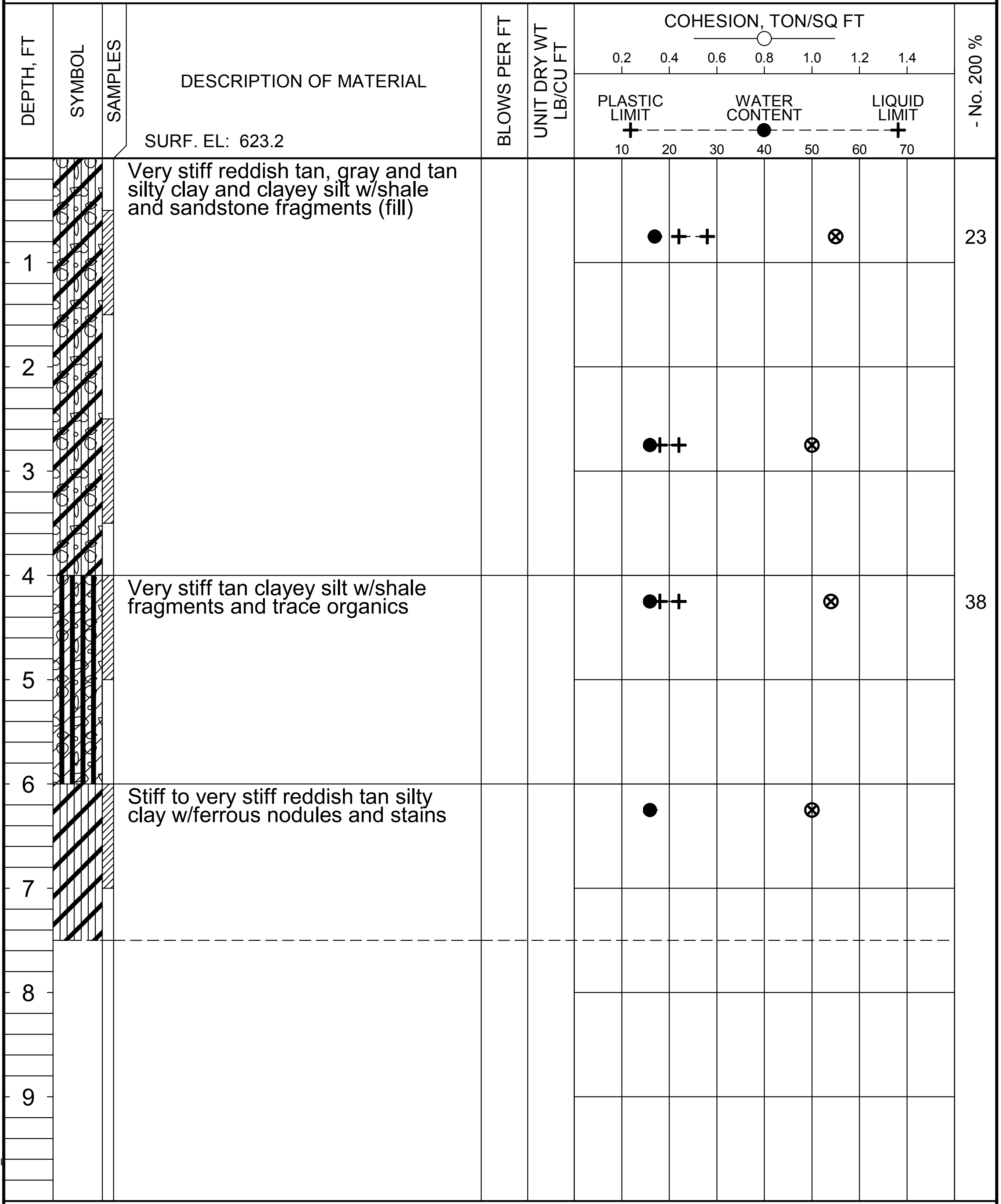
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 5A

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Backhoe
LOCATION: Approx Sta 693+25, 38 ft Rt

SURF. EL: 623.2



DEPTH, FT	DESCRIPTION OF MATERIAL	- No. 200 %
0	Very stiff reddish tan, gray and tan silty clay and clayey silt w/shale and sandstone fragments (fill)	23
4	Very stiff tan clayey silt w/shale fragments and trace organics	38
6	Stiff to very stiff reddish tan silty clay w/ferrous nodules and stains	

COMPLETION DEPTH: 7.5 ft
DATE: 10-14-13

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 10/14/2013

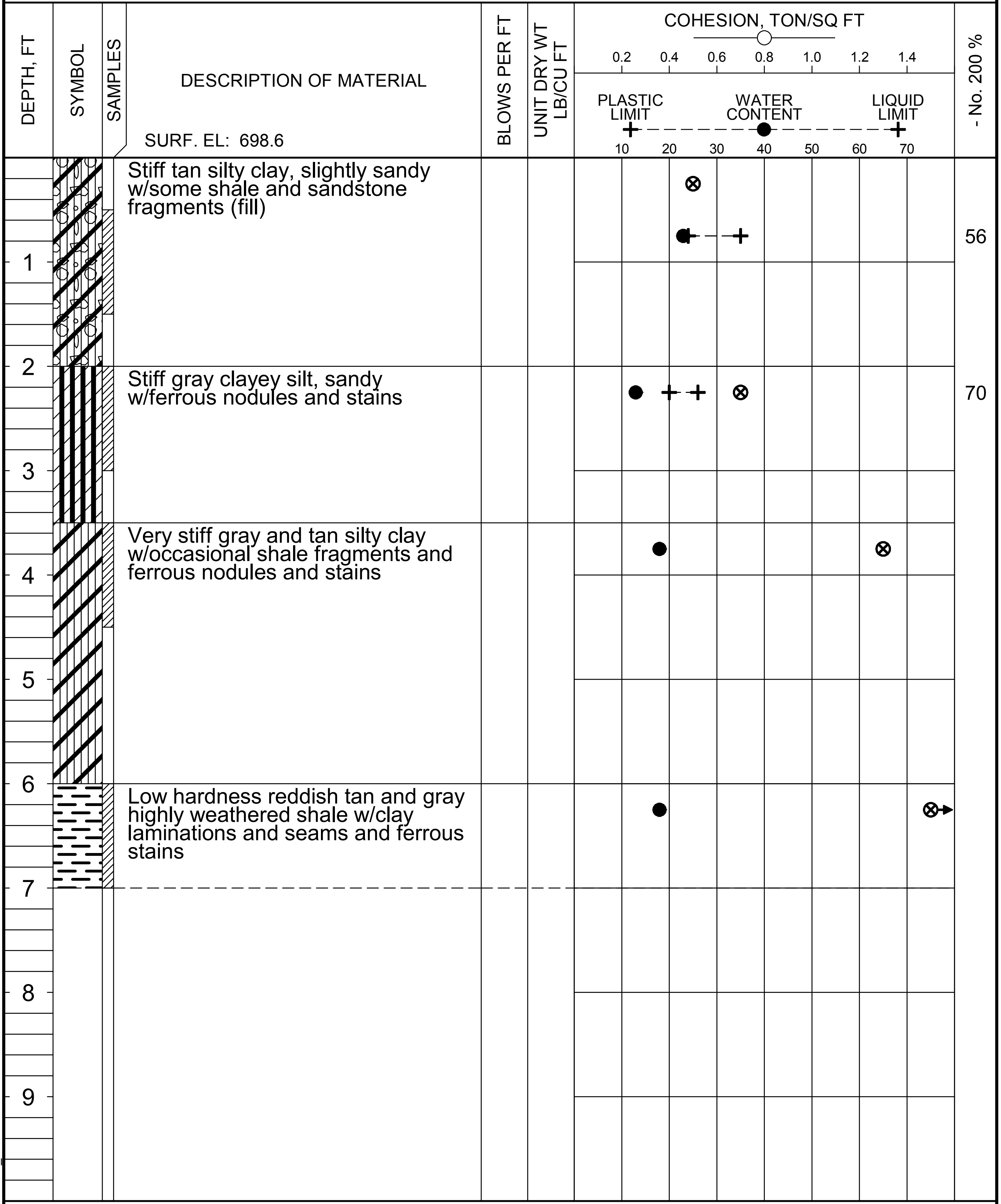
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 6A

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Backhoe

LOCATION: Approx Sta 750+86, 37 ft Rt



Description of material	- No. 200 %
Stiff tan silty clay, slightly sandy w/some shale and sandstone fragments (fill)	56
Stiff gray clayey silt, sandy w/ferrous nodules and stains	70
Very stiff gray and tan silty clay w/occasional shale fragments and ferrous nodules and stains	
Low hardness reddish tan and gray highly weathered shale w/clay laminations and seams and ferrous stains	

COMPLETION DEPTH: 7.0 ft
DATE: 10-14-13

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 10/14/2013

13-214

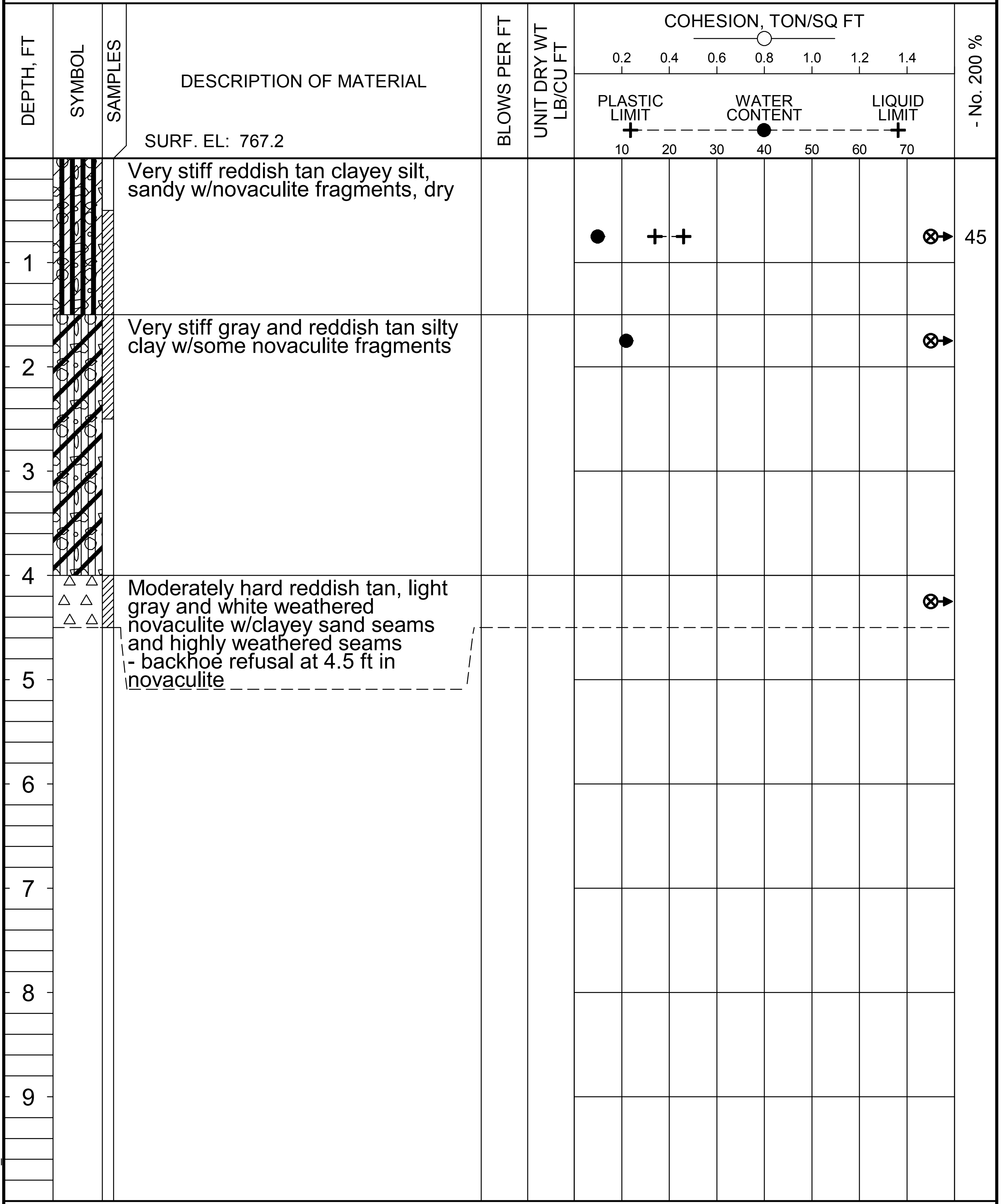
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 7A

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Backhoe

LOCATION: Approx Sta 802+80, 43 ft Rt



Very stiff reddish tan clayey silt, sandy w/novaculite fragments, dry

Very stiff gray and reddish tan silty clay w/some novaculite fragments

Moderately hard reddish tan, light gray and white weathered novaculite w/clayey sand seams and highly weathered seams

- backhoe refusal at 4.5 ft in novaculite

COMPLETION DEPTH: 4.5 ft
DATE: 10-14-13

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 10/14/2013

LTPNEW 13-214_TEST PITS.GPJ 5-11-16

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

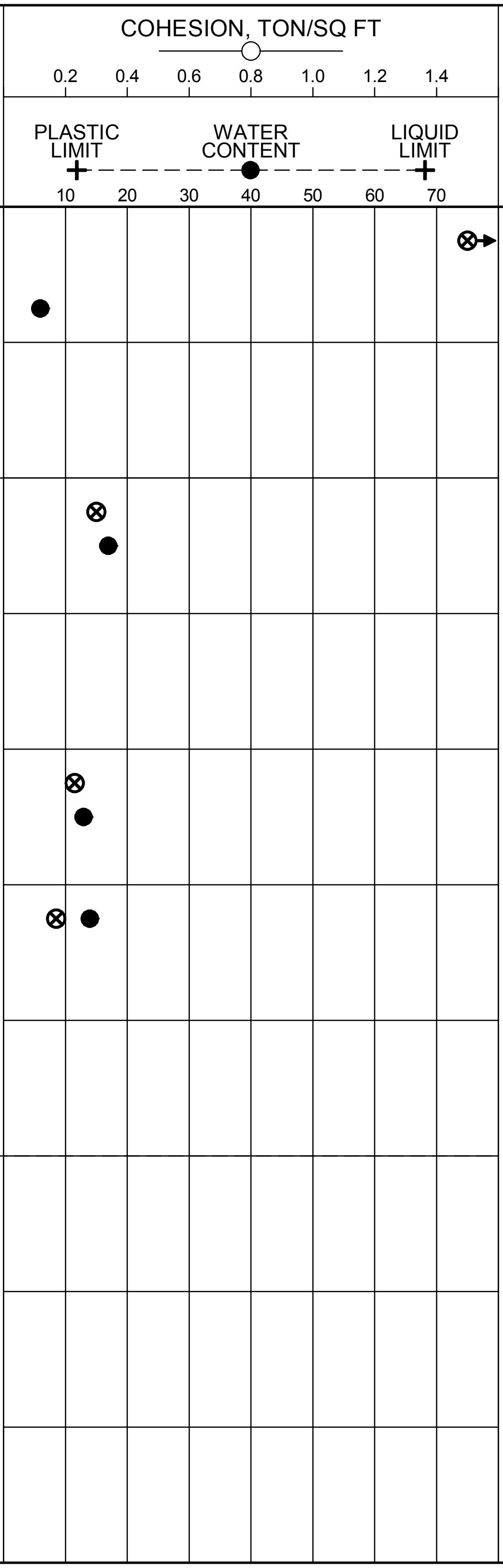
LOG OF TEST PIT NO. 8A

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Backhoe
LOCATION: Approx Sta 857+57, 22 ft Rt

SURF. EL: 549.2

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
0	Dense tan and dark gray shale fragments and novaculite fragments, crushed stone and some cobbles w/trace silty clay (fill)			
2	Firm reddish tan silty clay w/novaculite fragments (fill)			
4	- soft, damp below 4 ft			
6	- with more novaculite fragments below 6 ft			
7				



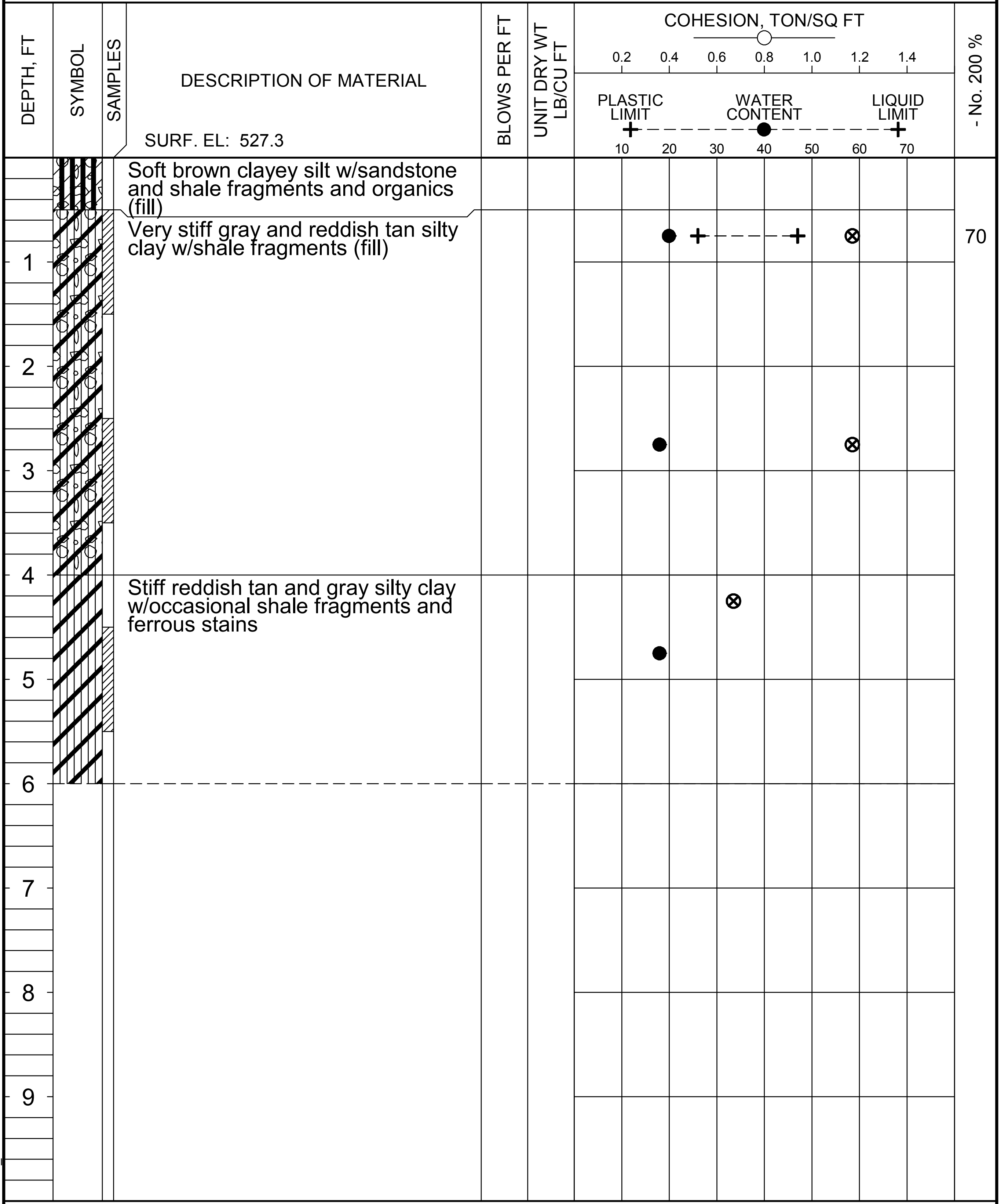
COMPLETION DEPTH: 7.0 ft
DATE: 10-14-13
DEPTH TO WATER IN TEST PIT: Dry
DATE: 10/14/2013

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

L O G O F T E S T P I T N O. 9A

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Backhoe
LOCATION: Approx Sta 910+60, 41 ft Rt



Soft brown clayey silt w/sandstone and shale fragments and organics (fill)

Very stiff gray and reddish tan silty clay w/shale fragments (fill)

Stiff reddish tan and gray silty clay w/occasional shale fragments and ferrous stains

COMPLETION DEPTH: 6.0 ft
DATE: 10-14-13
DEPTH TO WATER IN TEST PIT: Dry
DATE: 10/14/2013

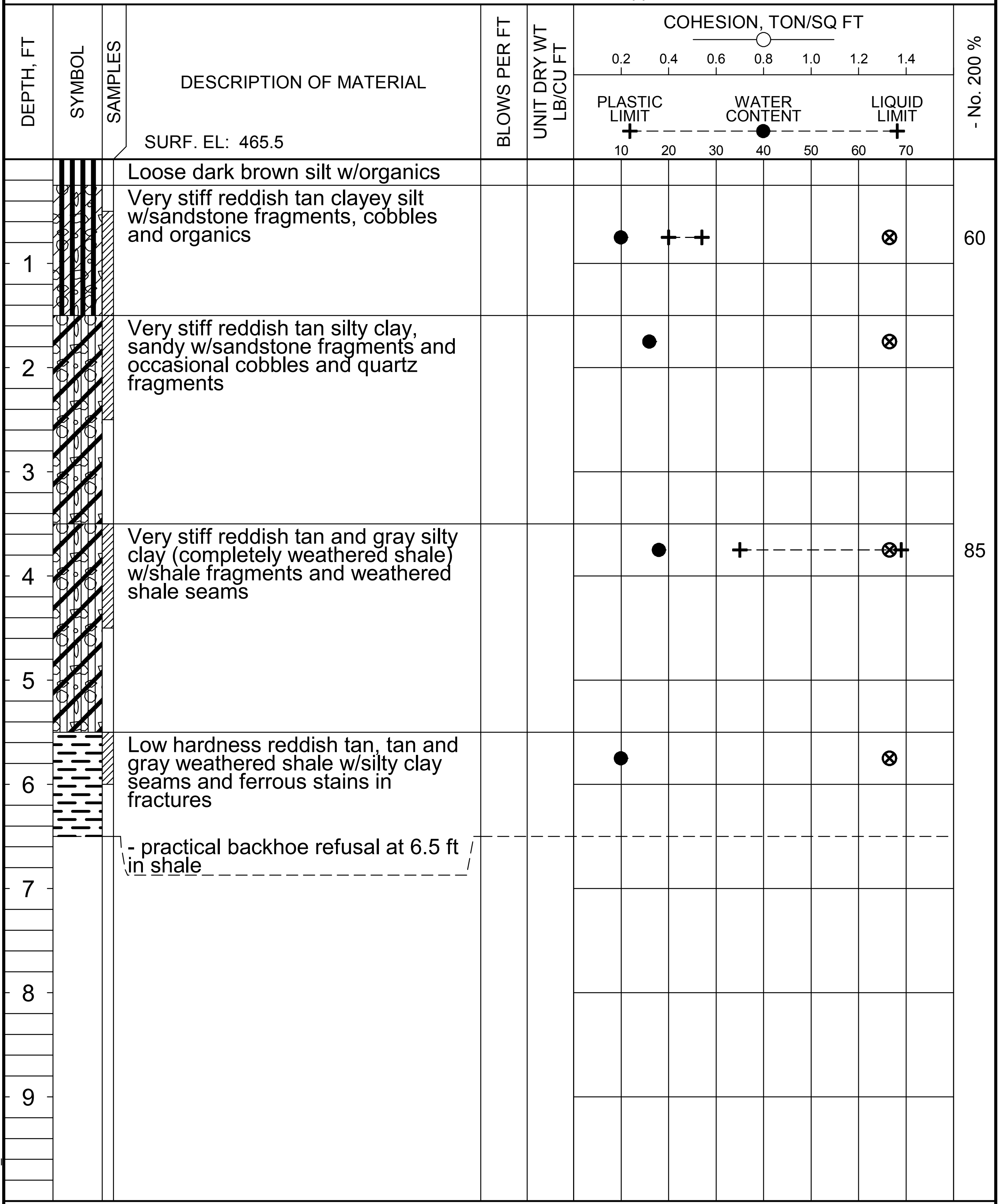
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF TEST PIT NO. 10A

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Backhoe

LOCATION: Approx Sta 964+65, 48 ft Rt



DESCRIPTION OF MATERIAL

SURF. EL: 465.5

DESCRIPTION OF MATERIAL	- No. 200 %
Loose dark brown silt w/organics	
Very stiff reddish tan clayey silt w/sandstone fragments, cobbles and organics	60
Very stiff reddish tan silty clay, sandy w/sandstone fragments and occasional cobbles and quartz fragments	
Very stiff reddish tan and gray silty clay (completely weathered shale) w/shale fragments and weathered shale seams	85
Low hardness reddish tan, tan and gray weathered shale w/silty clay seams and ferrous stains in fractures	

- practical backhoe refusal at 6.5 ft in shale

COMPLETION DEPTH: 6.5 ft
DATE: 10-14-13

DEPTH TO WATER
IN TEST PIT: Dry

DATE: 10/14/2013

Form 108-6(74) Job No. 13-214

13-214

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. C6

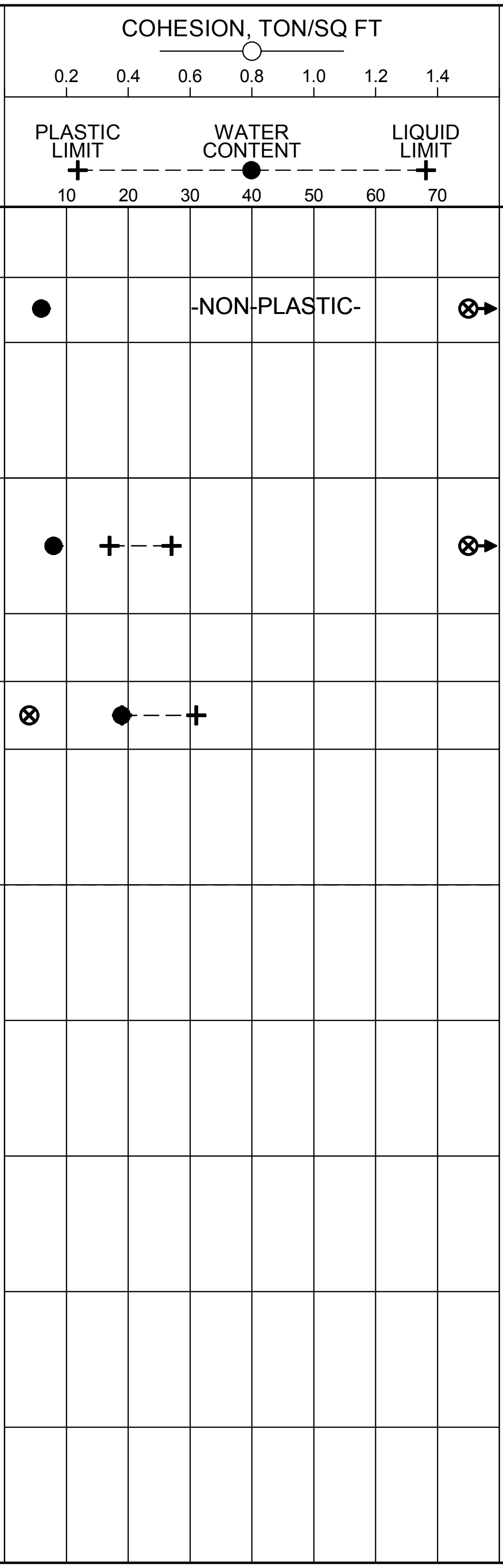
AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Auger

LOCATION: Approx Sta 545+26, 14 ft Lt

SURF. EL: 524.8

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
0	4.25 inches: Asphalt Concrete			
	2 inches: Crushed Stone Base			
	Medium dense to dense sandy fine to coarse crushed novaculite fragments (fill)			8
2	Very stiff dark gray silty clay and shale fragments (fill)			26
3.5	Soft gray and brown silty clay, sandy w/trace decayed organics			78
5				



COMPLETION DEPTH: 5.0 ft
DATE: 3-19-14

DEPTH TO WATER
IN BORING: Dry

DATE: 3/19/2014

LGBNEW 13-214_HWY 70_BORINGS.GPJ 5-11-16

ATTACHMENT 4

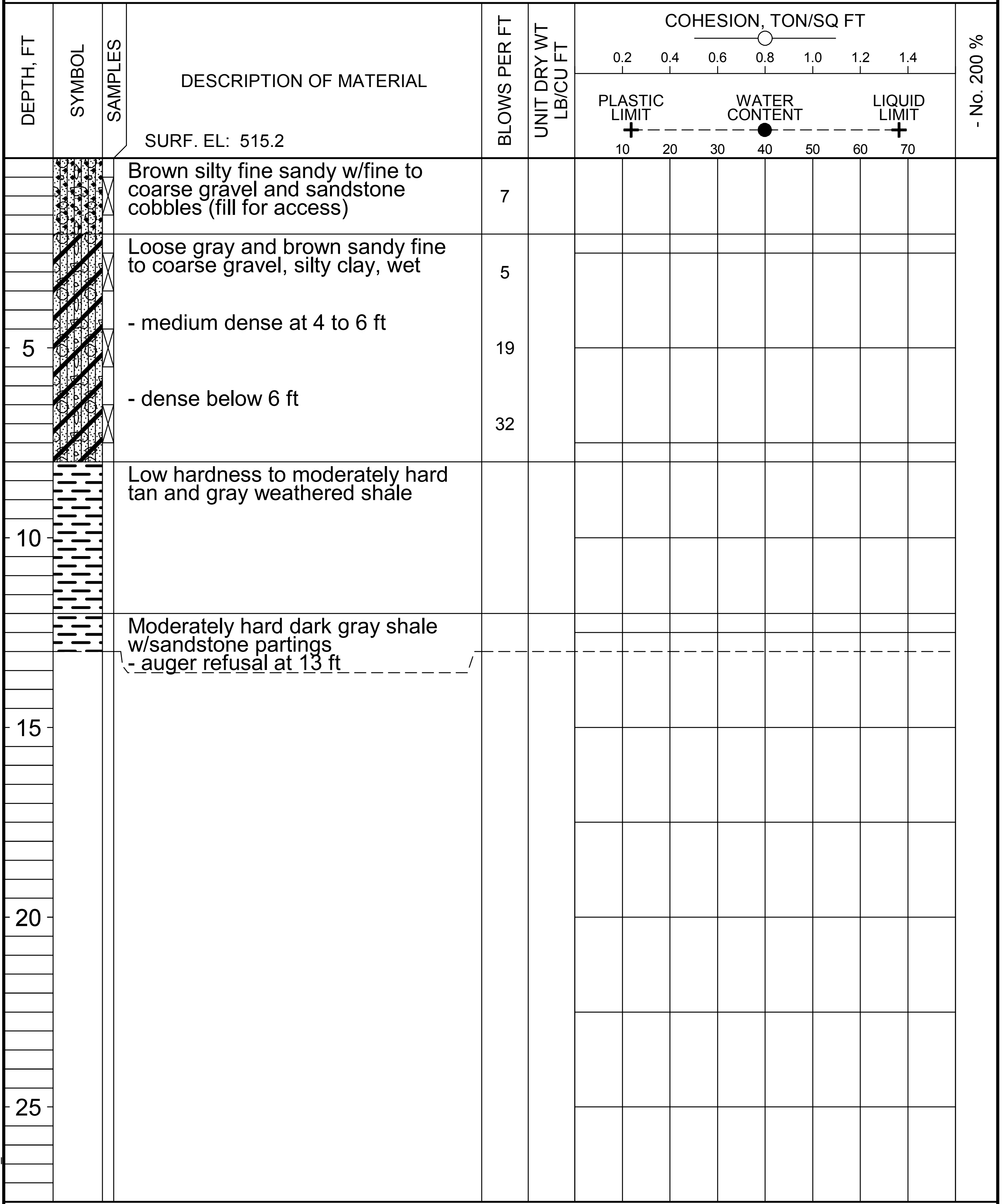
Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. S1

AHTD CA0606: US 70 over Ten Mile Creek (West)
Garland County, Arkansas

TYPE: Auger

LOCATION: Approx Sta 870+64, 19 ft Rt



SURF. EL: 515.2

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT
0–2	Brown silty fine sandy w/fine to coarse gravel and sandstone cobbles (fill for access)	7
2–8	Loose gray and brown sandy fine to coarse gravel, silty clay, wet	5
	- medium dense at 4 to 6 ft	19
	- dense below 6 ft	32
8–12	Low hardness to moderately hard tan and gray weathered shale	
12–13	Moderately hard dark gray shale w/sandstone partings - auger refusal at 13 ft	

COMPLETION DEPTH: 13.0 ft
DATE: 3-21-14

DEPTH TO WATER
IN BORING: 2 ft

DATE: 3/21/2014

Form 108-6(74) Job No. 13-214

13-214

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. S1B

AHTD CA0606: US 70 over Ten Mile Creek (West)
Garland County, Arkansas

TYPE: Auger to 11 ft /Wash

LOCATION: Approx Sta 870+59, 18 ft Rt

COHESION, TON/SQ FT: 0.2 0.4 0.6 0.8 1.0 1.2 1.4

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70

DEPTH, FT	DESCRIPTION OF MATERIAL SURF. EL: 515.6	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %	% Recovery	% RQD
	Brown silty fine sand w/fine to coarse sandstone gravel and fragments and cobbles (fill for access)					
	Dense brown sandy fine to coarse gravel	50/5"				
	Dense tan sandy fine to coarse gravel, slightly silty - water at 4 ft	50/5"				
5						
	- with some coarse gravel and cobbles below 6 ft	50/4"				
10						
	Low hardness to moderately hard tan and gray weathered shale					
	Moderately hard dark gray shale, carbonaceous w/very close sandstone partings, seams and inclusions, fractured					
15						
					27	0
20						
					40	0
25						

COMPLETION DEPTH: 24.0 ft
DATE: 5-7-14

DEPTH TO WATER
IN BORING: 4 ft

DATE: 5/7/2014

RECRQDN200-2 13-214_TEN MILE CREEK.GPJ 5-11-16

13-214

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. S2

AHTD CA0606: US 70 over Ten Mile Creek (West)
Garland County, Arkansas

TYPE: Auger

LOCATION: Approx Sta 871+09, 21 ft Rt

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURF. EL: 513.2	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT 0.2 0.4 0.6 0.8 1.0 1.2 1.4 PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT 10 20 30 40 50 60 70	- No. 200 %
			Loose brown silty fine sand w/fine to coarse sandstone fragments, fine gravel and cobbles (fill for access)	7			
5			Medium dense brown sandy fine to coarse gravel w/sandy clay pockets	13			
			Low hardness tan and dark gray weathered shale	37			
			- auger refusal at 8 ft				
10			NOTE: Water at surface at completion.				
15							

COMPLETION DEPTH: 8.0 ft
DATE: 3-21-14

DEPTH TO WATER
IN BORING: 3.5 ft

DATE: 3/21/2014

Form 108-6(74) Job No. 13-214

13-214

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. S2B

AHTD CA0606: US 70 over Ten Mile Creek (West)
Garland County, Arkansas

TYPE: Auger to 9 ft /Wash

LOCATION: Approx Sta 871+04, 20 ft Rt

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURF. EL: 513.6	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT 0.2 0.4 0.6 0.8 1.0 1.2 1.4 PLASTIC LIMIT WATER CONTENT LIQUID LIMIT 10 20 30 40 50 60 70	- No. 200 %	% Recovery	% RQD
			Brown silty fine sand w/fine to coarse sandstone fragments, fine gravel and cobbles (fill for access)	19					
				50/5"					
			- water at 3 ft						
5			Dense brown sandy fine to coarse gravel	50/9"					
			- coarse gravel and cobbles below 6 ft	30/0"					
			Moderately hard tan and dark gray weathered shale	30/0"					
10			Moderately hard dark gray and very dark gray shale, carbonaceous w/close sandstone seams and quartz veins						
								30	0
15									
			(limited recovery in both core runs)					8	0
20									
			NOTE: Set 10 ft casing.						
25									

RECRQDN200-2 13-214_TEN MILE CREEK.GPJ 5-11-16

COMPLETION DEPTH: 21.0 ft
DATE: 5-7-14

DEPTH TO WATER
IN BORING: 3 ft

DATE: 5/7/2014

PLATE 5

13-214

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

L O G O F B O R I N G N O. S3

AHTD CA0606: US 70 over Ten Mile Creek (West)
Garland County, Arkansas

TYPE: Auger

LOCATION: Approx Sta 871+53, 17 ft Rt

SURF. EL: 511.6

COHESION, TON/SQ FT: 0.2, 0.4, 0.6, 0.8, 1.0, 1.2, 1.4

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10, 20, 30, 40, 50, 60, 70

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
0	Loose brown fine to coarse sandy fine to coarse gravel and sandstone cobbles w/some sandy clay (fill for access)	8		
3	Low hardness tan and dark gray weathered shale	24		
3.5	- auger refusal at 3.5 ft			

COMPLETION DEPTH: 3.5 ft
DATE: 3-21-14

DEPTH TO WATER
IN BORING: 1 ft

DATE: 3/21/2014

Form 108-6(74) Job No. 13-214

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. S4

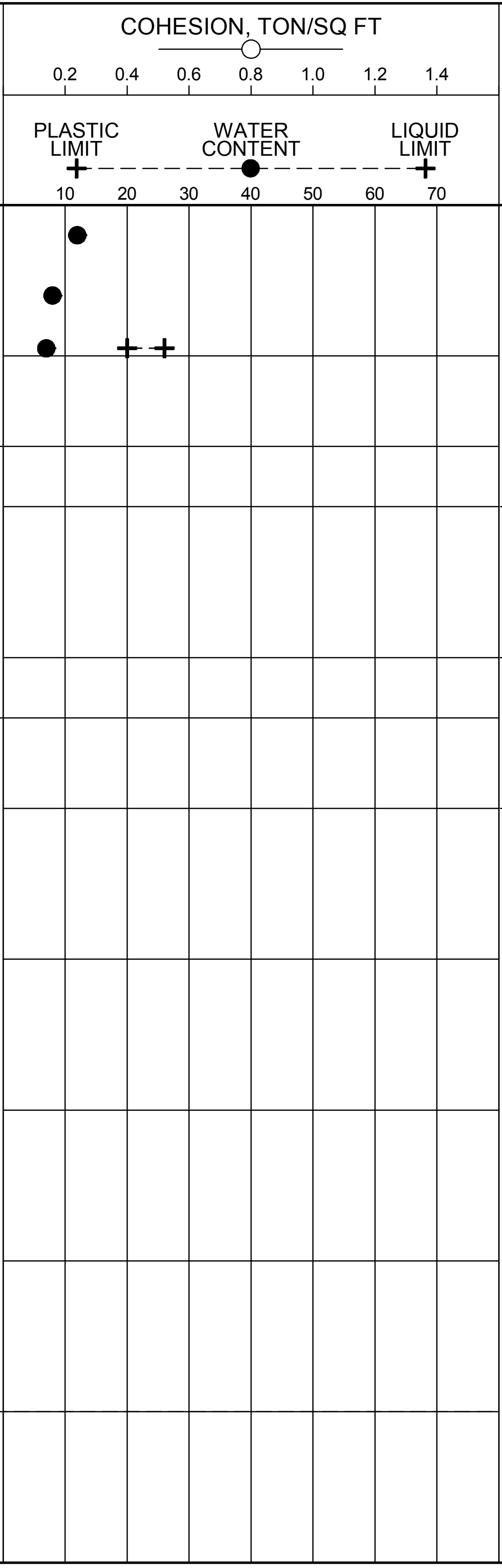
AHTD CA0606: US 70 over Ten Mile Creek (West)
Garland County, Arkansas

TYPE: Auger to 8.5 ft /Wash

LOCATION: Approx Sta 871+98, 35 ft Rt

SURF. EL: 514.5

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %	% Recovery	% RQD
	Medium dense brown clayey fine to coarse sand and fine to coarse gravel (fill)	21				
		19				
5		26		11		
	- water at 6 ft	50/2"				
	Moderately hard tan and very dark gray slightly weathered arenaceous shale, carbonaceous w/close sandstone partings and quartz inclusions	25/0"				
10						
					72	10
	- with pyrite seams and inclusions below 13 ft					
15						
	Moderately hard to hard dark gray shale w/close quartz veins and inclusions and sandstone partings				35	0
20						
		25/0"				
25						
		25/0"				
30						
		25/0"				
35						
		25/0"				
40						



COMPLETION DEPTH: 40.0 ft
DATE: 3-20-14

DEPTH TO WATER
IN BORING: 6 ft

DATE: 3/20/2014

RECRQDN200-2 13-214_TEN MILE CREEK.GPJ 5-11-16

13-214

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. S5

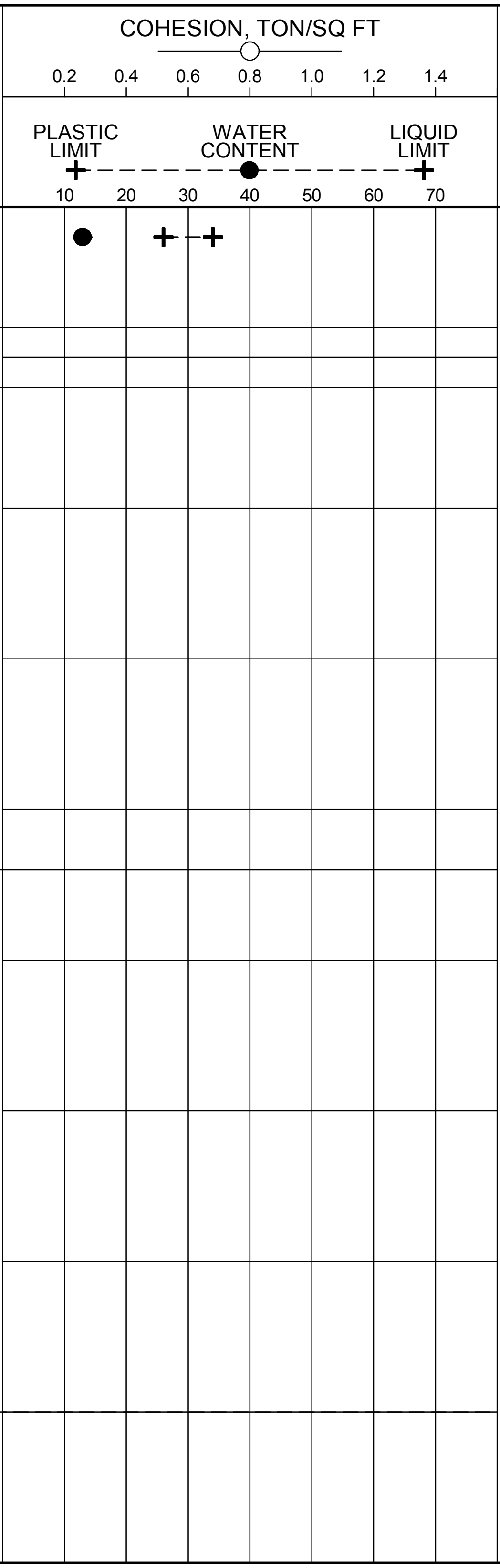
AHTD CA0606: US 70 over Ten Mile Creek (West)
Garland County, Arkansas

TYPE: Auger to 7 ft /Wash

LOCATION: Approx Sta 872+46, 29 ft Rt

SURF. EL: 513.8

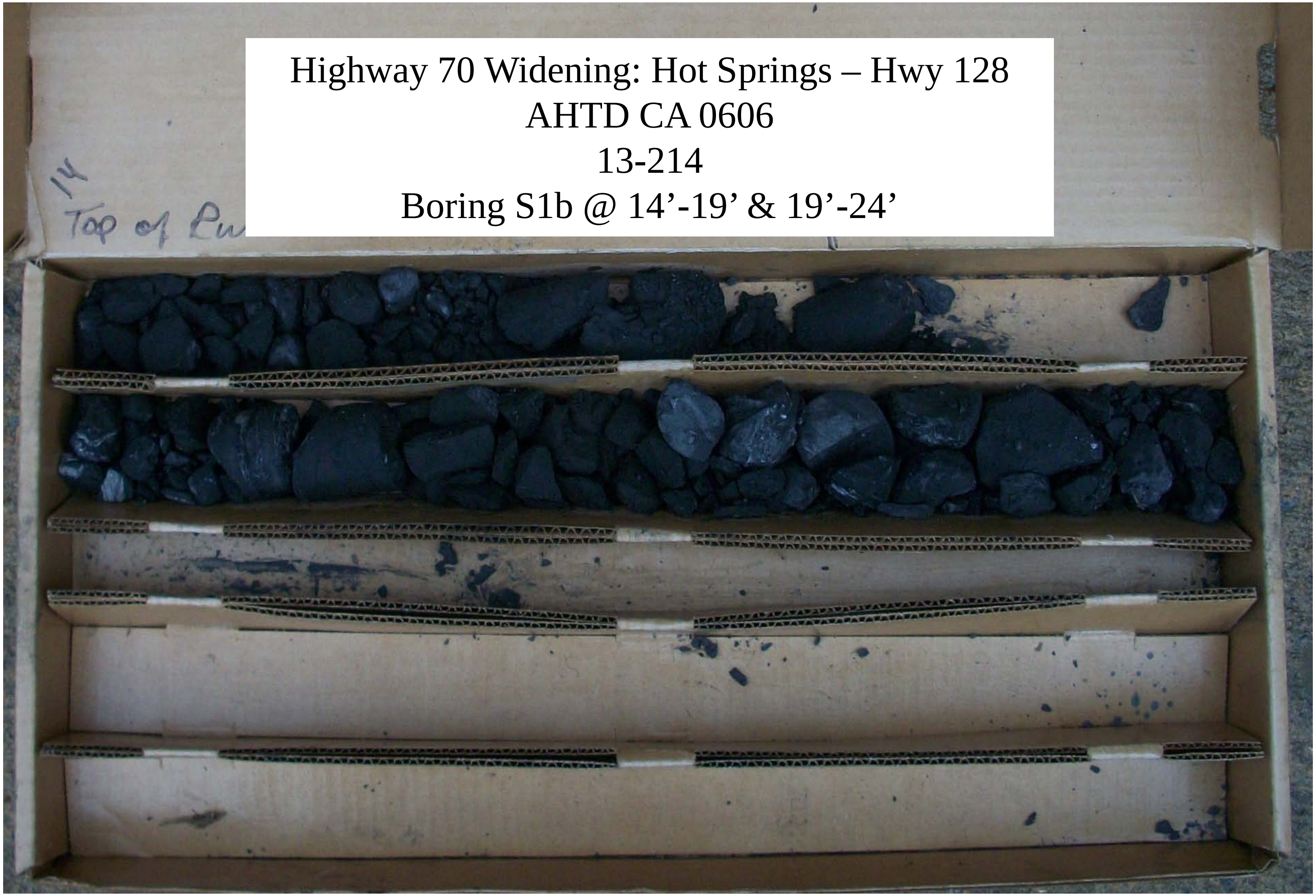
DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
0–4	Medium dense brown clayey fine to coarse sand and shale fragments and fine to coarse gravel (fill)	15 20		22
4–6	Dense brown sandy fine to coarse gravel	43		
6–22	Moderately hard tan and very dark gray slightly weathered shale, carbonaceous w/occasional quartz inclusions and close sandstone seams and partings - auger refusal at 7 ft - core barrel plugged at 15 ft, no recovery	25/0" 25/0" 25/0" 25/0"		
22–40	Moderately hard to hard very dark gray shale, carbonaceous w/occasional quartz inclusions and veins	25/0" 25/0" 25/0" 25/0"		



COMPLETION DEPTH: 40.0 ft
DATE: 3-20-14

DEPTH TO WATER
IN BORING: 5 ft

DATE: 3/20/2014



Highway 70 Widening: Hot Springs – Hwy 128
AHTD CA 0606
13-214
Boring S1b @ 14’-19’ & 19’-24’

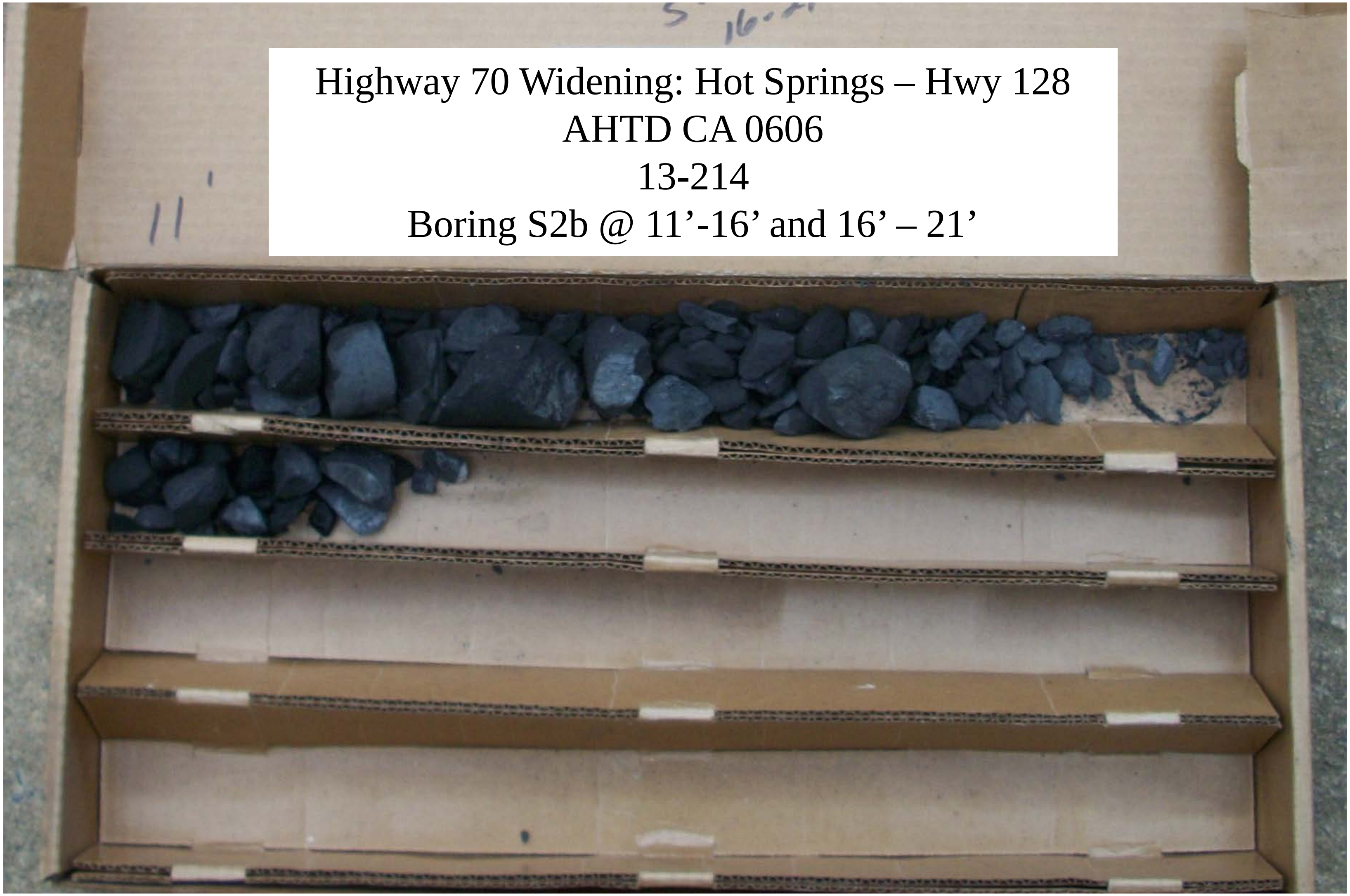
Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

ROCK CORE PHOTOGRAPH

HWY 70 WIDENING / HOT SPRINGS – HWY 128
AHTD JOB NO. CA 0606 – GARLAND COUNTY, AR
BORING S1b, 14 – 19 FT AND 19 – 24 FT

Job No. 13-214

Plate



Highway 70 Widening: Hot Springs – Hwy 128
AHTD CA 0606
13-214
Boring S2b @ 11’-16’ and 16’ – 21’

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

ROCK CORE PHOTOGRAPH

HWY 70 WIDENING / HOT SPRINGS – HWY 128
AHTD JOB NO. CA 0606 – GARLAND COUNTY, AR
BORING S2b, 11 – 16 FT AND 16 – 21 FT

Job No. 13-214

Plate

Highway 70 Widening: Hot Springs – Hwy 128
AHTD CA 0606
13-214
Boring S4 @ 10’-15’ and 15’- 20’

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

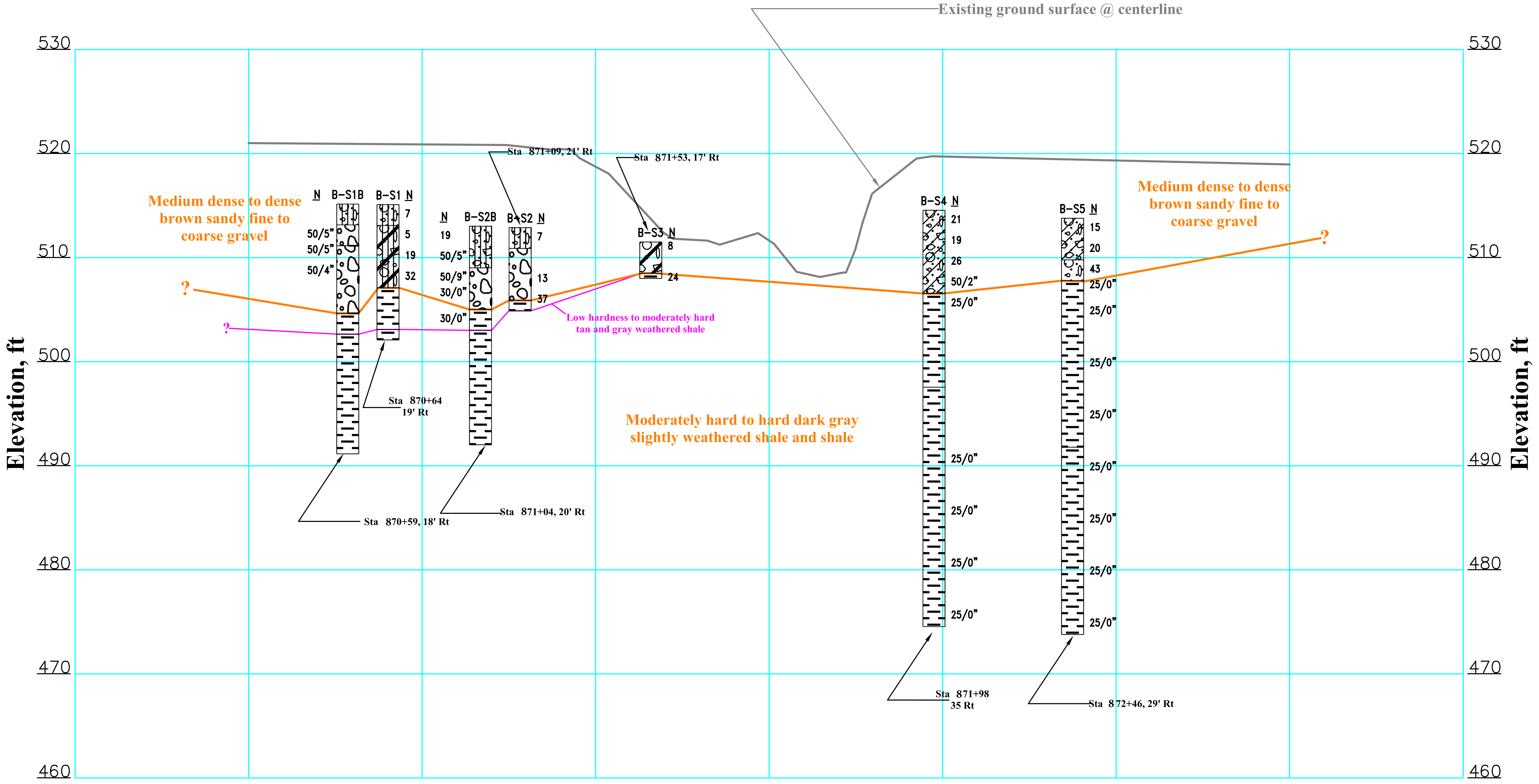
ROCK CORE PHOTOGRAPH

HWY 70 WIDENING / HOT SPRINGS – HWY 128
AHTD JOB NO. CA 0606 – GARLAND COUNTY, AR
BORING S4, 10 – 15 FT AND 15 – 20 FT

Job No. 13-214

Plate

ATTACHMENT 5



Note: Subsurface conditions have been inferred from discrete boring locations; actual conditions may vary.

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Generalized Subsurface Profile
AHTD JOB CA0606: US 70 over Ten Mile Creek (West)
Garland County, Arkansas

GHBW Job No.: 13-214

Scale: As Shown

November 14, 2015

Plate

ATTACHMENT 6

Grubbs, Hoskyn, Barton & Wyatt, Inc.
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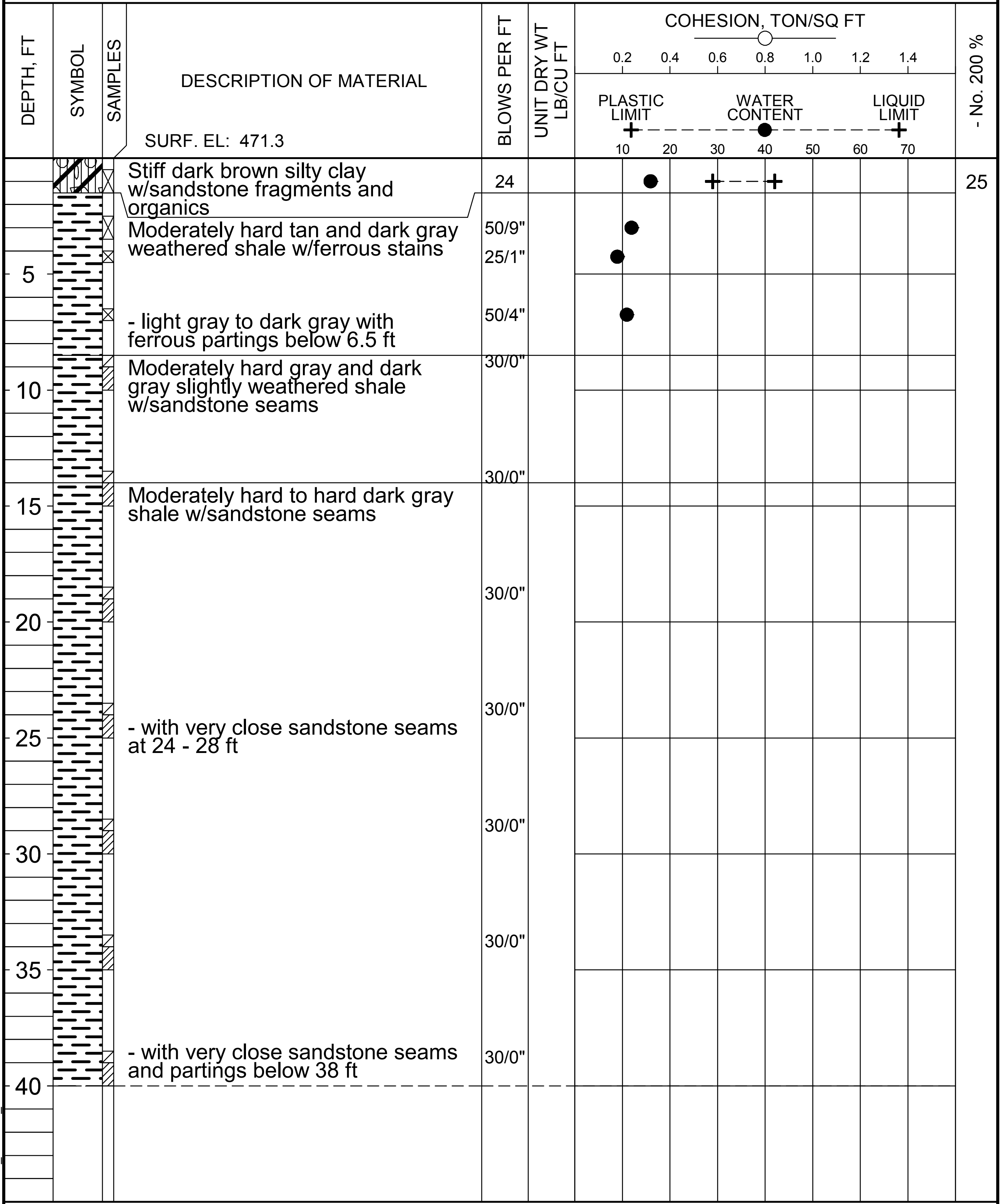
LOG OF BORING NO. ROW1

AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Auger to 8.5 ft /Wash
LOCATION: Approx Sta 489+14, 124 ft Lt



SURF. EL: 471.3

DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
Stiff dark brown silty clay w/sandstone fragments and organics	24		25
Moderately hard tan and dark gray weathered shale w/ferrous stains	50/9"		
	25/1"		
- light gray to dark gray with ferrous partings below 6.5 ft	50/4"		
Moderately hard gray and dark gray slightly weathered shale w/sandstone seams	30/0"		
	30/0"		
Moderately hard to hard dark gray shale w/sandstone seams			
	30/0"		
- with very close sandstone seams at 24 - 28 ft	30/0"		
	30/0"		
	30/0"		
- with very close sandstone seams and partings below 38 ft	30/0"		

COMPLETION DEPTH: 40.0 ft
DATE: 5-16-14

DEPTH TO WATER
IN BORING: Dry to 8.5 ft
DATE: 5/16/2014

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. ROW2

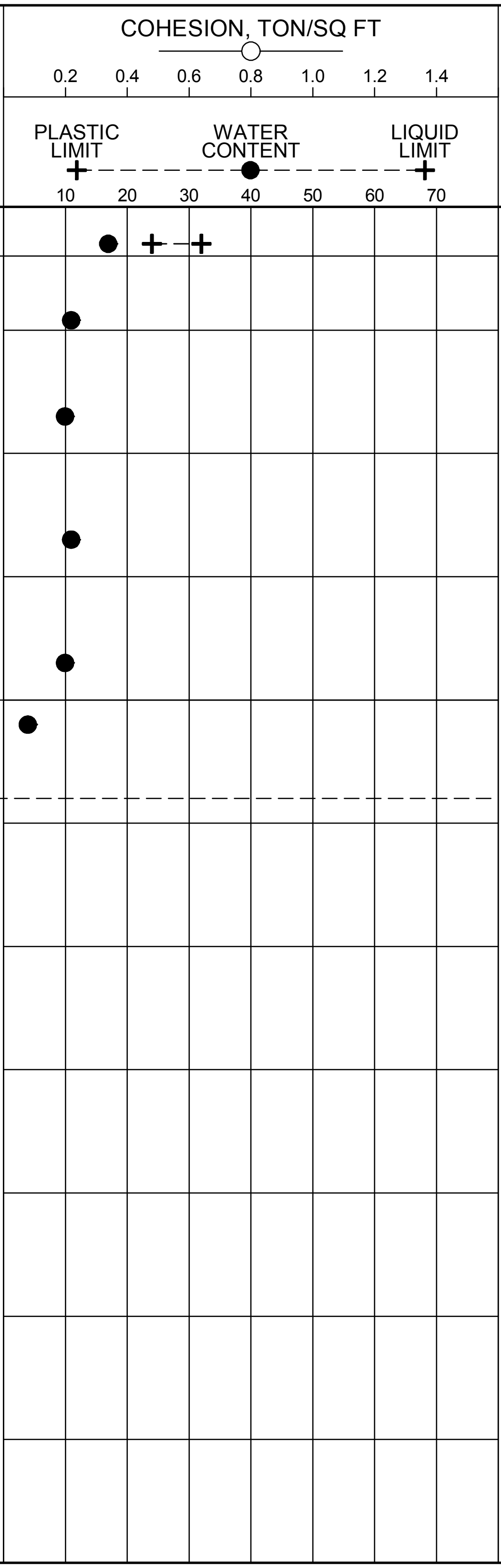
AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Auger

LOCATION: Approx Sta 490+77, 126 ft Lt

SURF. EL: 478.9

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
	Firm reddish brown silty clay w/numerous shale fragments	21		35
	Moderately soft tan weathered shale w/ferrous stains	50/7"		
		25/2"		
5		30/0"		
	- with dark gray below 9 ft	30/0"		
10	Hard gray fine-grained sandstone			
	- auger refusal at 12 ft			
15				
20				
25				



COMPLETION DEPTH: 12.0 ft
DATE: 5-17-14

DEPTH TO WATER
IN BORING: Dry

DATE: 5/17/2014

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. ROW3

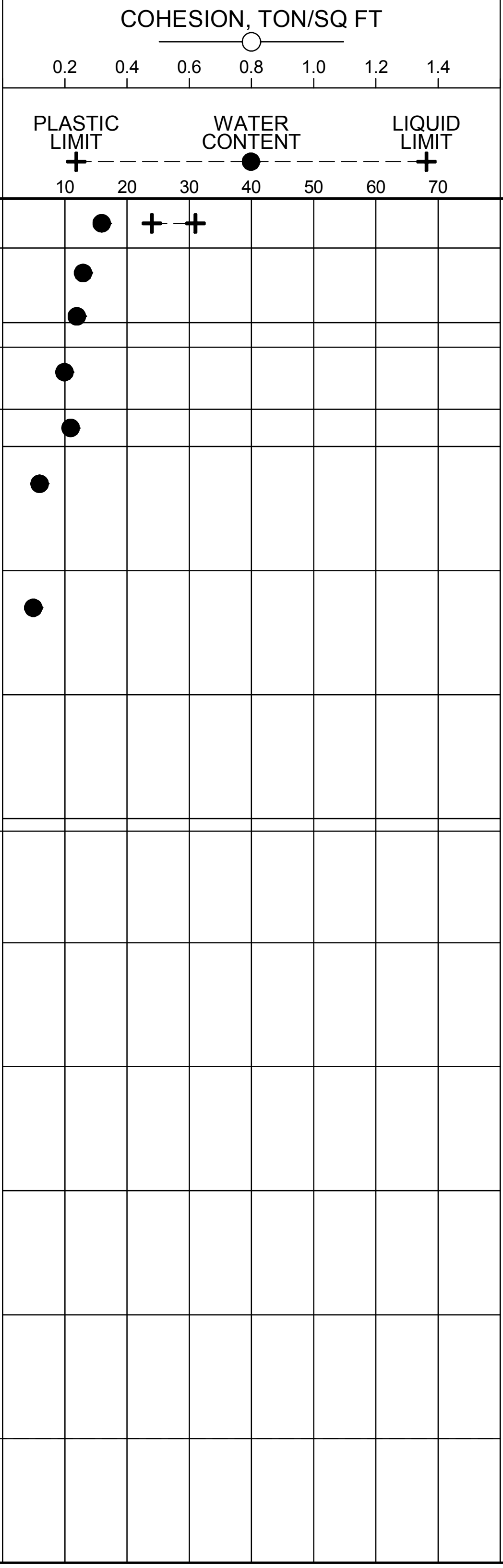
AHTD CA0606 - Hwy 70 Widening to Hwy 128
Garland County, Arkansas

TYPE: Auger to 18.5 ft /Wash

LOCATION: Approx Sta 492+39, 123 ft Lt

SURF. EL: 484.1

DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
Stiff to very stiff brown, reddish brown and gray silty clay w/shale fragments	24		25
Moderately soft reddish brown, light brown and light gray highly weathered shale, 30° dip ±	21		
	50/6"		
Moderately soft to moderately hard gray and dark gray weathered shale	50/2"		
Moderately hard to hard gray and dark gray slightly weathered shale	30/0"		
	30/0"		
- hard with numerous sandstone seams and quartz inclusions below 16 ft	30/0"		
	30/0"		
Moderately hard to hard dark gray shale w/occasional sandstone seams and partings	30/0"		
	30/0"		
	30/0"		
	30/0"		
	30/0"		



DEPTH, FT: 5, 10, 15, 20, 25, 30, 35, 40, 45, 50

COMPLETION DEPTH: 50.0 ft
DATE: 5-19-14

DEPTH TO WATER
IN BORING: Dry

DATE: 5/19/2014

SUMMARY OF CUT SLOPE FACE OBSERVATIONS

PROJECT: AHTD CA0606 - Hot Springs-Hwy 128 (Widening) (S)
LOCATION: Garland County, Arkansas
GHBW JOB No.: 13-214

Approx Sta	Offset	Approx Steepest Current Config	Slope Face Observations	Comments
494+00 to 496+00	Left	2.8H:1V	Moderately weathered shale outcrop at approx 10 ft above US 70 road grade. Shale has apparent dip of 15˚ South. Numerous shale and sandstone fragments along top of slope.	Drilled B-ROW1 at approx Sta 489+14, 124 ft Lt and B-ROW2 at approx Sta 490+77, 126 ft Lt and B-ROW3 at approx Sta 492+39, 123 ft Lt; cut slope faces mapped by geotechnical engineer
502+00 to 506+00	Right	2.3H:1	No outcrops in area. Numerous shale boulders along hillside. Numerous shale fragments at the base of trees along top of slope.	Cut slope faces mapped by geotechnical engineer
518+00 to 528+00	Left	2H:1V	Moderately weathered shale exposed in access easement road at top of slope. Moderately weathered shale outcrop on South side of US 70. Shale has apparent dip of 10˚ Southwest.	Cut slope faces mapped by geotechnical engineer
588+00 to 595+00	Left	1.5H:1V	Moderately weathered shale outcrops at top and bottom of slope with apparent dip of 45˚ South. Numerous shale and sandstone cobble along top of slope. Moderately weathered shale outcrop exposed at bottom of slope near Sta 592+00 with apparent dip of 10˚ North.	Cut slope faces mapped by geotechnical engineer
600+00 to 605+00	Left	1H:1V	Moderately weathered shale outcrop approx 5 ft above US 70 road grade. Shale also exposed at approx 10 ft below top of slope. Shale has apparent dip of 20˚-30˚ South. Numerous shale and sandstone cobbles along top of slope.	Cut slope faces mapped by geotechnical engineer

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SUMMARY OF CUT SLOPE FACE OBSERVATIONS

PROJECT: AHTD CA0606 - Hot Springs-Hwy 128 (Widening) (S)
LOCATION: Garland County, Arkansas
GHBW JOB No.: 13-214

Approx Sta	Offset	Approx Steepest Current Config	Slope Face Observations	Comments
670+00 to 674+00	Left	1:7H:1V	Moderately weathered shale outcrop at approx 5 ft above US 70 road grade. Moderately weathered shale exposed on slope face approx 2 ft below top of slope. Shale has apparent dip of 5˚-10˚ North. Numerous shale and sandstone cobbles and boulders along top of slope.	Cut slope faces mapped by geotechnical engineer
680+00 to 707+00	Left	1.4H:1V	Numerous shale fragments and sandstone cobbles scattered along slope near Sta 681+00. Moderately weathered shale outcrop approx 5 ft above US 70 road grade near Sta 702+00. Shale has apparent dip of 10˚-15˚ North.	Cut slope faces mapped by geotechnical engineer
789+00 to 795+00	Right	0.5H:1V	Massive novaculite outcrop exposed approx 5 ft above US 70 road grade. Novaculite is weathered at surface and has apparent dip of 85˚-90˚ North and strike is at ±25˚ West. Apparent joint spacing in novaculite is 12 in. to 18 in. Fault gouge apparent in slope face. No apparent shotholes in slope face. Numerous novaculite fragments scattered across top of slope.	Cut slope faces mapped by geotechnical engineer
799+00 to 809+00	Left	1H:1V	Massive novaculite outcrop exposed on north side of US 70. Novaculite is weathered at surface and has apparent dip of 20˚ North and strike of ±10˚ West. Fault gouge apparent in slope face. Novaculite is ripable with no apparent shotholes in slope face. Novaculite pinches out towards the east, near Sta 808+50. Highly weathered shale exposed beneath Novaculite. Shale exposed in slope face to the east of Sta 808+50. Shale has interbedded sandstone seams and layers with apparent dip of 15˚ North.	Cut slope faces mapped by geotechnical engineer

SUMMARY OF CUT SLOPE FACE OBSERVATIONS

PROJECT: AHTD CA0606 - Hot Springs-Hwy 128 (Widening) (S)
LOCATION: Garland County, Arkansas
GHBW JOB No.: 13-214

Approx Sta	**Offset**	**Approx Steepest Current Config**	**Slope Face Observations**	**Comments**
819+00 to 827+00	Left	1.7H:1V	Moderately weathered shale outcrop exposed approx 5 ft below top of slope near Sta 820+00 with apparent dip of 5˚-10˚ West. Moderately weathered shale outcrop exposed about 5 ft above US 70 road grade, near Sta 824+00 with apparent dip of 15˚-20˚ North. Some minor surface slumps apparent along hillside.	Cut slope faces mapped by geotechnical engineer
857+00 to 859+00	Right	3.7H:1V	Novaculite cobbles and boulders in stump hole approx 5 ft above US 70 road grade. Numerous novaculite fragments scattered along top of slope. No outcrops apparent in the area.	Cut slope faces mapped by geotechnical engineer
865+00 to 868+00	Right	2H:1V	Numerous novaculite fragments and cobbles scattered across top of slope. Novaculite fragments around base of trees along hillside. No outcrops apparent in the area.	Cut slope faces mapped by geotechnical engineer
881+00 to 883+00	Left	1H:1V	Massive novaculite outcrop exposed approx 20 ft above US 70 road grade. Novaculite is weathered near the surface and has apparent dip of 10˚ North.	Cut slope faces mapped by geotechnical engineer
885+00 to 886+00	Right	2H:1V	Numerous shale fragments scattered along base of slope. Moderately weathered shale cobbles with some sandstone seams and quartz veins in stump hole at approx 10 ft below top of slope. Numerous shale and sandstone fragments at top of slope.	Cut slope faces mapped by geotechnical engineer

SUMMARY OF CUT SLOPE FACE OBSERVATIONS

PROJECT: AHTD CA0606 - Hot Springs-Hwy 128 (Widening) (S)
LOCATION: Garland County, Arkansas
GHBW JOB No.: 13-214

Approx Sta	Offset	Approx Steepest Current Config	Slope Face Observations	Comments
891+00 to 893+00	Left and Right	1H:1V	Moderately weathered shale outcrop exposed at top of slope on North side of US 70. Shale has interbedded sandstone seams and layers with apparent dip of 5˚ South. Moderately weathered shale also exposed at top of slope on South side of US 70.	Cut slope faces mapped by geotechnical engineer
965+00 to 967+00	Left	2H:1V	Numerous shale fragments scattered across top and bottom of slope. Moderately weathered shale fragments and cobbles in stump hole at top of slope. Few quartz cobbles scattered across top of slope. No outcrops apparent in the area.	Cut slope faces mapped by geotechnical engineer
975+00	Right	2.5H:1V	Numerous weathered shale and quartz fragments scattered across the surface and around the base of trees on top of the slope. No outcrops apparent in the area.	Cut slope faces mapped by geotechnical engineer

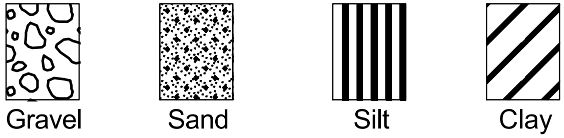
ATTACHMENT 7

**Grubbs, Hoskyn,
Barton & Wyatt, Inc.**
Consulting Engineers

SYMBOLS AND TERMS USED ON BORING LOGS

SOIL TYPES

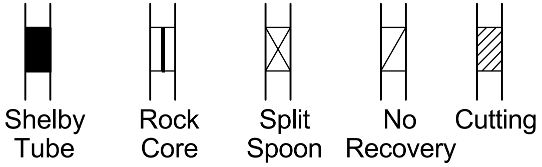
(SHOWN IN SYMBOLS COLUMN)



Predominant type shown heavy

SAMPLER TYPES

(SHOWN ON SAMPLES COLUMN)



TERMS DESCRIBING CONSISTENCY OR CONDITION

COARSE GRAINED SOILS (major portion retained on No. 200 sieve): Includes (I) Clean gravels and sands, and (2) silty or clayey gravels and sands. Condition is rated according to relative density, as determined by laboratory tests.

DESCRIPTIVE TERM	N-VALUE	RELATIVE DENSITY
VERY LOOSE	0-4	0-15%
LOOSE	4-10	15-35%
MEDIUM DENSE	10-30	35-65%
DENSE	30-50	65-85%
VERY DENSE	50 and above	85-100%

FINE GRAINED SOILS (major portion passing No. 200 sieve): Includes (1) Inorganic and organic silts and clays, (2) gravelly, sandy, or silty clays, and (3) clayey silts. Consistency is rated according to shearing strength, as indicated by penetrometer readings or by unconfined compression tests.

DESCRIPTIVE TERM	UNCONFINED COMPRESSIVE STRENGTH TON/SQ. FT.
VERY SOFT	Less than 0.25
SOFT	0.25-0.50
FIRM	0.50-1.00
STIFF	1.00-2.00
VERY STIFF	2.00-4.00
HARD	4.00 and higher

NOTE: Slickensided and fissured clays may have lower unconfined compressive strengths than shown above, because of planes of weakness or cracks in the soil. The consistency ratings of such soils are based on penetrometer readings.

TERMS CHARACTERIZING SOIL STRUCTURE

SLICKENSIDED - having inclined planes of weakness that are slick and glossy in appearance.
FISSURED - containing shrinkage cracks, frequently filled with fine sand or silt; usually more or less vertical.
LAMINATED - composed of thin layers of varying color and texture.
INTERBEDDED - composed of alternate layers of different soil types.
CALCAREOUS - containing appreciable quantities of calcium carbonate.
WELL GRADED - having a wide range in grain sizes and substantial amounts of all intermediate particle sizes.
POORLY GRADED - predominantly of one grain size, or having a range of sizes with some intermediate sizes missing.

Terms used on this report for describing soils according to their texture or grain size distribution are in accordance with the UNIFIED SOIL CLASSIFICATION SYSTEM, as described in Technical Memorandum No.3-357, Waterways Experiment Station, March 1953

Grubbs, Hoskyn,
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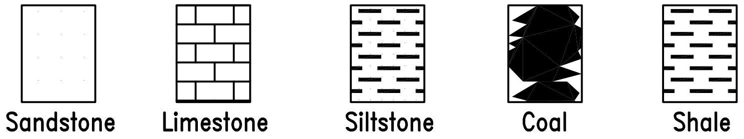
Consulting Engineers

BORING LOG TERMS – ROCK

ROCK TYPES
(SHOWN IN SYMBOLS COLUMN)



Joint Characteristics –

Spacing	
Very Close	0.75 to 2.5 in.
Close	2.5 to 8 in.
Moderately Close	8 to 24 in.
Wide	2 to 6 ft
Very Wide	More than 6 ft

Bedding Characteristics –

Very Thin	0.75 to 2.5 in.
Thin	2.5 to 8 in.
Medium	8 to 24 in.
Thick	2 to 6 ft
Massive	More than 6 ft

Lithologic Characteristics –

Clayey
Shaly
Calcareous (limy)
Siliceous
Sandy (Arenaceous)
Silty
Plastic Seams

Parting – Less than 1/16 inch
Seam – 1/16 to 1/2 inch
Layer – 1/2 to 12 inches
Stratum – Greater than 12 inches

Hardness–

Soft (S) – Reserved for plastic material alone.

Friable (F) – Easily crumbled by hand, pulverized or reduced to powder and is too soft to be cut with a pocket knife.

Low Hardness (LH) – Can be gouged deeply or carved with a pocket knife.

Moderately Hard (MH) – Can be readily scratched by a knife blade; scratch leaves a heavy trace of dust and scratch is readily visible after the powder has been blown away.

Hard (H) – Can be scratched with difficulty; scratch produces little powder and is often faintly visible; traces of the knife steel may be visible.

Very hard (VH) – Cannot be scratched with a pocket knife. Knife steel marks left on surface.

Texture – Fine – Barely seen with naked eye
Medium – Barely seen up to 1/8 in.
Coarse – 1/8 in. to 1/4 in.

Structure –

- Bedding
  - Flat – 0° – 5°
  - Gently Dipping – 5° – 35°
  - Moderately Dipping – 55° – 85°
  - Steeply Dipping – 55° – 85°
- Fractures, scattered
  - Open
  - Cemented or Tight
- Fractures, closely spaced
  - Open
  - Cemented or Tight
- Brecciated (Sheared and Fragmented)
  - Open
  - Cemented or Tight
- Joints
  - Faulted
  - Slickensides

Degree of Weathering –

Fresh – No visible signs of decomposition or discoloration. Rings under hammer impact.

Slighty Weathered – Slight discoloration inwards from open fractures, otherwise similar to fresh.

Moderately Weathered – Discoloration throughout. Weaker minerals such as feldspar decomposed. Strength somewhat less than fresh rock, but cores cannot be broken by hand or scraped by knife. Texture preserved.

Highly Weathered – Most minerals somewhat decomposed. Specimens can be broken by hand with effort or shaved with knife. Core stones present in rock mass. Texture becoming indistinct but fabric

Completely Weathered – Minerals decomposed to soil but fabric and structure preserved (Saprolite). Specimens easily crumbled or penetrated.

Residual Soil – Advanced state of decomposition resulting in plastic soils. Rock fabric and structure completely destroyed. Large volume change.

Solution and Void Conditions –

Solid, contains no voids
Vuggy (pitted)
Vesicular (igneous)
Porous
Cavities
Cavernous

Swelling Properties –

Nonswelling
Swelling

Slaking Properties –

Nonslaking
Slakes slowly on exposure
Slakes readily on exposure

Rock Quality Designation (RQD) –

RQD (Percent)	Diagnostic Description
Greater than 90	Excellent
75 – 90	Good
50 – 75	Fair
25 – 50	Poor
Less than 25	Very Poor

KEYROCK FHWA 3-2-12

ATTACHMENT 8

SUMMARY OF CLASSIFICATION TEST RESULTS

PROJECT: AHTD CA0606: Hwy 70 - Hot Springs to Hwy 128
LOCATION: Garland County, Arkansas
JOB NUMBER: 13-214

BORING/TEST PIT No.	SAMPLE DEPTH (ft)	WATER CONTENT (%)	ATTERBERG LIMITS			SIEVE ANALYSIS PERCENT PASSING									UNIFIED CLASS.	AASHTO CLASS.
			LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	3 in.	2 in.	1 in.	3/4 in.	3/8 in.	#4	#10	#40	#200		
1	0.5-1.5	10	29	19	10	100	100	100	100	86	69	58	47	31	SC	A-2-4
TP-2	2.5-3.5	19	46	36	10	---	---	---	---	---	---	---	---	17	GC	A-2-4
3	2.5-3.5	14	32	22	10	100	100	100	89	65	55	44	34	26	GC	A-2-4
TP-4	0.5-1.5	12	31	22	9	---	---	---	---	---	---	---	---	16	GC	A-2-4
TP-5	0.5-1.5	19	36	26	10	100	100	100	96	71	58	49	38	32	GC	A-2-4
TP-6	0.5-1.5	12	29	20	9	100	100	86	56	46	39	34	28	20	GC	A-2-4
TP-6	2.5-3.5	16	21	17	4	---	---	---	---	---	---	---	---	48	GC-GM	A-4
8	2.5-2.8	15	43	28	15	100	100	100	100	93	76	58	43	33	SC	A-2-7
TP-9	0.5-1.5	15	27	22	5	---	---	---	---	---	---	---	---	29	GC-GM	A-2-4
TP-14	0.5-1.5	13	47	28	19	100	100	78	66	50	40	32	23	18	GC	A-2-7
15	0.5-1.5	8	---	---	---	100	100	100	100	74	59	44	25	13	SC	A-2-4
15	4-5	19	44	25	19	100	100	100	100	91	76	63	49	41	SC	A-7-6
TP-16	0.5-1.5	5	21	16	5	100	100	90	81	51	35	25	13	7	GW-GM	A-1-a
TP-16	3-4	16	35	22	13	---	---	---	---	---	---	---	---	35	GC	A-2-6

GRUBBS, HOSKYN, BARTON & WYATT, INC.
Consulting Engineers

SUMMARY OF CLASSIFICATION TEST RESULTS

PROJECT: AHTD CA0606: Hwy 70 - Hot Springs to Hwy 128
LOCATION: Garland County, Arkansas
JOB NUMBER: 13-214

BORING/TEST PIT No.	SAMPLE DEPTH (ft)	WATER CONTENT (%)	ATTERBERG LIMITS			SIEVE ANALYSIS PERCENT PASSING									UNIFIED CLASS.	AASHTO CLASS.
			LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	3 in.	2 in.	1 in.	3/4 in.	3/8 in.	#4	#10	#40	#200		
17	2.5-3.5	13	25	19	6	100	100	100	90	82	72	64	51	35	SC-SM	A-2-4
TP-18	0.5-1.5	16	36	24	12	---	---	---	---	---	---	---	---	32	GC	A-2-6
TP-18	2-3	17	32	23	9	---	---	---	---	---	---	---	---	33	GC	A-2-4
TP-19	0.5-1.5	14	35	25	10	---	---	---	---	---	---	---	---	15	GC	A-2-4
TP-20	0.5-1.5	10	35	22	13	---	---	---	---	---	---	---	---	13	GC	A-2-6
TP-21	0.5-1.5	11	37	21	16	---	---	---	---	---	---	---	---	15	GC	A-2-6
TP-22	0.5-1.5	13	35	22	13	---	---	---	---	---	---	---	---	15	GC	A-2-6
TP-23	0.5-1.5	17	36	25	11	100	100	83	72	59	47	38	29	22	GC	A-2-6
TP-26	0.5-1.5	15	29	21	8	100	100	100	63	51	41	35	29	24	GC	A-2-4
TP-27	0.5-1.5	24	41	26	15	---	---	---	---	---	---	---	---	61	CL	A-7-6
TP-27	3.5-4.5	16	21	16	5	---	---	---	---	---	---	---	---	68	CL-ML	A-4
TP-28	0.5-1.5	9	32	19	13	100	100	100	75	61	41	29	21	17	GC	A-2-6
TP-29	0.5-1.5	19	43	23	20	100	100	100	100	82	76	71	67	57	CL	A-7-6

GRUBBS, HOSKYN, BARTON & WYATT, INC.
Consulting Engineers

SUMMARY OF CLASSIFICATION TEST RESULTS

PROJECT: AHTD CA0606: Hwy 70 - Hot Springs to Hwy 128
LOCATION: Garland County, Arkansas
JOB NUMBER: 13-214

BORING/TEST PIT No.	SAMPLE DEPTH (ft)	WATER CONTENT (%)	ATTERBERG LIMITS			SIEVE ANALYSIS PERCENT PASSING									UNIFIED CLASS.	AASHTO CLASS.
			LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	3 in.	2 in.	1 in.	3/4 in.	3/8 in.	#4	#10	#40	#200		
TP-30	0.5-1.5	21	44	23	21	---	---	---	---	---	---	---	---	71	CL	A-7-6
TP-31	0.5-1.5	19	26	20	6	---	---	---	---	---	---	---	---	59	CL-ML	A-4
TP-33	0.5-1.5	14	29	18	11	---	---	---	---	---	---	---	---	61	CL	A-6
34	0.5-1.5	16	---Non Plastic---			100	100	100	100	82	62	52	39	26	SM	A-4
TP-35	0.5-1.5	14	26	19	7	100	100	100	93	77	69	64	57	48	GC-GM	A-4
TP-36	0.5-1.5	7	21	16	5	100	100	67	65	34	28	22	15	11	GW-GM	A-1-a
TP-36	4-5	29	57	29	28	---	---	---	---	---	---	---	---	87	CH	A-7-6
TP-37	0.5-1.5	7	18	15	3	100	100	100	93	50	34	23	15	10	GW-GM	A-1-a
TP-37	5-6	14	28	17	11	---	---	---	---	---	---	---	---	55	CL	A-6
TP-38	0.5-1.5	28	70	32	38	100	100	100	100	96	94	91	87	84	CH	A-7-5
TP-39	0.5-1.5	15	34	21	13	100	100	87	84	58	45	36	27	21	GC	A-2-6
TP-41	0.5-1.5	16	34	20	14	---	---	---	---	---	---	---	---	33	GC	A-2-6
TP-42	0.5-1.5	18	33	23	10	100	100	89	86	68	56	47	37	31	GC	A-2-4

GRUBBS, HOSKYN, BARTON & WYATT, INC.
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SUMMARY OF CLASSIFICATION TEST RESULTS

PROJECT: AHTD CA0606: Hwy 70 - Hot Springs to Hwy 128
LOCATION: Garland County, Arkansas
JOB NUMBER: 13-214

BORING/TEST PIT No.	SAMPLE DEPTH (ft)	WATER CONTENT (%)	ATTERBERG LIMITS			SIEVE ANALYSIS PERCENT PASSING									UNIFIED CLASS.	AASHTO CLASS.
			LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	3 in.	2 in.	1 in.	3/4 in.	3/8 in.	#4	#10	#40	#200		
TP-43	0.5-1.5	8	25	21	4	---	---	---	---	---	---	---	---	10	GW-GM	A-2-4
TP-44	0.5-1.5	7	27	23	4	---	---	---	---	---	---	---	---	9	GW-GM	A-2-4
TP-44	2-3	6	27	18	9	---	---	---	---	---	---	---	---	12	GW-GC	A-2-4
TP-45	0.5-1.5	15	26	21	5	---	---	---	---	---	---	---	---	37	GC-GM	A-4
TP-45	2.5-3.5	10	23	19	4	100	100	67	53	33	26	21	17	14	GC-GM	A-1-a
TP-46	0.5-1.5	16	24	20	4	100	100	100	96	88	75	66	57	52	CL-ML	A-4
TP-47	0.5-1.5	23	49	30	19	---	---	---	---	---	---	---	---	49	GC	A-7-5
TP-49	0.5-1.5	21	46	29	17	---	---	---	---	---	---	---	---	41	GC	A-7-6
TP-49	3.5-4.5	25	43	24	19	---	---	---	---	---	---	---	---	79	CL	A-7-6
TP-51	0.5-1.5	21	39	28	11	---	---	---	---	---	---	---	---	37	GC	A-6
TP-52	0.5-1.5	25	56	28	28	---	---	---	---	---	---	---	---	82	CH	A-7-6
TP-52	3-4	28	76	38	38	---	---	---	---	---	---	---	---	83	MH	A-7-5
TP-53	0.5-1.5	26	50	32	18	---	---	---	---	---	---	---	---	58	MH	A-7-5

SUMMARY OF CLASSIFICATION TEST RESULTS

PROJECT: AHTD CA0606: Hwy 70 - Hot Springs to Hwy 128
LOCATION: Garland County, Arkansas
JOB NUMBER: 13-214

BORING/TEST PIT No.	SAMPLE DEPTH (ft)	WATER CONTENT (%)	ATTERBERG LIMITS			SIEVE ANALYSIS PERCENT PASSING									UNIFIED CLASS.	AASHTO CLASS.
			LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	3 in.	2 in.	1 in.	3/4 in.	3/8 in.	#4	#10	#40	#200		
TP-54	0.5-1.5	25	48	27	21	---	---	---	---	---	---	---	---	61	CL	A-7-6
TP-55	2.5-3.5	27	62	34	28	---	---	---	---	---	---	---	---	94	MH	A-7-5
TP-56	0.5-1.5	25	49	31	18	---	---	---	---	---	---	---	---	63	ML	A-7-5
TP-56	4.5-5.5	30	71	33	38	---	---	---	---	---	---	---	---	89	MH	A-7-5
TP-57	0.5-1.5	25	53	32	21	---	---	---	---	---	---	---	---	63	MH	A-7-5
113	2.5-3.5	12	31	22	9	100	100	100	84	49	36	26	18	13	GC	A-2-4
TP-1A	0-1	15	36	21	15	100	100	95	87	79	72	57	44	32	SC	A-2-6
TP-3A	0.5-1.5	11	37	24	13	100	100	72	66	58	50	41	30	24	GC	A-2-6
TP-4A	0.5-1.5	13	47	29	18	100	100	83	73	60	47	34	21	18	GC	A-2-7
TP-5A	0.5-1.5	17	28	22	6	100	79	74	68	55	46	37	30	23	GC-GM	A-1-b
TP-5A	4-5	16	22	18	4	100	85	78	74	68	61	53	47	38	GC-GM	A-4
TP-6A	0.5-1.5	23	35	24	11	---	---	---	---	---	---	---	---	56	CL	A-6
TP-6A	2-3	14	26	20	6	---	---	---	---	---	---	---	---	70	CL-ML	A-4

SUMMARY OF CLASSIFICATION TEST RESULTS

PROJECT: AHTD CA0606: Hwy 70 - Hot Springs to Hwy 128
LOCATION: Garland County, Arkansas
JOB NUMBER: 13-214

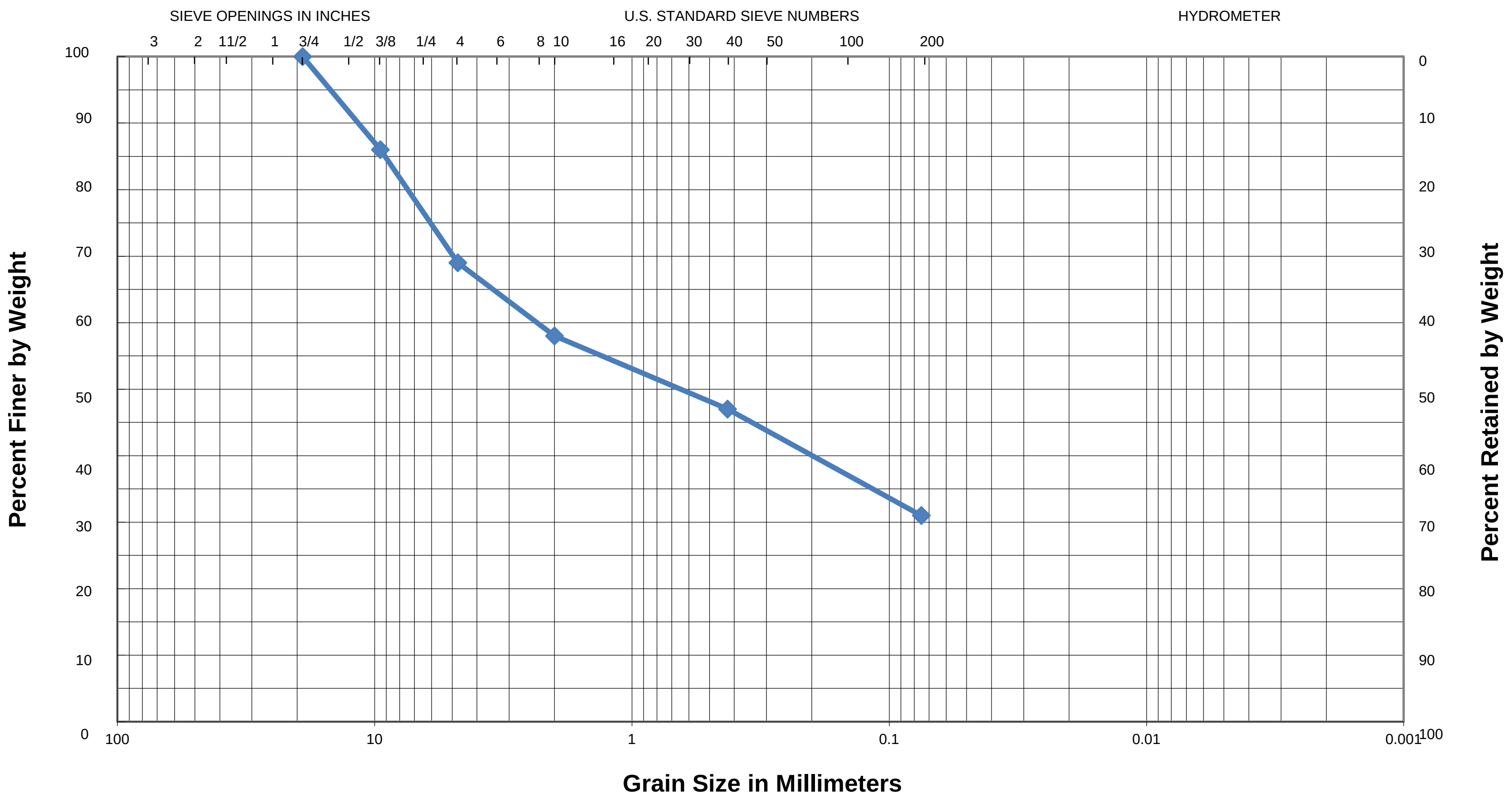
BORING/TEST PIT No.	SAMPLE DEPTH (ft)	WATER CONTENT (%)	ATTERBERG LIMITS			SIEVE ANALYSIS PERCENT PASSING									UNIFIED CLASS.	AASHTO CLASS.
			LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	3 in.	2 in.	1 in.	3/4 in.	3/8 in.	#4	#10	#40	#200		
TP-7A	0.5-1.5	5	23	17	6	100	100	64	56	42	34	26	19	15	GC-GM	A-1-a
TP-9A	0.5-1.5	20	47	26	21	100	100	97	88	78	71	63	56	50	CL	A-7-6
TP-10A	0.5-1.5	10	27	20	7	---	---	---	---	---	---	---	---	60	CL-ML	A-4
TP-10A	3.5-4.5	18	69	35	34	---	---	---	---	---	---	---	---	85	MH	A-7-5
C-6	0.5-2	6	---NON PLASTIC---			100	100	100	93	60	38	25	16	8	GW-GM	A-1-a
C-6	2-3.5	8	27	17	10	100	100	100	95	73	55	42	34	26	GC	A-2-4
C-6	3.5-5	19	31	19	12	100	100	100	100	100	98	93	87	78	CL	A-6
S4	4.5-5.5	7	26	20	6	100	100	100	92	58	40	28	17	11	GW-GM	A-1-a
S5	2.5-3.5	13	34	26	8	100	100	89	89	77	62	49	32	22	SC	A-2-4

GRUBBS, HOSKYN, BARTON & WYATT, INC.
Consulting Engineers

13-214

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

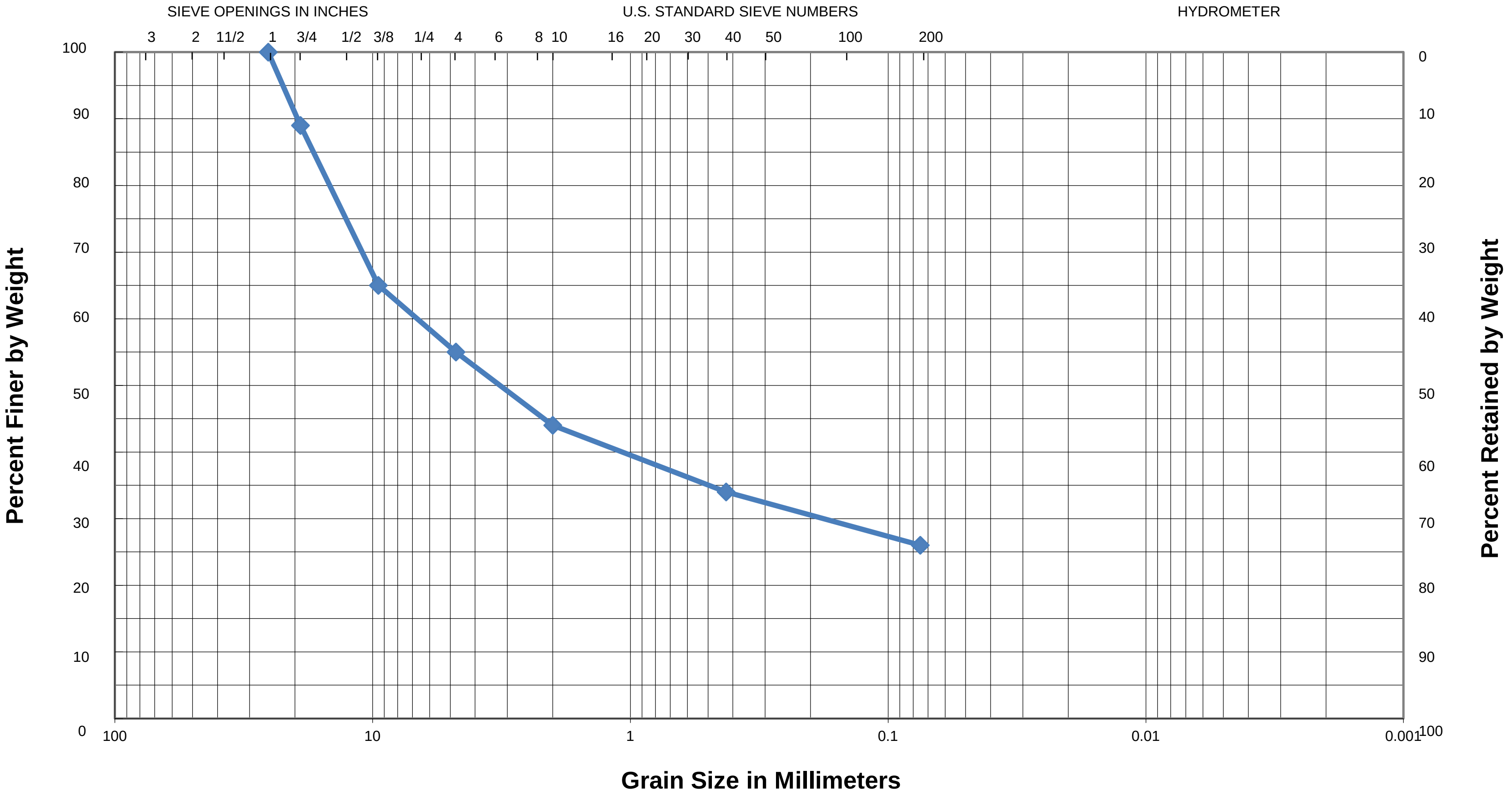
Sample: TP-1, 0.5-1.5 ft
Atterberg Limits: LL = 29, PL = 19, PI = 10

Desciption: Tan and gray silty clay and shale fragments
crushed stone, and fines and(fill)
Classification**: USCS = SC; AASHTO = A-2-4**

13-214

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

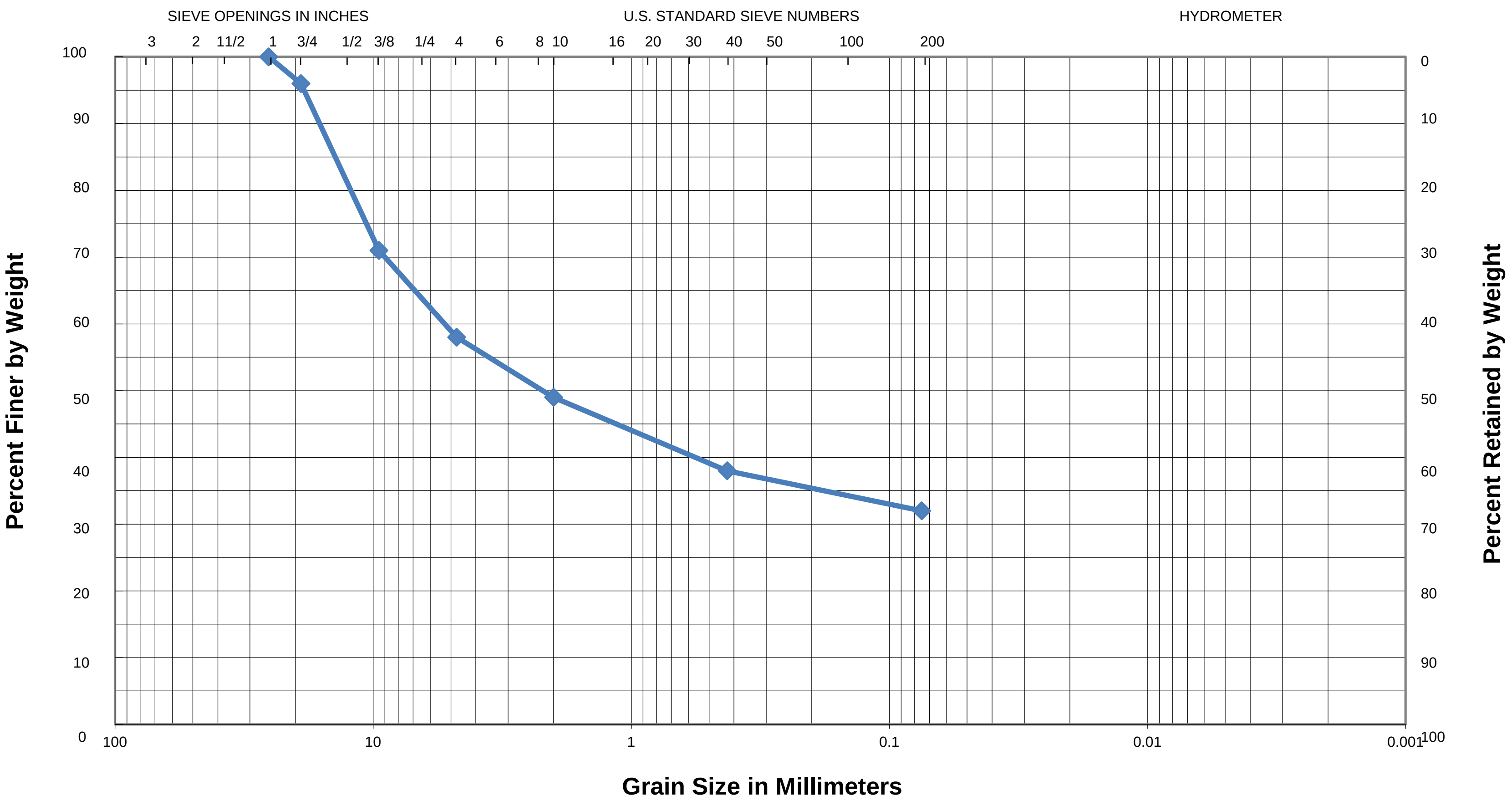
Sample: TP-3, 2.5-3.5 ft
Atterberg Limits: LL = 29, PL = 19, PI = 10

Desciption: Tan and gray silty clay and shale and sandstone fragments (fill)
Classification: **USCS = GC; AASHTO = A-2-4**

13-214

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

Sample: TP-5, 0.5-1.5 ft
Atterberg Limits: LL = 36, PL = 26, PI = 10

Description: Brown silty clay with shale fragments (fill)
Classification**: USCS = GC; AASHTO = A-2-4**

13-214

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

Sample: TP-6, 0.5-1.5 ft
Atterberg Limits: LL = 29, PL = 20, PI = 9

Description: Reddish tan and brown silty clay with shale and sandstone fragments (fill)
Classification: **USCS = GC; AASHTO = A-2-4**

13-214

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

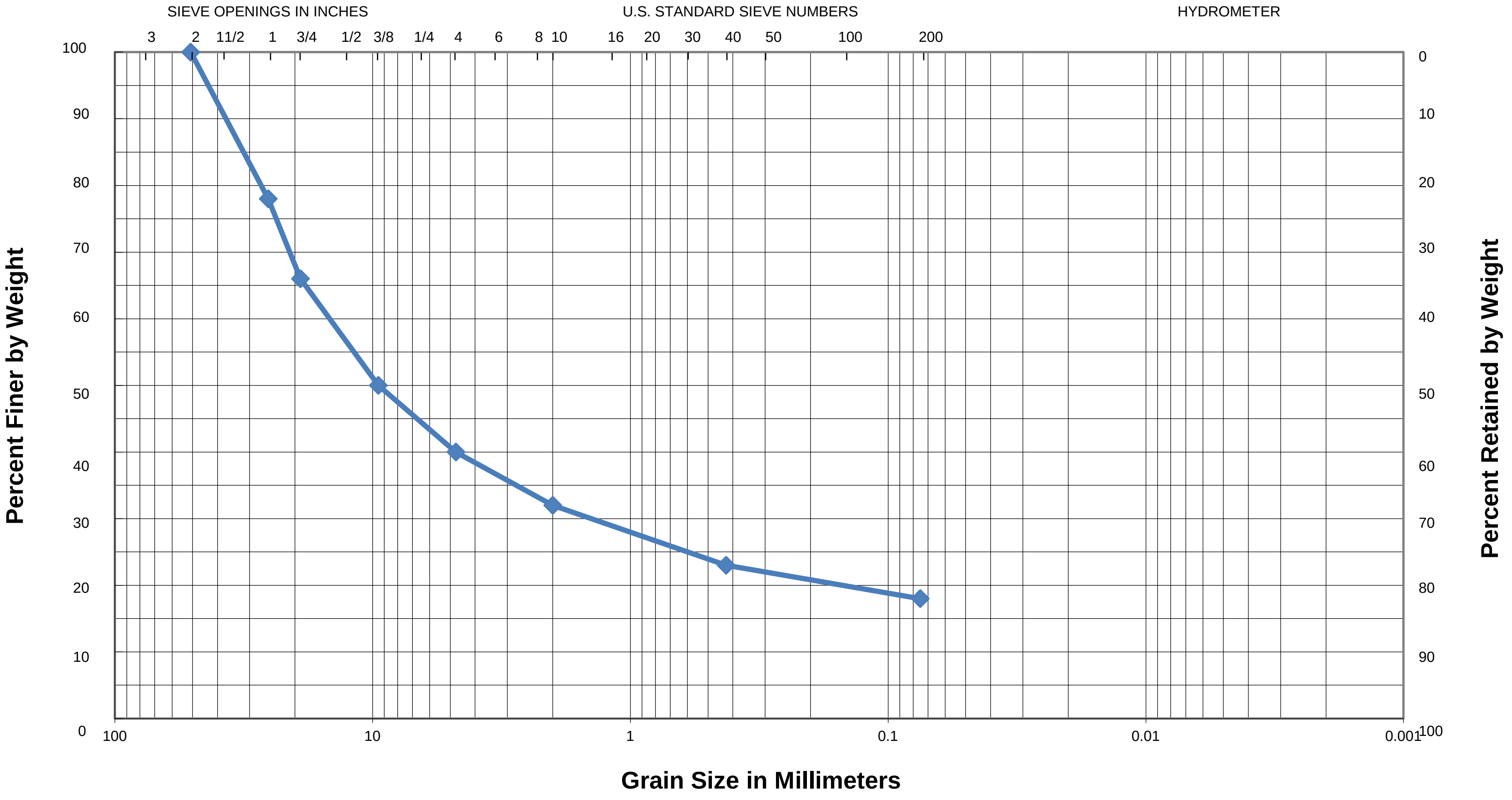
Sample: Boring 8, 2.5-2.8 ft
Atterberg Limits: LL = 43, PL = 28, PI = 15

Description: Tan and dark gray weathered shale with clay seams
Classification**: USCS = SC; AASHTO = A-2-7**

13-214

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

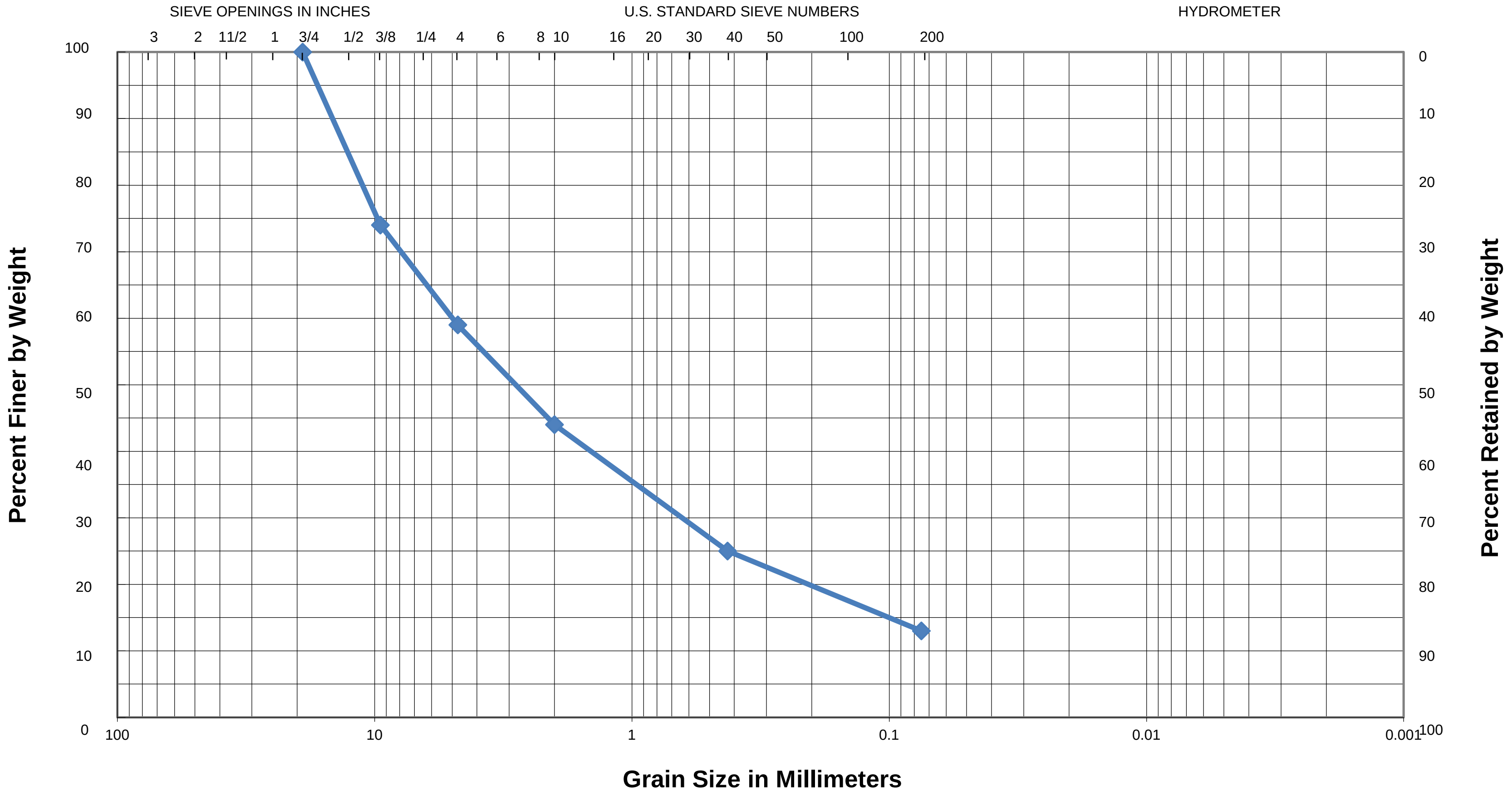
Sample: TP-14, 0.5-1.5 ft
Atterberg Limits: LL = 47, PL = 28, PI = 19

Description: Reddish brown clayey fine to coarse
gravel and sandstone fragments (fill)
Classification: **USCS = GC; AASHTO = A-2-7**

13-214

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

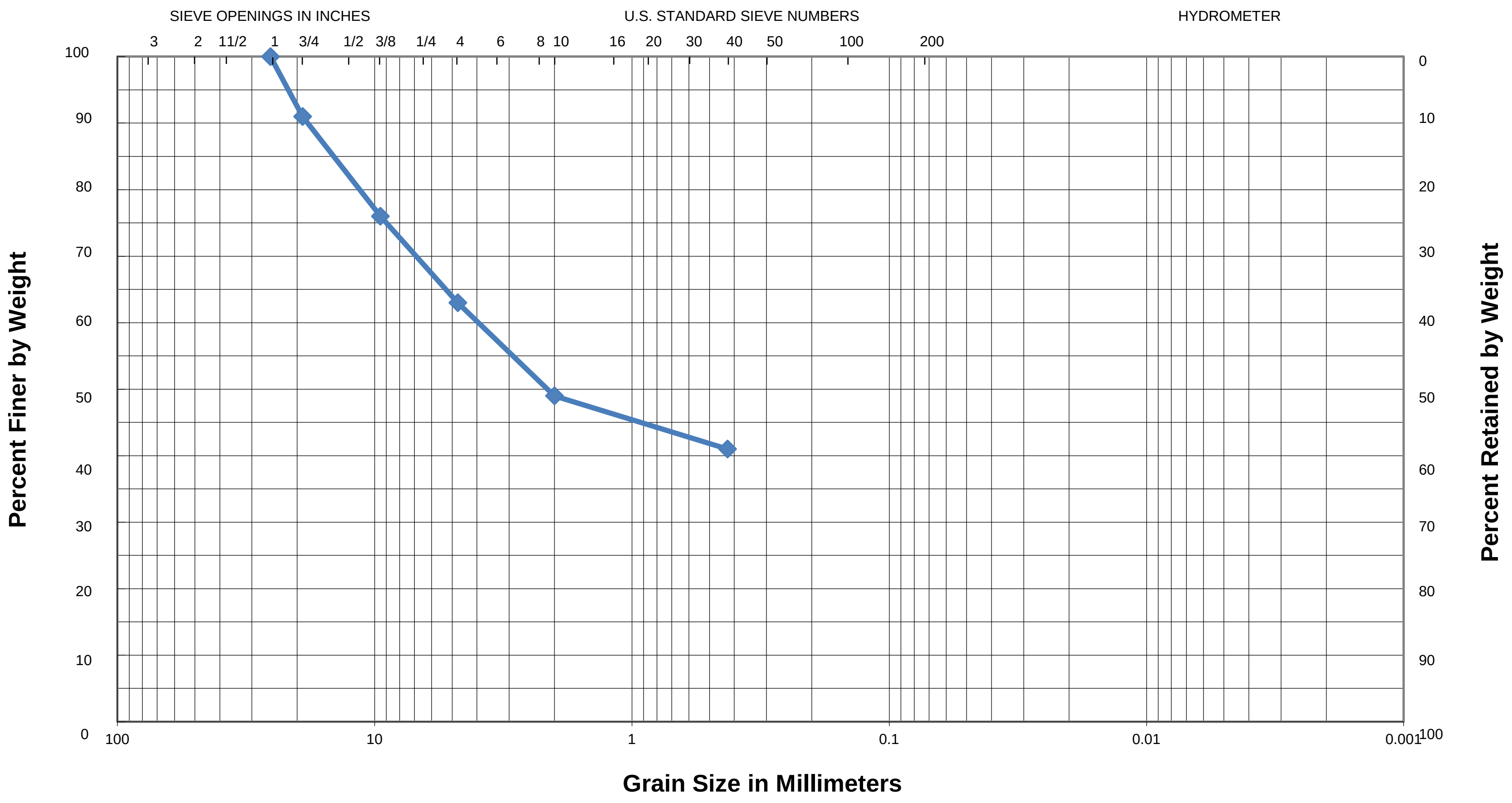
Sample: Boring 15, 0.5-1.5 ft

Description: Gray shale fragments with some silty clay (fill)
Classification**: USCS = SC; AASHTO = A-2-4**

13-214

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

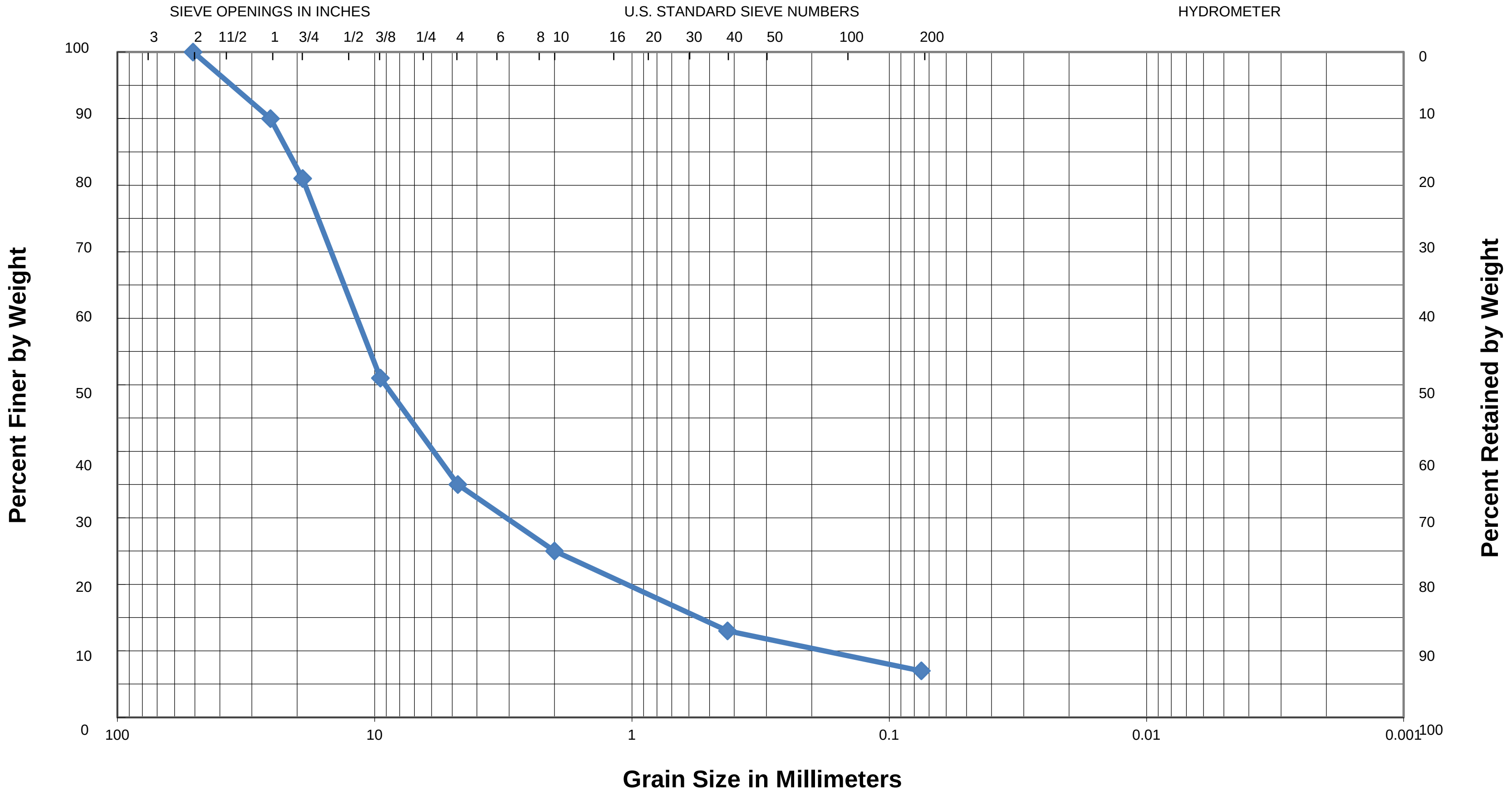
Sample: Boring 15, 4-5 ft
Atterberg Limits: LL = 44, PL = 25, PI = 19

Description: Gray, tan and reddish tan silty clay with shale and sandstone fragments (fill)
Classification: **USCS = SC; AASHTO = A-7-6**

13-214

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

Sample: TP-16, 0.5-1.5 ft
Atterberg Limits: LL = 25, PL = 19, PI = 6

Description: Reddish tan and tan sillty clay with shale and shale fragments (fill)
Classification**: USCS = GW-GM; AASHTO = A-1-a**

13-214

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

Sample: Boring 17, 2.5-3.5 ft
Atterberg Limits: LL = 25, PL = 19, PI = 6

Description: Tan silty clay with fine sand and some fine to coarse gravel and shale fragments (fill)
Classification: **USCS = SC-SM; AASHTO = A-2-4**

13-214

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

<table>
<tr><td colspan="2">GRAVEL</td><td colspan="3">SAND</td><td rowspan="2">SILT OR CLAY</td></tr>
<tr><td>COARSE</td><td>FINE</td><td>COARSE</td><td>MEDIUM</td><td>FINE</td></tr>
</table>

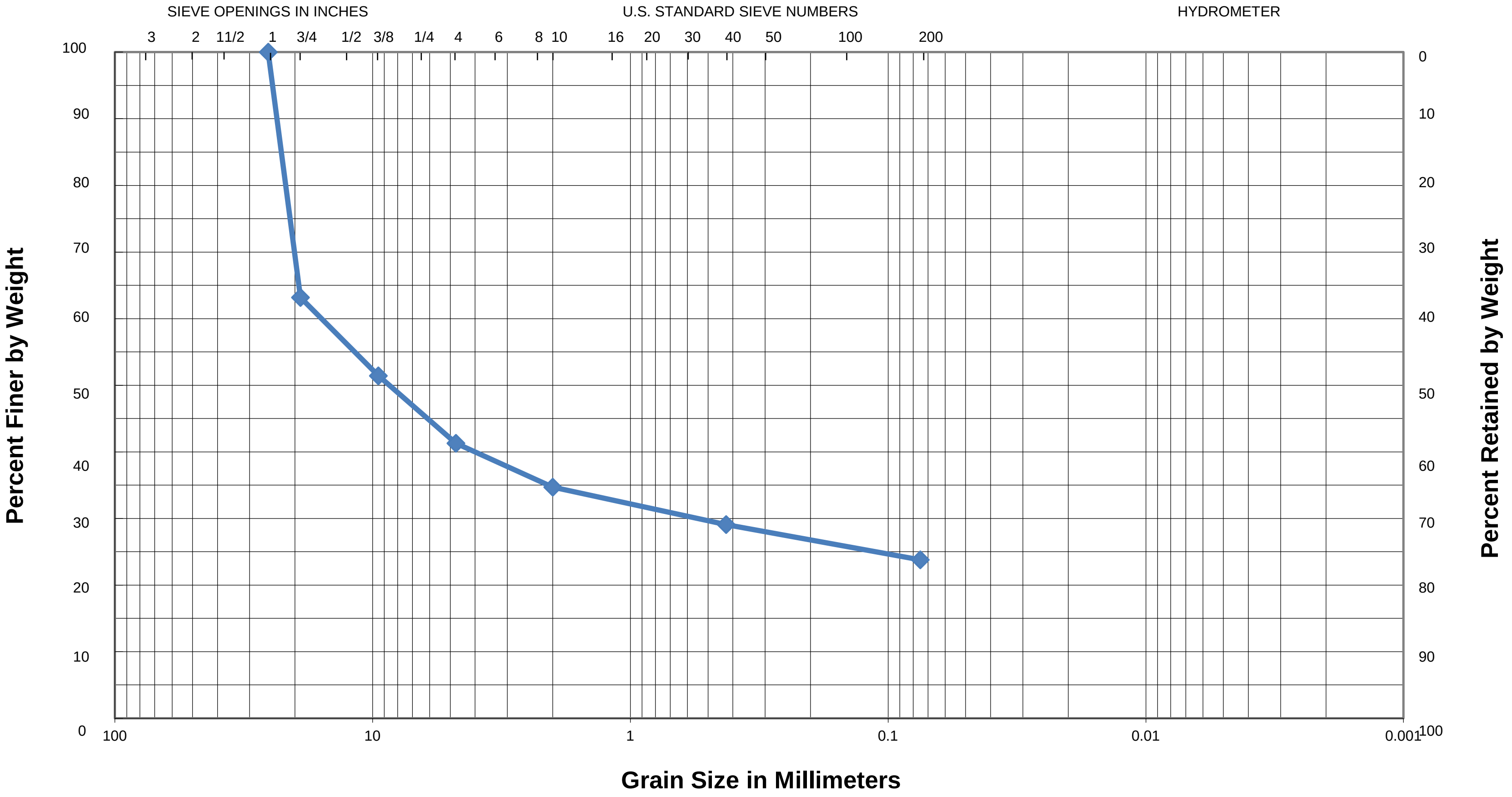
Sample: TP-23, 0.5-1.5 ft
Atterberg Limits: LL = 36, PL = 25, PI = 11

Description: Dark brown and tan silty clay and shale and sandstone fragments (fill)
Classification: **USCS = GC; AASHTO = A-2-6**

13-214

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

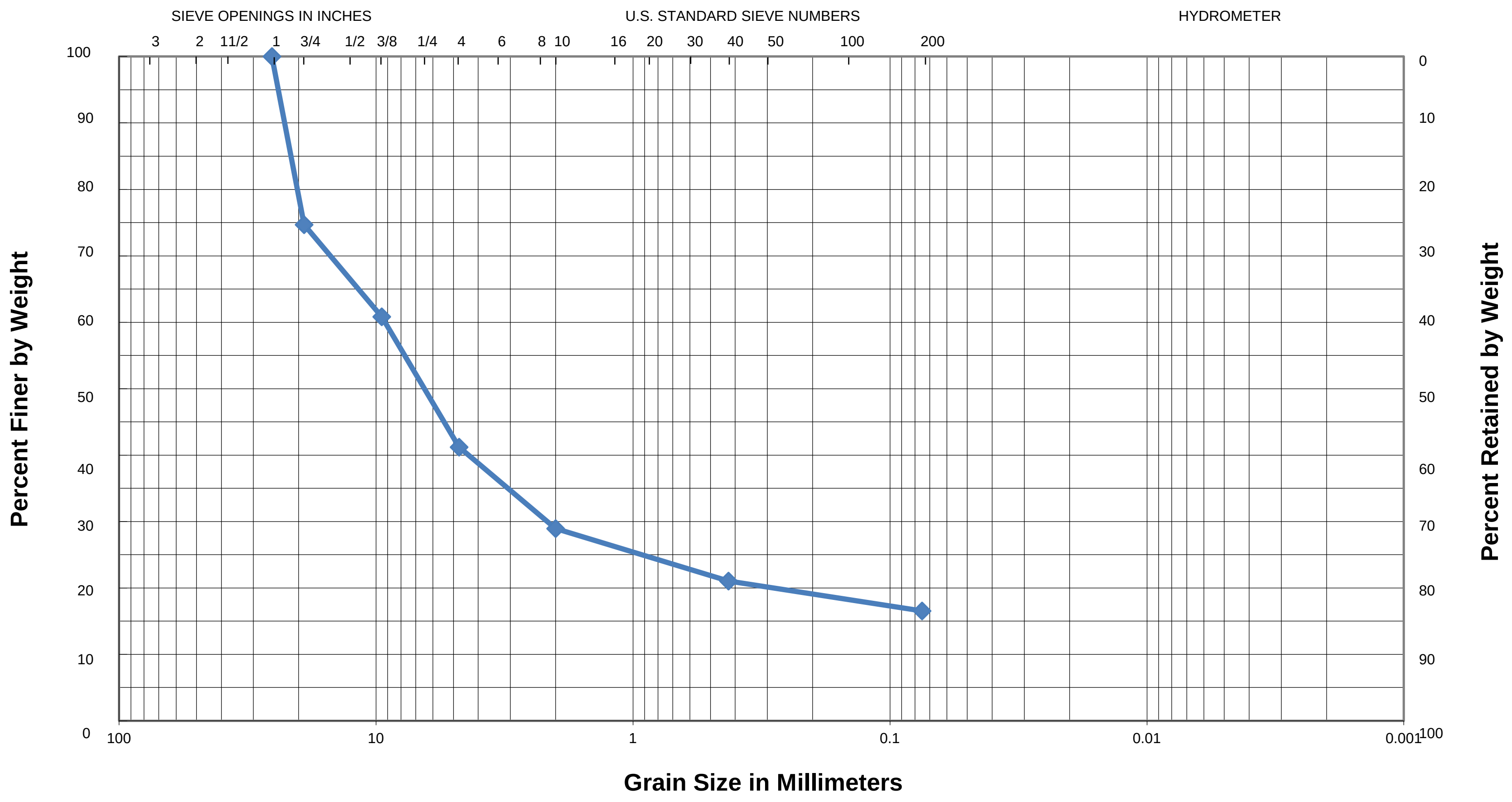
Sample: TP-26, 0.5-1.5 ft
Atterberg Limits: LL = 29, PL = 21, PI = 8

Description: Gray, brown and tan silty clay with shale fragments (fill)
Classification**: USCS = GC; AASHTO = A-2-4**

13-214

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

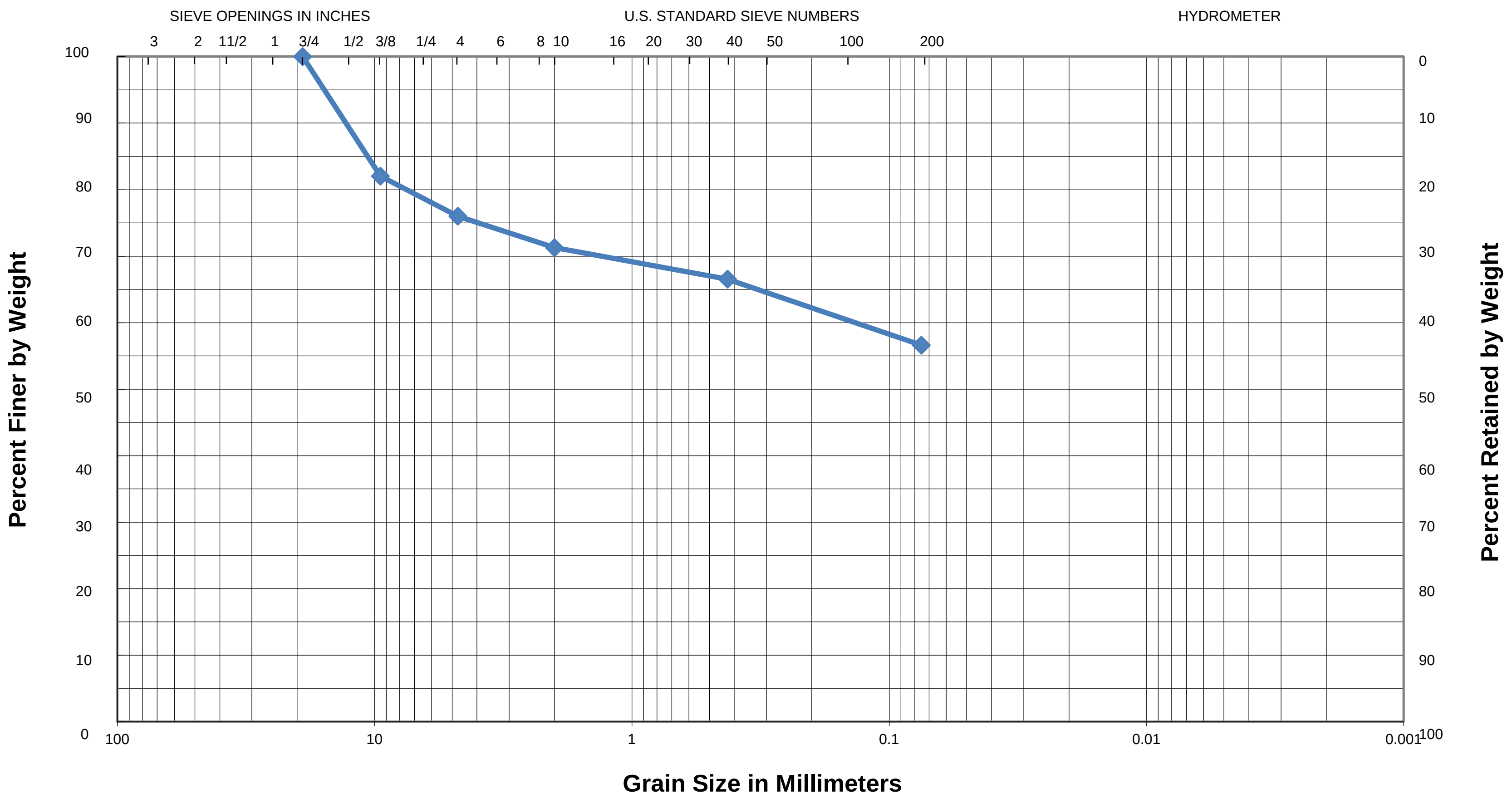
Sample: TP-28, 0.5-1.5 ft
Atterberg Limits: LL = 32, PL = 19, PI = 13

Description: Brown clayey fine to coarse gravel with cobbles (fill)
Classification**: USCS = GC; AASHTO = A-2-6**

13-214

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

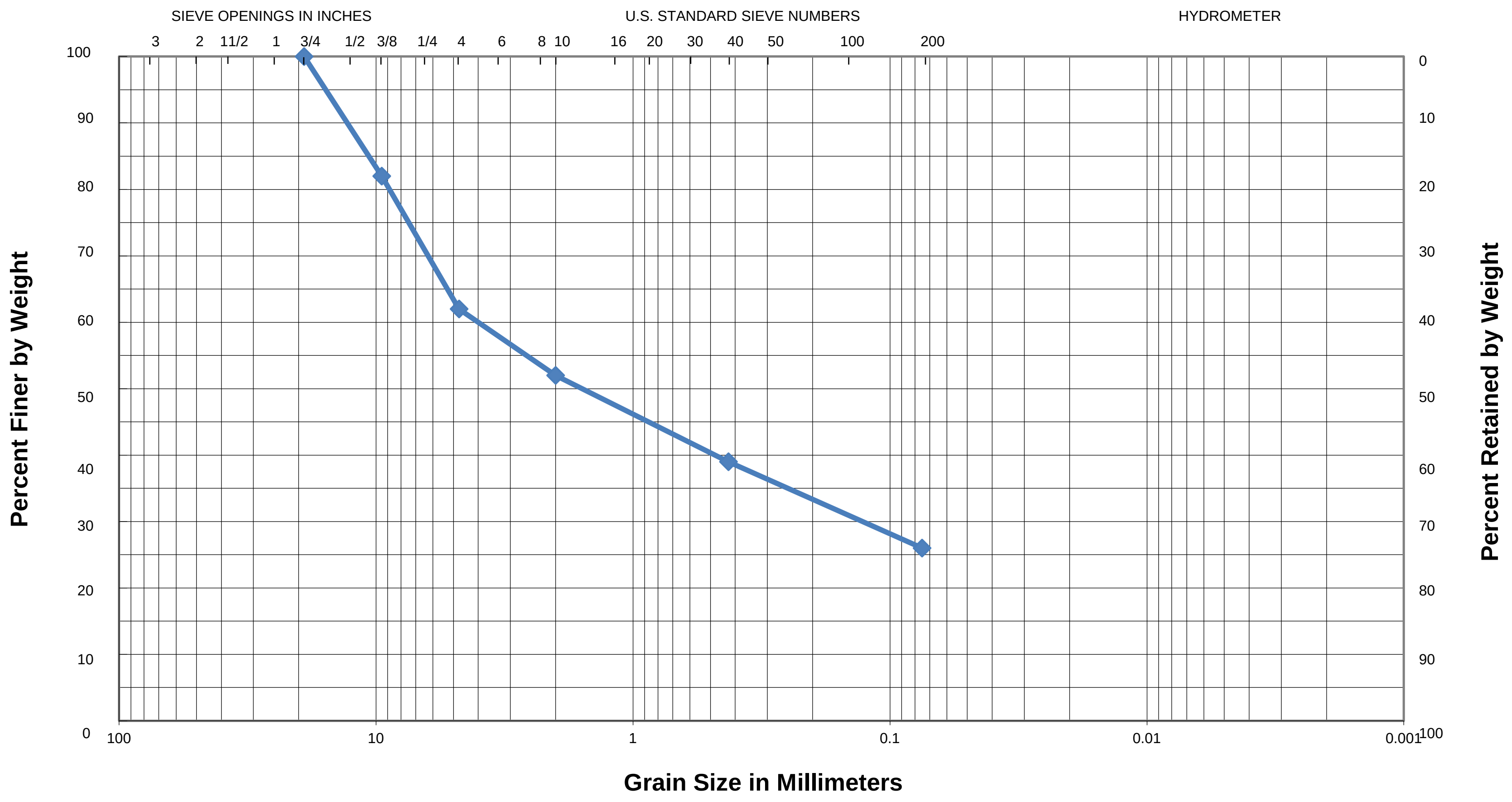
Sample: TP-29, 0.5-1.5 ft
Atterberg Limits: LL = 43, PL = 23, PI = 20

Description: Reddish brown silty clay with fine to coarse gravel and cobbles (fill)
Classification: **USCS = CL; AASHTO = A-7-6**

13-214

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

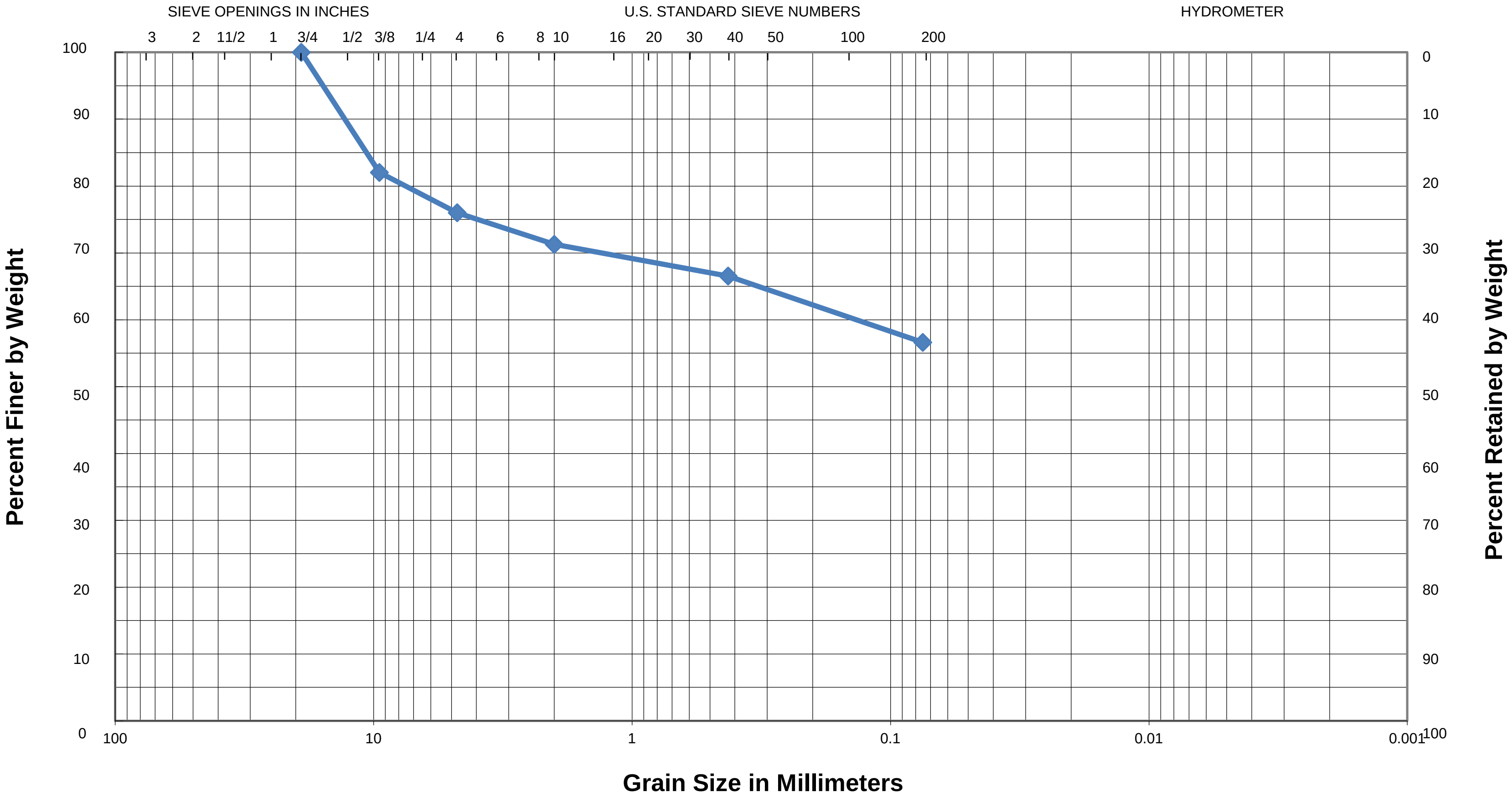
Sample: Boring 34, 0.5-1.5 ft
Atterberg Limits: Non-Plastic

Description: Reddish tan and tan fine sandy silt with shale fragments
Classification: **USCS = SM; AASHTO = A-4**

13-214

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

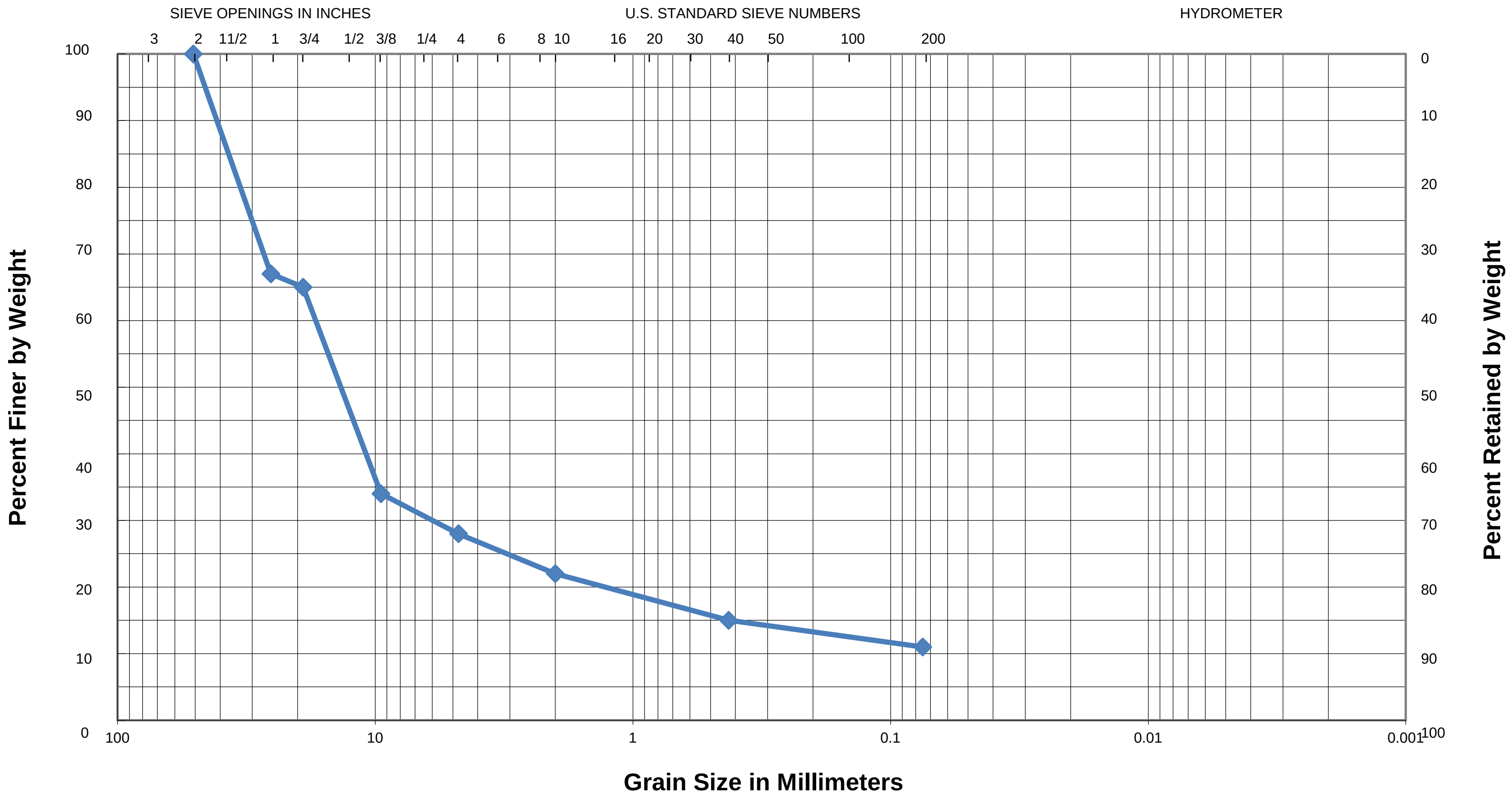
Sample: TP-35, 0.5-1.5 ft
Atterberg Limits: LL = 26, PL = 19, PI = 7

Description: Gray, dark brown, and tan silty clay with fine to coarse gravel and shale fragments (fill)
Classification**: USCS = GC-GM; AASHTO = A-4**

13-214

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

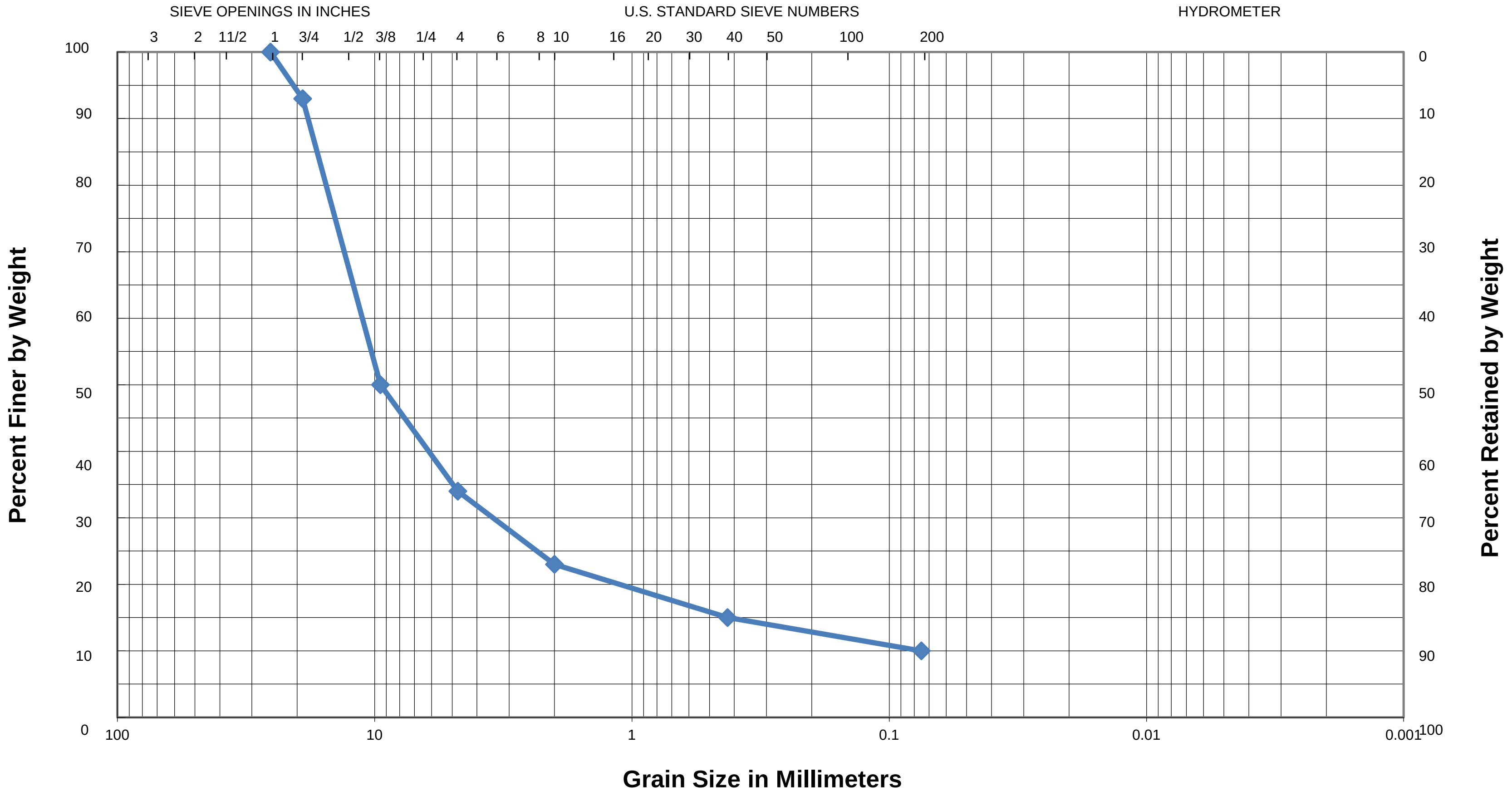
Sample: TP-36, 0.5-1.5 ft
Atterberg Limits: LL = 21, PL = 16, PI = 5

Description: Tan novaculite fragments with slightly clayey (fill)
Classification: **USCS = GW-GM; AASHTO = A-1-a**

13-214

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

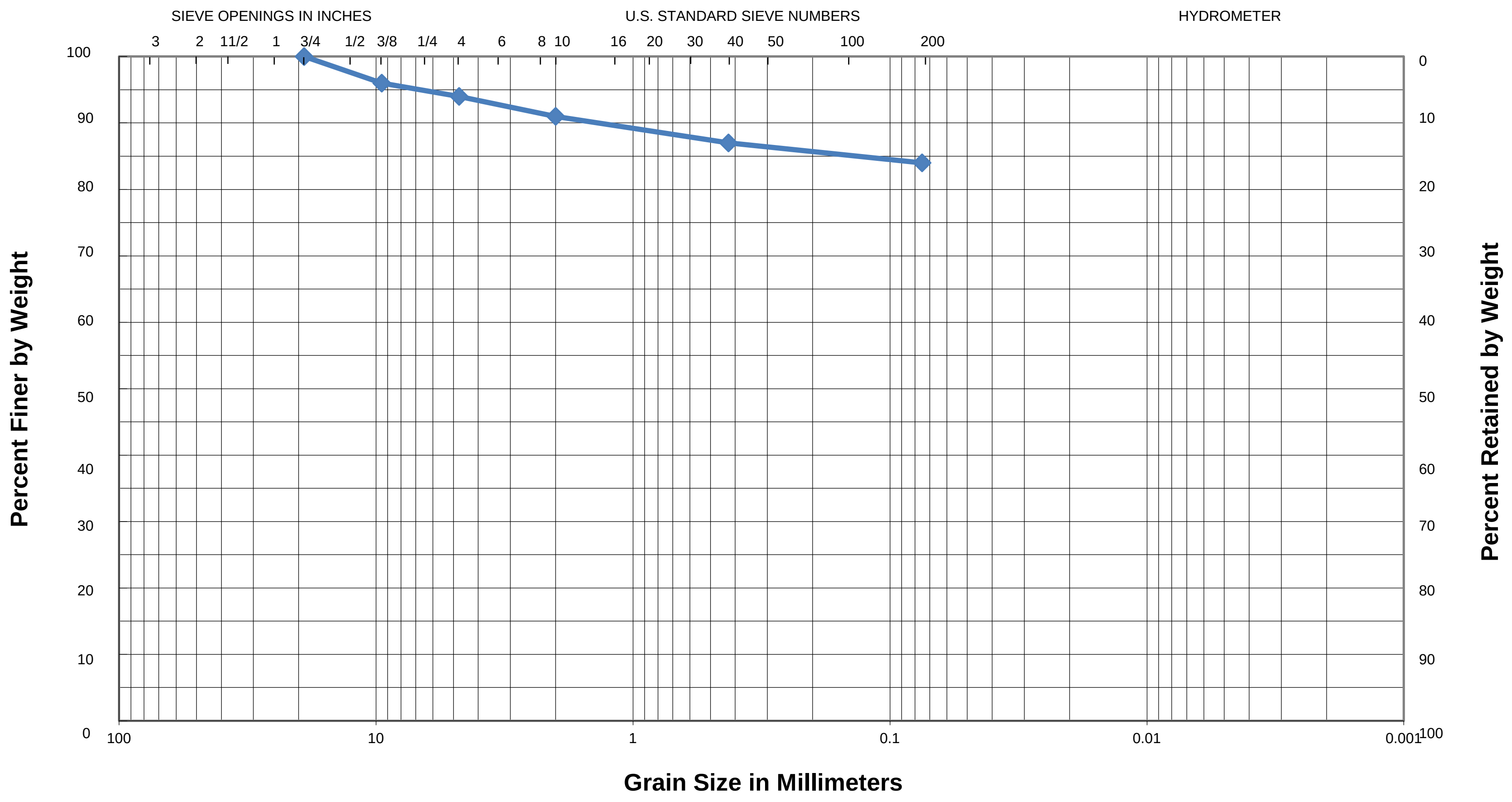
Sample: TP-37, 0.5-1.5 ft
Atterberg Limits: LL = 18, PL = 15, PI = 3

Description: Tan novaculite fragments with silt (fill)
Classification: **USCS = GW-GM; AASHTO = A-1-a**

13-214

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

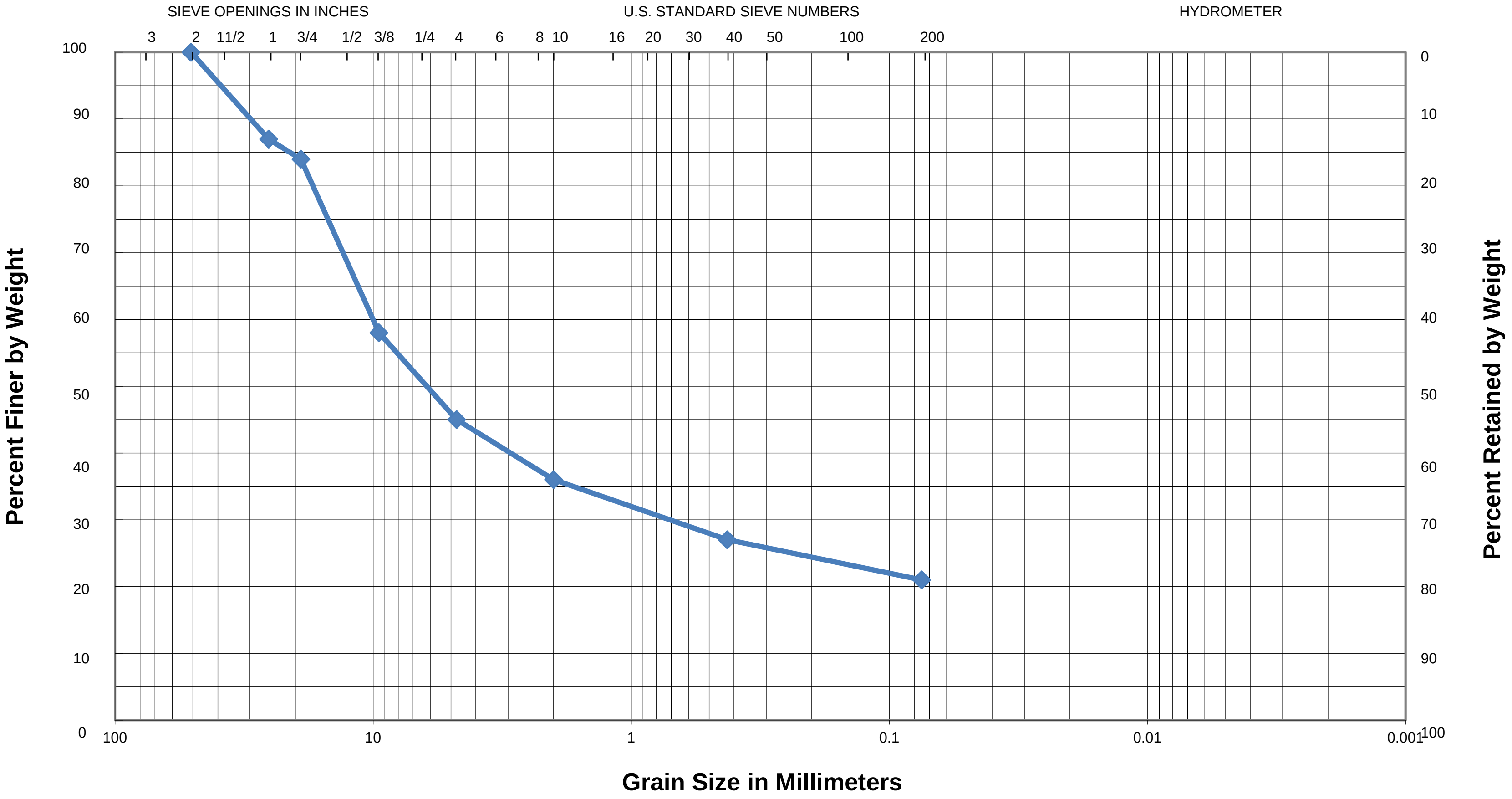
Sample: TP-38, 0.5-1.5 ft
Atterberg Limits: LL = 70, PL = 32, PI = 38

Description: Tan silty clay with some crushed stone (fill)
Classification: **USCS = CH; AASHTO = A-7-6**

13-214

GRAIN SIZE CURVE

Grubbs, Hoskyn,
Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

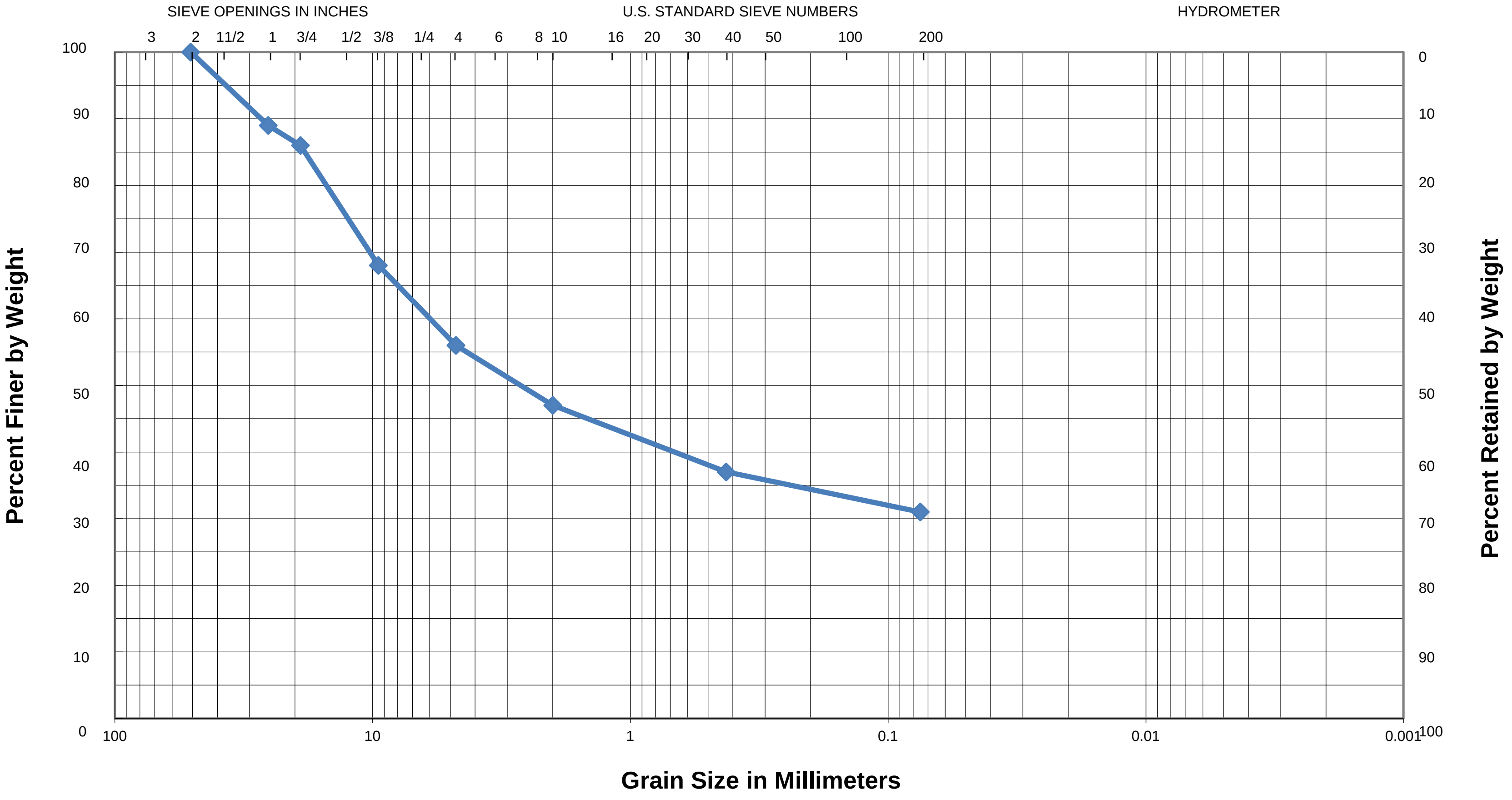
Sample: TP-39, 0.5-1.5 ft
Atterberg Limits: LL = 34, PL = 21, PI = 13

Description: Tan clayey fine to coarse gravel (fill)
Classification**: USCS = GC; AASHTO = A-2-6**

13-214

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

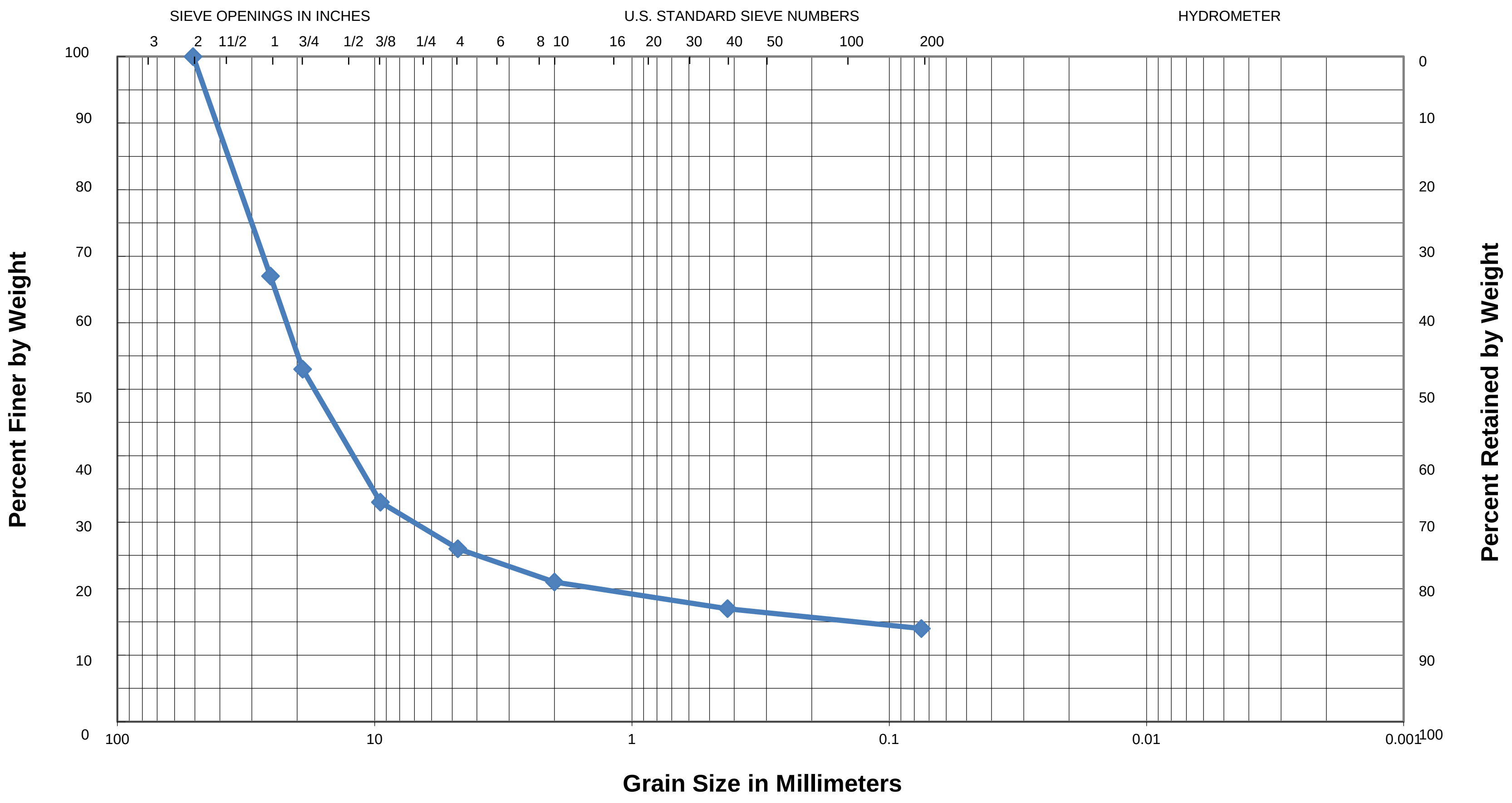
Sample: TP-42, 0.5-1.5 ft
Atterberg Limits: LL = 33, PL = 23, PI = 10

Description: Gray, tan and reddish brown silty clay with shale and novaculite fragments (fill)
Classification: **USCS = GC; AASHTO = A-2-4**

13-214

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

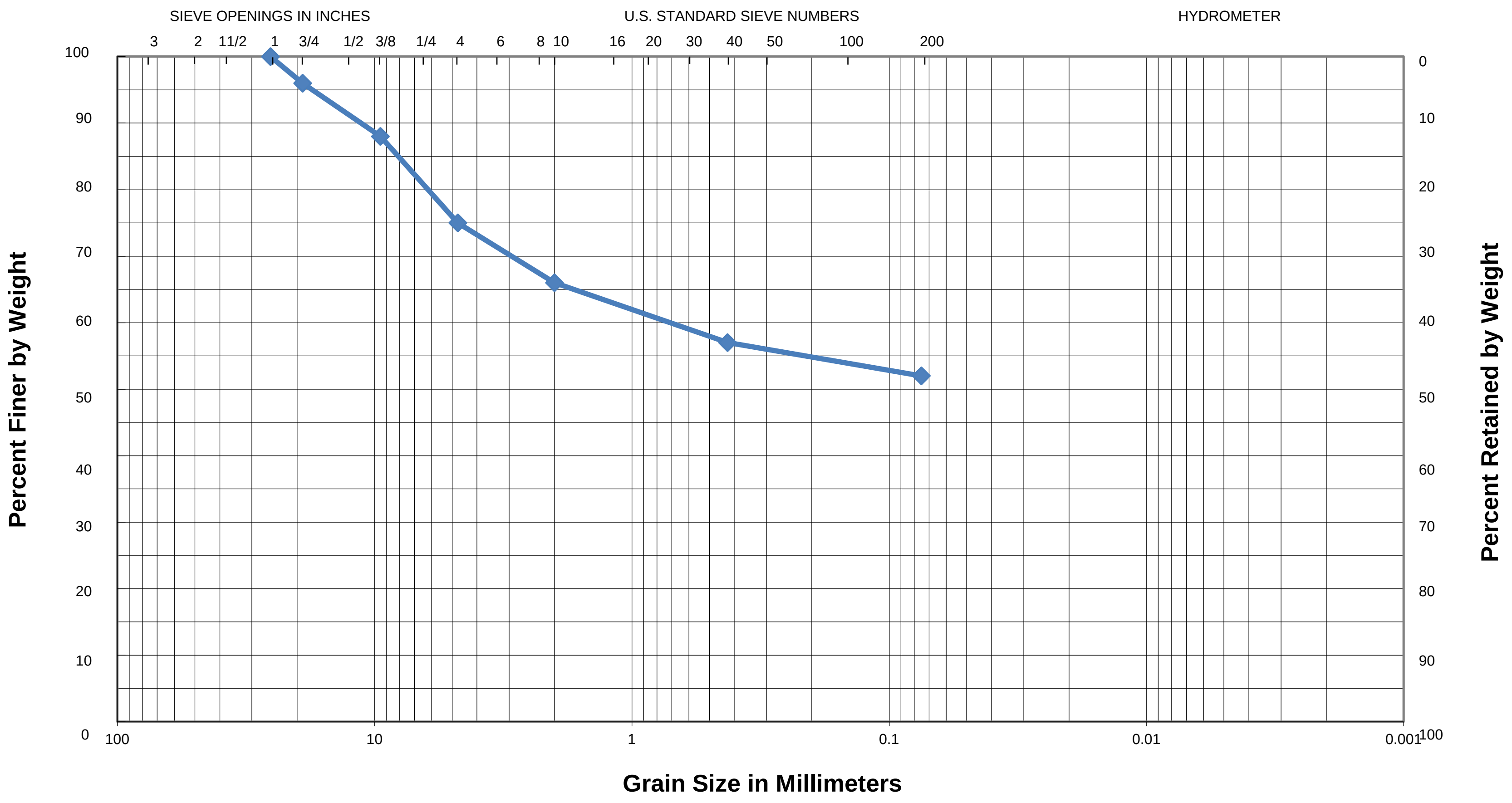
Sample: TP-45, 2.5-3.5 ft
Atterberg Limits: LL = 23, PL = 19, PI = 4

Description: Brown and reddish tan silty clay with crushed stone and organics (fill)
Classification**: USCS = GC-GM; AASHTO = A-1-a**

13-214

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

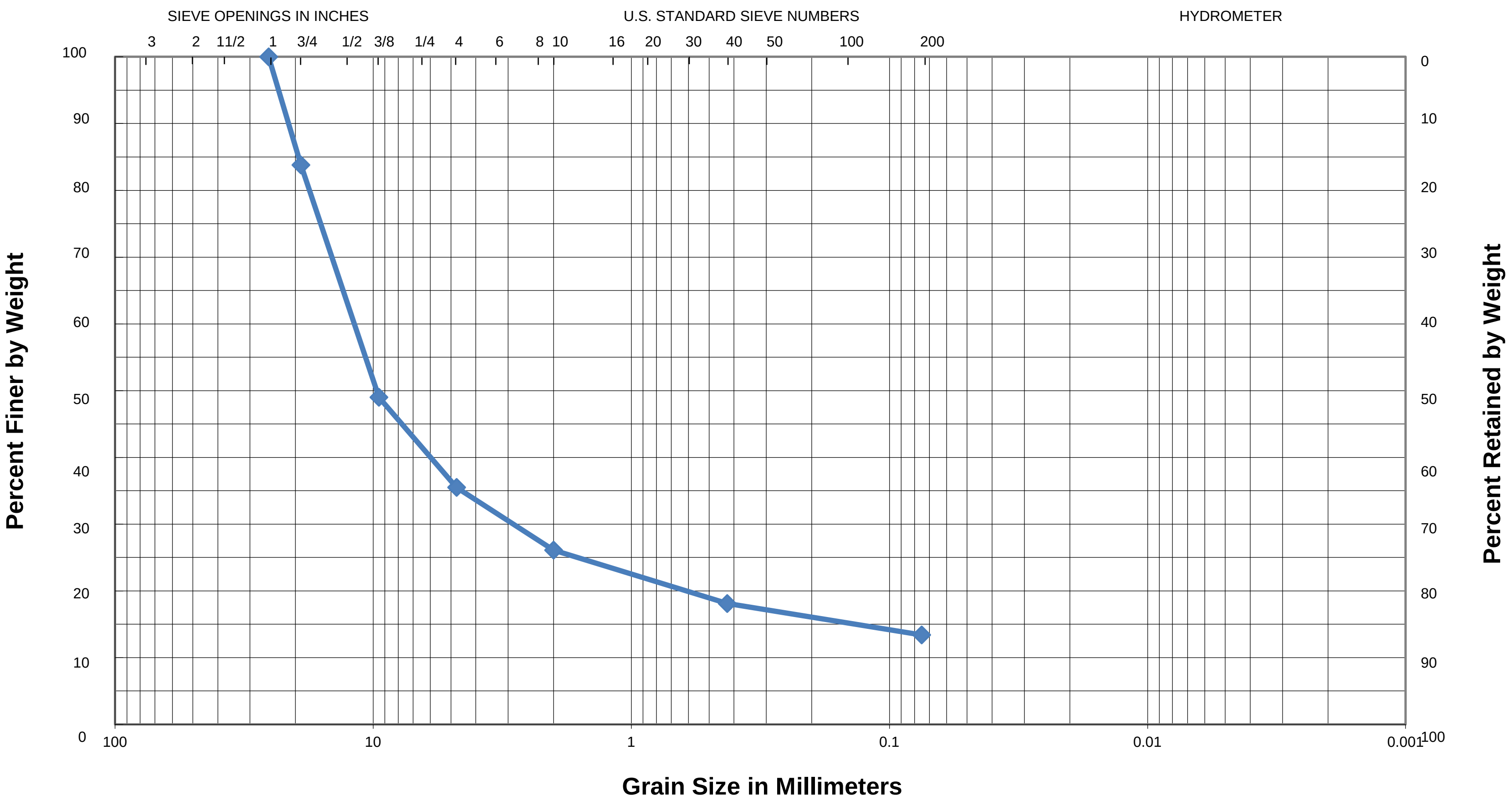
Sample: TP-46, 0.5-1.5 ft
Atterberg Limits: LL = 24, PL = 20, PI = 4

Description: Gray, dark brown, and tan silty clay with sandstone and novaculite fragments (fill)
Classification**: USCS = CL-ML; AASHTO = A-4**

13-214

GRAIN SIZE CURVE

Grubbs, Hoskyn,
Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

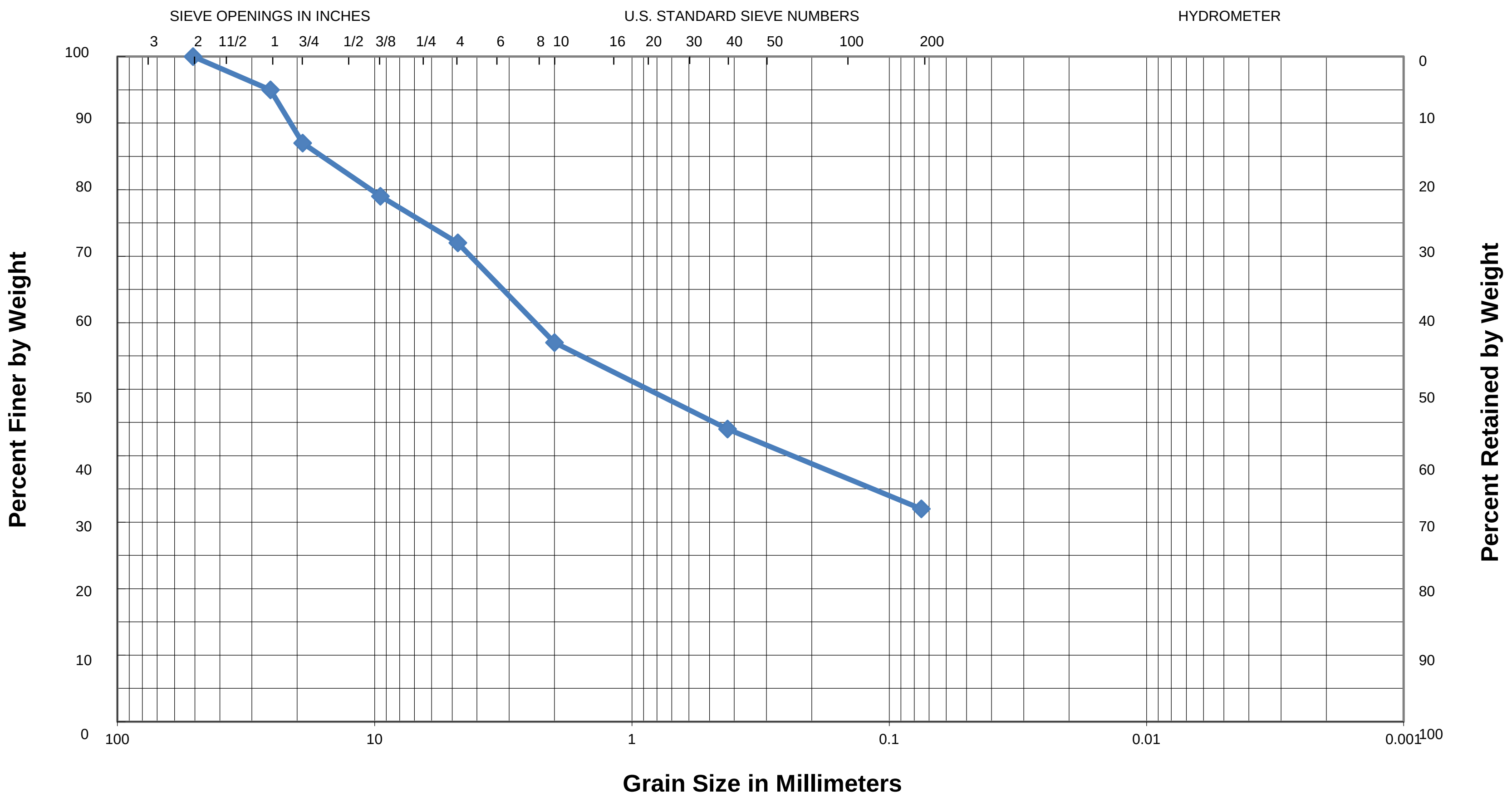
Sample: Boring 113, 2.5-3.5 ft
Atterberg Limits: LL = 32, PL = 19, PI = 13

Description: Dark gray, tan and gray shale fragments with silty clay (fill)
Classification: **USCS = GC; AASHTO = A-2-4**

13-214

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

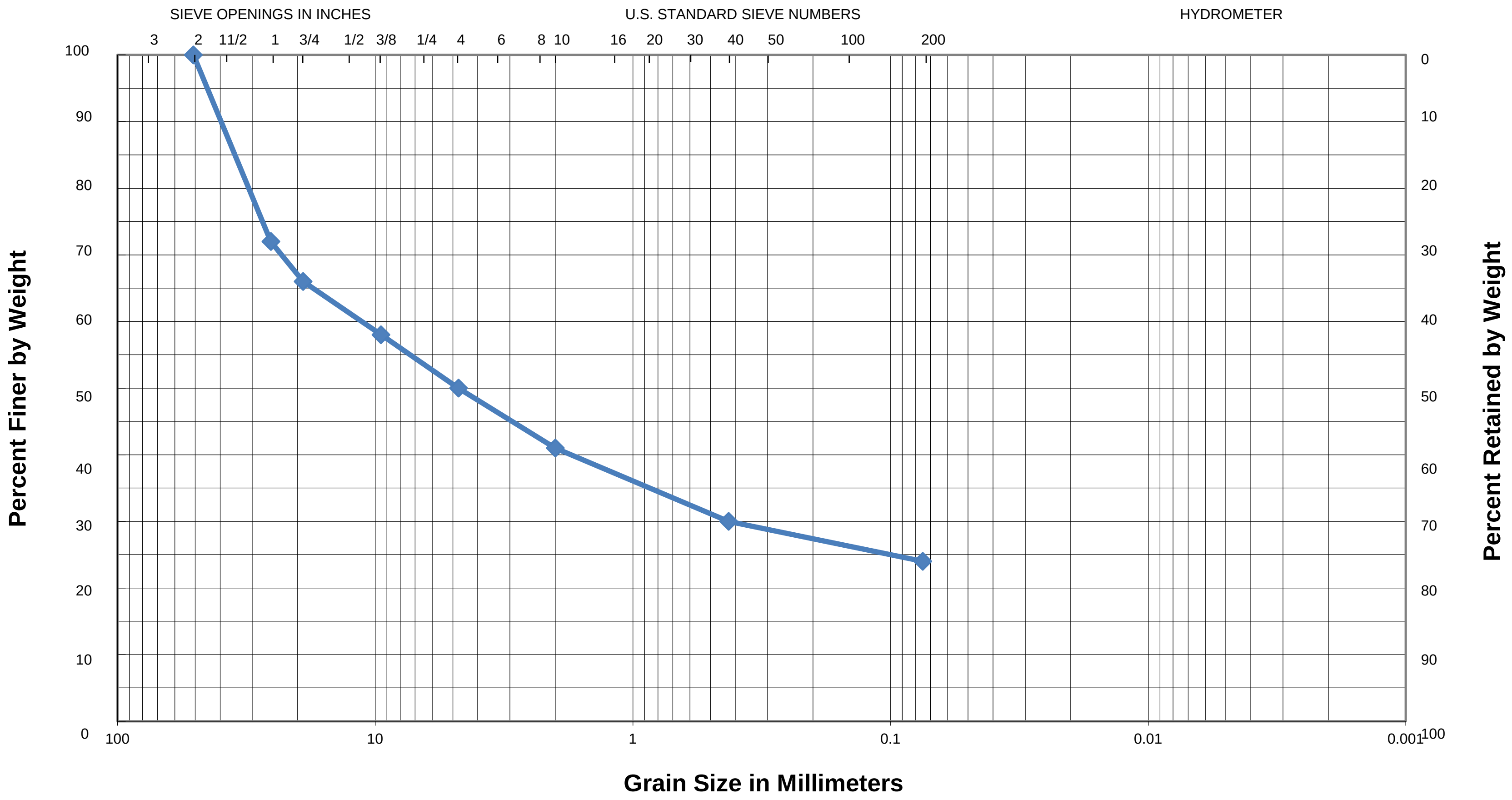
Sample: TP-1A, 0-1 ft
Atterberg Limits: LL = 36, PL = 21, PI = 15

Description: Reddish tan and tan silty clay with sandstone and shale fragments (fill)
Classification: **USCS = SC; AASHTO = A-2-6**

13-214

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

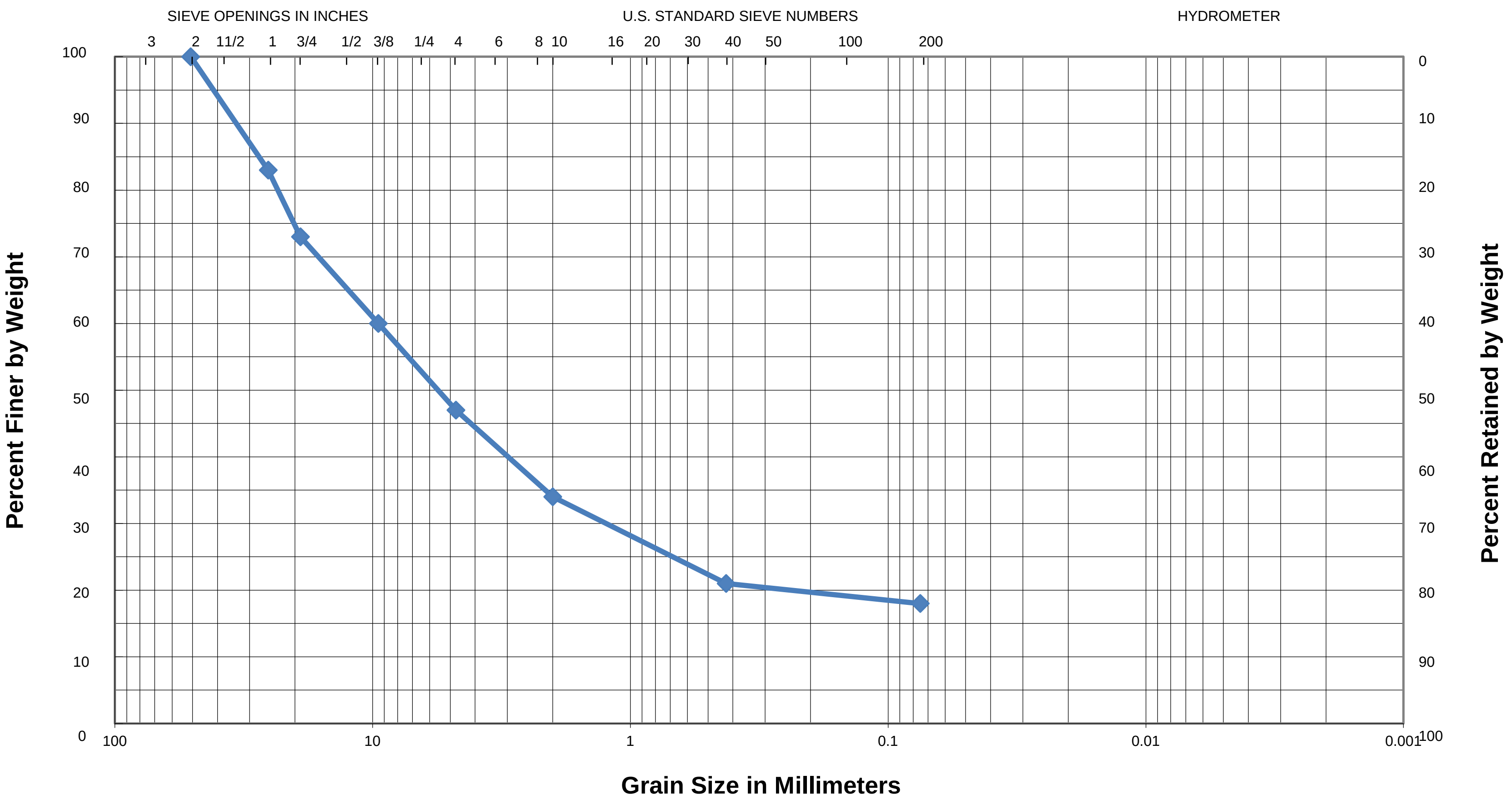
Sample: TP-3A, 0.5-1.5 ft
Atterberg Limits: LL = 37, PL = 24, PI = 13

Description: Reddish tan and tan silty clay with sandstone fragments
Classification: **USCS = GC; AASHTO = A-2-6**

13-214

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

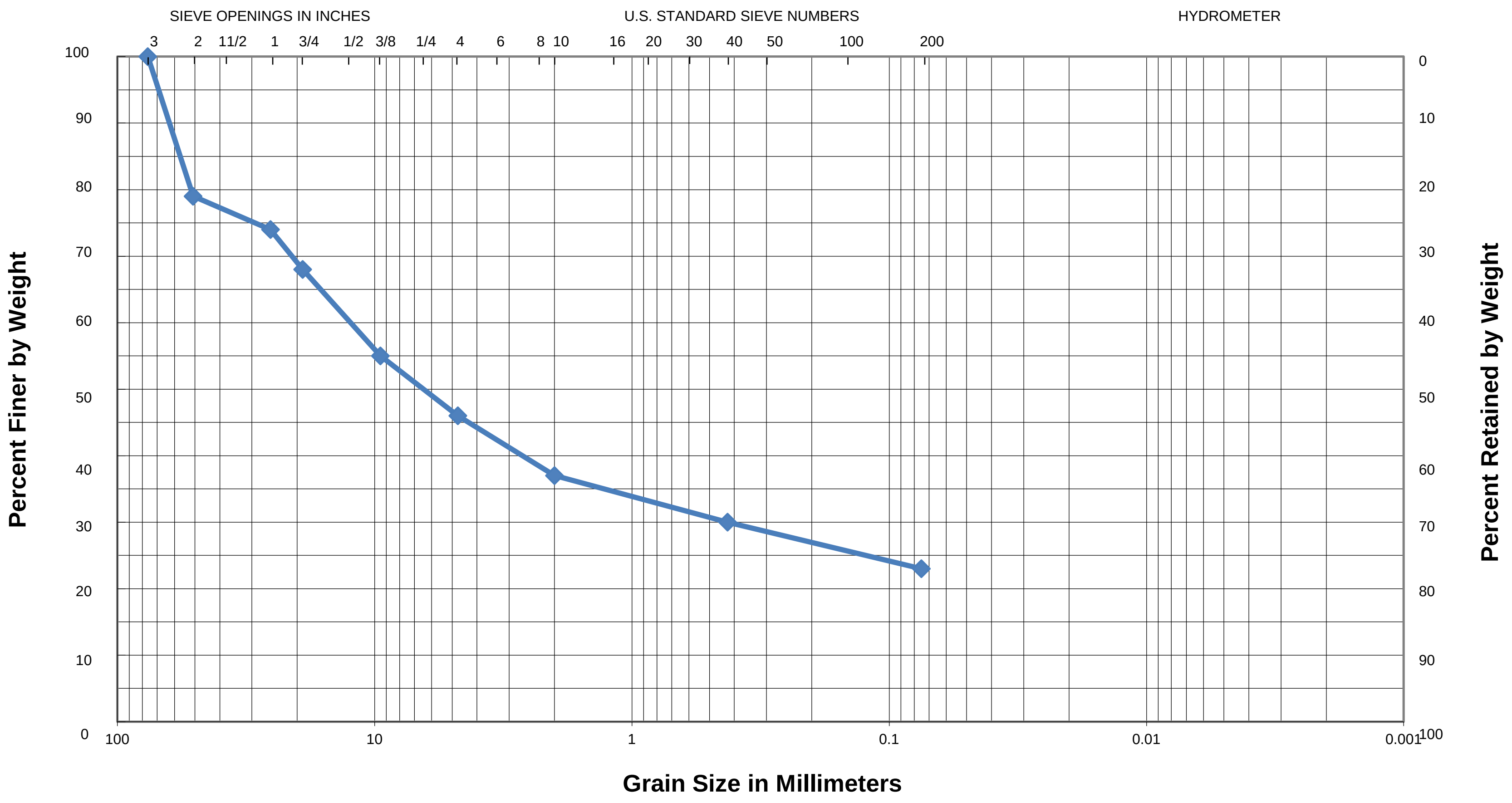
Sample: TP-4A, 0.5-1.5 ft
Atterberg Limits: LL = 47, PL = 29, PI = 18

Description: Reddish tan silty clay with sandstone and shale fragments
Classification: **USCS = GC; AASHTO = A-2-7**

13-214

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

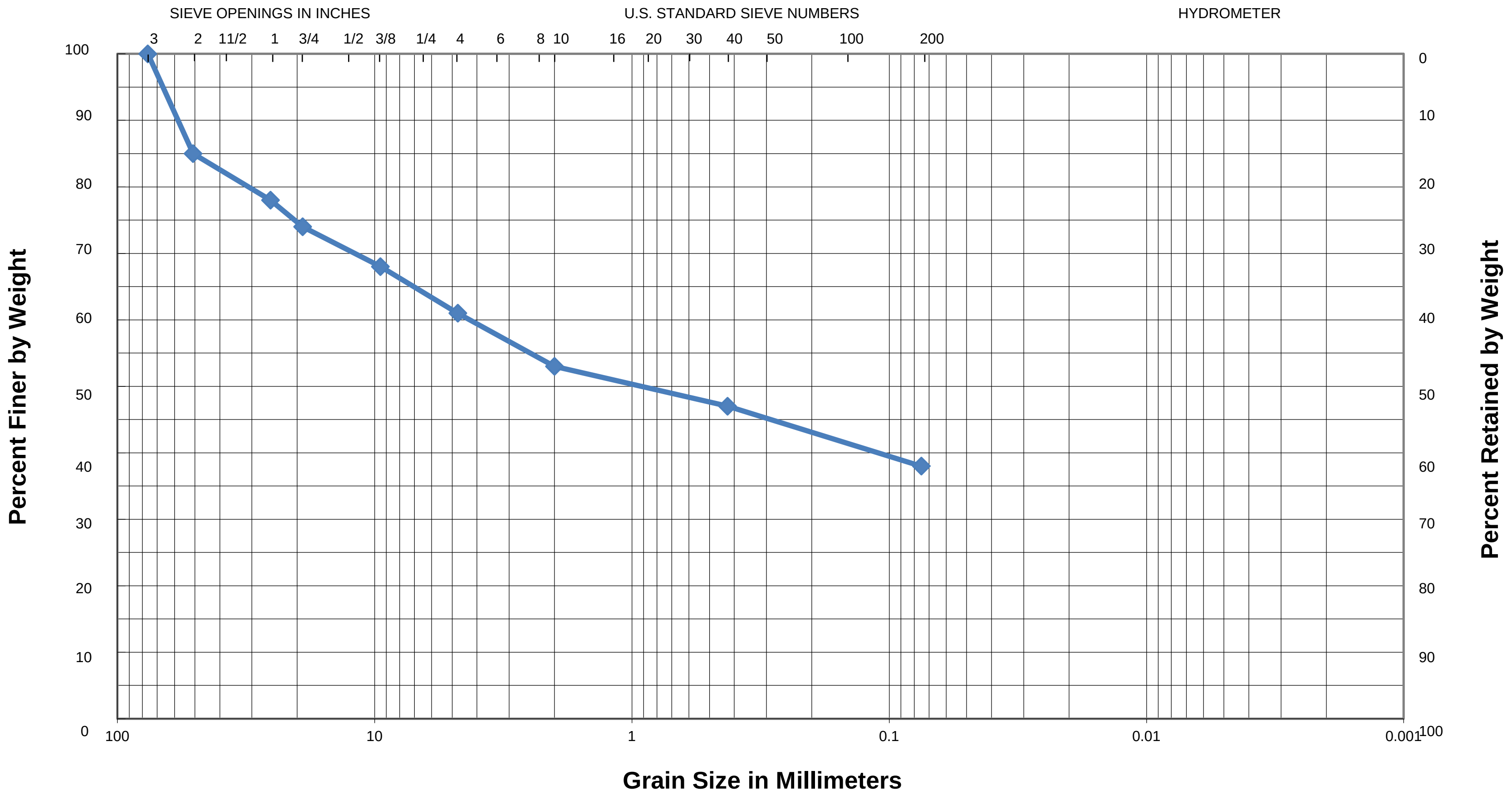
Sample: TP-5A, 0.5-1.5 ft
Atterberg Limits: LL = 28, PL = 22, PI = 6

Description: Reddish tan, gray and tan silty clay with shale and sandstone fragments (fill)
Classification**: USCS = GC-GM; AASHTO = A-1-b**

13-214

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

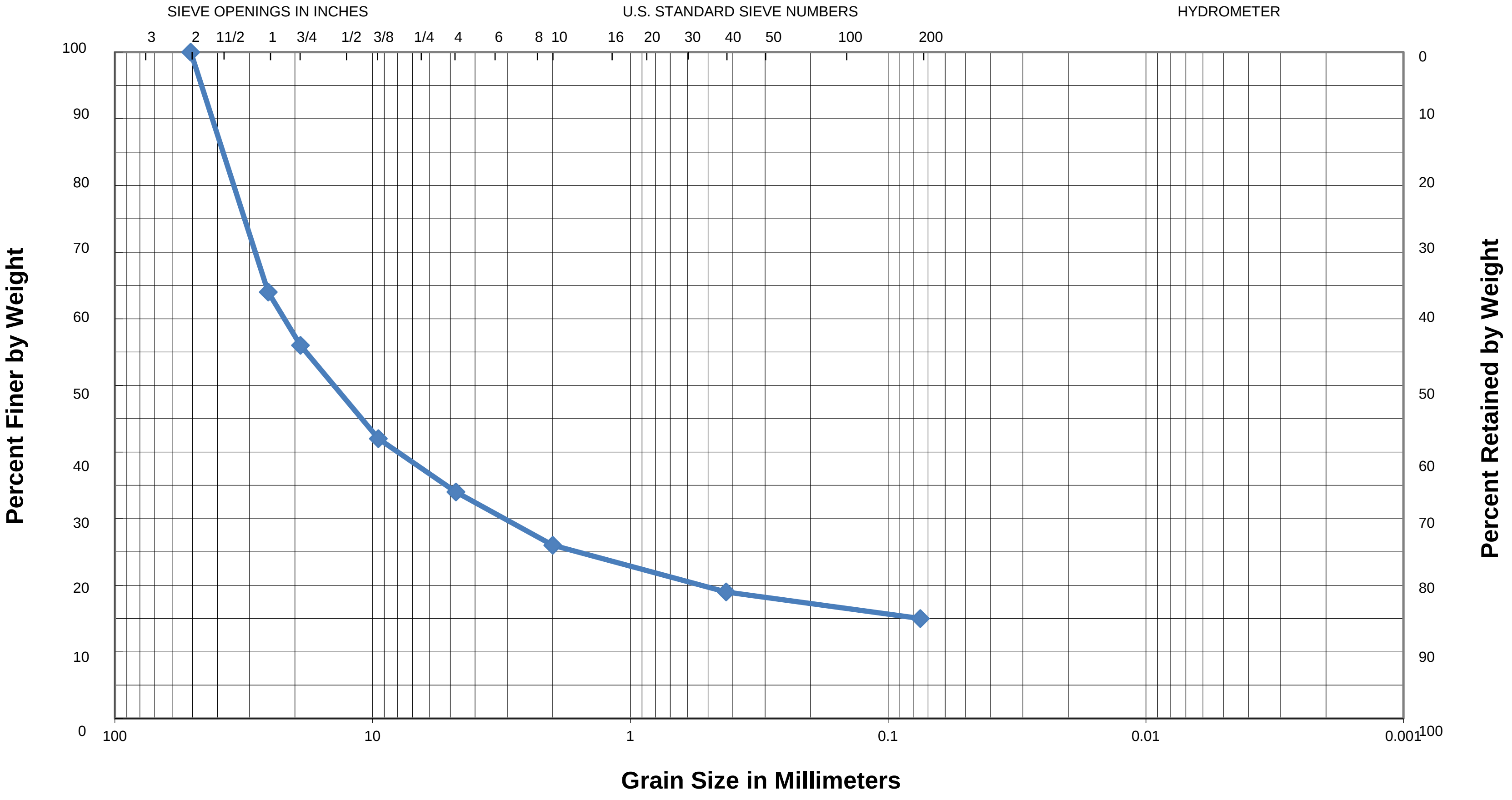
Sample: TP-5A, 4-5 ft
Atterberg Limits: LL = 22, PL = 18, PI = 4

Description: Tan clayey silt with shale fragments
Classification: **USCS = GC-GM; AASHTO = A-4**

13-214

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



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<tr><td>COARSE</td><td>FINE</td><td>COARSE</td><td>MEDIUM</td><td>FINE</td></tr>
</table>

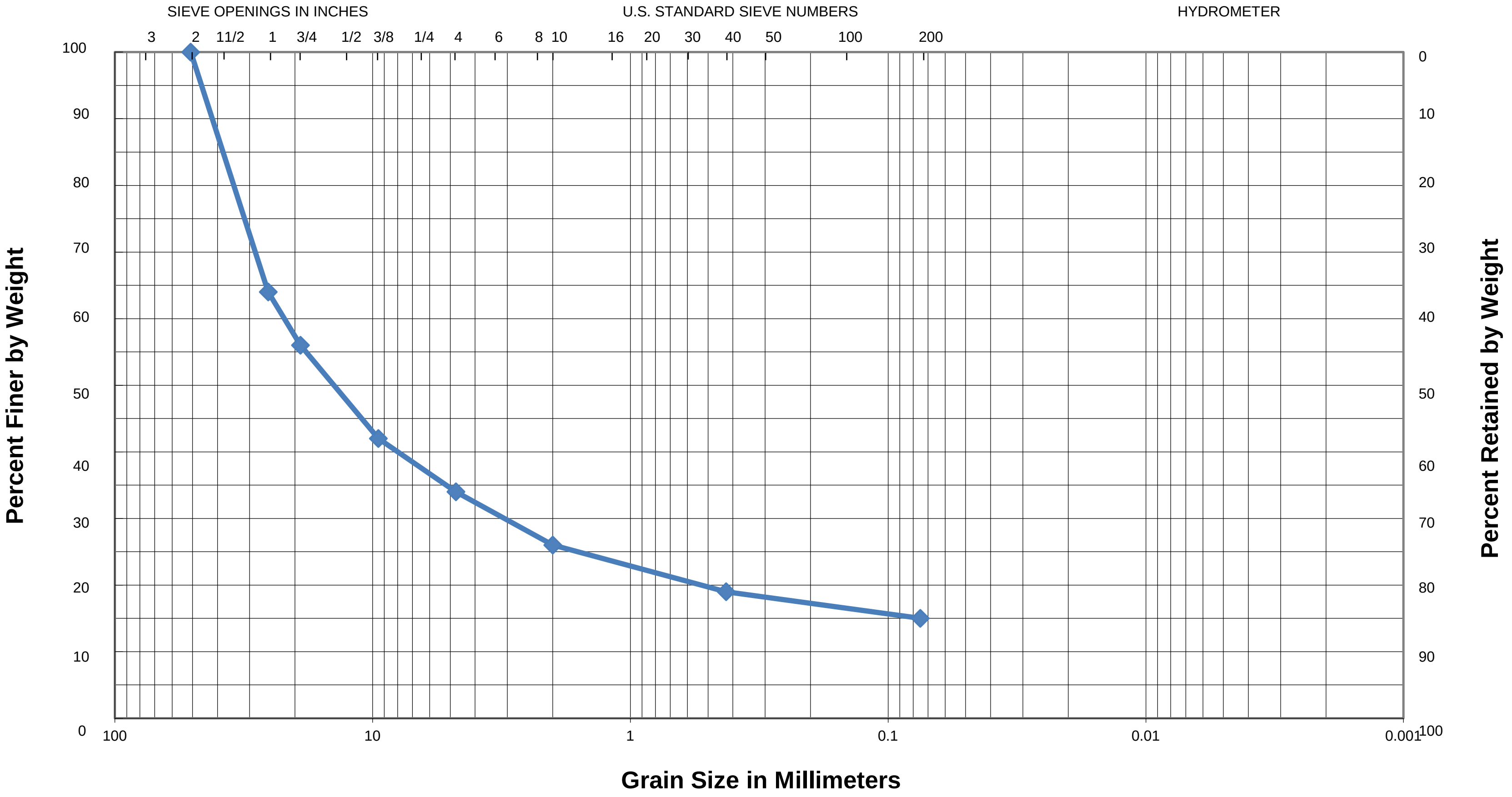
Sample: TP-7A, 0.5-1.5 ft
Atterberg Limits: LL = 23, PL = 17, PI = 6

Description: Reddish tan clayey silt, sandy
with numerous novaculite fragments
Classification**: USCS = GC-GM; AASHTO = A-1-a**

13-214

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



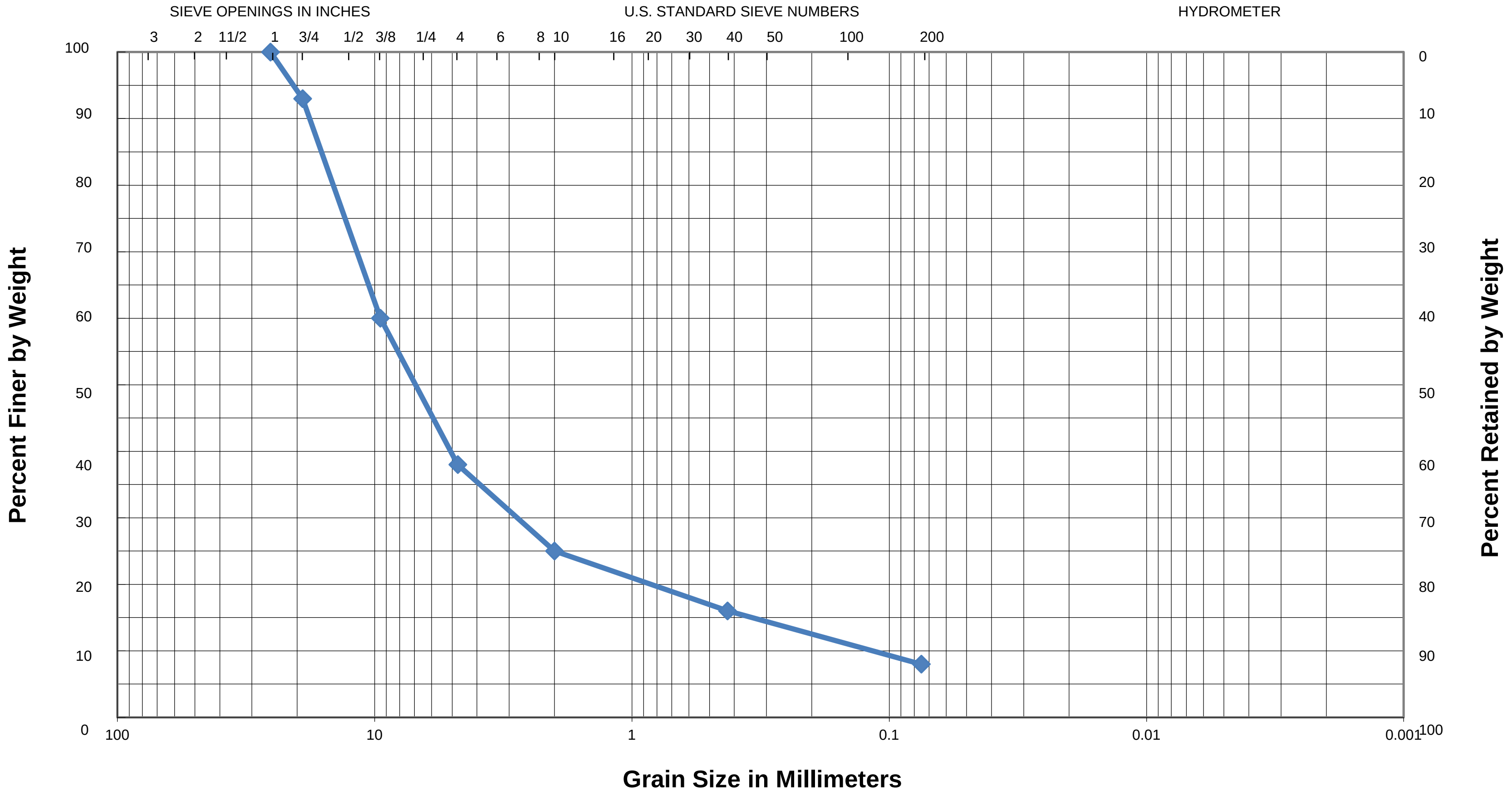
GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

Sample: TP-9A, 0.5-1.5 ft
Atterberg Limits: LL = 47, PL = 26, PI = 21

Description: Gray and reddish tan silty clay
with shale fragments (fill)
Classification**: USCS = CL; AASHTO = A-7-6**

13-214

GRAIN SIZE CURVE



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

Sample: Boring C6, 0.5-2 ft
Atterberg Limits: Non-Plastic

Description: Sandy fine to coarse crushed novaculite fragments (fill)
Classification: **USCS = GW-GM; AASHTO = A-1-a**

13-214

GRAIN SIZE CURVE

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

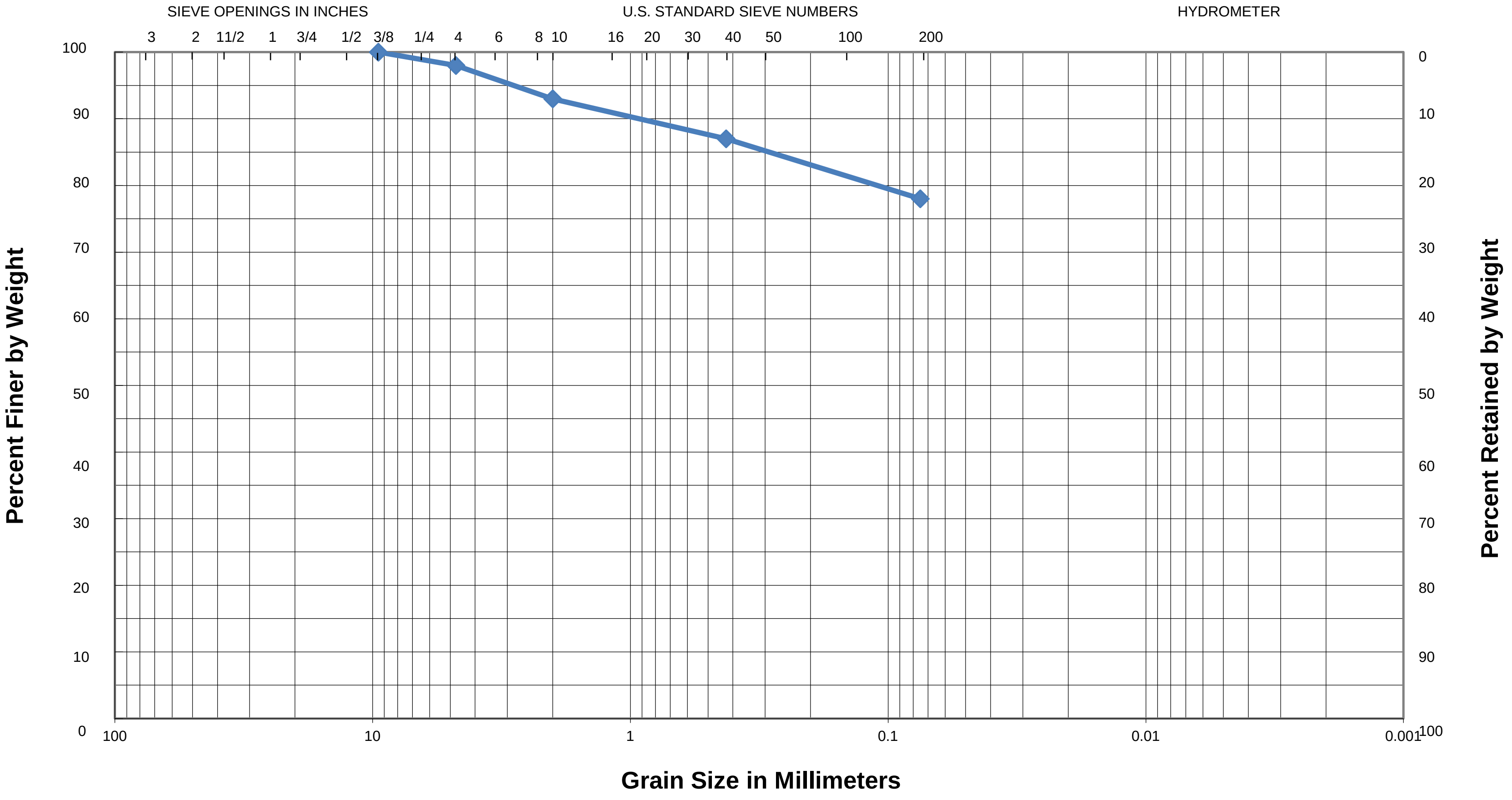
Sample: Boring C6, 2-3.5 ft
Atterberg Limits: LL = 27, PL = 17, PI = 10

Description: Dark gray silty clay
and shale fragments (fill)
Classification: **USCS = GC; AASHTO = A-2-4**

13-214

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



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<tr><td>COARSE</td><td>FINE</td><td>COARSE</td><td>MEDIUM</td><td>FINE</td></tr>
</table>

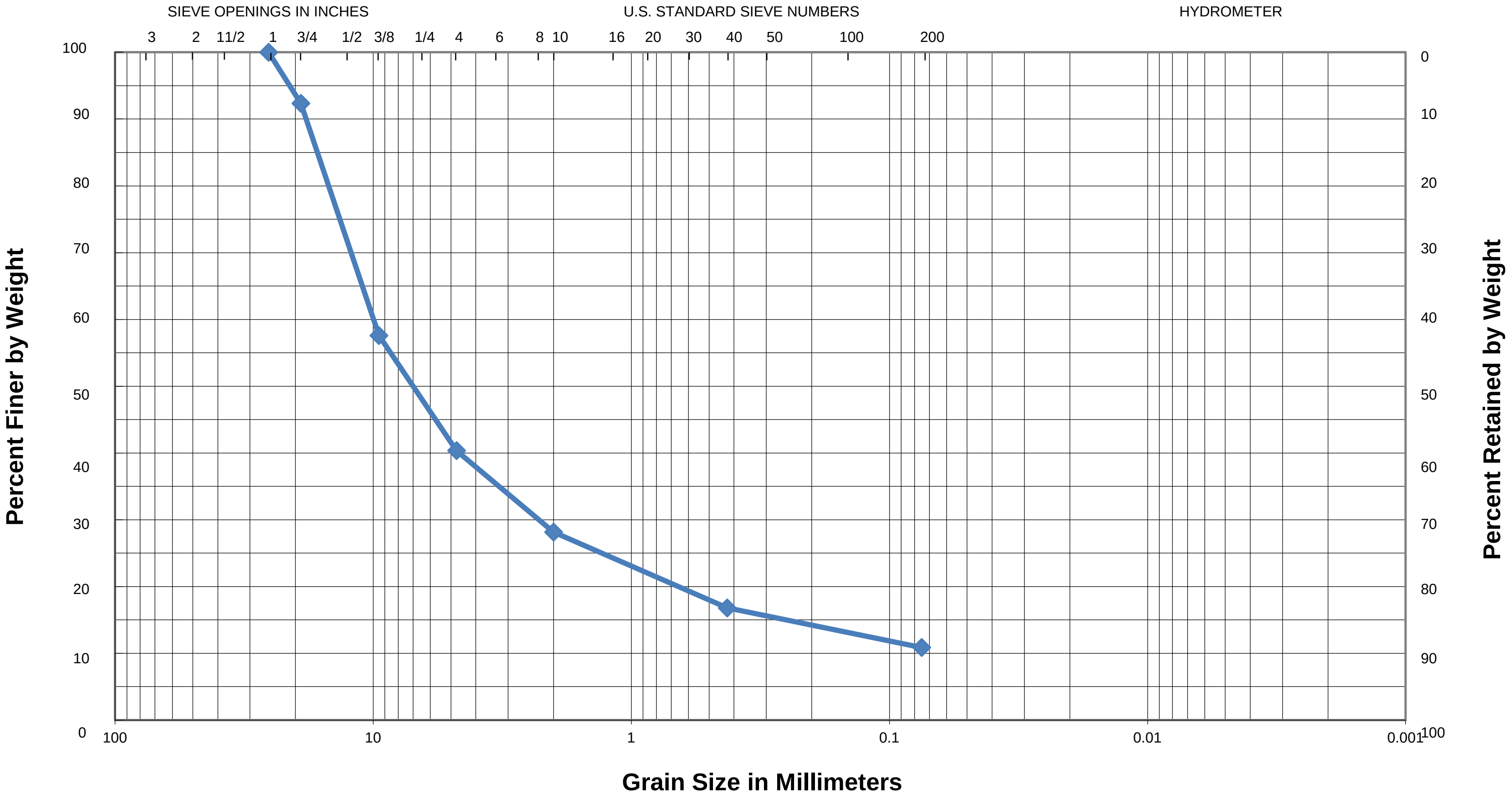
Sample: Boring C6, 3.5-5 ft
Atterberg Limits: LL = 31, PL = 19, PI = 12

Description: Gray adn brown silty clay, sandy
Classification: **USCS = CL; AASHTO = A-6**

13-214

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

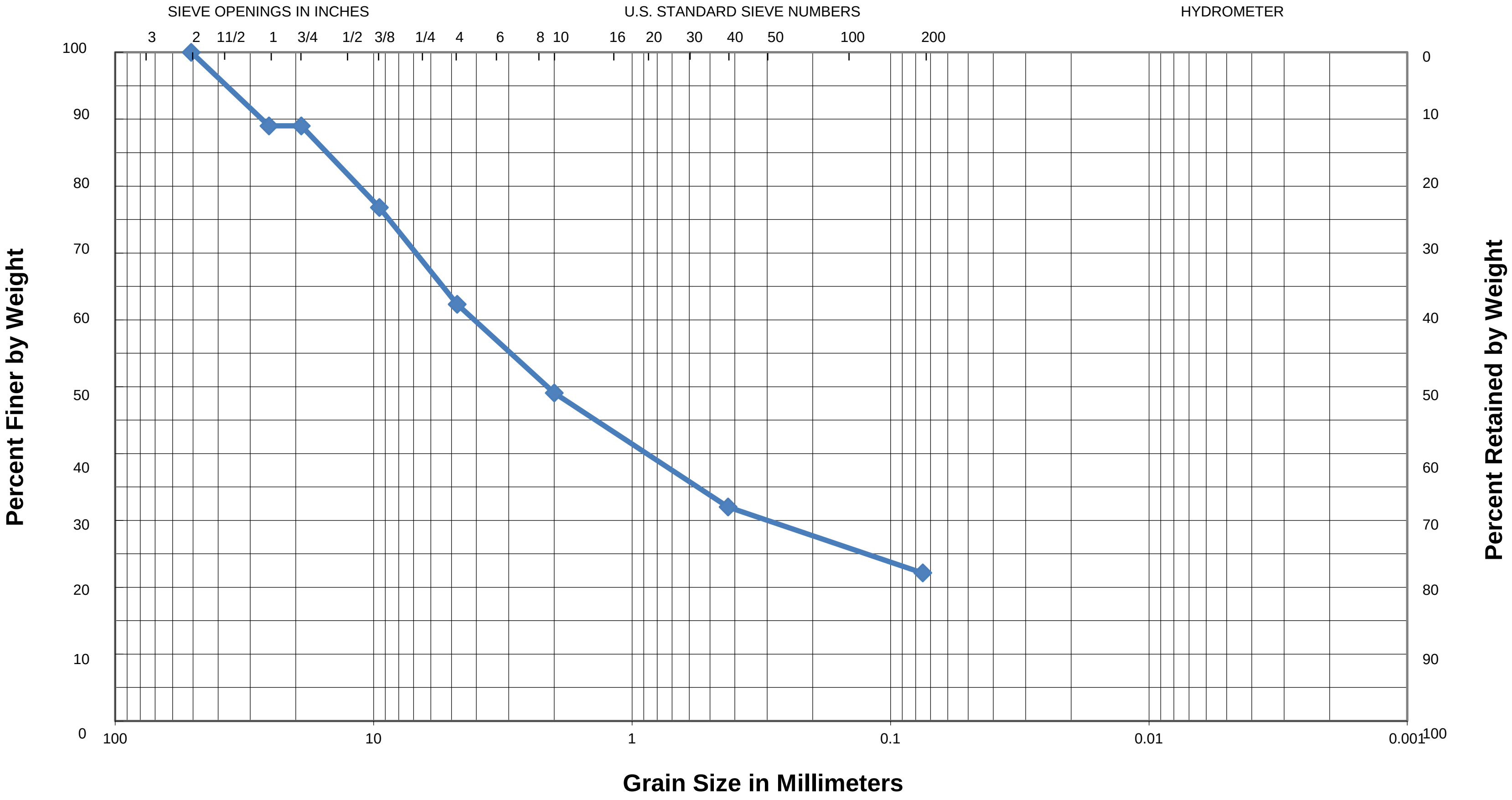
Sample: Boring S4, 4.5-5.5 ft
Atterberg Limits: LL = 26, PL = 20, PI = 6

Description: Brown clayey fine to coarse sand and fine to coarse gravel (fill)
Classification**: USCS = GW-GM; AASHTO = A-1-a**

13-214

GRAIN SIZE CURVE

Grubbs, Hoskyn,
Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

Sample: Boring S5, 2.5-3.5 ft
Atterberg Limits: LL = 34, PL = 26, PI = 8

Description: Brown clayey fine to coarse sand and shale fragments and fine to coarse gravel (fill)
Classification: **USCS = SC; AASHTO = A-2-4**

ATTACHMENT 9

SUMMARY of PROCTOR and CBR TEST RESULTS

PROJECT: AHTD 0606: Hwy 70 - Hot Springs to Hwy 128 (Widening) (S)
LOCATION: Garland County, AR
GHBW JOB No.: 13-214

																					PROCTOR TEST RESULTS		CBR TEST RESULTS (AASHTO T-193)			
TEST PIT NO.	SAMPLE DEPTH, FT	APPROX STA	APPROX OFFSET, FT	SOIL DESCRIPTION	WATER CONTENT, %	ATTERBERG LIMITS			SIEVE ANALYSIS - PERCENT PASSING									UNIFIED CLASS.	AASHTO CLASS.	AASHTO PROCTOR	MAX DRY UNIT WT, pcf	OPTIMUM MOISTURE, %	MOLDED DRY UNIT WT, pcf	MOLDED WATER CONTENT, %	CBR VALUE	
						LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	3 in.	2 in.	1 in.	3/4 in.	3/8 in.	#4	#10	#40	#200								TOP	BOTTOM
TP-3A	0.5-6	586+28	45 RT	Reddish tan silty clay with sandstone and shale fragments	12	37	25	12	95	83	70	57	38	30	25	18	14	GM	A-2-6	T-180	127.1	10.4	112.9	12.9	39.7	39.7
TP-5A	1-4	693+25	38 RT	Reddish tan, gray and tan silty clay with shale and sandstone fragments	15	24	20	4	98	98	97	95	83	64	55	45	35	GM	A-2-4	T-180	119.3	12.8	112.9	12.9	30.4	23.3
TP-6A	0.5-7	750+86	37 RT	Tan and gray silty clay, slightly sandy with some shale and sandstone fragments	14	34	21	13	100	100	100	99	91	86	80	75	63	CL	A-6	T-99	108.5	17.2	108.5	17.2	7.2	4.1
TP-8A	2-4	857+57	22 RT	Reddish tan silty clay with novaculite fragments	12	32	21	11	100	98	93	88	76	63	51	39	33	GC	A-2-6	T-180	127.6	9.5	121.0	9.4	37.8	30.7

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

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Little Rock, Arkansas 72260-0970
#1 Trigon Place 72209
(501) 455-2536
FAX (501) 455-4137

REPORT OF MODIFIED PROCTOR TEST
(AASHTO T-180)

Project: AHTD CA0606 - Hwy 70 to Hwy 128
Job No: 13-214
Material Description: Reddish tan silty clay w/ sandstone and shale fragments
Location Sampled/Source: Test Pit 3A
Sample Depth, ft: 0.5-6
Date Sampled: 10/14/2013
Date Tested: 12/5/2013
Tested By: RSL
Report Date: 12/18/2013

LAB COMPACTION PROCEDURE: AASHTO T-180 Method: D	
Maximum Unit Dry Wt. (pcf):	127.1
Optimum Water Content (%):	10.4

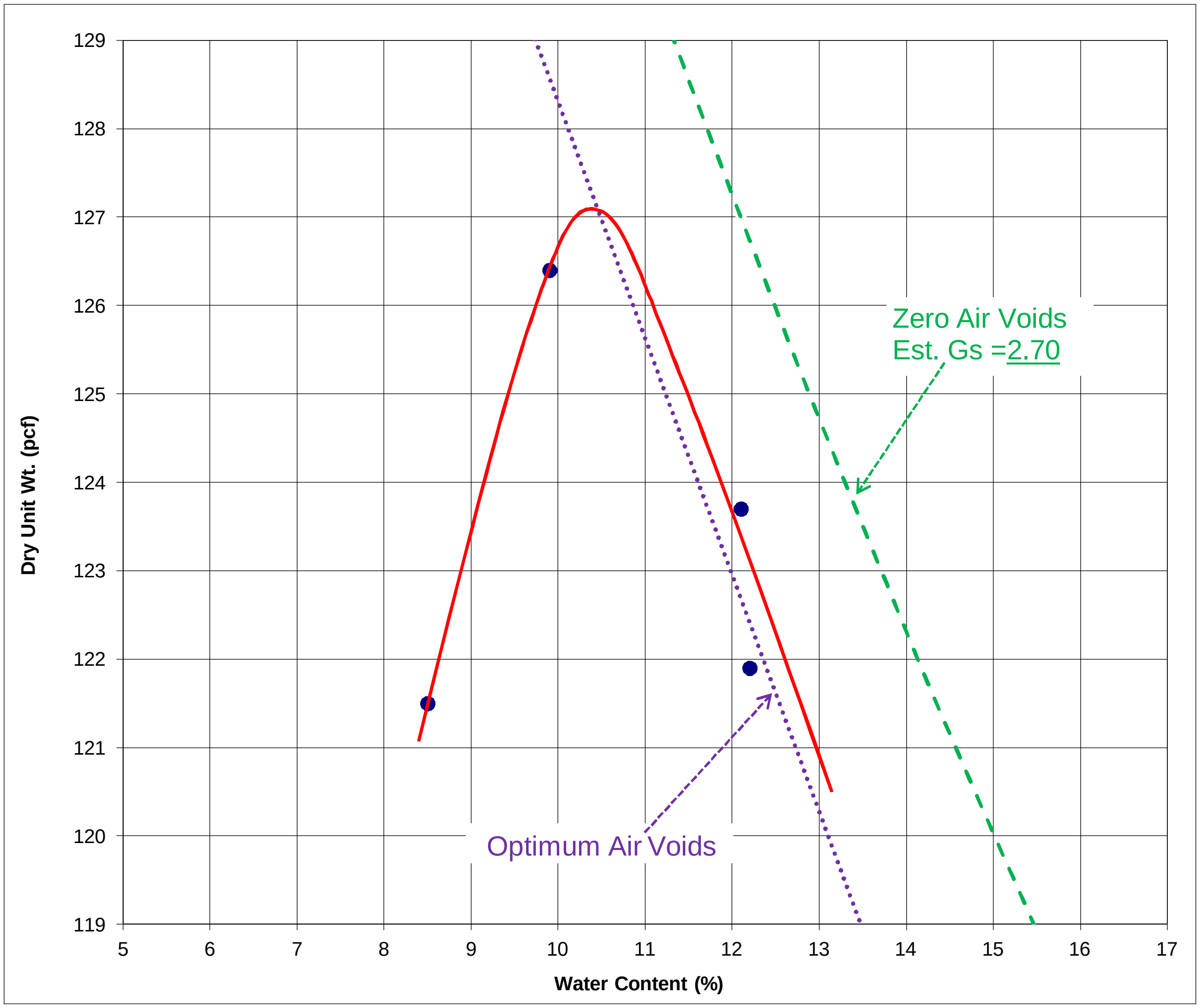
ATTERBERG LIMITS AASHTO T-89 & T-90
Liquid Limit: 37
Plastic Limit: 25
Plasticity Index: 12

AASHTO Classification:
A-2-6

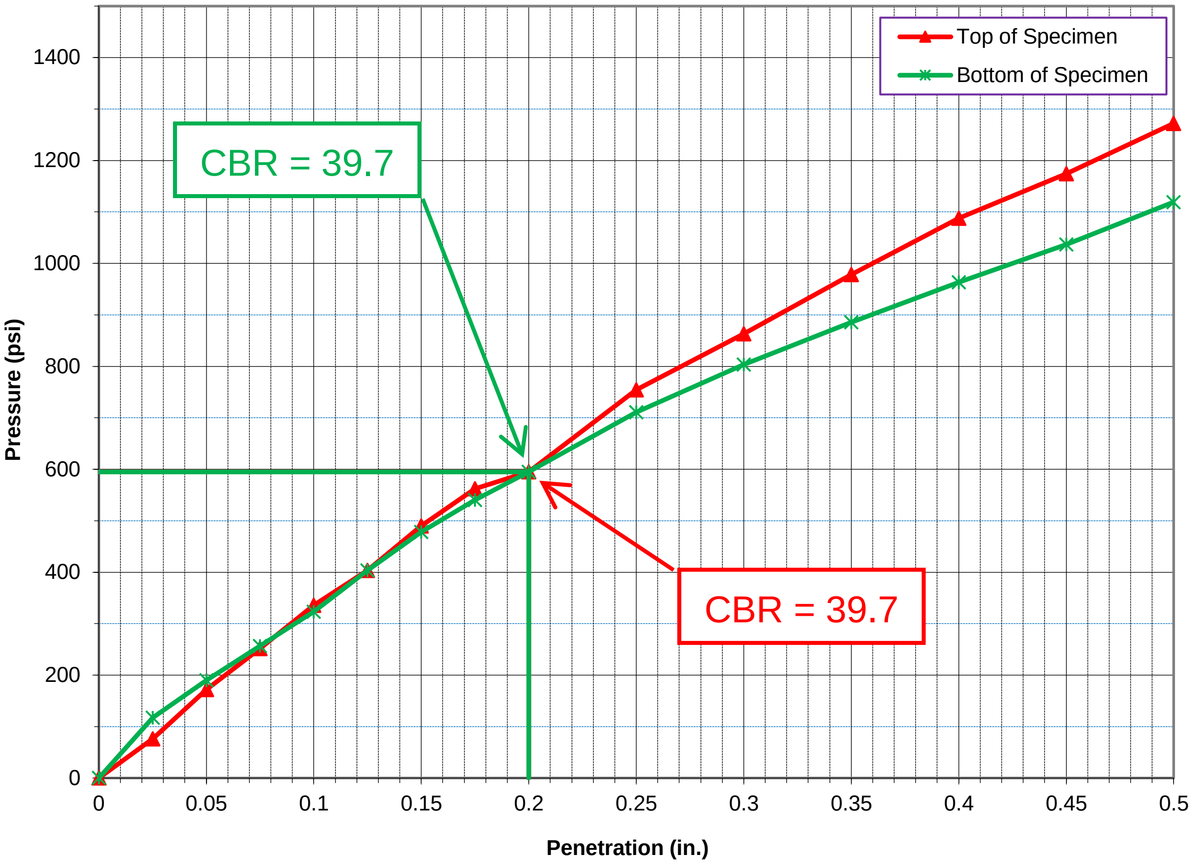
USCS Classification:
GM

GRADATION AASHTO T-88	
Sieve Number	Percent Passing
3 in.	95
2 in.	83
3/4 in.	57
3/8 in.	38
#4	30
#10	25
#40	18
#200	14

As Processed Water Content: 11.6 %



Laboratory CBR Test Report
(AASHTO T-193)



Test Pit/Depth, ft	Classification		Natural Moisture Content, %	Assumed Specific Gravity	Liquid Limit, %	Plastic Limit, %	% Passing No.4	% Passing No.200
	USCS	AASHTO						
TP-3A/.5-6	GM	A-2-6	NA	2.7	37	25	30	14

PROCTOR TEST RESULTS (AASHTO T-180)	**MATERIAL DESCRIPTION**
Optimum Moisture Content = 10.4% Maximum Dry Density = 127.1 pcf	Reddish tan silty clay w/ sandstone and shale fragments

Remarks:

As remolded: Dry Unit Weight, γ_d = 112.9 pcf; Moisture Content, w = 12.9%

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

Project: AHTD CA0606 Hwy 70 to Hwy 128
GHBW Project No.: 13-214
Location: Garland County, Arkansas
Sample Date: 10/14/2013
Test Date: 12/13/2013

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

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Little Rock, Arkansas 72260-0970
#1 Trigon Place 72209
(501) 455-2536
FAX (501) 455-4137

REPORT OF MODIFIED PROCTOR TEST
(AASHTO T-180)

Project: AHTD CA0606 - Hwy 70 to Hwy 128 Job No: 13-214
Material Description: Reddish tan, gray and tan silty clay w/ shale and sandstone fragments
Location Sampled/Source: Test Pit 5A
Sample Depth, ft: 1-4
Date Sampled: 10/14/2013
Date Tested: 12/5/2013
Tested By: RSL
Report Date: 12/18/2013

LAB COMPACTION PROCEDURE: AASHTO T-180 Method: D	
Maximum Unit Dry Wt. (pcf):	119.3
Optimum Water Content (%):	12.8

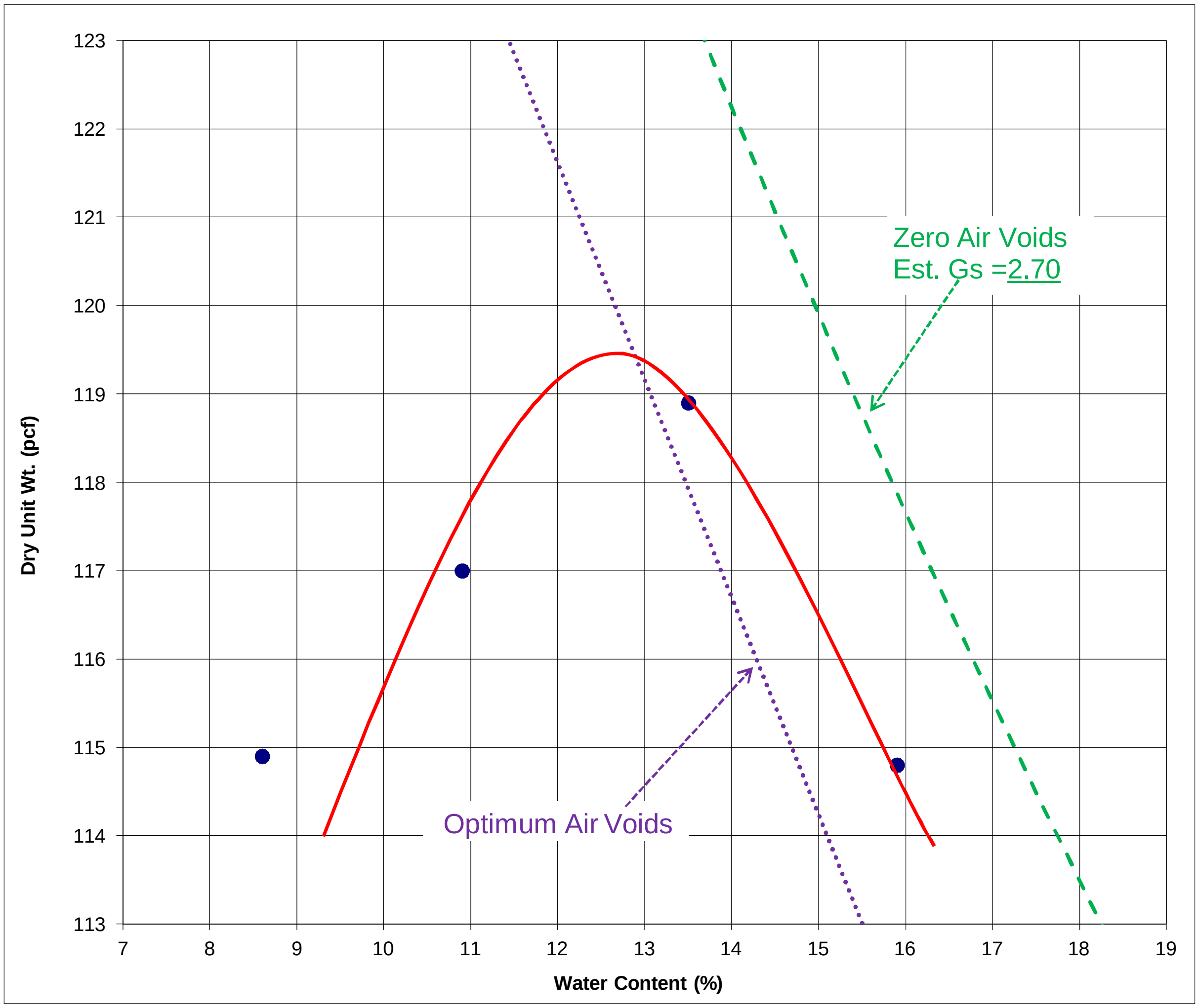
As Processed Water Content: 14.7 %

ATTERBERG LIMITS **AASHTO T-89 & T-90**
Liquid Limit: 24
Plastic Limit: 20
Plasticity Index: 4

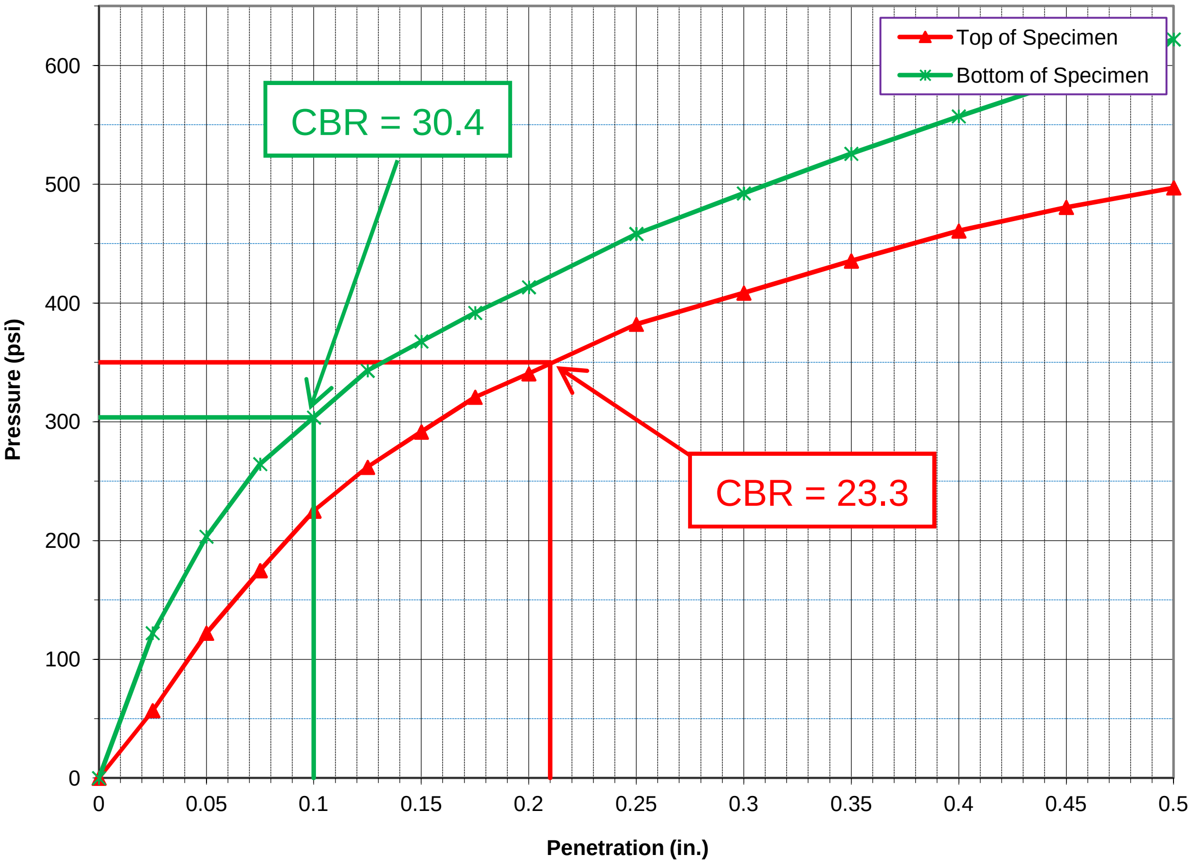
AASHTO Classification:
A-2-4

USCS Classification:
GM

GRADATION **AASHTO T-88**	
Sieve Number	Percent Passing
3 in.	98
2 in.	98
1 in.	96
3/4 in.	95
3/8 in.	83
#4	64
#10	55
#40	45
#200	35



Laboratory CBR Test Report
(AASHTO T-193)



Test Pit/Depth, ft	Classification		Natural Moisture Content, %	Assumed Specific Gravity	Liquid Limit, %	Plastic Limit, %	% Passing No.4	% Passing No.200
	USCS	AASHTO						
TP-5A/1-4	GM	A-2-4	NA	2.7	24	20	64	35

PROCTOR TEST RESULTS (AASHTO T-180)	**MATERIAL DESCRIPTION**
Optimum Moisture Content = 12.8% Maximum Dry Density = 119.3 pcf	Reddish tan, gray and tan silty clay w/ shale and sandstone fragments

Remarks:

As remolded: Dry Unit Weight, γ_d = 112.9 pcf; Moisture Content, w = 12.9%

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

Project: AHTD CA0606 Hwy 70 to Hwy 128
GHBW Project No.: 13-214
Location: Garland County, Arkansas
Sample Date: 10/14/2013
Test Date: 12/13/2013

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

P.O. Box 30970
Little Rock, Arkansas 72260-0970
#1 Trigon Place 72209
(501) 455-2536
FAX (501) 455-4137

REPORT OF STANDARD PROCTOR TEST

(AASHTO T-99)

Project: AHTD CA0606 - Hwy 70 to Hwy 128
Job No: 13-214
Material Description: Tan and gray silty clay, slightly sandy, with some shale and sandstone fragments
Location Sampled/Source: Test Pit 6A
Sample Depth, ft: 0.5-7
Date Sampled: 10/14/2013
Date Tested: 12/5/2013
Tested By: RSL
Report Date: 12/18/2013

LAB COMPACTION PROCEDURE: AASHTO T-99 Method: C	
Maximum Unit Dry Wt. (pcf):	108.5
Optimum Water Content (%):	17.2

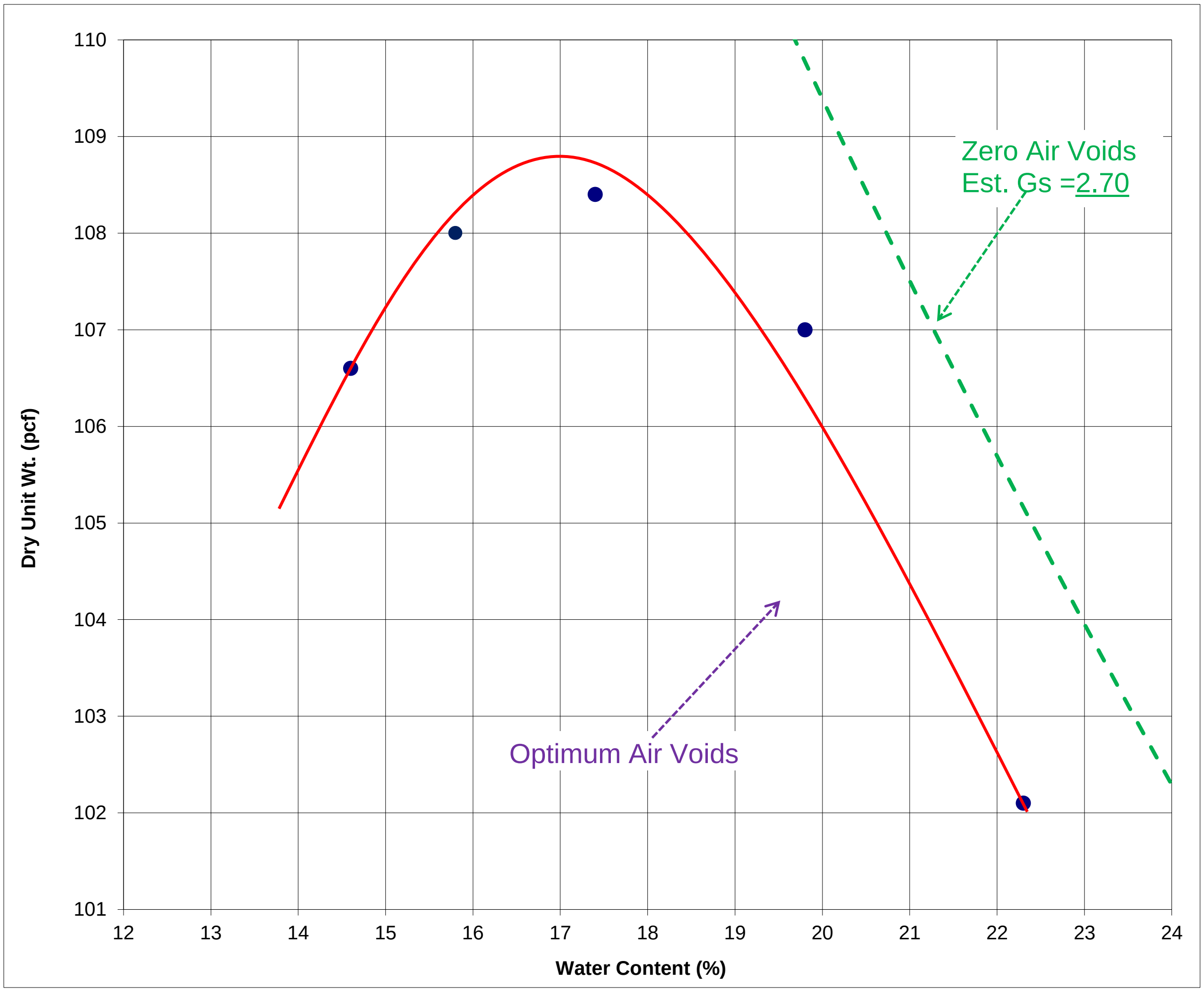
ATTERBERG LIMITS AASHTO T-89 & T-90
Liquid Limit: 34
Plastic Limit: 21
Plasticity Index: 13

AASHTO Classification:
A-6

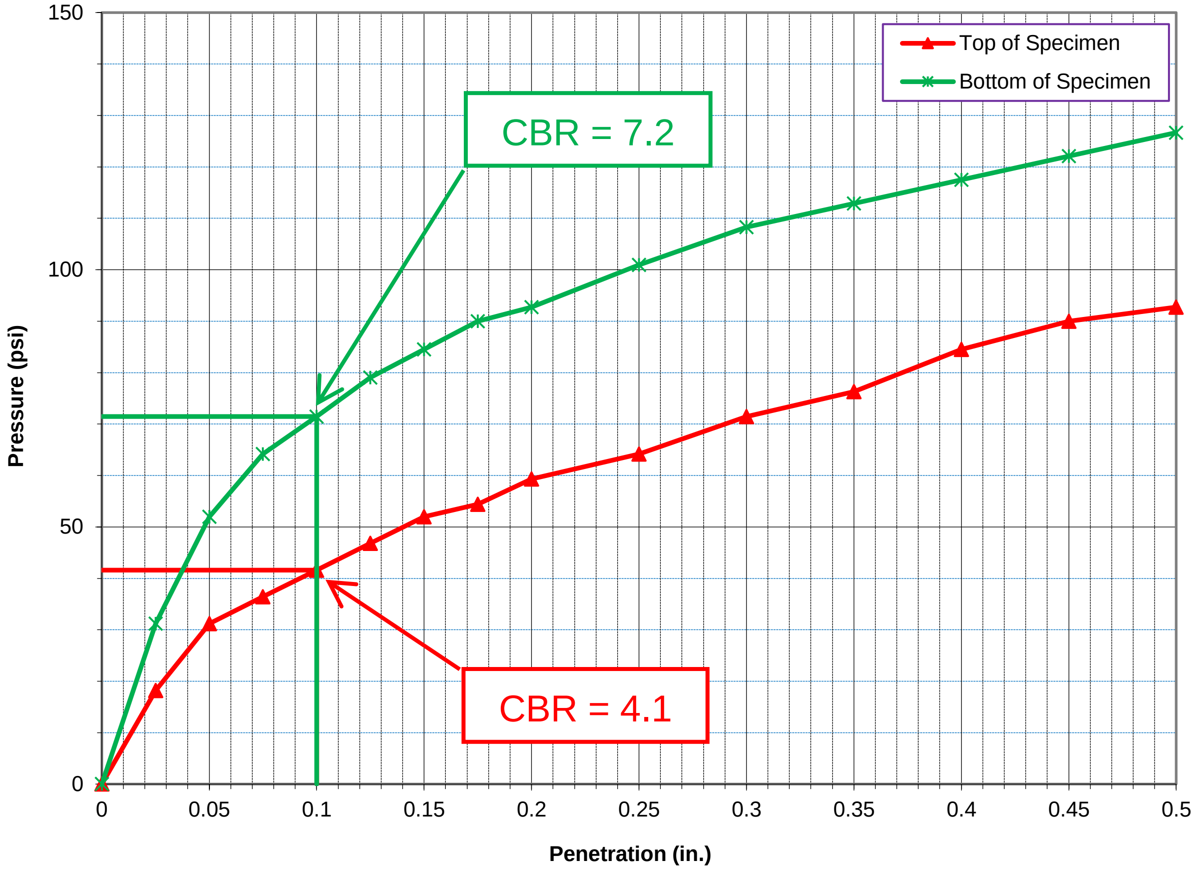
USCS Classification:
CL

GRADATION AASHTO T-88	
Sieve Number	Percent Passing
3 in.	100
2 in.	100
3/4 in.	99
3/8 in.	91
#4	86
#10	80
#40	75
#200	63

As Processed Water Content: 13.8 %



Laboratory CBR Test Report
(AASHTO T-193)



Test Pit/Depth, ft	Classification		Natural Moisture Content, %	Assumed Specific Gravity	Liquid Limit, %	Plastic Limit, %	% Passing No.4	% Passing No.200
	USCS	AASHTO						
TP-6A/.5-7	CL	A-6	NA	2.7	34	21	86	63

PROCTOR TEST RESULTS (AASHTO T-99)	**MATERIAL DESCRIPTION**
Optimum Moisture Content = 17.2% Maximum Dry Density = 108.5 pcf	Tan and gray silty clay, slightly sandy, with some shale and sandstone fragments

Remarks:

As molded: Dry Unit Weight, γ_d = 103.9 pcf; Moisture Content, w = 17.4%

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

Project: AHTD CA0606 Hwy 70 to Hwy 128
GHBW Project No.: 13-214
Location: Garland County, Arkansas
Sample Date: 10/14/2013
Test Date: 12/13/2013

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

P.O. Box 30970
Little Rock, Arkansas 72260-0970
#1 Trigon Place 72209
(501) 455-2536
FAX (501) 455-4137

REPORT OF MODIFIED PROCTOR TEST

(AASHTO T-180)

Project: AHTD CA0606 - Hwy 70 to Hwy 128
Job No: 13-214
Material Description: Reddish tan silty clay w/ novaculite fragments
Location Sampled/Source: Test Pit 8A
Sample Depth, ft: 2-4
Date Sampled: 10/14/2013
Date Tested: 12/4/2013
Tested By: RSL
Report Date: 12/20/2013

LAB COMPACTION PROCEDURE: AASHTO T-180 Method: D	
Maximum Unit Dry Wt. (pcf):	127.6
Optimum Water Content (%):	9.5

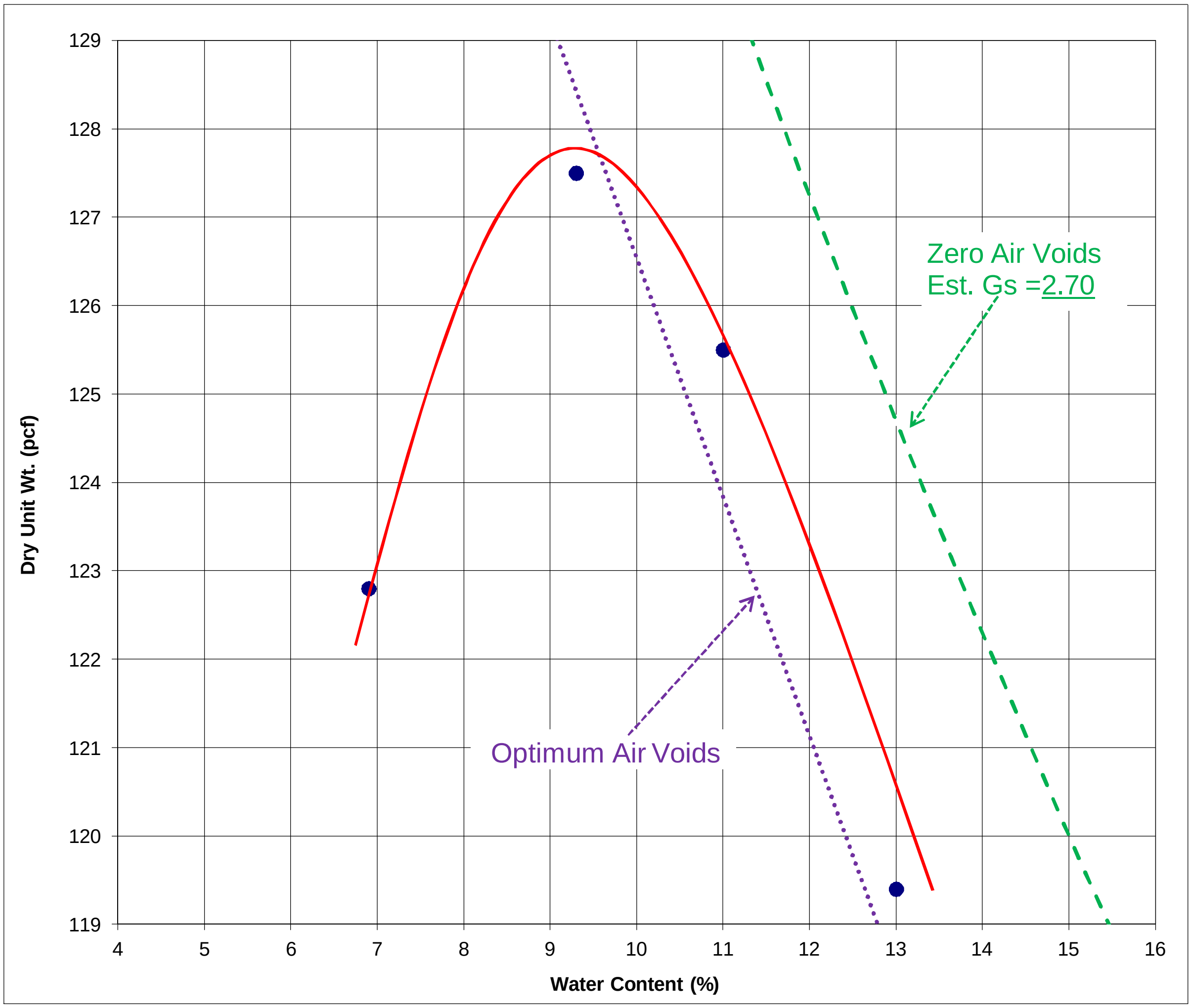
As Processed Water Content: 11.7 %

ATTERBERG LIMITS **AASHTO T-89 & T-90**
Liquid Limit: 32
Plastic Limit: 21
Plasticity Index: 11

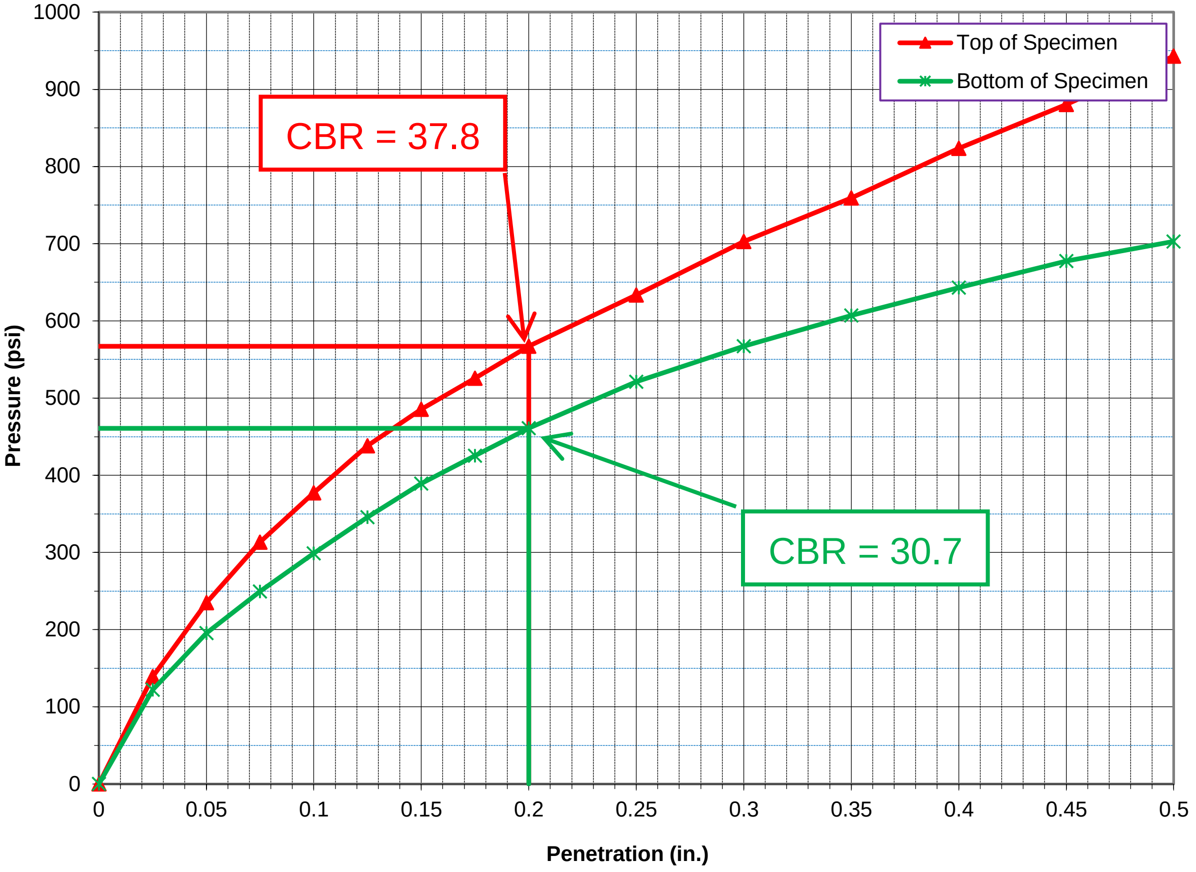
AASHTO Classification: A-2-6

USCS Classification: GC

GRADATION **AASHTO T-88**	
Sieve Number	Percent Passing
3 in.	100
2 in.	98
3/4 in.	88
3/8 in.	76
#4	63
#10	51
#40	39
#200	33



Laboratory CBR Test Report
(AASHTO T-193)



Test Pit/Depth, ft	Classification		Natural Moisture Content, %	Assumed Specific Gravity	Liquid Limit, %	Plastic Limit, %	% Passing No.4	% Passing No.200
	USCS	AASHTO						
TP-8A/2-4	GC	A-2-6	NA	2.69	32	21	63	33

PROCTOR TEST RESULTS (AASHTO T-180)	**MATERIAL DESCRIPTION**
Optimum Moisture Content = 9.5% Maximum Dry Density = 127.6 pcf	Reddish tan silty clay w/ novaculite fragments

Remarks:

As molded: Dry Unit Weight, γ_d = 121 pcf; Moisture Content, w = 9.4%

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

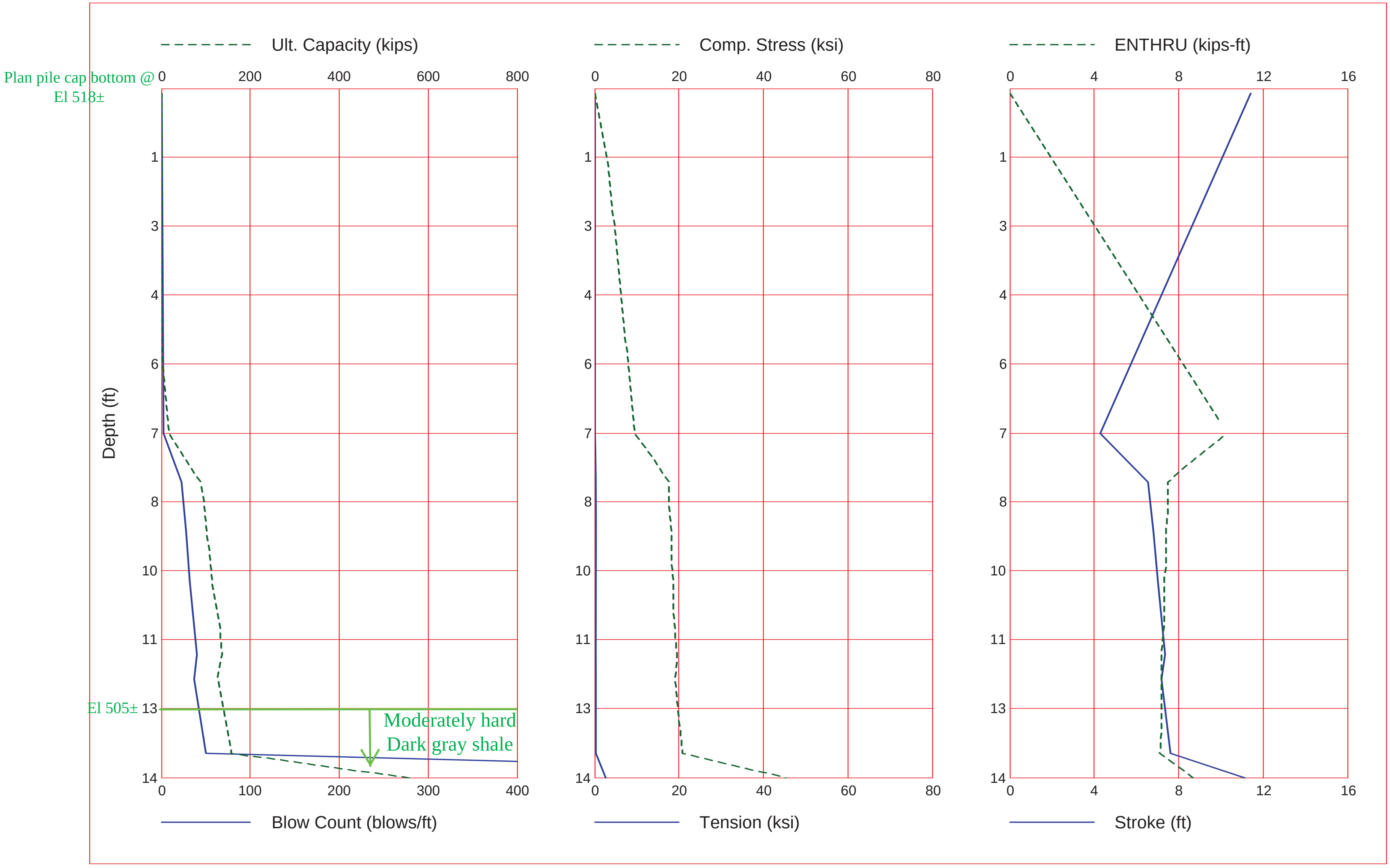
Project: AHTD CA0606 Hwy 70 to Hwy 128
GHBW Project No.: 13-214
Location: Garland County, Arkansas
Sample Date: 10/14/2013
Test Date: 12/13/2013

ATTACHMENT 10

Grubbs, Hoskyn, Barton & Wyatt, Inc.
13-214_Driveability_Bent 1_HP12x53

Jul 10 2014
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 1.000 / 1.000



Steel HP12×53 @ Bent 1
US 70 over Ten Mile Creek (West)
E = 20.1 ft-kips (DELMAG D 8-22)

Gain/Loss 1 at Shaft and Toe 1.000 / 1.000

Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
0.1	0.1	0.0	0.1	0.0	0.000	0.000	11.42	0.0
7.0	16.9	9.8	7.1	2.8	9.501	-0.073	4.28	10.3
8.0	88.4	12.8	75.6	23.2	17.541	-0.233	6.56	7.5
9.0	101.4	16.3	85.1	27.6	18.150	-0.249	6.80	7.4
10.0	114.9	20.2	94.7	32.2	18.681	-0.265	7.01	7.3
11.5	135.9	26.9	109.0	39.5	19.519	-0.236	7.36	7.2
12.0	126.9	36.9	90.0	36.9	19.142	-0.252	7.18	7.2
13.5	156.9	66.9	90.0	50.5	20.757	-0.276	7.63	7.1
14.0	558.0	98.9	459.1	1119.5	45.251	-2.672	11.17	8.7

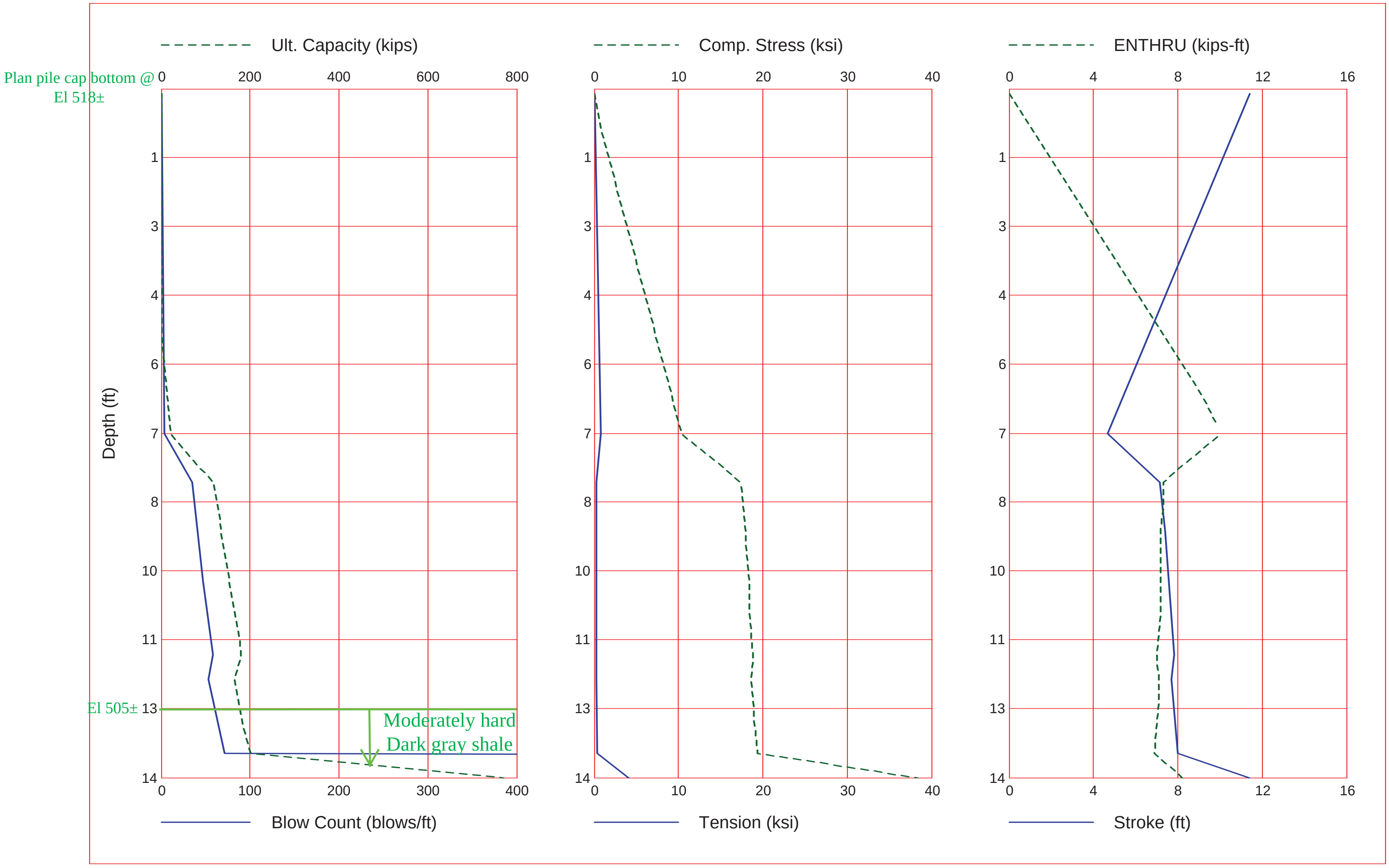
Total Continuous Driving Time 13.00 minutes; Total Number of Blows 510

Steel HP12×53 @ Bent 1
US 70 over Ten Mile Creek (West)
E = 20.1 ft-kips (DELMAG D 8-22)

Grubbs, Hoskyn, Barton & Wyatt, Inc.
12-214_Driveability_Bent 1_HP14x73

Jul 10 2014
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 1.000 / 1.000



Steel HP14×73 @ Bent 1
US 70 over Ten Mile Creek (West)
E = 20.1 ft-kips (DELMAG D 8-22)

Grubbs, Hoskyn, Barton & Wyatt, Inc. Jul 10 2014
12-214_Driveability_Bent 1_HP14x73 GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 1.000 / 1.000

Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
0.1	0.1	0.0	0.1	0.0	0.000	0.000	11.42	0.0
7.0	21.3	11.4	9.8	3.5	10.399	-0.762	4.67	10.1
8.0	117.8	15.0	102.8	34.6	17.332	-0.280	7.13	7.3
9.0	134.9	19.0	115.8	40.7	17.936	-0.274	7.41	7.2
10.0	152.4	23.6	128.9	47.2	18.348	-0.267	7.58	7.2
11.5	179.8	31.4	148.4	58.6	18.879	-0.276	7.82	7.0
12.0	165.6	43.1	122.5	53.0	18.646	-0.283	7.70	7.1
13.5	200.6	78.1	122.5	71.7	19.350	-0.390	8.01	6.9
14.0	770.3	115.5	654.9	9999.0	38.388	-4.104	11.42	8.2

Refusal occurred; no driving time output possible

Steel HP14×73 @ Bent 1
US 70 over Ten Mile Creek (West)
E = 20.1 ft-kips (DELMAG D 8-22)

ATTACHMENT 11

Novaculite exposure -
approx Sta 790

Novaculite
exposure approx
Sta 790

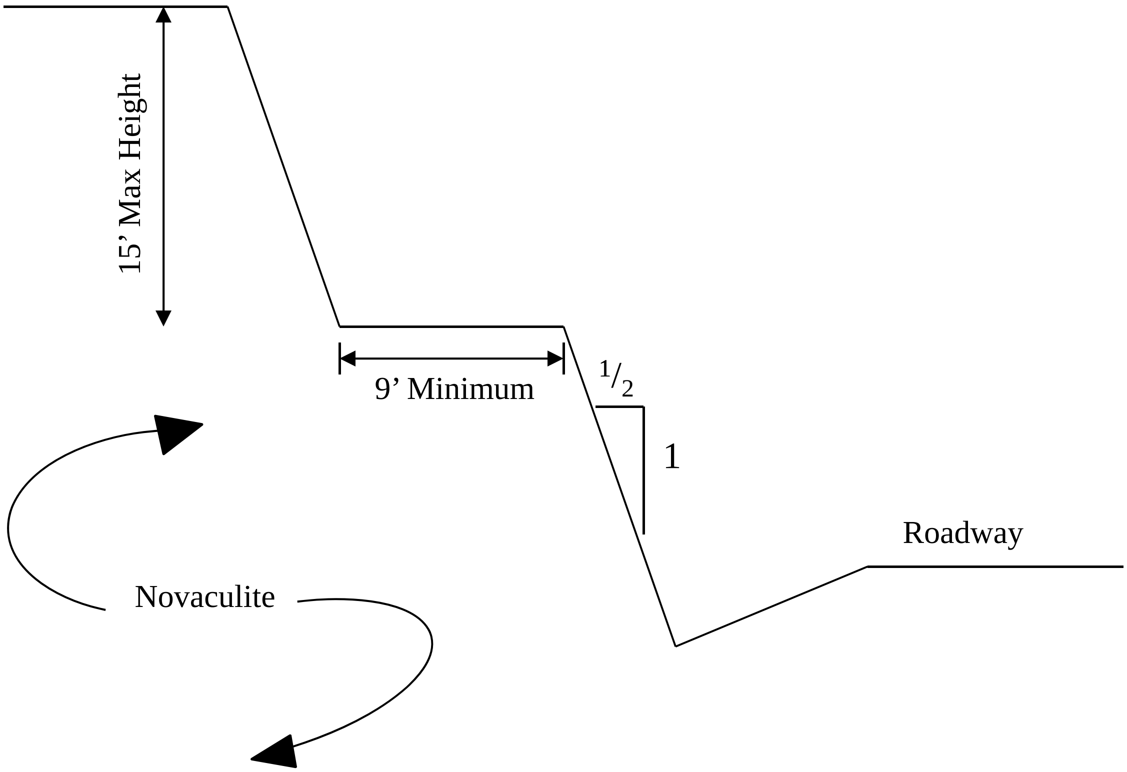

Novaculite
exposure approx
Sta 806

Novaculite exposure approx Sta 806


Novaculite
exposure approx
Sta 806

Novaculite
exposure approx
Sta 806

FOR INFORMATION ONLY
NOT FOR CONSTRUCTION



TYPICAL SECTION FOR CUT SLOPES INTO NOVACULITE

Grubbs, Hoskyn, Barton & Wyatt, INC. CONSULTING ENGINEERS	**CUT SLOPE CROSS-SECTION** **CA0606: HWY70: Hot Springs-Hwy 128** **Garland County, Arkansas**	**Job No. 13-214**
	Not to Scale	**Plate**

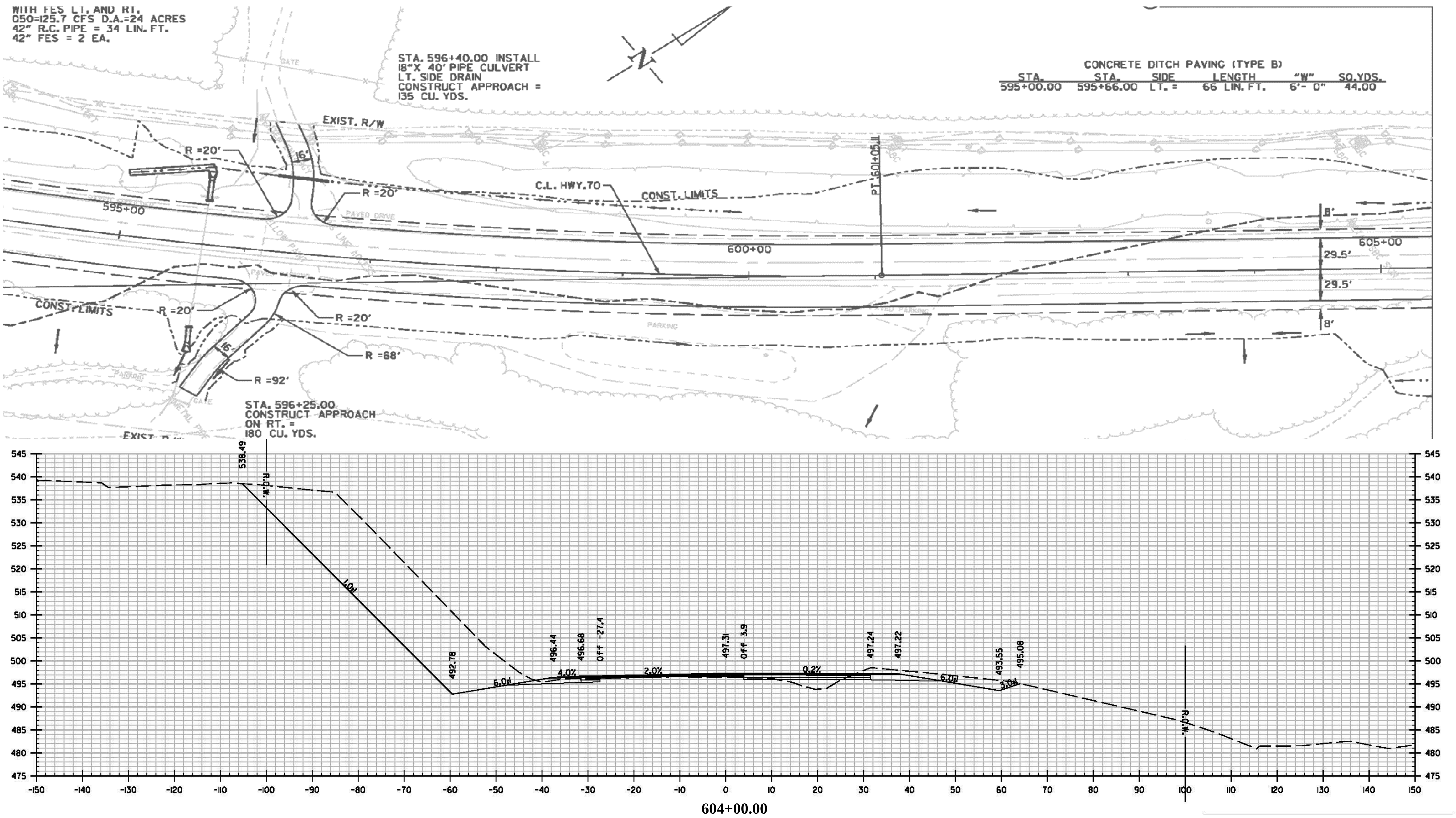
ATTACHMENT 12

Stability Analysis Results

Project: AHTD CA0606: Hwy 70: Hot Springs to Hwy 128
Garland County, Arkansas

Station	Side	Proposed Slope	Maximum Height, ft	Failure Method	Design Condition	Calculated Minimum Factory of Safety
604+00	Left	1H:1V	45	Slip Circle	End of Construction	5.8
					Long Term	1.5
					Seismic	1.4
				Sliding Block	End of Construction	3.7
					Long Term	1.4
					Seismic	1.2
806+00	Left	1H:1V	68	Sliding Block	End of Construction and Long Term*	1.7
					Seismic	1.5
867+00	Right	1H:1V	31	Slip Circle	End of Construction	4.0
					Long Term	1.7
					Seismic	1.4
				Sliding Block	End of Construction	1.3
					Long Term	1.2
					Seismic	1.1
881+00	Left	1H:1V	52	Slip Circle	End of Construction	2.1
					Long Term	1.1
					Seismic	1.0
				Sliding Block	End of Construction	1.9
					Long Term	1.5
					Seismic	1.3

* End of Construction and Long Term conditions have same input parameters



CONCRETE DITCH PAVING (TYPE B)

STA.	STA.	SIDE	LENGTH	"W"	SQ.YDS.
595+00.00	595+66.00	LT. =	66 LIN. FT.	6'- 0"	44.00

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

STA 604+00 CUT SLOPE PLAN AND PROFILE
AHTD CA0606: HWY 70: HOT SPRINGS TO HWY 128
GARLAND COUNTY, ARKANSAS

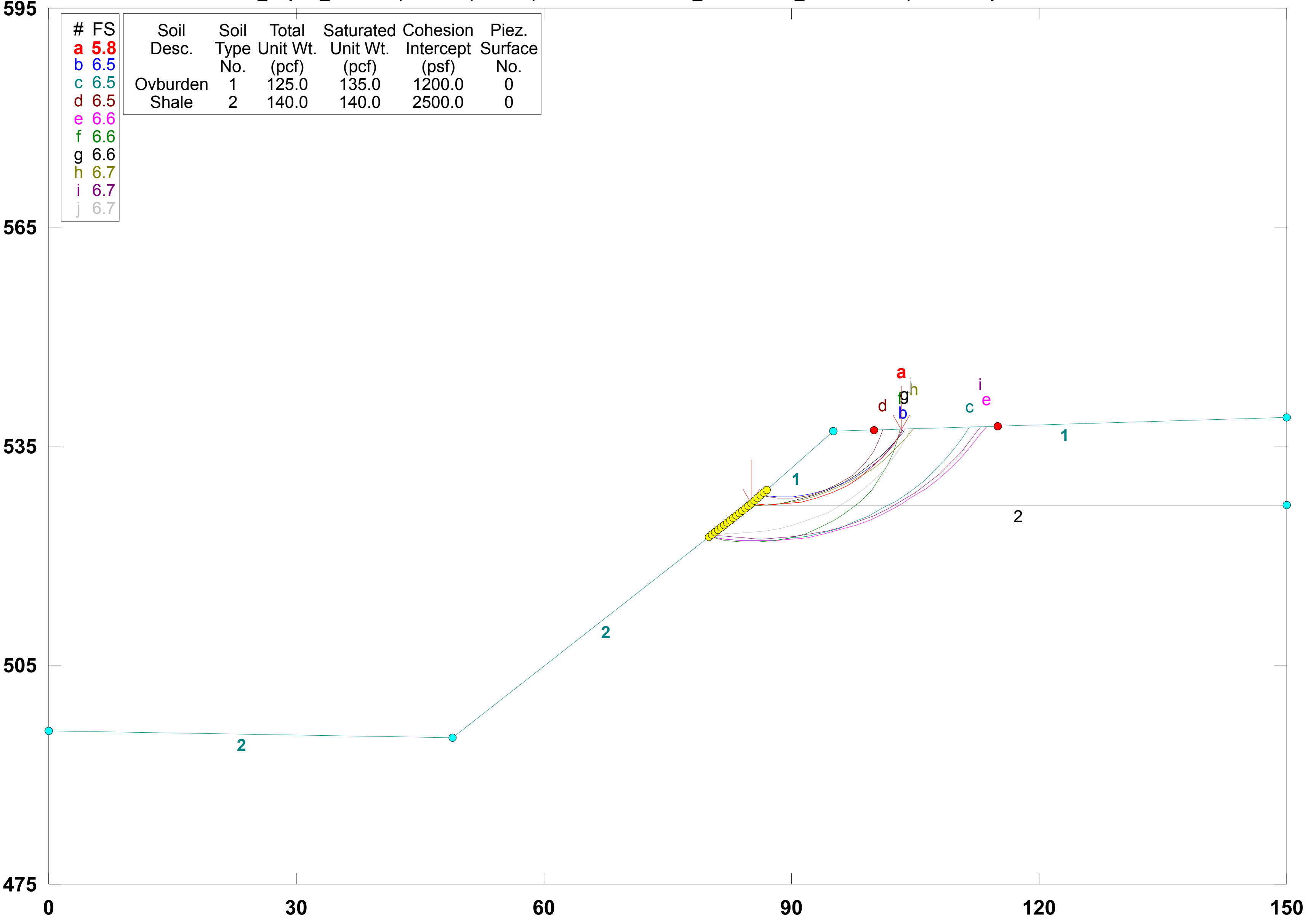
Not to Scale

Job No. 13-214

PLATE

AHTD CA0606: HWY 70-Hot Springs-hwy128 - Sta 604+00- Lt Side - End of Construc

z:\mrs\13-214_hwy 70_ca0606\updated report - september 2015\13-214_stabl\13-214_1004+00 eoc.pl2 Run By: Matt Satterfield, PE



#	FS
a	5.8
b	6.5
c	6.5
d	6.5
e	6.6
f	6.6
g	6.6
h	6.7
i	6.7
j	6.7

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Piez. Surface No.
Ovburden	1	125.0	135.0	1200.0	0
Shale	2	140.0	140.0	2500.0	0

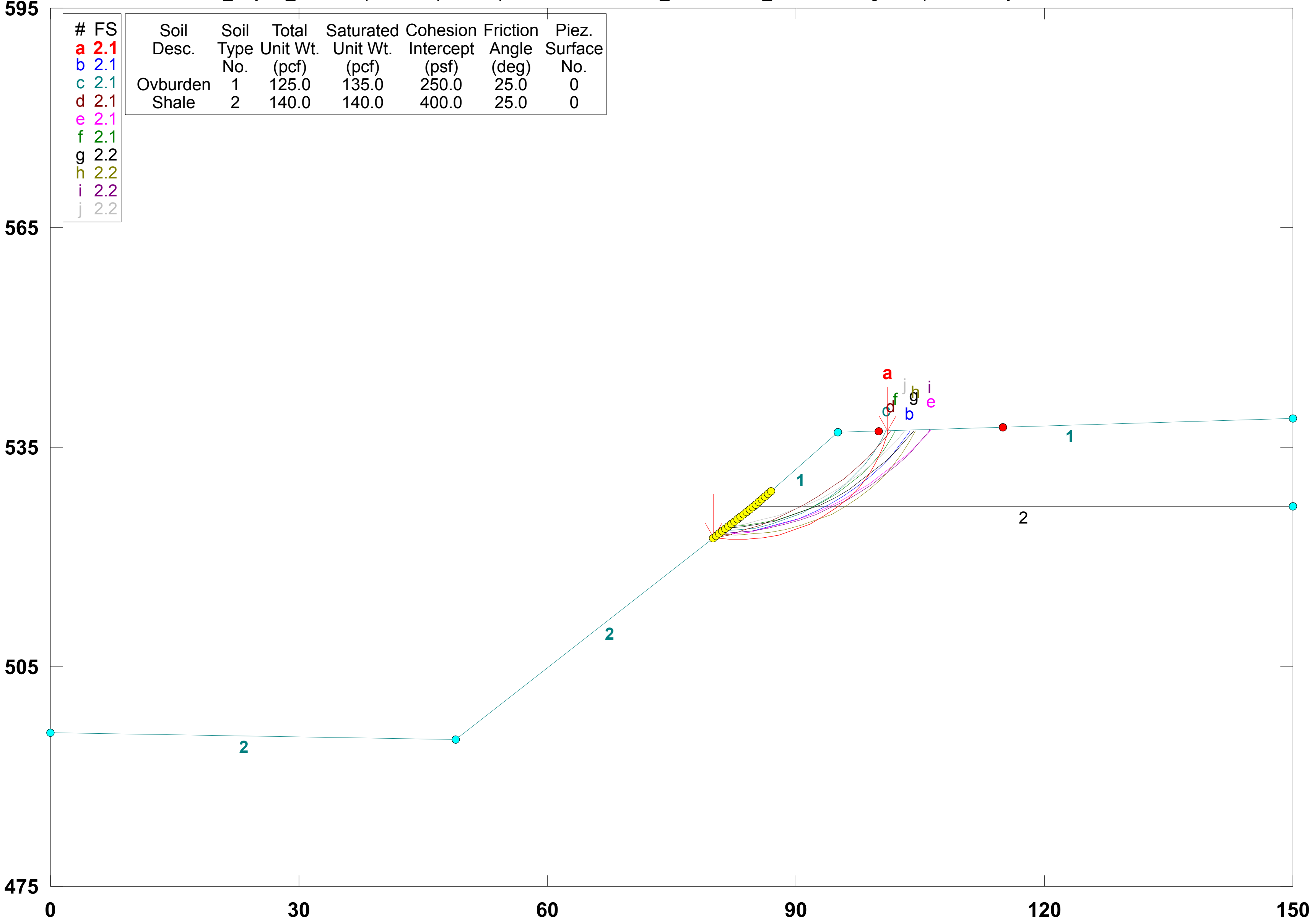
PCSTABL5M/si FSmin=5.8

Safety Factors Are Calculated By The Modified Bishop Method

GHBW

AHTD CA0606: HWY 70-Hot Springs-Hwy128 - Sta 604+00 - Lt Side - Long Term z:

\mrs\13-214_hwy 70_ca0606\updated report - september 2015\13-214_stabl\13-214_1004+00 long term.pl2 Run By: Matt Satterfield, PE



#	FS
a	2.1
b	2.1
c	2.1
d	2.1
e	2.1
f	2.1
g	2.2
h	2.2
i	2.2
j	2.2

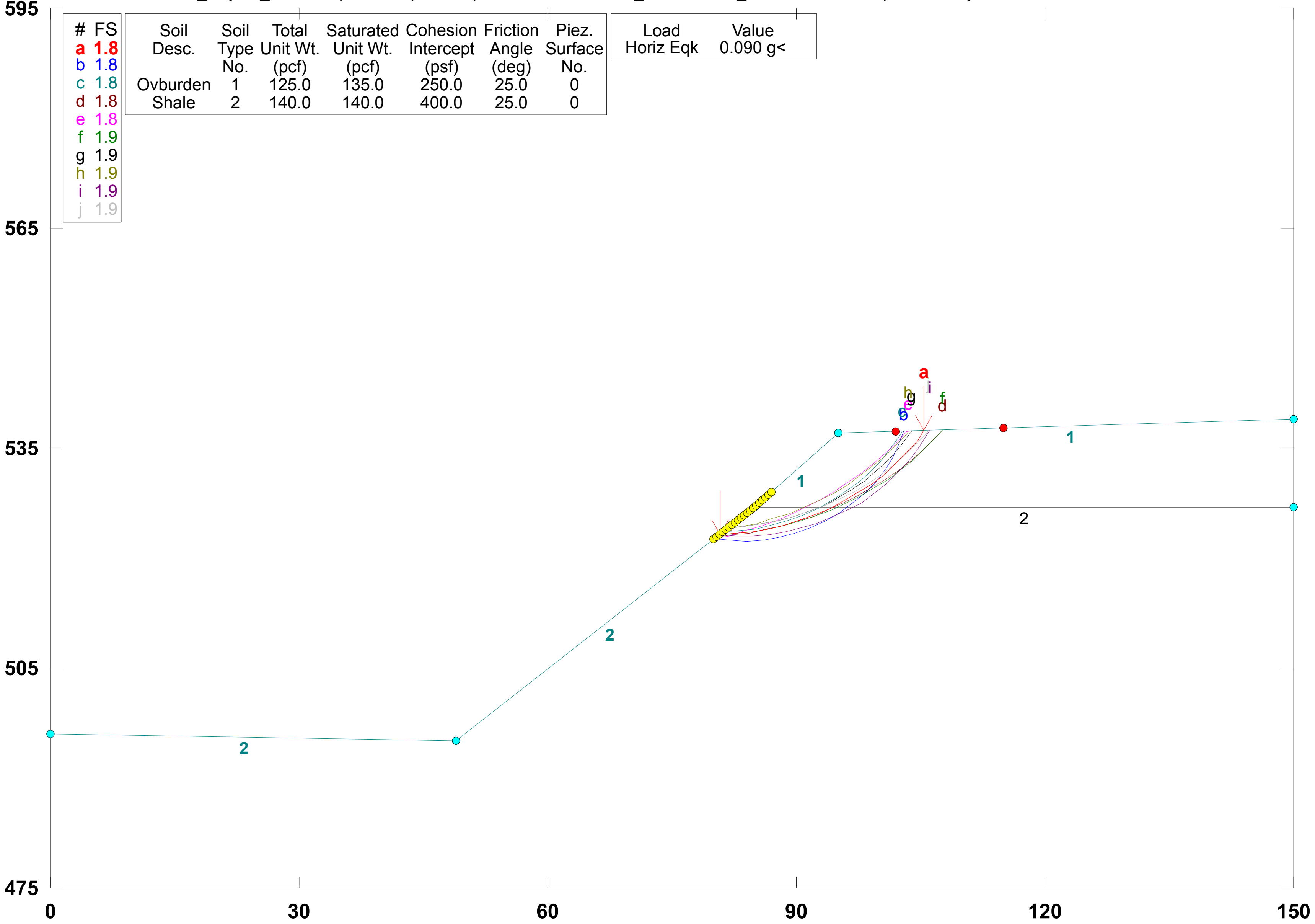
Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Ovburden	1	125.0	135.0	250.0	25.0	0
Shale	2	140.0	140.0	400.0	25.0	0

PCSTABL5M/si FSmin=2.1
Safety Factors Are Calculated By The Modified Bishop Method

GHBW

AHTD CA0606: HWY 70-Hot Springs-Hwy128 - Sta 604+00 - Lt Side - Seismic z:\mrs

\13-214_hwy 70_ca0606\updated report - september 2015\13-214_stabl\13-214_1004+00 seismic.pl2 Run By: Matt Satterfield, PE



#	FS
a	1.8
b	1.8
c	1.8
d	1.8
e	1.8
f	1.9
g	1.9
h	1.9
i	1.9
j	1.9

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Ovburden	1	125.0	135.0	250.0	25.0	0
Shale	2	140.0	140.0	400.0	25.0	0

Load	Value
Horiz Eqk	0.090 g<

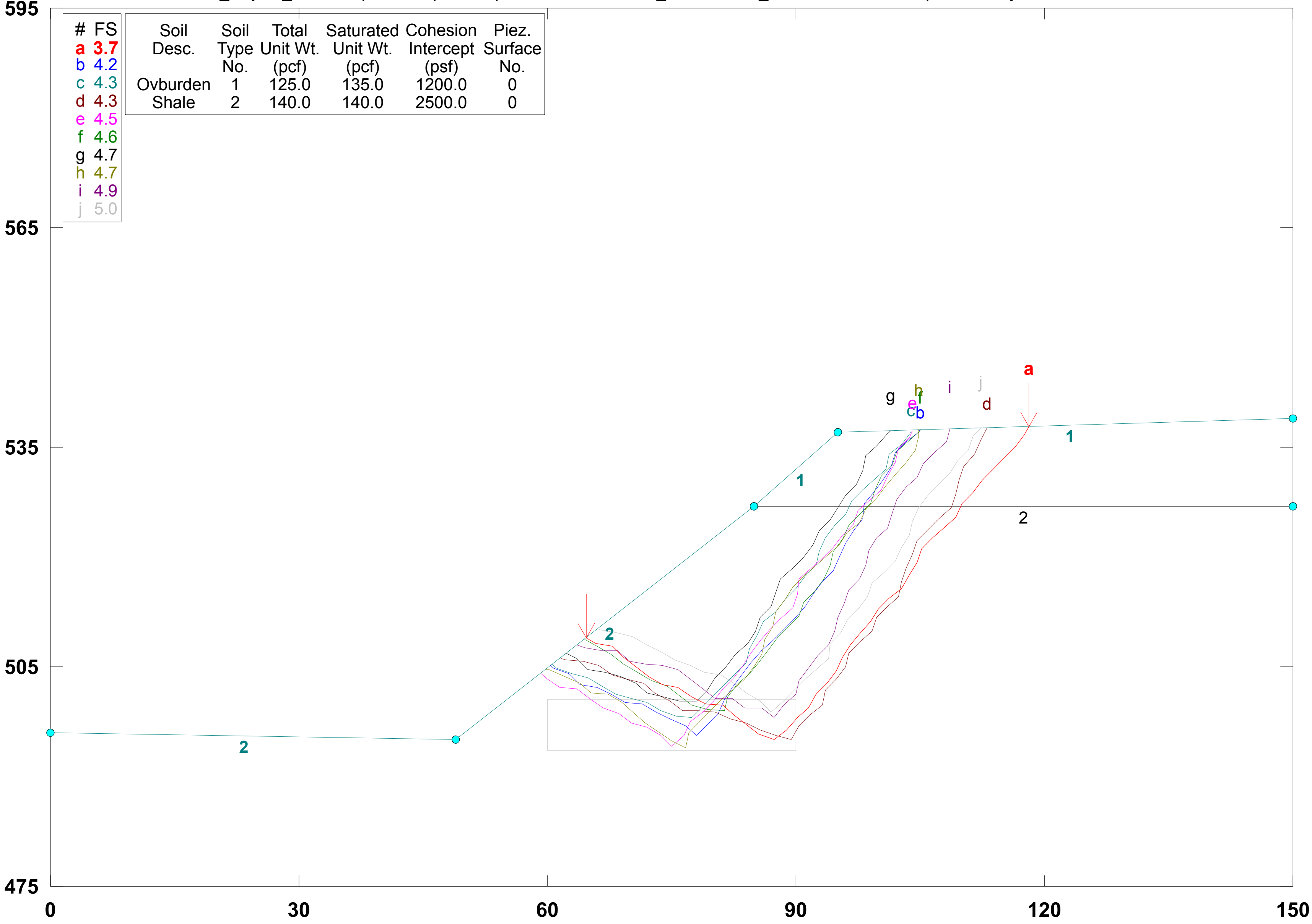
PCSTABL5M/si FSmin=1.8

Safety Factors Are Calculated By The Modified Bishop Method

GHBW

AHTD CA0606: HWY 70-Hot Springs-Hwy128 - Sta 604+00- Lt Side - End of Construc z:

\mrs\13-214_hwy 70_ca0606\updated report - september 2015\13-214_stabl\13-214_1004+00 block - eoc.pl2   Run By: Matt Satterfield, PE



Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Piez. Surface No.
Ovburden	1	125.0	135.0	1200.0	0
Shale	2	140.0	140.0	2500.0	0

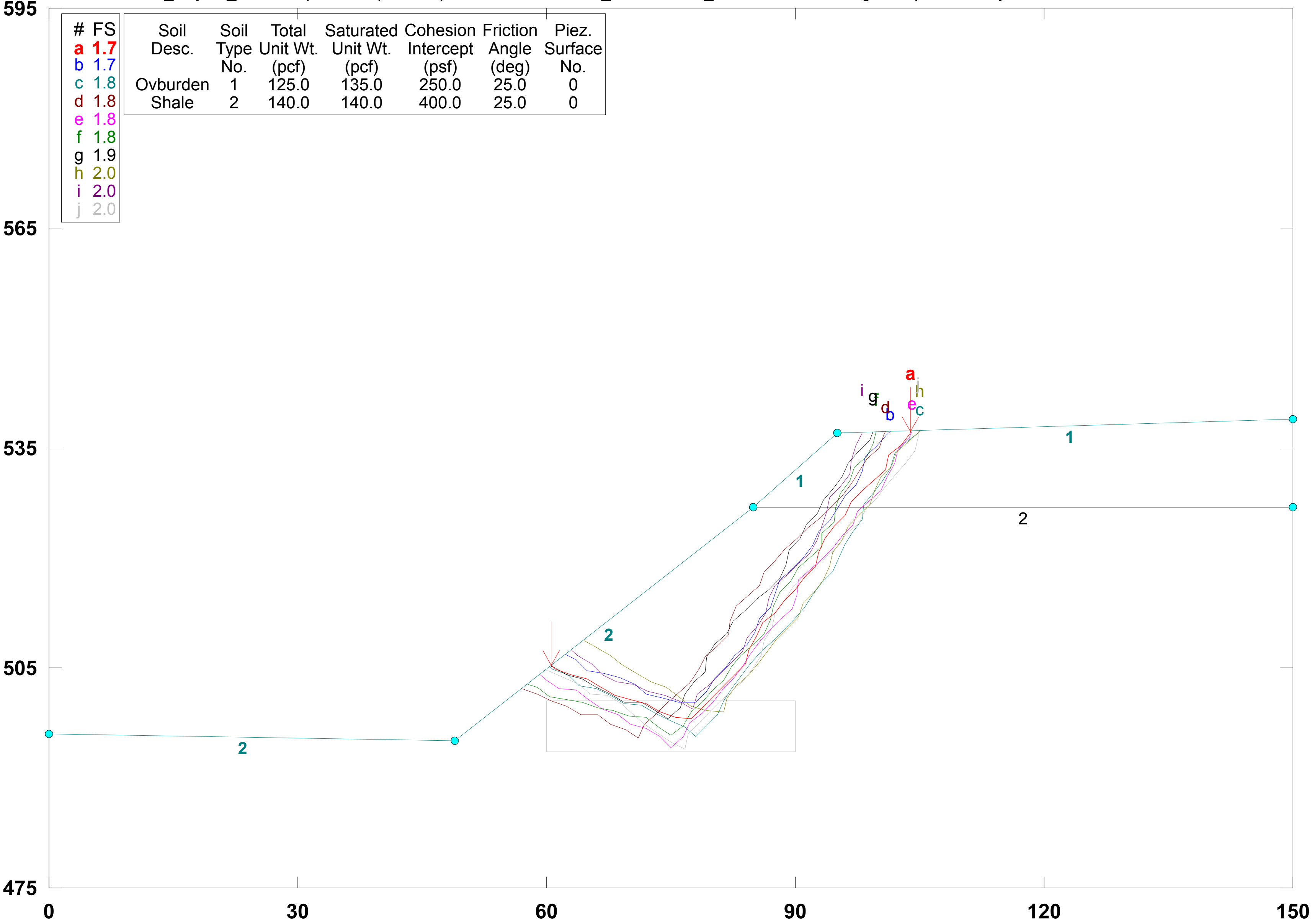
PCSTABL5M/si FSmin=3.7

Safety Factors Are Calculated By The Modified Janbu Method

GHBW

AHTD CA0606: HWY 70-Hot Springs-Hwy128 - Sta 604+00 - Lt Side - Long Term z:\mrs

\13-214_hwy 70_ca0606\updated report - september 2015\13-214_stabl\13-214_1004+00 block - long term.pl2   Run By: Matt Satterfield, PE



#	FS
a	1.7
b	1.7
c	1.8
d	1.8
e	1.8
f	1.8
g	1.9
h	2.0
i	2.0
j	2.0

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Ovburden	1	125.0	135.0	250.0	25.0	0
Shale	2	140.0	140.0	400.0	25.0	0

PCSTABL5M/si FSmin=1.7

Safety Factors Are Calculated By The Modified Janbu Method

GHBW

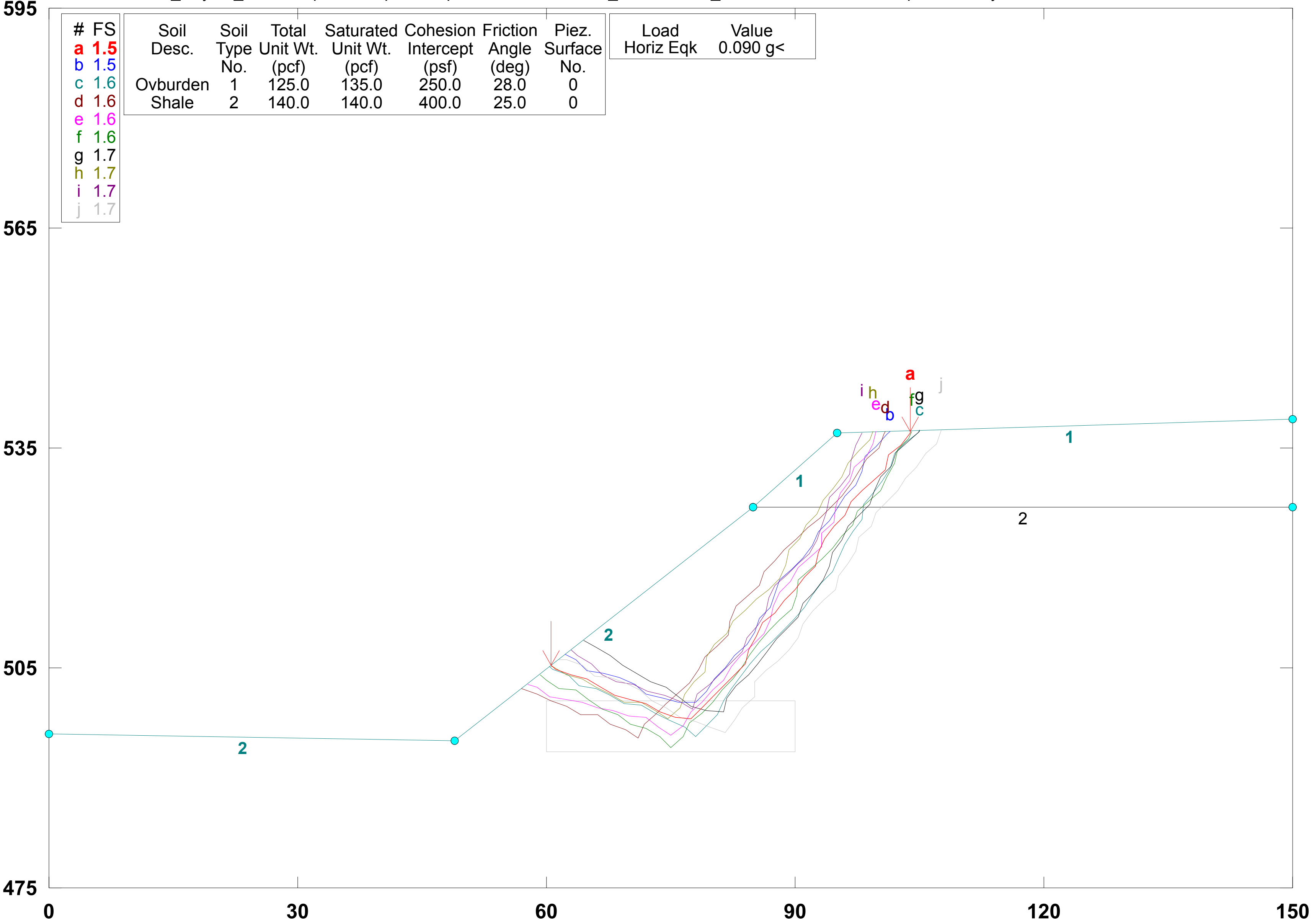
AHTD CA0606: HWY 70-Hot Springs-Hwy128 - Sta 604+00 - Lt Side - Seismic

z:\mrs \13-214_hwy 70_ca0606\updated report - september 2015\13-214_stabl\13-214_1004+00 block - seismic.pl2 Run By: Matt Satterfield, PE

#	FS
a	1.5
b	1.5
c	1.6
d	1.6
e	1.6
f	1.6
g	1.7
h	1.7
i	1.7
j	1.7

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Ovburden	1	125.0	135.0	250.0	28.0	0
Shale	2	140.0	140.0	400.0	25.0	0

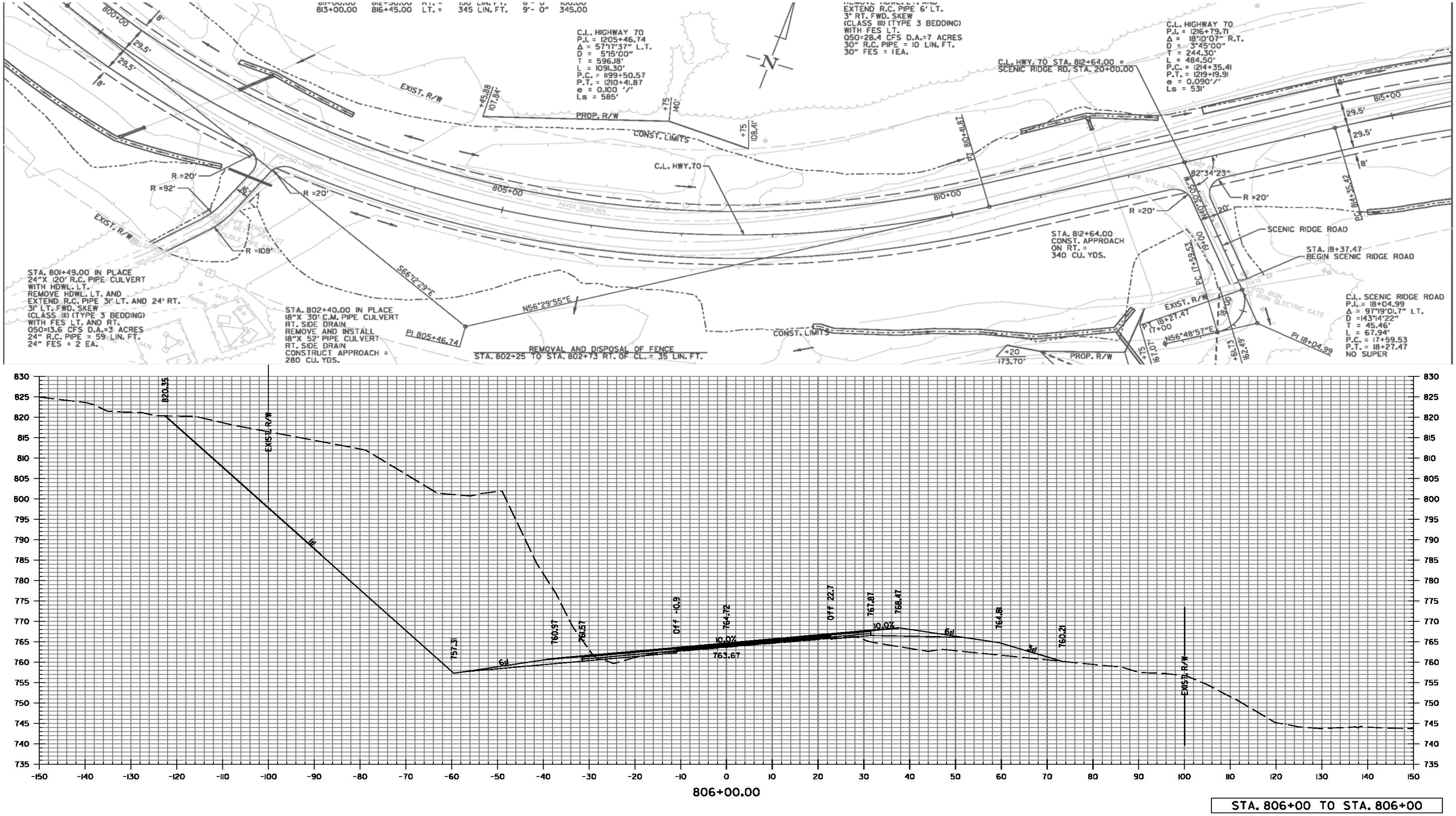
Load	Value
Horiz Eqk	0.090 g<



PCSTABL5M/si FSmin=1.5

Safety Factors Are Calculated By The Modified Janbu Method

GHBW



Grubbs, Hoskyn,
Barton & Wyatt, INC.
CONSULTING ENGINEERS

STA 806+00 CUT SLOPE PLAN AND PROFILE
AHTD CA0606: HWY 70: HOT SPRINGS TO HWY 128
GARLAND COUNTY, ARKANSAS

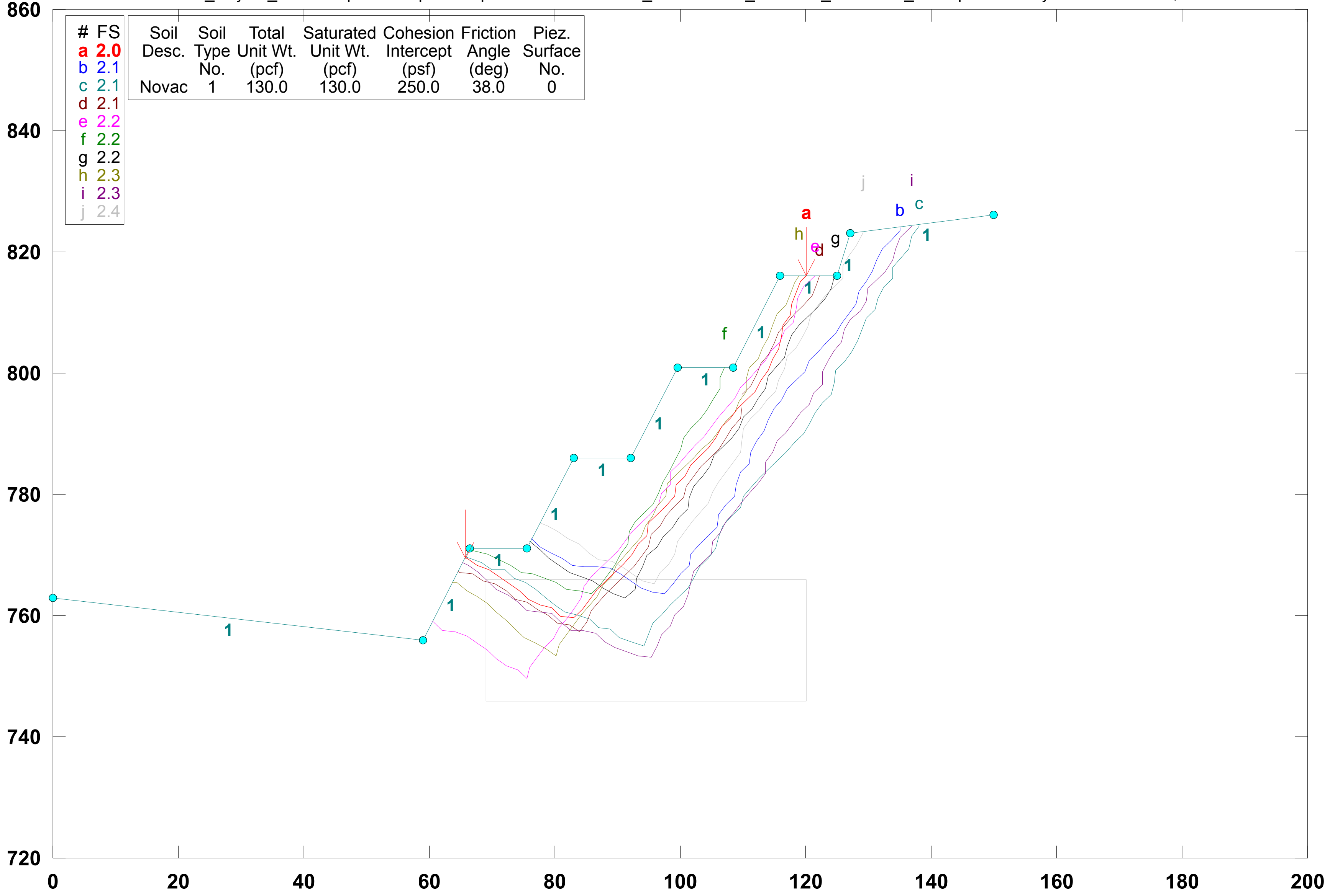
Not to Scale

Job No. 13-214

PLATE

AHTD CA0606: Hwy70-Hot Springs-Hwy128 - Sta 806+00-Left - End Const & Long Term z:

\mrs\13-214_hwy 70_ca0606\updated report - september 2015\13-214_stabl\13-214_1206+00_eoc and lt_block.pl2   Run By: Matt Satterfield, PE



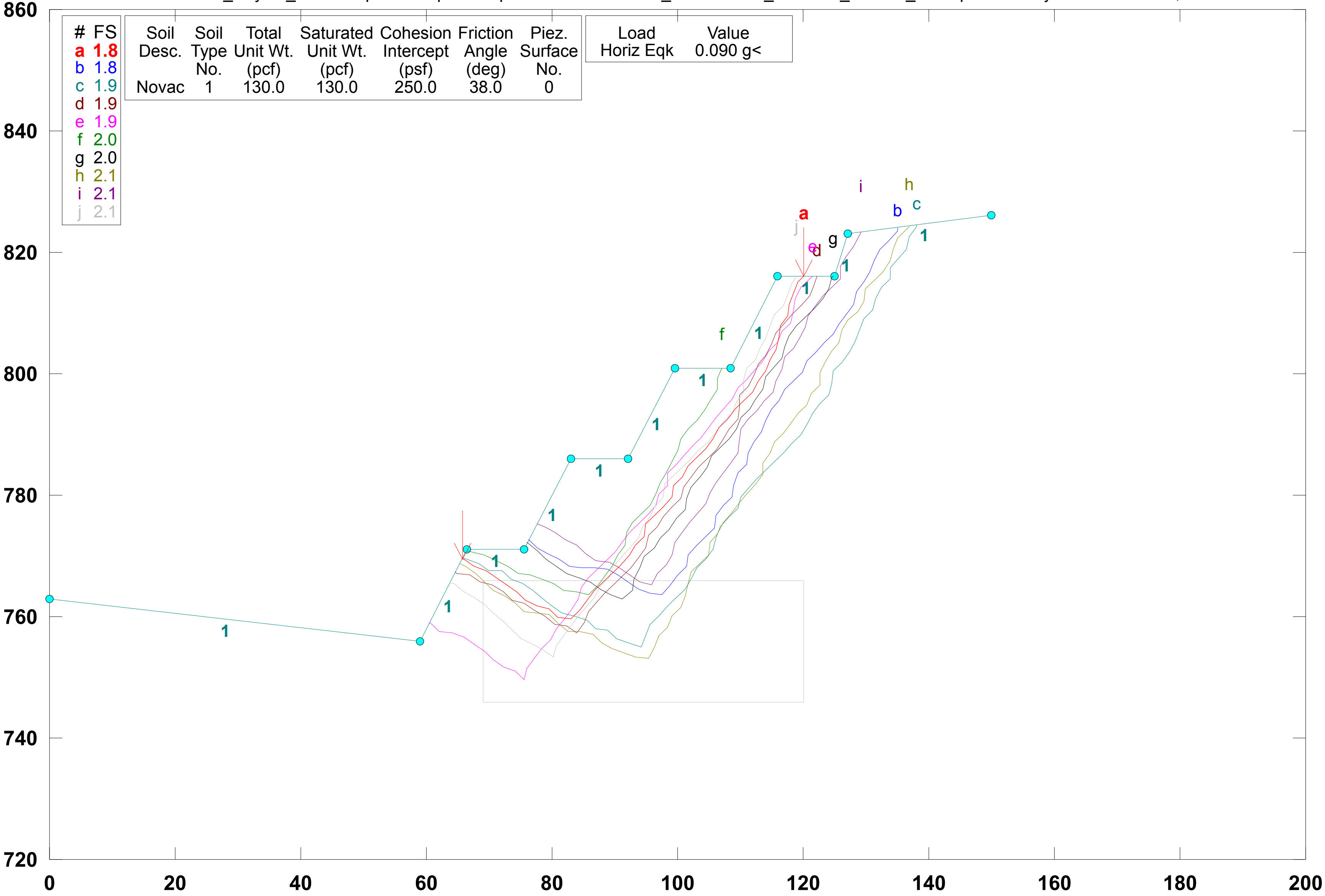
PCSTABL5M/si FSmin=2.0

Safety Factors Are Calculated By The Modified Janbu Method

GHBW

AHTD CA0606: Hwy70-Hot Springs-Hwy128 - Sta 806+00-Left - Seismic

z:\mrs\13-214_hwy 70_ca0606\updated report - september 2015\13-214_stabl\13-214_1206+00_seismic_block.pl2   Run By: Matt Satterfield, PE



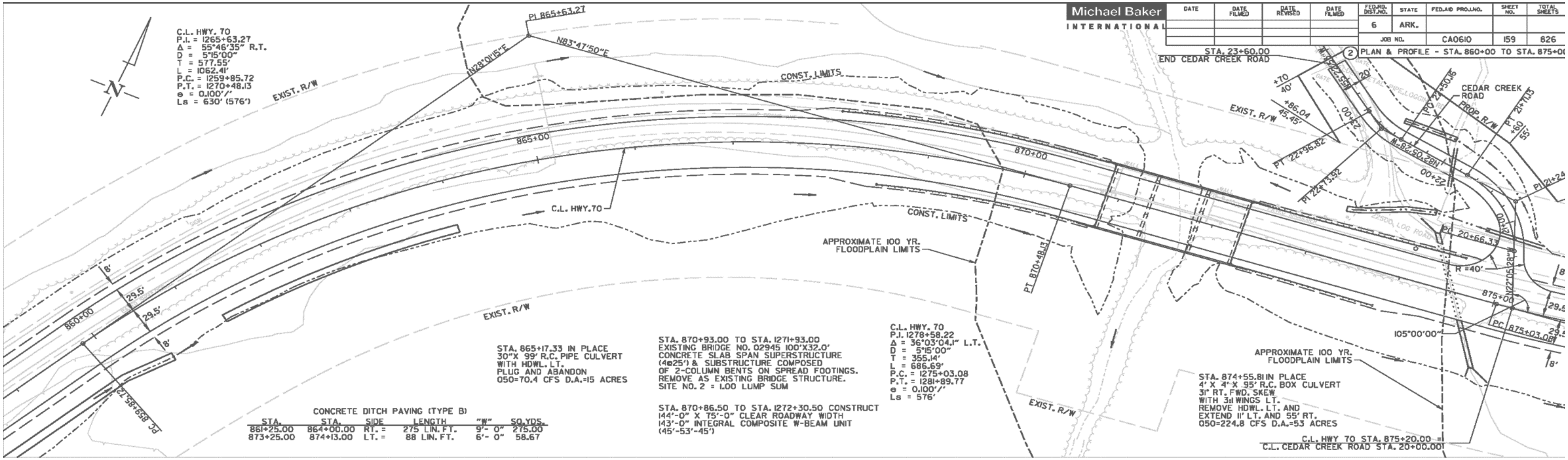
Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Novac	1	130.0	130.0	250.0	38.0	0

Load	Value
Horiz Eqk	0.090 g<

PCSTABL5M/si FSmin=1.8

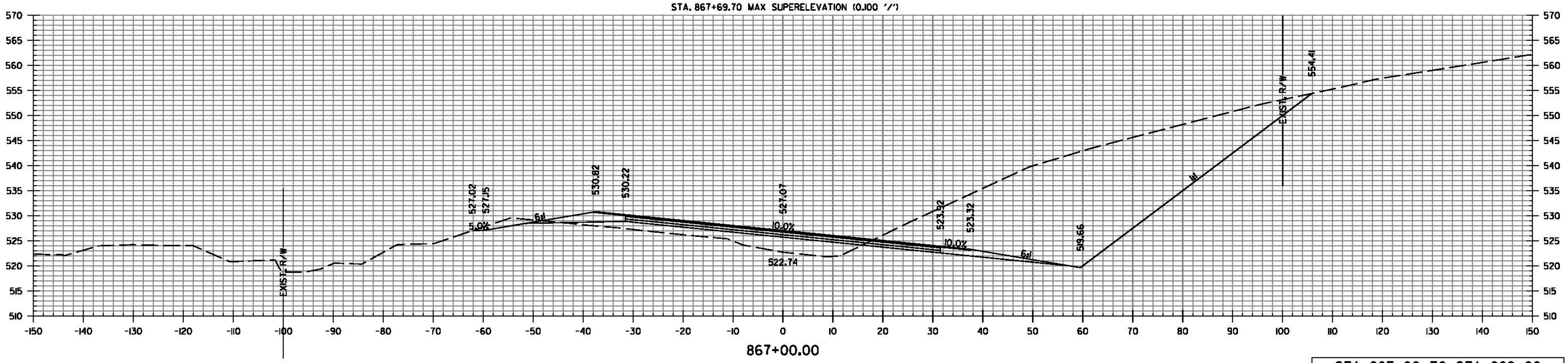
Safety Factors Are Calculated By The Modified Janbu Method

GHBW



CONCRETE DITCH PAVING (TYPE B)

STA.	STA.	SIDE	LENGTH	"W"	SQ.YDS.
861+25.00	864+00.00	RT. =	275 LIN. FT.	9'- 0"	275.00
873+25.00	874+13.00	LT. =	88 LIN. FT.	6'- 0"	58.67



STA. 867+00 TO STA. 869+00

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

STA 867+00 CUT SLOPE PLAN AND PROFILE
AHTD CA0606: HWY 70: HOT SPRINGS TO HWY 128
GARLAND COUNTY, ARKANSAS

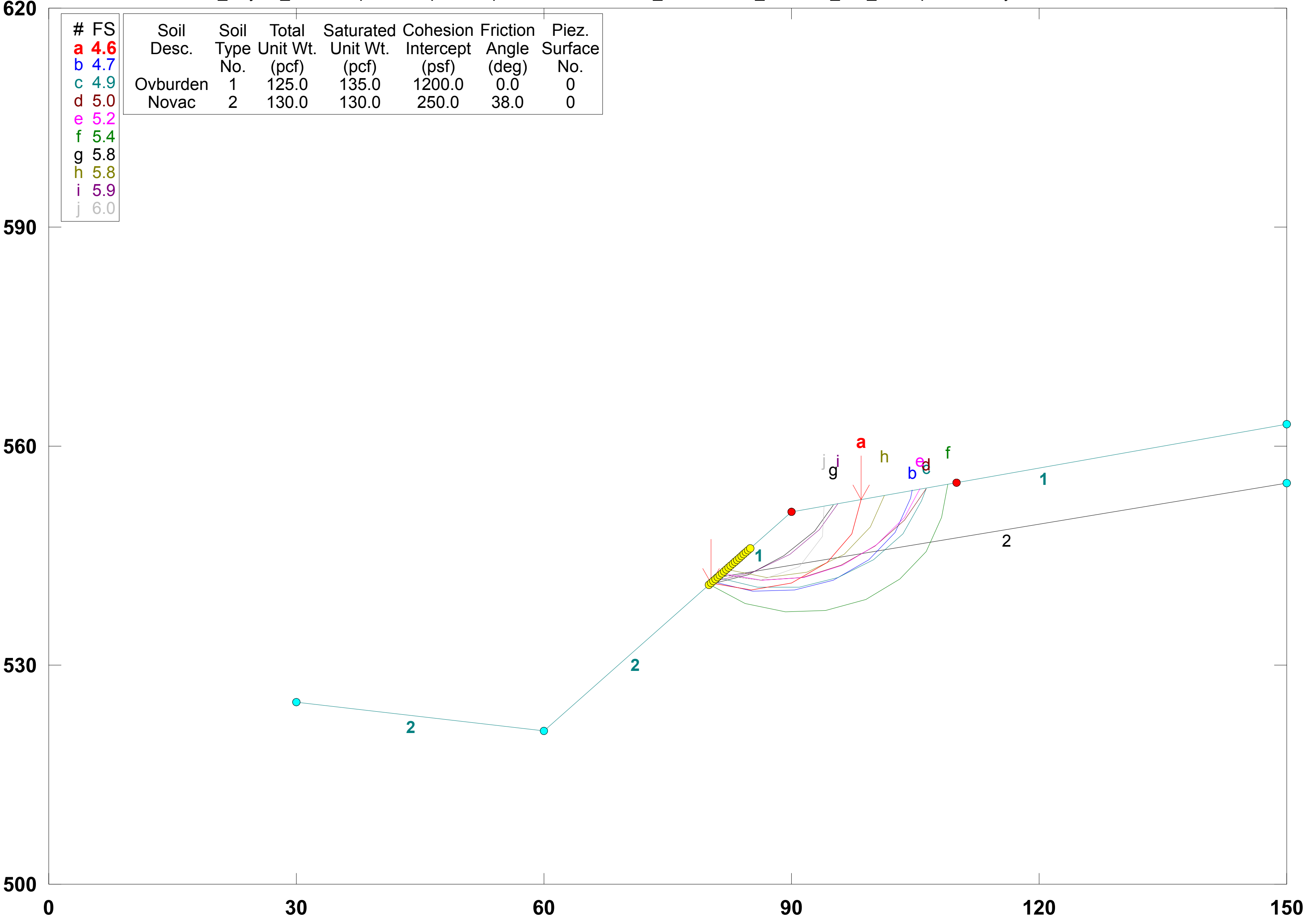
Not to Scale

Job No. 13-214

PLATE

AHTD CA0606: Hwy 70-Hot Springs-Hwy 128 Sta 867+00 - Rt Side - End of Construct z:

\mrs\13-214_hwy 70_ca0606\updated report - september 2015\13-214_stabl\13-214_1267+00_eoc_circle.pl2 Run By: Matt Satterfield, PE



#	FS
a	4.6
b	4.7
c	4.9
d	5.0
e	5.2
f	5.4
g	5.8
h	5.8
i	5.9
j	6.0

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Ovburden	1	125.0	135.0	1200.0	0.0	0
Novac	2	130.0	130.0	250.0	38.0	0

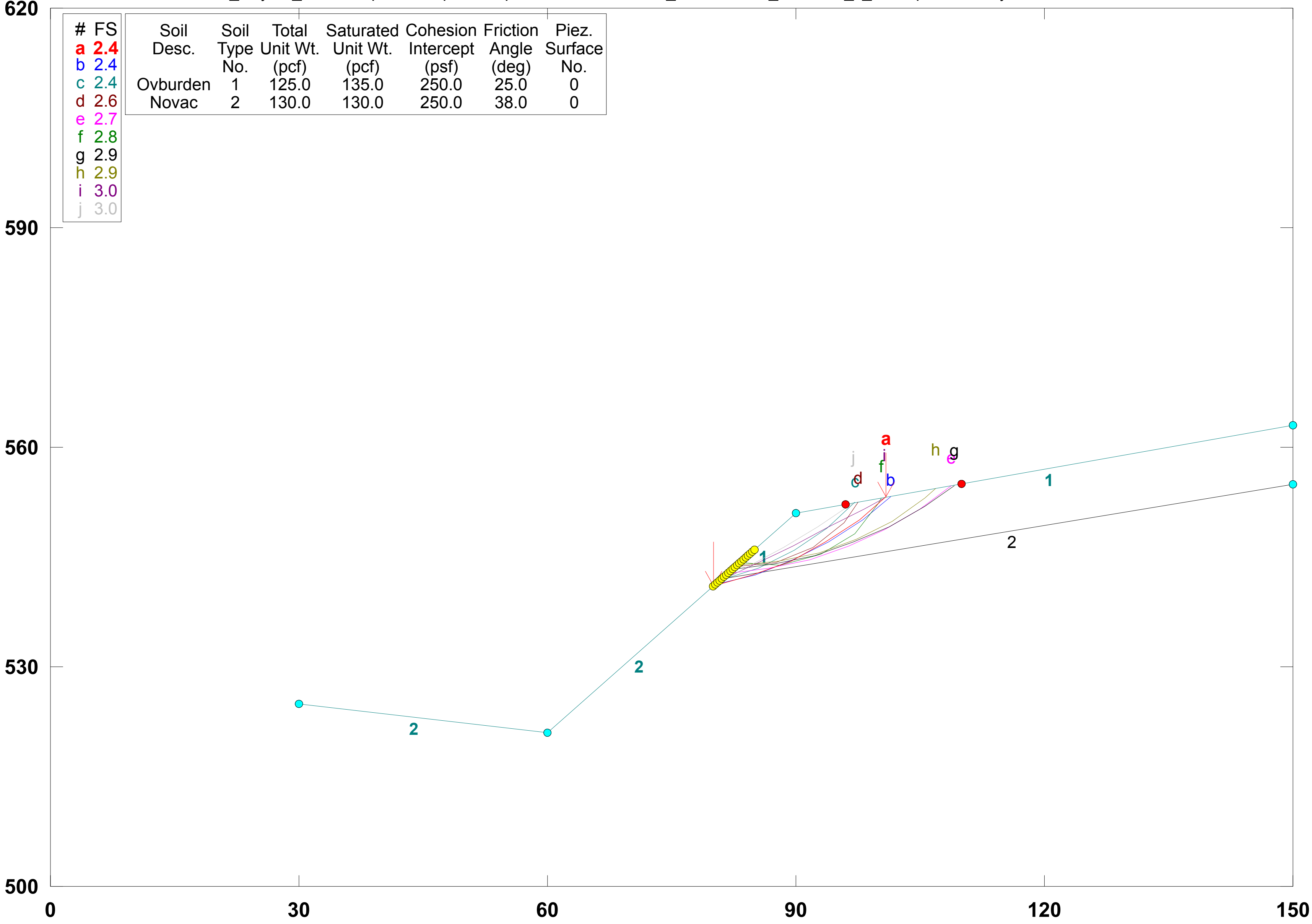
STABL6H FSmin=4.6

Safety Factors Are Calculated By The Modified Bishop Method

GHBW

AHTD CA0606: Hwy 70-Hot Springs-Hwy 128 Sta 867+00 - Rt Side - Long Term z:

\mrs\13-214_hwy 70_ca0606\updated report - september 2015\13-214_stabl\13-214_1267+00_lt_circle.pl2 Run By: Matt Satterfield, PE



Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Ovburden	1	125.0	135.0	250.0	25.0	0
Novac	2	130.0	130.0	250.0	38.0	0

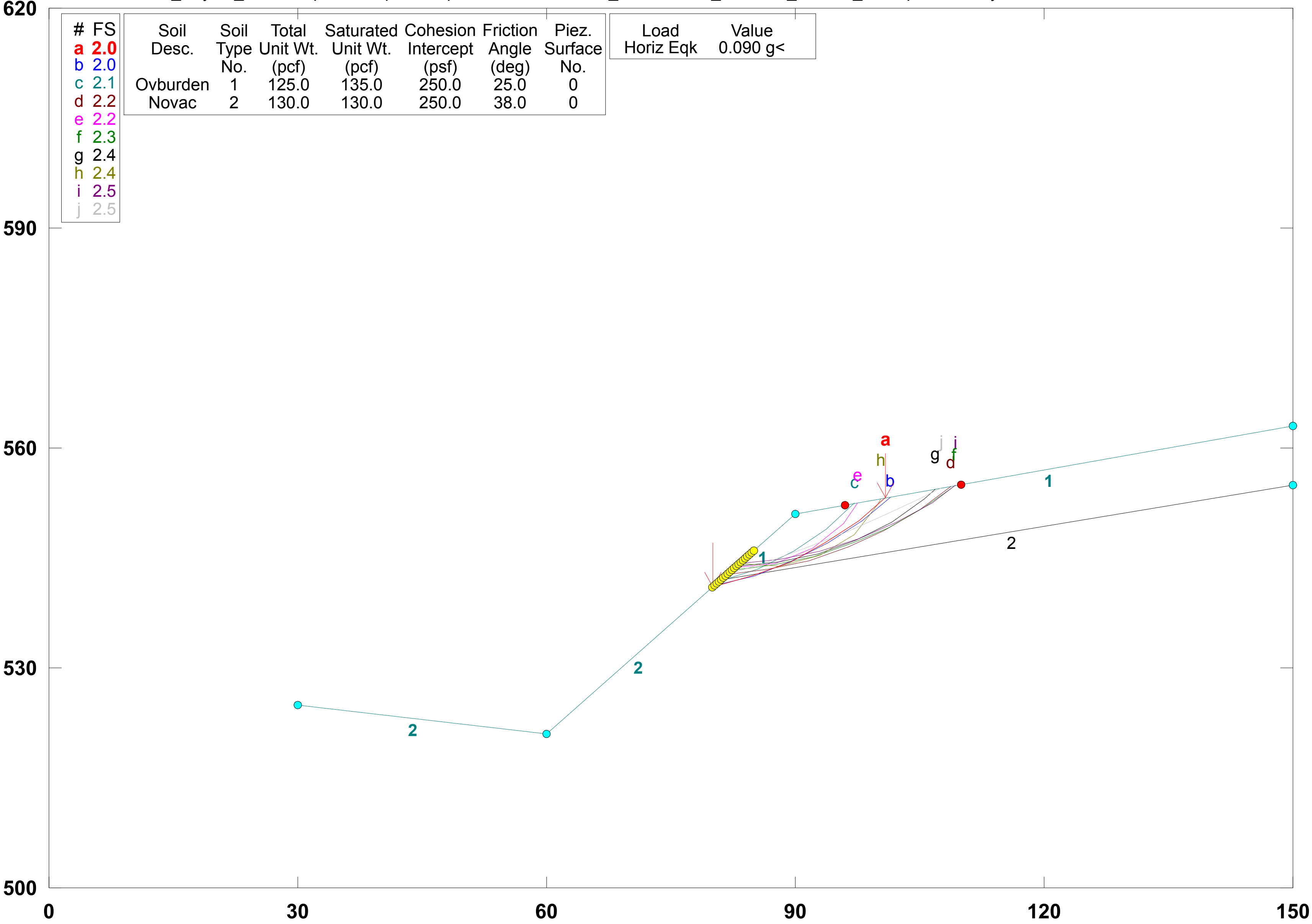
STABL6H FSmin=2.4

Safety Factors Are Calculated By The Modified Bishop Method

GHBW

AHTD CA0606: Hwy 70-Hot Springs-Hwy 128 Sta 867+00 - Rt Side - Seismic z:\mrs

\13-214_hwy 70_ca0606\updated report - september 2015\13-214_stabl\13-214_1267+00_seismic_circle.pl2 Run By: Matt Satterfield, PE



#	FS
a	2.0
b	2.0
c	2.1
d	2.2
e	2.2
f	2.3
g	2.4
h	2.4
i	2.5
j	2.5

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Ovburden	1	125.0	135.0	250.0	25.0	0
Novac	2	130.0	130.0	250.0	38.0	0

Load	Value
Horiz Eqk	0.090 g<

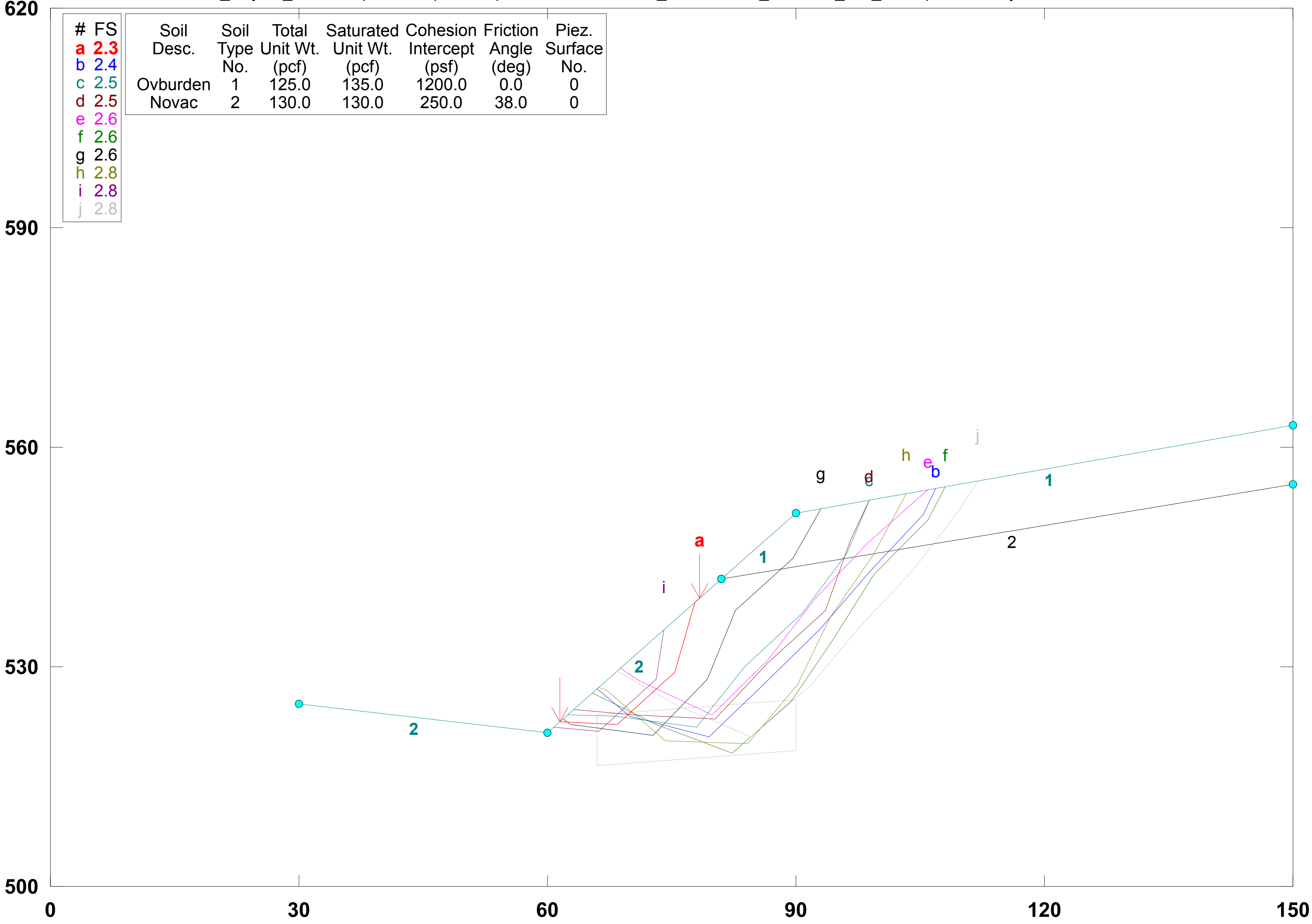
STABL6H FSmin=2.0

Safety Factors Are Calculated By The Modified Bishop Method

GHBW

AHTD CA0606: Hwy 70-Hot Springs-Hwy 128-Sta 867+00 - Rt Side - End of Construct z:

\mrs\13-214_hwy 70_ca0606\updated report - september 2015\13-214_stabl\13-214_1267+00_eoc_block.pl2   Run By: Matt Satterfield, PE



#	FS
a	2.3
b	2.4
c	2.5
d	2.5
e	2.6
f	2.6
g	2.6
h	2.8
i	2.8
j	2.8

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Ovburden	1	125.0	135.0	1200.0	0.0	0
Novac	2	130.0	130.0	250.0	38.0	0

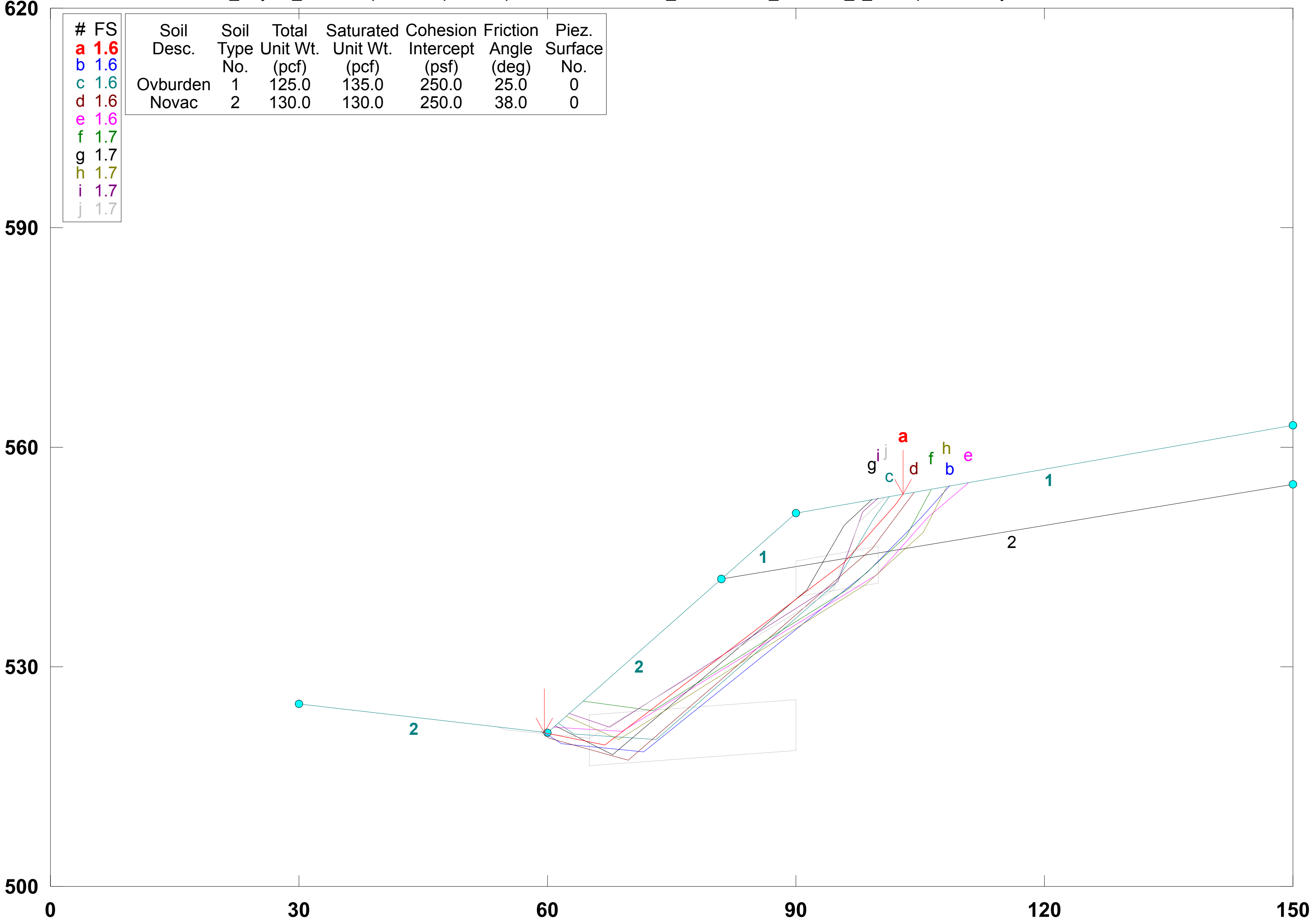
PCSTABL5M/si FSmin=2.3

Safety Factors Are Calculated By The Modified Janbu Method

GHBW

AHTD CA0606: Hwy 70-Hot Springs-Hwy 128-Sta 867+00 - Rt Side - Long Term z:

\mrs\13-214_hwy 70_ca0606\updated report - september 2015\13-214_stabl\13-214_1267+00_lt_block.pl2   Run By: Matt Satterfield, PE



#	FS
a	1.6
b	1.6
c	1.6
d	1.6
e	1.6
f	1.7
g	1.7
h	1.7
i	1.7
j	1.7

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Ovburden	1	125.0	135.0	250.0	25.0	0
Novac	2	130.0	130.0	250.0	38.0	0

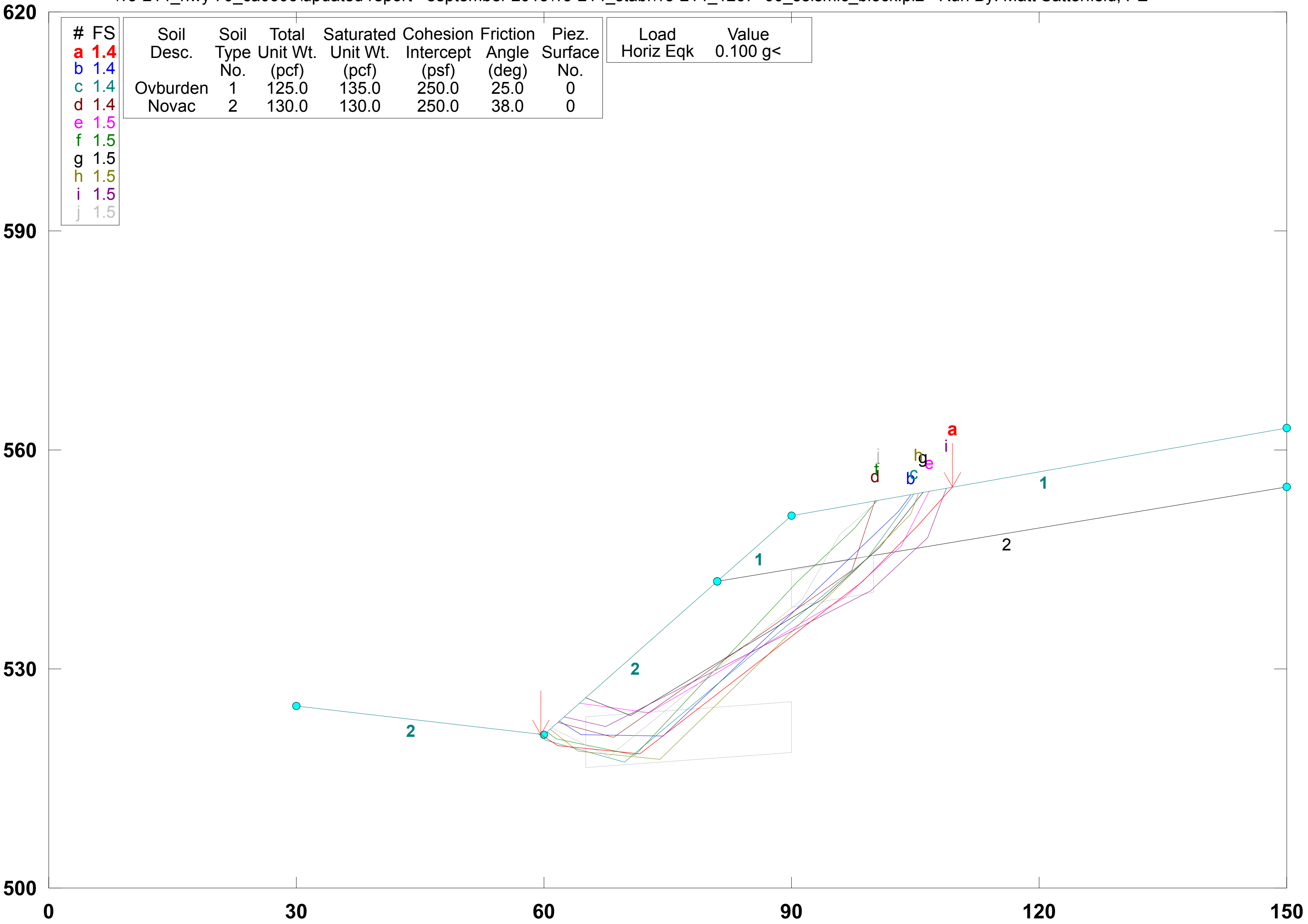
PCSTABL5M/si FSmin=1.6

Safety Factors Are Calculated By The Modified Janbu Method

GHBW

AHTD CA0606: Hwy 70-Hot Springs-Hwy 128-Sta 867+00 - Rt Side - Seismic z:\mrs

\13-214_hwy 70_ca0606\updated report - september 2015\13-214_stabl\13-214_1267+00_seismic_block.pl2 Run By: Matt Satterfield, PE



#	FS
a	1.4
b	1.4
c	1.4
d	1.4
e	1.5
f	1.5
g	1.5
h	1.5
i	1.5
j	1.5

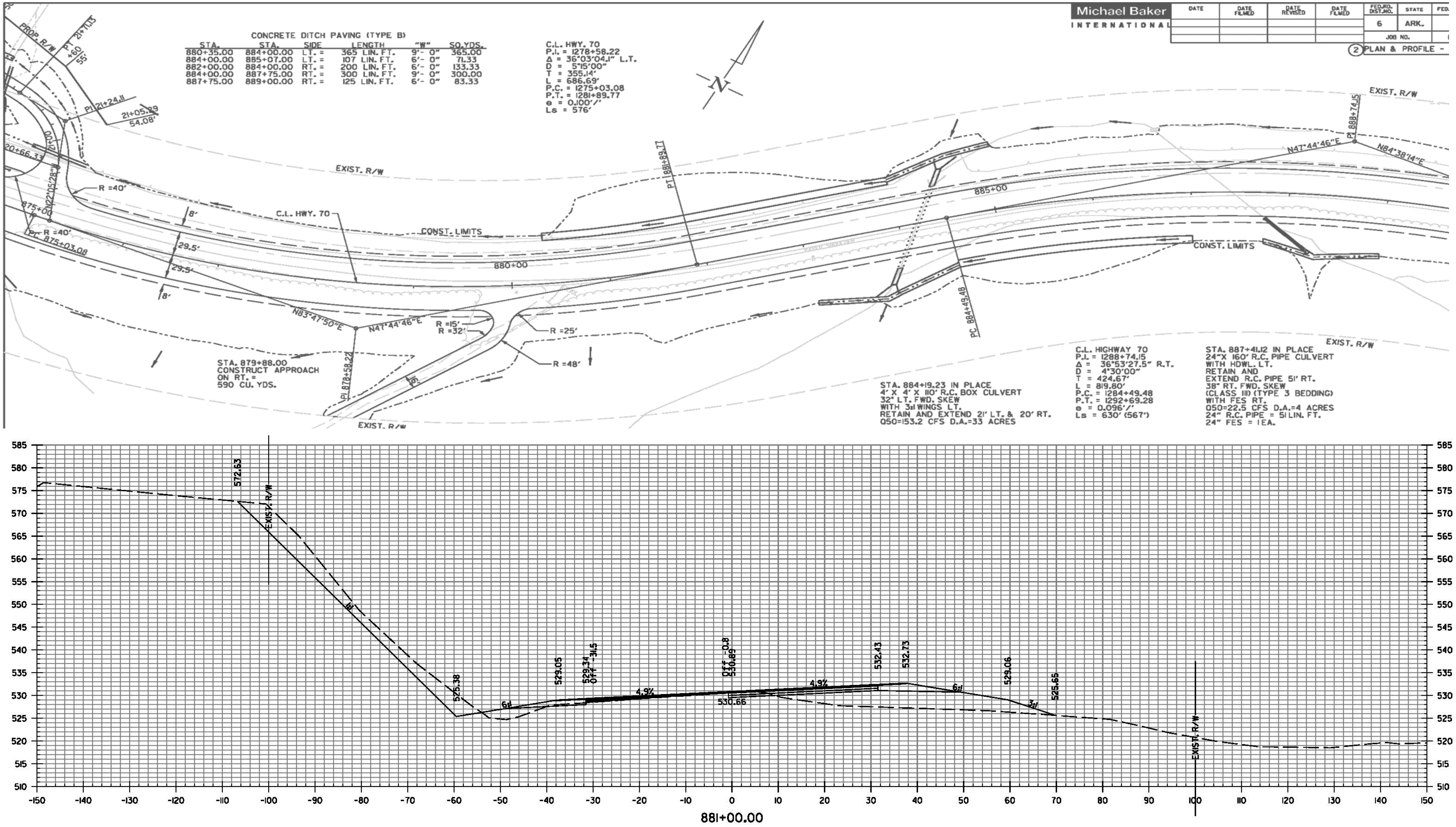
Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Ovburden	1	125.0	135.0	250.0	25.0	0
Novac	2	130.0	130.0	250.0	38.0	0

Load	Value
Horiz Eqk	0.100 g<

PCSTABL5M/si FSmin=1.4

Safety Factors Are Calculated By The Modified Janbu Method

GHBW



CONCRETE DITCH PAVING (TYPE B)

STA.	STA.	SIDE	LENGTH	"W"	SQ.YDS.
880+35.00	884+00.00	LT. =	365 LIN. FT.	9'- 0"	365.00
884+00.00	885+07.00	LT. =	107 LIN. FT.	6'- 0"	71.33
882+00.00	884+00.00	RT. =	200 LIN. FT.	6'- 0"	133.33
884+00.00	887+75.00	RT. =	300 LIN. FT.	9'- 0"	300.00
887+75.00	889+00.00	RT. =	125 LIN. FT.	6'- 0"	83.33

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

STA 881+00CUT SLOPE PLAN AND PROFILE
AHTD CA0606: HWY 70: HOT SPRINGS TO HWY 128
GARLAND COUNTY, ARKANSAS

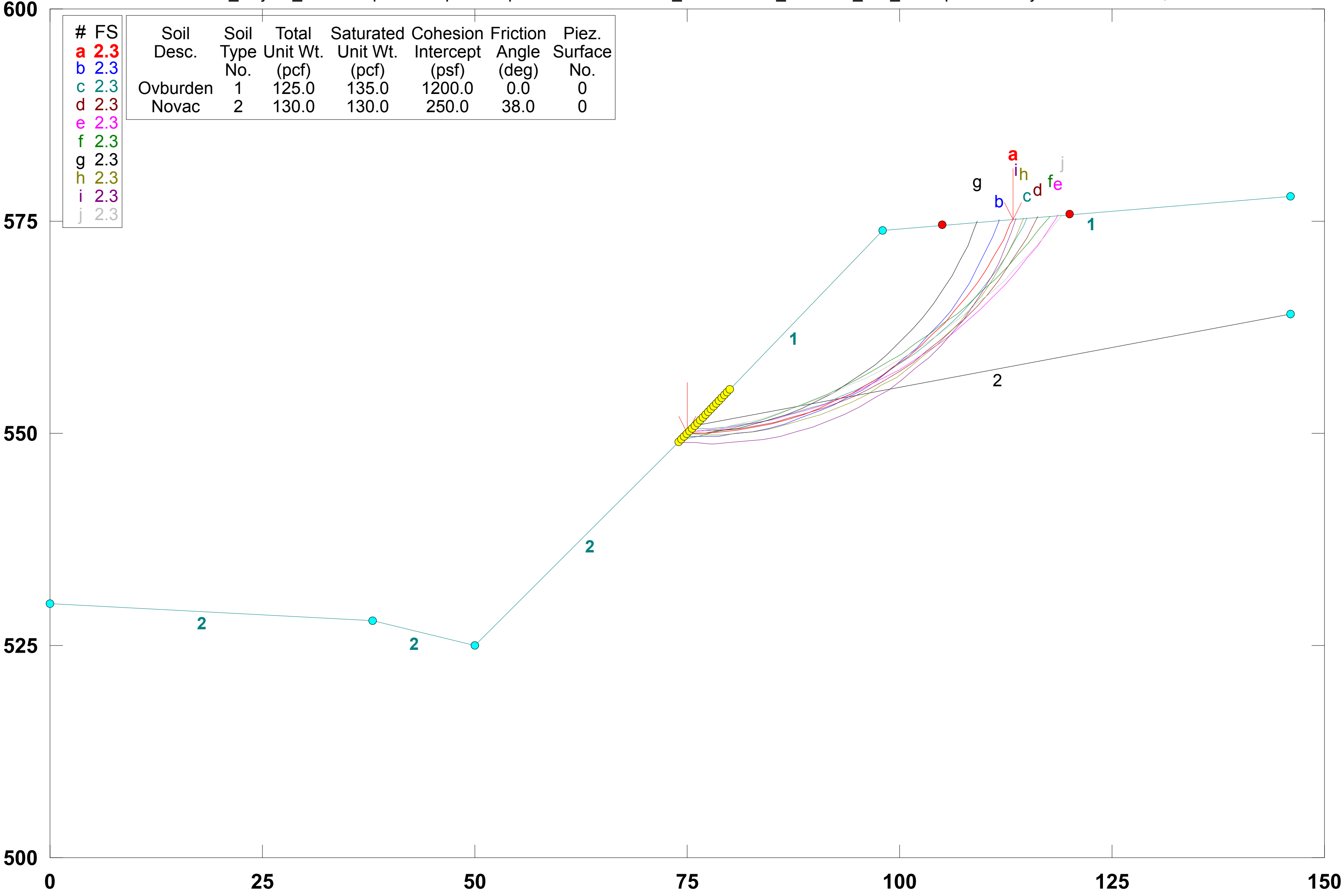
Not to Scale

Job No. 13-214

PLATE

AHTD CA0606: Hwy 70-Hot Springs-Hwy 128-Sta 881+00 - Lt Side - End of Construct z:

\mrs\13-214_hwy 70_ca0606\updated report - september 2015\13-214_stabl\13-214_1281+00_eoc_circle.pl2   Run By: Matt Satterfield, PE



#	FS
a	2.3
b	2.3
c	2.3
d	2.3
e	2.3
f	2.3
g	2.3
h	2.3
i	2.3
j	2.3

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Ovburden	1	125.0	135.0	1200.0	0.0	0
Novac	2	130.0	130.0	250.0	38.0	0

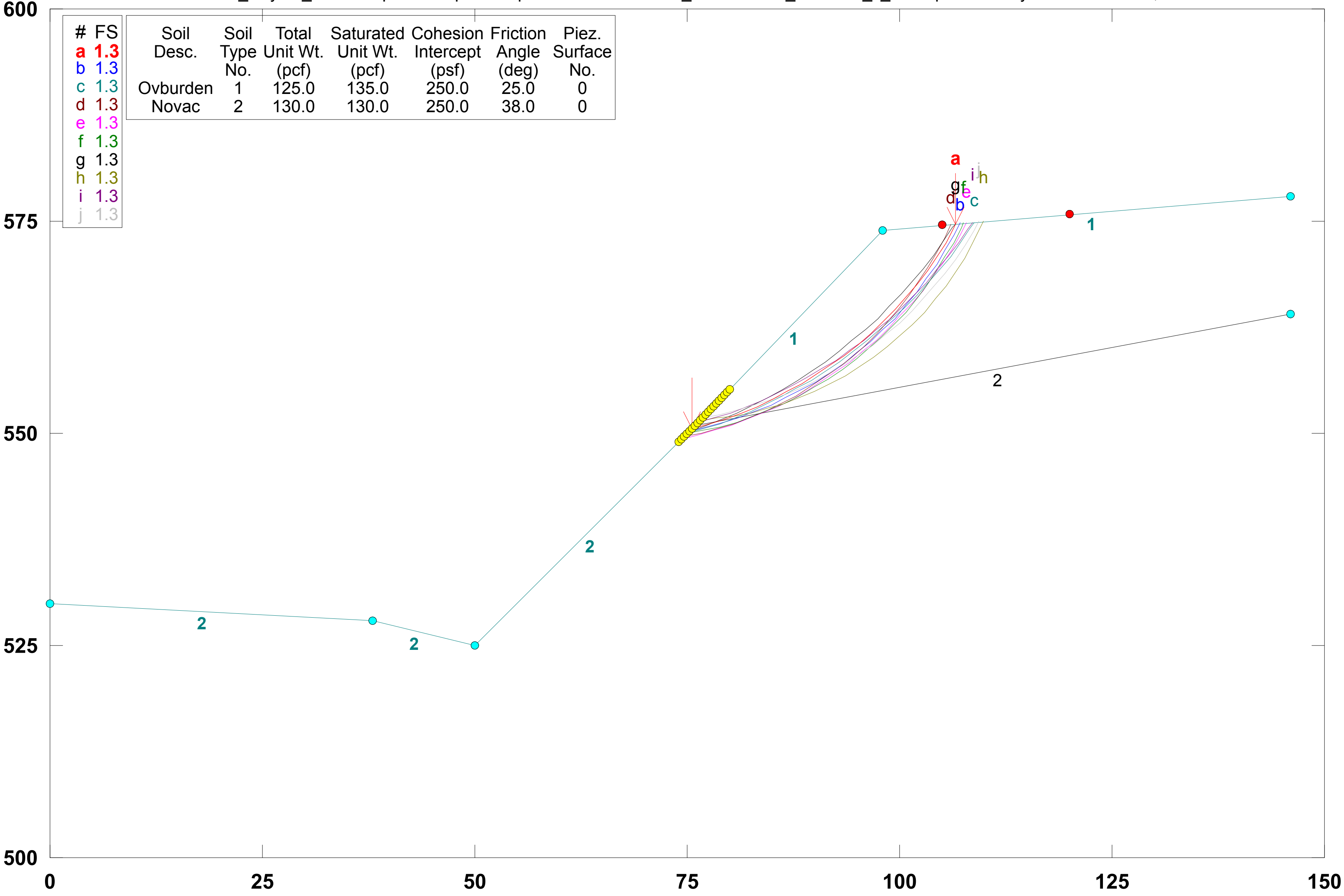
PCSTABL5M/si FSmin=2.3

Safety Factors Are Calculated By The Modified Bishop Method

GHBW

AHTD CA0606: Hwy 70-Hot Springs-Hwy 128-Sta 881+00 - Lt Side - Long Term

z:\mrs\13-214_hwy 70_ca0606\updated report - september 2015\13-214_stabl\13-214_1281+00_lt_circle.pl2   Run By: Matt Satterfield, PE



#	FS
a	1.3
b	1.3
c	1.3
d	1.3
e	1.3
f	1.3
g	1.3
h	1.3
i	1.3
j	1.3

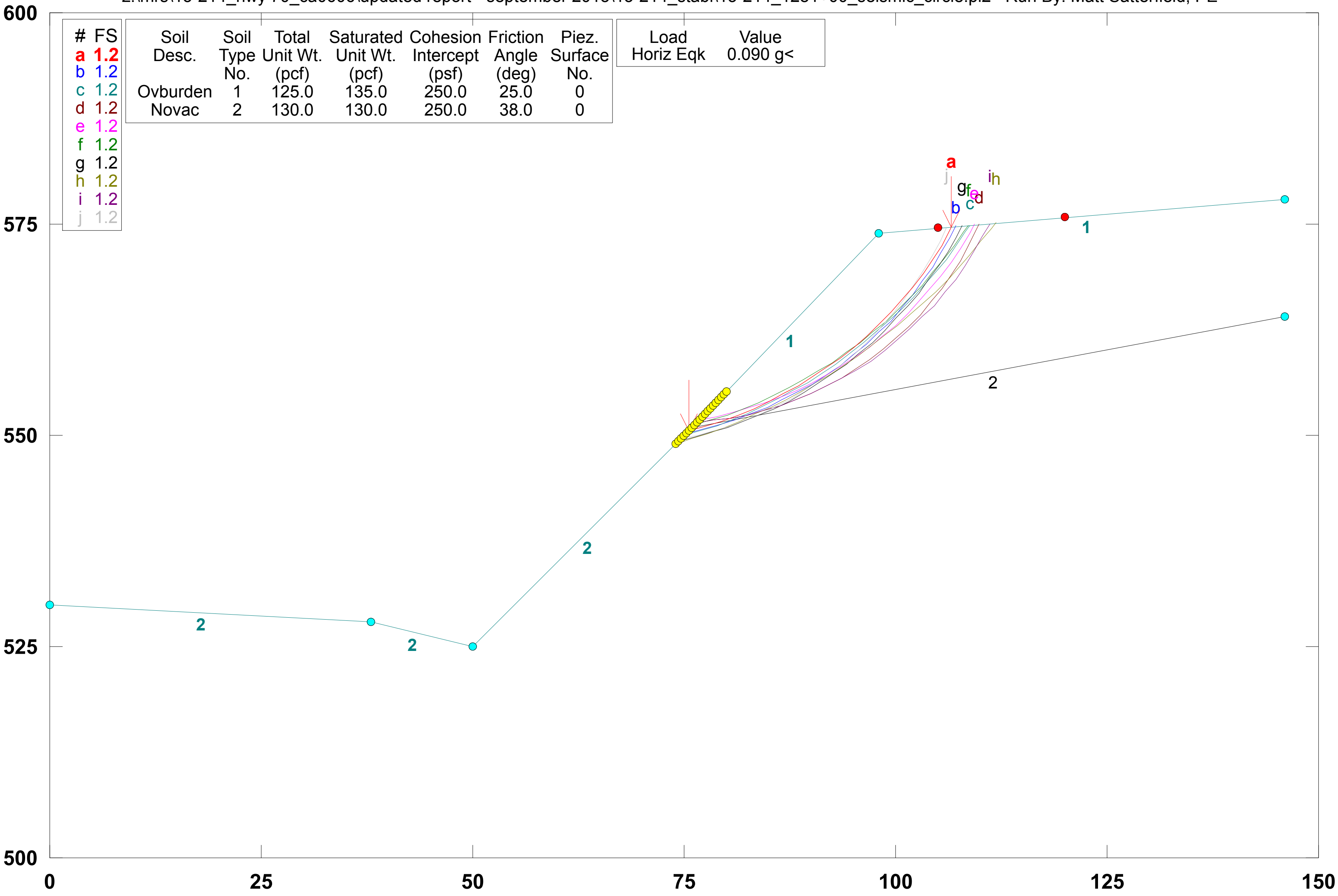
Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Ovburden	1	125.0	135.0	250.0	25.0	0
Novac	2	130.0	130.0	250.0	38.0	0

PCSTABL5M/si FSmin=1.3

Safety Factors Are Calculated By The Modified Bishop Method

AHTD CA0606: Hwy 70-Hot Springs-Hwy 128-Sta 881+00 - Lt Side - Seismic

z:\mrs\13-214_hwy 70_ca0606\updated report - september 2015\13-214_stabl\13-214_1281+00_seismic_circle.pl2 Run By: Matt Satterfield, PE



#	FS
a	1.2
b	1.2
c	1.2
d	1.2
e	1.2
f	1.2
g	1.2
h	1.2
i	1.2
j	1.2

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Ovburden	1	125.0	135.0	250.0	25.0	0
Novac	2	130.0	130.0	250.0	38.0	0

Load	Value
Horiz Eqk	0.090 g<

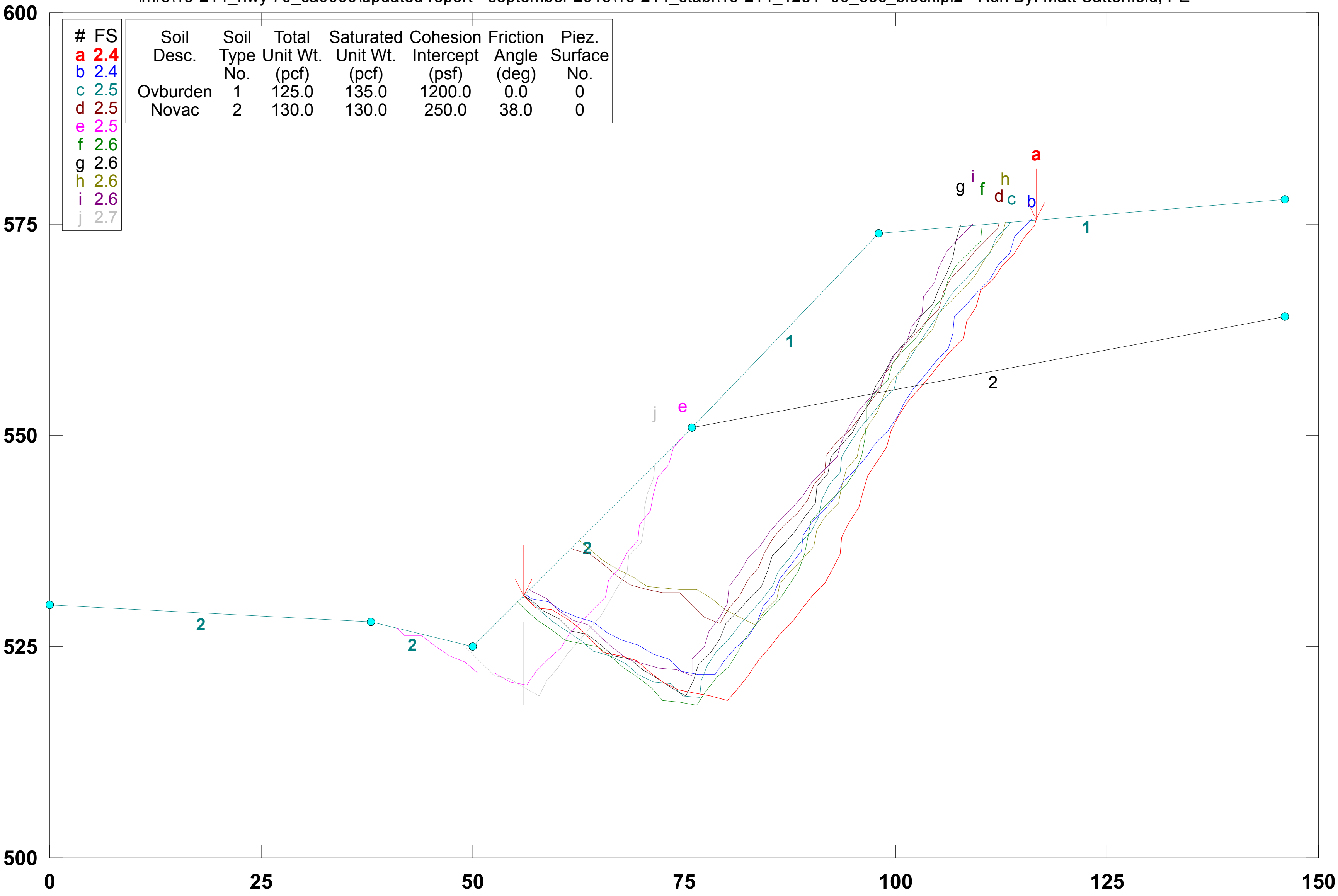
PCSTABL5M/si FSmin=1.2

Safety Factors Are Calculated By The Modified Bishop Method

GHBW

AHTD CA0606: Hwy 70-Hot Springs-Hwy 128-Sta 881+00 - Lt Side - End of Construct z:

\mrs\13-214_hwy 70_ca0606\updated report - september 2015\13-214_stabl\13-214_1281+00_eoc_block.pl2 Run By: Matt Satterfield, PE



#	FS
a	2.4
b	2.4
c	2.5
d	2.5
e	2.5
f	2.6
g	2.6
h	2.6
i	2.6
j	2.7

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Ovburden	1	125.0	135.0	1200.0	0.0	0
Novac	2	130.0	130.0	250.0	38.0	0

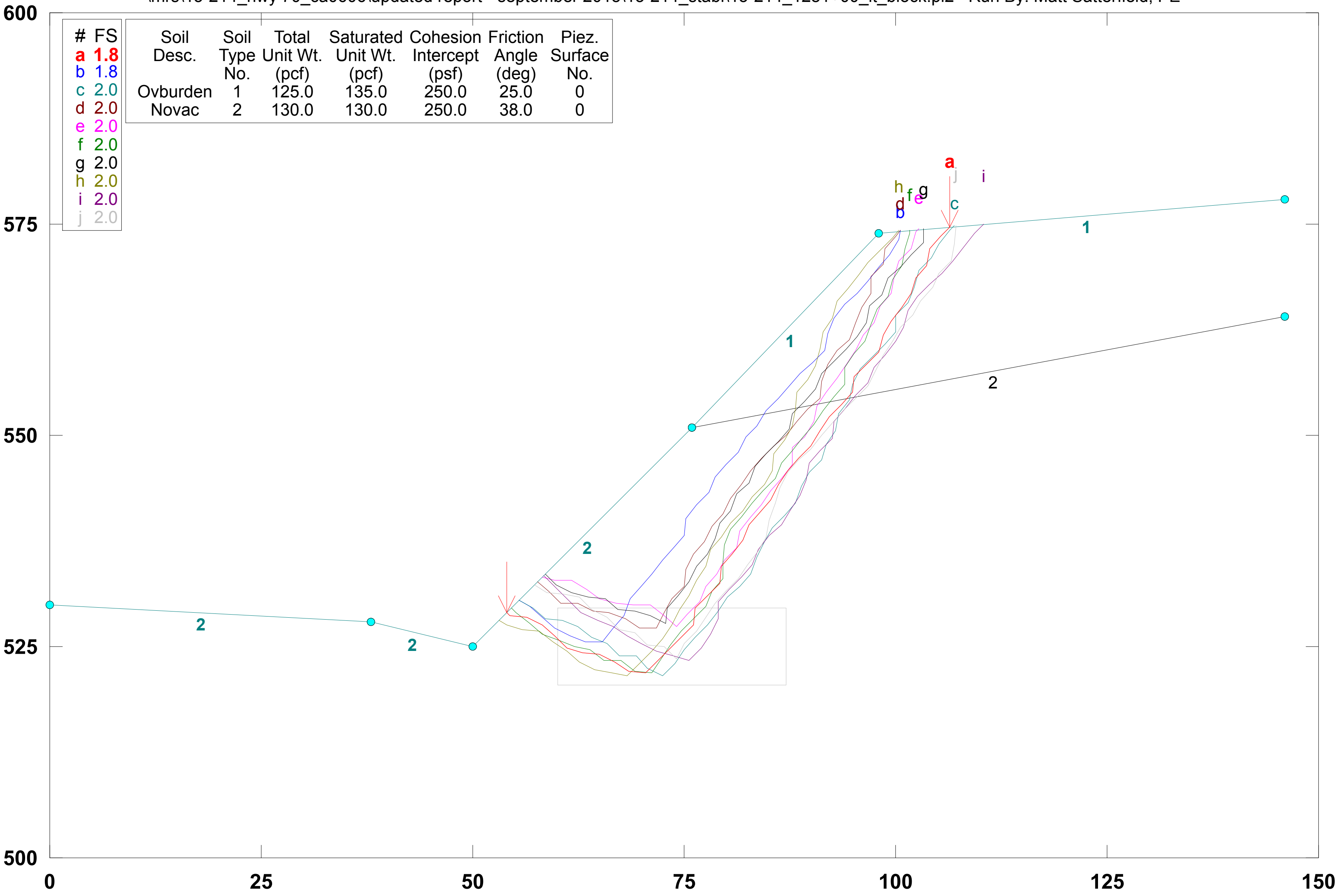
PCSTABL5M/si FSmin=2.4

Safety Factors Are Calculated By The Modified Janbu Method

GHBW

AHTD CA0606: Hwy 70-Hot Springs-Hwy 128-Sta 881+00 - Lt Side - Long Term z:

\mrs\13-214_hwy 70_ca0606\updated report - september 2015\13-214_stabl\13-214_1281+00_lt_block.pl2 Run By: Matt Satterfield, PE



#	FS
a	1.8
b	1.8
c	2.0
d	2.0
e	2.0
f	2.0
g	2.0
h	2.0
i	2.0
j	2.0

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Ovburden	1	125.0	135.0	250.0	25.0	0
Novac	2	130.0	130.0	250.0	38.0	0

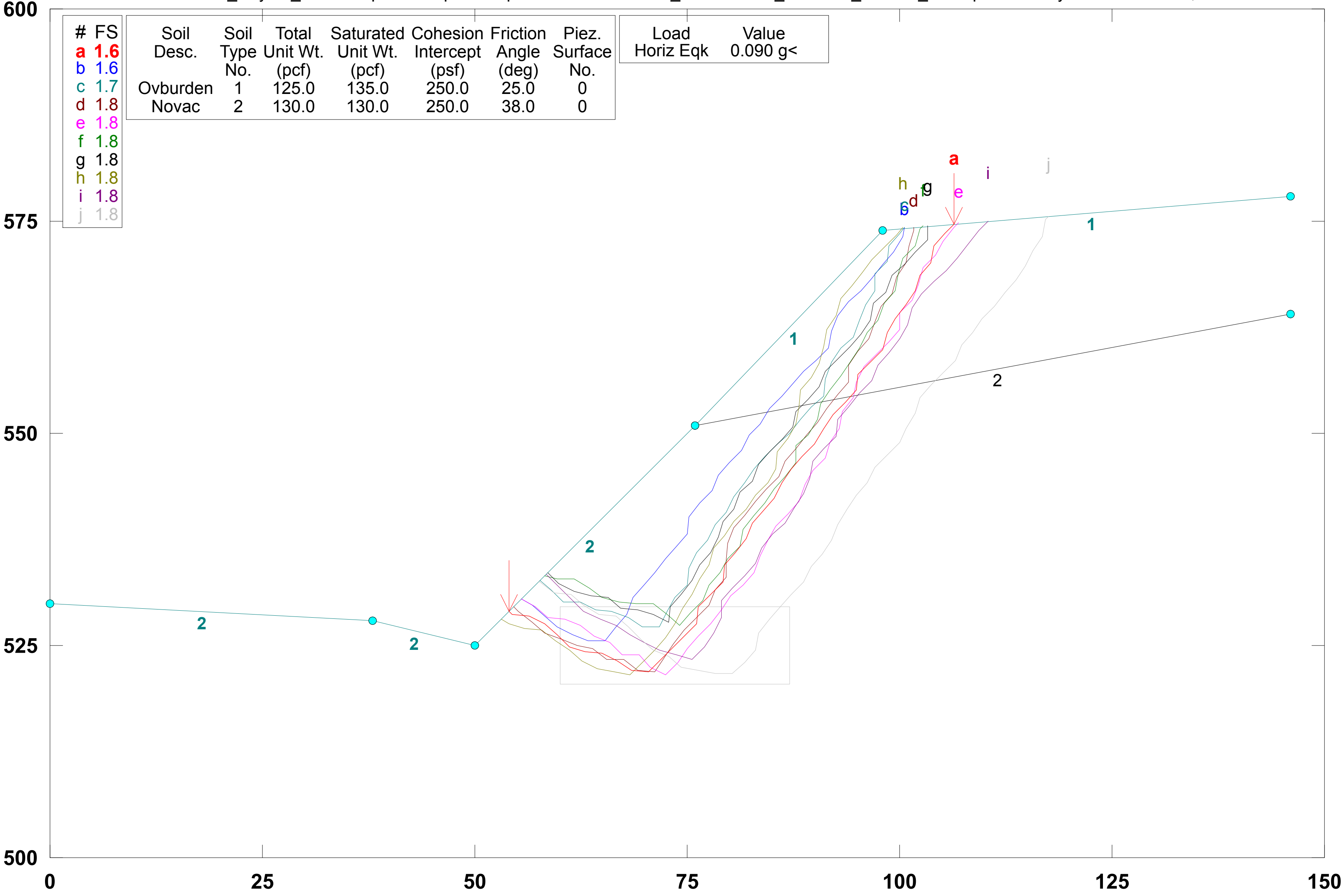
PCSTABL5M/si FSmin=1.8

Safety Factors Are Calculated By The Modified Janbu Method

GHBW

AHTD CA0606: Hwy 70-Hot Springs-Hwy 128-Sta 881+00 - Lt Side - Seismic

z:\mrs\13-214_hwy 70_ca0606\updated report - september 2015\13-214_stabl\13-214_1281+00_seismic_block.pl2   Run By: Matt Satterfield, PE



#	FS
a	1.6
b	1.6
c	1.7
d	1.8
e	1.8
f	1.8
g	1.8
h	1.8
i	1.8
j	1.8

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Ovburden	1	125.0	135.0	250.0	25.0	0
Novac	2	130.0	130.0	250.0	38.0	0

Load	Value
Horiz Eqk	0.090 g<

PCSTABL5M/si FSmin=1.6

Safety Factors Are Calculated By The Modified Janbu Method

GHBW