(60)

Geological Assessment of 4.00 Km long motor road from Km 13.900 of Kakdighat-Sitlakhet motor road to Vilage Matila (S.C. Basthi) District- Almora.

Priya Joshi
12.12.2019

1- **Introduction**- Provincial Division, Public Works Department Almora entrusted in construction of 4.00 Km long motor road from Km 14.900 of Kakdighat-Sitlakhet motor road to Vilage Matila (S.C. Basthi) Almora District. On the request of Executive Engineer, Provincial Division, Almora I carried out geological assessment of the above said motor road on dated 29/11/2019. Assistant Engineer Mr. Kamal Goyal and Junior Engineer Mr. Jagdish Prasad accompanied during the site visit.

2- **Location**- The proposed motor road starts from Kakdighat-Sitlakhet motor road Km 13.900. Total length of the road is 4Km. 5 HP bend are proposed all along the road which falls at 0/9-0/11, 0/21-0/23, 1/17-1/19, 2/1-2/3 and at 2/25-2/27 cross section respectively. Gradient of the whole road at each cross section are as follows- 0/0-0/9 1:20R, 0/9-0/11 1:40R, 0/11-0/21 1:20R, 0/21-0/23 1:40R, 0/23-1/17 1:20R, 1/17-1/19 1:40R, 1/19-2/1 1:20R, 2/1-2/3 1:40R, 2/3-2/25 1:20R, 2/25-2/27 1:40R, 2/27-2/40 1:20R, 2/40-3/25 LEVEL, 3/25-3/38 1:30R, 3/38-3/40 LEVEL. The co-ordinates of starting and end points taken from hand held GPS are as follows-

Starting Point	**End Point**
Latitude- 29°35'36.90"N	**Latitude**- 29°35'43.60"N
Longitude- 79°30'46.30"E	**Longitude**- 79°31'06.50"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 mostly barren. Rock type observed on the site is Micaceous Quartzite, and Schist which belongs to Saryu Formation and Gneiss which is of Crystalline Formation. The quartzite is moderately hard and compact in strength while the schist is weak in strength. The strength of the rock is estimated by manual test. Some manmade terraces were also observed near to the villages which are mostly cultivated. Three prominent sets of joints were observed in Quartzite. Joints are closely spaced and the opening between the joint

(61)

planes is close to open up to 1mm. In-between the opening clayey soil is filled. Largely the rocky strata along this alignment are capped by thin overburden material which varies in thickness from place to place. Gneiss outcrop were also observed in starting two kms having phyllitic content. The foliation in the schist dips in 300° direction with gentle amount. The soil material has silty content and the matrix is fine to very fine. The soils are good cohesive, dense and hard in dry conditions but these converts into soft clays under the wet/saturated conditions. Weathering condition is moderate to high in the schist and moderately lower in quartzite. Slope angle varies from 20°-50°. Some ephemeral nala are observed which are mainly monsoonal nalas. Water level in the nala is only high during the rainy season. The joints data observed from quartzite outcrop at the site is as follows-

Table 1

S.No.	Feature	Dip angle	Azimuth
1	Joint J1	55°	N 150°
2	Joint J2	35°	N 210°
3	Joint J3	40°	N 30°
4	Slope	45°	N200°

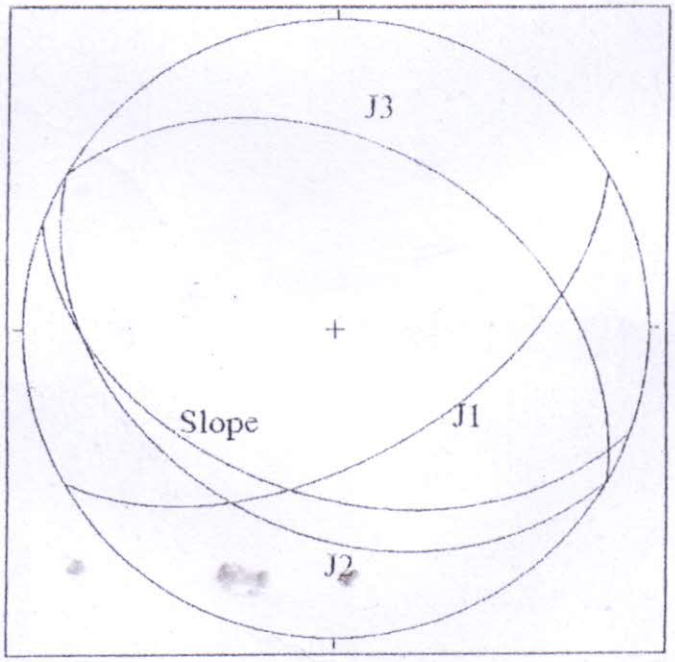

Figure 1: Stereographic projection of joints and slope data recorded from quartzite outcrop

From the above stereographic projections it is clear that planar failure can occur along joint J2 as the joint J2 dips in the slope direction and a wedge is also forming due to

intersection of joints J2 and J1 but does not dips in slope direction. Planar and wedge failure can occur in case if any joint or tension crack acts as a releasing surface

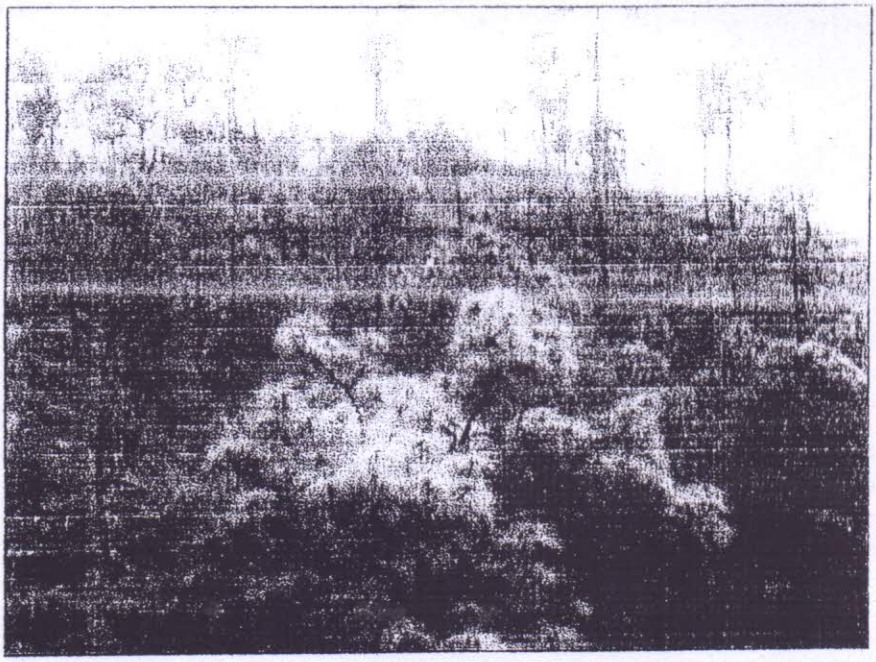

Figure 3 General topography of the area

(15) (12)

(63)

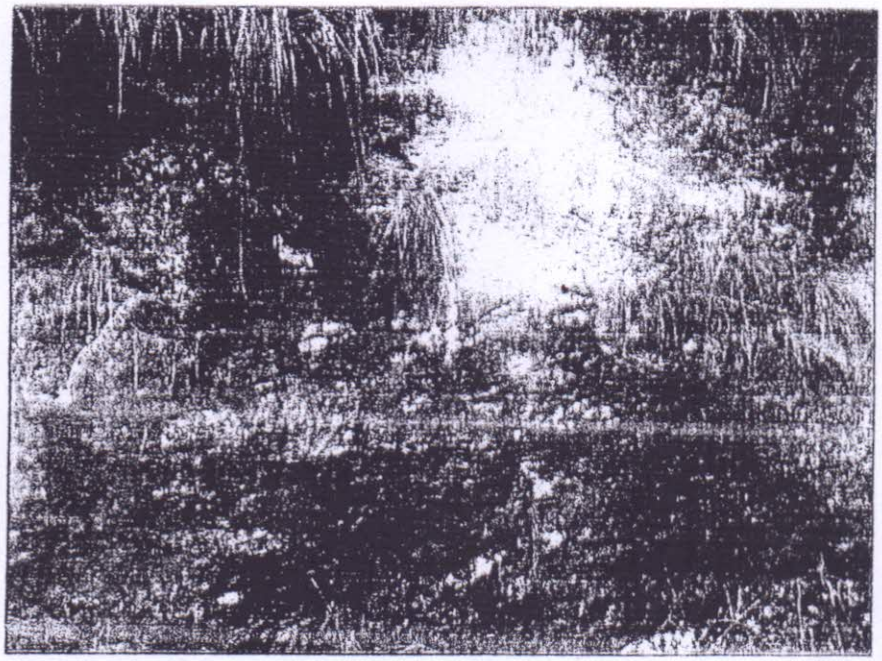

Figure 4 Gneiss outcrop with quartz veins observed at the starting point

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/bridges/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 on its lower hill slopes.

(13) (14)

(64)

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.

7- All the HP bends must be constructed with standard gradient and protection must be given on the hill side to retain the slope.

8- Protection must be given to prevent failure anywhere along the alignment during and post construction.

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.

Letter No: 6216 / 01 स०भू०वै०/19 **Date:** 12/12/2019

12/12/2019

Priya Joshi
(Assistant Geologist)
Chief Engineer Office
PWD, Almora.