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Preface.

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Mandi Forest Circle, initiated preparation of Catchment Area Treatment Plan during October 2002. Mr. K.K. Thakur R.F.O.(JFM) Mandi was made Nodal person and assigned the duty of preparation of CAT Plan with the cooperation and coordination of field staff and the relevant agencies. The first report was submitted in May, 2003 and has been revised again in May 2004. The Catchment Area Treatment Plan has been prepared involving field staff of Mandi & Nachan Forest Divisions of Mandi Circle, and Seraj and Parvati Forest Divisions of Kullu Circle and the subject matter specialists as and when required. The project has large Catchment Area, part of which is being treated in other projects, hence the left over area, which falls in Banjar, Tirthen, Sainj, Thachi, Panarsa, Hurla and Jari Forest Ranges, is being taken in this plan. The areas for Plantations, Soil and moisture conservation activities. Natural Regeneration activities, Subsidiary Silvicultural Operations and Fire protection measures were identified. Initially, the plan had been prepared on the basis of detailed site specific plans, but now it has been changed and the treatment of these areas has been proposed as per new norms by the committee constituted to suggest comprehensive norms for preparation of CA and CAT Plans. This is an effort to reduce/ check the soil erosion, to prolong life of the project and help getting stable and healthy environment. Draft document was discussed in workshop involving representative from Forest Department and Larji Hydro Electric Project Authorities and suggestions from all concerned have been duly incorporated except for the reclamation plan, which is being prepared by the user agency. Then came the suggestion from DFO WL Kullu that the two sanctuaries in the Catchment Area may also be included, which has been done.

> Conservator of Forests Mandi Forest Circle Mandi HP

Acknowledgements

Our sincere thanks are due, to Mr. J.S.Walia IFS now CCF projects H.P., who floated the idea of preparation of Larji Hydro Electric CAT Plan by Mandi Forest Division, Mandi and provided his valuable guidance at all levels.

We are thankful to the Forest Department, Government of Himachal Pradesh through respected Mr. D.C.Kanduri IFS (Retd.) who was CF Mandi, who took this opportunity to work on the preparation of this CAT Plan for Larji Hydroelectric Project.

We are thankful to Mr. Avtar Singh IFS CF Mandi, who always encouraged and guided whenever we were struck and with his able guidance and directions this document has been prepared.

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We would also like to extend our thanks to Mr. B.K.Mahajan Chief Engineer Larji Hydroelectric Project, Mr. S.S.Dhabas Deputy Chief Engineer Larji Hydroelectric Project and the staff of Larji Hydroelectric Project, who always extended their co-operation for preparation of this document.

Thanks are due, to Mrs. Upasana Patial IFS DFO Hyt. - cum - DFO JFM, who proposed and spared Mr. K.K. Thakur RFO JFM Mandi and gave a free hand to work on this assignment besides her valuable guidance.

We are thankful to DFOs Parvati, Nachan, Seraj; RFOs Banjar, Tirthan, Sainj. Thachi, Panarsa, Hurla & Jari along with their field staff without whose co-operation this document could not be imagined.

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Last but not least, we are thankful to Mr. K.S.Sen (Retired Range Forest Officer) who also spared his time and associated in the preparation of this document.

H.V.Kathuria IFS DFO Mandi MANDI HP.

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K.K.Thakur RFO (JFM) Mandi HP.

Introduction

The government of Himachal Pradesh envisages to make it a leading power generating state by utilization of its hydrological potential and its envision is being achieved by its concerted efforts and endeavors at various rivers by the construction of Hydroelectric Projects. Himachal Pradesh has a achievable potential of producing 20,000 MW of power. These type of Multi-purpose hydroelectric projects are proper utilization of natural resources and is a mile stone in the progress of the state. One of these at present is under construction on the River Beas at the confluence of River Beas, River Tirthan, and River Sainj at Larji near Aut in Mandi District, known as the Larji Hydroelectric Project.

The Larji Hydroelectric project has been contemplated as a power generation development. It is an upstream development of Pandoh Dam of Beas - Satluj Link Project and is located along National Highway - 21 at about 190 KM from Shimla. It envisages utilization of water of River Beas, through a gross head of 72.56 m for generating 126 MW of power in Larji Power Station.

The primary objective of this plan, that is being called as the Catchment Area Treatment Plan or CAT Plan in short, is to arrest soil loss and degradation of the area. This has been caused due to loss of soil and vegetative cover, due to direct human developmental actions and other biotic factors, that has lead to direct ecosystem changes. It is an effort at least to reduce the run off and soil that is being eroded. It is a fact that the developmental activities will not be stopped, and unless proper planning is done in other up stream soil activities, the soil will move down the river. It must be ensured that effective erosion control and best management practices are adopted, there by avoiding siltation, that will promote longevity to the dam reservoir, and maintain persistent and sustained electric supply from the project.

Due to other project activities and plans which are being implemented in total catchment and financial constraints, the immediate catchment i.e. 835.96 sq.km. out of the total catchment of 4921 sq.km. is proposed to be treated. As per the provisions thus, this plan has been prepared, which is an attempt to retrieve the deteriorating ecology, which is providing the cost estimates for undertaking various soil and moisture conservation measures in the CAT Plan area. As on today the proposed areas are vacant and the funds must be released as soon as possible. The CAT Plan has been proposed at a probable cost of Rs. 128033351.00 (Rs. Twelve crores eighty lacs thirty three thousand three hundred and fifty one only) which is 1.60% of the total initial cost i.e 800 crores.

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Chapter 1

Larji Hydroelectric Project - Description.

The project comprises concrete diversion barrage 26.50 m high above the river bed level on the river Beas about 600 m down stream of the confluence of river Sainj and Tirthan. The main features of the project

total Catchment area at dam site is 4921 sq.km, out of this, the snow catchment is 1394 sq.km.

it is a concrete barrage 26.5m high above river bed level,

- a spillway section 72.5m long having five bays controlled by five radial gates 11 m x 12 m size to pass a standard project flood of 8100 cumecs;
- a 46.1 mtr wide (crest length) power intake arrangement with 4 independent Bays on the right bank for drawing discharge of 312.50 cumecs;
- an underground descending arrangement on the right bank with four chambers of 127m x16 m each x depth varying from 15.5 m to 16.24 m to all silt particles of size 0.4 mm and above;

a 4119.861 m long 8.5 m dia circular head race tunnel opening into a 37 m dia restricted orifice type surge shaft with top at El 1010.0m,

three pressure shafts of 4.5 m dia each taking off from surge shaft with length of 83.33 m each with ASTM-A-537 steel liner and further feeding three francis, vertical axis generating units of 42 MW each

through a net head of 56.48 m in an underground power house on the right bank of river Beas at Duada nallah confluence;

a 132 KV GIS switchyard; and

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a tail race for conveying the water back to river Beas.

The project components lie in dolomite/lime stones, phyllites and micaceous phyllites and schists. It falls in zone -V of seismic zone of seismic zone map of India.

The reservoir level: -

- maximum reservoir level has been kept as 963.00 m,
- a normal reservoir level as 969.50 m., and
- a minimum draw down level as 963.00 m.

The live storage capacity of the Larji reservoir is 230 ha-m, which is adequate for running the power station at full installed capacity for more than four hours in a day during lean periods. The project will enable energy generation of 587 GWH in 90% dependable year pattern of flows. The power generated will be fed into the Northern Regional Grid through a system of 132 KV transmission. The project shall be operated as a peaking station for power absorption in the Grid.

The Central Electricity Authority accorded Technoeconomic clearance to the project at an Estimated that day cost (March' 99
Pl) of Rs. 732.29 crores including Transmission cost of Rs. 24.32 Crores &
IDC of Rs. 123.61 crores, and completed cost of Rs. 796.98 crores
including transmission cost of Rs. 25.74 crores & IDC of Rs. 131.16
crores. Cost of generation per unit works out to be 256 paise/unit in a
90% dependable year.

Even after the Project was initially cleared by the Central Electricity Authority, Government of India, from techno-economic angle and was later approved by the Planning commission during March, 1987, the project could not be taken up for execution in the right earnest due to severe constraint of the availability of funds. Some infrastructural works and construction stage investigations besides model studies of Dam & Intake arrangement were, however, initiated within the limits of available resources.

Subsequently, in the year 1995, a 5-member Panel of Experts (P.O.E) under the Chairmanship of Dr. Y.K.Murthy was appointed by the Board to render expert guidance/advice on various project related technical issues including general layout. On the basis of hydraulic and structural designs carried out so far and on the results of hydraulic model studies conducted at UPIRI Roorkee and in-depth interaction with P.O.E., the project layout has been modified, and now the work is in full swing.

Catchment Area of Larji Hydroelectric Project.

The dam of Larji Hydroelectric Project is being constructed on the River Beas, at Larji near Aut in Mandi District. River Beas is also known as "Vipasha" in ancient scriptures. It is the second most important river of Himachal Pradesh. It derives its origin from a place called "Beas kund" near the Rohtang Pass, which is a small spring near Rohtang-Pass at an elevation 4085 mtr. Unlike the other major rivers of Northern India, any natural lake does not feed this river, and is joined by several tributaries-important being the Parvati, the Hurla, the Tirthan, and the Saini.

Since the catchment area is dependent on the drainage pattern and starting from the "Beas Kund", the river is joined by many tributaries and which further join to form the rivers. All the tributaries have got perennial flow, which varies considerably during different months of the year. The discharge of the river doubles with addition of R. Parbati. At Larji, discharge is almost three to four times of discharge before confluence of Parvati river. River Beas gets it water from Manalsu Nalla, Allan Nalla, Phojal Nalla, Sarvari Nalla, Duhungan Nalla, and Mohal Nalla. R. Parvati gets its water from Malana Nalla, Tosh Nalla, Tichu Nalla, Shat Nalla, and Chhrod Nalla. Hurla Nalla directly drains into the River Beas and it has small tributaries as Najan Nalla, Pulia Nalla, Ursu Nal, Manihar Nal, Pancha Nal, Nihargarh Nalla. River Sainj joins River Beas at Larji, which receives its water from Jiwa Nalla and Sainj Khad. River Tirthan also has a very vast catchment and its tributaries are Kalwari Nala, Chotri Nala, Palchan Gad, Koki Gad, Tirthan Khad and the Banjar Khad

The total catchment of River Beas is 13,663 sq. km. The Catchment of the Larji Hydroelectric Project is the part of Catchment of River Beas and is spread over an area of 4921 sq.km.

The catchment area of River Beas and major tributaries is as under: -

 Catchment Area

 Main river at Kullu
 1711 sq.km.

 Sarvari Khad
 205 sq.km.

 Parvati river
 1660 sq.km.

 Hurla nalla
 192 sq.km.

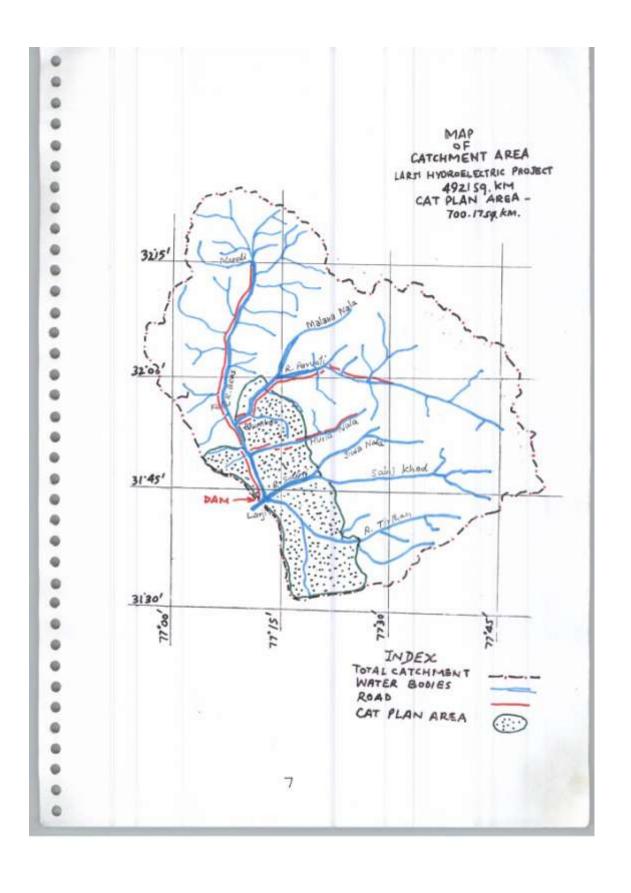
 Sainj Khad
 800 sq.km.

 Tirthan Khad
 717 sq.km.

 Small khads upto barrage site
 176 sq.km.

4921 sq.km.

Larji Hydroelectric Project -



The catchment is situated between 31 31 N Lat. to 32 10 N Lat. and 76 56 E Long. to 77 50 E Long. The major portion of the catchment falls in the District of Kullu and a part in Mandi i.e., Seraj Forest Division, Parvati Forest Division, Kullu Forest Division, Great Himalayan National Park, Kanawar Sanctuary, Khokhan Sanctuary, Manali Sanctuary, part of Panarsa Forest Range of Mandi Forest Division, and part of Thachi Forest Range of Nachan Forest Division.

Fall of all the tributaries in the originating sites is very steep and in this portion encounters many falls. As they descend to lower elevations rivers become more and more stable condition and flow is comparatively uniform, straight and less turbulent. Since the project is on the River Beas, its average slope is calculated. When the river originates from the Rohtang, to cover a distance of 28.9 km up to Manali there is a fall of 77m/km. From Manali to Kullu covering a distance of 38.6 km there is a fall of 15.6m/km. From Kullu to Larji covering a distance of 33.8 km there is a fall of 8m/km.

The river Beas passes through famous valley of Manali and Kullu, which is known for its scenic beauty, and grandeur of Himalayan Ranges. High peaks of the catchment remain covered with snow for about nine months in a year but this area is negligible as compared to the total catchment area. Most of the catchment area comprises precipitous slopes and peaks, which are mainly barren. Orographic pattern of catchment is such that there are high mountains in the east of the river valley, a high ridge on the west and a general level of 900m to 1200m on the south.

Larji Hydronlectric Project -

Status of Environment, in the Catchment.

The state of Himachal Pradesh has the estimated hydroelectric potential of 20,000 MW. The life of a project depends on its being kept in a better shape. So it becomes necessary to know the present status of the Environment (which includes the soil, the water, the social setup, the problems of the people dwelling there, the effect of cattle population, their fuel and fodder requirements etc.). When we know the basic data of the Catchment it becomes easy for planning.

The Himalayan hills are one of the most sensitive areas of the earth-surface. They may appear to be strong and formidable, but environmentally they are weak and fragile and the man - environment relationship is precariously balanced. The population growth, rapid urbanization, industrializations, and the greed/unavoidable necessities of under educated man have overused the resources, which has further accentuated the process of environmental degradation in the inhabited parts of the Himalayas. The declining biota, soil erosion, and landslides due to depletion of forest cover, have turned the Himalayas into an environmentally hazardous zone and the entire hydrological cycle appears to have been disturbed.

Large-scale deforestation and unscientific cultivation on the slopes have been mainly responsible for large-scale soil erosion. The Catchment, which forms a part of the Western Himalayas, is environmentally fragile and ecologically vulnerable. The soils are under great stress and strain due to different types of soil erosions.

Soil erosion is the destructive process for the soils, which may be defined as the wearing away of the earth's surface by breakdown and transportation of the soil by water, ice, wind. Water is the main agent.

The main type of soil erosions by water are: -

Splash Erosion

The floral component or the vegetative cover of the earth's surface keeps the soil intact, but when this cover is removed, the surface is directly exposed to the harsh impact of the rainfall. As the raindrops strike the loose soil particles, the soil constituents are broken up. Fine particles and organic constituents are separated from the heavier ones and that are lifted and carried away by the water.

Larji Hydroelectric Project -

· Sheet Erosion

Once the soil particles are detached from the earth's surface they are liable to be carried away by the flowing sheet of water and if the slope is greater, the damage is greater.

· Rill Erosion

Rill erosion starts when shallow surface flow starts to concentrate in low spots in the soil surface. The energy of this concentrated flow is able to detach and transport soil particles. This action of running water cuts shallow and tiny channels in the surface of soil or rocks called as rill. They are well defined small channels that are generally few inches deep.

· Gully Erosion

When the rills, which are shallow, go deeper and many rills join so that its cross-section takes a shape of V or U, it is referred to as Gully Erosion. It is the advanced stage of rill erosion and is formed where the velocity, volume, and slope has increased sufficiently resulting into floods.

Erosion due to developmental activities.

New constructions whether it is roads, paths or even buildings require cutting of soil and its disposal. The new disturbed soil is susceptible for the land slides, land slips which carry the fertile soil and the tree cover. While planning and executing a new developmental project up stream the project authorities must ensure that the disposal of the muck should be the top priority with all the developmental activities because how effective the planning down the stream may be, the soil will move down and create problems for the projects down the stream.

· Channel Erosion

Channel erosion occurs when bank vegetation is disturbed or when the volume or velocity of flow in a stream is increased, which cuts the slopes resulting in the widening of the tributaries.

The damages caused by the soil erosion are two fold:

 The site of the soil erosion is getting depleted by way of removal of top fertile layer of soil and thus destroying the soil structure. It takes years to years for the formation of new soil and vegetation only

Larji Hydroelectric Project -



Tirthan Range



Banjar Range

comes up when the soil is present on the exposed rocks i.e. when the soil is established.

2) The site where the eroded soil is getting deposited. The aim of the Dam on the river is not only to divert the water in to the diversion tunnel but the reservoir acts as the storage of water for whole of the year and lean water flow periods. If now that storage area is filled up, what could be fate of the project.

By the listed damages .

a) the life of the project is reduced,

- there is loss in production potential and of economic species,
- c) there is reduction in seepage and filtration rate.
- d) there is reduction in water holding capacity,

e) there is loss of nutrients,

f) the tillage operation cost increase,

g) there is reduction in transport and storage capacity,

h) there is reduction in water supply.

i) the production is reduced Depletion of wildlife, etc.

Excessive erosion and sedimentation cause both environmental and economic impacts. Economic impacts may be more prominent and easier to assess, whereas environmental impacts build slowly for years, and may sometime be irreversible or taking a very long time. The remaining sub-soil after erosion is often dry, hard, rocky, infertile, and contains gravel.

The forests of Himachal Pradesh and in the CAT Plan area have suffered tremendously over the years from over exploitation caused by the burgeoning human and cattle population. Snow, wind, insects and pathogens cause damage the trees but man causes the most damage deliberately or inadvertently. It is due to fuel wood pressure, timber pressure, grazing, encroachments, forest fires, and of course the developmental activities. The status of forests and its environment is a cause of concern not only to the locals but it is a worldwide phenomenon.

The project catchment receives precipitation due to the southwest monsoons as well as the western disturbances that pass over the northwest part of the country during winter. The south west monsoon generally lasts from June to September but may occasionally extend up to early October. Precipitation during this season which falls, as rain is generally not heavy but at times may contribute significantly towards flood run-off. The winter precipitation falls either as rain or snow depending upon the altitude and other meteorological conditions. It does

Larji Hydroelectric Project-

not contribute directly to river discharge significantly and mostly goes to feed the snow/glacier bound areas of the catchment.

Catchment area for Larji Hydroelectric Project is cut-off from heavy rainfall region around Dharmshala in the west by high ridge, running north south, east of Uhl River. Consequently, considerable less rainfall occurs in this part compared to whole catchment for Pong-dam. However, northern tip of the catchment is an area of heavy rainfall concentration. Rainfall pattern is unchanging from year to year.

The annual rainfall in the catchment ranges from 560mm at Banjar (1960) to 4650mm at Kothi (1961).

IMD has started temperature and humidity observations at Manali and Bhunter. Temperature observations had, however, been started at Pandoh dam site from 1960 about 15km downstream of Larji barrage site. The long term temperature data is also available at Bhunter and Manali since 1987. All these stations excepting Manali generally do not get anowfall during winter season.

The river run-off consists of two parts one which is derived from melting of the snow/glacial bound area of the catchment and the other which is directly derived from rainfall. The snow melt is a dominating factor in the production of run-off. Rainfall even in Rainfall season does not contribute as much as snowmelt in the majority of the years. The snowmelt, which depends upon temperature variations and extent of snowfall, does not vary from year to year.

Discharge observations have been recorded on River Beas at Thalout just down stream of Larji barrage site since June 1941 to-date. Discharge observations have also been recorded at other sites both upstream and downstream of Larji barrage. As fairly long-term discharge data is available at Thalout, only this data has been used for determining water availability for this project. The flow in the river begins to rise with start of the spring season. The increase is quite gradual in the beginning but fairly rapid from June onwards with the highest flow occurring in July and August. This is mainly due to high temperature that prevail during June to August and the monsoon rainfall. Onwards the end of September or early October, the flow begins to recede sharply. The fall is gradual during autumn and winter. The lowest flow generally occurs in the month of January and February.

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The Catchment area is in the vicinity of Great Himalaya National Park. Interior to the Hurla Range, Sainj Range, Banjar Range and Tirthen Ranges lies the Great Himalaya National Park.

In the earlier days, the population of the human beings was less and the population of Wild Life was in plenty, there was no problem for the Wild Life Protection. The interior areas of the catchment comprised of mainly Deodar, Fir, Spruce forests which were hardly exploited for commerce and therefore, no felling were carried out, more over man did not feel going in the interior areas frequently except occasional for 'Shikar' or for grazing the sheep and goat in the thatches or alpine pasture. The market value of the trees of broad leaf species and the Fir and Spruce being low, these forests were never exploited to the prescribed extent and the exploitation was very difficult. This in turn gave protection to the Wild Life. As the time went on, and with the increase in population, the trees species considered uneconomical also found market in the plains and more forests in the interior areas started to be worked out for market in the plains. The heavy demand for the fruit packing cases also opened the floodgate of exploitation of Fir & Spruce in the hitherto considered accessible areas putting on enormous pressure on the safety of Wild Life and soil as well.

The position of Wild Life in the catchment area is deplorable and main emphasis for the Wild Life management is on the protection and conservation of Wild animals and birds. The department besides its Wild Life wing is active in anti-poaching activities by side it is taking many steps to build congenial atmosphere and circumstances for conservation and multiplication of Wild life although department is treating the pasture and barren forest areas with grass and broad leave species which are of interest to the Wild Life. This is a step in the direction of habitat improvement. Lots of measures are being taken to protect the forest from fire. Since the area has perennial sources of water, there is no problem of water, but the domestic and stray cattle have infiltrated into the domain of the Wild Life. If any Wild Life animal per chance comes into the human inhabited areas and dues some damage to the human or cattle or the crop, adequate compensation is being given to the effected party. The faunal species that are in the Great Himalaya National Park and are occasionally near to the catchment area, adjoining the National Park are Yellow Throated Martan, Musk Deer, Barking Deer, Serow, Himalayan Thar, Ibex, Blue Sheep, Himalayan Black Bear, Himalayan Brown Bear, Snow Leopard and Common Leopard. Amongst the pheasant species Western Tragopan, Monal, Cheer Pheasant, Koklas, Pheasant, and Kalij Pheasant are the Wild Life reported to be in the Great Himalaya National Park.

It becomes important to go in for bio-diversity conservation that will improve the environment and protect the bad status of Wild Life in the catchment area.

3.2 Flora of the CAT Plan area.

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The Catchment Area falls in sub tropical zone with respect to its location from the equator. Because of its location in lesser Himalayas which can be referred to the map on Drainage Network And Catchment Regions, Major Mountain Ranges in Himachal Pradesh. The catchment area lies in between the Pirpanjal Range and Dhaula Dhar Range. There is a great variation in altitude at the Larji Dam Site (2299mtr MSL) and Rohtang, Sirikand Mahadev on Banjar border, Inder Tibba, Dibi Bokri etc. are the highest points on the border i.e. the track embraces climatic zones of sub tropical to alpine. Therefore, various types of forests from sub-tropical to alpine occur at various places. The aspect, slope and the edaphic factors influence the type of vegetation giving rise to local variations in the altitudinal zonations.

Generally the forests of various types occupy definite altitudinal zones but examples of local variations due to aspect, slope, moisture and soil are also seen frequently. All the important conifers i.e. Silver Fir, Spruce, Deodar, Kail, and Chil occur in the CAT Plan Area. The moist places along nalas and river banks are occupied by various broad leave species like Kosh, Khanor, Walnut, are also found in their altitudinal zone, Kharsu occupying the highest places, while Ban occupying the lower elevations. A host of other broad leaved species are also found in different altitudinal zones.

Normally on the ladder of altitude, Chil occupies the lower most elevation among the conifer, and then comes Kail-Deodar and Deodar-forests, till Deodar-Spruce belt extends into Spruce - Fir zone. At the tree limit Juniper (dwarf) are met.

3.3 Position of Medicinal Plants,

The position of the medicinal plants in the area is getting worse day by day. As per the settlements the right holders are permitted to remove roots, flowers, fruits, grass and other medicinal herbs and their parts free of charge from the forests wherein rights have been recorded. Such rights have been recorded for each forest. The right holders can also sell certain minor forest produce extracted from the forests. With the permission of Panchayats the traders can collect the NTFP from the right holders, and this has played a bad role in the exploitation of the medicinal plants. Many of the medicinal plants have been classified as endangered and are at the thresh hold of extinction.

3.4 Position of Soil and its Conservation.

The developmental activities like road construction, various project activities, house constructions, water supply schemes, communication activities non scientific agricultural activities etc. have accelerated the pace of soil erosion and is bound to stop with the saturation and till that date the mother earth has to bear the damages caused by these activities.

The department has always been insufficient in funds for soil conservation activities. However, some efforts have been made in few of the places but, a lot has to be done to check the soil erosion. Also due to the biotic factors i.e. trampling of grass lands by the increased cattle, fires, deforestation has been noted in the area which has increased the soil erosion.

3.5 Climatological Changes.

It is not only the catchment area that is proposed to be treated experiencing the wrath of environmental problems that may be the green house effect, the dwindling state of Wild Life, many of medicinal plants are at the verge of extinction. The water table has gone down. The rains are erratic and irregular, some times the dry spell is for many months and some times there is a heavy down pour that the life and property is even endangered. During the field visits people have said that the times have come when even the birds do not have a space or a tree fit enough to built its nests. The atmosphere is chemically charged. The issue here is not the debate on environmental conservation but treatment of the catchment area of the Larji Hydro electric Project and it is not an exaggerated statement that on this earth if even the smaller areas develop that will lead to a better place to live in.

To hold back the soil and improve the environment, it has become necessary to identify the entry points, vulnerable areas, for the better planning of the Catchment Area and further suggest strategies for sustainable development, which is socially relevant, economically viable, environmentally safe, and eco-friendly.

Chapter 4

CAT Plan Area.

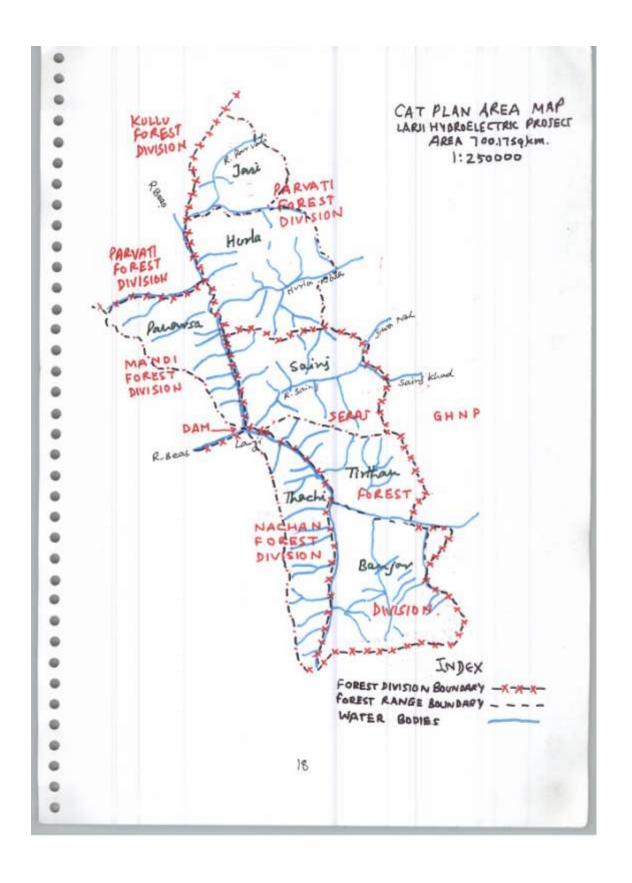
The Catchment of River Beas is 13,663 sq. km. The Catchment of the Larji Hydroelectric Project is the starting portion of the Catchment of River Beas up to the dam site and is spread over an area of 4921 sq.kms. It is situated between 31 31 N Lat. to 32 25 N Lat. and 76 56 E Long. to 77 50 E Long.

The present plan is being formulated for an area of 835.96 sq km out of the total catchment of 4921 sq. km. upto Larji , and it is situated between 31 31 N lat. to 32 0 N lat. and 77 5 E Long. to 77 27 E Long.

The detail is as under: -

Main River at Kullu	Catchment Area	CAT Han Area
Sarvari Khad Parvati river Hurla nalla Sainj Khad Tirthan Khad Small khads upto	1171 sq. km. 205 sq.km. 1660 sq.km. 192 sq.km. 800 sq.km. 717 sq.km.	154.32 sq.km. 100.00 sq.km. 118.44 sq.km. 308.34 sq.km.
barrage site	176 sq.km.	154.87 sq.km.

Trat sq.am.	835.96
The break up of the CAT Plan area of Seraj Forest Division	760.11 sq. km. is:
Banjar Forest Range - Tirthan Forest Range - Sainj Forest Range- Nachan Forest Division Thachi Forest Range -	127.91 sq km, 89.16 sq km, 118.44 sq km, 91.27 sq km,
Mandi Forest Division Panarsa Forest Range - Parvati Forest Division	81.56 sq km,
Hurla Forest Range - Jari Forest Range - Bhuntar Forest Range Wild Life Division Kullu	127.68 sq km, 64.15 sq kms 59.94 sq.kms
Khokhan WL Sanctuary Kanawar WL Sanctuary	13.36 sq. km s 62.49 sq. km s 835.96 sq km



Objectives and problem analysis of CAT Plan.

The soil erosion in the catchment or any area would reduce the productivity of land, effect adversely the local water supplies, cause aridity in the climate, and promote the frequency of land slides/slips. This will pose serious problems by increasing the siltation rate in the reservoir of the project and heavy floods down stream. So it is better to treat the catchment and try to reduce the silt inflows, instead of going for carrying out expensive and difficult operation of de-silting of reservoir and water. To check siltation is the objective and thus it is imperative that massive afforestation, soil and moisture conservation programs are taken up in the area.

The sustainability of the Hydroelectric Projects, to a larger extent depends on the regular supply of water; and water in the rivers comes directly from the rains or the seepage of water or the melting of snow. The winters should have sufficient snow, for the project requires water in summers. It should rain in rainy season so as to fill the reservoir, for the project requires water before the winter season. This objective of regular sustainable supply of water to the Hydroelectric Projects can only be achieved if there is ecological balance, the forests are well stocked, the ground cover is covered by the grasses, shrubs, bushes, and the trees.

The dependency of people on the forests and natural resources can not be ruled out. Alternatives need to be supplied. If the pressure is not decreased the ecosystem and the socio-economic conditions of the people of the area will not improve and the land would go on degrading.

Land is a core requirement for human beings and their settlements. Almost all the activities are associated with and are dependent on land. This resource, which is non-renewable, is also limited. The land use pattern determines the socio-economic and cultural complexion of a polity. Economically the concept of land does not merely denote the surface of the soil but also represents all those resources, which are gifts of Nature. LAND when defined includes not only its visible surface, but also includes flora, fauna, air, sunshine, precipitation and underground resources.

As long as population was with in the load-bearing capacity of the earth, everything went well, but once the balancing line was crossed, a proper stocktaking of the land use pattern with all its ecological implications became necessary. With the increase in population, the pressure on land has increased. The population of Himachal Pradesh was 19,20,294 with a density of 34persons

per sq.kms. in the year 1901. It was 51,70,877 in 1991 and the projected population as in 2001 is 62,70,900 with a density of 113 persons per sq.km. It is not only the human population, which affects the biomass, but also the livestock

population, which is about 55.48 Lac. Thus we can imagine the total biomass competing for survival on an inelastic supply of land.

It is, however, very important that the problems relating to land use are identified and immediate remedial measures initiated through proper prospective planning in the best interest of the Larji hydroelectric Project and of optimum land use. It is important to initiate necessary measures to preserve the run-off water and also to further strengthen the irrigation base by making maximum use of available water resources as this will help in improving pasture land management of the species suited to that area.

The importance of forests in the Catchment Area and in the geographical set-up of a State like Himachal Pradesh cannot be over-emphasized. Forests constitute a critical resource for the survival of our habitat, future projects and they do play a vital role in our life-support system.

For the loose soil to be held back, with this background, and in depth study of the CAT Plan area, the following points emerge, which need our attention for the stability of soil.

- a) the degraded areas need to be planted with suitable species,
- b) the covered areas need to be protected,
- c) the grassland areas need to be managed for fodder production,
- the run-off water needs to be harvested by way of gully plugging, check dams and the check walls on the nallahs, and
- e) the river water needs to be trained.

 n) moisture needs to conserved by way of contour trenching,
 - earthen dams.

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This will not be sufficient if the agricultural and horticultural practices of the people in their personal fields are unscientific and detrimental to the formation and preservation of the soil.

Since every area has its own problems and solutions, the planning/treatment has to be **SITE SPECIFIC.** The area may require any one of above treatments or combination of different treatments, as its proper cure.

Therefore, there is an urgent need of structural land use planning and management of the Catchment Area in order to have a optimal hydrological functioning of the region. In the disguise of CAT Plan, the need of the hour is the effective soil and moisture conservation measures and there by conserving and preserving the **BIO-DIVERSITY**.

Larji Hydroelectric Project

Chapter 6

Geological Structure

Himachal Pradesh with its complex Geological Structures presents an interesting museum of stratigraphy. Geology, rocks and soil effect the vegetation of a place by influencing the moisture regime, structure, texture and drainage of the soil. Therefore the study of geology, rocks and soils is very important from the point of view of forestry management.

According to Geo-synclinal and Plate Tectonic Theories, the Himalaya which constitute the major segment of Himachal Pradesh – have come in to existence due to sedimentation in the Tethys area and movement of the earth's northern and southern landmasses. The folding and faulting of these sediments during Eocene, Miocene and Pliocene periods have shaped the structure and of this hill and mountainous state. Himachal Pradesh can be divided into four major divisions, viz.

 Outer Shiwaliks, The Outer Shiwaliks are made of recent alluvium.

Shiwaliks,

The Shiwaliks are made up of rocks, which came into existence during Pilestocene, Oligocene, Eocene, and cretaceous periods. The districts of Una, Parts of Bilaspur, Hamirpur, some parts of Solan and Kangra are characterised by these types of deposits. The important rocks are shale, sandstone and clay. The Shiwaliks are separated from the central Himalaya by the great boundary faults and thrusts that run north to south.

3. Central Part,

The Jatog group of rocks, which originated in the middle of the proterojoic period, mainly represents the central part of Himachal Pradesh, which extends from Chamba district in the north, to Shimla district in the south. Shimla presents a very complicated rock system such as the Shali, Diaban and Larji groups- besides the Jatog group. Karol series are also found in this area. The Rampur-Banjar area, presents the Mandhati- Chandpur formation & this is bordered by unclassified granites in the north eastern part extending between Kullu, eastern Shimla, Lahaul & Spiti and parts of Kinnaur District. The Haimanta group of Cambro-silurian period extends in patch from north to south in between Lahaul & Spiti and Kinnaur districts.

4. Eastern Part.

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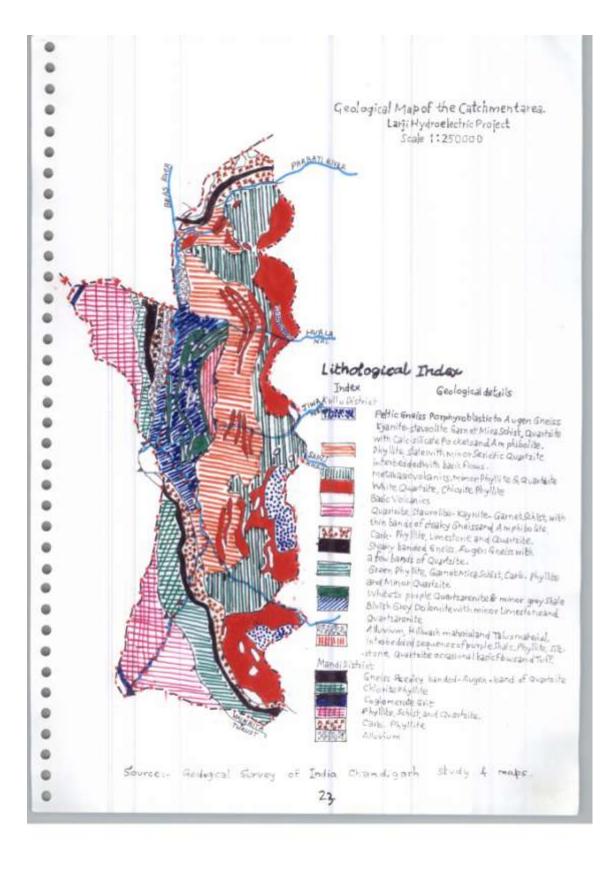
The eastern greater Himalayas present the Triassic formation, which is found in Kaza-Tehsil of Lahaul & Spiti district. The quartzite rocks of Devonian period are found in Manikaran, Nagthal and Muh. The northeastern part of Kinnaur district is characterised by Blaini formation of Permocarboniferous period.

Larji Hydroslectric Project -

The planning about the Catchment Area necessitates us to study and know about the geology or the lithology, i.e., the description of rocks through its grain size, structure, mineral content (as far as possible), the soils, and general appearance of rocks and soils in the Catchment Area. The soil is developed from the underlying parent rock, its softness or hardness, its mineral content, and its nature will help us decide, about its soil conservation measures and species to be planted.

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The basic material for the formation of rocks is the silica or quartzite that is also referred to as Silicon dioxide or the sandstone. When this very SiO2 combines with K2O, Na2O, Al2O3(OH)SiO3 Clay is formed, thus Clay is the hydrated silicate of Sodium, Potasium, and Aluminium... Clay when subjected to high temperature and pressure combines with Carbon becomes Shale, which then changes to Slates and further to Phyllites, and if this Phyllite combines with Mica it becomes Schist. Phyllite is Clay and Quartz is SiO2, which when subjected to high temperature and pressure becomes Quartzite (metamorphosed sandstone) and further to Porphyrite. Granite is the Quartz + Felspar + SiO2. Staurolite is the (Fe Mg) 2 (Al Fe) Si4 O16 (OH)2. Amphibolites are the hydroxylated chain silicates with some substitutions of F, Cl for (OH). The Sericitic Quartzite are the secondary micas of muscovitic composition, resulting from the hydrothermal alteration of rockf orming silicates. Garnet Schist is the Ca₂ Al₂ Si₃ O₁₂. Dolomite and Limestone are the rocks containing more than 50% carbonate as Ca.Mg.CO3 Mica is the sheet of cations of (Fe 2+, Fe 3+, Mg, Al) and hydroxyl anions (OH)-.



Chapter 7

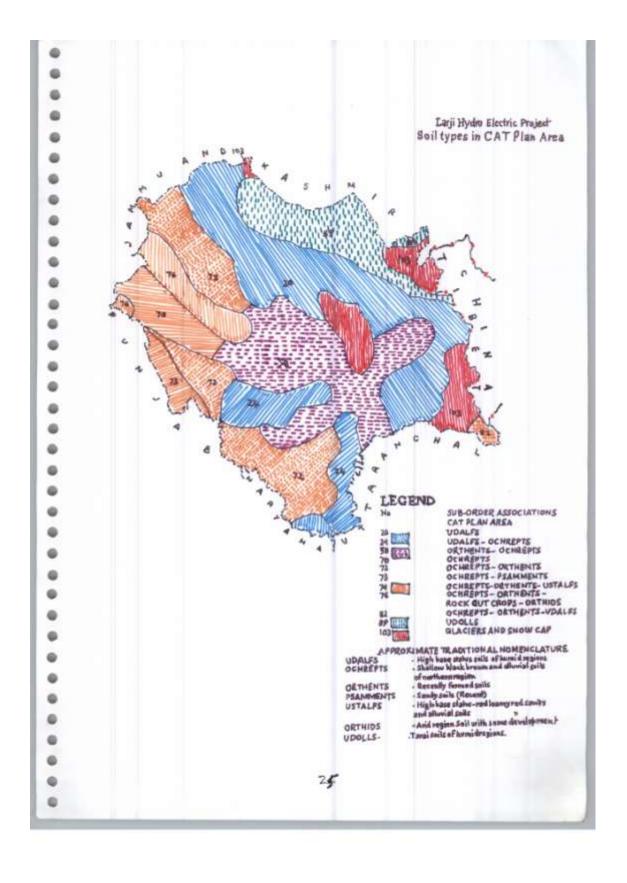
Soil profile & its loss in to the water.

According to the Agriculture Development report of Himachal Pradesh, the soils have been classified into five groups based on climate and altitudes: (i) low hill soil zone which extends up to an elevation of 900 mts in the subtropical areas, (ii) mid-hill soil zone which extends to an elevation of 900 mts to 1500 mts in the semi-temperate areas, (iii) high-hill soil zone which extends to an elevation of 1500 mts to 2100 mts in the temperate conditions, (iv) mountainous soil which extends between 2100mts to 3000 mts, and (v) dry hill soil zone which are found in Lahaul & Spiti, Pangi and Kinnaur where rainfall during the monsoons is insignificant.

Different types of soils are formed under different climatic and vegetative conditions. The under lying rocks play an equally important role in the formation of soils. While the physical contents of the soil are made after weathering of the underlying rocks, climatic conditions, vegetative cover and other edaphic factors influence the mineral and organic contents of soil. The type of soil determines the type of vegetation in a broad climatic zone.

As we look into the enclosed Geological Map of the Catchment Area, the composition of under lying rocks is quite clear as the underlying rocks are quartzite, schist, phyllites, dolomite, limestone, shales, slates, gneiss and granite. Which are responsible for a variety of coniferous and broad leaf vegetation. It would be quite useful and helpful to know the soil above the base rocks. However, the soils of Himachal Pradesh vary according to aspect, slope and climatic conditions. They may be classified as brown hill soils and sub montane soils. The brown soils are found in the Shiwaliks and Lesser Himalayan regions and cover 42.16 percent of the state's area. The middle and greater Himalayan zones are characterised by podsolic and sub-montane type of soils and these cover nearly 46.07 percent area of Himachal Pradesh. The soil in the CAT Plan area is a combination of black, brown and alluvial soils. They may also be shallow black as well as red loamy and red sandy in nature. The glacial and eternal snow types of soil cover an area of 11.77 percent. These soils are not fully developed as these are found in the snow-covered areas. The soils of Himachal Pradesh are usually thin and are deep only in the valleys.

If we go into the details of the formation of soils we will find that, the soils in the Himalayan region change frequently, depending upon the underlying rocks and the effect of various agencies from time to time. However, the gneiss and schists type of rocks gives rise to sandy loam, lateritic type of soils, which are rich in iron and alumina, the cohesive power and the fertility of which depends on their organic matter content. The loamy soils are conducive to the growth and



development, of both Deodar and Kail. On higher elevations, the forest soil is thick, un-decomposed, the humus is acidic, because of low rate of decomposition and deficiency of broad leaf trees. The un-decomposed soil creates problems in Spruce and Silver Fir forests, as natural regeneration is hampered, since the seed does not reach the soil. The red soils are found on the granite and the gneisses; these are deficient in phosphorus, lime and nitrogen. Shale and slates give rise to clayey loam soils. Black ruby loam is derived from the black shale and slates. Alluvial soils are formed due to erosion mainly by water and landslips. In this process the weathered material is transported and is deposited at a place other than its origin. In such cases the underlying rocks have little role to play in influencing the vegetation on alluvial soils. Such soils are found deposited in the basins of the rivers and along the banks of the rivers. The sandstone, siltstone, and quartzite yield sandy soil. Disintegrated quartzite supports superior quality of Chil, but is detrimental to Deodar.

Since the tract we are dealing in, is hilly with the slopes ranging from moderate to steep and precipitous, there is variety in the soils and also there is variety in the species and they are influenced by the environmental factors, and of course the edaphic factors. The tracts are well drained because of the steepness. It is therefore, the organic matter content and the depth of soil which influences the type of vegetation. The soil of Fir forest is very rich in humus while that of Deodar and Kail forest is poor in organic matter content and therefore is friable and liable to be easily eroded. Soils, in the adjoining villages, and in the forests have deteriorated, on account of incessant removal of litter from it. Erosion is frequent over such steep lands that lack vegetation cover and unchecked grazing accelerate slips. Unchecked breaking of lands for agriculture, horticulture, roads, and other developmental activities accelerate the process of degradation.

7.1 Soil loss

The Rainfall Erosion Index R. is a measure of the erosive force and intensity of rain in a normal year. The two components of the factor are the total energy and the maximum in 30 min intensity of storms. The rainfall erosion index is the sum of the product of all the major storms in an area during an average year. R. should not be considered a precise factor for any given year or location. Its principal value, and that of the soil loss equation itself, is used as a predictive tool and risk evaluator. Construction activities in areas with high R values will require greater attention to erosion control practices than construction in areas with lower R values.

R was calculated by using rainfall data. Results of investigations show that R-values could be approximated with reasonable

accuracy by using 2 year, 6 hr rainfall data. Regression equations for three different storm types (I,IA and II) are used to calculate R values. A storm type is distinguished by the rainfall distribution within the storm. Type I and IA storms occur in maritime climate. Type II storms are characterized by gradually increasing rainfall followed by strong peak in rainfall intensity that tapers off to low-intensity rain Type II storms are the one observed to be occurring in Himalayas. The differences in peak intensity are reflected in the coefficients of the equations for the rainfall factor. The equation used to a type II storm is

R= 0.029 p22.

6

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Where p is the 2 years, 6 hr. rainfall in millimeters. When the rainfall time distribution curves and the corresponding R-value equations are compared it is evident that the stronger the peak intensity of the typical storm, the higher the rainfall erosion index.

7.2 Estimating soil loss with the Universal Soil Loss Equation:

Soil conditions are a principal factor in determining the crosion potential at a site Soil Loss estimates are used for erosion control planning.

To identify erosion prone areas on site. 2.

To compare the effectiveness of different erosion control practices.

Thus by estimating soil loss, the crosion Catchment Area Treatment Planner will be able to avoid disturbing highly erodable areas and to select the most effective control measures for site.

A number of methods for assessing soil loss have been developed. They vary from simple qualitative models to elaborate watershed simulations. Qualitative models rely on subjective evaluation of a series of criteria. Watershed simulation models, empirical models are best suited to estimating erosion from very large areas and lack accuracy for use on small sites such as construction sites.

The Universal Soil Loss Equation (USLE) is an empirical model developed by the U.S. Deptt. Of Agriculture (USDA) to estimate sheet and rill erosion from agricultural lands. The equation has been tested worldwide in many countries. Some corrections and assumptions have been made for the various factors according to Indian conditions. Reference for this purpose can be taken from CWC's guidelines for sustainable water resources development & management.

USLE uses the USDA system of soil classifying the properties of soil. The USDA system of soil classification used by the U.S. soil Conservation Service (SCS) is directed at characteristics of soil important for agricultural uses, such as a texture, organic matter and nutrient content. A particle size analyses is necessary before a soil can be classified by using the USDA system.

Four soil characteristics that are important to the use of the universal soil loss equation and that effect erodibility are:-

> Texture Organic matter content Structure. Permeability.

7.3 Soil Texture:

Soil texture depends on the proportions by weight of sand, silt and clay in a soil, often referred to as the particle size distribution.

USDA Particle Size Classes

Particle Name Gravel Sand Very fine sand Silt Clay

2 - 0.10.1-0.05 0.05-0.002 Less than 0.002

Size (mm)

Greater than 2

The above table lists the USDA particle size classes. A triangle is used to present the soil texture names according to particle size content.

The percentages of sand, silt and clay in a soil add to 100. Sandy soils generally have a higher permeability than fine-textured soils have. The amount of run off is lower and since the particles are relatively large, they are not carried far in any runoff that does occur. Sand particles will settle out of runoff at the bottom of a slope or in a channel with a gentle slope.

Silt is the most important particle size class when soil erodibility is evaluated. The higher the silt content, the more erodable a soil is, because, silt-sized particles are small enough to reduce the permeability of a soil and are also easily carried by runoff. Control measures should be designed to prevent erosion of silt, or at least to contain it on site.

Clay is the smallest particle size class. A soil with high clay content tends to be quite cohesive. Runoff does not pick up clay particles as easily as it does silt. However, once clays are suspended in runoff, they will not settle out until they reach a large, calm water body.

It is easiest to prevent erosion of sandy soils, silts are most susceptible to erosion, but they can be recaptured on site by applying control measures. Clays are the most difficult to strap once erosion has occurred, so control measures must focus on preventing their erosion in the first place.

Although, texture is a principal soil characteristic affecting erodibility, organic matter, soil structure and permeability also have a strong influence on erosion potential of soil.

7.4 Soil Permeability

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Soil permeability refers to the ability of the soil to allow air and water to move through it. Soil texture, structure and organic matter all contribute to permeability. Sites with highly permeable soil absorb more rainfall, produce less runoff, are less susceptible to erosion and support plant growth more successfully.

Using the universal soil loss equation to estimate soil loss

The general form of the universal soil loss equation is

A=RxKxLSxCxP where

A= Soil loss, tons/ (acre year)
R= Rainfall erosion index, in 100 ft. tons/acre x in/hr.
K= Soil erodibility factor, tons/acre per unit of R.
LS= Slope length and steepness factor, dimensionless.
P= Erosion control practice factor, dimensionless.

The soil loss is an estimated annual average. The rainfail erosion index contains both an energy component and an intensity component. The LS, C and P actors are ratios of soil loss from the site to soil loss from a unit area of a standard plot with the following characteristics: - 22.1 m long, 9% slope tilled, bare soil.

CAT Plan Lucii Hydroelectric Project.-

To calculate soil loss, each of the factors is assigned a numerical value. The five factors are then multiplied together to produce an estimate of soil eroded from the site in an average year. Careful evaluation of site characteristics is important to obtain reasonable soil loss estimates. To produce the most accurate estimate of various factors controlling erosion, the entire catchment area has been divided into grids of 0.00020 in latitude as well as longitude.

The methodology used for evaluating these factors and the assumptions made are as follows

Rainfall Erosion Index,R

The equations used to calculate R is = 0.219 p22 (assuming type II storm as explained earlier.

Where p is the 2- year 6 hr rainfall in mm.

Rainfall Data has been collected from Indian Meteorological Department (IMD). The data is for 2 meteorological stations at Mandi and Shimla and is the average rainfall data for the last 40 years. The rainfall intensity has been estimated using the rainfall data averaged over the total number of actual rainy days. Average of the rainfall intensities for Shimla and Mandi has been used.

7.5 Soil Erodibility Factor, K

The soil erodibility factor K is a measure of the susceptibility of soil particles to detachment and transport by rain fall and runoff. Texture is the main factor affecting K but soil structure, organic matter and permeability also contribute. K values range from 0.02 to 0.69.

For Indian conditions, an equation for calculating K value has been formulated in the CWC's guidelines for sustainable water resources development & management. The equation, derived by using a Triangular Nomograph is as follows:

K= 0.07851 (% sand) 0.006x ((% clay)-0.1183x (%silt)0.466

The assumptions made this equation are

Content of very fine sands (0.05 to 0.1 mm) 15%

Organic matter in soil 2%

Rock content (% of soil particles greater than 2mm 15%)

For the present catchment area, actual soil testing has been done on day today basis and results shows that these assumptions made are correct and no corrections need to be made in the equation for evaluating K.

7.6 Length Slope Factor (LS)

The slope length gradient factor L.S. describes the combined effect of slope length and slope gradient. It is the ratio of soil loss per unit area on a site to the corresponding loss from a 22.1 m long experimental plot with a 9 percent slope. The slope gradient is attached to each grid using the slope map of the catchment area, whereas the slope length for the grid of approx. 20 m length in vertical, as well as horizontal direction .

1=	(1+ 2)20 2. taki	ng the average slope l	ength for each	grid.
LS=	(65.41* S2	4.56 *S	+0.065	1
	(82+10,000)	(S2+10,000)	- 0.000	72.5
LS= I= S=	Slope length fact slope length (m) slope steepness			
M=	0.2 for slope 0.3 for slope 0.4 for slope 0.5 for slope	1.0% 1.3% 3-5% 5%		

7.7 Cover Factor C

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The cover factor C is defined as the ratio of soil loss from land under specified crop or mulch conditions to the corresponding loss from tilled, bare soil. When the soil is bare, C is 1.0, whereas C for undisturbed native vegetation is assigned a value of 0.01. The value of C used for various land use class is given as Table:

Cover Factor, C
1
0.2
0.3
0.01

Open jungle	0.4
Scrubs	0.45
Built-up Area	0.01
Exposed Rock	0.001.
Water bodies	0.0001
Landuse class	-C factor
	-P factor depending on the slope.

7.8 Erosion Control Practice Factor P

The erosion control practice factor P is defined as the ratio of soil loss with as given surface condition to soil loss with up-and down hill plowing. Practices that reduce the velocity of runoff and the tendency of runoff to flow directly down slope reduce the P factor.

The agricultural land in the catchment area is under Terrace farming. The P factor for Terracing for varying slopes is as follows:

Practice	Land slope (S%)	р
Terracing	1.1-2.0	10.00
Terracing	2 1-7.0	0.45
Terracing		0.40
	7.1-12.0	0.45
Terracing	12.1-18.0	0.60
Terracing	18.1-24.0	0.70

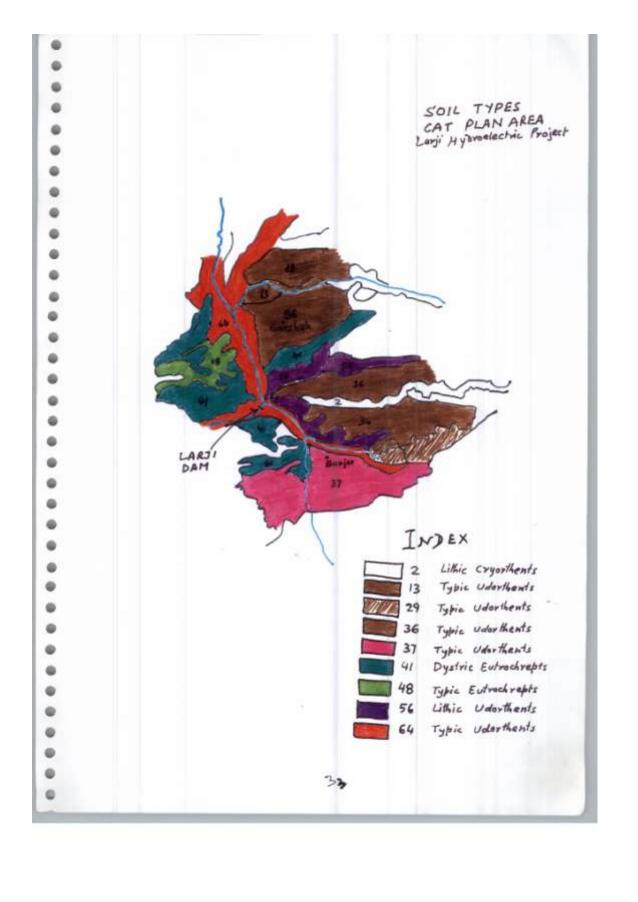
For non-agricultural lands, the value of P has been taken as 1 as no erosion control practice is being followed in the catchment generally. Combined effects of LS,C and R factors of the five factors in the USLE, the R,LS and C factors have the widest range. Although R for a site is constant and K is essentially a constant slope length and gradient, cover, and, to a limited extent, surface condition can be manipulated. Slope length and vegetative cover are the most effective and easily implement able measures.

7.9 Soil types in the CAT Plan Area

The soil types in the CAT Plan Area mainly Lithic Cryorthents, Typic Udorthents, Dystric Eutrochrepts ,Typic Eutrochrepts, Lithic Udorthents as shown in the map. The various areas shown in the map have been given numbers and against the number is the description of the soil types.

 Lithic Cryorthents: These are shallow excessively drained sandy skeletal soils on very steep slops with sandy surface, severe erosion and moderate stoniness associated with rock out crop.

13,29,36,37& 64. Typic Udorthents: Medium deep, excessively drained, mesic, sandy skeletal over fragmental soil on very steep



slopes with loamy surface severe erosion and moderate stoniness associated with rock out crop.

- 41. Dystric Eutrochrepts: Deep somewhat excessively drained thermic fine loamy soil on moderately steep slopes with loamy surface and severe erosion associated with deep well drained coarse loamy soil with loamy surface and severe erosion.
- 48. Typic Eutrochrepts: Medium deep well drained thermic fine loamy calcareous soils on moderately steep slopes with loamy surface and severe crosion, associated with medium deep well drained fine loamy soils with loamy surface moderate crosion.
- 56. Lithic Udorthents: Shallow excessively drained thermic loamy soil on very steep slopes with loamy surface and severe crosion associated with medium to deep well drained fine loamy soils with loamy surface moderate erosion.

7.10 Methodology of silt estimation in Larji CAT Plan.

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For the study of the rate of soil loss from the Beas River Catchment, actual report of the "Daily silt content in River Beas at Thalout for the year 2002" was procured from the records of Bhakra Beas Management Board Pandoh Office. They are actually carrying out the silt testing and observations at various sites, and one of them is Thalout i.e 1 Km from the Dam site.

Permanent staff has been deployed, who takes 5 litres of River Beas water and passes it through the graded sieves and grades the silt as coarse granules, medium granules, and fine granules. The fine granules go into the water, which is evaporated and all the granules are weighed.

If we see the details of the Silt Observations for the year 2002 which has been attached as bench mark, we find that: -

There is a flow of silt all the year around.

The intensity of silt varies during the months, it is minimum in the winter months i.e. January and increases considerably with the onset of summers and melting of snow.

 Then comes the rains and the water is heavily loaded with silt from 14.1230 gms/lit. in June, 22.7898 gms/lit. in July, 35.3818 gms/lit. in August, to 14.0973 gms/lit. in September.

The soil erosion intensity, the areas susceptible at different degrees were identified by actual surveys in the field and that has aided in site specific planning and formulating the approximate mitigatory measures of this CAT Plan.

CAT Plan Larji Hydroelectric Project -



Sainj Range



Hurla Range

CAT Plan Lary Hydroelectric Project - Site Specific Flanning

Daily Sift content in River Beas at Thalout for the year 2002

_		January			February			March	
Date		Medium	Fine	Coarse	Medium	Fine	Coarse	Medium	Fin
	granules	granules	granules	granules	granules	granules	granules	granules	granufe
10	gros/tit	gms/it	gms/it	gnistit	gros/lit	gmu/it	gms/it	gredit	granue
- 11		0.0040	0.0240	0.0032	0.0050	0.0240	0.0052	0.0078	0.044
- 3		0.0050	0.0200	0.0029	0.0046	0.0280	0.0058	0.0086	0.052
3		0.0046	0.0200	0.0034	0.0054	0.0240	0.0066	0.0008	0.064
4		0.0042	0.0200	0.0030	0.0048	0.0340	0.0062	0.0088	0.0566
5		0.0038	0.0200	0.0026	0.0042	0.0280	0.0056	0.0078	0.0521
- 6	0.0018	0.0038	0.0240	0.0038	0.0063	0.0320	0.0048	0.0076	0.0520
7	0.0018	0.004	0.0240	2.0044	0.0084	0.0400	0.0040	0.0070	0.0480
8		0.0043	0.0240	0.0050	0.0088	0.0400	0.0036	0.0066	0.0480
9		0.0036	0.0240	0.0056	0.0098	0.0480	0.0038	0.0072	0.0520
10		0.0044	0.0200	0.0048	0.0080	0.0440	0.0040	0.0080	0.0440
- 11		0.004	0.0200	0.0042	0.0076	0.0400	0.0045	0.0096	0.0480
12	100000000000000000000000000000000000000	0.0042	0.0200	0.0054	0.0082	0.0520	0.000	0.0000	V.V400
13		0.005	0.0240	0.0060	0.0096	0.0580	0.0044	0.0084	0.0600
14		0.0058	0.0280	0.0062	0.0086	0.9480	0.0054	0.0110	0.0720
15	100000	0.0062	0.0360	0.0050	0.0080	0.0480	0.0050	0.0064	0.0720
16		0.007	0.9400	0.0044	0.0074	0.0520	0.0062	0.0120	0.0800
17		0.006	0.0400	0.0048	0.0068	0.0520	0.0068	0.0136	0.0840
18		0.0056	0.0400	0.0054	0.0078	0.0480	0.0074	0.0150	0.0880
19		0.0052	0.0360	0.0058	0.0088	0.0560	0.0086	0.0210	0.0060
20	0.0030	0.0048	0.0360	0.0060	0.0092	0.0520	0.0096	0.0264	0.1040
21				0.0056	0.0086	0.0480	0.0110	0.0276	0.1120
22	0.0034	0.0068	0.0360	0.0052	0.0074	0.0440	0.0098	0.0266	0.1040
23	0.0035	0.0064	0.0280	0.0062	0.0098	0.0560	0.0088	0.0252	0.0960
24	0.0030	0.0054	0.0280	0.0058	0.0086	0.0480	0.0076	0.0232	0.0960
25	0.0032	0.0056	0.0320	0.0060	0.0068	0.0520	0.0066	0.0192	0.0880
26	0.0000		100000	0.0054	0.0078	0.0450	0.0062	0.0174	0.0840
27	0.0058	0.0052	0.0320				0.0054	0.0144	0.0800
28	0.0055	0.0048	0.0280	0.0048	0.0068	0.0480			0.0000
29	0.0048	0.0042	0.0280			1000	0.0058	0.0160	0.0960
30	0.0051	0.0046	0.0240				0.0072	0.0180	0.1040
31	0.0062	0.0052	0.0240				0.0078	0.0210	0.1200
um	0.0911	0.1427	0.8000	0.1299	0.2051	1.1800	0.1838	0.4140	2.1960
wr.	0.0031	0.0049	0.0276	0.0048	0.0076	OF STREET		TOTAL COOK	0.434897243
		0.0040	U.UE.TO	0.0040	0.0076	0.0437	0.0063	0.0143	0.0757
L	To	otal Sitt	1.0338	Te	otal Silt	1.5150	To	tal Sitt	2.7938

Based on SEMS Pursion S.H. observations labor of Thebad

CAT Plan Larji Hydroelectric Project

CAT Plan Larje Hydroelectric Project - Site Specific Planning

Daily Silt content in River Beas at Thalout for the year 2002

		April			May			June	
Date		Medium	Fine	Coarse	Medium	Fine	Course	Medium	Fin
	granules	granules	granules	granufes	granules	granules	granules	granules	granules
	gms/it	gms/tit	gmutit	gms/lit	gris/it	gnelit	gms/lit	gms/lit	gms/li
- 1		0.0124	0.1200				0.021	0.0296	0.2000
3	0.0102	0.0158	0.1400	0.0060	0.0102	0.1320	0.0188	0.0274	0.1840
- 3	8800.0	0.0130	0.1120	0.0068	0.0136	0.1400	0.0196	0.0286	0.1960
4 5 6	0.0078	0.0100	0.1040	0.0058	0.0094	0.1240	0.0282	0.0354	0.2340
- 5	0.0066	0.0096	0.0960	0.0074	0.0110	0.1600	0.0312	0.0372	0.2400
0	0.0066	0.0080	0.9880	0.0082	0.0158	0.1720	0.0342	0.0424	0.2540
7		0.0074	0.0840	0.0098	0.0174	0.1640	0.0360	0.0540	0.2560
8		0.0070	0.0720	0.0112	0.0216	0.1720	0.0410	0.0676	0.3000
9		0.0011	0.0800	0.0154	0.0284	0.1840	0.0432	0.0690	0.3760
10		0.0090	0.0760	0.1860	0.0362	0.2000	0.0390	0.0584	0.2800
11		0.0082	0.0920	0.0210	0.0400	0.2000	0.0450	0.0680	0.3200
12		0.0094	0.1040	0.0276	0,0450	0.2240	0.0406	0.0600	0.3000
13				0.0316	0.0510	0.2400	0.0522	0.0752	0.4200
14		0.0130	0.1200	0.0350	0.0544	0.2480	0.0496	0.0594	0.3840
15		0.0150	0.1320	0.0382	0.0602	0.2200	0.0400	0.0506	0.3400
16	0.0080	0.0124	0.1000	0.0360	0.0580	0.2000	0.0350	0.0410	0.4000
17		0.0150	0.1200	0.0432	0.0642	0.2440	0.0410	0.0490	0.3640
18		0.0170	0.1320	0.0600	0.0910	0.2640	0.0432	0.0560	0.3240
19	0.0072	0.0210	0.1520	0.0510	0.0732	0.2240	0.0274	0.0490	0.2840
20	0.0078	0.0238	0.1720	0.0409	0.0600	0.1840	0.0200	0.0366	0.2240
21	0.0066	0.0184	0.1800	0.8350	0.0690	0.1520	0.0236	0.0452	0.2040
22	0.0084	0.0258	0.1920	0.0322	0.0546	0.2800	0.0450	0.0710	0.3400
23	0.0096	0.0306	0.2200	0.0410	0.0732	0.3000	0.0600	0.0942	0.4600
24	0.0078	0.0210	0.1800	0.0380	0.0610	0.3240	0.0652	0.1200	0.5200
25	0.0216	0.0450	0.6600	0.0394	0.0574	0.2920	0.0710	0.1340	0.5640
26	0.0108	0.0376	0.4000	0.0290	0.0452	0.3600	0.0526	0.0920	0.4840
27	0.0098	0.0200	0.3440	0.0310	0.0420	0.2600	0.0680	0.1190	0.5400
28	0.0074	0.0178	0.2840	0.0276	0.0396	0.2920	0.0750	0.1452	0.5840
29	0.0060	0.0094	0.2000	0.0240	0.0330	0.2240	0.0816	0.1534	0.6200
30	0.0008	0.0110	0.1720	0.0190	0.0274	0.1960	0.0630	0.1024	0.5440
31				0.0157	0.0210	0.1720		-/3-0	
m	0.2250	0.4643	4.9280	0.9724	1,2830	6.5480	1.3122	2.0708	10.7400
r.	0.0078	0.0160	0.1699	0.0324	0.0428	0.2183	0.0437	0.0690	0.3580
	T	otal Silt	5.6173	Ti	otal Silt	8.8034	T	otal Silt	14.1230

Based on IVIME Pandon Sit observations taken at Thatour

CAT Plan Larje-Hydroelectric Project - :

CAT Plan Larji Hydroelectric Project - Site Specific Planning

Daily Silt content in River Beas at Ti	halout for the year 2002
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		July			August		- Contract of the Contract of	September	
Clate	Coarse	Medium	Fine	Coarse	Medium	Fine	Coarse	Medium	Fine
7	granules	granules	granules	granules	granules	granules	granules	granules	granules
	gme/sit	greatit	gms/lit	gms/lit	gros/kt	gms/tit	gms/lit	grafit	grans/6
- 1	0.0762	0.1472	0.5400	0.6280	0.1508	0.6000	0.1530	0.2000	0.4400
2	0.8340	0.1854	0.5640	0.0812	0.1832	0.7240	0.1274	0.2040	0.3640
3 4 5 6 7	0.1072	0.1892	0.6200	0.1148	0.1854	0.7800	0.1090	0.1652	0.3200
- 4	0.1144	0.2210	0.6440	0.0880	0.1340	0.5800	0.0986	0.1576	0.3000
- 5	0.0954	0.2002	0.5800	0.9420	0.1912	0.7640	0.0912	0.1524	0.2920
. 0	0.0842	0.1684	0.5640	0.1216	0.2252	0.7800	0.0874	0.1482	0.2540
7	0.0812	0.1564	0.4840	0.1234	0.2292	0.8000	0.0828	0.1440	0.2440
8 9	0.1026	0.1782	0.5200	0.1152	0.2000	0.7640	0.1236	0.2018	0.3400
	0.0928	0.1904	0.4640	0.1372	0.2240	0.8200	0.1082	0.1802	0.3240
10	0.1106	0.1932	0.5400	0.1390	0.2410	0.8600	0.0972	0.1662	0.2840
11	0.1190	0.2010	0.5240	0.1726	0.2840	0.9240	0.0892	0.1546	0.2640
12	0.1084	0.1870	0.6240	0.1972	0.3210	0.0960	0.0856	0.1492	0.2440
13	0.1310	0.2200	0.5800	0.2852	0.4832	4.3840	0.1016	0.2062	0.6680
14	0.1294	0.1945	0.5640	0.3580	0.5644	4.6200	0.1638	0.2600	0.8600
15	0.1564	0.2346	0.6000				0.1108	0.1852	0.5840
16	0.1160	0.1922	0.5840	0.1506	0.2248	1.8600	0.0852	0.1472	0.4600
17	0.1328	0.2940	0.6200	0.0852	0.1560	0.9440	0.0460	0.0870	0.3200
18	0.1274	0.1890	0.6040	0.9630	0.1064	0.6600	0.0453	0.0790	0.2640
19	0.0880	9.1520	0.5560	0.0310	0.0804	0.4240	0.0428	0.0742	0.2440
20	0.0942	0.1600	0.4800	0.0372	0.0758	0.2800	0.0392	0.0676	0.2240
21	0.1136	0.1914	0.5800	0.0406	0.0780	0.2440	0.0368	0.0654	0.2940
22	0.0806	0.1452	0.4400	0.0352	0.0684	0.2000	0.0346	0.0582	0:1840
23	0.0542	0.1040	0.3200	0.0443	0.0710	0.2200	0.0276	0.0512	0.1600
24	0.0416	0.0756	0.2640	0.0628	0.0920	0.2640	0.0180	0.0270	0.1400
25	0.0510	0.0928	0.3040	0.0962	0.1352	0.3000	0.0150	0.0210	0.1240
26	0.0456	0.0872	0.2880	0.1200	0.1800	0.3640	0.0110	0.0192	0.0960
27	0.0494	0.0926	0.3000	0.1520	0.2242	0.4200	0.0090	0.0170	0.0920
28	0.0622	0.1054	0.3240	0.1732	0.2462	0.4840	0.0084	0.0150	0.0840
29	0.0432	0.0772	0.4400	0.1684	0.2242	0.4400	0.0070	0.0142	0.0800
30	0.0450	0.0852	0.3800	San			0.0056	0.0136	0.0720
31	0.0372	0.0590	0.2600	0.1966	0.2682	0.5240			
um	2.7742	4.8596	15.1560	3.5464	5.8474	25.9880	2.0617	3.4916	8.5440
VI.	0.0895	0.1568	0.4889	0.1223	5.8474	0.8961	0.0687	0.1164	0.2848
- 1	7	otal Sift	22.7898	T	otal Sit	35.3818	T	otal Silt	14.0973

Based on ROMS Pandon Sitt abservations belon at Thebut

CAT Plan Larji Hydroelectric Project -

CAT Flam Larji Hydroelectric Project - Site Specific Flamming

Daily Silt content in River Beas at Thalout for the year 2002.

		October	-		November			December	
Date	Coarse	Medium	Fine	Coarse	Medium	Fine	Coarse	Medium	Fine
	granules	granules	granules	granules	granules	granules	granules	granules	granules
- 1	gmsfit	gms/it	gms/it	gms/tit	gmeRit	gms/lit	greefit	gms/lit	gms/it
1	0.0072	0.0144	0.0840	0.0028	0.0054	0.9400	0.0028	0.0048	0.0400
2				0.0032	0.0062	0.0400	0.0024	0.0040	0.0360
3	0.0064	0.0126	0.0800	0.0030	0.0058	0.0360	0.0022	0.0036	0.0320
4	0.0058	0.0118	0.0760				0.0020	0.0034	0.0260
5	0.0052	0.0110	0.0720	0.0026	0.0050	0.0360	0.0026	0.0042	0.0320
6	0.0048	0.0102	0.0680	0.0026	0.0056	0.0320	0.0030	0.0058	0.0360
7	0.0044	0.0092	0.0640	0.0024	0.0046	0.0320	0.0036	0.0050	0.0360
8	0.0040	0.0054	0.0600	0.0022	0.0042	0.0320	0.0028	0.0044	0.0320
9	0.0034	0.0072	0.0560	0.0026	0.0048	0.0320	0.0024	0.0038	0.0320
10	0.0030	0.0064	0.0560	0.0024	0.0044	0.0280	0.0026	0.0040	0.0320
11	0.0028	0.0058	0.0520	0.0022	0.0040	0.0290	0.0022	0.0036	0.0280
12	0.0032	0.0062	0.0820	0.0020	0.0036	0.0280	0.0020	0.0032	0.0280
13	0.0026	0.0054	0.0520	0.0018	0.0030	0.0280	0.0018	0.0030	0.0280
14	0.0022	0.0046	0.0520	0.0016	0.0028	0.0326	0.0020	0.0035	0.0320
15	1000		20000	0.0020	0.0032	0.0320	0.0016	0.0030	0.0320
16	0.0020	0.0042	0.0480	0.0022	0.0038	0.0320	0.0022	0.0040	0.0360
17	0.0024	0.0048	0.0480	0.0018	0.0034	0.0280	0.0018	0.0034	0.0360
18	0.0032	0.0060	0.0560	0.0024	0.0042	0.0280	0.0020	0.0038	0.0320
19	0.0026	0.0056	0.0520				0.0024	0.0042	0.0320
20	0.0026	0.0050	0.0520	0.0026	0.0044	0.0280	0.0028	0.0044	0.0320
21				0.0022	0.0040	0.0280	0.0024	0.0040	0.0320
22	20000	100000	200000	0.0019	0.0036	0.0240	0.0027	0.0048	0.0360
23	0.0032	0.0058	0.0580	0.0020	0.0038	0.0240	0.0032	0.0054	0.0360
24	0.0030	0.0056	0.0560	0.0017	0.0032	0.0240	0.0036	0.0060	0.0380
25	0.0026	0.0048	0.0520	0.0024	0.0036	0.0280	0.0040	0.0064	0.0400
26	0.0028	0.0052	0.0480	0.0030	0.0046	0.0280	0.0038	0.0060	0.0400
27	0.0024	0.0042	0.0440	0.0026	0.0040	0.9320	0.0032	0.0056	0.0360
28	0.0021	0.0038	0.0440	0.0024	0.0038	0.0320	0.0030	0.0054	0.0360
29	0.0018	0.0034	0.0400	0.0022	0.0032	0.0260	0.0028	0.0048	0.0320
30	0.0022	0.0040	0.0400	0.0020	0.0028	0.0280	0.0030	0.0056	0.0320
31	0.0020	0.0036	0.0360				0.0036	0.0050	0.0320
	0.0901	0.1792	1.4960	0.0650	0.1150	0.8480	0.0825	0.1381	1.0400
	0.0033	0.0066	0.0554	0.0023	0.0041	0.0303	0.0027	0.0045	0.0335
	T	otal Sitt	1.7653	T	otal Silt	1.0280	T	otal Sitt	1.2606

Resed on \$6MB Purckin Silt observations below at Thelesal

CAT Plan Larji Hydroelectric Project -

Chapter 8

Topographical Features with physiography, relief and drainage pattern in the Catchment Area.

The drainage area of the catchment is spread over an area of 4921 sq.kms. It is situated between 31 31 N Lat. to 32 25 N Lat. and 76 56 E Long. to 77 50 E Long. The drainage pattern of the CAT Plan area has been marked in the map showing the "Drainage Network and Catchment Regions".

The complex geological structure of Himachal Pradesh has risen to complicated topographical features, which comprises an intricate mosaic of mountain ranges, hills and valleys. The topographical features of Catchment Area may be gauged from the maps attached.

The area falls in the Lesser Himalayas, which extend from 65 to 85 kms with an average elevation of 3300 mtrs above mean sea level. The CAT Plan area falls between the Dhauladhar Range and Pirpanjal Range as marked in the map showing the "Major Mountain Ranges". This zone is marked by a gradual rise towards the Dhauladhar and Pirpanjal ranges. The elevation of Dhauladhar range varies between 3600 mtrs to 4500 mtrs above mean sea level and its altitude increases abruptly in the Kangra valley. The average elevation of the peaks of the Panjal range is 4600 mtrs.

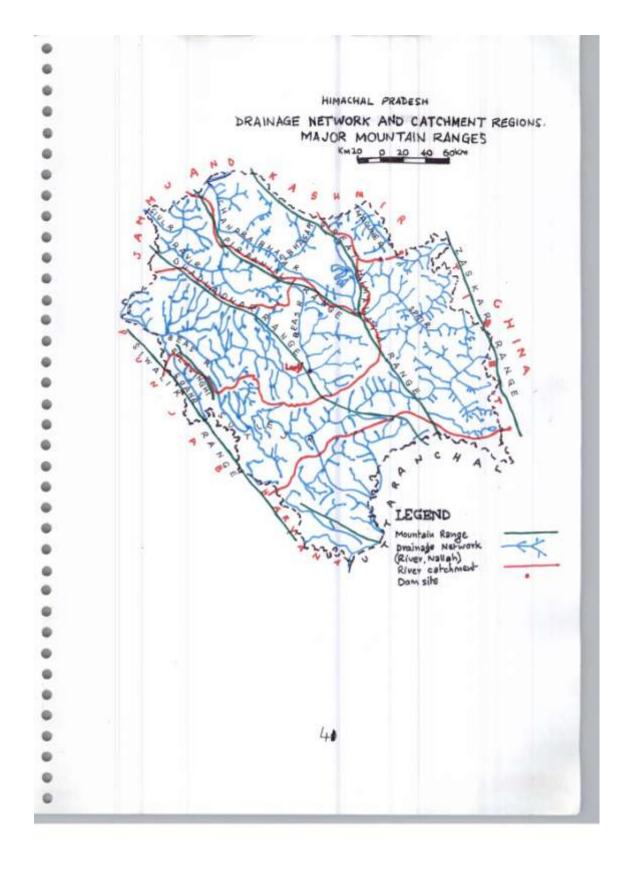
To the north of the CAT Plan Area lies the Bhunter Forest Range and Kullu Forest Range which are also the boundaries of Paavati Forest Division and Kullu Forest Division respectably and it is separated by the Bijni Mahadev and Pinsu Forest Top. Below it flows the Parvati River.

To the East is the Shat Nalla , which is also the boundaries of Dhara Block of Jari Forest Range . In the resent past there was a cloud burst and many people died at Shat and the same direction is the Najan Nalla of Hurla Range Great Himalayan National Park , adjoining to the complete Banjar Forest Division.

To the south is the Jalori Pass and Jogni Galoo dividing the water shed of Beas and Sutlej Rivers,

To the west of the catchment is the top boundary of Thachi Forest Range with its boundary as Deokanda Dhar and Tunga Devi Dhar of Panarsa Forest Range.

CAT Plan Larji Hydroelectric Project + +



The topography of the area is very undulating and the catchment area is traversed by several prominent ridges dividing the catchment of Sainj, Tirthan and Beas Rivers. While Sainj and Tirthan River drain from north east and east to north west and west and meet at Larji, Beas drain from north to south upto Larji and then traverses towards west. The drainage pattern is also clear from the administrative and executive maps of the Ranges. All the small rivulets have been marked on these maps.



Erosion at top-Effect at bottom Sainj Range

CAT Plan Largi Hydroelectric Project - 77 - 75 - 20 16:

Socio-economic conditions pattern in CAT Plan Area

9.1 Socio- economic conditions - Natural Resources.

The biggest natural recourse at present is the human population and it has immensely put overload and pressure on environment for use and over use.

The people of the area are hardy and their main occupation is cultivation, agriculture as well as horticulture and rearing of sheep and goat to meet out their cash requirements for their livelihood. Land holdings are very small and the crops are dependent on the rains and are thus rain fed.

The dependency of people in the catchment area or else where is on the forests, may be for fuel wood, timber, fodder, grazing of ever increasing cattle population. The minor forest produce in the form of medicinal plants has given a boost to the economy of the people. In the Sainj valley and Garsa valley there are slate mines. But these have been over exploited and are in bad shape. The forests have also been over exploited for timber and are heavily lopped. This has resulted in the over exploitation of natural resources and there by opened the land for soil erosion.

9.2 Land Use Pattern & Cropping Pattern.

For the study of land use pattern, forest cover maps based on digital interpretation of IRS-IC LISS-III data, for the period Nov. 1998 along with the survey sheets have been taken into consideration and verification in the field has been done.

The area being hilly, mountainous with slopes ranging from moderate to steep and precipitous, the agriculture fields are situated on slopes in-terraces and flat fields are rarely met with. The fields are very small and narrow strips mainly with every rain lots of newly ploughed soil is washed away. Due to uneven, unequal distribution of rain falls and there by low production of agriculture as well as horticulture crops, the people have shifted to cash crops like the vegetables.

Scope of the CAT Plan.

The Larji Hydro Electric Project, with an installed capacity of 126M.W. is being constructed on the confluence of River Beas, Sainj and Tirthen at Larji near Aut. Since the catchment area is quite large i.e. 4921 Sq.Kms. and prone to floods during the rains. The area is also subjected to landslides. These land slides some times block the passage of rivers, which then leads to formation of small reservoirs. The pressure built by these reservoirs, when released cause havoc down stream.

Over much of this catchment area, conditions are not very conducive to vegetative growth. It is quite difficult and expensive to treat the whole of the catchment area out of the total expenditure of one project. When to tap the large hydro electric potential of the rivers, a number of projects are coming upstream i.e. other power projects are being installed in the same catchment area and other bio-diversity projects are being implemented in the catchment area.

Taking of macro view of the Beas Basin the immediate catchment which is not coming under any treatment has been taken into consideration into the CAT Plan and there is great scope to treat this area which is 700 Sq. Kms. As on today the areas proposed for work are available, the funds need to be provided as proposed immediately.

Muck that has come out of the construction of the tunnels and its disposal is of great concern, for the life of downstream projects and the agricultural fields of the public, so a rehabilitation plan for the dumping site has also been proposed.

Methodology in preparation of CAT Plan

Mostly it has been seen and felt that it is not possible to treat all the deteriorated area in whole of the catchment simultaneously due to physical and financial constraints. There may be areas, which may require immediate attention due to its degree of degradation, and thus priorities have to be set. The field surveys have helped to set the priorities. The main criterion for prioritization is the area, which produces the maximum sediment, whose slope is more than moderate to steep.

These are the days of bottom up planning as it is rightly presumed that the person who is actually working in the field should be consulted before some thing is being planned in his / her area of work. Then that plan proposal can be scrutinized by the higher ups and final decision can be arrived at.

Discussions were held with the DFOs and with the Conservators and it was decided that the best way to plan for the preparation of the CAT Plan document was to go in for Site Specific Planning. The field staff and the planning people would visit each and every venerable site and an estimate for that particular site would be prepared to stabilize that site.

Looking at the hierarchical order in the Forest Department, Forest Guard is at the lowest level and all the works of the Department are being executed by this person who is supposed to know each and every thing that is present and happening in his / her jurisdiction. They know the Geography of the area, vulnerable places, the people, the soil, the rivulets and everything in the area. On him are the Block Officers and Range Officers.

The maps of the CAT Plan Area were carved out of the 1: 50,000 Survey Sheets available with the department and Forest Survey of India, Dehradun, were asked to provide latest digital forest cover maps available with them. The Geological map of the CAT Plan Area was provided by HP State Mining Department GO of HP Shimla and The Geological Survey of India, Chandigarh. The soil types study material was obtained from HP Remote Sensing Cell Kasumpati Shimla, Soil profile from Soil Survey of India Sunder Nagar. Rate and intensity of soil erosion data was collected from the Beas Bhakra Management Board Pandoh. Based on field visits and these reports, the prioritization has been done.

CAT Plan Larji Hydroelectric Project -

Surveys by the people involved in the field and experienced in the field of soil conservation and its sciences were conducted actually and thus looking at the conditions and reports, taking into consideration the gradient, slope, condition of the area, natural species at the area. Its matching was done with the maps available. When we see the forest cover maps or the executive map we find that the upper reaches on the top of the hills has the forest cover but adjoining areas to the Khads and the Rivers is barren and susceptible to soil erosion.

Meetings were held with the field staff i.e. Range Officers, Block Officers and the Forest Guards and public and concept, need and what is to be done and how it is to be done was explained and discussions were held. It was decided that, the field staff along with the CAT Plan formulation and documentation staff and experts visited the sample sites and planned the strategy for the stabilization of that area / site. Since every site has its own problems and every site has a different solutions e.g. a site may be a slide area that need soil stabilization, supplemented by plantation or the site may have degraded and it need pasture treatment in higher zone and plantations in the lower zone, and so on for moisture conservation, soil & water conservation, and slips stabilization.

The intensity of soil loss has been procured from the observations made by the BBMB Pandoh at its Thalout Silt Testing Site. That becomes our benchmark for the years to come and see, the effect of all the CAT Plans that are proposed and being executed in the total catchment of the River Beas.

Initially, the areas had been surveyed and Site Specific Plans or the estimates as per HP Forest Department Schedule Rates were prepared for the actual works to be done in that area. But later, due to variations in the costs for different works in various CAT Plans in the state, a committee was constituted to come with Model cost norms for the State and now the CAT Plan has been revised as per revised norms for the state.

As already stated the areas are vacant at present and funds should come immediately to avoid deviations in future.

Joint Workshop on Finalization of CAT Plan & its out puts.

A Joint Workshop of the Forest Department and Larji Hydroelectric Project representatives HP State Electricity Board was organized and held at Munish Resorts, Mandi on 9th May, 03 for discussion and finalization of CAT Plan for Larji Hydroelectric project.

At very outset DFO Mandi welcomed all the participants and briefed about the preparation of CAT Plan by the Forest Department for the first time. He appreciated the efforts put in by Mr. K.K.Thakur F.R. RFO JFM Mandi, the field staff of all the Ranges, the specialists, and all persons associated with it.

Then DFO Mandi asked Mr. Thakur to come forward and brief the members as to how the CAT Plan has been prepared, the methodology that has been adopted. He briefed the members about the same and then Mr. H.V.Kathuria IFS DFO Mandi described the various physical and financial proposals detailed in the CAT Plan.

Then the workshop was thrown open for discussions, and the proceedings of the workshop and the points that came for discussions and decisions are as follows:

- All the items like the vehicles, computers and other office items as detailed in the CAT Plan are to be provided in kind by the user agency, and it was agreed by the representatives of the user agency for the same.
- 2. CF Kullu and DFO Parbati stressed and suggested that not incorporating Bhuntar Forest Range in the CAT Plan would not do justice to the CAT Plan as the area was quite eroded and falls as a immediate catchment and not being treated in any of the plans. After discussions, the representatives of Larji Hydroelectric Project agreed that let the area be incorporated in this CAT Plan or a separate Plan should be appended as an Annexure.
- 3. Data should be collected for the silt observations and more emphasis should be given to the area from which the silt is the maximum. If Project authorities have some data then it should be reviewed after two years, So that the existing data and variations in the next two years could be assessed.
- SOPs should be constructed for the silt observations at places where data is being collected. These SOPs can be manned by HPSEB even.
- Two silt reviews should be done, first after 2 years, second after 5 years. On the basis of this review, changes can be made in the plan, if required.

- There should be provision in lump sum for maintenance of the soil conservation and other structures whatsoever will be constructed.
- Criterion for selection of species to be planted in the treatment area should be decided by concerned DFOs.
- In pasture development activities in addition to grass production there should be NTFP production as per requirement of the area.
- 9. Volume of muck for dumping should be assessed before dumping and simultaneously the area should be made available, that is to say, that it should be known that the muck produced is properly proportionate to the area proposed.
- Project Level Committee should be formed so that monitoring and evaluation could be done for the works executed in the treatment area in the right manner.
- 11. An amount of Rs. 75 lakh approximately would be the financial out lay for the treatment of the area of Bhuntar Range to be incorporated in the plan. Exact amount to be intimated and incorporated by RFO (JFM) as he is to attend DFO Parvati office on 10-05-03.
- Schedule of payments to be released by HPSEB every year should also be included.
- 13. An amount of Rs. 20 lacs has been included for "Afforestation, soil conservation works etc. and other ancillary works regarding, "Rehabilitation of Dumping sites" in the Larji Hydel Project Area, in the schedule of payments to be released by the HPSEB for different activities on Page 52 SNo.4.12.
- 14. It was suggested that there should be a implementation mechanism because more than one divisions are involved. Therefore, DFO Mandi should act as Nodal Officer for all the divisions involved in the CAT Plan. All the Division should give each year a copy of the APO to DFO Mandi. Similarly a copy of progress Reports on account of implementation of CAT Plan of this Project shall be forwarded to DFO Mandi for centralizing, monitoring and accounting.

Out Puts

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All the points were agreed by both of the agencies except for the implementation mechanism, because major area falls in the Kullu Forest Circle and the area of Mandi Division is small in the total CAT Plan area. It was decided that CF Kullu should do or all the Divisions should send their APO or the reports to the their head offices, as has been the procedure.

Then the workshop ended when DFO Mandi thanked all the participants for their valuable suggestions and participation.

The list of participants who were present in the workshop for finalization of CAT Plan for Larji Hydroelectric project on 9th May 03 at Mandi.

Mr. Avtar Singh IFS I.

2. Mr. Vineet Kumar IFS

Mr. S.S. Dabas 3.

Mr. O.P.Kapur 4.

5. Mr. V.K.Tiwari IFS

6. Mr. S.K.Mushafir IFS

7. Mr. H.V.Kathuria IFS

Mr. H.K.Malhotra IFS 8.

9. Mrs. Upasana Patial IFS

10. Er. M.R.Tapwal

11. Er. D.B.Vaidya

Mr. D.S.Thakur HPFS 12.

Mr. K.K.Thakur 13.

14. Mr.S.S.Kashyap

15. Mr.Rajiv Sharma

16. Mr.Bhimi Ram

17. Mr.Ganga Ram Thakur Conservator of Forests, Mandi.

Conservator of Forests, Kullu.

Dy. C.E. LCC | Sarabai HP

Addl. S.E. Larji Project Sarabai

DFO Parvati (Shamshi)

DFO Nachan

DFO Mandi

DFO Seraj (Banjar) DFO(Hqt.) o/o CF Mandi

Asstt. Engineer

AAE

ACF Mandi

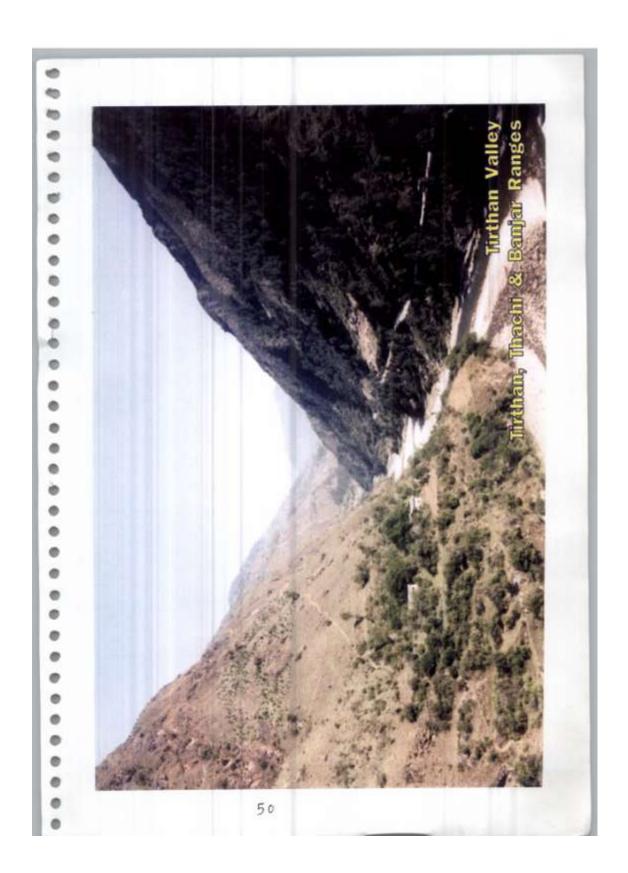
RFO (JFM) Mandi

RFO Thachi

RFO Sainj

RFO Jari

RFO Hurla



Revised cost model

Initially the CAT Plan was prepared on the basis of site specific Plan but later the per hectare cost Model for afforestation on degraded Forest Land was finally formulated, whose calculations are based on average of 5 ha. Plot of 250 x 200 Mtrs. And which has been calculated at wage rate of Rs. 65/- is enclosed herewith. The calculations are based on this model for plantation in this CAT Plan for LHEP.

	4: 7		Activity wise abstract Costs of CAT Plan for rehabilitation of LHEP catchment area	- world	Automotif Bull
	441	-	Details	Qty.	Amount(Rs)
NT.	SNo.	- 0	orestry Activities		48517230
4-05	1	4 4	digrestation	2859	40741700
ords		0.4	Inintenance afforestation for 7 years	4 16 16	842177
		2 %	latural Regeneration.	157	133295
	134	20	Mivicultural operations	100	5472398
		40.5	Pasture Development	537	2142460
		Dir	Decision of Decision		
		010	Asintenance Pasture Total of Forestry activities		97849260
		_7	Soil Conservation and Allied Works		4040000
	2	- 5	SOIL CONSERVATION THIS PAINTS		12129308
		8 5	Soil Conservation Works	11	1050000
		8//	Water Harvesting Structure	3	450000
		10	Construction of SQPs	11	281780
	1111	11	Total Soil Conservation and Allied Works		13911050
	134		total Golf Golf Golf Golf Golf Golf Golf Gol		111700320
-		- 1	inte - The OMSONAISE, Rangewise and your CAT Stone		
			of Physical and Financial statement for the CAY Plan -		
			Larg Hydro electric project to enclosed at P 83		
		12	Afforestation, soil conservation works etc. & other		
			applicate works in catchment or Dumping one		200000
			Nal in the Larji Hydel Project Area.		
	3		Wild Life Component		
	3	-	at table title Sanctuary	-	220000
		14	Rangwar Serioumy	US	80000
			Khokhan Sanduary	LJS	300000
	111		Total of Wild life Component		
		15	m - 1 - 5 E tou notivities (Sno 1.7+2.13+3.15)		11676032
1011		16	Total of Porestry activities (constru Activities)		583802
	4	17	Contigencies (5% of total cost on Forestry Activities)		12259835
-	5		Grand Total of Forestry activities (one control	-	
-	6	-	Agriculture I and Component	-	- 60/H-1
	-	4.00	Agriculture Area Management Plan in proposed CAT	1.40	400000
		10		L/S	400000
					NV
		19	Charges		500
	7		Departmental Charges Computer - Desktop (Compaq) with assessories	3	
				1	750
		21	Photocopier for Mandi Forest Division Maintenance cost of Computer, Photocopier for 5 years		100
	3 1 9	V 22	Maintenance cost of Composit, From the In Manufi		-
		23	Maintenance of Buildings/Inspection buts in Mandi,		10000
		1	Flankan, and Sanjar Polest Divisions to	A. I	\$000
		24			14380
		25			
			Note: Departmental Clayer Total Financial outlay for CAT Flan(Bno. 5+8.19+7.25)		12803333
	1		Total Financial outlay for west Financial		THE PARTY
	Note:		The cost of Fence Post will be in addition to above amount a	end the eat	no shall be realls
			The cost of Fence Post will be in addition to show amount from the user agency at the pravailing rates before the execu-	tion of CA	A SAMPLE

Non Pro Party

PERE HA. COST MODEL FOR AFFORESTATION OF DEGRADED FOREST LANDS, CALCULATIONS BASED ON AVERAGE OF 5 HA PLOT OF 250X290 MTRS,

(CALCULATED AT WAGE RATE OF RS. 65/-)

Sr. No.	Particulars of works	Quantity	Rate	Amount for Non tribal Area
l.	Survey and demarcation of plantation area including marking of sections, path and Preparation of map.	I ha.	44.36 per ha	44.36
2.	Cutting and preparation of wooden posts 1.80 mtr. long and 8 to 10 cm dia including debarking and fastening the top 15 cm in conical shape.	60 Nos	561.36 per hundred	336.81
3.	Carriage of fence post upto 2 mtr. long and 8 to 10 cm dia over distance 1 kms	60 Nos	295,41 per hundred per Kms	177.24
4.	Preparation/digging of holes 20-30 cm dia and 45 cm deep	60 Nos	393.02 per hundred	235.81
5.	Fixing of wooden posts including strutting	60 Nos	301.64 per hundred	180,98
6.	Carriage of Il/wire over average distance of 1 km. Up hills.	1 qtls	73.93 per Qtls per Knis	73.93
7.	Stretching and fixing of barbed wire with U-staples in each strand. (3 stands)	540 Rmt.	2.05 per Rmt.	1107.00
8.	Bush Cutting in the plantation site.	1 ha	517.00 per ha	517.00
9.	Interlacing of thorny bushes in B/wire obtained from planting	180 Rmt	1,78 per Rmt.	320,40
10.	Preparation of inspection path 6.	250 Rmt	4.71 per Rmt.	1177.50
11.	Layout of pits over	1 ha	73.82	73.82
12.	Digging of pits 45x45x45 cm (40% of total)	440 No.	413,60 per hundred	1819.84
13.	Digging of pits 30x30x30 cm (60% of total)	660 No.	206.85 per hundred	1365.21
14.	Filling of pits 45x45x45cms.	440 No.	118.51 per hundred	521,44

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			Residence of the Park of the P	A 200 35.46
15.	Filling of pits 30x30x30cms	660 No.	82.70 per hundred	545.82
16.	Carriage of naked root plants over distance 2kms up hills (BL as well as conifers)	400 No.	15.27 per hundred/ Kms	122.16
17.	Carriage of plants in P/bags over distance 2 kms. Up hills	700 No.	94.51 per hundred/ Kms	1323,14
18.	Planting of entire Plants raised in	700 No.	94,57 per hundred	661.99
19.	Planting of Naked root plants.	400 No.	79,73 per hundred	318.92
20.	Nursery cost of plants	1100 Nos	4.00 per plants	4400,00
21.	Total			15323-37
22.	Soil and proisture conservation works (25% of initial planting cost at serial number 21).	1 ha	25% of initial planting cost	3#30.75
23	Total			19154-12
24.	Add cost of B/wire including cost of U Nails	75 Hg.	2300	1785.00
25.	Total			20879.18
26.	Or Say			20800.00
	MAINTENANCE COST			
	1st year maintenance 25% mortality			
	Re-digging of pits 45x45x45 cms	110 No.	206.85 per hundred	227.53
	Re-digging of pits 30x30x30 cms	165 No	103.40 per hundred	170.61
	Filling of Pits 45x45x45 cms	110 No.	118,51 Per hundred	130.36
	Filling of pits 30x30x30 cms	165 No	82.70 per hundred	136.45
	Planting of Polythene bags plants	175 No	94.57 per hundred	165.49
	Planting of Naked root plants	100 No	79.73 per hundred	79.73
	Carriage of Polythene bags plants over a distance of 2 kms up hills.	175 No	94.51 per hundred	330.78
	Carriage of Naked root plants over a distance of 2 Kms up hills.	100 No	15.27 per hundred	30.54
	Nursery cost of plants	275 Nos	4.00 per plant	1100.00
-	Repair of fence	180 Rnst	0.70 per	126.00

		Rmt.	
Repair of Inspection path		L/S	300.00
Repair of soil and moisture conservation works		L/S	400.00
Total			3197,49
Or Say			3200,00
Second year maintenance 20% mortality			3200.00
Re-digging of pits 45x45x45 cms	58 No.	206.85 per hundred	182.02
Re-digging of pits 30x30x30 cms	132 No	103.40 per hundred	136.48
Filling of Pits 45x45x45 cms	88 No.	118.51 Per hundred	104,28
Filling of pits 30x30x30 cms	132 No	82.70 per bundred	109.16
Planting of Polythene bags plants	140 No	94.57 per Inindred	132.39
Planting of Naked root plants	80 No	79,73 per hundred	63.78
Carriage of Polythene bags plants over a distance of 2 kms up hills.	140 No	94,51 per hundred	204.02
Carriage of Naked root plants over a distance of 2 Kms up hills.	80 No	15:27 per hundred	24.42
Nursery cost of plants	220 Nos	4.00 per plant	880.00
Repair of fence	150 Rmt	0.70 per Rost.	126.00
Repair of Inspection path		L/S	300.00
Repair of soil and moisture conservation works		L/S	400,00
Total	3		2723.15
Or Say			2800,00
Third year maintenance 15% mortality			
Re-digging of pits 45x45x45 cms	66 No.	206.85 per hundred	136.52
Re-digging of pits 30x30x30 cms	99 No	103.40 per hundred	102.36
Filling of Pits 45x45x45 cms	66 No.	118.51 Per hundred	78.21
Filling of pits 30x30x30 cms	99 No	82.70 per hundred	81,87
Planting of Polythene bags plants	105 Nu	94.57 per hundred	99,29

Planting of Naked root plants	60 No	79.73 per hundred	47.83
Carriage of Polythene bags plants over a distance of 2 kms up hills.	105 No	94,51 per hundred	198.46
Carriage of Naked root plants over a distance of 2 Krus up hills.	60 No	15.27 per hundred	18,32
Nursery cost of plants	165 Nos	4,00 per plant	660.00
Repair of fence	200 Rmt	0.70 per Rmt	140.00
Repair of Inspection path		L/S	300.00
Repair of soil and moisture conservation works		L/S	400.00
Total			2262.86
Or Say		A PERSONAL PROPERTY.	2300.00
Fourth year maintenance 15% mortality			230000
Re-digging of pits 45x45x45 cms	66 No.	206.85 per bundred	136.52
Re-digging of pits 30x30x30 cms	99 No	103.40 per bundred	102.36
Filling of Pas 45x45x45 cms	66 No.	118,51 Per hundred	78.21
Filling of pits 30x30x30 cms	99 No	82.70 per bundred	81.87
Planting of Polythene bags plants	105 No	94.57 per hundred	99.29
Planting of Naked root plants	60 No	79,73 per hundred	47.83
Carriage of Polythene bags plants over a distance of 2 kms up hills.	105 No	94.51 per hundred	198.47
Carriage of Naked root plants over a distance of 2 Kms up hills.	60 No	15.27 per hundred	18.32
Nursery cost of plants	165 Nos	4.00 per plant	660,00
Repair of fence	200 Rmt	0.70 per Rmt	140.00
Repair of Inspection path		L/S	200.00
Repair of soil and moisture conservation works		L/S	200.00
Total			1962.87
Or Say			2000.00
Fifth year maintenance 10% mortality			2000,00
Re-digging of pits 45x45x45 cms	44 No.	206.85 per	91.01
		Committee of the Commit	

(iv)

		- Engineering	
		hundred	
Re-digging of pits 30x30x30 ems	66 No	103.40 per hundred	68.24
Filling of Pits 45x45x45 cms	44 No.	118.51 Per hundred	52.14
Filling of pits 30x30x30 cms	66 No	82.70 per hundred	54,58
Planting of Polythene bags plants	70 No	94.57 per hundred	66,19
Planting of Naked root plants	40 No	79,73 per hundred	31.89
Carriage of Polythene bags plants over a distance of 2 kms up hills.	70 No	94,51 per hundred	132,31
Carriage of Naked root plants over a distance of 2 Kms up hills.	40 No	15.27 per hundred	12.21
Nursery cost of plants	110 Nos	4.00 per plant	440.00
Repair of fence	200 Rmt	0.70 per Rmt	140.00
Repair of Inspection path		1./S	200.00
Repair of soil and moisture conservation works		L/S	200.00
Total			1488.57
Or Say			1500.00
Sixth year maintenance 10% mortality			1
Re-digging of pits 45x45x45 ems	44 No.	206.85 per bundred	91.01
Re-digging of pits 30x30x30 cms	66 No	103.40 per hundred	68.24
Filling of Pits 45x45x45 ems	44 No.	118.51 Per hundred	52.14
Filling of pits 30x30x30 cms	66 No	82,70 per hundred	54.58
Planting of Polythene bags plants	70 No	94.57 per hundred	66.19
Planting of Naked root plants	40 No	79.73 per hundred	31.89
Carriage of Polythene bags plants over a distance of 2 kms up hills.	70 No	94.51 per bundred	132.31
Carriage of Naked root plants over a distance of 2 Kms up hills.	40 No	15.27 per hundred	12.21
Nursery cost of plants	110 Nos	4.00 per plant	440.00
Repair of fence	150 Rmt	0.70 per Rmt	105.00

I make a second and a second an			10
Repair of Inspection path		LJS	100.00
Repair of soil and moisture conservation works		L/S	100.00
Total			1253.57
Or Say			1250,00
Seventh year maintenance 10% mortality			12.07.00
Re-digging of pits 45x45x45 cms	44 No.	206.85 per hundred	91,01
Re-digging of pits 30x30x30 cms	66 No	103.40 per hundred	68.24
Filling of Pits 45x45x45 cms	44 No.	118.51 Per hundred	52.14
Filling of pits 30x30x30 cms	66 No	82,70 per hundred	54.58
Planting of Polythene bags plants	70 No	94.57 per hundred	66.19
Planting of Naked root plants	40 No	79.73 per bundred	31.89
Carriage of Polythene bags plants over a distance of 2 kms up hills.	70 No	94.51 per bundred	132.31
Carriage of Naked root plants over a distance of 2 Kms up hills.	40 No	15.27 per bundred	12.21
Nursery cost of plants	110 Nos	4.00 per plant	440.00
Repair of fence	150 Rmt	0.70 per Rmt	105.00
Repair of Inspection path		L/S	100.00
Repair of soil and moisture conservation works		L/S	100.00
Total			1253.57
Or Say			1250.00
Grand Total Initial cost + 7 years maintenance	,		35/00-00
Contingencies (5% of total Cost)			
Grand Total			17.55-00
Or say			36 855.00
to			368em.00

Note

- Increase for tribal/difficult areas will be allowed in the above basic norms in addition, as per existing HP Govt. instructions.
- Future increase in wage rate will be incorporated proportionately in the proposed norms, which have been worked out at current wage rate of Rs. 65/- per day.
- For Lantana infested areas, the cost of uprooting lantana completely will be allowed over and above these cost norms as per the schedule of rates and intensity/percentage of lantana infestation.

	Name of Area	Name of Beat	Activities	Phy. Ha
1	Cholenel	Jigha	S.C. Works	
2	Sithenel	Jibhi	S.C.Works	
3	Cholanal	Johi	S.C. Works	
4	Dugalinala	Jibhi	S C Works	10.7
6	Chana Pat	Jibhi	Plantation	
8	Mignel	John	Plentition	
7	Chichhey ri Nali	Jibhi	Plantation	
8	36 Salanu C1	Jibhi	Silv Oper	
9	34 Balaidher C3	Jibhi	Silv Oper	2000
10	34 Belaidher C2b	Jibhi	Silv.Oper	
11	34 Balajdhar C4	Jibra	Silv.Oper	
12	37 Pukhardhar	Jbh	Sity.Oper	
13	Cherel Ged	Tarapur	Sour Sour	
14	Gharet Gad	Tanapur	S.C.Works	
16	Sai Gad	Tarapur	S.C.Works	
16	Dhuga Gad	Tarapur	S.C.Works	
17	Brach	Tarapur	Plantation	
18	Bung	Tarapur	Plantation	
19	Chamnal	Tarapur	Plantation	
20	Chhonsle	Tarapur	Plantation Plantation	Land Bridge
21	Suma Gad	Tarapur		
22	Mihara Gad	Tarapur	Plantation Plantation	
23	Sheri Gill	Tarapur	Plantation	1000
24	Kuta Dhar	Tarapur	Plantation	
25	Suma Dhar	Tarapur	Plantation	
26	Rhene Para	Tarapur	Plantation	
27	Brach	Tarapur	Plantation	
28	Sach Dhar	Tarapur	Plantation	
29		Tarapur	Spur	12 13 35 41
30	Pendia Nal	Soha	S C Works	1000
31	Shukrodinel	Sojha	S C Works	
32	Purelinal	Sojha	S.C.Works	
33	Khoii Gad	Some	Plantation	
34	Branchar	Some	Plantation	
35	Mathuathach	Sona	Plantation	1000
36	Gershall	Soma	Plantation	
37	30 Jalora C4 e1	Sojha	Silv.Oper	
38	30 Jalora C4 t/5	Softe	Silv.Oper	
39	30 Jalora C4 b1	Sohe	Silv Oper	-
	30 Jalora C4 b3	Soha	Silv Oper	
	Kutle	Soha	Plantation Pantation	
	Soiha	Sona	Land Slip Spur	200
43	Chho Nei	Hirb	Plantation	
44	Thou Nel	Hirb	Plantation	
	Bohlu Neil	Hirb	Plantation	
177	Katora Nat	Plets	Plantation	
100	Gejer wata Nata	Hirb	Plantation	
48	Paliged	Hirto	Plantation	
	Bai Piche	Hirb	Ptertation	
50	Burehta	Hirth	Plantation	
7	Thate	Hirth	Planiation	
		1 110	F Not 1239OFT	

S	Name of Area	Name of	Activities	Phy.	S	Name of Area	Name of	Activities	Phy.
No.		Beat	TAKEMANION	Ha/No	No.		Beat		Ha/N
52	Charandi	Hirb	Plantation	10	101	Shorni Nala	Sarindhi	C/Walls	
53	Shadol Nal	Hirb	Plantation	10	102	Heni Nala	Sarindhi	Plantation	
54	Deodhar	Hirb	Plantation	10	103	Choi Dhar	Sarindhi	Plantation	
55	Taraligad	Hirb	C/Walls		104	Dhol Nal	Sarindhi	Plantation	
58	Kandi Gad	Hirb	C/Walls		105	Sandha São	Sarindhi	Plant /C/vsa	
57	Balti Gad	Hirb	C/Walls		106	Banuala Nala	Gada Gosha	C/Walls	
58	Jibhi Gad	Hirb	Spur		107	Bahi Nala	Gada Gosha	C/Walls	
59	Suma Gad	Chaini	Plantation	5	108	Bat Nala	Gada Gosha	C/Walls	
60	Bhumach Dhar	Chaini	Plantation	10	109	Dugha Nat	Gada Gosha	C/Walls	
61	Chhulus Nal	Chaini	C/Walls		110	Alah Nala	Gada Gosha	C/Walls	
62	Bhumach Nala	Chaini	C/Walls		111	Khauli Khad	Gada Gosha	Plantation	1
63	Kotia	Chaini	C/Walls		112	Pattan Nala	Gada Gosha	Plantation	1
64	Ohara Bai	Chaini	C/Walls		113	Bahu	Gada Gosha	Spur	
65	Phagu Nal	Chaini	C/Walls		114	Thoda Dhar	Shikari	Plantation	
66	Ru Nal	Chaini	C/Walls		115	Thhula Dhar	Shikari	Plantation	1
67	Rai Nal	Chaini	C/Walls		116	Bhumar Dhar	Shikari	Plantation	1
68	Sackodur Nal	Chaini	C/Walls		117	Blown Nata	Shikari	C/Walls	
69	Banjar Khad	Chaini	Spur		118	Bhumia	Shikari	C/Walls	
70	Rai Nal	Chaini	Plantation	5	HAROLINIA (N	Latipri Nala .	Shikari	C/Walls	1
71	Naun Thach	Banjar	C/Walls		120	Kaotadhar	Shikari	C/Walls	
72	Glahi	Banjar	Pasture Dev	5	121	Dharti Dhar	Shikari	Plantation	1
73	Kathla	Banjar	Plantation	10	122	Baggi Dhar	Tandi	Plantation	
74	Kadol Nala	Banjar	Plantation	10	123	Khanoli Dhar	Tandi	C/Walls	-
75	Jogni Dhar	Banjar	Plantation	15	124	Chogi Nal	Tandi	C/Walls	
76	Bashir Nala	Banjar	CAVals	10	125	Tandi Nal	Tandi	C/Walls	
77	Seu-ra-Nai	Banjar	Piting/sowing	5	126	Chalahan Nal	Tandi	C/Walls	
78	Zillah Bashir	Banjar	C/Walls	-	127	Shill Nai	Tandi	C/Walls	
79	Chhechi Nala	Banjar	Plantation	10	128	Khatal Nal	Tandi	C/Walls	
20	Chilidhar Nala	Banjar	C/Walls	10	129	Kachhi Nal	Tandi	C/Walls	
81	Thach Dhar	Address and the later of the la	Plantation	5	130	Shai Nal	Tandi	C/Walls	-
82	Glahi Nala	Banjar Banjar	Spur	9	130	one rei	1 direct	CARAGE	-
83	The control of the co	A STATE OF THE PARTY OF THE PAR	C/Walls		-				-
-	Janeud Nala	Bahu	C/Wats		-			H-H-H	
84	Pujali Nala	Bahu	C/Wals	-	-				-
86	Chalori Sãp Podi Nala	Bahu	C/Wats		-		_		-
27	15 Kauri Nala	Bahu	C/Walls		-		-	-	-
88	20 Raghu Nal	Bahu	Plantation	5	-		-		-
59	Panola Dhar	Bahu	Plantation	5	-		-	-	-
90	A Company of the Comp	Bahu	Plantation	2	-		-	2.	-
91	Shegal Dhar Pokhar Dhar	Bahu	Plantation	5	-	-			-
92	Handu Nal	Gashini	C/Walls	9	-		-		1
-	Baniali	The second second	C/Walls		-			-	-
93	December 1	Gashini	Dec 27, 2, 22, 22		-				-
94	Bachhut Nala	Gashini	C/V/ats	-	-				-
95	Guthani Nala	Gashini	Plantation	6	2				-
96	Bachhut I	Gashini	Plantation	4	ļ		-		-
97	Shindi Nal	Gashini	Plantation	7	-		10		
88	Ghaini Nal	Sarindhi	C/Walls		-		100		-
99	Khoda Nai	Sarindhi	C/Walls						-
100	Chunnera Nala	Sarindhi	C/Walls		4			-	
		1							-

	Abstract for	Tirthan Forest Ra	ange Banjar Forest Div	ision
8	Name of Area	Flame of	Activities	Phy
No	The second secon	Beat	Mentido	Ha
1	Satingnnal	Kalwan	Plant C/wolls	176
2	Shanderjole	Kalwan	C walts	
3	Rambi	Kalwari	Plant C/wults	
1	Shauna Nal	Kalwan	Plant C/wells	
5	Dharaged	Bandal	Plant CAvalts	-
6	Choranala	Plach	S C Works	-
7	Soha Thach	Plach	S.C.Works	
8	Shiyali God	Plach	Plant C/wn/ls	
9	Kaneauli	Plach	Plantation	
10	Kotanei	Plach	Plant C/waits	-
11	Gharatgad	Plach	S.C. Works	
12	Gershada	Bandal	Plant CAvalis	1
13	Bhogusen	Bandal	Plantation	
14	Chhaindra	Bandul	Plantation	
15	Nimlagarh	Deotha	Plantation	-
16	Bhusha	Deotha	Planatation	-
17	Orithach	Deotha	Plantation	
18	Dughanal	Deotha	Plantation	-
19	Duwamai	Deothia	Plantation	+
20	Chimudhar	Deotha	Plantoson	-
21	Dhara Pichhe	Deothe	Plantation	-
22	Reunshi	Deothe	Plantation	+
23	Kei Nel	Deotha	S.C.Works	-
24	Galehni Dhadu	Deotha	Plant Charles	
25	Galonnala	Deotha	S.C.Works	-
26	Bachhetnala	Deotho	S.C.Works	-
27	Deruranal	Deothe	S.C.Works	-
28	Chhad dhar	Panihar	Plantation	-
29	Sihradhar	Panihar	Plantation	-
30	Chamin Nul	Panihar	Plantation	+
31	Branala	Panihar	Plantation	-
32	Kapuchil	Pandsar	Plantation	
33	Kodged nala	Panhar	S.C. Works	-
34	Panihamala	Panihar		-
35	Cheluluthach	TOTO CONTRACTOR OF THE PARTY OF	S.C.Works	-
market and the second	and the second s	Panihar	S.C. Works	-
36	Ghamimala	Panihar	S.C. Works	-
37	Narool	Charmon	Piantation	
39	Rai-I	Chennon	Plantation	P P
20	Sadhu-Ri-Thowor	Charmon	Plantation	-
2				

S No.	Name of Area	Name of Beat	Activities	Phy.	S No.	Name of Area	Name of Beat	Activities	Phy. Ha/N
1	Larji R.House	Kanon	Spur	10	46	Shalesh Thach	Larji	Pasture	
2	Larji Dhar	Kanon	Plant. C/W	10	47	Bada Thach	Larji	Pasture	
3	Larji Clonoy	Kanon	Spur		48	Ghasni Thach	Larji	Pasture	
4	Larji Nala	Kanon	C/Walts		49	Tipari Nala	Larji	C/Walls	
5	Larji Dhar -I	Kanon	Pasture	20	50	Pani Nala	Larji	C/Walls	
6	Larji Dhar-II	Kanon	Pasture	10	51	Spangni	Larji	Spur	
7	Sapagni Dhar	Kanon	Plant. C/W	15	52	Bihali	Larji	Spur	V.
8	Sagada	Kanon	Plant. C/VV	1	53	Larji Proj.Coly.	Larji	Spur	
9	Sagada Nala, I	Kanon	C/Walls		54	Larji Bridge	Larji	Spur	
10	Sagada Nala, II	Kanon	C/Walls		55	Bithu	Larji	Plant.C/W	
11	Tala-Ra-Nala	Kanon	Plantation	10	56	Bithu Kanda-I	Larji	Plant.C/W	
12	Bihat Dhar	Kanon	Plantation	10	57	Bithu Kanda.II	Larji	Plant.C/W	1
13	Bihat-II	Kanon	Plantation	10	58	Bihali Dhar	Larji	Plant,C/W	
14	Gawaru Thach	Kanon	Pasture	10	59	Garadhar	Larji	Plant.C/W	
15	Kachan Nal	Kanon	C/Walls		60	Sildi Dhar	Larji	Plant.CAV	
15	Banhu Nai	Kanon	Plant, C/W	5	61	Sikidahar-II	Larji	Plantation	
17	Handoo Tira	Kanon	Pasture	10	62	Larji	Larji	C/Walls	
18	Surgni Thach	Kanon	Pasture	30	63	Shiki to Phalana	Larji	Fire Line	3Kms
18	Baul No.1	Kanon	Plant.C/W	5	64	BithuKanda	Larji	Pasture	
20	Baul No.II	Kanon	Pasture	20	85	BithuKanda-II	Larji	Pasture	
21	Jogni Age	Kanon	Pasture	20	68	Kashi Thach	Larji	Pasture	
22	Kathla	Kanon	Plantation	20	67	Chila Thach	Larji	Pasture	
23	Gushala	Kanon	Plantation	5	68	Siklidharm Nry.	Larji	Spur	
24	Kalaut Dhar	Kanon	Plantation	15	69	Aut	Larji	Spur	
25	Salvar Nala	Kanon	Spur		70	Sila Bihali Nury.	Dalashni	Nury.	0.
26	Kharetla	Kanon	Spur		71	Sachni Nury.	Dalashni	Nury.	0.
27	Dhara Bir	Kanon	Plant.C/W	15	72	Akash Devi	Dalashni	Plant.C/W	1
28	Timbroo Dhar	Kanon	Plant,C/W	10	73	Kakra -I	Dalashni	Plant,C/W	
29	Khanori No.II	Kanon	Plant.C/W	10	74	Kakra -II	Dalashni	Plantation	1
30	Banhira Thach	Kanon	Pasture	10	75	Phalana	Dalashni	Plantation	
31	Jawal Dhar	Kanon	Pasture	5	76	Tatta Pani	Dalashni	Plant, C/W	
32	Thuari Dhar	Kanon	Plant,C/W	10	77	Shaga	Dalashni	Plant, C/W	1
33	Shari Nal	Kanon	C/Valls		78	Kakradhar	Dalashni	Plantation	01
34	Kanon Nala I	Kanon	C/Walls C/Walls	-	79 80	Daripar	Dalashni	Plantation Plantation	
35	Kanon Nala II	Kanon	C/VValls		81	Dari Upper Dari Samne	Dalashni Dalashni	Plantation	
38	Shakur Nala	B. Section 1	CONTRACTOR CONTRACTOR CONTRACTOR	0.4	here with	March 1994 by the company of the company	A STATE OF THE PARTY OF THE PAR	Plantation	1
37	Kanong Nury.	Kanon	Nury.	0.1	82	Cottiage Shogu Baihii	Dalashni Dalashni	Spur	- 1
39	Sikli Dhar Nury Candha	Larji	Nury. Plant.CAV	10	84	Kakkra Thach-I	Dalashni	Pasture	
40	Dhara	Larji	Plant.C/VV	10	85	Kakkra Thach-il	Dalashni	Pasture	
41	Kanda Hethe	Larji	Plant, C/W	8	88	Fhaniana Thach	Dalashni	Pasture	
42	Dhara Upper	Larji	Plantation	9	87	Tundadwar Thach	Table of the second second	Pasture =	
43	Shalash	Larji	Plant.CAV	8	88	Dari Thach	Dalashni	Pasture	
44	Sari	tarji	Plant.C/W	7	89	Akash Devi	Datashni	Fire Line	
45	Kandha Thach	Larji	Pasture	6	80	Bada Nala	Datashni	Plantation	- 11

-	Name of A			Activitie	s p	tiv.	S	Forest Divisi	on	2100	P:	2
- Breeze	ALC: A COLOR OF THE PARTY OF TH	Be	eat		- Liberton	No			Act.	Name o	f Activities	Ph
	1 Mahidhar	Dala	shni	Plantation	1	10		200		Beat		
- Break	2 Chalauta	Dala	shni	Plant,C/V		10	1000			Bhatan	Pasture	
Time.	3 Sami Dhar	Dala	shni	Plantation		12	1117	Comment Page		Bhatan	Pasture	
8	- Streethering Daily	fhra Dalas	hni	Plantation		8	4 300	ACCRECATION CASES		Deari	Plantation	13
8	The second of the same	Dalas	hni	Plantation		10	140	manual e Di	unga	Deori	C/Wall	1
8	Property at the	Dalas	hni	Plantation	-	12	Administration of the Parket			Deori	Plant_/CV/	1 2
9	Transcent HINDON	Datas	hni	Pasture	-	5	141	obbet testing		Deori	Pasture	1
9	Local Liberti	Dalas	-	Pasture	+-	8	142	The sales of the sales	1	Deori	Plant/CW	3
99	Trans Calife	Dalas		Spur	-	0	143	Colonia and Colonia		Sainj	C/Walls	1 0
10	Account of Printings	Datas		Spur	+	-	144	Dushadgad	2	Sain	C/Walls	-
10	Carri Opper	Dalasi		Fire Line	41.	-	145	Kulraigad	1	Sainj	C/Walls	-
102	THE RESERVE OF TAXABLE	Dalast		Plant.C/W	3ka		148	Jahilagad	1	Saini	C/Walls	-
103	Localin Little	Dalasi		Plant.C/W	-	10	147	Channidhar	1	Sohi	Plantation	100
104	SALABORATOR PROFILES	Datast		Plantation	9	0	148	Rolu Thach		ohi	Pasture	20
105	T. Williams			Plantation	+	8	149	Rakeshgad	10	ohi	C/Waits	30
108	Tarte Mi	Datash	ni c	lant.C/VV	-	0	150	Gohi Phat		ohi	Plantation	44
107	- deligh Piliti	Dalash		lant.C/VV	-	0	151	Dargehra		ohi	Plantation	20
108	Lalgi Dhar	Dalash				to diese	152	Gwalu Thach	G	ohi	Pasture	10
109	Jamir	Dalash	Description (lant.C/VV	-	territoria.	153	Sari land sip		ohi	C/Walls	35
110	Rai Dhar	Dalashi	77.	lant.C/VV			154	Sojha ra Phot	-4-	chi		
111	Bhartudhar	Dalashr		lant.C/VV	-		155	Kanali Dhar		ohi	Plant/CW	20
112	Jamir Thach-I	Dalashr		ire Line	3Kn	228.000	158	Phagla dhar		ohi	Plant /CW	20
113	Jamir Thach-II	Dalashr		asture		56.00	57	Phagla dhar to	naG	The same of	Plant/CVV	20
14	Satu Basu Thach	Datashi		asture			58	Bari Dhar		The state of the s	Fire Line	2km
115	Satu Basi Thach	III Dalashi		asture	5	1	59	Ohaugi Nala		and the latest and th	Plantation	30
16	Moulgahar Thach	Dalashn		isture	5		60	Tilga			C/Walls	
17	Shir Bihali	Dalashn	the state of	sture	5	1	61	R/8 Dhaugi	-		Plantation	20
	Shir Bihaii	Dalashn	++	ur		1	82 M	leela Thothru		Name of Street, or other Designation of the last of th	C/Walls	
	Shir Bihal Vil.		-126			1	83 E	hatki Dhar		Art Comments	Plantation	20
20	Sar Thach	Dalashni	100		2. 17	16		hacha Thuvari	Dh		Plantation	15
21	1/43Ruhan Nury.	Dalashni	0.00	sture	5	16		eela Thothru	200		lantation	30
22	Talara	Bhallan	Nu		0.3	16	6 B	hunga Thach			Walls	
	Bakar	Bhallan	Spi	majord at the same		16	7 T	hacha Gahar			asture	35
-	Pamii Nala	Bhallan	Spu	ur .		16	20.0	hatio Nala	DIN	lugi P	asture	35
		Bhallan		nt.C/W	5	16	100	dohan	Dha		Walts	
8 k	Chanyarji Phat Chajuri	Bhallan	Pas	ture	5	17	200	14 Gohi	Goh		at. Reg.	45
		Bhallan	Plan	it.CAV	10	-	110	14 Goni	Goh	i N	at, Reg.	17
200	obha Naia arei	Bhallan		it.C/W	8	-	-		10			-
40.0		Bhallan		it.C/W	8		+					
	rung	Bhallan		t.C/W	10	-	+			1		
-	hidhar	Bhallan		tation	10	-	+	1				
	upaii	Bhallan		tation	10	-	-					
- 10.0	March M. Control of the Control of t	Bhatan		tation	7	-	-			100		
	roo			ation	5		-					
	ari Dhar	Bhallan		ation	5		+					
U	harampur Thach	Bhallan I	asti		5		-					1
+		and the same	775		-	-	-					
1				V.			1	-				
-						-				-		1
1		-	C	AT Plan Lan	Hydro	elec	fric P	mecf	-			1

			Whattact 101	inaci	ror	est Range Nachan	OLGST DIAIRI	VEI.	-
S No.	Name of Area	Name of Beat	Activities	Ffy. He	5 No.	Name of Area	Name of Bast	Adivões	P
1	Kahuli Sih	Daher Shet	Plant C/wells	10	54	Taku Galoo Nala	Tikki	CWals	
2	Pel Thech	Dehar Ghat	Plantetion	10	66	Malala	Tako	C/Wells	-
3	Dogn	Dahar Ghat	Plant C/walls	10	56	Khaneli Nala	Tikki	CWels	_
4	Chhachgala	Bagra	Plant C/walts	15	57	Thata Nata	Taki	CWalts	
5	Tundi Nei		Plantation	10	58	Kofu Nala	Taxi	CWals	-
	Jhuhi Nei	Bagra	Plantation	5	50	Dharut Note 164	Tikko	CWells	-
6		Bagra Dahar Ghal	CWalts	.0	60	Chansi Nata	Tikki	CWels	_
7	Jhuli nal		Plantation	5	61		Tikki		-
8	Rampur					Jogani Galoo Nala Parvat Dhur Nala		CWells	
9	Sidhiar		Plant / C Wals	50	62		Tito	C/Wals	_
10	Benidher	Gada Gushaini		7	63	Khoda Thach Nels	T8Xi	C/Walts	
11	Suketidhar	Gede Gusheini		- 5	64	Bhel Nels	Tikki	CWals	
12	(Charn-pal	Gada Gushaini	Natural Rege.	15	65	Didge Nalu	Tikki	C/Wells	
13	Banee ra Nal	Вадга	CWalls		66	Shelled Nale	Gada Gushaini	CWals	
14	Chouli noi	Bagre	C/Walls		67	Preshi Nole	Goda Gustaini		
15	Sukat nel	Gada Gushaini			88	Machinged	Gade Gusheini		
16	Sharethi nai	Gada Gushaini			89	Gada Gozzani Bazar			
17	Juganni Dhar	Bagra Stanton	Pasture Dev	15	70	Chaudu Nain	Gada Gushaini		
10	Mathers Dhar	Deher Chief	Pasture Dev	10	71	Chhun Noia	Gede Gushaini		-
10	Khadol Sith	Dehar Ghal	Plantation	10	72	Koliu Nala	Gada Gushaini		-
74				10			Gada Gushaini		_
20	Manjihi Nal	Gede Gushaini			73	Buda Nala			
21	Maryhi	Gada Gushaini		- 5	74	Tirthan Khad	Bali Chowki	Spur	
22	Khadool Nal	Bagra	C/Walts		75	Salan Nalu	Bali Chowki	C/Walls	
23	Chhanjani	Phon	Plantation	- 5	76	Mani Nala	Bali Chowki	CWsls	
24	Dhuni geher	Khani	Plantation	10	17	Ethano Noia	Khani	C/Walis	
25	Dhun gahar Palun	Khani	Plantation	10	78	Jangaru Nala	Phani	CWals	
26	Makhreli Dhar	Khani	Plentation	10	79	Shegil DPF	Khani	C/Walts	
27	Rangch DoganDhar	Tithis	Plantation	10	80	Kandhi Chalayala	Bali Chowki	CWalis	
28	Ruheta	Tibhi	Pluritation	10	81	Khani	Khani	CWals	
29	Katwango	Těhi	Plantation	7	82	Jawani-ra-Nat	Khani	CWals	
30	Theigher	Partihol	Plantation	10	83	Dhuny Gahar NOPF	Khani	CWalts	
31	Leten	Parthol	Plantation	7	84	Chamdhyar DPF	Deodhar	CWalts	-
32	Khuhan Bain	Tibhi	Plantation	10	85	Melan DPF	Deochar	Plent /CW	
33	Banai Dhar	Parthol	Plantation	10	86	Seti Nala	Deodhar	CWalis	-
34	Sarol	Partihol	Plantaion	10	87	Chungi Chalahar	Deodher	Plant /CW	_
-	Chanamai	Tiphi	Planteion	10	86	Kali Safan	Deodhar	C/Wals	
35									
36	Kashal C1	Panjain	Plantation	- 5	89	Koshai DPF	Panjain	C/Walts	_
37	Kashel C2	Panjain	Plantation	10	90	Sudhrani Nala	Partihoal	C/Wals	
38	Kashal C3	Panjein	Plantation	10	91	Majaun	Parkhol	WHS	
39	Alari DPF C1	Panjein	Plantation	10	92	Encia Nala	Bali Chowki	WHS	
40	Sungardhar	Bali Chowki	SC works	140	93	Rope	Bak Chowki	WHS	
41	Tipper Chalyala	Bali Chowki	Plant C/wnits	10	94	Khanei Nala	Parkhol	WHS	
42	Bhureh	Ball Chowlo	Plantelion	10	95	Chanai Nale	Tikki	WHS	
43	Tipper Chalyala	Bali Chowki	Plant C/wells	10	96	Mani	Bali Chowki	WHS	_
44	Burahriele	Bali Chowki	Plant C/walls	5	97	Kofia Nafa	Parkhol	WHS	
45	Ropi DPF	Ball Chows	Plant C/weils	25	198	Saraul	Parkhol	WHS	
	Chure Chalahar	Deodhar	S C works	20	90	Committee	- Mariena	11110	
45		Deodhar	Plant C/wells	10	4				
47	Jhira Deon		Plantition	10	-		-		-
48	Melan	Degdinr	D. Cont. of Printers, Name of Street, Street, or other parts of the Contract o	5	-				
49	Chamdyar	Deodhar	Plantation	7	-				-
50	Maninal DPF	Deodhar	Plantation	- 5					
51	Jognidher	Deodhar	Plantation						
52	Kali Saji	Deodhar	Plantation	10					
53	Bhashail Nal	Bagra	CWals						
		T-1							
-				CA	Plan :	Lary Hydroelectric Project			

	Abstract	for Jarl Forest Rang	e Parvati Forest Division	8
SNo.	Name of Area	Name of	Activities	Phy
		Beat		H
12	Oheneli Piche	Pin	Plant/C works	1
2	Moraj Dhang	Pin	Pasture Dev	4
3	Bogy Pandey	Pina	Plant/C writs	2
4	Behii Gharat	Pini	Plant/C walts	1
5	Jai Bihal	Pira	S.C. Works	
6	Janipani Nala	Pini	Plant/C walls	2
7	Bharari Hethe	Kashewan	Plantation	2
8	Jaba	Kashawan	S.C. Works	
9	Chhasani	Kashawari	Plantation	3
10	Cholenal	Chhingra	PlantiC walls	3
11	Khanorunale	Shaf	Plant/C wells	1
12	Ropa	Shel	S.C. Works	
13	Devi re gharet	Shaf	Plant/C walts	1
14	Parey Pichhe	Shaf	PlanI/C walls	
15	Handunaza	Fagu	Plant/C wolfs	2
16	Paneuli Phat	Fagu	Plant/C walks	3
17	Kalga	Fagu	Plant/C walls	2
18	Ghor Eihal	Fagu	Plant/C walls	2
19	Barogi	Fagu	PlanI/C walls	2
20	Sohachnala	Fagu	S.C. Works	
21	Gahanbonbihai	Fagu	Plent C walls	- 3
22	Kelu mPadhar	Dhara	S C Works	
23	Nii Asi	Chera	Plantation	10
		CAT Plan Lury Hydroe	Secting Project	
		CAT Plan Larji Hydro	electric Project	

	Abstra	ct for Huria Fo	rest Range Parvati Forest	Division
2	Name of Area	Name of	14.7	
140		Beart	Activities	
1	1/20 Charl Thach	Barogi		
2	1/21 Sanglehar	Narogi	Plant/C/walls	
3	1/21 CVII 5	Narogi	CAvalts	
4	Bhuin thelia	The state of the s	Plant /C/walls	
1 5	Bahmi Khanor	Narogi	Plant /C/walls	
6	Bhosa Land Slida	Nonesh	Plant /Spur	
7	Bihali Gharat Nry.	Dryar	Plant /CAveits	
1 8	Kharna Thella Bridge	Jenta	Spur	A STATE OF THE PARTY OF THE PAR
9	Khani Kanda	Jesta	Sput	
10	Korg Nala	Jesta	Plant /C/walis	
-	2/18 Shoum	Najen	Plant /C/wells	
	Baga Hurta Khed	The state of the s	Plant/C/walls	
13	1/33 Juli Gahar	Najan	Spur	Valley Valley
14	Beshana Pot etc	Garsa	Plant /CAvalls	
16	KKIII	Shiah Shiah	Plant/C/walls	
16	kehuri Nali		Plant/C/walis	
17	1/38, 1/30, 1/40 Ft	Shish	Plantation	2
-	Bhalan II	Naral	Plant./C/webs	
Annual Control	1/41 Shandal	Narail	Spur	
	Rehater Bill	Tharash	Plet /C/Walls	THE RESERVE
Environment of	Bahugana	Tharash	Spur	
	Khansen	Tharash	Spur	
44	(Vielegel)	Thorsesh	Plat /C/Wells	

Sofoto of or or or

.

	8No. No. 1 2 3 4 4 5 6 7 8 9 10 11 12 13 14 15 16	Name of An Nirsh Dhar Khas Dhar Kufar Dhar Jemu Nel Dokasis Dokasis Dokasis Dokasis Nola Bai Torasari Khadi Bai Whoda Dhar Ghusani Khuba Dhar Khuba Dharu Khuba Dharu Khuba Dharu Khuba Dharu		Name of Beat Laksel Laksel Laksel Trai Trai Ropa Trai Trai Trai	Plantation Plantation Plantation College Plantation College Plantation College Plantation	Phy. HarNo As per
	No. 1 2 3 4 5 6 7 7 8 9 10 11 12 13 14 15	Nirsh Dhar Khas Dhar Kufar Dhar Jamu Nal Dukasis Nala Torasari Khada Bai Derai Nala Mooda Dhar Ghusari Rhuba Dhartu		Laksel Laksel Loksel Loksel Trai Trai Ropa	Plantation Plantation Plantation College Plantation College Plantation College Plantation	HarNo As per
	2 3 4 5 6 7 8 9 10 11 12 13 14	Khas Dhar Kufar Dhar Jamu Nal Dukasis Dukasis Nala Toresari Khadi Bai Dorai Nata Mhoda Dhar Ghusari Khuba Dhartu		Laksal Laksal Laksal Trail Ropa Trail	Plantation Plantation C/Welts Plantation C/Welts Plantation	HarNo As per
	3 4 5 6 7 8 9 10 11 12 13 14	Khas Dhar Kufar Dhar Jamu Nal Dukasis Dukasis Nala Toresari Khadi Bai Dorai Nata Mhoda Dhar Ghusari Khuba Dhartu		Laksal Laksal Laksal Trail Ropa Trail	Plantation Plantation C/Welts Plantation C/Welts Plantation	As per
	3 4 5 6 7 8 9 10 11 12 13 14	Kufer Dhar Jemu Nel Dukassi Dukassi Nela Jemu Nel Torasari Nela Jemu Nela Bei Derai Nela Moda Dhar Ghusari Khuba Dhartu Khuba Dhartu		Lokosi Laksel Trail Trail Ropa Trail	Plantation C/Walts Plantation C/Walts Plantation	
	5 6 7 8 9 10 11 12 13 14 15	Jemu Nel Dukasi Nala Dukasi Nala Torsseri Khadi Bai Derai Nala Moda Dhar Ghusari Khuba Dhartu		Leksel Trail Trail Rope Trail	C/Walts Plantation C/Walts Plantation	
	8 9 10 11 12 13 14 15	Dukasa Nola L Torasari Khada Bai / Darai Nola Khoda Dhar Ghusara Khuba Dhartu		Trail Trail Rope Trail	Plantation C/Walls Plantation	
	7 8 9 10 11 12 13 14 15	Dukasi Nale L Torasari Khadi Bai V Darai Nala Khada Dhar Ghusana Khuba Dhartu		Trail	Plentation	
	9 10 11 12 13 14 15	Toreseri Khedi Bai / Derel Nata Khoda Dhar Ghusans Khuba Dhartu		Ropa Trail	Plantation	
	9 10 11 12 13 14 15	Rhedi Bai Derai Nata Khoda Dhar Ghusani Khuba Dhartu		Trail		And the second
	10 11 12 13 14 15	Derei Nata Khoda Dhar Ghusara Khuba Dhartu		The state of the s	1994	As per
	11 12 13 14 15	Khode Dher Ghuseni Khube Dhertu		17350	Plantation	
	12 13 14 15	Ghusani Khuba Dhartu		Marie Control	C/Walls	Anna
	12 13 14 15	Khuba Dhartu		Đalu -	Plant / C. Walls	As per r
	13 14 15	Thrimbia ca Nat		8elu	Plant / C. Walts	-
	14		-	Balu	Plant/Grass	
	15	Tierre d'On		Balu	Plant/SC	
	Statement .	Tipandi Dhar		Balu	Plant/Grass/SC	
		Dodni-ra-Nai	1	Balu	Plant / C Walls	
		18-Pede	1	Balu	Plant / C. Walts	
	17	Parthachi	E	Balu	Plant / C Walls	
-	18	Bira Dhar	15	en	Plant / C Walls	
	19	Shile Nel	S	ian	Plant / C Walls - C/Walls	1911
-		Arsu Nai	S	ari		
-		Bhalhad	S	an	Plant / C Wells	1
-		Saran	R	ahn	Plant / C Walls	Prince Inc
-	-	Chubhiu	R	ahri	Plantation	
		Sharad	p,	enanca	Plantation	A FEBRUARY AND A SECOND
		an Thach		ahris	Plant / C. Walts	
	26 F	anarsa Hansu		snersa	Plantation	17-7-5-17
	27	lau Doghan		merce	Plant / C. Walls	
	26 N	au Kandhi Dhar	Au		Plant / C. Walts	10
_	29 P	anau Chaleyola -	Au		C/Walks	
3	30 K	itina	Au		Plant / C. Walis	
3	31 S	hani Dhar	Act		Plantation	
3		imuthi	Sar		Plantation	
3	() P	erthachi Nala	-	sirkol	Plantation	
3	M M	ajhogi	-	The state of the s	C/Walls	
35	5 10	t Shahni Nala		arkot	C/Walts	As per norm
3		godh Nale		irkot	C/Wells	As per norm
3/		riged Nala	San		C/Walks	As per norm
36		Inhar Naia		irkat	Spur	As per norm
36		ri Nala	San		C/Walls	As per norm
40		7.1.494	San		C/Wells	As per norma
41		an Takoli Nala	San		Plantation	
12	Pak	ehar Khad	Sari		C/Walls	10
43	17 488		San		Spur	As per norms
44	- P. 1940	Doghari 🗸	Pane		WHS	As per norms
45	11 1141	ovynan v	Pena		WHS	
10	Gen		Rahn		WHS	1
-						1
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-	Ab	stract for Bhuni	ar Forest Range Parvati Fo	rest Division
	Name of Area	Name of	Activities	Phy
No	K.	Beat		HafNe
	Silling Khaner	Sandher	Plan@C wafts	10
1 3	2 Linger	Sandher	CAvalls	
- 3	3 Chamba garh	Sendher	Pasture	2
1	4 Kathu ra Khol	Sandhar	Plantation	10
1	Rium nala	Peh	CAtems	
	Pahdhar	Pah	Plant/Sour	10
1	Mohal Khad	Ethulang	Spur	
	Kot dhar	Bhulang	PlantiC walls	20
1	Dodni Khaner	Bhulang	Plant/C walts	20
	Jamot	Mohal	PlantiC waits	10
1.	Shallani Slip.	Mohal	C/weils:	
13	Dibbemala	Mashgan	C/walls	
13	Kakru Nal to Sohani	Mashgan	C/weils:	
14	Sahoni	Machgan	Plantation	10
	Bharjunga	Mashgan	Penture	20
16	Bayoura Kandi	Mashgan	Spur	
	Reri Nelle	Mashgan	C/dams	
	Kataheli to Hot Baker	Mashgan	Spur	
	Dharu-Ri-Dhar	Mashgan	Plant/C walts	10
20	Mashgn	Khokhan.	Plantation	10
	Joker Kuffi.	Pihokhan.	Plan#C wills	10
27	Tapra	Neul	PlantiC walts	16
	Shog: Vill	Neul	Panture	40
	Tringed	Neul	PlantiC waits	10