

MUCK DISPOSAL AND MANAGEMENT PLAN FOR ROAD UPTO TRT OUTLET ON LEFT BANK KWAR HYDROELECTRIC PROJECT

1.1 INTRODUCTION

The surface excavation for the approach road up to Tail Race Tunnel (TRT) outlet of the project would generate a substantial quantity of muck. The total muck generated by excavation of TRT road is 14000 cum, which is to be used entirely for the filling of the proposed road. Initially the excavated material will be dumped in a designated dumping site scientifically keeping in view the economic aspects necessitating nearness to the muck generating component of the work, which understandably reduce the travel time of dumpers, less interference to surface flow and ground water aquifer and disposition of habitation. The muck disposal will be arranged in a proper manner to avoid any spillage into the river and to minimize damage to air and water environment. Subsequently, the dumping site will be rejuvenated with the help of suitable biological and engineering measures.

1.2 AIMS & OBJECTIVES OF REJUVENATION

The basic aims and objectives of rejuvenating these dumping sites are:

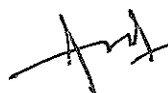
- To utilize the maximum quantity of muck for road construction & slope stabilization.
- To protect the dumping sites from soil erosion.
- To develop the dumping areas into green area, in harmony with the landscape.

1.3 CRITERIA FOR SELECTION OF DUMPING SITE

The following points were considered and followed as guidelines for finalization of the areas to be used as dumping sites:

- i. The dumping sites have been selected as close as possible to the project area to avoid long distance transport of muck.
- ii. The site is free from any landslides or creep and care has been taken that the sites do not have a possibility of toe erosion and slope instability
- iii. There is no active channel or stream flowing through the dumping sites
- iv. The site is away from human settlement areas.

The identification of muck disposal areas was done in line with the topographic and site specific conditions as specified above.



1.4 COMPONENT-WISE GENERATION OF MUCK

Total quantity of muck generated shall be **14000 cum**. The total **14000 cum** excavated material shall be consumed in the construction of road and restoration of slopes. The total 14000 cum excavated muck shall be kept in the dumping sites having 0.8 ha area for handling the material during the construction. Total muck generated needs suitable disposal arrangements, so that the muck does not wash away during run-off and enter in to the river course disturbing the river ecosystem, damaging aquatic lives and filling of reservoir of the downstream projects. The break-up of muck generated is given as under:

- i. Total length of the proposed road = 2.00 Km (2000 mtrs)
- ii. Cutting width of the road = 4.00 mtrs
- iii. Filling of road = 4.00 mtrs
- iv. Carriage way width = 5.00 mtrs
- v. Quantity of cutting = $(0.5 \times 4 \times 3.5) \times 2000 \text{ mtrs} = 14000 \text{ cum}$
- vi. Quantity of filling = $(0.5 \times 4 \times 3.5) \times 2000 \text{ mtrs} = 14000 \text{ cum}$

1.5 DUMPING SITE

The dumping site having a total area of 0.8 ha is located adjoining to the proposed road on lower slope side. The Location Map of the road up to the TRT outlet along with other components of the projects is shown in the Fig 1.1. The total muck generated by construction of the road is expected to be approximately 14000 cum. The total muck generated, approximately 14000 cum is expected to be used for construction of road & slope stabilization. However during the construction of road the muck dumping site is required handling of the muck.

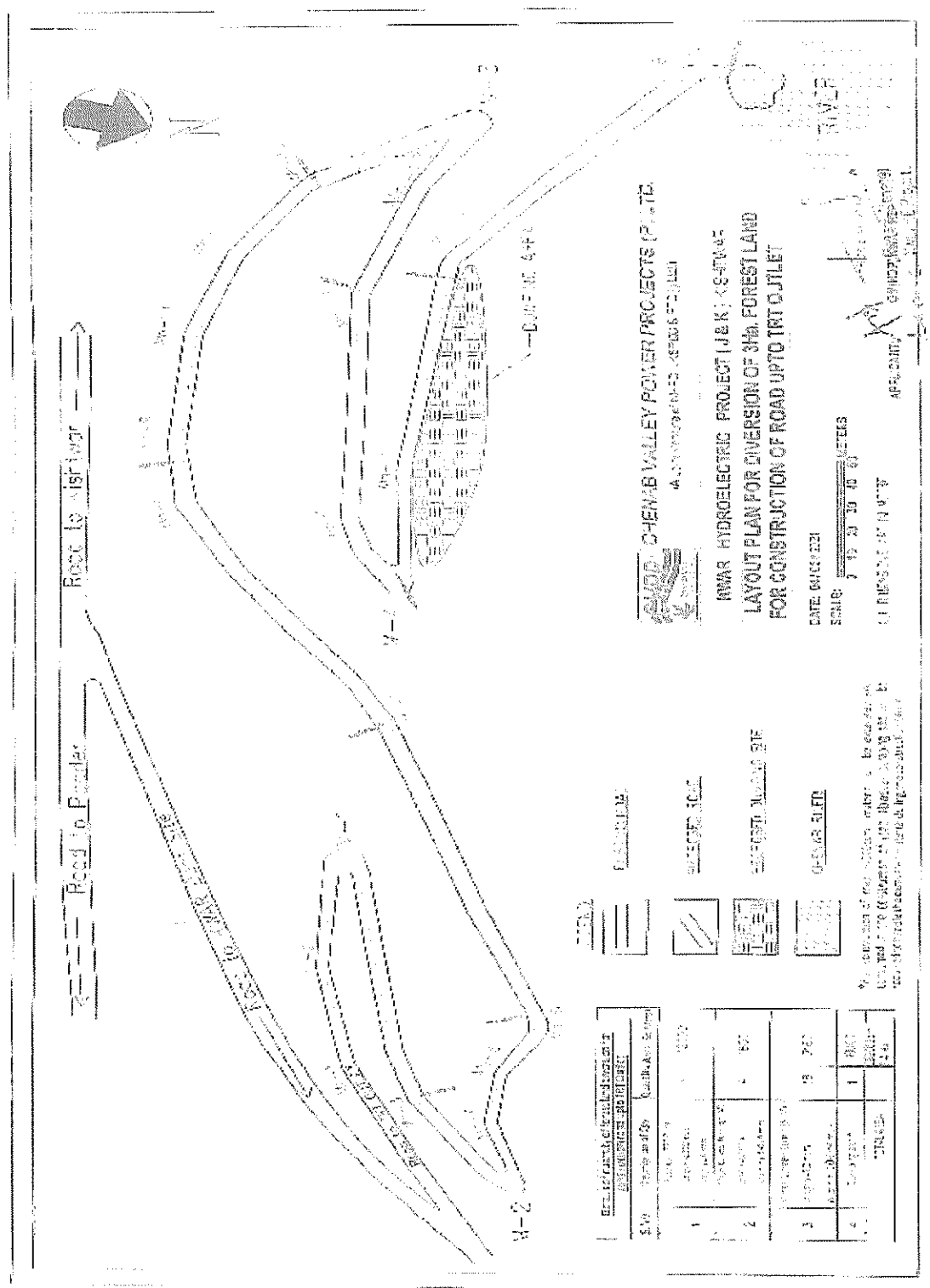
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Figure 1.1: Location map of proposed road upto TRT outlet including other components of Kwar H.E. Project

Layout plan for diversion of 2.4 Ha forest land for construction of road upto TRT outlet on left bank for kwar HE Project shown in Figure 1.2



2 METHODOLOGY OF MUCK DUMPING

The main objectives of process of muck dumping and restoration of the muck disposal site are:

- i) To protect and control soil erosion;
- ii) To create greenery in the muck disposal area;
- iii) To Improve and develop the sites into recreational site;
- iv) To ensure maximum utilization of muck for the construction purpose;
- v) To develop the muck disposal site/ dumping yard to blend with the surrounding landscape,
- vi) To minimise damages due to the spoilage of muck in the project area.

In the construction of road upto TRT outlet on left bank, a scientific approach and methodology was followed for identification of the dumping site. All possible alternate sites were inspected and examined before rejecting or selecting any site. The dumping site is characterized by:

- i) no forest cover,
- ii) the populated /settlement areas are away from the dumping site and therefore will have least impact on human settlements, and
- iii) The identified muck site is close to the area of generation to avoid hazards related to transport of muck for long distances and minimizing traffic problems

The generated muck will be carried in dumper trucks covered properly tied to the vehicle in line with international best practices. All precautionary measures will be followed during the dumping of muck. All dumpers will be well maintained to avoid any chances of loose soil from being falling during the transportation. All routes will be periodically wetted with the help of sprinklers prior to the movement of dump trucks. Dumping would be avoided during the high-speed wind, so that suspended particulate matter (PM10) levels could be maintained. After the dumping the surface of dumps will be sprayed with water with the help of sprinklers and then compacted.

The capacity/volume of the muck dumping sites is more than the volume of the muck to be disposed as the total muck generated shall be utilized completely in the construction of road and stabilization of slopes. The spare capacity has been earmarked for temporary storage of usable muck, traffic movement of dumpers and lifters. The spoil from construction sites would be disposed of at designated site in a controlled and orderly manner. All measures would be adapted to ensure that the dumping of muck does not cause injury or inconvenience to the people or the property around the area. The general topography of the disposal area has a very mild slope. The spillage of muck proposed to be prevented by making retaining structure to retain the piled muck.. The suitable retaining structure shall be constructed prior to dumping of muck, and terraces would be developed to support the muck on vertical slope and for optimum space utilization. Loose muck would be compacted layer-wise. The compacted muck will be ultimately covered with fertile soil, and suitable plants will be planted adopting suitable bio-technological measures.



3 REJUVENATION OF DUMPING SITES

The dumping of rock spoils and overburden material can potentially be a cause for environmental hazards. It may augment siltation in the downstream river due to spillage and cause deterioration of aesthetics too. The main aim of this plan is to protect and stabilize these areas from soil erosion and restore them by plantations by adopting engineering and biological measures. The muck disposal sites will be developed into green area considering the slope and location.

The dumping site after filling the excavation material will be restored by providing crate wall protection, spreading top soil and plantation of soil binding species. After rejuvenation, the area which shall be taken for temporary use shall be returned back to the State Forest Department.

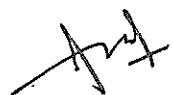
4 REJUVENATION PLAN FOR DUMPING SITES

Engineering and biological measures are suggested in and around the muck disposal sites. These protective measures include:

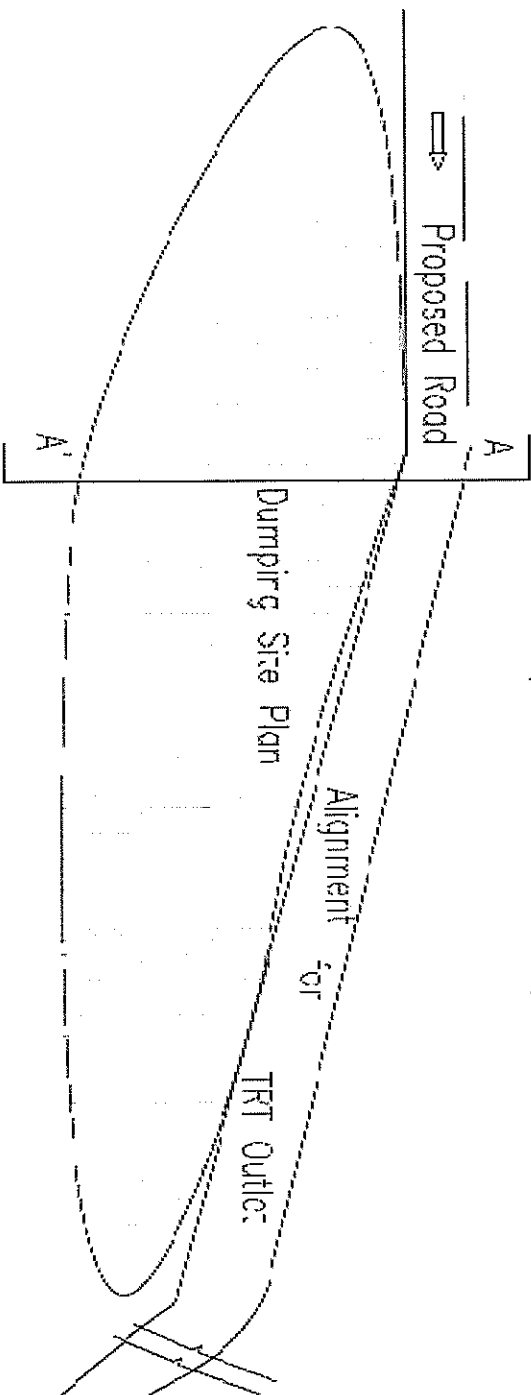
4.1 Engineering Measures

The Engineering measures proposed for dumping site is as follows:

- i. The excavated material would be dumped along the slope in terraces. In order to provide stability to the dumped material and for avoiding spillage of muck into river, crate walls shall be provided at the toe of every terrace. These crate walls shall be located at a minimum horizontal distance of 30.0m from the highest flood level of the river. A plan and typical cross section of the crate wall is depicted in **Figure 4.1A & 4.1B**
- ii. Catch water drains along the shoulder of the dump is proposed wherever hill folds interfere the dumping plane, which invite run off and augment soil erosion in the dumping locations. Typical cross section of Catch water drains is depicted in **Figure 4.1C**.
- iii. Consolidation of muck shall be done layer by layer of approximately 12 inches height with road roller. The objective of compacting the dumps is to improve their properties as regards strength, ability to settlement and resistance to weathering.



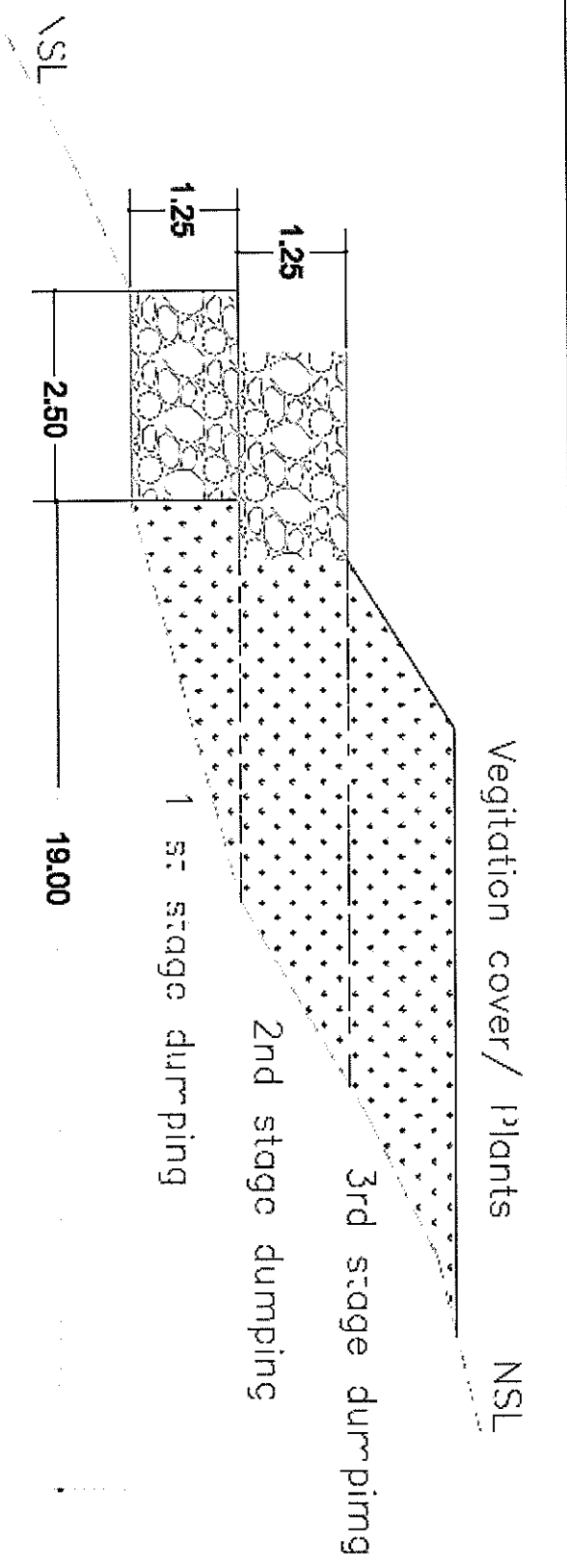
Proposed Muck Disposal Plan



See Detail 'A'

Sec A-A'

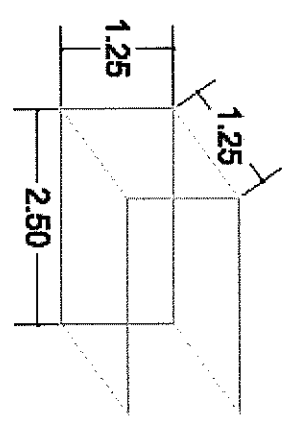
fit



Protection works typical sec. Dumping Site.

No. of Gabion — 600

Qty. of Gabion — 2344 cubm



Size of Gabion

Detail 'A'

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Figure 4.1A.: Typical Cross sections of the Crate Walls

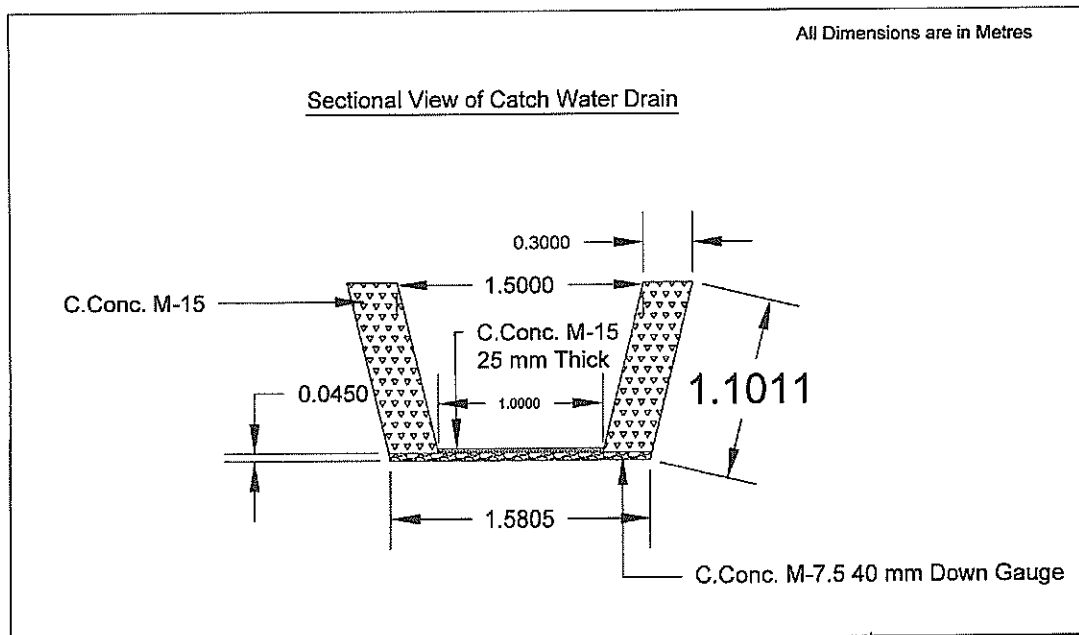


Figure 4.1B.: Typical Cross section of Catch Water Drain

4.2 Bio-Engineering and Biological Measures

- i. Special attention is required to execute Biological measures in the muck disposal site considering the lack of nutrients in the muck dump to support any vegetation. The stabilization of slopes generated by muck dumping should be treated by applying Jute Geotextiling Technology (JGT). Jute is natural, biodegradable and eco-friendly fiber. Jute geotextiling improves the engineering properties of soil. JGT in woven or non-woven forms permits free flow of water in both directions. For the stabilization of slopes of dumped material, open mesh JGT with heavy weight (500-600 gsm) is preferred. Minimum 15 cm overlapping should be provided while paving. Slopes should be dressed by filling ditches and gullies with light ramming. Top 75 mm soil need to be worked up in advance by mixing manure, garden soil, bio fertilizers and grass and shrub seeds. JGT should then be unrolled down the slope, suitably anchored with an overlap as shown in **Figure 4.2A**. Seed sowing of grass and shrubs should be done prior to textiling. Pinning should be done at the rate of one number per 2 sqm. After laying 75mm fertile soil mixed with manure, grass seeds and bio-compost is to be rubbed uniformly over the JGT. Water sprinkling is to be done for 2-3 consecutive weeks to obtain best result.
- ii. Plantation shall be carried out on the terraces of the muck disposal sites. The vegetation cover shall stabilize the slope and shall improve the aesthetic value of the

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area. This will also reduce soil erosion. However, in the muck disposal yards nutrient deficiency is the major constrain to support any vegetation. On terraces, grass seeds are to be sown and shrubs and trees having good canopy are to be planted together which will form two story canopy. In order to achieve this, following activities shall be done.

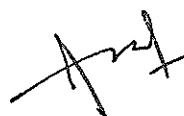
- a. Solid waste generated from the colony areas shall be composted for production of organic manure.
- b. This manure may be mixed with soil before plantation.
- c. Growth response of different plant species shall be evaluated periodically.
- d. Emphasis shall be given for propagation of native species for better survival.

Plantation of saplings will be carried out in pits in plain area of spoil tips, using organic manure. The method for reclamation of such sites is given in **Figure 4.2B**.

Reduction of loss of soil can be best achieved by planting trees, shrubs and grasses together. A list of plants proposed to be planted is as below.

List of plants proposed to be planted in the dumping sites.

Trees	Shrub and Grasses
<i>Ulmus wallichiana</i>	<i>Calopogonium orthocarpus</i>
<i>Aesculus indica</i>	<i>Pennisetum Purpureum</i>
<i>Robinia pseudoacacia</i>	<i>Cymbopogon sp.</i>
<i>Ailanthus excelsa</i>	<i>Dodonea sp.</i>
<i>Celtis australis</i>	<i>Agave americana</i>
<i>Populas sp.</i>	
<i>Salix sp.</i>	
<i>Morus alba</i>	



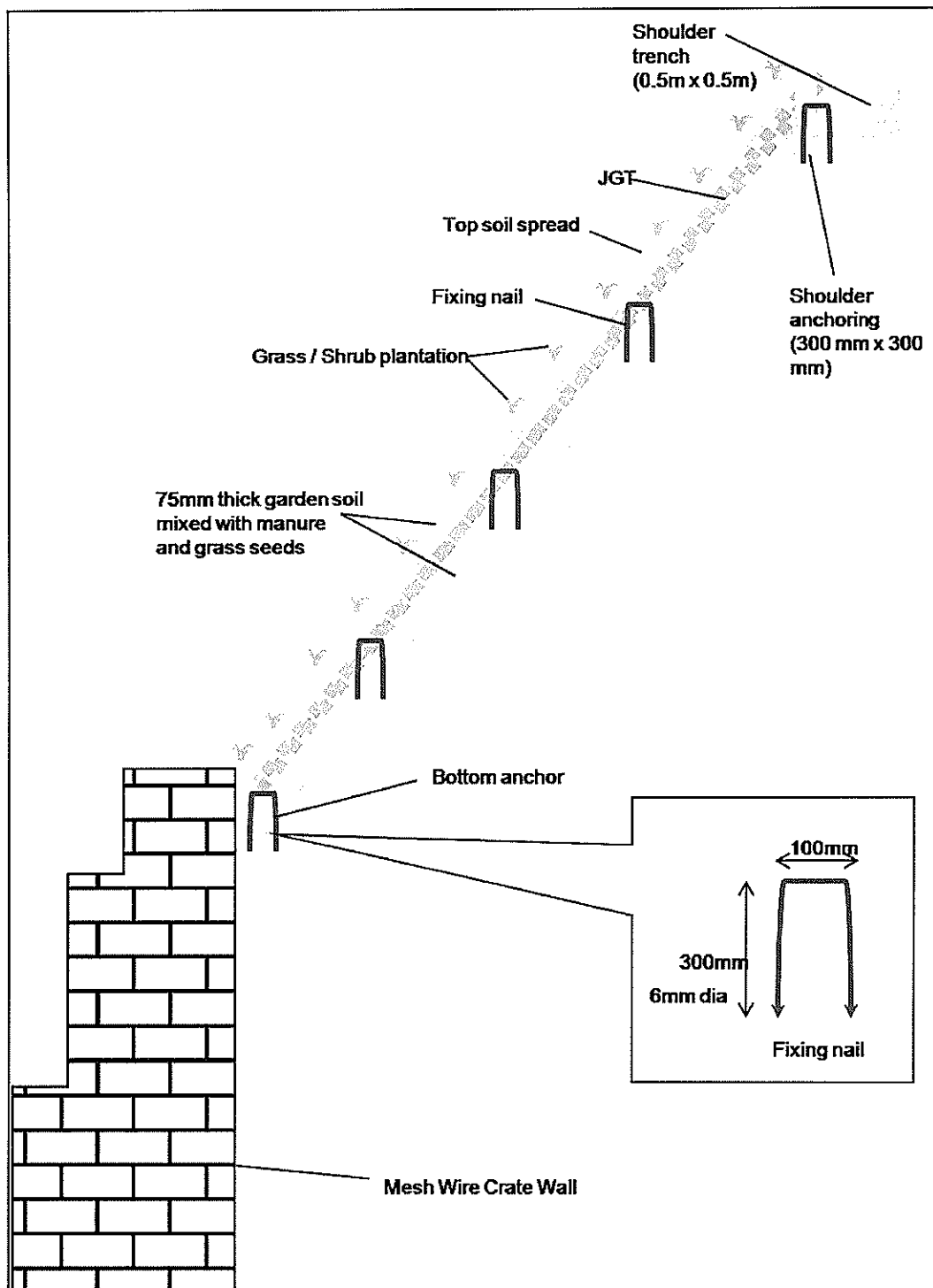


Figure 4.2A: A schematic diagram on restoration of muck disposal area by applying JGT technology

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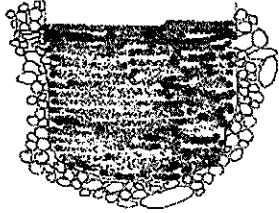
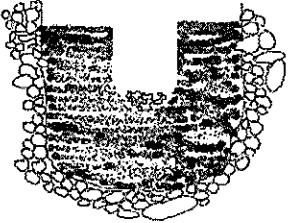
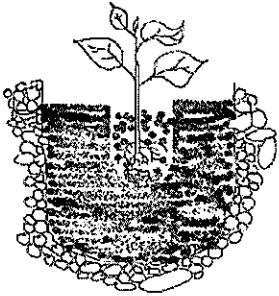
	<p>I. Excavation of muck dumping area for plantation (50cm x 50cm x 50cm)</p>
	<p>II. Refill the pit with garden soil mixed with manure in a ratio of 4:1. Composition of manure: Vermicompost, Dry farmyard manure, Citrus peel / compost in a ratio of 1:2:5</p>
	<p>III. Preparation for plantation</p>
	<p>IV. Plantation of sapling</p>

Figure 4.2B: A schematic representation of scientific approach of plantation in the muck dumping site

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5 BUDGETARY PROVISION

The disposal of the muck and rejuvenation of the dumping sites would require different engineering and biological measures. The measures chosen would be site-specific. For carrying out these activities and for follow up monitoring and maintenance of the sites, a budgetary provision has been kept. The component-wise budget allocation for these activities is given in Table 5.1. The rates are derived from JKSoR and tariff structure J&K Forest Department.

Table 5.1: Cost estimate for restoration of dumping sites

A.	Engineering measures				
S.no.	Items	Unit	Rate	Qty.	Amount (in Rs.)
1	Crate walls				
	Hand-Packing stones in Gabions; excluding cost of Gabions, with all lifts, leads & carriages.	Cum	337.45	2496	842275.20
	Zinc Coated Gabions Mechanically Woven Double Twisted Hexagonal in Shape Having Wire Mesh Size of 100 mm X 120 mm & Having Mesh Wire Dia 2.70 mm Selvedge Wire Dia 3.40 mm and lacing Wire Dia 2.20 mm . (2.5mx1.25mx1.25m size), with all lifts, leads & carriages.	Kg	129.461 [#]	22307	2887886.53
2	Catch water drain:	RM	7684	400	3145600
B.	Bio-Engineering and Biological measures				
1	Jute Geo-textile	Sq.m	93.5	2000	18700
2	Textiling and land preparation for slope protection	Sq.m	1.95 [#]	2000	3900 [*]
3	Turfing of soil with manure & fertilizer.	LS			100000
4	Plantation	LS			300000
5	Watering and maintenance, required misc. items etc., Watch and Ward	LS			300000
	Grand Total				75,98,361.73
	SAY				76 lakhs