

MEMORANDUM

DEPARTMENT OF HIGHWAYS

4201 East Arkansas Ave.
Denver, Colorado 80222



*High Mast Lights
W/ and E/ portals
of tunnel, S/ side*

IR 70-3(112)
E. of Idaho Springs
to Jct. U.S. 6
High Mast Lights

DATE: MAY 23, 1983
TO: STAFF BRIDGE DESIGN BRANCH
FROM: STAFF MATERIALS BRANCH
SUBJECT: FINAL FOUNDATION REPORT - HIGH MAST LIGHTS
EAST OF IDAHO SPRINGS

The proposed high mast lights will improve lighting conditions at the east and west approaches of I-70 at the twin tunnels located east of Idaho Springs.

Drilling commenced at the proposed sites on May 9, 1983 with three test holes being drilled.

Foundation design and subsurface geological conditions were discussed with Mr. Joe Audino on May 16, and May 18, 1983.

Geology:

Surrounding topography consists of mountainous terrain. Subsurface materials consist of scattered small boulders and cobbles intermixed with a sandy gravel fill ranging from 2.5 feet thick at the east location to 13.0 feet thick at the west location. Underlying the fill is a very hard bedrock of granite and gneiss. A water table elevation was not established at the time of drilling, but is thought to be at or near the sandy gravel/bedrock contact.

Recommendations:

Subsurface materials are similar at both locations with depth to bedrock being the only variable. It is recommended that the lights at the West Portal, where bedrock is approximately 13 feet down, be mounted on a caisson foundation and the lights at the East Portal, where bedrock is approximately 2.5 feet down, be mounted on a spread footing anchored in bedrock by grouted rock bolts.

West Portal High Mast Light - Station 171+70

The existing 37.5 foot mast appears to be mounted on a spread footing foundation embedded in sandy gravel fill. At the time of drilling, it was observed that the structure appeared to be tilting 2-3 degrees from the vertical. According to Maintenance

Staff Bridge Design Branch

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personnel, a sign post located adjacent to the light pole also showed signs of settlement and eventually was relocated because of this problem.

Test holes drilled in this area during the summer of 1981 revealed what could be interpreted as small void pockets within the fill. The void pockets, if present in sufficient numbers, could contribute to long term settlement problems. It is, therefore, recommended that the caisson be drilled to bedrock.

An allowable bearing in excess of 12.0 TSF can be achieved by drilling the proposed 48 inch diameter caisson to Elevation 7372.0.

Caisson dimensions and lateral pressure should be calculated by Bridge Design using the parameters given below:

<u>Soil Type</u>	<u>Thickness</u>	<u>Unit Weight</u>	<u>Phi</u>	<u>Cohesion</u>
Sandy gravel	13.0 ft.	128 PCF	37	0.0 Psi

East Portal High Mast Light - Station 181+66

At this location, bedrock is overlain by approximately 2.5 feet of sandy gravel. It is recommended that this bank of high mast lights be mounted on a spread footing foundation subexcavated to bedrock. To prevent overturning, the spread footing should be securely anchored to bedrock by a series of grouted number 10 rock bolts. Core analysis indicates that the bedrock tends to break along fractures parallel to its bedding planes, which at this location are tilted 45 degrees or greater. The rock bolts should be drilled into bedrock with sufficient depth to prevent any possible future loosening due to the less than favorable bedding plane orientation. It is recommended that the rock bolts be drilled a minimum of 4 feet into bedrock and that a pull test be conducted on one of the bolts to ensure that adequate bonding has taken place between the bedrock and bolt.

S. C. Tapp
Staff Materials Engineer

by: E. P. Belknap
E. P. Belknap
Geologist B

EPB/lb

cc: McOllough-Peterson
Yowell
FHWA via Bridge Design
Gilmore ✓

FOUNDATION BORING LOG

Top Hole Elev. 7386.1 Geologist Belknap Station 171 + 72 45' Rt. CL Boring No. 1

Elev.	Depth	Description of Material	BPF*	Remarks
7386.1	0.0 - 9.0	Gravelly sand to sandy gravel; brown w/variable colors, easy drilling; good circulation; probably fill		4" cas. 3 5/8 tri/water;
81.1	5.0 - 6.5	As above	4-11-4 (1a) 15	
77.1	9.0 - 9.5	Boulder		
76.6	9.5 -10.0	Gravelly sand; loose to soft		
76.1	10.0-12.0	Boulder; granitic, v. weathered, disintegrated		
76.1	10.0-11.5	As above	20-43 .-50/.5 (1b) 93	
74.1	12.0-13.0	Gravelly sand; brown, mostly sand		
73.1	13.0-25.0	Granite bedrock; black-grey w/white, fractures, v. hard		
70.1	16.0-20.5	As above	(1c) NX	Rec. 100% RQD 37%
65.6	20.5-25.0	As above	NX	Rec. 100% RQD 66%
7361.1	25.0-	T.D.		

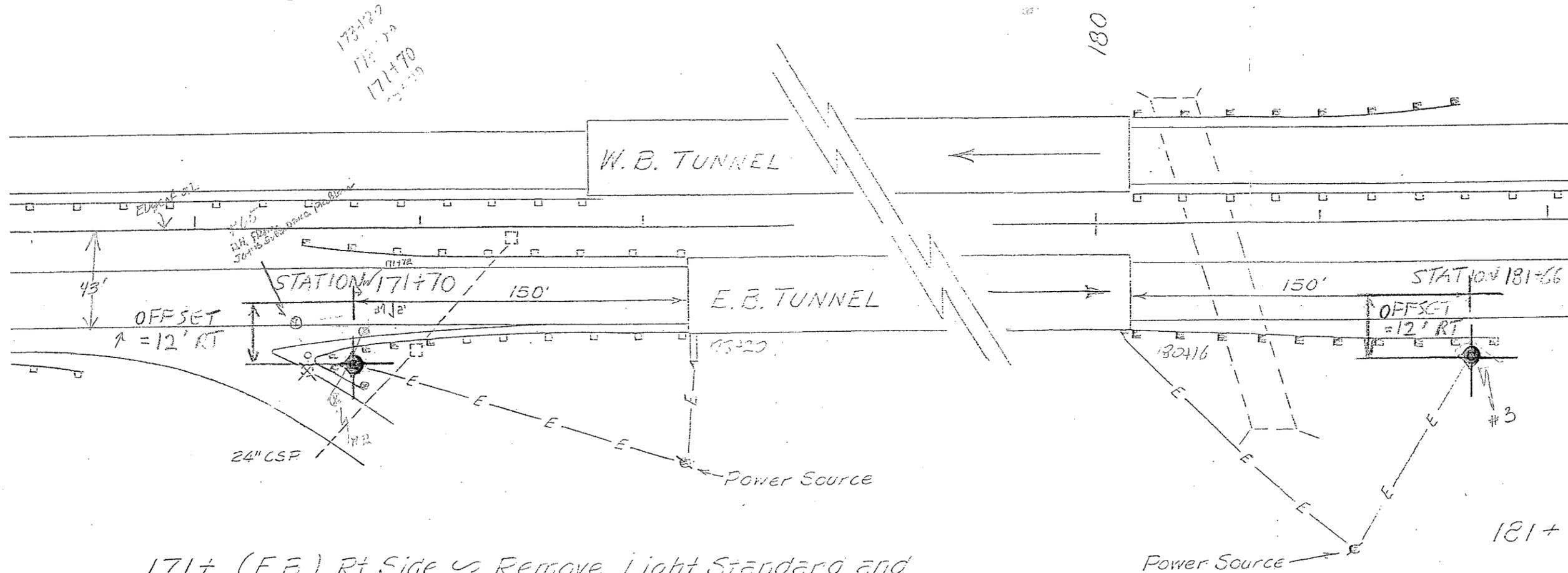
Standard Penetration Test (AASHTO T 206-74)

Water level upon completion _____ Elev. _____ Date _____ Time _____
 Water level (24 hrs.) 15.0' Elev. 7371.1 Date 5-10 Time 8:00 AM

FOR TUNNEL APPROACHES

171+ (E.E.) Lt. Side \hookrightarrow Remove Type I End Anchorage. Replace with 37.5' Type 3 Guard Rail and Type 3E End Anchorage.

180+ (W.E.) Rt. Side End Anchorage. Re. Type 3E End Anchorage



171+ (E.E.) Rt. Side \hookrightarrow Remove Light Standard and Type I End Anchorage. Replace with High Mast Light Standard, 37.5' Type 3 Guard Rail and Type 3F End Anchorage modified to fit around High Mast Light.

180+ (E.E.) Rt. Side with Type 3D End H