


परियोजना का नाम :- प्रधानमंत्री ग्राम सड़क योजना के अर्न्तगत जनपद टिहरी गढ़वाल के विकास खण्ड भिलगंगा में घनसाली घुत्तु मोटर मार्ग के कि०मी० 13.00 से कोठार गांव मोटर मार्ग के वन भूमि हस्तान्तरण प्रस्ताव। लम्बाई 3.6 किमी० स्टेज प्रथम, फ़ैज-~~xviii~~ ~~xix~~

भू-वैज्ञानिक की आख्या

प्रमाणित किया जाता है कि प्रस्तावित परियोजना की भू-वैज्ञानिक की आख्या अग्र पृष्ठों पर संलग्न है।


प्रयोक्ता एजेन्सी
अधिसंसी अभियंता
पी०एम०जी०एस०वाई०-III
लो०नि०वि० टिहरी

**Geological Investigation Report
Road / Bridge Alignment
PMGSY, Irrigation Division 1st, New Tehri (Tehri Garhwal)**

**Geological Assessment of the Alignment Corridor Proposed For –
Construction of Ghansali - Ghuttu Motor Road Km 13 to Kothar
(Stage-1) Motor Road with Two Year PBMC Maintenance
Distt. Tehri Garhwal Uttarakhand.**

2 August. 2018



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**Geological Assessment of the Alignment Corridor Proposed For –
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(Stage-1) Motor Road with Two Year PBMC Maintenance
Distt. Tehri Garhwal Uttarakhand.**

Harish Kainthola
02-08-18

1. Introduction: - The PMGSY, Irrigation Division 1st, New Tehri, Distt.- Tehri Garhwal proposed the construction of 3.600 Km long motor road named Ghansali - Ghuttu Motor Road km 13 to Kothar (Stage-1) Motor Road with two year PBMC Maintenance under PMGSY Project on the request of the Executive Engineer, PMGSY, Irrigation Division 1st, New Tehri, Distt.- Tehri Garhwal. I carried out the geological assessment of the proposed alignment on 02.08.18 in presence of Er. Vikash Pal, Junior Engineer, PMGSY, Irrigation Division 1st, New Tehri, Distt. - Tehri Garhwal.

2. Location: - The Proposed alignment of Ghansali - Ghuttu Motor Road from km 13 to Kothar (Stage-1) Motor Road with two year PBMC Maintenance. Three culverts having 3m, 5m & 15m span are proposed at different location along the alignment. Eight hair pin bend are proposed in this alignment. All hair pin bends proposed on moderate to steep slope. This alignment is passing on both *Nap* and civil land.

3. Geological Assessment: - Rocks of Central Crystallines and Garhwal Group are exposed in this region. The region is occupied mainly by Parana and Proterozoic rocks. The Garhwal Group and Central Crystalline are dominated by metamorphic, igneous and sedimentary rocks. Mainly gneiss, granite, quartz-felspar schist, chlorite schist, quartzite, metabasic schist, limestone, phyllite etc. are found in these groups. The Bhilangna Formation is divided into lower and upper units. The lower unit comprises of low to medium grade metamorphites. These are perphyroblastic biotite streaky gneiss, quartzite, quartzs – felspathic schist, chlorite schist, impermented by medium to high grade metamorphites like garnetiferous quartz schist, biotite schist, graphite schist, carbonaceous phyllite, porphyroblastic gneiss, granulites, marble and amphibolite.

The rock mass exposed along this alignment corridor is traversed by four prominent joints sets and the surfaces of these joints are moderately rough to smooth in nature. As the joints are widely spaced to one another they form very large blocks of dissected rock mass. According to the calculation made along this alignment corridor the Rock Quality Designation (RQD) percentage was found ranging between 70% and 90%. These rock masses are largely extremely strong in physical competence as per the estimation carried out on the exposures of the bed rocks. The “Uniaxial Compressive Strength” of the rocks was found ranging between 160 M Pa to > 240 M Pa which is the maximum limit for estimating the strength of the rock mass at the site by manual means. The rock mass rating values of the rocks was numbered between 70 and 90.



Following lithotectonic unit found in this region.

Tectonic Units	Lothology	
Central Himalayan Crystalline Group	Bhilangana Formation	Ghuttu member: Quartzite schist, carbonaceous phyllite, crystalline limestone.
-----Thayeli Thrust-----		
Deoban Garhwal Group	Ghansali Formation	Quartzite and slate sequence with gritty quartzite and limestone lenses in the upper horizons and basic and granitic intrusive rocks.

The overburden material deposited on and across this alignment slope is naturally dense, fully compacted and non-dispersive in nature. It does not contain any soft or dispersive soils. The alignment corridor and its adjoining slopes do not manifest any signatures of ground deformation i.e. formation of sink/pot holes and slush like ground condition as observed visually. The material exposed along this alignment corridor falls in the class of "Heavy Soils". According to estimation made at the site the "Undrained Shear Strength of this slope forming overburden material was found ranging between 350 K Pa to 500 K Pa. The alignment slope at places are thickly forested and at places altered in the form of stepped like small terraces i.e. cultivated fields. The loose handpicked stone walls constructed on the outer margins of these fields do not exhibits deformations like bulging or subsidence into the ground.

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

The details of the joints noted at the site are given in the following table:-

Table

S. No.	Feature	Dip angle	Azimuth
1	2	3	4
J ₁	(S ₀ Bedding Joint)	20 ⁰ -70 ⁰	N185-N260
J ₂	(Prominent Joint Set)	45 ⁰ -85 ⁰	N280-N355
J ₃	(Prominent Joint Set)	44 ⁰ -88 ⁰	N010-N045
J ₄	Joint	70 ⁰ -85 ⁰	N190-N210

A few more random joints are present in the area. The overburden material exposed along the alignment corridor is comprised of the scanty rock fragments of various shapes and sizes



embedded in the clay- silt matrix. This overburden material is naturally well compacted and dense in nature.

The slope forming overburden materials do not contain any soft/dispersive soils. By and large the alignment slopes are stable and do not bear any signature of mass wasting/land sliding.

On the basis of the geological / geotechnical studies carried at the site and the facts mentioned above the following recommendations are being made for the construction of the proposed road.

4. Recommendation:-

- (i) Construct suitably designed retaining walls / breast wall all along the road; it is essential for the overall stability of the hill slope.
- (ii) Construct large size lined long drain with the adequate cross drainage arrangements.
- (iii) Dispose the drained water on the safe / stable ground. The drainage work must be taken up immediately after the excavation of the hill slopes.
- (iv) The road must be formed shoulder to shoulder paved; this is so to check the water ingress into the sub surface material.
- (v) The excavated bench should not be rendered exposed for long period, the formation of the road must be taken up immediately and it will help to check the erosion of the excavated surface.
- (vi) Do not dispose the excavated waste on the lower slopes; otherwise it will threat the overall stability of the hill slope.
- (vii) Do not blast heavily on the rocks and blasting is restricted near the human settlement / public property. However blasting on rocks by explosives is geologically restricted.
- (viii) Plantation works on the either side slopes will enhance the overall stability of the hill slope.
- (ix) All the construction activity must be carried out as per the standards and norms following the BIS and MORTH codes prescribed for the similar civil construction in Himalayan Zone.

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 3.600 Km long motor road named Ghansali - Ghuttu Motor Road from km 13 to Kothar (Stage-1) Motor Road with two year PBMC Maintenance in District-Tehri Garhwal, Uttarakhand.



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