CATCHMENT AREA TREATMENT PLAN

Sambarkund Medium Project Taluka : Alibag District : Raigad

CHAPTER – I (General)

1.0 General

The river Sambarkund is one of the tributary of kundlika river valley. The proposed dam is situated up stream of village Mahan about 8 Kilometers upstream of its confluence to Kundlika River. The proposed command falls in Alibag Taluka. There is no existing or irrigation facility in this area. The main Nalla originate at an altitude of 335 M, having fan shaped catchment area. The catchment area at proposed dam site is 28.10 Sq.Km.

1.2 Climatic Condition

The rainfall in the valley is about 2500 to 5000 mm. The maximum and minimum temperatures are 31.8^0c and 17.7^0c respectively of Alibag station. The maximum precipitation is form June to October alone. The area is classified under Agro climatic zone No. IV A. Generally the soil in command is previous and hence water drains away rapidly. Due to this there is an acute shortage of water during summer. Hence the farmer's in this area are cultivating one crop in Kharif only.

1.3 Socio Economical Facility:

The main occupation of the people in this area is agriculture. Duel facility may avail from the proposed project; the people can habituate to take double crop with availed irrigation facility, which improves General masses of the area.

1.3.1 There is Gail and H.P Gas plant in the command of proposed project. However, there is one fertilize complex near Thal Vayshet about 20 to 25 K.M. from the proposed project area and Indian Petro chemical project about a distance of 35 to 40 K.M. From the project area.

1.4 Geological features :

There are no other natural resources such as mineral ores etc. The General Geological features of the area consist of thick nearly horizontal sub sequent flows of Deccan trap basalt. Important flows includes compact basalt, amygdaloidal basalt, volcanic basalt and redtachylitic basalt.

1.4.1 The catchment area seams to be with steep hills and camping ground forest. These forests have been lightly diminished on account of population growth. Excessive grazing etc. This leads to some extend of soil erosion.

1.4.2 A 60% of submergence area is of forest area. The said forest for storage also required forestation, which leads to the erosion of soil. Hence it is necessary to soil conservation horticultural on steep hills ground and scientific agricultural development program etc. For catchment area treatment.

1.4.3 With an view to above scheme for integrated development of catchment area treatment has been takes up with forest. Agriculture, Horticulture and soil conservation development with due consideration. The provision for marking out the expenditure over this activity may be made out development project, which are undergoing with the respectively departments.

CHAPTER – II (Catchment area)

2.1 The catchment area up to Sambarkund dam site is 28.10 Sq. Km. with steep hills and forest. The latitude and longitude of the proposed site are respectively $18^0 32'$ and 73^0 3' with reference Toposheet 47 F/2. The river is originating from altitude 335M and flows towards the west and meets Kundlika River near village Bhonang. The Kundlika River is a west flowing river and joint Arabian Sea near village Salav.

2.2 The dam site falls in the influence zone of Nagothane Rain gauge station. The area falls in the rainfall range of 2500 to 5000 mm. as per Isohytal map of I.M.D. It is proposed to utilizes full yield of 75% dependability, i.e. 50.70 Mcum. being there is no upstream utilization in the catchment.

2.3 It is revealed from the census book an about 46.5% of the area is cultivated and 41.5% of the forest with about 12% other area, such as Nalla, road, west land etc. Mostly there is a paddy cultivation is in routine. The soil erosion from the field & forest may be prevented by scientific way of soil conservation, by the way of round and planting forest etc. on steep slopes.

2.4 Reserved forest is the main type of in the catchment area.

CHAPTER – III (River system)

3.1 The presence of stream and channel, are the important elements in the drainage basin of the catchment. The stream with higher bed grade deposits less and eroded more with the product delivered to the main stream. All the stream are non-perennial and are active only during monsoon period.

3.2 The rainfall in the catchment area is confined much devouring rainy season except one or two past monsoon falls devouring November and December. The decrease in natural precipitation occur due to human interference in the catchment, such as unauthorized falling of trees, change in the agricultural practices, increase in the area of cultivation in the catchment etc. This results in the waste of excess flow during monsoon season.

3.3 After studding the catchment area from the Toposheet, whole area may be divided in to two number watersheds of left & right Nalla for development.

Being the right side of Nalla flows from longer distance with heavy forest, it is possible to develop the catchment area treatment with the help of forest department activities.

CHAPTER – IV (Geology)

4.1.1 Sub surface Geology have been studies on the basis of geological logging. Present Geotechnical investigation encompassing study of surface Geology. Area under investigation consists of thick nearly horizontal subsequent flows of Deccan trap basalt. Important flows include compact basalt, amygdaloidal basalt, volcanic breccias and re tachylitic basalts.

4.2 Area at the dam site consists of thick flows of amygdaloidal basalt & compact basalt. Amygdaloidal basalt in exposed at about Ch. 390 M. of the dam line bore whereas porphyritic basalt is exposed at about Ch. 360 M. of dam line. It is indicates that top of flows shows amygdaloidal structure while central part of flow is compact or porphyritic in nature. Excluding river bed there is overburden compromises of soil and angular boulders and pellets of basalt of various types. Overburden comprises boulders of vesicular laterites boulders on right bank, wherever over burden is devoid of laterite boulders on left bank.

Geological section proposed in the basis of Geological logging of cores. This indicates that there are thick flows of amygdaloidal and porphyritic basalt. Geological section along river indicates that amygdaloidal basalt occurs in the river bed.

4.3 Area under investigation consists of thick subsequent nearly horizontal flows of Deccan trap basalt. Amygdaloidal and porphyitic basalt is exposed in river bed while most of the part of dam alignments is covered with over burden which comprises of soil and boulders of be salt and vesicular primary laterite. Geological section along the dam alignment decided on the basis of geological logging of cores from bore holes.

4.4 On the basis of Geological investigation proposed dam appears to be geological suitable for construction of 38.18 M height earthen dam.

CHAPTER – V (Soil Survey)

5.0 The project will command a gross area of 4313 ha. in Alibag Taluka of Raigad District. The command area occupied patches of plain land, near sea coast, slopping foot- hills and few wooded hills. The climate is warm and humid during most of the year. It receives an average annual rainfall of 3,000 mm., mainly during the monsoon. The area is mostly under kharif paddy and grasses.

The soils are highly leached red loams or laterite. Th depth wise distribution of soil of the area surveyed is as follows:

Sr.No.	Depth- Class	Depth	L.B.C.	R.B.C.	Total	P.C.
1.	Very Shallow	0-20	375	300	675	8.65
2.	Shallow	20-40	625	850	1,475	18.91
3.	Medium	40-250	2,525	3,025	5,550	71.15
4.	Deep	+20	75	25	100	1.29
Total			3,600	4,200	7,800	100

Nearly 70% of the area would thus appear to be medium in depth and hence irrigable. Texture of the soils is usually silt clay loam. No salinity and alkalinity of soils was observed expect for the saline near the sea-creek.

Proposed crop-pattern provides only 5% perennials, which can easily be accommodated in suitable medium soil.

Reconnaissance soil survey Report of Sambarkund Medium Project.

5.1 Project :

A storage dam is dur to be at Village Mahan on Sambarkund River (a tributary of the Kundalika rive) Taluka Alibag, Raigad District which meets river kundlika at Village Bhonang.

The Right Bank PDN, 15 Km. In length, passes along the foothill slopes, and will have a branch near the village Mahajane; This branch further bifurcation and runs along the hills of the N.P.C. areas to command land to the North and South.

PDN on the left Bank will have a length of 5 Km. And will pass on the ridge of foothill slope up to Nangarwadi village, commanding areas to the west up to the Kundlika river.

A reconnaissance soil survey of the command area was therefore carried out in February-1997 to find out the suitability of soil for irrigation. The main finding of the soil survey area discussed below. A rapid, rather than detailed soil survey was undertaken on account of the necessity of quick but comprehensive report about the suitability of the soils of the area.

As per salient feature, the gross command area is 3722 ha. (R.B.C.) and 591 ha. (L.B.C.) i.e. approximately 4313 ha. But the actual area surveyed as per index plan is 7,800 ha.

5.2 Irrigation

Proposed right bank PDN takes of from Village Mahan and has a gross command area of 3722 ha. The command area lies in Alibag Taluka covering 28 Villages. The right bank PDN runs along the foot hills of Village Umate. Near Village Umate, there is dam constructed on local Nalla for water supply. Near Village Mahajane on the ridge, two branch PDN are proposed, one passing along Village Phanasapur, Chinchoti, Choul, on the foothills and the second along Village Walawadi, Wave and Andoshi, Sarai. These branch PDNs run along foot hills of the big hills near Wave.

The proposed left bank PDN is of 5 Km. Length having gross command area of 591 ha. Left bank PDN also runs along the ridges and foothill area of Village Rajewadi, Ramraj, Nangarwadi.

Cropping Pattern:

5.3 Rainfall and climate:

The command area of the proposed Sambarkund project is near coastal region of Western Ghats. The area of this project comes under the high rainfall region (Annual rainfall about 3,000m) In general, the Konkan region has a tropical semi-humid climate. Average temperature is 80^0 F. (26.5^0 C) and the maximum and minimum temperature is 92^0 F (33^0C) and 65^0F. (18^0 C) respectively. Except for the rain season, there is usually a moisture deficit in the climate of the region.

Existing Cropping Pattern :

A larger area of the command is under Kharif paddy. Practically no other crop is growth in the command. But some area in the Village Ramraj and is under the garden of palm, Coconut, Betelnut etc. % of existing crops are as under:-

1.	Paddy	51
2.	Other Food crops	10
3.	Pulses	11
4.	Grass	28
	Total	100

5.4 The Object and produced of Reconnaissance soil Survey:

The reconnaissance soil survey is undertake when a general idea of a long area required without spending much time on a more detailed survey. It involves the study if Toposheet, Which are drawn to a scale of 1:63,360. The toposheet study given the general nature of the land slopes, land configuration, surface drainage etc. These broad impressions are to be supplemented by visual inspection of topography, general land slopes, pattern of classification and general nature of the soil. The soil depth and profile characteristics and general nature of the soil. The depth and profile of classification need to be determined at few places, preferably by means of open profiles.

a) Data to be obtained in the pre-irrigation soil survey:

i) Classification of soils in to shallow, medium and deep.

Shallow soils - The area with the soil depth from 0 to 40 cm.

Sub divided into very shallow 0 to 20cm.

And shallow : 20 to 40 cm.

Medium soils – The area with soil depth from 40 cm. Up to 250cm.

Deep soils – The area with soil depth from more than 250 cm.

i. Data on salinity, alkalinity.
ii. Data on soil texture and soil structure, which is of use in designing the irrigation scheduled.

b) Field and Laboratory work:

Due to undulating nature of the area traverses of the area were taken for mapping very shallow, medium and deep soil areas. Traverses were supported by pit work on grid basis where larger stretches of same type of soils were observed.

In order to study the morphology of soil, profiles were examined to study different soil characteristics at suitable places. Study of open profits is necessary for identifying soils colour, texture, structure, molttling, consistence, existence of concretions, hardpan, root distribution etc. At suitable intervals infiltration testes were conducted to study the permeability of different horizons.

Observation of sub soil water levels for few scattered wells were made for the general depth of sub-soil water table and the quality of water in term of EC & PH.

For laboratory investigation samples were collected from all open profiles, natural layer wise; laboratory tests viz. Mechanical Analysis, electrical conductivity, saturation moisture, % ge shrinkage, Hydraulic conductivity were carried out.

Geology:

The underlying rock of this area is Deccan trap or basalt, uniform in composition. By weathering it gives rise to Murum. Some laterite rocks patches were also noticed.

Area close to creek is flat and rich in alluvial nut heavy concentration of salt is observed below the substrata as this area shows some marine deposits.

5.6 Right Bank PDN:

Most of the area under the command is gently to very gently sloping land. The PDN alignment is on the foothill slopes.

The command area near dam site up to Village Ramraj is highly undulating. Most of the area is hilly with a few shallow soil patches.

Roha- Alibag Road Passes near the PDN alignment up to wave khind. The Right side area of village. Bapale-Borghar, Umate, Phanasapur shallow medium soils with B to C class slopes. This soil has formed the deposition of colluviums. Deep soil is noticed near Phansapur and Agrav . The influence of creek water is observed in this part of the command area.

Most of the area of Wawe, Mahajane, Beloshi, is highly undulating with exposed rock are seen the village Khanav, Velavali, Usar and Ghotiwade.

The area of Village Velavali, Bhadane, and Dewale on road to Velavadi is shallow to medium. Most of the area is not under cultivation, being Government forest land. In some area crop like Watermelon and Beans are taken.

Area of village Khanav and Valavadi are very shallow with patches exposed rock. Area of Revdanda choul, villages is medium having thick gardening of hard nut and coconut etc. Remaining area of the command is medium flat, having B class slope i.e. 13%.

Left Bank PDN

Area near the PDN alignment is undulating. Terrace development is noticed near the low land of village Rajwadi and Nangarwadi. All the command area is medium to soil, deposited by colluviums action.

5.7 Broad soil Classification:

Following is the depth wise break up to the total surveyed are of 7,800 ha.

Sr. No.	Soil Class	Depth	**R.C.B.**		**L.B.C.**		Total	
		Cm.	Ha.	P.C.	Ha.	P.C.	Ha.	P.C.
1.	Very Shallow	0-20	300	7.1	375	10.4	675	8.65
2.	Shallow	20-40	850	20.2	625	17.4	1,475	18.91
3.	Medium	40-250	3,025	72.0	2,525	70.1	5,550	71.15
4.	Deep	250+	25	0.6	75	2.1	100	1.29
Total			4,200	99.9	3,600	100.0	7,800	100

Nearly 70% of the command area would thus appear to be medium in depth and hence irrigable. Most of the very shallow areas comprise of exposed rock and Murum. Deep soils are also not command and occupy hardly 1.5 % of the total area.

Salinity and alkalinity of soils were not observed except for the saline sub-soils near inlet of sea e.g. Village Bhonang, Navakhar and Divi.

5.8 Board Pattern of Land Use

The perennials will not be allowed in shallow and very shallow to prevent heavy percolation losses and losses due to excessive drainage. From medium and deep soils area with high water table, cut up area and saline area are not considered suitable for irrigation and are deleted from the suitable area. Areas within $^{1}/_{4}$ mile limite of village sites are not recommended for perennial irrigation on public health ground. Exact areas could be available after detail soil survey.

Traverses of the area were made and 74 auger bores and 7 open profits were taken to fix tentative M.I. Bs. And the soil series. The soils of the areas are classified in 4 different series for identification. The detailed description of the soil series are appended in this report.

The shallow and very shallow soils are grouped into one series in the command along with the two series for the medium soils. One series from the medium is located on sloping land near the foothill, and another on plain, bunded Land. Deep soil is very limited. The boundaries are shown on the map.

5.9 Characteristics of Tentative soils series.

Sr. No.	Name if Series Soil properties	Agrav I	Mahan II	Khanao III	Beloshi IV
1	Present material	Colluvium	Colluvium	Colluvium	Basalt
2	Mode of Development	Transported	Transported	Transported	In situ
3	Soil Depth (cm) Texture	0-140	100	100	25
4	Structure	Clavey	Clay loam	Clay loam	Clay loam
5	Free lime	Blocky & Massive	Sub angular Blocky	Sub angular Blocky & Massive	Sub angular Blocky & Massive
6	Mottling	Nil (maring shells present)	Nil	-	-
7	Soil drainage	Present	Nil	-	-
8	OH	Very poorly drained	Well drained	Well drained	Well drained
9	EC (mmhos/cm)	7.20-7.70	7.50-7.60	7.50	7.50

10	Irrigablity classes	0.32	0.11	0.11	0.18
11	Limiting Factors	IV	I – II	I-II	IV –VI
12	Extent of area Ha. P.c.	Internal Drainage 100 1.4	2150 27.6 (most extensive & suitable for irrigation	34000 43.6	Soil Depth 2150 27.4

5.10 Land Irrigability Classification

The concept of land irrigability classification is by itself highly qualitative. In the soils of Maharashtra, the problem in the past used to be heavy concentration of perennials and the subsoil drainage problems caused thereby. With the experience so far, it is now clear how this problem is to be tackled by the control of the extend of perennials outlet wise. At the pre-irrigation soil survey land irrigability classification endeavors to state these controlling factors in broader terms. In various irrigability classes the following percentages of perennials are permissible.

		p.c
Class I …		12-15
Class II	…	9-12
Class III		6-9
Class IV A		3-6
Class IV B		0-3
Class V		Nil
Class VI		Nil

Sub-soil Water table

Reconnaissance soil survey was done in the month of March-1997. The wells observed in the command are drinking water wells. Generally, the sub-soil water table was seen below 3 m.

Laboratory findings:

Texture of the soil in the command is medium to find medium i.e. loam, silty clay loam. Soils in the village Bhonang, Navkhar, and Divi highly saline and slight acidity is also noticed.

Communication, Marketing and other facility :

The main communication facilities in the command are as below:

1) Alibag- Roha district road passes through the command.
2) Alibag- Pen road is also near to the command.
3) Revdanda- Alibag road partly passes through the command.
4) Alibag is the Dist. Headquarter and taluka town near the command, which has good marketing and other commercial facilities.

CHAPTER – VI (Details of soil data in command)

1) Agrav Series:

Soils of the series are developed on plain, flat land near the creek and seashore of Alibag District. They are fine textures soil having the influence of marine deposits. The soil depth is 80 cm. And above. The soil is structurally well developed. Soils are clayey with the consistency plastic when wet. The soils are poorly drained; motting may be noticed below 60 cm.

Typical Profile :

0-20 cm	Dark brown (10 YR 4/3) dry grayish brown (10 YR 3/2) moist; clay; medium Weak sub angular blocky hard when dry, firm when moist and plastic when wet; no concretion; thin few roots; clear boundary.
20-60cm	brown (10YR 3/2) when moist; clay; medium moderate sub angular blocky; Hard when dry, firm when moist, plastic when wet; no concretions; no Roots diffused boundary.
60-140cm	Pale brown (10 YR 6/3) dry; clay; medium moderate sub angular blocky; dry hard, moist firm and plastic when; no concretion; common distinct mottles (10 YR 5/1); no roots.
140+ cm	Saline creek water.

Range in characteristics:

Colour ranges from dark grayish brown to pale brown. Texture ranges from clay to silt clay.
Physiography & Relief: It occurs on flat bunded land near seashore and creeks.

Drainage: Poorly drained.

Land use and vegetation: Practically free of natural vegetation but some salt living shrubs seen near the creek (marsh).

Distribution and Extend :

Under the command of Sambarkund project in village Agrav, choul, Revadanda on flat and Belkade, Navedar, Kurual and Vanavali near creek.

Location: In this village area of Agrav.

2) Mahan Series:

Soils of the series are developed from alluvium and colluvium material of the basaltic origin on sloping lands in the command of sambarkund project. It is moderately eroded soil having severe stoniness near the foothills. It is non- calcareous moderately will drained soils with gravelly and cobby loam. The structural development in this series in very limited up to 25cm.

Typical profile:

0-20 cm	Very dark gray (10 YR 5/2) dry and moist; gravelly clay loam; weak fine sub angular block; slightly hard when dry and friable when moist; no effervescence; thick and few roots; clear boundary.
20-50cm	Brown (10 YR 4/3) dry dark brown (10 YR 3/3) moist; gravelly clay loam; massive breaking into blocks; loose when dry; friable when moist; no concretions; no effervescence; clear boundary.
50-100cm	Dark yellowish brown (10 YR 4/4) dry; Dark brown (10 YR 3/3) moist; gravelly loams; massive; dry loose. Friable; no concretion; no effervescence.
100+ cm	Murum.

Range in characteristics:

Colour of the soils ranges from yellowish brown to dark yellowish brown. Texture range from clay loam to gravelly loam.

Physiography and relief: Sloping or undulating foothills

Drainge: Well drained.

Land use and vegetation: The natural vegetation is mango, babhul etc. and the land is cultivated in kharif for paddy only.

Distribution and Extent: Under the command of Samberkund project on both hill slopes area of villages Mahan, Rajewadi, Bapale, Belkade, Choul, Vincholi in Raigad district.

3) Khanao Series:

Soils of the series are dark brown to very dark brown developed from colluviums and cobbly material embedded on basaltic murum origin. The series occurs on flat bunded land surrounded by exposed rock and murum. It is well developed regarding structure and texture. The whole solum of this series appears to be uniform. Cobbles and pebbles are observed predominantly throughout the profile. It is hard when dry and firm when moist.

Typical Profile:

0-25 cm	Dark brown (10 YR 3/3) dry very dark grayish brown (10 YR 3/2) moist; clay medium moderate sub angular block; hard when dry firm when moist; no effervescence; thick and few roots; deffuse boundary.
25-50cm	Dark brown (10 YR 3/3) dry and most; clay loam; medium moderate sub angular blocky; hard when dry; friable when moist; no concretions; no effervescence; diffuse boundary.
60-100cm	When dry, firm when moist, no concretion; no effervescence with HCL.
100+ cm	Murum.

Range in Characteristics :

Soil depth ranges from 80-100cm. Texture below 20 cm. Is in the range of clay to clay loam. Vertical cracks are limited upto 25 cm.

Physiography and relief;

It occurs on nearly level to very gently sloping flat land.

Land use and vegetation; The land is thickly natural vegeted by forest trees and cultivated in kharif for peddy only.

Distribution and extend: Under the command of Samberkund Project, in the village area of Knanao, Divi etc.

Location; In the villages area of Khanao.

4) Beloshi series:

Soils of the series are developed from basaltic murum. They occur on slopping foothills and on gently sloping area surrounded by exposed murum. They are moderately fine textures soils like clay loam with yellowish brown to dark yellowish brown. Rocky and stony phase are predominantly noticed along with the severe erosion.

Typical Profile:

0-15 cm	Dark yellowish brown (10 YR 4/4) dry and dark brown (10 YR 3/3) moist; clay loam; medium moderate sub angular block; dry hard moist firm no concretions; no effervescence; thin and fine roots; clear boundary.
15-25cm	Dark yellowish brown (10 YR 3/4) dry and dark brown (10 YR 3/3) moist; clay loam; massive; dry loose, moist friable no concretions; no effervescence; clear boundary.
25+ cm	Murum.

Range in Characteristics: The texture of the soils ranges form clay loam to candy loam. The soil cover ranges from 10 to 25 cm.

Physiography and relief; Occur on slopping, undulating area surrounded by exposed rock and murum area and the very gently sloping flat land.

Drainage; Well-drained.

Land use and vegetation; Land is having poor natural vegetation like Babul and Neem. The land is cultivated only kharif for paddy.

Distribution and extend: Under the PDN command of Sambarkund Project of the village Mahan, Ramraj, Wave,Beloshi, Mahajane, Sarai, Area.

Location: In the village area of Beloshi.

CHAPTER – VII

Inhabitation & culture

7.1 The Sambarkund catchment fully comprises with steep hilly track and maximum forest area. The Sambarkund river formed by confluence of number of small Nallas and stream, upto the proposed site of sambarkund dam.

7.2 There is no village is under submergence. Only three pada of Mahan village may go under submergence. It is observed from the Toposheet that there are no major village in the catchment area of the project. Hence there is no question may occurs for creating amenities to the people in catchment area.

7.3 The proposed command area of the project seams to be well drained and connected with each other by village roads & other roads. About all most all village in command area are electrified and hence there is no necessity of special action development. The modern amenities such as telecommunication etc. are available in the near town of Roha, Alibag, Nagothana etc.

Considering the above process, it appears that the scheme for developing of area by afforestation and soil conservation. May holds good the effect for inhabitation and culture and also improve in balanced environment.

CHAPTER – VIII

States of Environment in catchment area.

8.1 It is known that any development may effected to that part of improvement and development of the standards of people in that area. Soil conservation is one of such type of development.

8.2 The soil is the outer most layer of earth crust. This tops layer of the soil plays the key role in agriculture activity and form the vegetable growth of the earth. The thickness of outer loose layer of earth is very less in steep hills. This may be dissent grated by wind pr weather action slowly. Due to this the process of migration is very less.

Due to hill track of catchment the rainfall being naturally more and surface run off increased due to great slope. This process results to an enormous erosive effects and form big and small stream for greater precipitation in the area. This phenomenal action in long run forms the debris which effects the environment of the area.

The consumption of forest product such as fuel wood, and fodder have also effect the erosion of soil by the process of decreasing forest growth. This in turns imbalance the environment of the area.

There are heavy paddy are in the agriculture fields of catchment and also these are unscientifically prepared agriculture fields. Hence the development of soil conservation work by bunding fields leads to the lesser erosion.

8.3 The people in the catchment area are using forest products for domestic purpose generally. It is also acceptable the use of forest goods for purposes such as building, I – Natures etc. may also leads to loss of wealth and effects to the environmental growth.

These can be substantially reduced i.e. consumption of fuel wood by replacing the conventional should by smokeless fuel efficient shoals, Gobar Gas plants, Kerosene stoves or oven L.P. Gas use. These help the improvement in the long run for balance in ecology due to saving of forest growth.

8.4 The protection of forest growth further help in retention of moisture in the soil. The water such retained flows through underground drains. The water retained through underground drains feed the water for growth of plants. The demand to the surface soil will directly hit to the process of underground drainage, which leads to the decay of forest; which effects to the environmental less.

8.5 The degradation of catchment area has given rise to the problems such as degradation of slope, low proportion of forest cover, sub optimum density and low potential forest, over grazed pasture, increased deposition of its in lower reasons of reservoir etc.

Silt deposition in reservoir leads to the reduction of life of reservoir. The soil moisture deficiency during dry seasons and enhancement of discharge during peak flood result in flooding the valuable wealth of forest during monsoon season.

Due to excessive explication of the natural resource, not only the non- renewable nut also renewable may face serious depletion in coming days. Thus the ecology balance gets disturbed.

8.6 Therefore the integrate development of the catchment area should account for the following may help the environmental development.

I. Passive afforestation or reforestation programme, with involvement of local community and special emphasis on plantation of broad leafed species.
II. Pasture development and their rotation.
III. Research for prevention of tree decay.
IV. Prevention and control of man-made fire i.e.
Adoption three dimensional fore standing including horticulture with due emphasis on plant giving seeds etc. for growing.
V. Development of fuel fodder and timber,, diversifying agriculture with commercial crops and high valued produces, training educating and demonstrating to the local people for scientific forming, etc.
VI. Soil conservation by bunds construction to increase water retention power.
VII. Replacement of conventional chufas by smokeless chufas etc.
VIII. Restoration and preservation of environment by all possible ways.

CHAPTER - IX

Land use and soil Erosion

The catchment area treatment involves essentially combination of engineering and biological measures with emphasis on latter. It emerges all the three resource viz. Land, forest and water. The measure should envisages planed change in land use pattern which very vital for effective implementation of such project framing of such scheme involves classification of the catchment area accruing to various capabilities is produce, crop vegetation and forest. The data regarding land use contemplates to potentiality of the land and physical option available.

Once the data regarding land use and erosion characteristic are known, it would facilitate to restore the demaged and diminished forest, revive depleted land and aqument water resources.

The catchment area treatment depends upon statues of soil erosion and the other erosion characteristic of the land. The entire catchment area for this purpose has been classified as (i) culturable land, (ii) forest land and (iii) other area.

The area of culturable land mainly belongs to private individual being used for growing different crops. The total area under cultivation in the catchment is 216 Ha. Which is about 12% of the total area.

Most of the forest area in the catchment is of reserved forest. The total area under forest is about 1647 Ha. Which is about 85% of the total area.

The area under Waste land and not available for cultivation is 60 Ha. Which is about 3% of the total land.

The soil erosion is very minimum considering the geological study of the area and reconsicence of the Nalla stream, with the forest cover etc. This can be further prevented by with the forest cover etc. This can be further prevented by compensatory afforestation, command are development and soil conservation measures of the area.

CHAPTER – X

Project Components

The Samarkand project was Administratively approved vide Govt. Resolution No. 2001/498/(80/2000) W.R.I. – 2 (Marathi Latter) dated 6/10/2001 for Rs. 5040.50 Lacs.

The catchment area of the project fully in the kundlika (West flowing) river valley. This way comprises fully in Alibag Taluka of Raigad District with small area of Roha Taluka i.e. the major area of village Mahan is in Alibag Taluka and very small area is under Roha Taluka. Area in Roha taluka is of only steep hilly area, which is negligible for providing catchment area treatment plan. There are no any other projects in the upstream catchment of the said Sambarkund project. But the Kundlika river valley is mainly covered with Kal river project.

The major area of the project in the upstream catchment is covered with forest area of Mahan village. The total area of the Mahan Village is 1923 Ha. Out of that 1647 Ha. Is the forest land. This has been extracted from censes book of Raigad District for the year 1981. The details of area and population area shown in annexure 2&3.

The requirement for improvement by proposed wood plantation is worked out in annexure – 5, which is an important and high yielding item of the development program. The type of plant's which may grow depends upon the factor like elevation of the plant location, Commercial value and the most important being type of soil. It is better situated to plant local broad leafed plants having more capacity to retain moisture and conservation of the soil.

An provision of providing smokeless chulas to about 25% of families of the catchment area is also proposed in the catchment plan as detailed in the annexure -6. An cost of F.R.L. counter plantation is also worked out in annexure – 7 and the same is provided in the action plan for the full length of F.R.L. counter periphery.

The requirement for development of soil conservation & agriculture work if the catchment area. Un-irrigated land (i.e. an about 20% area of total Un-irrigated land in the catchment) is proposed for development and worker out in the annexure-

The total cost of the whole scheme is tabulated in annexure – 4 which work out to 1,44% of the administrative approved cost project.

CHAPTER – XI

Action Plan

The successful implementation to the catchment area treatment scheme involves, (i) An organization and infrastructure to give requisite shape to the scheme. (2) Additional financial resources for funding resources for funding of the scheme (3) a phased implementation program based on rational criteria to ensure optimize utilization of resources, and (4) Monitoring and elevation to keep watch on the progress of work and to assess its impact on facilitating.

An organization, with the control authority of Divisional commissioner of various department heads may be set up for proper implementation of catchment area treatment.

The development of catchment area treatment may taken in hand debarring the proposed period of construction od Sambarkund irrigation project. Due to there will be no environmental loss of the catchment, by constructing the proposed Sambarkund irrigation project.

The program can also be implement by the respective department on their own management i.e. control authority set up for catchment area treatment program may allocate funds for various schemes of the project at the disposal of various department. The respective department can handle the monitoring evaluation and updating.

During the implemented period of scheme, watch may be kept to ensure speedy and effective implementation by fixing target, of physical program. This can be done with reference to available of financial aid. If any short fall may noticed, that may be up to dated by detailed investigation, therefore it is almost important to backup the scheme by scientific and technical studies to assess their impact. This kind of elevation would ensure quality, standard and control over unproductive expenditure.

This proposal of catchment area treatment concluded the (i) impact on silt load in the stream (ii) impact of planning different species for water retentively and soil erosion. (iii) Impact of mind foresting on natural fires and (V) Maintenance and or functioning of engineering work.

CHAPTER X.

Treatment of Catchment area of the project

Total Gross catchment area of project is 28.10 Sq. Km Total free catchment of Sambarkund Medium Project is **28.10 Sq. km** i.e. 2810 Hectare. Out of which all catchment area falls in Raigad District.

Total Forest area under catchment of the project is 2778.38 Ha. Non forest area is just 31.62 Ha. In addition to the catchment Total 228 Ha of Forest land is required mainly for Dam seat and Submergence. Diversion of Forest land proposal under Forest conservation act 1980 with enumeration of trees under reservoir periphery from FRL to FRL -2, FRL-2 to FRL-4 & up to MDDL is already done. Government of Maharashtra under water conservation scheme is already treating catchment area under forests or non forest under Jalyukta Shivar Scheme.

Objectives of Catchment Area Treatment Plan:

The main aims of the catchment area treatment plan are:

a. **Short term*:*** *Containment;* Control of erosion and checking degradation of land
b. **Mid-term:** *Restoration;* Sustained restoration of the land and its resources
c. **Long-term:** Improvement in biodiversity; to put in place a diversity of plants which would lead to natural restoration and regeneration of the eco-system.

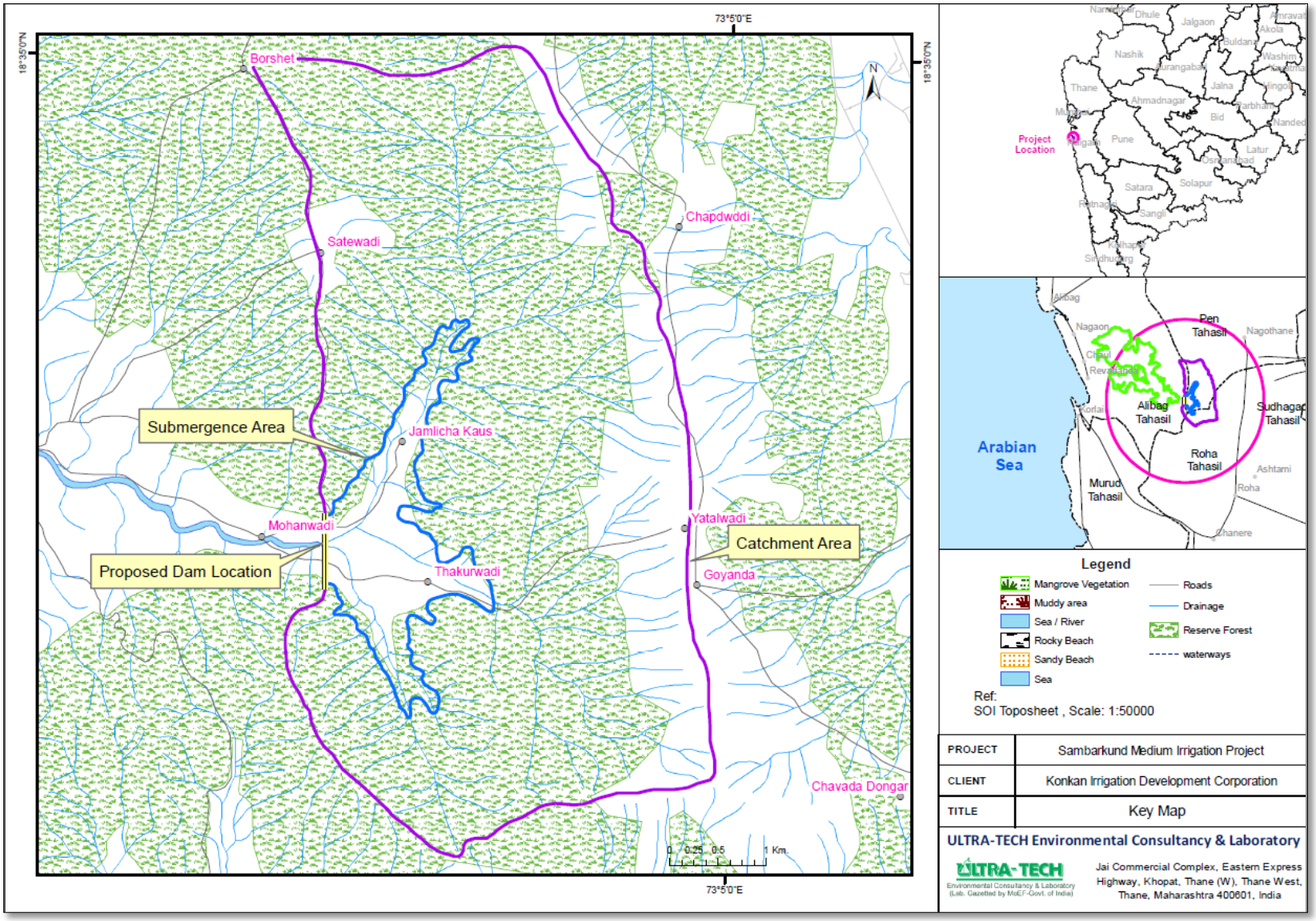
The objectives of the catchment area treatment plan may be listed as follows:

- Conservation of the important natural resources like soil and water.
- Prevention of siltation in the dam and thus maintaining the design capacity, depth and life
- Storage capacity of the dam.
- Economic up gradation of people in surrounding areas, as well as environmental conservation
- Through afforestation and reforestation activities.
- Improvement in the density and the biodiversity of flora and fauna thus making the ecosystem
- More stable and mature.
- Supplementation of production of fodder and fuel to promote livestock development.

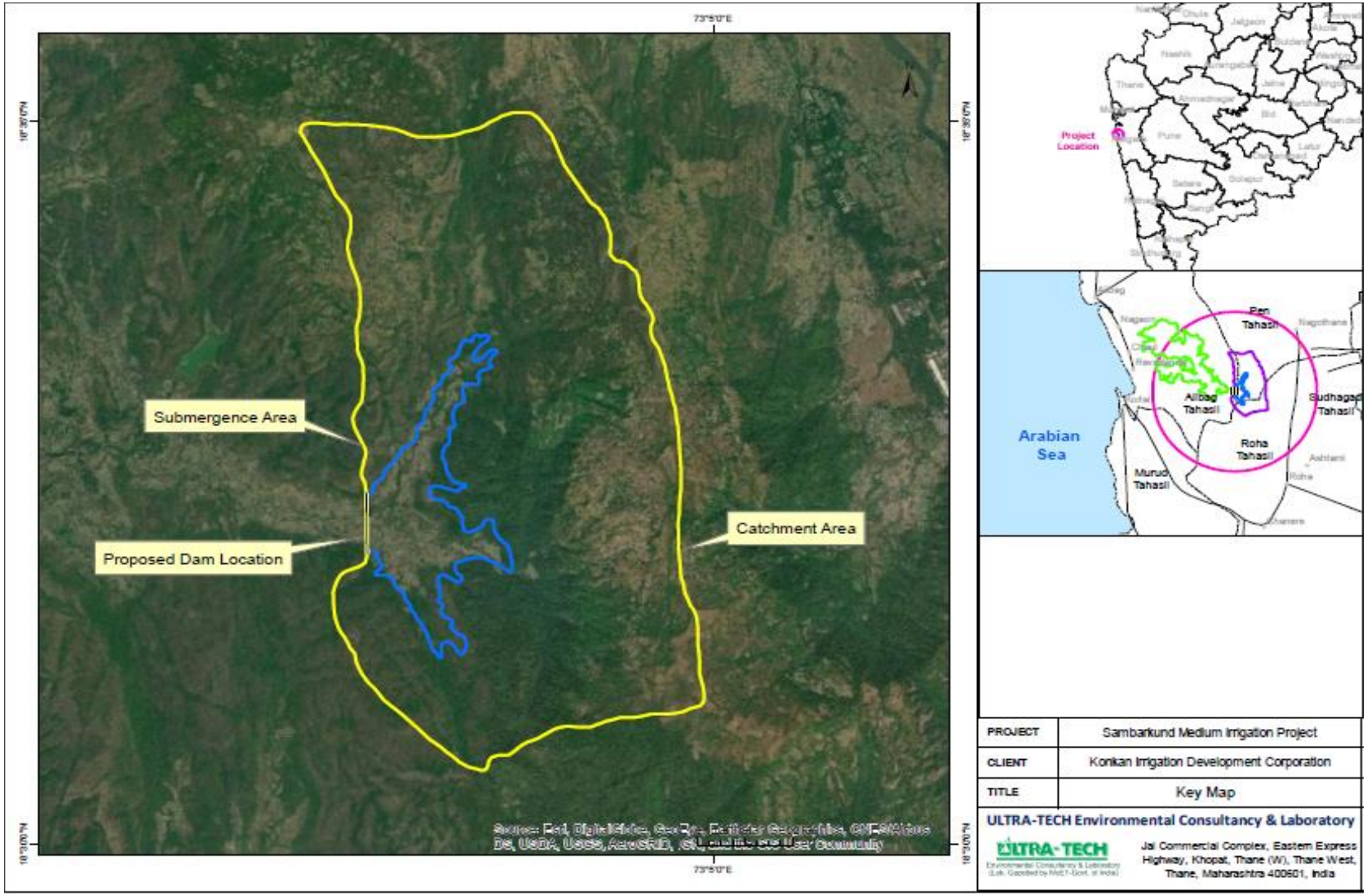
- Increase in the soil moisture content and the groundwater table level, which will result into the betterment of soil fertility and productivity.
- Reduction in the risk associated with the crop production, by softening the severity of the dry season by water conservation structures.
- Land treatment for increased vegetation tree density in the area, are also envisaged.

The scheme of implementation of the catchment area treatment involves various disciplines. It is advisable to take up work under each discipline simultaneously. The criteria for planning of the scheme are as below;

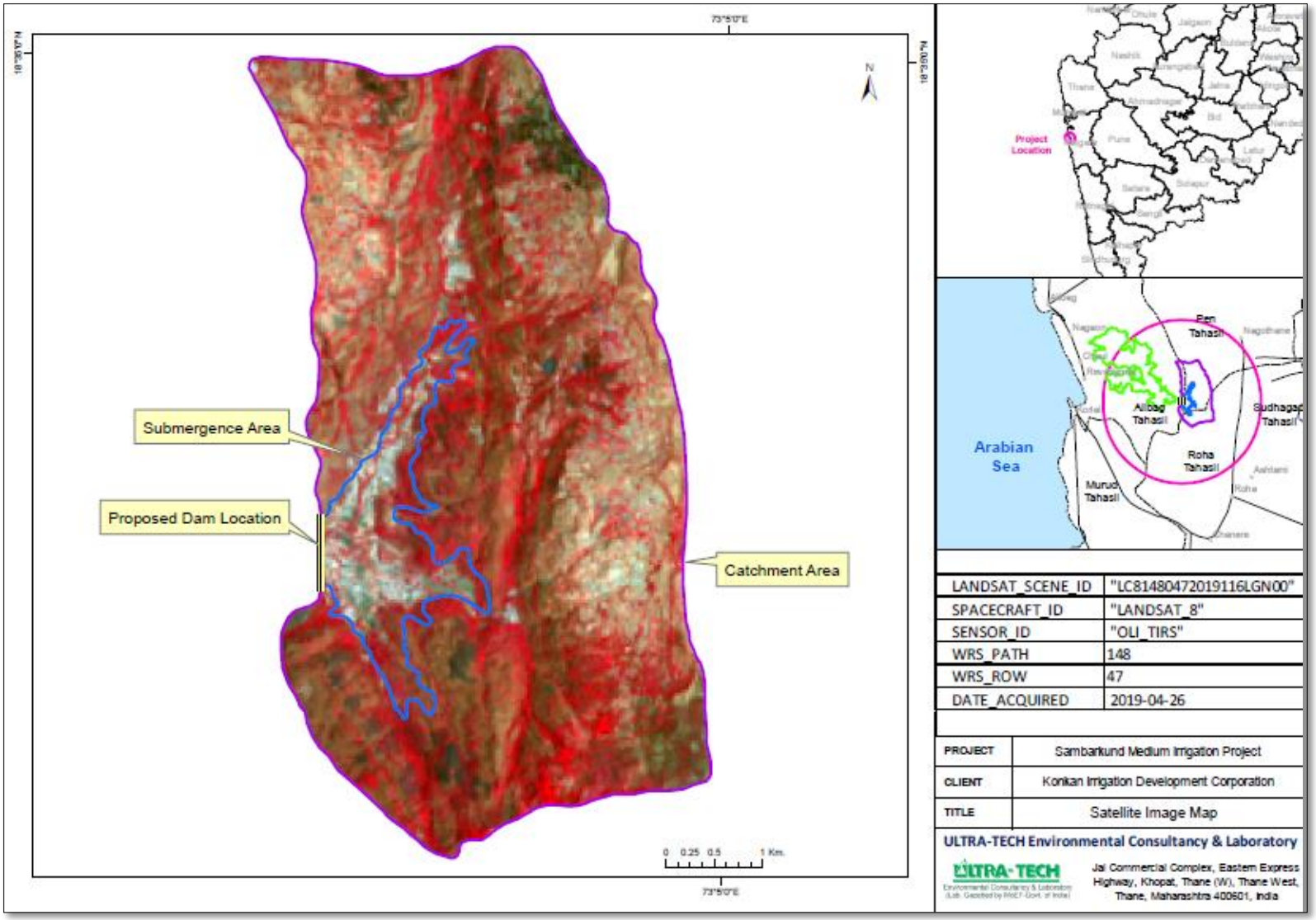
- The primary purpose of the scheme is to improve the environmental condition of the region. Second important object is to minimize the adverse impact of silt load on storage capacity of completed, on-going or proposed irrigation scheme. Thirdly, the most important factor the scheme is afforestation.
- The area contributing for maximum silt deposition into the stream is identified and taken up on priority.
- The treatment work will be taken from to peak to lower level.
- The under construction, proposed and under survey and investigation in the catchment area of this project are to be taken up for the treatment work.
- The catchment area of the storage tank is 28.10 Sq.km.
- The above watershed under the catchment is bringing major discharge into the main river.



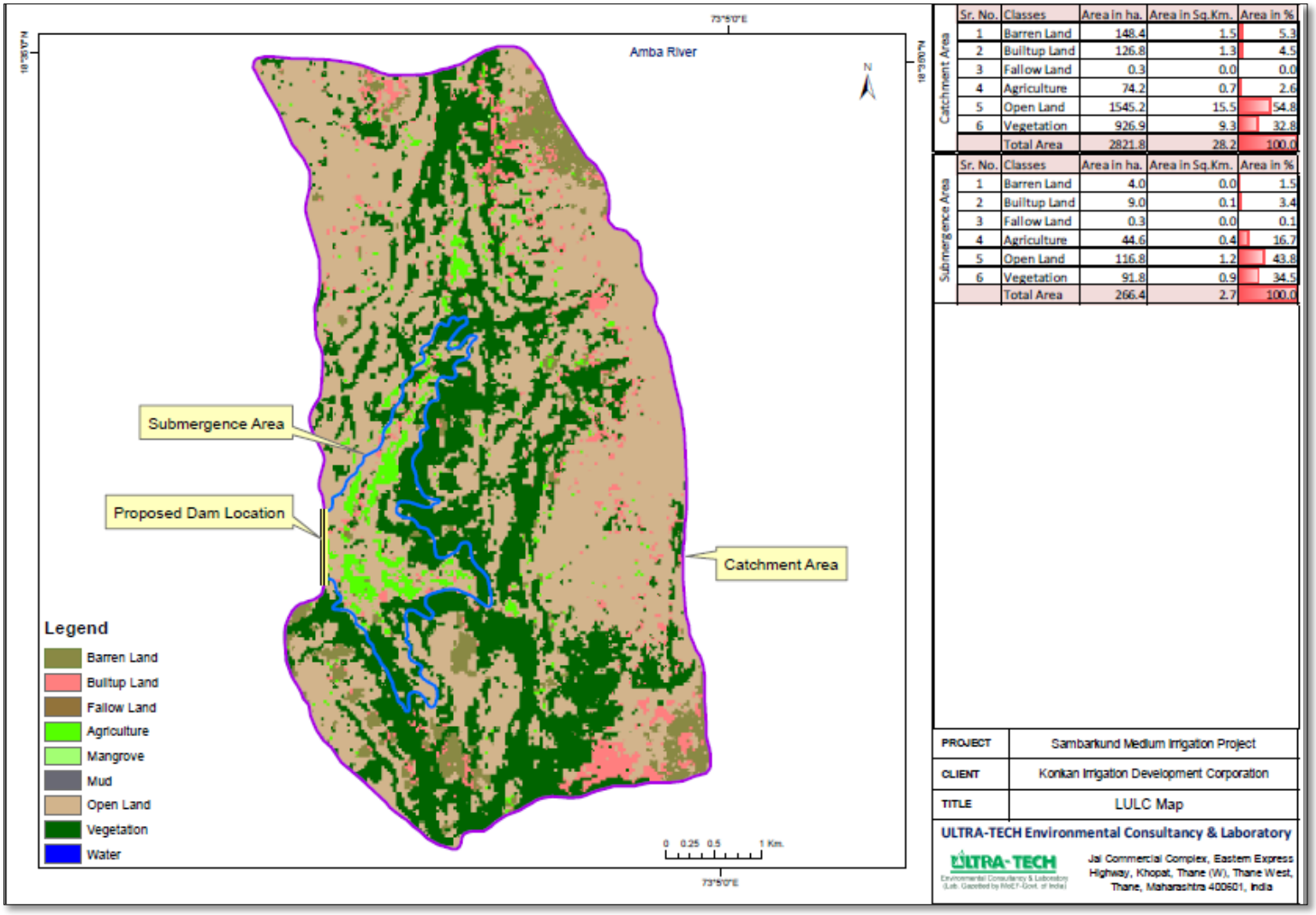
Catchment Area of Storage Tank



Google Image of Catchment Area of storage tank



Satellite Imagery of catchment area



Catchment Area

Sr. No.	Classes	Area in ha.	Area in Sq.Km.	Area in %
1	Barren Land	148.4	1.5	5.3
2	Builtup Land	126.8	1.3	4.5
3	Fallow Land	0.3	0.0	0.0
4	Agriculture	74.2	0.7	2.6
5	Open Land	1545.2	15.5	54.8
6	Vegetation	926.9	9.3	32.8
	Total Area	2821.8	28.2	100.0

Submergence Area

Sr. No.	Classes	Area in ha.	Area in Sq.Km.	Area in %
1	Barren Land	4.0	0.0	1.5
2	Builtup Land	9.0	0.1	3.4
3	Fallow Land	0.3	0.0	0.1
4	Agriculture	44.6	0.4	16.7
5	Open Land	116.8	1.2	43.8
6	Vegetation	91.8	0.9	34.5
	Total Area	266.4	2.7	100.0

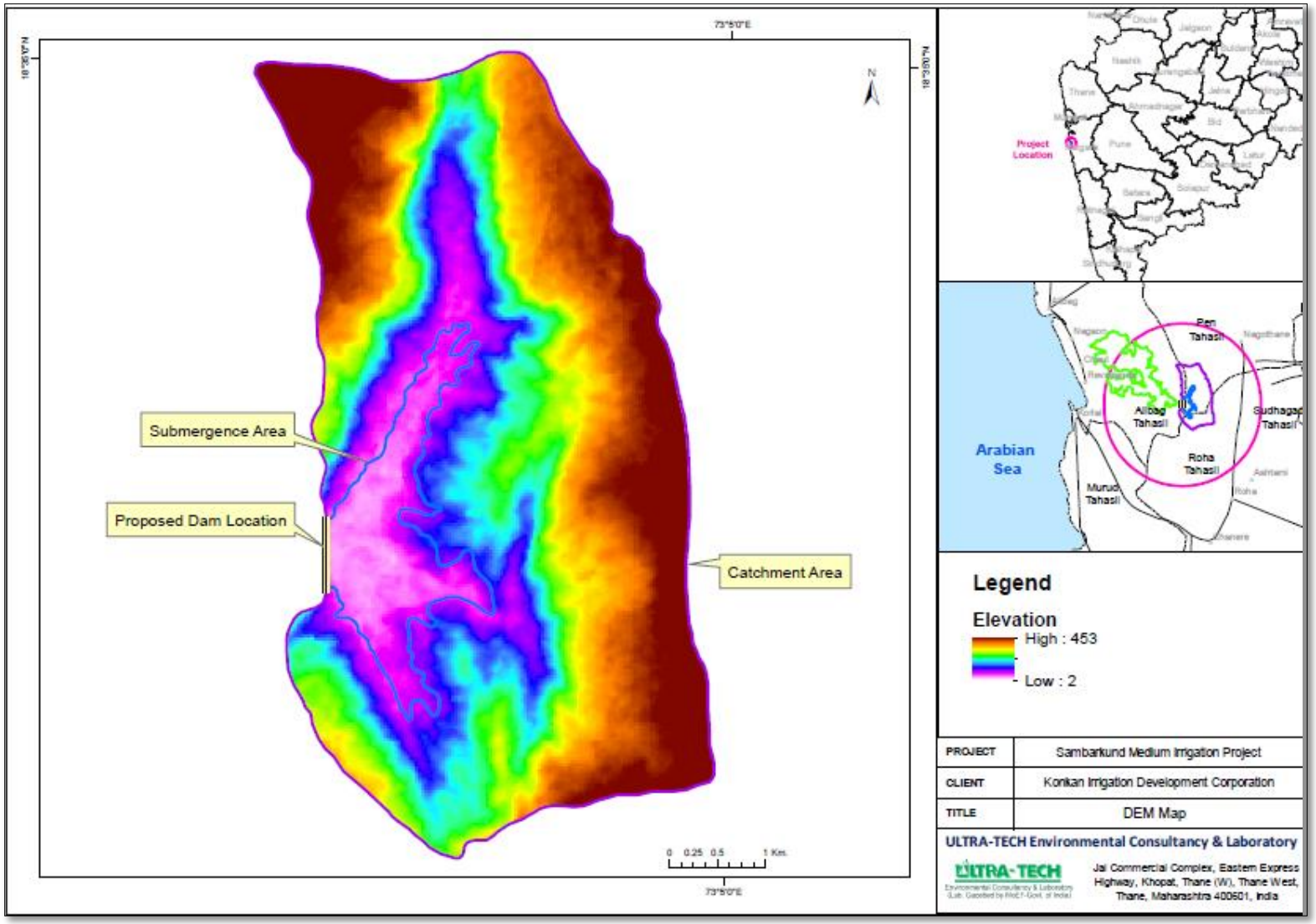
PROJECT	Sambarkund Medium Irrigation Project
CLIENT	Konkan Irrigation Development Corporation
TITLE	LULC Map

ULTRA-TECH Environmental Consultancy & Laboratory

ULTRA-TECH Environmental Consultancy & Laboratory (Lab. Gazetted by MoEF-Govt. of India)

Jai Commercial Complex, Eastern Express Highway, Khopat, Thane (W), Thane West, Thane, Maharashtra 400601, India

LULC of Catchment Area



DEM of Catchment Area

Details of the area from Forest Divisions under catchment of proposed Sambarkund Medium Project. Division and Range wise statement of catchment area is as follows

Table No 1. Details of Range wise Catchment Area under Forests Divisions

Sr. No	Compartment Number no	Range	Round	Division	kind	Total Area	Catchment area under project
1	201	Alibag	Ramraj	Alibag	RF	239.57	51.4
2	195	Alibag	Umata	Alibag	RF	214.89	130.3
3	197	Alibag	Ramraj	Alibag	RF	259.20	259.20
4	196 B	Alibag	Umata	Alibag	RF	220.96	220.96
5	196 A	Alibag	Umata	Alibag	RF	220.96	220.96
6	187	wadkhal	Bidwagale	Alibag	RF	313.03	79
7	210	Nagothane	Kadsura	Alibag	RF	199.92	199.92
8	196 A PT	Alibag	Umata	Alibag	RF	220.96	220.96
9	186	Wadkhal	Bidwagle	Alibag	RF	228.24	79
10	207	Nagothane	Kadsura	Alibag	RF	188.18	5
11	214	Nagothane	Kadsure	Alibag	RF	297.46	3.5
12	211	Nagothane	Kadsura	Alibag	RF	167.94	167.94
13	209	Nagothane	Kondgaon	Alibag	RF	265.47	58.9
14	200	Alibag	Ramraj	Alibag	RF	206.39	206.39
15	199	Alibag	Ramraj	Alibag	RF	203.15	203.15
16	198	Alibag	Ramraj	Alibag	RF	262.23	262.23
17	231	Roha	Medha	Roha	RF	188.18	13.2
18	226	Roha	Sanegaon	Roha	RF	189.99	2.53
19	228	Roha	Sanegaon	Roha	RF	297.85	297.85
20	229	Roha	Sanegaon	Roha	RF	198.30	96
						4582.86	**2778.38**

Details of forest area division wise is provided in table no 2.

Table No 2. Details of Catchment Area under Forests Divisions

Sr. No	Compartment Number no	Division	kind	Total Area	Catchment area under project
1	201	Alibag	RF	239.57	51.4
2	195	Alibag	RF	214.89	130.3
3	197	Alibag	RF	259.20	259.20
4	196 B	Alibag	RF	220.96	220.96
5	196 A	Alibag	RF	220.96	220.96
6	187	Alibag	RF	313.03	79
7	210	Alibag	RF	199.92	199.92
8	196 A PT	Alibag	RF	220.96	220.96
9	186	Alibag	RF	228.24	79
10	207	Alibag	RF	188.18	5
11	214	Alibag	RF	297.46	3.5
12	211	Alibag	RF	167.94	167.94
13	209	Alibag	RF	265.47	58.9
14	200	Alibag	RF	206.39	206.39
15	199	Alibag	RF	203.15	203.15
16	198	Alibag	RF	262.23	262.23
	Total under Alibag Division			**3708.54**	**2368.80**
17	231	Roha	RF	188.18	13.2
18	226	Roha	RF	189.99	2.53
19	228	Roha	RF	297.85	297.85
20	229	Roha	RF	198.30	96
	Total under Roha Division			**874.32**	**409.58**

Treatment Measures:

The treatment measures for arresting soil erosion in the catchment were basically classified into biological measures and engineering measures.

Various treatment measures, biological as well as engineering, have been proposed in the CAT Plan to manage the catchment area in an integrated manner to prevent soil erosion and maintain the ecology of the region. Sheet erosion has been observed to be the main cause of soil erosion, followed by gully and/or rill erosion, which makes it imperative that the land needs to be covered with vegetation. Accordingly, more emphasis has been given for biological methods like plantation of tree species, greening of the slopes with hardy pioneer grass and other shrub species. The factors such as over-grazing, road construction, fuel wood and fodder collection, etc. lead to soil erosion in the region.

Suggesting Combination of Engineering & Biological Method

In the catchment area, particularly in the free draining catchment, natural landslides are not the main cause and source of soil erosion or silt in the river. Sheet erosion, followed by rill and gully are the main sources of bringing silt load in the streams which finally comes to river. To address this emphasis is given to control the gully and rill erosion by adopting various engineering and bio-engineering measures, which are discussed below.

Specific requirement for a particular structure are considered at the time of planning and after looking into the condition of the area where treatment measure is to be undertaken. Dry rubble stone masonry (DRSM) check dams, masonry retaining walls, and bioengineering methods like use of Treatment of CCT / slips/ gullies/ rills are suggested. Considering the topography as well as the nature and quantum of erosion more emphasis is given for the use of Dry rubble stone masonry (DRSM) check dams.

While preparation of catchment area treatment plan the need of each compartment is taken into consideration for example, the area where erosion problem is known the concern area is proposed for Continuous Contour Trenches (CCT) treatment and on the sloppy area nalla bunds are proposed. Total 25 Nalla bunds are also proposed, Nineteen for Alibahg & Six for Roha Division. During last decade most of area is treated under various schemes. Considering large requirement of the treatment in most of areas, all crucial areas are taken into consideration for treatment. Therefore minimum 57 Ha of the treatment ie CCT and SMC (Gully Plugging) and plantation is proposed to cover maximum area under these divisions. Areas which are having good potential of soil plantation of 57 ha are also proposed to cover bank areas. In addition to this Distribution of Nonconventional Energy and Fuel Saving Devices in catchment area on a cost-sharing basis, such as, LPG, Pressure cookers and Solar devices. Estimate for Soil Moisture Conservation Work / Glully Plugging/CCT Works is enclosed as *Annexure I* and Estimate for Plantation Work under Catchment Area Treatment for Sambarkund Project Tal.. Alibag Dist Raigad is enclosed as *Annexure II*. However, updated wage rate 360.76 has been calculated during preparation of these plans.

Silt Observation Site:

A silt observation site for regular monitoring of silt load coming in river has been suggested. This would ensure monitoring efficacy of implementation various treatments measures suggested as in CAT plan. Monitoring would be undertaken for a period of 10 years including 5 years for CAT plan implementation period. An amount of Rs. 2.11 million has been earmarked for this purpose. The details are given in *Table-3*.

Catchment area of the proposed project along with tending operations of the existing root stock and soil and moisture conservation works shall be carried out in this area. However, during summer present perennial water sources are insufficient for enhancement the survival of wildlife, provision of treatment in this area will help in improvement of Flora & Fauna in the catchment of Sambarkund Project.

Table 3 Cost earmarked for establishing Silt Observation centre

Sr. No	Parameter	Cost (In Lakhs)
1	Cost of one laboratory	1.00
2	One observation hut at site	1.00
3	Cost for hiring services of @ one person at (Average salary- Rs 10,000/- for next 10 years) considering 10% escalation per year	19.12
	Total	**21.12**

Monitoring and Evaluation

Monitoring and evaluation is very essential for the various types of activities in CAT plan on daily, monthly and annual basis for proper execution of planned works. M & E studies including impact evaluation studies should be scheduled for the later years of the CAT Plan implementation calendar. An amount of Rs. 5 lakhs has been earmarked for Monitoring and Evaluation. Indicators for Monitoring impact of CAT Plan would include:

- Change in silt load.
- Survival of plantations
- Changes in land-use [private holdings]
- Changes in man-animal conflicts.
- Trend of fire incidences in vulnerable areas.

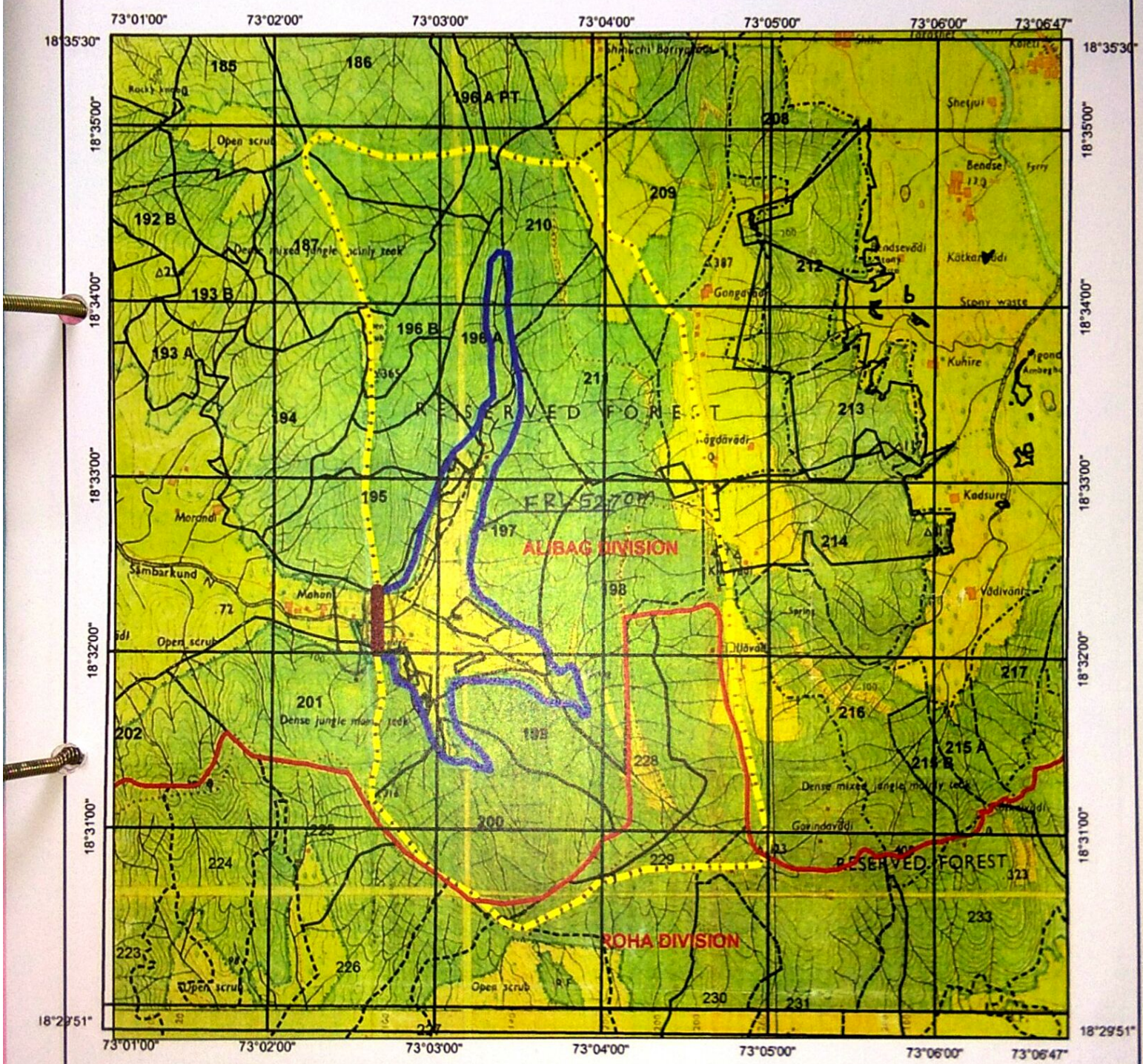
Table 4 Proposed treatment in respective forest Divisions

Sr. No	Divisions	Area under Catchment in Ha.	Treatment
1	Alibagh Forest Division	2368.8	19 Nalla bund +SMC 114 Ha + CCT 85.5 Ha + 57 Ha Plantation
2	Roha Forest Division	409.58	06 Nalla bund +CCT 57 Ha

Table 5 Detail of Division wise and compartment wise Treatment Plan

Sr. No	Compartment Number no	Division	Total Area	Catchment area under project	Nalla Bund in No	SMC Works in Ha	CCT in Ha	Plantation in Ha
1	201	Alibag	239.57	51.4	2	-	-	-
2	195	Alibag	214.89	130.3	1	-	-	-
3	197	Alibag	259.20	259.20	2	57	-	-
4	196 B	Alibag	220.96	220.96	1	28.5	-	-
5	196 A	Alibag	220.96	220.96	2	28.5	-	-
6	187	Alibag	313.03	79	1	-	-	-
7	210	Alibag	199.92	199.92	2	-	22.8	-
8	196 A PT	Alibag	220.96	220.96	1	-	-	-
9	186	Alibag	228.24	79	1	-	-	-
10	207	Alibag	188.18	5	0	-	-	-
11	214	Alibag	297.46	3.5	0	-	-	-
12	211	Alibag	167.94	167.94	1	-	-	12.5
13	209	Alibag	265.47	58.9	0	-	-	-
14	200	Alibag	206.39	206.39	2	-	22.8	-
15	199	Alibag	203.15	203.15	2	-	-	-
16	198	Alibag	262.23	262.23	1	-	22.8	12.5
17	231	Roha	188.18	13.2	1	-	-	-
18	226	Roha	189.99	2.53	0	-	-	-
19	228	Roha	297.85	297.85	2	-	22.8	-
20	229	Roha	198.30	96	3	-	22.8	-
		Total	**4582.86**	**2778.38**	**25**	**114**	**114**	**25**

MAP OF CATCHMENT AREA SHOWING DIVISIONWISE COMPARTMENT NUMBERS



Assistant Engineer (Grade-1)
Hetawane Medium Project Sub Division
Umberde,Pen

CATCHMENT AREA TREATMENT MAP OF SAMBARKUND MEDIUM PROJECT, TAL. ALIBAG, DIST. RAIGHAD

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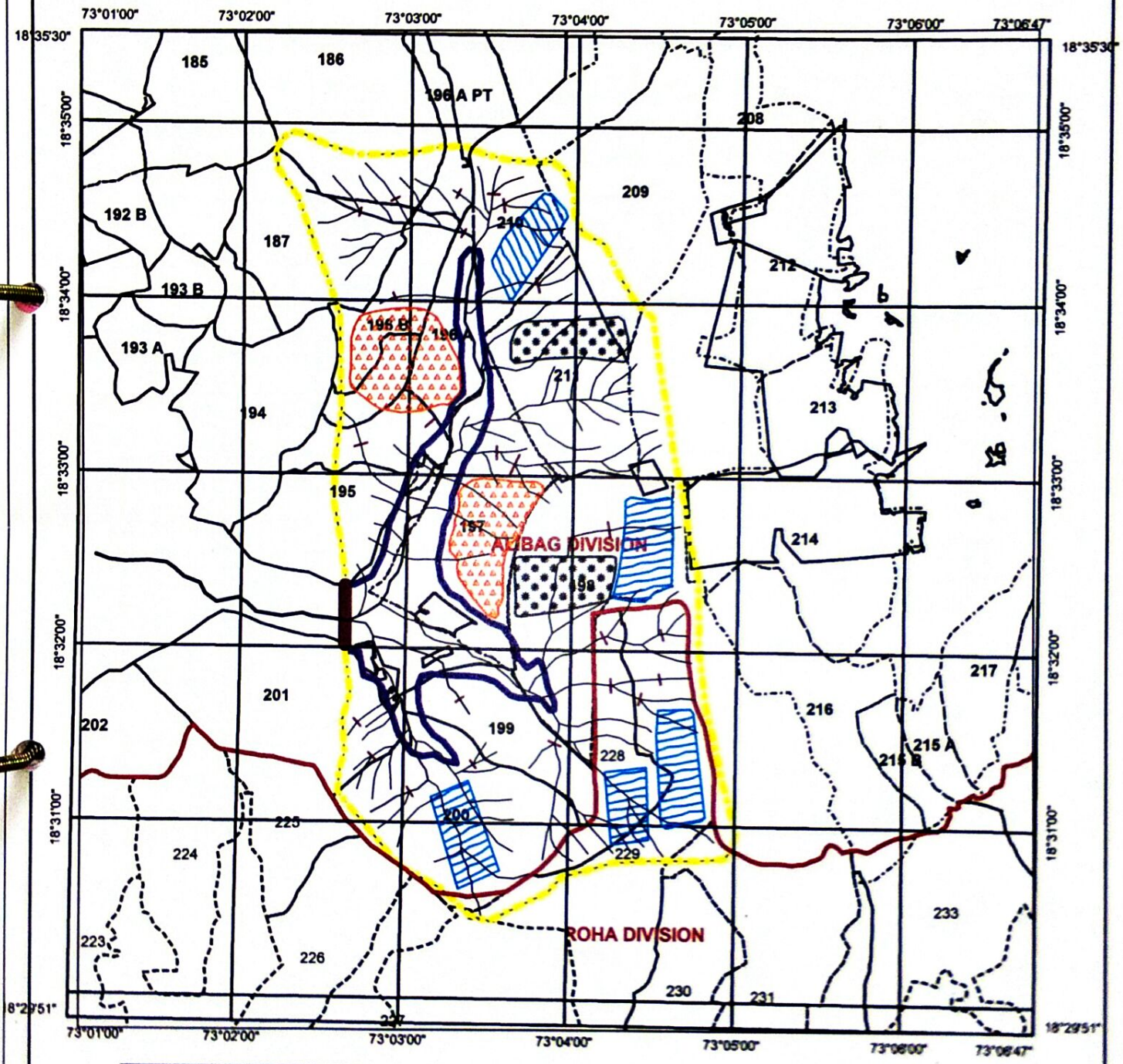
W E
S

1:40000

0.0 0.4 0.8 1.2 1.6 2.0
Kilometers



Legend	TREATMENT
Dam Seat	Nalla Bund
Division Boundary	CCT
Catchment_Area	SMC Works
Submerge_Area	Plantation
Compartment Boundary	

Assistant Engineer (Grade-1)
Hetawane Medium Project Sub Division
Umbarde,Pen

Table 6 ABSTRACT:-

S. No.	Name of Treatment	Area in Ha.	Rate per Ha./Nos.	Estimated Cost
1	Plantation Works	25 Ha	460253.00	1,15,06,326.00
2	Continuous Contour Trench	114 Ha	9005.78	10,26,659.00
3	Soil Moisture Conservation Work	114 Ha	9005.78	10,26,659.00
4	Nalla Bund	25 Nos	2,00,000	50,00,000.00
5	Distribution of Nonconventional Energy and Fuel Saving Devices in catchment area on a cost-sharing basis, such as, LPG, Pressure cookers and Solar devices		Lumpsum	10,00,000.00
6	Silt Observation centre		As per table No 3	21,12,000.00
7	Monitoring and Evaluation by NGO or Environment Expert		Lumpsum	5,00,000.00
			Total	**2,21,71,645.00**

(Amount In Words: - Two Crore Twentyone lakhs Seventyone Thousand & Six hundred and Fourtyfive Only)

Place: Alibag
Date:-12/05/2021

(Rokade A. D.)
Sub Divisional Engineer,
Hatewanwe Project Sub Division No 4,
Kamarli

(Jadhav S. D.)
Executive Engineer,
Hatewanwe Medium Project Division,
Kamarli