Khulna University of Engineering and Technology, Khulna

Department of Urban and Regional Planning

URP 4262: Project Planning Studio

TOR on "Construction and Improvement of Drainage Network for removing water logging Issue of Khulna City"

Submitted to

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Date: July 12, 2021

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1 Background of the study

Khulna, the third largest city of Bangladesh, lies in the coastal zone of Bangladesh, in the tidal floodplain of the Ganges. It is located on the banks of the Rupsha and the Bhairab River and is 2.5 m above the mean sea level (MSL). The city has been developed as an industrial along with an administrative center. For the last two decades, the city has become the first port of call for people living in the country's southwest area in pursuit of jobs, livelihood, education, and trade and commerce. In less than two decades, Khulna City's population has more than doubled (1995-2015). Khulna City Corporation (KCC) is rapidly expanding horizontally in the outskirts. The KCC region currently has a population of over 15 lakhs. Population pressure on KCC is expected to rise in the coming years as a result of its strategic proximity to many megaprojects and Mongla Port, as well as its emergence as a possible economic corridor as a result of the Padma Bridge's imminent operation. Previously the storm water of Khulna City had been drained out through some natural drainage like creek and canals. But new settlers mostly use farm land and low-lying areas in fringe areas as part of urban built-up areas, obstructing natural drainage in and around Khulna. Similarly, land grabbers have filled natural canals that usually drain rain and flood water. As a result, due to rapid urbanization and increasing development, these natural drainage and other water retention areas have gradually been transformed into built-up areas. Some of areas are changed by narrow surface drains.

Khulna City experiences about 1810 mm of rainfall annually, of which almost 80% falls during the monsoon. The frequency of severe weather incidents in the project region has risen in recent years as a result of the effects of climate change. Extreme weather events such as >100 mm rainfall in 12 hours exacerbate the problem of water logging in several areas of the city. The city is more vulnerable to inundation due to heavy and unpredictable rainfall but also for its decreasing drainage capacity due to unauthorized settlements and inappropriate development plan. Unfortunately, KCC is experiencing severe water logging as a result of a variety of plausible causes. This includes the following: (i) encroachment on drainage canals by new immigrants and land grabbers, (ii) inadequate maintenance of the current drainage network, (iii) the absence of a drainage network in the recently expanded city district, (iv)excessive rain fall in a limited period of time, and (v) tidal effects on the flow of rivers surrounding the city. Most of the waterlogged areas are located the Southwestern wards of Khulna City. Percentages of households affected by annual water logging

vary between 90-100% in those wards. In Khulna city, 38% of households regularly experience short-term water logging.

Khulna is located on the coastal belt of Bangladesh and is part of the Ganges–Brahmaputra Delta, which is known for its vulnerability to rising seas and floods. Most areas of Khulna are prone to fluvial and coastal flooding, and the water quality in nearby rivers is affected by salinity intrusion, posing high disaster risks and health hazards to residents. Urban infrastructure and services urgently need to be improved to adapt to these threats. A sustainable sewerage system will be critical to (i) mitigate water quality deterioration, and (ii) decongest the existing drainage system from uncontained septic tank discharge.

Khulna City Corporation has spent a huge amount of money over the past years for re-excavation of rivers, canals and reconstruction of drains in different areas of the city only with a view to putting an end to water-logging on the roads and highways. To address the issue of water logging a Drainage Master Plan was prepared for the KCC region in 2011. But water-logging still continuously happening on roads and highways after incessant rains and create problem to the residences. Thus, Khulna City Corporation Authority proposes to enforce the current project to upgrade the drainage system in order to alleviate the problem of water logging in the KCC district.

2 Goal of the project

The projects aim to construct and improve the drainage network for removing water logging issue of Khulna City.

3 Objective of the project

(i). To develop an environmentally sustainable drainage network in order to eliminate water logging in Khulna city.

(ii). To minimize the expense of KCC's drainage system and the property destruction incurred by water logging.

(iii). To rehabilitate and construct climate-resilient centralized and organized sewerage system for Khulna city.

4 Scope of the project

The project is mainly undertaken to construct and improve the drainage network for removing water logging issue of Khulna City as well as with a focus to minimize the expense of KCC's drainage system and the property destruction incurred by water logging.

4.1 Scopes of project services

The specific scope of services includes undertaking site reconnaissance, identifying scope of works and associated environmental and social impacts that may need to be addressed and developing detailed designs that are resilient to the effects of climate change and developing the associated cost, for implementation of the proposed packages. This would require stakeholders' meetings and consultations, field reconnaissance, survey reviews, topographic mapping and development of sustainable engineering solutions utilizing methods such as bioengineering solutions, gabion structures, reinforced concrete structures, lined and unlined drainage systems and use of geotextiles and preparation of final designs (technical information, bill of quantities and drawings).

Site reconnaissance, stakeholder meetings and consultation to identify existing problems

(a). At first future demand of water usage and discharge of waste water should be estimated for future population growth based on the current data.

(b). The condition of existing drainage network pattern, lacking and level of service currently provided to consumers including reliability, quality, and affordability should be assessed.

(c). Cost-effective waste water treatment options, suitable for application in KCC will be identified and assessed.

(d). Review all available data to facilitate proper engineering designs such as topographic and aerial surveys, cadastral maps to determine the extent of private property or livelihood that may be affected, to develop the alignment of the affected property for the proposed works.

(e). Where necessary undertake topographic surveys of the proposed sites and surroundings to carry out hydrological analyses and hydraulic assessments.

(f). Undertake simplified Environmental and Social Impact Assessments.

Preliminary Designs and Options

(a). Plan and preparation of the extending water supply network should be done by studying the contour and topographical maps produced by the concerned agency.

(b). Throughout the assignment the Consultation farm and local government will undertake a participatory approach to incorporate the participation of local people's views in the plan preparation.

(c). Develop sustainable engineering solutions utilizing methods such as bioengineering solutions, gabion structures, reinforced concrete structures and geotextiles to inform preliminary designs.

Final Design Report

(a). Final designs should incorporate recommendations received from stakeholders.

(b). Work with the Project Coordination Unit to develop the procurement strategy for the proposed works; in particular for labor intensive proposed works

(c). Preparation of final designs (technical information, specifications, bill of quantities and drawings) for the purposes of execution of the works.

4.2 Scopes of project implementation

This project scopes up the following aspects-

(a). The project assumes that, 15km of drainage line will be constructed and 10km existing drainage line will be improved on the ward wise selected roads around KCC after completion of the project.

(b). Under the project a large number of city dwellers will benefited and their life style will be improved through establishment of safe and environment friendly drainage and sewage system. Around 5 lakh of city dwellers are expected to be benefitted from the project succession.

(c). Prevention of 80% of each ward in the Khulna City Corporation (KCC) area against water logging above 30 cm depth after the project completion. Achievement of water logging reduction up to 75% after project completion.

(d). Climate resilience, mobility, flood resilience, and solid waste management in the project areas in Khulna city improved.

(e). This project anticipates that drainage network will be constructed to be served for a period of 20 years.

(f). Local expertise from Khulna should be encouraged to the activities for the construction and improvement of drainage network.

5 Planning Area

Khulna, the third largest divisional as well as the metropolitan city of the country, is located in the south-western region between 22°30' N latitude and 89° 20' E longitude. It is an industrial as well as the second seaport city. The population of the city has been increasing along with the development of the city since the early eighties. At present, the population in KCC area is about 0.80 million. According to forecast, the population in the city will be 103.64, 133.82 and 171.67 million in the year 2011, 2021 and 2031 respectively. In KCC area, there are about 528.120 km drainage network of which 175.43 km (33.22%) arc primary drain, 150.45 km (28.49%) arc secondary and 202.24 km (38.29%) arc tertiary drain and among those 291.230 km (55.14%) are pucca, 51. 790 km (9.81 %) arc semi-pucca and 185.10 km (35.05%) are kutcha drain.

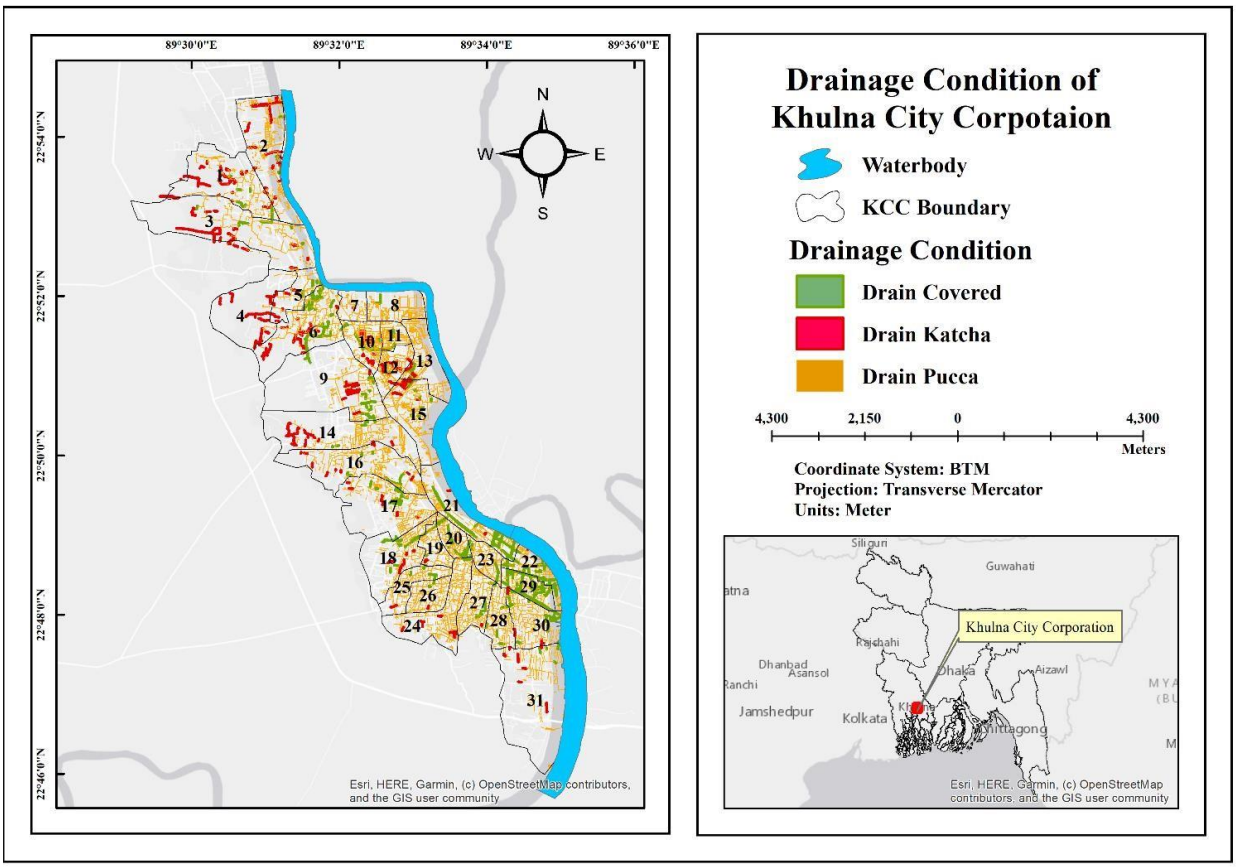

Figure 1: Drainage Condition of Khulna City Corporation

The average drainage density in the city is 11. 79 km/km2, the lowest density is 3.06 km/km2 in ward 31 and the highest drainage density is 33.88 km/ km2 in ward 23. All the drains have 49 major outlet points in the four main rivers as Bhairab, Rupsha, Mayur and Gallamari around KCC. It is revealed from the KDA, 2002 report that around 68% households of the Khulna city have no planned drainage facilities and only 32% have some sorts of facilities in and around their premises. The cleaning and maintenance performance of drains in KCC is very poor. Waste loadings in drains due to some wastewater parameters were assessed. The waste loading of the parameters varies with the seasonal variation or flow rates. All the drains have the flow in rainy season but there is no flow in some drains in other seasons. It is revealed that waste loading for most of the parameters is the maximum in rainy season and minimum in spring because the flow rate is the maximum in rainy season than that of spring. At these circumstances, this particular project is commenced with a vision of constructing 15km drainage and improving 10 km existing drainage network to reduce Khulna City's water logging problem in a cost-effective way.

6 Activities to be performed by Consulting Firm

6.1 Time frame for Water Supply Network Plan Preparation

Task Name	Duration	Start	Finish
Commencing activities of the project	81 days	Mon 5/31/21	Mon 9/20/21
Signing of the agreement	1 day	Mon 5/31/21	Mon 5/31/21
Scheduling of the project	1 month	Tue 6/1/21	Mon 6/28/21
Mobilization of resources and office setup	15 days	Tue 6/29/21	Mon 7/19/21
Reconnaissance survey	45 days	Tue 7/20/21	Mon 9/20/21
Collection, Arrangement and Analysis of Existing data	80 days	Tue 9/21/21	Mon 1/10/22
Collection of Mouza map	10 days	Tue 9/21/21	Mon 10/4/21
Collection of meteorological data	15 days	Tue 10/5/21	Mon 10/25/21
Collection of hydrological data	20 days	Tue 10/26/21	Mon 11/22/21
Collection of geological data	15 days	Tue 11/23/21	Mon 12/13/21
Collection of data on existing drainage system	1 month	Tue 12/14/21	Mon 1/10/22
Base map preparation	75 days	Tue 1/11/22	Mon 4/25/22
Scanning of the Maps	15 days	Tue 1/11/22	Mon 1/31/22
Digitization of the Maps	30 days	Tue 2/1/22	Mon 3/14/22
Checking and editing of the Maps	15 days	Tue 3/15/22	Mon 4/4/22
Preparation and compilation of the base map	15 days	Tue 4/5/22	Mon 4/25/22
Peoples participation	734 days	Mon 5/31/21	Thu 3/21/24
First consultation with the people of the KCC	15 days	Mon 5/31/21	Fri 6/18/21
Second consultation with the people of the KCC	15 days	Fri 3/1/24	Thu 3/21/24
Primary data collection	120 days	Thu 7/1/21	Wed 12/15/21
Carrying out Topographic survey	1 month	Thu 7/1/21	Wed 7/28/21
GPS survey	1 month	Thu 7/29/21	Wed 8/25/21
Carrying out survey on water usage demand	1 month	Thu 8/26/21	Wed 9/22/21
Carrying out survey on water discharge	1 month	Thu 9/23/21	Wed 10/20/21
Geo-referencing of the maps	1 month	Thu 10/21/21	Wed 11/17/21

Updating of maps and data	10 days	Thu 11/18/21	Wed 12/1/21
Preparation and printing of contour map	10 days	Thu 12/2/21	Wed 12/15/21
Primary data collection	90 days	Thu 7/1/21	Wed 11/3/21
Carrying out socio-economic survey (questionnaire)	1 month	Thu 7/1/21	Wed 7/28/21
Socio-economic data input	1 month	Thu 7/29/21	Wed 8/25/21
Database preparation	1 month	Thu 8/26/21	Wed 9/22/21
Socio-economic data analysis	15 days	Thu 9/23/21	Wed 10/13/21
Preparation of survey report	15 days	Thu 10/14/21	Wed 11/3/21
Training	300 days	Thu 11/4/21	Wed 12/28/22
Training (Session-1) for officers/staffs of KCC	20 days	Thu 11/4/21	Wed 12/1/21
Training (Session-2) for officers/staffs of KCC	20 days	Thu 12/1/22	Wed 12/28/22
Forecasting	82 days	Thu 12/16/21	Fri 4/8/22
Forecasting future demographic trend	20 days	Thu 12/16/21	Wed 1/12/22
Estimation of water demand of people over the next 25 years	15 days	Thu 1/13/22	Wed 2/2/22
Estimation of water discharge of people over the next 25 years	10 days	Thu 2/3/22	Wed 2/16/22
Waterlogging projection over the next 25 years	20 days	Thu 2/17/22	Wed 3/16/22
Forecasting future land use and land cover pattern	10 days	Thu 3/17/22	Wed 3/30/22
Updating study area map	7 days	Thu 3/31/22	Fri 4/8/22
Plan preparation	142 days	Mon 4/11/22	Tue 10/25/22
Planning and engineering Design & Drawing of all types of drain with cost estimates	2 months	Mon 4/11/22	Fri 6/3/22
Formulation of draft drainage network plan	1 month	Mon 6/6/22	Fri 7/1/22
Selection of Pilot Project and preparation of draft implementation plan	1 month	Mon 7/4/22	Fri 7/29/22
Explanation and discussion on Implementation of Pilot Project	7 days	Mon 8/1/22	Tue 8/9/22
Implementation and monitoring of Pilot Project	2 months	Wed 8/10/22	Tue 10/4/22
Formulation of final drainage network plan	15 days	Wed 10/5/22	Tue 10/25/22
Construction & Improvement of Drain	450 days	Wed 10/26/22	Tue 7/16/24
Marking of alignment	1 mon	Wed 10/26/22	Tue 11/22/22
Excavation/Digging in earth	4 mons	Wed 11/23/22	Tue 3/14/23

Removal of heap	1 mon	Wed 3/15/23	Tue 4/11/23
Embankment from borrow pits and purge soil	2 mons	Wed 4/12/23	Tue 6/6/23
Sand filling works	3 mons	Wed 6/7/23	Tue 8/29/23
Concrete Blinding	1 mon	Wed 8/30/23	Tue 9/26/23
Construction of top slab	1.5 mons	Wed 9/27/23	Tue 11/7/23
Construction of bottom slab	1.5 mons	Wed 11/8/23	Tue 12/19/23
Reinforcement (Iron rod) positioning	1.5 mons	Wed 12/20/23	Tue 1/30/24
Construction of drain wall	6 mons	Wed 1/31/24	Tue 7/16/24
Evaluation	65 days	Wed 10/26/22	Tue 1/24/23
Environmental impact assessment	45 days	Wed 10/26/22	Tue 12/27/22
Evaluation (cost estimation) of the plan	20 days	Wed 12/28/22	Tue 1/24/23
Reporting	662 days	Thu 12/16/21	Fri 6/28/24
Formulation of Inception Report	30 days	Thu 12/16/21	Wed 1/26/22
Discussion of Inception Report	15 days	Thu 1/27/22	Wed 2/16/22
Formulation, inspection and modification of Interim Report	3 months	Thu 2/17/22	Wed 5/11/22
Explanation and discussion of Interim Report	1 month	Thu 5/12/22	Wed 6/8/22
Formulation and discussion of progress report-01	20 days	Thu 6/9/22	Wed 7/6/22
Formulation and discussion of progress report-02	20 days	Thu 6/1/23	Wed 6/28/23
Formulation of draft final report	6 months	Thu 6/9/22	Wed 11/23/22
Inspection and modification of draft final report	1 month	Thu 11/24/22	Wed 12/21/22
Explanation and discussion of Draft Final Repo	15 days	Thu 12/22/22	Wed 1/11/23
Formulation of final report	4.3 months	Fri 3/1/24	Fri 6/28/24

Note: the activity schedule is also presented by GNATT Chart in Appendix- A

6.2 Manning Schedule

6.2.1 Manning Schedule of the Key Personnel

SI	Personnel	2021						2022												2023												2024						No. of Person	Total ManMonth
		July-Dec						Jan-Dec												Jan-Dec												Jan-June							
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36		
1	Team leader																																					1	36
2	Deputy Team Leader /Town Planner																																					1	36
3	Contract Management Specialist																																					1	10
4	Senior Safeguard Specialist																																					1	18
5	Structural Engineer																																					1	36
6	Mechanical/Electrical Engineer																																					1	18
7	Financial Management Specialist																																					1	30
8	Resident Engineer cum Quality Control Engineer																																					3	54
9	Procurement Specialist																																					1	10
10	Social Safeguards and Gender Specialist																																					2	12
11	GIS Specialist																																					1	24
12	Environment Specialist																																					3	24
13	Hydrologist																																					1	4
14	Training Specialist																																					1	14

6.2.2 Manning Schedule of the Supporting Staff

SI	Personnel	2021						2022												2023												2024						No. of Person	Total ManMonth
		July-Dec						Jan-Dec												Jan-Dec												Jan-June							
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36		
1	Office manager																																					1	36
2	Assistant Office Manager / Secretary																																					1	36
3	Assistant Resident Engineer																																					8	144
4	Computer /MIS Data Base Manager																																					1	36
5	Field Supervising Engineer																																					15	450
6	Junior Engineer																																					2	48
7	Training Coordinator																																					1	14
8	Estimator																																					3	36
9	AutoCAD Operators																																					2	12
10	Assistant Site Engineers																																					3	54
11	GPS Surveyor																																					3	12
12	Total Station Surveyor																																					2	8
13	Data Processor																																					2	32
14	Socio-economic Surveyor for questionnaire survey																																					5	20

15	GIS assistant		2	48
16	Media Officer		1	36
17	Assistants and guards		2	72

7 Consultancy Services

In order to prepare drainage network plan for Khulna City Corporation (KCC) there is a provision for involvement of consulting firms. For this purpose, a short list of consulting firms has been prepared and Request for Proposal (RFP) will be issued to the short-listed consulting firms for submission of the proposal.

7.1 Duration of the consultancy services

Approximately 36 months from the date of signing of the agreement.

7.2 Man-month of consulting firm

In order to accomplish the preparation of the drainage network plan each selected firm should have the involvement of the following key personnel and supporting staff:

A. Key personnel

SL no.	Particulars	Unit	No. of person	Total Manmonth
	Key Personnel (International)			
1	Team leader	PM	1	36
	Total Key Personnel (International)		1	36
	Key Personnel (National)			
1	Deputy Team Leader /Town Planner	PM	1	36
2	Contract Management Specialist	PM	1	12
3	Senior Safeguard Specialist	PM	1	18
4	Structural Engineer	PM	1	36
5	Mechanical/Electrical Engineer	PM	1	18
6	Financial Management Specialist	PM	1	30
7	Resident Engineer cum Quality Control Engineer	PM	3	54
8	Procurement Specialist	PM	1	10
9	Social Safeguards and Gender Specialist	PM	2	12
10	GIS Specialist	PM	1	24
11	Environment Specialist	PM	3	24
12	Hydrologist	PM	1	4

13	Training Specialist	PM	1	14
	Total Key Personnel (National)		19	292
	Total Key Personnel		20	328

B. Supporting staff

Serial no.	Particulars	Unit	No. of person	Total Manmonth
1	Office manager	PM	1	36
2	Assistant Office Manager / Secretary	PM	1	36
3	Assistant Resident Engineer	PM	8	144
4	Computer /MIS Data Base Manager	PM	1	36
5	Field Supervising Engineer	PM	15	450
6	Junior Engineer	PM	2	48
7	Training Coordinator	PM	1	14
8	Estimator	PM	3	36
9	AutoCAD Operators	PM	2	12
10	Assistant Site Engineers	PM	3	54
11	GPS Surveyor	PM	3	12
12	Total Station Surveyor	PM	2	8
13	Data Processor	PM	2	32
14	Socio-economic Surveyor for questionnaire	PM	5	20
15	GIS assistant	PM	2	48
16	Media Officer	PM	1	36
17	Assistants and guards	PM	2	72
	Total Supporting Staffs		54	1094

7.3 Qualifications and Professional Experience of key personnel

The key personnel should have the following qualification and professional experience:

Serial no.	Personnel	Qualification	Professional Experience

1	Team leader	Bachelor's degree in Civil Engineering with post graduate in structural engineering. Contract Management degree will be preferred.	5 years' experience as a TL/PM. Experience of drainage network project financed by Multilateral Financing Institution will be an added advantage.
2	Deputy Team Leader /Town Planner	Bachelor's degree in Urban and Regional Planning degree / Physical Planning in the related field.	At least 6 years of practical experience and should be a member of Bangladesh Institute of Planners
3	Contract Management Specialist	Bachelor's degree in Civil Engineering or other relevant fields. Preferable: Post graduate degree in Civil Engineering or other relevant fields; membership to professional institutions.	15 years
4	Senior Safeguard Specialist	Master's degree in Social science (Sociology/ Social Work/ Anthropology). Preferable: Post graduate degree in Environment Science or other relevant fields. Membership of professional institutions.	10 years minimum
5	Structural Engineer	Bachelor's degree in Civil Engineering with Master's in Structural Engineering.	15 years
6	Mechanical/Electrical Engineer	Bachelor's degree in Mechanical Engineering and Electrical and Electronics Engineering.	10 years minimum
7	Financial Management Specialist	Bachelor's degree in Finance/Accounts/Commerce/Business Administration /Chartered Accountant. Master's degree will be preferred. Professional designation in accounting (e.g., CPA/CA/CMA).	10 years minimum

8	Resident Engineer cum Quality Control Engineer	Bachelor's degree in Civil Engineering. Post graduate degree in Construction Management or Construction Material engineering will be preferred.	15 years
9	Procurement Specialist	Bachelor's degree in Engineering. Master's degree in Procurement will be preferred.	10 years with 3 years in direct procurement related activities.
10	Social Safeguards and Gender Specialist	Master's degree in Sociology or other relevant field of Social Sciences.	10 years with 5 years in sociological aspect/ resettlement issues in a linear project.
11	GIS Specialist	He/she should have bachelor or equivalent degree in urban and regional planning/ computer science and engineering/ information science and technology/ master in any	10 years
		discipline from any recognized university with specialization in GIS. Have expertise in preparing thematic and analytical map using database and GIS and RS programmes, updating and analyzing database. Technical knowhow of processing map preparation using participatory GIS method.	
12	Environment Specialist	Graduate in Civil Engineering/Environmental Science and Post Graduate degree in Environmental Engineering or Environmental Science or other relevant fields.	10 years with 8 years extensive experience in the implementation of drainage projects.
13	Hydrologist	Bachelor's degree in Civil/ Water Resources Engineering/ Hydrology.	15 years
14	Training Specialist	Master's degree in any social science subject, preferably in development economics and planning.	10 years

7.4 Tasks/ Responsibilities of Key Personnel

Sl no.	Personnel	Tasks/ Responsibilities
1	Team leader	Overall management of PISC team, acting as the Team Leader. The tasks typically include, but are not limited to, the following: • Manage and guide the team of consultants; • Implement the tasks mentioned in the scope of works of the project; • Coordinate and consult with LGED and concerned stakeholders regularly; • Monitor the progress of the project in meeting the desired outcome and outputs; • Prepare improvement and financing plan for the drainage construction and maintenance; • Review and monitor progress of the design and monitoring framework; • Monitor the progress on fulfilling loan covenants if any and advise LGED on any issues; • Review the standard designs of LGED and suggest any modifications if required; • Assess the existing procurement method and strategy and suggest if any modifications are required;
		• Cooperate closely with the Project Director in planning, coordinating and monitoring project implementation; • Advise on the preparation of contract specifications in consultation with the Project Director, in accordance with Government requirements and Donor's Guidelines; • Assist the Project Director in the preparation of detailed budget for all project activities, and in project financial management control; • Advise and assist the Project Director in preparing a detailed project implementation plan and Annual Plans of Operation which will include training activities, taking account of the need for timely completion of preparatory tasks, and improvements and up-grading prior to the monsoon season; • Advise on any modifications or additions required to standard designs and technical specifications used by LGED in order to meet project requirements, and prepare design standards for innovative activities; • Prepare and operate a monitoring plan and reporting system on the performance of planned improvements of drains in the project area;

		• Advise on preparation of standard contract documents, contract packaging, management of survey and design consultants, tender evaluation and contract award; • Assist the Project Director in establishing effective drainage network improvement planning and implementation procedures in the project districts, and assist the PMU staff to monitor the procedures for selection of structures on drains under the project; • Advise on land donation, if any, and environment safeguards, and assist the social team in monitoring participation, gender and development, poverty reduction and Benefit Monitoring Evaluation (BME) aspects of the project; • Advise the relevant specialist on design and conduct of training programs and orientation curriculum, employing participatory approaches and manuals for various courses and workshops in line with the project objectives including gender & social analysis, resettlement planning, environmental assessments, environmental management and climate change adaptation, road safety, and construction procedures, and other social development related areas in consultation with the PMU and other team members; • Ensure that poverty, social development and gender, as well as environmental and climate change issues, are integrated into all training/ orientation programs and courses where relevant; • Facilitate in arranging training and orientation programs at various levels in collaboration with relevant team members;

		• Prepare an annual training plan and budget and integrate the same into the overall annual plan of the project; • Act as resource person/ facilitator in different training courses; • Collect and compile training related data on a gender desegregated basis; • Advise on the coordination of project activities with relevant units and cells in LGED, and liaise with other development partners, in order to ensure that the project contributes to strengthening institutional capability in LGED; • Identify any actions to be taken to ensure achievement of the project's objectives, outputs and result; • Prepare Inception report and other periodic consolidated Monthly, Quarterly and Annual reports, and at the end of the assignment, prepare consolidated final report; • Assist with any other project relevant duties as may be reasonably assigned by the Project Director;

		• Assist the Employer in contract administration and management of the Project and civil work contracts including monitoring of validity of security deposit made by the contractor against advances if any; • Interpret the technical specifications and contract documents relevant to the project; • Obtain related approvals from concerned authorities for any redesign of road realignment, modifications; • Ensure receipt of requisite insurances as per contract requirements; • Review documentations and advance actions for handing over of site and advise on issuing notice to set the commencement date; • Ensure contractor effects and implements Quality Control System; • Issue approval to the Contractor's detailed work program, suggest modifications if any and ensure Contractor's compliance with the Program; • Issue approval to the Contractors' superintending personnel with modifications if any; • Scrutinize and approve Contractors' construction method statements; • Issue finalized or revised "Good for Construction Drawings" and additional detailed drawings required for the execution of the work; • Issue to the Contractor amended alignment plan and profile drawings based on review of tender drawings and updated topographic surveys; • Approve Contractor's working drawings based on setting out details;

		• Approve setting out data for the Works finalized as a result of ground verification and survey; • Monitor supervision of all works and ensure proper supervision as per contract requirement; • Monitor closely and regularly the progress of work and advise the Contractor about corrective measures; • Monitor status of Contractor's equipment, plant, machinery installations, housing and medical facilities; • Direct and/or advise Contractor to avoid and/or reduce the risk in case of any emergency; • Advise Contractor in all matters covering safety and care of work, environmental aspects and labor welfare;

		• Verify and recommend, if in order, Contractor's requests for advance and interim payment certificates; • Assist Employer in arranging relocation of services as may be needed; • Maintain a permanent record of all payments made to the contractors; • Approve "as built" drawings; • Inspect the works on completion of each milestone before accepting the work and report to the PMU; • Inspect works at appropriate intervals during Defects Notification Period and advise the PMU accordingly; • Ensure that contractors implement and maintain the environmental monitoring in compliance with the environmental management plan (EMP) as a part of the civil work contracts.
2	Deputy Team Leader /Town Planner	• Assist the Team Leader (TL) in all his roles and responsibilities mentioned above. • Act as TL during then TL's absence. • Act as TL during maintenance of Pilot drainage network Packages.
3	Contract Management Specialist	• Assist TL/DTL in contract management. • Assist the team in resolving contractual issues related to Construction and Maintenance. • Assist in incorporating good practices in future contract documents.
4	Senior Safeguard Specialist	• Train and provide guidance to the PMU/PIU and relevant LGED staff on principles of social and environment safeguard issues, GOB policy and ADB Safeguard Policy Statement (2009), and their implications for the project; • Provide specialist advise and support to the PMU for review and updating of the community participation framework; • Assist PMU and TL/DTL in preparation of monthly, quarterly, semi-annual, and annual progress reports, and project completion report.

		• Review the project's safeguard systems assessment (PSSA) including the project's likely positive and negative environmental impacts and risks, identifying the safeguard principles; and prepare a matrix on how the environmental safeguards are triggered by the project;

		• Prepare a diagnostic assessment of applicable and relevant laws, regulations, rules, and procedures for managing and mitigating the likely impacts of the project (focusing on the SPS policy principles that are likely to apply to the project); • Assess the country's implementation practice, capacity, and commitment to plan, implement, monitor, and report on the safeguard measures; • Assess gaps in safeguard documents and prepare safeguard related action program to address the identified weaknesses, including consideration on the need for capacity strengthening measures; • Identify measures for monitoring environmental safeguard systems performance; • Undertake field monitoring visits to oversee the actions taken by the contractors in regard to the implementation of EMP and suggest corrective measures if necessary; • Assist PMU and TL/DTL in accumulating climate vulnerability data and information from various national and if possible from international sources; • Investigate the current status of climate change, vulnerability and impacts over the study area and 21nalyse in detail future climate change projections and scenarios; • Make detailed investigation of climate change impacts on the project area's drainage system and prepare the climate resilient criteria to be incorporated in the drainage network design by considering future climate change scenarios; • Review periodically and report on the impact of project activities on the environment, and determine the nature and extent of environment impact, if and, caused by the Project; • Assist in facilitating participatory planning and the implementation of the initial environment examination recommendations; their proposed construction technology, and project implementation plan to identify any potential adverse impact; • Identify budget needs to strengthen LGED capacity for adequate environmental monitoring and management of the project; • Assist TL/DTL in reviewing all infrastructure design (climate resilient structure), their proposed construction technology, and project implementation plan to identify any potential adverse environmental impacts and climate risks;

		• Advise and support LGED in building in-house capacity for the training of LGED staff to carry out initial environmental examination for its projects, awareness-building of and motivating stakeholders/beneficiaries on environmental issues; • Monitor EMP and prepare compliance progress toward the expected outcomes, verify monitoring information to identify adverse environmental impacts, document results, identify the necessary corrective actions, and reflect them in a corrective action plan; • Keep liaison with institutions responsible for climate change issues in Bangladesh to keep abreast on all information necessary to assist the TL in planning and designing climate resilient infrastructure for the project; Develop monitoring and guidance tools for climate resilient improvements of the drains including climate resilient check list; • Prepare training materials and provide training to the LGED engineers and stakeholders on environment and climate change, impacts and adaptation especially for climate resilient road maintenance; • Contribute to the training of LGED staff and contractors on implementation procedures and technical matters related to environment and climate change compliance; • Provide inputs into training course for the project as required; • Prepare environmental field monitoring report, quarterly, annual, and midterm progress reports, and project completion report; • Other duties as may be identified by the Project Director and TL/DTL.
5	Structural Engineer	• Liaise with the PIU, district and upazila LGED staff and assist as required in the design of drainage structures • Responsible for design of drainage structures • Assist PMU and TL in developing standard design and technical specifications covering climate-resilient and road safety measures for all project civil works • Conduct engineering surveys and investigations as required for preparing designs of civil works under the project; • Prepare engineering drawings for roads, culverts, drainage structures and protection works to be executed under the project; • Prepare technical design criteria for roads and culverts specially in em • bankment design, protection measures, cross drainage capacity;

		• Report all unusual design conditions to the TL and DTLs and discuss solutions appropriate to the conditions; • Undertake special designs if necessary where standard design produced by LGED requires modification;

		• Undertake regular field visits to the project districts to review implementation and supervision of civil works and contribute to resolving any issues arising; • Arrange to carry out any necessary changes in design during the construction period; • Assist PMU/TL as necessary in all respect of design and specification; • In conjunction with PMU check all designs and documents prepared for the projects; • Contribute to the training of PMU and LGED district and Upazila staff on project implementation procedures and technical matters; • Provide inputs to developing a training course for the project as required; and
6	Mechanical/ Electrical Engineer	• Will support the structural engineer to undertake the design of the drainage network with special responsibility for all electromechanical components of the new modernized scheme. • To prepare the detailed specifications for the proposed electrical works.
7	Financial Management Specialist	• Work under supervision and guidance of PMU and TL/DTL, provide support and guidance to the PMU and LGED financial and accounting staff, including district accounting staff; • Develop a monitoring format for monthly progress monitoring of activities and tasks relevant to financial management of the project. • Effectively manage the financial aspects of the project in a timely and coordinated manner. • Be responsible for accurately monitoring and reporting actual and projected expenditures of funds (from government and ADB sources) on a monthly basis and quarterly basis. • Assist PMU to prepare monthly and quarterly financial statements, and quarterly, semi-annual, and annual progress reports and completion report. • Visit district accounting staff periodically for compliance monitoring of disbursement and accounting requirements and provide technical support.

		• Liaise with representatives of the ADB for the project, as necessary and directed by the Project Director. • Assist PMU to prepare annual project financial statements in the form acceptable to ADB. • Advise on actions to be taken to mitigate gaps in internal controls and effectively follow up on actions to be taken. • Advice on compliance with loan covenants and ensure that compliance with the covenants is maintained.

		• Advice and monitor audit observations, and effectively follow up and implement audit recommendations for resolving any audit issue. • Assist PMU to address issues raised by ADB on audited project financial statements and effectively follow up on actions to be taken. • Ensure adherence to ADB requirements and regulations in financial reporting and controls. • Perform any other relevant tasks given by the Project Director and TL/DTL. • Provide capacity building support to LGED (including PMU and district staff of the project). • Identify training needs of LGED staff, prepare tentative training program and coordinate with other relevant projects in preparing training modules, and implement the training program; • Prepare manuals for conducting continuous financial training and provide annual financial training to LGED staff • Ensure that relevant staff of LGED and other offices understand the differing requirement of the co financiers in budgeting and disbursing funds • Advise on the TORs for conducting internal audits • Assist with any other duties as may reasonably be assigned by LGED and agreed with the ADB • Prepare monthly report, quarterly report, annual report in connection to the financial management of the project's, including status of Financial Management Action Plan (in the Project Administration Manual) and LGED capacity building support. • Assist in monitoring of security deposit validity against advances made to the contractors if any.

8	Resident Engineer cum Quality Control Engineer	• Assist the PMU/PIU and TL/DTL in implementation of all activities of the project; • Assist the PMU/PIU and TL/DTL in the preparation of annual drainage network improvement plans of operations; • Assist the PMU/PIU and TL/DTL in planning, coordinating and monitoring project implementation including preparation of detailed budgets for all project activities; • Assist the PMU/PIU and TL/DTL in developing standard contract documents for the project's civil works, contract packaging, preparation of tender/ bidding documents, and evaluation of tenders for the civil works; • Oversee and supervise the work of Assistant Resident Engineer and Field Supervising Engineers (FSEs); • Oversee and support the engineering survey (Topographical Survey and Detailed drainage Condition Survey) and data

		collection for all infrastructure improvement subprojects, including sample site inspections, and recommend remedial actions to the PMU where problems arise; • Assist PMU and TL/DTL in developing standard design and technical specifications covering climate-resilient and road safety measures for all the civil works; • Assist PMU in verifying improvement cost estimates for selected drains including for climate proofing infrastructure proposed for improvement; • Monitor the progress and quality control of the improvement activities of subprojects administered by LGED District and Upazila Offices; • Undertake regular field visits to the project districts to review implementation and supervision of the civil works, and contribute to resolving any issues arising; • Assist PMU to monitor the progress of land acquisition or land donation with MOU; • Guide and oversee the work of Environment/Climate Change Specialist and check the effectiveness of the environmental mitigation measures; • Contribute to the training of PMU, LGED staff (District and Upazila level) and stakeholders on project implementation procedures, technical matters, environmental and climate change matters;

		• Assist PMU/PIU and TL/DTL in providing certification of the due quantity and quality of works based on cross checking of onsite approvals by the Field Supervising Engineers; • Inspect the existing LGED laboratories, and define any additional equipment requirements and improvements in operational procedures and staffing to meet project needs; • Define training requirements for LGED laboratory and field supervision staff on testing and quality control procedures, including preparation of training materials as necessary; • Contribute to the training of LGED staff and contractors on testing and quality control procedures; • Monitor and check on a continuous basis, through regular visits and on-site inspections, the performance of laboratory and onsite testing, and advise on remedial actions as needed; • Provide continuing advisory support, through the LGED executive engineers and Upazila engineers, to laboratory and onsite supervision staff, on improvements in quality control procedures; • Assist the PMU and the LGED executive engineers in reviewing and checking site investigations carried out by others;

		• Report regularly to the TL/DTLs on quality control matters, and identify any critical issues, which require attention; • Advise on the content and organize training courses where necessary for LGED district and Upazila staff and for contractors on construction methods, on-site supervision and quality control, laboratory testing procedures, environmental requirements and contract management; • Contribute to the preparation of monthly, quarterly, annual and midterm report; • Assist with any other duties as may be reasonably assigned by the Project Director.
9	Procurement Specialist	• Review the procurement plan of the project according to the Government of Bangladesh's procurement thresholds, procurement methods and approval requirements (prior or post) in connection with procurement of goods and works under the project, and advise the PMU on its application; • Support and advise the PMU in preparing, monitoring and reporting on their annual procurement plans for works and goods, and in resolving any significant problems and issues arising;

		• Assist the PMU in the procurement of civil works, equipment and vehicles, including preparation of specification and bidding documents, tendering and contract award; and preparing bid evaluation reports in accordance with ADB's procurement requirements; • Assist the PMU in the preparation of tender and contract documents for all construction and maintenance civil works, and in the tendering process, contract award and contract management and administration, in accordance with the GOB Public Procurement Rules, 2008; • Advise the PMU in resolving any significant issues and problems that arise in procurement and contract management; • Prepare training materials and contribute to the training of relevant LGED staff on procurement and contract management; • Support the PMU and TL/DTL in monitoring and reporting on procurement and contract management; • Assist TL/DTL and PMU in updating the procurement plan annually for goods and works, and suggest methods to be used; • Assess ongoing procurement reforms including e-procurement in the country, and feedback from the donor funded projects on the systemic issues; • Suggest how the country's procurement process can be further strengthened through this project;

		• Assist PMU and TL/DTL in preparation of monthly, quarterly, semi-annual and annual progress reports, and project completion report; • Perform other project related duties as may be identified by the Project Director and TL/DTL.

10	Social Safeguards and Gender Specialist	• Support the PMU to develop and operate monitoring and reporting formats for different social aspects of project implementation. • Guide and support PMU on the identification and involvement of disadvantaged women, the poor and indigenous communities in the project activities and the generation of benefits for them. • Provide support to the PMU in monitoring and reporting on social aspects of project implementation; • Support the PMU as required in training initiatives for capacity development of the poor, women and other disadvantaged groups. • Assess the progress on key social issues in project implementation through regular field visits and inspections, report to the Project Director and the TL/DTL, and advise on actions to address significant problems arising. • Provide guidance in developing policy, programs and procedures of the project to implement the Gender Action Plan and enhance contribution to social development; • Assist the TL/DTL to plan, design, prepare curriculum, deliver, monitor and evaluate training/orientation program on gender and social analysis, and support incorporating gender aspects in the training for the project targeted participants • Provide social and gender inputs for all the trainings both at institution and community levels; • Ensure implementation and monitoring of Gender Action Plan.
11	GIS Specialist	He/she should work under the team leader as a member of the team and assist to accomplish the task of: • All physical features land use inventory; • Supervise GPS/topographical survey and all digital map preparation; • Preparation of relational database precision.
12	Environment Specialist	• Review ADB SPS 2009, Government of Bangladesh applicable environmental laws and regulations, project's initial environmental examination report including all environment checklists included in the DPRs with emphasis on the individual roads/packages' likely positive and negative environmental impacts and risks, identifying the safeguard principles, and prepare a matrix on how the environmental safeguards are triggered by the project;

		• Assess the country's implementation practice, capacity, and commitment to plan, implement, monitor, and report on the safeguard measures;

		• Assess environment gaps, if any, prepare safeguard related action program to address the identified weaknesses, including consideration on the need for capacity strengthening measures; • Identify measures for monitoring environmental safeguard systems performance; • Undertake at least semi-annual field monitoring visits to oversee the actions taken by the contractors in regard to the implementation of EMP and suggest corrective measures if necessary; • Assist LGED to implement the measures identified in the EMP to include liaisons with concerned agencies to secure necessary clearances and permits (e.g., tree cutting, utility shifting, working near irrigation canals); • Monitor the effectiveness of EMP and negative impacts on environment caused by the construction works, and provide technical advice, including a feasible solution, so the LGED can improve the situation when necessary; • Investigate the current status of the climate change, vulnerability and impacts over the study area and analyze in detail future climate change projection and scenario; • Prepare environmental field monitoring report, quarterly report, annual report, midterm report and project completion reports;
13	Hydrologist	• Develop baseline condition of hydrological features of the study area, establish the drainage pattern and catchments' boundaries; • Review past and present morphological processes, i.e., erosion and deposition patterns, flow dynamics and sediment transport; • Analyze rainfall-runoff, tide, wave, drainage basin, river water levels, frequency analysis and establishment of design flood event of the project area; • Collect and analyse relevant hydrological data, in consultation with LGED design cell, and assess the requirement for additional cross-drainage capacity on project roads in order to maintain natural drainage; • Based on analysis of hydrological data, assist the Structural Engineer in establishing technical design criteria for drainage network; • Prepare relevant reports on the hydrological and morphological areas; • Assist PMU and TL/DTL in preparing the monthly, quarterly, annual, and mid-term progress reports, and project completion report;

14	Training Specialist	• Develop training programs for LGED staff and other stakeholders in technical and non-technical areas to improve levels of competence and build a more community oriented and gender sensitive approaches for climate change adaptation and road safety, and apply a participatory approach in performing their duties and responsibilities; • Co-ordinate with different training institute, individual trainers, agencies of GoB and facilitate in arranging training programs including in the logistics; • Prepare an annual training plan and budget and integrate the same into the overall annual plan of the project;

8 Firm's Capabilities

The consulting firm should have the following capabilities:

(i). Office personnel:

The consulting firm should have the personnel as mentioned in **Manning Schedule.**

(ii). Office and Technical Equipment:

The office should be fully equipped with the following general amenities and technical equipment, such as Ammonia Printing Machine, Paper Trimmer, Lettering Sets, Stencil Facilities, Drum Scanner, equipment for spiral, laminating and ring binding, Calculators and modern Filing Cabinets etc.

a. Physical Survey Equipment: Common and necessary filed survey equipment's should be possessed by the consulting firm to run relevant projects of the following number**.**

Sl no.	Item	Quantity
1	Total Stations	4
2	Theodolites	3
4	3d Scanners	2
5	Optical and digital levels	3
6	GNSS receivers	2
7	Walky-talky	5
8	Chain	3
9	Measuring tape	3
10	Ranging Rod	5
11	Prismatic Compass	2
12	Tripod	5

13	Alidade Table	3
14	Tellurometer	1
15	GPS	10
16	Safety Gear	20

b. Computers: All technical personnel should possess their own PCs which accelerate their ability in desired place, preferably in holidays or unofficial times.

c. GIS setup: Consulting firm should have managed this software's such as Arc View 3.3, Arc GIS

10.5, SPSS 26, Auto CAD 2018 etc.

d. Telecom facilities: Our consulting firm have managed adequate telecom facilities, phones, fax, e-mail, internet, voice mail etc. for both intercom as well as incoming and outgoing external calls.

e. Transport vehicles: Our firm should have enormous advantages for the professionals to transport any time. It should have the transport facilities such as Car, Motor cycle, Station wagon etc.

f. Construction Equipment:

Sl no.	Item	Function	Quantity
1	Scrapers/ Motor graders	leveling of the drainage machine's track, drain route after its laying and backfilling;	2
2	Dump Tracks	transportation of drainage pipes, filtering materials, assemblies of outlet and head structures, as well as surface inlets;	3
3	Bulldozers	for sliding apart of spoil banks from the collector and drain outfall, backfilling of drain trenches, grooves, and excavation pits;	2
4	Truck Cranes	for mounting of the surface inlets, outlet and head structures	2
5	Excavators	for excavation of outlet recesses and bottom-hole trench, installation of a drainage machine on the collector slope.	2

6	Reinforced Pipe Making Machine	To produce concrete pipes and prestress concrete pipe.	1
7	Loaders	for loading of sand & gravel filters onto dump trucks when transporting those from a storehouse next to the site to a continuously operating drainage machine;	3

g. Others: Our consulting firm have own medical facilities to provide first aid to the staff.

9 Format of Submission

9.1 Format of Base map preparation

Base maps will be prepared on the enlarged survey maps (RS mouza map) at scale 1:1980 (1" =165') and indicate but not limited to the following features.

Sl. No.	Physical feature	Illustrated
1.	River, Khal	Indicate direction and depth of flow
2.	Drainage channels	Indicate direction of flow for natural and improved ones
3.	Ponds/ditches	Indicate location
4.	Roads	Indicate location, right of way, slope, and status as pucca /semi-pucca/kutcha etc.
5.	Deep tube well station	Location of deep tube stations and outputs

Note: The features identified above should be provided in the base map. Names of settlements, villages, rivers, khals, lakes, roads, etc. must be indicated in the maps.

9.2 Format of Socio-economic Survey

Sl. No.	Items	Illustrated
1	Demographic information	Age, sex, household size, type of housing, health and educational profile, migration patterns
2	Family size	No. of household, no. family members
3	Occupation pattern	Government, private, and others
4	Land ownership	Private, communal, state, open access

9.3 Format of Topographic Survey

Topographic survey GPS and total station will cover the item of location/alignment of all roads, and other drainage divides. Closed boundary /out of homestead, water bodies, swamps, etc. spot heights or land levels at roughly 10m intervals in normal cases, contour at 0.3-meter interval, crest levels not exceeding50m along all roads and drainage divide.

Sl. no.	Topographic features	Illustrated
1	Alignment of drainage channel	The natural and manmade slopes with which the present drainage system is functioning
2	Road	Type, width, length and name of road, alignment and crest level of road and other drainage divides.
3	Water body	Outline of water body, swamps etc.

9.4 Format of Physical Feature Survey

Physical feature survey will cover location and dimension of existing all structures with height, use of structure and other, location of all existing exposed water, sewerage line, road (Katcha, Pucca), khal etc. Topographic and physical feature survey information will be incorporated in enlarged RS Mouza boundaries. Mouza map scale will be used in the preparation of the base map to demarcate the study area. The base map and other maps will be printed on Mylar and copy (digital and hard) would be handed over to Rangpur Sadar Paurashava for approval.

Sl no.	Physical features	Illustrated
1	Drainage Channels	Natural & manmade (Indicate with direction of flow & width)
2	Ponds/tanks/Ditches	Indicate them
3	Marshland/Flood prone area	Land liable to flooding during monsoon
4	Building/ Structure	Pucca/ Semi Pucca structures with the number of stories
5	Roads	Pucca/ HBB/ Kutcha etc.
6	Utility Condition	water works, waste disposal & treatment, telephone line
7	Water Demand	Average waste water discharge per person region wise
8	Water supply system	Indicate the system with the location of deep tubes well, overhead tank and its capacity, catchments area of overhead tanks etc.

9.5 Format for Secondary Data

Sl no.	features	Illustrated

1	Soil	workability, water holding capacity, erodibility, effective soil depth, subsurface drainage classification according to standard taxonomy, data on salinity and alkalinity
2	Ground water	Position of the water table relative to the ground surface, Fluctuations in water table levels
3	Geology	detailed information of geology
4	Meteorology	Rainfall intensity, Evaporation

9.6 Format of Map and digital information

(i). Software: Arc View 3.3, Arc GIS 10.5, SPSS 26, Auto CAD 2018 etc.

(ii). GPS: accuracy 0.5 meter

(iii). Grid (on tic points) geospatial references should be indicated in each sheet

(iv). Map layering: Particular feature or group of features should be in separate layer (coverage detail form attached)

(v). Input data: Sources should be mentioned

(vi). Digitizing (location accuracy) 0.001 inch

(vii). Media: for digital copy CD Floppy and pen drive

(viii). For original hard copy: Mylar paper or such stable paper (ix).

Title Blocks

(a). Name of the project
(b). Name of the organization
(c). Name of the firm (d). Subject title (e). Drawing No.
(f). Revision No.
(g). Drawing by and date
(h). Checked by and date
(i). Approved by and date
(j). Plot standard

9.7 Format of Submission of Maps and Plans

SI.	Description	Scale	No. of copies to be submitted

No			Draft	Final
1	Base Map	1"=330'	7	15
2	Socio economic Survey	1"=165'	7	15
3	Topographic Survey	1"=165'	7	15
4	Physical Feature Survey	1"=165'	7	15
5	Field survey (Original survey marking)	1"=165'	7	15
6	Road network	1"=165'	7	15
7	River/Khal/Drainage	1"=165'	7	15
8	Drainage network plan	1"=165'	10	20

9.8 Format of Time Schedule and list of reports to be submitted (both digital and hard copy)

The Consultant shall submit the following outputs/deliverables:

The Inception Report: This shall provide confirmation regarding mobilization and local arrangements made by the Consultants to carry out the assignment, availability of all key staff as per proposal (amended during contract negotiation) and include the detailed work plan, the final detailed time task schedule listing all the tasks, the estimate by task of both the staff time input by Consultants and the time requirement for task completion in bar chart and also include supporting text describing the basis for the schedule;

Interim Report: Interim Report on Drainage covering draft assessment of all aspects, such as water demand, NRW, production, water quality, transmission, distribution, and on water supply with response to the comments offered by the RC on the First Interim Report and all other aspects which were not covered in the previous Report, and draft ToRs for the proposed Sanitation Project, Project Management Consultant and Construction Supervision

Draft final report covering design of Drain and other Drain elements assets and embodying.), final ToRs for the project, project management consultant and construction supervision, draft economic and financial analysis, project cost estimate and appropriate Procurement Strategy for this project.

Final Report for drainage network plan and construction with detail drawings, and final economic and financial analysis.

SN	Deliverables	Quantity	Language	Print	Binding	Timeline (Month)
1	Inception Report	7	English	Photocopy	Spiral Binding	End of 1st Month
2	Socio economic Survey Report	7				End of 5th Month
3	Topographic survey Report	7				End of 5th Month
4	Physical Feature survey report	7				End of 5th Month
5	Interim Report	7				End of 12th Month

6	Draft Final Report	7			Leather Binding	End of 24th Month
7	Final Report	10				End of 35th Month

Note: Digital copies for all reports and Maps to be submitted. One copies each of compact disk (CD), floppy disk and pan drive. Sheet size 30"*40" paper Mylar and Ammonia.

10 Suggested Content of Reports

There are some reports to be submitted during the project. Again the draft and final layout plan for water supply network should be presented in both written and graphic form. All reports related to the plan should be presented following contents as suggested below.

10.1 Content of Inception report

Table of Content

List of Acronyms

Executive Summary

Section 1: Introduction

1.1 Background

1.2 Project Area

1.2.1 Existing Canals in KCC

1.2.2 Encroachments and Blockages

1.3 Objectives of the Project

1.4 Scope of Work

1.5 Structure of the Inception Report

Section 2: Award of the Consultancy Services

2.1 Consultancy Award

2.2 Effective Date of Contract

2.3 Commencement of Consultancy Services

2.4 Consultant's Mobilization

Section 3: Methods & Design Criteria of Project Works

3.1 Engineering Surveys

3.1.1 Setting of Benchmark and Reference Pillars

3.1.2 Preparation of Survey Maps

3.2 Sub Soil Investigation

3.3 Design of Drainage System

3.3.1 Delineation of Catchment Area of Drains

3.3.2 Selection of Design Storm Event

3.3.3 Selection of Design Flood

3.3.4 Basic Concept of Urban Drainage and Approach to Design

3.3.5 Design Criteria for Urban drainage network

3.3.6 Design Methods

3.3.7 Structural Design

3.4 Design of Drainage Sluices

3.4.1 General

3.4.2 Design Criteria for Drainage Sluices (DS)

3.4.3 Procedure for preparation of Engineering Design of drainage sluices

3.5 Design of Bridges over the Mayur River

3.6 Design of Pump House

3.6.1 Comparative Statement on Features of Conventional Turbine Pump and Submersible Motor Pump

3.6.2 Structural Design Parameters of Pump House

3.6.3 Supervisory Control and Data Acquisition Control (SCADA) System

3.7 GIS-based Database System

3.8 Bill of Quantities and Cost Estimates for all Components of project works

3.9 Preparation of Tender Documents

3.10 O&M Manual

3.11 Local Training

Section 4: Progress of Works Achieved

4.1 Project Start-up

4.2 Collection of Relevant Reports

4.3 Collection of Hydro-Meteorological Data

4.4 Review of Relevant Documents and Reports

4.5 Analysis of Hydro- Meteorological Data

4.6 Collection of Locations of Phase I & II Works from KCC

4.7 Deployment of Survey Teams

4.8 Coordination meeting with the representatives of Concerned Govt. Organizations

Section 5: Project Organization, Work & Staffing Schedule, Reporting Requirement

5.1 Project Organization

5.2 Work Plan

5.3 Reporting Requirements

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1.2 Project Objectives

1.3 Scope of work

1.4 Limitation

1.5 Brief description of the project area

1.6 Reconnaissance survey of the project area

Section 2: Approach to planning and methodology

2.1 Mobilization

2.1.1 Assignment of project team

2.1.2 Preliminary data review and identification of sources

2.1.3 Collection of maps, basic statistics and information

2.1.4 Preparation of base map and demarcating project boundary

2.1.5 Consultation

2.2 Methodology of physical feature survey

2.2.1 Establishment of ground control points (GCP) and bench mark (BM)

2.2.2 Topographic survey

2.3 Methodology of socio-economic survey

Section 3: Work program and manning schedule

3.1 Assignment of project team

3.2 Manning schedule

3.3 Activity schedule and network diagram

3.4 Reporting schedule with maps and diagram

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Section 5: Reflections on the Final Outputs

5.1 Draft Outline of Final Report

5.2 Output format (data management structure, projection parameter, map layout, and checklist for survey and studies)

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REFERENCES

ANNEX 1 - TERMS OF REFERENCES (TOR)

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5.2.3 Logistics

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5.5.3 Tax exemption and Customs procedures

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Section 6. APPENDICES

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6.2 Appendix 2 Summary of IPC Payments

6.3 Appendix 3 Physical Progress

6.4 Appendix 4 MSCI

10.4 Contents of Survey Report

The following are the content of survey report. This content will need to be expanded and broken down into sub-categories on the basis of the study area, collected information and result of analysis as follows:

Section-1: Introduction

1.1 Background of the Study

1.2 Objectives of the Study

1.3 Rationale of the Study

1.4 Scope of the Study

Section-2: Methodology of the survey

2.1 Socio-economic survey

2.2 Physical feature survey

2.3 Topographic Survey

Section-3: study area profile

3.1 Location of the study area (Khulna city corporation)

3.2 Existing socio-economic condition of local people.

3.3 Potentiality and weaknes**s** of the study area

Section-4: Existing condition of the Study area: Review the existing condition of the Khulna city corporation with respect to community facilities, public services, utilities, infrastructure etc. especially drainage system (source, run-off, discharge pattern etc.)

Section-5: Data analysis and interpretation: Detail analysis of the Socio-economic survey, Physical feature survey and Topographic Survey. This should also include sources of water which passes through the drainage line, water discharge pattern, water demand etc.

Section-6: Problems and Potentials: On the basis of the survey data analysis and interpretation the scope of development and problems and potentials of the study area should be discussed needing immediate attentions that are very much related to the study.

Section-6: Conclusion and Recommendation

10.5 Content of draft and final report

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1.1 Background of the Project

1.2 Project Objectives

1.3 Scope

1.4 Limitation

Section 2: Project methodology

2.1 Initial activities

2.2 Secondary data collection

2.3 Peoples participation and inception report

2.4 Physical feature survey and Socio-economic Survey

2.5 Forecasting

2.6 Plan preparation

2.7 Evaluation

2.8 Reporting

Section 3: Study area profile

3.1 Location and historical background

3.2 Topographical and climatic condition

3.3 Demographic characteristics of the population

3.4 Administration

Section 4: Data analysis

4.1 Socio Economic condition of the people

4.2 Forecasting future demographic trend

4.3 Estimation of future water demand

4.4 Estimation of existing water discharge

4.5 Water logging projection trend over the next 25 years

4.6 Estimation future land use and land cover pattern.

Section 5: Preparation of layout plan of drainage network

Section 6: Environmental impact assessment (EIA) report

Section 7: Summary findings

Section 8: Recommendation for the implementation of the plan

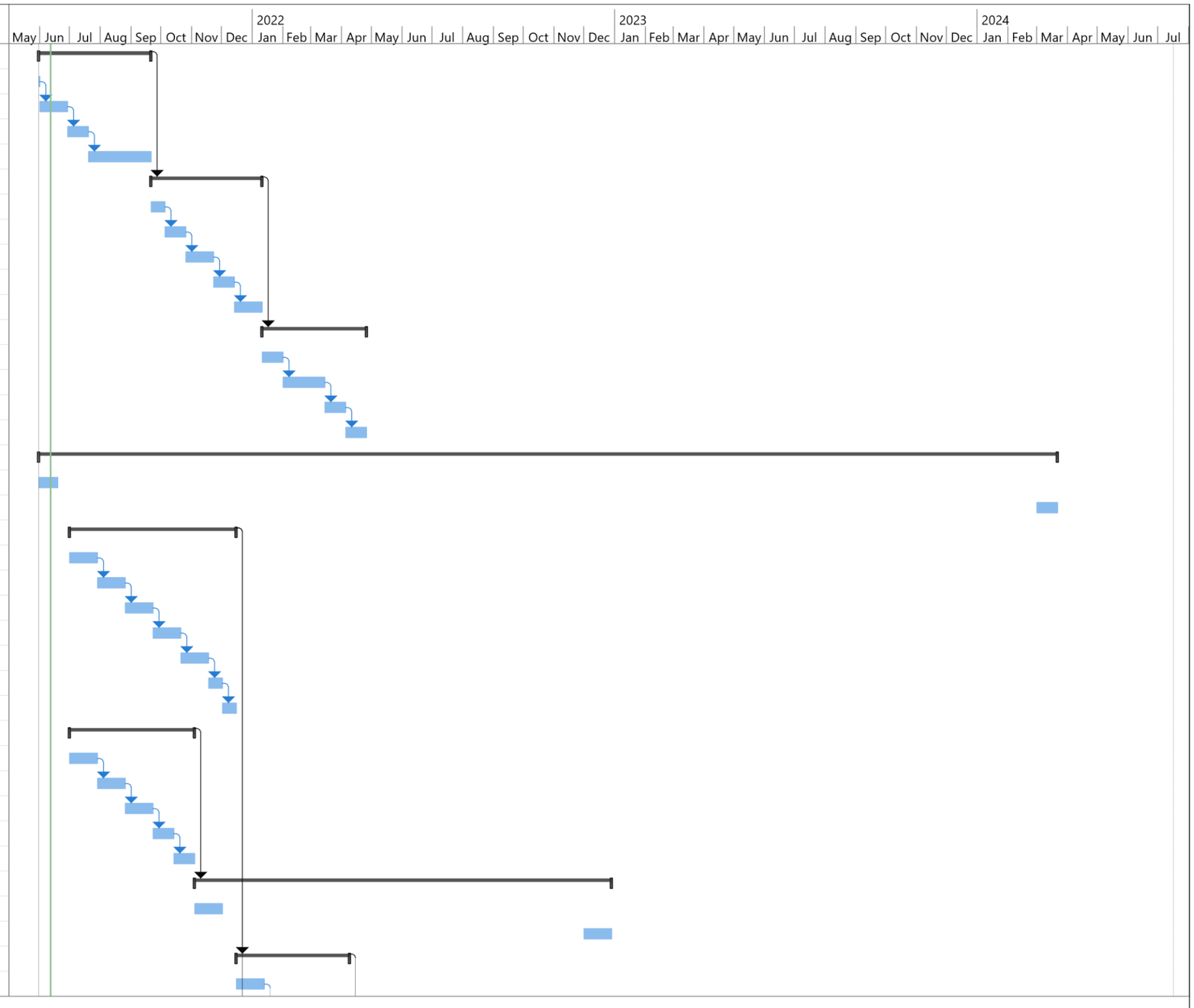
Conclusion

ANNEX 1- TERMS OF REFERENCES (TOR)

ANNEX 2- Questionnaire of Socioeconomic Survey

ANNEX 3- Summary of Socio-Economic Survey Report

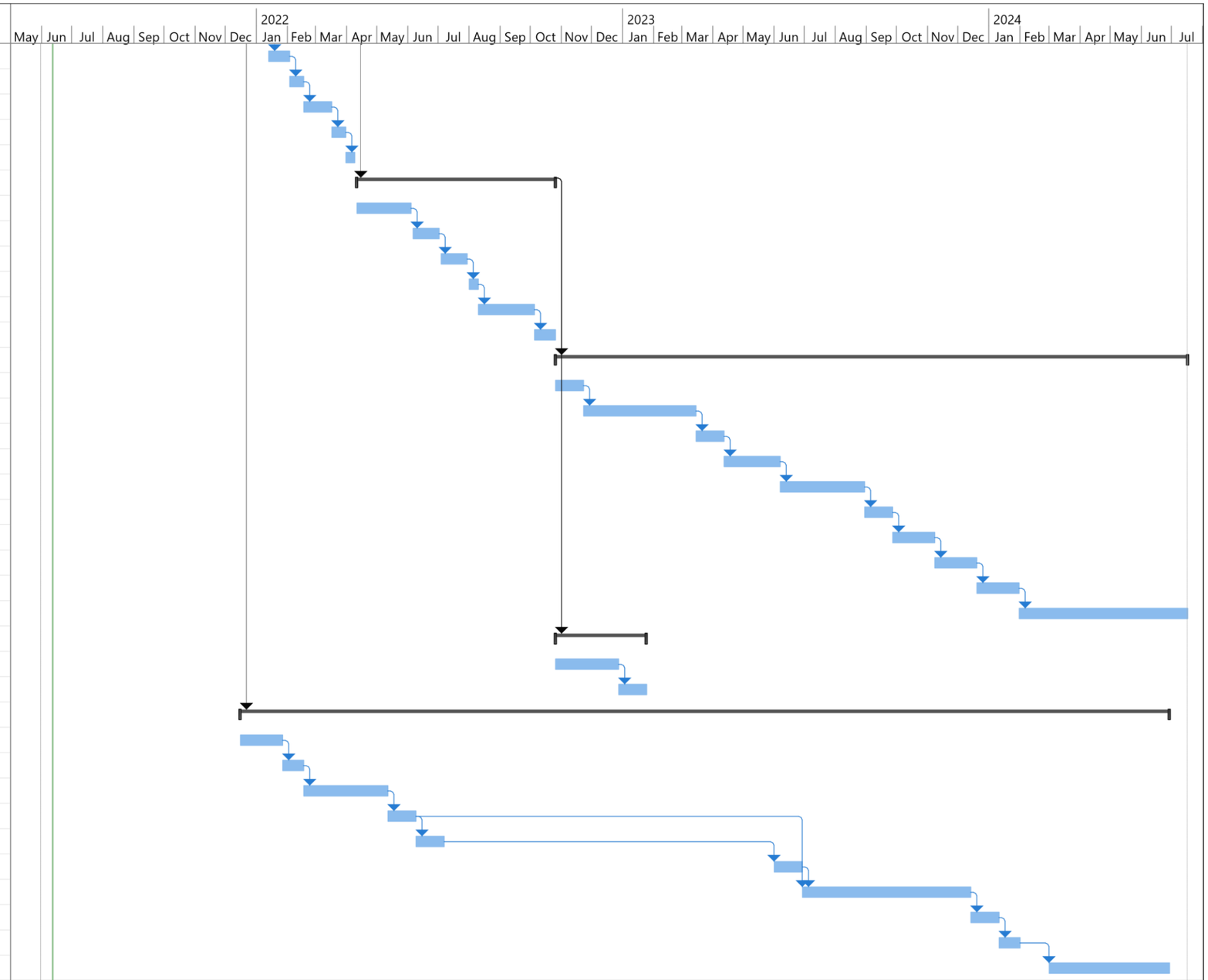
ID	Task Name
1	**Commencing activities of the project**
2	Signing of the agreement
3	Scheduling of the project
4	Mobilization of resources and office setup
5	Reconnaissance survey
6	**Collection, Arrangement and Analysis of Existing data**
7	Collection of Mouza map
8	Collection of meteorological data
9	Collection of hydrological data
10	Collection of geological data
11	Collection of data on existing drainage system
12	**Base map preparation**
13	Scanning of the Maps
14	Digitization of the Maps
15	Checking and editing of the Maps
16	Preparation and compilation of the base map
17	**Peoples participation**
18	First consultation with the people of the KCC
19	Second consultation with the people of the KCC
20	**Primary data collection**
21	Carrying out Topographic survey
22	GPS survey
23	Carrying out survey on water usage demand
24	Carrying out survey on water discharge
25	Geo-referencing of the maps
26	Updating of maps and data
27	Preparation and printing of contour map
28	**Primary data collection**
29	Carrying out socio-economic survey (questionnaire)
30	Socio-economic data input
31	Database preparation
32	Socio-economic data analysis
33	Preparation of survey report
34	**Training**
35	Training (Session-1) for officers/staffs of KCC
36	Training (Session-2) for officers/staffs of KCC
37	**Forecasting**
38	Forecasting future demographic trend



Date: 12-06-2021

Task	Project Summary	Manual Task	Start-only	Deadline
Split	Inactive Task	Duration-only	Finish-only	Progress
Milestone	Inactive Milestone	Manual Summary Rollup	External Tasks	Manual Progress
Summary	Inactive Summary	Manual Summary	External Milestone

ID	Task Name
39	Estimation of water demand of people over the next 25 years
40	Estimation of water discharge of people over the next 25 years
41	Waterlogging projection over the next 25 years
42	Forecasting future land use and land cover pattern
43	Updating study area map
44	**Plan preparation**
45	Planning and engineering Design & Drawing of all types of drain with cost estimates
46	Formulation of draft drainage network plan
47	Selection of Pilot Project and preparation of draft implementation plan
48	Explanation and discussion on Implementation of Pilot Project
49	Implementation and monitoring of Pilot Project
50	Formulation of final drainage network plan
51	**Construction & Improvement of Drain**
52	Marking of alignment
53	Excavation/Digging in earth
54	Removal of heap
55	Embankment from borrow pits and purge soil
56	Sand filling works
57	Concrete Blinding
58	Construction of top slab
59	Construction of bottom slab
60	Reinforcement (Iron rod) positioning
61	Construction of drain wall
62	**Evaluation**
63	Environmental impact assessment
64	Evaluation (cost estimation) of the plan
65	**Reporting**
66	Formulation of Inception Report
67	Discussion of Inception Report
68	Formulation, inspection and modification of Interim Report
69	Explanation and discussion of Interim Report
70	Formulation and discussion of progress report-01
71	Formulation and discussion of progress report-02
72	Formulation of draft final report
73	Inspection and modification of draft final report
74	Explanation and discussion of Draft Final Report
75	Formulation of final report



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