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Krol Carbonates of the Mussoorie Syncline, Lesser Himalaya,India with reference to Paleoclimate and Geotechnical Study of the Surbhi Landslide

Tewari, V.C.1 and Victoria Z. Bryanne2

1. Wadia Institute of Himalayan Geology (Retired) ,Dehradun-248001, Uttarakhand, India,
vinodt1954@yahoo.co.in

2,Mahadev Residency –III, Anand Vihar.Rajpur Road,Dehradun-248001,Uttarkhand, India

victoriabryanne@gmail.com

The Lesser Himalaya is bounded to the south by the Main Boundary Thrust and to the north by the Main Central Thrust.The two sedimentary basins of the Lesser Himalaya are located in between these thrusts. The older sedimentary belt in the inner part known as Deoban Group and the outer younger belt in contact with Main Boundary Thrust is called Krol Belt.The Krol belt sedimentary rocks of the Lesser Himalaya have been assigned Neoproterozoic (Ediacaran) age on the basis of Ediacaran metazoans, vendotaenids, stromatolites,acritarchs and carbon isotope chemostratigraphy[1,2,3].Krol carbonates were deposited over the Blaini Formation (Blainian), a Neoproterozoic glacial diamictite bed in the Mussoorie syncline. Blaini Formation is a marker bed of the Lesser Himalaya and corresponds to the global glaciation during the Neoproterozoic well known as Snow Ball Earth [1,2,3].The paleoclimate during Neoproterozoic changed from the cooling phase to warming phase and warm water carbonates were deposited globally.The warm water Krol belt carbonates extensively deposited from Solan in the Himachal Himalaya to the Nainital in the Kumaon Himalaya, stretching over a distance of 350 km.The Mussoorie Syncline lies in the central part of the Krol basin. The Krol Formation is characterized mainly by limestone.siltstone,slates and dolomites. The Upper Krol C is predominantly bluish brecciated limestone with ooids and intraclasts, and vuggy fenestral limestone. Stromatolites are well developed in the cherty limestone and the common forms include stratified and columnar types [4].Detailed sedimentological and petrographic studies of the Krol carbonate suggest a shallow marine tidal flat depositional environment of deposition which is also supported by the carbon isotope chemostratigraphy[1,2,3,4].

Landslides are frequently occurring in the Krol C Limestone at Surbhi Resort on Mussoorie- Kempty road since last two decade.Recent geotechnical studies by the present authors [4,5]have suggested that the main cause of the landslide is high intensity rainfall during monsoon.The mitigation suggested for the slope insability focuses on improved drainage on slopes.Retention walls method of mitigation may not be applicable to this region due to high slope angle.Bioengineering (regeneration of the natural vegetation) on the slope is recommended for providing stability for surface erosion processes.Mussoorie – Kempty road is under constant threat of subsidence and increased moisture on the slope from the

ongoing developmental projects , tourism and fast urbanization will have drastic and disasterous effects on subsidence.

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