Composite Water Supply Scheme

For

Sustainability and Quality

In

Chandrapur and Dimoria Development Block

Of

Kamrup District
(Zone-I : Chandrapur 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 – I : Chandrapur 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 Chandrapur Development Block of Kamrup District spanning between North latitude 26°10' to 26°16' and East Longitude 91°51' to 92°30'. All total 194 Habitations of 45 Villages in 4 GPs of the development block shall be benefited by the project.
5. Existing water supply facilities	:	Out of total 194 habitations proposed to be covered by the scheme, 123 are yet to be covered fully. The project area has 25 PWSS out of which 22 nos. are based on ground water, and the rest 3 nos. based on surface source. Out of the 25 existing scheme, 4 nos. has already crossed 15 years of commissioning and 2 nos area 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 : 29

   (ii) Fluoride affected : 11

   As a matter of fact certain areas like mathgharia has a fluoride level as high as 9.2 ppm and several residents there show signs of fluoride exposure like molting of the teeth and skeletal deformity. Hence it is of utmost importance to cover the entire area with water from a surface source and since the River Brahmaputra and the River Digaru are adjacent to the project area it can be easily tapped.

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.

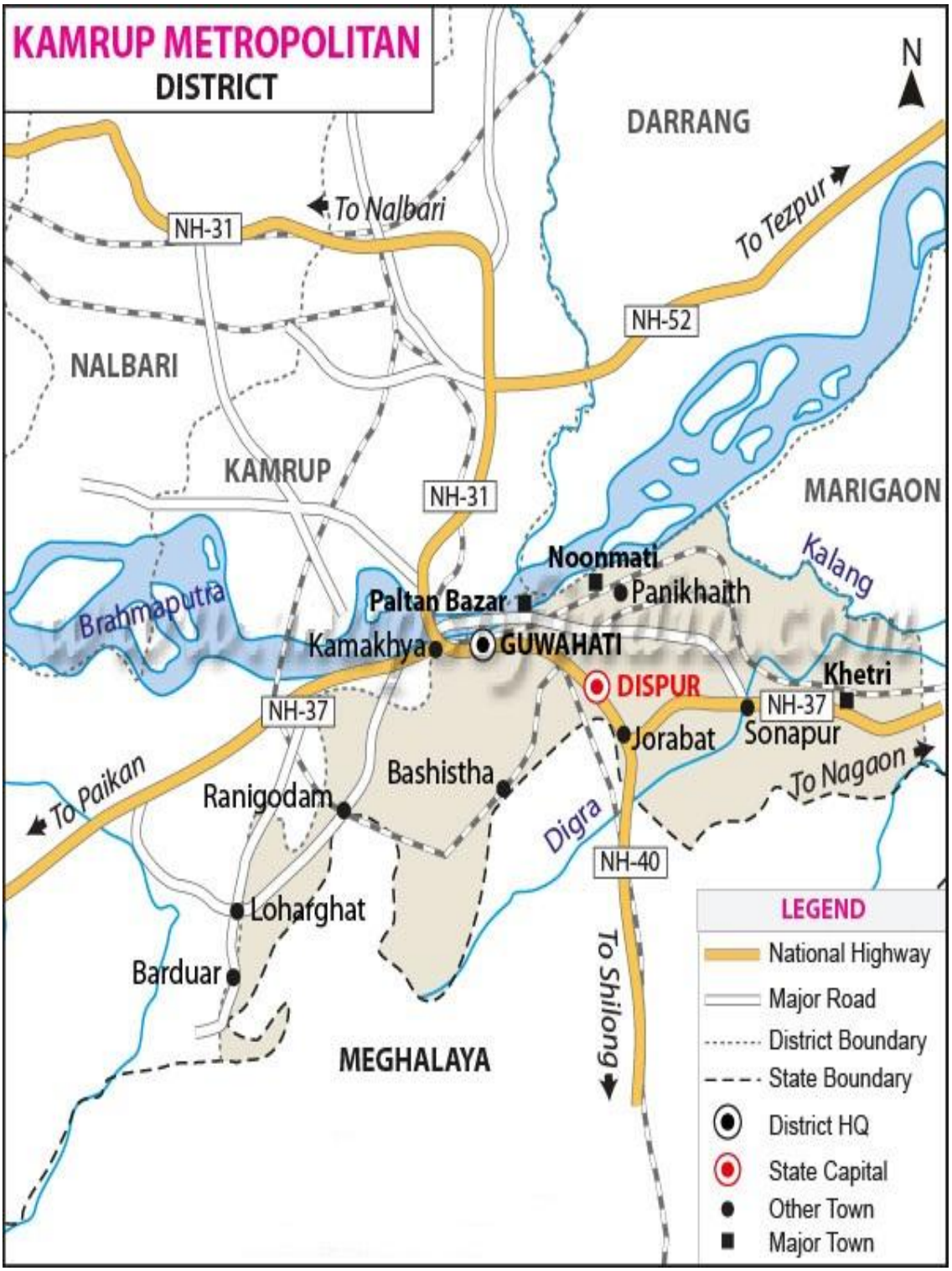
9. Design period	:	The project is designed for a period of 30 years, i.e., from the year 2015 to 2045.
10. Design Population to be served	:	(a) 2011 YSR Population – 49355 souls. (b) On commissioning in 2015 AD – 52768 souls. (c) After 10 years of commissioning in 2025 AD – 61739 souls (d) After 20 years of commissioning in 2035 AD – 72234 souls (e) After 30 years of commissioning in 2045 AD – 84514 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 : 4.2 MLD • After 10 Years in 2025 AD : 5.0 MLD. • After 20 Years in 2035 AD : 5.8 MLD. • After 30 Years in 2045 AD : 6.8 MLD. The Calculation of Water Demand is Shown in **Annexure – B**
13. Description of the Project and its Zoning	:	The entire area of Chandrapur Block comprising of 4 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, i.e., for all the 4 G.P.s of Chandrapur Block, raw water shall be tapped from the mighty river Brahmaputra at Tatimara near Panikhaiti.

15. Discharge of the source rivers	:	Average Run-off of River Brahmaputra is 6570.09 cumec in lean period and in monsoon period is 25039.84 cumec. .
16. Total length of Raw Water Pumping Main	:	750.0 Rm. From Intake station. The raw water main shall be of DI Class K9 pipe of dia 350 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 1000.0 Cu.m. to be located at treatment plant site.
19. Elevated Service Reservoir	:	All total 6 Nos. Of elevated service reservoirs spreading over the project area is proposed. Total capacity of all these 6 ESR shall be 1350.0 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 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 250.0 KW.
22. Estimated Project cost	:	Rs. 50.88 (Rupees fifty point eight eight) crore only. (Annexed at **Annexure – E**)
23. Per capita cost	:	• On commissioning (2015) AD : Rs. 9737.88 • After 10 Years (2025) AD : Rs. 8322.92 • After 20 Years (2035) AD : Rs. 7113.67 • After 30 Years (2045) AD : Rs. 6080.04
24. Execution authority	:	Public Health Engineering Department, Assam.

CONTENTS

DISTRICT MAP



CHAPTER – I

INTRODUCTION

1.1 Background:

The Government of Assam is going to implement the World Bank assisted Rural Water Supply & Sanitation Project in Kamrup Metro 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 and quality in Kamrup District Zone-I will cover the habitations of Chandrapur Development Block. Population under the project area is **49355 souls 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 area 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.

4 nos. of existing rural water supply scheme out of 25 have already crossed 15 years of commissioning and 2 nos. are more than 30 years old. All these schemes were designed for a period of 15 years with 40 lpcd level of supply. The area is in the proximity of Guwahati capital city and people of the locality are accustomed to avail modern amenities like city residents. As a consequence these on-service schemes have become incapable of serving the actual need of the population.

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

(i) Iron affected : 29

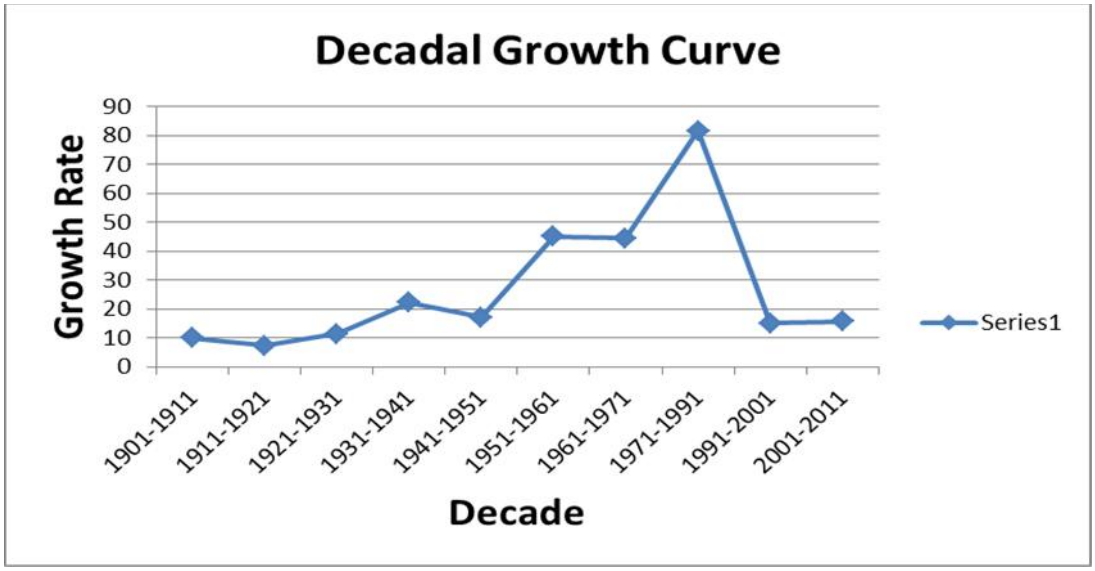
(ii) Fluoride affected : 11

The concentration fluoride level in certain areas like Mathgharia is as high as 9.2 ppm and several residents of the locality exhibits fluorosis symptoms like molting of the teeth as well as skeletal deformity.

The fractured rocky layer with discharge ranging from 4500LPH – 7500LPH is to be tapped as ground water source and inadequacy is experienced to run the scheme. Moreover, cynical behaviour of fractured zone is very often found to be too expensive. Hence, it is of utmost need to cover the entire area with water from a surface source and since the River Brahmaputra and the River Digaru is running adjacent to the project area, so it can easily be tapped.

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 Brahmaputra is flowing by 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. As per the report collected from the Water

Resource Department, Guwahati, the average discharge in lean period 6570.09 cumec/sec and in monsoon period is 25039.84 cumec/sec. (Report copy appended). Intake arrangement with floating barge has been considered for withdrawal of raw water from river Brahmaputra.

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 45 nos. villages under Chandrapur Development Block for the horizon period 2045.

1.2 Project Objectives:

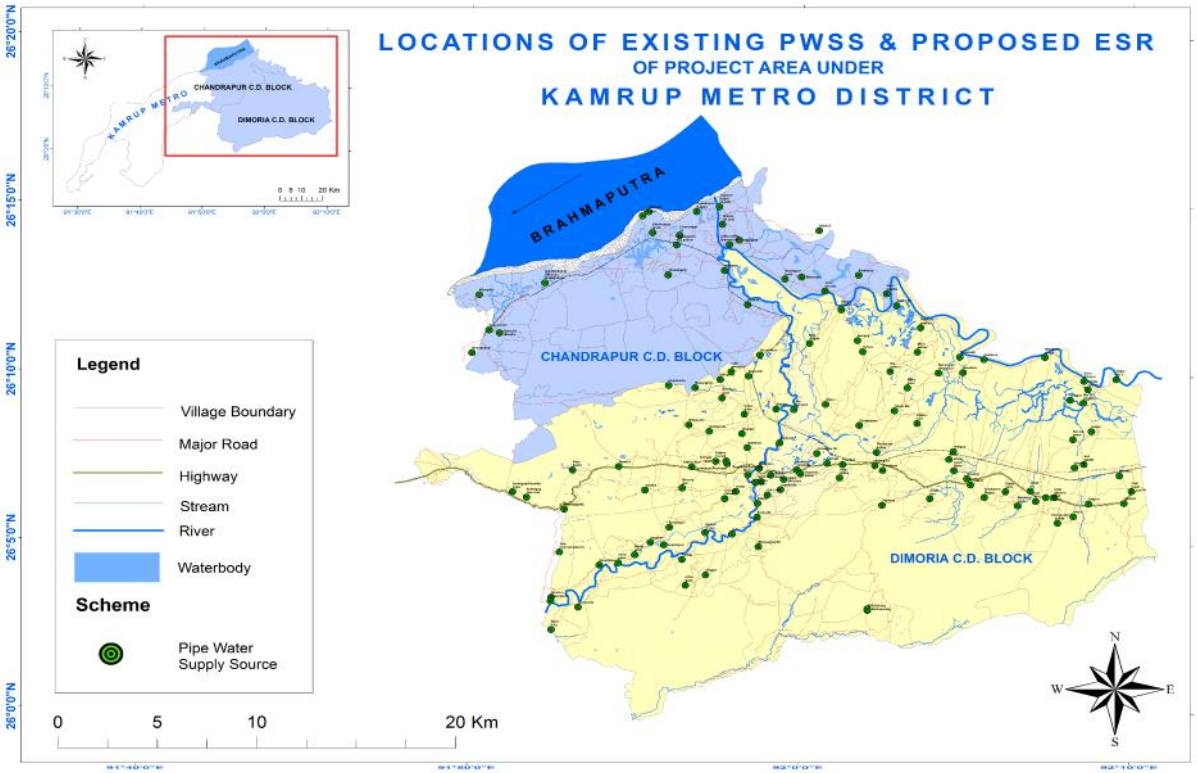
The project implementation objective is to improve rural water supply and sanitation services through progressive decentralization, community participation and enhanced accountability. The objective of the project is also to augment the capacity of the water supply arrangement of Kamrup district so as 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 Head quarters : Guwahati
Geographical Position:
North Latitude: 26°10' - 26°16'
East Longitude: 91°51' - 92°30'
Distances from major locations:
Nearest airport: Borjhar, Guwahati : 39 km
The project area lies in Chandrapur block of Kamrup district and in bounded in four directions as below:
North : Udalguri & Baksa district, South : Meghalaya, East: Darrang District & Kamrup Metropolitan District, West : Goalpara District & Nalbari 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. 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 neighborhood 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 km2 (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 25 nos. of rural PWSS have outlived their design period and the service level has drastically come down from even 40lpcd. 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 Chandrapur 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 x 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 population growth of the decade 2001-2011 in Kamrup district is 18.95 %. For design purpose the population is projected by taking into account of the state overall decadal growth i.e. 17%.

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 attracts 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. A section of the Assam-Bengal railway starts from Guwahati, and a branch of the Eastern Bengal railway has recently been opened to the opposite bank of the river. A metalled road runs due south from Guwahati to Shillong. 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. The natural depressions and low-lying areas are still un-claimed causing water stagnation in most of the eastern part of the valley mainly in Chandrapur block.

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. tamp. of Kamrup ranges 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 Chandrapur 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 Brahmaputra River.
ii. 5.0 MLD water treatment plant
iii. Sump of 1000 KL Capacity at Treatment Plant.
iv. Providing ESR of Capacity ranging from 150 KL to 250 KL with 16 m staging at 6 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 194 habitations proposed to be covered by the scheme, 123 are yet to be covered fully. The project area has 25 PWSS out of which 22 nos. are based on ground water, and the rest 3 nos. based on surface source. Out of the 25 existing scheme, 4 nos. has already crossed 15 years of commissioning and 2 nos area more than 30 years old. As a consequence these schemes have become incapable of serving the need of the population to the desired level. 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 : 29
(ii) Fluoride affected : 11

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:

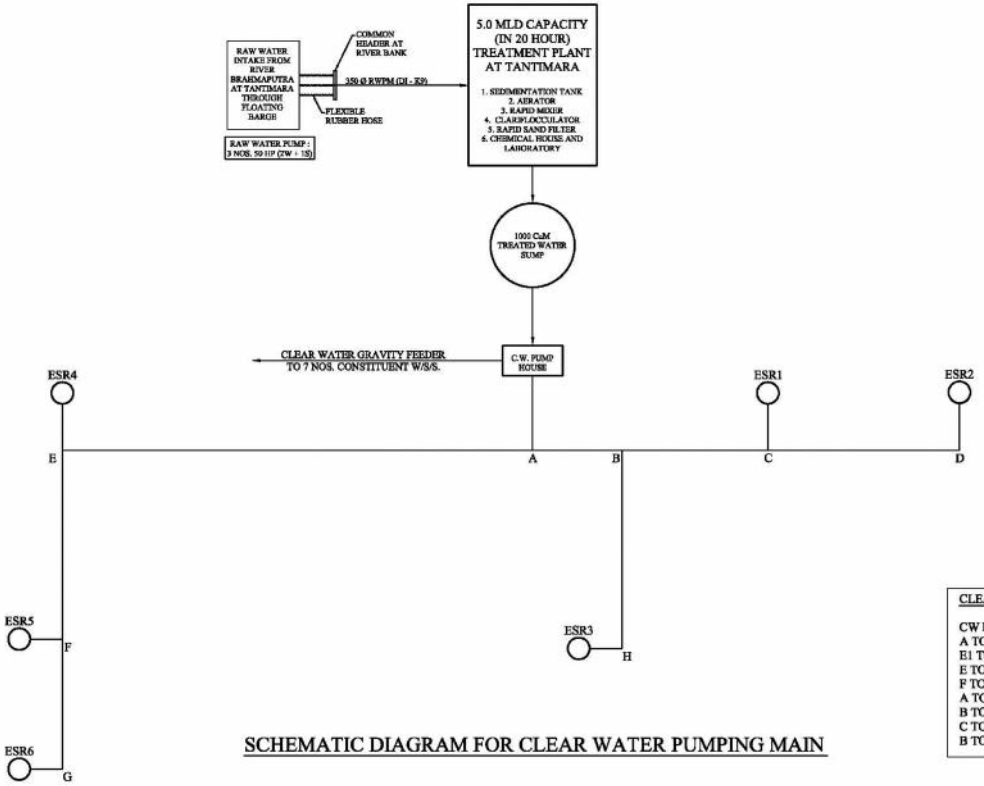
(a) 2011 YSR Population – 49355 souls.**(Annexure-B)**
(b) On commissioning in 2015 AD – 52768 souls.
(c) After 10 years of commissioning in 2025 AD – 61739 souls
(d) After 20 years of commissioning in 2035 AD – 72234 souls
(e) After 30 years of commissioning in 2045 AD – 84514 souls

2.5 Proposed Rate of supply : 70 lpcd .

2.6 Total Demand of Water :

Total demand for the project area at Different stages are :

- On commissioning in 2015 AD : 4.2 MLD
- After 10 Years in 2025 AD : 5.0 MLD.
- After 20 Years in 2035 AD : 5.8 MLD.
- After 30 Years in 2045 AD : 6.8 MLD.



SCHEMATIC DIAGRAM FOR CLEAR WATER PUMPING MAIN

CLEAR WATER MAIN :

CW PUMP HOUSE TO A : 1200.0 M. - 300 Ø,
A TO E1 : 6880.0 M. - 250 Ø
E1 TO E : 5680.0 M. - 250 Ø ; E1 TO ESR 4 : 400.0 M. - 100 Ø
E TO F : 4350. M. - 250 Ø : F TO ESR - 5 : 150.0 M. - 100 Ø
F TO G : 1500.0 M. - 150 Ø, G TO ESR - 6 : 100.0 M. - 100 Ø
A TO B : 1200.0 M. - 200 Ø
B TO C : 1970.0 M. - 150 Ø, C TO ESR - 1 : 450.0 M. - 100 Ø
C TO D : 2100.0 M. - 150 Ø, D TO ESR - 2 : 200.0 M. - 100 Ø
B TO H : 4560.0 M. - 200 Ø, H TO ESR - 3 : 500.0 m. - 100 Ø

CLEAR WATER PUMPS :

3 NOS. 20 HP (2W + 1S)

COMPOSITE WATER SUPPLY SCHEME FOR QUALITY & SUSTAINABILITY IN CHANDRAPUR & DIMORIADEVELOPMENT BLOCK OF KAMRUP DISTRICT
ZONE - I : CHANDRAPUR BLOCK
SCHEMATIC DIAGRAM

D:\16-07-13(WORLD BANK)\DPR Final RSC (FROM CD)\1 Final DPR_(24.07.2013)\DPR KAMRUP\Zone - I Chandrapur\3 Drawings\I

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 Norms for water supply:

Norms adopted for water supply as per CPHEEO norms.

3.3 Water Requirement:

The water requirement has been estimated for the total estimated prospective population projected for the year 2045. The Per capita requirement has been Considered as 70 LPCD.

3.4 Rate of per capita supply:

As per engineering matrices set for the implementation of Rural Water Supply Schemes under World Bank assisted project, per capita supply is considered as 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

Washing Cloths	10
Ablution	10
Total	70

3.5 Source:

It is proposed to draw raw water from the river Brahmaputra having sufficient run-off. As per the report collected from the Executive Engineer, Water Resource Division, Guwahati the average Run-off of River Brahmaputra is 6570.09 cumec in lean period and in monsoon period is 25039.84 cumec.

The intake point is selected at village Tatimara due to having the advantage of a rocky stable bank.

3.6 Design period:

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

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%.

Though habitations under coverage of the project area shows 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 Design Population to be served :

After 30 years of commissioning in 2045 AD – 84514 souls

3.9 Proposed Rate of supply: 70 lpcd.

3.10 Total Demand of Water:

Total demand for the project area at different stages are:

- On commissioning in 2015 AD: 4.2 MLD
- After 10 Years in 2025 AD: 5.0 MLD.

- After 20 Years in 2035 AD: 5.8 MLD.
- After 30 Years in 2045 AD: 6.8 MLD

3.11 Raw Water Transmission Main:

The raw water transmission Main shall be of DI Class K9 pipe of dia 350 mm with inside cement mortar lining for a total length of 750.00 RM. from Tatimara intake point at river Brahmaputra . 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: 7/3/2013

Sl.	Parameters	Test Result
1	P^H Value	6.2
2	Turbidity (NTU)	16.2
3	TDS (mg/l)	238
4	Total hardness(mg/l)	52
5	Alkalinity (mg/L)	64
6	Chloride (mg/L)	55
7	Nitrate(mg/L)	1.8
8	Calcium (mg/L)	25
9	Magnesium (mg/L)	16.5
10	Sulphate (mg/L)	429
11	Iron (mg/L)	0.15
12	Arsenic (mg/L)	0.005
13	Fluoride (mg/L)	0.07
14	Bacteriological strip test	+ve
15	Total solids (mg/L)	301
16	Total suspended solids (mg/L)	21.5
17	Lead(mg/l)	BDL
18	Phosphate (mg/l)	0.2
19	Ammonium (mg/l)	1.9
20	5 days BOD (mg/l)	34.2
21	COD (mg/l)	61.1
22	Manganese (mg/L)	0.5

Date of testing: 16/7/2013

Sl.	Parameters	Test Result
1	P^H Value	7.15
2	Turbidity (NTU)	280
3	Iron (mg/L)	1.5
4	Total hardness(mg/l)	216
5	Alkalinity (mg/L)	70
6	Chloride (mg/L)	40
7	Calcium (mg/L)	70
8	Fluoride (mg/L)	0.41

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 1000 Cum. is proposed along with the treatment plant to cater about 1 hour retention.

3.15 Elevated Service Reservoir (ESR) :

All total 6 Nos. Elevated service reservoirs spreading over the project area is proposed. Total capacity of all these 6 ESR shall be 1350.0 Cu.m., which is almost equal to 8 hour requirement of the project.

3.16 Transmission of treated Water :

Treated water from the underground clear water sump at treatment plant shall be fed to the different ESR through common header type clear water pumping main. The total length of clear water main shall be 31240.0 m comprising of different required diameter DI Class K7 pipe with inside Cement Mortar lining for serving ESR No. 1 to 6. The Design for different Clear Water Pumping Main is shown in **Annexure –C**

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 250.0 KW.

3.18 Estimated Project cost :

Rs. 50.88 (Rupees fifty point eight eight) crore only.

3.19 Per capita cost :

- On commissioning (2015) AD : Rs. 9737.88
- After 10 Years (2025) AD : Rs. 8322.92
- After 20 Years (2035) AD : Rs. 7113.67
- After 30 Years (2045) AD : Rs. 6080.04

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-

A) Raw water Intake System comprising of:

- M.S. Floating Barge with all necessary mooring materials & lifesaving equipment; tying arrangement; Over Head gantry Crane etc.

B) Raw Water Pumping Machinery and other accessories comprising of:

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

C) Raw Water Conveying Main

Supplying, laying, jointing, testing and commissioning of 350 mm dia DI S.S. raw water pumping main including all necessary valves & specials, valve chamber, supporting structures, anchor / thrust block etc., complete

D) Water Treatment Plant comprising of:

- Design and Construction of Complete Water Treatment Plant of capacity 5.0 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.)

- Construction of 10,00,000 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
- Land Development & Security Wall at Treatment Plant Location
- Twin Type Assam building accommodation at Treatment Plant Location for 3 (three) Nos. Pump Operator and 1 (one) No. Chowkider (Jointly for the Intake Station and Treatment Plant).
- Internal Road / Path etc.; Landscaping & Arboriculture including Compound illumination in the treatment plant site
- Approach Road to Treatment Plant Site from the nearby public road
- Dedicated Power Line to Treatment Plant including Substation
- Captive Power Generator at Treatment Plant

E) Clear Water Pumping System comprising of:

- Clear Water Pumping machinery at the treatment plant for all the Clear water feeder route including all necessary electrical and other installation works
- Clear Water Pump House at Treatment Plant Location
- Manifold type Common Header for the Clear water main of Different Route and RCC Pump foundation

F) Clear Water Conveying Main comprising of:

Supplying, laying, jointing, testing and commissioning of different required diameter DI/S.S. Clear water pumping main for Route - I serving ESR Nos. 1,2,3,4,5 and 6, including all necessary valves & specials, valve chamber, supporting structures, anchor / thrust block etc., complete

G) Elevated Service Reservoir comprising of:

- 200,250,150,250,250,250 Cum 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.
- Approach Road to ESR Location

H) Distribution System comprising of:

- Laying of DI Feeder Main from respective ESR to the concerned WDN
- Extension, Renovation, Augmentation of the existing Distribution network
- House service connection comprising of saddle piece, 10.0 m. PPR Pipe, Ferrule Cock etc.

I) 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

J) Auto Control System comprising of SCADA for auto control of the complete system.

K) 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 Annexures :

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

Name of GP and Respective Villages to be covered by the Project

Block Name	Panchayat Name	Village Name
1 Chandrapur	1 Chandrapur	1 Tatimara 2 Chandrapur No.2 3 Chandrapur Gaon 4 Missamari No.2 5 Missamari Gaon 6 Thakurkuchi Gaon 7 Thakurkuchi No.2 8 Thakurkuchi N.C. 9 Barchapari 10 Nij-Panbari Gaon 11 Nij-Panbari No.2 12 Chandrapur Bagicha 13 Chandrapur Bagicha (Ct)
	2 Panikhaiti	1 Hajobori 2 Hajobari No.2 3 Khankar No-2 4 Panikhaiti Gaon 5 Panikhaiti No.2 6 Bonda Gaon 7 Bonda No-2 8 Bonda Grant 9 Kharghuli Gaon 10 Kharghuli No.2 11 Kharghuli N.C.(Rajaba 12 Tintukura N.C. 13 Birkuchi No.2 14 Khankar N.C. 15 Hajobari N.C. 16 Bonda Grant No-2
	3 Amsing	1 Kalitakuchi N.C. 2 Amsing 3 Amsing N.C. 4 Bajrang Nc
	4 Pachim Mayong	1 Kajali Chowki 2 Garubandha 3 Gobhali 4 Kamarpur Pahar 5 Ghoramarajan Par 6 Dhamkhunda No.2 7 Hatibagara 8 Dhipuji Pathar 9 Dhipujijan Pam 10 Kamarpur 11 Dhamkhunda No.1 12 Gobardhan Grant

Annexure - B

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

Block Name	Panchayat Name	Village Name	Habitation Name		Present Population			
					SC	ST	GEN	Total
2 Chandrapur	1 Chandrapur	1 Tatimara	1	Tatimara	11	7	332	350
			2	Ganeshmandir	6	10	84	100
			3	Nizarapar	8	4	138	150
		2 Chandrapur No.2	1	Chandrapur No-2	0	11	168	179
			2	2 No Chandrapur	0	8	152	160
			3	Santipara	0	4	116	120
			4	Hjhnjkhkj (Sadhughuli)	0	8	122	130
		3 Chandrapur Gaon	1	Chandrapur Gaon	25	5	476	506
		4 Missamari No.2	1	Missamari No-2	0	53	20	73
			2	Nalghuli	0	0	150	150
		5 Missamari Gaon	1	Missamari	0	500	50	550
		6 Thakurkuchi Gaon	1	Thakurbari	0	0	60	60
			2	Ganeshgaon	0	0	100	100
			3	Dombitoli	0	0	100	100
			4	Medhikuchi	0	0	50	50
			5	Ahom Chupa	0	0	100	100
			6	Teteliguri	0	0	50	50
			7	Pagla Chupa	0	0	90	90
			8	Kochpara	0	0	110	110
			9	Thakurkuchi	0	0	100	100
		7 Thakurkuchi No.2	1	Thakurkuchi No-2	0	0	105	105
			2	Bilor Par	0	0	60	60
			3	Baregog Chupa	0	0	60	60

Block Name	Panchayat Name	Village Name	Habitation Name		Present Population			
					SC	ST	GEN	Total
2 Chandrapur	1 Chandrapur	8 Thakurkuchi N.C.	1	Thakurkuchi Nc	0	0	176	176
		9 Barchapari	1	Barsapari	0	0	132	132
			2	Ai Than	0	0	112	112
		10 Nij-Panbari Gaon	1	Niz Panbari Gaon	0	0	150	150
			2	Pirkuchi	0	0	110	110
			3	Rajakuchi	0	0	115	115
			4	Balikhara	0	0	120	120
			5	Benkuchi	0	0	105	105
			6	Barigog	0	0	110	110
		11 Nij-Panbari No.2	1	Nizpanbari No-2	12	1	139	152
			2	Katatali	10	2	158	170
			3	Mazubam	0	0	122	122
		12 Chandrapur Bagicha	1	Pragjoytish Nagar	6	50	344	400
			2	Digarumukh	8	20	445	473
			3	Akhashi Nagar	4	30	66	100
			4	Narasingha Bazar	7	43	250	300
			5	Chadrapur Bagicha (Ct) Ward No-1	15	250	335	600
			6	Jonaki Nagar	0	0	300	300
			7	Ahmed Nagar	0	0	275	275
		13 Chandrapur Bagicha (Ct)	1	Chadrapur Bagicha	0	0	100	100
			2	Singimari	0	35	215	250
			3	Rajgarh	0	0	250	250
			4	Block	0	0	200	200
			5	No-1 Chandrapur	0	0	173	173

Block Name	Panchayat Name	Village Name	Habitation Name		Present Population			
					SC	ST	GEN	Total
2 Chandrapur	2 Panikhaiti	1 Hajobori	1	Hajongbari	43	80	77	200
			2	Mikir Chbuba	31	39	130	200
			3	Kachari Basti	20	10	125	155
			4	Lutuma Gog	45	38	27	110
			5	Rohang Suba	0	173	314	487
		2 Hajobari No.2	1	Nepali Basti	0	11	139	150
			2	Hajongbari	5	5	220	230
			3	Dumpara	5	6	141	152
		3 Khankar No-2	1	Khankar No-2	1	4	110	115
			2	Ekara Basti	1	3	110	114
			3	Sam Pathar	0	70	39	109
			4	Malogog	0	3	98	101
		4 Panikhaiti Gaon	1	Panikhaiti	148	120	432	700
			2	Bengenabari	100	96	374	570
			3	Tyamulbari	85	40	365	490
			4	Nepali Basti	105	50	160	315
			5	Belguri	70	55	295	420
			6	Bihari Chuba	0	45	180	225
		5 Panikhaiti No.2	1	Panikhaiti N-2	7	0	109	116
			2	Kushal Nagar	0	0	143	143
			3	Rail Gate	0	0	106	106
			4	Kalimandir	5	0	103	108
			5	Jugal Nagar	0	0	112	112
			6	Lahar Para	0	12	100	112
			7	Lahar Para Nepali Basti	0	0	105	105
			8	Gandhi Nagar	2	0	122	124
			9	Bongaon	0	5	107	112
			10	Chun Factory	0	6	112	118
			11	Diyaswara Basti	0	0	109	109
			12	Training Center	0	0	114	114
			13	Lakhimandir	0	0	161	161

Block Name	Panchayat Name	Village Name	Habitation Name		Present Population			
					SC	ST	GEN	Total
2 Chandrapur	2 Panikhaiti	6 Bonda Gaon	1	Bonda	143	164	245	552
			2	Upper Hatisila	0	100	250	350
			3	Birkuchi Nc	0	100	945	1045
		7 Bonda No-2	1	Bonda No-2	0	9	200	209
			2	Dhumbari	50	45	23	118
			3	Ranghunath Choudhury	28	0	150	178
			4	Namghar Path	0	0	150	150
			5	Bonda Teron Path	22	6	114	142
			6	Dadhi Rongpi Path	0	0	223	223
		8 Bonda Grant	1	No-1 Grant	337	0	400	737
			2	Amgaon	100	2	320	422
			3	Amgaon Tari Bagan	130	0	371	501
		9 Kharghuli Gaon	1	Kharghuli Gaon	8	194	430	632
			2	Rajabari	5	145	405	555
		10 Kharghuli No.2	1	Kharghuli No-2	160	30	290	480
			2	Ramsing Sapari	107	28	165	300
			3	Sapaidang	105	30	115	250
			4	Ghuligaon	175	12	33	220
		11 Kharghuli N.C.(Rajaba	1	Kharghuli Nc (Rajabari)	5	53	252	310
			2	Surajnagar	35	50	215	300
			3	Dhubguri	25	50	342	417
		12 Tintukura N.C.	1	Tintukuria Nc	0	0	150	150
			2	Kalimandir	97	8	412	517
			3	Santipur	12	9	371	392
			4	Siba Mandir	21	0	422	443
			5	Boro Chok	12	89	315	416
			6	Sri Nagar	0	8	127	135
			7	Madgharia No 2	12	0	107	119
		13 Birkuchi No.2	1	Birkuchi No-2	7	42	136	185
			2	Surjya Nagar	9	18	163	190
			3	Bonda Birkuchi Link Road	0	0	109	109
			4	Assam Carbon Chuba	3	10	97	110
			5	Siv Mandir Path	3	4	98	105
			6	Birkuchi Oil India	10	0	100	110

Block Name	Panchayat Name	Village Name	Habitation Name		Present Population			
					SC	ST	GEN	Total
2 Chandrapur	2 Panikhaiti	14 Khankar N.C.	1	Khankar Nc	5	25	289	319
			2	Khankar Chuba	4	10	106	120
			3	Hatisila	0	11	189	200
			4	Pub Khandar	4	14	144	162
		15 Hajobari N.C.	1	Hajongbari Nc	5	17	110	132
		16 Bonda Grant No-2	1	Bonda Grant No-2	5	7	663	675
	3 Amsing	1 Kalitakuchi N.C.	1	Kalita Kuchi	17	23	527	567
			2	Natun Basti	11	20	453	484
			3	Piyal Basti	8	14	322	344
			4	Imli Basti	9	17	334	360
			5	No-2 Tal Tala	11	17	303	331
		2 Amsing	1	Amsing	5	10	213	228
			2	Silani Basti	3	0	117	120
			3	Jarna Basti	5	6	469	480
			4	Jorabat	5	7	408	420
			5	Santi Basti	12	1	387	400
			6	Na Mile	10	3	227	240
			7	Hindi School Basti	9	5	126	140
			8	Batakuchi Nc	3	0	1081	1084
			9	Dakhin Satgaon Suba	4	0	296	300
			10	Naupara	0	4	298	302
			11	Ambari Kabarthan	3	0	384	387
			12	Satgaon Suba	5	0	261	266
			13	Dakhin Chuba	3	0	102	105
		3 Amsing N.C.	1	Amsing Nc	0	34	181	215
			2	Dakhin Ashram Basti	8	11	122	141
			3	Ghuli Gaon	6	18	170	194
			4	Amtola	8	11	202	221
			5	Ashram Basti	0	9	286	295
		4 Bajrang Nc	1	Bajrang	0	5	173	178

Block Name	Panchayat Name	Village Name	Habitation Name		Present Population			
					SC	ST	GEN	Total
2 Chandrapur	4 Pachim Mayong	1 Kajali Chowki	1	Kajali Chaki	0	0	15	15
			2	Mazar Suba	15	0	30	45
			3	Sitari	15	0	40	55
			4	Jagobari	150	0	20	170
			5	Janpar	25	35	15	75
			6	Barbari	40	40	32	112
			7	Kajali Janpam	0	0	16	16
		2 Garubandha	1	Garubandha	200	0	300	500
			2	Hatigarh	100	0	150	250
		3 Gobhali	1	Gobhali	150	0	150	300
			2	Shilghar	100	0	200	300
			3	Kalita Para	50	0	200	250
		4 Kamarpur Pahar	1	Kamar Pathar	200	0	200	400
		5 Ghoramarajan Par	1	Gharamara Jan Par	40	0	400	440
			2	Uttarpara	200	0	100	300
			3	Ganeshmandir	100	0	150	250
			4	Beltola	100	0	150	250
			5	Naromari Ghuli	150	0	50	200
		6 Dhamkhunda No.2	1	Dhankhunda No-2	100	100	200	400
			2	Malobasti	25	50	175	250
		7 Hatibagara	1	Hatibagara	200	100	200	500
			2	Bihari Basti Mikirpam	100	50	250	400
		8 Dhipuji Pathar	1	Dhepuji Pathar	150	0	150	300
			2	Bherbheri	200	0	200	400
		9 Dhipujijan Pam	1	Dhepuji Janpam	500	100	400	1000
			2	Kalongpar	150	50	50	250
			3	Nalani	200	50	50	300
			4	Dighalhati	100	0	400	500
		10 Kamarpur	1	Kamarpur	120	0	82	202
			2	Barghuli	0	0	20	20
			3	Santipur	0	0	75	75
			4	Balguri	17	0	46	63
			5	Kamarpur Pahar	200	0	104	304

Block Name	Panchayat Name	Village Name	Habitation Name		Present Population			
					SC	ST	GEN	Total
2 Chandrapur	4 Pachim Mayong	11 Dhamkhunda No.1	1	Dhankhunda No-1	200	0	100	300
			2	Kardia	100	0	200	300
			3	Punnasali	100	0	0	100
		12 Gobardhan Grant	1	Gobardhan Grant	300	100	100	500
			2	Chakraghuli	200	0	100	300
			3	Barman Basti	150	0	150	300
			4	Niz Gobardhan No-1	0	0	250	250
			5	Niz Gobardhan No-2	0	200	0	200
			6	Mahadev Bari	200	0	100	300
			7	Nath Basti	200	0	150	350
			8	Shillong Basti	0	150	100	250
			9	Jalo Basti	100	0	100	200
			10	C N I Suba	100	0	150	250
			11	Catholic Suba	0	150	100	250
			12	Jali Khona	0	0	200	200
			13	Tila Suba	0	0	150	150
			14	Mash Ghat	100	0	0	100
			15	Gobardhan Ghat	500	0	0	500
			16	Gobardhan	350	0	0	350
				Total Popln of Chandrapur	**8871**	**4592**	**35892**	**49355**

Population Projection :

Population of Zone - I (Chandrapur Block) 49355

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

Present Population in 2013 = 176987 + 176987 x 0.034 = 51033 Souls
The project shall be commissioned in 2015 AD.
Therefore,
Population in the Year of commissioning (2015) :
= 183005 + 183005 x 0.034 = 52768 Souls
Population after 10 Years of commissioning in (2025) = :
= 189227 + 189227 x 1.17 = 61739 Souls
Population after 20 Years of commissioning in (2035) :
= 221395 + 221395 x 1.17 = 72234 Souls
Population after 30 Years of commissioning in (2045) :
= 259032 + 259032 x 1.17 = 84514 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) :	4247839.648 Ltr	4.2 MLD
b) After 10 Years of commissioning in (2025) :	4969972.388 Ltr	5.0 MLD
c) After 20 Years of commissioning in (2035) :	5814867.694 Ltr	5.8 MLD
d) After 30 Years of commissioning in (2045) :	6803395.201 Ltr	6.8 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 - I : CHANDRAPUR 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	4.20	MLD	52768	1
	Intermediate	2030	5.30	MLD	66224	1
	Ultimate	2045	6.80	MLD	84514	1
2	Length of Rising main			750	meter	
3	Static head including residual head			73	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	4.2	Mld	5.3	Mld
2)	Discharge at the end of 15 years	5.3	Mld	6.8	Mld
3)	Average discharge (MLD)	4.75	Mld	6.05	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	17.92	hrs	17.79	hrs
6)	Discharge in pumping hours	6.36	Mld	8.16	Mld
7)	KW required	1.03	H1	1.32	H2
8)	Annual cost of electrical energy	41899.23	KW1	41594.39	KW2
	=	43196.76	H1	55019.04	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 6.36 MLD	2nd stage 8.16 MLD	1st stage	2nd stage flow	Frictional loss (in mt.)	Other 10% of friction	Total losses 73 (in mt.)	Frictional (in mt.)	Other 10% of friction	Total losses 73 (in mt.)
1	250	7.72	12.25	1.50	1.92	5.79	0.58	79.37	9.19	0.92	83.11
2	300	3.18	5.04	1.04	1.34	2.38	0.24	75.62	3.78	0.38	77.16
3	350	1.50	2.38	0.76	0.98	1.12	0.11	74.24	1.78	0.18	74.96
4	400	0.78	1.24	0.59	0.75	0.59	0.06	73.65	0.93	0.09	74.02
5	450	0.44	0.70	0.46	0.59	0.33	0.03	73.36	0.52	0.05	73.58
6	500	0.26	0.42	0.37	0.48	0.20	0.02	73.22	0.31	0.03	73.35
7	600	0.11	0.17	0.26	0.33	0.08	0.01	73.09	0.13	0.01	73.14
8	700	0.05	0.08	0.19	0.25	0.04	0.00	73.04	0.06	0.01	73.07
9	750	0.04	0.06	0.17	0.21	0.03	0.00	73.03	0.04	0.00	73.05

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

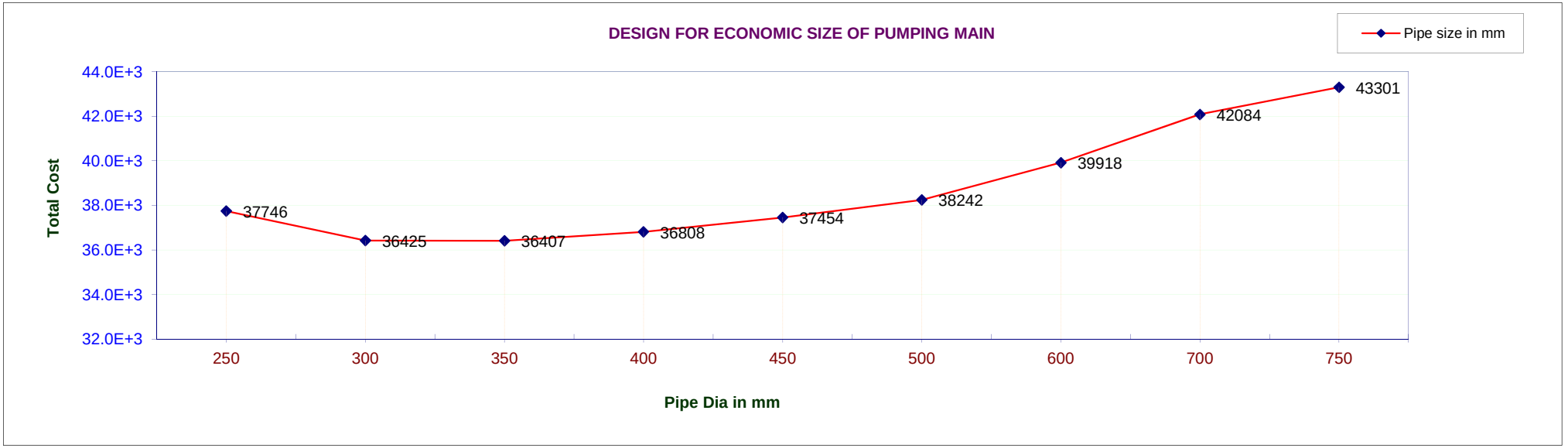
Sr no	Pipe size in mm	1st stage flow			2nd stage flow		
		H1 total head loss (in m)	Kw required with stand by	Cost of Pump (Rs. In thousand)	H2 total head loss (in m)	Kw required with stand by	Cost of Pump (Rs. In thousand)
1	250	79.37	122.74	859	83.11	164.90	1154
2	300	75.62	116.95	819	77.16	153.09	1072
3	**350**	**74.24**	**114.80**	**804**	**74.96**	**148.74**	**1041**
4	400	73.65	113.89	797	74.02	146.87	1028
5	450	73.36	113.45	794	73.58	145.99	1022
6	500	73.22	113.23	793	73.35	145.53	1019
7	600	73.09	113.03	791	73.14	145.12	1016
8	700	73.04	112.96	791	73.07	144.97	1015
9	750	73.03	112.94	791	73.05	144.94	1015

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. 750	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	79	83	2204	859	3429	26081	29144	1154	4572	34775	8601	37746
2	300	76	77	2771	819	3267	24849	28439	1072	4245	32288	7986	36425
3	**350**	**74.24**	**75**	**3452**	**804**	**3207**	**24393**	**28648**	**1041**	**4124**	**31367**	**7758**	**36407**
4	400	74	74	4153	797	3181	24195	29145	1028	4073	30980	7662	36808
5	450	73	74	4941	794	3169	24104	29839	1022	4048	30789	7615	37454
6	500	73	73	5800	793	3163	24058	30651	1019	4035	30691	7591	38242
7	600	73	73	7544	791	3157	24012	32348	1016	4024	30607	7570	39918
8	700	73	73	9733	791	3155	23997	34521	1015	4020	30576	7563	42084
9	750	73	73	10952	791	3155	23997	35740	1015	4019	30569	7561	43301

Table 3 shows that the most economical size of Main is **350** mm costing Capitalised Rs. **36406696.20**

Dia of economical size of rising main 350 mm



Therefore,

1. With this set of condiditions, economic diameter of raw water pumping main = 35**0** mm dia. DI (K9) pipe
2. Required capacity of pump with 50 % provision = 114.80 KW. = 154 HP Say, **150.0** HP.
3. Let Us Provide 3 Nos of Raw Water Pump (2 W + 1 S) of capacity = **50** HP Each

DETAILED DESIGN OF CW PUMPING MAIN FROM TREATMENT PLANT TO RESPECTIVE ESR FOR ZONE - I

Present population 2013	=	30,893	soul	Working period	=	20	hr
Population at installation 2015	=	31,943	soul	Head available at TP Site	=	40	m
Population at installation 2030	=	40,089	soul	Minimum terminal head	=	20	m
Design population 2045	=	51,161	soul	RL OF TP SITE	=	123.00	m
Rate of supply	=	70	LPCD	Hydraulic level at service reservoir	=	40 + RL	m
Rate of supply with wastage	=	77	LPCD		=	163.00	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 (soul)	Design population on the the line (soul)	Design polulation to be served by the line (soul)	Length of line (m)	Peak flow (LPM)	Pipe dia				Head loss for 1000 m (m)	Total head loss (m)	Hydraulic level (m)	RL (m)	Termina l 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	30893	0	51161	1200.00	3282.82	300				1.83	2.20	160.80	109.70	51.10	
A-A1	0	17238	0	28547	6880.00	1831.78	250				1.51	10.39	150.42	124.80	25.62	
A1-E	0	17238	0	28547	5680.00	1831.78	250				1.51	8.58	141.84	113.20	28.64	
E-ESR4	5710	5710	9456	9456	400.00	606.77	100				16.95	6.78	135.06	108.90	26.16	ESR 4
E-F	0	11528	0	19091	4350.00	1225.02	250				0.72	3.13	138.71	112.60	26.11	
F-ESR5	5688	5688	9420	9420	150.00	604.43	100				16.83	2.52	136.18	106.70	29.48	ESR 5
F-G	0	5840	0	9671	1500.00	620.58	150				2.45	3.68	135.03	110.10	24.93	
G-ESR6	5840	5840	9671	9671	100.00	620.58	100				17.67	1.77	133.26	112.60	20.66	ESR 6
A-B	0	13655	0	22614	1200.00	1451.04	200				2.91	3.49	157.31	113.20	44.11	
B-C	0	10242	0	16961	1970.00	1088.36	150				6.94	13.67	143.64	109.90	33.74	
C-ESR1	4552	4552	7538	7538	450.00	483.72	100				11.14	5.01	138.63	113.50	25.13	ESR 1
C-D	0	5690	0	9423	2100.00	604.64	150				2.34	4.91	138.73	111.80	26.93	
D-ESR2	5690	5690	9423	9423	200.00	604.64	100				16.84	3.37	135.36	110.90	24.46	ESR 2
B-H	0	3413	0	5652	4560.00	362.68	200				0.22	1.00	156.31	122.80	33.51	
H-ESR3	3413	3413	5652	5652	500.00	362.68	100				6.54	3.27	153.04	131.50	21.54	ESR 3
Total	**30893**				**31240.00**											

Summary of pipe dia and length

Dia (mm)	Length (m)
300	1200.00
250	16910.00
200	5760.00
150	5570.00
100	1800.00
Total	**31240.00**

Design of Clear Water Pump Set (for 15 yrs)

(i) Total Daily Demand = 3086846.8 LPD
(ii) Total Hourly Demand = 154342.34 LPH
(iii) Total Demand Per Minute = 2572.37 LPM
(iv) Total Head of Pump = 40 M

$$\text{HP Reqd.} = \frac{2572.37 \times 40}{4500 \times 0.7}$$

= 32.67 HP

provide 3 Nos. pump (2W + 1S) of capacity = 20.00 HP each

For BoQ Purpose, let us have 3 Pump Set, each giving 21.4 lps against a total head of 40.0 m

Annexure - D

HYDRAULIC DESIGN AND UNIT SIZING OF VARIOUS UNIT OF 5.00 MLD CAPACITY WATER TREATMENT PLANT IN 20 HOURS OF OPERATION

Capacity of the Treatment plant = 5.00 MLD.

Operating hours of the Plant = 20.0 hours

Therefore, hourly rate of treatment = 250.0 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.

2.1 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 = 250.0 Cu.m/hour.

= 0.07 Cu.m./sec.

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

= 0.09 Sq.m.

Therefore, required dia of the influent pipe = 0.333 m.

Let us provide 350 mm dia DI pipe as aerator Inlet.

2.2 Aeration Deck Size :

In our case, we propose for 1 aerator with hourly rate of flow of 250.0 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, 250.0 x 0.045 = 11.25 Sq.m. Let us provide a cascade aerator of overall inner diameter 5.1 m. with 5 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= 250.0 m^3/hour.

Detention time = 45 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

$$=\left(\frac{250.0}{60 \times 60}\right) \times 60 = 4.29\ M^3.$$

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

$$\left(\pi/_4 \times D^2\right) \times 1.5\ D = 4.29\ m^3$$

$$\therefore\ D = 1.6\ m, \text{ say, } 2.0\ m.$$

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

$= 250.0\ M^3/hour$

Detention period = 40 minute.

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

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

$$= \sqrt{\frac{250.0}{60 \times 60} \times \frac{1}{0.8} \times \frac{4}{\pi}} = 0.333 \text{ m.},$$

Let us provide a influent pipe of diameter, 350 mm.

Now, Volume of the flocculator

= (250.0 / 60) x 40 = 166.7m^3

(Considering 40 minute detention)

Providing a water depth of 4.5 m., area of the flocculator required = 37.037 m^2

Let D_f be the diameter of the flocculator and D_p be the influent pipe diameter.

Then, $\frac{\pi}{4} \times (D_f^2 - D_p^2) = 63.89\ m^2$,

Since D_p = 350+350x2=1050 mm, therefore, D_f =9.08 m.

Let us provide a tank of 9.0 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

$$= \frac{250.0 \times 20}{60} = 83.333\ m^2.$$

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 = 9.5 m.

Then, $\frac{\pi}{4} \times (D_c^2 - D_f^2) = 83.333\ m^2$,

Since D_f = 9.5 m., therefore, D_c =14.014 m.

Let us provide a tank of 14.0 m. for clarifier zone.

Now, length of the weir = π x 14 = 43.96 m.

Therefore, weir loading

$$= \frac{250.0 \times 20}{43.96} = 113.74\ m^3/day/m < 300 m^3/day.m.,\ O.K.$$

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 250.0 Cu.m, using an average limit of 5.7 m^3/m^2/hour, space required for the filter bed is worked out as 43.86m^2 for a average outflow of 250.0 m^3 per hour. For having flexibility of use, if we provide 2 (tw0) beds, area of each bed required is 21.93 m^2. Applying a length to width ratio of 1.25:1, the size of each bed shall be 4.19 m. x 5.24 m.

Let us provide a rapid sand filter unit having eight beds of size 4.8 m. x 6.0 m. each. Therefore, area available for filtration = 4.2 x 5.5 x 2 bed = 46.2 Sq.m., giving a filtration rate of 5.41 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.

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 - I : CHANDRAPUR 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.15,98,680.00
1.2	Dedicated Power Line to Intake including Substation	Not required. It is adjucent to TP
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.34,74,725.00
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.17,81,395.00
3	**Raw Water Conveying Main**	
3.1	Supplying, laying, jointing, testing and commissioning of 350 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 for Zone - I	Rs.91,83,950.00
4	**Water Treatment Plant**	
4.1	Design and Construction of Complete Water Treatment Plant of the 5.0 MLD capacity (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, as per specification provided in the connected Annexure. (@ Rs. 3.20 per Litre) (Note : The TP shall inclued provision for one Water Works Office and for Strage Accn.)	Rs.2,72,04,179.00

Sl. No.	Major Item of Works	Amount
4.2	Construction of following 1000 Cu.m. Capacity RCC Under Ground Treated Water Sump having provision for all inlet, outlet & overflow arrangement; mechanical type water evel indicator; Air Vent Pipe; Men Hole with Cover; CI Lugs inside the sump etc. , complete	Rs.64,32,370.00
4.3	Land Development & Security Wall at Treatment Plant Location	Rs.27,43,025.00
4.4	Twin Assam Type Staff Quarter at Treatment Plant Locations For Zone - I : 2 Nos. for 3 (three) Nos. of Operator and 1 (one) No. Chowkider (Jointly for the Intake Station and Treatment Plant):	Rs.22,07,440.00
4.5	Internal Road / Path etc.; Landscaping & Arboriculture including Compound Illumination in the treatment plant site	Rs.4,92,560.00
4.6	Approach Road to Treatment Plant Site from the nearby public road	Rs.1,10,88,465.00
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.90,03,440.00
4.8	Captive Power Generator	Rs.47,01,000.00
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.17,53,920.00
5.2	Clear Water Pump House at Treatment Plant Location	Rs.14,84,040.00
5.3	Manifold type Common Header for the Clear water main of Different Route and RCC Pump Foundation	Rs.3,87,730.00

Sl. No.	Major Item of Works	Amount
6	**Clear Water Conveying Main**	
6.1	Supplying, laying, jointing, testing and commissioning of 400 mm to 100 mm dia DI S.S. Clear water pumping main for Route - I of Zone - I serving ESR Nos. 1 to 6 including all necessary valves & specials, valve chamber, supporting structures, anchor / thrust block etc., complete	Rs.14,32,83,910.00
7	**Elevated Service Reservoir**	
7.1	Construction of 6 (six) 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 aerestoe, solar power system, security wall, signboard, landscapping, & arboriculture etc. at per litre rate as per the cost curve annexed in Annexure : E - 7.1	
	1) ESR No. 1 : 200 Cu.m.	Rs.58,92,721.00
	2) ESR No. 2 : 250 Cu.m.	Rs.63,37,585.00
	3) ESR No. 3 : 150 Cu.m.	Rs.48,23,115.00
	4) ESR No. 4 : 250 Cu.m.	Rs.63,37,585.00
	5) ESR No. 5 : 250 Cu.m.	Rs.63,37,585.00
	6) ESR No. 6 : 250 Cu.m.	Rs.63,37,585.00
7.2	Approach Road to ESR Location (total 6 site)	Rs.32,67,750.00
8	**Distribution System**	
8.1	DI Feeder Main from respevtive ESR to the concerned Distribution network	Rs.7,64,44,955.00
8.2	Extension, Renovation, Augmentation of the existing Distribution network	Rs.11,47,52,461.00
8.3	House connection comprising of shaddle piece, 10.0 m. PPR Pipe, Ferruule Cock etc.	Rs.1,65,18,650.00
9	**Water meter with 5 year maintanence contract**	
9.1	Bulk Water meter	Rs.26,95,870.00
9.2	Domestic Water meter	Rs.1,65,86,700.00
10	**Auto Control System**	
10.1	SCADA for auto control of the complete system	Rs.1,56,07,600.00
	Total =	Rs.50,87,60,991.00
	Say,	**Rs. 50.88 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

A. 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 – I: Chandrapur Block

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S. No.	Description	Particulars	Remarks
GENERAL			
1.	Name of Habitation(s)	194 Nos. (List annexed)	
2.	Name of Gram Panchayat(s)	4 Nos. (List annexed)	
3.	Name of Block(s)	Chandrapur Block	
4.	Name of District	Kamrup	
5.	Population (present)	51033 (2013 AD)	
6.	Total water demand (Litres per day)	4.1 MLD in 2013 AD	
7.	Present water supply (Litres per day)	1.53 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)	5.0 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 Brahmaputra 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?	5.0 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 2. SVS with source in deep aquifer located in safe zone of exploitation 3. SVS with perennial surface water source requiring slow sand filtration only	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. 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. 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 – I: Chandrapur 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 Chandrapur (Zone – I) Project

None of the components of the Chandrapur (Zone – I) 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 – I: CHANDRAPUR 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 + 3 Nos. for Raw & Clear Water Main	9	Nos.	12000	108000.00
iv)	Watchman =1 No. at Intake + 1 No. at TP + 6 Nos. for ESR	8	Nos.	12000	96000.00
B)	Energy Charges:				
i)	Power charge, considering average 18 hours availability of power @ Rs. 5.15 perKWH	73921	KWH	5.15	380693.15
ii)	Electricity Duty @ Rs. 0.10 per KWH	73921	KWH	0.10	7392.10
iii)	Fixed Electricity Charge @ Rs. 125.00 per KVA per month	250.0	KVA	125.00	31250.00
C)	Fuel Charge for balance 2 hours	8213.0	KWH	13.74	112830.19
D)	Chemicals				
	i) Lime				9750.00
	ii) Alum				31920.00
	iii) Bleaching Powder				13680.00
E)	Maintenance of bulk water supply (except roads & buildings)., @ 0.05 % of the respective Capital Cost	251050130.00			125525.07
F)	Maintenance of Intra Village Water Supply @ 0.05 % of the respective Capital Cost	233227875.00			116613.94
Total monthly O&M Cost = Rs.					1158654.45
Therefore, Annual O& M Cost = Rs.					**13903853.36**
Hence, Cost of production of 1 KL Water = Rs.					**8.88**

ISO 9001 : 2008 Certified
Quality Management System
for
Testing and Analysis of Water

Annexure - I

Results of Testing and Analysis of Water Sample

Sample ID – 12/3/13

Date – 07-03-13

Name of the source:- River Brahmaputra (Tatimara)

Sl No	Parameter	Test Result
1	pH	6.2
2	Turbidity (NTU)	16.2
3	TDS (mg/l)	238.0
4	Total Hardness (mg/l)	52.0
5	Alkalinity (mg/l)	64.0
6	Chloride (mg/l)	55.0
7	Nitrate (NO3-N) (mg/l)	1.8
8	Calcium (mg/l)	25.0
9	Magnessium (mg/l)	16.5
10	Sulphate (mg/l)	429.0
11	Iron (mg/l)	0.15
12	Electrical Conductivity (mS/m)	0.41
13	Arsenic (mg/l)	0.005
14	Fluoride (mg/l)	0.07
15	Bacteriological Strip Test	+Ve
16	Total Solids (mg/l)	301.0
17	Total Suspended Solids (mg/l)	21.5

BDL – Below Detectable Limit

JALAVIKSHAN R.D. Guwahati

JALAVIKSHAN
A Premier Water Quality Analysis Laboratory
Technoplaza Complex, 1st Floor
M.L. Nehru Road, Panbazar, Guwahati - 781 001
Ph.: 98642-78211, E-mail : jalavikshan@rediffmail.com

ISO 9001: 2008 Certified
Quality Management System
for
Testing and Analysis of Water

Sl No	Parameter	Test Result
18	Lead (mg/l)	BDL
19	Phosphate (mg/l)	0.2
20	Ammonium (mg/l)	1.9
21	5 Days BOD (mg/l)	34.2
22	COD (mg/l)	61.1
23	Manganese (mg/l)	0.5

JALAVIKSHAN Guwahati GUWAHATI

For JALAVIKSHAN

JALAVIKSHAN
A Premier Water Quality Analysis Laboratory
Technoplaza Complex, 1st Floor
M.L. Nehru Road, Panbazar, Guwahati - 781 001
Ph.: 98642-78211, E-mail : jalavikshan@rediffmail.com

NB

- The balance portion of the water sample after testing and analysis would be preserved for two weeks for any confirmation regarding the test results (if any).
- Results of different parameters, above the upper limit, beyond which rejection is necessary, need to be consulted with experts from relevant fields for adoption of appropriate measures.
- Contact our Consultants **(Free of Charge)** between 6.0 – 8.0 PM in working days for appropriate precautionary measures to ensure your drinking water source free from any contamination as well as necessary remedies for availability of safe drinking water.
- **Suggestive frequency** of Testing and Analysis of drinking water sources :-

Type of source	Water Quality Parameter testing frequency	
	Bacteriological**	Physical & Chemical
Ringwell / Reservoir	Bimonthly	Half yearly
Hand Pump / Deep Tube Well	Quarterly	Yearly
Piped Water Supply Scheme	When Residual Chlorine is nil	Yearly

** **Most essential** after every flood and waterloging condition

FEATURES :-

- Our words : **COMMITMENT AND PERFECTION.**
- Testing and Analysis of water sample through highly Advanced Technology based technique and equipments on nominal charge.
- Well equipped for testing and analysis of following parameters :
  pH, Turbidity, Total Dissolved Solid, Hardness, Alkalinity. Chloride, Nitrate, Calcium, Sulphate, Iron, Residual Chlorine, **Fluoride, Arsenic** and **Bacteriological**.
- Collection of water samples from sources located within Guwahati and handing over the Test Results with a nominal extra charge. (**Contact Ph.:-** +91 98642 78211)
- Tips from Expert Consultants **(free of charge)** on precautionary measures to keep water source safe and appropriate remedial measures for availability of safe drinking water.
- Free / discounted value added service like consultancy for design of **water filtration units**, ready made & portable **household filters** etc.

NB:- Contact **JALAVIKSHAN** for proper sample collection procedure

GOVT. OF ASSAM
OFFICE OF THE STATE PUBLIC HEALTH LABORATORY : : ASSAM : : GUWAHATI
****

REPORT ON CHEMICAL ANALYSIS OF WATER

Laboratory Ref .No	:	Chem. 323/13
Source of the water	:	Brahmaputra River Water (Raw).
Place of collection	:	Hengrabari, treatment plant point.
Date of collection	:	01/07/13
Collectad by	:	H.C.Goswami.
Date of receipt	:	01/07/13
Sent by	:	Junior Engineer, Assam Urban Water Supply & Sewerage Board, Guwahati Division.
Sender 's Ref. No.	:	Nil Dated – 01/07/13

PHYSICAL CHARACTERISTICS

Appearance	: Turbid	pH	: 7.69
Colour	:	Turbidity (NTU)	: 798
Odour	: Odourless		

CHEMICAL CHARACTERISTICS (mg/l)

Dissolved solids	: 118.0	Total chloride as Cl	: 6.0
Total hardness as CaCO3	: 60.0	Residual chlorine as Cl	: Nil
Carbonate hardness as CaCO3	: 6.0	Ammonical nitrogen as NH3	: 0.16
M-Alkalinity as CaCO3	: 56.0	Albumonid nitrogen as NH3	: 0.08
P-Alkalinity as CaCO3	: Nil	Nitrite nitrogen as NO2	: Nil
Total iron as Fe	: 26.4	Nitrite nitrogen as NO3	: Nil
		Fluoride as F	: 0.02

REMARKS :- **THE SAMPLE OF WATER IS TURBID AND CONTAINS IRON HIGHER THAN THE DESIRABLE LIMIT OF 0.30MG/L, MAXIMUM AND HENCE NEEDS PROPER TREATMENT BEFORE USE FOR DRINKING PURPESES.**

FOOD ANALYST TO THE GOVERNMENT OF ASSAM

DATED ,GUWAHATI ,THE 15/07/2013

(A.Goggoi)
Food Analyst to the Govt. of Assam,
Guwahati-21.

NB

- The balance portion of the water sample after testing and analysis would be preserved for two weeks for any confirmation regarding the test results (if any).
- Results of different parameters, above the upper limit, beyond which rejection is necessary, need to be consulted with experts from relevant fields for adoption of appropriate measures.
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NB:- Contact **JALAVIKSHAN** for proper sample collection procedure

CHEMICAL ANALYSIS REPORT

DISTRICT WATER ANALYSIS LABORATORY
P. H. E. DEPTT., BETKUCHI, GUWAHATI - 35

REPORT NO. : DWAL/KAM/Ghy./CHEM/ 35, 36 Date : 16/7/13

SL. NO.	SAMPLE COLLECTED BY (With Date and time)	NAME OF OFFICE	PIN POINT LOCATION	SOURCE	IRON	ALKALINITY	TURBIDITY	CALCIUM HARDNESS	TOTAL DISSOLVED SOLIDS	SULPHATE	CHLORIDE	FLUORIDE	TOTAL HARDNESS	RESIDUAL CHLORINE	NITRATE	PH
35.	Mr. Madan Kalita 15/7/13	Ghy. Sub-Div. P.H.E.D	Tatimara PWSS. Vill:- Tatimara Block:- Chandrapur G.P:- Chandrapur Hab:- Tatimara	RIVER BRAHMA-PUTRA	1.50	70	280	70	×	×	40	0.41	216	NIL	NIL	7.15
36.	- do - 15/7/13	- do - 15/7/13	Amarapathar PWSS. Vill:- Amara pathar Block:- Dimoria G.P:- Hahara Hab:- Amarapathar	RIVER KOLONG	1.32	56	130	100	×	×	40	NIL	180	NIL	NIL	6.67
DESIRABLE LIMIT / MAXIMUM PERMISSIBLE LIMIT :- (IF THERE IS NO ANY OPTIONAL SOURCE)					0.3-1.0	200-600	1 - 5	75-200	500-2000	200-400	250-1000	1 - 1.5	300-600	0.2	45	6.5-8.5
				Unit	mg/ltr.	mg/ltr.	N.T.U.	mg/ltr.	mg/ltr.	mg/ltr.	mg/ltr.	mg/ltr.	mg/ltr.	mg/ltr.	mg/ltr.	pH

REMARKS :-
(1) Iron and Turbidity more than the permissible limit.
(2)
(3)
(4)
(5)

TEST PERFORMED BY
16/7/13.
ASSTT. ANALYST
D.L.L. Betkuchi, Ghy-35

COUNTER SIGNED
16/7/13
EE (PHE)
Guwahati Division No. 1
Ghy-21

COPY TO :-
(1) The ACE (PHE) L.A. Zone, for favour of kind information.
(2) The S.E. (PHE), Ghy. Circle, for favour of kind information.
(3) The E.E. (PHE), Ghy. Division No. 1 for favour of kind information.
(4) The AEE (PHE), Boko / Hajo / Ghy. Sub Div., for favour of kind information.
(5)

CHECKED BY
16/7/13.
IN CHARGE
D.L.L. Betkuchi, Ghy-35

16/7/13

CHIEF WATER ANALYST (P.H.E.)
I/C STATE REFERRAL LAB (I&II)
BETKUCHI, GUWAHATI-35

CHEMICAL ANALYSIS REPORT

DISTRICT WATER ANALYSIS LABORATORY
P. H. E. DEPTT., BETKUCHI, GUWAHATI - 35

REPORT NO. : DWAL/KAM/Ghy./CHEM/.....35, 36..... Date : 16/7/13.

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35.	Mr. Madan Kalita 15/7/13	Ghy. Sub. Div. P.H.E.D.	Tatimara PWS/S/S. Vill:- Tatimara Block:- Chandrapur G.P.:- Chandrapur Hab:- Tatimara	River Brahma-putra	1.50	70	280	70	×	×	40	0.41	216	NIL	NIL	7.15
36.	- do - 15/7/13	- do - 15/7/13	Amarapathar PWSS. Vill:- Amara-pathar Block:- Dimoria G.P.:- Hahara Hab:- Amarapathar	River Kolong	1.32	56	130	100	×	×	40	NIL	180	NIL	NIL	6.67
DESIRABLE LIMIT / MAXIMUM PERMISSIBLE LIMIT :- (IF THERE IS NO ANY OPTIONAL SOURCE)					0.3-1.0	200-600	1 - 5	75-200	500-2000	200-400	250-1000	1 - 1.5	300-600	0.2	45	6.5-8.5
				Unit	mg/ltr.	mg/ltr.	N.T.U.	mg/ltr.	mg/ltr.	mg/ltr.	mg/ltr.	mg/ltr.	mg/ltr.	mg/ltr.	mg/ltr.	PH

REMARKS :-
(1) Iron & Turbidity more than the permissible limit.
(2)
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(5)

TEST PERFORMED BY
16.7.13.
ASSTT. ANALYST
D.L.L. Betkuchi, Ghy-35

COUNTER SIGNED
16/7/13
EE (PHE)
Guwahati Division No. 1
Ghy-21

CHECKED BY
16/7/13
IN CHARGE
D.L.L. Betkuchi, Ghy-35

16/7/13

CHIEF WATER ANALYST (P.H.E.)
I/C STATE REFERRAL LAB (I&II)
BETKUCHI, GUWAHAT-35

CHEMICAL ANALYSIS REPORT

DISTRICT WATER ANALYSIS LABORATORY
P. H. E. DEPTT., BETKUCHI, GUWAHATI - 35

REPORT NO. : DWAL/KAM/Ghy./CHEM/..... R 1 ..... Date : ..... 29/1/13 .....

SL. NO.	SAMPLE COLLECTED BY (With Date and time)	NAME OF OFFICE	PIN POINT LOCATION	SOURCE	IRON	ALKALINITY	TURBIDITY	CALCIUM HARDNESS	TOTAL DISSOLVED SOLIDS	ARSENIC SULPHATE	CHLORIDE	FLUORIDE	TOTAL HARDNESS	RESIDUAL CHLORINE	NITRATE	PH
R 1. (Sample 1.)	Mr. Madan Kalita Khalasi P.H.E. 7/1/13	Ghy Sub-Div. Ghy.	Jatimara P.W.S.S. Vill:- Jatimara Hab :- Jatimara G.P.: Chandrapur Block:- Chandrapur Dist:- Kamrup	RIVER BRAHMAPUTRA	NIL	64	5	116	x	0	16	NIL	284	NIL	NIL	7.12
2. (Sample 2.)	- do - 7/1/13		- do -	- do -	0.60	50	5	118	x	0	28	NIL	300	NIL	NIL	7.01
DESIRABLE LIMIT / MAXIMUM PERMISSIBLE LIMIT :- (IF THERE IS NO ANY OPTIONAL SOURCE)					0.3-1.0	200-600	5 - 10	75-200	500-2000	~~200-400~~ 0.01 0.05	250-1000	1 - 1.5	300-600	0.2	45	6.5-8.5
				Unit	mg/ltr.	mg/ltr.	N.T.U.	mg/ltr.	mg/ltr.	mg/ltr.	mg/ltr.	mg/ltr.	mg/ltr.	mg/ltr.	mg/ltr.	PH

REMARKS :-
(1)
(2)
(3)
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(5)

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(4) The AEE (PHE), Boko / Hajo / Ghy. Sub Div., for favour of kind information.
(5)

TEST PERFORMED BY
29.1.13
ASSTT. ANALYST
D.L.L. Betkuchi, Ghy-35

CHECKED BY
29/1/13
IN CHARGE
D.L.L. Betkuchi, Ghy-35

COUNTER SIGNED
EE (PHE)
Guwahati Division No. 1
Ghy-21

CHEMICAL ANALYSIS REPORT

DISTRICT WATER ANALYSIS LABORATORY
P. H. E. DEPTT., BETKUCHI, GUWAHATI - 35

REPORT NO. : DWAL/KAM/Ghy./CHEM/.....J.C..... Date : .....13/2/13.....

SL. NO.	SAMPLE COLLECTED BY (With Date and time)	NAME OF OFFICE	PIN POINT LOCATION	SOURCE	IRON	ALKALINITY	TURBIDITY	CALCIUM HARDNESS	TOTAL DISSOLVED SOLIDS	ARSENIC SULPHATE	CHLORIDE	FLUORIDE	TOTAL HARDNESS	RESIDUAL CHLORINE	NITRATE	PH
J C	Mr. K. Sharma A.E. (PHE) 11/1/13.	Ghy. P.H.E.D.	Pandu Barge Site	River Brahmaputra (RAW)	NIL	140	31	80	×	.005	26	NIL	180	NIL	NIL	7.67
DESIRABLE LIMIT / MAXIMUM PERMISSIBLE LIMIT :- (IF THERE IS NO ANY OPTIONAL SOURCE)					0.3-1.0	200-600	5 - 10	75-200	500-2000	~~200-400~~ 0.01 0.05	250-1000	1 - 1.5	300-600	0.2	45	6.5-8.5
				Unit	mg/ltr.	mg/ltr.	N.T.U.	mg/ltr.	mg/ltr.	mg/ltr.	mg/ltr.	mg/ltr.	mg/ltr.	mg/ltr.	mg/ltr.	pH

REMARKS :-
(1)
(2)
(3)
(4)
(5)

COPY TO :-
(1) The ACE (PHE) L.A. Zone, for favour of kind information.
(2) The S.E. (PHE), Ghy. Circle, for favour of kind information.
(3) The E.E. (PHE), Ghy. Division No. 1 for favour of kind information.
(4) The AEE (PHE), ~~Boko~~ / ~~Hajo~~ / Ghy. Sub Div., for favour of kind information.
(5)

TEST PERFORMED BY
ASSTT. ANALYST
D.L.L. Betkuchi, Ghy-35

COUNTER SIGNED
EE (PHE)
Guwahati Division No. 1
Ghy-21

CHECKED BY
IN CHARGE
D.L.L. Betkuchi, Ghy-35
13/2/13.

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 125.00 to 500.0 Cu.m.

But, for direct gravity feeding to 7 (seven) nos. of constituent scheme, approximately 525 Cu.m. Additional capacity has to be provided in this sump

Hence, Let us provide a sump of capacity 1000.0 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 and Dimoria Development Block of Kamrup District.

(Zone – I : Chandrapur 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	Tantimara	Non seismic net safe soil pressure : 14.40 Seismic net safe soil pressure : 18.00
2.	Elevated Service Reservoir	Birkuchi	Non seismic net safe soil pressure : 8.90 Seismic net safe soil pressure : 11.13
3.	Elevated Service Reservoir	Bonda	Non seismic net safe soil pressure : 11.75 Seismic net safe soil pressure : 14.67
4.	Elevated Service Reservoir	Thakurkuchi	Non seismic net safe soil pressure : 20.70 Seismic net safe soil pressure : 25.88
5.	Elevated Service Reservoir	Missamari	Non seismic net safe soil pressure : 23.10 Seismic net safe soil pressure : 28.89
6.	Elevated Service Reservoir	Kajalichaki	Non seismic net safe soil pressure : 23.13 Seismic net safe soil pressure : 28.91
7.	Elevated Service Reservoir	Kamarpur	Non seismic net safe soil pressure : 12.40 Seismic net safe soil pressure : 15.50