FOR CONTRACT NO.: 01-4722014

INFORMATION HANDOUT

MATERIALS INFORMATION

FOUNDATION REPORT

UNDERGROUND CLASSIFICATION

ROUTE: 01-HUM-96-3.0,7.4/7.6

State of California
Department of Transportation

Business, Transportation and Housing Agency

Memorandum

Flex your power!
Be energy efficient!

To: **GUDMUND SETBERG**
Design Branch 2
Office of Bridge Design North

Attn: Nghia Nguyen

Date: May 3, 2010

File: 01-HUM-96 PM 3.0
EA: 01-472201
Bridge No. 04E0027

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
OFFICE OF GEOTECHNICAL DESIGN – NORTH
BRANCH B - EUREKA

Subject: Foundation Report

This report contains foundation recommendations for the proposed cantilevered soldier-pile wall at 01-HUM-96 PM 3.0 (Figure 1). During the winter of 2005-2006, a shallow debris slide occurred adjacent to the northbound lane (Figures 2-3). The attached plan map (Figure 4) shows the approximate limits of the debris slide.

District 01 plans to restore the shoulder by constructing a cantilevered solder-pile wall with a see-through concrete barrier. The plan map (Figure 4) shows the 61-foot-long wall layout line. The maximum wall height is about 10.5 feet to the base of lagging (see critical cross section, Figure 5). The lower 2 feet of the wall will be buried below design grade. Within the wall limits, the northbound shoulder will be 4 feet wide.

Geotechnical Scope of Work

Geotechnical investigations included the review of maps and reports, field assessments of the site, and drilling to characterize subsurface materials beneath the roadway. Three exploratory borings were drilled to depths of 40-65 feet (locations shown on plan map, Figure 4). A slotted PVC pipe was installed in boring R-09-003 to monitor the elevation of the groundwater surface.

Pertinent Reports and Investigations

California Department of Transportation, 1997, California Foundation Manual: Engineering Service Center, Division of Structures Caltrans Office of Structure Construction, see Appendix A – Foundation Investigations

California Department of Transportation, 2003, Corrosion Guidelines, Version 1.0: Materials Engineering and Testing Services, Corrosion Technology Branch, 47 p.

California Department of Transportation, 2004, Bridge Design Specifications, Retaining Walls: Page 5-18, Equations 5.5.5.3-1 and 5.5.5.3-2.

California Department of Transportation, 2008, CT Flex, Version 2.2.4, Release Date 3/7/2008: Caltrans Office of Earthquake Engineering.

Fraticelli, L.A., Albers, J.P., Irwin, W.P., and Blake, M.C., Jr., 1987, Geologic map of the Redding 1 x 2 degree quadrangle, Shasta, Tehama, Humboldt, and Trinity counties, California: U.S. Geological Survey Open-File Report 87-257, 1:250,000.

Department of the Navy, Naval Facilities Engineering Command, 1986, NAVFAC Design Manual DM-7.2 (Page 7.2-4).

Samtani, N.C., and Nowatzki, E.A., 2006, Soils and foundations reference manual: National Highway Institute, Federal Highway Administration, FHWA-NHI-06-089, 2 Volumes.

Wylie, D.C., and Mah, C.W., 2004, Rock Slope Engineering, Civil and Mining, 4th Edition: New York, NY, Spon Press, 431 pages.

Wylie, D.C., 1999, Foundations on Rock, Second Edition: London and New York, E & FN SPON, 401 pages.

Young, J.C., 1978, Geology of the Willow Creek quadrangle, Humboldt and Trinity Counties, California: California Division of Mines and Geology Map Sheet 31, 1:62,500, Department of Conservation.

Site Geology

The site is west of the Trinity River on the outside of a meander bend (Figure 6) where rock and soil are being eroded below the northbound lane by fluvial and hillslope processes. Bedrock consists of metasedimentary rock referred to by Young (1978) as "semischist" of the Late Jurassic Galice Formation. Figure 7 is a geologic map.

Subsurface Conditions

We encountered three layers of material beneath the roadway:

- Layer 1: 9-28 feet of colluvium including silty gravel with sand (GM) that contains subangular to subrounded gravel fragments (11.6-26 feet thick at WLOL as projected from borings);

- Layer 2: 12-23 feet of very intensely fractured Galice Formation, which is decomposed to silty sand and silty sand with gravel (SM) with angular gravel-sized fragments of bedrock (6-20.6 feet thick at WLOL as projected from borings);

- Layer 3: slightly weathered to fresh, moderately hard, very intensely to intensely fractured metasedimentary rock (and minor amounts of metavolcanic rock) of the Galice Formation.

Table 1 shows information from the three borings. Figure 5 is a critical cross section showing the depths of layer boundaries and groundwater at station 15+65. The layer boundaries were projected from the borings to the profile along the WLOL (Figure 8)

Boring ID Number	Surface Elevation (ft)	Depth (ft)	Depth to 'Decomposed Bedrock' (ft)	Depth to Bedrock (ft)	GWS Elevation (ft)
R-09-001	451.5	65	24	32	Not Measured
R-09-002	450.4	50	9.5	30	Not Measured
R-09-003	450.3	40	15	26	441.4

Table 1. – Depth to layer boundaries and elevation of groundwater in borings.

Locations of particle size analyses and corrosion tests (ph and resistivity) performed on core samples are noted in the Log of Test Borings.

Groundwater

On March 16, 2009, Caltrans staff measured the water level at 8.9 feet below the surface of the southbound lane (boring R-09-003). This measurement was projected to a depth of 17 feet below the WLOL (430 feet in elevation). This elevation will be above pile-tip elevations.

Foundation Recommendations

Table 3 shows properties of the subsurface materials used to model the proposed wall. The silty sand and silty sand with gravel of Layer 2 was subdivided due to the geometry of the slope below the wall. The coefficient of passive earth pressure (Kp) for the colluvium (Layer 1) and upper portion of decomposed rock (Layer 2a) were reduced using Figure 5.5.5.4-2 of the Bridge Design Specifications to reflect the sloping ground condition of –32 degrees from bottom of lagging of the proposed wall.

Table 3. – Unit thicknesses, material properties, and estimated values of Ka and Kp.

Layer	Depth at WLOL (ft)	Unit Weight [a] (γ)	Internal Angle of Friction [a] (ϕ)	Cohesion (c)	Ka	Kp
1	0-16.5	*130 pcf*	*33°*	*0 psf*	*0.295*	*0.682*[b]
2a	16.5-24	*130 pcf*	*34°*	*0 psf*	*0.283*	*0.688*[b]
2b	24-33	*130 pcf*	*34°*	*0 psf*	*0.283*	*5.43*
3	33-NA	*145 pcf*	*35°*	*1,500 psf*	*0.271*	*5.74*

[a] Unit weights and friction angles for Layers 1 and 2 were derived from a combination of corrected SPT N_{60} values (California Department of Transportation, 1997; Samtani and Nowatzki, 2006), study of core samples, angles of existing slopes, and references.
[b] Coefficient of passive earth pressure (Kp) was reduced using Figure 5.5.5.4-2 of the Bridge Design Specifications to reflect the slope of –32 degrees from bottom of lagging of the proposed wall.

We recommend piles be drilled 5 feet into Layer 3. The upper boundary of Layer 3 is shown in Figures 5 and 8.

We recommend permeable material as backfill behind the wall to prevent the build-up of hydrostatic pressure and to slow the breakdown of the treated lagging wood. Further, we recommend that shims be placed between timber lagging. Drainage should be directed away from the slope below the wall to prevent unnecessary acceleration of downslope erosion.

Corrosion Potential

Three core samples of decomposed bedrock (Layer 2) were analyzed for ph and resistivity. The material is non-corrosive according to the Department's corrosion guidelines (California Department of Transportation, 2003, Corrosion Guidelines).

Construction Considerations

Caving conditions may be encountered during drilling for the piles, due to the granular nature of the colluvium and decomposed rock and the intensely fractured nature of the rock. Groundwater may be encountered during drilling and contribute to caving conditions. Temporary casing, drilling under slurry, or placement of slurry cement backfill or concrete and redrilling may be required to control caving and should be performed in conformance with the provisions in Section 49-4.03 "Drilled Holes," of the Standard Specifications.

Note groundwater will be above the elevation of pile tips and may be encountered in the pile holes. Pile installations may require dewatering or placement of concrete and grout under water. If water is present and the holes are not dewatered, it will be necessary to displace water and to place concrete and grout at the bottom of the holes by means of a closed system using a concrete pump or tremie tube in conformance with the provisions in Section 51-1.10 "Concrete Deposited Under Water" of the Standard Specifications.

The buried water-supply line must be protected during construction or relocated before construction. Its approximate location is shown on Figure 4.

If you have any questions or require further assistance please contact Dawn McGuire at 707 441-3994 or Charlie Narwold at 707 445-6036.

Report by:

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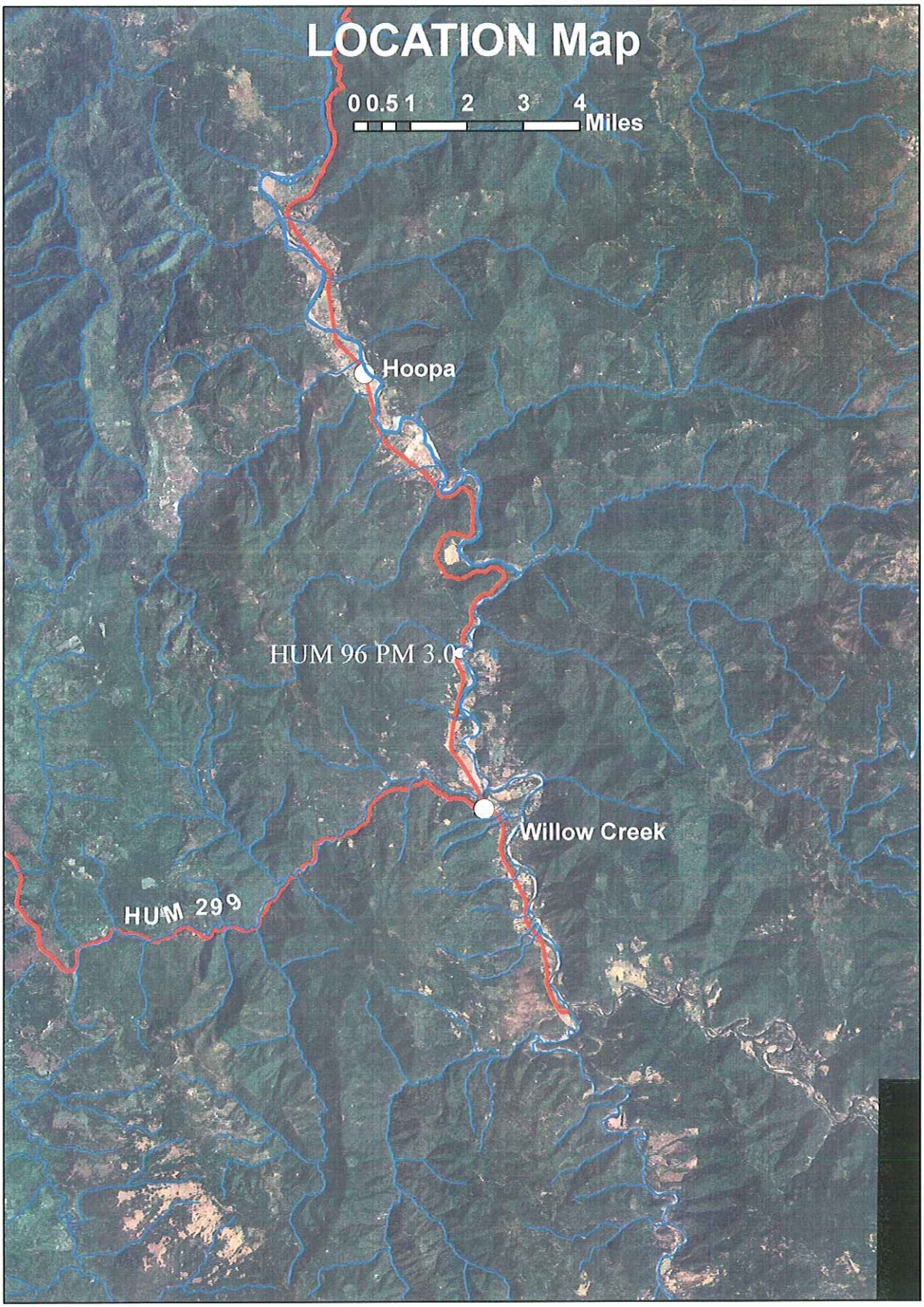
Attachments:
c: OGDN Project File

Figure 1. - Location map for HUM 96 PM 3.0



VIEW SOUTH

Blue line shows water line.

FIGURE 2

VIEW NORTH

Blue line shows water line.

FIGURE 3

FIGURE 5

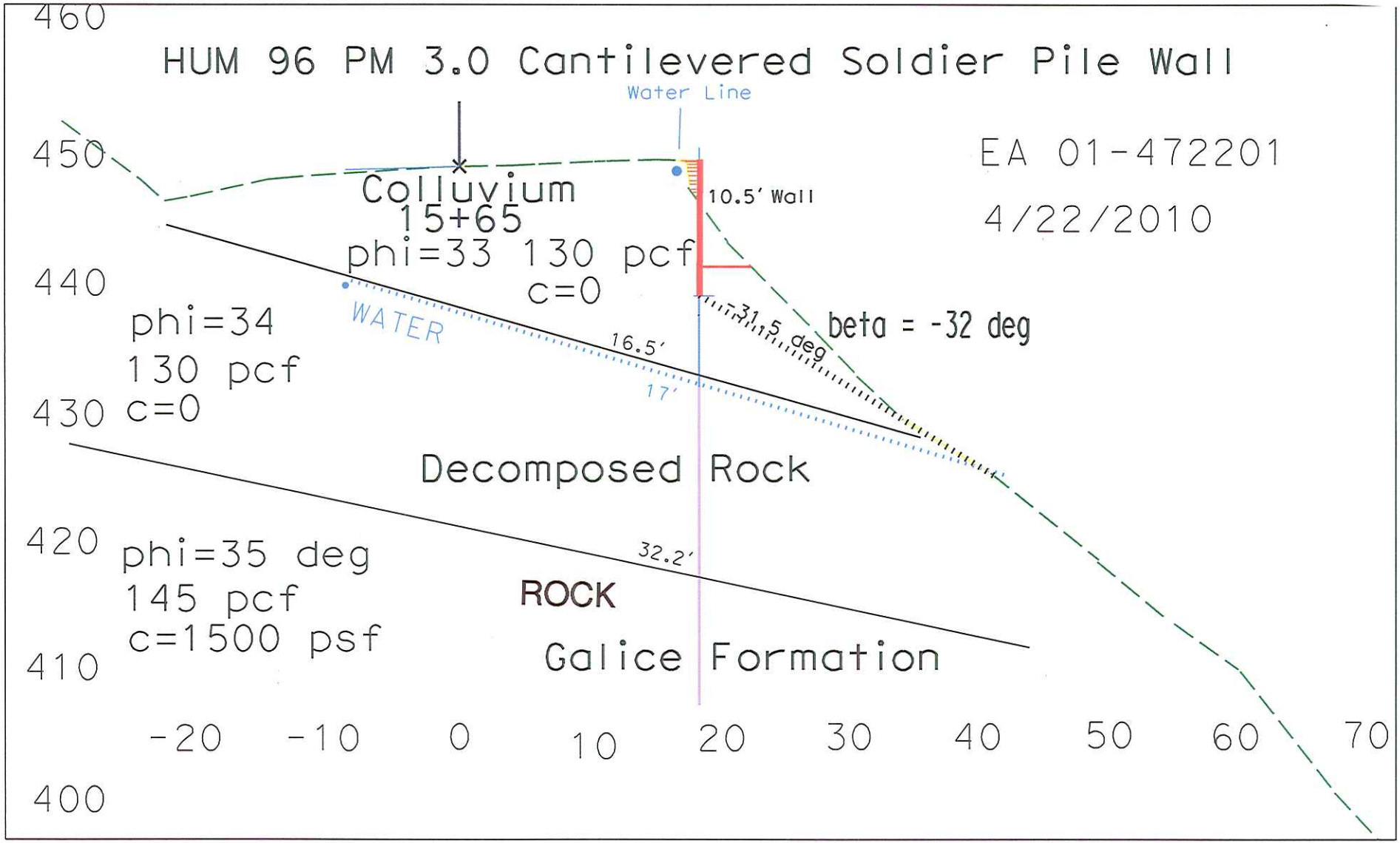


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Figure 6. Location of HUM 96 PM 3.0 on meander in Trinity River.

Figure 7. - Geologic map, HUM 96 PM 3.0. Unit (J) in green includes the Galice Formation.

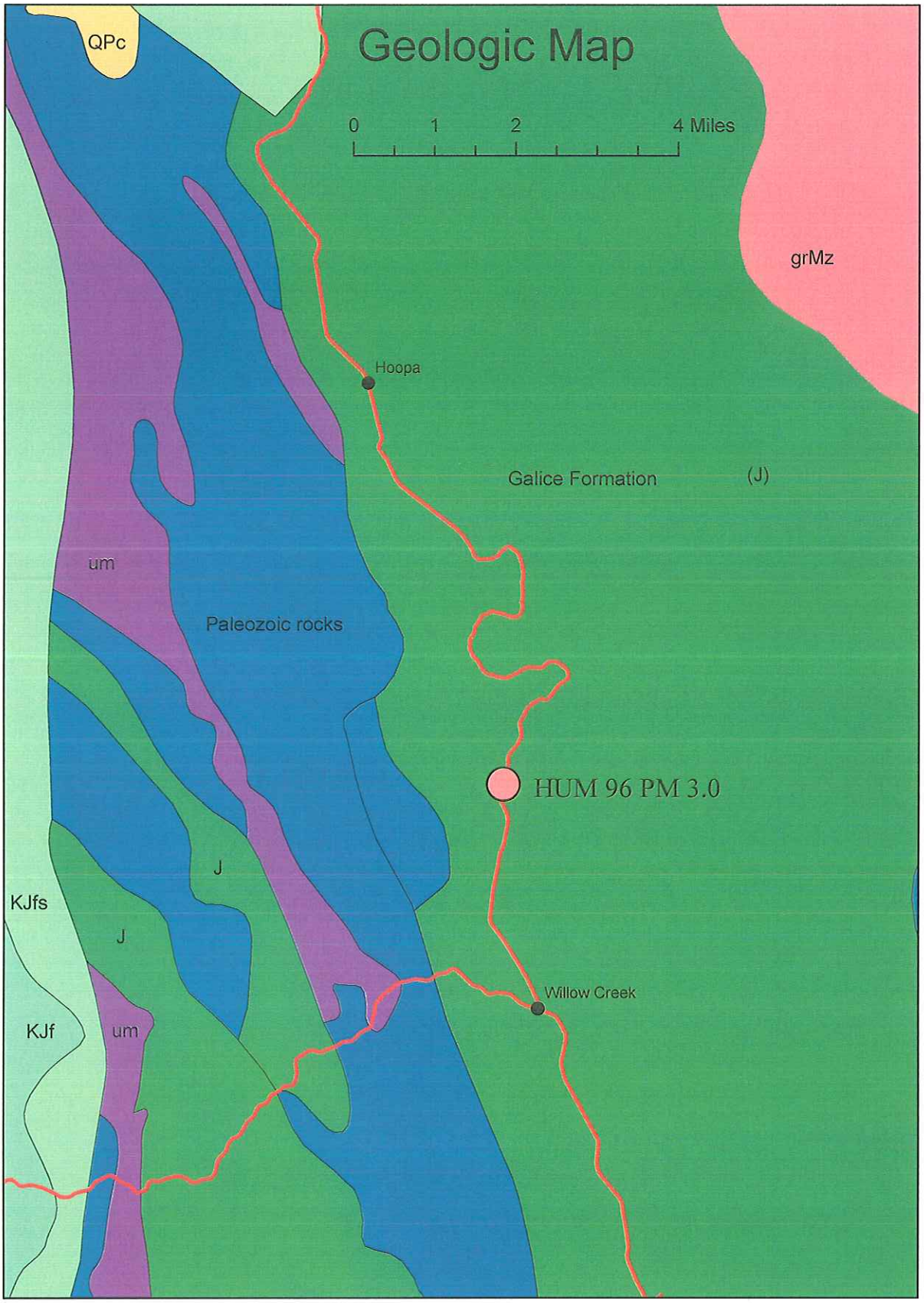
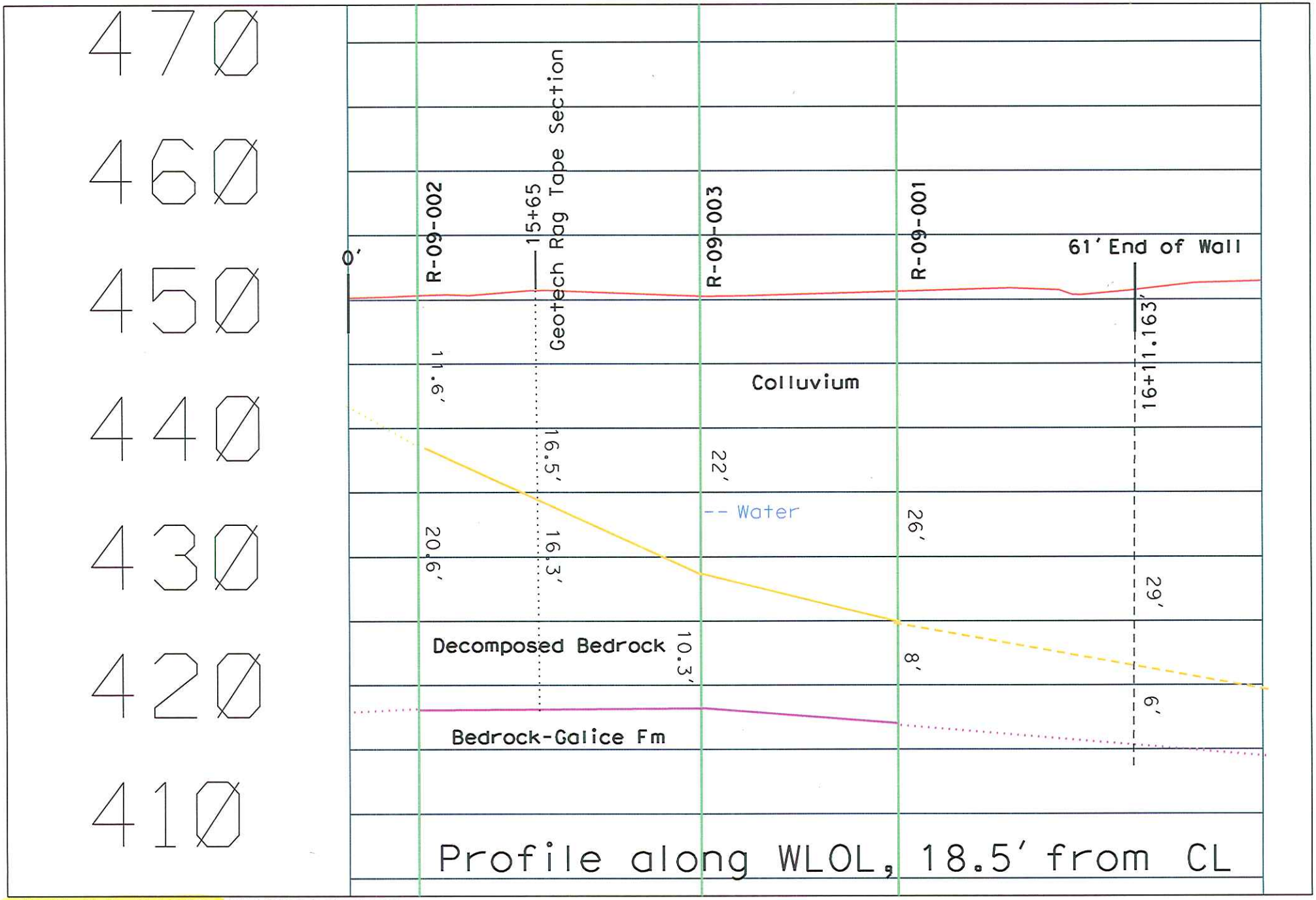


FIGURE 8



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STATE OF CALIFORNIA ARNOLD SCHWARZENEGGER, Governor

DEPARTMENT OF INDUSTRIAL RELATIONS
DIVISION OF OCCUPATIONAL SAFETY AND HEALTH
MINING AND TUNNELING UNIT
2211 Park Towne Circle, Suite 2
Sacramento, California 95825

Telephone (916) 574-2540
FAX (916) 574-2542

July 13, 2010

Department of Transportation
PO Box 496073
Redding, CA 95901

Attention: Apolinario Vivit (via e-mail)
Subject: Underground Classification No.: C012-023-11T

Soldier Pile Wall – Route 96 – Humboldt County

Apolinario Vivit:

The information provided to this office relative to the above project has been reviewed. On the basis of this analysis, Underground Classification of "Potentially Gassy with Special Conditions" has been assigned to the shafts identified on your submittal. Please retain the original Classification for your records and deliver a true and correct copy of the Classification to the shaft contractor(s) for posting at the job site.

When the contractor who will be performing the work is selected, please advise them to notify this office to determine if a mandated Prejob Conference with the Division is required prior to commencing any activity associated with drilling of the shafts.

Should you have another bore under construction that is not required to have an Underground Classification (i.e.: less than 30 inches in diameter), please contact the Mining and Tunneling Unit prior to any employee entry of such a space.

If you have any questions on this subject, please contact this office at your earliest convenience.

Sincerely,

John R. Leahy
Senior Engineer

cc: Jerry Snapp
File

State of California

Department of Industrial Relations

DIVISION OF OCCUPATIONAL SAFETY AND HEALTH
MINING AND TUNNELING UNIT

Underground Classification

C012-023-11T

DEPARTMENT OF TRANSPORTATION

(NAME OF TUNNEL OR MINE AND COMPANY NAME)

of PO Box 496073, Redding CA 95901

(MAILING ADDRESS)

at SOLDIER PILE WALL – ROUTE 96 – HUMBOLDT COUNTY

(LOCATION)

has been classified as *** POTENTIALLY GASSY with Special Conditions***

(CLASSIFICATION)

as required by the California Labor Code Section 7955.

The Division shall be notified if sufficient quantities of flammable gas or vapors have been encountered underground. Classifications are based on the California Labor Code Part 9, Tunnel Safety Orders and Mine Safety Orders.

SPECIAL CONDITIONS

1. A Certified Gas Tester shall perform pre-entry and continuous monitoring of the underground environment to measure Oxygen and detect explosive, flammable, and toxic gasses whenever an employee is working in the underground environment.
2. Mechanical ventilation shall provide for continuous exhaust of fumes and air at any time an employee is working in the underground environment. The primary ventilation fans must be located outside of the underground environment and shall be reversible by a single switch near the fan location.
3. The Division shall be notified immediately if any **Flammable Gas** or **Petroleum Vapor** exceeds 5% of the Lower Explosive Limit.
4. All utilities that may be in conflict with the project shall be identified and physically located (potholed) prior to the start of project operations.

The eleven 30-inch diameter by 40 feet deep drilled shafts located on the east side of Route 96, approximately 3.0 miles north of the intersection of Route 96 and Route 299, Willow Creek, Humboldt County.

This classification shall be conspicuously posted at the place of employment.

Date July 13, 2010

(SENIOR ENGINEER)

John R. Leahy

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