Composite Water Supply Scheme
for
Sustainability and Quality

in

Chandrapur and Dimoria Development Block of Kamrup District
(Zone-II : Dimoria Block)

under

World Bank Assisted RWSS – LIS Projects in Assam

EXECUTIVE SUMMARY :

1. Name of the Scheme	:	Composite WSS for Sustainability & Quality in Chandrapur & Dimoria Dev. Block of Kamrup District : Zone – II : Dimoria Block
2. Name of the programme	:	World Bank Assisted RWSS – LIS Projects in Assam.
3. Location	:	Kamrup District, Assam.
4. Area to be covered	:	The area to be covered by the project is complete area of Digaru Development Block of Kamrup District spanning between North latitude 26°0' to 26°15' and East 91°50' to 92°10'. All total 484 Habitations of 145 Villages in 12 GPs of the development block shall be benefited by the project.
5. Existing water supply facilities	:	Out of total 484 habitations proposed to be covered by the scheme, 123 are yet to be covered fully. The project area has 105 PWSS out of which 98 nos. are based on ground water, and the rest 7 nos. based on surface source. Out of the 105 existing scheme, 14 nos. has already crossed 15 years of commissioning and 5 nos are more than 30 years old. As a consequence these schemes become incapable of serving the need of the population.

6. Water quality issues in the project area : The quality affected habitation in the project area is a follows :

   (i) Iron affected : 79

   (ii) Fluoride affected : 18

   The fluoride contamination in ground water to the level as high as 9.2 ppm is posing threat to the health of the inhabitants and signs of fluorosis like mottling of the teeth and skeletal deformity is prominent amongst the children of age 6-8 years. Hence, it is of utmost importance to switch over to alternative safe source and it is proposed to cover the entire area with water from a surface source namely River Kolong flowing in the vicinity of the project area.

7. Ground water potential in the project area : The project area has very poor ground water potential. Most of the Deep Tube Wells installed in the area for the different water supply schemes situated there draw water from rock fracture and it has been observed the discharge in almost all the well are within the range 4500 – 7500 which is not adequate to run the scheme. Moreover water can be found after several unsuccessful attempts which lead to very high cost without getting any commensurate benefit. The DTW s that have been installed show signs of declining yield and quite a few of them have run dry. As a matter of fact many PWSS have been rendered defunct due to DTW failure.

8. Increase of service level : The project area borders the municipal limits of Guwahati city and as the price of land in the capital city has skyrocketed, the area has witnessed, heavy migration of people. This trend is expected to accelerate in the immediate future which will further compound the water supply crisis which already exists in the area. Further the people to have settled in the area or are expected do so in the near future will be relatively affluent and have aspirations comparable to the resident of the City. Hence not only will the water overall demand but also the per capita requirement will increase thereby further stressing the water supply infrastructure. Hence if the scheme is taken up there will be no dearth of people will to pay for house connection.

9. Design period	:	The project is designed for a period of 30 years, i.e., from the year 2015 to 2045.
10. Design Population to be served	:	(a) 2011 YSR Population – 176987 souls. (b) On commissioning in 2015 AD – 189227 souls. (c) After 10 years of commissioning in 2025 AD – 221395 souls (d) After 20 years of commissioning in 2035 AD – 259032 souls (e) After 30 years of commissioning in 2045 AD – 303068 souls The details of habitation wise population and population projection along with water demand at various stages are shown in **Annexure - B**
11. Proposed Rate of supply	:	70 lpcd.
12. Total Demand of Water	:	Total demand for the project area at Different stages are : • On commissioning in 2015 AD :15.2 MLD • After 10 Years in 2025 AD: 17.8 MLD. • After 20 Years in 2035 AD: 20.9 MLD. • After 30 Years in 2045 AD: 24.4 MLD. The Calculation of Water Demand is Shown in **Annexure – B**
13. Description of the Project and its Zoning	:	The entire area of Dimoria Block comprising of 12 GPs. Shall be one Zone having its independent system components viz. Raw water intake, treatment plant, different sub-zonal elevated service reservoirs, clear water conveying main and distribution system. An illustrative schematic diagram is annexed.
14. Source of water	:	Surface sources are proposed for the scheme. For all the 12 G.P.s of Dimoria Block, raw water shall be tapped river Kolong at Amora Pathar.

15. Discharge of the source rivers	:	Average Run-off of River Kolong is 48.5 Cumec.
16. Total length of Raw Water Pumping Main	:	7150.0 Rm. From Intake station. The raw water main shall be of DI Class K9 pipe of dia 600 mm with inside cement mortar lighting.
17. Type of treatment		Since source of water for the proposed project is surface water to be tapped from rivers, treatment process having facilities for Sedimentation - Aeration – Coagulation – flocculation – Filtration, followed by Disinfection is proposed. Along with the treatment plant there shall be a quality monitoring laboratory. The treatment plant shall be operated for 20 hours a day.
18. Storage of treated water	:	For collecting the treated water from the Rapid sand filter and to facilitate either pumping of clear water to different service reservoir or gravity fed to constituent distribution network, underground clear water sumps are propsed. The capacity of sump is worked out to be 2000.0 Cu.m. to be located at treatment plant site.
19. Elevated Service Reservoir	:	All total 29 Nos. of elevated service reservoirs spreading over the project area is proposed. Total capacity of all these 29 ESR shall be 6290.0 Cu.m.
20. Conveyance of treated Water	:	Treated water from the underground clear water sump at different treatment plant shall be fed either to the different distribution network under gravity or to different ESR through four different (Route – I to Route – IV) common header type clear water pumping main.

21. Electrical power requirement	:	Total Electrical Power Requirement for raw & clear water pumping, as well as to run the agitator drive motors etc. of the treatment plants and for internal & compound lighting of the respective intake site & the treatment plant location is calculated as 1500.0 KW.
22. Estimated Project cost	:	Rs. 169.35 (Rupees one six nine point three five) crore only. (Annexed at **Annexure – E**)
23. Per capita cost	:	• On commissioning (2015) AD : Rs. 9038.90 • After 10 Years (2025) AD : Rs. 7725.58 • After 20 Years (2035) AD : Rs. 6603.06 • After 30 Years (2045) AD : Rs. 5643.63
24. Execution authority	:	Public Health Engineering Department, Assam.

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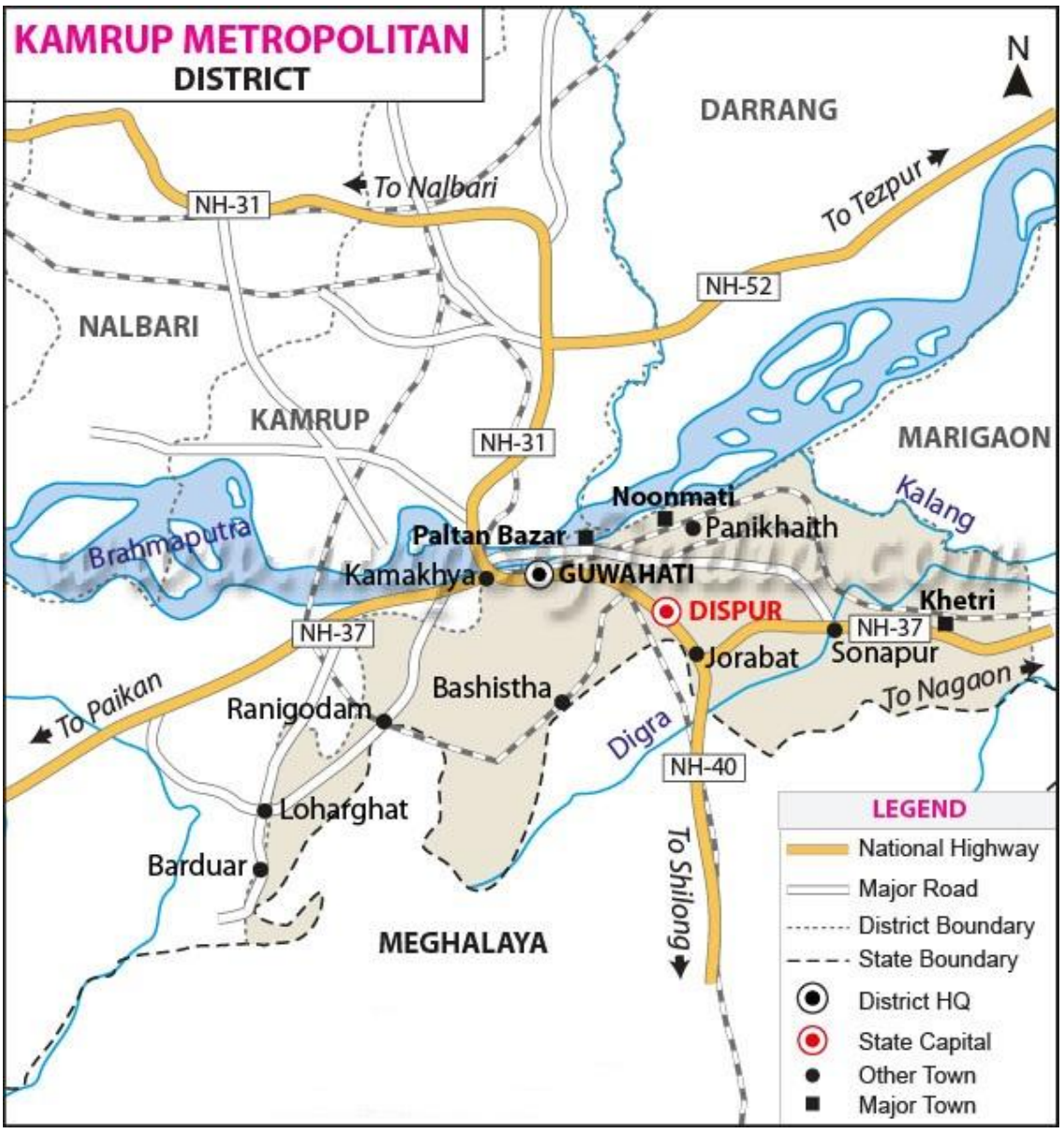


CHAPTER – I

INTRODUCTION

1.1 Background:

In drinking water supply sector for the first time the Government of Assam is going to implement the World Bank assisted Rural Water Supply & Sanitation Project in Kamrup district for providing potable drinking water to the villagers in 24/ 7 model, with assistance from the World Bank. This Detailed Project report on the proposed scheme is prepared by incorporating the comments / observations on the preliminary report and discussions at various levels at different forums.

The Composite Water Supply Scheme for Sustainability & Quality in Kamrup District Zone-II will cover all the habitations under Dimoria Development Block. Population under the project area is **176987souls as per 2011** census and projected with 17% overall decadal growth as such the decadal growth in the last decade shows abnormal growth in urban population.

The decadal growth of the decade 2001-2011 in urban area and rural area of Kamrup district are 22.90% and 2.93% and overall decadal growth is 18.95%. The decadal population growth in urban areas seems to be abnormally higher than the State overall. Hence, in order to rationalize the matter, the state overall growth rate i.e. 17% is considered in forecasting the design stage population.

Out of the 105 existing schemes, 14 nos. has already crossed its life design life span i.e 15 years and 5 nos are more than 30 years old. The level of service in accordance to the need of the consumers cannot be maintained by these old schemes.

The quality affected habitation in the project area is a follows:

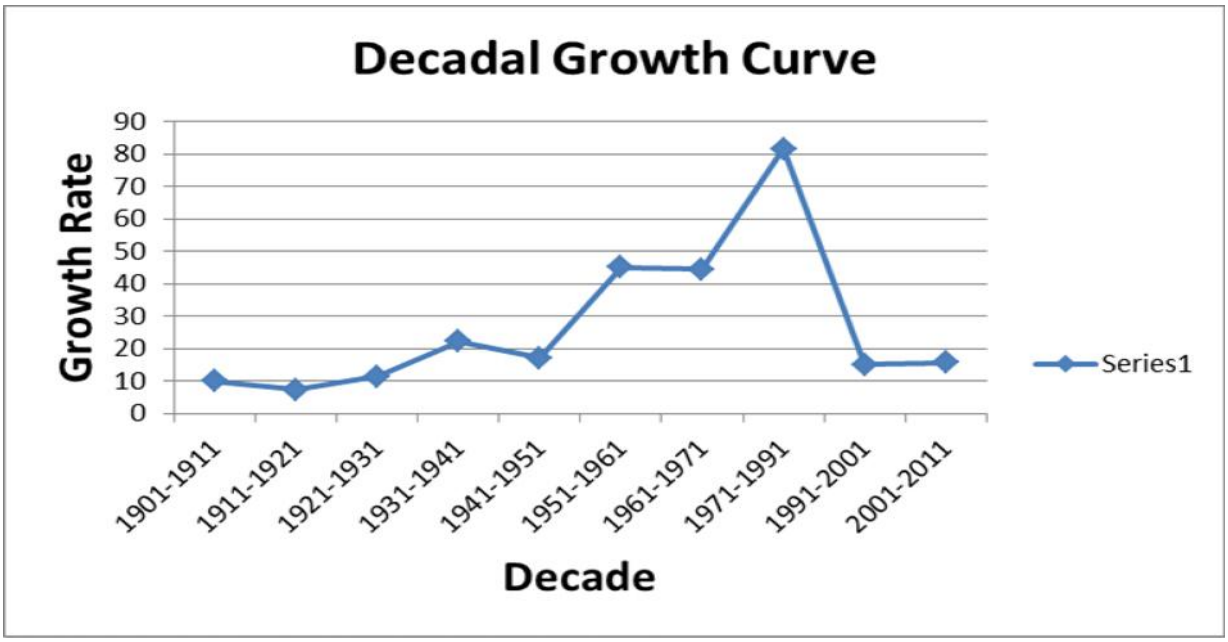
(i) Iron affected : 79

(ii) Fluoride affected : 18

The fluoride contamination in ground water to the level as high as 9.2 ppm is posing threat to the health of the inhabitants and signs of fluorosis like mottling of the teeth and skeletal deformity is prominent amongst the children of age 6-8 years. Hence, it is of utmost importance to switch over to alternative safe source and it is proposed to cover the entire area with water from a surface source namely River Kolong flowing in the vicinity of the project area.

The decadal growth of the project district is shown below in graphical manner-

Year	Growth Rate
1901-1911	10.01
1911-1921	7.36
1921-1931	11.42
1931-1941	22.11
1941-1951	17.01
1951-1961	45.12
1961-1971	44.48
1971-1991	81.53
1991-2001	14.97
2001-2011	15.67



River Kolong is flowing along the side of the command area which has substantial surface flow throughout the year to draw required quantity of water for the proposed water supply scheme even in the lean period. Average Run-off of River Kolong is 48.5 Cumec. Intake arrangement with floating barge has been considered for withdrawal of raw water from river Kolong at Amora Pathar.

Thus, this project is programmed to build a sustainable Large Multi-villages Piped water supply scheme, withdrawing water from the same, to serve a cluster of 145 nos. villages under Dimoria development Block for the design period 2045.

1.2 Project Objectives:

The project implementation objective is to improve rural water supply and sanitation services through progressive decentralization, community participation and enhanced accountability. The objective of the project is also to augment the capacity of the water supply arrangement of Kamrup district so as to bridge the existing gap between demand and supply and to adequately meet the projected need of the area to be covered till the year 2045. The proposed scheme will have provision for supply of water through house connection besides a few street hydrants for the benefit of the low income groups.

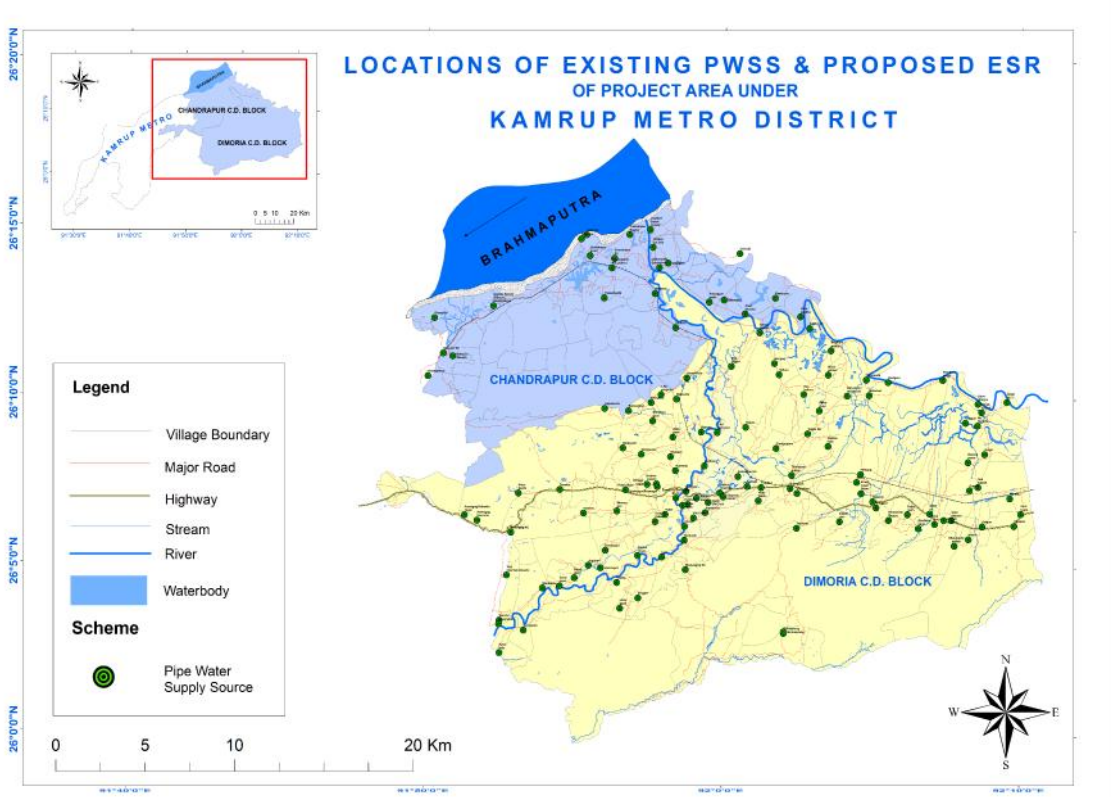
1.3 Project area:

District: Kamrup
District Headquarters: Guwahati
Geographical Position:
North Latitude: 26°0' - 26°15'
East Longitude: 91°50' - 92°10'
Distances from major locations:
Nearest airport: Borjhar, Guwahati: 60 km
The project area lies in Dimoria block of Kamrup district.

1.4 Land availability:

Govt. land is available for execution of the scheme at the intake point as well as for all intra-village ESRs' and WTP of respective area. In some case, it is proposed to erect

the ESR at the PHE complex of existing scheme thus ruling out the arrangement for additional land. The proposal for allotment of Govt. land has been moved to the District Land Advisory Board and document shall be produced after approval.



1.5 Communication:

The project area is well connected by National Highway & State Highway and also by railway with District HQ and State with the state Capital and rest of the country.

1.6 District Profile:

Kamrup district is one of the 27 districts of Assam state in north-eastern India. Undivided Kamrup district is a former administrative district located in Western Assam from which Kamrup Rural (2003), Kamrup Metropolitan (2003), Barpeta (1983), Nalbari (1985) and Baksa (2004) districts were formed. There are ten Assam Legislative Assembly constituencies in Kamrup district. Boko, Chaygaon, Palasbari, Jalukbari, Dispur, Guwahati East, Guwahati West, Hajo, Kamalpur & Rangia. Out of ten Legislative Assembly constituencies eight are in the Guwahati Lok Sabha constituency and two are in Mangaldoi Lok Sabha constituency. Kamrup district

occupies an area of 4,345 square kilometres (1,678 sq mi). Out of this, 17.68% is reserve forest. There are total of 312 nos. reserve forests in Kamrup district.

In the immediate neighbourhood of the Brahmaputra the land is low, and exposed to annual inundation. In this marshy tract reeds and canes flourish luxuriantly, and the only cultivation is that of rice. At a comparatively short distance from the river banks the ground begins to rise in undulating knolls towards the mountains of Bhutan on the north, and towards the Khasi hills on the south. The hills south of the Brahmaputra in some parts reach the height of 800 feet (240 m). The Brahmaputra, which divides the district into two nearly equal portions, is navigable by river steamers throughout the year, and receives several tributaries navigable by large native boats in the rainy season. The chief of these are the Manas, Chaul Khoya and Barnadi on the north, and the Kulsi and Dibru on the south bank. In 1989 Kamrup district became home to the Dipor Bil Wildlife Sanctuary, which has an area of 4.1 km^2 (1.6 sq mi).

1.7 Sector Background :

The National Rural Drinking Water Programme (NRDWP) of the Government of India emphasizes the involvement of Panchayati Raj Institutions (PRIs) and communities in planning, implementing and managing drinking water supply schemes. States are incentivized to hand over management of their schemes to PRIs. Funds for sustainability of schemes are provided on a 100% central share basis. A separate component of support activities to fund Information Education and Communications (IEC), Human Resources Development (HRD), Management Information Systems (MIS), Water Quality Monitoring and Surveillance and other support activities has been introduced. Recently, as part of the NRDWP, the state departments responsible for drinking water supply and sanitation have prepared their long term strategic plan (2011-2022) for ensuring drinking water security to all rural households. The strategic plans aim to cover 90% of households with piped water and at least 80% of households with tap connections during this period. This forward looking strategy supports the creation of an enabling environment for the Panchayati Raj Institutions, SHG and local communities to manage rural drinking water sources and systems. The strategy emphasizes achieving water security through decentralized governance with oversight and regulation, participatory planning and implementation of sources and schemes.

Capacity building programs will be required for communities to monitor and prudently use their water resources. Sustainable service delivery mechanisms are a central feature of the program, with State institutions or Zilla Panchayats implementing and managing large multi-village schemes, delivering bulk water to villages in water stressed areas, and GPs implementing and managing in-village and intra-Panchayat schemes. The strategy highlights source sustainability measures, water quality safety, monitoring and surveillance, service agreements with operators, convergence of different development programs, and building professional capacity at all levels.

The lagging states in terms of piped water coverage, viz. Assam faces constraints in institutional and technical capacity at the state, district, block and GP levels for implementing sustainable rural water supply projects. The constraints are in terms of institutional capacity for involving communities and Panchayats in planning, implementing and managing their own drinking water supply schemes, and technical capacity of the State Rural Water Supply Departments for supporting and implementing the decentralization program. Also, operations and maintenance of existing schemes is not satisfactory, resulting in non-functionality of many schemes. Further, the States face issues of water quality affected habitations that require supply of water from distant safe sources.

Key Elements of the RWSS Program for Lagging States

The RWSS Program for Lagging States program will be a separate component of NRDWP focusing on lagging states with different allocation criteria and funding components, but implemented within the framework of NRDWP, supporting the following key elements of the reform program:

- Placing GPs and communities in the central role, supported by higher levels of PRIs, the State government and the local non-governmental and private sector, for facilitating, planning, implementing, monitoring and providing a range of O&M back-up services.
- Using sustainable, community or local government managed models for intra-GP RWSS schemes and using State-PRI partnership models for multi-GP schemes.

- Putting water resources security as a core theme of the new model, including increased community management of scarce resources.
- Moving the RWSS sector to recovery of at least 50% O&M and replacement costs and initiating contribution to capital costs keeping affordability and inclusiveness in mind.
- Moving towards metered household connections, with 24/7 water supply where feasible, as a basic level of service.
- Promoting professionalized service provision management models, and/or back-up support functions, for the different market segments (simple/small single village/GP schemes; large single village/GP schemes; multi village/GP schemes).
- Integrating water supply and sanitation, with effective sanitation promotion programs for achieving “clean villages”.
- Establishing M&E systems with independent reviews and social audits.

The Government of India has approached the World Bank for assistance on a National Project for the lagging states particularly Assam, Uttar Pradesh, Jharkhand and Bihar. The project will bring about positive health and environmental benefits through supply of 'safe' drinking water and creation of sanitary conditions in the village. The project will have programmes related to improved water quality monitoring, health and hygiene education as well as ground water recharge for water supply source protection.

1.8 Project Rationale :

The project area of Kamrup District is in shortage of quality drinking water. Most of the existing 105 nos. of rural PWSS have outlived their design period and the service level has drastically come down from even 40 lpcd. The burgeoning population has aggravated the situation and the prospect of growth in commercial activities is likely to make the position grimmer. In the habitations Dimoria development block of Kamrup District, multi village rural water supply scheme is essential for following reasons.

1. Quality problem of existing sources.
2. Sustainability of existing ground water based sources is cynical and effective GWR not possible.

3. Going for individual treatment plant to each habitation is not being viable both financially and operationally.
4. Treatment of chemical contamination at household level is expensive.
5. People of the locality are cautious about health hazards due to fluoride contamination.
6. The economic survey report conducted in the project area reveals that majority of the inhabitants of the area are willing to pay for getting individual house hold water supply connection and monthly tarrif fixed thereof provided 70 lpcd water is supplied to them for 24 / 7 in a sustainable manner.

In the context of the above, and water being a very basic need, the Public Health Engineering Department, Government of Assam has decided to go for a Large Multi village rural water supply scheme in Kamrup District under World Bank assisted RWSS-LIS project in Assam.

1.9 Demography :

According to the 2011 census Kamrup district has a population of 1,517,202. This gives it a ranking of 327th in India (out of a total of 640). The district has a population density of 436 inhabitants per square kilometre (1,130 /sq mi). The decadal growth of the decade 2001-2011 in urban area and rural area of Kamrup district are 22.90% and 2.93% and overall decadal growth is 18.95%. The population is done by taking into account of the state overall decadal growth i.e. 17%. for design purpose.

The district is the home of large number of different communities. The district has followers of Hinduism, Islam, Christianity, and Buddhism. The ancient temples of Kamakhya and Hajo attract many pilgrims from all quarters. .

1.10 Economy :

The staple crop of the district is rice, of which there are three crops. The indigenous manufactures are confined to the weaving of silk and cotton cloths for home use, and to the making of brass cups and plates. The chief exports are rice, oil seeds, timber and cotton; the imports are fine rice, salt, piece goods, sugar, betel nuts, coconuts and hardware.

Although the rural economy of Kamrup district is agrarian in nature however, the tertiary sector is dominant in terms of its income share and employment and livelihood generation. The sector contributes 66 percent of the total income in the Gross District Domestic Product while secondary sector contributes 20 percent. The primary sector contribution is estimated to be 14 percent. The per capita Gross District Domestic Product of Kamrup estimated at Rs.22292 is the highest among the districts of the state.

1.11 Geology :

Among the 15 agro-climatic regions of the country, categorized/identified on the basis of homogeneity in agro-characteristics, Kamrup falls in the Eastern Himalayan region. This region as a whole has high forest cover and practice of shifting cultivation. Felling of trees in upper reaches/hills and catchments areas of the Eastern Himalayan region has caused denudation and Kamrup district falls under the Lower Brahmaputra Valley zone. Soil structure of the district is mainly alluvial in nature. The result is heavy run-off, massive soil erosion and floods in lower reaches and basins. Large scale floods cause substantial damage to crops in the district.

The district falls under Brahmaputra river basin. The district has large reservoir of water resources with the river Brahmaputra and its tributaries of Puthimari, Bornoi, Nona, Kulsi, Pagladiya and Kalajal. The rivers also act as reservoir for fisheries. The district has a total of five registered river fisheries along with 20 registered beel fisheries. The district experiences heavy annual rainfall in the range of 1500 mm to 2600 mm. As the soil in the Eastern Himalayan region is highly susceptible to erosion, top soils of the hills gets washed away and are deposited in lower reaches. Due to rolling nature of the plain especially towards western part of Guwahati sub-division, some pockets are prone to gully erosion.

1.12 Climate:

The climate of Kamrup is Sub -tropical with semi dry hot in summer and cold in winter. Annual rainfall is ranges between 1500 mm to 2600 mm. Average humidity is 75 %. Max. temp. of Kamrup range from 370 C -390 C and min. temp. ranges from 60 C -70 C.

1.13 Hydrogeology :

Hydro geologically Assam can be divided into three units namely consolidated formation, semi consolidated formation and unconsolidated formation. More than 75% of the state is underlain by unconsolidated formation comprising of clay, silt, sand, gravel, pebble and boulders. The Bhabar belt is about 11 to 15 km wide; the tubewells yield 27 to 59 m3/hr in this zone. The Tarai zone follows immediately down slope of the Bhabar zone where the yield of the wells ranges between 80-240 m3/hr. The flood plains follow the Tarai in Brahmaputra valley where the shallow tube wells yield between 20-50 m3/hr and deep tube wells between 150-240 m3/hr. Flood occurs generally in the low lying areas of the district during May to August every year. Late flood during the later part of September & October also occurs. The occurrence of flood in the district is due to the river Brahmaputra and its Tributaries.

CHAPTER – 2

DETAILED SCHEME REPORT (DSR):

The detailed project report is formulated for the large multi village rural water supply scheme in Dimoria Development Block of Kamrup District covering the habitations of the block after getting the habitations and the proposed scheme network surveyed with the Total station survey and maps in Auto CAD showing the layout, existing features of PWSS components and the proposed features of PWSS components.

The location of proposed new ESRs have been identified at locations suitable and as required as per design. The alignment & Layout plan was prepared based on the detailed survey conducted in the project area. The longitudinal levels were taken along the proposed alignment. In every village the Ground Level (GL) and Lowest Water Level (LWL) for ESRs were taken.

The Hydraulic Designs were done by using LOOP Software for the best suited design for the individual habitations and the overall extension Scheme. Based on the Outputs of designs the detailed estimate for the proposed water supply scheme, components were prepared covering the following Components of Multi Village Scheme

i. Intake arrangement with floating barge at Kolong River.
ii. 17.8 MLD water treatment plant
iii. Sump of 2000 KL Capacity at Treatment Plant.
iv. Providing ESR of Capacity ranging from 150 KL to 550 KL with 16 m staging at 29 different locations.
v. Providing motors at intake point for Pumping main.
vi. Leading Mains from TP to ESRs in individual villages.
vii. ESRs in Villages
viii. Distribution system in the intra- villages.
ix. House service connections/Public stand posts.
x. Valves and valve pits etc
xi. Other relevant Components

2.1 Existing water supply facilities:

Out of total 484 habitations proposed to be covered by the scheme, 123 are yet to be covered fully. The project area has 105 PWSS out of which 98 nos. are based on ground water, and the rest 7 nos. based on surface source. Out of the 105 existing scheme, 14 nos. has already crossed 15 years of commissioning and 5 nos area more than 30 years old. As a consequence these schemes become incapable of serving the need of the population. The existing schemes can hardly meet the existing demand and hence cannot cater to the minimum service standard of 40 LPCD.

2.2 Water quality issues in the project area:

The quality affected habitation in the project area is a follows:

(i) Iron affected : 79

(ii) Fluoride affected : 18

2.3 Design period :

The project is designed for a period of 30 years, i.e., from the year 2015 to 2045.

2.4 Design Population to be served:

(a) 2011 YSR Population – 176987 souls. (Annexure-B)

(b) On commissioning in 2015 AD – 189227 souls.

(c) After 10 years of commissioning in 2025 AD – 221395 souls

(d) After 20 years of commissioning in 2035 AD – 259032 souls

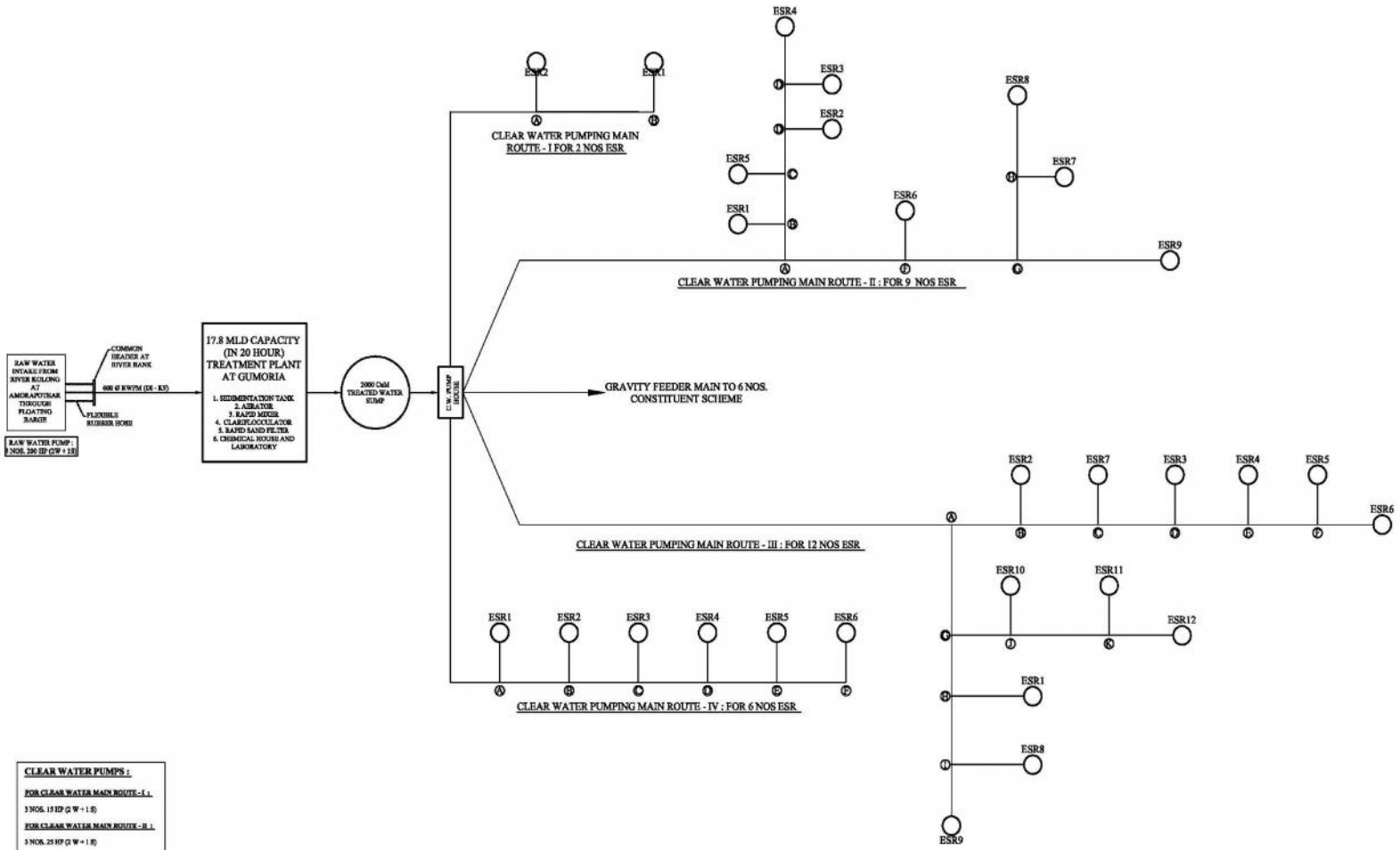
(e) After 30 years of commissioning in 2045 AD – 303068 souls

2.5 **Proposed Rate of supply:** 70 lpcd.

2.6 Total Demand of Water :

Total demands for the project area at Different stages are:

- On commissioning in 2015 AD: 15.2 MLD
- After 10 Years in 2025 AD: 17.8 MLD.
- After 20 Years in 2035 AD: 20.9 MLD.
- After 30 Years in 2045 AD: 24.4 MLD.



CLEAR WATER PUMPS :

FOR CLEAR WATER MAIN ROUTE - I :
3 NOS. 15 HP (2 W + 1 S)

FOR CLEAR WATER MAIN ROUTE - II :
3 NOS. 25 HP (2 W + 1 S)

FORCLEAR WATER MAIN ROUTE - III :
3 NOS. 60 HP (2 W + 1 S)

FOR CLEAR WATER MAIN ROUTE - IV :
3 NOS. 15 HP (2 W + 1 S)

SUMMARY OF PIPE

CLEAR WATER MAIN ROUTE - I :

CW PUMP HOUSE TO A : 5500.0 M. - 250 Ø ; A TO ESR1 : 950.0 M. - 150 Ø
A TO B : 4750.0 M. - 200 Ø ; B TO ESR2 : 800.0 M. - 150 Ø

CLEAR WATER MAIN ROUTE - II :

CW PUMP HOUSE TO A : 7250.0 M. - 300 Ø
A TO B : 900.0 M. - 250 Ø ; B TO ESR1 : 1018.0 M. - 100 Ø
B TO C : 2350.0 M. - 250 Ø ; C TO ESR5 : 1960.0 M. - 150 Ø
C TO D : 500.0 M. - 150 Ø ; D TO ESR2 : 250.0 M. - 100 Ø
D TO E : 530.0 M. - 150 Ø ; E TO ESR3 : 2460.0 M. - 150 Ø ;
E TO ESR4 : 1780.0 M. - 150 Ø
A TO F : 3560.0 M. - 250 Ø ; F TO ESR6 : 250.0 M. - 100 Ø
F TO G : 850.0 M. - 200 Ø ; G TO ESR 9 : 3150 M. - 150 Ø
G TO H : 2820.0 M. - 200 Ø ; H TO ESR7 : 150.0 M. - 100 Ø
H TO ESR8 : 2970.0 M. - 150 Ø

CLEAR WATER MAIN ROUTE - III :

CW PUMP HOUSE TO A : 6250.0 M. - 300 Ø ;
A TO B : 3310.0 M. - 250 Ø ; B TO ESR2 : 200.0 M. - 100 Ø
B TO C : 2460.0 M. - 250 Ø ; C TO ESR7 : 200.0 M. - 100 Ø
C TO D : 2270.0 M. - 250 Ø ; D TO ESR3 : 200.0 M. - 100 Ø
D TO E : 2780.0 M. - 200 Ø ; E TO ESR4 : 200.0 M. - 100 Ø
E TO F : 2890.0 M. - 200 Ø ; F TO ESR5 : 200.0 M. - 100 Ø
F TO ESR6 : 1820.0 M. - 150 Ø
A TO G : 940.0 M. - 200 Ø ;
G TO J : 1110.0 M. - 200 Ø ; J TO ESR10 : 250.0 M. - 100 Ø
J TO K : 1770.0 M. - 150 Ø ; K TO ESR11 : 100.0 M. - 100 Ø
K TO ESR12 : 3010.0 M. - 150 Ø
G TO H : 1060.0 M. - 200 Ø ; H TO ESR1 : 950.0 M. - 100 Ø
H TO I : 2910.0 M. - 200 Ø ; I TO ESR8 : 1700.0 M. - 150 Ø ;
I TO ESR9 : 2500.0 M. - 150 Ø

CLEAR WATER MAIN ROUTE - IV :

CW PUMP HOUSE TO A : 6250.0 M. - 350 Ø ; A TO ESR1 : 950.0 M. - 150 Ø
A TO B : 2150.0 M. - 300 Ø ; B TO ESR2 : 1090.0 M. - 150 Ø
B TO C : 2150.0 M. - 300 Ø ; C TO ESR3 : 1100.0 M. - 150 Ø
C TO D : 2250.0 M. - 300 Ø ; D TO ESR4 : 800.0 M. - 150 Ø
D TO E : 3050.0 M. - 250 Ø ; E TO ESR5 : 750.0 M. - 150 Ø
E TO F : 2500.0 M. - 150 Ø ; F TO ESR6 : 650.0 M. - 100 Ø

COMPOSITE WATER SUPPLY SCHEME FOR QUALITY & SUSTAINABILITY IN CHANDRAPUR & DIMORIADEVELOPMENT BLOCK OF KAMRUP DISTRICT
ZONE - II (DIMORIA BLOCK)

SCHEMATIC DIAGRAM FOR CLEAR WATER PUMPING MAI... IN DIFFERENT ROUTE

CHAPTER – 3

DESIGN DETAILS

3.1 General :

The water supply system has been planned as per the standard norms to ensure adequate & sufficient water supply for the proposed layout. Design parameters used have been adopted according to the guidelines provided in CPHEEO manual. The water distribution network is being designed with and LOOP Software.

The present proposed Scheme is designed to cover all streets and localities of the habitation with safe dependable local be pumped into ESR proposed within the habitation through pumping main and from the ESR, the water will be supplied to the end users through Gravity main (distribution main) with a ferrule provision outside each house, to enable the house holds to get their house hold connection through the GPWSC concerned.

3.2 3.2 Norms For Water Supply:

Norms adopted for water supply as per CPHEEO norms.

3.3 3.3 Water Requirement:

The water requirement has been estimated for the total estimated prospective population projected for the year 2025. The Per capita requirement has been Considered as 70 LPCD.

3.4 3.4 Per Capita Demand:

As per engineering matrices set for the implementation of Composite WSS for Sustainability & Quality in Chandrapur & Dimoria Dev. Block of Kamrup District for Zone-II : Dimoria Block, per captia demand will be 70 litres. (70 LPCD).

The approximate activity-wise break-up is considered as follows:

Activity	Quantity (LPCD)
Drinking	5
Cooking	5
Bathing	30

Washing utensils & house	10
Washing Cloths	10
Ablution	10
Total	70

3.5 3.5 Source:

It is proposed to draw raw water from the river Kolong having sufficient run-off nearly 48.5 cumec on an average. The intake point is selected at Amora Pathar.

3.6 3.6 Design period:

The project is designed for a period of 30 years, i.e., from the year 2015 to 2045.

3.7 3.7 Population Projection:

The decadal growth method as prescribed in the CPHEEO manual is used. The decadal growth of the decade 2001-2011 in urban area and rural area of Kamrup district are 22.90% and 2.93% and overall decadal growth is 18.95% in the census for 2011. Though habitations under coverage of the project area show the tendency of population growth of a peri-urban area, it is not as much in case of Guwahati city and fringe area. Hence, the state overall growth rate i.e. 17% is considered for population projection purpose.

3.8 3.8 Design Population to be served :

After 30 years of commissioning in 2045 AD – 303068 souls

3.9 3.9 Proposed Rate of supply: 70 lpcd .

3.10 3.10 Total Demand of Water:

Total demand for the project area at Different stages are :

- On commissioning in 2015 AD: 15.2 MLD
- After 10 Years in 2025 AD: 17.8 MLD.
- After 20 Years in 2035 AD: 20.9 MLD.
- After 30 Years in 2045 AD: 24.4 MLD

3.11 3.11 Raw Water Pumping Main:

The raw water Main shall be of DI Class K9 pipe of dia 600 mm with inside cement mortar lining for a total length of 7150.00 RM from Amora Pathar Intake point at river Kolong. The Design for economic dia. of Raw Water Pumping Main along with matching capacity of Raw Water Pump Set is shown in the design part of the DPR in **Annexure-C**

3.12 Raw water quality:

The result of the laboratory test of sample collected from the proposed intake point i.e. Tatimara is as follows-(**Annexure - I**)

Date of testing: 16/7/2013

Sl.	Parameters	Test Result
1	P^H Value	6.67
2	Turbidity (NTU)	130
3	Iron (mg/L)	1.32
4	Total hardness(mg/l)	180
5	Alkalinity (mg/L)	56
6	Chloride (mg/L)	40
7	Calcium (mg/L)	100

3.13 Type of treatment:

Since source of water for the proposed project is surface water to be tapped from rivers, conventional treatment process having facilities for Aeration – Coagulation – flocculation – Filtration, followed by Disinfection is proposed. Along with the treatment plant there shall be a quality monitoring laboratory. The treatment plant shall be operated for 20 hours a day as per the engineering matrix fixed by WB Technical consultants.

3.14 Storage of treated water:

For collecting the treated water from the Rapid sand filter and to facilitate pumping of clear water to different service reservoir, one underground clear water sump of capacity 2000 Cum. is proposed along with the treatment plant.

3.15 Elevated Service Reservoir (ESR):

In total 29 Nos. Elevated service reservoirs spreading over the project area is proposed. Total capacity of all these 29 ESR shall be 6290.0 Cu.m. which is almost equal to 8 hour requirement of the project.

3.16 Conveyance of treated Water :

Treated water from the underground clear water sump at different treatment plant shall be fed either to the different distribution network under gravity or to different ESR through four different (Route – I to Route – IV) common header type clear water pumping main.

3.17 Electrical power requirement :

Total Electrical Power Requirement for raw & clear water pumping, as well as to run the agitator drive motors etc. of the treatment plants and for internal & compound lighting of the respective intake site & the treatment plant location is calculated as 1500.0 KW.

3.18 Estimated Project cost :

Rs. 169.35 (Rupees one six nine point three five) crore only.

3.19 Per capita cost:

- On commissioning (2015) AD : Rs. 9038.90
- After 10 Years (2025) AD : Rs. 7725.58
- After 20 Years (2035) AD : Rs. 6603.06
- After 30 Years (2045) AD : Rs. 5643.63

3.20 Executing Authority:

Public Health Engineering Department, Assam.

3.21 Improvements to the Sanitation System:

It is also in principle proposed to improve total sanitation system in the habitation duly utilizing the funds sanctioned under World Bank assistance. Efforts will be made to –

- Ensure 100% IHHL construction in BPL and APL houses for the entire habitation in order to prevent open defection in the village premises.
- Ensure safe solid waste disposal system in the entire habitation as per SWM Guidelines G.O.I.

CHAPTER – 4

COST ESTIMATE

4.1 Rates

The Total Project cost has been arrived based on the Revised Standard Data of government of Assam. The basic rates for the rate analysis are taken from the APWD Schedule of Rates for the year 2010-11 and APHED Schedule of Rates for the year 2008-09 of Government of Assam. The provision of price escalation is made to arrive at the current prices for estimating purpose.

4.2 Estimate Components

The MVS Scheme is proposed with by providing all the facilities detailed below

4.2.1 Raw water Intake System comprising of:

(a) M.S. Floating Barge with all necessary mooring materials & lifesaving equipment; tying arrangement; Over Head gantry Crane etc.
(b) RCC Single Storied Utility cum Operator's Room at River bank of Intake Point
(c) River bank Protection Work at Intake Point
(d) Approach Road to Intake Point from the nearby public road
(e) Land Development & Security Wall at Intake Station
(f) Twin Assam Type accommodation at Intake Location for 1 (one) No. Pump Operator and 1 (one) No. Chowkider
(g) Dedicated Power Line to Intake including Substation
(h) Captive Power Generator at Intake Station

4.2.2 Raw Water Pumping Machinery and other accessories comprising of :

(a) Raw Water Pumping machinery in the Intake barge including all necessary electrical and other installation works

(b) Manifold type Common Header at river bank for the raw water Main and flexible hoses for connecting the same with the barge including campus Illumination at intake location

4.2.3 Raw Water Conveying Main

Supplying, laying, jointing, testing and commissioning of 600 mm dia DI S.S. raw water pumping main including all necessary valves & specials, valve chamber, supporting structures, anchor / thrust block etc., complete

4.2.4 Water Treatment Plant comprising of:

(a) Design and Construction of Complete Water Treatment Plant of capacity 17.8 MLD (in 20 hours of operation) with suitable design in conformity with the CPHEEO Manual having provision for Sedimentation, Aeration, Coagulation, Rapid Mixing, Clariflocculation & Filtration followed by disinfection, including all Mechanical and Electrical Installation Work suitable for automated operation of the plant, Provision for Back Washing, Laboratory Facility, all internal connection & by-pass piping system including provision for one Water Works Office and for Storage accommodation.

(b) Construction of 20,00,000.0 ltrs. Capacity RCC Under Ground Treated Water Sump in 2 (two) compartment and with a suction pit for pumps having provision for all inlet, outlet & overflow arrangement; mechanical type water level indicator; Air Vent Pipe; Men Hole with Cover; CI Lugs inside the sump etc. , complete

(c) Land Development & Security Wall at Treatment Plant Location

(d) Twin Assam Type accommodation at Treatment Plant Location for 1 (one) No. Pump Operator and 1 (one) No. Chowkider

(e) Internal Road / Path etc.; Landscaping & Arboriculture including Compound Illumination in the treatment plant site

(f) Approach Road to Treatment Plant Site from the nearby public road

(g) Dedicated Power Line to Treatment Plant including Substation

(h) Captive Power Generator at Treatment Plant

4.2.5 Clear Water Pumping System comprising of:

(a) Clear Water Pumping machinery at the treatment plant for all the Clear water feeder route including all necessary electrical and other installation works

(b) Clear Water Pump House at Treatment Plant Location

(c) Manifold type Common Header for the Clear water main of Different Route and RCC Pump foundation

4.2.6 Clear Water Conveying Main comprising of:

(a) Supplying, laying, jointing, testing and commissioning of different required diameter DI/SS (Class K7) Clear water pumping main for Route - I serving 2 Nos. ESR in Hahara & Maloibari GP including all necessary valves & specials, valve chamber, supporting structures, anchor / thrust block etc., complete

(b) Supplying, laying, jointing, testing and commissioning of different required diameter DI/SS (Class K7) Clear water pumping main for Route - II serving 9 Nos. ESR in Khetri, Topatoli & Dhupguri GP including all necessary valves & specials, valve chamber, supporting structures, anchor / thrust block etc., complete

(c) Supplying, laying, jointing, testing and commissioning of different required diameter DI/SS (Class K7) Clear water pumping main for Route - III serving 12 Nos. ESR in Digaru, Sonapur, Baruabari & Kamarkuchi GP including all necessary valves & specials, valve chamber, supporting structures, anchor / thrust block etc., complete

(d) Supplying, laying, jointing, testing and commissioning of different required diameter DI/SS (Class K7) Clear water pumping main for Route - IV serving 6 Nos. ESR in Nortap, Tetelia & Barkhat GP including all necessary valves & specials, valve chamber, supporting structures, anchor / thrust block etc., complete

4.2.7 Elevated Service Reservoir comprising of:

(a) Construction of 29 Nos. elevated service reservoirs of following capacity with suitable foundation, including all necessary inlet/outlet etc. piping arrangement, control valves amenable to motorised operation, water level indicator, lightening arrestor, solar power system (including the backup battery shall be inclusive of 5 years maintenance guarantee), security wall, signboard, landscaping, & arboriculture etc.

(b) Approach Road to ESR Location

4.2.8 Distribution System comprising of :

(a) Laying of DI Feeder Main from respective ESR to the concerned Distribution network

(b) Extension, Renovation, Augmentation of the existing Distribution network

(c) House connection comprising of saddle piece, 10.0 m. PPR Pipe, Ferrule Cock etc.

4.2.9 Water meter with 5 year maintenance contract comprising of:

(a) Supplying and fixing of Bulk Water meter

(b) Supplying and fixing of Domestic Water meter

4.2.10 Auto Control System comprising of SCADA.

4.2.11 Provision towards Contingencies:

Necessary provision is made in this estimate for contingencies like Survey, Soil investigation and Geo physical investigation of source etc.

4.3 Cost of the Project:

The proposals as outlined have been worked out into detailed cost. The cost for the proposed MVS Scheme covering each and every element component necessary for taking up the work and completing the Scheme have been considered. Details of the various Subcomponents have been worked out in detailed annexed in **Annexure- E**.

4.4 Annexure:

Annexure-A: Name of GP and respective villages to be covered by the project

Annexure-B: Population of habitations to be covered with Population projection and Calculation of water demand

Annexure-C: Calculation of economic diameter Raw water Pumping Main and pump capacity for Raw water

Annexure-D: Hydraulic Design

Annexure-E: Abstract of Cost

Annexure-F: Disaster Management practices

Annexure-G: Environmental data sheet and EMF

Annexure-H: Annual maintenance cost sheet

Annexure-I: Water quality report of river Brahmaputra

Annexure-J: Capacity of Sump

Annexure-K: Soil testing reports

Annexure - A

World Bank supported RWSS - LS Project in Kamrup District : GP & Village under Dimoria Development Block

Block Name	Panchayat Name	Village Name
Dimoria	1 Tapatoli	1 Topatoli N.C. 2 Tapaioli 3 Kakikuchi (Kahikuchi 4 Killing N.C. 5 Oujari No-2 6 Aujuri No.3 (Ajurigao 7 Durang 8 Murkata
	2 Dhupguri	1 Talani Nc 2 Nibira N.C. 3 Tamahalong Gaon 4 Nibira Gaon 5 Bherakuchi Pathar 6 Uttar Dimoria 7 Ulani Gaon 8 Dakshin Dimoria 9 Dharbam Gaon 10 Bherakuchi
	3 Khetri	1 Bhogpur 2 Kendubam Bagicha 3 Kendubam Gaon (Kenbub 4 Sekurabari 5 Uluisamgaon 6 Senabar Gaon 7 Khaloibari Nc 8 Bhogpur N.C. 9 Solona Gaon 10 Khaloibari 11 Helagog (Melagog) 12 Tegheria No.2 13 Tegheria No.1
	4 Maloibari	1 Aujuri No.1 2 Pub-Maloibari 3 Maloibari N.C 4 Maloibari Jangal 5 Maloibari Pathar 6 Maloibari 7 Dimoria Gaon

Block Name	Panchayat Name	Village Name
Dimoria	5 Tetelia	1 Rewa Gaon 2 Rewa Pathar 3 Teteliguri Gaon 4 Teteliguri Pathar 5 Lumsum Pathar 6 Tetelia N.C. 7 Tetelia Gaon (Teteli 8 Tetelia Pathar 9 Khat Tetelia 10 Lumsum Gaon 11 Teteliguri N.C. 12 Tetelia Nc 13 Lumsum N.C. 14 Khat Tetelia N.C. 15 Rewa N.C. 16 Bagisabad 17 Mitani Gaon 18 Dapata Gaon
	6 Nartap	1 Kalongpur N.C.(Kolong 2 Upper Killing N. C. 3 Dhemaigaon 4 Aperikala Gaon 5 Maupur Gaon (Maubar G 6 Apari Kala N.C. 7 Maupur N.C. 8 Kakar N.C. 9 Tegheria N.C. 10 Barkasarang N.C.(Brka 11 Bandargog N.C. 12 Dhemai 13 Nartap Gaon 14 Lofar Gaon 15 Laflang Gaon 16 Lafar N.C. 17 Bhakuagog Gaon 18 Luri N.C. 19 Nortap N.C. 20 Bhakuwagog Nc 21 Borni Gaon 22 Borkuchi N.C. 23 Luri Tea Garden 24 Luri Gaon 25 Bakuchi Gaon

Block Name	Panchayat Name	Village Name
Dimoria	7 Sonapur	1 Sonapur Pathar 2 Chamata Pathar 3 Sonapur Gaon 4 Kasutali Pathar 5 Dik Sak N.C. 6 Dik Sak Gaon 7 Hathkhola
	8 Barkhat	1 Morang Dala (Moraddal 2 Sonai Gaon 3 Kamalajari Gaon 4 Ambher N.C. 5 Sonai N.C. 6 Sarutari 7 Moragdala N.C. 8 Kanakjari N.C.(Kamala 9 Sorutari N.C. 10 Borkhat Gaon 11 Ambher N.C. 12 Dhangiri 13 Kamalajari
	9 Digaru	1 Digaru Gaon 2 Ghogua Gaon 3 Bamunkhat N.C 4 Jubai Gaon 5 Bamunkhat 6 Bamunkhat
	10 Hahara	1 Borbilla 2 Bijni Grant 3 Mitani N.C. 4 Bijni Gaon (Bazeni Ga 5 Hahara Gaon 6 Amara Pathar 7 Gumoria Grant 8 Bogibari Pathar. 9 Amara N.C. 10 Borgog Gaon 11 Gomoria Gaon 12 Niz Hahara 13 Hulu Khal 14 Hahara Pathar 15 Mitani Pathar 16 Gumoria N.C. 17 Gumoria Pathar(Gomori 18 Hahara N.C.

Block Name	Panchayat Name	Village Name
Dimoria	11 Kamarkuchi	1 Tamuli Kuchi N.C. 2 Upper Tapesia N.C. 3 Amerigog N.C. 4 Kamarkuchi Gn 5 Karchia 6 Tepasia Gaon 7 Kamarkuchi N.C. 8 Ambherkuchi Gaon 9 Tamuli Kuchi Gaon 10 Karchia N.C. 11 Tapesia N.C. 12 Moidam Gaon 13 Borsojai Gaon 14 Sarusajai
	12 Baruahbari	1 Maita Kuchi Gaon 2 Siale Khati 3 Damora Pathar 4 Batakuchi Gaon (Balak 5 Lomati Gaon 6 Digarupar N.C. 7 Barua Bari Gaon

Annexure - B

World Bank supported RWSS - LS Project in Kamrup District : GP & Village under Dimoria Development Block

Block Name	Panchayat Name	Village Name	Habitation Name		Present Population			
					SC	ST	GEN	Total
1 Dimoria	1 Tapatoli	1 Topatoli N.C.	1	Topatoli Nc	0	104	200	304
		2 Tapaioli	1	Topatoli	22	288	498	808
			2	Topatali Bazar	0	127	219	346
			3	Diksak	0	0	279	279
			4	Belguri	0	0	326	326
			5	Belguri South	0	0	305	305
			6	Topatali No-1	0	200	199	399
			7	Bakori	10	100	46	156
		3 Kakikuchi (Kahikuchi	1	Kahikuchi	0	842	500	1342
		4 Killing N.C.	1	Killing Nc	0	0	128	128
			2	Killing Lower	0	100	44	144
			3	Khamar No. 1	0	100	39	139
		5 Oujari No-2	1	Aujari No-2	700	0	61	761
		6 Aujuri No.3 (Ajurigao	1	Aujari No-3	345	0	0	345
			2	Parhali Suba	427	0	5	432
			3	Borapahar	80	12	22	114
		7 Durang	1	Durung	200	0	118	318
			2	Bordurung	400	0	340	740
			3	Durung Bazar	345	0	414	759
			4	Durang Bajar South	327	0	0	327
			5	Durang Bajar North	200	0	0	200
			6	Saru Durang	250	0	0	250

Block Name	Panchayat Name	Village Name	Habitation Name		Present Population			
					SC	ST	GEN	Total
1 Dimoria	1 Tapatoli	8 Murkata	1	Murkata	159	173	2	334
			2	Silasapari	0	288	14	302
			3	Impur	0	200	12	212
			4	Barahu	0	317	35	352
			5	Borahu South	20	78	30	128
			6	Impur North	18	44	65	127
			7	Talewa	0	73	42	115
			8	Barahu No. 1	0	88	30	118
			9	Koikari No.2	110	0	0	110
			10	Hahoni	55	18	22	95
			11	Koikari	100	22	18	140
			12	Borapahar	85	13	14	112
			13	Lakhin Dhap North	44	18	45	107
			14	Lakhin Dhap	32	20	32	84
			15	Santipur	18	78	14	110
	2 Dhupguri	1 Talani Nc	1	Talani Nc	5	0	68	73
		2 Nibira N.C.	1	Nibira Nc	0	277	105	382
\		3 Tamahalong Gaon	1	Tamahalong Gaon	0	151	347	498
			2	Tamahalong No. 2	0	178	57	235
			3	Tamahalong No. 1	0	114	16	130

Block Name	Panchayat Name	Village Name	Habitation Name		Present Population			
					SC	ST	GEN	Total
1 Dimoria	2 Dhupguri	4 Nibira Gaon	1	Nibira Gaon	0	85	85	170
			2	Bagal Bari	0	115	139	254
			3	Chari Kuria	0	23	168	191
			4	Palasung	0	117	1	118
			5	Nibira Gaon No. 2	0	38	92	130
			6	Nibira Gaon No. 1	0	55	107	162
		5 Bherakuchi Pathar	1	Bherakuchi Pathar	0	120	148	268
		6 Uttar Dimoria	1	Uttardimoria	250	35	20	305
			2	Dimoria Gaon	50	0	50	100
			3	Bhukumbari	150	17	230	397
			4	Kalibari	86	41	249	376
		7 Ulani Gaon	1	Ulanigaon	598	0	208	806
			2	Uluani Samabai Suba	15	47	82	144
			3	Lecharabari South	0	95	40	135
			4	Lecharabari No. 2	0	73	76	149
			5	Uluani Boro Suba	40	89	63	192
			6	Uluani Pub Site	0	98	71	169
			7	Lecharabari No. 1	0	83	91	174
			8	Panchim Uluni	0	79	47	126
		8 Dakshin Dimoria	1	Dakhin Dimoria	4	152	155	311
			2	Koch Suba	0	70	245	315
			3	Majorsuba	0	85	155	240
			4	Bheragaon	0	294	152	446

Block Name	Panchayat Name	Village Name	Habitation Name		Present Population			
					SC	ST	GEN	Total
1 Dimoria	2 Dhupguri	9 Dharbam Gaon	1	Dharbam Gaon	0	262	415	677
			2	Dharbam Panchim Talo	12	96	39	147
			3	Dharbam Talono No.1	18	85	32	135
		10 Bherakuchi	1	Bherakuchi	0	200	143	343
	3 Khetri	1 Bhogpur	1	Bhogpur	0	0	447	447
			2	Bhakdoikuchi	230	0	175	405
		2 Kendubam Bagicha	1	Kendubam Bagicha	0	0	200	200
			2	Kendubam Pathar	0	0	200	200
			3	Robin Gaon	0	47	319	366
			4	Dhupguri East	0	100	15	115
			5	Bahtala West	0	0	65	65
			6	Bahtala	0	45	20	65
		3 Kendubam Gaon (Kenbub	1	Kendubam Gaon	0	0	100	100
			2	Chahkurabari South	15	25	53	93
			3	Chahkurabari North	0	70	30	100
			4	Chahbagicha Robingao	0	100	100	200
			5	Chakurabari	0	25	78	103
			6	Chakuabari	30	70	30	130
			7	Bijaypur South	12	10	30	52
			8	Bijaypur Suba	0	0	204	204
			9	Veterinary Suba	20	10	20	50
			10	Seed Farm B	10	20	50	80

Block Name	Panchayat Name	Village Name	Habitation Name		Present Population			
					SC	ST	GEN	Total
1 Dimoria	3 Khetri	4 Sekurabari	1	Sekurabari Gaon	0	0	250	250
		5 Uluisamgaon	1	Ulusom Gaon	100	0	200	300
			2	Ulubam	46	0	286	332
			3	Ulubam No-1	12	25	300	337
			4	Ulubam West	12	40	20	72
			5	Natun Bajar	26	40	25	91
			6	Bariaghat	25	40	30	95
			7	Kochmari	12	43	25	80
			8	Ulubam South	15	50	42	107
			9	Ulubam North	20	35	25	80
		6 Senabar Gaon	1	Senabor	0	0	123	123
			2	Habigaon	0	101	180	281
			3	Bhadakuchi	0	0	250	250
			4	Dewolguri	43	173	3	219
			5	Hospital Suba	0	45	60	105
			6	Senabar Lowe	10	15	40	65
			7	Senabar East	5	17	33	55
			8	Senabar West	15	35	50	100
			9	Senabar South	10	20	45	75
			10	Senabar North	18	40	44	102
			11	Senabar Upper	15	38	50	103

Block Name	Panchayat Name	Village Name	Habitation Name		Present Population			
					SC	ST	GEN	Total
1 Dimoria	3 Khetri	7 Khaloibari Nc	1	Khaloibari Nc	0	0	178	178
		8 Bhogpur N.C.	1	Bhogpur Nc	0	15	250	265
		9 Solona Gaon	1	Solona	102	64	200	366
			2	Station Suba	0	0	267	267
		10 Khaloibari	1	Khaloibari	0	47	200	247
			2	Pachim Citalpur	0	0	265	265
			3	Khaloibari Hill	0	0	288	288
			4	Pub Citalpur	0	0	288	288
			5	Bhadoikuchi	18	40	60	118
			6	Habigaon	0	20	40	60
		11 Helagog (Melagog)	1	Helagog	220	0	528	748
			2	Bahtala	115	122	258	495
			3	Golap	0	242	440	682
			4	Benganabari	0	0	235	235
			5	Chataipathar A	0	0	100	100
			6	Chataipathar	45	0	78	123
			7	Golap 3	0	0	55	55
			8	Golap 2	0	15	25	40
			9	Golap 1	15	0	75	90
			10	Bengenabari B	0	0	80	80
			11	Bhelagaon A	25	40	0	65

Block Name	Panchayat Name	Village Name	Habitation Name		Present Population			
					SC	ST	GEN	Total
1 Dimoria	3 Khetri	12 Tegheria No.2	1	Tegheria No-2	15	10	300	325
		13 Tegheria No.1	1	Tegheria No-1	0	291	5	296
	4 Maloibari	1 Aujuri No.1	1	Aujari No-1	1086	0	162	1248
			2	Tokoravheti No 1	0	320	0	320
			3	Oujari Suba	0	0	470	470
			4	Tokoravheti No 2	0	0	350	350
			5	Tiniali Chok	0	50	240	290
			6	Namghar Suba	0	40	260	300
			7	Dongbari West	0	0	410	410
		2 Pub-Maloibari	1	Pubmaloibari	107	2	162	271
			2	Nawpara	95	0	89	184
			3	Nadaipara	132	0	133	265
			4	Koibatrapara	90	0	140	230
			5	Kalimandir Suba	88	0	148	236
			6	Lahpara	590	0	0	590
			7	Boro Para	500	0	0	500
			8	Nath Supa	650	0	0	650
		3 Maloibari N.C	1	Maloibari Nc	374	0	226	600
		4 Maloibari Jangal	1	Maloibari Jungle	265	141	339	745

Block Name	Panchayat Name	Village Name	Habitation Name		Present Population			
					SC	ST	GEN	Total
1 Dimoria	4 Maloibari	5 Maloibari Pathar	1	Maloibari Pathar	42	0	383	425
			2	Gandhibasti	40	0	135	175
			3	Sowalkuchi Para	6	0	219	225
			4	Baripara	0	0	210	210
			5	Sankarmandir Suba	45	0	112	157
			6	Kuruapara	0	0	205	205
		6 Maloibari	1	Maloibari	245	0	244	489
			2	Sitalpur	296	0	327	623
			3	Lakhitari	163	0	98	261
			4	Barpitali	155	0	176	331
		7 Dimoria Gaon	1	Dimoriagaon	1164	0	269	1433
			2	Jiongpar South	0	390	0	390
			3	Jiongpar North	0	450	0	450
			4	Niz Dimoria	0	500	0	500
	5 Tetelia	1 Rewa Gaon	1	Rewagaon	10	0	185	195
		2 Rewa Pathar	1	Rewapathar	35	120	350	505
		3 Teteliguri Gaon	1	Teteliaguri Gaon	0	0	94	94
			2	Nawpamsuba	0	0	267	267
			3	Lalmati Suba	0	0	150	150
			4	Ganakpara	0	250	0	250
			5	Dakhin Bam	0	240	0	240
			6	Chakuripara	0	560	0	560

Block Name	Panchayat Name	Village Name		Habitation Name		Present Population			
						SC	ST	GEN	Total
1 Dimoria	5 Tetelia	4	Teteliguri Pathar	1	Teteliguri Pathar	0	0	106	106
		5	Lumsum Pathar	1	Lumsum Pathar	0	0	194	194
		6	Tetelia N.C.	1	Padum Pkhuri	0	0	250	250
				2	Padumbari Chowk	0	0	390	390
		7	Tetelia Gaon (Teteli	1	Tetliagaon	0	97	314	411
				2	Sarugaon Suba	0	25	150	175
		8	Tetelia Pathar	1	Teteliapathar	0	5	250	255
				2	Bhoragaon Suba	0	0	460	460
				3	Barego	0	100	0	100
				4	Kacharikuchi	0	100	0	100
				5	Katajari	0	260	0	260
				6	Chakanibari	0	0	165	165
				7	Namghar Suba	0	350	250	600
				8	Rajakhat Suba	0	200	110	310
				9	Dumuni Suba	0	260	0	260
				10	Napali Suba	0	0	250	250
				11	Katabari	0	175	0	175
				12	Pub Boripara Suba	0	250	0	250
				13	Sarugaon Suba	0	200	0	200
		9	Khat Tetelia	1	Khat Tetelia	16	22	348	386
		10	Lumsum Gaon	1	Lumsum Gaon	0	3	315	318

Block Name	Panchayat Name	Village Name	Habitation Name		Present Population			
					SC	ST	GEN	Total
1 Dimoria	5 Tetelia	11 Teteliguri N.C.	1	Titliguri Nc	4	0	441	445
		12 Tetelia Nc	1	Tetelia Nc	0	0	37	37
		13 Lumsum N.C.	1	Lumsum Nc3	0	0	165	165
		14 Khat Tetelia N.C.	1	Khat Tetelia Nc	0	0	123	123
		15 Rewa N.C.	1	Rewa Nc	0	0	16	16
		16 Bagisabad	1	Lower Bagisabad	0	0	350	350
			2	Upper Bagisabad	0	0	450	450
		17 Mitani Gaon	1	Mahesor Suba	0	0	120	120
			2	Kalikajari	0	120	0	120
			3	Krishna Suba	0	150	0	150
			4	Madhya Mitani	0	0	120	120
			5	Lower Mitani	0	0	130	130
			6	Upper Mitani	0	0	50	50
			7	Tiniali Suba	0	0	100	100
			8	Jaganath Suba	0	100	0	100
		18 Dapata Gaon	1	Asram Suba	50	100	150	300
			2	Maheswar Rewakuchi	0	75	150	225
			3	Karbi Suba	0	150	0	150
			4	Das Suba	180	0	0	180
			5	Dapata Kalitakuchi	0	0	150	150
			6	Kachari Basti	0	180	0	180

Block Name	Panchayat Name	Village Name	Habitation Name		Present Population			
					SC	ST	GEN	Total
1 Dimoria	6 Nartap	1 Kalongpur N.C.(Kolong	1	Kalampur Nc	0	0	430	430
		2 Upper Killing N. C.	1	Upper Killing Nc	0	0	260	260
		3 Dhemaigaon	1	Nortop Gaon	0	0	313	313
			2	Dhemai Gaon	0	55	258	313
		4 Aperikala Gaon	1	Aperikala Gaon	0	0	139	139
		5 Maupur Gaon (Maubar G	1	Moupur Gaon	0	204	215	419
		6 Apari Kala N.C.	1	Aperikala Nc	2	41	361	404
		7 Maupur N.C.	1	Mowpur Nc	0	0	152	152
		8 Kakar N.C.	1	Kakar Nc	0	0	841	841
		9 Tegheria N.C.	1	Tegheria	0	0	572	572
		10 Barkasarang N.C.(Brka	1	Barkasarang Nc	0	1	613	614
		11 Bandargog N.C.	1	Bandargog Nc	0	0	163	163
		12 Dhemai	1	Dhemai Nc	0	0	213	213
		13 Nartap Gaon	1	Nartapgaon	6	7	481	494
			2	Rang Kimi Chupa	0	555	0	555
			3	Rang Terang Chupa	0	302	0	302
		14 Lofar Gaon	1	Lofar Gaon	0	0	282	282
		15 Laflang Gaon	1	Laflong Gaon	0	403	62	465
		16 Lafar N.C.	1	Lafar Nc	0	6	377	383
		17 Bhakuagog Gaon	1	Bhakuagog Gaon	0	0	394	394
		18 Luri N.C.	1	Luri Nc	0	1	235	236
			2	Luri Grant	0	250	200	450

Block Name	Panchayat Name	Village Name	Habitation Name		Present Population			
					SC	ST	GEN	Total
1 Dimoria	6 Nartap	19 Nortap N.C.	1	Nartap Nc	0	77	231	308
			2	Jakaikona Chuba	0	320	0	320
			3	Laharighat	300	0	100	400
		20 Bhakuwagog Nc	1	Bhakuagog Nc	0	0	48	48
			2	Bhugsang	0	270	0	270
			3	Bazari	0	210	0	210
		.	4	Boroghuria	0	120	0	120
		21 Borni Gaon	1	Bornigaon	0	0	377	377
		22 Borkuchi N.C.	1	Borkuchi Nc	20	49	167	236
		23 Luri Tea Garden	1	Luri Tea Garden	7	89	30	126
		24 Luri Gaon	1	Lurigaon	0	437	342	779
				Bhum Gaon	0	160	200	360
		25 Bakuchi Gaon	1	Barkuchi Gaon	28	368	506	902
			2	Borgog	0	75	200	275
			3	Pir Kuchi	105	0	200	305
			4	Niz Panbari	0	110	200	310
			5	Rajakuchi	70	20	50	140
			6	Sonaikuchi	200	40	45	285
			7	Goda Basti	0	0	250	250
			8	Panbari Gaon	0	0	170	170
	7 Sonapur	1 Sonapur Pathar	1	Sonapur Pathar	0	10	460	470
			2	Sonapurpathar Pachim	0	359	355	714
			3	**Sonapurpathar Pub**	0	0	450	450

Block Name	Panchayat Name	Village Name	Habitation Name		Present Population			
					SC	ST	GEN	Total
1 Dimoria	7 Sonapur	2 Chamata Pathar	1	Chamatapathar	7	0	103	110
			2	Kheubari Suba	0	0	69	69
			3	Jugakuchi Chuk	0	483	207	690
			4	Kuchpara	0	0	275	275
			5	Karbi Suba	0	500	89	589
		3 Sonapur Gaon	1	Sonapur Gaon	122	7	261	390
			2	Balia Than	0	0	540	540
			3	Hatkhola	79	0	341	420
			4	Alenga	24	0	224	248
			5	Moumara Suba	34	0	302	336
			6	Sikim Ali Suba	112	0	490	602
			7	Lalmati	0	0	400	400
			8	Karbie Suba	30	325	0	355
			9	Beysuba	0	290	0	290
			10	Kalangpur Nc	230	390	0	620
			11	Rongharang Suba	0	600	20	620
			12	Rongtari Suba	0	0	270	270
			13	Sonapur Nc	10	300	0	310
			14	Kapalkata	0	360	500	860
			15	Boraghoria	0	195	300	495
		4 Kasutali Pathar	1	Kachutali Pathar	67	0	341	408
			2	Bora Kuma Suba	0	243	150	393
			3	No 2 Kuchatoli	0	216	144	360
			4	No 1 Kuchatoli	0	292	210	502
			5	Para Kumar Chuba	0	270	180	450

Block Name	Panchayat Name	Village Name	Habitation Name		Present Population			
					SC	ST	GEN	Total
1 Dimoria	7 Sonapur	5 Dik Sak N.C.	1	Diksak Nc	0	0	155	155
		6 Dik Sak Gaon	1	Diksak Gaon	0	92	97	189
			2	Kharikata	0	85	130	215
			3	Jagukuchi	0	117	37	154
			4	Kochutali North	0	0	360	360
			5	Bongalibasti	0	0	409	409
			6	Lower Diksar	0	425	275	700
			7	Upper Diksar	0	690	0	690
		7 Hathkhola	1	Natunbasti	225	0	380	605
			2	Hathkhola Suba	150	0	353	503
	8 Barkhat	1 Morang Dala (Moraddal	1	Maragdala Gaon	0	0	160	160
			2	Fakiri Chuba	0	120	360	480
			3	Patowari Chuba	60	0	110	170
			4	Hati Chuba	0	200	250	450
			5	Ujan Chuba	120	70	147	337
			6	Kalbari Chuba	1197	0	0	1197
		2 Sonai Gaon	1	Sonaigaon	0	1	375	376
			2	Panchim Suba	0	421	0	421
			3	Uttar Suba	0	370	0	370
		3 Kamalajari Gaon	1	Kamalajari Gaon	0	75	135	210
			2	Medhi Suba	0	35	233	268
			3	Sarania Suba	0	0	231	231
		4 Ambher N.C.	1	Amver Nc	0	17	159	176

Block Name	Panchayat Name	Village Name	Habitation Name		Present Population			
					SC	ST	GEN	Total
1 Dimoria	8 Barkhat	5 Sonai N.C.	1	Sonai Nc	0	0	484	484
		6 Sarutari	1	Sarutari Gaon	0	33	422	455
			2	Hindu Suba	120	35	256	411
			3	Muslim Suba	0	0	280	280
			4	Nepali Suba	0	130	230	360
			5	Uttar Suba	0	450	0	450
		7 Moragdala N.C.	1	Maragdala Nc	0	22	196	218
			2	Moragdola Nc	0	0	217	217
		8 Kanakjari N.C.(Kamala	1	Kamalajari Nc	0	0	369	369
			2	Medhi Suba	0	0	268	268
			3	Kamalajari Nc	0	0	369	369
		9 Sorutari N.C.	1	Sarutarigaon	0	0	377	377
		10 Borkhat Gaon	1	Barkhat Gaon	33	273	236	542
			2	Uraul	0	230	497	727
			3	Bitini Basti	120	67	490	677
			4	Arabari Chupa	410	225	285	920
		11 Ambher N.C.	1	Bamun Suba	0	25	214	239
			2	Kalita Suba	0	40	210	250
			3	Khasia Basti	0	280	0	280
			4	Garu Basti	0	470	0	470
		12 Dhangiri	1	Mulla Suba	40	123	160	323
			2	Melki Suba	0	0	170	170
			3	Teirapara	0	120	270	390
			4	Dhangiri Gaon	5	182	108	295

Block Name	Panchayat Name	Village Name	Habitation Name		Present Population			
					SC	ST	GEN	Total
1 Dimoria	8 Barkhat	13 Kamalajari	1	South Suba	120	640	210	970
			2	Kamalajari Gaon	0	0	210	210
	9 Digaru	1 Digaru Gaon	1	Digaru Gaon	1174	115	228	1517
		2 Ghogua Gaon	1	Ghogua Gaon	37	346	1	384
			2	Kandubasti	0	165	0	165
			3	Lalung Suba	0	210	0	210
			4	Kurkuria	200	0	0	200
			5	Napali Suti	0	255	0	255
			6	Daruga Kuchi	0	165	0	165
			7	Malor Moupur	0	240	0	240
			8	Balguri Pathar	0	100	0	100
			9	Mazkuchi	0	490	0	490
			10	Gaonbura Suba	0	220	0	220
		3 Bamunkhat N.C	1	Bamunhat Nc	21	0	835	856
		4 Jubai Gaon	1	Jubai Gaon	121	0	161	282
			2	Jalunagar	64	242	85	391
			3	Baro Para	0	207	35	242
			4	Jari Kuchi	208	10	32	250
		5 Bamunkhat	1	Bamunkhat	0	141	192	333
			2	Chenimur	0	123	352	475
			3	Dhaligaon	0	81	170	251
			4	Haldhibari	0	159	222	381
			5	Nizgodam	0	123	176	299

Block Name	Panchayat Name	Village Name	Habitation Name		Present Population			
					SC	ST	GEN	Total
1 Dimoria	9 Digaru	5 Bamunkhat	6	Kopilikuchi	0	440	0	440
			7	Boniakuchi	0	370	0	370
			8	Sarigog	0	380	0	380
			9	Brantipara	0	190	0	190
			10	Ghuligaon	0	300	0	300
	10 Hahara	1 Borbilla	1	Borbila	157	196	106	459
		2 Bijni Grant	1	Bizini Garden Grant	61	57	125	243
			2	Kapather Suba	56	62	97	215
			3	Pathak Suba	0	65	35	100
			4	Pasor Chuburi	98	20	30	148
			5	Mali Bagan	69	51	89	209
			6	Borpathar Chuburi	76	56	20	152
		3 Mitani N.C.	1	Mitani Nc	12	116	344	472
			2	Mitani Gaon	0	7	224	231
			3	Kalika Jari	0	0	150	150
			4	Krishna Nagar	58	12	115	185
		4 Bijni Gaon (Bazeni Ga	1	Bijni Gaon	0	155	154	309
		5 Hahara Gaon	1	Hahara Gaon	14	0	307	321
			2	Kamarkuche Gaon	0	0	273	273
			3	Niz Hahara	20	122	131	273
		6 Amara Pathar	1	Amara Pathar	73	81	224	378
			2	Bengali Chuba	52	23	171	246
			3	Nepali Chuba	60	39	148	247
			4	Asomia Suba	33	103	39	175

Block Name	Panchayat Name	Village Name		Habitation Name	Present Population			
					SC	ST	GEN	Total
1 Dimoria	10 Hahara	7 Gumoria Grant	1	Gomaria Garden Grant	0	0	282	282
		8 Bogibari Pathar.	1	Bagibari Pathar	79	140	56	275
			2	Amguri Suba	79	41	145	265
			3	Nepali Suba	23	56	120	199
			4	Ahotguri	91	200	5	296
			5	Holi Suba	81	17	110	208
			6	Hatisila	250	40	120	410
		9 Amara N.C.	1	Amara Nc	89	129	122	340
		10 Borgog Gaon	1	Borgog Gaon	0	91	326	417
			2	Barbari Grant	15	164	25	204
			3	Thumuki	34	103	189	326
			4	Nagaon	0	150	136	286
			5	Kamarkuchi	32	0	282	314
			6	Hatalibari	3	0	143	146
			7	Rajaghuli	0	101	75	176
		11 Gomoria Gaon	1	Gomaria Gaon	37	0	252	289
			2	Santipur	14	0	158	172
			3	Gomaria Nc	6	0	216	222
		12 Niz Hahara	1	Niz Hahara	74	0	174	248
			2	Tulsi Jari	92	71	169	332
			3	Bagichabati Suba	30	110	0	140
			4	Karbi Suba	40	120	0	160
			5	Dohbari Suba	15	133	0	148
			6	Majdoor Suba	30	120	15	165

Block Name	Panchayat Name	Village Name	Habitation Name		Present Population			
					SC	ST	GEN	Total
1 Dimoria	10 Hahara	13 Hulu Khal	1	Hulukhal	7	63	222	292
			2	Kamar Suba Boro Suba	59	0	263	322
		14 Hahara Pathar	1	Hahara Pathar	0	21	271	292
		15 Mitani Pathar	1	Mitani Pathar	257	121	189	567
		16 Gumoria N.C.	1	Borgog Nc	15	19	20	54
		17 Gumoria Pathar(Gomori	1	Gumoria Pathar	109	154	215	478
		18 Hahara N.C.	1	Hahara Nc	0	189	66	255
	11 Kamarkuchi	1 Tamuli Kuchi N.C.	1	Tamulikuchi Nc	0	79	242	321
		2 Upper Tapesia N.C.	1	Upper Tepesia	0	6	178	184
		3 Amerigog N.C.	1	Amerigog Nc	17	58	575	650
			2	Maili	0	0	730	730
			3	Jorabat	0	0	1012	1012
		4 Kamarkuchi Gn	1	Kamarkuchi Gaon	15	108	140	263
			2	Patarkuchi	0	170	117	287
			3	Medhikuchi	50	135	227	412
			4	Gariaghuli	0	72	45	117
			5	Nepali Suba	0	63	226	289
			6	Hatimura	0	60	235	295
		5 Karchia	1	Karchia	15	508	159	682
			2	Najirakhat	0	0	265	265
			3	Bakongabari	210	220	190	620
			4	Jogdol	110	370	170	650
		6 Tepasia Gaon	1	Tepesia Gaon	5	699	250	954

Block Name	Panchayat Name	Village Name	Habitation Name		Present Population			
					SC	ST	GEN	Total
1 Dimoria	11 Kamarkuchi	7 Kamarkuchi N.C.	1	Kamarkuchi Nc	7	19	277	303
		8 Ambherkuchi Gaon	1	Ambherkuchi	0	43	153	196
		9 Tamuli Kuchi Gaon	1	Tamulikuchi	5	51	774	830
			2	Garobasti	6	90	456	552
		10 Karchia N.C.	1	Karchia Nc	0	6	94	100
			2	Maujazar Suba	122	440	308	870
			3	Mazar Suba	25	550	205	780
		11 Tapesia N.C.	1	Tepesia Nc	0	6	109	115
		12 Moidam Gaon	1	Karbi Para	0	1600	150	1750
			2	Nagaon	170	50	275	495
			3	Kasoma Suba	10	0	270	280
			4	Majar Suba	0	0	460	460
			5	Bongaon	485	1895	390	2770
			6	Bhagadattapur	205	310	170	685
			7	Beltola	312	910	13	1235
			8	Lakhimi Nagar	1575	230	337	2142
			9	Saurabh Nagar	270	330	470	1070
			10	Trinayan	100	215	311	626
			11	Patarkuchi	255	725	455	1435
			12	Barpathar	105	270	455	830
			13	Ganesh Nagar	370	665	291	1326
			14	Moidam Gaon	410	825	115	1350

Block Name	Panchayat Name	Village Name	Habitation Name		Present Population			
					SC	ST	GEN	Total
1 Dimoria	11 Kamarkuchi	13 Borsojai Gaon	1	Bhatepara	25	500	500	1025
			2	Jugipara	50	395	359	804
			3	Hatigaon	35	290	165	490
			4	Sijubari	12	27	473	512
			5	Ganeshpur	20	106	584	710
			6	Gosaibari	35	170	563	768
			7	Lalmati	210	109	250	569
			8	Sonkuchi	0	0	285	285
			9	Beharbari	320	970	595	1885
			10	Ghoramara	320	1125	257	1702
			11	Kharaikuchi	160	670	330	1160
			12	Barsojai Gaon	320	465	210	995
		14 Sarusajai	1	Sarusajai	250	370	450	1070
	12 Baruahbari	1 Maita Kuchi Gaon	1	Pachim Supa	25	0	75	100
			2	Pub Chupa	100	0	10	110
			3	Dhangarpara	120	220	480	820
			4	Dabarni	300	0	185	485
			5	Dalechupa	0	475	0	475
			6	Napara	0	0	400	400
			7	Pukhuribari	0	0	500	500
			8	Santipur	0	0	500	500
			9	Maitakuchi Gaon	123	381	382	886
		2 Siale Khati	1	Pachim Suba	25	0	75	100
			2	Pub Suba	100	0	10	110
			3	Siale Khati	2	131	425	558

Block Name	Panchayat Name	Village Name	Habitation Name		Present Population			
					SC	ST	GEN	Total
1 Dimoria	12 Baruahbari	3 Damora Pathar	1	Pub Chupa	120	20	330	470
			2	Damarapathar	30	0	314	344
			3	Bengali Suba	0	0	359	359
			4	Nepali Suba	0	0	141	141
		4 Batakuchi Gaon (Balak	1	Uttar Supa	25	75	480	580
			2	Batakuchi Gaon	0	446	498	944
		5 Lomati Gaon	1	Boropara	0	180	0	180
			2	Karbipara	0	310	0	310
			3	Dharibua	0	230	40	270
			4	Lomati Gaon	22	169	126	317
		6 Digarupar N.C.	1	Digarupar Nc	90	0	25	115
		7 Barua Bari Gaon	1	Baruabari Gaon	303	107	430	840
			2	Baruabari Bangali Suba	59	0	473	532
			3	Baruabari Bazar	265	0	357	622
			4	Joyti Nagar	49	63	158	270
			5	Kushal Nagar	0	51	263	314
				Total Population of Dimoria	**29506**	**58143**	**89338**	**176987**

Population Projection :

Population of Zone - II (Dimoria Block) 176987 Souls

Decadal Growth Rate : 17 %
Therefore, Annual; Growth Rate : 1.7 %

Present Population in 2013 = 176987 + 176987 x 0.034 = 183005 Souls
The project shall be commissioned in 2015 AD.
Therefore,
Population in the Year of commissioning (2015) :
= 183005 + 183005 x 0.034 = 189227 Souls
Population after 10 Years of commissioning in (2025) = :
= 189227 + 189227 x 1.17 = 221395 Souls
Population after 20 Years of commissioning in (2035) :
= 221395 + 221395 x 1.17 = 259032 Souls
Population after 30 Years of commissioning in (2045) :
= 259032 + 259032 x 1.17 = 303068 Souls

Water Demand for Design of the Water Treatment Plant:

Rate of Supply = 70 lpcd.
Losses = 5 % Production Loss + 10 % Transmission Loss, Total 15 %

Daily Requirement of Water at various stages

a) In the Year of commissioning in (2015) :	15232750.39 Ltr	15.2 MLD
b) After 10 Years of commissioning in (2025) :	17822317.96 Ltr	17.8 MLD
c) After 20 Years of commissioning in (2035) :	20852112.01 Ltr	20.9 MLD
d) After 30 Years of commissioning in (2045) :	24396971.06 Ltr	24.4 MLD

Annexure - C

CALCULATION OF ECONOMIC DIAMETER OF RAW WATER PUMPING MAIN AND PUMP FOR COMPOSITE WATER SUPPLY SCHEME FOR QUALITY AND SUSTAINABILITY IN CHANDRAPUR & DIMPORIA DEVELOPMENT BLOCK OF KAMRUP DISTRICT (ZONE - II : DIMORIA BLOCK) UNDER WORLD BANK ASSISTED RWSS - LS PROGRAMME IN ASSAM.

1	Water Supply Scheme to be pumped					
		Year	Peak	Discharge	Population	Peak Factor
	Initial	2015	15.20	MLD	189227	1
	Intermediate	2030	19.10	MLD	237480	1
	Ultimate	2045	24.40	MLD	303068	1
2	Length of Rising main			7150	meter	
3	Static head including residual head			62	meter	
4	Design Period			30	Years	
5	Combined efficiency of Pumping set			70	%	
6	Cost of Pumping Unit Rs.			7000	Per KW	
7	Interest rate			10	%	
8	Life of electrical motor & Pump			15	Years	
9	Energy charges			6.4	Rs.per unit	
10	Hours of Pumping			Average		
				20	Hours	
11	Stand by KW 1st Stage			50.00%		
12	Stand by KW 2nd Stage			50.00%		

Input Data for Pipe

Dia of pipe (mm)	Pipe Material	Class	C" value of pipe	Cost of pipe (Rs.)	Remarks
250	DI	K9	140	2938	This rates are departmentally accepted rate for various on-going NRDWP Schemes of APHED
300	DI	K9	140	3695	
350	DI	K9	140	4603	
400	DI	K9	140	5537	
450	DI	K9	140	6588	
500	DI	K9	140	7733	
600	DI	K9	140	10058	
700	DI	K9	140	12977	
750	DI	K9	140	14603	

Solution

			1st 15 year		**2nd15 years**	
1)	Discharge at installation MLD		15.2	Mld	19.1	Mld
2)	Discharge at the end of 15 years		19.1	Mld	24.4	Mld
3)	Average discharge (MLD)		17.15	Mld	21.75	Mld
4)	Hours of pumping for discharge at the end of 15 years		20	hrs	20	hrs
5)	Average hours for pumping for average discharge		17.96	hrs	17.83	hrs
6)	Discharge in pumping hours		22.92	Mld	29.28	Mld
7)	KW required		3.72	H1	4.75	H2
8)	Annual cost of electrical energy		41977.74	KW1	41673.29	KW2
		=	155963.05	H1	197795.70	H2

Table1 showing velocity and loss of head for diff pipe size

Sr no	Pipe size in mm	Frictional head loss per 1000 meter		Velocity in m/sec		1st stage flow			2nd stage flow		
		1st stage flow	2nd stage	1st stage	2nd stage flow	Frictional loss	Other	Total losses	Frictional	Other	Total losses
		22.92 MLD	29.28 MLD			(in mt.)	10% of friction	62 (in mt.)	(in mt.)	10% of friction	62 (in mt.)
1	250	82.94	130.54	5.40	6.90	593.05	59.30	714.35	933.35	93.34	1088.69
2	300	34.13	53.72	3.75	4.79	244.03	24.40	330.44	384.06	38.41	484.47
3	350	16.11	25.35	2.76	3.52	115.18	11.52	188.70	181.28	18.13	261.41
4	400	8.41	13.23	2.11	2.70	60.11	6.01	128.12	94.60	9.46	166.06
5	450	4.74	7.46	1.67	2.13	33.87	3.39	99.26	53.31	5.33	120.64
6	500	2.84	4.46	1.35	1.73	20.28	2.03	84.30	31.91	3.19	97.10
7	600	1.17	1.84	0.94	1.20	8.34	0.83	71.18	13.13	1.31	76.44
8	700	0.55	0.87	0.69	0.88	3.94	0.39	66.33	6.20	0.62	68.82
9	750	0.39	0.62	0.60	0.77	2.81	0.28	65.10	4.43	0.44	66.87

TABLE 2 SHOWING KILOWATTS REQUIRED AND COST OF PUMP SETS FOR DIFFERENT PIPE

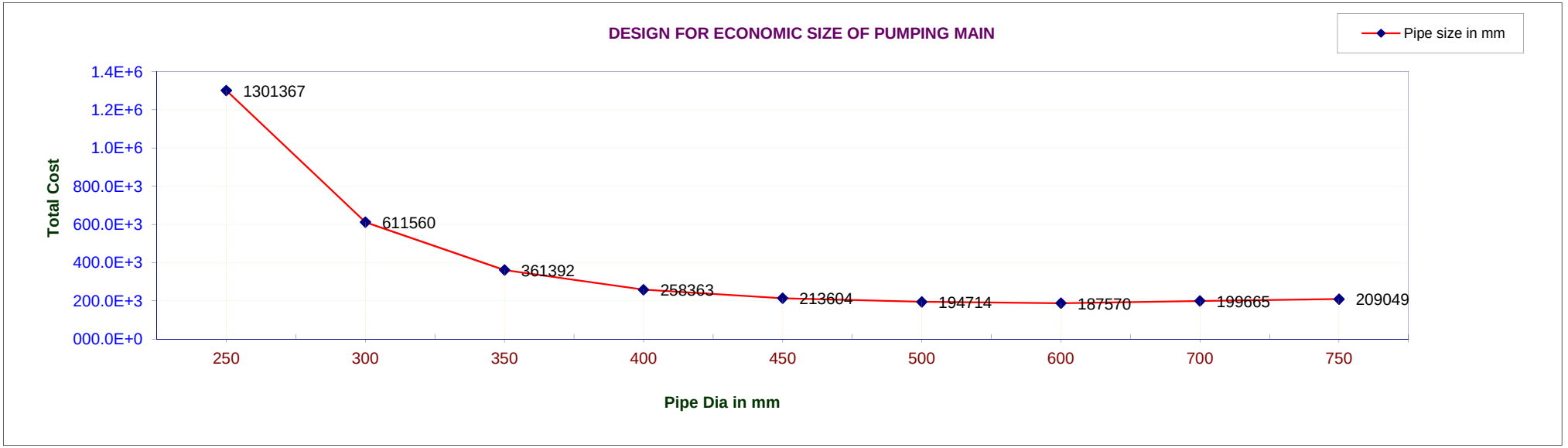
Sr no	Pipe size in mm	1st stage flow			2nd stage flow		
		H1 total head loss (in m)	Kw required with stand by	Cost of Pump (Rs. In thousand)	H2 total head loss (in m)	Kw required with stand by	Cost of Pump (Rs. In thousand)
1	250	714.35	3981.12	27868	1088.69	7750.92	54256
2	300	330.44	1841.54	12891	484.47	3449.19	24144
3	350	188.70	1051.65	7362	261.41	1861.09	13028
4	400	128.12	714.03	4998	166.06	1182.29	8276
5	450	99.26	553.17	3872	120.64	858.87	6012
6	500	84.30	469.82	3289	97.10	691.31	4839
7	**600**	**71.18**	**396.68**	**2777**	**76.44**	**544.24**	**3810**
8	700	66.33	369.67	2588	68.82	489.95	3430
9	750	65.10	362.78	2539	66.87	476.09	3333

TABLE 3 SHOWING COMPARATIVE STATEMENT OF OVER ALL COST STRUCTURE OF PUMPING MAIN FOR DIFF. PIPE SIZES

Sr no	Pipe size in mm	Total head in (m)		Cost of Pipeline of length mts. 7150	Cost of Pump	Annual cost of energy charges	Energy charges capitalized	Total capitalized cost	Cost of Pump	Annual cost of energy charges	Energy charges capitalized	Initial capital investment for pumpset & annual electrical	Grand total of capitalized cost for 30 years
		1st stage	2nd stage										
1	250	714	1089	21007	27868	111412	847409	896283	54256	215338	1637878	405084	1301367
2	300	330	484	26419	12891	51536	391987	431297	24144	95826	728860	180263	611560
3	350	189	261	32911	7362	29431	223855	264127	13028	51705	393272	97265	361392
4	400	128	166	39590	4998	19982	151985	196573	8276	32847	249837	61790	258363
5	450	99	121	47104	3872	15480	117742	168718	6012	23861	181489	44886	213604
6	500	84	97	55291	3289	13148	100005	158584	4839	19206	146082	36129	194714
7	**600**	**71.18**	**76**	**71915**	**2777**	**11101**	**84435**	**159127**	**3810**	**15120**	**115004**	**28443**	**187570**
8	700	66	69	92786	2588	10345	78685	174059	3430	13612	103534	25606	199665
9	750	65	67	104411	2539	10152	77217	184167	3333	13227	100606	24882	209049

Table 3 shows that the most economical size of Main is **600** mm costing Capitalised Rs. **187569845.96**

Dia of economical size of rising main 600 mm



Therefore,

1. With this set of condiditions, economic diameter of raw water pumping main = **600** mm dia. DI (K9) pipe
2. Required capacity of pump with 50 % provision = 396.68 KW. = 532 HP Say, **600.0** HP.
3. Let Us Provide 3 Nos of Raw Water Pump (2 W + 1 S) of capacity = **200** HP Each

DESIGN OF CW PUMPING MAIN (ROUTE - I) FROM TREATMENT PLANT TO RESPECTIVE ESR FOR 2 NOS. ESR IN HAHARA & MALOIBARI GP

Present population 2013	=	21,722	soul	Working period	=	20	hr
Population at installation 2015	=	22,461	soul	Head available at TP Site	=	40	m
Population at installation 2030	=	28,188	soul	Minimum terminal head	=	20	m
Design population 2045	=	35,973	soul	RL OF TP SITE	=	75.25	m
Rate of supply	=	70	LPCD	Hydraulic level at service reservoir	=	40 + RL	m
Rate of supply with wastage	=	77	LPCD		=	115.25	m
Peak flow factor	=	1					
Peak flow in LPM	=	0.064166667	x design population	Design value of 'C'	DI	=	140
					PVC & AC	=	140

Line	Present population on the line	Present population to be served by	Design population on the the	Design polulation to be served by	Length of line (m)	Peak flow (LPM)	Pipe dia				Head loss for 1000 m (m)	Total head loss	Hydraulic level (m)	RL (m)	Terminal head (m)	Remarks
							DI	AC	PVC							
									OD	ID						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
TP - A	0	21722	0	35973	5500.00	2308.27	250				2.32	12.76	102.49	62.45	40.04	
A-A1	11727	11727	19421	19421	950.00	1246.16	150				8.92	8.47	94.02	68.95	25.07	ESR 1
A-B	0	9995	0	16552	4750.00	1062.11	200				1.63	7.74	94.75	63.81	30.94	
B-B1	9995	9995	16552	16552	800.00	1062.11	150				6.64	5.31	89.44	64.45	24.99	ESR 2
Total	**21722**				**12000.00**											
	0															

Summary of pipe dia and length

Dia (mm)	Length (m)
450	0.00
400	0.00
350	0.00
300	0.00
250	5500.00
200	4750.00
150	1750.00
Total	**12000.00**

Design of Clear Water Pump Set (For 15 yrs)

(i) Total Daily Demand	=	2170475.06	LPD	
(ii) Total Hourly Demand	=	108523.75	LPH	
(iii) Total Demand Per Minut	=	1808.73	LPM	
(iv) Total Head of Pump	=	40	M	
HP Reqd.	=	$\frac{1808.73 \times 40}{4500 \times 0.7}$		
	=	22.97	HP	
provide 3 Nos. pump (2W + 1S) of capacity	**=**	**15.00**	**HP each**	

For BoQ Purpose, let us have 3 Pump Set, each giving 15.1 lps against a total head of 40.0 m

DESIGN OF CW PUMPING MAIN (ROUTE - II) FROM TREATMENT PLANT TO 9 NOS. ESR IN KHETRI, TOPATOLI & DHUPGURI GP.

Present population 2013	=	36,459	soul	Working period	=	20	hr
Population at installation 2015	=	37,699	soul	Head available at TP Site	=	50	m
Population at installation 2030	=	47,312	soul	Minimum terminal head	=	20	m
Design population 2045	=	60,379	soul	RL OF TP SITE	=	75.25	m
Rate of supply	=	70	LPCD	Hydraulic level at service reservoir	=	50 + RL	m
Rate of supply with wastage	=	77	LPCD		=	125.25	m
Peak flow factor	=	1					
Peak flow in LPM	=	0.064166667	x design population	Design value of 'C'	DI	=	140
					PVC & AC	=	140

Line	Present population on the line (soul)	Present population to be served by the line	Design population on the the line	Design polulation to be served by the line	Length of line (m)	Peak flow (LPM)	Pipe dia				Head loss for 1000 m (m)	Total head loss (m)	Hydraulic level (m)	RL (m)	Terminal head (m)	Remarks
							DI	AC	PVC							
									OD	ID						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
TP - A	0	36459	0	60379	7250.00	3874.29	300				2.49	18.05	107.20	64.30	42.90	
A-B	0	20895	0	34604	500.00	2220.39	250				2.16	1.08	106.12	65.60	40.52	
B - ESR1	4264	4264	7061	7061	200.00	453.11	100				9.87	1.97	104.14	64.80	39.34	ESR 1
B - C	0	16631	0	27542	2050.00	1767.28	250				1.42	2.91	103.21	65.20	38.01	
C - ESR5	4691	4691	6356	7769	1960.00	498.49	150				1.63	3.19	100.01	65.80	34.21	ESR 5
C - D	0	11940	0	19773	500.00	1268.80	150				9.22	4.61	98.60	64.60	34.00	
D - ESR2	3838	3838	7061	6356	250.00	407.84	100				8.12	2.03	96.57	64.90	31.67	ESR 2
D - E	0	8102	0	13417	500.00	860.95	150				4.50	2.25	96.35	64.10	32.25	
E - ESR3	4264	4264	6356	7061	2460.00	453.11	150				1.37	3.37	92.98	65.30	27.68	ESR 3
E - ESR4	3838	3838	0	6356	1780.00	407.84	150				1.13	2.01	94.34	66.80	27.54	ESR 4
A - F	0	15564	0	25775	3360.00	1653.90	250				1.25	4.20	103.00	64.70	38.30	
F - ESR6	4264	4264	7061	7061	250.00	453.11	100				9.87	2.47	100.53	65.70	34.83	ESR 6
F - G	0	11300	0	18714	850.00	1200.79	200				2.05	1.74	101.26	66.10	35.16	
G - H	0	7036	0	11652	2820.00	747.68	200				0.85	2.40	98.86	66.90	31.96	
H-ESR7	3198	3198	5296	5296	190.00	339.83	100				5.79	1.10	97.76	66.20	31.56	ESR 7
H - ESR8	3838	3838	6356	6356	2970.00	407.84	150				1.13	3.36	95.50	67.70	27.80	ESR 8
G-ESR9	4264	4264	7061	7061	3160.00	453.11	150				1.37	4.33	96.93	69.30	27.63	ESR 9
Total	**36459.00**				**31050.00**											

Summary of pipe dia and length

Dia (mm)	Length (m)
450	0.00
400	0.00
350	0.00
300	7250.00
250	5910.00
200	3670.00
150	13330.00
100	890.00
Total	**31050.00**

Design of Clear Water Pump Set (For 15 yrs)

(i) Total Daily Demand = 3643004.8 LPD
(ii) Total Hourly Demand = 182150.2 LPH
(iii) Total Demand Per Minut = 3035.8 LPM
(iv) Total Head of Pump = 50 M

$$\text{HP Reqd.} = \frac{3035.84 \times 50}{4500 \times 0.7}$$

= 48.19 HP

provide 3 Nos. pump (2W + 1S) of capacity = 25.00 HP each

For BoQ Purpose, let us have 3 Pump Set, each giving 25.3 lps against a total head of 50.0 m

DESIGN OF CW PUMPING MAIN (ROUTE - III) FROM TREATMENT PLANT TO 12 NOS. ESR IN DIGARU, SONAPUR, BARUAHBARI & KAMARKUCHI GP

Present population 2013	=	50,745	soul	Working period		=	20	hr
Population at installation 2015	=	52,470	soul	Head available at TP Site		=	80	m
Population at installation 2030	=	65,850	soul	Minimum terminal head		=	20	m
Design population 2045	=	84,037	soul	RL OF TP SITE		=	75.25	m
Rate of supply	=	70	LPCD	Hydraulic level at service reservoir		=	80 + RL	m
Rate of supply with wastage	=	77	LPCD			=	155.25	m
Peak flow factor	=	1		Design value of 'C'	DI	=	140	
Peak flow in LPM	=	0.064166667	x design population		PVC & AC	=	140	

Line	Present population on the line (soul)	Present population to be served by the line	Design population on the the line	Design polulation to be served by the line	Length of line (m)	Peak flow (LPM)	Pipe dia				Head loss for 1000 m (m)	Total head loss (m)	Hydraulic level (m)	RL (m)	Terminal head (m)	Remarks
							DI	AC	PVC							
									OD	ID						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
TP - A	0	50745	0	84037	6230	5392.385	300				4.6	28.658	126.59	64.6	61.99	
A-B	0	25586	0	42372	3310	2718.88	250				3.14	10.393	116.20	65.3	50.90	
B-ESR2	3838	3838	6356	6356	200	407.8426	100				8.12	1.624	114.57	66.1	48.47	ESR 2
B-C	0	21748	0	36016	2460	2311.037	250				2.33	5.7318	110.47	67.3	43.17	
C-ESR7	4264	4264	7061	7061	200	453.1112	100				9.87	1.974	108.49	67.9	40.59	ESR 7
C-D	0	17484	0	28955	2270	1857.926	250				1.55	3.5185	106.95	66.8	40.15	
D-ESR3	4691	4691	7769	7769	200	498.4861	100				11.78	2.356	104.59	65.7	38.89	ESR 3
D-E	0	12793	0	21186	2380	1359.44	200				2.58	6.1404	100.81	67.2	33.61	
E-ESR4	4691	4691	7769	7769	200	498.4861	100				11.78	2.356	98.45	66.8	31.65	ESR 4
E-F	0	8102	0	13417	2890	860.9538	200				1.11	3.2079	97.60	67.2	30.40	
F-ESR5	3838	3838	6356	6356	200	407.8426	100				8.12	1.624	95.98	67.8	28.18	ESR 5
F-ESR6	4264	4264	7061	7061	1820	453.1112	150				1.37	2.4934	95.11	69.7	25.41	ESR 6
A-G	0	25159	0	41665	940	2673.505	200				9.03	8.4882	118.10	66.9	51.20	
G-J	0	12366	0	20479	1110	1314.065	200				2.42	2.6862	115.42	67.8	47.62	
J-ESR10	4264	4264	7061	7061	250	453.1112	100				9.87	2.4675	112.95	67.2	45.75	ESR 10
J-K	0	8102	0	13417	1770	860.9538	150				4.5	7.965	107.45	68.4	39.05	
K-ESR11	4264	4264	7061	7061	300	453.1112	100				9.87	2.961	104.49	68.7	35.79	ESR 11
K-ESR12	3838	3838	6356	6356	3010	407.8426	150				1.13	3.4013	104.05	72.1	31.95	ESR 12
G-H	0	12793	0	21186	1060	1359.44	200				2.58	2.7348	115.37	72.2	43.17	
H-ESR1	4264	4264	7061	7061	350	453.1112	100				9.87	3.4545	111.91	78.2	33.71	ESR 1
H-I	0	8529	0	14125	2120	906.3287	200				1.22	2.5864	112.78	79.4	33.38	
I-ESR8	4691	4691	7769	7769	870	498.4861	150				1.63	1.4181	111.36	79.6	31.76	ESR 8
I-ESR9	3838	3838	6356	6356	4030	407.8426	150				1.13	4.5539	108.23	81.4	26.83	ESR 9
Total	**50745**				**38170.00**											

Summary of pipe dia and length

Dia (mm)	Length (m)
450	0.00
400	0.00
350	0.00
300	6230.00
250	8040.00
200	10500.00
150	11500.00
100	1900.00
Total	**38170.00**

Design of Clear Water Pump Set (For 15 yrs)

(i) Total Daily Demand = 5070470.3 LPD
(ii) Total Hourly Demand = 253523.52 LPH
(iii) Total Demand Per Minu = 4225.39 LPM
(iv) Total Head of Pump = 80 M

$$\text{HP Reqd.} = \frac{4225.39 \times 80}{4500 \times 0.7}$$

= 107.31 HP

provide 3 Nos. pump (2W + 1S) of capacity = 60.00 HP each

For BoQ Purpose, let us have 3 Pump Set, each giving 35.2 lps against a total head of 80.0 m

DESIGN OF CW PUMPING MAIN (ROUTE - IV) FROM TREATMENT PLANT TO 6 NOS. ESR IN NORTAP, TETELIA & BORKHAT GP

Present population 2013	=	25,586	soul	Working period	=	20	hr
Population at installation 2015	=	26,456	soul	Head available at TP Site	=	30	m
Population at installation 2030	=	33,202	soul	Minimum terminal head	=	20	m
Design population 2045	=	42,372	soul	RL OF TP SITE	=	75.25	m
Rate of supply	=	70	LPCD	Hydraulic level at service reservoir	=	30 + RL	m
Rate of supply with wastage	=	77	LPCD		=	105.25	m
Peak flow factor	=	1					
Peak flow in LPM	=	0.064166667	x design population	Design value of 'C'	DI	=	140
					PVC & AC	=	140

Line	Present population on the line	Present population to be served by	Design population on the the	Design polulation to be served by	Length of line (m)	Peak flow (LPM)	Pipe dia				Head loss for 1000 m (m)	Total head loss	Hydraulic level (m)	RL (m)	Terminal head (m)	Remarks
							DI	AC	PVC							
									OD	ID						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
TP - A	0	25586	0	42372	8250.00	2718.88	350				0.61	5.03	100.22	63.80	36.42	
A-A1	4691	4691	7769	7769	950.00	498.49	100				11.78	11.19	89.03	63.70	25.33	ESR 1
A-B	0	20895	0	34604	2350.00	2220.39	300				0.89	2.09	98.13	63.80	34.33	
B-B1	4264	4264	7061	7061	1050.00	453.11	100				9.87	10.36	87.76	63.90	23.86	ESR 2
B-C	0	16631	0	27542	2150.00	1767.28	300				0.58	1.25	96.88	63.60	33.28	
C-C1	4691	4691	7769	7769	1100.00	498.49	150				1.63	1.79	95.09	64.40	30.69	ESR 3
C-D	0	11940	0	19773	2250.00	1268.80	300				0.32	0.72	96.16	64.10	32.06	
D-D1	3838	3838	6356	6356	800.00	407.84	100				8.12	6.50	89.66	63.90	25.76	ESR 4
D-E	0	8102	0	13417	3050.00	860.95	250				0.37	1.13	95.03	66.80	28.23	
E-E1	3838	3838	6356	6356	750.00	407.84	150				1.13	0.85	94.18	72.20	21.98	ESR 5
E-F	0	4264	0	7061	2300.00	453.11	150				1.37	3.15	91.88	63.90	27.98	
F-F1	4264	4264	7061	7061	650.00	453.11	100				9.87	6.42	85.46	64.20	21.26	ESR 6
Total	**25586**				**25650.00**											

Summary of pipe dia and length

Dia (mm)	Length (m)
450	0.00
400	0.00
350	8250.00
300	6750.00
250	3050.00
150	4150.00
100	3450.00
Total	**25650.00**

Design of Clear Water Pump Set (For 15 yrs)

(i) Total Daily Demand = 2556568 LPD
(ii) Total Hourly Demand = 127828.41 LPH
(iii) Total Demand Per Minut = 2130.47 LPM
(iv) Total Head of Pump = 30 M

$$\text{HP Reqd.} = \frac{2130.47 \times 30}{4500 \times 0.7}$$

= 20.29 HP

provide 3 Nos. pump (2W + 1S) of capacity = 15.00 HP each

For BoQ Purpose, let us have 3 Pump Set, each giving 17.8 lps against a total head of 30.0 m

Annexure - D

HYDRAULIC DESIGN AND UNIT SIZING OF VARIOUS UNIT OF 17.8 MLD CAPACITY WATER TREATMENT PLANT IN 20 HOURS OF OPERATION

Capacity of the Treatment plant = 17.80 MLD.

Operating hours of the Plant = 20.0 hours

Therefore, hourly rate of treatment = 890.0 Cu.m.

Since, hourly rate of treatment is very high, we propose to make twin units for aerator, rapid mixer and clariflocculator.

Hence, hourly rate of flow for each of these three units shall be 445.0 Cu.m.

Now, the unit size of various system component of the scheme are as below :

1. The Aerator :

Since raw water is from surface source and does not contain much minerals viz. iron, manganese etc., cascade type aerator is proposed for the scheme. In cascade aerators water is allowed to flow downwards after spreading over inclined thin sheets and the turbulence is secured by allowing the water to pass through a series of steps ranging from 4 to 6 nos. As per CPHEEO manual, space requirement of the aerator varies from 0.015 to 0.045 m^2 /m^3/hour.

1.1 Influent Pipe Size :

Water from the River Intake shall directly come to the aerator through the raw water main. Therefore, a velocity of 0.8 m/sec is assumed in the influent pipe.

Rate of flow in the influent pipe = 445.0 Cu.m/hour.

= 0.123 Cu.m./sec.

With0.80 m/sec velocity, C/S area of the pipe required is

= 0.155 Sq.m.

Therefore, required dia of the influent pipe = 0.443 m.

Let us provide 450 mm dia DI pipe as aerator Inlet.

1.2 Aeration Deck Size :

In our case, we propose for 2 aerator with hourly rate of flow of 435.0 m^3/ hour, per aerator. Providing a space of 0.025 m^2 /m^3/hour for the purpose, space required in the aerator deck is, 445.0 x 0.025 = 11.125 Sq.m. Let us provide a cascade aerator of overall inner diameter 5.50 m. with 6 steps.

2. Rapid Mix Unit (Flash mixer) :

To help in formation of micro floc with resultant utilization of chemical coagulant preventing localization of concentration and premature formation of hydroxides which leads to less efficient utilization of the coagulant and for rapid & uniform dispersion throughout the volume of water, mechanical type rapid mix unit is proposed.

In our case,

No. of Flash Mixer = 1

Therefore, design flow to be treated= 435.0 m^3/hour.

Detention time = 30 sec. (range – 20 to 60 sec.)

Ratio of height to dia = 1.5:1 (range – 1:1 to 3:1)

Dimension of the tank is given by,

Volume = Flow x detention time

$$=\left(\frac{445.0}{60 \times 60}\right) \times 30 = 3.708\ M^3.$$

For a ratio of 1.5 : 1 for tank height to diameter, sizes of the tank shall be,

$$(\pi/4 \times D^2) \times 1.5\ D = 3.708\ m^3$$

$$\therefore\ D = 1.774\ m, \text{ say, } 2.0\ m.$$

And height, H = 1.5 D = 3.0 m.

With a free board of 0.3 m., the total height of the rapid mixing tank shall be 3.3 m.

To match with the level of raw water channel and to maintain the required hydraulic gradient between various units of the treatment plant, suitable staging may have to provide for the flash mixer.

3. Clariflocculator :

The Clariflocculator is proposed to eliminate the alum floc developed in the flash mixer and to get clarified water to minimize the load on the filter unit and thus obviate the necessity of frequent back washing. We propose a circular Clariflocculator having vertical paddles. The water enters through a central influent pipe and is fed to the flocculation zone through ports. The effluent from flocculation zone passes below the partition wall dividing the flocculator portion and the clarifier portion. The clarified effluent is collected by a peripheral effluent launder. For our case, we are to design the Clariflocculator size for the following data :

Desired average outflow from Clariflocculator

$$= 445.0\ M^3/\text{hour}$$

Detention period = 30 minute.

Average value of velocity gradient, $G = 40\ S^{-1}$.

Now, considering a velocity of 0.8 m/sec, influent pipe diameter required is,

$$= \sqrt{\frac{445.0}{60 \times 60} \times \frac{1}{0.8} \times \frac{4}{\pi}} = 0.443 \text{ m.},$$

Let us provide a influent pipe of diameter, 450 mm.

Now, Volume of the flocculator
= (445.0 / 60) x 30 = 222.50 m^3
(Considering 30 sec detention)
Providing a water depth of 4.5 m., area of the flocculator required = 49.44 m^2
Let D_f be the diameter of the flocculator and D_p be the influent pipe diameter.

Then, $\frac{\pi}{4} \times (D_f^2 - D_p^2) = 49.44 \text{ m}^2$,

Since D_p = 450 + 350 x 2 = 1150 mm, therefore, D_f = 8.01 m.

Let us provide a tank of 8.0 m. for flocculation zone.
For designing the Clarifier, let us assume a surface overflow rate of 60 $m^3/m^2/day$

Therefore, surface area of the clarifier required

$$= \frac{445.0 \times 20}{60} = 148.33 \text{ m}^2.$$

Let D_c be the diameter of the clarifier, and D_f be the outer diameter of the flocculator. Considering 250 thick wall for flocculator zone, outer diameter of the flocculator, D_f = 8.5 m.

Then, $\frac{\pi}{4} \times (D_c^2 - D_f^2) = 148.33 \text{ m}^2$,

Since D_f = 8.5 m., therefore, D_c =16.16 m.

Let us provide a tank of 16.0 m. for clarifier zone.

Now, length of the weir = π x 16.0 = 50.24 m.

Therefore, weir loading

$$= \frac{445.0 \times 20}{50.24} = 177.15 \text{ m}^3/\text{day/m} < 300 \text{m}^3/\text{day.m., O.K.}$$

4. The Filter Unit :

As the raw water shall be discharged at atmospheric pressure at the outlet of the aerator, the aerated water shall travel under gravity to other units of the treatment plant. Therefore, instead of pressure filter, we propose a rapid sand filter for the purpose.

For rapid sand gravity filters, standard rate of filtration as prescribed in the said Manual is 4.8 to 6.0 m^3/m^2/hour. Since ours is a plant of high capacity having hourly requirement of 890.0 Cu.m, using an average limit of 5.0 m^3/m^2/hour, space required for the filter bed is worked out as 178.0 m^2 for a average outflow of 890.0 m^3 per hour. For having flexibility of use, if we provide 8 (eight) beds, area of each bed required is 22.25m^2. Applying a length to width ratio of 1.25:1, the size of each bed shall be 4.21 m. x 5.27 m.

Let us provide a rapid sand filter unit having eight beds of size 4.2 m. x 5.3 m. each. Therefore, area available for filtration = 4.2 x 5.3 x 8 bed =178.08 Sq.m., giving a filtration rate of 5.0 m^3/m^2/hour, which is well within the range.

The Overall size of the building accommodating the filter units shall be kept more than this for accommodating the raw water and back wash water gutters; operating gallery; rate of

flow controller; filtered water channel; Chlorine Dozer; and, air compressor etc.

5. Chemical dosing, disinfection etc.:

For chemical dosing (lime alum solution etc.) to the raw water; to add disinfecting chemicals (mostly bleaching powder); and, to monitor the quality of both raw & clear water, one laboratory cum chemical house shall be provided along with the treatment plant. This laboratory cum chemical house shall accommodate the storage of chemicals, chemical solution preparation tanks, and the quality-monitoring laboratory. In addition, the clear water pump room shall also be provided in the same building. The plinth area of each floor of the double storied chemical house, laboratory and clear water pump house building shall be 84.0 Sq.m.

6. Back Wash Water:

Requirement of Back wash water @ 600 ltr. per Sq.m. per minute for 10 minutes shall be 1,33,600.0 liters. This shall be accommodated in a RCC Tank over the Chemical House.

Annexure E

DETAILED ESTIMATE FOR PROPOSED RWSS - LS PROJECTS IN ASSAM

ABSTRACT OF COST FOR COMPOSITE WSS FOR SUSTAINABILITY & QUALITY IN CHANDRAPUR & DIMORIA DEV. BLOCK OF KAMRUP DISTRICT

Zone - II (DIMORIA BLOCK)

Sl. No.	Major Item of Works	Amount
1	**Raw water Intake System**	
1.1	M.S. Floating Barge with all necessarry mooring materials & life saving equipment; tying arrangement; Over Head gantry Crane etc.	Rs.17,07,900.00
1.2	RCC Single Storied Utility cum Operator's Room at River bank of Intake Point	Rs.9,41,150.00
1.3	River bank Protection Work at Intake Point	Rs.41,40,960.00
1.4	Approach Road to Intake Point from the nearby public road	Rs.87,94,520.00
1.5	Land Development & Security Wall For Intake Station	Rs.23,35,640.00
1.6	Twin Assam Type Staff Quarter at Intake Loxcation for 1 (one) No. Pump Operator and 1 (one) No. Chowkider	Rs.11,03,720.00
1.7	Dedicated Power Line to Intake including Substation	Rs.57,76,895.00
1.8	Captive Power Generator at Intake	Rs.1,17,52,000.00
2	**Raw Water Pumping Machinery and other accessories**	
2.1	Raw Water Pumping machinery in the Intake barge including all necessary electrical and other installation works	Rs.82,12,580.00
2.2	Manifold type Common Header at river bank for the raw water main and flexible hoses for connecting the same with the barge including campus illumination at intake location	Rs.18,00,210.00
3	**Raw Water Conveying Main**	
3.1	Supplying, laying, jointing, testing and commissioning of 600 mm dia DI S.S. (class - K9)raw water pumping main including all necessary valves & specials, valve chamber, supporting structures, anchor / thrust block etc., complete	Rs.12,87,58,160.00

Sl. No.	Major Item of Works	Amount
4	**Water Treatment Plant**	
4.1	Design and Construction of Complete Water Treatment Plant of capacity 17.8 MLD (in 20 hours of operation) with suitable design in conformity with the CPHEEO Manual having provision for Aeration, Coagulation, Rapid Mixing, Clariflocculation & Filtration followed by disinfection, including all Mechanical and Electrical Installation Work suitable for automated operation of the plant, Provision for Back Washing, Laboratory Facility, all internal connection & by-pass piping system etc. , all complete, as directed and specified	Rs.5,58,47,693.00
4.2	Construction of 2 (two) Nos. 10,00,000.0 ltrs. (each) Capacity RCC Under Ground Treated Water Sump in 2 (two) compartment and with a suction pit for pumps having provision for all inlet, outlet & overflow arrangement; mechanical type water level indicator; Air Vent Pipe; Men Hole with Cover; CI Lugs inside the sump etc. , complete	Rs.1,28,64,680.00
4.3	Land Development & Security Wall at Treatment Plant Location	Rs.33,93,630.00
4.4	Twin Assam Type Staff Quarter at Treatment Plant Location for 1 (one) No. Pump Operator and 1 (one) No. Chowkider	Rs.11,03,720.00
4.5	Internal Road / Path etc.; Landscaping & Arboriculture including Compound Illumination in the treatment plant site	Rs.11,49,460.00
4.6	Approach Road to Treatment Plant Site from the nearby public road	Rs.50,01,880.00
4.7	Dedicated Power Line to Treatment Plant including Substation (Only for Zone - II (B), as because, for Zone - I & Zone - II (A), the same has been considered along with the intake station)	Rs.75,81,940.00
4.8	Captive Power Generator at Treatment Plant	Rs.58,76,000.00

Sl. No.	Major Item of Works	Amount
5	**Clear Water Pumping System**	
5.1	Clear Water Pumping machinery at the treatment plant for all the Clear water feeder route including all necessary electrical and other installation works	Rs.56,76,160.00
5.2	Clear Water Pump House at Treatment Plant Location	Rs.16,24,420.00
5.3	Manifold type Common Header for the Clear water main of Different Route and RCC Pump Foundation	Rs.8,19,575.00
6	**Clear Water Conveying Main**	
6.1	Suppling, laying, jointing, testing and commissioning of different required diameter DI/S.S. (Class K7) Clear water pumping main for Route - I serving 2 Nos. ESR in Hahara & Maloibari GP including all necessary valves & specials, valve chamber, supporting structures, anchor / thrust block etc., complete	Rs.5,95,20,515.00
6.2	Suppling, laying, jointing, testing and commissioning of different required diameter DI/S.S. (Class K7) Clear water pumping main for Route - II serving 9 Nos. ESR in Khetri, Topatoli & Dhupguri GP including all necessary valves & specials, valve chamber, supporting structures, anchor / thrust block etc., complete	Rs.11,60,58,850.00
6.3	Suppling, laying, jointing, testing and commissioning ofdifferent required diameter DI/S.S. (Class K7) Clear water pumping main for Route - III serving 12 Nos. ESR in Digaru, Sonapur, Baruabari & Kamarkuchi GP including all necessary valves & specials, valve chamber, supporting structures, anchor / thrust block etc., complete	Rs.13,89,04,635.00
6.4	Suppling, laying, jointing, testing and commissioning of different required diameter DI/S.S. (Class K7) Clear water pumping main for Route - IV serving 6 Nos. ESR in Nortap, Tetelia & Barkhat GP including all necessary valves & specials, valve chamber, supporting structures, anchor / thrust block etc., complete	Rs.13,95,97,310.00

Sl. No.	Major Item of Works	Amount
7	**Elevated Service Reservoir**	
7.1	Construction of 29 Nos elevated service reservoirs of following capacity with suitable foundation, including all necessary inlet/outlet etc. piping arrangement, control valves amenable to motorised operation, water level indicator, lightening aerestor, solar power system, security wall, signboard, landscapping, & arboriculture etc. @ Rs. 30.00 / ltr.	
	For Maloibari & Hahara GP	
	1) ESR No. 1 : 450 Cu.m.	Rs.99,18,052.00
	2) ESR No. 2 : 550 Cu.m.	Rs.1,16,21,714.00
	For the Other 10 GP	
	3) ESR No. 1 : 200 Cu.m.	Rs.58,92,720.98
	4) ESR No. 2: 180 Cu.m.	Rs.54,51,333.00
	5) ESR No. 3 : 200 Cu.m.	Rs.58,92,720.98
	6) ESR No. 4: 180 Cu.m.	Rs.54,51,333.00
	7) ESR No. 5 : 220 Cu.m.	Rs.60,59,375.00
	8) ESR No. 6 : 200 Cu.m.	Rs.58,92,720.98
	9) ESR No. 7 : 150 Cu.m.	Rs.48,23,115.00
	10) ESR No. 8 : 180 Cu.m.	Rs.54,51,333.00
	11) ESR No. 9 : 200 Cu.m.	Rs.58,92,720.98
	12) ESR No. 10 : 200 Cu.m.	Rs.58,92,720.98
	13) ESR No. 11 : 180 Cu.m.	Rs.54,51,333.00
	14) ESR No. 12 : 220 Cu.m.	Rs.60,59,375.00
	15) ESR No. 13 : 220 Cu.m.	Rs.60,59,375.00
	16) ESR No. 14 : 180 Cu.m.	Rs.54,51,333.00
	17) ESR No. 15 : 200 Cu.m.	Rs.58,92,720.98
	18) ESR No. 16 : 200 Cu.m.	Rs.58,92,720.98
	19) ESR No. 17 : 220 Cu.m.	Rs.60,59,375.00
	20) ESR No. 18 : 180 Cu.m.	Rs.54,51,333.00
	21) ESR No. 19 : 200 Cu.m.	Rs.58,92,720.98
	22) ESR No. 20 : 200 Cu.m.	Rs.58,92,720.98
	23) ESR No. 21 : 180 Cu.m.	Rs.54,51,333.00
	24) ESR No. 22 : 220 Cu.m.	Rs.60,59,375.00
	25) ESR No. 23 : 200 Cu.m.	Rs.58,92,720.98
	26) ESR No. 24 : 220 Cu.m.	Rs.60,59,375.00
	27) ESR No. 25 : 180 Cu.m.	Rs.54,51,333.00
	28) ESR No. 26 : 180 Cu.m.	Rs.54,51,333.00
	29) ESR No. 27 : 200 Cu.m.	Rs.58,92,720.98
7.2	Approach Road to ESR Location (total 29 site)	Rs.1,57,94,135.00

Sl. No.	Major Item of Works	Amount
8	**Distribution System**	
8.1	DI Feeder Main from respevtive ESR to the concerned Distribution network	Rs.22,43,13,856.00
8.2	Extension, Renovation, Augmentation of the existing Distribution network	Rs.39,46,15,177.00
8.3	House connection comprising of shaddle piece, 10.0 m. PPR Pipe, Ferruule Cock etc.	Rs.5,91,76,625.00
9	**Water meter with 5 year maintanence contract**	
9.1	Bulk Water meter	Rs.1,13,89,820.00
9.2	Domestic Water meter	Rs.5,94,20,400.00
10	**Auto Control System**	
10.1	SCADA for auto control of the complete system	Rs.2,18,13,830.00
	Total =	Rs.1,69,34,69,104.8

Say, Rs, 169.35 Cr.

Annexure - F

DISASTER MANAGEMENT PRACTICES IN PHED, ASSAM.

The very concept of disaster management is embedded in the departmental activity of Engineering Departments. In some cases only additional quick response and mitigation planning is required.

Disaster Management in Conceptual Stage:

The preventive measures of disasters are enforced in Engineering Departments in the form Codes, Byelaws etc in concept preparation stage and planning of an engineering project e.g. National Building Code of India (SP7), Building byelaws of local administrative bodies etc. At this stage itself evacuation plans during disaster, access for rescue / firefighting teams and facilities required fight such untoward incidents are worked out.

Disaster Management in Design Stage:

During design stage, all possible loads structures have to bear during its service life is taken in to account. Here, in the design process Importance Factor, Factor of Safety etc based on the degree of losses in case of failure, degree of vulnerability are taken in to account. For this there are clear guide lines set by Bureau of Indian Standards (BIS) in the form of codes of practices e.g. IS:875 for Loads (Dead Loads, Live Loads, Wind Loads) to be considered during design. There are also codes for design of Concrete Structures (IS:456), Steel Structures (IS:800) etc.

Disaster Management in Construction Stage:

There are guidelines for stages of construction, tests for assessment of strength of supporting structures to overcome any probable disaster. There are also Rules set by administrative authority for safety of workers, compulsory use of safety gadgets like apron, goggles, helmets, safety belt etc. and availability of First Aid facilities.

Disaster Management through Rehabilitation and Retrofitting of Structures:

There are Handbooks on Repair and Rehabilitation of structures published by Govt. agencies to overcome disaster from old and damaged structures. There is also handbook on Seismic Retrofit of buildings to support structures which were designed without considering the seismic forces properly.

Disaster Management during service life of Structures:

This includes inspection and structural safety assessment of structures at regular interval, regulating the intended use of structures to avoid overloading etc. For this there is scope for improvement by setting norms, capacity development through training, putting alert system to invite joint effort all departments working on it.

Annexure - G

Environmental Data Sheet (EDS) for Water Supply Schemes

Name of Scheme: Composite WSS for Sustainability & Quality in Chandrapur & Dimoria Dev. Block of Kamrup District: Zone – II: Dimoria Block

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S. No.	Description	Particulars	Remarks
GENERAL			
1.	Name of Habitation(s)	484 Nos. (List annexed)	
2.	Name of Gram Panchayat(s)	12 Nos. (List annexed)	
3.	Name of Block(s)	Dimoria Block	
4.	Name of District	Kamrup	
5.	Population (present)	183005 (2013 AD)	
6.	Total water demand (Litres per day)	14.70 MLD in 2013 AD	
7.	Present water supply (Litres per day)	4.41 MLD in 2013 AD	
8.	Present classification of habitation (s)	Partially Covered	
9.	Problem with present water supply	GWT depletion, Iron contamination, Fluoride contamination, Less supply level.	
10.	Net demand of water from the proposed source (Litres/day)	17.8 MLD	
11.	Type of source	Surface water	
12.	Type of scheme	Multi Village Scheme (MVS)	
13.	Is De-fluoridation/ RO planned?	No	
LOCATION			
14.	Where is the source located?	On Kolong river	
15.	Has a sanitary survey of the source location been done? Enclose the report of the sanitary survey; conduct this survey as per the ECOP given in the Sanitary Survey of Water Supply Sources in the EMF.	No, Raw Water Quality test report enclosed.	
16.	Is any component of the scheme located in a forest area? If yes, obtain permission in writing from the Forest Department. Legal status of forest: Area of forest land involved:	No	
17.	Is the source is near (within 5 km) any ecologically sensitive area (National Parks, Wildlife Sanctuaries, Game Reserves, Bio-spheres, etc.)? Avoid the sensitive areas. If not possible, obtain permission in writing from the Forest Department and follow mitigation measures as suggested by the Forest Department.	No	
18.	Is any historical/ archaeological/ protected monument located within 300 m distance? If yes, give details of monument: Name of Monument: Status of Monument:	No	

	Distance from site:		
19.	Are any trees likely to be cut at the location for construction of the scheme? If yes, mention the number of trees per each species. Obtain permission in writing from the Forest Department.	No	
20.	Have approved/ legal sources been identified for the construction materials (sand, aggregate, bricks, etc.) If yes, mention details of sources identified for each material.	Already taken care of as per Assam PWD building schedule of rates 2010-11 including	
21.	What is the amount of construction waste likely to be generated? Have appropriate sites been identified for disposal of construction waste? If yes, mention details of disposal sites; name of site, present land use and distance from work site, etc. for each site.	The contractor will be liable to clear the construction waste, if any.	
IN CASE OF SURFACE WATER SOURCE			
LOCATION			
22.	Will there be any significant land disturbance resulting in erosion, subsidence and instability?	No	
23.	Will the scheme involve alteration of natural drainage? If yes, indicate the measures for the drainage.	No	
24.	What is the distance of the source from the nearest sewage or industrial effluent disposal point. Please give details such as distance, location, upstream/ downstream, etc.	NA	
SUSTAINABILITY			
25.	Is the expected safe yield from the source greater than water demand?	Yes	
WATER QUALITY			
26.	What is the Turbidity of raw water (NTU)? (Enclose water quality test report)	Raw Water Quality test report as enclosed.	
27.	Is this source within 100 m from the nearest sewage/industrial effluent disposal point (disposal into the surface water source)?	No	
28.	Is there any chemical impurity present? If yes, furnish the details. (Enclose water quality test report)	No	
29.	What is the frequency planned for testing water for bacteriological contamination? (should be 1 every month)	Every day, There shall be a full-fledged water quality testing laboratory in the treatment plant.	
30.	What is the frequency planned for testing water for physical and chemical contamination? (should be 4 times/year)	Every 3 month	
31.	What is the frequency planned for testing residual chlorine? (should be once every day)	Every day	
32.	What is the frequency planned for sanitary inspection by VWSC? (should be 12 times/year)	Every month	
33.	What is the frequency planned for sanitary inspection by Dept.? (should be 2 times /year if population serviced is less than 5000; should be 24-48 times /year if population serviced is between 5000-20000)	36-48 times /year	
WATER TREATMENT			

34.	What is the method of water treatment proposed?	Aeration, Coagulation, Flocculation, Filtration, Disinfection.	
35.	What is the capacity of treatment plant?	17.8 MLD	
36.	Will the proposed treatment bring water quality to the desirable limits?	Yes	
37.	What is the quantity of backwash water generated per day?	350 Cum, Which will again be recycled.	
38.	What is the quantity of sludge generated per day? How will the sludge and other residue from the water treatment plant be disposed?		

Category of Scheme: Category 1 / Category II

Category I	**Category II**
1. SVS with source in shallow aquifer in safe and semi-crtitical zone	1.SVSs/MVSs with shallow groundwater source located in either critical or over exploitation zones of groundwater exploitation and deep groundwater source in semi-critical and over exploited zones
2. SVS with source in deep aquifer located in safe zone of exploitation	2. SVSs/MVSs with sources located at or nearer (within 1 km) to natural habitats/sensitive ecosystem such as National Park / Wildlife Sanctuaries (Seek Forest Department permission)
3. SVS with perennial surface water source requiring slow sand filtration only	3. SVSs/MVSs with the water quality at the source is not treatable with conventional treatment, and involves special treatment/RO treatment. 4. MVSs with surface water source requiring treatment

EDS filled and Categorization done by:

Signature		
Name		
Designation	District Environment Expert	Executive Engineer
Date		

Environment Management Plan (EMP)

Name of Scheme: Composite WSS for Sustainability & Quality in Chandrapur & Dimoria Dev. Block of Kamrup District: Zone – II: Dimoria Block

S. No ...	Identified negative impacts on environment	Actions to be taken to mitigate (remove/reduce) negative impacts	Time frame	Responsible agencies	Reference of Coverage in bid document	Cost of activities
Site and Construction Related Aspects						
1	Extraction of materials from illegal or inappropriate locations.	• Verify suitability of all material sources and obtain approval of Project Authority. • List the approved quarry sites and sources:	Approval to be secured before construction.	• List of approved sources for materials to be made available Project Authority • Material to be sourced from approved sources by Contractor.		NA
2	Disposal of construction waste at inappropriate locations.	• Reuse the construction waste as much as possible. • Verify appropriateness of all construction waste disposal sites and obtain approval of Project Authority • List the approved disposal sites:	Approval to be secured before construction.	• List of approved disposal sites to be made available by Project Authority • Construction waste to be disposed at approved sites by Contractor.		NA
3	Dust pollution due to excavation.	• All earth work in habitation areas will be protected to minimize generation of dust. • Sprinkling of water on construction sites in habitation areas using water tanker as and when necessary during dry weather.	During construction phase.	Contractor.		NA

4	Risk of improper management of archaeological chance finds	All fossils, coins, articles of value of antiquity, structures and other remains or things of geological or archaeological interest discovered on the site shall be the property of the Government and shall be dealt with as per provisions of the relevant legislations. The contractor will take reasonable precautions to prevent his workmen or any other persons from removing and/or damaging any such article or thing. He will, immediately upon discovery thereof and before removal acquaint the Project Authority of such discovery and carry out the given instructions for dealing with the same, waiting which all work shall be stopped. The Project Authority will seek direction from the Archaeological Survey of India (ASI) before instructing the Contractor to recommence the work in the site.	During construction phase.	Contractor.		NA
5	Improper disposal of dewatered water.	• Do not let out dewatered water onto the road or into nearby water bodies. • Dewatered water is to be disposed into appropriate drains or disposal sites.	During construction phase.	Contractor.		NA
6	Risk of accidents and occupational health impacts.	Implement Health and Safety measures including: (a) excluding public from the site (including setting up barricades and warning signs) (b) ensuring all workers are provided with and use Personal Protective Equipment including: helmet, gloves and gumboots at concreting locations, nose mask at dust producing areas, safety belt during work at height, hearing protection at noise producing locations; (c) documentation of work-related accidents; (d) First Aid box shall be easily accessible throughout the site; (e) Provide supplies of potable drinking water at labour camp and work site.	During construction phase.	Contractor.		NA

		(f) Provide toilet facility at labour camp				
7	Risk of improper clearance and restoration of construction sites.	On completion of the works, all temporary structures will be cleared away, all rubbish cleared, borrow pits, trenches, etc., filled/levelled and effectively sealed off and the site left clean and tidy, at the contractor' s expenses, to the satisfaction the Project Authority.	During construction phase.	Contractor.		NA
Water Supply Related Aspects						
8	Risk of poor water quality	Ensure that raw water quality and selected water treatment technology are appropriate to bring the water to desirable limits.	During scheme design.	Project Director		NA
		Ensure that water quality testing is undertaken regularly (test for residual chlorine – daily, test of bacteriological parameters – monthly, test of physical/chemical parameters – once in 3 months) and a record of the test results is maintained for a representative set of samples (including samples from clean water outlet at WTP, samples from chief and branch mains and samples from end of distribution system).	During O & M phase.	As per contract agreement		NA
9	Improper disposal of backwash water from WTP	Integrate system for reuse / recycling of backwash water into design of WTP.	During scheme design.	Project Director		NA
10	Improper disposal of sludge from WTP	Integrate system for proper disposal of sludge into design of WTP.	During scheme design.	Project Director		NA

NOTE: Based on above prepare a detailed EMP with Cost. The screening and EMP should be part of DPR and later RFP.

EMP prepared by:

Name: ……., Designation: Environment Expert, Signature: ……

Name: ……., Designation: Executive Engineer, Signature: ……

Date: ……

EMF of Dimoria (Zone – II) Project

None of the components of the Dimoria (Zone – II) Project is located in any forest area, moreover, the source is sufficiently away from historical/archaeological monuments, ecologically sensitive areas such as, National Park, Wild Life Sanctuaries, bio-spheres etc. As all of the units are proposed in our existing premises or so, there is no scope of felling of existing trees. As per trend, there is no significant erosion, landslide, subsidence around the surface water source and along the distribution network. The construction and laying activities are so planned that nowhere, the natural drainage would be affected. In the upstream of the source, no industrial effluent is discharged into the river source .There seems to be no potential environmental threat to the project area.

All the mitigation measures like- i) River Shore lining, ii) Water Treatment Plant and iii) Water Quality et. are integrated in the DPR as a part of Environmental management.

Annexure-H

ANNUAL OPERATION AND MAINTENANCE COST FOR COMPOSITE WSS FOR SUSTAINABILITY & QUALITY IN CHANDRAPUR & DIMORIA DEV. BLOCK OF KAMRUP DISTRICT: ZONE – II: DIMORIA BLOCK

Sl No.	Description	Qty	Unit	Rate (Rs.)	Amount
A)	Salary & Wages				
i)	Supervisor / Asstt. Manager (AE)	1	No.	35000	35000.00
ii)	Operator = 3 Nos. at Intake + 3 Nos. at TP	6	Nos.	15000	90000.00
iii)	Helper / fitter = 3 Nos. at Intake + 3 Nos. at TP + 4 Nos. for Raw & Clear Water Main	10	Nos.	12000	120000.00
iv)	Watchman =1 No. at Intake + 1 No. at TP + 29 Nos. for ESR	31	Nos.	12000	372000.00
B)	Energy Charges:				
i)	Power charge, considering average 18 hours availability of power @ Rs. 5.15 perKWH	317237	KWH	5.15	1633767.98
ii)	Electricity Duty @ Rs. 0.10 per KWH	317237	KWH	0.10	31723.65
iii)	Fixed Electricity Charge @ Rs. 125.00 per KVA per month	1500.0	KVA	125.00	187500.00
C)	Fuel Charge for balance 2 hours				
i)	For Intake station	21484.8	KWH	13.37	287208.81
ii)	For Treatment Plant	12353.8	KWH	13.63	168357.04
D)	Chemicals				
	i) Lime				34710.00
	ii) Alum				113635.20
	iii) Bleaching Powder				48871.68
E)	Maintenance of bulk water supply (except roads & buildings)., @ 0.05 % of the respective Capital Cost	905367126.00			452683.56
F)	Maintenance of Intra Village Water Supply @ 0.05 % of the respective Capital Cost	729617605.00			364808.80
Total monthly O&M Cost = Rs.					3940266.72
Therefore, Annual O& M Cost = Rs.					**47283200.62**
Hence, Cost of production of 1 KL Water = Rs.					**8.49**

Annexure – J

CAPACITY OF UNDER GROUND CLEAR WATER SUMP

For collecting and storage of the treated water coming out from the filter unit, and to facilitate pumping of treated water to the elevated service reservoirs, underground sump is provided. Retention capacity of the underground sump is generally provided as ½ to 2 hour production of the sump. Therefore, in this particular case, the capacity requirement of the sump is ranging between 445 to 1780.0 Cu.m.

Again from this sump, water shall be directly feed to some of the constituent scheme by gravity.

Therefore, Let us provide a sump of capacity 2000.0 Cu.m.

Annexure – K

Summary of Sub Soil Investigation Report for the Proposed World Bank Assisted RWSS – LS Projects in Assam : Composite Water Supply Scheme for Quality and Sustainability in Chandrapur & Dimoria Development Block of Kamrup District

(Zone – II : Dimoria Block)

Sl. No.	Name of Structure	Location	Safe Bearing Capacity of Soil at 2.0 m. below existing G.L. (in MT / m^2)
1.	Treatment Plant	Gumaria	Non seismic net safe soil pressure : 19.00 Seismic net safe soil pressure : 23.75
2.	Elevated Service Reservoir	Barkacharang	Non seismic net safe soil pressure : 20.20 Seismic net safe soil pressure : 25.25
3.	Elevated Service Reservoir	Maitakuchi	Non seismic net safe soil pressure : 19.00 Seismic net safe soil pressure : 23.75
4.	Elevated Service Reservoir	Kamalajari	Non seismic net safe soil pressure : 12.80 Seismic net safe soil pressure : 16.00
5.	Elevated Service Reservoir	Rai Maheswar	Non seismic net safe soil pressure : 39.20 Seismic net safe soil pressure : 49.00
6.	Elevated Service Reservoir	Nazirkhat	Non seismic net safe soil pressure : 11.00 Seismic net safe soil pressure : 13.75
7.	Elevated Service Reservoir	Chamata Pathar.	Non seismic net safe soil pressure : 11.70 Seismic net safe soil pressure : 14.63
8.	Elevated Service Reservoir	Jorabat	Non seismic net safe soil pressure : 10.90 Seismic net safe soil pressure : 13.63
9.	Elevated Service Reservoir	Khetri	Non seismic net safe soil pressure : 11.35 Seismic net safe soil pressure : 14.19

Sl. No.	Name of Structure	Location	Safe Bearing Capacity of Soil at 2.0 m. below existing G.L. (in MT / m^2)
10.	Elevated Service Reservoir	Hahara	Non seismic net safe soil pressure : 11.75 Seismic net safe soil pressure : 14.69
11.	Elevated Service Reservoir	Kopili Koch	Non seismic net safe soil pressure : 20.20 Seismic net safe soil pressure : 25.25
12.	Elevated Service Reservoir	Rupnagar	Non seismic net safe soil pressure : 11.85 Seismic net safe soil pressure : 14.81
13.	Elevated Service Reservoir	Tetelia-Rajakhat	Non seismic net safe soil pressure : 21.00 Seismic net safe soil pressure : 26.25
14.	Elevated Service Reservoir	Diksak	Non seismic net safe soil pressure : 17.00 Seismic net safe soil pressure : 21.25
15.	Elevated Service Reservoir	Gosaigaon	Non seismic net safe soil pressure : 19.00 Seismic net safe soil pressure : 23.75
16.	Elevated Service Reservoir	Batakuchi	Non seismic net safe soil pressure : 18.90 Seismic net safe soil pressure : 23.63
17.	Elevated Service Reservoir	Killing N.C.	Non seismic net safe soil pressure : 19.80 Seismic net safe soil pressure : 24.75
18.	Elevated Service Reservoir	Tepesia	Non seismic net safe soil pressure : 20.40 Seismic net safe soil pressure : 25.50
19.	Elevated Service Reservoir	Amsing Gaon	Non seismic net safe soil pressure : 22.30 Seismic net safe soil pressure : 27.88
20.	Elevated Service Reservoir	Nartap	Non seismic net safe soil pressure : 15.60 Seismic net safe soil pressure : 19.50

Sl. No.	Name of Structure	Location	Safe Bearing Capacity of Soil at 2.0 m. below existing G.L. (in MT / m^2)
21.	Elevated Service Reservoir	Amorapathar	Non seismic net safe soil pressure : 10.80 Seismic net safe soil pressure : 13.50
22.	Elevated Service Reservoir	Kalitakuchi	Non seismic net safe soil pressure : 11.70 Seismic net safe soil pressure : 14.75
23.	Elevated Service Reservoir	Niz Dimoria	Non seismic net safe soil pressure : 11.10 Seismic net safe soil pressure : 13.11
24.	Elevated Service Reservoir	Belguri	Non seismic net safe soil pressure : 10.90 Seismic net safe soil pressure : 13.63
25.	Elevated Service Reservoir	Dakhin Dimoria	Non seismic net safe soil pressure : 11.60 Seismic net safe soil pressure : 14.50
26.	Elevated Service Reservoir	Durung Bazar	Non seismic net safe soil pressure : 11.00 Seismic net safe soil pressure : 13.75
27.	Elevated Service Reservoir	Silachapor	Non seismic net safe soil pressure : 17.20 Seismic net safe soil pressure : 21.50
28.	Elevated Service Reservoir	Bhakua gaon	Non seismic net safe soil pressure : 18.80 Seismic net safe soil pressure : 23.50
29.	Elevated Service Reservoir	Jyotinagar	Non seismic net safe soil pressure : 19.10 Seismic net safe soil pressure : 23.88
30.	Elevated Service Reservoir	Helagog	Non seismic net safe soil pressure : 11.60 Seismic net safe soil pressure : 14.50