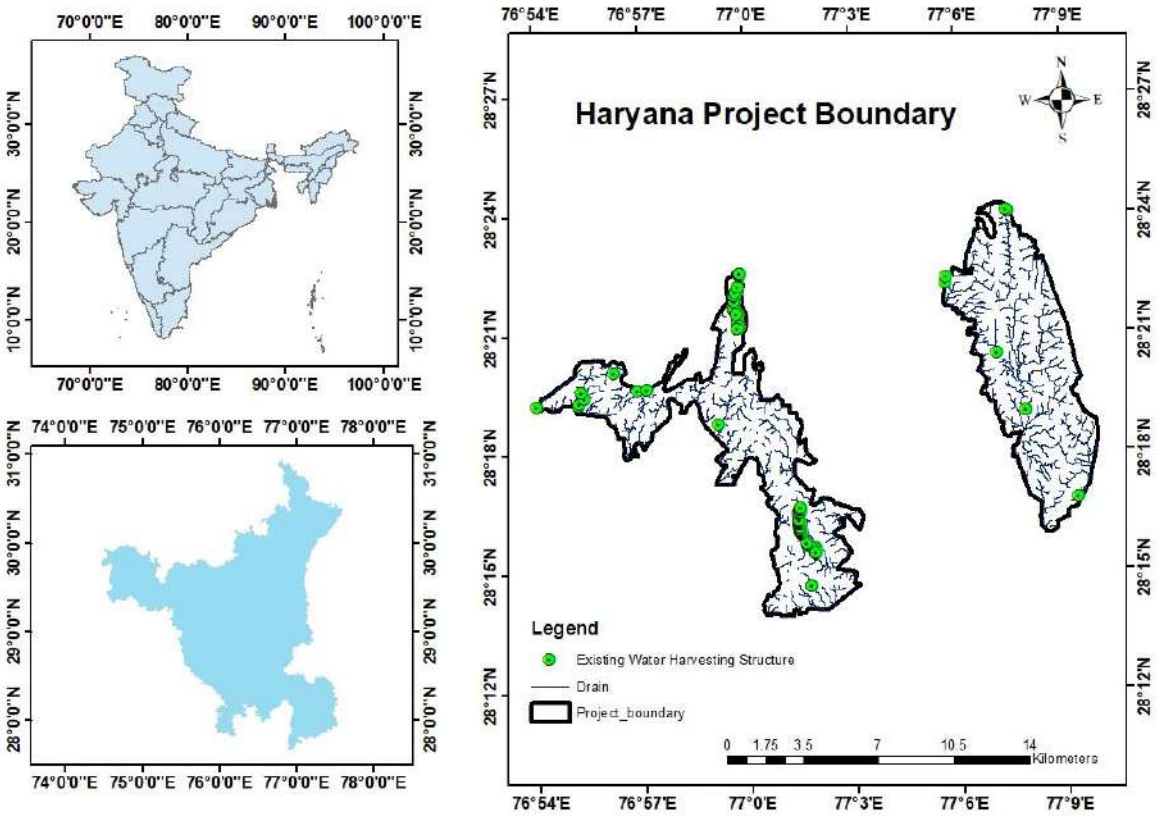
Preparation of DPR with LiDAR Survey for

Forest catchment treatment- Haryana

Detailed Project Report

Haryana -Project Boundary



Submitted by **WAPCOS Limited** to **MoEF, Government of India**

Year: 2020-21

Salient Features of the Project

S. No.	Salient Features	Details
1	District	Gurgaon, Mewat, Faridabad
2	Taluk	Taoru, Sohna, Pataudi, Gurgaon
3	Total Project Area	10978 hectare
4	Average rainfall	529.2 mm
5	Average soil loss	15.73 ton/ha/year
7	Total cost of the project	Rs 4972.73 lacs **(Rs 49.72 crores)**
8	Highest elevation in the area	345 m
10	Latitude/Longitude	latitudes 28°11' N to 28°28’ N and 76°55' E to 77°10' E longitudes

Executive Summary

Most of the forest lands are in upper part of the catchment of river basins and are the originating source of the runoff. Their degradation mainly caused due to erosive runoff has aggravated the problem like soil erosion, flash floods, droughts, depleting ground water and poor vegetation in the ridge areas.

Tackling the runoff at originating points will prevent numerous atrocities of runoff hence the project of preparing the scientific DPR using modern technologies to plan and identify site locations for construction of appropriate and feasible micro soil and water conservation structures in forest areas has been initiated. **The need and paradigm shift in planning process has been elaborated in Chapter 1.**

The processes of planning started with gathering lot of information about problems in the project area and recommendations to address the same and how the ongoing programs are addressing these. All this baseline data from has been collected from the academic and departmental sites. sources like census2011 hand books, NRCS "WRIS" portal, IMD website, National Bureau of Soil Survey and Land Use planning (NBSS&LUP), Ground Water Information Booklet of each district prepared by central ground water board, the websites of central and state forest department, watershed department (IWMP DPRs), water resources department, agriculture department. Also, a Reconnaissance survey was conducted by WAPCOS expert by visiting the sites for two three days **(from 19/12/20 to21/12/20).** All the data gathered about the project area and district of project area has been elaborated in **Chapter 2.**

Methodology for planning the treatment works in the area has been adopted keeping in mind the local conditions of the area, local practices and the objective of conserving as much moisture as possible. The selection of activities in the area are based on certain criteria which are influenced by the

type of soil in the area, runoff, drainage pattern, order of stream, catchment area at identified site, vegetation cover, slope, geology, geomorphology, terrain conditions and local practices. **Chapter 3 mentions about the methodology adopted in identifying the locations and brief on type of interventions proposed**. The type of interventions proposed are no different than in practice in the project area, the only difference is in methodology of identification of site. The recommendations mentioned in "action plan on climate change adaptation" to address the problems of forest areas, land resources, and water resources in the respective chapters has been followed and the groundwater recharge recommendations of the concerned district prepared by the Central Groundwater Board has been taken into consideration in planning. **So, executing the works proposed will be acting on the recommendation and adhering to climate change**

After preparation of various thematic layers and proposing various structures based on the criteria mentioned above, the location sites of planned works were sent to the field practitioners for verification. **Field Verification of the Sites (activities/structures) proposed in the DPR was done in the state from 13/12/21 to 20/12/21 by the WAPCOS consultant** along with the district forest officers. The district officers later continued the process of verification. It was not just verification but also knowledge transfers to the district forest officers on ridge to valley watershed planning, capacity building of the district forest teams so they understand the activities planned the procedure adopted for DPR preparation and gain knowledge on their execution methodology etc. The first one or two days the WAPCOS experts along with the forest officers visited the points together and the later 2 to 3 days, multiple teams of forest officers were formed so that verification was done in parallel which helped not only in verification but capacity building of the offices. The DPR verification process was concluded with a video conference of the WAPCOS central expert team with the district forest officers where a threadbare discussion on all

queries and feedback on sites identified was done and everyone coming on to the same page. The field verification concluded that above 95% the sites were found suitable and the variation percentage was to large extent addressed in the final submissions **Photos of the field verification process can be** seen at pages 34-45 of this DPR.

The identified location of structures with details like location (latitude-longitude), catchment area, dimensions, submergence area, storage capacity, fetch length and cost all are given in tabular form in **Chapter IV "List of proposed structures".** The runoff management strategy has been two-pronged harvesting it and reducing its erosive velocity. Water harvesting structure such as Check dams, percolation tanks, ponds soil conservation works like LSCD and gabion have been proposed in streams. In low density of forest areas, the water harvesting structures combined with catchment area treatment works like Contour trenches, staggered trenches have been proposed to increase moisture and reduce erosive velocity of runoff. Also, afforestation proposed in poor vegetation areas however the type and species of plantations in these areas can be selected based on the local variety of trees or as per the necessity of the community living around the areas. Also, to reduce pressure on forest areas pasture and catchment area works have also been proposed in scrub lands

The abstract of cost is at chapter V and the design of structures and the model estimates have been given in the chapter VI. The SOR2017 provided by forest department have been used and SOR 2021-22 of the state PWD has been used in estimation.

It is expected that implementation of these works would be carried out on watershed approach and construction of these structures will reduce the erosive velocity of runoff, store Runoff, arrest silt carried by runoff, increase moisture regime and recharge Ground Water which would assist in not only regeneration of the forest areas but improve the economy and societies.

TABLE OF CONTENTS

CHAPTER - 1

INTRODUCTION

1.1 The Objective of project:

The project has been initiated with an aim to plan and identify site locations for construction of appropriate and feasible micro soil and water conservation structures in forest areas. It is expected that implementation of these works would be carried out on watershed approach and construction of these structures will reduce the erosive velocity of runoff, store Runoff, arrest silt carried by runoff, increase moisture regime and recharge Ground Water which would assist in not only regeneration of the forest areas but improve the economy and societies.

1.2 The criteria for selection of project areas:

Ministry of Environment, Forest and Climate Change, Government of India has identified one major ridge inside a forest block under the control of State Forest Department satisfying, the following criteria of selection

a. The selected area should have average rainfall of that particular State/UT.
b. The selected area should be a single and contiguous watershed including and surrounding the ridge with up to 10,000 hectares in size (but not less than 5,000 hectares). This will help in putting the Ridge to Valley approach in action.
c. To the extent possible, the strata of the area should be conducive to watershed interventions.
d. The area selected should have at least 40% area under 'open forest' (forest density < 0.4) category. The area should have the potential to regenerate with the Assisted Natural Regeneration interventions.
e. The area should be such where investment should help the three pillars of

sustainability that is ecology, economy and society.

1.3 Need of paradigm shift in identification of micro soil and water conservation structures in forest areas

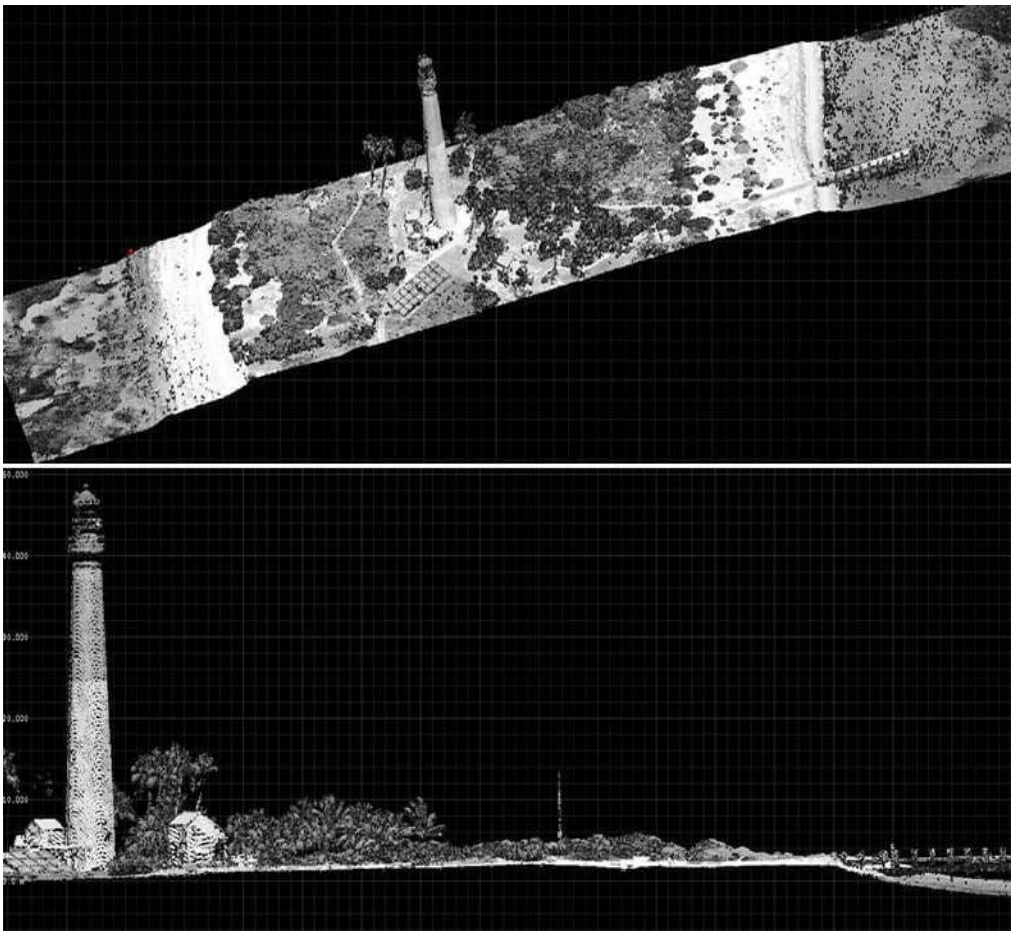
It was being felt that the interventions be not only cost effective but efficient in purpose and be identified on scientific inputs with minimal efforts.

The preparation of DPRs using traditional tools of land surveying is a cumbersome and hectic process and are limited in lot of fronts. Traditional survey involves physically moving (mostly on foot) to each of the locations where the data needs to be taken and hence accessibility is one of the main hurdles (in cases like hilly terrains, forests). Since most of the survey work is manual (skilled labor intensive), there are many grey areas such as human errors. And if it is without surveys, the site selection on eye judgment may result in failure of structure or less economic site selection or ineffective site selection. The developments in technologies offer better spatial and spectral resolutions data and stereo viewing thus eliminating the need of physical surveys. Also, the scientific planning for development and moisture conservation requires a detailed understanding and analysis of various hydrological phenomenon (like rainfall-runoff processes, groundwater recharge etc.), land use/cover scenario, soil erosion in the area. The analysis of so many variables (parameters) is very complex and can be made easy with the technology inputs like GIS. With satellite data it is possible to find the location of structure but not it's dimensioning and designing. But using LIDAR survey, now it is possible to generate Digital Elevation Model (DEM) of higher resolution and contours of 30 cm interval which facilitate the micro level planning with all dimensions of structure and most effective and economic site selection of the structures.

A brief on LiDAR survey: LiDAR, which stands for "Light Detection and

Ranging", is a remote sensing method that uses light in the form of a pulsed laser to measure ranges (variable distances) to the Earth. These light pulses combined with other data recorded by the airborne system generate precise, three-dimensional information about the shape of the Earth and its surface characteristics. A LiDAR instrument principally consists of a laser, a scanner, and a specialized GPS receiver.

When an airborne laser is pointed at a targeted area on the ground, the beam of



light is reflected by the surface it encounters. A sensor records this reflected light to measure a range. When laser ranges are combined with position and orientation data generated from integrated GPS and Inertial Measurement Unit systems, scan angles, and calibration data, the result is a dense, detail-rich group of elevation points, called a "point cloud."

Each point in the point cloud has three-dimensional spatial coordinates (latitude, longitude, and height) that correspond to a particular point on the Earth's surface from which a laser pulse was reflected. The point clouds are used to generate other geospatial products, such as digital elevation models, canopy models, building models, and contours.

Figure (1.1): LiDAR Ortho Images of the Project Area-Arable land

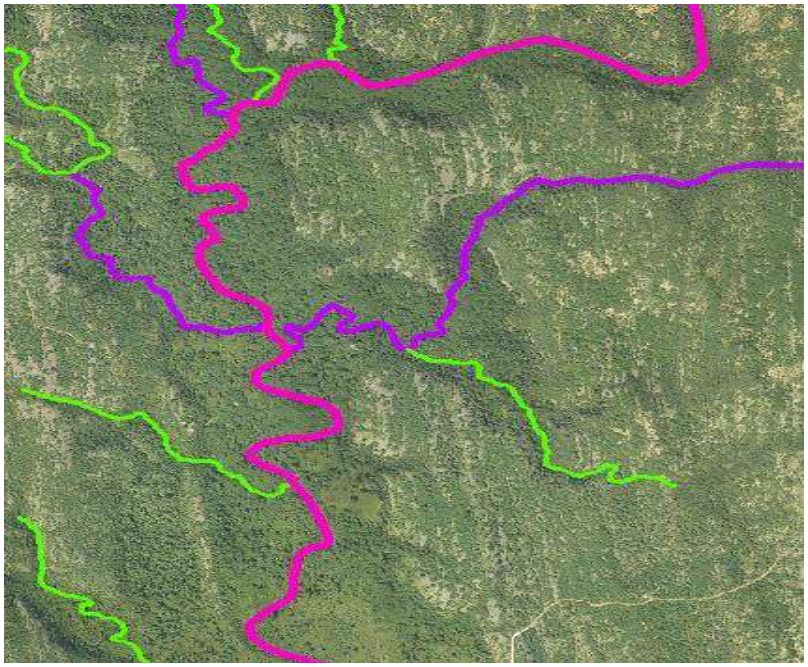


Figure (1.2): LiDAR Ortho Images of the Project Area- Forest land

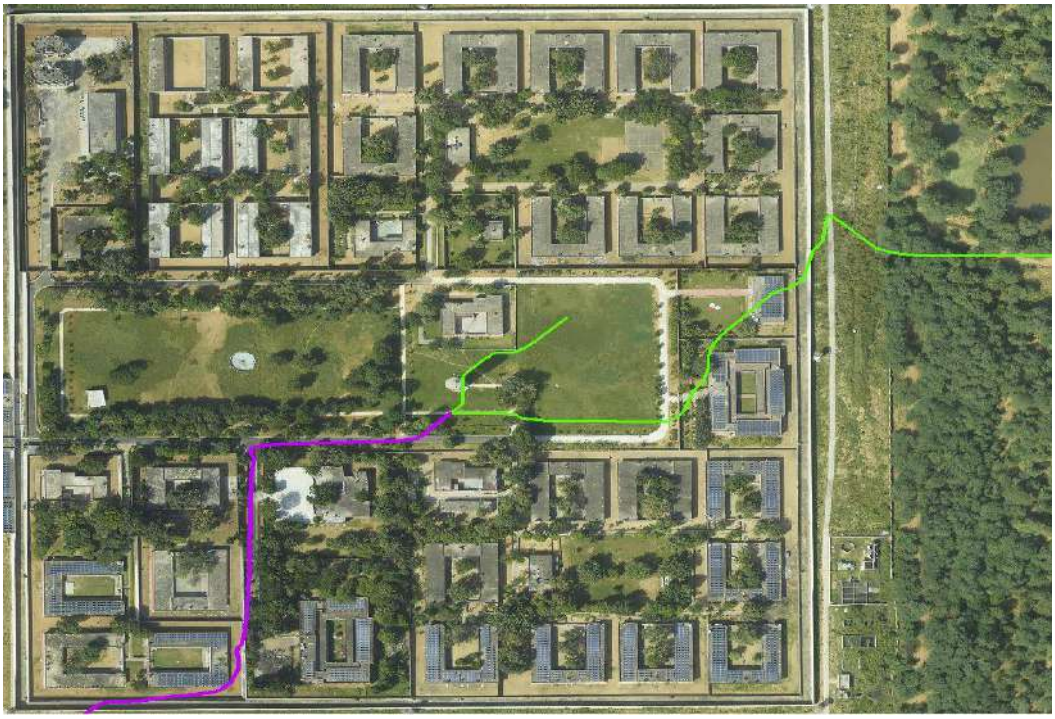


Figure (1.3): LiDAR Ortho Images of the Project Area- Habitation

Figure (1.4): LiDAR Ortho Images of the Project Area- Existing

CHAPTER - 2

Project Area and Its Characteristics

2.1 Location

The project area is located in Taoru, Sohna, Pataudi, Gurgaon Taluk of Gurgaon, Mewat and Faridabad district of Haryana, between the latitudes 28°11' N to 28°28’ N and 76°55' E to 77°10' E longitudes covering 37 villages.

2.2 About the district and project boundary

Gurgaon district is adjacent to the Delhi State surrounded by Jhajjar, Rewari, Mewat, Palwal and Faridabad districts. It has both oval and elongated shape. It lies between 27° 39' 00" North and 28° 32' 25" North latitudes and between 76° 39' 30" East and 77° 20' 45" East longitudes. It has a geographical area of 1258.00 square kilometers containing 976.65 square kilometers of rural area and 281.35 square kilometers of urban area. The district is located in the south-eastern bulge of the State and is having common border with Delhi State in the north. Jhajjar district lies to its north west, Rewari district to its south west Mewat district in South, Palwal district in south east and Faridabad district makes eastern boundary with the district.

Table 2.1: General features of the district and project boundary

S. No	Features	Particulars
(a)	Area of district	1258 Sq. Km
(b)	Total Project area	10978 hectares
(c)	Population of the district	1,514,432
(d)	Population of the Project area	98919
(e)	Total household Project area	16328
(f)	Total Sc population Project area	13874
(g)	Major Drainage basins in district	Ghaggar and Yamuna

Table 2.2: Demographic details of project area

Sr. no.	Village Name	No_HH	TOT_P	P_SC
1	Shikohpur	150	4485	626
2	Navrangpur	181	3132	741
3	Sakatpur	208	1450	370
4	Manesar	484	15400	921
5	Gairatpur bas	597	1590	579
6	Bar gujar	2076	1618	132
7	Nainwal	545	840	92
8	Gwaliar	233	1056	169
9	Bhrempur	204	1472	114
10	Bandhwari	437	3151	672
11	Kadarpur	760	4235	847
12	Bhondsi	430	11201	1087
13	Rethoj	116	3619	17
14	Sahjawas	505	1402	71
15	Behlpa	120	1285	87
16	Raisena	90	2433	435
17	Kherla	259	4473	1302
18	Damdma	114	2802	77
19	Mandawar	50	620	69
20	Abhepur	218	3353	704
21	Mohammadpur gujar	32	645	305
22	Sohna rural	445	544	90
23	Sampki nagli	411	1755	103
24	Rojka gujar	748	487	35
25	Khobri	76	0	0
26	Kota khandewla	93	1514	286
27	Gangani	168	170	0
28	Baghanki	381	2646	559
29	Bissar akbarpur	422	2823	363
30	Mohmmadpur ahir	826	4451	1052
31	Jalalpur sohna	18	588	0
32	Kharak sohna	150	648	0
33	Bhango	181	1083	220
34	Sondh	208	2440	1117
35	Chehalka	484	2666	16
36	Sehsaula	597	6695	616
37	Chhajupur	2076	147	0
	Total	**16328**	**98919**	**13874**

2.2.1 Rainfall

Maximum rainfall in August (33% of SW monsoon rainfall) followed by July (32 % of SW monsoon rainfall). 82% of annual rainfall receives during southwest monsoon rainfall (June –September). Kaithal, Faridabad and Mewat districts receive 85-86% of annual rainfall in SW monsoon season.

Table 2.3: Mean Rainfall for project area districts (in mm) from 1989-2018)

Month	District	June	July	August	September	Monsoon	Annual
Rainfall in mm	Gurugram	43.8	146.1	166.5	92.9	447.2	529.2
	Mewat	48.3	132.7	178.1	101.4	460.5	536.6
	Faridabad	46.7	174.2	192.5	123.4	534.9	618.8

(Source: Observed Rainfall Variability and Changes over Gurgaon State Haryana, IMD Pune, 2020)

Key observations in Observed Rainfall Variability and Changes from 1989-2018:

- It can be seen that June month's rainfall has shown decreasing trend in Gurgaon In July rainfall, significantly decreasing trend has been noticed in three districts namely Sirsa, Kaithal, Panchkula. Faridabad, Palwal has shown increasing trend while rest of state has decreasing trend but these trends are not significant. In the monthly rainfall June show increasing trend while July, August and September rainfall show decreasing trend. However, neither monthly nor seasonal/annual trend is significant statistically. For the annual rainfall three districts viz. Ambala, Panchkula and Panipat show significant decreasing trend while rest of districts showed non-significantly decreasing trend
- Most of the state shows non-significant in Monsoon season either increasing or decreasing.

- The number of rainy days lies in the range of 18 to 32 days in monsoon season. In June 2 to 6 days, in July 8 to 11 days, in August 7 to 12 days and in September 5 to 6 days. In August the rainy days are increased but decrease continues in September.
- The number of Heavy rainfall days during monsoon or entire year lies in the range of 1 to 3 days.
- The spatial distribution of minimum number of heavy rainfall days in Annual is similar to that of southwest monsoon season.

2.2.2 Temperature and Climate

The climate of the project area is characterized by its dryness and extremes of temperature and scanty rainfall. Four seasons are observed in a year. Mid-March to end of June is summer season, followed by rainy season from July to mid-September, after which a transition period of two months follows. Very hot in summer and very cold in winters. Winter months have average temperatures in the range 3^{o}C to 9^{o}C and the summer months temperatures are higher in the range of 48^{o}C to 35^{o}C. It has a sub-tropical continental monsoonal climate where we find seasonal rhythm, hot summer, cool winter, unreliable rainfall and great variation in temperature. Air is generally dry.

The air over the entire state is dry during the greater part of the year. Humidity is high in the monsoon months. April and May are the driest months with relative humidity of about 30% in the morning and less than 20% in the afternoons.

2.2.3 Soils

Gurgaon has light soils as sandy loam, medium soil particularly light loam (Seoti) and loam (Bhangar and Nardak), coarse loam (Dahar and choeknote) and rocky surfaces. Soils as classified by the National Bureau of Soil Survey and Land Use Planning (ICAR), Nagpur, the district has Ochreptps type of

soils in its major parts while Orthids-Fluvents and Ochrepts-Ustrets-Ustalfs types of soils are found in central western and south western parts of the district respectively. The soils in Gurgaon Sub-Division range between sandy to sandy-loam.

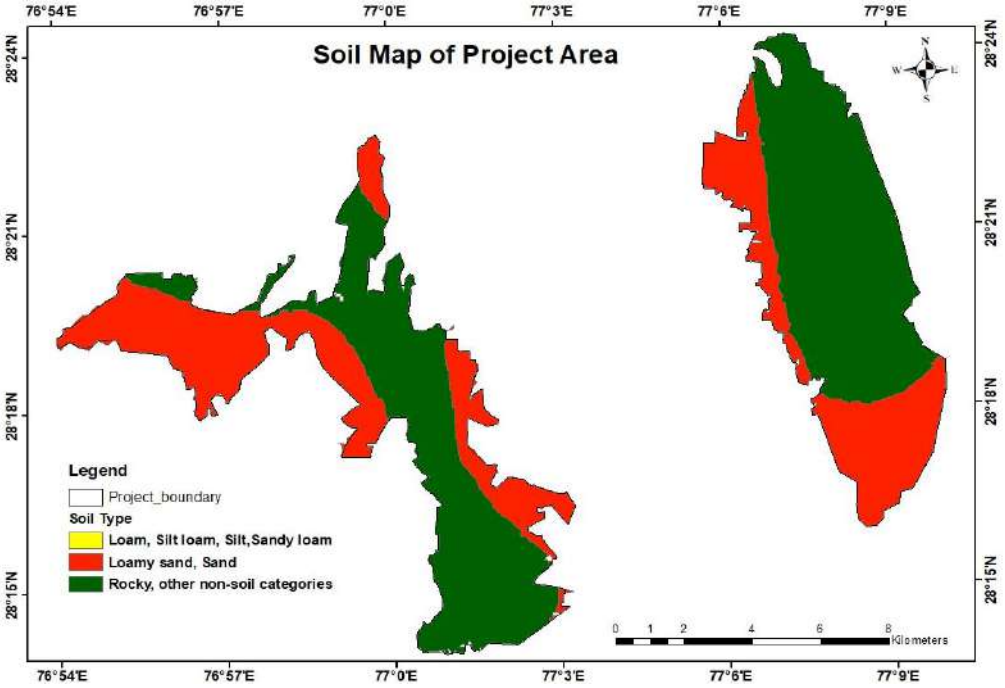


Figure (2.1): Project Area Soil Texture Map

Table 2.4: Soil Texture Details

Sr. no.	Soil_Class	Area(ha.)
1	Loam, Silt loam, Silt, Sandy loam	*5*
2	Loamy sand, Sand	3355
3	Rocky, other non-soil categories	7618
Total		10978

2.2.4 Geology and Geomorphology:

The geological structure of the Gurgaon is formed of Alluvium (recent) and Delhi Super Group (Middle Proterozoic) rock formations. Major part of Gurgaon district contained alluvial tracts, out of which protrude widely

scattered isolated strike ridges of old rocks, the remnants of Aravalli hills of pre-cambrian age. Delhi Super Group consists of Alwar and Ajabgarh rock formations. Due to poor quality of groundwater, its availability for drinking and irrigation is low. The discontinuous patches of Aravalli hillocks in Southern Haryana are exposed in Faridabad, Palwal, Gurgaon, Mewat, Bhiwani, Rewari and Mahendragarh districts and houses maximum number of economic mineral deposits. Sand, bajri and quartzites are mined from various localities from the hills of Manger-Harchandpar Bhondsi-Sohna. Minor occurrences of saltpetre are reported from all tahsils of the district. Other minerals found in small quantities in the district are arsenopyrite, china clay (kaoline) and other clays, graphite, farnet, iron, kyanite, silicons kankar, mica and quartz. Mica in large flakes is obtainable from Bhondsi. Good deposits of potter's clay occur at Sikanderpur, Alipur, Ghamroj and Ghausgarh. Clay occurs near Kasan and Ferozepur Jhirka. The Alwar quartzite, in weathering, has given rise to friable sand which is excavated as bajri but is suitable for glass making. Such deposits occur at Manger village. Graphite occurs in a band of schist, interbedded in the quartzite in the hill just west of Sohna town. The deposit is very small one. It is also reported in a gorge on the eastern side of Sohna hill. Graphite is also reported west of Hariahera. The reported occurrence of kankar in 112 villages in the district was examined to assess their suitability for manufacturing of Cement. Kyanite crystals are reported from Bhondsi and Mahammadpur Meo villages in schist bands. Transparent quartz crystals occur near Bhondsi, Indri and Sohna. Poor quality slate bands, about 3.5 meters in thickness, occur in Basai Meo. Hot springs of mineral water are located at the base of hill at Sohna in the district. The temperature of water is 46°C and it is said it resembles Vichy type of water. This water is known for its curative powers for the skin diseases and liver ailments for the past one and a half century. Mining in Haryana State is lying closed since March, 2010 due Environmental non-clearance.

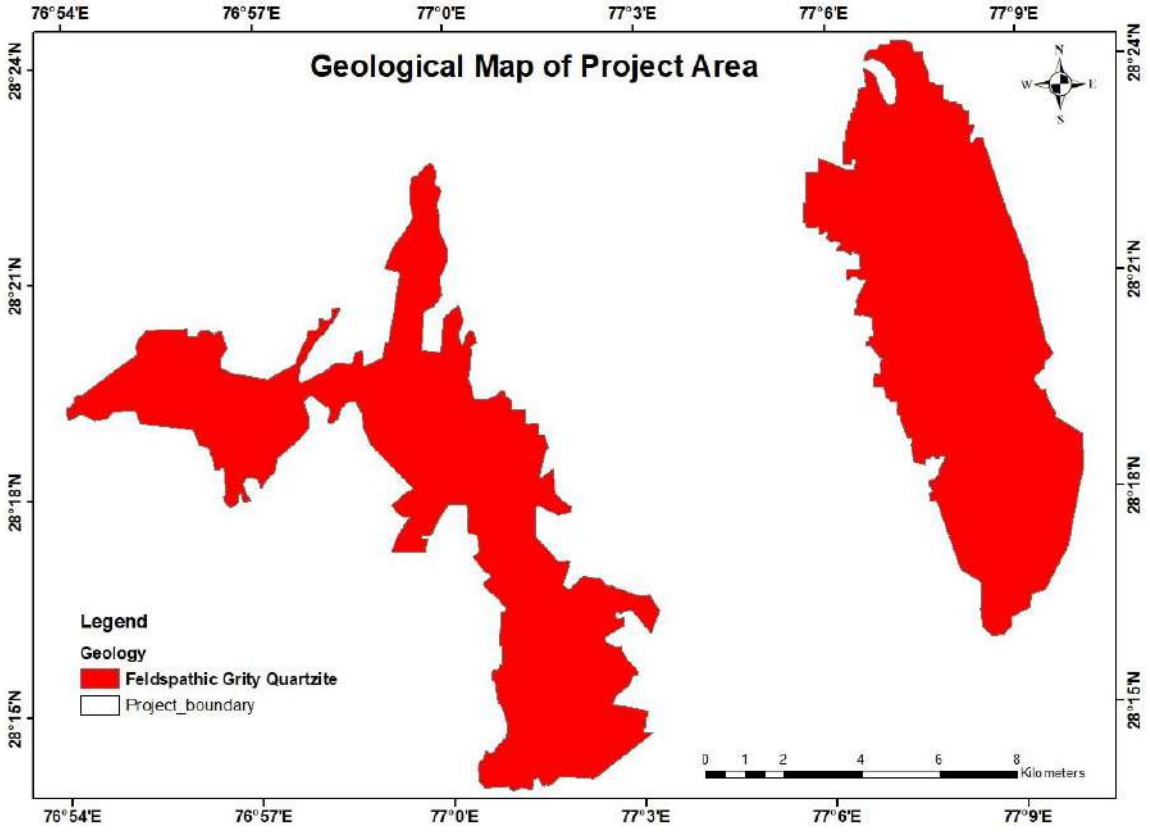


Figure (2.2): Project Area Geology Map

2.2.5 Drainage

There is no perennial river in the district. Seasonal streams are only a few, smaller in size and are inland. The drainage of the district is typical of the arid and semi-arid areas. Because of topographic diversity, the streams do no flow in any uniform direction. The district is drained mainly two rivers sahibi nadi and indori nadi which originate from Rajasthan.

2.2.6 Vegetation

There are two agro climatic zones in the state. The north western part is suitable for Rice, Wheat, Vegetable and temperate fruits and the south western part is suitable for high quality agricultural produce, tropical fruits, exotic vegetables and herbal and medicinal plants.

The district covers Gurgaon, Sohna and Pataudi forest ranges headed by the Range Forest Officers. These natural forests contain species like Khairi

(Acacia Senegal) Dhouk (Anaogeisus pendula edgew), Dhak (Butea monosperma), Papri, (Holopetelea integrifolia planch) Rounj, (Acacia leucophloea) Inderjo, (Wrightia tincloria) Chamror (Erhetia laevis), Grevia populifolia etc. Shisham and Neem are found in the foothills and plains. Kikar grows in the plains. Its bark is good for tanning. Shisham, Neem and Kikar are valuable as timber, firewood and for making agricultural implements. Plantation of Eucalyptus trees in the plains, along roads, canals and boundaries of agricultural fields are the latest phenomenon in forestry development. Kit is used as firewood and pulp wood for paper industry.

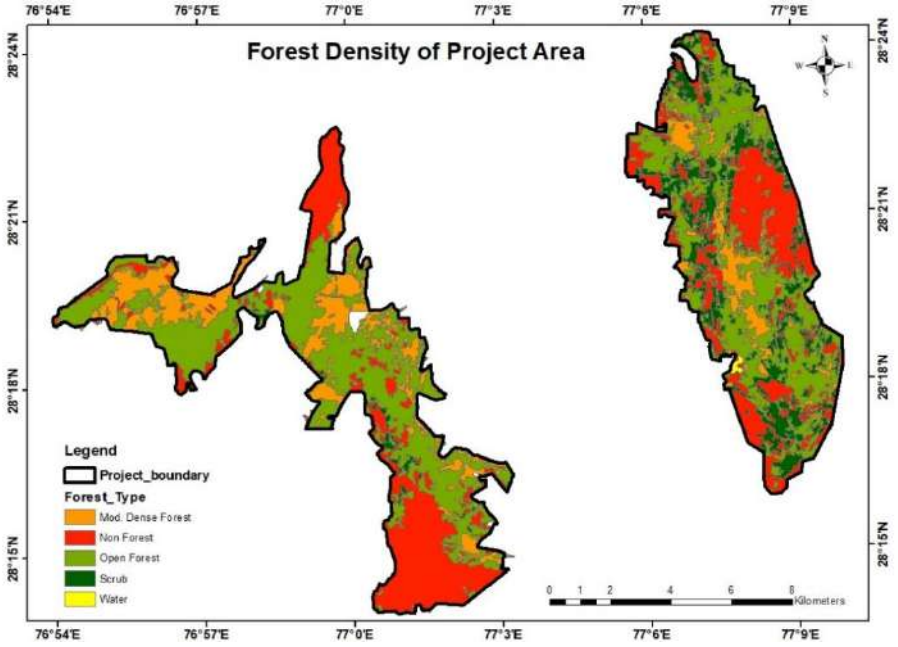


Figure (2.3): Project Area Forest Map

Table 2.5 Area under different Classes as per forest density

SN.	Classes	Area (ha)
1	Mod. Dense Forest	1652
2	Non-Forest	3349
3	Open Forest	4793
4	Scrub	1170
5	Water	14
Grand Total		10978

2.2.7 Yield in Project Area:

The annual runoff yield in the project area is 31869 TCM. The Natural Resources Conservation Service Curve Number (NRCS-CN), has been used for the estimation of direct runoff as it takes into account most of the watershed's runoff producing characteristics such as soil type, land use, hydrologic condition and antecedent moisture condition. The thematic maps corresponding to each parameter was generated processed to create surface runoff map for project AOI.

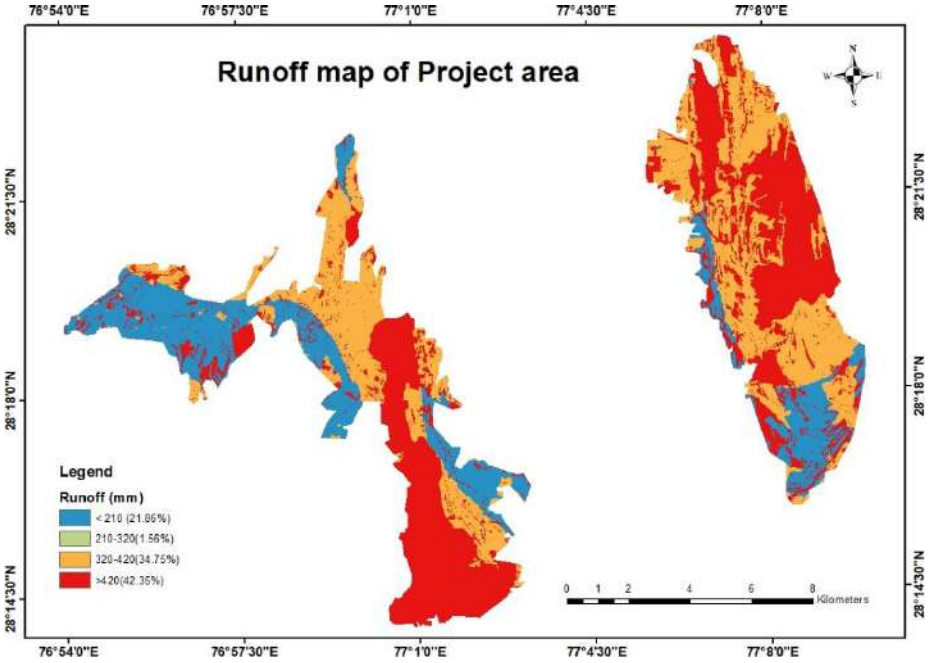


Figure (2.4): Project Area Runoff Map

Table 2.6: Area under different classes of runoff

S. No.	Runoff Classification (mm)	Area (ha)	Percent Area
1	< 210	2364.69	21.86
2	210-320	102.33	1.02
3	320-420	3770-83	34.75
4	>420	4581.23	42.35
Total		**7048**	**100**

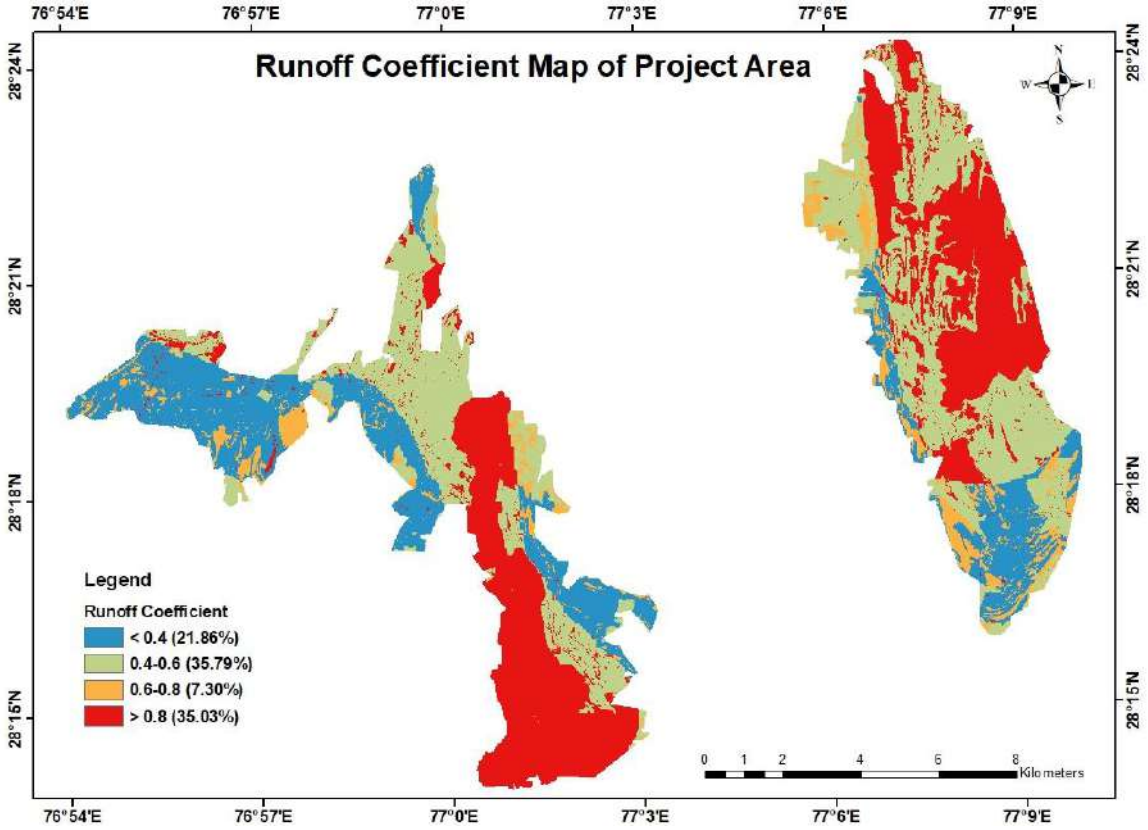


Figure (2.5): Project Area Runoff Coefficient Map

Table 2.7: Area under different classes of runoff coefficient

S. No.	Runoff coefficient Classification	Area (ha)	Percent Area
1	< 0.4	2415	22
2	0.4-0.6	3931	36
3	0.6-0.8	792	7
4	>0.8	3840	35
Total		10978	100

2.2.7 Soil Erosion in Project Area:

Soil erosion has been estimated from Modified RUSLE method using SWAT (ArcGIS)

Soil Erosion A = R*K*L*S*C*P……. (1)

Where, A= computed average annual soil loss (tonnes/ha/year), R= rainfall-runoff erosivity factor, K= soil erodibility factor, L = slope length factor, S=

slope steepness factor, C = cover management factor, P = conservation practice factor. **In the project area, the average soil loss is 15.73 ton/hectare/year.**

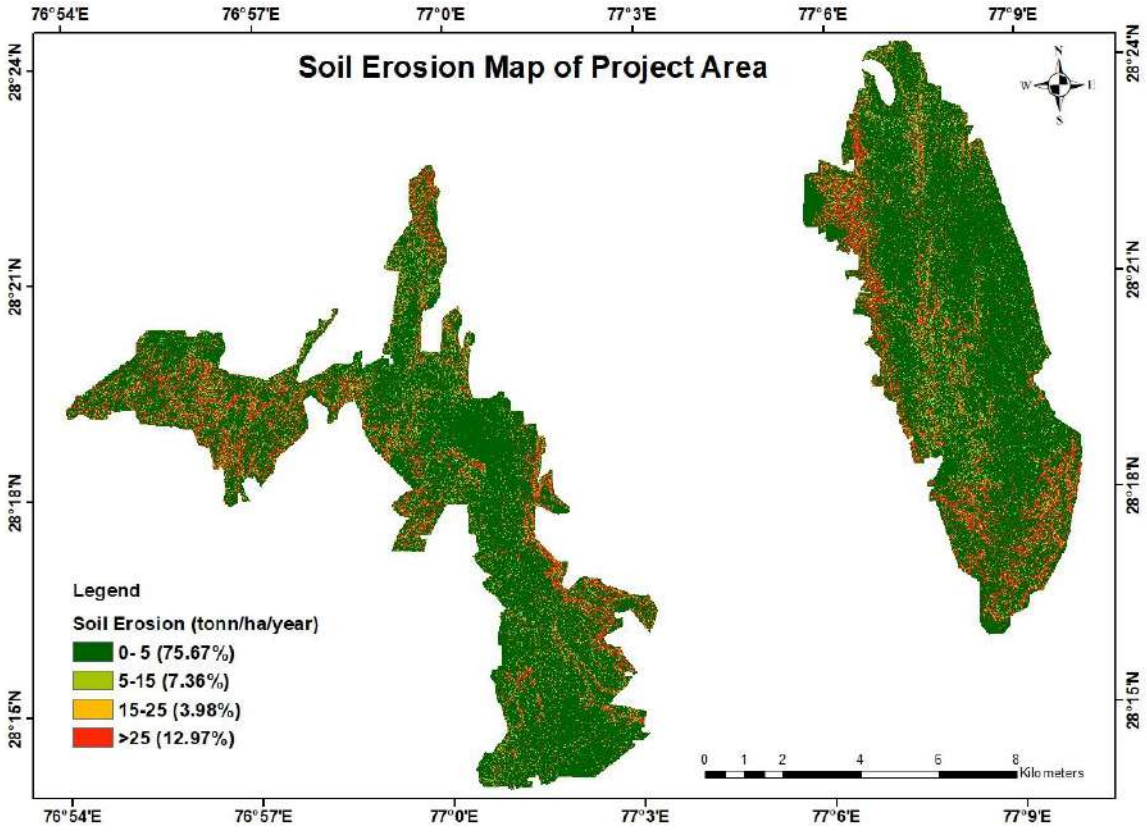


Figure (2.6): Project Area Soil Erosion Map

Table 2.8 Rate of Soil Erosion Classes for Project Area

S. No.	Erosion (t/ha/year)	Area (ha)	Percent Area
1	0-5	8287	76
2	5-15	799	7
3	15-25	433	5
4	>25	1459	12
Total		**10978**	**100**

CHAPTER - 3

METHODOLOGY ADOPTED FOR PREPARATION OF MICRO SOIL AND WATER CONSERVATION PLAN

The type of interventions proposed are no different from that in practice in the project area, the only difference is in methodology of identification of sites. The identified location of structures with details like location (latitude-longitude), catchment area, dimensions, submergence area, storage capacity, fetch length and cost all are given in tabular form in **Chapter IV "List of proposed structures". The abstract of cost is at chapter V** and the **design of structures and the model estimates** have been given in the **chapter VI.**

Forest lands are the originating source of the runoff. The degradation of forest areas results into erosive runoff which aggravates the problems of soil erosion, flash floods, droughts, depleting ground water and poor vegetation in the ridge areas. Tackling the runoff at originating points will prevent numerous atrocities of runoff hence runoff management can address both soil and water issues.

The runoff management strategy can be two-pronged: harvesting it and reducing its erosive velocity. Site specific Water harvesting structure like check dams, mini percolation tanks and percolation tanks have been thus proposed. All such measures can augment groundwater resources (Technical Report groundwater brochure of the district has emphasized on such structures). The above measures have also been highlighted in state action plan for climate change Strategies

Catchment area treatment works and afforestation have been proposed for treating the originating source of runoff that is forest areas to reduce the erosive velocity of runoff. Also, pasture development works have been

proposed to meet the fuel wood and fodder requirement from other resources instead of meeting the demand from forest areas.

3.1 Use of Various Thematic Layers for planning

Various thematic layers were created using the LiDAR data. The precision and accuracy of the data helps in very fine assessment of natural features like fine streams of small orders and other areas which are physically inaccessible. The layers that were created using the LiDAR data and some of their characteristics are mentioned below:

- **Base Map:** Map included the forest boundary
- **Contours:** Using the DEM layer of 0.3 m resolution, contours of 30 cm interval are generated to examine the elevation at each point and draw a line through points of similar elevations. This helped in analyzing the flow patterns along the drains and most used layer in finding the suitable site. Using this layer, the point where maximum fetch length, minimum dimensioning was selected.
- **Land use Land Cover:** The LULC plays a vital role in understanding the land coverage of the area as it details the various classes in which the land is being used. The LULC in this project has been prepared using ortho images captured through Lidar. This layer was very useful in calculating the soil loss and runoff generated in the project area. Also, in proposing type of structures to be proposed especially the afforestation patch.

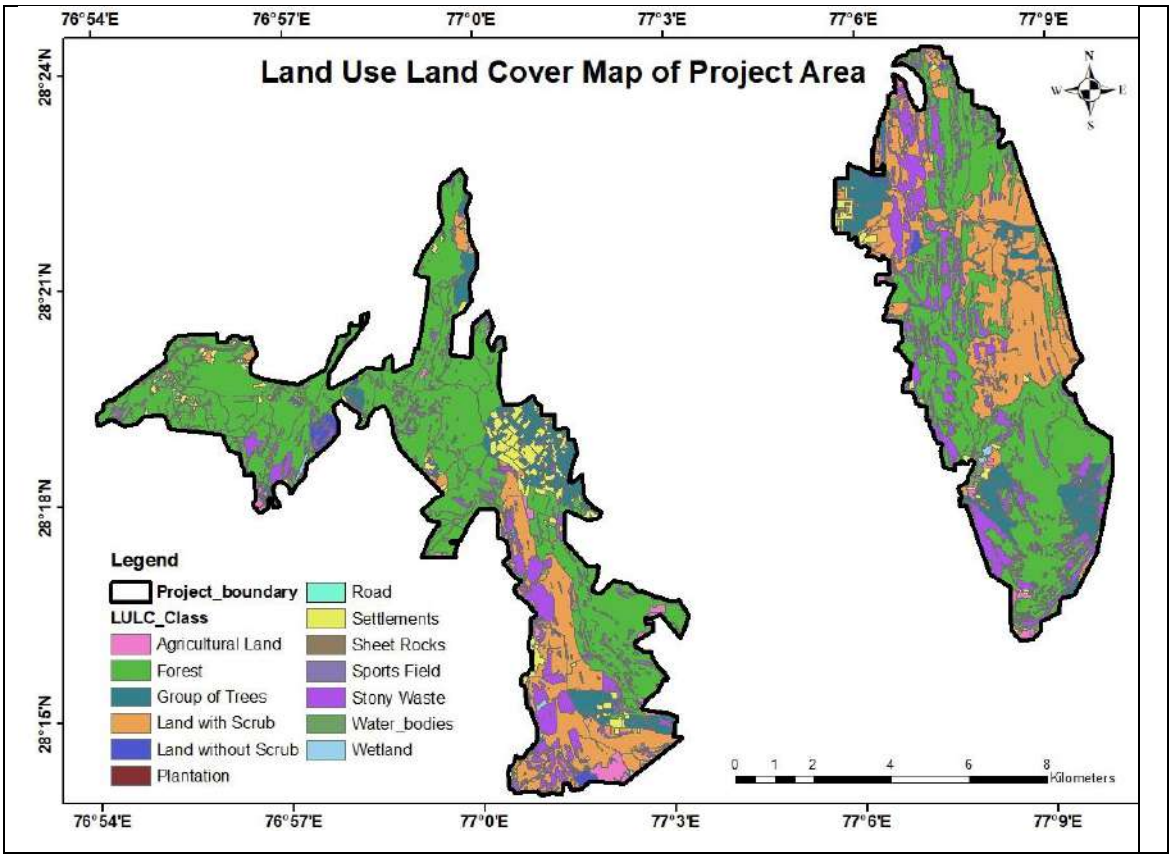


Figure (3.1): Project Area lulc Map

Table 3.1 LULC Classes for Project Area

SNo.	LULC Classes	Area(Ha.)
1	Agricultural Land	189
2	Forest	5411
3	Group of Trees	897
4	Land with Scrub	2276
5	Land without Scrub	102
6	Plantation	2
7	Road	111
8	Settlements	424
9	Sheet Rocks	2
10	Sports Field	7
11	Stony Waste	1420
12	Water_bodies	110
13	Wetland	27
Grand Total		10978

- **Digital Elevation Model (DEM):** The LiDAR survey generated a layer of DEM with a fine resolution of 0.3 m. This DEM was useful in calculating elevations of Earth's surface and generate other layers from it. This layer is useful and can be considered as the basis for other operations of delineating watersheds and drains for an area.

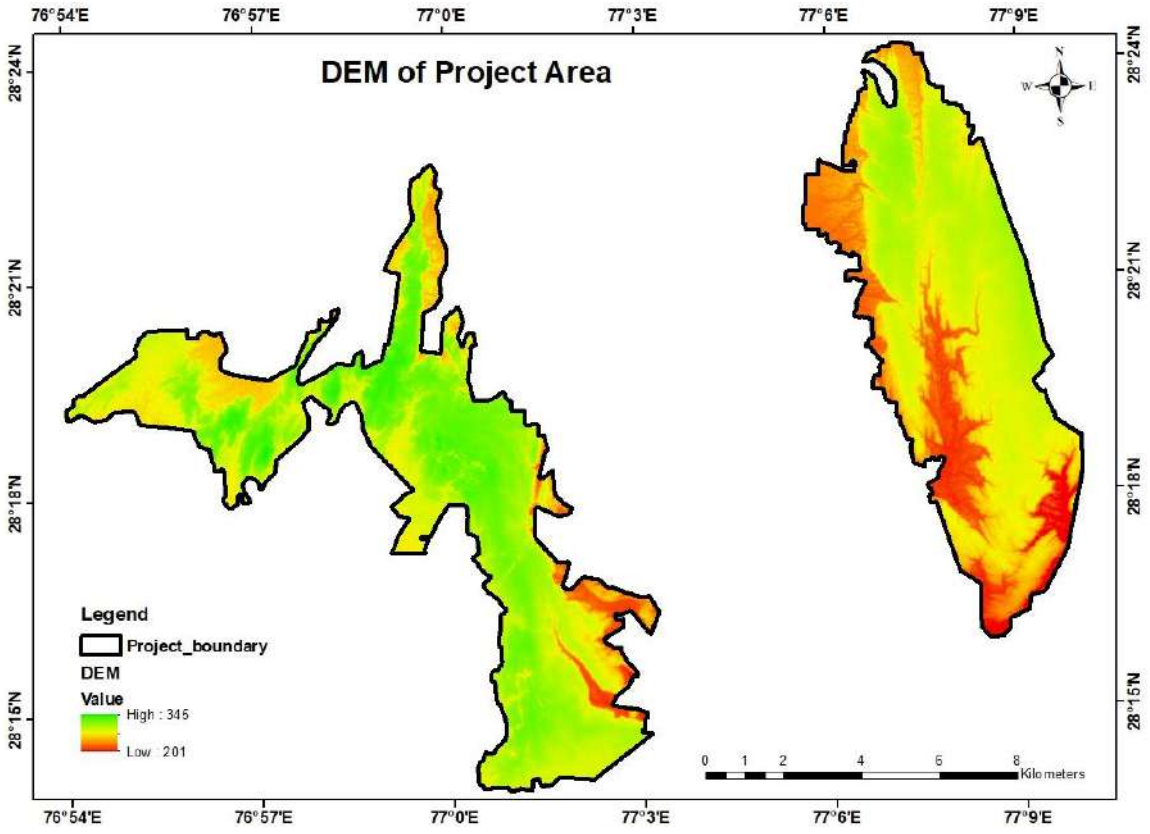


Figure (3.2): Project Area Digital Elevation Map

- **Slope layer:** Using the DEM, slope map is calculated by categorizing the slope in groups of different values of slopes. The slope categorization is done in the following categories--(a) 0-1% (b) 1-3% (c) 3-8% (d) 8-10% (e) >10%. This helps in selecting the area where certain structures can be constructed based on slope criterion.

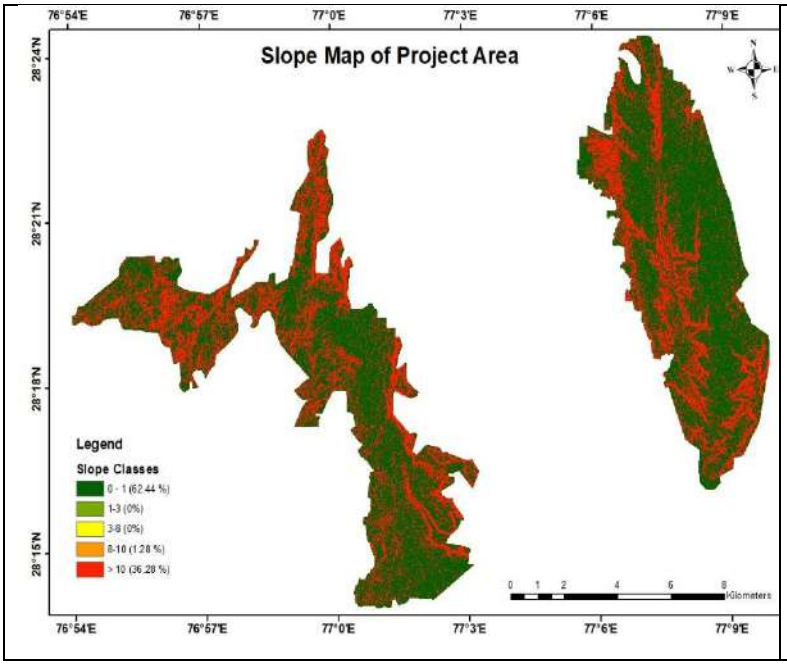


Table 3.2: Slope classes in project area

Slope	Area(ha)	% Area
0-1	6847	62
1-3	0	0
3-8	0	0
8=10	12	1
>10	4119	36
Total	10978	100

Figure (3.3): Project Area Slope Map

- **Drainage layer:** This was most important layer used in planning. The order of the stream, slope in the bed of drain, width and depth of drain are the most critical factors in deciding the location of structure and its type.

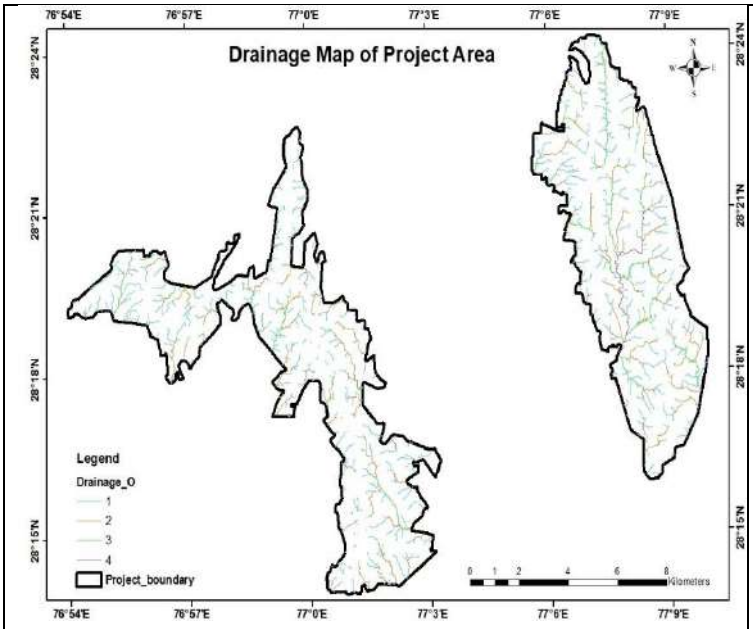


Table 3.3: length and count of stream orders

Classes	Length(m)
1	185703
2	88809
3	34434
4	7300
Grand Total	316246

Figure (3.4): Project Area Drainage Map

3.2 Criteria for planning of different structures

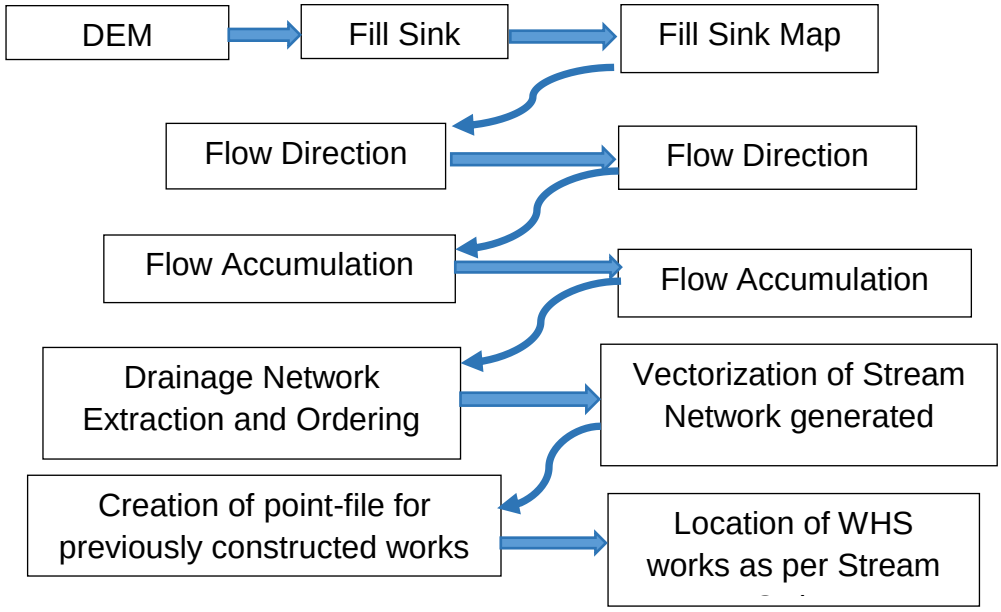
Methodology for planning the treatment works in the area has been adopted keeping in mind, the local conditions of the area, local practices and the objective of conserving as much moisture as possible. The selection of activities in the area are based on certain criteria which are influenced by the type of soil in the area, runoff, drainage pattern, order of stream, catchment area at identified site, vegetation cover, slope, geology, geomorphology, terrain conditions and local practices.

- The structures hence planned in the area have been proposed with an aim to generate maximum fetch length along the stream lines and maximum storage. It will further improve the moisture regime of the areas which will help in accelerated growth of trees and other plant varieties.
- In higher order drains and lower reaches where slope is less, Check Dams have been proposed to harvest runoff.
- In low density of forest areas, the water harvesting structures combined with catchment area treatment works like Contour trenches, staggered trenches have been proposed to increase moisture and reduce erosive velocity of runoff. Also, afforestation has been proposed in poor vegetation areas. However, **the type and species of plantations in these areas can be selected based on the local variety of trees or the necessity of the community living around the areas.**

3.3 Generating streams:

The different hydrological tools used in GIS for site identification of harvesting structures on different streams are mentioned in the flowchart given below:

Figure (3.4): Methodology for planning Soil moisture conservational and water harvesting activities



All the processes have been carried out using 30cm DEM (Digital Elevation Model).

Fill tool in the Hydrology toolbox is used to remove any imperfections (sinks) in the digital elevation model. The generated output is then used for further processes.

Flow direction grids have been created from the output generated from 'Fill' tool. It assigns a value to each cell to indicate the direction of flow – that is, the direction that water will flow from that particular cell based on the underlying topography of the landscape (elevation).

After flow direction, Flow accumulation is generated by using 'Flow Accumulation' tool which calculates the flow into each cell by identifying the upstream cells that flow into each downslope cell. In other words, each cell's flow accumulation value is determined by the number of upstream cells flowing into it based on landscape topography. Accumulation can be understood as a phase, wherein, the flow will not start unless a certain value is

reached.

After the raster for Flow accumulation, a stream network is generated by linking all the points where the value for accumulation crosses a certain threshold value. This threshold value for accumulation has been decided based on the objective and site conditions, to take into account the variation in soil, crop, and rainfall in these agroclimatic zones. A 'CON' tool for conditional statement is used to generate a raster stream network from flow accumulation. Streams are then ordered using Stream Order (either Shreve or Strahler) method of ordering. The final step is often to convert this stream ordered raster to a vector, which is simply performed using the stream to feature command.

3.4 Methodology for Inventory of existing water bodies

The pre-existing moisture conservational activities have been identified through Ortho-images captured in LiDAR survey. A point shape file of existing Water harvesting works was thus created, mentioning the type and condition of the structure.

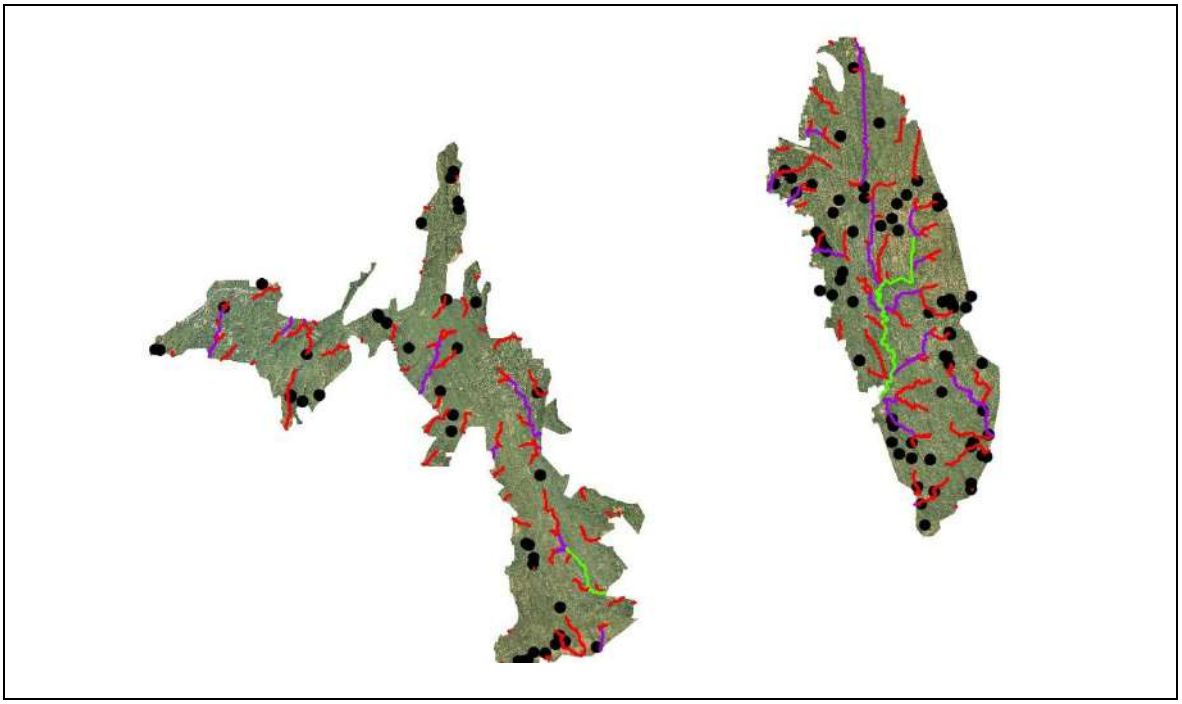


Fig 3.5:Map of Project Area showing Existing Structues

3.5 Methodology for site selection of proposed structures

3.5.1 Catchment area works like CCT and staggered trenches

These activities have been proposed in combinations, e.g. Afforestation along with Continuous Trenches (or Staggered Trenches). These activities help in the conservation of moisture by digging up trenches across the slope, which then helps in the growth of trees and other plant species. The forest density map and the slope map were superimposed and ortho images were used in identifying areas to be put under afforestation and catchment area works.

Afforestation- Model includes Catchment area works (CCT/SGT) and plantation of Forestry Saplings These works have been proposed with the objective of protecting land against erosion, restoration of degraded forest land to productive use, better soil and moisture conservation for improving productivity; reduce siltation in reservoirs and finally generation of employment opportunities.

i. **Staggered Trenches (SGT) -** On higher slopes of the catchment, a number of rows of trenches are dug in hilly areas having steeper slopes. Distance between two trenches is kept equal to half the length of a trench. Adjacent rows are staggered to reduce the maximum length of runoff for better retention. Trenches break the slope and reduce the velocity of surface runoff. It can be used in all slopes irrespective of rainfall conditions (i.e. in both high and low rainfall conditions), varying soil properties.

ii. **Continuous Contour Trenches (CCT) -** On lower slopes, CCTs are Trenches constructed on contours with breaks in between. These are both on hill slopes as well as on degraded and barren waste lands to prevent soil erosion and harvesting rainwater. It improves moisture status of soil and the flowing runoff over the slope is collected in the trenches, which gives more time for runoff to infiltrate. Eroded soils are trapped into contour trench and it also helps in breaking the kinetic energy of the runoff water. The soils trapped in the

trenches are found to be very fertile and can be used for area lower to the contour trenches. Because of more infiltration into the soil the lower portion of the area under the contour trenches gets enough water for the growth of vegetation

iii. **Deep CCT-** Constructed at the junction of Forest/non-arable and arable land on contours, the above trenches check the velocity of runoff as well as conserve in-situ moisture.

Fig 3.6:Staggered Trenches (SGT)

Fig 3.7: Continuous Contour Trenches (CCT)

Fig 3.8: Deep CCT

Pasture Development and Horticulture:

In agrarian economy, livestock plays an important role in augmenting income, employment and women empowerment. Apart from supporting agriculture operations, dairying is an important enterprise to supplement the rural economy. Silvi-pasture development has been proposed to create fuel wood and fodder resources in villages situated in and around the forest area to reduce pressure on forest lands. This activity will fulfil the fodder demand of locals around forest areas instead of meeting the demand from forest areas and to enhance the income of Gram panchayats by auctioning the usufructs. local communities can be involved in the choice of species to be planted.

The model consists of over seeding of grasses, energy plantation/social forestry / plantation of horticulture plants for community benefits in the identified patch. Sites have been identified and intervention deemed best suited are mentioned but as per demand of community or departmental norms the complete flexibility lies with the executing agency. Any of the prevailing models can be used but these have been modified and catchment area works have been incorporated in the models. Also, if horticulture is to be used, pest and nutrient management practices as per recommendations of the horticulture Department be followed.

Four models have been focused:

- Afforestation with poor vegetation cover in forest areas
- Enrichment model in scanty vegetation for Natural Regeneration for restocking of forests
- Silvi pastures and / Energy plantations in scrub lands near arable lands

The salient features are:

- Cost per unit hectare is mentioned against each site and has been arrived at by modifying state forest department models by including cost of

Catchment area treatment works like Continuous contour trench, Deep CCT, Staggered trenches and five-year maintenance cost.

- The Afforestation model has been proposed in forest areas with poor vegetation taking 1000 plants per ha. The model includes the cost plantation model plus maintenance cost up to five years and cost of CCT and Staggered and Deep CCT cost models.
- Enrichment model has been proposed in forest areas with sparse vegetation taking 200 plants per ha and the model includes the cost of plantation cost of enrichment model plus maintenance of it for five years and cost of staggered trenches
- Silvi Pasture & Horticulture has been proposed in open forest/scrub lands near agriculture fields using the model of low-lying pastures 200 plants and overseeding of grasses and RCC fencing the pasture and horticulture and horticulture practices.
- In Silvi Pasture & Horticulture models, Recommendations of State horticulture department for nutrient pest management can be followed
- Sites have been identified and intervention deemed best suited are mentioned but as per demand of community or departmental norms the complete flexibility lies with the executing agency.
- Species can be as per site suitability

3.5.2 Structures in streams

A point shapefile of existing Water harvesting works was created as mentioned in point 3.4. This point layer was superimposed on the shape file of contour, ortho-images and on streams. All these layers were used in identifying the most suitable site such that at minimum cost (length and height are less) maximum fetch length and storage (i.e. Moisture regime at longer length for better vegetative growth) is available.

Loose stone check dams: These structures have been proposed in lower order drains to reduce the velocity of runoff and where stone is locally available

Fig 3.9: Loose Stone Check Dam

Mini Percolation Tanks/ percolation Tanks: The earthen embankments constructed in drains with a surplus arrangement. These structures not only harvest water, but also reduce the velocity of runoff water and thus prevent expansion of drains. The structures with less catchment area (Less than less than 10 hectares are MPT and those with catchment (greater than 10 hectare) have been termed as percolation tanks otherwise there is no difference in construction or type. Besides catchment length of structure and fetch length is also deciding factor in type of structure

Figure (3.10): Mini-Percolation Tanks with waste weir

Check Dams: Have been proposed in higher-order drains where runoff is high and the slope is less than 3% and soil depth seems shallow i.e., unavailability of sufficient soil or soil that cannot be compacted and due to which the Earthen check dam cannot be constructed. The site is such that maximum fetch length can be obtained.

Figure 3.11-Check Dams

Gabions have been proposed to reduce the velocity of runoff with high slope and where soil depth seemed shallow i.e., unavailability of sufficient soil or soil that cannot be compacted and due to which the Earthen check dam cannot be constructed or accessibility of machinery seemed difficult or drain is narrow catchment is more. The site is such that maximum fetch length can be obtained.

Fig 3.12:Gabions

Pond

Rainwater harvesting has been proposed through ponds which are constructed by excavation where flow accumulation is observed to store runoff water

Fig 3.13:Sunken Pond

For each proposed structures calculation of catchment area of structure, weir height total height,fetch length , submergence area and storage capacity of structure was calculated

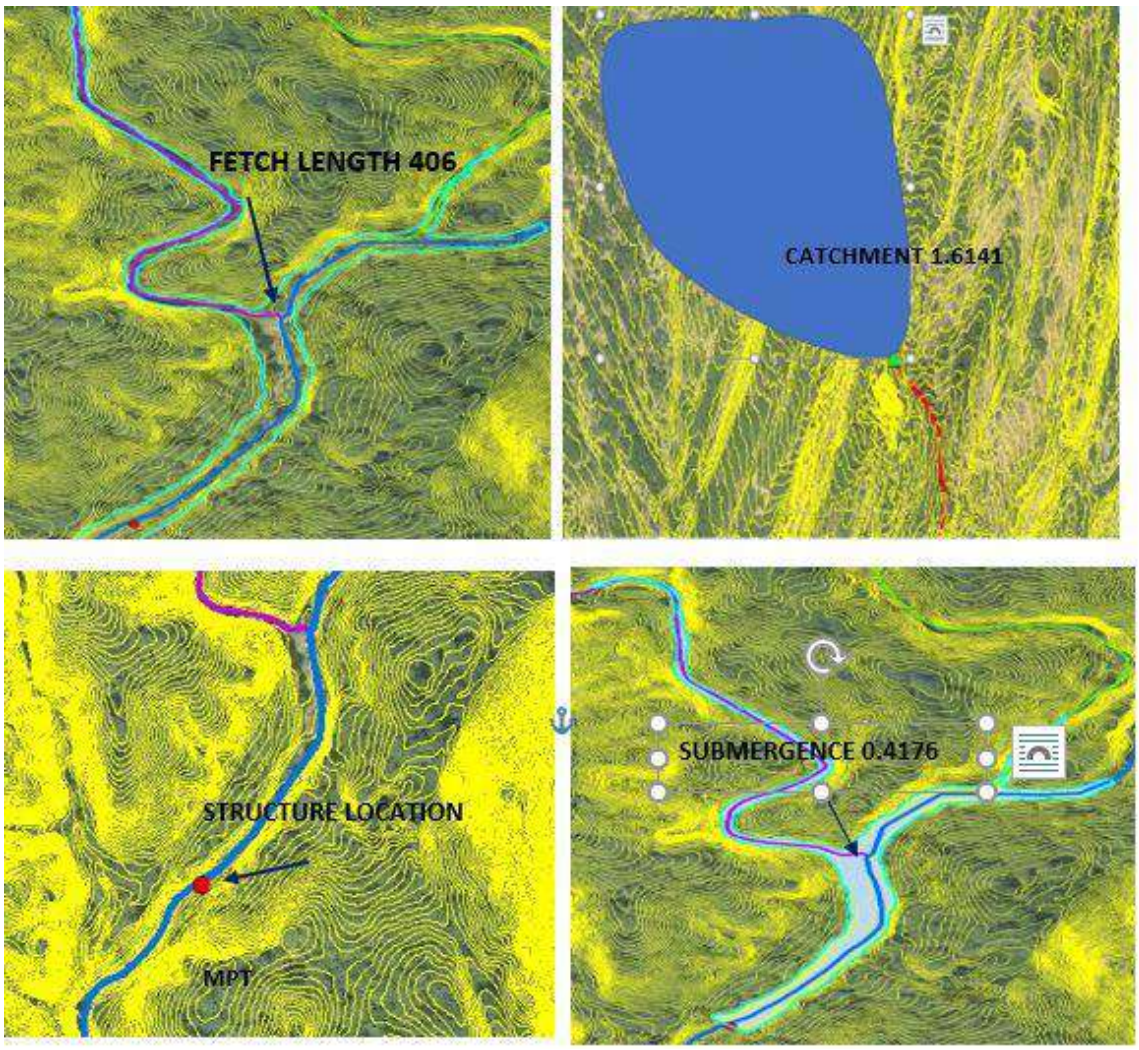


Fig 3.14: Different Hydrological Calculations for identified Structures

3.5.3 Cost and Estimation

The SOR 2017 provided by forest department and BSR of PWD 2021 has been used in estimation. **The abstract of cost is at chapter V** and the design of structures and the model estimates have been given in the **chapter VI.**

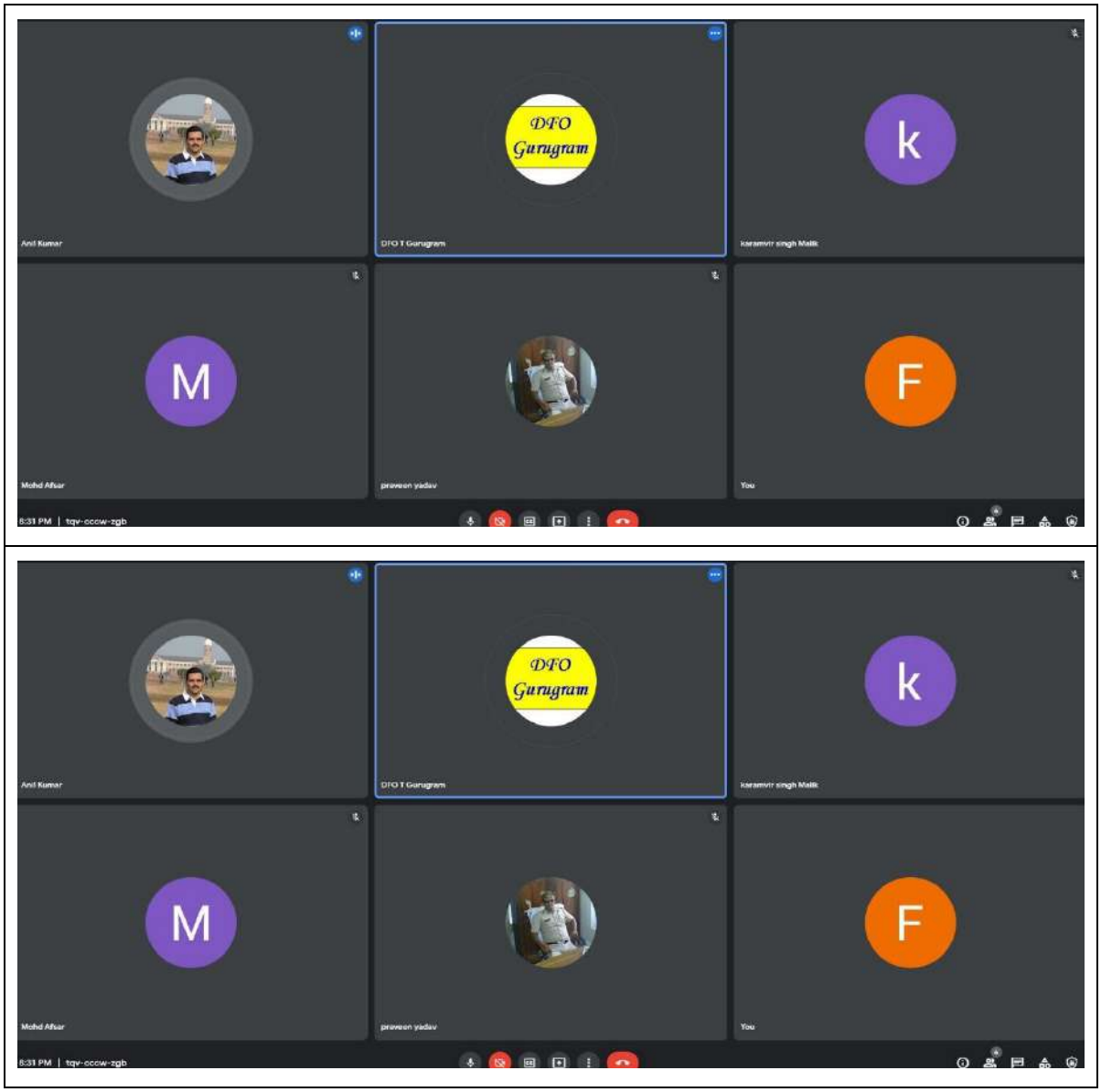
Dimensions of the structure may vary on the site with even slight change in the proposed location, hence these must be taken as per the site condition during execution. The cost of the structure is based on models and items proposed in

the models and therefore will change with change in model, its items and BSR. Also, as per site condition some structure type may change at some places like mini percolation tank can be percolation tank

3.6 Field Verification of the proposed activities

After the delineation of various hydrological layers for the area and proposing various structures based on the criteria mentioned above, the planned works are then sent on to the field practitioners for verification. A technical expert was sent to the field for verification along with the local forest officials to assess the feasibility, structural stability and utility of the proposed structure. Photographic and geographic attributes of the location were also captured in order to facilitate the discussions on those marked points. The DPR verification process was concluded with a video conference of the WAPCOS central expert team with the district forest officers where a threadbare discussion on all queries and feedback on sites identified was done and everyone coming on to the same page

Certain examples and photos have been given below, clearly depicting the site conditions and geographic location of the area.


DFO Gurugram
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DFO T Gurugram
karamvir singh Malik
M
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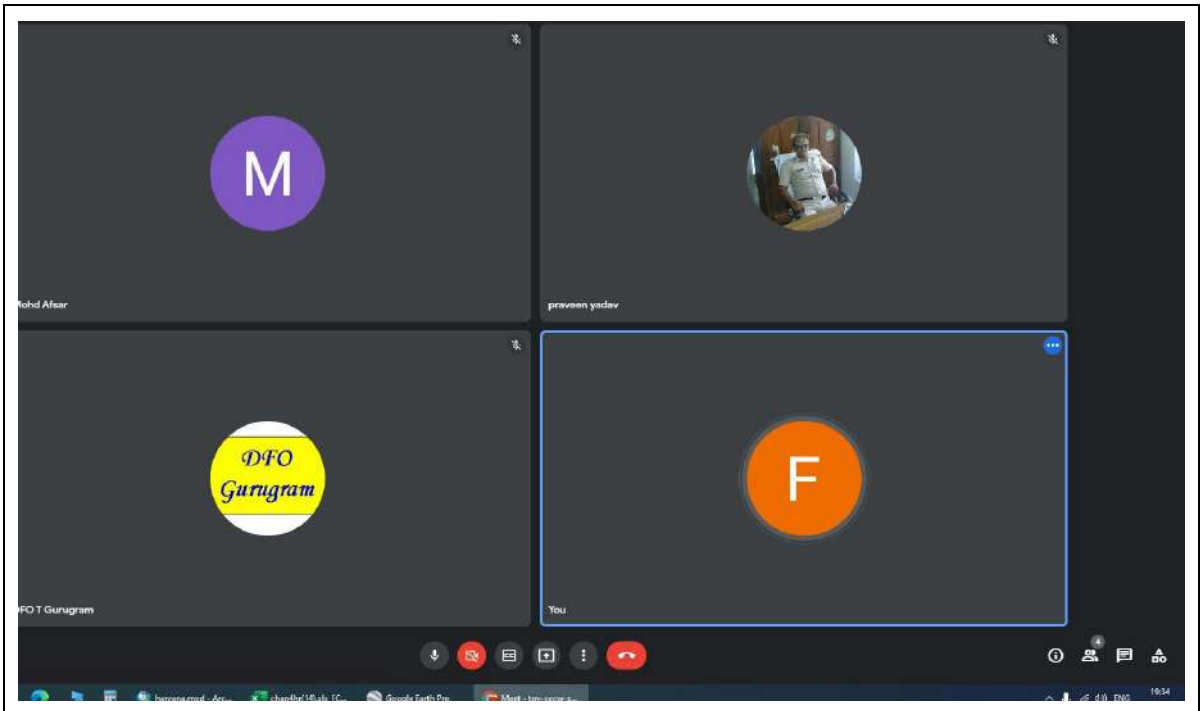
F
You
8:31 PM | tqv-occw-zgb


M
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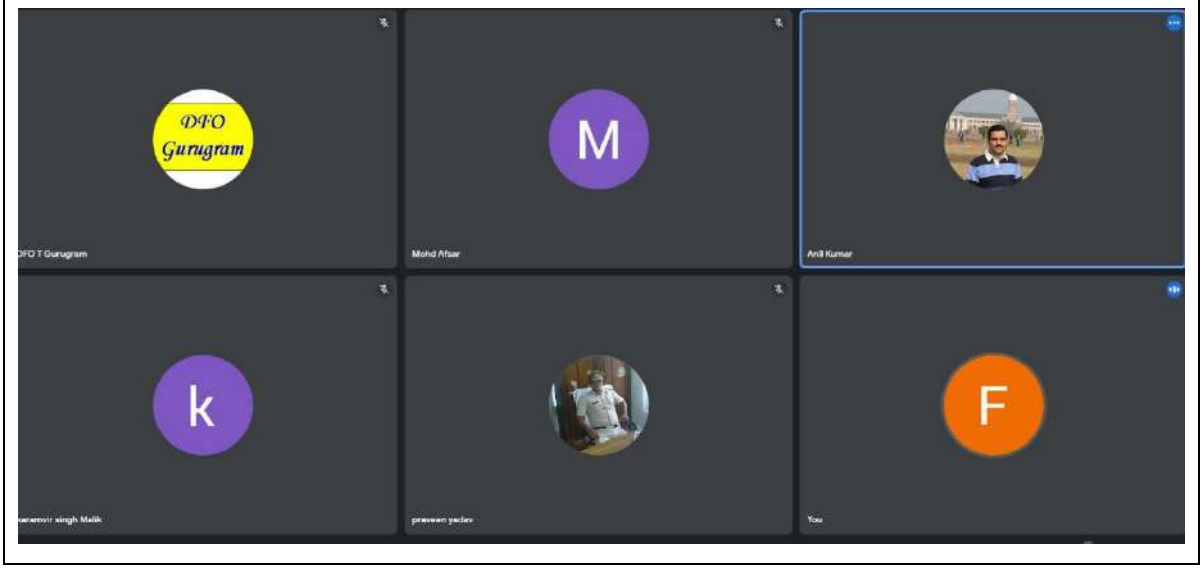
DFO Gurugram
F
You


DFO Gurugram
M
Mohd Afsar
Anil Kumar
k
F
praveen yadav
You


Latitude: 28°23' 42" N
Longitude: 77° 7' 27" E
Elevation: 245.04±6 m
Accuracy: 15.0 m
Azimuth: 222° (SW)
Pitch: -8.9° (-16°)
Time: 12-14-2021 15:20
Note: fd hr 166 mpt ok


Latitude: 28.329892
Longitude: 76.921485
Elevation: 277.75±4 m
Accuracy: 3.0 m
Time: 12-15-2021 12:42
Note: for hr 195mpt ok


Latitude: 28.328849
Longitude: 76.921167
Elevation: 267.35±4 m
Accuracy: 1.8 m
Time: 12-15-2021 12:55


Latitude: 28.332592
Longitude: 76.933472
Elevation: 275.7±4 m
Accuracy: 2.2 m
Time: 12-15-2021 11:30
Note: for hr 185mpt ok


Latitude: 28.399438
Longitude: 77.124298
Elevation: 250.33±12 m
Accuracy: 21.5 m
Azimuth: 345° (N)
Pitch: -5.9° (1.0°)
Time: 12-14-2021 14:14
Note: WID HR 1 MPT OK


Latitude: 28.399576
Longitude: 77.124393
Elevation: 249.72±32 m
Accuracy: 29.9 m
Azimuth: 127° (SE)
Pitch: -0.6°
Time: 12-14-2021 14:19


Latitude: 28°23' 34" N
Longitude: 77° 7' 30" E
Elevation: 239.42±8 m
Accuracy: 9.4 m
Azimuth: 140° (SE)
Pitch: 1.1° (-3.5°)
Time: 12-14-2021 15:06


Latitude: 28°23' 30" N
Longitude: 77° 7' 29" E
Elevation: 255.54±12 m
Accuracy: 12.2 m
Azimuth: 25° (NE)
Pitch: -8.2°
Time: 12-14-2021 15:10


Latitude: 28°22' 51" N
Longitude: 77°8' 15" E
Elevation: 266.55±8 m
Accuracy: 17.1 m
Azimuth: 234° (SW)
Pitch: -13.0° (3.7°)
Time: 12-15-2021 12:58


Latitude: 28.329888
Longitude: 76.921227
Elevation: 276.95±4 m
Accuracy: 3.1 m
Time: 12-15-2021 12:50


Latitude: 28.330331
Longitude: 76.922314
Elevation: 272.25±4 m
Accuracy: 3.0 m
Time: 12-15-2021 13:08


Latitude: 28.379174
Longitude: 77.140843
Elevation: 252.19±96 m
Accuracy: 14.5 m
Azimuth: 149° (SE)
Pitch: -7.6° (3.3°)
Time: 12-15-2021 13:15


Latitude: 28.386429
Longitude: 77.124473
Elevation: 271.75±48 m
Accuracy: 54.2 m
Azimuth: 191° (S)
Pitch: 8.0° (2.8°)
Time: 12-15-2021 11:31


Latitude: 28.379103
Longitude: 77.141016
Elevation: 257.23±64 m
Accuracy: 18.4 m
Azimuth: 225° (SW)
Pitch: -7.6°


Latitude: 28.338125
Longitude: 76.931937
Elevation: 262.55±12 m
Accuracy: 13.1 m
Azimuth: 280° (W)
Pitch: -13.6° (1.4°)
Time: 15-12-2021 15:00


Latitude: 28.386627
Longitude: 77.125116
Elevation: 331.22±96 m
Accuracy: 32.4 m
Azimuth: 224° (SW)
Pitch: -7.9° (4.0°)
Time: 12-15-2021 11:29


Latitude: 28°20'0"
Longitude: 76°59'35"
Elevation: 201.44±96 m
Accuracy: 113.2 m
Azimuth: 97° (E)
Pitch: -8.7° (1.3°)


Latitude: 28.386175
Longitude: 77.124557
Elevation: 270.06±48 m
Accuracy: 28.5 m
Azimuth: 196° (S)
Pitch: -2.3° (0.3°)
Time: 12-15-2021 11:22


Latitude: 28.386952
Longitude: 77.124522
Elevation: 249.83±32 m
Accuracy: 28.0 m
Azimuth: 165° (S)
Pitch: -4.6° (0.8°)
Time: 12-15-2021 11:33


Latitude: 28.252441
Longitude: 77.03627
Elevation: 222.14±5 m
Accuracy: 9.5 m
Time: 12-16-2021 16:09


Latitude: 28.251568
Longitude: 77.038516
Elevation: 246.19 m
Accuracy: 5.9 m
Time: 12-16-2021 16:38


Latitude: 28°20'55"
Longitude: 76°59'50"
Elevation: 254.68±32 m
Accuracy: 124.2 m
Azimuth: 280° (W)
Pitch: -2.9° (2.9°)


Latitude: 28°19'19"
Longitude: 77°0'56"
Elevation: 298.47±24 m
Accuracy: 28.9 m
Azimuth: 122° (SE)
Pitch: 2.9°


Latitude: 28°20'49"
Longitude: 76°59'44"
Elevation: 242.39±12 m
Accuracy: 26.4 m
Azimuth: 306° (NW)
Pitch: 0.1° (-0.7°)


Latitude: 28.257245
Longitude: 77.035535
Elevation: 212.68±5 m
Accuracy: 5.2 m
Time: 12-16-2021 15:52


Latitude: 28.256857
Longitude: 76.957019
Elevation: 268.6±12 m
Accuracy: 20.5 m
Time: 17-12-2021 16:50


Latitude: 28.306703
Longitude: 77.153229
Elevation: 284.76±8 m
Accuracy: 30.2 m
Azimuth: 173° (S)
Pitch: 14.9° (5.8°)
Time: 12-17-2021 14:33


Latitude: 28.314686
Longitude: 76.969269
Elevation: 294.03±16 m
Accuracy: 12.3 m
Time: 17-12-2021 16:21


Latitude: 28.319758
Longitude: 76.956014
Elevation: 276.85±12 m
Accuracy: 5.4 m
Time: 17-12-2021 12:23


Latitude: 28.320438
Longitude: 76.955449
Elevation: 272.1±8 m
Accuracy: 5.1 m
Time: 17-12-2021 12:16


Latitude: 28.251572
Longitude: 77.040716
Elevation: 206.9±3 m
Accuracy: 3.6 m
Time: 12-16-2021 15:38

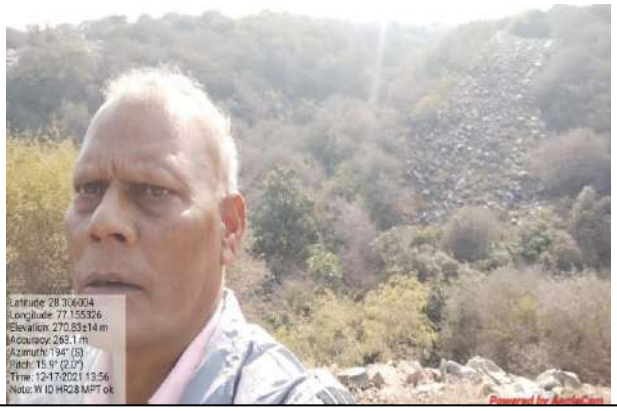

Latitude: 28.253564
Longitude: 77.040711
Elevation: 210.06±6 m
Accuracy: 17.7 m
Time: 12-16-2021 15:40


Latitude: 28.306256
Longitude: 77.154338
Elevation: 279.84±9 m
Accuracy: 7.5 m
Azimuth: 206° (SW)
Pitch: 5.5° (3.0°)
Time: 12-17-2021 14:21
Note: W ID HR26 MPT ok


Latitude: 28.314695
Longitude: 76.987241
Elevation: 260.54±12 m
Accuracy: 13.3 m
Time: 18-12-2021 13:05
Note: W ID HR225 MPT OK


Latitude: 28.306988
Longitude: 77.15272
Elevation: 276.98±8 m
Accuracy: 7.7 m
Azimuth: 193° (S)
Pitch: 7.6° (0.8°)
Time: 12-17-2021 14:40
Note: W ID HR24MPT ok


Latitude: 28.318759
Longitude: 76.989936
Elevation: 260.76±16 m
Accuracy: 7.5 m
Time: 18-12-2021 12:26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Accuracy: 268.1 m
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Time: 12-17-2021 13:56
Note: W ID HR28 MPT ok


Latitude: 28.307331
Longitude: 77.153384
Elevation: 276.48±6 m
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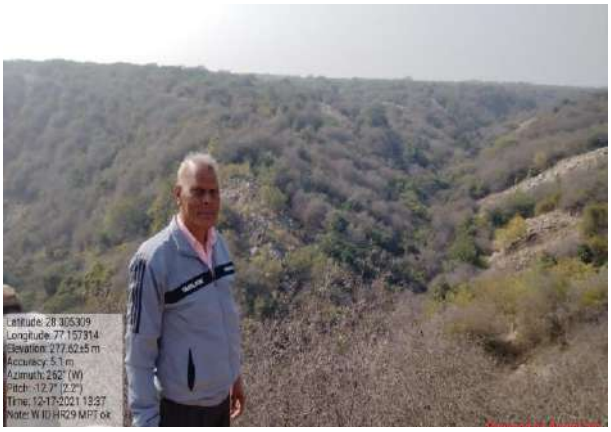
Note: W ID HR23MPT ok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Elevation: 277.62±5 m
Accuracy: 5.1 m
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Time: 12-17-2021 13:37
Note: W ID HR29 MPT ok


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Longitude: 77.154826
Altitude: 225.9±11 m
Accuracy: 598.1 m
Azimuth: 159° (S)
Pitch: 10.4° (1.8°)
Time: 12-17-2021 14:11
Note: W ID HR27 MPT ok


Latitude: 28.312417
Longitude: 76.986638
Elevation: 259.31±16 m
Accuracy: 10.3 m
Time: 18-12-2021 14:19
Note: WID HR 225 MPT OK
Powered by NoteCam


Latitude: 28.314347
Longitude: 76.987777
Elevation: 303.88±16 m
Accuracy: 12.6 m
Time: 18-12-2021 13:19
Note: WID HR 224 MPT OK


Latitude: 28.312135
Longitude: 76.986309
Elevation: 267.06±24 m
Accuracy: 11.9 m
Time: 18-12-2021 14:26
Note: WID HR 230 MPT OK


Latitude: 28.312807
Longitude: 76.985703
Elevation: 277.61±9 m
Accuracy: 9.4 m
Time: 18-12-2021 14:32


Latitude: 28.308128
Longitude: 77.151756
Elevation: 282.1±5 m
Accuracy: 4.5 m
Azimuth: 233° (SW)
Pitch: -14.5° (L 5°)
Time: 12-17 2021 14:50
Note: WID HR22MPT ok


Latitude: 28.312403
Longitude: 76.986631
Elevation: 258.56±24 m
Accuracy: 31.5 m
Time: 18-12-2021 14:57


Latitude: 28.314922
Longitude: 76.988645
Elevation: 275.14±12 m
Accuracy: 11.2 m
Time: 18-12-2021 13:47
Note: WID HR 223 MPT OK


Latitude: 28.314497
Longitude: 76.989021
Elevation: 281.32±5 m
Accuracy: 7.1 m
Time: 18-12-2021 13:30
Note: WID HR 233 MPT OK


Latitude: 28.313936
Longitude: 76.980111
Elevation: 273.13±6 m
Accuracy: 6.6 m
Time: 18-12-2021 15:30
Note: WID HR 234 MPT OK
Powered by NoteCam


Latitude: 28.298283
Longitude: 76.997046
Elevation: 276.47±12 m
Accuracy: 7.6 m
Time: 18-12-2021 17:10
Powered by NoteCam


Latitude: 28.293569
Longitude: 76.992571
Elevation: 264.66±8 m
Accuracy: 14.9 m
Time: 18-12-2021 16:49


Latitude: 28.297931
Longitude: 76.993533
Elevation: 281.83±8 m
Accuracy: 8.2 m
Time: 18-12-2021 17:00
Note: WID HR 242 MPT OK
Powered by NoteCam


Latitude: 28.311926
Longitude: 76.985094
Elevation: 280.94±12 m
Accuracy: 10.0 m
Time: 18-12-2021 14:50
Note: WID HR 231 MPT OK
Powered by NoteCam


Latitude: 28.300657
Longitude: 76.998853
Elevation: 269.12±12 m
Accuracy: 10.3 m
Time: 18-12-2021 17:16
Powered by NoteCam


Latitude: 28.313262
Longitude: 76.985713
Elevation: 269.36±16 m
Accuracy: 6.7 m
Time: 18-12-2021 14:57


Latitude: 28.322845
Longitude: 76.975783
Elevation: 269.22±16 m
Accuracy: 10.4 m
Time: 18-12-2021 15:16


Latitude: 28.325149
Longitude: 76.959701
Elevation: 297.66±6 m
Accuracy: 11.4 m
Time: 19-12-2021 13:23
Note: WID HR 292 Sunken pond OK


Latitude: 28.324108
Longitude: 76.954566
Elevation: 290.79±6 m
Accuracy: 6.8 m
Time: 20-12-2021 12:58
Note: WID HR 215 MPT NOT OK Check Dam OK


Latitude: 28.316374
Longitude: 76.99309
Elevation: 321.87±12 m
Accuracy: 5.2 m
Time: 20-12-2021 12:24
Note: WID HR 232 MPT NOT OK Check Dam OK


Latitude: 28.308537
Longitude: 76.940556
Elevation: 287.18±8 m
Accuracy: 7.5 m
Time: 19-12-2021 14:42


Latitude: 28.307846
Longitude: 76.943799
Elevation: 273.2±6 m
Accuracy: 11.3 m
Time: 19-12-2021 14:20
Note: WID HR 209 MPT OK


Latitude: 28.308955
Longitude: 76.943614
Elevation: 277.01±12 m
Accuracy: 8.1 m
Time: 19-12-2021 14:29


Latitude: 28.29464
Longitude: 76.98967
Elevation: 274.69±16 m
Accuracy: 9.5 m
Time: 19-12-2021 16:38


Latitude: 28.286144
Longitude: 76.99148
Elevation: 263.23±8 m
Accuracy: 5.6 m
Time: 19-12-2021 16:37


Latitude 28.321918
Longitude 77.015375
Elevation 306.54±3 m
Accuracy 26.9 m
Time 12-21-2021 09:57


Latitude 28.285479
Longitude 77.00885
Elevation 305.16±24 m
Accuracy 11.9 m


Latitude 28.300612
Longitude 77.01873
Elevation 303.85±7 m
Accuracy 4.3 m


Latitude 28.292753
Longitude 77.018533
Elevation 293.16±3 m
Accuracy 5.1 m
Time 12-21-2021 11:56


Latitude 28.285387
Longitude 77.020125
Elevation 298.94±3 m
Accuracy 3.8 m
Time 12-21-2021 11:29


Latitude 28.292911
Longitude 77.018755
Elevation 298.94±3 m
Accuracy 3.8 m


Dec 21, 2021 10:38:56 AM
28.300672228N 77.020942585E
14° N
Hariahera
Gurgaon
Haryana
Altitude 249 y m
Speed 0.0km/h

Chapter IV

List of Proposed Structure

Brief details of Water Harvesting Structures

Dimensions of the structure may vary on the site with even slight change in the proposed location, Hence these must be taken as per the site condition during execution. The cost of the structure is based on models and items proposed in the models and therefore will change with change in model, its items and SOR 2021-22 of PWD .

S.No	Structure Name	Impounding height (weir height) (FTL) (meter)	Total Height of structure (TBL)	Latitude	Longitude	Length	Fetch Length (m)	Catchment Area (Ha)	Submergence Area (m^2)	Annual Runoff (mm)	Soil Erosion (t/ha/year)	Storage Capacity (TCM)	Cost (in Rs#)
1	LSCD	1.20	1.95	28.282151	77.137223	8	NA	3	NA	258	47	NA	13008
2	LSCD	1.20	1.95	28.339572	77.139625	14	NA	1	NA	429	7	NA	22764
3	GABION	1.20	1.95	28.349019	77.140063	19	NA	137	NA	415	11	NA	172273
4	LSCD	1.20	1.95	28.344159	77.139267	15	NA	1	NA	416	24	NA	24390
5	LSCD	1.20	1.95	28.336743	77.136093	14	NA	1	NA	252	7	NA	22764
6	LSCD	1.20	1.95	28.336570	77.134752	12	NA	2	NA	429	10	NA	19512
7	GABION	1.20	1.95	28.322295	76.918417	8	NA	19	NA	25	23	NA	72536
8	GABION	1.50	2.25	28.323566	76.940012	9	NA	28	NA	19	29	NA	81603
9	LSCD	1.20	1.95	28.391224	77.110892	11	NA	5	NA	489	33	NA	17886
10	LSCD	1.20	1.95	28.390590	77.110180	8	NA	0	NA	232	13	NA	13008
11	LSCD	1.20	1.95	28.332331	76.923725	11	NA	0	NA	56	13	NA	17886
12	LSCD	1.20	1.95	28.267731	77.026247	10	NA	1	NA	229	9	NA	16260
13	LSCD	1.20	1.95	28.323155	76.997997	16	NA	5	NA	288	17	NA	26016
14	LSCD	1.20	1.95	28.313772	76.985681	11	NA	0	NA	276	18	NA	17886
15	LSCD	1.20	1.95	28.313586	76.985664	10	NA	0	NA	12	32	NA	16260
16	LSCD	1.20	1.95	28.316328	76.980804	10	NA	1	NA	39	12	NA	16260
17	LSCD	1.20	1.95	28.323321	76.914483	12	NA	0	NA	277	45	NA	19512
18	LSCD	1.20	1.95	28.307263	76.941250	11	NA	0	NA	277	9	NA	17886
19	LSCD	1.20	1.95	28.306919	76.941562	11	NA	0	NA	12	46	NA	17886
20	ECD	1.20	1.95	28.289354	76.986973	11	19	0	11.89	12	8	0.035	3520
21	ECD	1.20	1.95	28.289017	76.986382	15	23	0	14.86	124	9	0.102	4800
22	Check Dam	1.80	2.55	28.399545	77.124141	41	1373	348	18535	340	10	67.178	2754298
23	MPT	1.20	1.95	28.281057	77.148581	14	107	24	925	24	20	3.344	22568
24	GABION	1.20	1.95	28.280471	77.148161	13	NA	25	NA	45	51	NA	117871
25	GABION	1.20	1.95	28.279939	77.147592	13	NA	27	NA	124	13	NA	117871
26	Check Dam	2.10	2.85	28.275466	77.142540	31	1012	80	23875	85	7	67.178	2082518
27	Check Dam	2.10	2.85	28.282226	77.138304	14	125	21	2028	121	18	67.178	940492
28	GABION	1.20	1.95	28.281855	77.137945	13	NA	4	NA	129	9	NA	117871
29	GABION	1.20	1.95	28.285365	77.145366	23	NA	2	NA	19	3	NA	208541
30	Check Dam	2.40	3.15	28.286102	77.151773	24	224	46	3027	41	9	25.670	1612272
31	MPT	1.80	2.55	28.287806	77.153121	29	145	0	395	12	5	0.117	46748
32	Check Dam	2.10	2.85	28.289556	77.155556	33	894	80	12727	115	4	67.178	2216874
33	GABION	2.10	2.85	28.307975	77.151669	10	NA	75	NA	237	5	NA	90670
34	PT	2.10	2.85	28.307024	77.152239	14	109	80	202	233	4	0.034	39634
35	PT	2.10	2.85	28.305971	77.154236	18	68	96	366	238	7	2.320	50958
36	MPT	2.10	2.85	28.305649	77.154796	18	65	1	142	292	21	0.092	29016
37	PT	2.10	2.85	28.305489	77.155547	18	152	111	880	236	10	6.391	50958
38	MPT	1.50	2.25	28.296601	77.161479	24	190	19	4733	143	20	1.612	38688
39	Check Dam	1.20	1.95	28.301307	77.160928	16	620	282	5546	235	29	67.178	1074848
40	MPT	1.50	2.25	28.294887	77.154771	26	122	5	1496	116	7	12.706	41912
41	Check Dam	2.10	2.85	28.293598	77.155133	14	307	67	2594	179	14	18.245	940492
42	MPT	2.10	2.85	28.293160	77.143724	26	61	7	132	41	28	0.373	41912
43	PT	1.20	1.95	28.320882	77.145811	28	113	66	251	229	27	0.045	79268
44	MPT	1.20	1.95	28.320397	77.148920	43	360	17	11451	239	17	1.612	69316
45	MPT	1.20	1.95	28.319858	77.148441	57	319	21	12687	235	7	1.612	91884
46	GABION	1.20	1.95	28.321171	77.142816	12	NA	123	NA	267	34	NA	108804
47	PT	1.20	1.95	28.320190	77.142756	11	118	126	632	258	6	2.814	31141
48	GABION	1.20	1.95	28.319682	77.142599	12	NA	128	NA	241	8	NA	108804
49	GABION	1.20	1.95	28.317302	77.142037	8	NA	138	NA	231	17	NA	72536
50	GABION	1.20	1.95	28.316904	77.142126	8	NA	140	NA	244	14	NA	72536
51	GABION	1.20	1.95	28.316388	77.142305	10	NA	140	NA	288	21	NA	90670
52	MPT	1.50	2.25	28.315463	77.136201	21	132	12	2577	228	13	11.953	33852
53	GABION	1.20	1.95	28.326707	77.134493	11	NA	63	NA	434	11	NA	99737
54	pt	1.20	1.95	28.327028	77.134108	15	53	63	406	458	7	1.297	42465
55	GABION	1.20	1.95	28.327376	77.133276	8	NA	65	NA	441	18	NA	72536
56	PT	1.20	1.95	28.332515	77.138763	18	56	150	298	427	32	1.063	50958
57	GABION	1.20	1.95	28.332612	77.136683	11	NA	160	NA	431	3	NA	99737
58	GABION	1.20	1.95	28.332015	77.134722	22	NA	168	NA	434	3	NA	199474
59	GABION	1.20	1.95	28.329322	77.133537	21	NA	177	NA	461	5	NA	190407
60	GABION	1.20	1.95	28.328666	77.133394	8	NA	189	NA	437	4	NA	72536
61	PT	1.20	1.95	28.327725	77.132510	11	105	68	740	280	5	4.684	31141
62	GABION	1.20	1.95	28.350546	77.139295	11	NA	130	NA	423	14	NA	99737
63	GABION	1.20	1.95	28.345381	77.139443	22	NA	248	NA	387	7	NA	199474
64	GABION	1.20	1.95	28.343686	77.138992	12	NA	275	NA	115	34	NA	108804
65	GABION	1.20	1.95	28.343071	77.138958	19	NA	278	NA	410	32	NA	172273
66	GABION	1.20	1.95	28.342214	77.138961	9	NA	280	NA	392	8	NA	81603
67	GABION	1.20	1.95	28.341724	77.138834	11	NA	282	NA	310	16	NA	99737
68	GABION	1.20	1.95	28.340852	77.138807	9	NA	284	NA	403	19	NA	81603
69	GABION	1.20	1.95	28.340026	77.138838	10	NA	299	NA	393	17	NA	90670
70	GABION	1.20	1.95	28.339533	77.138791	9	NA	369	NA	399	17	NA	81603
71	GABION	1.20	1.95	28.338431	77.138883	11	NA	372	NA	364	17	NA	99737
72	GABION	1.20	1.95	28.338012	77.138935	9	NA	381	NA	420	7	NA	81603
73	GABION	1.20	1.95	28.337245	77.139073	10	NA	383	NA	316	33	NA	90670
74	GABION	1.20	1.95	28.336538	77.139117	14	NA	384	NA	294	41	NA	126938
75	GABION	1.20	1.95	28.335609	77.138171	10	NA	394	NA	424	13	NA	90670

76	GABION	1.20	1.95	28.336150	77.137185	14	NA	398	NA	389	27	NA	126938
77	GABION	1.20	1.95	28.336424	77.136679	14	NA	399	NA	365	17	NA	126938
78	GABION	1.20	1.95	28.336140	77.133775	16	NA	421	NA	355	24	NA	145072
79	GABION	1.20	1.95	28.335726	77.132850	22	NA	424	NA	395	34	NA	199474
80	PT	1.50	2.25	28.363011	77.129789	38	778	66	11183	422	32	15.143	107578
81	PT	2.10	2.85	28.359553	77.127280	17	120	108	1118	373	6	4.158	48127
82	Check Dam	1.20	1.95	28.358124	77.127044	19	138	203	2931	352	16	67.178	1276382
83	GABION	1.20	1.95	28.357669	77.126953	13	NA	218	NA	355	11	NA	117871
84	GABION	1.20	1.95	28.357355	77.126985	8	NA	220	NA	331	19	NA	72536
85	GABION	1.20	1.95	28.356716	77.127119	10	NA	221	NA	242	0	NA	90670
86	GABION	1.20	1.95	28.355900	77.127184	16	NA	224	NA	320	17	NA	145072
87	GABION	1.20	1.95	28.355478	77.126787	11	NA	227	NA	300	17	NA	99737
88	GABION	1.20	1.95	28.354315	77.127250	15	NA	230	NA	306	12	NA	136005
89	GABION	1.20	1.95	28.353478	77.127171	14	NA	276	NA	348	12	NA	126938
90	GABION	1.20	1.95	28.353114	77.126851	18	NA	278	NA	378	12	NA	163206
91	GABION	1.20	1.95	28.349224	77.126693	16	NA	321	NA	327	14	NA	145072
92	GABION	1.20	1.95	28.348585	77.126695	20	NA	323	NA	481	7	NA	181340
93	GABION	1.20	1.95	28.348052	77.126566	16	NA	326	NA	368	22	NA	145072
94	GABION	1.20	1.95	28.342739	77.125719	15	NA	375	NA	361	23	NA	136005
95	Check Dam	2.10	2.85	28.336352	77.127767	18	437	396	3692	286	20	67.178	1209204
96	PT	1.80	2.55	28.367651	77.124798	26	384	36	5140	261	8	2.831	73606
97	Check Dam	1.80	2.55	28.370794	77.125210	19	941	72	10630	269	10	27.506	1276382
98	pt	1.80	2.55	28.373115	77.125327	12	355	93	3161	233	8	9.994	33972
99	Check Dam	2.10	2.85	28.375389	77.125213	9	691	117	10849	309	10	67.178	604602
100	Check Dam	2.10	2.85	28.377769	77.125158	8	544	146	4556	314	12	21.391	537424
101	Check Dam	2.10	2.85	28.379617	77.125121	12	302	156	1456	240	30	7.613	806136
102	Check Dam	1.80	2.55	28.381040	77.124911	8	608	186	7415	332	13	67.178	537424
103	Check Dam	1.80	2.55	28.383000	77.124924	16	256	196	2247	274	16	17.043	1074848
104	Check Dam	2.10	2.85	28.384220	77.125017	15	304	204	2226	259	18	21.489	1007670
105	Check Dam	2.10	2.85	28.386311	77.124911	11	297	219	1855	275	12	8.793	738958
106	Check Dam	2.10	2.85	28.392453	77.124741	16	1013	297	5733	289	12	67.178	1074848
107	MPT	1.20	1.95	28.384140	77.114936	17	63	28	549	446	5	1.837	27404
108	MPT	2.10	2.85	28.395072	77.121404	10	113	4	581	312	14	3.799	16120
109	MPT	1.50	2.25	28.394276	77.121128	10	130	5	1022	295	13	6.742	16120
110	MPT	2.10	2.85	28.394612	77.121962	14	219	12	1087	436	6	5.786	22568
111	MPT	2.10	2.85	28.394726	77.123081	7	110	13	596	433	5	3.843	11284
112	MPT	2.10	2.85	28.391547	77.121761	8	144	6	585	298	11	3.515	12896
113	MPT	2.10	2.85	28.391547	77.122259	11	59	7	293	409	7	1.662	17732
114	MPT	1.80	2.55	28.391489	77.123180	7	111	8	449	328	8	1.505	11284
115	gabion	2.10	2.85	28.391549	77.124577	5	NA	10	NA	321	11	NA	45335
116	MPT	2.10	2.85	28.386528	77.123048	11	106	10	540	351	8	1.972	17732
117	MPT	1.80	2.55	28.386677	77.124150	10	141	12	908	238	16	7.827	16120
118	MPT	2.10	2.85	28.384594	77.124187	10	103	1	963	244	35	7.008	16120
119	MPT	2.40	3.15	28.383499	77.123662	11	134	5	600	324	17	5.397	17732
120	MPT	2.40	3.15	28.379111	77.124254	13	128	7	1008	376	15	10.859	20956
121	MPT	2.10	2.85	28.377221	77.124390	7	54	2	271	285	13	3.957	11284
122	MPT	2.10	2.85	28.373599	77.124237	19	197	4	1419	293	20	11.934	30628
123	PT	1.20	1.95	28.370652	77.140691	21	126	68	515	413	7	1.139	59451
124	PT	2.10	2.85	28.371959	77.141098	26	162	73	2132	380	12	8.753	73606
125	PT	2.10	2.85	28.373261	77.141186	27	219	85	1705	370	8	11.282	76437
126	PT	2.10	2.85	28.375821	77.141889	20	341	94	2774	358	13	21.680	56620
127	PT	2.10	2.85	28.376886	77.142049	17	121	96	1355	256	15	7.039	48127
128	MPT	1.50	2.25	28.356629	77.144144	45	612	24	12631	377	6	1.612	72540
129	PT	1.50	2.25	28.356249	77.140877	30	182	41	1874	424	3	14.612	84930
130	MPT	2.10	2.85	28.332554	76.933339	27	97	0	211	11	18	0.243	43524
131	Check Dam	1.80	2.55	28.318689	76.919150	28	707	206	10036	108	32	67.178	1880984
132	MPT	2.10	2.85	28.320713	76.918018	14	522	23	3535	28	22	20.070	22568
133	Check Dam	2.10	2.85	28.323950	76.918754	10	195	12	1287	87	24	14.523	671780
134	MPT	2.10	2.85	28.324851	76.916053	14	61	1	227	12	29	3.567	22568
135	MPT	2.10	2.85	28.320831	76.912337	14	57	4	366	12	24	4.170	22568
136	MPT	2.10	2.85	28.323046	76.912732	9	79	11	441	70	21	3.624	14508
137	MPT	2.10	2.85	28.319114	76.909477	15	80	13	309	41	23	1.577	24180
138	MPT	2.10	2.85	28.328879	76.921310	24	150	0	336	291	32	0.402	38688
139	MPT	2.10	2.85	28.329788	76.921853	17	58	0	201	49	36	0.471	27404
140	Check Dam	1.50	2.25	28.324702	76.941607	22	479	64	5607	37	30	67.178	1477916
141	Check Dam	2.10	2.85	28.326359	76.944159	30	384	74	6691	56	18	67.178	2015340
142	Check Dam	2.10	2.85	28.328477	76.946490	8	196	7	1196	45	15	7.108	537424
143	MPT	2.10	2.85	28.324794	76.946073	13	87	32	659	32	29	6.231	20956
144	Check Dam	1.80	2.55	28.325756	76.947436	8	347	40	2610	56	27	17.016	537424
145	PT	1.50	2.25	28.328107	76.948728	31	583	115	4402	68	19	2.831	87761
146	MPT	2.10	2.85	28.324589	76.946953	9	108	3	665	23	38	5.980	14508
147	MPT	2.40	3.15	28.325125	76.947944	7	122	4	907	16	34	8.631	11284
148	PT	2.10	2.85	28.324097	76.949834	11	393	53	3436	15	32	9.509	31141
149	MPT	2.10	2.85	28.327564	76.949422	8	90	1	736	185	45	3.536	12896
150	Check Dam	2.10	2.85	28.308807	76.943411	27	521	90	8747	285	9	67.178	1813806
151	Check Dam	1.50	2.25	28.302197	76.943925	29	1104	123	48213	149	30	67.178	1948162
152	PT	1.50	2.25	28.322303	76.975694	21	91	106	245	159	15	0.032	59451
153	MPT	2.10	2.85	28.357296	76.986813	23	141	3	1773	232	15	11.283	37076
154	MPT	2.10	2.85	28.348581	76.997237	19	94	3	952	436	7	16.642	30628
155	MPT	2.10	2.85	28.324911	76.989673	27	92	4	1355	229	5	8.531	43524
156	MPT	2.10	2.85	28.324912	76.990347	18	56	5	180	228	5	0.379	29016
157	MPT	2.10	2.85	28.324311	76.997163	24	98	23	1028	229	6	4.735	38688
158	MPT	2.10	2.85	28.324480	76.996205	27	113	25	1333	228	12	7.884	43524
159	MPT	2.10	2.85	28.324104	76.994416	15	70	35	599	227	10	4.512	24180
160	MPT	2.10	2.85	28.323580	76.993379	18	80	40	770	231	14	3.923	29016
161	PT	2.10	2.85	28.323117	76.992767	26	84	41	1130	234	13	7.934	73606
162	PT	1.50	2.25	28.318768	76.989973	23	334	141	3428	241	12	26.617	65113
163	Check Dam	1.50	2.25	28.317173	76.989953	10	272	160	1924	236	9	16.788	671780

164	Check Dam	1.80	2.55	28.315629	76.989140	10	209	163	1728	184	15	7.574	671780
165	Check Dam	1.80	2.55	28.314320	76.987933	5	370	245	3348	43	23	22.020	335890
166	MPT	2.40	3.15	28.312411	76.986689	22	58	1	1119	67	26	18.688	35464
167	MPT	2.10	2.85	28.314160	76.987143	14	327	11	2818	20	24	16.742	22568
168	MPT	1.50	2.25	28.312940	76.986600	6	81	12	302	38	34	2.458	9672
169	Check Dam	2.40	3.15	28.313389	76.985322	10	112	5	1308	128	19	13.561	671780
170	MPT	2.10	2.85	28.313014	76.985883	9	79	7	750	11	30	4.686	14508
171	MPT	1.50	2.25	28.312518	76.986184	7	53	7	219	12	16	1.778	11284
172	MPT	2.10	2.85	28.311758	76.984749	18	240	3	1869	12	46	1.612	29016
173	PT	2.10	2.85	28.316463	76.993196	16	54	56	365	227	9	1.435	45296
174	Check Dam	2.40	3.15	28.314728	76.989415	9	162	74	1690	211	14	13.611	604602
175	MPT	2.10	2.85	28.313860	76.980724	13	164	34	2402	11	29	10.371	20956
176	PT	2.10	2.85	28.307700	76.991972	16	73	52	1180	220	14	2.831	45296
177	MPT	1.80	2.55	28.297070	76.987194	15	392	31	4652	23	30	1.612	24180
178	Check Dam	1.80	2.55	28.300687	76.998762	23	671	104	14990	329	15	67.178	1545094
179	MPT	1.50	2.25	28.294577	76.989601	21	315	4	7100	18	20	26.051	33852
180	MPT	1.50	2.25	28.298260	76.997076	32	289	0	721	279	3	0.095	51584
181	MPT	1.80	2.55	28.288144	76.991396	18	140	2	2467	123	22	1.612	29016
182	MPT	2.10	2.85	28.297961	76.993506	11	182	4	1717	129	21	11.972	17732
183	MPT	2.10	2.85	28.321876	77.015445	32	54	1	166	463	6	0.827	51584
184	GABION	2.10	2.85	28.292439	77.020505	10	NA	65	NA	123	49	NA	90670
185	PT	1.50	2.25	28.292811	77.018686	27	172	53	1955	288	5	4.652	76437
186	MPT	2.10	2.85	28.285375	77.008768	19	93	35	222	448	9	0.149	30628
187	PT	2.10	2.85	28.300187	77.018653	35	317	123	3852	436	2	20.416	99085
188	PT	2.10	2.85	28.298574	77.018726	37	178	125	2811	78	19	13.829	104747
189	GABION	2.10	2.85	28.297372	77.019851	18	NA	180	NA	285	4	NA	163206
190	Check Dam	2.10	2.85	28.295452	77.020119	28	245	183	4975	104	38	67.178	1880984
191	PT	1.50	2.25	28.279186	77.034572	38	382	42	5683	44	28	2.831	107578
192	MPT	1.50	2.25	28.272975	77.043373	21	385	36	6603	129	37	1.612	33852
193	PT	2.40	3.15	28.266128	77.036271	16	294	60	4256	237	6	2.831	45296
194	PT	2.10	2.85	28.274395	77.024525	25	97	51	719	425	5	3.383	70775
195	PT	2.10	2.85	28.273894	77.025598	17	90	67	865	268	4	4.205	48127
196	PT	2.10	2.85	28.271361	77.026922	18	90	90	646	244	7	2.945	50958
197	PT	2.10	2.85	28.269683	77.026664	17	75	98	559	246	9	2.920	48127
198	PT	2.10	2.85	28.268561	77.027123	16	87	101	463	262	15	3.002	45296
199	GABION	2.10	2.85	28.263028	77.030438	28	NA	241	NA	292	12	NA	253876
200	GABION	2.10	2.85	28.262037	77.031615	24	NA	269	NA	248	12	NA	217608
201	MPT	2.10	2.85	28.261115	77.032788	44	63	1	1148	280	3	10.420	70928
202	MPT	2.10	2.85	28.253192	77.036212	20	159	0	527	284	8	5.653	32240
203	Check Dam	2.10	2.85	28.251648	77.038199	17	303	437	2584	413	7	11.789	1142026
204	Check Dam	1.50	2.25	28.251552	77.040841	19	301	440	2580	256	13	25.494	1276382
205	Check Dam	1.80	2.55	28.260381	77.033469	22	226	282	3600	300	12	13.373	1477916
206	Check Dam	1.80	2.55	28.258645	77.035092	23	462	294	6927	283	16	14.635	1545094
207	MPT	2.10	2.85	28.367411	77.114975	17	60	24	619	410	6	4.355	27404
208	Check Dam	1.80	2.55	28.369622	77.107703	14	301	80	4293	375	21	24.383	940492
209	MPT	2.10	2.85	28.358135	77.107717	26	283	15	5777	332	35	1.612	41912
210	MPT	2.10	2.85	28.345561	77.109155	42	427	36	9380	167	30	1.612	67704
211	MPT	1.50	2.25	28.357665	77.145764	37	106	1	817	421	1	4.651	59644
212	PT	2.10	2.85	28.349976	77.142583	26	87	41	632	426	4	1.785	73606
213	GABION	2.10	2.85	28.339386	77.127140	27	NA	385	NA	345	19	NA	244809
214	Check Dam	2.10	2.85	28.292737	77.158154	17	565	76	13833	209	33	67.178	1142026
215	MPT	2.10	2.85	28.308369	76.940504	21	91	1	1086	11	26	8.483	33852
216	PT	2.10	2.85	28.376245	77.135994	18	107	52	1052	274	7	6.076	50958
217	pt	2.10	2.85	28.377261	77.136254	11	89	54	658	236	21	2.852	31141
218	pt	2.10	2.85	28.378603	77.136343	15	116	62	566	228	11	2.578	42465
219	PT	2.10	2.85	28.379674	77.136361	21	112	64	584	230	23	2.539	59451
220	PT	2.10	2.85	28.380821	77.136978	24	139	67	1504	231	23	7.087	67944
221	Pond	NA	NA	28.306812	77.020979	NA	NA	NA	0.00	365.07	0.13	0.500	66970
222	GABION	1.20	1.95	28.385797	77.113083	13	NA	58	NA	438	7	NA	117871
223	GABION	1.20	1.95	28.385986	77.112638	13	NA	59	NA	483	6	NA	117871
224	GABION	1.20	1.95	28.386187	77.112157	13	NA	65	NA	452	4	NA	117871
225	pt	1.20	1.95	28.388845	77.109972	14	145	79	1514	451	12	13.905	39634
226	MPT	1.80	2.55	28.373328	77.116414	25	319	14	7376	432	5	1.612	40300
227	MPT	2.10	2.85	28.374097	77.115244	14	120	17	1104	469	6	6.211	22568
228	GABION	1.20	1.95	28.377378	77.112387	14	NA	21	NA	446	4	NA	126938
229	PT	2.10	2.85	28.343797	77.116222	20	76	96	563	390	20	3.486	56620
230	PT	1.50	2.25	28.344894	77.111448	36	337	125	3606	152	35	2.831	101916
231	PT	1.50	2.25	28.332633	77.141646	22	150	60	1504	429	3	10.144	62282
232	PT	2.40	3.15	28.333020	77.140981	18	77	137	448	422	4	3.173	50958
233	MPT	2.40	3.15	28.323642	77.138171	16	94	24	600	415	5	3.546	25792
234	PT	1.80	2.55	28.326106	77.135012	28	161	60	1575	283	7	6.421	79268
235	MPT	1.80	2.55	28.335434	77.124394	21	126	39	1034	280	15	4.238	33852
236	PT	2.10	2.85	28.334779	77.125397	22	118	41	2799	245	22	16.719	62282
237	MPT	1.20	1.95	28.334143	77.125875	27	54	1	57	342	15	0.249	43524
238	MPT	1.20	1.95	28.310752	77.158144	36	54	3	669	225	3	1.618	58032
239	MPT	1.50	2.25	28.307973	77.158232	22	74	1	171	226	6	0.313	35464
240	PT	2.40	3.15	28.307670	77.158906	18	69	60	699	483	21	9.068	50958
241	MPT	2.10	2.85	28.303349	77.160956	13	106	1	367	256	61	3.566	20956
242	mpt	1.50	2.25	28.350977	76.997288	28	224	3	3484	437	11	15.579	45136
243	MPT	1.50	2.25	28.296301	77.150477	31	105	28	776	67	9	4.461	49972
244	MPT	1.80	2.55	28.290319	77.151996	15	102	6	799	116	14	3.464	24180
245	MPT	2.10	2.85	28.319774	76.907509	14	122	10	1076	119	28	6.453	22568
246	MPT	2.10	2.85	28.322609	76.907518	17	121	3	1341	53	24	6.580	27404
247	MPT	1.50	2.25	28.321071	76.907407	10	154	7	422	121	22	0.021	16120
248	MPT	1.20	1.95	28.320608	76.906852	11	144	7	1904	65	10	9.082	17732
249	MPT	1.80	2.55	28.320562	76.905857	13	112	2	851	221	29	3.167	20956
250	MPT	2.10	2.85	28.319793	76.905748	17	97	3	1795	180	28	15.019	27404
251	MPT	2.10	2.85	28.332756	76.924665	18	191	0	770	286	10	0.091	29016

252	MPT	1.80	2.55	28.324086	76.936983	36	292	16	4504	19	35	22.192	58032
253	MPT	2.10	2.85	28.327807	76.936021	18	108	10	661	13	27	3.052	29016
254	MPT	1.80	2.55	28.327824	76.937088	18	119	12	1680	12	31	3.935	29016
255	MPT	1.20	1.95	28.327908	76.938500	22	171	15	2037	12	27	7.536	35464
256	MPT	2.10	2.85	28.319507	76.950106	12	54	19	123	21	14	0.021	19344
257	MPT	1.50	2.25	28.321826	76.950880	27	176	33	2879	14	34	5.738	43524
258	Check Dam	1.50	2.25	28.325306	76.951023	20	271	59	2781	177	13	28.336	1343560
259	Check Dam	2.10	2.85	28.326327	76.949474	11	286	64	7734	36	15	67.178	738958
260	MPT	1.50	2.25	28.328956	76.918875	14	100	7	452	149	15	4.575	22568
261	MPT	1.50	2.25	28.328457	76.919874	23	115	0	286	287	14	0.230	37076
262	Check Dam	1.20	1.95	28.328595	76.920906	8	187	11	3082	141	14	67.178	537424
263	MPT	2.10	2.85	28.320519	76.958177	28	160	10	1348	86	23	8.100	45136
264	MPT	2.10	2.85	28.323058	76.959846	33	132	8	1293	42	22	7.880	53196
265	MPT	1.50	2.25	28.311291	76.944837	12	249	42	3781	57	26	7.196	19344
266	PT	2.10	2.85	28.320346	76.990495	23	238	77	4342	239	12	2.831	65113
267	MPT	1.80	2.55	28.311958	76.988301	17	128	4	1042	122	20	2.739	27404
268	MPT	2.10	2.85	28.312457	76.989441	16	98	11	590	135	18	2.271	25792
269	MPT	2.10	2.85	28.312800	76.988612	9	98	12	547	31	14	2.829	14508
270	MPT	1.50	2.25	28.297404	76.992215	26	268	7	5964	29	20	21.252	41912
271	MPT	1.20	1.95	28.297400	76.989531	26	626	18	7284	21	24	1.612	41912
272	MPT	2.10	2.85	28.289509	76.990984	13	160	2	2645	11	25	12.500	20956
273	MPT	1.20	1.95	28.240931	77.040325	14	109	1	741	449	11	2.681	22568
274	MPT	1.20	1.95	28.238304	77.039989	14	141	0	370	426	20	0.046	22568
275	LSCD	1.20	1.95	28.293400	77.142180	8	NA	39	NA	51	15	NA	13008
276	GABION	1.20	1.95	28.293351	77.141813	14	NA	41	NA	108	22	NA	126938
277	LSCD	1.20	1.95	28.292979	77.141680	8	NA	42	NA	92	17	NA	13008
278	LSCD	1.20	1.95	28.292963	77.141198	9	NA	43	NA	32	35	NA	14634
279	LSCD	1.20	1.95	28.293002	77.140934	9	NA	43	NA	12	29	NA	14634
280	LSCD	1.20	1.95	28.293300	77.140600	6	NA	44	NA	70	48	NA	9756
281	LSCD	1.20	1.95	28.293308	77.140083	8	NA	48	NA	49	22	NA	13008
282	LSCD	1.20	1.95	28.292052	77.138055	16	NA	33	NA	128	37	NA	26016
283	LSCD	1.20	1.95	28.293103	77.139543	8	NA	49	NA	86	42	NA	13008
284	GABION	1.20	1.95	28.293486	77.138745	9	NA	108	NA	58	25	NA	81603
285	GABION	1.20	1.95	28.294121	77.138436	12	NA	110	NA	91	46	NA	108804
286	PT	1.20	1.95	28.302870	77.136310	21	444	84	5546	264	24	26.593	59451
287	PT	1.20	1.95	28.307952	77.139389	13	270	51	2555	246	8	9.606	36803
288	pt	1.20	1.95	28.307266	77.139208	15	83	51	767	265	8	2.615	42465
289	PT	1.20	1.95	28.306678	77.138476	17	124	59	621	234	14	1.943	48127
290	PT	1.20	1.95	28.306455	77.136143	22	387	68	3533	295	14	17.819	62282
291	GABION	1.20	1.95	28.306238	77.153664	11	NA	95	NA	228	12	NA	99737
292	GABION	1.20	1.95	28.313721	77.136779	15	NA	224	NA	317	9	NA	136005
293	LSCD	1.20	1.95	28.314208	77.142466	8	NA	25	NA	249	6	NA	13008
294	LSCD	1.20	1.95	28.314229	77.142247	9	NA	25	NA	427	9	NA	14634
295	LSCD	1.20	1.95	28.314271	77.141955	9	NA	25	NA	380	29	NA	14634
296	LSCD	1.20	1.95	28.314293	77.141653	9	NA	28	NA	367	5	NA	14634
297	LSCD	1.20	1.95	28.314966	77.140700	7	NA	32	NA	259	13	NA	11382
298	LSCD	1.20	1.95	28.323826	77.137415	12	NA	25	NA	434	10	NA	19512
299	GABION	1.20	1.95	28.340925	77.128739	9	NA	74	NA	326	12	NA	81603
300	GABION	1.20	1.95	28.338230	77.128555	9	NA	81	NA	277	10	NA	81603
301	GABION	1.20	1.95	28.337259	77.128518	7	NA	83	NA	278	15	NA	63469
302	GABION	1.20	1.95	28.336440	77.129026	10	NA	85	NA	289	21	NA	90670
303	GABION	1.20	1.95	28.336034	77.129436	12	NA	85	NA	309	14	NA	108804
304	GABION	1.20	1.95	28.335521	77.129709	7	NA	87	NA	336	12	NA	63469
305	Check Dam	1.50	2.25	28.328594	77.129584	11	1059	974	7055	376	12	67.178	738958
306	Check Dam	1.20	1.95	28.328062	77.130258	5	529	265	2824	441	13	14.722	335890
307	GABION	1.20	1.95	28.332326	77.125918	13	NA	88	NA	292	11	NA	117871
308	PT	1.20	1.95	28.331490	77.125701	11	121	92	1024	277	17	4.522	31141
309	GABION	1.20	1.95	28.329827	77.127054	9	NA	102	NA	303	14	NA	81603
310	PT	1.20	1.95	28.328568	77.127764	11	123	105	674	230	12	2.747	31141
311	MPT	1.20	1.95	28.366256	77.140157	23	115	34	820	422	4	1.967	37076
312	GABION	1.20	1.95	28.343712	77.116979	13	NA	95	NA	291	8	NA	117871
313	MPT	1.20	1.95	28.268643	77.025467	21	77	24	680	400	8	2.713	33852
314	MPT	1.20	1.95	28.325583	77.127075	13	115	23	1116	284	17	5.302	20956
315	GABION	1.20	1.95	28.324515	77.127741	11	NA	26	NA	232	20	NA	99737
316	MPT	1.20	1.95	28.324037	77.128710	17	86	28	682	231	12	2.274	27404
317	MPT	1.20	1.95	28.320748	77.124757	19	76	29	478	316	15	1.253	30628
318	MPT	1.20	1.95	28.319876	77.125910	14	130	31	788	255	16	4.103	22568
319	PT	1.20	1.95	28.317890	77.127164	20	322	61	4432	529	7	12.497	56620
320	PT	1.20	1.95	28.316320	77.127966	16	254	65	2827	253	13	9.574	45296
321	PT	1.20	1.95	28.314665	77.128663	16	264	70	4395	248	17	2.831	45296
322	MPT	1.20	1.95	28.310447	77.127173	14	196	31	1706	232	5	7.851	22568
323	Pond	NA	NA	28.380180	77.131946	NA	NA	NA	0.00	224.40	0.12	0.500	66970
324	Pond	NA	NA	28.378398	77.130795	NA	NA	NA	0.00	224.40	0.11	0.500	66970
325	Pond	NA	NA	28.376406	77.129980	NA	NA	NA	0.00	228.01	7.62	0.500	66970
326	Pond	NA	NA	28.373349	77.132717	NA	NA	NA	0.00	224.40	0.13	0.500	66970
327	MPT	2.70	3.45	28.325222	76.992535	29	90	5	761	232	3	3.319	46748
328	MPT	2.40	3.15	28.322786	76.991312	25	104	26	1507	240	11	16.273	40300
329	MPT	1.20	1.95	28.323573	76.997931	14	64	19	334	227	5	0.738	22568
330	MPT	1.20	1.95	28.323016	76.998297	33	64	4	174	231	3	0.528	53196
331	MPT	2.70	3.45	28.321556	76.989374	28	57	16	555	277	17	4.649	45136
332	PT	1.20	1.95	28.322502	76.983471	17	138	16	1161	139	8	3.030	48127
333	MPT	1.20	1.95	28.321819	76.983522	21	67	18	443	105	7	1.090	33852
334	MPT	1.20	1.95	28.321297	76.983640	27	65	20	736	167	11	2.378	43524
335	MPT	1.20	1.95	28.321079	76.984130	21	59	21	790	116	17	5.346	33852
336	MPT	1.20	1.95	28.321015	76.984463	15	55	22	312	60	11	1.093	24180
337	MPT	2.70	3.45	28.320394	76.985773	23	146	28	1744	150	11	8.825	37076
338	PT	1.50	2.25	28.320496	76.989772	21	131	61	1679	267	12	1.152	59451
339	MPT	2.70	3.45	28.314586	76.986025	17	61	1	182	288	17	0.143	27404

340	MPT	1.20	1.95	28.314739	76.981676	21	52	9	520	52	29	1.473	33852
341	MPT	1.20	1.95	28.323114	77.005249	8	76	12	446	317	8	1.740	12896
342	MPT	1.80	2.55	28.320471	77.001250	41	365	18	5319	291	2	16.226	66092
343	ECD	1.80	2.55	28.306632	76.991069	37	115	6	491	32	24	22.101	11840
344	ECD	1.50	2.25	28.299528	76.991910	29	114	0	456	278	3	0.006	9280
345	ECD	1.20	1.95	28.290233	76.987519	14	20	0	432	12	45	1.791	4480
346	ECD	2.10	2.85	28.289218	76.992915	24	65	1	887	121	7	2.754	7680
347	ECD	1.80	2.55	28.274998	77.038841	35	107	2	3471	129	17	13.663	11200
348	ECD	1.80	2.55	28.273355	77.039265	21	213	17	3748	21	38	11.668	6720
349	ECD	1.20	1.95	28.279762	77.027971	15	39	2	373	31	5	2.301	4800
350	ECD	1.20	1.95	28.279654	77.028386	16	25	8	174	12	4	0.396	5120
351	ECD	1.20	1.95	28.270739	77.039545	10	17	7	81	23	24	0.185	3200
352	ECD	1.20	1.95	28.270784	77.039076	17	23	2	167	119	17	0.708	5440
353	ECD	1.20	1.95	28.271040	77.040007	8	11	8	35	17	46	0.080	2560
354	ECD	2.10	2.85	28.269192	77.043634	25	167	5	2842	278	5	25.612	8000
355	MPT	1.20	1.95	28.236533	77.016149	27	51	3	269	442	9	1.253	43524
356	MPT	0.00	0.75	28.323392	76.983339	33	155	12	10	232	2	0.135	53196
357	Pond	NA	NA	28.306816	77.023538	NA	NA	NA	0.00	239.23	0.17	0.500	66970
358	Pond	NA	NA	28.299052	77.016970	NA	NA	NA	0.00	224.40	0.08	0.500	66970
359	Pond	NA	NA	28.292916	77.017475	NA	NA	NA	0.00	224.40	0.07	0.500	66970
360	Pond	NA	NA	28.292509	77.016410	NA	NA	NA	0.00	224.40	4.37	0.500	66970
361	Pond	NA	NA	28.292904	77.016358	NA	NA	NA	0.00	224.40	0.06	0.500	66970
362	Pond	NA	NA	28.288025	77.019005	NA	NA	NA	0.00	228.01	0.00	0.500	66970
363	Pond	NA	NA	28.283448	77.030113	NA	NA	NA	0.00	224.40	0.39	0.500	66970
364	Pond	NA	NA	28.282516	77.030265	NA	NA	NA	0.00	224.40	0.39	0.500	66970
365	Pond	NA	NA	28.372622	76.993330	NA	NA	NA	0.00	224.40	10.23	0.500	66970
366	Pond	NA	NA	28.316068	76.983637	NA	NA	NA	0.00	224.40	22.77	0.500	66970
367	Pond	NA	NA	28.316782	76.984302	NA	NA	NA	0.00	228.01	0.27	0.500	66970
368	Pond	NA	NA	28.336567	76.987733	NA	NA	NA	0.00	234.62	0.05	0.500	66970
369	Pond	NA	NA	28.358391	76.993506	NA	NA	NA	0.00	224.40	0.10	0.500	66970
370	Pond	NA	NA	28.340134	77.001784	NA	NA	NA	0.00	224.40	0.09	0.500	66970
371	Pond	NA	NA	28.340658	77.002454	NA	NA	NA	0.00	224.40	0.08	0.500	66970
372	Pond	NA	NA	28.334579	77.003894	NA	NA	NA	0.00	224.40	0.08	0.500	66970
373	Pond	NA	NA	28.332786	76.999215	NA	NA	NA	0.00	224.40	15.20	0.500	66970
374	ECD	1.5	2.25	28.308522	76.990501	11	27	<1	180	224.40	0.28	0.135	3520
375	ECD	1.5	2.25	28.308088	76.990614	22	46	<1	484	224.40	94.53	0.363	7040
376	ECD	1.5	2.25	28.307241	76.990570	9	21	<1	151	224.40	76.45	0.113	2880
377	ECD	1.5	2.25	28.306898	76.990741	10	39	<1	238	224.40	94.53	0.179	3200
378	ECD	1.5	2.25	28.306782	76.990523	10	25	<1	216	10.27	0.31	0.162	3200
379	ECD	1.5	2.25	28.305843	76.991615	8	26	<1	158	11.80	69.19	0.119	2560
380	ECD	1.5	2.25	28.305659	76.991797	11	33	<1	272	11.80	69.19	0.204	3520
381	ECD	1.5	2.25	28.301483	76.997515	13	21	<1	172	12.34	12.48	0.129	4160
382	ECD	1.5	2.25	28.301527	76.996936	11	20	<1	145	10.27	0.00	0.109	3520
383	ECD	1.5	2.25	28.299629	76.999501	11	26	<1	173	232.48	12.48	0.130	3520
384	ECD	1.5	2.25	28.299353	76.999500	8	18	<1	117	234.62	0.00	0.088	2560
385	ECD	1.5	2.25	28.299003	76.998975	13	29	<1	378	224.40	0.10	0.283	4160
386	ECD	1.5	2.25	28.298842	76.998733	12	24	<1	199	224.40	54.61	0.149	3840
387	ECD	1.5	2.25	28.299536	76.998362	19	43	<1	583	224.40	0.10	0.437	6080
388	ECD	1.5	2.25	28.298130	76.999101	14	20	<1	302	224.40	12.55	0.226	4480
389	ECD	1.5	2.25	28.297905	76.998606	21	49	<1	833	10.27	0.39	0.624	6720
390	ECD	1.2	1.95	28.297588	76.998637	21	33	<1	498	12.46	0.40	0.299	6720
391	ECD	1.5	2.25	28.295835	76.996908	12	18	<1	292	10.94	0.00	0.219	3840
392	ECD	1.5	2.25	28.295952	76.997244	15	23	<1	349	10.27	46.17	0.262	4800
393	MPT	1.5	2.25	28.295091	76.995393	12	60	<1	512	10.94	61.32	0.384	19344
394	ECD	1.5	2.25	28.294766	76.993017	12	22	<1	145	10.27	75.92	0.109	3840
395	ECD	1.5	2.25	28.294710	76.992794	8	12	<1	118	11.23	0.00	0.088	2560
396	ECD	1.5	2.25	28.294195	76.993258	13	49	<1	323	10.27	0.35	0.242	4160
397	ECD	1.5	2.25	28.294300	76.992912	9	20	<1	103	10.27	30.57	0.077	2880
398	ECD	1.5	2.25	28.293774	76.994468	17	17	<1	639	10.27	0.43	0.479	5440
399	ECD	1.5	2.25	28.293780	76.993868	10	28	<1	122	10.27	0.40	0.092	3200
400	ECD	1.5	2.25	28.293311	76.994287	11	16	<1	124	11.23	0.40	0.093	3520
401	MPT	1.5	2.25	28.293194	76.993908	18	97	<1	974	12.34	0.38	0.730	29016
402	ECD	1.5	2.25	28.292694	76.993726	11	24	<1	150	11.23	0.36	0.113	3520
403	ECD	1.5	2.25	28.292183	76.992842	10	42	<1	455	10.27	10.20	0.341	3200
404	ECD	1.5	2.25	28.292434	76.992643	9	18	<1	101	10.27	77.47	0.076	2880
405	ECD	1.5	2.25	28.292588	76.992427	13	24	<1	224	11.23	16.25	0.168	4160
406	MPT	1.5	2.25	28.292140	76.992185	10	64	<1	652	10.27	29.98	0.489	16120
407	ECD	1.5	2.25	28.292463	76.991925	10	29	<1	226	10.27	0.35	0.170	3200
408	ECD	1.5	2.25	28.292308	76.991017	15	20	<1	172	10.27	0.35	0.129	4800
409	MPT	1.5	2.25	28.291919	76.990719	15	71	<1	652	10.27	10.53	0.489	24180
410	ECD	1.5	2.25	28.291571	76.989602	14	42	<1	365	11.80	0.38	0.274	4480
411	ECD	1.5	2.25	28.290850	76.989232	10	24	<1	61	10.94	0.38	0.046	3200
412	ECD	1.5	2.25	28.291375	76.988592	8	45	<1	101	10.94	73.24	0.076	2560
413	ECD	1.5	2.25	28.291642	76.988736	7	16	<1	86	10.27	0.00	0.065	2240
414	MPT	1.5	2.25	28.291719	76.987933	8	62	<1	331	10.27	81.83	0.248	12896
415	ECD	1.5	2.25	28.292547	76.989229	7	15	<1	77	11.63	29.48	0.058	2240
416	ECD	1.5	2.25	28.292698	76.988982	9	14	<1	88	11.80	16.25	0.066	2880
417	ECD	1.5	2.25	28.292874	76.989273	8	44	<1	328	10.27	15.61	0.246	2560
418	MPT	1.5	2.25	28.293006	76.990025	10	71	<1	346	10.27	0.00	0.260	16120
419	ECD	1.5	2.25	28.292898	76.990355	8	17	<1	126	10.27	22.35	0.095	2560
420	ECD	1.5	2.25	28.293185	76.990335	10	25	<1	181	10.27	32.74	0.136	3200
421	ECD	1.5	2.25	28.293410	76.990157	9	13	<1	78	10.94	0.31	0.059	2880
422	ECD	1.5	2.25	28.293441	76.989917	9	24	<1	155	12.34	0.31	0.116	2880
423	ECD	1.5	2.25	28.293252	76.990808	13	14	<1	144	10.27	0.30	0.108	4160
424	MPT	1.5	2.25	28.293041	76.991135	9	50	<1	333	10.27	39.54	0.250	14508
425	ECD	1.5	2.25	28.293791	76.991006	9	30	<1	245	10.27	0.33	0.184	2880
426	Pond	NA	NA	28.293767	76.991259	NA	NA	NA	0.00	12.78	48.43	0.500	66970
427	ECD	1.5	2.25	28.293579	76.991427	8	24	<1	154	10.27	33.03	0.116	2560

428	ECD	1.5	2.25	28.293544	76.991842	11	24	<1	175	10.27	33.03	0.131	3520
429	ECD	1.5	2.25	28.293735	76.991596	8	15	<1	98	10.27	0.32	0.073	2560
430	ECD	1.5	2.25	28.293325	76.992644	19	45	<1	691	10.27	0.41	0.519	6080
431	MPT	1.5	2.25	28.290293	76.989491	21	82	<1	1422	10.27	19.08	1.066	33852
432	MPT	1.5	2.25	28.289804	76.988648	15	69	<1	1255	11.80	0.44	0.941	24180
433	ECD	1.5	2.25	28.289086	76.988216	7	11	<1	47	10.27	15.74	0.035	2240
434	ECD	1.5	2.25	28.289004	76.987815	14	40	<1	424	10.27	0.42	0.318	4480
435	ECD	1.5	2.25	28.288878	76.987308	10	34	<1	317	10.27	47.56	0.238	3200
436	MPT	1.5	2.25	28.291103	76.986887	12	56	<1	507	11.80	15.74	0.380	19344
437	ECD	1.5	2.25	28.290869	76.987821	10	11	<1	72	11.80	0.42	0.054	3200
438	MPT	1.5	2.25	28.290504	76.987612	9	56	<1	373	11.80	47.56	0.280	14508
439	ECD	1.5	2.25	28.290502	76.987224	10	114	<1	16	12.46	15.95	0.012	3200
440	ECD	1.5	2.25	28.290058	76.987218	12	12	<1	45	11.80	22.35	0.034	3840
441	ECD	1.5	2.25	28.289925	76.986916	9	13	<1	89	10.27	32.74	0.067	2880
442	ECD	1.5	2.25	28.289831	76.987342	19	25	<1	315	10.27	0.31	0.236	6080
443	ECD	1.5	2.25	28.289745	76.986840	9	14	<1	79	10.27	0.31	0.059	2880
444	ECD	1.5	2.25	28.289323	76.986570	10	20	<1	56	10.94	0.30	0.042	3200
445	ECD	1.5	2.25	28.289452	76.986351	8	20	<1	101	10.27	0.36	0.076	2560
446	Pond	NA	NA	28.321381	76.917277	NA	NA	NA	0.00	10.94	12.59	0.500	66970
447	Check Dam	1.50	2.25	28.321688	76.918609	7	329	25	2749	27.5	22.0	3.670	470246
448	Pond	NA	NA	28.317608	76.922885	NA	NA	NA	0.00	528.18	0.36	0.500	66970
449	Pond	NA	NA	28.316648	76.932830	NA	NA	NA	0.00	10.94	32.74	0.500	66970
450	Pond	NA	NA	28.313207	76.937220	NA	NA	NA	0.00	10.27	15.26	0.500	66970
451	Pond	NA	NA	28.334162	76.932815	NA	NA	NA	0.00	224.40	0.10	0.500	66970
452	Pond	NA	NA	28.337171	76.938605	NA	NA	NA	0.00	224.40	0.10	0.500	66970
453	Pond	NA	NA	28.332371	76.936948	NA	NA	NA	0.00	224.40	0.08	0.500	66970
454	Pond	NA	NA	28.326797	76.952778	NA	NA	NA	0.00	10.27	0.08	0.500	66970
455	Pond	NA	NA	28.312583	76.941496	NA	NA	NA	0.00	10.27	0.40	0.500	66970
456	Pond	NA	NA	28.312467	76.942826	NA	NA	NA	0.00	10.27	0.31	0.500	66970
457	Pond	NA	NA	28.313593	76.945407	NA	NA	NA	0.00	10.27	0.34	0.500	66970
458	Pond	NA	NA	28.321977	76.938077	NA	NA	NA	0.00	10.27	0.37	0.500	66970
459	Pond	NA	NA	28.321977	76.938077	NA	NA	NA	0.00	10.27	0.37	0.500	66970
460	Pond	NA	NA	28.325348	76.956160	NA	NA	NA	0.00	10.27	51.02	0.500	66970
461	Pond	NA	NA	28.324904	76.954234	NA	NA	NA	0.00	10.27	0.28	0.500	66970
462	Pond	NA	NA	28.324904	76.954234	NA	NA	NA	0.00	10.27	0.28	0.500	66970
463	ECD	1.5	2.25	28.281168	77.137968	11	11	<1	122	10.27	0.28	0.092	3520
464	ECD	1.5	2.25	28.280909	77.137903	15	10	<1	158	10.27	0.47	0.118	4800
465	MPT	1.5	2.25	28.281007	77.138256	23	8	<1	332	11.23	85.34	0.249	37076
466	MPT	1.5	2.25	28.279283	77.137682	26	64	0	1046	12.34	0.47	0.784	41912
467	ECD	1.5	2.25	28.277381	77.146812	23	32	<1	98	10.27	0.46	0.074	7360
468	ECD	1.5	2.25	28.290524	77.159953	12	35	<1	293	239.23	92.15	0.220	3840
469	ECD	1.5	2.25	28.290594	77.159551	13	28	<1	73	239.23	15.60	0.055	4160
470	Pond	NA	NA	28.294355	77.159771	NA	NA	NA	0.00	239.23	0.33	0.500	66970
471	MPT	1.5	2.25	28.294557	77.157623	25	192	0	3558	239.23	0.32	2.669	40300
472	MPT	1.5	2.25	28.295630	77.155767	19	135	0	2455	528.18	0.32	1.841	30628
473	Pond	NA	NA	28.351800	77.118153	NA	NA	NA	0.00	232.48	0.32	0.500	66970
474	Pond	NA	NA	28.373626	77.100468	NA	NA	NA	0.00	239.23	18.41	0.500	66970
475	Pond	NA	NA	28.333388	77.125711	NA	NA	NA	0.00	224.40	6.31	0.500	66970
476	Pond	NA	NA	28.354969	77.107471	NA	NA	NA	0.00	239.23	0.43	0.500	66970
477	Pond	NA	NA	28.377950	77.108284	NA	NA	NA	0.00	239.23	0.42	0.500	66970
478	Pond	NA	NA	28.379514	77.108138	NA	NA	NA	0.00	239.23	57.35	0.500	66970
479	Pond	NA	NA	28.375431	77.108151	NA	NA	NA	0.00	239.23	57.35	0.500	66970
480	Pond	NA	NA	28.355144	77.108045	NA	NA	NA	0.00	239.23	18.41	0.500	66970
481	Pond	NA	NA	28.320216	77.126436	NA	NA	NA	0.00	224.40	6.31	0.500	66970
482	Pond	NA	NA	28.318235	77.126813	NA	NA	NA	0.00	228.01	0.43	0.500	66970
483	MPT	1.5	2.25	28.297040	77.158638	36	130	0	2618	239.23	0.42	1.964	58032
484	Pond	NA	NA	28.388677	77.123121	NA	NA	NA	0.00	224.40	0.13	0.500	66970
485	Pond	NA	NA	28.391912	77.129362	NA	NA	NA	0.00	224.40	0.13	0.500	66970
486	Pond	NA	NA	28.386623	77.136901	NA	NA	NA	0.00	528.18	38.77	0.500	66970
487	Pond	NA	NA	28.374902	77.138327	NA	NA	NA	0.00	224.40	0.11	0.500	66970
488	Pond	NA	NA	28.349784	77.144849	NA	NA	NA	0.00	424.32	0.09	0.500	66970
489	Pond	NA	NA	28.351347	77.146688	NA	NA	NA	0.00	439.93	0.00	0.500	66970
490	Pond	NA	NA	28.346307	77.147181	NA	NA	NA	0.00	424.32	0.12	0.500	66970
491	Pond	NA	NA	28.344264	77.147812	NA	NA	NA	0.00	424.32	0.12	0.500	66970
492	Pond	NA	NA	28.350845	77.143497	NA	NA	NA	0.00	424.32	0.10	0.500	66970
493	Pond	NA	NA	28.342390	77.144655	NA	NA	NA	0.00	424.32	0.13	0.500	66970
494	Pond	NA	NA	28.348528	77.139061	NA	NA	NA	0.00	224.40	18.12	0.500	66970
495	Pond	NA	NA	28.344401	77.140990	NA	NA	NA	0.00	424.32	0.13	0.500	66970
496	Pond	NA	NA	28.340773	77.137417	NA	NA	NA	0.00	224.40	0.13	0.500	66970
497	Pond	NA	NA	28.334542	77.145541	NA	NA	NA	0.00	424.32	63.36	0.500	66970
498	Pond	NA	NA	28.335573	77.143593	NA	NA	NA	0.00	424.32	0.12	0.500	66970
499	Pond	NA	NA	28.348206	77.131143	NA	NA	NA	0.00	224.40	0.14	0.500	66970
500	Pond	NA	NA	28.355031	77.138029	NA	NA	NA	0.00	528.18	0.14	0.500	66970
501	Pond	NA	NA	28.359064	77.140855	NA	NA	NA	0.00	436.66	0.00	0.500	66970
502	Pond	NA	NA	28.358053	77.128862	NA	NA	NA	0.00	224.40	0.14	0.500	66970
503	Pond	NA	NA	28.362816	77.133211	NA	NA	NA	0.00	530.00	0.13	0.500	66970
504	Pond	NA	NA	28.361837	77.132552	NA	NA	NA	0.00	224.40	0.15	0.500	66970
505	Pond	NA	NA	28.363828	77.129639	NA	NA	NA	0.00	424.32	0.13	0.500	66970
506	Pond	NA	NA	28.333728	77.141051	NA	NA	NA	0.00	424.32	0.12	0.500	66970
507	Pond	NA	NA	28.334133	77.143036	NA	NA	NA	0.00	424.32	0.12	0.500	66970
508	Pond	NA	NA	28.330649	77.142867	NA	NA	NA	0.00	424.32	0.10	0.500	66970
509	Pond	NA	NA	28.322690	77.145458	NA	NA	NA	0.00	224.40	0.11	0.500	66970
510	Pond	NA	NA	28.348932	77.140745	NA	NA	NA	0.00	528.18	29.80	0.500	66970
511	Pond	NA	NA	28.388715	77.123241	NA	NA	NA	0.00	224.40	0.12	0.500	66970
512	Pond	NA	NA	28.390168	77.124671	NA	NA	NA	0.00	224.40	0.09	0.500	66970
513	Pond	NA	NA	28.385322	77.125804	NA	NA	NA	0.00	235.24	5.70	0.500	66970
514	Pond	NA	NA	28.387202	77.126024	NA	NA	NA	0.00	228.01	11.50	0.500	66970
515	Pond	NA	NA	28.392661	77.129386	NA	NA	NA	0.00	235.83	10.35	0.500	66970

516	Pond	NA	NA	28.374390	77.134275	NA	NA	NA	0.00	224.40	0.12	0.500	66970
517	Pond	NA	NA	28.374200	77.138661	NA	NA	NA	0.00	224.40	2.93	0.500	66970
518	Pond	NA	NA	28.385142	77.137040	NA	NA	NA	0.00	228.01	0.14	0.500	66970
519	MPT	1.5	2.25	28.295752	76.988937	14	57	<1	562	10.27	60.15	0.421	22568
520	ECD	1.5	2.25	28.295588	76.989712	10	44	<1	344	10.94	72.41	0.258	3200
521	ECD	1.5	2.25	28.296231	76.990279	10	37	<1	108	10.27	81.04	0.081	3200
522	MPT	1.5	2.25	28.296364	76.987127	43	77	<1	2905	10.27	0.00	2.179	69316
523	Pond	NA	NA	28.304688	76.951880	NA	NA	NA	0.00	10.27	0.35	0.500	66970
524	MPT	1.5	2.25	28.298097	76.985607	14	66	<1	1042	11.80	0.00	0.782	22568
525	ECD	1.5	2.25	28.298538	76.986165	8	26	<1	139	10.27	57.26	0.104	2560
526	ECD	1.5	2.25	28.298986	76.987112	9	30	<1	292	10.27	0.37	0.219	2880
527	ECD	1.5	2.25	28.299494	76.987484	8	37	<1	362	10.94	0.37	0.271	2560
528	ECD	1.5	2.25	28.299247	76.988213	12	40	<1	392	11.80	34.82	0.294	3840
529	ECD	1.5	2.25	28.297847	76.992289	11	33	<1	254	10.27	0.00	0.190	3520
530	ECD	1.5	2.25	28.300348	76.991561	20	37	<1	440	11.80	72.42	0.330	6400
531	ECD	1.5	2.25	28.298753	76.993829	9	24	<1	109	12.22	0.23	0.082	2880
532	ECD	1.5	2.25	28.298861	76.994120	14	46	<1	633	10.27	0.34	0.475	4480
533	ECD	1.5	2.25	28.299073	76.994538	13	13	<1	95	10.27	0.36	0.072	4160
534	ECD	1.5	2.25	28.299316	76.993967	11	31	<1	254	10.27	0.23	0.191	3520
535	MPT	1.5	2.25	28.297435	76.994948	11	97	<1	1751	10.27	0.34	1.313	17732
536	ECD	1.5	2.25	28.298004	76.994953	15	26	<1	362	10.27	0.36	0.271	4800
537	ECD	1.5	2.25	28.298452	76.994941	12	23	<1	73	10.27	0.29	0.055	3840
538	ECD	1.5	2.25	28.298093	76.995585	9	33	<1	287	12.34	61.20	0.215	2880
539	ECD	1.20	1.95	28.285536	77.145075	43	29	1	150	36.29	45.85	**0.002**	13659
540	ECD	1.20	1.95	28.320117	77.147202	35	34	4	164	234.81	12.97	**0.014**	11323
541	MPT	1.20	1.95	28.288584	77.019127	11	236	25	5530	320.58	8.39	**2.803**	17016
542	MPT	2.10	2.85	28.375474	77.132059	68	251	9	5564	224.40	15.65	**1.016**	109275
543	ECD	2.40	3.15	28.325016	76.993096	18	87	7	1016	235.24	18.97	**0.315**	5665
544	MPT	2.70	3.45	28.325565	76.996520	52	180	3	4157	229.90	3.37	**0.745**	83219
545	MPT	1.50	2.25	28.314376	76.986572	8	59	1	357	11.22	25.04	**0.112**	13333
546	MPT	2.70	3.45	28.313304	76.986525	10	90	0	153	12.32	11.23	**0.002**	16359
547	MPT	2.10	2.85	28.310691	76.984339	14	83	2	984	55.98	19.84	**0.342**	22298
548	MPT	2.10	2.85	28.314745	76.981159	41	83	23	1868	96.58	38.31	**0.390**	65684
549	MPT	1.20	1.95	28.322203	76.914607	12	78	1	1458	115.78	6.71	**0.216**	18660
550	MPT	1.20	1.95	28.307039	76.942011	9	119	3	1120	11.68	36.88	**0.207**	15304
551	MPT	1.80	2.55	28.352370	76.998171	26	136	2	3499	368.53	17.67	**1.482**	41856

Brief Details of Catchment Area works(Plantation Work)							
Assumptions and suggestions							
1	Cost per unit hectare is mentioned against each site and has been arrived at by modifying state forest department models by including cost of catchment area and five-year maintenance cost.						
2	All the models include cost of advance work(Catchment area treatment works like Continuous contour trench, Deep CCT, Staggered trenches) for estimation cost of staggered trench has been used as this would be in major area looking to vegetative cover in the area.						
3	Sites have been identified and intervention deemed best suited are mentioned but as per departmental norms the complete flexibility lies with the executing agency. The Afforestation model has been proposed in forest areas with poor vegetation taking 1000 plants per ha. ANR(aided natural regeneration) model has been proposed in forest areas with sparse vegetation taking 200 plants per ha . Silvi Pasture & Horticulture has been proposed in open forest/scrub landsnear agriculture fields with 200 plants and overseeding of grasses.All The modesl include the cost plantation model plus maintenance cost up to five years and cost of CCT and Staggered and Deep CCT cost models						
4	Species can be as per site suitability						
SR_NO	**NAME**	**LAT**	**LONG**	**AREA**	**Cost per ha**	**Cost in Rs**	**Cost in Lacs**
552	AFFORESTATION	28.3219	76.9064	35	386432	13525118	135.25
553	AFFORESTATION	28.3121	76.9407	80	386432	30914555	309.15
554	ANR	28.3321	76.9766	5	248495	1242477	12.42
555	ANR	28.3372	76.988	15	248495	3727432	37.27
556	ANR	28.3209	76.9831	115	248495	28576977	285.77
557	ANR	28.2911	76.9905	55	248495	13667250	136.67
558	ANR	28.2878	77.0158	8	248495	1987964	19.88
559	Silvi Pasture	28.2927	77.0146	15	386432	5796479	57.96
560	ANR	28.3162	76.9557	10	248495	2484955	24.85
561	ANR	28.3121	76.9513	35	248495	8697341	86.97
562	ANR	28.3238	76.911	25	248495	6212386	62.12
563	ANR	28.3352	76.9911	10	248495	2484955	24.85
564	ANR	28.33	76.9881	30	248495	7454864	74.55
565	ANR	28.3408	76.9913	10	248495	2484955	24.85
566	ANR	28.3421	76.9895	10	248495	2484955	24.85
567	AFFORESTATION	28.2654	77.0318	40	386432	15457278	154.57
568	ANR	28.2675	77.035	10	248495	2484955	24.85
569	ANR	28.2714	77.031	18	248495	4472918	44.73

570	ANR	28.2697	77.0421	44	248495	10933800	109.34
571	Silvi Pasture	28.2765	77.0401	15	386432	5796479	57.96
572	ANR	28.276	77.025	25	248495	6212386	62.12
573	AFFORESTATION	28.2812	77.0209	40	386432	15457278	154.57
574	AFFORESTATION	28.3063	77.0016	10	386432	3864319	38.64
575	AFFORESTATION	28.2993	76.9955	5	386432	1932160	19.32
576	ANR	28.3022	76.9926	5	248495	1242477	12.42
577	ANR	28.305	76.9963	20	248495	4969909	49.70
578	ANR	28.3808	77.1167	10	248495	2484955	24.85
579	ANR	28.3829	77.1354	15	248495	3727432	37.27
580	ANR	28.3827	77.1294	10	248495	2484955	24.85
581	ANR	28.3822	77.132	10	248495	2484955	24.85
582	AFFORESTATION	28.3773	77.1285	60	386432	23185916	231.86
583	ANR	28.3914	77.1298	5	248495	1242477	12.42
584	ANR	28.3886	77.1267	5	248495	1242477	12.42
585	ANR	28.3883	77.1291	10	248495	2484955	24.85
586	ANR	28.3855	77.1264	5	248495	1242477	12.42
587	ANR	28.3962	77.1257	10	248495	2484955	24.85
588	ANR	28.3943	77.1218	5	248495	1242477	12.42
589	ANR	28.3878	77.1225	5	248495	1242477	12.42
590	Silvi Pasture	28.4003	77.1142	5	386432	1932160	19.32
591	ANR	28.267	77.0188	5	248495	1242477	12.42
592	AFFORESTATION	28.2702	77.0233	7	386432	2705024	27.05
593	ANR	28.2949	77.0112	10	248495	2484955	24.85
594	ANR	28.2989	77.0069	20	248495	4969909	49.70
595	ANR	28.2971	77.0107	5	248495	1242477	12.42
596	Silvi Pasture	28.303	77.0091	10	386432	3864319	38.64
597	ANR	28.2994	77.0103	10	248495	2484955	24.85
598	ANR	28.2565	77.0412	5	248495	1242477	12.42
599	ANR	28.3804	77.1143	5	248495	1242477	12.42
600	ANR	28.3782	77.1184	5	248495	1242477	12.42
601	ANR	28.3123	77.1405	10	248495	2484955	24.85
602	ANR	28.3108	77.1388	10	248495	2484955	24.85
603	ANR	28.3193	77.1431	5	248495	1242477	12.42
604	ANR	28.3195	77.1396	5	248495	1242477	12.42
605	ANR	28.3303	77.1417	30	248495	7454864	74.55
606	ANR	28.3233	77.1341	10	248495	2484955	24.85
607	ANR	28.3267	77.1536	5	248495	1242477	12.42
608	ANR	28.3217	77.1518	5	248495	1242477	12.42
609	ANR	28.3197	77.1517	5	248495	1242477	12.42
610	ANR	28.3725	77.1429	10	248495	2484955	24.85

611	ANR	28.3641	77.1169	5	248495	1242477	12.42
612	Silvi Pasture	28.3641	77.1049	30	386432	11592958	115.93
613	ANR	28.2723	77.1429	5	248495	1242477	12.42
614	ANR	28.3677	77.1297	5	248495	1242477	12.42
615	ANR	28.3257	77.1396	30	248495	7454864	74.55
616	ANR	28.3154	77.1434	5	248495	1242477	12.42
617	ANR	28.2979	77.1497	20	248495	4969909	49.70
618	ANR	28.3003	77.1563	5	248495	1242477	12.42
619	ANR	28.2997	77.1533	20	248495	4969909	49.70
620	ANR	28.294	77.157	10	248495	2484955	24.85
621	ANR	28.2913	77.1518	5	248495	1242477	12.42
622	ANR	28.3629	77.1302	10	248495	2484955	24.85
623	ANR	28.3409	77.1152	25	248495	6212386	62.12
624	ANR	28.2835	77.1537	5	248495	1242477	12.42
625	ANR	28.2815	77.1552	5	248495	1242477	12.42
626	ANR	28.2775	77.1527	5	248495	1242477	12.42
627	ANR	28.3069	77.156	5	248495	1242477	12.42
628	AFFORESTATION	28.3125	77.1599	15	386432	5796479	57.96
629	ANR	28.303	77.1492	5	248495	1242477	12.42
630	ANR	28.3038	77.1454	5	248495	1242477	12.42
631	ANR	28.3071	77.1456	5	248495	1242477	12.42
632	ANR	28.375	77.1387	30	248495	7454864	74.55
633	ANR	28.3841	77.1265	5	248495	1242477	12.42
634	ANR	28.3523	77.1109	10	248495	2484955	24.85
635	ANR	28.358	77.1211	5	248495	1242477	12.42
636	ANR	28.3087	77.1514	30	248495	7454864	74.55
637	AFFORESTATION	28.3199	76.9552	15	386432	5796479	57.96
638	Silvi Pasture	28.3262	76.9608	5	386432	1932160	19.32
639	ANR	28.3297	76.9755	10	248495	2484955	24.85
640	ANR	28.3298	76.9815	20	248495	4969909	49.70
641	ANR	28.3193	77.1318	10	248495	2484955	24.85
642	ANR	28.3239	77.1177	10	248495	2484955	24.85
643	ANR	28.3277	76.9317	20	248495	4969909	49.70
644	Silvi Pasture	28.2486	77.0495	5	386432	1932160	19.32
645	AFFORESTATION	28.3909	77.1227	10	386432	3864319	38.64
646	ANR	28.3165	77.13	45	248495	11182295	111.82

Chapter V-Abstract of Cost

S.No.	Activity	Unit	No of unit/ Area	Cost (in Rs)	Cost (in lacs)
A) WHS					
1	Anicut	No	45.00	50719390.00	507.19
2	ECD	No	97.00	416567.06	4.17
3	GABION	No	74.00	8785923.00	87.86
4	LSCD	No	30.00	504060.00	5.04
5	MPT	No	157.00	5005264.90	50.05
6	Pond	No	86.00	5759420.00	57.59
7	PT		62.00	3603863.00	36.04
	SubTotal A		**551**	**74794487.96**	**747.9448796**
	B) Plantation				
	Activity	**No of sites**	**Area in ha**	**Cost (in Rs)**	**Cost (in lacs)**
8	Afforestation	11	317	122498925.3	1224.989253
9	ANR	77	1075	267132611.8	2671.326118
10	Silvi pasture	7	85	32846714.99	328.4671499
SubTotal B		**95**	**1477**	**422478252.1**	**4224.78**
Grand Total(A+B)		**646**		**497272740.02**	**4972.73**

Chapter 6
Design and Estimates

Detailed Estimate for Construction of Gabion Structure

Dimension for Construction & Costing of Gabion Structure

S.no	Particulars	Measurement	unit
1	Length of Head Wall	10.0	meters
2	Height of Head Wall	1.5	meters
3	Top Width of Head Wall	1.0	meters
4	Bottom Width of Head Wall	2.4	meters
5	Width of Apron	2.5	meters
6	Thickness of Apron	0.6	meters
7	Length of Side Wall	4.9	meters
8	Height of Side Wall	2.5	meters
9	Thickness of Side Wall	1.0	meters
10	Length of Key Wall	2.0	meters
11	Total Length of Structure	16.0	meters
12	Steps (V:H)	0.625 :1	

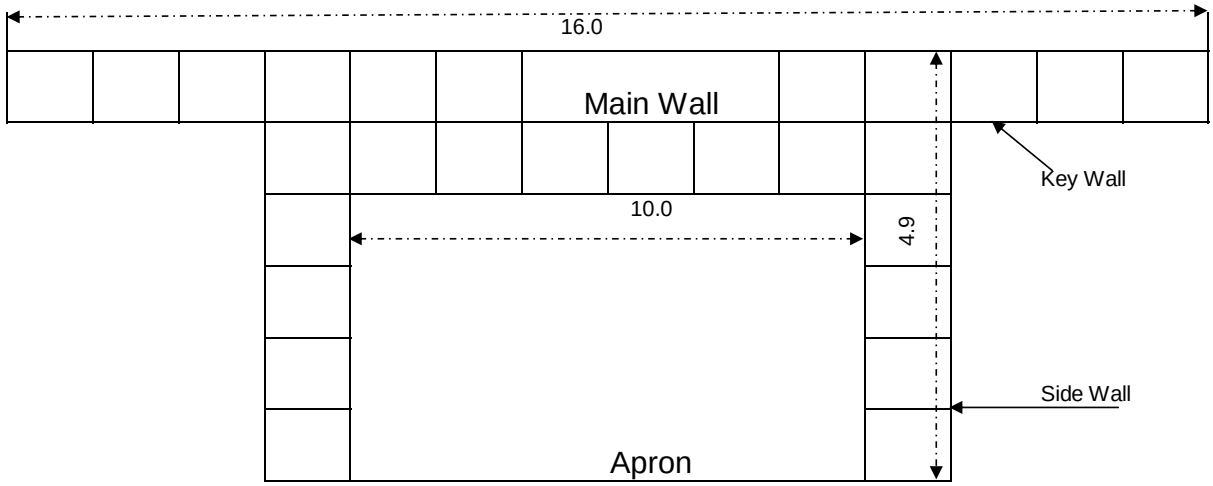
Summary : cost of structure

Total cost of structure in Rs.	**145082**

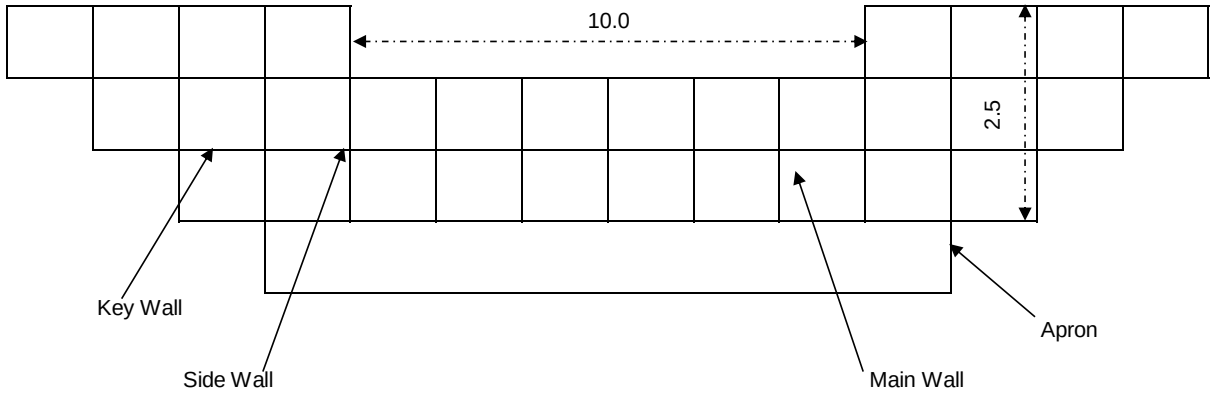
BoQ for Gabion Structure

#REF! #REF!

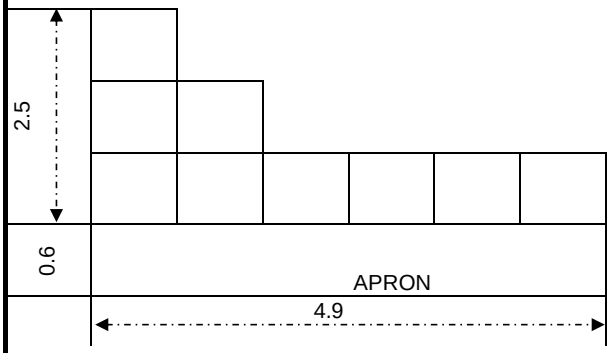
Detail Drawing of Gabion Structure



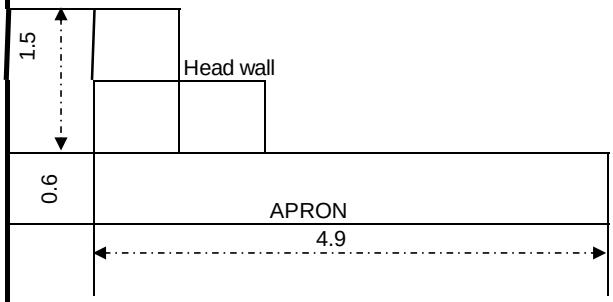
Plan view of Gabian Structure



Longitudnal section of Gabion



Cross section of side wall



Cross section of main wall

Notes :- All Dimension Are in Metres

Not to Scale

BoQ for Gabion Structure

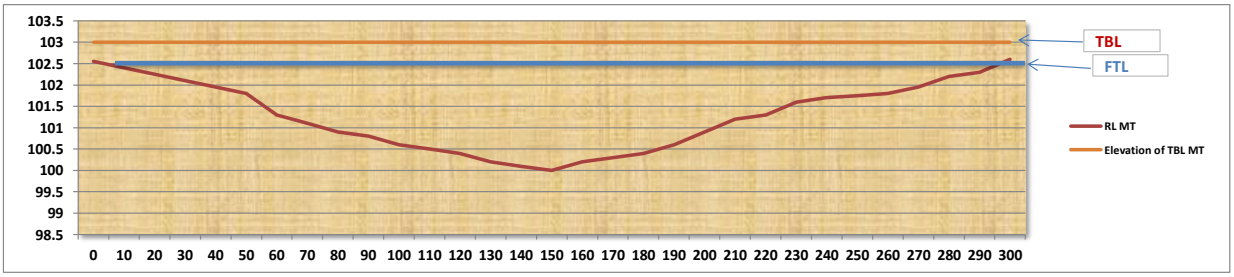
Quantity & Cost Estimation of Gabion Structure							
S.no	**Particular**	**No.**	**Length**	**Width**	**H/D/T**	**Quantity**	**Unit**
0101	Cleaning of work site and heaping and transportation etc.	1	16.0	10.0		160.00	Sqm
317	Marking and Layout of Site						
(d)	Single line spade marking up to 75cm deep	3	26.0			78.00	Sqm
1	**Excavation**						
1.1	Below head wall and for Apron in H.S.	1	12.0	4.9	0.6	35.3	
1.2	For Key in H.S.	2	2.0	1.0	1.54	6.1	
	Total Excavation					41.42	Cum.
2	**Construction**						
2.1	Head Wall	1	10.0	1.7	1.5	25.5	
2.2	Below head wall and for Apron in H.S.	1	12	4.9	0.6	35.28	
2.3	Key Wall	2	2.0	1.0	1.54	6.1	
2.4	Side Wall	2	4.9	1	1.7	16.66	
2.5	Side Wall next step	2	2.0	1	1	4	
	Quantity of boulder					87.58	Cum.

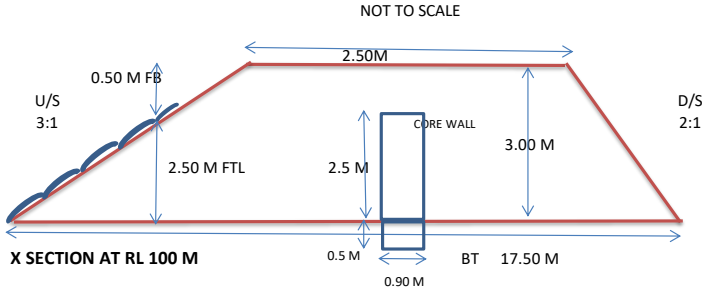
Detailed Estimate for Construction of Gabion Structure

							Length	**10**		
							Height	**1.5**		
S.No.	**SOR item no.**	**Work Discription**	**No**	**Length**	**Width**	**Height**	**Quantity**	**Unit**	**Rate**	**Amount**
1	2	3	4	5	6	7	8	9	10	11
1	sor 2021 item no 4.1	Clearing jungle land including uprooting rank vegetation, grass, bushes, shrubs, saplings and trees girth up to 30 cm, measured at a height of 1 m above ground leveland removal of rubbish up to a distance of50 m outside theperiphery of the area cleared	1	16.00	10.00	-	160.00	SQM	7.00	1120
2	PCCF PANCHKULA BSR 2017 ITEM 3.12 a	Construction ridges / digging of trenches/pits by hired JCB / mechanical with manual breaking og clods and dressing in medium soil		12.00	4.90	0.60	35.28			
				2.00	1.00	1.54	6.14			
				Total			41.42	CUM	100.00	4142.04
3	**SOR 2021, 16.38.2**	wire crates of mesh size 1.20 m x 1.2m from all directions of GI wire filled with boulders with square cut faces against the wire . 4mm dia. GI wire,15 cmx 15cm mesh (diagonal wise)	1.000				87.58	CUM	1564.00	136975.67
			Total					Rs		**142237.7**
		Add extra	Work charge Contigency @2%							2844.75
		Amount for 1 structure						**Rs**		**145082.46**
								Per Running Meter		**9067.65**

Name of work:-Construction of Percolation Tank 300 M (PT)

chainage	RL	Elevation of TBL	HT	TW	BW	C/S	AV C/S	E/W	BENCHING BASE	depth of cut of trench	AV.DEPTH	E/W FOR CUT OFF TRENCH	HT.OF CORE WALL	av ht	e/w for core wall	Area for Dressing of embankment	Ht upto which Rip Rap Pitchintg propose	Area of slant surface on u/s of embankment for Rip Rap
RMT	MT	MT	MT	MT	MT	MT2	MT2	CUM	CUM	MT	MT	CUM		MT	CUM	MT^2		MT^2
0	102.55	103	0.45	2.50	4.75	1.63	0.00	0.00		0.5								
10	102.4	103	0.6	2.50	5.50	2.40	2.02	20.16	11.79	0.5	0.5	4.50	0.1	0.05	0.45	53.34	0.33	5.22
20	102.25	103	0.75	2.50	6.25	3.28	2.84	28.41	13.51	0.5	0.5	4.50	0.25	0.175	1.57	61.44	0.48	12.81
30	102.1	103	0.9	2.50	7.00	4.28	3.78	37.78	15.24	0.5	0.5	4.50	0.4	0.325	2.93	69.54	0.63	17.55
40	101.95	103	1.05	2.50	7.75	5.38	4.83	48.28	16.96	0.5	0.5	4.50	0.55	0.475	4.28	77.63	0.78	22.29
50	101.8	103	1.2	2.50	8.50	6.60	5.99	59.91	18.69	0.5	0.5	4.50	0.7	0.625	5.63	85.73	0.93	27.04
60	101.3	103	1.7	2.50	11.00	11.48	9.04	90.38	22.43	0.5	0.5	4.50	1.2	0.95	8.55	103.28	1.43	37.31
70	101.1	103	1.9	2.50	12.00	13.78	12.63	126.25	26.45	0.5	0.5	4.50	1.4	1.3	11.70	122.17	1.63	48.38
80	100.9	103	2.1	2.50	13.00	16.27	15.03	150.25	28.75	0.5	0.5	4.50	1.6	1.5	13.50	132.97	1.83	54.71
90	100.8	103	2.2	2.50	13.50	17.60	16.94	169.38	30.48	0.5	0.5	4.50	1.7	1.65	14.85	141.06	1.93	59.45
100	100.6	103	2.4	2.50	14.50	20.40	19.00	190.00	32.20	0.5	0.5	4.50	1.9	1.8	16.20	149.16	2.13	64.19
110	100.5	103	2.5	2.50	15.00	21.88	21.14	211.38	33.93	0.5	0.5	4.50	2	1.95	17.55	157.26	2.23	68.94
120	100.4	103	2.6	2.50	15.50	23.40	22.64	226.38	35.08	0.5	0.5	4.50	2.1	2.05	18.45	162.66	2.33	72.10
130	100.2	103	2.8	2.50	16.50	26.60	25.00	250.00	36.80	0.5	0.5	4.50	2.3	2.2	19.80	170.76	2.53	76.84
140	100.1	103	2.9	2.50	17.00	28.28	27.44	274.38	38.53	0.5	0.5	4.50	2.4	2.35	21.15	178.85	2.63	81.59
150	100	103	3	2.50	17.50	30.00	29.14	291.38	39.68	0.5	0.5	4.50	2.5	2.45	22.05	184.25	2.73	84.75
160	100.2	103	2.8	2.50	16.50	26.60	28.30	283.00	39.10	0.5	0.5	4.50	2.3	2.4	21.60	181.55	2.53	83.17
170	100.3	103	2.7	2.50	16.00	24.98	25.79	257.88	37.38	0.5	0.5	4.50	2.2	2.25	20.25	173.45	2.43	78.42
180	100.4	103	2.6	2.50	15.50	23.40	24.19	241.88	36.23	0.5	0.5	4.50	2.1	2.15	19.35	168.06	2.33	75.26
190	100.6	103	2.4	2.50	14.50	20.40	21.90	219.00	34.50	0.5	0.5	4.50	1.9	2	18.00	159.96	2.13	70.52
200	100.9	103	2.1	2.50	13.00	16.27	18.34	183.38	31.63	0.5	0.5	4.50	1.6	1.75	15.75	146.46	1.83	62.61
210	101.2	103	1.8	2.50	11.50	12.60	14.44	144.37	28.18	0.5	0.5	4.50	1.3	1.45	13.05	130.27	1.53	53.13
220	101.3	103	1.7	2.50	11.00	11.48	12.04	120.38	25.88	0.5	0.5	4.50	1.2	1.25	11.25	119.47	1.43	46.80
230	101.6	103	1.4	2.50	9.50	8.40	9.94	99.38	23.58	0.5	0.5	4.50	0.9	1.05	9.45	108.67	1.13	40.48
240	101.7	103	1.3	2.50	9.00	7.47	7.94	79.38	21.28	0.5	0.5	4.50	0.8	0.85	7.65	97.88	1.03	34.15
250	101.75	103	1.25	2.50	8.75	7.03	7.25	72.53	20.41	0.5	0.5	4.50	0.75	0.775	6.97	93.83	0.98	31.78
260	101.8	103	1.2	2.50	8.50	6.60	6.82	68.16	19.84	0.5	0.5	4.50	0.7	0.725	6.53	91.13	0.93	30.20
270	101.95	103	1.05	2.50	7.75	5.38	5.99	59.91	18.69	0.5	0.5	4.50	0.55	0.625	5.63	85.73	0.78	27.04
280	102.2	103	0.8	2.50	6.50	3.60	4.49	44.91	16.39	0.5	0.5	4.50	0.3	0.425	3.82	74.93	0.53	20.71
290	102.3	103	0.7	2.50	6.00	2.98	3.29	32.88	14.38	0.5	0.5	4.50	0.2	0.25	2.25	65.49	0.43	15.18
300	102.6	103	0.4	2.50	4.50	1.40	2.19	21.88	12.08	0.5	0.5	4.50	-0.1	0.05	0.45	54.69	0.13	8.85
							TOTAL	4103.156	779.9875			135			340.65	3601.68		1411.48





Detailed Estimate for Construction of Percolation Tank (PT)

	(A) Earthen Embankment							Length	300
ITEM CODE	**Details**	**Unit**	**No.**	**Length**	**Bredth**	**Depth/ Height**	**Qty.**	**Rate**	**Amount**
PCCF PANCHKULA BSR 2017 ITEM 2.1 a	Collectionand removal of grass	100Sq M	1	300.00	15.00		4500.00	38.22	1719.90
PCCF PANCHKULA BSR 2017 ITEM 3.12 a	Construction ridges / digging of trenches/pits by hired JCB / mechanical with manual breaking og clods and dressing in medium soil	Cu M	1	Qty as per Table			779.99	100.00	77998.75
PCCF PANCHKULA BSR 2017 ITEM 3.12 a	Construction ridges / digging of trenches/pits by hired JCB / mechanical with manual breaking og clods and dressing in medium soil	Cu M	1	Qty as per Table			135.00	100.00	13500.00
PWD HARYANA SCHEDULE RATE item 4.8.1	Earth work in rough excavation, banking excavated earth in layers not exceeding 20cm in depth, breaking clods, watering, rolling each layer with ½ tonne roller or wooden or steel rammers, and rolling every 3rd and top-most layer with power roller of minimum 8 tonnes and dressing up in embankments for roads, flood banks, marginal banks and guide banks or filling up ground depressions, lead up to 50 m and lift up to 1.5 m 4.8.1 All kinds of soil cum	Cu M	1	Qty as per Table			4103.16	158.00	648298.69
						Total			**741517.34**
						Contengency @2%			**14830.35**
						Grand Total			**756350**
									2521
									per rm

Detailed Estimate for Construction of Percolation Tank 300 M (PT)

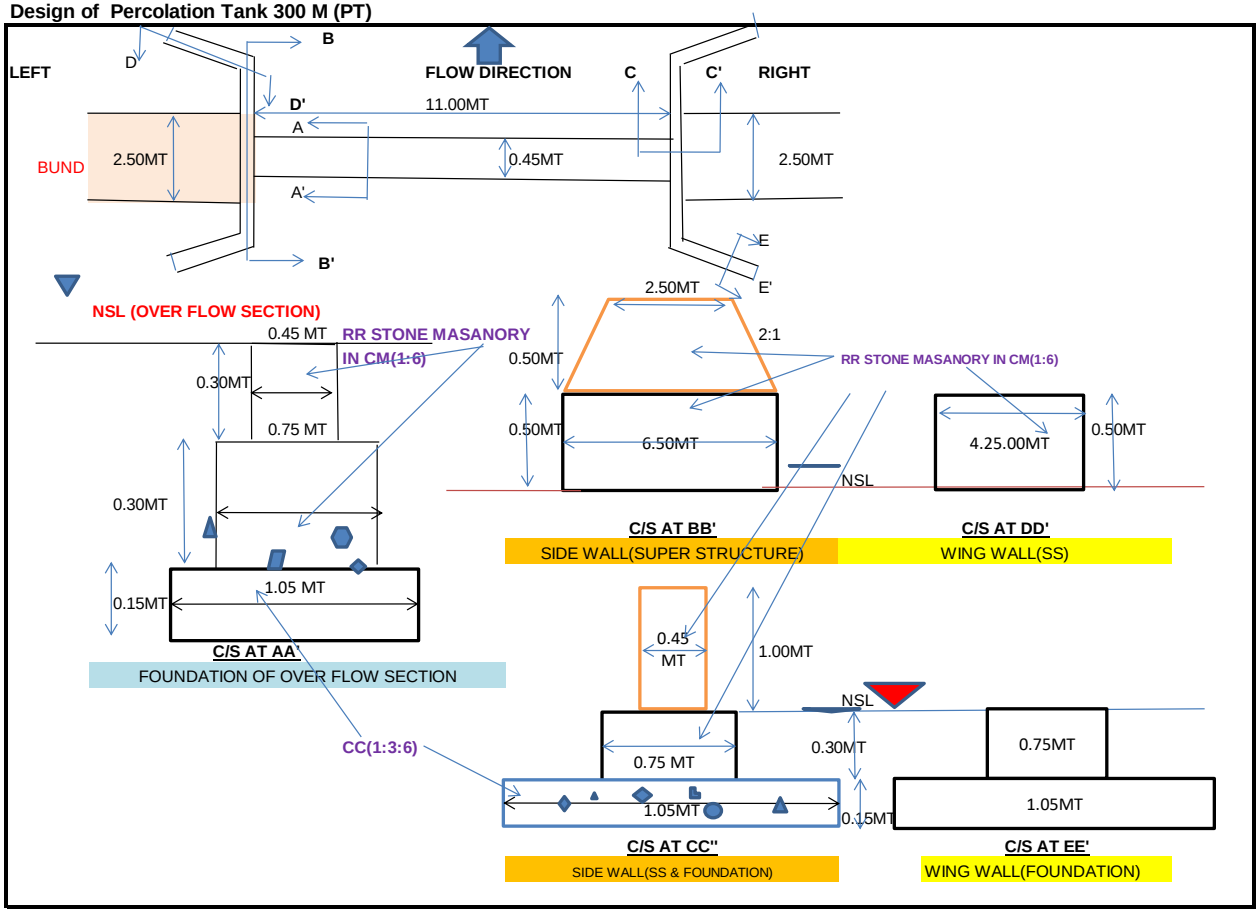
Model Estimate

Name of Work : Construction of waste weir

DETAILED ESTIMATE

S. No.	Particular	No.	Length	Width	H / D	Qty.	unit
1	**Excavation for foundation**						
A	HEAD WALL (over flow sec.)	1	11.00	1.05	0.75	8.66	cu.m
B	SIDE WALL						
	LEFT	1	6.50	1.05	0.45	3.07	cu.m
	RIGHT	1	6.50	1.05	0.45	3.07	cu.m
C	WING WALL						
	LEFT	2	4.25	1.05	0.45	4.02	cu.m
	RIGHT	2	4.25	1.05	0.45	4.02	cu.m
		Total Item :- 1 =				**22.84**	cu.m
2	**C .C . (1 :3 :6) in foundation**						
A	HEAD WALL (over flow sec.)	1	11.00	1.05	0.15	1.73	cu.m
B	SIDE WALL	2	6.50	1.05	0.15	2.05	cu.m
C	WING WALL	4	4.25	1.05	0.15	2.68	cu.m
		Total Item :- 2 =				**6.46**	
3	**R.R.Stone Masonry in cement sand mortar (1:6) in foundation**						
A	HEAD WALL (over flow sec.)						
	IST STEP	1	11.00	0.45	0.30	1.49	cu.m
	II ND STEP	1	11.00	0.75	0.30	2.48	cu.m
B	SIDE WALL(RT &LT)	2	6.50	0.75	0.30	2.93	cu.m
C	WING WALL(RT &LT)	4	4.25	0.75	0.30	3.83	cu.m
		Total Item :- 3 =				**10.71**	
4	**R.R.Stone Masonryin CM (1:6) for super structure above NSL**						
A	SIDE WALL(RT &LT)						
a	LOWER HALF(.50 MT HT)	2	6.50	0.45	0.50	2.93	cu.m
b	UPPER HALF(.50 MT HT)	2	4.50	0.45	0.50	2.03	cu.m
B	WING WALL(RT &LT)	4	4.25	0.45	0.50	3.83	cu.m
		Total Item :- 4 =				**8.78**	
5	**50mm C.C.Coping in (1:2:4)**						
A	HEAD WALL (over flow sec.)	1	11.00	0.45		4.95	
B	SIDE WALL(RT &LT)	2	4.74	0.45		4.26	
C	WING WALL(RT &LT)	4	4.25	0.45		7.65	
		Total Item :- 5 =				**16.86**	**Sqm**
6	**20mmThk Cement Plaster in CM(1:3)**						
A	SIDE WALL(RT &LT)						
a	LOWER HALF(.50 MT HT)	2	6.50		0.50	6.50	
b	UPPER HALF(.50 MT HT)	2	4.50		0.50	4.50	
B	WING WALL(RT &LT)	4	4.25		0.50	8.50	
		Total Item :- 6 =				**19.50**	**Sqm**

Design of Percolation Tank 300 M (PT)



	Detailed Estimate for Construction of Percolation Tank 300 M (PT)				
Modal Estimate					
Name of Work : (B) Construction of waste weir					
BSR item no.	Particular	unit	Qty	Rate	Amount
PCCF PANCHKULA BSR 2017 ITEM 3.12 a	Construction ridges / digging of trenches/pits by hired JCB / mechanical with manual breaking og clods and dressing in medium soil	Cum	22.84	100.00	2283.8
PWD HARYANA SCHEDULE RATE item 6.1.6	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work below plinth level and up to Floor IV level:1 : 3: 6(1 Cement: 3 coarse sand (zone-lll) : 6 cum graded stone aggregate 40 mm nominal size)	Cum	6.46	2735	17661.3
PWD HARYANA SCHEDULE RATE item 7.83.1	Random rubble masonry with hard stone in foundation and plinth including levelling up with cement concrete 1 :6: 12 (1 cement : 6 coarse sand : 12 graded stone aggregate 20 mm nominal size) up to plinth level with : Cement mortar 1 :6 (1 cement : 6 coarse sand)	Cum	10.71	3287	35203.8
PWD HARYANA SCHEDULE RATE item 7.83.2	Random rubble masonry with hard stone in foundation and plinth including levelling up with cement concrete 1 :6: 12 (1 cement : 6 coarse sand : 12 graded stone aggregate 20 mm nominal size) up to plinth level with : Cement mortar 1 :6 (1 cement : 6 coarse sand)	Cum	8.78	3287	28843.4
PWD HARYANA SCHEDULE RATE item 6.1.2	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work below plinth level and up to Floor IV level:1 : 2:4(1 Cement: 2 coarse sand (zone-lll) : 4 cum graded stone aggregate	Cum	0.84	3892	3281.0
PWD HARYANA SCHEDULE RATE item 11.13.2	CEMENT PLASTER WITH A FLOATING COAT OF NEAT CEMENT 20mm 1:3 (1 cement: 3 fine sand)	sqm	19.50	203	3958.5
				Total	91231.7
	Contengency @2%				**1824.6**
	Grand Total				**93060.00**

Abstract of Percolation Tank

S.No.	Detail	Length	Cost (Rs/-)	Per meter cost
1	(A) Embankment	300.00	756350	
2	(B) Waste Weir	11.00	93060	
3	Total	-	849410	2831

Detailed Estimate for Construction of Check Dam(anicut)

	:-		
Input Data			
Catchment Area M	:-	**2.5**	Sq. KM
Crest Length of Anicut L	:-	**50**	Meters
Nallah Depth	:-	**2.5**	Meters
Depth of foundation	:-	**2**	Meters
Head Wall exten. Length L	:-	**3.5**	Meters
Head Wall exten. Length R	:-	**3.5**	Meters
Head Wall exten. Foundtion	:-	**2**	Meters
Side Wall	:-	**2**	No's
Side Wall	:-	**0**	No's
Wing Wall	:-	**0**	No's
Head wall Extension	:-	**2**	No's
discharge (Q)	:-	**38.12**	

DETAILED ESTIMATES

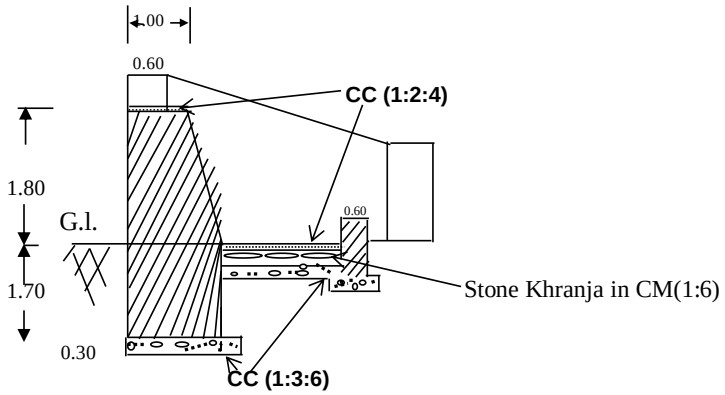
S.No.	Particulars	No	L	B	H	Qty	Unit
1	Excavation in all kinds of soil including boulders upto 0.30 m dia. For foundations of canal cross drainage and other appurtenant structures and placing the excavated stuff neatly in specified dump area or disposing off the same as directed etc., complete with initial lead upto 50 m and initial lift upto 3 m						
a.	Head wall	1	50.3	3.15	2	316.89	Cum
b.	Side wall	2	2.45	1.6	2.4	18.82	Cum
c.	Wing walls	0	1.75	1.3	2.4	0.00	Cum
d.	Head wall extention	2	7	2.75	2	77.00	Cum
e.	Toe wall	1	49.7	0.9	0.9	40.26	Cum
f.	Apron	1	49.7	2.3	0.7	80.02	Cum
						532.98	Cum
1	in all kind of soil	20				319.79	Cum
2	In ordainary rock (%)	40				106.60	Cum
3	in hard rock(%)	40				106.60	Cum
2	Providing and laying insitu vibrated M-10 (28 days cube compressive strength not less than10 N / sq mm) grade cement concrete using 40 mm down size approved, clean, hard, graded aggregates for foundation filling including cost of all materials, machinery, labour, formwork, cleaning, batching, mixing, placing in position, levelling, vibrating, finishing, curing etc.,complete with initial lead upto 50 m and all lifts. (Cement content: 220 kg / cum with use of super plasticiser(0.4% by wt. of cement),						
	Head wall	1	50.3	2.7	0.3	40.74	Cum
	Side wall	2	2.6	1.6	0.3	2.50	Cum
	Wing Wall	0	1.75	1.3	0.3	0.00	Cum
	Head wall ext.	2	7	2.3	0.3	9.66	cum
	Toe Wall	1	49.7	0.9	0.3	13.42	Cum
	Apron	1	50	2.6	0.15	19.50	Cum
		1	50	2.6	0.15	19.50	Cum
						85.82	Cum
3	Stone kharanja in cement mortar (1:6) including curing etc. complete.						
	For bed	1	50	2.6		130.00	Cum

4	Providing and laying insitu vibrated M-20 (28 days cube compressive strength not less than 10 N / sq mm) grade cement concrete using 40 mm down size approved, clean, hard, graded aggregates for piers and abutments including cost of all materials, labour, machinery, formwork, cleaning, batching, mixing, placing in position, levelling, vibrating, finishing, curing etc., complete with initial lead upto 50 m and all lifts. (Cement content: 220 kg / cum with use of super plasticiser(0.4% by wt. of cement),CA : 0.90cum, Blending Ratio of CA--50:30:20, FA :0.40						
	Head wall	1	50	2.4	1.7	204.00	Cum
	Side Wall	2	2.6	1.3	2.1	14.20	Cum
	Wing wall	0	1.6	1	2.1	0.00	Cum
	Head wall Extension	2	7	2	1.7	47.60	Cum
	Toe wall	1	50	0.6	0.6	18.00	Cum
						283.80	Cum
5	Providing and laying insitu vibrated M-20 (28 days cube compressive strength not less than 10 N / sq mm) grade cement concrete using 40 mm down size approved, clean, hard, graded aggregates for piers and abutments including cost of all materials, labour, machinery, formwork, cleaning, batching, mixing, placing in position, levelling, vibrating, finishing, curing etc., complete with initial lead upto 50 m and all lifts. (Cement content: 220 kg / cum with use of super plasticiser(0.4% by wt. of cement),CA :						
	Head wall	1	50	1.7	1.7	144.50	Cum
	Side Wall	2	0.5	1.1	2.4	2.64	Cum
		2	3	0.95	1.675	9.55	Cum
	Wing wall	0	1.6	0.8	1	0.00	Cum
	Head wall Extension	2	7	1.5	2.4	50.40	Cum
	Toe wall	1	50	0.6	0.35	10.50	Cum
						217.59	Cum
7	Providing 20 mm thick plastering in cement mortar 1:4 proportion by volume including cost of all materials, machinery, labour, scaffolding, cleaning joints, smooth finishing, curing etc.,complete with initial lead upto 50 m and all lifts.						
	Head wall	1	50	1.8		90.00	Sqm
	On side slop	1	50	2.3		115.00	Sqm
	Side wall	2	0.2	2.5		1.00	Sqm
		2	2.6	1.8		9.36	Sqm
	On slide slope	2	0.2	2.7		1.08	Sqm
		2	2.6	1.9		9.88	Sqm
	Wing wall	0	1.6	1.1		0.00	Sqm
		0	1.6	1.2		0.00	Sqm
	Head wall extension L	2	3.5	2.5		17.50	Sqm
	Head wall extension R	2	3.5	2.7		18.90	Sqm

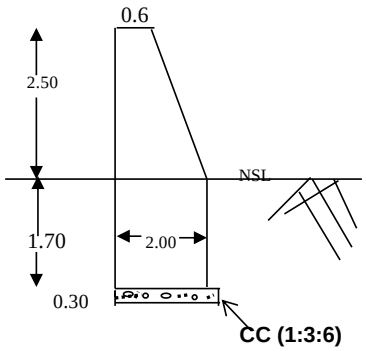
	Toe wall	2	50	0.45		45.00	Sqm
						307.72	Sqm
8	Dewatering / approch road etc.	LS					
9	Providing hearting embankment using selected impervious soil from approved borrow areas in layers of 25 to 30 cm before compaction including cost of all materials, machinery, labour, all operations such as excavation, sorting out, transportation, spreading soil in layer of specified 50 thickness, breaking clods, sectioning, watering, compacting to density control of not less than 95 percent or as stipulated using Sheep foot roller/ Vibratory roller/ 8 to 10 tonne power roller etc., complete with initial lead upto 1 km and all lifts.	1	3.5	2.5	1.25	10.9375	
10	Providing and constructing 225 mm thick dry rubble stone pitching including cost of all materials, labour, hand packing, finishing etc., complete (rubble stones : 0.2475 cum/sqm)	1	3.5	2.5		8.75	

DESIGN OF Concrete Anicut

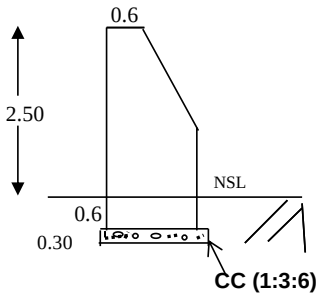
CROSS SECTIONS OF DIFFERENT COMPONENTS



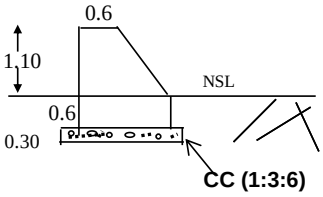
cut of Section of anicut (Head Wall ,Appron & Toe Wall)



C/S OF HEAD WALL EXTENTION



C/S OF SIDE WALL At HWExt Juct.

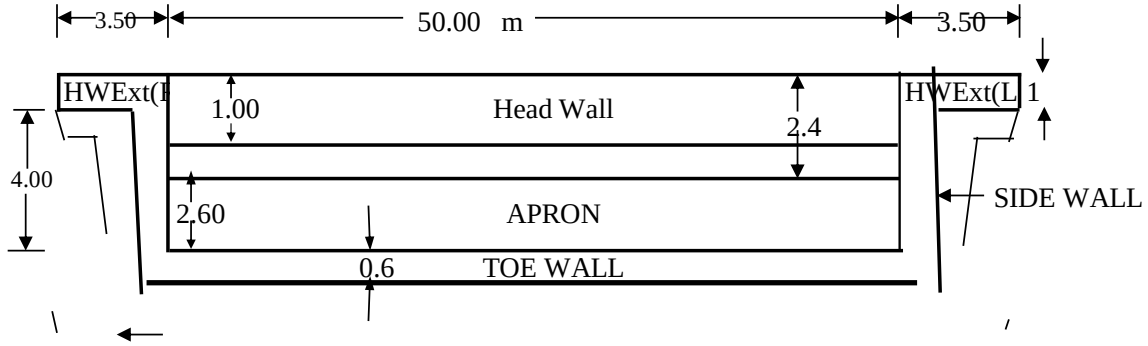


C/S OF WING WALL At.S.W. Juct.

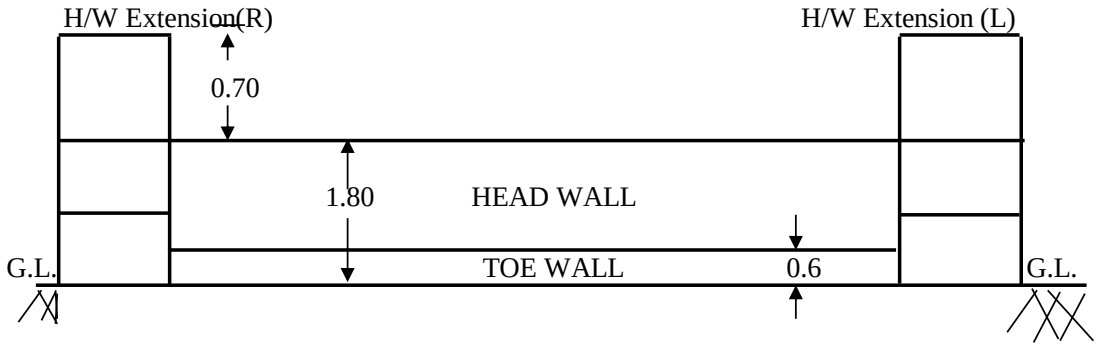
Not to the Scale

All Dimension in Meter

DESIGN OF Masonry Anicut



PLAN



DOWN STREAM ELEVATION

MATERIAL CONSUMPTION

DESIGN OF Concrete Anicut

S.No.	ITEM	QTY.	Cement	Sand	Stone	Agg.	
						40mm	20mm
1	Cement concrate (1:3:6)	85.82	386.18	36.90		73.80	
2	Stone kharanja in CM(1:6)	130.00	67.60	26.00	130.00		
3	C.C.(1:2:4)	501.38	2928.08	205.57			411.13
4	20Mm thick cement plaster in CM(1:4)	307.72	68.93	9.85			
5	DRY Stone pitching	8.75			8.75		
	Total =>		3451.00	278.32	138.75	73.80	411.13

Detailed Estimate for Construction of Anicut

S.NO	BSR ITEM	ITEM	Unit	Qty.	Rate	Amount
1	IRR-DAW-1-1	Excavation in all kinds of soil including boulders upto 0.30 m dia. For foundations of canal cross drainage and other appurtenant structures and placing the excavated stuff neatly in specified dump area or disposing off the same as directed etc., complete with initial lead upto 50 m and initial lift upto 3 m	Cum	319.788	153	48927.56
2	IRR-DAW-1-2	Excavation for foundation in ordinary rock (including HDR) without blasting including boulders above 0.3 m upto 0.6 m dia for dam, spillway,intake structure and other appurtenant works and placing the excavated material neatly in dump area or disposing off the same as directed etc., complete with initial lead upto 1 km and all lifts.	Cum	106.596	201.5	21479.09
3	IRR-DAW-1-3	Excavation for foundation in ordinary rock (including FF) without blasting including boulders above 0.6m upto 1.2 m dia for dam, spillway,intake structure and other appurtenant works and placing the excavated material neatly in dump area or disposing off the same as directed etc., complete with initial lead upto 1 km and all lifts.	Cum	106.596	297.3	31690.99
4	IRR-DAW-2-5	Providing and **laying insitu vibrated M-10** (28 days cube compressive strength not less than10 N / sq mm) grade cement concrete using 40 mm down size approved, clean, hard, graded aggregates for foundation filling including cost of all materials, machinery, labour, formwork, cleaning, batching, mixing, placing in position, levelling, vibrating, finishing, curing etc.,complete with initial lead upto 50 m and all lifts. (Cement content: 220 kg / cum with use of super plasticiser(0.4% by wt. of cement),	Cum	85.818	4043.2	346979.34
5	IRR-DAW-2-6	strength not less than 10 N / sq mm) grade cement concrete using 40 mm down size approved, clean, hard, graded aggregates for piers and abutments including cost of all materials, labour, machinery, formwork, cleaning, batching, mixing, placing in position, levelling, vibrating, finishing, curing etc., complete with initial lead upto 50 m and all lifts. (Cement content: 220 kg / cum with use of super plasticiser(0.4% by wt. of cement),CA : 0.90cum, Blending Ratio of CA--50:30:20, FA :0.40 cum) If water is to be brought from other place add only lead charges @ 500 ltr / cum	Cum	501.384	5437.5	2726272.78
7	IRR-CCDW-4-10	Providing 20 mm thick plastering in cement mortar 1:4 proportion by volume including cost of all materials, machinery, labour, scaffolding, cleaning joints, smooth finishing, curing etc.,complete with initial lead upto 50 m and all lifts.		307.72	311.3	95793.24
8		DEWATERING	LS			20000.00
9	IRR-DAW-5-2	Providing hearting embankment using selected impervious soil from approved borrow areas in layers of 25 to 30 cm before compaction including cost of all materials, machinery, labour, all operations such as excavation, sorting out, transportation, spreading soil in layer of specified 50 thickness, breaking clods, sectioning, watering, compacting to density control of not less than 95 percent or as stipulated using Sheep foot roller/ Vibratory roller/ 8 to 10 tonne power roller etc., complete with initial lead upto 1 km and all lifts.	Cum	10.9375	171.50	1875.78
8	IRR-CAW-8-2-A	Providing and constructing 225 mm thick dry rubble stone pitching including cost of all materials, labour, hand packing, finishing etc., complete (rubble stones : 0.2475 cum/sqm)	sqm	8.75	249.40	2182.25
					Say Rs.(Lacs)	**3293018.8**
			Contengency @2%			**65860.4**
						3358879.2
					PER R/M	**67178**

Detailed Estimate for Construction of Mini Percolation Tank (MPT)

Design of Mini Percolation Tank (MPT)			
Input Data			
MPT Length		30	METER
Chain length		10	METER
Waste weir length		4	METER
Below the slope drain	1:	2	
Top Width of mpt		2.5	METER
Width for forest clearance		20	METER
Cut off trench depth		0.5	METER
Pitch in		0	0 for No and 1 for yes
Chainwise elevation of	chain	30	Height
	0	10	0
	10	10	0.75
	20	10	1.5
	30	10	2

Detailed Estimate for Construction of Mini Percolation Tank (MPT)

Details as per chainage													
Chainage	length of embackment	Height	up stream slope	Down stream slope	top width (meter)	bottom width (meter)	crossection (Sqm)	Avg. Cross section (Sqm)	Quantity of Striping (Cum)	quanty of earthwork in embackment	Area of slopes for dressing (Sqm)	Avg. Area of slopes for dressing (Sqm)	Area of dressing (Sqm)
Chainage - 0	0	0.00	2:1	2:1	2.50	0.00	0.00				1.25		
Chainage - 10	10	0.75	2:1	2:1	2.50	5.50	3.00	1.50	8.25	15.00	3.35	2.3	25.5
Chainage - 20	10	2.00	2:1	2:1	2.50	10.50	13.00	8.00	24.00	80.00	8.94	6.145	63.95
Chainage - 30	10	1.00	2:1	2:1	2.50	6.50	4.50	8.75	25.50	87.50	4.47	6.705	69.55
Total	30	1.25					20.5		57.75	182.5			159
Didact													
Qty. of Core Wall										6.9	meter		
Qty. of Earth work for embackment										175.6	meter		
Qty. of Clay soil (Black)										11.4	meter		
Core Wall													
Chaiage	Length of Core wall	Height of Core wall			width of Core wall		Crossection of Core wall	Avg. Crossection of Core wall		quanty of earthwork for core wall			
Chainage - 0	0	0.00			0.60		0.00						
Chainage - 10	10	0.00			0.60		0.00	0.00		0.00			
Chainage - 20	10	1.10			0.60		0.66	0.33		3.30			
Chainage - 30	10	0.10			0.60		0.06	0.36		3.60			
Total	**30**	**1.20**					**0.72**		**0.00**	**6.90**			
Cut of trench													
Chaiage	Length of Cut of Trench	Depth of Cut of Trench			top width of Cut of Trench	Bottom width of Cut of Trench	Crossection of Cut of Trench	Avg. Crossection of Cut of Trench		quanty of earthwork for Cut of Trench			
Chainage - 0	0	0.00			0.60	0.60	0.00						
Chainage - 10	10	0.00			0.60	0.60	0.00	0.00		0.00			
Chainage - 20	10	0.50			0.60	0.60	0.30	0.15		1.50			
Chainage - 30	10	0.50			0.60	0.60	0.30	0.30		3.00			
Total		**1.00**					**0.60**	**0.45**	**0.00**	**4.50**			

Detailed Estimate for Construction of Mini Percolation Tank (MPT)

Name of work:-Construction of Mini Percolation Tank(MPT)

Length of MPT -30 M

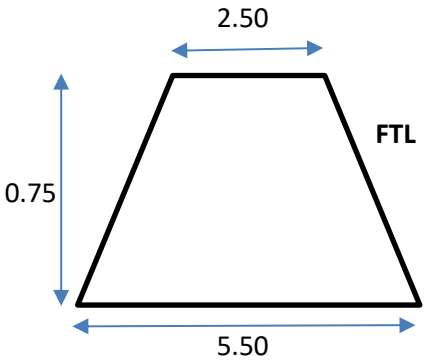
MPT Estimation

S. N	ITEM NO	Details	Unit	Number	Length	Breadth	Depth/ Height	Qty.	Rate	Amount
1	PCCF PANCHKULA BSR 2017 ITEM 2.1 a	collectionm and removal of grass	100Sq M	1	30.00	20.00		192.50	38.22	73.57
2	PCCF PANCHKULA BSR 2017 ITEM 3.12 a	Construction ridges / digging of trenches/pits by hired JCB / mechanical with manual breaking og clods and dressing in medium soil	Cu M	1	Qty as per chain			57.75	100.00	5775.00
3	PCCF PANCHKULA BSR 2017 ITEM 3.12 a	Construction ridges / digging of trenches/pits by hired JCB / mechanical with manual breaking og clods and dressing in medium soil	Cum	1	Qty as per chain			9.00	100.00	900.00
4	PCCF PANCHKULA BSR 2017 ITEM 3.12 a	Construction ridges / digging of trenches/pits by hired JCB / mechanical with manual breaking og clods and dressing in medium soil	Cum	1	Qty as per chain			15.90	100.00	1590.00
5	PWD HARYANA SCHEDULE RATE item 4.8.1	Earth work in rough excavation, banking excavated earth in layers not exceeding 20cm in depth, breaking clods, watering, rolling each layer with ½ tonne roller or wooden or steel rammers, and rolling every 3rd and top-most layer with power roller of minimum 8 tonnes and dressing up in embankments for roads, flood banks, marginal banks and guide banks or filling up ground depressions, lead up to 50 m and lift up to 1.5 m 4.8.1 All kinds of soil cum	Cum	1	Qty as per chain			175.60	158.00	27744.80
6	PWD HARYANA SCHEDULE RATE item 4.8.1	Construction ridges / digging of trenches/pits by hired JCB / mechanical with manual breaking og clods and dressing in medium soil	Cu M					75.00	100.00	7500.00
7	PWD HARYANA SCHEDULE RATE item 16.42.	16.42 Stone or kankar block pitching by mechanical/ mannual On slopes of guide banks and protection works	Cum					4.49	253.00	1134.71
	PWD HARYANA SCHEDULE RATE item B0152	Stone for pitching 15cmx22.5 cm	cum					4.49	600.00	2691.00
							Total			**47409.08**
							Contengency @2%			**948.18157**
							Grand Total			**48357.26**
							per m			**1612**

Design of Mini Percolation Tank (MPT)

30

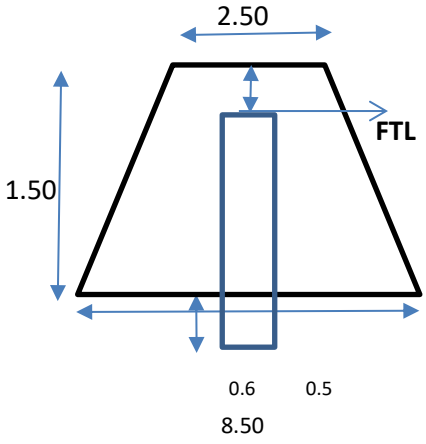
Chainage - 10.00



5.5 + 2.5 /2 x 0.75 = 3.00 Sqm

SLOPE= 2:1(both side)

Chainage - 20.00



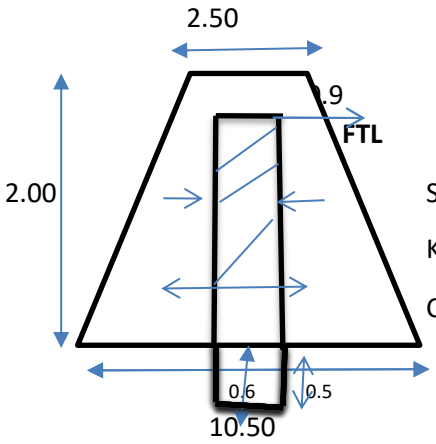
8.5 + 2.5 /2 x 1.50 = 8.25 Sqm

SLOPE= 2:1(both side)

Key Trench= 0.6 x 0.5 = 0.30 Sqm

CORE WALL= 0.6 x 1.50 = 0.90 Sqm

Chainage - 30.00



10.5 + 2.5 /2 x 2.00 = 13.00 Sqm

SLOPE= 2:1(both side)

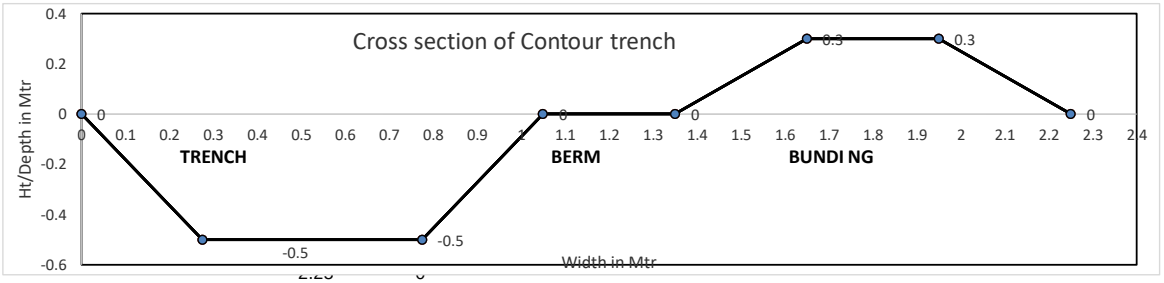
Key Trench= 0.6 x 0.5 = 0.30 Sqm

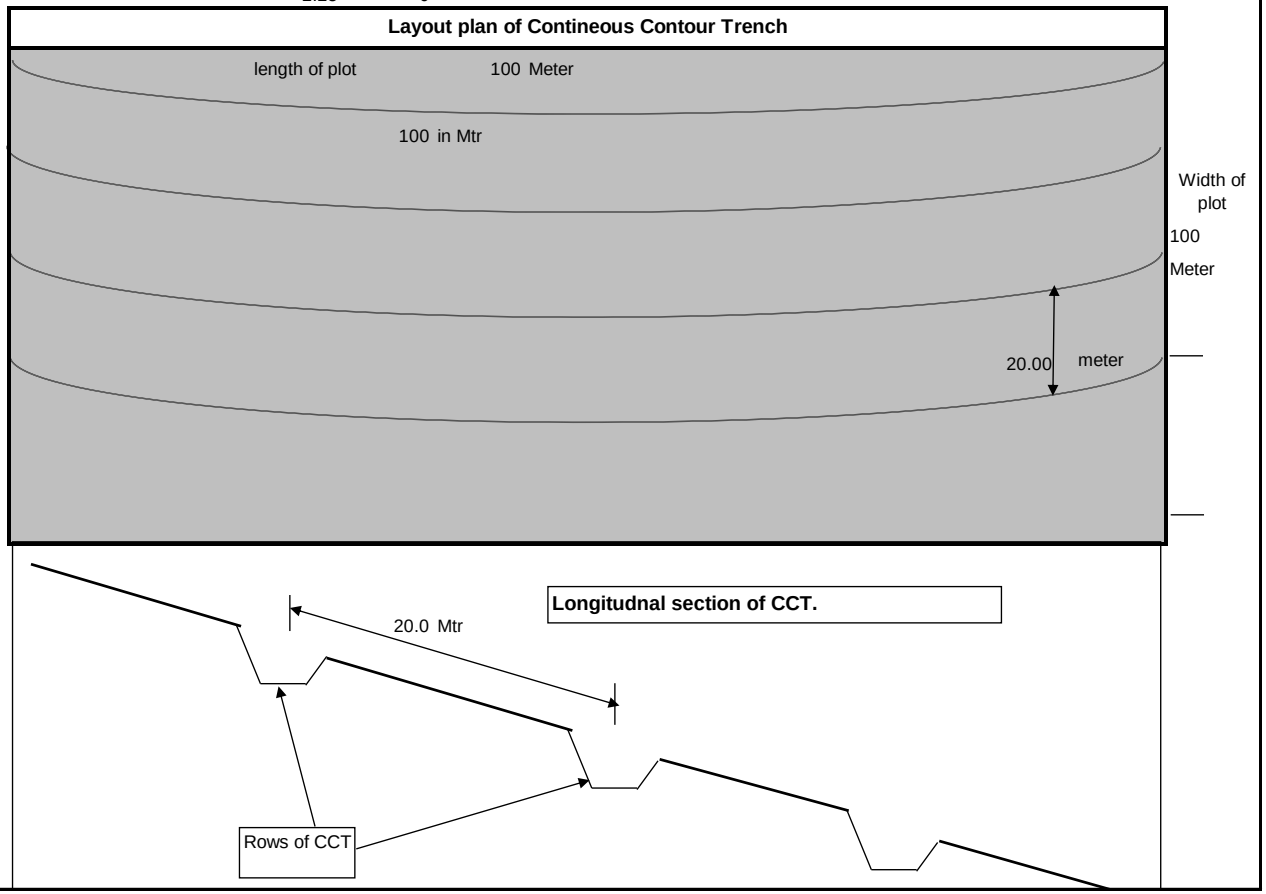
CORE WALL= 0.6 x 1.10 = 0.66 Sqm

Design of Continuous Contour Trench

Design and Cost Estimate of Continuous Contour Trench

Particular	Quantity	Unit
Plot Area	10000	Sq. meter
Top Width of Continuous Contour Trench	1.05	Meter
Bottom Width of Continuous Contour Trench	0.5	Meter
Depth of Continuous Contour Trench	0.5	Meter
Length of one trench	100	Meter
Cofficient of runoff	0.35	Constant
Peak intensity of rainfall	0.100	Meter/hr.
Discharge	350.00	Cum/Per hr
Water harvested (%)	262.50	Cubic meter
Storage capacity of one row of trench	38.75	Cubic meter
Effective Storage capacity of one trench @125%	48.4375	Cubic meter
No. of trench required for 100%water harvesting	5	nos
Length of plot (across the slope)	100	Meter
No. of trench in one row	1.00	
No. of rows required for 100%water harvesting	5.00	
Width of plot (along the slope)	100	Meter
Spcing between two rows	20.00	Meter
Total length of Contineous counter Trench in the plot	500	Meter
Earth work in Excavation	193.75	Cubic meter





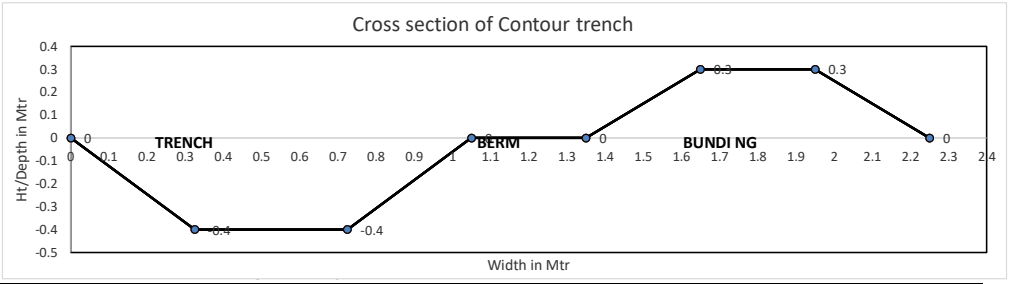
Detailed Estimate for Construction of Continuous Contour Trench											
Name		Continuous Contour Trench	Size of plot		100	Mtr	100	Mtr		Quantity	area in ha
Size of CT					1.05	0.5	0.5	in mtr			
S no	SOR item no.	Work Discription	No		Length	Width	Height	Quantity	Unit	Total Rate	Total Amount
1		3	4	5	6	7	8	9	10	11	12
1	PCCF PANCHKULA BSR 2017 ITEM 2.1 a	collectionm and removal of grass	1	1	100.00	100.00	20%	20.00	100Sqm	38.22	764.40
2	PCCF PANCHKULA BSR 2017 ITEM 3.1	Alignment and dagbailing in other plantations	2	5.00	100.00	-	-	1.00	km	191.08	191.08
3	PCCF PANCHKULA BSR 2017 ITEM 3.12 a	Construction ridges / digging of trenches/pits by hired JCB / mechanical with manual breaking og clods and dressing in medium soil		5.00	100.00	0.78	0.50	193.75	Cum		
					Avg Width of 1 trench		Total	193.75	Cum	100.00	19375.00
							Total				20330.48
Add extra		Work charge Contigency @2%						2%		Rs/-	406.61
							1 ha	Grand total in Rs/-			20740.00

Detailed Estimate for Construction of Staggered Contour Trench (SGT/ST)

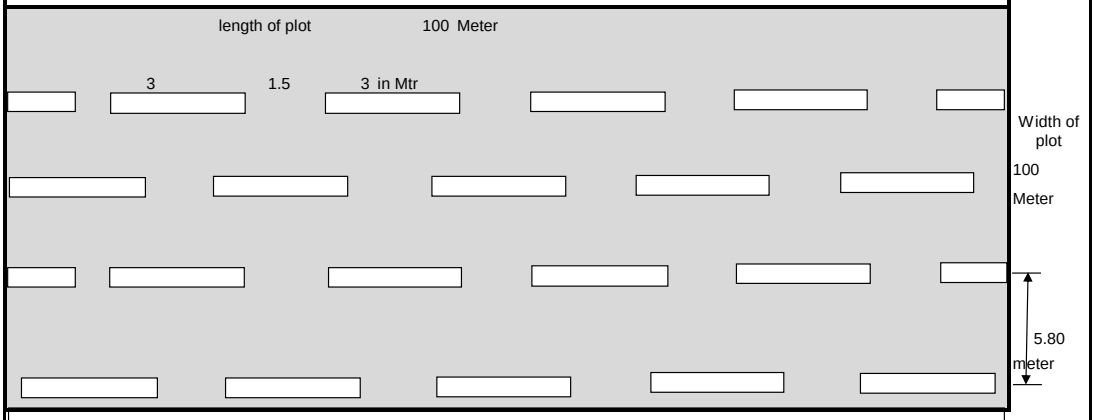
Design and Cost Estimate of Steggered Contour Trench

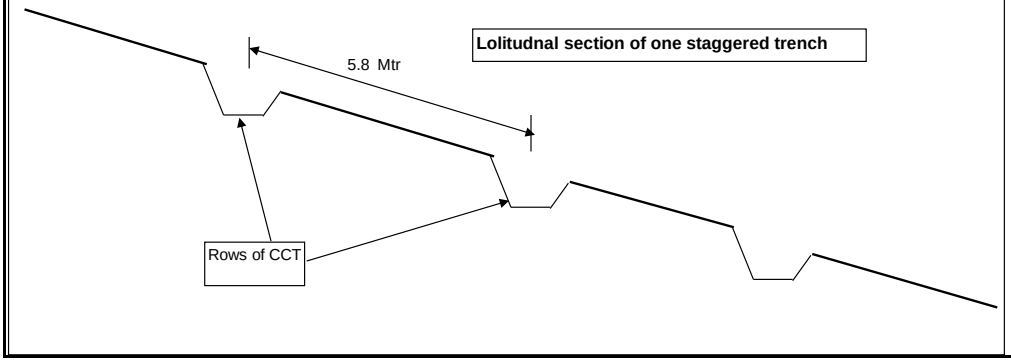
Particular	Quantity	Unit
Plot Area	10000	Sq. meter
Top Width of Steggered counter Trench	1.05	Meter
Bottom Width of Steggered counter Trench	0.4	Meter
Depth of Steggered counter Trench	0.4	Meter
Length of one trench	3	Meter
Spacing between two trench	1.5	Meter
Cofficient of runoff	0.5	Constant
Peak intensity of rainfall	0.1	Meter/hr.
Discharge	500	Cum/Per hr
Water harvested (100%)	500	Cubic meter
Storage capacity of one trench	0.87	Cubic meter
Effective Storage capacity of one trench @150%	1.305	Cubic meter
No. of trench required for 100%water harvesting	383	nos
Length of plot (across the slope)	100	Meter
NO.of trench in one row	22.22	
No. of rows required for 100%water harvesting	17.24	
Width of plot (along the slope)	100	Meter
Spcing between two rows	5.80	Meter
Total length of Staggered CT in the plot	1149	Meter
Earth work in Excavation	333.33	Cubic meter

Design of Steggered Contour Trench



Layout plan of Staggered Contour Trench





Detailed Estimate for Construction of Staggered Contour Trench (SCT/ST)

Cost estimation											
Name		Staggered								1	hac area
			Size of CT		1.05	0.4	0.4	in mtr	Size of plot	100	100
S no	SOR item no.	Work Discription	No		Length	Width	Height	Quantity	Unit	Total Rate	Total Amount
1	2	3	4	5	6	7	8	9	10	11	12
1	PCCF PANCHKULA BSR 2017 ITEM 2.1 a				collectionm and removal of grass						
			1	1	100.00	100.00	20%	2000.00	100 sqm	38.22	76440
2	PCCF PANCHKULA BSR 2017 ITEM 3.1				Alignment and dagbailing in other plantations						
		(a) 5cm to 7.5cm deep									
			2	17.24	100.00	-	-	3448.28	km	191.08	659
3	PCCF PANCHKULA BSR 2017 ITEM 3.12 a				Construction ridges / digging of trenches/pits by hired JCB / mechanical with manual breaking og clods and dressing in medium soil						
Length of All trenchs			383		3.00			1149.43	M		
Qty of All Trenchs					1149.43	0.73	0.40	333.33	CUM		
					1.05+0.40/2						
								333.33	CUM	100.00	33333
							Total				110432
Add extra		Work chaege Contigency @2%						2%		#-	2209
				per ha	**Grand total in Rs**			**112641**			

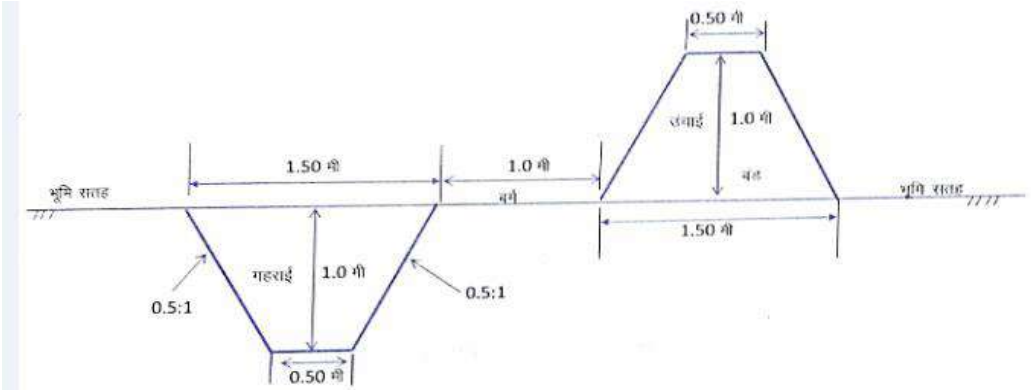
Detailed Estimate for Construction of Deep Continuous Contour Trench (Deep CCT)

Length of Trench	1000	meter	Top Width	1.5	meter	No of Trench	100	
Hard soil percentage	20	%	Bottom Width	0.5	meter	Depth	1.0	meter
Kunker Boulder Percentage	30	%				Length	10	meter
Percentage of soft decomposed rock	50	%						

S.No.	DESCRIPTION	UNIT	NOS.	L	W	H/D	QTY	TOTAL QTY	
PCCF PANCHKULA BSR 2017 ITEM 3.1	Alignment and dagbailing in other plantations	M	2	1000	---	---	2000	2000	
2	TOTAL EXCAVATION	CUM	100	10	1.00	1.00	1000		
PCCF PANCHKULA BSR 2017 ITEM 3.12 a	Construction ridges / digging of trenches/pits by hired JCB / mechanical with manual breaking og clods and dressing in medium soil		1	20% of Qty. of item no 2			200.0	200.0	
PCCF PANCHKULA BSR 2017 ITEM 3.12 a	Construction ridges / digging of trenches/pits by hired JCB / mechanical with manual breaking og clods and dressing in heavy soil	CUM	1	30% of Qty. of item no 2			300.0	300.0	
PCCF PANCHKULA BSR 2017 ITEM 3.12 a	Construction ridges / digging of trenches/pits by hired JCB / mechanical with manual breaking og clods and dressing in rocky area	CUM	1	50% of Qty. of item no 2			500.0	500.0	
	SEED SOWING WORK								
PCCF PANCHKULA BSR 2017 ITEM 8.10	Sewan grass seed collection	KG	2	10.00			20.00	20.00	
PCCF PANCHKULA BSR 2017 ITEM 4.3	line sown in trenches	M	2	1000			2000	2000.00	

Abstract of Cost

ITEM CODE	DESCRIPTION	QTY	UNIT	RATE	AMOUNT		
PCCF PANCHKULA BSR 2017 ITEM 3.1	Alignment and dagbailing in other plantations	20.00	100M	38.22	764.40		
2	TOTAL EXCAVATION						
PCCF PANCHKULA BSR 2017 ITEM 3.12 a	Construction ridges / digging of trenches/pits by hired JCB / mechanical with manual breaking og clods and dressing in medium soil	200.00	CUM	100.00	20000.00		
PCCF PANCHKULA BSR 2017 ITEM 3.12 a	Construction ridges / digging of trenches/pits by hired JCB / mechanical with manual breaking og clods and dressing in heavy soil	300.00	CUM	150.00	45000.00		
PCCF PANCHKULA BSR 2017 ITEM 3.12 a	Construction ridges / digging of trenches/pits by hired JCB / mechanical with manual breaking og clods and dressing in rocky area	500.00	CUM	200.00	100000.00		
	TOTAL				**165764.40**		
	SEED SOWING WORK						
PCCF PANCHKULA BSR 2017 ITEM 8.10	Sewan grass seed collection	20.00	KG	723	14460.00		
PCCF PANCHKULA BSR 2017 ITEM 4.3	line sown in trenches	2000.00	100m	31.85	637.00		
					15097.00		
TOTAL	**180861.40**	**180861.40**					
CONTINGENCY 2%		**3617.23**					
GRAND TOTAL		**184478.63**					
NET AMOUNT		**184480**				**18448**	PER HA



चित्र – 3 : डीप सी.सी.टी. का क्रॉस सेक्शन

Detailed Estimate for Construction of Staggered Contour Trench (SCT/ST)

Cost estimation

Name		Staggered Contour Trench								1	hac area
Name of the Forest Circle				**Name of the Division**			**Name of the Range**				
Name of the Nala					**Compartment Numbers**						
			Size of CT		1.05	0.4	0.4	in mtr	Size of plot	100	100
Sno	SOR item no.	Work Discription	No		Length	Width	Height	Quantity	Unit	Total Rate	Total Amount
1	2	3	4	5	6	7	8	9	10	11	12
1	PCCF PANCHKULA BSR 2017 ITEM 2.1 a	collectionm and removal of grass									
			1	1	100.00	100.00	20%	2000.00	100 sqm	38.22	764
2	PCCF PANCHKULA BSR 2017 ITEM 3.1	Alignment and dagbailing in other plantations									
		(a) 5cm to 7.5cm deep									
			2	17.24	100.00	-	-	3448.28	km	191.08	659
3	PCCF PANCHKULA BSR 2017 ITEM 3.12 a	Construction ridges / digging of trenches/pits by hired JCB / mechanical with manual breaking og clods and dressing in medium soil									
		Length of All trenchs	383		3.00			1149.43	M		
		Qty of All Trenchs			1149.43	0.73	0.40	333.33	CUM		
						1.05+0.40/2					
								333.33	CUM	100.00	33333
							Total				34757
	Add extra						Work chaege Contigency @2%	2%		#-	695
								Grand total in Rs			**35452**

Design data for Proposed gulley plug	
Total Length	5
Max. height	1
U/S Slope 1:	2
D/S Slope 1:	3
Top Width (0.3 m to 0.5M)	0.4
All measurment in Mtr.	
Chainage	Height of X-section
0	0
0.8	0.25
1.7	0.7
2.5	1
3.3	0.7
4.2	0.6
5	0
Reading interval of nala X-Sec.	0.8

Note: 1. No EGP to be taken up in isolation, to be taken in series with catchment of indvidual EGP less than 2 ha..

2. EGP to be proposed only on smaller streams having catchment less than 25 ha.

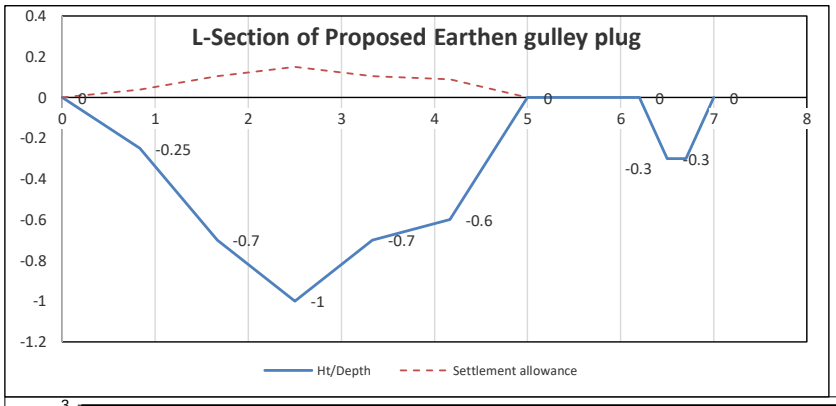
3. Spacing of Two EGP should be in between 10m-30m, so that the submergence of lower EGPshould not submerge the toe of upper EGP.

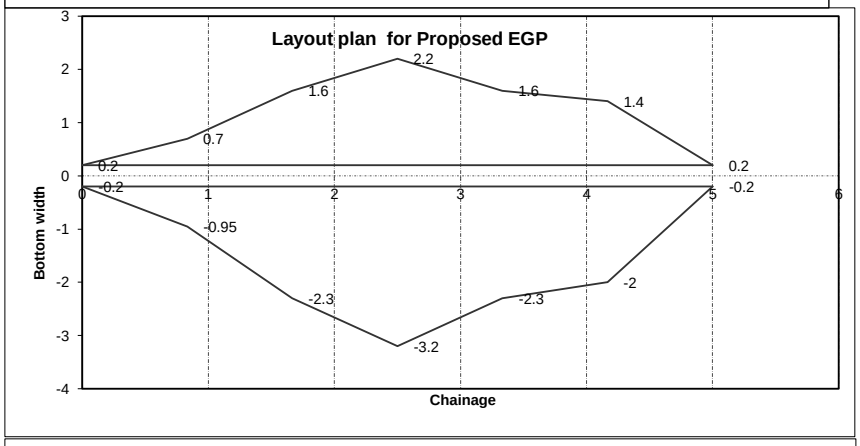
Design estimate OF ECD(earthen Check Dam)/gully plug

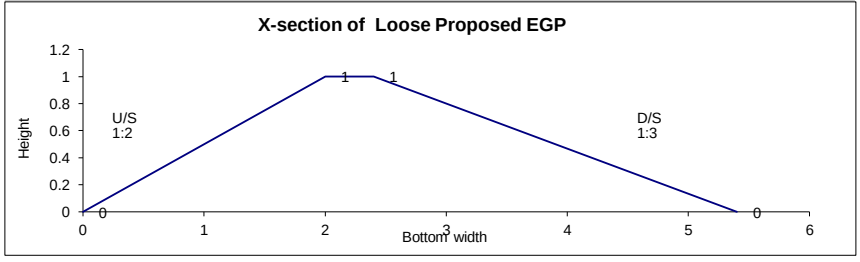
Design data for Proposed EGP			
Total Length		5	Mtr
Max. height		1	Mtr
U/S Slope 1:		2	
D/S Slope 1:		3	
Top Width		0.4	Mtr

Earthen gulley plug Quantity Calculation

Chainage	Height	Area of X-Section	Av.area of x-Section	Length	Quantity	width of stripping	Av. Width of stripping	Area of stripping
		A= (TW+BW)/2 X Ht	Av= (A1+A2)/2	L	Av X L	BW of sec.	Bav.= (Bw1+BW2)/2	LX Bav.
0.00	0	0				0.4		
0.83	0.25	0.25625	0.128125	0.83	0.106771	1.65	1.025	0.85
1.67	0.7	1.505	0.880625	0.83	0.73	3.9	2.775	2.31
2.50	1	2.9	2.2025	0.83	1.84	5.4	4.65	3.88
3.33	0.7	1.505	2.2025	0.83	1.84	3.9	4.65	3.88
4.17	0.6	1.14	1.3225	0.83	1.10	3.4	3.65	3.04
5.00	0	0	0.57	0.83	0.48	0.4	1.9	1.58
				5	**6.09**			**15.54**
	Add 15% for keying & exit weir				0.91			2.33
	Total Quantity				**7.00**			**17.87**
					Cum			**Sqm**







Design estimateECD(earthen check dam)/gully plug

Detailed Estimate for Construction of Gully Plug

Work Name: -		Gully Plug					Length	5	meter		
S.No.	SOR item No	work Detailed	No		Length	Breadth	Heigth/Depth	Qty.	Unit	Rate	Amount
1	2	3	4	5	6	7	8	9	10	11	12
1	sor 2021 item no 4.1	Clearing jungle land including uprooting rank vegetation, grass, bushes, shrubs, saplings and trees girth up to 30 cm, measured at a height of 1 m above ground leveland removal of rubbish up to a distance of50 m outside theperiphery of the area cleared	1	1	5.00	5.40	-	27.00	CUM	7.00	189
2	PWD HARYANA SCHEDULE RATE item 4.8.1	Earth work in rough excavation, banking excavated earth in layers not exceeding 20cm in depth, breaking clods, watering, rolling each layer with ½ tonne roller or wooden or steel rammers, and rolling every 3rd and top-most layer with power roller of minimum 8 tonnes and dressing up in embankments for roads, flood banks, marginal banks and guide banks or filling up ground depressions, lead up to 50 m and lift up to 1.5 m 4.8.1 All kinds of soil cum	As per detailed sheet					7.00	CUM	158.00	1106
3	PCCF PANCHKULA BSR 2017 ITEM 3.12 a	Construction ridges / digging of trenches/pits by hired JCB / mechanical with manual breaking og clods and dressing in medium soil			17.87		0.15	2.68	CUM	100	268.09
			Total								1563
		Add extra	Work chaege Contigency @2%								31
			Gully Plug Cost - Grand Total								1600
								per rm			320

Cost Statement of Plantation of Small (Polypot0 Plants under Compensatory Afforestation for Gurugram Division during the year 2021-22 at a wage rate of Rs. 363.77/- per day

Name of plants per Ha.=1000 spacing -3mx3m

S.No.	Item of Work	Unit	Qty.	Rate/Unit (Rs.)	Amount
	Ist year plantation (2021-22)	Ha.			
1	Jungle clearance	RKM	0.5	5456.55	2728.275
2	Dag bailing and alignment	M 3	3.3	254.64	840.312
3	catchment area works SGT per ha	**ha**			**35452.00**
4	Earthwork digging of pits 1000x0.45mx0.45mx0.45m	No.	91.00	236.45	21516.95
5	Raising of plants in Nry.(15cmx22cm)1000+20% extra	No.	1200	12.02	14424
6	Loading and unloading of plants in Tractor/cart	No.	1100	1.09	1199
7	Carriage of plants	No.	1100	4.58	5038
8	Further Carriage of Plants by Labour in Hillyarea where vehicle etc. cannot reach	No.	1100	3.63	3993
9	Plantating of plants including 10% replacement	No.	1100	7.27	7997
10	Application of fertilizer (one time DAP+one time Ureas)	No.	2000	0.72	1440
11	Irrigation five times (upto10KM)	No.	5000	5.47	27350
12	Purchase of water for irrigation (4000 litre in one tank)	No.			0
13	First weeding and Hocking	No.	1000	5.47	5470
14	Subsequent weeding and hocking two times	No.	2000	3.63	7260
15	Miscellaneous expenditure (Purchase of furtilizer, tools etc.)	LS			0
16	Cost of wages of proctection watcher (1 protection watcher for one year plantation area of 20 Ha.)				6546.00
	Total				**141254.537**
	Second year maintenance				
1	Repair and maintenance of loose stone wall, 10% of first year	M^3	11.71	836.67	9797.41
2	Clearing of Mesquite stumps including prunning of Singled shoots in first year (Once)	250 stumps	250	10.9	2725.00
3	Re-opening of pits (40 x 0.45 x 0.45 x 0.45)	M^3	18.2	72.76	1324.23
4	Loading and unloading of plants	No.	240	1.09	261.60
5	Carriage of plants	No.	220	4.58	1007.60
6	Further Carriage of plants by manual labour (In hilly, desert area, where vehicles etc. cannot reach)	No.	220	3.63	798.60
7	Planting of seedlings	No.	220	7.27	1599.40
8	Hand watering two times	No.	2000	5.47	10940.00
9	Weeding and hoeing once	No.	2000	5.47	10940.00
10	Miscellaneous Expenditure				1100.00
11	Cost of wages of proctection watcher (1 protection watcher for one year plantation area of 20 Ha.)				6546.00
	Total				**47039.84**
	Rising of plants in Nursery (P-bag 15 x 22 cm) 200 plants + 20% extra	No.	220	12.02	2644.40
	G. Total				**49684.24**
	Third to fifth year maintenance				
1	Hand watering two times	No.	2000*3	5.47	32820.00
2	Weeding and hoeing once	No.	2000*3	5.47	32820.00
3	Miscellaneous Expenditure				3300.00
4	Cost of wages of proctection watcher (1 protection watcher for one year plantation area of 20 Ha.)				19638.00
					88578.00
					279516.77
	Added EPF @ 13%				36337.18071
	Added ESI @ 3.25%				9084.295178
	Of wages components 15% of total				41927.51621
	Added contractor profit @ 7% of total				19566.17423
	Total per hectare cost for five year afforestation model				**386431.94**

Cost Statement of Plantation under Ecorestoration in Aravalli Model of State/NPV Scheme/Pit Method with protection-cum-regeneration of natural spaces of Aravalli hills during the year 2021-22 at wage rate Rs. 363.77/per day					
No. of plants per hectare = 200					
S. No.	**Item Work**	**Unit**	**Qty.**	**Rate/Unit**	**Amount**
1	Construction of loose stone wall 125m x 1.25m x 0.75m x 1.25 height (Top width 1.25m, base width)	M^3	156.25	836.67	130729.69
2	Clearing of Mesquite stumps including prunning of Singled shoots in first year (twice)	250 stumps	250	14.56	3640.00
3	**catchment area works SGT per ha**	**ha**			**35452.00**
4	F.W. digging of pits (200 x 0.45 x 0.45 x 0.45) (45.56 cum)	M^3	18.22	236.45	4308.12
5	Loading and unloading of plants in tractor/ carts	No.	220	1.09	239.80
6	Carriage of plants from nursery to sites	No.	220	4.58	1007.60
7	Further Carriage of plants by manual labour (In hilly, desert area, where vehicles etc. cannot reach)	No.	220	3.63	798.60
8	Planting of seedlings including 10% replacements	No.	220	7.27	1599.40
9	Application of fertilizers (1 time DAP + 1 time urea)	No.	400	0.72	288.00
10	Hand watering two times	No.	400	5.47	2188.00
11	First Weeding and hoeing	No.	200	5.47	1094.00
12	Sub weeding and hoeing two times	No.	200	3.63	726.00
13	Miscellaneous Expenditure				1200.00
	Cost of wages of proctection watcher (1 protection watcher for 1 year for plantation area of 20 Ha.)				6546.00
14	**Total**				**189817.21**
15	Rising of plants in Nursery (P-bag 15 x 22 cm) 200 plants + 20% extra	No.	240	12.02	2884.80
	G. Total				**192702.01**
	Added EPF @ 13%				
	Added ESI @ 3.25%				
	Of wages components 15% of total				12510.63
	Added contractor profit @ 7% of total				10778.39
	Net Total				215991.03
Second year maintenance					
1	Repair and maintenance of loose stone wall, 10% of first year	M^3	11.71	836.67	9797.41
2	Clearing of Mesquite stumps including prunning of Singled shoots in first year (Once)	250 stumps	250	10.9	2725.00
3	Re-opening of pits (40 x 0.45 x 0.45 x 0.45)	M^3	3.64	72.76	264.85
4	Loading and unloading of plants	No.	44	1.09	47.96
5	Carriage of plants	No.	44	4.58	201.52
6	Further Carriage of plants by manual labour (In hilly, desert area, where vehicles etc. cannot reach)	No.	44	3.63	159.72
7	Planting of seedlings	No.	40	7.27	290.80
8	Hand watering two times	No.	400	5.47	2188.00
9	Weeding and hoeing once	No.	200	5.47	1094.00
10	Miscellaneous Expenditure				1100.00
11	Cost of wages of proctection watcher (1 protection watcher for one year plantation area of 20 Ha.)				6546.00
	Total				**24415.25**
	Rising of plants in Nursery (P-bag 15 x 22 cm) 200 plants + 20% extra	No.	44	12.02	528.88
	G. Total				**24944.13**
	Added EPF @ 13%				3242.74
	Added ESI @ 3.25%				810.68
	Of wages components 15% of total				1760.78
	Added contractor profit @ 7% of total				1746.09
	Net Total				**32504.42**
	Total 2 year model cost				**248495.45**

Detailed Estimate for Construction of Losse Stone Check Dam(LSCD)

Dimension of structure

LENGTH	5	meter	DEPTH	0.15	meter	TOP WIDTH	0.60	meter
Height	1.20	meter				BOTTOM WIDT	1.80	meter

ITEM CODE	DESCRIPTION	UNIT	NO	L	W	H/D		QTY	Rate	Amount	
PCCF PANCHKULA BSR 2017 ITEM 3.1	Alignment and dagbailing in other plantations	km	2	5.00				10.00	191.08	1.91	
PCCF PANCHKULA BSR 2017 ITEM 3.12 a	Construction ridges / digging of trenches/pits by hired JCB / mechanical with manual breaking og clods and dressing in medium soil	CUM	1	5.00	1.80	0.15		1.35	100.00	135.00	
PCCF PANCHKULA BSR 2017 ITEM 8.10	Construction of stone wall fencing including collection dressing of stones more than 100 m	CUM									
	(a)For Foundation		1	5.00	1.80	0.15		1.35			
	(b)For super structure		1	5.00	1.80	0.40		3.60			
			1	5.00	1.20	0.40		2.40			
			1	5.00	0.60	0.40		1.20			
	TOTAL							8.6	915.7	7829.06	
							TOTAL			7965.97	
							Contengency 2% Rs.			159.32	
							GRAND TOTAL Rs.			8130.00	
Per meter cost (Rs.)			**1626**								

CHAPTER – VI Design and Estimates

Detailed Estimate for Construction of Farm Pond

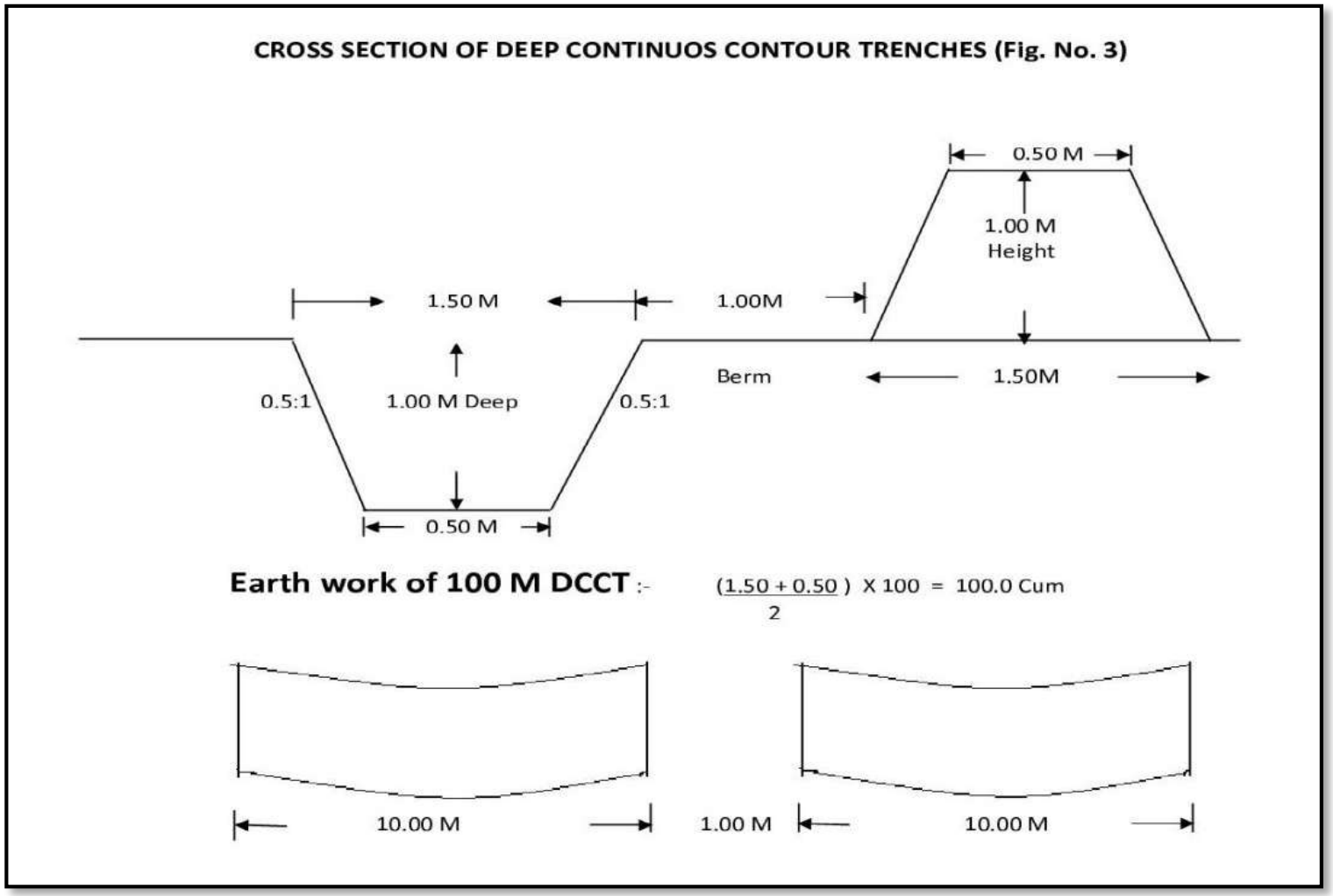
Salient Data –

(A)	Tank Size	30.00 x 30.00 Mtrs		(B)	Tank Depth	1.50 M	(c)	Cutting S	2:1
Embankment Portion									
(A)	Top Width of embankment	2.00	Mtrs	(B)	Embankment slope	2:1	(c)	Height of Embankment	1.20 Mtrs (Av.Ht.)
(D)	Bottom Width of Embankment	6.80	Mtrs		Length of Embankment	131.20	Mtrs		
Qty. of embankment		692.74							

Inlet/Outlet

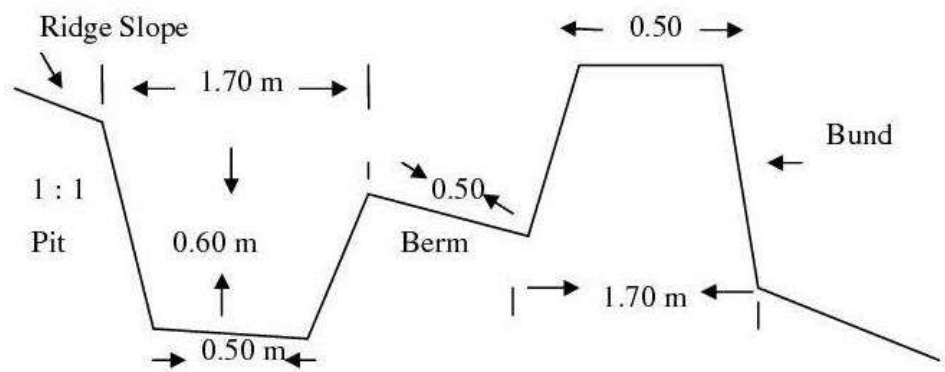
(A)	Length of Inlet				Lengt				
S.No.	**Particulars**	**No.**	**Length**	**Width**	**Ht.**	**Qty**	**Unit**	**Rate**	**Amoun**
PCCF PANCHKULA BSR 2017 ITEM 2.1 a	collectionm and removal of grass	1	47.60	47.60		2265.76	100sqm	38.22	865.97
PCCF PANCHKULA BSR 2017 ITEM 3.12 a	Construction ridges / digging of trenches/pits by hired JCB / mechanical with manual breaking og clods and dressing in lioght soil	1	131.20	6.80	0.15	133.82	Cum	75.00	10036.80
PCCF PANCHKULA BSR 2017 ITEM 3.12 a	Construction ridges / digging of trenches/pits by hired JCB / mechanical with manual breaking og clods and dressing in medium soil								
		1	30.00	30.00	0.30	270.00			
		1	29.40	29.40	0.30	259.31			
		1	28.80	28.80	0.30	243.83			
		1	28.20	28.20	0.30	238.57			
		1	27.60	27.60	0.30	228.53			
						1240.24			
						692.74			
	Deduct Qty. of Embankment Material								
					G. Total	**547.50**	**Cum**	100	**54750.40**
				Total					**65653.17**
							Total		#######
						Net Amount			65653
					Add for 2 % Contingencies			2.00%	1313.1
	Providing& fixing Sing Board & Photographs							L.S.	1314.00
								G.Total	**66970**

Deep Continuous Contour Trenching



Continuous Contour Trenching

CROSS SECTION OF CONTINUOUS CONTOUR TRENCHES



Cross Section of The CCT :- $\frac{(1.70 + 0.50)}{2}$ X 0.60 = 0.66 Sqm

- **Staggered Trenching**