

CATCHMENT AREA TEATMENT PLAN

AT BARRAGE AREA

VILL. HIRPURA, TA. VIJAPUR, DIST. MEHSANA

PREPARED BY
OFFICE OF EXECUTIVE ENGINEER,
DHAROI CANAL DIVISION NO. 3,
VISNAGAR

INTROCUCTION:

Catchment Area Treatment is a term used to describe the process of implementing land use practices and water management practices to protect and improve the quality of the water and other natural resources within a watershed by managing the use of those land and water resources in a comprehensive manner.

This approach is done for the Rejuvenation on Bank of River Sabarmati near Vill. Hirpura to control the amount of silt into the lake.

Office of Executive Engineer, Dharoi Canal Division no.3, Visnagar with the support of the Gandhinagar Forest Department worked to improve the lake catchment falling in the Hirpura area. Loose rubble check dams along with trenches and dikes along with afforestation were done as part of this process.

India, a diverse country where 58% of the total population directly depending upon agriculture contributing approximately ₹19.48 Lac crores in annual average income, although rain plays a pivotal role in agriculture. India is endowed with a rich and vast diversity of natural resources, water being one of them. Its development and management play a vital role in agriculture production. Integrated water management throughout country is vital for poverty reduction, environmental sustenance and sustainable economic development.

The Narmada, Water Resources, Water Supply and Kalpsar Department; a unit of Government of Gujarat is taking up various activities under Jal Kranti Abhiyaan to conserve and protect water and related resources in an environmentally and economically sound manner in the interest for the public of Gujarat.

In view of the above, Office of the Executive Engineer, Dharoi Canal Division No.3, Visnagar proposed to construct a 19 Gated Barrage Concrete Structure over Sabarmati River in Village Hirpura of Ta. Vijapur, Dist.: Mehsana to enhance the irrigation facilities for livelihood of the region completely depending upon agribusiness. For construction of proposed barrage, Reserve Forest under the jurisdiction of Gandhinagar Forest Division needs to be diverted for overall development by irrigating more than 7060 acres of cultivable land.

The proposed construction of 19 Gated Barrage Concrete Structure will be carried out on stream of Sabarmati River at Lat-72°49'24"E and Long-23°35'33"N in Village Hirpura, However the present proposal for diversion of 10.19 Ha. of Reserve Forest Land of survey no. 150, 151 and 186/1 paiki of Village Hirpura and survey no. 1 of Gadhdha Village is required for construction of external catchment earthen bund and approach road to connect proposed barrage.

The study of erosion and sediment yield from catchment is of utmost importance as the deposition of sediment in reservoir reduces its capacity, thus affecting the water available for the designated use. The eroded sediment from catchment when deposited on streambeds and banks causes braiding of river reach. The removal of top fertile soil from catchment adversely affects the agricultural production and silt laden water affect the turbine blades thereby affect the hydro power production. Another important factor that adds to the sediment load is due to grazing of animals. A large number of cattle, sheep, and goats graze the pastures continuously for about six months in ravines region.

The lack of proper vegetal cover is a factor, which causes degradation and thereby results in severe run off/soil erosion, resulting in premature siltation of the reservoir. Thus, a well-designed Catchment Area Treatment (CAT) Plan is essential to ameliorate the above including process of soil erosion. The catchment area treatment involves the understanding of the erosion characteristics of the terrain and identifying/suggesting remedial measures to reduce the erosion rate. For this reason, the catchment area responsible for directly draining rivers, streams, tributaries, etc. are treated and the cost is included in the project cost.

The pre-requisite for a watershed management is the collection of multipronged data like geology, geomorphology, topography, soil, land use/ land cover, climate, hydrology, drainage pattern, etc. The multi-pronged data generated from various published sources and actual data collected from these watersheds on the above-mentioned parameters are the basis of the Action Plan for Catchment Area Treatment.

CAT plans for the free draining catchment area of the proposed project has been prepared for areas with moderately soil erosion intensity, which targets toward overall improvement in the environmental conditions of the region. All the activities are aimed at treating the degraded and potential areas with severe soil erosion. The plan provides benefits due to biological and engineering measures and its utility in maintaining the ecosystem health. The plan with objectives addresses issues such as prevention of gully erosion, enhancing the forest cover for increasing soil holding capacity; and arresting total sediment flow in the reservoir and flowing waters.

Although the proposed project is not expected to have any significant negative impacts on the environment, measures to minimize the entry of silt in to its reservoir and enhance its life as well as for conservation of the ecosystem, are described in the following paragraphs.

OBJECTIVES:

The main aim of the CAT is to rejuvenate various potential and degraded ecosystems in the catchment area. The action plan has been prepared for this purpose with the following objectives;

- To facilitate the hydrological functioning of the catchment and to augment the quality of water of the river and its tributaries.
- Conservation of soil cover and to arrest the soil erosion, floods and siltation of the river and its tributaries and consequent reduction of siltation in the reservoir of the project.
- Demarcation of the priority of sub watersheds of treatment on the basis of soil erosion intensity in the catchment area.
- Rehabilitation of degraded forest through afforestation.
- Mitigation of landslide landslip and rock falls.
- Soil conservation through biological and engineering measures to reduce sediment load in river and tributaries, thus improving the quality of water.
- Ecosystem conservation resulting from increased vegetative cover and water retaining properties of soil.
- Employment generation through community participation and conservation.

Out of **97050 ha**. Geographical Area of Taluka Vijapur, **190.53 ha**. is **Reserve Forest Area of Hirpura** and **237.83 ha**. Reserve Forest Area of **Gadhda** in Vijapur Taluka of Mehsana District. Along western boundary of River Sabarmati consists of five watersheds. Pre-requisites for Watershed Management in the collection of multipronged data. These data generated from various published sources and actual data collected from watershed parameters are the basis of the action plan for Catchment Area Treatment.

The area lies between Lat-72°49'24"E and Long-23°35'33"N.

The Ravines, Forests, Undulating tracts, slopes from North-East to South-West stream drainage in Sabarmati. The Sabarmati bed through deep is entirely sandy. The soil around bank is subject to severe erosion leading to formation of medium to deep gullies. The network of small Canon like Nallas gullies (Vangha-Kotar) complicates the Bank of river and stream in the sand area which further remify and extend with each succeeding in monsoon season.

The Sabarmati River originates from Arvalli Mountainous Range in Rajasthan leading towards Bay of Cambay. It is a perennial river having small rivulates. The average rainfall is 630 mm from West to East which is irregular and erratic in nature. The Reserve Forest On western bank of river Falls under Group-5 tropical dry deciduous forest and the density vaies from 0.00 to 0.5.

The Area has large chunk of ravines infested wasteland, posture land etc. which requires urgent attention and which are available for treatment, such areas to be treated meticulously by analysing the problem.

There are number of streams and rivulates meandering through area whose catchment and adjoining watershed needs careful treatment including intensive SMC measure in order to regulate Hydrological regime in the area. The area is ecologically fragile having slopes undulating topography and constitutes catchment area of rivers, nala. Because of proneness of these area to soil erosion and surface run off, solid for SMC on watershed basis from an important prescription. This will not only prevent solid erosion but help in development of good soil profile.

The following measures to minimise the entry of silt into its reservoir and enhance its life as well as for conservation of the eco-system following actions shall be carried out as per suitability.

SOIL CLASS:

Soil erosion in the country is a major problem, which results in loss of soil fertility and increased sediment load in the rivers. Apparently, increase in sediment load has direct influences on the conditions of a irrigation project. Therefore, it is required to ensure proper maintenance of soil functions and its health.

In present study the soil-based thematic maps were used and also to collect other attributes such as soil type and soil depth of the region (catchment area). In the proposed project, a catchment area treatment plan is being prepared, which considers various attributes related to soil, such as soil depth, texture, drainage, pH of the soil, etc. Some of the parameters are extremely important to deduce the erosion intensity and developing a susceptible erosion model in a particular region and accordingly to plan various treatment measures and to protect it from soil erosion.

The Soil Map and Soil Depth Map of the area is shown in Figure 1 and 2 respectively:

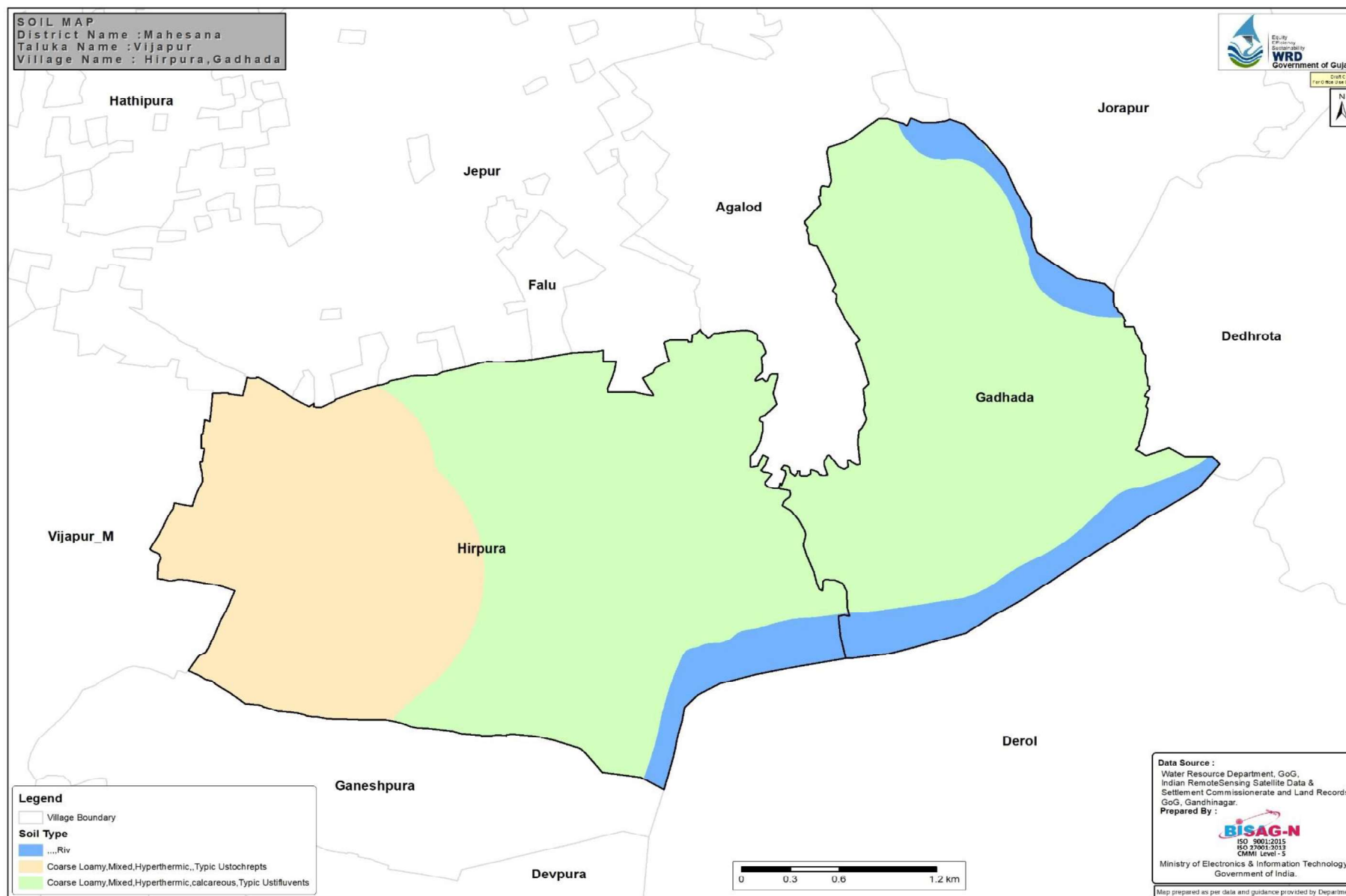


Figure 1: Soil Map of Village Hirpura and Village Gadhada, Ta. Vijapur, Dist. Mehsana

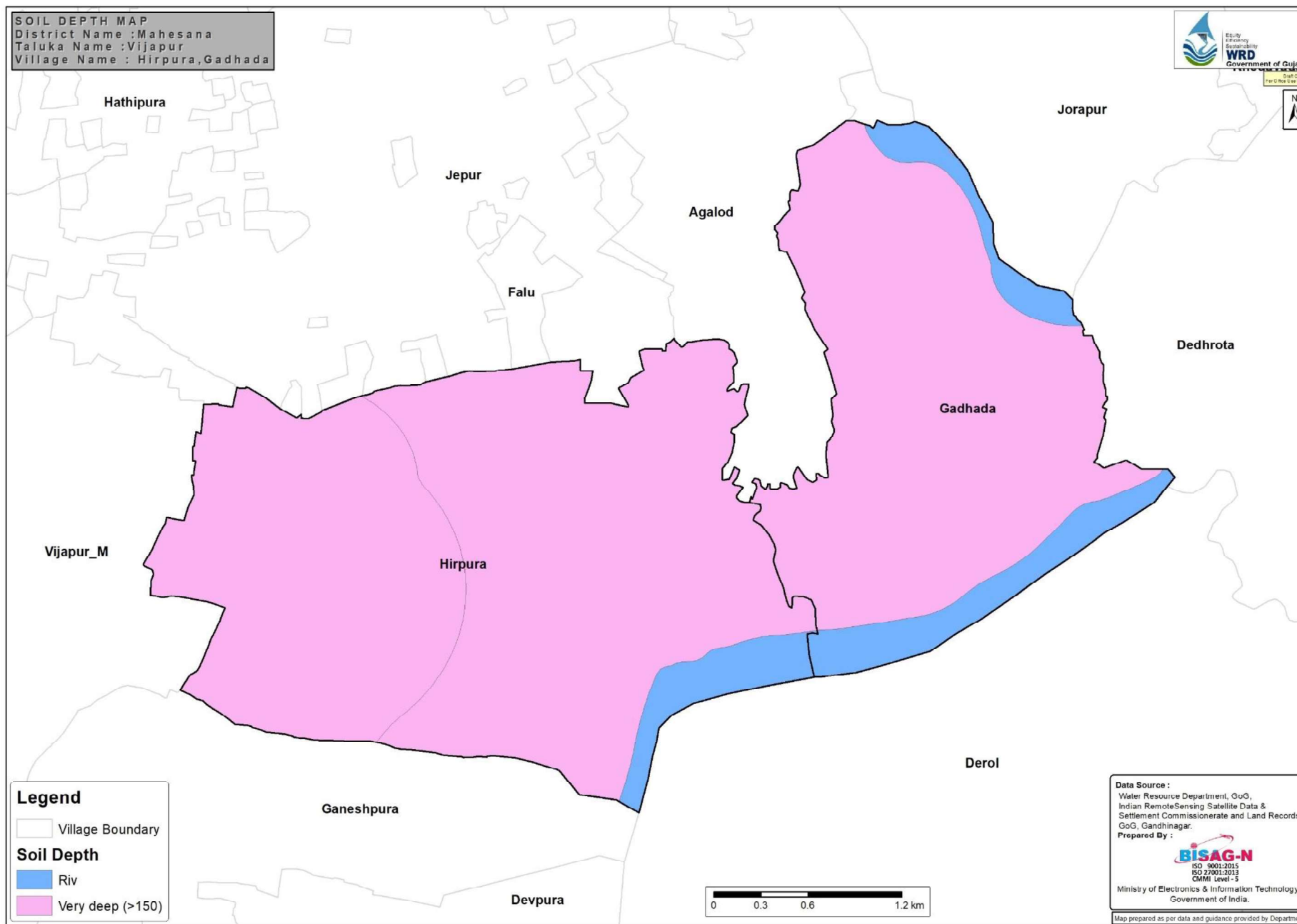
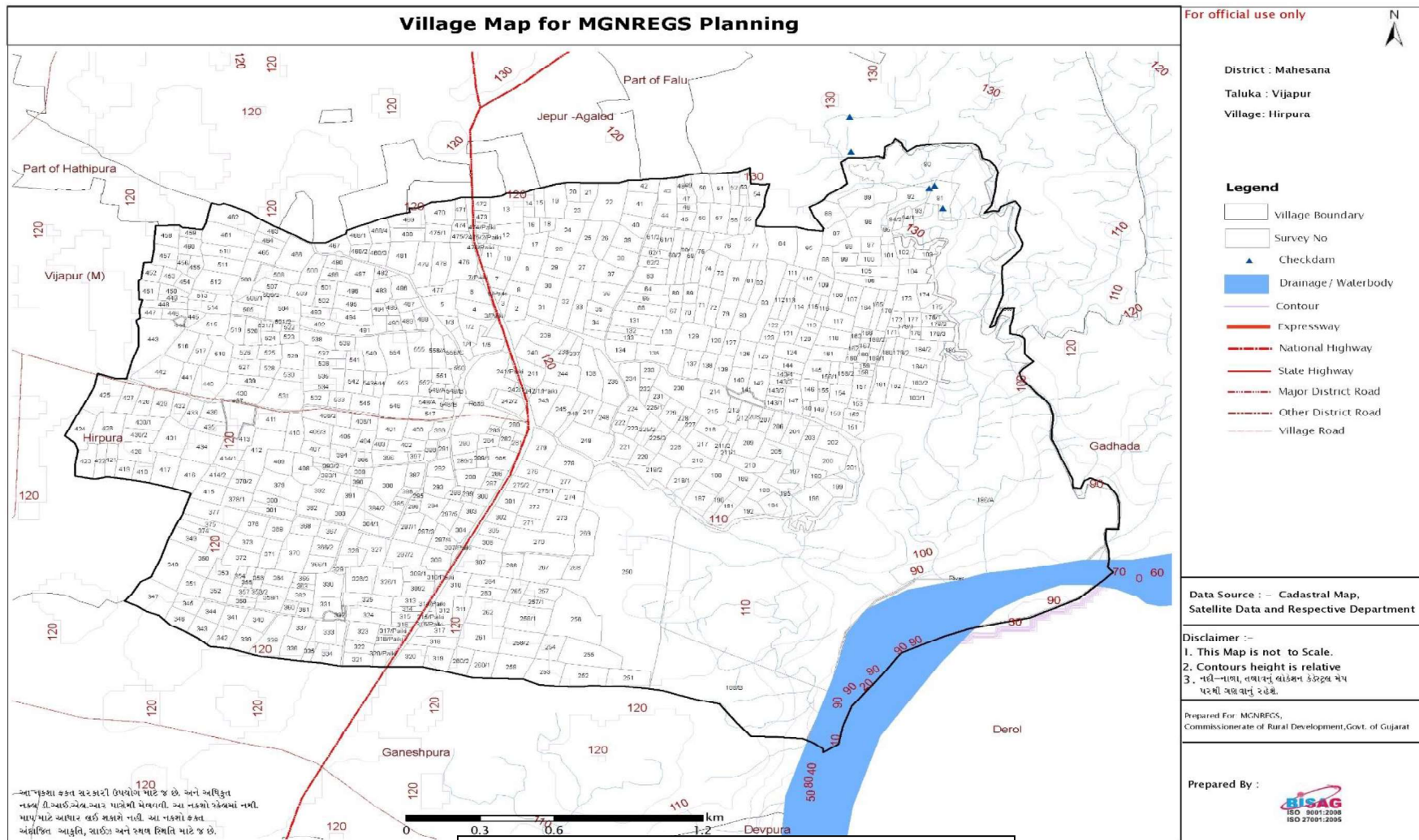


Figure 2: Soil Depth Map of Vill. Hirpura and Vill Gadhda, Ta. Vijapur, Dist. Mehsana

TOPOGRPAHY:

The river bed at barrage site is about 392 M wide and the abutments are steep sloping on the left bank at angles of about 65 to 70 and on the right bank slope is about 55 up to the proposed barrage top. The elevation also varies in the free draining catchment area.

The Topography Map of Village Hirpura and Gadhdha is as shown below in figure 3 and 4 respectively:



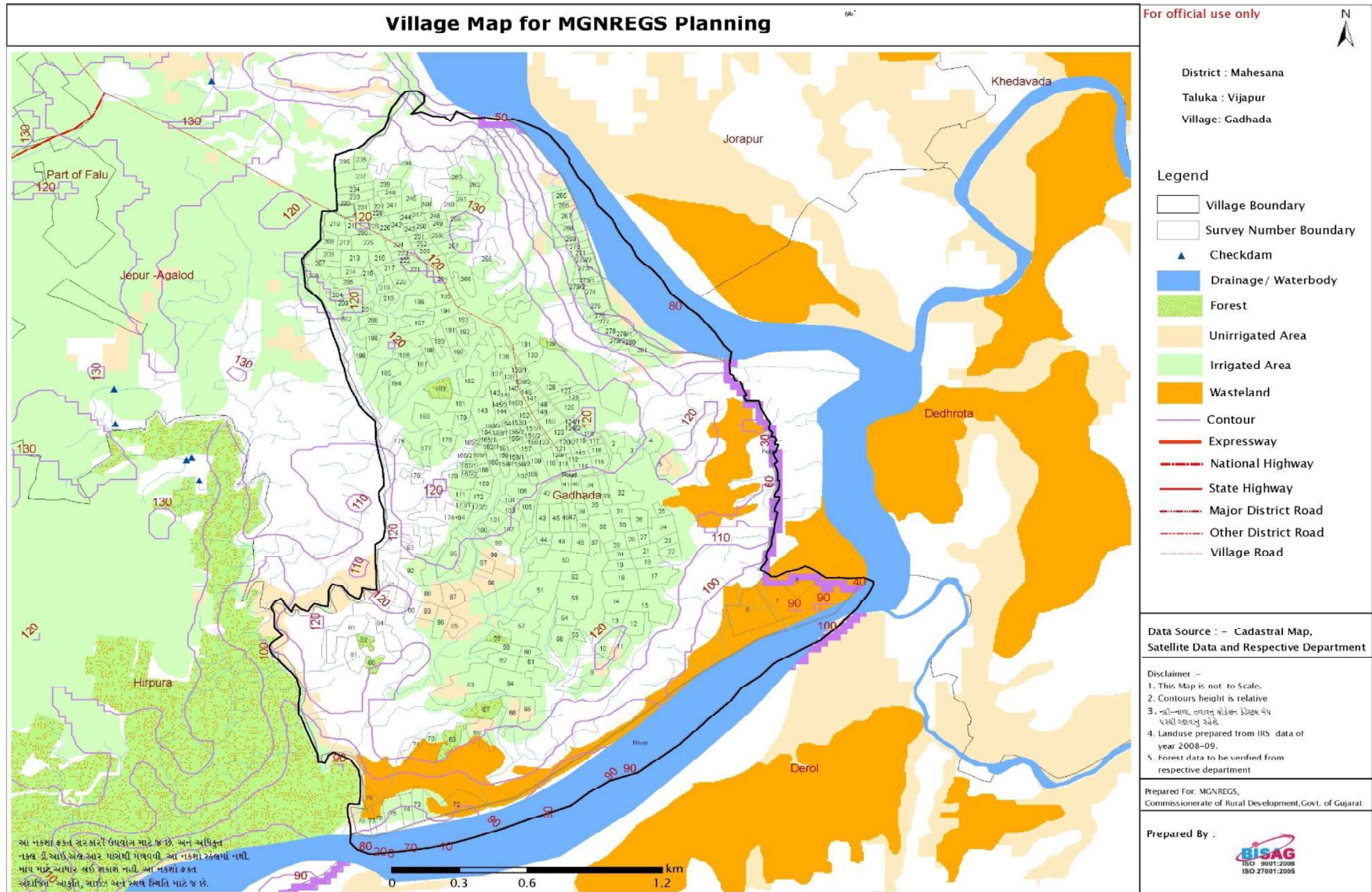


Figure 4: Topography Map of Village Gadhda, Ta. Vijapur, Dist. Mehsana

LANDUSE:

SLOPE:

Slope has major influence on the loss of soil and water from the watershed and thereby influences the land use capability. The slope percentage determines the erosion susceptibility of the soil depending on its nature and class. This helps in classifying various lands suitability classes, which enables us to formulate suitable conservation measures for the prevention of soil erosion. The slope model of the proposed area is determined by the contour maps and Survey of India topo sheets.

Superimposing topography, slope, soil and land use data/maps, a tentative estimation of erosion prone areas and landslides area in the catchment have been made. The vulnerable and problematic areas were identified in different physiographic zones.

These data sets were used for preparation of the thematic maps, calculation of sediment yield index and Erosion Intensity Units.

(i) Erosion Intensity

Determination of erosion intensity unit is primarily based upon the integrated information on soil characters, physiography, slope, land-use/land-cover, lithology and structure. This is achieved through super-imposition of different thematic map overlays. Based upon the field data collected during the field survey, weightage value and delivery ratio were assigned to each erosion intensity unit.

Erosion intensity for entire catchment was done using the overlay and union techniques. Based on ground truth verification conducted during field work.

The Drainage and Watershed Map of the area is as shown in Figure 5:

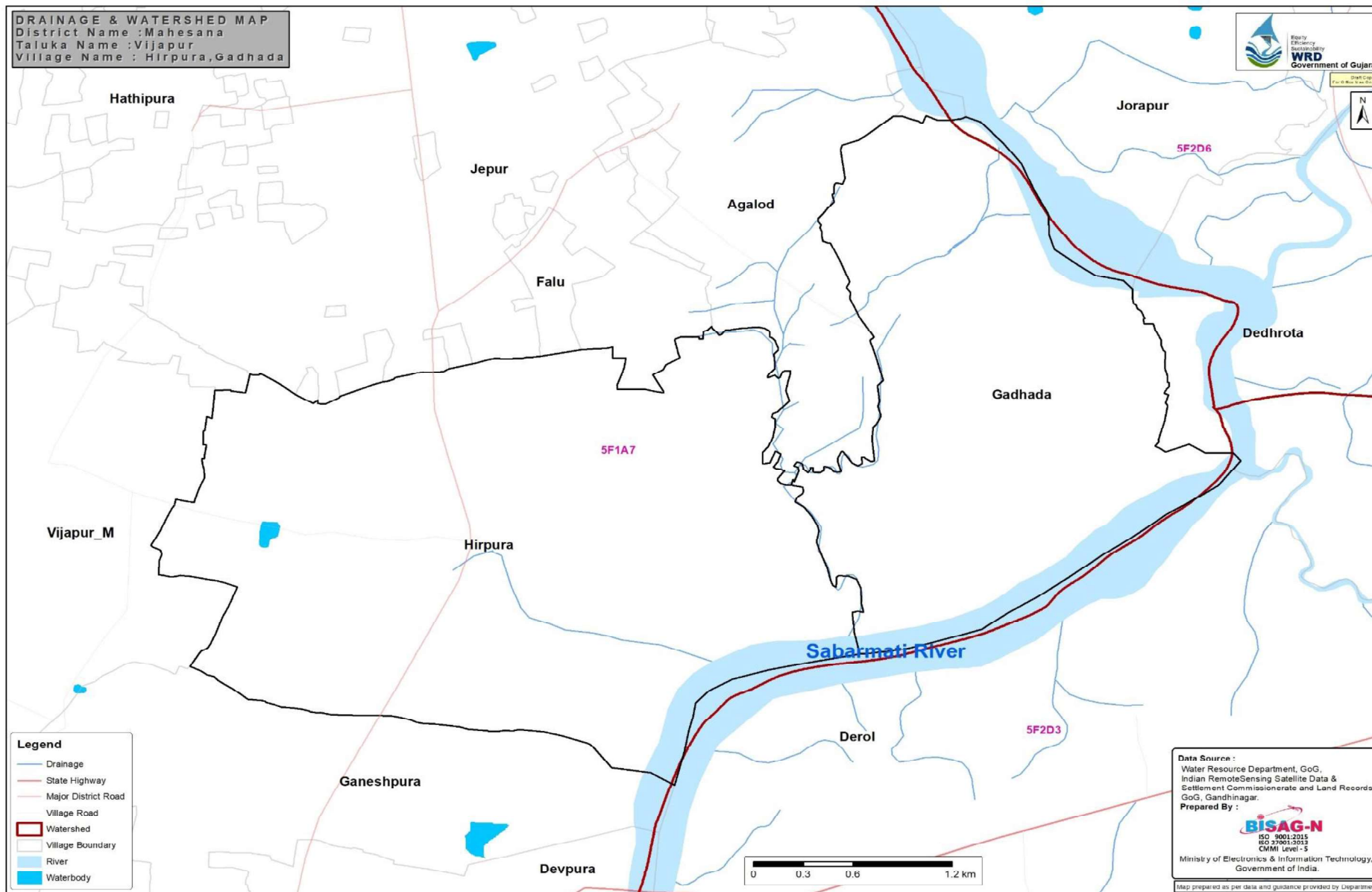


Figure 6: Drainage and Watershed Map

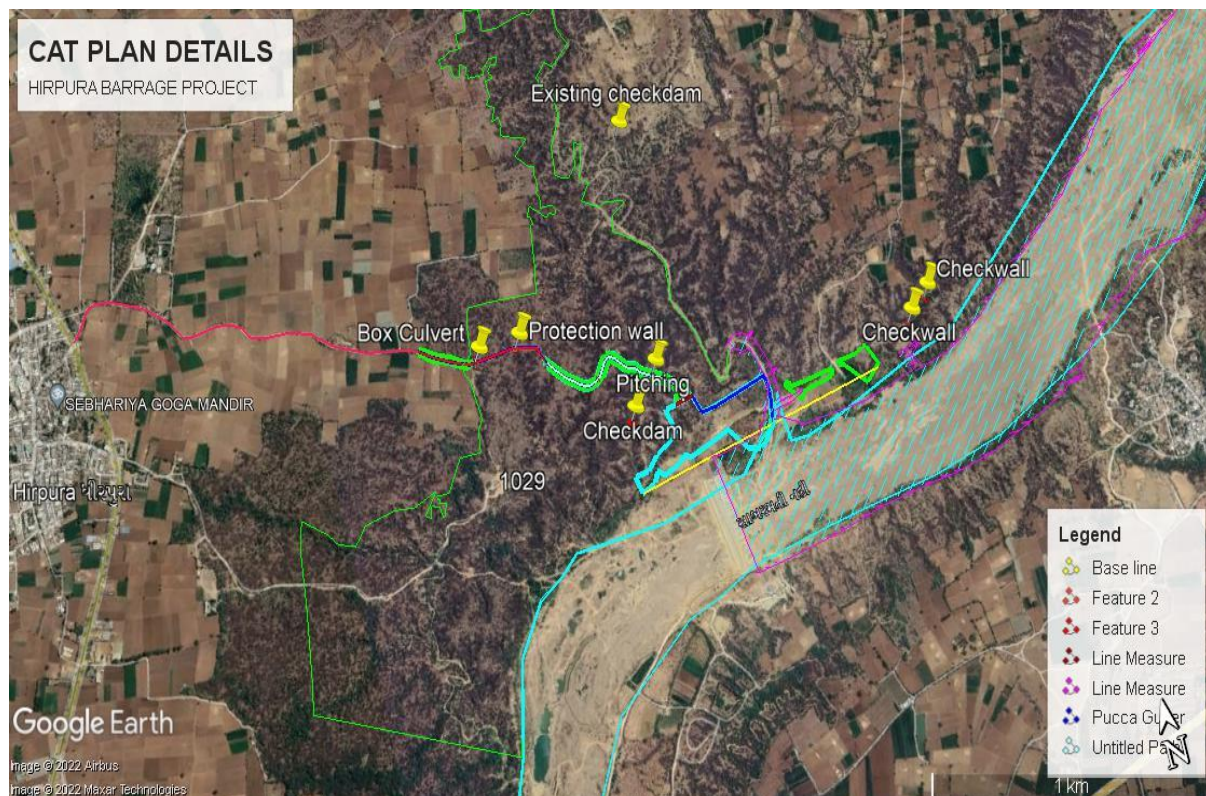
CATCHMENT AREA TREATMENT PLAN:

It is known that there are mainly five categories of Land uses for which a proper treatment plan should be developed. First is the adjoining Agricultural Land as this activity can never be eliminated, because the faulty practice results in heavy loss of fertile soil.

Second, being open forest land for obvious conservation reasons. Third is scrub or degraded land, which contributes heavily to the silt load and possibilities exist to bring this area under plantation to meet the local demand of fuel and fodder and thus decreasing the biotic pressure on the forests and leading to environment friendly approach of sustainable development. The fourth and most important category is Barren land because with practically no vegetal cover, the area produces huge amount of silt load.

Considering the topographic factors, soil type, climate, land-use/land-cover in the catchment area, engineering and biological measures have been proposed to be undertaken with the aim to check soil erosion, prevent/check siltation of reservoir and to maintain its storage capacity in long run.

No area found under very severe erosion.



ACTIVITIES TO BE UNDERTAKEN (TREATMENT MEASURES)

Details of treatment measures viz. engineering measures as well as biological measures to be undertaken are described in the following paragraphs. Watershed-wise details of various activities to be undertaken are provided in **Table** along with Plan, Cross Section.

ENGINEERING MEASURES:

Gully Control: The gully(s) would be treated with the help of engineering/ mechanical as well as vegetative methods. Check dams would be constructed in some of the areas to promote growth of vegetation that will consequently lead to the stabilisation of the slopes/area and prevention of further deepening of gully(s) and erosion. For controlling the gully(s), the erosive velocities are reduced by flattening out the steep gradient of the gully. This is achieved by constructing a series of check which transform the longitudinal gradient into a series of steps with low risers and long flat treads. Different types of check dams would be required for different conditions comprising different materials depending upon the site conditions and the easy availability of material at local level.

The following types are recommended for this area:

- a. Protection Wall
- b. Rubble Pitching
- c. Check Dam
- d. Check Wall

BIOLOGICAL MEASURES/PREVENTIVE MEASURES

The Biological Measures/Preventive Measures suggested are:

- A. Afforestation.
- B. Promote Natural Regeneration.
- C. Seed Sowing of local viable species.

In addition to above proposed works, the box culvert and side drainage along the proposed road for SMC works would be carried out by Office of Executive Engineer, Dharoi Canal Division no. 3, Visnagar a unit of Narmada, Water Resources, Water Supply and Kalpsar Department; Government of Gujarat which be ultimately supplementing the Catchment Plan.

Total Estimated Cost for the CAT Plan would be Rs. **85,89,800/-** (i.e. 86,00,000/-)

The Detailed Component Wise Cost Estimation including Unit, Quantity and Rates is as per Table 1.

-:TABLE 1:-

COMPONENT-WISE COST ESTIMATION FOR CATCHMENT AREA TREATMENT PLAN AT HIRPURA BARRAGE

Sr. No.	Item of Work	Unit	Qty.	Rate (Rs.)	Amount (in Lakhs)	Remarks
A	Engineering Measures					
1	Protection Wall	Mtr	15		4,89,800	
2	Rubble Pitching	Mtr	20			
3	Check Dam	Nos	3	5,00,000	15,00,000	
4	Check Wall	Nos	2	3,00,000	6,00,000	
B	Biological Measures					
1	Afforestation	Ha.	10	6,00,000	60,00,000	
	GRAND TOTAL				85,89,800	

Deputy Executive Engineer
Sujalam Sufalam Sub Dn. No. 3
Vadnagar

Executive Engineer
Dharoi Canal Division No. 3
Visnagar

Note: In addition to above proposed works, the box culvert and side drainage along the proposed road for SMC works would be carried out by Office of Executive Engineer, Dharoi Canal Division no. 3, Visnagar a unit of Narmada, Water Resources, Water Supply and Kalpsar Department; Government of Gujarat which be ultimately supplementing the Catchment Plan.

MONITORING AND EVALUATION:

Monitoring and evaluation will be developed as an integral part of the project management. Thus, a process of self-evaluation at specified intervals of time will ensure the field worthiness and efficacy of the CAT plan. Annual work plan for each sub-watershed would be prepared well in advance specifying physical and financial targets, sites, locations and beneficiaries of each component of the project activity. Month-wise work scheme of various items of each component for the financial year would also be prepared in advance and its timely implementation would be ensured.

The execution of CAT plan in Hirpura Barrage Project area would require extensive efforts on the part of executing agencies. Keeping in view the local topography and climate, it is being estimated that the entire treatable area would require at least 3 years to be completed. However, the maintenance of plantations would continue for one year and accordingly CAT plan has been prepared for 5 years. All these works would have to start with the pre-construction activities especially the studies in respect of micro-planning for each sub-watershed, which would require further detailed investigations.

PROPOSED AFFORESTATION

Daily wages Rs. 354.20

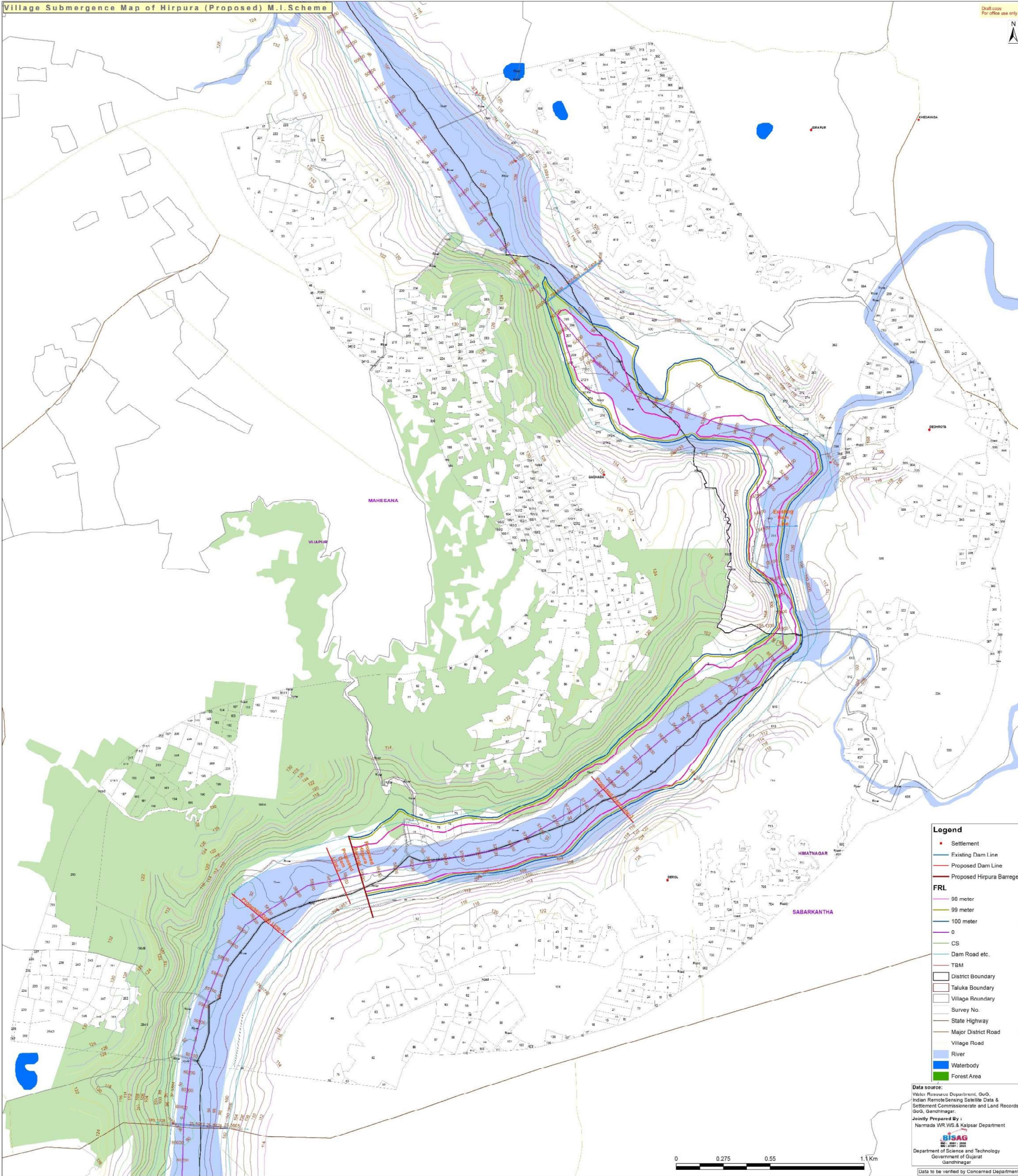
Spacements = 3 m x 3 m				
1111 seedling / Ha				
1st year replacement 10 % = 111 seedling /ha				
2nd year replacement 20 % = 111+111 seedling /ha				
3rd year replacement 10 % = 111 seedling /ha				
Total Seedlings = 1333 seedling /ha				
Polypot size : 15 cm x 25 cm x 200				
Item of work	Qty.	Labour	Material	Total
1	2	3	4	5
0 year				
Nursery				
(a) Cost of soil, ,manure, seeds, water, fartillizer, insecticides, implements, rent of lands. Shade, etc. (including 10 % for casualty replacement)	1222	0	2089	2089
(b) labour : Preparation of beds, filling and arranging of bags,showing of seeds, watering shifting, weeding etc.	1222	5109	265	5374
(c) Seedling cost for casualty replacement in one year old (20%)	222	1614	483	2097
(d) Seedling cost for casualty replacement in two year old (10%)	111	809	241	1049
Total		7532	3078	10609
2. Area Development (Land Preparation)				
(a) Survey, cutback and promotion of root suckers		3840	0	3840
(b) Aligment and digging of pits 0.45 X 0.45 X 0.45	1111@ 6.00	11087	0	11087
Total		14927	0	14927
(a) Natural fertilizer (Neem cake/ Castor cake)	1111 @ 5.00	0	11309	11309
Total		0	11309	11309
3. SMC Works				
(a) Check wall/ retaining wall /checkdem (all pucca only)	L.S.	13639	27074	40713
(b) Contour trench 2 M x 45 Cm x 30 Cm as per Rs.17.00/rmt (300 trench)	600 rmt.	10382	0	10382
Total		24020	27074	51094
4. Protection				
(a) Barbed wire fencing	Rmt. 450	13078	117698	130776
(b) Seed sowing and planting of cuttings of Ipomea/ Glaricidia along the fence		1266	544	1810

Total		14344	118242	132586
Sub Total of 0 year		60823	159703	220526
1st Year				
(a) Maintenance of nursery (April to June)	1222	3920	390	4310
(b) Transport of seedling for plantation	1111	2150	444	2595
(c) Planting with khamna of Min 1 m dia	1111	6608	0	6608
(d)Transport of seedling for casualty replacement	111	229	52	281
(e) 3 weeding cum soil working	1111	25760	0	25760
(f) Support watering 5 times @ 3.25		16466	23628	40095
(g) Protection / tending operation		5330	0	5330
(h) Tending to natural vegetation		1332	0	1332
(i) Contingency		0	1332	1332
Total for 1st year		61796	25847	87643
2nd Year				
(a) 2 weeding & soil working		14307	0	14307
(b) 20 % Casually replcement, transport and planting	111+111	241	1197	1438
(c) Natural fertilizer (neem cake / caster cake) etc.	Rs.5/ plant	0	13365	13365
(d) Support watering 3 times @ 3.25		10700	15358	26058
(e) Protection / tending operation		5774	0	5774
Total for 2nd year		31021	29920	60941
3rd Year				
(a) 2 weeding & soil working		15408	0	15408
(b) 10 % Casually replcement, transport and planting	111	130	646	775
(c) Natural fertilizer, neem cake etc.	Rs.5/ plant	0	14392	14392
(d) Support watering 1 times @ 3.25		3842	5513	9355
(e) Protection & maintenance of fencing / tending operation	L.S.	7772	0	7772
Total for 3rd year		27152	20551	47702
4thYear				
(a) 1 weeding & soil working		8254	0	8254
(b) Protection & Maintenance of fencing/ Tending operation	L.S.	8328	0	8328
Total for 4th year		16581	0	16581
5thYear				
Protection & maintenance of fencing/ tending operation	L.S.	8883	0	8883
Total for 5th year		8883	0	8883
6thYear				
Protection & maintenance of fencing/ tending operation	L.S.	9438	0	9438

Total for 6th year		9438	0	9438
7thYear				
Protection & maintenance of fencing/ tending operation	L.S.	9993	0	9993
Total for 7th year		9993	0	9993
8thYear				
Protection & maintenance of fencing/ tending operation	L.S.	10548	0	10548
Total for 8th year		10548	0	10548
9thYear				
Protection & maintenance of fencing/ tending operation	L.S.	11103	0	11103
Total for 9th year		11103	0	11103
10thYear				
Protection & maintenance of fencing/ tending operation	L.S.	11659	0	11659
Total for 10th year		11659	0	11659
SUB TOTAL :		258997	236020	495018
The Cost of Supervision/subsequential silvicultureal Operations	20%	51799	47204	99004
		310797	283225	594021

Note :-

- (1) Seed sowing along fencing towards the inner side, and also in the plot.
- (2) Planting of cutting of ipomea//Glaricidia along the fencing towards outer side.



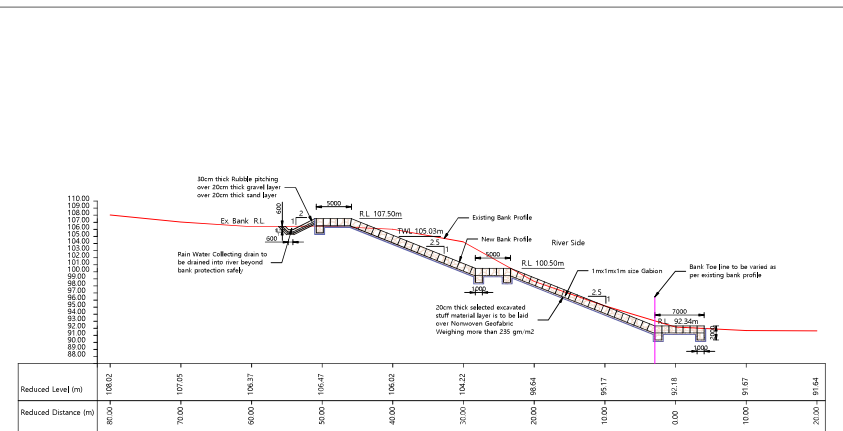


Fig-1(A) TYPICAL CROSS SECTION OF HIRAPURA BARRAGE GUIDE BANK - D/S LHS @ CH. 120 m

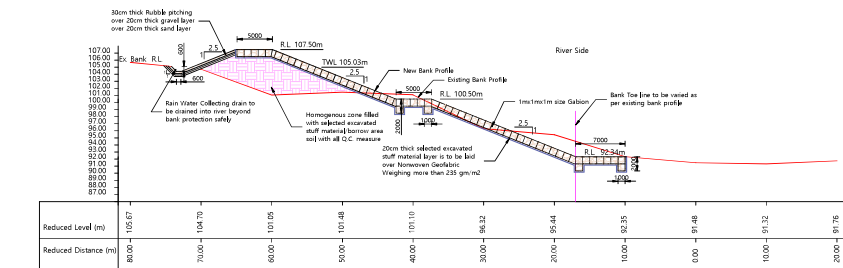


Fig-1(B) TYPICAL CROSS SECTION OF HIRAPURA BARRAGE GUIDE BANK - D/S LHS @ CH. 180 m

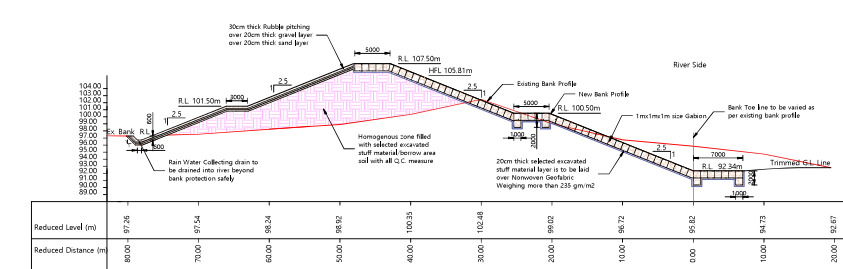


Fig-1(C) TYPICAL CROSS SECTION OF HIRAPURA BARRAGE GUIDE BANK - U/S LHS @ CH. 120 m (@ LOCAL KOTAR)

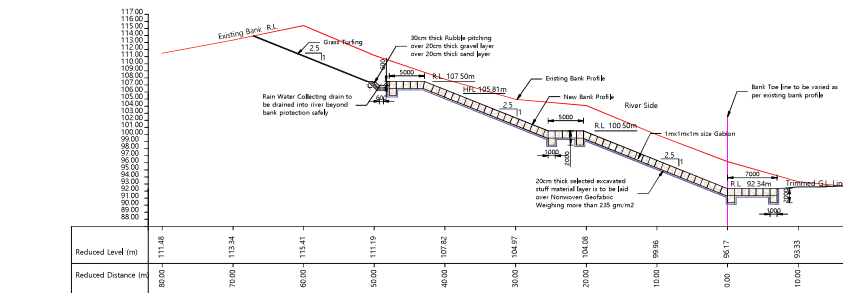


Fig-1(D) TYPICAL CROSS SECTION OF HIRAPURA BARRAGE GUIDE BANK - U/S LHS @ CH. 360 m

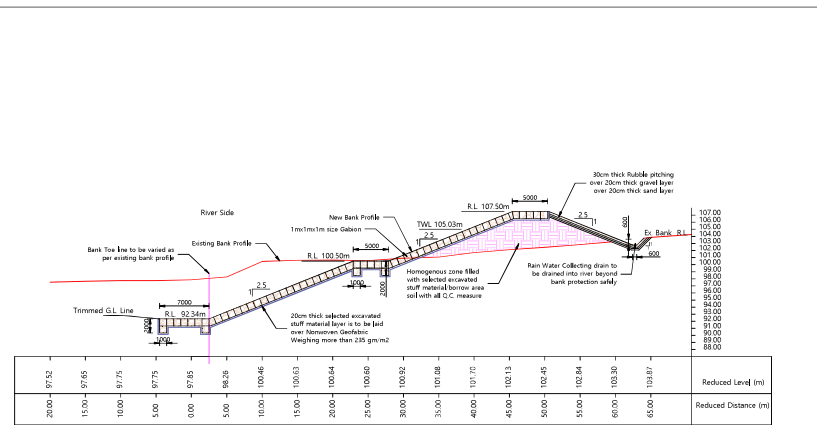


Fig-2(A) TYPICAL CROSS SECTION OF HIRAPURA BARRAGE GUIDE BANK - D/S RHS @ CH. 120 m

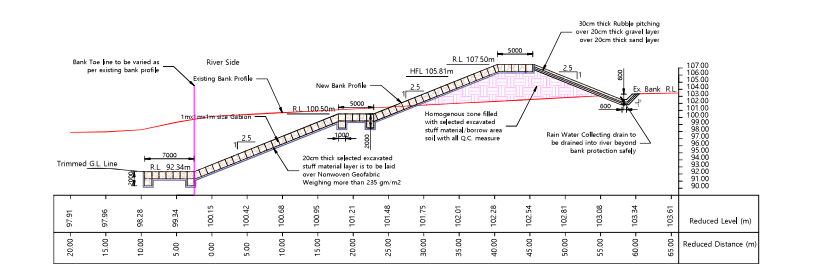


Fig-2(B) TYPICAL CROSS SECTION OF HIRAPURA BARRAGE GUIDE BANK - U/S RHS @ CH. 120 m

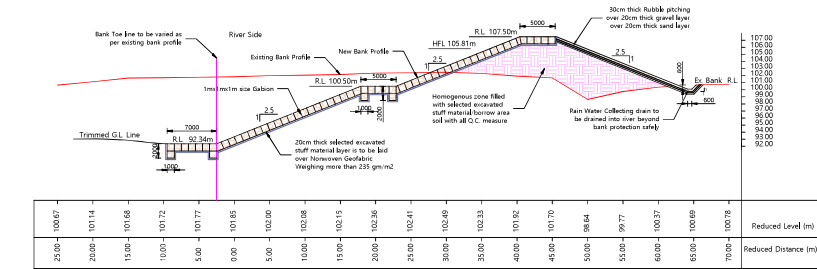


Fig-2(C) TYPICAL CROSS SECTION OF HIRAPURA BARRAGE GUIDE BANK - U/S RHS @ CH. 360 m

DESIGN SOIL PARAMETERS FOR GUIDE BANKS				
SR. NO.	ZONE	M.D.D. Kg/m ³	O.M.C. %	Cohesion Kg/m ²
1	EXISTING BANK- LHS	1690	18	4200
2	EXISTING BANK- RHS	1650	4.50	0
3	SELECTED EXCAVATED STUFF MATERIAL/ BORROW AREA SOIL (BOTH BANKS)	1800	11.80	500
4	FOUNDATION - LHS	1690	18	4200
5	FOUNDATION -RHS	1650	4.50	0

NOTES :

- EXISTING U/S & D/S NATURAL BANK SLOPES ON THE LEFT BANK BE TRIMMED/FILLED WITH SELECTED EXCAVATED STUFF MATERIAL OR BORROW AREA SOIL TO ACHIEVE THE SLOPE OF 2.5(H):1(V) & DESIGN TOP OF BANK AS SHOWN IN THE TYPICAL DRAWINGS (Fig-1(A), 1(B), 1(C), 1(D)).
- AS NATURAL (EXISTING) BANK TOP LEVELS @ CH.180.0m ON L.H.S. D/S BANK AND @ CH.120.0m ON L.H.S. U/S BANK (@ LOCAL KOTAR) ARE LOWER THAN REQUIRED TOP OF GUIDE BANK LEVEL FOR SOME LENGTH, IT SHALL BE RAISED UP TO REQUIRED LEVEL BY FILLING WITH AVAILABLE SELECTED EXCAVATED STUFF MATERIAL OR BORROW AREA SOIL HAVING DESIGN SOIL PARAMETERS WITH ALL QUALITY CONTROL MEASURES AND REQUIRED COMPACTION (Fig-1(B),1(C)).
- THE EXISTING U/S & D/S NATURAL BANK SLOPES ON THE RIGHT BANK BE TRIMMED UP TO THE LEVELS AS SHOWN IN DRAWING & THEN FILLED UP TO REQUIRED TOP LEVEL WITH AVAILABLE SELECTED EXCAVATED STUFF MATERIAL OR BORROW AREA SOIL HAVING DESIGN SOIL PARAMETERS TO ACHIEVE THE SLOPE OF 2.5(H):1(V) WITH ALL QUALITY CONTROL MEASURES AND REQUIRED COMPACTION AS SHOWN IN THE TYPICAL DRAWINGS (Fig-2(A), 2(B), 2(C)).
- LENGTHS OF BOTH THE U/S & D/S BANK PROTECTION WORKS ARE REQUIRED AS L=400m & 0.4L=200m, RESPECTIVELY AS PER CL. 4.5.1.4.5.2 & 4.5.3 OF IS: 10751-1994 "PLANNING AND DESIGN OF GUIDE BANKS FOR ALLUVIAL RIVER-GUIDE LINES". HOWEVER, AS PER ACTUAL SITE CONDITION DEMANDS, IT CAN BE EXTENDED FOR REQUIRED LENGTH, BEYOND THE LENGTH AS MENTIONED ABOVE.
- THESE TYPICAL SECTIONAL DETAILS OF U/S & D/S BANK PROTECTION ON BOTH THE FLANKS ARE SHOWN CHAINWISE FOR PERFORMANCE WITH ACTUAL (EXISTING) GROUND LEVELS AND TOE LINES OF THE BANKS AS SUGGESTED & FURNISHED BY THE S.E. SSC-2 OFFICE'S LETTER DATED ON 05/06/2020. THE EXCAVATION WORK SHALL BE CARRIED OUT PROPERLY AS PER TOE LINE MARKING. THE TOP OF U/S BANK PROTECTION SHALL BE SUGGESTED AT R.L. 107.50m WITH RESPECT TO MAXIMUM WATER LEVEL 106.08m @ CH. 240.0m AT U/S AS PER GERI MODEL REPORT-2 (FEB-2020) RESULT + FREEBOARD REQUIREMENT.
- THE TOP OF D/S BANK PROTECTION SHALL BE SUGGESTED AT R.L. 107.50m WITH RESPECT TO MAXIMUM WATER LEVEL 105.76m @ CH. 120.0m AT D/S AS PER GERI MODEL REPORT-2 (FEB-2020) RESULT + FREEBOARD REQUIREMENT.
- THE 7.0m WIDE LAUNCHING APRON WITH GABION KEY OF 2.0m DEPTH BE PROVIDED AT THE RIVER BED LEVEL. THE GABION KEY SHALL ALSO BE PROVIDED AT BERM R.L. 100.50m AND BANK TOP R.L. 107.50m AS SHOWN IN DRAWINGS.
- THE RAIN WATER COLLECTING DRAINS WITH ADEQUATE SIZE ON THE D/S (BANKSIDE) TOE AS SHOWN IN DRAWINGS SHALL BE PROVIDED TO DRAIN AWAY THE SURFACE WATER INTO RIVER BEYOND THE BANK PROTECTION WORK.
- THE PROPOSED LEFT & RIGHT BANKS PROTECTION WORK SHALL BE CARRIED OUT BY TRIMMING BANK SLOPES/FILLING WITH SELECTED EXCAVATED STUFF MATERIAL OR BORROW AREA SOIL HAVING DESIGN SOIL PARAMETERS OVER THE EXISTING STABLE BANK SLOPES. THE STABILITY ANALYSIS OF TYPICAL BANK CROSS SECTIONS ARE CARRIED OUT BASED ON BIS 7894:1975 "CODE OF PRACTICE OF STABILITY ANALYSIS OF EARTH DAMS" WITH AVAILABLE DETAILS AND SOIL DATA FURNISHED BY S.E. SSC-2 OFFICE'S LETTER DATED ON 30/08/2016 AND 08/04/2019. AS THESE SOIL DATA ARE FURNISHED BEFORE YEARS, MAY BE CONFIRMED PRIOR TO EXECUTION.
- MAXIMUM RIVER FLOW VELOCITY OF 5.38 m/s OCCURRING @ U/S LEFT FLANK AT CH. 240m U/S OF THE STRUCTURE FOR DESIGN FLOOD OF 16707 CUMECs AS DERIVED IN MODEL STUDY REPORT-2 (FEB 2020 OF GERI VADODARA) IS ADOPTED FOR DESIGN.
- AS PER FIELD SOIL REPORT FURNISHED WITH S.E. SSC-2 LETTER'S DATED ON 30/08/2016, THE AVERAGE VALUE OF S.F.T FACTOR OF RIVER BED MATERIALS NEARER TO THE TOE LINE OF BANK IS 1.2m. THE SAME VALUE OF S.F.T FACTOR IS CONSIDERED IN DESIGN.
- AVERAGE BED R.L. = 92.34m, HFL = 105.81m AND FLOOD DISCHARGE (Q) = 16707 CUMECs IS CONSIDERED FOR DESIGN.
- GABIONS OF SIZE 1m X 1m X 1m TO BE PLACED ON SLOPE FOR PROTECTION. DRY DENSITY OF GABION SHOULD BE MORE THEN 1650 kg/m³. GABION SHOULD BE MADE UP FROM ZINC+PVC COATED WIRE.
- 20cm THICK SELECTED EXCAVATED STUFF MATERIAL LAYER IS TO BE LAID OVER NONWOVEN GEOFABRIC BEFORE LAYING OF GABION TO PREVENT THE MECHANICAL RUPTURE OF THE FABRIC BY GABION STONES. THE WEIGHT OF NONWOVEN GEOFABRIC SHOULD BE MORE THAN 235 g/m².
- AS PER LAYOUT PLAN FURNISHED BY S.E. SSC-2 LETTER'S DATED ON 17/08/2021, THERE EXISTS KOTAR CROSSING ALIGNMENT OF U/S SIDE RIGHT BANK PROTECTION WORK AT CH. 180.0m. AT THIS LOCATION BOTH SIDE RIVER BANK PROTECTION WORK OF KOTAR BE ANCHORED/SMOOTHLY TRANSITED INTO KOTAR BANK SECTION UP TO APPROPRIATE LENGTH AS PER ACTUAL SITE CONDITION. THE EXISTING BED LEVEL AND BED WIDTH OF KOTAR SHALL BE MAINTAINED AS IT IS. IN KOTAR SECTIONS APRON LEVEL OF PROPOSED TYPICAL SECTION SHALL BE MAINTAINED AS PER EXISTING BED LEVEL OF KOTAR. THE ADDITIONAL EARTWORK SHALL BE CARRIED OUT BEHIND THE JUNCTION OF PROPOSED BANK SECTION AND KOTAR SECTION AS PER SITE REQUIREMENT.
- THERE ARE TWO EXISTING INLET STRUCTURES ON LEFT SIDE PROTECTION WORK ONE EACH ON U/S & D/S FLANKS. THE PROPOSED BANK PROTECTION WORK ON LEFT BANK SHALL BE CARRIED OUT CONTINUOUSLY BY RAPPINGS ROUND THESE INLET STRUCTURES. THESE INLET STRUCTURES SHALL EITHER BE STRENGTHENED/PROVIDED AFRESH WITH RESPECT TO F.R.L. LEVEL ON U/S & MINIMUM WATER LEVEL ON D/S AS PER ACTUAL SITE CONDITION. ALTERNATIVELY IF THE DISCHARGE FROM THESE INLETS ARE NOT SIGNIFICANT AND THE WATER FROM BANKS CAN BE DIVERTED INTO THE RIVER IN D/S BY OPEN DRAIN AS SHOWN IN CROSS SECTION DETAILS, THESE INLETS BE DELETED/REMOVED.
- THE PROPOSED LEFT & RIGHT SIDE BANK PROTECTION WORKS SHALL BE ANCHORED ON BOTH ENDS HAVING SMOOTH TRANSITION AND PROPER RAP AROUND TO EXISTING BANK WITH RESPECT TO THE LEVEL OF PROPOSED BANK TOP R.L.
- AS PER LAYOUT PLAN FURNISHED BY FIELD OFFICE'S LETTER DATED ON 17/08/2021, THE U/S RIGHT BANK TOE LINES FROM CH. 400m TO CH. 600m IS APPROXIMATELY 60.0m TO 80.0m PROVIDING INTO THE RIVER BED. AS PER GERI MODEL REPORT-2 (FEB-2020) GUIDE BANK ALIGNMENT FROM CH. 400m TO 600m WAS CONSIDER AS STRAIGHT. THE SUGGESTED TOE LINE AS PER LAYOUT PLAN FURNISHED BY FIELD OFFICE WAS NOT OBSERVED IN MODEL RUNS. HENCE, THE PROPOSED GUIDE BANK WORK WILL BE CARRIED OUT AS PER THE ALIGNMENT STUDIED IN MODEL RUN WITHOUT DISTRACTED THE PROPOSED GUIDE BANK TOE LINE. ALTHOUGH GUIDE BANK ALIGNMENT REQUIRED TO BE SHIFTED TOWARD THE RIVER SIDE ADJUSTING THE ACTUAL SITE CONDITION AS PER LAYOUT FURNISHED BY FIELD OFFICE'S LETTER DATED ON 17/08/2021, THE SAME ARRANGEMENT WILL BE REPRODUCE IN EXISTING MODEL AT GERI AND TAKE THE NECESSARY OBSERVATION OF MODEL RUNS WITH RESPECT TO DESIGN DISCHARGE. IF, THERE WILL BE NO ADVERSE EFFECT OBSERVED DUE TO SHIFTED ALIGNMENT THEN GUIDE BANK ALIGNMENT WORK WILL BE CARRIED OUT AS PER THE FIELD OFFICE'S LAYOUT PRIOR TO TAKE NECESSARY APPROVAL FROM THE COMPETENT AUTHORITY.
- THESE CROSS SECTIONS ARE REPRODUCED FROM THE CROSS SECTIONS FURNISHED BY S.E. SSC-2 OFFICE'S LETTER DATED 05-06-2020.
- THE PROTECTION WORK FOR BOTH THE BANKS AS SHOWN IN DRAWING ARE FOR MAXIMUM HEIGHT. THE CROSS SECTIONS OF BANK OF PROPOSED LENGTH AT DIFFERENT CHAINAGE SHOULD BE CHECKED & CONFIRMED AS PER ACTUAL SITE CONDITION BEFORE STARTING OF WORK.
- THIS DRAWING IS NOT TO SCALE. NO DIMENSIONS SHOULD BE MEASURED DIRECTLY FROM THE DRAWING.
- ALL DIMENSIONS ARE IN 'mm' AND ALL R.L.'S ARE IN 'm'.

PLATE-5

NARMADA, WATER RESOURCES, WATER SUPPLY AND KALPSAR DEPARTMENT

CENTRAL DESIGNS ORGANISATION

GANDHINAGAR

DETAILS OF GUIDE BANK PROTECTION WORK

FOR U/S AND D/S GUIDE BANKS OF HIRPURA BARRAGE

TA, VIJAPUR, DIST, SABARKANTHA

J J PATEL (DEE)
DRAWN BY

J J PATEL
DY. EXE. ENGINEER

P V VYAS
SUPERINTENDING ENGINEER

M C KOTHARI (DEE)
CHECKED BY

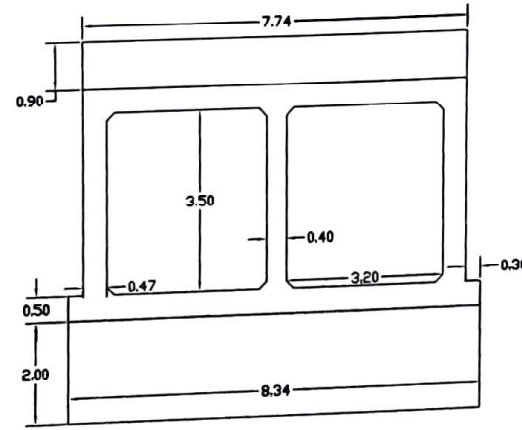
H H MITRA
EXECUTIVE ENGINEER (I/C)

H U KALYANI
CHIEF ENGINEER
& ADDL. SECY.

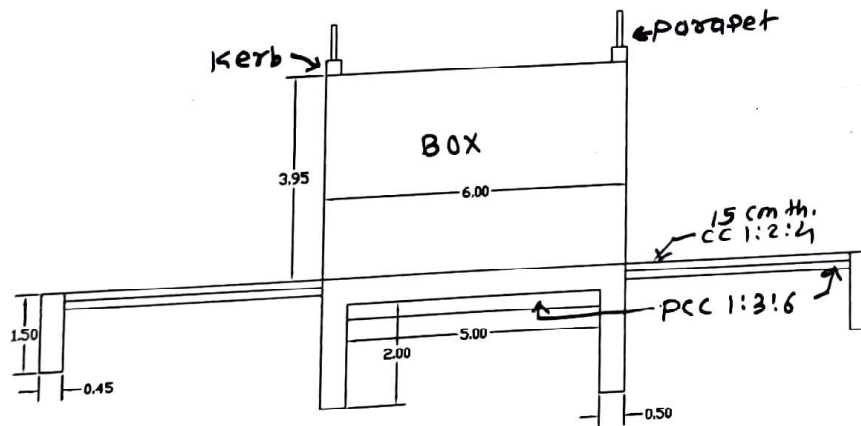
DRAWING NO. : CDO/CHIRPURA BARRAGE/ DATED : /02/2021

DETAILS OF U/S AND D/S GUIDE BANK PROTECTION WORK FOR HIRPURA BARRAGE

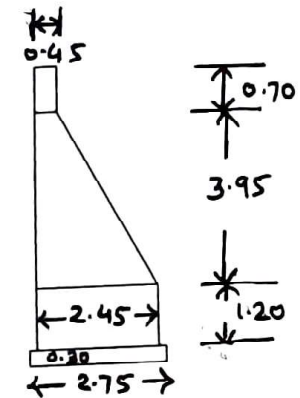
Name Of Work:- Constructing road from Hirpura Village to Hirpura Barrage site Ta.Vijapur Dist.Mehsana.



SECTIONAL ELEVATION



SECTIONAL ELEVATION

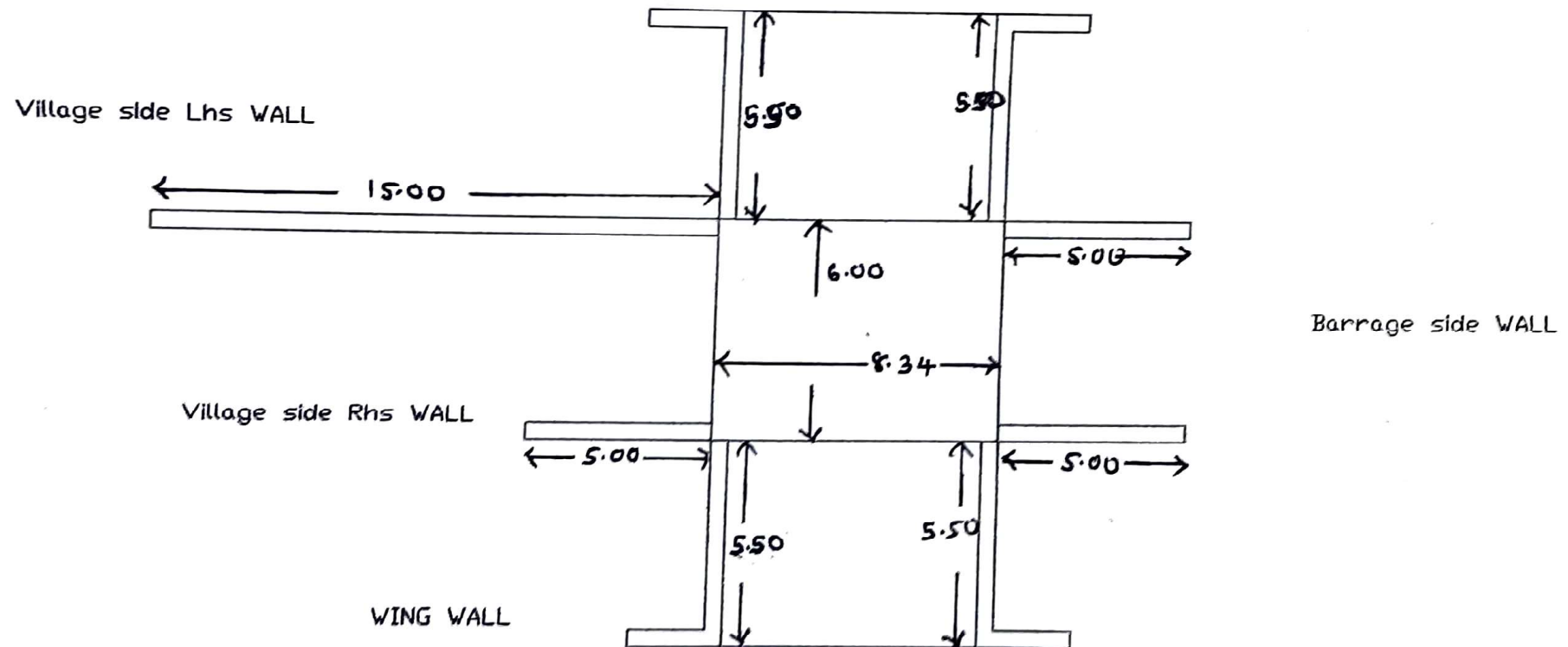


WING WALL

J. P. G. A. E.

B. K. S. W. M.
Deputy Executive Engineer
Sujlam-Sufalam Sub. Dn. No.-3
VADNAGAR

Name of Work:- Constructing road from Hirpura Village to Hirpura
Barrage site at Village Hirpura Ta.Vijapur Dist.Mehsana.

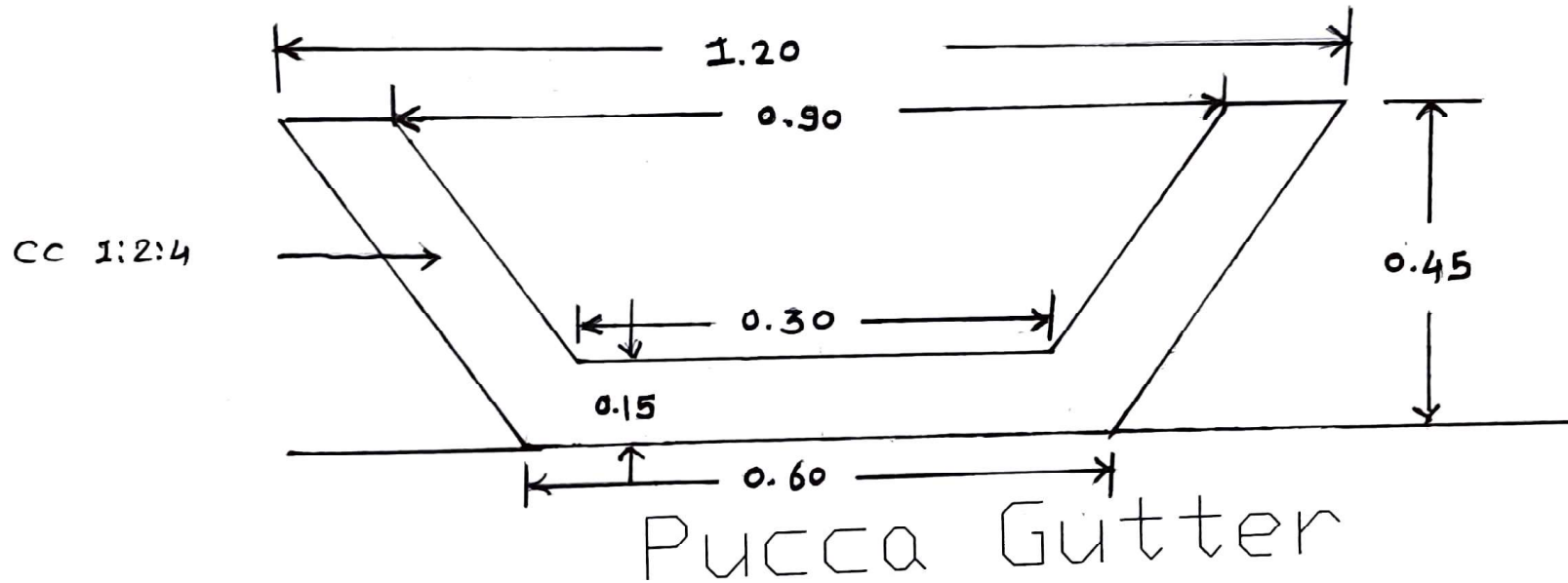


PLAN

B. S. Kumar
Deputy Executive Engineer
Sujam-Sufalam Sub. Dn. No.-3
VADNAGAR

S. B. Singh
12/8

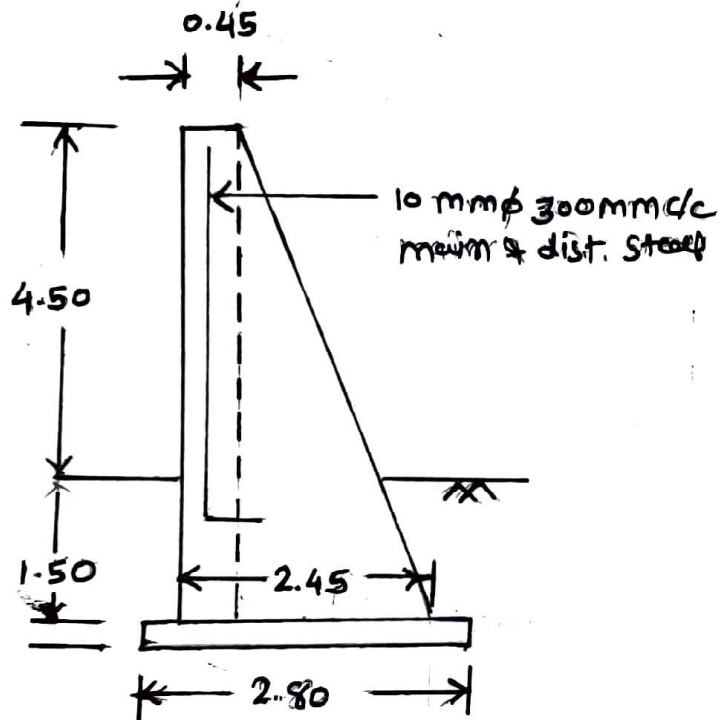
Name of Work:- Constructing road from Hirpura Village to Hirpura Barrage site Ta. Vijapur Dist. Mehsana.



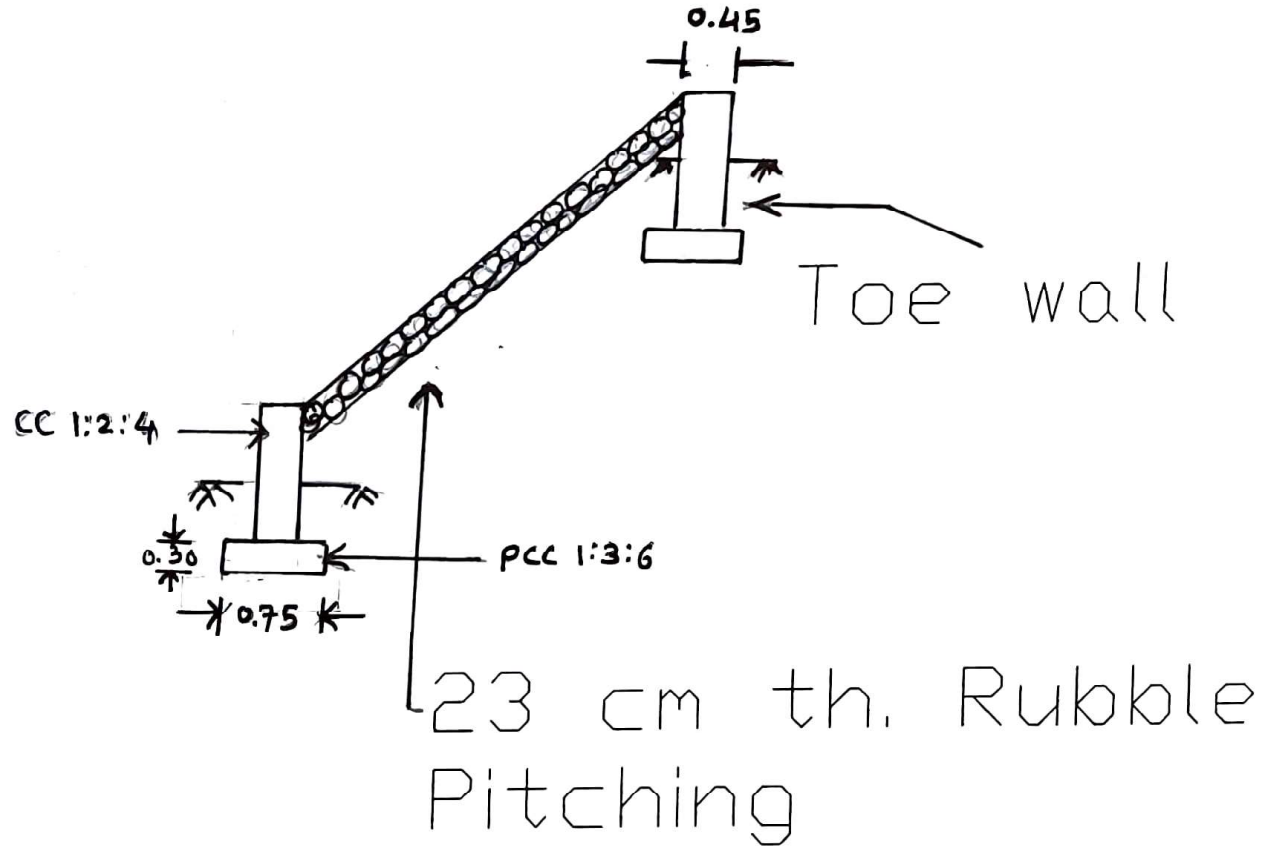
Handwritten signature
AE

Handwritten signature
Deputy Executive Engineer
Sujiam-Sufalam Sub. Dn. No.-3
VADNAGAR

Name Of Work:- Constructing road from Hirpura Village to Hirpura
Barrage site at Village Hirpura Ta. VI Japur Dist. Mehsana.



Protection
wall



B. K. Butani
Deputy Executive Engineer
Sujam-Sufalam Sub. Dn. No.-3
VADNAGAR

AE