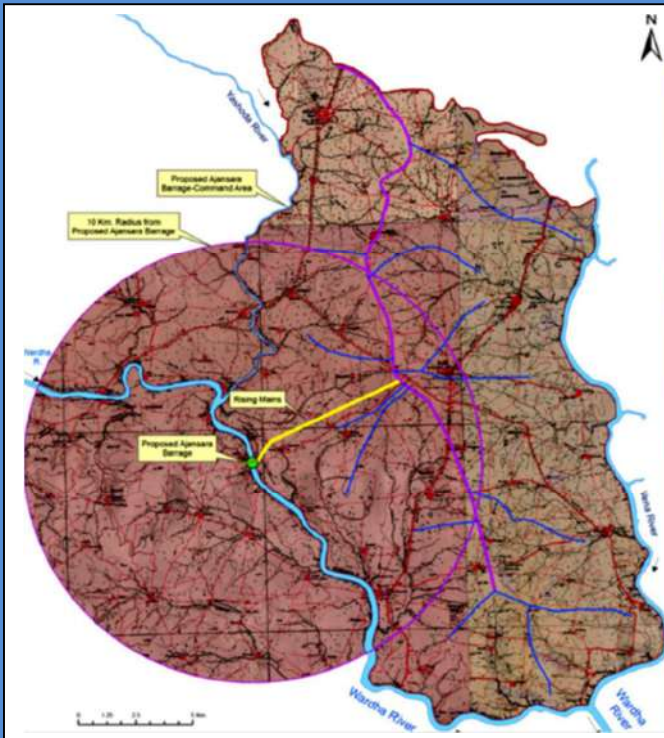


PRE-FEASIBILITY REPORT

**PROPOSED AJANSARA BARRAGE PROJECT
FOR LIFT IRRIGATION
CAPACITY: TOTAL 30004 CCA
at Village Ajansara, Taluka Hinganghat,
District Wardha, Maharashtra**

**M/s. Vidharbha
Irrigation Development
Corporation (VIDC)**



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3	Detailed of Capacity of Barrage
4	Detailed Cost Estimation

1. EXECUTIVE SUMMARY

Sr. No.	PARTICULARS	DETAILS		
A	PREAMBLE			
1.	Project Name	Ajansara Barrage Project		
2.	Project Proponent	M/ s. Vidharbha Irrigation Development Corporation		
3.	Screening Category	Item 1 (C) in EIA Notification, 14 th September 2006		
4.	Location			
	Village/ Area	Ajansara		
	Taluka	Hinganghat		
	District	Wardha		
	State	Maharashtra		
	Topo sheet Number	55L/ 10, 55L/ 11, 55L/ 14, 55L/ 15		
	Geographical Coordinate	Particular	Latitude	Longitude
		Head	20° 24' 15" N	78° 39' 30" E
B	SALIENT FEATURES OF THE PROJECT			
1.	River	Wardha		
2.	River Basin	Godavari		
3.	Type of project	Lift Irrigation		
3.	Gross Command Area (GCA)	35940 Ha		
4.	Culturable Command Area (CCA)	30004 Ha		
5.	Irrigable Command Area (ICA)	24000 Ha		
6.	Area Under Irrigation	Kharif: 12000 Ha (50%) Rabi: 9600 Ha (40%) Two Seasonal: 6480 Ha (27%) GCA: 28080 Ha (117%) Intensity of Irrigation: 93.59%		
7.	Water Supply	A: Domestic: a. Villages: Ajansara, Sonegaon, Fukta, Hiwara, Mankapur, Bopapur, Takli, Nidha, Sirasgaon, Wadner & Pipri		

		b. Size of Population served up to year 2020: 130000 Souls c. Quantum of Water made: 3310 TMC d. Quantum of water per capita: 55 Lit./ day	
8.	Hydrology	Catchment	Gross: 11605 Sq.km Free: 2618 Sq.km
		Influencing Rain gauge stations	Multai, Atner, Morshi, Katol, Chandurbazar, Amraoti, Arvi, Badnera, Chnadur Rly, Warud, Ner, Yaotmal, Talegaon, Karanja, Pandharkawada & Saunsar
9.	Yield available		
	75 % dependable	1819.570 Mm ³	
	U/S reservation at 75% dependability	1553.572 Mm ³	
10.	Proposed Utilization		
	Kharif	29.732 Mm ³	
	Rabi	72.185 Mm ³	
	Two seasonal	51.939 Mm ³	
	Total	153.856 Mm ³	
11.	Flood		
	Water Level	a. TBL: 223.900 b. AHFL: 221.900 c. HFL: 221.300 d. Inglis Flood Level: 219.800 e. FRL: 217.500 f. Crest Level: 208.000 g. Dead Storage Level: 208.000	
	Free Board	2.00 M	
12.	Live storage (M. cum)	22.12 Mm ³	

13.	Capacity	
	FRL	22.24 Mm ³
	MDDL	0.12 Mm ³
	Dead Storage Level	0.12 Mm ³
	Flood absorption capacity below FRL	22.24 Mm ³
14.	Head Work	
	Dam	<ol style="list-style-type: none"> 1. Type: Earthen Dam 2. Length: 3765 M 3. Top Width: 6.50 M 4. Max. Height: 9.21 M 5. Type of cutoff: Partial 6. Maximum Height: 3.74 M 7. Upstream Blanket: Grouting proposed
	Barrage	<ol style="list-style-type: none"> a. Location: R.D. 3240 to 3507 M b. Length: 267 M c. Spillway Gate: 15 Nos d. Maximum Water Level: 221.900 M e. Maximum height of Spillway (crest) above deepest foundation: 14.36 M f. Crest Level: 208.000 M g. Size of Gate: 15X9.50 M h. Type of Gate: Vertical Gate i. Type of energy dissipation: Stilling Basin 40 M length j. Maximum Discharge Capacity: 15168.500 Cumecs
15.	Submergence	
	Land & Property Submerged	<ol style="list-style-type: none"> a. Land affected @ RL 218.000 M <ol style="list-style-type: none"> i. Gross: 1044.13 Ha ii. Culturable: 517.47 Ha iii. Irrigated: 21.14 Ha

		<p>b. Village affected No. @ 220.800 M</p> <p>i. Fully: 1 (Dapori)</p> <p>ii. Partially: 4 (Jagjai, Mansaoli, Kosurla, Sonegaon (Raut))</p> <p>c. Building/ Houses affected:</p> <p>i. Private: 107 Nos</p> <p>ii. Temple: 4. Nos</p> <p>iii. Well: 23 Nos</p> <p>iv. Other: 3 Small K.T. weirs, 2 Bridges (minor), Water supply wells to supply water to Ajansara, Lift Scheme Ajansara.</p>
	Submergence Ratio @ RL 218.00 M	4.35 %
	No. of Families affected	100 Nos.
	No. of Persons affected	525 souls
16.	Canals	
16.1	Kachangaon Canal (LBC)	<p>a. Purpose of Canal: Irrigation</p> <p>b. Type Flow/ Lift: Flow</p> <p>c. Unlined: 95%</p> <p>d. Lined (CC Lining): 5%</p>
	Date	<p>a. Bed Width: 6.10 M</p> <p>b. Side slope: 1/ 2: 1</p> <p>c. Bed Gradient: 1. 2500</p> <p>d. Maximum Discharge: 6.64 M³ / Sec.</p> <p>e. GCA: 18340 Ha</p> <p>f. CCA: 15313 Ha</p> <p>g. ICA: 12250 Ha</p>
16.2	Weni Canal	<p>a. Purpose of Canal: Irrigation</p> <p>b. Type Flow/ Lift: Flow</p> <p>c. Unlined: 95%</p> <p>d. Lined (CC Lining): 5%</p>

	Date	a. Bed Width: 6.00 M b. Side slope: 1/ 2: 1 c. Bed Gradient: 1. 2500 d. Maximum Discharge: 6.34 M ³ / Sec. e. GCA: 17600 Ha f. CCA: 14691 Ha g. ICA: 11750 Ha
	Total	a. GCA: 35940 Ha b. CCA: 30004 Ha c. ICA: 24000 Ha
17.	Lift	
	Location	Jack well Left Bank U/ s. of 50 m @ RD 3240 M
	Length of Rising Main	7200 M
	Diameter of Rising Main	1950 mm Dia.
	Size of Delivery Chamber	15 X 15 X 3.50 M
	Discharge of Rising Main	13.00 Cumecs
	Horse Power Needed	8080 HP
	Pumps Provided	8 Nos. of 1010 HP
C	ENVIRONMENTAL SETTINGS OF THE AREA	
	Highway	NH-7 at 7.50 Km towards E & ESE
	Nearest Railway Station	Wardha RS at 9.5 Km in ENE
	Nearest Air Port	Dr. Babasaheb Ambedkar IA, Nagpur at 86 Km in NE
	Nearest Town	Wardha Town at 9.5 Km in ENE
	Nearest Water Bodies	Wardha River (Project site)
	Eco Sensitive Zone (National Park, Wildlife Sanctuary, Biosphere Reserve, Wild Life Corridors etc.)	No Eco Sensitive Zone viz. National Park, Wild Life Sanctuary, Biosphere reserve, Wildlife Corridors falling within 10 km radius from the project site.

	Historical & Archeological Important Place, Defense Establishment	No Historical & Archeological site and defense establishment is falling within impact zone of the project. Nearest defense Installment (Central Ammunition Depot) at Pulgaon is located at 41.0 Km in NW direction
5.	Project Cost	
	Head Works	Rs. 12984.367 Lakhs
	Canal	Rs. 3870.708 Lakhs
	Direct Charges	Rs. 3758.966 Lakhs
	Indirect Charges	Rs. 228.270 Lakhs
	Total Cost of Project	Rs. 20842.270 Lakhs

Source: Detailed Project Report

2. INTRODUCTION OF THE PROJECT/ BACKGROUND INFORMATION

2.1 Identification of project

M/s. Vidarbha Irrigation Development Corporation (VIDC), Nagpur under Water Resource Department, Government of Maharashtra has proposed the Ajansara Barrage Project for Lift Irrigation to irrigate an area of 30004 Ha of Culturable Command Area (CCA) by utilizing the water from the Wardha River in Village Ajansara, Hinganghat Taluka of Wardha District of Maharashtra State.

The scheme involves a masonry barrage across Wardha River at village Ajansara flanked by earthen bunds of both the sides. The barrage site has a gross catchment area of 11.605 Sq. km with interception of 2618 Sq. Km. The masonry barrage has a length of 267 m with 15 nos. of vertical lifting gates of size 15 X 9.50 m. The Length of earthen dam on both flanks is 3765 m. The storage is proposed against gates only, while the earthen bunds are proposed to take care of outflanking due to high floods and approach to barrage in flood period.

Administrative approval to the project is accorded by Government of Maharashtra Vide Marathi Letter Shasan Nirnaya No. Ajansara-2005/964/ (207/05) J.S.A. Mantralaya, Mumbai. Dated 27th November, 2006.

2.2 Brief History of nature of the project

Four K.T. weirs were proposed on Wardha River respectively at Kapsi, Anji-Andori, Kharda and Ajansara in Hinganghat Taluka of Wardha District. The reconnaissance reports were submitted to Government for approval but were returned back stating that the flow in the river is more than irrigation requirement and hence the storage is not necessary.

Meanwhile committee constituted to study the technical requirement of K.T. Weirs and recommended that instead of K.T. Weirs, Gated Barrages shall be constructed on the rivers having catchment area more than 1000 Sq. Km. Since K.T. Weirs on big rivers involve operation of large number of steel needles, the committee felt that the Barrages might be more suitable in such cases.

Accordingly, the proposal of gated barrages at Ajansara, Kharda were submitted to government which were accepted Vide Letter No. KTW/ 2289/ 568/ MT-2 (Marathi) dated 1/ 12/ 94.

The Nagpur Irrigation Circle, Nagpur, did this process. But since after planning barrages, the scheme were falling in the range of major project (ICA>1000 ha) hence the proposals were transferred to investing circle for further processing. The reconnaissance report of Ajansara Barrage was prepared and approved by Chief Engineer, Irrigation Department, Nagpur in February 1996.

2.3 Need for the project and its importance to the country and region.

India take up 3.29 million sq.km geographical area, which forms 2.4% of the world's land area, it supports over 15% of the world's population. India supports about 1/ 6th of world population, 1/ 50th of world's land and 1/ 25th of world's water resources. India also has a livestock population of 500 million, which is about 20% of the world's total livestock population. More than half of these are cattle, forming the backbone of Indian agriculture. The total utilizable water resources of the country are assessed as 1086 km³. The gross irrigated area is 80 million ha which gets India the prize for the largest amount of irrigated agriculture in the world.

The minor irrigation is now the major source as groundwater provides 50 per cent of the gross area under irrigation (in fact recent data shows that in terms of net sown area, groundwater provides 60 per cent of the net irrigated area. Details of Irrigated area in India is given below:

Table no. 1: Irrigated area in India

Particular	Utilization (In million ha)	Capacity (In mha)	Ultimate irrigation potential (In mha)
Major, Medium & minor	28.02	32.69	58.50
Groundwater	42.50	45.73	64.05
Surface	10.12	10.89	17.38
Sub Total	52.62	56.62	-
Total	80.54	89.31	139.90

There are many regions of India with hard rock geology which have lower groundwater potential than the alluvial plains. Since groundwater extraction is primarily driven by the needs of the population and the density of farmer population and not the quality of resource, groundwater irrigation is scaling up even in such hard rock areas causing irreversible depletion of the resource base.

Till the 1990s, Finance Ministers used to say that 'Every budget is a gamble on the monsoon'. For the more than 70 per cent of the Indian population, living in rural India and dependent on agriculture directly or indirectly, the monsoon controlled their purchasing power year after year. Even now, when agriculture contributes less than 20 per cent to the national economy, more than 600 million people are dependent on agriculture for their livelihood. Therefore, irrigation infrastructure, which has the potential to insure the farmer against the vagaries of the monsoon and increase his income from a small (and diminishing) land holding, is the most critical infrastructure for rural India.

There have been several studies which have established immense benefits of irrigation. The increased food security of the country, increased agriculture incomes in irrigated areas, the success of the green revolution, are all linked to timely availability of water for crops not dependent on rainfall alone. In addition to the direct benefits there are indirect benefits emanating from forward and backward integration. Studies both at the village level and regional level have shown these indirect impacts.

For every Rs. 100 of direct benefits the Bhakra dam generated 90 rupees of indirect benefits for the regional economy and had an impact in areas even beyond the region (World Bank, 2005). Similarly, the impact of the green revolution in the North Arcot region of Tamil Nadu proved that each rupee spent on irrigation led to an additional value generation in the non-farm economy (IFPRI, 1985). About 50 per cent of the

growth in the non-farm economy was due to agricultural demand for inputs and marketing services and the remaining 50 per cent was because farmers as consumers had higher purchasing power to buy more consumer and other goods (Chambers, 1988). In fact, the provision of irrigation improved the returns on social sector investment as well. Returns to five years of education were 32 per cent in irrigated districts and nil in un-irrigated districts (Pritchett, 2002). Major positive impacts impact of irrigation on the livelihoods of the rural poor comes about through employment incomes, security against impoverishment, non-compulsive migration, and improvement in the quality of life.

In terms of food security in India, the 35 per cent irrigated area provides more than 60 per cent of the food production. Studies show that at the village level irrigation provides higher and more stable employment and the poor are the major beneficiaries. In fact, the contribution of irrigation to employment is greater than even high yielding varieties. The increase in value and incomes which irrigation provides can also be judged by two other indicators: (a) increase in land prices after a rain fed area got access to irrigation and (b) the large private investments made by individual farmers in ground water irrigation.

A major concern regarding the irrigation systems, especially, that provided by large dams is that it benefits only large farmers. In addition the increased income of labourers who are not direct beneficiaries of the irrigation system is substantial. Besides, with the increased number of working days, the wage rate is also likely to increase when there is provision of irrigation. These are great benefits, especially, for the landless that have to migrate every year to urban areas to get employment during the non-monsoon period leading to fragmentation of families.

Continuation on the above, proposed project located in Village Ajansara, Taluka Hinganghat, District Wardha, MH will definitely add the irrigation capacity of the region, State and country as whole.

2.4 Benefit of Project

This proposed project is to provide a comprehensive irrigation solution and enable increase in agricultural productivity through equitable distribution of irrigation water with lesser electrical power consumption. After visiting the proposed project site, we have come up with a comprehensive irrigation solution suited to the local needs of the region. As per site visit and data collected from project site, it seems that the undulation

or elevation difference is not more or in the project area. The objective of this proposal is increase the water use efficiency and thereby increases the area under cultivation to improve the standard of living of farmers. Total 30004 Ha (CCA) area is planned to be irrigated by the scheme.

3. PROJECT DESCRIPTION

3.1 Type of project including interlinked and interdependent projects, if any.

M/s. Vidarbha Irrigation Development Corporation (VIDC), Nagpur under Water Resource Department, Government of Maharashtra has proposed the Ajansara Barrage Project for Lift Irrigation to irrigate an area of 30004 Ha of Culturable Command Area (CCA) by utilizing the water from the Wardha River in Village Ajansara, Hinganghat Taluka of Wardha District of Maharashtra. This is completely independent project and not interlinked with any other project.

3.2 Regulatory Frame Work

As per the Schedule attached to the EIA Notification, 2006 and its amendment in 2009 the proposed project is covered under Project or Activity of 1(C), namely “**River Valley Projects**”, requires prior Environmental Clearance (EC). It is categorized as Category A project and requiring Environmental Clearance from the Expert Appraisal Committee (EAC-River Valley and Hydroelectric Projects), Ministry of Environment Forest and Climate Change (MoEFCC), New Delhi.

3.3 Location (map showing general location, specific location, and project boundary & project site layout) with coordinates.

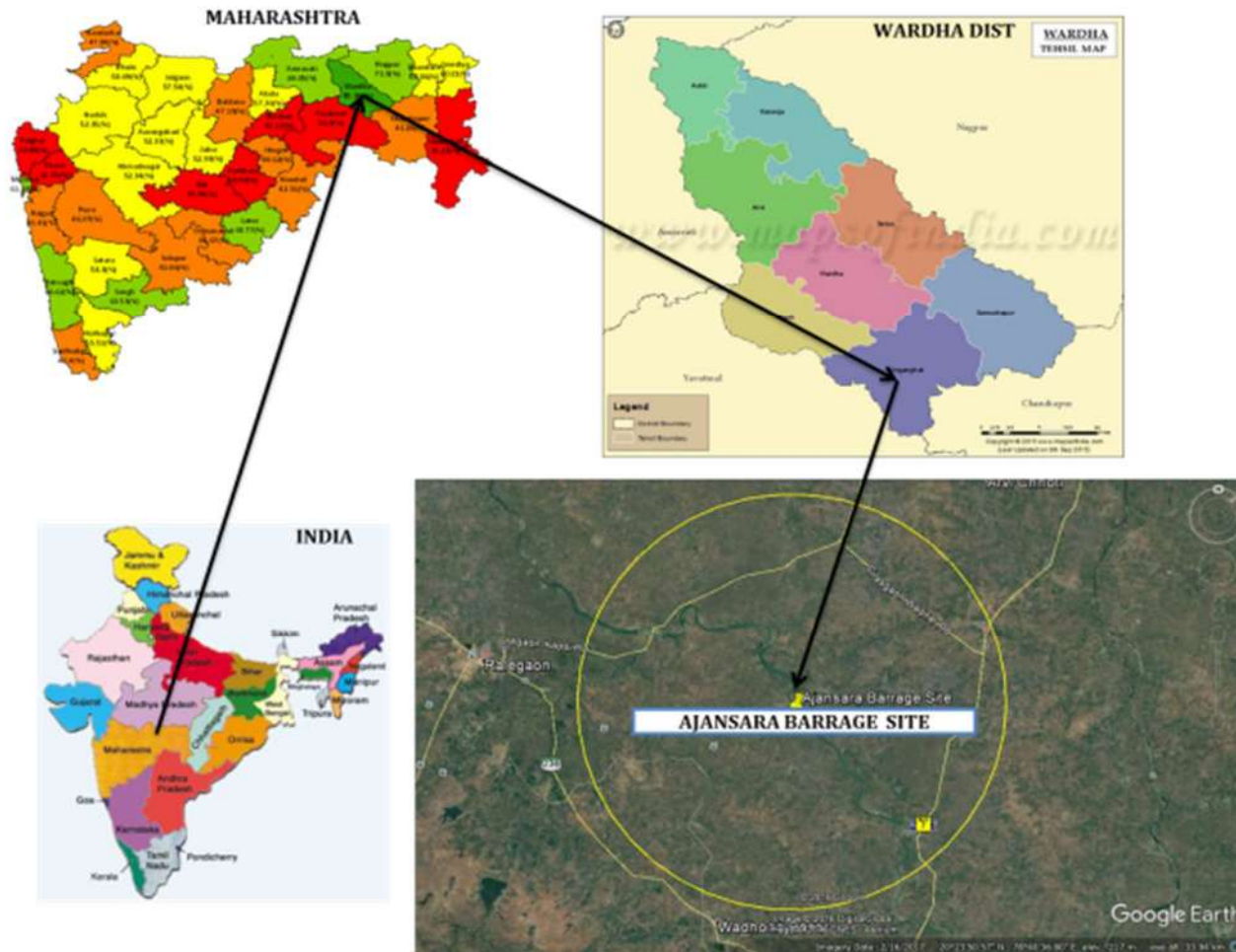


Figure No. 1: Project Location Map

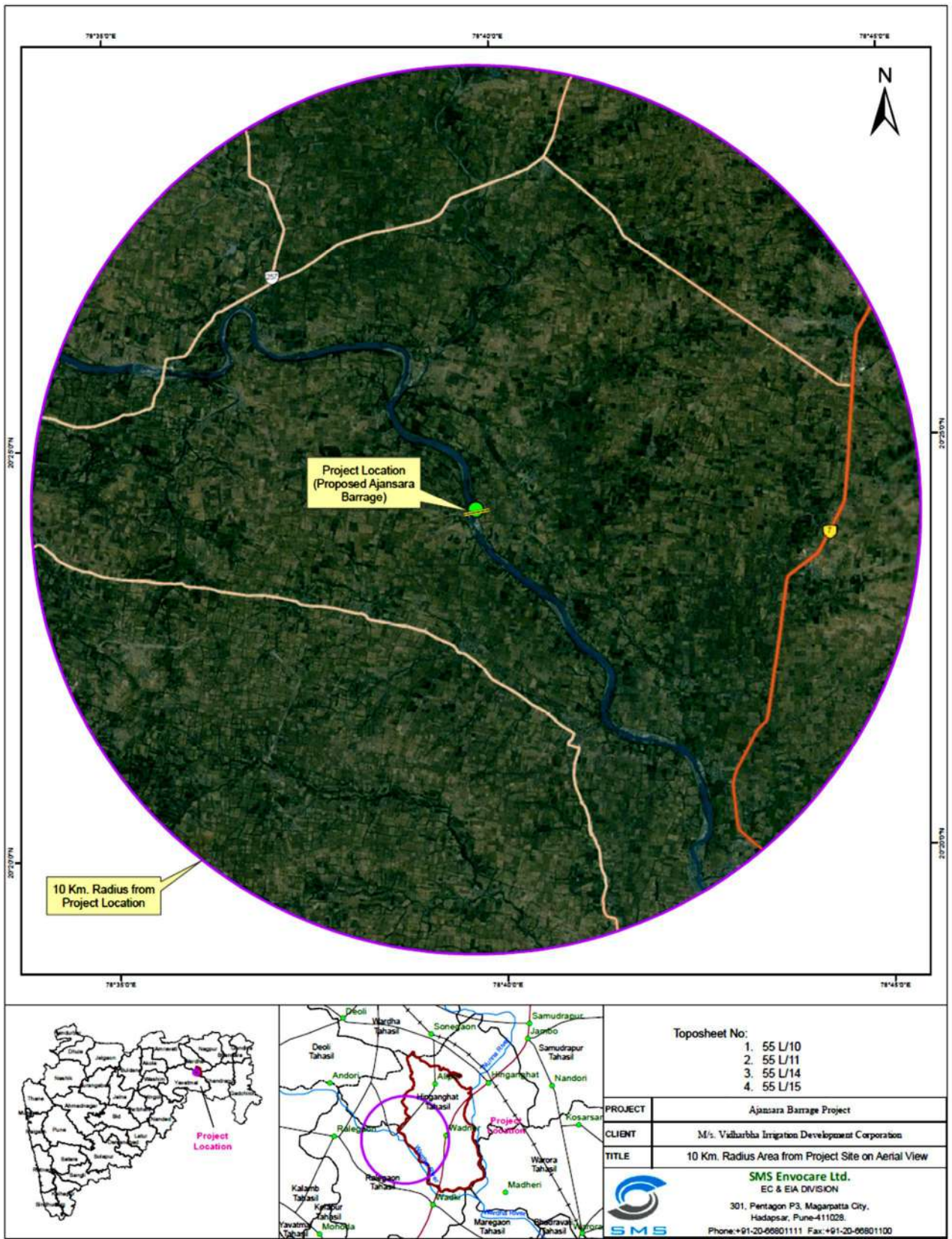


Figure No. 2: 10 Km Radius Google Imagery Map

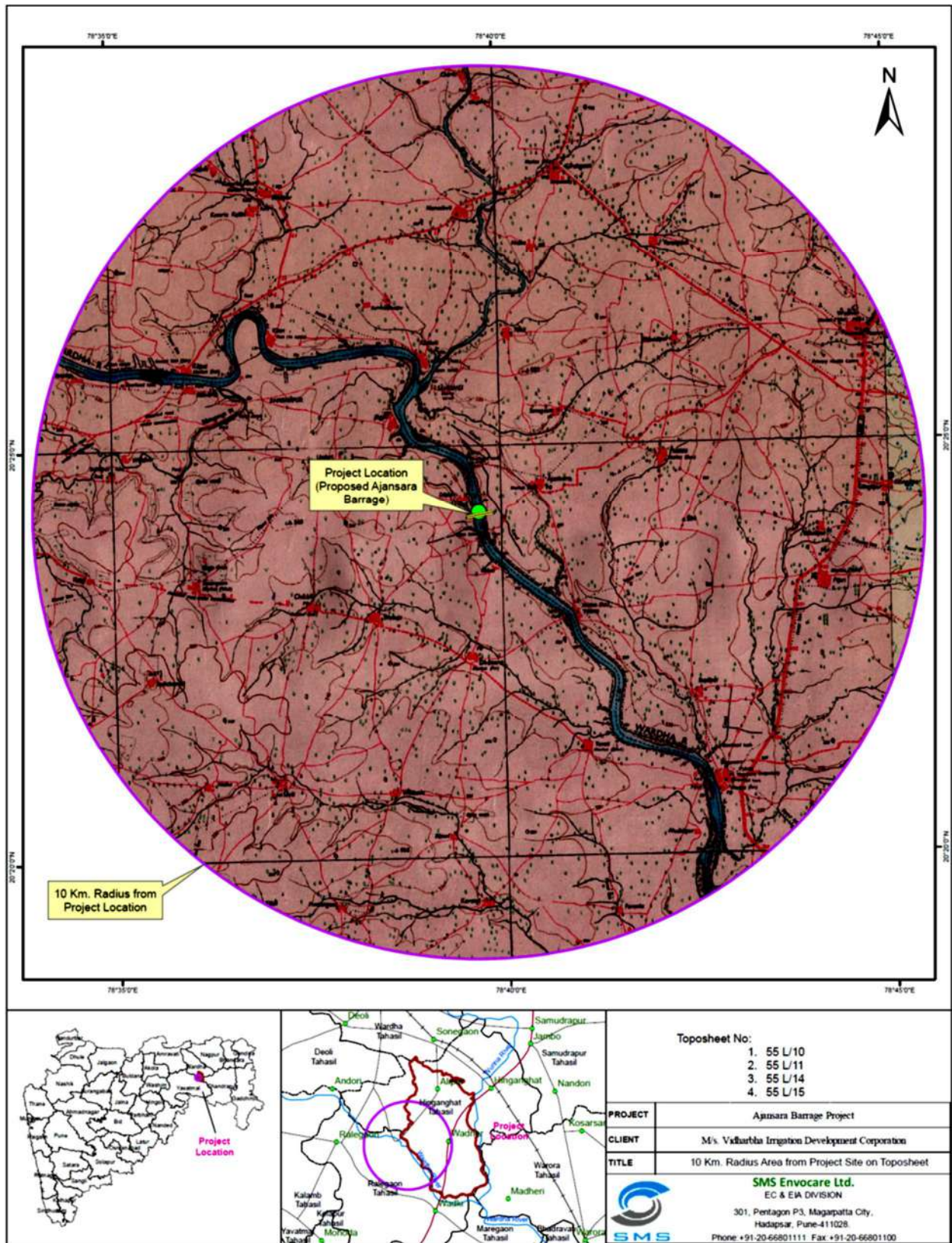


Figure No. 3: 10 Km Radius Google Imagery Map

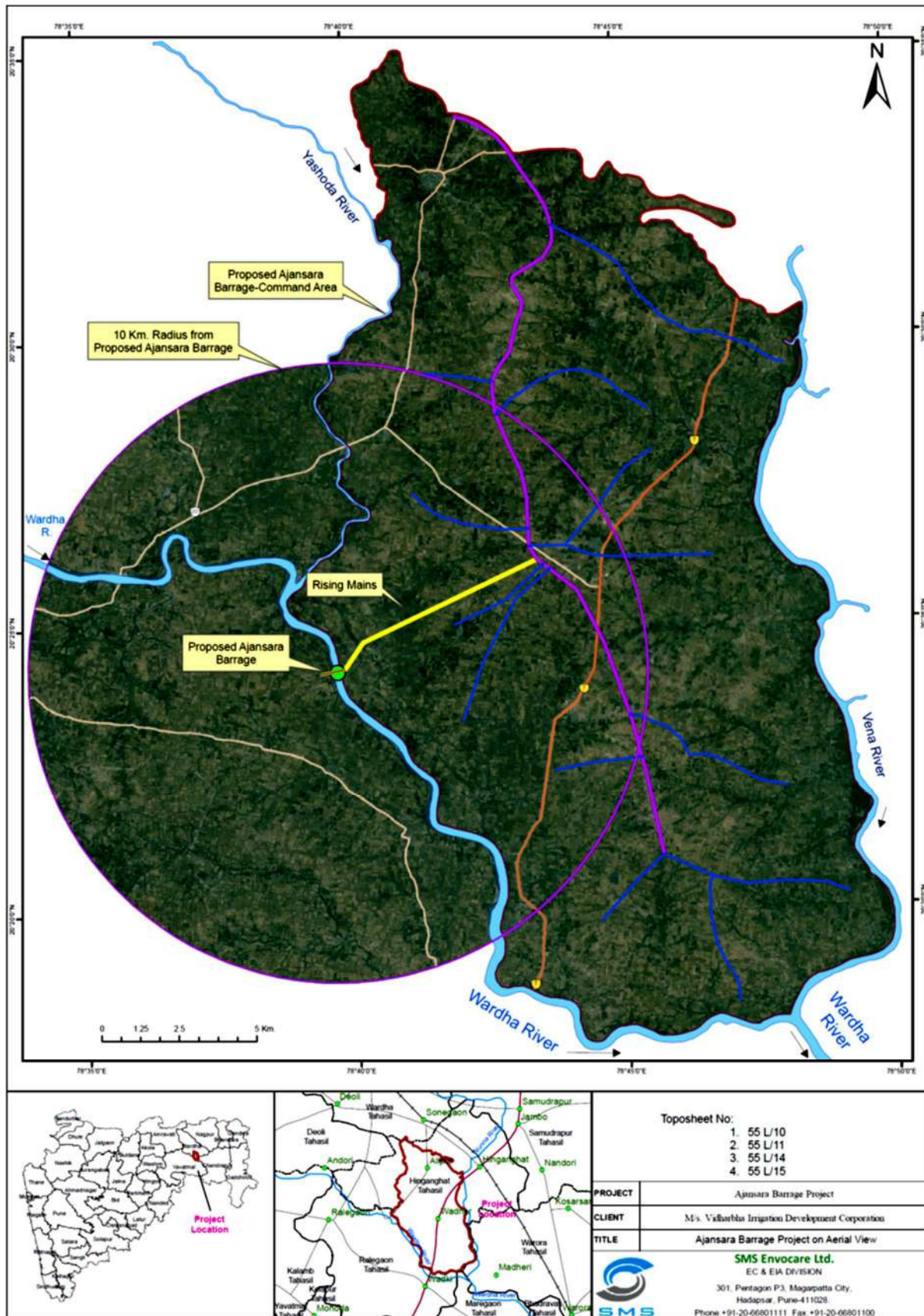


Figure No. 4: 10 Km Radius Google Imagery Map with Scheme

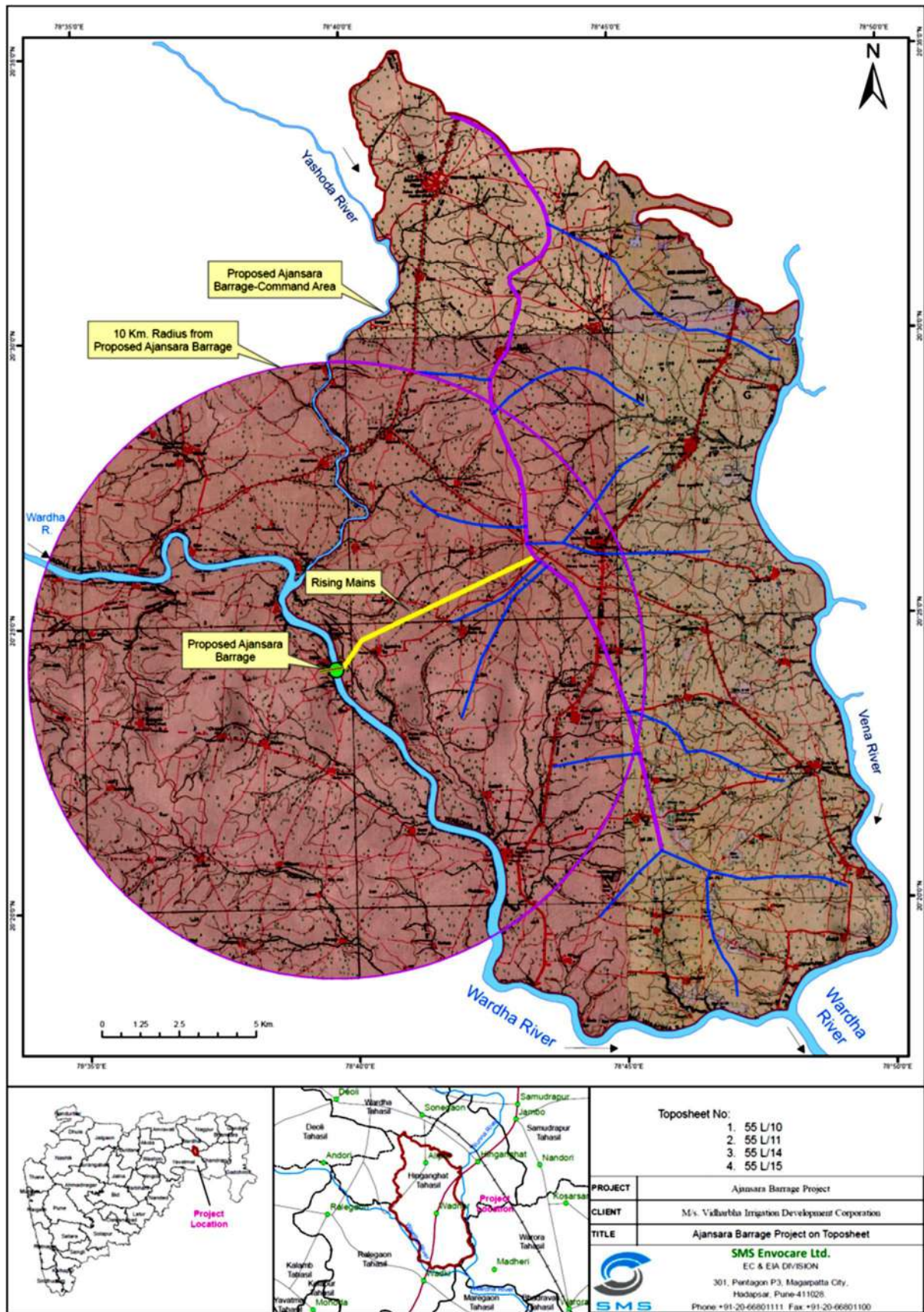


Figure No. 5: 10 Km Radius Toposheet map with Scheme

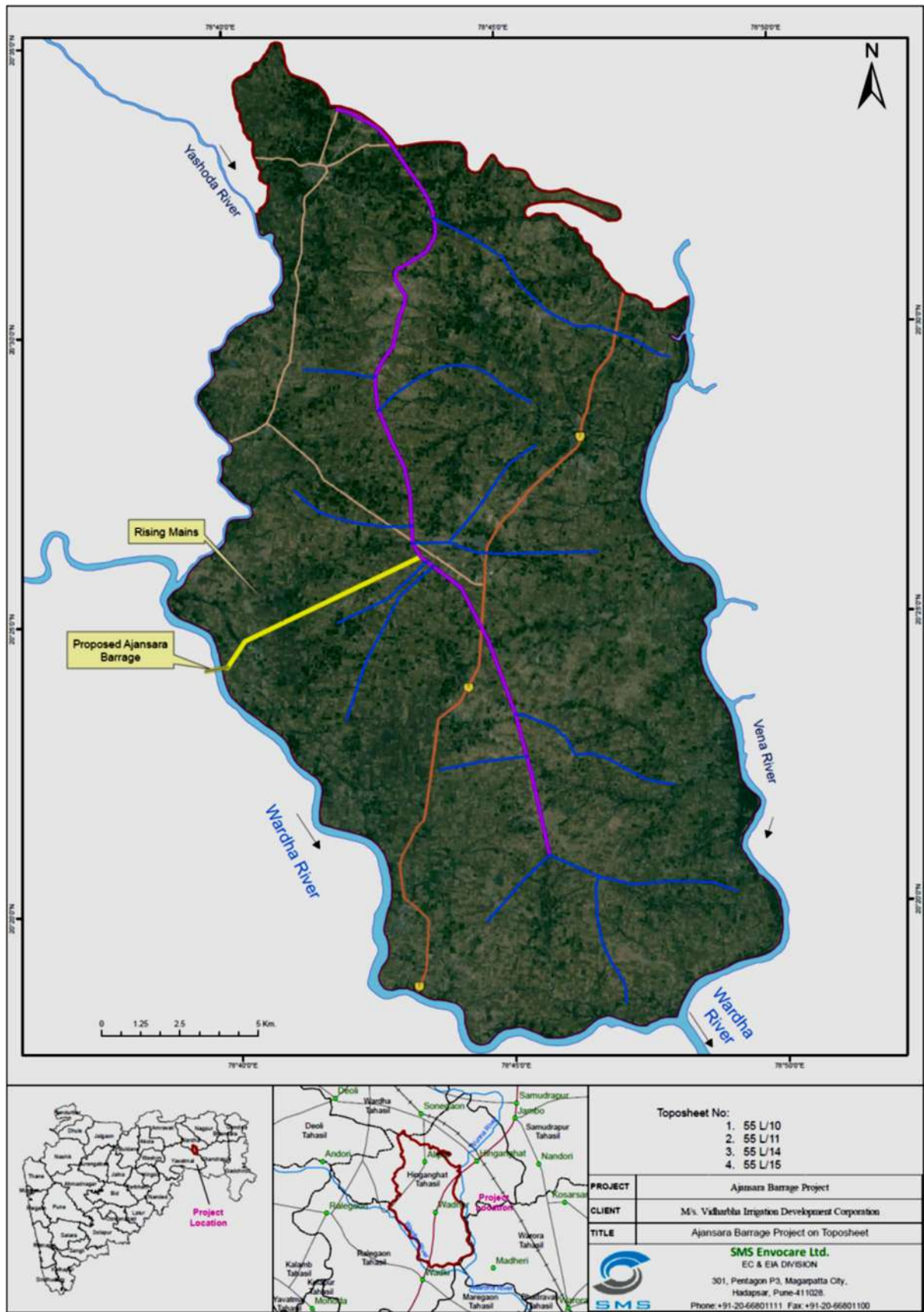


Figure No. 6: Irrigation Scheme on Google Image

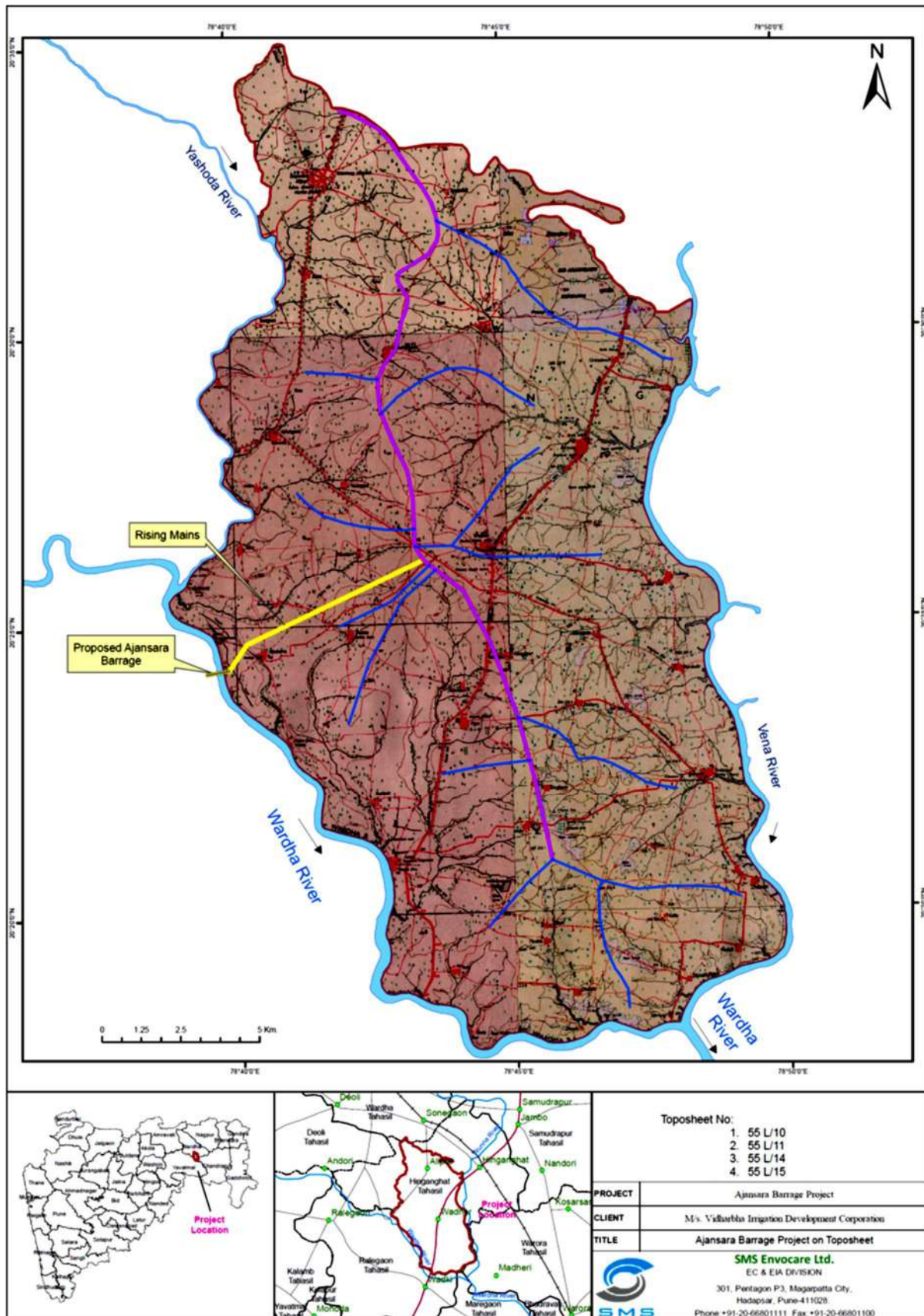


Figure No. 7: Irrigation Scheme on Toposheet map

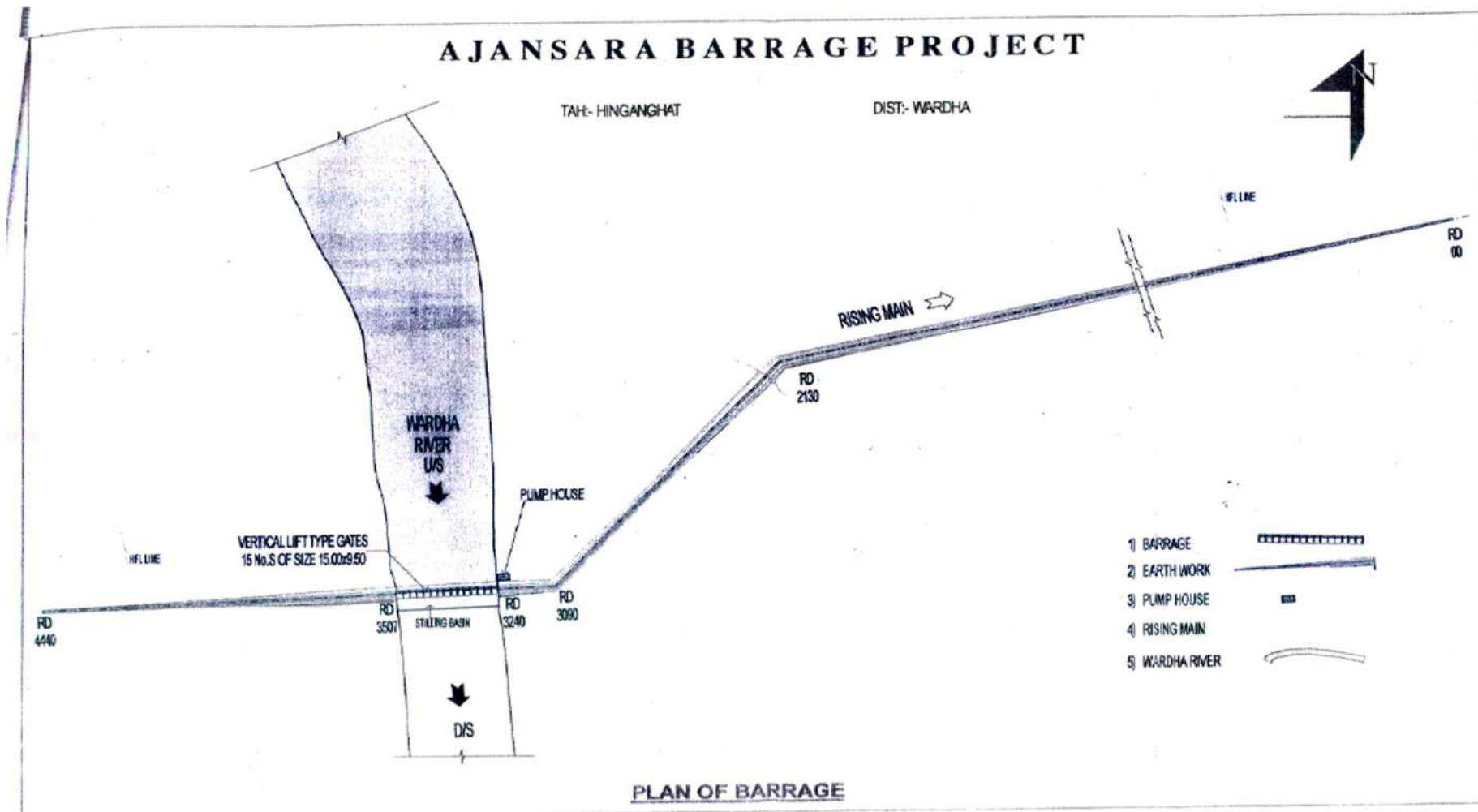


Figure No. 8: Plan of Barrage

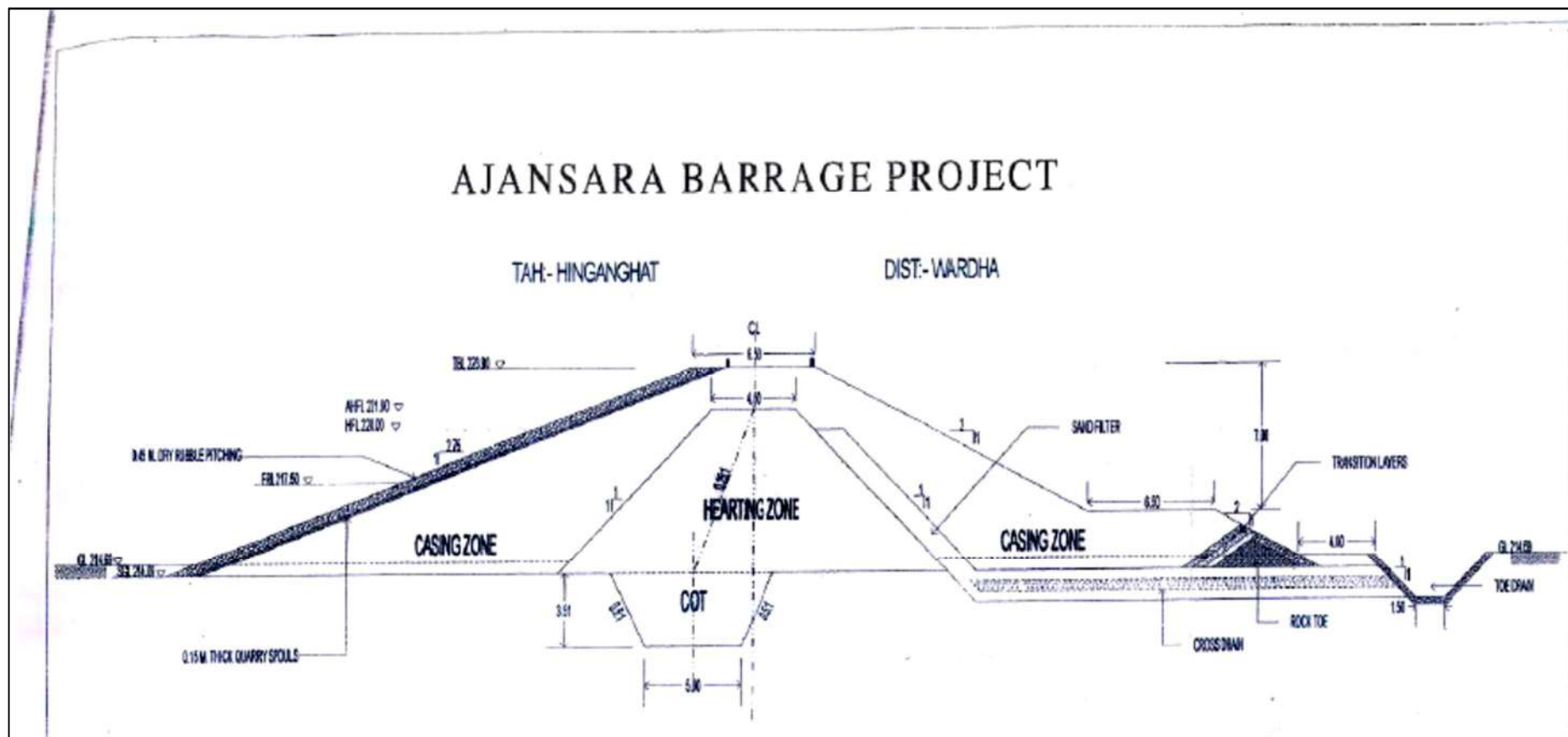


Figure No. 9: Typical CIS of Earthen Bund

3.4 Details of alternate sites considered and the basis of selecting the proposed site, particularly the environmental considerations gone into should be highlighted.

No other alternative site identified/ considered as proposed site is found feasible with techno-economical & environmental point of view.

3.5 Size or magnitude of operation

The capacity of Proposed Lift Irrigation project given below:

Gross Command Area (GCA)	35940 Ha
Culturable Command Area (CCA)	30004 Ha
Irrigable Command Area (ICA)	24000 Ha

3.6 Project description with process details (a schematic diagram/ flow chart showing the project layout, components of the project etc. Should be given)

This is a Lift Irrigation project to irrigate an area of 30004 Ha of Culturable Command Area (CCA) by utilizing the water from the Wardha River in Village Ajansara, Hinganghat Block of Wardha District of Maharashtra State.

The scheme involves a masonry barrage across Wardha River at village Ajansara flanked by earthen bunds of both the sides. The barrage site has a gross catchment area of 11.605 Sq. km with interception of 2618 Sq. Km. The masonry barrage has a length of 267 m with 15 nos. of vertical lifting gates of size 15 X 9.50 m. The Length of earthen dam on both flanks in 3765 m. The storage is proposed against gates only, while the earthen bunds are proposed to take care of outflanking due to high floods and approach to barrage in flood period. Detailed highlight of the project is given above in section on. 1.

3.6.1 Design Feature of Head Work

Controlling Level:

Crest Level: To minimize the sediment deposition and afflux over HFL, the crest level of barrage is kept as low as possible at RL 208.00 m which is just 1.38 m above the River Bed.

Full Reservoir Level: Due to non-availability of higher ground levels on the left bank and also to minimize the submergence of valuable cultivable land of nearby village, the FRL of Ajansara Barrage is kept at RL 217.500 m to contain the submergence in river banks only. Thus the gross storage in 22.24 Mm³. The storage is mostly against the gates.

High Flood Level: Stage discharge curve for Wardha River at Janasara Barrage site for natural condition has been plotted. It is seen that to pass the standard project flood of 15168.50 Cummeecs, the water level attains RL 221.900 m and HFL is kept at RL 221.900. The observed height flood level is 219.980 m. The Inglis flood when passes through the barrage section gives the level as 219.800 m.

Affluxed HFL: To minimize the obstruction and to maintain TBL at a minimum possible level, 15 number of vertically lifting type gates of size 15 X 9.50 m are provide. The afflux calculation for the barrage indicates that to pass the standard project flood of 15168.50 Cumeecs, the affluxed level comes at RL 221.900 m.

Top Bund Level: Considering free board of 2.00 m, above affluxed HFL, RL 221.900 M TBL is proposed at RL 223.900 m.

3.6.2 Rolled Filled Earth Dam:

Since the storage is to be made against gates only, the earth dam is proposed to prevent out flanking due to flood water to provide approach to the barrage in flood season. The earthen bunds are provided on both the flanks enveloping the barrage. The total length or earthen bunds is 4155 m.

The hearting and casing material is available with in a reach of 3 km away (by road). The construction material survey has been carried out and soil samples have been tested in the laboratory for ascertaining their physical properties.

Proposed Section: The top width of the dam is kept as 6.50 m. Both U/ s and D/ s slopes are 2.75: 1 and 2:1 respectively. On the D/ s a berm of 6.50 m width at depth of 7.00 m from the top bund level is proposed. The top of hearting Zone is kept at RL 224.200 M having a top width of 4.50 m with side slopes of 1:1.

Nature of Foundation: Since the earthen dam is not proposed for holding water against, it and since the ground levels for most of the length are considering with FRL a nominal stripping will be required. As such minimum cut off trench of 2.00 m depth is proposed for laying. On the left bank from RD 1980 m to RD 2190 M there is a dipression is ground level and the foundation rock is kept seated. In this reach the depth of COT is proposed as 1.25 (FSL-GL)

Inclined Filter, L-Drain and Cross Drains: The seepage through embankment is proposed to be tapped and conveyed through L-drains and cross drains. These drains will carry seepage to outside collection drains. The cross drains are proposed at 30 m C/ C of dam. The depth of L-drains and cross drains will be 1.50 m. The L-drain have a slope of 1:1 on hearting

sides and 0.50:1 on other side with a bed width of 1.5 m. The cross drain will have bed width of 1.50 m with side slope of 0.50:1 on either side.

Rock Toe: Rock Toe is proposed D/ s end at height is considered at 1/ 6 height of bund.

Upstream and Downstream Pitching: U/ s face of dam is proposed to be protected by dry rubble stone pitching of 3.0, thickness over a quarry spauls of 0.10m thick. The pitching on U/ s side has been proposed from TBL RL 223.900 m to GL and turfing has been from RL 223.900 m up to rock tow level on D/ s of the dam.

Junction of Earth Dam and Masonry Section: Both junctions of earth and masonry dam on left and right bank will be of divide wall type. Divide wall top level of 223.900 m RL and foundation resting on hard rock are proposed to guide the flow of river and also to protect the earth dam from eddy currents on D/ s the top width of divide wall is kept as 1.50 m back batter of 0.95:1 with water side face as vertical.

3.6.3 Barrage

A central gated barrage in the river from RD 3240 M to 3507 m (total length 267 m) with 15 nos. of vertically lifted gates is proposed. The size of gates will be 15 X 9.50 m to pass the project flood 15168.50 Cumecs.

3.6.4 Design of Barrage

Crest Level: The Crest level of spillway is fixed at RL 208.00 m. The lower crest level is proposed to allow free of silt to D/ s to maximum possible extent.

Shape of Crest: This weir is a low crest having a tail water level higher than the conjugate depth. Due to submergence effect the ogee shape will not function. Hence a trapezoidal type weir is proposed having a top width of 5.00 m U/ s and D/ s slope of 2:1 and 3"1 respectively.

3.6.5 Foundation of Barrage

For proposed barrage Amygdaloidal basalt is available for foundation, upper layers of these rocks in joined and weathered. The general foundation level as suggested by Geologist is in the range of 203.11 m to 206.21 m. accordingly foundation is proposed in two steps. From RD 3240 m to 3440 M. The foundation level is 203.80 m and from RD 3440 m to 3525 m the foundation level is proposed at RL 203.11 m. Thus the deepest foundation level is 203.11 m and height of barrage from the deepest foundation up to crest level is 4.89 m.

A detail of Recapitulation Sheet is enclosed as *annexure-1*.

4. IRRIGATION PLANNING

4.1 Existing and Proposed Facilities in Command Area

There is a good network of road communication is available in the command area. All important villages are connected by roads. The mode of transportation is generally by ST bus, trucks, and private vehicles. Taluka place and other important towns and cities in Wardha district are connected by telephone lines and having postal services.

4.2 Existing and Proposed Cropping Patterns

The crop approved by Director of Agriculture of Lower Wardha project is adopted for this project. Since Lower Wardha project Command is adjacent to this project command and both are in the same agro-climatic zone.

Table No. 2: Cropping pattern

Sr. No.	Crops	Percentage
Two Seasonal		
1	Turmeric	4%
	Chilies	5%
	Improved Cottons	18%
	Total	27%
Kharif Seasonal Irrigated:		
2	Paddy (Dilled)	5%
	Hy. Jwar	20%
	Hy. Maize	5%
	Ground Not	10%
	Hy. Bajra	5%
	Vegetables	5%
	Total	50%
Kharif Seasonal Un-irrigated		
	Pulses and Green Mannering	23%
	Total	23%
Rabbi Crops		
5	Wheat	10%
	Gram	12%
	Sunflower	6%
	Sunflower	7%
	Vegetables	5%
	Total	40%

4.3 Soil Survey

Soil survey has been undertaken by the Director of Irrigation Research and Development Organization, Water Resource Department Pune. Detailed report received which is shows the satisfactory results.

4.4 Evaporation Losses

Total evaporation losses are worked out to 10.23 Mm³ by trial and error method. The evaporation loss depths are obtained from the observations of the Navegaon Khairy reservoir.

Details of Crop Water Requirement for 1000 ha area is enclosed as *annexure-2*.

5. SURVEY AND INVESTIGATION

5.1 Topographical Survey & Investigation

Permanent benchmark was carried out from G.T.S. to the site by double leveling. Temporary benchmarks are established by double leveling all along the dam and canal to facilitate the survey work and checking.

5.2 Survey for Barrage

Grid survey for barrage is carried out @ grid of 30 m. X 30 m. up to a length of 500 m U/s and D/s of the centerline of the barrage. Grid is plotted to the scale of 1: 3000 with contours plotted at 1 km. interval. This survey also includes the cross section of the of the river at barrage site.

5.3 Submergence Survey

Submergence survey is carried out at a level of 221.00 m by taking a grid of 150 m X 30 M FRL stones have been fixed at 150 m interval. Village Dapori of Yotmal district comes fully and four villages are partially affected. They are Jagjai of Yotmal district and Kosurla, Mansaoli, Sonegaon (Raut) of Wardha district. Total souls required to be rehabilitated are about 525. Total area of submergence is 1044.13 ha which includes 549.21 ha private land, 31, 56 ha of forest land and 463.36 ha of govt. land.

5.4 Canal and Command Area Survey

Two ridge canals are proposed from delivery chambers. The Weni canal travel towards south for 10.59 km and Kachangaon canal travels towards north for 15.00 km. Alignment survey by taking levels at 30 m intervals along L-Section with Cross-Section at 150 m interval for a length of 150 m on either side is carried out. Plotting of L-Section and Plan of canal is done at a scale of Vertical 1:300 and horizontal 1:3000.

5.5 Survey for Construction Material

The construction material required for the scheme is:

1. Hearting material
2. Casing material
3. Rubbles for rock toe, masonry & aggregates

4. Sand
5. Cement
6. Steel etc.

Borrow area surveys were carried out to estimate the availability of hearting material quantitatively and qualitatively.

The hearting quarry is located in submergence area 3. Km away (by road) from barrage site. Six trial pits were taken to ascertain the nature of material available. Samples were sent to soil testing laboratory to test the physical properties of the material and found suitable as hearting material.

Most of the stone required will be used from excavated material from river bed. However, one stone quarry is investigated in submergence near village Sawangi (Rithi) 3 km from U/ s of dam site.

Sand of good quality is available in river bed in ample quantity within a reach of 2 km. Other construction material like steel and cement will be available from, the relevant respective factories.

5.6 Geotechnical Investigation

Total 20 bore holes are taken to know the thickness of the overburden and the underlying strata. Out of above, the river bed is investigated with 12 bore holes. Seven bore holes are drilled on the left bank and one bore hole on right bank. Assistant Geologist, Geological unit, Nagpur inspected the bores. According to the report, compact basalt, amygdaloidal basalt rock types are available as the foundation rock for the barrage.

Capacity of Ajansara Barrage at different contour level is enclosed as **annexure-3**

6. PROJECT HYDROLOGY

6.1 General Climate and Hydrology

The proposed Ajansara barrage envisaged construction of a barrage flanked by earthen bunds across the Wardha River near village Ajansara in Hinganghat Tehsil of Wardha District of MS. The site is located at approx. 20 Km. above the confluence of Wardha and Wunna River. The reservoir of this scheme has the storage 22.24 mm³ and will irrigate 24000 ha of land on the left bank in the Wardha district by Lift Irrigation.

The climate of the valley is almost dry and temperature has large variations. The maximum and minimum temperature recorded in valley is 47^o in summer and 8^o in winter.

6.2 Hydrological Data

6.2.1 Catchment Area

The gross catchment area up to Ajansara site is 11605 Sq. Km and free catchment area is 2618 sq. km. The details of catchment area and yield are also as follows:

Table No. 3: Catchment Area details

1	Catchment Area	
	Gross	11605 Sq. km
	Free	2618 Sq. km
2	75 % dependable yield	
2.1	Gross annual	1819.570 Mm ³
	Monsoon	1755.885 Mm ³
	Post Monsoon	63.685 Mm ³
2.2	U/ s reservation at 75% dependability	1553.572 Mm ³
3	Annual yield available for planning	
	Monsoon	265.998 Mm ³
	Post Monsoon	9.300 Mm ³
4	Regeneration flow (@ 7.5 % of U/ s utilization)	116.510 Mm ³
5	Net yield available for planning (annual)	383.508 Mm ³

6.3 Rainfall Data

There are sufficient numbers of rain guage stations installed by IMD as well as irrigation Department in the Wardha Valley. Rainfall data of these stations from year 1960 to 2013 (53 years) for monsoon months has been collected and accordingly weighted rainfall for Wardha catchment area is computed.

6.4 Rainfall – Runoff Co relationship

The correlation equations developed by the Central Designs Organization, Nashik in June 1995 for the Dindora Project, which is situated just 27 km downstream of Ajansara Barrage site on the same river are, adopted for working out yield.

6.5 Rainfall – runoff co relationship

Total yield from free catchment area of 2618 Sq. m in 1819.57 mm³ (@ 75% dependability). Upstream water requirement @ 75% dependability is as follows:

- 1) Wardha source and up to upper Wardha Dam: 925.411 Mm³
- 2) Wardha from Upper Wardha Dam to Bemla-Wardha confluence: 323.187 Mm³

3) Bembla up to Bemla-Wardha confluence: 304.774 Mm³

Total U/s requirement : 1553.572 Mm³

After deducting 1553.572 U/s utilization, net yield available at Ajansara Barrage site @ 75% dependability is about 266 Mm³. Assuming 7.5% regeneration flow 116.51 Mm³ water will be available at site. Thus the net annual yield available at 75% dependability at Ajansara Barrage site will be 382.508 Mm³.

6.6 Monsoon Yield

Monthly weighted rainfall for Ajansara barrage catchment for monsoon months (June-October) is worked out. The monthly run off series is developed by adopted by applying correlation equation to rainfall series and accordingly yield series up to Ajansara site for the monsoon period is developed.

6.7 Post Monsoon Yield

The analysis of observed post monsoon flow at Ghugus River gauging station indicated that an average 3.67% flow during non-monsoon period (Nov. to May) is assured at Ghugus river gauging station of CWC and is adopted to compute post monsoon yield. The monthly distribution of post monsoon flow is calculated by averaging the observed post monsoon flow at Ghugas site. Thus the distribution pattern for the post monsoon flow is kept content for all years since the quantum is marginal.

6.8 Silt Studies

Silt distribution study is carried out assuming that the silt will accumulate up to the crest level only, above which the silt will be flushed out due to heavy discharge and lower elevation of crest.

6.9 Working Table

Instead of preparing working tables for 36 years by conventional methods, a single table showing simulation for 36 years is prepared. The table shows that out of 36 years, 25 years are successful in satisfying irrigation requirements. Thus the percentage of success is 70%.

6.10 Design Flood

In the preset studies the Flood hydrograph developed for Wardha river up to Dindora barrage (developed by Central Design Organization) is used. The flood study for Dindora barrage has been carried out by adopting synthetic method technique. There exists a river gauging site, maintained by CWC at Ghugas which is located on the downstream of present Ajansara barrage site. It is felt more appropriate to carry out flood studies by synthetic method as variation of temporal and spatial distribution of rainfall over whole catchment

varies considerably. The peak flood of 38268.45 Cumecs, which is for the entire catchment up to Dindora project, is considered by CDO, Nashik. The standard project flood for Ajansara Barrage is calculated in proportion of Square root of catchment area both Ajansara and Dindora Barrage sites and it works out to 30533 Cumecs.

7. REQUIREMENTS OF PROJECT

7.1 Crop Water Requirement

The Crop Water requirement approved for Lowar Wardha Project by CWC is used for computing the irrigation requirement of 24000 ha. of the project. The crop water requirement for 1000 Ha comes out to 7.136 Mm³. Thus total requirement of 24000 ha. is 171.24 Mm³.

As per direction of Government, a provision for domestic water use at 15% of live storage is made in the project planning. The quantum of reservation works out to 3.31 Mm³.

7.2 Power Requirement

Total power requirement during construction shall be made available by DG sets of required capacity. During operation phase, power shall be supplied from Sub-station which will be installed by MSEDCL near to project site.

Alternate fuel like portable LPG cylinder shall be provided to the workers for domestic purpose during construction phase so as to avoid the use of forest products/ Timbers/ firewood. Local shall be preferred for construction, there may not any requirement of accommodation. Power requirement during operation phase shall be made available by Sub-station by MSEDCL.

7.3 Manpower Power Requirement

Different category of manpower required is as follows:

- Machinery operator & driver
- Fitters & machinery for repair
- Masons
- Unskilled Labors Majdoors

Required manpower shall be sourced from Local area during construction phase. They will be preferred for jobs based on their educational qualification, experience and capabilities during construction phase.

8. DRAINAGE

8.1 Godavari River Basin

The Godavari river basin is formed by the rivers and their tributaries such as Darna, Pravara, (originates from Western Ghats); Sindphana, Manjara, Manar (from Balaghat Range); Purna, Bhagwati, Dudhana (from Ajanta Range) of the Uttar Maharashtra and the Marathwada regions as well as the rivers like Painganga, Wardha, Pench, Wainganga, Indravati, Pranhita from the Amravati and Nagpur regions in turns meets Godavari river partly in the State of Maharashtra, partly in the State of Andhra Pradesh and partly on these State boundaries. The basin Code number is 3 and having an area of 302063.93 Km².

The river Godavari, the largest of the peninsular rivers, and third largest in India, drains about 10% of India's total geographical area. The catchment area of the river is 3, 12,812 sq.km. and is spread in the states of Maharashtra (48.6%), Andhra Pradesh (23.4%), Madhya Pradesh (10.0%), Chhattisgarh (10.9%), Orissa (5.7%) and Karnataka (1.4%). The basin lies in the Deccan plateau and is situated between latitude 16° 16' 00" North and 22° 36' 00" North and longitude 73° 26' 00" East and 83° 07' 00" East.

The river Godavari rises at an elevation of 1,067 m in the Western Ghats near Thriambak Hills in the Nasik district of Maharashtra. After flowing for about 1,465 km., in a generally south-east direction, it falls into the Bay of Bengal. About 64 km. from its source, the Godavari receives the waters from Dharna, on its right bank and a short distance downstream the Kadana joins it from the left. The combined waters of the Pravara and Mula which rise in the hills of Akola join the river from left about 217 km. from its source. About 338 km. from its source, the river receives the combined waters from the Purna and Dudhna rivers and after a further 138 km. at the border of Maharashtra and Andhra Pradesh, the waters of the Manjira river joins it from the South. At this point, Godavari flows at an elevation of about 329 m.

The river Pranhita, conveying the combined waters of Penganga, the Wardha and Wainganga, which drain Nagpur and southern slopes of the Satpura ranges, falls into Godavari about 306 km. below its confluence with the Manjira. The waters of the Indravathi join the river Godavari 48 Km downstream. The last major tributary is the Sabari from Orissa, which joins the Godavari, 100 km. up-stream of Rajahmundry.

The largest tributary of the Godavari is the Pranhita with about 34.87% coverage of drainage area. The Pravara, Manjira and Maner are right bank tributaries covering about 16.14%, the Purna, Pranhita, Indravathi and Sabari are important left bank tributaries, covering nearly 59.7% of the total catchment area of the basin. The Godavari in the upper, middle, and lower

reaches make up for the balance 24.16%. The particulars of the catchment area, length, elevation of the source points of the river and its tributaries in the order of their occurrence along the length of the main river are indicated in the table below.

Table No. 4: Important Tributaries of Godavari

Sl. No.	Name of River	Elevation of Source	Length of Tributary (km)	Catchment area (sq. km)	Average
1	Upper Godavari (source to Manjira confluence)	1,067	675	33502	770
2	Pravara	1,050	208	6537	606
3	Purna	838	373	15579	797
4	Manjira	823	724	30844	846
5	Middle Godavari (between confluence points Manjira and Pranhita)	323	328	17205	955
6	Maner	533	225	13106	932
7	Penganga	686	676	23898	960
8	Wardha	777	483	24087	1055
9	Pranhita	640	721	61093	1363
10	Lower Godavari (Pranhita confluence to sea)	107	721	24869	1208
11	Indravati	914	535	41665	1588
12	Sabari	1,372	418	20427	1433

Godavari River basin in Vidarbha Region constituted by three rivers i.e. Wardha, Wainganga, and Painganga river sub basin.

Wardha Sub-basin: It originates in Satpura Range near Multai in Madhya Pradesh. It is a tributary of the Pranhita river, which ultimately flows into the Godavari River. The important tributaries of Wardha river are Vena river, Bembala and Painganga river.

Wainganga Sub-basin: The Wainganga river, which originates about 12 km. from Mundara village of Seoni district in the southern slopes of the Satpura Range of Madhya Pradesh, and flows south through Madhya Pradesh and Maharashtra in a very meandering course of

roughly 360 miles. After joining the Wardha, the united stream was called the Pranhita, finally empties into the River Godavari. The principal tributaries of the Wainganga are the Garhavi, Kathani, Khobragadi and Potphondi on the western bank and Andhari on the eastern bank.

Painganga Sub-basin: The Painganga river is the major river of Yeotmal district of Maharashtra State. It originates in the Ajantha ranges in Aurangabad district in Maharashtra. It flows through Buldhana and Washim districts and acts as a boundary between Yavatmal and Nanded districts of Maharashtra. It finally empties into Wardha river near a small village called Wadha in Wani Tehsil of Yavatmal district.

8.2 Warda Sub-River Basin

The Wardha River is one of the biggest rivers in Vidarbha region in India. The Wardha River joins the Wainganga River south of Chamorshi and forms the Pranahita River at Adilabad District, Telangana. Wardha originates at an altitude of 777 meters Satpura Range in village khairwani near Multai, Betul District of Madhya Pradesh. From the origin it flows 32 km in Madhya Pradesh and then enters into Maharashtra. After traversing 528 km, it joins the Wainganga forming the Pranahita, which ultimately flows into the Godavari River. Kar, Wena, Jam, Erai are the left tributaries and Madu, Bembla, Penganga are the right tributaries.

9. GEOMORPHOLOGY

The area is physiographically divided in two parts, the north and north eastern parts forming into a hilly spur projecting south and south eastwards from the Satpuras. While the southern part forms in to an undulating plain with average elevation ranging between 300 and 500 meter above mean sea level (m amsl). The general slope is southwards and gentle towards Wardha River, but tends to become steeper in the northern uplands. The entire district is mainly drained by Wardha River and its tributaries viz., Yashoda, Wunna and Bakli. Based on geomorphological setting and drainage pattern, the district is divided into 39 watersheds.

The soil of the district is basically derived from Deccan Trap Basalt and almost entire district consists of black or dark brown soil over a sheet of Deccan Trap Basalt. The soil varies in depth from few centimetres to 3 m with average thickness being about 0.75 m. The soils of the district can be grouped under four main local categories viz., Kali, Morand, Khardi and Bardi, with major part of the district being occupied by Kali soil.

The major part of the district is underlain by Deccan lava flows of Upper Cretaceous to Eocene age, whereas Alluvium is restricted along the banks of Wardha River and Yashoda River.

9.1 Deccan Trap Basalt

Deccan Trap Basalt represents a thick pile of nearly horizontal flows, within these thick piles seven flows have been deciphered down to a depth of 120 m. The porosity and permeability has been found to change in an individual flow, from flow to flow and from place to place.

Ground water in the near-surface strata generally occurs under unconfined conditions but at deeper levels it usually occurs under semi confined state, the confining layers being red boles and dense massive part of Basalt. Deeper confined aquifers are less productive than shallow semi confined and phreatic aquifers, unless they have interconnected fracture system, which is being recharged. Weathering of Basalt both in massive and vesicular unit have given rise to good phreatic aquifers even down to a depth of 20 m and these shallow aquifers are extensive and homogeneous. The palaeo-weathering which has taken place during the time intervals between two eruptions has given rise to stratified aquifer systems. Ground water is under semi-confined conditions in these aquifers, which get recharged mainly from downward recharge through shallow aquifers and from major surface water bodies. Broadly speaking, three distinct aquifer systems are available in the Basalts in areas underlain by Deccan Traps, Wardha district being one such area:

- 1- Shallow water table or phreatic aquifer down to 20 m depth
- 2- Semi-confined aquifers at slightly deeper levels overlain by massive Basalt and red boles from 20 to 40 m depth
- 3- Confined aquifers, which are noticed at still deeper levels in flows not exposed and available from about 40 m to about 120 m

9.2 Alluvium

The Alluvial deposits are restricted along the banks of Wardha River and Yashoda River and have limited areal extent. They comprise of upper layer of silt material underlain by a coarse detrital material like sand and gravel with admixture of clay. Coarse detrital material occurring as lenses form good aquifers, whereas finer silt and clayey material are poorly permeable and act as aquiclude. The maximum thickness of Alluvium is about 18 m near Pulgaon, which is situated along the bank of Wardha River elsewhere it is very shallow.

9.3 Soil and Mineral

The alluvial soil along the water courses of main tributaries of Wardha, Dham and Bor rivers is eminently suited to tree growth. The basaltic rocks can be distinguished into two types, namely, those that are extremely compact, hard and homogeneous and the other type is the softer basalt exfoliating in softer flakes. The former type of rocks withers very slowly and the

small quantity of soil that is formed in such areas supports low quality tree growth. This covers, mainly, Ashti range. In the areas having softer basalt rapid decomposition takes place and a fine yellowish brown loam is obtained. It supports valuable tree growth.

As withering advances the finer grains of the soil and the decomposed organic matter are washed away from the loam and deposited in the lower sheltered regions forming patches of 'regur' or black cotton soil. This is a fine grained dark soil which varies greatly in colour, consistency and fertility. It is highly hygroscopic and results in water logging at saturation point. This is chemically rich soil and is capable of yielding valuable field crops when well aerated by constant hoeing. In the forests, however, the vegetation supported by this soil has mostly to depend upon its natural aeration. Wherever, the drainage is good, as in belts along streams, it supports valuable forests, elsewhere, it remains practically waterlogged and produces as abundant crop of important fodder grasses. Such soils are not favourable for plantations. Regur is sometimes mixed with kankar which generally increases its alkalinity and thus renders it somewhat less suitable for vegetation.

10. CLIMATIC CONDITION

10.1 Climate and Rainfall

The climate of Wardha district is hot and dry. There are three seasons namely cold, hot and monsoon. The cold season starts by the end of November and continues up to middle of February. The cold is mild and the weather is pleasant. The hot season starts in the middle of February till the onset of monsoon in the middle of June. During the months of April and May the heat of the day is rather unbearable due to hot winds and the dryness of the atmosphere. The monsoon months are humid and sultry. The heat increases as soon as monsoon ends and the months of October and November are, mostly uneasy till winter sets in.

The average annual rainfall of Wardha district is 961.72 mm. The major portion of the total annual rainfall is received during June to September each year, which generally amounts to 85 percent of the annual rainfall. August is the heaviest rainfall month in the year. Average number of rainy days in a year varies with place and time and decreases from Wardha to Ashti.

Except, the rainy season, the entire year is dry. The variation of rainfall from year to year is, significantly, large. The following table shows the average annual rainfall and average number of rainy days (during the year 2002 to 2011) in a year for 8 rain gauge stations of Wardha District.

Table No.5: Rainfall pattern of Wardha district from 2002 to 2011

Taluka	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Average
Wardha	864.6	951.1	885.4	1121	940.3	1152.9	892.7	617.3	1393.4	927.9	974.7
Seloo	1279.5	968	1105	1395	1084.3	1643.1	968.1	758.3	1329.5	976	1152.5
Deoli	941.7	967	739.6	1165	-	-	62.3	581	1242.6	1013.8	916.6
Hinganghat	988.2	1048.2	956.9	1246.9	-	-	1011	769.3	1513.6	941.4	1059.4
Samundrapur	1074	1112	882.8	1281.2	-	-	733.9	772.9	1440.2	1108.5	1050.7
Arvi	793.9	863.7	789.5	1216.6	1146	1132	977.6	605	1147.1	1109.9	978.1
Asthi	760.6	706.8	688	1020	843.7	1203.3	578.8	669.4	873.6	820.4	807.6
Karanja	876	910.5	879.5	1051.3	958.7	1061.6	705.2	702.2	1253	924	932.2
Average	947.3	940.9	867.2	1187.1	994.6	1238.6	821.0	671.9	1274.1	977.7	

Source: Ground Water Information, Dist. Wardha, MG by CGWB

The average annual rainfall for the last ten years when compared with the normal annual rainfall, it is observed that the average rainfall is much less than the normal annual rainfall, except during 2005, 2006 and 2010 when it has exceeded the normal annual rainfall. Thus the rainfall has definitely decreased in the district over the period of time.

10.2 Temperature

The diurnal range of temperature is the maximum during March. In August these changes are minimum. The overall minimum and maximum temperature is 9.9° C and 46.0° C, respectively. In April the maximum temperature goes up to 43.7° C, while in May it goes up to 46° C. The shorter divergence is only during the rainy season. The high temperature during the summer months adversely affects the vegetation in flat and bare country owing to the exposed and highly radiating basaltic rocks. In forest clad hills, however, conditions favorable to plant growth are present. Annual minimum and maximum temperature is summarized below:

Table No. 6: Annual Temperature of Wardha district

Month	Temperature		Diurnal Range °C
	Maximum °C	Minimum °C	
January	33.3	9.9	23.4
February	35.6	11.2	24.4
March	40.1	14.8	25.3
April	43.1	20.2	22.9
May	46.0	25.3	20.7
June	44.3	24.9	19.4
July	36.8	20.7	16.1
August	35.2	19.8	15.4
September	35.2	19.9	15.3

October	34.9	16.7	18.2
November	33.8	12.4	21.4
December	28.9	10.1	18.8

10.3 Drought

Damage due to drought is a rare incident. Severe drought has affected the forest crop, especially to teak to some extent in the year 1939-40, 1940-41 and in 1952-53 in the poorer teak forest of Hingni and Karanja ranges. In the recent past, there have been erratic rains during the monsoon, every alternate year. This affects the natural regeneration and afforestation works undertaken in the division.

10.4 Storms, Floods and Frost

The prevailing winds are North-Easterly from October to March and South-Westerly from April to September. The winds are generally moderate. Occasional storms in pre-monsoon period are also experienced which sometimes result in uprooting of isolated trees. High floods are not of common occurrence. Frost is not recorded so far and is almost unknown in the forest areas of the district.

11. CONSTRUCTION PROGRAMME & PLANNING

The Proposed scheme mainly consists of following components:

- 1- Earthen Dam
- 2- Gated Masonry Barrage
- 3- Jackwell and Pump House
- 4- Rising Main and Delivery Chamber
- 5- Canal Systems

All above components are planned to be constructed in 7 years.

11.1 Construction Material

The quantum of construction material required and its availability from borrow or available stuff as follows:

Table No. 7: Details of Construction material

Construction Material	Availability	
	Borrow	Available
Hearting material	199943 Cum.	43657 Cum.
Casing Material	414746 Cum.	24324 Cum.
Stone	52019 Cum.	--
Steel	Steel & Cement will be made available from local market at Hinganghat	
Cement		

11.2 Construction Machinery

Equipment required for rock-excavation like air compressors, jack, hammer etc. are proposed to be acquired. Beside above, provisions for other machinery like Road Roller, water tankers, Conventional trucks, batching plant is made in the estimate.

11.3 Construction Organization

One Civil Division with 7 Civil Sub-Divisions for head work and Civil-sub- Divisions for canal work is proposed.

12. COMMAND AREA DEVELOPMENT

12.1 Common Area

The command area comes under the Hinganghat Taluka of Wardha district. The classification of the lands in the command area is collected from the Census book of Wardha District. The soil of Command area is BC. Soil. The average rainfall of the area is 1092 mm. At present, irrigation in the command area is a rare occurrence. Out of the gross command area 35940 ha only 20.48 ha of land is under irrigation by different source like dug well, pumps on stream and a minor irrigation scheme. The general slope of the fields towards streams is 2%.

12.2 Socioeconomic Aspects

The total population of the command area is 47737 from census book of Wardha district. Major occupation of the people in the area is agriculture. The farmers in the command area can be grouped in two main categories mainly. One group is big farmers and other is small agriculture workers which do hold marginal lands. Due to nonexistence of irrigation facilities in the area, agriculture industry is not much beneficial. Sufficient agricultural labours are available. The wages are governed by minimum wages act of State Government. of Maharashtra.

13. RESETTLEMENT & REHABILITATION

Total five (One fully and Four Partially) villages are likely to be affected due to the proposed project. The necessary rehabilitation of these villages will be done as per Maharashtra Resettlement of Project Displaced Persons Act, 1999 at As per The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013. Details of submergence and property affected are given below :

Table No. 8: Details of Submergence

Submergence	
Land & Property Submerged	Land affected @ RL 218.000 M 1. Gross: 1044.13 Ha 2. Culturable: 517.47 Ha 3. Irrigated: 21.14 Ha Village affected No. @ 220.800 M 1. Fully: 1 (Dapori) 2. Partially: 4 (Jagjai, Mansaoli, Kosurla, Sonegaon (Raut)) Building/Houses affected: 1. Private: 107 Nos 2. Temple: 4. Nos 3. Well: 23 Nos 4. Other: 3 Small K.T. weirs, 2 Bridges (minor), Water supply wells to supply water to Ajansara, Lift Scheme Ajansara.
Submergence Ratio @ RL 218.00 M	4.35 %
No. of Families affected	100 Nos.
No. of Persons affected	525 souls

14. PROJECT COST ESTIMATES

Total cost of the project workout is Rs. 20842.270 Lakhs which include direct, indirect charges, receipt and recoveries etc. as defined by CWC while clearing other projects on the region.

Table no. 9: Details of Cost estimation

Project Cost	
Head Works	Rs. 12984.367 Lakhs
Canal	Rs. 3870.708 Lakhs
Direct Charges	Rs. 3758.966 Lakhs
Indirect Charges	Rs. 228.270 Lakhs
Total Cost of Project	Rs. 20842.270 Lakhs

Detailed Cost estimation is enclosed as *annexure-4*

15. ANALYSIS OF PROPOSAL (FINAL RECOMMENDATIONS)

Project shall create direct & indirect employment opportunities to the people residing at surrounding region. Different types of people will be recruited for proposed unit based on the basic qualification as skilled, unskilled or semiskilled. As the project needs good amount of workforce of non-technical and technical nature, they are being made available from the nearby villages. Migration of highly education and skilled experience people will result in increase of literacy in the surrounding villages. Project will also enhance the prospects of employment to the nearby people. Additional government revenues are generated from taxes, duties and other fees. Additional benefit of the project also includes considerable growth of the industrial and commercial activities in the region and the state.

Annexure-1
Detailed of Recapitulation Sheet

RECAPITULATION SHEET				
Sr. No.	Sub Heads	Unit I Head works Rs. In Lakhs	Unit II Canal works Rs. In Lakhs	Total Rs. In Lakhs
1	"A" Preliminary	42.046	6.991	49.037
2	"B" land	1029.556	68.552	1098.108
3	"C" Works	10911.272	0.000	10911.272
4	"D" Regulator	0.000	63.392	63.392
5	"E" Falls	0.000	38.848	38.848
6	"F" RHT Works	0.000	0.000	0.000
7	"G" Bridges	0.000	45.094	45.094
8	"H" Escape	0.000	5.000	5.000
9	"K" Building	270.432	54.362	324.794
10	"L" Earth Work	0.000	311.845	311.845
11	"M" Plantation	10.911	0.425	11.336
12	"O" Miscellaneous	436.451	17.258	453.709
13	"P" Maintenance	112.371	4.316	116.687
14	"Q" Special T&P	115.909	15.031	130.940
15	"R" Communication	55.419	6.304	61.723
	Total Rs.	12984.367	637.418	13621.785
16	III Distributory	-	1080.000	1080.000
17	IV Water Courses	-	2153.289	2153.289
	Total Rs.	12984.367	3870.708	16855.074

Annexure-2
Detailed of Crop Water Requirement

STATEMENT SHOWING THE ABSTRACT OF CROP WATER REQUIREMENT FOR 1000 Ha.

Sr. No.	Name of Crops	Area In Ha.	%	June		July		August		September		October		November		December		January		February		March		April		May		Total	Remarks	
				I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II			
A Seasonal Crop																														
1	Turmeric	40	4%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0072	0.0271	0.0374	0.0533	0.0429	0.0538	0.0326	0.0315	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2858	
2	Chillies	50	5%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0076	0.0377	0.0508	0.0624	0.0603	0.0395	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2593	
3	L.S. Cotton	180	18%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0349	0.1356	0.1630	0.2553	0.2421	0.1869	0.1525	0.1241	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.3143	
B Kharif Crop																														
4	Paddy	50	5%	0.0000	0.0795	0.0535	0.0409	0.0014	0.0219	0.0575	0.0762	0.0409	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3738	
5	Hy. Jawar	200	20%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0108	0.0123	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0231	
6	Hy. Maize	50	5%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0055	0.0091	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0146	
7	Ground Nut	100	10%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0250	0.0558	0.0321	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1128	
8	Hy. Bajra	50	5%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
9	Vegetable	50	5%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0055	0.0301	0.0428	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0782	
C Unirrigated																														
D Rabi Crop																														
11	Wheat	100	10%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0288	0.0588	0.1057	0.1170	0.1174	0.1290	0.1121	0.0574	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.7244	
12	Gram	120	12%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5910	
13	Sunflower	60	6%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0161	0.0275	0.0428	0.0637	0.0670	0.0720	0.0217	0.0344	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3453	
14	Safflower	70	7%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0188	0.0321	0.0500	0.0743	0.0781	0.0253	0.0402	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4028		
15	Vegetable	50	5%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0113	0.0135	0.0335	0.0503	0.0496	0.0550	0.0599	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2734		
Fortnightly CWR		1400	140%	0.0000	0.0795	0.0535	0.0409	0.0014	0.0219	0.1539	0.3658	0.3867	0.3758	0.4798	0.5132	0.5546	0.5948	0.4096	0.3851	0.2189	0.1321	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	4.7877	1000 Ha
Total Monthly CWR				0.0795	0.0944	0.0233	0.5397	0.7625	0.9930	1.1494	0.7949	0.3509	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	4.7877	1000 Ha	
Total				KH. Crop Water Requirement = 1.1237 Mm ³		Rb. Crop Water Requirement = 3.6640 Mm ³		HW. Crop Water Requirement = 0.0		Total = 4.7877 Mm ³																				

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Annexure-3
Detailed of Capacity of Barrage

CAPACITY TABLE

Sr. No.	Contour R. L.	Interval in MTR	Area in Mm ²	AMm ²	A ₁ + A ₂ Mm ²	A ₁ A ₂	Capacity in Mm ²	Commulative Capacity Mm ²	Remarks
1	206.62								R.B.L
2	207.00	0.38	0.0750	0.2738	0.0750		0.0095	0.0095	
3	208.00	1.00	0.2737	0.5231	0.3487	0.1432	0.1639	0.1734	MDDL
4	209.00	1.00	0.4881	0.6986	0.7618	0.3654	0.3557	0.5291	
5	210.00	1.00	0.6660	0.8180	1.1541	0.5700	0.5747	1.1038	
6	211.00	1.00	0.8825	0.9394	1.5485	0.7665	0.7716	1.8754	
7	212.00	1.00	1.1020	1.0497	1.9845	0.9860	0.6601	2.8655	
8	213.00	1.00	1.6827	1.2971	2.7847	1.3615	1.3820	4.2475	
9	214.00	1.00	2.4561	1.5657	4.1334	2.0308	2.0550	6.3025	
10	215.00	1.00	3.1298	1.7691	5.5814	2.7698	2.7837	9.0862	
11	216.00	1.00	4.5013	2.1216	7.6311	3.7533	3.7948	12.8810	
12	217.00	1.00	6.9020	2.6271	11.4033	5.5736	5.6589	18.5399	
13	217.50	0.50	7.9012	2.8109	14.8032	7.3845	3.6979	22.2378	F.R.L
14	218.00	0.50	10.2248	3.1976	18.1260	8.9881	4.5190	26.7568	
15	219.00	1.00	14.6432	3.8206	24.8680	12.2359	12.3679	39.7568	
16	220.00	1.00	18.9751	4.3560	33.6183	16.6686	16.7623	55.8870	H.F.L.

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Annexure-4
Detailed Cost Estimation

SUMMARY OF COST

10.1 SUB HEAD WISE COST

The total cost of the project is as follows -

(A) Direct Charges -	
1) I Hesd works	Rs. 12984.367 Lakhs
2) II Main Canals	Rs. 637.418 Lakhs
3) III Distributories and Water courses	Rs. 3233.289 Lakhs
4) ETP Charges	Rs. 3758.964 Lakhs
(B) Indirect Charges -	Rs. 228.232 Lakhs
Total	Rs. 20842.270 Lakhs

The details of sub-head wise cost are as follows -

10.1.1 'A' Preliminary : Rs. 49.037 Lakhs

An investigation of the project has been nearly completed which includes the foundation and other investigation. Survey for submergence with tentative property survey of affected is carried out. The detailed investigation of foundation by taking bore holes is completed.

Future Provision :

Provisions for model study, details design, working drawing from C.D.O. nasik, printing of reports, Hydrological and Meteorological Survey, Environmental and Ecological study, soil survey and testing etc. is also made in the estimate.

10.1.2 'B' Land : Rs. 1098.108 Lakhs

Most of land coming under submergence is a private land. Hence, land compensation is proposed on the basis of land rates. (Av. Rates) obtained from the Revenue Department. The cost of Rehabilitation, Compensatory afforestation, Crop compensation, Property coming under submergence, Demarcation charges etc. is also made in the estimate.

10.1.3 'C' Works : Rs. 10911.272 Lakhs

It includes construction of earthen dam, Barrage with vertical lifting gates and lift components such as Jack well, Pump House, Rising Main and Delivery Chamber etc.

(A) Barrage (Including Gates) : Rs. 4490.139 Lakhs

(B) Earthen Dam : Rs. 726.712 Lakhs

(C) Lift Components : Rs. 4241.231 Lakhs

10.1.4 'D' Regulator : Rs. 63.392 Lakhs

10.1.5 'E' Falls : Rs. 38.848 Lakhs

10.1.6 'G' Bridges : Rs. 45.094 Lakhs

10.1.7 'K' Buildings : Rs. 324.794 Lakhs

The works will be carried out on contract basis. Hence, the buildings for supervisory staff officers and office purposes are proposed to be constructed. Both residential and nonresidential building and permanent & temporary building are to be constructed near work site.

The cost of building is proposed at Rs. 5750 per M2 for permanent and Rs. 5550 per M2 for temporary building on plinth area basis. In addition to the cost of building provision for following items is also made under this head -

- a) Land Development Levelling and Filling)
- b) Colony Roads
- c) Fencing
- d) Service connections such as water supply, sanitation and electrification.
- e) Lawns and Gardens.

10.1.8 'L' Earth work & Lining : Rs. 311.845 Lakhs

The provisions include the cost of earth work for canal and lining to 5% of main canal system.

10.1.9 'M' Plantation : Rs. 11.336 Lakhs

Plantation is proposed along the roads of head works and along the canals. .

10.1.10 'O' Miscellaneous : Rs. 433.709 Lakhs

The provision is restricted to 3% of head works. The main items proposed under this sub-head are electrification, water supply, sewage disposal, hospital, telephone lines, visit of high dignitaries, training, security arrangement, sesmological & climatological observations, photography etc.

10.1.11 'P' Maintenances : Rs. 116.687 Lakhs

This provision is made for maintenance of head works during construction period which is restricted to 1% of head works.

10.1.12 'Q' Special Tools and Plants : Rs. 130.940 Lakhs

The equipments / machineries are estimated on the basis of earth work & other works involved under each item.

10.1.13 'R' Communications : Rs. 61.723 Lakhs

This sub-head covers the cost of following items -

- a) O.D.R. standard road along foot of dam
- b) Quarry roads
- c) Construction of submergence bridge on U/s of dam.
- d) Colony roads.
- e) Diversion roads.

10.2 Total Cost : Rs. 20842.270 Lakhs

The total cost of the project works out to Rs. 20842.270 Lakhs which include direct, indirect charges, receipts and recoveries etc. as defined by C.W.C. while clearing other projects of the region.