Susitna Joint Venture
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0025

Watana
Top of Rock Contours

Task 6

830309

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lation Cover Sheet

PROJECT No. P5700.06

FILE No. P5700-14.06.09

SERIAL No. 0025

HYDRO ELECTRIC PROJECT

ALASKA POWER AUTHORITY

DEPARTMENT C

CALCULATIONS FOR: A.

ORIGINAL BY L. DUNCAN & N.BOWS DATE 2 / Sept / 81
#28 Sept 81.

CHECKED BY DATE / /

REV No.	BY	DATE	CHECKED	DATE
Superceded top-of-rock map		/ /		/ /
1 See 1980-81 Geotech Report		/ /		/ /
2 See 1982 Supplement		/ /		/ /
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CRITERIA - LED 2 PAGES.
REVISED (RETYPED) 2 PAGES
MEMO TO R. IBBOTSON 5 PAGES
9 PAGES TOTAL.

TOP OF ROCK MAP SUPERCEDED SEE ABOVE

APPROVED BY

PROFESSIONAL ENGINEERS SEAL

ORIGINAL COPIES PLACED IN MAIN FILE ON CLOSURE OF PROJECT

BY

DATE 2/28/83

TOTAL No. OF SHEETS 14 W/COVER

60.04.01 Form 146 A

1) Order of quality of data:
   1) drill holes;
   2) mapped outcrops;
   3) seismic lines;
   4) inferred geologic features;
   5) topographic expressions.

The above data was applied to the topography of the base maps. Interpretations were made, where data could be extrapolated, to construct top-of-rock contours. Using borehole plots and outcrops, segments were constructed to show general 100 ft contours. Using seismic line data, extensions were then made. Final connection of contours was made by comparing the inferred geology (shear zones, sound rock areas) with local topography at nearby known locations. The results were contours drawn from known bedrock locations to adjacent spots, assuming:

1) virtually all outcrops have been located;
2) areas of no observed outcrop have deeper overburden;
3) shear zones will have deeper erosion, hence deeper overburden;
4) topographic "swales" and "guts" except where bedrock is exposed have deeper overburden that adjacent "knobs" and "ridges".

Application of these assumptions was modified in four cases:

1) Left abutment, upstream of axis, gut that passes south through DH-25. Because of the depth of glaciofluvial or till material encountered in the hole and because of observed deep alluvial and boulder deposits at the break in slope, the topographic feature was inferred to be an infilled gully.

2) Left abutment downstream of dam, vicinity of plunge pool area. Due to observed deep talus material, the topographic basin was inferred to be an eroded gully later filled with talus and till. This interpretation is reasonable in addition because a set of significant shear zones (North South and 300° sets) intersect in the area and would probably have been much more readily eroded.

3) SW-2, north abutment, Because BH-1 encountered rock at the intersection of SW-2 and SL-80-2 at about 19 ft in depth, the 6030 fps zone on SW-2 was inferred to be rock at all points.

4) The river seismic lines run off the ice in the spring of 1981 did not provide good top-of-rock interpretation. The 12,000 and 14,000 fps zones in SL-81-4 and SL-81-5 are probably rock, but to be conservative the assumption is being made at this time that they are talus or frozen alluvium. The resultant bedrock elevation of 1355-1370 ft does compare moderately well with the downstream drillhole elevation of 1380-1400 ft for top of rock. However, Line SL-81-6 does not compare comparably so this line was thrown out and 1360 was taken as assumed bedrock low in the channel. This may very well be some 20 ft on the conservative side but avoids the unjustified assumption that the four boreholes to rock did indeed hit the deepest bedrock elevations.

The first two and fourth deviations mentioned above represent conservative assumptions to preclude introducing major changes in arrangement configuration at a later date should these features be proven to exist. The third case represents a reasonable correction of the seismic line information based on numerous outcrops and the borehole BH-1.

WATANA - TOP OF ROCK CRITERIA

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R.K. Ibbotson — September 21, 1981

→ N. Bond — P5700.14.06.09

Susitna Hydroelectric Project
Watana Dam Foundation-Excavation

This memo sets out the depth of excavation to be used for estimating purposes.

The depths have been largely based on borehole logs (summary attached) with additional information from seismic lines, rock outcrops, photographs, and field observations by geologists.

An appendix is attached giving further criteria used to estimate the elevation of the top of rock in certain areas of the site.

Overburden

The foundation can be divided into two areas:

a) Riverbed

Depth to bedrock in four boreholes in the river ranged from 44 ft to 78 ft. The information available is limited, and for estimating purposes, the average thickness of overburden should be taken as 78 ft, the maximum observed in the boreholes.

b) Abutments

The depths to rock in 12 boreholes ranged from 3.5 ft to .5 ft, averaging 9 ft. However, considering the results of the seismic surveys and the distribution of the boreholes, 15 ft is a more reasonable estimate.

The weighted average over the whole foundation area is 20 ft.

For estimating purposes, it is understood that the volume of overburden material to be removed will be calculated from the "Preliminary Top of Rock Contour Map" September 3, 1981, and topographic maps.

Foundation For Core and Filters

The core and filters shall be founded on sound, competent, unweathered rock. All rock which has weathered to the extent that the rock mass

permeability and compressibility have been adversely affected shall be excavated.

Closely spaced jointing will not itself be a criteria for excavation. If the joints are tight and fresh, then excavation will not be required. Joints which are only stained will not be considered as weathered.

Information from 15 boreholes indicates an average depth of weathered rock of 30 ft with depths ranging from zero to 9 ft (see attached borehole data).

Additional excavation of sound rock may be required to form a regular foundation surface on which the core may be well compacted. There is insufficient information at present to assess the degree of irregularity of the foundation. Observations of rock outcrops suggests the foundation surface will be rugged and trimming will be required.

It is proposed, therefore, that a further 10 ft of rock excavation be allowed to cover this requirement and as a further contingency because of the limited data available.

The total rock excavation depth in the core area should, therefore, be taken as 40 ft for present estimating purposes.

It must be emphasized that this is an average figure, and the actual excavation may vary from 5 ft to 65 ft or more.

Weathered joints and shears may extend under the foundation to considerable depths. In such cases where it is impracticable and/or uneconomic to excavate all weathered and sheared material, these zones will be locally excavated to a shallow depth backfilled with concrete and, if necessary, grouted.

It is expected that after excavation of the weathered rock, the exposed rock foundation will contain jointing which will require consolidation grouting. Provision has been made for consolidation grouting to a depth of 30 ft over the area of the core and filter/rock contact.

Rock Excavation Under the Rockfill Shells

The rockfill shells shall be founded on competent rock. This will require the removal of overburden and rippable rock.

Heavily jointed and fractured rock need not be excavated unless there is a substantial amount of joint in-fill material which could be washed out and cause the rock to become unstable or give rise to settlement of the rock surface.

Steep slopes will be required to be trimmed and a regular rock surface formed for placement of the rockfill.

This excavation under the rockfill shells is expected to total 10 ft average depth over the whole shell foundation area.

N. Bond

NB:ccv

cc: D. Meilhede
Geotech file copy cird: L. Duncan
K. White
R. Gorny
N. Bond
File

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