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Geological Assessment of 5.5 Km long Salla Bhatkot-Sukna Salyudi motor road District- Almora.

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1- Introduction- Construction Division, Public Works Department entrusted in construction of 5.5 Km long Salla Bhatkot-Sukna Salyudi motor road District-Almora. On the request of Assistant Engineer, Construction Division, Almora I carried out geological assessment of the above said motor road. Junior Engineer Mr. K. S. Patwal accompanied during the site visit on dated 01/01/2019.

2- Location- The Salla Bhatkot-Sukna Salyudi motor road starts at Km 3.50 of Seraghat-Malli Nali motor road. Sanctioned length of the motor road is 5.0 Km after survey the alignment comes of 550 Km which consists of 9 HP Bend at 0/28-0/30, 1/7-1/9, 1/18-1/20, 2/20-2/22 3/7-3/9, 3/32-3/34, 4/9-4/12, 4/34-4/36 and 4/40-5/2 cross section respectively. The gradient of road cross section wise varies as- 0/0-0/4 1:18R, 0/1-0/3 1:30R, 0/4-0/5 Level, 0/5-0/10 1:18R, 0/10-0/16 1:17R, 0/16-0/28 1:18R 0/28-0/30 1:40R, 0/30-1/7 1:18R, 1/7-1/9 1:40R, 1/9-1/18 1:20R, 1/18-1/20 1:40R, 1/20-1/30 1:18R, 1/30-1/40 1:20R, 1/40-2/10 1:17R, 2/10-2/20 1:20R, 2/20-2/22 1:40R, 2/22-2/32 1:18R, 2/32-2/40 1:20R, 2/40-3/7 1:18R, 3/7-3/9 1:40R, 3/9-3/20 1:18R, 3/20-3/32 1:20R, 3/32-3/34 1:40R, 3/34-4/5 1:18R, 4/5-4/9 1:15R, 4/9-4/12 1:40R, 4/12-4/25 1:20R, 4/25-4/34 1:18R, 4/34-4/36 1:40R, 4/36-4/40 1:18R, 4/40-5/2 1:40R, 5/2-2/8 1:18R, 5/8-5/10 Level, 5/10-5/20 1:20R. The co-ordinates of starting and end points taken from hand held GPS are as follows-

Starting Point
Latitude- 29°41'36.878"N
Longitude- 79°54'46.173"E

End Point
Latitude- 29°38'22.429"N
Longitude- 79°54'14.269"E

3- Geological Assessment- The alignment corridor proposed for the above said motor road lies in part of Kumaun Lesser Himalayan. Geologically the site in question lies in Almora Nappe of Kumaun Lesser Himalaya. Almora Nappe is bounded by South Almora Thrust (SAT) in South and by North Almora Thrust (NAT) in the North. It comprises rocks of Almora Group. Almora Group comprises of two different lithological units which are Biotite Mica Schist, and Micaceous Quartzite of Saryu Formation and Granite-Granodiorite plutonic bodies.

Topography of the area overall is gentle to moderately steep. Area is covered with forest. Some manmade terraces were also observed which are mostly cultivated. Starting portion of the area is much steeper and is mostly covered with forest than the last few

km's which falls on the terraces from where the road will pass. Slope direction varies from place to place. Slope angle varies from 25° - 60° . Hydrological conditions are mainly dry, except in rainy season. There is one prominent nala which will fall across the length of the road. The nala is ephemeral. Water level in the nala is only high during the rainy season. Rock type is Micaceous Quartzite and Schist, quartzite is hard and compact in strength while schist is weak. The strength of the rock is estimated by manual test. Foliation in the schist dips with gentle amount in $N210^{\circ}$. Joints are closely spaced and the opening between the joint planes is close to open up to 1mm. In-between the opening clayey soil is filled. At some places the rock is highly sheared and weathered. High grade of deformation is observed in schist. While in quartzite weathering condition is low to moderate. The soil material has clay content and the matrix is fine to very fine. Largely the rocky strata along this alignment are capped by thin overburden material which varies in thickness from place to place. The soils are good cohesive, dense and hard in dry conditions but these converts into soft clays under the wet/saturated conditions. The joints data observed from schist outcrop at the site is as follows-

Table-1

S.No.	Feature	Dip angle	Azimuth
1	J1	35°	N 250°
2	J2	50°	N 340°
3	J3	45°	N 55°
4	Slope	50°	N 300°

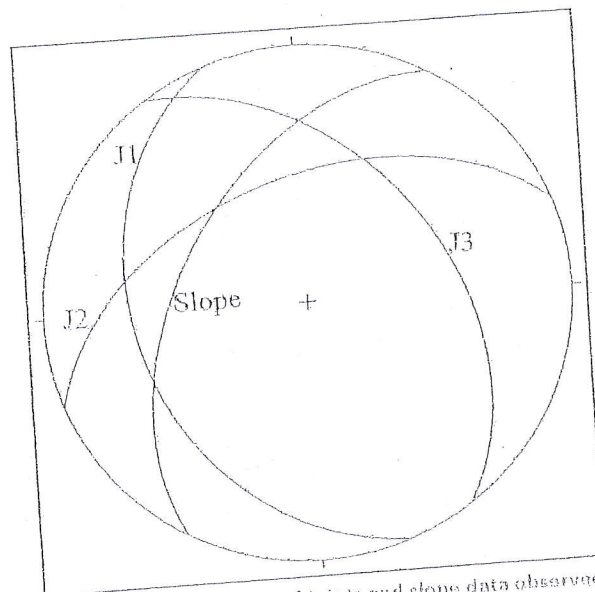


Figure 1 Stereographic projection of joints and slope data observed in Schist.

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From the above stereographic projection Fig 1 it is clear that Joints J1 and J2 are forming a wedge in slope direction thus wedge failure can occur if any joint or tension crack acts as a releasing surface. At the starting point of the road landslide is observed (Fig 3) which consists of mainly debris and crushed rockmass.

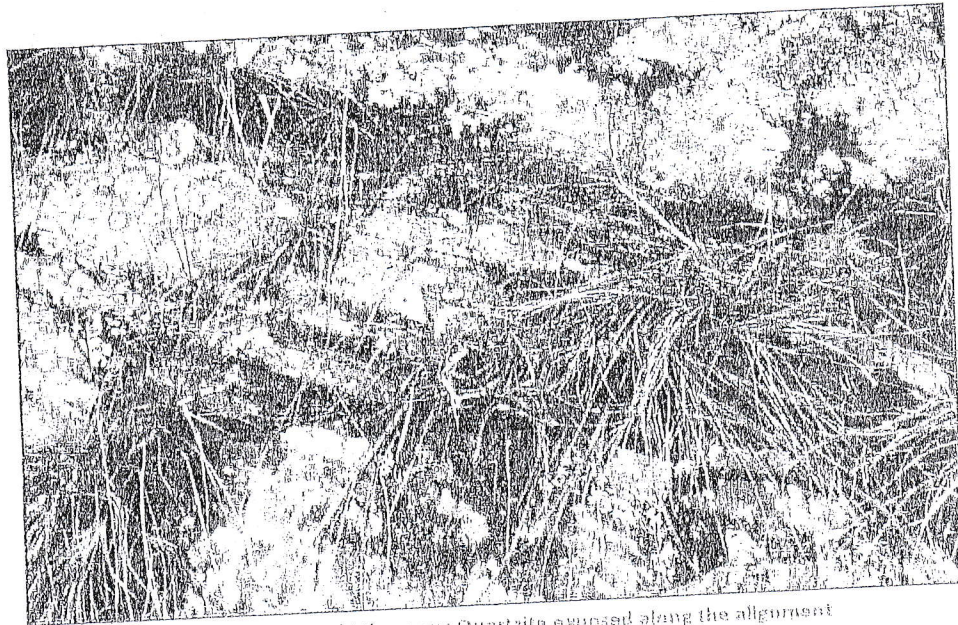


Figure 2 Outcrop of Micaceous Quartzite exposed along the alignment

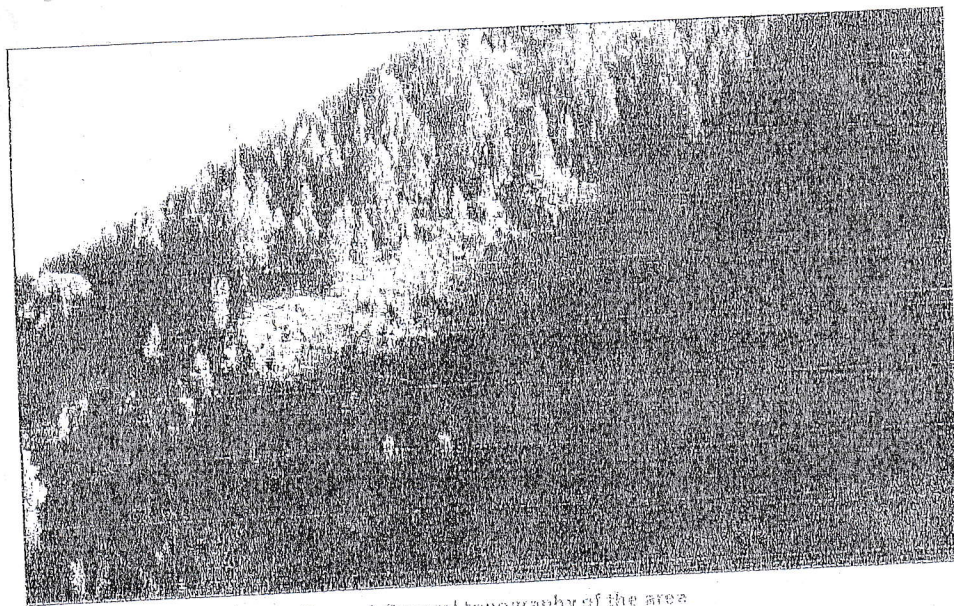


Figure 3 General topography of the area

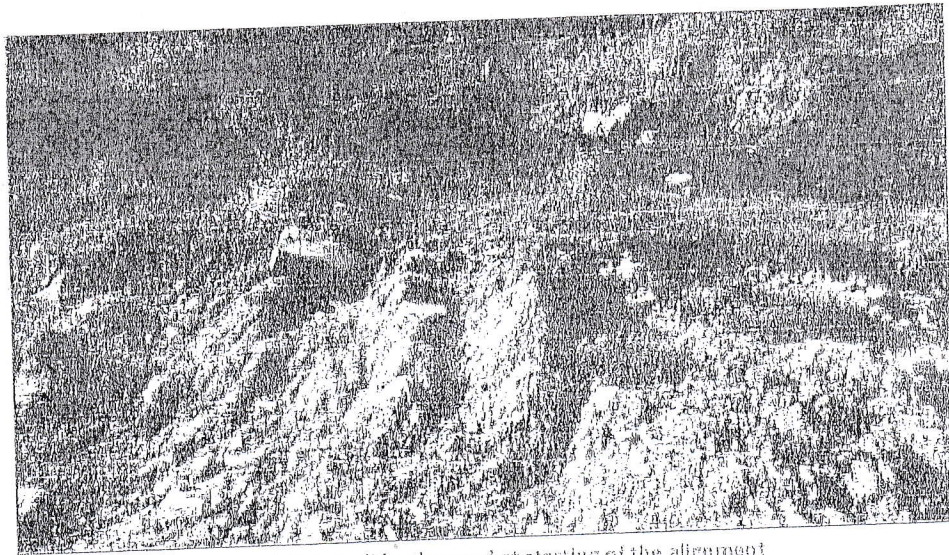


Figure 4 Debris slide observed at starting of the alignment

On the basis of the geological/geotechnical studies carried at the site and the fact mentioned above the following recommendations are being made for the construction of the proposed road, failing to these recommendations this report will be treated as cancelled.

4- Recommendations-

- 1- Do not blast heavily by explosives. It is recommended that the blasting shall be carried out by controlled method i.e. by leaving large volume of dummy holes.
- 2- The entire hill and valley side slope along the whole length of the road must be protected by suitably designed retaining and breast walls. This work should be done simultaneously with the advancement of the road cutting. It is advised to leave sufficient weep holes in the walls; this is so as to facilitate the subsurface drainage.
- 3- Properly designed culvert/bridge/causeway must be constructed over the nala whichever is suitable.
- 4- Construct U shaped lined drain all along the hill side of the road and made adequate cross drainage arrangements. The accumulated rain water from upper reaches of the hill must not allow to flow freely over the road constructed and its lower hill slopes.
- 5- Disposal of muck and excavated waste on the lower slopes of this road is to be strictly avoided. It is advised to dispose the muck on the identified site for muck disposal.
- 6- The portion of the road which passes through the cultivated field where water seepage from the ground is high; RCC should be done.

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- 7- Protection must be given if failure occurs anywhere along the alignment during and post construction.
- 8- All the HP bends must be constructed with standard gradient and protection must be given on the hill side to retain the slope.
- 9- All the construction activities must be carried out as per the prescribed norms and the standard codes of the practice laid by BIS and MORTH.

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ज्ञाये प्रति भवति

सहायक अभियन्ता,
विशेष गण्ड, बा०नि०व०
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