CATCHMENT AREA TREATMENT PLAN

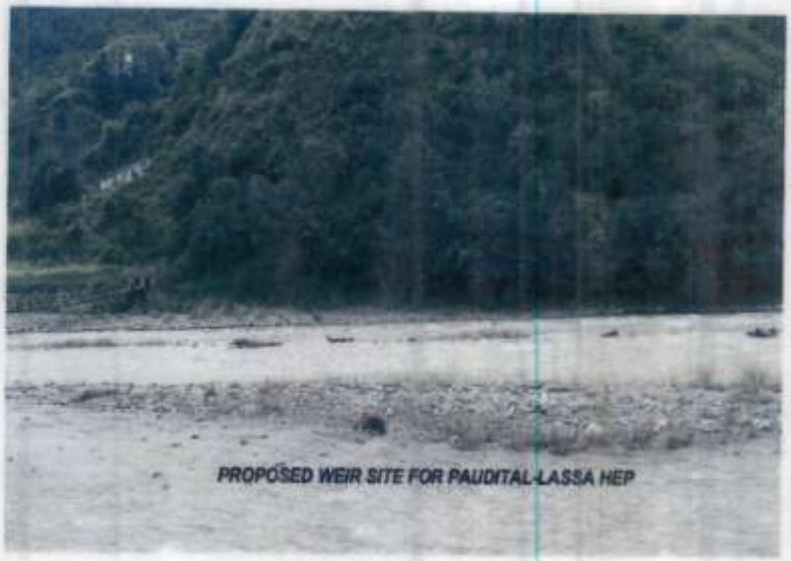
FOR

PAUDITAL-LASSA (24 MW) HEP

IN PABBAR BASIN

TEHSIL ROHRU

DISTRICT SHIMLA (H. P)



PROPOSED WEIR SITE FOR PAUDITAL-LASSA HEP

PROJECT PERIOD: 2012-13 to 2022-23

TOTAL COST OF CAT PLAN: Rs. 296 LACS

AUGUST-2010

M/s GREENKO HATKOTI ENERGY (P) LTD.

PLOT NO.1071, ROAD NO.44, JUBLIEE HILLS

HYDERBAD-500 033

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GENERAL DESCRIPTION OF THE TRACT

1.1 INTRODUCTION

India is endowed with a vast Hydro Power potential, assessed at 1, 50,000 MW (corresponding to 84,044 MW at 60% load factor). Out of this about 26900 MW amounting to 18% of the total potential has been harnessed. The 16th Electric Power survey carried out by Central Electricity Authority (CEA) has projected a peak demand of 1,15,700 MW and an energy requirement of 7,19,100 MU by the end of 10th five year plan, while the requirement by the end of 11th five year plan has been projected as 1,51,100 MW and 9,72,520 respectively.

Himachal Pradesh has five river basins, which provide an ample scope for development of Hydro power potential. Out of these five basins, Sutlej basin has the highest potential of about 9,227 MW of electricity. The Paudital-lassa Hydro Electric Project is a scheme which envisages construction of a trench weir across river Pabbar, a tributary of Tons river further a major tributary of Yamuna River, in Shimla District of Himachal Pradesh. Pabbar has its origin in Gangdhari Dhar ranges of Himalayas at an altitude of 5400 m and passes through dense forest areas. The catchment area of Pabbar River up to diversion site is about 900 sq. km. However the effective sub-catchment of the Paudital-lassa HEP works out to 400 sq.km. This is the area from the intake of immediate upstream project i.e Chirgaon-Majgaon (60MW) to the intake of Paudital-Lassa SHEP; this has been calculated from the area of sub-micro water sheds falling in the effective catchment. Catchment area map of projects in Pabbar River basin is enclosed as MAP-01 and catchment area plan of Paudital-lassa HEP catchment is enclosed as MAP-02

A large portion of catchment is under snow and major portion is steep mountainous region with rocky outcrops & contains many glaciers, which provide the stream with perennial water flow. Topo-sheets Survey of India No 53 E/13, 53E/15, 53E/16 & 53E/14 covers the catchment area. The head water catchment can be described as an extreme high mountain catchment. The river valley of both the main Pabbar River and its tributaries are incised with very steep slides in some sections. In the downstream regions the relief reveals much more fluvial characteristics with river terraces and evident traces of recent fluvial erosion in the upper parts.

A total of five hydro electric projects are coming up on river Pabbar, the upper most being Tangnu Romai (44MW) followed by Dhamwari-Sundha (70MW), Chirgaon Majgaon (60MW),

Paudital-Lassa (24MW) and Sawra Kuddu (110MW). Generation capacity of each one of the five projects will be more than 10 MW meaning thereby that each one will have its own catchment area treatment plan, as per GOI stipulations. Hence the whole of the catchment of Pabbar River can be sub-divided into six zones as there would be five sub-catchments, above the intake of each project extending up-to the barrage site of the immediate upstream one, which would be its effective sub-catchment. The sixth zone of catchment area would consist of areas draining areas draining into Pabbar River below the barrage site of the lowermost project down to its tailrace outlet.

It is a well-established fact that reservoirs formed by weirs on rivers are subjected to sedimentation. The process of sedimentation embodies the sequential processes of erosion, entrainment, transportation, deposition and compaction of sediment. The study of erosion and sediment yield from catchments is of utmost importance as the deposition of sediment in reservoir reduces its capacity, and thus affecting the water availability for the designated use. The eroded sediment from catchment when deposited on streambeds and banks causes breaching of river reach. The removal of top fertile soil from catchment adversely affects the agricultural production. Thus, a well-designed Catchment Area Treatment (CAT) plan is essential to ameliorate the above-mentioned adverse process of soil erosion and maintenance of ecological balance including atmospheric equilibrium, which is vital for sustenance of all life forms, humans, animal and plants of Pabbar valley. Therefore, proper soil and moisture conservation treatment, bio-engineering works, habitat improvement by way of incentive management and Eco -development activities are required to be carried out in the Catchment Area. The human and cattle population living in and around the catchment are dependent on the natural resources. Because of which greater emphasis has been laid to undertake afforestation, pasture development, bio-diversity conservation with soil and moisture conservation works in the catchment area including eco-development activities with the provision of alternative sources of domestic energy on a subsidized basis (50% cost to be given by the beneficiaries) to reduce pressure on the existing forest areas.

1.2 TOPOGRAPHY AND DRAINAGE:

The terrain of the catchment area is mainly mountainous, which can be described as moderate to steep with precipitous slopes. The river flows in the south westerly direction down to Rohru Township some 55 Km. from the source. Left bank area is steep to precipitous and almost continuous linear slope. Therefore most of the area drains into Pabbar River. There are a few small tributaries namely Gumalti Khad, Pakhal Khad and Peja Khad and numerous small depression drainage lines that bring the surface flow from left bank into the Pabbar River. Supin Gad, Sundru Gad, Rakhto Gad, Khanayara khad, Andhra khad, Masrat khad,Dogri Khad

and Shikri khad, are major tributaries and Banirath Gad, Polari Gad, Moti Gad are small ones which drain from the right bank slopes to the Pabbar River. All these Gads have their bed slopes in the range of 12 to 25 percent.

1.3 ELEVATION ZONES IN THE CATCHMENT

The entire catchment of Pabbar in Himachal Pradesh falls between and elevation of 1400m to 5400m above mean sea level. About 25% of this area falls below 200m: 35% between 2000m to 3000m: 39% between 3000m to 4500m and only 1.11 % of the catchment is above 4500m which falls in the permanent snow line basin.

	Elevation range (in meters above MSL)	Percentage of Catchment	Area of effective catchment 400 sq. km
	1400 m to 2000m	25	100 sq.km
	2000 m to 3000 m	35	140 sq.km
	3000 m to 4500 m	39	156 sq.km
	4500 m and above	1	4 sq.km
	Total catchment 1400 m and above	100	400 sq.km

1.4 SLOPE CLASS ZONES IN THE CATCHMENT

The slope of the catchment area varies greatly between extremes of gradients as tabulated below.

		Classification of Slopes	Percentage of Catchment	Area of effective catchment 400 sq. km
		Very gently to gently sloping	1-10%	4-40 sq.km
		Moderately steep to steep	15-33%	60-132 sq.km
		Steep to very steep	15-33%	60-132 sq.km
		Very steep to very very steep	>33%	132 sq.km

1.5 GEOLOGY:

According to the stratigraphic succession established by the Geological Survey of India, the Jutog groups of formations (Precambrain-proterozoic) form the bed rock in Pabbar valley. They are covered by fluvio-glacial recent to sub-recent deposits in the river bed. Slide debris and talus material occur along some of the steep nala.

The Jutog group comprises highly metamorpirised rocks like kynite schist, gametiferobs biotitic, schist, quartz-schist, gneissose-schist, gneissose quartzite and quartizite.All the Jutog group formations participated in and were affected by the tectonic movements of the Himalayas. Consequently they are highly deformed, metamorporosed to varying degrees and generally folded into antiforms and synforms and faulted. Major tectonic features like Jutog thrust occurring to the south of Sawra Bridge, the Andhra fault, and Jakha and Peja faults occur in the area, one of the major khad crossings lie along fault alignments.

Seismically the project area falls in zone IV of the seismic zoning map of India (I.S.1993-94). The project area is located between iso-acceleration lines of VI-VII on the MKS scale

1.6 LAND USE PATTERN:

Land use describes how a patch of land is used whereas land cover describes the material such as vegetation, rock or building that area present on the surface. The land use classification and coverage in the catchment, as per land use map (source: Procured from NRSA, Hyderabad, Survey of India Topo-sheet and others) the built up land, degraded or scrub land, evergreen/semi green forest, forest plantation, grass land/grazing land, agricultural land (kanf and Rabi),with or without scrubs, plantations, snow covered/glacial area and rocky uncultivable wastes including area of streams and river bed is approximately, 0.15%, 3.25%, 20%, 15%, 10%,15%,30%,3%,3%,2% and 1.6% respectively. For the ease of reading the same is tabulated below.

TABLE

S.N.	Land Use	Percentage of Catchment	Area of effective catchment 400 sq. km in sq.km
1	Built-up land	0.15	0.6
2	Degraded or scrub land	3.25	13
3	Evergreen/semi-evergreen forest	20.00	80
4	Forest plantation	15.00	60
5	Grass land/grazing land	10.00	40
6	Agricultural land (kharif + rabi)	15.00	60
7	Wasteland without scrub	30.00	120
8	Plantation	3.00	12
9	Snow covered/glacial area	2.00	8
10	Rocky uncultivable wastes f/c areas of steams & river beds	1.60	6.40
	Total	100	400

These studies do not quantify the area under snows or alpine pastures. However, the results make an excellent base for other studies. The map of Land use is attached.

1.7 SOIL IN THE CATCHMENT

The soil in the catchment area are derived from heterogeneous parent material i.e. gneiss, schist, sandstone and phyllite. The upper and mid mountainous portions that comprise this catchment area are characterized by shallow soils with coarse to medium texture and dark brown to very dark greyish brown color and have a thick layer of leaf and organic matter on the surface. The soil profiles met within the area i/c catchment area are generally well developed with clear demarcation of horizons. The soils are brown podsols and transitional podsols. They have a fine texture akin to clay and clayey loams. Spruce and fir grow on a wide range of soil especially brown soils. Kail and deodar generally thrive on brown soils. Large quantities of decomposing vegetation material enrich the forest soil with a good deal of humus. The following textures of soil generally of good depth are met within the area.

1. Loam or clayey in Khasdhar,Gauna, Dumreda and Khadrala area
2. Sandy loam in Rohru area
3. Loamy clays with black color as in oak bearing areas
4. Loamy soil with a cover of humus suited for fir and spruce.

As in Larot, Guas, Dumreda, Khadrala, Khasadhar and Gauna area, on ridges precipitatous slopes and southern aspects, the soil tends to be shallow and dry; it is a common feature around villages because of frequent fires and excessive grazing.

Important physiographic units classification as per soil taxonomy together with their other important characteristics the soils of upper Yamuna catchment, which includes Pabber catchment, as brought up in their report on "Demarcation of priority sub-water sheds in the catchment of uppermost Yamuna river by "All India Soil and Land Use Survey Organization, Govt of India (Report No Agri.830) are furnished in table No.1 &2 and drawing Nos 3, 3.1, 3.2 &3.3 soil types and their coverage in the catchment.

S.No	Soil Type	Percentage of Catchment	Area of effective Catchment (400 Sq.Km)
1.	Sandy	20%	80 sq.km
2.	Loamy	15%	60 sq.km
3.	Coarse Loamy soil	25%	100 sq.km
4.	Sandy to coarse loamy soil	35%	140 sq.km
5.	Clayey	5%	20 sq.km
	Total	100%	400 sq.km

1.8 LIVE STOCK POPULATION:

The approximate population of livestock in the effective catchment area is as follows

	Cattle	Sheep	Goat	Horses/Mule	Total
Ransar Valley	997	1000	100	50	2147
Spail Valley	500	500	200	50	1250
Mandal Garh Valley	850	500	200	30	1580
Villages on left bank of Pabbar river from Chirgaon to Rohru	1500	500	200	75	2275
Total	3847	2500	700	205	7252

1.9 HUMAN POPULATION:

According to the 2001 census of Shimla District the total population is 721745 with 380244 males and 341501 females and sex ratio is 898 females per 1000 males. The density per Sq. Km is 141 persons. The average family size is about 7 persons. The scheduled caste population is 23.5%.

1.10 FLORA:

The forest of the catchment comprises coniferous prone with occupation of various species according to altitudinal zonation. Herbaceous alpine pastures occupy the topmost zone. Kail, Deodar, Fir, Spruce, Betula utilis, Ban Oak, Mohru oak, Kharsu oak, Alders, Rhododendrons, Aesculas indica, Bird Cherry, Maple, Juglan regia, Pyrus species, Wild popular, Salix, Alnus nitida etc. The under growth is Viola, Indigofera, Desmodium, Rubus spps. Sarcococca Saligna, Viburnum, Berberis spp, Prinsepia utilis, Prunus Cornuta, and medicinal herbs like Dhoop, Karu, Patish, Bankakri, Hathpanja, and mushaq bala etc. are also found. The forest lies between the elevations 2000 to 3900 mtr. above mean sea level. The Alpine pastures are great attraction to the migratory grazers as well as local people who have a right to graze their domestic cattle under the provision of forest settlement report, 1921.

FOREST TYPE:

The main type of forest in the catchment is as below

Moist Deodar Forest – *The chief under wood comprises of poles of deodar, kail and mohru in pallas and depressions. Alnus nepalensis, Prunus comuta, Aesculus indica, Juglans regia and Rhododendron arboretum form an unevenly distributed under storey.*

1. ***Western mixed coniferous forest*** – *the habitat of this type lies above the Deodar Zone. These are broad leaved tree species like Maple, Birdcherry, and Oak occur either singly or in groups along depressions. In Janglikh UF, the fir occurs in the pure stands and at places mixed with spruce.*
2. ***Moist Temperate Deciduous Forests*** – *this type of forest occur in the area between 2300m and 2500m above mean sea level. The typical examples of this are around Janglikh, Pekha Pandhar, Dumreda, Gauna, Kashadhar and Khadrala forests. The species are akin to that of usual Fir and Spuce.*
3. ***Low Level Blue Pine Forest*** – *it is dominating type between 200m and 2750m above mean sea level. There is high level Kail in this tract.*
4. ***Birch Rhododendron Scrub Forests*** – *Ables spectabilis in an admixture with Betula utilis is met in the upper parts of coniferous forests. Practically no other kind of tree is intermingled in the forest canopy. The deforested ground is covered with bushes of Rosa macrophylla, Cotoneaster microphylla, and Rhododendron species.*

1.11 FAUNA

	Herbivores	Carnivores
Mammals	*Musk Deer*	*Snow Leopard*
	Himalayan Tahr	*Leopard*
	Goral	*Himalayan Black Beer*
	Serow	*Himalayan Brown Beer*
	Bharal etc.	
Pheasants	*Woodcock*	
	Himalayan monal	
	Kaleej	
	Koklass	
	Chukor	

1.12 BIO-DIVERSITY:

Biodiversity conservation is on the national agenda which came into force on December 29, 1993 for Nation/States which are signatory to the Conservation of Bio–logical diversity. It is well known that the Conservation of Bio-logical diversity involves conservation of ecosystem, species, land races and population including conservation of genes. Biodiversity conservation is essential not only for ecological and environmental rejuvenation but also for a sustainable development. These forests regulate the water balance in the lands around them and influence the climate to considerable extents. Apart from their ecological functions, they serve as valuable gene pools.

Anthropogenic activities, particularly economic activities influencing habitat and more particularly poaching induce an increased extinction of species. Loss of habitat need be controlled scientifically and poaching prevention must be stringently enforced. In this catchment area treatment of Pabbar efforts should be made to develop strategies for the protection of ecosystems, species and genes, taking into consideration human population processes and futuristic developmental needs. The in situ and ex situ conservation strategies are to be supplemented using holistic and adaptable conservation of Bio-logical diversity strategies in the catchment area. Preservation of medical plant sites, cultivation of medicinal plants for health, development of a package for growing life supporting species, fast growing species for village commons, propagation of bamboo in households and wilderness sites and development of heritage plant sites would help preserve some of the species under threat. Priority for conservation must focus on endemic species native to a particular ecological niche region or country, as once lost, it is loss of Biodiversity forever. It is estimated that the disappearance of one plant species can result in the loss of 10 – 15 dependent insects, animals and other plants. For those who appreciate calculation in monetary terms, it has been shown that extinction of a single species of plant is equivalent to the loss of about $203 million. A proper appreciation of bio-diversity and a meticulous cataloguing of it are the essential steps to be adopted during catchment area treatment activity in efforts for its in-situ and ex-situ conservation of bio-diversity.

1.13 *RIGHTS OF THE PEOPLES:*

Grazing:

In almost all the forests, right for grazing exist for each demarcated and un-demarcated forests. The field studies conducted indicated that 70% requirements of the fodder are met from the forest area. The settlement provides for free grazing to all animals of the right holders in their own chaks and no ceiling has been fixed on the number of cattle that might be grazed. The grazers availing summer grazing facilities in the alpine pastures are not allowed to graze their animals outside chaks unless allowed as special concessions or through payment of a certain grazing fee. A large number of cattle graze in these forests leading to great damages to the vegetation as well as to the plantations. This right of grazing also comes in the way of taking up more closure for raising plantations of different species as the consent of the local people is to be obtained before plantation work can be undertaken.

Collection of fuel wood:

people have the right to collect dry and fallen wood for their domestic use as per the forest settlement record. In the project area people depend entirely upon fuel wood for their day to day use. Annual consumption of fuel wood per house hold has been assessed to be 6.50 tones during the field survey. Mainly the requirement is fulfilled from the Kunish tree which is found in abundance along the river banks.

Timber:

People have the right to get timber at nominal rates for construction/repair/maintenance of their houses. The concessional rates were fixed at the time of forest settlement. No limit on the number of trees to be sanctioned was placed. A stage has now been reached that not a single tree is available on silvicultural basis in some of the forests for the right holders.

Cutting of Grass and lopping of trees:

people have the right to cut grass and lop trees for fodder purpose. Cutting of grass is being done as of present in the forests without paying any fees to the department.

Minor Forest Produce reported (1996-1997)

The local people collect medicinal plants and other valuable products of commercial value from the forests and alpine pastures. The details of products collected and exported from Kashdhar Range during 1996-1997 are given in Table below

S.No.	Name of Species	Quantity Qtl.

	1.	Bhojpatra	157
	2.	Mahmeda	267
	3.	Dhoop	499.5
	4.	Goodbuch	66
	5.	Anjhar	65
	6.	Kakarsinghi	20
	7.	Buchhang	22.45
	8.	Ravcnchini	70
	9.	Karoo	12
	10	Mitha Palis	27
	11.	Chora	7
	12.	Mithatelia	7
	13.	Mushkbala	0.35
	14.	Kunish Cones	80
	15.	Guchchi	66

1.14 GENERAL CONDITION AND DENSITY:

The composition and condition of the forests is not so good and tends to vary considerably with the altitude and aspect. DPF's and UPF's which are in the entire and away from habitations are fairly well stocked. The forests in nearby habitation are under a lot of pressure of the illegal encroachments over forest land and the status of regeneration is very poor. The present poor state of affairs is the cumulative result of heavy grazing, lopping and encroachments.

1.15 SOCIO-ECONOMIC PROFILE:

There are 23 Panchyat in and around the catchment area of Pabbar in and around the project area having a human population of 35000. The average family size is 7 persons. The Joint family and polyandry system are responsible for large size of family. The Scheduled caste population is about 23.5%. Horticulture development has been fully explored it being an apple belt. Most of the people are educated and employed. Agriculture and Horticulture is not merely an occupation but an established tradition and an expected way of life, in which majority of the population is engaged. The major crops grown in the area are Maize, Wheat Barley, there has been a boom in fruit

cultivation particularly apple which has up-lifted the economy of the area substantially. Electricity is available to all household. Apart from the agricultural land, livestock is also an asset of rural population.

People own milk yielding livestock like goats and milch cows. People are seen carrying spindles and spinning the thread. Their folk lore and culture is full of references to the forests and wild life. Having regard to the symbiotic relationship between the people and forests, a primary task of all agencies responsible for forests management and to associate the people closely in the protection, regeneration and sustainable management of forests as well as to provide gainful employment to people living in and around the Catchment area, while safeguarding the customary rights and interests of such people.

1.16 PERIOD OF CAT PLAN:

The CAT plan has been formulated for a period of ten years with effect from 2012-13 to 2022-23. For the first year of the plan not much of works have been prescribed and only establishment of nursery will be done besides minor works and purchase of some equipments. However, from the second year onwards works will be done in full swing and will gradually take off 6th year onwards and completed the work during the plan period.

1.17 COST OF THE PLAN:

The total outlay envisaged for the implementation of this CAT Plan is Rs. **296.00 Lac**.

The total cost of the project as per TEC issued by the Chief Engineer (P&M) HPSEB, vidyut Bhawan Shimla vide his letter No HPSEB(Sectt.) 401-Paudital-Lassa /06-45041-54 dated 29-07-06 is **Rs. 118.23 crore. 2.5%** of this cost has been kept for catchment area treatment plan which amounts to **Rs.2.956 crore say 2.96 crore**, the CAT plan has been prepared for this cost. However in case the cost of the project increases as additional funds for cat plan calculated at the prescribed 2.5% shall be given to the forest department by the project developers. Copy of the TEC issued is attached with this document as annexure at page 175-180.

Name of the beat which come under effective catchment area of Paudital Lassa SHEP

Name of the Division *Rohru Division*

Name of the Range *Rohru Range* ***Khasadhar Range***

Sumerkot Block

1. *Grema*
2. *Kui*
3. *Machoti*
4. *Sumerkot*

Khashadhar Block

1. *Khasadhar*
2. *Telga*
3. *Dali*
4. *Diswani*

Rohru Block

1. *Dalgoan*
2. *Kutara*
3. *Gawana*
4. *Rohru*

Todsa Block

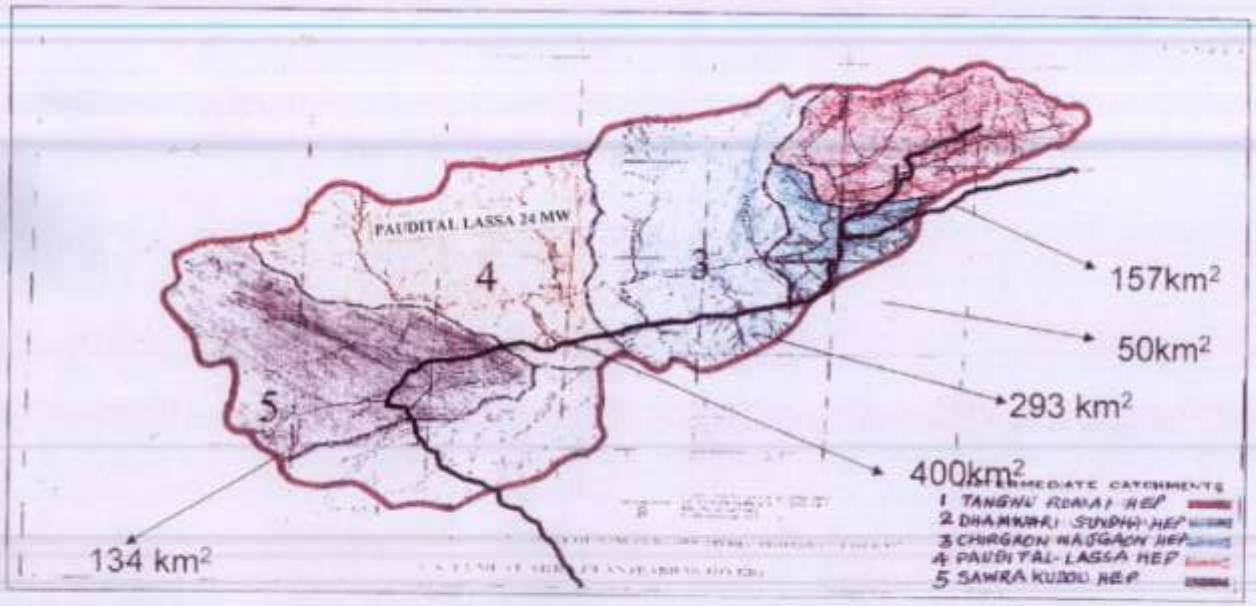
1. *Todsa*
2. *Banoti*
3. *Jalwari*

Gwas block

1. *Baggi*
2. *Gwas*

Divisional Forest Officer
Rohru Division
ROHRU

HEP-wise Catchment & Sub-Catchments of Pabbar Valley with reference to Paudital Lassa HEP (24 MW)



CHAPTER -II

PROBLEM ANALYSIS AND OBJECTIVES

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PROBLEM ANALYSIS AND OBJECTIVES

The study area designed for the Catchment Area treatment is experiencing all the classic vagaries of the nature on large scale. The terrain and geology of the area susceptible to incidence of landslides/ slips/ glaciers and water erosion. Bulk of soil erosion takes place due to scurrying action of water running off the surface during melting of snow. The runoff water first form localized channels which in turn form bigger gullies leading to serious Soil erosion problem.

2.1 SOIL EROSION:

Soil erosion may be defined as the detachment and transportation of soil. Water is the major agent responsible for this erosion. In many locations, winds, glaciers, etc. also cause soil erosion. In the catchment area of a hilly area like that being considered for the proposed project, water erosion is a common phenomenon and the same has been studied as a part of the Catchment Area Treatment (CAT) plan. The problem has aggravated in last few years and the silt level in all the rivers and streams have gone up to the alarming level in Himachal. This is causing great problems in the power generation and lowering the efficiency of turbines in various hydroelectric projects in the state.

2.1.1 Soil erosion leads to:

Loss in production potential

Reduction in infiltration rates

Reduction in water-holding capacity

Loss of nutrients

Increase in tillage operation costs

Reduced transport and storage capacity and

Reduction in water availability

2.1.2 Methodology for the Study for Soil Erosion:

Main aim of study involves:

To study erosion characteristics of the terrain.

To evolve a proper plan to minimize the rate of erosion.

A comprehensive database on terrain conditions, different types of soil of the catchment, natural resources and socio-economic status etc. is essential to evolve a treatment plan. In

high hills variability of site parameters such as topography, soils, land use, climate and rainfall matters. Not all areas contribute equally to the erosion problem. Several techniques like manual overlay of spatially index-mapped data have been used to estimate soil erosion in complex topography.

In order to ensure the latest and accurate data is taken for the analysis, satellite data has been used for data and ground realities have also been taken into account. Geographic Information System (GIS) is a tool to store, analyze and display various spatial data. GIS is a computerized resource data base system and has a capacity to perform numerous function and operations.

2.1.3 Study of the Problem:

The different data layers of the catchment area used for the study are as under:

Land use classification map

Correct management practices

Catchment area map

Soil map

Slope map

2.2 STATUS OF EROSION IN THE REGION:

Due to steep slopes, the Runoff and erosion are active. Landslides and movement of debris in steep nallahs take place in the area particularly during the rainy season. The land under agricultural use is not at all terraced. Pabbar and its tributaries having high velocity of flow, cause serious erosion and flow problems. In rainy seasons when these are in full spate, they bring down boulders, stones and coarse material with muddy water. Although commercial felling have been stopped in the state for last 10 years. But still the activities are carried clandestinely and also the increased grazing of domestic cattle has caused great loss of vegetation.

2.3 WATERSHEDS AND SOIL EROSION ESTIMATION

Various factors affecting erosions in the region are soil characteristics, meteorological conditions such as annual precipitation, snow fall, intensity of precipitation, wind velocity etc. Sedimentation of reservoir is a function of soil erosion rate of river catchment area. It reduces the water storage capacity of reservoir and availability of water for its designated use. It could therefore be concluded that useful life of a hydroelectric project is directly related to the soil erosion rates of catchment area. To reduce and overcome this problem a thorough study of sub watersheds of catchment area is a pre-requisite to devise a comprehensive CAT Plan.

$$RPI = \sum AR \times WR/AS$$

Whereas RPI = Run-off potential index for the sub-watershed. AR – Area of Run-off Potential Mapping units. WR = Weight age value of Runoff Potential

Unit AS = Total area of the sub-watershed.

Higher the runoff potential indices, higher will be the priority.

c. **Priority categorization an treatment:**

RPI for various watershed areas have been calculated. The intense gradation of priority within sub water sheds is based on the Average Potential run-off range as given in Table below:

Priority Categorization

	Priority Category	Average Potential Runoff Range
1	Very high	75 & Above
2.	High	65 – 74
3.	Medium	55 – 64
4.	Low	50 – 54
5.	Very low	Below 50

d. Priority sub-watersheds

The data showing sub watershed-wise distribution of erosion intensity their run-off potential index have been arrived at and grading of sub-watersheds under very high and medium priority categories is given in Table **Priority of treatment**

For deciding the priority of area for treatment susceptibility to soil erosion has been taken as the sole basis. The AIS&LUS (All India Soil and Land Use Survey) Agriculture Report No. 830 has been adopted. This report categorizes Pabbar Watershed catchment into various sub-watersheds. Priority of treatment has been assigned to each sub-watershed based on value obtained for run-off potential as tabulated ahead. Table-1&Table-2.

Table-I

Runoff Potential Mapping Unit Legend

Mapping Symbol	Description	Approved Run off Potential Value
I1	Very gently to gently sloping (1- 10%) river terraces. Cultivated, brown to very dark grayish brown and dark yellowish brown,	50

		moderately deep to very deep, coarse loamy soils; slight erosion.	
M1		Moderately steep to steep (15-33%) mountain side slopes, cultivated poorly terraced; brown, shallow to moderately deep sandy to coarse loamy soils, moderate to severe erosion.	65
M2		Moderately steep to steep (15-33%) mountain side slopes; thin forest vegetation (mostly bushes) and grass lands; brown to dark grayish brown, shallow to moderately deep, sandy to coarse loamy soils ; 10-25% rock out crops; moderate to severe erosion with occasional land slips.	70
M3		Moderately steep to steep (15-33%) mountain side slopes; moderately thick forest vegetation (mostly bushes) and grass lands; brown to dark grayish brown, shallow to moderately deep, sandy to coarse loamy soils ; 10-25% rock out crops; moderate to severe erosion with occasional land slips.	65
P1		Very steep to very very steep (more than 33%) mountain side slopes, grass land and thin forest vegetation(mostly bushes) dark brown to dark grayish brown, shallow to moderately deep, coarse loamy soils; 15-40% rock out crops; moderate to severe erosion with occasional landslides.	60

P2	Very steep to very very steep (more than 33%) mountain side slopes, moderately thick forest vegetation, brown to very dark grayish brown, shallow to moderately deep, coarse loamy soils; 15-40% rock out crops; moderate to severe erosion with occasional landslides.	75
U1	Very Steep to very-very steep (more than 33%) mountain slopes; snow bound for 5 to 8 months in a year; thin grassy cover; brown to dark grayish brown; very shallow to shallow, coarse loamy soils; 15-40% rock out crops; moderate to severe erosion with occasional landslides.	60
U2	Very steep to very-very steep (more than 33%) mountain slopes, glacier etc; permanent snow cover.	40

These indices have been and are still in vogue for deciding priority of treatment under RVP (River Valley Projects) and FPR (Flood Prone Rivers) schemes of the government of India Ministry of Agriculture. Although some of the watersheds may have been treated in the past yet as mentioned elsewhere in this report the situation in the catchment is dynamic and proneness to erosion keeps varying with time. Moreover, due to this scheme's own limitations entire watershed in many cases could not be treated as norms provided for hilly regions were kept at par or even below those of plain areas. Physical norms for number of plants per hectare of treated land were also reduced considerably to obviate incurring expenditure beyond the cost norms. For the same reasons barbed-wire fencing was not provided to the plantations and instead live hedge fencing was attempted. Effectiveness of live hedge fencing has been and is debatable in these regions as it was created in the same year as that of main species planting. Owing to slow growth rates in these colder climes the fencing has by and large remained ineffective. This seriously compromised the quality of treatment provided. Relative Priority Index has been classified as per requirement of this CAT Plan and may be at variance with those followed in RVP/FPR scheme. Without passing any value judgment on the success or otherwise of the treatments done in the past, effort would again be made in this Plan to treat all sub- watersheds afresh with new initiatives to reduce silt flow which remains one of the objectives of this plan.

The priority class's vis-à-vis run off potential index is given as under.

S.N.	Relative Priority Index class	Treatment Priority

1	> 80	Critical
2	56-80	Very High
3	46-55	High
4	31 - 45	Medium
5	<30	Low

A word of caution needs to be added here that the AIS&LUS despite being the only authentic survey ever taken to cover all the sub-watersheds may have become dated for some areas in view of fast changing conditions in and dynamics of catchments. As such some deviations may have to be made at the time of implementation. The implementing agency should use its own observation, experience and judgment while making departure from this prioritization of sub-watersheds for treatment.

2.4 WATER SHED MANAGEMENT – AVAILABLE TECHNIQUES:

Watershed management is the optimal use of soil and water resources within a given geographical area so as to enable sustainable production. It implies changes in land use, vegetative cover, and other structural and non-structural action that are taken in a watershed to achieve specific watershed management objectives. The overall objectives of watershed management programme are to:

- *Increase infiltration into soil;*
- *Control excessive runoff;*
- *Manage and utilize runoff for useful purpose*

The watershed management measures have been classified under the following categories:

a. *Biological measures*

b. *Soil and Moisture conservation*

I) *Engineering measure*

II) *Bio Engineering measures*

a) **Biological Measures**

The various measures covered in this category are:-

- *A forestation of degraded Forest land*
- *Shrub Plantation*
- *Enrichment plantation*
- *Assisted Natural Regeneration Plantation*
- *NTFP'S*
- *Nursery Development*

B) **Soil and Moisture conservation**

i) **Engineering measures**

- Wire Crate Check Dams
- Dry Stone Check dams
- Check walls
- Stabilization works

ii) **Bio engineering measures**

- Brush Wood Check Dams
- Palisades, fascines, included with Vegetative Support
- Raising And Planting of bio engineering species

2.5 PRESSURE ON FOREST RESOURCES:

The current problems being faced in forest conservation arises directly from the natural resource dependence of the people inhabiting in forested region. These dependences are becoming intense because of eco-system is going down from the abuse and over use of natural resources. Man is responsible for degrading the forest eco-system. As his number increased and his culture and technology advanced, he modified the natural eco-system into an artificial. As a result many species of flora and fauna have endangered. It is said that if the present course of environmental degradation is continued, then it will destroy the capability of our natural environment to support a civilized human society. The depletion of our Wild life and also the hardships faced by people dependence on natural resources is due to: -

a) Reduction of Wild life habitats

b) Increasing biotic pressure

c) Increasing demand of forest resources as per Forest Settlement Report, 1921.

d) Illicit felling, poaching and encroachment on forest land

e) Forest fire

f) Cultural transition

g) Collection of minor forest produce

h) Grant of Nature land

2.6 GRAZING:

The catchment area of Pabbar River has large portion cover under snow. During summer these act as the alpine pastures and migratory routes to the grazers towards the district Kinnaur of Himachal Pradesh and vice-versa. The Pabbar Valley has vast tracks under high altitude pastures. Discussion with the local people revealed that these pastures have badly degraded over a period of time. At many places weeds like rumex species have encroached upon this alpine pasture. The palatable grasses are not more than a few inches tall and the other related pasture species have also been started showing signs of stress. As a result that neither the animal gets sufficient fodder nor the land protected from the subsequent onslaught of the range on account of over grazing, this result in large scale deterioration of the ecology and environment of the Pabbar Valley. The age Old Forest Settlement Report, 1921 which recognizes several rights of the people has also become out dated with reference to the present context with passage of time. The problem of grazing becomes much graver in view of the Pabbar catchment being home to some medicinally important plants.

2.7 MAN - WILDLIFE CONFLICT:

Man - wildlife conflict is a result of gradual degradation of natural resources and the most sufferers are poor, marginalized communities living in and around the forest. The problem of animal damage in whether it is crop depredation, live stock depredation and human causalities is not as alarming as it is evident in other parts of the state or else-where in the country. The problem of livestock predation and killing by Leopard and black bear is gradually escalating and to some extent, appropriate compensation is needed and also environmental awareness programmes for migratory grazers thus need to be developed. Concentrated efforts, education, awareness, research monitoring, policy, law and governance; habitat restoration and development of essentially needed infrastructure to tackle complex issues pertaining to the man-animal conflict are required to be implemented on a priority basis.

2.8 INADEQUATE SCIENTIFIC INFORMATION:

The area by virtue of its location is considered to be very rich in bio-diversity. However, systematic scientific studies to support documentation are not available and whatever information is available has been gleaned from the secondary sources. Exhaustive inventory of the flora and fauna is yet to be prepared, whatever little information is there it is in the working plan of Rohru Forest Division. The status of important habitat types and that of the

threatened flora and fauna is not known. No information is available in this division regarding the carrying capacity of the forests and alpine meadows in Rohru Forest Division. Therefore, in the absence of reliable primary data on various aspects, only general type of strategy and approach can be made as management and improvement of the area is concerned.

2.9 HARMFUL PRACTICES BY THE LOCAL PEOPLE

The trees near habitations are lopped ruthlessly for fuel wood and fodder. The grant of Nautor to landless people is also putting the forest in danger. The forest is experiencing tremendous pressure of human and livestock needs. The animals roam freely in the forest area tramping and eating the sapling in the forest area. This results in the increased rate of soil erosion. These factors have put following problems to the fore:

1. Excessive soil loss and increase in runoffs
2. Man and wildlife conflict
3. Fuel wood and fodder are becoming scarce

Moreover as the area has been experiencing growth in apple production and other cash crops being cultivated in private lands. People of the area are putting extra pressure on forest resources by deriving the material for packaging of these items. The unscientific collection of NTPF is also harmful to the biodiversity of the catchment area. The people in the area own cow for milk and ghee and is the major livestock in the area. But once after stopping milk production the owners set them free in the adjoining areas. This has become the major hazard in the area and the whole state.

2.10 ECO-TOURISM POTENTIAL:

The area being interior and picturesque, there are very few income generation opportunities for the local people. The concept of community based eco-tourism enshrined in the H.P. Eco-tourism policy 2005 seems to have good potential in the Pabbar Valley. The policy will be implemented through eco-tourism society and for this purpose; Chanshal Eco-Tourism Society has been constituted and registered under the Registration of Societies Act, 2006 and Eco tourism activities will be execute through this society.

2.11 BUILDINGS, PATHS, BRIDGES AND COMMUNICATION NETWORK:

The existing buildings, I/Paths and B/Paths are in dilapidated conditions and some of existing bridges are in bad conditions. Their abutments and wooden beams/planks are in worn-out conditions and needs replacement. In addition to these, there is need to construct and maintain

new bridges and maintenance of existing I/paths, B/paths for effective patrolling/touring in the catchment area. Not only it will provide facilities to the field functionaries but it will also helpful to local people. It was also reported that the floods caused a major damage to the range office in which some record of the office also went missing. The area is highly remote and devoid of major facilities. Also for better management of the Division, ranges and beats the conditions of existing inspection paths and B/paths are to be improved on the priority basis. For successful implementation of CAT Plan and better management the catchment area the infrastructure in the catchment should be up to date.

2.12 LACK OF TRAINED STAFF IN PA'S:

There is a lack of professional knowledge/skills of management especially habitat improvement, procedure for monitoring and evaluation in different event, vegetation charges overtime and its relationship to changes in prey base species, collection of evidences and biological material, symptoms of important diseases, preventive measures and treatment assessment, techniques and methodologies and bio-diversity impacts etc. The staff is therefore, left with no option but to undertake a protection job and implementation of various works in the traditional ways.

2.13 LACK OF CONCERN ABOUT CONSERVATION BY THE LOCAL PEOPLE:

As the local population in majority is backward it is apparent that the people have little or no knowledge about the environment conservation. The local people of the area do not seem to show any concern for the conservation of bio-diversity available in the area. There is no local concern voluntary organization willing to make conservation as a primary issue. Off late the government has realized that the effective implementation of various biodiversity conservation and environment related programmes cannot achieve their objectives without awareness and concerns of the local people. So, it is highly needed to initiate a dialogue with local people on the conservation of natural resources by formation of V.F.D.S./VFDC etc. at the village/Panchayat level.

2.14 MONITORING AND EVALUATION:

Monitoring is yet another important and integral component for effective conservation and management as it provides a ways to track the status of various components of biological diversity and forest eco system over time. The regular feed back through monitoring and evaluation allows better understanding, midway corrections and

adoption of appropriate strategies. Mathur and Uniyal have provided details on the proposed long term ecological monitoring (LTEM) programme must be followed. The desired success could not be achieved in this direction in the absence of adequate man power, scientific and professional knowledge, financial constraint, support from local institutions and participation of

local communities. Regular review and evaluation meeting should be arranged to assess the results achieved and further course of action. All the agencies involved in the implementation of the CAT Plan should, in a coordinated effort regularly evaluate the achievement of desired results.

2.15 LACK OF APPROPRIATE INFRASTRUCTURAL SUPPORT:

The area is facing a lack of basic minimum infrastructure support in the field of housing, I/Hut, FRH, Office equipment i.e. Computer, GPS, Compass, Camping equipments, field equipment etc. In the absence of this infrastructural support, the information flow is very slow and erratic in management.

Table

Characteristics of sub-watersheds in the effective catchment area of Paudital Lassa SHEP (24MW)

S. No	Sub- Water-shed code		Area in ha	Runoff %	Product of area and Runoff	Runoff Potential Index (RPI)	Relative priority
1	Ym1g	I1	25	50	1250		
		M1	500	65	32500		
		P1	1575	80	126000		
		P2	2475	75	185625		
	Total		**4574**		**345375**	**75**	**29(Low)**
2.	Ym1h	Ii	25	50	1250		
		M 1	125	65	8125		
		M 2	25	70	1750		
		M 3	700	65	45500		
		P1	1250	80	100000		
		P2	900	75	67500		
	Total		**3025**		**224125**	**74**	**48** (High)
3	Ym1k	Ii	350	50	17500		
		M 2	50	70	350		
		M 3	200	65	13000		
		P1	825	80	66000		

		P2	100	75	9000		
	Total		**2625**		**190000**	72	**62 (very high)**
4.	**Ym1c**	li	25	50	1250		
		P1	425	80	34000		
		P2	2900	75	217500		
	Total		**3350**		**252750**	75	**26(Low)**
5	**Ym2m**	li	100	50	5000		
		M1	675	65	43875		
		M 2	175	70	12250		
		M 3	300	65	19500		
		P1	2100		168000		
	Total		**3725**		**276750**	74	**65(very high)**

6	**Ym2n**	li	650	50	32500		
		M 1	375	65	24375		
		M2	550	70	38500		
		M3	450	65	29250		

		P1	1600	80	128000		
		P2	1475	75	110625		
	Total		**5100**		**363250**	**72**	**47 (High)**
7.	**Ym2p**	ii	550	50	27500		
		M 1	825	65	53625		
		M2	375	70	26250		
		M 3	575	65	37375		
		P1	1425	80	114000		
		P2	750	75	56250		
	Total		**4500**		**315000**	**70**	**52 (High)**
	Ym2s		**375**	50	**18750**		
			50	65	**3250**		
			125	70	**8750**		
	M3	200	65	13000			
	P1	1150	80	92000			
	P2	575	75	43125			
Total		**2475**		**178875**	**72**	**63(very high)**	

9.	Ym2t	M1	100	65	6500		
		P1	1450	80	116000		
		P2	1700	75	127 500		
		U1	50	60	3000		
	Total		3300		253000	77	5 (Low)
10.	Ym2g	ii	200	50	10000		
		M 1	25	65	1625		
		M3	200	65	13000		
		P1	625	80	50000		
		P2	100	75	7500		
	Total		1150		82125	71	69(very high)
	Ym2k		325	50	16250		
			300	65	19500		

			25	70	1750		
			575	65	37375		
			275	80	22000		
			125	75	9375		
	Total		1625		106250	65	50 (High)
	Ym1n		50	50	2500		
			25	65	1625		
			225	70	15750		
			850	65	55250		

			1300	80	104000		
			1950	75	146250		
	Total		4400		325375	74	49 (High)

Detailed Micro Watershed Wise Planning of The Effective catchment Area of

Paudital -Lassa SHEP 24 (MW)

WATER SHED MANAGEMENT

ENGINEERING / BIO-LOGICAL MEASURES

The development activities, including hydro electric projects have some impact on natural resources. The environmental impacts of such projects to-gather with the faulty management practice etc ultimately lead to environmental degradation and accelerated soil erosion in the catchment area of the project and transport of the detached material through drainage network gives rise to a series of problems, notably siltation, depleting flows capacity, steady loss in storage capacity, frequent floods and consequently lesser generation.

Therefore for sustainable hydro power development with least negative impact on the environment, watershed management plays a pivotal role, in order to minimize immediate damage to the environment the watershed management programme, involving extreme soil conservation measures in the catchment have assumed tremendous importance for formulation of a comprehensive and detailed catchment area treatment plan.

For formulation of a comprehensive and detailed catchment area treatment plan water shed management involves collection of information on a whole range of parameters of static & dynamic nature related to geology, hydrology, soil geo morphology, topography, drainage conditions, land use, land cover etc.Thus a comprehensive cat plan should focus on

i. *Mitigation means for erosion and land slide hazards.*
ii. *The problem of silt and debris load to the river from susceptible areas of catchment*
iii. *Checking sediment load from the tributaries discharging directly into the main river.*
iv. *Protecting the directly draining catchment from scouring/sloughing and slips.*

Paudital-Lassa SHEP being a run of the river project is not expected to have any negative impact on the envoirment.

The catchment area treatment is extremely crucial in the context of hydro power development, keeping in mind the topography, soil type, climate, land use and the vegetative cover in the catchment various measures both engineering and biological are proposed to check soil erosion.

The engineering measure comprise construction of check dams, wire crates, DRSM works, contour bunds etc. while biological measures include mainly raising and plantation of economically and environmentally important and exotic type of trees.

In order to formulate this cat plan areas prone /venerable to erosion have been identified in field and studied, various factors that are responsible for soil erosion and the drainage pattern in the area, slope soil type, land use and land cover etc.

The total catchment area of Paudital-Lassa SHEP up to its intake is 900 sq.km, part of this is common to the three major HEP's coming up upstream, as such a effective catchment has been considered, this is from the intake of the immediately up stream project and up to the intake of this project, this effective catchment area works out to 400 sq.km.The directly draining catchment comprises of twelve sub-micro water sheds, they are ym2p, ym2m, ym2k, ym2n, ym2t, ym2s,ym2q on the right bank and ym1c, ym1n, ym1k, ym1g and ym1h on the left bank of river Pabbar, a index map these twelve sub-micro watersheds directly draining catchment is given at page 38(a). The hierarchical deleation system developed by AISLUS was followed for the demarcation of sub-watersheds within the study area the codification system as given in the watershed atlas of India (AISLUS) was followed for Paudital-lassa effective catchment area plan. Area of the twelve sub-water sheds of directly draining catchment is given in the table below.

S.No	Sub-water shed code	Area in ha	Percentage
1.	Ym2p	4500	11.29263
2.	Ym2m	3725	9.34779
3.	Ym2k	1625	4.07789
4.	Ym2n	5100	12.79831
5.	Ym2t	3300	8.28126
6.	Ym2s	2475	6.21095
7.	Ym2q	1150	2.88589
8.	Ym1n	4400	11.04168

9.	Ym1c	3350	8.40674
10.	Ym1k	2625	6.58737
11.	Ym1h	3025	7.59116
12.	Ym1g	4574	11.47833
	Total	39849 ha	100%
	Say	400000ha	100%

In the upper catchment of the sub-watersheds brush wood check dams have been proposed to control the erosion in the basin. Streams are segmented into 50 m intervals depending upon the gradient.

In the lower reaches where the discharge is higher loose boulder (dry stone masonry) check dams are proposed.

The areas where discharge is much higher gabion (G.I.Wire crates) are proposed.

In areas where erosion intensity is severe to very severe contour bunding is proposed.

In third order to more than third order silt retention dams are proposed.

It is seen that 12% to 18% of the area comprises of open forests and degraded for reforestory, therefore a 15% of the total area of sub-watersheds shall be treated by means of plantation. The planning for implementation of these measures and cost estimation is given in the preceding pages.

SUB WATER SHED WISE LAND USE/LAND COVER DETAILS

Land use describes how a patch of land is used whereas land cover describes the material such as vegetation, rock or building present on the surface, this has been described in Para 1.6

S.No	Sub-water shed code	EIMU		Area in ha
1.	Ym2p	Built-up land	0.15%	6.75
		Degraded or scrub land	3.25%	146.25
		Evergreen/semi green forest	20.0%	900
		Forest plantation	15.0%	675
		Grass land/grazing land	10.0%	450
		Agriculture land (kharif+rabi)	15.0%	675
		Waste land without scrub	30.0%	1350
		Plantation	3.0.%	135
		Snow covered/glacial area	2.0%	90
		Rocky uncultivable wastes i/c streams & river beds	1.60%	72
		Total		**4500**
2.	Ym2m	Built-up land	0.15%	5.59
		Degraded or scrub land	3.25%	121.06
		Evergreen/semi green forest	20.0%	745
		Forest plantation	15.0%	558.75
		Grass land/grazing land	10.0%	372.50
		Agriculture land (kharif+rabi)	15.0%	558.75
		Waste land without scrub	30.0%	1117.50
		Plantation	3.0.%	111.75
		Snow covered/glacial area	2.0%	74.5

		Rocky uncultivable wastes i/c streams & river beds	1.60%	59.60
		Total		**3725**
3.	**Ym2k**	Built-up land	0.15%	2.44
		Degraded or scrub land	3.25%	52.81
		Evergreen/semi green forest	20.0%	325
		Forest plantation	15.0%	243.75
		Grass land/grazing land	10.0%	162.25
		Agriculture land (kharif+rabi)	15.0%	243.75
		Waste land without scrub	30.0%	487.5
		Plantation	3.0.%	48.75
		Snow covered/glacial area	2.0%	32.50
		Rocky uncultivable wastes i/c streams & river beds	1.60%.	26
		Total		**1625**
4.	**Ym2n**	Built-up land	0.15%	7.65
		Degraded or scrub land	3.25%	165.75
		Evergreen/semi green forest	20.0%	1020
		Forest plantation	15.0%	765
		Grass land/grazing land	10.0%	510
		Agriculture land (kharif+rabi)	15.0%	765
		Waste land without scrub	30.0%	1530
		Plantation	3.0 %	153
		Snow covered/glacial area	2.0%	102
		Rocky uncultivable wastes i/c streams & river beds	1.60%	81.6
		Total		**5100**

5.	Ym2t	Built-up land	0.15%	4.95
		Degraded or scrub land	3.25%	107.25
		Evergreen/semi green forest	20.0%	660
		Forest plantation	15.0%	495
		Grass land/grazing land	10.0%	330
		Agriculture land (kharif+rabi)	15.0%	495
		Waste land without scrub	30.0%	990
		Plantation	3.0.%	99
		Snow covered/glacial area	2.0%	66
		Rocky uncultivable wastes i/c streams & river beds	1.60%.	52.8
		Total		**3300**
6.	Ym2s	Built-up land	0.15%	3.71
		Degraded or scrub land	3.25%	80.44
		Evergreen/semi green forest	20.0%	495
		Forest plantation	15.0%	371.25
		Grass land/grazing land	10.0%	247.5
		Agriculture land (kharif+rabi)	15.0%	371.25
		Waste land without scrub	30.0%	742.5
		Plantation	3.0.%	74.25
		Snow covered/glacial area	2.0%	49.5
		Rocky uncultivable wastes i/c streams & river beds	1.60%.	39.6
		Total		**2475**

7.	Ym2q	Built-up land	0.15%	1.73
		Degraded or scrub land	3.25%	37.75
		Evergreen/semi green forest	20.0%	230
		Forest plantation	15.0%	172.5
		Grass land/grazing land	10.0%	115
		Agriculture land (kharif+rabi)	15.0%	172.5
		Waste land without scrub	30.0%	345
		Plantation	3.0.%	34.5
		Snow covered/glacial area	2.0%	23
		Rocky uncultivable wastes i/c streams & river beds	1.60%	18.4
		Total		**1150**
8.	Ym1n	Built-up land	0.15%	6.6
		Degraded or scrub land	3.25%	143
		Evergreen/semi green forest	20.0%	880
		Forest plantation	15.0%	660
		Grass land/grazing land	10.0%	440
		Agriculture land (kharif+rabi)	15.0%	660
		Waste land without scrub	30.0%	1320
		Plantation	3.0.%	132
		Snow covered/glacial area	2.0%	88
		Rocky uncultivable wastes i/c streams & river beds	1.60%	70.4
		Total		**4400**

9.	Ym1c	Built-up land	0.15%	5.03
		Degraded or scrub land	3.25%	108.87
		Evergreen/semi green forest	20.0%	670
		Forest plantation	15.0%	502.5
		Grass land/grazing land	10.0%	335
		Agriculture land (kharif+rabi)	15.0%	502.5
		Waste land without scrub	30.0%	1005
		Plantation	3.0.%	100.5
		Snow covered/glacial area	2.0%	67
		Rocky uncultivable wastes i/c streams & river beds	1.60%	53.60
		Total		**3350**
10.	Ym1k	Built-up land	0.15%	5.44
		Degraded or scrub land	3.25%	117.81
		Evergreen/semi green forest	20.0%	525
		Forest plantation	15.0%	393.75
		Grass land/grazing land	10.0%	262.25
		Agriculture land (kharif+rabi)	15.0%	393.75
		Waste land without scrub	30.0%	787.5
		Plantation	3.0.%	78.75
		Snow covered/glacial area	2.0%	52.25
		Rocky uncultivable wastes i/c streams & river beds	1.60%	42
		Total		**2625**

11.	Ym1h	Built-up land	0.15%	4.54
		Degraded or scrub land	3.25%	98.31
		Evergreen/semi green forest	20.0%	605
		Forest plantation	15.0%	453.75
		Grass land/grazing land	10.0%	302.5
		Agriculture land (kharif+rabi)	15.0%	453.75
		Waste land without scrub	30.0%	907.5
		Plantation	3.0 %	90.75
		Snow covered/glacial area	2.0%	60.5
		Rocky uncultivable wastes i/c streams & river beds	1.60%	48.4
		Total		**3025**
12.	Ym1g	Built-up land	0.15%	6.86
		Degraded or scrub land	3.25%	148.65
		Evergreen/semi green forest	20.0%	914.80
		Forest plantation	15.0%	686.1
		Grass land/grazing land	10.0%	457.4
		Agriculture land (kharif+rabi)	15.0%	686.1
		Waste land without scrub	30.0%	1372.2
		Plantation	3.0 %	137.22
		Snow covered/glacial area	2.0%	91.48
		Rocky uncultivable wastes i/c streams & river beds	1.60%	73.18
		Total		**4574**
		Grand Total		**39849**
			Say	**40000**

Detail Planning For Micro Water Sheds In The Effective Area Of Poudital Lass SHEP (24 MW)

Name Of Micro Water Shed---------- Ym2p

Ym2p is the micro water shed of Pabber basin in yamuna catchment . The total area of this micro water shed is **4500** ha . This micro water shed is categorized as **52 High** priority. On the basis of reconnaincence survey carried out during the field exercise the following acitivitis are proposed for treatment of the micro water shed.

A)-: Biological Measures

Sr No.	Name Of The Component	Name Of The Area	Area In Hac
1	Shrub Plantation	RF-Sungri	10

B)-: Soil And Moisture Conservation

1.- Engineering Measures

SrNo.	Name Of Work	Units/Nos
1	Dry Stone Masonry	1
2	Silt Retation Dams	1

2.- Bio Engineering Measures

SrNo.	Name Of Work	Units/Nos
1	Brush Wood Check Dam	100
2	Palisades , fascines, including With Vegitative supports	114
3	Rising Plants Of Bio Engeering Species	Details Are given in the Spread Sheet Column NO.2(B)
4	Planting Of Plants Of Bioengring Species	

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Detail Planning For Micro Water Sheds In The Effective Area Of Poudital Lass SHEP (24 MW)

Name Of Micro Water Shed---------- Ym2m

Ym2m is the micro water shed of Pabber basin in yamuna catchment . The total area of this micro water shed is **3725 ha** . This micro water shed is categorized as **65 Very High** priority. On the basis of reconiancence survey carried out during the field exercise the following acitivitis are proposed for treatment of the micro water shed.

A)-: Biological Measures

Sr No.	Name Of The Component	Name Of The Area	Area In Hac
1	Enrichment Plantation	RF-Khnola	5
2	NTFP's	RF-Dharoli	5

B)-: Soil And Moisture Conservation

1.- Engineering Measures		
SrNo.	Name Of Work	Units/Nos
1	Dry Stone Masonry bunds	1
2	Silt Retation Dams	1
3	Check Dam Grema(Slip)	112
4	Wire Crate Check DamsThali Gad(khad/ Nallah)	3
5	Dry Stone Masonry Thali Gad(khad/ Nallah)	6
2.- Bio Engineering Measures		
SrNo.	Name Of Work	Units/Nos
1	Brush Wood Check Dam	100
2	Palisades , fascines, including With Vegitative supports	114
3	Rising Plants Of Bio Engeering Species	Details Are given in the Spread Sheet Column NO.2(B)
4	Planting Of Plants Of Bioengring Species	

Detail Planning For Micro Water Sheds In The Effective Area Of Poudital Lass SHEP (24 MW)

Name Of Micro Water Shed---------- Ym2k

Ym2k is the micro water shed of Pabber basin in yamuna catchment. The total area of this micro water shed is **1625 ha**. This micro water shed is categorized as **50 High** priority. On the basis of reconiancence survey carried out during the field exercise the following acitivitis are proposed for treatment of the micro water shed.

A)-: Biological Measures

Sr No.	Name Of The Component	Name Of The Area	Area In Hac
1	A Frostation of Degraded Forest Land	RF-Bhamnoli	10
		RF-Dharal	10

B)-: Soil And Moisture Conservation

1.- Engineering Measures		
SrNo.	Name Of Work	Units/Nos
1	Dry Stone Masonry	1
3	wire crate Check Dam Bhamnoli(Slip)	34
4	Wire Crate Check Dams SiaGad (khad/ Nallah)	8
5	Dry Stone Masonry Sia Khad (khad/ Nallah)	6
6	Wire Crate Check Dams Chammi Khad (khad/ Nallah)	9
7	Dry Stone Masonry Chammi Khad (khad/ Nallah)	10

2.- Bio Engineering Measures		
SrNo.	Name Of Work	Units/Nos
1	Brush Wood Check Dam	100
2	Palisades , fascines, including With Vegitative supports	114
3	Rising Plants Of Bio Engeering Species	Details Are given in the Spread Sheet Column NO.2(B)
4	Planting Of Plants Of Bioengring Species	

Detail Planning For Micro Water Sheds In The Effective Area Of Poudital Lass SHEP (24

Name Of Micro Water Shed---------- Ym2n

Ym2k is the micro water shed of Pabber basin in yamuna catchment . The total area of this micro water shed is **5100 ha** . This micro water shed is categorized as **47High** priority. On the basis of reconnaissance survey carried out during the field exercise the following acitivitis are proposed for treatment of the micro water shed.

A)-: Biological Measures

Sr No.	Name Of The Component	Name Of The Area	Area In Hac
1	A Frostation of Degraded Forest Land	1.RF- Bhalta	5
		2. RF- Khirgi	10
2	Nursery Development	3.RF -Buthara	1.5
3	Assited Natural Regenration	4.RF-Dalgaon	5

B)-: Soil And Moisture Conservation

1.- Engineering Measures		
SrNo.	Name Of Work	Units/Nos
1	Dry Stone Masonry	1
3	Wire Crate Check Dams Oltu Gad (khad/ Nallah)	19
4	Dry Stone Masonry Oltu (khad/ Nallah)	32
5	Wire Crate Check Dams Shammer Khad (khad/ Nallah)	9
6	Dry Stone Masonry Shammer Khad (khad/ Nallah)	10
7	Wire Crate Check Dams Chira Gad Khad (khad/ Nallah)	4
8	Dry Stone Masonry Chira Gad (khad/ Nallah)	4
2.- Bio Engineering Measures		
SrNo.	Name Of Work	Units/Nos
1	Brush Wood Check Dam	100
2	Palisades , fascines, including With Vegitative supports	114
3	Rising Plants Of Bio Engeering Species	Details Are given in the Spread Sheet Column NO.2(B)
4	Planting Of Plants Of Bioengring Species	

Detail Planning For Micro Water Sheds In The Effective Area Of Poudital Lassa SHEP

Name Of Micro Water Shed---------- Ym2s

Ym2k is the micro water shed of Pabber basin in yamuna catchment . The total area of this micro water shed is **2475 ha** . This micro water shed is categorized as **63 (very high)** priority. On the basis of reconiancence survey carried out during the field exercise the following acitivitis are proposed for treatment of the micro water shed.

A)-: Biological Measures

Sr No.	Name Of The Component	Name Of The Area	Area In Hac
3	NTF's	Dhumreda	5

B)-: Soil And Moisture Conservation

1.- Engineering Measures		
SrNo.	Name Of Work	Units/Nos
1	Dry Stone Masonry	2
3	Wire Crate Check Dams Banoti Khad (khad/ Nallah)	4
4	Dry Stone Masonry Bnoti khad (khad/ Nallah)	3
5	Wire Crate Check Dams Mangra Khad (khad/ Nallah)	4
6	Dry Stone Masonry Mangra Khad (khad/ Nallah)	6
2.- Bio Engineering Measures		
SrNo.	Name Of Work	Units/Nos
1	Brush Wood Check Dam	100
2	Palisades , fascines, including With Vegitative supports	114
3	Rising Plants Of Bio Engeering Species	Details Are given in the Spread Sheet Column NO.2(B)
4	Planting Of Plants Of Bioengring Species	

Detail Planning For Micro Water Sheds In The Effective Area Of Poudital Lassa SHEP (24

Name Of Micro Water Shed---------- Ym2q

Ym2k is the micro water shed of Pabber basin in yamuna catchment . The total area of this micro water shed is **1150 ha** . This micro water shed is categorized as **69(veryhigh)** priority. On the basis of reconiancence survey carried out during the field exercise the following acitivitis are proposed for treatment of the micro water shed.

A)-: Biological Measures

Sr No.	Name Of The Component	Name Of The Area	Area In Hac
1	Shrub Plantation	RF-Shagli	10

B)-: Soil And Moisture Conservation

1.- Engineering Measures		
SrNo.	**Name Of Work**	**Units/Nos**
1	Dry Stone Masonry	1
2	Wire Crate Check Dams Masad Khad (khad/ Nallah)	13
3	Dry Stone Masonry Masad khad (khad/ Nallah)	26
2.- Bio Engineering Measures		
SrNo.	**Name Of Work**	**Units/Nos**
1	Brush Wood Check Dam	100
2	Palisades , fascines, including With Vegitative supports	114
3	Silt Retantaion Dam	1
3	Rising Plants Of Bio Engeering Species	Details Are given in the Spread Sheet Column NO.2(B)
4	Planting Of Plants Of Bioengring Species	

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Detail Planning For Micro Water Sheds In The Effective Area Of Poudital Lassa SHEP (24 MW)

Name Of Micro Water Shed---------- Ym1n

Ym2k is the micro water shed of Pabber basin in yamuna catchment . The total area of this micro water shed is **4400ha** . This micro water shed is categorized as **49 (high)** priority. On the basis of reconiancence survey carried out during the field exercise the following acitivitis are proposed for treatment of the micro water shed.

A)-: Biological Measures

Sr No.	Name Of The Component	Name Of The Area	Area In Hac
1	A Frostation of Degraded Forest Land	RF- Khasha Dhar	5

B)-: Soil And Moisture Conservation

1.- Engineering Measures		
SrNo.	Name Of Work	Units/Nos
1	Dry Stone Masonry	1
2.- Bio Engineering Measures		
SrNo.	Name Of Work	Units/Nos
1	Brush Wood Check Dam	100
2	Palisades , fascines, including With Vegitative supports	114
3	Rising Plants Of Bio Engeering Species	Details Are given in the Spread Sheet Column NO.2(B)
4	Planting Of Plants Of Bioengring Species	

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Detail Planning For Micro Water Sheds In The Effective Area Of Poudital Lassa SHEP

Name Of Micro Water Shed---------- Ym1c

Ym2k is the micro water shed of Pabber basin in yamuna catchment . The total area of this micro water shed is **3350ha** . This micro water shed is categorized as **26 (low)** priority. On the basis of reconiancence survey carried out during the field exercise the following acitivitis are proposed for treatment of the micro water shed.

A)-: Biological Measures

Sr No.	Name Of The Component	Name Of The Area	Area In Hac
1	Shrub Plantation	RF-Jitata	10

B)-: Soil And Moisture Conservation

1.- Engineering Measures		
SrNo.	Name Of Work	Units/Nos
1	Dry Stone Masonry	1
2	Wire Crate Check Dams Peja Khad (khad/ Nallah)	10
3	Dry Stone Masonry Peja khad (khad/ Nallah)	10
2.- Bio Engineering Measures		
SrNo.	Name Of Work	Units/Nos
1	Brush Wood Check Dam	150
2	Palisades , fascines, including With Vegitative supports	114
3	Silt Retantaion Dam	1
3	Rising Plants Of Bio Engeering Species	Details Are given in the Spread Sheet Column NO.2(B)
4	Planting Of Plants Of Bioengring Species	

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Detail Planning For Micro Water Sheds In The Effective Area Of Poudital Lassa SHEP

Name Of Micro Water Shed---------- Ym1k

Ym2k is the micro water shed of Pabber basin in yamuna catchment . The total area of this micro water shed is **2625ha** . This micro water shed is categorized as **62 (very High)** priority. On the basis of reconiancence survey carried out during the field exercise the following acitivitis are proposed for treatment of the micro water shed.

A)-: Biological Measures

Sr No.	Name Of The Component	Name Of The Area	Area In Hac
1	Enrichment Plantation	RF-Diswani	5

B)-: Soil And Moisture Conservation

1.- Engineering Measures		
SrNo.	Name Of Work	Units/Nos
1	Dry Stone Masonry	1
2	Wire Crate Check Dams Peja Khad (khad/ Nallah)	10
3	Dry Stone Masonry Peja khad (khad/ Nallah)	10
2.- Bio Engineering Measures		
SrNo.	Name Of Work	Units/Nos
1	Brush Wood Check Dam	150
2	Palisades , fascines, including With Vegitative supports	114
3	Silt Retantaion Dam	1
3	Rising Plants Of Bio Engeering Species	Details Are given in the Spread Sheet Column NO.2(B)
4	Planting Of Plants Of Bioengring Species	

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Detail Planning For Micro Water Sheds In The Effective Area Of Poudital Lassa SHEP (24 MW)

Name Of Micro Water Shed---------- Ym1h

Ym2k is the micro water shed of Pabber basin in yamuna catchment . The total area of this micro water shed is **3025ha** . This micro water shed is categorized as **48(High)** priority. On the basis of reconiancence survey carried out during the field exercise the following acitivitis are proposed for treatment of the micro water shed.

A)-: Biological Measures

Sr No.	Name Of The Component	Name Of The Area	Area In Hac
1	Afforestation of degreaded Forest land	RF-Lorja	5

B)-: Soil And Moisture Conservation

1.- Engineering Measures		
SrNo.	Name Of Work	Units/Nos
1	Dry Stone Masonry	2
2	Wire Crate Check Dams Smoli (Slip)	38
2.- Bio Engineering Measures		
SrNo.	Name Of Work	Units/Nos
1	Brush Wood Check Dam	100
2	Palisades , fascines, including With Vegitative supports	114
4	Planting Of Plants Of Bioengring Species	Details Are given in the Spread Sheet Column NO.2(B)
4	Planting Of Plants Of Bioengring Species	

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Detail Planning For Micro Water Sheds In The Effective Area Of Poudital Lassa SHEP (24

Name Of Micro Water Shed---------- Ym1g

Ym2k is the micro water shed of Pabber basin in yamuna catchment . The total area of this micro water shed is **4574ha** . This micro water shed is categorized as **29 Low** priority. On the basis of reconiancence survey carried out during the field exercise the following acitivitis are proposed for treatment of the micro water shed.

A)-: Biological Measures

Sr No.	Name Of The Component	Name Of The Area	Area In Hac
1	Asstted Natural Regenration	RF- Bagi	5

B)-: Soil And Moisture Conservation

1.- Engineering Measures		
SrNo.	Name Of Work	Units/Nos
1	Dry Stone Masonry	1
2	Wire Crate Check Dams Pakhal Khad (Khad /Nallah)	6
3	Dry stos Check Dams Pakhal Khad (Khad /Nallah)	14
2.- Bio Engineering Measures		
SrNo.	Name Of Work	Units/Nos
1	Brush Wood Check Dam	100
2	Palisades , fascines, including With Vegitative supports	114
4	Planting Of Plants Of Bioengring Species	Details Are given in the Spread Sheet Column NO 2(B)
4	Planting Of Plants Of Bioengring Species	

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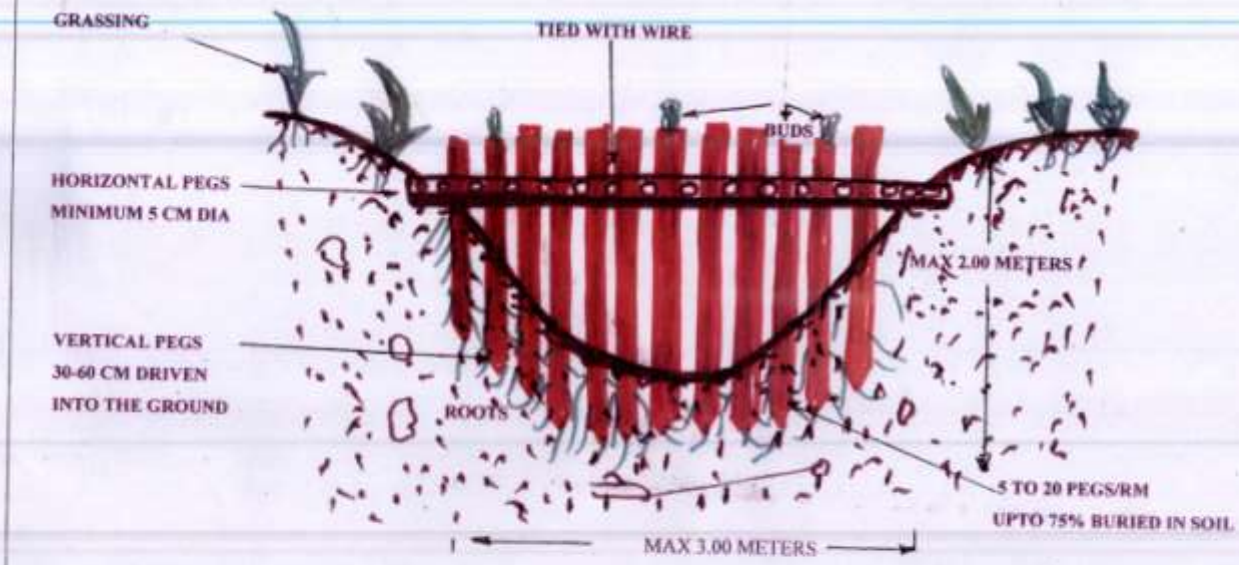
BIO-ENGINEERING TECHNIQUE

VEGETATIVE PALISADES

SALLIX TETRASPERME CUTTINGS
AGEX6-18 MONTHS, DIA 2-5 CM
LENGTH 1-2 METERS

BY USING SALIX TETRASPERMINE

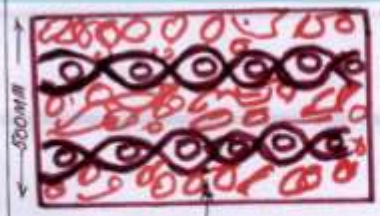


BIO-ENGINEERING TECHNIQUES

LIVE CHECK DAM

PLAN VIEW

GULLY SIDES



FOUNDATION TRENCH
LONG LIVE CUTTINGS
LAID HORIZONTLY AND
WOVEN BETWEEN VERTILE
POSTS 2M LONG, 20-50MM DIA

TRENCHEON CUTTINGS USED
AS VERTILE POSTS BURRIED
2/3 RD INTO GULLY BED
(2M LONG, 30-80 MM DIA)

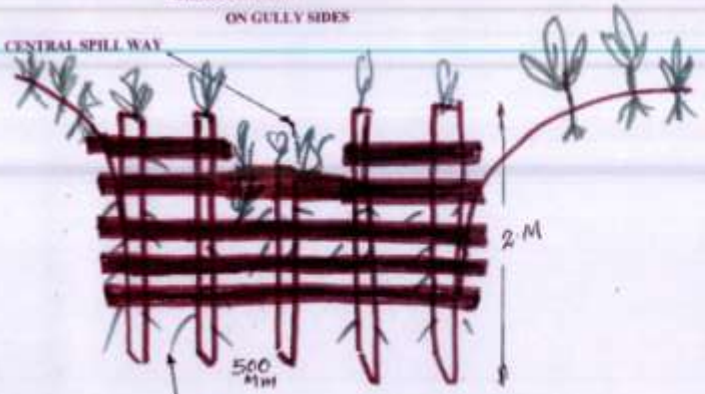
STONE BACK FILL OF 50-100 MM SIZE
WITH SOIL BETWEEN THE STONES

SUITABLE SPECIES
ADHATODA VASICA
SALIX TETRASPERNA
IPOMEA BATALA
VITEX NEGUNDO

FRONT ELEVATION

GRASS PLANTED
ON GULLY SIDES

CENTRAL SPILL WAY

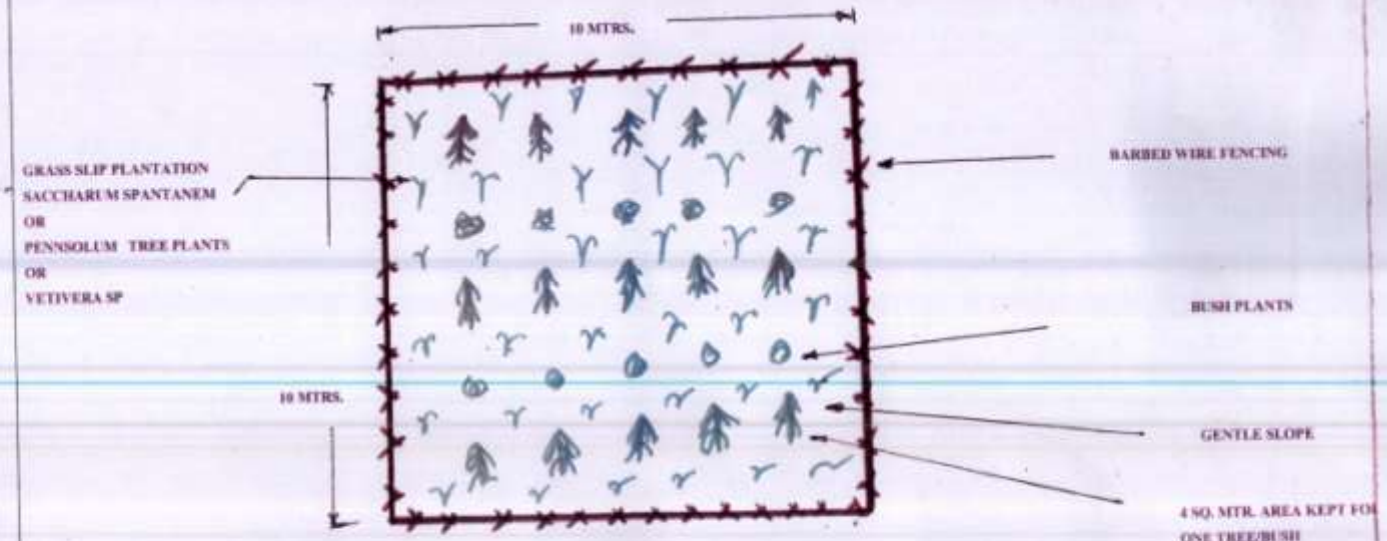


ROOTS

GULLY BED LEVEL
OR GULLY FLOOR

BIO-ENGINEERING TECHNIQUE

TREE AND SHRUB PLANTATION FOR SLOPE STABILISATION



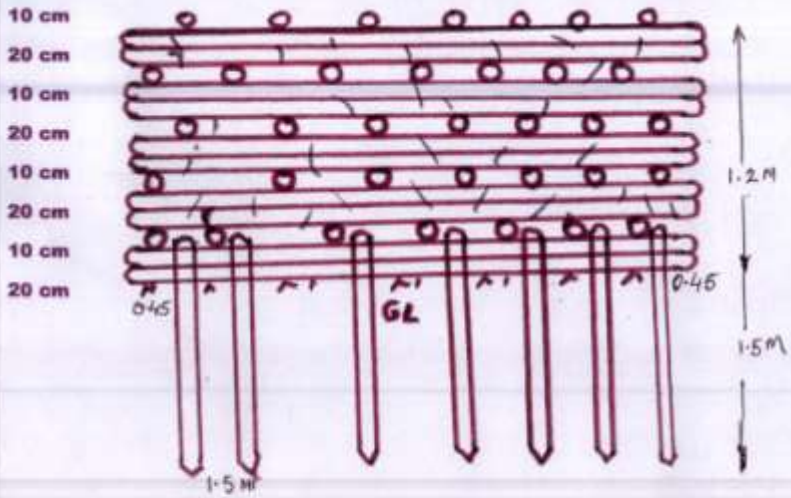
BIO ENGINEERING TECHNIQUE FOR SLOPE STABILISATION

CRIB FORMATION

ELEVATION

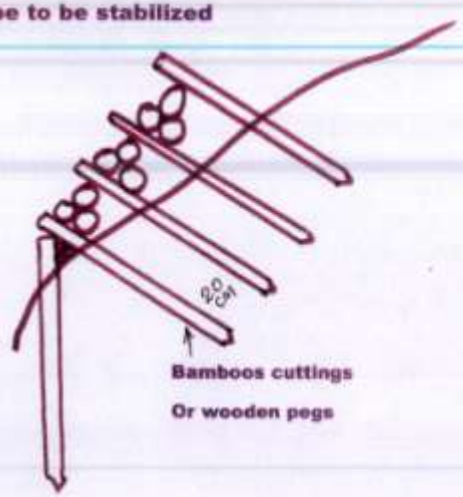
Earth & Boulders **Horizontal Bamboos or Layers**

Length 10 mtrs.



CROSS-SECTION

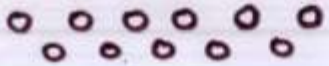
Slope to be stabilized



BIO-ENGINEERING TECHNIQUE

PALISADE (STAGGERED)

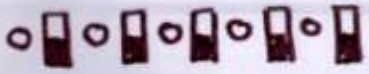
HOLES SHOULD BE LARGE ENOUGH
TO INSERT CUTTING EASILY



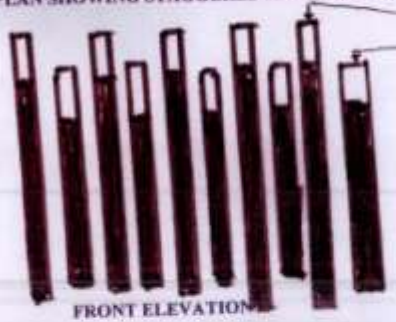
PLAN OF STAGGERED HOLES

STAGGERING DISTANCE AS REQUIRED

NOTE (SPACING BETWEEN TWO PALISADES 2 M, 30 SLOPE, MAX 30-60 SLOPE



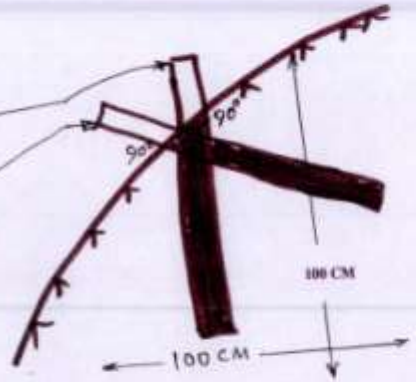
PLAN SHOWING STAGGERED H.W.C. OF PLANTS



FRONT ELEVATION

H.W.C. VERTILE TO THE SLOPE

H.W.C. RIGHT ANGLE TO SLOPE

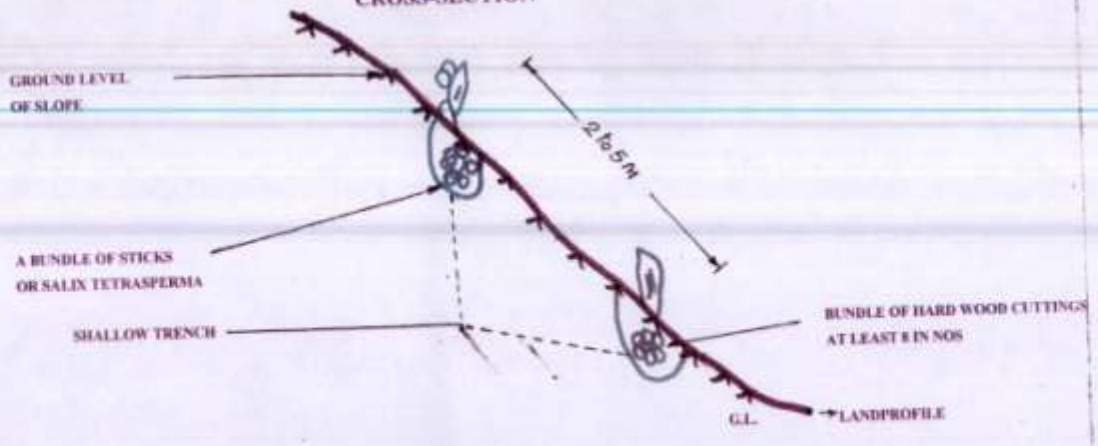


CROSS SECTION

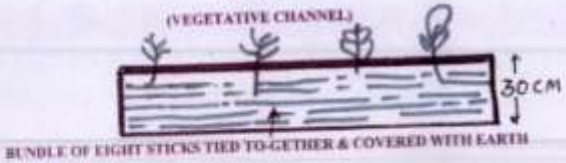
BIO-ENGINEERING TECHNIQUE

FASCINES DRAINAGE

CROSS-SECTION



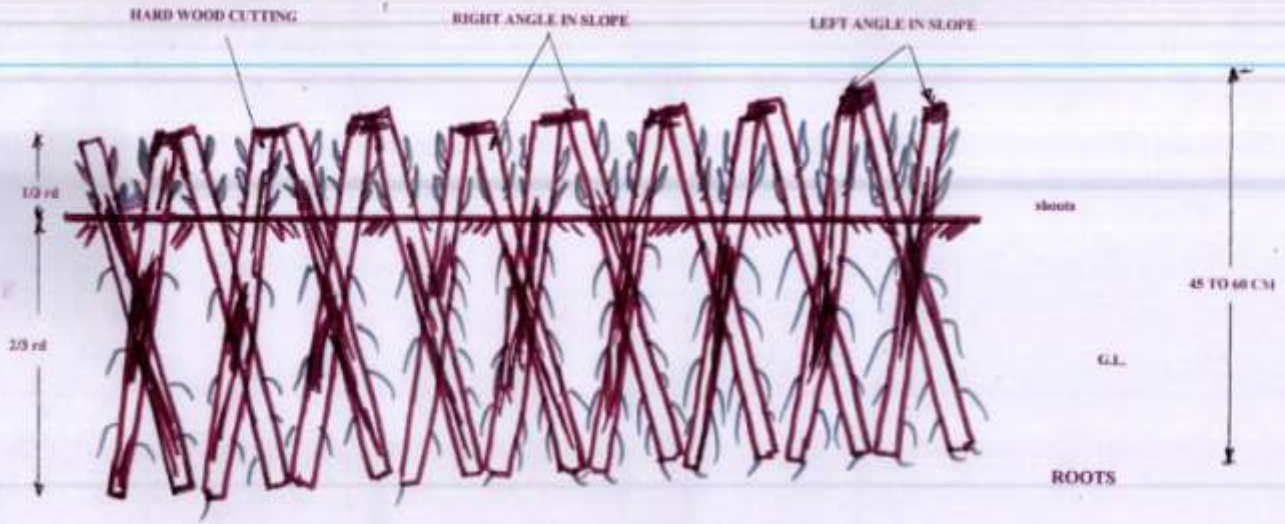
PLAN



BIO-ENGINEERING TECHNIQUE

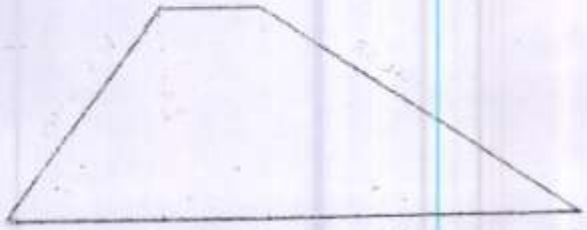
PALISADES

WITH STAGGERED HOLES



HARD WOOD CUTTINGS USED 20 PER R.MTR.

LOOSE BOULDER STRUCTURE SKETCH



TOP WIDTH = 0.50 M

BOTTOM WIDTH =2.75 M

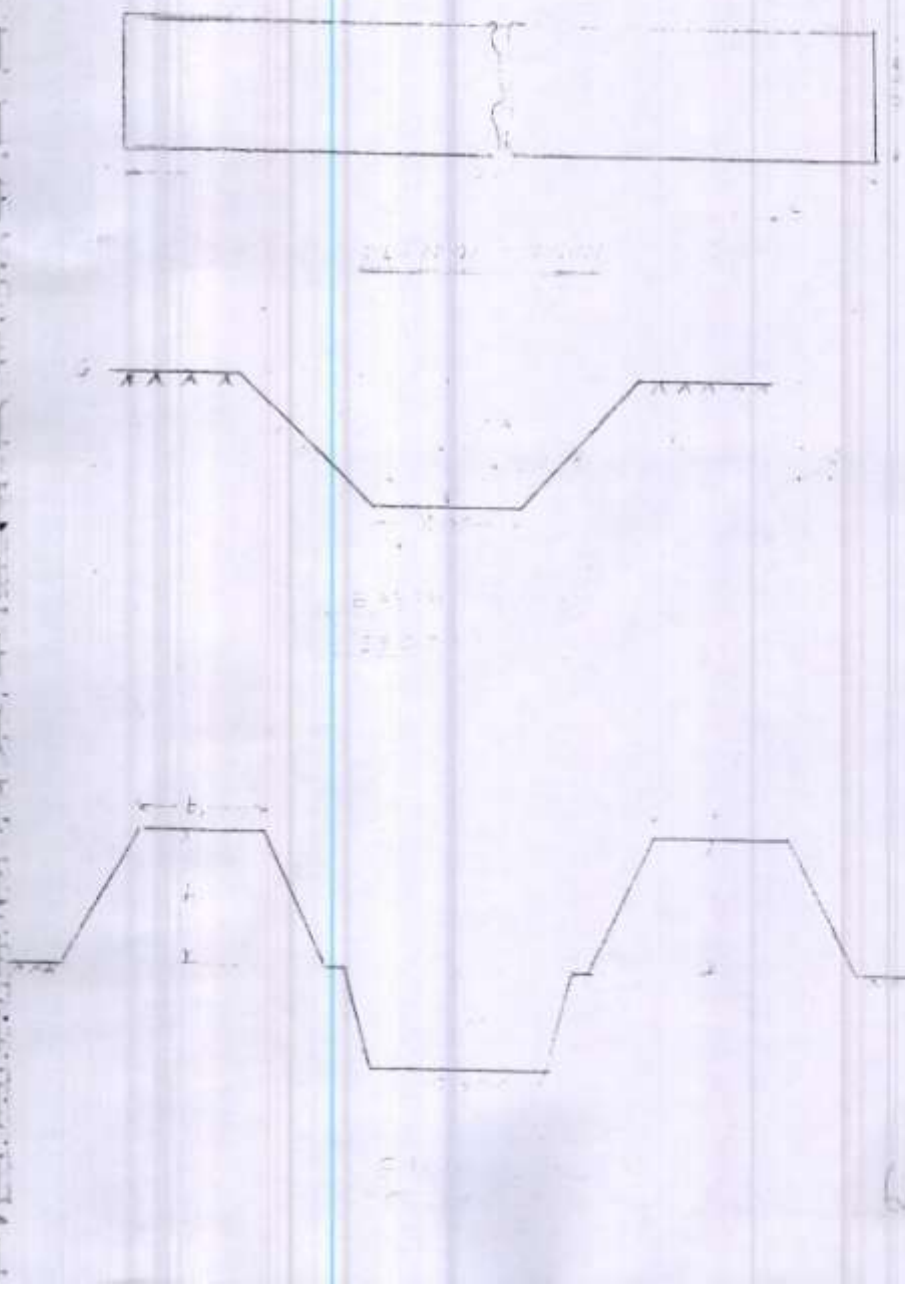
HEIGHT = 1 M

INNER SLOPE = 1:1

OUTER SLOPE =1:2

BOTTOM = 1.62 M

SCHEMATIC REPRESENTATION OF COUNTOUR BUND



CHAPTER -III

JOINT FOREST MANGEMENT(JFM) IN THE CAT PLAN

CHAPTER – III

JOINT FOREST MANAGEMENT (JFM) IN THE CAT PLAN

Forests play a vital role in maintaining ecological balance and in the socio-economic development of the country. Forests are an important resource base for meeting subsistence needs of millions of rural poor, especially the tribal's and forest dwellers. As per the State of Forest Report published by Forest Survey of India (FSI, 1997) the recorded forest area of the country is 76.52 million ha., whereas the actual forest cover is estimated to be 63.33 million ha., which constitutes 19.27% of the country's geographical area.

Dense forests (crown density above 40%) constitute only about 11.17% and forests with more than 70% crown density exist only over 6% of the country's land mass. Total forest cover in the tribal districts as per the 1997 assessment of Forest Survey of India is 41.72 million ha. which constitutes about 65.86% of the total forest cover of the country?

Loss of forest cover in tribal districts of the country as compared to 1995 assessment has been noted to be 0.4899 million ha. Growing stock has been tentatively estimated by the Forest Survey of India to be 4,740 million cu.mt. with an average volume of 74.42 cu.mt. per ha. India is one of the 12 mega biodiversity countries of the world and it supports 16 major forest types. India's human population constitutes about 16% of the world's population and its cattle population is about 18% of the world's population, whereas the geographical area is only 2.5%. Per capita forest area in India is only 0.08 ha. as against the worlds per capita forest area of 0.64 ha. an average of 0.5 ha. for the developing countries. The rural population is heavily dependent on the forest resources for meeting its livelihood needs. Per capita availability of forest biomass in the natural forests of the country is only about 6 ton as against an average of 82 ton in developing countries. As a result of this imbalance Indian forests are under tremendous biotic pressure. More than 50% of country's forest area is annually prone to fires causing a loss of **Rs.440 crore** (only replacement cost of seedlings).

These factors have led to severe degradation and depletion of our forest resources. This in turn is making the lives of rural poor very difficult besides threatening the environmental stability. The dense forests are losing their productivity and more than 40% of country's forest cover has degraded. Main cause of degradation is use of the forest resource beyond its carrying capacity and without much consideration to its sustainability. The trend of degradation of forests can be reversed only if this precious resource is managed sustainably with the involvement of local communities in its protection and management. All the stake holders need to be involved in the protection and development of forest resources and Joint Forest Management Programme has come out as an important management intervention for sustainable forest management.

3.1 JOINT FORESTRY MANAGEMENT IN HIMACHAL PRADESH

The Government of Himachal Pradesh its JFM Programme, Sanjhi Van Yojana in 1998, there are nearly. Joint Forest Management (JFM) programme in the present form can be traced to the Arabari experiment initiated by foresters in the state of West Bengal. This experiment provided a strong feedback for incorporation of the system in the National Forest Policy of 1988. In many locations people's voluntary groups were engaged in protection of forests without any initiative from the Government. Subsequently, based on the experience, the process of institutionalizing people's participation in forest protection and regeneration began. This type of collective endeavour in protection and management of forests through people's involvement was later termed as Joint Forest Management. At present there are nearly 700 Village Forest Committee constituted in Himachal Pradesh under this scheme. At present, the JFM committees are being registered under different names in various States as per the provisions contained in the resolutions. Memorandum of Understanding, with clearly defined roles and responsibilities for different work or areas should be separately assigned and signed between the State Governments and the committees. All adults of the village should be eligible to become members of the JFM Committees. It has following objectives

i) Involvement of grass root level institutions such as gram Panchayat, Mahila Mandals, yuvak Mandals, ex-servicemen's bodies, schools, Village Forest Development Societies (VFDSs), User groups, other Community Based Organizations (CBOs) and NGOs in sustainable management of forest resources;

ii) Grant of 100 % income from plantations to the VFDSs and Panchayats;

iii) Grant of total usufruct rights to the VFDSs;

iv) Regeneration of degraded forest areas and conservation & sustainable use of better forests through community involvement.

v) Involvement of local communities in the choice of species to be planted under the scheme;

vi) Creation and enhancement of social, physical and financial capital of the participating communities for poverty reduction;

vii) Special emphasis on involvement of women in the scheme;

viii) Address problem of rural unemployment by utilizing degraded forest land for large scale plantations;

ix) Establish linkage between Food for Work Programme and the present scheme by making payments in the shape of food grains under the scheme;

x.) Increasing productivity of the Forest areas by improvement of nursery stock and adoption of mixed plantations.

xi.) Training of forest staff, VFDS members and CBOs/NGOs for facilitating and strengthening community participation.

xii.) Gradually empower local communities and local level institutions to become more pro-active in sustainable forest management.

xiii.) To help VFDSs achieve financial viability and sustainability by introducing proper mix of short and long duration cropping patterns as a short and long term objective to ensure their continued participation in the scheme.

xiv.) Gradually empower local communities and local level institutions to become more pro-active in sustainable forest management.

xv.) To help VFDSs achieve financial viability and sustainability by introducing proper mix of short and long duration cropping patterns as a short and long term objective to ensure their continued participation in the scheme.

3.2 PREPARATION OF MICRO PLAN:

The micro plans should be prepared by the Forest Officers and Village Forest Protection Committees after detailed PRA exercise and should reflect the consumption and livelihood needs of the local communities as well as provisions for meeting the same sustainably. It should utilize locally available knowledge as well as aim to strengthen the local institutions. It should also take into account marketing linkages for better return of NNTP's to the gatherers and should also reflect the needs of local industries/ markets. This should be done with due regards to the environmental functions and productive potentials of the forests and their carrying capacity as also their conservation and biodiversity values.

i.) If the existing working plans are in force (till their revision in future), for incorporation of micro plans in the working plans, a special order may be issued by the PCCFs for implementation of the micro plan. In these areas, micro plan should aim at ensuring a multi product and more NTFP oriented approach. Without changing the basic principles of silviculture, deviations may be approved in the existing working plans if necessary. To ensure this, the concerned DFO and CF should dovetail the requirements of micro plans with the working plans.

ii.) The micro plan should also take into consideration and provide suitable advice for areas planted/ to be planted on community lands and other Government lands outside the notified forest areas including in the district council areas of North East.

iii.) Infrastructure/ Eco- development under micro plan should form a separate entity for funding it through concerned development agencies.

3.3 JFM AND PAUDITAL-LASSA CAT PLAN

The works specified under the CAT plan will be executed based on this model of JFM. The various activities planned are in consonance with the JFM. Provisions have been kept for plantations in the degraded forest land, NTFP Plantations and Bamboo/shrubs plantations. Besides this the major thrust of the CAT Plan is on Income Generation Activities (IGA). So that people get their livelihood without entering in the forests. VFDC will be formed for this specific purpose besides this the active Mahila Mandals and Yuvak Mandals and NGOs will be approached to carry out the various works of the CAT Plan. Considering the immense potential and genuine need for women's participation in JFM programme, following guidelines are suggested for ensuring meaningful participation of women in JFM. For plantations, however, the forest department shall continue to supply planting material to the VFDS on demand, free of cost for three years including the year of plantation. Thereafter, for any more supply of plants price shall be charged from the VFDS.

At least 50% members of the JFM general body should be women. For the general body meeting, the presence of at least 50% women members should be a prerequisite for holding the general body meeting. Local people and committees will be engaged for the CAT Plan works such as plantation and maintenance etc. instead of hiring the labour. The wages will be met out from the provision incorporated in the norms.

CHAPTER -IV

OBJECTIVE AND PROJECT PROPOSAL

CHAPTER – IV
OBJECTIVE AND PROJECT PROPOSAL

4.1 PROJECT OBJECTIVES:

The objectives of the project are summarized as under:-

- To achieve in-situ and ex-situ conservation and also ecological rehabilitation in the project area leading to an all round eco-development activities on sustainable basis.
- To initiate measure to rehabilitate the degraded habitat through afforestation of native species and assisting of natural regeneration.
- To improve alpine pasture land for augmenting grass and fodder availability and to solve the problem of grazer.
- To carry out soil conservation measure in the Catchment to ensure longevity of the Hydel Project.
- To increase the potential/production of the bio – mass in the area and to ensure sustainable use of natural resources.
- To provide employment to the local people by engaging them in project activities such as afforestation, fire, rural infrastructure activities and other works except soil conservation works. As it has been stressed off late that the local people are involved in the CAT Plan activities. To strengthen the extension and follow up activities i.e. monitoring and evaluations of forestry development activities, publicity, motivation and extension programme to be given the desired focus.

4.2 PROJECT PERIOD

The project period would be for 10 years from 2012-13 to 2022-23.

4.3 PROJECT COMPONENT:

The project has been design to develop the project area in an integrated manner by improving the vegetative cover over the degraded and blank areas and also to treat flood prone areas to stabilize nallah, and land slips by providing suitable bio-engineering structure and various soil conservation measures. Apart from that one of the most important part of successful habitat improvement & its manipulation as per the needs along with fire control measures with mitigation of Human Wild – Life conflict. The important steps to be undertaken in this regard during the project period are as under:

4.4.1. MANAGEMENT OF CATCHMENT AREA -IN-SITU CONSERVATION.

4.4.1 AFFORESTATION MEASURES

- Biological works
- A forestation of degraded Forest land
- Enrichment Plantation
- Assisted Natural Re-generation
- NTFP Plantation
- Nursery Development
    - i) New Nurseries Development
    - ii) Raising of Plants

4.4.2 SOIL AND MOISTURE CONSERVATION AND STABILIZATION WORKS

- Land slide/slips stabilization
- Nallah stabilization
- River bank stabilization
- Bio Engineering Works

4.4.3 PAYMENTS FOR ENVIORNMENTAL SERVICES

- Payment for Environmental services
- Maintenance of Various Logs huts / FRH, Camping Site and other (Eco tourism) activities.

4.4.3.1 RESEARCH,TRAINING & CAPACITY BUILD UP

- Research
- Training and Capacity Build-Up for HPFD, officers/officials.

4.4.5 INFRASTRUCTURE BUILD UP AND FOREST PROTECTION

A) Construction / Maintenance of Building

- Construction of Type three Quarters
- Maintenance of old buildings

B) Vehicle and Operational Support to HPFD.

- Purchase of Vehicle (in Kind)
- Maintenance of Vehicle and Machinery
- Purchase of Computer

C) PROTECTION OF FORESTS

- Construction and Maintenance of boundary pillars.

WILDLIFE MEASURES

- Development of Water Hole
- Signage for wildlife
- Plantation of fruit bearing trees, shrubs and medicinal plants
- Awareness of wild life conservation among local communities
- Wild life census
- Conservation and development of natural springs
- Provision of Salt licks
- Budgetary supports for Purchase/transport of cages etc.
- Contingency

4.4.7 **MONITORING AND EVALUATION ACTIVITIES @ 5%**

4.4.8 **Support for Preparing Site Specific Works Plan**

4.4.9 **CONTINGENCIES**

4.4.1 AFFORESTATION MEASURES (20% OF OUT LAY)

BIO-LOGICAL WORKS

a) AFFORESTATION OF DEGRADED FOREST LAND:

The aim of the CAT Plan is to conserve in situ including flora and fauna along with the full range of eco-system they inhabit. Under this scheme blank area's devoid of tree growth, degraded forests areas and failure plantation areas shall be undertaken for plantations, while the choice of species will be mainly governed by the site/location, effort will be made to revise a mixture of conifers, broad leaved species and fruit bearing species, which are helpful to wild life as far as practical. The main species to be raised under this scheme are Deodar, Kail, Maple, Ban oak, Salix, Popular ciliate, Aculum indicia, Prunus persica, Chestnut, Juglans regia, Pyrus spps. and other local fruit bearing spps etc. Plantation must use local and indigenous species since exotics have long term negative impacts on the environment. The preference of local communities as regards the choice of species will be ascertained and given due weight-age as per the requirement of site, 1100 plants per hect. will be planted under this scheme. Since this is a mountainous tract, all afforestation works should be supported by anti erosion measures such as small check dams and gully plugging etc. Before starting the afforestation works bush cutting should be done and area will be cleared of obnoxious vegetation. Hoeing mulching weeding shall be attended regularly. The details are suggestive only and not binding. Divisional Forest Officer may make changes upon administrative exigencies. The plantation will be maintained for subsequent five years. A total of 45 ha has been identified as available for planting under this scheme. The detail of areas identified to be planted is given below: -

Sr. No	Location/name of Forest	Area in ha.
1.	RF-Bhamnoli	10
2.	RF- Bhalta	5
3.	RF-Dharal	10
4	RF-Khirgi	10
5	RF-Kshadhar	5
6	RF- Lorja	5
Total		**40**

The afforestation norms have been worked out both for conifers and B/leaves species. Looking to the high incident of grazing during summer all the plantation areas will be fenced with B/wire in 3 – 4 strands.

Expenditure Detail:	**Amount Rs. (Lac)**
Afforestation cost with conifers/B/L over 40 hac. @ Rs. 42000/- per hac.	16.80
Maintenance cost for 5 years	
1st year maintenance cost for 40 hac @ Rs. 5500/- per ha.	2.20
2nd year maintenance cost for 40 hac @ Rs. 4400/- per ha.	1.76
3rd year maintenance cost for 40 hac @ Rs. 3382/- per ha.	1.35
4th year maintenance cost for 40 hac @ Rs. 3382/- per ha.	1.35
5th year maintenance cost for 40 hac @ Rs. 2464/- per ha.	98
G. Total (New + Maint.)	**24.50**

b) SHRUBS PLANTATION

Since all wildlife in nature live in complex web of linkage with other organisms, the proper evaluation of habitat of each species followed by its proper managements is very essential. The plant life provides congenial home to wildlife and bio diversity therefore the habitat of wild life is to be improved by supplementing the Shrubs plantations and supported by minor soil conservation works.

For this purpose bushy, shrubby and thick forests are to be maintained and no grass should be removed from the home range of the wild life so that habitat of wild life could be preserved and protected. In degrapded forest area suitable species i.e. Shrubs species be carried out as per site location, the bank area in the forests in high reaches along ridge should be maintained as pasture land by sowing suitable local grasses for the need of wild herbivores which are pray base for the carnivores.

The shrubs in the under story is very important for Himalayan Monal, Western Tragopan and other pheasants conservation. It is recommended that all such patches and other associate vegetation of

under story such as cotoneasters spps. virbernum spps, Principia utilis and Berbris spp. etc. be protected and preserved.

An area of 15 hac has been identified as available for planting under this component. The detail of the areas identified is as under.

S. No.	Location/Name of Forest	Area in (Ha)
1.	UF – Surigri	10
2.	RF- Shagil	10
3	RF- [illegible]	10
	Total	**30**

	Expenditure Detail	Amount In lac
1.	Afforestation cost for Shrubs Plantation over 30 Ha area @ Rs. 22000/- per Ha.	6.60
2.	Maintenance cost of five years	
	1st year maintenance cost of 30 ha @ Rs. 3345/- per Ha.	1.00
	2nd year maintenance cost of 30 ha @ Rs. 2903/- per Ha.	0.87
	3rd year maintenance cost of 30 ha @ Rs. 2404/- per Ha.	0.72
	4th year maintenance cost of 30 ha @ Rs. 2404/- per Ha.	0.72
	5th year maintenance cost of 30 ha @ Rs. 2145/- per Ha.	0.64
	Total	
	G. Total (New + Maint.)	**10.56**

C) **ENRICHMENT PLANTATION:**

There are some forests in the catchment area where in patch density of crop is poor and devoid of overhead shade where planting could be done. In such areas planting of 800 seedlings per hectare is expected to result in full density forests. Extent to such areas is estimated to be 15 hectares. Thus, it is imperative that such forest areas are planted by artificial means to increase their stocking to the required level. The detail of the areas identified is as under:

Sr.No	Location/name of Forest	Area in ha.
	RF-Khnole	5
	RF- Dimzoni	5
	Total	10

	Expenditure Detail	Amount in Lac
1.	Afforestation cost with Conifer/Bfleave over 10 Ha area @ Rs. 22000/- per ha.	2.20
2.	Maintenance cost of five years	
	1st year maintenance cost of 10 ha @ Rs. 4011/- per ha.	0.40
	2nd year maintenance cost of 10ha @ Rs. 10433/- per ha.	1.04
	3rd year maintenance cost of 10 ha @ Rs. 2706/- per ha.	0.27
	4th year maintenance cost of 10 ha @ Rs. 2706/- per ha.	0.27
	5th year maintenance cost of 10 ha @ Rs. 2184/- per ha.	0.22
	Total	
	G. Total (New + Maint.)	**4.41**

D) **ASSISTED NATURAL REGENERATION**

In some forest area, conditions are conducive to natural regeneration provided some sort of assistance is provided. Such areas shall be taken up under this component. The areas shall be closed to exclude biotic interference. Forest floor will be cleared of slash, debris and pruning to afford a clean seed bed to the falling seed. Where natural regeneration is found deficient, it will be supplemented by artificial

planting/patch sowing may be done. Up to 250/200 plants/patches per hectare will be planted/patch sowing to take place the process of regenerating the area uniformly.

An area of 15 hac. has been identified for treatment under this component as detail is given below:

RF-Dalgaon	5 ha
RF- Kutda	5
Total	**10 ha**

	Expenditure Detail:	**Amount in (Rs. lacs)**
1.	Natural regeneration closure cost over 10 hac. @ Rs. 14004/- per ha.	1.42
2.	Maintenance cost for 5 years	
	1st year Maint. 10 hac. @ Rs. 1961/- per ha.	0.20
	2nd Year Maint. 10 hac. @ Rs.1652[illegible]/- per ha.	1.65
	3rd year Maint. 10 hac. @ Rs. 1494/- per ha.	0.15
	4th year Maint. 10 hac. @ Rs. 1494/- per ha.	0.15
	5th year Maint. 10 hac. @ Rs. 1255/- per ha.	0.13
	Total	3.74
	G. Total (New + Maint.) **Rs. 3.74 lacs**	

E) **N.T. F.P.'s PLANTATION (MEDICINAL PLANTS) :**

A number of valuable medicinal plants have become endangered due to over exploitation and unscientific extraction and collection from their natural habitat without adequate replacement by way of artificial regeneration. Local people have a right to collect/extraction of Minor Forest Produce in and around the Forest Area under provision of Forest Settlement Report, 1921 for domestic use and their livelihood, thereby threatening the very existing of rare and endangered species of medicinal herbs. Therefore, it is need to address the livelihood issue by encouraging forest based enterprises for development NTFP is required on the sustainable basis as it provides alternative income generation activities. Under this scheme medicinal herbs like Dhoop, Karu, Kuth, Salam Panja (Hath Panja), Ban Kakri, Chora, Patish, Guchhi and Discorea deltoidea etc. will be raised. About 5000 plants in 1000 patches shall be planted in 1 ha. area depending upon the site. The plants can also be raised as intercrop in the other plantation area taken for the tree plantation. The plantation area will be fenced

with B/wire fence in four strands on wooden fence posts. An area of 10 hac. has been identified as available for planting under this component. The details of the area identified are as under.

S. No.	Name of Location	Area in (Ha)
1.	UF – Dharoli	5
2.	RF- Dumereda	5
	Total	**10**

	Expenditure Detail:	Amount in (Rs. Lacs)
1.	Plantation cost of N.T.P.F over 10 ha @ Rs. 42680/- per ha.	4.27
2.	Maintenance cost for 3 years	
	1st year maintenance of 10 ha @ Rs. 13718/- per ha.	1.37
	2nd year maintenance of 10 ha @ Rs. 10043/- per ha.	1.00
	3rd year maintenance of 10 ha @ Rs. 10333/- per ha.	1.03
	G. Total (New + Maint.)	**7.77**

F) NURSERY DEVELOPMENT:

To raise successful plantations it is necessary to have a good planting stock. It is proposed to establish nursery at UF - Machoti. The nursery shall be raised in the 1st year of the project and will be further maintained till the completion of the HEP project. Nursery should be located in planting zone. Exposed windy ridges should be avoided. It should have adequate irrigation facility. For planting Deodar, the nursery should be located in low elevation in Deodar Zone. Seed is collected from healthy, middle aged, self pruned trees of good form and quality. Cones are collected during October November and dried in sun after these have opened. Seeds should be stored in sealed tins in cool dry place.

In addition to that it is also proposed to bring about effective closure of pasture area with the prior consent of the local people for raising of seed locally This would help collection of seed from the closed area. The local grass spps i.e. marchunang and parchunang is available and would be consulted from the Scientists of UHF Nauni, Solan for choice of local spps, collection of seed and planting techniques etc. during the 1st two years of the project period.

Expenditure Detail:

	Amount in lac
Establishment of New Nursery at UF – Buthara 1 hac	1,00,000
Raising of Plants	7,70,000
Total	8,70,000
	8.70 lac

4.4.2 SOIL & MOISTURE, CONSERVATION, STABILIZATION WORKS (25% OF TOTAL OUTLAY)

i) Active Land -slides/slips stabilization:

Land slide are caused by the down hills movement of weathered rock mass, boulders, soil etc. There are various factors natural and man-made, which contribute directly or indirectly in producing land slide. The identified areas as per the CAT Plan are to be stabilized through various control measure which would depend upon the size, extent and location of the slip of the area. However in general the following measures shall be applied depending upon the situation on the site/field. Constructions of masonry check walls and underbuilding of vegetation measure.

Planting of shrubs, grass and quick growing species and carryout soil conservation measures to treat the sliding/eroding slip areas. Choice of species will be depending upon the site/field.

The list of various land slip/land slide stabilization proposed for treatment is given below: -

Land slip stabilization

Sr. No.	Name of location	No.	Amount (Rs.)
1	Gharema Slip	1	1217376.00
2	Bhamnoli Slip	1	548812.00
3	Samoli Slip	1	458533.00
	Total	**3**	**2200000.00**

The actual size and expenses may vary as per the site conditions.

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ii) Nallah Stabilization:

The primary objective of this treatment has been to check the run offs and cutting of the banks of different nallahs. About 13 nallahs identified for treatment depending upon the sites/location not to treat total length in the catchment area. The identified areas are given in the CAT Plan shall be stabilized through control measure which will depend upon the size, extent and location of the Nallah/area. The following methods shall be applied depending upon the situation in the field.

- Construction of check dams with gabion wall, protection wall with crate wire to regulate and check/reduce the speed of flow.
- The eroded and effected Nallah will be channelized and protected by constructing crate wire of check wall/toe wall, dams and spurs.
- Live hedge vegetative spurs along the nallah shall be put up after one or two years, when the nallah will be filled by the silt. Local species, which are known as good soil binder like Salix, Alnus nitida, Viburnum, Hippophae spp etc., will be planted.

Nallahs which are highly vulnerable to soil erosion are to be taken up on high priority and silt detention dams shall be constructed in order to reduce the silt load in the Pabbar River. These structures would break the velocity of the water and arrest the silt discharge in the khads/nallahs. Besides this construction of spurs where ever required will also be constructed. Planting of shrubs and quick growing species to treat the nallahs will also be carried out.

The details of Nallah's are given below along with financial implications.

S. No.	Name of Nalla	Amount (Rs.)
1	Thali Gad	32275.00
2	Shamer khad	144063.00
3	Chammi Gad	79037.00
4	Oltu Gad	177814.00
5	Chira Gad	31138.00
6	Phakal Khad	123380.00
7	Sia Gad	66373.00
8	Sityani Khad	29394.00
9	Maira Khad	61690.00

10	Banoti Khad	32202.00
11	Manghara Khad	38254.00
12	Masrat Khad	136566
13	Peja Khad	87596
	TOTAL	**980000.00**

The name of nallah and cost estimate of the particular nallah is indicative only which may change as per the site condition and requirements.

iii) ***River bank stabilization***

A large number of nallas in the catchment bring large quantity of sediments in to the Pabbar river with frequent cutting and resulting in slope failures. This phenomenon occurs all along the Pabbar River.

The following options are proposed to be undertaken for river bank stabilization as per the situation depending upon the situation in the field.

a) *Construction of check dams and vegetative spurs*

An outlay of Rs. 5.26 Lacs have been kept for this purpose.

iv) ***Bio Engineering Measure***

- *Brush Wood Check Dams* ***RS. 9.11Lacs***
- *Palisades, fascines, included with Vegetative Support* ***RS. 9.28 lacs***
- *Raising And Planting of bio engineering species* ***Rs. 18.49 lacs***

4.4.3 ***PAYMENTS FOR ENVIORNMENTAL SERVICES (15% of total Outlay)***

- *Payment for Environmental services*

The People draw their sustenance largely from the forests for their day to day consumption and their livelihood. We cannot deny the needs as the people who live in harmony with the forests, environment and ecologically they cannot be

disregarded. Safeguards are required to ensure that catchment area treatment and other works should be executed ecologically. The following important mitigate measures are to be undertaken in this regard are as under: -

24.40 Lac

- Maintenance of Various Logs huts / FRH, Camping Site and other (Eco tourism) activities.

The area is also known for its scenic beauty. The area has a very high potential for development of Ecotourism but poor infrastructure, low publicity, trained manpower and inadequate financial resources have been the main constraints in the proper development of eco-tourism. There is priority need to promote and develop eco-tourism, wilderness travel and adventure travel in the landscape. The Eco-tourism shall be implemented through various Eco-tourism promotional activities. The local people are not aware of vast eco tourism potential and they need training and awareness/importance of the conservation of wild life along with Eco-tourism. Therefore the following strategies shall be adopted to implement the sustainable eco-tourism in the project area:-

Maintenance of Log Huts and Camping sites: an amount on **Rs. 20.00 lacs** have been kept for maintenance of camping site.

4.4.4 RESEARCH,TRAINING & Capacity Build -Up (5% of Total Outlay)

- Research
- Training and Capacity Build-Up for HPFD, officers/officials in India and abroad.

Provision to be made for participatory action Research for Adaptive Management. Depending upon the size of CAT plan. Specific Provision for training & Capacity building through state FTIs is to be made

Rs. 14.80 Lac

4.4.5 Infrastructural Build-Up and Forest Protection (15% of Total outlay)

For the optimum management of Forest resources of the track, it is essential that the field infrastructure of the forest department adequately developed. The Forest buildings in the region are the important lines of communication in these difficult terrains and to keep them in serviceable condition is highly desirable but due to paucity of funds many existing paths are in a state of neglect Some paths have been identified for new construction to facilitate efficient Management in the Catchment area. Similarly in case of buildings, few existing buildings will need immediate repair. The present infrastructure is not adequate. More over there is no scope for further development and extension in near future. Secondly, for the management point of view,

it is very necessary to improve the forest infrastructure. For this a conference hall attached to Forest Rest House Rohru office will be constructed, repair and maintenance of staff quarters and forest rest house at Khadrala and Bashla will be done. A provision of **Rs. 44.40 Lacs** has been made for this component. Year wise allocation shown in the schedule is only indicative and

A) Construction / Maintenance of Building

- For Construction of new Type three Quarters at Rohru an amount **L.S Rs. 18 lac has been kept.**
- For Maintenance of old buildings **Rs. 6 lac**

B) Vehicle and Operational Support to HPFD.

To Purchase of Vehicle **(in Kind)** For HPFD **Rs. 8.00 lac**

- Purchase of Computer **Rs.1.50 lacs**

C) FOREST OF PROTECTION

- Construction And Maintenance of Boundary pillar **Rs. 2 lac**
- Maintenance of Fire line **Rs. 2 lac**
- Control Burning **Rs. 2.90 lacs**

4.4.6 WILDLIFE MEASURES (5% of total outlay)

The provision has been kept on Chapter V

4.4.7 MONITORING AND EVALUATION Activities @ 5%

The regular quarterly meeting/workshop will be conducted/organized with the approval of the competent authority during the plan period.

Strategy for Capacity Building of Project Team:

- To build in house capacity of the project team to take up this job a two pronged strategy needs to be developed.
- First part of the strategy would include training/workshop

- Appreciation of the issues
- Developing Skills
- Developing appropriate and specific extension technologies
- Developing extension material for various target groups
- Implementing the extension Programme and.
- Programme assessment and impact
- The second part of the strategy would deal with actual execution of the extension programme, which would include :
  - Identification of various target groups
  - Sensitization of the identified target groups to the problem
  - Formation of village level programme participatory committee/ societies and their involvement in the programme
- Working outside specific solution with the participation of these committees/societies

As an interim arrangement a committee shall monitor the works of the CAT Plan on annual basis. The Monitoring committee would be constituted as below:-

1. Chairman, Conservator of Forest Shimla.
2. ACF Rohru
3. PRI representatives
4. Developers representative
5. DFO Rohru – Member Secretary.

The committee would need to ensure the implementation and monitoring of the catchment area works and review progress from time to time. The implementing agency upon its approval will provide a copy of the approved APO giving the details such as list of areas along with the works to be taken up and their costs to each member of the committee. The committee shall strive to make the monitoring process transparent. Meeting of this committee shall be convened at least once in a year or as and when required in emergency with due approval from members and higher DF

authorities. All non official members shall be entitles to TA/DA as per rates approved and being followed by DC Shimla. All the expenditure incurred on these meetings shall be met from this head of Monitoring and Evaluation.

In all **Rs. 14.80Lacs** has been kept for this purpose.

4.4.8 **Support for Preparing Site Specific Works Plan**

The provision has been made in the CAT Plan to provide support to the implementing agency in the form of establishment charges, office expenses, Survey etc. **Rs. 14.80 lac**

4.4.9 CONTINGENCIES (5% of Total outlay) Rs. 14.80 for some Leeway to adjust any **Unforeseen expenditure.**

CHAPTER -V

PROTECTION, IMPROVEMENT AND MANAGEMENT OF WILDLIFE

CHAPTER – V

PROTECTION, IMPROVEMENT AND MANAGEMENT OF WILDLIFE

The Paudital-Lassa HEP as conceived is situated near Rohru town, the forest area proposed for diversion has no trees, only a small fraction of this land is required for open works, whereas most of the land sought for diversion is for underground works, it will not have any impact on the land use.

The total catchment area of this project is about 900 sq.km, three HEP's of 44 to 70 MW capacity are proposed upstream they will have some common catchment, accordingly an effective catchment area of 400 sq.km.has been considered for treatment, this is the area form the intake of the immediate upstream project and up to the intake of Paudital-lassa.

There are no protected areas in the catchment of Paudital-Lassa, to establish the project the required no objection certificate from the **wildlife, fishery and I&PH** department have been already obtained, principal **approval for diversion of forest land** required for the project has also been obtained from the MOEF.

Para 10 of the HP forest department notification No.FFE-B-F-(2 72/2004-Pt-II dated 30.9.2009 calls for incorporating a separate chapter on wild life and reduction in human-wildlife conflict, provision of the funds for this activity as envisaged in the guidelines has been kept at **5%** of the total outlay for the CAT plan.

The waters of the Pabbar river will be diverted by constructing a trench weir across the river at Rohru town, this water will be then conveyed through a 5.74 Km long HRT to generate 24 MW of power at the surface power house to be

located at Lassa Dogri. In this process a stretch of about 6.5 Km along the course of the river will be affected. this has been taken care of by ensuring release of 15% of lean period discharge to sustain aquatic life and demand of local people at all times , this discharge will be monitored online by the State pollution control board and it is mandatory for the developer to make appropriate provision for this in the structure while designing and construction, moreover this water will be supplemented substantially by the streams joining the river downstream of the intake.

The state pollution control board has given their consent to establish the project.

The current problems being faced in forest conservation arises directly from the natural resource dependence of the people inhabiting near and in forested region. These dependences are becoming intense because of eco-system is going down from the abuse and over use of natural resources. Man is responsible for degrading the forest eco-system. As his number increased and his culture and technology advanced, he modified the natural eco-system into an artificial. As a result many species of flora and fauna have endangered. It is said that if the present course of environmental degradation is continued, then it will destroy the capability of our natural environment to support a civilized human society. The depletion of our Wild life and also the hardships faced by people dependence on natural resources is due to: -

a) Reduction of Wild life habitats

b) Increasing biotic pressure

c) Increasing demand of forest resources

d) Illicit felling, poaching and encroachment on forest land.

e) Forest fire

f) Cultural transition

g) Collection of minor forest produce

MAN - WILDLIFE CONFLICT:

Man - wildlife conflict is a result of gradual degradation of natural resources and the most sufferers are poor, marginalized communities living in and around the forest. The problem of animal damage in whether it is crop depredation, livestock depredation and human causalities is not as alarming as it is evident in other parts of the state or else-where in the country. The problem of livestock predation and killing by Leopard and black bear is gradually escalating and to some extent, appropriate compensation is needed and also environmental awareness programmes for migratory grazers thus need to be developed. Concentrated efforts, education, awareness, research monitoring, policy, law and governance; habitat restoration and development of essentially needed infrastructure to tackle complex issues pertaining to the man-animal conflict are required to be implemented on a priority basis.

MITIGATION OF HUMAN – WILD LIFE CONFLICT

The People draw their sustenance largely from the forests for their day to day consumption and their livelihood. We cannot deny the needs as the people who live in harmony with the forests; environment and ecologically they cannot be disregarded. Safeguards are required to ensure that catchment area treatment

and other works should be executed ecologically. The following important mitigative measures are to be undertaken in this regards.

GRAZING:

The catchment area of Pabbar River has large portion cover under snow. During summer these act as the alpine pastures and migratory routes to the grazers towards the district Kinnaur of Himachal Pradesh and vice-versa. The Pabbar Valley has vast tracks under high altitude pastures. Discussion with the local people revealed that these pastures have badly degraded over a period of time. At many places weeds like rumex species have encroached upon this alpine pasture. The palatable grasses are not more than a few inches tall and the other related pasture species have also been started showing signs of stress. As a result that neither the animal gets sufficient fodder nor the land protected from the subsequent onslaught of the range on account of over grazing, this result in large scale deterioration of the ecology and environment of the Pabbar Valley. The age Old Forest Settlement Report, 1921 which recognizes several rights of the people has also become out dated with reference to the present context with passage of time. The problem of grazing becomes much graver in view of the Pabbar catchment being home to some medicinally important plants. At many places the scarcity of drinking water in the catchment area prompts the wild animals and monkeys to venture towards the habituated area and water sources of local people, this sometimes result in human wildlife conflict and damages of crops in the fields. To avoid this water holes should be constructed wherever is required.

For the optimum conservation of natural resources it is essential to develop rural infrastructure. It is necessary to immunize the domestic cattle against contagious disease like foot and mouth etc. It will prevent disease from spreading from domestic cattle to Wild animals and vice-versa.

One of the major factors impacting on the effective bio-diversity conservation is the dependence of people on the natural resources for their livelihood. This is to be minimized.

Animal husbandry is an important occupation of the people of the area. Live stock practices are rather primitive in the project area. Mostly open grazing is practiced with little stall feeding and minimum fodder cultivation. A large number of unproductive cattle are trampling the grazing land, which results in severe damage to the vegetation and soil productivity. It is therefore required that need to keep large herds of unproductive cattle is reduced by demonstrating benefits of improved breeds cattle to the local people and strengthening the animal husbandry infrastructure support to such a change with the passage of time. The area by virtue of its location is considered to be very rich in bio-diversity. However, systematic scientific studies to support documentation are not available and whatever information is available has been gleaned from the secondary sources. Exhaustive inventory of the flora and fauna is yet to be prepared, whatever little information is there it is in the working plan of Rohru Forest Division. The status of important habitat types and that of the threatened flora and fauna is not known. No information is

available in this division regarding the carrying capacity of the forests and alpine meadows in Rohru Forest Division. Therefore, in the absence of reliable primary data on various aspects, only general type of strategy and approach can be made as management and improvement of the area is concerned.

HARMFUL PRACTICES BY THE LOCAL PEOPLE

The trees near habitations are lopped ruthlessly for fuel wood and fodder. Due to the enormous encroachment of forest land to make way for apple orchards and cultivation, the forest is experiencing tremendous pressure of human and livestock needs. The animals roam freely in the forest area tramping and eating the sapling in the forest area. This results in the increased rate of soil erosion. These factors have put following problems to the fore:

1. Excessive soil loss and increase in runoffs
2. Man and wildlife conflict
3. Fuel wood and fodder are becoming scarce

The unscientific collection of NTPF is also harmful to the biodiversity of the catchment area. The people in the area own cow for milk and ghee and is the major livestock in the area. But once after stopping milk production the owners set them free in the adjoining areas. This has become the major hazard in the area and the whole state.

At many places the scarcity of drinking water in the catchment area prompts the wild animals and monkeys to venture towards the habituated area and

water sources of local people. this sometimes result in human wildlife conflict and damages of crops in the fields. To avoid this water holes should be constructed wherever is required. Water holes needs to be constructed at various points as per management plan. The recommended size of water ponds is 7m x 6m x 2m (with stone masonry inside) it is strongly emphasized that all these water point must be kept under vigil of patrolling staff. This is to preempt any suspected poaching attempt at the water ponds/holes.

It is recommended that the sign and slogan boards must be put up at selected sites. All these sign and slogan boards must be in Hindi and English Languages in the form of an appeal to the local people, telling them the importance of Wildlife conservation under the provision of Wildlife (Protection) Act, 1972 and IFA, 1927 and FCA, 1980 etc. All such development works which are taking place in the project area must be properly displayed at the site of execution e.g. plantation work, nursery, pasture development, soil conservation works etc.

WILDLIFE IN THE CATCHMENT AREA

As gathered from interaction with the local people the following species of wildlife are occasionally spotted in the catchment area, since the catchment is very vast exact figures cannot be worked out in a very short time given for formulation of CAT plan.

Since the project is located far away from the catchment area the project activities will have no impact on the flora wildlife in the catchment and project area.

Mammals	Herbivores	Carnivores

	Musk Deer	Snow Leopard
	Himalayan Tahr	Leopard
	Goral	Himalayan Black Beer
	Serow	Himalayan Brown Beer
	Bharal etc.	
Pheasants	Woodcock	
	Himalayan monal	
	Kaleej	
	Koklass	
	Chukor	
	Snowcock etc	

The total outlay for the cat plan based on the techno-economic clearance works out to Rs.296 lac, accordingly the budget kept for wildlife management worked out on the basis of provisions in the guidelines for the purpose and at the rate of 5% works out to **Rs. 14.80 lac**. The following activities for wildlife management and development are proposed

I). **PLANTATION OF FRUIT BEARING TREES, SHRUBS & MEDICINAL PLANTS.**

The major reason for the wild animals to trespass into other areas is the scarcity of enough food in the forests. The aim of the CAT Plan is to conserve in situ including flora along with the full range of eco-system they inhabit. As it has been under this scheme, blank area's devoid of tree growth, degraded forests area's and failure plantation area's shall be undertaken for plantations, while the choice of species will be mainly governed by the site/location, effort will be made to plant fruit bearing species, which are helpful to wild life so far as practical. The main species to be raised under this scheme are wild chulli, Bird Cherry, Ban

oak, Juglans regia, Pyrus spps. and other local edible fruit bearing spps. Etc. Plantation must use local and indigenous species since exotics have long term negative impacts on the environment. The preference of local communities as regards the choice of species will be ascertained and given due weight age as per the requirement of site .For this an amount of **Rs.4.06 lac** has been kept

ii). DEVELOPMENT OF WATER HOLES

The scarcity of drinking water in the catchment area prompts the wild animals and monkeys to venture towards the habituated area and water sources of the local people, this sometimes results in human wild life conflict and damage of crops. To avoid this water holes should be constructed at various points as per management plan. The recommended size of the water ponds is 7mx6mx2m, with stone masonry in the inner side. It is however strongly recommended that these water holes may be kept under strict vigil of patrolling staff to preempt any suspected poaching attempts. An outlay of **Rs. 2.00 lac** has been proposed for this

iii.) CONSERVATION AND DEVELOPMENT OF NATURAL SPRINGS

Normally natural springs are not to be disturbed as it may result in their disappearance, they may be conserved/developed by constructing suitable catch pits in the near vicinity without disturbing them. A provision of **Rs.1.00 lac** has been kept for this.

iv.) **PROVISION FOR SALT LICK**

Salt slabs may be provided at suitable sites so that wild animals area able to lick the same. A provision of **Rs.0.50** lac has been kept for this.

v.) **CENSUS OF WILDLIFE**

It is proposed to carryout wildlife census in the key area to know the density of key species so that these can be further improved and developed from management point of view. The census should be carried out twice in an alternative year. For this the whole tract is to be traversed for which camping has to be done in the forest and catchment area for which the following camping equipment will be provided by the company in kind.

Equipment	Amount
Camping equipment, alpine tents 4 No, kitchen tents 2 No, toilet tents 4 No, Dining tents 2 No, Sleeping bags 10 N0, Ruck sack 10 No, Axe hammer 10 No, Jacket and lower 12 No, snow boots 12 pair, Trekking sticks 10 No, Gloves 10 No, search lights 5 No, binocular 5 No, pedometer 1 No, Compass, altimeter and GPS 1 each..	3.00 lac

A provision of **Rs.3.00 lac** has been kept for this.

vi). **AWARENESS OF WILDLIFE CONSERVATION AMONGST LOCAL COMMUNITIES.**

The current problems being faced in wildlife conservation arises directly from the natural resource dependence of the local people inhabiting the forest region. These are becoming intense because of eco system is going down due to abuse and over use of the natural resources. Man is

responsible for degrading the forest eco-system. As his number increased and his culture and technology advanced, he modified the natural eco-system into an artificial. As a result many species of fauna and flora have endangered. It is said that if the present course of environmental degradation is continued, then it will destroy the capability of our natural envoirment to support a civilized human society.

The people draw their susterance largely for their day to day consumption and livelihood. We cannot deny the needs as the people who live in harmony with the forests, envoirment and ecology they cannot be disregarded. Safeguards are required to ensure that catchment area treatment and other works be treated ecologically. For the optimum conservation of natural resources it is essential to develop rural infrastructure i.e. village paths, repair and construction of cattle ponds and if necessary immunize the domestic cattle against contagious disease like foot and mouth etc, it will prevent it from spreading to wild animals and vice versa. A provision of **Rs.1.00 lac** has been kept for this.

vii). BUDGETARY SUPPORT FOR TRANSPORT OF CAGES, CAPTURE CAGES AND TRANQUILIZER GUNS ETC.

With the ever reduction in the habitat of wild animals they have an ever increasing tendency to stray into habituated areas resulting in animal wild life conflict. They are where possible required to be tranquilized and captured and then let off in their natural inhabitant for this capturing and transporting cages along with tranquilizing guns are to be procured for this a budget provision of **Rs.2.00 lac** has been kept.

viii). O.E. T.A. FOR WILDLIFE OFFICES

The guideline for framing of cat plans issued by the H.P forest department lays down that outside the protected areas the wildlife activities will be implemented by the territorial staff. provision on this account has been kept in the cat plan. As such no provision for this item has been kept for wildlife staff.

ix). CONTINGENCY

A provision of 5% of the total outlay for wildlife has been kept for Contingency, this works out to **Rs. 0.74 lac.**

x). SIGNAGE FOR WILDLIFE

Sign and slogan Boards will be put up at selected places. All these signs and slogan boards must be in English and hind in the form of appeal to the local people, telling them the importance of wildlife conservation. All the development works which are taking place in the project area must be properly displayed at the site of execution e.g. plantation work, nursery ,pasture development soil conservation works etc.Therefor an amount of **Rs. 0.50 lac** has been kept for this purpose during the plan period.

YEARLY FINANCIAL SUPPORT

The yearly financial planning has been included in the systematic planning for execution of cat plan activities for Paudital-Lassa HEP at item No.3 annexed to the cat plan.

CHAPTER -VI

ORGANISATIONAL STRUCTURE AND IMPLEMENTATION STRATEGY

CHAPTER – VI

ORGANIZATIONAL STRUCTURE AND IMPLEMENTATION STRATEGY

6.1 TIME PHASING :

The CAT Plan works will be implemented w.e.f. 2011-12 to 2020-21. The implementation of CAT Plan will be done on society mode or CAMPA constituted by the MOEF, Govt. of India, New Delhi.

Afforestation work will be preferably completed during first 3 – 4 years and thereafter maintenance will be done up to five years and NTFP/Pasture development will be completed in first 3 – 4 years of project period. The soil conservation works and other forest infrastructure including Eco-development activities will be completed in first six years and will be further maintained till the completion of project period. Necessary infrastructure and establishment of nurseries at suitable places will be completed 1st year of the project period. All the works will be carried out after the approval of A. P. O. by the competent authority during the plan period.

6.2 ORGANIZATIONAL STRUCTURE AND IMPLEMENTATION:

The execution of CAT Plan is proposed to be carried out through H. P. Forest Department under the administrative/financial control of the Conservator of Forests Shimla. At the field level the actual implementation will be done by the D. F. O. Rohru who have the

Jurisdiction over the area covered under this CAT Plan. The area of CAT Plan will be divided into small watersheds. The A. P. O. will be prepared by DFO Rohru and it will be approved by P. C. C. F. on the recommendation of CF Shimla. He shall be empowered to modify the activities under this plan or the works which are not covered in this plan, if required during the implementation period to resolve the issue or to fulfill the objectives of the CAT Plan. Any major modification if required with the passage of time it shall be approved from executive body through Pr CCF H. P. during the plan period. For successful achievement of the CAT Plan objectives, a close liaison shall be maintained with the other Departments like Civil Administration, Agriculture, Horticulture, Animal Husbandry, Art and Culture, Social Welfare and Panchayati Raj etc. It has strongly been felt at the Government level that the CAT Plan should have more and more involvement of local people. In some activities where local people can be engaged should be engaged this shall provide them employment and awareness towards their environment.

6.3 PROJECT STAFF :

The existing staff of Rohru Division will be involved for the implementation of CAT Plan works in addition to their own duties; eco task force will also be involved in the implementation of the CAT Plan.

6.4 HEADQUARTERS OF THE PROJECT

As the CAT Plan is to be implemented through DFO Rohru, the headquarters of all allied staff will be as per the territorial jurisdiction

and the headquarter of the ECO Task Force will be fixed according to their jurisdiction of work. Wildlife & floristic surveys will be got done through CWLW, HP.

6.5 MONITORING AND EVALUATION

MONITORING COMMITTEE FOR CAT PLAN WORKS

As in case of APO approval the monitoring committee would be constituted as furnished below:-

1. Conservator of Forest Shimla- Chairman
2. ACF Rohru Forest Division Rohru- Member
3. From the effected panchyat any five members to be Nominated by Chairman in rotation as per convenience- Members
4. Four representatives from remaining catchment to be nominated by Chairman in rotation- Members
5. Representative of M/S Greenko Hatkoti Energy Pvt.Ltd the developers- Member
6. Divisional Forest Officer Rohru- Member Secretary

The committee would need to ensure the implementation and monitoring of the catchment area treatment works and review the progress from time to time. The implementing agency will immediately upon its approval, provide a copy of the approved APO giving details such as list of area(with name and location) along with works to be taken up and their cost to each member of the committee right in the beginning of the year. The report/proceeding of the approval committee as available would also be placed before this committee. Annual progress report would be submitted to M/S Greenko Hatkoti Energy Pvt.Ltd. the developers.

The committee shall strive to make the monitoring process as transparent as possible. The members of the PRI institutions would be responsible for sharing information in their area and also with other representatives of PRI who in turn are to share the information in their respective area.

Meeting of the committee would be held at least once a year a quorum of 50% of the members would suffice to hold the meeting. All non- official members shall be entitled to TA/DA as per rates approved By DC Shimla, all the expenditure on the conduct of the meetings would be met from the funds of monitoring and evaluation head.

Services of a professional monitoring expert as individual or as an agency (group/firm/company) would be required for supplementing the efforts of the monitoring committee and also for preparing a well documented monitoring report. Conservator Forest Shimla is fully authorized to hire a competent agency for this purpose and order release payment for the same from the funds allocated for monitoring and evaluation. However this report shall be tabled before the monitoring committee for its approval.

6.6 OTHER RECOMMENDATIONS

Besides above the following recommendation are made for smooth implementation of the CAT Plan

1. The implementing agency The HP forest department should give priority to the project effected families and local population while employing labour in the CAT plan activities and also in selection of beneficiaries' under alternative fuel devices.
2. The Developers should ensure frequent meetings with the forest department's CAT plan implementation officials and executing team members to enable smooth implementation of the CAT plan and ensure financial flow
3. Sub-contracting of appropriate activities of the CAT plan through local people/agencies should be encouraged.
4. Adequate emphasis on NTFP introduction and prorogation would help the local population in the short term.
5. Display of information boards at the work sites showing name of work/component, scope and extent of work, cost involved and year of

completion an also name of the funding agency would help in public information.

6.7 COST ESCALATION :

The present cost projections are based on the prevailing wage rates. The cost of the project will escalate and when wage rates are hiked by the H. P. Government from time to time. In such an eventuality cost for proportionate increase in the cost of material and wages for funding will be submitted to the user agency by the implementing agency and differential amount will be met by the user agency during the plan period.

CHAPTER -VII

COST ESTIMATE

CHAPTER – VII

COST ESTIMATE

7.1 TOTAL PROJECT COST:

Cost of the various project components have been worked out on schedule rate for the year 2005 – 06 as applicable in Shimla Forest Circle H. P. Forest Deptt. The detail of expenditure for various components has been shown in the respective chapter. Total Project cost for 10 years will be as under: -

Year		Amount (Rs.) in Lac
2012-13	1st Year	4.93
2013-14	2nd Year	76.46
2014-15	3rd Year	37.65
2015-16	4th Year	38.56
2016-17	5th Year	31.72
2017-18	6th Year	33.35
2018-19	7th Year	24.45
2019-20	8th Year	15
2020-21	9th Year	14
2021-22	10th Year	9
2022-23	11th year	7.64
	Total Rs.	**296.00**

7.2 ANNUAL PHASING:

Annual phasing of works to be carried out in Paudital-Lassa HEP as per approved CAT Plan is as per article 5.2.1 to 5.2.10. The schematic planning is attached as Annexure VIII.

DETAIL OF WORK EXPENDITURE FOR THE FIRST YEAR2012-13

Sr No.	Name of Component	Name Of Area	Physical Target	Amount
1	Nursery Development	Bathara	1 hac	
	New			1.0
2	Bio-Engineering Measures			
	(iii) Raising and planting of bio-engineering species			1.68
	Sub. Total			
3	Research , Trening and capacity build up			
	Research			2
4	Protection and Management of Wildlife			
	iv) Awareness of Wide life conservation among local communities			0.25
			Total Amount	4.93

Divisional Officer
Research Division
HOHRU

DETAIL OF WORK EXPENDITURE FOR THE SECOND YEAR 2013-14

Sr	Name of	Name Of Area	Physical Target	Amount
I	**Habitat Improvement**			
	BIOLOGICAL MEASURES			
	i) Afforestation of Degraded Forest Land			
	New	RF Bhamnoli, RF-Dharsil, RF- Khasha Dhar	20	8.2
	ii)Shrubs Plantation			
	New	PF-Shagli,RF-Sangri, RF-Jiuta	15	3.3
	vi) Nursery Development			
	Raising of Plants	Buthara	LS	1.54
II	**Soil and Moisture Conservation**			
	Engineering Measures			
	Land Slip			
	I) Wire Crate Chek Dam	Garima Slip		12.17
	Bio-Engineering Measures			
	II) Plasids,Fascines,included With Vegitative support		LS	1.03
	III) Raising and planting of bio-engineering species		LS	1.68
III	**Payment for Enviornmental services including eco tourism**			
	i) Payment for Enviornmental services		LS	4.4
	ii) Maintenance of Various Log huts/ FRH and camping site and other (eco tourism) activities			4
IV	**Research, training& Capacity buil-up**			
	i) Research			2
	ii) Training & Capacity Beild up For HPFD staff in Indai & Abroad			4
V	**Infrastructural build-up and forest protection**			
	A) construction /maintenance of building			
	i) Construction of type III Quarters (new)		LS	18
	B) Vehical and operational Support to HPFD			
	i) Purchase of vehical (in kind)			8
	ii) Purchase of Computer	Nos	1	0.5
	C) Forest Protection			
	i) Construction and Maintenance of boundary pillars			1
VI	**Wildlife Measures**			
	C/O Water Holes	Nos		0.5
	Sign and Slogan Boards	Nos		0.5
	Plantation of Wild Fruit bearing plantation	Nos		0.58
	Awarness of Wide life conservation among local communities			0.25
	Development of natural Spring	Nos		0.25
	Provision of Salt licks			0.05
	iii) Contigency			0.074
VII	**Mointoring & Evaluation**			1.48
VIII	**Support for Preparing site specific works plan**			1.48
IX	**Contingencies**			1.48
	Total			76.454

Divisional Forest Officer
Rohru Forest Division
ROHRU

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DETAIL OF WORK EXPENDITURE FOR THE THIRD YEAR 2014-15

Sr	Name of	Name Of Area	Physical Target	Amount
I	**Habitat Improvement**			
	BIOLOGICAL MEASURES			
	i) Afforestation of Degraded Forest Land			
	New	RF Bhalta, RF-Khirgi	10 hac	4.2
	Maint.	RF Bhamnoli, RF-Dhural, RF-Khatha Dhar	20 hac	1.1
	ii)Shrubs Plantation			
	New	PF-Shagli,RF-Sungri, RF- Jitata	15	3.3
	Maint.	PF-Shagli,RF-Sungri, RF- Jitata	15	0.5
	Enrichment Plantation			
	New	RF-Khnola	5	1.1
	vi) Nursery Development			
	Raising of Plants	Buthara	LS	1.54
II	**Soil and Moisture Conservation**			
	Bio-Engineering Measures			
	I) Brush Wood Check Dams			1.01
	II) Plasids,Fascines,included With Vegitative support			1.03
	III) Raising and planting of bio-engineering species			1.68
III	**Payment for Enviornmental services including eco tourism**			
	Payment for Environmental services			4
	Maintenance of Various Log huts/ FRH and camping site and other (eco tourism) activities			2
IV	**Research, training& Capacity buil-up**			
	i) Research			2.8
V	**Infrasatroctural build-up and forest protection**			
	A) construction /maintenance of building			
	Maintenance of Old Building			2
	B) Vehical and operational Support to HPFD			
	Maintenance of Vehical and machnery			1
	Purchase of Computer			0.5
	C) Forest Protection			
	Construction and Maintenance of boundary pillars			1
	controll burning			1
VI	**Wildlife Measures**			
	C/O Water Holes			0.5
	Plantation of Wild Fruit bearing plantation			0.58
	Awareness of Wide life conservation among local communities			0.23
	Wildlife census			2
	Provision of Salt licks			0.05
	Contigency			0.074
VII	**Monitoring & Evaluation**			1.48
VIII	**Support for Preparing site specific works plan**			1.48
IX	**Contingencies**			1.48
	Total			37.654

Divisional Forest Officer
Rohru Forest Division
ROHRU

DETAIL OF WORK EXPENDITURE FOR THE FOURTH YEAR 2015-16

Sr.	Name of	Name Of Area	Physical Target	Amount
I	Habitat Improvement			
	BIOLOGICAL MEASURES			
	i) Afforestation of Degraded Forest Land			
	New	RF-Loora ,RF-Khirgi	10	4.2
	Maint.	RF Dhamnoli, RF-Dharal, RF-Khasha Dhar RF Bhalta, RF-Khirgi	30	3.43
	Afforestn Plantation			
	New			
	Maint	PF-Shagli,RF-Songri, RF- Bhata	30	6.94
	Enrichment Plantation			
	New	RF-Dhowani	5	1.5
	Maint	RF-Khasha	5	0.23
	vi) Nursery Development			
	Raising of Plants		2.5	1.54
	Assisted Natural Regeration			
	New	Bagi	5	0.73
II	Soil and Moisture Conservation			
	Engineering Measures			
	a) Land Slide/Slip stabilization			
	Wire Crate Chek Dam	Dhamnoli Slip	44	5.48
	b) Nullah Stabilization			
	I) Dry Stone Check Dams	Thuh Gad, Shammer Khad, Cheera Khad, Paikal khad, Chanoo Khad	40	1
	Bio-Engineering Measures			
	I) Brush Wood Check Dams			1.01
	II) Plasola,Fascines,included With Vegitative support			1.03
	III) Raising and planting of bio-engineering species			1.08
III	Payment for Enviornmental services including eco tourism			
	i) Payment for Environmental services			4
	ii) Maintenance of Various Log huts/ CRH and camping site and other eco tourism) activities			2
V	Infrastructural build-up and forest protection			
	A) Construction /maintenance of building			
	Maintenance of Old Building			2
	B) Vehical and operational Support to HPFD			
	Maintenance of Vehical and machinary			1
	Purchase of Computer			0.5
	C) Forest Protection			
	Maintenance of Fire lines			1
	annuall burning			0.9
VI	Wildlife Measures			
	Development of natural Spring			0.25
	Provision of Salt licks			0.05
	Budgetary support for purchase of Cages etc.			2

	Contigency			0.074
VII	**Monitoring & Evaluation**			1.48
VIII	**Support for Preparing site specific works plan**			1.48
IX	**Contingencies**			1.48
	Total			38.564

Divisional Forest Officer
Ronni Forest Division
RONNI

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DETAIL OF WORK EXPENDITURE FOR THE FIFTH YEAR 2016-17

Sr	Name of	Name Of Area	Physical Target	Amount
I	Habitat Improvement			
	BIOLOGICAL MEASURES			
	i) Afforestation of Degraded Forest Land			
	Maint.	RF [illegible], RF-Dharal, RF-Chaiba Dhar, RF [illegible], RF-Khirgi, RF-Loija, RF-[illegible]	40	1.67
	ii)Shrubs Plantation			
	Maint.	PF [illegible], RF-Sangri, RF-[illegible]	30	0.8
	iii) Enrichment Plantation			
	maint.	RF- Khoola, RF Dewani	10	0.73
	iv) Assisted Natural Re-generation			
	New	RF-Kulda	3	0.73
	Maint.		5	0.09
	vi) Nursery Development			
	New			
	Raising of Plants	[illegible]	LS	1.34
II	Soil and Moisture Conservation			
	Engineering Measures			
	b) Nallah Stabilization			
	I) Wire crate Check Dams	Thah Gad, Shammer Khad, Cheera Khad, Pakhal khad, Chammi Khad	36	2.3
	Bio-Engineering Measures			
	I) Brush Wood Check Dams			1.01
	II) Plaids,Fascines,Included With Vegitative support			1.02
	III) Raising and planting of bio-engineering species			1.65
III	Payment for Enviornmental services including eco tourism			
	Payment for Environmental services			4
	Maintenance of Various Log huts/ FRH and camping site and other (eco tourism) activities			2
IV	Research, training& Capacity buil-up			
	Training & Capacity Build up For HPFD staff in India & Abroad			4
V	Infrastructural build-up and forest protection			
	A) construction /maintenance of building			
	Maintenance of Old Building			2
	B) Vehical and operational Support to HPFD			
	Maintenance of Vehical and machinery			1
	C) Forest Protection			
	Maintenance of Fire lines	LS		1
	controll burning	LS		1
VI	Wildlife Measures			
	Plantation of Wild Fruit bearing plantation			0.55
	Provision of Salt licks			0.05
	Contigency			0.074

VII	Moinitoring & Evaluation			1.48
VIII	Support for Preparing site specific works plan			1.48
IX	Contingencies			1.48
	Total			31.724

Divisional Forest Officer
Rohtru Forest Division
ROHRU

[illegible]

Sr	Name of	Name Of Area	Physical Target	Amount
I	*Habitat Improvement*			
	BIOLOGICAL MEASURES			
	i) **Afforestation of Degraded** Forest Land			
	Maint	RF Dhamoli, RF-Dharol, RF- Khadu Dhar RF Bhabo, RF-Khargi RF-Loga RF-Khargi	40	1.46
	ii)**Shrubs Plantation**			
	Maint	PF-Shagli RF-Sangri, RF-Sitata	30	0.72
	iii) Enrichment Plantation			
	Maint	RF- Khnola, RF-Dswan	10	0.66
	iv) Assisted **Natural Re-generation**			
	Maint	RF-Kaidu, RF-Bagi	10	0.92
	NTFP'S			
	New	RF-Dhamoda, RF - Dhedi	10	4.2
	vi) Nursery **Development**			
	Raising of Plants	RF-Bathora	.5	1.54
II	**Soil and Moisture Conservation**			
	Engineering Measures			
	Slip Stabilization	Saudi Slip	35	4.3
	b) **Nallah Stabilization**			
	II) Dry stone Chek Dam	Otu Gad Sinyani Gad Matra Gad	50	0.8
	c) River **Bank Stabilization**			
	i) Wire Crate Chek Dam	Pabbar	25	2.64
	Bio-Engineering Measures			
	I) Brush Wood Check Dam			1.81
	II) Plasids,Fascines,included With Vegitative support			1.03
	III) Raising and planting of bio-engineering **species**			1.68
III	**Payment for Envioramental** services including **eco tourism**			
	Payment for Environmental services			4
	Maintenance of Various Log huts/ FRH and camping site and other (eco tourism) activities			2
	G Total (III)			
V	**Infrastructural build-up** and forest protection			
	Vehical and operational Support to **HPFD**			
	Maintenance of Vehical and machinery			3
VI	**Wildlife Measures**			
	Plantation of Wild Fruit bearing plantation			0.58
	Development of natural Spring			0.25
	Provision of Salt licks			0.05
	Contigency			0.074
VII	**Mointoring & Evaluation**			1.48
VIII	**Support for Preparing site** specific works plan			1.48
IX	**Contingencies**			1.48
	Total			33.354

Sr	Name of	Name Of Area	Physical Target	Amount
I	**Habitat Improvement**			
	BIOLOGICAL MEASURES			
	i) Afforestation of Degraded Forest Land			
	New			
	Maint.	RF Bhamnoli, RF-Dharal, RF-Khasha Dhar RF Bhalta, RF-Khirgi ,RF-Lorja ,RF-Khirgi	40	1.18
	ii)Shrubs Plantation			
	Maint.	PF-Shagli,RF-Sungri, RF- Jiata	30	0.68
	iii) Enrichment Plantation			
	Maint.	RF- Khasla ,RF-Diwani	10	0.28
	iv) Assisted Natural Re-generation			
	New			
	Maint.	RF-Kutala ,RF-Bagi	10	0.9
	NTFPS			
	Maint.	RF-Dhumreda, RF - Dhroli	10	1.3
II	**Soil and Moisture Conservation**			
	Engineering Measures			
	b) Nallah Stabilization			
	I) Dry Stone Check Dams			
	II) Wire Crate Chek Dam		28	1.7
	c) River Bank Stabilization			
	i) Wire Crate Chek Dam		24	2.63
	Bio-Engineering Measures			
	I) Brush Wood Check Dams			1.01
	II) Plasids,Fascines,Included With Vegitative support			1.03
	III) Raising and planting of bio-engineering species			1.68
III	**Payment for Enviornmental services including eco tourism**			
	i) Payment for Environmental services			4
	ii) Maintenance of Various Log huts/ FRH and camping site and other (eco tourism) activities			2
VI	**Wildlife Measures**			
	ii) Sign and Slogan Boards			0.5
	v) Wildlife census			1
	VII)Provision of Salt licks			0.05
	ix) Contigency			0.074
VII	**Moniotoring & Evaluation**			1.48
VIII	**Support for Preparing site specific works plan**			1.48
IX	**Contingencies**			1.48
	Total			24.454

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DETAIL OF WORK EXPENDITURE FOR THE EIGHTH YEAR 2019-20

Sr	Name of	Name Of Area	Physical Target	Amount
I	**Habitat Improvement**			
	BIOLOGICAL MEASURES			
	i) Afforestation of Degraded Forest Land			
	Maint.	RF Bhalta, RF-Khirgi	20	0.59
	ii)Shrubs Plantation			
	Maint.	PF-Shagli,RF-Sungri, RF-Jitata	15	0.32
	iii) Enrichment Plantation			
	Maint.	RF- Khnola ,RF-Diswani	10	0.25
	iv) Assisted Natural Re-generation			
	Maint.	RF-Kunda ,RF-Bagi	10	0.14
	v) NTFP			
	maint.	RF- Dumreda, RF- Dharoli	10	1.09
II	**Soil and Moisture Conservation**			
	Engineering Measures			
	c) Nallah Stabilization			
	i) Dry Stone Chek Dam	Baneti khad, Sia Khad, Mangara Khad, Masrat khad, Peja Khad	50	1
	Bio-Engineering Measures			
	I) Brush Wood Check Dams			1.01
	II) Plaoids,Fascines,included With Vegitative support			1.03
	III) Raising and planting of bio-engineering species			1.68
III	**Payment for Enviornamental services including eco tourism**			
	Maintenance of Various Log huts/ FRH and camping site and other (eco tourism) activities	LS		2
VI	**Wildlife Measures**			
	Plantation of Wild Fruit bearing plantation			0.58
	Development of natural Spring			0.25
	Provision of Salt licks			0.05
	Contigency			0.074
VII	**Moinitoring & Evaluation**			1.48
VIII	**Support for Preparing site specific works plan**			1.48
IX	**Contingencies**			1.48
	Total			15

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2.55

DETAIL OF WORK EXPENDITURE FOR THE NINTH YEAR 2020-21				
Sr	Name of	Name Of Area	Physical Target	Amount
I	**Habitat Improvement**			
	BIOLOGICAL MEASURES			
	i) Afforestation of Degraded Forest Land			
	Maint.	RF-Larja ,RF-Khirgi	10	0.23
	iii) Enrichment Plantation			
	Maint	RF-Diswani	5	0.11
	iv) Assisted Natural Re-generation			
	Maint	RF-Kutda ,RF-Bagi	10	0.13
	v) NTFP's			
	New			
	Maint.	RF- Dumreda, RF- Dharoli	10	1.03
II	**Soil and Moisture Conservation**			
	Engineering Measures			
	Nallah Stablization			
	Wire Crate Check Dam	Banoti khad, Sia Khad, Mangara Khad, Maurat khad, Peja Khad	39	2.0
B	**Bio-Engineering Measures**			
	I) Brush Wood Check Dams			1.03
	II) Plasids,Fascines,included With Vegitative support			1.03
	III) Raising and planting of bio-engineering species			1.68
III	**Payment for Enviornmental services including eco tourism**			
	Maintenance of Various Log huts/ FRH and camping site and other (eco tourism) activities			2
IV	**Research, training& Capacity buil-up**			
VI	**Wildlife Measures**			
	C/O Water Holes			0.05
	Plantation of Wild Fruit bearing plantation			0.58
	Provision of Salt licks			0.05
	Contigency			0.074
VII	**Mointoring & Evaluation**			1.48
VIII	**Support for Preparing site specific works plan**			1.48
IX	**Contingencies**			1.48
	Total			14

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DETAIL OF WORK EXPENDITURE FOR THE TENTH YEAR 2021-22

Sr	Name of	Name Of Area	Physical Target	Amount
I	**Habitat Improvement**			
	BIOLOGICAL MEASURES			
	iv) Assisted Natural Re-generation			
	Maint.	RF-Bagi	5	0.06
II	**Soil and Moisture Conservation**			
	Bio-Engineering Measures			
	I) Brush Wood Check Dams			1.01
	II) Plants,Fascines,included With Vegitative support			1.03
	III) Raising and planting of bio-engineering species			1.68
III	**Payment for Enviornmental services including eco tourism**			
VI	**Wildlife Measures**			
	Plantation of Wild Fruit bearing plantation			0.53
	Provision of Salt licks			0.05
	Contigency			0.074
VII	**Moistering & Evaluation**			1.48
VIII	**Support for Preparing site specific works plan**			1.48
IX	**Contingencies**			1.48
	Total			9

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DETAIL OF WORK EXPENDITURE FOR THE ELEVENTH YEAR 2022-23

Sr	Name of	Name Of Area	Physical Target	Amount
I	**Habitat Improvement**			
	BIOLOGICAL MEASURES			
II	**Soil and Moisture Conservation**			
	Bio-Engineering Measures			
	I) Brush Wood Check Dams			**1.1**
	III) Raising and planting of bio-engineering species			**1.69**
VI	**Wildlife Measures**			
	Awareness of Wide life conservation among local communities			0.25
	Provision of Salt licks			0.05
	Contigency			0.074
VII	**Maintoring & Evaluation**			1.48
VIII	**Support for Preparing site specific works plan**			1.48
IX	**Contingencies**			1.48
	Total			7.604

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PER HACTARE COST NORM FOR MODAL PLANTATION UNDER CAT PLAN 1500 PLANT PER HACT WITH WOODEN FANCE

Per-Hac Cost Modal For Afforstation Of Degraded Fores Land

Calculation for wages Increased Rate Rs 120 per day

Sr No	Particular of works fancing	Qty	units	Reate	Amount
1	Survey and Demarcation area	1	hac	67.33	67.33
2	Prepration of wooden fance post	60	%nos	863.35	518.0
3	Carrege of wooden fance post up to 2mtr long over distanse 2 km	60	nos/km	453.67	272.2
4	Charring and col tarring of the ends pf fence posts	60	%nos	186.33	111.8
5	Prepration /Digging of hole 20-30 cm diaand 50cm deep	60	%nos	604.51	362.7
6	fixing of wooden fance post including sttruting	60	%nos	477.34	286.4
7	Carrege of barbed wire over distanse 2 km	0.9	qtl/km	54.5	98.1
8	Stracting & fixing of barbed wire in 4 strands	720	rmt	3.16	2275.2
9	Prepration inspection path 60 cm Width.	250	mtr	7.24	1810
10	Prepration of water retention mounds/ trenches	LS		LS	2000
11	interlasing of thorny bushes along the fance	180	rmt	2.74	493.2
					8294.95
	TOTAL -FANCING COST PLANTING			0	
12	Digging of pits 45*45*45cm	600	%nos	636.28	3817.7
15	digging of pits 30*30*30cm	900	%nos	318.22	2863.98
16	filling of pits45*45*45cm	600	%nos	182.31	1093.86
17	Filling of pits30*30*30cm	900	%nos	127.22	1144.98
18	Carring of nakid root plants over distanse 2 km up hill	600	%nos	23.49	281.88
6	carrige of plants in p/bags distance 2 km u	900	%nos	145.39	2617.02
7	Planting of intire plant rised in p bag	900	%nos	145.49	1309.41
8	Planting of nakid root plants	600	per plant	122.66	735.96
9	Planting of grass Tufts/ preprations of strips including sowing in strips 100*3*5 cm for grass sowing along contour.	500	Strips	613.33	3066.65
	Total				16931.42
	TOTAL - PLANTING COST MATREIL				
1	Cost of barbed wire	0.9	per qtl	7000	6300
	Nursery cpst of plsnts	600	Per/plant	6	3600
	P- Bag plants	900	Per/plant	8	7200
					17100
	TOTAL COST OF PLANTS			Say	42000

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Per Hac Cost Model for Afforsstration of dgraded Forests Land

maintenance Norm of 1st year (30%mortality)

Sr No	Particular	Qty	Rate	unit	Amount
1	Re-Digging of pits 45*45*45cm	110	318.22		350.042
2	Rr-digging of pits 30*30*30cm	165	159.07		262.4655
3	filling of pits45*45*45cm	110	182.31		200.541
4	Filling of pits30*30*30cm	165	127.22		209.913
5	Planting of intire plant rised in p bag i/ramming	175	145.49		254.6075
6	Planting of nakid root plants(OBL) i/c Ramming	100	145.39		145.39
7	Carring of nakid root plants over distanse 2 km up hill	175	122.66		214.655
8	carrige of plants in p/bags distance 2 km up hill	100	23.49		23.49
9	Nursery cost of plants	275	7		1925
10	Repair of b wire of fance	180	1.16		208.8
11	repair of inspection path 60 cm Width.	LS	700		700
12	Soil and moistur coservation works	LS	1000		1000
					5494.904

Per Hac Cost Model for Afforsstration of dgraded Forests Land

maintenance Norm of 2nd year (20%mortality)

Sr No	Particular	Qty	Rate	unit	Amount
1	Re-Digging of pits 45*45*45cm	88	318.22		280.0336
2	Rr-digging of pits 30*30*30cm	132	159.07		209.9724
3	filling of pits45*45*45cm	88	182.31		160.4328
4	Filling of pits30*30*30cm	132	127.22		167.9304
5	Planting of intire plant rised in p bag i/ramming	140	145.49		203.686
6	Planting of nakid root plants(OBL) i/c Ramming	80	145.39		116.312
7	Carring of naked root plants over distanse 2 km up hill	140	122.66		171.724
8	carrige of plants in p/bags distance 2 km up hill	80	23.49		18.792
9	Nursery cost of plants	220	7		1540
10	Repair of b wire of fance	180	1.16		208.8
11	repair of inspection path 60 cm Width.	LS	500		500
12	Soil and moistur coservation works	LS	800		800
					4377.6832

Per Hac Cost Model for Afforsstration of dgraded Forests Land

maintenance Norm of 3rd year (10%mortality)

Sr No	Particular	Qty	Rate	unit	Amount
1	Re-Digging of pits 45*45*45cm	60	318.22		190.932
2	Rr-digging of pits 30*30*30cm	90	159.07		143.163
3	filling of pits45*45*45cm	60	182.31		109.386

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4	Filling of pits30*30*30cm	90	127.22		114.498
5	Planting of intire plant rised in p bag l/ramming	90	145.49		130.941
6	Planting of nakid root plants(OBL) l/c Ramming	60	145.39		87.234
7	Carring of nakid root plants over distanse 2 km up hill	90	122.66		110.394
8	carrige of plants in p/bags distance 2 km up hill	60	23.49		14.094
9	Nursery cost of plants	150	7		1050
10	Repair of b wire of fance	200	1.16		232
11	repair of inspection path 60 cm Width.	LS			400
12	Soil and moistur coservation works	LS			800
					3382.642

Per Hac Cost Model for Afforsstration of dgraded Forests Land

maintenance Norm of 4th year (10%mortality)

Sr No	Particular	Qty	Rate	unit	Amount
1	Re-Digging of pits 45*45*45cm	66	318.22		210.0252
2	Rr-digging of pits 30*30*30cm	99	159.07		157.4793
3	filling of pits45*45*45cm	66	182.31		120.3246
4	Filling of pits30*30*30cm	99	127.22		125.9478
5	Planting of intire plant rised in p bag l/ramming	105	145.49		152.7645
6	Planting of nakid root plants(OBL) l/c Ramming	60	145.39		87.234
7	Carring of nakid root plants over distanse 2 km up hill	105	122.66		128.793
8	carrige of plants in p/bags distance 2 km up hill	60	23.49		14.094
9	Nursery cost of plants	165	7		1155
10	Repair of b wire of fance	200	1.16		232
11	repair of inspection path 60 cm Width.	LS			300
12	Soil and moistur coservation works	LS			700
					3333.6624

Per Hac Cost Model for Afforsstration of dgraded Forests Land

maintenance Norm of 5th year (10%mortality)

Sr No	Particular	Qty	Rate	unit	Amount
1	Re-Digging of pits 45*45*45cm	44	318.22		140.0168
2	Rr-digging of pits 30*30*30cm	66	159.07		104.9862
3	filling of pits45*45*45cm	44	182.31		80.2164
4	Filling of pits30*30*30cm	66	127.22		83.9652
5	Planting of intire plant rised in p bag l/ramming	70	145.49		101.843
6	Planting of nakid root plants(OBL) l/c Ramming	40	145.39		58.156

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7	Carring of nakid root plants over distanse 2 km up hill	70	122.66	85.862
8	carrige of plants in p/bags distance 2 km up hill	40	23.49	9.396
9	Nursery cost of plants	110	7	770
10	Repair of b wire of fance	200	1.16	232
11	repair of inspection path 60 cm Width.	LS		300
12	Soil and moistur coservation works	LS		500
				2466.4416

ABSTRACT

New plantation	42000
1ts year Maintenance	5494.904
2nd year Maintenance	4377.68
3rd year Maintenance	3382.642
4th year Maintenance	3383.2662
5th year Maintenance	2466.4416
say	62305

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Per hac cost model for Shrub Plantation Plantation

Sl No	particular of works	Qty	Rates	Units	Amounts
1	Survey and Demarcation area	1	67.33	hac	67.33
2	cutting Prepration of wooden fance post	70	863.35	%nos	604.345
3	Carring of col taaring ends of fpost 45cm bottom,15 cm conical top	70	186.33	%nos	130.431
4	Carrege of wooden fance post up to 18.mtr long over distanse 2 km	70	453.67	%nos/km	635.138
5	Digging of hole 20-30 cm diaand 45cm deep	70	604.51	%nos/km	423.157
6	fixing of wooden fance post including sttruting	70	477.34	%nos	334.138
7	Carrege of barbed wire over distanse 2 km	0.9	54.5	oth/km	98.1
8	Srtatching & fixing of bwire	0.72	3.16	Rmt	2.2752
9	Prepration inspection path 60 cm Width.	150	7.24	Rmt	1086
10	Interlasing of thorny bushes along the fance	180	2.74	Rmt	493.2
11	Digging Pits45*45*45cm	800	636.28	%nos	5090.24
12	Filling of pits45*45*45cm	800	182.31	%nos	1458.48
13	Carring of nakid root plants over distanse 2 km up hill	800	23.49	%nos/km	375.84
14	Planting of nakid root plants of (OBL) I/c rimmining	800	122.26	%nos	978.08
				Total	11776.7542
			B- wire .90 qtl*7000		7000
			Cost of Plants 800*3		2400
				Total	21176.7542

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Per hac cost model for Shrub Plantation Plantation
Maintenance Norms Of 1st year 25% motality

Sl No		Qty	Rate	Units	Amounts
1	Re-diging of failure pits 45*45*45for B/spps	200	318.22	%NOS	636.44
2	Filling of pits 45*45*45cm for b/l spps	200	182.31	%NOS	364.62
3	Carriage of Nake roots plants up hill side 2 km	200	23.49	%NOS	93.96
4	Planting of nakid root plants of (OBL) I/c rimmining	200	122.66	%NOS	245.32
	Cutting and prep of woden fancening post 1.80 mtr long 78 to				
6	10 cm dia	30	863.35	%NOS	259.005
7	Carriage of f posts o/d of 2 km	30	453.67	%NOS	272.202
8	Digging of holes for fixing of f/ post	30	604.51	%NOS	181.353
9	Fixing of fancing post	30	477.34	%NOS	143.202
10	Interlacing of thorny bushes wood in B / wire	200	2.74	Rmt	548
				Total	**2744.102**
	Cost Of plant200*3				600
					3344.102

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Per hac cost model for Shrub Plantation Plantation
Maintenance Norms Of 2nd year 20% motality

Sl No		Qty	Rates as per Frst SR	Units	Amounts
1	Re-diging of failure pits 45*45*45for B/spps	160	318.22	%nos	509.152
2	Filling of pits 45*45*45cm for b/l spps	160	182.31	%nos	291.696
3	Carriage of Nake roots plants up hill side 2 km	160	23.49	%nos	37.584
4	Planting of nakid root plants of (OBL) I/c rimmining	160	122.66	%nos	196.256
6	Cutting and prep of woden fancening post 1.80 mtr long 78 to 10 cm dia	30	863.35	%nos	259.005
7	Carriage of f posts o/d of 1.5 km	30	453.67	%nos	136.101
8	Digging of holes for fixing of f/ post	30	604.51	%nos	181.353
9	Fixing of fancing post	30	477.34	%nos	143.202
10	Interlacing of thorny bushes wood in B / wire	200	2.74	Rmt	548
				Total	**2302.349**
		Cost Of plant200*3			600
				Total	**2902.349**

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Per hac cost model for Shrub Plantation Plantation
Maintenance Norms Of 3rs&4th year 15% motality

Sl No		Qty	Rate	Units	Amounts
1	Re-diging of failure pits 45*45*45for B/spps	120	318.22	%nos	381.864
2	Filling of pits 45*45*45cm for b/l spps	120	182.31	%nos	218.772
3	Carriage of Nake roots plants up hill side 2 km	120	23.49	%nos	28.188
4	Planting of nakid root plants of (OBL) i/c rimmining	120	122.66	%nos	147.192
	Cutting and prep of woden fancening post 1.80 mtr long				
6	78 to 10 cm dia	30	863.35	%nos	259.005
7	Carriage of f posts o/d of 1.5 km	30	453.67	%nos	136.101
8	Digging of holes for fixing of f/ post	30	604.51	%nos	181.353
9	Fixing of fancing post	30	477.34	%nos	143.202
10	Interlacing of thorny bushes wood in B / wire	200	2.74	Rmt	548
				Total	**2043.677**
			Cost Of plant120*3		360
					2403.677

Per hac cost model for Shrub Plantation Plantation
Maintenance Norms Of 5th year 10% motality

Sl No		Qty	Rate	Units	Amounts
1	Re-diging of failure pits 45*45*45for B/spps	80	318.22	%nos	254.576
2	Filling of pits 45*45*45cm for b/l spps	80	182.31	%nos	145.848
3	Carriage of Nake roots plants up hill side 2 km	80	23.49	%nos	18.792
4	Planting of nakid root plants of (OBL) i/c rimmining	80	122.66	%nos	98.128
	Cutting and prep of woden fancening post 1.80 mtr long				
6	78 to 10 cm dia	30	863.35	%nos	259.005
7	Carriage of f posts o/d of 1.5 km	30	453.67	%nos	136.101
8	Digging of holes for fixing of f/ post	30	604.51	%nos	181.353
9	Fixing of fancing post	30	477.34	%nos	143.202
10	Interlacing of thorny bushes wood in B / wire	200	2.74	Rmt	548
				Total	**1785.005**
			Cost Of plant120*3		360
					2145.005

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Per hac cost model for Enrichment Plantation
Maintenance Norms Of 2nd year 20% motality

Sl No		Qty	Rate	Units	Amounts
1	Re-diging of failure pits 30*30*30 cm for p/bgs	96	159.07	%nos	152.7072
2	Re-diging of failur pits 45*45*45cm for b/l spps	64	318.22	%nos	203.6608
3	filling plt 30*30*30 cm	96	127.22	%nos	122.1312
4	filling of Pits 45*45*45 cm	64	182.31	%nos	116.6784
5	Carriage of plant with p/ bags	96	145.39	%nos	139.5744
6	Carriage of Nake roots plants up hill side 2 km	64	23.49	%nos	15.0336
7	Planting of plants raised in p bag i/c ramming	96	145.49	%nos	139.6704
8	Planting of nakid root plants of (OBL) i/c rimmining	64	122.66	%nos	78.5024
9	Mulching / weeding ofplant in p/area	800	863.35	%nos	6906.8
10	Cutting and prep of woden fancening post 1.80 mtr long 78 to 10 cm dia	15	453.67	%nos	68.0505
11	Carriage of f posts o/d of 1.5 km	15	604.51	%nos	90.6765
12	Digging of holes for fixing of f/ post	15	477.34	%nos	71.601
13	Fixing of fancing post	15	1.16	%nos	0.174
14	Repair of b/ wire fencing -	200	2.74	Rmt	548
15	Interlacing of thorny bushes wood in B / wire	200	3.5	Rmt	700
				Total	9353.2604
			Cost Of plant160*7		1120
				Total	10473.2604

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Per hac cost model for Enrichment Plantation
Maintenance Norms Of 3rd&4th year 15% motality

page-9

Sl No		Qty	Rate	Units	Amounts
1	Re-diging of failure pits 30*30*30 cm for p/bgs	72	159.07	%nos	114.5304
2	Re-diging of failur pits 45*45*45cm for b/l spps	48	318.22	%nos	152.7456
3	filling pit 30*30*30 cm	72	127.22	%nos	91.5984
4	filling of Pits 45*45*45 cm	48	182.31	%nos	87.5088
5	Carriage of plant with p/ bags	72	145.39	%nos	104.6808
6	Carriage of Nake roots plants up hill side 2 km	48	23.49	%nos	11.2752
7	Planting of plants raised in p bag l/c ramming	72	145.49	%nos	104.7528
8	Planting of nakid root plants of (OBL) l/c rimmining	48	122.66	%nos	58.8768
	Cutting and prep of woden fancening post 1.80 mtr				
10	long 78 to 10 cm dia	15	863.35	%nos	129.5025
11	Carriage of f posts o/d of 1.5 km	15	453.67	%nos	68.0505
12	Digging of holes for fixing of f/ post	15	604.51	%nos	90.6765
13	Fixing of fancing post	15	477.34	%nos	71.601
14	Repair of b/ wire fencing	200	1.16	Rmt	232
15	Interlacing of thorny bushes wood in B / wire	200	2.74	Rmt	548
	Total			TOTAL	1865.7993
		Cost Of plant120*7			840
				TOTAL	2705.7993

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Per hac cost model for Enrichment Plantation
Maintenance Norms Of 3rd&4th year 15% motality

page-9

Sl No		Qty	Rate	Units	Amounts
1	Re-diging of failure pits 30*30*30 cm for p/bgs	72	159.07	%nos	114.5304
2	Re-diging of failur pits 45*45*45cm for b/l spps	48	318.22	%nos	152.7456
3	filling pit 30*30*30 cm	72	127.22	%nos	91.5984
4	filling of Pits 45*45*45 cm	48	182.31	%nos	87.5088
5	Carriage of plant with p/ bags	72	145.39	%nos	104.6808
6	Carriage of Nake roots plants up hill side 2 km	48	23.49	%nos	11.2752
7	Planting of plants raised in p bag i/c ramming	72	145.49	%nos	104.7528
8	Planting of nakid root plants of (OBL) i/c rimmining	48	122.66	%nos	58.8768
10	Cutting and prep of woden fancening post 1.80 mtr long 78 to 10 cm dia	15	863.35	%nos	129.5025
11	Carriage of f posts o/d of 1.5 km	15	453.67	%nos	68.0505
12	Digging of holes for fixing of f/ post	15	604.51	%nos	90.6765
13	Fixing of fancing post	15	477.34	%nos	71.601
14	Repair of b/ wire fencing	200	1.16	Rmt	232
15	Interlacing of thorny bushes wood in B / wire	200	2.74	Rmt	548
	Total			**TOTAL**	**1865.7993**
		Cost Of plant120*7			840
				TOTAL	2705.7993

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Per hac cost model for Enrichment Plantation
Maintenance Norms Of 5th year 10% motality

page-9

Sl No		Qty	Rate	Units	Amounts
1	Re-diging of failure pits 30*30*30 cm for p/bgs	48	159.07	%nos	76.3536
2	Re-diging of failur pits 45*45*45cm for b/l spps	32	318.22	%nos	101.8304
3	filling pit 30*30*30 cm	48	127.22	%nos	61.0656
4	filling of Pits 45*45*45 cm	32	182.31	%nos	58.3392
5	Carriage of plant with p/ bags	48	145.39	%nos	69.7872
6	Carriage of Nake roots plants up hill side 2 km	32	23.49	%nos	7.5168
7	Planting of plants raised in p bag i/c ramming	48	145.49	%nos	69.8352
8	Planting of nakid root plants of (OBL) i/c rimmining	32	122.66	%nos	39.2512
10	ınd prep of woden fancening post 1.80 mtr long 78 to 1	15	863.35	%nos	129.5025
11	Carriage of f posts o/d of 1.5 km	15	453.67	%nos	68.0505
12	Digging of holes for fixing of f/ post	15	604.51	%nos	90.6765
13	Fixing of fancing post	15	477.34	%nos	71.601
14	Repair of b/ wire fencing	200	1.16	Rmt	232
15	Interlacing of thorny bushes wood in B / wire	200	2.74	Rmt	548
				TOTAL	**1623.8097**
			Cost Of plant80*7		560
				TOTAL	**2183.8097**

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Per hac cost model for Assisted natural regeneration

Sl No		Qty	Rate	Units	Amounts
1	Survey and Demarcation area	1	67.33	hac	67.33
2	cutting Prepration of wooden fance post	60	863.35	%nos	518.01
3	Carring of col taaring ends of fpost 45cm bottom,15 cm conical top	60	168.33	%nos	100.998
4	Carrege of wooden fance post up to 18.mtr long over distanse 2 km	60	453.67	%nos/km	544.404
5	Digging of hole 20-30 cm diaand 45cm deep	60	604.51	%nos/km	362.706
6	fixing of wooden fance post including sttruting	1	477.34	Qtl/km	477.34
7	Carrege of barbed wire over distanse 2 km	0.72	54.5	Rmt	78.48
8	Srtatching & fixing of bwire	180	3.16	Rmt	568.8
9	interlasing of thorny bushes along the fance	250	2.74	%nos	6.85
10	Prepration& Diging of patches 45*45*45	250	636.28	%nos	1590.7
12	Digging of pits 20-30 cm dia and 50cm deep	250	604.51	%nos	1511.275
13	Carriage of plants with p bags	250	145.39	%nos/km	363.475
15	Planting of plants rised in p/bag	250	145.49	%nos	363.725
				Total	6554.093
			Cost Of plant250*7		1750
			B-Wire .9*7000		6300
				Total	14604.093

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Per hac cost model for Assisted natural regeneration
Maintenance Norms Of 1st year 25% motality

Sl No		Qty	Rate	Units	Amounts
1	Re-Digging Patches 45*45*45	65	318.22	%nos	206.843
2	Re- Diggingof pits30*30*30	65	159.07	%nos	103.3955
3	Filling of pits 30*30*30	65	127.122	%nos	82.6293
4	Carriage of plants with p bags	65	145.39	%nos	94.5035
5	Planting of plants rised in p/bag	65	145.49	%nos	94.5685
7	Repair of b wire in fance	200	1.16	%nos	2.32
8	Cutting and prepration of wooden post	15	863.35	%nos	129.5025
9	Carriage of F post	15	453.67	%nos	136.101
10	Diging of hole for fance post	15	604.51	%nos	90.6765
11	Fixing of fance post	15	477.34	%nos	71.601
12	Interlacing of thorny bushesh wood in b/ wire	180	2.74	rmt	493.2
				Total	1505.3408
	Cost Of Material				
1	Plant	65	7	Nos	455
				Total	1960.3408

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Per hac cost model for Assisted natural regeneration

Maintenance Norms Of 2nd year 20% motality

Sl No		Qty	Rate	Units	Amounts
1	Re-Digging Patches 60*60*25	50	318.22	%nos	159.11
2	Re- Diggingof pits30*30*30	50	159.07	%nos	79.535
3	Filling of pits 30*30*30	50	127.122	%nos	63.561
4	Carriage of plants with p bags	50	145.39	%nos	72.695
5	Planting of plants rised in p/bag	50	145.49	%nos	72.745
7	Repair of b wire in fance	200	1.16	%nos	2.32
8	Cutting and prepration of wooden post	15	863.35	%nos	129.5025
9	Carriage of F post	15	453.67	%nos	68.0505
10	Diging of hole for fance post	15	604.51	%nos	90.6765
11	Fixing of fance post	15	477.34	%nos	71.601
12	Interlacing of thorny bushesh wood in b/ wire	180	2.74	rmt	493.2
	Cost Of Material			Total	1302.9965
	Plant	50	7	nos	350
				Total	1652.9965

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ANX-I

Per hac cost model for Assisted natural regeneration
Maintenance Norms Of 3rd&4th year 15% mortality

Sl No		Qty	Rate	Units	Amounts
1	Re-Digging Patches 45*45*45	40	318.22	%nos	127.288
2	Re- Diggingof pits30*30*30	40	159.07	%nos	63.628
3	Filling of pits 30*30*30	40	127.122	%nos	50.8488
4	Carriage of plants with p bags	40	145.39	%nos	58.156
5	Planting of plants rised in p/bag	40	145.49	%nos	58.196
7	Repair of b wire in fance	200	1.16	%nos	2.32
8	Cutting and prepration of wooden post	15	863.35	%nos	129.5025
9	Carriage of F post	15	453.67	%nos	68.0505
10	Diging of hole for fance post	15	604.51	%nos	90.6765
11	Fixing of fance post	15	477.34	%nos	71.601
12	Interlacing of thorny bushesh wood in b/ wire	180	2.74	rmt	493.2
				Total	1213.4673
	Cost Of Material				
	Plant	40	7		280
				Total	1493.4673

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ANX-IV

Per hac cost model for Assisted natural regeneration

Maintenance Norms Of 5thyear 10% mortality

Sl No	Re-Digging Patches 60*60*25	Qty	Rate	Units	Amounts
1	Re- Diggingof pits30*30*30	25	318.22	%nos	79.555
2	Filling of pits 30*30*30	25	159.07	%nos	39.7675
3	Carriage of plants with p bags	25	127.122	%nos	31.7805
4	Planting of plants rised in p/bag	25	145.39	%nos	36.3475
6	Repair of b wire in fance	25	145.49	%nos	36.3725
7	Cutting and prepration of wooden post	200	1.16	%nos	2.32
8	Carriage of F post	15	863.35	%nos	129.5025
9	Diging of hole for fance post	15	453.67	%nos	68.0505
10	Fixing of fance post	15	604.51	%nos	90.6765
11	Interlacing of thorny bushesh wood in b/ wire	15	477.34	%nos	71.601
12		180	2.74	rmt	493.2
				Total	1079.1735
	Cost Of Material				
	Plant	25	7		175
				Total	1254.1735

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Per hac cost model for Raising NTFP plantations

page13

Sl No		Qty	Rate	Unit	Amounts
1	Survey and Demarcation area	1	67.33	hac	67.33
3	cutting Prepration of wooden fance post	60	863.35	%nos	518.01
	Carrege of wooden fance post up to 18.mtr long over distanse				
4	2 km	60	453.67	%nos	544.404
5	Digging of hole 20-30 cm diaand 45cm deep	60	604.51	%nos	362.706
6	fixing of wooden fance post including sttruting	60	477.34	%nos	286.404
	Carring of col taaring ends of fpost 45cm bottom,15 cm				
7	conical top	60	186.33	%nos	111.798
8	Carrege of barbed wire over distanse 2 km	1	54.5	qtl/km	109
9	Srtatching & fixing of bwire	0.72	3.16	Rmt	2.2752
9	interlasing of thorny bushes along the fance	150	2.74	rmt	411
10	Prepration inspection path 60 cm Width.	180	7.24	Rmt	1303.2
13	Prep. Patches 30*30*25cm	1000	318.22	%nos	3182.2
14	Rod planting of madicinal plants in patches(nakid Roots)	5000	122.66	%nos	6133
15	Carring of nakid root plants over distanse 2 km up hill	5000	23.49	nos/km	2349
	Total			**Total**	**15380.3272**
	TOTAL - PLANTING COST MATREIL				
	Cost of barbed wire	0.9Qtl*7000 per/Qtl			6300
	COST OF PLANTS	3000	7		21000
				Total	**42680.3272**

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Per hac cost model for Raising NTFP plantations
Maintenance Norms Of 2nd year 20% motality

page14

Sl No		Qty	Rate	Units	Amounts
1	Redigging Patches of 30*30*25cm	250	65.45	%nos	163.625
2	Planting of madicenal plants in 600 pathes	1250	73.6	%nos	920
3	Caarriage of Plants with p/bag, O/D 2 km	1250	14.2	%nos	177.5
4	Cutting and prepration of fance post	15	518	%nos	77.7
5	Carriage of fance post over distance 1.5 km	15	272.7	%nos	40.905
6	Re-Digging of holes for fixing of f post	15	181.4	%nos	27.21
7	Fixing of fance post	15	278.45	%nos	41.7675
8	Repair of barbed wire	200	0.7	Rmt	140
9	Insertion of bushes along the barbed wire.	180	3.5	Rmt	630
				Total	2218.7075
	Matrial cost				
	Cost of plants	1255*3			3750
					5968.7075
		Add-83.35% primium			4974.917701
				Total	10943.6252

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Per hac cost model for Raising NTFP plantations
Maintenance Norms Of 2nd year 20% motality

page14

Sl No		Qty	Rate	Units	Amounts
1	Redigging Patches of 30*30*25cm	250		65.45 %nos	163.625
2	Planting of madicenal plants in 600 pathes	1250		73.6 %nos	920
3	Caarriage of Plants with p/bag, O/D 2 km	1250		14.2 %nos	177.5
4	Cutting and prepration of fance post	15		518 %nos	77.7
5	Carriage of fance post over distance 1.5 km	15		272.7 %nos	40.905
6	Re-Digging of holes for fixing of f post	15		181.4 %nos	27.21
7	Fixing of fance post	15		278.45 %nos	41.7675
8	Repair of barbed wire	200		0.7 Rmt	140
9	Insertion of bushes along the barbed wire.	180		3.5 Rmt	630
				Total	**2218.7075**
	Matrial cost				3750
	Cost of plants	1255*3			5968.7075
					4974.917701
	Add-83.35% primium			Total	10943.6252

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Per hac cost model for Raising NTFP plantations
Maintenance Norms Of 3rdyear 15% motality

page15

Sl No		Qty	Rate	Units	Amounts
1	Redigging pits of 30*30*25cm	150	159.07	%nos	238.605
2	Planting of madicenal plants in 600 pathes	750	122.66	%nos	919.95
3	Caarriage of Plants with p/bag, O/D 2 km	750	145.39	%nos	1090.425
4	Cutting and prepration of fance post	15	863.35	%nos	129.5025
5	Carriage of fance post over distance 1.5 km	15	453.67	%nos	68.0505
6	Re-Digging of holes for fixing of f post	15	604.51	%nos	90.6765
7	Fixing of fance post	15	477.34	%nos	71.601
8	Repair of barbed wire	200	1.16	Rmt	232
9	Insertion of bushes along the barbed wire.	180	2.74	Rmt	493.2
				Total	3334.011
	Matrial cost				
	Cost of plants	1000	7		7000
					10334.01

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ENGINEERING MEASURES

1. BRUSH WOOD CHECK DAM MODEL:

The scouring of streams at their peak flows and sediment laden run-off causes gullies. Narrow gully can be treated with brush wood check dams to control gully erosion. Brushood will be available locally in abundance. The construction will be faster and the catchment can be protected from gulley erosion and subsequently this will help in reducing sedimentation in the water bodies.

Before commencing the construction for the check dam, the sides of the gully at the selected sites are slopped to 1 : 1.5 and the gully bottom for the whole length of dam is lowered by about 15 cm. Also 15 cm excavations are carried up into the bank as high as required to give the necessary notch capacity for discharging the run-off. The country wood stakes about 10 cm to 13 cm diameter are driven 0.90 m apart in two rows to go at least 0.90 m to 1.20 m in to the hard bed of gully. The distance between the rows will be 0.90 m. The tops of the stakes are kept at such a height as to form a distinct depression in the to form a notch of the required waterway to enable the maximum run-off to discharge. The first layer of straw and brushwood is laid across the gully between two rows of wood stakes. Over it long branches of specially selected species are laid length wise of the gully and well pressed. The process is repeated till the required height is obtained. The brush is anchored on to the stakes by means of galvanized iron wire. Intermediate stakes of shorter lengths are driven and brush is anchored on to them to prevent lifting from bed by water. Cost estimation for the brushwood check dam is placed below in Table A-II-1.

Table A-II-1

Particulars	Unit	Quantity	Rate (Rs.)	Amount (Rs.)
Survey & Alignment	Bund	1	100	100
Purchase & Transport of wooden pegs of size 10 to 13 cm dia. and 75 cm length	Nos.	10	16	160
Construction of Bund by fixing wood pegs at distance 90 cm in two rows & supporting soil & Murom	Nos.	10	20	200
Laying of straw and brush wood	Layers	2	25	50

ANNEXURE-II

Laying of long branches of trees over brushwood	Layers	2	50	100
Intercultivation 3 times	Layers	9	5	45
Total				655
Contingency @ 3%				19.65
Grand Total				674.65 Say 675.00

2. LOOSE BOULDER CHECK DAM MODEL

Boulder check dams can be made of boulder piled up across the gully if they are locally available. Such structures for damming a gulley or a stream to refine the flow velocity are called loose boulder check dams

The site where the dam is to be erected is cleared and the sides are sloped to 1:1.5. The bed of the gully is excavated to a uniform depth of 0.30 m and the dry boulders are packed over pressed straw from that level. In the centre of the dam portion sufficient waterway is allowed to discharge the maximum run-off from the catchment. The boulder filling should go up to 0.30 m to 0.60 m into the stable portion of gully side to prevent end cutting. In the rear sufficient length and width of apron has to be provided to prevent scour. The thickness of apron packing should not be less than 0.45 m and gully sides above apron have to be protected with stone pitching to a height of at least 0.30 m above the anticipated maximum water level to prevent side scouring. The boulders should be properly packed and may be supported on the downstream side by putting few post. Cost estimate for loose boulder check dam is placed at Table A-II-2

Table A-II-2

Particulars	Unit	Quantity	Rate (Rs.)	Amount (Rs.)
Survey and alignment	per sund	1	100	100
Excavation both banks and foundation	Cum	11.5	100	1150

Collection and supply of dry boulders	Cum	35	62	2170
Transportation charge for dry boulders	Cum	35	60	2100
Stone pitching in bottom	Sq.m	6.50	60	390
Stone pitching in both banks	Sq.m	12.90	60	654
Galvanize wire mesh 15 cm x 15 cm size and 3 mm diameter	Sq.m	150	60	9000
Transportation of wire mesh up to 5 km up hill			L.S	150
Survey during construction	Per bund	1	125	125
Total				15839
Contingency @ 3%				475.17
Grand Total				16314.17 Say, 16,314.00

3. STONE MASNORY STRUCTURES MODEL

If loose boulders are considered not to be stable in a particular reach of the stream Stone masonry structure can be installed. This is not very encouraging because the terrain is stiff and the cement has to be carried by human labour. Carrying of cement will be tedious, time consuming and sometimes cement itself can set, damaged during the carriage or while it is stocked at site for use. Therefore with proper judgment about the site conditions these structures may be installed. Cost estimate for these type of structures is placed at Table A-II-3.

Table A-II-3

Particulars	Unit	Quantity	Rate (Rs.)	Amount (Rs.)
Survey and alignment	per bund	1	100	100
Excavation of foundation in all kinds of soil	Cum	12	100	1200
Cement concrete in 1:3:6 15 cm thick in foundation	Cum	1.2	3500	3150

ANNEXURE II

Masonry work in C.M. 1:5	Cum	9.00	800	25200
Total				**29650**
Contingency @ 3%				889.50
Grand Total				30539.50 Say, 30,540.00

4. CONTUR BUNDING MODEL

Contour bunding in shallow and medium soil at appropriate vertical interval and horizontal distance across the slopes helps in reduction of soil erosion and conservation of moisture. It consists of constructing narrow based trapezoidal bunds on contours to improve runoff rainwater in such a manner that it percolates and recharges the root profile on either side of the bunds. Unit cost estimate of contour bunding is placed at Table A-II-4

Table A-II-4

Particulars	Unit	Quantity	Rate (Rs.)	Amount (Rs.)
Earth work in trenches in all kinds of soil including all leads and lifts	Cum	20	150	3000
Laying 15 cm thick sand layer at bottom of trench	Cum	0.95	650	585
Back filling of trench with locally available soil/sand including all leads and lifts	Cum	19.10	120	2292
Total				**5877**
Contingency @ 3%				176.31
Grand Total				**6053.31** Say, **6053.00**

ANNEXURE-II

5. SILT RETENTION DAM MODEL

Silt retention dam is a concrete structure which consists of spillway in one side and diversion in the other side. This kind of structure is useful for retaining the silt where discharge is more and the slope is moderate. Normally a free board of 0.5 m is provided. The cost estimation and dimension of silt retention dam is provided below

- Depth of foundation = 1.50 m
- Height of Dam = 3.00 m from bed level
- Top width = 1.50 m
- Bottom width = 5.50 m

Table A-II-5

Particulars	Unit	Quantity	Rate (Rs.)	Amount (Rs.)
Earth work	Cum	16.5	150	2475
Cement concrete in 1:3:6 in foundation	Cum	1.65	3200	5288
RR masonry in C.M. 1:5 in foundation	Cum	14.85	2500	37125
RCC in M 15 (1:2:4) in Dam	Cum	21	4200	88200
Reinforcement steel	MT	0.013	70000	910
Total				**133998.00**
Contingency @ 3%				4019.94
Grand Total				138017.94 Say; 138018.00

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Cost EstimateThali Gad

Sr No	description	Nos	Rate	Amount
1	Dry stone masonry hight-1.0m length-2.0m	1	1217	1217
2	Dry stone masonry hight-1.0m length-2.5m	1	1440	1440
3	Dry stone masonry hight-1.0m length-3.0m	1	1666	1666
4	Dry stone masonry hight-1.25m length-2.0m	1	1720	1720
5	Dry stone masonry hight-1.25m length-2.5m	1	2034	2034
6	Dry stone masonry hight-1.25m length-3.0m	1	2353	2353
7	Wire crate checkdam height-1.0m,lenth2.5m	1	5995	5995
8	Wire crate checkdam height-1.25m,lenth2.5m	1	8498	8498
9	Wire crate checkdam height-1.25m,lenth2.0m	1	7352	7352
			Total	32275

Cost Estimate Shamer Gad Stabilization

Sr No	description	Nos	Rate	Amount
1	Dry stone masonry hight-1.0m length-2.0m	5	1217	6085
2	Dry stone masonry hight-1.0m length-2.5m	4	1440	5760
3	Dry stone masonry hight-1.0m length-3.0m	4	1666	6664
4	Dry stone masonry hight-1.25m length-2.0m	5	1720	8600
5	Dry stone masonry hight-1.25m length-2.5m	4	2034	8136
6	Dry stone masonry hight-1.25m length-3.0m	4	2353	9412
7	Wire crate checkdam height-1.0m,lenth2.0m	2	5161	10322
8	Wire crate checkdam height-1.0m,lenth2.5m	2	5995	11990
9	Wire crate checkdam height-1.0m,lenth3.0m	2	6813	13626
10	Wire crate checkdam height-1.0m,lenth4.m	1	6813	6813
11	Wire crate checkdam height-1.0m,lenth5.0m	1	6813	6813
12	Wire crate checkdam height-1.25m,lenth2.0m	1	7352	7352
13	Wire crate checkdam height-1.25m,lenth2.5m	1	8498	8498
14	Wire crate checkdam height-1.25m,lenth3.0m	1	8498	8498
15	Wire crate checkdam height-1.25m,lenth4.0m	1	8498	8498
16	Wire crate checkdam height-1.25m,lenth5.0m	2	8498	16996
			Total	144063

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Cost Estimate Chami Gad Stabilization

Sr No	description	Nos	Rate	Amount
1	Dry stone masonry hight-1.0m length-2.0m	2	1217	2434
2	Dry stone masonry hight-1.0m length-2.5m	2	1440	2880
3	Dry stone masonry hight-1.25m length-2.0m	2	1666	3332
4	Dry stone masonry hight-1.25m length-2.5m	1	1720	1720
5	Dry stone masonry hight-1.25m length-3.m	2	2034	4068
6	Dry stone masonry hight-1.25m length-3.0m	1	2353	2353
7	Wire crate checkdam height-1.0m,lenth2.0m	2	5161	10322
8	Wire crate checkdam height-1.0m,lenth2.5m	1	5995	5995
9	Wire crate checkdam height-1.0m,lenth3.0m	1	6813	6813
10	Wire crate checkdam height-1.0m,lenth4.m	1	6813	6813
11	Wire crate checkdam height-1.25m,lenth2.0m	1	6813	6813
12	Wire crate checkdam height-1.25m,lenth3.0m	1	8498	8498
13	Wire crate checkdam height-1.25m,lenth4.0m	2	8498	16996
				0
			TOTAL	79037

Cost Estimate Oltu Gad Stabilization

Sr No	description	Nos	Rate	Amount
1	Dry stone masonry hight-1.0m length-2.0m	7	1217	8519
2	Dry stone masonry hight-1.0m length-2.5m	5	1440	7200
3	Dry stone masonry hight-1.0m length-3.0m	5	1666	8330
4	Dry stone masonry hight-1.25m length-2.0m	5	1720	8600
5	Dry stone masonry hight-1.25m length-2.5m	5	2034	10170
6	Dry stone masonry hight-1.25m length-3.0m	5	2353	11765
7	Wire crate checkdam height-1.0m,lenth2.0m	5	5161	25805
8	Wire crate checkdam height-1.0m,lenth2.5m	5	5995	29975
9	Wire crate checkdam height-1.0m,lenth3.0m	2	6813	13626
10	Wire crate checkdam height-1.25m,lenth2.0m	2	6813	13626
11	Wire crate checkdam height-1.25m,lenth2.5m	2	7352	14704
12	Wire crate checkdam height-1.25m,lenth3.0m	3	8498	25494
			Total	177814

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Cost Estimate Chira (khad) Stabilization

Sr No	description	Nos	Rate	Amount
1	Dry stone masonry hight-1.0m length-2.0m	1	1217	1217
2	Dry stone masonry hight-1.0m length-2.5m	2	1440	2880
3	Dry stone masonry hight-1.25m length-2.0m	1	1720	1720
4	Wire crate checkdam height-1.0m,lenth2.0m	1	5161	5161
5	Wire crate checkdam height-1.0m,lenth2.5m	1	5995	5995
6	Wire crate checkdam height-1.0m,lenth4.m	1	6813	6813
7	Wire crate checkdam height-1.25m,lenth2.5m	1	7352	7352
		Total		31138

Cost Estimate pakhal khad Stabilization

Sr No	description	Nos	Rate	Amount
1	Dry stone masonry hight-1.0m length-2.0m	5	1217	6085
2	Dry stone masonry hight-1.0m length-2.5m	5	1440	7200
3	Dry stone masonry hight-1.0m length-3.0m	1	1666	1666
4	Dry stone masonry hight-1.25m length-2.0m	1	1720	1720
5	Dry stone masonry hight-1.25m length-2.5m	1	2034	2034
6	Dry stone masonry hight-1.25m length-3.0m	1	2353	2353
7	Wire crate checkdam height-1.0m,lenth2.0m	1	5161	5161
8	Wire crate checkdam height-1.0m,lenth2.5m	1	5995	5995
9	Wire crate checkdam height-1.0m,lenth3.0m	1	6813	6813
10	Wire crate checkdam height-1.0m,lenth2.0m	1	6813	6813
11	Wire crate checkdam height-1.25m,lenth2.5m	1	7352	7352
12	Wire crate checkdam height-1.25m,lenth3.0m	1	8498	8498
				0
		Total		61690

Cost Estimate Sia (khad) Stabilization

Sr No	description	Nos	Rate	Amount
1	Dry stone masonry hight-1.0m length-2.0m	1	1217	1217
2	Dry stone masonry hight-1.0m length-2.5m	1	1440	1440
3	Dry stone masonry hight-1.0m length-3.0m	1	1666	1666
4	Dry stone masonry hight-1.25m length-2.0m	1	1720	1720
5	Dry stone masonry hight-1.25m length-2.5m	1	2034	2034
6	Dry stone masonry hight-1.25m length-3.0m	1	2353	2353
7	Wire crate checkdam height-1.0m,lenth2.0m	1	5161	5161
8	Wire crate checkdam height-1.0m,lenth2.5m	1	5995	5995
9	Wire crate checkdam height-1.0m,lenth3.0m	1	6813	6813
10	Wire crate checkdam height-1.0m,lenth4.m	1	6813	6813
11	Wire crate checkdam height-1.25m,lenth2.0m	1	6813	6813
12	Wire crate checkdam height-1.25m,lenth2.5m	1	7352	7352
13	Wire crate checkdam height-1.25m,lenth3.0m	1	8498	8498
14	Wire crate checkdam height-1.25m,lenth4.0m	1	8498	8498
				0
			Total	66373

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Cost EstimateManghara Gad

Sr No	description	Nos	Rate	Amount
1	Dry stone masonry hight-1.0m length-2.0m	1	1217	1217
2	Dry stone masonry hight-1.0m length-2.5m	1	1440	1440
3	Dry stone masonry hight-1.0m length-3.0m	1	1666	1666
4	Dry stone masonry hight-1.25m length-2.0m	1	1720	1720
5	Dry stone masonry hight-1.25m length-2.5m	1	2034	2034
6	Dry stone masonry hight-1.25m length-3.0m	1	2353	2353
7	Wire crate checkdam height-1.0m,lenth3.0m	1	6813	6813
8	Wire crate checkdam height-1.0m,lenth2.0m	1	5161	5161
9	Wire crate checkdam height-1.25m,lenth2.5m	1	8498	8498
10	Wire crate checkdam height-1.25m,lenth2.0m	1	7352	7352
			Total	38254

Cost Estimate Masrat Khad Stabilization

Sr No	description	Nos	Rate	Amount
1	Dry stone masonry hight-1.0m length-2.0m	5	1217	6085
2	Dry stone masonry hight-1.0m length-2.5m	4	1440	5760
3	Dry stone masonry hight-1.0m length-3.0m	3	1666	4998
4	Dry stone masonry hight-1.25m length-2.0m	4	1720	6880
5	Dry stone masonry hight-1.25m length-2.5m	5	2034	10170
6	Dry stone masonry hight-1.25m length-3.0m	5	2353	11765
7	Wire crate checkdam height-1.0m,lenth2.0m	2	5161	10322
8	Wire crate checkdam height-1.0m,lenth2.5m	2	5995	11990
9	Wire crate checkdam height-1.0m,lenth3.0m	2	6813	13626
10	Wire crate checkdam height-1.0m,lenth4.m	1	6813	6813
11	Wire crate checkdam height-1.0m,lenth5.0m	1	6813	6813
12	Wire crate checkdam height-1.25m lenth2.0m	1	7352	7352
13	Wire crate checkdam height-1.25m lenth2.5m	1	8498	8498
14	Wire crate checkdam height-1.25m,lenth3.0m	1	8498	8498
15	Wire crate checkdam height-1.25m,lenth4.0m	1	8498	8498
16	Wire crate checkdam height-1.25m,lenth5.0m	1	8498	8498
			Total	136566

Cost Estimate Peja Khad Stabilization

Sr No	description	Nos	Rate	Amount
1	Dry stone masonry hight-1.0m length-2.0m	2	1217	2434
2	Dry stone masonry hight-1.0m length-2.5m	2	1440	2880
3	Dry stone masonry hight-1.25m length-2.0m	1	1666	1666
4	Dry stone masonry hight-1.25m length-2.5m	2	1720	3440
5	Dry stone masonry hight-1.25m length-3.m	1	2034	2034
6	Dry stone masonry hight-1.25m length-3.0m	2	2353	4706
7	Wire crate checkdam height-1.0m,lenth2.0m	1	5161	5161
8	Wire crate checkdam height-1.0m,lenth2.5m	2	5995	11990
9	Wire crate checkdam height-1.0m,lenth3.0m	1	6813	6813

10 Wire crate checkdam height-1.0m,lenth4.m	1	6813	6813
11 Wire crate checkdam height-1.25m,lenth2.0m	1	6813	6813
12 Wire crate checkdam height-1.25m,lenth2.m	1	7352	7352
13 Wire crate checkdam height-1.25m,lenth3.0m	2	8498	16996
14 Wire crate checkdam height-1.25m,lenth4.0m	1	8498	8498
			0
		TOTAL	**87596**

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Cost Estimate Sityani (khad) Stabilization

Sr No	description	Nos	Rate	Amount
1	Dry stone masonry hight-1.0m length-2.0m	1	1217	1217
2	Dry stone masonry hight-1.0m length-3.0m	1	1666	1666
3	Dry stone masonry hight-1.25m length-2.5m	1	2034	2034
4	Dry stone masonry hight-1.25m length-3.0m	1	2353	2353
5	Wire crate checkdam height-1.0m,lenth3.0m	1	6813	6813
6	Wire crate checkdam height-1.25m,lenth2.0m	1	6813	6813
7	Wire crate checkdam height-1.25m,lenth3.0m	1	8498	8498
				0
			Total	29394

Cost Estimate Maira Khad Stabilization

Sr No	description	Nos	Rate	Amount
1	Dry stone masonry hight-1.0m length-2.0m	5	1217	6085
2	Dry stone masonry hight-1.0m length-2.5m	5	1440	7200
3	Dry stone masonry hight-1.0m length-3.0m	1	1666	1666
4	Dry stone masonry hight-1.25m length-2.0m	1	1720	1720
5	Dry stone masonry hight-1.25m length-2.5m	1	2034	2034
6	Dry stone masonry hight-1.25m length-3.0m	1	2353	2353
7	Wire crate checkdam height-1.0m,lenth2.0m	1	5161	5161
8	Wire crate checkdam height-1.0m,lenth2.5m	1	5995	5995
9	Wire crate checkdam height-1.0m,lenth3.0m	1	6813	6813
10	Wire crate checkdam height-1.0m,lenth2.0m	1	6813	6813
11	Wire crate checkdam height-1.25m,lenth2.5m	1	7352	7352
12	Wire crate checkdam height-1.25m,lenth3.0m	1	8498	8498
				0
		Total		61690

Cost Estimate Banoti Khad (khad) Stabilization

Sr No	description	Nos	Rate	Amount
1	Dry stone masonry hight-1.0m length-2.0m	1	1217	1217
2	Dry stone masonry hight-1.0m length-3.0m	1	1666	1666
3	Dry stone masonry hight-1.25m length-2.5m	1	2034	2034
4	Wire crate checkdam height-1.0m,lenth2.0m	1	5161	5161
5	Wire crate checkdam height-1.0m,lenth3.0m	1	6813	6813
6	Wire crate checkdam height-1.25m,lenth2.0m	1	6813	6813
7	Wire crate checkdam height-1.25m,lenth3.0m	1	8498	8498
				0
			Total	32202

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Cost Estimation of Slip Estabilization

A- Garima Slip

Sr.No	Description	Nos		Rate	Amount
1	Wire Crate protection hight -1.25 mtr Length -5.0mtr		30	14324	429720
2	Wire Crate protection hight -1.25 mtr Length -4.0mtr		20	11873	237460
3	Wire Crate protection hight -1.25 mtr Length -3.0mtr		20	9611	192220
4	Wire Crate protection hight -1.25 mtr Length -2.0mtr		10	7352	73520
5	Wire Crate protection hight -1.0 mtr Length -5.0mtr		12	10228	122736
6	Wire Crate protection hight -1.0 mtr Length -4.0mtr		10	9359	93590
7	Wire Crate protection hight -1.0mtr Length -3.0mtr		10	6813	68130
			112	Total	1217376

B - Bhamnoli Slip

Sr.No	Description	Nos		Rate	Amount
1	Wire Crate protection hight -1.25 mtr Length -5.0mtr		20	14324	286480
2	Wire Crate protection hight -1.25 mtr Length -4.0mtr		14	11873	166222
3	Wire Crate protection hight -1.25 mtr Length -3.0mtr		10	9611	96110
			44	Total	548812

A- Smoli Slip

Sr.No	Description	Nos		Rate	Amount
1	Wire Crate protection hight -1.25 mtr Length -5.0mtr		15	14324	214860
2	Wire Crate protection hight -1.25 mtr Length -4.0mtr		10	11873	118730
3	Wire Crate protection hight -1.25 mtr Length -3.0mtr		10	9611	96110
			35	Total	429700

Pabber River Bank Stablization

Sr.No	Description	Nos		Rate	Amount
1	Wire Crate protection hight -1.25 mtr Length -5.0mtr		10	14324	143240
2	Wire Crate protection hight -1.25 mtr Length -4.0mtr		10	11873	118730
3	Wire Crate protection hight -1.25 mtr Length -3.0mtr		10	9611	96110
4	Wire Crate protection hight -1.25 mtr Length -2.5mtr		9	7352	66168
5	Wire Crate protection hight -1.25 mtr Length -2.0mtr		10	10228	102280
			49	Total	526528

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COST MODEL FOR CONSTRUCTION OF DRY STONE CHECK DAM(HEIGHT = 1 Mtr. LENGTH =2.00 Mtr).

S.No.	Particulars	Nos.	Measurements			Qty.	Unit	Rate	Amount
			L	B	H/B			Rs.	Rs.
1	Excavation in foundation trenches in earth work, lift up to 1.50 mtrs., stacking the excavated soil not more than 3 meters clear from the edge of excavation and then returning the stacked soil in 15 cm layers where required into plinth sides of foundation etc. consolidating each deposited layer by ramming and watering and then disposal of excavated material within a lead of 20mtrs Pick and jumper work I) Foundation	1	2.5	1.55	0.4	1.55	Cum		
	II) Apron	1	2	1	0.3	0.6	Cum		
	Total					2.15	Cum	89.95	193.39
2	Coutting in earth work and disposal of excavated earthup to a lead of 20 mtrs	2	0.5	1.55	1	1.55	Cum	36.00	55.80
3	Dry hand packed boulder stone filling in I) foundation	1	2.5	1.55	0.4	1.55	Cum		
	II) Apron	1	2	1	(0.30+0.40)/2	0.7	Cum		
	Total					2.25	Cum	57.70	129.83
4	Construction of check dam/Checkwalls in dry rough stone masonry i/c dressing in Super structure	1	(3.00+2.50)/2	(0.50+1.55)/2	1	2.82	Cum	111.00	313.02
5	Breaking of Boulder Stones @ 25% of the qty. of stone masonry in super structure					0.71	Cum	100.00	71.00
6	Carriage of B/STONES from local nallah to work site over distance 0.200 Km by Manual Labour					5.07	Cum	207.40	210.30
	Total								**973.34**
7	Add 25% increase (on acount of enhancement of labour basic rates and on schedule of labour and works rates)								243.34
	Total								1216.68
	Or Say								1217.00

D. F. O, Rohtu

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COST MODEL FOR CONSTRUCTION OF DRY STONE CHECK DAM(HEIGHT = 1 Mtr. LENGTH =2.00 Mtr).									
S.No.	Particulars	Nos.	Measurements			Qty.	Unit	Rate	Amount
			L	B	H/B			Rs.	Rs.
1	Excavation in foundation trenches in earth work, lift up to 1.50 mtrs., stacking the excavated soil not more than 3 meters clear from the edge of excavation and then returning the stacked soil in 15 cm layers where required into plinth sides of foundation etc. consolidating each deposited layer by ramming and watering and then disposal of excavated material within a lead of 20mtrs Pick and jumper work. I) Foundation	1	2.5	1.55	0.4	1.55	Cum		
	II) Apron	1	2	1	0.3	0.6	Cum		
	Total					2.15	Cum	89.95	193.39
2	Coutting in earth work and disposal of excavated earthup to a lead of 20 mtrs	2	0.5	1.55	1	1.55	Cum	36.00	55.80
3	Dry hand packed boulder stone filling in I) foundation	1	2.5	1.55	0.4	1.55	Cum		
	II) Apron	1	2	1	(0.30+0.40)/2	0.7	Cum		
	Total					2.25	Cum	57.70	129.83
4	Construction of check dam/Checkwalls in dry rough stone masonry i/c dressing in Super structure	1	(3.00+2.50)/2	(0.50+1.55)/2	1	2.82	Cum	111.00	313.02
5	Breaking of Boulder Stones @ 25% of the qty. of stone masonry in super structure					0.71	Cum	100.00	71.00
6	Carriage of B/STONES from local nallah to work site over distance 0.200 Km by Manual Labour					5.07	Cum	207.40	210.30
	Total								**973.34**
7	Add 25% increase (on acount of enhancement of labour basic rates and on schedule of labour and works rates)								243.34
	Total								**1216.68**
	Or Say								1217.00

D. F. O, Rohtu

COST MODEL FOR CONSTRUCTION OF DRY STONE CHECK DAM(HEIGHT = 1 Mtr. LENGTH =2.50 Mtr).									
S.No.	Particulars	Nos.	Measurements			Qty.	Unit	Rate	Amount
			L	B	H/B			Rs.	Rs.
1	Excavation in foundation trenches in earth work, lift up to 1.50 mtrs., stacking the excavated soil not more than 3 meters clear from the edge of excavation and then returning the stacked soil in 15 cm layers where required into plinth sides of foundation etc. consolidating each deposited layer by ramming and watering and then disposal of excavated material within a lead of 20mtrs Pick and jumper work I) Foundation	1	3	1.55	0.4	1.86	Cum		
	II) Apron	1	2.5	1	0.3	0.75	Cum		
	Total					2.61	Cum	89.95	234.77
2	Coutting in earth work and disposal of excavated earthup to a lead of 20 mtrs	2	0.5	1.55	1	1.55	Cum	36.00	55.80
3	Dry hand packed boulder stone filling in I) foundation	1	3	1.55	0.4	1.86	Cum		
	II) Apron	1	2.5	1	(0.30+0.40)/2	0.87	Cum		
	Total					2.73	Cum	57.70	157.52
4	Construction of check dam/Checkwalls in dry rough stone masonry i/c dressing in Super structure	1	(3.50+3.00)/2	(0.50+1.55)/2	1	3.33	Cum	111.00	369.63
5	Breaking of Boulder Stones @ 25% of the qty. of stone masonry in super structure					0.83	Cum	100.00	83.00
6	Carriage of B/STONES from local nallah to work site over distance 0.200 Km by Manual Labour					6.06	Cum	207.40	251.37
	Total								**1152.09**
11	Add 25% increase (on acount of enhancement of labour basic rates and on schedule of labour and works rates)								288.02
	Total								**1440.11**
	Or Say								**1440.00**

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D. F. O. Rohtu

COST MODEL FOR CONSTRUCTION OF DRY STONE CHECK DAM(HEIGHT = 1.25 Mtr. LENGTH =3.00 Mtr).									
S.No.	Particulars	Nos.	Measurements			Qty.	Unit	Rate	Amount
			L	B	H/B			Rs.	Rs.
1	Excavation in foundation trenches in earth work, lift up to 1.50 mtrs., stacking the excavated soil not more than 3 meters clear from the edge of excavation and then returning the stacked soil in 15 cm layers where required into plinth sides of foundation etc. consolidating each deposited layer by ramming and watering and then disposal of excavated material within a lead of 20mtrs Pick and jumper work I) Foundation	1	3.5	1.82	0.5	3.19	Cum		
	II) Apron	1	3	1.25	0.3	1.13	Cum		
	Total					4.32	Cum	89.95	388.58
2	Coutting in earth work and disposal of excavated earthup to a lead of 20 mtrs	2	0.5	1.82	1.25	2.28	Cum	36.00	82.08
3	Dry hand packed boulder stone filling in I) foundation	1	3.5	1.82	0.5	3.19	Cum		
	II) Apron	1	3	1.25	(0.30+0.40)/2	1.31	Cum		
	Total					4.5	Cum	57.70	259.65
4	Construction of check dam/Checkwalls in dry rough stone masonry i/c dressing in Super structure	1	(3.50+4.00)/2	(0.50+1.82)/2	1.25	5.44	Cum	111.00	603.84
5	Breaking of Boulder Stones @ 25% of the qty of stone masonry in super structure					1.36	Cum	100.00	136.00
6	Carriage of B/STONES from local nallah to work site over distance 0.200 Km by Manual Labour					9.94	Cum	207.40	412.31
	Total								**1882.47**
11	Add 25% increase (on acount of enhancement of labour basic rates and on schedule of labour and works rates)								470.62
	Total								**2353.08**
	Or Say								2353.00

D. F. O. Rohtu

COST MODEL FOR CONSTRUCTION OF DRY STONE CHECK DAM(HEIGHT = 1.25 Mtr. LENGTH =2.50 Mtr).									
S.No.	Particulars	Nos.	Measurements			Qty.	Unit	Rate	Amount
			L	B	H/B			Rs.	Rs.
1	Excavation in foundation trenches in earth work, lift up to 1.50 mtrs., stacking the excavated soil not more than 3 meters clear from the edge of excavation and then returning the stacked soil in 15 cm layers where required into plinth sides of foundation etc. consolidating each deposited layer by ramming and watering and then disposal of excavated material within a lead of 20mtrs Pick and jumper work I) Foundation	1	3	1.82	0.5	2.73	Cum		
	II) Apron	1	2.5	1.25	0.3	0.94	Cum		
	Total					3.67	Cum	89.95	330.12
2	Coutting in earth work and disposal of excavated earthup to a lead of 20 mtrs	2	0.5	1.82	1.25	2.28	Cum	36.00	82.08
3	Dry hand packed boulder stone filling in I) foundation	1	3	1.82	0.5	2.73	Cum		
	II) Apron	1	2.5	1.25	(0.30+0.40)/2	1.09	Cum		
	Total					3.82	Cum	57.70	220.41
4	Construction of check dam/Checkwalls in dry rough stone masonry i/c dressing in Super structure	1	(3.50+3.00)/2	(0.50+1.82)/2	1.25	4.71	Cum	111.00	522.81
5	Breaking of Boulder Stones @ 25% of the qty. of stone masonry in super structure					1.18	Cum	100.00	118.00
6	Carriage of B/STONES from local nallah to work site over distance 0.200 Km by Manual Labour					8.53	Cum	207.40	353.82
	Total								**1627.24**
7	Add 25% increase (on acount of enhancement of labour basic rates and on schedule of labour and works rates)								406.81
	Total								**2034.06**
	Or Say								2034.00

D. F. O. Bolpu

COST MODEL FOR CONSTRUCTION OF DRY STONE CHECK DAM(HEIGHT = 1.25 Mtr. LENGTH =2.50 Mtr).									
S.No.	Particulars	Nos.	Measurements			Qty.	Unit	Rate	Amount
			L	B	H/B			Rs.	Rs.
1	Excavation in foundation trenches in earth work, lift up to 1.50 mtrs., stacking the excavated soil not more than 3 meters clear from the edge of excavation and then returning the stacked soil in 15 cm layers where required into plinth sides of foundation etc. consolidating each deposited layer by ramming and watering and then disposal of excavated material within a lead of 20mtrs Pick and jumper work I) Foundation	1	3	1.82	0.5	2.73	Cum		
	II) Apron	1	2.5	1.25	0.3	0.94	Cum		
	Total					3.67	Cum	89.95	330.12
2	Coutting in earth work and disposal of excavated earthup to a lead of 20 mtrs	2	0.5	1.82	1.25	2.28	Cum	36.00	82.08
3	Dry hand packed boulder stone filling in I) foundation	1	3	1.82	0.5	2.73	Cum		
	II) Apron	1	2.5	1.25	(0.30+0.40)/2	1.09	Cum		
	Total					3.82	Cum	57.70	220.41
4	Construction of check dam/Checkwalls in dry rough stone masonry i/c dressing in Super structure	1	(3.50+3.00)/2	(0.50+1.82)/2	1.25	4.71	Cum	111.00	522.81
5	Breaking of Boulder Stones @ 25% of the qty. of stone masonry in super structure					1.18	Cum	100.00	118.00
6	Carriage of B/STONES from local nallah to work site over distance 0.200 Km by Manual Labour					8.53	Cum	207.40	353.82
	Total								**1627.24**
7	Add 25% increase (on acount of enhancement of labour basic rates and on schedule of labour and works rates)								406.81
	Total								**2034.06**
	Or Say								2034.00

D. F. O. Rohru

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Annexure - XII

COST MODEL FOR CONSTRUCTION OF DRY STONE CHECK DAM(HEIGHT = 1.25 Mtr, LENGTH =2.00 Mtr).									
S.No.	Particulars	Nos.	Measurements			Qty.	Unit	Rate	Amount
			L	B	H/B			Rs.	Rs.
1	Excavation in foundation trenches in earth work, lift up to 1.50 mtrs., stacking the excavated soil not more than 3 meters clear from the edge of excavation and then returning the stacked soil in 15 cm layers where required into plinth sides of foundation etc. consolidating each deposited layer by ramming and watering and then disposal of excavated material within a lead of 20mtrs Pick and jumper work I) Foundation	1	2.5	1.82	0.5	2.28	Cum		
	II) Apron	1	2	1.25	0.3	0.75	Cum		
	Total					3.03	Cum	89.95	272.55
2	Coutting in earth work and disposal of excavated earthup to a lead of 20 mtrs	2	0.5	1.82	1.25	2.28	Cum	36.00	82.08
3	Dry hand packed boulder stone filling in								
	I) foundation	1	2.5	1.82	0.5	2.28	Cum		
	II) Apron	1	2	1.25	(0.30+0.40)/2	0.68	Cum		
	Total					3.16	Cum	57.70	182.33
4	Construction of check dam/Checkwalls in dry rough stone masonry i/c dressing in Super structure	1	(3.0+2.5)/2	(0.50+1.82)/2	1.25	3.99	Cum	111.00	442.89
5	Breaking of Boulder Stones @ 25% of the qty. of stone masonry in super structure					1	Cum	100.00	100.00
6	Carriage of B/STONES from local nallah to work site over distance 0.200 Km by Manual Labour					7.15	Cum	207.40	296.58
	Total								**1376.43**
7	Add 25% increase (on acount of enhancement of labour basic rates and on schedule of labour and works rates)								344.11
	Total								**1720.54**
	Or Say								**1720.00**

D. F. O. Bohru

COST MODEL FOR CONSTRUCTION OF WIRE CRATE CHECK DAM(HEIGHT = 1 Mtr. LENGTH = 5 Mtr).										
S.No.	Particulars	Nos.	Measurements			Qty.	Unit	Rate	Amount
			L	B	H/B				
1	Excavation in foundation trenches in earth work, lift up to 1.50 mtrs. and then disposal of excavated material within a lead of 20mtrs Pick and jumper work foundation	1							
	Apron	1	3.75	1	0.3	1.13	CUM		
	Total					3.20	CUM	69.95	288.04
2	Cutting in earth work and disposal of excavated earthup to a lead of 20 mtrs	2	(0.50+0.75)/2	0.9	1.4	1.58	CUM	36.00	56.88
3	Dry hand packed boulder stone filling in foundation	1	5.77	0.9	0.4	2.08	CUM		
	Apron	1	3.75	1	(0.30+0.40)/2	1.31	CUM		
	Total					3.39	CUM	57.70	195.44
4	Construction of super structure of check dam	1	6.34	0.75	1.4	6.66	CUM		
	Deduction of spillway	1	2.5	1	0.4	-0.75	CUM		
	Total					5.91	CUM		
	i) Dry Random Rubble Stone masonry@ 25%					1.48	CUM	111	163.92
	ii) Boulder filling dry hand packed tightly in wire crate @ 75%					4.43	CUM	57.70	255.63
5	Spreading of wire cartes over pitching, stone masonry, boulder filling etc i) Foundation Bottom	1	5.77	0.9	0	5.19	SqM		
	Sides i/c 15cm lap	2	5.77	0	0.95	10.96	SqM		
	Ends	2	0	0.9	0.4	1.08	SqM		
	ii) Apron Top/Bottom	2	3.75	1	0	7.50	SqM		
	Dfi side	1	3.75	0	0.4	1.50	SqM		
	Ends	2	0	1	(0.30+0.40)/2	1.05	SqM		
	iii) Super Structure 2 Top / Bottom	2	6.34	0.75	0	9.51	SqM		
	Sides	2	6.34	0	1.4	17.75	SqM		
	Ends	3	0	0.75	1.4	3.15	SqM		
	Deduction of spillway Side	2	2.5	0	0.4	-2.00	SqM		
	Total					55.69	SqM	11.80	657.14
6	Tipping of wire crate i/c equipment Qty. same as per item no. 3+4	0	0	0	0	9.29	CUM	39.60	368.05
7	Breaking of Boulder Stones					5.91	CUM	100.00	590.70
8	Carriage of B/STONES from local nallah to work site over distance 0.600 Km by Manual Labour					9.29	CUM/Km	207.40	1541.40
9	Carriage of GI wire from raod to work site over distance 2.5 Km by Manual Labour					0.16	Tonne/Km	258.00	103.20
	Total								4230.39
10	Add 25% increase (on acount of enhancement of labour basic rates and on schedule of labour and works rates)								1055.10
	Total								5275.49
11	Add cost of GI Wire upto road site					55.69		90.00	5012.10
	Grand Total								10287.59
	Or Say								10288.00

D. F. O. Rohtu

COST MODEL FOR CONSTRUCTION OF WIRE CRATE CHECK DAM(HEIGHT = 1 Mtr. LENGTH = 4 Mtr)

S. No	Particulars	Nos	Measurements			Qty	Unit	Rate	Amount
			L	B	H/B				
1	Excavation in foundation trenches in earth work, lift up to 1.50 mtrs. and then disposal of excavated material within a lead of 20mtrs Pick and jumper work foundation	1	4.73	0.9	0.4	1.70	CUM		
	Apron	1	3.00	1	0.3	0.90	CUM		
	Total					2.60	CUM	89.95	234.12
2	Cutting in earth work and disposal of excavated earthup to a lead of 20 mtrs	2	(0.50+0.75)/2	0.9	1.4	1.58	CUM	36.00	56.88
3	Dry hand packed boulder stone filling in foundation	1	4.73	0.9	0.4	1.70	CUM		
	Apron	1	3.75	1	(0.30+0.45)/2	1.05	CUM		
	Total					2.75	CUM	57.70	158.64
4	Construction of super structure of check dam	1	5.3	0.75	1.4	5.57	CUM		
	Deduction of spillway	1	2	0.75	0.4	-0.6	CUM		
	Total					4.97	CUM		
	i) Dry Random Rubble Stone masonry@ 25%					1.24	CUM	111	137.78
	ii) Boulder filling dry hand packed tightly in wire crate @ 75%					3.72	CUM	57.70	214.66
5	Spreading of wire carties over pitching, stone masonry, boulder filling etc i) Foundation Bottom	1	4.73	0.9	0	4.26	SqM		
	Sides #c 15cm top	2	4.73	0	0.95	8.98	SqM		
	Ends	2	0	0.9	0.4	0.72	SqM		
	ii) Apron Top/Bottom	2	3	1	0	6.00	SqM		
	D/S side	1	3	0	0.4	1.20	SqM		
	Ends	2	0	1	(0.30+0.45)/2	0.7	SqM		
	iii) Super Structure 2 Top / Bottom	2	4.73	0.75	0	7.95	SqM		
	Sides	2	4.73	0	1.4	14.84	SqM		
	Ends	3	0	0.75	1.4	2.1	SqM		
	Deduction of spillway Side	2	2	0	0.4	-1.60	SqM		
	Total					45.74	SqM	11.80	539.73
6	Tipping of wire crate i/c equipment Qty. same as per item no. 3+4	0	0	0	0	7.72	CUM	39.60	305.62
7	Breaking of Boulder Stones					4.97	CUM	100.00	496.50
8	Carriage of B/STONES from local nallah to work site over distance 0.800 Km by Manual Labour					7.72	CUM/Km	207.40	1280.54
9	Carriage of GI wire from raod to work site over distance 2.6 Km by Manual Labour					0.082	Tonne/Km	258.00	52.89
	Total								3477.76
10	Add 25% increase (on acount of enhancement of labour basic rates and on schedule of labour and works rates)								869.44
	Total								4347.20
11	Add cost of GI Wire upto road site					55.60		90.00	5012.50
	Grand Total								9359.30
	Or Say								9359.00

D. F. O. Bahru

COST MODEL FOR CONSTRUCTION OF WIRE CRATE CHECK DAM(HEIGHT = 1 Mtr, LENGTH = 3 Mtr).

S.No.	Particulars	Nos.	Measurements			Qty.	Unit	Rate	Amount
			L	B	H/B				
1	Excavation in foundation trenches in earth work, lift up to 1.50 mtrs. and then disposal of excavated material within a lead of 20mtrs Pick and jumper work foundation	1	3.69	0.9	0.4	1.33	CUM		
	Apron	1	2.25	1	0.3	0.68	CUM		
	Total					2.00	CUM	89.95	180.21
2	Cutting in earth work and disposal of excavated earthup to a lead of 20 mtrs	2	(0.50+0.75)/2	0.9	1.4	1.58	CUM	36.00	56.88
3	Dry hand packed boulder stone filling in foundation	1	3.69	0.9	0.4	1.33	CUM		
	Apron	1	2.25	1	(0.30+0.40)/2	0.79	CUM		
	Total					2.12	CUM	57.70	122.33
4	Construction of super structure of check dam	1	4.26	0.75	1.4	4.47	CUM		
	Deduction of spillway	1	1.5	0.75	0.4	-0.45	CUM		
	Total					4.02	CUM		
	i) Dry Random Rubble Stone masonry@ 25%					1.01	CUM	111	111.64
	ii) Boulder filling dry hand packed tightly in wire crate @ 75%					3.02	CUM	57.70	174.10
5	Spreading of wire carles over pitching, stone masonry, boulder filling etc i) Foundation Bottom	1	3.69	0.9	0	3.32	SqM		
	Sides i/c 15cm lap	2	3.69	0	0.95	7.01	SqM		
	Ends	2	0	0.9	0.4	0.72	SqM		
	ii) Apron Top/Bottom	2	2.25	1	0	4.50	SqM		
	Drill side	1	2.25	0	0.4	0.90	SqM		
	Ends	2	0	1	(0.30+0.40)/2	0.7	SqM		
	iii) Super Structure 2 Top / Bottom	2	4.26	0.75	0	6.39	SqM		
	Sides	2	4.26	0	1.4	11.93	SqM		
	Ends	2	0	0.75	1.4	2.1	SqM		
	Deduction of spillway Side	2	1.5	0	0.4	-0.60	SqM		
	Total					36.97	SqM	11.80	436.25
6	Tipping of wire crate i/c equipment Qty. same as per item no. 3+4	0	0	0	0	6.14	CUM	39.60	243.20
7	Breaking of Boulder Stones					4.02	CUM	100.00	402.30
8	Carriage of B/STONES from local nallah to work site over distance 0.800 Km by Manual Labour					6.14	CUM/Km	207.40	1018.96
9	Carriage of GI wire from road to work site over distance 2.5 Km by Manual Labour					0.000	Tonne/Km	258.00	42.57
	Total								**2788.35**
10	Add 25% increase (on acount of enhancement of labour basic rates and on schedule of labour and works rates)								697.09
	Total								**3485.43**
11	Add cost of GI Wire upto road site					36.97		90.00	3327.30
	Grand Total								6812.73
	Or Say								**6813.00**

D. F. Officer

COST MODEL FOR CONSTRUCTION OF WIRE CRATE CHECK DAM(HEIGHT = 1 Mtr. LENGTH = 2.50 Mtr).

S.No.	Particulars	Nos.	Measurements			Qty.	Unit	Rate	Amount
			L	B	H/S				
1	Excavation in foundation trenches in earth work, lift up to 1.50 mtrs. and then disposal of excavated material within a lead of 20mtrs Pick and jumper work foundation	1	3.17	0.9	0.4	1.14	CUM		
	Apron	1	1.86	1	0.3	0.56	CUM		
	Total					1.71	CUM	89.95	153.36
2	Cutting in earth work and disposal of excavated earthup to a lead of 20 mtrs	2	(0.50+0.75)/2	0.9	1.4	1.58	CUM	36.00	56.88
3	Dry hand packed boulder stone filling in foundation	1	3.17	0.9	0.4	1.14	CUM		
	Apron	1	1.86	1	(0.30+0.40)/2	0.66	CUM		
	Total					1.80	CUM	57.70	103.93
4	Construction of super structure of check dam	1	3.75	0.75	1.4	3.94	CUM		
	Deduction of spillway	1	1.25	0.75	0.4	-0.38	CUM		
	Total					3.56	CUM		
	i) Dry Random Rubble Stone masonry@ 25%					0.89	CUM	111	98.72
	ii) Boulder filling dry hand packed tightly in wire crate @ 75%					2.67	CUM	57.70	153.95
5	Spreading of wire carles over pitching, stone masonry, boulder filling etc i) Foundation Bottom	1	3.17	0.9	0	2.85	SqM		
	Sides i/c 15cm top	2	3.17	0	0.95	6.02	SqM		
	Ends	2	0	0.9	0.4	0.72	SqM		
	ii) Apron Top/Bottom	2	1.86	1	0	3.78	SqM		
	DIS side	1	1.86	0	0.4	0.75	SqM		
	Ends	2	0	1	(0.30+0.40)/2	0.7	SqM		
	iii) Super Structure 2 Top / Bottom	2	3.75	0.75	0	5.63	SqM		
	Sides	2	3.75	0	1.4	10.5	SqM		
	Ends	2	0	0.75	1.4	2.1	SqM		
	Deduction of spillway Side	2	1.25	0	0.4	-1.00	SqM		
	Total					32.63	SqM	11.80	385.03
6	Tipping of wire crate i/c equipment Qty. same as per item no. 3+4	0	0	0	0	5.36	CUM	39.60	212.20
7	Breaking of Boulder Stones					3.56	CUM	100.00	355.75
8	Carriage of B/STONES from local nallah to work site over distance 0.800 Km by Manual Labour					5.36	CUM/Km	207.40	889.12
9	Carriage of GI wire from razd to work site over distance 2.6 Km by Manual Labour					0.058	Tonne/Km	258.00	37.41
	Total								2446.36
10	Add 25% increase (on account of enhancement of labour basic rates and on schedule of labour and works rates)								611.59
	Total								3057.97
11	Add cost of GI Wire upto road site					32.63		90.00	2936.70
	Grand Total								5994.67
	Or Say								5995.00

D. F. O. Rohru

COST MODEL FOR CONSTRUCTION OF WIRE CRATE CHECK DAM(HEIGHT = 1.25 Mtr, LENGTH = 5 Mtr).

S.No.	Particulars	Nos.	Measurements			Qty.	Unit	Rate	Amount
			L	B	H/B				
1	Excavation in foundation trenches in earth work, (if) up to 1.50 mtrs. and then disposal of excavated material within a lead of 20mtrs Pick and jumper work foundation	1							
	Apron	1	3.75	1.25	0.3	1.41	CUM		
	Total					4.39	CUM	88.95	395.08
2	Cutting in earth work and disposal of excavated earth upto a lead of 20 mtrs in anchorage	2	(0.50+0.75)/2	1.15	1.65	2.37	CUM	36.00	85.32
3	Dry hand packed boulder stone filling in i) foundation	1	5.77	1.15	0.45	2.99	CUM		
	ii)Apron	1	3.75	1.25	(0.30+0.40)/2	1.64	CUM		
	Total					4.63	CUM	57.70	266.97
4	Construction of super structure of check dam 1st	1	6.34	1.15	0.625	4.56	CUM		
	2nd Block	1	6.34	0.95	0.625	3.76			
	3rd Block	2	1.92	0.75	0.4	1.15			
	Total					9.47	CUM		
	i) Dry Random Rubble Stone masonry@ 25%					2.37	CUM	111	262.68
	ii) Boulder filling dry hand packed tightly in wire crate @ 75%					7.10	CUM	57.70	409.66
5	Spreading of wire cartes over pitching, stone masonry, boulder filling etc i) Foundation Bottom	1	5.77	1.15	0	6.64	SqM		
	Sides i/c 15cm lap	2	5.77	0	0.45	5.19	SqM		
	Ends	3	0	1.15	0.45	1.55	SqM		
	Apron Top/Bottom	2	3.75	1.25	0	9.38	SqM		
	D/S side	1	3.75	0	0.4	1.50	SqM		
	Ends	2	0	1.25	(0.30+0.40)/2	0.88	SqM		
	Super Structure 1st Block Top / Bottom	2	6.34	1.15	0	14.58	SqM		
	Sides	2	6.34	0	0.625	7.93	SqM		
	Ends	3	0	1.15	0.625	2.15	SqM		
	Super Structure 2nd Block Top / Bottom	1	6.34	0.95	0	6.02	SqM		
	Sides	2	6.34	0	0.625	7.93	SqM		
	Ends	3	0	0.95	0.625	1.78	SqM		
	Super Structure 3rd Block Top / Bottom	2	1.92	0.75	0	2.88	SqM		
	Sides	2X2	1.92	0	0.4	3.07	SqM		
	Ends	4	0	0.75	0.4	1.2	SqM		
	TOTAL					72.69		11.8	857.57
6	Tipping of wire crate i/c equipment Qty. same as per item no. 3+4	0	0	0	0	14.10	CUM	39.60	558.33
7	Breaking of Boulder Stones					9.47	CUM	100.00	947.33
8	Carriage of B/STONES from local nallah to work site over distance 0.800 Km by Manual Labour					14.10	CUM/Km	207.40	2339.34
9	Carriage of GI wire from raod to work site over distance 2.5 Km by Manual Labour					0.16	Tonne/Km	259.00	103.20
	Total								4226.93
10	Add 25% increase (on acount of enhancement of labour basic rates and on schedule of labour and works rates)								1556.48
	Total								7782.41
11	Add cost of GI Wire upto road site					72.58		90.00	6541.20
	Grand Total								14323.61
	Or Say								14324.00

D. F. O. Rohru

S.No.	Particulars	Nos.	Measurements L	B	H/B	Qty.	Unit	Rate	Amount
COST MODEL FOR CONSTRUCTION OF WIRE CRATE CHECK DAM(HEIGHT = 1.25 Mtr. LENGTH = 4 Mtr)									
1	Excavation in foundation trenches in earth work, lift up to 1.50 mtrs. and then disposal of excavated material within a lead of 20mtrs Pick and jumper work foundation	1	4.73	1.15	0.45	2.45	CUM		
	Apron	1	3	1.25	0.3	1.13	CUM		
	Total					3.57	CUM	89.95	321.37
2	Cutting in earth work and disposal of excavated earth upto a lead of 20 mtrs in anchorage	2	(0.50+0.75)/2	1.15	1.65	2.37	CUM	36.00	85.32
3	Dry hand packed boulder stone filling in i) foundation	1	4.73	1.15	0.45	2.45	CUM		
	ii)Apron	1	3	1.25	(0.30+0.40)/2	1.31	CUM		
	Total					3.76	CUM	57.70	216.82
4	Construction of super structure of check dam Ist	1	5.3	1.15	0.625	3.81	CUM		
	2nd Block	1	5.3	0.95	0.625	3.15			
	3rd Block	2	1.65	0.75	0.4	0.99			
	Total					7.98	CUM		
	i) Dry Random Rubble Stone masonry@ 25%					1.99	CUM	111	220.51
	ii) Boulder filling dry hand packed tightly in wire crate @ 75%					5.98	CUM	57.70	343.87
5	Spreading of wire carten over pitching, stone masonry, boulder filling etc i) Foundation Bottom	1	4.73	1.15	0	5.44	SqM		
	Sides iii 15cm top	2	4.73	0	0.45	4.26	SqM		
	Ends	2		1.15	0.45	1.04	SqM		
	Apron Top/Bottom	2	3	1.25	0	7.50	SqM		
	D/S side	1	3	0	0.4	1.20	SqM		
	Ends	2	0	1.25	(0.30+0.40)/2	0.88	SqM		
	Super Structure 1st Block Top / Bottom	2	5.3	1.15	0	12.19	SqM		
	Sides	2	5.3	0	0.625	6.63	SqM		
	Ends	2	0	1.15	0.625	1.44	SqM		
	Super Structure 2nd Block Top / Bottom	1	5.3	0.95	0	5.04	SqM		
	Sides	2	5.3	0	0.625	6.63	SqM		
	Ends	2	0	0.95	0.625	1.19	SqM		
	Super Structure 3rd Block Top / Bottom	2	1.65	0.75	0	2.48	SqM		
	Sides	2X2	1.65	0	0.4	2.64	SqM		
	Ends	4	0	0.75	0.4	1.2	SqM		
	TOTAL					59.75		11.8	705.04
6	Tipping of wire crate i/c equipment Qty. same as per item no. 3+4	0	0	0	0	11.70	CUM	39.60	463.48
7	Breaking of Boulder Stones					7.95	CUM	100.00	794.61
8	Carriage of B/STONES from local nallah to work site over distance 0.800 Km by Manual Labour					11.70	CUM/Km	207.40	1941.93
9	Carriage of GI wire from raod to work site over distance 2.5 Km by Manual Labour					0.16	Tonne/Km	258.00	103.20
	Total								5196.18
10	Add 25% increase (on acount of enhancement of labour basic rates and on schedule of labour and works rates)								1299.04
	Total								6495.22
11	Add cost of GI Wire upto road site					59.75		90.00	5377.50
	Grand Total								11872.72
	Or Say								11873.00

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D. F. O. Nehru

COST MODEL FOR CONSTRUCTION OF WIRE CRATE CHECK DAM(HEIGHT = 1.35 Mtr. LENGTH = 4 Mtr)

S.No.	Particulars	Nos.	Measurements L	B	H/D	Qty.	Unit	Rate	Amount
1	Excavation in foundation trenches in earth work, lift up to 1.50 mtrs. and then disposal of excavated material within a lead of 20mtrs Pick and jumper work foundation	1							
	Apron	1	4.73	1.15	0.45	2.45	CUM		
	Total	1	3	1.25	0.3	1.13	CUM		
2	Cutting in earth work and disposal of excavated earth upto a lead of 20 mtrs in anchorage					3.57	CUM	89.88	321.37
3	Dry hand packed boulder stone filling in () foundation	2(0.50+0.75)/2	1.15	1.85		2.37	CUM	38.00	90.32
	()Apron	1	4.73	1.15	0.45	2.45	CUM		
	Total	1	3	1.25	(0.30+0.40)/2	1.31	CUM		
4	Construction of super structure of check dam 1st					3.76	CUM	57.70	216.82
	2nd Block	1	5.3	1.15	0.625	3.81	CUM		
	3rd Block	1	5.3	0.95	0.625	3.15			
		2	1.65	0.75	0.4	0.99			
	Total					7.96	CUM		
	i) Dry Random Rubble Stone masonry@ 25%					1.99	CUM	111	220.51
	ii) Boulder filling dry hand packed tightly in wire crate @ 75%					5.96	CUM	57.70	343.81
5	Spreading of wire carles over pitching, stone masonry, boulder filling etc i) Foundation Bottom	1	4.73	1.15	0	5.44	SqM		
	Sides ,tc 15cm top	2	4.73	0	0.45	4.26	SqM		
	Ends	2		1.15	0.45	1.04	SqM		
	Apron Top/Bottom	2	3	1.25	0	7.50	SqM		
	D/S side	1	3	0	0.4	1.20	SqM		
	Ends	2	0	1.25	(0.30+0.40)/2	0.88	SqM		
	Super Structure 1st Block Top / Bottom	2	5.3	1.15	0	12.19	SqM		
	Sides	2	5.3	0	0.625	6.63	SqM		
	Ends	3	0	1.15	0.625	1.44	SqM		
	Super Structure 2nd Block Top / Bottom	1	5.3	0.95	0	5.04	SqM		
	Sides	2	5.3	0	0.625	6.63	SqM		
	Ends	3	0	0.95	0.625	1.19	SqM		
	Super Structure 3rd Block Top / Bottom	2	1.65	0.75	0	2.48	SqM		
	Sides	2X2	1.65	0	0.4	2.64	SqM		
	Ends	4	0	0.75	0.4	1.2	SqM		
	TOTAL					59.73		11.8	705.04
6	Tipping of wire crate in equipment Qty. same as per Item no. 3+4	0	0	0	0	11.70	CUM	39.60	463.48
7	Breaking of Boulder Stones					7.95	CUM	100.00	794.63
8	Carriage of BOTTONES from local nallah to work site over distence 0.800 Km by Manual Labour					11.70	CUM/Km	207.40	1941.93
9	Carriage of GI wire from road to work site over distance 2.5 Km by Manual Labour					0.19	Tonne/Km	258.00	103.20
	Total								5196.18
10	Add 25% increase (on acount of enhancement of labour basic rates and on schedule of labour and works rates)								1299.04
	Total								6495.22
11	Add cost of GI Wire upto road site					59.73		90.00	5377.83
	Grand Total								11873.72
	Or Say								11873.00

D. F. O. Rohru

COST MODEL FOR CONSTRUCTION OF WIRE CRATE CHECK DAM(HEIGHT = 1.25 Mtr, LENGTH = 2 Mtr).

S.No.	Particulars	Nos.	Measurements L	B	H/B	Qty.	Unit	Rate	Amount
1	Excavation in foundation trenches in earth work, lift up to 1.50 mtrs. and then disposal of excavated material within a lead of 20mtrs Pick and jumper work	1							
	foundation		2.65	1.15	0.45	1.37	CUM		
	Apron	1	1.5	1.25	0.3	0.56	CUM		
	Total					1.93	CUM	89.95	173.56
2	Cutting in earth work and disposal of excavated earth upto a lead of 20 mtrs in anchorage	2	(0.30+0.75)/2	1.15	1.65	2.37	CUM	36.00	85.32
3	Dry hand packed boulder stone filling in i) foundation	1	2.65	1.15	0.45	1.37	CUM		
	ii)Apron	1	1.5	1.25	(0.30+0.40)/2	0.66	CUM		
	Total					2.03	CUM	57.70	117.21
4	Construction of super structure of check dam lst	1	3.22	1.15	0.625	2.31	CUM		
	2nd Block	1	3.22	0.95	0.625	1.91			
	3rd Block	2	1.11	0.75	0.4	0.67			
	Total					4.89	CUM		
	i) Dry Random Rubble Stone masonry@ 25%					1.22	CUM	111	135.76
	ii) Boulder filling dry hand packed tightly in wire crate @ 75%					3.67	CUM	57.70	211.71
5	Spreading of wire cartas over pitching, stone masonry, boulder filling etc i) Foundation Bottom	1	2.65	1.15	0	3.05	SqM		
	Sides rfc 15cm lap	2	2.65	0	0.45	2.39	SqM		
	Ends	3	0	1.15	0.45	1.04	SqM		
	Apron Top/Bottom	2	1.5	1.25	0	3.75	SqM		
	D/S side	1	1.5	0	0.4	0.60	SqM		
	Ends	2	0	1.25	(0.30+0.40)/2	0.88	SqM		
	Super Structure 1st Block Top / Bottom	2	3.22	1.15	0	7.41	SqM		
	Sides	2	3.22	0	0.625	4.02	SqM		
	Ends	3	0	1.15	0.625	1.44	SqM		
	Super Structure 2nd Block Top / Bottom	1	3.22	0.95	0	3.06	SqM		
	Sides	2	3.22	0	0.625	4.03	SqM		
	Ends	3	0	0.95	0.625	1.19	SqM		
	Super Structure 3rd Block Top / Bottom	2	1.11	0.75	0	1.67	SqM		
	Sides	2&3	1.11	0	0.4	1.78	SqM		
	Ends	4	0	0.75	0.4	1.2	SqM		
	TOTAL					37.50		11.8	442.47
6	Tipping of wire crate etc equipment Qty. same as per item no. 3+4	0	0	0	0	6.92	CUM	39.60	274.19
7	Breaking of Boulder Stones					4.86	CUM	100.00	486.23
8	Carriage of BSTONES from local nallah to work site over distance 0.800 Km by Manual Labour					6.92	CUM/Km	207.40	1148.77
9	Carriage of GI wire from raod to work site over distance 2.5 Km by Manual Labour					0.16	Tonne/Km	288.00	103.20
	Total								**3181.75**
10	Add 25% increase (on account of enhancement of labour basic rates and on schedule of labour and works rates)								795.46
	Total								**3977.34**
11	Add cost of GI Wire upto road site					37.5		90.00	3375.00
	Grand Total								7352.34
	Or Say								**7352.00**

D. F. O. Rohru

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COST MODEL FOR CONSTRUCTION OF WIRE CRATE CHECK DAM(HEIGHT = 1.25 Mtr. LENGTH = 2.50 Mtr)

S.No.	Particulars	Nos.	Measurements			Qty.	Unit	Rate	Amount
			L	B	H/D				
1	Excavation in foundation trenches in earth work, (If up to 1.50 mtrs and then disposal of excavated material within a lead of 20mtrs Pick and jumper work foundation	1							
	Apron	1	1.88	1.25	0.3	0.71	CUM		
	Total					2.35	CUM	89.95	210.99
2	Cutting in earth work and disposal of excavated earth upto a lead of 20 mtrs in anchorage	2(0.50+0.75)/2	1.15	1.65		2.37	CUM	38.00	89.32
3	Dry hand packed boulder stone filling in i) foundation	1	3.17	1.15	0.45	1.64	CUM		
	ii)Apron	1	1.88	1.25	(0.30+0.40)/2	0.82	CUM		
	Total					2.46	CUM	57.70	141.97
4	Construction of super structure of check dam 1st	1	3.75	1.15	0.625	2.70	CUM		
	2nd Rock	1	3.75	0.90	0.625	2.23			
	3rd Rock	2	1.88	0.75	0.4	0.75			
	Total					5.67	CUM		
	i) Dry Random Rubble Stone masonry@ 25%					1.42	CUM	111	157.36
	ii) Boulder filling dry hand packed tightly in wire crate @ 75%					4.25	CUM	57.70	245.45
5	Spreading of wire cartes over pitching, stone masonry, boulder filling etc i) Foundation Bottom	1	3.17	1.15	0	3.65	SqM		
	Sides W.15cm top	2	3.17	0	0.45	2.85	SqM		
	Ends	2	0	1.15	0.45	1.04	SqM		
	Apron Top/Bottom	2	1.88	1.25	0	4.70	SqM		
	DIS side	1	1.88	0	0.4	0.75	SqM		
	Ends	2	0	1.25(0.30+0.40)/2		2.44	SqM		
	Super Structure 1st Block Top / Bottom	2	3.75	1.15	0	8.63	SqM		
	Sides	2	3.75	0	0.625	4.69	SqM		
	Ends	2	0	1.15	0.625	1.44	SqM		
	Super Structure 2nd Block Top / Bottom	1	3.75	0.90	0	3.38	SqM		
	Sides	2	3.75	0	0.925	4.69	SqM		
	Ends	2	0	0.90	0.925	1.19	SqM		
	Super Structure 3rd Block Top / Bottom	2	1.25	0.75	0	1.88	SqM		
	Sides	2X2	1.25	0	0.4	0	SqM		
	Ends	4	0	0.75	0.4	1.2	SqM		
	TOTAL					43.15		11.8	509.12
6	Tipping of wire crate inc equipment Qty. same as per item no. 3+4	8	0	0	0	8.13	CUM	39.60	322.04
						5.67	CUM	100.00	567.19
7	Breaking of Boulder Stones								
8	Carriage of BSTONES from local nallah to work site over distance 0.500 Km by Manual Labour					8.13	CUM/Km	207.40	1349.32
9	Carriage of GI wire from road to work site over distance 2.5 Km by Manual Labour					0.16	Tonne/Km	208.00	103.20
	Total								3681.87
10	Add 25% increase (on account of enhancement of labour basic rates and on schedule of labour and works rates)								922.69
	Total								4614.57
11	Add cost of GI Wire upto road site					43.15		80.00	3880.50
	Grand Total								8495.07
	Or Say								8495.00

D. F. O. Bohru

ANNEXURES


NO 63 E/15

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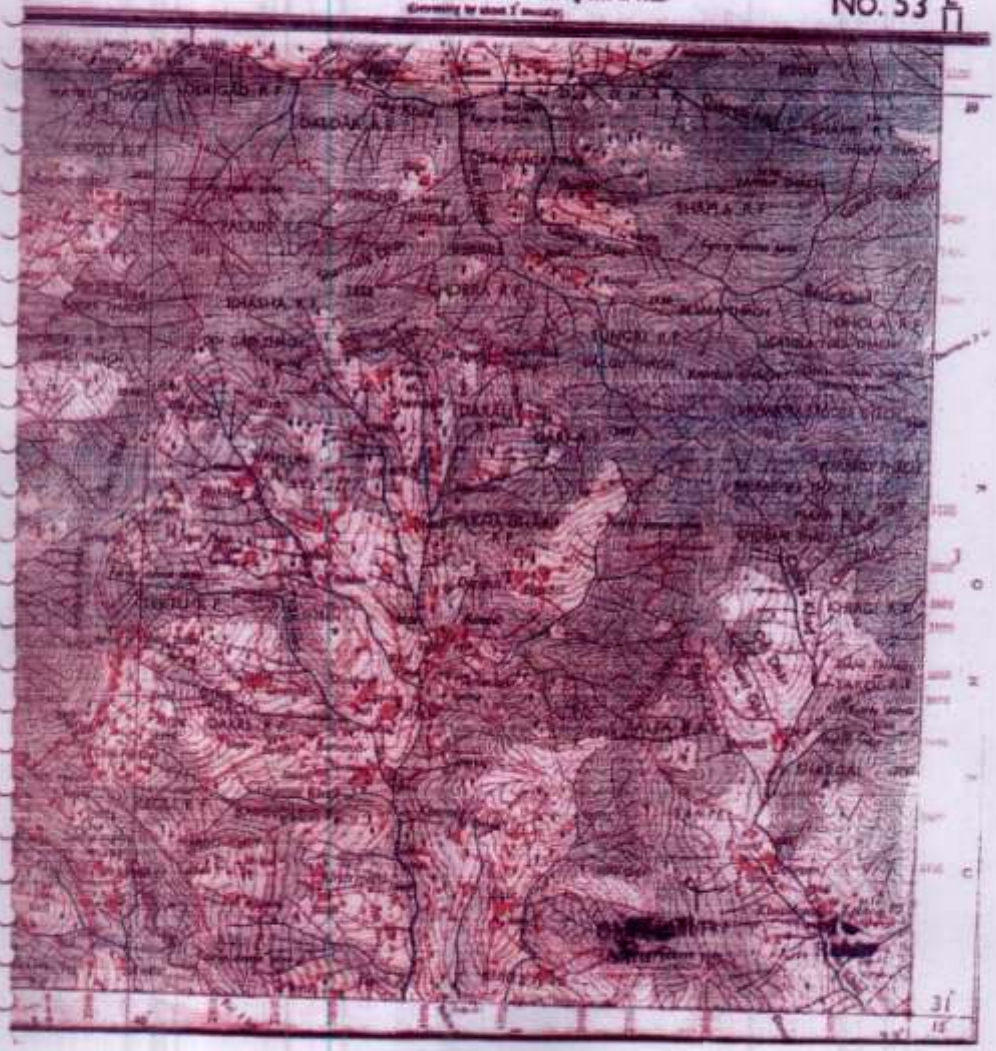
SHEET 53 E/11 FIRST E

FIRST EDITION

Magnetic Variation from True North about ½ East in 1962.
Decreasing by about 3' annually

No. 53 E



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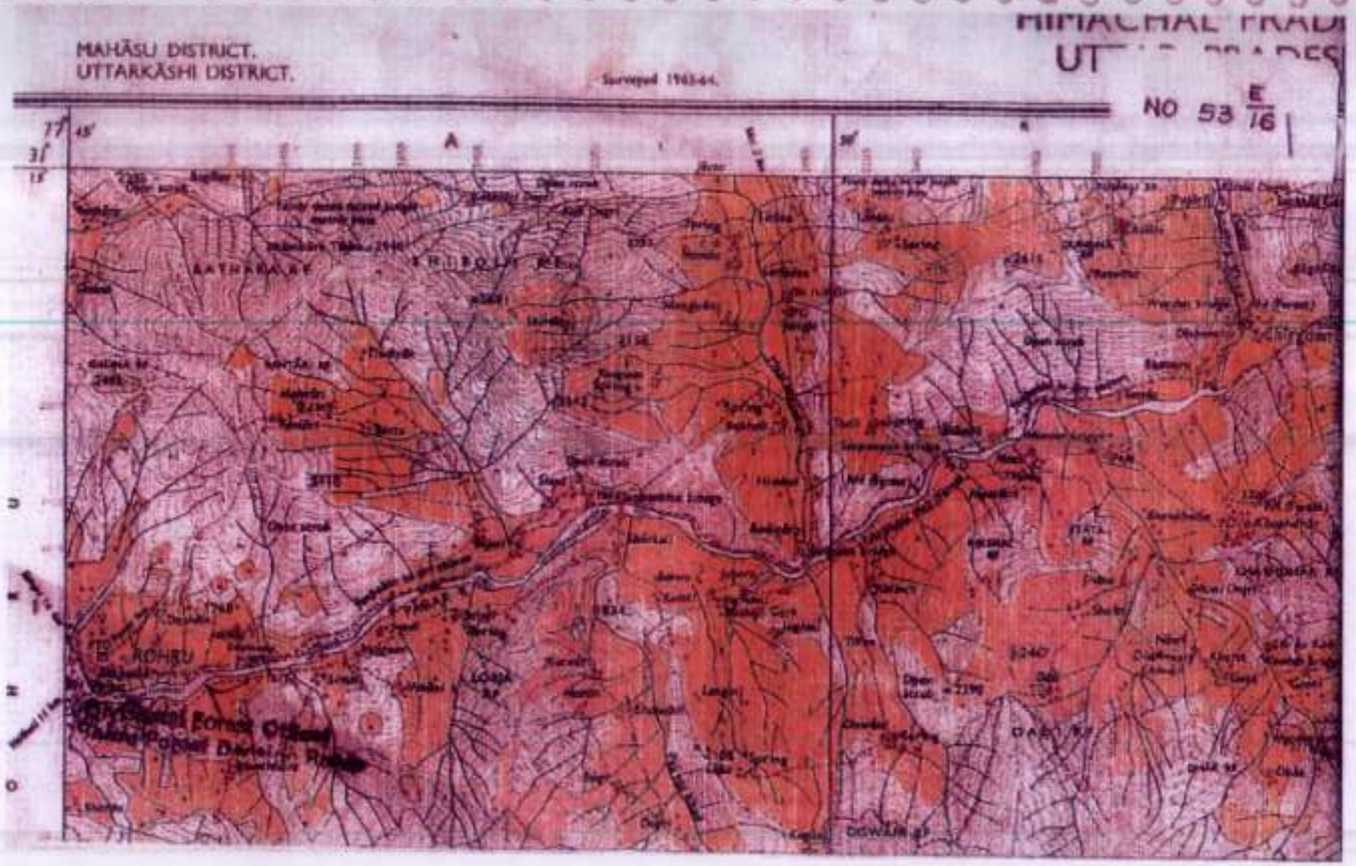
MAHĀSU DISTRICT.
UTTARKĀSHI DISTRICT.
Surveyed 1963-64.
HIMACHAL PRADE
NO 53 E/16
ROHRU
DOWLIN

HIMACHAL PRADESH STATE ELECTRICITY BOARD

OFFICE ORDER

HPSEB is pleased to accord Techno Economic Clearance(TEC) to **Pauditai Lassa HEP (2 x 12 MW)** in Yamuna Basin in Distt. Shimla of Himachal Pr. esh at an estimated cost (at Power House Bus Bars) of Rs. 118.23 crores (Rupees One Hundred Eighteen crores and Twenty three lacs only) at Decembe: 2005 Price Level, including I.D.C., escalation, Financial Charges and LADA Charges(@ 1.5 %), subject to the following conditions.:

1 i) The complete cost of the scheme shall not exceed the above cost except on account of the following.

a) Interest During Construction (IDC) shall be as per actual not exceeding the amount as indicated at **Annex-I** unless revised by HPSEB while according concurrence under Section 31 of Electricity (Supply) Act, 1948 repealed by Electricity Act, 2003 after review of financial package.

b) Change in rates of Indian taxes/ duties such as excise duty, sales tax/VAT, custom duty and levy of any other taxes/duties subsequent to issue of Techno-economic Clearance (TEC).

c) Change in Indian Law resulting in change in cost.

ii) The abstract of the estimated cost approved by HPSEB is furnished at **Annex-I**, Summary of Financial package as considered by HPSEB is at **Annex-II** and the Salient Features of Scheme are at **Annex-III**.

2. The following conditions shall also be fulfilled :

i) Completed cost/ techno-economic clearance shall not be re-opened due to the following:

a) Non-acquisition of land.

b) Non-finalisation of Power Purchase Agreement (PPA).

c) Delay in financial closure.

ii) Tariff shall be decided by the Central/ State Electricity Regulatory Commission.

iii) The final financial arrangement shall not be inferior to the financing arrangement projected in the Detailed Project Report (DPR) for TEC.

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iv) The public issue expenses, if any , shall be reconsidered at the time of approval of completion cost based on documentary proof and in accordance with Security Exchange Board of India (SEBI) guidelines regarding regulation of public issue expenses.

v) Fulfillment of conditions stipulated in Central Electricity Authority (CEA)/ Central Water Commission (CWC) guidelines in respect of civil works at the stage of detailed design/ execution.

vi) Any increase in the cost estimate due to design modifications and geological surprises would be absorbed by the firm / IPP.

vii) No additional cost shall be allowed due to Resettlement & Rehabilitation (R&R) Plan.

viii) Normal operation life of the hydro power plant shall be as per the provisions of the Sixth schedule of the Electricity (Supply) Act 1948 repealed by Electricity Act, 2003.

ix) The Techno-economic Clearance (TEC) is subject to clearances of project by MOE & F from environmental and forest angle. The statutory clearances as per Annexure-IV shall be obtained before execution/ implementation of the project.

x) The promoter shall obtain Forest clearance for power evacuation line before commencement of the construction work.

xi) The IPP/promoter has to bear the cost for 132 KV D/C line from Paudital Lassa HEP to 132/ 220 KV pooling station near Hatkoti alongwith 2 nos. 132 KV terminal bays at the pooling station.

xii) The cost in respect of 132/220 kV pooling station proposed near Hatkoti as well as of the transmission system from the pooling station upto Giri / Moginand shall be shared between the IPPs/ promoters of Paudital Lassa (24 MW), Tangnu Romai (50 MW), Chirgaon Majhgaon (46 MW) and any other project to be included in the pooling station/transmission system from pooling station upto Giri/ Moginand. The undertaking of the IPP in this regard is enclosed as Annex-V.

xiii) The TEC is based on the reports and data furnished in the DPR and it is presumed that information furnished is accurate. The scrutiny does not cover the examination of the detailed design & working drawings of work components with respect to the structural, hydraulic and mechanical performance & safety, which shall be ensured by the Project Authority/ IPP. Design and layout of components will be such that there is no loss to public property. The observations of HPSEB and replies thereof shall form a part of the DPR.

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b) The observations of HPSEB and the reply thereon by the Company in annotated form shall be incorporated as an Annexure and included in the DPR itself.

c) The total cost of the project as amended shall be incorporated in the DPR and the copy of the updated DPR shall be supplied to this office as well as to the other concerned agencies, viz., CEA etc. by the O/o CE(Projects).

By order of the Board

Chief Engineer (P&M),
HPSEB, Vidyut Bhawan,
Shimla-171004.

No. HPSEB: (Sectt) 401- Paudital Lassa/06; 4504I-54 **Dated:-** 29-7-06

Copy of the above alongwith relevant annexures is forwarded for information and necessary action to:-

1. The Additional Secretary (Power) to the Govt. of HP., Shimla-2.
2. The Chief Engineer(PSP), HPSEB, Shimla-4.
3. The Chief Engineer(Sys.Planning), HPSEB, Shimla-4.
4. The Chief Engineer (Projects), HPSEB, Shimla-4 with reference to his office UO note no. HPSEB/ CE (P)/CC-PL/06-1016 dt. 7.7.2006.
5. The Secretary, HPSEB, Shimla-4 alongwith the photocopy of the memorandum as approved by the WTMs of the Board by circulation.
6. The Chief Accounts Officer, HPSEB Shimla-4.
7. The Dy. CE(Contracts),HPSEB,SDA Complex,Kasumpti,Shimla-9.
8. The Addl. Secretary-cum-PS/Sr.PS/Spl.PS/ PSs to Chairman/Members for kind information of Chairman/ Members.
9. The Managing Director, Shree Jayalakshmi PowerCorp Limited,Tobacco Colony, P.B. No.6, Guntur, Andhra Pradesh-522 001.

DA/As above.

Chief Engineer (P&M),
HPSEB, Vidyut Bhawan,
Shimla-171004

xiv) The IPP shall carry out the Geological explorations before taking up project construction and submit the report to HPSEB.

xv) The IPP shall continue to carryout the discharge measurements of Paudital Lassa separately.

xvi) 15% of the minimum inflow observed in the lean season to be released immediately downstream of the diversion structure of the project throughout the year as per H.P. Govt. Notification dated 9.9.05.

3. The project shall be completed within 36 (Thirty Six) months.

4. The concurrence of the HPSEB to the scheme under Section 31 of the Electricity (Supply) Act, 1948 repealed by Electricity Act, 2003 shall be considered by the Board on submission of Firm Financial Package (FFP) and tie-up of balance inputs/ clearances as per 2 (ix) above by the company within six months.

5. Three copies of the semi-annual physical progress report of the scheme and expenditure actually incurred duly certified by the statutory auditors shall be submitted to the HPSEB till the commercial operation of the plant. The project promoters/ project authorities would give free accessibility to the HPSEB officers and staff to have on the spot assessment of various aspects of the project.

6. The completion cost of the scheme shall be submitted to HPSEB for approval within three (3) months from the Commercial Operation Date (COD) of the plant.

7. In case the time gap between the Techno-economic Clearance of the scheme and actual start of work on the project by the generating company is three years or more, a fresh Techno-economic Clearance shall be obtained from HPSEB before start of actual work.

8. The HPSEB reserves the right to revoke the Techno-economic Clearance, if the conditions stipulated above are not complied with to the satisfaction of the HPSEB.

9. The Implementing Agency/ Project Authority shall have to obtain clearance from CERC/ HPSERC as per provision in the Electricity Act, 2003.

10. The IPP shall publish the scheme duly approved in at least 2 National News papers inviting objections from public/ others within 2 months period.

11. LADA charges @ 1.5 % of the final cost of the project have been considered while according TEC.

12. The following points shall be ensured by the O/o CE(Projects) and the IPP:

a) The DPR shall be got updated by the O/o CE(Projects) based on the modified parameters in view of the various observations as were raised by the different offices of HPSEB from time to time.

ANNEX-II

SUMMARY OF FINANCIAL PACKAGE IN RESPECT OF PAUDITAL LASSA HYDROELECTRIC PROJECT(2 X 12 MW)

ALLOTTED TO M/s SHREE JAYALAKSHMI POWER CORPORATION LIMITED, GUNTUR

1. **Tentative Financial Package:**

Debt:Equity 70:30

Sr. no.	Description	Amount (Rs. In Crore)
A	Equity by Promoter	35.47
B	Debt from Financial Institution	82.76
	Total (Debt + Equity)	118.23

2. **Terms of Loan**

Sr.no.	Item	Package
i)	Source of Debt	Financial Institution
ii)	Loan Amount(Rs. In Crore)	82.76
iii)	Interest Rate	9 %
iv)	Repayment period	10 years
v)	Moratorium Period	3 years

ANNEX-I

ABSTRACT OF COST ESTIMATE OF PAUDITAL LASSA HYDROELECTRIC PROJECT(2 X 12 MW) (DECEMBER 2006 PRICE LEVEL)

ALLOTTED TO M/s SHREE JAYALAKSHMI POWER CORPORATION LIMITED, GUNTUR

		(Rs. in Lac)
1	Civil Works	7140.55
2	Electro-mechanical works	2400.00
	Total Generation Cost (Sub-Total (1+2))	**9540.55**
3	Escalation	847.53
4	IDC	1175.43
5	Financial Charges	84.99
	Sub-Total (3+4+5)	**2107.95**
A	**Total Cost –A (1 to 5)**	**11648.50**
	LADA Charges @ 1.5% on A above	**174.73**
	Grand Total	**11823.23**
		Say Rs.118.23 Crores

(Rupees One hundred Eighteen crore & twenty three lac) only.

B DESILTING CHAMBER

Type	Surface
Size	Two chamber of 150m x20m with inlet and outlet transition
Particle size	Designed to exclude all particles Down to 0.20 mm size.
Flushing discharge	12.00 cumec

C WATER CONDUCTOR SYSTEM

a) Power tunnel

Type &Size	4m dia circular shaped tunnel
Length	3000 m
Slope	1 in 2000
Design discharge	53 cumec
Velocity	4.08 m/sec

D SURGE SHAFT

Type	Circular
Diameter	15 m
Maximum up-surge elevation	1502m
Minimum down surge elevation	1478.00m

E PENSTOCK

Type	Circular,surface steel penstock
Size	4500 mm dia, thickness varying between 12mm to16 mm
Length	140m

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Annexure-III

Paudital Lassa (24MW), In Shimla Distt.Of Himachal Pradesh of M/S Shree Jayalakshmi Power Corporation Limited Tobacco Colony, P.B.No-6 Guntur-522001.

SALIENT FEATURES

I.	LOCATION	
	State	Himachal Pradesh
	District	Shimla
	Stream	Pabbar river aTributary of Tons
	Vicinity	Paudital Lassa and Hatkoti
	Latitude	Northing 31° 07' 30"
	Longitude	Easting 77° 43' 00"
II	Hydrology	
	Catchment Area at diversion	900.00 Sq. Km.
	Design Discharge	47.97 cumecs
	Design flood	2000 cumecs
III	PROJECT STRUCTURES	
A.	DIVERSION BARRAGE Type	Gated structure
	River bed level	El 1480.00 m
	FRL	EL 1495.00 m
	Spillway Capacity	2000.00 Cumecs
	Shingle flushing system	Undersluices
a)	Approach channel	
	Type & Size	Trapezoidal
	Length	50.00m
	Design discharge	60.00 cumecs

B DESILTING CHAMBER	
Type	Surface
Size	Two chamber of 150m x20m with inlet and outlet transition
Particle size	Designed to exclude all particles Down to 0.20 mm size.
Flushing discharge	12.00 cumec
C WATER CONDUCTOR SYSTEM	
a) Power tunnel	
Type &Size	4m dia circular shaped tunnel
Length	3000 m
Slope	1 in 2000
Design discharge	53 cumec
Velocity	4.08 m/sec
D SURGE SHAFT	
Type	Circular
Diameter	15 m
Maximum up-surge elevation	1502m
Minimum down surge elevation	1478.00m
E PENSTOCK	
Type	Circular,surface steel penstock
Size	4500 mm dia, thickness varying between 12mm to16 mm
Length	140m

	Velocity	3.33 m/sec.
	Normal tail water level	El 1423.00m
	Bifurcation at lower end into 2.60m diameter each	
F	POWER HOUSE	
	Type	Surface
	Size	24.30mx52.50mx24.50m/16.50m
	Turbine	
	Type	Horizontal Francis turbine
	Number	two
	Capacity	12000 KW
	Normal TWL	1423.00m
	Net head	60.00m
G.	TAIL RACE	
	Type & size	Trapezoidal section
	Length	12 m

Annexure IV

Paudital Lassa (245MW), In Shimla Distt.Of Himachal Pradesh of M/S. Shree Jayalakshmi Power Corporation Limited Tobacco Colony, P.B.No-6 Guntur-522001.

SR.NO.	ITEM	AGENCY	REMARKS
1	WATER AVAILABILITY	1. State Govt. 2. CWC	Interaction between State Govt. Deptt. & CWC required. Relevant Irrigation Act of the State & Central Water Commission.
2	SEB CLEARANCE	1. SEB 2. StateGovt.	Section 44, E(S) Act, 1948 repealed by Electricity Act 2003.
3	POLLUTION CLEARANCE WATER AND AIR	State/Central Pollution Control Board	Water (Prevention & Control of Pollution) Act,1974, Air (Prevention) Act 1981.
4	FOREST CLEARANCE	1. State Govt. 2. Min. of E&F GOI.	Coordination with State Forest Deptt./Min. of Environ. & Forest (MOE&F) regarding Forest Conservation Act,1980 as per item (6) & (7) & Govt. Policy in force.
5	ENVIRONMENT & FOREST CLEARANCE	1. State Govt. 2. Min. of E&F GOI	
6	REGISTRATION OF COMPANY	Registrar of Companies	Under Indian Companies Act, 1950.
7	REHABILITATION & RESETTLEMENT OF DISPLACED FAMILIES BY LAND ACQUISITION	1. State Govt. 2. Min. of E&F GOI	
8	EQUIPT. PROCUREMENT	DGTD,CCI&E	Import & Export Acts.

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(½)

SHREE JAYALAKSHMI POWERCORP LIMITED

Tuticorin Colony, P.B. No. 6, Guntur 522 001, India

Phones: 221924, 356730 Fax: (0863) 356793 Telex: 0471 277 Grams: GOGINENI

26th July, 2006

To
The Chief Engineer (P&M)
HPSEB
Vidyut Bhawan
Shimla – 171 004

Dear Sir,

Sub : Draft proposal and recommendations for TEC to DPR of Paudital Lassa HEP (2 x 12 MW) in Distt. Shimla of Himachal Pradesh

Ref : Your office letter no. HPSEB/(Sectt)401-Paudital Lassa-TEC/42656-60 dated 26.07.2006

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With reference to subject cited matter kindly find enclosed herewith the undertakings as desired by you.

Thanking you.

Yours faithfully,
For **Shree Jayalakshmi PowerCorp Ltd**

(R. Sambasiva Rao)
Managing Director

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