

**Seismic refraction measurements at
Keilisnes. Proposal**

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The best geophysical method to discover weakness zones in postglacial basaltic lavas, like those at Keilisnes, is determination of P-wave velocity by seismic refraction measurements. This is because the P-wave velocity of basalt is normally lowered by 30-70% in case of weakness zones such as fractures and high scoria content.

There are some possibilities of occurrence of domes of scoria within the postglacial lava at Keilisnes (see accompanying geological cross section). If these scoria domes are of considerable lateral extent they must be strengthened by grouting if a heavy load is to be placed in that area.

There are mainly two methods which could be applied to discover such weakness zones, by boreholes or by seismic refraction measurements. The former is a direct method but it gives only information below a single point while the latter is an indirect method but it gives estimate of the average material properties of considerable volume. In principle it would be best to look for weakness zones by refraction measurements and then locate the boreholes according to the P-wave velocity anomalies.

At least three different seismic layers are likely to be found in the uppermost 30-50 m at Keilisnes in addition to the thin soil layer at the surface. The postglacial lava will most likely appear as two seismic layers, one denotes the part of the postglacial lava formation which is above the water table and the second is the same formation below water table. The third seismic layer is the underlying older and denser Quaternary lava. A possible low velocity zone could occur between the lavas, consisting of sediments and brecciated lavas.

Refraction seismic profiles will give information of the thickness of the two uppermost seismic layers, and the detailed velocity structure of all the three layers.

For high resolution we recommend not less than 120 m long profiles with geophone spacing of 5 m and shot point interval of 20-25 m but 240 m long profiles with 10 m geophone spacing and double shot intervals for obtaining the overall picture. The lateral resolution of the seismic velocity of the uppermost layer is of the order of the geophone spacing while the resolution of the velocity of the underlying layers is similar to the thickness of the overlying material.

For obtaining the overall view of the site we suggest the following method to look for large scale weakness zones and scoria domes in the postglacial basaltic lava at Keilisnes. Run four 960 m long profiles with 10 m geophone spacing across the proposed site of the factory and one 1440 m long perpendicular profile. After the measurements are finished the results are used to locate boreholes or high resolution refraction profiles at critical places.

The total unit price per 120 m profile covering all cost of field work, interpretation and report is 170.000 lkr. If more than 10 profiles are made the price of the remaining profiles is reduced by 15%. The price for 240 m profile with 10 m spacing and 40-50 m shot point intervals will be the same as for 120 m profile. Thus the total price for the 4 times 960 m profile and the 1440 m profile will be 3.434.000 kr.

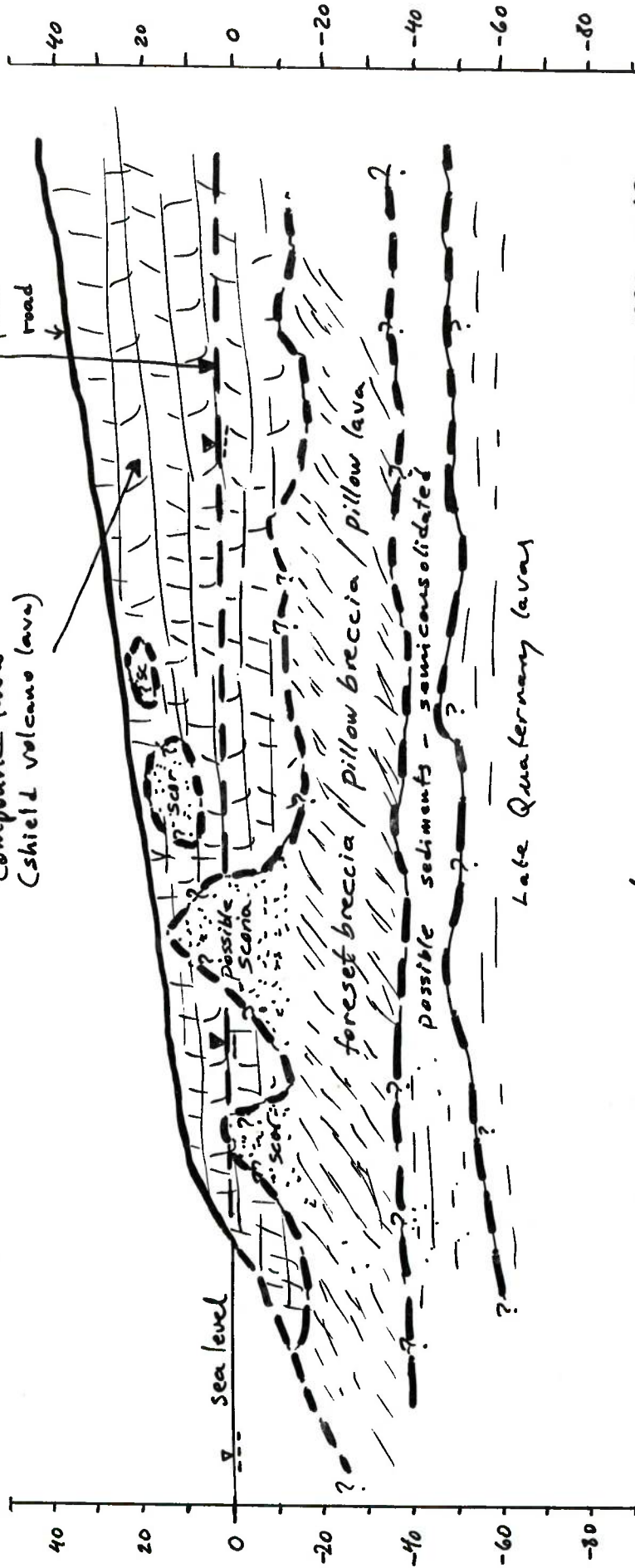
Possible geological section
at Keilisesnes.

Approx. location of
Aluminium smelter

Compound lava
(shield volcano lava)

approximate
ground water table

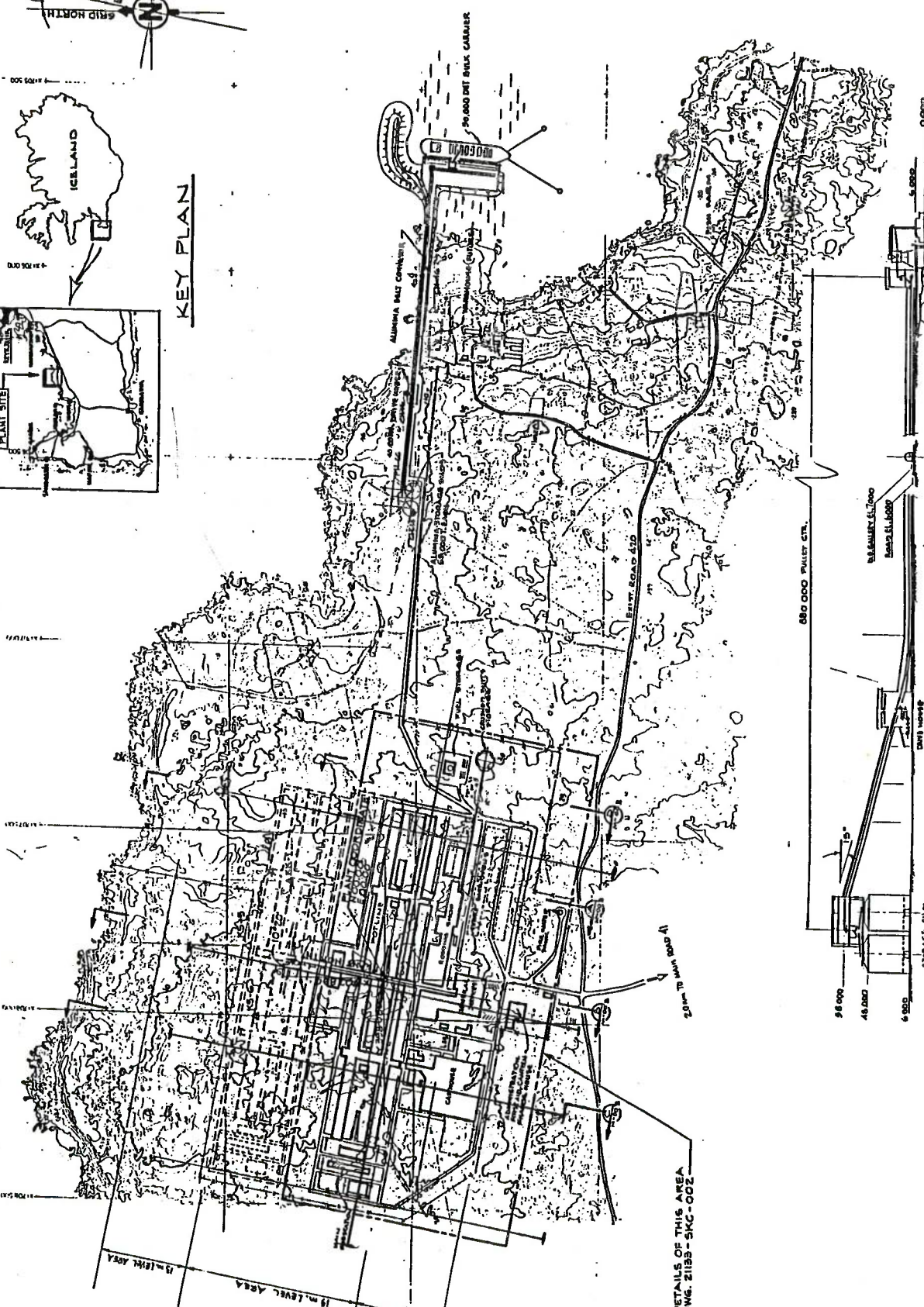
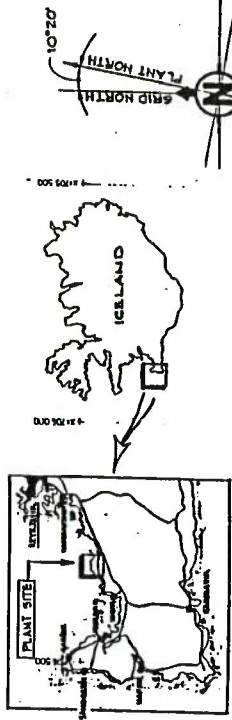
present
road



All contacts are approximate

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NB: If the scoria domes / pseudo craters are present
they could be detected by seismic refraction survey.



1:40000

Bechtel Corporation SAN FRANCISCO		ATLANTAL ALUMINUM SMELTER	
APPROVAL: _____ DATE: _____ SCALE: 1:2000		BORNEO LOCATION PLAN	
PROJECT NUMBER: _____ CONTRACT NO.: _____ PURCH ORDER NO.: _____		DRAWING NO.: 21133-SKC-001 DATE: _____	
REVISIONS: _____ DATE: _____		REFERENCE DRAWINGS: _____	

1. FOR NOTES AND LEGEND, SEE DWG. 21133-SKC-002.