

Project Name: Forest proposal for Approach Road with Avalanches Protection Works from Z-morh Tunnel East Portal to Zojilla Tunnel West Portal in Ganderbal district of Jammu & Kashmir.

Muck Disposal Plan

1. Muck Disposal Plan

Muck disposal for construction of road, tunnels and other components like catch dams, avalanches protection works etc. would be generated. The excavation shall result in large quantity of excavated material i.e. muck which have to be evacuated, disposed off and roller compacted or laid on mild slopes with the excavation work to such designated areas where the muck piles do not substantially interfere with either environment / ecology or the river flow regime and do not cause turbidity impairing the quality of water. The disposal of muck has to be scientifically planned keeping in view the economic aspects necessitating nearness to the muck generating component of work, which understandably reduce the travel time of dumpers, less interference to surface flow and ground water aquifer and disposition of habitation.

Based on the quantities of surface and underground excavation a muck management plan, therefore, has been formulated to manage the disposal of muck and restore such areas from further degradation of the environment. During construction of the project, huge quantities of excavation will be carried out from the tunneling and surface components and shall be dumped in designated areas to provide stable slopes. The quantity of muck to be disposed has been worked out on the basis of 25% swell factor.

2. Quantity of Muck disposal and its reuse

During construction of the various components of the project, muck is generated both from soil or slide material and from rock excavation. Total quantity of muck / debris, generated due to the project, shall be 12,62,926 cum. Out of the total muck generated, 8,95,582 cum shall be utilized on project work leaving 3,67,344 cum to be dumped which shall amount to 4,59,180 with 25% swelling factor. It is proposed to utilize about 71% of the excavated material as construction material for High Embankments, Avalanche Dams, back fill, shotcreting and for construction of various project components. The balance 29% shall have to be disposed off away from sites to make available the site clear. The muck shall be properly roller compacted and dumped on slopes and treated to mix and match with the surrounding environment with least change in landscape. Table-1 indicates for muck disposal quantity below:



Table- 1: Abstract of Muck Generated and its Disposal

| Project Component | Quantity of muck/debris generated (cum) | | Estimated quantity of muck/ debris proposed to be utilized (cum) | | Balance quantity of muck/debris (cum) | | Quantity of muck due to swell factor (cum) | | Name of the dumping site | Capacity of the dumping site (cum) |
|-------------------|---|-----------------|--|-----------------|---------------------------------------|-----------------|--|-----------------|--------------------------|------------------------------------|
| | Rock | Soil | Rock | Soil | Rock | Soil | Rock (25%) | Soil (25%) | | |
| Tunnel | 6,65,532 | 0 | 4,65,872 | 0 | 1,99,660 | 0 | 2,49,575 | 0 | Muck Dumping Site 1 | 1,59,792 |
| Road | 0 | 3,60,044 | 0 | 2,52,030 | 0 | 1,08,014 | 0 | 1,35,017 | Muck Dumping Site 2 | 1,23,656 |
| Cut & Cover | 0 | 2,37,350 | 0 | 1,77,680 | 0 | 59,670 | 0 | 74,588 | Muck Dumping Site 3 | 1,76,820 |
| TOTAL | 6,65,532 | 5,97,394 | 4,65,872 | 4,29,710 | 1,99,660 | 1,67,684 | 2,49,575 | 2,09,605 | | 4,60,268 |

3. Selection of Muck Disposal Site

The selection of muck disposal sites was carried out considering the quantity of the muck, landscape, cost effectiveness, nearness to source of generation, absence of ground and surface water, relief and scope for afforestation works. All the dumping locations shall be well supported at base and at higher elevation by suitable retaining structures. Subsequently all the spoil tips (muck disposal sites) will be developed by taking up plantation through bio-technological methods to generate a thick forest canopy over them. Two (2) muck dumping sites have been identified on forest land matching the criteria. The details of dumping sites along with their total capacity and amount of muck to be disposed are enumerated in **Table 2**.

Table-2: Details of Muck Disposal sites

| S.N. | Name of Dumping Sites | Location of Dumping Site | Area in ha | Capacity in cum | Vol. of muck to be dumped |
|------|-----------------------|---|------------|-----------------|---------------------------|
| 1. | Muck disposal area 1 | Right hand side of project road from km 12+500 to km 12+750 | 3.0914 | 123656 | 459180 |
| 2. | Muck disposal area 2 | Left hand side of the project road from km 13+450 to km 13+850 | 2.947 | 176820 | |
| 3. | Muck disposal area 3* | Proposed Ch. 5+850 to 6+050 (on Left Bank of River Sindh, opposite Fish Pond in Revenue Land) | 2.66 | 1,59,792 | |



*Muck disposal area 3 is on revenue land.

Layout plan of muck disposal sites is given below in Figs.1 & 2.



Fig.1: Location of muck dumping sites falling in Forest area.

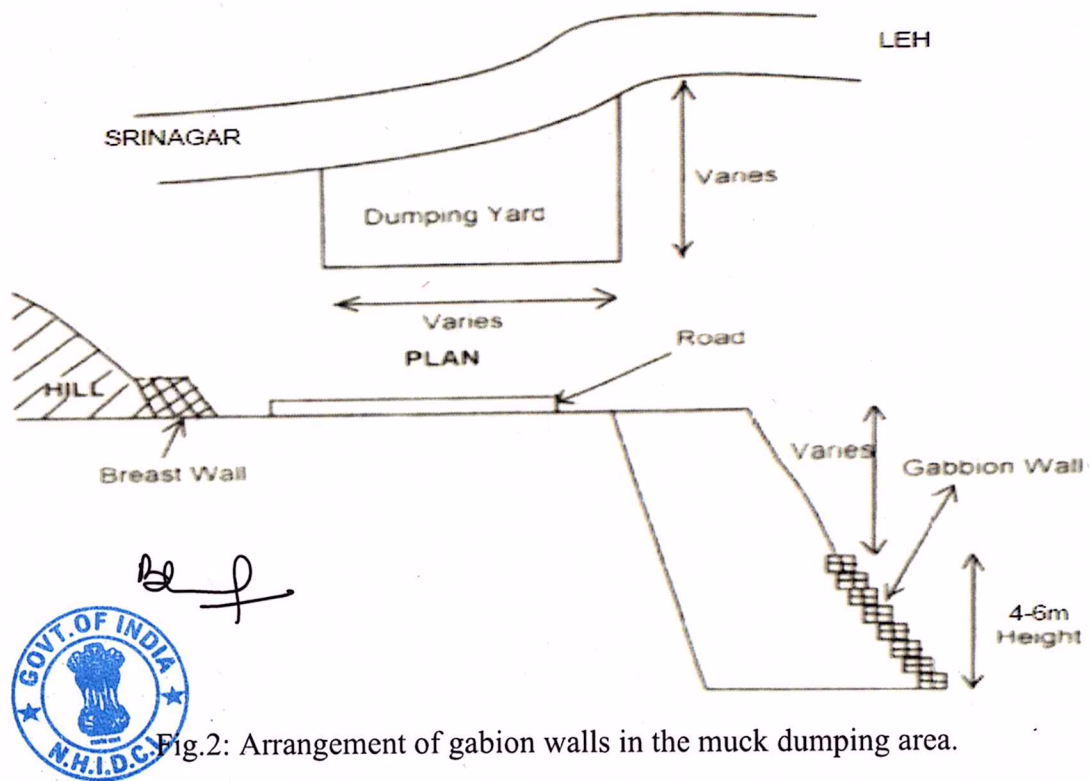


Fig.2: Arrangement of gabion walls in the muck dumping area.

4. Description On Muck Disposal Sites

4.1 Muck Disposal Site 1

The proposed muck disposal site 1 located on Right bank of River Sindh. The Proposed Chainage of the Muck Disposal Site D-1 is 12+500 to 12+750. The plan area of the site is 3.09 ha.

4.2 Muck Disposal Site 2

The proposed muck disposal site 2 is located a on Right bank of River Sindh. The Proposed Chainage of the Muck Disposal Site D-2 is 13+450 to 13+850. The plan area of the site is 2.95 ha.

In total 4,59,180 cum shall be dumped in Muck Disposal Site 1, 2 and 3 and properly roller compacted. After the capacity of any disposal area is exhausted, the top surface would be levelled, graded and provided a gradual slope for efficient drainage. The surface so available would be put to greenery development.

4.3 Muck Disposal Site 3 (at revenue land)

The proposed muck disposal site 3 is located opposite to Fish Pond in Revenue Land on Left Bank of River Sindh. The Proposed Chainage of the Muck Disposal Site D-3 is 5+850 to 6+050. The plan area of the site is 2.66 ha.



Photo-1: Muck disposal area 1

[Handwritten signature]





Photo-2: Muck disposal area 2

5. Implementation of Engineering Measures At Muck Disposal Site

It has been observed that after disposal of muck, it creates problem as it is susceptible to scattering unless the muck disposal yards are supported with engineering measures such as gabions. All the dumping sites need proper handling to avoid spilling of muck into the river water while dumping and in the post dumping stages. All the muck disposal sites have to be developed from the ground level either by providing stone masonry or by gabion structure. The costing of engineering measures has been worked out based on gabion structure. In all the muck dump sites, the muck brought in dumpers shall be dumped and manually spread behind the crates and roller compacted in such a manner that rock mass is properly stacked behind the crates with minimum of voids.

6. Implementation Of Biological Measures At Muck Disposal Site

Biological measures, however, require special efforts as the disposed muck will be devoid of nutrients and soil contents to support vegetation. The selection of soil for spreading over such an area would require nutrient profiling of soil for different base elements. Suitable mixture of nutrients would be done before placing the soil on the top surface of muck disposal areas to have administered growth of forest canopy.

7. Plantation Technique

In view of the peculiar site conditions, particularly the soil conditions, the planting technique for all the categories of the plants has to be very site specific and suited to the stress conditions as anticipated and discussed above. The planting substrates would need to be considerably improved to support the plants in their initial stages of establishment. The moisture retention capability, availability of nutrients and soil aeration, permeability and porosity would require intervention and assistance.

Multi-level and multipurpose plantations are proposed to be raised on the muck dumping sites as also in road side strips using grasses, shrubs and bushes in the under story and trees in the upper story. Nursery raised grass slips, seedlings of shrubs & bushes and tree species would be planted in the area combined with grass sowing in patches. In addition, cuttings of bushes

and shrubs can also be planted to supplement the nursery raised stock but this would substitute requirement of raising the nursery of these species. Intimate mixture of species would be avoided right at the planning stage and would be strictly followed during planting. Grasses would be mixed by groups in rows, shrubs and bushes by group again in rows.

Grass slip planting and grass seed sowing would be done in strips at 0.10 m x 0.10 m spacing in the prepared staggered patches of 1 m x 0.5 m with a depth of 0.30 m. Soil mixture would be used while filling the patches. Shrubs and bushes would be planted in elongated strips of 1.5 m x 0.5 m with a depth of 0.45m. Soil mixture would be used while filling the patches. Each patch would have two rows of planting. Planting of trees would be done in pits of 0.60 m x 0.60 m x 0.60 m size. Soil mixture would be used while filling the pits. Balance dug up soil/ muck will be stacked on downhill side of the pit for trapping the rain water and allowing it to percolate in the pit.

It is proposed to use soil mixture in the pits & patches consisting of soil imported from nearby areas mixed with compost or vermin-compost manually. The ratio for the mix would be 5 parts: Compost/manure 2 parts: Sand 2 part: and humus or vermin-compost 1 part. This will make nutrients available for the plants in the preliminary stages and also help increase soil aeration, porosity & permeability and improved moisture available for the plants.

The stabilization sites from the time of execution of biological measures would be protected with barbed wire fencing on 2m high RCC posts and provided with inspection paths. Since the muck dumping sites are being provided with the wire crate (gabion) wall on the valley side (towards river) which is not negotiable by animals and human beings, fencing would not be required along the entire perimeter. Hence, it would be done on the vulnerable sections i.e. towards the hillside only. The plantations under biological measures would be maintained for a period of 3 years by watering the plantation during dry seasons, mortality replacement and repair of fencing & inspection paths within the area. The task of irrigation would be performed by the watchmen provided in the cost estimate. The proposed costs include raising plants, grass seedlings and also for mortality replacement. Although the sites would be either levelled or finished in a grade, yet due to rain and sliding etc., they tend to develop rills and gulley. As such, while carrying out plantation; suitable soil conservation measures would also be taken.

8. Species For Plantation

Afforestation with suitable plant species of high ecological and economic value and adaptable to local conditions will be undertaken in accordance with canopy cover requirement. Some plant species viz. Fir, Kail, Cuperious, willow, maple, Bazar Bhang, Common mullein, Achnatherum sp, Artemisia etc. have been suggested. The selection of plant species, propagation and cultivation technique would be done in coordination with the state forest department/ local research institute.

9. Budget For Muck Disposal Plan

An estimation has been made for engineering measures of muck disposal plan as **Rs. 242.15 Lakhs** whereas engineering measures as **Rs. 210.63 Lakhs** and biological measures as **Rs. 31.52 Lakhs**. The cost break-up of engineering and biological measures are detailed in **Table 3 and Table 4**.



Table 3: Cost Estimate for Engineering Measures

| S. No. | Name of the work | Quantity | Unit | Rate | Amount (Rs.Lakhs) |
|--|----------------------------|----------|-------|------|----------------------|
| A. Muck Disposal Site – 1 (5850-6050) | | | | | |
| 1 | Gabion Wall construction | 666.32 | m | 6076 | 40.49 |
| 2 | Filling of earth /Top Soil | 26632 | sq. m | 55 | 14.65 |
| 3 | Levelling | 2.66 | ha | 2000 | 0.05 |
| Sub-Total | | | | | 55.19 |
| Contingencies @ 10% | | | | | 5.52 |
| Total (A) | | | | | 60.71 |
| B. Muck Disposal Site – 2 (12500 – 12750) | | | | | |
| 1 | Gabion Wall construction | 747.31 | m | 6076 | 45.41 |
| 2 | Filling of earth /Top Soil | 30914 | sq. m | 55 | 17.00 |
| 3 | Levelling | 3.09 | ha | 2000 | 0.06 |
| Sub-Total | | | | | 62.47 |
| Maintenance Cost @10% | | | | | 6.25 |
| Total (B) | | | | | 68.72 |
| C. Muck Disposal Site – 3 (13450 – 13850) | | | | | |
| 1 | Gabion Wall construction | 947.35 | m | 6076 | 57.56 |
| 2 | Filling of earth /Top Soil | 29470 | sq. m | 55 | 16.21 |
| 3 | Levelling | 2.95 | ha | 2000 | 0.06 |
| Sub-Total | | | | | 73.83 |
| Maintenance Cost @10% | | | | | 7.38 |
| Total (B) | | | | | 81.21 |
| Grand Total T1 = (A + B + C) | | | | | 210.63 |

Table 4: Cost estimate for biological measures

| Sl. No. | Name of the work | Unit | Qty | Rate | Amount (Rs. Lakhs) |
|-------------------------------|--|--------|------|------|-----------------------|
| Muck Disposal Site – 1 | | | | | |
| 1 | Raising of Plantation (Creation Cost) | | | | |
| | Survey/ demarcation/plantation planning/site clearance | Days | 49 | 150 | 0.074 |
| | Pit Digging /Soil working/ Manuring & Planting | Days | 90 | 150 | 0.135 |
| | Seedling cost | Number | 3330 | 8.25 | 0.275 |
| | | | | | 0.483 |
| | Maintenance of Plantation Cost for 3 years | | | | |



| | | | | | |
|-------------------------------|---|-------------|------------|-------------|---------------------|
| 2 | Seedling casualty replacement (2nd year 15% and 3rd Year 10%) | Number | 833 | 8.25 | 0.069 |
| | Tending Operation (1st Year Operation) | | | | |
| | 3 weeding (1 DLS per weeding for 100 plants) | Days | 100 | 150 | 0.150 |
| | Tending Operation (2nd Year Operation) | | | | |
| | 2 weeding (1 DLS per weeding for 100 plants) | Days | 67 | 150 | 0.101 |
| | Tending Operation (3rd Year Operation) | | | | |
| | 1 weeding (1 DLS per weeding for 100 plants) | Days | 33 | 150 | 0.050 |
| | | | | | 0.369 |
| 3 | Fencing Cost | | | | |
| | i) Erection of barbed wire fencing (1.2 m) cost | Meter | 847 | 227.85 | 1.930 |
| | ii) Maintenance of barbed wire fencing @5 % of erection cost for 2nd and 3rd year | | | | 0.193 |
| | | | | | 2.123 |
| S. No. | Name of the work | Unit | Qty | Rate | Amount (Rs.) |
| 4 | Grass carpeting cost for ha | Ha. | 3.0914 | 30000 | 0.927 |
| | Total (1+2+3+4) | | | | 3.902 |
| | Contingency@ 5 % | | | | 0.195 |
| | Grand Total | | | | 5.024 |
| Muck Disposal Site – 2 | | | | | |
| 1 | Raising of Plantation (Creation Cost) | | | | |
| | Survey/ demarcation/plantation planning/site clearance | Days | 35 | 150 | 0.053 |
| | Pit Digging /Soil working/ Manuring & Planting | Days | 50 | 150 | 0.075 |
| | Seedling cost | Number | 2009 | 8.25 | 0.166 |
| | | | | | 0.294 |
| 2 | Maintenance of Plantation Cost for 3 years | | | | |
| | Seedling casualty replacement (2nd year 15% and 3rd Year 10%) | Number | 502 | 8.25 | 0.041 |
| | Tending Operation (1st Year Operation) | | | | |
| | 3 weeding (1 DLS per weeding for 100 plants) | Days | 60 | 150 | 0.090 |
| | Tending Operation (2nd Year Operation) | | | | |
| | 2 weeding (1 DLS per weeding for 100 plants) | Days | 40 | 150 | 0.060 |
| | Tending Operation (3rd Year Operation) | | | | |
| | 1 weeding (1 DLS per weeding for 100 plants) | Days | 20 | 150 | 0.030 |
| | | | | | 0.221 |
| 3 | Fencing Cost | | | | |
| | i) Erection of barbed wire fencing (1.2 m) | Meter | 755 | 227.85 | 1.720 |
| | ii) Maintenance of barbed wire fencing @5 % of erection cost for 2nd and 3rd year | | | | 0.172 |



| | | | | | |
|----------------------------------|--|-------|-------|-------|--------------|
| | | | | | 1.892 |
| 4 | Grass carpeting cost for ha | Ha. | 2.94 | 30000 | 0.882 |
| | Total (1+2+3+4) | | | | 2.948 |
| | Contingency@ 5 % | | | | 0.147 |
| | Grand Total | | | | 2.285 |
| Provision for maintenance | | | | | |
| 1 | Wages for 2 persons for 5 years | Month | 15000 | | 18.00 |
| 2 | Consumables and Tools cost | | | | 6.00 |
| 3 | Miscellaneous expenditure | | | | 2.5 |
| | Total (1+2+3) | | | | 26.5 |
| | Grand Total Cost For Biological Treatment | | | | 31.52 |

Note: biological measures have not taken in cost estimate for muck disposal site on private land.

