

कार्यालय प्रमुख अभियन्ता एवं विभागाध्यक्ष  
उत्तराखण्ड लोक निर्माण विभाग,  
देहरादून।

भू - गर्भीय निरीक्षण आख्या एस0जी0-713/सड़क/पुल समरेखण/ गढ़वाल/2014

**Geological assessment of the alignment  
corridor proposed for Shivpuri-Hadisera  
Jajal Double land motor road, Distt. Tehri  
Garhwal.**

04-फरवरी-2015

# Geological assessment of the alignment corridor proposed for Shivpuri-Hadisera Jajal Double land motor road, Distt. Tehri Garhwal.

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04.02.2015

**1-Introduction:-** The Construction Division, Public works Department, Narendranagar has been entrusted for the construction of 23.00 km long Double lane motor road namely Shivpuri-Hadisera Jajal motor road, under State Sector. On the request made by Er. M.A Khan Executive Engineer, I carried out the geological assessment of the site proposed for the above said bridge on 17.12.2014 in presence of Er. D.M. Tiwari, Asstt. Engineer and Er. Nitin Saini, Jr. Engineer, PWD, Narendranagar.

**2-Location:-** The alignment corridor of this road originates from the hamlet Jajal located on NH-34 and with no HP Bends it ends at Shivpuri located on NH-58 in the premises of Distt. Tehri Garhwal.

In all two alignment i.e No. 1 and No. 2 were referred to the undersigned but considering the various geological, geotechnical, geomorphological and hydrogeological parameters vis-a-vis the geometry of these alignments the alignment no.1 was found suitable as compared to the Alignment no.2. This report is being generated for the alignment no. 1.

**3-Geological Assessment:-** Geologically the alignment corridor of the proposed road falls in the Outer Belt of Garhwal Lesser Himalay and it stretches between the two hamlets namely Jajal and Shivpuri located on the NH. 34 and NH. 58 respectively. This segment containing the alignment corridor is bounded by the Shrinagar Thrust (ST) in the north and the Main Boundary Thrust (MBT) in the south direction. A prominent fault namely Nagni to Shivpuri runs parallel to this alignment and river Heval flows more or less along this tectonic plane. The terrain containing this alignment is characterized by the river vallies bounded by the hill slopes on its either directions. The topography of this stretch is rugged and dissected and a number of small stretches of surficial mass movement activities have also been recorded in this areas. This alignment corridor upto cross section 10/18 passes along the right bank slopes of river Heval and thereafter it goes along the left bank upto its end chainage. The rocks of Damta, Nagthat, Chandpur and Shubatu Formation are exposed in this area which are represented by the quartz, arenites, quartzites, phyllites and shales respectively. The cross slopes of this alignment are inclined at moderate to steep angle and largely these are covered by the thin sheet of overburden material. The rock masses exposed in this area exhibits a wide range of physical competency and these are slight to partially weathered and oxidized in



nature. The quartzites are least altered along this alignment corridor while the shales, slates and phyllites have been partially altered by the physical as well as chemical weathering. According to an investigation carried along the alignment corridor the geotechnical parameters recorded are given the following table.

### Geotechnical Parameters

1	रॉक टाइप (Rock Type)	चाँदपुर फिलाइट्स, नागथात क्वार्टजाइट्स, डोलोमाइट्स, शैल एवं स्लेट्स
2	वेदरिंग ग्रेड (Weathering Grade)	फ्रेश - $(W_0-W_1)$ 10% स्लाइटली वेदर्ड - $(W_1-W_2)$ 80% पार्सियली वेदर्ड - $(W_2-W_3)$ 10%
3	रॉक डिफेक्ट (संधियां) (Joints)	तलिका में वार्णित
4	यूनिअक्सियल कम्प्रेसिव स्ट्रेन्थ (Uniaxial Compressive Strength)	फिलाइट्स- 30 M Pa -50 M Pa तक थिनली फोलिएटेड मैसिव फिलाइट्स- 150 M Pa -200 M Pa तक क्वार्टजाइट्स-50 M Pa -250 M Pa तक डोलोमाइट्स-20 M Pa -150 M Pa तक शैल / स्लेट्स-30 M Pa -100 M Pa तक
5	रॉक क्वालिटी डिस्सिग्नेश (RQD)	फिलाइट्स- 30% -45% क्वार्टजाइट्स-45% -50% डोलोमाइट्स-45% -61% शैल / स्लेट- 22% -30%
6	रॉक मास रेटिंग (RMR)	फिलाइट्स- 21-40 फेयर (poor) क्वार्टजाइट्स-41-60 गुड रॉक (Fair) डोलोमाइट्स-41-60 फेयर (fair) शैल / स्लेट- 0-20 फेयर (Very poor)

It has been observed that the in-situ rocks exposed along the alignment are traversed by four prominent linear discontinuities which exhibits long persistence and widely spaced, at places thickly jointed in nature. All the joint sets are tight and sometimes they are infilled and sealed by the secondary inclusions. The details of these joints are given in the following table.

Table			
S.No	Feature	Dip angle	Azimuth
1	2	3	4
J <sub>1</sub>	(So bedding joint)	25°	N310
J <sub>2</sub>	joint	70°	N070
J <sub>3</sub>	joint	54°	N210
J <sub>4</sub>	joint	80°	N110

River Jajal is a perennial river and its course is wide and narrow below the alignment corridor which indicates that the rock masses at places are highly susceptible for chemical weathering under the influence of water and at places they resist weathering activities. It has been observed that the frequent fluvial terraces along with the river born terraces are formed on the either banks of river Heval and most of the human settlement has been taken place on and around these terraces. In case of the construction of this road these geomorphological features must be taken into the account in order to construct a stable road. The stretches where the river course is wide the rock masses along the alignment is highly friable and soft in physical characteristics excessive excavation of hill slopes in these stretches will lead to the hill slopes instability.

The overburden material deposited on the cross slopes of this alignment is comprised of the angular rock fragments of various sizes embedded in the sandy-silty –clayey matrix. This material is naturally fully compacted and hard and dense in physical characteristics. It has been observed that the stretches having good amount of plastic clays is susceptible for the ductile deformation under the wet/saturated conditions, otherwise in dry state these soils deposited across this alignment corridor are “stiff” and “heavy soils” for all engineering purposes.

By and large the alignment slopes are stable and presently free from any landslide/mass wasting ground subsidence activities.

On the basis of the geological inspection of the site studies carried and the facts given above, the following recommendations are being made for the construction of the proposed road failing to these this report will be automatically treated as cancelled.

#### 4-Recommendations:-

1. Construct the road by half cut and half fill techniques and compact the fill material properly by dynamic compaction.
2. Do not blast the rocks heavily, controlled blasts must be done leaving large volume of dummy holes.



3. The either side slopes of the entire road must be protected by retaining walls/ breast walls, this work shall be carried out simultaneously with the advancement of the road cutting. This is very important for the stability of the hill side slopes.
4. The entire surface of the road from outer edge to inner edge must be sealed immediately after the excavation, this is so as to check the water infiltration into the sub soil, otherwise the slope will fail.
5. Construct extra large lined drain all along the hill side of the road and make adequate cross drainage arrangements. The accumulated rain water run-off from this road and its upslope catchment should not allow to flow freely over the lower hills.
6. Do not dispose the excavated waste on the lower slopes, it will damage the entire down hill slopes and villages located below it.
7. All the construction activity must be carried out as per the standard codes of practice laid by the BIS and MORTH.

**5- Conclusion:-** On the basis of the geological / geotechnical studies carried at the site and with the above recommendations, the site was found geologically suitable for the construction of 23.00 km long Double lane motor road namely Shivpuri-Hadisera Jajal motor road, under State Sector Distt. Tehri Garhwal.

*V. Dangwal*  
4/2/15

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Photocopy  
Attested  
*[Signature]*  
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