

Terms of Reference

MUHURI IRRIGATION MANAGEMENT OPERATOR

I. Introduction

A. Project Background

1. In Bangladesh, agricultural development and sustainable natural resource management are critical for poverty reduction, as the majority of the poor (85%) live in rural areas and depend on agriculture for their livelihood. Agriculture generates 50% of employment, contributes 20% of gross domestic product, and provides a secure food supply for the whole population. Major causes of poverty are recurrent floods and riverbank erosion, as well as drainage congestion, salinity, cyclones and tidal surges, arsenic contamination, over-exploitation of groundwater, chemical and biological contamination of surface water, and drought. Climate change is expected to affect the future incidence and severity of disasters, necessitating more attention to managing disaster risk and adapting to change.

2. Extensive irrigation facilities have been constructed that include privately owned and operated groundwater abstraction technologies, and publicly owned and financed large surface water irrigation schemes.¹ The large irrigation schemes suffer from inefficient water utilization, inadequate maintenance, and a large backlog of needed repairs. More effort is required to foster community participation in sustainable management, and to include women and the private sector. The productivity of these schemes continues to be weakened by inadequate management, operation and maintenance (MOM), and now the infrastructure of most large schemes requires rehabilitation. This weakness is due to inadequate financing,² lack of beneficiary participation in management, and poor service delivery. The present low performance may be aggravated in future by changes in temperature and rainfall patterns owing to climate change. Such risks need to be considered when rehabilitating the infrastructure and modernizing system operations.

3. Government provides distribution systems down to secondary or tertiary levels for 15 existing large irrigation schemes, with a total command area of around 550,000 hectares (ha).³ For the period 1996-98, only about 46% of their net command area was irrigated from BWDB sources in the main irrigation season, and there is little evidence of improvement since then. Increasing the areas irrigated and recovering fees would assist economic growth through increased production and reduced subsidies. Also, developing sustainable approaches for MOM of the existing schemes would provide a sound basis for developing new schemes: the National Water Management Plan (2001) identified an additional 1 million hectare that could be irrigated with new surface water schemes in areas where groundwater resources are limited.

¹ In Bangladesh, large irrigation schemes are classified as larger than 2,000 hectares.

² Funds provided by Government for maintenance of these schemes is less than 50% of requirement and irrigation service charges collected from end-users amounts to only about 10% of the assessed amount.

³ 2000. National Water Management Plan. Volume No 3: Investment Portfolio. Ref AW001

4. Enhancing land, water and labour productivity is a high priority under the Government of Bangladesh's (the Government) Sixth Five-Year Plan, FY2011–FY2015.⁴ Robust and well managed irrigation systems are central to boosting productivity and contributing to food security. Agriculture growth is driven by a shift from subsistence rice-based cultivation to commercial high-value agriculture commodities, which is instrumental in advancing rural economic growth and contributing to long-term food security. The Government promotes diversification in agriculture by encouraging private agribusiness as well as providing access and improvements to rural infrastructure. The Government's objectives for surface irrigation are, among others: (i) promote peoples participation in conformity with Integrated Water Resources Management principles; (ii) achieving food security of food grains through ensuring year-round sustainable irrigation; (iii) ensuring climate change resilience; (iv) strengthening and capacity building of water resource institutions; (v) command area development and irrigation expansion; (vi) increase beneficiary participation and, where possible, transfer management to beneficiary organizations, local government and the private sector; (vii) introduction of public-private partnerships (PPPs) to provide support to agriculture and for selected-services; and (viii) provide agricultural extension services including irrigation technology and on-farm water management.

5. Following the completion of the First Command Area Development (CAD-I) Project in 2003,⁵ the Government requested the Asian Development Bank (ADB) to provide assistance with preparing a Second Command Area Development Project (CAD-II) aimed at improving the performance of large flood control drainage and irrigation schemes (FCDI) schemes.⁶ During preparation of CAD-II two principal constraints to sustainable performance of major water schemes emerged: (i) limited capacity and resources of public agencies in effective maintenance of public agencies in effective MOM of large irrigation schemes; and (ii) chronic system deterioration as a result of inadequate operation and maintenance planning and financing mechanisms. The CAD-II investment project did not proceed and instead, the ADB supported the Government with capacity development TA7260-BAN: Developing Innovative Approaches to Management of Major Irrigation Schemes (DIAMMIS).⁷ DIAMMIS investigated the potential for alternative service delivery agreement and management arrangements including using independent entities that would better manage and operate the systems. DIAMMIS developed innovative MOM approaches for the Muhuri Irrigation Project (MIP) based on establishing an independent Irrigation Management Operator (IMO).

6. Subsequently, the Government and ADB agreed to a USD46 million to support the USD59.6 million Irrigation Management Improvement Project (IMIP, the "Project"). IMIP will improve the management, infrastructure and productivity of MIP and undertake the feasibility study and detail design of the modernization of the Ganges-Kobadak (GKIP) and TeestaBarrageProject (TBP). These terms of reference are for engaging an international or national entity to undertake the role and responsibilities of the IMO for the first five years of the Project, to prepare detailed designs for some of the MIP modernization investments, to supervise construction works, to ensure the Management Operation and Maintenance of the modernized

⁴ Government of Bangladesh, Planning Commission, Ministry of Planning. 2011. Sixth Five-Year Plan: FY2011–FY2015. Dhaka.

⁵ ADB First Command Area Development Project 2003.

⁶ ADB Second Command Area Development Project Haskoning, BETS 2008.

⁷ TA7260-BAN: Developing Innovative Approaches to Management of Major Irrigation Schemes (DIAMMIS) 2011.

irrigation infrastructure (secondary and tertiary level only) and ultimately to provide satisfactory irrigation services to the farmers on behalf of BWDB.

B. The Overall Project

7. The impact of the project will be sustained high growth in irrigated agriculture. The Project's outcome will be efficient and sustainable management for large scale irrigation schemes producing higher yields, with expanded irrigated areas, and with a higher cropping intensification including diversification into higher value crops. The project will be implemented over five years 2014 to 2019. The project will have the following three key outputs:

- (i) **Performance-based irrigation management and agriculture support services established.** This output will include contracting irrigation management operators under 5 years performance-based management contracts. This "Construction phase" irrigation management operators (C-IMO) will supervise modernization works, establish sustainable MOM and provide agricultural support services in MIP. Efficient management systems will be adopted to maximize water use efficiencies and develop sustainable and reliable irrigation service delivery. Viable and effective operations and maintenance (OM) cost recovery mechanisms will be setup to achieve 100 % cost recovery. The objective will be to bring MIP scheme to the level of profitability and sustainability required for enabling the recruitment of a long term (15 years) "Management phase" irrigation management operator (M-IMO) through a PPP modality. The Project will also support the preparation of the long-term PPP transaction.
- (ii) **Irrigation system infrastructure rehabilitated and modernized.** This output will include physical rehabilitation and modernization of irrigation infrastructure including (i) repair of 450 km of canals and 22.6 km of coastal embankments with ancillary facilities; (ii) development of 17,000 ha of modern and highly efficient piped water distribution system to improve timely water access and reduce water losses; (iii) provision of prepaid card meters to allow water allocations to be based on a volumetric basis and ensure full and transparent payment and accounting, (iv) full electrification of the pumping to reduce the operational costs and increase management flexibilities and; (v) pilot solar panels and pumps for 60ha.
- (iii) **The Project is efficiently managed with effective institutional development.** This output will include (a) establishment of competent project management and project implementation unit; (b) timely procurement and disbursement; (c) timely appraisal of GKIP and TBP modernization requirements and provision of required feasibility studies and detail designs and strategies to transfer MOM to private sector; and (d) institutional support and capacity and awareness building of BWDB and water management organizations to successfully administer and support PPP contracts.

C. Implementation Arrangements

8. The Executing Agency (EA) for the Project is the Bangladesh Water Development Board (BWDB) in which a Project Management Unit (PMU) will be established and led by the Project Director (PD). A Project implementation unit (PIU) will be established in MIP. A PIU Director will be appointed to supervise MIP modernization field implementation and manage the

Irrigation Management Operator (C-IMO). The PMDC will support the PMU and the PD and PIU Director. Design support units led by an executive engineer will be established in GKIP and TBP sites to support feasibility and detail design preparation for the 2 schemes modernization. The PIU Director will be supported by a team of planning, design and construction, procurement, accounts and administration staff. A Project Steering Committee (PSC) will be established within the Ministry of Water Resources (MOWR) to provide overall coordination of the Project and facilitate inter-ministerial coordination. The PSC will be chaired by the Secretary, MOWR. The PD will be the PSC's secretary and all concerned ministries and agencies will be represented.

9. Also supporting the PMU will be a new PPP Cell that will provide guidance on tendering, private public partnerships, contract management, negotiating, legal, and communication. BWDB's Monitoring Division will be supported with a new Monitoring Cell that will provide independent verification of the performance of various stakeholders as well as assessing impacts associated with Project's objectives. A Safeguards Desk will also be established to support the Monitoring Division with safeguard compliance management.

10. An Implementation Coordination Committee (ICC) will be established for Muhuri Irrigation Project to manage field implementation issues that arise related to conflicts, safeguards, security, and more generally concerns about the performance of the implementing parties. The ICC will be chaired by the project's BWDB Zonal Chief Engineer and committee members will comprise representatives from the offices of the Deputy Commissioner, the Water Users Associations and the C-IMO.

11. The C-IMO will arrange the rental of appropriate, furnished offices in Feni as well as small field offices in each Upazila to accommodate C-IMO staff. The C-IMO will liaise with the BWDB regarding the arrangements for office facilities. BWDB has quite limited office facilities, some of these will be rehabilitated under the project by end of year 2. It is possible that some costs maybe associated with offices provided by BWDB including some repair and upgrading works. The EA will also provide counterpart staff, equipment, maps and other necessary information as available.

II. Muhuri Irrigation Project

A. Introduction

12. The Muhuri Irrigation Project (MIP) is located in the middle of the Southeastern Region of Bangladesh adjacent to the coastal belt of the Bay of Bengal.⁸ It has an approximate a total area of about 43,900ha and covers the four Upazilas of FeniSadar, Sonagazi, Chagalnaiya and ParsuramUpazilas under Feni District, and the MirsaraiUpazila of Chittagong District. The Muhuri project (MIP) overlaps with the Muhuri-Kahua Irrigation Project (MKIP) which was developed in the 1990s. The area of MuhuriKahua outside the original Muhuri has a total area of about 21,700 ha, and is contiguous with MIP. Both schemes rely on the same water supply and hence will be considered combined under IMIP and referred to as the Muhuri Irrigation Project (MIP) (Figure 1). The scope of this service will cover the extended areas incorporating both

⁸ Between latitudes 22°45'N to 23°09'N and longitudes 91°21'E to 91°35'E

projects with a gross area of around 65,000ha with a cultivated area of around 38,500ha. A summary of their total, settled, cultivated and commanded areas is shown in Table 1.

Table 1: Muhuri and Muhuri-Kahua Areas

Irrigation Project	Land Use (ha)				Rabi Season Cropping (ha)		
	Total	Settlements	Cultivated	Other	Boro Rice	Fallow	Other
Muhuri	43,892	15,265	24,776	3,851	11,843	9,773	3,160
Muhuri-Kahua lying outside Muhuri	21,731	7,168	13,783	780	6,108	7,136	539
Total Project Area under MIP	65,623	22,433	38,559	4,631	17,951	16,909	3,700

Source: Analysis of 2011 satellite imagery prepared for the project by CEGIS, 2013

13. Topographic relief of the project area is generally low lying with ground elevations varying from 8m PWD in the north to 4m PWD in the south; and 5.3m in the west to 6m PWD in the east. The area comprises smooth, broad ridges and basins which are underlain by silty-soil deposits. Land types classified according to seasonal depth of flooding are shown in Table 2 which shows about 70% of the area floods to a depth of 0.9 m or more during the Kharif season.

Table 2: Geographic and Crop Data

Land Type	Description	Flood depth (cm)	Percentage (%)	Remarks
F0	High land	0 - 30	20	Triple cropping possible with irrigation during Rabi
F1	Medium high land	30 – 90	51	
F2	Medium low land	90 – 180	21	Double cropping possible with deep water
F3	Lowland	>180	8	Aman and irrigation during Rabi
Total			100	

Source: CAD-II Agriculture Report 2008

14. Geologically, MIP comprises parts of the physiographic unit of MeghnaEstuarine Flood Plain, Chittagong Coastal Plain, and the Northern and Eastern Hills. The area has the following soil characteristics:

- (i) Old Meghna Estuarine Flood plain: Silt-loam soils predominate on highlands and silty-clay to clay in lowlands. Non-calcareous Dark Grey Flood plain soils are the only general type of the area. Organic matter content of the soils is moderate, moisture holding capacity is medium. Top soils are moderately acidic but sub soils neutral in reaction. General fertility level is medium.
- (ii) Chittagong Coastal Plain: Non-calcareous Grey Floodplain Soils, Non-calcareous Alluvium and acid sulphate soils are the major components of general soil types of the area. Generally the fertility level of soils is medium. Organic matter content is low to moderate.

15. Based on sample surveys, landholdings comprise: (i) 37% are landless or functionally landless with less than 0.2 ha of landholdings; (ii) 47% have small or marginal land holdings

ranging from 0.2 ha to 1.0 ha; (iii) 13% have medium landholdings ranging from 1 ha to 3 ha; and (iv) 3% have large landholdings greater than 3 ha.⁹

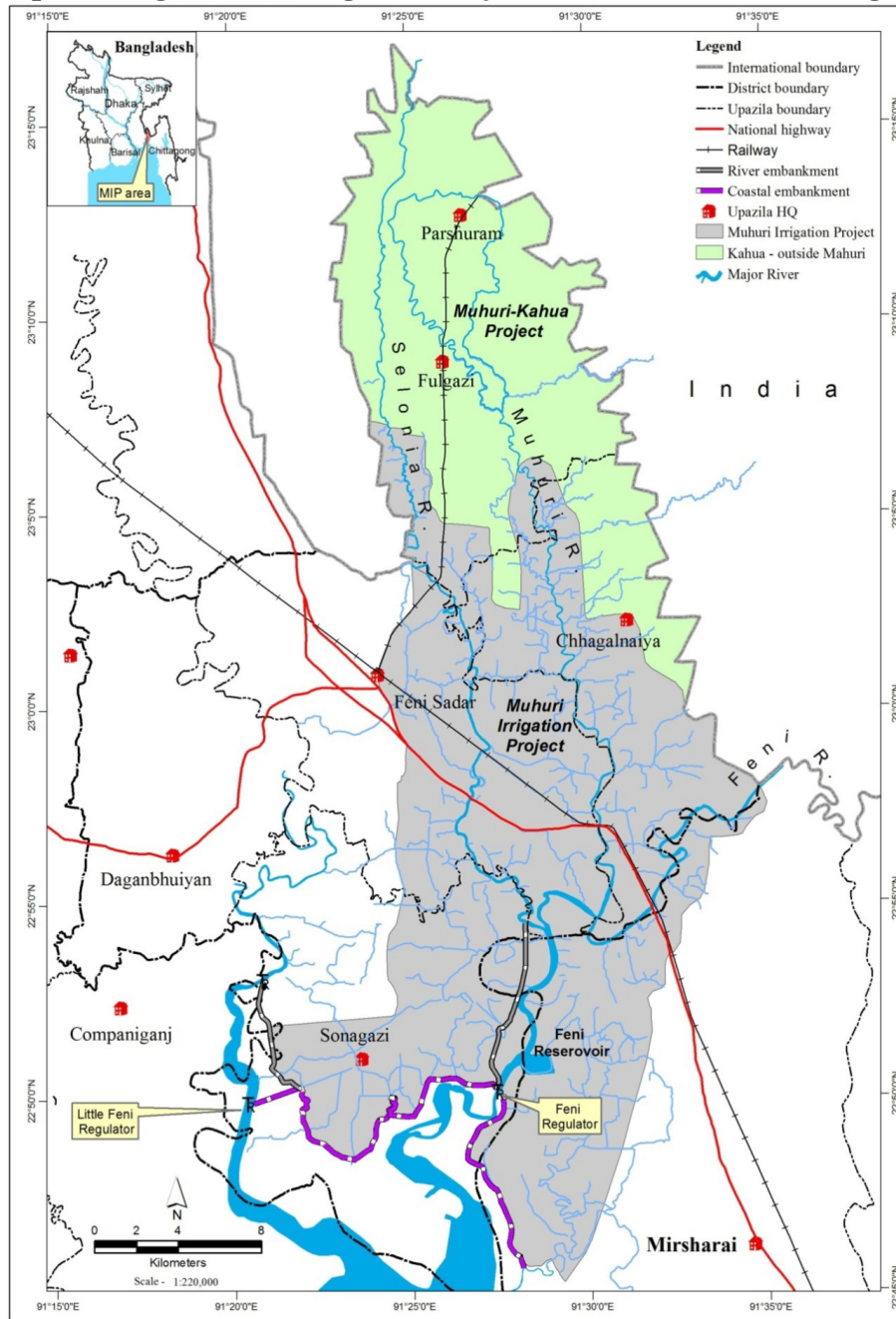
16. The MIP area experiences three seasons:

- (i) Southwest Monsoon, usually starting in May and lasting until October. Almost 90% of the total annual rainfall occurs during this period, when temperatures and relative humidity are high.
- (ii) Northeast Monsoon, usually lasting from November to March. This is the dry, cold season but occasionally rainfall occurs.
- (iii) Hot Season, usually a short period that extends from about late March to May. The highest daily temperatures generally occur at this time and, owing to cloud burst events, flash floods often occur from the rivers flowing from the Tripura Hills located in the eastern region.

17. MIP has a three tiered system: (i) the Level 1 primary system comprises the coastal embankment, main regulator structures, the Feni Reservoir and the Feni, Muhuri and Kalidash-Pahalia main river channels; (ii) the Level 2 secondary system comprises the khals; and (iii) the Level 3 tertiary system comprises the low lift pumps (LLPs) and farm distribution systems. The embankment and regulator raises water levels in the upstream rivers which in-turn flood the khals. LLPs are positioned along the khals and raise the water from the khal into the farm distribution systems, each servicing command areas ranging from 5ha to 40ha. In addition to irrigation, the Level 1 system also manages the risk of both river and tidal flooding.

⁹CAD-II Agriculture Report 2008

Figure 1: Map showing Muhuri Irrigation Project and Muhuri-Kahua Irrigation Project



Source: PPTA, 2013

B. Main Issues Affecting MIP Productivity

18. MIP has lost productivity, in terms of irrigated area and cropping intensities, owing to limited access to water and poor drainage. The main causes are complex and include:

- (i) Major siltation in the khals and rivers which: (a) limits sufficient irrigation water in the khals from reaching the LLPs; and (b) restricts drainage from flowing back to the rivers.

- (ii) Significant reduction in Feni Reservoir storage due to siltation. The original reservoir storage was about 32Mm³ but this has reduced to about 7Mm³. The current overall storage in reservoir, rivers and khals is 54Mm³ of which 18Mm³ is live storage.
- (iii) There are large annual climatic variations which are affecting water availability. Delayed planting due to cold winters and slow mobilisation of the pumps are delaying the planting dates of boro rice and putting additional pressure on the scarce water resources during February and March which coincide with the lowest river flows.
- (iv) The low prices of rice and high prices of inputs including pumping has resulted in many farmers not planting rice.
- (v) Pump operators find it too expensive to provide water to plots located far from the pumps and most of the irrigated land is a nucleus around each pump.
- (vi) There is a significant drop in the number of operational pumps and the irrigated areas. Pump inventories in 2013 show there are only about 440 operational pumps from an original 800 pumps. The irrigated area from surface water based on 2013 satellite imagery is estimated to be 11,300 ha in MIP (including the Muhuri-Kahua area) reduced by 50% from the original target of 23,000ha.

19. Other issues include deterioration of the coastal embankment and associated structures which are causing salinity intrusion and impediments to drainage as well as risk from sea water inundation during high sea level periods.

C. Planned MIP Infrastructure Investments

20. In the framework of the IMIP an investment plan is designed to increase the productivity and long term sustainability of the MIP. The investments have been targeted to improve the irrigation performance and cost recovery and include:

- (i) Repair of the coastal embankment and associated structures to prevent saline intrusion and ingress of sea water during storms.
- (ii) Repair of 10 existing flow control structures including the main Regulator and provision of 8 new small water/ flood control structures.
- (iii) Excavation of about 3.8 million m³ from the 460km of khals to provide full access to irrigation water for all irrigation water users and to improve drainage.
- (iv) Upgrading and modernization of the Level 3 system including: (a) the replacement of existing (mostly diesel) pumps with electric pumps; (b) replacement of the existing open canals with buried PVC pipe distribution system; and (c) installation of a prepaid meter system to allow water allocations to be based on a volumetric basis and ensure full and transparent payment and accounting.
- (v) Upgrading and expansion of the local electrical distribution system to energize all new pumps to reduce operation costs and allow for the introduction of prepaid card meters and control systems. Four pilot solar power pumping units will also be installed to irrigate 60ha.
- (vi) Provision of the prepaid card meters and control systems.
- (vii) Repair of BWDB office space for use by BWDB and the IMO.

21. The investment to modernize the tertiary (farmer) distribution system forms about 40% of the investment and is designed to increase the water efficiencies to maximize the irrigable area, as well as reduce operation and maintenance (OM) costs. The prepaid metering and piped distribution will enable provision of on-demand water to farmers throughout the year. It will open opportunities for farmers to increase cropping intensities, support crop diversification and facilitate collection of water charges. The use of low pressure pipes offers the best to solution to meeting the needs of water and power efficiencies.

22. All the existing diesel pumps will be replaced with electric pumps to reduce the operating costs and improve efficiencies. For about 60 ha (4 schemes), provision of solar panels will also be installed as pilots to demonstrate the potential for supplementary electric power.

23. To advance project preparedness and allow construction activities to begin during the IMO's first year of operation, detailed designs of new Level 3 systems have been prepared and approved by the government. These cover about 2,000 ha of MIP, including a 60ha pilot with solar pumping as well the preparation of designs for the earthworks (khal excavation and repairs to the coastal embankment).

D. Planned Pre-paid Smartcard Pump Operation and Revenue Collection System

24. Prepaid smartcard meter and control systems offer a highly efficient and transparent collection of service fees from farmers. The system also allows the farmers to pay based on the volume of water received which has shown to result in significant water use reduction over current systems that charge on seasonal payments per area basis. Prepaid meter have been tested and are proving very effective under the Barind Multipurpose Development Authority Project.¹⁰ In conjunction with a buried pipe tertiary distribution system, this modernized system is expected to result in the following: (i) water use efficiency gains; (ii) flexible on-demand irrigation supply to farmers; (iii) 100% financial cost recovery from users (farmers) according to amount of water each uses; and (iv) elimination of possible "rent seeking" from pump owners and operators, corruption, or loss of project funds. These in turn will enable: (i) considerable expansion in cropped area; (ii) reduced pumping volumes and costs; (iii) a variety of crops to be cultivated with different planting dates, crop durations and irrigation water requirements, to suit individual farmers; (iv) improved crop yields arising the individual farmers being able to control timing and amounts of irrigations; and (v) sustainable funding for operation and maintenance.

E. Planned MIP Management Arrangements

25. The MOM of the Level 1 will remain with the BWDB; although there is some discussion that the OM of some minor structures (including minor sluice gates in the coastal and river embankment) might be assigned to the IMO. This transfer of the responsibility will however not occur during the stage 1 management contract.

26. Under the IMIP it has been agreed that the MOM of Levels 2 and 3 will be assigned to the IMO. The IMO will be contracted by BWDB in two stages: (i) Stage 1 IMO will be a performance-based management contract for Years 1 to 5 (inclusive) during which the IMO will design and supervise construction of the investment works while also managing, operating and

¹⁰<http://www.bmda.gov.bd/>

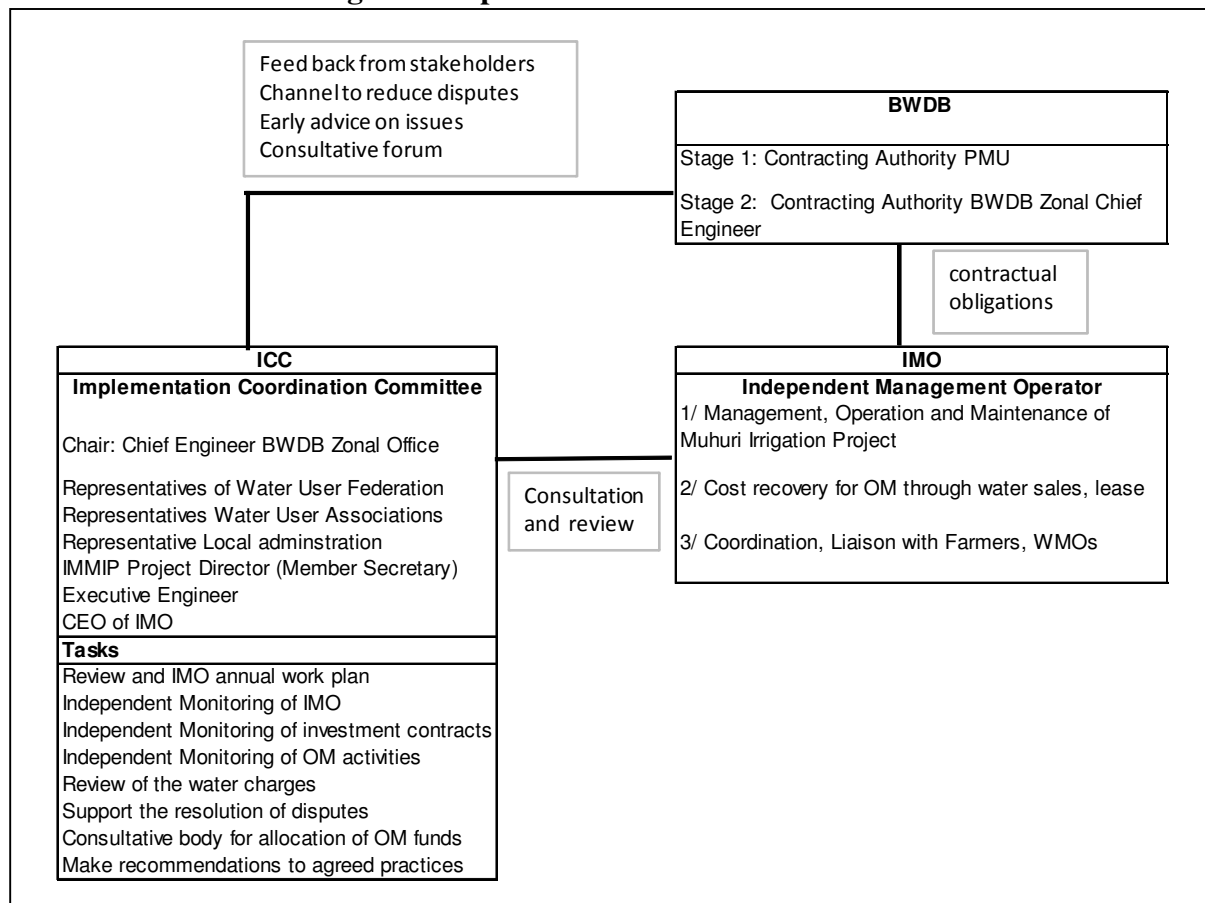
maintaining Levels 2 and 3 of the project; and (ii) Stage 2 IMO will be a 15 year lease contract for years 6 to 21 (inclusive) to undertake MOM of Level 2 and 3 of the project. The Stage 1 IMO will be financed by IMIP according to the terms of the contract, whereas the Stage 2 IMO should be financed solely from water tariff revenues. During Stage 1 there will be an independent review of the IMO arrangements and terms of reference (TOR) for Stage 2 will be prepared with support from PMDC. The present TOR applies to the Stage 1 IMO only.

27. The stage 1 IMO will be a private company or consortium contracted by BWDB through international competitive bidding based on a two-envelope technical and financial offer. The contract will be for a five year period. During this period, the IMO will be responsible for MIP's MOM (Levels 2 and 3) and will include the establishment and management of efficient revenue collecting through the prepaid meter systems. The IMO would also be responsible for: (i) the design for tertiary level infrastructure (LLPs with prepaid smartcard systems and water distribution system), (ii) supervision of construction of all the investment contracts (including those for the Level 1 system that will be designed by the PMDC); and (iii) the development of pilot agricultural demonstrations and pilot cost recovery activities. All MIP assets will remain in the ownership of the Government. A summary of the design and construction supervision responsibilities are summarised in the table below.

Works Package	Design	Construction Supervision
CW-1; Excavation of khal-1, rehabilitation of coastal embankment	PPTA 2013/14	IMO 2014-18
CW-2; Excavation of khal-1	PPTA 2013/14	IMO 2014-18
CW-3; Farmer distribution, pumps and prepayment meters-stage-1: 2,000ha	PPTA 2013/14	IMO 2014-15
CW-4; Upgrading of electrical distribution	IMO 2014	IMO 2015-17
CW-5; Farmer distribution, pumps and prepayment meters-stage 2 :5,000 ha	IMO 2014/15	IMO 2015-16
CW-6; Farmer distribution, pumps and prepayment meters-stage 3: 5,000 ha	IMO 2014/15	IMO 2016-17
CW-7; Farmer distribution, pumps and prepayment meters-stage 4: 5,000 ha	IMO 2015/16	IMO 2017-18
CW-8; New structures, rehabilitation of structures, rehabilitation of BWDB buildings	PMDC 2014	IMO 2015-16

28. The Water Management Organizations (WUG, WMA and WMF) will play a supporting and guiding role for the IMO through the Implementation Coordination Committee (ICC) as shown in Figure 2. The ICC would meet quarterly. The costs including honorarium of the ICC would be paid through the ISC fund.

Figure 1 Implementation Coordination Committee



F. Financing of Operation and Maintenance

29. The recovery of operation and maintenance (O&M) costs at MIP will be via irrigation charges levied through the prepaid meters. The irrigation charge will be based on a tariff per cubic meter (m³) pumped measured against the volume of water pumped by each farmer. The financial analysis incorporates an evaluation of the current and future O&M costs at 2013 prices. The current costs of O&M are estimated to be USD26/ha for Level 1, USD20/ha for Level 2, and for Level 3 USD100/ha for electric pumps and USD137/ha for the diesel pumps. The estimated future costs of O&M for Levels 2 and 3 under Stage 2 (year 7 onwards) are summarised in Table 4 below¹¹.

¹¹ Under Stage 1, an IMO will be recruited through a 5 year performance based management contract to supervise the modernization works and bring the scheme to the required level of efficiency and profitability. Under Stage 2, an IMO will be contracted for 15 years through a public private partnership.

Table 4: Estimated Future Costs of Operation and Maintenance of Levels 2 and 3

Category	Annual Outgoings (USD million)	Cost (USD/ha)	Cost (Tk/ha)	%
1. O&M Level 3 Pumps Pipe Distribution	0.637	37.5	3000	36.2
2. O&M Level 2 Khals and other secondary structures	0.338	19.9	1592	19.2
3. Irrigation Service Charge Tk260/ha (USD3.25/ha)	0.055	3.3	260	3.1
4. IMO Organisation Costs	0.399	23.5	1876	22.6
5. IMO Margin (10%) on Operational Costs (1, 2 and 3)	0.103	6.1	485	5.8
6. VAT 15%	0.230	13.5	1082	13
Total Outgoings	1.763	103.7	9,928	100.0

30. The estimated annual volume of water pumped in an average rainfall year is around 145million m³ mainly to meet the requirements of 17,000 ha of boro rice at a water requirement of 8,500 m³/ha. The water requirement would increase in dry years including requirement to pump outside the boro season., in wet years it would reduce. To meet the needs of full O&M cost recovery for Levels 2 and 3 requires an annual revenue of USD1.760 million (Tk14.1 crore) per year which requires the water tariff to be set at USD12.2 per 1,000 m³ based on an average of 145 million m³ pumped per year.

31. A comparison of current levels of charging and the estimated future costs of O&M is in **Error! Reference source not found..** The full O&M cost recovery tariff for levels 1 and 2 is estimated at an equivalent to USD104/ha, equal to approximately 75% of the current water charge for diesel pumps (USD138/ha) and around the same charge as currently applied for electric pumps (USD100ha).

Table 5: Comparison of Current and Estimated Future Costs

Stage	Pump/Distribution System	Level	Cost per \$/ha	Cost Tk/ha
Current	Diesel Pump earth canal	Level 3 only	138	11,000
Current	Electric Pump earth canal	Level 3 only	100	8,000
Future	Electric pump, pipes, prepaid meters (includes costs of IMO)..	Level 2 and 3	104	8300

32. Farmers have reported difficulty in meeting current water charges due to the low price of rice. The new irrigation system will improve opportunities to increase crop returns. While keeping tariffs low may seem desirable, an underfunded IMO will not deliver an adequate service. In theory, keeping the tariff below the full cost recovery level can be compensated by periodic government transfer. In practice however, budgetary allocations are very often subverted resulting in operators not being able to meet their operational obligations. A strategy of self-financing of the IMOs was adopted. Alternative and supplementary cost recovery mechanisms will be investigated and piloted by the IMO during the first stage of MIP development including the lease of land and water assets, agricultural services, and royalties from sand abstraction.

33. During Stage 1 the management costs of the IMO would be paid for by the loan with no linkage to the tariff. This will allow the IMO to operate and establish the MOM systems with no

linkage to revenue It is however proposed that nine months operational revenue is built up during stage 1 to act as a seed fund for the stage 2 including a fund for replacements and deferred maintenance. The annual operational costs from year 6 onwards would be \$1.76 million per year so requirement for 9 months of seed fund would be \$1.3 million. To meet this requirement and meet the basic OM costs during year 1-5 an initial 10% reduction in the tariff could be applied during the initial years . This indicative start up tariff could be around \$11.0/1000m3 (Tk8400/1000m3). The tariff will be agreed by the BWDB at the time of the project start up in line with inflation especially the cost of electricity. The operation and maintenance requirements and costs will be carefully monitored during the initial years and the adjustments made to tariffs made annually based on actual costs

34. Setting an appropriate water tariff needs to be reviewed by the BWDB working in close liaison with the Implementation Coordination Committee (ICC) at the time of the project start up. The appropriate water charge is linked to the financial returns of the boro rice and other irrigated crops. Although keeping tariffs low may seem desirable, an underfunded organisation will not deliver an adequate service. In theory keeping the tariffs below the cost recovery can be compensated by periodic government transfer however in practice as budgetary allocations are very often subverted by government agenda and as a result the operator is not able to meet the operational obligations

35. For Level 1 infrastructure, current annual maintenance costs are estimated at USD0.5 million (Tk40 million), excluding BWDB costs estimated at USD0.3 million (Tk24 million) per year. Current government allocations are sufficient to meet these requirements. The estimated overall O&M budgets for MIP are shown in **Error! Reference source not found..** Under the project, BWDB will transfer the responsibility for Level 2 and 3 O&M to the IMO and BWDB allocations for Levels 2 and 3 O&M will be transferred to Level 1. With this reallocation of resources and recent increases in O&M funding it is estimated that government funding would be sufficient to meet the sustainable requirements of Level 1 O&M.

Table 6: Overall Operation and Maintenance Budgets for MIP (USD million)

Level	Current Requirement ^a			Current Allocation ^b			Future Requirement ^c		
	O&M	Estab	Total	O&M	Estab	Total	O&M	Estab	Total
1	0.5								
2	0.3	0.3	1.1	0.5	0.3	0.8	0.5	0.3	0.8
3	2.1	-	2.1	1.3		1.3	0.3	0.5 ^d	1.8
Total	2.9	0.3	3.2	1.8	0.3	2.1	1.8	0.8	2.6

Estab = establishment costs. O&M = physical O&M costs. Future Levels 2 and 3 O&M costs funded from irrigation revenues. USD0.055million costs for ISC incorporated into the Level 3 costs

a. Based on 17,000 ha 75% diesel pumps, earth canals, full management by BWDB

b. Based current area of boro crop 11,300 ha 75% diesel pumps, full management by BWDB

c. Based on 17,000 ha full electric pumping, pipe distribution, Level 1 managed by BWDB, Levels 2 and 3 managed by IMO..

d. Costs of IMO.

III. Scope of services

A. Introduction

36. The IMO will be engaged under a Management Services Contract for the provision of services for design, construction supervision, MOM, and agricultural support services for MIP. A general schedule of the following activities is shown in Figure 2:

- (i) Activity 1: Establishment of efficient and sustainable MOM of Level 2 and 3 infrastructures on rehabilitated areas.
- (ii) Activity 2: Construction supervision of MIP investment works.
- (iii) Activity 3: Participatory design of the Level 3 distribution systems.
- (iv) Activity 4: Agricultural support services, pilot cost recovery activities, and implementation of training and awareness programmes.

Figure 3: Activity planning during over the contract time

	Year 1	Year 2	Year 3	year 4	year 5
Activity 1 : Establishment of Efficient and Sustainable Management Operation and Maintenance of level 2 and 3 infrastructure					
Activity 2 : Supervision of the Construction of the Tranche 1 Investment Contracts					
Activity 3 : Participative Design of the Pipe Distribution Systems					
Activity 4 : Agricultural Support Services, Pilot Cost Recovery Activities and Training and Awareness					

37. Given the importance of all aspects of the contract in the long-term sustainability of the provision of irrigation services for MIP, bidders should submit as part of their technical proposal a detailed plan showing their proposed approach to the integration of the four activities, an appreciation of the key issues involved, and their approach to staffing and project management. The services and outputs of the IMO are described in detail below. Any urgent tasks evolved during contract period and not mentioned in the TOR should be accomplished by the IMO if it is in accordance with the Contract.

B. Activity 1: Efficient and Sustainable MOM of Level 2 and 3 Infrastructure

1. Scope of Services

38. Efficient and sustainable MOM for MIP is the core activity for the IMO and includes:

- (i) The establishment and implementation of effective OM systems of the Levels 2 and 3. Costs of maintenance would be paid for through water tariffs. Physical maintenance activities would be done by the most appropriate method as decided by the IMO.
- (ii) Effective OM on the rehabilitated structures, after completion of the works, accordingly to the provisional schedule.
- (iii) Annually agreeing with BWDB and ICC the water tariff rate.
- (iv) Once investment works are completed ensure full cost recovery for MOM activities are achievable through tariff collection using the prepaid meter systems.
- (v) Maintain close coordination and liaison with water users and other stakeholders, and implement programs of communication and awareness to ensure stakeholders

are well informed and engaged with the project process. This will include the close liaison and support for the implementation coordination committee (ICC) which comprises of the BWDB, Key Stakeholders including the WUA and the IMO.

- (vi) Establishing transparent and open systems of financial management through an Escrow¹² bank account for the project which would be used for collected revenue and payment of pump operations including pump operators, payment of electricity and telecom tariffs, and seed money for financing the IMO in Stage 2.
- (vii) The water tariff will incorporate the collection of the irrigation service charge. A portion of the ISC currently levied at USD3.25/ha will be paid to BWDB, the Implementation Coordination Committee (ICC) and to the WUAs. The allocation of the ISC funds will be decided by the ICC.
- (viii) Preparation of an annual report and work plan, preparation of quarterly progress reports showing revenues and disbursements.
- (ix) Maintaining a professional approach to undertaking all tasks and keeping the highest possible level of cooperation and relationship with water users and other stakeholders.
- (x) Selecting and contracting individual pump operators. The IMO will prepare a standard form of contract for engaging all pump operators which will be amended and updated as necessary on a collective basis. Selection will be based on their skills, attitude and experience. The experience of existing pump operators will be taken into account.
- (xi) For OM works funded by revenue engage for small works or service contracts as required. Procurement will follow government and ADB Procurement Guidelines (2013, as amended from time to time) and ADB's Guidelines for the Use of Consultants (2013, as amended from time to time).
- (xii) Monitoring, developing and maintaining a water resources management plan for the project area that includes surface and ground water. The plans will be developed in coordination with the PMDC consultants who will undertake hydrological and hydro-geological studies for MIP and the IMO will be responsible to apply the outputs of the technical studies and engage with stakeholders to develop long-term sustainable management including balancing and optimising the available water resources with the cropping systems. The management plan will include; (i) working with BWDB hydrology unit to improve the quality of flow measurement (budget has been allocated to the PMU to procure ADCP flow measurement equipment); (ii) to apply the outputs of the PMDC hydrological studies to improve the operation procedures for the MIP including the operation of the main barrage gates; (iii) applying rainfall and flow monitoring information provide annual forecasting information to farmers of likely dry season flow conditions which can be applied to improve crop planning; (iv) apply the outputs of the hydrological studies to develop mechanisms for farmers better fit cropping to the water availabilities, these could include adjusting the water tariffs during certain months to encourage/discourage water use; (v) develop improved assessments of trends of river flows and engage with farmers to

¹² Escrow refers to money held by a third-party on behalf of transacting parties. The escrow manager has the duty to properly account for the escrow funds and ensure that usage of funds is explicitly for the purposes intended.

- adapt cropping patterns to meet possible future water shortages; (vi) based on the hydro-geological assessments by the PMDC improve the conjunctive management of surface and groundwater in the MIP.
- (xiii) Liaise with the Rural Electrification Board (REB) and PalliBidyutSamity (PBS) to ensure the best quality of service is made available for irrigation including reducing wherever possible power cuts especially during the periods of peak irrigation requirements and the sensitive periods of crop growth. The provision of power for the MIP will be based on an Memorandum of Understanding (MOU) between the BWDB and the REB; the MOU will be signed in early 2014.
 - (xiv) Supporting the farmers to manage pumping to meet the needs of crops within the constraints of electrical power outages. Mitigation measures to meet power shortages will include; (i) the optimum use of the two pumps to be provided at each location. (for each irrigation unit, two pumps will be provided-the main pump will meet the peak irrigation requirements based on 24 hours electricity supply, a second booster pump will provide additional capacity to allow the peak water requirements to be met within 16hours of power per day which is the current average power availability); (ii) organising some staggering of the peak requirements especially land preparation in case of severe shortages; (iii) preparation of emergency contingency plans in case of very severe power cuts including the use of farmer owned portable pumps, existing diesel pumps and tubewells; payments for emergency supplies would be paid for through the water charges, the details to be agreed with farmer pump owners.
 - (xv) Ensuring environmental, social and gender safeguard compliances are maintained during implementation of investment works and regulation MOM activities.
 - (xvi) In coordination with the PMDC develop an Project Monitoring and Evaluation System (PME) including the necessary management information systems (MIS) to meet the needs of project management. The PME would include, among other things: (i) GIS spatial database of infrastructure, assets and landholdings;(ii) time-series database of operational data including rainfall, water levels and flows throughout the Level 1 to 3 system including pump flows;(iii) records of maintenance needs and actions detailed by their nature, type, and location; (iv) record of all tariff and ISC revenues collected; (v) records of all OM expenses; and (vi) records of crops, yields and marketed surpluses based on the monitoring of a representative sample of farmers and other sampling methods; and (vi) cost recovery.
 - (xvii) Preparing OM Manuals to meet all OM needs and procedures based on an assessment of requirements as well as lessons learnt during the initial four years. The manuals will be the key documents to support the bidding process for the Stage 2 IMO. Three manuals will be prepared: (i) scheme operational manual; (ii) scheme maintenance manual; and (iii) a scheme administration manual.

2. Management of the Operation and Maintenance of Level 2 and 3

39. The IMO will be required manage, operate and maintain the Level 2 and 3 infrastructure including:

- (i) OM of the LLPs and smart card metering system.
- (ii) Management of revenue collection using the smartcard metering systems.
- (iii) Maintenance of the pipe distribution systems.
- (iv) Maintenance of the khals and other secondary infrastructure.

40. There are an estimated 450km of khal within the overall MIP project area, most but not all will be re-excavated under the project. The selection of priority khal for maintenance will be a key task of the IMO; optimising and efficient use of the limited maintenance funds will be essential. Priority will be given to ensuring access to irrigation water for the 17,000ha development area; other requirements will be to maintain adequate drainage capacity. The secondary infrastructure will be limited to the small structures (small hydraulic structures, bridges and protection works on the secondary and tertiary water courses currently owned by the BWDB (excluding the main river and coastal embankments). The IMO will also play an important role in controlling other structures erected or to be erected in the khal waterways; this includes structures built by various government departments as well as privately owned structures. Special action is required for structures that are encroaching into the canal hydraulic section and are obstructing the irrigation flows and/or drainage flows. The IMO will liaise with BWDB and the local government organisations to ensure appropriate design of new infrastructure and removal of structures affecting the hydraulic flow.

41. The estimated OM requirements for the Level 2 and 3 systems are summarized in Table 7. The IMO will establish an escrow account for all the revenues and OM expenditures including the collection and allocation of the irrigation service charges (ISC). The IMO will be responsible for the technical and financial management for the operation and maintenance of the level 2 and level 3 irrigation facilities. The IMO Project Manager and the Deputy Project Manager will be signatories to the escrow account. The revenue for the OM will be derived from the cost recovery for the OM derived from the water revenues from the smart card systems as well other supplementary revenue systems to be established. The allocation of funds for OM must follow the approved Annual Work Plan and would follow the administration procedures defined in the Project Management and Administration Manual. The payments for OM work will include: (i) electricity payments; (ii) pump operator fees; (iii) smartcard vendor fees; (iv) maintenance of the Level 2 and 3 irrigation systems; and (v) other miscellaneous payments relating to the field activities. During stage 1 all the operational costs of the IMO including staff costs, transport, office costs, training and meetings would be paid through the IMO contract. The IMO will be required to prepare independently audited accounts which will be incorporated into the annual report to be prepared by 30th of June each year and presented to the Annual General Meeting of Implementation Coordination Committee.

Table 7: Estimated OM Costs for Years 1 to 5

Cost Categories		Year						
		1	2	3	4	5	6	7 onwards
		Stage 1 Management Contract					Stage 2 Lease	
Area of Irrigation under new management		500	2,000	6,000	12,000	17,000	17,000	17,000
Volume Pumped	Mm3	6	24	71	141	200	200	200
Income \$ million								
Tariff \$/000m3	10.6	0.062	0.248	0.745	1.489	2.110	2.110	2.110
Outgoings \$ million								
OM/depreciation Level 3 pumps/pipe distribution		0.027	0.107	0.322	0.644	0.912	0.912	0.912
OM Level 2 Khals and other costs		-	0.100	0.100	0.100	0.100	0.150	0.338
Irrigation Service Charge Tk260/ha (\$3.25/ha)		0.002	0.007	0.020	0.039	0.055	0.055	0.055
IMO Organisation Costs		-	-	-	-	-	0.399	0.399
IMO margin 10% on operational costs							0.112	0.131
VAT 15%		0.004	0.032	0.066	0.117	0.160	0.244	0.275
Total Outgoings		0.033	0.246	0.507	0.900	1.227	1.871	2.110
Net Balance \$ million		0.029	0.002	0.237	0.589	0.883	0.238	-
Cum Balance \$ million per year		0.029	0.032	0.269	0.858	1.741	1.979	1.979

3. Tasks Required for Bid Submission

42. A methodology for MOM of MIP to ensure a consistently high standard of service for delivery of irrigation water services to the farmers that also takes into account the issues discussed in the following paragraphs.

43. With the proposed Level 3 system with pipes and prepaid meters, the operation of the rehabilitated areas may become relatively simple; however the Bidder should describe in their technical proposal the main aspects of the work to be undertaken. The methodology should: (i) demonstrate that the Bidder understands the tasks needed to be carried out and their ability to plan, manage and guarantee dependable, efficient and cost-effective water delivery service; (ii) describe the organization of its team to guarantee the water services during irrigation season (Rabi season and Kharif 1 and 2 seasons). and the organization of the team and their activities during the non-irrigation season (Kharif 2 season: July to December). The Bidder will: (i) specify the level of labour intensity they intend to apply for scheme operation and how local staff (pumps operators) will be hired/contracted and supervised, to ensure quality of service; (ii) propose how the electrical pumps can be effectively managed including actions to mitigate against severe power shortages; (iii) describe the procedures to cooperate with BWDB that will keep the responsibility of MOM of the Level 1 system; and (iv) describe the mechanisms for data collection from the prepaid meter system.

44. Draft maintenance Manual: The proposed mechanisms for routine, emergency and preventative maintenance should be developed by the IMO as part of its bid. It should demonstrate a planned approach to maintenance of the infrastructure with a planned program of activities, and measurable parameters to ensure potential for effective monitoring and control as well as record keeping system. The Draft Manual to be presented as part of bid submission will be used to evaluate the Bidders' approach and methodology. During the contract period the successful bidder has the task of updating and developing fully this draft.

45. Draft Maintenance Program: a fully resourced and time bound maintenance program for the completed Scheme including resources to be mobilized by the IMO, e.g. use of own labour, equipment, renting or outsourcing to local or regional contractors; the bidder will specify the level of labour intensity he intends to apply for maintenance works and how local labour would be hired and supervised to ensure adequate quality of works; detailed specifications, time-bound and priced proposals for items of major plant and equipment that the bidder intends to purchase or hire to carry out maintenance are to be provided by the bidder in the respective technical and financial forms of the bid.

46. Information system proposals to develop the data bases and SIG linked to infrastructures, O&M, water users; agricultural situation; hydraulic and climatic data collection; etc. The bidder will describe its staff organization and effective means of implementation.

47. Management reporting approach: To show the items of financial, technical and operational data collection and reporting that will be provided on a regular basis. This to show the program and procedures for reporting both internally and to BWDB.

48. Customer Service Plan to include levels of service response, dispute resolution, interaction with farmers and IWUA, as well as to incorporate approaches to office staffing, equipment.

49. The bidder will describe the effective means of implementation to guarantee efficient and sustainable operation and maintenance of the rehabilitated infrastructures (transport means for operation staffs, organization chart; office requirement at Upazila level; workshop; etc.)

C. Activity 2: Construction Supervision of MIP Investment Works

1. Scope of services

50. The construction contracts for the MIP rehabilitation will be let by BWDB through the nominated Project Director who will act as the "Employer". The BWDB will appoint the IMO as the resident engineer with full responsibilities for the supervision of the construction contracts under the IMIP. The General Manager of the Irrigation Management Operator, or the Deputy General Manager in the absence of the General Manager will be the nominated "ResidentEngineer".

51. The IMO will be responsible for the supervision of construction of all the investment contracts under IMIP (including the coastal embankment, khal excavation, rehabilitation and new structures, pipe distribution/pumps/prepaid meters, upgrading of the electricity network, rehabilitation of offices). The proposed works for MIP are summarised in **Table 8** below. Payments would be made by BWDB based on progress certificates by the IMO. The IMO staff supported surveyors will develop a very high level of supervision to international ISO or equivalent standards which can form a model for future supervision under the IMIP. The construction time schedule is as shown in Figure 4 below.

Figure 4: Construction Implementation Schedule

	Year 1				Year 2				Year 3				Year 4				Year 5			
	2014	2015				2016				2017				2018				2019		
	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3
Wet Season			x	x			x	x			x	x			x	x			x	x
Coastal embankment works ^{a/}	x	x			x	x			x	x			x	X						
Khal excavation ^{b/}	x	x			x	x			x	x			x	X						
New and rehabilitation of hydraulics structures and BWDB offices ^{c/}	x	x			x	x														
Level 3 system works ^{d/}	x	x	x	x	x	x	x	x	x	x	x	x	x	x						
Upgrading of the electricity network ^{e/}	x	x	x	x	x	x	x	x	x	x	x	x	x	x						

Notes:

^{a/} Number of km of coastal embankment works = 22.4 km;

^{b/} The new and structures proposed for rehabilitation include (i) the rehabilitation of coastal sluice structures 05,06, 06/07 and 08; (ii) rehabilitation of river sluices including the main Feni regulator and the little Feni river sluices 10 and 11; (iii) new coastal protection/drainage structures sluice 07 and Sluice 09; and (iv) new water and flood control structures, north Daulatpur, South Daulatpur and water retention structures BhalukiaKhal, Madhya Khal and IchakhaliKhal; and (v) rehabilitation of the BWDB offices and houses at Feni.

^{c/} Excavation of Khal to support irrigation and drainage, estimated volume is 3.8 million m³;

^{d/} 17,000 ha need to be modernized, 2000ha advance systems have been designed through the PPTA

^{e/} estimated to be about 160km of new electrical distribution of which it is estimated 70% would high tension and 30% low tension.

52. The scope of services of the IMO for construction supervision will include the following:
- (i) Represent the interests of BWDB under the Works Contracts, in any manner related to the Works Contracts and the proper execution thereof.
 - (ii) Review and comment or recommend acceptance of Contractor's performance security, insurances and other legal documents.
 - (iii) Deliver instructions to commence or suspend works according to the provisions of the contract on behalf of BWDB.
 - (iv) Review and comment or approve the Contractor's work program, method statements, proposals for materials sources, quality management plan

Table 8: Summary of the Proposed Civil Works for MIP

Ref	Item	Unit	Qty	Cost (Tk Million)	Cost (\$ Million)	Sub Total Tk million	Sub Total \$ million	%
1	Coastal Flood Protection							
1.1	Repairs to the coastal embankment Polder 60	m3	325,000	66.625	0.833	66.6	0.8	2.7
1.2	Coastal Flood Protection Structures							
1.2.1	Rehabilitation of Coastal Protection/Drainage Structures							
	1 Polder 60 Sluice 05 Rehabilitation	nr	1	0.826	0.010			
	2 Polder 60 Sluice 06 Rehabilitation	nr	1	0.839	0.010			
	3 Polder 60 Sluice between 6 and 7 Rehabilitation	nr	1	1.774	0.022			
	4 Polder 60 Sluice 08 Rehabilitation	nr	1	10.925	0.137			
1.2.2	New Coastal Protection/Drainage Structures							
	1 Polder 60 Sluice 07 New 2 Vent	nr	1	23.485	0.294			
	2 Polder 60 Sluice 09 New 2 Vent	nr	1	21.136	0.264	59.0	0.7	2.4
2	Main River System							
2.1	Repairs to Water and Flood Control Structures							
	2.1.1 Feni Regulator Structure-gate and lifting system	Ls	1	9.900	0.124			
	2.1.2 Little Feni River Sluice 10 Rehabilitation	nr	1	2.640	0.033			
	2.1.3 Little Feni River Sluice 11 Rehabilitation	nr	1	0.350	0.004			
2.2	New Water and Flood Control Structures							
	2.2.1 North Daulatpur New 2 Vents	nr	1	23.340	0.292			
	2.2.2 South Daulatpur New 4 Vent	nr	1	42.639	0.533			
	2.2.3 Bhalukia New 2 Vent	nr	1	28.340	0.354			
	2.2.4 Madhya Khal New 4 Vent Water Retention Structure	nr	1	41.672	0.521			
	2.2.5 Ichakhali Khal New 7 Vent Water Retention Structure	nr	1	62.571	0.782	211.5	2.6	8.7
3	Excavation of khals	m3	3,825,000	688.500	8.606	688.5	8.6	28.4
4	Repair of BWDB Offices,stores	Ls	1	15.000	0.188	15.0	0.2	0.6
5	Farmer Canal Systems							
5.1	New low lift pumps with electric motors	ha	17,000	81.600	1.020			
5.2	Buried UPVC Pipe and associated structures	ha	17,000	952.000	11.900			
5.3	Prepaid meters and system	ha	17,000	68.000	0.850			
5.4	Pilot solar pumps and panels	ha	60	14.400	0.180	1,116.0	14.0	46.0
6	Upgrading of electrical distribution system							
6.1	Upgrading of electrification	ha	17,000	272.000	3.400	272.0	3.4	11.2
	Total			2,428.562	30.357	2,428.6	30.4	100.000

- (v) Review and comment or approve the Contractor's testing laboratories and procedures for testing, Environmental Management Plan (EMP), Health and Safety Plan (HSP), Public Health and Public Safety Awareness (PHPSA) Plan, including HIV/AIDS Awareness Program, Traffic Management Plan, and other deliverables that the Contractor is obliged to furnish for the Engineer's approval.
- (vi) Prepare and submit to BWDB for approval a disbursement schedule based on the Contractor's proposal in accordance with the requirements of the construction contract.
- (vii) Verify the Contractor's pre-construction survey and setting out.
- (viii) Prepare a quality assurance plan, in consultation with the Contractor, including arrangements to check the quality of materials brought to the site, to ensure that the quality of construction is consistent with the technical specifications, and to maintain test records.
- (ix) Prepare a program for inspections and load testing of existing structures (as applicable), review test results and make recommendations for any further actions.
- (x) Review and approve the Contractor's construction drawings, and drawings for temporary site works.
- (xi) Review and approve the as-built construction drawings prepared by the contractor. The as-built drawings will be based on detailed design drawings with amendments for changes during construction.
- (xii) Visit the site on a routine basis to observe the progress and quality of the Contractor's work, and maintain representatives at the site in such a manner that adequate supervision of construction works is provided at all times the Contractor is working.
- (xiii) Organize the supervision of the works with proper allocation of responsibilities to individual inspectors and supervise their work to ensure effective execution, including proper conduct, attendance and performance of their duties.
- (xiv) Ensure the Contractor supplies to the site all material, equipment and machinery that have been committed in its bid, and ensure that all items remain on site until their release has been authorized. Ensure that the Contractor properly records all equipment, materials and labour which have been supplied under the Works Contract.
- (xv) Assess the adequacy of all inputs, such as equipment, labour and materials provided by the Contractor and its methods of work in relation to the required rate of progress and, when required, take appropriate action in order to maintain agreed schedule.
- (xvi) Inspect and evaluate all Contractor's installations, shops and warehouses and other accommodation to ensure compliance with the terms and conditions of the Contract.
- (xvii) Provide timely assistance and direction to the Contractor in all matters related to the interpretation or clarification of the Works Contract, ground survey controls, quality control testing and other matters related to Works Contract compliance and progress of the Works; and ensure prompt responses when the Contractor calls for inspections and approvals.

- (xviii) Issue instructions, in accordance with the authority specified in the Conditions of Contract, to Contractors to ensure Works will proceed according to agreed schedule.
- (xix) Collect, track and furnish BWDB with indicators of Construction Performance, against contractual requirements as enumerated in the Construction Contract.
- (xx) Ensure that the Works are executed in accordance with the detailed design drawings and that the quality of workmanship and materials is in compliance with the technical specifications. Evaluate and determine acceptability of substitute or “equal” materials and equipment proposed by the Contractor.
- (xxi) Perform or oversee all laboratory and field testing of Contractor’s work, materials and products required to ensure that the quality as specified in the Contract is attained. The Construction Contractor will provide testing facilities and will establish routine testing related to construction works. Review all certificates of inspections, tests and approvals.
- (xxii) Assure the receipt of, and maintain as permanent records, all warrants required under the terms of the Construction Contract for materials and equipment accepted and incorporated in the Scheme. All local materials incorporated in their source are also to be approved.
- (xxiii) Monitor implementation of Environmental and Social Management Plan of the Scheme during construction phase.
- (xxiv) Monitor implementation of the Health Safety Plan. Check and ensure that the Contractor has taken suitable measures with regard to the safety and health of its workers (e.g. provision of potable water, lodging, mosquito nets, and first aid kits), site safety, and accident prevention measures. Inspect the security and safety aspects of construction and temporary works to ensure that every reasonable measure has been taken to protect life and property.
- (xxv) Monitor implementation any public health requirements including HIV/AIDS awareness and prevention.
- (xxvi) Liaise with communities and businesses affected by any of the works undertaken under the Project.
- (xxvii) Ensure that Contractor complies with its contractual obligations in respect of labour standards (including the monitoring of trafficking in persons), mitigation of impacts on the environment, health and safety, by withholding payment against appropriate items in applications for interim payment, as applicable in accordance with the provisions of the Works Contract.
- (xxviii) Prepare and maintain inspection and engineering reports and records to adequately document the progress and performance of the works.
- (xxix) Prepare incident reports, covering accidents, environmental and other incidents, and take appropriate follow on action.
- (xxx) Perform all survey measurements of completed or partial works where required for the determination of quantities. Compute quantities of approved and accepted work and materials and check, certify and make recommendations to BWDB on the Contractor's interim and final payment certificates. All payment certificates shall be checked and countersigned by the IMO.
- (xxxi) Review and comment on, or recommend approval of, Contractor’s proposals for variations.

- (xxxii) Propose and present for the approval of IMO any variations in the Works Contract that may be deemed necessary for the completion of Works, including information on any effect that the variations may have on the Works Contract amount and the time for completion of the Scheme, and prepare all necessary variation orders, including alterations of plans, technical specifications, and other details for the approval of BWDB.
- (xxxiii) Inform BWDB about problems or potential problems, which may arise in connection with the Works Contract and make recommendations for possible solutions.
- (xxxiv) Examine and make recommendations to BWDB on all claims from the Contractor for extension of time, additional compensation, extra work or expenses or other similar matters. Attend claims meetings between BWDB and Contractor.
- (xxxv) Arrange and preside at periodic coordination and progress meetings on site, and prepare the minutes of meetings.
- (xxxvi) Review reports and documents submitted by Contractor.
- (xxxvii) Prepare and submit reports on the progress of the Works, the Contractor's performance, quality of works and the Project's financial status and forecasts.
- (xxxviii) Keep on site full and complete records of all matters pertaining to the Works including, but not limited to, programs, correspondence, instructions, variations, revised drawings, site sketches, minutes of meetings, testing, inspections, approvals, measurements, interim payments, progress reports, insurances, visitors to site, completion certificates, day works, Contractor's labour and equipment, site diaries and inspector's daily reports.
- (xxxix) Arrange and make public presentations of the work done to date at the request of BWDB.
- (xl) Upon completion of the Works, carry out the necessary inspection, specify and supervise any remedial works to be carried out and, upon completion, propose to BWDB a date for a joint inspection, prior to the issuance of the Certificate of Substantial Completion.
- (xli) Review and comment on or approve as-built drawings prepared by the Contractor.
- (xlii) Submit supervision Plan for Investment Works and supervision progress report.
- (xliii) Perform all other tasks, not specifically mentioned above, but which are necessary and essential to ensure the successful supervision and control of all the construction activities, in accordance with the terms of the Works Contract.

53. The IMO will also be responsible for post construction services that take place during the Contractor's defect liability period. Also, during the defect liability period the Contractor should provide an active maintenance program to maintain the elements of the scheme in good order until Final Acceptance. During this period, the IMO will act on behalf of the Employer in all matters related to the full performance by the construction contractor of its obligations under its defect liability warranty. The IMO's tasks shall include the following:

- (i) Inspect the Works at appropriate intervals during the Contractor's Defects Liability Period and ensure that the Contractor is maintaining all scheme elements in good condition.
- (ii) Inspect the Works at appropriate intervals during the Contractor's Defects Liability Period; and, prior to expiration of the Defects Liability Period, prepare a

- final deficiency list, supervise remedial works and recommend to BWDB the date of the Final Inspection of the Works.
- (iii) Carry out the Final Inspection of Works together with representatives of BWDB, and the Contractor.
- (iv) Prepare and issue the Final Acceptance Certificate in consultation with BWDB and the collaborating agencies.
- (v) Prepare the Final Payment Certificate.

2. Tasks Required for Bid Submission

54. A methodology and program of work will be submitted as part of the bid submission including:

- (i) Detailed methodology for supervision of rehabilitation work (preparation of construction; technical management; administrative management ; communication with stakeholders; financial management; agreement with quality, health, environmental plans); Post construction services (periodical inspection of infrastructure and reparation of defects; issuing of final certificates).
- (ii) Scoping: A statement confirming limits of work, including: (a) a clear definition of the work to be carried out for the various components of the activity (coastal embankment; khal excavation; rehabilitation of new structures; distribution system; electricity network; rehabilitation of offices), noting any difficulties that may be expected and how they may be overcome; (b) proposed timetable of each components; and (c) IMO team and specialist needs.
- (iii) Outline program of work, showing expected time, duration and personnel as well as the interrelationship between components.
- (iv) Regarding excavation of the khal, the bidder shall describe in their proposal the best method to estimate and control the amount of sediment excavated from the khal.

55. The bidder will describe the effective means of implementation to guarantee efficient and supervision of work (transport means for field staffs; organization chart; etc.)

D. Activity 3: Participatory Design of the Level 3 Distribution Systems

1. Scope of services

56. The IMO is responsible for preparing the detailed engineering design, bill of quantities (BOQ), engineering cost estimates, specifications and contract bidding documents for the Level 3 distribution systems for the remaining 15,000ha which includes: (i) the LLPs and associated civil structures; (ii) the buried pipe distribution network including storage tanks, pressure risers, and outlet valves and associated civil structures; (iii) expansion and necessary upgrading of the electricity distribution network; and (iv) installation of the smartcard prepaid meters and control systems. The designs should generally follow the design criteria for the advance designs already prepared for the initial 2,000ha. Upgrading of the electricity will require following the requirements and specifications of the Rural Electrification Board (REB). The IMO will prepare the layout designs of the distribution systems with participation of the farmers, landowners, local water user associations, ICC and local communities. The participatory approach to be followed

by the IMO during the design consultation process will be firstly agreed with ICC and BWDB. A tentative schedule for the design and implementation of Level 3 works is shown in Figure 4 which shows the design and implementation of investment works taking a phased approach with the initial 2,000ha systems being implemented in the first year followed by three phases of participatory design and implementation of 5,000ha units of investment works. The preparation of the tender documents and the tendering will be implemented by the PMU with the support of the PMDC.

Figure 5: Tentative Design and Implementation Schedule for Level 3

	Year 1				Year 2				Year 3				Year 4				Year 5			
	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3
Wet Season			x	x			x	x			x	x			x	x			x	x
Phase 1 (2,000 ha)																				
Construction	x	x																		
Defects Period			x	x	x															
Phase 2 (5,000 ha)																				
Consultations	x	x																		
Design		x	x																	
Bidding				x																
Construction					x	x														
Defects Period							x	x	x	x										
Phase 3 (5,000 ha)																				
Consultations					x	x														
Design						x	x													
Bidding								x												
Construction									x	x										
Defects Period											x	x	x	x						
Phase 4 (5,000 ha)																				
Consultations									x	x										
Design										x	x									
Bidding												x								
Construction													x	x						
Defects Period															x	x	x	x		

57. The design process will generally follow:

- (i) Review of existing data and reports made available to the consultant including: (a) available topographical information and digital elevation models; (b) layout map

of MIP showing the reservoir, rivers, khal, roads, etc., and boundaries of project area; (c) design criteria for the buried pipe system including cropping patterns, and crop water requirements and design duties; and (d) specifications and a blank (sample) Bill of Quantities.

- (ii) Identification of pumped systems for about 15,000 ha (net) irrigation based on the current layout of pumps and farm distribution systems in consultation with the farmers and needs for improvements. The number of systems will depend on their size but is likely to be about 600 assuming an average of 25ha/system. Selection of the schemes to be taken up for investment will include a technical assessment of the viabilities including; avoiding areas where there is risk of flood damage, good soils, avoiding schemes where khal siltation will be very problematic, minimising the costs of the electrical interconnections, minimising the length of pipelines, avoiding high pumping lifts etc..
- (iii) Organise and undertake consultations with farmers, landowners, land holders, ICC and WUAs, including detailed stakeholders identification for consultations, providing awareness campaigns, organising meetings, and signing of Memorandum of Understanding (MOU) for every system for which detailed designs are prepared. On signing of the MOU's, each farmer must commit to making an upfront payment of BTK1, 500 prior to construction of the buried pipe systems. Payment would be made at the time of mobilisation of the contractor to the IMO whom will deposit the payments into the escrow account.
- (iv) Preparing detailed engineering designs of each distribution system including preparation of drawings, bill of quantities, and cost estimates that are disaggregated for each scheme. Drawings shall be done showing for: (a) layouts of the khal, pumps and pipe systems; (b) long sections for systems; (c) all for associated civil structures; and (d) all associated electro and mechanical equipment. However, except for the header tank and any other one-off structures, all drawings should be standardised as much as possible.
- (v) Assessment of required electric power supply and LLP requirements including pump and motor capacity, control systems, and power and energy requirements for the systems for which detailed designs are prepared. Design and specifications of electricity distribution extensions to energize the LLPs shall be prepared. Extensions to the electric distribution system will include extension to existing substations, if necessary, distribution lines, poles and transformers, if required.

2. Tasks Required for Bid Submission:

58. A methodology and program of work and staffing schedule will be submitted as part of the bid. This will include the participative approach proposed to plan and design the distribution system, along with undertaking the detail designs. The Bidder will also provide a detailed time schedule for this activity to guarantee that the participative design will be in accordance with the proposed deadline for the rehabilitation of the distribution system.

E. Activity 4: Agricultural Support Services, Pilot Cost Recovery Activities, and Implementation of Training and Awareness Programs

1. Scope of services

59. Provisional sums have been allocated to support this work and the IMO is required to arrange the engagement of appropriate organizations to implement Activity 4 as sub-contractors.

60. **Agricultural Support Services** are a responsibility of the IMO with the objective of enabling small farmers to take up more efficient water use, crop diversification through sustainable practices, and developing opportunities for commercial farming and agribusiness. The intention is for IMO to offer a nucleus of localised self-financing support services either directly or by interacting and engaging with existing government and non-government organizations. Pilot programs will be established for MIP under the Project to assess viabilities and response agriculture support programs before up-scaling under the next phase IMO.

61. The objective of the agricultural services is to directly involve the IMO in agriculture extension services and providing technical support to farmers. The IMO will be required to prepare an annual training plan which, on approval by PMU, will be implemented by the IMO. The training will focus on, among other things: optimizing water use, expanding the service area, promoting and facilitating crop diversification, and increasing cropping intensity. The result of the training should raise farmer incomes and therefore their ability to pay the ISC and for irrigation services. The training program will be implemented using both in-house training capacities of the IMO, BWDB and DOA as well as subcontracting to local, regional and national qualified training institutes and individual specialists.

62. **Development of Pilot Cost Recovery Activities:** Opportunities for increasing the cost recovery of providing irrigation services, over and above revenue from water charges, will be explored to minimize the burden on farmers as well as minimize or avoid the need for Government subsidies. There are various opportunities that can be researched including, but not limited to: leasing of BWDB land assets; leasing of areas within the khal, rivers and reservoir for fisheries including stocking; royalties from sand abstraction; and agriculture support enterprises. Their concepts and viabilities will be studied by the IMO and presented to BWDB and ICC for endorsement. The most promising, viable and sustainable opportunities would be taken up as pilots by the IMO. A provisional sum within the IMO contract has been allocated to support this work.

63. **Awareness and Training:** The need for a strong program of awareness, communication and engagement with stakeholders has been identified as a key role for the IMO. This component is designed to provide continued support for the stakeholders including BWDB, Department of Agriculture, Local Government, Water Management Organizations, ICC, and most important the farmers to achieve the targets described in the project design. The roles of these supporting organizations are critical and how the stakeholders can work most effectively with the IMO is an essential requirement. Selected and focused training will be provided by the IMP and will include a mix of informal on-the-job training and formal institutional training to key stakeholders. The mechanisms to establish and develop effective engagement with the project stakeholder will form a key part of the IMOs responsibilities as part of the awareness and training program. The IMO will prepare and submit an awareness and training plan to the PMU,

which on their approval, will be implemented under the IMO. It is anticipated that training and awareness would be a mix of; (i) activities implemented directly by the IMO staff without additional cost, (ii) direct engagement of individuals or procurement of materials to support the training which would be reimbursed at cost; (iii) subcontracted to third party organizations and (iv) establishment and development of training financed through commercial organizations.

64. The training plan and program must develop new initiatives to ensure the long term sustainability of training, including initiatives to reduce the dependencies on project funded training. The outline requirements for communication and awareness are described in the Project Administration Manual (PAM).

2. Tasks Required for Bid Submission

65. A methodology and program of work for undertaking these activities will be submitted as part of the bid submission. The Bidder will provide the method it will adopt to identify and carry out or sub contract: (i) agricultural support services; (ii) training and awareness programs including initiatives to effectively engage with the stakeholders aligned with the Project communication strategy; (iii) pilot cost recovery activities; and (iv) capacity building and capacity strengthening programs of the main stakeholders. The Bidder will provide an outline work program and staffing schedule.

IV. Deliverables

66. The deliverables of the IMO contract will be in two parts: (i) reporting deliverables; and (ii) project deliverables.

A. Reporting Deliverables

67. The reporting deliverables are summarized in **Error! Reference source not found.**⁹. All reports will be submitted in English, in both editable and fixed electronic form, and hard copies. All deliverables shall be uploaded to an electronic sharing network such as an File Transfer Protocol (FTP)site or Share point site that BWDB and their representatives can access. In addition, the IMO shall submit all backup Excel spread sheets and computer based analytical models, including models that are developed using specialized software applications. The format for AutoCAD and GIS data to be submitted by the IMO shall be agreed with BWDB.

68. The IMO shall establish and maintain a comprehensive inventory, both hard copy and electronic, of all relevant documents made available and collected. All such documents, which are considered confidential, will be compiled in usable form and delivered in an organized fashion to BWDB at the end of the contract.

Table 9: IMO Reporting and Documentation Deliverables

Ref.	Report	Description	Submission (month)
A	Establishment of Efficient and Sustainable MOM		
1	Project Management and Administration Manual	The Project Management and Administration Manual (PMAM) will be prepared at the beginning of the IMO contract and will be routinely updated as required. It will present the MIP development and MOM arrangements including documenting arrangements for, but not limited to: asset management; staffing logistics; financial management; stakeholder liaison and engagement; operational methodologies; maintenance and administrative procedures; extension services; cost recovery activities, and social and environmental requirements. It will also detail how assets will be catalogued, assessed and maintained. The initial and amended contents of the PMAM will be agreed by PMU and ICC. The PMAM will also present procurement plan and timeframe for items under provisional sums	1 and as needed
2	Water Resources Management Plan	Monitoring, developing and maintaining a water resources management plan for the project area that includes surface, ground water and agricultural water demands. The plans will be developed in coordination with the PMDC consultants who will undertake hydrological and hydro-geological studies for MIP.	12 with annual updates
3	Quarterly and Annual Reports	Progress reports to be submitted to BWDB on a quarterly and annual basis. The reports would show actual expenditures, revenues and MOM outputs. The quarterly reports will be concise and will report only on the previous three months. The annual report will be comprehensive and present cumulative results throughout the preceding year. The annual report will be supported by an external independent audit. The annual report will include progress of the Key Performance Indicators (KPI).	Annual report: 12, 24, 36, 48, 60; Quarterly reports: every 3 months
4	Annual Work Plans	Annual work plans (AWPs) will be prepared in liaison with WUAs through the ICC and agreed with the PMU. The AWPs will present the IMO's plans for the year ahead, including: MOM activities; design and construction supervision activities; and, agricultural support services and pilot cost recovery activities. The AWP will also present estimated revenues and costs, and will present the agreed tariff for that year. The annual reports and annual work plan will be presented to the PMU and ICC annually by 30th June. The annual reports and work plan will be presented to the PMU and the ICC at the Annual General Meeting to be held by 31st July. The annual work plan would be approved not later than 15th August to allow the IMO to initiate the implementation. The year 1 work plan will be produced within 3 months of contract signing.	3, 12, 24, 36, 48
5	Asset Management Plans	Asset Management Plans (AMPs) will be an inventory of all scheme assets and will present their current conditions and indicate if maintenance or replacements are required. The AMPs will be prepared annually, three months prior to submitting the AWPs. The AMPs will be used to support planned OM activities presented within the AWPs. The IMO will routinely inspect the condition of all Level 2 and 3 scheme	9, 21, 33, 45, 57

		assets which will be documented within the AMPs. The initial AMP will outline the inventory reference and GIS database system.	
6	Information System Report	Annual report on main data collected and up dated in the data base: rainfall, level and flow in the Khal, volumes pumped; land register; agriculture; etc.	Annual report
7	Implementation and monitoring of the environmental management and gender action plans.	Working with PMU, Stakeholders, the ICC and contractors to ensure the environmental management (EMP) and gender action plans (GAP) are effectively implemented and monitored.	Annual and periodic reports as described in the EMP and GAP
8	Project Monitoring and Evaluation(PME)	Implementation of the project monitoring and evaluation activities. Including setting up the system according to the system design (to be developed by PMDC) and preparing annual PME reports	PME established by month 6. Annual PME reports
B	Construction Supervision of MIP Investment Works		
1	Supervision Plan for Investment Works	Detailed plan for the supervision activities including requirements for surveys, quality control to ISO standards or equivalent	3
2	Supervision Progress Report	Monthly construction progress reports	monthly
3	Progress Certificates	Payment certificates as required.	monthly
C	Participatory Design of the Level 3 Distribution Systems		
1	Detailed Design Reports and Drawings	Detailed engineering design reports are prepared for the Level 3 Distribution system detailing the design process, assumptions, parameters, formulae, results, specifications and costs of the designs. The report will be accompanied by detailed designs drawings for all components. A single document will be prepared that will be updated and expanded following design of each implementation phase. The design and design reports will need to be submitted for design approval by the BWDB and the REB for the electrification works.	12, 24, 36
2	Design Progress Reports	Periodic reports on the progress of design and accounts of farmer participation in the design process.	Quarterly
D	Agricultural Support Services and Pilot Cost Recovery Activities		
1	Awareness and Training Plan	The Awareness and Training Plan (ATP) will present the results of IMO's needs assessment of awareness and training of farmers, pump operators, WUAs, BWDB and other relevant stakeholders. It will outline an awareness and training programme that the IMO will implement during its term, using either internal or external resources.	4
2	Agricultural Support Services Plan	The Agricultural Support Services Plan (ASSP) will review of the scope and potential for agricultural support and present strategies and recommended plan for engaging external support for implementing the services. The plans should be prepared in detail with agricultural support pilots and demonstrations, and include budget estimates. These will be prepared in consultation with the WUA and ICC, and approved by BWDB.	6
3	Cost Recovery Opportunities Plan	The Cost Recovery Opportunities Plan (CROP) will identify and assess alternative cost recovery opportunities. It will present approaches and strategies for development of the pilot	6

		projects, for approval of BWDB.	
4	Recruitment Documents	Prepare, in consultation with WUAs and ICC, contract documents and scope of works for agricultural support services and pilot cost recovery activities. These will be approved by BWDB.	9
5	Monitoring Reports	Quarterly monitoring reports of the agriculture support services, cost recovery pilot activities, and training and awareness activities.	quarterly
6	Agricultural Support Evaluation Report and Strategic Plan	The Agricultural Support Evaluation and Strategic Plan (ASERSP) will present the evaluation of the agricultural support pilots and preparation of strategies and recommend proposals for the long-term development of agriculture and water saving systems and the provision of agricultural support services.	36
7	Cost Recovery Opportunities Assessment Report	The Cost Recovery Opportunities Assessment Report (CROAR) will present the evaluation of the pilot cost recovery activities and recommend proposals for long-term cost recovery activities.	36

B. Project Deliverables

69. In addition to the reporting deliverables, the IMO is required to take a lead support role of the key project deliverables which as described in Table 10 below.

Table 10: IMO Project Outputs

Ref	Output	Description	Submission (months)
A Establishment of Efficient and Sustainable MOM			
1	Pumps and pipe irrigation commissioned	17,000ha of piped irrigation including pumps, pipe distribution and prepaid meters are installed commissioned and operating. These will be constructed in a phased approach with 2,000ha completed in Year 1, and 5,000ha completed each year in Years 2 to 4.	12, 24, 36, 48
2	OM of pumps, pipes and prepaid meters	Efficient OM of the pumps, pipe distribution and prepaid meters. Breakdowns are repaired within 24 hours. Over the year all the pumps are operable 95% of the time.	Continuous
3	Cost Recovery	OM cost recovery systems are established and 100% of the OM costs are recovered for 17,000ha	48
4	Maintenance works	Maintenance work is properly planned and implemented.	Continuous
5	Irrigation Areas	Target cropping patterns and yields as estimated in the economic analysis are achieved.	60
B Construction Supervision of MIP Investment Works			
1	Investment Works	All investment works for MIP are constructed according to the target schedules and international standards and norms have been followed. Progress and final payments have been agreed and paid by BWDB.	48
C Participatory Design of the Level 3 Distribution Systems			
1	Designs of Level 3 Distribution System	Participatory designs of the Level 3 distribution systems	30
D Agricultural Support Services and Pilot Cost Recovery Activities			
1	Agricultural Support	Agricultural support services and demonstrations are	42

	Services	implemented. Long-term sustainable and viable cropping systems are identified to increase farmer incomes and reduce water use. Up-scaling of improved systems models over 1,000ha are achieved.	
2	Supplementary cost recovery pilots	Supplementary cost recovery pilots are identified and implemented. Supplementary cost recovery is achieved to fund 10% of the overall OM costs.	36
3	Awareness and training	Implementation of awareness and training based on the awareness and training plan	36
4	Farmer and Stakeholder Engagement	Farmers are fully aware of the project and support the objectives. The ICC is established and meets four times per year, the WUA and the WUF representatives attend the ICC meetings. Farmer and stakeholder complaints are compiled, assessed, and adequately addressed	36

V. Terms of Reference for Professional Staff

70. The Irrigation Management Operator (IMO) consultant will be for a period of five years to be provided during the Project implementation. The total international input will be for 44 person-months (pm) and 674 pm for national consultants (key experts) and about 700 pm of non-key experts & support staff. The overall requirement is 1,418 pm. Outline terms of reference for individual IMO specialists are given below and a summary of specialist inputs is shown in Table 11.

Table11: Estimated Requirements for Professional and Support Staff

Position	Person-Months Key Experts		Person-Months non key expert and staff
	International	National	National
MIP Management			
General Manager / Chief Irrigation Engineer	35		
Deputy General Manager / Executive Engineer		50	
Office Manager			50
Assistant Office Manager/Secretary			50
Accountant / Procurement Specialist		50	
Safeguards / Public Relations Specialist		40	
Computer / MIS Database Manager			40
Upazila Field Offices (6 nos)			
Field Officer Managers (6 positions)		200	
Field Office Staff (Assistant OM Engineers and Agriculture Support- 6 Positions)			200
Agriculture Extension Office			
Agricultural Management Specialist	8		
Extension and Training Specialist		50	
Design Office			
Senior Irrigation Planning and Design Engineer		25	
Irrigation Design Engineers (2 positions)		50	
Assistant Design Engineers / AutoCAD Operators			100

Position	Person-Months Key Experts		Person-Months non key expert and staff
	International	National	National
Mechanical / Electrical Engineer ^{ai}	1	10	
Construction Supervision Office Chief Resident Engineer Assistant Site Engineers		30	180
Senior Topographic Surveyor Assistant Surveyors / Chain-persons Mechanical / Electrical Engineer (Supervision and OM)		40 45	80
OM Office Senior OM Engineer OM Engineer		39 45	
Overall Total	44	674	700

Notes: The national Mechanical / Electrical Engineer can fulfill the responsibilities for both the design and supervision roles with a total input of 60 pm.

A. KEY EXPERTS

International Specialists (44 person months)

1. General Manager/ Chief Irrigation Engineer (35 person months)

71. The General Manager / Chief Irrigation Engineer will be required to work closely with PMU and will be responsible of the overall management of the IMO to achieve the four main activities describe in the scope of works above. The specialist will also lead the design team. The specialist will have a Master's degree in Civil or agriculture engineering, or a related field, and will have at least 20 years of technical project experience with at least 5 of those years leading the implementation and management of projects. Experience of working in irrigation and water resources development in South Asia on major irrigation systems is highly desirable. The specialist will be responsible for:

- (i) Represent the IMO in all its contractual obligations and be in charge of the relationship with the PMU/BWDB and the regional authorities.
- (ii) Overseeing the implementation of the various activities including design, construction supervision and MOM and be responsible for the preparing and maintaining quality insurance plans.
- (iii) To act as the resident engineer for supervision of construction. As the employers (BWDBs) representative to take full responsibility for the quality control and effective supervision of the construction works.
- (iv) Manage the teams of the four activities and specifically supervise the recruitment and evaluation of the operation and management local staff
- (v) Overall direction of the team, coordination of inputs, and management of individual specialists.
- (vi) Ensuring the timely progress of the project implementation including planning, design, construction and institutional development as well as the programmed Project and Safeguards Monitoring Systems.

- (vii) Ensuring timely delivery of all deliverables as listed in Table 4 including the various progress reports.
- (viii) To take overall charge of the development and updating of the water resources management plan for the project area that includes surface, ground water and agricultural water demands. The plans will be developed by the various technical specialists of the IMO in coordination with the PMDC consultants who will undertake hydrological and hydro-geological studies for MIP
- (ix) To provide strong and effective management support to help guide the BWDB, other stakeholders and contractors to achieve the targeted project deliverables identified in Table 5.
- (x) To support the necessary approval processes of deliverables including BWDB, ADB and stakeholders.
- (xi) Guide the management and coordination with the government, and other stakeholders including the facilitation of regular management dialogue between the EA, other associated agencies and stakeholders at central and project levels.
- (xii) Support the establishment and guide the activities of the Implementation Coordination Committees (ICC) and other proposed institutional arrangements.
- (xiii) Supervise and organize the irrigation services with the national experts during the irrigation season. During the first years he/she will have to strengthen the capacity of the national irrigation engineers. He/she will also provide technical inputs to the O&M manuals with regard to irrigation management. With the deputy team leader and the national irrigation O&M engineer, he/she will organize the operation services, maintenance services, customer relationship services.
- (xiv) Be responsible for the review of distribution system prepared by the construction Contractor, and for the overall supervision of the structural components of the Works.
- (xv) Coordinate the design review of distribution system gathering inputs from other subject specialists.
- (xvi) Contribute to propose relevant training related to best irrigation practices on plot.

2. Agricultural Management Specialist (8person months)

72. The Agricultural Management specialist must have a background in Agronomy or related field/discipline and a Master of Science in Agro-economics or related field/discipline. She/he must have a minimum of twelve (12) years of experience in agro-economics/agronomy with a minimum of at least two (2) successful agriculture development projects in the sub-region, with Bangladesh preferred. The Agricultural Management Specialist should have experience in the development of irrigated agriculture projects, economic value chains and market based crop production analysis. The Agricultural Management Specialist should have experience working in multi-disciplinary teams. Fluency in written and spoken English is mandatory.

- (i) To take the lead role, in coordination with the other specialist to develop and maintain the project data collection and data base.
- (ii) Agricultural aspects will be a core requirement for the data base including at the scheme level (record of crops, yields and marketed; other sampling methods for monitoring agriculture development within the scheme).

- (iii) He/she will have to liaise with other agriculture, local government, WUA and other stakeholders and support agencies.
- (iv) He/she will have to propose and assess the requirements of pilot cost recovery activities. He/she will advise the ICC and PMU on water tariff. He/she will contribute to the establishment of the training plan. He/she will build capacity of the local Extension officer/training specialist /agriculture extension, regarding the optimal use of the irrigation infrastructure (rise the cultural intensity) and diversification of crops (rise the ability of the farmers to pay for the water services).
- (v) Engage with farmers and stakeholders to identify the main constraints to crop production in MIP.
- (vi) Assess the scope and capacities of the existing agricultural extension services and other related organizations working in the project area. Identify gaps and possible areas of support from the project.
- (vii) Review the requirements and propose strategies for increasing agricultural productivity, increasing POW, improving farm water application efficiencies and overall scheme efficiencies, reducing water use, and assessing potentials and strategies for crop diversification for MIP. The review will assess the irrigation needs for the main boro crop as well as supplementary irrigation during other seasons including Aman crop.
- (viii) Identify the key requirements for efficient irrigation to meet the needs of crop productivity including: timely water availabilities, crop diversification, scheduling of planting, reduced water use. Discuss with stakeholders to identify irrigation management strategies to help meet requirements to meet targets for increased productivity.
- (ix) Work with the other specialists to develop strategies for investment and management of MIP, and show how these strategies can incorporate the requirements and help meet the needs and full potentials of irrigated agriculture.
- (x) To work with the other specialists and the PMDC to design and establish a Project Monitoring and Evaluation System for MIP.
- (xi) Develop a plan and costs for agricultural support services to be implemented by the IMO's for MIP. The plan should build on the existing agriculture extension and support programmes within those areas.

3. Mechanical / Electrical Engineer (1 person month)

73. The international Electro-mechanical Engineer will be a highly qualified professional electrical and mechanical engineer, (at least BSc degree) with a minimum of 10 years of experience in all aspects of pumping station design and construction, in the design and rehabilitation of irrigation electromechanical equipment including but not limited to pumps, valves, modules, maintenance, operation. Fluency in written and spoken English is required:

- (i) Contribute to drafting the OM manuals with regard to electro-mechanical maintenance activities and related training. With the support of other members of the team he/she will have to propose the best option for electrical pumps backup system. He/she will have to organize with the Computer IT specialist/Data base, the data collection regarding individual Low lift Pump at the scheme level.

- (ii) To review the requirements for the upgrading and extension of the electricity network. To liaise with REB regarding the norms and standards for the electrical works to ensure the contract complies with the specification and standards of the REB.
- (iii) Be responsible for the review and production of all pump, electrical materials designs and drawings, and for the overall supervision of the electro-mechanical components of the Works. He/she will work with the Computer IT specialist/Data base to fulfil the pumps register and define the average efficiency of each pump that will be used for operation KPI.
- (iv) The Electro-mechanical engineer will undertake the design review for all electro-mechanical components of the Scheme.
- (v) The Electro-mechanical engineer will contribute to propose relevant training related to pumps operation and maintenance.

B. National Specialists (674 person months)

1. Deputy General Manager / Executive Engineer (50 person months)

74. The Deputy General Manager (DGM) will have either a Degree in Civil Engineering, or equivalent; or at least a Diploma of Business Management, or equivalent. The DGM will have at least 12 years of business management experience and will be fluent in both English and Bengali. The DGM will work in closely with the General Manager / Chief Engineer and is responsible for the day-to-day management of the team, and relationship with the local authorities and project beneficiaries. It is intended the DGM will take over the role of General Manager following completion of the IMO's design activities. The main tasks of the specialist will include:

- (i) To support the General Manager in all aspects of the management of the levels 2 and 3 of the Muhuri Irrigation Project.
- (ii) In the absence of the project manager to act as the resident engineer for supervision of construction. As the employers (BWDBs) representative to take full responsibility for the quality control and effective supervision of the construction works
- (iii) Ensuring the IMO undertakes the four main activities according to schedule, meeting key performance indicators and with inputs targeted on the design of the OM system and capacity building of stakeholders in the first years.
- (iv) Monitoring and developing overall water resources management plan for the project area including surface and ground water.
- (v) Liaising with the Rural Electrification Board (REB) and negotiate the best quality of service is made available for irrigation.

2. Accountant / Procurement Specialist (50 person months)

75. The Accountant Specialist will have at least a Degree in Accounting, and have at least 10 years of experience in project/private business accounting and at least 5 years of experience in

accounting and procurement of works, goods, services, preferably on international donor projects. The main tasks of the specialist will include:

- (i) Preparing, developing, maintaining and using an accounting database system to maintain all transaction and procurement records of the IMO.
- (ii) Setting up an Escrow Account in the name of the IMO
- (iii) Making payments to suppliers, pump operators and smartcard vendors.
- (iv) Preparing and submitting payment invoices to BWDB and ADB.
- (v) Support the design team with packaging and procurement of civil works and the supply and installation of mechanical and electrical equipment.
- (vi) Support the team with procuring additional surveys and studies.

3. Safeguards and Public Relations Specialist (40 person months)

76. The Safeguards and Public Relations Specialist will have at least an advanced social sciences degree or equivalent, with at least 10 years of experience working international development projects. The main tasks of the specialist will include:

- (i) Be guided by ADB's Safeguard Policy Statement (2009) guidelines, procedures and best practices.¹³
- (ii) Supporting BWDB and IMO staff with: (a) training and capacity building on environmental management, supervision, reporting and monitoring of implementation of environmental management plans (EMP); and (b) orienting contractors on implementation of EMP.
- (iii) Guiding IMO staff on reporting requirements on environmental monitoring to ADB and BWDB.
- (iv) Recommending any corrective actions on any unforeseen environmental impacts.
- (v) Plan and implement consultations with the affected people in accordance with the Support the implementation of the stakeholder communication strategy that was prepared during the PPTA.
- (vi) As part of the annual work plans, prepare communications plan for disseminating information on consultation, design, construction and MOM activities throughout the project area.
- (vii) Support IMO staff to implement the communications plan and facilitate consultation meetings.
- (viii) Train and support the field office managers with customer relation skills and handling of complaints.

4. Field Office Managers (6 positions, 33.3 person-months each, total: 200 person-months)

77. The Field Office Managers will have graduate qualifications in engineering or agriculture with at least 10 years of irrigation management experience. They will be the managers of the

¹³ Refer to <http://www.adb.org/documents/safeguard-policy-statement> for a copy of the SPS; and <http://www.adb.org/site/safeguards/main> for a copy of Involuntary Resettlement Safeguards: A Planning and Implementation Good Practice Sourcebook, and Environment Safeguards: A Good Practice Sourcebook.

Upazila Field Offices and are responsible for day-to-day customer relations and provision of irrigation services. They will also be responsible for:

- (i) Acting as the IMO representative at the Upazila level and being the focal point for all customer services issues, complaints, information dissemination, training activities, payment of services, etc.
- (ii) Coordinating between the customers and technical and OM staff in main IMO office.
- (iii) Liaising between the farmers and the irrigation design and OM engineers.
- (iv) Catalogue and respond to customers' complaints and ensure prompt service and technical support is provided by the IMO.
- (v) Provide support to the main IMO office on design, construction supervision, MOM activities, and agriculture support.
- (vi) Assist IMO with preparing and implementing training activities for the farmers.
- (vii) Plan and manage the work plan of ex-BWDB staff placed in the field offices.

5. Extension and Training Specialist (50 person months)

78. The Extension and Training Specialist will have an extended experience with regard to capacity building of farmers (at least 5 years of experience dedicated to this type of training). Experience with specific training requirements for irrigation scheme management and WUAs is a plus. Fluency in English and in Bengali is required. The national extension officer/training specialist will:

- (i) Design the training program and supervise its implementation, including recruitment of trainers, training logistics, training materials.
- (ii) Will support of the other members of the team he/she will specifically assess the training requirements for farmers as well as other stakeholders, with regard to OM of large scale irrigation scheme. He/she will then establish a detailed training program, and organize its implementation based on locally available training capacities or establishing them when required.

6. Senior Irrigation Planning and Design Engineer (25 person months)

79. The Irrigation Planning and Design Engineer will support the Chief Engineer with the overall preparation of detailed engineering designs and contract documents for the modernised Level 3 system. The Engineer will have at least a Master's degree in Civil Engineering, be a chartered, professional engineer, and have at least 15 years of experience in planning and designing irrigation schemes, preferably on international donor assisted projects. The Engineer's tasks will include:

- (i) Reviewing previous studies and understand the current norms for irrigation planning and design.
- (ii) Review of the current design criteria and design of the advance 2,000ha and propose adjustments as considered necessary
- (iii) Support the Chief Engineer with leading and supporting the design team with: (a) consulting the farmers; (b) assessing cropping and water use patterns; (c)

- reviewing current water use, water allocations and water use efficiencies; (d) preparing water balances for the current water and cropping systems; and (e) assessing future water balances based on the new system layouts and cropping patterns on which to base the system designs.
- (iv) Develop standard designs, drawings and specifications for the modernised Level 3 systems based on the designs for the initial 2,000ha and incorporating international best practices for using pipes, LLPs and smartcard control systems. Present the criteria to the BWDB and obtain theirs and other necessary government approvals.
- (v) Planning, preparing and managing all necessary surveys and investigations for the design for rehabilitation and modernization of infrastructure including surveys, geotechnical investigations, and structural analysis.
- (vi) Leading the preparation of detailed designs, including working with the team to prepare the engineering cost estimates, specifications, BOQs and contract documents.
- (vii) Assisting BWDB with packaging, tendering and awarding civil works and equipment supply and installation.

7. Irrigation Design Engineers (2 positions, 25 person-months each, total: 50 person months)

80. The Irrigation Design Engineers shall be a qualified and competent Irrigation Design Engineer (MSc degree) with a minimum of 10 years of experience and at least 4 years of experience in charge of the design of secondary or tertiary level irrigation schemes including some experience of pipe distribution. The Engineers will support the Senior Irrigation Planning and Design Engineer and will be responsible for the preparation of the pipeline design and pipe designs for 15,000ha, as well as coordination of design aspects of the main rehabilitation works including:

- (i) Engage with farmers and surveyors to ensure a high level of participation to define the pipe layouts and locations of the pumps
- (ii) Prepare the detailed design for the 15,000ha including the drawings, bills of quantities, specifications and cost estimates.
- (iii) Liaise with the PMDC relating to the other design activities including upgrading of electrification, new and rehabilitation of structures, river bank protection and repairs to buildings.
- (iv) Supporting training programmes related to best irrigation practices on plot.

8. Mechanical / Electrical Engineer (11 person months)

81. The Mechanical/Electrical Engineer shall be a qualified Mechanical Engineer (at least BSC degree) with a minimum of 5 years of experience in maintenance and operation of water pump or in the design and rehabilitation of irrigation electromechanical equipment. The Engineer must also be able to communicate in English. The Engineer will support the design as of the electro-mechanic systems. Main tasks of the Engineer include:

- (i) Will support the international electromechanical engineer and the irrigation design engineers to undertake the design of the piped irrigation systems with special responsibility for all electro-mechanical components of the new modernized scheme.
- (ii) To identify and requirements for extending the electrification for any new pump schemes.
- (iii) To prepare the detailed specifications for the proposed electrical works.

9. Mechanical/Electrical Engineer - Supervision & OM (44 person months)

82. The Mechanical/Electrical Engineer shall be a qualified Mechanical Engineer (at least BSC degree) with a minimum of 5 years of experience in maintenance and operation of water pump. The Engineer must also be able to communicate in English. The Engineer will support the implementation and OM of the electro-mechanic systems. The same consultant can hold the position of the mechanical/electrical design and OM engineer as the inputs would be consecutive. The main tasks of the Engineer include:

- (i) Providing support to the pump operators for maintaining the pumps, the prepaid meter system and electrical pump backup system.
- (ii) Will periodically collect the pump data on behalf of the Computer IT specialist/Data base. He/she will also provide technical inputs to the OM manuals with regard to Pumps maintenance.
- (iii) Supervise the construction of the pumps and transmission upgrading

10. Chief Resident Engineer (30person months)

83. The Chief Resident Engineer (CRE) will have at least a Master's degree in Civil Engineering, and have at least 10 years of experience supervising the construction of civil works, preferably as the CRE. The main tasks of the CRE will include:

- (i) Leading the overall supervision of the structural components of the implementation works (coastal embankment, khal excavation, rehabilitation and new structures, pipe distribution/pumps/ prepaid meters, upgrading of the electricity network, rehabilitation of offices)
- (ii) Contributing to the preparation of the OM manuals with regard to regular structural checks to be included in the preventive maintenance program.
- (iii) Support the design engineers with improving designs based on lessons learned during earlier construction.
- (iv) Manage the site supervision engineers.
- (v) To report to the General Manager/Deputy General Manager all construction supervision and construction quality issues.

11. Senior Topographic Surveyor (40 person)

84. The Senior Topographic Surveyor will have at least a Degree in Land Surveying and at least 10 years of surveying experience. The specialist will be responsible for leading the surveying team, preparing work plans, and undertaking topographical surveys to support the design team and monitoring dredging works within the khals.

12. Senior OM Engineer (39 person months)

85. The Senior OM Engineer shall be a qualified and competent Irrigation Engineer (MSc degree) with a minimum of 10 years of experience. At least 4 years of experience in a service in charge of the Operation and Maintenance of Water scheme will be a plus. He shall be fluent in English and Bengali. With the deputy team leader and the international irrigation engineer the O&M Engineer will:

- (i) Design the OM system. He/she will be in charge of writing the OM manual. He/she will be one of the main interlocutors with the final users. He/she will be in charge of the water services field team management. With the electromechanical engineers he/she will be in charge of organizing a reliable electrical pumps backup system. He/she will be in charge of organizing the team of water dealers.
- (ii) Because of his close contact with Upazila irrigation engineers and with customers it will be particularly involved in the participative design review.

13. OM Engineer (45 person months)

86. The Senior OM Engineer shall be a qualified and competent Irrigation Engineer (MSc degree) with a minimum of 10 years of experience. At least 4 years of experience in a service in charge of the Operation and Maintenance of Water scheme will be a plus. He shall be fluent in English and Bengali. With the deputy team leader and the international irrigation engineer the OM Engineer will establish efficient and sustainable OM for Levels 2 and 3.

C. Non Key experts and supporting Staff

87. The IMO will also recruit non key experts and supporting staff; the estimated requirements are shown in **Error! Reference source not found.**¹². The nominations for the supporting staff are not required for technical proposal but would form a part of the financial proposal. It is recommended that as far as possible supporting staff are recruited locally to the MIP project area.

88. IMO will recruit non key experts supporting staff based on relevant qualifications, skills and experience as relevant. Experience of planning, design, management and construction supervision and of surface water irrigation or agriculture projects will be required. IMO will identify and recruit non key experts who are looking for challenging opportunities to develop modern and efficient irrigation investment and management for the MIP.

89. Persons who have demonstrated experience and in such projects and with drive and capacity for hard work would be identified and recruited by the IMO. Applicants could be from private sector, NGOs, government or semi autonomous organizations. Service holders who would like to apply would require to follow the IMO rules/regulations and would be required to obtain 'lien'¹⁴ by their own arrangement for the tenure of assignment as shown in Table 12. Candidates need to meet any criteria set by the IMO over and above those given in the TOR. Preference will be given to candidates with proven skills in management of irrigation and

¹⁴ Lien is leave of absence from Government with the job and salary level kept open for a pre-agreed period. The remuneration package would be provided by the new/host organization.

irrigated agriculture preferably working locally to the MIP. Female candidates are especially invited to apply.

90. Remuneration of the supporting staff to be recruited by the IMO would to be paid by the IMO as per the organization's own salary structure and conditions of contract including the terms for giving notice

91. It is proposed that not less than 20 % of the person months of support staff are nominated and agreed at the time of contract negotiations. The IMO would select appropriate and experienced staff. Candidates who have agreement for lien from Government service could also be considered. Selection will be by the IMO and would be on a competitive basis based on appropriate qualification and relevant experience to the establishment of sustainable MOM for MIP. For each position the IMO will present to the Project Director (i) the terms of reference including required qualification and the (ii) proposed candidate CV with assessment of his competence The Project Director will review and approve the proposed candidates..

92. Staff on lien will not exceed 20% of the proposed supporting staff; selection will however be based entirely on merit of candidates whether from private sector or government staff on lien.

Table 12: Non Key Experts and Supporting Staff

Ref.	Role	Qualification / Experience	Tasks	Inputs (person months)
1	Office Manager	Masters/bachelors degree. At least 5 years of good office management experience preferably with an international company. Good English and computing skills	Office management, financial management, formulating draft memos, logistics, support for field trips, workshops etc.	50
2	Assistant Office Manager / Secretary	Bachelors degree, Good English and computing skills.	Office support, data entry, preparing letters, organising printing, photocopying etc	50
3	Computer /MIS Data Base Manager	Bachelors Degree in computing science or relevant degree 2 years experience in information systems including GIS	In coordination with other team member to develop the scheme information system. To maintain the scheme information systems including the preparation of the key outputs and reports. Maintain customer feedback and complaints mechanisms,	40
3	Field Office Staff	Bachelors degree in agriculture or irrigation engineering. Good experience in MOM of major irrigation projects and experience with support agriculture services. Local experience of 3 years would be required	Report to the Field Office Managers and support MOM operations, respond to farmer issues and complaints, etc.	200
4	Assistant Design Engineers / AutoCAD Operators	Degree in Civil Engineer/ Irrigation engineer , or equivalent, with practical	Report to the senior irrigation design engineers, prepare design drawings, bill of	100

		experience in using AutoCAD of minimum 2 years.	quantities, cost estimates.	
5	Assistant Site Engineers	Degree in Agricultural Engineer/Civil Engineer/Water Resources, or equivalent, with construction site experience. Local experience of 5 years would be required .	Report to the CRE, assure quality and monitor construction activities.	180
6	Assistant Surveyors / Chain-persons	Diploma in Surveying, or equivalent with one year experience in field surveying	Report to the Senior Topographic Surveyor, carry out topographic surveys.	80
7	Assistants and guards	High school education for assistants and primary school education for guards. Minimum Class VIII passed but preference SSC passed None	Office peon/messengers, cleaners, guards etc as required	

D. Procurement of Additional Studies, Equipment and Training

93. Provisional sums have been included in the IMO contract for the procurement of various additional studies, equipment and training to support the project. The exact implementation arrangements, specifications and detailed costs estimates of the procurement will be approved by the PMU Programme Director. The tentative scope of works for the additional studies are summarized in Table 13.

Table 13: Additional Procurement

	Name	Tasks
1	Procurement of office and field equipment	Including internet equipment, software, computer, laptop, printer, photocopier ,air conditioner, fax, office furniture, power invertor, field equipment including GPS, ADCP Flow meter,
2	Agriculture Support Services	To support the objective of enabling small farmers to take up more efficient water use and improved cropping through sustainable practices, and developing opportunities for commercial farming. The fund will be used to support farmer training, crop demonstrations in close coordination with the Department of Extension and BWDB. The agriculture support services are designed to be implemented on a commercial self financing basis to allow the activities to be sustainable after the completion of the project. The provisional sum allocated is to meet the initial activities in year 1. Subject to the successful outcome of the initial activities it is planned to supplement the allocation of the provisional sum for agriculture support in year 2.
3	Pilot cost recovery programs	Opportunities for increasing the cost recovery of providing irrigation services, over and above revenue from water charges, will be explored to minimize the burden on farmers as well as minimize or avoid the need for Government subsidies. Concepts and viabilities will be studied by the IMOand taken up as pilots. Provisional sum for studies and seed money for pilots.
4	Training, capacity building and awareness	Costs for the implementation of the training and awareness program including training and workshops for local stakeholders to help the process of understanding and engagement with the new management initiatives including operation of the new piped systems, cost recovery, training for pump operators, vendors, farmers and WUA as well as government officials with linkages to the Muhuri irrigation

		project. ,
5	Surveys and studies	Supporting surveys and specific studies including topographic surveys, geotechnical investigations, flow monitoring, agriculture support, pilot cost recovery activities.

VI. Additional Remuneration

94. In addition to the remuneration paid according to the standard ADB time-based contract, the IMO will also receive management fee and performance-based bonus payments.

A. Management Fees

95. The IMO may charge a management fee of up to 5% of the total value of additional procurement activities as listed in Table 13. The management fees will be presented as a part of the Bidder's financial proposal. The estimated value of additional procurement is USD592,000

96. The IMO will manage the project Water Revenue and OM Expenditure Account. The following routine payments will be made solely from revenue collected from the irrigation service tariffs: (i) electricity tariffs; (ii) pump operator fees; (iii) smartcard vendor fees; (iv) maintenance of the Level 2 and 3 distribution system; and (v) and other miscellaneous field expenditures. No management fee will be payable for these activities. The IMO management costs including staff costs, office costs, training, transport will all be paid under the IMO contract and not from the Water Revenue and OM Expenditure Account.

97. The consultant shall maintain two accounts; (i) a consultants account that will be related to all payments in relation to the contract with the BWDB for the C-IMO for Muhuri Irrigation Project; (ii) an escrow account which will be maintained for all the operation and maintenance costs relating to level 2 and 3 and will be paid for from revenue from water tariffs and other cost recovery sources.

98. The consultant will be responsible for meeting the cost of items for the consultants account whether or not the consultant's remuneration is sufficient to cover the cost, or whether or not the cost was anticipated, and whether or not the consultant has the funds available.

99. The escrow account will be funded by payments made in advance by the farmers through the prepaid meters to meet the cost of operation and maintenance of the level 2 and 3 irrigation. The general manager and the deputy general manager will be the only authorized signatories to this account. The consultant will work with the BWDB and the Water User Associations to ensure the tariff is set at an appropriate level to meet the OM costs. The tariff would be reviewed annually and endorsed by the BWDB and the WUAs through the Implementation Coordination Committee. The consultant would not have any financial liability for any shortfall of the funds in the escrow account. The exception to this would be if it is shown that the consultant had used the escrow account without authorization for any personal gain or for expenditures outside the approved work plan or authorized amendments to the annual work plan.

B. Performance Based Remuneration

1. Basis of Remuneration

100. To enhance the delivery of the IMO's outputs and the outcome of the project, additional payments will be paid to the IMO if key milestones or Key performance indicators (KPI) are met. The objective of the performance based remuneration is to support the serious engagement of the IMO as a stakeholder in the MIP and shares some of the benefit of achieving the project targets according to the time schedule. Table 14 presents the Performance Targets and Criterion Values.

101. Payments will be triggered based on the measurement of milestones/KPI as described below:

(i) The performance based remuneration will not exceed the equivalent of USD250,000 over the period of the contract.

(ii) Only in exceptional circumstances will the he performance based remuneration in any one contract year exceed the equivalent of USD50,000 (the Maximum Annual Performance Remuneration [APR]).

(iii) The actual amount paid to the IMO shall be determined by the extent by which the IMO achieves the performance criteria set out in the performance indicator tables and by the application of the calculations set out in the performance procedure described below. The performance based remuneration would be assessed at the end of every contract year.

(iv) All the activities of the IMO are to varying degrees influenced by externalities outside the control of the IMO. The payments of the KPIs have been designed to be triggered when selected key project deliverables are achieved. Key management tasks of the IMO include working with the various stakeholders to take a lead role in ensuring that the various the outputs defined in the project design targets are met according to the schedule.

(v) The milestones/KPIs have been carefully selected and designed so that they can be easily verified; they also include a mix of more complex deliverables which are influenced by external factors as well as ones with less external influence. Criterion values have been set to allow for some level of delays or unforeseen circumstances.

(vi) Appropriate weightings have been assigned to each milestone/KPI to reflect its importance.

(vii) If the amount of the Annual Performance Remuneration (APR) is equal or less than zero the IMO shall neither receive nor pay any amount to the EA for the applicable contract year.

(viii) Except in exceptional circumstances (such as delays very substantially outside the control of the IMO) where as judged by the EA if the IMO fails to achieve the

maximum annual performance remuneration in any one year the shortfall will not be available to the IMO in subsequent contract years.

(ix) The milestones/KPIs and the performance values would be discussed and agreed during the contract negotiations. Although the KPIs would not change some refinements to the measurement can be considered during the project period.

2. Method for Calculating Performance Based Remuneration in Each Contract Year

102. The basis of calculating the Performance Based Remuneration shall be as follows.

Annual Performance Remuneration (APR) payable =	<u>3.5- Composite Score X</u> 2.5	Maximum Annual Performance Remuneration
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103. The composite score for each contract year shall be as follows.

Composite Score=	Total of All Weighted Scores for the Performance Criteria
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Where:

- (i) The weighted score for each performance criterion equals the indicator weight x indicator value.
- (ii) The performance indicator value is measured from 'Excellent' to 'Poor' with corresponding values as set out in Table 10. The raw scores range from 1 for excellent to 5 for poor. For simplicity 9 raw scores are considered 1, 1.5, 2, 2.5, 3, 3.5, 4, 4.5 and 5.
- (iii) If the actual performance is in between the performance standards for two indicator values then the score for that performance shall be rounded to the nearest 0.5.
- (iv) A composite score of 3.5 (between good and fair) is the cut off for performance remuneration, a score of above 3.5 results a zero composite score
- (v) A composite score 'excellent' would have a composite score of 1 and would qualify for the full maximum annual performance remuneration.
- (vi) For example the annual performance based remuneration -if the IMO gets an overall score of 1 in all the activities the APR is $3.5-1/2.5=1$ a full APR would be given. If the score is 3.5 or above the APR is $3.5-3.5/2.5=0$

Table14: Performance Targets and Criterion Values

	Reference	Description of service	Milestones/Key Performance Indicators	5 year project targets.	Yearly Target					Performance Indicator Weight	Performance Indicator Values				
					Year 1	Year 2	Year 3	Year 4	Year 5		1 Excellent	2 Very Good	3 Good	4 Fair	5 Poor
A	Establishment of Efficient and Sustainable OM														
1	Annual Reports and Work Plans	Annual reports and work plans reporting on the previous year performance, and proposed activities,	Annual report Work plan to be submitted by 30 June. Annual general meeting held by 31 July.	5 annual plans and reports and AGMs prepared as per schedule= 100%, 0.5month delay deduct 10%.	100%	100%	100%	100%	100%	0.1	100%	90%	80%	70%	60%
2	Pumps and Pipe Irrigation Commissioned	17000ha of piped irrigation including pumps, pipe distribution and prepaid meters installed, commissioned and operating	Commissioned area as a percentage of the target 17000ha	Y1:0ha Y2: 2000ha, Y3: 7000ha, Y4:12,000ha Y5:17000ha	100%	100%	100%	100%	100%	0.15	100%	90%	80%	70%	60%
3	OM of pumps pipes and prepaid meters	Efficient OM of pumps, pipe distribution. Breakdowns repaired in 24 hours.	All pumps are fully operational, repairs carried out within 24hours	Over the year 95% of the pumps in operating condition with 100% of repairs completed in 24 hours.	95%	95%	95%	95%	95%	0.15	95%	90%	80%	70%	60 %
4	Cost Recovery	OM cost recovery systems are established using prepaid meters.	90% of the estimated OM costs for levels 2 and 3 are recovered by year 5.	Target annual revenue USD million Y1:USD0.05 M Y2:USD0.25 M Y3:USD0.75 M Y4:USD1.5M Y5:USD2.1M	90%	90%	90%	90%	90%	0.15	90%	80%	70%	60%	50%
B Design and Construction															
5	Participatory Design of the Piped Irrigation Systems	Participatory detailed designs are prepared for the pumps, pipe and electrification.	17,000ha (100%) completed by year 3	Y1 7000ha (includes 2000ha already completed) Y2 12000ha	100%	100%	100%	100%	100%	0.1	100%	90%	80%	70%	60%

	Reference	Description of service	Milestones/Key Performance Indicators	5 year project targets.	Yearly Target					Performance Indicator Weight	Performance Indicator Values				
					Year 1	Year 2	Year 3	Year 4	Year 5		1 Excellent	2 Very Good	3 Good	4 Fair	5 Poor
				Y3 17000											
C Agriculture Support Services and Pilot Cost Recovery															
6	Agriculture Support Services	Agriculture support services are implemented and new improved long term cropping systems to increase farmer incomes and reduce water losses are identified.	Successful upscaling of 1000ha of new farming systems by Year 5.	Target area of upscaling Y1 0ha Y2 5ha Y3 20ha Y4 500ha Y5 1000ha	100%	100%	100%	100%	100%	0.15	100%	90%	80%	70%	60%
7	Supplementary Cost Recovery Pilots	Supplementary pilot cost recovery pilots in addition to water delivery charges are identified and pilot programs taken up	Supplementary cost recovery systems are identified and implemented to reduce burden on farmers of water charges	10% of OM costs are collected through supplementary cost recovery is achieved by year 5 (10% =USD200,000) Y1 USD10,000 Y2 USD50,000 Y3 USD100,000 Y4 USD150,000 Y5 USD200,000	100%	100%	100%	100%	100%	0.1	100%	90%	80%	70%	60%
8	Farmer and stakeholder Engagement	.	The Implementation Coordination Committee (ICC) Meetings form a key measureable parameter to assess farmer and stakeholder engagement. Each meeting to be attended by 7	Four ICC meetings are programmed to be held each year. 100% = 4 meetings attended by the 7 WU representatives max score = 28	100%	100%	100%	100%	100%	0.1	100%	90%	80%	70%	60%

	Reference	Description of service	Milestones/Key Performance Indicators	5 year project targets.	Yearly Target					Performance Indicator Weight	Performance Indicator Values				
					Year 1	Year 2	Year 3	Year 4	Year 5		1 Excellent	2 Very Good	3 Good	4 Fair	5 Poor
			Water User Representatives (6 x WUA +1 x WUF)	25=90% 20=70% 17=60% 14=50%											
	TOTAL									1.0					

104. The procedure for the calculation of the “Composite Score” is shown in an example in Table 15. The Maximum Annual Performance Remuneration is USD50,000. Then the annual performance remuneration payable to the IMO in respect of the sample year is calculated as:

$$\text{Annual Performance Remuneration Payable} = (3.5 - 2.975) / 2.5 \times \text{USD}50,000$$

$$= \text{USD}10,500$$

105. The annual performance remuneration will be assessed as part of the annual report to be submitted by the IMO at the end of June each year. The end of June corresponds with financial year as well as the end of the Rabi period.

Table15: Example Calculation of Performance Scoring[illegible]

VII. Risk Register

101. The Consultant and Employer shall maintain a Risk Register and shall be jointly responsible for the identification of risk/(s) promptly with appropriate contingency planning strategy by recording it duly in the Risk Register. The Risk Register shall be regarded as a prompt communication tool between the Consultant and the Employer. Employer /Consultant shall respond to every risk event brought to his notice by other party by recording steps to be taken by the respective party in mitigating that risk in the Risk Register. A copy of all issues entered in the Risk Register shall be retained by the Employer or Consultant as the case may be. For guidance purpose, sample format of risk register is provided in Table 16 hereunder. It can be modified suitably during the course of the contract with the mutual agreement of Consultant and Employer.

Table 16: Format of Risk Register

S. No	Risk	Probability of Occurrence	Potential Impact	Response	Risk Allocation		Remarks
					Employer	Consultant	
A	Meteorological						
1	Heavy rains	High					
B	Hydrological						
1	High flood inflow due to rainfall/ other reasons	High(during monsoon period only)					
C	Seismological						
1	Occurrence of high intensity earthquake	Very low					
D	Restricted access to site						
1	Obstruction of Highways/roads connecting the Site due to heavy traffic/ bad weather conditions/ accidents etc.	Medium					
E	Environmental						
1	Instability of disposed soil	Low					
2	Failure of slopes in dumping areas	Medium					
F	Political & social risks						

1	Force Majeure	Very Low					
G	Economic & legal risks						
1	Fluctuation of prices of materials, labour and equipment	Medium					
2	Changes in administrative regulation/ government policies/Law	Low					
H	Behavioral risks						
1	a) Employer's obligations - - Modification in schedule which affects the Works of the Consultant. - Suspension of Works ordered by the Employer. - Delay in Handing over work fronts. - Delay in Consultants Design approvals.	Medium					
2	(b) Consultant's behavioural risks -Staff injuries and accidents - Acts or defaults by Sub-Consultants -Defects in Materials, Plant and Workmanship - Failure to depute a competent project management team -Lack of forward planning and budgetary control - inadequate maintenance	Medium					

I	General Problems						
1	Accidents, Strikes by staff	Medium					
2	Non availability of water/ Power supply	Medium					
3	Stoppage / Slow progress of work due to default of Consultant (design & construction delays etc.)	Low					