BHAISRODGARH-BORAV WATER SUPPLY PROJECT

FEASIBILITY AND PROJECT CONCEPT REPORT

OF RWSS OF 38 VILLAGES & 27 OTHER HABITATIONS OF PANCHAYAT SAMITI BHAISRODGARH, DISTRICT CHITTORGARH FROM RIVER CHAMBAL.

Estimated Cost: Rs. 50.73 Crore

(Report ,Design & Estimates)

SUBMITTED BY:-

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CHAPTER 1:
GENERAL REPORT

1.1. Geographic Profile

The area of 6 nos. gram panchayat namely Bhaisrodgarh, Sripura, Dhanganmmau Kallan, Borav, Tamboliya and Gopalpura of panchayat Samiti Bhaisrodgarh (Distt. Chittaurgarh) assembly constituency Begun of Rajasthan is situated Southern area of the state. Area of above mentions 6 nos. gram panchayat is compact rocky strata (Sand stone and shale), hilly terrians, forest and having maximum height of 400 meter from Mean Sea Level. In this project almost entire area is falling under Jawahar Sagar Sanctuary, Bhainsrodgarh Sanctuary from Bhainsrodgarh to village Lothiyana and further area in some portion of Dhanganmau khurd, umercha (Kamliya Dungri),Nagpuru (Karena) and Nahargarh (Jopara) is falling under forest (Borave range van mandal Chittorgarh)

1.2. Climate of District

The climate of the area is dry, summer is too hot and winter is too cold. The yearly average rainfall is 900 mm. Maximum temperature is 48 degree celsius and minimum temperature is 2 degree celsius.

1.3. Demographic Status

As per census 2011 Population growth trend of district is quite regular. Rural growth is about 15.20% per decade where as urban growth is quite high near about 20.20%. As per 2011 census, total population of the district is 1544338 souls. Population of Panchayat samiti Bhaisroadgarh is 102429 souls.

1.4. Drinking Water Status of 38 villages

About 90% villages of Panchayat Samiti Bhaisrodgarh are covered by Hand-pump schemes and 10% are covered by other type of schemes like P&T, piped etc.

Out of all 38 villages of above mentioned 6 Gram Panachayat, 36 villages with their other habitations are covered by Hand Pump schemes. Whereas the village Bhainsrodgarh is covered by departmental piped water supply scheme (source river Chambal) and the village Borav is covered by departmental P&T Scheme, besides this in the village Borav, local distribution system is also laid and developed by Gram Panchayat (Borav) and maintained by Gram Panchayat. Other habitations of village Bhainsrodgarh and Borav are covered by Hand Pump Scheme.

1.5. Details of A&F Sanction

As per demand of local Hon'ble MLA (Constituency Begun) and government policy it is proposed to cover above 38 villages with their other habitations of Panchayat Samiti Bhainsrodgarh by river Chambal. In this project it is proposed to use existing Intake of RWSS Bhainsrorgarh (with rejuvenation

and construction of Intake Structure adjoining to existing Intake) as source Intake. This project has been sanctioned Administratively & Financially by policy planning committee in 194th meeting held on Dated 9.12.2014 for Rupees 50.73 Crores under budget head State Plan (Rural)

1.6. Brief Description of the Proposed Project

- In this Project, it is proposed to lift water (2.25 MLD up to year 2048) from river Chambal through proposed intake structure adjoining to existing Intake of RWSS Bhainsrorgarh by means of submersible mono pump set of 2000 LPM Discharge & 30 Mtr. Head pumping to Proposed Filter plant at Bhainsrorgarh through 250 mm D.I. K-7 Pipe Line (950 Mtr.).
- From proposed Filter Plant (2.25 MLD) at Bhainsrodgarh, water after filtration, will comes to proposed CWR Bhainsrodgarh (300KL) in same Head Works.
- From CWR Bhainsrorgarh Water will be pumped to in three directions viz i . To proposed cluster ESR (150 KL, 22 mtr. Staging) for villages/ other habitations of Gram Panchayat Bhainsrodgarh (Cluster. 1) by means of Centrifugal Pump Set 225 LPM discharge and 60 mtr head. ii To proposed (200 KL, 20 mtr. Staging) and existing ESRs (100 KL, 15 mtr. Staging) for piped water supply schemes Bhainsrodgarh by means of Centrifugal Pump Set 520 LPM discharge and 70 mtr head., iii. To proposed CWR (350 KL) Sripura through 250 mm D.I. K-7 pipe line 3000 mtr and 200 mm DI K-7 8450 mtr. by means of Centrifugal Pump Set 1150 LPM discharge and 75 mtr head.
- From proposed CWR at Sripura water will be pumped to in three directions viz i. To proposed Cluster ESR (100 KL, 18 mtr. Staging) at Bhunjar Kalan (Cluster 2) for villages Bhunjar Khurd, Bhunjar Kalan, Nasera, / other habitations of these villages by means of Centrifugal Pump Set 120 LPM discharge and 75 mtr head. ii. To proposed Cluster ESR (100 KL, 20 mtr. Staging) at Sripura (Cluster 3) for villages Sripura and Lothiyana/ other habitations of these villages by means of Centrifugal Pump Set 160 LPM discharge and 30 mtr head.. iii. To proposed CWR (250 KL) at Borav through 200 mm D.I. K-7 pipe line 12150 mtr. by means of Centrifugal Pump Set 900 LPM discharge and 50 mtr head.
- From CWR Borav water will be pumped to in five directions for Gram Panchayat area of Borav, Tamboliya, Dhangarmahu Kalan and Gopalpura viz i. To proposed Cluster ESR (100 KL, 20 mtr. Staging) at Naya Gaon (Cluster 4) and proposed Cluster GLSR (50 KL) at Kundal Ka Khera (Cluster 5) for villages / other habitations by means of Centrifugal Pump Set 210 LPM discharge and 90 mtr head. ii. To proposed Cluster ESR (200 KL, 22 mtr. Staging) at Borav (Cluster 6) for villages / other habitations by means of Centrifugal Pump Set 300 LPM discharge and 30 mtr head. iii. To proposed Cluster ESR (100 KL, 20 mtr. Staging) at Shambhupuriya (Cluster 7) and

proposed Cluster ESR (100 KL, 20 mtr. Staging) Karena (Cluster 8) for villages/ other habitations by means of Centrifugal Pump Set 200 LPM discharge and 90 mtr head. iv. To proposed Cluster ESR (100 KL, 18 mtr. Staging) at Nahargarh (Cluster 9) for villages / other habitations by means of Centrifugal Pump Set 100 LPM discharge and 50 mtr head. V. To proposed Cluster ESR (100 KL, 18 mtr. Staging) at Shambhunath Ji Ka Khera (Cluster 10) for villages / other habitations by means of Centrifugal Pump Set 150 LPM discharge and 65 mtr head.

- From all 10 Cluster ESRs water will be distributed to all 37 villages (except Bhainsrodgarh) and other habitations of all 38 villages up to village transfser chamber through distribution main.
- From village transfer chamber (VTC) water will be supplied to PSPs, which will be erected in populated area of villages/ other habitations through village distribution pipe line.
- From PSPs water will be available to villagers.
- From proposed and existing ESR for piped water supply scheme Bhainsrodgarh, water will be supplied to the consumers of village Bhainsrorgarh through domestic water connections.
- Entire scheme will be monitored by proposed SCADA system.

CHAPTER 2 :
WATER DEMAND ASSESMENT

2.1 Rural Population

As per 2011 census, there are 38 populated villages with their other habitations to be covered under this project. Total population of these 38 villages as per 2011 census is 27671 souls.

2.2 Population Projection And Water Demand

The decadal growth from 2001 to 2011, of rural population of Chittaurgarh District, as per 2011 census is 15.20%. This growth rate has been taken in forecasting the designed population.

The designed demand of drinking water for this project has been worked out as under :

- ✓ For Villages : 35 lpcd

2.2.1 Rural Projected Population

In this project almost entire area is falling under Jawahar Sagar Sanctuary, Bhainsrodgarh Sanctuary from Bhainsrodgarh to village Lothiyana and further area in some portion of Dhanganmau khurd, umercha (Kamliya Dungri),Nagpuru (Karena) and Nahargarh (Jopara) is falling under forest (Borave range van mandal Chittorgarh)

looking to this, it is expected that the execution of work will be commenced in year 2016 (expected) and two years are taken as execution period. Therefore the design year is taken as 2048 (30 years after completion of execution of the scheme).

In this project entire area is divided in 10 clusters. Population of year 2011 (census 2011) and projected population and demand for year 2018, 2033 and 2048 for Rural Areas is shown in following table.

CLUSTER WISE PROJECTED POPULATION & WATER DEMAND

क. स.	ग्राम पंचायत का नाम	ग्राम का नाम	कोड नः		ढाणी का नाम	जनसंख्या 2011 गांव/ ढाणी	Population 2018	Water Demand 2018 in KLD	Population 2033	Water Demand 2033 in KLD	Population 2033	Water Demand 2048 in KLD
Demand at OHSR for Villages of G.P.Bhainsrorgarh (Cluster No. 1)												
1	भेंसरोड़गढ़	मदार चोक	100436			525	581	20.33	718	25.13	888	31.08
				1	केनपुरिया	250	277	9.68	342	11.97	423	14.80
2	भेंसरोड़गढ़	जगपुरा	100440			825	913	31.95	1128	39.49	1395	48.84
3	भेंसरोड़गढ़	बालापुर	100438			105	116	4.07	144	5.03	178	6.22
4	भेंसरोड़गढ़	हाजीपुर	100439			52	58	2.01	71	2.49	88	3.08
5	भेंसरोड़गढ़	आम्बा	100433			154	170	5.96	211	7.37	260	9.12
6	भेंसरोड़गढ़	गोपालपुरा	100435			600	664	23.23	820	28.72	1015	35.52
				1	कालुपुरा	83	92	3.21	113	3.97	140	4.91
7	भेंसरोड़गढ़	भवानीपुरा	100455			530	586	20.52	725	25.37	896	31.38
				1	पालका	77	85	2.98	105	3.69	130	4.56
8	भेंसरोड़गढ़	उदपुरिया	100454			212	235	8.21	290	10.15	359	12.55
		भेंसरोड़गढ़							0		0	0.00
				1	मोतीपुरा	60	66	2.32	82	2.87	101	3.55
				2	बेवडा का खाल	60	66	2.32	82	2.87	101	3.55
				3	चावण्ड का खेडा	70	77	2.71	96	3.35	118	4.14
Total Demand of Cluster No.1						**3603**	**3986**	**139.52**	**4927**	**172.44**	**6094**	**213.31**
9	भेंसरोड़गढ़	भेंसरोड़गढ़	100434			4383	4849	339.45	5993	419.55	7414	518.97
Demand of Bhainsrodgarh village						**4383**	**4849**	**339.45**	**5993**	**419.55**	**7414**	**518.97**
Demand at OHSR at Bhunjar kallan (Cluster No. 2)												
10	श्रीपुरा	भूंजर खुर्द	100430			542	600	20.99	741	25.94	917	32.09
				1	झौंपडा	60	66	2.32	82	2.87	101	3.55
11	श्रीपुरा	नासेरा	100431			113	125	4.38	155	5.41	191	6.69
12	श्रीपुरा	भूंजर कलाँ	100425			665	736	25.75	909	31.83	1125	39.37
				1	झौंपडा	300	332	11.62	410	14.36	507	17.76
Total Demand of Cluster No.2						**1680**	**1859**	**65.06**	**2297**	**80.41**	**2842**	**99.46**
Demand at OHSR at Sripura(Cluster No. 3)												
13	श्रीपुरा	श्रीपुरा	100428			1708	1890	66.14	2336	81.75	2889	101.12
				1	हिम्मतपुरा	30	33	1.16	41	1.44	51	1.78
14	धागणमऊ कंला	लोठियाना	100427			770	852	29.82	1053	36.85	1302	45.59
Total Demand of Cluster No.3						**2508**	**2775**	**97.12**	**3429**	**120.03**	**4242**	**148.48**

Demand at OHSR at Naya Gaon (Cluster No. 4)

15	धागणमऊ कंला	नया गांव	100424			466	516	18.05	637	22.30	788	27.59
16	धागणमऊ कंला	धागणमऊ कंला	100422			836	925	32.37	1143	40.01	1414	49.49
17	धागणमऊ कंला	खुमानगंज	100426			340	376	13.17	465	16.27	575	20.13
18	धागणमऊ कंला	सुखपुरा	100423			531	587	20.56	726	25.41	898	31.44
				1	धोकडा	100	111	3.87	137	4.79	169	5.92
19	धागणमऊ कंला	धागणमऊ खुर्द	100464			180	199	6.97	246	8.61	304	10.66
				1	छिपिया	120	133	4.65	164	5.74	203	7.10
				2	सिडिया	90	100	3.49	123	4.31	152	5.33
Total Demand of Cluster No.4						**2663**	**2946**	**103.12**	**3641**	**127.45**	**4504**	**157.66**
Demand at OHSR at Kundal ka khera (Cluster No. 5)												
	धागणमऊ कंला	धागणमऊ खुर्द		3	सिंगडिया	200	221	7.74	273	9.57	338	11.84
	धागणमऊ कंला	धागणमऊ खुर्द		4	बावडीखेडा	130	144	5.03	178	6.22	220	7.70
	धागणमऊ कंला	धागणमऊ खुर्द		5	गुजरों का ढाणा	90	100	3.49	123	4.31	152	5.33
	धागणमऊ कंला	धागणमऊ खुर्द		6	कुदाल का खेडा	300	332	11.62	410	14.36	507	17.76
	धागणमऊ कंला	धागणमऊ खुर्द		7	साईपुरा	120	133	4.65	164	5.74	203	7.10
	धागणमऊ कंला	धागणमऊ खुर्द		8	लाडपुरा	70	77	2.71	96	3.35	118	4.14
Total Demand of Cluster No.5						**910**	**1007**	**35.24**	**1244**	**43.55**	**1539**	**53.87**
Demand at OHSR at Borav (Cluster No. 6)												
20	बोराव	बोराव	100414			2726	3016	105.56	3728	130.47	4611	161.39
				1	कोठारी का कुंआ	200	221	7.74	273	9.57	338	11.84
21	बारोव	खेमा खेड़ा	100415			335	371	12.97	458	16.03	567	19.83
22	धागणमऊ कंला	लक्ष्मी खेड़ा	100421			290	321	11.23	397	13.88	491	17.17
23	तम्बोलिया	तम्बोलिया	100413			523	579	20.25	715	25.03	885	30.96
24	तम्बोलिया	केशरपुरा	100412			322	356	12.47	440	15.41	545	19.06
				1	क्लबेलयो का डेरा	100	111	3.87	137	4.79	169	5.92
25	गोपालपुरा	गणेशपुरा	100473			477	528	18.47	652	22.83	807	28.24
Total Demand of Cluster No.6						**4973**	**5502**	**192.57**	**6800**	**238.01**	**8412**	**294.41**

Demand at OHSR at shambhupuriya (Cluster No. 7)												
26	गोपालपुरा	गोपालपुरा	100468			859	950	33.26	1175	41.11	1453	50.85
27	गोपालपुरा	शम्भूपुरिया	100471			162	179	6.27	222	7.75	274	9.59
				1	लाडपुरा	70	77	2.71	96	3.35	118	4.14
28	गोपालपुरा	बोरदा	100470			322	356	12.47	440	15.41	545	19.06
29	गोपालपुरा	रामनगर	100472			418	462	16.19	572	20.01	707	24.75
Total Demand of Cluster No.7						**1831**	**2026**	**70.90**	**2504**	**87.63**	**3097**	**108.40**
Demand at OHSR at Karena (Nagpura) (Cluster No. 8)												
30	गोपालपुरा	उर्मचा	100465			466	516	18.05	637	22.30	788	27.59
				1	कमलिया डूंगरी	60	66	2.32	82	2.87	101	3.55
31	गोपालपुरा	जयनगर	100467			116	128	4.49	159	5.55	196	6.87
32	गोपालपुरा	नगपुरा	100466			626	693	24.24	856	29.96	1059	37.06
				1	बहेडिया	70	77	2.71	96	3.35	118	4.14
				2	मालीपुरा	150	166	5.81	205	7.18	254	8.88
				3	करेणा	100	111	3.87	137	4.79	169	5.92
Total Demand of Cluster No.8						**1588**	**1757**	**61.49**	**2171**	**76.00**	**2686**	**94.01**
Demand at OHSR at Nahargarh(Cluster No. 9)												
33	तम्बोलिया	प्रताप पुरा	100416			633	700	24.51	866	30.30	1071	37.48
34	तम्बोलिया	नारहगढ़	100419			370	409	14.33	506	17.71	626	21.90
				1	झौंपडा	78	86	3.02	107	3.73	132	4.62
35	तम्बोलिया	गोरख्या	100420			28	31	1.08	38	1.34	47	1.66
Total Demand of Cluster No.9						**1109**	**1227**	**42.94**	**1516**	**53.08**	**1876**	**65.66**
Demand at OHSR at Shambhunathji ka khera (Cluster No. 10)												
36	तम्बोलिया	टाकरदा	100411			840	929	32.53	1149	40.20	1421	49.73
				1	हेमगंज	240	266	9.29	328	11.49	406	14.21
37	तम्बोलिया	पिपल्दा	100410			624	690	24.16	853	29.87	1055	36.94
38	तम्बोलिया	शम्भुनाथ जी का खेड़ा	100418			719	796	27.84	983	34.41	1216	42.57
Total Demand of Cluster No.10						**2423**	**2681**	**93.83**	**3313**	**115.97**	**4099**	**143.45**
Total Demand of Project						**27671**	**30615**	**1241.26**	**37837**	**1534.13**	**46805**	**1897.68**

For designing purpose 3 % Filter Losses and 15 % pipe line losses (as per new guidelines) has also been incorporated.

With 3% Filtration losses Design Demand for year 2048 comes to 1954.61 KLD

With 15% Pipe Line losses Design Demand for year 2048 comes to 2247.80 KLD **(Say 2.25 MLD)**

In above cluster wise water demand of 37 villages (except village Bhainsrodgarh) is taken as @ 35 LPCD where as for village Bhainsrodgarh water demand is taken as @ 70 LPCD, because this village Bhainsrodgarh is situated near to Town Rawatbhata and only the river Chambal is flowing in between town Rawatbhata and village Bhainsrodgarh. The village Bhainsrodgarh is covered by departmental piped water supply scheme and living standard of villagers of village Bhainsrodgarh is likely to urban habitants. The village Bhainsrodgarh is a Panchayat Samiti head quarter and many government offices are there. Besides this due to sanctuary area many tourist are also came to visit Bhainsrodgarh site and stay at Bhainsrdogarh hotel (fort). The village is situated at hilly area and all insides streets are covered by cemented road and are very narrowed. Level difference of populated area of village Bhainsrodgarh are quite irregular and variable. Before ending the design year (2048), this village may be converted in urban town and lands will also be not available in village at required level to construct the over head service reservoir of balance capacity and it will also be very difficult to re-augment the distribution system in future. At present the habitants of village Bhainsrodgarh is consuming water more than 35 LPCD and difference in proposed new pipe lines for augmentations of village distribution system of Bhainsrodgarh with 35 LPCD and 70 LPCD are quite low (maximum proposed pipe lines are comes to of 100mm). Looking to this situation the rate of water supply for village Bhainsrodgarh (only) is taken as 70 LPCD instead of 35 LPCD.

CHAPTER-3:
PROJECT COMPONENTS

3.1 Water Source

Chambal, the only perennial river of State is adopted source of water for this project. The Chambal river downstream of Rana Pratap Sagar dam at Bhaisrodgarh will be the tapping point for this project. The withdrawal of water will be of tune 2.25 MLD (for year 2048) for drinking purpose for Bhaisrodgarh-Borav Water Supply Project, proposed to cater drinking water demand of all 38 villages and 27 other habitations of Bhasirodgarh Panchayat Samiti. Since the existing Intake (Dry Intake) of RWSS Bhainsrorgrh is of small diameter (3.30 mtr.), for source it proposed to construct intake structure adjoining to Intake of RWSS Bhainsrorgarh to install Submersible mono pump sets in River Chambal for lifting the desired quantity of water.

3.2 Design periods etc. for various Components of Project

Design period etc. for various component of project, given in Table no 7.1, are adopted as per CPHEEO manual and PHED guide lines.

Table 3.1: Design Period for Project Components

S. No.	Particulars	Design Period
1	Pumping Station- Civil Works	30 years
2	Electrical Mechanical & Instrumentation	15 years
3	Rising Mains for ESRs	30 years
4	Distribution System Pipe line	30 years
5	Clear water reservoir	2 hour storage capacity For the demand of design year 2048
6	Elevated Service Reservoir	Half day demand of design year 2048
7	Pumping Hours	16 hours

3.3 Proposed Component of Pumping Stations

In this project following pump house are proposed to install pumping the desired quantity of water.

S. No	Location	No. of installed working pump sets	No. of installed standby pump set	Size of pump house
1	Bhainsrodgarh pumping station	3	3	140 SQM
2	Sripura pumping station	3	3	140 SQM
3	Borav pumping station	5	5	175 SQM
4	Intake Structure Bhainsrorgarh	2	1	100 SQM

3.4 Proposed Components for Transfer and Distribution System

3.4.1 Transfer Mains

Economical analysis of transfer mains has been carried out with modified Hazen-Williams formula for 16 hour pumping based on consideration of annual energy charges and investment on capital charges with 10% interest rate on capital investment. DI pipe has been taken for pipeline size less than 800 mm on the basis of techno-economic consideration. Class of DI pipes has been adopted on the basis of allowable pressure with surge. Following transfer mains are proposed in this project.

S. No	From	To	Size	Material	Class	Length (Mtr.)
1	Intake Bhainsrodgarh	CWR/ Filter Bhainsrodgarh	250mm	D.I.	K-7	950
2	CWR Bhainsrdogarh	CWR Sripura	250mm 200 mm	D.I. D.I.	K-7 K-7	3000 8450
3	CWR Sripura	CWR Borav	200mm	D.I.	K-7	12150
					Total	**24550**

3.4.2 Clear Water Reservoirs

Clear water reservoirs are designed on the basis of 2 hour capacity of the daily water demand for the design year 2048 at Bhainsrodgarh pumping station and four hours capacity of the daily water demand for the design year 2048 at Sripura and Borav pumping station, because Bhainsrodgarh pumping station and Sripura/ Borav pumping stations will be connected with separate electric feeder. There are two kind of pumping stations, transfer pumping stations and cluster pumping stations. But looking at the capacities required for transfer and

cluster distribution, common CWRs have also been considered at all locations. In this project following clear water reservoirs are proposed :-

S. No	Location	Capacity
1	Pumping Station Bhainsrodgarh	300 KL
2	Pumping Station Sripura	350 KL
3	Pumping Station Borav	250 KL

3.4.3 Cluster Pumping Mains

There are proposed 10 clusters having 9 ESRs and 1 GLSR for cluster Kundal ka khera which are required for all 37 villages and 27 other habitations to achieve this objective, 3 cluster pumping stations have been proposed. Efforts have been made to connect each ESR separately with a pump set and a pumping main. But due to location of ESRs and other considerations, ESRs have also been connected in series. In this project GLSR at Kundal Ka Khera (Dhangarmahu Khurd) and Naya Gaon are connected by common cluster pumping main and like this ESR at Kanera (Nagpura) and Shambhupuria are connected by common cluster pumping main. One ESR for piped water supply scheme Bhainsrodgarh is also proposed. In this project following cluster pumping mains are proposed :-

S. No	From	To	Size	Material	Class	Length (Mtr.)
1	CWR Bhainsrorgarh	ESR Bhainsrorgarh for cluster	100	DI	K-7	1150
2	CWR Bhainsrorgarh	Junction for ESRs Bhainsrorgarh for village Bhainsrorgarh	150	DI	K-7	1250
3	CWR Sripura	OHSR Sripura	100	DI	K-7	50
4	CWR Sripura	OHSR Bhunjar Kallan	100	DI	K-7	5250
5	CWR Borav (Junctio)	OHSR Naya Gaon	100	DI	K-7	2650
6	CWR Borav (Junction)	GLSR Kundal ka Khera	100	DI	K-7	9800
7	CWR Borav	Junction for Kundal ka Khera & Naya Gaon	150	DI	K-7	4050
8	CWR Borav	OHSR Borav	100	DI	K-7	50
9	CWR Borav (Junction)	OHSR Shambhupuriya	100	DI	K-7	2400
10	CWR Borav (Junction)	OHSR Karena(Nagpura)	100	DI	K-7	5900
11	CWR Borav	Junction for Sambhupuriya & Karena	150	DI	K-7	3700

S. No	From	To	Size	Material	Class	Length (Mtr.)
12	CWR Borav	ESR Nahargarh	100	DI	K-7	5000
13	CWR Borav	ESR Sambhunathji ka khera	100	DI	K-7	8700
14	CWR Bhainsrorgarh (Junction)	Existing ESR Bhainsrorgarh in village Bhainsrorgarh	100	DI	K-7	1600
15	CWR Bhainsrorgarh (Junction)	ESR (Proposed) Bhainsrorgarh for village Bhainsrorgarh	100	DI	K-7	350
					Total	**51900**

3.4.4 Village Cluster Distribution System

On the basis of topography of the area, available route between villages, ground level etc., number of villages are clubbed into a group to form a cluster. It is proposed to construct one centrally located 'Elevated Service Reservoir' (ESR) in a cluster and to connect villages of that cluster with ESR through pipe lines. A 'Village Transfer Chamber' (VTC) shall be constructed outside the village where a control valve and bulk supply meter shall be installed. ESRs of clusters shall be filled through cluster pumping mains from cluster pumping stations. DI pipes are proposed (due to heavy rocky strata and hilly terrain with forest area) to be laid to connect VTCs of villages with respective ESRs. Cluster distribution pipe lines have been designed for the water demand of year 2048. Since some other habitation will have separate locations, due to remote situation from its main habitation (village). In this project 45 Nos. VTC (village transfer chamber) are proposed. Due hilly terrain, rocky strata and forest area all cluster distribution pipe lines are proposed of D.I. In this project following cluster distribution mains are proposed :-

S. No	Item	Size	Material	Class	Length (Mtr.)
1	Cluster Distribution Main	100mm	DI	K-7	102250
2	Cluster Distribution Main	150mm	DI	K-7	10920
3	Cluster Distribution Main	200mm	DI	K-7	2900
				Total	**116070**

3.4.5 Elevated Service Reservoir

RCC ESR (GLSR for cluster Kundal ka khera) for each cluster has been proposed at a location from where water can be supplied to all the villages and

other habitations of that cluster through cluster distribution pipe lines. Capacity of a service reservoir is proposed 50% of design water demand i.e. total design water demand for the year 2048 of all the villages and other habitations of that cluster. Staging of ESR is proposed to be kept minimum 18/20 /22 m to obtain at least minimum 12m terminal head at consumer's end and PSP at the highest location in any village of that cluster. One ESR is proposed in one cluster. In this project 9 RCC ESRs and 1 GLSR of required capacity are proposed for 10 clusters. One RCC ESR of balance capacity is also proposed for piped water supply scheme Bhainsrodgarh. In this project following ESRs are proposed. Minimum capacity of proposed ESR is taken as 100 KL :-

S. No	Name of cluster	Half day design demand in KLD	Capacity of ESR in KL	Staging of ESR (In Mtr.)
1	Cluster 1 Bhaisrorgarh ESR	122.65	150	22
2	Cluster 2 Bhunjar kalan ESR	57.19	100	18
3	Cluster 3 Sripura ESR	85.38	100	20
4	Cluster 4 Naya gaon ESR	90.65	100	20
5	Cluster 5 Kudal ka khera GLSR	30.98	50	-
6	Cluster 6 Borav ESR	169.29	200	22
7	Cluster 7 Shambhupuriya ESR	62.33	100	20
8	Cluster 8 Karena ESR	54.06	100	20
9	Cluster 9 Nahargarh ESR	37.75	100	18
10	Cluster 10 Shambhunathji ka ka khera ESR	82.48	100	18
11	Village Bhaisrorgarh	298.41	200	20

Since in village Bhainsrodgarh one RCC, OHSR of capacity 100 KL is already existed. Hence for piped water supply scheme Bhainsrodgarh, 200 KL capacity OHSR (300 KL – 200 KL) with 20 mtr staging is proposed in this project.

3.4.6 Village Distribution

Water to village public stand posts will be supplied from the transfer chamber through HDPE/ DI pipe lines. Due to heavy rocky strata and cemented roads in villages, about 60% distribution pipe line are proposed of HDPE and 40% pipe lines are proposed of D.I. PSPs will be placed at locations in consultation with the Village Water Committee. At each PSP a platform and a soak pit shall be

constructed. In this project as per departmental norms of one PSP for 100 person total 425 PSPs are proposed. Bare minimum distribution pipe line as per topography of habitations and population of habitations are taken in this project, total length of distribution of pipe line for standing PSPs is proposed 40.93 Km. In this project Cattle Water Trough are not proposed, due to other water sources for cattle is available in the proposed area. In this project following cluster distribution mains are proposed :-

S. No	Item	Size	Material	Class	Length (Mtr.)
1	Village Distribution Pipe Line	90mm	HDPE	PE 80 6 Kg. /CM^2	24530
2	Village Distribution Pipe Line	100mm	D.I.	K-7	12000
3	Village Distribution Pipe Line	150mm	D.I.	K-7	4400
				Total	**40930**

3.4.7 Dedicated Power Feeder

11 KV dedicated power feeder from 33 KV GSS (AVVNL) at Bhainsrorgarh is proposed for proposed Intake Structure Bhainsrorgarh and proposed filter plant / pumping station at Bhainsrorgarh.

11 KV dedicated feeder has been taken at Sripura and Borav Head works where supply will be taken from existing 33 KVA GSS of AVVNL at Borav. About 12 to 13 Km 11 KV power line has to be laid by AVVNL for making supply at Sripura and Borav head works.

3.4.8 Augmentation of Piped Water Supply Scheme Bhainsrodgarh

The village Bhainsrodgarh is already covered by departmental piped water supply scheme with source as River Chambal. Augmentation/ reorganisation of this scheme is also required therefore, in this project augmentation/ reorganisation of this scheme is also proposed. Entire areas of this village is situated over hill and due to rocky strata D.I. pipes are only proposed for augmenting distribution system. Following distribution pipe lines are proposed for augmenting piped water supply scheme Bhainsrodgarh.

S. No	Item	Size	Material	Class	Length (Mtr.)
1	Distribution Pipe Line for Piped	100mm	D.I.	K-7	7932

S. No	Item	Size	Material	Class	Length (Mtr.)
	Water Supply Scheme Bhainsrodgarh				
2	Distribution Pipe Line for Piped Water Supply Scheme Bhainsrodgarh	125mm	D.I.	K-7	280
3	Distribution Pipe Line for Piped Water Supply Scheme Bhainsrodgarh	150mm	D.I.	K-7	452
4	Distribution Pipe Line for Piped Water Supply Scheme Bhainsrodgarh	200mm	D.I.	K-7	110
				Total	**8774**

3.4.9 Filter Plant

Since the capacity of filter plant comes to very low therefore, in this project designing the capacity of filter plant, demand of design year 2048 is taken . A rapid gravity filter plant of design capacity 2.25 MLD for year 2048 is taken in this project.

3.4.10 Forest Clearance

Since almost all area of this project from source (Bhainsrodgargh) to village Lothiyana is falling under Jawahar Sagar Sanctuary and Bhainsrodgarh Sanctuary and further area in some portion of Dhanganmau khurd, umarcha (Kamliya Dungri),Nagpuru (Karena) and Nahargarh (Jopara) is falling under forest (Borave range van mandal Chittorgarh)

provision of forest clearance for construction of different head works and laying of pipe line etc. is also taken in this project.

3.4.11 Miscellaneous Provisions

In the project provision of following miscellaneous items are taken:

- Construction of residence for support staff at each HW as per requirement.
- Development of campus of all Head-Works which shall include landscaping, approach roads, boundary walls, electrification, water supply, sanitation arrangement etc.
- Land acquisition, crop compensation
- Provision for Highway Crossings, Road Crossings, etc. as required.
- Provision for SCADA System interlinking with Master Control Unit for the Project.

3.5 Cost Estimates

Engineering estimation has been done on the basis of latest rates/estimates of various items issued by CE(SP),PHED, Jaipur vide letter no. 1836-1950 dt. 10.07.13 for all the project components.

CHAPTER-4
DESIGN CRITERIA AND ESTIMATION

4.1 Water Demand

As per new guideline, service level of 35 LPCD has been considered for rural area for connecting from surface source. Water demand of 37 villages (except village Bhainsrodgarh) is taken as @ 35 LPCD where as for village Bhainsrodgarh water demand is taken as @ 70 LPCD, because this village Bhainsrodgarh is situated near to Town Rawatbhata and only the river Chambal is flowing in between town Rawatbhata and village Bhainsrodgarh. The village Bhainsrodgarh is covered by departmental piped water supply scheme and living standard of villagers of village Bhainsrodgarh is likely to urban habitants. The village Bhainsrodgarh is a Panchayat Samiti head quarter and many government offices are there. Besides this due to sanctuary area many tourist are also came to visit Bhainsrodgarh site and stay at Bhainsrdogarh hotel (fort). The village is situated at hilly area and all insides streets are covered by cemented road and are very narrowed. Level difference of populated area of village Bhainsrodgarh are quite irregular and variable. Before ending the design year (2048), this village may be converted in urban town and lands will also be not available in village at required level to construct the over head service reservoir of balance capacity and it will also be very difficult to re-augment the distribution system in future. At present the habitants of village Bhainsrodgarh is consuming water more than 35 LPCD and difference in proposed new pipe lines for augmentations of village distribution system of Bhainsrodgarh with 35 LPCD and 70 LPCD are quite low (maximum proposed pipe lines are comes to of 100mm). Looking to this situation the rate of water supply for village Bhainsrodgarh (only) is taken as 70 LPCD instead of 35 LPCD.

For this project 3% filter losses and 15% pipe line losses are also incorporated for design propose.

Water demand for covered villages in this package according to above mentioned parameters is as given below :

Sector	Tehsil/P.S.	No. of villages/ other habitations	Water Demand in MLD		
			2018	2033	2048
Rural	**Bhaisroadgarh**	**38/27**	1.470	1.817	2.248
		TOTAL	**1.470**	**1.817**	**2.248**

4.2 Design Criteria

- The rising mains have been designed with software based on modified Hazen William formula. Looking to the high cost of water along with water being

precious commodity in Chittaurhgarh District, DI pipes have been selected for use in all sizes of rising mains form one pumping station to next pumping station as well as to cluster ESR's up to designed demand of year 2048.

- The pumping machinery has been proposed for 15 years i.e 2033 demand.
- The construction of clear water reservoir at three locations has been proposed in this proposal with taking 2 hours demand for year 2048 for Bhainsrodgarh pumping station and four hour demand for year 2048 for pumping station Sripura and Borav due to Bhainsrodgarh pumping station and Sripura/ Borav pumping stations will be connected with separate electric feeder.
- The capacity of the ESR has been adopted half day demand for year 2048.
- All rising mains have been designed for 16 hrs in rural areas.
- Minimum pressure at each village transfer chamber has been kept as 12.00 meter at peak load due to connect the other habitations later on through nearby distribution lines.
- The main system will be laid up to the village entry point called the Village Transfer Chamber (VTC). Provision has been taken to construct a double chamber consisting of sluice valve in one part under control of the PHED and water meter in the second part under joint control of PHED and village water committee.
- The distribution has been designed by using EPANET. The pipe size calculated for the distribution system where working pressure in the network permits its use.
- 60% HDPE pipes and 40% D.I. pipes have been adopted for internal village distribution (due to heavy rocky strata and Cement Concrete roads) with minimum diameter of 100 mm as per decision of T.C.
- The material of rising main & distribution pipe lines have been adopted as per guide lines issued by the PPC recently. The DI pipe line for transfer mains & rising mains has been adopted as per the guide lines mentioned in the pipe policy decided in PPC meeting. The DI pipes has been adopted for cluster distribution system due to hilly terrain, rocky strata and forest area.
- The period for operation and maintenance has been taken as 10 years after completion of defect liability period as per departmental policy.

4.3 Details of Formation of Cluster

38 villages and 27 other habitations of Panchayat Samiti Bhaisroadgarh proposed to be covered in this proposal have been divided into 10 rural clusters.

The formations of clusters of habitations have been done on following considerations:

1) As far as possible the ESR has been kept in the area of Gram Panchayat as per technical suitability.
2) General topography of the area i.e. rising/falling terrain.
3) Social aspect i.e. size of village for location of ESR.
4) Economizing of capitalized energy charges.
5) Concept of totality of user command.

4.4 I.E.C. Activities

The main objective of I.E.C. activities is the support of the operation and maintenance of the water supply project and to maximize its benefits for the the target population. The activities under this component shall primarily be focused for building environment for project acceptance. A village level committee viz "Village Water, Health & Sanitation Committee (VWHSC)" shall be formed and will take up all the tasks related to the project. Lump sum provision of Rs. 0.25 lac per village/ other habitations, to engage an experienced NGO to carry out I.E.C. activities has been taken in the estimate.

4.5 Operation & Maintenance

After completion of the physical works, there would be a defect liability period of 1 year during which the scheme would be operated and maintained by the contractor free of cost. Thereafter, the scheme shall be operated & maintained by the same contractor for a period of ten years. During the O&M period, the contractor shall be fully responsible for:

(a) Operation & Maintenance of clear water reservoirs, pump houses & elevated service reservoirs

(b) Operation & Maintenance of rising/distribution mains/distribution pipelines including all pipeline appurtenances

(c) Metering and Submission of Daily Production and Distribution Report.

4.6 Implementation Schedule

The execution period for the work shall be 24 months from date of issue of work order. The execution of the scheme will be commenced after clearance of forest with sanctuary.

4.7 Execution of Work

It is proposed to get the entire work under this project to be done on turnkey lump sum basis through Single Responsibility Contract including O&M for 10 years.

4.8 Basis of Rates for Estimation

Engineering estimation has been done on the basis of latest rates/estimates of various items issued by CE (SP), PHED, Jaipur vide letter no. 1836-1950 dt. 10.07.13 for all the project components.

Assistant Engineer
PHED Project Dn. Chittaurgarh

Executive Engineer
PHED Project Dn. Chittaurgarh

Superintending Engineer
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