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JICA ASSISTED ODISHA INTEGRATED SANITATION IMPROVEMENT PROJECT (ID-P252)

BID DOCUMENTS

FOR

CONSTRUCTION OF BOX DRAINS WITH ROAD BETWEEN CHAINAGE 3300 – 6700 OF MAIN DRAIN – 1, CUTTACK, DESIGN BUILD  
(PACKAGE NO. JICA/OWSSB/OISIP/04 - II)

ON

INTERNATIONAL COMPETITIVE BIDDING

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March 2019
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1. SCOPE OF WORK

1.1 Introduction
Storm water flow in Cuttack is managed mainly by two principal drains, Main Drain 1 and Main Drain 2. The drains flow from northwest to southeast, reaching the Katajori river through sluice gates.

In this tender a portion of the Main Drain 1 is to be converted to closed drain (box drain). The project will be executed as a Design Build mode. The successful bidder will be responsible for pre-design, design, construction and seven years operation and maintenance. Mode of payment will be lump sum with mutually agreed billing milestones.

MD1-Box Drain is a 3400 m portion of the Main Drain 1, from Chainage 3300 (Rousapatna) to 6700 (Mathrubhavan). The work has been partially done and the remaining length to construct in this project is 3067 meters. The portion already constructed will remain under the former Contractor’s responsibility, except for the transitions where this project and partially constructed structures join, which will be under the responsibility of the successful bidder under this tender. See below for sketches depicting the already constructed areas.

Figure 1. Drainage system including MD-1 box drain
The work includes the construction of the box drain, connection of secondary and tertiary drains, construction of bar screen and silt traps for secondary drains, provision of access ports for cleaning the box drain with machinery, interconnection to the Main Drain 1 open drain at both ends of the box drain, and the construction of a concrete cement road on top of the drain, matching the elevations of intersecting roads and providing foot paths as required.

The main challenges for this project are:

1. Collapsible soils
2. Urban area with homes in close proximity to drain wall
3. Continuous live sewage flow in drain
4. Restricted access to site
5. Restricted work space
6. Limited seasonal and daily work time
7. Coordination with utility departments for removal or relocation of conflicts

Many household and secondary drains join the Main Drain 1 along the route. Contractor’s design responsibility under this project includes creating temporary and permanent solutions to each and every drain regardless of size. Water lines cross the drain at multiple locations. The Contractor shall coordinate his design with the appropriate government departments to address the issue in full knowledge of present and future needs.

**Accessibility Conditions.**

The Main Drain 1 is an urban drain. The portion designated for box drain crosses neighborhoods with varying degrees of congestion, access and work space. Access to the work site and space availability for machinery and equipment and to perform the work differ from site to site. In addition, water diversion equipment must be accommodated in every case. Three conditions exist in the route:

- **Condition A.** There are roads on both sides of the drain and the homes or boundary walls are about 6 meters from the drain wall. Approximate length is 1,120 meters. Access to the sites in this condition is generally from side streets of varying width. Pedestrian and vehicular traffic is constant and Contractor must provide for separation of public and work space positively for safety purposes.

- **Condition B.** One side of the drain has an access road and the other is adjacent to the residential or boundary walls. The distance from walls to drain on the road side is about 5 m. Approximate length is 1,435 meters. Access is from side streets. In this condition the traffic is to be handled as in Condition A. Road closures may be necessary but will only be allowed in coordination with local authorities.

- **Condition C.** The drain wall is within one meter of the residential or boundary walls. There is no side road and access is from the drain ends only. Approximate total length is 845 meters. Contractor must create their own access, work space and space for water diversion equipment and delivery pipes.

The types of condition are distributed along the drain and are not always sequential. Length of section and distance from drain to walls varies and must be independently confirmed by Contractor. The table below shows the accessibility condition prevalent by chainage. Contractor is to evaluate the various sites and ascertain the condition assessment and methodology to accomplish the work.
Table 1. Type of lateral access by location

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Chainage From</th>
<th>Chainage To</th>
<th>Length in &quot;m&quot;</th>
<th>Remarks</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>3300</td>
<td>3400</td>
<td>100</td>
<td></td>
</tr>
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<td>4330</td>
<td>5450</td>
<td>1120</td>
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<td>4</td>
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<td>5850</td>
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<td>5850</td>
<td>6120</td>
<td>270</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>6120</td>
<td>6225</td>
<td>105</td>
<td>Narrow Road on RHS (Aprox 2m)</td>
</tr>
<tr>
<td>7</td>
<td>6225</td>
<td>6700</td>
<td>475</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1120</td>
<td>Total 1435</td>
<td>Total 845</td>
<td></td>
</tr>
</tbody>
</table>

1.2 Key Design and Construction Criteria

The key criteria in this project are:

1.2.1 Safety.
Safety is of the utmost importance and the goal for this project is ZERO accidents. Contractor shall employ all means necessary to isolate the area population from the work area. Solid barricades are to be employed to positively impede the access of onlookers and people transiting next to the work area. Under no circumstances will work be allowed if this condition is not met.

1.2.2 Impact to local traffic.
The local traffic will be managed by sufficient number of traffic marshals and directional signs to facilitate the maximum fluidity in the local traffic. As conditions necessitate the Contractor is to arrange with Police Department for temporary street closure. Contractor may have to create his own working space off road to maintain local traffic.

1.2.3 Access and Work Space.
Contractor is responsible for access routes to the site and for creating working space for his machinery, equipment and materials.

1.2.4 Third Party Property Protection.
Contractor is responsible for means and methods. Structures in close proximity to the drain wall and the soils in Cuttack are collapsible. Specifically, the installation of shoring may cause damage to structures along the drain, hence the Contractor is to use methods and machinery that will minimize or eliminate the possibility of structural damage.
Contractor is required to indemnify and hold harmless the Employer on this type of damage and the Contractor will be expected to use his own resources or insurance to mitigate any problems caused by construction activities.

1.2.5 Live Sewage Flow Management.
The drain is designed to handle storm flows; however, the drain carries upto 45 MLD of sewage on a daily average basis. During the peak periods this flow can increase to 100 MLD for short periods. Contractor will develop a solution or mix of solutions to address any and all discharge conditions in the drain. Under no circumstances will sewage overflows caused by Contractor’s operations will be permitted.

Additionally, the sewage carries an extremely large amount of floating debris, consisting mainly of residential garbage; Contractor will be expected to manage this condition by removing garbage from the drain as required to maintain his water diversion operation in good form.

1.2.6 Traffic restrictions.
The municipal authorities in Cuttack prohibit the circulation of heavy machinery and trucks during the daytime hours. Plying the Cuttack roads with said machinery is restricted to the hours of between 8.00AM to 10.00PM

1.2.7 Limited working time.
By official order of the Cuttack Municipality the Main Drain 1 work will cease on 15-Jun and resume on or about 15-Oct every year, to facilitate the drainage of monsoon rains. The Contractor will be expected to complete removal of machinery, equipment and materials from the drain by 15-June, no exceptions. This means that any temporary works erected to facilitate the construction of permanent works will have to be removed. This and the traffic restrictions are critical considerations during development of work plan and methodology.

1.2.8 Work plan consistent with removal of utilities.
The Contractor will be required to provide a detailed work plan for each section of work that takes into consideration the time required for removal of utilities, if any. Utilities in potential conflict with the project as of November 2018 are shown below. The intent of the early work plan is to allow the concerned entities to plan and execute the removal of utilities in an orderly manner.
Employer’s Requirements

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JICA Assisted Odisha Integrated Sanitation Improvement Project (ID-P252)
Bid Document for Construction of Box Drains with Road between Chainage 3300 – 6700 of Main Drain - I, Cuttack, Design Build
(Package No. JICA/OWSSB/OISIP/04 - II).

Micro Analysis of Hindrance: Box Drain of MD-1

Ch. 3300 to 3600

Notes:

(1) Action to be taken by

- From Ch. 3300 to 3310: existing culvert to be dismantled.
- From Ch. 3320 to 3328: construction completed.
- From Ch. 3329 to 3360: no space available on either side. Contractor has to provide sheet piles.
- From Ch. 3354 to 3460: temporary wall adjacent to drain wall. No space. Contractor has to provide sheet piles.
- From Ch. 3400 to 3450: boundary wall just along on the drain wall. Contractor has to provide sheet piles.
- From Ch. 3467 to 3515: culvert of Barana River. Contractor.
- From Ch. 3415 to 3560: water supply line along the alignment at a distance of 6 ft from wall shall have to be shifted before execution. (PHD)
- There are four bridges of RCC at chainage 3442.54, 3446.29, 3450.05, and 3454.2. Sheeting piles are to be dismantled before execution. (PHD)
- Water taps on the MS line also need to be shifted at 3 places in the reach while shifting the line. (PHD)
- Overhead lines at 10m height approximately. (DESU)
- There are 6 Nos. of water supply connections PVC pipes across the drain at Ch. 3645 and they cannot be removed as they essential service and shall have to be supported temporarily by contractor execution of work. (PHD)

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**Notices:**

- From Ch. 3600 to 3859 no space available on left side building walls and temple walls adjoining the drain wall at a distance of 6 ft. (Contractor has to provide sheet piles.)
- From CA. 3700 to 3740 no space available on left side building walls adjoining the drain wall. (Contractor has to provide sheet piles.)
- There are foot bridges of RCC at Chainage 3619, 3630, 3640 & 3730 are to be dismantled before execution. (Contractor)
- Water taps on the MD line should be shifted at 2 places in the reach while shifting the line. (PHEP)
- There are 5 open head culverts at Ch. 3560, 3610, 3620, 3630, 3640 & 3645 can be shifted temporarily for driving of sheet piles. Opened lines at 10 m height approximately. (COSW)
- Water supply line at 3690 to be shifted before execution of work by the contractor with coordination of respective PHEP department and COSW. (PHEP)
- At Ch. 3850 existing culvert to be dismantled. (Contractor)
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Bid Document for Construction of Box Drains with Road between Chainage 3300 – 6700 of Main Drain - I, Cuttack, Design Build
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NOTES: (Action to be taken by)

1. From Ch. 4330 to 4339 existing outlet to be dismantled. (Contractor)
2. At Ch. 4332, two water supply lines and at Ch. 4350 one water supply line cross the drain which need to be shifted before execution of the work by PWD. Contractor has to coordinate with PWD and OWSSB. (PWD)
3. From Ch. 4330 to 4339 C.C. road of width 3.2 to 3.9 exists on R.H.S and C.C. road of 5.9 to 10.0 exists on left. House connection at Ch. 4334, 4332, 4364 and 4336 to be reconnected after construction of main drain by the contractor. (Contractor)
4. The inlet drains at Ch. 4412, 4432 and 4428 to be constructed after construction of main drain and to be connected by the contractor. (Contractor)
Section VI. Employer’s Requirements

Orissa Water Supply & Sewerage Board

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Ch. 4800 (B.K. Canal Road)

Micro Analysis of Hindrance: Box Drain of MD-1

**NOTES:** (Action to be taken by)
- Electric post at Ch. 5000 to 5500 right post at 5000 needs to be shifted before execution. (CEIU)
- Existing culvert from Ch. 5050 to 1050 to be dismantled. (Contractor)
- Water supply line at Ch. 5020, 5040, 5060, 5200 needs to be shifted before execution. Contractor has to coordinate with PHE and OWSSB. (PHE)
- Joint drain at Ch. 5014, 5140, 5162, 5230, 5252, 5254 to be reconstructed and connected to make drain after construction of main drain. (Contractor)
- From Ch. 5000 to 5500 both sides roads available.
- Work completed from 5120 to 5175, 5227 to 5300 and 5321 to 5361 in this reach.
- House connection at 5170, 5316, and 5380 is to be reconnected to main drain after construction. (Contractor)
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Bid Document for Construction of Box Drains with Road between Chainage 3300 – 6700 of Main Drain - 1, Cuttack, Design Build
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Ch. 5030 (B.K.Canal Road)  Ch. 5250 (B.K.Canal Road)

Micro Analysis of Hindrance: Box Drain of MD-1

Notes: (Action to be taken by)
- Electric post at Ch. 5491 M97 and 5543 is on the alignment of drain and needs to be shifted before execution. (CESU)
- Existing valves from Ch. 5467 to 5472 to be dismantled.
- Inlet drain at Ch. 5477 to be reconstructed and connected to main drain after construction of main drain. (Contractor)
- At Ch. 5483, one water supply line need to be shifted before execution. Contractor has to coordinate with PHD and DWSOB. (PHD)
- GH cable at 15m height at Ch. 5488. Shut down required for street pile driving work. (CESU)
- From Ch. 5480 to 5490 only 6.15m sheet is available and no 4m550 there is no access. Work completed from 5484 to 5490 only on 6.15m sheet in available and no 4m550 there is no access.
- ESRN junction box at Ch. 9409 needs to be relocated. (ESRL)
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Bid Document for Construction of Box Drains with Road between Chainage 3300 – 6700 of Main Drain - I, Cuttack, Design Build
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Ch. 5500( Professor pada)  Ch. 5600( Professor pada)

MICRO ANALYSIS OF HINDRANCE - BOX DRAIN OF MD-1

Ch. 5600 to 5654

Main Water supply line at Ch. 5635,5637,5676,5649,5677,5684 needs to be shifted before execution. Contractor has to coordinate with PHD and OWSSB. (PHD)
Inlet drain at Ch. 5600,5702 to be reconstructed and reconnected to main drain after construction of new drain. (Contractor)
House connection at 5556,5757 and 5853 to be reconstructed to main drain after construction. (Contractor)
Electric pole at Ch. 5619,5640,5641 and 5844 fall on the alignment of drain and needs to be shifted and for transformer at Ch. 5640 special care to be taken for driving of sheet piles. (EESU)
BSNL junction box at Ch. 5826 needs to be repositioned. (BSNL)
Existing solvret from Ch. 5923 to 5927 and 5940 to 5950 to be dismantled. (Contractor)
Existing solvret from Ch. 5923 to 5927 and 5940 to 5950 to be dismantled. (Contractor)
GsH cable at 15m height at Ch. 5933. Shut down needed for sheet pile driving work. (EESU)
JICA Assisted Odisha Integrated Sanitation Improvement Project (ID-P252)

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Orissa Water Supply & Sewerage Board
1.3 **Mode of Tender**

The project will be delivered on a Design Build basis. The Contractor is responsible for all phases of the project including but not limited to pre-engineering, engineering, planning and construction phases.

1.4 **Salient Features**

The main features of this project are listed below. For details on each item consult the proper specification section:

1.4.1 **Design Build mode.**

The project will be delivered under a design build mode. The hydraulic design has already been done in relation to the entire 11 km length of Main Drain 1, therefore the invert elevations are fixed. A base design is furnished for reference and Contractor shall be responsible to modify it to meet the intent of the project. Adopting the base design with no changes is not acceptable.

Pre-design data beyond that furnished in these specifications shall be obtained by the Contractor at his cost. The data furnished is for reference only and Contractor shall adopt it at his own risk. Contractor is responsible for all design, including but not limited to civil, structural and mechanical. Means and methods are the responsibility of the Contractor. The Employer shall not be under any obligation to resolve design methodology issues.
1.4.2 Box drain.
The box drain is a 3400-meter reach of the Main Drain 1. Approximately 334 meters have been completed, with 41 additional meters partially completed. The Contractor will complete the entire 3400 meters reach. The box drain consists of two vents, roughly 4m by 4m.

The existing drain is made mostly of Laterite stone wall and in some places earthen and cement concrete, with earthen bed. The existing walls will be dismantled. The new drain will have an invert level elevation lower than the existing drain and steeper slope to increase its hydraulic capacity. The unsuitable material in the drain shall be removed and replaced by sand filling and a blinding layer made of PCC.

The MD1 Box Drain at Potapole, chainage 3300 is joined by a lateral drain also constructed as box drain, for which a suitable transition is required. The box drain shall be constructed of reinforced concrete, cast in situ or pre-cast, at the Contractor’s judgment.

Access for cleaning equipment and extraction of silt during cleaning operations is required. There shall be two vents for ease of maintenance. Each vent will have a sluice stop log system at each end for isolation purposes. The gates shall be water tight. Access manholes shall be installed at 30-50-meter intervals to facilitate cleaning and ventilation.

1.4.3 Culverts.
12 no of culverts are in the box drain alignment. These culverts will be eliminated and become part of the box drain. Traffic management during construction will be critical, as roads cannot be completely blocked off. Contractor is expected to minimize the work duration by detailed planning, accurate logistics and securing all resources are in place before starting the work. The list and location of culverts can be found below.

Table 2. List of Culverts

<table>
<thead>
<tr>
<th>SL No</th>
<th>Location</th>
<th>Chainage</th>
<th>Existing Top RL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Potapole</td>
<td>3300</td>
<td>22.360</td>
</tr>
<tr>
<td>2</td>
<td>Barapathar</td>
<td>3415</td>
<td>23.035</td>
</tr>
<tr>
<td>3</td>
<td>Meriabazar</td>
<td>3800</td>
<td>21.880</td>
</tr>
<tr>
<td>4</td>
<td>Rozouspatna</td>
<td>4010</td>
<td>21.660</td>
</tr>
<tr>
<td>5</td>
<td>Gamadia</td>
<td>4330</td>
<td>22.050</td>
</tr>
<tr>
<td>6</td>
<td>Bajrakabati</td>
<td>5025</td>
<td>23.675</td>
</tr>
<tr>
<td>7</td>
<td>Professorpada</td>
<td>5475</td>
<td>22.665</td>
</tr>
<tr>
<td>8</td>
<td>Professorpada</td>
<td>5586</td>
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</tr>
<tr>
<td>9</td>
<td>Chhatrabazar</td>
<td>5850</td>
<td>23.070</td>
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<tr>
<td>10</td>
<td>Shankarpur Canal Road</td>
<td>6174</td>
<td>21.855</td>
</tr>
<tr>
<td>11</td>
<td>Shankarpur Canal Road</td>
<td>6284</td>
<td>21.750</td>
</tr>
<tr>
<td>12</td>
<td>Bisinabar</td>
<td>6700</td>
<td>22.190</td>
</tr>
</tbody>
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1.4.4 Junctions of Lateral Drains.
There are 53 nos. junctions of lateral drains. The lateral drains are to be connected in a manner consistent with the specifications. A list of lateral junctions is shown below.

Table 3. List of lateral drain junctions

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Chainage (m)</th>
<th>Lateral Drain Inlet / Lateral other type of Inlets</th>
<th>Proposed Main Drain</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Width (m)</td>
<td>Invert Level (m)</td>
</tr>
<tr>
<td>1</td>
<td>3400.00</td>
<td>0.400</td>
<td>20.520</td>
</tr>
<tr>
<td>2</td>
<td>3411.22</td>
<td>0.539</td>
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</tr>
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<td>3450.00</td>
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</tr>
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<td>4</td>
<td>3455.00</td>
<td>1.500</td>
<td>20.251</td>
</tr>
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<td>0.417</td>
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1.4.5 Junction of Existing Sluice Gate Inlets.
There are five locations where secondary drains meet the Main Drain 1 that shall be connected to the box drain; the locations are given in the table below.

**Table 4. List of sluice gates**
The Contractor is responsible for dismantling the existing sluice gate, civil and mechanical components inclusive, and replace with a brand-new sluice gate.

### 1.4.6 Approach foot bridges.

All foot bridges shall be dismantled during construction and temporary access to those served by the foot bridge shall be provided by the Contractor at no extra cost to the project.

### 1.4.7 Bar screens.

The project requires bar screens to be installed in every significant junction of secondary or tertiary drains to the box drain. Contractor shall construct the juncture of the sub drain with the box drain up to the upstream side of the screen.

### 1.4.8 Maintenance access.

The box drain will be cleaned periodically by mechanical means. Removable access ports shall be designed at suitable intervals to allow for ingress and egress of machinery and equipment. Ventilation ports shall be provided in the form of manway ports constructed in proximity to the side footpaths to allow long-term, continuous ventilation while minimizing traffic conflicts. Extraction of mud, silt, trash will be facilitated by provision of removable covers at locations where traffic disruption can be minimized. Design features for facilitation of this task are to be discussed with the Engineer before completion. A separate report on the intended maintenance strategy and the use of the design features is to be prepared. [add requirements for this report in the specification]

### 1.4.9 Roads and drains.

The box drains and adjacent roads will be converted to a concrete road with footpaths, rain inlets and local drains on both sides. The road will be made of concrete and provide adequate elevation transitions for crossing roads. It will also feature suitable access points for conducting periodic cleaning of the drain.

The access points will include openings at strategic locations for ingress and egress of mini front loaders, extraction of materials and ventilation. Additionally, the road will feature humps whose function is to house the water lines that cross the drain. Coordination with the utility departments is required during design.

The road design will take into consideration the plinth elevation of the structures along the road. Conflicts with these structures are to be highlighted and specific solutions designed to avoid inundation of the houses by road run-off.

### 1.4.10 Utility relocation.

The project will require permanent or temporary relocation of utilities and services including but not limited to electricity, telephone, water, sewer, cables of other services, etc. and drains.
Relocation of utilities on a permanent basis is the responsibility of the Employer; only 1,070 meters of the box drain are currently affected.

Temporary relocation of utilities for construction purposes is the responsibility of the Contractor, who must program the work with enough advance notice to allow the government department or utility company enough time to respond. The work program specification establishes parameters regarding the orderly programming of temporary utility relocations.

### 1.4.11 Water mains crossing drain.
There is no room in the drain freeboard to place the water lines under the top slab thus they will remain on the surface of the top slab, inside a casing and protected by a reinforced concrete hump, designed for traffic loads. Contractor is to design these humps only after consultation with the Public Health Department and the Engineer, to address their present needs and future plans.

### 1.4.12 Water diversion.
Contractor shall manage the discharge in the drain, which consists of 40-45 MLD of sewage, with peak discharge up to 100 MLD. Gravity conveyance and pumping can be used but in all cases the contractor shall provide the appropriate capacity and redundancy to maintain the freeboard specified for the project. The cost of water diversion shall be included in the lump sum price. No separate payment will be made for this activity. Water flow details per reach are given in the water diversion specification.

### 1.4.13 Shoring
The nature of soils and depth of excavation will require that engineered shoring be used. In addition, many structures are in close proximity of the drain wall and are particularly vulnerable to damage due to soil shifting or vibration. Contractor to provide all material and equipment.

Contractor shall be responsible to develop a shoring method that provides structural stability to the embankment and minimizes damaging vibrations. Contractor is advised that the responsibility for prevention, avoidance and mitigation of structural damages is his only. The Employer is to be indemnified and held harmless in accordance with the General Conditions.

### 1.4.14 Traffic Control requirements
The work shall be carried out in a manner that causes least interruption to the traffic. The road/street may be closed only after obtaining necessary permissions from relevant authorities such as Police, Local Urban Body etc. Where it is necessary suitable foot crossings shall be provided to cross open trenches. Necessary traffic de-touring, safety signs shall be used for safe and smooth traffic movement.

The Contractor shall provide efficient lighting and safety signs on temporary roads during construction and shall adopt and implement adequate traffic regulation. The Contractor shall take effective safety and warning measures to reduce accidents and provide suitable temporary crossings to facilitate normal life and business.

### 1.4.15 Safety Measures
Contractor shall implement and enforce national safety standards in the work site. The public is to positively be isolated from the work site and equipment maneuvering areas by physical
barriers as detailed in the specifications. Bamboo stakes, rails or safety tape will not be acceptable. Contractor’s employees and all subcontractors are to be trained in safety and provided Personal Protection Equipment. The Contractor shall not allow any worker (his or his subcontractors’ employees) to be in the work area without PPE.

Safety training is to be coordinated with the Engineer and properly documented. Daily review of potential safety issues in each work site is mandatory. Accident information is expected to be shared with the Engineer immediately upon learning about it. Near-accidents and first aid incidents are to be documented and provided to the Engineer.

1.4.16 Coordination with other contractors and battery limits
Contractor shall coordinate work with other contractors working in the area. They include contractors installing sewer lines in Cuttack, relocating or installing water lines on behalf of PHEO; and contractors working on the open drain. Facilitation of mutual work is expected from all contractors.

1.4.17 Testing and Commissioning
Contractor shall clean the drains and provide CCTV documentation of the final state of the drain. Sluice gates and other mechanical elements shall be tested for proper functioning. O&M Manuals and As-Built drawings shall be provided before Taking Over Certificate is issued.

1.4.18 Work plan requirements
The Contractor will prepare a general project plan at the onset of the project. The plan will list the initial sequence of work, duration of intended activities, list of resources and expected monthly billing. Upon commencement of work the Contractor will prepare a three-month microplanning schedule, which will be updated every month. This document will be the basis for Engineer’s authorization of new work fronts.

1.4.19 Design requirements
The base design provided with the tender documents is for illustration purposes only. The Contractor is to submit his own design if his intended product varies in materials, products or methodology. Design of the preparatory activities of shoring and water diversion must be submitted to the Engineer for approval.

1.4.20 Measurement and payment – price break up
Payment for the box drain work will be per meter completed, broken up as a percentage of the total price. Categories will include:

1. Completion of shoring (for a full work length front previously authorized by the Engineer)
2. Completion of box drain sections up to top slab with all appurtenant items such as lateral connections, by the meter, including removal of shoring as required.
3. Road length between junctions, completed in all regards.
4. Testing and Commissioning