Appendix C

Geotechnical and Pavement Design Report
Rock Creek Road
Inyo National Forest
Mono County, California
February 12, 2013

GEOTECHNICAL AND PAVEMENT DESIGN REPORT
ROCK CREEK ROAD
CA PFH 89-1(1)

INYO NATIONAL FOREST
MONO COUNTY, CALIFORNIA

February 12, 2013
YA Project No. 212-106

Prepared for:
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TABLE OF CONTENTS

TABLE OF CONTENTS - continued

APPENDICES

1.0 EXECUTIVE SUMMARY

Yeh and Associates, Inc., as a subconsultant to Jacobs Engineering Group Inc., Denver, Colorado, was retained by the Federal Highway Administration (FHWA), Central Federal Lands Highway Division (CFLHD) to provide geotechnical investigations to provide information for pavement designs for 9.2 miles of Rock Creek Road between the junction with US 395 near Tom's Place and Rock Creek Lake, as well as foundation design for widening of five creek crossing structures located near Stations 1070+00, 1078+50, 1128+50, 1202+50 and 1303+50 along Rock Creek Road in Inyo National Forest, Mono County California.

In addition to the structure geotechnical information, the geotechnical investigations included sampling to provide pavement design recommendations for 9.2 miles of Rock Creek Road between US 395 and Rock Creek Lake.

The investigation included a site reconnaissance, subsurface exploration and laboratory testing. Results of the investigation were used to provide recommendations for structure foundation and retaining structure design and pavement thickness design. Subsurface conditions at the structure locations generally consisted of 8 to 12 feet of very loose to medium dense silty sand fill underlain by native medium to very dense silty to clayey sand with gravels and boulders. Weathered to hard granite bedrock was encountered beneath the native soils at a depth of 24 feet near Sta. 1070+00 and at depths of 22 to 27 feet near Sta. 1078+50 . It is our understanding that H-piles with a factored load of 78 kips per pile are being considered for the support of the proposed widening of the structures. Our estimated pile tip embedment depths using the FHWA software DRIVEN are 15 to 20 feet below the ground surface for HP 12x74 and HP 12x84 using a PDA for construction control. If FHWA-modified Gates dynamic pile formula is used in lieu of a PDA, our estimated pile tip embedment depths using the FHWA software DRIVEN are 25 to 30 feet below the ground surface for HP 12x74 and HP 12x84. Wing walls can be supported on spread footings bearing on the native sandy soils. The recommended nominal bearing resistance for footings on the native sandy soils is 10 ksf.

Structure backfill should conform to the Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects, FP-03.

Our recommendation for rehabilitation and widening of the pavement is to pulverize the existing pavement, widen the roadway base using aggregate base course, ABC and pave with 3.0 inches of Hot Asphalt Concrete Pavement, HACP.

2.0 PURPOSE AND SCOPE OF STUDY

Yeh and Associates, Inc., as a subconsultant to Jacobs Engineering Group, Denver, Colorado, was retained by the Federal Highway Administration (FHWA), Central Federal Lands

Highway Division (CFLHD) to provide geotechnical, foundation and pavement recommendations for preliminary and final design of improvements to Rock Creek Road in the Inyo National Forest in Inyo and Mono County, California. Rock Creek Road (Forest Highway 89) begins at US 395 and proceeds southerly for approximately 9.2 miles to Rock Creek Lake. The route is almost entirely within Mono County with only a small section in Inyo County. The route is classified as a minor collector and 100% of the traffic on Rock Creek Road is related to recreational use of the national forest. The roadway is maintained by Mono and Inyo Counties. The project location is shown on Figure 1.1.

The proposed road reconstruction will closely follow the existing road and construct widening as needed to achieve a consistent width as well as improve safety and minimize impacts. The project includes drainage, subsurface drainage, pulverization and hot asphalt concrete pavement (HACP) in addition to signing, striping, guardrail and other safety-related features needed to meet current design practice. The construction also includes improvements on five creek crossing structures located. near Stations 1070+00, 1078+50, 1128+50, 1202+50 and 1303+50 along Rock Creek Road, all planned to be widened to the downstream side.

The improvements will be designed and implemented in accordance with CFLHD, and American Association of State Highway and Transportation Officials (AASHTO) Highway Design Standards, in cooperation with the United States Forest Service and the CFLHD Denver Service Center.

The purpose of the geotechnical investigation is to evaluate geologic and subsurface conditions in the project area and provide recommendations for the design of pavements, foundations recommendations and an evaluation of rock fall potential and geologic hazards. This report presents the results of the geotechnical investigation along Rock Creek Road. This report addresses potential geotechnical constraints for the proposed improvements, existing pavement conditions along Rock Creek Road, and includes recommendations for pavement section thickness designs and foundation recommendations for five structures over Rock Creek that are planned to be widened.

The recommendations presented in this report were developed from the boring data and from observations of the existing ground surface. Laboratory testing was completed on selected samples to evaluate the engineering characteristics of the soils and bedrock.

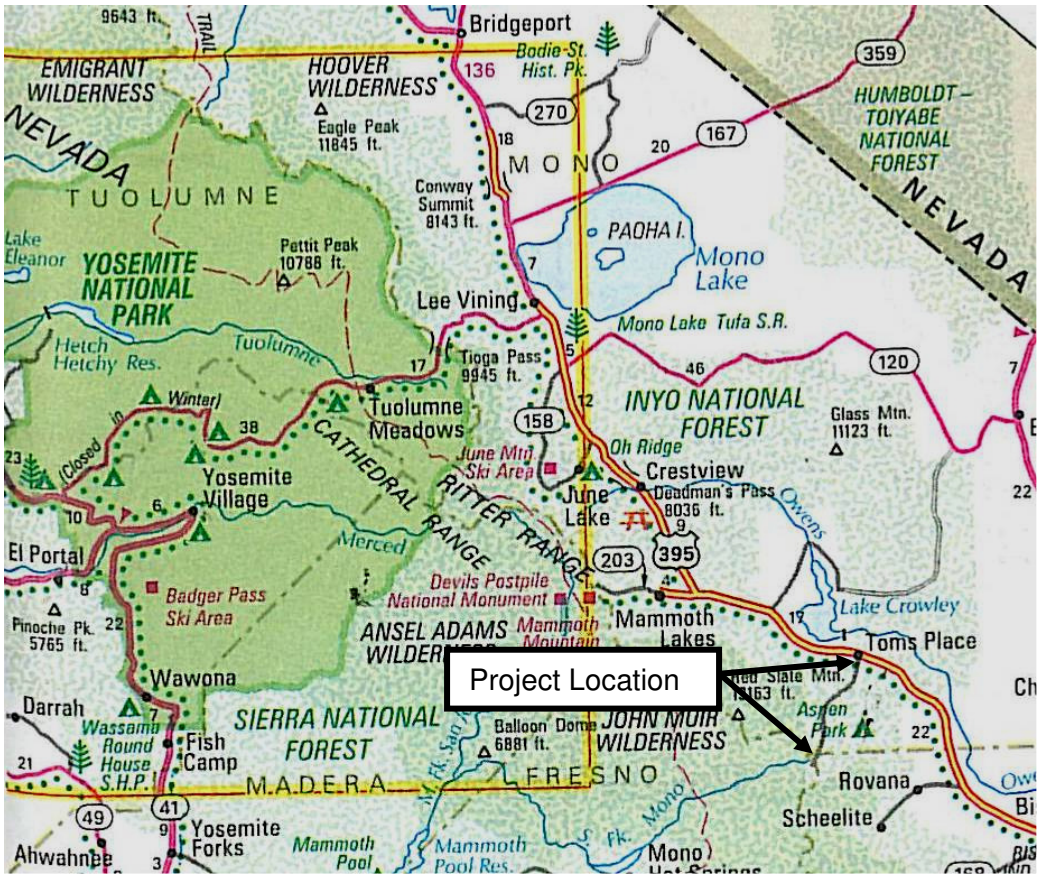


Figure 1.1 Project Location Map

3.0 GEOLOGIC SETTING

The project location is on the east side of the Sierra Nevada Mountains in eastern California. The Sierra Nevada Mountains are derived from the Sierra Nevada Batholith, a collection of granitic plutons that formed during the Triassic/Jurassic Periods. Approximately 25 million years ago tectonic uplift during the Oligocene Epoch caused the Sierra Nevada Mountains to rise. This uplift continues to the present, creating earthquakes in active fault zones along the eastern base of the High Sierra Mountains.

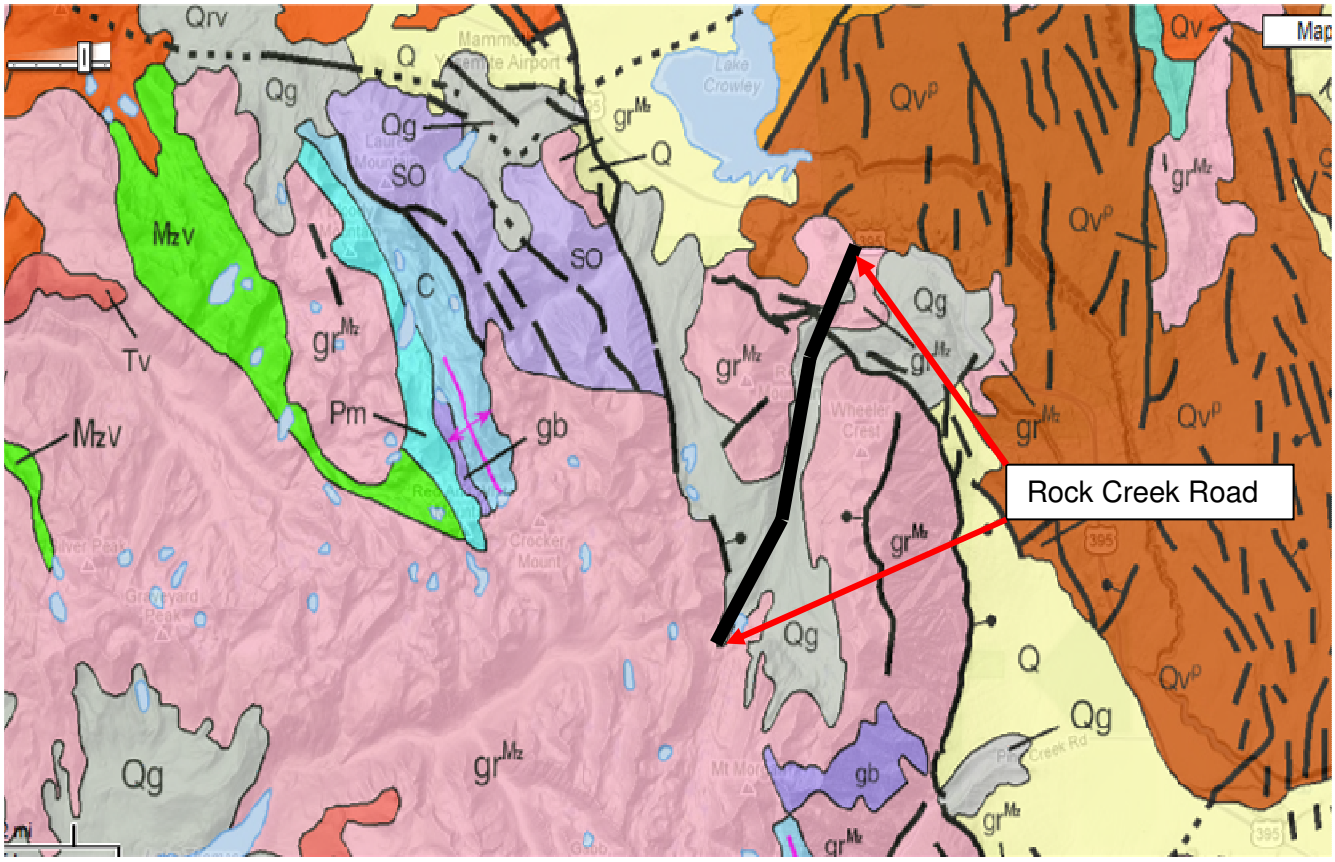
Beginning approximately 2.5 million years ago and coinciding with global cooling, four major glacial advances occurred in the Sierra Nevada Mountains. These advances took place approximately 1.5 million, 1 million, 100,000, and 20,000 years ago.

Rock Creek Canyon is the result of fluvial and glacial erosion of Mesozoic aged granite bedrock. From the intersection with Crowley Lake Drive to approximate Station 1077+00 Rock Creek Road traverses an alluvial fan of fluvial and glacial origin. The material underlying the roadway is comprised of sand, gravels, cobbles and boulders chiefly of granitic origin.

Beyond Station 1077+00 Rock Creek Road ascends Rock Creek Canyon. Rock Creek Canyon is comprised of glacial till and moraine deposits flanked by grantic bedrock. Granitic

bedrock exposures intersperse the glacial till deposits throughout the project length. The glacial till deposits are exposed in numerous cut slopes throughout the project length and consist of sand, gravel, cobbles and boulders and are typically standing at 34 degrees. A geology map of the project area is presented in Figure 3.1.

Borings YA-B3 and YA-B4 encountered bedrock at approximately 22 and 27 feet respectively. Boring YA-B2 encountered bedrock at an approximate depth of 24 feet. All other borings encountered alluvial/glacial deposits and fill only.



No Scale

Figure 3.1 - Geology Map: Rock Creek Road

Qg Glacial till and moraines. Found at high elevations mostly in the Sierra Nevada and Klamath Mountains.

gr ^{mz} Mesozoic granite, quartz monzonite, granodiorite and quartz diorite

Glacial till and moraines. Found at high elevations mostly in the Sierra Nevada and Klamath Mountains.

4.0 SITE CONDITIONS

4.1 Terrain

The site is located in mountainous terrain with vegetation consisting of small deciduous trees, grasses and shrubs at the lower elevations, and alpine vegetation with coniferous trees and other bushes and grasses at its highest elevations. Rock Creek Road is winding and has moderate grades to steep grades that primarily traverse the valley floor. The roadway rises from an elevation of approximately 7,100 feet at Tom's Place near US 395 to an elevation of 9,700 near Rock Creek Lake.

4.2 Climate

Tom's Place at an elevation of approximately 7,100 feet near the north end of the project has a mild climate similar to Bishop, California typical of the semi-arid regions of eastern California. The average annual precipitation is about 5.2 inches with temperatures ranging from the average high temperature in July of 98° F. to the average low temperature in 22° F. in December. Average annual high temperature is 86° F and average annual low temperature is about 53° F.

Rock Creek Lake at an elevation of 9,100 feet the south end of the project has climate and weather more similar to Mammoth Lakes which receives over 200 inches of snow per year and an average maximum high temperature of 78° F. in July and an average low temperature of 16° F. in January. Historic weather data for both Bishop and Mammoth Lakes are presented in Appendix A.

4.3 Geologic Hazards; Cut Slopes

Nearly all of the cut slopes on this project are composed of glacial till deposits. The few instances where bedrock is exposed in a cut slope, no major stability problems were observed. All of the rockfall catchment ditches should be cleaned to increase rock storage. Appendix B contains a photographic survey and site specific descriptions and discussions of the cut slopes

4.4 Pavement Condition

The pavement is in fair to poor condition depending on location throughout the project. Moderate to severe level linear cracking is prevalent throughout the project. Numerous locations have deteriorated edge cracking especially at pull outs and numerous locations have fatigue cracking in the wheel paths. The fatigue cracking is more prevalent at the higher elevations. Several locations at the higher elevations have vegetation up to the edge of pavement with little ditch to manage runoff water. At station 1427, a spring at the edge of the pavement is believed to be the cause of the pavement deterioration. A photographic survey of the pavement conditions is presented in Appendix C.

5.0 SUBSURFACE INVESTIGATION

Yeh and Associates contracted with Technicon Engineering Services, Inc. of Fresno, Ca. to drill exploratory borings for the geotechnical investigation along the pavement of Rock Creek Road and for the structure foundation investigations. Traffic control during drilling was provided by Traffic Management, Inc. of Signal Hill, California. The borings were drilled between September 5 and 10, 2012.

5.1 Exploratory Borings

Borings YA-P01 through YA-P38 were drilled at approximately ¼-mile intervals alternating between the two lanes. Odd numbered borings were generally located in the southbound lane and even numbered borings were in the northbound lane, however several locations are switched to address traffic and roadway geometry.. The borings were drilled to evaluate subgrade conditions and provide information for pavement design.

Borings YA-B01 through YA-B10 were drilled through the shoulder or pavement to provide information for foundation recommendations for widening the five structures over Rock Creek that will be improved by construction on this project. Structure borings were drilled on the downstream side of each structure because we understand that the downstream side is where the widening will occur.

The pavement borings were drilled with a truck-mounted CME 55 drilling rig using 8-inch O.D. hollow stem auger. Bulk samples were obtained from beneath the pavement and at selected intervals using a 1.5-inch I.D. split-spoon sampler in addition to split spoon samples.

The structure borings were drilled with a CME 55 using an air rotary drill. Sampling included split spoon samples as well as some rock cores.

The split-spoon sampler was driven into the subsoils with a 140-pound hammer falling 30 inches. The number of blows needed to drive the sampler 12 inches constitutes the blow count, N, reported on the Boring Logs. The blow count can be used as a relative measure of the material stiffness or density. Bulk samples of auger cuttings were also obtained from the borings at selected intervals. Upon completion, the borings were backfilled with auger cuttings. The pavement was patched with cold asphalt patch mix. The boring locations are presented on the engineering geology sheets in Appendix A and the boring logs are presented in Appendix D.

5.2 Laboratory Testing

Samples retrieved during the field exploration were returned to our laboratory for evaluation assignment by the project geotechnical engineer. An applicable program of laboratory testing was developed to determine engineering properties of the subsurface materials. Following the

completion of the laboratory testing, the field descriptions were confirmed or modified as necessary and boring logs were prepared.

Laboratory tests performed included gradation (ASTM D 421, C 136 and AASHTO T 27), Atterberg limits (AASHTO T 89/T 90), moisture content (AASHTO T 265), R-value (ASTM D 2844), sulfate content (AASHTO T290), pH (ASTM D 4972/AASHTO T 289), chloride ion content (ASTM D 4327) and soil resistivity (AASHTO T 288). Gradation and Atterberg limits test results were used to classify the soils in accordance with the AASHTO classification system and the Unified Soil Classification System (USCS). Moisture content provides an estimate of the moisture conditions of the subgrade and underlying materials. Soil R-value is a measure of soil subgrade strength used for pavement design. Tests for soluble sulfate content, pH, chloride content and resistivity are used to evaluate the potential of the soil to be aggressive to concrete and to corrode buried metal. The laboratory test results are presented in Appendix E and on the boring logs in Appendix D.

5.3 Pavement Borings

The thickness of asphalt pavement encountered in the exploratory borings ranged from 2 to 4 inches. Core samples were taken at each pavement boring location and the reported asphalt thickness includes the Hot Asphalt Concrete Pavement (HACP) and chip seal applications.

An obvious layer of aggregate base course was not encountered in the borings. Gravelly soils encountered below the asphalt appear to be the same as the local glacial outwash aggregate screened to remove oversize rocks. The asphalt pavement thicknesses and brief location descriptions are summarized in Table 5.1. Laboratory tests performed on samples of the subgrade soils and bedrock are presented in Appendix E.

Subgrade materials encountered along Rock Creek Road appear to be the same as the native soil materials and are difficult to distinguish from possible fill materials in the exploratory borings because the fill materials were likely produced from nearby road cuts. Embankment fill encountered appear to be glacial outwash or glacial till materials and are filled with cobbles and rocks. The fill encountered in most borings consists of silty sand with subangular to subrounded gravel. The subgrade materials have 9 to 27 percent fines consisting of silty sand and gravel which is non plastic. The natural moisture contents of the samples range from 1.4% to 6.9%. R-value tests were performed on three combined bulk samples of the subgrade soils from Borings YA-P01 and YA-P12 (Bulk Sample 1, A-1-b(0)), YA-P23 and YA-P37 (Bulk Sample 2, A-1-b(0)) and YA-P17 (Bulk Sample 3, A-2-4(0)). The R-value of Bulk Sample 1 was 70; the R-value of Bulk Sample 2 was 71; and the R-value of Bulk Sample 3 was 62. The silty sand and silty gravel subgrade soils have AASHTO classifications of A-1-b(0) and A-2-4(0).

Table 5.1: Pavement Thickness and Location

Boring Number	Station	Location	Pavement Thickness (inches)
YA-P1	1000+60	6.5" rt	3.5
YA-P2	1011+00	7.5' lt	3.75
YA-P3	1025+00	6.5' rt	3.5
YA-P4	1039+20	6' lt	2.5
YA-P5	1052+40	4.75' rt	3
YA-P6	1068+00	6' lt	3.5
YA-P7	1077+00	7.5' lt	2.75
YA-P8	1090+20	5' lt	2.75
YA-P9	1104+00	6' rt	3.5
YA-P10	1115+80	6' lt	3.5
YA-P11	1129+50	7' rt	2.75
YA-P12	1140+15	6.5 lt	3.25
YA-P13	1154+75	5.75 rt	3.5
YA-P14	1166+50	7' lt	3.5
YA-P15	1180+50	6.5' rt	2.75
YA-P16	1194+90	6.75' lt	3
YA-P17	1207+10	6.5' rt	3.5
YA-P18	1220+80	7.3' lt	4
YA-P19	1232+70	7.4' rt	-
YA-P20	1246+30	6' lt	3
YA-P21	1256+85	7.5' lt	2.5
YA-P22	1272+00	7' lt	3.5
YA-P23	1286+00	6.75' lt	2.5
YA-P24	1299+90	6.5' rt	3.25
YA-P25	1314+10	6' rt	3.25
YA-P26	1327+50	6.5' lt	3.25
YA-P27	1340+50	5.75' rt	2.5
YA-P28	1354+10	7.5'	3.5
YA-P29	1365+00	4.5' rt	4
YA-P30	1377+00	7' lt	3
YA-P31	1390+50	5.25 rt	4
YA-P32	1408+20	7' lt	3.25
YA-P33	1416+50	7.25' rt	4
YA-P34	1429+05	7.5' lt	3.5
YA-P35	1443+80	6' rt	2.75
YA-P36	1454+30	7.5 lt	4
YA-P37	1472+50	5.25' lt	2.75
YA-P38	1481+60	7.5' lt	2.75
		Average	**3.24**

5.4 Structure Borings

Borings YA-B01 through YA-B10 encountered medium dense to very hard silty sand and gravel with cobbles and boulders to the depth of bedrock or refusal because of large cobbles and boulders. The fill and native soils have AASHTO classifications of A-1-a(0), A-1-b(0) and A-2-4(0). Granite bedrock was encountered in Borings YA-B02, B03, and B04 at depths ranging from 22 to 27 feet. All structure borings encountered silty sand and gravel with cobbles and boulders and all structure borings encountered water at depths between 8 feet and 13 feet below the pavement surface. The bedrock is described as very hard granite. The structure boring logs are presented in Appendix D with test data presented in Appendix E.

6.0 GEOTECHNICAL (STRUCTURE FOUNDATION) RECOMMENDATIONS

6.1 Site Conditions

According to the County of Mono Bridge Inspection Reports prepared by Quincy Engineering, Inc. of Sacramento, California dated October, 2011, all five structures are a single arch culvert made of built-up corrugated metal plate supported on reinforced concrete footings with reinforced concrete headwalls. The length of the structures ranges from 12 to 14 feet. The inspection reports indicated concrete spalling on some abutment walls. Photographs of the outlets of the structures, where the planned widening will occur, are presented in Appendix F.

6.12 Exploratory Borings

Subsurface conditions were investigated by drilling 10 exploratory borings, one near each abutment of the five existing structures. The borings were logged by a representative of Yeh and Associates. All of the borings were drilled in or on the shoulders of the road and were backfilled with compacted cuttings. The exploratory boring locations are shown on the Engineering Geology Sheets, presented in Appendix A.

Samples of the subsurface materials were taken at selected intervals from the borings. Bulk samples of the soils were recovered from the cuttings. Additional samples were obtained by driving a split-spoon sampler. Penetration resistance measurements were made by driving the samplers into the subsurface materials with a 140-pound hammer falling 30 inches utilizing an automatic mechanism attached to the drilling rig. The penetration resistance value is a useful index to the consistency, relative density or hardness of the materials encountered.

6.13 Subsurface Conditions

Structure near Station 1070+00: Loose to medium dense sand and fill with cobbles and boulders was encountered at both abutments to depths of about 24 to 33 feet. The boring on the east side encountered granite bedrock at a depth of about 24 feet. Groundwater was measured at a depth of about 9 feet.

Laboratory test results indicate the on-site soils have pH of 7.7, water soluble sulfate content of 0.001 percent, chloride content of 0.0007 percent, resistivity of 8,929 ohm.cm and are non-plastic. The soils were classified as A-1-a(0), A-1-b(0), and A-2-4(0)in accordance with AASHTO.

Structure near Station 1078+50: Very loose to dense silty sand fill was encountered to a depth of about 8 to 10 feet. Below the sand fill, fine to coarse sand with cobbles and boulders was encountered to a depth of 22 to 27 feet where weathered to hard granite bedrock was encountered. Groundwater was measured at depths of 10 to 12 feet.

Laboratory test results indicate the sand soils are non-plastic and have pH of 6.8 to 7.3, water soluble sulfate content of 0.002 percent, chloride content of 0.006 to 0.002 percent and resistivity of 7,937 to 8,065 ohm.cm . The AASHTO classification for the silty sand is A-1-a(0) to A-1-b(0).

Structure near Station 1128+50: The subsoils encountered consist of 11 to 12 feet of loose to medium dense silty sand fill with gravels and boulders. Beneath the fill, dense to very dense silty to clayey sand with gravels and boulders was encountered that extended to the maximum explored depth of 30 to 34 feet. Groundwater was measured at depths of 8 to 9 feet.

Laboratory tests indicate the subsurface soils are non-plastic and have a pH of 7.3 and water soluble sulfate content of less than 0.001 percent, chloride content of 0.0006 percent and resistivity of 23,256 ohm.cm. The subsurface soils were classified as A-1-a(0) to A-1-b(0) in accordance with AASHTO.

Structure near Station 1202+50: The subsoils encountered in borings drilled consisted of very loose to medium dense silty sand fill with gravels. Medium to very dense silty sand with gravels and boulders was found to underlie the fill to the maximum explored depths of 29.8 to 33.5 feet. Ground water was measured at depths of 8 to 11 feet.

Laboratory test results indicate the subsurface soils are non-plastic and have a pH of 7.2 and water soluble sulfate content of less than 0.001 percent, chloride content of 0.0004 percent and resistivity of 18,519 ohm.cm. The soils have an AASHTO classification of A-1-b(0).

Structure near Station 1303+50: Borings drilled near the down-stream side of the structure abutments encountered 9.5 to 11.5 feet of loose to medium dense silty sand fill with gravels and boulders. Medium to very dense silty sand and sandy gravel with boulders were encountered below the fill. Groundwater was measured at depths of 9 to 13 feet.

Laboratory test results indicate the subsurface soils are non-plastic and have a pH of 6.8, water soluble sulfate content of 0.003 percent, chloride content of 0.0021 percent and resistivity of 9,091 ohm.cm. AASHTO Classifications of A-1-b(0) or A-2-4(0).

It is our understanding that all five existing structures are supported on continuous footings with a base dimension of 3 feet and a top dimension of about 1.5 feet. The height of the footings is about 4 feet 8 inches with a vertical face on the creek side and a tapered face on the other side. It appears that the footings at all five structure locations are supported on the native medium to very dense silty to clayey sand with gravels and boulders. This should be verified once the boring elevations are surveyed and the existing footings elevations of all five structures are obtained. The existing continuous spread footings appear to have provided adequate foundation support for the existing structures. Existing footings, if structurally sound can be extended to support the propose structure widening. Driven piles or drilled caissons maybe considered but will be difficult to construct due to the presence of subsurface cobbles and boulders.

6.2 Continuous Footing Foundations

Continuous footings similar to those supporting the existing structures may be used as foundation element for the widening of the existing structures. Dowels may be used to connect the existing to new footings to reduce the effect of differential settlement. A nominal bearing resistance of 10 ksf and a resistance factor of 0.45 may be used for the design of the footing for the abutments and retaining walls. Footings should be placed on medium to very dense native silty to clayey sand. Footings supported by native granular soils or compacted fill should be designed using a nominal coefficient of friction of 0.62, with a resistance factor of 0.80. Spread footings for structure foundations should have an average load factor computed as 1.25(DL + 1.40LL) where DL = Dead Load, LL = Live Load.

Spread footings should have a minimum width of 3 feet and bear at the same elevation as the existing footings or lower. Footings should also be placed below the frost line and the depth of anticipated scour. Any existing fill, organic materials and loose, soft or disturbed soils encountered at foundation bearing levels should be removed and replaced with compacted granular structure back fill. Dewatering will be necessary for the construction of the new footings. All foundation excavations should be observed by a representative of the geotechnical engineer prior to concrete placement.

It is our understanding that spread footings placed on the fill materials approximately 2 to 3 feet above the native sand and gravel are being considered. Fill materials that will support the spread footings should be proof rolled. Loose granular fill materials if encountered during proof rolling, should be compacted to 95% of maximum dry density based on the AASHTO T180. A nominal bearing resistance of 8 ksf may be used for footings placed on the fill material in this manner. The project hydraulic engineer should be consulted regarding the scour protection of the footings. Other spread footing design recommendations presented in this section above should be followed for the footing design. Rammed aggregate piers penetrate through the loose fill materials may be used to support the spread footings if the footings are to be placed more than 2 to 3 feet

above the native sand and gravel. A specialty rammed aggregate pier contractor should be consulted to determine the pier length, diameter and spacing based on the loading requirement.

6.3 Driven Pile Foundations

Construction of driven piles will encounter cobbles and boulders and will be difficult. Predrill may be required to ensure that piles can be driven to the design tip elevations. A pile driving analyzer (PDA) is recommended during construction to verify pile capacity and to establish pile driving criteria. Piles should be driven to at least 10 feet into the native sand and gravel. The project hydraulic engineer should be consulted regarding the scour protection of the driven pile foundations.

It is our understanding that H-piles with a factored load of 78 kips per pile are being considered. Assuming 10 feet of predrill and a groundwater depth of 8 feet, our estimated pile tip embedment depths using the FHWA software DRIVEN are 15 to 20 feet below the ground surface for HP 12x74 and HP 12x84. These estimated pile tip embedment depths assume that a PDA will be used for construction control in accordance with the AASHTO specifications. If FHWA-modified Gates dynamic pile formula is used in lieu of a PDA, our estimated pile tip embedment depths using the FHWA software DRIVEN are 25 to 30 feet below the ground surface for HP 12x74 and HP 12x84. It should be noted that pile embedment depth may be less than estimated if boulder or bedrock is encountered below the predrilled depth.

6.4 Drilled Caisson Foundations

Construction of drilled caissons will encounter cobbles and boulders and will be difficult. Casing and slurry will be required during the construction excavation. Concrete placement using tremie method will also be required.

Caissons may be embedded into the native undisturbed sand and gravel. Assuming a caisson embedment depth of 20 feet from the existing road grade, a nominal tip resistance of 30 ksf and a nominal side resistance of 1.2 ksf may be used for the design of caissons embedded in the native undisturbed sand and gravel. Resistance factors of 0.5 and 0.55 are recommended for the tip resistance and the side resistance, respectively. The project hydraulic engineer should be consulted regarding the scour protection of the caisson foundations.

6.5 Lateral Earth Pressures

Backfill for footings and retaining walls at all of the sites should consist of on-site or imported granular materials meeting the requirements of Section 704.04 of the Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects (FP-03).

For soils above any free water surface, recommended equivalent fluid pressures for unrestrained foundation elements are:

Active:

Cohesionless soil backfill (imported sands and gravels)	40 psf/ft

Passive:
Cohesionless soil backfill (imported sands and gravels) 350 psf/ft

Passive pressure to resist sliding should be calculated using a resistance factor of 0.50.

At rest:
Cohesionless soil backfill (imported sands and gravels) 50 psf/ft

The lateral earth pressures herein do not include any factor of safety and are not applicable for hydrostatic loading. The designs for walls and retaining structures should include underdrains to reduce the potential for build-up of hydrostatic pressures.

Fill against foundation and retaining walls should be compacted in accordance with Section 208 of FP-03. Compaction of each lift adjacent to abutment walls should be accomplished with hand-operated tampers or other lightweight compactors. Overcompaction may cause excessive lateral earth pressures, which could result in wall movement and distress.

6.6 Soil Corrosivity

Samples of the soils from both pavement and structure borings were tested for determination of water-soluble sulfate and chloride concentration, pH and resistivity. The pH ranged from 6.1 to 7.7. Water soluble chlorides ranged from 0.0002 to 0.0004 percent. Test results indicated the water soluble sulfates concentration in the soils is low,(<0.001 to 0.003 percent) which is considered a Class 0 potential exposure by AASHTO. The concentration of water-soluble sulfates in the soils indicates the use of Type I cement is acceptable for the site concrete.

Soil resistivity values were all well over 7000 ohms-cm, up to 36,232 ohm-cm. Low soil resistivity (<2000 ohms-cm) is an indication that the soils will be corrosive to buried metals such as utility pipes and steel culverts. The laboratory resistivity values indicate the soils are not corrosive to buried metal.

6.7 Seismicity

A latitude of 37.5246 and a longitude of -118.7111 were used to evaluate the preliminary seismic design parameters. A Site Class D was obtained in accordance with method B per AASHTO Table C3.10.3.1-1. The Peak Ground Acceleration (PGA), and the short- and long-period spectral acceleration coefficients (S_s and S1, respectively) were obtained using USGS Seismic Design Parameters Version 2.10 for an event with a 7% Probability of Exceedance (PE) in 75 years and a Site Class B (reference site). An event with the above probability of exceedance has a return period of about 1000 years. The values were adjusted using Site Factors for Site Class D in accordance with AASHTO Section 3.10.3.2 The seismic parameters are shown in the tables below.

Seismic Design Parameters

PGA (0.0 sec)	Ss (0.2 sec)	S1 (1.0 sec)
0.649 g	1.555 g	0.569 g

For Site Class D

As (0.0 sec)	SDs (0.2 sec)	SD1 (1.0 sec)	Seismic Zone
0.649 g	1.555 g	0.854	4

6.8 Structure Earthwork

Groundwater will be encountered in the foundation excavations and dewatering will be necessary, especially during periods of heavy stream flow such as spring runoff.

6.9 Structure Site Grading

Site grading should be in accordance with Section 200 of FP-03. Permanent fill slopes should be constructed at a maximum slope angle of 1.5H:1V for embankment materials consisting of on-site soils. However, establishing vegetation will be difficult on slopes steeper than 2:1 and may require erosion control measures such as slope retention blankets.

7.0 PAVEMENT RECOMMENDATIONS

7.1 Subgrade Strength

The following equations are from NCHRP Study 128, which was used in the preparation of AASHTO 1993 Pavement Design Guide.

$$S_1 = [(R-5)/11.29] + 3 \qquad \text{(Eq. 2.1)}$$

$$M_R = 10^{[S_1 + 18.72)/6.24]} \qquad \text{(Eq. 2.2)}$$

Where: M_R = resilient modulus (psi)
S_1 = the soil support value
R = the R-value obtained from the Hveem Stabilometer (AASHTO T190)

R-values measured in accordance with AASHTO T190 on the soils from the project, were 70, 71, and 62. Using these equations, an R-value of 60 was used to calculate a resilient modulus of 18,259 psi. This resilient modulus value was used as one of the inputs for the DARWin Pavement Design computer program to determine recommended pavement thickness for Rock Creek Road. The DARWin pavement design computer program generally follows the AASHTO 1993 Pavement Design Manual.

Other structural layer coefficients used in design were found in the “FHWA CFL Project Development and Design Manual (PDDM)”, March 2011.

7.2 Traffic Loading

Traffic information for this project was obtained from the Rock Creek Rock (Route 89) California Forest Highway Project Application. The current and 20-Year Projected Seasonal Average Daily Traffic was used to calculate the number of 18-kip Equivalent Daily Loads (ESALs) that the roadway will receive. The percentage of recreational vehicles and heavy vehicles was assumed based on discussions with county personnel. The resulting traffic loading used for pavement thickness design is 106,861 ESALs. The calculation of ESALs is presented in Appendix G.

7.3 Recommended Pavement Thickness

Using the strength information based on the soils testing and the strength coefficients from the PDDM for various treatments, three treatments were evaluated for the widening and reconstruction of Rock Creek Road.

The pavement thicknesses listed in Table 5.1 show that there is adequate thickness of HACP for this treatment. Table 7.3 contains the input parameters used for the pavement thickness design. The parameters were taken from the FHWA Project Development and Design Manual March 2011 based on the traffic loading and treatments for this pavement.

Table 7.3.1 - Pavement Design Parameters

Design Parameter	Parameter Value	Design Parameter	Parameter Value
18-kip ESALs	106,861	Initial Serviceability	4.2
Reliability	75%	Terminal Serviceability	2.5
R-value	60	Resilient Modulus M_R	18, 259
	Minimum Structural Number	1.52	

The output from the DARWin Pavement Design Program is presented in Appendix F.

The three options presented in Table 7.3.2 are:

1 - HACP overlay of existing pavement

2 - Cold recycle of the existing pavement followed by a new HACP pavement

3 - Pulverization of the existing pavement followed by a new HACP overlay

4 - Widening with ABC and new HACP overlay

Options 1, 2 and 3 are presented as possibilities and option 4 using ABC is presented as a the most likely method of widening the existing pavement with any of the other options.

Table 7.3.2 presents a summary of the treatments and proposed thicknesses for the pavement treatment options.

Table 7.3.2 - Treatments and HACP Thickness

Option No.	Treatment	Base Thickness (inches)	Base Str. Layer Coefficient	HACP Thickness (inches)
1	Overlay Existing	3 (old HACP)	0.20	3
2	Cold Recycle	3	0.25	3
3	Pulverization	6	0.12	3
4	ABC	6	0.12	3

As can be seen, all of the options require three (3) inches of HACP to meet the traffic loading requirements and will result in a rise in the existing grade of approximately 3 inches..

Option 1, overlay of existing, does not address the widening which would need to be done with ABC and a new 3 inches of HACP. The existing linear cracks would soon reflect through the new pavement and a longitudinal crack at the joint between the old pavement and the new widening often develops using this treatment. This option would also require a large amount of patching of the deteriorated edges and some potholes.

Option 2, cold recycle of the existing addresses the problems in the existing mat, but may have the same problems as the overlay with a longitudinal crack using widening using ABC. Cold recycle of the existing also costs more that the overlay or pulverization options.

Option 3, pulverization of the existing, followed by 3 inches of new HACP presents what we believe to be the best option. The pulverization option allows the widening to take place with the use of ABC to provide a uniform base for the new pavement since pulverized material and the ABC have similar properties and the same strength coefficients. The widened section should not have the potential for the longitudinal crack to develop at the widening. The pavement design program outputs are presented in Appendix H

At one specific location near Station 1305+00, the recommended pulverization depth has been requested to be only 4 inches in order to minimize disturbance of a cultural/historic site. Based on the boring data, we believe that the pavement thickness at this location is 3.25 inches.

7.4 Binder and Mix Recommendations

Using the Long Term Pavement Performance Binder Selection Program, LTPPBind, the 98% reliability binder recommended for the closest weather station in Bishop, Ca. is PG 70-16. However, as stated earlier, this project spans an elevation from the desert climate near Bishop to the high mountains at Rock Creek Lake. The State of California has adopted a program of Asphalt Binder Grade Selection which classifies this project area as either High Desert or High Mountain Climate Region. The recommended binder for both areas based on Caltrans data is PG 64-28. This binder was also recommended in discussions by county personnel because of good performance on past projects.

We recommend following the Caltrans recommendations to use PG 64-28 Binder for this project because of the large range of temperatures that the Rock Creek Road pavement will experience. The Caltrans Binder Selection Guidelines are presented in Appendix G following the pavement design program outputs.

The new HACP overlay should be a nominal l/2-inch or 3/4-inch mix with the above recommended binder. Grading Designation D or E mix is recommended (as per FP-03). A Hveem mix design is also recommended. The quantity of binder can be estimated at 6% by weight of the mix and the unit weight can be estimated at 145 lbs/ft^3.

This project is in a relatively remote location and we understand the asphalt plant may be several miles from the construction site. Loss of temperature and segregation of the hot asphalt mix can occur during long distance transport. We recommend the project specifications require the use of a material transfer device at the point of placement to insure uniform temperatures and prevent segregation of the mix during placement. Use of a material transfer device is especially important if the mix is placed in cool weather.

The application of tack coat (at 0.10 gallons/ yd^2) is required on the pulverized base material prior to paving. The tack coat material should be CSS-1, CSS-1h, SS-1, or SS-1h. A tack coat at the above rate should be included between each lift of HACP.

Pulverized material or aggregate base course should receive a prime coat of an emulsion blended as a penetrating prime at a rate of 0.33 gallons/yd^2.

7.5 Drainage

Surface drainage adjacent to the existing road is generally fair except several locations where it may have caused excess moisture into the subgrade, weakening the pavement structure and causing deterioration. The depressions and ridges in the pavement surface near the south end of the project are probably the result of surface moisture infiltration.

The collection and diversion of surface drainage away from paved areas is extremely important to the satisfactory performance of the pavement structure. Proper design of drainage should include prevention of ponding of water on or immediately adjacent to pavement areas. Over-spray from sprinklers should be minimized. Slopes and other stripped areas should be protected against erosion by re-vegetation or other methods. Under drains may even be considered for very wet areas such as cut areas next to irrigated landscape.

7.6 Earthwork

The soils encountered in the exploratory borings are suitable for use as embankment fill under roadways. Embankment materials should be placed and compacted in accordance with the Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects, FP-

03. Cut and fill slopes should be graded at 3 horizontal to 1 vertical or flatter. Slopes should be protected from erosion by re-vegetation or other means.

If soft soils are encountered or become unstable during construction when subjected to traffic loads following removal or pulverization of the existing pavement the upper 1.5 feet of the soft material should be removed and replaced with compacted Subbase Fill, Grading A or B or ABC. The required depth of removal and replacement can be reduced if a geosynthetic reinforcement or separator fabric is used below the subbase fill.

8.0 REFERENCES

Federal Highway Administration (FHWA), 2003, *Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects*, FP-03.

Google Earth, 2011

AASHTO 1993 Pavement Design Guide

Jennings, C.W., Strand, R.G., and Rogers, T.H., 1977, Geologic map of California: California Division of Mines and Geology, scale 1:750,000.

FHWA Central Federal Lands Division, Project Development and Design Manual, 2011, FHWA.

California Asphalt Binder Selection Guidelines, Caltrans 2005.

9.0 LIMITATIONS

This study was conducted in accordance with generally accepted geotechnical engineering practices in this area for use by the client for design and construction purposes. The conclusions and recommendations submitted in this report are based upon the data obtained from exploratory borings and field review and the proposed type of construction. Subsurface variations across the site are likely and may not become evident until excavation is performed. If during construction, fill, soil, rock or water conditions appear to be different from those described herein, this office should be advised at once so reevaluation of the recommendations may be made. We recommend on-site observation of excavations and pavement subgrade conditions by a representative of the geotechnical engineer.

Appendix A – Boring Locations and Engineering Geology and Weather Data

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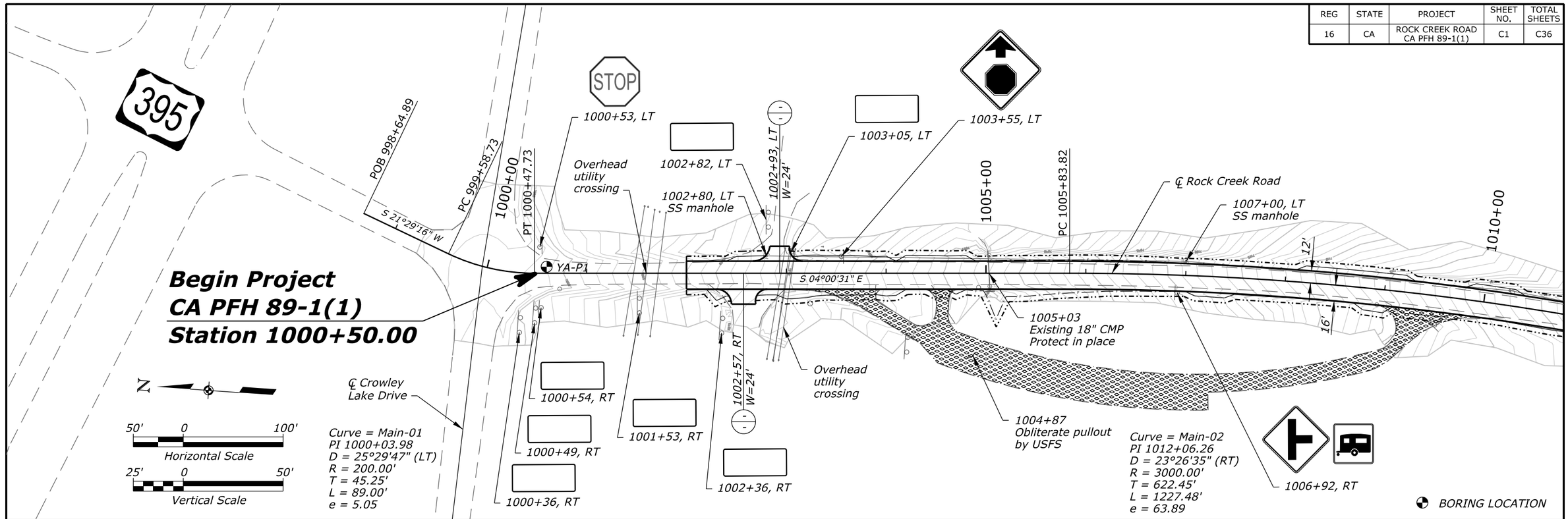

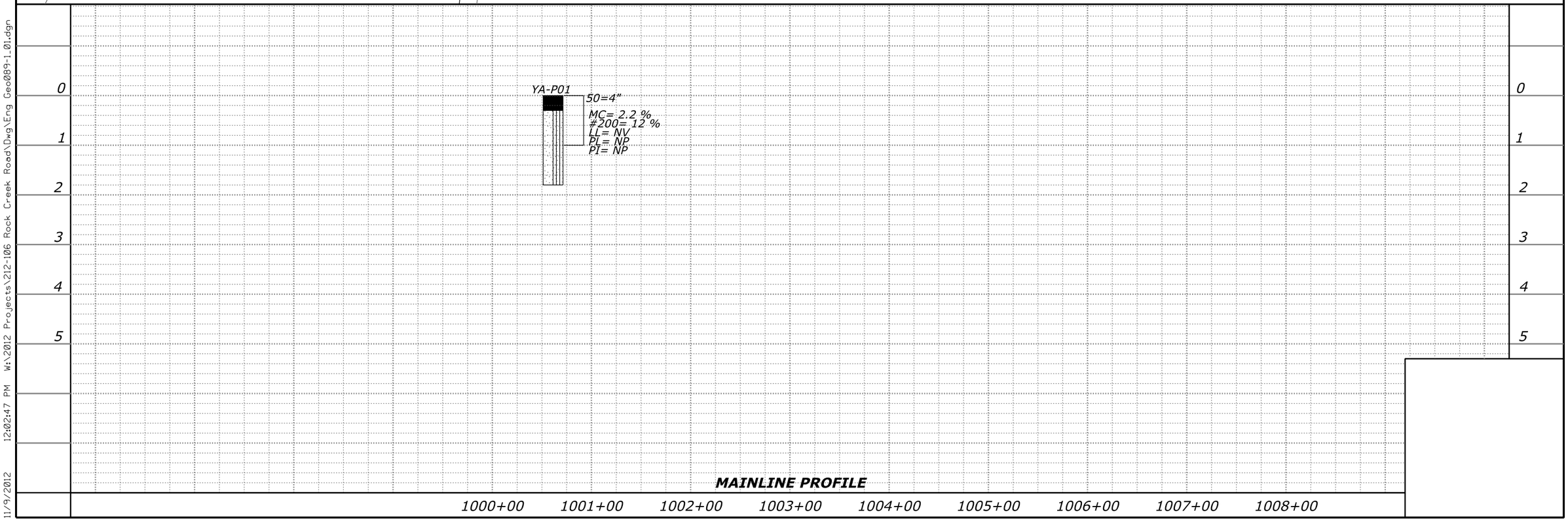

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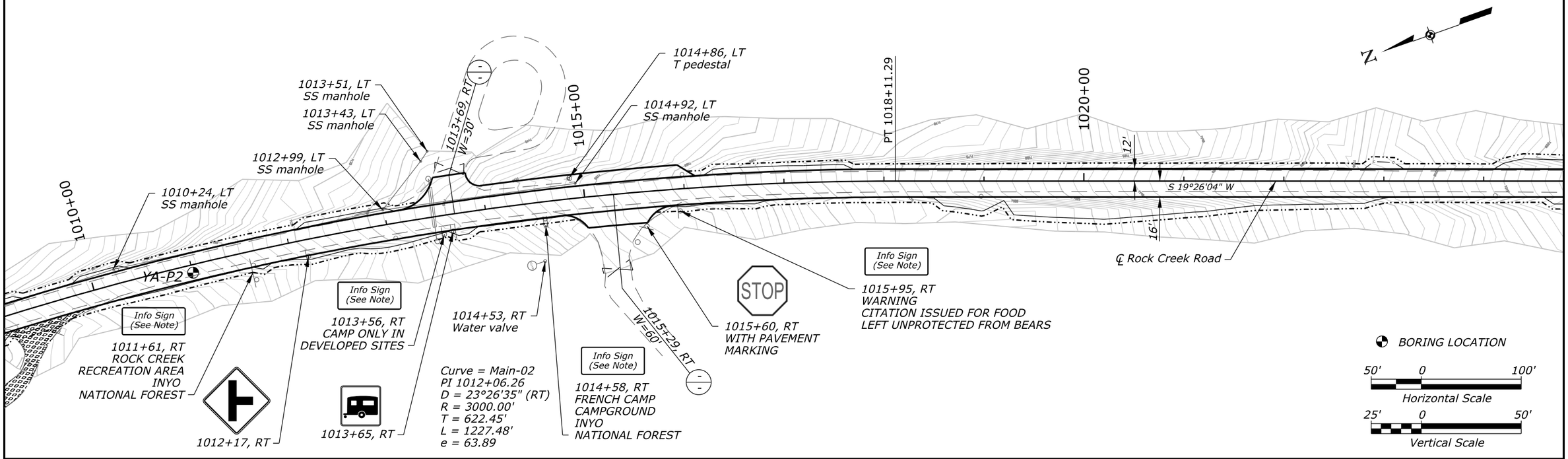

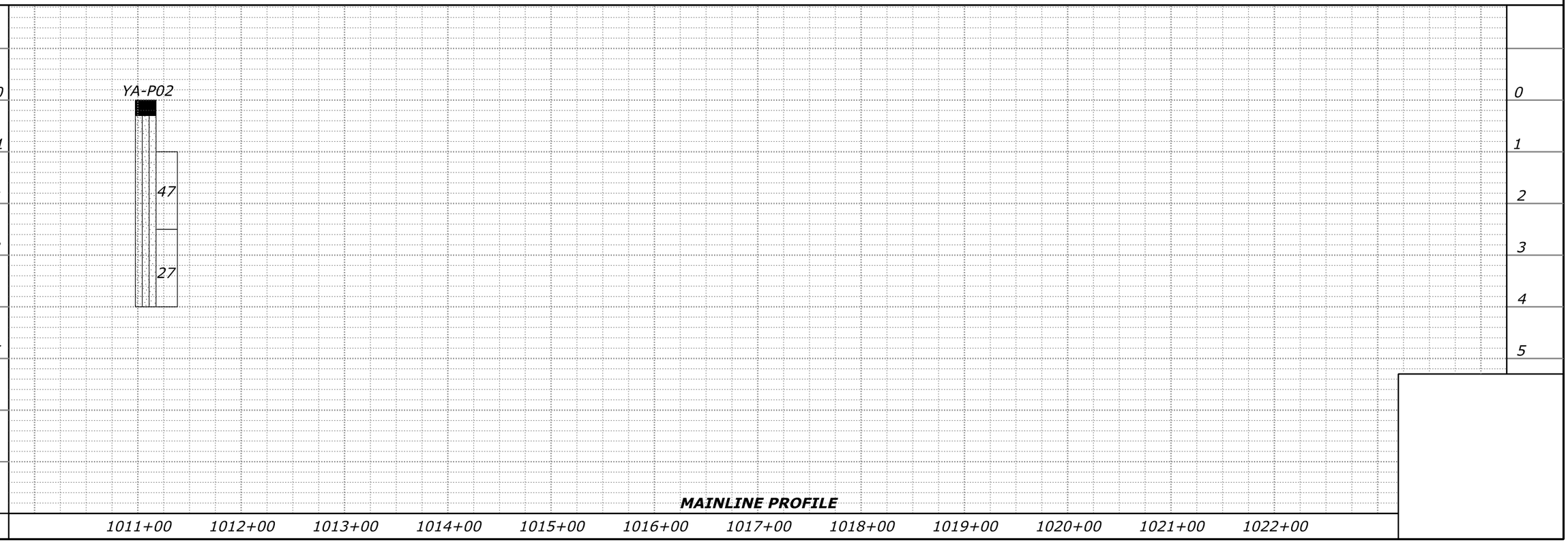

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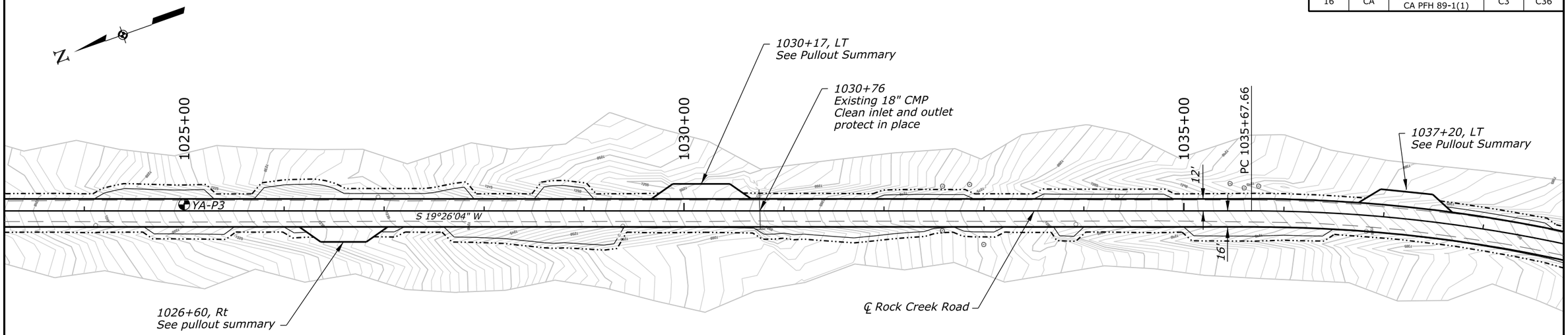
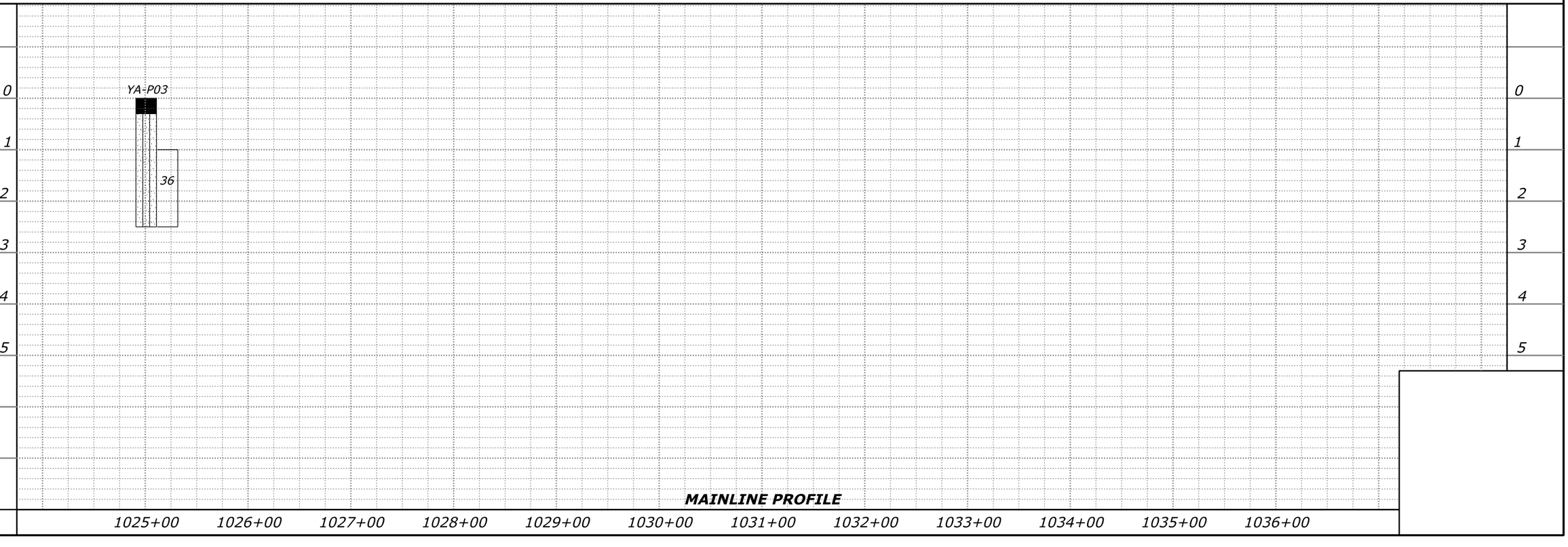


BORING LOCATION

50' 0 100'
Horizontal Scale

25' 0 50'
Vertical Scale

Curve = Main-03
PI 1042+58.95
D = 49°29'10" (RT)
R = 1500.00'
T = 691.29'
L = 1295.55'
e = 151.63



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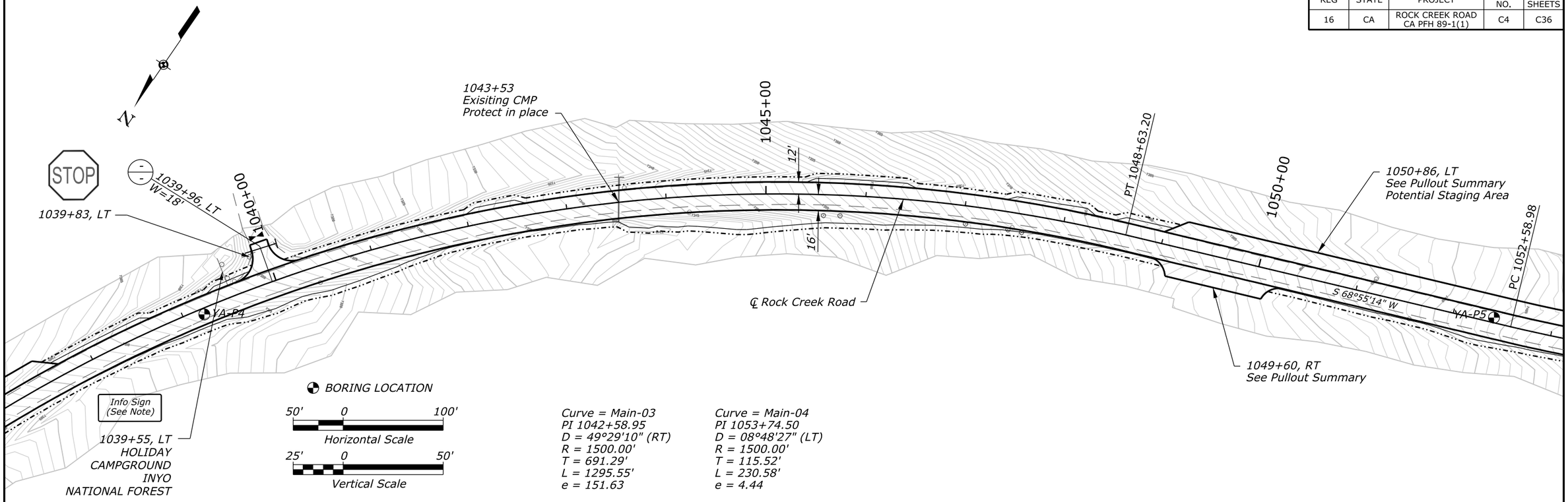

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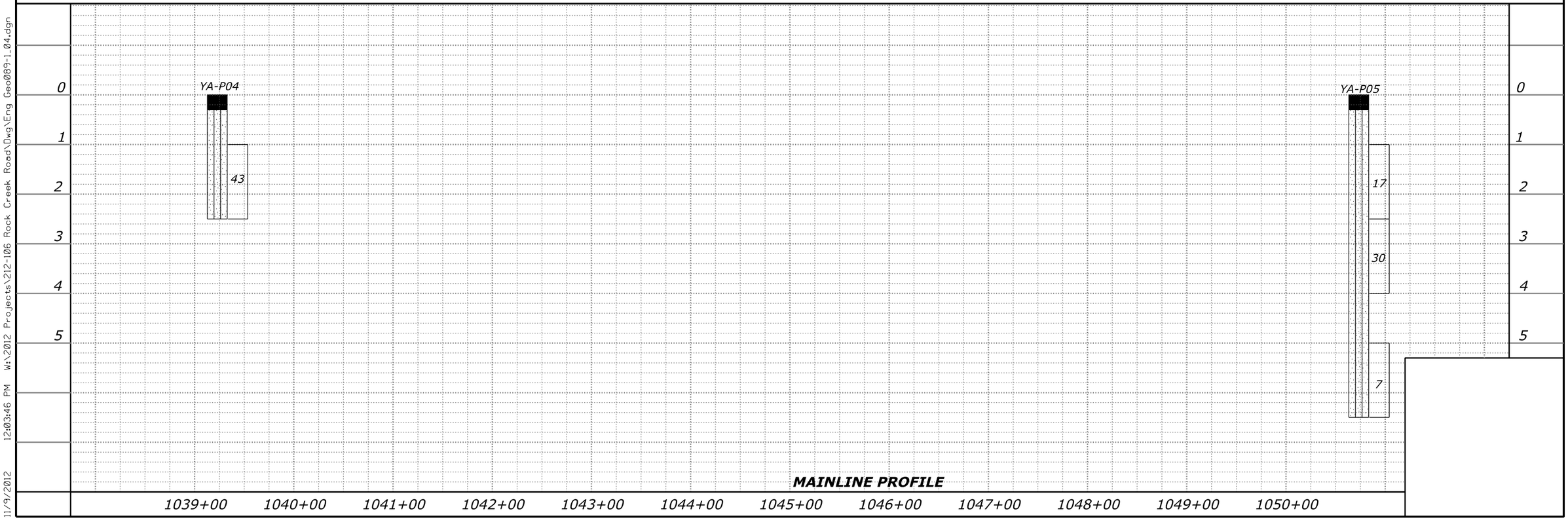
PI 1042+58.95
D = 49°29'10" (RT)
R = 1500.00'
T = 691.29'
L = 1295.55'
e = 151.63

Curve = Main-04
PI 1053+74.50
D = 08°48'27" (LT)
R = 1500.00'
T = 115.52'
L = 230.58'
e = 4.44



REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
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N

PC 1052+58.98

PT 1054+89.56

1055+00

1060+00

1065+00

S 68°55'14" W

YA-P5

12'

16'

S 60°06'47" W

1061+11, LT
W=14'

WATER TANK

1065+60, LT
See Pullout Summary

℄ Rock Creek Road

1057+50, RT
W=14'

1057+82, RT

1059+75
Existing 18" CMP
Clean inlet and outlet
Protect in Place

1062+31, RT
See Pullout Summary

1064+19, RT
T Pedestal

1064+31, RT
SS manhole

Info Sign
(See Note)

1064+60, RT
SNOW SLIDE AREA
FOREST SERVICE
ROUTE 12

BORING LOCATION

50' 0 100'
Horizontal Scale

25' 0 50'
Vertical Scale

Curve = Main-04
PI 1053+74.50
D = 08°48'27" (LT)
R = 1500.00'
T = 115.52'
L = 230.58'
e = 4.44

YA-P05

17

30

7

MAINLINE PROFILE

1053+00 1054+00 1055+00 1056+00 1057+00 1058+00 1059+00 1060+00 1061+00 1062+00 1063+00 1064+00

0 1 2 3 4 5 6 7

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Curve = Main-05
PI 1072+64.35
D = 38°12'59" (LT)
R = 350.00'
T = 121.25'
L = 233.45'
e = 20.41

Curve = Main-06
PI 1076+12.86
D = 22°46'03" (LT)
R = 400.00'
T = 80.54'
L = 158.95'
e = 8.03

Curve = Main-07
PI 1080+09.55
D = 39°36'21" (RT)
R = 250.00'
T = 90.02'
L = 172.81'
e = 15.71

1065+00
1066+94, LT
SPEED LIMIT 35
12'
16'
℄ Rock Creek Road
S 60°06'47" W
1069+83, LT
1069+80
14' Arch crossing
Protect in place
1069+38, RT
SS manhole
YA-B2
1069+45, RT
6'x60' Slab Bridge
1069+76, RT
1070+00
1070+34, LT
YA-B1
1070+55, RT
See Pullout Summary
30 MPH
1071+22, RT
PC 1071+43.09
FALLEN ROCKS
1071+42, RT
PT 1073+76.54
1073+56, RT
SS manhole
1075+00
PC 1075+32.32
S 21°53'48" W
1075+49, RT
SS manhole
PT 1076+91.27
1076+09
Install New CMP
6'x60' Slab Bridge
1078+95, LT
1078+86, RT
SS manhole
YA-B3
S 00°52'15" E
1078+76, RT
T pedestal
1078+78, RT
Utility meter
PC 1079+19.53
YA-B4
1079+32, LT
1080+00
12'
16'
PT 1080+59.25
PC 1081+48.27
1079+39, RT
1079+15
14' Arch crossing
Protect in place
1078+97, RT

BORING LOCATION
50' 0 100'
Horizontal Scale
25' 0 50'
Vertical Scale

YA-B02
6 MC= 4.8 %
#200= 13 %
LL= NV
PL= NP
PI= NP
pH= 7.7
S= 0.001 %
Re= 8929 ohms-cm
AASHTO: A-1-b (0)
USCS: SM
5
24 MC= 9.6 %
#200= 19 %
LL= NV
PL= NP
PI= NP
AASHTO: A-1-b (0)
USCS: SM
30 MC= 8.2 %
#200= 19 %
LL= NV
PL= NP
PI= NP
AASHTO: A-1-b (0)
USCS: SM

YA-B01
7
19 MC= 8.9 %
#200= 4 %
LL= NV
PL= NP
PI= NP
AASHTO: A-1-a (0)
USCS: GP
22 MC= 10.2 %
#200= 32 %
LL= NV
PL= NP
PI= NP
AASHTO: A-2-4 (0)
USCS: SM
34 MC= 9.9 %
#200= 30 %
LL= NV
PL= NP
PI= NP
AASHTO: A-2-4 (0)
USCS: SM
50=4"

YA-B03
10 MC= 1.4 %
#200= 7 %
LL= NV
PL= NP
PI= NP
pH= 7.3
S= 0.002 %
Re= 1937 ohms-cm
AASHTO: A-1-b (0)
USCS: SP-SM
4
R
>50
50=4"
MC= 4.5 %
#200= 9 %
LL= NV
PL= NP
PI= NP
AASHTO: A-1-a (0)
USCS: SP-SM

YA-B04
34 MC= 1.4 %
#200= 10 %
LL= NV
PL= NP
PI= NP
pH= 6.8
S= 0.002 %
Re= 8065 ohms-cm
AASHTO: A-1-b (0)
USCS: SP-SM
2
50=5
RQD
80

0 5 10 15 20 25 30 35

MAINLINE PROFILE

1067+00 1068+00 1069+00 1070+00 1071+00 1072+00 1073+00 1074+00 1075+00 1076+00 1077+00 1078+00

REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
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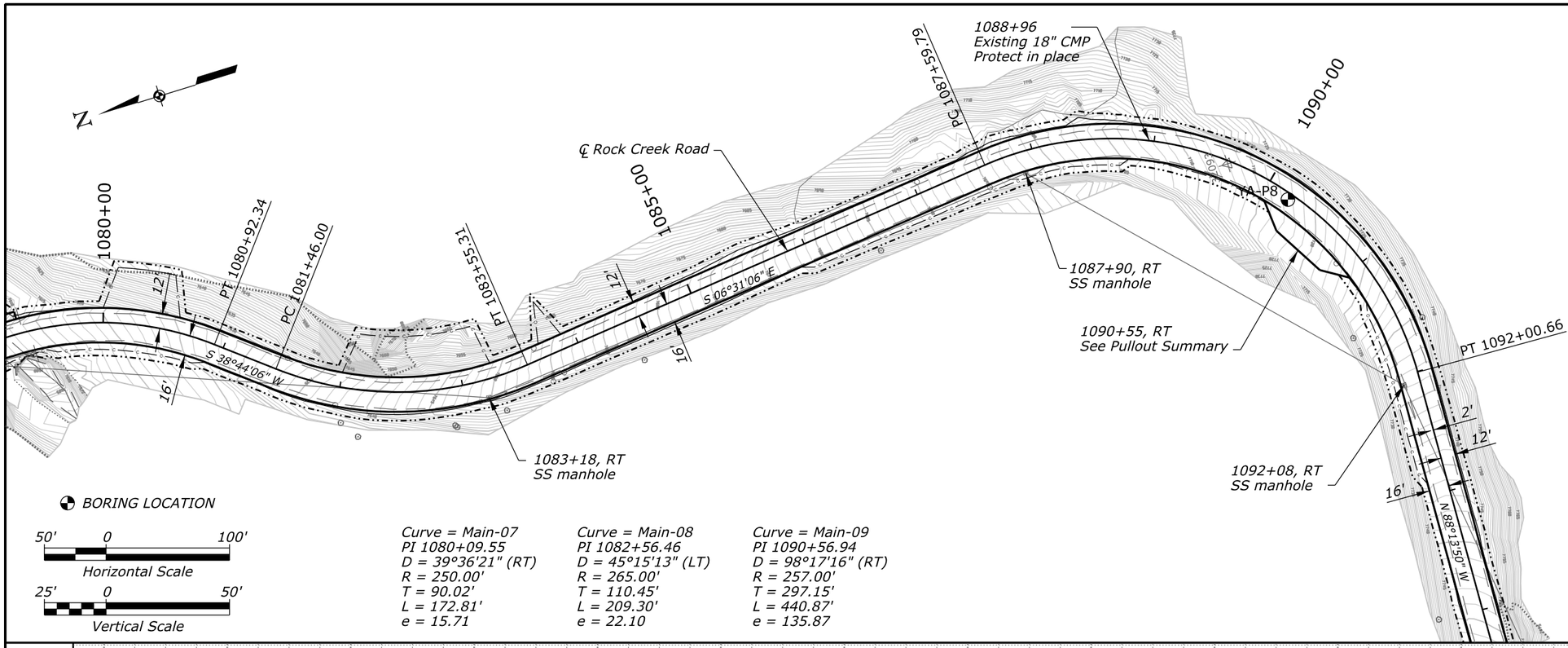

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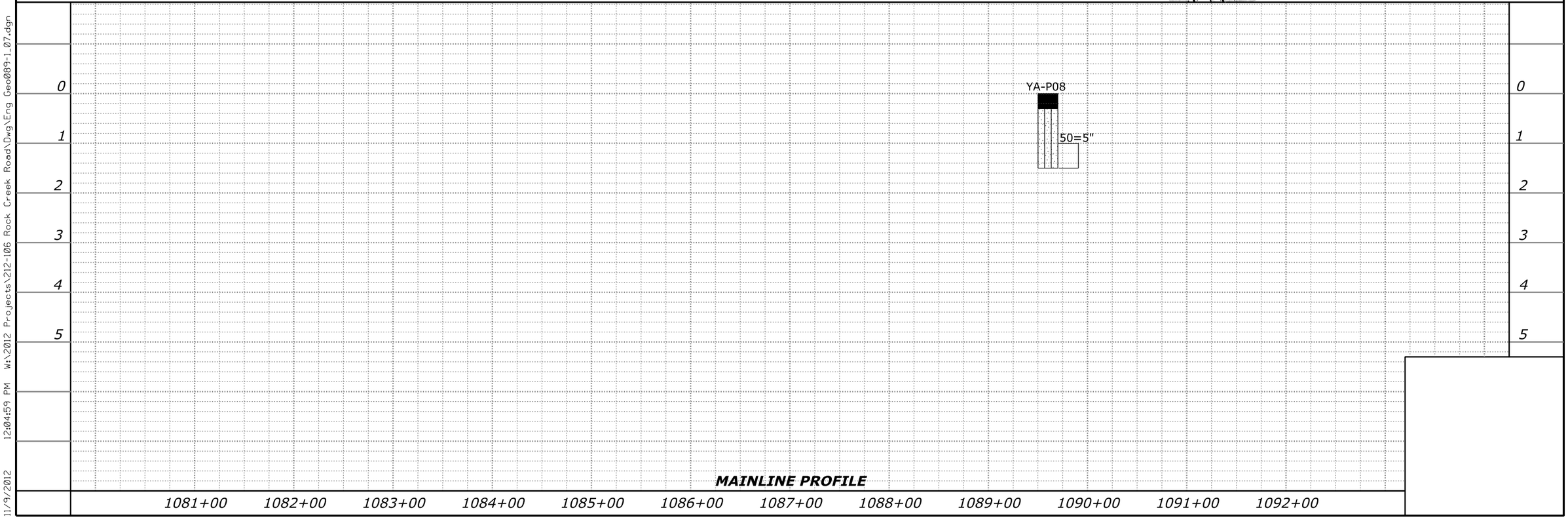
PI 1080+09.55
D = 39°36'21" (RT)
R = 250.00'
T = 90.02'
L = 172.81'
e = 15.71

Curve = Main-08
PI 1082+56.46
D = 45°15'13" (LT)
R = 265.00'
T = 110.45'
L = 209.30'
e = 22.10

Curve = Main-09
PI 1090+56.94
D = 98°17'16" (RT)
R = 257.00'
T = 297.15'
L = 440.87'
e = 135.87



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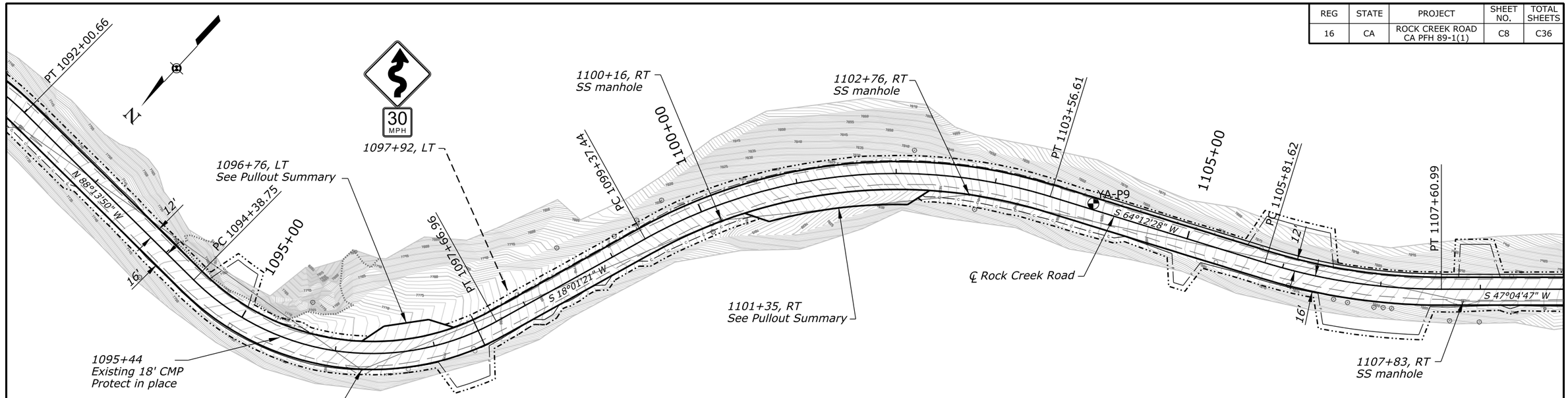


BORING LOCATION

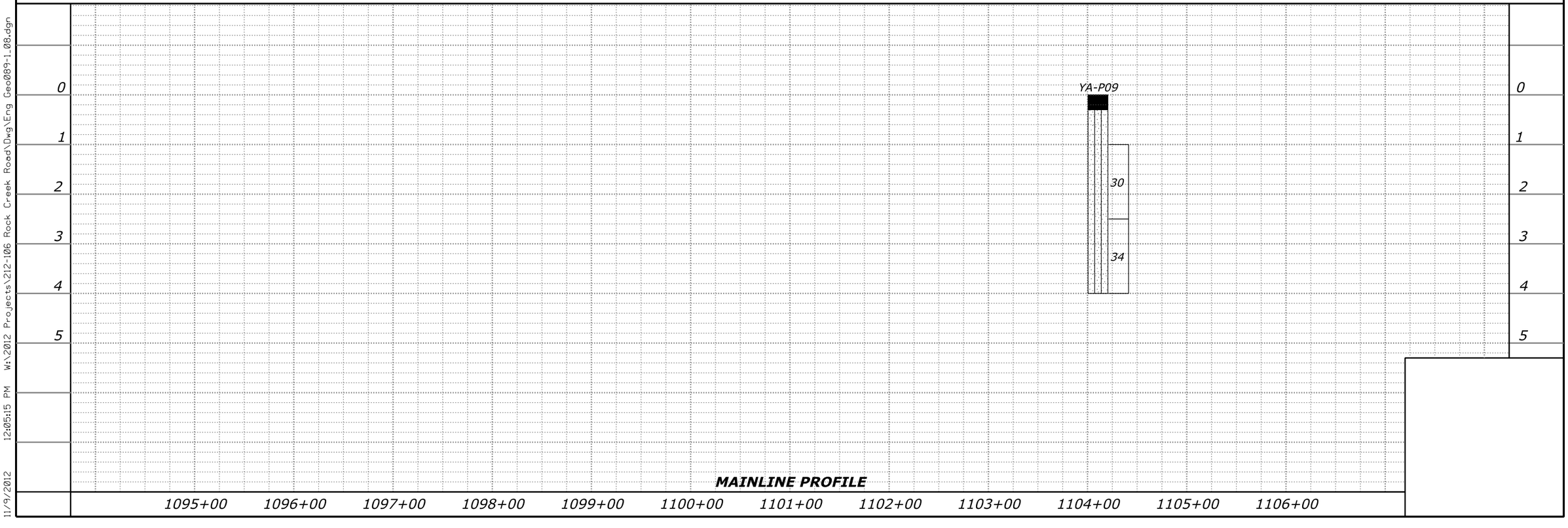
50' 0 100'
Horizontal Scale

25' 0 50'
Vertical Scale

Curve = Main-10
PI 1096+30.02
D = 73°44'49" (LT)
R = 255.00'
T = 191.27'
L = 328.22'
e = 63.76

Curve = Main-11
PI 1101+59.16
D = 46°11'07" (RT)
R = 520.00'
T = 221.72'
L = 419.16'
e = 45.30

Curve = Main-12
PI 1106+71.98
D = 17°07'41" (LT)
R = 600.00'
T = 90.36'
L = 179.36'
e = 6.77



REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
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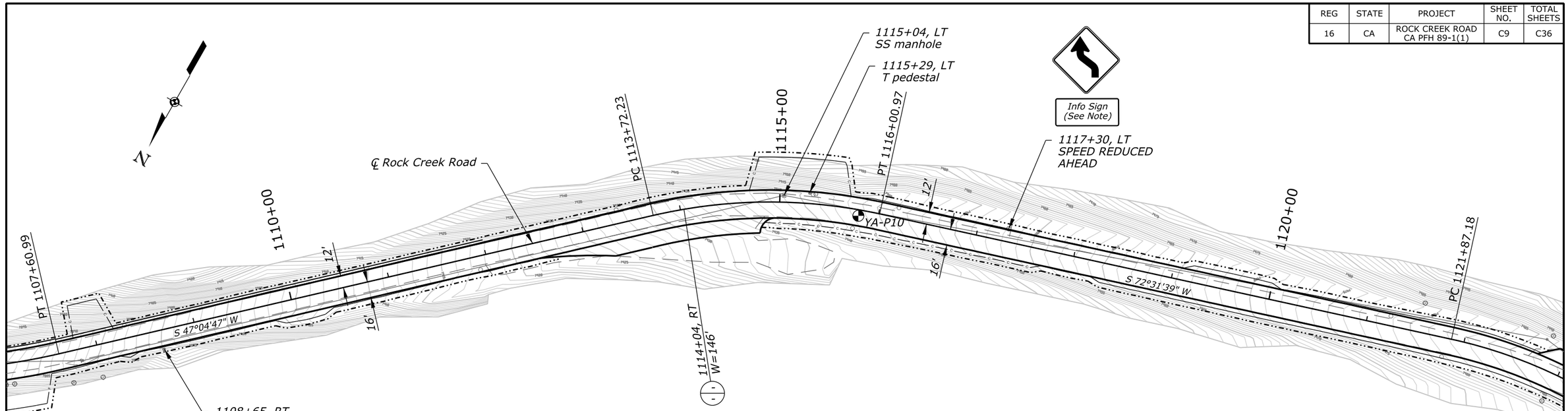

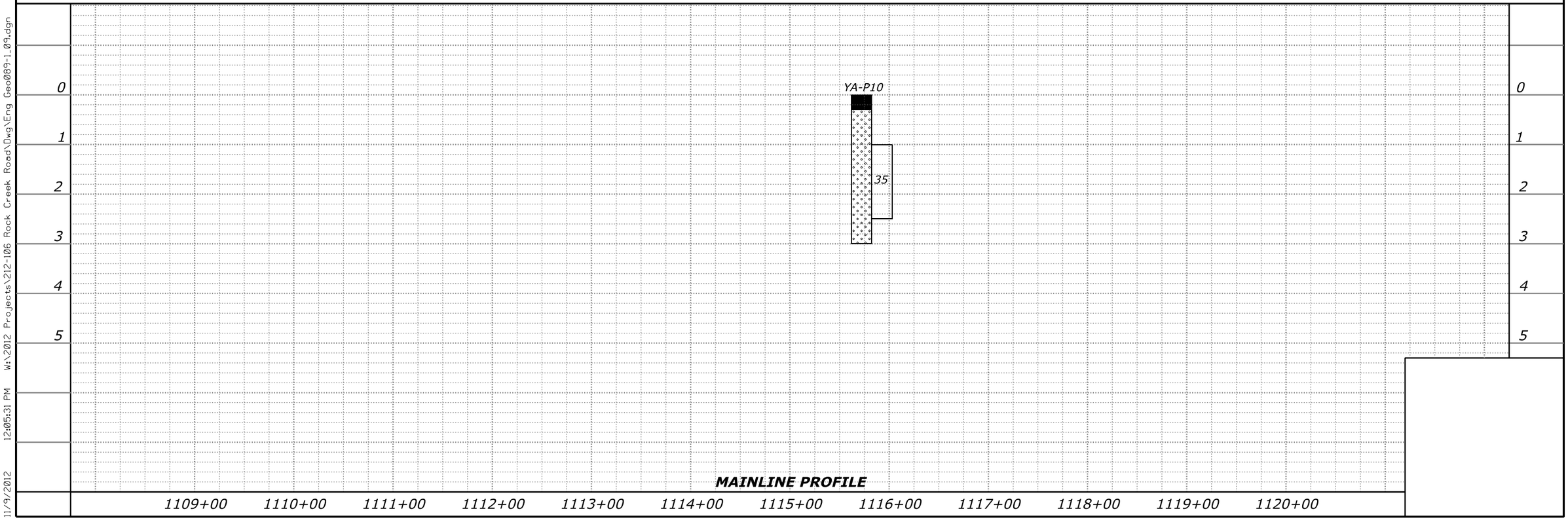

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11/9/2012

REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
16	CA	ROCK CREEK ROAD CA PFH 89-1(1)	C10	C36

1122+76, LT
SS Manhole

PC 1121+87.18

1123+15, LT
See Pullout Summary

PT 1123+96.71

S 72°31'39" W

1125+00

1125+76
Install CMP
See Drainage Summary

1126+30, LT
SS Manhole

1126+08, LT
T pedestal

1126+44, LT

1126+80, LT

YA-B6

YA-B5

1126+44, RT

1126+62
14.5' Arch crossing
Protect in place

6'x60' Slab Bridge

1126+81, RT

1129+64, RT
W=18'

N 82°43'13" W

1128+36, LT
SS Manhole

1129+06, LT
See Pullout Summary

PC 1129+80.67

1130+00

12'

16'

1133+81, LT
See Pullout Summary

1133+64, LT
T pedestal

1133+57, LT
SS Manhole

1135+00

PT 1135+83.40

S 28°12'43" W

1135+60
Existing CMP
Protect in place

℄ Rock Creek Road

N

Curve = Main-14
PI 1122+93.61
D = 24°45'08" (RT)
R = 485.00'
T = 106.42'
L = 209.52'
e = 11.54

Potential Staging Area

Curve = Main-15
PI 1133+24.75
D = 69°04'03" (RT)
R = 500.00'
T = 344.08'
L = 602.73'
e = 106.95

BORING LOCATION

50' 0 100'
Horizontal Scale

25' 0 50'
Vertical Scale

YA-B05

10 MC= 2.3 %
#200= 9 %
LL= NV
PL= NP
PI= NP

26 AASHTO: A-1-b (0)
USCS: SW-SM

12 MC= 5.5 %
#200= 11 %
LL= NV
PL= NP
PI= NP

33 AASHTO: A-1-b (0)
USCS: SW-SM

>50=2" MC= 6.8 %
#200= 18 %
LL= NV
PL= NP
PI= NP

AASHTO: A-1-b (0)
USCS: SM

50=7" MC= 6.7 %
#200= 16 %
LL= NV
PL= NP
PI= NP

AASHTO: A-1-b (0)
USCS: SM

57

YA-B06

50=4" MC= 1.1 %
#200= 4 %
LL= NV
PL= NP
PI= NP
pH= 7.2
S= <0.001 %
Re= 23256 ohms-cm
AASHTO: A-1-a (0)
USCS: GW

8 MC= 14.4 %
#200= 6 %
LL= NV
PL= NP
PI= NP

43 AASHTO: A-1-b (0)
USCS: SP-SM

50=6" MC= 7.2 %
#200= 14 %
LL= NV
PL= NP
PI= NP

41 AASHTO: A-1-b (0)
USCS: SM

R MC= 6.6 %
#200= 16 %
LL= NV
PL= NP
PI= NP

AASHTO: A-1-b (0)
USCS: SM

50=6"

MAINLINE PROFILE

0 5 10 15 20 25 30 35

1123+00 1124+00 1125+00 1126+00 1127+00 1128+00 1129+00 1130+00 1131+00 1132+00 1133+00 1134+00

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REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
16	CA	ROCK CREEK ROAD CA PFH 89-1(1)	C10	C36

1122+76, LT
SS Manhole

PC 1121+87.18

1123+15, LT
See Pullout Summary

PT 1123+96.71

1126+30, LT
SS Manhole

1126+08, LT
T pedestal

1125+00

1126+44, LT

1126+80, LT

1128+36, LT
SS Manhole

1129+06, LT
See Pullout Summary

PC 1129+80.67

1130+00

1133+81, LT
See Pullout Summary

1133+64, LT
T pedestal

1133+57, LT
SS Manhole

1135+00

PT 1135+83.40

S 72°31'39" W

S 28°12'43" W

1125+76
Install CMP
See Drainage Summary

N 82°43'13" W

1126+44, RT

1126+62
14.5' Arch crossing
Protect in place

6'x60' Slab Bridge

1126+81, RT

1129+64, RT
W=18'

YA-P11

12'

16'

1135+60
Existing CMP
Protect in place

℄ Rock Creek Road

N

Curve = Main-14
PI 1122+93.61
D = 24°45'08" (RT)
R = 485.00'
T = 106.42'
L = 209.52'
e = 11.54

Potential Staging Area

Curve = Main-15
PI 1133+24.75
D = 69°04'03" (RT)
R = 500.00'
T = 344.08'
L = 602.73'
e = 106.95

BORING LOCATION

50' 0 100'
Horizontal Scale

25' 0 50'
Vertical Scale

YA-P11

34

0
1
2
3
4
5

MAINLINE PROFILE

1123+00 1124+00 1125+00 1126+00 1127+00 1128+00 1129+00 1130+00 1131+00 1132+00 1133+00 1134+00

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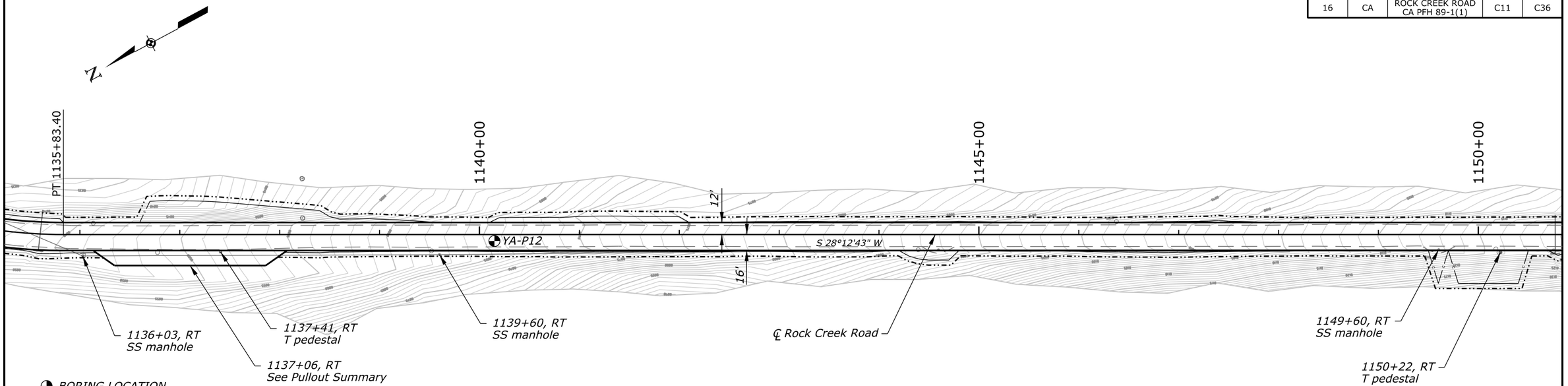
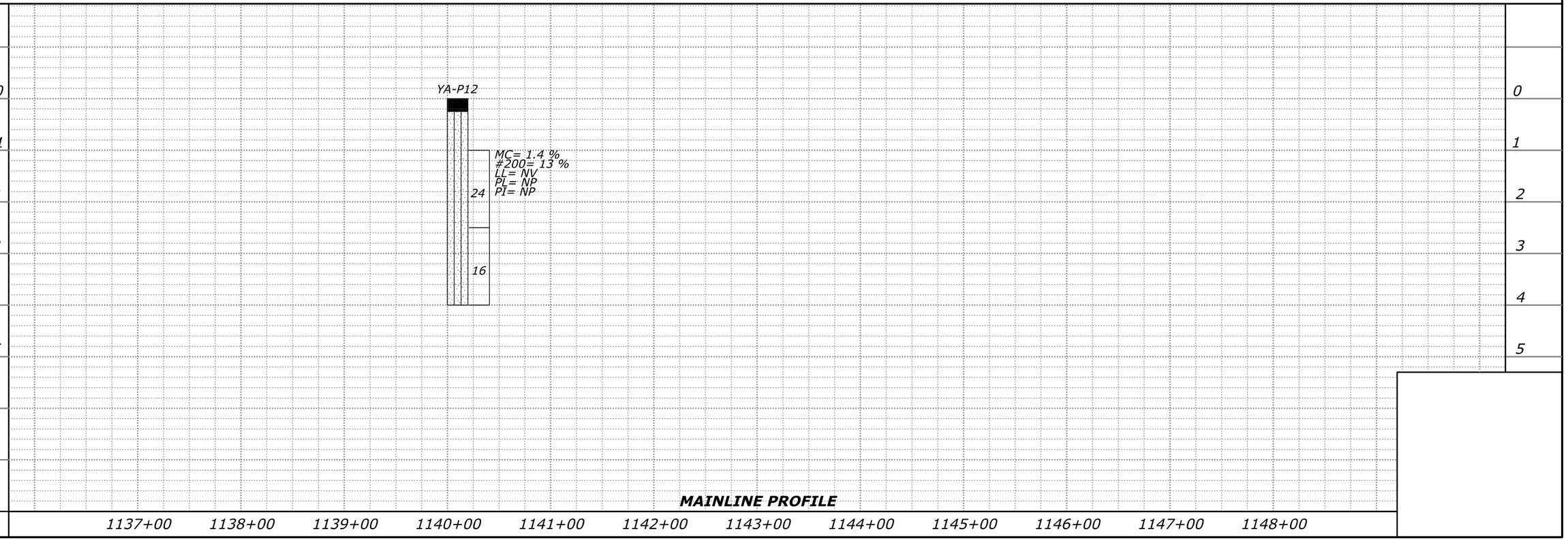
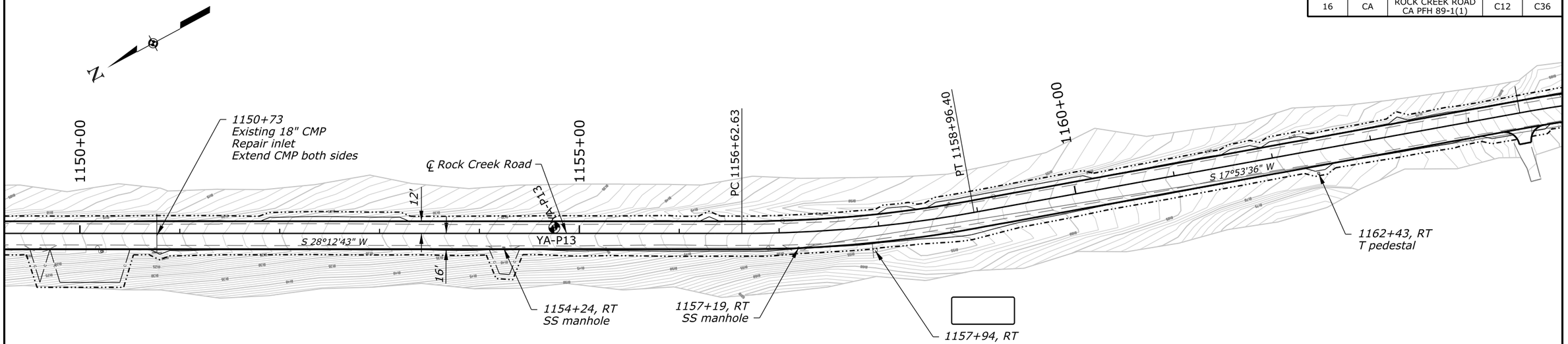
11/9/2012

REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
16	CA	ROCK CREEK ROAD CA PFH 89-1(1)	C11	C36





REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
16	CA	ROCK CREEK ROAD CA PFH 89-1(1)	C12	C36

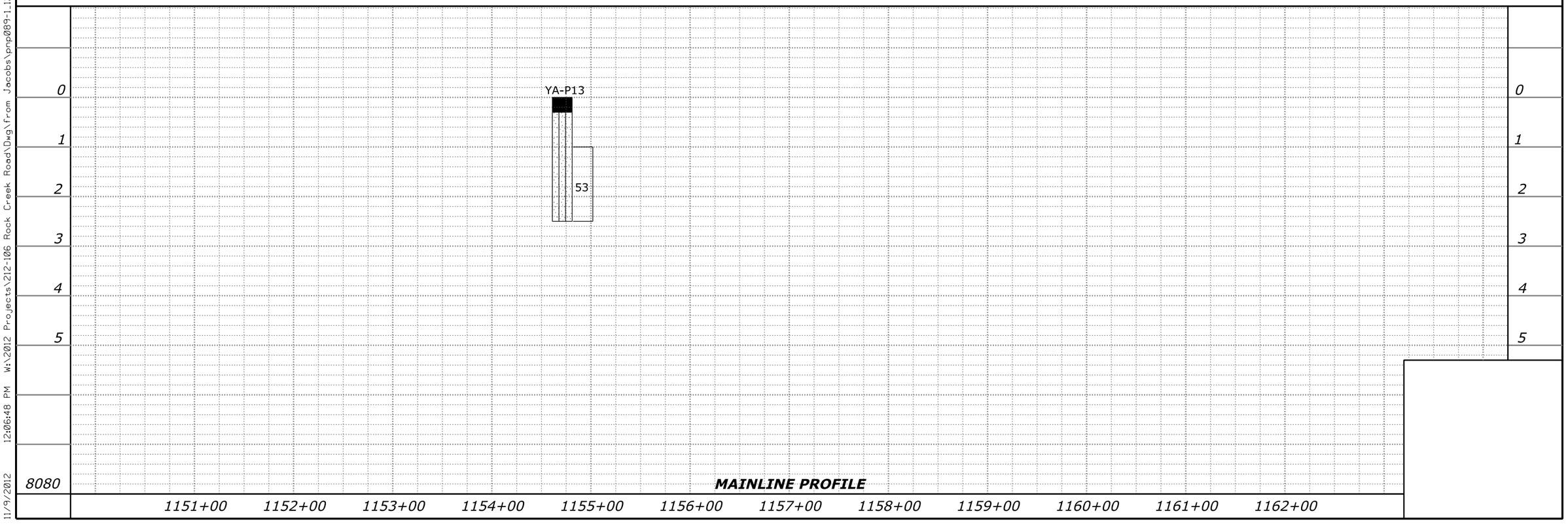


BORING LOCATION

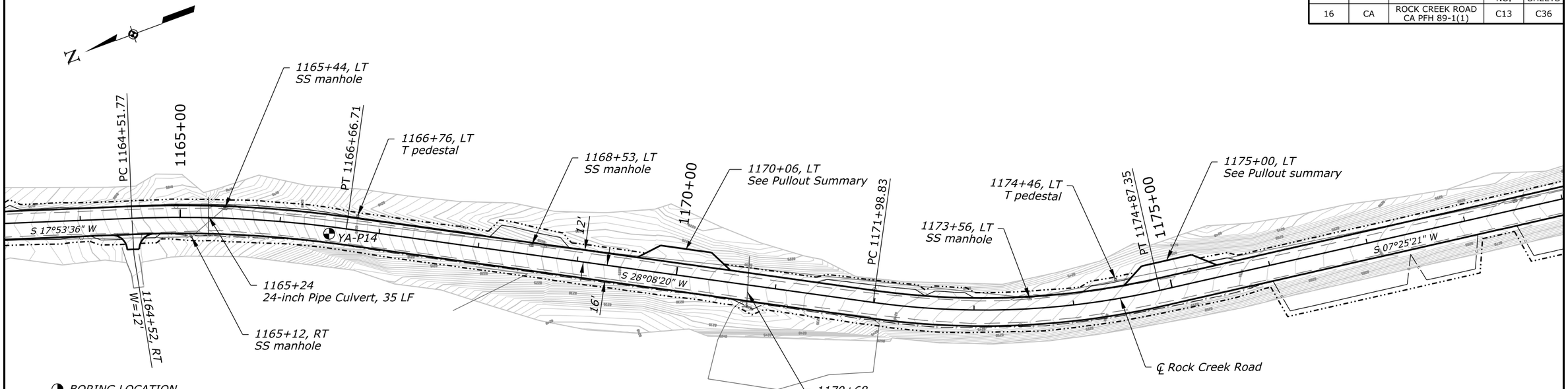
50' 0 100'
Horizontal Scale

25' 0 50'
Vertical Scale

Curve = Main-16
PI 1157+79.83
D = 10°19'07" (LT)
R = 1298.00'
T = 117.20'
L = 233.76'
e = 5.28



REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
16	CA	ROCK CREEK ROAD CA PFH 89-1(1)	C13	C36



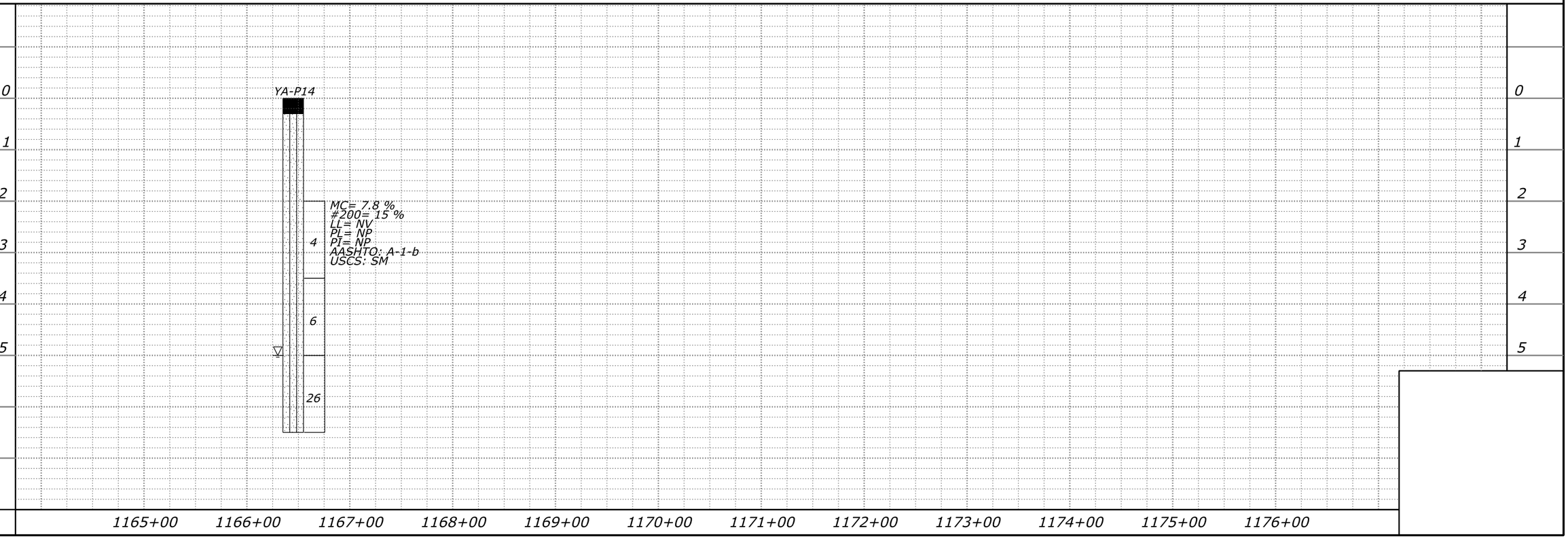
BORING LOCATION

50' 0 100'
Horizontal Scale

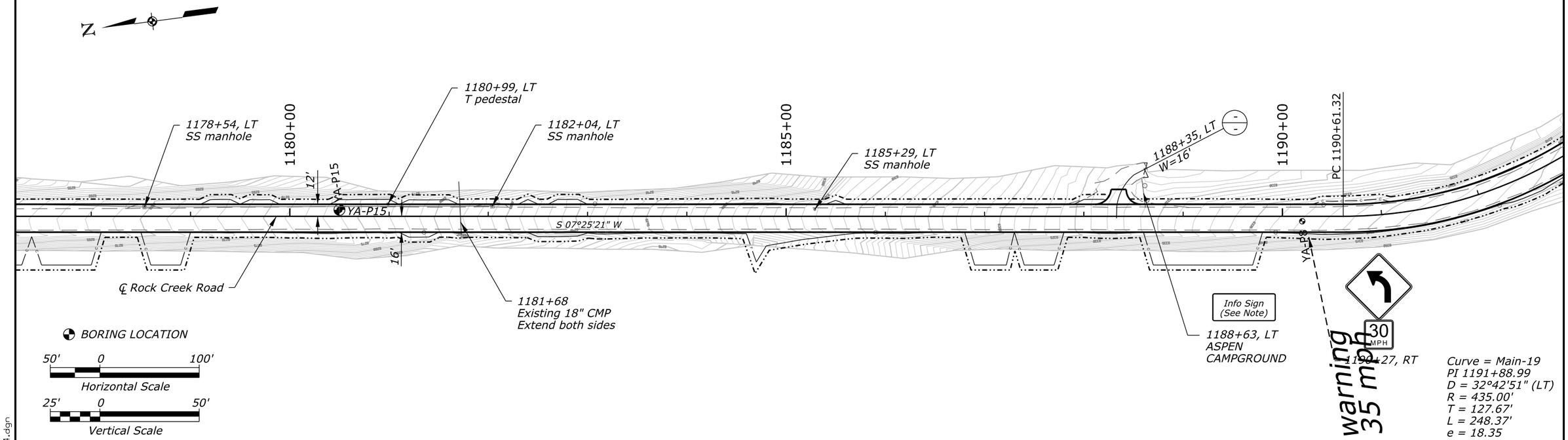
25' 0 50'
Vertical Scale

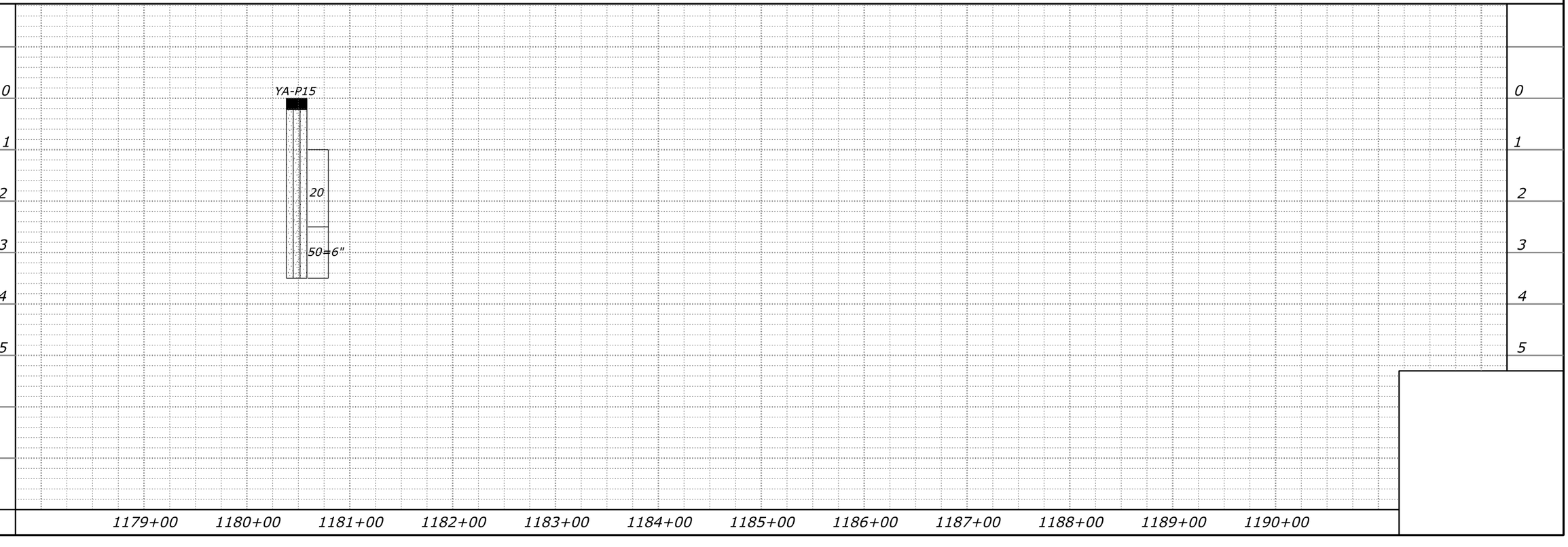
Curve = Main-17
PI 1165+59.53
D = 10°14'43" (RT)
R = 1202.00'
T = 107.76'
L = 214.65'
e = 4.82

Curve = Main-18
PI 1173+44.68
D = 20°42'58" (LT)
R = 798.00'
T = 145.86'
L = 288.53'
e = 13.22



REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
16	CA	ROCK CREEK ROAD CA PFH 89-1(1)	C14	C36





REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
16	CA	ROCK CREEK ROAD CA PFH 89-1(1)	C15	C36

N

30 MPH

1194+00, LT

PT 1193+09.69

1195+00

1195+15
Existing CMP

℄ Rock Creek Road

12'

16'

Rock Area

S 25°17'29" E

1200+00

1201+32, LT

1200+40, RT

1201+31, RT

1201+50
14' Arch crossing
Protect in place

1201+69, RT

PC 1201+76.48

YA-B7

YA-B8

1201+69, LT

1202+42, LT
See Pullout Summary

1201+83, RT

25 MPH

1203+34, RT
T pedestal

1204+52, RT

1204+93, RT
W=40'

1205+00

1205+14, RT

STOP

12'

16'

BORING LOCATION

50' 0 100'
Horizontal Scale

25' 0 50'
Vertical Scale

Curve = Main-19
PI 1191+88.99
D = 32°42'51" (LT)
R = 435.00'
T = 127.67'
L = 248.37'
e = 18.35

Curve = Main-20
PI 1206+04.45
D = 62°52'55" (RT)
R = 700.00'
T = 427.97'
L = 768.25'
e = 120.46

YA-B07

4

0 MC= 10.4 %
#200= 5 %
LL= NV
PL= NP
PI= NP
AASHTO: A-1-b (0)

44 USCS: SP-SM

61

41

55 MC= 7 %
#200= 12 %
LL= NV
PL= NP
PI= NP

R AASHTO: A-1-b (0)
USCS: SM

YA-B08

19 MC= 2 %
#200= 10 %
LL= NV
PL= NP
PI= NP
pH= 7.2
S= <0.001 %
Re= 18519 ohms-cm
AASHTO: A-1-b (0)
USCS: SP-SM

7

30=8" MC= 8.6 %
#200= 12 %
LL= NV
PL= NP
PI= NP
AASHTO: A-1-b (0)
USCS: SM

56 MC= 7.8 %
#200= 13 %
LL= NV
PL= NP
PI= NP

27 AASHTO: A-1-b (0)
USCS: SM

50=4"

0 5 10 15 20 25 30 35

1193+00 1194+00 1195+00 1196+00 1197+00 1198+00 1199+00 1200+00 1201+00 1202+00 1203+00 1204+00

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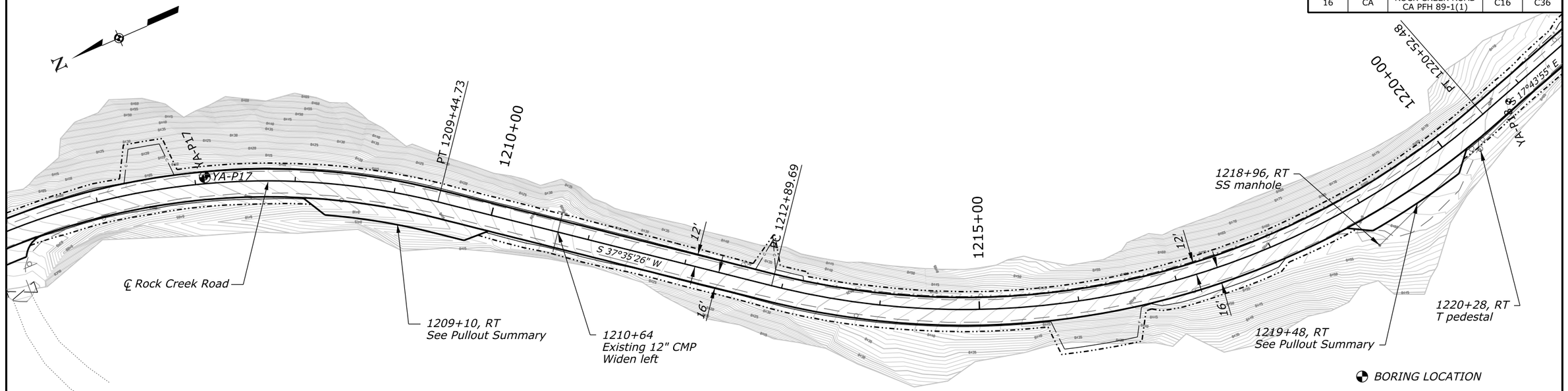
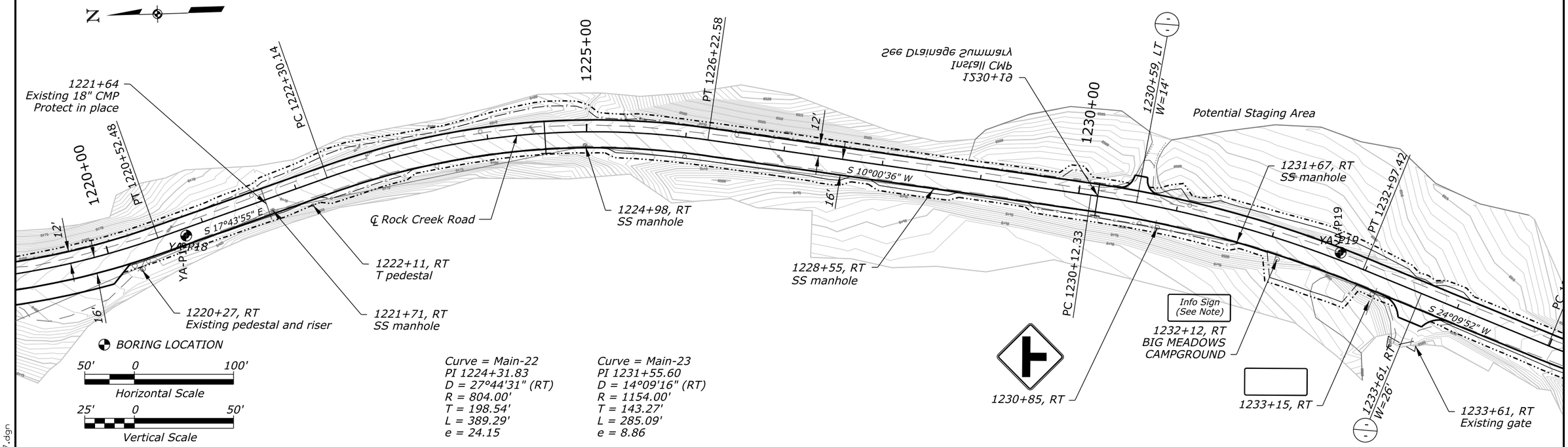
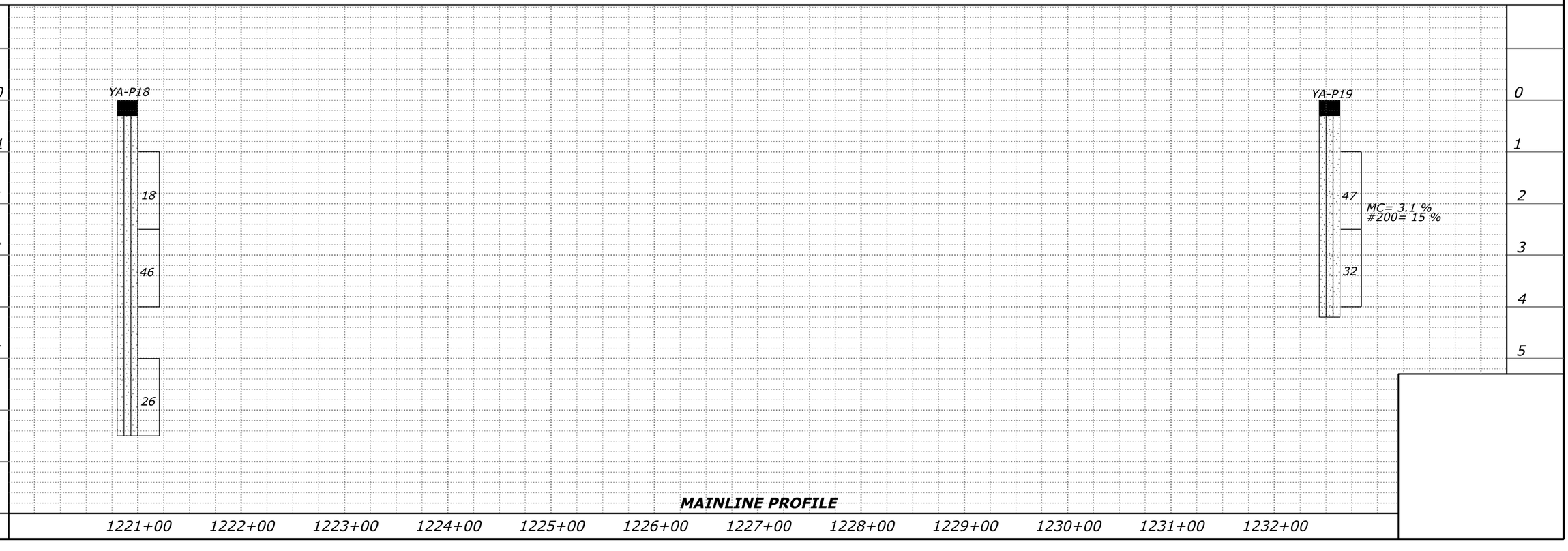
REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
16	CA	ROCK CREEK ROAD CA PFH 89-1(1)	C16	C36



REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
16	CA	ROCK CREEK ROAD CA PFH 89-1(1)	C17	C36





REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
16	CA	ROCK CREEK ROAD CA PFH 89-1(1)	C19	C36

PC 1247+50.98

PT 1249+68.75

1250+00

1248+61, RT
SS manhole

S 19°37'30" W

1253+39, RT
SS manhole

1253+53, RT
W=24'
Abandoned

12'

16'

1255+00

PC 1256+61.41

℄ Rock Creek Road

YA-P21

YA-P20

1256+86, RT
SS manhole

1260+00

PT 1260+43.96

PC 1262+77.91

S 21°15'16" E

1260+23, RT
SS manhole

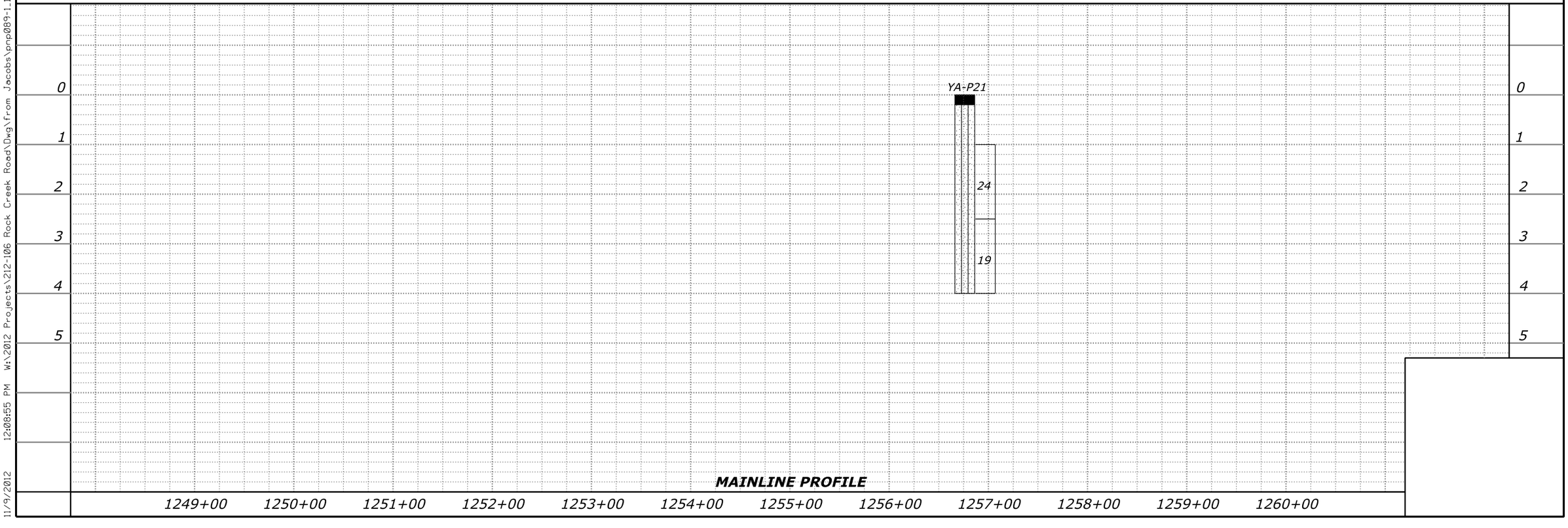
BORING LOCATION

50' 0 100'
Horizontal Scale

25' 0 50'
Vertical Scale

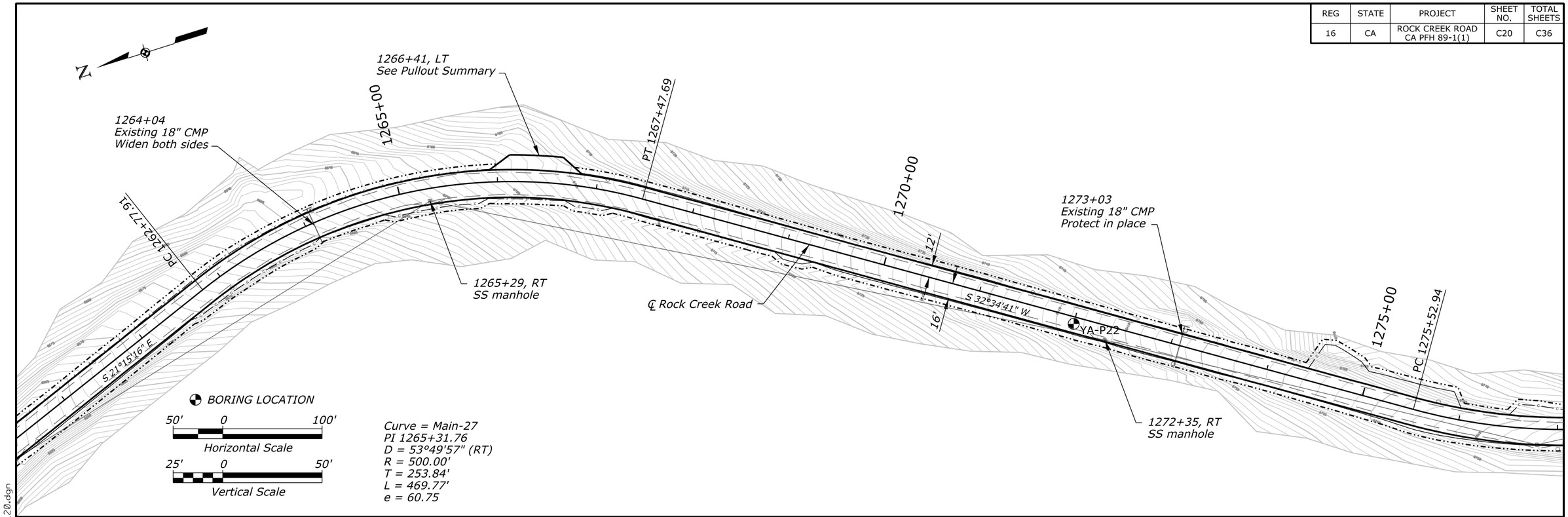
Curve = Main-25
PI 1248+61.06
D = 20°37'25" (RT)
R = 605.00'
T = 110.08'
L = 217.77'
e = 9.93

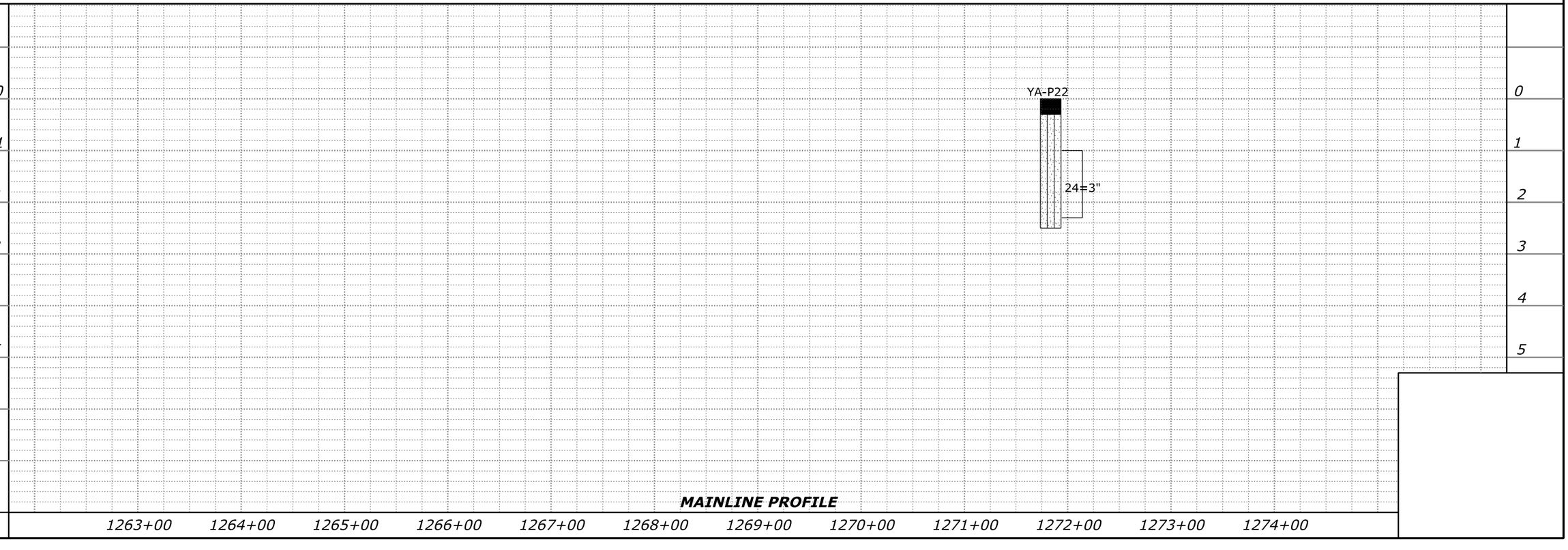
Curve = Main-26
PI 1258+56.32
D = 40°52'46" (LT)
R = 523.00'
T = 194.92'
L = 373.15'
e = 35.14



MAINLINE PROFILE

REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
16	CA	ROCK CREEK ROAD CA PFH 89-1(1)	C20	C36





REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
16	CA	ROCK CREEK ROAD CA PFH 89-1(1)	C21	C36

N

PC 1275+52.94

PT 1278+54.90

1280+00

1284+01
Existing 24" CMP
Protect in place

PC 1284+68.47

1285+00

PT 1286+45.10

1290+00

YA-P23

12'

16'

S 17°56'21" W

S 02°29'21" W

℄ Rock Creek Road

1276+80, RT
SS manhole

1279+60, RT
T pedestal

1280+48, RT
W=30'

1283+26, RT
SS manhole

1283+32, RT
T pedestal

1285+76, RT
SS manhole

BORING LOCATION

50' 0 100'
Horizontal Scale

25' 0 50'
Vertical Scale

Curve = Main-28
PI 1277+07.49
D = 30°05'20" (LT)
R = 575.00'
T = 154.55'
L = 301.96'
e = 20.41

Curve = Main-29
PI 1285+57.32
D = 15°26'60" (RT)
R = 655.00'
T = 88.85'
L = 175.62'
e = 6.00

YA-P23

24

37

R

MC= 3.4 %
#200= 12 %
LL= NV
PL= NP
PI= NP
AASHTO: A-1-b
USCS: SM

MAINLINE PROFILE

0 1 2 3 4 5

1277+00 1278+00 1279+00 1280+00 1281+00 1282+00 1283+00 1284+00 1285+00 1286+00 1287+00 1288+00

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12:09:30 PM
11/9/2012

REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
16	CA	ROCK CREEK ROAD CA PFH 89-1(1)	C22	C36

N

1290+00

1290+18
Existing 18" CMP
Protect in place

1290+29, RT
SS manhole

12'

16'

1295+00

1295+58, LT
SS manhole

1295+29, RT
SS manhole

S 17°56'21" W

1297+65, LT

PI 1298+05.46

℄ Rock Creek Road

S 19°05'05" W

1300+51, LT
SS manhole

1300+40, LT
W=24'

PI 1300+40.50

YA-P24

1300+82, LT

East Fork Parking Area
Potential Staging Area

Info Sign
(See Note)

1300+08, RT
PUBLIC PARKING
EAST FORK

Info Sign
(See Note)

1300+34, RT
NO OVERNIGHT
PARKING

1300+83, LT
Existing sewer
cleanout

1300+84, LT
T pedestal

1300+87, RT

S 17°56'21" W

Info Sign
(See Note)

1301+42, LT
PARKING
TOILETS

1301+06
Existing 16' Arch culvert
Protect in place

6'x60' Slab Bridge

1302+59, LT
SS manhole

1302+60, LT
Existing
valve box

1303+20, LT
Water valve

PC 1303+77.83

1302+79, RT
W=26'

Potential Staging Area

1302+97, RT

16'

Info Sign
(See Note)

1303+03, RT
PALISADE
CAMPGROUND
INYO
NATIONAL FOREST

STOP

BORING LOCATION

50' 0 100'
Horizontal Scale

25' 0 50'
Vertical Scale

YA-P24

19

MAINLINE PROFILE

0 1 2 3 4 5

1291+00 1292+00 1293+00 1294+00 1295+00 1296+00 1297+00 1298+00 1299+00 1300+00 1301+00 1302+00

REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
16	CA	ROCK CREEK ROAD CA PFH 89-1(1)	C22	C36

N

1290+00

1290+18
Existing 18" CMP
Protect in place

1290+29, RT
SS manhole

12'

16'

1295+00

1295+58, LT
SS manhole

1295+29, RT
SS manhole

S 17°56'21" W

1297+65, LT

PI 1298+05.46

℄ Rock Creek Road

S 19°05'05" W

1300+40, LT
W=24'

1300+51, LT
SS manhole

PI 1300+60.50

YA-B9

1300+82, LT

East Fork Parking Area
Potential Staging Area

Info Sign
(See Note)

1300+08, RT
PUBLIC PARKING
EAST FORK

Info Sign
(See Note)

1300+34, RT
NO OVERNIGHT
PARKING

1300+83, LT
Existing sewer
cleanout

1300+84, LT
T pedestal

YA-B10

S 17°56'21" W

1300+87, RT

1301+06
Existing 16' Arch culvert
Protect in place

6'x60' Slab Bridge

1301+42, LT
PARKING
TOILETS

Info Sign
(See Note)

1302+59, LT
SS manhole

1302+60, LT
Existing
valve box

PC 1303+77.83

1303+20, LT
Water valve

12'

16'

1302+79, RT
W=26'

Potential Staging Area

Info Sign
(See Note)

1303+03, RT
PALISADE
CAMPGROUND
INYO
NATIONAL FOREST

STOP

1302+97, RT

BORING LOCATION

50' 0 100'
Horizontal Scale

25' 0 50'
Vertical Scale

MAINLINE PROFILE

YA-B09

21 MC= 2.2 %
#200= 9 %
LL= NV
PL= NP
PI= NP
pH= 6.8
9 S= 0.003 %
Re= 9091 ohms-cm
AASHTO: A-1-b (0)
USCS: SP-SM
27 MC= 14.2 %
#200= 6 %
LL= NV
PL= NP
PI= NP
32=4" AASHTO: A-1-b (0)
USCS: SW-SM
MC= 5.7 %
#200= 11 %
LL= NV
PL= NP
20=4" PI= NP
AASHTO: A-1-b (0)
USCS: SP-SM
50=6"
50=7"

YA-B10

18
R MC= 9.5 %
#200= 10 %
LL= NV
PL= NP
PI= NP
AASHTO: A-1-b (0)
22 USCS: SW-SM
R
25 MC= 13.4 %
#200= 9 %
LL= NV
PL= NP
50=6" PI= NP
AASHTO: A-1-b (0)
USCS: SP-SM
MC= 7.9 %
#200= 7 %
LL= NV
PL= NP
PI= NP
31 AASHTO: A-1-b (0)
USCS: SW-SM

0 5 10 15 20 25 30 35

1291+00 1292+00 1293+00 1294+00 1295+00 1296+00 1297+00 1298+00 1299+00 1300+00 1301+00 1302+00

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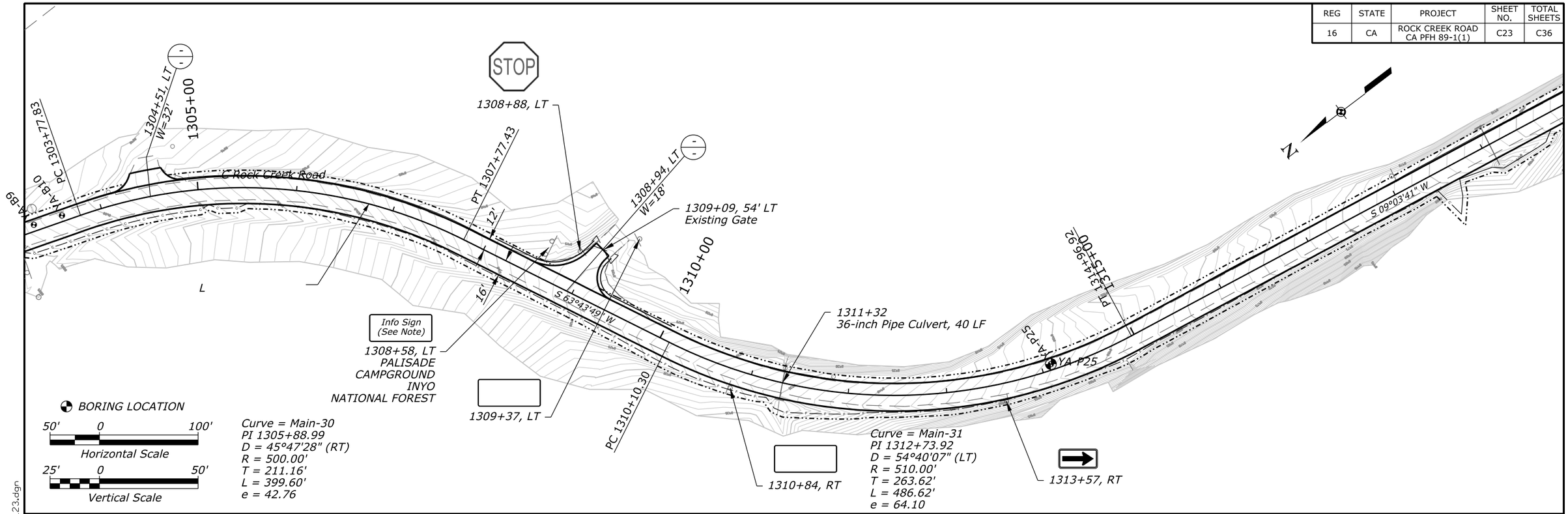
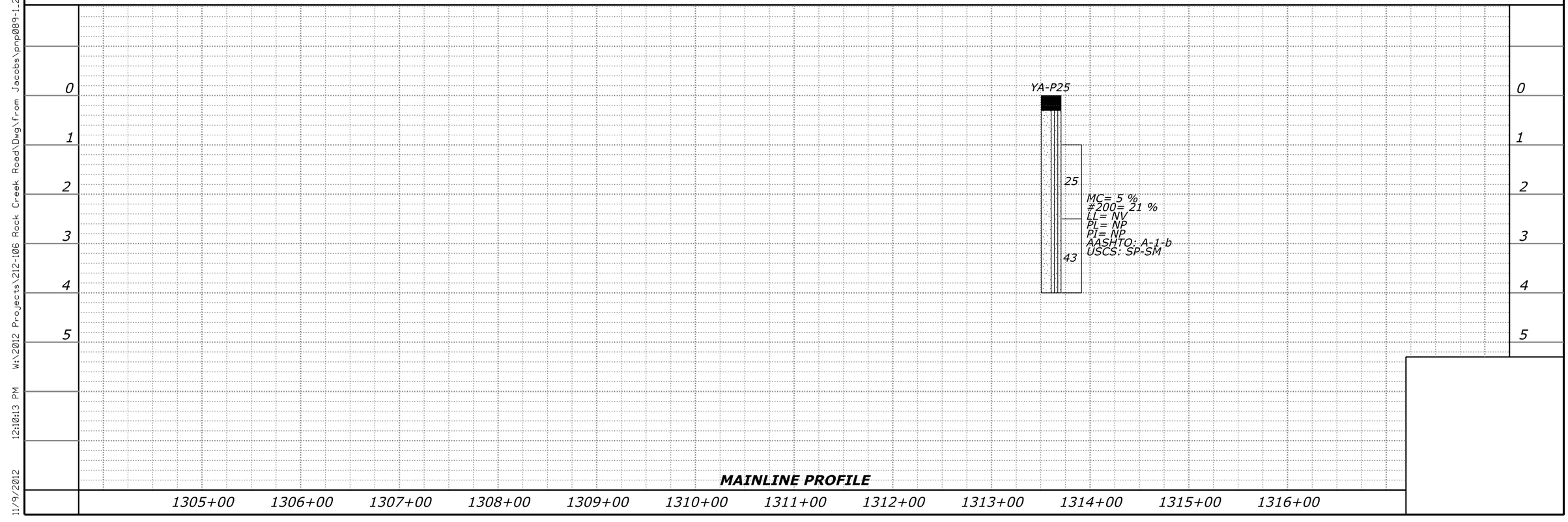
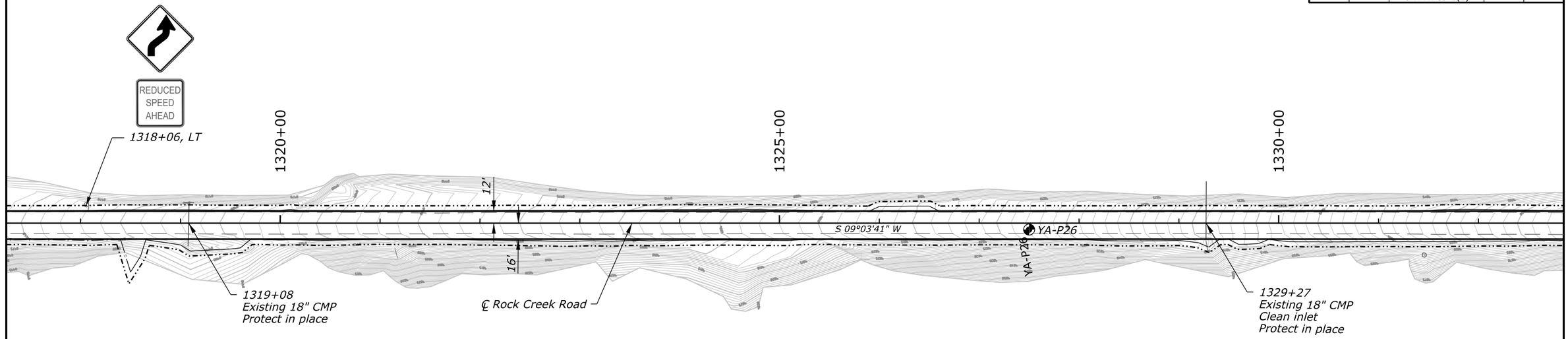
REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
16	CA	ROCK CREEK ROAD CA PFH 89-1(1)	C23	C36





REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
16	CA	ROCK CREEK ROAD CA PFH 89-1(1)	C24	C36

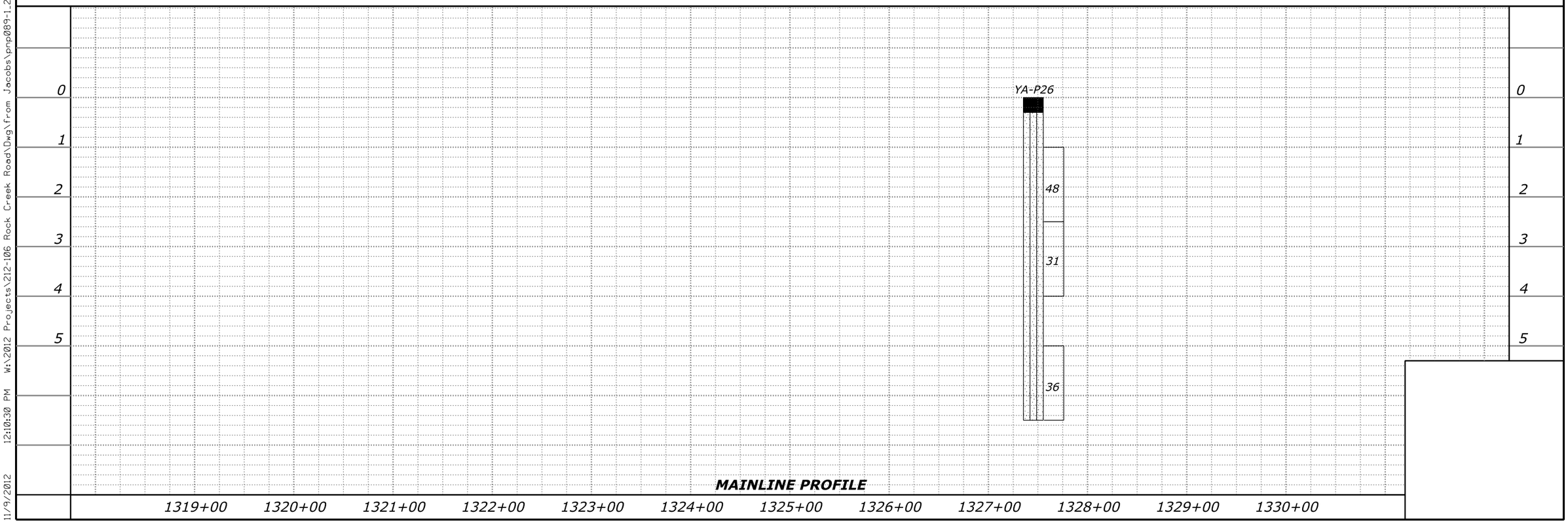


BORING LOCATION

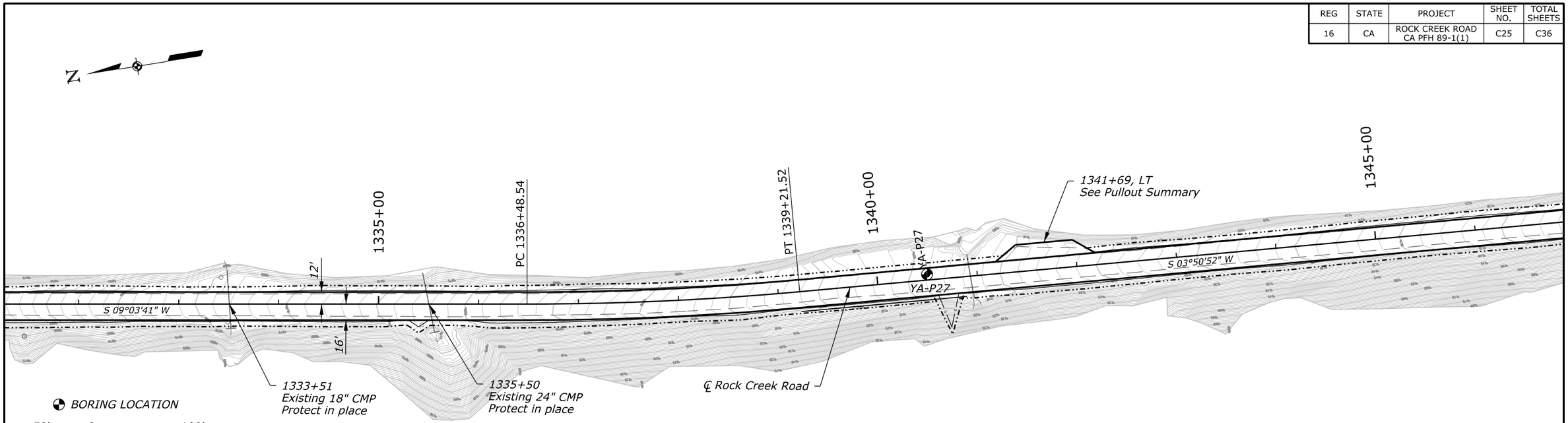
50' 0 100'
Horizontal Scale

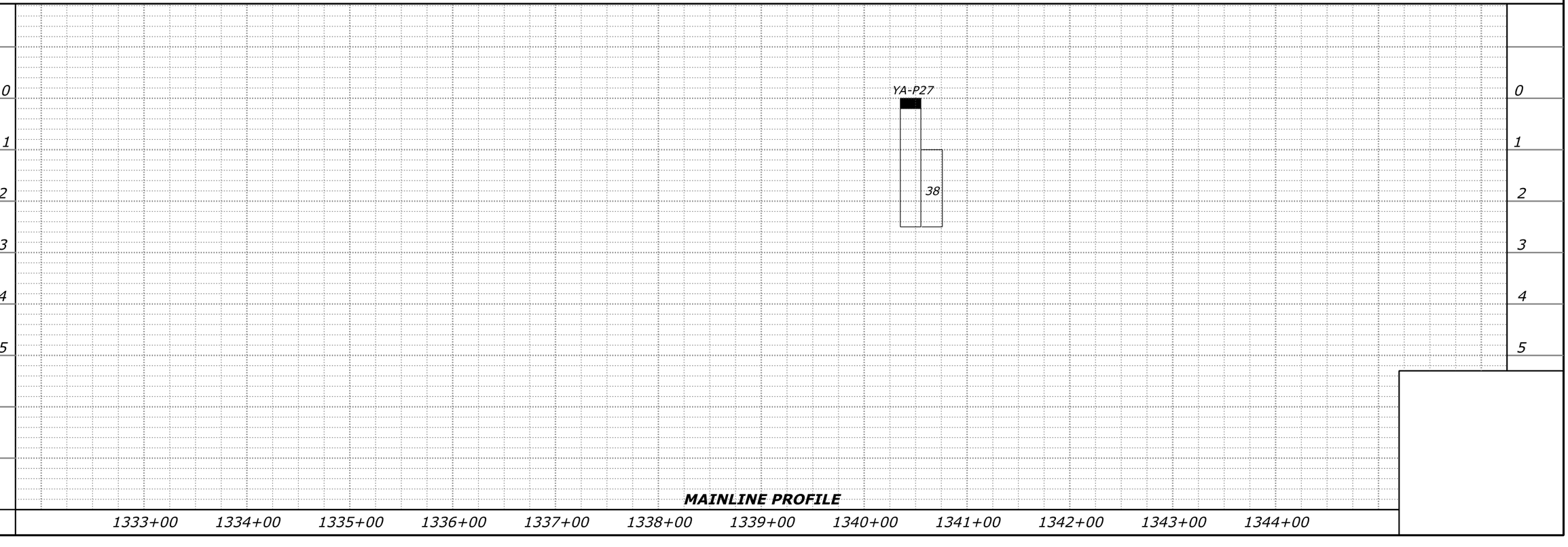
25' 0 50'
Vertical Scale

N

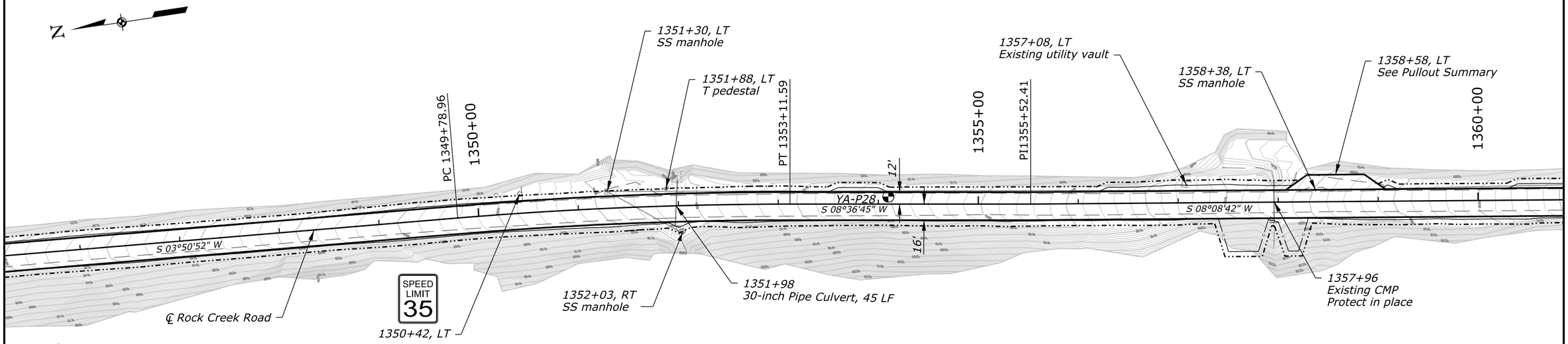


REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
16	CA	ROCK CREEK ROAD CA PFH 89-1(1)	C25	C36





REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
16	CA	ROCK CREEK ROAD CA PFH 89-1(1)	C26	C36

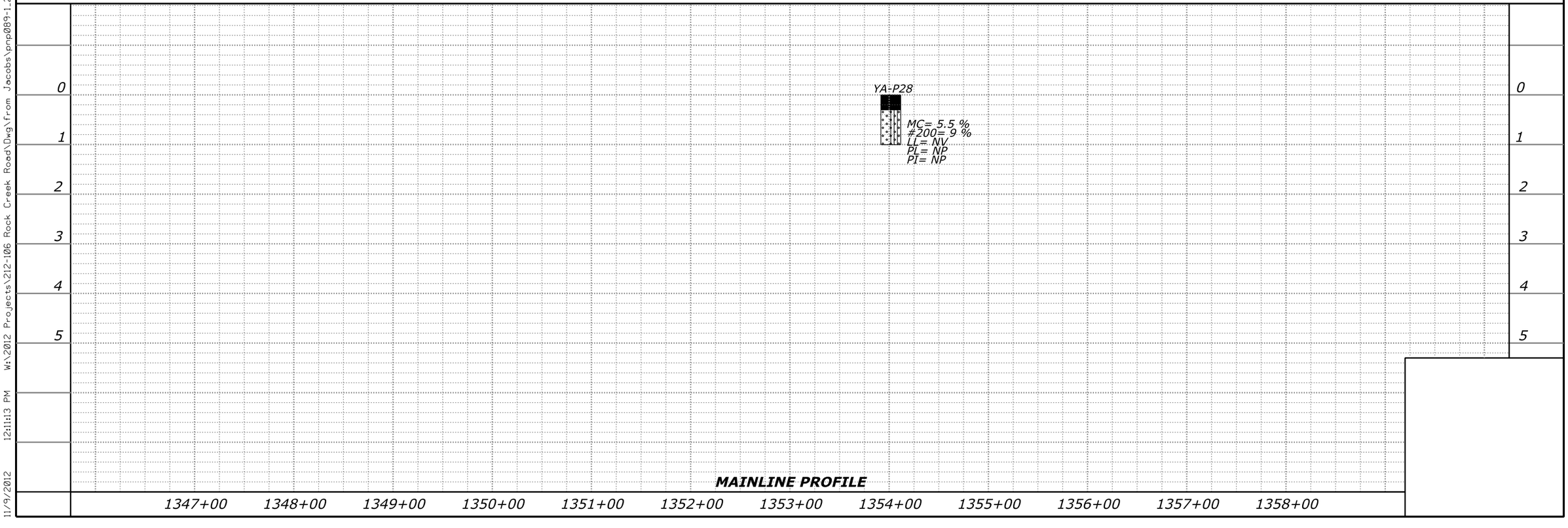


BORING LOCATION

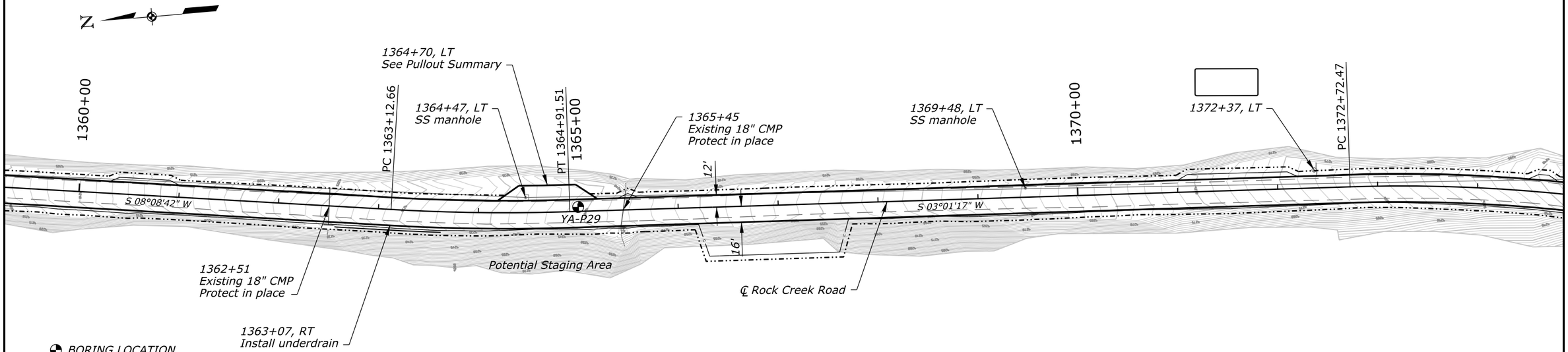
50' 0 100'
Horizontal Scale

25' 0 50'
Vertical Scale

Curve = Main-33
PI 1351+45.37
D = 04°45'53" (RT)
R = 4000.00'
T = 166.41'
L = 332.64'
e = 3.46



REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
16	CA	ROCK CREEK ROAD CA PFH 89-1(1)	C27	C36



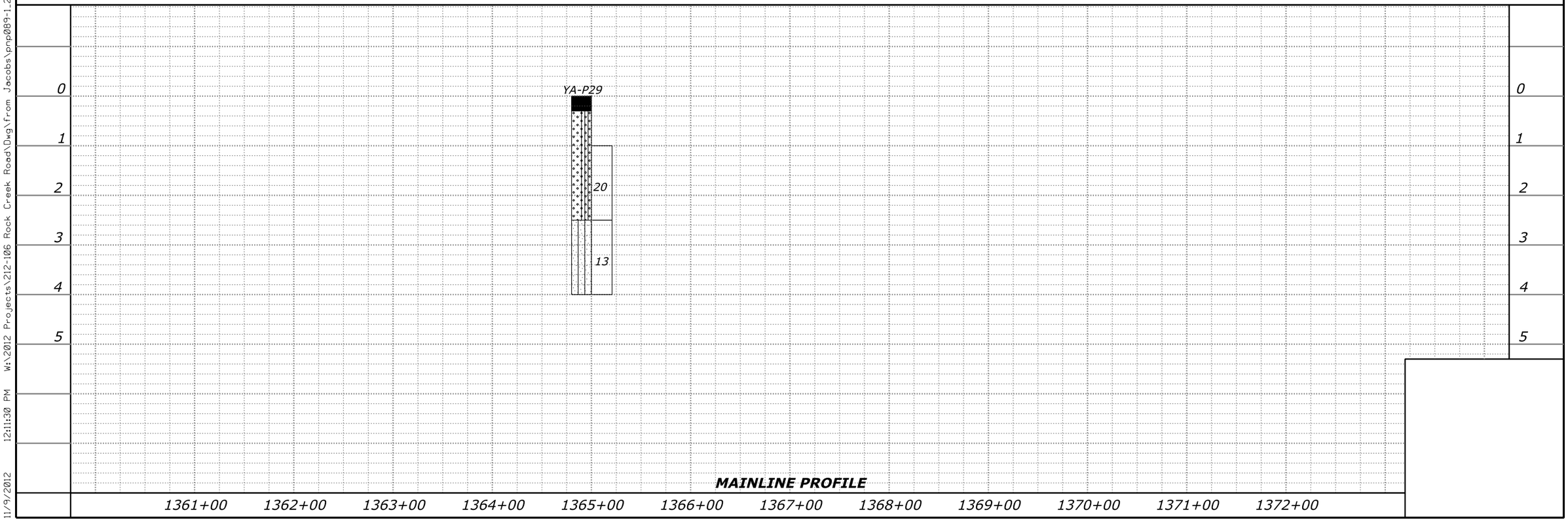
BORING LOCATION

50' 0 100'
Horizontal Scale

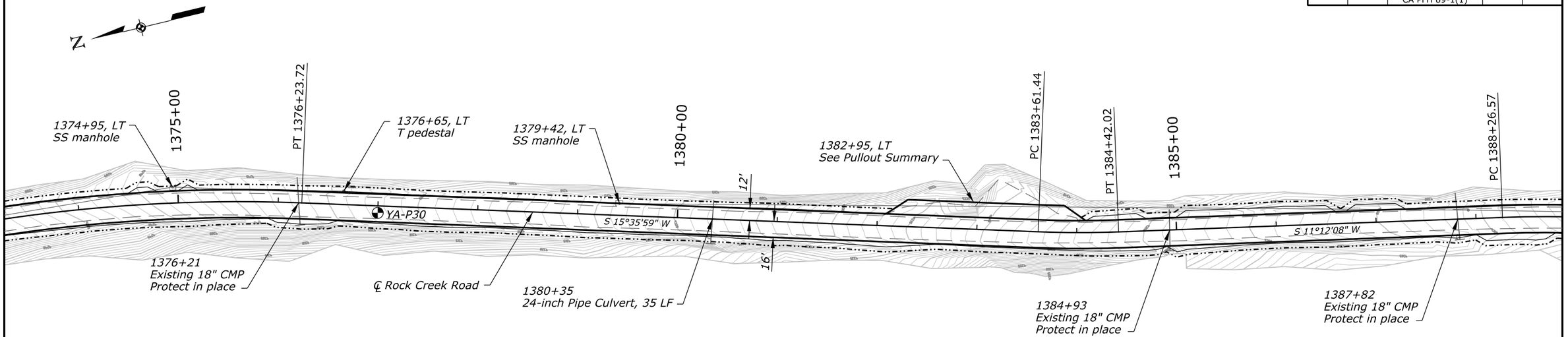
25' 0 50'
Vertical Scale

Curve = Main-34
PI 1364+02.14
D = 05°07'25" (LT)
R = 2000.00'
T = 89.48'
L = 178.85'
e = 2.00

Curve = Main-35
PI 1374+48.81
D = 12°34'42" (RT)
R = 1600.00'
T = 176.34'
L = 351.25'
e = 9.69



REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
16	CA	ROCK CREEK ROAD CA PFH 89-1(1)	C28	C36



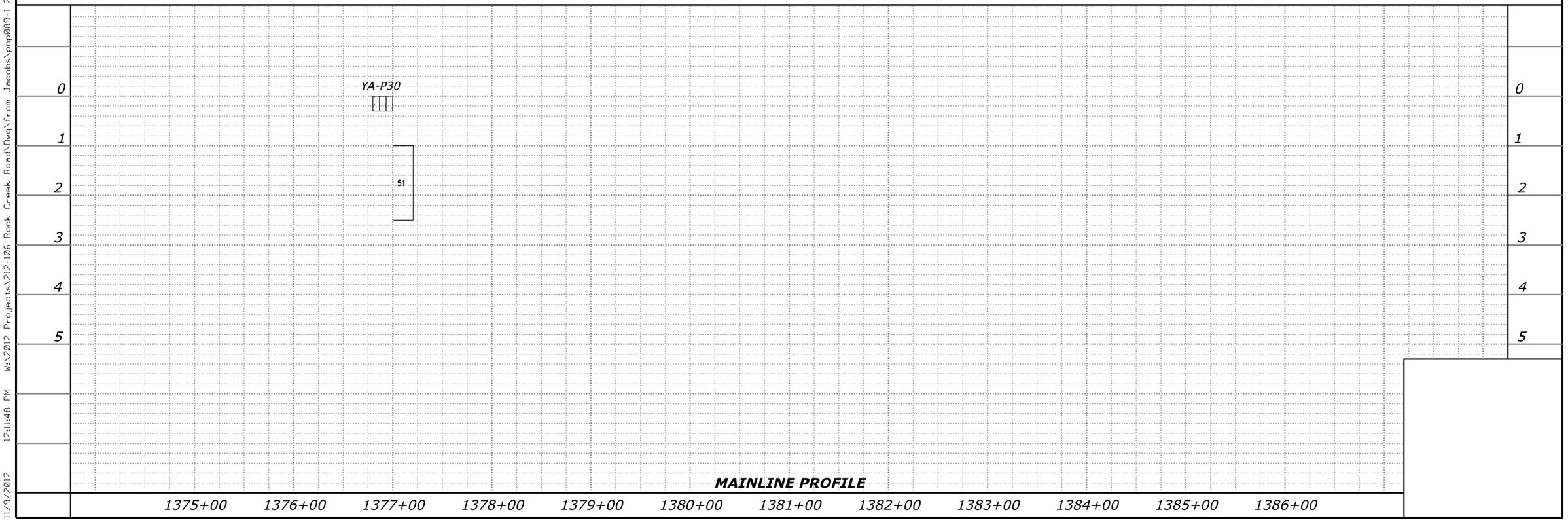
BORING LOCATION

50' 0 100'
Horizontal Scale

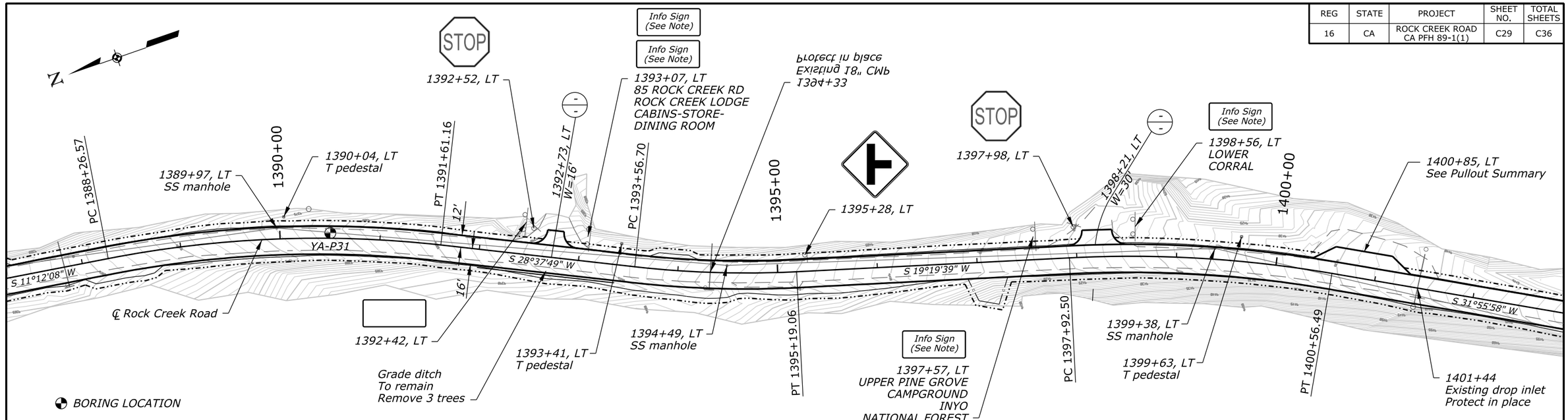
25' 0 50'
Vertical Scale

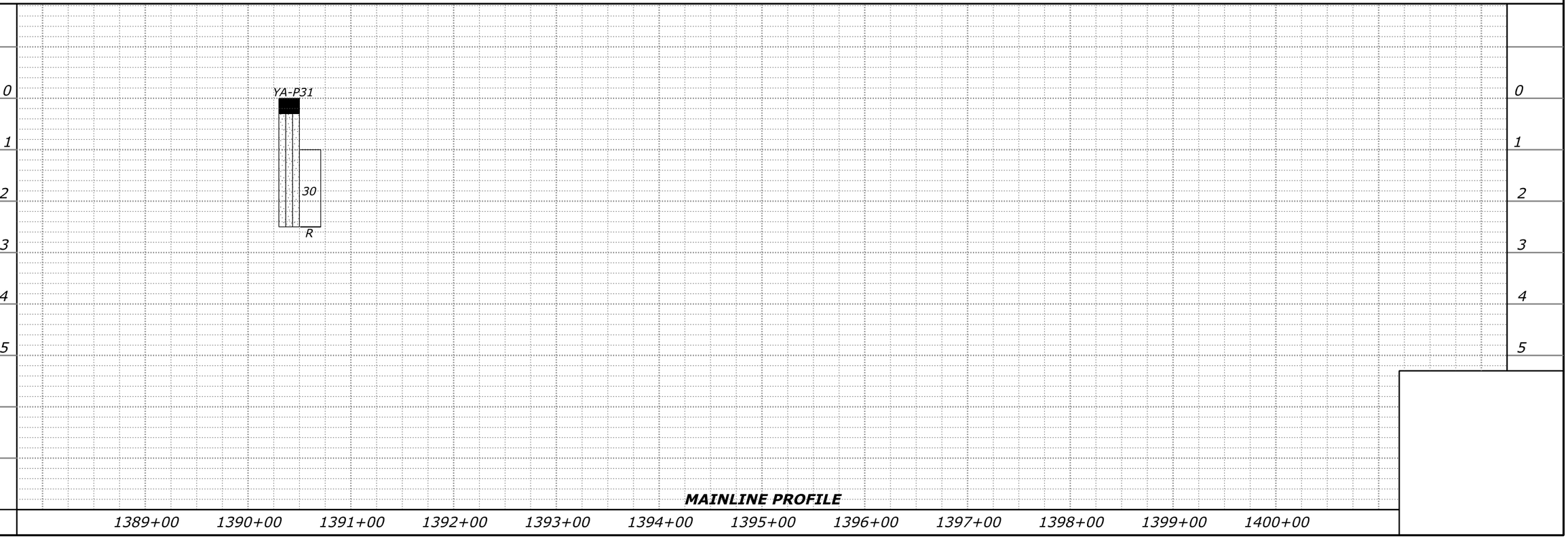
Curve = Main-35
PI 1374+48.81
D = 12°34'42" (RT)
R = 1600.00'
T = 176.34'
L = 351.25'
e = 9.69

Curve = Main-36
PI 1384+01.75
D = 04°23'50" (LT)
R = 1050.00'
T = 40.31'
L = 80.59'
e = 0.77

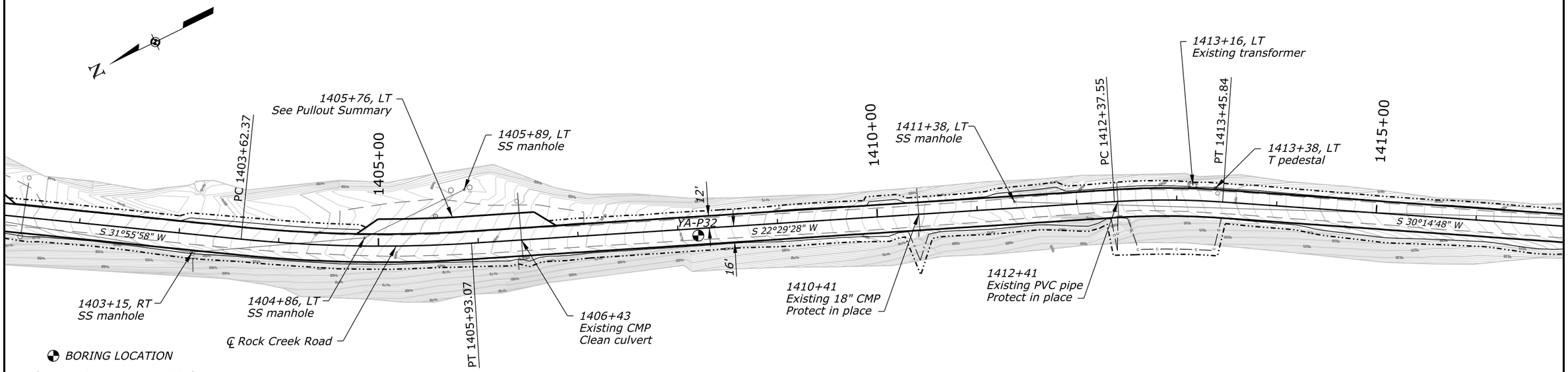


REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
16	CA	ROCK CREEK ROAD CA PFH 89-1(1)	C29	C36





REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
16	CA	ROCK CREEK ROAD CA PFH 89-1(1)	C30	C36



BORING LOCATION

50' 0 100'

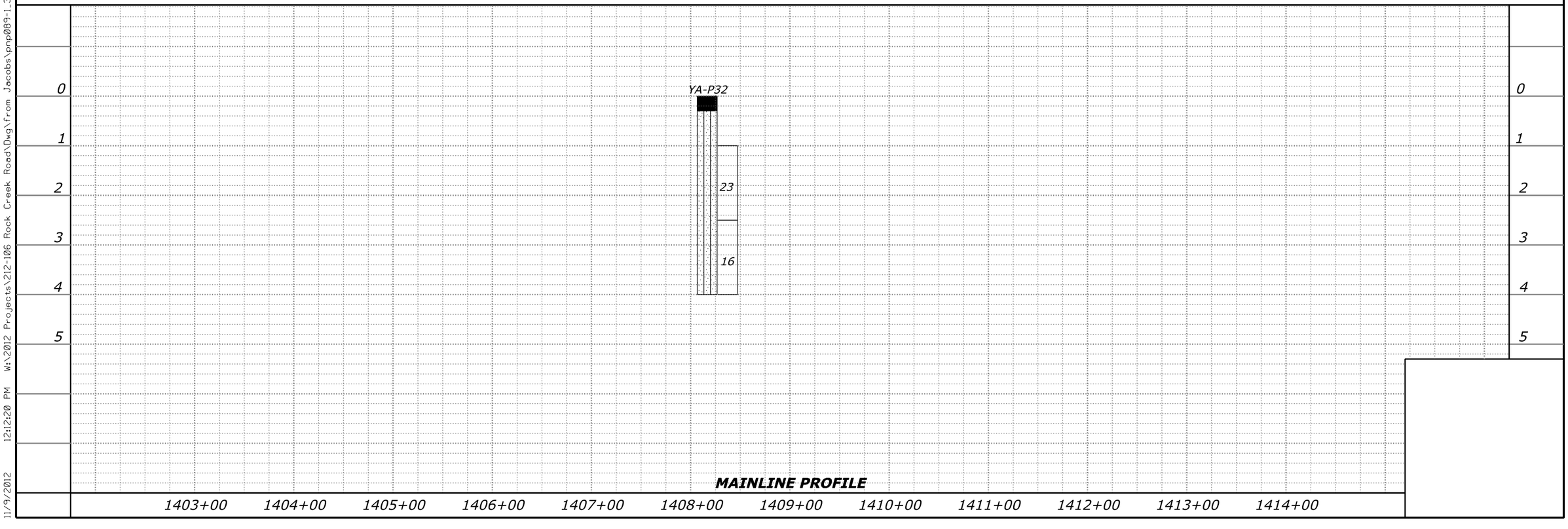
Horizontal Scale

25' 0 50'

Vertical Scale

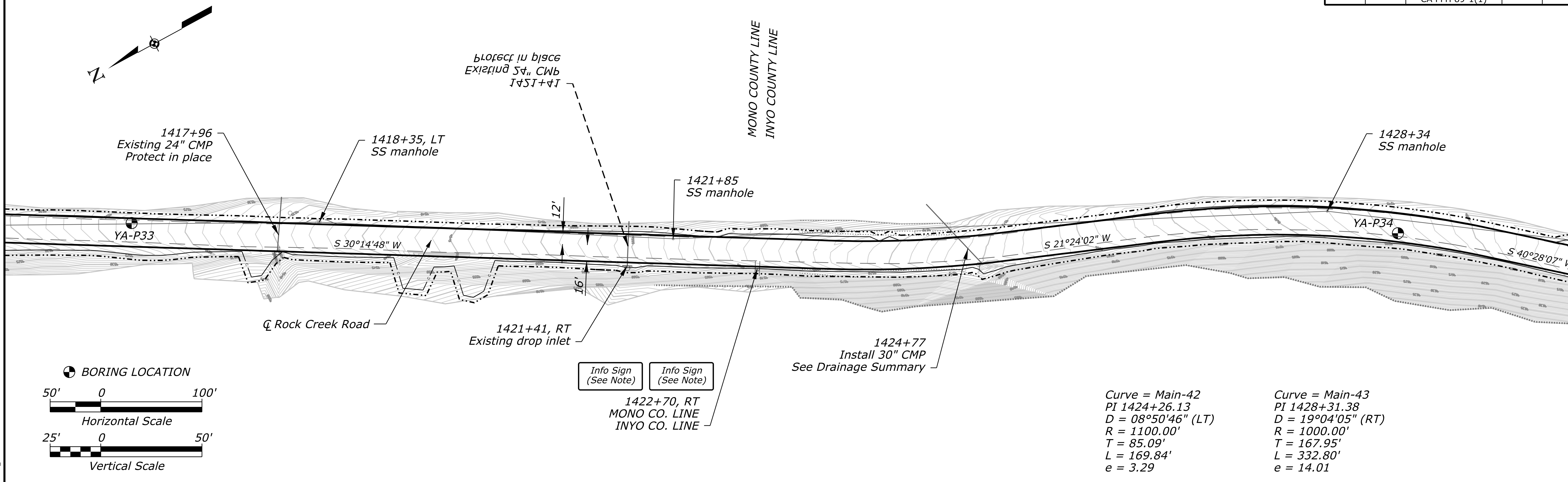
Curve = Main-40
PI 1404+77.98
D = 09°26'29" (LT)
R = 1400.00'
T = 115.61'
L = 230.70'
e = 4.77

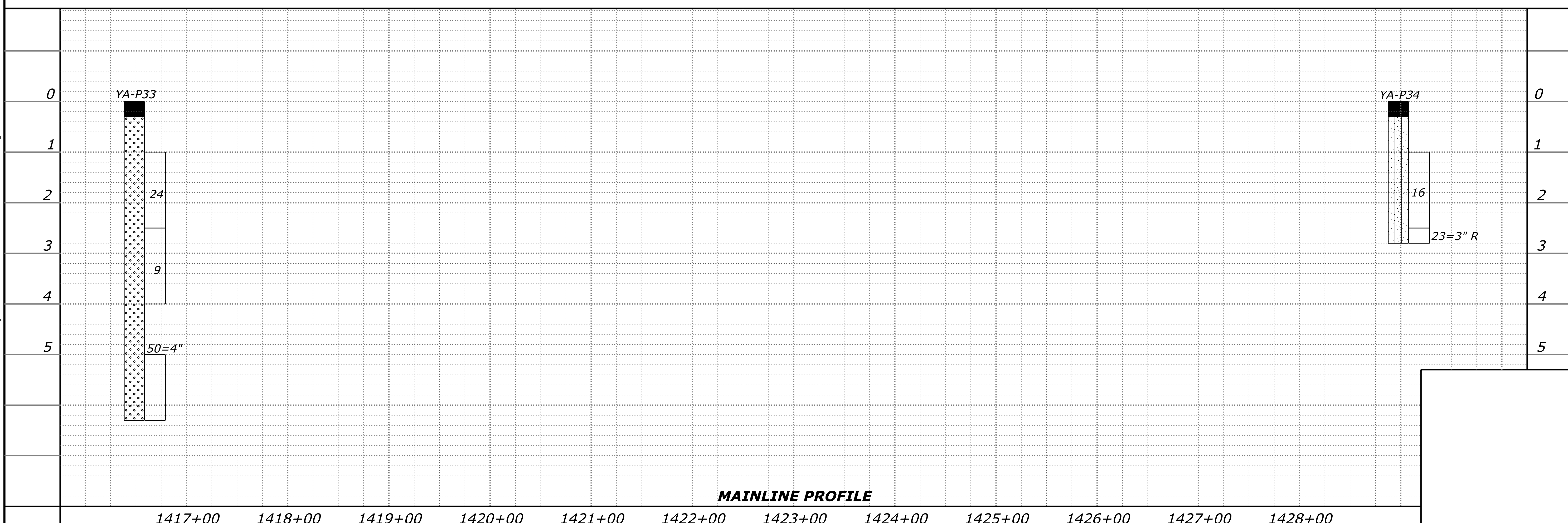
Curve = Main-41
PI 1412+91.78
D = 07°45'19" (RT)
R = 800.00'
T = 54.23'
L = 108.29'
e = 1.84



MAINLINE PROFILE

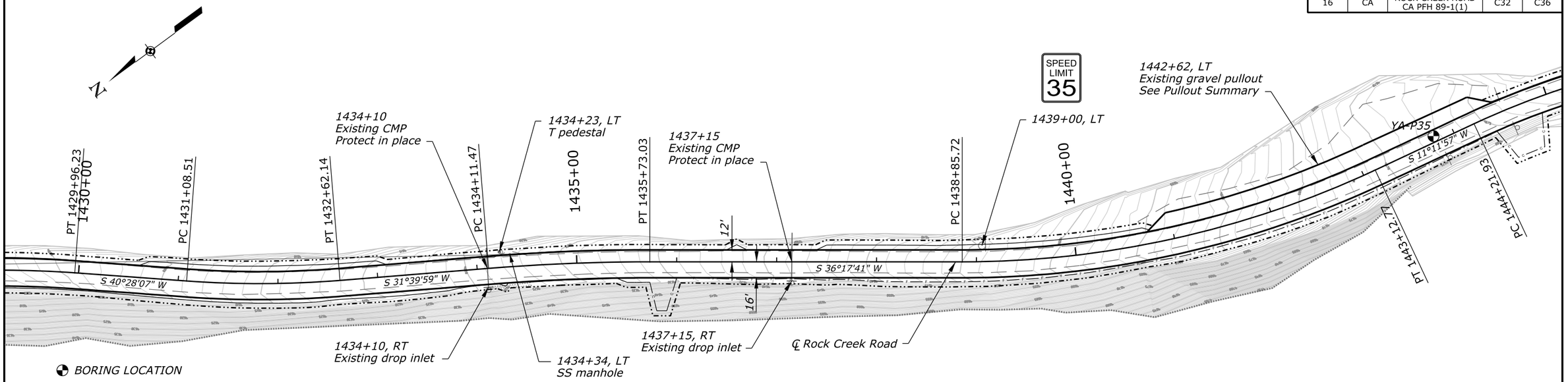
REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
16	CA	ROCK CREEK ROAD CA PFH 89-1(1)	C31	C36





11/9/2012 12:12:38 PM W:\2012 Projects\212-106 Rock Creek Road\Dwg\from Jacobs\pnp089-1-31.dgn

REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
16	CA	ROCK CREEK ROAD CA PFH 89-1(1)	C32	C36



BORING LOCATION

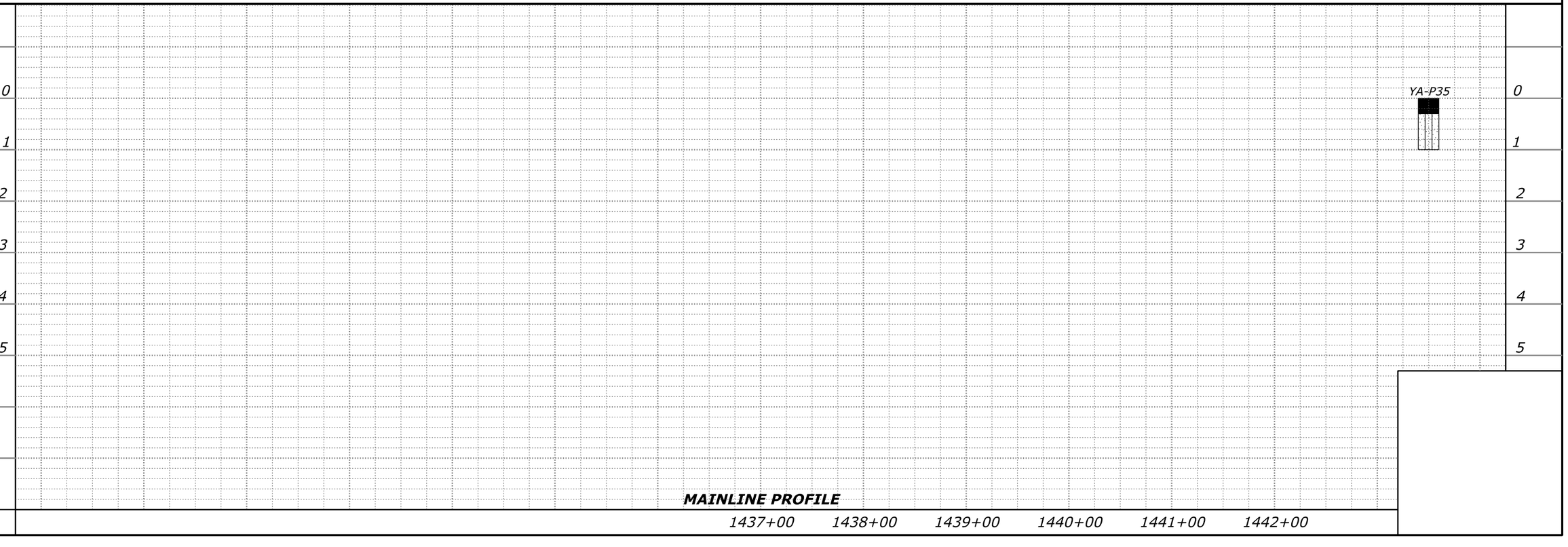
50' 0 100'
Horizontal Scale

25' 0 50'
Vertical Scale

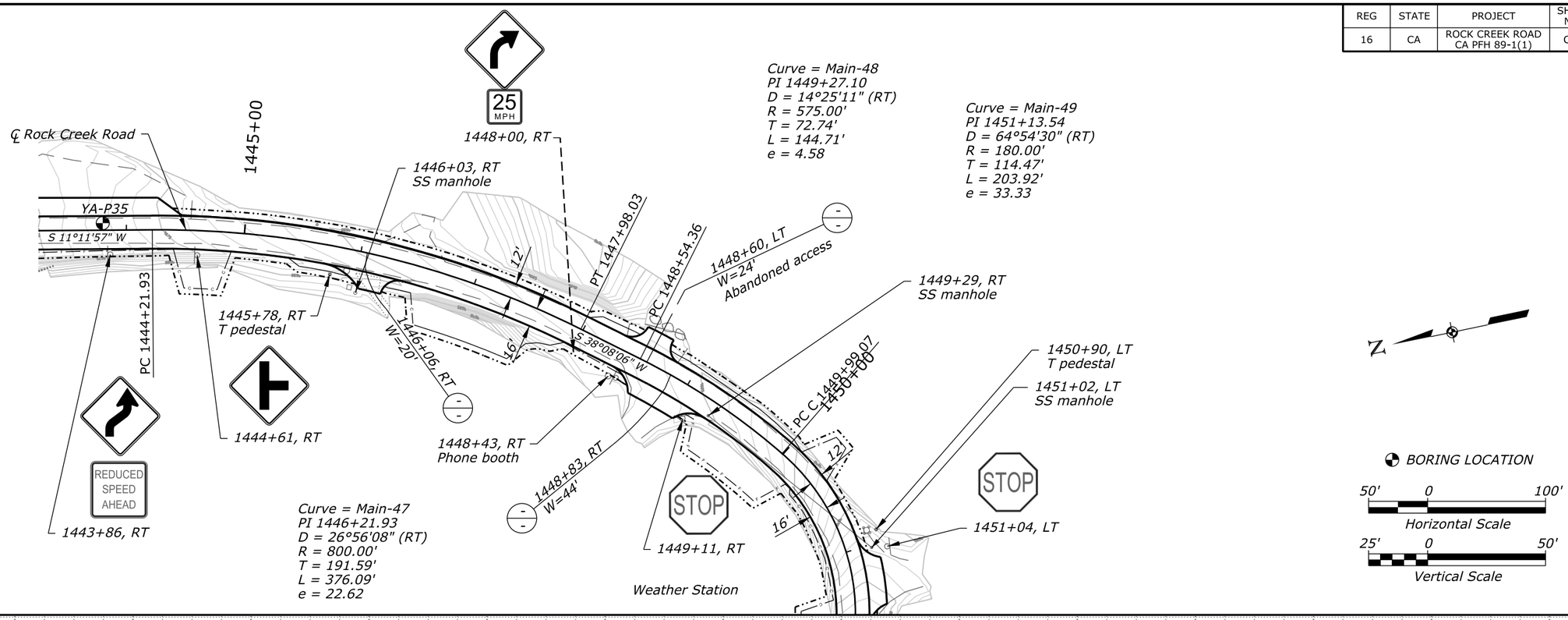
Curve = Main-44
PI 1431+85.48
D = 08°48'07" (LT)
R = 1000.00'
T = 76.96'
L = 153.62'
e = 2.96

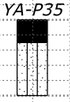
Curve = Main-45
PI 1434+92.30
D = 04°37'42" (RT)
R = 2000.00'
T = 80.82'
L = 161.56
e = 1.63

Curve = Main-46
PI 1441+02.72
D = 25°05'44" (LT)
R = 975.00'
T = 217.00'
L = 427.05'
e = 23.86



REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
16	CA	ROCK CREEK ROAD CA PFH 89-1(1)	C33	C36





MAINLINE PROFILE

1445+00 1446+00 1447+00 1448+00 1449+00 1450+00 1451+00

REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
16	CA	ROCK CREEK ROAD CA PFH 89-1(1)	C34	C36

STOP
1451+04, LT
1450+90, LT
T pedestal
1451+27, LT
W=40'
Info Sign
(See Note)
1451+58, LT
ROCK CREEK LAKE
CAMPGROUND
INYO
NATIONAL FOREST
PT 1452+02.99
1452+57, LT
STOP
1452+80, LT
1452+96, LT
W=40'
25
MPH
PC 1453+60.18
1454+50, LT
SS manhole
1455+00
1455+80, RT
Overhead utility
crossing
REDUCED
SPEED
AHEAD
1459+08, LT
1460+00
PT 1459+01.65
PC 1461+69.10
PT 1463+45
S 70°59'21" W
S 55°24'54" W
N 62°32'12" W
1451+02, LT
SS manhole
WEATHER STATION
1453+00, LT
Existing 18" CMP
Clean inlet
YA-P36
12'
16'
1457+44, RT
1457+86, LT
W=30'
1460+78
Existing CMP
1460+78, RT
Existing drop inlet
Info Sign
(See Note)
1453+18, LT
ROCK CREEK GROUP
CAMPGROUND
INYO
NATIONAL FOREST
1455+38
Existing 18' CMP
Clean culvert

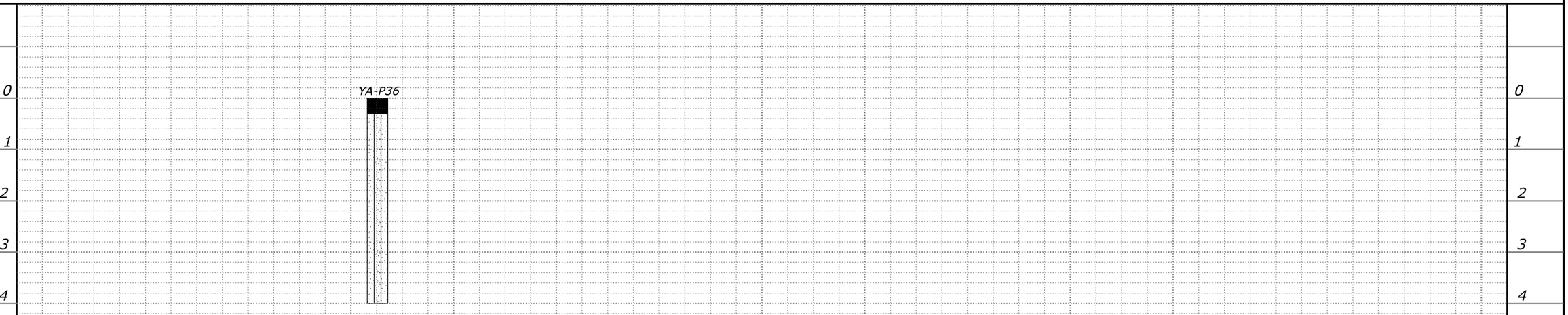
N

BORING LOCATION

50' 0 100'
Horizontal Scale

25' 0 50'
Vertical Scale

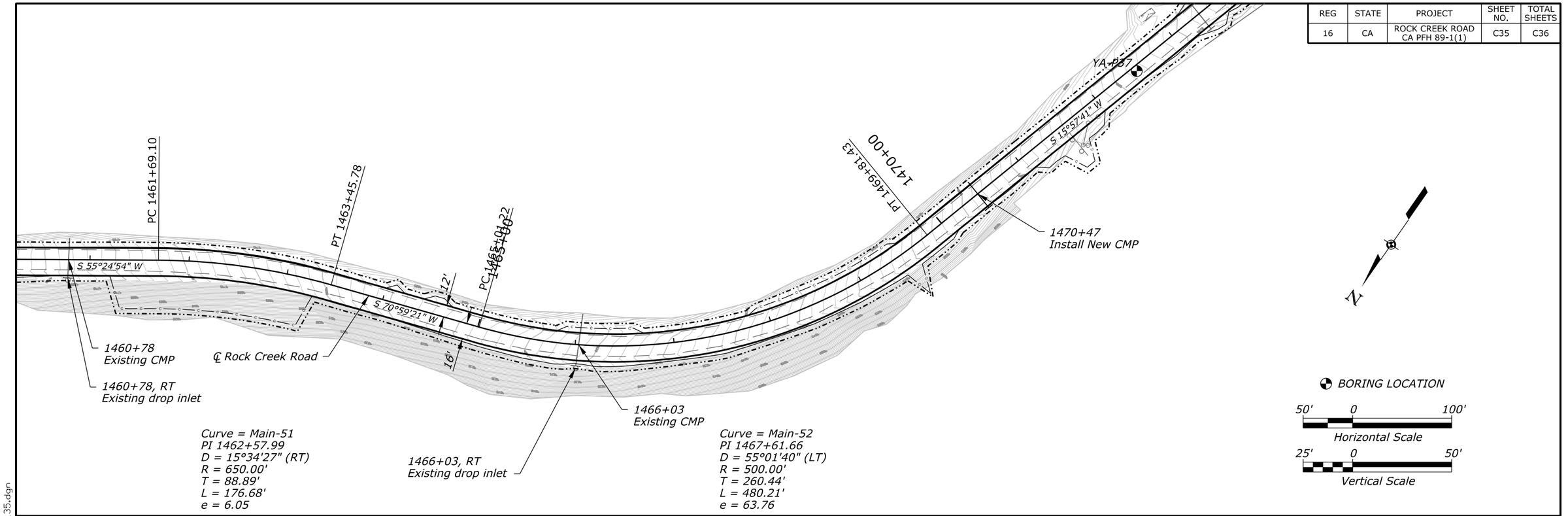
Curve = Main-49	Curve = Main-50	Curve = Main-51
PI 1451+13.54	PI 1456+60.89	PI 1462+57.99
D = 64°54'30" (RT)	D = 62°02'53" (LT)	D = 15°34'27" (RT)
R = 180.00'	R = 500.00'	R = 650.00'
T = 114.47'	T = 300.72'	T = 88.89'
L = 203.92'	L = 541.47'	L = 176.68'
e = 33.33	e = 83.46	e = 6.05

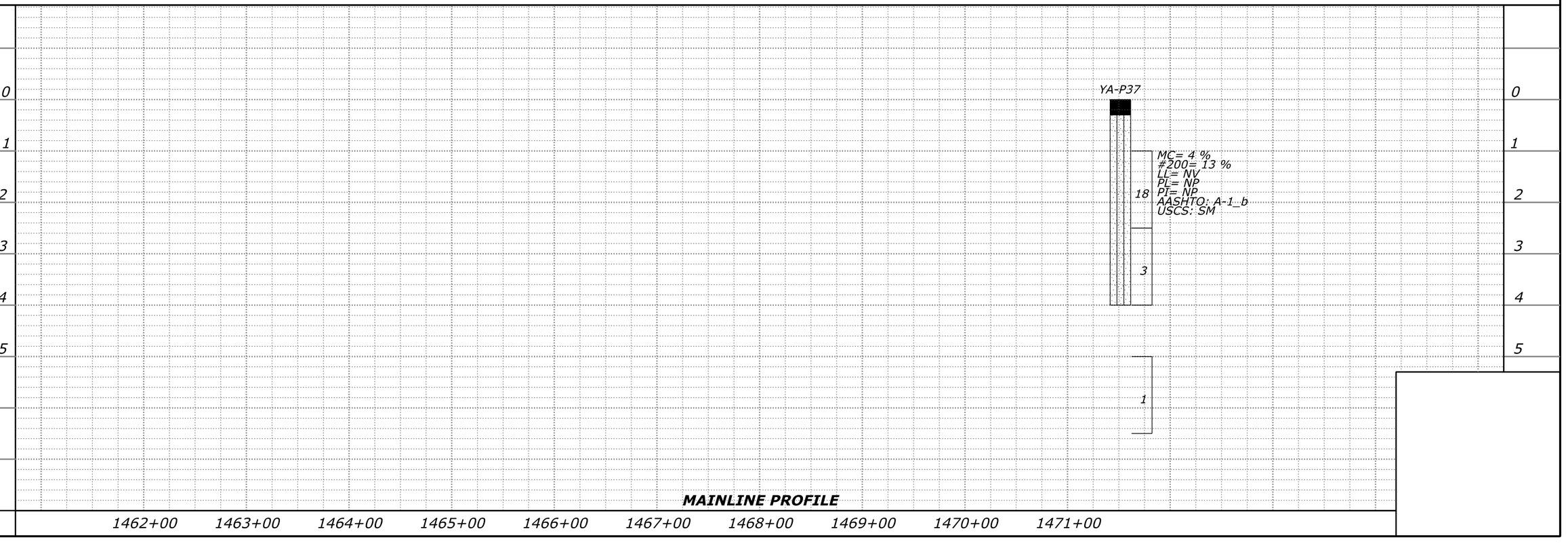


MAINLINE PROFILE

1452+00 1453+00 1454+00 1455+00 1456+00 1457+00 1458+00 1459+00 1460+00 1461+00

REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
16	CA	ROCK CREEK ROAD CA PFH 89-1(1)	C35	C36





REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
16	CA	ROCK CREEK ROAD CA PFH 89-1(1)	C36	C36

N

Info Sign (See Note)

1473+63, LT
HILTON CREEK
TRAILHEAD

1473+77, LT
Bear locker

1472+95, LT
Existing comfort station

1475+00

1476+93
Existing 30" CMP
Protect in place

℄ Rock Creek Road

1480+00

End Project
CA PFH 89-1(1)
Station 1481+80.97

12'

YA-P37

S 15°57'41" W

YA-P38

16'

Info Sign (See Note)

1473+35
Existing CMP
Protect in place

1474+70, RT
T pedestal

1471+58, RT
DAVIS LAKE

1475+83, RT
Parking Area
See Pullout Summary

1477+43, RT
Parking Area
See Pullout Summary

ROAD NARROWS

1479+45, RT

ROAD CLOSED

1481+94
Existing gate

ROCK CREEK PACK STATION

BORING LOCATION

50' 0 100'
Horizontal Scale

25' 0 50'
Vertical Scale

YA-P37

MC= 4 %
#200= 13 %
LL= NV
PL= NP
PI= NP
AASHTO: A-1-b
USCS: SM

18

3

1

YA-P38

0
1
2
3
4
5

MAINLINE PROFILE

1472+00 1473+00 1474+00 1475+00 1476+00 1477+00 1478+00 1479+00 1480+00 1481+00

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11/9/2012

Bishop, California Weather Data

Monthly Climate Summary

Month	Avg. High °F	Avg. Low °F	Avg. Mean °F	Precip(in)	Record High °F	Record Low °F
Jan	54	23	39	1.05	77	-7
Feb	58	27	43	0.88	81	-2
Mar	66	31	49	0.53	87	9
Apr	73	36	55	0.26	93	15
May	82	44	63	0.19	102	25
Jun	92	51	72	0.19	109	29
Jul	98	56	77	0.17	110	34
Aug	96	54	75	0.13	107	37
Sep	88	47	68	0.19	112	26
Oct	76	37	57	0.30	97	16
Nov	63	28	46	0.52	84	5
Dec	54	22	38	0.80	78	-8
Average	**75**	**38**	**56.8**	**5.21**	**-**	**-**

MAMMOTH LAKES RANGER STN, CALIFORNIA (045280)

Period of Record Monthly Climate Summary

Period of Record : 12/1/1993 to 9/30/2012

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	40.5	39.2	44.9	49.3	60.2	69.7	78.1	77.1	71.0	60.0	48.2	41.2	56.6
Average Min. Temperature (F)	16.3	15.9	20.7	24.8	33.1	40.4	46.5	45.0	37.9	28.5	21.8	15.9	28.9
Average Total Precipitation (in.)	4.60	3.77	2.40	1.54	1.17	0.56	0.51	0.31	0.37	1.51	2.09	4.13	22.95
Average Total SnowFall (in.)	43.1	44.0	30.2	17.0	4.4	0.5	0.0	0.0	0.0	6.7	14.9	45.3	206.0
Average Snow Depth (in.)	22	28	25	8	0	0	0	0	0	1	2	11	8

Percent of possible observations for period of record.
Max. Temp.: 94.5% Min. Temp.: 93.7% Precipitation: 92% Snowfall: 93.3% Snow Depth: 83.1%
Check Station Metadata or Metadata graphics for more detail about data completeness.

Western Regional Climate Center, wrcc@dri.edu

Geologic Hazards; Cut Slopes

General Observations

Nearly all of the cut slopes in the project area are in composed of glacial till deposits. In the few instances where bedrock is exposed in a cut slope no major stability problems were observed. All of the rockfall catchment ditches should be cleaned to increase rock storage.

Specific Cut Slopes

Cut Slope at Approximate Stations 1173 to 1175

Cut Slope at Approximate Stations 1173 to 1175: This cut slope in glacial till is standing at 34 degrees and is performing well. Evidence of rockfall was found in the roadway. This slope would benefit from an increase in catchment ditch width.

Cut Slope at Approximate Stations 1206 to 1221+50: Taken from 1206 Looking South

Rockfall Source; Approximate Station 1208

Approximate Station 1215

Cut Slope at Approximate Stations 1206 to 1221+50; This approximately 1550 foot long cut slope in glacial till deposits varies in height from approximately 40 to 15 feet and is generally standing at 34 degrees. The section from Station 1206 to 1210 ranges from 30 to 40 feet high with the upper 6 to 10 feet standing at approximately 60 degrees. This upper zone is the source for rockfall that is not completely contained in the catchment ditch and reaches the roadway. The catchment ditch in this area is approximately 4 to 6 feet with rockfall debris present. Beyond Station 1210 the slope height drops and the majority of rockfall appears to be contained in the catchment ditch. Rockfall mitigation such as slope drapery or a rockfall fence could be employed between Stations 1206 and 1210. Rock scaling alone would provide short term mitigation and would be recommended prior to any permanent installations.

Cut Slope at Approximate Station 1316+50 to 1320

Cut Slope at Approximate Stations 1316+50 to 1320; This approximately 350 foot long cut slope in glacial till deposits varies in height from approximately 25 to 30 feet, is generally standing at 34 degrees with a rockfall catchment ditch width of 4 to 5 feet. Rock debris is evident along the entire length of the catchment ditch. Greater potential for rockfall exists between approximate Stations 1319 to 1320 where the cut is taller, unvegetated and has larger and more boulders. The photo below shows last 100 feet of the cut slope between Stations 1319 and 1320. Rockfall mitigation such as slope drapery or a rockfall fence could be employed between Stations 1319 and 1320. Rock scaling alone would provide short term mitigation and would be recommended prior to any permanent installations.

Cut Slope, Approximate Stations 1319 to 1320

Cut Slope Approximate Stations 1338+50 to 1343+50; Looking north from 1343+50

Cut Slope Approximate Stations 1338+50 to 1343+50; Looking south from 1338+50

Cut Slope at Approximate Stations 1338+50 to 1343+50; This approximately 500 foot long cut slope in glacial till deposits varies in height to approximately 50 feet. The cut is generally standing at 34 degrees with the top 8 to 10 feet at 45 degrees and a rockfall catchment ditch width of 4 to 6 feet. This top section appears to be the source of the rockfall that reaches the roadway. Rock debris is evident along the entire length of the catchment ditch and there is a large accumulation of maintenance spoils on the other side of the roadway. The largest boulders on the slope measure approximately 4x4x4 feet with the most common size being less than or equal to one foot in diameter. Rockfall mitigation such as slope drapery or a rockfall fence could be employed along the entire length of the cut slope. Rock scaling alone would provide short term mitigation and would be recommended prior to any permanent installations.

Maintenance spoils at Cut Slope at 1338+50 to 1343+50

Cut Slope at Approximate Station 1355 to 1360; Looking south from 1355

Cut Slope at Approximate Station 1355 to 1360; Looking north from 1360

Cut Slope at Approximate Station 1355 to 1360; Rockfall source area

Cut Slope at Approximate Stations 1355 to 1360; This approximately 500 foot long cut slope in glacial till deposits varies in height to approximately 45 feet. The cut is generally standing at 34 degrees with a rockfall catchment ditch width of 4 to 6 feet. The top 10 feet appears to be the source of the 1 to 2.5 diameter rockfall that reaches the roadway. The largest boulders on the slope measure approximately 4 feet in diameter with the most common size being less than or equal to 2.5 feet in diameter. The catchment is full and maintenance stockpile of spoils over the adjoining embankment is substantial. Rockfall mitigation such as slope drapery or a rockfall fence could be employed along the entire length of the cut slope. Rock scaling alone would provide short term mitigation and would be recommended prior to any permanent installations.

Cut Slope at Approximate Station 1430+50 to 1434+50; Looking south from 1431+50

Cut Slope at Approximate Station 1430+50 to 1434+50; Looking north from 1434+50

Cut Slope at Approximate Station 1430+50 to 1434+50; Looking south from 1434+50

Cut Slope at Approximate Stations 1430+50 to 1434+50; This approximately 400 foot long cut slope in glacial till deposits varies in height to approximately 40 feet. The cut is generally standing at 34 degrees with a near vertical 6 foot high brow at the top of slope. The rockfall catchment ditch is approximately 4 to 6 feet wide and is full of debris. The top 6 feet appears to be the source of rockfall that reaches the roadway. The largest boulder on the slope measures approximately 3x3x6 feet with the most common size being less than or equal to 2 feet in diameter. Rockfall mitigation such as slope drapery or a rockfall fence could be employed along the entire length of the cut slope. Rock scaling alone would provide short term mitigation and would be recommended prior to any permanent installations.

Appendix C – Pavement Condition Photographs

Photographic Pavement Condition Survey

Photograph 1 - Sta. 1005 - East End of project near Crowley Lake Road Intersection. Moderate to high severity thermal transverse cracking with same severity block and edge cracking.

Photograph 2- Sta. 1050 - Low to moderate fatigue cracking across entire pavement. Also loss of chip seal between wheel paths indicates slight rutting which occurs throughout project.

Photographic Pavement Condition Survey

Photograph 3 - Sta. 1070 - Moderate severity thermal cracking and deteriorated edge with settlement next to utility cut center left.

Photograph 4 - Sta.1091 - Deteriorated edge of pavement and moderate to severe thermal transverse and block cracking.

Photographic Pavement Condition Survey

Photograph 5 - Sta. 1097 - Rutting and lateral shoving with deteriorated edge and pothole formation at pull-out. Pavement also has fatigue cracking in wheel path.

Photograph 6 Sta. 1226 - Moderate to severe thermal cracking and patched edge on half of pavement also slight rutting bsaed on snowplow damage to chip seal coat.

Photographic Pavement Condition Survey

Photograph 7 - Sta. 1276 - Severe thermal and longitudinal cracking with deteriorated edges

Photograph 8 - Sta. 1405-1406 - Wet area with deteriorated edge and fatigue cracking in center right of photograph. Drainage at side of pavement may be contributing ot pavement deterioration.

Photographic Pavement Condition Survey

Photograph 9 - Sta. 1421 - Longitudinal cracking with pothole / bump possibly caused from rock in subgrade in conjunction with frost action.

Photograph 10 - Sta. 1427 - Wet spot from spring causing deterioration in right half of driving lane.

Appendix D – Boring Logs

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Rock Creek Road
Project Number: 212-106 Date: 9/6/12

Boring: **YA-B01**
Sheet 1 of 1

Boring Began: 9/5/2012
Drilling Method: Air Rotary
Drill: CME 55
Driller: Technicon Engineering
Logged By: W.Hoon
Final By: W.Hoon
Inclination: Vertical

Completed: 9/9/2012
Drill Bit: HQ
Casing:
Weather: Ptly Cloudy/Warm

Total Depth: 33.5 ft
Ground Elevation:
Location:
Coordinates: N: E:

Ground Water Notes:

Depth	▽ 9.0 ft	-	-	-
Date	9/5/12	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 9.0 ft. silty SAND some silt, SM, brown, dry, loose, angular.	
					4/4/3	7			
	10							**9.0 - 12.0 ft. gravelly SAND** some gravel, SW, brown, wet, medium dense, angular.	MC= 8.9 % #200= 4 % LL= NV PL= NP PI= NP AASHTO: A-1-a (0) USCS: GP
					5/8/11	19			
								12.0 - 31.0 ft. clayey SAND little clay, SC, gray, wet, medium dense, angular.	MC= 10.2 % #200= 32 % LL= NV PL= NP PI= NP AASHTO: A-2-4 (0) USCS: SM
					6/10/12	22			
	20				9/15/19	34		With lenses of silty fine sand and decomposed granite, dense.	MC= 9.9 % #200= 30 % LL= NV PL= NP PI= NP AASHTO: A-2-4 (0) USCS: SM
					30/50=4"	50=4"			
	30							**31.0 - 33.5 ft. GRANITE**, gray, fresh, probably a boulder.	
								Bottom of Hole at 33.5 ft.	

BORING LOG ROCK CREEK 1.GPJ YEH ASSOCIATES.GDT 11/2/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Rock Creek Road
Project Number: 212-106 Date: 9/6/12

Boring: **YA-B02**
Sheet 1 of 1

Boring Began: 9/5/2012
Drilling Method: Air Rotary
Drill: CME 55
Driller: Technicon Engineering
Logged By: W.Hoon
Final By: W.Hoon
Inclination: Vertical

Completed:
Drill Bit: HQ
Casing:
Weather: Ptly Cloudy/Warm

Total Depth: 32.0 ft
Ground Elevation:
Location:
Coordinates: N: E:

Ground Water Notes:

Depth	▽ 8.8 ft	-	-	-
Date	9/5/12	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples: Blows per 6 in	Soil Samples: N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.3 ft. ASPHALT.	
								0.3 - 5.0 ft. silty SAND Little silt, SM, brown, dry, loose.	
					3/3/3	6			MC= 4.8 % #200= 13 % LL= NV PL= NP PI= NP pH= 7.7 S= 0.001 % Re= 8929 ohms-cm AASHTO: A-1-b (0) USCS: SM
	5							**5.0 - 6.5 ft. GRANITE**, gray, fresh, , boulder.	
								6.5 - 9.0 ft. silty SAND Little silt, SM, brown, dry to wet, loose.	
▽					2/3/2	5			
	10							**9.0 - 11.0 ft. GRANITE**, gray, fresh, , boulder.	
								11.0 - 16.0 ft. silty SAND with trace to few fine angular gravel, gray, wet, medium dense.	
					9/12/12	24			MC= 9.6 % #200= 19 % LL= NV PL= NP PI= NP AASHTO: A-1-b (0) USCS: SM
	15							**16.0 - 24.0 ft. clayey SAND** Little clay, SW-SC, gray, wet, very dense, granite residium.	
					14/24/30:3"	30:3"			MC= 8.2 % #200= 19 % LL= NV PL= NP PI= NP AASHTO: A-1-b (0) USCS: SM
	20								
			0	0					
	25		67	0				**24.0 - 32.0 ft. GRANITE**, gray, fresh, hard, joint, joint spacing moderately close, moderate angle, open fractures, clay infilling, slightly rough surfaces.	
			40	0					
	30		100	0					
								Bottom of Hole at 32.0 ft.	

BORING LOG ROCK CREEK 1.GPJ YEH ASSOCIATES.GDT 11/2/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Rock Creek Road
Project Number: 212-106 Date: 9/6/12

Boring: **YA-B03**
Sheet 1 of 1

Boring Began: 9/6/2012
Drilling Method: Air Rotary
Drill: CME 55
Driller: Technicon Engineering
Logged By: W.Hoon
Final By: W.Hoon
Inclination: Vertical

Completed:
Drill Bit: HQ
Casing:
Weather: Ptly Cloudy/Warm

Total Depth: 31.5 ft
Ground Elevation:
Location:
Coordinates: N: E:

Ground Water Notes:

Depth	▽ 10.0 ft	-	-	-
Date	9/6/12	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.3 ft. ASPHALT.	
								0.3 - 10.0 ft. silty SAND Some silt, few fine angular gravel, SM, brown, damp, loose.	
					6/6/4	10			MC= 1.4 % #200= 7 % LL= NV PL= NP PI= NP pH= 7.3 S= 0.002 % Re= 7937 ohms-cm AASHTO: A-1-b (0) USCS: SP-SM
	5								
					4/2/2	4		Very loose.	
▽	10							**10.0 - 14.0 ft. GRANITE**, gray, fresh, , Boulder.	
					R	R			
								14.0 - 22.0 ft. sandy COBBLES Boulders, cobbles and fine to coarse sand, gray, wet.	
	15				>50	>50			
					10/35/50=4"	50=4"			MC= 4.5 % #200= 9 % LL= NV PL= NP PI= NP AASHTO: A-1-a (0) USCS: SP-SM
	20								
								22.0 - 31.5 ft. GRANITE, gray, fresh to slightly weathered.	
	25								
	30								
								Bottom of Hole at 31.5 ft.	

BORING LOG ROCK CREEK 1.GPJ YEH ASSOCIATES.GDT 11/2/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Rock Creek Road
Project Number: 212-106 Date: 9/6/12

Boring: **YA-B04**
Sheet 1 of 1

Boring Began: 9/6/2012
Drilling Method: Air Rotary
Drill: CME 55
Driller: Technicon Engineering
Logged By: W.Hoon
Final By: W.Hoon
Inclination: Vertical

Completed:
Drill Bit: HQ
Casing:
Weather: Ptly Cloudy/Warm

Total Depth: 30.5 ft
Ground Elevation:
Location:
Coordinates: N: E:

Ground Water Notes:

Depth	▽ 12.0 ft	-	-	-
Date	9/6/12	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.3 ft. ASPHALT.	
								0.3 - 8.0 ft. silty SAND Little to some silt, few fine angular gravels, SM, brown, dry, dense.	
	5				6/9/25	34			MC= 1.4 % #200= 10 % LL= NV PL= NP PI= NP pH= 6.8 S= 0.002 % Re= 8065 ohms-cm AASHTO: A-1-b (0) USCS: SP-SM SPT at 9 feet hit void
								8.0 - 8.5 ft. Granite Cobble.	
	10				1/1/1	2		**8.5 - 27.0 ft. silty SAND** Little silt, some sand and granitic gravels, cobbles and boulders, SM, moist to wet.	
▽									
	15				50=5"	50=5"			
			100	0					
	20			0					
			70	0					
	25								
			100	80				**27.0 - 30.5 ft. GRANITE**, gray, slightly weathered, hard, joint, joint spacing moderately close, low angle, open fractures, iron oxide stains, slightly rough surfaces, Possible boulder.	
	30							Bottom of Hole at 30.5 ft.	

BORING LOG ROCK CREEK 1.GPJ YEH ASSOCIATES.GDT 11/2/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Rock Creek Road
Project Number: 212-106 Date: 9/6/12

Boring: **YA-B05**
Sheet 1 of 1

Boring Began: 9/7/2012
Drilling Method: Air Rotary
Drill: CME 55
Driller: Technicon Engineering
Logged By: W.Hoon
Final By: W.Hoon
Inclination: Vertical

Completed: 9/7/2012
Drill Bit: N/A
Casing:
Weather: Ptly Cloudy/Warm

Total Depth: 30.5 ft
Ground Elevation:
Location:
Coordinates: N: E:

Ground Water Notes:

Depth	▽ 9.0 ft	-	-	-
Date	9/7/12	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples: Blows per 6 in	Soil Samples: N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.3 ft. ASPHALT.	
								0.3 - 12.0 ft. silty SAND Little silt, few fine angular gravels, SM, gray, dry, loose.	
	5				3/5/5	10			MC= 2.3 % #200= 9 % LL= NV PL= NP PI= NP AASHTO: A-1-b (0) USCS: SW-SM
▽					5/14/12	26		Gravels are subangular, moist, medium dense.	MC= 5.5 % #200= 11 % LL= NV PL= NP PI= NP AASHTO: A-1-b (0) USCS: SW-SM
	10				3/3/9	12		Dark brown, wet.	
								12.0 - 26.0 ft. clayey SAND few clay fines, few fine subrounded gravels, SW, gray, wet, dense.	
	15				9/15/18	33			MC= 6.8 % #200= 18 % LL= NV PL= NP PI= NP AASHTO: A-1-b (0) USCS: SM
	20				10/>50=12"	>50=12"		Increasing gravel.	
	25				20/50=7"	50=7"		**gravelly** , few clay fines, some fine subangular to rounded gravels, very dense.	MC= 6.7 % #200= 16 % LL= NV PL= NP PI= NP AASHTO: A-1-b (0) USCS: SM
								26.0 - 27.0 ft. GRANITE, gray, fresh, , Boulder.	
								27.0 - 30.5 ft. little clay fines.	
	30				15/22/35	57			
								Bottom of Hole at 30.5 ft.	

BORING LOG ROCK CREEK 1.GPJ YEH ASSOCIATES.GDT 11/2/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Rock Creek Road
Project Number: 212-106 Date: 9/6/12

Boring: **YA-B06**
Sheet 1 of 1

Boring Began: 9/7/2012
Drilling Method: Air Rotary
Drill: CME 55
Driller: Technicon Engineering
Logged By: W.Hoon
Final By: W.Hoon
Inclination: Vertical

Completed: 9/7/2012
Drill Bit: N/A
Casing:
Weather: Ptly Cloudy/Warm

Total Depth: 34.0 ft
Ground Elevation:
Location:
Coordinates: N: E:

Ground Water Notes:

Depth	▽ 8.0 ft	-	-	-
Date	9/7/12	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.3 ft. ASPHALT.	
								0.3 - 6.0 ft. silty SAND Few silts, few fine angular gravels, SM, brown-gray, damp, medium dense.	
					4/9/50=4"	50=4"			MC= 1.1 % #200= 4 % LL= NV PL= NP PI= NP pH= 7.2 S= <0.001 % Re= 23256 ohms-cm AASHTO: A-1-a (0) USCS: GW
								6.0 - 7.5 ft. GRANITE, gray, fresh, Boulder.	
▽								**7.5 - 11.0 ft. silty SAND**, SM, brown, wet, loose.	
	10				5/4/4	8			MC= 14.4 % #200= 6 % LL= NV PL= NP PI= NP AASHTO: A-1-b (0) USCS: SP-SM
								11.0 - 13.0 ft. GRANITE, gray, fresh, Boulder.	
								13.0 - 27.0 ft. silty SAND Few silts, few fine subangular to subrounded gravels, SM, brown, wet, dense.	MC= 7.2 % #200= 14 % LL= NV PL= NP PI= NP AASHTO: A-1-b (0) USCS: SM
					17/20/23	43			
	20				28/50=6"	50=6"		Trace coarse gravels, very dense.	
					9/16/25	41		Gray, dense.	MC= 6.6 % #200= 16 % LL= NV PL= NP PI= NP AASHTO: A-1-b (0) USCS: SM
								27.0 - 30.0 ft. GRANITE, gray, fresh, Boulder.	
	30				R	R		**30.0 - 34.0 ft.** slightly more silt.	
					20/50=6"	50=6"			
								Bottom of Hole at 34.0 ft.	

BORING LOG ROCK CREEK 1.GPJ YEH ASSOCIATES.GDT 11/2/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Rock Creek Road
Project Number: 212-106 Date: 9/6/12

Boring: **YA-B07**
Sheet 1 of 1

Boring Began: 9/7/2012
Drilling Method: Air Rotary
Drill: CME 55
Driller: Technicon Engineering
Logged By: W.Hoon
Final By: W.Hoon
Inclination: Vertical

Completed: 9/7/2012
Drill Bit: N/A
Casing:
Weather: Ptly Cloudy/Warm

Total Depth: 33.5 ft
Ground Elevation:
Location:
Coordinates: N: E:

Ground Water Notes:

Depth	▽ 8.0 ft	-	-	-
Date	9/7/12	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.4 ft. ASPHALT.	
								0.4 - 6.0 ft. silty SAND Little to some silts, SM, brown-gray, moist, medium dense.	
					3/2/2	4			
								6.0 - 10.0 ft. silty SAND few silts, few fine angular gravel, SM, brown, wet, very loose.	
					0/0/0	0			MC= 10.4 % #200= 5 % LL= NV PL= NP PI= NP AASHTO: A-1-b (0) USCS: SP-SM
	10							**10.0 - 33.5 ft. silty SAND** few silts, few fine angular gravel, SM, gray, dense.	
					8/17/27	44			
					16/27/34	61		With coarse gravels, very dense.	
	20								Harder drilling at 21 feet
					10/18/23	41		Gravels are subangular to rounded, dense.	
									Harder at 26 feet, eased at 27.5, hardened at 28
					24/30/25	55		Very dense.	MC= 7 % #200= 12 % LL= NV PL= NP PI= NP AASHTO: A-1-b (0) USCS: SM Increasing gravel content
	30								
					R	R		Bottom of Hole at 33.5 ft.	

BORING LOG ROCK CREEK 1.GPJ YEH ASSOCIATES.GDT 11/2/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Rock Creek Road
Project Number: 212-106 Date: 9/6/12

Boring: **YA-B08**
Sheet 1 of 1

Boring Began: 9/8/2012
Drilling Method: Air Rotary
Drill: CME 55
Driller: Technicon Engineering
Logged By: W.Hoon
Final By: W.Hoon
Inclination: Vertical

Completed: 9/8/2012
Drill Bit: N/A
Casing:
Weather: Ptly Cloudy/Warm

Total Depth: 29.8 ft
Ground Elevation:
Location:
Coordinates: N: E:

Ground Water Notes:

Depth	▽ 11.0 ft	-	-	-
Date	9/8/12	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples: Blows per 6 in	Soil Samples: N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.3 ft. ASPHALT.	
								0.3 - 10.0 ft. silty SAND Little to some silts, few fine angular gravels, SM, brown, damp, medium dense.	
					8/8/11	19			MC= 2 % #200= 10 % LL= NV PL= NP PI= NP pH= 7.2 S= <0.001 % Re= 18519 ohms-cm AASHTO: A-1-b (0) USCS: SP-SM
	5								
					3/3/4	7		Few to little silts, moist, loose.	MC= 8.6 % #200= 12 %
	10							**10.0 - 25.0 ft. silty SAND** Little fines, few subangular to angular gravels, SM, gray, wet, very dense.	LL= NV PL= NP PI= NP AASHTO: A-1-b (0) USCS: SM
▽					13/25/30=3"	30=3"			
	15								
					26/35/21	56		Few fines, Little angular to subangular gravels.	MC= 7.8 % #200= 13 % LL= NV PL= NP PI= NP AASHTO: A-1-b (0) USCS: SM
	20								
					2/11/16	27		Wet, medium dense.	
	25						+ + + +	**25.0 - 26.0 ft. GRANITE**, gray, fresh, , Boulder.	
								26.0 - 29.8 ft. SAND trace to few fine subangular to rounded gravel, SW, gray, wet, very dense.	
					20/50=4"	50=4"			
	30							Bottom of Hole at 29.8 ft.	

BORING LOG ROCK CREEK 1.GPJ YEH ASSOCIATES.GDT 11/2/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Rock Creek Road
Project Number: 212-106 Date: 9/6/12

Boring: **YA-B09**
Sheet 1 of 1

Boring Began: 9/8/2012
Drilling Method: Air Rotary
Drill: CME 55
Driller: Technicon Engineering
Logged By: W.Hoon
Final By: W.Hoon
Inclination: Vertical

Completed: 9/8/2012
Drill Bit: N/A
Casing:
Weather: Ptly Cloudy/Warm

Total Depth: 34.1 ft
Ground Elevation:
Location:
Coordinates: N: E:

Ground Water Notes:

Depth	▽ 13.0 ft	-	-	-
Date	9/9/12	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.3 ft. ASPHALT.	
								0.3 - 11.5 ft. silty SAND Some silts, few fine angular gravels, SM, light brown, damp, medium dense.	
					5/6/15	21			MC= 2.2 % #200= 9 % LL= NV PL= NP PI= NP pH= 6.8 S= 0.003 % Re= 9091 ohms-cm AASHTO: A-1-b (0) USCS: SP-SM
	10				10/5/4	9			
▽								**11.5 - 13.0 ft. GRANITE**, gray, fresh, , Boulder.	
					8/10/17	27		**13.0 - 15.5 ft. clayey SAND** Few clays, few to little fine subangular gravels, SC, grayish brown, wet, medium dense.	MC= 14.2 % #200= 6 % LL= NV PL= NP PI= NP AASHTO: A-1-b (0) USCS: SW-SM
								15.5 - 17.5 ft. GRANITE, gray, fresh, , Boulder.	
					11/20/32=4"	32=4"		**17.5 - 21.0 ft. silty SAND** Trace to few silts,, SM, grayish brown, moist, very dense.	MC= 5.7 % #200= 11 % LL= NV PL= NP PI= NP AASHTO: A-1-b (0) USCS: SP-SM
	20							**21.0 - 22.5 ft. GRANITE**, gray, fresh, , Boulder.	
								22.5 - 28.5 ft. wet.	
					8/33/20=4"	20=4"			
					50=6"	50=6"		**28.5 - 33.5 ft. sandy GRAVEL** Some fine to coarse gravel, GP, gray, wet, very dense.	
	30								
					50=7"	50=7"		Bottom of Hole at 34.1 ft.	

BORING LOG ROCK CREEK 1.GPJ YEH ASSOCIATES.GDT 11/2/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Rock Creek Road
Project Number: 212-106 Date: 9/6/12

Boring: **YA-B10**
Sheet 1 of 1

Boring Began: 9/8/2012
Drilling Method: Air Rotary
Drill: CME 55
Driller: Technicon Engineering
Logged By: W.Hoon
Final By: W.Hoon
Inclination: Vertical

Completed: 9/8/2012
Drill Bit: N/A
Casing:
Weather: Ptly Cloudy/Warm

Total Depth: 35.0 ft
Ground Elevation:
Location:
Coordinates: N: E:

Ground Water Notes:

Depth	▽ 9.0 ft	-	-	-
Date	9/8/12	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.3 ft. ASPHALT.	
								0.3 - 1.5 ft. silty SAND Some silt, SM, brown, damp, medium dense.	
								1.5 - 2.5 ft. GRANITE, gray, fresh, , Boulder.	
					5/8/10	18		**2.5 - 5.2 ft. silty SAND** Some silt, SM, brown, damp, medium dense.	
								5.2 - 6.5 ft. GRANITE, gray, fresh, , Boulder.	
								6.5 - 9.5 ft. silty SAND Few to little silts, few angular fine gravel, SM, dark brown, wet.	
▽					1/3/R	R			MC= 9.5 % #200= 10 % LL= NV PL= NP PI= NP AASHTO: A-1-b (0) USCS: SW-SM
	10							**9.5 - 12.0 ft. GRANITE**, gray, fresh, , Boulder.	
								12.0 - 26.0 ft. silty SAND Few silts, SM, yellowish brown, wet, medium dense.	
					8/10/12	22			
					R	R			
	20								
					9/14/11	25			MC= 13.4 % #200= 9 % LL= NV PL= NP PI= NP AASHTO: A-1-b (0) USCS: SP-SM
					26/50=6"	50=6"		**26.0 - 35.0 ft. silty SAND** Few silts, little to some fine subangular gravel, SM, gray, wet, very dense.	MC= 7.9 % #200= 7 % LL= NV PL= NP PI= NP AASHTO: A-1-b (0) USCS: SW-SM
	30								
					8/10/21	31		With coarse gravel, dense.	
								Bottom of Hole at 35.0 ft.	

BORING LOG ROCK CREEK 1.GPJ YEH ASSOCIATES.GDT 11/2/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Rock Creek Road
Project Number: 212-106 Date: 9/6/12

Boring: **YA-P01**
Sheet 1 of 2

Boring Began: 9/9/2012
Completed: 9/9/2012
Total Depth: 2.3 ft
Drilling Method: Hollow-Stem Auger (8" O.D.)
Drill Bit: N/A
Ground Elevation:
Drill: CME 55
Casing:
Location:
Driller: Technicon Engineering
Weather: Ptly Cloudy/Warm
Coordinates: N: E:
Logged By: W.Hoon
Final By: W.Hoon
Inclination: Vertical

Ground Water Notes:

Depth	DRY	-	-	-
Date	-	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.3 ft. Asphalt.	
					20/50=4"	50=4"		**0.3 - 1.8 ft. SAND** few to little fines, little gravel, SP-SM, brown, dry, medium dense.	MC= 2.2 % #200= 12 % LL= NV PL= NP PI= NP
								Bottom of Hole at 2.3 ft.	SPT driving a rock. Auger will not advance beyond 2.25 feet, on large cobble/boulder

BORING LOG ROCK CREEK 1.GPJ YEH ASSOCIATES.GDT 10/29/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Rock Creek Road
Project Number: 212-106 Date: 9/6/12

Boring: **YA-P01**
Sheet 2 of 2

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
	5								

BORING LOG ROCK CREEK 1.GPJ YEH ASSOCIATES.GDT 10/29/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Rock Creek Road
Project Number: 212-106 Date: 9/6/12

Boring: **YA-P02**
Sheet 1 of 1

Boring Began: 9/9/2012
Completed: 9/9/2012
Total Depth: 4.0 ft
Drilling Method: Hollow-Stem Auger (8" O.D.)
Drill Bit: N/A
Ground Elevation:
Drill: CME 55
Casing:
Location: 7.5 FT LT CL Sta. 1011+00
Driller: Technicon Engineering
Weather: Ptly Cloudy/Warm
Coordinates: N: E:
Logged By: W.Hoon
Final By: W.Hoon
Inclination: Vertical

Ground Water Notes:

Depth	DRY	-	-	-
Date	-	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.3 ft. Asphalt.	
								0.3 - 4.0 ft. silty SAND some silt, few fine angular gravels, SM, brown, dry.	
					22/37/10	47		Dense, some coarse gravels.	
					8/8/19	27		Medium dense, some silt, few fine to coarse subangular gravels.	Auger refusal at 3 feet
								Bottom of Hole at 4.0 ft.	

BORING LOG ROCK CREEK 1.GPJ YEH ASSOCIATES.GDT 10/29/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Rock Creek Road
Project Number: 212-106 Date: 9/6/12

Boring: **YA-P03**
Sheet 1 of 1

Boring Began: 9/9/2012
Completed: 9/9/2012
Total Depth: 2.5 ft
Drilling Method: Hollow-Stem Auger (8" O.D.)
Drill Bit: N/A
Ground Elevation:
Drill: CME 55
Casing:
Location:
Driller: Technicon Engineering
Weather: Ptly Cloudy/Warm
Coordinates: N: E:
Logged By: W.Hoon
Final By: W.Hoon
Inclination: Vertical

Ground Water Notes:

Depth	DRY	-	-	-
Date	-	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.3 ft. ASPHALT.	
								0.3 - 2.5 ft. silty SAND Few to Little silts, few fine to coarse angular gravels, SM, brown, damp, dense.	
					6/19/17	36			Auger refusal at 2 feet
								Bottom of Hole at 2.5 ft.	

BORING LOG ROCK CREEK 1.GPJ YEH ASSOCIATES.GDT 10/29/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Rock Creek Road
Project Number: 212-106 Date: 9/6/12

Boring: **YA-P04**
Sheet 1 of 1

Boring Began: 9/9/2012
Completed: 9/9/2012
Total Depth: 2.5 ft
Drilling Method: Hollow-Stem Auger (8" O.D.)
Drill Bit: N/A
Ground Elevation:
Drill: CME 55
Casing:
Location:
Driller: Technicon Engineering
Weather: Ptly Cloudy/Warm
Coordinates: N: E:
Logged By: W.Hoon
Final By: W.Hoon
Inclination: Vertical

Ground Water Notes:

Depth	DRY	-	-	-
Date	-	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.3 ft. ASPHALT.	
								0.3 - 2.5 ft. silty SAND Little to some silt, little fine to coarse gravel, SM, light brown, dry, dense.	
					7/18/25	43			
								Bottom of Hole at 2.5 ft.	Auger refusal at 2.5

BORING LOG ROCK CREEK 1.GPJ YEH ASSOCIATES.GDT 10/29/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Rock Creek Road
Project Number: 212-106 Date: 9/6/12

Boring: **YA-P05**
Sheet 1 of 1

Boring Began: 9/9/2012
Completed: 9/9/2012
Total Depth: 6.5 ft
Drilling Method: Hollow-Stem Auger (8" O.D.)
Drill Bit: N/A
Ground Elevation:
Drill: CME 55
Casing:
Location:
Driller: Technicon Engineering
Weather: Ptly Cloudy/Warm
Coordinates: N: E:
Logged By: W.Hoon
Final By: W.Hoon
Inclination: Vertical

Ground Water Notes:

Depth	DRY	-	-	-
Date	-	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.3 ft. ASPHALT.	
								0.3 - 6.5 ft. silty SAND Little silt, few fine to coarse gravel, SM, brown, dry, medium dense.	
					7/8/9	17			
					9/12/18	30		Dense.	
	5				2/3/4	7		Loose.	
								Bottom of Hole at 6.5 ft.	

BORING LOG ROCK CREEK 1.GPJ YEH ASSOCIATES.GDT 10/29/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Rock Creek Road
Project Number: 212-106 Date: 9/6/12

Boring: **YA-P06**
Sheet 1 of 1

Boring Began: 9/9/2012
Completed: 9/9/2012
Total Depth: 2.5 ft
Drilling Method: Hollow-Stem Auger (8" O.D.)
Drill Bit: N/A
Ground Elevation:
Drill: CME 55
Casing:
Location:
Driller: Technicon Engineering
Weather: Ptly Cloudy/Warm
Coordinates: N: E:
Logged By: W.Hoon
Final By: W.Hoon
Inclination: Vertical

Ground Water Notes:

Depth	DRY	-	-	-
Date	-	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.3 ft. ASPHALT.	
								0.3 - 2.5 ft. silty SAND Little silt, few to little fine to coarse gravel, SM, brown, moist, dense.	
					15/19/17	36			Auger refusal at 2 feet
								Bottom of Hole at 2.5 ft.	

BORING LOG ROCK CREEK 1.GPJ YEH ASSOCIATES.GDT 10/29/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Rock Creek Road
Project Number: 212-106 Date: 9/6/12

Boring: **YA-P07**
Sheet 1 of 1

Boring Began: 9/9/2012
Completed: 9/9/2012
Total Depth: 4.0 ft
Drilling Method: Hollow-Stem Auger (8" O.D.)
Drill Bit: N/A
Ground Elevation:
Drill: CME 55
Casing:
Location:
Driller: Technicon Engineering
Weather: Ptly Cloudy/Warm
Coordinates: N: E:
Logged By: W.Hoon
Final By: W.Hoon
Inclination: Vertical

Ground Water Notes:

Depth	DRY	-	-	-
Date	-	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.3 ft. ASPHALT.	
								0.3 - 4.0 ft. silty SAND Few to little silts, few to little fine to coarse gravel, SM, grayish brown, dry, dense.	
					7/10/26	36			
					9/13/11	24		Medium dense.	Auger refusal at 2.5 feet
								Bottom of Hole at 4.0 ft.	

BORING LOG ROCK CREEK 1.GPJ YEH ASSOCIATES.GDT 10/29/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Rock Creek Road
Project Number: 212-106 Date: 9/6/12

Boring: **YA-P08**
Sheet 1 of 1

Boring Began: 9/9/2012
Completed: 9/9/2012
Total Depth: 1.5 ft
Drilling Method: Hollow-Stem Auger (8" O.D.)
Drill Bit: N/A
Ground Elevation:
Drill: CME 55
Casing:
Location:
Driller: Technicon Engineering
Weather: Ptly Cloudy/Warm
Coordinates: N: E:
Logged By: W.Hoon
Final By: W.Hoon
Inclination: Vertical

Ground Water Notes:

Depth	DRY	-	-	-
Date	-	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.3 ft. ASPHALT.	
								0.3 - 1.5 ft. silty SAND Few to little silts, little to some fine to coarse gravel, SM, grayish brown, dry.	
					50=5"	50=5"			
								Bottom of Hole at 1.5 ft.	

BORING LOG ROCK CREEK 1.GPJ YEH ASSOCIATES.GDT 10/29/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Rock Creek Road
Project Number: 212-106 Date: 9/6/12

Boring: **YA-P09**
Sheet 1 of 1

Boring Began: 9/9/2012
Completed: 9/9/2012
Total Depth: 4.0 ft
Drilling Method: Hollow-Stem Auger (8" O.D.)
Drill Bit: N/A
Ground Elevation:
Drill: CME 55
Casing:
Location:
Driller: Technicon Engineering
Weather: Ptly Cloudy/Warm
Coordinates: N: E:
Logged By: W.Hoon
Final By: W.Hoon
Inclination: Vertical

Ground Water Notes:

Depth	DRY	-	-	-
Date	-	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.3 ft. ASPHALT.	
								0.3 - 4.0 ft. silty SAND Few to little silts, little to some fine to coarse gravel, SM, grayish brown, dry, medium dense.	
					10/12/18	30			
					15/19/15	34		Increasing gravels below 3 feet, moist, dense.	
								Bottom of Hole at 4.0 ft.	

BORING LOG ROCK CREEK 1.GPJ YEH ASSOCIATES.GDT 10/29/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Rock Creek Road
Project Number: 212-106 Date: 9/6/12

Boring: **YA-P10**
Sheet 1 of 1

Boring Began: 9/9/2012
Completed: 9/9/2012
Total Depth: 3.0 ft
Drilling Method: Hollow-Stem Auger (8" O.D.)
Drill Bit: N/A
Ground Elevation:
Drill: CME 55
Casing:
Location:
Driller: Technicon Engineering
Weather: Ptly Cloudy/Warm
Coordinates: N: E:
Logged By: W.Hoon
Final By: W.Hoon
Inclination: Vertical

Ground Water Notes:

Depth	DRY	-	-	-
Date	-	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.3 ft. Asphalt.	
								0.3 - 3.0 ft. SAND trace silt, some fine to coarse gravel, SW, grayish brown, dry, dense.	
					27/22/13	35			gravels and cobbles increasing below 1 foot
								Bottom of Hole at 3.0 ft.	Auger refusal at 3 feet, cobbles

BORING LOG ROCK CREEK 1.GPJ YEH ASSOCIATES.GDT 10/29/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Rock Creek Road
Project Number: 212-106 Date: 9/6/12

Boring: **YA-P11**
Sheet 1 of 1

Boring Began: 9/9/2012
Completed: 9/9/2012
Total Depth: 2.5 ft
Drilling Method: Hollow-Stem Auger (8" O.D.)
Drill Bit: N/A
Ground Elevation:
Drill: CME 55
Casing:
Location:
Driller: Technicon Engineering
Weather: Ptly Cloudy/Warm
Coordinates: N: E:
Logged By: W.Hoon
Final By: W.Hoon
Inclination: Vertical

Ground Water Notes:

Depth	DRY	-	-	-
Date	-	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.3 ft..	
								0.3 - 2.5 ft. SAND trace silt, some fine to coarse subangular to subrounded fine to coarse gravel, SW, grayish brown, dry, dense.	
					18/17/17	34			Auger refusal at 2 feet, cuttings are coarse 1" - 3" subrounded gravels
								Bottom of Hole at 2.5 ft.	

BORING LOG ROCK CREEK 1.GPJ YEH ASSOCIATES.GDT 10/29/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Rock Creek Road
Project Number: 212-106 Date: 9/6/12

Boring: **YA-P12**
Sheet 1 of 1

Boring Began: 9/9/2012
Completed: 9/9/2012
Total Depth: 4.0 ft
Drilling Method: Hollow-Stem Auger (8" O.D.)
Drill Bit: N/A
Ground Elevation:
Drill: CME 55
Casing:
Location:
Driller: Technicon Engineering
Weather: Ptly Cloudy/Warm
Coordinates: N: E:
Logged By: W.Hoon
Final By: W.Hoon
Inclination: Vertical

Ground Water Notes:

Depth	DRY	-	-	-
Date	-	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.3 ft. Asphalt.	
								0.3 - 4.0 ft. silty SAND Litlle silt, trace fine subangular gravels, SM, brown, dry, medium dense.	
					5/12/12	24			MC= 1.4 % #200= 13 % LL= NV PL= NP PI= NP
					5/7/9	16			
								Bottom of Hole at 4.0 ft.	auger refusal at 4 feet, cobbles

BORING LOG ROCK CREEK 1.GPJ YEH ASSOCIATES.GDT 10/29/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Rock Creek Road
Project Number: 212-106 Date: 9/6/12

Boring: **YA-P13**
Sheet 1 of 1

Boring Began: 9/9/2012
Completed: 9/9/2012
Total Depth: 2.5 ft
Drilling Method: Hollow-Stem Auger (8" O.D.)
Drill Bit: N/A
Ground Elevation:
Drill: CME 55
Casing:
Location:
Driller: Technicon Engineering
Weather: Ptly Cloudy/Warm
Coordinates: N: E:
Logged By: W.Hoon
Final By: W.Hoon
Inclination: Vertical

Ground Water Notes:

Depth	DRY	-	-	-
Date	-	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.3 ft. Asphalt.	
								0.3 - 2.5 ft. silty SAND Little silt, Little fine to coarse subangular gravel, SM, brown, damp, very dense.	
					4/24/29	53			
								Bottom of Hole at 2.5 ft.	Auger refusal at 2.5 feet, gravels

BORING LOG ROCK CREEK 1.GPJ YEH ASSOCIATES.GDT 10/29/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Rock Creek Road
Project Number: 212-106 Date: 9/6/12

Boring: **YA-P14**
Sheet 1 of 1

Boring Began: 9/9/2012
Completed: 9/9/2012
Total Depth: 6.5 ft
Drilling Method: Hollow-Stem Auger (8" O.D.)
Drill Bit: N/A
Ground Elevation:
Drill: CME 55
Casing:
Location:
Driller: Technicon Engineering
Weather: Ptly Cloudy/Warm
Coordinates: N: E:
Logged By: W.Hoon
Final By: W.Hoon
Inclination: Vertical

Ground Water Notes:

Depth	▽ 5.0 ft	-	-	-
Date	9/9/12	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.3 ft. Asphalt.	
								0.3 - 6.5 ft. silty SAND Little silt, few to little fine to coarse subangul;ar gravels, SM, grayish brown, moist, very loose.	
					10/2/2	4			MC= 7.8 % #200= 15 % LL= NV PL= NP PI= NP AASHTO: A-1-b USCS: SM
					4/3/3	6		Loose.	
	5 ▽				1/6/20	26		Yellowish brown, wet, medium dense.	
								Bottom of Hole at 6.5 ft.	

BORING LOG ROCK CREEK 1.GPJ YEH ASSOCIATES.GDT 10/29/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Rock Creek Road
Project Number: 212-106 Date: 9/6/12

Boring: **YA-P15**
Sheet 1 of 1

Boring Began: 9/9/2012
Completed: 9/9/2012
Total Depth: 3.5 ft
Drilling Method: Hollow-Stem Auger (8" O.D.)
Drill Bit: N/A
Ground Elevation:
Drill: CME 55
Casing:
Location:
Driller: Technicon Engineering
Weather: Ptly Cloudy/Warm
Coordinates: N: E:
Logged By: W.Hoon
Final By: W.Hoon
Inclination: Vertical

Ground Water Notes:

Depth	DRY	-	-	-
Date	-	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.2 ft..	
								0.2 - 3.5 ft. silty SAND Few to little silts, little fine to coarse subangular gravels, SM, brown, moist, medium dense.	
					3/7/13	20			
					8/50=6"	50=6"			
								Bottom of Hole at 3.5 ft.	Auger refusal at 3.5 feet

BORING LOG ROCK CREEK 1.GPJ YEH ASSOCIATES.GDT 10/29/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Rock Creek Road
Project Number: 212-106 Date: 9/6/12

Boring: **YA-P16**
Sheet 1 of 1

Boring Began: 9/9/2012
Completed: 9/9/2012
Total Depth: 4.0 ft
Drilling Method: Hollow-Stem Auger (8" O.D.)
Drill Bit: N/A
Ground Elevation:
Drill: CME 55
Casing:
Location:
Driller: Technicon Engineering
Weather: Ptly Cloudy/Warm
Coordinates: N: E:
Logged By: W.Hoon
Final By: W.Hoon
Inclination: Vertical

Ground Water Notes:

Depth	DRY	-	-	-
Date	-	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.3 ft. Asphalt.	
								0.3 - 4.0 ft. SAND Trace silt, some fine to coarse subangular to rounded gravel, SW, brown, moist, medium dense.	
					11/9/20	29			
					10/8/10	18			
								Bottom of Hole at 4.0 ft.	Auger refusal at 4 feet, coarse gravels

BORING LOG ROCK CREEK 1.GPJ YEH ASSOCIATES.GDT 10/29/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Rock Creek Road
Project Number: 212-106 Date: 9/6/12

Boring: **YA-P17**
Sheet 1 of 1

Boring Began: 9/9/2012
Completed: 9/9/2012
Total Depth: 2.5 ft
Drilling Method: Hollow-Stem Auger (8" O.D.)
Drill Bit: N/A
Ground Elevation:
Drill: CME 55
Casing:
Location: 6.5 Ft RT CL Sta. 1207+10
Driller: Technicon Engineering
Weather: Ptly Cloudy/Warm
Coordinates: N: E:
Logged By: W.Hoon
Final By: W.Hoon
Inclination: Vertical

Ground Water Notes:

Depth	DRY	-	-	-
Date	-	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.3 ft. Asphalt.	
								0.3 - 2.5 ft. silty SAND Some silt, little fine to coarse subangular to rounded gravel, SM, light gray, moist, dense.	
					23/15/17	32			MC= 6.9 % #200= 27 % LL= NV PL= NP PI= NP
								Bottom of Hole at 2.5 ft.	Auger refusal at 2.5 feet, coarse gravels/cobbles

BORING LOG ROCK CREEK 1.GPJ YEH ASSOCIATES.GDT 10/29/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Rock Creek Road
Project Number: 212-106 Date: 9/6/12

Boring: **YA-P18**
Sheet 1 of 1

Boring Began: 9/9/2012
Completed: 9/9/2012
Total Depth: 6.5 ft
Drilling Method: Hollow-Stem Auger (8" O.D.)
Drill Bit: N/A
Ground Elevation:
Drill: CME 55
Casing:
Location: 7.3 FT LT CL Sta. 1220+80
Driller: Technicon Engineering
Weather: Ptly Cloudy/Warm
Coordinates: N: E:
Logged By: W.Hoon
Final By: W.Hoon
Inclination: Vertical

Ground Water Notes:

Depth	DRY	-	-	-
Date	-	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.3 ft. Asphalt.	
								0.3 - 6.5 ft. silty SAND Little silt, little to some fine to coarse subangular gravels, SM, grayish brown, moist, medium dense.	
					14/8/10	18			
					25/22/24	46		Dense w/ coarse gravels.	
	5				20/13/13	26		Medium dense.	
								Bottom of Hole at 6.5 ft.	

BORING LOG ROCK CREEK 1.GPJ YEH ASSOCIATES.GDT 10/29/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Rock Creek Road
Project Number: 212-106 Date: 9/6/12

Boring: **YA-P19**
Sheet 1 of 1

Boring Began: 9/9/2012
Completed: 9/9/2012
Total Depth: 4.2 ft
Drilling Method: Hollow-Stem Auger (8" O.D.)
Drill Bit: N/A
Ground Elevation:
Drill: CME 55
Casing:
Location: 7.4 FT RT CL Sta. 1232+70
Driller: Technicon Engineering
Weather: Ptly Cloudy/Warm
Coordinates: N: E:
Logged By: W.Hoon
Final By: W.Hoon
Inclination: Vertical

Ground Water Notes:

Depth	DRY	-	-	-
Date	-	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.3 ft. Asphalt.	
								0.3 - 4.2 ft. silty SAND Little silt, some fine to coarse subangular gravel, SM, grayish brown, moist, dense.	
					11/21/26	47			MC= 3.1 % #200= 15 %
					11/10/22	32			
								Bottom of Hole at 4.2 ft.	Auger refusal at 4.2 feet

BORING LOG ROCK CREEK 1.GPJ YEH ASSOCIATES.GDT 10/29/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Rock Creek Road
Project Number: 212-106 Date: 9/6/12

Boring: **YA-P20**
Sheet 1 of 1

Boring Began: 9/9/2012
Completed: 9/9/2012
Total Depth: 4.0 ft
Drilling Method: Hollow-Stem Auger (8" O.D.)
Drill Bit: N/A
Ground Elevation:
Drill: CME 55
Casing:
Location: 6 FT LT CL Sta. 1246+30
Driller: Technicon Engineering
Weather: Ptly Cloudy/Warm
Coordinates: N: E:
Logged By: W.Hoon
Final By: W.Hoon
Inclination: Vertical

Ground Water Notes:

Depth	DRY	-	-	-
Date	-	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.3 ft. Asphalt.	
								0.3 - 4.0 ft. SAND few silts, little fine subangular gravel, SP-SM, brown, moist, medium dense.	
					2/12/12	24			MC= 2.9 % #200= 11 % LL= NV PL= NP PI= NP AASHTO: A-1-b USCS: SP-SM
					6/8/9	17			
								Bottom of Hole at 4.0 ft.	Auger refusl at 4 feet, coarse gravels

BORING LOG ROCK CREEK 1.GPJ YEH ASSOCIATES.GDT 10/29/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Rock Creek Road
Project Number: 212-106 Date: 9/6/12

Boring: **YA-P21**
Sheet 1 of 1

Boring Began: 9/10/2012
Completed: 9/10/2012
Total Depth: 4.0 ft
Drilling Method: Hollow-Stem Auger (8" O.D.)
Drill Bit: N/A
Ground Elevation:
Drill: CME 55
Casing:
Location:
Driller: Technicon Engineering
Weather: Ptly Cloudy/Warm
Coordinates: N: E:
Logged By: W.Hoon
Final By: W.Hoon
Inclination: Vertical

Ground Water Notes:

Depth	DRY	-	-	-
Date	-	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.2 ft. ASPHALT.	
								0.2 - 4.0 ft. silty SAND Little silt, some fine to coarse subangular gravels, SM, light brown, damp, medium dense.	
					23/14/10	24			
					4/9/10	19			
								Bottom of Hole at 4.0 ft.	Auger refusal at 4 feet

BORING LOG ROCK CREEK 1.GPJ YEH ASSOCIATES.GDT 10/29/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Rock Creek Road
Project Number: 212-106 Date: 9/6/12

Boring: **YA-P22**
Sheet 1 of 1

Boring Began: 9/10/2012
Completed: 9/10/2012
Total Depth: 2.5 ft
Drilling Method: Hollow-Stem Auger (8" O.D.)
Drill Bit: N/A
Ground Elevation:
Drill: CME 55
Casing:
Location:
Driller: Technicon Engineering
Weather: Ptly Cloudy/Warm
Coordinates: N: E:
Logged By: W.Hoon
Final By: W.Hoon
Inclination: Vertical

Ground Water Notes:

Depth	DRY	-	-	-
Date	-	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.3 ft. ASPHALT.	
								0.3 - 2.5 ft. silty SAND Few to little silts, some fine to coarse subangular gravels, SM, light brown, damp, dense.	
					24/26/24=3"	24=3"			
								Bottom of Hole at 2.5 ft.	Auger refusal at 2.5 feet

BORING LOG ROCK CREEK 1.GPJ YEH ASSOCIATES.GDT 10/29/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Rock Creek Road
Project Number: 212-106 Date: 9/6/12

Boring: **YA-P23**
Sheet 1 of 1

Boring Began: 9/10/2012
Completed: 9/10/2012
Total Depth: 5.0 ft
Drilling Method: Hollow-Stem Auger (8" O.D.)
Drill Bit: N/A
Ground Elevation:
Drill: CME 55
Casing:
Location:
Driller: Technicon Engineering
Weather: Ptly Cloudy/Warm
Coordinates: N: E:
Logged By: W.Hoon
Final By: W.Hoon
Inclination: Vertical

Ground Water Notes:

Depth	DRY	-	-	-
Date	-	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.2 ft. ASPHALT.	
								0.2 - 5.0 ft. silty SAND Few to little silts, little fine subangular gravels, SM, brown, moist, medium dense.	
					4/11/13	24			MC= 3.4 % #200= 12 % LL= NV PL= NP PI= NP AASHTO: A-1-b USCS: SM
								Dense.	
					9/16/21	37			
	5				R	R		Bottom of Hole at 5.0 ft.	SPT refusal at 5 feet, coarse gravels in auger spoils

BORING LOG ROCK CREEK 1.GPJ YEH ASSOCIATES.GDT 10/29/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Rock Creek Road
Project Number: 212-106 Date: 9/6/12

Boring: **YA-P24**
Sheet 1 of 1

Boring Began: 9/10/2012
Completed: 9/10/2012
Total Depth: 2.5 ft
Drilling Method: Hollow-Stem Auger (8" O.D.)
Drill Bit: N/A
Ground Elevation:
Drill: CME 55
Casing:
Location:
Driller: Technicon Engineering
Weather: Ptly Cloudy/Warm
Coordinates: N: E:
Logged By: W.Hoon
Final By: W.Hoon
Inclination: Vertical

Ground Water Notes:

Depth	DRY	-	-	-
Date	-	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.3 ft. ASPHALT.	
								0.3 - 2.5 ft. silty SAND Few to little silts, little fine to coarse subangular gravel, SM, brown, moist, medium dense.	
					8/11/8	19			
								Bottom of Hole at 2.5 ft.	Auger refusal at 2.5 feet, grinding on rock

BORING LOG ROCK CREEK 1.GPJ YEH ASSOCIATES.GDT 10/29/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Rock Creek Road
Project Number: 212-106 Date: 9/6/12

Boring: **YA-P25**
Sheet 1 of 1

Boring Began: 9/10/2012
Completed: 9/10/2012
Total Depth: 4.0 ft
Drilling Method: Hollow-Stem Auger (8" O.D.)
Drill Bit: N/A
Ground Elevation:
Drill: CME 55
Casing:
Location:
Driller: Technicon Engineering
Weather: Ptly Cloudy/Warm
Coordinates: N: E:
Logged By: W.Hoon
Final By: W.Hoon
Inclination: Vertical

Ground Water Notes:

Depth	DRY	-	-	-
Date	-	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.3 ft. ASPHALT.	
								0.3 - 4.0 ft. silty SAND Little silt, some fine subangular gravel, SP-SM, gray yellowish brown, moist, medium dense.	
					11/12/13	25			MC= 5 % #200= 21 % LL= NV PL= NP PI= NP AASHTO: A-1-b USCS: SP-SM
					9/14/29	43		With coarse gravels, gray, dense.	Auger refusal at 3 feet
								Bottom of Hole at 4.0 ft.	

BORING LOG ROCK CREEK 1.GPJ YEH ASSOCIATES.GDT 10/29/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Rock Creek Road
Project Number: 212-106 Date: 9/6/12

Boring: **YA-P26**
Sheet 1 of 1

Boring Began: 9/10/2012
Drilling Method: Hollow-Stem Auger (8" O.D.)
Drill: CME 55
Driller: Technicon Engineering
Logged By: W.Hoon
Final By: W.Hoon
Inclination: Vertical

Completed: 9/10/2012
Drill Bit: N/A
Casing:
Weather: Ptly Cloudy/Warm

Total Depth: 6.5 ft
Ground Elevation:
Location:
Coordinates: N: E:

Ground Water Notes:

Depth	DRY	-	-	-
Date	-	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.3 ft. ASPHALT.	
								0.3 - 6.5 ft. silty SAND Few to little silts, Little subaangular fine to coarse gravel, SM, light brown, moist, dense.	
					14/24/24	48			
					5/16/15	31			Coarse gravel in tip of sampler, increasing gravels below 3.5 feet
	5				12/10/26	36			
								Bottom of Hole at 6.5 ft.	

BORING LOG ROCK CREEK 1.GPJ YEH ASSOCIATES.GDT 10/29/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Rock Creek Road
Project Number: 212-106 Date: 9/6/12

Boring: **YA-P27**
Sheet 1 of 1

Boring Began: 9/10/2012
Completed: 9/10/2012
Total Depth: 2.5 ft
Drilling Method: Hollow-Stem Auger (8" O.D.)
Drill Bit: N/A
Ground Elevation:
Drill: CME 55
Casing:
Location:
Driller: Technicon Engineering
Weather: Ptly Cloudy/Warm
Coordinates: N: E:
Logged By: W.Hoon
Final By: W.Hoon
Inclination: Vertical

Ground Water Notes:

Depth	DRY	-	-	-
Date	-	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.2 ft. ASPHALT.	
								0.2 - 2.5 ft. silty SAND Little silt, little fine to coarse subangular gravels, SM, brown, moist, dense.	
					20/19/19	38			Auger refusal at 2 feet, on cobbles
								Bottom of Hole at 2.5 ft.	

BORING LOG ROCK CREEK 1.GPJ YEH ASSOCIATES.GDT 10/29/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Rock Creek Road
Project Number: 212-106 Date: 9/6/12

Boring: **YA-P28**
Sheet 1 of 1

Boring Began: 9/10/2012
Completed: 9/10/2012
Total Depth: 1.0 ft
Drilling Method: Hollow-Stem Auger (8" O.D.)
Drill Bit: N/A
Ground Elevation:
Drill: CME 55
Casing:
Location:
Driller: Technicon Engineering
Weather: Ptly Cloudy/Warm
Coordinates: N: E:
Logged By: W.Hoon
Final By: W.Hoon
Inclination: Vertical

Ground Water Notes:

Depth	DRY	-	-	-
Date	-	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.3 ft. ASPHALT.	
								0.3 - 1.0 ft. silty SAND Few silts, some fine to coarse gravels, SW-SM, brown, moist.	MC= 5.5 % #200= 9 % LL= NV PL= NP PI= NP
								Bottom of Hole at 1.0 ft.	

BORING LOG ROCK CREEK 1.GPJ YEH ASSOCIATES.GDT 10/29/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Rock Creek Road
Project Number: 212-106 Date: 9/6/12

Boring: **YA-P29**
Sheet 1 of 1

Boring Began: 9/10/2012
Completed: 9/10/2012
Total Depth: 4.0 ft
Drilling Method: Hollow-Stem Auger (8" O.D.)
Drill Bit: N/A
Ground Elevation:
Drill: CME 55
Casing:
Location:
Driller: Technicon Engineering
Weather: Ptly Cloudy/Warm
Coordinates: N: E:
Logged By: W.Hoon
Final By: W.Hoon
Inclination: Vertical

Ground Water Notes:

Depth	2.5 ft	-	-	-
Date	9/9/12	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.3 ft. ASPHALT.	
								0.3 - 2.5 ft. silty Few to Little silts, Little fine to coarse subangular gravels, SW-SM, gray, moist, medium dense.	
					5/11/9	20			
								2.5 - 4.0 ft. silty Little to some silt, some fine to coarse subangular gravel, SM, gray, moist to wet, medium dense.	Auger refusal at 3 feet, coarse gravels
					2/5/8	13			
								Bottom of Hole at 4.0 ft.	

BORING LOG ROCK CREEK 1.GPJ YEH ASSOCIATES.GDT 10/29/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Rock Creek Road
Project Number: 212-106 Date: 9/6/12

Boring: **YA-P30**
Sheet 1 of 1

Boring Began: 9/10/2012
Completed: 9/10/2012
Total Depth: 2.5 ft
Drilling Method: Hollow-Stem Auger (8" O.D.)
Drill Bit: N/A
Ground Elevation:
Drill: CME 55
Casing:
Location:
Driller: Technicon Engineering
Weather: Ptly Cloudy/Warm
Coordinates: N: E:
Logged By: W.Hoon
Final By: W.Hoon
Inclination: Vertical

Ground Water Notes:

Depth	DRY	-	-	-
Date	-	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.3 ft. silty SAND Few to little silts, little to some fine to coarse subangular gravels, SM, light brown, moist, very dense.	
					7/24/27	51		Bottom of Hole at 2.5 ft.	Auger refusal at 2 feet

BORING LOG ROCK CREEK 1.GPJ YEH ASSOCIATES.GDT 10/29/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Rock Creek Road
Project Number: 212-106 Date: 9/6/12

Boring: **YA-P31**
Sheet 1 of 1

Boring Began: 9/10/2012
Completed: 9/10/2012
Total Depth: 2.5 ft
Drilling Method: Hollow-Stem Auger (8" O.D.)
Drill Bit: N/A
Ground Elevation:
Drill: CME 55
Casing:
Location:
Driller: Technicon Engineering
Weather: Ptly Cloudy/Warm
Coordinates: N: E:
Logged By: W.Hoon
Final By: W.Hoon
Inclination: Vertical

Ground Water Notes:

Depth	DRY	-	-	-
Date	-	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.3 ft. ASPHALT.	
								0.3 - 2.5 ft. silty SAND Little silt, little to some fine to coarse gravel, SM, grayish brown, moist, dense.	
					3/8/22	30			
				R	R			Bottom of Hole at 2.5 ft.	Auger refusal at 2.5 feet

BORING LOG ROCK CREEK 1.GPJ YEH ASSOCIATES.GDT 10/29/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Rock Creek Road
Project Number: 212-106 Date: 9/6/12

Boring: **YA-P32**
Sheet 1 of 1

Boring Began: 9/10/2012
Completed: 9/10/2012
Total Depth: 4.5 ft
Drilling Method: Hollow-Stem Auger (8" O.D.)
Drill Bit: N/A
Ground Elevation:
Drill: CME 55
Casing:
Location:
Driller: Technicon Engineering
Weather: Ptly Cloudy/Warm
Coordinates: N: E:
Logged By: W.Hoon
Final By: W.Hoon
Inclination: Vertical

Ground Water Notes:

Depth	DRY	-	-	-
Date	-	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.3 ft. ASPHALT.	
								0.3 - 4.0 ft. silty SAND Little silt, little to some fine to coarse gravel, SM, grayish brown, moist, medium dense.	
					11/13/10	23			
					2/7/9	16			
									Auger refusal at 4.5 feet
								Bottom of Hole at 4.5 ft.	

BORING LOG ROCK CREEK 1.GPJ YEH ASSOCIATES.GDT 10/29/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Rock Creek Road
Project Number: 212-106 Date: 9/6/12

Boring: **YA-P33**
Sheet 1 of 1

Boring Began: 9/10/2012
Completed: 9/10/2012
Total Depth: 6.3 ft
Drilling Method: Hollow-Stem Auger (8" O.D.)
Drill Bit: N/A
Ground Elevation:
Drill: CME 55
Casing:
Location:
Driller: Technicon Engineering
Weather: Ptly Cloudy/Warm
Coordinates: N: E:
Logged By: W.Hoon
Final By: W.Hoon
Inclination: Vertical

Ground Water Notes:

Depth	4.5 ft	-	-	-
Date	9/9/12	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.3 ft. ASPHALT.	
								0.3 - 6.3 ft. gravelly SAND Few fine gravels, SW, gray - brown, moist, medium dense.	
					4/11/13	24			
					3/5/4	9		Loose.	
	5				3/5/50=4"	50=4"		With some coarse gravel, wet.	water in ditch adjacent to roadway
								Bottom of Hole at 6.3 ft.	

BORING LOG ROCK CREEK 1.GPJ YEH ASSOCIATES.GDT 10/29/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Rock Creek Road
Project Number: 212-106 Date: 9/6/12

Boring: **YA-P34**
Sheet 1 of 1

Boring Began: 9/10/2012
Drilling Method: Hollow-Stem Auger (8" O.D.)
Drill: CME 55
Driller: Technicon Engineering
Logged By: W.Hoon
Final By: W.Hoon
Inclination: Vertical

Completed: 9/10/2012
Drill Bit: N/A
Casing:
Weather: Ptly Cloudy/Warm

Total Depth: 3.3 ft
Ground Elevation:
Location:
Coordinates: N: E:

Ground Water Notes:

Depth	DRY	-	-	-
Date	-	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.3 ft. ASPHALT.	
								0.3 - 2.8 ft. silty SAND Little silt, little to some fine to coarse gravel, SM, brown, moist, medium dense.	
					4/7/9	16			
					23=3" R	23=3" R			
								Bottom of Hole at 3.3 ft.	

BORING LOG ROCK CREEK 1.GPJ YEH ASSOCIATES.GDT 10/29/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Rock Creek Road
Project Number: 212-106 Date: 9/6/12

Boring: **YA-P35**
Sheet 1 of 1

Boring Began: 9/10/2012
Completed: 9/10/2012
Total Depth: 1.0 ft
Drilling Method: Hollow-Stem Auger (8" O.D.)
Drill Bit: N/A
Ground Elevation:
Drill: CME 55
Casing:
Location:
Driller: Technicon Engineering
Weather: Ptly Cloudy/Warm
Coordinates: N: E:
Logged By: W.Hoon
Final By: W.Hoon
Inclination: Vertical

Ground Water Notes:

Depth	DRY	-	-	-
Date	-	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.3 ft. ASPHALT.	
								0.3 - 1.0 ft. silty SAND Little silt, little to some fine to coarse gravel, SM, brown, moist.	
								Bottom of Hole at 1.0 ft.	Auger refusal at 1 foot, large boulder

BORING LOG ROCK CREEK 1.GPJ YEH ASSOCIATES.GDT 10/29/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Rock Creek Road
Project Number: 212-106 Date: 9/6/12

Boring: **YA-P36**
Sheet 1 of 3

Boring Began: 9/10/2012
Completed: 9/10/2012
Total Depth: 1.5 ft
Drilling Method: Hollow-Stem Auger (8" O.D.)
Drill Bit: N/A
Ground Elevation:
Drill: CME 55
Casing:
Location:
Driller: Technicon Engineering
Weather: Ptly Cloudy/Warm
Coordinates: N: E:
Logged By: W.Hoon
Final By: W.Hoon
Inclination: Vertical

Ground Water Notes:

Depth	DRY	-	-	-
Date	-	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.3 ft. ASPHALT.	
								0.3 - 4.0 ft. silty SAND Little silt, little to some fine to coarse gravel, SM, brown, moist.	Auger refusal at 1.5 feet, coarse gravels/cobbles

BORING LOG ROCK CREEK 1.GPJ YEH ASSOCIATES.GDT 10/29/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Rock Creek Road
Project Number: 212-106 Date: 9/6/12

Boring: **YA-P36**
Sheet 2 of 3

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests

BORING LOG ROCK CREEK 1.GPJ YEH ASSOCIATES.GDT 10/29/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Rock Creek Road
Project Number: 212-106 Date: 9/6/12

Boring: **YA-P36**
Sheet 3 of 3

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								Bottom of Hole at 1.5 ft.	
	5								

BORING LOG ROCK CREEK 1.GPJ YEH ASSOCIATES.GDT 10/29/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Rock Creek Road
Project Number: 212-106 Date: 9/6/12

Boring: **YA-P37**
Sheet 1 of 1

Boring Began: 9/10/2012
Completed: 9/10/2012
Total Depth: 6.5 ft
Drilling Method: Hollow-Stem Auger (8" O.D.)
Drill Bit: N/A
Ground Elevation:
Drill: CME 55
Casing:
Location:
Driller: Technicon Engineering
Weather: Ptly Cloudy/Warm
Coordinates: N: E:
Logged By: W.Hoon
Final By: W.Hoon
Inclination: Vertical

Ground Water Notes:

Depth	DRY	-	-	-
Date	-	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.3 ft. ASPHALT.	
								0.3 - 4.0 ft. silty SAND Little silt, little fine to coarse gravel, SM, light brown, moist, medium dense.	MC= 4 % #200= 13 % LL= NV PL= NP PI= NP AASHTO: A-1_b USCS: SM
					15/8/10	18			
					1/2/1	3		Very loose.	
	5				0/0/1	1		Wet at 5.5, very loose.	
								Bottom of Hole at 6.5 ft.	

BORING LOG ROCK CREEK 1.GPJ YEH ASSOCIATES.GDT 10/29/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Rock Creek Road
Project Number: 212-106 Date: 9/6/12

Boring: **YA-P38**
Sheet 1 of 1

Boring Began: 9/10/2012
Completed: 9/10/2012
Total Depth: 2.5 ft
Drilling Method: Hollow-Stem Auger (8" O.D.)
Drill Bit: N/A
Ground Elevation:
Drill: CME 55
Casing:
Location:
Driller: Technicon Engineering
Weather: Ptly Cloudy/Warm
Coordinates: N: E:
Logged By: W.Hoon
Final By: W.Hoon
Inclination: Vertical

Ground Water Notes:

Depth	DRY	-	-	-
Date	-	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.3 ft. ASPHALT.	
								0.3 - 2.5 ft. silty SAND Little silt, little to some fine to coarse gravel, SM, brown, moist.	
								Occassional cobble.	Too cobbly/coarse gravelly to SPT
								Bottom of Hole at 2.5 ft.	

BORING LOG ROCK CREEK 1.GPJ YEH ASSOCIATES.GDT 10/29/12

Appendix E – Soil Test Data

YEH & ASSOCIATES, INC

Summary of Laboratory Test Results

Project No: 212-106 Project Name: Rock Creek Road Date: 10/1/2012

Sample Location			Natural Moisture Content (%)	Natural Dry Density (pcf)	Gradation			Atterberg			pH	Water Soluble Sulfate %	Resistivity ohm.cm	Chloride %	R-VALUE	CLASSIFICATION	
Boring NO.	Depth (ft)	Sample Type			Gravel > #4 (%)	Sand (%)	Fines < #200 (%)	LL	PL	PI						AASHTO	USCS
B-1	10-11.5	SS	8.9	–	51	45	4	NV	NP	NP	–	–	–	–	–	A-1-a (0)	GP
B-1	13.5-15	SS	10.2	–	10	58	32	NV	NP	NP	–	–	–	–	–	A-2-4 (0)	SM
B-1	18.5-23.5	SS	9.9	–	12	58	30	NV	NP	NP	–	–	–	–	–	A-2-4 (0)	SM
B-2	2.5-4	SS	4.8	–	12	75	13	NV	NP	NP	7.7	0.001	8929	0.0007	–	A-1-b (0)	SM
B-2	12.5-14	SS	9.6	–	17	64	19	NV	NP	NP	–	–	–	–	–	A-1-b (0)	SM
B-2	17.5-18.5	SS	8.2	–	20	61	19	NV	NP	NP	–	–	–	–	–	A-1-b (0)	SM
B-3	3-4.5	SS	1.4	–	28	65	7	NV	NP	NP	7.3	0.002	7937	0.0006	–	A-1-b (0)	SP-SM
B-3	18.5-19.3	SS	4.5	–	44	46	9	NV	NP	NP	–	–			–	A-1-a (0)	SP-SM
B-4	4-5.5	SS	1.4	–	43	47	10	NV	NP	NP	6.8	0.002	8065	0.0020	–	A-1-b (0)	SP-SM
B-5	4-4.5	SS	2.3	–	30	61	9	NV	NP	NP	–	–	–	–	–	A-1-b (0)	SW-SM
B-5	7.8-9.3	SS	5.5	–	35	54	11	NV	NP	NP	–	–	–	–	–	A-1-b (0)	SW-SM
B-5	14-15.5	SS	6.8	–	22	60	18	NV	NP	NP	–	–	–	–	–	A-1-b (0)	SM
B-5	(19-20.5)(24-25.5)	SS	6.7	–	35	49	16	NV	NP	NP	–	–	–	–	–	A-1-b (0)	SM
B-6	4-5.3	SS	1.1	–	55	41	4	NV	NP	NP	7.3	< 0.001	23256	0.0008	–	A-1-a (0)	GW
B-6	9-10.5	SS	14.4	–	38	56	6	NV	NP	NP	–	–	–	–	–	A-1-b (0)	SP-SM
B-6	14-15.5	SS	7.2	–	25	61	14	NV	NP	NP	–	–	–	–	–	A-1-b (0)	SM

YEH & ASSOCIATES, INC

Summary of Laboratory Test Results

Project No: 212-106 Project Name: Rock Creek Road Date: 10/1/2012

Sample Location			Natural Moisture Content (%)	Natural Dry Density (pcf)	Gradation			Atterberg			pH	Water Soluble Sulfate %	Resistivity ohm.cm	Chloride %	R-VALUE	CLASSIFICATION	
Boring NO.	Depth (ft)	Sample Type			Gravel > #4 (%)	Sand (%)	Fines < #200 (%)	LL	PL	PI						AASHTO	USCS
B-6	(19-20)(24-25.5)	SS	6.6	–	26	58	16	NV	NP	NP	–	–	–	–	–	A-1-b (0)	SM
B-7	8.5-10	SS	10.4	–	29	66	5	NV	NP	NP	–	–	–	–	–	A-1-b (0)	SP-SM
B-7	(23.5-25)(28.5-30)	SS	7.0	–	29	59	12	NV	NP	NP	–	–	–	–	–	A-1-b (0)	SM
B-8	3.5-5	SS	2.0	–	22	68	10	NV	NP	NP	7.2	< 0.001	18519	0.0004	–	A-1-b (0)	SP-SM
B-8	8.5-10	SS	8.6	–	24	64	12	NV	NP	NP	–	–	–	–	–	A-1-b (0)	SM
B-8	(13.5-15)(18.5-20)	SS	7.8	–	31	56	13	NV	NP	NP	–	–	–	–	–	A-1-b (0)	SM
B-9	3.5-5	SS	2.2	–	23	68	9	NV	NP	NP	6.8	0.003	9091	0.0021	–	A-1-b (0)	SP-SM
B-9	13.5-15	SS	14.2	–	27	67	6	NV	NP	NP	–	–	–	–	–	A-1-b (0)	SW-SM
B-9	14.5-20	SS	5.7	–	11	78	11	NV	NP	NP	–	–	–	–	–	A-1-b (0)	SP-SM
B-10	8.5-10	SS	9.5	–	22	68	10	NV	NP	NP	–	–	–	–	–	A-1-b (0)	SW-SM
B-10	23.5-25	SS	13.4	–	3	88	9	NV	NP	NP	–	–	–	–	–	A-1-b (0)	SP-SM
B-10	28.5-29	SS	6.8	–	35	58	9	NV	NP	NP	–	–	–	–	–	A-1-b (0)	SM

YEH & ASSOCIATES, INC

Summary of Laboratory Test Results

Project No: 212-106 Project Name: Rock Creek Road Date: 10/1/2012

Sample Location			Natural Moisture Content (%)	Natural Dry Density (pcf)	Gradation			Atterberg			pH	Water Soluble Sulfate %	Resistivity ohm.cm	Chloride %	R-VALUE	CLASSIFICATION	
Boring NO.	Depth (ft)	Sample Type			Gravel > #4 (%)	Sand (%)	Fines < #200 (%)	LL	PL	PI						AASHTO	USCS
P-1	0-1	Bulk	2.2	–	21	67	12	NV	NP	NP	–	–	–	–	–	A-1-b (0)	SP-SM
P-5	1-3	Bulk	3.0	–	16	69	15	NV	NP	NP	–	–	–	–	–	A-1-b (0)	SM
P-12	1-3	Bulk	1.4	–	19	68	13	NV	NP	NP	–	–	–	–	–	A-1-b (0)	SM
P-14	1-3	Bulk	7.8	–	13	72	15	NV	NP	NP	–	–	–	–	–	A-1-b (0)	SM
P-17	1-2	Bulk	6.9	–	17	56	27	NV	NP	NP	–	–	–	–	–	A-2-4 (0)	SM
P-19	1-3	Bulk	3.1	–	30	55	15	NV	NP	NP	–	–	–	–	–	A-1-b (0)	SM
P-20	1-3	Bulk	2.9	–	15	74	11	NV	NP	NP					–	A-1-b (0)	SP-SM
P-23	1-2	Bulk	3.4	–	23	65	12	NV	NP	NP	–	–	–	–	–	A-1-b (0)	SM
P-25	4-5.5	Bulk	5.0	–	27	62	21	NV	NP	NP					–	A-1-b (0)	SP-SM
P-28	4-4.5	Bulk	5.5	–	29	62	9	NV	NP	NP	–	–	–	–	–	A-1-b (0)	SW-SM
P-37	0-2	Bulk	4.0	–	15	72	13	NV	NP	NP	–	–	–	–	–	A-1-b (0)	SM
Mix (P-1)+(P-12)		Bulk	–	–	–	–	–	–	–	–	6.4	< 0.001	27548	0.0002	70	A-1-b (0)	SM
Mix (P-23)+(P-37)		Bulk	–	–	–	–	–	–	–	–	6.6	< 0.001	36232	0.0004	71	A-1-b (0)	SM
Mix (P-17)		Bulk	–	–	–	–	–	–	–	–	6.1	< 0.001	29070	0.0003	62	A-2-4 (0)	SM

Appendix F – Structure Outlet Photographs

Photograph 1. Outlet of the structure near Station 1070+00

Photograph 2. Outlet of the structure near Station 1078+50

Photograph 3. Outlet of the structure near Station 1128+50

Photograph 4. Outlet of the structure near Station 1202+50

Photograph 5. Outlet of the structure near Station 1303+50

Appendix G - Traffic Loading

10. **Provide any available traffic data from recent counts or other documented sources (please list sources):**

	Current	20-Year Projection	Data Source
Average Daily Traffic	-	-	N/A as upper 1/2 of road closed in winter.
Seasonal Average Daily Traffic	910	1100	Mono County Traffic Count (6/2001)
Recreation Visitor Days (RVD)	41,500	41,500	Inyo National Forest
% Forest Generated Traffic	100 %	100 %	
% Non-Forest Generated Traffic	0 %	0 %	

11. **How will the proposed project improve the continuity of the transportation network?** How does this project improve or change the access or utilization of major destinations along this route in the National Forest System?

Currently cyclists are forced to use the travel lanes while travelling uphill at a slow speed. This forces automobiles to go around them on this steep and windy mountain road. Providing a shoulder for uphill bicycle travel improves continuity of the network for bicycle travel. As cyclists travel at a similar speed to automobiles when going downhill, the widened shoulder is not necessary at both sides.

12. **To what extent does this project improve or provide linkages to alternate modes?** Please explain in detail. Note: This will not apply to most projects.

This project will improve the current linkage to Rock Creek Canyon for cyclists by both improving the road surface and providing a shoulder for uphill bicycle travel. This shoulder will also be available for pedestrians accessing fishing locations, rock climbers, and hunters throughout the canyon.

Funding and Economic Development

13. **Describe how the project supports economic development at the local, regional, or state level** (Temporary economic development, that is, construction employment will not be counted). Identify the breadth of industries that would benefit from this project. How is the local economy tied to the transportation network near this project? How will the proposed project improve the transportation network and support the community's economic goals or needs? Is the project located on a designated scenic byway? If yes, identify the scenic byway.

The Rock Creek Canyon is one of the most popular forest destination and wilderness access points in the Sierras. Rehabilitation of the road surface and associated drainage improvements will improve visitor experiences to the area, directly benefiting the visitors, campgrounds and lodges both in and adjacent to Rock Creek Canyon. Rock Creek Road is designated in the County Scenic Highway System and begins at U.S. 395 which is included in the Eastern Sierra Scenic Byway. As noted under question #5, enhancement of the County's tourism and outdoor recreation-based economy is a high priority in planning and developing transportation improvements for the County. This project will help maintain popularity of the area and the ability to continue its inclusion in the Everest Challenge bicycle race.

(continued on separate sheet - Attachment A)

Given*: 2001 Seasonal AADT 910 * #10 Ca. Forest Highway Application
20-Year Projection 1100
Calculated 20-Year Growth Factor: 1100/910 = 1.2

In order to calculate the future traffic volume and loading, the same 20-year factor was used starting with the build year of 2013.

Year	Seasonal AADT	Given		
			1.2	20-Year Factor
2001	910	910	1.01	Annual Growth Factor
2002	919			
2003	928			
2004	938			
2005	947			
2006	956			
2007	966			
2008	976			
2009	985			
2010	995			
2011	1005			
2012	1015			
2013	**1025**	**Build Year Seasonal AADT Volume**		
2014	1036			
2015	1046			
2016	1056			
2017	1067			
2018	1078			
2019	1088			
2020	1099			
2021	1110	1100		
2022	1121			
2023	1133			
2024	1144			
2025	1155			
2026	1167			
2027	1179			
2028	1190			
2029	1202			
2030	1214			
2031	1227			
2032	1239			
2033	**1251**	**20-Year Seasonal AADT Volume**		
2034	1264			

Note: Using the above annual growth factor and the given values for 2001 and 2021, the project volumes for the years 2013 and 2033 were calculated below. The given values were used to determine the annual growth factor.

ESAL Calculations Based on County Counts

Calculated Volumes for Rock Creek Road

	Year	Vol.			
Sea. AADT	2013	1025	Road Closed 6 mo.	Adjusted 2013 AADT =	513
Sea. AADT	2033	1251	of Year =>	Adjusted 2033 AADT =	626

Design Volume Calculation
(Present Volume + 20-Year Volume)/2 = Design Volume
Design Volume = 569 AADT

Assumed the following Vehicle Classifications and Distribution

	Percentage	ESAL Factor	ESALs/ Day		ESALs/ Year
Cars and Pickups	0.945	0.0004	0.21508	X 365 =	79
Heavy Trucks	0.005	1.5	4.2675	X 365 =	1558
Rec. Vehicles	0.050	0.7	19.915	X 365 =	7269

ESALs/ Year		Design ESALs
79	X 20 yr =	1570
1558	X 20 yr =	31153
7269	X 20 yr =	145380

Total 20-Year ESALs = 178102

Lane Correction Factor = 0.6

Total 20-Year Design ESALs = 106861

Discussion:

Based on the current traffic of 513 per day, the vehicle mix is approximately 50 campers and 5 heavy trucks per day for the camping season, May 1 to Nov. 1 with the remaining vehicles cars and pick-ups.

Appendix H – Pavement Designs and Binder Information

1993 AASHTO Pavement Design

DARWin Pavement Design and Analysis System

A Proprietary AASHTOWare
Computer Software Product

Richard Johnson

Flexible Structural Design Module

Rock Creek Road
212-106

Flexible Structural Design

18-kip ESALs Over Initial Performance Period	106,861
Initial Serviceability	4.2
Terminal Serviceability	2.5
Reliability Level	75 %
Overall Standard Deviation	0.49
Roadbed Soil Resilient Modulus	18,259 psi
Stage Construction	1
Calculated Design Structural Number	1.52 in

Specified Layer Design

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Thickness (Di)(in)	Width (ft)	Calculated SN (in)
1	HACP	0.4	1	3	26	1.20
2	Existing Pavement	0.2	1	3	26	0.60
Total	-	-	-	6.00	-	1.80

1993 AASHTO Pavement Design

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Computer Software Product

Richard Johnson

Flexible Structural Design Module

Rock Creek Road
212-106

Flexible Structural Design

18-kip ESALs Over Initial Performance Period	106,861
Initial Serviceability	4.2
Terminal Serviceability	2.5
Reliability Level	75 %
Overall Standard Deviation	0.49
Roadbed Soil Resilient Modulus	18,259 psi
Stage Construction	1
Calculated Design Structural Number	1.52 in

Specified Layer Design

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Thickness (Di)(in)	Width (ft)	Calculated SN (in)
1	HACP	0.4	1	3	26	1.20
2	Cold Recycled	0.25	1	3	26	0.75
Total	-	-	-	6.00	-	1.95

1993 AASHTO Pavement Design

DARWin Pavement Design and Analysis System

A Proprietary AASHTOWare
Computer Software Product

Richard Johnson

Flexible Structural Design Module

Rock Creek Road
212-106

Flexible Structural Design

18-kip ESALs Over Initial Performance Period	106,861
Initial Serviceability	4.2
Terminal Serviceability	2.5
Reliability Level	75 %
Overall Standard Deviation	0.49
Roadbed Soil Resilient Modulus	18,259 psi
Stage Construction	1
Calculated Design Structural Number	1.52 in

Specified Layer Design

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Thickness (Di)(in)	Width (ft)	Calculated SN (in)
1	HACP	0.4	1	3	26	1.20
2	Pulverized Material	0.12	1	6	26	0.72
Total	-	-	-	9.00	-	1.92

1993 AASHTO Pavement Design

DARWin Pavement Design and Analysis System

A Proprietary AASHTOWare
Computer Software Product

Richard Johnson

Flexible Structural Design Module

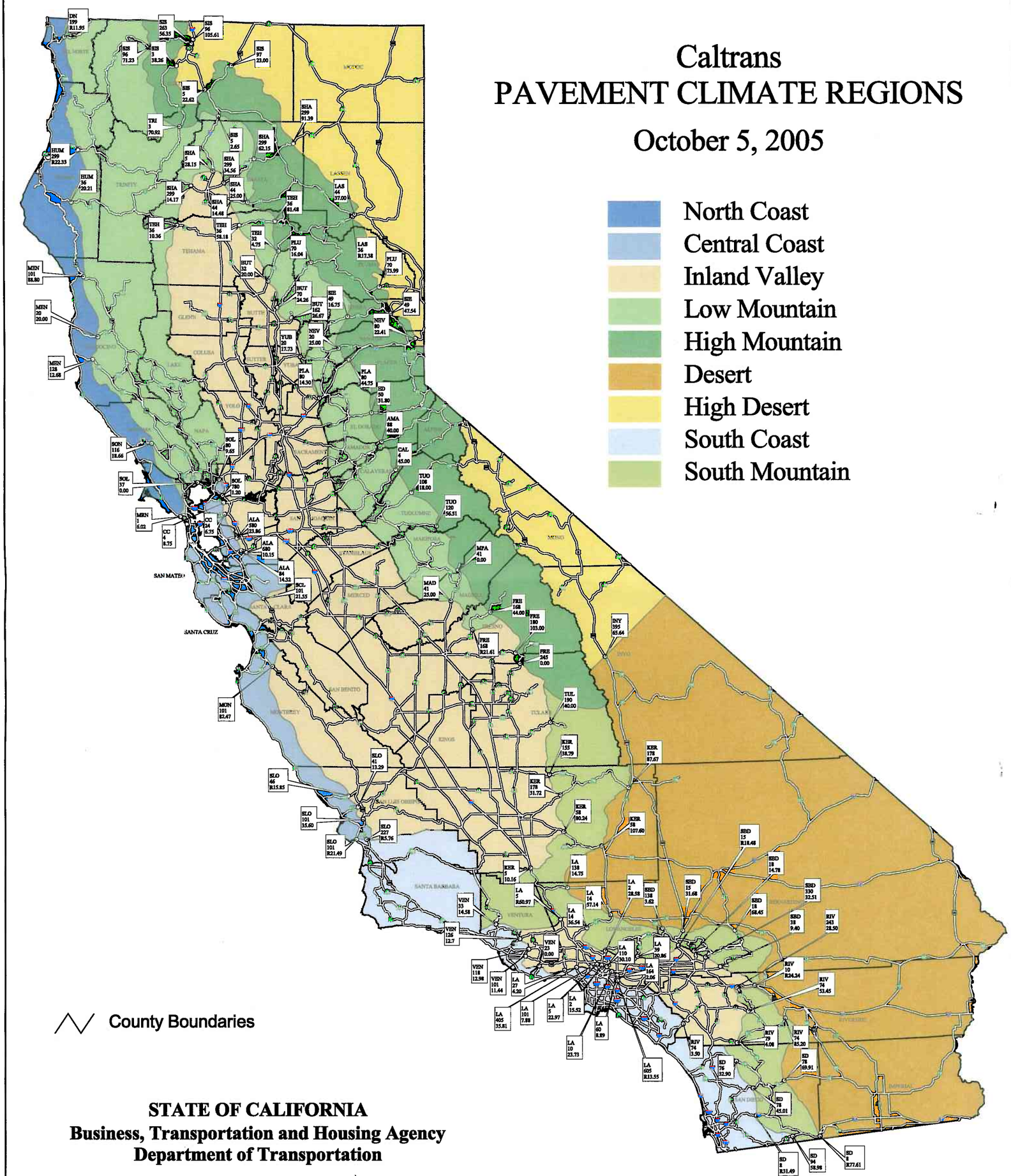
Rock Creek Road
212-106

Flexible Structural Design

18-kip ESALs Over Initial Performance Period	106,861
Initial Serviceability	4.2
Terminal Serviceability	2.5
Reliability Level	75 %
Overall Standard Deviation	0.49
Roadbed Soil Resilient Modulus	18,259 psi
Stage Construction	1
Calculated Design Structural Number	1.52 in

Specified Layer Design

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Thickness (Di)(in)	Width (ft)	Calculated SN (in)
1	HACP	0.4	1	3	26	1.20
2	ABC	0.12	1	6	26	0.72
Total	-	-	-	9.00	-	1.92


Caltrans
PAVEMENT CLIMATE REGIONS
October 5, 2005
North Coast
Central Coast
Inland Valley
Low Mountain
High Mountain
Desert
High Desert
South Coast
South Mountain
County Boundaries
STATE OF CALIFORNIA
Business, Transportation and Housing Agency
Department of Transportation

SELECTION OF ASPHALT BINDER GRADE

1.0 BACKGROUND

Asphalt binders are most commonly characterized by their physical properties. An asphalt binder's physical properties directly describe how it will perform as a constituent in asphalt concrete (AC) pavement. Although asphalt binder viscosity grading is still common, new binder tests and specifications are developed to more accurately characterize asphalt binders for use in AC pavements. These tests and specifications are specifically designed to address AC pavement performance parameters such as rutting, fatigue cracking and thermal cracking.

In the past, Caltrans has classified binder using viscosity grading based on Aged Residue (AR) System. Beginning January 1, 2006, Caltrans will use the Performance Graded (PG) System. For Polymer modified binder, Caltrans has used and will continue to use the Performance Based (PBA) binder system.

Performance grading is based on the idea that asphalt binder properties should be related to the conditions under which it is used. Performance Graded (PG) asphalt binders are selected to meet expected climatic conditions as well as aging considerations with a certain level of reliability. Therefore, the PG system uses a common set of tests to measure physical properties of the binder that can be directly related to field performance of the pavement at extreme temperatures. For example, a binder identified as PG 64-10 must meet performance criteria at an average 7-day maximum pavement design temperature of 64°C and also at a minimum pavement design temperature of –10°C.

Polymer modified binders (PBA) are used wherever extra performance and durability are desired. Improvement in resistance to rutting, thermal cracking, fatigue damage, stripping, and temperature susceptibility have led polymer modified binders to be substituted for asphalt in many paving and maintenance applications. For example, polymer modification is used to concurrently meet the requirements for high temperature resistance to rutting and low temperature resistance to thermal cracking.

2.0 PROCEDURES

Table 2.0 provides the binder grade that is to be used for each pavement climatic region. For locations of each pavement climate region see the Pavement Climate Map. A more detailed map can be found on the pavement web site beginning November 15, 2005 at http://www.dot.ca.gov/hq/oppd/pavement/guidance.htm.

Table 2.0 – ASPHALT BINDER GRADE[1]

Binder / Climatic Region	Conventional Asphalt					Rubberized Asphalt	
	Dense Graded			Open Graded		Gap Graded	Open Graded
	Typical	Special					
	PG	PG	PBA	PG	PBA[2]	PG	PG
South Coast Central Coast Inland Valleys	64-10	70-10	6a(mod)	64-10	6a	64-16	64-16
North Coast	64-16	N/A	6a(mod)	64-16	6a	64-16	64-16
Low Mountain South Mountain	64-16	N/A	6a(mod)	64-16	6a	64-16	64-16
High Mountain High Desert	64-28	N/A	6a, 6b	64-28	6a	58-22	58-22
Desert	70-10	N/A	6a(mod), 7	70-10	6a(mod)	64-16	64-16

Notes:
1. For asphalt concrete dikes use PG 70-10. For tack coats use either 64-10 or 64-16.
2. For low temperature placement.

For conventional Dense Graded Asphalt concrete, values are given for typical and special conditions. Special conditions are defined as those roadways or portion of roadways which meet any of the following criteria:

- Truck/bus traffic (over 10 million ESALs for 20 years)
- Truck/bus stopping areas (parking area, rest area, loading area, etc.)
- Truck/bus stop and go areas (intersections, metered ramps, ramps to and from Truck Scales etc.)

It should be noted that special binder grades may help to meet the requirements for the above criteria. However, there are other provisions that may also be necessary to address the above special conditions. The District Materials Engineer should be consulted for additional recommendations for these locations. Final decision as to whether a roadway meets the criteria for special conditions rests with the District.

For more detailed information on PG binder selection, refer to technical guides available on pavement web site at http://www.dot.ca.gov/hq/oppd/pavement/guidance.htm.