CHAPTER - 8

LANDSCAPE AND RESTORATION PLAN

8.1 INTRODUCTION

The Integrated Kashang HEP has three trench weirs located in the interior area of District Kinnaur. The Stage-I trench weir is located across Kashang Khad near village Dolo Dogri which is 16 km from Reckong Peo. The Stage II trench weirs are located across Kerang Khad near village Lapo and Toktu which are 45 km and 50 km from Reckong Peo. For construction of trench weir site minimum of forest land shall be diverted so as to accommodate the structure. Thus being in remote interior and at a detour from NH-22, the weir sites do not provide a great site for landscaping besides being aesthetically unattractive too. The water conductor system, the powerhouse and appurtenant works are all underground structures and thus their landscaping is not warranted. Considering this the landscape plan is restrictive in nature being limited to residential, office complex areas and also the approach road to powerhouse MAT area. In view of a provision of Rs 9.0 lacs in DPR, for development of garden, parks and lawns in the residential areas/office complexes under the head M-Plantation, it is only proposed to provide landscaping for the area near power house MAT and the approach road to powerhouse.

8.2 COST ESTIMATE

The financial provision of landscape works is presented in Table 8.1.

Table 8.1: Cost Estimate for Landscaping Plan

S.No	Particular	Quantity	Amount (Rs lacs)
1	Providing one view point on NH-22 near exit point of Tail race	LS	3.00
2	Providing Channel fencing along approach road to powerhouse	LS	8,00
3	Providing ornamental, avenue and flowering plants	LS	2.00
4	Providing rest benches	LS	1.00
5	Providing for lighting arrangements to enhance the night effect	LS	5.00
6	Watch and ward	LS	3.00
7	Provision for recurring cost on maintenance of item 1 to 5 @ 2.5% of cost per year for 4 years	LS	1.90
8	Provision for meeting electricity Charges @ Rs 0.50 lacs per year for 4 years.	LS	2.00
9	Contingencies	LS	0.50
			26.00

CHAPTER - 7

RESTORATION PLAN FOR QUARRY SITES

7.1 GENERAL

The integrated Kashang HEP mainly involves construction of drop type trench weir, conveyance channel, descending basin, power channel, underground water conductor system involving Head Race Tunnel, Balancing Reservoir, Pressure Shaft, Underground Powerhouse and Transformer Hall, Main access Tunnel, Tail Race Tunnel and other adits and tunnels. For the construction of such components huge quantities of concrete work, structural steel work, shotcreting and grouting and fixing of precast lagging is involved for which construction material like coarse and fine aggregates, boulder, stones and earth for backfilling are required besides cement, structural steel and reinforcement steel. The quantities of construction material like stone, sand and aggregate for various uses and their potential quarry/mining sites are mentioned in **Table 7.1**.

Table 7.1: Quantity of Various Material

S. No	Material	Quantity (lac m^3)	Quarry/ Mining Sites.
1	Fine aggregate for c.c	2.29	River deposit at Akpa quarry and from crushing of muck.
2	Coarse aggregate	4.0	Quarry site-1 (U/S of intake of Stage-I) and excavated material from underground excavation.
3	Boulder/Stone	0.20	Quarry site-I (U/S of intake of Stage-I)
4	Soil	0.11	Private land at Kashang Getenge (intake area.)
	Total	6.60	

Excavation of construction material entails land acquisition and management of quarry areas at a later date to maintain the environment in its natural state. Therefore, during material survey/investigation it was realized that the quarry areas may be identified in river plain as far as possible and also the material excavated from different components be utilized. In view of this aspect the river shoal along River Satluj near Akpa and another site u/s of intake of Stage-I on Kashang Khad have been identified and evaluated based on the parameters suiting to the requirement.

7.2 DETAILS OF QUARRY SITES

In construction of the project 6.49 lac cum aggregate/stone material is required. To meet this demand stream/river bed shoals in Kashang, Kerang and River Satluj were investigated. It is also proposed that the excavated material derived from the underground and open surface works will be utilized to a maximum and about 2.94 lac cum excavated material will therefore, be used out of the total quantity of 11.74 lac cum excavated material. The coarse aggregate obtained through crushing of excavated muck shall be utilized in non-wearing concrete works like back fill concrete in water conductor system like HRT, balancing reservoir, pressure shaft, MAT, TRT and other adits and also in shotcreting and grouting works for which 2.3 lac cum quantity is required. The lining and structural concrete shall be made from aggregates obtained from quarry No. 1 and 2. The location plan of the two-quarry/mining sites is depicted in **Figure 7.1** and details of different kind of material and quarry areas are described below.

7.2.1 Quarry Site No-1, Near Intake (Stage-1)

About 300m u/s of the intake point of Stage-I and in the right bank of Kashang Khad a rock quarry site comprising of magmatite gneiss has been identified by the project proponents. The quarry area involves 3.2558 ha of forestland the division of which for non-forestry purpose has already been accorded by the MOEF. Against a demand of 1.70 lacs cum. aggregate /boulder, the quarry is likely to yield 2.5 lac cum of rock mass which can be crushed into suitable size of coarse aggregate besides sand. The aggregate from the quarry shall be used in lining, structural concrete, mass concrete works such as in HRT, Balancing Reservoirs, Powerhouse Transformer Hall, K-K link tunnel, desanding basin and also in intake. The quarry site at present is not approachable by road but a road from Pangi village to intake is under construction and shall be extended upto quarry area for which 0.6801 ha of forestland has already been obtained. The distance of the quarry site from Reckong Peo shall be about 16 km. The distance of the nearest village, school and the cremation ground is about 1.0 km, 1.2 km and 1. 8 km. respectively from the site.

7.2.2 Quarry Site No-2 Near Jangi

The quarry site located on right bank of River Satluj in riverbed in "Mauja" Jangi under Tehsil Moorang is an extensive shoal deposit being functional since long. It is located below NH-22 at a distance of 24 km from Reckong Peo, the district headquarter of Kinnaur. Quarry lies in the forest area and for its diversion of forest land to the tune of 3.47340 ha has already been sanctioned. The quarry, which comprises of coarse to fine sand intermixed with shingle and gravel is likely to yield 0.6 lac cum of sand and shingle on

yearly basis. Thus the quarry is self sufficient to meet the requirement of fine aggregate under the project during the schedule time frame of 4 years. The distance of the intake point of Stage IV at Toktu is about 27 km from this quarry site. It is also proposed to erect a crushing and screening plant at this quarry site. Thus this quarry is adequate to meet out the thorough demand of 2.29 lac cum of sand under the project. The general view of the quarry is presented in **Figure 7.2**. The nearest village school and the cremation ground are located approx. 1.5 km to 2 km. distance away from the site.

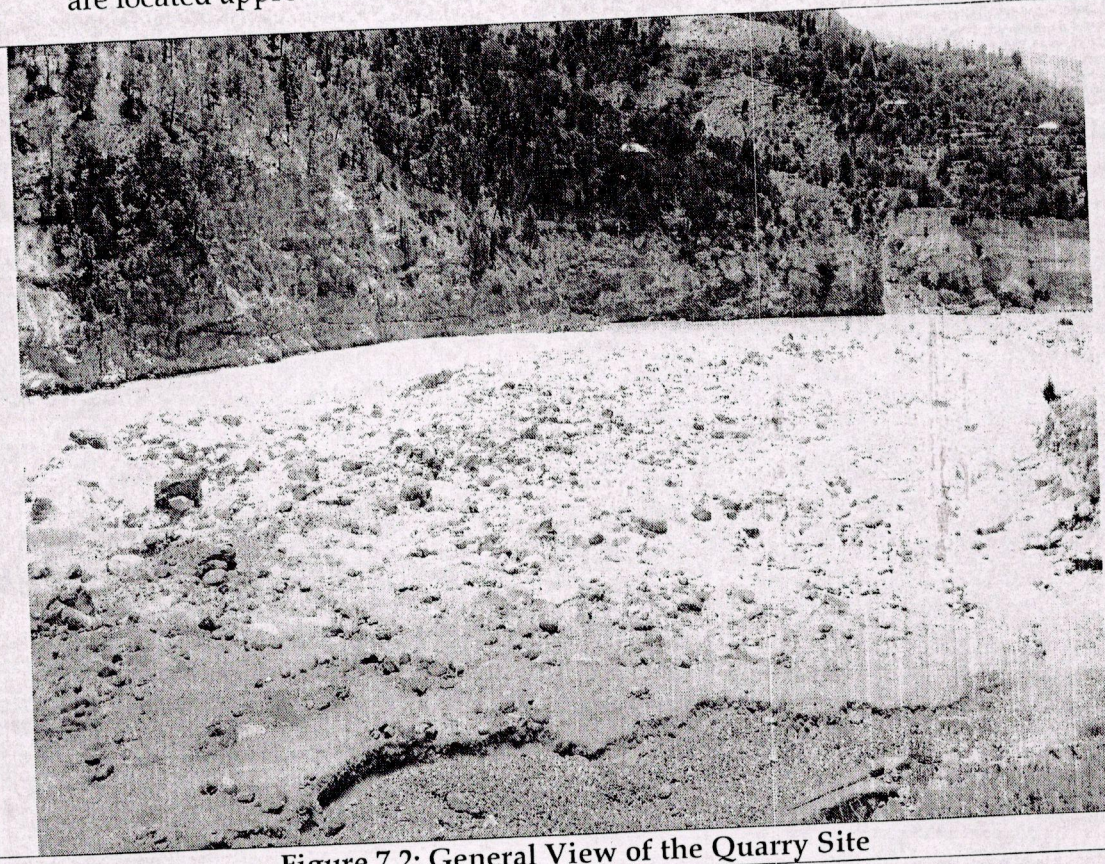

Figure 7.2: General View of the Quarry Site

7.2.3 Stone/ Boulder

The total requirement of 0.20 lacs m^3 of stone shall be obtained from the quarry site-I near intake of Stage-I project and also from excavated material from Stage II & III at Lappo village and also excavated material from Stage-IV at Toktu.

7.2.4 Soil (Earth)

The total requirement of 0.11 lac m^3 earth to be used in backfill in conveyance channel, desanding arrangement and Power Channel of Stage-I shall be met from the over burden excavation at intake and also from the excavation during development of private land at Kashang Getenge (Intake area)

7.2.5 Coarse Aggregate

Out of the total requirement of 4.0 lacs m^3 of coarse aggregate 2.30 lac m^3 shall be obtained from excavation of Diversion Weir Powerhouse, Transformer House, Pressure Shaft, Balancing Reservoir and the balance 1.70 lac m^3 shall be obtained from quarry site-I near intake of stage-I.

7.2.6 Fine Aggregate

The total requirement of approximately 2.29 lacs m^3 of fine aggregate shall be met out form river bed quarry situated on right bank of River Satluj and also from the crushed sand obtained during crushing processing and screening of rock mass obtained from Quarry Site No. I at intake of Stage-I. The distance of the proposed quarry site from Reckong Peo is about 24 km and is well connected through all weather roads. The quarry lies under Tehsil Moorang.

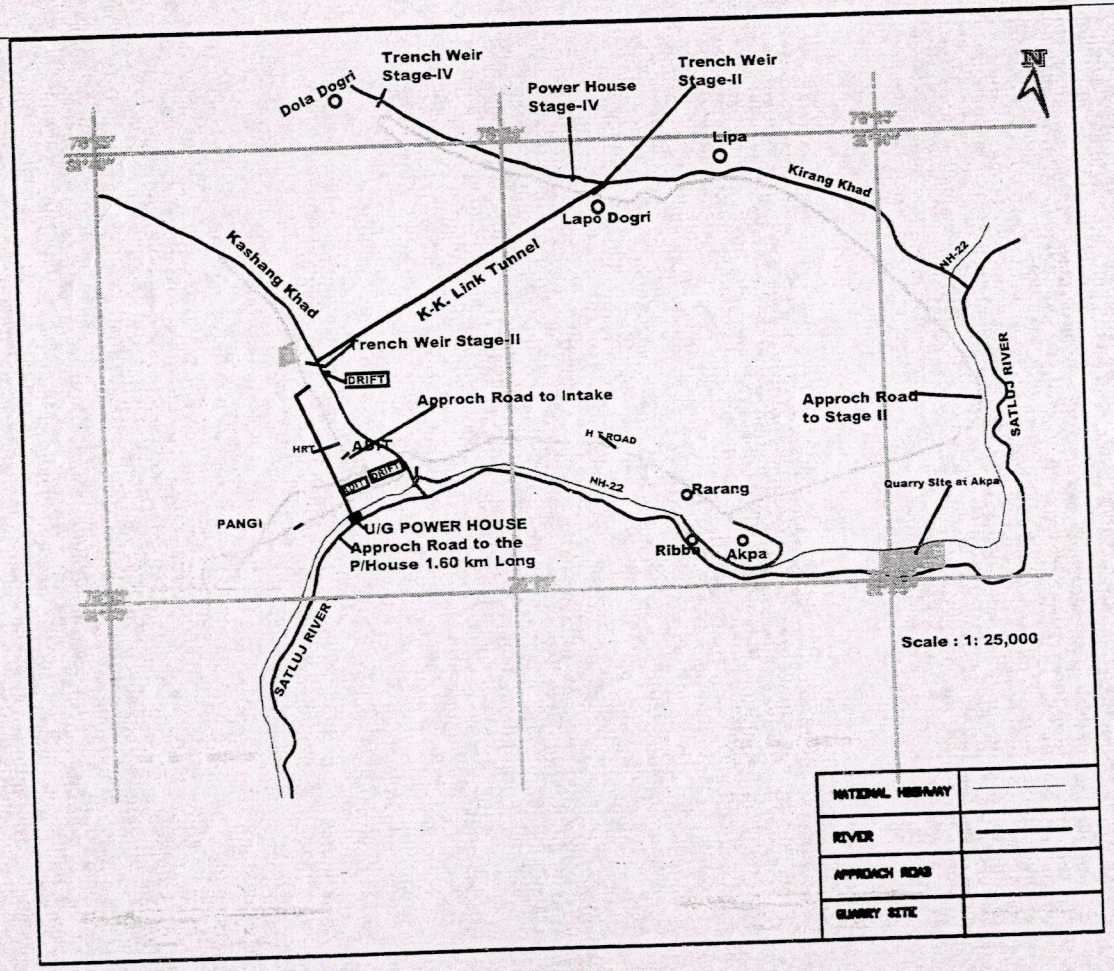

FIGURE 7.1 THE LOCATION PLAN OF QUARRY / MINING AREA

7.3 ENVIRONMENTAL IMPACTS

The impacts of excavation of construction materials such as rock mass/boulder and sand for construction of hydroelectric projects on environment depend on excavation process, local hydrological conditions, climate, rock types, size and type of operations and topography. Impacts also vary with stage of development at quarry sites e.g. development of working platforms has a less impact compared to the excavation of aggregates and sand. Physical changes in the soil, water and air associates with environment impacts would be due to excavation and degradation of land around the quarry and on biota around it. Maximum excavated material from the proposed under ground works shall be utilized together with rock mass/stone obtained from Quarry No-1. The rock face areas do not require any major restoration measures. However, keeping in view that due to blasting etc. the rock features along the joint surfaces may get weak or disturbed, for overcoming which some rock bolting and shotcrete measures along the exposed face are proposed to be done. The river shoal areas fall in the river bed/plain, as such no restoration measures are proposed for them. The river shoal at Jangi quarry site will be restored during the flood season as it falls within the river coarse of River Satluj. Therefore, the riverbed quarry activity shall not lead to any negative impact either during the functioning of the quarry or at a later date. Blasting shall not be allowed in the riverbed. Copious use of sprinkler shall be resorted to stockpiles of aggregate and the washing of the aggregate shall be first allowed to settle in the setting tanks before disposing into river. As a dust arrester G.C sheet shield shall be erected on the valley side of portion of NH-22 situated over the quarry site.

7.4 TREATMENT MEASURES FOR RESTORATION

The biological and engineering measures proposed to be implemented for restoration of Quarry No-I near intake of Stage-I and preventive measures in respect of Quarry No-2 are as follows.

7.4.1 Biological Measures

Under the biological measures plantation over an area of 3.26 ha as per the suitability of the area will be conducted to bring the diverted area under rock quarry No-I at intake under forest cover after the quarry is no more needed. In addition to plantation seeding of local plant species will also be done to enhance natural regeneration. The plantation technique and the rate of plantation shall be adopted as in the case of biological treatment of muck disposal sites by plantation.

7.4.2 Barbed Wire Fencing

The area of rock quarry site will be fenced on first occasion to ward off animals from entering the quarry area and later to protect the plantation from grazing and to enhance natural regeneration.

7.4.3 Engineering Measures

For the reclamation of the quarry sites, the following engineering measures are proposed for restoration of quarry site.

7.4.3.1 Filling and Leveling

Required filling and leveling of earth in the rock quarry area will be conducted to support vegetation. Drains will be constructed in the quarry area to flush out the unwanted water.

7.4.3.2 Protective Shield

Along 670 m length of the NH-22 overlooking the River Satluj river bed quarry site, proper G.C Sheet Shielding shall be erected to safeguard against fugitive dust particles.

7.5 COST ESTIMATE FOR RESTORATION OF BORROW AREAS

The details of the expenditure likely to be incurred on the implementation of biological and engineering measures to be adopted is placed in **Table 7.2.**

Table-7.2: Cost estimate for restoration of borrow areas

SI. No.	Item of Work	Quantity	Unit	Rate (Rs.)	Amount (Rs. Las)
1	Rock bolting 25 mm dia in jointed/fissured surface	250	m.	1110	2.78
2	Shot Creting (50 mm)	200	m^2	545	1.09
3	Leveling and filling of area after use in rock quarry at intake of Stage-I	30000	Cum	125	3.75
4	Construction of drains	100	M	1100	1.10
5	Stone masonry (1:6) in retaining wall of 4 m height in 200 m	880	Cum	1345	11.84
6	Barbed wire fencing on 2 m high RCC posts	3.25	ha	30000	0.975

SI. No.	Item of Work	Quantity	Unit	Rate (Rs.)	Amount (Rs. Las)
7	Plantation in 3.26 ha. Including maintenance for 4 years.	3.26	ha	485,432	15.83
8	Watch and ward 3 No Chowkidars @ Rs 3000 p.m. for 4 years	144	months	3000	4.32
9	Providing G.C. Sheet shield in 670 m length.	670	Rm	2500	16.75
10	Provision for Settling Tanks	Job		LS	5.30
	Total				**63.735**

Say Rs 64.00 lacs.

DGM (Civil)-cum-HOP
Stage-IV, Kashang HEP
HPPCL, Kashang Pco.