



EXECUTIVE SUMMARY

Gunjawani Irrigation Project in Pune District, Maharashtra



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PUNE IRRIGATION PROJECT CIRCLE PUNENIRA DEOGHAR PROJECT DIVISION, BHOR
WATER RESOURCES DEPARTMENT, GOVT. OF MAHARASHTRA

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1. Introduction

Gunjawani Irrigation Project envisages construction of an earthen dam across river Kanand, a tributary of Gunjawani River. Gunjawani near village Dhanep The proposed dam site is situated at 67 Km from Pune.

The planed utilization of the project is 4.17 TMC. The dam height is 52.825 m. It is an earthen dam with spillway located on the left flank. Two radial gates of 12 X 8m! size are provided to handle the inflow flood of 1175 Cumecs.

The total length of the dam is 1730 m. and maximum height is 52.825 m. The gross storage capacity of the reservoir at FRL is 104.69 Mcum and that of live storage capacity is 104.48 Mcum. The total area under submergence is 641 Ha. including 17.23 Ha of forest land.

Gunjawani left bank canal of 83.698 Km. length is proposed through close pipe line. Also right bank canal of length 20.378 Km with off-take pointing 17.681Km. from Gunjawani left bank canal is proposed through close pipe The canal runs in Velhe, Bhor and Purandar talukas irrigating an area of 21392 Ha. in these talukas.

At CH.57 /850 km of Gunjawani Left Bank Canal Narayanpur lift irrigation scheme with two stage of pumping is proposed.

The cost of this project is estimated to 1313.72 crores with B.C. Ratio of 2.43 As most of the area being served are female affected B.C. Ratio obtained is more than the desired one.

The remaining work of earthen dam was started in May 2015 and totally completed with D/s and U/s pitching. The construction of spillway and I.C.P.O. is started in Dec 2015 and Completed in March 2017.

2. Administrative Approvals

- ❖ Administrative approval by Govt. of Maharashtra on 16/10/1993 for Rs. 86.77 Crore.
- ❖ The first revised administrative approval by Maharashtra Krishna Valley Development Corporation, Pune on 03/10/2002 for Rs. 316.60 Crore.
- ❖ Second revised administrative approval by Government of Maharashtra, on 03/08/2018 for Rs. 1313.73 Crores
- ❖ Expenditure incurred up to Dec 2019 Rs. 311.18 Crores.

3. Location of the project

The Geodetic location of the proposed dam site is as under

Location: Village Dhanep, Tal. Velhe, District Pune

1) Longitude : 73°- 38'- 27" (E)

2) Latitude : 18°- 18'- 30" (N)

4. Access:

The dam site is near village Dhanep, Taluka Velhe, Dist. Pune and is approachable by road from Pune at (Mumbai-Bangalore Road). National highway No.4 .The Dam is at upstream side of village Velhe, Tal. Velhe, Dist Pune. The command area of this project is transverse by the Mumbai - Bangalore National Highway No.4. This National Highway No-4 crosses the Gunjawani left bank canal alignment in between village Kelavade and Cheladi. The Gunjawani left bank canal alignment also crosses the South -Central Railway line in between railway stations Jejuri and Velhe. The nearest railway station from site is Pune located at a distance of the 67kms.

5. Present status

The work of dam is almost completed. The gross capacity of dam is 104.69M. Cum. **This Project proposal consists of conversion of open canal into pipe canal.** Feasibility of the conversion of open canal into pipe canal is studied in detail. **While shifting from open canal system into closed**

conduit system there is saving of water quantity as computed in comparative statement. The saved water is proposed to be utilized for irrigation of high level area through lift.

Left Bank pipe canal of 83.698 Km. length having the C. B. L. at head 682.800 meters, the right bank Pipe Canal of 20.378 km length and Narayanpur Lift irrigation Scheme irrigating an area of 21392 Ha. of Velhe, Bhore, and Purander talukas of Pune district

The gross command area is about 34502.00 Ha. & culturable area is 21392 Ha. Reason for CCA = ICA = 21392 be mentioned & hence the percentage of G. C. A. to I. C. A. Works out to 62.50%.

The main features of the project are as under:

- 1) Dam Site : Dhanep, Tal. Velhe, District Pune
- 2) Catchment area : 19.55 Sq. miles/50.613 Sq. Km.
- 3) 50% dependable yield : 4.17 T. M. C./118.06 M.Cum
- 4) Length of canal : 83.698Km. L.B. C. & 20.378 Km. RBC.
- 5) Estimated Cost of the project: 1313.72 Cr
- 6) B. C. Ratio : 2.43
- 7) Irrigable area 21392 Ha.

SI	Command Area	Original	Revised
1	Gross Command Area (GCA)	31424 Ha	34502 Ha 3078 ha GCA increased due Proposed pipe canal instead of open canal
2	Culturable Command Area (CCA)	19484 Ha	21392 Ha 1908 Ha CCA increased due Proposed pipe canal instead of open canal
3	Irrigable Command Area (ICA)	16500 Ha	21392 Ha 4892 Ha ICA increased due Proposed pipe canal instead of open canal
4	Narayanpur lift irrigation Scheme	N/A	Approx. 45 km The saved water is proposed to be utilized for irrigation of high level area through lift named as Narayanpur lift irrigation Scheme

Submergence Area: 848 Ha (Out of which for 835 Ha. of land, compensation is paid and land is in possession with WRD department. Proposals for direct purchase of 12.89 Ha. Balance land is completed)

- ❖ Fully Submerged Villages 4 : Kanand, Chapet, Vaghdara & Gevhande
- ❖ Partially Submerged Villages 5 : Vihir, Antroli, Nivi, Bopalghar & Dhanep

6. Canal and Canal Structures

The reconnaissance survey was carried out at site to verify the feasibility of demand and number of alternatives were studied.

This Project proposal consists of conversion of open canal into pipe canal. Feasibility of the conversion of open canal into pipe canal is studied in detail. While shifting from open canal system into closed conduit system there is saving of water quantities computed in comparative statement. The saved water is proposed to be utilized for irrigation of high level area through lift named as Narayanpur lift irrigation Scheme.

According to the proposal prepared and government has sanctioned principle approval vide letter no. Gunjawani -1114/pra kra /359/14/mp/21/4/16.

The proposal consists of 94.05 km left bank closed pipe canal/ Right bank canal offtakes from left bank canal & runs up to 20 km. In this proposal NLIS feeder pipe has off take from CH.33/915 km. It has 3 stage of pumping with total 286.37 m Head.

C.E., WR department, Pune & S.E., PIPC Pune visited the Gunjawani Closed pipe line canal & NLIS sites periodically and instructed to study the alternative alignments for LBC to avoid excess curves & bends . The C.E., WR, Pune instructed to study alternative location for NLIS to save the head to lift the water from left bank closed pipe canal Inspection.

Accordingly the detailed survey is carried out which results length of LBC closed pipeline 83.698km, RBC offtake from LBC at DH. 17/681 km and runs up to 20/378 km. The alignment for the same is got approval from competent authority.

NILS has its first lift i.e. stage I at CH. 57/850 km of LBC. It has 2 Stage of pumping with total head of 281.55m

The alignment of main canal and distributaries are almost cross country but are approachable by cross roads at various places. The pipe line will follow the ground topography with max possible Constant gradient in longer length.

The various minors and direct outlets are proposed on piped distributor along with appropriate regulating provisions so as to control the discharge of each offtake

Tail channel condition of sub-strata

There is small nalla formation from Ch.390 and this nalla meets the main nallas coming from the Dhanep village, Dhanep nalla meets the river kanandi near 600meters D/s. of dam alignment.

With the above proposal as per project report the tail channel is proposed to be diverted in this nalla. But taking in to account that the nalla is very small and over flow discharge from tail channel may be affected the toe of the dam. Now the alignment of tail channel is taken generally straight and the tail channel will meet the river in the boundary of village Kondhavale (Bk) and end to the Kondavale Dhanep road. The alignment for the same is got approval from C. D. O. Nashik.

7. Status of Private land acquisition

Land acquisition process for submergence area was started in 1997. Total area to be acquired for submergence is 848 Ha. Out of which for 835 Ha. of land, compensation is paid and land is in possession with WRD department. Proposals for direct purchase of 12.89 Ha. balance land going under submergence is under process rate for additional land was approved by committee heading by collector Pune and payments are made accordingly to PAPs

8. Irrigation Planning

The command area of this project lies in Velhe, Haveli, and Bhore & Purandhar Talukas of Pune District. Each of these Taluka has got pre-dominant crop like paddy, wheat, jowar, bajari L. S. Cotton & secondary crops like gram, pulse, chilies, vegetables etc. The existing cropping pattern is given in below table

There are no irrigation facilities available in the command area of this project, except some area irrigated through lift irrigation scheme at Jeur and Mandki and under percolation tanks at Mahur, Veer Nala, and Pillanwadi. This facility is also very limited and irrigable area is very small i. e. To the extent of 1 to 2% only.

The whole command area is divided in three parts, High rainfall zone i. e above 50" and Medium rainfall zone. i. e. 50" to 30" and Low rainfall zone i. e. below 30". According to rainfall conditions. The high rainfall zone taken in to account up to NH4 (Pune-Bangalore road) and future it is taken a scarcity zone up to the end of entire proposed area. Zone wise area is as under. I) High rainfall zone (irrigable area 1868 hector) and ii) Scarcity zone (irrigable area 12872 hector)

The existing cropping pattern is as per following table

SI	Crop	Percentage		
		Vella	Bhor	Purandar
	Kharip			
1	Paddy(T.P.)	40	28	-
2	Hybrid Jawar	5	9	2
3	Groundnut	5	14	2
4	Pulses (Tur)	5	3	-
5	Nachani (Bajara)	30	12	-
6	Bajara	-	5	28
7	Udid	-	4	-
8	Other Pulses	-	13	5
9	Til	-	8	-
10	Paddy (Drilled)	-	-	1
11	Follow	15	-	13
	Sub Total	100	96	51
	Rabbi			
1	Jawar	8	34	40

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 Maharashtra-reg. amendment in EC
File No. J-12011/20/2003-IA-I, Proposal No. IA/MH/RIV/9870/2005

2	Wheat	5	14	2
3	Gram	5	12	3
4	Sunflower	-	6	4
5	Other	-	8	-
6	Vegetable	-	3	-
	Sub Total	18	77	49
	Total	118	173	100

Proposed Cropping Pattern

The cropping pattern for high rainfall zone and as well as medium and low rainfall zone is proposed in the command area of this project, which is approved by *Vibhagiya Krushi Sahasanchalak, Pune Vibhag, Pune vide letter No. Vikrusasa/ka-2/pik rachna/813/dated 29/03/2017*

Taluka	Velha	Bhor			Purandar
Rainfall Zone	High	High	Medium	Low	Low
Kharif					
Paddy (Drilled)	25%	25%	0%	0%	0%
Onion	0%	0%	5%	5%	5%
Vegetables	10%	10 %	20%	15%	15%
Leafy Vegetables	0%	0%	15%	15%	15%
Pulses	0%	0%	0%	10%	10 %
Total	35%	35%	40%	45%	45%
Rabbi					
Onion	10%	15%	5%	5%	5%
Vegetables	30%	30%	12%	2%	15%
Leafy Vegetables	30%	30%	10%	2%	10%
Total	70%	75%	27%	9%	30%
Two season & Annual					
Mango	10%	10 %	15%	10%	10%
Acid Lime	0%	0%	5%	5%	5%
Pomogrannate	0%	0%	0%	5%	5%
Grape vine	0%	0%	5%	5%	5%
Papaya	0%	0%	5%	5%	5%
Banana	0%	0%	10%	5%	5%
Sugarcane	20%	22%	5%	5%	5%
Custard Apple	0%	0%	5%	5%	5%
Chilies	20%	20%	10%	2%	10%
Total	50%	52%	60%	47%	55%
Cropping Intensity	155%	162%	127%	101%	130%

Crop water requirement is worked out by Modified Penman method

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Water Requirement and Utilisation														
Sr.No.	Fortnight	Area Ha	Velha High		Bhor High		Bhor Med		Bhor Low		Purandar Low		Total	
			850	1018	6652	1765	11107	21392						
	Days	Mm ³	Cumec	Mm ³	Cumec	Mm ³	Cumec	Mm ³	Cumec	Mm ³	Cumec	Mm ³	Cumec	
1	June II	15	0.000	0.000	0.000	0.000	0.000	0.000	0.149	0.115	0.937	0.723	1.086	0.84
2	July I	15	0.000	0.000	0.000	0.000	0.000	0.000	0.218	0.168	1.373	1.059	1.591	1.23
3	July II	16	0.000	0.000	0.000	0.000	0.000	0.000	0.191	0.138	1.211	0.876	1.402	1.01
4	August I	15	0.000	0.000	0.000	0.000	0.000	0.000	0.275	0.213	1.910	1.474	2.185	1.69
5	August II	15	0.000	0.000	0.000	0.000	0.068	0.049	0.493	0.357	3.343	2.418	3.904	2.82
6	September I	15	0.000	0.000	0.000	0.000	0.210	0.162	0.436	0.336	3.009	2.322	3.655	2.82
7	September II	15	0.000	0.000	0.000	0.000	0.040	0.031	0.000	0.000	0.000	0.000	0.040	0.03
8	October I	15	0.087	0.067	0.106	0.082	2.474	1.909	0.554	0.428	4.020	3.102	7.241	5.59
9	October II	16	0.199	0.144	0.248	0.179	1.991	1.441	0.330	0.238	3.222	2.331	5.990	4.33
10	November I	15	0.281	0.217	0.354	0.273	1.986	1.533	0.309	0.238	3.273	2.525	6.203	4.79
11	November II	15	0.244	0.188	0.309	0.238	1.811	1.398	0.282	0.218	3.002	2.316	5.648	4.36
12	December I	15	0.328	0.253	0.423	0.326	1.975	1.524	0.275	0.212	2.820	2.176	5.822	4.49
13	December II	16	0.351	0.254	0.441	0.319	1.902	1.376	0.288	0.208	3.123	2.259	6.105	4.42
14	January I	15	0.276	0.213	0.351	0.271	1.808	1.395	0.278	0.215	2.658	2.051	5.371	4.14
15	January II	16	0.253	0.183	0.322	0.233	1.858	1.344	0.319	0.231	2.990	2.163	5.742	4.15
16	February I	14	0.176	0.145	0.228	0.188	1.492	1.233	0.283	0.234	2.215	1.831	4.394	3.63
17	February II	14	0.109	0.090	0.142	0.117	1.189	0.983	0.287	0.237	1.805	1.492	3.532	2.92
18	March I	15	0.130	0.100	0.168	0.129	1.410	1.088	0.340	0.263	2.141	1.652	4.188	3.23
19	March II	16	0.150	0.109	0.195	0.141	1.566	1.133	0.380	0.275	2.392	1.730	4.683	3.39
20	April I	15	0.152	0.118	0.197	0.152	1.605	1.238	0.390	0.301	2.452	1.892	4.796	3.70
21	April II	16	0.160	0.123	0.207	0.159	1.709	1.319	0.423	0.327	2.663	2.055	5.162	3.98
22	May I	15	0.213	0.164	0.276	0.213	1.530	1.181	0.469	0.362	2.949	2.275	5.437	4.20
23	May II	16	0.173	0.125	0.225	0.163	1.076	0.778	0.438	0.317	2.759	1.995	4.672	3.38
24	June I	15	0.027	0.021	0.035	0.027	0.191	0.147	0.133	0.103	0.837	0.646	1.223	0.94
	Total Irrigation	MCM	3.308		4.227		27.893		7.540		57.103		100.072	
		TMC	0.117		0.149		0.986		0.266		2.018		3.536	

8.1 Design Details

Gunjawani & Narayanpur LIS

SI	Description	Discharge	Unit
1	As per Modified Pennman Method NIR	5.59	Cumec
	i.e.	0.26	Lps/Ha
2	10 % water is assumed for Drinking, Tank filing etc. purposes.	0.026	Lps/Ha
3	Since all the farmers may not use micro irrigation from the day one and it may take some time for them to adopt micro irrigation system. Hence some margin of safety is allowed for flood irrigation which is 10 %	0.026	Lps/Ha
4	Total	0.31	Lps/Ha
	i.e. 0.31 lps x 21392 Ha	6.63	Cumec

8.2 Design Approach and Irrigation Scheduling of 24 Ha Chack under Micro - Irrigation

Irrigation Scheduling.

IRRIGATION SCHEDULING				
		Daily	Alternate	Four
1	Chak Area Ha	24	24	24
2	lps / Ha	0.31	0.31	0.31
3	Total Flow lps	7.44	7.44	7.44
4	cum / hr.	26.78	26.78	26.78
5	Time	24	48	96
6	Shift Area Ha	1	1	1
7	No. of Shifts	24	24	24
8	Shift Duration (hrs)	1	2	4
9	Water Applied lps/Irrigation Cycle	0.31	0.62	1.24

8.3 Gross irrigation water requirement

The gross irrigation water requirement is obtained from the net irrigation water requirement by adjusting the same for the following losses in application and transport.

- ❖ Portion of water lost in application in the farm and conveyance of water to the plant from farm gate (farm losses or application losses)
- ❖ Portion of water lost in transit from outlet to farm gate (Distribution losses)
- ❖ Portion of water lost in transit from water source (Delivery tank) up to outlets(conveyance and operation losses)

These adjustments are effected in terms of irrigation efficiency. The irrigation efficiencies for lined canals and distribution network adopted in Maharashtra are given below:

8.4 Irrigation intensity

The proposed irrigation is in Kharif, Rabi, Bi Seasonal and Annual Crops with the intensity of irrigation from 101% to 162%.

8.5 Irrigation water requirement

Water requirement in any period for each crop is arrived by first calculating crop evapotranspiration for the standard crop (by modified penmen method) and the corresponding crop coefficients and then reducing the crop water requirement by effective precipitation. Effective precipitation in any period is that portion of the rainfall that is useful for the consumptive use of water by plants. Effective precipitation is computed based on dependable rainfall using USDA method.

The net water requirement is to be arrived at for each crop by adjusting the irrigation water requirement for the following losses in transport.

- ❖ Portion of water lost in application on the farm and conveyance of water to the plant from the farm gate (farm losses)
- ❖ Portion of water lost in transit from outlet to the farm gate (Distribution losses).
- ❖ Portion of water lost in transit from the source of water (head work of canals) to the outlets (Conveyance and operation losses)

This correction is effected in terms of the co-called irrigation efficiency.

8.6 Drip irrigation efficiency

The proposal suggests distributing of water through pipelines and hence, there will not be any need for field canals. Therefore, as water is conveyed through Pipelines by micro irrigation system up-to 3 Ha Chak, conveyance efficiency is considered as 100% "

Conveyance efficiency	: 95%
Field application Efficiency	: 90%
Hence overall irrigation efficiency	: $0.95 \times 0.9 = 0.855$
	: Say 85%

8.7 Total head requirement

Total head requirement is composed of friction head losses in mainline, sub main, primary and secondary filters, control valves, emitting pipe, field fittings etc. and the operating pressure of

emitter. In this project, we have suggested pressure compensated Drip line for which recommended operating pressure is 10 m emitter inlet.

The pressure head at each Chak outlet is kept at 20m for operation of the drip irrigation system.

8.8 Increases in yield

The adoption of Drip irrigation results in high yield in the production of the crops. This increase in the yield will help in the socio economic development of the drought prone area of the Project in Pune district.

This proposal for the field design is to go in for modern micro-irrigation methods. These methods have unique advantages over the conventional surface methods of irrigation. The micro-irrigation systems fulfill the following objectives of:

- ✓ Higher water use efficiency
- ✓ Energy Efficiency
- ✓ Higher crop productivity for every drop of water
- ✓ Savings in labor
- ✓ Savings in fertilizers
- ✓ Faster returns on investment
- ✓ Use of state of art drip irrigation technology eliminates the use of electricity for operation of the micro-irrigation system at the farmers' field

Advantages:

- ❖ Saving in pumps and electricity costs in the farmer's field. This also saves the cost for construction of canal network and land acquisition in the project area. Water for MI would be made available through the network of pipes at the farmers' field.
- ❖ Micro-Irrigation System has been designed in multiple module of 3Ha Area.
- ❖ The drip irrigation system is a permanent system. The mains and sub-mains are installed underground and the field control valves above surface. Hence, there is no need for shifting

for pipes and nozzles every day. The farmers need to only ON I OFF their respective field control valves on their need basis.

- ❖ The drip irrigation system can be operated on daily or alternative basis. Considering the water requirement, climatic conditions, soil type, water holding capacity and crop growth stage
- ❖ This design eliminates the need of constructing main canals and all the eventual expenses like construction of main canals, land acquisition, etc.
- ❖ As construction of Distributaries canals and Field canals are eliminated therefore project execution can be completed in shorter time.
- ❖ Land acquisition is minimized because of pipe network resulting in project cost saving.
- ❖ This also increases the conveyance efficiency of water which is around 40-50% in canal system to almost 90-95% in a pipe network and drip irrigation system.
- ❖ This system will have all the advantages that micro-irrigation system offers over flood/furrow irrigation viz. water saving, labor saving, power saving, fertilizer savings, etc.
- ❖ Considerable increase of water use efficiency.
- ❖ Lesser operations and maintenance costs over open canals, which will give more longevity to the system.
- ❖ This system operates like a Pressurized Irrigation Network System (PINS) and therefore adequate pressure is available in the pipelines for operation of drip irrigation system at the outlets at the farm level. This eliminates the need of creating electricity infrastructure for irrigation across the command area.
- ❖ The centralized pumping system ensures easy operation of the system as flow of water through the network of pipes can be controlled from one place rather than from various locations.
- ❖ This also reduces O & M costs and cost of valves at various locations

8.9 Distribution Network

Water Suitable for farming will be delivered at Chak outlet i.e. at Distribution Management System. On a peak demand day, it is very highly likely that all Distribution Management System in distributaries is fully open and delivers peak flows to chak

On the other hand (for example the days of unexpected heavy rains during a peak demand period) all Distribution Management System may not need to be turned off to prevent excess watering and consequent damage to crops

In between these two extremes, the number of Distribution Management Systems operating at any given time may vary from total number of Distribution Management Systems in the distributaries. In addition, the Distribution Management Systems may be operated only for certain number of hours in a day depending on the demand etc. so it is required to control and monitor the Distribution Management Systems with effective automation system as depending on the no. of Distribution Management Systems open/close, Water Demand, the flow will vary and accordingly no. of operating pumps will vary.

The System has many more advantages such as

- I. Distribution Management System will enable to operate only when there is demand
2. Distribution Management System will prevent the Draining of water from the Network.
3. Distribution Management System avoid the Air Entry in pipeline and so reduces the problems associated with air lock such as less/Partial Flow, Leakages etc.
4. Distribution Management System enables the uniform & equitable distribution of water irrespective of its elevation and distance from the supply source otherwise outlets at lower elevation and near to supply source will get the more water and other will get may be less or NIL water.
5. In Distribution Management System the water will be immediately available at Distribution Management System once the supply will start.

6. In Distribution Management System as water always remains in pipe network it will increase the life and efficiency of pipeline.

Entire Distribution Network System will cover through Distribution Management System, Air Management System, and Distribution Control Unit Management System.

9. Atomization Techniques for Distribution Network

9.1 Automatic screen filter with self-cleaning mechanism along with isolation butterfly valve and manifold etc.

The schemes designed to irrigate 21400Ha. The suitable Gravity system will be made to enable to deliver @ 23868 m³/hr. for 892Chaks of 24Ha and water will be delivered by Gravity after Primary Filtration of 200 Micron to remove the Dirt Load and Suspended Solids from the water that will enhance the Pipeline Life and increase the Life of project. The water will be delivered to Various Chak in the Distribution Network. Pipe Disnet System with provision of Secondary Self Cleaning Filter.

9.2 Distribution Management System

Distribution Management System (DMS) to control, measure and monitor the flow from remote without electric energy and with wireless communication for Chak. This system is able to control the flow as per demand to facilitate Uniform Distribution of water to the outlets irrespective of its location, elevation and distance from the water source. The system is enclosed in the cabinet having Vandalized alert. The System is capable to record the Instantaneous and Cumulative flow through the Distribution Management System at Remote Control Centre placed at Pumping station. This will sum up the flow through each Distribution Management System and subsequently through each Minor/Distributaries and will able to operate the No. of Pumps according to the requirements. This system will not only maintain the equitable distribution in the complete network but will also increase the efficiency of the project in Totality. This Prepaid Water Metering Management System will work on NIL external Energy and Wireless Communication and will

- leads to efficient and reliable long-term trouble free operation

- no guess work
- precise delivery of specified quantities of water
- complete control on time and quantities of water to be delivered
- Complete control on Isolation of part of Network whenever needed

9.3 Operating Management System (OMS) to deliver the flow in Chak

This system is able to do the Remote on/off without electric energy and with wireless communication in Chak. The system is enclosed in the cabinet having Vandalized alert.

Air Management System is proposed for Air Intake and Air Discharge for the complete Pipe Distribution Network to protect the pipe network from Vacuum and Air Lock problems. The Air Management System is having the feature of Burst Monitoring with the help of Pressure Monitoring. Air Management is necessary for effective working of system, as the choke air will leads to water hammer and less flow. In the Working Conditions due to Temperature and Pressure Variation, the Dissolved Air is released from the water and if this Entrapped Air will not remove from the Pipeline, it will form the Air Pockets and will lead to Partial/less flow and this phenomenon is observed very commonly in the Pipe Network. It is necessary to have the Proper Air Management for Efficient working and Long life of pipeline. In addition, the theft of water not only leads to the water loss but also to Hydraulic Issues.

Air Management System (AMS) having tamperproof enclosure system with Vandalized alert and Burst Monitoring by pressure monitoring at suitable Air valve locations. The system is able to work without electric energy and with wireless communication

Following methods will be used to know System ON/OFF scheduling, Farmer complaints registration & to know Status of credit and balance water quantity

- ❖ By SMS from registered mobile
- ❖ Using web site
- ❖ IVRS - Voice recorded system on toll free no or any no provide by service provider (optional)
- ❖ Using Mobile App (optional)

9.4 Distribution Control Unit Management System

Every section (3Ha) will be controlled with Outlet Distribution Control Unit

System. The Distribution Control Unit also enables to record the quantity of water delivered in each section at any time automatically. We can operate this Outlet Distribution Control Unit Remotely and Time can be varied as per our requirement. These operations are done without Electric Energy and Communication is wireless

Hydraulically Supervisory Control and Data Acquisition (HSCADA) system for pumping stations to enable, to operate the pumps as level, demand etc.

The system enables to synchronize with Distribution network automation and it is able to generate reports, gives alarm etc. for pumping station.

Working of Distribution Management System

- We are reading Water Volume in m³, Distribution Management Open/Close status, panel door switch open/close status
- HSCADA (Hydraulically Supervised Control and Data Acquisition) will display next one week water quota, System open/close timings.
- HSCADA will also display previous one week quota and actual water quantity passed.
- HSCADA can provide required data to KY Pipe software in CVS
- For every Distribution Management System user can able to view one year calendar with daily quota, valve Opening and closing time.
- Based upon farmer requirement he can change the daily quota.
- On change in water quota or valve operational timings by user, the data will be sent to KY Pipe software for Analysis or modeling.
- Farmer can change his daily quota within the given prescribed limits

9.5 Surge protection system

Pipe 2000 is the most widely used software in the world for surge (water hammer)analysis of complex pipeline systems and allows for designing most accurate and reliable surge protection system. The surge protection system provided for LIS bulk water supply system is based on highly sophisticated and almost maintenance free bladder vessels and world renowned non-slam air

valves. The surge protection system ensures that the maximum surge pressures are just about same as the steady state pressures thereby increasing the life of all pipelines many folds compared to the surge protection systems based on zero velocity valves and/or air cushion valves. When the rising main and other pipelines are protected from unwanted surge pressures, it would be easy to ensure uninterrupted supply of water to crops and expect anticipated high yields.

10. Status of Rehabilitation

Due to Gunjawani Dam, 4 villages i.e. Kanand, Chapet, Vaghdara & Gevhande are going under submergence fully and 5 villages, i.e. Vihir, Antroli, Nivi, Bopalghar & Dhanep are going to be submerged partially.

As per the provisions of Maharashtra Project Affected Persons Rehabilitation Act 1986, The project affected person should be rehabilitated in new rehabilitated gaothan with basic civic amenities (i.e. Supply of water, Electricity, Roads (Internal & approach), School bldg, community hall, Grampanchyat office building, built gutters, open spaces for Khalwadi, market, playground, etc.) developed plots for construction of their houses, and alternative lands in nearby vicinity (within 8 km from rehabilitated gaothan).

Establishment of new rehabilitation gaothans at seven rehabilitation sites were taken on priority along with construction activities during 1997 to 2001

Table 1. The expenditure incurred on civic amenities

SI	Name of village	Allotted Rehabilitation Gaothan	Expenditure for Civic Amenities Amount in Lakh
1	Dhanep (Kumbhar wasti) Adavali Tal- Velhe Dist- Pune	Tal-Velhe, Dist- Pune	25.25
2	Chapet Tal- Velhe, Dist- Pune	Kalus Tal-Khed, Dist- Pune	55.69
3	Kanand Tal- Velhe, Dist- Pune	Jategaon 1&2 Tal-Shirur, Dist- Pune	60.00
4	Gevande Tal- Velhe, Dist- Pune	Mukhai Tal-Shirur, Dist- Pune	46.78
5	Wagdara Tal- Velhe, Dist- Pune	GanegaonKhalasa Tal- Shirur, Dist- Pune	32.40

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6	Bopalghar Tal- Velhe, Dist- Pune	Koregaon Bhivar Taluka Daund Dist- Pune	20.60
		Total Amount in Lakhs	220.12

11. Status of Rehabilitation

1) **Chapet.** For rehabilitation of this village, new gaathan site was established at Kalus, Tal. Khed. However PAP's did not shifted their houses to Kalus and instead shifted at Karanjvane Tal- Velhe as per their desire. Water supply scheme was provided at Karanjvane as per the request of PAPs.

2) **Kanand** - Kodapur and Bhosale wasti of village Kanand is going under submergence after construction of spillway this year. As per rehabilitation plan, for PAPs fi-om village Kanand , Two rehabilititation sites were established at Jategaon, Tal. Shirur in the year 2000. However PAP's from Kodapur and Bhosale wasti of Kanand village did not shifted at rehabilititation so work of Gunjawani Dam construction of spillway was held up from 2001 to 2015. In September 2014, 158 PAPs from Kodapur and Bhosalewasti approached R & R authorities and requested to rehabilitate them by establishing new gaathan site near village Dhanep in the vicinity of Gunjawani dam and alternate agricultural land anywhere in Pune district as per availability vide an affidavit signed before Taluka Magistrate & Tahsildar Velha. They also agreed as -per affidavit to shift their houses immediately if their demand is fulfilled.

3) Accordingly GOM, Revenue Department approved two additional gaathan sites for these PAP's vide Government Resolution dated 6/4/2015. Two additional gaathan sites at Dhanep in the vicinity of dam are established and basic civic amenities like internal roads, Electrification, water supply Samaj Mandir, School Building etc. are provided along with transit sheds for temporary stay. Cost of civic amenities of this gaonthan is Rs.284 Lakhs. 163 number of PAPs are allotted residential plots at these site and PAPs have started construction of houses for which house building grants have been provided. 104 families from Kodapur and Bhosalewasti of Kanand village will be affected immediately after completion of spillway construction and submergence at FRL. PAPs from Kodapur and Bhosalewasti had shifted to new gaathan from their houses in submergence area. (Rehabilitation is completed as on today)

Maral wasti of Kanand village where about 56 PAP's are staying, is above FRL of Gunjawani Dam and their houses will not be submerged. However they have opted for shifting at Jategaon where they have been allotted alternate agriculture land and residential plots. These PAP's will be shifted as per their convenience.

4) Waghdara- As per rehabilitation plan, Village Waghdara is to be rehabilitated at rehabilitated gaathan at Ganegaon Khalsa Tal Shirur, Dist. Pune. Work of all basic civic amenities are completed way back in 2000-2001. However out of total 47 PAPs, 43 had shifted at higher elevation in the original village above submergence, while remaining 4 in submergence have requested residential plots at Adavli Tal. velhe and they were shifted to Adavali as per their request.

5) Gevande - As per rehabilitation plan Village Gevande is to be rehabilitated at new rehabilitated gaathan at Mukhai Tal Shirur, Dist. Pune. Work of all basic civic amenities are completed way back in 2000-2001. However all 69 PAPs have been shifted in the original village at higher elevation above the right side ring road. Hence no house from this village is coming under submergence at present.

6) Vihir - As per rehabilitation plan, Village Vihir is to be shifted at new rehabilitated gaathan at Jategaon (Bk) Tal Shirur, Dist. Pune. Work of all basic civic amenities are completed way back in 2000-2001. However as only lands are going under submergence, PAP's have not shifted to rehabilitated village.

7) Antroli - As per rehabilitation plan , Village Antroli is to be rehabilitated at gaathan Vadgaon Bande, Tal Daund, Dist. Pune. However as only lands are going under submergence, PAP's have not shifted to rehabilitated village.

8) Nivi- As per rehabilitation plan, Village Nivi is to be rehabilitated at gaathan at Rahu, Tal Daund, Dist. Pune. However as only lands are going under submergence, PAP's have not shifted to rehabilitated village.

9) Bopalghar - As per rehabilitation plan, Village Bopalghar is to be rehabilitated at gaathan Koregaon Bhivar, Tal Shirur, Dist. Pune. However as only lands are going under submergence, PAP's have not shifted to rehabilitated village.

10) Dhanep- As per rehabilitation plan , Village Dhanep is to be rehabilitated at gaathan Adavali, Tal Bhor, Dist. Pune. However only houses of PAPs of Kumbharwasti are coming under seat of dam, and they have shifted to rehabilitated village Adavali in2000

12. Status of Forest Land Diversions & Environmental Clearance

The forest land required for construction of Gunjawani Project is 50.08 Ha. Out of50.08 Ha. 16.27 Ha. Land is required for submergence area of Gunjawani dam and balance 33.81 Ha. Land is required for canal in various reaches.

The total 50.08 Ha. Non-forest land has been handed over to the forest Department on DT. 06/07/2007. In principle clearance from Ministry of Environment and Forest is issued for the project subject to condition vide letter F.No. 8-85/2000 FC Dated 06/03/2003. After fulfillment of all conditions, Additional Principle Chief Conservator of Forest and Nodal Officer, Nagpur has requested to The Central Government on 11/01/2016 for final approval of 50.08 Ha. Forest land for Gunjawani Project and MoEFCC New Delhi has given final Forest Clearance on13/06/2016.

The Environmental clearance for this project is accorded by the MoEFCC Govt. of India vide their letter No.J-12011/20/2003-IAI, Dated 29/04/2005.

13. The comparative statement with reference to earlier proposal and revised proposal

SI	Details	Original	Revised
1	Dam	3.69 TMC	No change in configuration. The work of dam is almost Completed
2	Power	2 MW	0 MW (No Change)
3	Gross Command Area	31424 Ha	34502 Ha (<i>3078 ha GCA increased due Proposed pipe canal instead of open canal</i>)
4	Culturable Command Area	19484 Ha	21392 Ha (<i>1908 Ha CCA increased due Proposed pipe canal instead of open canal</i>)

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5	Irrigable Command Area	16500 Ha	21392 Ha (4892 Ha ICA increased due Proposed pipe canal instead of open canal)
6	Open Canal (Length in km)	LBC-144 KM RBC-22KM	Proposed pipe canal instead of open canal The Open Canal system is now PDN
7	Pipe canal (Length in km)	0	LBC- 83.698KM RBC- 20.378KM
8	Narayanpur lift irrigation Scheme	N/A	Approx. 45 km (The saved water is proposed to be utilized for irrigation of high level area through lift named as Narayanpur lift irrigation Scheme)
9	Pump House	0	Addition of 2 nos. of Power House
10	Transmission Line	0	Addition of 33 KV Transmission Line
11	Power House	1	No Change

14. Amendment Required

Reference of Approved EC	Description as per Approved EC	Description as per Proposal	Remarks
Proposal No. IA/MH/RIV/9870/2005 File No. J-12011/20/2003-IA-I dated 29/04/2005	Gunjawani Irrigation is located in district Pune and envisage construction of earthen dam across river Kanadi a left bank tributary of Gunjawni river. The project will provide irrigation in 19484 ha (CCA) land in drought prone area of Pune district	As per the initial approval project involve open canal system for irrigation. However, now we would like to propose pipe canal instead of open canal. While shifting from open canal system into closed conduit system there is saving of water quantity. The saved water is proposed to be utilized for irrigation of high level area through lift named as Narayanpur lift irrigation Scheme. Work of canal is not initiated yet.	We would like to propose pipe canal instead of open canal. The saved water is proposed to be utilized for irrigation of high level area through lift named as Narayanpur lift irrigation Scheme. Work of canal is not initiated yet.

15. Main Features of the project

- ❖ Unique Design In India : 24x7x365
- ❖ Piped Irrigation Network up to Farm
- ❖ Without any external energy, utilization of available water head
- ❖ Water Either in Dam or at Root of Crop
- ❖ 892 Chaks of 24 Ha : Subdivided into 6 sub chaks of 3Ha
- ❖ Minimum 20 m Pressure Head at each Farm (3 Ha), Ready for Micro Irrigation
- ❖ Per Drop More Crop
- ❖ 173 WUA Planned
- ❖ Equitable Distribution of Water & Pressure through OMS

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- ❖ Water Meters @ 24Ha Chak
- ❖ Central Control and Monitoring by HSCADA
- ❖ Auto Filters Primary and Secondary for Micro Irrigation
- ❖ Wireless Energy less Communication System by Radio / GPRS
- ❖ Vandalism Alerts
- ❖ SMS Alerts to Farmers
- ❖ Officials can access through Internet on their computers/Smart Phones
- ❖ Reports and Data Log available on Computer