FOR CONTRACT NO.: 01-262004

INFORMATION HANDOUT -PART 1

MATERIALS REPORT

1-1. District Geotechnical Design Report, December 30, 2009
.

1-2. Landslide Mitigation S101-W20 Connector Bridge No. 10-0129F, July 14, 2009.

1-3. Preliminary Materials Recommendation, January 16, 2007.

1-4. Supplemental Materials Recommendation No. 1, Roundabout at Quail Meadows, April 24, 2009.

1-5. Additional Geotechnical Recommendations, July 23, 2008

1-6. Geotechnical Recommendations. February 26, 2009

ROUTE: 01-MEN-101-R69.4/78.9

District Geotechnical Design Report

For

Willits Bypass
(Phase 1)

Highway 101 realignment from
1.3 km south of Haehl Overhead to
2.9 km south of Reynolds Highway

01-MEN-101; KP R69.4/78.9 (PM R43.1/49.0)
EA: 01-262001

Prepared for:

District 3
North Region Design and Engineering Services
Design Branch M4

By:

Division of Engineering Services
Geotechnical Services
Geotechnical Design – North

December 30, 2009

State of California
Department of Transportation

Business, Transportation and Housing Agency

Memorandum

Flex your power!
Be energy efficient!

To: MR. DAVE KELLEY
Chief, Design Branch M4
North Region Design and Engineering Services
District 3

Attention: Mr. Brad Miller
Project Engineer

Date: December 30, 2009

File: 01-MEN-101
KP R69.4/78.9
PM R43.1/49.0
01-262001
Willits Bypass

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
GEOTECHNICAL SERVICES – MS 5

Subject: District Geotechnical Design Report

This report has been prepared to provide geotechnical recommendations for the roadway portion of the Willits Bypass project that proposes to construct a new segment of Route 101 from KP R69.4 to 78.9 (PM R43.1 to 49.0) and will bypass the City of Willits, in Mendocino County, California.

This report defines the geotechnical conditions as evaluated from field and laboratory test data and used in the development of the geotechnical design. It provides recommendations and specifications for project design and construction.

If there are any questions or comments in regards to this report, please contact Ben Barnes at (916) 227-1039.

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1.0 Introduction

This report has been prepared to provide geotechnical recommendations for the Willits Bypass project that proposes to construct a new segment of Route 101 from KP R69.4 to 78.9 (PM R43.1 to 49.0) that will bypass the City of Willits, in Mendocino County, California. The intention of the bypass is to relieve congestion, reduce delays, and improve safety for traffic.

The project limits begin approximately 1.3 km (0.8 miles) south of Haehl Overhead and end approximately 2.9 km (1.8 miles) south of Reynolds Highway, a distance of approximately 9.3 kilometers (5.8 miles). The project includes cut slopes, fill embankments, retaining walls, and multiple structures. A map showing the vicinity of the project is attached in **Appendix A** as **Figure 1**.

The purpose of this report is to document subsurface geotechnical conditions, provide analyses of anticipated site conditions as they pertain to the project described herein, and recommend geotechnical design and construction criteria for the roadway portions of the project.

2.0 Existing Facilities and Proposed Improvements

Within the project area, Highway 101 travels in a general north-south direction and passes through the town of Willits from approximate PM 45 to 48. South of the town of Willits, Highway 101 is a 2 to 4 lane undivided highway. Through the town of Willits, Highway 101 is 2 to 4 lanes (including a left turn median) and crosses numerous signalized intersections. North of the town, Highway 101 is a 2 lane undivided highway.

The proposed Willits Bypass would diverge from the existing Route 101 alignment approximately 1.3 km (0.8 miles) south of Haehl Overhead and rejoin Route 101 approximately 2.9 km (1.8 miles) south of Reynolds Highway, a distance of approximately 9.3 km (5.8 miles). The proposed roadway would have two to four 3.6-meter lanes with 1.5 meter inside and 3.0-meter outside shoulders. Cut slopes are proposed at the southern end of the project with slope inclinations of 1:2 (V:H) or flatter and heights up to approximately 10 meters (32 feet). Fill embankments are proposed throughout the length of the project with slope inclinations of 1:2 (V:H) or flatter and heights up to approximately 12.5 meters (41 feet).

3.0 Pertinent Reports and Investigations

The following Caltrans Foundation Reports (FR) and Geotechnical Design Reports (GDR) have been completed for other aspects of this project and are complimentary to this report:

- FR for Route 101/20 Separation dated 10/20/2006, Tim Alderman.
- FR for Haehl Creek Bridge dated 6/18/2008, Tim Alderman.
- FR for East Hill Road UC 6/18/2008, Tim Alderman.
- FR for Haehl Creek Bridge dated 11/9/2006, Tim Alderman.
- FR for Floodway Viaduct, dated 2/23/2009, Tim Alderman.
- FR for Quail Meadows OH dated 6/19/2009, Tim Alderman.
- FR for Quail Meadows UC dated 1/15/2009, Tim Alderman.
- FR for Upp Creek Bridge dated 3/11/2009, Tim Alderman.
- Geotechnical Recommendations, Haehl Creek IC, 7/23/2008, Brandon Badeker.
- Geotechnical Recommendations, Haehl Creek IC, 2/26/2009, Brandon Badeker.
- GDR for Haehl Creek Bridge Slide dated 7/14/2009, Jim Morris.
- GDR for Oil Well Hill Borrow Site dated 12/23/2009, Joe Kaump.

The following publications were reviewed to assist in the assessment of site conditions:

- California Seismic Hazard Map 1996, Caltrans, Lalliana Mualchin, 1996.
- The Geologic Map of California, Ukiah Sheet, Charles W. Jennings and Rudolph G. Strand, 1992, California Division of Mines and Geology.
- Willits, CA 7.5-Minute Quadrangle, 1962.
- "Willits, CA, Period of Record Monthly Climate Summary" provided by Western Regional Climate Center.
- Highway Design Manual, Caltrans, 2001.
- Project Plans and Cross-Sections, October 2008.

The bridge files for the following structures located within or near the project limits were reviewed to assist in the determination of the subsurface conditions:

- South Willits Overhead, Br. No. 10-0001, KP 67.74 (PM 42.09)
- Haehl Overhead, Br. No. 10-0125, KP 70.75 (PM 43.96)
- Baechtel Creek, Br. No. 10-0013, KP 73.85 (PM 45.89)
- Broaddus Creek, Br. No. 10-0014, KP 75.06 (PM 46.64)

- Willits Creek, Br. No. 10-0015, KP 75.88 (PM 47.15)
- Upp Creek, Br. No. 10-0070, KP 77.47 (PM 48.14)
- Outlet Creek, Br. No. 10-0016, KP 81.53 (PM 50.66)

Additionally, a subsurface investigation of the project site was conducted from August 2004 to September 2006 for the purpose of determining geological and geotechnical conditions.

4.0 Physical Setting

4.1 Climate

According to the Western Regional Climate Center, the average annual precipitation at Willits 1E (located near the project site) is about 1300 mm (51 in). The majority of this precipitation (over 95 percent) falls between October and May. The average annual air temperature is 15.6°C (60.1°F) with the highest average daily maximum of 29.5°C (85.2°F) in July and the lowest average daily minimum of 0.2°C (32.6°F) in December. Freezing temperature conditions are usually brief and freeze / thaw conditions do not typically occur. **Table 1** presents the monthly climate summary.

Table 1. Period of Record Monthly Climate Summary

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	55.0	58.0	60.4	64.4	71.1	78.1	85.2	85.0	82.5	74.2	60.7	54.4	69.1
Average Min. Temperature (F)	32.9	34.9	36.0	36.9	40.5	44.5	47.3	46.0	42.3	38.5	35.7	32.6	39.0
Average Total Precipitation (in.)	10.2	7.9	7.0	3.1	1.5	0.4	0.1	0.2	0.7	2.9	7.3	10.0	51.2
Average Total Snowfall (in.)	1.6	0.6	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	3.8

4.2 Topography and Drainage

The Willits, Ca. 7.5-Minute Quadrangle, dated 1962, was reviewed to determine the topographic features of the project region. The general terrain is of moderate relief with elevations in the project area varying from approximately 250 to 470 meters (820 to 1542 feet) above sea level. Oak trees and prairie grasses are the dominant types of vegetation. Most of the localized drainage is generally trending to the north. Small creeks cross at

numerous locations. A map showing the topographic features of the project area is attached in **Appendix A** as **Figure 2**.

4.3 Regional Geology

The project is located within the northern section of the Coast Ranges province. West of the Great Valley province, the Coast Ranges province stretches about 960 kilometers (600 miles) from the Oregon border to the Santa Ynez River. The province contains many elongate ranges and narrow valleys that are approximately parallel to the coast, although the coast usually shows a somewhat more northerly trend than do the ridges and valleys. The province contains dominantly sedimentary rocks underlain by two unlike kinds of basement rocks that are mostly of middle Mesozoic age, the Franciscan Formation and granitics with associated meta-sedimentary rocks. Geologic history of the Coast Ranges is intricately interwoven with the tectonics of the San Andreas and other major faults, particularly those in the western part of the state (Noms & Webb, 1990).

Locally, the project site is located at the north end of Little Lake Valley. Little Lake Valley is an intermontane basin within the northern California Coast Ranges in Mendocino County that contains a record of sedimentation and deformation during the Pleistocene. The basin is approximately 11.3 kilometers (7 miles) in length and up to approximately 4.8 kilometers (3 miles) wide near the middle of the valley. The town of Willits is situated in the west-central portion of the valley. The basin was likely formed by faulting along the Maacama Fault Zone on the southwest and northeast margins of the valley. Sediments within the basin, in places over 140 meters (460 feet) thick, consist of fine grained lacustrine and overbank deposits, and coarser grained gravel alluvium from flowing streams. Geologic investigations of the coarse-grained gravel alluvium suggest the valley formerly drained to the south (Russian River drainage). Currently, the valley drains to the north into the Eel River system. A suggested cause for the stream drainage changes may be from tectonic stresses related to the northward progression of the Mendocino Triple Junction (Woolace, et al., 2005).

The Geologic Map of California, Ukiah Sheet, scale 1:250,000, compiled by Charles W. Jennings and Rudolph G. Strand, 1992, California Division of Mines and Geology (Currently known as the California Geological Survey) indicates the area geology consists of Quaternary alluvium (Qal) deposits overlying Plio-Pleistocene nonmarine sedimentary deposits underlain by the Franciscan Formation (KJf). According to the map explanation, the Quaternary alluvium deposits consist of alluvium, recent breccia, conglomerate, sand, and valley fill. The Plio-Pleistocene (Pliocene-Pleistocene nonmarine sedimentary deposits) deposits are identified as the Cache Formation that

consists of laucustrine and fluvial deposits and unnamed Plio-Pleistocene deposits bordering alluviated valleys in Mendocino County. The Franciscan Formation consists of sandstone, shale, chert, and conglomerate with locally small areas of greenstone, limestone, basalt, glaucophane schist and related metamorphic rocks. **Table 2** lists the geologic zones according to the new highway alignment stationing.

Table 2. Geology of Proposed Alignment

Approximate Station (m)	Geologic Map Symbol	Primary Soil Type
96+00 to 118+00	QP	Plio-Pleistocene nonmarine sedimentary deposits, Cache Formation
118+00 to 124+00	Qal	Recent alluvium, recent breccia, conglomerate and sand; valley fill
124+00 to 132+00	QP	Plio-Pleistocene nonmarine sedimentary deposits, Cache Formation
132+00 to 188+00	Qal	Recent alluvium, recent breccia, conglomerate and sand; valley fill

At the project site, the materials encountered during the subsurface investigation are interpreted as deposits of the Quatenary alluvium. Refer to the field investigation section of this report for more detailed information. A map showing the geologic features of the project area is attached in **Appendix A** as **Figure 3**.

4.4 Seismicity

Several faults are located in the vicinity of the project location. **Table 3** lists active and potentially active faults located in the project vicinity based on the Department's California Seismic Hazard Map 1996. Corresponding faulting style, moment magnitude, distance to the site, and maximum bedrock acceleration based on the maximum credible earthquake for the project location are also provided.

Table 3. Active Faults in Project Vicinity

Fault	Style of Faulting	Moment Magnitude of Maximum Credible Earthquake	Shortest Distance from the Proposed Alignment to the Fault (km)	Maximum Credible Horizontal Bedrock Acceleration
Maacama-Brush	Strike-Slip	7.25	1.5	0.7g (gravity)
Bartlett Springs Round Valley	Strike-Slip	6.75	27	0.2g
San Andreas/N	Strike-Slip	8.00	50	0.2g

The fault possessing the potential to influence the project site the greatest is the Maacama-Brush fault (MBM). The MBM fault ranges approximately 1.5 to 2 kilometers (0.9 to 1.2 miles) southwest of the site and is capable of generating a Maximum Credible Earthquake (MCE) moment magnitude of Mw=7.25. The corresponding Peak Bedrock Acceleration (PBA) at the site is estimated to be about 0.7g. A map showing the active faults within the project area is presented in **Appendix A** as **Figure 4**.

The potential for surface rupture due to fault movement within the project limits is considered negligible, as there are no faults projecting towards or passing through the project location.

Liquefaction is a loss of soil strength and stiffness due to an increase in pore water pressure during cyclic loading, such as occurs during an earthquake. Soils with liquefaction potential include loose cohesionless soils that may become saturated. Embankments founded upon liquefied soils are subject to slope instability, embankment spreading, and embankment settlement. Liquefaction potential within the project limits is considered negligible as the subsurface material is predominantly clayey and the granular material present is dense to very dense.

5.0 Exploration

The Office of Geotechnical Design-North conducted a geotechnical field investigation from August 2004 to September 2006 to evaluate subsurface soil conditions, and to provide foundation design and site development criteria for the proposed project.

5.1 Drilling and Sampling

A subsurface investigation was performed for both the roadway and structures portion of the project and consisted of 100 borings using both mud rotary and hollow stem auger methods, and 33 cone penetrometer tests (CPT). The drill rigs used to drill the borings consisted of a CME-85, a Mobile B-80, a Mobile B-47, an Acker 3837 and an Acker MP-8, all equipped with safety hammers; and a CS-2000 and Acker MPCA, both equipped with automatic hammers. Penetration resistance tests were conducted as the borings were advanced. The weight of the sampler driving hammers was 63.5 kg with a 762 mm drop. Two types of samplers were used. A modified California split spoon sampler (63.5 mm, 2.5 in), with liners, a Standard Penetration Test (SPT) sampler (35.6 mm, 1.4 in), without liners, and a Shelby tube sampler (72.9 mm, 2.87 in).

Sampling was performed at various depths as shown in the boring logs. Selected samples of the native subsoil were collected from the borings, and laboratory tests were performed in order to evaluate the characteristics of the material encountered.

Maps showing the boring and CPT locations are presented in **Appendix A** as **Figures 5 through 14**. Detailed descriptions of the soils encountered in the roadway borings are presented on the boring logs in **Appendix B**. CPT data is presented in **Appendix C**. Detailed descriptions of the soils encountered in the structure borings is presented on Log-Of-Test-Boring (LOTB) sheets as part of the Foundation Report for each structure.

6.0 Geotechnical Testing

6.1 In Situ Testing

In-situ testing was performed in the field during the subsurface exploration. Penetration values for the driven samplers were recorded and used to correlate to approximate soil strength values in cohesionless soils. Pocket penetrometer tests were performed on cohesive soil samples and used to correlate to approximate shear strength. Blow counts and pocket penetrometer data is shown on the boring logs in **Appendix B**.

6.2 Laboratory Testing

Laboratory tests were performed on selected samples to evaluate physical characteristics and engineering properties and included sieve analysis, in-place moisture content and density, Atterberg limits (plasticity), direct shear tests, unconfined compression tests, consolidation tests, and corrosion tests. The lab results were used in the evaluation of

geotechnical recommendations. Test results for dry density, moisture content, unconfined compressive strength (UC), and undrained shear strength (UU), are shown on the boring logs in **Appendix B**.

7.0 Geotechnical Conditions

7.1 Subsurface Soil Conditions

Subsurface soil conditions were determined from our subsurface investigation and are shown in **Table 4**.

Table 4. Subsurface Soil Conditions

Station (m)	Depth (m)	Soil Type
104+00 to 114+00	0 to 3	Medium dense to dense silty to clayey sand
	3 to 20	Very stiff to hard silty clay with interbedded seams of medium dense to dense silty to clayey sand
	20 to 30	Dense to very dense silty to clayey sand
114+00 to 136+00	0 to 6	Stiff to very stiff silty clay
	6 to 18	Soft to stiff silty clay with interbedded seams of medium dense to dense silty to clayey sand
	18 to 30	Dense to very dense silty sand and clayey gravel
136+00 to 150+00	0 to 6	Medium stiff to stiff silty clay
	6 to 18	Soft to stiff silty clay with interbedded seams of medium dense to dense silty to clayey sand
	18 to 30	Dense to very dense clayey gravel
167+00 to 171+00	0 to 1.5	Medium dense to dense clayey sand
	1.5 to 24	Soft to stiff silty clay
	24 to 30	Dense to very dense silty to clayey sand and clayey gravel

171+00 to 178+00	0 to 1.5	Medium dense to dense clayey sand
	1.5 to 6	Medium stiff to stiff silty clay
	6 to 23	Soft to stiff silty clay with interbedded seams of medium dense to dense silty to clayey sand
	23 to 30	Medium dense to dense silty to clayey sand
178+00 to 188+00	0 to 3	Medium dense clayey sand
	3 to 21	Soft to stiff silty clay with interbedded seams of medium dense to dense clayey sand
	21 to 30	Medium dense to dense silty to clayey sand

Specific descriptions of the soils encountered within the borings are described in the boring logs in **Appendix B**.

7.2 Groundwater

Groundwater was measured in the borings at depths from 1.8 to 9.7 meters (6 to 31.8 feet) below the ground surface during our subsurface investigation. The majority of the groundwater depths were measured at 3.0 meters or shallower. Specific groundwater depths within the boreholes are shown in the boring logs in **Appendix B**. Groundwater conditions can be expected to fluctuate in response to seasons, storm events, and other factors. Localized saturated conditions or perched groundwater conditions near the ground surface should be anticipated during and following periods of heavy precipitation.

8.0 Geotechnical Recommendations

The following recommendations are based on the project plans and cross sections dated October 2008, communication with the North Region Design, field reconnaissance, and the subsurface investigation conducted within the project limits.

8.1 Cut Slopes

There are two significant cut sections proposed on the new alignment. **Table 5** summarizes the cut locations, heights, and material type that will likely be encountered.

Table 5. Proposed Cut Slopes

Approx. Stationing	Maximum Height (m)	Proposed Slope (V:H)	Material Type Anticipated	Method Recommended
100+40 to 102+40 Left	10	1:2	Silty Sand / Gravel	Easy Ripping
103+20 to 105+20 Right	9	1:2	Silty Sand / Gravel	Easy Ripping

It is our opinion that the significant cut slopes in the table above, as well as smaller cuts within the project limits, will be stable at the proposed 1:2 (V:H) slope angle. The earthwork factor for the material to be removed from the cuts is estimated to be between 0.85 and 0.95.

8.2 Fill Embankments

There are seven significant fill sections proposed on the new alignment. **Table 6** summarizes the locations, heights, and proposed slopes.

Table 6. Proposed Fill Embankments

Approx. Begin Station (m)	Approx. End Station (m)	Maximum Height (m)	Proposed Side Slopes (V:H)
104+00	110+00	7.6	1:2
117+00	126+00	8.5	1:2
126+00	134+00	8.5	1:2
135+00	149+00	7.9	1:2
168+00	171+00	11.0	1:2
171+00	178+00	12.5	1:2
178+00	188+00	10.1	1:2

The cross sections provided by North Region Design for the proposed construction show embankments with slope inclinations of 1:2 (V:H) or flatter. If the embankments will be constructed using local borrow material, the embankments may be constructed as proposed and should be stable at the 1:2 (V:H) or flatter inclination proposed.

This report addresses Phase 1 of the project, which will construct the fill embankments for a two-lane highway. Phase 2 of the project proposes to widen the highway to four lanes by widening the Phase 1 fill embankments. The additional fill for Phase 2 will create additional load on the Phase 1 bridge abutments. As the Phase 1 bridge abutments are not designed to handle this additional loading, it is recommended that the fill embankments within 200 feet of the bridge abutments be built to Phase 2 width and height.

8.3 Embankment Settlement

The foundation soils in the project area consist predominantly of clayey material. This soil type exhibits significant settlement potential and low initial shear strength. **Table 7** summarizes the settlement magnitudes at various locations throughout the project based upon laboratory results, published and internal reports, and calculations.

Table 7. Summary of Settlement

Approx. Begin Station	Approx. End Station	Maximum Embankment Height (m)	Immediate Settlement (mm)	Primary Settlement (mm)	Secondary Settlement (mm)	Time needed for 90% of primary settlement (days)
104+00	110+00	7.6	76-127	305	152-203	30
117+00	126+00	8.5	102-152	406	152-203	120
126+00	134+00	8.5	102-152	406	152-203	120
135+00	149+00	7.9	127-178	457	152-203	180
168+00	171+00	11.0	152-203	610	152-203	3600
171+00	178+00	12.5	152-203	660	152-203	720
178+00	188+00	10.1	127-178	559	152-203	300

As shown in the above table, settlement will be significant for portions of the project. The immediate settlement is expected to occur during the loading process, the primary settlement will occur during the loading and settlement waiting period, and secondary settlement is expected to occur for many years after construction is complete.

Options to reduce the settlement period include the use of wick drains and surcharge. **Table 8** summarizes options for the portions of the project with the longest settlement waiting periods.

Table 8. Options to Reduce Settlement Waiting Period

Approx Begin Station	Approx End Station	Time needed for 90% of primary settlement (days)							
		No Improvements	Wick Drains				Surcharge		
			1.5 m Spacing	1.8 m Spacing	2.4 m Spacing	3.0 m Spacing	1.5 m Height	2.4 m Height	3.0 m Height
168+00	171+00	3600	180	240	12	360	2010	1500	1200
171+00	178+00	720	180	240	12	360	510	450	390

Wick drains should be installed within the limits of the proposed embankment footprint, in a triangular pattern at the desired spacing to a depth of 24.4 meters (80 feet). It is anticipated that the near surface soils are of adequate strength to support the wick driving equipment. Once the wicks are installed, a drainage layer should be installed. Options for the drainage layer are:

1. Gravel blanket - consists of a filter fabric placed on existing ground, followed by a 305 mm (12 inch) layer of Class 1 permeable material, followed by a geosynthetic reinforcing fabric. The filter fabric will keep fines from penetrating the gravel layer. The reinforcing fabric will lessen the chance of circular slip failures and hold the fill together as the foundation consolidates, reducing cracking at the surface. The gravel blanket should cover the entire wick drain area.
2. Geocomposite blanket – consists of a polymeric sheet (drainage core) encapsulated by a highly permeable geotextile wrap. The geotextile retains soil, allowing water to pass into the drainage core. The sheets will be placed on existing ground and below the fill embankment. The geocomposite blanket should cover the entire wick drain area.
3. Horizontal strip drains – consists of polymeric strips (drainage core) encapsulated by a highly permeable geotextile wrap. The geotextile retains soil, allowing water to pass into the drainage core. The strips should be placed on existing ground and below the fill embankment. The horizontal strip drains may be spaced such that each strip drain ties into one or two rows of wicks.

The drainage layer will allow for excess pore water to escape from the clay layers during loading. A diagram showing the wick drain layout is presented in **Appendix A** as **Figure 15**.

A controlled rate of loading should be used for all embankments greater than 8.5 m deep between Station 143+00 to Station 188+00. **Table 9** summarizes the embankment loading rates.

Table 9. Embankment Loading Rates

Embankment Height (m)	Loading Rate
0 to 8.5	Uncontrolled
Over 8.5	0.30 m per day

As shown, the calculated time required to achieve 90% primary consolidation varies significantly from 30 to 3600 days. These variances are dependant upon the thickness of soft soil layers, their properties, and fill heights. Based on past experiences, settlement may occur more rapidly than calculated due to sand lenses and organic fibers within the clay. The settlement should be monitored to assure that primary consolidation is 90% complete before any surcharge is removed or the structural section is constructed. If surcharge is used, compaction of the surcharge is recommended, as some of the surcharge will remain as part of the final embankment after the settlement period has taken place.

The discharge of water from the wicks is highly variable and is based on pore water discharged from the clay as it consolidates. Previous projects have seen very little water coming out at the surface, as the majority of the water dissipates into more permeable seams below the surface. **Table 10** summarizes the wick drain discharge rates, based upon the conservative assumption that there are no permeable seams and that all water will discharge to the surface.

Table 10. Discharge Rates for Wick Drains

Begin STA (m)	End STA (m)	Discharge (gpm)
167+60	172+00	14
172+20	178+00	24
178+20	179+50	7
179+70	180+40	4

These above discharge rates are based upon the footprint of the fills, the estimated settlement and the settlement period. Based upon historical project experience, the actual

discharge is anticipated to be only a small fraction of these values. The discharge of water is anticipated to begin from the beginning of fill placement to the end of the primary settlement period. The discharge water collection system may be abandoned at the end of the primary settlement period or as directed by the Resident Engineer.

Secondary settlement is expected to occur on the order of 150 to 200 mm (6 to 8 inches) over a period of about 50 years. This type of settlement may require some long-term maintenance.

8.4 Geotechnical Instrumentation

Geotechnical instrumentation, including vibrating wire piezometers and fluid gage settlement platforms should be installed to monitor settlement and pore pressure dissipation. We recommend that the contract documents specify that furnishing, installation and monitoring of the instrumentation be the responsibility of the Contractor. Once operational, we recommend that the interpretation of the monitoring data be shared between the Resident Engineer and this Office.

Table 11 summarizes the piezometer and settlement platform locations.

Table 11. Piezometer / Settlement Platform Locations

Piezometers			Settlement Platforms	
STA (m)	Depths (m)	Centerline Offset (m)	STA (m)	Centerline Offset (m)
125+50	4, 6, 10	1.0 Left	125+50	1.0 Right
126+50	4, 6, 10	1.0 Left	126+50	1.0 Right
148+50	3, 6, 12	1.0 Left	148+50	1.0 Right
168+00	4, 9, 12	1.0 Left	168+00	1.0 Right
169+50	4, 9, 12	1.0 Left	169+50	1.0 Right
170+50	4, 9, 12	1.0 Left	170+50	1.0 Right
171+50	4, 9, 12	1.0 Left	171+50	1.0 Right
173+00	4, 9, 12	1.0 Left	173+00	1.0 Right
175+50	4, 9, 12	1.0 Left	175+50	1.0 Right
177+50	3, 8, 13	1.0 Left	177+50	1.0 Right
179+00	3, 8, 13	1.0 Left	179+00	1.0 Right
180+00	3, 8, 13	1.0 Left	180+00	1.0 Right

Each station should include the following instruments:

- Vibrating wire piezometers (3) installed at depths shown in **Table 11**, within the clay layers to obtain and monitor the increase and subsequent dissipation of excess pore water pressure associated with the placement of fill and subsequent consolidation of the clay layer(s).

- Fluid gage settlement platforms installed after placement of the drainage layer and wick drains but prior to placement of fill. Since moderate settlement is expected to occur during construction, surface survey measurements made with control on hubs or stakes may not be reliable for controlling fill thicknesses and rates of filling.

- Automated data acquisition unit to read and record outputs from the piezometer and settlement gauges.

- Wires for instrumentation should be placed in a conduit, buried not less than 0.3 meters, to protect them from damage during construction.

The settlement platforms should be installed below the center of the fill near the same locations as the piezometers, as shown in **Table 11**. This will allow for correlation between pore pressure dissipation and settlement.

The monitoring proposed will be used to allow the safe placement of fill in stages with the rate controlled by actual rate of foundation soil consolidation and subsequent strength gain. Also, the completion of primary consolidation will be verified by settlement and pore pressure measurements.

Due to the critical nature of the geotechnical monitoring proposed, the project specifications should explicitly indicate that the contractor during construction must carefully protect the measurement points/instrumentation. Any instrumentation equipment damaged by the contractor should be immediately replaced prior to work commencement unless the Resident Engineer authorizes work continuance in writing.

8.5 Pond

There is an existing pond between STA 142+00 and STA 144+00, which is used to provide water for cattle. The new alignment passes through the southern end of the pond and the proposed embankment fill will cover a portion of the pond. Design has proposed to extend the pond to the north to compensate for the portion covered.

The water in the pond is recharged through a small water channel, which connects to the pond on the south end, and from groundwater, which is estimated to be 1.5 meters (5 feet) below the ground surface. Design has proposed piping the small water channel under new fill embankment. The groundwater level corresponds with the water level in the pond. As such, it is anticipated that extending the pond to the south will not affect the water level, as the water level in the pond will continue to match the groundwater level. The extension of the pond to the south should be constructed before fill embankment placement. As the groundwater fluctuates seasonally, it is recommended that excavation of the pond extension be done in the summer or fall, when groundwater levels are the lowest.

It is anticipated that as the pond is recharged with groundwater, dewatering will not be feasible. Therefore, for construction of the fill embankment into the end of the pond, it is recommended that Class 3 permeable material be placed into the end of the pond to above the water level. A filter fabric should then be placed on top of the Class 3 permeable material layer and then the fill embankment may be constructed on the filter fabric. Care should be taken in placement of the fill to reduce the amount of fines that may contaminate the pond.

8.6 Culverts

Culverts are proposed beneath the embankment at various locations throughout the project. Total settlement throughout the project varies from 533 to 1066 mm (21 to 42 inches). As the settlement of the embankment above the culverts may cause damage, the following options are available for construction:

For smaller embankments heights and where feasible, the culvert can be placed by excavating the embankment after the primary settlement waiting period is complete and backfilling.

For larger embankments, the options for installation of culverts include:

1. The use of jack and bore method after the primary settlement waiting period is complete.

2. Placing the culvert before the embankment with a vertical camber, which will allow the culvert to settle with the embankment. The camber height should equal the predicted total settlement at the centerline of the fill prism and continue down to the proposed final elevation at the ends. As the consolidation settlement may

not be uniform, and may be more or less than predicted, the vertical alignment of the culvert after the settlement period may not be as designed. The final vertical culvert alignment may be such that the culvert loses functionality, and may need to be removed and replaced. For this option, the culvert material would need to be of sufficient strength and flexibility to withstand the anticipated settlement.

3. Excavating the embankment after the primary settlement waiting period is complete, placing the culvert and then backfilling.

8.7 Landslide Mitigation

Abutment 1 of the proposed S101-W20 Connector Bridge will be constructed within an existing landslide area. Jim Morris, of Geotechnical Design North, addressed the mitigation of the landslide in respect to Abutment 1 of this bridge in a Geotechnical Report dated July 14, 2009. The toe of the slide extends into Haehl Creek, and it appears that the limits may extend near the south abutment of the left Haehl Creek Bridge structure. We recommend that during construction of the fill embankment, any loose or unsuitable material found within this area be removed and replaced. North Region Design has proposed a 1.5:1 (V:H) fill embankment slope for the main line alignment at the south end of the project (approximate STA 107+80), due to space constraints. As this embankment toes into Haehl Creek and the existing landslide, we recommend using RSP at the base of the slope.

9.0 Corrosion Studies

Composite soil samples were collected in the structure borings during the subsurface investigation. The Office of Testing and Technology Services, Corrosive Technology Branch tested the composite samples for corrosive potential. The Corrosion Technology Branch considers a site to be corrosive if one or more of the following conditions exist for the representative soil samples taken at the site: chloride concentration is 550 ppm or greater, sulfate concentration is 2000 ppm or greater, or the pH is 5.5 or less. The minimum resistivity serves only as an indicator parameter for the possible presence of soluble salts and is not included to define a corrosive site. It is the practice of the Corrosion Technology Branch that if the minimum resistivity of the sample is greater than 1000 ohm-cm, the sample is considered to be non-corrosive and testing to determine the sulfate and chloride content is not performed.

The Office of Testing and Technology Services results of the laboratory tests determined that the composite samples collected are not corrosive at this site. **Table 12** summarizes the corrosion test results.

Table 12. Corrosion Test Results

Boring	Station (m)	Sample	Depth (m)	pH	Minimum Resistivity (ohm-cm)
80	177+80	1	0-1.5	5.82	4729
84	154+00	1	0-1.5	6.96	5214
84	154+00	3	1.5-3	6.87	5214
87	180+00	3	1.5-3	6.39	3800
87	180+00	7	4.6-5.2	6.83	5988
88	179+00	2	0-1.5	6.11	4690

10.0 Construction Considerations

All earthwork should conform to Section 19 "Earthwork" of the Standard Specifications.

Based on our subsurface investigation, the materials within the proposed cut slopes are anticipated to be easily rippable.

The earthwork factor is an estimate of the volume change due to shrinkage or swell that a material will experience due to excavation, handling, and recompaction for fill embankments. For the material removed from the cuts within the project limits, we estimate that an earthwork factor of 0.9 may be used. Material from additional borrow sources will need to be evaluated to determine earthwork factors.

11.0 Project Information

Standard Special Provision S5-280, "Project Information", discloses to bidders and contractors a list of pertinent information available for their inspection prior to bid opening. The following is an excerpt from SSP S5-280 disclosing information originating from Geotechnical Services. Items listed to be included in the Information Handout will be provided in Acrobat (.pdf) format to the addressee(s) of this report via electronic mail.

Data and information attached with the project plans are:

A. None

Data and Information included in the Information Handout provided to the bidders and Contractors are:

A. Geotechnical Design Report for EA 01-262001, dated 12/30/2009.

Data and Information available for inspection at the District Office:

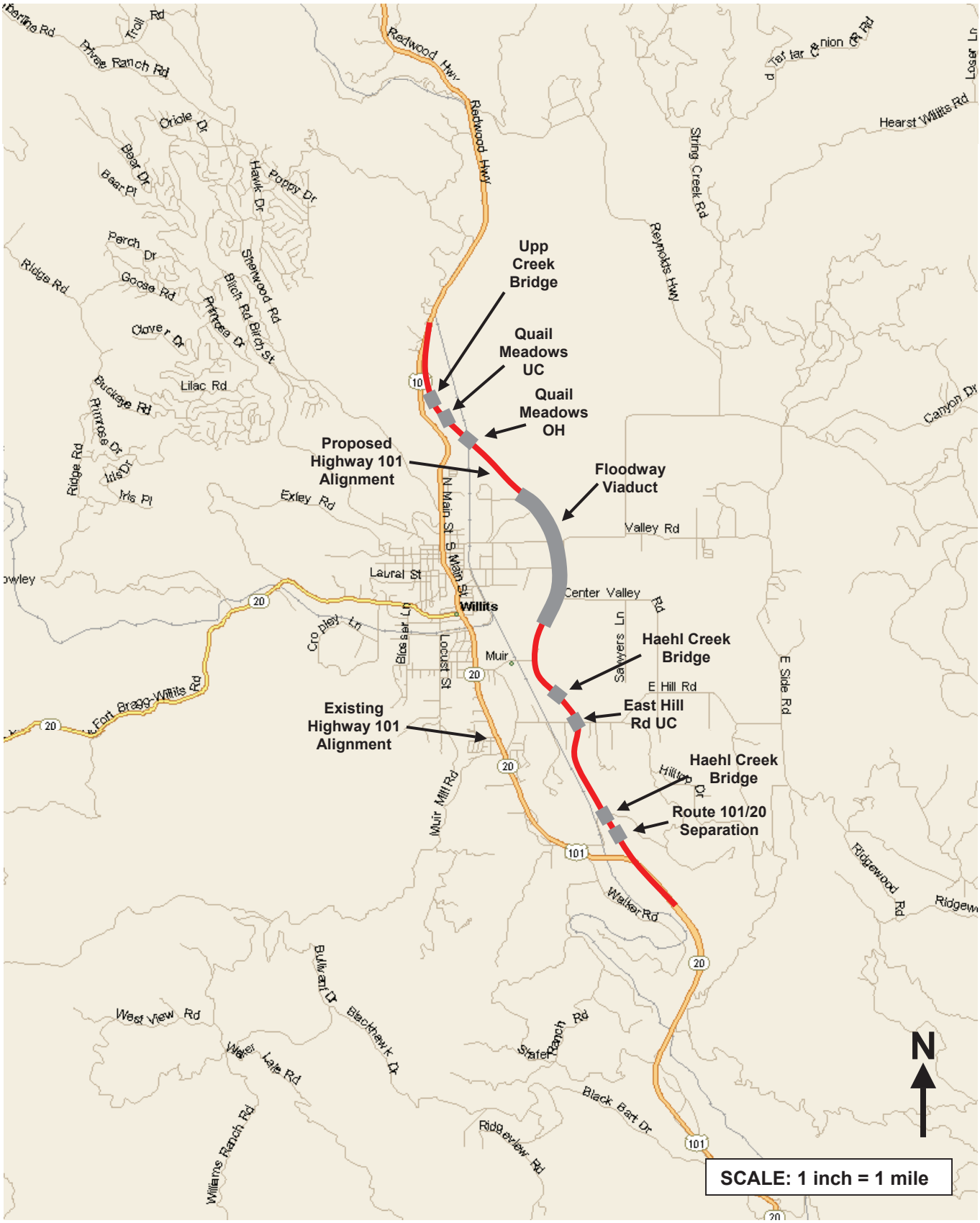
A. None

Data and Information available for inspection at the Transportation Laboratory are:

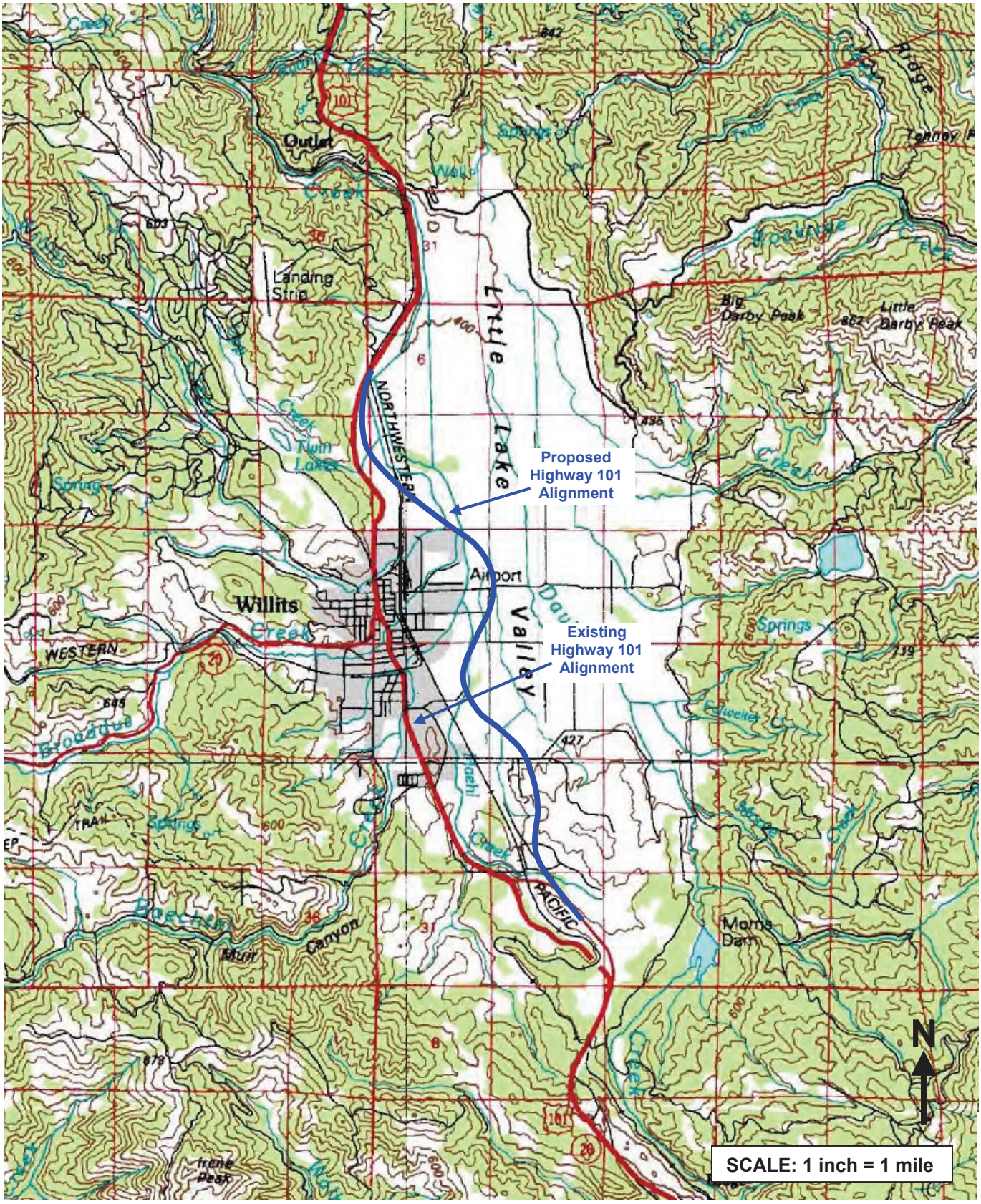
A. None

APPENDIX A

Figure 1	Location Map
Figure 2	Topographic Map
Figure 3	Geologic Map
Figure 4	Seismic Map
Figures 5 –14	Boring Location Maps
Figure 15	Wick Drain Layout & Embankment Instrumentation



CALTRANS Division of Engineering Services Geotechnical Services Geotechnical Design -North	EA: 01-262001 Date: December 2009	**Location Map**
	01-MEN-101; KP R69.4/78.9 (PM R43.1/49.0) GEOTECHNICAL DESIGN REPORT	Figure 1



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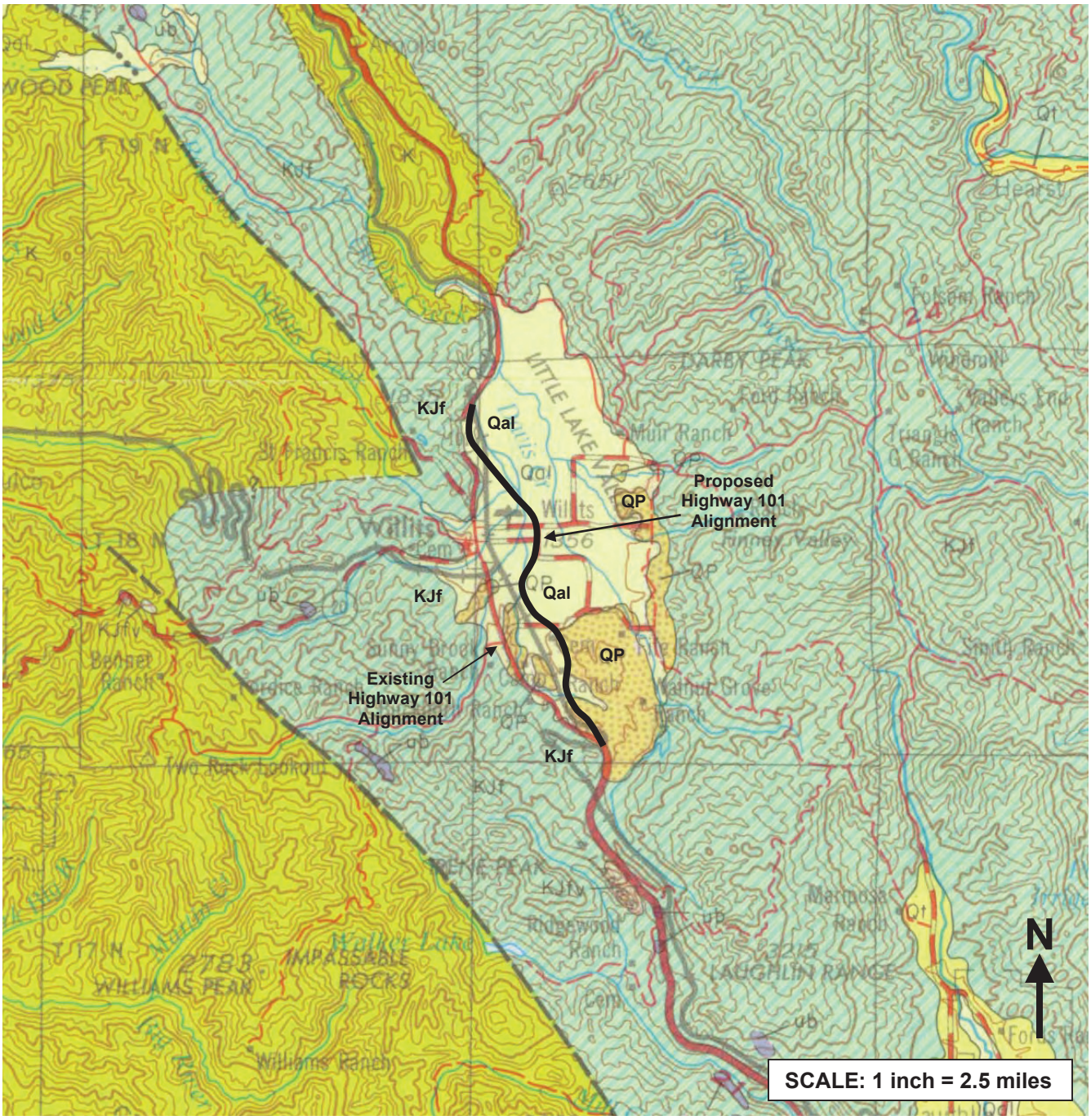
Date: December 2009

Topographic Map

01-MEN-101; KP R69.4/78.9 (PM R43.1/49.0)
GEOTECHNICAL DESIGN REPORT

Figure 2



LEGEND

Qal	Recent Alluvium, recent breccia, conglomerate and sand of C.A. Anderson, valley fill.
QP	Plio-Pleistocene nonmarine sedimentary deposits; Cache Formation – laucustrine and fluvial deposits, unnamed Plio-Pleistocene deposits bordering alleviated valleys in Mendocino County.
KJf	Franciscan Formation – sandstone, shale, chert, and conglomerate, locally small areas of greenstone, limestone, basalt, glaucophane, schist, and related metamorphic rocks.

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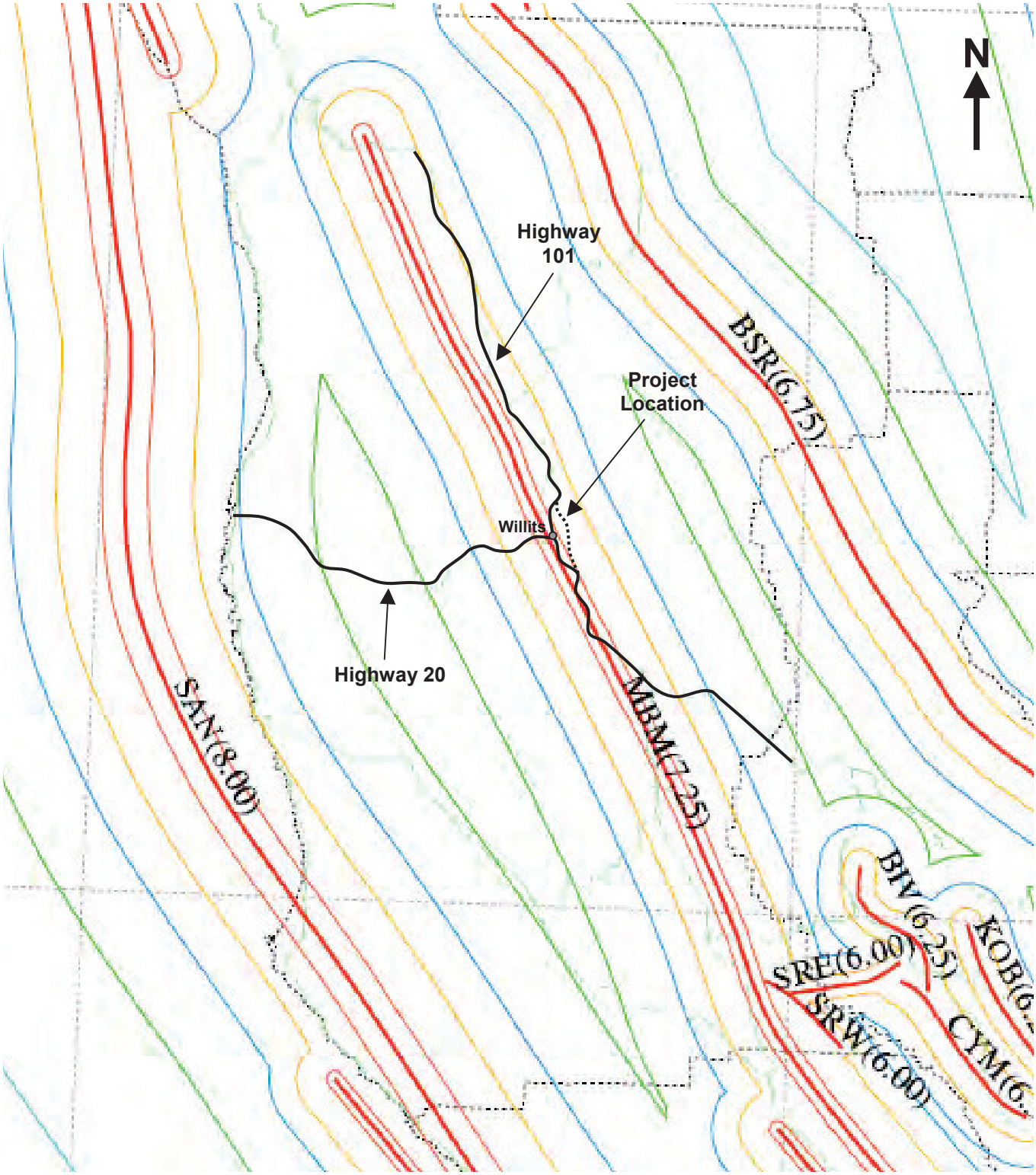
Geologic Map

01-MEN-101; KP R69.4/78.9 (PM R43.1/49.0)
GEOTECHNICAL DESIGN REPORT

Figure 3



MBM: Maacama-Brush Fault – Strike Slip – Mw = 7.25
SAN: San Andreas/N Fault – Strike Slip – Mw = 8.00
BSR: Bartlett Springs Round Valley – Strike Slip – Mw = 6.75

SCALE: 1 inch = 12 miles

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Seismic Map

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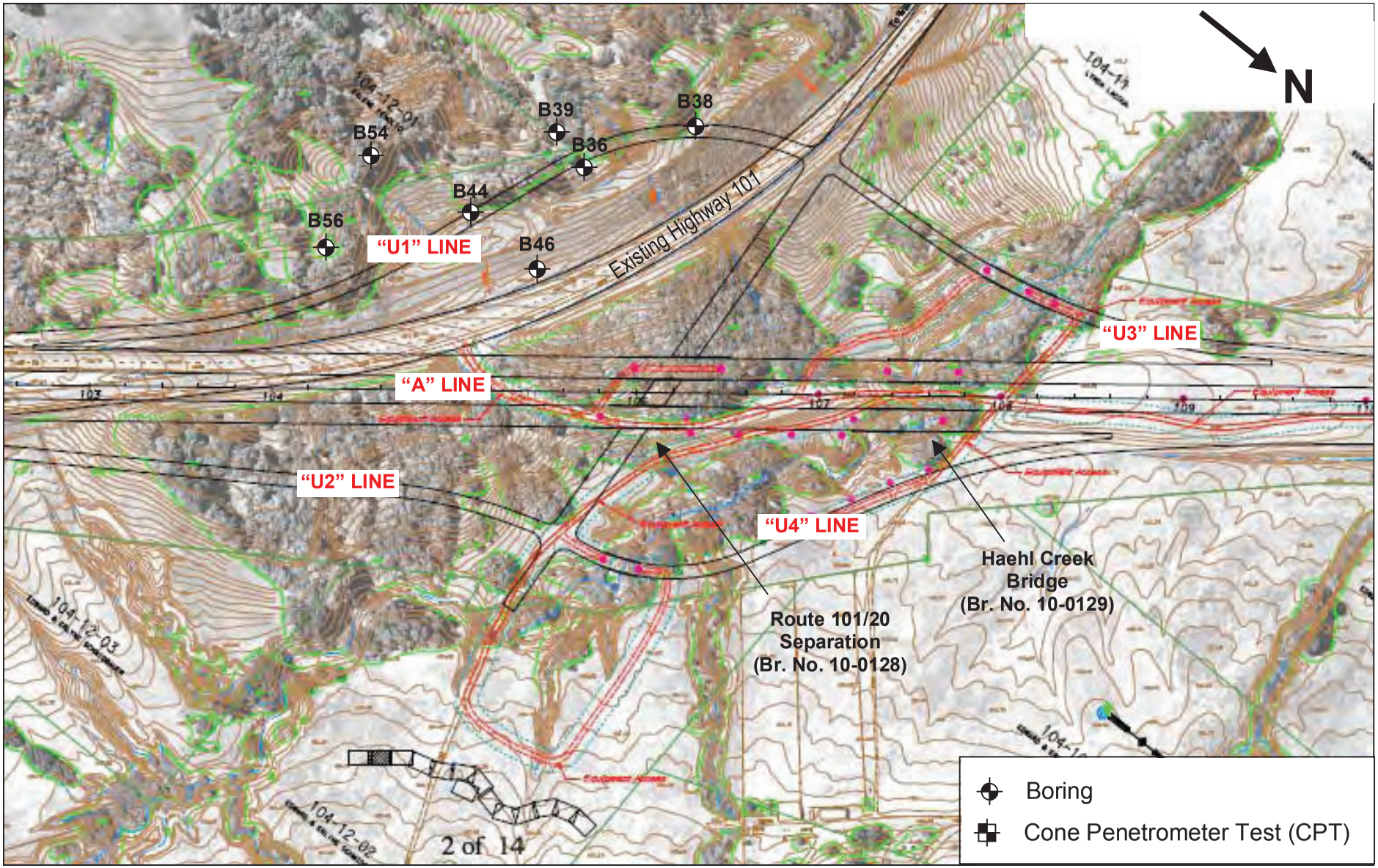
GEOTECHNICAL DESIGN REPORT

Figure 4



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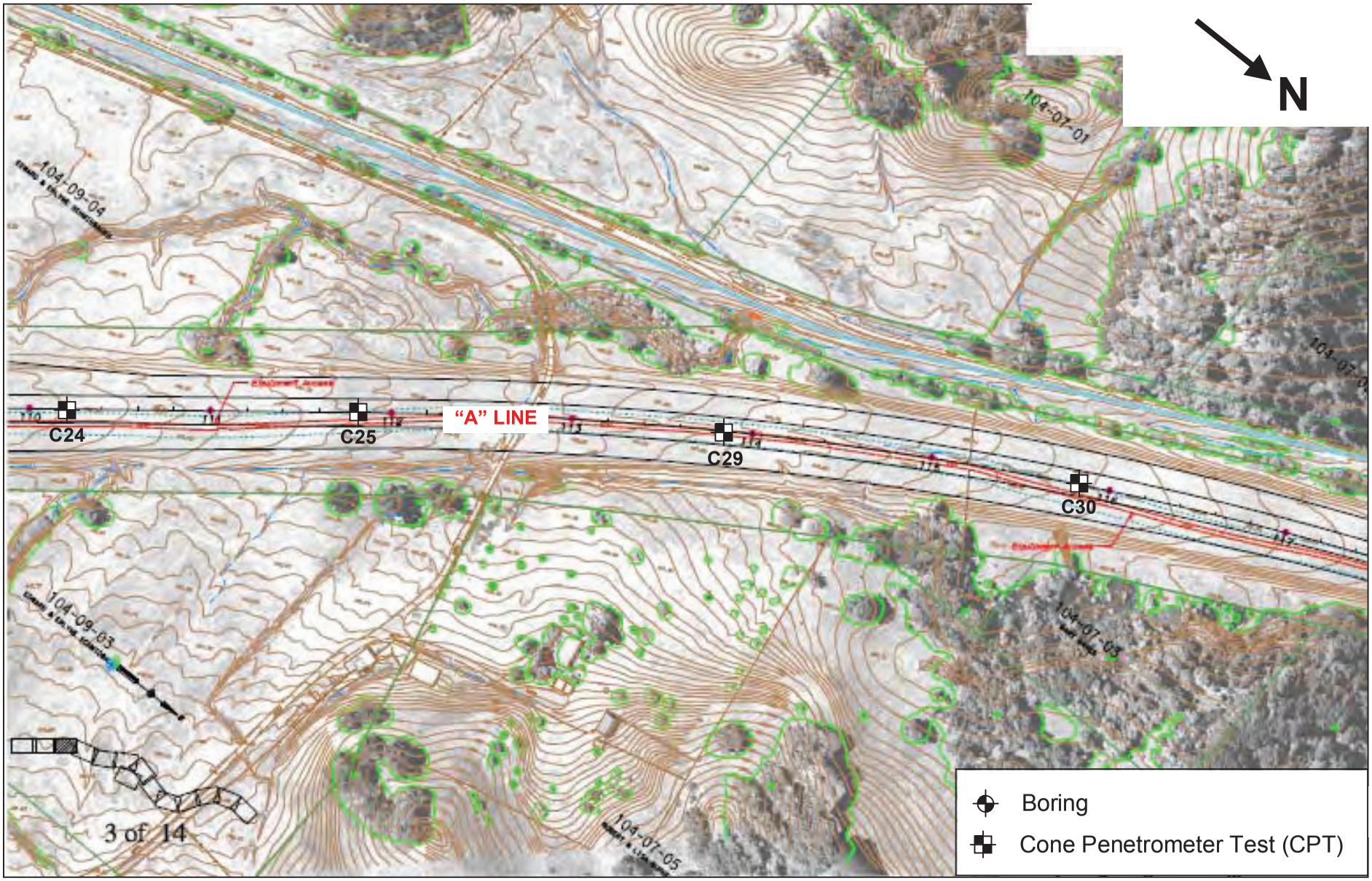
BORING LOCATION MAP

Figure No. 5

01-MEN-101; KP R69.4/78.9 (PM R43.1/49.0)
GEOTECHNICAL DESIGN REPORT



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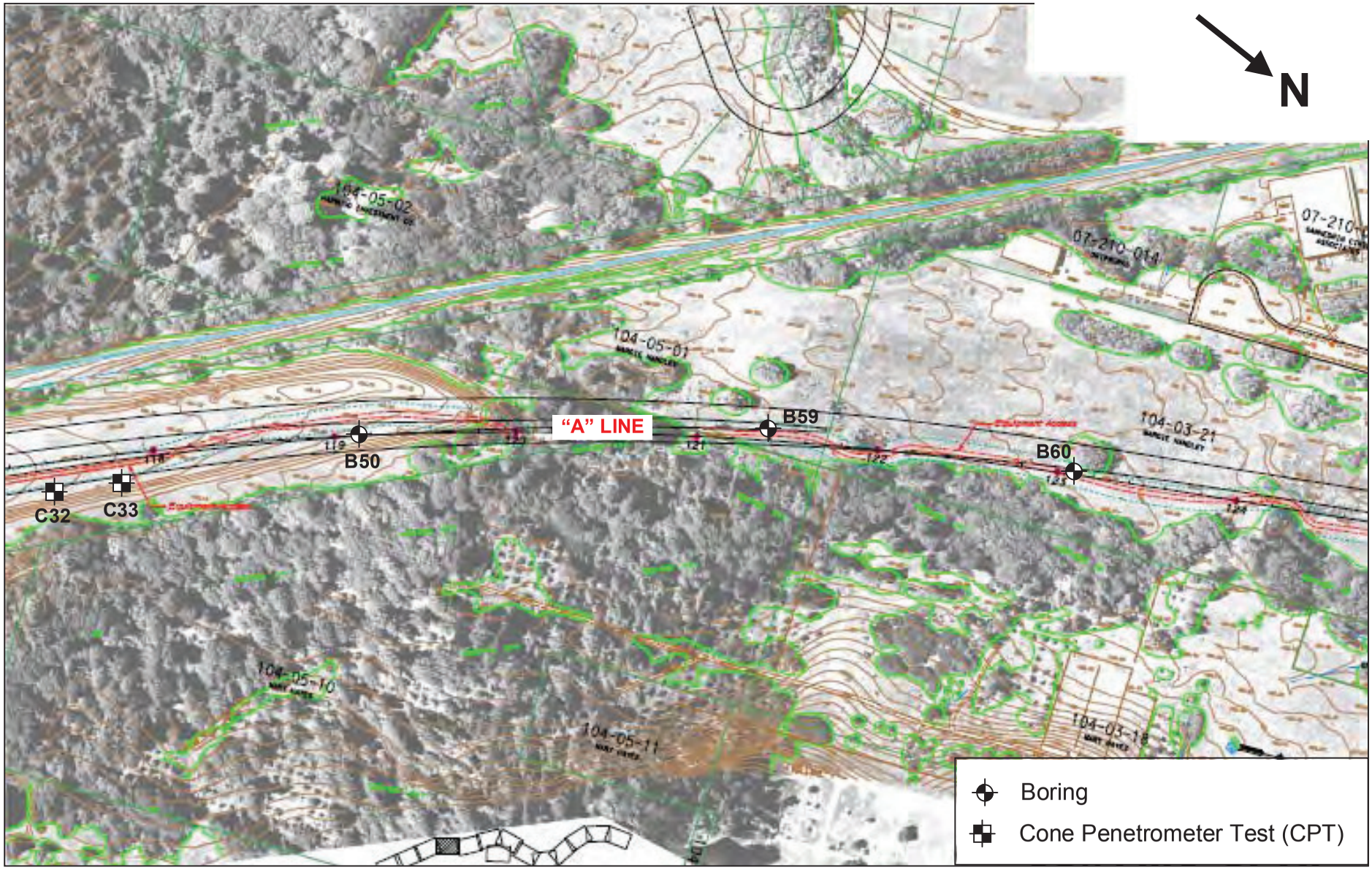
BORING LOCATION MAP

Figure No. 6

01-MEN-101; KP R69.4/78.9 (PM R43.1/49.0)
GEOTECHNICAL DESIGN REPORT



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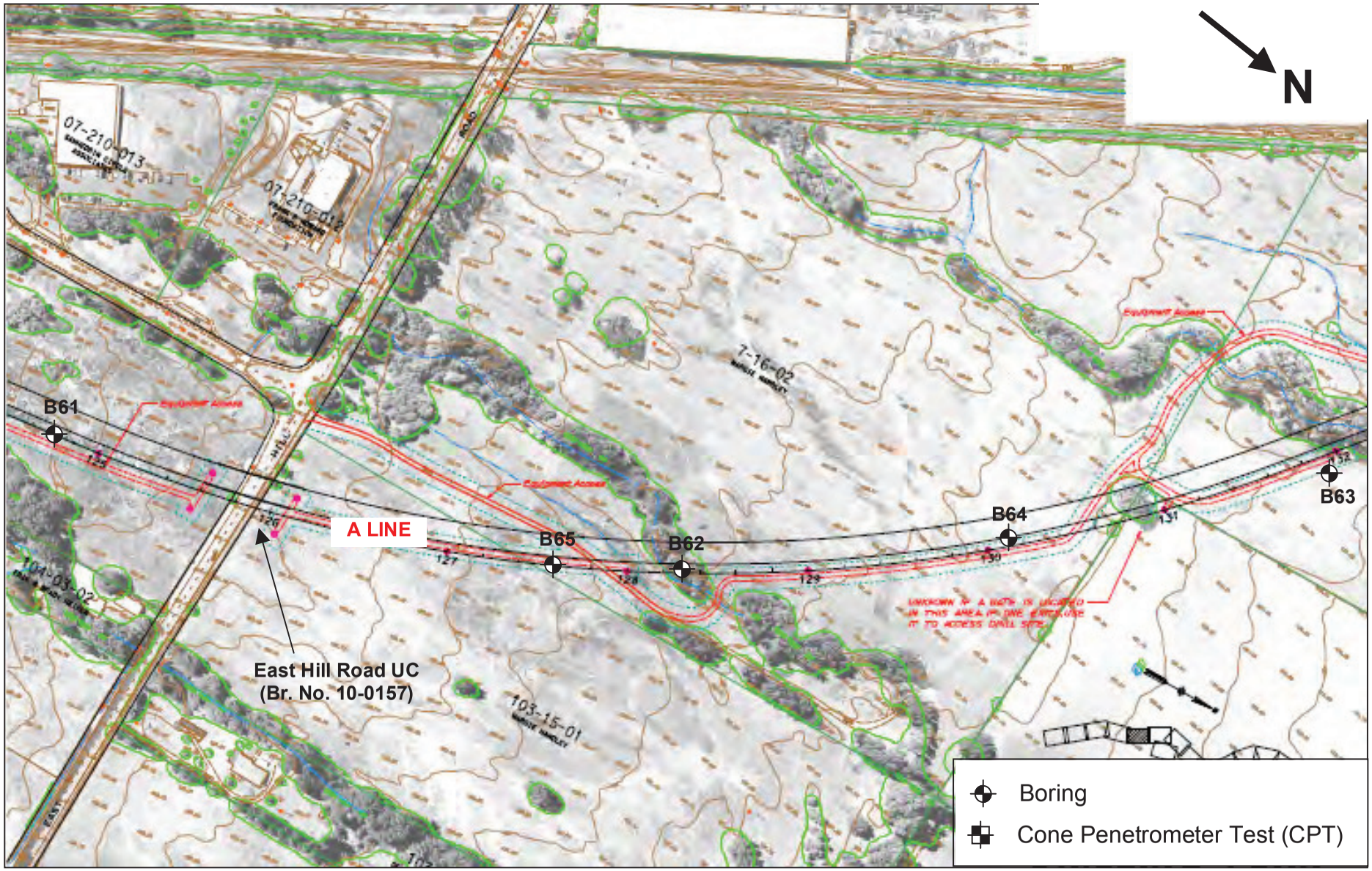
BORING LOCATION MAP

Figure No. 7

01-MEN-101; KP R69.4/78.9 (PM R43.1/49.0)
GEOTECHNICAL DESIGN REPORT



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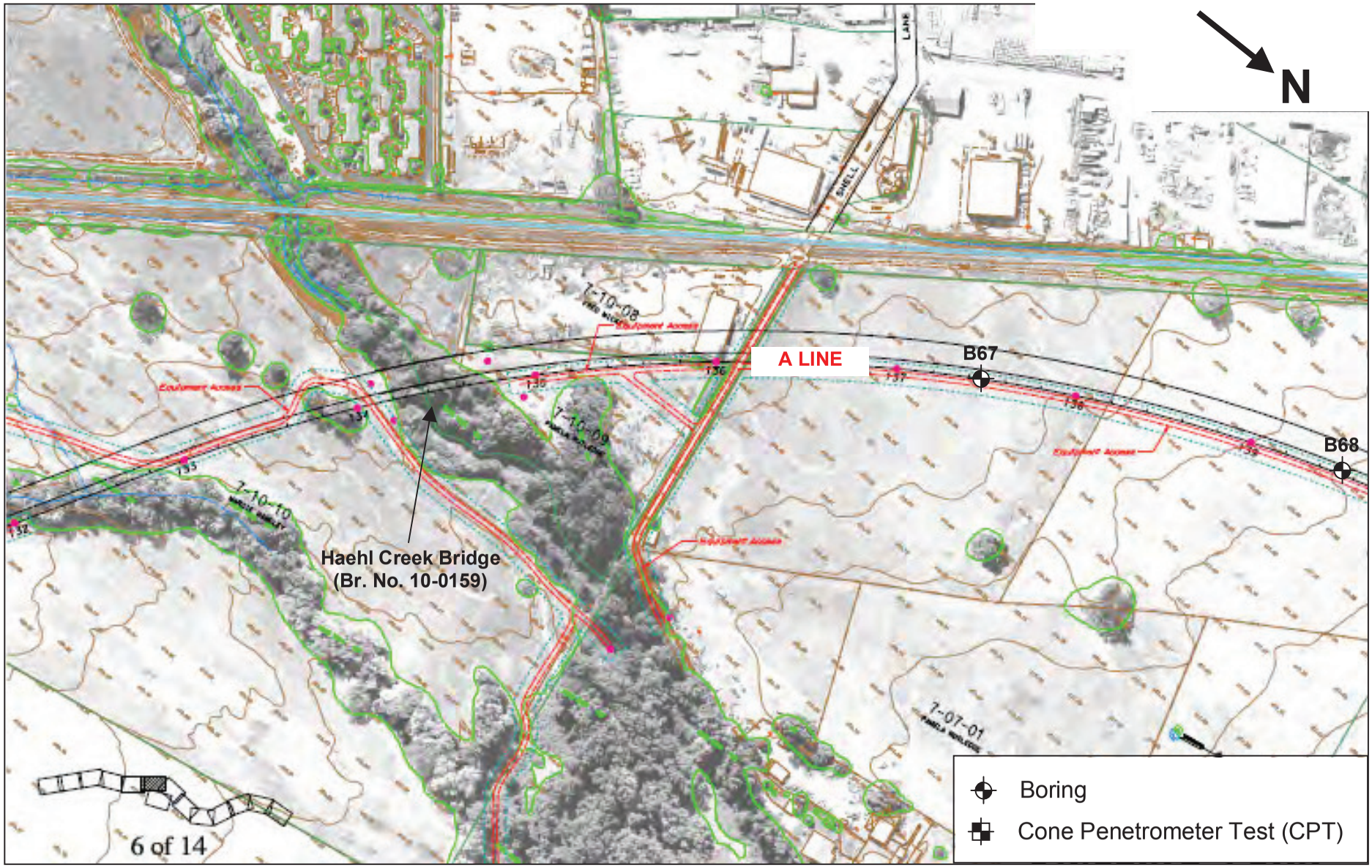
BORING LOCATION MAP

Figure No. 8

01-MEN-101; KP R69.4/78.9 (PM R43.1/49.0)
GEOTECHNICAL DESIGN REPORT



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BORING LOCATION MAP

Figure No. 9

01-MEN-101; KP R69.4/78.9 (PM R43.1/49.0)
GEOTECHNICAL DESIGN REPORT

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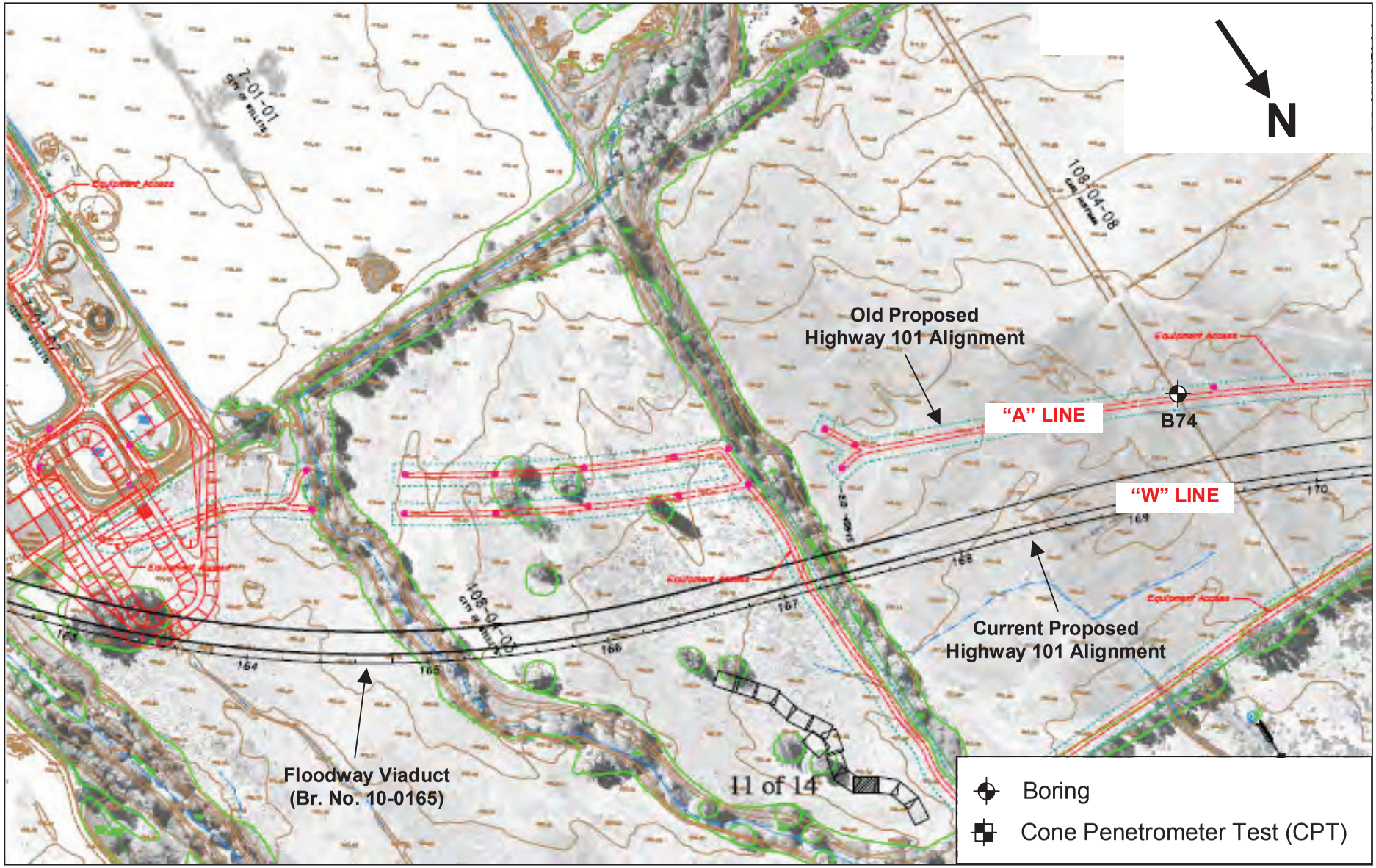
BORING LOCATION MAP

Figure No. 10

01-MEN-101; KP R69.4/78.9 (PM R43.1/49.0)
GEOTECHNICAL DESIGN REPORT



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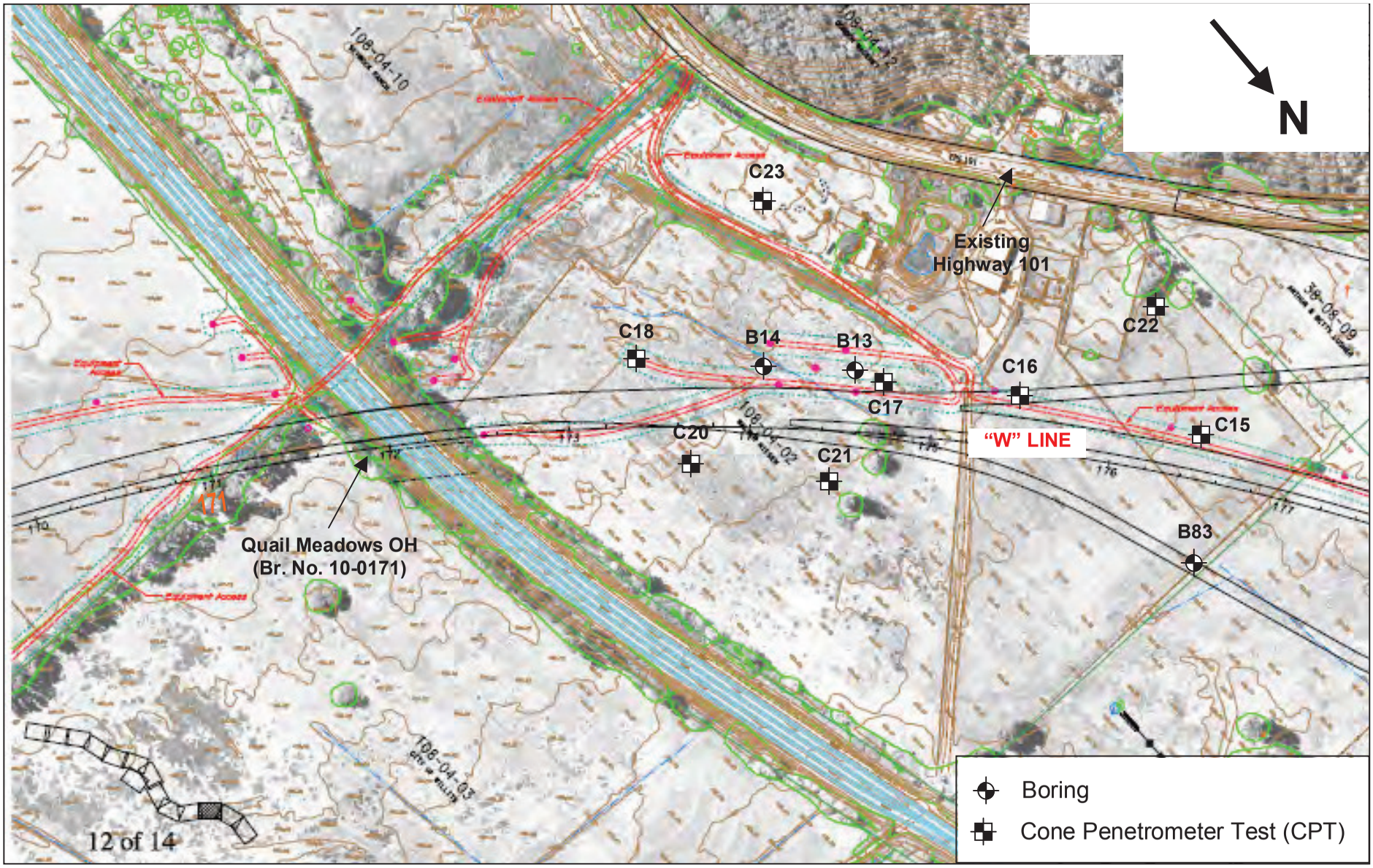
BORING LOCATION MAP

Figure No. 11

01-MEN-101; KP R69.4/78.9 (PM R43.1/49.0)
GEOTECHNICAL DESIGN REPORT



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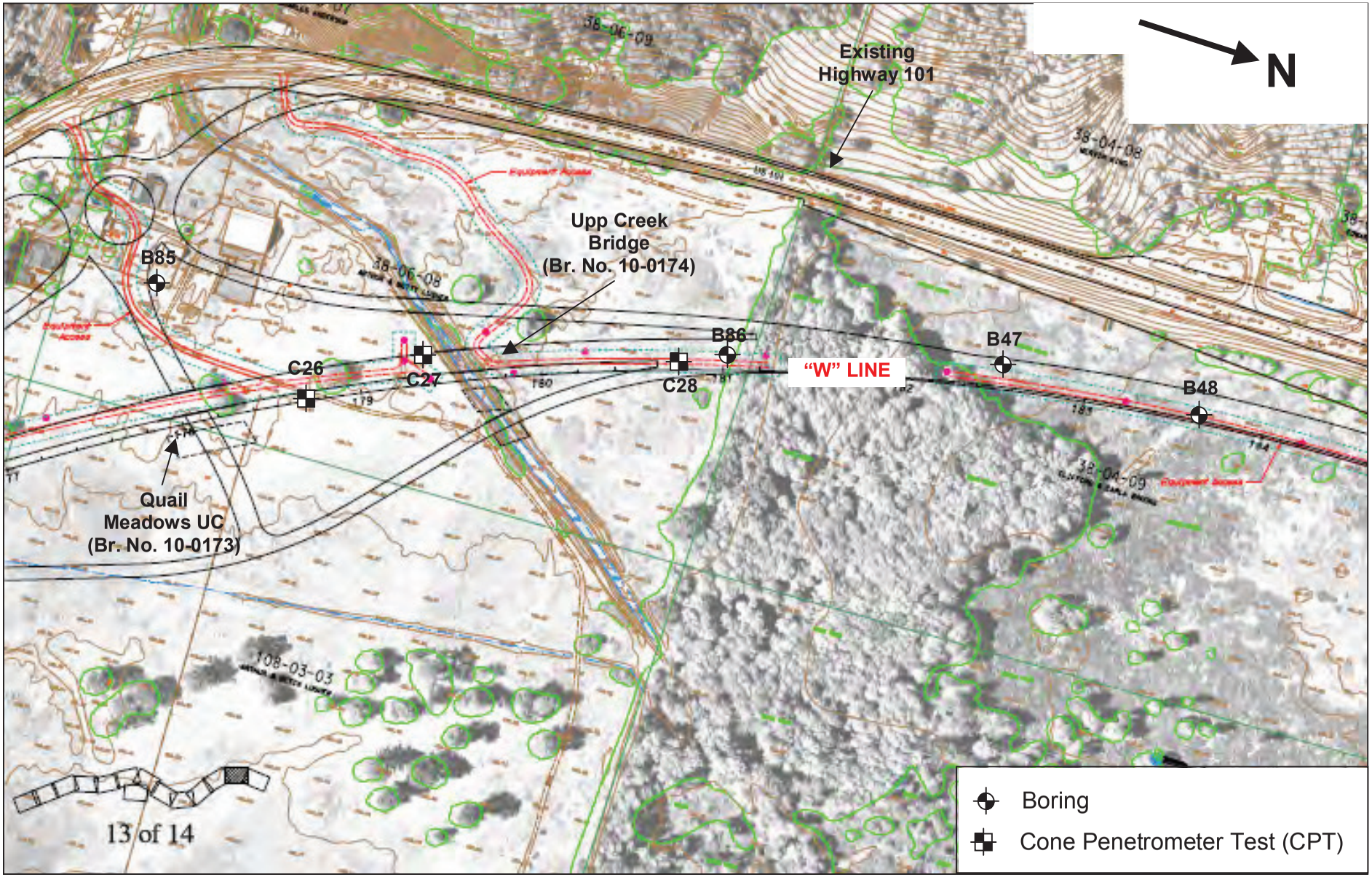
BORING LOCATION MAP

Figure No. 12

01-MEN-101; KP R69.4/78.9 (PM R43.1/49.0)
GEOTECHNICAL DESIGN REPORT



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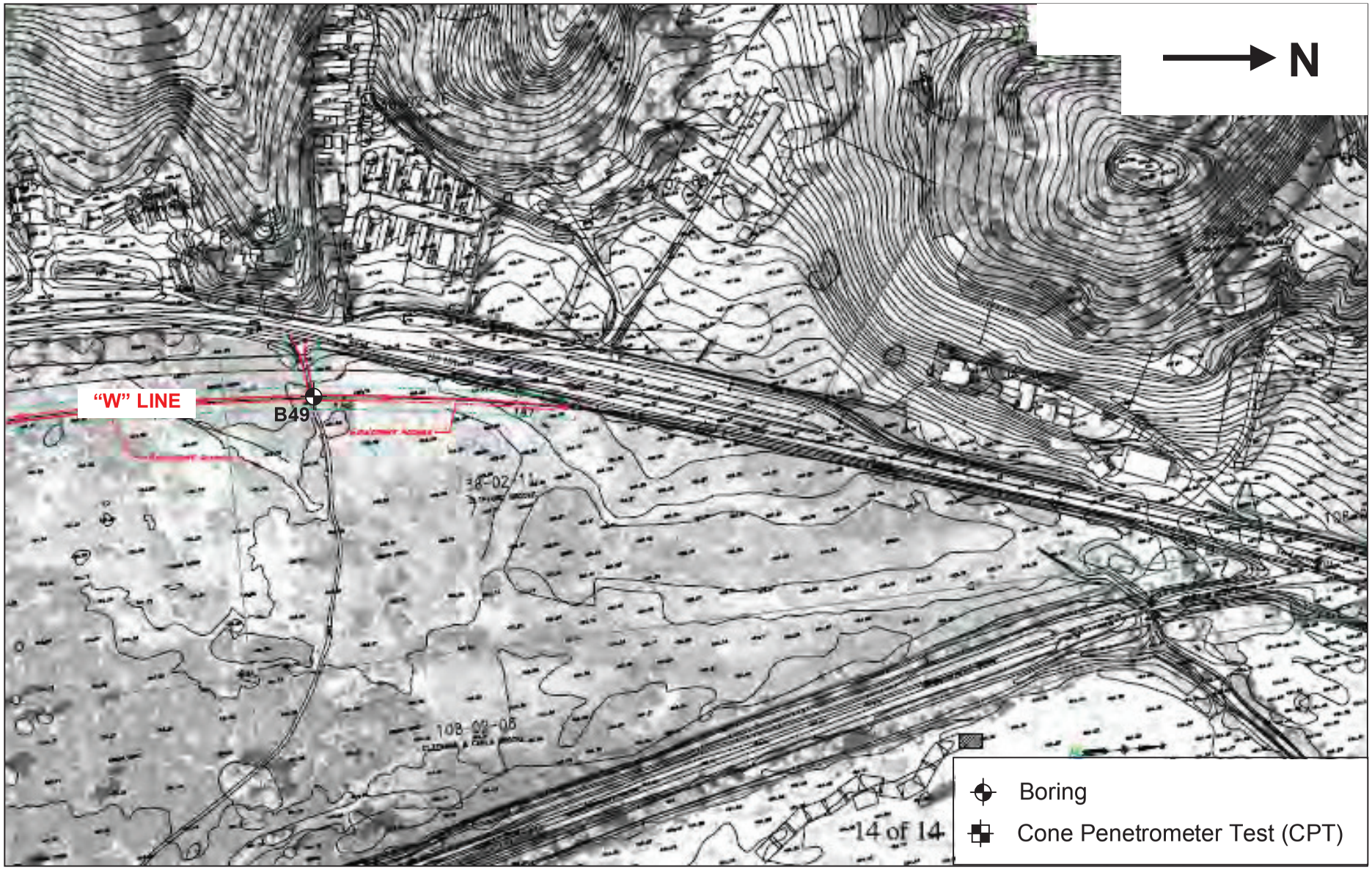
BORING LOCATION MAP

Figure No. 13

01-MEN-101; KP R69.4/78.9 (PM R43.1/49.0)
GEOTECHNICAL DESIGN REPORT



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EA: 01-262001

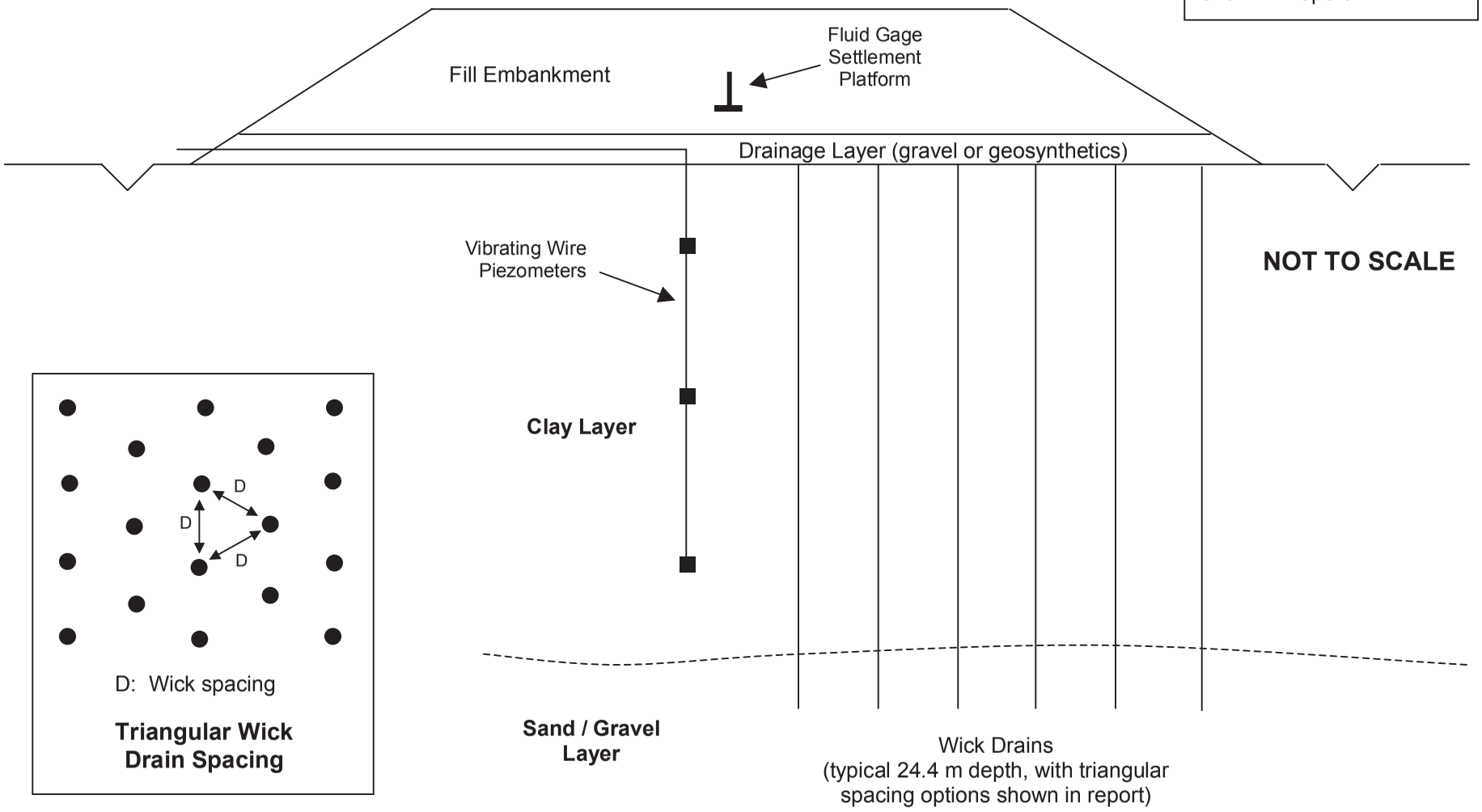
Date: December 2009

BORING LOCATION MAP

Figure No. 14

01-MEN-101; KP R69.4/78.9 (PM R43.1/49.0)
GEOTECHNICAL DESIGN REPORT

Location of settlement platforms and location and depths of piezometers are shown in report.



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EA: 01-262001

Date: December 2009

WICK DRAIN LAYOUT AND EMBANKMENT INSTRUMENTATION

Figure 15

01-MEN-101; KP R69.4/78.9 (PM R43.1/49.0)
GEOTECHNICAL DESIGN REPORT

APPENDIX B

Boring Logs

GROUP SYMBOLS AND NAMES

Graphic / Symbol	Group Names
GW	Well-graded GRAVEL Well-graded GRAVEL with SAND
GP	Poorly graded GRAVEL Poorly graded GRAVEL with SAND
GW-GM	Well-graded GRAVEL with SILT Well-graded GRAVEL with SILT and SAND
GW-GC	Well-graded GRAVEL with CLAY (or SILTY CLAY) Well-graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)
GP-GM	Poorly graded GRAVEL with SILT Poorly graded GRAVEL with SILT and SAND
GP-GC	Poorly graded GRAVEL with CLAY (or SILTY CLAY) Poorly graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)
GM	SILTY GRAVEL SILTY GRAVEL with SAND
GC	CLAYEY GRAVEL CLAYEY GRAVEL with SAND
GC-GM	SILTY, CLAYEY GRAVEL SILTY, CLAYEY GRAVEL with SAND
SW	Well-graded SAND Well-graded SAND with GRAVEL
SP	Poorly graded SAND Poorly graded SAND with GRAVEL
SW-SM	Well-graded SAND with SILT Well-graded SAND with SILT and GRAVEL
SW-SC	Well-graded SAND with CLAY (or SILTY CLAY) Well-graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)
SP-SM	Poorly graded SAND with SILT Poorly graded SAND with SILT and GRAVEL
SP-SC	Poorly graded SAND with CLAY (or SILTY CLAY) Poorly graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)
SM	SILTY SAND SILTY SAND with GRAVEL
SC	CLAYEY SAND CLAYEY SAND with GRAVEL
SC-SM	SILTY, CLAYEY SAND SILTY, CLAYEY SAND with GRAVEL
PT	PEAT
	COBBLES COBBLES and BOULDERS BOULDERS

Graphic / Symbol	Group Names
CL	Lean CLAY Lean CLAY with SAND Lean CLAY with GRAVEL SANDY lean CLAY SANDY lean CLAY with GRAVEL GRAVELLY lean CLAY GRAVELLY lean CLAY with SAND
CL-ML	SILTY CLAY SILTY CLAY with SAND SILTY CLAY with GRAVEL SANDY SILTY CLAY SANDY SILTY CLAY with GRAVEL GRAVELLY SILTY CLAY GRAVELLY SILTY CLAY with SAND
ML	SILT SILT with SAND SILT with GRAVEL SANDY SILT SANDY SILT with GRAVEL GRAVELLY SILT GRAVELLY SILT with SAND
OL	ORGANIC lean CLAY ORGANIC lean CLAY with SAND ORGANIC lean CLAY with GRAVEL SANDY ORGANIC lean CLAY SANDY ORGANIC lean CLAY with GRAVEL GRAVELLY ORGANIC lean CLAY GRAVELLY ORGANIC lean CLAY with SAND
OL	ORGANIC SILT ORGANIC SILT with SAND ORGANIC SILT with GRAVEL SANDY ORGANIC SILT SANDY ORGANIC SILT with GRAVEL GRAVELLY ORGANIC SILT GRAVELLY ORGANIC SILT with SAND
CH	Fat CLAY Fat CLAY with SAND Fat CLAY with GRAVEL SANDY fat CLAY SANDY fat CLAY with GRAVEL GRAVELLY fat CLAY GRAVELLY fat CLAY with SAND
MH	Elastic SILT Elastic SILT with SAND Elastic SILT with GRAVEL SANDY elastic SILT SANDY elastic SILT with GRAVEL GRAVELLY elastic SILT GRAVELLY elastic SILT with SAND
OH	ORGANIC fat CLAY ORGANIC fat CLAY with SAND ORGANIC fat CLAY with GRAVEL SANDY ORGANIC fat CLAY SANDY ORGANIC fat CLAY with GRAVEL GRAVELLY ORGANIC fat CLAY GRAVELLY ORGANIC fat CLAY with SAND
OH	ORGANIC elastic SILT ORGANIC elastic SILT with SAND ORGANIC elastic SILT with GRAVEL SANDY elastic ELASTIC SILT SANDY ORGANIC elastic SILT with GRAVEL GRAVELLY ORGANIC elastic SILT GRAVELLY ORGANIC elastic SILT with SAND
OL/OH	ORGANIC SOIL ORGANIC SOIL with SAND ORGANIC SOIL with GRAVEL SANDY ORGANIC SOIL SANDY ORGANIC SOIL with GRAVEL GRAVELLY ORGANIC SOIL GRAVELLY ORGANIC SOIL with SAND

FIELD AND LABORATORY TESTS

C	Consolidation (ASTM D 2435-04)
CL	Collapse Potential (ASTM D 5333-03)
CP	Compaction Curve (CTM 216 - 06)
CR	Corrosion, Sulfates, Chlorides (CTM 643 - 99; CTM 417 - 06; CTM 422 - 06)
CU	Consolidated Undrained Triaxial (ASTM D 4767-02)
DS	Direct Shear (ASTM D 3080-04)
EI	Expansion Index (ASTM D 4829-03)
M	Moisture Content (ASTM D 2216-05)
OC	Organic Content (ASTM D 2974-07)
P	Permeability (CTM 220 - 05)
PA	Particle Size Analysis (ASTM D 422-63 [2002])
PI	Liquid Limit, Plastic Limit, Plasticity Index (AASHTO T 89-02, AASHTO T 90-00)
PL	Point Load Index (ASTM D 5731-05)
PM	Pressure Meter
PP	Pocket Penetrometer
R	R-Value (CTM 301 - 00)
SE	Sand Equivalent (CTM 217 - 99)
SG	Specific Gravity (AASHTO T 100-06)
SL	Shrinkage Limit (ASTM D 427-04)
SW	Swell Potential (ASTM D 4546-03)
TV	Pocket Torvane
UC	Unconfined Compression - Soil (ASTM D 2166-06) Unconfined Compression - Rock (ASTM D 2938-95)
UU	Unconsolidated Undrained Triaxial (ASTM D 2850-03)
UW	Unit Weight (ASTM D 4767-04)
VS	Vane Shear (AASHTO T 223-96 [2004])

SAMPLER GRAPHIC SYMBOLS

- Standard Penetration Test (SPT)
- Standard California Sampler
- Modified California Sampler
- Shelby Tube
- Piston Sampler
- NX Rock Core
- HQ Rock Core
- Bulk Sample
- Other (see remarks)

DRILLING METHOD SYMBOLS

- Auger Drilling
- Rotary Drilling
- Dynamic Cone or Hand Driven
- Diamond Core

WATER LEVEL SYMBOLS

- First Water Level Reading (during drilling)
- Static Water Level Reading (short-term)
- Static Water Level Reading (long-term)

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE
BORING RECORD LEGEND

DIST.	COUNTY	ROUTE	POSTMILE	EA
01	MEN	101	R43.1/R49.0	01-262001

PROJECT OR BRIDGE NAME
Willits Bypass

BRIDGE NUMBER	PREPARED BY	DATE	SHEET
N/A			1 of 2

CONSISTENCY OF COHESIVE SOILS

Descriptor	Unconfined Compressive Strength (tsf)	Pocket Penetrometer (tsf)	Torvane (tsf)	Field Approximation
Very Soft	< 0.25	< 0.25	< 0.12	Easily penetrated several inches by fist
Soft	0.25 - 0.50	0.25 - 0.50	0.12 - 0.25	Easily penetrated several inches by thumb
Medium Stiff	0.50 - 1.0	0.50 - 1.0	0.25 - 0.50	Can be penetrated several inches by thumb with moderate effort
Stiff	1.0 - 2.0	1.0 - 2.0	0.50 - 1.0	Readily indented by thumb but penetrated only with great effort
Very Stiff	2.0 - 4.0	2.0 - 4.0	1.0 - 2.0	Readily indented by thumbnail
Hard	> 4.0	> 4.0	> 2.0	Indented by thumbnail with difficulty

APPARENT DENSITY OF COHESIONLESS SOILS

Descriptor	SPT N_{60} - Value (blows / foot)
Very Loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

MOISTURE

Descriptor	Criteria
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

PERCENT OR PROPORTION OF SOILS

Descriptor	Criteria
Trace	Particles are present but estimated to be less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

SOIL PARTICLE SIZE

Descriptor		Size
Boulder		> 12 inches
Cobble		3 to 12 inches
Gravel	Coarse	3/4 inch to 3 inches
	Fine	No. 4 Sieve to 3/4 inch
Sand	Coarse	No. 10 Sieve to No. 4 Sieve
	Medium	No. 40 Sieve to No. 10 Sieve
	Fine	No. 200 Sieve to No. 40 Sieve
Silt and Clay		Passing No. 200 Sieve

PLASTICITY OF FINE-GRAINED SOILS

Descriptor	Criteria
Nonplastic	A 1/8-inch thread cannot be rolled at any water content.
Low	The thread can barely be rolled, and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll, and not much time is required to reach the plastic limit; it cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.

CEMENTATION

Descriptor	Criteria
Weak	Crumbles or breaks with handling or little finger pressure.
Moderate	Crumbles or breaks with considerable finger pressure.
Strong	Will not crumble or break with finger pressure.

NOTE: This legend sheet provides descriptors and associated criteria for required soil description components only. Refer to Caltrans Soil and Rock Logging, Classification, and Presentation Manual (July 2007), Section 2, for tables of additional soil description components and discussion of soil description and identification.

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
T. Alderman	**8-24-04**	**8-25-04**	**NAD83**	**B13**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			**49' Lt Sta 174+59 W**	**406 m MSL**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			**Mobile B80**	**102 mm**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4"), Punch Core			**Safety semi-automatic, 30-inch drop**	**56%**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING / AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Bentonite seal			**Not measured** / **1.8 m on 8-26-04**	**34.0 m**

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method / Casing Depth	Remarks
	0.0		Lean CLAY (CL); very soft; grayish brown mottled with yellowish brown; wet.		1			100						
	0.5													
405.00	1.0													
	1.5				2	1 1 1	2	100						PP = 5 kPa
404.00	2.0				3			100		26				PP = 5 kPa
	2.5													
403.00	3.0		Becomes stiff to very stiff.											PP = 192 kPa
			Lean CLAY with SAND (CL); very soft; grayish brown; wet.		4	3 2 2	4	100						
	3.5				5			100						PP = 5 kPa UU = 21 kPa
402.00	4.0									29	15.6			
			Lean CLAY (CL); stiff; gray mottled with yellowish brown; wet.											
	4.5				6	3 5 5	10	100						
401.00	5.0				7			100						PP = 96 to 144 kPa
	5.5		SANDY lean CLAY with GRAVEL (CL); very soft to soft; dark gray mottled with dark brown; wet.											
400.00	6.0				8	2 4 4	8	100						PP = 5 kPa
	6.5				9			100		21				PP = 5 to 48 kPa
399.00	7.0													
	7.5													
			Lean CLAY (CL); stiff; gray mottled with brown; wet.		10	1 3 3	6	100						PP = 120 to 192 kPa
398.00	8.0		GRAVELLY lean CLAY (CL); very soft to soft; yellowish brown; wet; subrounded to rounded GRAVEL.		11			100						PP = 5 to 48 kPa
	8.5		Lean CLAY (CL); very soft to soft; dark gray; wet.											
397.00	9.0				12	1 2 2	4	100						PP = 5 to 48 kPa
	9.5													
	10.0		GRAVELLY lean CLAY (CL); very soft to soft; dark gray; wet.		13			100		29	14.9			PP = 5 to 48 kPa UU = 24 kPa

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				**B13**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**MEN**	**101**	**R43.1/R49.0**	**01-262001**
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**B. Barnes**		**11-1-09**	**1 of 3**

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ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method	Casing Depth	Remarks
	10.0		GRAVELLY lean CLAY (CL) *(continued)*.		13			100							
	10.5														
395.00	11.0			X	14	7 3 3	6	100							
			Lean CLAY with SAND (CL); soft; dark gray; wet.		15			100		27	16.0				UU = 38 kPa
	11.5														
394.00	12.0			X	16	3 2 5	7	100							
	12.5		GRAVELLY lean CLAY (CL); soft to medium stiff; dark gray; wet.		17			100							
393.00	13.0														
	13.5														
				X	18	2 3 4	7	100							PP = 72 kPa
392.00	14.0				19			100		30	14.8				PP = 48 to 72 kPa UC = 77 kPa UU = 38 kPa
	14.5														
391.00	15.0														
			Lean CLAY (CL); stiff to very stiff; dark gray; wet.	X	20	8 5 4	9	100							
	15.5				21			100							PP = 120 to 240 kPa
390.00	16.0														
	16.5														
389.00	17.0			X	22	1 3 3	6	100							
			Becomes medium stiff.		23			100		28	15.1				PP = 48 to 96 kPa UC = 77 kPa UU = 59 kPa
388.00	17.5														
	18.0														
	18.5		Becomes soft to medium stiff.	X	24	3 4 4	8	100							PP = 24 to 72 kPa
387.00	19.0				25			100							PP = 48 to 72 kPa
	19.5		CLAYEY GRAVEL with SAND (GC); medium dense; dark gray; wet; angular to subangular GRAVEL.												
386.00	20.0			X	26	6 6 7	13	0							
	20.5				27			100							PP = 120 kPa
385.00	21.0		SANDY lean CLAY with GRAVEL (CL); stiff; dark gray; wet.												
	21.5			X	28	7 11 13	24	100							
	22.0				29			100							PP = 96 to 192 kPa

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				**B13**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**MEN**	**101**	**R43.1/R49.0**	**01-262001**
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**B. Barnes**		**11-1-09**	**2 of 3**

CALTRANS BORING RECORD MET+ENG FIXED WILLITS_BYPASS.GPJ CALTRANS LIBRARY 040808.GLB 12/17/09

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method / Casing Depth	Remarks
	22.5		SANDY lean CLAY with GRAVEL (CL) *(continued)*.		29			100		15				
383.00	23.0				30	6 12 12	24	100						
	23.5		Lean CLAY with SAND (CL); medium stiff to stiff; dark gray; wet; fine SAND.		31			100						PP = 72 to 120 kPa
382.00	24.0													
	24.5				32	6 7 10	17	100						PP = 72 to 120 kPa
381.00	25.0		GRAVELLY lean CLAY with SAND (CL); stiff to very stiff; dark gray; wet; subangular to subrounded GRAVEL.		33			100		12				PP = 96 to 288 kPa
	25.5													
380.00	26.0				34	17 10 18	28	100						PP = 96 to 144 kPa
	26.5		Lean CLAY (CL); stiff to very stiff; dark gray; wet.		35			100						PP = 96 to 144 kPa
379.00	27.0													
	27.5				36	5 13 22	35	100						PP = 216 kPa
378.00	28.0		Lean CLAY with GRAVEL (CL); very stiff; dark gray; wet; fine, subangular to subrounded GRAVEL.		37			100						PP = 144 to 240 kPa
	28.5													
377.00	29.0													
	29.5													
376.00	30.0													
	30.5				38	8 13 18	31	100						
375.00	31.0				39			100						PP = 216 to 288 kPa
	31.5													
374.00	32.0													
	32.5													
373.00	33.0													
	33.5				40	7 12 16	28	100		14				PP = 264 to 312 kPa
	34.0		Bottom of borehole at 34.0 m bgs											

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REPORT TITLE **BORING RECORD**					HOLE ID **B13**
DIST. **01**	COUNTY **MEN**	ROUTE **101**	POSTMILE **R43.1/R49.0**		EA **01-262001**
PROJECT OR BRIDGE NAME **Willits Bypass**					
BRIDGE NUMBER **N/A**	PREPARED BY **B. Barnes**		DATE **11-1-09**	SHEET **3 of 3**	

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
T. Alderman	8-26-04	8-31-04	NAD83	B14
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			52' Lt Sta 174+08 W	406 m MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			Mobile B80	102 mm
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4"), Punch Core			Safety semi-automatic, 30-inch drop	56%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING / AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Bentonite seal			Not measured / 2.0 m on 8-31-04	40.1 m

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method / Casing Depth	Remarks
	0.0		Lean CLAY (CL); medium stiff to stiff; yellowish red mottled with gray; moist.		1			100						
405.31	0.5													
	1.0													
	1.5				2	2 2 4	6	100						PP = 96 to 144 kPa
404.31	2.0													
	2.5				3			100		29	16.8			PP = 48 to 72 kPa UU = 17 kPa
403.31	3.0				4	3 6 6	12	100		23	16.7			
	3.5				5			100						PP = 48 to 72 kPa UU = 48 kPa
402.31	4.0													
	4.5				6	1 2 3	5	100						
401.31	5.0				7			100		30	15.2			PP = 48 to 96 kPa UU = 24 kPa
	5.5													
400.31	6.0		Lean CLAY with GRAVEL (CL); very soft to soft; brown; wet; fine GRAVEL.		8	1 2 4	6	100		13	17.3			PP = 24 to 48 kPa
	6.5				9			100		19				PP = 5 to 24 kPa UU = 24 kPa
399.31	7.0		CLAYEY SAND with GRAVEL (SC); loose; brown; wet; coarse to fine, subrounded to rounded GRAVEL.											
	7.5				10	1 2 2	4	100						PP = 48 to 72 kPa
398.31	8.0		Lean CLAY (CL); very soft to soft; dark gray; wet.		11			100		28	16.2			UU = 24 kPa
	8.5													
397.31	9.0				12	2 2 3	5	100						PP = 5 to 24 kPa
	9.5				13			100		27	16.0			PP = 5 to 24 kPa UU = 21 kPa
	10.0													

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REPORT TITLE				HOLE ID
BORING RECORD				B14
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	MEN	101	R43.1/R49.0	01-262001
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	B. Barnes		11-1-09	1 of 4

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ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method / Casing Depth	Remarks
	10.0		Lean CLAY (CL) *(continued)*.		13			100						
	10.5													
395.31	11.0				14	1 3 3	6	100						
	11.5				15			100						PP = 48 kPa
			SANDY lean CLAY with GRAVEL (CL); soft to medium stiff; dark gray; wet.											
394.31	12.0				16	7 6 5	11	100		17				
	12.5													
393.31	13.0				17			100		35 18	16.8			PP = 24 to 96 kPa UU = 76 kPa
			Lean CLAY (CL); very soft to soft; dark gray; wet.											
	13.5													
392.31	14.0				18	1 2 1	3	100		31				
	14.5				19			100		19 29	17.1 16.0			PP = 24 to 384 kPa UC = 48 kPa UU = 96 kPa
			SANDY lean CLAY (CL); medium stiff; dark gray; wet.											
391.31	15.0				20	4 4 17	21	100						PP = 72 kPa
	15.5		GRAVELLY lean CLAY (CL); stiff; dark gray; wet; coarse to fine, subangular to subrounded GRAVEL.		21			100						
390.31	16.0		Lean CLAY (CL); soft to medium stiff; dark gray; moist.											
	16.5													
389.31	17.0				22	3 4 5	9	100						PP = 96 kPa
	17.5				23			100						PP = 24 to 96 kPa
388.31	18.0		CLAYEY GRAVEL with SAND (GC); dense; dark gray; wet; subangular to subrounded GRAVEL.											
	18.5				24	17 20 18	38	100						
387.31	19.0				25			100						
	19.5		SANDY lean CLAY (CL); stiff to very stiff; dark gray; wet; fine SAND.											
386.31	20.0				26	4 5 6	11	100						PP = 96 to 216 kPa
			Lean CLAY (CL); medium stiff to stiff; dark gray; moist.											
	20.5				27			100						
385.31	21.0													
	21.5				28	5 6 7	13	100						PP = 72 to 144 kPa
	22.0				29			100						PP = 72 to 192 kPa

(continued)

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REPORT TITLE: **BORING RECORD**
HOLE ID: **B14**

DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**MEN**	**101**	**R43.1/R49.0**	**01-262001**

PROJECT OR BRIDGE NAME: **Willits Bypass**

BRIDGE NUMBER	PREPARED BY	DATE	SHEET
N/A	**B. Barnes**	**11-1-09**	**2 of 4**

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method / Casing Depth	Remarks
			Lean CLAY (CL) *(continued)*.		29			100		26	15.4			UC = 96 kPa
	22.5													
383.31	23.0			X	30	6 8 8	16	100						PP = 96 to 144 kPa
	23.5				31			100						PP = 72 to 168 kPa
382.31	24.0													
	24.5			X	32	5 6 7	13	100						PP = 96 to 120 kPa
381.31	25.0				33			100						PP = 96 kPa
	25.5													
380.31	26.0		GRAVELLY lean CLAY with SAND (CL); stiff; dark gray; moist; coarse to fine, subangular to subrounded GRAVEL.											
	26.5		CLAYEY GRAVEL with SAND (GC); dense; dark gray; wet; coarse to fine, subrounded to rounded GRAVEL.											
379.31	27.0													
	27.5		Lean CLAY (CL); stiff to very stiff; dark gray; moist.	X	34	6 12 20	32	100						PP = 216 to 288 kPa
378.31	28.0				35			100						PP = 144 to 288 kPa
	28.5													
377.31	29.0													
	29.5													
376.31	30.0													
	30.5			X	36	6 6 8	14	100						PP = 96 kPa
375.31	31.0				37			100						PP = 96 to 240 kPa
	31.5													
374.31	32.0													
	32.5													
373.31	33.0		GRAVELLY lean CLAY (CL); hard; dark gray; moist; subrounded GRAVEL.											
	33.5		Lean CLAY (CL); very soft; dark gray and yellowish brown; moist.	X	38	0 0 0	0	100						PP = 5 to 24 kPa
	34.0													

(continued)

CALTRANS BORING RECORD MET+ENG FIXED WILLITS_BYPASS.GPJ CALTRANS LIBRARY 040808.GLB 12/17/09

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REPORT TITLE: **BORING RECORD**
HOLE ID: **B14**

DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**MEN**	**101**	**R43.1/R49.0**	**01-262001**

PROJECT OR BRIDGE NAME: **Willits Bypass**

BRIDGE NUMBER	PREPARED BY	DATE	SHEET
N/A	**B. Barnes**	**11-1-09**	**3 of 4**

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method	Casing Depth	Remarks
			Lean CLAY (CL) *(continued)*.		39			100							
	34.5		Becomes stiff to very stiff.												PP = 96 to 336 kPa
371.31	35.0														
	35.5														
370.31	36.0														
	36.5		Becomes hard.		40	6 10 15	25	100							PP = 432 kPa
369.31	37.0		Becomes stiff to very stiff.		41			47							PP = 144 to 288 kPa
	37.5														
368.31	38.0														
	38.5														
367.31	39.0														
	39.5														
366.31	40.0				42	7 12 13	25	100							
			Bottom of borehole at 40.1 m bgs												
	40.5														
365.31	41.0														
	41.5														
364.31	42.0														
	42.5														
363.31	43.0														
	43.5														
362.31	44.0														
	44.5														
361.31	45.0														
	45.5														
	46.0														

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REPORT TITLE **BORING RECORD**				HOLE ID **B14**
DIST. **01**	COUNTY **MEN**	ROUTE **101**	POSTMILE **R43.1/R49.0**	EA **01-262001**
PROJECT OR BRIDGE NAME **Willits Bypass**				
BRIDGE NUMBER **N/A**	PREPARED BY **B. Barnes**		DATE **11-1-09**	SHEET **4 of 4**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
T. Alderman	11-16-04	11-16-04	NAD83	B21
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			128' Lt Sta 145+31 A	414 m MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			Acker 3837	102 mm
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4"), Punch Core			Safety semi-automatic, 30-inch drop	68%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING	AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Bentonite seal			Not measured	2.8 m on 11-23-04	61.3 m

ELEVATION (m)	DEPTH (m)	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method / Casing Depth	Remarks
	0.0	Lean CLAY (CL); stiff to very stiff; dark brown; moist.		1			100						
413.29	1.0												
	1.5	Lean CLAY with SAND (CL); soft to medium stiff; dark grayish brown mottled with reddish brown; moist to wet; fine SAND.		2	2 3 2	5	100						PP = 24 to 96 kPa
412.29	2.0			3			100		23	16.5			PP = 72 to 96 kPa
	2.5	Lean CLAY (CL); stiff to very stiff; reddish brown mottled with grayish brown; moist.											
411.29	3.0			4	5 6 9	15	100						PP = 144 to 240 kPa
	3.5			5			100		22	17.1			PP = 96 to 144 kPa
410.29	4.0												
	4.5			6	10 11 7	18	100						PP = 144 to 192 kPa
409.29	5.0	GRAVELLY lean CLAY (CL); medium stiff; reddish brown mottled with grayish brown; moist; subangular GRAVEL.		7			100						PP = 48 to 96 kPa
	5.5	Lean CLAY with GRAVEL (CL); stiff; reddish brown mottled with grayish brown; moist to wet; fine GRAVEL.											
408.29	6.0	Lean CLAY with SAND (CL); very soft to soft; gray mottled with reddish brown; wet; coarse to medium SAND.		8	4 3 3	6	100						PP = 5 to 48 kPa
	6.5			9			100		23	2.5			PP = 5 to 24 kPa
407.29	7.0	Lean CLAY (CL); medium stiff to stiff; dark bluish gray; moist; medium to high plasticity fines.											
	7.5			10	4 6 5	11	100						PP = 48 to 96 kPa
406.29	8.0			11			100		28	15.2			
	8.5												
405.29	9.0			12	5 6 10	16	100						PP = 48 to 96 kPa
	9.5			13			100		22				
	10.0												

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				B21
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	MEN	101	R43.1/R49.0	01-262001
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	B. Barnes		11-1-09	1 of 6

CALTRANS BORING RECORD MET+ENG FIXED WILLITS_BYPASS.GPJ CALTRANS LIBRARY 040808.GLB 12/17/09

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method	Casing Depth	Remarks
	10.0		Lean CLAY (CL) *(continued)*.		13			100							
	10.5														
403.29	11.0			X	14	5 5 8	13	100							PP = 72 to 96 kPa
					15			100		30	14.3				PP = 96 to 144 kPa
	11.5														
402.29	12.0														
				X	16	10 11 18	29	100							PP = 192 kPa
	12.5														
					17			100							PP = 96 to 144 kPa
401.29	13.0														
	13.5														
				X	18	8 9 13	22	100							PP = 72 to 96 kPa
400.29	14.0														
					19			100							PP = 72 to 120 kPa
	14.5														
399.29	15.0									28	15.2				UU = 50 kPa UC = 72 kPa PP = 120 to 168 kPa
				X	20	8 10 11	21	100							
	15.5														
					21			100							PP = 48 to 144 kPa
398.29	16.0														
	16.5														
397.29	17.0			X	22	12 13 15	28	100		12	16.2				PP = 96 to 144 kPa UU = 54 kPa
					23			100							PP = 96 to 144 kPa
	17.5														
			CLAYEY GRAVEL with SAND (GC); very dense; dark bluish gray; moist; coarse to fine, subangular to subrounded GRAVEL.												
396.29	18.0			X	24	34 36 49	85	100							
	18.5														
					25			100							
395.29	19.0														
	19.5														
394.29	20.0			X	26	28 33 57	90	100		8					UU = 24 kPa
					27			100							
	20.5														
393.29	21.0														
	21.5			X	28	24 27 31	58	100		13					
	22.0				29			100							

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Department of Transportation
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REPORT TITLE: **BORING RECORD**
HOLE ID: **B21**

DIST.	COUNTY	ROUTE	POSTMILE	EA
01	MEN	101	R43.1/R49.0	01-262001

PROJECT OR BRIDGE NAME: **Willits Bypass**

BRIDGE NUMBER	PREPARED BY	DATE	SHEET
N/A	B. Barnes	11-1-09	2 of 6

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method / Casing Depth	Remarks
			CLAYEY GRAVEL with SAND (GC) *(continued)*.		29			100						
	22.5													
391.29	23.0			X	30	30 56/6"		100						
	23.5				31			100						
390.29	24.0													
	24.5			X	32	22 31 55	86	100						
389.29	25.0				33			100						
	25.5													
388.29	26.0			X	34	40 54/6"		100						
	26.5				35			100						
387.29	27.0													
	27.5			X	36	25 28 45	73	100						
386.29	28.0				37			100						
	28.5													
385.29	29.0			X	38	23 27 36	63	100		15				PP = 288 kPa
	29.5				39			100						
384.29	30.0													
	30.5													
383.29	31.0													
	31.5													
382.29	32.0			X	40	30 33 47	80	100						
	32.5				41			100						PP = 288 kPa
381.29	33.0													
	33.5													
	34.0													

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Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE: **BORING RECORD**

HOLE ID: **B21**

DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**MEN**	**101**	**R43.1/R49.0**	**01-262001**

PROJECT OR BRIDGE NAME: **Willits Bypass**

BRIDGE NUMBER	PREPARED BY	DATE	SHEET
N/A	**B. Barnes**	**11-1-09**	**3 of 6**

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method / Casing Depth	Remarks
	34.5				41			100						
379.29	35.0				42	40 51/6"		100		15				PP = 384 to 432 kPa
	35.5				43			100						
378.29	36.0													
	36.5													
377.29	37.0													
	37.5													
376.29	38.0				44	45 63		100						PP = 96 to 288 kPa
	38.5				45			100						PP = 192 to 384 kPa
375.29	39.0													
	39.5													
374.29	40.0													
	40.5		Lean CLAY with SAND (CL); hard; yellowish brown; moist.											
373.29	41.0													
	41.5													
372.29	42.0													
	42.5		Lean CLAY with GRAVEL (CL); very stiff to hard; yellowish brown; moist.											
					46	61/6"		100						PP = 192 to 432 kPa
371.29	43.0		CLAYEY GRAVEL with SAND (GC); very dense; yellowish brown; wet; coarse to fine, subangular to subrounded GRAVEL.		47			100						
	43.5													
370.29	44.0													
	44.5													
369.29	45.0		Lean CLAY (CL); hard; yellowish brown; moist.											
	45.5													
	46.0													

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REPORT TITLE: **BORING RECORD**

HOLE ID: **B21**

DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**MEN**	**101**	**R43.1/R49.0**	**01-262001**

PROJECT OR BRIDGE NAME: **Willits Bypass**

BRIDGE NUMBER	PREPARED BY	DATE	SHEET
N/A	**B. Barnes**	**11-1-09**	**4 of 6**

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method / Casing Depth	Remarks
	46.0		CLAYEY GRAVEL with SAND (GC); very dense; yellowish brown; wet.		47			100						
	46.5													
367.29	47.0		Lean CLAY (CL); very stiff to hard; yellowish brown and gray; moist.											
	47.5													
366.29	48.0		GRAVELLY lean CLAY with SAND (CL); medium stiff; yellowish brown; moist; subrounded to rounded GRAVEL.											
	48.5													PP = 48 kPa
365.29	49.0		CLAYEY GRAVEL with SAND (GC); very dense; yellowish brown and gray; wet; coarse to fine, subangular to subrounded GRAVEL.		48	44 48 50/2"		100						
					49			100						PP = 24 to 336 kPa
	49.5													
364.29	50.0													
	50.5													
363.29	51.0		Lean CLAY (CL); hard; yellowish brown mottled with gray; moist.											
	51.5													
362.29	52.0		CLAYEY SAND with GRAVEL (SC); very dense; dark bluish gray; wet; coarse to fine, subrounded to rounded GRAVEL.											
	52.5													
361.29	53.0													
	53.5													
360.29	54.0													
	54.5													
359.29	55.0		Lean CLAY (CL); hard; dark bluish gray; moist.		50	11 20 28	48	100						
					51			100						PP = 432 kPa
	55.5													
358.29	56.0													
	56.5		SANDY lean CLAY with GRAVEL (CL); hard; dark bluish gray; moist; coarse to fine, subrounded to rounded GRAVEL.											
357.29	57.0													
	57.5													
	58.0													

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REPORT TITLE **BORING RECORD**				HOLE ID **B21**
DIST. **01**	COUNTY **MEN**	ROUTE **101**	POSTMILE **R43.1/R49.0**	EA **01-262001**
PROJECT OR BRIDGE NAME **Willits Bypass**				
BRIDGE NUMBER **N/A**	PREPARED BY **B. Barnes**		DATE **11-1-09**	SHEET **5 of 6**

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method	Casing Depth	Remarks
	58.5		SANDY lean CLAY with GRAVEL (CL) *(continued)*.		51			100							
355.29	59.0														
	59.5														
354.29	60.0		CLAYEY SAND with GRAVEL (SC); very dense; dark bluish gray; moist to wet.												
	60.5														
353.29	61.0			X	52	50/3"		100							
	61.5		Bottom of borehole at 61.3 m bgs.												
352.29	62.0														
	62.5														
351.29	63.0														
	63.5														
350.29	64.0														
	64.5														
349.29	65.0														
	65.5														
348.29	66.0														
	66.5														
347.29	67.0														
	67.5														
346.29	68.0														
	68.5														
345.29	69.0														
	69.5														
	70.0														

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REPORT TITLE				HOLE ID
BORING RECORD				**B21**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**MEN**	**101**	**R43.1/R49.0**	**01-262001**
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**B. Barnes**		**11-1-09**	**6 of 6**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
T. Alderman	6-20-05	6-20-05	NAD83	B25
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			64' Lt Sta 142+44 A	416 m MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			Acker 3837	102 mm
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4"), Punch Core			Safety semi-automatic, 30-inch drop	68%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING / AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Bentonite seal			Not measured / 9.7 m on 4-26-06	23.2 m

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method / Casing Depth	Remarks
	0.0		Lean CLAY (CL); soft to medium stiff; brown; moist; nonplastic to low plasticity fines.		1						17.0			PP = 48 kPa
414.71	1.0													
	1.5		Lean CLAY with SAND (CL); soft to medium stiff; brown; wet; fine SAND; low plasticity fines.		2	2 3 3	6	100		23				PP = 48 kPa
413.71	2.0				3					25	15.7			
	2.5													
412.71	3.0		Lean CLAY (CL); stiff to very stiff; greenish gray; moist; medium plasticity fines.		4	5 6 8	14	100		25				PP = 192 kPa
	3.5				5									
411.71	4.0													
	4.5		Lean CLAY with SAND (CL); very soft to soft; greenish gray; moist; fine SAND; low plasticity fines.		6	1 3 3	6	100		24				PP = 24 kPa
410.71	5.0				7					26	15.6			
	5.5													
409.71	6.0		CLAYEY SAND (SC); loose; greenish gray; wet; low plasticity fines.		8	5 1 3	4	100		22	16.7			
	6.5				9									
408.71	7.0													
	7.5		Poorly graded SAND (SP); medium dense; greenish gray; wet; fine SAND; nonplastic to low plasticity fines.		10	6 6 6	12	100		25	16.5			
407.71	8.0				11									PP = 72 kPa
	8.5													
406.71	9.0													
	9.5		Lean CLAY (CL); stiff to very stiff; greenish gray to dark gray; moist; medium plasticity fines.		12	4 4 7	11	100		23	16.5			
	10.0				13									

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REPORT TITLE				HOLE ID
BORING RECORD				B25
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	MEN	101	R43.1/R49.0	01-262001
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	B. Barnes		11-1-09	1 of 3

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ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method / Casing Depth	Remarks
	10.0		Lean CLAY (CL) *(continued)*.		13									
	10.5													
404.71	11.0				14	4 5 11	16	100						
					15					25	16.0			
	11.5													
403.71	12.0													
			Lean CLAY with SAND (CL); soft to medium stiff; dark gray; moist; fine SAND; medium plasticity fines.		16	5 6 8	14	100						PP = 72 kPa
	12.5				17					24	16.2			
402.71	13.0													
	13.5				18	5 5 8	13	100		26	16.2			PP = 72 kPa
401.71	14.0				19									
	14.5													
400.71	15.0				20	3 3 6	9	100						PP = 48 kPa
	15.5				21									
399.71	16.0													
			CLAYEY SAND (SC); medium dense; dark gray; wet; nonplastic to low plasticity fines.											
	16.5				22	3 5 7	12	100		28	15.1			PP = 96 kPa
398.71	17.0		Lean CLAY (CL); medium stiff to stiff; dark gray; moist; medium plasticity fines.											
	17.5		Lean CLAY with SAND (CL); medium stiff; dark gray; moist; fine SAND; medium plasticity fines.		23					22	17.7			
397.71	18.0													
	18.5				24	3 5 7	12	100						PP = 72 kPa
396.71	19.0				25									
			CLAYEY GRAVEL with SAND (GC); medium dense to dense; dark gray; moist to wet; nonplastic to low plasticity fines.											
	19.5													
395.71	20.0				26	35 17 13	30	100		9	17.0			
	20.5				27									
394.71	21.0													
	21.5				28	14 21 21	42	100		9				
	22.0				29									

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Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE				HOLE ID
BORING RECORD				**B25**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**MEN**	**101**	**R43.1/R49.0**	**01-262001**
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**B. Barnes**		**11-1-09**	**2 of 3**

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m^3)	Shear Strength (kPa)	Drilling Method	Casing Depth	Remarks
	22.5		CLAYEY GRAVEL with SAND (GC) *(continued)*.		29										
392.71	23.0			X	30	50/5"		100							
			Bottom of borehole at 23.2 m bgs												
	23.5														
391.71	24.0														
	24.5														
390.71	25.0														
	25.5														
389.71	26.0														
	26.5														
388.71	27.0														
	27.5														
387.71	28.0														
	28.5														
386.71	29.0														
	29.5														
385.71	30.0														
	30.5														
384.71	31.0														
	31.5														
383.71	32.0														
	32.5														
382.71	33.0														
	33.5														
	34.0														

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REPORT TITLE **BORING RECORD**				HOLE ID **B25**
DIST. **01**	COUNTY **MEN**	ROUTE **101**	POSTMILE **R43.1/R49.0**	EA **01-262001**
PROJECT OR BRIDGE NAME **Willits Bypass**				
BRIDGE NUMBER **N/A**	PREPARED BY **B. Barnes**		DATE **11-1-09**	SHEET **3 of 3**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
T. Alderman	6-22-05	6-22-05	NAD83	B26
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			31' Lt Sta 142+36 A	416 m MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			Acker 3837	102 mm
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Punch Core			Safety semi-automatic, 30-inch drop	68%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING	AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Bentonite seal			Not measured	Not measured	9.1 m

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method	Casing Depth	Remarks
	0.0		Lean CLAY (CL); medium stiff; brown; moist; low plasticity fines.		1			100							
415.20	1.0				2			100							PP = 72 kPa
	1.5				3			100		23	17.0				
414.20	2.0														
	2.5		SILTY SAND (SM); brown; wet; coarse to medium SAND; nonplastic fines.												
413.20	3.0				4			100		18	18.1				
	3.5														
			CLAYEY GRAVEL with SAND (GC); brown; moist; nonplastic to low plasticity fines.		5			100			19.2				
412.20	4.0														
	4.5				6			100							PP = 96 kPa
411.20	5.0														
	5.5		Lean CLAY with SAND (CL); medium stiff; dark greenish gray; moist; fine SAND; medium plasticity fines.												
410.20	6.0				7			100							
	6.5		CLAYEY SAND (SC); dark gray; wet; nonplastic to low plasticity fines.												
409.20	7.0		Lean CLAY with SAND (CL); medium stiff; dark gray; moist; fine SAND; medium plasticity fines.												
	7.5				8			100							PP = 72 kPa
408.20	8.0														
	8.5														
407.20	9.0		Bottom of borehole at 9.1 m bgs												
	9.5														
	10.0														

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Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE				HOLE ID
BORING RECORD				B26
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	MEN	101	R43.1/R49.0	01-262001
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	B. Barnes		11-1-09	1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
T. Alderman	**6-22-05**	**6-22-05**	**NAD83**	**B28**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			**24' Lt Sta 142+14 A**	**416 m MSL**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			**Acker 3837**	**102 mm**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4"), Punch Core			**Safety semi-automatic, 30-inch drop**	**68%**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING / AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Bentonite seal			**Not measured** / **1.8 m on 9-27-05**	**8.1 m**

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method / Casing Depth	Remarks
	0.0		Lean CLAY with GRAVEL (CL); dark brown; moist; fine GRAVEL; low plasticity fines.		1			100						
414.71	1.0													
	1.5		Lean CLAY with SAND (CL); soft; dark brown; moist; fine SAND; low plasticity fines.		2	2 1 1	2	100		13				
413.71	2.0				3			100						
	2.5		CLAYEY GRAVEL (GC); dark brown; wet; nonplastic to low plasticity fines.											
412.71	3.0		Lean CLAY with SAND (CL); medium stiff to stiff; dark brown; moist; fine SAND; medium plasticity fines.		4	5 5 8	13	100						PP = 96 kPa
	3.5				5			100						
411.71	4.0													
	4.5		SANDY lean CLAY (CL); medium stiff to stiff; grayish brown; moist to wet; low to medium plasticity fines.		6	4 5 8	13	100						PP = 48 kPa
410.71	5.0				7			100						PP = 144 kPa
	5.5													
409.71	6.0		Lean CLAY with SAND (CL); soft to medium stiff; dark gray; moist; fine SAND; low to medium plasticity fines.		8	2 4 8	12	100		26				PP = 48 kPa
	6.5				9			100						
408.71	7.0													
	7.5				10	3 4 6	10	100		21				
407.71	8.0		Bottom of borehole at 8.1 m bgs											
406.71	9.0													
	9.5													
	10.0													

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REPORT TITLE				HOLE ID
BORING RECORD				**B28**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**MEN**	**101**	**R43.1/R49.0**	**01-262001**
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**B. Barnes**		**11-1-09**	**1 of 1**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
C. Avila	6-23-05	6-23-05	NAD83	B29
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			2' Rt Sta 144+06 A	415 m MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			Acker 3837	102 mm
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4"), Mod Cal (2.5"), Punch Core			Safety semi-automatic, 30-inch drop	68%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING	AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Bentonite seal			Not measured	Not measured	19.4 m

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method	Casing Depth	Remarks
	0.0		CLAYEY GRAVEL (GC); loose; dark gray; moist; nonplastic to low plasticity fines.												
	0.5														
414.18	1.0														
	1.5			X	1	5 4 3	7	100		26	15.4				
413.18	2.0		Lean CLAY with SAND (CL); stiff to very stiff; brown; moist; fine SAND; medium plasticity fines.		2			100							
	2.5														
412.18	3.0			X	3	3 5 5	10	100		26					PP = 144 kPa
	3.5				4			100		27	15.4				PP = 192 kPa
411.18	4.0		Well-graded GRAVEL with SAND (GW); medium dense; dark gray; wet; nonplastic fines.												
	4.5			X	5	3 8 10	18	100		14					
410.18	5.0				6			100							
	5.5		Lean CLAY with SAND (CL); medium stiff; dark gray; moist; fine SAND; medium plasticity fines.												
409.18	6.0			X	7	1 3 4	7	100		26	15.2				PP = 72 kPa
	6.5				8			100							
408.18	7.0														
	7.5			X	9	2 3 3	6	100		23					PP = 72 kPa
407.18	8.0				10			100		24	16.0				
	8.5		GRAVELLY lean CLAY (CL); soft to medium stiff; dark gray; moist; nonplastic to low plasticity fines.												
406.18	9.0			X	11	2 3 5	8	0		21	17.0				
	9.5				12			100							PP = 48 kPa
	10.0														

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REPORT TITLE				HOLE ID
BORING RECORD				B29
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	MEN	101	R43.1/R49.0	01-262001
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	B. Barnes		11-1-09	1 of 2

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method / Casing Depth	Remarks
	10.0		Lean CLAY (CL); medium stiff to stiff; dark gray; wet; medium plasticity fines.		12			100						
	10.5													
404.18	11.0				13	2 4 7	11	100		27	15.6			
					14			100						PP = 96 kPa
	11.5		CLAYEY SAND (SC); loose; dark gray; moist; nonplastic to low plasticity fines.											
403.18	12.0		Lean CLAY (CL); medium stiff to stiff; dark gray; moist; medium plasticity fines.		15	2 3 4	7	100						
					16			100		26	15.7			
	12.5													
					17			100						PP = 96 kPa
402.18	13.0													
					18	4 8 7	15	100						
	13.5													
			Lean CLAY with SAND (CL); medium stiff to stiff; dark gray; moist; fine SAND; medium plasticity fines.		19			100		30	13.7			
401.18	14.0													
					20			100						PP = 120 kPa
	14.5													
400.18	15.0				21	4 5 7	12	100						
					22			100		19	17.7			
	15.5													
					23			100						PP = 144 kPa
399.18	16.0													
					24	5 8 10	18	100						PP = 96 kPa
	16.5													
					24A			100		12				
398.18	17.0		Well-graded GRAVEL with SAND (GW); medium dense to dense; gray; wet; nonplastic to low plasticity fines.		25			100						
	17.5													
					26	14 20 20	40	100						
397.18	18.0									11				
	18.5													
					27	6 5 20	25	100						
396.18	19.0													
	19.5		Bottom of borehole at 19.4 m bgs											
395.18	20.0													
	20.5													
394.18	21.0													
	21.5													
	22.0													

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REPORT TITLE				HOLE ID
BORING RECORD				**B29**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**MEN**	**101**	**R43.1/R49.0**	**01-262001**
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**B. Barnes**		**11-1-09**	**2 of 2**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
T. Alderman	6-28-05	6-28-05	NAD83	B32
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			197' Rt Sta 142+43 A	418 m MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			Acker 3837	102 mm
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4"), Mod Cal (2.5"), Punch Core			Safety semi-automatic, 30-inch drop	68%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING / AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Bentonite seal			Not measured / 8.1 m on 9-27-05	20.3 m

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method / Casing Depth	Remarks
	0.0		SANDY lean CLAY (CL); dark gray; moist; low plasticity fines.		1			100						
	0.5													
416.79	1.0				2			100						
	1.5		Lean CLAY (CL); stiff to very stiff; dark gray; moist; medium plasticity fines.		3	4 6 9	15	100		19	17.3			PP = 144 kPa
415.79	2.0				4			100						
	2.5				5			100						PP = 192 kPa
414.79	3.0		Lean CLAY with SAND (CL); medium stiff to stiff; dark gray; moist; fine SAND; medium plasticity fines.		6	5 5 9	14	100		24	16.0			PP = 144 kPa
	3.5				7			100						
413.79	4.0				8			100						PP = 96 kPa
	4.5				9	1 2 3	5	100		20	16.3			
412.79	5.0		CLAYEY SAND (SC); loose; dark gray; moist.		10			100						
	5.5		Lean CLAY with SAND (CL); medium stiff; dark gray; moist; fine SAND; low plasticity fines.		11			0						PP = 72 kPa
411.79	6.0				12	3 3 3	6	100		28				
	6.5		SILTY SAND (SM); loose; brown; wet; fine SAND.		13			100						
410.79	7.0				14			100						
	7.5				15	4 2 5	7	100		19				
409.79	8.0		Lean CLAY (CL); medium stiff; dark gray; moist; medium plasticity fines.		16			100						PP = 72 kPa
	8.5				17	3 4 6	10	100						PP = 96 kPa
408.79	9.0		SANDY lean CLAY (CL); medium stiff to stiff; dark gray; moist; low plasticity fines.		18			100		25	15.6			
	9.5		CLAYEY SAND (SC); dark gray; wet; low plasticity fines.		19			25						
	10.0													

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REPORT TITLE				HOLE ID
BORING RECORD				B32
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	MEN	101	R43.1/R49.0	01-262001
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	B. Barnes		11-1-09	1 of 2

ELEVATION (m)	DEPTH (m)	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method / Casing Depth	Remarks
	10.0	Lean CLAY (CL); medium stiff to stiff; dark gray; moist; medium plasticity fines.		19			25						
	10.5			20	4 7 8	15	100						PP = 96 kPa
				21			100		24				
406.79	11.0			22			100						PP = 72 kPa
	11.5			23	5 8 8	16	100						PP = 72 kPa
405.79	12.0	Lean CLAY with SAND (CL); medium stiff to stiff; dark gray; moist; fine SAND; low plasticity fines.		24			100		25	15.7			
	12.5			25			100						PP = 96 kPa
404.79	13.0			26	5 8 11	19	100						PP = 96 kPa
	13.5												
403.79	14.0	Lean CLAY (CL); stiff; dark gray; moist; medium plasticity fines.		27			100		28	14.8			
	14.5			28			100						
402.79	15.0	CLAYEY SAND with GRAVEL (SC); dense; dark gray; wet; fine GRAVEL; nonplastic to low plasticity fines.		29	13 19 15	34	100						
	15.5			30			100		23	16.5			
401.79	16.0	Well-graded SAND with GRAVEL (SW); medium dense; dark gray; moist; fine GRAVEL.		31			100						
	16.5			32	10 10 10	20	100						
400.79	17.0	SANDY lean CLAY (CL); medium stiff to stiff; dark gray; moist; low plasticity fines.		33			100		23	16.3			
	17.5	SANDY lean CLAY with GRAVEL (CL); very stiff; dark gray; moist; fine GRAVEL; low plasticity fines.		34			100						PP = 96 kPa
399.79	18.0			35	4 7 13	20	100						
	18.5	CLAYEY GRAVEL with SAND (GC); dense; brown; moist; nonplastic to low plasticity fines.		36			100		29				
				37			100						
398.79	19.0			38	28 28 15	43	100						
	19.5			39			100						
397.79	20.0			40	28 30 40	70	100						
	20.5	Bottom of borehole at 20.3 m bgs											
396.79	21.0												
	21.5												
	22.0												

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REPORT TITLE				HOLE ID
BORING RECORD				**B32**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**MEN**	**101**	**R43.1/R49.0**	**01-262001**
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**B. Barnes**		**11-1-09**	**2 of 2**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
T. Alderman	**6-29-05**	**6-29-05**	**NAD83**	**B33**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			**192' Rt Sta 142+29 A**	**416 m MSL**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			**Acker 3837**	**102 mm**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Punch Core			**Safety semi-automatic, 30-inch drop**	**68%**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING / AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Bentonite seal			**Not measured** / **Not measured**	**9.1 m**

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method	Casing Depth	Remarks
	0.0		SANDY lean CLAY with GRAVEL (CL); medium stiff; dark brown; moist; fine GRAVEL; low plasticity fines.		1			100							
	0.5														PP = 72 kPa
414.79	1.0		Lean CLAY (CL); stiff to very stiff; dark brown; moist; medium plasticity fines.												
	1.5				2			100							PP = 144 to 288 kPa
413.79	2.0														
	2.5														
412.79	3.0				3			100							PP = 96 kPa
	3.5														
411.79	4.0		Poorly graded SAND (SP); dark brown; wet; fine SAND.												
	4.5		SANDY lean CLAY (CL); medium stiff; dark brown; moist; low plasticity fines.		4			40							PP = 72 kPa
410.79	5.0														
	5.5		CLAYEY SAND with GRAVEL (SC); very dark gray; moist; fine GRAVEL; low plasticity fines.												
409.79	6.0		Lean CLAY (CL); medium stiff; greenish gray; moist; medium plasticity fines.		5			50							PP = 72 kPa
	6.5														
408.79	7.0		Poorly graded SAND (SP); dark gray; moist; medium SAND.												
	7.5		GRAVELLY lean CLAY (CL); greenish gray; moist; low plasticity fines.		6			33							
407.79	8.0														
	8.5				7			100							PP = 96 kPa
406.79	9.0		SANDY lean CLAY with GRAVEL (CL); medium stiff to stiff; greenish gray; moist; fine GRAVEL; low plasticity fines.												
	9.5		Bottom of borehole at 9.1 m bgs												
	10.0														

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REPORT TITLE				HOLE ID
BORING RECORD				**B33**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**MEN**	**101**	**R43.1/R49.0**	**01-262001**
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**B. Barnes**		**11-1-09**	**1 of 1**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
T. Alderman	6-29-05	6-29-05	NAD83	B34
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			361' Rt Sta 143+91 A	414 m MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			Acker 3837	102 mm
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4"), Mod Cal (2.5"), Punch Core			Safety semi-automatic, 30-inch drop	68%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING / AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Bentonite seal			Not measured / Not measured	21.3 m

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method	Casing Depth	Remarks
	0.0		Lean CLAY with SAND (CL); soft to medium stiff; brown; moist; fine SAND; low plasticity fines.		1			100							
413.47	1.0				2			100							PP = 48 kPa
	1.5				3	1 3 5	8	100		23	16.3				PP = 48 kPa
412.47	2.0		Becomes stiff..		4			100		17	16.3				PP = 120 kPa
	2.5				5	5 7 8	15	100							PP = 120 kPa
411.47	3.0				6			100		27	15.4				
	3.5		Becomes medium stiff to stiff..		7			100							PP = 96 kPa
410.47	4.0				8	4 4 6	10	100							PP = 72 kPa
	4.5				9			100							
409.47	5.0				10			100							PP = 96 kPa
	5.5				11	3 5 6	11	100							
408.47	6.0				12			100							
	6.5				13			100							PP = 96 kPa
407.47	7.0				14	3 5 6	11	100							
	7.5				15			100		30	14.1				
406.47	8.0		CLAYEY SAND (SC); greenish gray; moist; low plasticity fines.		16			100							PP = 120 kPa
	8.5		Lean CLAY (CL); medium stiff to stiff; greenish gray; moist; medium plasticity fines.		17	3 4 6	10	100							PP = 96 kPa
405.47	9.0				18			60		20	17.0				PP = 120 kPa
	9.5														
	10.0														

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REPORT TITLE				HOLE ID
BORING RECORD				B34
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	MEN	101	R43.1/R49.0	01-262001
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	B. Barnes		11-1-09	1 of 2

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method	Casing Depth	Remarks
	10.0		Lean CLAY (CL) *(continued)*.		18			60		20	17.0				
	10.5														PP = 96 kPa
403.47	11.0		Poorly graded SAND (SP); loose to medium dense; dark brown; moist; fine SAND; nonplastic fines.		19	2 4 6	10	100							
	11.5		Lean CLAY (CL); soft to medium stiff; dark greenish gray; moist; low to medium plasticity fines.		20			100							
402.47	12.0														
	12.5				21	3 4 4	8	100		25					PP = 48 kPa
401.47	13.0				22			57							PP = 48 kPa
	13.5		SANDY lean CLAY (CL); medium stiff; dark greenish gray; moist; low plasticity fines.												
400.47	14.0				23	5 4 4	8	100							PP = 72 kPa
	14.5		Lean CLAY with SAND (CL); soft to medium stiff; dark greenish gray; moist; fine SAND; low plasticity fines.		24			29							PP = 48 kPa
399.47	15.0														
	15.5		Lean CLAY (CL); medium stiff to stiff; dark greenish gray; moist; medium plasticity fines.		25	6 8 10	18	100							PP = 72 kPa
398.47	16.0				26			86							PP = 96 kPa
	16.5		Lean CLAY with SAND (CL); stiff; dark greenish gray; moist; fine SAND; low to medium plasticity fines.												
397.47	17.0				27	4 7 11	18	100		11					
	17.5				28			100							
396.47	18.0		CLAYEY GRAVEL with SAND (GC); medium dense; dark greenish gray; moist; low plasticity fines.												
	18.5				29	17 14 14	28	100							
395.47	19.0				30			100							
	19.5		Lean CLAY (CL); very stiff; dark greenish gray; moist; medium plasticity fines.												
394.47	20.0				31	9 10 14	24	100							
	20.5				32			100							
393.47	21.0		SANDY lean CLAY with GRAVEL (CL); dark greenish gray; moist; low plasticity fines.												
	21.5		Bottom of borehole at 21.3 m bgs												
	22.0														

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REPORT TITLE				HOLE ID
BORING RECORD				**B34**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**MEN**	**101**	**R43.1/R49.0**	**01-262001**
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**B. Barnes**		**11-1-09**	**2 of 2**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
C. Avila	6-30-05	6-30-05	NAD83	B35
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			359' Rt Sta 143+72 A	415 m MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			Acker 3837	102 mm
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
Punch Core			Safety semi-automatic, 30-inch drop	68%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING / AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Bentonite seal			Not measured / Not measured	9.1 m

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method	Casing Depth	Remarks
	0.0		Lean CLAY with SAND (CL); very soft to soft; brown; moist; fine SAND; low plasticity fines.		1			20							
	0.5														PP = 24 kPa
413.50	1.0														
	1.5		Becomes stiff.		2			60							PP = 144 kPa
412.50	2.0														
	2.5		CLAYEY GRAVEL (GC); brown; moist.												
411.50	3.0		Lean CLAY with SAND (CL); stiff; brown; moist; fine SAND; low plasticity fines.		3			20							
	3.5														
410.50	4.0														
	4.5		Lean CLAY (CL); medium stiff to stiff; dark brown; moist; low plasticity fines.		4			50							PP = 96 kPa
409.50	5.0														
	5.5														
408.50	6.0		Lean CLAY with GRAVEL (CL); dark greenish gray; moist; fine GRAVEL; medium plasticity fines.		5			0							
	6.5														
407.50	7.0														
	7.5				6			40							
406.50	8.0														
	8.5														
405.50	9.0		Bottom of borehole at 9.1 m bgs												
	9.5														
	10.0														

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REPORT TITLE				HOLE ID
BORING RECORD				B35
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	MEN	101	R43.1/R49.0	01-262001
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	B. Barnes		11-1-09	1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
C. Avila	7-5-05	7-6-05	NAD83	B36
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			394' Lt Sta 105+71 A	472 m MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			Acker 3837	102 mm
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4"), Mod Cal (2.5"), Punch Core			Safety semi-automatic, 30-inch drop	68%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING	AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Bentonite seal			Not measured	Not measured	27.9 m

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method	Casing Depth	Remarks
	0.0		SILTY CLAY (CL-ML); very stiff; brown; dry; low plasticity fines.		1			100							
470.75	1.0														PP = 336 kPa
	1.5		Lean CLAY with SAND (CL); medium stiff to stiff; brown; moist; low plasticity fines.		2	7 10 17	27	100							
469.75	2.0				3			100							PP = 96 kPa
	2.5														
468.75	3.0		Stiff to very stiff; Becomes stiff to very stiff.		4	6 9 10	19	100							PP = 192 kPa
	3.5				5			100							
467.75	4.0		Very stiff to hard; Becomes very stiff to hard.												PP = 384 kPa
	4.5		Lean CLAY (CL); very stiff; dark gray; moist; low plasticity fines.		6	7 9 10	19	100							PP = 288 kPa
466.75	5.0				7			100							
	5.5		SILTY SAND (SM); very dense; dark gray; moist; nonplastic fines; weak cementation.												
465.75	6.0				8	16 50/6"		100							
	6.5				9			100							
464.75	7.0		SILTY SAND with GRAVEL (SM); dense; dark brown; moist; weak cementation.												
	7.5				10	24 20 21	41	100		14					
463.75	8.0		SILT (ML); dense; brown; moist; nonplastic fines.		11			100							
	8.5		SILTY SAND with GRAVEL (SM); dark brown; moist; fine GRAVEL; weak cementation.												
462.75	9.0		SILTY SAND (SM); very dense; dark brown; moist; weak cementation.		12	21 37 42	79	100							
	9.5				13			14							
	10.0														

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				B36
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	MEN	101	R43.1/R49.0	01-262001
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	B. Barnes		11-1-09	1 of 3

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ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method / Casing Depth	Remarks
	10.0		CLAYEY SAND with GRAVEL (SC); very dense; dark gray; moist; fine GRAVEL; low plasticity fines.		13			14						
	10.5				14	50/6"		100						
460.75	11.0				15			100						
	11.5													
459.75	12.0				16	21 42 46	88	100						PP = 384 kPa
	12.5													
458.75	13.0		SILTY SAND (SM); dark gray; moist.		17			100						PP = 384 kPa
	13.5		CLAYEY SAND (SC); dense; dark greenish gray; moist; low plasticity fines.		18	12 17 19	36	100						PP = 384 kPa
457.75	14.0													
	14.5				19			100						
			SILTY SAND (SM); dark greenish gray; moist.											
456.75	15.0		SANDY lean CLAY (CL); very stiff; dark greenish gray; moist; nonplastic to low plasticity fines.											
	15.5				20	10 14 17	31	100		20				
455.75	16.0				21			100						
	16.5		CLAYEY SAND (SC); dense; dark greenish gray; moist; low plasticity fines.											
454.75	17.0				22	10 19 27	46	100						PP = 432 kPa
	17.5		SANDY lean CLAY (CL); hard; dark greenish gray; moist; low plasticity fines.		22A			100						PP = 408 kPa
453.75	18.0													
	18.5		Lean CLAY (CL); very stiff to hard; dark greenish gray; moist; medium plasticity fines.		23	7 11 17	28	100						PP = 384 kPa
452.75	19.0				24			100						PP = 408 kPa
	19.5													
451.75	20.0				25			100						
			SILTY SAND (SM); very dense; very dark greenish gray; wet; fine SAND; nonplastic fines.											
	20.5				26	21 37 50	87	100						
450.75	21.0		Lean CLAY (CL); hard; very dark greenish gray; moist; low plasticity fines.		27			100						
	21.5				28	6 10 17	27	100						
	22.0				29			100						

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				**B36**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**MEN**	**101**	**R43.1/R49.0**	**01-262001**
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**B. Barnes**		**11-1-09**	**2 of 3**

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method	Casing Depth	Remarks
			Lean CLAY (CL) *(continued)*.		29			100							PP = 432 kPa
	22.5		SANDY lean CLAY (CL); very stiff; very dark greenish gray; moist; low plasticity fines.												
448.75	23.0				30	15 20 28	48	100							
	23.5				31			100							PP = 288 kPa
447.75	24.0		Poorly graded SAND with SILT (SP-SM); very dense; very dark greenish gray; moist; medium SAND; weak cementation.												
	24.5				32	21 37 21	58	100		18					
446.75	25.0				33			100							PP = 432 kPa
	25.5		CLAYEY SAND (SC); very dark greenish gray; moist.												
445.75	26.0		Poorly graded SAND with SILT (SP-SM); very dense; very dark greenish gray; moist; medium SAND; weak cementation.		34	19 24 26	50	100							
	26.5				35			100							
444.75	27.0		CLAYEY SAND (SC); very dark greenish gray; moist; low plasticity fines.												
	27.5		SANDY lean CLAY (CL); hard; very dark greenish gray; moist; low plasticity fines.		36	10 18 23	41	100							
443.75	28.0		Bottom of borehole at 27.9 m bgs												
	28.5														
442.75	29.0														
	29.5														
441.75	30.0														
	30.5														
440.75	31.0														
	31.5														
439.75	32.0														
	32.5														
438.75	33.0														
	33.5														
	34.0														

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REPORT TITLE				HOLE ID
BORING RECORD				**B36**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**MEN**	**101**	**R43.1/R49.0**	**01-262001**
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**B. Barnes**		**11-1-09**	**3 of 3**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
T. Alderman	7-6-05	7-6-05	NAD83	B38
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			464' Lt Sta 106+32 A	472 m MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			Acker 3837	102 mm
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4"), Mod Cal (2.5"), Punch Core			Safety semi-automatic, 30-inch drop	68%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING	AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Bentonite seal			Not measured	Not measured	27.9 m

ELEVATION (m)	DEPTH (m)	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method	Casing Depth	Remarks
472.00	0.0	SANDY SILT (ML); medium dense; brown; moist; nonplastic fines.		1			100							
470.58	1.5	SILTY SAND with GRAVEL (SM); dense; brown; moist; coarse to fine GRAVEL.		2	20 11 19	30	100							
469.58	2.5			3			100							
468.58	3.0			4	8 7 8	15	100							PP = 144 kPa
467.58	3.5	SANDY lean CLAY (CL); stiff to very stiff; dark gray; moist; low to medium plasticity fines.		5			100							PP = 192 kPa
466.58	4.5	Lean CLAY (CL); stiff; brown; moist; medium plasticity fines.		6	4 7 8	15	100							
465.58	5.0	SILTY SAND with GRAVEL (SM); medium dense; brown; moist; fine GRAVEL; nonplastic to low plasticity fines; weak cementation.		7			100							
464.58	6.0			8	14 10 15	25	100							
	6.5			9			100							PP = 384 kPa
463.58	7.0	Lean CLAY (CL); very stiff; dark gray; moist; low plasticity fines.		10	4 13 18	31	100		22					PP = 288 kPa
	8.0			11			100							PP = 288 kPa
462.58	9.0	SILTY SAND with GRAVEL (SM); very dense; dark gray; moist; fine GRAVEL; weak cementation.		12	25 44/5"		100							
	9.5			13			100							
	10.0													

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BORING RECORD				B38
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	MEN	101	R43.1/R49.0	01-262001
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	B. Barnes		11-1-09	1 of 3

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method	Casing Depth	Remarks
	10.0		SILTY SAND with GRAVEL (SM) *(continued)*.		13			100							
	10.5														
460.58	11.0		SANDY lean CLAY with GRAVEL (CL); hard; grayish brown; moist; fine GRAVEL; low plasticity fines.		14	40 50/5"		100		13					
					15			100							
	11.5		SILTY SAND (SM); very dense; dark grayish brown; moist; nonplastic to low plasticity fines.												
459.58	12.0														
					16	28 26 27	53	100							PP = 288 kPa
	12.5														
					17			100							
458.58	13.0														
	13.5														
			SANDY lean CLAY (CL); very stiff; greenish gray; moist; low plasticity fines.		18	14 24 28	52	100							PP = 288 kPa
457.58	14.0														
					19			100							PP = 336 kPa
	14.5														
456.58	15.0		Poorly graded SAND with CLAY (SP-SC); very dark greenish gray; wet; medium SAND; nonplastic to low plasticity fines.												
			SANDY lean CLAY (CL); very stiff to hard; very dark greenish gray; moist; low plasticity fines.		20	12 24 24	48	100		18					PP = 288 kPa
	15.5														
					21			100							
455.58	16.0														
	16.5														
					22	9 14 19	33	100							PP = 288 kPa
454.58	17.0														
					23			100							PP = 432 kPa
	17.5														
453.58	18.0														
					24	4 10 14	24	100		20					PP = 336 kPa
	18.5														
					25			100							PP = 312 kPa
452.58	19.0														
	19.5														
451.58	20.0				26					23	16.3				UU = 210 kPa
	20.5		CLAYEY SAND (SC); dense; very dark greenish gray; moist; low plasticity fines.		27			100							
450.58	21.0														
					28	10 18 26	44	100							PP = 192 kPa
	21.5														
	22.0				29			100							

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REPORT TITLE: **BORING RECORD**
HOLE ID: **B38**

DIST.	COUNTY	ROUTE	POSTMILE	EA
01	MEN	101	R43.1/R49.0	01-262001

PROJECT OR BRIDGE NAME: **Willits Bypass**

BRIDGE NUMBER	PREPARED BY	DATE	SHEET
N/A	B. Barnes	11-1-09	2 of 3

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method	Casing Depth	Remarks
			CLAYEY SAND (SC) *(continued)*.		29			100							
	22.5		SANDY lean CLAY (CL); very stiff to hard; very dark greenish gray; moist; nonplastic to low plasticity fines.												
448.58	23.0				30	7 14 19	33	100							PP = 384 kPa
	23.5				31			100							
447.58	24.0														
	24.5				32	10 33 40	73	100							
446.58	25.0				33			100							
	25.5		Well-graded SAND with GRAVEL (SW); very dense; very dark greenish gray; wet; weak cementation.												
445.58	26.0				34	21 30 25	55	100							
	26.5				35			100							
444.58	27.0														
	27.5		Poorly graded SAND with SILT (SP-SM); very dense; dark brown; moist; weak cementation.		36	24 43 50	93	100							
443.58	28.0		Bottom of borehole at 27.9 m bgs												
	28.5														
442.58	29.0														
	29.5														
441.58	30.0														
	30.5														
440.58	31.0														
	31.5														
439.58	32.0														
	32.5														
438.58	33.0														
	33.5														
	34.0														

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REPORT TITLE				HOLE ID
BORING RECORD				**B38**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**MEN**	**101**	**R43.1/R49.0**	**01-262001**
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**B. Barnes**		**11-1-09**	**3 of 3**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
C. Avila	7-12-05	7-12-05	NAD83	B39
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			457' Lt Sta 105+52 A	481 m MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			Acker 3837	102 mm
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4"), Punch Core			Safety semi-automatic, 30-inch drop	68%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING / AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Bentonite seal			Not measured / Not measured	36.6 m

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method / Casing Depth	Remarks
	0.0		SILT with GRAVEL (ML); very dense; brown; dry; fine GRAVEL; nonplastic to low plasticity fines.		1			100						
	0.5													
480.29	1.0													
	1.5				2	14 24 45	69	100						PP = 336 kPa
479.29	2.0				3			100						PP = 432 kPa
	2.5													
478.29	3.0		Lean CLAY with SAND (CL); hard; brown; dry; fine SAND; low plasticity fines; moderate cementation.		4	24 40 42	82	100		19				PP = 432 kPa
	3.5		SILTY SAND with GRAVEL (SM); brown; dry; fine GRAVEL; moderate cementation.		5			100						
477.29	4.0		SILT with SAND (ML); brown; dry; fine SAND; moderate cementation.											
	4.5													
			SILTY SAND with GRAVEL (SM); very dense; brown; dry; fine GRAVEL; moderate cementation.		6	24 50/4"		100						
476.29	5.0				7			100						
	5.5		SILT (ML); dense; brown; dry; moderate cementation.											
475.29	6.0				8	24 20 17	37	100						PP = 144 kPa
	6.5				9			100						PP = 432 kPa
474.29	7.0		SILT with SAND (ML); dense; brown; dry; fine SAND; moderate cementation.											
	7.5		CLAYEY SILT (ML/CL); dense; brown; dry; nonplastic to low plasticity fines.		10	14 21 20	41	100						PP = 336 kPa
473.29	8.0				11			100						PP = 432 kPa
	8.5		Lean CLAY (CL); very stiff to hard; brown; dry; low plasticity fines.											
472.29	9.0				12	14 24 37	61	100						PP = 192 kPa
	9.5				13			100						PP = 432 kPa
	10.0													

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REPORT TITLE				HOLE ID
BORING RECORD				B39
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	MEN	101	R43.1/R49.0	01-262001
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	B. Barnes		11-1-09	1 of 4

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ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method / Casing Depth	Remarks
	10.0		Lean CLAY (CL) *(continued)*.		13			100						
	10.5													
470.29	11.0				14	13 19 20	39	100						PP = 336 kPa
					15			100						PP = 336 kPa
	11.5													
469.29	12.0		SILTY SAND with GRAVEL (SM); very dense; brown; moist; fine GRAVEL; weak cementation.		16	50/5"		100						
	12.5				17			100						
468.29	13.0		Well-graded SAND with GRAVEL (SW); very dense; brown; moist; fine, subrounded GRAVEL; weak cementation.											
	13.5													
467.29	14.0		Lean CLAY (CL); hard; brown; dry; weak cementation.		18	24 28 50	78	100		13				
					19			100						PP = 432 kPa
	14.5													
466.29	15.0		SANDY lean CLAY with GRAVEL (CL); hard; brown; dry to moist; fine GRAVEL; fine SAND; weak to moderate cementation.		20	21 50/5"		100						
	15.5				21			100						
465.29	16.0													
	16.5				22	25 35 49	84	100						
464.29	17.0				23			100						
	17.5													
463.29	18.0		SILTY SAND with GRAVEL (SM); very dense; brown; dry to moist; fine GRAVEL; weak cementation.		24	24 28 37	65	100						
	18.5				25			100						
462.29	19.0													
	19.5				26	24 42 45	87	100						
461.29	20.0				27			100						
	20.5													
460.29	21.0		SILTY SAND (SM); very dark greenish gray; moist; weak cementation.											
	21.5		SANDY lean CLAY (CL); very stiff to hard; very dark greenish gray; moist; fine SAND; low plasticity fines.		28	16 34 50	84	100		18				PP = 384 kPa
	22.0				29			100						

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REPORT TITLE				HOLE ID
BORING RECORD				**B39**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**MEN**	**101**	**R43.1/R49.0**	**01-262001**
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**B. Barnes**		**11-1-09**	**2 of 4**

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method / Casing Depth	Remarks
			SANDY lean CLAY (CL) *(continued)*.		29			100						
	22.5													
458.29	23.0			X	30	16 24 36	60	100						PP = 408 kPa
	23.5				31			100						PP = 432 kPa
457.29	24.0													
	24.5		Lean CLAY (CL); hard; very dark greenish gray; moist; medium plasticity fines.	X	32	10 18 18	36	100						PP = 432 kPa
456.29	25.0				33			100						
	25.5													
			SILTY SAND (SM); very dense; very dark greenish gray; moist; weak cementation.											
455.29	26.0			X	34	18 50/6"		100						
	26.5				35			100						
454.29	27.0													
			Lean CLAY (CL); hard; dark greenish gray; moist; medium plasticity fines.											
	27.5			X	36	10 18 24	42	100						PP = 408 kPa
453.29	28.0				37			100						PP = 432 kPa
	28.5													
			SANDY lean CLAY (CL); hard; very dark greenish gray; moist; low plasticity fines.											
452.29	29.0				38			100						PP = 432 kPa
	29.5													
451.29	30.0		Well-graded SAND with CLAY (SW-SC); very dense; very dark greenish gray; moist; weak cementation.											
	30.5			X	39	16 50/6"		100						
450.29	31.0				40			100						
	31.5		SANDY lean CLAY (CL); dark greenish gray; moist; fine SAND; nonplastic to low plasticity fines.											
449.29	32.0		SILTY SAND (SM); dark greenish gray; moist; fine SAND; weak cementation.		41			80						
	32.5													
448.29	33.0													
			SANDY lean CLAY (CL); dense; very dark greenish gray; moist; fine SAND; low plasticity fines.											
	33.5			X	42	16 17 21	38	100		31				PP = 288 kPa
	34.0													

(continued)

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Department of Transportation
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REPORT TITLE				HOLE ID
BORING RECORD				**B39**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**MEN**	**101**	**R43.1/R49.0**	**01-262001**
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**B. Barnes**		**11-1-09**	**3 of 4**

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m^3)	Shear Strength (kPa)	Drilling Method	Casing Depth	Remarks
	34.5		Lean CLAY (CL); hard; very dark greenish gray; moist; medium plasticity fines.		43			100							PP = 432 kPa
446.29	35.0				44			80							
	35.5														
445.29	36.0														
	36.5		Bottom of borehole at 36.6 m bgs												
444.29	37.0														
	37.5														
443.29	38.0														
	38.5														
442.29	39.0														
	39.5														
441.29	40.0														
	40.5														
440.29	41.0														
	41.5														
439.29	42.0														
	42.5														
438.29	43.0														
	43.5														
437.29	44.0														
	44.5														
436.29	45.0														
	45.5														
	46.0														

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REPORT TITLE				HOLE ID
BORING RECORD				**B39**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**MEN**	**101**	**R43.1/R49.0**	**01-262001**
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**B. Barnes**		**11-1-09**	**4 of 4**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
C. Avila	7-13-05	7-13-05	NAD83	B44
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			312' Lt Sta 105+08 A	467 m MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			Acker 3837	102 mm
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4"), Punch Core			Safety semi-automatic, 30-inch drop	68%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING / AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Bentonite seal			Not measured / Not measured	21.8 m

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method / Casing Depth	Remarks
	0.0		SILTY SAND with GRAVEL (SM); very dense; dark grayish brown; moist; fine GRAVEL; weak cementation.		1			100						
465.68	1.0				2	26 45 47	92	100		12	19.3			
464.68	2.0				3			100						
463.68	3.0				4	50/4"		100		10	18.5			
	3.5				5			100						
462.68	4.0		CLAYEY SAND (SC); very dense; yellowish brown; wet; low plasticity fines.											
	4.5				6	22 26 26	52	100		13	17.6			
461.68	5.0				7			100						
	5.5		SILTY SAND (SM); very dense; brown; moist; fine SAND; weak cementation.											
460.68	6.0		SANDY lean CLAY (CL); very stiff; very dark grayish brown; moist; low plasticity fines.		8	17 24 33	57	100		21				PP = 336 kPa
	6.5				9			100		15	18.1			
459.68	7.0													
	7.5		SILTY SAND (SM); dense; very dark greenish gray; moist; weak cementation.		10	12 16 33	49	100						
458.68	8.0				11			100						
	8.5													
457.68	9.0		SANDY lean CLAY (CL); stiff to very stiff; very dark greenish gray; moist; fine SAND; nonplastic to low plasticity fines.		12	17 18 22	40	100		21				PP = 288 kPa
	9.5				13			100		18	17.0			PP = 192 kPa
	10.0													

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				B44
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	MEN	101	R43.1/R49.0	01-262001
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	B. Barnes		11-1-09	1 of 2

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ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method / Casing Depth	Remarks
	10.0		SANDY lean CLAY (CL) *(continued)*.		13			100						
	10.5													
455.68	11.0			X	14	12 11 15	26	100		19	17.6			PP = 312 kPa
	11.5				15			100						UU = 334 kPa
454.68	12.0													
	12.5		Lean CLAY (CL); very stiff; very dark greenish gray; moist; medium plasticity fines.	X	16	9 11 15	26	100						
453.68	13.0				17			100						
	13.5													
452.68	14.0		SANDY lean CLAY (CL); very stiff; very dark greenish gray; moist; low plasticity fines.	X	18	12 17 20	37	100						PP = 360 kPa
	14.5				19			100						
451.68	15.0													
	15.5		Lean CLAY (CL); very stiff to hard; very dark greenish gray; moist; medium plasticity fines.	X	20	10 14 14	28	100						PP = 408 kPa
450.68	16.0				21			100						PP = 408 kPa
	16.5													
449.68	17.0			X	22	9 16 18	34	100						PP = 384 kPa
	17.5				23			100						PP = 432 kPa
448.68	18.0													
	18.5		Lean CLAY with SAND (CL); hard; very dark greenish gray; moist; fine SAND; medium plasticity fines.	X	24	10 15 20	35	100		24				PP = 408 kPa
447.68	19.0				25			100						
	19.5													
446.68	20.0		Lean CLAY (CL); very stiff to hard; very dark greenish gray; moist; medium plasticity fines.	X	26	10 11 12	23	100						PP = 408 kPa
	20.5				27			100						PP = 336 kPa
445.68	21.0													
	21.5			X	28	10 12 21	33	100						PP = 408 kPa
	22.0		Bottom of borehole at 21.8 m bgs											

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REPORT TITLE				HOLE ID
BORING RECORD				**B44**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**MEN**	**101**	**R43.1/R49.0**	**01-262001**
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**B. Barnes**		**11-1-09**	**2 of 2**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
C. Avila	7-14-05	7-14-05	NAD83	B46
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			214' Lt Sta 105+42 A	459 m MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			Acker 3837	102 mm
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4"), Punch Core			Safety semi-automatic, 30-inch drop	68%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING / AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Bentonite seal			Not measured / Not measured	9.6 m

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method / Casing Depth	Remarks
	0.0		Lean CLAY with SAND (CL); stiff to very stiff; dark gray; moist; low plasticity fines.		1			100						
	0.5													
458.04	1.0													
	1.5				2	3 7 8	15	100						PP = 192 kPa
457.04	2.0		Lean CLAY (CL); very stiff; very dark greenish gray; moist; low plasticity fines.		3			100						PP = 336 kPa
	2.5													
456.04	3.0				4	4 5 8	13	100		24				PP = 240 kPa
	3.5				5			100						
455.04	4.0		Poorly graded SAND (SP); medium dense; very dark greenish gray; moist; fine SAND.											
	4.5		Well-graded SAND with GRAVEL (SW); dense; very dark greenish gray; wet.		6	17 19 13	32	100		12				
454.04	5.0				7			100						
	5.5		Well-graded SAND (SW); dense; very dark greenish gray; moist; weak cementation.											
453.04	6.0				8	14 17 14	31	100						
	6.5		Poorly graded SAND (SP); dense; very dark greenish gray; moist; fine SAND; nonplastic fines.		9			100						
452.04	7.0													
	7.5		SANDY lean CLAY (CL); stiff; very dark greenish gray; moist; nonplastic to low plasticity fines.		10	8 15 12	27	100						
451.04	8.0				11			100						
	8.5													
450.04	9.0				12	8 14 18	32	100		17				
	9.5		Bottom of borehole at 9.6 m bgs											
	10.0													

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REPORT TITLE				HOLE ID
BORING RECORD				B46
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	MEN	101	R43.1/R49.0	01-262001
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	B. Barnes		11-1-09	1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
C. Avila	8-23-05	8-23-05	NAD83	B47
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			36' Lt Sta 182+51 W	405 m MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			CME 85	102 mm
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4"), Mod Cal (2.5"), Punch Core			Automatic, 30-inch drop	87%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING	AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Bentonite seal			Not measured	Not measured	21.3 m

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method	Casing Depth	Remarks
	0.0		SILT with SAND (ML); very loose; brown; moist; coarse SAND; low plasticity fines.		1			100							
403.86	1.0									22	14.8				
402.86	2.0		Lean CLAY (CL); medium stiff; very dark gray; moist; low plasticity fines.		2	P 2 2	4	100							PP = 72 kPa
	2.5				3			100							PP = 72 kPa
401.86	3.0														
	3.5		Lean CLAY with GRAVEL (CL); soft to medium stiff; dark greenish gray; moist to wet; fine GRAVEL; low plasticity fines.		4			100		25	16.3				
400.86	4.0				5	2 2 2	4	100							PP = 48 kPa
	4.5				6			100							PP = 72 kPa
399.86	5.0		Lean CLAY with SAND (CL); very soft; dark greenish gray; moist to wet; fine SAND; low plasticity fines.		7			100							
	5.5				8	P P 2		100							
398.86	6.0				9			100							
	6.5		Lean CLAY with GRAVEL (CL); medium stiff to stiff; dark greenish gray; moist to wet; fine GRAVEL; low plasticity fines.		10			100							
397.86	7.0				11	P P 3		100							PP = 96 kPa
	7.5				12			100		21	17.1				
396.86	8.0				13			100							
	8.5		Lean CLAY (CL); soft to medium stiff; dark greenish gray; moist; low to medium plasticity fines.		14	P P 3		100							PP = 48 kPa
395.86	9.0				15			100		24	16.0				
	9.5				16			100		29	14.9				PP = 48 kPa
	10.0														

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				B47
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	MEN	101	R43.1/R49.0	01-262001
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	B. Barnes		11-1-09	1 of 2

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ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method	Casing Depth	Remarks
	10.0		Lean CLAY (CL) *(continued)*.		16			100		29	14.9				
	10.5		Becomes medium stiff to stiff.		17	P 3 4	7	100							PP = 96 kPa
393.86	11.0				18			100							
	11.5				19			100							
392.86	12.0				20	1 4 5	9	100							PP = 120 kPa
	12.5		Lean CLAY with GRAVEL (CL); medium stiff to stiff; dark greenish gray; moist; fine GRAVEL; medium plasticity fines.		21			100		29	14.8				
391.86	13.0				22			100							
	13.5				23	P 3 4	7	100							PP = 96 kPa
390.86	14.0				24			100		31	13.5				
	14.5		Lean CLAY (CL); soft to medium stiff; dark greenish gray; moist; low to medium plasticity fines.		25			100							PP = 48 kPa
389.86	15.0				26	P P P		100							PP = 48 kPa
	15.5				27			100		12	6.1				
388.86	16.0		GRAVELLY lean CLAY (CL); very soft; dark greenish gray; moist.		28			100							
	16.5		SANDY lean CLAY (CL); very soft; dark greenish gray; moist; low plasticity fines.		29	P P P		100							
387.86	17.0				30			100		15	18.4				
	17.5		CLAYEY SAND (SC); medium dense; dark greenish gray; moist; fine SAND.		31			100							
386.86	18.0				32	1 4 6	10	100							
	18.5				33			100		18	17.6				
385.86	19.0		SILTY SAND (SM); very dense; dark greenish gray; dry; moderate cementation.		34			100							
	19.5				35	12 24 40	64	100							
384.86	20.0				36			100		17	18.2				
	20.5				37			100							
383.86	21.0				38	18 43 50	93	100		21	17.1				
	21.5		Bottom of borehole at 21.3 m bgs												
	22.0														

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REPORT TITLE				HOLE ID
BORING RECORD				**B47**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**MEN**	**101**	**R43.1/R49.0**	**01-262001**
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**B. Barnes**		**11-1-09**	**2 of 2**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
C. Avila	8-24-05	8-24-05	NAD83	B48
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			2' Rt Sta 183+56 W	404 m MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			CME 85	102 mm
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4"), Mod Cal (2.5"), Punch Core			Automatic, 30-inch drop	87%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING	AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Bentonite seal			Not measured	Not measured	27.4 m

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method	Casing Depth	Remarks
	0.0		SILTY SAND (SM); brown; wet; nonplastic fines.		1			100							
	0.5														
403.00	1.0				1A			100							
	1.5		Lean CLAY (CL); soft to medium stiff; dark gray; moist; low plasticity fines.		2	P P 2		100		27	15.1				PP = 48 kPa
402.00	2.0				3			100							
	2.5		Becomes medium stiff to stiff..		4			100							PP = 96 kPa
401.00	3.0				5	P 2 3	5	100		29					
	3.5		Lean CLAY with GRAVEL (CL); medium stiff; dark gray; moist; fine, angular GRAVEL.		6			100							
					7			100							
400.00	4.0				8	P 1 4	5	100							PP = 72 kPa
	4.5				9			100		28	14.6				
399.00	5.0				10			100		32	14.1				PP = 48 kPa
	5.5		Lean CLAY (CL); soft to medium stiff; dark greenish gray; moist; low plasticity fines.		11	P P 2		100							
398.00	6.0				12			100		33					
	6.5				13			100							PP = 48 kPa
397.00	7.0		SANDY lean CLAY with GRAVEL (CL); soft to medium stiff; dark greenish gray; moist; fine GRAVEL; coarse SAND; low plasticity fines.		14	2 2 3	5	100							PP = 48 kPa
	7.5				15			100		29	14.9				
396.00	8.0		Lean CLAY (CL); soft to medium stiff; dark greenish gray; moist to wet; low plasticity fines.		16			100							PP = 48 kPa
	8.5				17	P 1 3	4	100							
395.00	9.0				18			100		23	16.0				
	9.5		Lean CLAY with GRAVEL (CL); medium stiff to stiff; dark greenish gray; moist; fine GRAVEL; low plasticity fines.		19			100							PP = 96 kPa
	10.0														

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REPORT TITLE				HOLE ID
BORING RECORD				B48
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	MEN	101	R43.1/R49.0	01-262001
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	B. Barnes		11-1-09	1 of 3

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ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method	Casing Depth	Remarks
	10.0		Lean CLAY with GRAVEL (CL) *(continued)*.		19			100							
	10.5				20	1 2 4	6	100							PP = 96 kPa
					21			100		16	18.2				
393.00	11.0				22			100							
	11.5		Lean CLAY (CL); stiff; dark greenish gray; moist; low plasticity fines.		23	1 4 3	7	100							PP = 96 kPa
392.00	12.0				24			100		29	14.8				
	12.5				25			100		15	18.4				PP = 120 kPa
391.00	13.0				26	2 3 3	6	100							PP = 144 kPa
	13.5		SANDY lean CLAY with GRAVEL (CL); medium stiff to stiff; dark greenish gray; wet; fine GRAVEL; low plasticity fines.		27			100		17					
390.00	14.0				28			100							PP = 96 kPa
	14.5				29	4 5 9	14	100							
389.00	15.0				30			100		16	18.2				
	15.5				31			100							
388.00	16.0				32	4 5 5	10	100							
	16.5		Lean CLAY with SAND (CL); stiff; dark greenish gray; moist; coarse to medium SAND; low plasticity fines.		33			100		20	16.5				
387.00	17.0				34			100							
	17.5				35	P P 5		100							
386.00	18.0				36			100		19	16.8				
	18.5		CLAYEY SAND (SC); medium dense; dark greenish gray; moist; nonplastic to low plasticity fines.		37			100		13	17.8				
385.00	19.0				38	5 6 8	14	100							
	19.5		CLAYEY SAND with GRAVEL (SC); medium dense; dark greenish gray; moist; fine GRAVEL; nonplastic to low plasticity fines.		39			100		12	19.6				
384.00	20.0				40			100							
	20.5		GRAVELLY lean CLAY with SAND (CL); stiff; dark greenish gray; moist; fine SAND; low plasticity fines.		41	3 6 8	14	100							
383.00	21.0				42			100		12	19.5				
	21.5				43			100							
	22.0														

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REPORT TITLE				HOLE ID
BORING RECORD				**B48**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**MEN**	**101**	**R43.1/R49.0**	**01-262001**
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**B. Barnes**		**11-1-09**	**2 of 3**

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method	Casing Depth	Remarks
			GRAVELLY lean CLAY with SAND (CL) *(continued)*.		43			100							PP = 144 kPa
	22.5		CLAYEY GRAVEL (GC); medium dense; dark greenish gray; moist.		44	1 6 7	13	100							
381.00	23.0		SANDY lean CLAY with GRAVEL (CL); very stiff; dark greenish gray; moist; fine GRAVEL; low plasticity fines.		45			100		13	19.6				
	23.5				46			100		12					
380.00	24.0				47	6 8 11	19	100							
	24.5				48			100		16	18.8				
379.00	25.0				49			100		15	18.7				
	25.5		CLAYEY GRAVEL (GC); dark greenish gray; moist; low plasticity fines.		50	4 7 10	17	100							
378.00	26.0				51			100		13	19.9				
	26.5		CLAYEY GRAVEL with SAND (GC); medium dense; dark greenish gray; moist; fine SAND; nonplastic to low plasticity fines.		52			100							
377.00	27.0				53	7 10 12	22	100							
	27.5		Bottom of borehole at 27.4 m bgs												
376.00	28.0														
	28.5														
375.00	29.0														
	29.5														
374.00	30.0														
	30.5														
373.00	31.0														
	31.5														
372.00	32.0														
	32.5														
371.00	33.0														
	33.5														
	34.0														

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REPORT TITLE				HOLE ID
BORING RECORD				**B48**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**MEN**	**101**	**R43.1/R49.0**	**01-262001**
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**B. Barnes**		**11-1-09**	**3 of 3**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
C. Avila	8-25-05	8-25-05	NAD83	B49
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			3' Lt Sta 185+92 W	404 m MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			CME 85	102 mm
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4"), Mod Cal (2.5"), Punch Core			Automatic, 30-inch drop	87%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING	AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Bentonite seal			Not measured	Not measured	7.0 m

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method	Casing Depth	Remarks
	0.0		Lean CLAY with GRAVEL (CL); soft to medium stiff; very dark gray; moist; fine GRAVEL.		1			100							
	0.5				1A			100							
402.50	1.0				2	P P P		100		29	14.8				PP = 48 kPa
	1.5				3			100							
401.50	2.0				4			100		18	17.3				
	2.5		SILTY SAND (SM); medium dense; dark greenish gray; dry; moderate to strong cementation.		5	4 4 8	12	100							
400.50	3.0				6			100							
	3.5				7			100		15					
399.50	4.0		Becomes very dense.		8	13 28 42	70	100							
	4.5				9			100							
398.50	5.0				10			100							
	5.5				11	15 39 50	89	100							
397.50	6.0				12			100							
	6.5				13	25 50/4"		100							
396.50	7.0		Bottom of borehole at 7.0 m bgs												
395.50	8.0														
394.50	9.0														
	10.0														

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REPORT TITLE				HOLE ID
BORING RECORD				B49
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	MEN	101	R43.1/R49.0	01-262001
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	B. Barnes		11-1-09	1 of 1

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
T. Alderman	8-25-05	8-25-05	NAD83	B50
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			1' Rt Sta 119+04 A	434 m MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			CME 85	102 mm
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4"), Mod Cal (2.5"), Punch Core			Automatic, 30-inch drop	87%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING	AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Bentonite seal			Not measured	Not measured	17.7 m

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method	Casing Depth	Remarks
	0.0		Lean CLAY (CL); soft to medium stiff; dark greenish gray; moist; low plasticity fines.		1			100							
	0.5														PP = 48 kPa
432.67	1.0														
	1.5														
431.67	2.0				2	3 6 6	12	100		17					
	2.5		Lean CLAY with GRAVEL (CL); stiff to very stiff; dark greenish gray; moist; fine GRAVEL; low plasticity fines.		3			100							PP = 192 kPa
430.67	3.0		Lean CLAY (CL); stiff; brown; moist; low plasticity fines.												
	3.5				4			100		21	16.2				PP = 144 kPa
429.67	4.0				5	3 4 5	9	100							PP = 144 kPa
	4.5		Well-graded SAND with GRAVEL (SW); medium dense; brown; moist; nonplastic fines.		6			100							
428.67	5.0				7	3 6 11	17	100							
	5.5				8			100							
427.67	6.0														
	6.5		Lean CLAY (CL); stiff; brown; moist; low plasticity fines.		9			100							PP = 144 kPa
426.67	7.0		SANDY lean CLAY (CL); medium stiff to stiff; dark greenish gray; moist; fine SAND; low plasticity fines.		10	2 2 3	5	100		25	15.7				PP = 48 kPa
	7.5				11			100							PP = 96 kPa
425.67	8.0				12	P P 5		100							PP = 48 kPa
	8.5				13			100							PP = 120 kPa
424.67	9.0		Lean CLAY (CL); stiff; dark greenish gray; moist; low plasticity fines.												
	9.5				14			100							PP = 144 kPa
	10.0														

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				B50
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	MEN	101	R43.1/R49.0	01-262001
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	B. Barnes		11-1-09	1 of 2

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method	Casing Depth	Remarks
	10.0		Lean CLAY (CL) *(continued)*.		15	1 2 4	6	100		21	17.0				PP = 144 kPa
	10.5				16			100							
422.67	11.0		Well-graded GRAVEL with SAND (GW); medium dense; dark greenish gray; wet; coarse to fine GRAVEL.		17	10 15 14	29	100							
	11.5				18			100							
421.67	12.0		Poorly graded SAND (SP); very loose to loose; dark greenish gray; wet; medium SAND; weak cementation.												
	12.5				19			100		21	16.8				
420.67	13.0				20	1 2 1	3	100							
	13.5		Lean CLAY with SAND (CL); medium stiff to stiff; dark greenish gray; moist; fine SAND.		21			100							PP = 96 kPa
419.67	14.0		SANDY lean CLAY with GRAVEL (CL); medium stiff; dark greenish gray; wet; fine GRAVEL; low plasticity fines.		22	P 2 10	12	100		10					PP = 72 kPa
	14.5														
418.67	15.0		CLAYEY GRAVEL (GC); dense; dark greenish gray; wet.		23			100							
	15.5														
417.67	16.0				24	3 19 24	43	100							
	16.5		SILTY GRAVEL (GM); dense; dark greenish gray; moist; weak cementation.		25			100							
416.67	17.0														
	17.5				26	21 24 20	44	100							
415.67	18.0		Bottom of borehole at 17.7 m bgs												
	18.5														
414.67	19.0														
	19.5														
413.67	20.0														
	20.5														
412.67	21.0														
	21.5														
	22.0														

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REPORT TITLE				HOLE ID
BORING RECORD				**B50**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**MEN**	**101**	**R43.1/R49.0**	**01-262001**
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**B. Barnes**		**11-1-09**	**2 of 2**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
C. Avila	9-27-05	9-27-05	NAD83	B54
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			411' Lt Sta 104+48 A	481 m MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			CME 85	102 mm
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4"), Mod Cal (2.5"), Punch Core			Automatic, 30-inch drop	87%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING / AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Bentonite seal			Not measured / Not measured	33.5 m

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method / Casing Depth	Remarks
	0.0		Lean CLAY (CL); hard; brown; dry; low plasticity fines.		1			100						
	0.5													PP = 432 kPa
480.09	1.0													
	1.5				1A			100		22	14.8			
														UU = 186 kPa
479.09	2.0				2	14 25 28	53	100						
	2.5		SANDY lean CLAY (CL); hard; brown; dry; moderate cementation.		3			100						
478.09	3.0				4			100		15	16.0			
	3.5				5	11 14 17	31	100						
477.09	4.0				6			100						
	4.5				7			100		17	16.0			PP = 432 kPa
476.09	5.0		SILT with SAND (ML); dense; brown; dry; fine SAND; moderate cementation.		8	12 19 27	46	100						
	5.5				9			100						
475.09	6.0		SANDY lean CLAY (CL); very stiff; brown and dark grayish brown; moist; low plasticity fines; weak cementation.		10			100		14	16.2			
	6.5													
474.09	7.0				11	7 11 13	24	100						
	7.5				12			100						PP = 336 kPa
			Lean CLAY (CL); dark greenish gray; moist; medium plasticity fines.		13			100		25	14.9			PP = 288 kPa
473.09	8.0													UU = 83 kPa
			CLAYEY SAND (SC); very dense; dark greenish gray; dry; moderate to strong cementation.		14	13 22 32	54	100						
	8.5				15			100						
472.09	9.0		CLAYEY SAND with GRAVEL (SC); dark greenish gray; dry; fine GRAVEL.		16			100		18	16.8			
	9.5		Lean CLAY (CL); very stiff; dark greenish gray; moist; low plasticity fines.		17	12 9 17	26	100						
	10.0													

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REPORT TITLE				HOLE ID
BORING RECORD				B54
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	MEN	101	R43.1/R49.0	01-262001
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	B. Barnes		11-1-09	1 of 3

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ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method / Casing Depth	Remarks
	10.0		Lean CLAY (CL) *(continued)*.		18			100						
	10.5		SANDY lean CLAY (CL); very stiff; dark greenish gray; moist; low to medium plasticity fines.		19			100		23	16.2			PP = 288 kPa
470.09	11.0				20	6 12 14	26	100						PP = 240 kPa
	11.5				21			100						
469.09	12.0		Lean CLAY (CL); very stiff; dark greenish gray; moist; medium plasticity fines.		22			100		25	15.2			PP = 288 kPa
	12.5													UU = 196 kPa
468.09	13.0				23	5 10 12	22	100						
	13.5		CLAYEY SAND (SC); dark greenish gray; moist; weak cementation.		24			100						PP = 336 kPa
467.09	14.0		Lean CLAY (CL); very stiff; dark greenish gray; moist; medium plasticity fines.		25			100						PP = 288 kPa
	14.5		CLAYEY SAND (SC); dense; dark greenish gray; moist; low plasticity fines.		26	8 15 19	34	100						
466.09	15.0		SANDY lean CLAY (CL); hard; dark greenish gray; moist; medium plasticity fines.		27			100						PP = 432 kPa
	15.5				28			100		20	16.5			PP = 432 kPa
465.09	16.0				29	8 15 17	32	100						
	16.5		Lean CLAY with SAND (CL); hard; dark greenish gray; moist; medium plasticity fines.		30			100						
464.09	17.0				31			100		23	16.3			PP = 408 kPa
	17.5				32	7 13 18	31	100						UU = 183 kPa PP = 408 kPa
463.09	18.0				33			100						PP = 408 kPa
	18.5		Lean CLAY (CL); very stiff; dark greenish gray; moist; medium plasticity fines.		34			100		29	14.8			PP = 312 kPa
462.09	19.0				35	6 13 17	30	100						UU = 169 kPa
	19.5		Lean CLAY with SAND (CL); hard; dark greenish gray; moist; fine SAND; medium plasticity fines.		36			100						PP = 408 kPa
461.09	20.0				37			100		51	10.7			PP = 432 kPa UU = 179 kPa
	20.5				38	7 12 17	29	100						
460.09	21.0		Lean CLAY with GRAVEL (CL); hard; dark greenish gray; moist; fine GRAVEL; medium plasticity fines.		39			100		10				
	21.5				40	19 20 37	57	100						
	22.0													

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REPORT TITLE				HOLE ID
BORING RECORD				**B54**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**MEN**	**101**	**R43.1/R49.0**	**01-262001**
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**B. Barnes**		**11-1-09**	**2 of 3**

ELEVATION (m)	DEPTH (m)	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method / Casing Depth	Remarks
		CLAYEY GRAVEL (GC); dark greenish gray; moist; fine GRAVEL; weak cementation.		41			100						PP = 144 kPa
	22.5			42			100						PP = 144 kPa
458.09	23.0												
		CLAYEY GRAVEL with SAND (GC); very dense; dark greenish gray; moist; fine GRAVEL; medium SAND; weak cementation.		43	13 30 41	71	100						
	23.5			44			100						
457.09	24.0												
	24.5			45	20 21 32	53	100						
456.09	25.0			46			100		19				
		SILTY SAND (SM); very dense; dark greenish gray; moist; fine SAND; weak cementation.											
455.09	26.0			47	12 18 37	55	100						PP = 336 kPa
	26.5			48			100						
454.09	27.0												
	27.5			49	12 17 30	47	100						
453.09	28.0												
		SILTY SAND with GRAVEL (SM); very dense; dark greenish gray; moist; weak cementation.											
	28.5												
452.09	29.0			51	26 50/6"		100						
	29.5			52			100						
451.09	30.0	CLAYEY GRAVEL with SAND (GC); very dense; dark greenish gray; moist; fine SAND; weak cementation.											
	30.5			53	26 50/5"		100						
450.09	31.0			54			100						
	31.5	CLAYEY SAND (SC); very dense; dark greenish gray; moist; fine SAND; low plasticity fines.											
449.09	32.0			55	18 41 50/5"		100						
	32.5			56			100						
448.09	33.0	SANDY lean CLAY (CL); hard; dark greenish gray; moist; low plasticity fines.		57	20 39 37	76	100						PP = 432 kPa
	33.5	Bottom of borehole at 33.5 m bgs											
	34.0												

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REPORT TITLE				HOLE ID
BORING RECORD				**B54**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**MEN**	**101**	**R43.1/R49.0**	**01-262001**
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**B. Barnes**		**11-1-09**	**3 of 3**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
C. Avila	10-6-05	10-6-05	NAD83	B56
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			258' Lt Sta 104+24 A	482 m MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			CME 85	102 mm
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4"), Punch Core			Automatic, 30-inch drop	87%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING	AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Bentonite seal			Not measured	Not measured	31.9 m

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method	Casing Depth	Remarks
	0.0		Lean CLAY (CL); very stiff to hard; brown to strong brown; dry; low plasticity fines.		1			100							
	0.5														
481.19	1.0														
	1.5				2	7 10 14	24	100							PP = 384 kPa
480.19	2.0				3			100							
	2.5														
					4			100							
479.19	3.0		SILTY SAND with GRAVEL (SM); very dense; brown; dry; weak cementation.		5	17 27 24	51	100							
	3.5				6			100							
478.19	4.0		Lean CLAY (CL); gray; dry; low plasticity fines.												
	4.5		Poorly graded SAND (SP); very dense; strong brown; dry; medium SAND.		7	18 50/5"		100							
477.19	5.0		CLAYEY SAND with GRAVEL (SC); very dense; strong brown; dry; low plasticity fines.		8			100							
	5.5														
476.19	6.0				9	18 25 31	56	100		9					
	6.5		SILTY SAND with GRAVEL (SM); very dense; brown; dry; coarse to fine, subrounded GRAVEL; weak cementation.		10			100							
475.19	7.0														
	7.5				11	21 32 46	78	100							
474.19	8.0		SANDY lean CLAY with GRAVEL (CL); strong brown; wet; fine, subangular GRAVEL; weak cementation.		12			100							
	8.5		Poorly graded SAND with SILT (SP-SM); dense; yellowish brown; wet.												
473.19	9.0		SILTY SAND (SM); dense; grayish brown; moist; weak to moderate cementation.		13	12 20 21	41	100							
	9.5				14			100							
	10.0														

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REPORT TITLE				HOLE ID
BORING RECORD				B56
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	MEN	101	R43.1/R49.0	01-262001
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	B. Barnes		11-1-09	1 of 3

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ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method	Casing Depth	Remarks
	10.0		SILTY SAND (SM) *(continued)*.		14			100							
	10.5				15	8 18 28	46	100							
471.19	11.0				16			100							PP = 408 to 432 kPa
	11.5		SANDY lean CLAY (CL); hard; gray; moist; weak to moderate cementation.												
470.19	12.0				17	7 13 16	29	100							
	12.5		Lean CLAY (CL); very stiff to hard; dark greenish gray; moist; moderate cementation.		18			100							PP = 192 to 432 kPa
469.19	13.0														
	13.5				19	4 7 11	18	100							
468.19	14.0				20			100							
	14.5		SILTY SAND (SM); dense; dark greenish gray; moist; weak to moderate cementation.												
467.19	15.0				21	5 12 18	30	100							
	15.5		Lean CLAY with SAND (CL); very stiff to hard; dark gray; moist.		22			100							PP = 192 to 432 kPa
466.19	16.0														
	16.5				23	6 15 18	33	100							
465.19	17.0				24			100							
	17.5		CLAYEY SAND (SC); dense; dark greenish gray; moist; weak to moderate cementation.												
464.19	18.0				25	10 21 23	44	100							
	18.5				26			100							
463.19	19.0														
	19.5		Lean CLAY (CL); very stiff to hard; dark greenish gray; moist.		27	7 13 16	29	100							
462.19	20.0				28			100							PP = 192 to 432 kPa
	20.5														
461.19	21.0				29	8 14 18	32	100							
	21.5				30			100							PP = 432 kPa
	22.0														

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				**B56**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**MEN**	**101**	**R43.1/R49.0**	**01-262001**
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**B. Barnes**		**11-1-09**	**2 of 3**

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method / Casing Depth	Remarks
			Lean CLAY (CL) *(continued)*.		30			100						
	22.5													
459.19	23.0			X	31	5 7 12	19	100						
	23.5				32			100						
458.19	24.0		SANDY lean CLAY (CL); hard; dark greenish gray; moist.	X	33	12 12 18	30	100						
	24.5				34			100						PP = 384 to 432 kPa
457.19	25.0													
	25.5		Lean CLAY (CL); hard; dark greenish gray; moist.	X	35	8 12 17	29	100						
456.19	26.0				36			100						PP = 432 kPa
	26.5													
455.19	27.0			X	37	9 12 14	26	100						
	27.5				38			100						PP = 432 kPa
454.19	28.0													
	28.5		SANDY lean CLAY (CL); hard; dark greenish gray; moist.	X	39	7 11 14	25	100						
453.19	29.0				40			100						PP = 432 kPa
	29.5													
452.19	30.0		CLAYEY SAND with GRAVEL (SC); very dense; dark greenish gray; wet.	X	41	34 52/6"		100						
	30.5				42			0						
451.19	31.0													
	31.5													
450.19	32.0		Bottom of borehole at 31.9 m bgs											
	32.5													
449.19	33.0													
	33.5													
	34.0													

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REPORT TITLE				HOLE ID
BORING RECORD				**B56**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**MEN**	**101**	**R43.1/R49.0**	**01-262001**
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**B. Barnes**		**11-1-09**	**3 of 3**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
C. Avila	7-25-06	7-26-06	NAD83	B59
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			3' Lt Sta 121+38 A	428 m MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			Acker 3837	102 mm
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4"), Mod Cal (2.5"), Shelby (2.87), Punch Core			Safety semi-automatic, 30-inch drop	68%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING	AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Bentonite seal			Not measured	Not measured	24.8 m

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method	Casing Depth	Remarks
	0.0		SANDY lean CLAY (CL); stiff; brown; dry; low plasticity fines.		1			100							
427.04	0.5														
	1.0														
	1.5		CLAYEY SAND (SC); loose; brown; wet; low plasticity fines.		2			100		23	15.9				
426.04	2.0				3	4 3 2	5	100		21					
	2.5				4			100							PP = 144 kPa
425.04	3.0		Lean CLAY (CL); stiff to very stiff; brown; moist; low to medium plasticity fines.		5			100		24	16.3				
	3.5				6	9 15 24	39	100							PP = 288 kPa
424.04	4.0				7			100							
	4.5				8			100		25	15.6				
423.04	5.0		Lean CLAY with SAND (CL); very stiff; dark greenish gray; moist; fine SAND; low plasticity fines.		9	4 11 5	16	100							
	5.5				10			100							
422.04	6.0				11			100		23	16.3				
	6.5				12	4 5 7	12	100		24					
421.04	7.0		CLAYEY SAND (SC); medium dense; dark greenish gray; wet; low plasticity fines.		13			100							
	7.5		Lean CLAY with SAND (CL); medium stiff to stiff; dark greenish gray; moist.												PP = 96 to 144 kPa
420.04	8.0														
	8.5														
419.04	9.0				14			100		28	15.1				
	9.5		Lean CLAY (CL); medium stiff to stiff; dark greenish gray; moist.		15	5 7 8	15	100							
	10.0				16			100							PP = 120 kPa

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REPORT TITLE				HOLE ID
BORING RECORD				B59
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	MEN	101	R43.1/R49.0	01-262001
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	B. Barnes		11-1-09	1 of 3

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ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method / Casing Depth	Remarks
	10.0		Lean CLAY (CL) *(continued)*.		16			100						
	10.5													PP = 96 to 144 kPa
417.04	11.0		CLAYEY SAND with GRAVEL (SC); medium dense; dark greenish gray; wet.		17			100		22	16.7			
	11.5				18	11 12 8	20	100		16				
416.04	12.0				19			100						
	12.5				20			100		12	17.9			
415.04	13.0				21	9 11 13	24	100						PP = 288 kPa
			Lean CLAY with SAND (CL); stiff to very stiff; dark greenish gray; moist.		22			100						
	13.5													PP = 144 to 192 kPa
414.04	14.0				23			100		20	16.8			
			Poorly graded SAND with SILT (SP-SM); very dense; dark gray; moist to wet.		24	17 22 34	56	100						
	14.5													
413.04	15.0				25			100						
			Poorly graded SAND with SILT and GRAVEL (SP-SM); very dense; dark gray; moist to wet.		26	23 29 35	64	100		13				
	15.5				27			100						
412.04	16.0		SILTY GRAVEL with SAND (GM); dense; dark greenish gray; moist to wet.											
	16.5													
411.04	17.0				28	15 20 21	41	100		22				
			SILTY SAND (SM); dense; dark greenish gray; moist to wet; nonplastic fines.		29			100						
	17.5													
410.04	18.0				30	21 28 39	67	100						
	18.5				31			100						
409.04	19.0													
	19.5		SANDY lean CLAY (CL); very stiff; dark greenish gray; moist; low plasticity fines.		32	14 17 22	39	100						PP = 336 kPa
408.04	20.0				33			100						PP = 288 kPa
	20.5													
407.04	21.0		Lean CLAY (CL); very stiff; dark greenish gray; moist; low plasticity fines.							21	17.0			
	21.5				34			100						
	22.0													

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BORING RECORD				**B59**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**MEN**	**101**	**R43.1/R49.0**	**01-262001**
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**B. Barnes**		**11-1-09**	**2 of 3**

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method	Casing Depth	Remarks
			Lean CLAY (CL) *(continued)*.		35	9 15 18	33	100							PP = 264 kPa
	22.5														
			Lean CLAY with SAND (CL); very stiff; dark greenish gray; moist; low plasticity fines.		36			100							
405.04	23.0				37	10 17 29	46	100							PP = 288 kPa
	23.5				38			100							
404.04	24.0		SANDY lean CLAY (CL); very stiff; dark greenish gray; moist; low plasticity fines.												
	24.5				39	19 20 35	55	100							PP = 240 kPa
403.04	25.0		Bottom of borehole at 24.8 m bgs												
	25.5														
402.04	26.0														
	26.5														
401.04	27.0														
	27.5														
400.04	28.0														
	28.5														
399.04	29.0														
	29.5														
398.04	30.0														
	30.5														
397.04	31.0														
	31.5														
396.04	32.0														
	32.5														
395.04	33.0														
	33.5														
	34.0														

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DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**MEN**	**101**	**R43.1/R49.0**	**01-262001**
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**B. Barnes**		**11-1-09**	**3 of 3**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
C. Avila	7-26-06	7-26-06	NAD83	B60
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			6' Rt Sta 123+12 A	427 m MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			Acker 3837	102 mm
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4"), Shelby (2.87), Punch Core			Safety semi-automatic, 30-inch drop	68%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING	AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Bentonite seal			Not measured	Not measured	24.8 m

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method	Casing Depth	Remarks
	0.0		Lean CLAY with SAND (CL); hard; brown; moist; fine SAND; low plasticity fines.		1			100							
425.53	1.0														
	1.5		SANDY lean CLAY (CL); hard; brown; moist; low plasticity fines.		2			100		17					
424.53	2.0				3	12 16 19	35	100							
	2.5				4			100		12					
423.53	3.0		CLAYEY GRAVEL with SAND (GC); medium dense; brown; wet; fine, subangular GRAVEL; fine SAND; low plasticity fines.		5	12 9 7	16	100							
	3.5				6			100							
422.53	4.0														
	4.5		CLAYEY SAND (SC); loose; greenish gray; wet; low plasticity fines.		7	2 3 3	6	100							
421.53	5.0		CLAYEY GRAVEL with SAND (GC); dense; greenish gray; moist; low plasticity fines.		8			100							
420.53	6.0				9	12 21 23	44	100		12					
	6.5		CLAYEY GRAVEL (GC); dense; dark greenish gray; wet; fine, subangular GRAVEL; low plasticity fines.		10			100							
419.53	7.0														
	7.5		CLAYEY GRAVEL with SAND (GC); dense; dark greenish gray; wet; fine, subangular GRAVEL; fine SAND; low plasticity fines.		11	19 16 16	32	100							
418.53	8.0				12			100							
	8.5														
417.53	9.0		Lean CLAY (CL); stiff; dark greenish gray; moist; low plasticity fines.		13	3 4 6	10	100							PP = 144 kPa
	9.5				14			100		29					
	10.0														

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REPORT TITLE				HOLE ID
BORING RECORD				B60
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	MEN	101	R43.1/R49.0	01-262001
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	B. Barnes		11-1-09	1 of 3

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ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method	Casing Depth	Remarks
	10.0		Lean CLAY (CL) *(continued)*.		14			100							
					15			100							
	10.5		CLAYEY SAND (SC); loose; dark greenish gray; wet; low plasticity fines.		16			100							
415.53	11.0		Lean CLAY with GRAVEL (CL); medium stiff to stiff; gray; moist; fine GRAVEL; low plasticity fines.		17	6 4 4	8	100							PP = 72 kPa
	11.5				18			100							PP = 96 kPa
414.53	12.0		CLAYEY SAND (SC); dark greenish gray; moist; low plasticity fines.												
	12.5				19			0							
413.53	13.0		CLAYEY GRAVEL with SAND (GC); dark greenish gray; wet; nonplastic to low plasticity fines.		20			100		9					
	13.5														
412.53	14.0		Lean CLAY with SAND (CL); very stiff to hard; dark greenish gray; moist; fine GRAVEL; low plasticity fines.		21	11 19 36	55	100							PP = 384 kPa
	14.5		CLAYEY SAND with GRAVEL (SC); dense; dark greenish gray; moist; fine GRAVEL; low plasticity fines.		22			100							
411.53	15.0		CLAYEY GRAVEL with SAND (GC); very dense; dark greenish gray; moist; fine SAND; low plasticity fines.		23	40 31 34	65	100							
	15.5				24			100							
410.53	16.0		Lean CLAY (CL); very stiff; dark greenish gray; moist; medium plasticity fines.												
	16.5				25	11 13 18	31	100		23					PP = 216 kPa
409.53	17.0		SANDY lean CLAY (CL); dark greenish gray; moist; low plasticity fines.		26			100							
	17.5														
408.53	18.0		Lean CLAY with SAND (CL); very stiff; dark greenish gray; moist; fine SAND; low plasticity fines.		27	10 16 27	43	100							PP = 264 kPa
	18.5				28			100							
407.53	19.0		CLAYEY SAND (SC); dark greenish gray; moist; low plasticity fines.												
	19.5		Lean CLAY (CL); very stiff; dark greenish gray; moist; low to medium plasticity fines.		29	9 16 21	37	100		24					PP = 240 kPa
406.53	20.0				30			100							PP = 312 kPa
	20.5														
405.53	21.0														
	21.5		CLAYEY GRAVEL (GC); very dense; dark greenish gray; moist; low to medium plasticity fines.		31	10 38 44	82	100							
	22.0				32			100							

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REPORT TITLE: **BORING RECORD**

HOLE ID: **B60**

DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**MEN**	**101**	**R43.1/R49.0**	**01-262001**

PROJECT OR BRIDGE NAME: **Willits Bypass**

BRIDGE NUMBER	PREPARED BY	DATE	SHEET
N/A	**B. Barnes**	**11-1-09**	**2 of 3**

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method	Casing Depth	Remarks
			SILTY SAND (SM); dark greenish gray; moist.		32			100		10					
	22.5														
			Well-graded SAND with GRAVEL (SW); very dense; dark greenish gray; moist to wet; weak cementation.												
403.53	23.0				33	20 48 50	98	100							
	23.5		CLAYEY GRAVEL (GC); dark greenish gray; moist; low plasticity fines.		34			100							
402.53	24.0		SANDY lean CLAY (CL); stiff; dark greenish gray; moist.												
	24.5				35	11 21 23	44	100							PP = 168 kPa
401.53	25.0		Bottom of borehole at 24.8 m bgs												
	25.5														
400.53	26.0														
	26.5														
399.53	27.0														
	27.5														
398.53	28.0														
	28.5														
397.53	29.0														
	29.5														
396.53	30.0														
	30.5														
395.53	31.0														
	31.5														
394.53	32.0														
	32.5														
393.53	33.0														
	33.5														
	34.0														

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REPORT TITLE				HOLE ID
BORING RECORD				**B60**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**MEN**	**101**	**R43.1/R49.0**	**01-262001**
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**B. Barnes**		**11-1-09**	**3 of 3**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
C. Avila	7-27-06	7-27-06	NAD83	B61
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			6' Rt Sta 124+69 A	428 m MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			Acker 3837	102 mm
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4"), Shelby (2.87), Punch Core			Safety semi-automatic, 30-inch drop	68%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING / AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Bentonite seal			Not measured / Not measured	21.8 m

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method	Casing Depth	Remarks
	0.0		Lean CLAY with SAND (CL); stiff; brown; dry; fine SAND; low plasticity fines.		1			100							
426.71	1.0														
	1.5				2			100		20					
425.71	2.0		CLAYEY SAND (SC); medium dense; brown; wet; low plasticity fines.		3	5 5 6	11	100							
	2.5				4			100							
424.71	3.0				5			100		18	17.4				
	3.5		CLAYEY GRAVEL with SAND (GC); loose; brown; wet; weak cementation.		6	7 5 4	9	100							
423.71	4.0				7			100							
	4.5		CLAYEY SAND with GRAVEL (SC); loose; dark greenish gray; wet; fine, subangular GRAVEL; low plasticity fines; weak cementation.		8	6 4 2	6	100		16					
422.71	5.0				9			100							
	5.5														
421.71	6.0				10	10 5 2	7	22							
	6.5				11			100							
420.71	7.0		Lean CLAY with SAND (CL); medium stiff to stiff; dark greenish gray; moist; low plasticity fines.												
	7.5				12			100		26	15.6				PP = 96 kPa
419.71	8.0		Lean CLAY (CL); stiff; dark greenish gray; moist; low plasticity fines.		13	4 6 10	16	100							PP = 144 kPa
	8.5				14			100							
418.71	9.0				15			100		26					
	9.5		Lean CLAY with SAND (CL); stiff; dark greenish gray; moist; fine SAND; low plasticity fines.		16	11 11 13	24	100							PP = 144 kPa
	10.0														

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REPORT TITLE				HOLE ID
BORING RECORD				B61
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	MEN	101	R43.1/R49.0	01-262001
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	B. Barnes		11-1-09	1 of 2

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ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method	Casing Depth	Remarks
	10.0		Lean CLAY with SAND (CL) *(continued)*.		17			100							
	10.5		Lean CLAY (CL); stiff; dark greenish gray; moist; low to medium plasticity fines.												
416.71	11.0				18	5 6 12	18	100							PP = 144 kPa
	11.5				19			100							
415.71	12.0		CLAYEY GRAVEL with SAND (GC); dark greenish gray; moist; low plasticity fines.												
	12.5		SANDY lean CLAY (CL); very stiff; dark greenish gray; moist; low plasticity fines.		20	12 7 15	22	100							
414.71	13.0		CLAYEY GRAVEL with SAND (GC); medium dense; dark greenish gray; moist; low plasticity fines.		21			100							
	13.5														
413.71	14.0				22	6 9 12	21	100							
	14.5		Lean CLAY (CL); stiff to very stiff; dark greenish gray; moist; low plasticity fines.		23			100		22	16.5				
412.71	15.0				24			100							PP = 192 kPa
	15.5		CLAYEY GRAVEL with SAND (GC); very dense; dark greenish gray; moist; coarse to fine GRAVEL; low plasticity fines.		25	31 41 36	77	100							
411.71	16.0				26			100							
	16.5														
410.71	17.0		SANDY lean CLAY (CL); very stiff; dark greenish gray; moist; low plasticity fines.		27	22 17 13	30	100							
	17.5		CLAYEY SAND (SC); dark greenish gray; wet; weak cementation.		28			100		13					
409.71	18.0		Well-graded SAND with GRAVEL (SW); very dense; dark greenish gray; moist.												
	18.5				29	31 42 46	88	100							
408.71	19.0				30			100							
	19.5		GRAVELLY lean CLAY with SAND (CL); hard; dark greenish gray; moist; low plasticity fines.												
407.71	20.0				31	50/6"		100							
	20.5				32			100		12					
406.71	21.0														
	21.5		SANDY lean CLAY (CL); hard; dark greenish gray; moist; low plasticity fines.		33	18 25 50/5"		100							
	22.0		Bottom of borehole at 21.8 m bgs												

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REPORT TITLE				HOLE ID
BORING RECORD				**B61**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**MEN**	**101**	**R43.1/R49.0**	**01-262001**
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**B. Barnes**		**11-1-09**	**2 of 2**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
C. Avila	7-31-06	7-31-06	NAD83	B62
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			4' Rt Sta 128+31 A	421 m MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			Acker 3837	102 mm
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4"), Punch Core			Safety semi-automatic, 30-inch drop	68%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING	AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Bentonite seal			Not measured	Not measured	15.4 m

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method	Casing Depth	Remarks
	0.0		Lean CLAY with SAND (CL); stiff to very stiff; brown; dry to moist; fine SAND; low plasticity fines.		1			100							
419.51	1.0				2	8 8 7	15	100							
	1.5				3			100							
418.51	2.0														
	2.5				4	4 7 8	15	100							PP = 192 kPa
417.51	3.0				5			100							
	3.5														
416.51	4.0				6	6 8 12	20	100							
	4.5				7			100							
415.51	5.0														
	5.5		Well-graded GRAVEL with SAND (GW); medium dense; brown; dry; fine SAND; weak cementation.		8	8 12 11	23	100							
414.51	6.0				9			100							
	6.5														
413.51	7.0		Poorly graded SAND with SILT (SP-SM); dense; brown; moist; weak cementation.		10	15 25 22	47	100							
	7.5				11			100							
412.51	8.0														
	8.5		Lean CLAY with SAND (CL); very stiff; olive gray; moist; fine SAND; low plasticity fines.		12	9 11 15	26	100							PP = 312 kPa
411.51	9.0				13			100							
	9.5														
	10.0														

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				B62
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	MEN	101	R43.1/R49.0	01-262001
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	B. Barnes		11-1-09	1 of 2

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ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method	Casing Depth	Remarks
	10.0		Poorly graded SAND with CLAY (SP-SC); very dense; brown; moist; weak cementation.		13			100							
	10.5				14	39 44 45	89	100							
409.51	11.0				15			100							
	11.5		Poorly graded SAND with SILT (SP-SM); very dense; brown; dry; weak cementation.												
408.51	12.0				16	25 39 45	84	100							
	12.5				17			100							
407.51	13.0														
	13.5				18	11 16 22	38	100							
406.51	14.0		SANDY lean CLAY (CL); stiff to very stiff; brown; moist; low plasticity fines.		19			100							PP = 192 kPa
	14.5														
405.51	15.0				20	9 18 25	43	100							
	15.5		Bottom of borehole at 15.4 m bgs												
404.51	16.0														
	16.5														
403.51	17.0														
	17.5														
402.51	18.0														
	18.5														
401.51	19.0														
	19.5														
400.51	20.0														
	20.5														
399.51	21.0														
	21.5														
	22.0														

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REPORT TITLE				HOLE ID
BORING RECORD				**B62**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**MEN**	**101**	**R43.1/R49.0**	**01-262001**
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**B. Barnes**		**11-1-09**	**2 of 2**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
C. Avila	8-1-06	8-1-06	NAD83	B63
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			4' Rt Sta 131+94 A	421 m MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			Acker 3837	102 mm
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4"), Shelby (2.87), Punch Core			Safety semi-automatic, 30-inch drop	68%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING	AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Bentonite seal			Not measured	Not measured	23.2 m

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method	Casing Depth	Remarks
	0.0		Lean CLAY with SAND (CL); brown; dry; fine SAND; low plasticity fines.		1			100							
419.51	1.0														
	1.5				2			100		16					
418.51	2.0		CLAYEY SAND with GRAVEL (SC); loose; brown; wet; fine GRAVEL; low plasticity fines.		3	3 3 4	7	100							
	2.5				4			100							PP = 264 kPa
417.51	3.0		Lean CLAY (CL); very stiff; brown; moist; low plasticity fines.		5			100		24	17.3				
	3.5				6	18 14 12	26	100							
416.51	4.0		Well-graded SAND with CLAY and GRAVEL (SW-SC); loose to medium dense; brown; wet; low plasticity fines.		7			100							
	4.5				8	7 6 3	9	100							
415.51	5.0				9			100							
	5.5														
414.51	6.0		Lean CLAY (CL); medium stiff to stiff; dark gray; moist; low plasticity fines.		10	3 4 3	7	100		24					PP = 96 kPa
	6.5				11			100							
413.51	7.0		CLAYEY GRAVEL with SAND (GC); dark gray; moist.												
	7.5				12	11 11 6	17	100							
412.51	8.0		Well-graded SAND with GRAVEL (SW); medium dense; dark gray; wet; weak cementation.		13			100							
	8.5														
411.51	9.0				14	4 6 9	15	0							
	9.5		Lean CLAY with SAND (CL); stiff; dark greenish gray; moist; fine SAND; low to medium plasticity fines.		15			100							PP = 120 kPa
	10.0														

(continued)

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BORING RECORD				B63
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	MEN	101	R43.1/R49.0	01-262001
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	B. Barnes		11-1-09	1 of 3

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method	Casing Depth	Remarks
	10.0		Lean CLAY with SAND (CL) *(continued)*.		15			100							
	10.5														
409.51	11.0				16			100		31	14.1				
	11.5				17	6 7 9	16	100							PP = 120 kPa
408.51	12.0				18			100							
	12.5				19	4 7 9	16	100							PP = 120 kPa
407.51	13.0				20			100							
	13.5														
406.51	14.0		Well-graded SAND with GRAVEL (SW); medium dense; dark greenish gray; wet; weak cementation.		21			100		13	19.0				
	14.5				22	4 6 8	14	100							
405.51	15.0		SANDY lean CLAY (CL); stiff to very stiff; dark greenish gray; moist; low plasticity fines.		23			100							PP = 192 kPa
	15.5				24			100		25	15.9				
404.51	16.0				25	6 10 12	22	100							PP = 240 kPa
	16.5		Poorly graded SAND with SILT (SP-SM); medium dense; dark greenish gray; wet.		26			100							
403.51	17.0				27	5 7 9	16	100							
	17.5		Lean CLAY (CL); stiff; dark greenish gray; moist; low to medium plasticity fines.		28			100							PP = 168 kPa
402.51	18.0		SANDY lean CLAY (CL); stiff; dark greenish gray; moist; low plasticity fines.												
	18.5				29	5 11 15	26	100							PP = 144 kPa
401.51	19.0		Well-graded SAND with GRAVEL (SW); dense; dark greenish gray; moist to wet; weak cementation.		30			100							
	19.5														
400.51	20.0				31	14 16 21	37	100							
	20.5				32			100							
399.51	21.0														
	21.5		CLAYEY GRAVEL with SAND (GC); very dense; dark greenish gray; wet; weak cementation.		33	20 19 34	53	100							
	22.0				34			100							

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				**B63**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**MEN**	**101**	**R43.1/R49.0**	**01-262001**
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**B. Barnes**		**11-1-09**	**2 of 3**

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m^3)	Shear Strength (kPa)	Drilling Method	Casing Depth	Remarks
			CLAYEY GRAVEL with SAND (GC) *(continued)*.		34			100		11					
	22.5		Well-graded GRAVEL with SAND (GW); very dense; dark greenish gray; wet; weak cementation.												
397.51	23.0				35	50/6"		100							
			Bottom of borehole at 23.2 m bgs												
	23.5														
396.51	24.0														
	24.5														
395.51	25.0														
	25.5														
394.51	26.0														
	26.5														
393.51	27.0														
	27.5														
392.51	28.0														
	28.5														
391.51	29.0														
	29.5														
390.51	30.0														
	30.5														
389.51	31.0														
	31.5														
388.51	32.0														
	32.5														
387.51	33.0														
	33.5														
	34.0														

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REPORT TITLE				HOLE ID
BORING RECORD				**B63**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**MEN**	**101**	**R43.1/R49.0**	**01-262001**
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**B. Barnes**		**11-1-09**	**3 of 3**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
C. Avila	8-2-06	8-2-06	NAD83	B64
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			1' Lt Sta 130+12 A	422 m MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			Acker 3837	102 mm
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4"), Shelby (2.87), Punch Core			Safety semi-automatic, 30-inch drop	68%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING	AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Bentonite seal			Not measured	Not measured	23.9 m

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method	Casing Depth	Remarks
	0.0		Lean CLAY with SAND (CL); brown; dry; fine SAND; medium plasticity fines.		1			100							
	0.5														
420.65	1.0														
	1.5		CLAYEY SAND with GRAVEL (SC); medium dense; brown; wet; fine GRAVEL; subrounded SAND.		2	7 5 5	10	100							
419.65	2.0				3			100							PP = 312 kPa
	2.5		Fat CLAY (CH); hard; bluish gray; moist; high plasticity fines.												
418.65	3.0				4			100		20	17.6				
	3.5		Lean CLAY (CL); medium stiff to stiff; bluish gray; moist; medium plasticity fines.		5	6 6 6	12	100		22					
417.65	4.0				6			100							PP = 96 kPa
	4.5		Poorly graded GRAVEL with CLAY (GP-GC); loose; brown; wet; fine, subrounded GRAVEL.		7			100		14					
416.65	5.0				8	3 3 5	8	100		26					PP = 96 kPa
	5.5		Lean CLAY with SAND (CL); medium stiff to stiff; brown; moist; fine SAND.		9			100							PP = 96 kPa
415.65	6.0				10			100		19	17.9				PP = 120 kPa
	6.5		Fat CLAY with GRAVEL (CH); stiff; brown; moist; fine, subrounded GRAVEL; high plasticity fines.		11	4 7 7	14	100							PP = 24 kPa
414.65	7.0		Lean CLAY (CL); very soft to soft; bluish gray; moist; medium plasticity fines.		12			100							PP = 24 kPa
	7.5		Fat CLAY (CH); very soft to soft; brown; moist; high plasticity fines.		13	3 4 6	10	100							PP = 48 kPa
413.65	8.0		Lean CLAY with SAND (CL); soft to medium stiff; brown; moist; fine SAND.		14			100							PP = 48 kPa
	8.5		Fat CLAY (CH); soft to medium stiff; bluish gray; moist; high plasticity fines.												
412.65	9.0				15			100		24	14.8				PP = 72 kPa
	9.5				16	6 9 10	19	100							PP = 72 kPa
	10.0														

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				B64
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	MEN	101	R43.1/R49.0	01-262001
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	B. Barnes		11-1-09	1 of 3

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ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method	Casing Depth	Remarks
	10.0		Fat CLAY (CH) *(continued)*.		17			100							
	10.5														PP = 48 kPa
410.65	11.0				18	3 5 8	13	100							PP = 72 kPa
	11.5				19			100							PP = 96 kPa
409.65	12.0		Fat CLAY with SAND (CH); medium stiff to stiff; bluish gray; moist; fine SAND.		20	2 5 6	11	100		26					PP = 96 kPa
	12.5														
408.65	13.0				21			100							PP = 96 kPa
	13.5														
407.65	14.0				22			100		26	15.7				PP = 120 kPa
			Lean CLAY (CL); medium stiff to stiff; bluish gray; moist; medium plasticity fines.												
	14.5				23	7 9 12	21	100							PP = 72 kPa
406.65	15.0				24			100							PP = 72 kPa
	15.5		Poorly graded GRAVEL with SAND (GP); medium dense; bluish gray; moist; fine, subrounded GRAVEL.		25	12 11 6	17	100							
405.65	16.0				26			0							
			Fat CLAY (CH); soft to medium stiff; bluish gray; moist; high plasticity fines.												
	16.5														
404.65	17.0				27	4 7 8	15	0							
	17.5				28			100							PP = 48 kPa
403.65	18.0														
	18.5		Becomes stiff.		29	9 14 17	31	100							PP = 120 kPa
402.65	19.0				30			100							PP = 120 kPa
	19.5														
401.65	20.0				31	7 12 12	24	0							
	20.5				32			0							
400.65	21.0		Well-graded GRAVEL with SAND (GW); dense to very dense; brown; wet; subrounded GRAVEL.												
	21.5				33	24 20 20	40	100							
	22.0				34			100							

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				**B64**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**MEN**	**101**	**R43.1/R49.0**	**01-262001**
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**B. Barnes**		**11-1-09**	**2 of 3**

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method / Casing Depth	Remarks
	22.5		Well-graded GRAVEL with SAND (GW) *(continued)*.		34			100						
398.65	23.0				35	32 34 50	84	100		13				
	23.5				36			100						
397.65	24.0		Bottom of borehole at 23.9 m bgs											
	24.5													
396.65	25.0													
	25.5													
395.65	26.0													
	26.5													
394.65	27.0													
	27.5													
393.65	28.0													
	28.5													
392.65	29.0													
	29.5													
391.65	30.0													
	30.5													
390.65	31.0													
	31.5													
389.65	32.0													
	32.5													
388.65	33.0													
	33.5													
	34.0													

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REPORT TITLE **BORING RECORD**				HOLE ID **B64**
DIST. **01**	COUNTY **MEN**	ROUTE **101**	POSTMILE **R43.1/R49.0**	EA **01-262001**
PROJECT OR BRIDGE NAME **Willits Bypass**				
BRIDGE NUMBER **N/A**	PREPARED BY **B. Barnes**		DATE **11-1-09**	SHEET **3 of 3**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
T. Alderman	8-3-06	8-3-06	NAD83	B65
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			5' Rt Sta 127+62 A	423 m MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			Acker 3837	102 mm
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4"), Shelby (2.87), Punch Core			Safety semi-automatic, 30-inch drop	68%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING	AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Bentonite seal			Not measured	Not measured	18.6 m

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method	Casing Depth	Remarks
	0.0		Lean CLAY with SAND (CL); stiff to very stiff; brown; moist; medium plasticity fines.		1			100							
	0.5														PP = 192 kPa
421.60	1.0														
	1.5				2			100		19	17.4				PP = 168 kPa
420.60	2.0				3	6 6 6	12	100							TV = 24 kPa
	2.5				4			100							PP = 168 kPa
419.60	3.0				5	4 5 7	12	100		23					PP = 120 kPa
	3.5		Becomes soft to medium stiff.		5A			100							PP = 48 kPa
418.60	4.0														
	4.5				6			100		33	14.3				PP = 72 kPa
417.60	5.0				7	5 6 10	16	100		28					PP = 48 kPa
	5.5				8			100							PP = 48 kPa
416.60	6.0		Poorly graded SAND (SP); medium dense to dense; bluish gray; moist; fine SAND.		9	11 10 10	20	100							
	6.5				10			100							
415.60	7.0														
	7.5				11	15 16 23	39	100		11					
414.60	8.0				12			100							
	8.5		Well-graded SAND with GRAVEL (SW); wet; fine, subrounded GRAVEL.												
413.60	9.0				13	5 5 7	12	100		26					PP = 96 kPa
	9.5		Lean CLAY (CL); medium stiff to stiff; bluish gray; moist; medium plasticity fines.		14			100							PP = 48 kPa
	10.0														

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				B65
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	MEN	101	R43.1/R49.0	01-262001
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	B. Barnes		11-1-09	1 of 2

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ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method / Casing Depth	Remarks
	10.0		Lean CLAY (CL) *(continued)*.		14			100						
	10.5													
411.60	11.0				15			100		26	15.2			PP = 72 kPa
	11.5				16	7 6 8	14	100						PP = 72 kPa
410.60	12.0				17			100						PP = 72 kPa
	12.5				17A	3 5 7	12	100						PP = 96 kPa
409.60	13.0				18			100						PP = 96 kPa
	13.5		Poorly graded SAND (SP); dense; bluish gray; wet; fine SAND.											
408.60	14.0				19	7 12 24	36	100						
	14.5		Well-graded SAND (SW); dense; bluish gray; wet.		20			100						
407.60	15.0		Poorly graded SAND with GRAVEL (SP); bluish gray; wet; fine GRAVEL; medium SAND.											
	15.5		Lean CLAY (CL); stiff; bluish gray; moist; medium plasticity fines.		21	6 11 15	26	100						PP = 192 kPa
406.60	16.0				22			100						PP = 96 kPa
	16.5		Well-graded SAND with GRAVEL (SW); very dense; bluish gray grades to brown; wet; medium, subrounded SAND.											
405.60	17.0				23	22 27 27	54	100		10				
	17.5				24			100						
404.60	18.0				25	37 37 50/3"		100						
	18.5		Bottom of borehole at 18.6 m bgs											
403.60	19.0													
	19.5													
402.60	20.0													
	20.5													
401.60	21.0													
	21.5													
	22.0													

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REPORT TITLE				HOLE ID
BORING RECORD				**B65**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**MEN**	**101**	**R43.1/R49.0**	**01-262001**
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**B. Barnes**		**11-1-09**	**2 of 2**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
C. Avila	8-8-06	8-8-06	NAD83	B67
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			13' Lt Sta 137+46 A	419 m MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			Mobile B47	102 mm
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4"), Shelby (2.87), Punch Core			Safety semi-automatic, 30-inch drop	57%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING / AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Bentonite seal			Not measured / Not measured	21.6 m

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method / Casing Depth	Remarks
	0.0		Lean CLAY (CL); very stiff; brown; moist; low plasticity fines.		1			100						
	0.5													
418.20	1.0													
	1.5													
417.20	2.0				2			100		20				PP = 240 kPa
	2.5		Well-graded SAND (SW); loose; brown; wet.		3	4 4 4	8	100						
416.20	3.0		Lean CLAY (CL); stiff; brown; moist; low plasticity fines.		4			100						PP = 144 kPa
	3.5		CLAYEY GRAVEL (GC); medium dense; brown; wet; low plasticity fines.		5			100						
					6	8 16 12	28	100						
415.20	4.0		Well-graded GRAVEL with CLAY and SAND (GW-GC); medium dense; brown; wet; fine, subangular GRAVEL; weak cementation.		7			100						
	4.5		Well-graded SAND with GRAVEL (SW); medium dense; brown; wet.											
414.20	5.0				8	8 10 7	17	100						
	5.5				9			100		14				
413.20	6.0													
	6.5		Lean CLAY (CL); medium stiff to stiff; dark greenish gray; moist; low plasticity fines.		10			100		29				PP = 96 kPa
412.20	7.0				11	2 3 4	7	100						PP = 96 kPa
	7.5		SANDY lean CLAY (CL); medium stiff to stiff; dark greenish gray; moist; low plasticity fines.		12			100						
411.20	8.0				13			100		26				PP = 96 kPa
	8.5				14	2 4 5	9	100						
410.20	9.0		Lean CLAY with GRAVEL (CL); stiff; dark greenish gray; moist; low plasticity fines.		15			100						
	9.5				16	3 6 7	13	100						
	10.0													

(continued)

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BORING RECORD				B67
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	MEN	101	R43.1/R49.0	01-262001
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	B. Barnes		11-1-09	1 of 2

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method	Casing Depth	Remarks
	10.0		Lean CLAY with GRAVEL (CL) *(continued)*.		17			100							
	10.5														
408.20	11.0		SANDY lean CLAY (CL); stiff; dark greenish gray; moist; low plasticity fines.		18			100		21	17.0				
	11.5				19	4 7 11	18	100							PP = 120 kPa
407.20	12.0		Lean CLAY (CL); medium stiff to stiff; dark greenish gray; moist; low plasticity fines.		20			100							
	12.5				21	2 6 6	12	100							PP = 144 kPa
406.20	13.0				22			100							
	13.5														
405.20	14.0				23			100		22	16.5				PP = 144 kPa
	14.5				24	6 8 10	18	100							PP = 96 kPa
404.20	15.0		SANDY lean CLAY (CL); stiff; dark greenish gray; moist; low plasticity fines.		25			100							PP = 120 kPa
	15.5		Lean CLAY (CL); medium stiff to stiff; dark greenish gray; moist; low plasticity fines.		26	3 5 6	11	100							PP = 96 kPa
403.20	16.0				27			100							
	16.5														
402.20	17.0		CLAYEY SAND (SC); dark greenish gray; wet; low plasticity fines.		28			100							
	17.5		Well-graded GRAVEL with SAND (GW); dense to very dense; dark gray; moist to wet; coarse to fine, subangular GRAVEL; weak cementation.		29	20 36 22	58	100							
401.20	18.0				30			100							
	18.5				31	20 21 19	40	100							
400.20	19.0		Well-graded SAND with CLAY and GRAVEL (SW-SC); medium dense to dense; dark gray; wet; low plasticity fines.		32			100							
	19.5														
399.20	20.0				33	15 15 18	33	100							
	20.5				34			100		9					
398.20	21.0		Well-graded GRAVEL with CLAY and SAND (GW-GC); very dense; dark gray; wet; weak cementation.												
	21.5				35	50/4"		100							
	22.0		Bottom of borehole at 21.6 m bgs												

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REPORT TITLE				HOLE ID
BORING RECORD				**B67**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**MEN**	**101**	**R43.1/R49.0**	**01-262001**
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**B. Barnes**		**11-1-09**	**2 of 2**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
T. Alderman	8-9-06	8-9-06	NAD83	B68
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			2' Rt Sta 139+52 A	418 m MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			Mobile B47	102 mm
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4"), Shelby (2.87), Punch Core			Safety semi-automatic, 30-inch drop	57%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING / AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Bentonite seal			Not measured / Not measured	21.6 m

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method / Casing Depth	Remarks
	0.0		Lean CLAY with SAND (CL); medium stiff; brown; moist; fine SAND; low plasticity fines.		1			100						
416.52	1.0													
415.52	2.0				2			100		20				
	2.5				3	1 3 3	6	100						
414.52	3.0		Lean CLAY (CL); medium stiff; brown; moist; low plasticity fines.		4			100						
	3.5				5			100		19	17.3			
413.52	4.0				6	6 9 11	20	100						
	4.5				7			100						PP = 72 kPa
412.52	5.0				8			100		21	17.3			
	5.5				9	4 5 7	12	100						
411.52	6.0		CLAYEY GRAVEL (GC); loose to medium dense; dark gray; moist; low plasticity fines.		10			100						
	6.5				11	2 3 3	6	100						
410.52	7.0		Lean CLAY with GRAVEL (CL); medium stiff to stiff; dark gray; moist; low plasticity fines.		12			100						
	7.5													
409.52	8.0				13			100		33	13.7			PP = 96 kPa
	8.5		Lean CLAY (CL); medium stiff to stiff; dark greenish gray; moist; low to medium plasticity fines.		14	6 9 12	21	100						PP = 96 kPa
408.52	9.0				15			100						
	9.5				16	3 7 8	15	100						
	10.0													

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BORING RECORD				B68
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	MEN	101	R43.1/R49.0	01-262001
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	B. Barnes		11-1-09	1 of 2

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method	Casing Depth	Remarks
	10.0		Lean CLAY (CL) *(continued)*.		17			100							
	10.5		Well-graded GRAVEL with SAND (GW); dark gray; wet; weak cementation.												
406.52	11.0		Well-graded GRAVEL with CLAY (GW-GC); dense; dark gray; wet; weak cementation.		18	17 17 13	30	100							
	11.5				19			100							
405.52	12.0		CLAYEY SAND (SC); dark greenish gray; moist; low plasticity fines.												
	12.5				20			100		23	16.7				
404.52	13.0		Well-graded SAND with GRAVEL (SW); medium dense; dark gray; wet; weak cementation.		21	5 8 17	25	100							
	13.5				22			100							
403.52	14.0		Lean CLAY (CL); stiff; dark greenish gray; moist; low to medium plasticity fines.		23	6 12 14	26	100							PP = 120 kPa
	14.5				24			100							PP = 120 kPa
402.52	15.0														
	15.5				25			100		23					
401.52	16.0		SANDY lean CLAY (CL); very stiff; dark greenish gray; moist; low plasticity fines.		26	2 9 20	29	100							
	16.5				27			100							
400.52	17.0		Well-graded SAND with GRAVEL (SW); medium dense; dark greenish gray; moist; weak cementation.		28	12 17 9	26	100							
	17.5				29			100							
399.52	18.0		Lean CLAY (CL); dark greenish gray; moist; low plasticity fines.												
	18.5		Well-graded SAND with CLAY (SW-SC); dense; dark greenish gray; wet; weak cementation.		30	12 20 12	32	100							
398.52	19.0				31			100							
	19.5														
397.52	20.0		Well-graded SAND with GRAVEL (SW); very dense; dark gray; moist to wet; weak cementation.		32	42 33 50	83	100							
	20.5				33			100							
396.52	21.0														
	21.5				34	30 33 29	62	100							
	22.0		Bottom of borehole at 21.6 m bgs												

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BORING RECORD				**B68**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**MEN**	**101**	**R43.1/R49.0**	**01-262001**
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**B. Barnes**		**11-1-09**	**2 of 2**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
C. Avila	8-10-06	8-10-06	NAD83	B69
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			4' Rt Sta 140+49 A	418 m MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			Mobile B47	102 mm
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4"), Shelby (2.87), Punch Core			Safety semi-automatic, 30-inch drop	57%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING / AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Bentonite seal			Not measured / Not measured	19.1 m

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method / Casing Depth	Remarks
	0.0		SANDY lean CLAY (CL); brown; dry; low plasticity fines.		1			100						
	0.5													
416.50	1.0													
	1.5		Lean CLAY (CL); stiff to very stiff; brown to dark greenish gray; dry to moist; medium to high plasticity fines.											
415.50	2.0				2			100		10				
	2.5				3	8 12 14	26	100						
414.50	3.0				4			100						
	3.5				5			100		23	16.3			UU = 148 kPa
413.50	4.0				6	6 13 14	27	100						PP = 144 kPa
	4.5				7			100						PP = 192 kPa
412.50	5.0				8			100		29	12.4			UU = 134 kPa
	5.5				9	7 10 14	24	100						PP = 240 kPa
411.50	6.0				10			100						
	6.5				11	8 12 16	28	100						PP = 264 kPa
410.50	7.0		Becomes very stiff to hard.		12			100						PP = 408 kPa
	7.5													
409.50	8.0				13			100		40	12.7			UU = 103 kPa
	8.5				14	8 13 19	32	100						PP = 336 kPa
408.50	9.0				15			100						
	9.5				16	8 8 12	20	100						PP = 336 kPa
	10.0													

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REPORT TITLE				HOLE ID
BORING RECORD				B69
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	MEN	101	R43.1/R49.0	01-262001
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	B. Barnes		11-1-09	1 of 2

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ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method	Casing Depth	Remarks
	10.0		Lean CLAY (CL) *(continued)*.		17			100							
	10.5														
406.50	11.0			X	18	4 8 11	19	100							PP = 336 kPa
	11.5				19			100							PP = 408 kPa
405.50	12.0														
	12.5			X	20	6 10 14	24	100							
404.50	13.0				21			100							
	13.5														
403.50	14.0		Poorly graded SAND with CLAY (SP-SC); very dense; dark greenish gray; wet; medium SAND; low plasticity fines.	X	22	30 43 45	88	100							
	14.5				23			100							
402.50	15.0														
	15.5		Well-graded SAND with CLAY and GRAVEL (SW-SC); very dense; dark greenish gray; wet; fine GRAVEL; weak cementation.	X	24	33 50/4"		100		21					
401.50	16.0				25			100							
	16.5		Well-graded SAND with CLAY (SW-SC); dark greenish gray; wet; weak cementation.												
400.50	17.0		Poorly graded SAND with CLAY (SP-SC); very dense; dark greenish gray; wet; weak cementation.	X	26	50/5"		100							
	17.5				27			100							
399.50	18.0														
	18.5		CLAYEY SAND (SC); very dense; dark greenish gray; moist; low plasticity fines.	X	28	28 45 50/5"		100							
398.50	19.0		Bottom of borehole at 19.1 m bgs												
	19.5														
397.50	20.0														
	20.5														
396.50	21.0														
	21.5														
	22.0														

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REPORT TITLE				HOLE ID
BORING RECORD				**B69**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**MEN**	**101**	**R43.1/R49.0**	**01-262001**
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**B. Barnes**		**11-1-09**	**2 of 2**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
T. Alderman	9-13-06	9-14-06	NAD83	B74
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			192' Lt Sta 169+38 W	409 m MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			CS 2000 (truck)	102 mm
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4"), Shelby (2.87), Punch Core			Automatic, 30-inch drop	84%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING / AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Bentonite seal			Not measured / 2.0 m on 9-18-06	40.1 m

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method / Casing Depth	Remarks
	0.0		Lean CLAY with SAND (CL); hard; gray mottled with yellowish brown; dry.		1	4 5 5	10	100						
	0.5				2			0						PP = 432 kPa
408.00	1.0		Lean CLAY (CL); stiff to very stiff; brown mottled with gray; moist.											
	1.5				3	4 4 6	10	100						PP = 192 to 288 kPa
407.00	2.0				4			100						PP = 144 to 240 kPa
	2.5													
406.00	3.0				5	3 4 6	10	100						PP = 96 to 240 kPa
	3.5				6			100		26	15.4			UU = 24 kPa
405.00	4.0													
	4.5				7	2 4 4	8	100						PP = 120 to 144 kPa
404.00	5.0		Becomes medium stiff to stiff.		8			100						PP = 72 to 96 kPa
	5.5													
403.00	6.0				9	3 3 4	7	100						PP = 48 to 144 kPa
	6.5				10			100		30				
402.00	7.0													
	7.5		Becomes soft to medium stiff.		11	3 2 3	5	100						PP = 24 to 96 kPa
401.00	8.0													PP = 24 to 96 kPa
	8.5		Lean CLAY with SAND (CL); very soft to soft; greenish gray mottled with brown; wet; fine SAND.		12			100		33				
400.00	9.0				13	0 0 0	0	100		32				PP = 10 to 20 kPa
	9.5				14			100						PP = 10 to 20 kPa
	10.0													

(continued)

Department of Transportation
Division of Engineering Services
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REPORT TITLE				HOLE ID
BORING RECORD				B74
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	MEN	101	R43.1/R49.0	01-262001
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	B. Barnes		11-1-09	1 of 4

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method / Casing Depth	Remarks
	10.0		Lean CLAY with SAND (CL) *(continued)*.		14			100						
	10.5									30	14.8			UU = 72 kPa
398.00	11.0				15			100		27	15.1			UU = 72 kPa
	11.5				16			0						
397.00	12.0				17			100		29	14.6			UU = 96 kPa
	12.5				18	3 3 3	6	100						PP = 5 to 48 kPa
396.00	13.0		Lean CLAY (CL); medium stiff; greenish gray; moist.		19			100						PP = 48 to 72 kPa
	13.5													
395.00	14.0				20	3 3 4	7	100						PP = 48 to 72 kPa
	14.5				21			100		29	14.5			UU = 96 kPa
394.00	15.0													
	15.5				22	2 4 4	8	100						PP = 48 to 72 kPa
393.00	16.0				23			100						PP = 48 to 72 kPa
	16.5													
392.00	17.0		Becomes medium stiff to stiff.		24			100						PP = 48 to 144 kPa
	17.5													
391.00	18.0													
	18.5				25	4 4 6	10	100						PP = 120 to 144 kPa
390.00	19.0				26			100		30	14.8			PP = 96 to 144 kPa UU = 145 kPa
	19.5													
389.00	20.0				27	3 3 3	6	100						PP = 72 to 96 kPa
	20.5				28			100						PP = 96 to 120 kPa
388.00	21.0													
	21.5				29	5 7 7	14	100						PP = 96 to 192 kPa
	22.0				30			100						

(continued)

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REPORT TITLE: **BORING RECORD**
HOLE ID: **B74**

DIST.	COUNTY	ROUTE	POSTMILE	EA
01	MEN	101	R43.1/R49.0	01-262001

PROJECT OR BRIDGE NAME: **Willits Bypass**

BRIDGE NUMBER	PREPARED BY	DATE	SHEET
N/A	B. Barnes	11-1-09	2 of 4

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method / Casing Depth	Remarks
			Lean CLAY (CL) *(continued)*.		30			100		22				
	22.5													
386.00	23.0				31	4 4 5	9	100						PP = 48 to 96 kPa
	23.5				32			100						PP = 72 to 144 kPa
385.00	24.0		GRAVELLY lean CLAY (CL); very stiff to hard; dark greenish gray slightly mottled with yellowish red; moist; coarse, rounded GRAVEL.											
	24.5				33	18 14 6	20	100						PP = 384 kPa
384.00	25.0				34			100						
	25.5		CLAYEY SAND with GRAVEL (SC); dense; reddish brown; moist; coarse to fine GRAVEL; rounded SAND.											PP = 96 to 240 kPa
383.00	26.0				35	4 16 16	32	100		21				PP = 5 to 48 kPa
	26.5		CLAYEY GRAVEL (GC); medium dense to dense; dark greenish gray; moist; coarse, rounded GRAVEL.		36			100						
382.00	27.0													
	27.5				37	5 6 8	14	100						
381.00	28.0				38			100						
	28.5													
380.00	29.0				39	6 7 9	16	100		25				PP = 96 to 192 kPa
	29.5				40			100						PP = 96 to 192 kPa
379.00	30.0		Lean CLAY (CL); stiff to very stiff; dark greenish gray; moist.											
	30.5				41	6 7 8	15	100						PP = 144 to 264 kPa
378.00	31.0		CLAYEY GRAVEL with SAND (GC); medium dense; dark greenish gray; moist; coarse to fine, subrounded to rounded GRAVEL.		42			100		29				
	31.5													
377.00	32.0				43			100		12				
	32.5													
376.00	33.0													
	33.5		Lean CLAY (CL); stiff to very stiff; dark greenish gray; moist.		44	6 7 10	17	100						PP = 144 to 240 kPa
	34.0													

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REPORT TITLE: **BORING RECORD**
HOLE ID: **B74**

DIST.	COUNTY	ROUTE	POSTMILE	EA
01	MEN	101	R43.1/R49.0	01-262001

PROJECT OR BRIDGE NAME: **Willits Bypass**

BRIDGE NUMBER	PREPARED BY	DATE	SHEET
N/A	B. Barnes	11-1-09	3 of 4

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method / Casing Depth	Remarks
	34.5		Lean CLAY (CL) *(continued)*.		45			100						PP = 96 to 192 kPa
374.00	35.0				46			100						
	35.5		CLAYEY GRAVEL with SAND (GC); medium dense; dark greenish gray; moist; coarse to fine, rounded GRAVEL.											PP = 144 to 432 kPa
373.00	36.0													
	36.5				47	5 9 10	19	100						PP = 5 to 96 kPa
372.00	37.0		CLAYEY SAND with GRAVEL (SC); medium dense; brown; moist; coarse to fine, rounded GRAVEL.		48			100						PP = 5 to 96 kPa
	37.5													
371.00	38.0				49			100						PP = 144 to 192 kPa
	38.5													
370.00	39.0		Lean CLAY (CL); stiff; dark greenish gray; moist.											
	39.5				50	5 7 9	16	100						PP = 144 to 168 kPa
369.00	40.0		Bottom of borehole at 40.1 m bgs											
	40.5													
368.00	41.0													
	41.5													
367.00	42.0													
	42.5													
366.00	43.0													
	43.5													
365.00	44.0													
	44.5													
364.00	45.0													
	45.5													
	46.0													

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REPORT TITLE				HOLE ID
BORING RECORD				**B74**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**MEN**	**101**	**R43.1/R49.0**	**01-262001**
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**B. Barnes**		**11-1-09**	**4 of 4**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
J. Thorne	**9-26-07**	**9-27-07**	**NAD83**	**B83**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			**147' Rt Sta 176+59 W**	**405 m MSL**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			**Acker MPCA**	**102 mm**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4"), Punch Core			**Automatic, 30-inch drop**	**83%**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING / AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Bentonite seal			**Not measured** / **2.4 m on 9-28-07**	**34.0 m**

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method / Casing Depth	Remarks
	0.0		Lean CLAY (CL); stiff; dark olive gray; moist; medium plasticity fines.		1			100						
	0.5													
404.00	1.0													
	1.5				2	P P 7		100						PP = 96 to 192 kPa
403.00	2.0				3			0						
	2.5		▼											
402.00	3.0		Fat CLAY (CH); medium stiff; greenish black; moist; medium to high plasticity fines.		4	P P P		100						PP = 48 to 72 kPa
	3.5				5			100						
401.00	4.0													
	4.5				6	P P P		100						PP = 72 kPa
400.00	5.0				7			100						
	5.5													
399.00	6.0				8	P P P		100						PP = 48 kPa
	6.5				9			0						
398.00	7.0													
	7.5		Becomes very soft to soft.		10	P P P		100						PP = 24 kPa
397.00	8.0				11			100		29				
	8.5													
396.00	9.0				12	P P P		100						
	9.5				13			100		35				
	10.0													

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REPORT TITLE				HOLE ID
BORING RECORD				**B83**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**MEN**	**101**	**R43.1/R49.0**	**01-262001**
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**B. Barnes**		**11-1-09**	**1 of 3**

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ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method	Casing Depth	Remarks
	10.0		Fat CLAY (CH) *(continued)*.		13			100							
	10.5														
394.00	11.0		SILT with SAND (ML); very soft; dark greenish gray; moist to wet; fine SAND; medium plasticity fines.		14	P P P		100							
					15			100		30					
393.00	12.0														
			Fat CLAY with SAND (CH); medium stiff to stiff; dark greenish gray; moist to wet; fine SAND; high plasticity fines.		16	P P P		100							PP = 96 to 144 kPa
	12.5														
					17			100		25	15.6				
392.00	13.0														
	13.5														
					18	P P P		100							PP = 48 to 120 kPa
391.00	14.0														
					19			100							
	14.5														
390.00	15.0														
					20	P P 3		100							PP = 120 to 168 kPa
	15.5														
					21			100		31					
389.00	16.0														
	16.5														
					22	P P P		100							PP = 72 to 120 kPa
388.00	17.0														
					23			100							
	17.5														
387.00	18.0														
					24	P P 8		0							PP = 144 kPa
	18.5		CLAYEY GRAVEL with SAND (GC); loose; dark greenish gray; moist to wet; medium to fine SAND; medium to high plasticity fines.												
					25			100							
386.00	19.0														
	19.5														
					26	P P 2		100							
385.00	20.0														
					27			100		18					
	20.5														
384.00	21.0														
			Fat CLAY with SAND (CH); medium stiff to stiff; dark greenish gray; moist to wet; fine SAND; medium to high plasticity fines.		28	P P 2		100							
	21.5														PP = 48 to 144 kPa
	22.0				29			100							

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REPORT TITLE				HOLE ID
BORING RECORD				**B83**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**MEN**	**101**	**R43.1/R49.0**	**01-262001**
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**B. Barnes**		**11-1-09**	**2 of 3**

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method / Casing Depth	Remarks
	22.5		Fat CLAY with SAND (CH) *(continued)*.		29			100						
382.00	23.0				30	P P 4		0						
	23.5				31			100						
381.00	24.0													
	24.5		CLAYEY GRAVEL with SAND (GC); very loose; dark greenish gray; moist to wet; coarse to fine GRAVEL; medium plasticity fines.		32	3 4 P		100						
380.00	25.0				33			100						
	25.5		Fat CLAY with SAND (CH); stiff to very stiff; dark greenish gray; moist; fine SAND; medium to high plasticity fines.											
379.00	26.0				34			100						PP = 144 to 288 kPa
	26.5													
378.00	27.0													
	27.5				35	P 5 6	11	100						PP = 96 to 168 kPa
377.00	28.0				36			100						
	28.5													
376.00	29.0				37			100						
	29.5													
375.00	30.0		CLAYEY GRAVEL with SAND (GC); dense; olive gray; moist; coarse to fine GRAVEL; medium plasticity fines.											
	30.5				38	16 16 23	39	100						
374.00	31.0				39			100						
	31.5													
373.00	32.0				40			0						
	32.5													
372.00	33.0													
	33.5				41	10 20 28	48	100						
	34.0		Bottom of borehole at 34.0 m bgs											

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REPORT TITLE				HOLE ID
BORING RECORD				**B83**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**MEN**	**101**	**R43.1/R49.0**	**01-262001**
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**B. Barnes**		**11-1-09**	**3 of 3**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
T. Alderman	10-2-07	10-2-07	NAD83	B85
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			261' Lt Sta 178+06 W	407 m MSL
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			Acker MP-8	102 mm
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4"), Punch Core			Safety semi-automatic, 30-inch drop	74%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING / AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Bentonite seal			Not measured / 3.0 m on 10-3-07	19.1 m

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method / Casing Depth	Remarks
	0.0		CLAYEY GRAVEL with SAND (GC); medium dense; brown; moist; coarse to fine, subrounded GRAVEL.		1			100						
406.01	1.0													
	1.5													
405.01	2.0				2	4 5 5	10	100						PP = 48 to 192 kPa
	2.5				3			100						
404.01	3.0		Lean CLAY with GRAVEL (CL); medium stiff to stiff; brown mottled with bluish gray; wet; coarse to fine, subrounded GRAVEL.											
	3.5				4	3 5 5	10	100						PP = 48 to 144 kPa
403.01	4.0				5			100						PP = 48 to 144 kPa
	4.5		Lean CLAY (CL); very soft; brown; wet.											
402.01	5.0		CLAYEY GRAVEL with SAND (GC); loose; brown; wet; coarse to fine, subrounded GRAVEL.		6	3 2 3	5	100						PP = 144 to 216 kPa
	5.5		Lean CLAY with GRAVEL (CL); medium stiff to stiff; brown mottled with bluish gray; wet; fine, subrounded GRAVEL.		7			100						PP = 96 to 168 kPa
401.01	6.0		Lean CLAY (CL); soft to medium stiff; brown mottled with bluish gray; wet.											
	6.5				8	1 4 4	8	100						PP = 48 to 96 kPa
400.01	7.0				9			100						PP = 24 to 72 kPa
	7.5													
399.01	8.0		Becomes stiff to very stiff.		10	2 4 10	14	100						PP = 144 to 192 kPa
	8.5				11			100						
398.01	9.0		CLAYEY GRAVEL with SAND (GC); medium dense; brown; wet; coarse to fine, subangular to subrounded GRAVEL.											
	9.5				12	11 13 15	28	100						PP = 144 to 288 kPa
	10.0													

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REPORT TITLE				HOLE ID
BORING RECORD				B85
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	MEN	101	R43.1/R49.0	01-262001
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	B. Barnes		11-1-09	1 of 2

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method / Casing Depth	Remarks
	10.0		CLAYEY GRAVEL with SAND (GC) *(continued)*.		13			100						PP = 144 to 288 kPa
	10.5													
396.01	11.0			X	14	9 14 14	28	100						PP = 192 to 288 kPa
	11.5				15			100						PP = 432 kPa
395.01	12.0		Lean CLAY with SAND (CL); soft to medium stiff; bluish gray; wet.											
	12.5			X	16	1 1 3	4	100						PP = 24 to 72 kPa
394.01	13.0		Lean CLAY (CL); soft to medium stiff; bluish gray; wet.		17			100						PP = 24 to 72 kPa
	13.5													
393.01	14.0		Becomes very soft to soft.	X	18	P P P		100						PP = 5 to 48 kPa
	14.5				19			100						
392.01	15.0		Lean CLAY with GRAVEL (CL); stiff to very stiff; bluish gray; moist; coarse to fine, subangular to subrounded GRAVEL.											PP = 144 to 192 kPa
	15.5			X	20	3 5 8	13	100						PP = 96 to 120 kPa
391.01	16.0				21			100						PP = 192 to 384 kPa
	16.5		Well-graded GRAVEL with CLAY and SAND (GW-GC); medium dense; grayish green; wet; coarse to fine, subangular to subrounded GRAVEL.											
390.01	17.0			X	22	9 15 11	26	100						PP = 192 kPa
	17.5				23			100						PP = 48 to 432 kPa
389.01	18.0		CLAYEY SAND with GRAVEL (SC); medium dense; grayish green; moist; fine, subrounded GRAVEL.											
	18.5			X	24	10 12 13	25	100						
388.01	19.0		Bottom of borehole at 19.1 m bgs											
	19.5													
387.01	20.0													
	20.5													
386.01	21.0													
	21.5													
	22.0													

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REPORT TITLE				HOLE ID
BORING RECORD				**B85**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**MEN**	**101**	**R43.1/R49.0**	**01-262001**
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**B. Barnes**		**11-1-09**	**2 of 2**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
J. Thorne	**10-3-07**	**10-4-07**	**NAD83**	**B86**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			**32' Lt Sta 181+04 W**	**406 m MSL**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Wash			**Acker MPCA**	**102 mm**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4"), Punch Core			**Automatic, 30-inch drop**	**83%**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING / AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Bentonite seal			**Not measured** / **2.1 m on 10-9-07**	**27.9 m**

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method	Casing Depth	Remarks
	0.0		SANDY lean CLAY (CL); stiff to very stiff; very dark gray grades to dark yellowish brown; dry to moist; fine SAND; low plasticity fines.		1			100							
	0.5														PP = 96 to 384 kPa
404.67	1.0														
	1.5		Lean CLAY with GRAVEL (CL); stiff; very dark grayish brown; moist; medium plasticity fines.		2	P P P		100		27					PP = 96 to 192 kPa
403.67	2.0				3			100							
	2.5														
402.67	3.0				4	P P P		100							
	3.5				5			100		27					
401.67	4.0														
	4.5		GRAVELLY fat CLAY (CH); medium stiff to stiff; very dark gray; moist; coarse to fine GRAVEL; medium to high plasticity fines.		6	P P P		100							PP = 96 kPa
400.67	5.0				7			100							
	5.5		GRAVELLY fat CLAY with SAND (CH); soft to medium stiff; dark greenish gray; moist to wet; coarse to fine GRAVEL; medium to high plasticity fines.												
399.67	6.0				8	P P P		100		18					PP = 24 to 96 kPa
	6.5				9			100							
398.67	7.0														
	7.5				10	P P P		100							PP = 48 to 96 kPa
397.67	8.0				11			0							
	8.5														
396.67	9.0		Becomes medium stiff to stiff.		12	P P P		100							PP = 48 to 120 kPa
	9.5				13			100		14					
	10.0														

(continued)

CALTRANS BORING RECORD MET+ENG FIXED WILLITS_BYPASS.GPJ CALTRANS LIBRARY 040808.GLB 12/17/09

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE				HOLE ID
BORING RECORD				**B86**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**MEN**	**101**	**R43.1/R49.0**	**01-262001**
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**B. Barnes**		**11-1-09**	**1 of 3**

ELEVATION (m)	DEPTH (m)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method / Casing Depth	Remarks
	10.0		GRAVELLY fat CLAY with SAND (CH) *(continued)*.		13			100						
	10.5													
394.67	11.0			X	14	P P P		100						PP = 120 kPa
					15			0						
	11.5													
393.67	12.0			X	16	P P P		100		23				PP = 48 to 96 kPa
	12.5				17			100						
392.67	13.0		SANDY fat CLAY with GRAVEL (CH); soft; dark greenish gray; moist; coarse to fine GRAVEL; medium to high plasticity fines.											
	13.5			X	18	P P P		100						PP = 24 to 48 kPa
391.67	14.0				19			100		29				
	14.5													
390.67	15.0			X	20	2 P 2		100						
	15.5				21			100						
389.67	16.0													
	16.5		Fat CLAY (CH); medium stiff to stiff; dark greenish gray; moist; medium to high plasticity fines.											
388.67	17.0			X	22	P P P		100						PP = 48 to 96 kPa
	17.5				23			100						
387.67	18.0													
	18.5			X	24	P P P		100		31				PP = 48 to 120 kPa
386.67	19.0				25			100						
	19.5													
385.67	20.0		Becomes stiff to very stiff.	X	26	P P P		100						PP = 168 to 288 kPa
	20.5				27			100						
384.67	21.0		CLAYEY SAND with GRAVEL (SC); medium dense; dark greenish gray; moist; coarse to medium SAND; medium plasticity fines.											
	21.5			X	28	15 16 10	26	100		14				PP = 144 to 336 kPa
	22.0				29			0						

(continued)

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Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE: **BORING RECORD**
HOLE ID: **B86**

DIST.	COUNTY	ROUTE	POSTMILE	EA
01	MEN	101	R43.1/R49.0	01-262001

PROJECT OR BRIDGE NAME: **Willits Bypass**

BRIDGE NUMBER	PREPARED BY	DATE	SHEET
N/A	B. Barnes	11-1-09	2 of 3

ELEVATION (m)	DEPTH (m)	DESCRIPTION	Sample Location	Sample Number	Blows per 150 mm	Blows per 305 mm	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (kN/m³)	Shear Strength (kPa)	Drilling Method / Casing Depth	Remarks
	22.5	CLAYEY SAND with GRAVEL (SC) *(continued)*.		29			0						
		Fat CLAY (CH); medium stiff to stiff; dark greenish gray; moist; medium to high plasticity fines.											
382.67	23.0			30	P P 6		100						PP = 96 to 168 kPa
	23.5			31			0						
381.67	24.0												
	24.5			32	P P P		100		28				PP = 72 kPa
380.67	25.0	Becomes stiff to very stiff.		33			100						PP = 264 to 288 kPa
	25.5												
379.67	26.0			34	P 6 10	16	100						PP = 144 to 192 kPa
	26.5			35			100						
378.67	27.0												
	27.5			36	P 5 18	23	100		18				PP = 96 to 264 kPa
377.67	28.0	Bottom of borehole at 27.9 m bgs											
	28.5												
376.67	29.0												
	29.5												
375.67	30.0												
	30.5												
374.67	31.0												
	31.5												
373.67	32.0												
	32.5												
372.67	33.0												
	33.5												
	34.0												

CALTRANS BORING RECORD MET+ENG FIXED WILLITS_BYPASS.GPJ CALTRANS LIBRARY 040808.GLB 12/17/09

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE				HOLE ID
BORING RECORD				**B86**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**MEN**	**101**	**R43.1/R49.0**	**01-262001**
PROJECT OR BRIDGE NAME				
Willits Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
N/A	**B. Barnes**		**11-1-09**	**3 of 3**

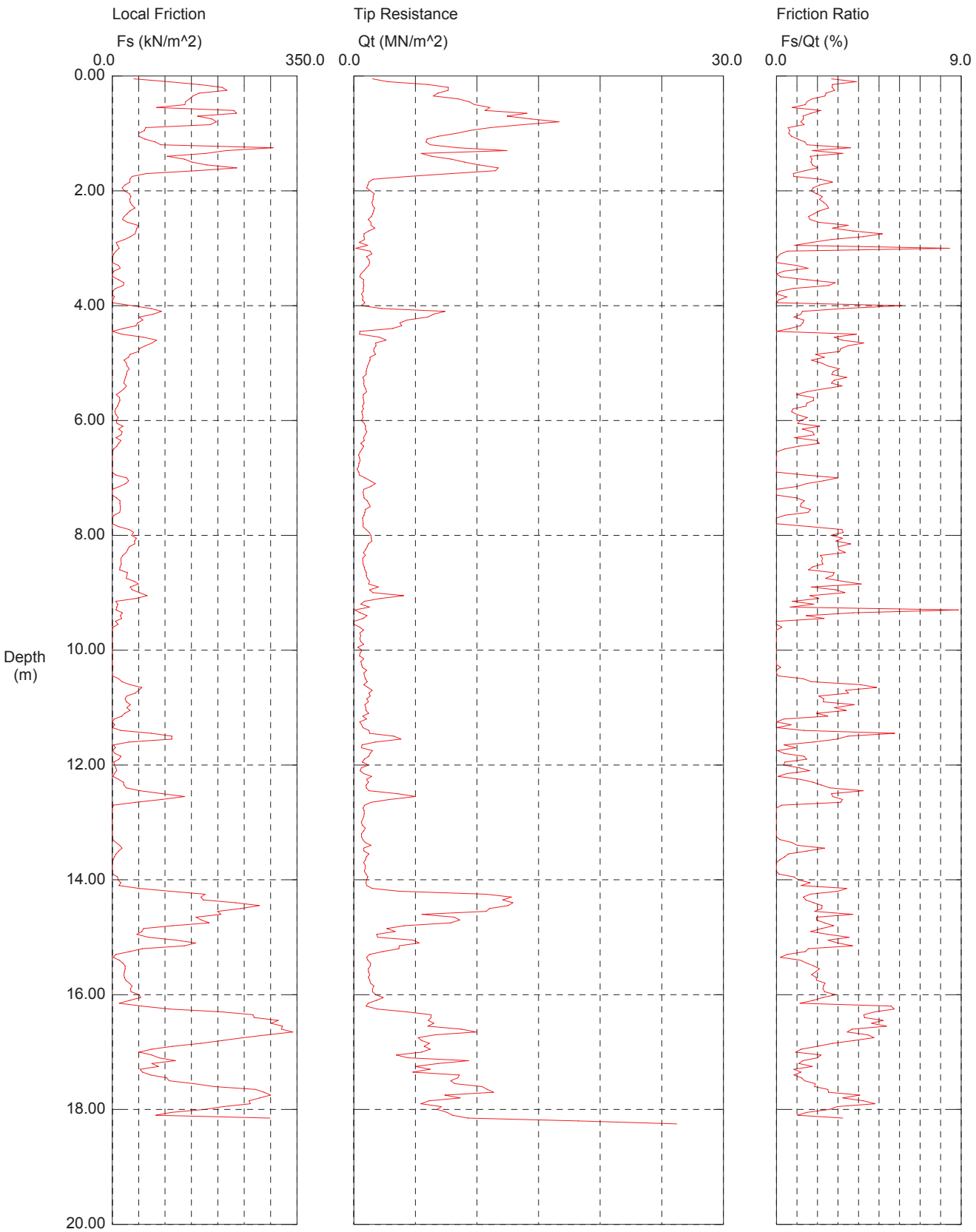
APPENDIX C

CPT Logs

C15, STA 176+46, W Line, Offset 24.7 m Left

Operator: TOTH\O'BRIEN
Sounding: 04-258
Cone Used: 774 TC

CPT Date/Time: 09-02-04 08:01
Location: CPT-15
Job Number: 01-262001



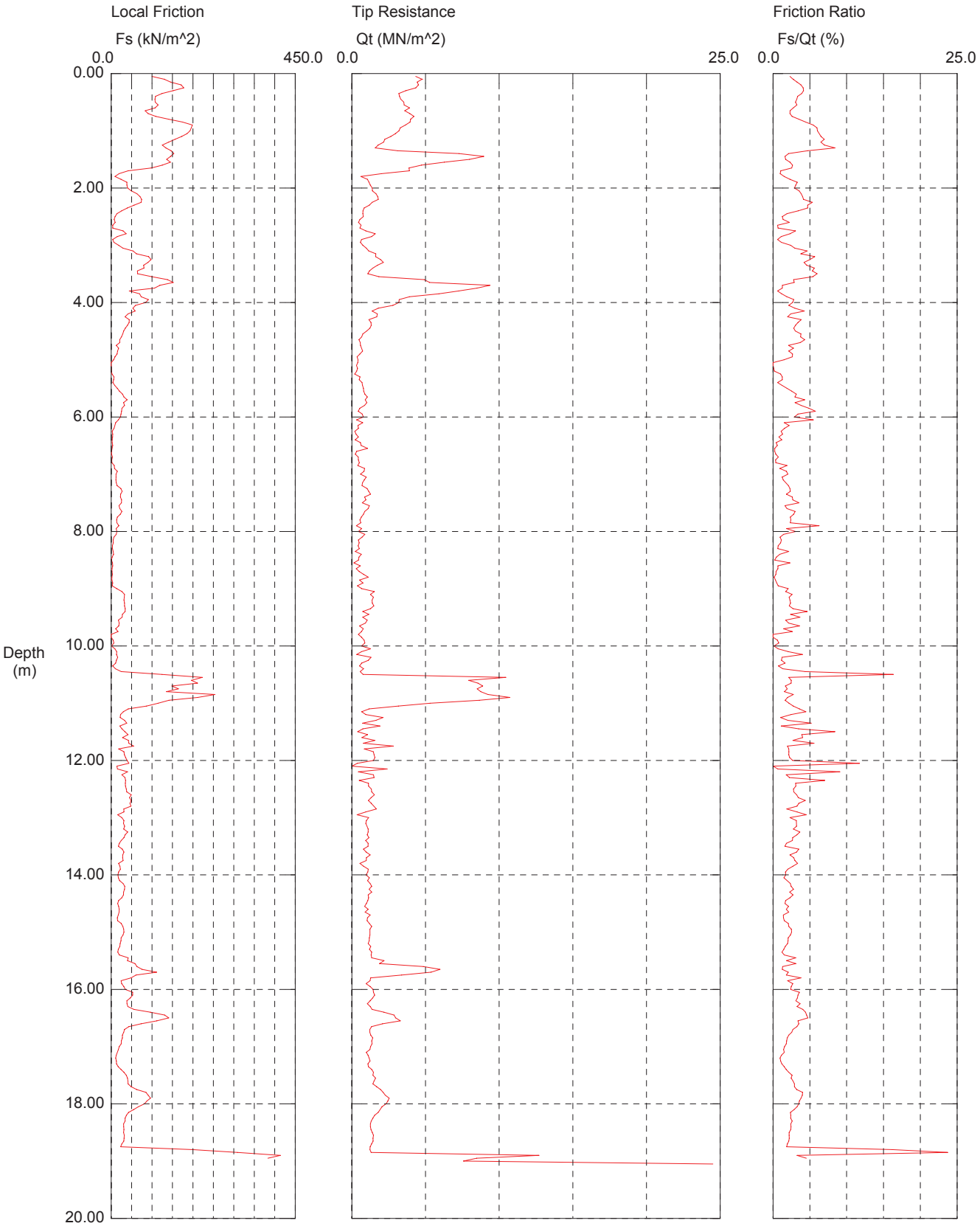
Maximum Depth = 18.25 meters

Depth Increment = 0.05 meters

C16, STA 175+43, W Line, Offset 28.7 m Left

Operator: TOTH\O'BRIEN
Sounding: 04-259
Cone Used: 774 TC

CPT Date/Time: 09-02-04 09:02
Location: CPT-16
Job Number: 01-262001



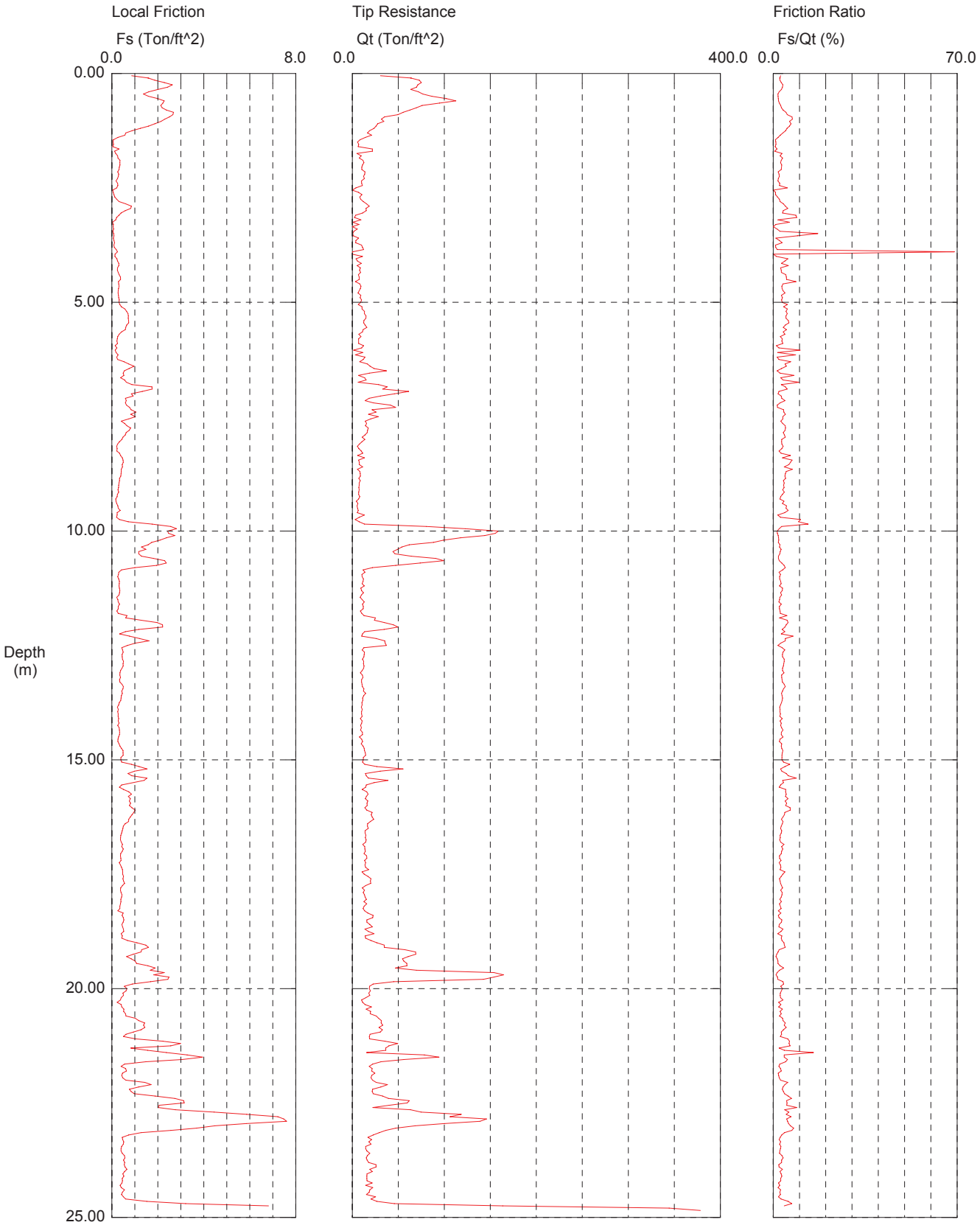
Maximum Depth = 19.05 meters

Depth Increment = 0.05 meters

C17, STA 174+72, W Line, Offset 29.3 m Left

Operator: TOTH\O'BRIEN
Sounding: 04-254
Cone Used: 774 TC

CPT Date/Time: 08-31-04 12:34
Location: CPT-17
Job Number: 01-262001



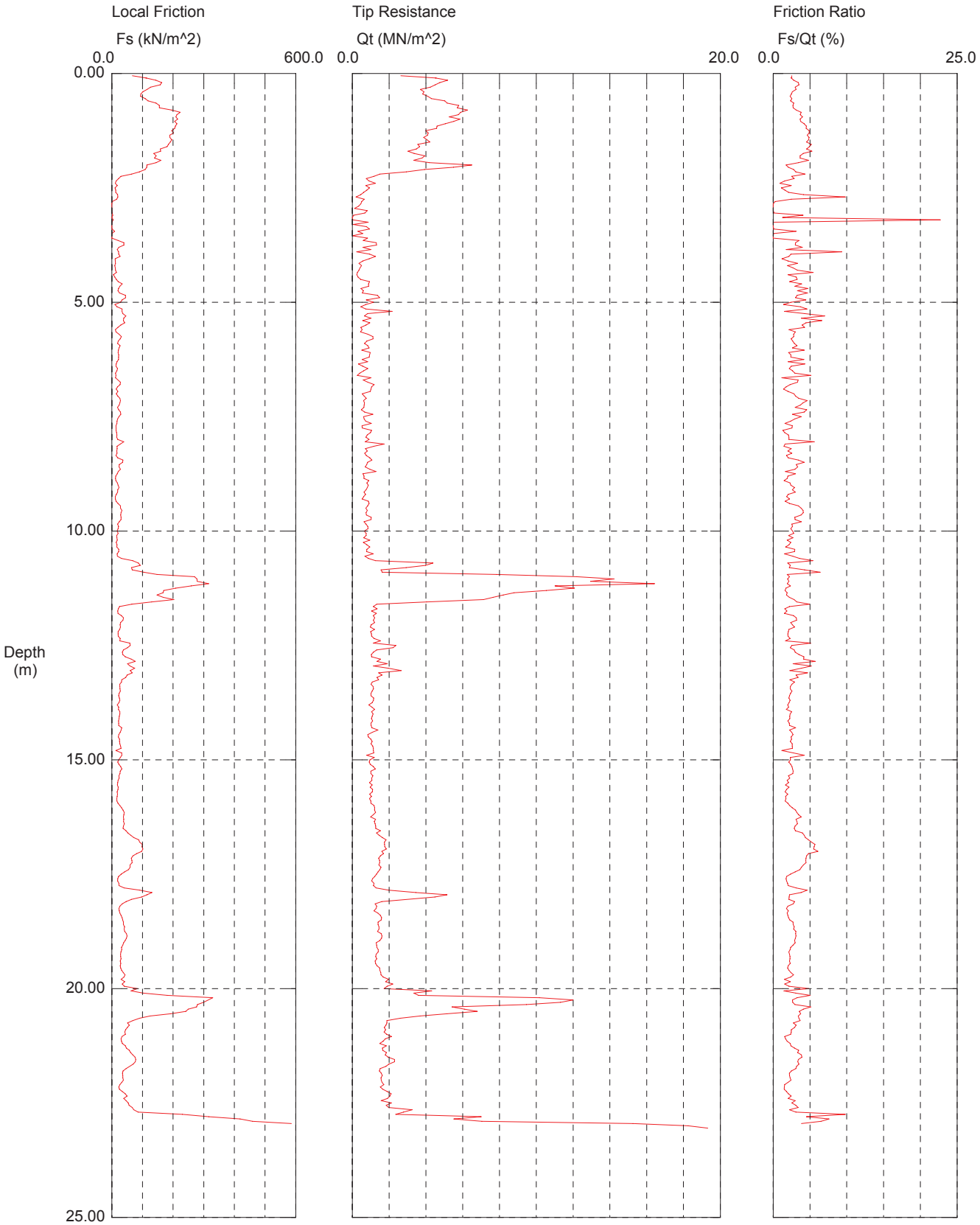
Maximum Depth = 24.85 meters

Depth Increment = 0.05 meters

C18, STA 173+38, W Line, Offset 36.0 m Left

Operator: TOTH\O'BRIEN
Sounding: 04-257
Cone Used: 774 TC

CPT Date/Time: 09-01-04 12:43
Location: CPT-18
Job Number: 01-262001



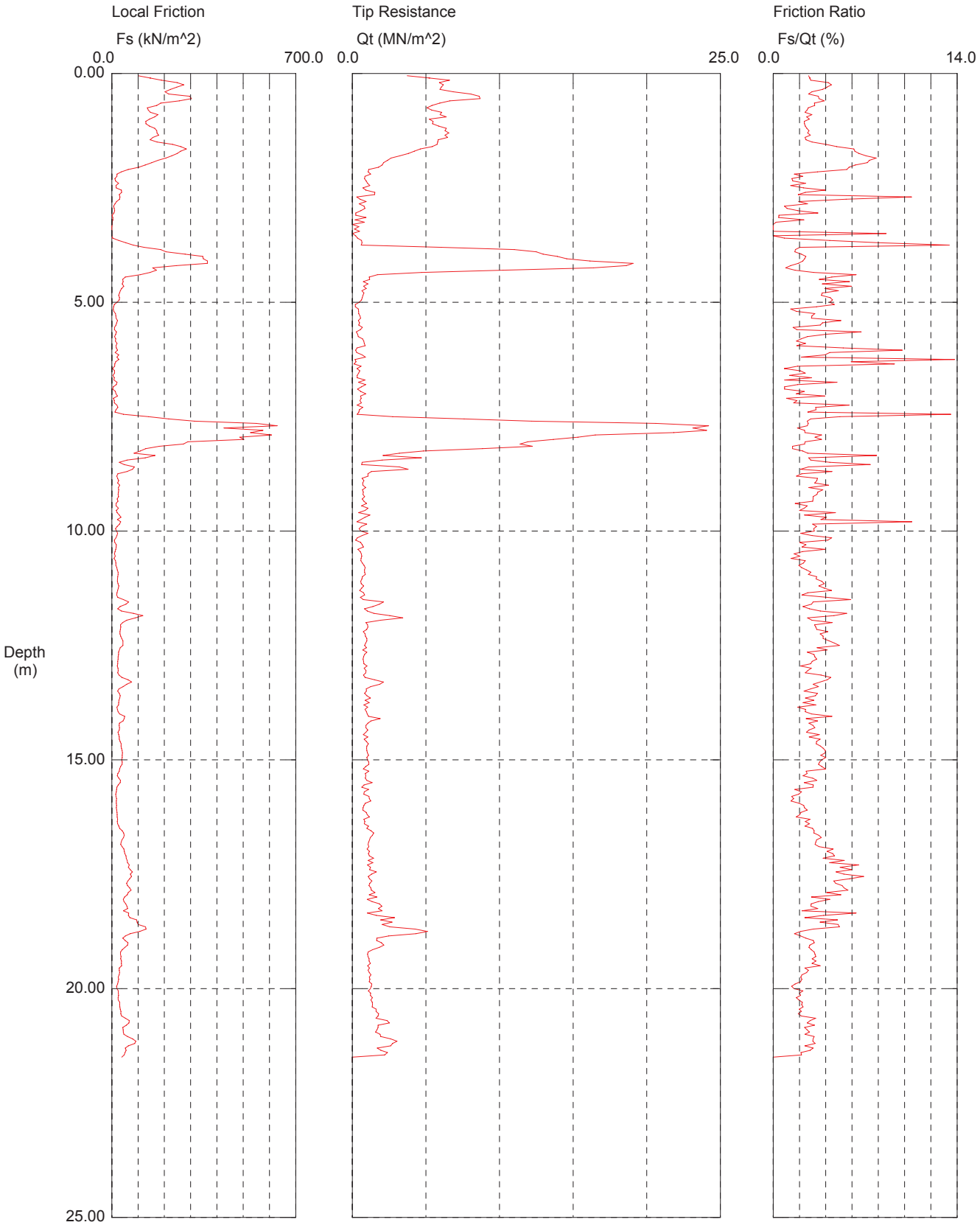
Maximum Depth = 23.05 meters

Depth Increment = 0.05 meters

C20, STA 173+67, W Line, Offset 19.5 m Right

Operator: TOTH\O'BRIEN
Sounding: 04-256
Cone Used: 774 TC

CPT Date/Time: 09-01-04 11:39
Location: CPT-20
Job Number: 01-262001



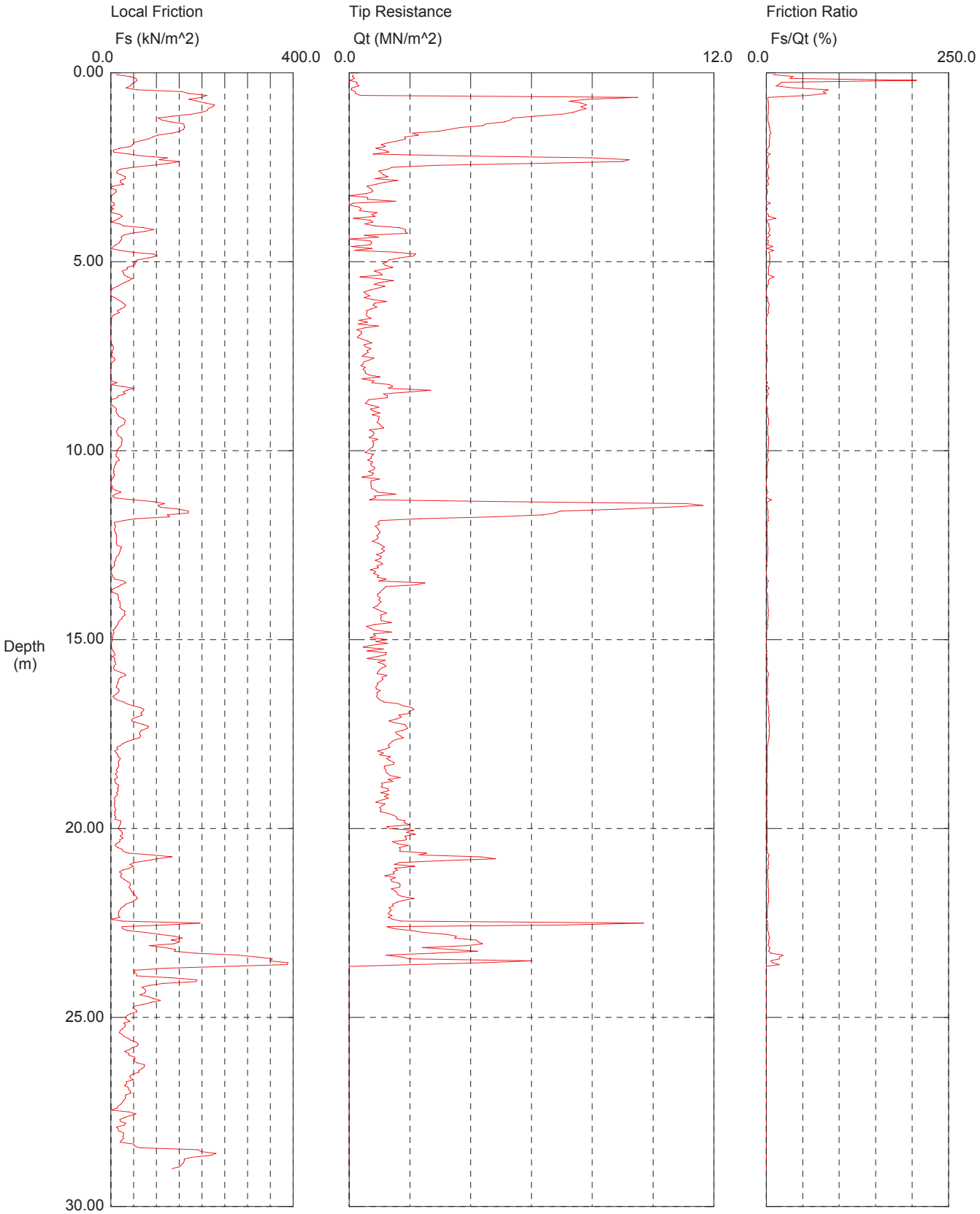
Maximum Depth = 21.60 meters

Depth Increment = 0.05 meters

C21, STA 174+44, W Line, Offset 29.3 m Right

Operator: TOTH\O'BRIEN
Sounding: 04-255
Cone Used: 774 TC

CPT Date/Time: 09-01-04 07:57
Location: CPT-21
Job Number: 01-262001



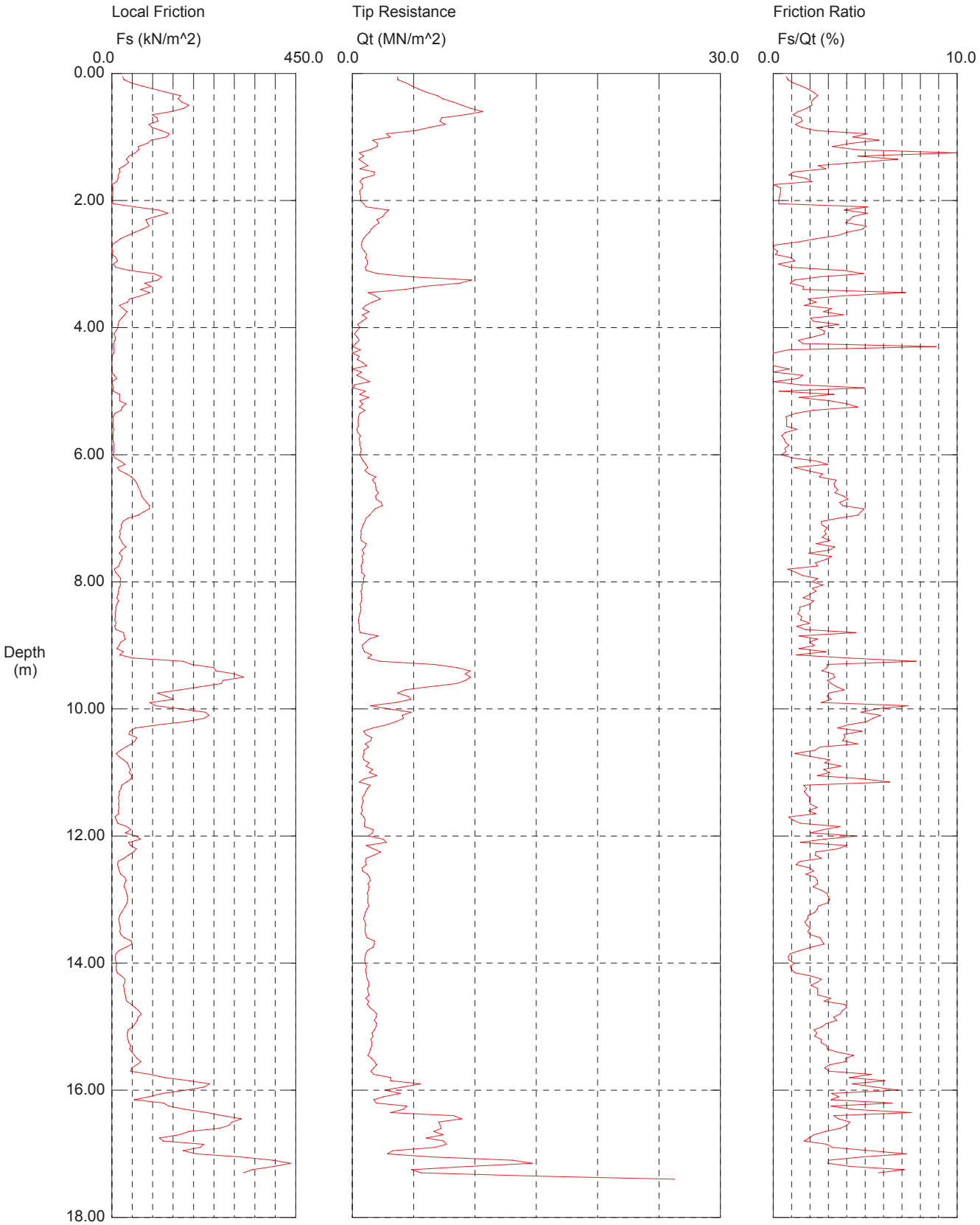
Maximum Depth = 29.10 meters

Depth Increment = 0.05 meters

C22, STA 176+16, W Line, Offset 89.6 m Left

Operator: TOTH\O'BRIEN
Sounding: 04-260
Cone Used: 774 TC

CPT Date/Time: 09-02-04 10:56
Location: CPT-22
Job Number: 01-262001



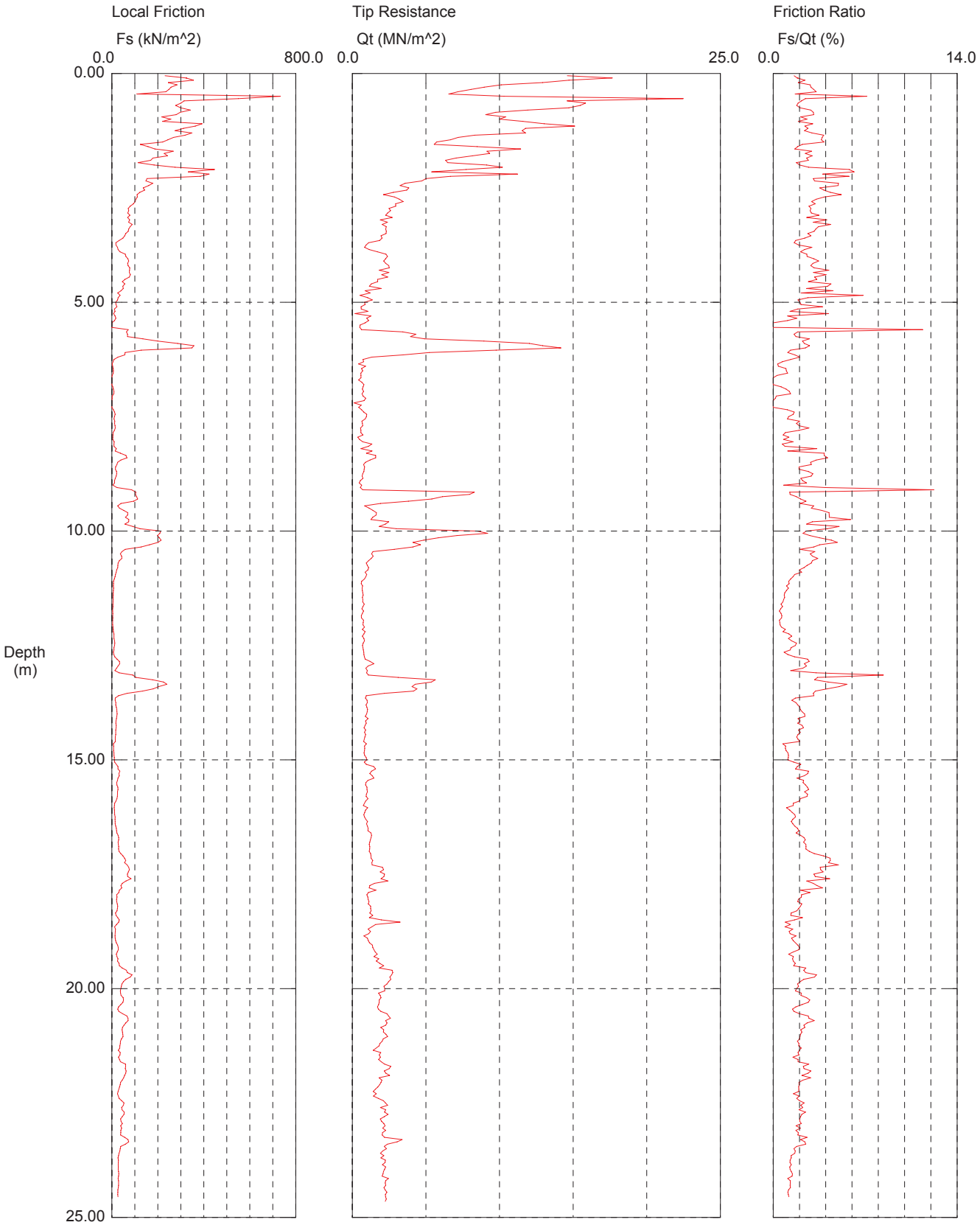
Maximum Depth = 17.40 meters

Depth Increment = 0.05 meters

C23, STA 174+08, W Line, Offset 122.5 m Left

Operator: TOTH\O'BRIEN
Sounding: 04-261
Cone Used: 774 TC

CPT Date/Time: 09-02-04 11:30
Location: CPT-23
Job Number: 01-262001



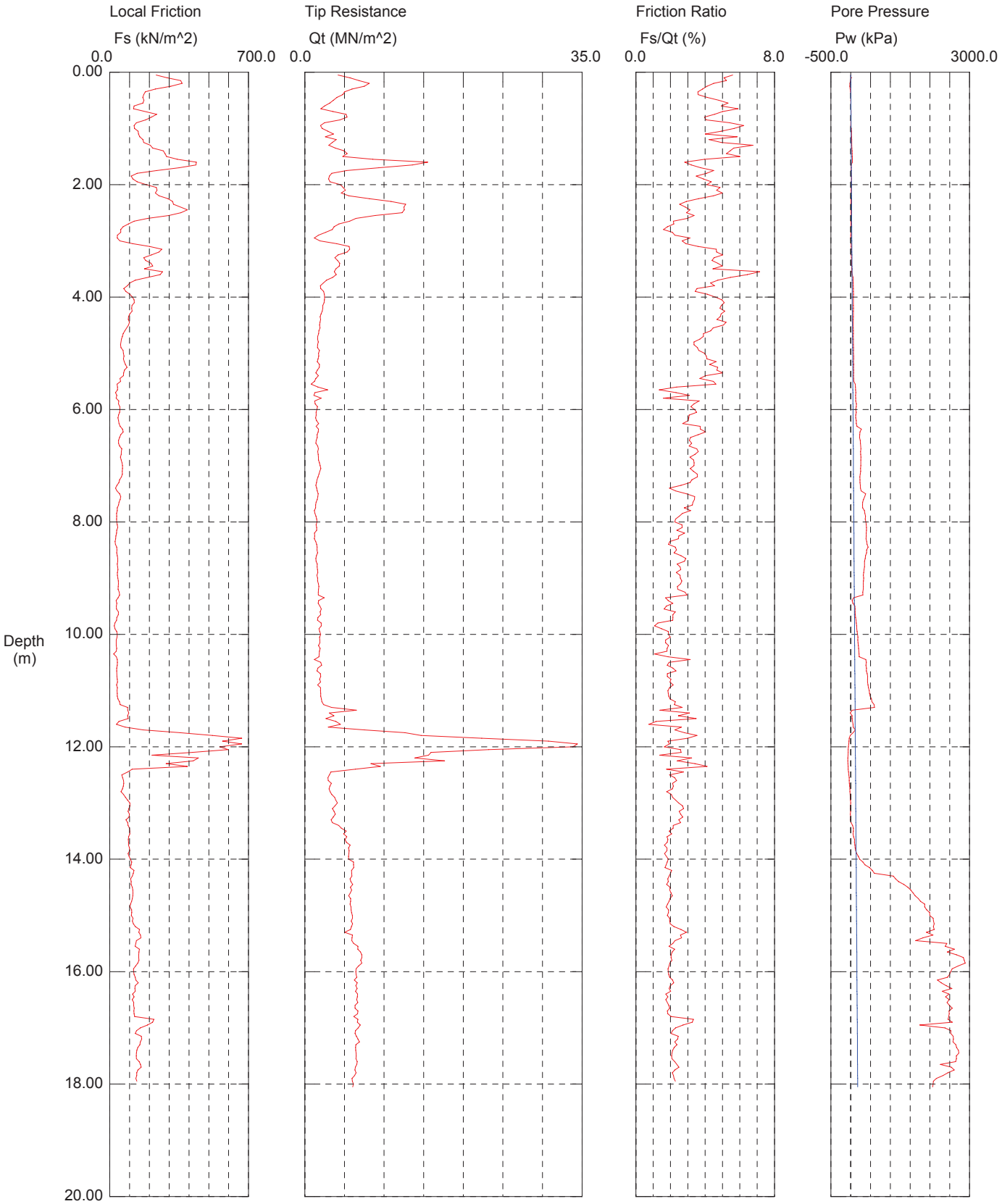
Maximum Depth = 24.65 meters

Depth Increment = 0.05 meters

C24, STA 110+19, A Line, Offset 1.2 m Left

Operator: SAWKO/DB/DM
Sounding: 05-085
Cone Used: 730

CPT Date/Time: 06-29-05 08:50
Location: CPT-24A
Job Number: 01-262001



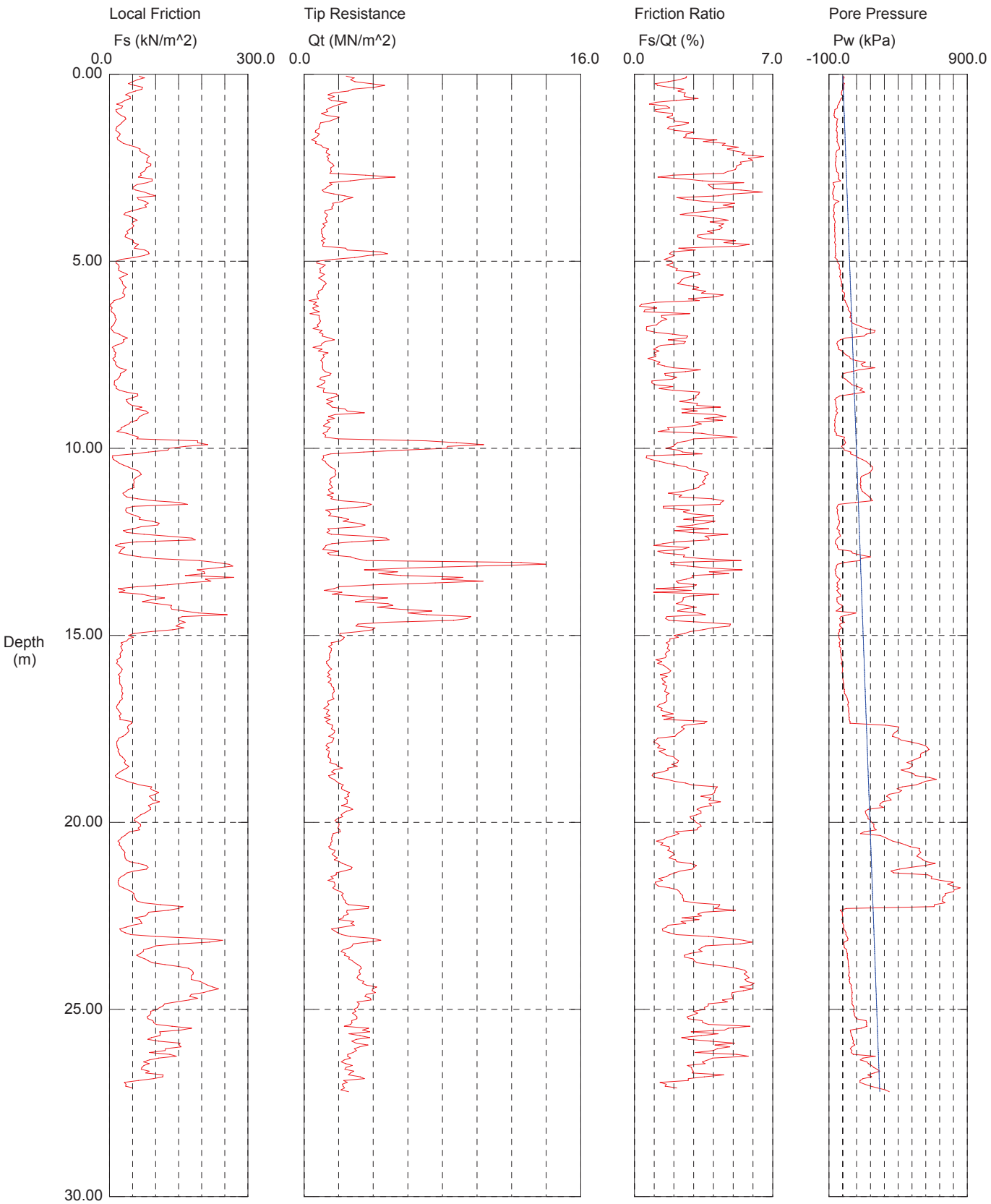
Maximum Depth = 18.05 meters

Depth Increment = 0.05 meters

C25, STA 111+82, A Line, Offset 1.8 m Left

Operator: SAWKO/DB/DM
Sounding: 05-086
Cone Used: 730

CPT Date/Time: 06-30-05 08:13
Location: CPT-25
Job Number: 01-262001



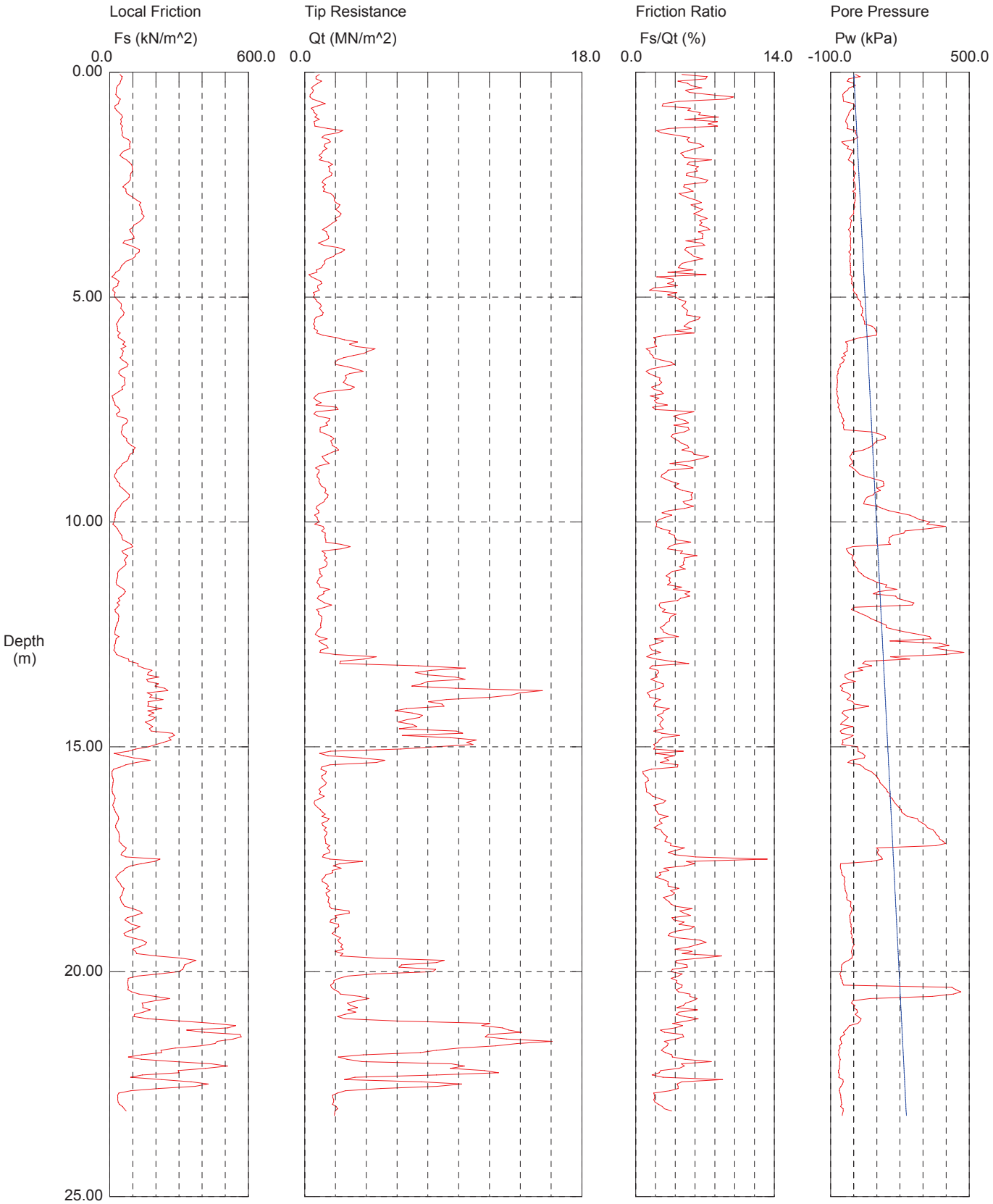
Maximum Depth = 27.20 meters

Depth Increment = 0.05 meters

C26, STA 178+68, W Line, Offset 2.4 m Left

Operator: SAWKO/GELARDI
Sounding: 05-087
Cone Used: 730

CPT Date/Time: 07-06-05 08:26
Location: CPT-26
Job Number: 01-262001



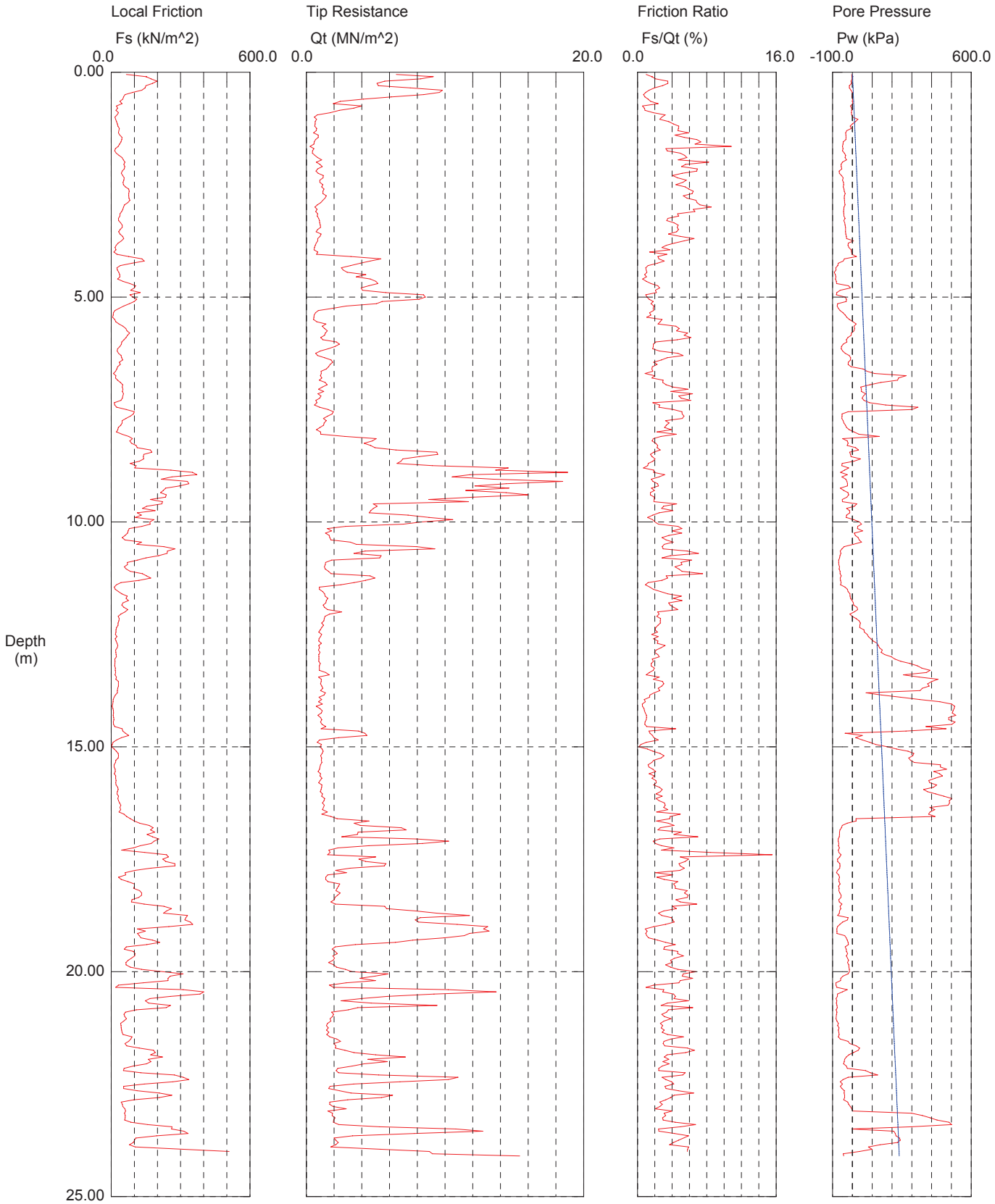
Maximum Depth = 23.20 meters

Depth Increment = 0.05 meters

C27, STA 179+37, W Line, Offset 14.3 m Left

Operator: SAWKO/GELARDI
Sounding: 05-088
Cone Used: 730

CPT Date/Time: 07-06-05 12:38
Location: CPT-27
Job Number: 01-262001



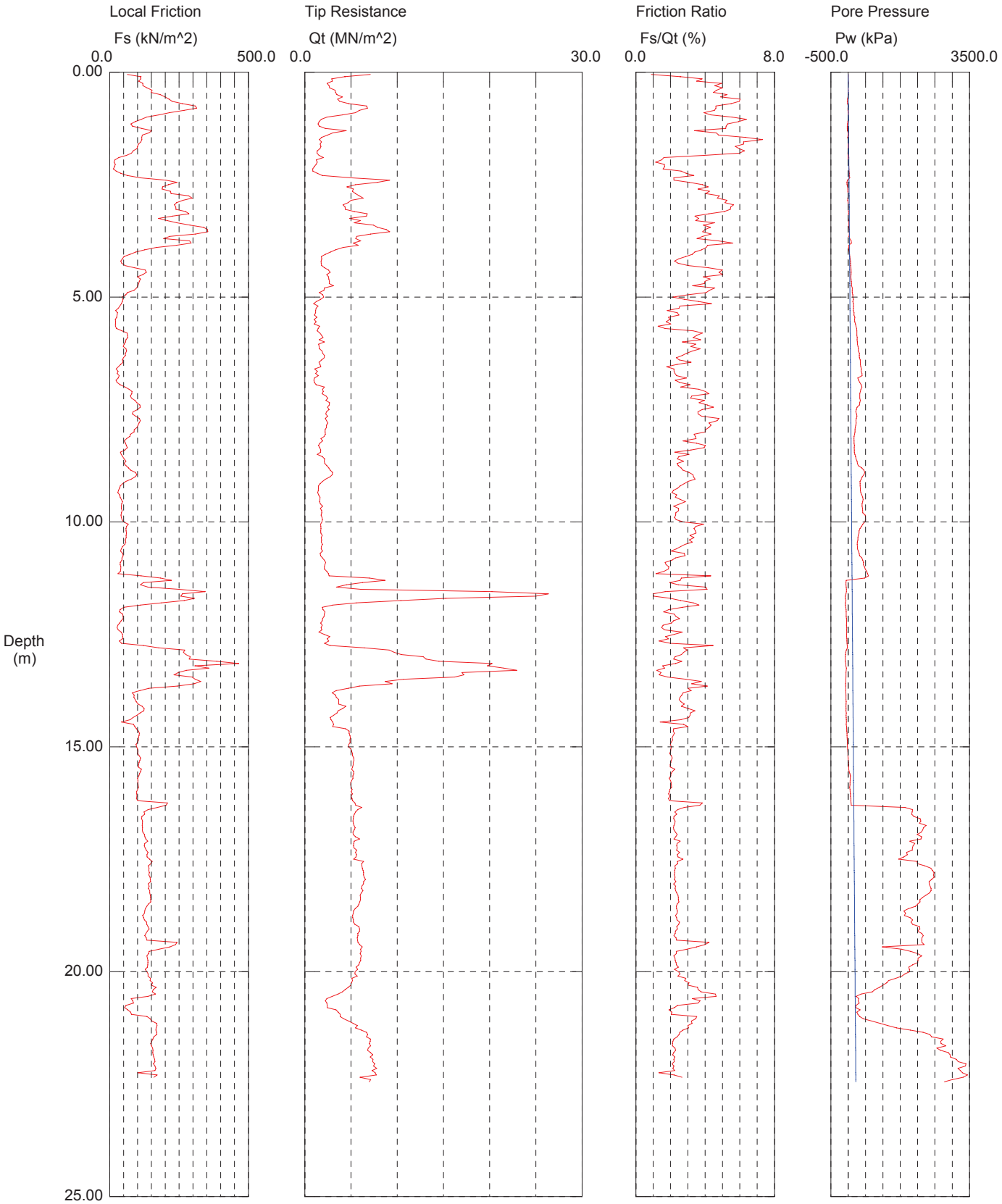
Maximum Depth = 24.10 meters

Depth Increment = 0.05 meters

C28, STA 180+71, W Line, Offset 3.7 m Left

Operator: SAWKO/GELARDI
Sounding: 05-089
Cone Used: 730

CPT Date/Time: 07-07-05 09:09
Location: CPT-28
Job Number: 01-262001



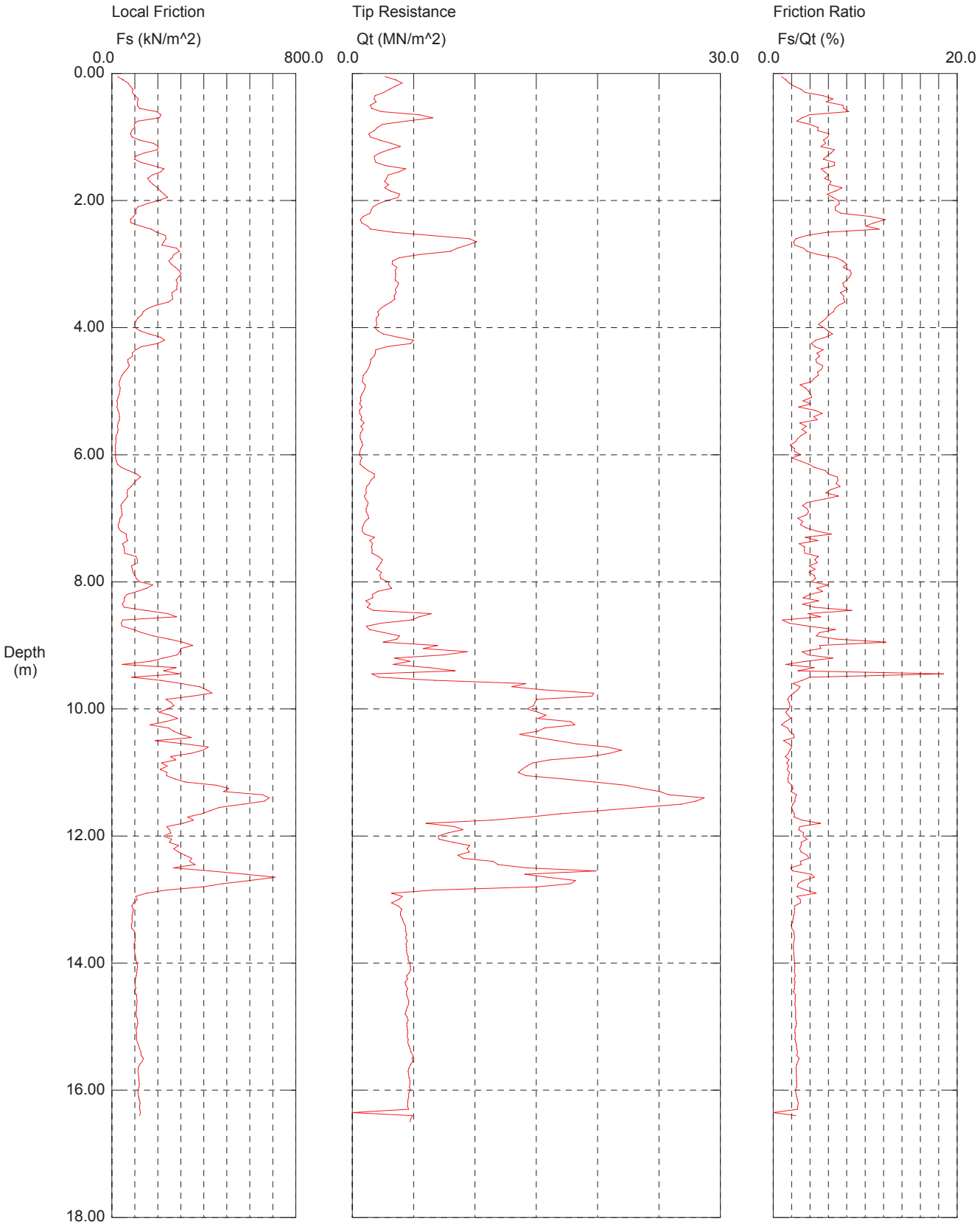
Maximum Depth = 22.45 meters

Depth Increment = 0.05 meters

C29, STA 113+86, A Line, Offset 1.5 m Right

Operator: SAWKO/GELARDI
Sounding: 05-090
Cone Used: 777

CPT Date/Time: 07-07-05 13:41
Location: CPT-29
Job Number: 01-262001



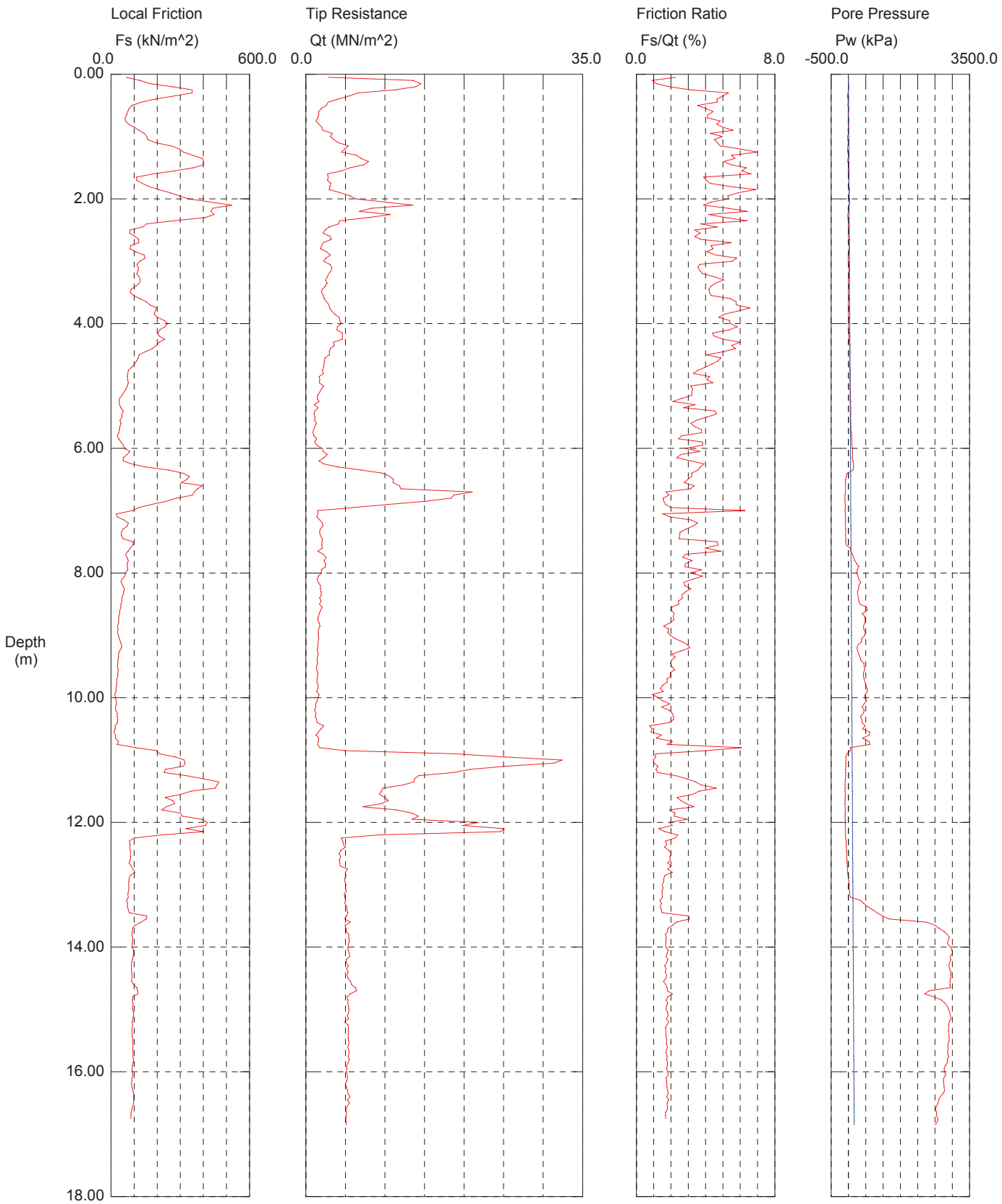
Maximum Depth = 16.50 meters

Depth Increment = 0.05 meters

C30, STA 115+81, A Line, Offset 0.9 m Right

Operator: SAWKO/GELARDI
Sounding: 05-091
Cone Used: 730

CPT Date/Time: 07-12-05 12:16
Location: CPT-30
Job Number: 01-262001



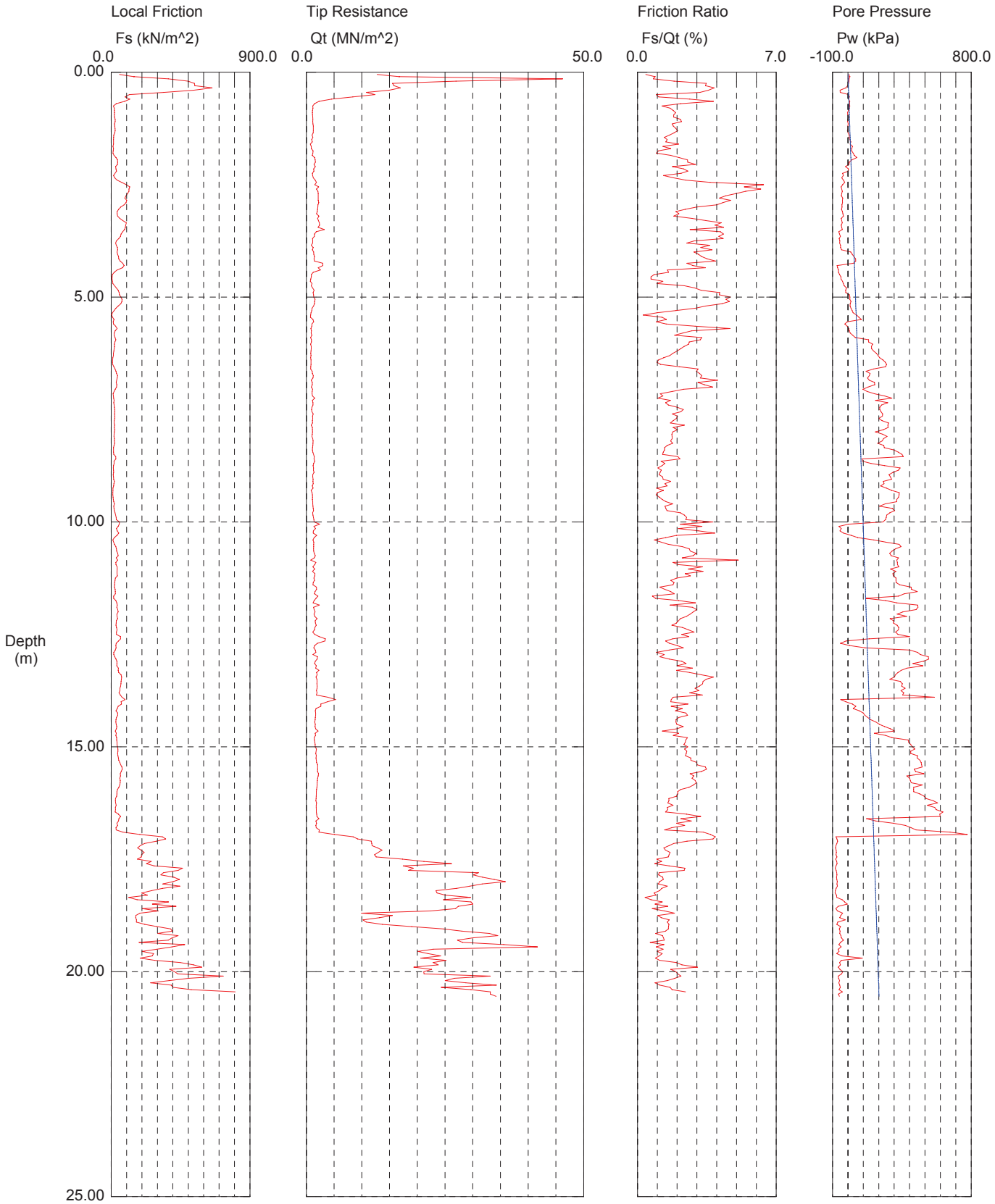
Maximum Depth = 16.85 meters

Depth Increment = 0.05 meters

C31, STA 144+28, A Line, Offset 2.4 m Left

Operator: SAWKO/GELARDI
Sounding: 05-092
Cone Used: 730

CPT Date/Time: 07-13-05 08:22
Location: CPT-31
Job Number: 01-262001



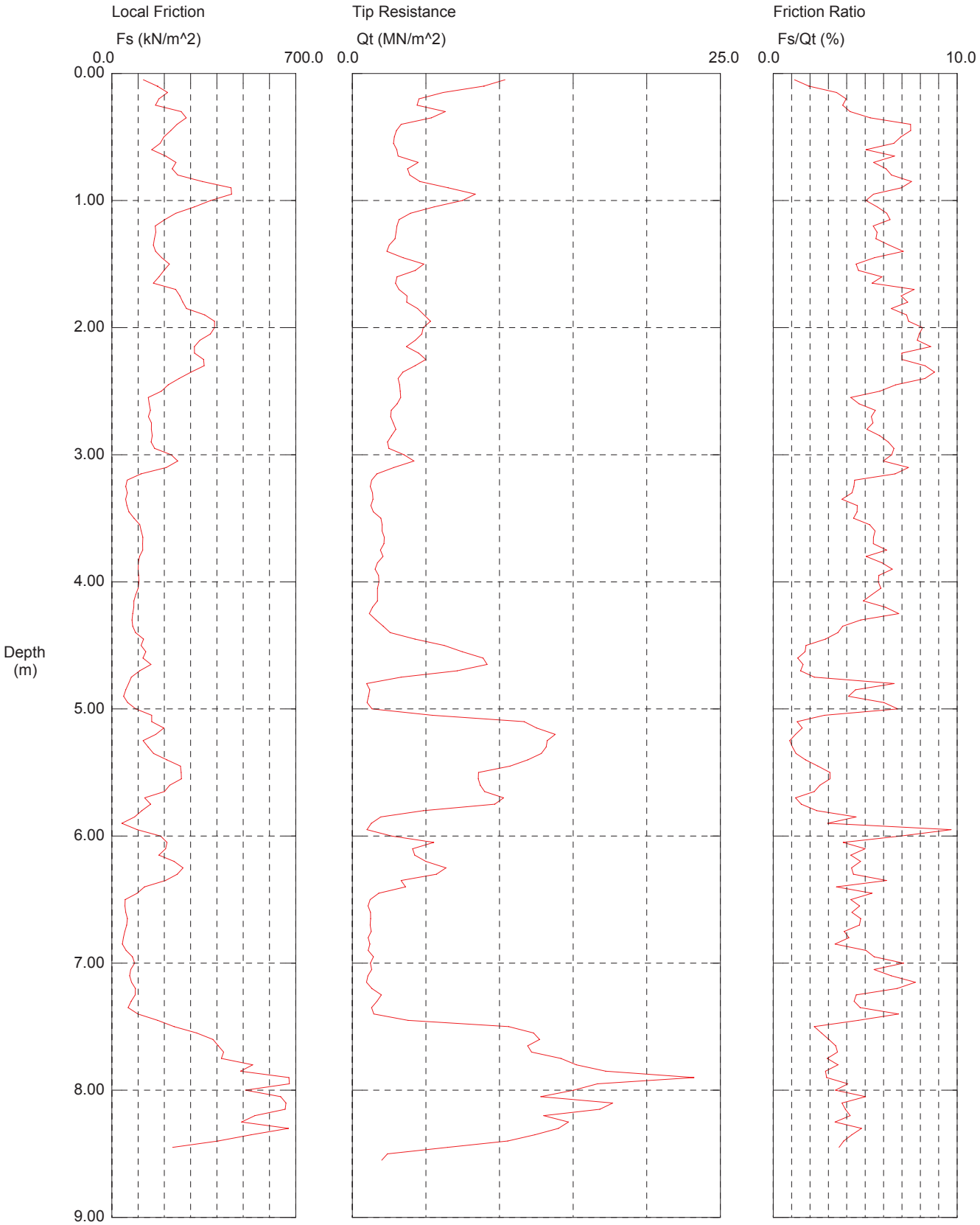
Maximum Depth = 20.55 meters

Depth Increment = 0.05 meters

C32, STA 117+31, A Line, Offset 13.1 m Right

Operator: SAWKO/GELARDI
Sounding: 05-094
Cone Used: 777

CPT Date/Time: 07-13-05 12:54
Location: CPT-32A
Job Number: 01-262001



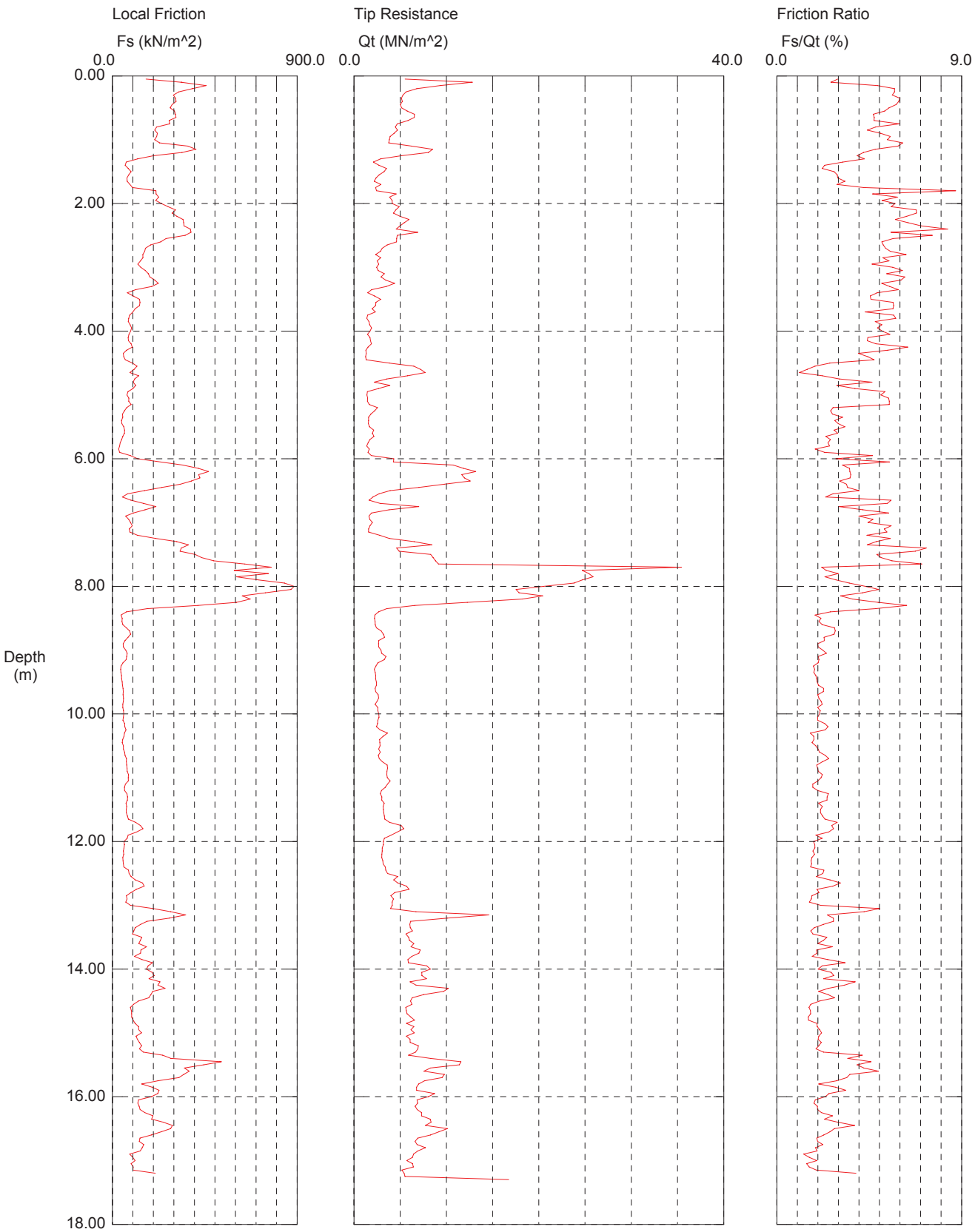
Maximum Depth = 8.55 meters

Depth Increment = 0.05 meters

C33, STA 117+83, A Line, Offset 14.9 m Right

Operator: SAWKO/GELARDI
Sounding: 05-095
Cone Used: 777

CPT Date/Time: 07-13-05 13:39
Location: CPT-33
Job Number: 01-262001



Maximum Depth = 17.30 meters

Depth Increment = 0.05 meters

State of California Business, Transportation and Housing Agency

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To: MR. DAVE KELLEY
Chief, Design Branch M4
North Region Design and Engineering Services
District 3

Attention: Mr. Brad Miller

Date: July 14, 2009

File: 01-Men-101-PM R43.88
01-262001
Br. No. 10-0129F

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
Geotechnical Services – MS 5
Office of Geotechnical Design – North

Subject: Landslide Mitigation – S101–W20 Connector Br. – Abut 1

Introduction

This report provides recommendations to stabilize a landslide at the location of Abutment 1 of the S101-W20 Connector Bridge. This new proposed structure will be incorporated as part of the Willits Bypass Project. Our investigation has determined that Abutment 1 of the S101-W20 Connector Bridge is located within an existing landslide and should be stabilized prior to construction of the abutment foundations.

Scope of Work

The scope of work is based on the information gathered during the subsurface investigation performed intermittently from April 2004 to October 2006, multiple field reconnaissance's performed prior to and following the subsurface investigation, available published and unpublished geologic reports and maps providing information for the project site, available plans concerning the proposed structure, and any available additional data including records and photos pertaining to the project site. With regards to the current recommendations given in this report, elevations are based on the NGVD 29 vertical datum, unless otherwise noted.

Site/Project Description

The new proposed S101-W20 Connector Bridge is a single span reinforced concrete box girder structure supported on driven steel H-Piles and will span Haehl Creek. Currently at the Abutment 1 location of the new proposed structure is an existing shallow landslide. The approach embankment to Abutment 1 is about 5 meters high and will increase the driving forces on the unstable slope. This would also create unacceptable lateral loads on the abutment foundations if the slope is not stabilized. The landslide is roughly defined with a principal scarp at the head of the slide and a center hummocky surface that includes relatively young vegetation within the debris slope as shown on the aerial photo with topographic overlay of Figure 1. The landslide is roughly 45 meters in length, with an average width of approximately 100 meters, and has an elevation differential of approximately 20 meters from the scarp to the toe. A photo

looking towards the head scarp from across Haehl Creek is shown on Figure 2. A x-section thru the slide from the stability analysis, showing the approximate location of the Abutment 1, is shown in Figure 3.

The toe of the slide extends into Haehl Creek where a potential slide plan was observed near the creek elevation. The potential slide plane consists of black and dark bluish gray elastic silt and fat clay dipping approximately 19 to 21 degrees towards the creek. The slide material (colluvium) overlying the elastic silt and fat clay is a mixture of reddish and yellowish brown silty sand and sandy clay with gravel.

Aerial Photo Site History

Aerial photos suggest the landslide may have initially moved more than forty years ago. The oldest available aerial showing the site location is dated back to 1963. Aerial photos from the 1980s indicate the slide became larger and the bigger trees are no longer present within the slide area. When compared to current aerial photos the movement since the 1980s has been much less.

Climate

According to the National Climate Data Center (NCDC) Cooperative Stations, California climate normals between between 1960 and 1995, the average annual precipitation in Willits is 1363.9 mm (53.7 in). The average air temperature is approximately 12.2°C (54°F). Average monthly temperature extremes of 29.5°C (85.1°F) and 0.0°C (32.0°F) occur in July and January, respectively.

Regional Setting and Area Geology

The project site is located at the south end of Little Lake Valley. Little Lake Valley is an intermontane basin within the northern California Coast Ranges in Mendocino County that contains a record of sedimentation and deformation during the Pleistocene. The basin is approximately 11.3 kilometers in length and up to approximately 4.8 kilometers wide near the middle of the valley. The town of Willits is situated in the west-central portion of the valley. The basin was likely formed by faulting along the Maacama Fault Zone on the southwest and northeast margins of the valley. Sediments within the basin, in places over 140 m thick, consist of fine grained lacustrine and overbank deposits, and coarser grained gravel alluvium from through flowing streams. Geologic investigations of the coarse-grained gravel alluvium suggest the valley formerly drained to the south (Russian River drainage). Currently, the valley drains to the north into the Eel River system. A suggested cause for the stream drainage changes may be from tectonic stresses related to the northward progression of the Mendocino Triple Junction (Woolace, *et al*., 2005).

The Geologic Map of California, Ukiah Sheet, scale 1:250,000, compiled by Charles W. Jennings and Rudolph G. Strand, 1992, California Division of Mines and Geology (Currently known as the California Geological Survey) indicates the area geology consists of Quaternary

alluvium (Qal) deposits overlying Plio-Pleistocene nonmarine sedimentary deposits underlain by the Franciscan Formation (KJf) (Figure 4). According to the map explanation, the Quaternary alluvium deposits consist of alluvium; recent breccia, conglomerate, sand, and valley fill. The Plio-Pleistocene (Pliocene-Pleistocene nonmarine sedimentary deposits) deposits are identified as the Cache Formation that consists of laucustrine and fluvial deposits and unnamed Plio-Pleistocene deposits bordering alluviated valleys in Mendocino County.

At the project site, the materials encountered during the subsurface investigation are interpreted as deposits of the Plio-Pleistocene nonmarine sedimentary deposits identified as the Cache Formation.

Field Investigation and Subsurface Conditions

The subsurface investigation included the drilling of exploratory borings and the installation of a slope inclinometer for measuring movement of the landslide. Upon completion of the subsurface investigation, laboratory testing of selected samples was performed along with monitoring of the slope inclinometer. A map of the boring locations is shown on the Foundation Plan in Figure 5.

The subsurface investigation consisted of four mud rotary borings, two within the slide (B-37 and B-40), and two outside the slide (B-5 and B-45), and a single cone penetrometer sounding (C-7) outside of the slide. A piezometer was installed to the bottom of boring B-37. In addition, an auger boring to a depth of 40 feet was made to install an observation well to measure ground water (B-78). The mud rotary borings were advanced using a self-casing wireline drilling method extending down to a maximum depth of 46.2 m (151.5 ft). The equipment used to drill borings B-37, B-40 and B-45 consisted of a Mobile B-47 drill rig equipped with a safety hammer. The equipment used to drill boring B-5 consisted of an Acker drill rig equipped with a safety hammer. Sampling (disturbed) was achieved by advancing the Standard Penetration Test (SPT) sampler (51 mm, 2.0 inch OD) under a standard striking force weight dropped 462 mm (30 inch) at 1.5 m (4.9 ft) intervals. Sampling (relatively undisturbed) was achieved by drilling with the inner barrel (punchcore) lined with brass (114 mm, 4.5 inch OD). Select disturbed and relatively undisturbed soil samples were collected and sealed for laboratory testing in all borings except B-78 and B-40. Select bulk samples were collected and bagged and sent for laboratory testing. Samples were not collected in boring B-40 and slope inclinometer (SI) piping was installed for monitoring slope movement.

The subsurface investigation revealed the foundation materials encountered at the project site generally consist of 5.2 m (17 ft.) to 16.2 m (53 ft.) of stiff to hard clay and dense to very dense silt, silty gravel, silty sand and clayey sand. Underlying this material is 4.1 m (13.5 ft.) to 5.2 m (17 ft.) of hard fat clay and elastic silt with organics. Below the hard fat clay and elastic silt is interbedded hard clay and dense to very dense sand, clayey sand and silt. The foundation materials were encountered down to a maximum depth explored of 46.2 m (151.5 ft), an elevation of 403.2 m (1322.7 ft).

The Log of Test Borings are provided as an attachment to this report.

Ground Water

Ground water levels monitored in boring B-78 indicate a depth to water between 7.41 m(24.3 ft) and 7.84 m(25.7ft). Ground water levels in boring B-37, which was a much deeper boring, indicated near surface ground water levels. It appears that artesian ground water conditions may exist at the site. During a site visit on February 6, 2007, seepage and spring activity was visible throughout the hummocky surface of the landslide and appeared to be draining towards the existing Haehl Creek. Near the toe of the landslide, free water was visible on the surface of the potential slide plane consisting of black and dark grayish blue organic clay and/or silt visible along the bottom slope of the creek.

Slope Inclinometer Data

Slope inclinometer readings have been collected intermittently to date at the boring B-40 location. The data indicates the slide movement at this location less than 3 m (10 ft) deep and horizontal displacement was less than 12 mm (0.5 inches) over 3 years. The graphical results are presented in Figure 6.

Scour Evaluation

A Final Hydraulic Report (dated March 22, 2005) for the Haehl Creek structures was completed by the Office of Structure Maintenance and Investigations, Structure Hydraulics Branch. According to this report, there are no local pier scour concerns for this structure since it is a single span structure. The report recommends the abutment foundations be designed assuming no ground support (lateral and vertical) as a result of soil loss due to possible degradation or lateral stream migration down to the current stream thalwag elevation (lowest elevation in channel). The approximate thalwag elevation provided for the proposed S101-W20 Connector Bridge (Br. No. 10-0129F) is 440.25 m (1444.4 ft).

Laboratory Testing

Laboratory testing was performed on selected samples of the subsurface materials obtained from the subsurface investigation. Tests were performed to determine the corrosion and engineering properties of the subsurface materials for use in the foundation analysis. The tests performed included: mechanical analysis (Sieve and Hydrometer), Atterberg Limits (Liquid Limit, Plastic Limit and Plasticity Index), Unit Weight, Consolidation, Triaxial (UU) and Soil Corrosion Testing (pH, sulfate, chloride, and resistivity). All tests were performed in general accordance with American Society for Testing and Materials (ASTM) standards or California Test Methods (CTM).

The Atterberg Limit tests indicate liquid limits up to 79% and plastic index up to 39 % for the elastic silt and fat clay. Moisture contents for these materials ranged from 33% to 55%. The high plasticity and high moisture contents are characteristic of low shear strength soils and this type of landslide failure. Laboratory test results are available upon request.

Seismic Data and Evaluation

The project site is not located within any Alquist-Priolo Earthquake Fault Zones (EFZs) as established by the California Geological Survey (CGS, 1997). Based on the Department of Transportation (Caltrans) 1996 Seismic Hazard Map, the controlling fault for the site is the Maacama Brush Mountain (MLM), a strike-slip fault. The MLM fault is located less than one kilometer west of the site and is capable of generating a Maximum Credible Earthquake (MCE) moment magnitude of M_w=7.25. The corresponding Peak Bedrock Acceleration (PBA) at the site is estimated to be about 0.7g. The soil profile at the site may be classified as Type D, as defined in the Department's Seismic Design Criteria (SDC, 2006, Version 1.4). The recommended design Acceleration Response Spectrum (ARS) curve shown in Figure 4 was obtained by modifying the ARS curve in Figure B.8 of the SDC corresponding to a PBA of 0.7g. These modifications were introduced to account for the proximity of the controlling seismic source and included a 20% increase in spectral accelerations for periods greater than or equal to 1.0 second. No modifications were introduced for periods less than or equal to 0.5 second. The spectral accelerations for periods between 0.5 and 1.0 second were obtained by linear interpolation.

The potential for ground rupture hazard due to fault movement is considered low since no known fault crosses the project site. The potential for liquefaction to occur is considered to be minimal at the project site.

Slide Characterization and Analysis

The currently active landslide appears to be relatively shallow and is estimated at less than 3 meters deep. The original slide was probably several meters deeper but the material was transported into Haehl Creek and eroded away at high flows during storm events over the last 50 years. The material that remains is very weak and will move with additional embankment loading. This landslide can probably be classified as an earth flow, where the colluvium (reddish brown and yellowish brown silty sand, and sandy clay with gravel) is sliding on the weak elastic silt and fat clay (black and dark gray) which dips towards the creek. A stability analysis was performed utilizing SLOPE/W software (GEOSLOPE International LTD., Version 6.20). Figure 7 shows the estimated pre-slide geometry with the assumed material properties and ground water used in the stability analysis to achieve a factor of safety of 1.0.

An additional stability analysis was performed to reflect the current conditions of the remaining colluvium that continues to slowly creep towards the creek. Figure 8 shows the current slide geometry with the assumed material properties and ground water used in the stability analysis to achieve a factor of safety of 1.0.

Stabilization Trench Recommendations

We recommend the construction of a stabilization trench to stabilize the foundation of the approach embankment at Abutment 1. A maximum excavation depth of about 7 meters is recommended, as shown in Figures 9 and 10. This will allow the removal of existing slide material and key into more stable ground at about elevation 442 m. This should include a drainage blanket up to elevation 451 m, as shown in Figure 10. The side slopes of the

stabilization trench should be at 1.5:1, with the trench bottom sloped back at 8% to a 300mm (12 inch) diameter perforated pipe. The drainage blanket should be located to avoid the abutment and wing wall foundation piling. Excavation for the stabilization trench should be done after the excavation for the thru cut just south of the approach embankment. This order of work will reduce the potential for instability of the excavation before the trench is backfilled. Organic materials removed from these excavations should not be incorporated into the embankments on the project and should be disposed of.

If you have any questions or comments, please call Jim Morris at (530) 265-9867 or Tim Alderman at (916) 227-1035.

J. Morris
for T. Alderman

REGISTERED PROFESSIONAL ENGINEER
JAMES E. MORRIS
No. CE036925
Exp. 6-30-10
CIVIL ENGINEER
STATE OF CALIFORNIA

James E. Morris

TIM ALDERMAN
Engineering Geologist
Geotechnical Design – North

JIM MORRIS, P.E.
Senior Materials and Research Engineer (Specialist)
Geotechnical Design - North

Attachments:

- Figure 1: Aerial Photograph
- Figure 2: Head Scarp Photo
- Figure 3: Slide X-Section
- Figure 4: Geologic Legend
- Figure 5: Boring Locations
- Figure 6: SI Data
- Figure 7: Pre-Slide X-Section
- Figure 8: Slide X-Section
- Figure 9: Stabilization Trench Plan
- Figure 10: Stabilization Trench Details
- Log of Test Borings

cc: OGDSN
GS File Room
Roy Bibbens (e-file)
Reid Buell (e-file)
Charlie Narwald (e-file)
R.E. Pending
Structure OE(e-file)

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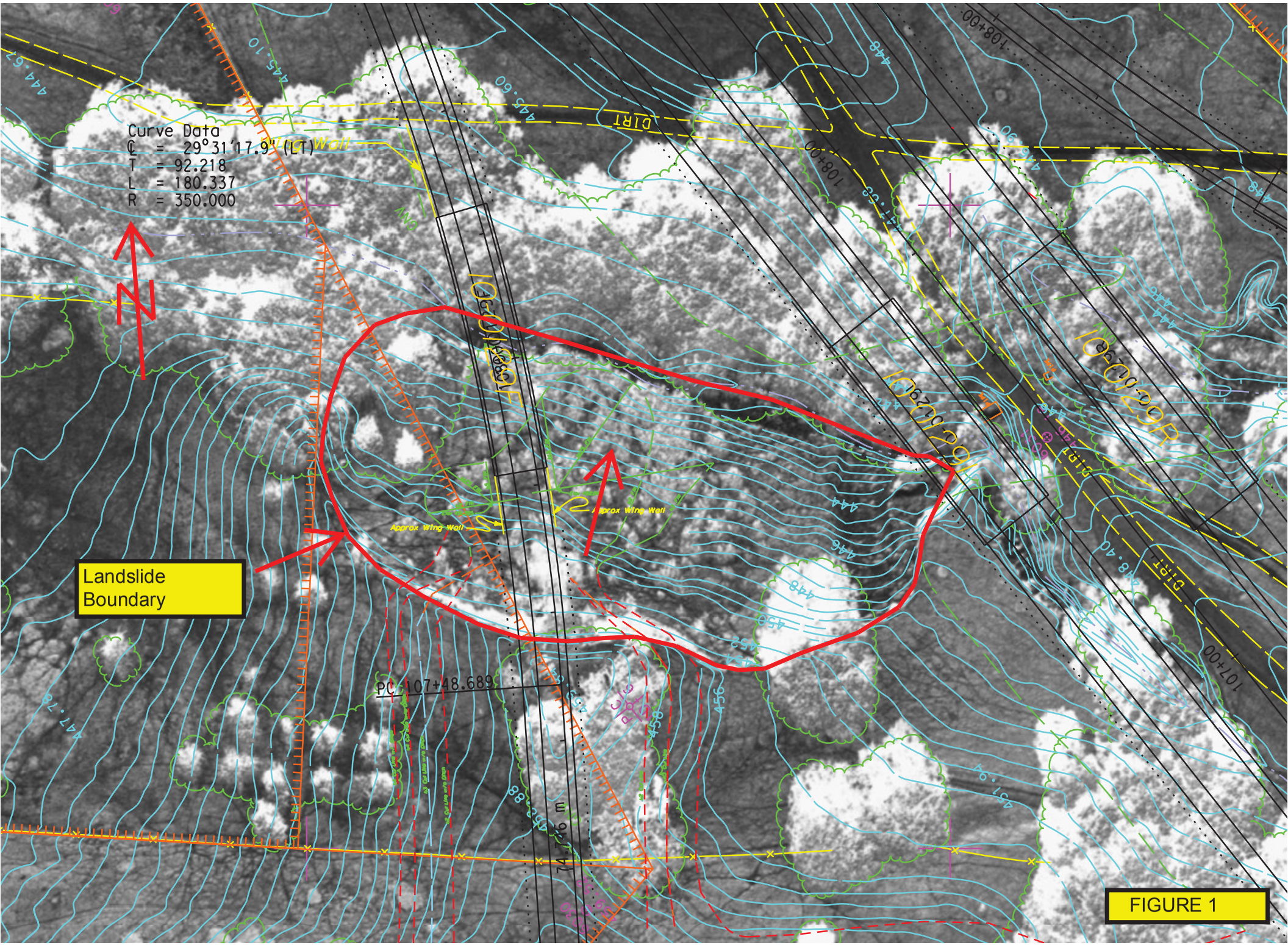
- Standard Specifications, May 2006
- Bridge Standard Details Sheets, April 2000.
- Memo to Designers, Section 3-1, December 2000.
- CT-Corrosion Guidelines, September 2003, Version 1.0.

Woolace, A. C. *et al*., 2005, Late Neogene and Quaternary Stratigraphy and Structure of Little Lake (Willits) Valley, Northern Coast Range, California, in Abstracts with Programs, Vol. 37, No. 4, p. 68, Paper No. 25-3, Geological Society of America 101st Annual Meeting, April 29 through May 1, 2005, San Jose, CA.


Curve Data
℄ = 29°31'17.9" (LT)
T = 92.218
L = 180.337
R = 350.000
N
Landslide Boundary
Approx Wing Wall
Approx Wing Wall
PC 107+48.689
DIRT
108+00
107+00
FIGURE 1

Division of Engineering Services Geotechnical Services Office of Geotechnical Design – North	EA: 01-262001 February 2009	Head Scarp Photo
	01-MEN-101 KP R70.62/PM R43.88 **S101-W20 Connector Bridge, Br. No. 10-0129F**	Figure 2

01-Men-101-PM 43.88
S101-W20 Conn Br No. 10-0129F
01-262001

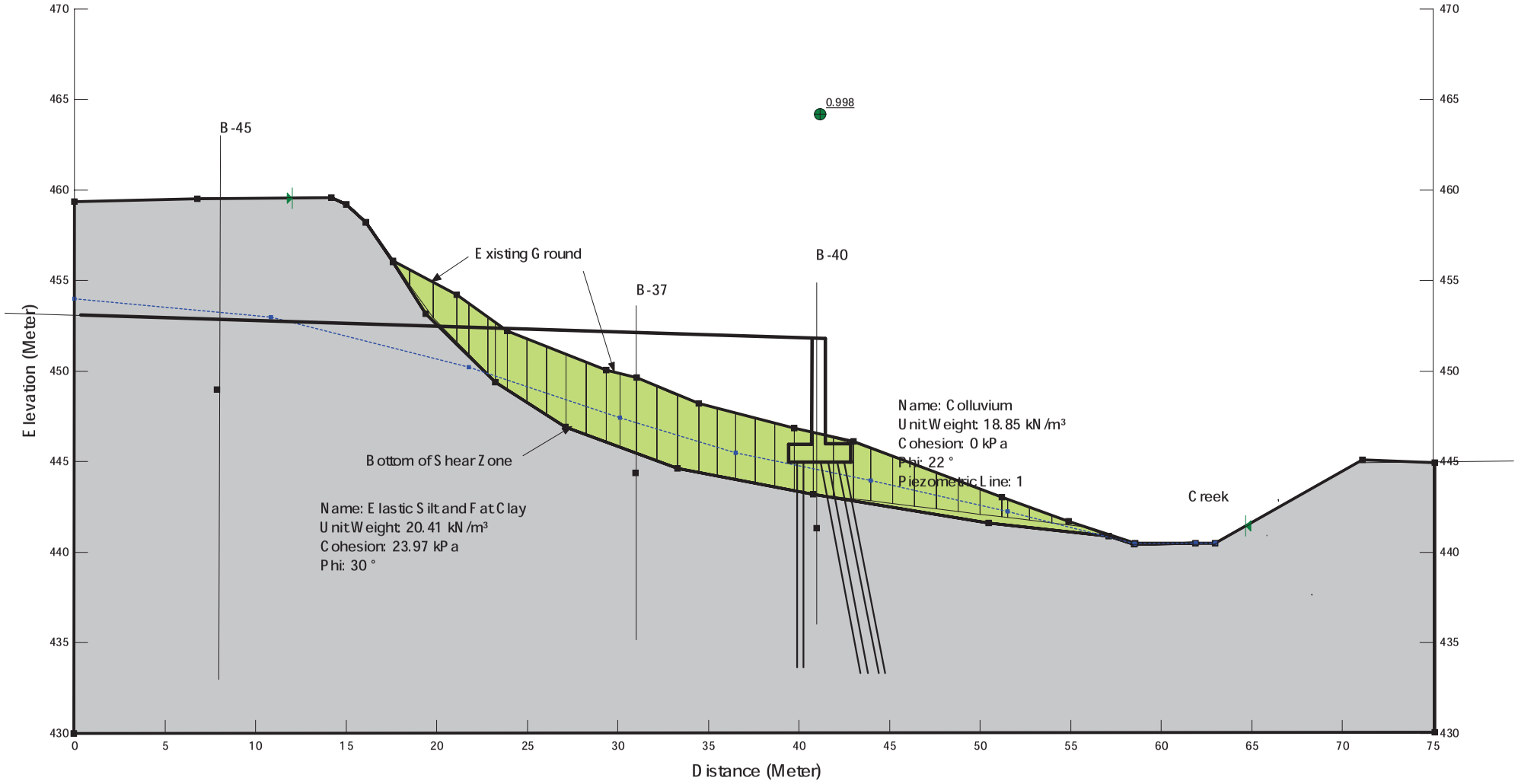
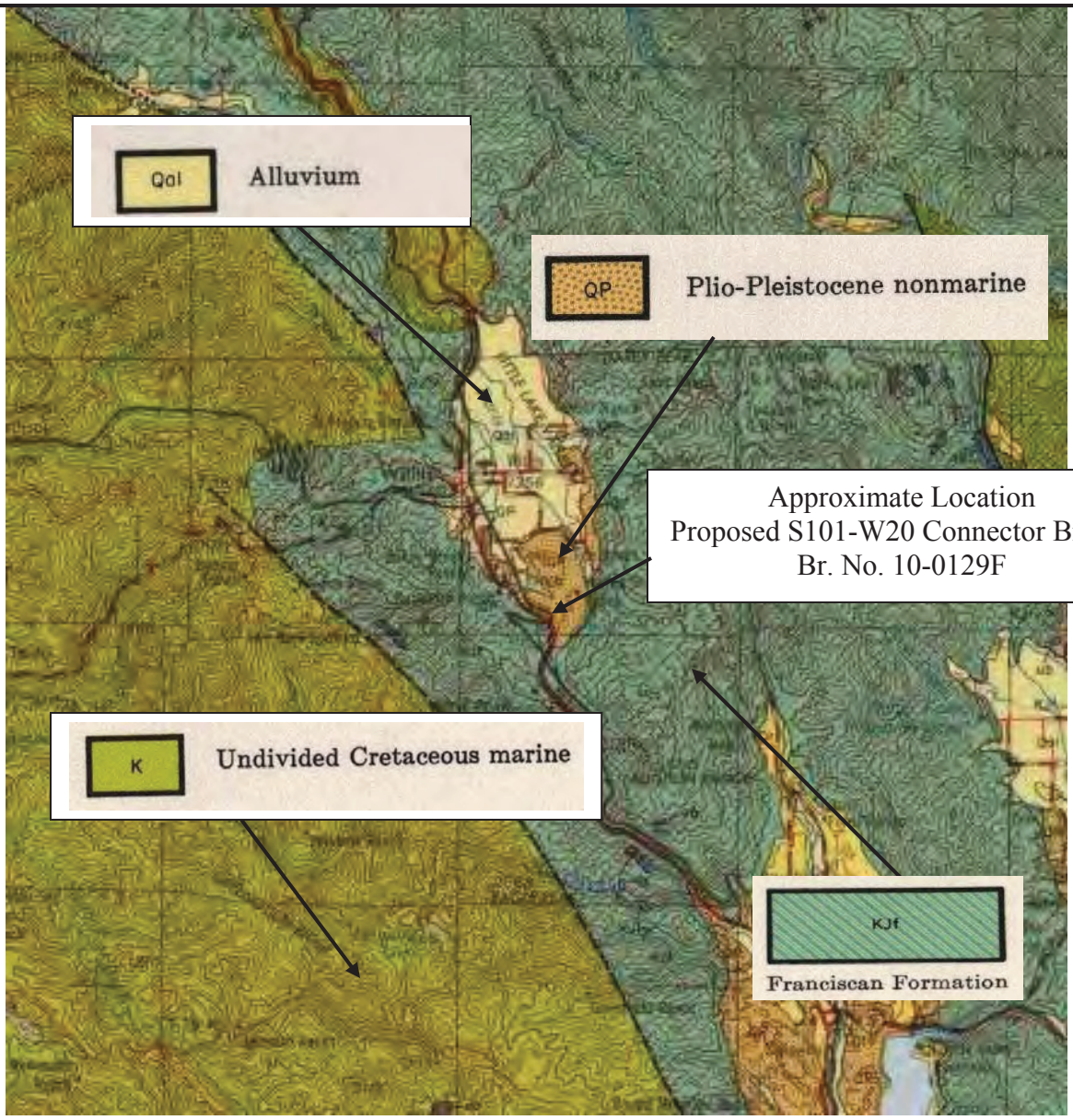
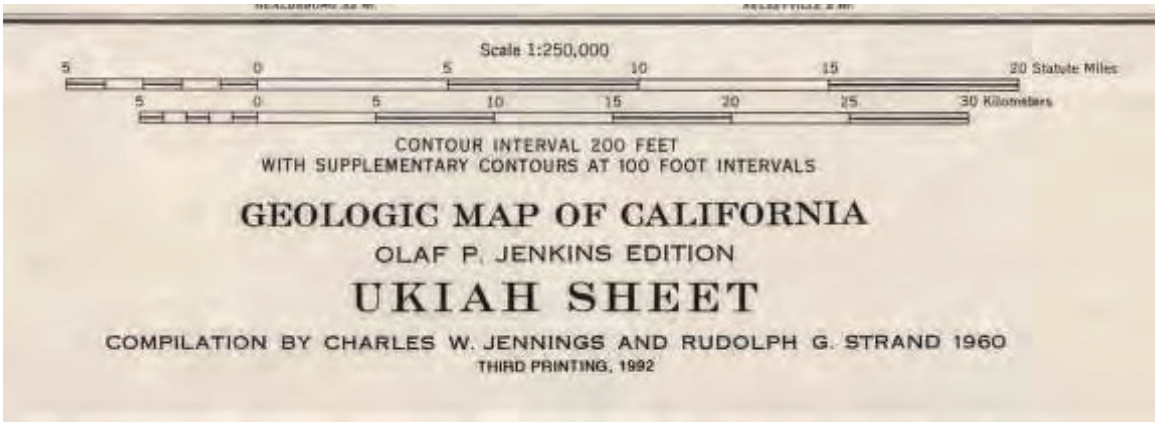


FIGURE 3





Division of Engineering Services Geotechnical Services Office of Geotechnical Design – North	EA: 01-262001 June 28, 2008	Geologic Map
	01-MEN-101 KP R70.62/PM R43.88 **S101-W20 Connector Bridge, Br. No. 10-0129F**	Figure 4

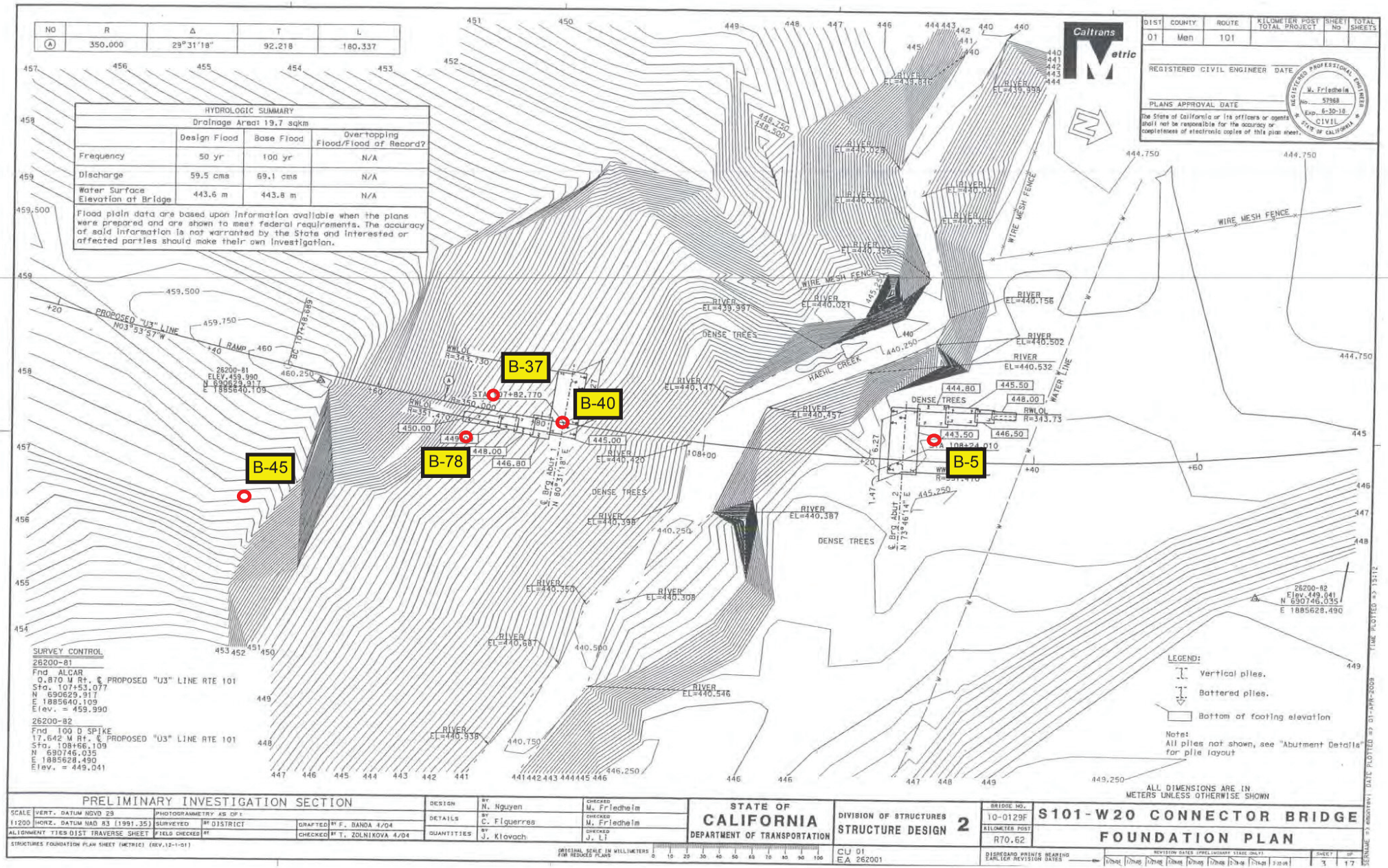
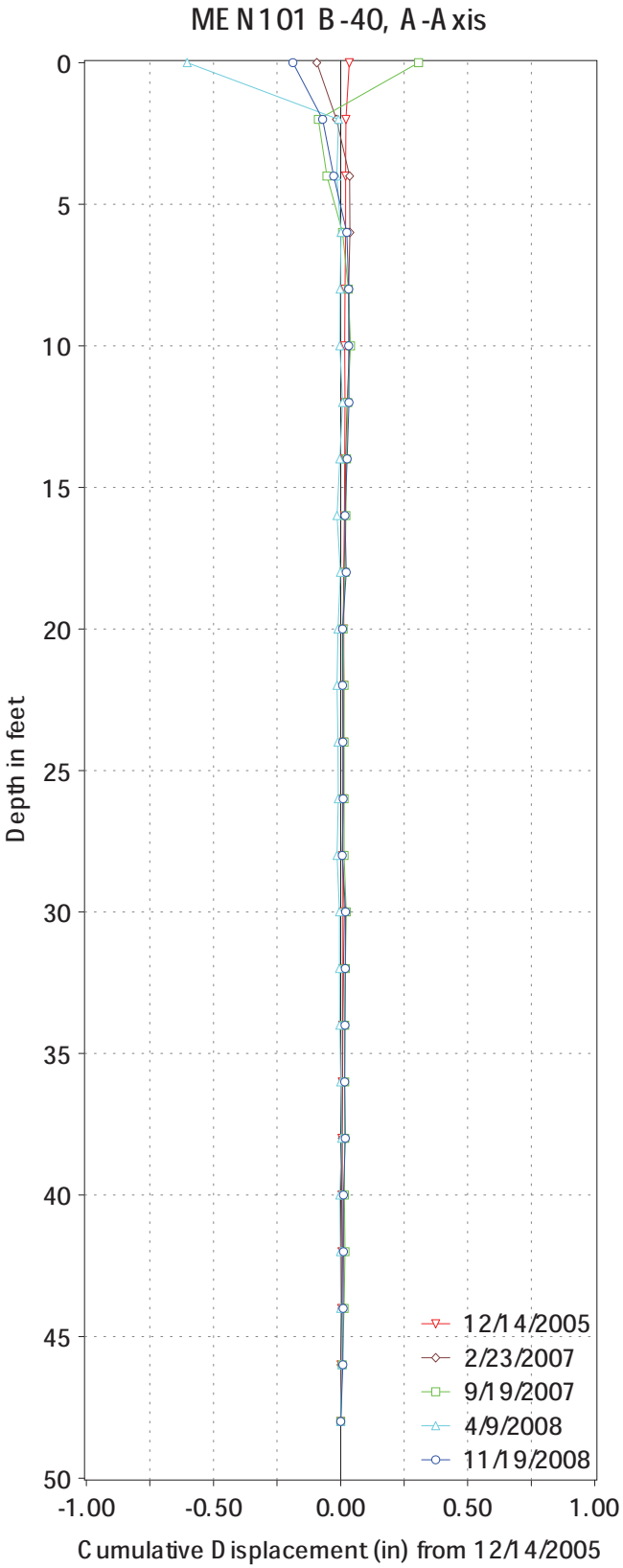
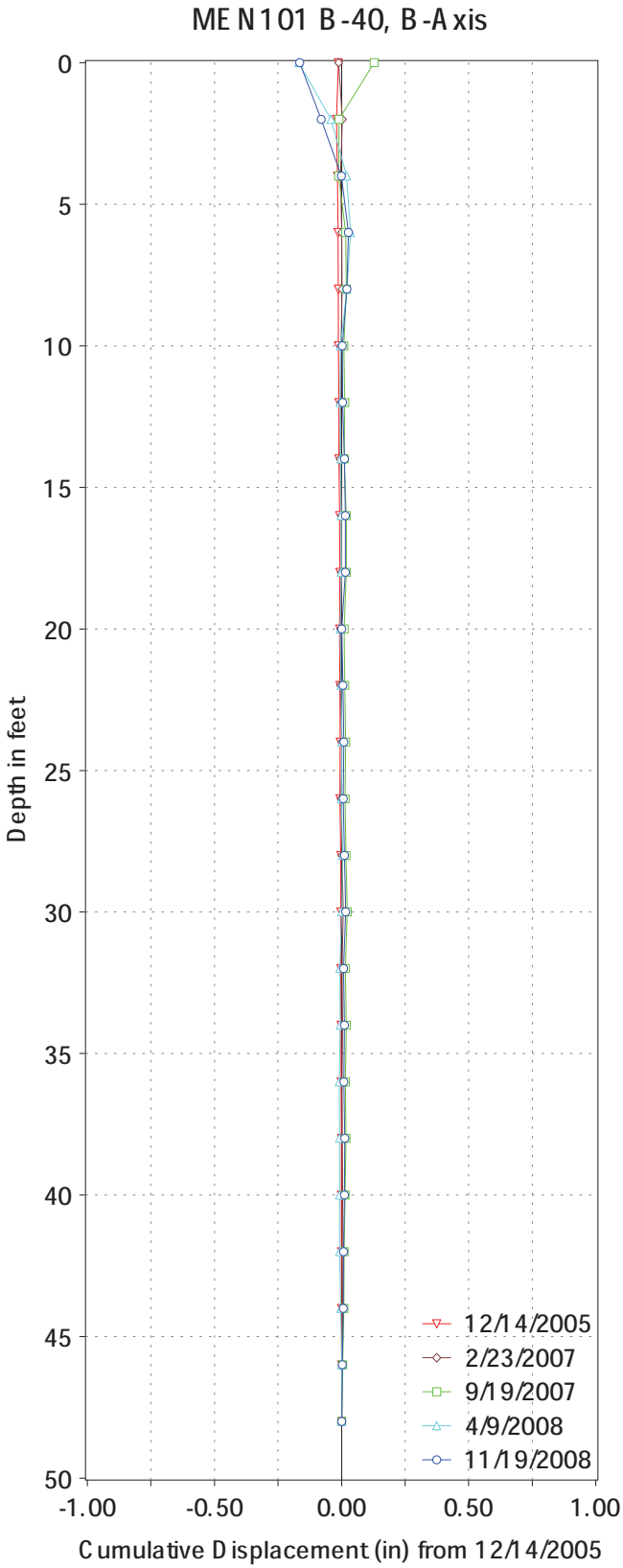

B-37
B-40
B-78
B-45
B-5
HYDROLOGIC SUMMARY
Drainage Area: 19.7 sqkm
Flood plain data are based upon information available when the plans were prepared and are shown to meet federal requirements. The accuracy of said information is not warranted by the State and interested or affected parties should make their own investigation.
SURVEY CONTROL
26200-81
Fnd ALCAR
0.870 M Rt. ℄ PROPOSED "U3" LINE RTE 101
Sta. 107+53.077
N 690629.917
E 1885640.109
Elev. = 459.990
26200-82
Fnd 100 D SPIKE
17.642 M Rt. ℄ PROPOSED "U3" LINE RTE 101
Sta. 108+66.109
N 690746.035
E 1885628.490
Elev. = 449.041
LEGEND:
Vertical piles.
Battered piles.
Bottom of footing elevation
Note:
All piles not shown, see "Abutment Details" for pile layout
ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN
PRELIMINARY INVESTIGATION SECTION
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
DIVISION OF STRUCTURES
STRUCTURE DESIGN 2
S101-W20 CONNECTOR BRIDGE
FOUNDATION PLAN

FIGURE 5





INCLINOMETER MONITORING RESULTS

01-MEN-101-KP 43.5
Willits Bypass
E.A. No.: 01-262001

Depth of Inclinometer Casing: 51 feet
Ao Direction: 340° (Magnetic North)
Location (WGS-84): 39°22.594' N; 123°19.638' W

FIGURE 6

01-Men-101-PM 43.88
S101-W20 Conn Br No. 10-0129F
01-262001

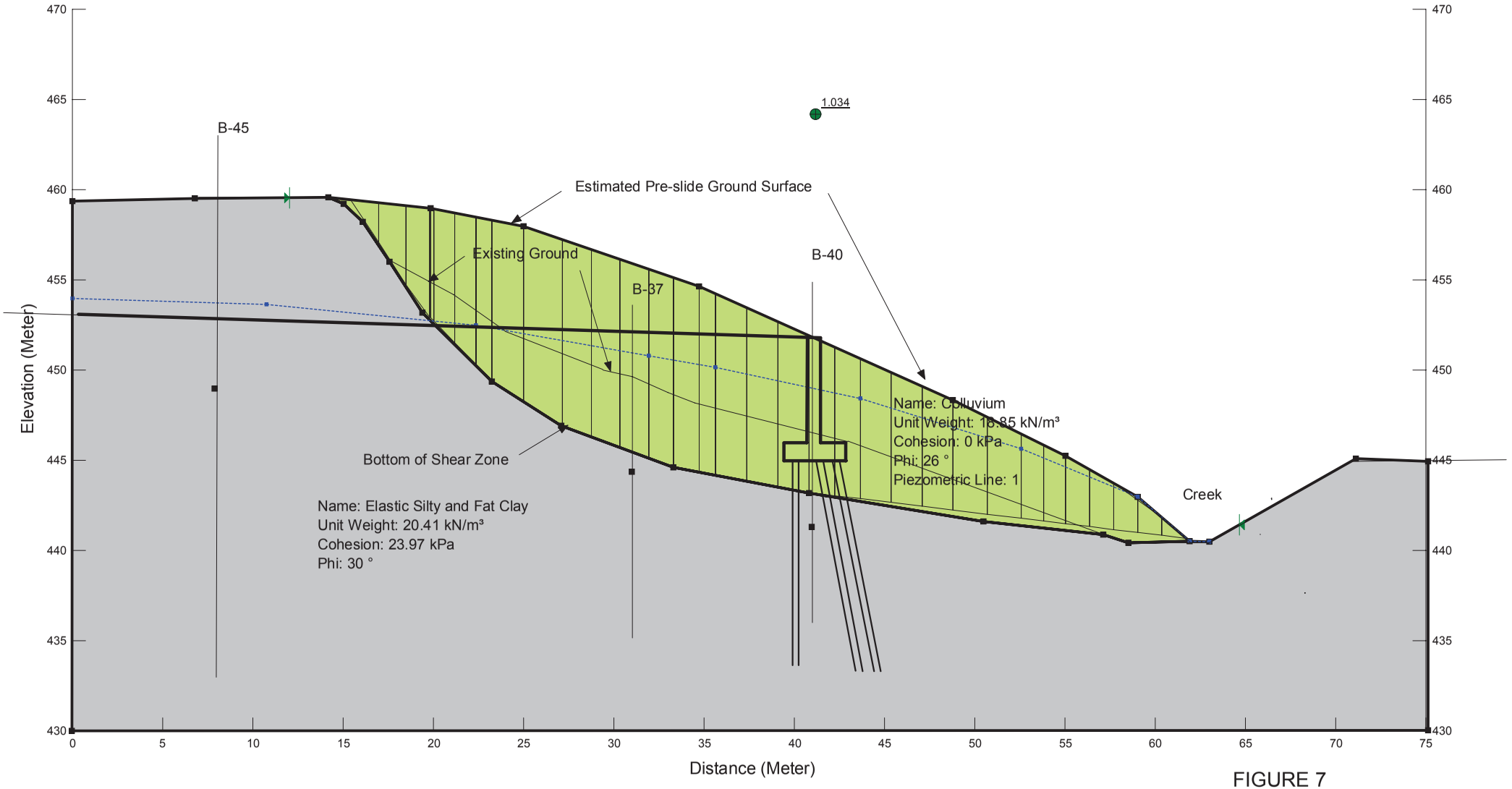


FIGURE 7

01-Men-101-PM 43.88
S101-W20 Conn Br No. 10-0129F
01-262001

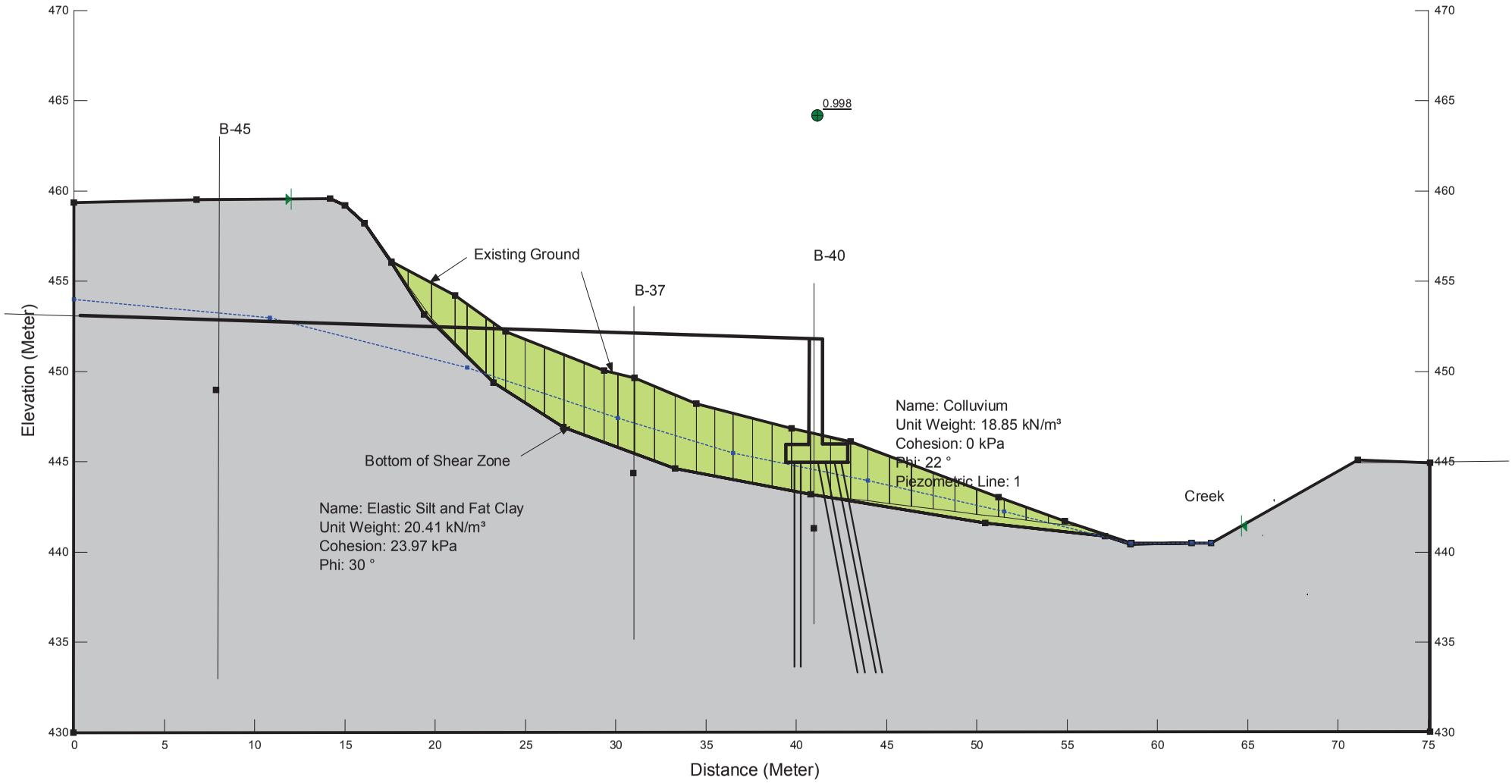
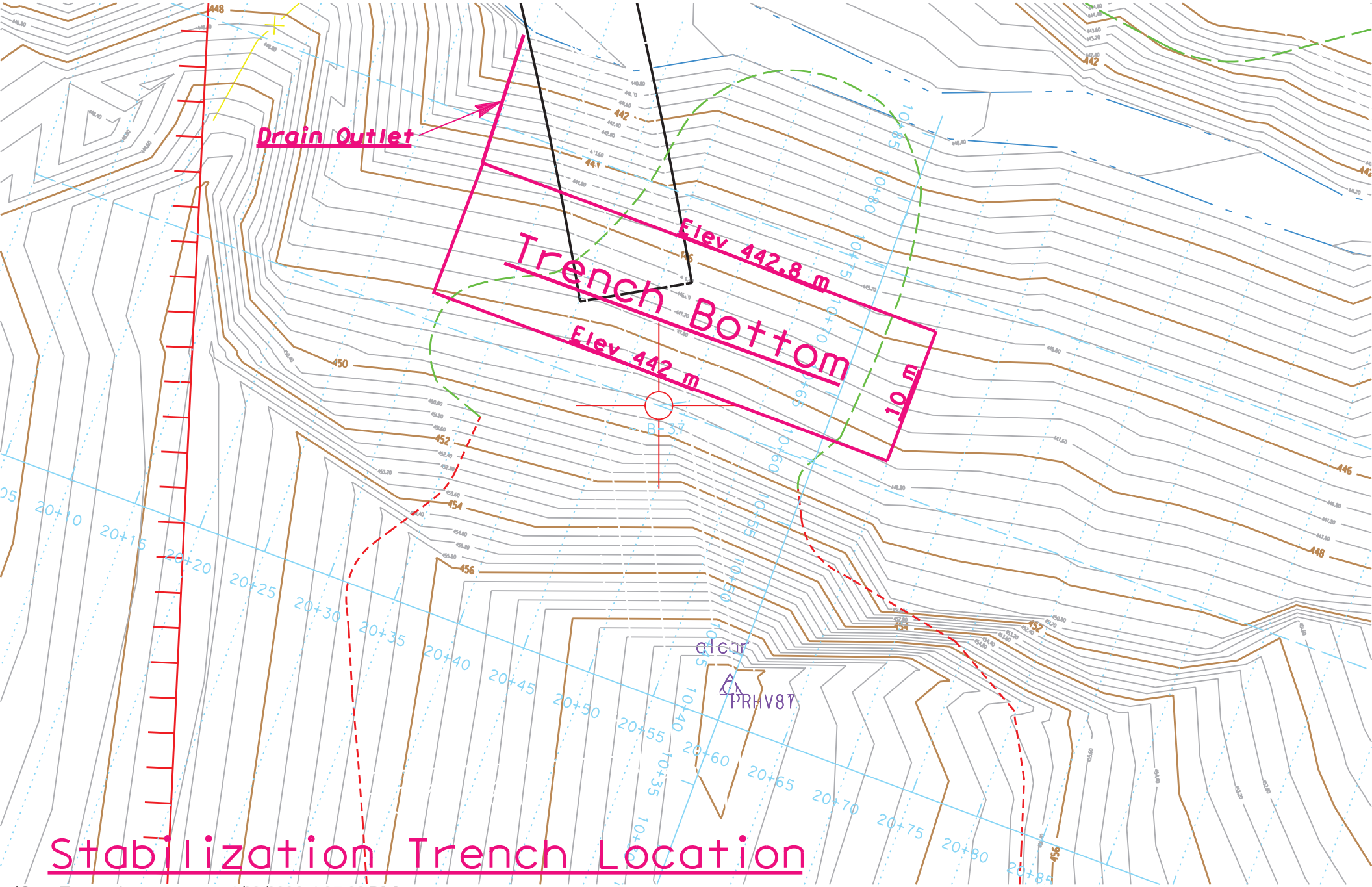


FIGURE 8



Stabilization Trench Location

...\Stab Trench Location.dgn 4/28/2009 4:05:30 PM

FIGURE 9

Stabilization Trench Details

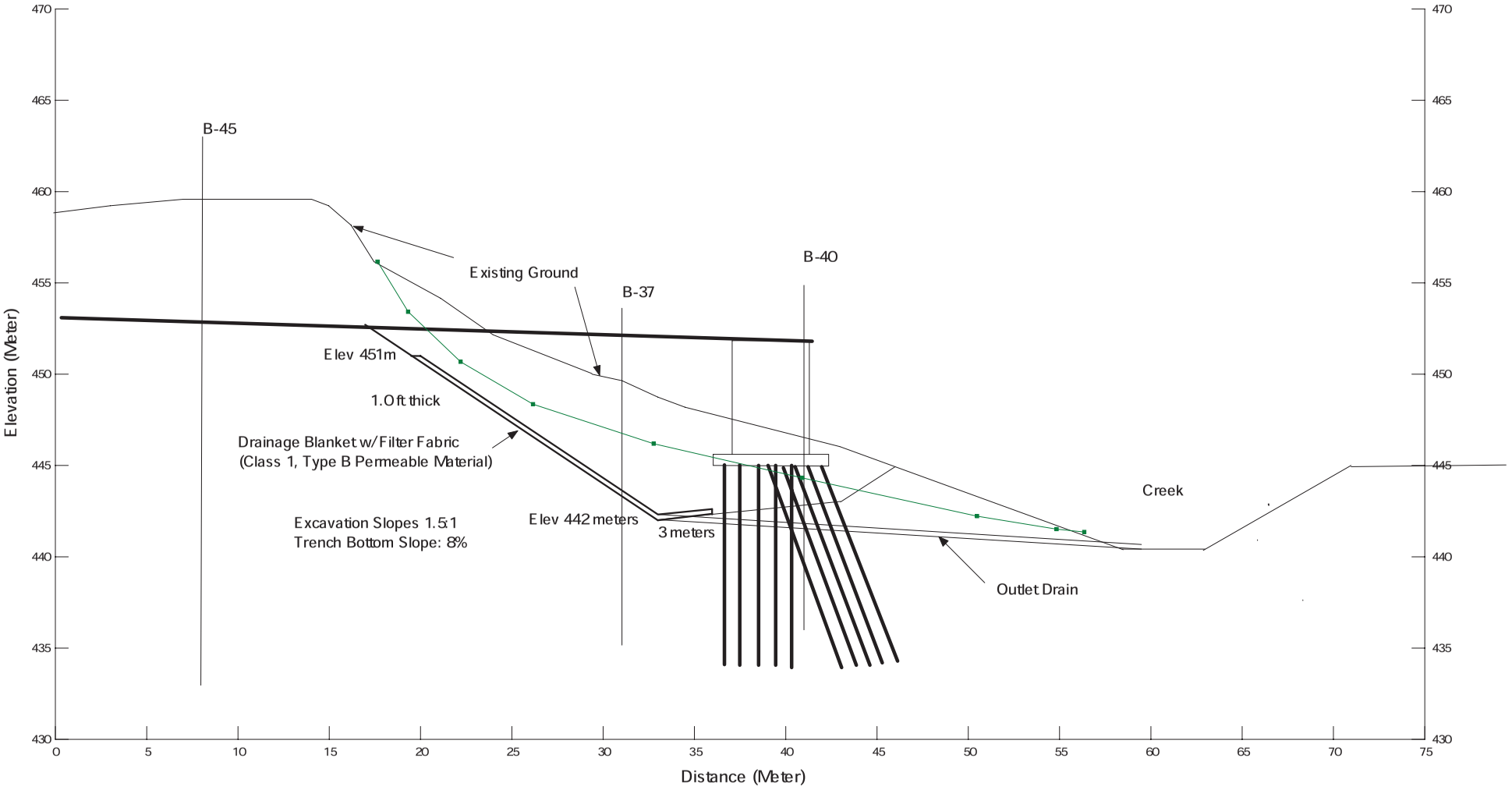


Figure 10

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET NO	TOTAL SHEETS
01	Men	101			

CERTIFIED ENGINEERING GEOLOGIST — 6-17-09 DATE

Reid Buell, No. 1481, Exp. 4-30-11, CERTIFIED ENGINEERING GEOLOGIST, STATE OF CALIFORNIA

PLANS APPROVAL DATE

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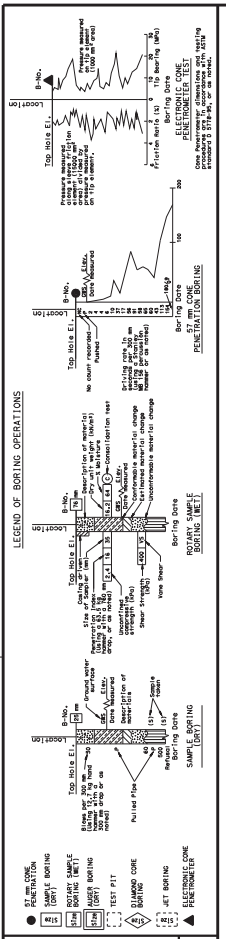
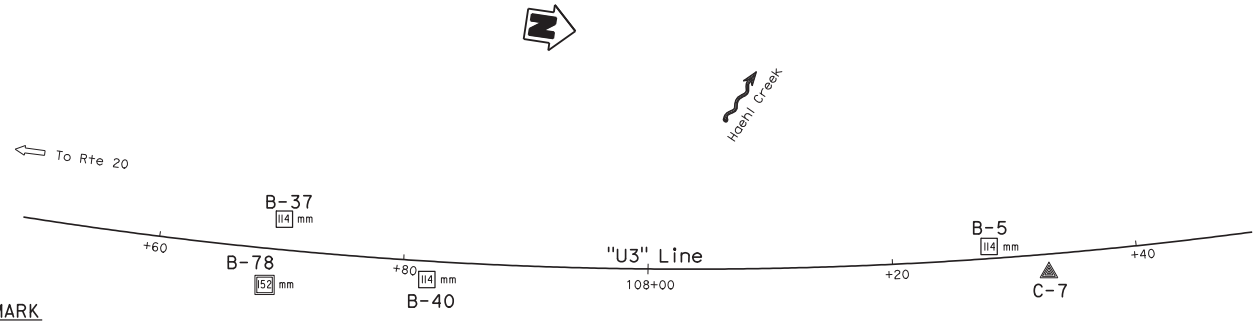




BENCH MARK

SURVEY CONTROL

26200-81

Fnd ALCAR
0.870 M Rt ℄ PROPOSED "U3" LINE RTE 101
Sta 107+53.077
N 690629.917
E 1885640.109
Elev = 459.990

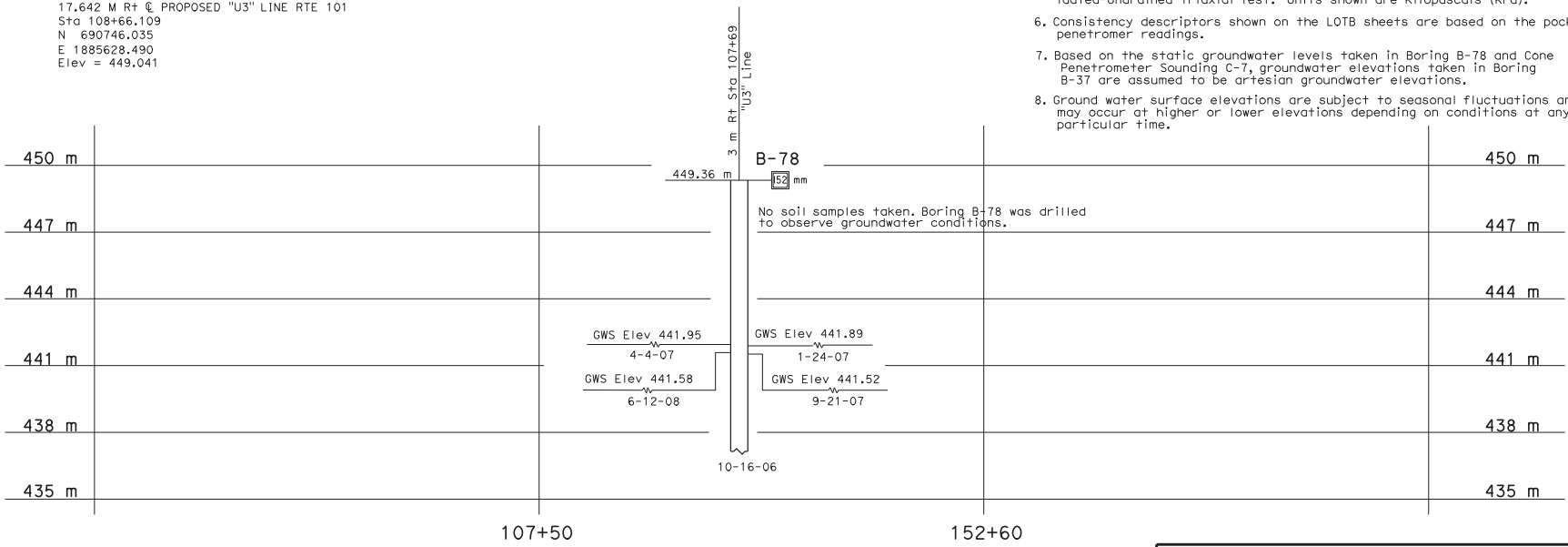
26200-82

Fnd 100 D SPIKE
17.642 M Rt ℄ PROPOSED "U3" LINE RTE 101
Sta 108+66.109
N 690746.035
E 1885628.490
Elev = 449.041

PLAN
1:200

NOTES:

1. Standard Penetration Tests (SPT) performed in Borings B-5 and B-37 were advanced using a 63.5 kg Safety Hammer.
2. E = Blow count for 0.3 m penetration extrapolated from blow count for less than 0.3 m (due to change in material or hard driving).
3. Penetration index value designated as "REF" means sampler refusal.
4. pp=Unconfined compressive strength determined in the field by "Pocket Penetrometer." Units shown are kilopascals (kPa).
5. UU = Undrained shear strength determined in the laboratory by Unconsolidated-Undrained Triaxial Test. Units shown are kilopascals (kPa).
6. Consistency descriptors shown on the LOTB sheets are based on the pocket penetromer readings.
7. Based on the static groundwater levels taken in Boring B-78 and Cone Penetrometer Sounding C-7, groundwater elevations taken in Boring B-37 are assumed to be artesian groundwater elevations.
8. Ground water surface elevations are subject to seasonal fluctuations and may occur at higher or lower elevations depending on conditions at any particular time.



ENGINEERING SERVICES	GEOTECHNICAL SERVICES	FIELD INVESTIGATION BY:	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	WILLITS BYPASS
DRAWN BY: F. Nguyen 5/09		T. Alderman and J. Martin		DESIGN BRANCH	10-0129F	S101-W20 CONNECTOR BRIDGE
CHECKED BY: T. Alderman					KILOMETER POST R70.62	LOG OF TEST BORINGS 1 OF 3

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS 0 10 20 30 40 50 60 70 80 90 100

CU 01
EA 262001

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY) | SHEET | OF

06-17-09

OGS CIVIL LOG OF TEST BORINGS SHEET (METRIC) (REV. 4/04)

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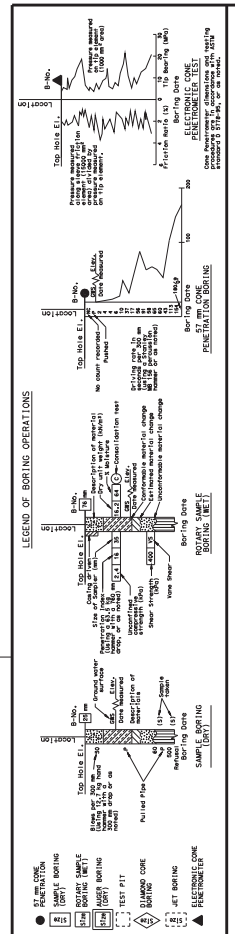
USERNAME => s116982 DATE PLOTTED => 17-JUN-2009 TIME PLOTTED => 15:07



FOR PLAN VIEW, SEE
"LOG OF TEST BORINGS" 1 OF 5

2.5 m Lt Sta 107+70
"U3" Line

B-37

450 m
447 m
444 m
441 m
438 m
435 m
432 m
429 m
426 m
423 m
420 m
417 m

449.36

114 mm

GWS Elev 447.46
4-4-07
GWS Elev 447.25
1-24-07
GWS Elev 447.13
6-12-08

GWS Elev 447.19
7-26-07
GWS Elev 446.64
9-21-07
GWS Elev 444.46
7-8-05

37 35
91 35
38 35
31 35
30 35
44 35
44 35
46 35
39 35
45 35
59 35
70 35
65 35
60 35
87 35
46 35
46 35
68 35
43 35

CLAY with SAND (CL), stiff, brown and dark gray, find sand, organics (grass and weeds).
- from elev. 449.05 to 447.22 m, pp=96 kPa.

SILTY GRAVEL with SAND (GM), dense to very dense, yellowish brown, moist, fine sand, fine subangular gravel, moderately cemented.

SILTY SAND with GRAVEL (SM), dense to very dense, dark yellowish brown, moist, fine to medium sand.

CLAY with SAND with some organics (CL), hard, dark bluish gray, moist, fine sand, organics (wood fragments).

Elastic SILT and Fat CLAY with some organics (MH/CH), hard, dark bluish gray, moist, organics (wood fragments).
- at elev. 442.65 m, UU=209 kPa.
- at elev. 441.73 m, pp=287 kPa.
- at elev. 441.12 m, UU=364 kPa.

SILTY SAND (SM), dense, dark bluish gray, moist, fine sand, trace organics (wood fragments).

Elastic SILT with some organics (MH), hard, dark bluish gray, moist, organics (wood fragments).
- at elev. 437.16 m, pp=383 to 431 kPa.
- at elev. 436.40 m, UU=460 kPa.
- at elev. 435.64 m, pp=383 kPa.
- at elev. 434.57 m, UU=335 kPa.
- from elev. 434.11 to 431.98 m, pp≥431 kPa.

CLAY with SAND (CL), hard, dark bluish gray, moist, fine sand, organics (wood fragments).
- at elev. 433.20 m, UU=287 kPa

SANDY CLAY (CL), hard, dark bluish gray, fine sand, organics (wood fragments).
- from elev. 431.98 to 430.46 m, pp>431 kPa.

CLAY (CL), hard, dark bluish gray, moist, trace organics (wood fragments).
- from elev. 430.46 to 417.96 m, pp≥431 kPa.

- at elev. 427.26 m, UU=594 kPa.

SILT (ML), very dense, dark bluish gray, moist, trace organics (wood fragments).

CLAY (CL), hard, dark bluish gray, moist.

107+60

108+00

40 35
60 35
REF 35
E119 35
97 35
63 35

CLAY (CL), hard, dark bluish gray, moist.

Well-graded SAND (GW), very dense, dark bluish gray, moist, fine to medium sand.

SANDY CLAY (SC), hard, dark bluish gray, moist, fine sand, organics (wood fragments). — 417 m

CLAY (CL), hard, dark bluish gray, moist.
SILTY SAND (SM), very dense, dark bluish gray, moist, fine sand.
CLAY (CL), hard, dark grayish brown, moist. — 414 m
- at elev. 414.30 m, pp>431 kPa.
SILT with SAND (ML), very dense, dark bluish gray, moist, fine sand.
- at elev. 412.78 m, pp>431 kPa.

SILT (ML), very dense, bluish gray, moist.
CLAY (CL), hard, grayish black, moist, from elev. 410.80 to 409.73 m dark brown to black organics. — 411 m

- at elev. 409.73 m, pp>431 kPa.
SILTY SAND (SM), very dense, dark bluish gray, moist, fine sand, trace organics (wood fragments). — 408 m

CLAY (CL), hard, dark bluish gray, moist.
- at elev. 406.68 m, pp>431 kPa.
SILT (ML), very dense, dark grayish brown, moist, trace organics (wood fragments). — 405 m
- at elev. 405.0, redwood fragment (approx. 50 mm thick)
Poorly-graded SAND (SP), very dense, light gray, moist, fine sand.
Fat CLAY (CH), hard, dark bluish gray, moist.
- at elev. 403.63 m, pp>431 kPa. — 402 m

7-7-05

Note: Piezometer installed in Boring B-37 on 7-7-05.

PROFILE
HOR. 1:200
VER. 1:100

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET NO	TOTAL SHEETS
01	Men	101			

CERTIFIED ENGINEERING GEOLOGIST — 6-17-09 DATE

REGISTERED GEOLOGIST — Reid Buell — No. 1481 — Exp. 4-30-11 — CERTIFIED ENGINEERING GEOLOGIST — STATE OF CALIFORNIA

PLANS APPROVAL DATE

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Caltrans Metric

ENGINEERING SERVICES	GEOTECHNICAL SERVICES
DRAWN BY	F. Nguyen 5/09
CHECKED BY	T. Alderman

FIELD INVESTIGATION BY: T. Alderman and J. Martin

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DIVISION OF ENGINEERING SERVICES
STRUCTURE DESIGN
DESIGN BRANCH

BRIDGE NO. 10-0129F
KILOMETER POST R70.62

CU 01
EA 262001

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS 0 10 20 30 40 50 60 70 80 90 100

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY) 06-17-09

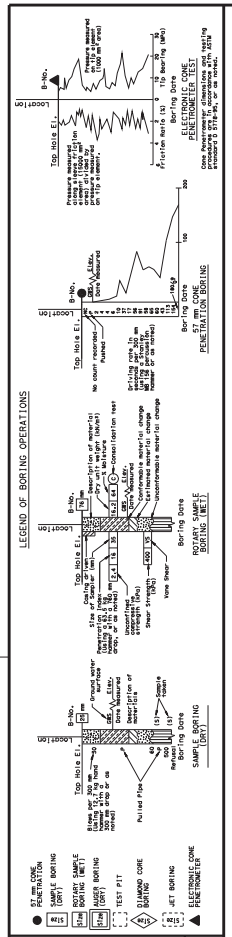
SHEET OF

OGS CIVIL LOG OF TEST BORINGS SHEET (METRIC) (REV. 4/04)

FILE => s101-w20conn2of3.dgn

WILLITS BYPASS
S101-W20 CONNECTOR BRIDGE
LOG OF TEST BORINGS 2 OF 3

USERNAME => s116982 DATE PLOTTED => 17-JUN-2009 TIME PLOTTED => 15:07



FOR PLAN VIEW, SEE
"LOG OF TEST BORINGS" 1 OF 16

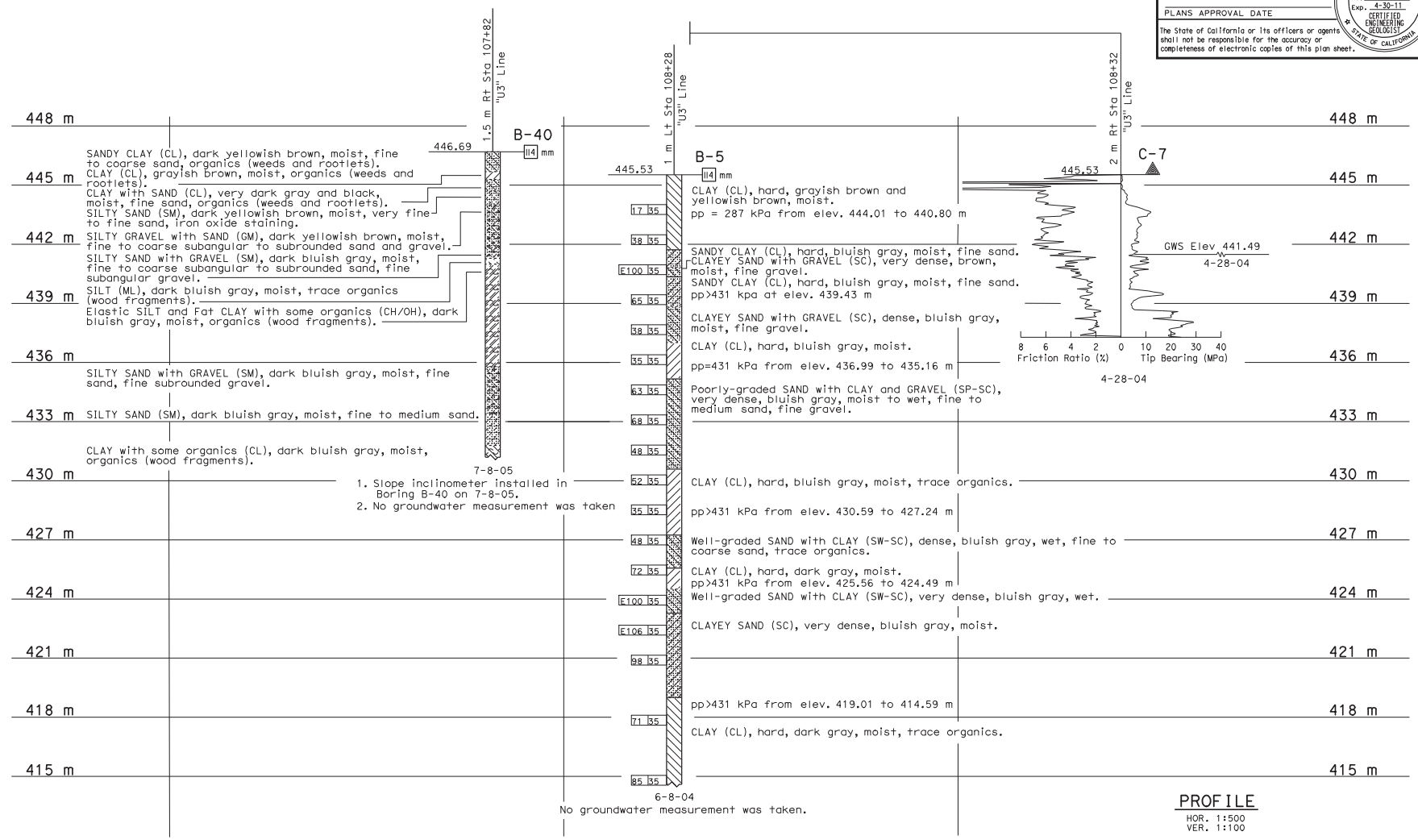
DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET NO	TOTAL SHEETS
01	Men	101			

CERTIFIED ENGINEERING GEOLOGIST — 6-17-09 DATE

Reid Buell No. 1481 Exp. 4-30-11 CERTIFIED ENGINEERING GEOLOGIST STATE OF CALIFORNIA REGISTERED GEOLOGIST

PLANS APPROVAL DATE

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.



PROFILE
HOR. 1:500
VER. 1:100

ENGINEERING SERVICES	GEOTECHNICAL SERVICES	FIELD INVESTIGATION BY:	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO.	WILLITS BYPASS
DRAWN BY: F. Nguyen 5/09		T. Alderman and J. Martin		DESIGN BRANCH	10-0129F	S101-W20 CONNECTOR BRIDGE
CHECKED BY: T. Alderman					KILOMETER POST R70.62	LOG OF TEST BORINGS 3 OF 3

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS 0 10 20 30 40 50 60 70 80 90 100

CU 01
EA 262001

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY) 06-17-09

SHEET OF

OGS CIVIL LOG OF TEST BORINGS SHEET (METRIC) (REV. 4/04)

FILE => s101-w20conn3of3.dgn

USERNAME => s116982 DATE PLOTTED => 17-JUN-2009 TIME PLOTTED => 15:11

Willits Bypass

01-Men-101-KP R69.4/84.2
(PM R43.1/52.3)
01-262001

North Region, Eureka Materials Lab

Preliminary Materials Recommendation

Materials Recommendation

01-262001
Willits Bypass

State of California Business, Transportation and Housing Agency

Memorandum

To: Dave Kelley, Chief
Design Branch M4

Date: January 16, 2007

Attn: Don Rushton

File: 01-Men-101-KP R69.4/84.2)
(PM R43.1/52.3)
01-262001
Willits Bypass

From: DEPARTMENT OF TRANSPORTATION - North Region
Michael Stapleton - North Region, Eureka Materials Engineer

Subject: Preliminary Materials Recommendation

In response to a request from Don Rushton dated March 28, 2006, personnel from the Eureka Materials Lab conducted field reviews within the limits of this project on several occasions to determine required thicknesses for new structural sections and an alternate pipe culvert recommendation.

During our reviews, 19 soil and 1 water sample were taken along the proposed new alignment, along with an additional 3 soil samples from Oil Well Hill.

Twenty of the soil samples were tested for R-value (resistance to deformation) of the existing basement materials to help determine the required new structural section thicknesses. R-value results ranged from a low of 7 to a high of 22 where samples were taken from within the proposed new alignment, and a low of 23 to a high of 73 along Oil Well Hill. (Please see Attachment A for testing info.)

The 22 soil samples and the 1 water sample taken were tested for pH and resistivity to help determine an alternate pipe culvert recommendation giving a 50 year design life.

The following is based on these findings:

New Structural Sections

The different alternatives in this report are given for flexible pavement only and do not include rigid pavement.

REGISTERED PROFESSIONAL ENGINEER
MICHAEL R. STAPLETON
No. C 53868
Exp. 06/30/07
CIVIL
STATE OF CALIFORNIA

Material Specifications (Continued):

- Asphalt Binder:

  AC (Type A): Asphalt binder for AC (Type A) shall conform to the standard special provisions for PG 64-28PM. The estimated percentage of asphalt to be added, per dry weight is 5.5%.

  Open Graded Asphalt Concrete: At atmospheric temperatures above 20°C., asphalt binder shall be PG 64-28PM conforming to the standard special provisions. At atmospheric temperatures below 20°C., but above 7°C., asphalt binder for open graded asphalt concrete shall be PG 58-34PM. Open graded asphalt concrete shall be treated with liquid anti-strip at a rate of 0.5% by mass of asphalt binder.

- Asphalt Concrete Dike: Asphalt concrete used in the construction of dikes shall be Type A, 9.5 mm Maximum, conforming to Section 39 of the Standard Specifications. The amount of asphalt binder used in asphalt concrete placed in dikes shall be increased one percent by mass of the aggregate over the amount of asphalt binder determined for use in asphalt concrete placed on the traveled way. Asphalt binder used in construction of dikes shall conform to the standard special provisions for PG 64-16. Please see Attachment C for construction detail for modified dike installation when open graded asphalt concrete is placed.

- Aggregate Base (AB): Shall be Class 2, conforming to Section 26 of the Standard Specifications with the following changes and additions: The durability index shall be 25 minimum. The minimum loose unit weight per CTM-212 shall be 1,682 kilograms per cubic meter (105 lbs/ft3).

- Aggregate Subbase (AS): Shall be Class 2, conforming to Section 25 of the Standard Specifications with the following addition: The minimum loose unit weight per CTM-212 shall be 1,682 kilograms per cubic meter (105 lbs/ft3).

- Subgrade Enhancement Fabric (SEF): Shall conform to the two pages of Attachment B within this report.

Pipe Underdrains

Underdrains should be placed within new cut sections at a minimum depth of 1.5 meters below finished grade. This will help alleviate the potential for pumping and migration of fines to the surface.

Alternate Pipe Culvert Recommendation

Based on the soil and water samples taken and tested for pH and resistivity, the following alternate pipe culverts may be used for any new or modified culverts within the project limits and are approved for a 50 year service life

- Reinforced Concrete Pipe may be used meeting the minimum requirements in Sections 65 and 90 of the Standard Specifications. Type II modified or Type IP modified cement shall be used with a maximum water to cement ratio of 0.45 percent.

- 4.3 mm (8 gage) galvanized, bituminous coated (water side only), corrugated steel pipe conforming to Section 66 of the Standard Specifications.

- 2.8 mm (12 gage) galvanized, bituminous coated (minimum of soil side), corrugated steel pipe conforming to Section 66 of the Standard Specifications.

- Corrugated, galvanized steel pipe with a thickness of 1.3 mm (18 gage) and having a 90 degree polymerized asphalt invert coating conforming to Section 66-1.03 of the Standard Specifications.

- Plastic pipe - Shall be high density polyethylene(HDPE), conforming to Section 64 of the Standard Specifications. Reference should be made to durability in Section 854.8 of the Highway Design Manual.

Note:
Pipe thicknesses greater than 2.8 mm (12 gauge) should not be specified for culverts less than 610 mm in diameter.

If you have any questions, please call Dave Waterman at Calnet 538-6355 or 707-445-6355.

Attachments

DW:dw
c: J. Bulinski
D. Rushton
Lab Files

Attachment A

Soil Testing Information

01-Men-101-KP R69.4/84.2 (PM R43.1/52.3)
01-262001
Willits Bypass

Sample Location	Soil R-Value	Soil pH	Soil Resistivity	Water pH	Water Resistivity	Notes
A Line, STA 104+20	14	6.65	1900			
A Line, STA 106+00	14	6.05	3900			
A Line, STA 107+60				6.85	24000	Water Sample Only
A Line, STA 110+60	16	7.33	4100			
A Line, STA 112+60	10	6.73	1200			
A Line, STA 118+20	22	5.79	3700			Maint. Stockpile
A Line, STA 118+40	9	7.80	1600			Maint. Stockpile
A Line, STA 118+80	8	6.48	2600			
A Line, STA 120+20		5.97	6200			
A Line, STA 181+40	20	6.20	6200			
A Line, STA 186+20	18	5.91	4500			
Men-101-KP 82.15	73	5.69	19000			Oil Well Hill, Loc.1
Men-101-KP 82.73	46	5.34	6700			Oil Well Hill, Loc. 2
Men-101-KP 82.86	23	5.58	12000			Oil Well Hill, Loc 3
U1 Line, STA 102+90	17	5.68	2800			Used for Project APC
U1 Line, STA 107+00	13	6.66	2900			
U2 Line, STA 101+00	7	6.79	1400			
U2 Line, STA 105+40	8	5.60	3000			
U3 Line, STA 107+95	12	6.98	2100			
H Line, STA 98+80	7	6.43	1900			
M Line, STA 72+62	19	5.14	5100			

Alternate Pipe Culverts

01-262001
Willits Bypass

MAINTENANCE-FREE SERVICE DESIGN ESTIMATES FOR DRAINAGE FACILITIES USING:
CALIFORNIA CULVERT CRITERIA AND CULVERT4.EXE, (RELEASE DATE 04-16-98)

OJECT LOCATION...01-Men-101-PM 43.1/52.3

PROJECT ACCOUNT NO.01-262000

SAMPLE LOCATION....@ A Line: Sta: 104+20

TEST SAMPLE NO.....56756

OPERATOR.....

TEST DATE.....

********** A DATA VALUE OF ZERO INDICATES NO DATA INPUT **********
CSP SITE pH = 6.7 , WATER pH = 0.0 , SOIL pH = 6.7
MINIMUM RESISTIVITY, OHM-CM: CSP SITE = 1900 , WATER = 0 , SOIL = 1900
****

ESTIMATED SERVICE LIFE OF CSP CULVERTS, YEARS
SEE CALTRANS HIGHWAY DESIGN MANUAL CHAPTER 850

CSP THICK Gage	& mm	GALV. 57 g	GALV.+ BIT COAT. (WATER SIDE)	GALV.+ BIT COAT & PAVED INV. (ABRASION)	GALV.+ BIT COAT (SOIL SIDE)	GALV.+ POLYMER 90 DEG INVERT
18	1.3	16	24	31	41	(66)
16	1.6	22	30	37	47	72
14	2.0	27	35	42	(52)	77
	2.8	37	45	52	62	87
	3.5	47	(55)	62	72	97
8	4.3	(57)	65	72	82	107

FLOW VEL. <1.5 m/s WITH NON-ABRASIVE CONDITIONS, (DEFAULT VALUES)
CAP, 18 GAGE (1.3 mm) CSP AND CASP MAY BE USED WITH THESE FLOW VELOCITIES

STANDARD REINFORCED CONCRETE PIPE DESIGN SHOULD BE
SUITABLE FOR THIS USER DEFINED LEVEL OF CHLORIDES

CONCRETE AND RCP MITIGATION MEASURES FOR pH
TYPE IP (MS) MODIFIED CEMENT OR TYPE II MODIFIED CEMENT
MINIMUM REQUIRED BY CALTRANS STD. SPEC. 90-1.01
MAXIMUM W/C RATIO OF 0.45

A CORRUGATED ALUMINUM PIPE, CAP, MAY BE USED
IF ABRASIVE CONDITIONS DO NOT EXIST
SITE CONDITIONS MEET CORROSION REQUIREMENTS

A CORRUGATED ALUMINIZED STEEL PIPE, CASP, MAY BE USED
SITE CONDITIONS MEET CORROSION REQUIREMENTS

PLASTIC PIPE IS APPROVED FOR 50 YEARS SERVICE LIFE FOR
CORROSIVE CONDITIONS. ABRASION MUST BE EVALUATED. ALSO,
CONSIDER CONCRETE HEADWALLS AND CONCRETE OR METAL END
TREATMENT WHERE HIGH FIRE POTENTIAL EXISTS.

MAINTENANCE-FREE SERVICE DESIGN ESTIMATES FOR DRAINAGE FACILITIES USING:
CALIFORNIA CULVERT CRITERIA AND CULVERT4.EXE, (RELEASE DATE 04-16-98)

OJECT LOCATION...01-Men-101-PM 43.1/52.3

PROJECT ACCOUNT NO.01-262000

SAMPLE LOCATION....

TEST SAMPLE NO.....56758

OPERATOR.....

TEST DATE.....

********** A DATA VALUE OF ZERO INDICATES NO DATA INPUT **********
CSP SITE pH = 5.0 , WATER pH = 0.0 , SOIL pH = 5.0
MINIMUM RESISTIVITY, OHM-CM: CSP SITE = 8600 , WATER = 0 , SOIL = 8600

ESTIMATED SERVICE LIFE OF CSP CULVERTS, YEARS
SEE CALTRANS HIGHWAY DESIGN MANUAL CHAPTER 850

CSP THICK Gage	& mm	GALV. 57 g	GALV.+ BIT COAT. (WATER SIDE)	GALV.+ BIT COAT & PAVED INV. (ABRASION)	GALV.+ BIT COAT (SOIL SIDE)	GALV.+ POLYMER 90 DEG INVERT
18	1.3	17	25	32	42	67
16	1.6	23	31	38	48	73
14	2.0	28	36	43	53	78
	2.8	39	47	54	64	89
12	3.5	50	58	65	75	100
8	4.3	61	69	76	86	111

FLOW VEL. <1.5 m/s WITH NON-ABRASIVE CONDITIONS, (DEFAULT VALUES)
CAP, 18 GAGE (1.3 mm) CSP AND CASP MAY BE USED WITH THESE FLOW VELOCITIES

STANDARD REINFORCED CONCRETE PIPE DESIGN SHOULD BE
SUITABLE FOR THIS USER DEFINED LEVEL OF CHLORIDES

NCRETE AND RCP MITIGATION MEASURES FOR pH
TYPE II MODIFIED CEMENT OR TYPE V CEMENT
400 kg/m3 WITH 25% MINERAL ADMIXTURE REPLACEMENT (BY WEIGHT)
AND A MAXIMUM WATER-TO-CEMENTITIOUS RATIO OF 0.40

A CORRUGATED ALUMINUM PIPE, CAP, SHOULD NOT BE USED
DUE TO CORROSIVE CONDITIONS

A CORRUGATED ALUMINIZED STEEL PIPE, CASP, SHOULD NOT BE USED
DUE TO CORROSIVE CONDITIONS

PLASTIC PIPE IS APPROVED FOR 50 YEARS SERVICE LIFE FOR
CORROSIVE CONDITIONS. ABRASION MUST BE EVALUATED. ALSO,
CONSIDER CONCRETE HEADWALLS AND CONCRETE OR METAL END
TREATMENT WHERE HIGH FIRE POTENTIAL EXISTS.

MAINTENANCE-FREE SERVICE DESIGN ESTIMATES FOR DRAINAGE FACILITIES USING:
CALIFORNIA CULVERT CRITERIA AND CULVERT4.EXE, (RELEASE DATE 04-16-98)

PROJECT LOCATION...01-Men-101-PM 43.1/52.3

PROJECT ACCOUNT NO.01-262000

SAMPLE LOCATION.... A Line Sta: 106+00

TEST SAMPLE NO.....56760

OPERATOR.....

TEST DATE.....

********** A DATA VALUE OF ZERO INDICATES NO DATA INPUT **********

CSP SITE pH = 6.1 , WATER pH = 0.0 , SOIL pH = 6.1

MINIMUM RESISTIVITY, OHM-CM: CSP SITE = 3900 , WATER = 0 , SOIL = 3900

****

ESTIMATED SERVICE LIFE OF CSP CULVERTS, YEARS
SEE CALTRANS HIGHWAY DESIGN MANUAL CHAPTER 850

CSP THICK Gage	& mm	GALV. 57 g	GALV.+ BIT COAT. (WATER SIDE)	GALV.+ BIT COAT & PAVED INV. (ABRASION)	GALV.+ BIT COAT (SOIL SIDE)	GALV.+ POLYMER 90 DEG INVERT
18	1.3	17	25	32	42	67
16	1.6	22	30	37	47	72
14	2.0	27	35	42	52	77
12	2.8	38	46	53	63	88
10	3.5	48	56	63	73	98
8	4.3	59	67	74	84	109

FLOW VEL. <1.5 m/s WITH NON-ABRASIVE CONDITIONS, (DEFAULT VALUES)
CAP, 18 GAGE (1.3 mm) CSP AND CASP MAY BE USED WITH THESE FLOW VELOCITIES

STANDARD REINFORCED CONCRETE PIPE DESIGN SHOULD BE
SUITABLE FOR THIS USER DEFINED LEVEL OF CHLORIDES

CONCRETE AND RCP MITIGATION MEASURES FOR pH
TYPE IP (MS) MODIFIED CEMENT OR TYPE II MODIFIED CEMENT
MINIMUM REQUIRED BY CALTRANS STD. SPEC. 90-1.01
MAXIMUM W/C RATIO OF 0.45

A CORRUGATED ALUMINUM PIPE, CAP, MAY BE USED
IF ABRASIVE CONDITIONS DO NOT EXIST
SITE CONDITIONS MEET CORROSION REQUIREMENTS

A CORRUGATED ALUMINIZED STEEL PIPE, CASP, MAY BE USED
SITE CONDITIONS MEET CORROSION REQUIREMENTS

PLASTIC PIPE IS APPROVED FOR 50 YEARS SERVICE LIFE FOR
CORROSIVE CONDITIONS. ABRASION MUST BE EVALUATED. ALSO,
CONSIDER CONCRETE HEADWALLS AND CONCRETE OR METAL END
TREATMENT WHERE HIGH FIRE POTENTIAL EXISTS.

MAINTENANCE-FREE SERVICE DESIGN ESTIMATES FOR DRAINAGE FACILITIES USING:
CALIFORNIA CULVERT CRITERIA AND CULVERT4.EXE, (RELEASE DATE 04-16-98)

PROJECT LOCATION...

PROJECT ACCOUNT NO. 01-262001

SAMPLE LOCATION.... A Line, STA 107+60 (Culvert Inlet)

TEST SAMPLE NO.....

OPERATOR.....

TEST DATE.....

********** A DATA VALUE OF ZERO INDICATES NO DATA INPUT **********
CSP SITE pH = 6.8 , WATER pH = 6.8 , SOIL pH = 0.0
MINIMUM RESISTIVITY, OHM-CM: CSP SITE = 24000 , WATER = 24000 , SOIL = 0

ESTIMATED SERVICE LIFE OF CSP CULVERTS, YEARS
SEE CALTRANS HIGHWAY DESIGN MANUAL CHAPTER 850

CSP THICK Gage	& mm	GALV. 57 g	GALV.+ BIT COAT. (WATER SIDE)	GALV.+ BIT COAT & PAVED INV. (ABRASION)	GALV.+ BIT COAT (SOIL SIDE)	GALV.+ POLYMER 90 DEG INVERT
18	1.3	34	42	49	59	84
[illegible]	1.6	44	52	59	69	94
[illegible]	2.0	54	62	69	79	104
12	2.8	75	83	90	100	125
10	3.5	95	103	110	120	145
8	4.3	116	124	131	141	166

FLOW VEL. <1.5 m/s WITH NON-ABRASIVE CONDITIONS, (DEFAULT VALUES)
CAP, 18 GAGE (1.3 mm) CSP AND CASP MAY BE USED WITH THESE FLOW VELOCITIES

STANDARD REINFORCED CONCRETE PIPE DESIGN SHOULD BE
ITABLE FOR THIS USER DEFINED LEVEL OF CHLORIDES

CONCRETE AND RCP MITIGATION MEASURES FOR pH
TYPE IP (MS) MODIFIED CEMENT OR TYPE II MODIFIED CEMENT
MINIMUM REQUIRED BY CALTRANS STD. SPEC. 90-1.01
MAXIMUM W/C RATIO OF 0.45

A CORRUGATED ALUMINUM PIPE, CAP, MAY BE USED
IF ABRASIVE CONDITIONS DO NOT EXIST
SITE CONDITIONS MEET CORROSION REQUIREMENTS

A CORRUGATED ALUMINIZED STEEL PIPE, CASP, MAY BE USED
SITE CONDITIONS MEET CORROSION REQUIREMENTS

PLASTIC PIPE IS APPROVED FOR 50 YEARS SERVICE LIFE FOR
CORROSIVE CONDITIONS. ABRASION MUST BE EVALUATED. ALSO,
NSIDER CONCRETE HEADWALLS AND CONCRETE OR METAL END
REATMENT WHERE HIGH FIRE POTENTIAL EXISTS.

MAINTENANCE-FREE SERVICE DESIGN ESTIMATES FOR DRAINAGE FACILITIES USING:
CALIFORNIA CULVERT CRITERIA AND CULVERT4.EXE, (RELEASE DATE 04-16-98)

OJECT LOCATION...

PROJECT ACCOUNT NO. 01-262001

SAMPLE LOCATION.... A Line, STA 110+60

TEST SAMPLE NO.....

OPERATOR.....

TEST DATE.....

********** A DATA VALUE OF ZERO INDICATES NO DATA INPUT **********

CSP SITE pH = 7.3 , WATER pH = 0.0 , SOIL pH = 7.3

MINIMUM RESISTIVITY, OHM-CM: CSP SITE = 4100 , WATER = 0 , SOIL = 4100

****

ESTIMATED SERVICE LIFE OF CSP CULVERTS, YEARS
SEE CALTRANS HIGHWAY DESIGN MANUAL CHAPTER 850

CSP THICK Gage	& mm	GALV. 57 g	GALV.+ BIT COAT. (WATER SIDE)	GALV.+ BIT COAT & PAVED INV. (ABRASION)	GALV.+ BIT COAT (SOIL SIDE)	GALV.+ POLYMER 90 DEG INVERT
18	1.3	44	52	59	69	94
16	1.6	57	65	72	82	107
14	2.0	71	79	86	96	121
	2.8	97	105	112	122	147
12	3.5	124	132	139	149	174
8	4.3	151	159	166	176	201

FLOW VEL. <1.5 m/s WITH NON-ABRASIVE CONDITIONS, (DEFAULT VALUES)
CAP, 18 GAGE (1.3 mm) CSP AND CASP MAY BE USED WITH THESE FLOW VELOCITIES

STANDARD REINFORCED CONCRETE PIPE DESIGN SHOULD BE
SUITABLE FOR THIS USER DEFINED LEVEL OF CHLORIDES

NCRETE AND RCP MITIGATION MEASURES FOR pH
TYPE IP (MS) MODIFIED CEMENT OR TYPE II MODIFIED CEMENT
MINIMUM REQUIRED BY CALTRANS STD. SPECS. 90-1.01

A CORRUGATED ALUMINUM PIPE, CAP, MAY BE USED
IF ABRASIVE CONDITIONS DO NOT EXIST
SITE CONDITIONS MEET CORROSION REQUIREMENTS

A CORRUGATED ALUMINIZED STEEL PIPE, CASP, MAY BE USED
SITE CONDITIONS MEET CORROSION REQUIREMENTS

PLASTIC PIPE IS APPROVED FOR 50 YEARS SERVICE LIFE FOR
CORROSIVE CONDITIONS. ABRASION MUST BE EVALUATED. ALSO,
CONSIDER CONCRETE HEADWALLS AND CONCRETE OR METAL END
REATMENT WHERE HIGH FIRE POTENTIAL EXISTS.

MAINTENANCE-FREE SERVICE DESIGN ESTIMATES FOR DRAINAGE FACILITIES USING:
CALIFORNIA CULVERT CRITERIA AND CULVERT4.EXE, (RELEASE DATE 04-16-98)

:OJECT LOCATION...01-Men-101-PM 43.1/52.3

PROJECT ACCOUNT NO.01-262000

SAMPLE LOCATION.... A Line, Sta: 112+60

TEST SAMPLE NO.....56763

OPERATOR.....

TEST DATE.....

********** A DATA VALUE OF ZERO INDICATES NO DATA INPUT **********
CSP SITE pH = 6.7 , WATER pH = 0.0 , SOIL pH = 6.7
MINIMUM RESISTIVITY, OHM-CM: CSP SITE = 1200 , WATER = 0 , SOIL = 1200
****

ESTIMATED SERVICE LIFE OF CSP CULVERTS, YEARS
SEE CALTRANS HIGHWAY DESIGN MANUAL CHAPTER 850

CSP THICK Gage	& mm	GALV. 57 g	GALV.+ BIT COAT. (WATER SIDE)	GALV.+ BIT COAT & PAVED INV. (ABRASION)	GALV.+ BIT COAT (SOIL SIDE)	GALV.+ POLYMER 90 DEG INVERT
18	1.3	14	22	29	39	64
16	1.6	19	27	34	44	69
14	2.0	23	31	38	48	73
	2.8	32	40	47	57	82
	3.5	41	49	56	66	91
8	4.3	50	58	65	75	100

FLOW VEL. <1.5 m/s WITH NON-ABRASIVE CONDITIONS, (DEFAULT VALUES)
CAP, 18 GAGE (1.3 mm) CSP AND CASP MAY BE USED WITH THESE FLOW VELOCITIES

STANDARD REINFORCED CONCRETE PIPE DESIGN SHOULD BE
SUITABLE FOR THIS USER DEFINED LEVEL OF CHLORIDES

NCRETE AND RCP MITIGATION MEASURES FOR pH
TYPE IP (MS) MODIFIED CEMENT OR TYPE II MODIFIED CEMENT
MINIMUM REQUIRED BY CALTRANS STD. SPEC. 90-1.01
MAXIMUM W/C RATIO OF 0.45

A CORRUGATED ALUMINUM PIPE, CAP, SHOULD NOT BE USED
DUE TO CORROSIVE CONDITIONS

A CORRUGATED ALUMINIZED STEEL PIPE, CASP, SHOULD NOT BE USED
DUE TO CORROSIVE CONDITIONS

PLASTIC PIPE IS APPROVED FOR 50 YEARS SERVICE LIFE FOR
CORROSIVE CONDITIONS. ABRASION MUST BE EVALUATED. ALSO,
CONSIDER CONCRETE HEADWALLS AND CONCRETE OR METAL END
TREATMENT WHERE HIGH FIRE POTENTIAL EXISTS.

MAINTENANCE-FREE SERVICE DESIGN ESTIMATES FOR DRAINAGE FACILITIES USING:
CALIFORNIA CULVERT CRITERIA AND CULVERT4.EXE, (RELEASE DATE 04-16-98)

PROJECT LOCATION...01-Men-101-PM 43.1/52.3

PROJECT ACCOUNT NO.01-262000

SAMPLE LOCATION.... A Line, Sta 118+20

TEST SAMPLE NO.....56764

OPERATOR.....

TEST DATE.....

********** A DATA VALUE OF ZERO INDICATES NO DATA INPUT **********

CSP SITE pH = 5.8 , WATER pH = 0.0 , SOIL pH = 5.8

MINIMUM RESISTIVITY, OHM-CM: CSP SITE = 3700 , WATER = 0 , SOIL = 3700

****

ESTIMATED SERVICE LIFE OF CSP CULVERTS, YEARS
SEE CALTRANS HIGHWAY DESIGN MANUAL CHAPTER 850

CSP THICK Gage	& mm	GALV. 57 g	GALV.+ BIT COAT. (WATER SIDE)	GALV.+ BIT COAT & PAVED INV. (ABRASION)	GALV.+ BIT COAT (SOIL SIDE)	GALV.+ POLYMER 90 DEG INVERT
18	1.3	15	23	30	40	65
16	1.6	20	28	35	45	70
	2.0	25	33	40	50	75
12	2.8	34	42	49	59	84
10	3.5	44	52	59	69	94
8	4.3	53	61	68	78	103

FLOW VEL. <1.5 m/s WITH NON-ABRASIVE CONDITIONS, (DEFAULT VALUES)
CAP, 18 GAGE (1.3 mm) CSP AND CASP MAY BE USED WITH THESE FLOW VELOCITIES

STANDARD REINFORCED CONCRETE PIPE DESIGN SHOULD BE
SUITABLE FOR THIS USER DEFINED LEVEL OF CHLORIDES

CONCRETE AND RCP MITIGATION MEASURES FOR pH
TYPE IP (MS) MODIFIED CEMENT OR TYPE II MODIFIED CEMENT
MINIMUM REQUIRED BY CALTRANS STD. SPEC. 90-1.01
MAXIMUM W/C RATIO OF 0.45

A CORRUGATED ALUMINUM PIPE, CAP, MAY BE USED
IF ABRASIVE CONDITIONS DO NOT EXIST
SITE CONDITIONS MEET CORROSION REQUIREMENTS

A CORRUGATED ALUMINIZED STEEL PIPE, CASP, MAY BE USED
SITE CONDITIONS MEET CORROSION REQUIREMENTS

PLASTIC PIPE IS APPROVED FOR 50 YEARS SERVICE LIFE FOR
CORROSIVE CONDITIONS. ABRASION MUST BE EVALUATED. ALSO,
CONSIDER CONCRETE HEADWALLS AND CONCRETE OR METAL END
TREATMENT WHERE HIGH FIRE POTENTIAL EXISTS.

MAINTENANCE-FREE SERVICE DESIGN ESTIMATES FOR DRAINAGE FACILITIES USING:
CALIFORNIA CULVERT CRITERIA AND CULVERT4.EXE, (RELEASE DATE 04-16-98)

PROJECT LOCATION...01-Men-101-PM 43.1/52.3

PROJECT ACCOUNT NO.01-262000

SAMPLE LOCATION.... A Line, STA: 118+40

TEST SAMPLE NO.....56765

OPERATOR.....

TEST DATE.....

********** A DATA VALUE OF ZERO INDICATES NO DATA INPUT **********
CSP SITE pH = 7.8 , WATER pH = 0.0 , SOIL pH = 7.8
MINIMUM RESISTIVITY, OHM-CM: CSP SITE = 1600 , WATER = 0 , SOIL = 1600
****

ESTIMATED SERVICE LIFE OF CSP CULVERTS, YEARS
SEE CALTRANS HIGHWAY DESIGN MANUAL CHAPTER 850

CSP THICK Gage & mm		GALV. 57 g	GALV.+ BIT COAT. (WATER SIDE)	GALV.+ BIT COAT & PAVED INV. (ABRASION)	GALV.+ BIT COAT (SOIL SIDE)	GALV.+ POLYMER 90 DEG INVERT
18	1.3	30	38	45	55	80
	1.6	39	47	54	64	89
	2.0	48	56	63	73	98
12	2.8	66	74	81	91	116
10	3.5	84	92	99	109	134
8	4.3	102	110	117	127	152

FLOW VEL. <1.5 m/s WITH NON-ABRASIVE CONDITIONS, (DEFAULT VALUES)
CAP, 18 GAGE (1.3 mm) CSP AND CASP MAY BE USED WITH THESE FLOW VELOCITIES

STANDARD REINFORCED CONCRETE PIPE DESIGN SHOULD BE
ITABLE FOR THIS USER DEFINED LEVEL OF CHLORIDES

CONCRETE AND RCP MITIGATION MEASURES FOR pH
TYPE IP (MS) MODIFIED CEMENT OR TYPE II MODIFIED CEMENT
MINIMUM REQUIRED BY CALTRANS STD. SPECS. 90-1.01

A CORRUGATED ALUMINUM PIPE, CAP, MAY BE USED
IF ABRASIVE CONDITIONS DO NOT EXIST
SITE CONDITIONS MEET CORROSION REQUIREMENTS

A CORRUGATED ALUMINIZED STEEL PIPE, CASP, MAY BE USED
SITE CONDITIONS MEET CORROSION REQUIREMENTS

PLASTIC PIPE IS APPROVED FOR 50 YEARS SERVICE LIFE FOR
CORROSIVE CONDITIONS. ABRASION MUST BE EVALUATED. ALSO,
)NSIDER CONCRETE HEADWALLS AND CONCRETE OR METAL END
TREATMENT WHERE HIGH FIRE POTENTIAL EXISTS.

MAINTENANCE-FREE SERVICE DESIGN ESTIMATES FOR DRAINAGE FACILITIES USING
CALIFORNIA CULVERT CRITERIA AND CULVERT4.EXE, (RELEASE DATE 04-16-98)

OJECT LOCATION...

PROJECT ACCOUNT NO. 01-262001

SAMPLE LOCATION.... A Line, STA: 118+80

TEST SAMPLE NO.....

OPERATOR.....

TEST DATE.....

********** A DATA VALUE OF ZERO INDICATES NO DATA INPUT **********
CSP SITE pH = 6.5 , WATER pH = 0.0 , SOIL pH = 6.5
MINIMUM RESISTIVITY, OHM-CM: CSP SITE = 2600 , WATER = 0 , SOIL = 2600

ESTIMATED SERVICE LIFE OF CSP CULVERTS, YEARS
SEE CALTRANS HIGHWAY DESIGN MANUAL CHAPTER 850

CSP THICK Gage	& mm	GALV. 57 g	GALV.+ BIT COAT. (WATER SIDE)	GALV.+ BIT COAT & PAVED INV. (ABRASION)	GALV.+ BIT COAT (SOIL SIDE)	GALV.+ POLYMER 90 DEG INVERT
18	1.3	17	25	32	42	67
16	1.6	22	30	37	47	72
14	2.0	28	36	43	53	78
12	2.8	38	46	53	63	88
10	3.5	49	57	64	74	99
8	4.3	59	67	74	84	109

FLOW VEL. <1.5 m/s WITH NON-ABRASIVE CONDITIONS, (DEFAULT VALUES)
CAP, 18 GAGE (1.3 mm) CSP AND CASP MAY BE USED WITH THESE FLOW VELOCITIES

STANDARD REINFORCED CONCRETE PIPE DESIGN SHOULD BE
SUITABLE FOR THIS USER DEFINED LEVEL OF CHLORIDES

NCRETE AND RCP MITIGATION MEASURES FOR pH
TYPE IP (MS) MODIFIED CEMENT OR TYPE II MODIFIED CEMENT
MINIMUM REQUIRED BY CALTRANS STD. SPEC. 90-1.01
MAXIMUM W/C RATIO OF 0.45

A CORRUGATED ALUMINUM PIPE, CAP, MAY BE USED
IF ABRASIVE CONDITIONS DO NOT EXIST
SITE CONDITIONS MEET CORROSION REQUIREMENTS

A CORRUGATED ALUMINIZED STEEL PIPE, CASP, MAY BE USED
SITE CONDITIONS MEET CORROSION REQUIREMENTS

PLASTIC PIPE IS APPROVED FOR 50 YEARS SERVICE LIFE FOR
CORROSIVE CONDITIONS. ABRASION MUST BE EVALUATED. ALSO,
CONSIDER CONCRETE HEADWALLS AND CONCRETE OR METAL END
TREATMENT WHERE HIGH FIRE POTENTIAL EXISTS.

MAINTENANCE-FREE SERVICE DESIGN ESTIMATES FOR DRAINAGE FACILITIES USING:
CALIFORNIA CULVERT CRITERIA AND CULVERT4.EXE, (RELEASE DATE 04-16-98)

:OJECT LOCATION...

PROJECT ACCOUNT NO. 01-262001

SAMPLE LOCATION.... A Line, STA.: 120+20

TEST SAMPLE NO.....

OPERATOR.....

TEST DATE.....

********** A DATA VALUE OF ZERO INDICATES NO DATA INPUT **********

CSP SITE pH = 6.0 , WATER pH = 0.0 , SOIL pH = 6.0

MINIMUM RESISTIVITY, OHM-CM: CSP SITE = 6200 , WATER = 0 , SOIL = 6200

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ESTIMATED SERVICE LIFE OF CSP CULVERTS, YEARS
SEE CALTRANS HIGHWAY DESIGN MANUAL CHAPTER 850

CSP THICK Gage	& mm	GALV. 57 g	GALV.+ BIT COAT. (WATER SIDE)	GALV.+ BIT COAT & PAVED INV. (ABRASION)	GALV.+ BIT COAT (SOIL SIDE)	GALV.+ POLYMER 90 DEG INVERT
18	1.3	19	27	34	44	69
16	1.6	25	33	40	50	75
14	2.0	31	39	46	56	81
'	2.8	43	51	58	68	93
-	3.5	55	63	70	80	105
8	4.3	67	75	82	92	117

FLOW VEL. <1.5 m/s WITH NON-ABRASIVE CONDITIONS, (DEFAULT VALUES)
CAP, 18 GAGE (1.3 mm) CSP AND CASP MAY BE USED WITH THESE FLOW VELOCITIES

STANDARD REINFORCED CONCRETE PIPE DESIGN SHOULD BE
SUITABLE FOR THIS USER DEFINED LEVEL OF CHLORIDES

NCRETE AND RCP MITIGATION MEASURES FOR pH
TYPE IP (MS) MODIFIED CEMENT OR TYPE II MODIFIED CEMENT
MINIMUM REQUIRED BY CALTRANS STD. SPEC. 90-1.01
MAXIMUM W/C RATIO OF 0.45

A CORRUGATED ALUMINUM PIPE, CAP, MAY BE USED
IF ABRASIVE CONDITIONS DO NOT EXIST
SITE CONDITIONS MEET CORROSION REQUIREMENTS

A CORRUGATED ALUMINIZED STEEL PIPE, CASP, MAY BE USED
SITE CONDITIONS MEET CORROSION REQUIREMENTS

PLASTIC PIPE IS APPROVED FOR 50 YEARS SERVICE LIFE FOR
CORROSIVE CONDITIONS. ABRASION MUST BE EVALUATED. ALSO,
CONSIDER CONCRETE HEADWALLS AND CONCRETE OR METAL END
TREATMENT WHERE HIGH FIRE POTENTIAL EXISTS.

MAINTENANCE-FREE SERVICE DESIGN ESTIMATES FOR DRAINAGE FACILITIES USING:
CALIFORNIA CULVERT CRITERIA AND CULVERT4.EXE, (RELEASE DATE 04-16-98)

PROJECT LOCATION...01-Men-101-PM 43.1/52.3

PROJECT ACCOUNT NO.01-262000

SAMPLE LOCATION.... A Line, STA: 181+40

TEST SAMPLE NO.....56769

OPERATOR.....

TEST DATE.....

********** A DATA VALUE OF ZERO INDICATES NO DATA INPUT **********

CSP SITE pH = 6.2 , WATER pH = 0.0 , SOIL pH = 6.2

MINIMUM RESISTIVITY, OHM-CM: CSP SITE = 6200 , WATER = 0 , SOIL = 6200

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ESTIMATED SERVICE LIFE OF CSP CULVERTS, YEARS
SEE CALTRANS HIGHWAY DESIGN MANUAL CHAPTER 850

CSP THICK Gage	& mm	GALV. 57 g	GALV.+ BIT COAT. (WATER SIDE)	GALV.+ BIT COAT & PAVED INV. (ABRASION)	GALV.+ BIT COAT (SOIL SIDE)	GALV.+ POLYMER 90 DEG INVERT
18	1.3	20	28	35	45	70
16	1.6	27	35	42	52	77
14	2.0	33	41	48	58	83
	2.8	46	54	61	71	96
10	3.5	58	66	73	83	108
8	4.3	71	79	86	96	121

FLOW VEL. <1.5 m/s WITH NON-ABRASIVE CONDITIONS, (DEFAULT VALUES)
CAP, 18 GAGE (1.3 mm) CSP AND CASP MAY BE USED WITH THESE FLOW VELOCITIES

STANDARD REINFORCED CONCRETE PIPE DESIGN SHOULD BE
SUITABLE FOR THIS USER DEFINED LEVEL OF CHLORIDES

CONCRETE AND RCP MITIGATION MEASURES FOR pH
TYPE IP (MS) MODIFIED CEMENT OR TYPE II MODIFIED CEMENT
MINIMUM REQUIRED BY CALTRANS STD. SPEC. 90-1.01
MAXIMUM W/C RATIO OF 0.45

A CORRUGATED ALUMINUM PIPE, CAP, MAY BE USED
IF ABRASIVE CONDITIONS DO NOT EXIST
SITE CONDITIONS MEET CORROSION REQUIREMENTS

A CORRUGATED ALUMINIZED STEEL PIPE, CASP, MAY BE USED
SITE CONDITIONS MEET CORROSION REQUIREMENTS

PLASTIC PIPE IS APPROVED FOR 50 YEARS SERVICE LIFE FOR
CORROSIVE CONDITIONS. ABRASION MUST BE EVALUATED. ALSO,
CONSIDER CONCRETE HEADWALLS AND CONCRETE OR METAL END
TREATMENT WHERE HIGH FIRE POTENTIAL EXISTS.

MAINTENANCE-FREE SERVICE DESIGN ESTIMATES FOR DRAINAGE FACILITIES USING:
CALIFORNIA CULVERT CRITERIA AND CULVERT4.EXE, (RELEASE DATE 04-16-98)

PROJECT LOCATION...01-Men-101-PM 43.1/52.3

PROJECT ACCOUNT NO.01-262000

SAMPLE LOCATION.... A Line Sta 186+20 (pm 48.24)

TEST SAMPLE NO.....56770

OPERATOR.....

TEST DATE.....

********** A DATA VALUE OF ZERO INDICATES NO DATA INPUT **********

CSP SITE pH = 5.9 , WATER pH = 0.0 , SOIL pH = 5.9

MINIMUM RESISTIVITY, OHM-CM: CSP SITE = 4500 , WATER = 0 , SOIL = 4500

****

ESTIMATED SERVICE LIFE OF CSP CULVERTS, YEARS
SEE CALTRANS HIGHWAY DESIGN MANUAL CHAPTER 850

CSP THICK Gage	& mm	GALV. 57 g	GALV.+ BIT COAT. (WATER SIDE)	GALV.+ BIT COAT & PAVED INV. (ABRASION)	GALV.+ BIT COAT (SOIL SIDE)	GALV.+ POLYMER 90 DEG INVERT
18	1.3	17	25	32	42	67
16	1.6	22	30	37	47	72
14	2.0	28	36	43	53	78
12	2.8	38	46	53	63	88
10	3.5	49	57	64	74	99
8	4.3	59	67	74	84	109

FLOW VEL. <1.5 m/s WITH NON-ABRASIVE CONDITIONS, (DEFAULT VALUES)
CAP, 18 GAGE (1.3 mm) CSP AND CASP MAY BE USED WITH THESE FLOW VELOCITIES

STANDARD REINFORCED CONCRETE PIPE DESIGN SHOULD BE
SUITABLE FOR THIS USER DEFINED LEVEL OF CHLORIDES

CONCRETE AND RCP MITIGATION MEASURES FOR pH
TYPE IP (MS) MODIFIED CEMENT OR TYPE II MODIFIED CEMENT
MINIMUM REQUIRED BY CALTRANS STD. SPEC. 90-1.01
MAXIMUM W/C RATIO OF 0.45

A CORRUGATED ALUMINUM PIPE, CAP, MAY BE USED
IF ABRASIVE CONDITIONS DO NOT EXIST
SITE CONDITIONS MEET CORROSION REQUIREMENTS

A CORRUGATED ALUMINIZED STEEL PIPE, CASP, MAY BE USED
SITE CONDITIONS MEET CORROSION REQUIREMENTS

PLASTIC PIPE IS APPROVED FOR 50 YEARS SERVICE LIFE FOR
CORROSIVE CONDITIONS. ABRASION MUST BE EVALUATED. ALSO,
CONSIDER CONCRETE HEADWALLS AND CONCRETE OR METAL END
TREATMENT WHERE HIGH FIRE POTENTIAL EXISTS.

MAINTENANCE-FREE SERVICE DESIGN ESTIMATES FOR DRAINAGE FACILITIES USING:
CALIFORNIA CULVERT CRITERIA AND CULVERT4.EXE, (RELEASE DATE 04-16-98)

PROJECT LOCATION...01-Men-101-PM 43.1/52.3

PROJECT ACCOUNT NO.01-262000

SAMPLE LOCATION.... 101, PM 51.05

TEST SAMPLE NO.....56771

OPERATOR.....

TEST DATE.....

********** A DATA VALUE OF ZERO INDICATES NO DATA INPUT **********

CSP SITE pH = 5.7 , WATER pH = 0.0 , SOIL pH = 5.7

MINIMUM RESISTIVITY, OHM-CM: CSP SITE = 19000 , WATER = 0 , SOIL = 19000

****

ESTIMATED SERVICE LIFE OF CSP CULVERTS, YEARS
SEE CALTRANS HIGHWAY DESIGN MANUAL CHAPTER 850

CSP THICK Gage	& mm	GALV. 57 g	GALV.+ BIT COAT. (WATER SIDE)	GALV.+ BIT COAT & PAVED INV. (ABRASION)	GALV.+ BIT COAT (SOIL SIDE)	GALV.+ POLYMER 90 DEG INVERT
18	1.3	25	33	40	50	75
16	1.6	32	40	47	57	82
14	2.0	40	48	55	65	90
	2.8	55	63	70	80	105
10	3.5	70	78	85	95	120
8	4.3	85	93	100	110	135

FLOW VEL. <1.5 m/s WITH NON-ABRASIVE CONDITIONS, (DEFAULT VALUES)
CAP, 18 GAGE (1.3 mm) CSP AND CASP MAY BE USED WITH THESE FLOW VELOCITIES

STANDARD REINFORCED CONCRETE PIPE DESIGN SHOULD BE
SUITABLE FOR THIS USER DEFINED LEVEL OF CHLORIDES

CONCRETE AND RCP MITIGATION MEASURES FOR pH
TYPE IP (MS) MODIFIED CEMENT OR TYPE II MODIFIED CEMENT
MINIMUM REQUIRED BY CALTRANS STD. SPEC. 90-1.01
MAXIMUM W/C RATIO OF 0.45

A CORRUGATED ALUMINUM PIPE, CAP, MAY BE USED
IF ABRASIVE CONDITIONS DO NOT EXIST
SITE CONDITIONS MEET CORROSION REQUIREMENTS

A CORRUGATED ALUMINIZED STEEL PIPE, CASP, MAY BE USED
SITE CONDITIONS MEET CORROSION REQUIREMENTS

PLASTIC PIPE IS APPROVED FOR 50 YEARS SERVICE LIFE FOR
CORROSIVE CONDITIONS. ABRASION MUST BE EVALUATED. ALSO,
CONSIDER CONCRETE HEADWALLS AND CONCRETE OR METAL END
TREATMENT WHERE HIGH FIRE POTENTIAL EXISTS.

MAINTENANCE-FREE SERVICE DESIGN ESTIMATES FOR DRAINAGE FACILITIES USING:
CALIFORNIA CULVERT CRITERIA AND CULVERT4.EXE, (RELEASE DATE 04-16-98)

PROJECT LOCATION...01-Men-101-PM 43.1/52.3

PROJECT ACCOUNT NO.01-262000

SAMPLE LOCATION.... Pm 51.41

TEST SAMPLE NO.....56772

OPERATOR.....

TEST DATE.....

********** A DATA VALUE OF ZERO INDICATES NO DATA INPUT **********
CSP SITE pH = 5.3 , WATER pH = 0.0 , SOIL pH = 5.3
MINIMUM RESISTIVITY, OHM-CM: CSP SITE = 6700 , WATER = 0 , SOIL = 6700
****

ESTIMATED SERVICE LIFE OF CSP CULVERTS, YEARS
SEE CALTRANS HIGHWAY DESIGN MANUAL CHAPTER 850

CSP THICK Gage	& mm	GALV. 57 g	GALV.+ BIT COAT. (WATER SIDE)	GALV.+ BIT COAT & PAVED INV. (ABRASION)	GALV.+ BIT COAT (SOIL SIDE)	GALV.+ POLYMER 90 DEG INVERT
18	1.3	17	25	32	42	67
16	1.6	23	31	38	48	73
14	2.0	28	36	43	53	78
12	2.8	38	46	53	63	88
10	3.5	49	57	64	74	99
8	4.3	60	68	75	85	110

FLOW VEL. <1.5 m/s WITH NON-ABRASIVE CONDITIONS, (DEFAULT VALUES)
CAP, 18 GAGE (1.3 mm) CSP AND CASP MAY BE USED WITH THESE FLOW VELOCITIES

STANDARD REINFORCED CONCRETE PIPE DESIGN SHOULD BE
SUITABLE FOR THIS USER DEFINED LEVEL OF CHLORIDES

CONCRETE AND RCP MITIGATION MEASURES FOR pH
TYPE II MODIFIED CEMENT OR TYPE V CEMENT
400 kg/m3 WITH 25% MINERAL ADMIXTURE REPLACEMENT (BY WEIGHT)
AND A MAXIMUM WATER-TO-CEMENTITIOUS RATIO OF 0.40

A CORRUGATED ALUMINUM PIPE, CAP, SHOULD NOT BE USED
DUE TO CORROSIVE CONDITIONS

A CORRUGATED ALUMINIZED STEEL PIPE, CASP, SHOULD NOT BE USED
DUE TO CORROSIVE CONDITIONS

PLASTIC PIPE IS APPROVED FOR 50 YEARS SERVICE LIFE FOR
CORROSIVE CONDITIONS. ABRASION MUST BE EVALUATED. ALSO,
CONSIDER CONCRETE HEADWALLS AND CONCRETE OR METAL END
TREATMENT WHERE HIGH FIRE POTENTIAL EXISTS.

MAINTENANCE-FREE SERVICE DESIGN ESTIMATES FOR DRAINAGE FACILITIES USING:
CALIFORNIA CULVERT CRITERIA AND CULVERT4.EXE, (RELEASE DATE 04-16-98)

PROJECT LOCATION...01-Men-101-PM 43.1/52.3

PROJECT ACCOUNT NO.01-262000

SAMPLE LOCATION.... PM 51.49

TEST SAMPLE NO.....56773

OPERATOR.....

TEST DATE.....

********** A DATA VALUE OF ZERO INDICATES NO DATA INPUT **********

CSP SITE pH = 5.6 , WATER pH = 0.0 , SOIL pH = 5.6

MINIMUM RESISTIVITY, OHM-CM: CSP SITE = 12000 , WATER = 0 , SOIL = 12000

****

ESTIMATED SERVICE LIFE OF CSP CULVERTS, YEARS
SEE CALTRANS HIGHWAY DESIGN MANUAL CHAPTER 850

CSP THICK Gage	& mm	GALV. 57 g	GALV.+ BIT COAT. (WATER SIDE)	GALV.+ BIT COAT & PAVED INV. (ABRASION)	GALV.+ BIT COAT (SOIL SIDE)	GALV.+ POLYMER 90 DEG INVERT
18	1.3	22	30	37	47	72
16	1.6	28	36	43	53	78
14	2.0	35	43	50	60	85
12	2.8	48	56	63	73	98
10	3.5	61	69	76	86	111
8	4.3	75	83	90	100	125

FLOW VEL. <1.5 m/s WITH NON-ABRASIVE CONDITIONS, (DEFAULT VALUES)
CAP, 18 GAGE (1.3 mm) CSP AND CASP MAY BE USED WITH THESE FLOW VELOCITIES

STANDARD REINFORCED CONCRETE PIPE DESIGN SHOULD BE
SUITABLE FOR THIS USER DEFINED LEVEL OF CHLORIDES

CONCRETE AND RCP MITIGATION MEASURES FOR pH
TYPE IP (MS) MODIFIED CEMENT OR TYPE II MODIFIED CEMENT
MINIMUM REQUIRED BY CALTRANS STD. SPEC. 90-1.01
MAXIMUM W/C RATIO OF 0.45

A CORRUGATED ALUMINUM PIPE, CAP, MAY BE USED
IF ABRASIVE CONDITIONS DO NOT EXIST
SITE CONDITIONS MEET CORROSION REQUIREMENTS

A CORRUGATED ALUMINIZED STEEL PIPE, CASP, MAY BE USED
SITE CONDITIONS MEET CORROSION REQUIREMENTS

PLASTIC PIPE IS APPROVED FOR 50 YEARS SERVICE LIFE FOR
CORROSIVE CONDITIONS. ABRASION MUST BE EVALUATED. ALSO,
CONSIDER CONCRETE HEADWALLS AND CONCRETE OR METAL END
TREATMENT WHERE HIGH FIRE POTENTIAL EXISTS.

MAINTENANCE-FREE SERVICE DESIGN ESTIMATES FOR DRAINAGE FACILITIES USING:
CALIFORNIA CULVERT CRITERIA AND CULVERT4.EXE, (RELEASE DATE 04-16-98)

PROJECT LOCATION...01-Men-101-PM 43.1/52.3

PROJECT ACCOUNT NO.01-262000

SAMPLE LOCATION.... 01 Line, Sta: 102+90

TEST SAMPLE NO..... 56755

OPERATOR.....

TEST DATE.....

Will use for APC

********** A DATA VALUE OF ZERO INDICATES NO DATA INPUT **********

CSP SITE pH = 5.7 , WATER pH = 0.0 , SOIL pH = 5.7

MINIMUM RESISTIVITY, OHM-CM: CSP SITE = 2800 , WATER = 0 , SOIL = 2800

****

ESTIMATED SERVICE LIFE OF CSP CULVERTS, YEARS
SEE CALTRANS HIGHWAY DESIGN MANUAL CHAPTER 850

CSP THICK Gage	& mm	GALV. 57 g	GALV.+ BIT COAT. (WATER SIDE)	GALV.+ BIT COAT & PAVED INV. (ABRASION)	GALV.+ BIT COAT (SOIL SIDE)	GALV.+ POLYMER 90 DEG INVERT
18	1.3	13	21	28	38	63
16	1.6	17	25	32	42	67
14	2.0	22	30	37	47	72
	2.8	30	38	45	55	80
10	3.5	38	46	53	63	88
8	4.3	46	54	61	71	96

FLOW VEL. <1.5 m/s WITH NON-ABRASIVE CONDITIONS, (DEFAULT VALUES)
CAP, 18 GAGE (1.3 mm) CSP AND CASP MAY BE USED WITH THESE FLOW VELOCITIES

STANDARD REINFORCED CONCRETE PIPE DESIGN SHOULD BE
SUITABLE FOR THIS USER DEFINED LEVEL OF CHLORIDES

CONCRETE AND RCP MITIGATION MEASURES FOR pH
TYPE IP (MS) MODIFIED CEMENT OR TYPE II MODIFIED CEMENT
MINIMUM REQUIRED BY CALTRANS STD. SPEC. 90-1.01
MAXIMUM W/C RATIO OF 0.45

A CORRUGATED ALUMINUM PIPE, CAP, MAY BE USED
IF ABRASIVE CONDITIONS DO NOT EXIST
SITE CONDITIONS MEET CORROSION REQUIREMENTS

A CORRUGATED ALUMINIZED STEEL PIPE, CASP, MAY BE USED
SITE CONDITIONS MEET CORROSION REQUIREMENTS

PLASTIC PIPE IS APPROVED FOR 50 YEARS SERVICE LIFE FOR
CORROSIVE CONDITIONS. ABRASION MUST BE EVALUATED. ALSO,
CONSIDER CONCRETE HEADWALLS AND CONCRETE OR METAL END
TREATMENT WHERE HIGH FIRE POTENTIAL EXISTS.

MAINTENANCE-FREE SERVICE DESIGN ESTIMATES FOR DRAINAGE FACILITIES USING:
CALIFORNIA CULVERT CRITERIA AND CULVERT4.EXE, (RELEASE DATE 04-16-98)

OJECT LOCATION...01-Men-101-PM 43.1/52.3

PROJECT ACCOUNT NO.01-262000

SAMPLE LOCATION.... u1 Line, STA: 107+00

TEST SAMPLE NO.....56757

OPERATOR.....

TEST DATE.....

********** A DATA VALUE OF ZERO INDICATES NO DATA INPUT **********
CSP SITE pH = 6.7 , WATER pH = 0.0 , SOIL pH = 6.7
MINIMUM RESISTIVITY, OHM-CM: CSP SITE = 2900 , WATER = 0 , SOIL = 2900
****

ESTIMATED SERVICE LIFE OF CSP CULVERTS, YEARS
SEE CALTRANS HIGHWAY DESIGN MANUAL CHAPTER 850 .

CSP THICK Gage	& mm	GALV. 57 g	GALV.+ BIT COAT. (WATER SIDE)	GALV.+ BIT COAT & PAVED INV. (ABRASION)	GALV.+ BIT COAT (SOIL SIDE)	GALV.+ POLYMER 90 DEG INVERT
18	1.3	19	27	34	44	69
16	1.6	25	33	40	50	75
14	2.0	31	39	46	56	81
	2.8	43	51	58	68	93
12	3.5	54	62	69	79	104
8	4.3	66	74	81	91	116

FLOW VEL. <1.5 m/s WITH NON-ABRASIVE CONDITIONS, (DEFAULT VALUES)
CAP, 18 GAGE (1.3 mm) CSP AND CASP MAY BE USED WITH THESE FLOW VELOCITIES

STANDARD REINFORCED CONCRETE PIPE DESIGN SHOULD BE
SUITABLE FOR THIS USER DEFINED LEVEL OF CHLORIDES

NCRETE AND RCP MITIGATION MEASURES FOR pH
TYPE IP (MS) MODIFIED CEMENT OR TYPE II MODIFIED CEMENT
MINIMUM REQUIRED BY CALTRANS STD. SPEC. 90-1.01
MAXIMUM W/C RATIO OF 0.45

A CORRUGATED ALUMINUM PIPE, CAP, MAY BE USED
IF ABRASIVE CONDITIONS DO NOT EXIST
SITE CONDITIONS MEET CORROSION REQUIREMENTS

A CORRUGATED ALUMINIZED STEEL PIPE, CASP, MAY BE USED
SITE CONDITIONS MEET CORROSION REQUIREMENTS

PLASTIC PIPE IS APPROVED FOR 50 YEARS SERVICE LIFE FOR
CORROSIVE CONDITIONS. ABRASION MUST BE EVALUATED. ALSO,
CONSIDER CONCRETE HEADWALLS AND CONCRETE OR METAL END
TREATMENT WHERE HIGH FIRE POTENTIAL EXISTS.

MAINTENANCE-FREE SERVICE DESIGN ESTIMATES FOR DRAINAGE FACILITIES USING:
CALIFORNIA CULVERT CRITERIA AND CULVERT4.EXE, (RELEASE DATE 04-16-98)

PROJECT LOCATION...01-Men-101-PM 43.1/52.3

PROJECT ACCOUNT NO.01-262000

SAMPLE LOCATION... U2 Line Sta: 101+00

TEST SAMPLE NO.....56754

OPERATOR.....

TEST DATE.....

********** A DATA VALUE OF ZERO INDICATES NO DATA INPUT **********
CSP SITE pH = 6.8 , WATER pH = 0.0 , SOIL pH = 6.8
MINIMUM RESISTIVITY, OHM-CM: CSP SITE = 1400 , WATER = 0 , SOIL = 1400
****

ESTIMATED SERVICE LIFE OF CSP CULVERTS, YEARS
SEE CALTRANS HIGHWAY DESIGN MANUAL CHAPTER 850

CSP THICK Gage	& mm	GALV. 57 g	GALV.+ BIT COAT. (WATER SIDE)	GALV.+ BIT COAT & PAVED INV. (ABRASION)	GALV.+ BIT COAT (SOIL SIDE)	GALV.+ POLYMER 90 DEG INVERT
18	1.3	16	24	31	41	66
16	1.6	21	29	36	46	71
14	2.0	26	34	41	51	76
	2.8	36	44	51	61	86
	3.5	46	54	61	71	96
8	4.3	56	64	71	81	106

FLOW VEL. <1.5 m/s WITH NON-ABRASIVE CONDITIONS, (DEFAULT VALUES)
CAP, 18 GAGE (1.3 mm) CSP AND CASP MAY BE USED WITH THESE FLOW VELOCITIES

STANDARD REINFORCED CONCRETE PIPE DESIGN SHOULD BE
SUITABLE FOR THIS USER DEFINED LEVEL OF CHLORIDES

CONCRETE AND RCP MITIGATION MEASURES FOR pH
TYPE IP (MS) MODIFIED CEMENT OR TYPE II MODIFIED CEMENT
MINIMUM REQUIRED BY CALTRANS STD. SPEC. 90-1.01
MAXIMUM W/C RATIO OF 0.45

A CORRUGATED ALUMINUM PIPE, CAP, SHOULD NOT BE USED
DUE TO CORROSIVE CONDITIONS

A CORRUGATED ALUMINIZED STEEL PIPE, CASP, SHOULD NOT BE USED
DUE TO CORROSIVE CONDITIONS

PLASTIC PIPE IS APPROVED FOR 50 YEARS SERVICE LIFE FOR
CORROSIVE CONDITIONS. ABRASION MUST BE EVALUATED. ALSO,
CONSIDER CONCRETE HEADWALLS AND CONCRETE OR METAL END
TREATMENT WHERE HIGH FIRE POTENTIAL EXISTS.

MAINTENANCE-FREE SERVICE DESIGN ESTIMATES FOR DRAINAGE FACILITIES USING:
CALIFORNIA CULVERT CRITERIA AND CULVERT4.EXE, (RELEASE DATE 04-16-98)

PROJECT LOCATION...01-Men-101-PM 43.1/52.3

PROJECT ACCOUNT NO.01-262000

SAMPLE LOCATION.... U2 Line, STA: 105+40

TEST SAMPLE NO.....56759

OPERATOR.....

TEST DATE.....

********** A DATA VALUE OF ZERO INDICATES NO DATA INPUT **********
CSP SITE pH = 5.6 , WATER pH = 0.0 , SOIL pH = 5.6
MINIMUM RESISTIVITY, OHM-CM: CSP SITE = 3000 , WATER = 0 , SOIL = 3000
****

ESTIMATED SERVICE LIFE OF CSP CULVERTS, YEARS
SEE CALTRANS HIGHWAY DESIGN MANUAL CHAPTER 850

CSP THICK Gage	& mm	GALV. 57 g	GALV.+ BIT COAT. (WATER SIDE)	GALV.+ BIT COAT & PAVED INV. (ABRASION)	GALV.+ BIT COAT (SOIL SIDE)	GALV.+ POLYMER 90 DEG INVERT
18	1.3	13	21	28	38	63
16	1.6	18	26	33	43	68
14	2.0	22	30	37	47	72
	2.8	30	38	45	55	80
10	3.5	38	46	53	63	88
8	4.3	47	55	62	72	97

FLOW VEL. <1.5 m/s WITH NON-ABRASIVE CONDITIONS, (DEFAULT VALUES)
CAP, 18 GAGE (1.3 mm) CSP AND CASP MAY BE USED WITH THESE FLOW VELOCITIES

STANDARD REINFORCED CONCRETE PIPE DESIGN SHOULD BE
SUITABLE FOR THIS USER DEFINED LEVEL OF CHLORIDES

CONCRETE AND RCP MITIGATION MEASURES FOR pH
TYPE IP (MS) MODIFIED CEMENT OR TYPE II MODIFIED CEMENT
MINIMUM REQUIRED BY CALTRANS STD. SPEC. 90-1.01
MAXIMUM W/C RATIO OF 0.45

A CORRUGATED ALUMINUM PIPE, CAP, MAY BE USED
IF ABRASIVE CONDITIONS DO NOT EXIST
SITE CONDITIONS MEET CORROSION REQUIREMENTS

A CORRUGATED ALUMINIZED STEEL PIPE, CASP, MAY BE USED
SITE CONDITIONS MEET CORROSION REQUIREMENTS

PLASTIC PIPE IS APPROVED FOR 50 YEARS SERVICE LIFE FOR
CORROSIVE CONDITIONS. ABRASION MUST BE EVALUATED. ALSO,
CONSIDER CONCRETE HEADWALLS AND CONCRETE OR METAL END
TREATMENT WHERE HIGH FIRE POTENTIAL EXISTS.

MAINTENANCE-FREE SERVICE DESIGN ESTIMATES FOR DRAINAGE FACILITIES USING:
CALIFORNIA CULVERT CRITERIA AND CULVERT4.EXE, (RELEASE DATE 04-16-98)

PROJECT LOCATION...

PROJECT ACCOUNT NO. 01-262001

SAMPLE LOCATION.... US Line, STA: 107+95

TEST SAMPLE NO.....

OPERATOR.....

TEST DATE.....

********** A DATA VALUE OF ZERO INDICATES NO DATA INPUT **********
CSP SITE pH = 7.0 , WATER pH = 0.0 , SOIL pH = 7.0
MINIMUM RESISTIVITY, OHM-CM: CSP SITE = 2100 , WATER = 0 , SOIL = 2100
****

ESTIMATED SERVICE LIFE OF CSP CULVERTS, YEARS
SEE CALTRANS HIGHWAY DESIGN MANUAL CHAPTER 850

CSP THICK Gage	& mm	GALV. 57 g	GALV.+ BIT COAT. (WATER SIDE)	GALV.+ BIT COAT & PAVED INV. (ABRASION)	GALV.+ BIT COAT (SOIL SIDE)	GALV.+ POLYMER 90 DEG INVERT
18	1.3	21	29	36	46	71
16	1.6	27	35	42	52	77
14	2.0	34	42	49	59	84
	2.8	47	55	62	72	97
10	3.5	59	67	74	84	109
8	4.3	72	80	87	97	122

FLOW VEL. <1.5 m/s WITH NON-ABRASIVE CONDITIONS, (DEFAULT VALUES)
CAP, 18 GAGE (1.3 mm) CSP AND CASP MAY BE USED WITH THESE FLOW VELOCITIES

STANDARD REINFORCED CONCRETE PIPE DESIGN SHOULD BE
SUITABLE FOR THIS USER DEFINED LEVEL OF CHLORIDES

CONCRETE AND RCP MITIGATION MEASURES FOR pH
TYPE IP (MS) MODIFIED CEMENT OR TYPE II MODIFIED CEMENT
MINIMUM REQUIRED BY CALTRANS STD. SPEC. 90-1.01
MAXIMUM W/C RATIO OF 0.45

A CORRUGATED ALUMINUM PIPE, CAP, MAY BE USED
IF ABRASIVE CONDITIONS DO NOT EXIST
SITE CONDITIONS MEET CORROSION REQUIREMENTS

A CORRUGATED ALUMINIZED STEEL PIPE, CASP, MAY BE USED
SITE CONDITIONS MEET CORROSION REQUIREMENTS

PLASTIC PIPE IS APPROVED FOR 50 YEARS SERVICE LIFE FOR
CORROSIVE CONDITIONS. ABRASION MUST BE EVALUATED. ALSO,
CONSIDER CONCRETE HEADWALLS AND CONCRETE OR METAL END
TREATMENT WHERE HIGH FIRE POTENTIAL EXISTS.

MAINTENANCE-FREE SERVICE DESIGN ESTIMATES FOR DRAINAGE FACILITIES USING:
CALIFORNIA CULVERT CRITERIA AND CULVERT4.EXE, (RELEASE DATE 04-16-98)

PROJECT LOCATION...

PROJECT ACCOUNT NO. 01-262001

SAMPLE LOCATION.... H Line, STA.: 98+80

TEST SAMPLE NO.....

OPERATOR.....

TEST DATE.....

********** A DATA VALUE OF ZERO INDICATES NO DATA INPUT **********

CSP SITE pH = 6.4 , WATER pH = 0.0 , SOIL pH = 6.4

MINIMUM RESISTIVITY, OHM-CM: CSP SITE = 1900 , WATER = 0 , SOIL = 1900

****

ESTIMATED SERVICE LIFE OF CSP CULVERTS, YEARS
SEE CALTRANS HIGHWAY DESIGN MANUAL CHAPTER 850

CSP THICK Gage	& mm	GALV. 57 g	GALV.+ BIT COAT. (WATER SIDE)	GALV.+ BIT COAT & PAVED INV. (ABRASION)	GALV.+ BIT COAT (SOIL SIDE)	GALV.+ POLYMER 90 DEG INVERT
18	1.3	15	23	30	40	65
	1.6	19	27	34	44	69
	2.0	24	32	39	49	74
12	2.8	33	41	48	58	83
10	3.5	42	50	57	67	92
8	4.3	52	60	67	77	102

FLOW VEL. <1.5 m/s WITH NON-ABRASIVE CONDITIONS, (DEFAULT VALUES)
CAP, 18 GAGE (1.3 mm) CSP AND CASP MAY BE USED WITH THESE FLOW VELOCITIES

STANDARD REINFORCED CONCRETE PIPE DESIGN SHOULD BE
SUITABLE FOR THIS USER DEFINED LEVEL OF CHLORIDES

CONCRETE AND RCP MITIGATION MEASURES FOR pH
TYPE IP (MS) MODIFIED CEMENT OR TYPE II MODIFIED CEMENT
MINIMUM REQUIRED BY CALTRANS STD. SPEC. 90-1.01
MAXIMUM W/C RATIO OF 0.45

A CORRUGATED ALUMINUM PIPE, CAP, MAY BE USED
IF ABRASIVE CONDITIONS DO NOT EXIST
SITE CONDITIONS MEET CORROSION REQUIREMENTS

A CORRUGATED ALUMINIZED STEEL PIPE, CASP, MAY BE USED
SITE CONDITIONS MEET CORROSION REQUIREMENTS

PLASTIC PIPE IS APPROVED FOR 50 YEARS SERVICE LIFE FOR
CORROSIVE CONDITIONS. ABRASION MUST BE EVALUATED. ALSO,
CONSIDER CONCRETE HEADWALLS AND CONCRETE OR METAL END
TREATMENT WHERE HIGH FIRE POTENTIAL EXISTS.

MAINTENANCE-FREE SERVICE DESIGN ESTIMATES FOR DRAINAGE FACILITIES USING:
CALIFORNIA CULVERT CRITERIA AND CULVERT4.EXE, (RELEASE DATE 04-16-98)

OJECT LOCATION...01-Men-101-PM 43.1/52.3

PROJECT ACCOUNT NO.01-262000

SAMPLE LOCATION.... M Line Sta 72+62

TEST SAMPLE NO.....56768

OPERATOR.....

TEST DATE.....

********** A DATA VALUE OF ZERO INDICATES NO DATA INPUT **********
CSP SITE pH = 5.1 , WATER pH = 0.0 , SOIL pH = 5.1
MINIMUM RESISTIVITY, OHM-CM: CSP SITE = 5100 , WATER = 0 , SOIL = 5100
****

ESTIMATED SERVICE LIFE OF CSP CULVERTS, YEARS
SEE CALTRANS HIGHWAY DESIGN MANUAL CHAPTER 850

CSP THICK Gage	& mm	GALV. 57 g	GALV.+ BIT COAT. (WATER SIDE)	GALV.+ BIT COAT & PAVED INV. (ABRASION)	GALV.+ BIT COAT (SOIL SIDE)	GALV.+ POLYMER 90 DEG INVERT
18	1.3	15	23	30	40	65
16	1.6	20	28	35	45	70
14	2.0	24	32	39	49	74
	2.8	33	41	48	58	83
10	3.5	43	51	58	68	93
8	4.3	52	60	67	77	102

FLOW VEL. <1.5 m/s WITH NON-ABRASIVE CONDITIONS, (DEFAULT VALUES)
CAP, 18 GAGE (1.3 mm) CSP AND CASP MAY BE USED WITH THESE FLOW VELOCITIES

STANDARD REINFORCED CONCRETE PIPE DESIGN SHOULD BE
SUITABLE FOR THIS USER DEFINED LEVEL OF CHLORIDES

NCRETE AND RCP MITIGATION MEASURES FOR pH
TYPE II MODIFIED CEMENT OR TYPE V CEMENT
400 kg/m3 WITH 25% MINERAL ADMIXTURE REPLACEMENT (BY WEIGHT)
AND A MAXIMUM WATER-TO-CEMENTITIOUS RATIO OF 0.40

A CORRUGATED ALUMINUM PIPE, CAP, SHOULD NOT BE USED
DUE TO CORROSIVE CONDITIONS

A CORRUGATED ALUMINIZED STEEL PIPE, CASP, SHOULD NOT BE USED
DUE TO CORROSIVE CONDITIONS

PLASTIC PIPE IS APPROVED FOR 50 YEARS SERVICE LIFE FOR
CORROSIVE CONDITIONS. ABRASION MUST BE EVALUATED. ALSO,
CONSIDER CONCRETE HEADWALLS AND CONCRETE OR METAL END
TREATMENT WHERE HIGH FIRE POTENTIAL EXISTS.

State of California Business, Transportation and Housing Agency

Memorandum

To: Dave Kelley, Chief
Design Branch R-3

Date: April 24, 2009

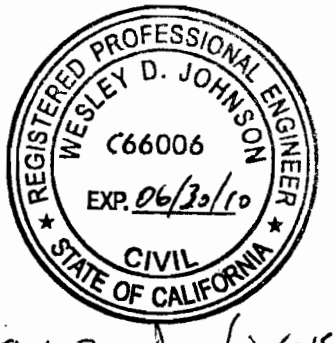
Attention: Don Rushton
Project Engineer
(Roundabout)

File: 01-MEN-101
PM 48.1
EA 01-262001
Willits Bypass
(Roundabout at Quail Meadows)

From: DEPARTMENT OF TRANSPORTATION - North Region
Wesley D. Johnson - North Region Materials, Eureka

Subject: Supplemental Materials Recommendation #1, Roundabout at Quail Meadows

In response to a request from Don Rushton of your office dated November 3, 2008, personnel from the Eureka Materials Lab conducted a field review and retrieved soil samples from within the project limits along the "RA2" line and "RA5" line near the location of the proposed roundabout at Quail Meadows. These samples were used to determine the R-value (resistance to deformation); and, pH and Resistivity of the native soils. The R-value of the native soil is used to calculate the structural section of the proposed new construction. The pH and Resistivity values are used to calculate the estimated service life of culverts. The structural section for the circulatory roadway of the roundabout is presented with a Hot Mix Asphalt (HMA) option and a Jointed Plain Concrete Pavement (JPCP) option. As requested, this materials recommendation is provided in ***Metric*** units.



Wesley D. Johnson

New Structural Sections, Roundabout at Quail Meadows

Circulatory Roadway (6.0 Meter traffic lane)

The results of R-value testing of soils sampled during the field visit were 39 and 48; however, due to the wide variation seen in R-value from samples taken for the mainline construction and the variety of soils in and around the outwash plains at this location, a conservative R-value of 7 was used for the calculation of the structural section (HMA option). Also, due to the turning movements expected to occur from the truck traffic and the potential for wheel loading in the outside shoulder, this recommendation considers the full 6.0 meter width of the circulatory roadway (lane and shoulder) to be traveled way. Open Graded Friction Course (OGFC) should not be placed within the roundabout proper due to the expected slow-speed turning movements and the high potential for raveling.

HMA option (20 year design life, circulatory roadway):

Based on an assumed R-value of 7, and a 20 year traffic index of 10.0, the following structural section strategies are recommended for traffic lanes and shoulders of the circulatory roadway using the existing soils for embankment. Each strategy is structurally equivalent.

Strategy	HMA (Type C) (19 mm Agg.)	HMA (Type C) (37.5 mm Agg.)	AB (Class 2)	AS (Class 2)
1	75 mm	75 mm	255 mm	360 mm
2	75 mm	75 mm	580 mm	----
3	75 mm	315 mm	----	----

HMA option (20 year design life, circulatory roadway) (With Subgrade Enhancement Geotextile (SEG)):

The following structural section strategies are recommended where Subgrade Enhancement Geotextile (SEG) will be placed over existing soils and soils from within the project limits are placed within 1.2 meters of finished grade. Based on an increased R-value of 20 as a result of using SEG, and a 20 year traffic index of 10.0, the following structural section strategies are recommended for traffic lanes and shoulders of the circulatory roadway using the existing soils for embankment. Each strategy is structurally equivalent.

Strategy	HMA (Type C) (19 mm Agg.)	HMA (Type C) (37.5 mm Agg.)	AB (Class 2)	AS (Class 2)
1	75 mm	75 mm	255 mm	360 mm
2	75 mm	75 mm	580 mm	----
3	75 mm	270 mm	----	----

Note:
If imported materials that have an R-value of 25 or greater are used for embankment, the structural section strategies (HMA option with SEG) noted above can be used without placing SEG.

JPCP option (20 year design life, circulatory roadway):

The JPCP structural section strategies presented below were selected in accordance with procedures in the Highway Design Manual, Section 623. The JPCP Traveled Way is assumed to be laterally supported. These recommendations are based on an assumed R-value of 10, a soil classification of SC (Clayey Sands) which equate to the soil classification of Type II (HDM Table 623.1A), and using a 20 year traffic index of 10.0. The climate region at this project's location is classified as: "*Low Mountain*" (HDM Figure 615.1). Additional guidance was provided by a Draft Pavement Policy Bulletin signed by A. Benipal. The following structural section strategies are recommended for the JPCP traffic lane and shoulder of the circulatory roadway using the existing soils for embankment. Each strategy is structurally equivalent.

Strategy 1	Strategy 2	Strategy 3
210 mm JPCP	210 mm JPCP	225 mm JPCP
105 mm LCB	75 mm HMA-A	300 mm AB
150 mm AB*	150 mm AB*	----------

* District 1 Materials Engineer recommends substituting Aggregate Base (AB) for Aggregate Subbase (AS).

Structural Section for Concrete Truck Apron

The JPCP structural Section strategies presented below were selected in accordance with procedures in the Highway Design Manual, section 623. The JPCP Truck Apron is assumed to be laterally supported. These recommendations are based on an assumed R-value of 10, a soil classification of SC (Clayey Sands) which equate to the soil classification of Type II (HDM Table 623.1A), and using an extrapolated 20 year traffic index of < 9.0. The climate region at this project's location is classified as "*Low Mountain*" (HDM Figure 615.1). Additional guidance was provided by a Draft Pavement Policy Bulletin signed by A. Benipal. The following structural section strategies are recommended for the JPCP truck apron using the existing soils for embankment. Each strategy is structurally equivalent.

Strategy 1	Strategy 2	Strategy 3
210 mm JPCP	210 mm JPCP	225 mm JPCP
105 mm LCB	75 mm HMA-A	300 mm AB
150 mm AB*	150 mm AB*	----------

* District 1 Materials Engineer recommends substituting Aggregate Base (AB) for Aggregate Subbase (AS).

Notes:

- For additional guidance for the design of the JPCP option, see: "***Guide for Design and Construction of New Jointed Plain Concrete Pavements (JPCPs)" January 9, 2008,*** which can be downloaded from the department's pavement website: http://www.dot.ca.gov/hq/esc/Translab/ope/RigidPavement.html

  See Section 7.5, *Joints at Intersection* for information on the design and placement of joints and joint seal types. See Attachment "A" for a general guide to joint placement design for intersections.

- JPCP design and detail guidance for new construction is also provided in the Standard Plans: P1, P10, P12, P17, and P20.

- If the JPCP option is chosen for the circulatory roadway, the transition between JPCP and HMA at the entrance/exit roadways should be planned so that the majority of the transient loading due to vehicle breaking occurs on the JPCP section. Transition sections between JPCP and HMA in the entrances/exits to the roundabout should be designed in accordance with Standard Plan P30.

- Lateral support should be provided for the JPCP truck apron and JPCP circulatory traffic lane and shoulder by the use of tie bars in curbs and in longitudinal joints. The tie bars should be placed according to Standard Plan P1 to ensure lateral support for any portion of traveled way, shoulder, or truck apron that is constructed with JPCP. Tie bars are not used in curbs on the lane side with the HMA option.

Curbs and Gutters

Concrete curbs and gutters expected to carry transient traffic loading should be designed using the structural section strategies noted above for the concrete truck apron. For ease of constructability purposes, strategy 3 is recommended. Curb type *B2-150 Mod* should be modified so that the gutter pan thickness matches the

selected circulatory roadway structural section thickness for JPCP. Tie bars placed in the Truck Apron curb (Type TA) should be staggered so that they are out of alignment between the truck apron side and the circulatory roadway side.

Splitter Islands

The Splitter Islands should be constructed by placing concrete 150 mm (min) thick on top of 150 mm (min) of compacted Aggregate Base (Class 2). Wire mesh reinforcement (102x102 MW9.1/9.1 (Formerly 4x4-10/10)) should be placed in the lower half of the 150 mm of concrete.

Hardscape

Hardscape construction should be planned so that a minimum thickness of 150 mm of concrete extends below the lower surface of the imbedded rock. Wire mesh reinforcement (102x102 MW9.1/9.1 (Formerly 4x4-10/10)) should be placed in the lower half of the 150 mm of concrete. Rock cobble to be inserted in the surface should be clean and free of debris, fine material, or deleterious substances. The grading for the rock cobble should be that which passes the 150 mm sieve and is retained on the 75 mm sieve. Place 150 mm (min) of compacted Aggregate Base (Class 2) below the concrete hardscape.

Notes:

- Imported borrow used to construct the embankment must meet a minimum R-value of 25 when placed within 1.2 meters of finished grade.
- For structural sections designed to last 20 years, the alternative to use full depth HMA (Type C) should be considered for special situations only. This would include, but not be limited to, narrow widening, shallow utilities coverage, or shortening traffic control periods.
- All concrete joints (new construction) should be sealed with "Compression" type seals in accordance with Section 622.5, *Joint Seals*, of the Highway Design Manual. See Standard Plan P20 for detail.

Material Specifications

- Hot Mix Asphalt (HMA): used to construct the circulatory roadway shall be Hot Mix Asphalt, High Stability, HMA (Type C) conforming to Section 39 of the Standard Specifications, and shall be composed of 37.5 mm aggregate for the bottom lift

followed by HMA (Type C), 19 mm aggregate for the surface lift. HMA used as a sub-layer to JPCP shall be HMA (Type A), 19 mm aggregate or 12.5 mm aggregate conforming to Section 39 of the Standard Specifications. See Attachment "B" for grading specifications for HMA (Type C), constructed with 37.5 mm aggregate.

- Asphalt Binder: Shall be PG 64-16 for HMA-A and PG 70-10 for HMA-C. The estimated percentage of asphalt to be added per dry weight of aggregate is 5.0% for 37.5 mm HMA-C and 6.0% for 19 mm HMA-C. The estimated percentage of asphalt to be added per dry weight of aggregate is 5.5% for 19 mm HMA-A and 6.0% for 12.5 mm HMA-A.

- Concrete: Concrete used to construct the truck apron and the JPCP circulatory roadway shall be Class II and shall comply with Section 40 and Section 90 of the Standard Specifications. Concrete used to construct curbs and sidewalks shall be Class II and shall comply with Section 73 of the Standard Specifications with the exception of curbs that are expected to carry transient wheel loading which shall comply with Section 40 and Section 90 of the Standard Specifications.

- Paint Binder (Tack Coat): Shall conform to Section 39 of the Standard Specifications.

- Aggregate Base (AB): Shall be Class 2, conforming to Section 26 of the Standard Specifications with the following changes: The Durability Index per California Test Method 229 shall be 25 minimum and the minimum loose unit weight per California Test Method 212, Compacted Method (by rodding) shall be 1682 Kg/m^3.

- Aggregate Subbase (AS): Shall conform to Section 25 of the Standard Specifications.

- Lean Concrete Base (LCB): Shall conform to Section 28 of the Standard Specifications.

- Shoulder Backing: Shall conform to the requirements within the Standard Special Provisions for shoulder backing, with the following change: The minimum loose unit weight per California Test Method 212, (a. Compacted Method (by rodding)) shall be 1682 Kg/m^3.

- Subgrade Enhancement Geotextile (SEG): Shall be woven (Class A1) and have a minimum grab tensile strength of 1.10 kN. Please see Attachment "C" for a table of required geotextile parameters at this location.

Alternative Pipe Culverts

Although not originally included in your request for materials recommendations, the following Alternative Pipe Culvert recommendations are included in this materials report in the event that work to install roadway drainage at this location becomes necessary. The recommendations are based on soil pH and resistivity testing from the soils sampled at this location. Alternative pipe culverts approved for a 50 year service life are shown below.

- Reinforced Concrete Pipe may be used with the following addition to Section 65 of the Standard Specifications: Type II modified or Type IP cement shall be used with a maximum water-to-cement ratio of 0.45.

- 3.5 mm (0.138" ((10 gage)) galvanized, corrugated steel pipe conforming to Section 66 of the Standard Specifications.

- 2 mm (0.079" ((14 gage)) galvanized, polymeric sheet coated, corrugated steel pipe conforming to Section 66 of the Standard Specifications.

- Plastic pipe - Shall be high density polyethylene (HDPE), conforming to Section 64 of the Standard Specifications. Reference should be made to durability in Section 854.8 of the Highway Design Manual.

See Attachment "D" or "E" for culvert installation details.

If you have any questions, please call me at (707) 445-6386 or David Waterman at (707) 445-6355.

Attachments

WJ: wj

C: D. Kelly
D. Rushton
Lab Files

American Concrete Pavement Association

CONCRETE INFORMATION

Intersection Joint Layout

Ideally, designers should develop an intersection joint layout while developing project plans. Though on paper, the plan view of an intersection provides the best birds-eye view for seeing the entire intersection. During construction it is difficult to visualize an intersection because of construction staging.

A good jointing plan will ease construction by providing clear guidance. It is common practice for some designers to leave intersection joint layout to the field engineer and contractor. These designers often justify this practice by citing the many field adjustments that occur during construction, which they contend negates the usefulness of a jointing plan. However, it is not desirable to eliminate the jointing plan except for very simple intersections. A jointing plan and appropriate field adjustments are both necessary for more complex intersections, because islands, medians and turning lanes complicate joint layout and require some forethought before construction. The plan will also enable contractors to more accurately bid the project.

During construction it is likely that location changes will be necessary for some joints within an intersection. The primary reason is to ensure that joints pass through fixtures embedded in the pavement like manholes or drainage inlets. It is common for the actual location of manholes, or drainage inlets to vary from the location shown on the plans. As a result, it will be desirable for the construction crew to adjust the location of some joints so that they coincide with the actual location of a nearby manhole or inlet. The designer should consider placing a note on the plan to give the field engineer and contractor the latitude to make appropriate adjustments.

The transverse and longitudinal joints in concrete pavement are necessary primarily to control cracking. The desirable transverse joint spacing depends on the slab thickness and subbase, but is usually about 4.5 m (15 ft). On typical roadway pavements, longitudinal joints divide lanes of traffic and in most cases are no more than about 4 m (12 ft) apart. Because the transverse and longitudinal joint spacing are usually not identical, it is difficult to maintain an even spacing on either roadway through an intersection.

The ten-step method in this publication provides intersection joint layout fundamentals. The examples show a right-angle and a skewed T-intersection. The detail diagrams show preferable alternates, but there may be certain intersections with unique geometry that the methodology does not fully address. This publication does not address dowel and reinforcing requirements for joints.

A primary goal of this method is to minimize or eliminate joints that intersect another joint or the pavement edge at an acute angle. Experience shows that cracks often occur near acute angles, especially angles less than 60°. For most intersections it is possible to eliminate all angles less than 90° from the roadway slabs — there may be some acute angles in the curb and gutter. For skewed intersections it is likely that some joints will intersect at angles less than 90°. However, even for skewed intersections it is preferable to avoid angles less than 60°.

The method works equally well for integral curb and gutter, as well as for separate curb and gutter. The diagrams show how to place joints through curb and gutter and along curves between the intersecting roadways. The method also helps the designer produce a plan that is easier to construct by avoiding width changes along the edge of the mainline or primary paving lane(s).

New terms:

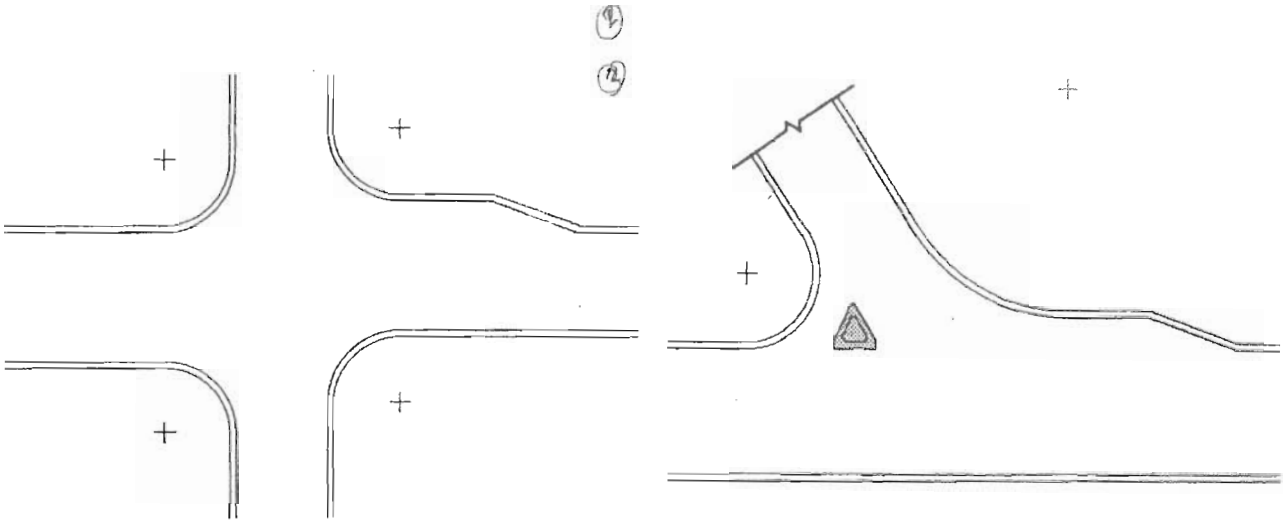
Doglegs: Construction block-outs at points where the pavement changes width. (See page 5 for details.)

Circumference-Return Line: A lightly drawn line 0.5-1.0 m (1.5-3.0 ft) from the face of the gutter along the curve between the edges of the intersecting roads. For obtuse angles, the line is 1/2 the nominal lane width from the gutter. Any joint that meets the circumference-return line is brought along the curve's radius to the back of the curb and gutter. Older publications use the term "off-set points" to refer to the points where joints return to the back of the curb.

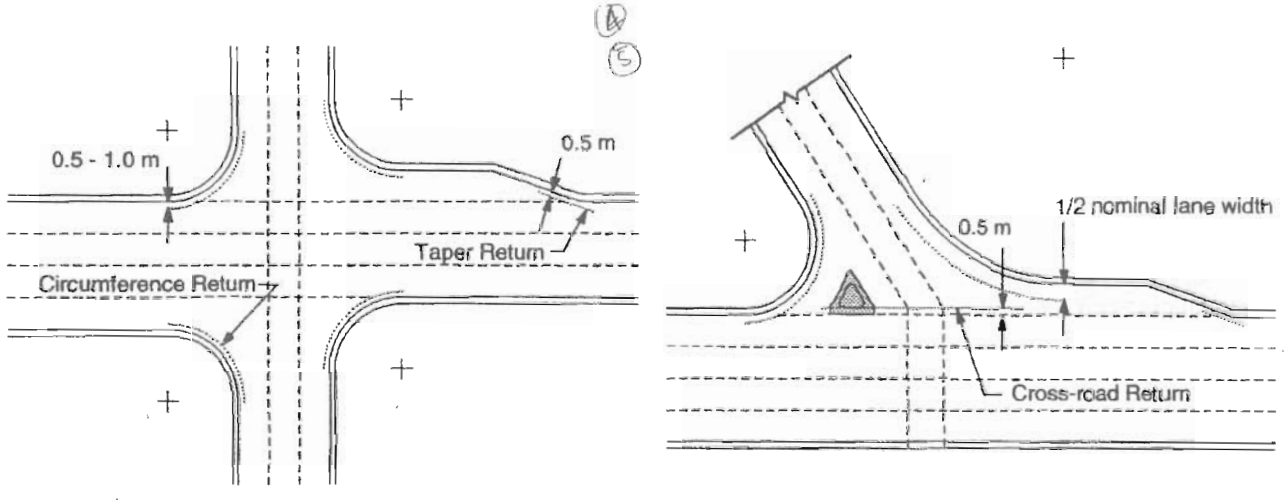
Taper-Return Line: A lightly drawn line 0.5 m (1.5 ft) from the face of the gutter at the start of a turn lane taper. Any longitudinal joint that meets a taper-return line defines a location for a dogleg in the gutter.

Cross-Road Return Line: A lightly drawn line 0.5 m (1.5 ft) from the edge of the mainline roadway at a skewed intersection. Any cross-road longitudinal joint will meet a transverse joint for the mainline roadway at the cross-road return line.

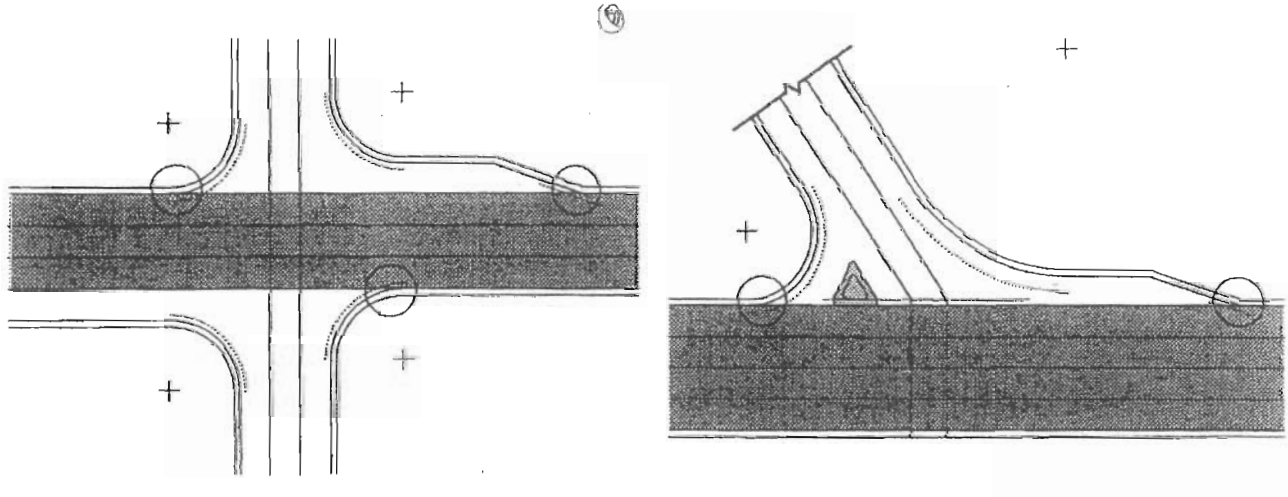
Intersection Box: The box formed by the edge of the mainline and intersecting paving lanes (including turning lanes).



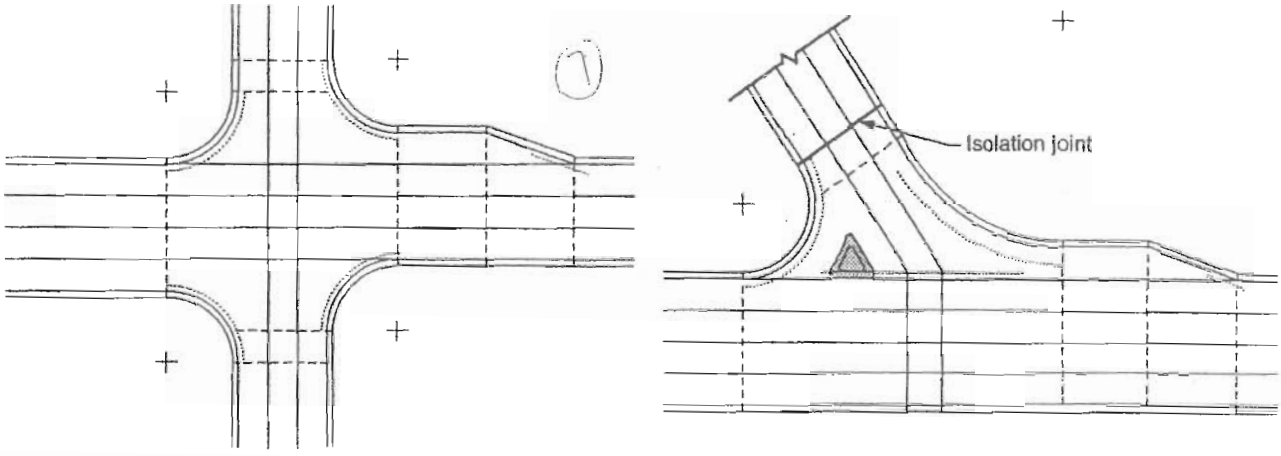
Step 1: Draw all pavement edge and back-of-curb lines on the plan view.



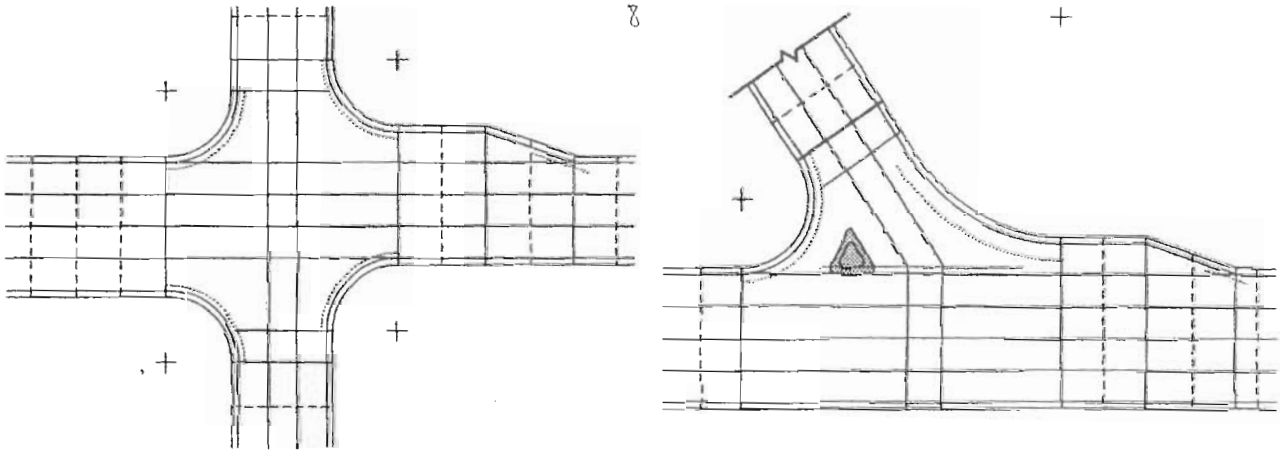
Step 2: Lightly draw the circumference-return, taper-return, and the cross-road-return line(s).
Step 3: Draw all lines that define lanes on the mainline and cross road. (Do not extend these lines past the circumference-return, taper-return or cross-road-return lines.)



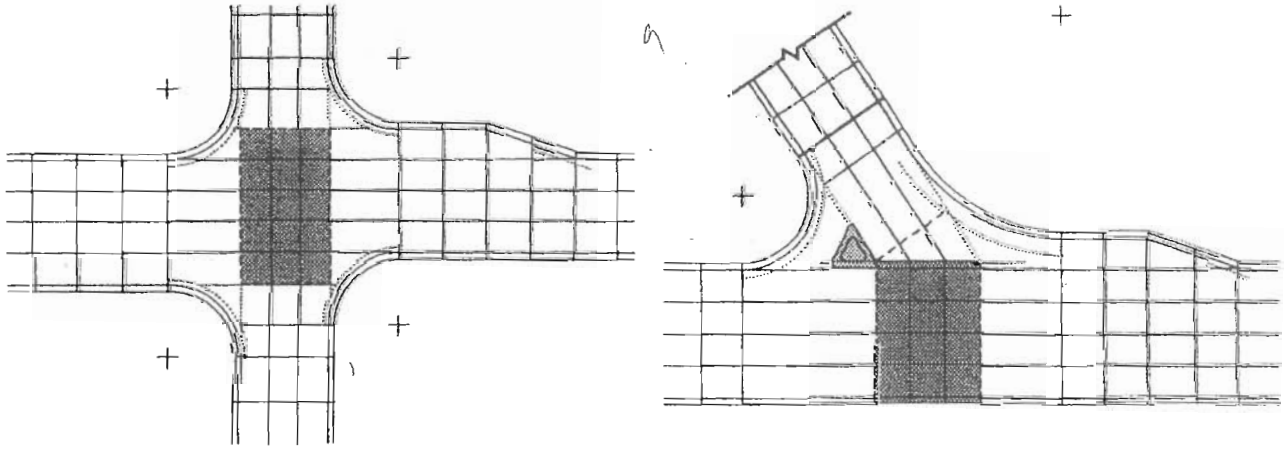
Step 4: Define the mainline lanes for paving. Find all locations where the mainline lanes intersect circumference-return or taper-return lines. At these locations only, extend the mainline paving edge lines past the circumference-return or taper-return line(s). Any block-outs for doglegs at these locations are preferable in the gutter for the curb.



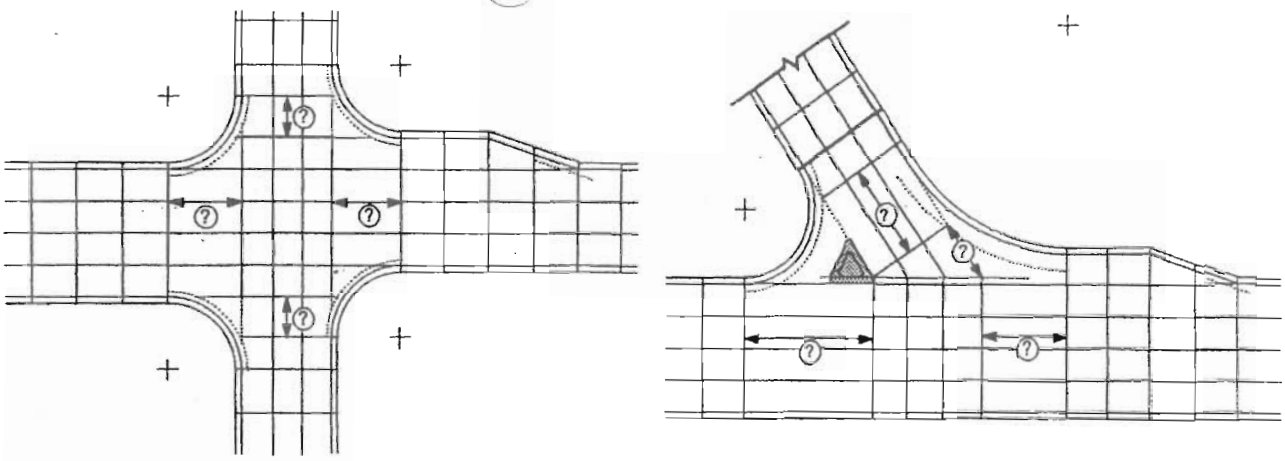
Step 5: Add transverse joints at all locations where the pavement changes width, extending the joints through the curb and gutter. Do not extend joints that intercept a circumference-return or cross-road-return line, except at the tangent points. The joint at the tangent point farthest from the mainline becomes an isolation joint in the cross road for T- and unsymmetrical intersections.



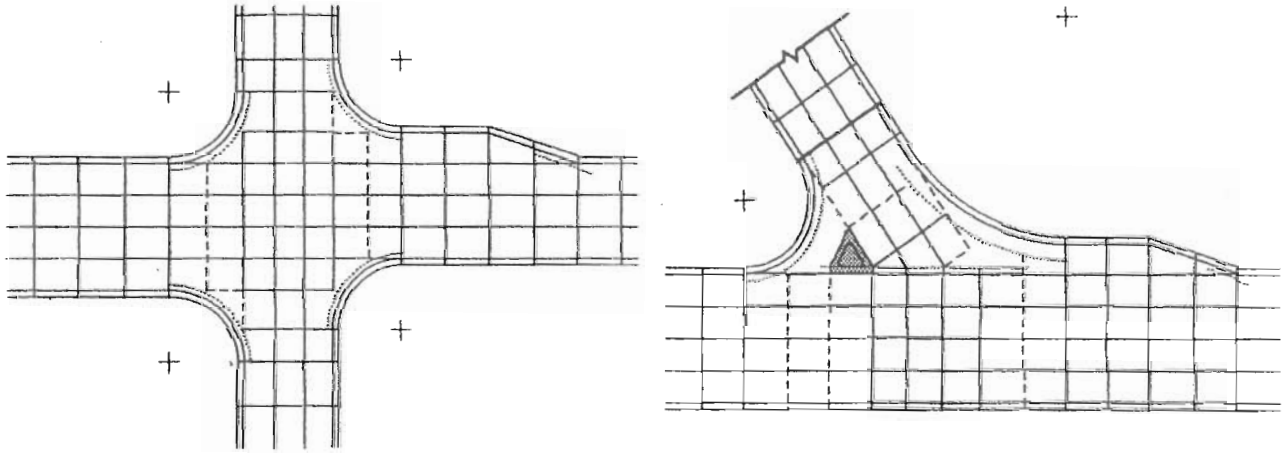
Step 6: Add transverse joint(s) between and beyond the joints you defined in Step 5, but do not add joints to the center of the intersection yet. Attempt to keep the distance between joints less than the maximum desirable length. Usually the maximum length is about 4.5 m (15 ft). (To calculate: ML = Dx24 for slabs on granular or unstabilized subbases; ML = Dx21 on stabilized subbases or existing asphalt or concrete pavements; ML=maximum length; D=slab thickness.)



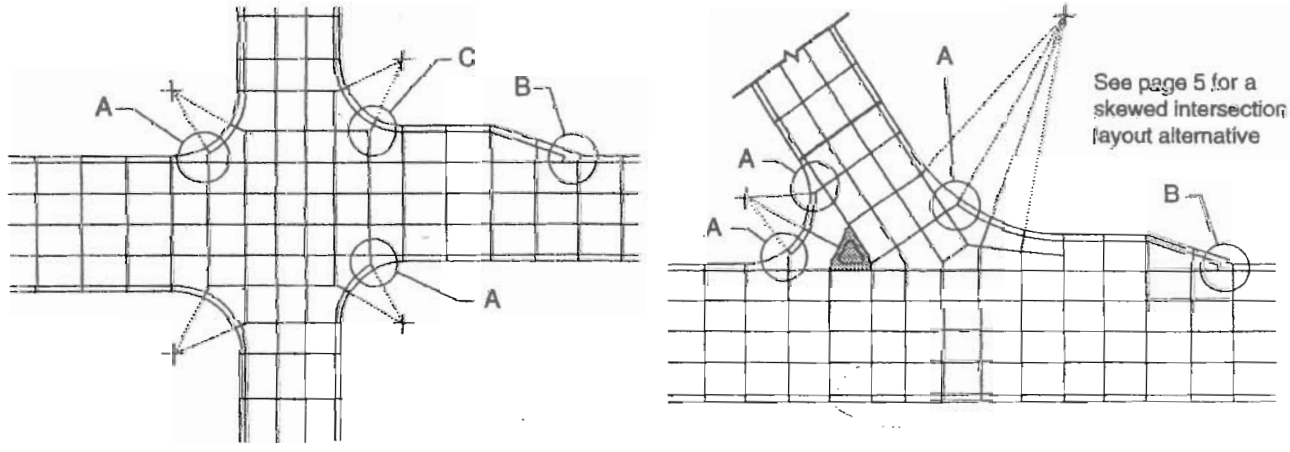
Step 7: By extending the edge of pavement lines for the cross road and any turning lanes, define the intersection box. (Note: For skewed intersections do not extend the lines for the turning lanes. Instead, place a transverse joint normal to the cross road centerline starting from the corner of the intersection box that is nearest to the acute angle of the intersection.)



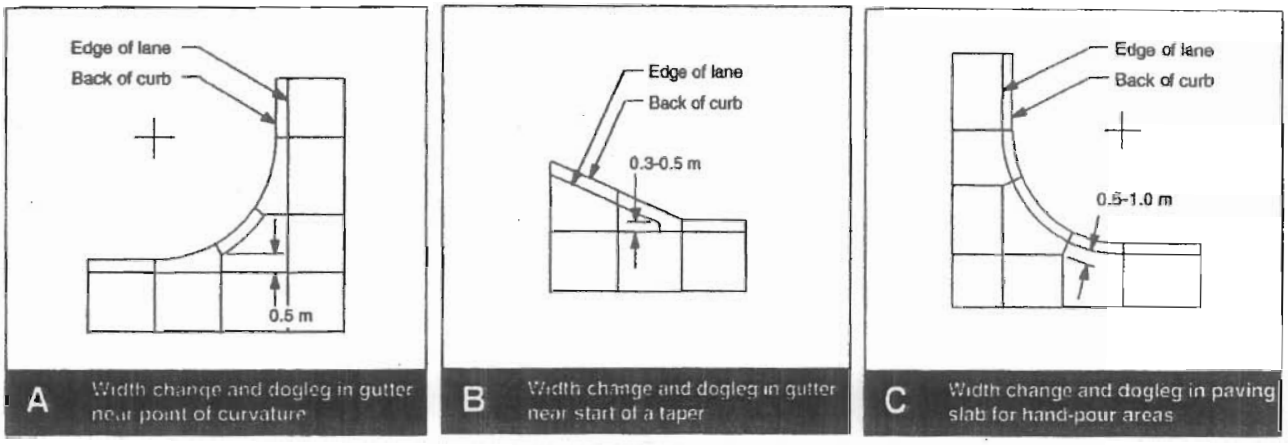
Step 8: Check the distances between the "intersection box" and the surrounding joints.



Step 9: If the distance is more than the maximum desirable joint spacing, then add transverse joint(s) at an equal spacing. Do not extend these joints past the circumference-return or cross-road-return lines.



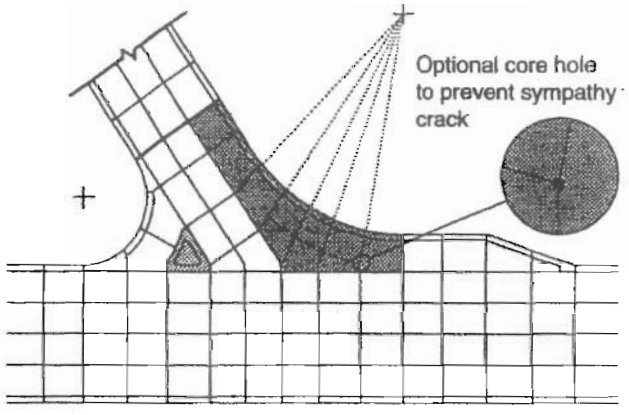
Step 10: Lightly extend lines from the center of the curve(s) to the points defined by the "intersection box," any intermediate joints surrounding the "intersection box" and point(s) along any islands. Add joints along these radius lines. Finally, make slight adjustments to eliminate doglegs in mainline edges. (See details on page 5.)

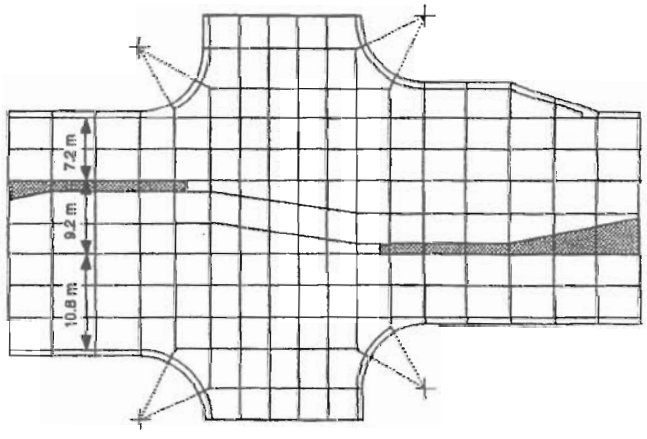


Skewed Intersection Layout Alternative

This alternative for a skewed intersection is useful for simple curve radii greater than 11 m (36 ft) and offset or compound radius curves. It can simplify field construction when the contractor builds the curve area in a single hand pour (indicated by the shaded area).

It is necessary to add an additional longitudinal joint near the center of the slabs that exceed 5 m (15 ft) wide. The additional joint should prevent the occurrence of a longitudinal crack. It is desirable to begin and end the additional longitudinal joint at a transverse joint, as shown in the diagram. Some agencies core a small 50-mm (2-in.) hole through the slab at the ends of this longitudinal joint to prevent sympathy cracking (see diagram).





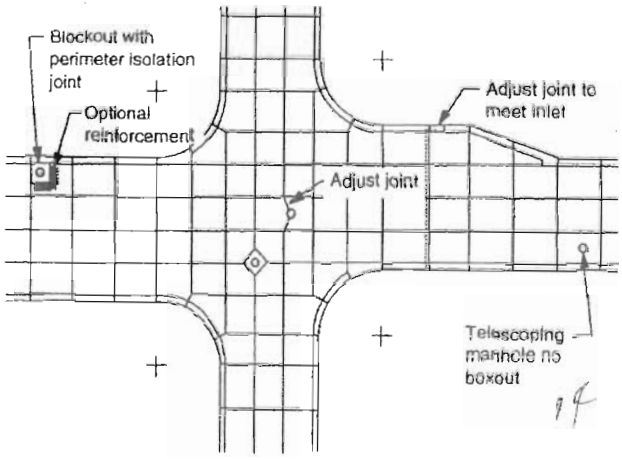
Handling Wide Medians and Dual-Left Turn Lanes

Large urban and suburban intersections that contain dual-left turn lanes, create joint alignment challenges. The medians in these large intersections are often up to 9.2 m (30 ft) wide. The diagram shows how to skew joints through the intersection box in order to maintain the joints along the lane lines for dual-left turn lanes. The ability to use this method will depend on construction staging; it is just one option to apply for complex intersections.

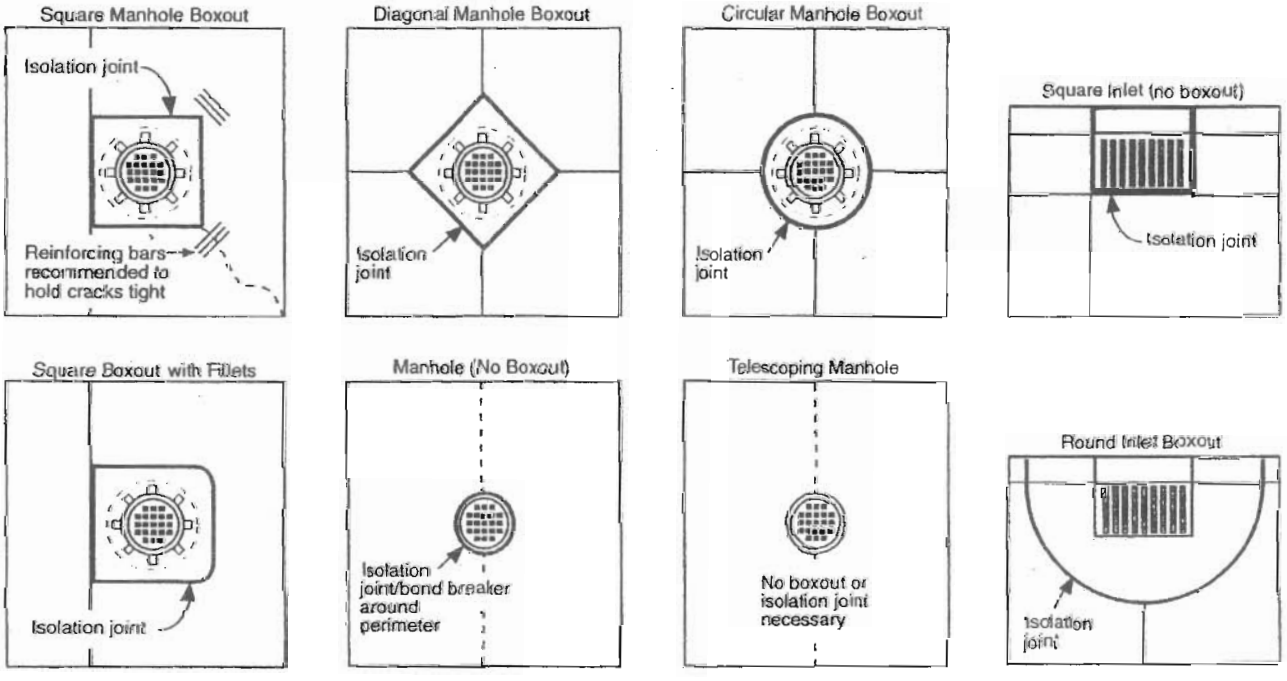
Adjusting Joints for Utility Fixtures

After developing the jointing plan, plot any catch basins, manholes or other fixtures that are within the intersection. Non-telescoping manholes will require a boxout or isolation to allow for vertical and horizontal slab movement. Consider using rounded boxouts or placing fillets on the corners of square boxouts to avoid crack-inducing corners. Also for square boxouts, wire-mesh or small-diameter reinforcing bars in the concrete around any interior corners will hold cracks tight should they develop. Telescoping manholes can be cast integrally within the concrete, and do not necessarily require a boxout. The two-piece casting does not inhibit vertical movement and is less likely to create cracks within the pavement.

Finally, when a joint is within 1.5 m (5 ft) of a fixture, it is desirable to adjust the joint so that it will pass through the fixture or the boxout surrounding the fixture. The diagram on the right shows several acceptable ways to skew or shift a joint to meet a fixture.



Details for Boxing Out Fixtures



Notes: 1. Isolation joints should be at least 12 mm (1/2 in.) wide and filled with a compressible material.
2. Boxouts should be large enough to provide at least 0.3 m (1 ft) clearance between the fixture and the surrounding isolation joint.

American Concrete Pavement Association
5420 Old Orchard Road, Suite A100
Skokie, IL 60077-1059

Printed in U.S.A.

IS006.01P

Attachment B

01-MEN-101 PM 48.1
01-262001 (Roundabout)

HMA (Type C), 37.5 mm Maximum Grading

The aggregate for HMA (Type C), 37.5 mm maximum grading asphalt concrete, shall conform to the following grading:

Sieve Size	Target Value Limits	Allowable Tolerance
50-mm	100	100
37.5-mm	90-100	TV±2
25-mm	75-90	TV±3
19-mm	67-82	TV±3
9.5-mm	48-64	TV±3
4.75-mm	40-44	TV±3
2.36-mm	30-34	TV±3
600-µm	16-20	TV±3
75-µm	2-7	2-10

Attachment C

01-MEN-101 PM 48.1
01-262001 (Roundabout)

Subgrade Enhancement Geotextile (SEG)

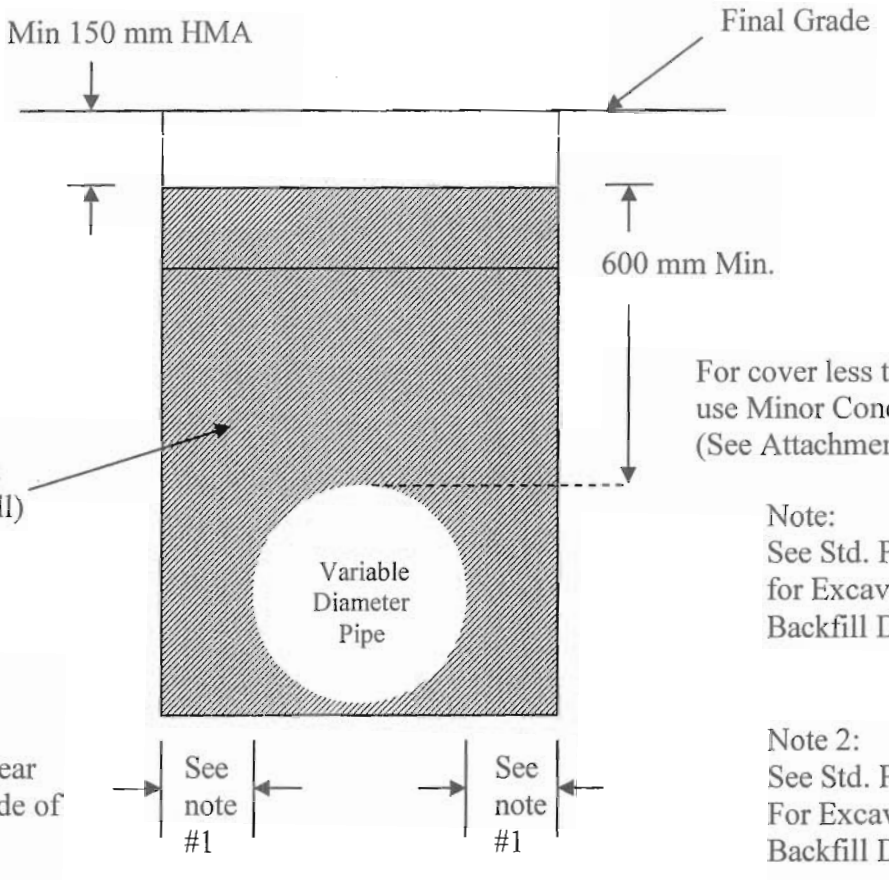
Subgrade enhancement geotextile shall be woven and shall conform to the following requirements:

Property	ASTM Test	Value
Grab Tensile Strength, minimum, kN	D 4632	1.10
Puncture Resistance, minimum, kN	D 6241	2.20
Tear (impact) Resistance, minimum, kN	D 4533	0.40
Permittivity, minimum, sec^{-1}	D 4491	0.05
Apparent Opening size, maximum, mm	D 4751	0.30
Ultraviolet Stability, minimum, %, (after 500 hrs exposure)	D 4355	70
Elongation at break, %	D 4632	<50

Attachment D

01-MEN-101 PM 48.1
01-262001 (Roundabout)

Structure Backfill, or Slurry Cement Backfill



Note 1:
Structure Backfill
Trench width shall have a minimum of 600 mm of clear distance between the outside of the pipe and the side of excavation on each side.

Note 2:
See Std. Plan A62F
For Excavation and
Backfill Details.

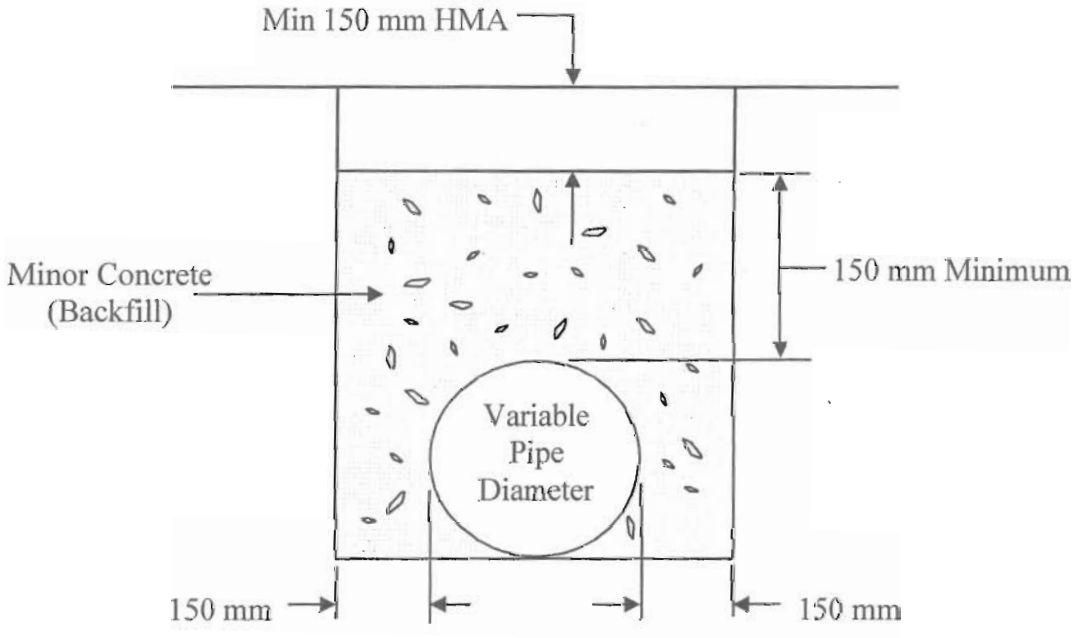
Slurry Cement Backfill
Trench width shall be a minimum of 150 mm beyond outside edge of pipe and the side of excavation on each side for pipe diameters up to and including 1060 mm, or 300 mm for pipes over 1060 mm in diameter.
See Standard Specifications
19-3.062

NO SCALE

Attachment E

01-MEN-101 PM 48.1
01-262001 (Roundabout)

Minor Concrete (Backfill)



NO SCALE

State of California
DEPARTMENT OF' TRANSPORTATION

Business, Transportation and Housing Agency

Memorandum

Flex your power!
Be energy efficient!

To: MR. DAVE KELLEY
Branch Chief
Design M4

Date: July 23, 2008

Attention: Brad Miller

File: 01-Men-101
KP 69.4/84.2
(PM 43.1/52.3)
EA 01-262001

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
GEOTECHNICAL SERVICES – MS 5

Subject: Additional Geotechnical Recommendations

Introduction

As requested, the Office of Geotechnical Design North (OGDN) is providing additional geotechnical recommendations for the cut slope for the Haehl Creek Interchange southbound onramp as part of the Willits Bypass project in Mendocino County. A 1:2 (V:H) cut is proposed to facilitate construction of the southbound onramp. The cut slope will require a large volume of material to be removed and will result in the removal of many trees. To reduce the amount of cut material and limit the impact on trees, Design has requested a review of alternatives to the cut slope.

Existing Conditions

Highway 101 in this area follows a radius trending from an easterly direction to a southeasterly direction. A fill slope lies immediately southwest of the roadway in this area and consists of a soil buttress created to mitigate slope failures that occurred along the original cut slope prior to 1982. According to the As-Builts the soil buttress is approximately 1000 feet long, 20 to 60 feet in height and 70 to 120 feet wide. The soil buttress was constructed on a 1:1 to 1:1.5 (V:H) backcut, was underlain by a 3-foot thick permeable material blanket, and was graded on its outer slope to 1:2 (V:H). The permeable material blanket is connected to an 8-inch psp at the base of the cut slope. Recently, due to cracked drainage culverts, surficial erosion has occurred at a few locations along the soil buttress.

Site Geology

According to the Geologic Map of California, Ukiah Sheet (CDMG, 1960), the site is situated on Quaternary alluvial deposits (Qal). The alluvial deposits, including gravel, sand and silt, crop out in the old head scarp of the 1982 slide, immediately west of the observed soil buttress. The soil buttress was constructed of artificial fill composed of sands, silts and some clays.

Seismicity

Based on the California Seismic Hazard Map (Caltrans, 1996), the controlling fault is the Maacama-Brush Mountain Fault (MBM). The MBM is a strike slip style fault. The fault possesses a Maximum Credible Earthquake of moment magnitude $M_w = 7.25$ and is located approximately 0.672 km kilometers west of the project site. Based on the Attenuation Curves (Mualchin and Jones, 1992) the peak bedrock acceleration at the site is about 0.7g.

The southerly portion of the cut lies within the Alquist-Priolo Special Study Zone on the Willits SE Quadrangle (CDMG, 1983) although the approximate trace of the fault on this map is to the east of the existing highway.

A seismic evaluation was performed for Bridge No. 10-0128 R/L for this project. It is recommended that the seismic considerations be evaluated in the development of this portion of the project.

Slope Stability

Various cut slope options were modeled for slope stability using SLOPE/W. For cut slopes of 1:1 and 1:1.5 (V:H), the Factor of Safety (FOS) was below one indicating an high probability for slope failure with these configurations. The FOS for a 1:2 (V:H) cut slope was 1.33 indicating an increased probability of a stable slope. Under a lower than anticipated seismic load, the FOS was below one. Stability modeling was also performed for soil buttress configurations where the limit of the backcut would approximate the catch line for a 1:2 (V:H) cut slope. The buttress slopes were stable (FOS greater than 1.0) without adding anticipated seismic loads. Even under less than anticipated seismic load, the FOS for a soil buttress falls below 1.0.

Slope inclinometers were installed outside of the original landslide limits in December 2005 and have been monitored through April 2008. The monitoring has shown that the maximum amount of displacement has occurred in the top 10 feet and was on the order of 10.2 mm (0.4-inch) for SI-Men101-B54 in September 2007. This shows that there is still movement occurring in this area and should be taken into consideration when designing any retaining structure alternative.

Recommendations

It was brought to our attention that a traffic analysis currently being conducted for the intersection to the north of this area may require that the new onramp trend more parallel to the existing road alignment. In that case all of the options presented below should be acceptable provided the Office of Geotechnical Design North is consulted for design elements such as height and lateral extent of any anticipated retaining structure.

Many of the existing retaining walls observed in the vicinity of the project appeared to be soldier pile tieback walls that incorporated architectural facing elements.

Stations 103+00 to 107+00:

The proposed road alignment in the area between stations 106+20 to 107+00 is anticipated to acutely cut through "Location 4" on the 'As-Builts' which is a large soil buttress overlying a previous landslide. In order to perform this cut in the area of the location 4 soil buttress, we originally recommended a cut slope of 1:2 (V:H) or flatter and the construction of a soil buttress along the toe of the slope. Upon further review, if the soil buttress option is considered, the backslope can be cut at 1:1.5 (V:H) or 1:1 (V:H), as was graded during the original buttress construction. It does not appear that this will reduce the catch line, but may reduce the volume of material removed.

To reduce the amount of material to be removed during the cut and move the catch line closer to the proposed alignment, a soldier pile wall could be installed on the south-southwesterly cut with tiebacks to a height of 4.6 meters. A 1:2 (V:H) backslope could be constructed beyond the wall. This would move the catch line approximately 20 meters towards the northeast depending on the exact location (Figure 2). The wall would extend from approximately section 103+40 to 106+80 (about 340 meters) as shown in Figure 1. The unit cost for this type of wall is approximately $200-$250 per square foot of wall face. With the above described size, the approximate cost would be $3.4M to $4.2M. To potentially reduce the cost, the wall may be able to be constructed as two units, separated by the area lying between stations 104+50 to 105+40 where the catch line is closer to the proposed alignment. This would reduce the wall length by about 90 meters. With the two-wall option, the wall cost would be about $2.5M to $3.1M.

A soldier pile wall incorporating multiple rows of tiebacks may be used to increase the height of the wall and in turn reduce the lateral extent of the backslope, reducing the catch line up to 40 meters depending on the exact location (Figure 3). The anticipated wall height could be up to 9 meters and encompass the same lateral extent as the 4.6-meter high wall. With the one wall option (340 meter length), the approximate cost would be $6.6M to $8.2M. With the two-wall option the approximate cost would be $4.8M to $6.1M.

If the soldier pile wall alternative is chosen, additional analysis will need to be performed in order to determine an adequate tieback length, vertical tieback spacing, pile type and pile spacing due to the potential for a failure surface to migrate further into the hillside. The wall may need to be higher or designed with additional tiebacks if the seismic and fault rupture displacement increases the loads, and is recommended that it be evaluated once the alternative is chosen.

The proposed alignment is anticipated to trend through the area of the landslide that occurred prior to 1982. Much of the original landslide material is still in place behind (to the southwest) of the existing soil buttress. Special consideration needs to be taken for this area (approximate stations 104+60 to 105+40) due to the proposal to place the roadway between the old landslide and the soil buttress. Any loose landslide debris underneath the roadway section will have to be removed and replaced with Structural Backfill in accordance with Caltrans Standard Specifications. The soldier pile wall option was presented as two segments in order to reduce the cost and may be allowed because the catch line is closer to the anticipated alignment in this area. Due to the fact that a portion of the retaining material for the slide will be removed, it would be prudent to continue a retaining structure in this portion of the alignment. Due to the topography, and the fact that a soil buttress has been used successfully in the past, reconstructing a soil buttress would be acceptable.

Stations 102+00 to 103+00:

The cut heights anticipated along this section of alignment range from approximately 0m (station 102+00) to approximately 3.75m (102+00).

In this area, due to the low cut heights, we do not recommend a wall option. We do recommend that the cut slope be graded at 1:2 (H:V) due to the erodable nature of the materials anticipated to be in the cut slope.

Due to the potential physical and monetary constraints, another feasible alternative would be to use and enhance the existing alignment.

Construction Considerations

Any alternative chosen may have to take into account the anticipated seismic forces that could occur at the site.

With respect to the options presented, the surface water drainage in this area will need to be mitigated such that water is not allowed to flow over the face of the slope. Adequate drainage will need to be provided behind the retaining structure(s) to prevent inundation of water into the soils, potentially causing failure.

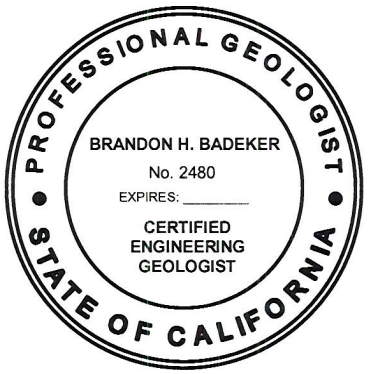
Pertinent Reports and Investigations

The following presents a list of references used in preparation of this report.

- Jennings, C.W. and Strand, R.G., Geologic Map of California: Ukiah sheet: California Division of Mines and Geology, 1960.
- Alquist-Priolo Special Studies Zones Map of the Willits SE Quadrangle, California Division of Mines and Geology, 1983.
- *As-Built Plans to correct slide and repair slope, Contract No. 01-195944, dated August 16, 1982.*
- Foundation Report, Bridge No. 10-0128R/L, Caltrans, 2006.

It is anticipated that once an alternative is chosen, the Office of Geotechnical Design North (OGDN) should be consulted for additional geotechnical design parameters.

If you have any questions or comments, please call Brandon Badeker at (916) 227-1046 or John Huang at (916) 227-1037.



BRANDON BADEKER, CEG
Engineering Geologist
Geotechnical Design – North

QIANG (JOHN) HUANG, P.E.
Senior Materials and Research Engineer
Geotechnical Design - North

Attachments:
Figures 1, 2 and 3

c: RBibbens (E-copy)
JHuang (E-copy)
GDN File

State of California
DEPARTMENT OF' TRANSPORTATION

Business, Transportation and Housing Agency

Memorandum

Flex your power!
Be energy efficient!

To: MR. DAVE KELLEY
Branch Chief
Design M4

Date: February 26, 2009

Attention: Brad Miller

File: 01-Men-101
KP 69.4/84.2
(PM 43.1/52.3)
EA 01-262001

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
GEOTECHNICAL SERVICES – MS 5

Subject: Geotechincal Recommendations

Introduction

As requested, the Office of Geotechnical Design North (OGDN) is providing additional recommendations for the Haehl Creek Interchange southbound (U-1) onramp as part of the Willits Bypass project in Mendocino County. This memo is in response to the earlier draft memo "Additional Geotechnical Recommendations" dated July 23, 2008 in which several options were presented to perform the cutslope for the new U-1 onramp. A tieback wall is proposed for the south side of the onramp between Stations 105+40 and 106+80. A 1:2 (V:H) cut is proposed for the remainder of the alignment.

Upon further evaluation, the Office of Geotechnical Design North would like to recommend another alternative. We would like to propose that the proposed U-1 onramp be moved to the existing Highway 101 between Station 104 and Station 107. As State liability along our roadways increases, the Office of Geotechnical Design believes in a philosophy of avoidance rather than mitigation with regards to roadway hazards associated with slope stability issues. Generally, avoidance is less costly than secondary mitigation measures in terms of immediate construction costs, recurrent maintenance, and liability claims. Secondarily, there are increased environmental mitigation measures associated with providing a soil buttress to the proposed onramp, as well as potential construction problems associated with a tieback wall option for the onramp.

Recommendations

Previously, the Office of Geotechnical Design North recommended a soldier pile tieback retaining wall in order to limit the catch line for the new cut slope for the U-1 onramp. Upon further evaluation, we would feel it is more pertinent to recommend the option of eliminating the proposed

U-1 onramp alignment through the existing soil buttress and landslides, and using the existing Highway 101 between Station 104 and Station 107. Below is a discussion of the benefits of this alternative as well as some of the geotechnical ramifications of mitigating the cut slopes required for the proposed alignment.

- The Office of Geotechnical Design North believes in a philosophy of avoidance versus mitigation when all possible with regards to hazards associated with slope stability.
- Because this area has experienced several landslides in the past, the cuts for the proposed alignment would require a soil buttress or retaining wall (mitigation) along nearly the entire 300-meter length.
- The existing buttress has performed well for about 27 years; it is unknown how the disturbance will affect the remaining buttress left in place, both outside of the alignment and any potentially remaining behind a soil buttress or retaining wall.
- Utilizing the existing alignment would eliminate necessity for a large area requiring environmental mitigation.
- The proposed soil buttress would have to be sized according to the existing conditions, which would require increased environmental mitigation.
- The proposed tieback retaining wall would have to be sized larger and cost more than originally anticipated.
- Through further analysis, the tieback wall may not be easily constructible. Numerous problems may arise including 1) not being able to attain the correct lock out force for the tiebacks due to poor subsurface materials behind the wall, 2) an unreasonable tieback bonded length due to the potential for a large global slope failure and poor subsurface conditions.
- Utilizing the existing alignment would save potentially millions of dollars in construction costs, both associated with the roadway and retaining structure, as well as any construction claims and costs associated with difficult construction. Recurrent maintenance costs would be eliminated as well as potential liability if one of the systems fails.

If the alignment cannot be moved, the following are geotechnical recommendations for retaining the proposed cut slopes.

Soil Buttress Option:

It is proposed to cut the slope at 1:2 (V:H) between Stations 103+00 to 104+60 (Location A). A soil buttress could be used to limit the catch line of the new cut. A soil buttress may increase the volume of material removed versus a 1:2 (V:H) cut slope, although much of the material could be reused as fill for the soil buttress. The backcut can be graded at 1:1 and still provide stability during construction provided that the soil buttress is constructed in concurrence or immediately after the cut is performed. The face of the soil buttress should be graded at 1:1.5 (V:H) or flatter. The buttress

should be 15 meters in height and 12.5 meters in width. A typical section for this area is provided as Figure 2.

It is also proposed to grade the slope at 1:2 (V:H) between Stations 104+60 to 105+40 (Location B). This geometry will not remove all of the old landslide debris remaining, and a buttress may be used to retain the remaining material. The new buttress can be sized to match the maximum limits of the existing buttress, as shown in Table 1. The backcut should be graded at 1:1.5 (V:H) and the face of the slope should be graded to 1:2 (V:H) or flatter. A typical section for this area is provided as Figure 3.

A soil buttress may be used from Station 105+40 to 106+80. Because of the successful performance of the existing buttress, the proposed buttress would have to follow the same sizing factors in terms of height and width. The backcut can be graded at 1:1 and still provide stability during construction provided that the soil buttress is constructed in concurrence or immediately after the cut is performed. The slope face should be graded at 1:1.5 (V:H) or flatter. Below is a table of the stationing and the proposed size of the buttress:

Table 1: Soil Buttress Sizing Chart

Location	Station	Existing Buttress Size (HxW) in meters	Proposed Buttress Size (HxW) in meters
A	103+00 to 104+60	No Buttress	15m x 12.5m
B	104+60 to 105+40	6.4-8.2 m x 9.1m	8.2m x 9.1m
C	105+40 to 106+80	11.9–17.1m x 9.1–12.5m	20m x 15-18m

Permeable Material Blanket:
The construction of the buttress would have to include a permeable material blanket and filter fabric as was done during the construction of the existing buttress. The material provided for the permeable material blanket should be clean sand or crushed gravel with no fines and conform to Section 19-3.065 of the 2006 Standard Specifications.

Underdrains:
An underdrain would need to be provided within the lowermost portion of the material blanket along the entire length of the buttress. The underdrain would be connected to perforated outlet pipes, spaced every 30.5m (100 ft). Currently an 8-inch perforated steel pipe is being utilized for the under drain. Underdrains should be constructed in accordance with Section 68-1 in the 2006 Standard Specifications. A copy of the existing underdrain system is provided in the as-built sections from the landslide repair in the attachments.

Construction:
A 1:1 backcut may be allowed behind the soil buttress where the construction of the soil buttress will be concurrent with the grading of the backcut or performed immediately thereafter. The construction

should commence during the dry season (June through September) in order to further increase the stability during construction. The buttress can then be constructed in lifts in accordance with Sections 19-5 Compaction, and 19-6 Embankment Construction of the 2006 Standard Specifications. Due to the rilling observed in the existing soil buttress, we would recommend the outer slope face to be graded at 1:1.5 (V:H) or flatter. The top of the buttress should be graded back towards the slope at about 8 percent (1V:7H) and connected to the underdrain system.

Soldier Pile Tieback Retaining Wall:

We considered a 4.6-meter soldier pile tieback wall from Station 103+40 to 106+80. Upon further evaluation, there may be many attributes that could cause considerable construction difficulties. The soil types behind the wall consist of elastic silts and plastic clays. It may be likely that adequate capacity could not be obtained for creep verification. It could also result in a long term loss of capacity for the tiebacks resulting in wall failure. Preliminary analysis has resulted in extremely long bonded lengths for the tiebacks, indicating potential problems associated with the unsuitable earth materials behind the wall.

Construction Considerations

Any alternative chosen may have to take into account the anticipated seismic forces that could occur at the site.

With respect to the options presented, the surface water drainage in this area will need to be mitigated such that water is not allowed to flow over the face of the slope. Adequate drainage will need to be provided behind the retaining structure(s) to prevent inundation of water into the soils, potentially causing failure.

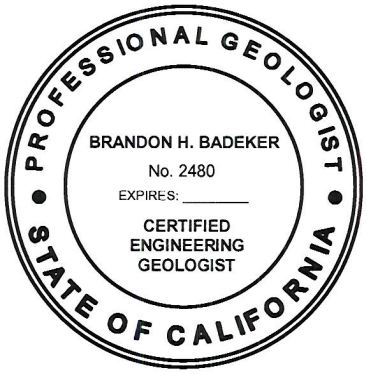
Pertinent Reports and Investigations

The following presents a list of references used in preparation of this report.

- Jennings, C.W. and Strand, R.G., Geologic Map of California: Ukiah sheet: California Division of Mines and Geology, 1960.
- Alquist-Priolo Special Studies Zones Map of the Willits SE Quadrangle, California Division of Mines and Geology, 1983.
- *As-Built Plans to correct slide and repair slope, Contract No. 01-195944, dated August 16, 1982.*
- *Project Plans for Construction on State Highway, Contract No. 01-86604, dated August 16, 1982.*
- Foundation Report, Bridge No. 10-0128R/L, Caltrans, 2006.

It is anticipated that once an alternative is chosen, the Office of Geotechnical Design North (OGDN) should be consulted for additional geotechnical design parameters.

If you have any questions or comments, please call Brandon Badeker at (916) 227-1046 or John Huang at (916) 227-1037.



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Attachments:
Figures 1, 2, 3 and 4

c: RBibbens (E-copy)
JHuang (E-copy)
GDN File