

India: National Ganga River Basin Project
The Kolkata Metropolitan Development Authority(KMDA)
Pollution Abatement and Rehabilitation of Bagjola Canal

Terms of Reference

1.0 PROJECT BACKGROUND

The Upper BagjolaKhalofftaking from B.T.Road crossing near Dunlop traverses a distance of 9.235Kms. through Kamarhati , Baranagar, South Dum Dum Municipalities uptoV.I.P.Road Crossing and the downstream extension of the said channel from V.I.P. Road crossing, known as Lower BagjolaKhal flows through the areas of Bidhannagar Municipal Corporation, a small portion of Rajarhat Block, New Town flowed by Bhangore and Haroa Blocks for a length of 28.80 kms. and ultimately outfall to river Kultigong in P.S.- Haroa through 10 and 9 vented Sluices and one outfall Pumping Station at Kulti of installed capacity of 1650 cusecs.

Sources of discharge :

The stretch of Upper Bagjolakhalreceives the dry and storm weather flow from the following areas either through gravity flow or Drainage Pumping Station –

- i. Portion of Panihati Municipality,
- ii. Portion of Kamarhati Municipality,
- iii. Portion of Baranagar Municipality,
- iv. Portion of Kolkata Municipal Corporation,
- v. South Dum Dum Municipality,
- vi. Portion of Dum Dum Municipality,
- vii. Portion of North Dum Dum Municipality

A. Major tributaries/drainage channels inletting to the Upper Stretch of Bagjola khal –

- i. DantiaKhal from Kamarhati Municipality,
- ii. East and West side drain of B.T.Road from Panihati Municipality,
- iii. Full BaganNikashiKhalfrom Baranagar Municipality,
- iv. UdaypurKhal from North & South Dum Dum Municipalities,
- v. LalababuNikashiKhal from Kolkata Municipal Corporation area,
- vi. Cantonment Khal from South Dum Dum Municipality

B. Drainage Pumping Stations disposing storm and dry weather flow in the stretch –

- i. Outfall of Kamarhati Pumping Stn. on the L/B at Ch.-10.00 m.
- ii. Outfall of Noapara Pumping Stn.[Baranagar Municipality] on the R/B at Ch.- 2900 m.
- iii. Birpara Pumping Stn. of Kolkata Municipal Corpn. on the R/B at Ch.- 6815 m.
- iv. DuttaBagan Pumping Stn. of Kolkata Municipal Corpn. on the R/B at Ch.-7390 m.
- v. Lake Town Boosting up Pumping Stn.of PHE on R/B at Ch.-7390 m.
- vi. Bhangore Pumping Stn. of PHE on R/B at Ch.- 7390 m.
- vii. Dum Dum Park Pumping Stn. of KMDA on L/B at Ch.-7530 m.
- viii. Bangur STP of Kolkata Metropolitan Corpn. on R/B at Ch.- 8080 m.
- ix. Bangur Pumping Stn. of SDDM on R/B at Ch.- 8610 m.

In addition to the discharge receives from Upper Bagjolakhal, the stretch of Lower Bagjolakhal receives the dry and storm weather flow from the following areas either through gravity flow or Drainage Pumping Stations –

- i. Bidhannagar Municipal Corporation,
- ii. Portion of Rajarhat Block, North 24-Parganas,
- iii. New Town areas

C. Major tributaries/drainage channels inletting to the Lower Stretch of Bagjolakhal[upto 13.073 km.] –

- i. BB-1 Branch channel from Bidhannagar Municipal Corporation
- ii. Adarshapally Channel from Bidhannagar Municipal Corporation
- iii. Anandapally Channel from Bidhannagar Municipal Corporation
- iv. Sulanguri Channel (near Police Camp) from Bidhannagar Municipal Corporation,
- v. Sulanguri Channel (near High School) from Rajarhat Block.
- vi. XX-1 Channel from New Town
- vii. DD-1 Channel from New Town
- viii. EE-1 Channel from New Town
- ix. EE-2 Channel from New Town

D. Drainage Pumping Stations disposing storm and dry weather flow in the stretch –

- i. Drainage Pumping Stn. (DPS-Point-A) of NKDA on R/B at Ch.- 2397 m.
- ii. Drainage Pumping Stn.(DPS-C) of NKDA on R/B at Ch.- 4279 m.
- iii. Drainage Pumping Stn.(DPS-A-12) at Jatragachi of NKDA on L/B at Ch.-4800 m.[over CC-1 Br.Channel]
- iv. Drainage Pumping Stn.(DPS-Point-IB) of NKDA on R/B at Ch.- 5008 m.v.
- v. Drainage Pumping Stn.(DPS-Point-F) of NKDA on R/B at Ch.- 6436 m.
- vi. Drainage Pumping Stn. (DPS-CBD-VII) of NKDA on L/B at Ch.- 6700 m.
- vii. Drainage Pumping Stn. (DPS-Point-H) of NKDA on R/B at Ch.- 7406 m.
- viii. Drainage Pumping Stn. (DPS-Point-IIIB) of NKDA on R/B at Ch.- 8367 m.
- ix. Drainage Pumping Stn. (DPS-Point-IIIC) of NKDA on R/B at Ch.- 10393 m.
- x. Drainage Pumping Stn. (DPS-Point-IIID) of NKDA on L/B at Ch.- 10915 m.

Extent of SWF and DWF upto end of New Township [Ch.-13.078 Km. of Lower Bagjolakhal at Gabtala] :

A.	In the Upper Bagjola Stretch [from 0 m . to 9235 m.]	i) Estimated SWF	-	1744.43 cusecs
		ii) Estimated DWF	-	376.45 cusecs
B.	In the Lower Bagjola Stretch [Upto 13078 m. of Lower Bagjolakhal including the Upper Bagjolaportion]	i) Estimated SWF	-	5524.43 cusecs
		ii) Estimated DWF	-	597.72 cusecs

As already stated since, the entire Bagjola system is fed from the inflow receives from its tributaries as well as the pumping discharge of all the Pumping Stations outfalling to the system and the entire inflow so receives by the drainage system is in untreated condition , the extent of contamination in the channel water during the dry weather flow is predominant and unhealthy . While, during the rainy season, receive of precipitation water to its entire catchment reduces the extent of contamination and clearer water than the dry spell flows through the channel.[Copy of the Test Report of Water Quality conducted in the Lower Stretch of Bagjolakhal during Nov’2016 is enclosed as ready reference as ANNEXURE-III]

Owing to the drainage channel is traversing through the fringe of Kolkata Metropolitan City ,adjoining thickly populated urban areas and more importantly through the newly developed prestigious New Townwhere dignitaries all over the World frequently visits, keeping of the drainage discharge free from contamination, colour, odour is becoming a concern to the authorities.

Since, the drainage channel has no separate source of discharge and is fed entirely from the drainage disposal of the urban bodies viz. the municipalities, Bidhannagar Municipal Corporation, New Town, disposal of treated discharge in the drainage channel is the only feasible solution to keep the drainage water clean.

The condition of the dry weather flow is worsened during the lean season in comparison to the storm weather flow and moreover, since, the extent of dry weather flow [assessed as **597 cusecs** upto the end of the territorial jurisdiction New Town vide ANNEXURE-II], disposal of such extent to Bagjolakhal after necessary treatment may reduce the water condition being prevailed.

Under such condition, commissioning of Treatment Plant to all the existing Pumping Stations on DWF outlets duly separating SWF & DWF outlets from the combined outflow system[both in upper and lower stretch] belonging the municipal bodies, Kolkata Municipal Corporation, New Town Kolkata Development Authority may help in keeping the drainage water clean. In addition, since, there are several tributary channels disposing untreated discharge to Bagjola System viz. Udaypurkhal, Cantonment khal in the upper stretch and BB-1, XX-1, DD-1, EE-1 and EE-2 Branch channels in the lower stretch upto New Town jurisdiction from the areas as stated in the ANNEXURE-I and ANNEXURE-II, to get clear water to the channels, on commissioning of separate sewerage network coming from different civic bodies are to be intercepted and then to be disposed duly treating them. Moreover, there are innumerable drains directly outfalling both in the upper and lower stretches of the drainage channel which are also to be intercepted as per suitable site conditions and treating the discharge to clear water again may disposed of to the drainage channel.

Since, all the municipal bodies, NKDA (for New Town) are falling under the jurisdiction of Urban Development & Municipal Affairs Department, for effective implementation of the work under a common platform, UD & MA Department being the nodal department may take the initiative so that the clear water may prevail during the lean season in the Bagjola Drainage System within the important and prestigious urban areas.

Another aspect of indiscriminate dumping of solid wastes from the dwellers along the drainage channel of different municipal bodies including disposal of khatal affluent deteriorating the condition to a large extent by increasing the rate of siltation to the channel bed

1.3 Bagjola Canal which flows from west to east through the north & south east Kolkata and which merges with the Hoogly (Ganga), is an important and major drainage channel with strong tidal influence. Rapid and unplanned urbanization, particularly in the northern and south-eastern parts of Kolkata, channel bank encroachment (due to huge post-independence influx of refugees from East Pakistan), disposal of raw sewage and poor management of solid wastes generated from households, livestock and religious activities and above all, lack of maintenance contributed to severe environmental pollution to the Nullah. Bagjola Canal became a silted-up 'sewer channel' and an out and out polluted tributary to the Hoogly (Ganga), which is impacting the river water quality. Therefore, abatement of pollution of Bagjola Canal is now integrated to the efforts being made to clean the River Ganga--at its downstream.

1.4 The Bagjola canal drainage basin in the Hoogly River (drainage) system of Kolkata city drainage (see the attached map showing Drainage Flow Pattern). Its catchment area is approximately 164 KM² in which 49.2 sq km in upper Bagjola to VIP Road. Upper Bagjola portion from Kamarhati to VIP Road is 9.2 Km Long and lower Bagjolla portion from VIP road to Bidyadhari river is 28.8 km long.

1.5 The Bagjola canal is a manmade water duct meant for irrigation. Farmers may use its water for crops and Launches may ply along their length. Rain water drains into the canal too. But the water washes away the silt as it flows and same gets deposited in different places in the canal. To ensure smooth flow of the water the canal needs to be de-silted / dredged thoroughly. The Irrigation and Waterways Division conducted a pilot study on this canal and taken up some works there for abatement of pollution. There are now 10 nos vents and upper Bagjola has the capacity of 1560 Cusecs. But due to malfunction of sewage treatment plants and discharge of sewage through gravity outfalls in its total course towards Ganga, the water quality in Bagjola Canal has degraded. Moreover handling of solid wastes is not well-managed in the

proximity of the Canal. Throwing of garbage into the Canal posed a serious threat to the water quality.

1.6 The Government of West Bengal (GoWB) has decided to rejuvenate the Bagjola canal into a SW-II class water body (suitable for Bathing, Contact water sports and Commercial fishing) and improve the aesthetics of the surroundings as a scheme of the NGRBA to be implemented by the KMDA.

2.0 OBJECTIVE OF THE ASSIGNMENT

2.1 The KMDA will hire a consulting firm to assess the existing arrangements for wastewater and solid waste management in the Bagjola Canal drainage basin (“the basin”), identify the issues which contribute to the pollution and consequent environmental degradation of the Canal and develop strategies to redress the situation in the short-term, the medium term and the long term. The consulting firm shall prepare Master plans for implementation of the above strategies and transform the plans into implementable detailed project reports (DPRs) for pollution abatement and rehabilitation of the Bagjola Canal.

3.0 SCOPE OF CONSULTANCY SERVICES

3.1 The prerequisite for achieving the objective of the assignment is to study the existing situation and the management of the environmental sanitation -- human excreta disposal (onsite-- sanitation units, and offsite--wastewater collection, conveyance and treatment), municipal solid wastes management services and the urban drainage –infrastructure and services in the Nullah basin, and more specifically study the same in greater details within the zone which influences the functioning of the Nullah and causes environmental degradation and consequent pollution in the River Ganga.

3.2 The consultants shall, therefore, carry out the following tasks, among other things, to achieve the objective of this assignment stated above.

3.2.1. Mapping Infrastructure. The consultants shall carry out (i) a preliminary survey of the Canal basin and prepare a work plan for undertaking surveys to prepare accurate maps and drawings for the existing environmental sanitation infrastructure, and (ii) survey of the existing sewerage and drainage system and prepare the maps and drawings in appropriate scale and in adequate details. Instead of keeping the review of the maps and drawings until substantial production, the consultants shall obtain the views of the designated official of the KMDA at every stage of progress and obtain their comments on the accuracy of the maps and details in the drawings. The Base maps prepared by using Total Station Method or any relevant map of Survey of India shall be used for the surveys.

3.2.2 Assess the Existing Service Delivery and Condition of Infrastructure. The consultants shall document the access to sanitation system and the practices followed by industries, institutions and private houses, and study the existing operation from source to disposal of wastewater, storm water and solid wastes in the basin, identify zones along the course of the Canal and its tributaries which impact its functioning and provide an estimate of the pollutants generated and quantify the portion which is disposed in the Canal. The study shall document the population coverage by the existing services and provide historical statistical information about water borne diseases and their variations over time and identify prone areas and the relation, if any, with the existing environmental sanitation conditions.

3.2.3 The consultants shall provide an assessment of performance (current carrying capacity vis-à-vis installed capacity) of the existing infrastructure such as (a) sewer network including appurtenances, (b) pumping stations including the mechanical and electrical components, (c) sewage treatment plant, (d) drainage system, and (e) generation, collection and removal for disposal of municipal solid wastes, based on the performance records available with the operating agencies. The consultants shall study the characteristics of the solid wastes, existing practices of collection and disposal and consider litter reduction methods, for example, planning controls, source controls and structural controls, applicable for the basin and more specifically in the area from where the solid wastes are transported and disposed to the Canal. The consultants shall carry out an assessment of the strengths and weaknesses of the institutional effectiveness of the service delivery arrangements presently in place.

3.2.4 Following the assessment (para 3.2.3 above), the consultants shall provide preliminary recommendations whether more detailed condition assessment will be required for any of the existing infrastructure and provide a road map for revitalizing non-performing and underperforming assets. Subject to strong justification and agreement of KMDA, the consultants shall carry out more detailed condition assessment (which shall be paid through a separately allocated provisional sum) and develop the detailed scope of the above road map for implementation. All maps and drawings (para 3.2.1 above) shall be submitted along with the Report on Existing situation and issues (Deliverable No. 2)

3.2.5 Develop Strategies to Improve Water Quality. Having documented the existing situation and service delivery arrangements (para 3.2.2 to 3.2.4 above), the consultants shall (i) provide an estimate of the generation of wastewater, storm water and municipal solid wastes in the design period of 30 years (base year shall be the year of survey, para 3.2.2 above) in the basin and that would have found place in the Canal if no action is taken to improve services, and (ii) prepare short-term, medium-term and long-term strategies and action plans giving due consideration to the possible alternatives to handle these in environmentally acceptable manner, and more specifically keeping focus on pollution abatement of Bagjola Canal.

3.2.6 The short-term action plan shall include those which can be implemented immediately in a period of one year and are 'quick gain' activities which can achieve perceptible improvement in service delivery resulting improvement in water quality. The medium-term action plan shall include those which can be implemented within a period of 3 years and which will contribute to further improvement in water quality and the establishment of institutional arrangement to sustain the services. At the end of the medium-term plan the water quality in the Canal shall be aimed to improve to SW-III class (suitable for Industrial Cooling, Recreation (non-contact) and Aesthetics). The long-term action plan shall include those which will be implemented within a period of 5 years to achieve transformation of Bagjola Canal into a water body of SW-II class (suitable for Bathing, Contact Water Sports and Commercial Fishing).

3.2.7 Prepare Conceptual Design. The consultants shall identify all possible design alternatives to give shape to the strategy and prepare short-term, medium-term and long-term plans as indicated above for the entire basin to achieve pollution abatement and for rehabilitation of the Canal. Few suggestions are mentioned below on (a) Sanitation, Sewerage and Drainage, and (b) Solid Wastes Management in the perspective of pollution abatement of the Canal and its tributaries, which exemplify the thoughts of the KMDA. These should not be construed to be an exhaustive treatment of the subject. The consultants shall work closely with the stakeholders, ward committees, urban local body, West Bengal Pollution Control Board to build consensus on the strategy, action plan and conceptual design including the institutional and financial aspects of service delivery for sustainable operation.

3.2.8 Sanitation, Sewerage and Drainage. With respect to the area within the basin not covered by sewer network, the consultants shall determine the conditions where onsite sanitation systems can be accepted as a solution and where offsite systems will be necessary, and prepare conceptual designs for improving the existing onsite facilities by (various) improved onsite facilities which are socio-culturally acceptable, and improve the existing onsite system by connecting to a sewerage system for offsite treatment and disposal. Innovative non-conventional options for conveyance and treatment will require serious attention.

3.2.9 The consultants shall pay particular attention to utilise the existing sewerage system consisting of the sewer networks, appurtenances, pumping stations, giving emphasis to their physical condition and techno-economically feasible rehabilitation, and augment the system where the carrying capacity requirement for the design period will demand so.

3.2.10 The consultants shall prepare conceptual-design options to improve the hydraulic performance of the Canal and its tributaries and improvement of the Canal front. All possible alternatives for rejuvenating the present Canal into a SW-II class water body with general improvement/extension of the ghats and connected access roads and aesthetics of the surroundings and development of open space, where possible for recreational purposes, shall be presented in the conceptual design report ranking them in the order of socio-cultural acceptability. The design options considered for

improving the hydraulics of the Canal and its tributaries shall be ranked in the order of their acceptance by the community, in other words in the order of less challenging one to the most challenging one for implementation.

3.2.11 The consultants shall recommend the monitoring mechanism (monitoring stations, institutional arrangement for monitoring and reporting) for water quality in the Canal and set the benchmark values of key parameters for each monitoring station to be achieved by the end of each year in order to achieve SW-II class water body in the Canal in 5 years.

3.2.12 **Solid Wastes Management.** Based on the scope of the services mentioned above, the design options to be developed by the consultants shall be comprehensive and shall encompass all waste generators and collection modalities. The options studied shall be equitable in nature and responsive to the prevailing local socio-economic conditions.

3.2.13 The consultants shall identify various design options (segregation of recyclable solid wastes, door to door collection, decentralised system, centralised system, deeper involvement of community, involvement of private sector, involvement of the local body, etc.) and variations and combination of these options not merely as a theoretical exercise, but in relation to their practical application in the Canal basin and more specifically within the area of influence which negatively impact the Canal in order to articulate the design of an efficient and sustainable solution. The consultants shall also examine the aspects of recovering revenue directly from customers, advantages and disadvantages, revenue potential, risk transfer, equity, community relations as prerequisite for successful intra-community service, positive and negative externalities, etc.

3.2.14 The best technical solutions consistent with economic and financial, institutional and management, social and environmental and operational aspects emanated from the above shall be recommended together with the road map for development of detailed project report and implementation.

3.2.15 **Prepare Detailed Project Reports.** The DPRs shall consist of design of the selected interventions (para 3.2.14 above) and its components and shall be prepared on the basis of detailed survey, investigation and engineering design, most of which has been discussed above. The designs shall conform to the Guidelines for Preparation of Project Reports under National River Conservation Plan and National Ganga River Basin Authority, and the Environmental and Social Management Framework for World Bank assisted National Ganga River Basin Project (May 2011) prepared by the PMG, NGRBA. Right at the outset of the preparation of the DPR, the consultants shall check the topographical surveys, location of sewage treatment plants, verify the proposed routing of sewers, siting of lift/pumping stations, preliminary designs and drawings of each element of the new system, location of disposal of solid wastes, and identify additional surveys, such as geotechnical surveys and any analysis required for establishing design criteria for the final design of the proposed works.

3.2.16 As regards, the onsite systems, the consultants shall prepare necessary documentation comprising the drawings, brief technical specifications, statement of materials required, cost estimates, and do's and don'ts for the communities to improve the existing system and construct a new sanitation system and solid waste disposal arrangement following acceptable design standards.

3.2.17 As regards the sewerage system, the consultants shall provide design of the manholes, lift/pumping stations, pumps, collection and transmission pipelines and a general outline/conceptual design of the sewage treatment plant and other associated infrastructure. Where required, for example, buildings, pumping stations, the consultants shall provide structural design including the design of the foundation structure.

3.2.18 The consultants shall prepare (a) environmental impact assessment report, (b) environmental mitigation and monitoring plan, according to the World Bank Guidelines (OP/BP 4.01), and also (c) a tentative social assessment report for resettlement of displaced population (no measurements and identification will be needed at this stage), according to the World Bank guidelines (OP/BP 4.12) for the recommended project activities. These reports and plans shall also conform to the Environmental and Social Management Framework for World Bank assisted National Ganga River Basin Project (May 2011), Programme Management Group, NGRBA.

3.2.19 Engineering detailed design documents. The consultant shall prepare all necessary detailed network plans, longitudinal profiles of pipelines, as needed, detailed drawings of all civil works in different sections and scales (1:50 and/or 1:25), geotechnical and soil investigation reports, structural design (for major civil works such as all buildings, plants and pumping station), detailed reinforcement and shuttering plans for all civil works in scales 1:50 and/or 1:25, technical specifications and bills of quantities as well as cost estimation of supplies and construction works, procurement plan for supplies and construction works, and estimation of operations, maintenance and management cost breaking them down into staff cost, electricity cost, vehicle operation, cost of repair, etc.. The O&M costs of first five years operation arrived on the basis of specific calculations for each investment shall be included in the total cost for each DPR. Further, all investments with significant O&M costs (such as WWTPs, pumping stations, landfills and waste processing) shall be developed and managed under Design-Build-Operate (DBO) or other long term (15 years) contracts. All individual design reports shall be produced with the necessary documents (e.g. drawings, hydraulic designs, structural designs, summary cost estimate, etc.) attached in annex.

3.2.20 Preparation of Bidding Documents. Upon validation of the proposed contract packages by KMDA, the consultants shall prepare the draft bidding documents (for supply and works contracts) necessary to enable tendering of supplies and construction services. The bidding documents shall be prepared following the World Bank’s Standard Bidding Documents. The final bidding documents shall be prepared after comments on the draft bidding documents are available from the NMCG and the World Bank.

4.0 LIST OF REPORTS, SCHEDULE OF DELIVERIES AND PERIOD OF PERFORMANCE

4.1 Table below shows the deliverables that will be submitted by the consultants, the schedule of delivery, and the number of hard copies to be delivered.

Sl. No.	Outputs / Deliverables	Date of delivery from commencement of contract	No. of hard copies to be delivered
1.	Inception Report	End of 4 th weeks	10
2.	Report on the existing situation, issues	End of 8 th weeks	10
3.	Master Plan - Short-term, medium-term and long-term strategies and action plan	End of 12 th weeks	10
4.	Conceptual design of Short-term, medium-term and long-term interventions	End of 16 th weeks	10
5.	Draft DPR	End of 18 th weeks	10
6.	Draft Bidding Documents	End of 20 th weeks	10
7.	Final DPR	End of 22 th weeks	10
8.	Final Bidding Documents	End of 24 th weeks	10
9.	Assignment Completion Report	End of 28 th weeks	10

4.2 Draft report shall be submitted for the Outputs/Deliverables at serial 2, 3 and 4 above and these shall be finalized within 2 weeks from the receipt of the comments from the Review Committee (para 6.1 below) and any other. All reports shall be accompanied with a PDF soft copy on a CD (One Master and 3 additional copies shall be included), number of hard copies as mentioned in the above table and a Power Point presentation.

4.3 Apart from the above, the consultants shall submit a monthly report (para 4.8 below) within a week following the month for which progress report is submitted.

4.4 **Report Format.** The consultant shall prepare reports presenting the data, the assumptions and their justification, the analysis, and the conclusions and recommendations.

4.5 All the reports required by the TOR shall provide a clear presentation and include a table of contents and an executive summary. The main body of the text shall be organized in sections and concentrating on the finding and recommendations and their justification. Supporting data and analysis shall be contained in the Annex which will be referenced as appropriate in the body of the text. All paragraphs in the executive summary, the text, and the Annex, shall be numbered to facilitate communication across the contents of reports.

4.6 The report shall be illustrated as appropriate with such drawings, sketches, tables, graphs, and maps to aid comprehension and assimilation of their contents.

4.7 **Inception Report.** The Inception Report shall include the detailed work plan, the final detailed time-task-schedule listing all the tasks, 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 program.

4.8 **Monthly Progress Reports.** Monthly progress reports should be furnished by the consultants within a week following every month. The report will briefly cover: (a) review of the work accomplished in the preceding month in relation to the work plan, (b) any constraints to progress or achieve full effectiveness of the work done and recommend measures for their alleviation and (c) an outline of the work planned to be done during the subsequent month. In all cases it has to provide a forecast of completion and submission of each of the deliverables.

4.9**Draft Reports and Final Reports [Conceptual Design Report (Master Plan) and Detailed Project Report].** The Draft Reports shall be prepared in sufficient detail as required for a Draft Final Report and shall contain tentative conclusions arrived at by the consultants. The Final Reports shall be prepared taking due cognizance of the comments received on the Draft Report.

4.10 **Draft and Final Bidding Documents.** The Bidding Documents shall be prepared using the World Bank's Standard Bidding Documents and shall contain the BOQ, technical specifications and tender drawings and other technical and commercial information.

5.0 DATA, LOCAL SERVICES, PERSONNEL, AND FACILITIES TO BE PROVIDED BY KMDA

5.1 The client will provide to the consultant previous reports/documents, data and maps with mention of Heading/Title, Name of Preparer and Time of Preparation of the document relevant to this assignment as per the availability with KMDA.

- Sewerage and drainage network diagram showing the pumping stations, sewage treatment plant in Bagjola Canal basin.
- Map showing the Bagjola Canal and the built-up property on both sides of the Nullah
- Map of the Bagjola Canal basin showing the physical feature such as roads, railways, canals, open drains, storm drains, pressure/gravity outfalls with penstock gates, markets, public facilities, etc.
- Details of the sewage pumping stations including the information on the mechanical and electrical installations
- Map of the sewage treatment plant site showing the structures and pipelines
- Records of water quality of Bagjola Canal at mouth and intermittent locations along its course during different seasons, especially during monsoon and non-monsoon
- The Census data on population in the sub-basin for the last two consecutive censuses
- Salaries of various categories of staff in Sewerage & Drainage department and Solid Waste Management department

5.2 The client will also assist consultants in obtaining permission/data from other stakeholders.

5.3 The consultants shall use the latest available Schedule of Rates (SOR) of the KMDA, and update the unit rates of the items to be used for the purposes of estimation of cost on the basis of the rates of labour and materials provided by KMC. For items not included in the KMC SOR the consultants shall use latest available SOR of PWD/KMC/I & WW Dept., GoWB and update the unit rate as per above, if necessary. However, for any non-scheduled item, the consultants shall prepare rate analysis based on the rates of labour and materials provided by KMDA or shall use the market rates and provide analysis of rate for such item.

5.4 The consultants shall verify the correctness of the data/information provided by the client and satisfy them about the accuracy of data/information /material before these are used. Data/information /material provided to the consultants shall remain the property of the originating agency and shall be provided solely for the purpose of the work to be done under this contract. All such borrowed material shall be returned to KMDA upon completion of the study. Apart from data/information provided by the KMDA and that which the KMDA could procure from other agencies, the consultants are responsible to collect any other data/information required for the assignment, through field survey and investigations.

6.0 INSTITUTIONAL AND ORGANIZATIONAL ARRANGEMENTS FOR REPORTING AND REVIEW

6.1 The consultants shall submit the Outputs/Deliverables to Water and Sanitation Sector, KMDA and Chief Engineer, W&S Sector KMDA along with a power point presentation (para 4.2 above). Each of the Outputs/Deliverables will be reviewed by a Review Committee (RC) consisting of controlling officers/HoDs/senior officers of KMDA and Programme Director along with the Technical Team of SPMG, and the RC will ask the consultants to deliver the presentation on a mutually agreed date/time within a week from submission. The deliverable will be discussed and comments will be provided by the RC. Brief minutes of such meetings will be prepared and communicated to the consultants for appropriate incorporation when the concerned reports are finalized by the consultants. RC's communication will be copied to the NMCG and the World Bank,

6.2 However, the draft DPR, the draft bidding documents, the final DPR and the final bidding documents will be shared by SPMG with the NMCG for review/comments upon completion of review by the RC. These will also be reviewed by the World Bank following NMCG review. Consolidated review comments will be communicated to SPMG/KMDA.

7.0 KEY PROFESSIONALS WHOSE CV WILL BE EVALUATED

7.1 It is estimated that 36 man months of the following key professionals will be required to deliver a quality product. Besides these key positions, several other support technical and non-technical professionals will be required to carry out this assignment. Some of the support technical professional may have to be from the disciplines of surveying, civil engineering, mechanical and electrical engineering, geotechnical engineering, water and sanitation engineering, urban planning, economics and communications, etc.

7.2 Team Leader and Project Manager. A wastewater and drainage engineer with a Bachelor degree or more in engineering and a minimum of 15 years of proven track record in planning and designing wastewater infrastructure, municipal solid waste management system and rehabilitation/rejuvenation of drainage channels, and practical experience as Team Leader for a minimum of 2 number projects of complexity of the proposed assignment. He/she will provide guidance to the team regarding the various surveys and investigations that will have to be carried out to deliver the services in an effective manner. He/she will coordinate with the client, review the relevant data, reports, and deliver presentation on the outputs/deliverables/reports to the RC, and execute work plan to deliver the project on time and to the satisfaction of client, among other things.

7.3 Sanitation and Wastewater Engineering Specialist. Sanitary engineer with a Bachelor degree in Civil Engineering or more in engineering and a minimum of 10 years of proven track record in planning and designing onsite/offsite sanitation and wastewater services infrastructure for urban cities. He/she will assess the existing situation and prepare conceptual design of innovative onsite and offsite systems as appropriate, lead the preparation of conceptual design, detailed designs including the drawings, technical specifications, related bill of quantities and cost estimates of the interventions in the wastewater sector, among other things as assigned by the Team Leader.

7.4 Wastewater System Rehabilitation Engineer. A civil/mechanical/ electrical engineer with a minimum of 10 years of proven track record in rehabilitation of water and wastewater systems comprising pumping machinery, electrical panels, sewage pumping stations and sewage treatment plants. He/she will lead the condition assessment of the existing sewerage infrastructure and develop the program for rehabilitation with all technical inputs necessary, among other things as assigned by the Team Leader.

7.5 Solid Waste Management Specialist. Degree in Engineering or more with a minimum of 10 years relevant experience. He/she shall be responsible, among other things, for analysing the existing municipal solid waste management system in the Bagjola Canal sub-basin and design of an eco-friendly, effective and sustainable solid wastes handling and management system. He may also be assigned additional responsibilities for environmental analysis and impact assessment and any other by the Team Leader.

7.6 Water Resources and Drainage Engineer. Degree is engineering with a minimum of 10 years relevant experience in water resources planning and designing surface drainage system to drain out storm water. He/she shall, among other things, undertake the analysis of the hydrology and hydraulics of Bagjola Canal and be responsible for designing an adequate and hydrologically sustainable channel which will maintain a reasonable flow.

7.7 Social Development Specialist. Master degree or more in social sciences with a minimum of 10 years' working experience in social sector projects and worked at least in one World Bank financed project and familiar with the World Bank's social safeguards requirements in projects. He/she will complete a preliminary assessment of the social safeguards including the issues to be addressed and analyse the present legislative and institutional challenges that may be faced while implementing the safeguards action plan.

7.8 Environmental Specialist. Master degree in environmental sciences/engineering/ management with a minimum of 10 years working experience in social sector projects and worked at least in one World Bank financed project and familiar with the World Bank's environmental safeguards requirements in projects. He/she will review and analyse the present legislative and institutional issues, review the existing law, prepare environmental assessment and environmental management plan, among other things. He will also provide support to the Solid Wastes Management Specialist to the extent necessary.

7.9 Procurement Specialist. Degree in engineering with a minimum of 10 years working experience in procurement of public works. Familiarity with the World Bank procurement guidelines and the Bank's Standard Bidding Documents is essential. He/she will be responsible for preparing the bidding documents complete in all respect in a timely manner.

7.10 Institutional and Financial Specialist. MBA (Finance) with a minimum of 10 years working experience in analysing performance of utility and institutional performance. He/she will be responsible for analysing the prevailing service delivery arrangements in the KMDA especially with respect to the Bagjola Canal and identify the support (organization, structure, finance, system) needed to strengthen the system to achieve sustainable operation and management.

Pollution Abatement and Rehabilitation of Bagjola Canal**Bagjola Canal and Past Interventions to Clean-up****Bagjola Canal.**

1. Bagjola Canal provides the main drainage basin area of 164 sq. KM, 49.2 Sq. KM is in the upper Bagjola to VIP Road. It crosses several municipalities including Panihati, KamarHati, Baranagar, North Dum Dum, Dum Dum and South Dum Dum. It does not pass through KMC area but part of Borough 1 the Upper Bagjola Canal thus from BT Road in the south easterly direction for about 9.2 KM upto VIP road through a densely populated area. Beyond VIP Road the Channel is known as Lower Bagjola canal, it runs through Rajarhat, Bangore, Haroa etc areas for a length of 28.5 Km and a drainage basin area about 115 Sq. KM before discharging into the Kulti Gang near Ghusi ghata through two Sluice Gates.

Subsequently, rapid and unplanned urbanization, particularly in the southern and south-western parts of Kolkata, channel bank encroachment (due to huge post-independence influx of refugees from East Pakistan), disposal of raw sewage and poor management of solid wastes generated from households, livestock and religious activities and above all, lack of maintenance contributed to severe environmental pollution to the Canal. The Bagjola Canal became a silted-up 'sewer channel' and an out and out polluted tributary to the Hoogly (Ganga), which is considerably polluting the River.

3. The Bagjola canal drainage basin in the Hoogly River (drainage) system of Kolkata city drainage (see the attached map showing Drainage Flow Pattern). Its catchment area is approximately 164 KM² in which 49.2 sq km in upper Bagjola to VIP Road. Upper Bagjola portion from Kamarhati to VIP Road is 9.2 Km Long and lower Bagjolla portion from VIP road to Bidyadhari river is 28.8 km long.

4..Estimation of Storm Weather flow & Dry Waether flow inletting to the stretch of Upper Bagjola Khal

Estimation of Storm Weather Flow (SWF)				Estimation of Dry Weather Flow (DWF)				
At Meterage	Assessed SWF [in cusecs]	Cumulative SWF [in cusecs]	Remarks	At Meterage	Name of Pumping Stn. /Drainage Channel	Installed Capacity/ Storm Weather Discharge [in cusecs]	Extent of DWF [in cusecs] [considering DWF as 15% of SWF of drainage channel]	Remarks
0	356.64	356.64	Estimated inflow from the upper catchment viz. Dantia khal, East and West side drains of BT Road coming from Panihati Municipality	0.00	Upper catchment of BT Road crossing	356.64	55.00	
595.00	10.17	366.81		10.00	Kamarhati Pumping Stn.	149.00	25.00	Disposing SWF & DWF of Kamarhati Municipality area
1980.00	42.19	409.00		2900.00	Noapara Pumping Stn.	198.60	21.00	Disposing SWF & DWF of Baranagar Municipality area

2960.00	101.94	510.94		3950.00	Udaypur khal	645.00	100.00	Disposing SWF & DWF of Panihati, North Dum Dum, Kamarhati, Baranagar and South Dum Dum Municipality areas
3850.00	599.04	1109.98		6815.00	Birpara Pumping Stn.	170.00	1.25	Disposing SWF & DWF of KMC areas thro. Lalababu Nikashi khal
4907.00	47.43	1157.41		7390.00	Bhangore Pumping Stn.	156.00	22.00	Disposing SWF & DWF of South Dum Dum Municipality
6065.00	113.95	1271.36		7460.00	Duttabagan Pumping Stn.	242.00	40.20	Disposing SWF & DWF of KMC areas.
6470.00	106.56	1377.92		7500.00	Lake Town Pumping Stn.	20.00	4.00	Disposing SWF & DWF of South Dum Dum Municipality
7470.00	118.58	1496.50		7530.00	Dum Dum Pumping Stn.	123.56	25.00	
9235.00	247.93	1744.43		8080.00	Bangur (STP)[KMC]	21.21	10.00	
				8502.00	Cantonment khal	330.00	50.00	Disposing SWF & DWF of NSCB International Airport and South Dum Dum Municipality
				8610.00	Bangur Pumping Stn.[SDDM]	88.29	3.00	Disposing SWF & DWF of South Dum Dum

							Municipality	
				Additional discharge outfalling from innumerable direct drains on both banks along its length			20.00	
TOTAL		1744.43					376.45	

Annexure – II

Estimation of Storm Weather flow & Dry Waether flow inletting to the stretch of Lower Bagjola Khal

Estimation of Storm Weather Flow (SWF)				Estimation of Dry Weather Flow (DWF)				
At Meterage	Assessed SWF [in cusecs]	Cumulative SWF [in cusecs]	Remarks	At Meterage	Name of Pumping Stn. /Drainage Channel	Installed Capacity/ Storm Weather Discharge [in cusecs]	Extent of DWF [in cusecs] [considering DWF as 15% of SWF of drainage channel]	Remarks
0	1744.43	1744.43	Estimated inflow from the Upper Bagjola khal	0.00	Upper Bagjola khal		376.45	
2640.00	2203	3947.43		1383.00	BB-1 Branch Channel	176.58	30.00	Disposing SWF & DWF of South Dum Dum Municipality area
13078.00	1577	5524.43		1623.00	Adarshapally Channel	35.32	6.00	Disposing SWF & DWF of Bidhannagar Municipal Corporation areas

				1857.00	Anandapally Channel	35.32	6.00	
				2397.00	DPS (Point-A)	222.48	11.00	Disposing SWF & DWF of New Town areas.
				2623.00	Sulanguri Police Camp Channel	70.63	11.00	Disposing SWF & DWF of Bidhannagar Municipal Corporation areas
				2850.00	Sulanguri High School Channel	35.32	6.00	Disposing SWF & DWF of Rajarhat Block
				4279.00	Drainage Pumping Stn.(DPS)-C	224.01	4.63	Disposing SWF & DWF of New Town areas.
				4800.00	DPS-A-12 (Jatragachi)	470.87	17.15	Disposing SWF & DWF of New Town area through CC-1 Br.Channel
				5008.00	DPS (Point-1B)	109.87	1.62	Disposing SWF & DWF of New Town areas.
				6436.00	DPS-F	140.95	4.40	
				6548.00	XX-1 Br.Channel	141.26	22.00	
				6700.00	DPS (CBD-VII)	201.10	1.12	
				7406.00	DPS (POINT-H)	140.48	1.70	
				7707.00	DD-1 Branch Channel	141.26	22.00	
				8367.00	DPS (POINT-IIIB)	58.86	0.50	
				10393.00	DPS-III C	39.02	0.15	
				10915.00	DPS-III D	229.55	0.00	
				11850.00	EE-1 Branch Channel	282.52	40.00	

				12300.00	EE-2 Branch Channel	105.95	16.00	
					Additional discharge outfalling from innumerable direct drains on both banks along its length		20.00	
TOTAL		5524.43					597.72	

ANNEXURE - III

GOVERNMENT OF WEST BENGAL
DIRECTORATE OF PUBLIC HEALTH ENGINEERING
OFFICE OF THE EXECUTIVE ENGINEER, NEW TOWN KOLKATA WATER SUPPLY DIVISION-I
ADMINISTRATIVE BUILDING, WATER TREATMENT PLANT SITE, NEAR TANK NO-1
NEW TOWN, RAJARHAT, KOLKATA - 700 156

TEST REPORT: Govt. Of West Bengal Metropolitan Head Quarter Sub-Division Irrigation & Waterways Dtg.

Sub.: Water Testing Report (Physico-chemical, Bio-chemical & Biological)

Date of Testing: 29.11.16

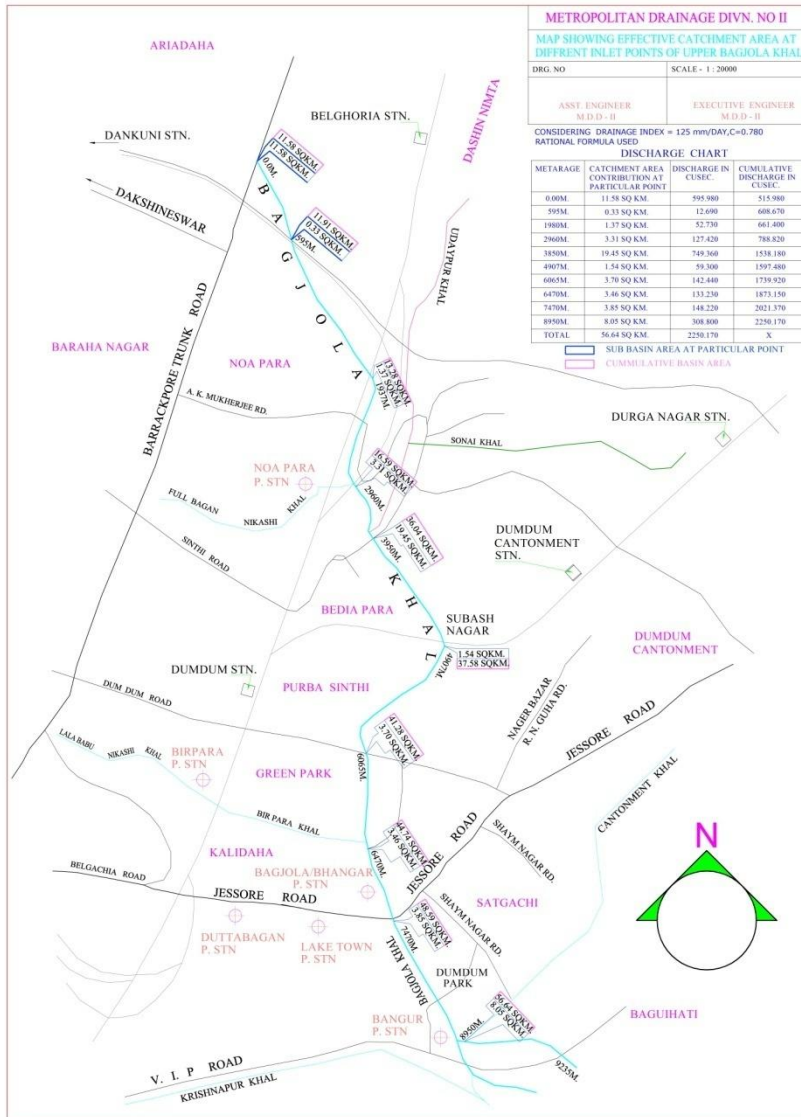
Sl. No	Characteristic	Requirement (Acceptable Limit) (IS 10500-2012) (CPHEEO)	Permissible Limit (IS 10500-2012) (CPHEEO)	Experimental results	
				SOURCE	
				LOWER BAGJOLA KULL, JATRAGACHI. (168 m. ds)	LOWER BAGJOLA KHAL, JATRAGACHI. (232 m. ds)
A. Physico-chemical Test Results:					
1	pH Value	6.5 to 8.5/7.0 to 8.5	6.5 to 8.5/6.5 to 9.2	6.96	6.59
2	Turbidity (NTU)	1/1	5/10	39.43	37.63
3	Odour	Agreeable/ Agreeable	Agreeable/ Agreeable	BAD SMELL	BAD SMELL
4	Temperature (degree C.)	---	---	26.7	25.8
5	Colour (Hazen)	5/5	15/25	51.07	43.13
B. Bio-chemical Test Results:					
6	BOD ₅ (mg/L)	---	---	42	30
7	COD (mg/L)	---	---	61.6	83
C. Biological Test Results:					
8	Total Coliform (Colony/100 ml)	Absent/Absent	Absent/Absent	TNC	TNC
9	Fecal Coliform (Colony/100 ml)	Absent/Absent	Absent/Absent	130	100

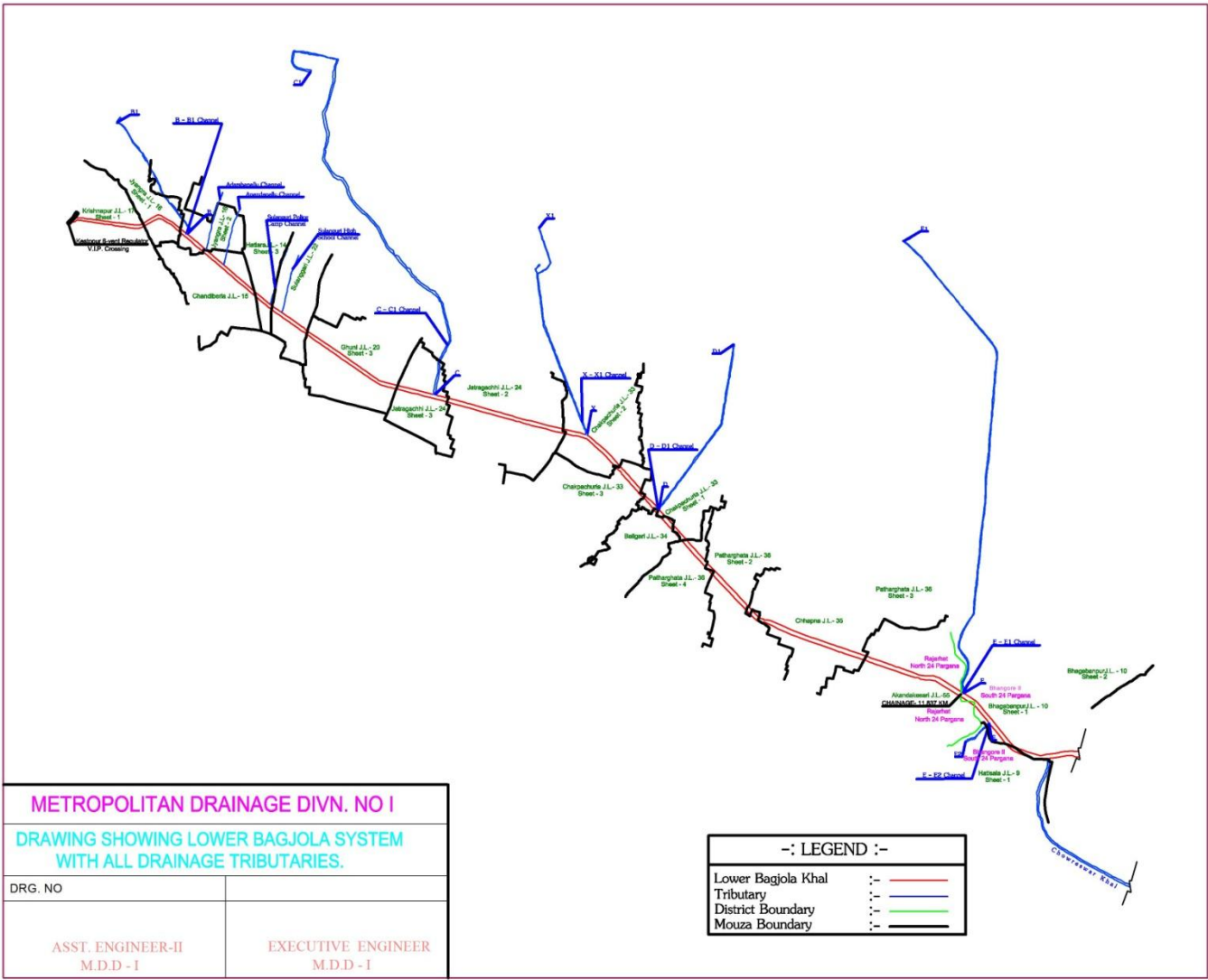
BDL - BELOW DETECTED LEVEL, N.F. - NOT FOUND, TNC - TOO NUMEROUS TO COUNT

[Signature]
29.11.16
Chemist & Bacteriologist
New Town Kolkata W.S Division-I
P.H.E. Dtg.

[Signature]
29.11.16
Assistant Engineer
New Town Kolkata W.S Division-I
P.H.E. Dtg.

[Signature]
Executive Engineer
New Town Kolkata W.S Division-I
P.H.E. Dtg.





METROPOLITAN DRAINAGE DIVN. NO I	
DRAWING SHOWING LOWER BAGJOLA SYSTEM WITH ALL DRAINAGE TRIBUTARIES.	
DRG. NO	
ASST. ENGINEER-II M.D.D - I	EXECUTIVE ENGINEER M.D.D - I

-: LEGEND :-	
Lower Bagjola Khal	:-
Tributary	:-
District Boundary	:-
Mouza Boundary	:-