

## Muck disposal plan for Package I Sikkim

### (NH 717 A &B)

#### Introduction

The proposed National Highway project NH 717 A and NH 717 B is located in the state of Sikkim and West Bengal. The proposed project of National Highway Package - I is 27.123 km long and having 7 meter width. Large quantity of muck to be generated due to the road widening and new alignment construction. This generated muck due to the project activity needs to be dispose in sustainable manner for better environmental management.

#### Quantity of Material to be Excavated

The muck quantity expected to be generated from various project components is given in **Table 1.1**

The total quantity / volume of muck to be dug out or excavated during the construction of various project components is estimated to be **359271.36** cubic meter of muck including 40% swelling factor and utilisation of approximately 56.02 percent of total muck generated. For surface works the utilisation of generated muck is taken for fill option to level the road project.

#### Dumping Site

The identification of muck dumping areas was done in line with the topographic conditions and site specific conditions. Muck to be disposed in 2 predefined sites with 6 meter fill area from ground surface. The muck disposal site has been approved by state forest department. Most of the generated muck will be accommodate in earth fill of cut sections to minimise the cost of transportation and mitigation of dust pollution which may occur during transportation.

**Table 1.1 Quantity estimation for dumping in Identified Areas**

Sr. No.	Project Component	Quantity of Muck generated after utilisation in fill section	Additional quantity of Muck due to 40% of swell factor	Total quantity of muck generated	Capacity of dumping site
1	Package I (NH 717A&B)	256622.4 cub. mt.	Not considered	256622.4 cub. mt.	255960 cub. mt.

The proposed dumping site has been sanctioned 4.2660 Ha at a distance from 200 to 300 meter from project site. The muck that needs disposal would be piled at an angle of 30° at a proposed dumping site in addition to the quantity that would either be widened or newly constructed. This angle was selected keeping in view of the ground situation as the entire slopes are very steep with very little scope of muck to be disposed off at an angle below this. However the slopes would be broken up by creating benches across the slope. This will be done to provide stability to the slopes and also to provide ample space for planting of trees which would further help in holding and consolidating the material stacked at different sites. Efforts will be made to relocate and rehabilitate

the material within short distances from sites of its generation. The options like dumping the muck in stages and allowing it to consolidate/settle through the monsoon, compacting the dumped muck in the process of Dozer movement, zoning the dumping judiciously to ensure the stability of 30° slope under all superimposed conditions will be utilised. Quantity of muck disposal site has been provided in **Table no. 1.2**

**Table 1.2 Quantity of muck to be disposed at muck disposal site**

Muck from project component	Volume of Muck to be disposed	Volume of muck disposal area	Area of Muck disposal site
Total muck after subtracting from utilisation in fill section	256622.4	260226	4.2660 Ha

### Process of dumping

The main objectives of process of muck dumping and restoration of these muck disposal sites are:

- to protect and control soil erosion
- to create greenery in the muck disposal areas
- to improve and develop the sites into recreational sites
- to ensure maximum utilization of muck for the construction purpose
- to develop the muck disposal sites/ dumping yards to blend with the surrounding landscape
- to minimise damages due to the spoilage of muck in the project area.

Suitable retaining walls shall be constructed prior to dumping of muck and terraces would be developed so as to support the muck on vertical slope and for optimum space utilization. Loose muck would be compacted layer-wise. The muck disposal area will be developed in a series of terraces of retention walls. In between the terraces, catch water drains will also be provided. The terraces of the muck disposal area will be ultimately covered with fertile soil and suitable plants will be planted adopting suitable bio-technological measures. In addition, drainage measures and land levelling shall also be required to be made.

The project authorities would ensure that the dumping yards blend with the natural landscape by developing the sites with gentle slopes, bunds, terraced and water ponds, patches of greenery in and around them. These sites can also be developed later as recreational parks and tourist spots with sufficient greenery by planting ornamental plants. The re-vegetation of dumping yards through 'Integrated Biotechnological Approach' would be undertaken. It may be necessary to inoculate the spoil dumps for development of landscape as the soils would be poor in nutrients. This can be developed through culture of microorganism or vermiculture practices at the nurseries developed for this purpose.

All the spoil areas will be developed as per the latest technology of dumping, the impact of rain, the time and angle of soil setting. In addition sprinkling of water may also be resorted to, if required to

avoid or minimize dust pollution. Proper drainage system also has to be provided to ensure unobstructed flow of runoff. Planting with suitable species of trees, shrubs and other biomass will also be initiated.

## **Reclamation measures for stabilization of spoil dumps**

The following engineering and biological measures have been proposed for the development of spoil areas.

### **Engineering measures**

For stacking and dumping material concrete reinforced retaining walls are proposed to be built before the dumping of any material on to the site. The cost of the same has been described in below given sections. In addition catch water drains are also proposed to be built and levelling of soil would also be done after dumping the material on every cycle and simultaneously improving the drainage of the disposal site.

Cost of engineering structures are provided below:

- i) Excavation of soil
- ii) Excavation of Earth Material
- iii) Concrete wall for dump retaining
- iv) Contingencies and work charged establishment
- v) levelling and construction of dump site

### **Biological measures**

In order to stabilise the stacked dumped material vegetation cover would be provided which will hold the dumped material over a period of time. Following steps are envisaged.

- Plantation of suitable tree species and soil binding using bio-fertilizer technology.
- Turfing of the exposed area and improvement of environment with ornamental species.
- Protection with mechanical support
- Social fencing through the mass public awareness.

The work plan formulated for re-vegetation of the dumping sites through "Integrated Biotechnological Approach" is based on following parameters :

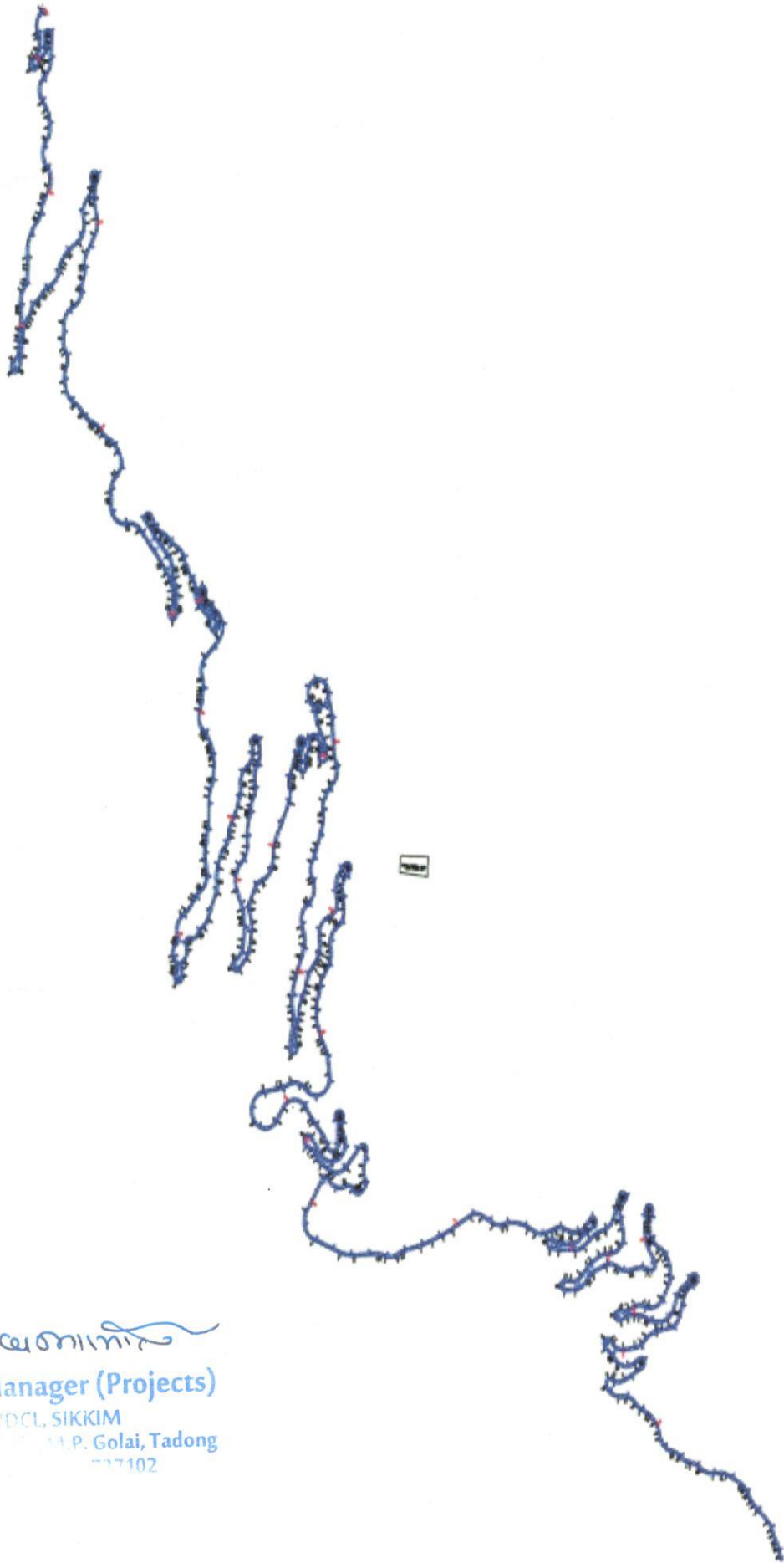
- a) Evaluation of dumped material for their physical and chemical properties to assess the nutrient status to support vegetation.
- b) Formulation of appropriate blends of organic waste and soil to enhance the nutrient status of rhizosphere.
- c) Isolation and screening of specialized strains of mycorrhizal fungi, rhizobium, azotobacter and phosphate solubilizers (biofertilizers inoculum) suitable for the dumped material.
- d) Mass culture of plant specific bio fertilizer and mycorrhizal fungi.



e) Plantation of dumping sites/areas using identified blend and biofertilizer inoculum.

The afforestation with suitable plant species of high ecological and economic value which can adapt to local habitat will be undertaken with 400-600 plants per hectare depending upon the canopy cover required. Major tree species which would be planted are *Acer caesium*, *Betula alnoides*, *Cedrus deodara*, *Populus ciliata*, *Pinus wallichiana*, *Alnus nepalensis*, *Quercus semecarpifolia* and *Salix denticulata*. The shrubs are planted in between the trees are *Cotoneaster microphyllus*, *Desmodium elegans*, *Indigofera heterantha*, *Euphorbia royleana*, *Agave americana*, *Sorbaria tomentosa* and *Wikstroemia canescens*. The herbaceous layer is also helpful for the soil binding it reduces soil erosion due to rain. Herbs and grasses suggested for plantation is *Mentha arvensis*, *Peristrophe speciosa*, *Amaranthus hybridus*, *Lotus corniculatus*, *Eriophorum comosum*, *Carex alpine*, *Trigonella corniculata*, *Salvia moorcrotianna*, *Cynodon sp.*, *Digitaria cruciata*, *Arundo donax*, etc.





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**General Manager (Projects)**

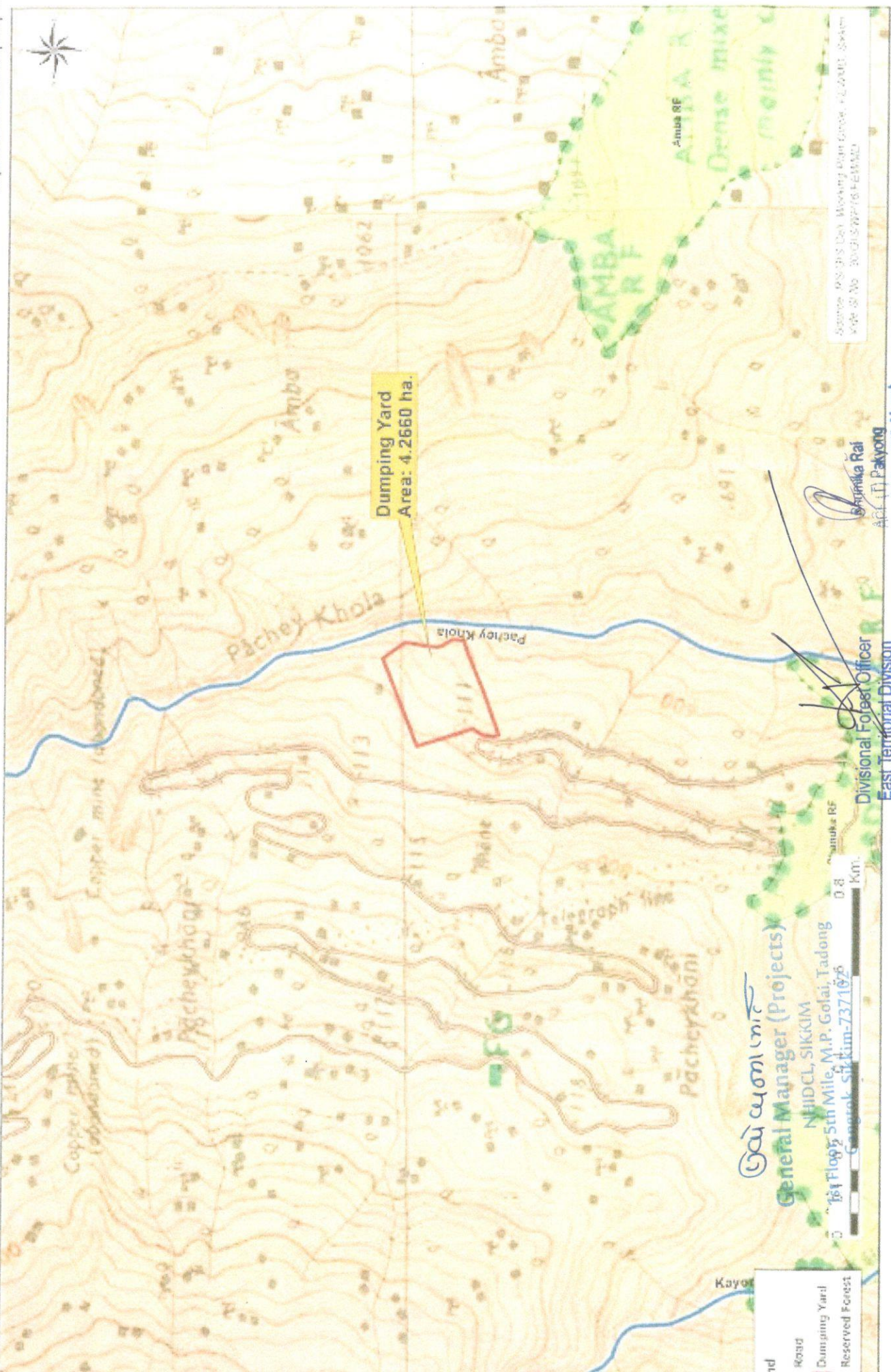
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**MAP SHOWING THE PROPOSED AREA FOR DIVERSION OF 4.2660 HA. FOREST LAND FOR DUMPING BY NHIDCL FOR NH-717"A" RHENOCK TO PAKYONG AT BHARLANG KHAMMAL UNDER PAKYONG RANGE, EAST SIKKIM**

Toposheet No. 78A/12/1



Dumping Yard  
Area: 4.2660 ha.

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