Environmental Screening Report

Kandy Drainage Improvement; Rehabilitation of Storm Water Underground Drainage Network in Kandy

Project Management Unit
Strategic Cities Development Project

August 2016
## Table of Contents

1. Project Identification 03
2. Project Location 03
3. Project Justification 05
4. Project Description 08
5. Description of the Existing Environment 24
6. Public Consultation 29
7. Environmental Effects and Mitigation Measures 31
   7a. Screening for Potential Environmental Impacts 31
   7b. Environmental Management Plan 38
8. Cost of Mitigation 65
9. Conclusion and Screening Decision 66
10. EMP Implementation responsibilities and Costs 69
11. Screening Decision Recommendation 69
12. Details of Persons Responsible for the Environmental Screening 70

### Annexes

1. Location Map of the Project Area
2. Geological and Soil Map of the Project Area
3. Environmental Sensitive Area Map of the Project Area
4. Location Map for the Manholes
5. Summary of Procedure to Obtain Mining License for Borrow Pit Operation
6. Summary of Procedure to Obtain Mining License for Quarry Operation
1. Project Identification

| Project title | Strategic Cities Development Project  
Kandy Drainage Improvement: Rehabilitation of Underground Storm Water Drainage Network in Kandy |
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Project Proponent</td>
<td>Strategic Cities Development Project of the Ministry of Megapolis and Western Development, Sri Lanka financed by the World Bank</td>
</tr>
</tbody>
</table>

2. Project Location

| Location (relative to the nearest town, highway) | Kandy, Central Province.  
Location of the project is given in Annexure 01. |
|-------------------------------------------------|--------------------------------------------------------------------------------|
| Definition of Project Area (The geographical extent of the project & areas affected during construction) | Kandy town is situated at the head of the Meda-Ela valley, having its outlet at Getambe about 4km from the City Centre. There are three sub valleys at the head of Meda Valley, one in the north, where Kandy central business district (CBD) is situated, another one between two south eastern hills where Kandy Lake is located and the third is further south of the south eastern hills. There are three main underground storm water drains namely  
(a) Yatinuwara underground drain,  
(b) Meda Ela underground drain,  
(c) Bogambara underground drain  
Yatinuwara, underground drain carries storm water from the town, Meda Ela underground drain carries overflow storm water from Kandy Lake and the Bogambara underground drain carries storm water that flows from the Dunumadalawa potable water reservoir  
These three drains convey the storm water from each of the valleys into the main Meda Ela channel and is eventually discharged into the Mahaweli River at Getambe as shown in Figure 1. |

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Strategic Cities Development Project
Adjacent land and features

Project area is situated in the Kandy’s central business district area (referred to as the ‘Grid City’) which was selected for the initial phase of the SCDP intervention. Construction activities for the rehabilitation of the underground tunnel network are proposed at the selected Man Hole locations along the Yatinuwara Street and Sri Wickrama Rajasinghe Mawatha. As per the design the manholes are located near Kandy District Secretariat Office Building, St. Sylvester’s College, Hemamali Girl’s College, Meera Maccam Mosque, Trinity College, Kandy Market Complex, Kandy Police Station, Torrington Bus Stand, Sri Pushpadana Girl’s College and Kandy Municipal Car Park. Since this area is within the commercial zone, some of commercial banks, Financial companies and shops and many other commercial establishments are situated close proximity to the project site. Entire Almost all the areas could be specified as highly built up and commercial area.
### 3. Project Justification

<table>
<thead>
<tr>
<th>Need for the project (What problem is the project going to solve)</th>
<th>The drainage system of the KMC area consists of a network of large open and underground drains and smaller tributary canals. The system is expected to function to serve the storm water drainage needs of the KMC area and reduce the incidence of flooding and thereby improves the health and sanitation conditions of the urban community. There are three main underground storm water drains namely Yatinuwara, which carries storm water from the town centre, Meda Ela, which carries overflow storm water from Kandy Lake and the Bogambara drain which carries storm water that flows from the Dunumadalawa potable water reservoir. The storm water underground drainage network in Kandy was constructed more than a century ago with major brick and stone masonry outfall and peripheral drains of varying shapes and sizes. The main surface water collector drainage network is more than 10km long and comprises of brick/stone masonry tunnels of about 1.8km long, peripheral drains of about 6.7km within the grid city and approximately 1.6km of peripheral drains outside the Grid City. The tunnel drains traverse underneath the roads, buildings, shops, main bus stand and railway tracks within the city. Between 2008 and 2013 there were 17 collapses were recorded by Kandy Municipal Council (KMC). According to the data six collapses occurred during 2013, three occurred in 2012 and the remaining eight were distributed over the previous 4 years. The collapsing pattern shows a rapid increase over the observed period. Frequent collapses of the underground drains not only caused considerable disruption to road and rail traffic but also raised public safety issues. Therefore the urgent rehabilitation of the system is very much required at this stage. As per the investigations carried out within the entire underground drain by the Consultant, it was revealed that the risk of collapses in identified locations is very high and the sections were ranked according to the level of probability of collapses in order to select the most important sections to be rehabilitated under the SCDP. Since the entire drainage network is within the city limits, the investment on this component is a timely need for Kandy city in order to avoid the unpredicted damages to the physical assets causing problems to the city dwellers.</th>
</tr>
</thead>
</table>
Figure 2. Dropping of bricks from the crown - Yatinuwara underground drain

Figure 3. Collapsed section - Yatinuwara underground drain
Having identified the gravity and the seriousness of this public safety issue and the importance of the dire need for rehabilitation of the underground drain network, the Ministry of Megapolis and Western Development proposed to include the improvement to existing drainage underground network as part of the Strategic City Development Project (SCDP) for Kandy City.

As per the investigations carried out within the entire underground drain by the Consultant, it was revealed that the risk of collapses in identified locations is very high and the sections were ranked according to the level risk of collapses in order to select the most important sections to be rehabilitated under the SCDP. Since the entire drainage network is within the city limits, the investment on this component is a timely need for Kandy city in order to avoid the unpredicted damages to the physical assets causing problems to the city dwellers.

<table>
<thead>
<tr>
<th>Purpose of the project (what is going to be achieved by carrying out the project)</th>
<th>The purpose of the project is to derive the following benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Mitigation of flood in the Kandy City.</td>
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<tr>
<td></td>
<td>• Reduction in number of flooding events in urbanized areas</td>
</tr>
<tr>
<td></td>
<td>• Improves public safety by reducing further underground drain failures.</td>
</tr>
<tr>
<td></td>
<td>• Reduction of disruption to road and rail traffic due to frequent collapses of the underground drains</td>
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<tr>
<td></td>
<td>• Enhancement of canal conveyance capacity, and discharge rate.</td>
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</tbody>
</table>

**Figure 4. Badly eroded invert of the drain-Yatinuwara underground drain**
Reduction of regular maintenance cost for Kandy Municipal Council
Reduction of negative economic impacts of flooding on commercial activities

Alternatives considered (different ways to meet the project need and achieve the project purpose)

Alternatives to the proposed rehabilitation project include (a) No action (b) Including diversions known as Option 1 and Option 2 and (c) Reconstruction of the network. Alternative (a) poses a high risk to public safety, reduces economic growth, reduces the ultimate value of the urban intervention work undertaken by SCDP and will have other negative environmental impacts and hence should not be followed. Alternatives (b) and (c) are not economically viable at this time. Therefore Rehabilitation of Drainage Underground Network in Kandy is the most economically viable intervention to overcome the currently facing issues.

4. Project Description

<table>
<thead>
<tr>
<th>Proposed start date</th>
<th>October 2016</th>
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<tbody>
<tr>
<td>Proposed completion date</td>
<td>September 2017</td>
</tr>
<tr>
<td>Estimated total cost</td>
<td>LKR 515 Million</td>
</tr>
<tr>
<td>Present land ownership</td>
<td>Canal belongs to the Kandy Municipal Council</td>
</tr>
</tbody>
</table>

Description of the project (with supporting material such as maps, drawings etc attached as required)

There are three major drains, (a) Yatinuwara underground drain, (b) Meda Ela underground drain, and (c) Bogambara underground drain. These three drains convey the storm water from each of the valleys into the main Meda Ela channel and is eventually discharged into the Mahaweli River at Getambe. The proposed interventions for rehabilitation of the underground drainage network in Kandy area are given below

<table>
<thead>
<tr>
<th>Drain and Chainages</th>
<th>Proposed Interventions</th>
</tr>
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<tbody>
<tr>
<td>Yatinuwara Brick Masonry Drain</td>
<td></td>
</tr>
<tr>
<td>Ch.0+000m to Ch.0+608m</td>
<td>Rehabilitation by Structural Liner</td>
</tr>
<tr>
<td>Ch.0+608m to Ch.0+813m</td>
<td>Invert reinstatement by cast in-situ or precast reinforced concrete and shotcrete repairs to walls and roof.</td>
</tr>
<tr>
<td><strong>Meda Ela Underground Drain</strong></td>
<td></td>
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<td>--------------------------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>Spillway to Outfall (Ch.0+197m to Ch.0+508m)</td>
<td>Invert reinstatement by cast insitu or precast reinforced concrete and shotcrete repairs to walls and roof.</td>
</tr>
<tr>
<td>Bus Stand (Ch.0+804m to Ch.0+945m)</td>
<td>Invert reinstatement by cast insitu or precast reinforced concrete and shotcrete repairs to walls and roof.</td>
</tr>
<tr>
<td>Railway Premises (Ch.0+959m to Ch.1+145m)</td>
<td>Invert reinstatement by cast insitu or precast reinforced concrete and shotcrete repairs to walls and replacement of arch brick roof by of RC slab by open excavation method.</td>
</tr>
<tr>
<td>Play Ground (Ch.1+174m to Ch.1+293m)</td>
<td>Invert reinstatement by cast insitu or precast reinforced concrete and shotcrete repairs to walls and roof.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Bogambara Outfall Drain</strong></th>
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</thead>
<tbody>
<tr>
<td>Bogambara Drain (Ch.0+133m to Ch.0+277m)</td>
<td>Invert reinstatement by cast insitu or precast reinforced concrete and shotcrete repairs to walls and roof.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Yatinuwara Underground Main Drainage</strong></th>
<th></th>
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</table>

(a) *Chainage from (MH1) CH.0+00m to CH.0+66m*

Extended single layer ovoid brick masonry drain, the size of the drain is 1240 x1420 mm high. Supply, delivery, installation, fixing and grouting of Standalone structural liner of suitable size to the drain as detailed in the drawings.
(b) Chainage from CH.0+66m to CH.0+395m

Extended single layer ovoid brick masonry drain, the size of the drain is 1400 x 1880 mm high. Supply, delivery, installation, fixing and grouting of Standalone structural liner of suitable size to the drain as detailed in the drawings.

(c) Chainage from CH.0+395m to CH.0+489m

Extended single layer ovoid brick masonry drain, the size of the drain is 1500 x 1980 mm high. Supply, delivery, installation, fixing and grouting of Standalone structural liner of suitable size to the drain as detailed in the drawings.

(d) Chainage from CH.0+489m to CH.0+608m

Extended single layer ovoid brick masonry drain, the size of the drain is 1660 x 2100 mm high. Supply, delivery, installation, fixing and grouting of Standalone structural liner of suitable size to the drain as detailed in the drawings.

(e) Chainage from CH.0+608m to CH.0+616m

Single layer circular brick masonry drain, the size of the drain is 1790 x 1800 mm high. Supply, delivery, installation, fixing and grouting of Standalone structural liner of suitable size to the drain as detailed in the drawings.

Total length of drain nominated for Rehabilitation by Standalone structural liner is 616m.
(a) **Chainage from CH.0+616m to CH.0+635m**

Fully internally concrete lined D shaped or Horse shaped brick masonry tunnel with concrete invert. The size of the drain size is 2170 x 1500mm high.

Hack the existing flow channel and construct a new 100mm thick mild steel reinforcement mesh with Grade 50 concrete invert channel as detailed in the drawing. The concrete shall be dual shrinkage modified, and high strength to limit cracking and future erosion.

Apply minimum 30mm thick shotcrete above exposed existing concrete aggregate to all surfaces of internal walls and roof. The shotcrete to be steel trowel finished to improve hydraulics.

(b) **Chainage from CH.0+635m to CH.0+642m**

Exposed brick masonry arch roof with internally concrete lined walls and flow channel D shaped or Horse shaped brick masonry drain. The size of the drain is 2170 x 1450mm high.

Hack the existing flow channel and construct a new 100mm thick mild steel reinforcement mesh with Grade 50 concrete invert channel as detailed in the drawing. The concrete shall be dual shrinkage modified, and high strength to limit cracking and future erosion.

Installation of mild steel reinforcement mesh using stainless steel fixings on all exposed brick arch roof surfaces. Apply 75mm of shotcrete to all exposed brick arch roof to embed the reinforcement. The shotcrete to be steel trowel finished to improve hydraulics.

(c) **Chainage from CH.0+642m to CH.0+652m**

Exposed brick masonry arch roof with internally concrete lined walls and flow channel D shaped or Horse shaped brick masonry drain. The size of the drain is 1950 x 1690mm high.
Hack the existing flow channel and construct a new 100mm thick mild steel reinforcement mesh with Grade 50 concrete invert channel as detailed in the drawing. The concrete shall be dual shrinkage modified, and high strength to limit cracking and future erosion.

Installation of mild steel reinforcement mesh using stainless steel fixings on all exposed brick arch roof surfaces. Apply 75mm of shotcrete to all exposed brick arch roof to embed the reinforcement. The shotcrete to be steel trowel finished to improve hydraulics.

(d) Chainage from CH.0+652 m to CH.0+661m

Exposed brick masonry arch roof with internally concrete lined walls and flow channel D shaped or Horse shaped brick masonry drain. The size is 1650 x 1690mm high.

Hack the existing flow channel and construct a new 100mm thick mild steel reinforcement mesh with Grade 50 concrete invert channel as detailed in the drawing. The concrete shall be dual shrinkage modified, and high strength to limit cracking and future erosion.

Installation of mild steel reinforcement mesh using stainless steel fixings on all exposed brick arch roof surfaces. Apply 75mm of shotcrete to all exposed brick arch roof to embed the reinforcement. The shotcrete to be steel trowel finished to improve hydraulics.

(e) Chainage from CH.0+661 m to CH.0+763m

Fully internally concrete lined D shaped or Horse shaped brick masonry. The size of the drain is 2140 x 1600mm high.

Hack the existing flow channel and construct a new 100mm thick mild steel reinforcement mesh with Grade 50 concrete invert channel as detailed in the drawing. The concrete shall be dual shrinkage modified, and high strength to limit cracking and future erosion.
Apply minimum 30mm thick shotcrete above exposed existing concrete aggregate to all surfaces of internal walls and roof. The shotcrete to be steel trowel finished to improve hydraulics.

(f) Chainage from CH.0+763 m to CH.0+789m

Exposed brick masonry arch roof with internally concrete lined walls and flow channel D shaped or Horse shaped brick masonry drain. The size of the drain is 2380 x 1990mm high.

Hack the existing flow channel and construct a new 100mm thick mild steel reinforcement mesh with Grade 50 concrete invert channel as detailed in the drawing. The concrete shall be dual shrinkage modified, and high strength to limit cracking and future erosion.

Installation of mild steel reinforcement mesh using stainless steel fixings on all exposed brick arch roof surfaces. Apply 75mm of shotcrete to all exposed brick arch roof to embed the reinforcement. The shotcrete to be steel trowel finished to improve hydraulics.

(g) Chainage from CH.0+789 m to CH.0+798m

Fully internally concrete lined D shaped or Horse shaped brick masonry. The size of the drain is 2140 x 1600mm high.

Hack the existing flow channel and construct a new 100mm thick mild steel reinforcement mesh with Grade 50 concrete invert channel as detailed in the drawing. The concrete shall be dual shrinkage modified, and high strength to limit cracking and future erosion.

Apply minimum 30mm thick shotcrete above exposed existing concrete aggregate to all surfaces of internal walls and roof. The shotcrete to be steel trowel finished to improve hydraulics.

(h) Chainage from CH.0+798 m to CH.0+813m
Fully internally concrete lined D shaped or Horse shaped brick masonry with reinforced concrete arch “ribs” The size of the drain is 2380 x 1990mm high.

Hack the existing flow channel and construct a new 100mm thick mild steel reinforcement mesh with Grade 50 concrete invert channel as detailed in the drawing. The concrete shall be dual shrinkage modified, and high strength to limit cracking and future erosion.

Installation of mild steel reinforcement mesh using stainless steel fixings on all exposed brick arch roof surfaces. The reinforcement may be discontinued either side of the “ribs” and along to top of the concrete walls. Apply 75mm of shotcrete to all exposed brick arch roof to embed the reinforcement. Shotcrete thickness over the walls and ribs shall be 30mm. The shotcrete to be steel trowel finished to improve hydraulics.

**Total length of drain nominated for invert reinstatement is 197m.**

**Meda Ela Main underground Drain drain**

Meda Ela (Spillway to Outfall)

(a) **Chainage from CH.0+197m to CH.0+257m**

It is a U shaped stone masonry channel covered with RC slab built on traverse beams. The size of the drain is 3830x3720mm high.

Hack the existing flow channel and construct a new 100mm thick mild steel reinforcement mesh with Grade 50 concrete invert channel as detailed in the drawing. The concrete is to be dual shrinkage modified and of high strength to limit cracking and erosion.

Apply low shrink high strength patch repair mortar to re-embed all areas of exposed reinforcement in the slab and to the affected walls (estimated to be around 10% of the area)

(b) **Chainage from CH.0+257m to CH.0+263m**

It is U shaped brick masonry drain covered with brick masonry arch roof. The size of the drain is 1720x2410mm high.

Hack the existing flow channel and construct a new 100mm thick mild steel reinforcement mesh with Grade 50 concrete invert channel as detailed in the drawing. The concrete is to be dual shrinkage modified and of high strength to limit cracking and erosion.
Apply low shrink, high strength patch repair mortar to the affected wall (estimated to be around 10% of the area)

(c) Chainage from CH.0+263m to CH.0+280m

It is a U shaped stone masonry drain covered with brick masonry arch roof. The size of the drain is 1820x1980mm high.

Hack the existing flow channel and construct a new 100mm thick mild steel reinforcement mesh with Grade 50 concrete invert channel as detailed in the drawing. The concrete is to be dual shrinkage modified and of high strength to limit cracking and erosion.

No work required to stone/brick masonry walls and brick arch roof.

(d) Chainage from CH.0+280m to CH.0+317m

It is a U shaped stone masonry drain covered with brick masonry arch roof. The size of the drain is 1760x2380mm high (varies).

Hack the existing flow channel and construct a new 100mm thick mild steel reinforcement mesh with Grade 50 concrete invert channel as detailed in the drawing. The concrete is to be dual shrinkage modified and of high strength to limit cracking and erosion.

Application of minimum 30mm of shotcrete above the existing exposed concrete aggregate of the all surface of internal walls and roof as per details in the drawings. The shotcrete to be steel trowel finished to improve hydraulics.

(e) Chainage from CH.0+317m to CH.0+332m

It is a U shaped stone masonry channel covered with brick masonry arch roof. The size of the drain is 1610x2280mm high.

Hack the existing flow channel and construct a new 100mm thick mild steel reinforcement mesh with Grade 50 concrete invert channel as detailed in the drawing. The concrete is to be dual shrinkage modified and of high strength to limit cracking and erosion.
Application of minimum 30mm of shotcrete above the existing exposed concrete aggregate of all surface of internal walls and roof as per details in the drawings. The shotcrete to be steel trowel finished to improve hydraulics.

(f) Chainage from CH.0+332m to CH.0+383m

It is a U shaped stone masonry channel covered with brick masonry arch roof. The size of the drain is 2220x2600mm high. There are several invert drops in the invert channel.

Hack the existing flow channel and construct a new 100mm thick mild steel reinforcement mesh with Grade 50 concrete invert channel as detailed in the drawing. The concrete is to be dual shrinkage modified and of high strength to limit cracking and erosion. All the associated invert drops shall be re-instated as part of the invert construction.

Application of minimum 30mm of shotcrete to all surface of internal walls and roof as per details in the drawings. The shotcrete to be steel trowel finished to improve hydraulics.

(g) Chainage from CH.0+383m to CH.0+488m

It is a U shaped stone masonry channel covered with brick masonry arch roof. The size of the drain is 1830x3270mm high. There are several invert drops in the invert channel.

Hack the existing flow channel and construct a new 100mm thick mild steel reinforcement mesh with Grade 50 concrete invert channel as detailed in the drawing. The concrete is to be dual shrinkage modified and of high strength to limit cracking and erosion. All the associated invert drops shall be re-instated as part of the invert construction.

Application of minimum 30mm of shotcrete above the existing exposed concrete aggregate of all surface of internal walls and roof as per details in the drawings. The shotcrete to be steel trowel finished to improve hydraulics.
(h) Chainage from CH.0+488m to CH.0+508m

It is a U shaped stone masonry channel covered with brick masonry arch roof. The size of the drain is 3900x 3000mm high.

Hack the existing flow channel and construct a new 100mm thick mild steel reinforcement mesh with Grade 50 concrete invert channel as detailed in the drawing. The concrete is to be dual shrinkage modified and of high strength to limit cracking and erosion. All the associated invert drops shall be re-instated as part of the invert construction.

Application of minimum 30mm of shotcrete above the existing exposed concrete aggregate of the all surface of internal walls and roof as per details in the drawings. The shotcrete to be steel trowel finished to improve hydraulics.

Total stone/brick masonry underground drain nominated for invert reinstatement and repairs is 311m.

Meda Ela (Good’s Shed Bus Stand)

(a) Chainage from CH.0+804m to CH.0+914m

It is U shaped RC drain covered with RC slab. The size of the drain is 4600 x 2920mm high.

Hack away the protruding block work on the side of the walls and install reinforcement and cast insitu mild steel reinforcement mesh with Grade 50
concrete flow channel of 100mm thick as per details shown in the drawings. The concrete is to be dual shrinkage modified and of high strength to limit cracking and erosion.

Apply low shrink, high strength patch repair mortar to the affected wall and roof slab (estimated to be around 10% of the area)

(b) Chainage from CH.0+914m to CH.0+921m

It is a brick masonry U shaped drain slabbed over by RC concrete on steel girders. The size of the drain is 4600 x 2920mm high.

Hack the existing flow channel and construct a new 100mm thick mild steel reinforcement mesh with Grade 50 concrete invert channel as detailed in the drawing. The concrete is to be dual shrinkage modified and of high strength to limit cracking and erosion.

Grit blast transverse steel girder and apply minimum 30mm of shotcrete to all surface of internal walls and roof as per details in the drawings. The shotcrete to be steel trowel finished to improve hydraulics.

(c) Chainage from CH.0+921m to CH.0+945m

It is a U shaped RC drain, covered with RC slab. The size of the drain is 4530 x 3420mm high.

Hack the existing flow channel and construct a new 100mm thick mild steel reinforcement mesh with Grade 50 concrete invert channel as detailed in the drawing. The concrete is to be dual shrinkage modified and of high strength to limit cracking and erosion.

Apply low shrink, high strength patch repair mortar to the affected wall and roof slab (estimated to be around 10% of the area).

Total length of U shaped underground drain nominated for invert reinstatement and repairs is 141m.

Meda Ela (Railway Premises)
(a) Chainage from CH.0+959m to CH.0+979m

It is a brick masonry circular drain with concrete invert (to be confirmed on site by the contractor).

It is a twin tunnel up to 86m and thereafter it becomes a single cell brick masonry drain with brick masonry arch roof. The size of the drain is 2990 x 2590mm high.

The initial 20m length of underground drain on the west (right hand side, looking d/s of the drain) has been replaced with twin 1200mm dia RC pipe drain.

Examine the structural status of the RC twin pipe and do nothing if found to be okay.

(b) Chainage from CH.0+979m to CH.1+045m

The twin drain size (each) is 2990 x 2590mm high.

Application of minimum 30mm of shotcrete to all internal surfaces, including the invert as per details in the drawings. The shotcrete to be steel trowel finished to improve hydraulics.

(c) Chainage from CH.1+045m to CH.1+051m

It is a brick masonry twin cell rectangular drain covered with RC slab circular drain with concrete invert (to be). The size of the drain is 2990 x 2590mm high.

Hack the existing flow channel and construct a new 100mm thick mild steel reinforcement mesh with Grade 50 concrete invert channel as detailed in the drawing. The concrete is to be dual shrinkage modified and of high strength to limit cracking and erosion.

Application of minimum 30mm of shotcrete to all internal surface of the brick masonry walls, as per details in the drawings. The shotcrete to be steel trowel finished to improve hydraulics.
(d) Chainage from CH.1+051m to CH.1+145m

It is a brick masonry U drain covered with brick masonry arch roof. The size of the drain is 3080 x 2750mm high.

The roof structure has collapsed a few times and the collapsed arch roof sections were replaced with flat RC slab.

The structural condition of the remaining brick masonry arch roof is in very poor condition and is on the verge of collapse. There is a significant longitudinal crack at the inner arch of the brick masonry roof. The crack pattern indicates that the walls are unable to provide adequate lateral support to the roof. It is proposed to replace the brick masonry arch roof with RC slab by open excavation method.

Hack the existing flow channel and construct a new 100mm thick mild steel reinforcement mesh with Grade 50 concrete invert channel as detailed in the drawing. The concrete is to be dual shrinkage modified and of high strength to limit cracking and erosion.

Total length of underground drain nominated for rehabilitation under Railway Premises is 186m.

Meda Ela (Play Ground)

(a) Chainage from CH.1+174m to CH.1+184m:
It is a horseshoe shaped drain with RC invert and brick masonry arch roof and built probably in 1950’s. The size of the drain is 4740 x 3880mm high. The drain is structurally in good condition and requires minimum repairs.

Apply low shrink, high strength patch repair mortar to the affected wall and roof slab (estimated to be around 10% of the area)

(b) Chainage from CH.1+184m to CH.1+195m:

It is also a horseshoe shaped drain with RC invert and brick masonry arch roof and walls and built probably in 1950’s. The size of the drain is 5950 x 4480mm high. The drain is structurally in good condition and requires minimum repairs.

Application of minimum 30mm of shotcrete to all internal surface of the brick masonry walls, as per details in the drawings. The shotcrete to be steel trowel finished to improve hydraulics.

(c) Chainage from CH.1+199m to CH.1+208m

It is U shaped drain below the playground and is slabbed over by an RC slab. The walls are brick masonry and the invert is an RC slab. The size of the drain is 6870 x 2730mm high.

Hack the existing flow channel and construct a new 100mm thick mild steel reinforcement mesh with Grade 50 concrete invert channel as detailed in the drawing. The concrete is to be dual shrinkage modified and of high strength to limit cracking and erosion.

Apply low shrink, high strength patch repair mortar to the affected wall and roof slab (estimated to be around 10% of the area)

(d) Chainage from CH.1+208m to CH.1+228m

It is a brick masonry U shaped drain below the playground and it is covered with RC slab. The size of the drain is 5060 x 2730mm high.

Hack the existing flow channel and construct a new 100mm thick mild steel reinforcement mesh with Grade 50 concrete invert channel as detailed in the
drawing. The concrete is to be dual shrinkage modified and of high strength to limit cracking and erosion.

Apply low shrink, high strength patch repair mortar to the affected wall and roof slab (estimated to be around 10% of the area)

(e) **Chainage from CH.1+228m to CH.1+293m**

It is a brick masonry U shaped drain below the playground and it is covered with RC lab. The size of the drain is 4540 x 2730mm high.

Hack the existing flow channel and construct a new 100mm thick mild steel reinforcement mesh with Grade 50 concrete invert channel as detailed in the drawing. The concrete is to be dual shrinkage modified and of high strength to limit cracking and erosion.

Apply low shrink, high strength patch repair mortar to the affected wall and roof slab (estimated to be around 10% of the area)

**Total length of underground drain nominated for rehabilitation under Playground Premises is 115m.**

**Bogambara Underground Drain**

| Chainage from CH.0+011 - CH.0+133 |
|---|---|
| Ø | 900 |

| Chainage from CH.0+133 - CH.0+202 |
|---|---|
| Width | Height |
| 3000 | 4500 |

| Chainage from CH.0+202 - CH.0+277 |
|---|---|
| Width | Height |
| 1800 | 3200 |

(a) **Chainage from CH.0+11m to CH.0+133m**

It is twin 900mm diameter RC pipes. Hydraulically the combined capacity of the twin 900 mm dia pipes is sufficient to carry the stormwater flow.

General cleaning and some minor repairs to the pipes are envisaged.
(b) Chainage from CH.0+133m to CH.0+202m

It is U shaped drain with stone masonry walls on the sides. It is covered with RC roof slab which is supported on RC columns. The invert is in dilapidated condition and is full of rubbish. The drain size is 3000x4500mm high.

The drain requires extensive cleaning and reconstruction of invert. Install reinforcement and cast insitu mild steel reinforcement mesh with Grade 50 concrete flow channel of 100mm thick, all as per details shown in the drawings. The concrete is to be dual shrinkage modified and of high strength to limit cracking and erosion.

Apply minimum 30mm thick shotcrete above exposed existing concrete aggregate to all surfaces of internal walls and roof. The shotcrete to be steel trowel finished to improve hydraulics.

The upstream of this drain is a twin 900mmm diameter RC pipe.

The contractor shall investigate the option to extend the twin RC pipe up to the Chamber near the junction of William Gopallawa Mawatha and Keppitipola Road as an alternative to invert reconstruction and shotcreting.

(c) Chainage from CH.0+202m to CH.0+277m

It is a stone masonry U shaped drain covered with a three layered brick masonry arch roof. It runs below William Gopallawa Mawatha. The size of the drain is 1800 x 3100mm high.

There was a collapse in the downstream section of the drain and it appears that the collapse was triggered by uprooting of a tree which might have had its roots penetrated through the roof.

Install reinforcement and cast insitu mild steel reinforcement mesh with Grade 50 concrete flow channel of 100mm thick, all as per details shown in the drawings. The concrete is to be dual shrinkage modified and of high strength to limit cracking and erosion. All the associated invert drops shall be re-instated as part of the invert construction. Application of minimum 30mm of shotcrete to all surface of internal walls and roof as per details in the drawings.

**Total length of Bogambara outfall underground drain nominated for rehabilitation is 144m.**

<table>
<thead>
<tr>
<th>Project Management Team</th>
<th>A Project Management Unit (PMU) has been established under the Ministry of Megapolis and Western Development, to implement the proposed development activities in Kandy under the SCDP.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Agency</strong></td>
<td><strong>Strategic Cities Development Project (SCDP)</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Ministry of Megapolis and Western Development</strong></td>
</tr>
<tr>
<td><strong>Contact person</strong></td>
<td><strong>Mr. Anura Dassanayake, Project Director</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Strategic Cities Development Project (SCDP)</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Ministry of Megapolis and Western Development</strong></td>
</tr>
<tr>
<td><strong>Tel:</strong></td>
<td><strong>0112 887320</strong></td>
</tr>
<tr>
<td><strong>Fax:</strong></td>
<td><strong>0112868188</strong></td>
</tr>
<tr>
<td><strong>Email:</strong></td>
<td><strong><a href="mailto:pdscdp14@gmail.com">pdscdp14@gmail.com</a></strong></td>
</tr>
</tbody>
</table>
Mrs. Gangadari Ranawaka, Deputy Project Director (Envt.)
Strategic Cities Development Project (SCDP),
Ministry of Megapolis and Western Development
Tel: 0112 887320 (Exe. 115) Fax: 0112868188 Email: gangadariscdp@gmail.com

Nature of consultation and input received
List of consultation meetings held to comply with the process of stakeholder consultations is given below

1. Discussion on designs carried out with the participation of officials of PMU, TTI consulting Engineers (Pvt).Ltd, World Bank and KMC
2. Site visits along the underground drain stretch by the officials of the PMU jointly with the TTI experts and KMC officials were undertaken on several occasions
3. Community consultations were also carried out individually and as groups during the field inspections.
5. Description of the existing environment

5.1 Physical features – Ecosystem components

| Topography and terrain | Kandy City, where the project area is situated, is a plateau in the central mountainous region and lies 462 to 489 MSL while canal lies in the range of 460m to 490m MSL. The terrain is made up of a basin-like morphology and does not contain many steep, plunging slopes except in the surrounding mountains. The topography in this plateau consists of undulating plains with hillocks and valleys formed by the drainage paths.

Topographically, the terrain of the watershed of the Kandy town is situated at the head of the Meda-Ela valley, having its outlet at Getambe about 4km from the City Centre. There are three sub valleys at the head of Meda Valley, one in the north, where Kandy central business district (CBD) is situated, another one between two south eastern hills where Kandy Lake is located and the third is further south of the south eastern hills. Meda Ela valley consists of rolling hills and valleys. A considerable number of perennial and seasonal tributaries originating from the hilly terrain empty into the main stream on either side of the canal. |

| Soil (type and quality) | The soil cover mainly consisting of Reddish Brown Latosolic soils and loams made from the weathering of underlying rocks and boulders and rock outcrops. It is also located within a belt of Quartzite, quartz schist commonly with sillimanite adjacent to widespread area of Hornblende/Hornblende biotite gneiss.

The main geological feature of the Kandy City and its surrounding area is a band of marble that extends up to 650 m to one kilometer thick. This band is classified as coarse crystalline mainly made up of calcite. Calcsilicate gneiss intruded as bands within the host marble including scapolite and spinel as additional minerals. Collectively these two rock types give rise to red-brown overburden latosolic soil that on average ranges in thickness from one to three meters. |

Geologically, the location where the canal lies is on highly weathered quartzite, crystalline marble and gneisses. For most of its course, the canal |
flows through a crystalline limestone bed. The alluvial bed of the stream in the unpaved areas is highly silted and the total amount of bed sediment is substantially higher towards the confluence of the canal with the main river at Getambe.

(Geology and Soil Map of the Project Area is given in annex 3).

| Surface water | The surface water sources are intermittent streams, creeks and canals associated with surface runoff which flows towards the Meda Ela and Kandy Lake.
There are no other surface water sources available in the vicinity other than the Kandy Lake where Meda Ela starts from its point of over flow and Mahaweli Ganga where the canal merges with at Getambe. Mahaweli River is one of the drinking water sources in the Kandy city.

**Local uses**
The underground drain plays an important role in conveying surface drainage and storm waters. Although the local people do not derive other benefits other than diverting their surface drainage into this underground drain, the intrinsic function is vital and most important in draining flood waters of the area. The canal is subjected to severe human interferences. It could be observed the points where the canal receives wastewater directly from hotels, schools, markets, garages and service stations.

| Ground water | In Kandy area, the cover of the overburden is relatively thin. Groundwater table is relatively shallow. The data on groundwater availability in the project area is not sufficient to make a clear judgment and therefore it is not possible to exactly quantify the availability, yield and the capacity within the project area. It is noted that groundwater is not extracted in large quantities for water supply projects or for commercial purposes in the close proximity.

| Air quality | Air emissions by sources such as vehicular and commercial emissions are the major pollutant sources that contribute baseline ambient air quality levels in the area. Measured ambient air quality levels by NBRO with respect to SO2, NO2, CO, O3 and PM$_{10}$ and PM$_{2.5}$ were below the Ambient Air Quality Standards stipulated by the Ministry of Environment & Natural Resources of Sri Lanka (Extraordinary Gazette No. 1562/22 August 15, 2015)
Monitoring of Baseline Ambient Air Quality Levels measured by National Building Research Organization (NBRO)-2015 for the SCDP

Figure 5.4: Air Pollutant concentrations in the KMC area

Sampling location of the Kandy city

L1 At The Good Shed area (In front of Post Office)
L2 At the Clock Tower Junction
L3 At the Queens Hotel Junction
L4 In Front of The District Secretariat
L5 At the Ampitiya Junction
L6 At the Mosque Close to Kandy City Centre
L7 At the Katugasthota Market
L8 At the Gatambe Junction

5.2 Ecological features – Eco-system components

Vegetation (trees, ground cover, aquatic vegetation)

The project area is completely affected by human interventions and hence there is no considerable vegetation cover. The following table shows the existing flora species in the surrounding area of the project.

<table>
<thead>
<tr>
<th>Family</th>
<th>Species Name</th>
<th>Common Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anacardiaceae</td>
<td>Mangifera indica</td>
<td>Amba</td>
</tr>
<tr>
<td>Apocynaceae</td>
<td>Alstonia macrophyll</td>
<td>Havari nuga</td>
</tr>
<tr>
<td></td>
<td>Alstonia scholaris</td>
<td>Rukaththana</td>
</tr>
<tr>
<td>Family</td>
<td>Genus</td>
<td>Species</td>
</tr>
<tr>
<td>---------------</td>
<td>------------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>Combretaceae</td>
<td>Terminalia arjuna</td>
<td>Kubuk</td>
</tr>
<tr>
<td>Fabeacea</td>
<td>Acasia mangium</td>
<td>Ahela</td>
</tr>
<tr>
<td>Pandunacea</td>
<td>Pandunace tectories</td>
<td>Watekaiya</td>
</tr>
<tr>
<td>Euphorbiaceae</td>
<td>Macaranga peltata</td>
<td>Kenda</td>
</tr>
<tr>
<td>Fabaceae</td>
<td>Albizia sp.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Erythrina variegata</td>
<td>Erabadu</td>
</tr>
<tr>
<td></td>
<td>Mimosa pudica</td>
<td>Nidikumba</td>
</tr>
<tr>
<td></td>
<td>Gliricidia sepium</td>
<td>Ginisiriya</td>
</tr>
<tr>
<td>Bignonieae</td>
<td>Tabebuia rosea</td>
<td></td>
</tr>
<tr>
<td>Flacouriaceae</td>
<td>Homalium ceylanicum</td>
<td>Liyan</td>
</tr>
<tr>
<td>Lauraceae</td>
<td>Litsea glutinosa</td>
<td>Bomee</td>
</tr>
<tr>
<td>Lecythidaceae</td>
<td>Careya orborea</td>
<td>Kahata</td>
</tr>
<tr>
<td>Melastomatace</td>
<td>Osbeckia octandra</td>
<td>Heen bowitiya</td>
</tr>
<tr>
<td></td>
<td>Osbeckia aspera</td>
<td>Bowitiya</td>
</tr>
<tr>
<td>Poaceae</td>
<td>Panikcum maximum</td>
<td>Rata tana</td>
</tr>
<tr>
<td></td>
<td>Cymbopogon nardus</td>
<td>Mana</td>
</tr>
<tr>
<td>Proteaceae</td>
<td>Gravillea robusta</td>
<td></td>
</tr>
<tr>
<td>Rubiaceae</td>
<td>Wendlandia bicuspidata</td>
<td>Rawan idala</td>
</tr>
<tr>
<td>Ulmaceae</td>
<td>Trema orientalis</td>
<td>Gadumba</td>
</tr>
<tr>
<td>Verbenaceae</td>
<td>Stachytarpheta jamaicensis</td>
<td>Balu nakuta</td>
</tr>
<tr>
<td></td>
<td>Vitex altissima</td>
<td>Milla</td>
</tr>
<tr>
<td>Presence of wetlands</td>
<td>No wetlands are located in the vicinity of the project area.</td>
<td></td>
</tr>
<tr>
<td>---------------------</td>
<td>-------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Fish and fish habitats</td>
<td><strong>Terrestrial Fauna in the vicinity of the project area</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Category</strong></td>
<td><strong>Species Name</strong></td>
</tr>
<tr>
<td>Mammals</td>
<td><em>Lutra Lutra</em></td>
<td>Diya-ballā</td>
</tr>
<tr>
<td>Fishes</td>
<td><em>Poecilia reticulata</em></td>
<td>Guppies</td>
</tr>
<tr>
<td></td>
<td><em>Labeo dussumier</em></td>
<td>Kanaya</td>
</tr>
<tr>
<td></td>
<td><em>Tilapia mossambica</em></td>
<td>Tilapia</td>
</tr>
<tr>
<td></td>
<td><em>Etroplus suratensis</em></td>
<td>Koraliya</td>
</tr>
<tr>
<td>Amphibians</td>
<td><em>Rana temporaria</em> and <em>Bufo sp.</em></td>
<td>Frog</td>
</tr>
<tr>
<td>Crustaceans</td>
<td><em>Ceylonthelphusa rugosa</em></td>
<td>Fresh water crabs</td>
</tr>
<tr>
<td>Insects</td>
<td><em>Corixa punctata</em></td>
<td>Water boratmen</td>
</tr>
<tr>
<td>Birds (waterfowl, migratory birds, others)</td>
<td>Crows, Spotted Dows, Kingfisher and Minas were observed during the field visits.</td>
<td></td>
</tr>
<tr>
<td>Presence of special habitat areas (special designations and identified sensitive zones)</td>
<td>No any special habitats are presence in the site.</td>
<td></td>
</tr>
<tr>
<td>Other features</td>
<td>Kandy District Secretariat Office Building, St. Sylvester’s College, Hemamali Girl’s College, Meera Maccam Mosque, Trinity College, Kandy Market Complex, Kandy Police Station, Torrington Bus Stand, Sri Pushpadana Girl’s College, Kandy Municipal Car Park, some of commercial banks, Financial companies and shops are situated close proximity to the project site. Most of the land uses bordering the canal are residential and commercial establishments. Almost all the areas could be specified as highly built up and commercial area.</td>
<td></td>
</tr>
<tr>
<td>Traditional economic and cultural activities</td>
<td>Traditional economic and cultural activities are not observed in the project area.</td>
<td></td>
</tr>
<tr>
<td>Archeological resources (recorded or potential to exist)</td>
<td>Any specific archeological resources are not recorded and less potential to exist along the canal.</td>
<td></td>
</tr>
</tbody>
</table>
### 6. Public Consultation

<table>
<thead>
<tr>
<th>Public consulted</th>
<th>Consultation method</th>
<th>Date</th>
<th>Details/Issues raised</th>
</tr>
</thead>
<tbody>
<tr>
<td>W.W.L Fernando, Laxman Studio, Yatinuwara Street, Kandy, 081 2224721</td>
<td>Informal discussions</td>
<td>27/07/2016</td>
<td>Appreciated the initiatives taken on the rehabilitation of the underground drain because they have several experiences of collapsing the underground drain during past years as the lifetime of the underground drain getting expired. Therefore this is most important intervention of the development of the Kandy city.</td>
</tr>
<tr>
<td>Upul Senaviratne, Multi Finance, Hill Street, Kandy, 0715338583</td>
<td>Informal discussions</td>
<td>27/07/2016</td>
<td>Requested to provide alternative access to the business places during the construction period. If the constructions could be carried out in the night as night shifts, it will be benefitted for both business owners and the pedestrians.</td>
</tr>
<tr>
<td>Mr. A. M. Ismail, Gem Light Shoes, 31, Yatinuwara Street, Kandy, 0812223285</td>
<td>Informal discussions</td>
<td>27/07/2016</td>
<td>Several studies/initiatives have been undertaken to improve the underground drain in the past and however, nothing was successful. It is needed to consider the tributaries merge to the main cannel when repairing the underground canal network</td>
</tr>
<tr>
<td>Mr. P. P. Selvaraj Mangala Jewelers, 68, Yatinuwara Street, Kandy, 0812234064</td>
<td>Informal discussions</td>
<td>27/07/2016</td>
<td>Expect to have a solution from the proposed project for the existing bad odor due to the stagnation of water in some places of the underground drain</td>
</tr>
<tr>
<td>Mr. D. K. S. Dharmasiri, Three wheel Driver, In front of District secretary Building, Kandy, 0771111413</td>
<td>Informal discussions</td>
<td>27/07/2016</td>
<td>Appreciated the new development efforts for the canal rehabilitation. When rehabilitating the underground drain it is necessary to consider the total areas of the underground drain as well as the entire drainage network of the city.</td>
</tr>
<tr>
<td>K. A. Sunul Karawita, Antenna House, 70 Yatinuwara Street,</td>
<td>Informal discussions</td>
<td>27/07/2016</td>
<td>Suitable places should be selected to establish manholes to minimize the disturbances to the business places.</td>
</tr>
<tr>
<td>Kandy.</td>
<td></td>
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<tr>
<td>0773756613</td>
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</tr>
</tbody>
</table>

S. Parameshwaram, Atlas Electricals, 72/A, Yatinuwara Street, Kandy 0814929075

Requested to provide them a detail awareness on the entire steps of the project. Consented to come the KMC Town hall
7. Environmental Effects and Mitigation Measures

7a. Screening for Potential Environmental Impacts

<table>
<thead>
<tr>
<th>Screening question</th>
<th>Yes</th>
<th>No</th>
<th>Significance of the effect (Low, moderate, high)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Will construction and operation of the Project involve actions which will cause</td>
<td></td>
<td>No</td>
<td>The proposed project includes structural rehabilitation and improvement to the existing underground drains</td>
</tr>
<tr>
<td>physical changes in the locality (topography, land use, changes in water bodies, etc)</td>
<td></td>
<td></td>
<td>(i.e. provision of structural lining and invert improvement) which will provide enhancement stability, extend the life span and also enhance the hydraulic flow condition of the drains.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Construction of the project components involves relatively new trenchless techniques involving minimal excavation, which is only required for the working shafts and hence there will be minimum or no physical disturbance to surrounding areas of the project area. Therefore there will be no any physical changes of the project area due to the project activities.</td>
</tr>
<tr>
<td>Will the Project involve use, storage, transport, handling or production of</td>
<td>Yes</td>
<td></td>
<td>Low to Medium</td>
</tr>
<tr>
<td>substances or materials which could be harmful to human health or the environment</td>
<td></td>
<td></td>
<td>Fugitive emissions from stored materials and vehicles/machineries emissions will induce some impact on the air quality in the construction sites. Anticipated consequences include increase of dust and increase in concentration of vehicle/machinery-related pollutants such as carbon monoxide, sulfur oxides, particulate matter, nitrous oxides, and</td>
</tr>
<tr>
<td>or raise concerns</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question</td>
<td>Answer</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>--------</td>
<td>-------------</td>
<td></td>
</tr>
<tr>
<td>about actual or perceived risks to human health?</td>
<td></td>
<td>Hydrocarbons. This impact is expected to be temporary and occurring only during construction activities. To mitigate the impact, construction contractors will be required to identify the designated areas for stockpiling of construction materials; Use tarpaulins to cover sand and other loose material when transported by trucks; fit all heavy equipment and machinery with air pollution control devices; and ensure that the air pollution control devices are operating correctly. Overall rehabilitation program will be relatively short and is expected to be completed in 12 months and there is no effect in the long term.</td>
<td></td>
</tr>
</tbody>
</table>
| Will the Project produce solid wastes during construction or operation? | Yes    | **Moderate**  
**During Construction:**  
Construction process of underground drain lining involves relatively new trenchless techniques with minimal excavation, which is only required for the working shafts. Therefore very little amount of excavated soil and debris will be generated due to this activity. But during construction of manholes, demolition of existing structures (if any) and other construction related debris will have to be collected and disposed by the contractor at the site recommended by the Engineer. Garbage generated from construction sites will have to be disposed through KMC. |
<table>
<thead>
<tr>
<th></th>
<th>Will the Project release pollutants or any hazardous, toxic or noxious substances to air?</th>
<th>Yes</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>During construction, only possible pollutant is Dust particles and other exhaust emissions from vehicles and machineries used for construction activities. Other than that there will be no any pollutants or any hazardous toxic or noxious substance released to the air.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Will the Project cause noise and vibration or release of light, heat energy or electromagnetic radiation?</th>
<th>Yes</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>During construction, noise and vibration from vehicle movements, demolition activities, loading, unloading of materials, compaction activities (if any), etc are potential sources. But, these are temporary in nature. Limited to construction period of very small time frame as the construction or rehabilitation of silt traps will not take long time. Release of light, heat energy and electromagnetic radiation will not be expected due to the proposed construction activities.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Will the Project lead to risks of contamination of land or water from releases of pollutants onto the ground or into surface waters, groundwater or coastal wasters?</th>
<th>Yes</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Run-off from stockpiled materials and chemical contamination from fuels / lubricants / chemicals used during rehabilitation works may drain to channels leading to Meda Ela. These potential impacts are temporary</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
and short-term duration only and to ensure these are mitigated, construction contractor will be required to:

(i) Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets;

(ii) Prioritize re-use of excess spoils and materials in the construction works. If spoils are be disposed, the contractor will consult with PMU/DSC on designated disposal areas according to CEA rules and regulations;

(iii) Place storage areas for fuels / lubricants / chemicals away from any drainage leading to water bodies;

(iv) Dispose any waste generated by construction activities in designated sites.

7 | Will the project cause localized flooding and poor drainage during construction? | Yes | Low  

**Construction Phase:**  
The underground storm water drains are in a dilapidated condition, especially the 150 years old underground drains and are likely to collapse if the integrity of the underground drain body is affected due to vibrations due to heave vehicular movement or construction activities. The underground drain rehabilitation works may trigger underground drain
collapses inside the drains that may hamper the storm water flow and it will lead to localized flooding during rainy seasons and this will negatively affect the worker safety also. During periods of heavy rainfall the rehabilitation work of the main underground drains will be stopped to ensure the smooth flow of the underground to avoid localized flooding.

The project area is situated in the Kandy city area and this area is not a flooding location.

<table>
<thead>
<tr>
<th>8</th>
<th>Will there be any risks and vulnerabilities to public safety due to physical hazards during construction or operation of the Project?</th>
<th>Yes</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Construction work will cause unavoidable significant issues to the public safety and public traffic as well as minor issues to the nearest business properties and pedestrians where the working area and manholes are located. These issues may occur due to the excavation for construction activities and temporary storage facilities including excavated materials, and use of construction machinery and vehicles. However, such incidences can be avoided with proper precautions exercised on health and safety aspects. During the use of machinery, the boundary has to be marked properly restricting the public entering displaying proper signage.</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Question</td>
<td>Response</td>
<td>Impact</td>
</tr>
<tr>
<td>---</td>
<td>---------------------------------------------------------------------------</td>
<td>----------</td>
<td>--------</td>
</tr>
<tr>
<td>9</td>
<td>Are there any transport routes on or around the location which are susceptible to congestion or which cause environmental problems, which could be affected by the project?</td>
<td>Yes</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>As the main construction sites and the manholes will be located on the main roads and streets in the Kandy city limits where the traffic congestion are high during peak hours, there will be traffic congestion from time to time and will cause inconveniences to the users of the access road due to the excavation of roadsides and operation of construction vehicles and machineries. Traffic diversions will have to be arranged with a proper traffic management plan in order to minimize the impact. In General, disturbance to pedestrians, motorcyclists and motorists may be very likely on a temporary basis due to traffic congestions. Traffic congestion will have to be managed with the assistance of Traffic Police. Continuous awareness among the community will be made prior to undertaking the project activities.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Are there any routes or facilities on or around the location which are used by the public for access to recreation or other facilities,</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>No such recreational locations encountered to be affected from the proposed activities.</td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td><strong>11. Are there any areas or features of high landscape or scenic value on or around the location which could be affected by the project?</strong></td>
<td>No</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Along this stretch there is no high landscape or aesthetically attractive places that exist as viewing areas and are of scenic value. Therefore no any affect to the surrounding scenic value due to project</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>12. Are there any other areas on or around the location which are important or sensitive for reasons of their ecology e.g. wetlands, watercourses or other water bodies, the coastal zone, mountains, forests which could be affected by the project?</strong></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Low</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>At the upstream the canal is connected to Kandy Lake and at the downstream with the Mahaweli River. The Kandy Lake will not be affected due to high in elevation and however, poor water quality may have great impact on Mahaweli River water quality which will in turn affect the water intake of the KMC which is in close proximity to the Mahaweli River mouth</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>13. Are there any areas on or around the location which are used by protected, important or sensitive species of fauna or flora e.g. for</strong></td>
<td>No</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>No protected, important or sensitive fauna and flora species were identified in the project stretch.</td>
<td></td>
</tr>
<tr>
<td>Question</td>
<td>Answer</td>
<td>Details</td>
<td></td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
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<td>-------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>breeding, nesting, foraging, resting, migration, which could be affected by the project?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14 Is the project located in a previously undeveloped area where there will be loss of green field land</td>
<td><strong>No</strong></td>
<td>The project is located in a developed area and there will be no loss of green field land.</td>
<td></td>
</tr>
<tr>
<td>15 Will the project cause the removal of trees in the locality?</td>
<td><strong>No</strong></td>
<td>No removal of trees required</td>
<td></td>
</tr>
<tr>
<td>16 Are there any areas or features of historic or cultural importance on or around the location which could be affected by the project?</td>
<td><strong>No</strong></td>
<td>No features of historic importance identified</td>
<td></td>
</tr>
</tbody>
</table>
| 17 Are there existing land uses on or around the location e.g. homes, gardens, other private property, industry, commerce, recreation, public open space, community facilities, agriculture, forestry, | **Yes** | **High**  
The adjacent project area consists of small, medium and large scale commercial premises which will be affected by project interventions. Mainly shops, commercial places, industries which are situated close... |
<table>
<thead>
<tr>
<th>18</th>
<th>Are there any areas on or around the location which are densely populated or built-up, which could be affected by the project?</th>
<th>Yes</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The project area is observed as a densely populated (built-up area) area and temporary inconvenience could be expected. Mainly these will be disturbed in accessing their places and due to generation of potential dust and noise during construction period.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

19 | Are there any areas on or around the location which are occupied by sensitive land uses e.g. hospitals, schools, places of worship, community facilities, which could be affected by the project | Yes | Low |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Kandy District Secretariat Office Building, St. Sylvester’s College, St. Sylvester’s Church, Hemamali Girl’s College, Meera Maccam Mosque, Trinity College, Kandy Market complex, Kandy Police Station, Torrington Bus stand, Sri Pushpadana Girl’s College, Kandy Municipal car park, some of commercial banks, Financial companies and shops are situated close proximity to the project site. Most of the land uses bordering the canal are residential and commercial establishments. Almost all the areas could be specified as highly built up and commercial area. Community will adequately be informed about project activities. Sign boards in both</td>
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</tr>
<tr>
<td><strong>20</strong></td>
<td>Are there any areas on or around the location which contain important, high quality or scarce resources e.g. groundwater, surface waters, forestry, agriculture, fisheries, tourism, minerals, which could be affected by the project?</td>
<td><strong>Yes</strong></td>
<td><strong>Low</strong></td>
</tr>
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<td></td>
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<tr>
<td><strong>21</strong></td>
<td>Are there any areas on or around the location which are already subject to pollution or environmental damage e.g. where existing legal environmental standards are exceeded, which could be affected by the project?</td>
<td><strong>No</strong></td>
<td>No location where any environmental standards exceeded or are severely environmentally polluted exist in the project area.</td>
</tr>
</tbody>
</table>

Sinhala and Tamil languages will be exhibited at appropriate locations. The reinstatement activities will be organized in such a way so that alternate ways of accessibility to homes are made sure.
7b. Environment Management Plan (EMP) for implementation

<table>
<thead>
<tr>
<th>Environmental Issues</th>
<th>Protection and preventive measures</th>
<th>Locations/Project phase</th>
<th>Mitigation cost</th>
<th>Institutional Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0 Construction Phase</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1 Earthwork and Soil Conservation</td>
<td>Disposal of Sediments/debris</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1.1</td>
<td>Prior to commencement of construction activities of the underground tunnel drain, sediment samples shall be collected at 6 selected locations (Two samples from Yatiniwara tunnel drain, two samples from Medaela Tunnel drain and two from Bogambara tunnel drain) and analysis for bellow stated parameters are to be done to assess the potential toxicity of canal sediments on the environment. Based on the sediment quality in the proposed sections of the underground drainage tunnel, suitable disposal method and disposal site should be selected for disposal of the excavated sediments and waste. If contamination is established according to accepted reference criteria, disposal must be planned properly complying with the local regulatory requirements. The approval of the Engineer should be obtained for disposal site prior to commencement of the disposal activities. (Sediment parameters include percentage of debris, Colour, and Particle size distribution, pH, Sulfate, Chloride, Heavy metal content (Fe, Cd, Ni, Underground drainage rehabilitation sites: 1. Yatiniwara Brick Masonry Drain 2. Meda Ela Drainage 3. Bogambara Outfall Drain)</td>
<td>Engineering Cost</td>
<td>Contractor</td>
<td>PMU, KMC, SC</td>
</tr>
<tr>
<td>Environmental Issues</td>
<td>Protection and preventive measures</td>
<td>Locations/Project phase</td>
<td>Mitigation cost</td>
<td>Institutional Responsibility</td>
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</tr>
<tr>
<td>(b) Cu, Cr, Pb, Hg and As., leachability, the levels of Oil &amp; greases, Polychlorinated Biphenyls (PCB) and pesticides to be tested to find out possible impacts on environment dredging and disposal of dredged sediments)</td>
<td>If contamination is not established, bottom sediments and all debris materials shall be disposed on a daily basis without allowing to stockpile onsite, at identified locations for debris disposal, recommended by the engineer. During transportation, dispose materials should be covered with tarpaulin.</td>
<td>Disposal sites (including temporary and permanent) identified by the contractor and approved by Engineer are subjected to approval of DS, Engineer &amp; KMC</td>
<td>Engineering cost</td>
<td>contractor PMU, LA, SC, KMC</td>
</tr>
<tr>
<td>(c) Contractor shall obtain the approval from the relevant Local Authority (LA) such as Pradeshiya Sabha, Municipal Council and other government agencies (as required) for disposal and spoil at the specified location.</td>
<td></td>
<td>Disposal sites (including temporary and permanent) identified by the contractor and approved by Engineer are subjected to approval of DS, Engineer &amp; KMC</td>
<td>Engineering cost</td>
<td>contractor PMU, LA, SC, KMC, CEA</td>
</tr>
<tr>
<td>(d) The debris and spoil shall be disposed in such a manner that;</td>
<td></td>
<td>-do-</td>
<td>-do-</td>
<td>-do-</td>
</tr>
</tbody>
</table>

Strategic Cities Development Project  Page 43
### Environment Issues

<table>
<thead>
<tr>
<th>Protection and preventive measures</th>
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<th>Mitigation cost</th>
<th>Institutional Responsibility Implement</th>
<th>Supervision</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) waterways and drainage paths are not blocked</td>
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<tr>
<td>(ii) the disposed material should not be washed away by runoff and</td>
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<td>(iii) should not be a nuisance to the public</td>
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</tr>
<tr>
<td>(e) If consented by the engineer, contractor can dispose construction</td>
<td>In identified filling sites</td>
<td>-do-</td>
<td>-do-</td>
<td></td>
</tr>
<tr>
<td>debris and excavated earth as land filling material provided that the contractor can ensure that</td>
<td>subjected to the approval of</td>
<td></td>
<td></td>
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<tr>
<td>such material is used for legally acceptable purposes and is disposed in a manner that will not be</td>
<td>engineer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>harmful to the surrounding environment.</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>(f) The contractor shall maintain a waste register in the site office which will keep records of</td>
<td>At the site office</td>
<td></td>
<td>Contractor PMU, KMC</td>
<td></td>
</tr>
<tr>
<td>types and quantities of waste removed from the site and places of disposal. The waste registry will</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>be monitored by the PMU staff during project implementation.</td>
<td></td>
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</tbody>
</table>

#### 1.1.2 Protection of Ground Cover and Vegetation

<table>
<thead>
<tr>
<th>Protection of Ground Cover and Vegetation</th>
<th>Locations/ Project phase</th>
<th>Mitigation cost</th>
<th>Institutional Responsibility Implement</th>
<th>Supervision</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Construction vehicle, machinery and equipment shall be used and</td>
<td>Designated vehicle yards</td>
<td>-do-</td>
<td>Contractor PMU, LA, SC</td>
<td></td>
</tr>
<tr>
<td>stationed only in the areas of work and in any other area designated/approved by the engineer.</td>
<td></td>
<td></td>
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<tr>
<td>Ad-hoc and scattered parking and placement of machinery should be avoided to minimize harm to</td>
<td></td>
<td></td>
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<tr>
<td>roadside ground cover.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(b) Contractor should provide necessary instructions to drivers, operators and other</td>
<td>-do-</td>
<td>-do-</td>
<td>-do-</td>
<td>-do-</td>
</tr>
<tr>
<td>construction workers not to destroy ground vegetation cover unnecessarily. Designated vehicle</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>parks and maintenance yards must be informed to labour force.</td>
<td></td>
<td></td>
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</tbody>
</table>

#### 1.1.3 Contamination of Soil by fuel & Lubrications

<table>
<thead>
<tr>
<th>Contamination of Soil by fuel &amp; Lubrications</th>
<th>Locations/ Project phase</th>
<th>Mitigation cost</th>
<th>Institutional Responsibility Implement</th>
<th>Supervision</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Vehicle/machinery and equipment servicing and maintenance work shall be carried out only in</td>
<td>Servicing yards to be used for vehicle</td>
<td></td>
<td>Contractor PMU, LA, CEA,/SC</td>
<td></td>
</tr>
<tr>
<td>designated locations/ service stations approved by the engineer</td>
<td>servicing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environment al Issues</td>
<td>Protection and preventive measures</td>
<td>Locations/ Project phase</td>
<td>Mitigation cost</td>
<td>Institutional Responsibility</td>
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</tr>
<tr>
<td>(b)</td>
<td>Approval from CEA in the form of an Environmental Protection Licenses (EPL) should be secured by the contractor if he intends to establish his own vehicle servicing yard</td>
<td>-do-</td>
<td>-</td>
<td>-do- PMU./SC</td>
</tr>
<tr>
<td>(c)</td>
<td>Waste oil, other petroleum products and untreated wastewater shall not be discharged on ground so that to avoid soil pollution. Clean up measures shall be taken against pollution of soil by spillage of petroleum/oil products from storage tanks and containers. All waste petroleum products shall be disposed of in accordance with the guidelines issued by the CEA or the engineer (See Annexure I)</td>
<td>Servicing yards to be used for vehicle servicing and locations where vehicles will be temporarily stationed</td>
<td>Engineering cost</td>
<td>-do- PMU, LA, CEA./SC</td>
</tr>
<tr>
<td>(d)</td>
<td>Sites used for vehicle and plant service and maintenance shall be restored back to its initial status. Site restoration will be considered as incidental to work.</td>
<td>New servicing yards developed by the contractor for the project</td>
<td>Engineering cost</td>
<td>-do- -do-</td>
</tr>
</tbody>
</table>

1.1.4 Disposal of harmful construction wastes

<p>| (a)                  | Contractor prior to the commencement of work shall provide list of harmful, hazardous and risky chemicals/ material that will be used in the project work to the Engineer. Contractor shall also provide the list of places where such chemicals/materials or their containers or other harmful materials have been dumped as waste at the end of the project, via the waste register. | Locations identified to store chemicals and waste disposal | -                | Contractor PMU, LA, CEA./SC |
| (b)                  | All disposal sites should be approved by the engineer and approved by CEA and relevant local authority.                                                                                                                                                                                                 | -Do-                     | -                | -do- PMU./SC                |
| (c)                  | The contractor shall clean up any area including water-bodies affected/contaminated (if any) as directed by the engineer at his own cost.                                                                                                                                                                           | All affected water bodies close to material storage and waste disposal sites | Engineering cost   | -do- -do-                   |</p>
<table>
<thead>
<tr>
<th>Environment Issues</th>
<th>Protection and preventive measures</th>
<th>Locations/Project phase</th>
<th>Mitigation cost</th>
<th>Institutional Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2</td>
<td>Storage, transport and handling of construction material</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>1.2.1</td>
<td>Emissions of Dust</td>
<td>At all material storage locations</td>
<td>Engineering cost</td>
<td>contractor</td>
</tr>
<tr>
<td>(a)</td>
<td>Dust emissions should be controlled by wet spraying of construction sites and roads which are used for transportation of Construction materials at regular intervals. Tarpaulin covering is mandatory on trucks /lorries which are used for transporting materials. All stockpiles including temporary storage of debris and construction materials should be covered using tarpaulin covering.</td>
<td></td>
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</tr>
<tr>
<td>(b)</td>
<td>Noise and Dust barriers with minimum height of 3m should be erected around each working shafts and manholes to control dust emission to the ambient air. Selection of the suitable material for the barriers is subject to approval of the Engineer.</td>
<td>All working shafts and manholes.</td>
<td>Engineering cost</td>
<td>contractor</td>
</tr>
<tr>
<td>(c)</td>
<td>Vehicles should be maintained in good condition regularly so that noise generating from wear and tear will be minimal.</td>
<td>-do-</td>
<td>Engineering cost</td>
<td>contractor</td>
</tr>
<tr>
<td>(d)</td>
<td>The construction materials intended for temporarily storage should be properly stockpiled in most appropriate areas in the site to avoid disturbance to site mobility, traffic and stored away from drainage paths and suitably covered (with artificial barriers or vegetation) to avoid washout.</td>
<td>-do-</td>
<td>Engineering cost</td>
<td>contractor</td>
</tr>
<tr>
<td>(e)</td>
<td>All vehicles delivering materials shall be covered to avoid spillage and dust emission.</td>
<td>-do-</td>
<td></td>
<td>contractor</td>
</tr>
<tr>
<td>(f)</td>
<td>The contractor should enforce vehicle speed limits to minimize dust generation. Please refer section 1.12.1 &amp; 1.12.3 on traffic management for transport routes and times of the day that transport of construction material to the site is allowed.</td>
<td>-do-</td>
<td></td>
<td>contractor</td>
</tr>
<tr>
<td>1.2.2</td>
<td>Storage of fuel, oil and chemicals (avoid fumes and offensive odour)</td>
<td></td>
<td></td>
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</tbody>
</table>
### Environmental Issues

#### Protection and preventive measures

<table>
<thead>
<tr>
<th>Locations/Project phase</th>
<th>Mitigation cost</th>
<th>Institutional Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>All material storage locations (cement, bitumen, fuel, oil and other chemicals used for construction activities)</td>
<td>Engineering cost</td>
<td>-do-</td>
</tr>
</tbody>
</table>

---

1.3 Water – Protection of Water Sources & Quality, Dewatering and Temporary Water Diversion

#### 1.3.1 Loss of minor water sources and disruption to water users

| (a) | Underground drainage rehabilitation sites:  
1. Yatinuwara Brick Masonry Drain  
2. Meda Ela Drainage  
3. Bogambara Outfall Drain | Engineering cost | -do- | -do- |

---

- All cement, bitumen (barrels), oil and other chemicals should be stored and handled on an impervious surface (metal sheet, concrete slab) above ground level.

- Storage facility of cement, bitumen (barrels), oil and other chemicals should be an enclosed structure ensuring that no storm water flows in to the structure.

- Alternatively, if the storage is not enclosed a ridge should be placed around the storage facility to avoid runoff getting in to the structure.

- Adequate ventilation should be kept to avoid accumulation of fumes and offensive odour that could be harmful to material handlers.

- Measures given under clause 1.12 should be considered to avoid any accidents and risks to worker population and public.
<table>
<thead>
<tr>
<th>Environment Issues</th>
<th>Protection and preventive measures</th>
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<th>Institutional Responsibility Implement</th>
<th>Supervision</th>
</tr>
</thead>
<tbody>
<tr>
<td>(b)</td>
<td>Do not extract water from ground water or surface water bodies without the permission from Engineer &amp; relevant authority. Obtain the permission for extracting water prior to the commencing of the project, from the relevant authority.</td>
<td>-do-</td>
<td>-do-</td>
<td>-do-</td>
<td>-do-</td>
</tr>
<tr>
<td>(c)</td>
<td>Apply best management practices to control contamination of run-off water during maintenance &amp; operation of equipment.</td>
<td>-do-</td>
<td>-do-</td>
<td>-do-</td>
<td>-do-</td>
</tr>
<tr>
<td>1.3.2</td>
<td>Locating, sanitation and waste disposal in construction camps</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>(a)</td>
<td>Locations selected for labour camps should be approved by engineer and comply with guidelines/recommendations issued by the CEA/Local Authority (LA). Construction of labour camps shall not be located within 200m from waterways (onsite or offsite) or near to a site or premises of religious, cultural or archeological importance and school.</td>
<td>Sensitive locations such as Temples, Kovils, Churches, Schools, etc.,</td>
<td>Engineering cost</td>
<td>Contractor</td>
<td>PMU, LA, CEA</td>
</tr>
<tr>
<td>(b)</td>
<td>Labour camps shall be provided with adequate and appropriate facilities for disposal of sewerage and solid waste. The sewage systems shall be properly designed, built and operated so that no pollution to ground or adjacent water bodies/watercourses takes place. Garbage bins shall be provided the camps and regularly emptied. Garbage should be disposed off in a hygienic manner, to the satisfaction of the relevant norms. Compliance with the relevant regulations and guidelines issued by the CEA/LA shall be strictly adhered to.</td>
<td>At all labour camps</td>
<td>Engineering cost</td>
<td>-do-</td>
<td>-do-</td>
</tr>
<tr>
<td>(c)</td>
<td>Contractor shall ensure that all camps are kept clean and hygienic. Necessary measures shall be taken to prevent breeding of vectors</td>
<td>-Do-</td>
<td>Engineering cost</td>
<td>-do-</td>
<td>-do-</td>
</tr>
<tr>
<td>(d)</td>
<td>Contractor shall report any outbreak of infectious disease of importance in a labour camp to the engineer and the Medical Officer of Health (MOH) or to the Public Health Inspector (PHI) of the area</td>
<td>With special attention near to labour camps</td>
<td>-do-</td>
<td>-do-</td>
<td>-do-</td>
</tr>
</tbody>
</table>
### Environmental Issues

#### Protection and preventive measures

1. Contractor shall carry out all instructions issued by the authorities, if any.

2. **(e)** Contractor shall adhere to the CEA recommendations on disposal of wastewater. Wastewater shall not be discharged to ground or waterways in a manner that will cause unacceptable surface or ground water pollution.

3. **(f)** All relevant provisions of the Factories Act and any other relevant regulations aimed at safety and health of workers shall be adhered to.

4. **(g)** Contractor shall remove all labour camps fully after its need is over, empty septic tanks, remove all garbage, debris and clean and restore the area back to its former condition.

#### Dewatering/temporary water diversion

1. **(a)** Proper and adequate dewatering should be ensured either using a proper monitoring schedule or using an automated submersible pump system with float device to ensure site activities are uninterrupted due to seepage water.

2. **(b)** Proper surface drainage and retention-detention capacity should be provided to safely remove pumped-up water from the site to natural drainage to avoid in site ponding effects.

3. **(c)** Construction/Rehabilitation should be carried out during dry weather periods when the canal flow is low and almost stagnant to

<table>
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<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Implement Supervision</td>
</tr>
<tr>
<td>(a)</td>
<td>Proper and adequate dewatering should be ensured either using a proper monitoring schedule or using an automated submersible pump system with float device to ensure site activities are uninterrupted due to seepage water.</td>
<td>Underground drainage rehabilitation areas : 1. Yatinuwa Brick Masonry Drain 2. Meda Ela Drainage 3. Bogambara Outfall Drain</td>
<td>Engineering cost</td>
<td>contractor PMU,, SC, KMC</td>
</tr>
<tr>
<td>(b)</td>
<td>Proper surface drainage and retention-detention capacity should be provided to safely remove pumped-up water from the site to natural drainage to avoid in site ponding effects.</td>
<td>-do-</td>
<td>Engineering cost</td>
<td>contractor PMU,, SC, KMC</td>
</tr>
<tr>
<td>(c)</td>
<td>Construction/Rehabilitation should be carried out during dry weather periods when the canal flow is low and almost stagnant to</td>
<td>-do-</td>
<td>Engineering cost</td>
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<tr>
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<td></td>
<td>minimize the need for pumping and/or adequate flow diversions, dewatering, pumping should be arranged to maintain required cross drainage flows and to provide required dry conditions for construction activities while avoiding flooding and temporarily ponding issues.</td>
<td></td>
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</tr>
<tr>
<td>(d)</td>
<td>Silt traps and catch pits should be used during the rehabilitation period where necessary to avoid excessive mixing of fines and potentially contaminated material back into canal and downstream water bodies.</td>
<td>-do-</td>
<td>Engineeri ng cost</td>
<td>contractor</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>PMU, SC, KMC</td>
</tr>
<tr>
<td>(e)</td>
<td>Catch pits, drain inlet sediment traps/barriers, turbidity curtains should be used to minimize washout of fines and silting effects in the downstream. Energy dissipaters and drops should be used where necessary to reduce flow velocities to reduce erosion and cavitation risks.</td>
<td>Underground drainage rehabilitation areas 1. Yatinuwara Brick Masonry Drain 2. Meda Ela Drainage 3. Bogambara Outfall Drain</td>
<td>Engineeri ng cost</td>
<td>contractor</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td>PMU, SC, KMC</td>
</tr>
<tr>
<td>(f)</td>
<td>Minimum flow velocities required flow self-cleansing of drains/structures should be maintained by providing required design gradients in drains, toe drains to minimize siltation.</td>
<td>-do-</td>
<td>Engineeri ng cost</td>
<td>contractor</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PMU, SC, KMC</td>
</tr>
<tr>
<td>1.3.4</td>
<td><strong>Wastage of water and waste minimization</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a)</td>
<td>The contractor will minimize wastage of water in the construction process/operations by reusing water as much as possible, utilizing only the required amount of water for the construction works etc.</td>
<td>Underground drainage rehabilitation areas</td>
<td>Contractor</td>
<td>PMU, CEA, LA</td>
</tr>
<tr>
<td>Environment Issues</td>
<td>Protection and preventive measures</td>
<td>Locations/ Project phase</td>
<td>Mitigation cost</td>
<td>Institutional Responsibility</td>
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</tr>
</tbody>
</table>
|                    | The contractor shall maintain a record of usage of water for various purposes and sources tapped. | 1. Yatinuwara Brick Masonry Drain  
2. Meda Ela Drainage  
3. Bogambara Outfall Drain and labour camps | | |
| 1.4 | Flood Prevention due to Underground Drainage Rehabilitation | | |
| 1.4.1 | Blockage of drainage paths and drains | Underground drainage rehabilitation areas 1. Yatinuwara Brick Masonry Drain  
2. Meda Ela Drainage  
3. Bogambara Outfall Drain | Contractor PMU, SC, KMC | |
| (a) | If the contractor requires temporary water diversion (as mentioned above) which might cause the closure or blocking of canals and streams leading to floods, the contractor shall first obtain the Engineer’s approval in writing. Contractor shall carry out a prior investigation on potential flood situations and report to the Project Management Unit. If the flood prevention measures are required, the Contractor shall also obtain the approval from the relevant agencies such as Irrigation Department (ID) /Divisional Secretary (DS) prior to such action is taken. Contractor shall restore the drainage path back to its original status once the need for such diversion or closure or blockage is no longer required. | Underground drainage rehabilitation areas 1. Yatinuwara Brick Masonry Drain  
2. Meda Ela Drainage  
3. Bogambara Outfall Drain | Engineering cost Contractor PMU, SC, KMC | |
<p>| (b) | If flooding or stagnation of water is caused by contractor’s activities, contractors shall provide suitable means to (a) prevent loss of access to any land or property and (b) prevent damage to land and property. Contractor shall compensate for any loss of income or damage as a result. | Underground drainage rehabilitation areas Underground drainage | Engineering cost Contractor PMU, SC, KMC | |</p>
<table>
<thead>
<tr>
<th>Environment Issues</th>
<th>Protection and preventive measures</th>
<th>Locations/Project phase</th>
<th>Mitigation cost</th>
<th>Institutional Responsibility</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>rehabilitation areas</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1. Yatinuwara Brick</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Masonry Drain</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>2. Meda Ela Drainage</td>
<td></td>
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<td></td>
<td></td>
<td>3. Bogambara Outfall Drain</td>
<td></td>
<td></td>
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<tr>
<td>1.4.2</td>
<td><strong>Streamlining of drainage outfalls</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a)</td>
<td>Streamlining should be carried out ensuring that the required gradients to maintain design hydraulic flows are not altered or disrupted.</td>
<td>Underground drainages to be rehabilitated</td>
<td>Engineeri ng cost</td>
<td>Contractor PMU,SC, KMC</td>
</tr>
<tr>
<td>1.5</td>
<td><strong>Air Pollution</strong></td>
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<tr>
<td>1.5.1</td>
<td><strong>Generation of Dust</strong></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>(a)</td>
<td>The contractor shall effectively manage the dust generating activities such as ground clearing, topsoil removal, handling and transporting sand, rubble, bitumen, and cement during periods of high winds or during more stable conditions with winds directed towards adjacent residences and other facilities.</td>
<td>Within the Underground Drainage area where earth work will take place, storage locations of sand, rubble, bitumen, cement and all sub roads used for material transportation, paying special</td>
<td>Engineeri ng cost</td>
<td>Contractor PMU,SC, KMC</td>
</tr>
<tr>
<td>(b)</td>
<td>All vehicles delivering materials shall be covered to avoid spillage and dust emission.</td>
<td>-do-</td>
<td>-do-</td>
<td>-do-</td>
</tr>
<tr>
<td>(c)</td>
<td>The Contractor should avoid, where possible and take suitable action to prevent dirt and mud being carried to the roadway (particularly following wet weather).</td>
<td>-do-</td>
<td>-do-</td>
<td>-do-</td>
</tr>
<tr>
<td>(d)</td>
<td>The contractor should enforce vehicle speed limits to minimize dust generation.</td>
<td>-do-</td>
<td>-do-</td>
<td>-do-</td>
</tr>
</tbody>
</table>
### Environmental Issues

<table>
<thead>
<tr>
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<th>Locations/Project phase</th>
<th>Mitigation cost</th>
<th>Institutional Responsibility Implement</th>
<th>Supervision</th>
</tr>
</thead>
<tbody>
<tr>
<td>(e)</td>
<td>The Contractor shall employ a water truck to sprinkle water for dust suppression on all exposed areas as required (note: the use of waste water / waste oil for dust suppression is prohibited)</td>
<td>attention to sensitive locations.</td>
<td>-do-</td>
<td>-do-</td>
<td>-do-</td>
</tr>
<tr>
<td>(f)</td>
<td>All cleared areas on the surface for manhole rehabilitation shall be rehabilitated progressively.</td>
<td></td>
<td>-do-</td>
<td>-do-</td>
<td>-do-</td>
</tr>
<tr>
<td>(g)</td>
<td>All earthwork shall be protected in a manner acceptable to the minimized generation of dust.</td>
<td></td>
<td>-do-</td>
<td>-do-</td>
<td>-do-</td>
</tr>
<tr>
<td>(h)</td>
<td>All existing roads used by vehicles of the contractor, or any of his sub-contractor or supplies of materials or plant and similar roads which are part of the works shall be kept clean and clear of all dust/mud or other extraneous materials dropped by such vehicles or their tyres.</td>
<td></td>
<td>-do-</td>
<td>-do-</td>
<td>-do-</td>
</tr>
<tr>
<td>(i)</td>
<td>Clearance shall be affected immediately by manual sweeping and removal of debris, or, if so directed by the Engineer, by mechanical sweeping and clearing equipment. Additionally, if so directed by the Engineer, the road surface will be hosed or sprinkled water using appropriate equipment’s.</td>
<td></td>
<td>-do-</td>
<td>-do-</td>
<td>-do-</td>
</tr>
<tr>
<td>(k)</td>
<td>Plants, machinery and equipment shall be handled (including dismantling) so as to minimize generation of dust.</td>
<td></td>
<td>-do-</td>
<td>-do-</td>
<td>-do-</td>
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</tbody>
</table>

#### 1.5.2 Emission from Hot-Mix Plants and Batching Plants

<table>
<thead>
<tr>
<th>Environmental Issues</th>
<th>Protection and preventive measures</th>
<th>Locations/Project phase</th>
<th>Mitigation cost</th>
<th>Institutional Responsibility Implement</th>
<th>Supervision</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a)</td>
<td>The contractor shall take every precaution to reduce the level of dust emission from the hot mix plants and the batching plants up to the satisfaction of the Engineer in accordance with the relevant emission norms.</td>
<td>All stations where hot mix plants fixed in construction stage</td>
<td>-do-</td>
<td>-do-</td>
<td>-do-</td>
</tr>
<tr>
<td>(b)</td>
<td>The hot mix plant be sited in accordance with CEA guidelines and operated with an EPL. The hot mix plants shall be fitted with the requirements of the relevant current emission control legislation.</td>
<td></td>
<td>-do-</td>
<td>-do-</td>
<td>-do-</td>
</tr>
</tbody>
</table>
### Envir **onmental Issues**

#### 1.5.3 Odour and offensive smells

**Contractor** shall take all precautions such as storing all chemicals used for construction works in properly closed containers with good ventilations to prevent odour and offensive smell emanating from chemicals and processes applied in construction works or from labour camps. In a situation when/where odour or offensive smell does occur contractor shall take immediate action to rectify the situation. Contractor is responsible for any compensation involved with any health issue arisen out of bad odour and offensive smells.

<table>
<thead>
<tr>
<th>Locations/Project phase</th>
<th>Mitigation cost</th>
<th>Institutional Responsibility Implement</th>
<th>Supervision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underground drainage rehabilitation areas</td>
<td>-do-</td>
<td>Contractor</td>
<td>-do-</td>
</tr>
<tr>
<td>1. Yatinuwara Brick Masonry Drain</td>
<td>-do-</td>
<td>PMU, SC, KMC</td>
<td>-do-</td>
</tr>
<tr>
<td>2. Meda Ela Drainage</td>
<td>-do-</td>
<td>-do-</td>
<td>-do-</td>
</tr>
<tr>
<td>3. Bogambara Outfall Drain</td>
<td>-do-</td>
<td>-do-</td>
<td>-do-</td>
</tr>
</tbody>
</table>

#### 1.5.4. Emission from construction Vehicles, Equipment and Machinery

**Contractor** shall take all precautions such as storing all chemicals used for construction works in properly closed containers with good ventilations to prevent odour and offensive smell emanating from chemicals and processes applied in construction works or from labour camps. In a situation when/where odour or offensive smell does occur contractor shall take immediate action to rectify the situation. Contractor is responsible for any compensation involved with any health issue arisen out of bad odour and offensive smells.

<table>
<thead>
<tr>
<th>Locations/Project phase</th>
<th>Mitigation cost</th>
<th>Institutional Responsibility Implement</th>
<th>Supervision</th>
</tr>
</thead>
<tbody>
<tr>
<td>All plants, machinery and vehicles used for construction</td>
<td>-</td>
<td>Contractor</td>
<td>PMU, CEA, LA, SC</td>
</tr>
<tr>
<td>-Do-</td>
<td>Engineeri ng cost</td>
<td>-do-</td>
<td>-do-</td>
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<td>-Do-</td>
<td>-Do-</td>
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</tbody>
</table>
1.6. Noise Pollution and Vibration

1.6.1 Noise from Vehicles, Plants and Equipment.

(a) Noise barriers with minimum height of 3m should be installed around the working shafts and manholes as shown in the following figures and the construction noise levels should be maintained outside the noise barriers below 75dB during day time.

All machinery and equipment should be well maintained and fitted with noise reduction devices in accordance with manufacturer’s instructions. Generally – noise can’t exceed 75 dB during day time (See Annexure 8).

(b) In construction sites within 150 m of the nearest habitation, noisy construction work such as hot mixing and batching, mechanical compaction, etc., will be stopped between 20.00 hours to 06.00 hours. Near noise sensitive sites, noisy equipment shall not be used during noise sensitive times of the day.

<table>
<thead>
<tr>
<th>Environment Issues</th>
<th>Protection and preventive measures</th>
<th>Locations/Project phase</th>
<th>Mitigation cost</th>
<th>Institutional Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.6. Noise Pollution and Vibration</td>
<td>All working shafts and manholes</td>
<td>Engineeri ng Cost</td>
<td>Contractor</td>
<td>PMU, LA,SC</td>
</tr>
<tr>
<td>1.6.1 Noise from Vehicles, Plants and Equipment.</td>
<td>All machinery and vehicles used for construction works</td>
<td>-</td>
<td>-do-</td>
<td>-do-</td>
</tr>
<tr>
<td>Environmental Issues</td>
<td>Protection and preventive measures</td>
<td>Locations/ Project phase</td>
<td>Mitigation cost</td>
<td>Institutional Responsibility Implement</td>
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<tr>
<td>(c)</td>
<td>All vehicles and equipment used in construction shall be fitted with exhaust silences. During routine servicing operations, the effectiveness of exhaust silencers shall be checked and if found to be defective shall be replaced. Notwithstanding any other conditions of contract, noise level from any item of plant(s) must comply with the relevant legislation for levels of sound emission. Non-compliant plant shall be removed from site. (See Annexure 8)</td>
<td>All equipment, machinery and vehicles used for underground drainage improvement works</td>
<td>Engineering cost</td>
<td>-do-</td>
</tr>
<tr>
<td>(d)</td>
<td>Noise limits for construction equipment used in this project (measured at one meter from the edge of the equipment in free field) such as compactors, rollers, front loaders, concrete mixers, cranes (moveable), vibrators and saws shall not exceed 75 dB(A ).</td>
<td></td>
<td>-do-</td>
<td>-do-</td>
</tr>
<tr>
<td>(e)</td>
<td>Maintenance of vehicles, equipment and machinery shall be regular and proper, to the satisfaction of the Engineer, to keep noise from these at a minimum.</td>
<td>-do-</td>
<td>Engineering cost</td>
<td>-do-</td>
</tr>
<tr>
<td>(f)</td>
<td>Workers in vicinity of strong noise, and workers working with or in crushing, compaction, batching or concrete mixing operations shall be provided with protective gear. Refer safety section 1.12 and 1.13</td>
<td>-do-</td>
<td>Engineering cost</td>
<td>-do-</td>
</tr>
<tr>
<td><strong>1.6.2 Vibration</strong></td>
<td></td>
<td>-do-</td>
<td>-do-</td>
<td>Contractor PMU,SC</td>
</tr>
<tr>
<td>(a)</td>
<td>Contractor shall take appropriate action to ensure that construction works do not result in damage to adjacent properties due to vibration.</td>
<td>Underground drainage rehabilitation areas 1. Yatinuwara Brick Masonry Drain 2. Meda Ela Drainage</td>
<td>-do-</td>
<td>Contractor PMU,SC</td>
</tr>
<tr>
<td>Environment al Issues</td>
<td>Protection and preventive measures</td>
<td>Locations/ Project phase</td>
<td>Mitigatio n cost</td>
<td>Institutional Responsibility</td>
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<tr>
<td></td>
<td>3. Bogambara Outfall Drain</td>
<td>-do-</td>
<td>-do-</td>
<td>-do-</td>
</tr>
<tr>
<td>(b)</td>
<td>Prior to commencement of the activities with regard to the underground tunnel, a pre-construction crack survey of permanent structures shall be carried out along the tunnel trace 15 m on either side of the centerline and 15 m radius of the each working shafts. This pre-condition crack survey should be a well-documented detailed survey including all existing cracks of the structures with sketch of the building including photographic evidences and should be approved by the Engineer prior to work commencing on sites.</td>
<td>-do-</td>
<td>-do-</td>
<td>-do-</td>
</tr>
<tr>
<td>(c)</td>
<td>If dynamite blasting is required, Contractor shall carry out monitoring at the nearest vibration sensitive receptor during blasting or when other equipments causing vibration are used.</td>
<td>-do-</td>
<td>-do-</td>
<td>-do-</td>
</tr>
<tr>
<td>(d)</td>
<td>The contractor shall modify the method of construction until compliance with the criteria, if vibration levels exceed the relevant vibration criteria.</td>
<td>-do-</td>
<td>-do-</td>
<td>-do-</td>
</tr>
<tr>
<td>(e)</td>
<td>Contractor shall pay due consideration on vibration impacts of blasting on adjoining structures. Explosive loads shall be determined so that excessive vibration can be avoided and blasts shall be controlled blasting in nature. Notwithstanding to these provisions contractor is liable for any damage caused by blasting work. This is only if dynamite blasting is required. Otherwise this section will not apply.</td>
<td>-do-</td>
<td>-do-</td>
<td>-do-</td>
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</tbody>
</table>

1.7 Application of Shotcrete (to repair the drainage damage surfaces)
<table>
<thead>
<tr>
<th>Environment al Issues</th>
<th>Protection and preventive measures</th>
<th>Locations/ Project phase</th>
<th>Mitigatio n cost</th>
<th>Institutional Responsibility</th>
<th>Implement</th>
<th>Supervision</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a)</td>
<td>All workings where shotcrete application is conducted in underground drainages must install adequate water spray system/water curtain option for dust control and to avoid hazardous levels of respirable dust to be liberated into the work environment, potentially exposing workers.</td>
<td>Underground drainage rehabilitation areas 1. Yatinuwara Brick Masonry Drain 2. Meda Ela Drainage 3. Bogambara Outfall Drain</td>
<td>Engineeri ng cost</td>
<td>Contractor</td>
<td>PMU,SC, KMC</td>
<td></td>
</tr>
<tr>
<td>(b)</td>
<td>The contractor shall demonstrate acceptable performance of equipment/machineries and personnel prior to placement of any shotcrete as a precautionary measure to avoid dispersion of dust particles into the air</td>
<td>-do-</td>
<td>Engineeri ng cost</td>
<td>Contractor</td>
<td>PMU,SC, KMC</td>
<td></td>
</tr>
<tr>
<td>(c)</td>
<td>Contractor shall take all measures reasonably necessary in the circumstances to protect workers from exposure to shotcrete dust because of the storage, handling, processing or use of such shotcrete in the workplace</td>
<td>-do-</td>
<td>Engineeri ng cost</td>
<td>Contractor</td>
<td>PMU,SC, KMC</td>
<td></td>
</tr>
<tr>
<td>(d)</td>
<td>Personnel engaged in the application of shotcrete/sprayed concrete should wear the personal protective equipment (impact-resistant goggles, helmet, gloves, breathing apparatus, ear defenders, safety boots, full body clothing) and it must be ensured that no entry to unprotected, freshly sprayed areas.</td>
<td>-do-</td>
<td>Engineeri ng cost</td>
<td>Contractor</td>
<td>PMU,SC, KMC</td>
<td></td>
</tr>
</tbody>
</table>

1.8 Formation of GRP Manholes

<table>
<thead>
<tr>
<th>Environment al Issues</th>
<th>Protection and preventive measures</th>
<th>Locations/ Project phase</th>
<th>Mitigatio n cost</th>
<th>Institutional Responsibility</th>
<th>Implement</th>
<th>Supervision</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a)</td>
<td>Contractor shall install the trash screens within manholes ensuring the reduction of accumulation of debris while allowing ease of</td>
<td>Manhole (MH) Locations at CH 0+026 -MH 1</td>
<td>Engineeri ng cost</td>
<td>Contractor</td>
<td>PMU,SC, KMC</td>
<td></td>
</tr>
</tbody>
</table>
### Environmental Issues

#### Protection and preventive measures

- access to regular maintenance activities (See annexure for locations).

#### Locations/Project phase

<table>
<thead>
<tr>
<th>CH 0+075 - MH 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH 0+198 - MH 3</td>
</tr>
<tr>
<td>CH 0+317 - MH 4</td>
</tr>
<tr>
<td>CH 0+395 - MH 5</td>
</tr>
<tr>
<td>CH 0+489 - WS 5</td>
</tr>
<tr>
<td>CH 0+535 - MH 6</td>
</tr>
<tr>
<td>CH 0+559 - WS 5</td>
</tr>
<tr>
<td>CH 0+579 VS 1</td>
</tr>
<tr>
<td>CH 0+642 – MH 7</td>
</tr>
<tr>
<td>CH 0+192 - MH 8</td>
</tr>
<tr>
<td>CH 0+288 - MH 9</td>
</tr>
<tr>
<td>CH 0+338 VS 2</td>
</tr>
<tr>
<td>CH 0+364 - MH 10</td>
</tr>
</tbody>
</table>

#### Mitigation cost

- do-

#### Institutional Responsibility

- Contractor: PMU, SC, KMC

### 1.9 Impacts to Flora

#### 1.9.1 Loss or Damage to Trees and Vegetation

- (a) All works shall be carried out in a manner that the destruction to the flora and their habitats is minimized. Trees and vegetation shall be felled/removed only if that impinges directly on the permanent works or necessary temporary works. In all such cases contractor shall take prior approval from the Engineer.

- Underground drainage rehabilitation areas

- Contractor: PMU, DS, DoF, CEA, SC

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Strategic Cities Development Project  Page 59
<table>
<thead>
<tr>
<th>Environment Issues</th>
<th>Protection and preventive measures</th>
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<th>Mitigation cost</th>
<th>Institutional Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.9.2 Chance found important Flora</td>
<td>During construction, if a rare/threatened/endangered flora species is found, it shall be immediately informed to the PMU by the contractor. All activities that could destroy such flora and/or its habitat shall be stopped with immediate effect. Such activities shall be started only after obtaining the Engineer's approval. Contractor shall carry out all activities and plans that the Engineer instructed him to undertake to conserve such flora and/or its habitat.</td>
<td>Underground drainage rehabilitation areas</td>
<td>-</td>
<td>Contractor PMU, DoF, DWLC, SC</td>
</tr>
</tbody>
</table>

<table>
<thead>
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<td>During construction, if a rare/threatened/endangered flora species is found, it shall be immediately informed to the PMU by the contractor. All activities that could destroy such flora and/or its habitat shall be stopped with immediate effect. Such activities shall be started only after obtaining the Engineer's approval. Contractor shall carry out all activities and plans that the Engineer instructed him to undertake to conserve such flora and/or its habitat.</td>
<td>Underground drainage rehabilitation areas</td>
<td>-</td>
<td>Contractor PMU, DoF, DWLC, SC</td>
</tr>
</tbody>
</table>
### Environmental Issues

#### Protection and preventive measures

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<thead>
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<th>Mitigation cost</th>
<th>Institutional Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.10. Impact on Fauna</td>
<td>2. Meda Ela Drainage</td>
<td></td>
<td>Contractor</td>
</tr>
<tr>
<td>1.10.1 Loss, Damage or Disruption to Fauna</td>
<td>3. Bogambara Outfall Drain</td>
<td></td>
<td>PMU, DWLC/DoF, SC</td>
</tr>
<tr>
<td>(a) All works shall be carried out in such a manner that the destruction or disruption to the fauna and their habitats is minimum.</td>
<td>Underground drainage rehabilitation areas</td>
<td></td>
<td>Contractor</td>
</tr>
<tr>
<td></td>
<td>1. Yatinuwara Brick Masonry Drain</td>
<td></td>
<td>PMU, DWLC/DoF, SC</td>
</tr>
<tr>
<td></td>
<td>2. Meda Ela Drainage</td>
<td></td>
<td>Contractor</td>
</tr>
<tr>
<td></td>
<td>3. Bogambara Outfall Drain</td>
<td></td>
<td>PMU, DWLC/DoF, SC</td>
</tr>
<tr>
<td>(b) Construction workers shall be instructed to protect fauna including wild animals and aquatic life as well as their habitats. Hunting, poaching and unauthorized fishing by project workers is not allowed.</td>
<td>-do-</td>
<td>Contractor</td>
<td></td>
</tr>
</tbody>
</table>

#### Chance found important Fauna

| (a) During construction, if a rare/threatened/endangered fauna species is found, it shall be immediately informed to the PMU by the contractor. All activities that could destroy such fauna and/or its habitat shall be stopped with immediate effect. Such activities shall be started only after obtaining the Engineer’s approval. Contractor | -do- | Contractor                  |

| 1.10.2 Chance found important Fauna |  - | Contractor                  |
| (b) | -do- | Contractor                  |

---

Strategic Cities Development Project  Page 61
<table>
<thead>
<tr>
<th>Environment Issues</th>
<th>Protection and preventive measures</th>
<th>Locations/Project phase</th>
<th>Mitigation cost</th>
<th>Institutional Responsibility Implement</th>
<th>Supervision</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.11 Disruption to Users</td>
<td>shall carry out all activities and plans that the Engineer instructed him to undertake to conserve such fauna and/or its habitat.</td>
<td></td>
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</tr>
<tr>
<td>1.11.1 Loss of Access</td>
<td>At all times, the Contractor shall provide safe and convenient passage for vehicles, pedestrians and livestock to and from side the road and property accesses connecting the project specially at the manholes rehabilitation and construction points. Work that affects the use of side roads and existing accesses shall not be undertaken without providing adequate provisions to the prior satisfaction of the Engineer. (See annexure 4 for Locations and Designs)</td>
<td>Manhole (MH) Locations at CH 0+026 - MH 1 CH 0+075 - MH 2 CH 0+198 - MH 3 CH 0+317 - MH 4 CH 0+395 - MH 5 CH 0+489 - WS 5 CH 0+535 - MH 6 CH 0+559 - WS 5 CH 0+579 VS 1 CH 0+642 - MH 7 CH 0+192 - MH 8 CH 0+288 - MH 9 CH 0+338 VS 2 CH 0+364 - MH 10</td>
<td>Engineering cost</td>
<td>Contractor</td>
<td>PMU/SC</td>
</tr>
<tr>
<td>1.11.2 Traffic Jams &amp; Congestion</td>
<td>Detailed Traffic management Plans shall be prepared in consultation with Traffic Division of the Kandy Police Station and the Kandy Municipal Council and submitted to the Engineer for approval 5 days prior to commencement of works specially in the working shafts and manhole locations. The traffic management</td>
<td>-do-</td>
<td>-</td>
<td>Contractor</td>
<td>PMU, RDA LA, Police</td>
</tr>
<tr>
<td>Environmental Issues</td>
<td>Protection and preventive measures</td>
<td>Locations/ Project phase</td>
<td>Mitigation cost</td>
<td>Institutional Responsibility Implement</td>
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<td>plans shall contain details of temporary diversions, special arrangements to deal with rush hours specially during school hours and details of arrangements for construction under traffic details of traffic arrangements after secession of work each day, transport routes and times for construction vehicles. In order to ease traffic within the city, transport of construction material and machinery will be done prior to 6.00 am and after 6.00 pm. If directed by the Engineer the contractor shall obtain the consent for the traffic arrangement from the Police Traffic Division, Kandy.</td>
<td>-do-</td>
<td>-</td>
<td>-do-</td>
<td>-do-</td>
</tr>
<tr>
<td>(b)</td>
<td>Special consideration shall be given in the preparation of the traffic control plan to the safety of pedestrians and workers at night.</td>
<td>-do-</td>
<td>-</td>
<td>-do-</td>
<td>-do-</td>
</tr>
<tr>
<td>(c)</td>
<td>The contractor shall ensure that the road surface is always properly maintained, particularly during the monsoon so that no disruption to the traffic flow occurs.</td>
<td>-do-</td>
<td>Engineeri ng cost</td>
<td>-do-</td>
<td>-do-</td>
</tr>
<tr>
<td>(d)</td>
<td>The temporary traffic detours shall be kept free of dust by frequent application of water.</td>
<td>-do-</td>
<td>-do-</td>
<td>-do-</td>
<td>-do-</td>
</tr>
<tr>
<td>(e)</td>
<td>Personnel used for traffic control by the contractor shall be properly trained, provided with proper gear including communication equipment, luminous jackets for night use. All signs, barricades, pavement markings used for traffic management should be to the standards and approved by the Engineer/ Police.</td>
<td>-do-</td>
<td>-do-</td>
<td>-do-</td>
<td>-do-</td>
</tr>
<tr>
<td>(f)</td>
<td>The manual of traffic control devices of RDA Should be followed during construction period in order to ensure the safety and traffic control.</td>
<td>-do-</td>
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<td>-do-</td>
<td>-do-</td>
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</tbody>
</table>
## 1.12 Traffic Control and Safety

(a) The Contractor shall take all necessary measures for the safety of traffic during construction and provide, erect and maintain such barricades, including signs, markings, flags, lights and flagmen as may be required by the Engineer for the information and protection of traffic approaching or passing through the manhole locations under improvement. The provision of traffic safety measures shall be considered incidental to work and follow The Institute for Construction Training and Development (ICTAD) guidelines and instructions given by the Police, if any.

(b) Informing the public through newspapers/announcements/radio/TV etc. about the construction activities in order to avoid any inconveniences due to the construction activities.

(c) Provide information and boards at each entry and exit points of the manhole locations as specified in the social document. Basic info – times of closure, diversion routes etc.

## 1.12 Accidents and Risks

### 1.12.1 Public and Worker Safety

(a) All reasonable precautions will be taken to prevent danger of the workers and the public from accidents such as fire, explosions, blasts, falling rocks, falling to excavated pits, chemical sprays, unsafe power supply lines etc.

(b) The Contractor shall comply with requirements for the safety of the workmen as per the international labor organization (ILO) convention No. 62 and Safety and Health regulations of the Factory Ordinance of Sri Lanka to the extent that those are applicable to this contract. The contractor shall supply all necessary safety appliances such as safety goggles, helmets, masks, boots, etc., to the workers.
<table>
<thead>
<tr>
<th>Environment Issues</th>
<th>Protection and preventive measures</th>
<th>Locations/Project phase</th>
<th>Mitigation cost</th>
<th>Institutional Responsibility Implement</th>
<th>Supervision</th>
</tr>
</thead>
<tbody>
<tr>
<td>and staff. The contractor has to comply with all regulations regarding safe scaffolding, ladders, working platforms, gangway, excavations, trenches and safe means of entry</td>
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<tr>
<td>1.12.2 <strong>Prevention of Risks due to Electrocution</strong></td>
<td>All electrical wiring and supply related work should confirm to British Standards (BS) or relevant Sri Lankan Standards. Adequate precautions will be taken to prevent danger of electrocuting from electrical equipment and power supply lines including distribution boards, transformers, etc. Measures such as danger signboards, danger/red lights, fencing and lights will be provided to protect the public and workers. All electric power driven machines to be used in the construction shall be free from defect, be properly maintained and kept in good working order, be regularly inspected and as per BS provisions and to the satisfaction of the Engineer.</td>
<td>Construction areas, material storage and worker camps</td>
<td>Engineering cost</td>
<td>Contractor PMU, SC, KMC</td>
<td></td>
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<tr>
<td>1.12.3 <strong>Prevention of Risks at Hazardous Activities in underground drainage</strong></td>
<td>(a) All workers employed in hazardous activities shall be provided with necessary protective gear. These activities include mixing asphalt material, cement, lime mortars, concrete etc., welding work, work at crushing plants, blasting work, operators of machinery and equipment such as power saws, etc.</td>
<td>Drainage Rehabilitation/Manhole Construction areas, material storage and worker camps</td>
<td>Engineering cost</td>
<td>Contractor PMU, SC, KMC</td>
<td></td>
</tr>
<tr>
<td>(b) The use of any toxic chemicals such as shotcrete shall be strictly in accordance with the manufacturer’s instructions. The Engineer shall be notified of toxic chemicals that are planned to be used in all contract related activities. A register of all toxic chemicals delivered to the site shall be kept and maintained up to date by the Contractor. The register shall include the trade name, physical properties and</td>
<td></td>
<td>Drainage Rehabilitation/Manhole Construction areas, material storage and worker camps</td>
<td>Engineering cost</td>
<td>Contractor PMU, SC, KMC</td>
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<tr>
<td>Environmental Issues</td>
<td>Protection and preventive measures</td>
<td>Locations/Project phase</td>
<td>Mitigation cost</td>
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<td></td>
<td>characteristics, chemical ingredients, health and safety hazard information, safe handling and storage procedures, and emergency and first aid procedures for the product.</td>
<td>storage and worker camps</td>
<td>-</td>
<td>Contractor SC/PMU</td>
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</tr>
<tr>
<td>1.12.4 Lead Pollution</td>
<td>(a) No paint containing lead or lead products will be used except in the form of paste or readymade paint. Facemasks shall be supplied to workers who are working in spray painting or scraping lead paints.</td>
<td>Workshops, yards where spray painting is done</td>
<td>-</td>
<td>Contractor SC/PMU</td>
<td></td>
</tr>
<tr>
<td>1.12.5 Handling of Explosives</td>
<td>(a) Except as provided in the contract or ordered or authorized by the Engineer, the Contractor shall not use explosives. Where the use of explosives is so provided or ordered or authorized, the Contractor shall comply with the requirements of the following Sub-Clauses of this Clause besides the law of the land as applicable.</td>
<td>Drainage Rehabilitation/Manhole Construction areas, material storage and worker camps</td>
<td>Engineer ing cost</td>
<td>Contractor PMU, SC, KMC</td>
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<td></td>
<td>The Contractor shall at all times take every possible precaution and shall comply with relevant laws and regulations relating to the importation, handling, transportation, storage and use of explosives. Contractor shall obtain Ministry of Defense (MoD) approval for importing and handling explosives and keep the Local Police informed of the same.</td>
<td>-do-</td>
<td>Engineer ing cost</td>
<td>Contractor PMU, SC, KMC</td>
<td></td>
</tr>
<tr>
<td>1.13 Health and Safety</td>
<td>1.13.1 Prevention of Vector based Diseases</td>
<td>At worker camps, stores, yards</td>
<td>Engineer ing cost</td>
<td>Contractor SC/PMU, LA</td>
<td></td>
</tr>
<tr>
<td>Environment al Issues</td>
<td>Protection and preventive measures</td>
<td>Locations/ Project phase</td>
<td>Mitigatio n cost</td>
<td>Institutional Responsibility</td>
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<td>chemicals to destroy mosquitoes and larvae should be regularly applied.</td>
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<td></td>
<td>All burrow sites should be rehabilitated at the end of their use by the contractor in accordance with</td>
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<td>-do-</td>
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<td>the requirements/guidelines issued by the Central Environmental authority and relevant local authorities</td>
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<td></td>
<td>(b) Contractor shall keep all places of work, labour camps, plus office and store buildings clean</td>
<td>Drainage Rehabilitation/</td>
<td>-</td>
<td>Contractor</td>
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<td>devoid of garbage to prevent breeding of rats and other vectors such as flies.</td>
<td>Manhole Construction</td>
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<td>SC/PMU</td>
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<td>areas, Worker Camps and</td>
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<td></td>
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<td>storage sites</td>
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<tr>
<td>1.13.2 Workers Health and Safety</td>
<td></td>
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<tr>
<td></td>
<td>(a) Contractor shall comply with the provisions in Health and Safety regulations under the Factory Ordinance with regard to provision of health and safety measures and amenities at work place(s).</td>
<td>Drainage Rehabilitation/</td>
<td>Engineeri ng cost</td>
<td>Contractor</td>
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<td>Manhole Construction</td>
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<td>SC, PMU, LA</td>
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<td>areas, Labour Camps and</td>
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<td>storage sites</td>
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<td>1.13.3 First Aid</td>
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<td>(a) At every workplace, first aid kit shall be provided as per the regulations. At every workplace an</td>
<td>Drainage Rehabilitation/</td>
<td>-</td>
<td>Contractor</td>
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<td></td>
<td>ambulance room containing the prescribed equipment and nursing staff shall be provided.</td>
<td>Manhole Construction</td>
<td></td>
<td>SC, PMU, LA</td>
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<td></td>
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<td>areas, Labour Camps and</td>
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<td></td>
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<td>storage sites</td>
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<tr>
<td>1.13.4 Potable Water</td>
<td></td>
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<td>-do-</td>
<td>-do-</td>
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<tr>
<td></td>
<td>(a) In every workplace and labour camps portable water shall be available throughout the day in</td>
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<td>-do-</td>
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<td></td>
<td>sufficient quantities.</td>
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<tr>
<td>Environment al Issues</td>
<td>Protection and preventive measures</td>
<td>Locations/ Project phase</td>
<td>Mitigation cost</td>
<td>Institutional Responsibility Implement</td>
<td>Supervision</td>
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<tr>
<td>1.14 Protection of Archeological Properties</td>
<td>Prevention of damage to Cultural and Religious Places and Properties</td>
<td>Near physical cultural resources</td>
<td>-</td>
<td>Contractor PMU, SC, KMC &amp; Department of Archeology, religious leaders</td>
<td></td>
</tr>
<tr>
<td>1.14.1 Prevention of damage to Cultural and Religious Places and Properties</td>
<td>(a) During construction activities the contractor should take all necessary and adequate care to minimize impacts on cultural properties which includes cultural sites and remains, places of worship. Workers should not be allowed to trespass in to such areas.</td>
<td>-</td>
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<tr>
<td>1.14.2 Chance found Archaeological property</td>
<td>(a) All fossils, coins, articles of value of antiquity and structures and other remains or things of geological or archaeological interest etc. discovered on the site and/or during construction work shall be the property of the Government of Sri Lanka, and shall be dealt with as per provisions of Antiquities Ordinance of 1940 (Revised in 1956 &amp; 1998)</td>
<td>Drainage Rehabilitation/ Manhole Construction areas</td>
<td>-</td>
<td>Contractor PMU, SC, KMC &amp; Department of Archeology, religious leaders</td>
<td></td>
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<tr>
<td></td>
<td>(b) The contractor shall take reasonable precaution to prevent his workmen or any other persons from removing and damaging any such article or thing and shall, immediately upon discovery thereof and before removal acquaint the Engineer of such discovery and carry out the Engineer’s instructions for dealing with the same, awaiting which all work shall be stopped within 100m in all directions from the site of discovery.</td>
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<td>Engineer ing cost</td>
<td>-</td>
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<td></td>
<td>(c) If directed by the Engineers the Contractor shall obtain advice and assistance from the Department of Archaeological of Sri Lanka on conservation measures to be taken with regard to the artifacts prior to recommencement of work in the area.</td>
<td>-</td>
<td>Engineer ing cost</td>
<td>-</td>
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</tr>
</tbody>
</table>
1.15 Environmental Enhancement

(a) On completion of the works, the temporary structures shall be cleared away in full, all rubbish burnt, waste dumps and septic tank shall be filled and closed and roadsides, workplaces and labour camps, cleared and cleaned.

1.16 Handling Environmental Issues during Construction

(a) The Contractor will appoint a suitably qualified Environmental Safeguard Officer following the award of the contract. The Environmental Safeguard Officer will be the primary point of contact for assistance with all environmental issues during the pre-construction and construction phases. He/ She shall be responsible for ensuring the implementation of EMP.

(b) The Contractor shall direct the Environmental Safeguard Officer responsible for community liaison and to handle public complaints regarding environmental/ social related matters. All public complaints will be entered into the Complaints Register. The Environmental safeguard Officer will promptly investigate and review environmental complaints and implement the appropriate corrective actions to arrest or mitigate the cause of the complaints. A register of all complaints is to be passed to the Engineer within 24 hrs they are received, with the action taken by the Environmental safeguard Officer on complaints thereof.

(c) Contractor shall develop suitable method to receive complaints. The complaint register shall be placed at a convenient place, easily accessible by the public.
## Grievance Redress Mechanism

Grievances are inevitable during the entire construction period. Grievances submitted in writing shall be referred to the PMU by the safeguard officer of the Contractor through the Engineer. Verbal communications shall be directed to PMU through Engineer. Contact information of Engineer/PMU/KMC in print form shall be available at the site.

The grievances shall be submitted to the Engineer on the same day of receiving. It has to be recorded and the safeguard officer of the Engineer shall ensure the timely redress through the PMU.

<table>
<thead>
<tr>
<th>Environment al Issues</th>
<th>Protection and preventive measures</th>
<th>Locations/Project phase</th>
<th>Mitigation cost</th>
<th>Institutional Responsibility</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Contractor shall prepare detailed Environmental Method Statement (EMS) clearly stating the approach, actions and manner in which the EMP is implemented within a month of mobilization. It is required from the contractor to prepare the EMS for each work site, if work will be carried out at more than one site at once and time plan for implementation. The EMS shall be updated regularly and submit for Engineers review.</td>
<td>Masonry Drain</td>
<td>Throughout the project construction period</td>
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<tr>
<td></td>
<td>2. Meda Ela Drainage</td>
<td>-</td>
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<td>-do-</td>
</tr>
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<td></td>
<td>3. Bogambara Outfall Drain</td>
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<td>-do-</td>
</tr>
<tr>
<td>(d)</td>
<td>Grievance Redress Mechanism</td>
<td>SC/KMC/PMU</td>
<td>-</td>
<td>-do-</td>
</tr>
</tbody>
</table>
8. Cost of Mitigation

<table>
<thead>
<tr>
<th>Cost Item</th>
<th>Unit</th>
<th>Quantity</th>
<th>Rate</th>
<th>Estimated Amount (LKR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  Provision of drains required to divert water flows, storm water and</td>
<td>Item</td>
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<tr>
<td>wastewater mgt, etc</td>
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<tr>
<td>2  Obtaining Approvals such as night-time works, CEA clearances, etc</td>
<td>PS</td>
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<td>50,000.00</td>
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<tr>
<td>(if required)</td>
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<tr>
<td>3  Arrange proper dust barriers especially closer to sensitive areas</td>
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<td>such as religious places, schools and highly residential areas. Proper</td>
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<td>dust barriers are required in all manhole locations.</td>
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<td>4  Making silt traps closer to water sources to reduce erosion</td>
<td>Item</td>
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<tr>
<td>5  Preparation of disposal yards, operation &amp;</td>
<td>Item</td>
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<td>maintenance and landscaping after construction</td>
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<tr>
<td>6  Use of thick polythene sheets to cover temporary soil piles (if</td>
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<td>available) left at the site for a long time</td>
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</table>
and use of tarpaulin sheets to cover materials when transporting the materials

7 Information disclosure among the residents, commercial establishments and small, medium & large industries residing around the immediate vicinity of Meda Ela; provide them with information on the project activities

<table>
<thead>
<tr>
<th>Item</th>
<th>PS</th>
<th>12 Months</th>
<th>600,000.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safeguard Monitoring - Recruitment of Dedicated Environmental Safeguard Officer</td>
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</table>

Other than above mentioned line items of cost of mitigation related to environment safeguards, all the other line items are included in the Engineering Bill of Quantities.

9. Conclusion and Screening Decision

Summary of environmental effects:

Assuming that all mitigation measures are implemented as proposed, the following effects can be predicted

<table>
<thead>
<tr>
<th>Key project activities</th>
<th>Potential Environmental Effects</th>
<th>Significance of environmental effect with mitigation in place</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>N/S - Effect not significant, or can be rendered insignificant with mitigation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SP - Significant positive effect</td>
</tr>
<tr>
<td>Activity</td>
<td>Description</td>
<td>SN/U</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>Siting of Construction Camps</td>
<td>If construction camps, labor camps, stock yards, vehicle refuelling areas etc. are located near sensitive areas such as wetlands, conservation zones and places of scenic beauty or recreational value, or any waterbody, those areas may be adversely affected. Social problems owing to alien labour gangs. E.g. communal diseases.</td>
<td>N/S</td>
</tr>
<tr>
<td>Removal of public utilities</td>
<td>If any relocation of utility services (temporary or permanently) be required such as electricity, water supply, telecom, etc., and therefore, there may be fugitive dust and high noise levels will be emanated from machinery and equipment being used. Localized ponding/inundation due to disruption to existing drainage paths and erosion risk inconvenience to public due to temporary interruption of services. This is potential undertake as there are large number houses, industries, public places, etc for which utility services must have been provided.</td>
<td>N/S</td>
</tr>
<tr>
<td>Demolition of structures</td>
<td>Removal or demolition of structures and rebuilding of structures particularly along underground drainage paths and objectionable or obstructions materials along the construction boundary and rebuilding of boundary of such structures may create air pollution in terms of suspended particulate matters. Erosion risk due to exposed slopes, disruption to existing drainage paths, washout of fines and silting of waterways, local earth slips due to soil over saturation.</td>
<td>S/N</td>
</tr>
<tr>
<td>Planning of temporary traffic arrangements</td>
<td>Manhole constructions, excavations along underground drainage paths, material transport and sediment transport may cause temporary disruption to road traffic. Full closure of surrounding roads is not anticipated but, temporary traffic congestion on the road may affect the roads.</td>
<td>U</td>
</tr>
<tr>
<td>Cut &amp; Fill Activities</td>
<td>High noise and vibration levels are likely from equipment and machinery. Impacts are temporary in nature.</td>
<td>U</td>
</tr>
<tr>
<td><strong>Solid and Hazardous Waste Management</strong></td>
<td>Desilting and rehabilitation of underground drain bottom will generate a mixed spoilage consisting of solid waste and sediments from drained. Stockpiling of such excavated material may block surface drainage paths causing localized flooding during construction period. If not properly stored and adequately covered washout of fine material may contribute to further deterioration of surface water quality in the canal as well as other water bodies such as Mahaweli Ganga, and may increase risk of siltation and blockage of structures. If not properly disposed the excavated material will pollute water sources at location where it is disposed.</td>
<td>S/N</td>
</tr>
<tr>
<td><strong>Transportation and storage of construction materials</strong></td>
<td>Transportation of material and equipment will cause dust, noise and vehicle emissions along the canal. Storage of construction material will lead to access issues</td>
<td>N/S</td>
</tr>
<tr>
<td><strong>Demolition or Removal of structures</strong></td>
<td>Removal or demolition of structures and rebuilding of structures particularly along underground drains and objectionable or obstructions materials along the construction boundary and rehabilitation of boundary of such structures may create air pollution in terms of suspended particulate matters. Erosion risk due to exposed slopes, disruption to existing drainage paths, washout of fines and silting of waterways, local earth slips due to soil over saturation.</td>
<td>U</td>
</tr>
<tr>
<td><strong>Movement of vehicles, equipment and machineries</strong></td>
<td>Vehicles, Machineries and equipment’s cause air and noise pollution which could be a nuisance in populated areas.</td>
<td>N/S</td>
</tr>
</tbody>
</table>
10. EMP Implementation responsibilities and Costs

The overall responsibility of ensuring compliance with safeguard requirements lie with the PMU supported by the Supervision Consultant while the contractor will be responsible for implementing the provisions of the EMP. In addition, the PMU will be directly responsible for reviewing the proposed design to ensure that all design related mitigation measures mentioned herein are implemented. The overall supervision will be carried out by the supervision consultant appointed by the PMU. Additionally in-house staff of the PMU supported by the Engineer responsible for overall monitoring of the proposed sub-project. Any consequent design modification will be reflected in the project cost.

Environmental monitoring will be carried out largely through visual observations and compliance monitoring using the Environmental Monitoring Data Sheet provided by the PMU. The Environmental Safeguard Officer of the contractual party is expected to carry out field visit on weekly basis and shall report the issues and performance on EMP implementation to the PMU.

11. Screening decision recommendation

Potential environmental impacts can be classified as general construction related impacts and can be mitigated on site with known technology. Standalone environmental assessment is not required and the environmental management plan provided with this report would be sufficient to mitigate the identified impacts. The project will not also influence significantly on the natural surroundings of the locality.

Considering the physical characteristics of the area and the proposed interventions, most of the environmental impacts described in the EMP caused by project activities are not expected to have any significant or irreversible impact and are related to dust/noise generation, siltation, safety hazards, traffic congestion and other general impacts which can be mitigated with good construction, site management and public safety practices. The areas affected during rehabilitation work are mainly confined to the Man Hole locations and main construction sites proposed along the Yatinuwara Street and Sri Wickrama Rajasinghe Mawatha

Construction has to be encouraged during the dry and night shifts in order to minimize the traffic congestions and disturbances to the business places as the project area is situated in Kandy Central Business District (Grid City) and no any residential areas within the project area.

Hazardous materials should be handled by competent authorities who are registered with CEA.

Given the above, it is considered that a standalone EIA is not needed for the proposed project and that the EMP thus prepared is suffice to manage the potentially adverse impacts.
12. Details of Persons Responsible for Environmental Screening

<table>
<thead>
<tr>
<th>Screening report completed by</th>
<th>Date 01.09.2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deepthi Bandara</td>
<td></td>
</tr>
<tr>
<td>Assistant Project Director (Envt)</td>
<td>0716860669</td>
</tr>
<tr>
<td>Name/Designation/Contact information</td>
<td></td>
</tr>
<tr>
<td>Signature</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Screening report reviewed by</th>
<th>Date 01.09.2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gangadari Ranawaka</td>
<td></td>
</tr>
<tr>
<td>Deputy Project Director (Envt)</td>
<td><a href="mailto:gangadariscdp@gmail.com">gangadariscdp@gmail.com</a></td>
</tr>
<tr>
<td>Name/Designation/Contact information</td>
<td></td>
</tr>
<tr>
<td>Signature</td>
<td></td>
</tr>
</tbody>
</table>
Annex 1: Location Map of the Project Area
Annex 2: Geology and Soil Map of the Project Area
Annex 3: Environmental Sensitive Areas of Kandy
Annex 4: Locations for the Manhole
Drawings of Typical Manhole Types:
Annexure 5:
5 a: Summary of Procedure to Obtain Mining License for Borrow Pit Operation

1. Identify the site and verify ownership (land clearing)
2. Obtain letters of consent from the owners (Private / Government)
3. Contractor applies for site clearance from CEA
4. CEA may request a IEE or EIA to be carried out by the contractor
5. CEA gives clearance.
6. Contractor applies for Mining License (IML/A, IML/B or IML/C) from GSMB.
7. GMSB conducts joint inspection with a committee comprising with CEA, DS, and PS.
8. Contractor has to make bank guarantee specified by the GSMB based on the situation of the land, prior to issuing Mining License.
9. Contractor applies for Trade License from PS

5 b: Burrow Pit Management Guidelines

1. Development Plans of Borrow Pit and Quarry

A detailed development plan will be prepared by the selected contractor before the starts of extraction of material from each borrow pit or quarry. Site development plans will augment this operations plan with specific details. These development plans will include:

- *Site layout and boundaries with the following provisions:*
  - Minimum setback of 31m from environmentally sensitive areas, a 100 m when feasible;
  - Adequate room for all activities;
  - Estimates of the resources to be extracted;
  - Re-fueling station with appropriate containment (if required);
  - Stockpiling location;
  - Dust and noise consideration;
  - Waste management;
  - Water management structures;
  - Sequence of operation;
  - Contractor involved in the operation;
  - Site operating procedures; and
  - Spill response procedures.

- *Monitoring:*
  - Pit wall stability (for quarry);
• Extent of permafrost or ground-ice;
• Wildlife interactions or sightings; and
• Contingencies if changes to the original development scenario are required.

• Reclamation:
  • Overburden replacement for site grading and re-contouring;
  • Reclamation of natural drainage;
  • Slope reconstruction;
  • Removal of all garbage and debris;
  • Removal of all temporary storages/structures/equipment;
  • Reclamation of access road and block access (if required); and
  • Replacement of all salvaged topsoil (if required).
2. Water Management

Site development must ensure positive drainage to prevent water pooling or flooding of the pit. The following measures will be implemented to enhance re-establishment of equilibrium and minimization of erosion and water ponding:

- Where possible, excavations will be minimized by utilizing above grade sources for material (hills and swales), which will minimize water collection and drainage disruption;

- Cut and fill areas will be stabilized by constructing gentle slopes less prone to erosion.

- Cut and fill areas are expected to be relatively small in horizontal and vertical extent. The side slopes of the borrow pits will be 1H:1V to 2H:1V, slightly gentler than natural slopes to reduce erosion;

- In low-lying areas where roadbed fill is in the order of 1m and permafrost can be expected to rise to a meaningful degree, swales or culverts will be installed as part of road maintenance to prevent water ponding;

- At closure, swales will be left in place, or alternatively, the road bed will be breached to allow drainage;

- Borrow activities will be concentrated in few areas to limit the area of disturbance;

- Thawed layers will be removed sequentially;

- Areas of unexpected settlement will be filled to re-establish natural contours and eliminate water ponding; and

- Borrow locations will be regularly inspected and unstable slopes regraded to eliminate depressions and re-establish natural drainage patterns.

3. Resource Extraction

Extraction methods will depend on the nature of the material, equipment used, and extent and nature of the permafrost.

Pits and quarries will not be excavated below the water table. If excavated material contains ground-ice, the material will be stored at a location in the pit where it can thaw and drain. Meltwater from such stockpiles must be treated for sediment control. Machinery and equipment used on the site will be serviced on a routine maintenance schedule to ensure proper operation and thus minimize emissions and noise. If fuel storage is required, fuel tanks must be double-walled and placed within a containment berm. A well-stocked spill response kit must be placed in the refueling area. Vehicles must be equipped with spill response kits and drip trays. Used oil and fuel must not be stored at the pit/quarry sites. A spill contingency plan must be in place for each quarry site. This plan outlines the logical order of how operators should respond to spills, resources available onsite for spill response, and notification procedures.

4. Closure

The abandonment of the Project works and site reclamation for the quarries and borrow pits will be undertaken at or before the close of the Project. The works will be integrated into the overall Project Abandonment and Reclamation Plan, although separate closure plans for each quarry and borrow pit
will be required. Closure of the Project will involve removing construction materials, equipment and infrastructure and reclaiming the site to self-sustaining productive ecosystem near its original condition.

In addition to the measures described above, the general abandonment and reclamation plans include the following:

- Dismantle and transport all fuel/chemical storage and handling infrastructure to an approved facility or for reuse where applicable;
- Dismantle and remove all buildings and related infrastructure;
- Any remaining concrete piles will be cut to below grade and covered with overburden.
- Dismantle water and sewage treatment plants for reuse or disposal at an approved facility;
- Remove all hazardous waste and explosives;
- Regrade as necessary to establish safe slopes and restore the natural drainage to the area; and
- Test soils and granular materials for hydrocarbon content; contaminated soils will be remediated.
Annex 6: Waste Management General Guidelines

1. General requirements

Priorities must be given for promoting source separation and sorted waste collection.

In the waste management plan priorities must be given on waste recycling and resource recovery and to reduce the amount of final disposal

The existing recommended colour code must be used for waste collecting bins and garbage bags. (Please see the Annexure A below)

When handling biodegradable waste and waste not containing any toxic contaminants priorities must be given for biological processing such as composting, anaerobic digestion or any other appropriate biological processing for stabilization of waste.

Land filling shall be encouraged to non-biodegradable, inert waste and other waste that are not suitable either for recycling or for biological processing.

Labour Ordinance, Factory Ordinance, other relevant regulations and guidelines stipulated by the Central Environmental Authority (CEA) approval procedures and relevant Local Authority approval procedures shall be followed. All designs shall comply with the requirements of relevant agencies. Operator should take adequate mitigatory measures to minimize possible pollution of air, water and soil.

Adequate training should be given to workers involved in solid waste management operations and operator should endeavor to involve trained workers as far as possible.

Any person wishing to operate a solid waste disposal (including transfer station, materials recovery, incineration, composting etc.) shall provide to the CEA the following information and any further information as may be requested by the CEA for approval procedure.

A topographic map showing the location and boundaries of the proposed site and land use within one Kilometer radius of the proposed site

A clear lay out plan with appropriate scale showing full details of the proposed locations for different activities.

The capacity of the facility, all machineries and equipment to be used in the facility, operating hours, number of working days, number of workers for each activity.

The details of the operation flow diagram for the proposed facility, origin, composition, and expected weight or volume of solid waste to be accepted as well as the projected waste quantity expected in future years.

2. Legal requirement

If any of the solid waste management facilities mentioned hereinafter meets the requirement of the Gazette (Extra Ordinary) No. 772/22 of 24th June 1993 and the subsequent amendments, then it shall follow the Environmental Impact Assessment Process in order to obtain the environmental clearance.

The noise levels shall be maintained at the boundaries of the site as stipulated in the Gazette (Extra Ordinary) No. 924/12 dated 23rd May 1996.
Effluents or leachate quality should be monitored and treated to conform to the standards /tolerance limits as mentioned in the CEA guidelines.

Prior approval for the building plan needs to be obtained from the relevant Local Authority

An environmental recommendation prior to initiate any activity and a permit for construction and operation of the facility shall be obtained from the CEA

3. Operational requirement

Authorized officer shall be on duty during operating and non-operating hours at the waste reception point to control unauthorized access. (This is not applicable in the case of Waste Collection System)

Any infectious waste or hazardous waste should not be accepted into the facility. A proper screening procedure or mechanism shall be established for preventing the solid waste from the infectious waste or hazardous waste that may be mixed.

Litter, insects, odour and vectors shall be controlled to prevent sanitary nuisance and unsightly appearance.

Adequate fire protection shall be installed and available at all times.

A contingency plan to cover the machine / vehicle breakdown or any operation interruptions and delay.

Attention should be given to collect and transport obnoxious waste separately as much as possible

4. Waste collection

4.1 Introduction

Waste collection is the act of picking up wastes at homes, businesses, institutions, commercial and industrial plants and other locations; loading them into a collection vehicle and hauling them to a facility for further processing or transfer to a disposal site. Collection of wastes is the one of the basic elements of any waste management system.

Collection of unseparated (commingled) and separated solid waste in an urban area is difficult and complex because the generation of wastes takes place in every house, every apartment building and commercial and individual facility as well as in the streets, parks, and even vacant areas. Therefore in any waste collection operation it is important to look into; types of waste collection services/systems, type of equipment to be used and associated labour requirements, collection routes etc.

Any person wishing to operate a waste collection system shall have the following information given under general requirements below.

4.2 General Requirements

The waste collection areas and transport routes, the number and type of the collection vehicles to be used, frequency of waste collection and the schedule for collection and transport.

4.3 Design Requirements

Specifications of all machineries, equipment and vehicles to be used in the facility. Type, numbers, capacities shall be detailed.
Collection vehicles shall be fully covered and leachate collection box shall also be prepared to prevent littering and leachate spill during transportation.

4.4 Operational Requirements

Heavily travelled roads should not be served or used during rush hours.

Any infectious waste or hazardous waste should not be accepted into the normal waste collection vehicles.

Daily records of the quantity of solid waste collected, the origin of waste, the quantity of solid waste transferred to disposal site, shall be maintained.

The Proposed Colour Codes for Garbage Bags

<table>
<thead>
<tr>
<th>Colour</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green Colour</td>
<td>Organic Waste</td>
</tr>
<tr>
<td>Blue Colour</td>
<td>Paper</td>
</tr>
<tr>
<td>Red Colour</td>
<td>Glass Bottles</td>
</tr>
<tr>
<td>Brown Colour</td>
<td>Metals / Coconut shells</td>
</tr>
<tr>
<td>Orange Colour</td>
<td>Plastic &amp; Polythene</td>
</tr>
</tbody>
</table>
## 5. Waste Management Best Practices

<table>
<thead>
<tr>
<th>Waste Type</th>
<th>Waste Materials</th>
<th>Trade Contractor</th>
<th>Waste Minimizations</th>
<th>Best Practice</th>
<th>Off-site Re-use/Recycling/Recovery</th>
<th>Disposal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inert</td>
<td>Concrete</td>
<td>Construction</td>
<td>Retention of concrete onsite where possible. Only order what is required.</td>
<td>Use as secondary aggregate on site.</td>
<td>Segregate for re-processing and reuse as recycled secondary aggregate.</td>
<td>Landfill and cover</td>
</tr>
<tr>
<td></td>
<td>Rubble (hardcore)</td>
<td>Construction</td>
<td>Only order what is required.</td>
<td>Opportunities to reuse cut material as fill in proposed noise bund</td>
<td>Segregate for reprocessing and reuse as recycled secondary aggregate.</td>
<td>Landfill and cover</td>
</tr>
<tr>
<td></td>
<td>Soil/Green waste/Vegetation</td>
<td>Construction</td>
<td>Opportunities to reuse cut material as fill in proposed noise bund</td>
<td></td>
<td></td>
<td>Landfill and cover</td>
</tr>
<tr>
<td></td>
<td>Mixed waste</td>
<td>Construction</td>
<td>Use of standard sizes. Arrange take back of unused materials with the supplier.</td>
<td>N/A</td>
<td>Segregate for reprocessing and reuse as recycled secondary aggregate.</td>
<td>Landfill/Incineration</td>
</tr>
<tr>
<td></td>
<td>Metal</td>
<td>Construction</td>
<td>Made to measure, correct ordering just in time delivery store correctly. Arrange take back of unused materials with the supplier.</td>
<td></td>
<td>Segregate for reprocessing and reuse as recycled secondary aggregate.</td>
<td>Landfill</td>
</tr>
<tr>
<td></td>
<td>Timber</td>
<td>Construction</td>
<td>Avoid over ordering. Provision of suitable storage to avoid damage. Arrange take back of unused materials with the supplier.</td>
<td></td>
<td>Re-use/Recycle if feasible</td>
<td>Landfill/Incineration</td>
</tr>
<tr>
<td></td>
<td>Plasterboard</td>
<td>Construction</td>
<td>Avoid over ordering. Provision of suitable storage to avoid damage. Arrange take back of unused materials with the supplier.</td>
<td>Cannot reuse</td>
<td>Recycle if feasible</td>
<td>Landfill</td>
</tr>
<tr>
<td></td>
<td>Packaging</td>
<td>Construction</td>
<td>Ask suppliers to send products with minimal packaging/ reusable containers, buy bulk not individually wrapped products. Return pallet to supplier or use plastic pallets.</td>
<td>N/A</td>
<td>Segregate for reprocessing and reuse as recycled secondary aggregate.</td>
<td>Landfill/Incineration</td>
</tr>
<tr>
<td></td>
<td>Cabal &amp; wiring</td>
<td>Construction</td>
<td>Avoid over ordering. Arrange take back of unused materials with the supplier.</td>
<td>Reuse onsite if appropriate</td>
<td>Segregate and recycle to reclaim plastics and metal.</td>
<td>Landfill</td>
</tr>
<tr>
<td></td>
<td>General office waste</td>
<td>Site Management</td>
<td>Print double sided and send documents electronically, reusable crockery and cutlery.</td>
<td>Reuse paper, cartridges, plastic cups, tins and cardboards.</td>
<td>Segregate and recycle white papers. Send for composting (food waste only)</td>
<td>Landfill</td>
</tr>
<tr>
<td></td>
<td>Glass</td>
<td>Construction</td>
<td>Avoid over ordering, appropriate storage to avoid accidents. Arrange take back of unused</td>
<td>N/A</td>
<td>Segregate and send for recycling</td>
<td>Landfill and cover</td>
</tr>
<tr>
<td>Hazardous</td>
<td>WEEE</td>
<td>Construction</td>
<td>Materials with the supplier.</td>
<td>Reuse elsewhere onsite</td>
<td>Send to dedicated recycling facility for recovery and recycling.</td>
<td>Landfill</td>
</tr>
<tr>
<td>-----------</td>
<td>------</td>
<td>--------------</td>
<td>------------------------------</td>
<td>-----------------------</td>
<td>-----------------------------------------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>WEEE</td>
<td>Construction</td>
<td>Arrange take back of unused materials with the supplier.</td>
<td>Reuse elsewhere onsite</td>
<td>Send to dedicated recycling facility for recovery and recycling.</td>
<td>Landfill</td>
<td></td>
</tr>
<tr>
<td>Asbestos</td>
<td>Construction</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>Landfill</td>
<td></td>
</tr>
<tr>
<td>Contaminated Land</td>
<td>Construction</td>
<td>Avoid excavation where unnecessary</td>
<td>Consider onsite treatment methods</td>
<td>Treatment contaminated land hubs.</td>
<td>Landfill</td>
<td></td>
</tr>
<tr>
<td>Paintings, line markers, mastic</td>
<td>Construction</td>
<td>Use solvent free paints that are not disposed of as hazardous waste, maximum use of mechanical fitting rather than adhesives. Arrange take back of unused materials with the supplier.</td>
<td>Use lockable COSHH container for storage</td>
<td>N/A</td>
<td>Landfill</td>
<td></td>
</tr>
<tr>
<td>WEEE</td>
<td>Construction</td>
<td>N/A</td>
<td>Re-use elsewhere on-site</td>
<td>Send to dedicated recycling facility for recovery and recycling.</td>
<td>Landfill</td>
<td></td>
</tr>
</tbody>
</table>
Annex 7: Environmental Pollution Control Standards

1. Emission Standards

1.1 Regulations
The National Environmental (Ambient Air Quality) Regulations, 1994, published in Gazette Extraordinary, No. 850/4 of December, 1994 are hereby amended by the substitution for the Schedule to that regulation of the following :-

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Time Average</th>
<th>Emission Standards (µg/ m³)</th>
<th>Emission Standards (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SO₂</td>
<td>1 hr</td>
<td>200</td>
<td>0.08</td>
</tr>
<tr>
<td></td>
<td>8 hrs</td>
<td>120</td>
<td>0.05</td>
</tr>
<tr>
<td></td>
<td>24 hrs</td>
<td>80</td>
<td>0.03</td>
</tr>
<tr>
<td>NO₂</td>
<td>1 hr</td>
<td>250</td>
<td>0.13</td>
</tr>
<tr>
<td></td>
<td>8 hrs</td>
<td>150</td>
<td>0.08</td>
</tr>
<tr>
<td></td>
<td>24 hrs</td>
<td>100</td>
<td>0.05</td>
</tr>
<tr>
<td>CO</td>
<td>1 hr</td>
<td>30000</td>
<td>26.00</td>
</tr>
<tr>
<td></td>
<td>8 hrs</td>
<td>10000</td>
<td>9.00</td>
</tr>
<tr>
<td></td>
<td>anytime</td>
<td>58000</td>
<td>50.0</td>
</tr>
<tr>
<td>O₃</td>
<td>1 hr</td>
<td>200</td>
<td>0.10</td>
</tr>
<tr>
<td>PM₁₀</td>
<td>24 hrs</td>
<td>100</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Annual</td>
<td>50</td>
<td>-</td>
</tr>
<tr>
<td>PM₂.₅</td>
<td>24 hrs</td>
<td>50</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Annual</td>
<td>25</td>
<td>-</td>
</tr>
</tbody>
</table>

* Minimum number of observations required to determine the average over the specified period —
  03 hour average - 03 consecutive hourly average
  08 hour average - 08 hourly average
  24 hour average - 18 hourly average
  Yearly average - 09 monthly average with at least 02 monthly average each quarter.

+ By using Chemicals or Automatic Analyzers.
### FIRST SCHEDULE

#### A: Petrol Vehicles:

<table>
<thead>
<tr>
<th>Type of Vehicles</th>
<th>Emission standards (Effective From April 1, 2008)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Carbon Monoxide CO (% v/v)</td>
<td>Hydrocarbon HC (ppm v/v)</td>
</tr>
<tr>
<td>1. Petrol Vehicles other than motor cycles and motor tricycles</td>
<td>4.5</td>
<td>1200</td>
</tr>
<tr>
<td>2. Petrol Motor cycles and motor tricycles</td>
<td>6</td>
<td>9000</td>
</tr>
</tbody>
</table>

**Abbreviations:**
- % v/v - percent by volume  
- ppm v/v - parts per million by volume  
- RPM - revolutions per minute

#### B: Diesel Vehicles:

<table>
<thead>
<tr>
<th>Type of Vehicles</th>
<th>Emission Standards (Effective from April 1, 2008)</th>
<th>Smoke Opacity on Snap Acceleration k factor (m⁻¹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diesel Vehicles</td>
<td></td>
<td>8.0</td>
</tr>
</tbody>
</table>

**Abbreviations:**
- k factor - Absorption co-efficient  
- Snap acceleration - has the same meaning as defined in SAE RECOMMENDED PRACTICEJ 1667
2. Noise Level Regulations

<table>
<thead>
<tr>
<th>Area</th>
<th>$L_{Aeq}'$ T - Day Time</th>
<th>$L_{Aeq}'$ T - Night Time</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Schedule I</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Noise</td>
<td>55</td>
<td>45</td>
</tr>
<tr>
<td>Medium Noise</td>
<td>63</td>
<td>50</td>
</tr>
<tr>
<td>High Noise</td>
<td>70</td>
<td>60</td>
</tr>
<tr>
<td>Silent Zone</td>
<td>50</td>
<td>45</td>
</tr>
<tr>
<td><strong>Schedule III</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>For Construction Activities</td>
<td>75</td>
<td>50</td>
</tr>
<tr>
<td><strong>Schedule IV</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rural Residential</td>
<td>55</td>
<td>45</td>
</tr>
<tr>
<td>Urban Residential</td>
<td>60</td>
<td>50</td>
</tr>
<tr>
<td>Noise Sensitive</td>
<td>50</td>
<td>45</td>
</tr>
<tr>
<td>Mix residential</td>
<td>63</td>
<td>55</td>
</tr>
<tr>
<td>Commercial</td>
<td>65</td>
<td>55</td>
</tr>
<tr>
<td>Industrial</td>
<td>70</td>
<td>60</td>
</tr>
</tbody>
</table>

**ILO Standards of Noise Levels**

<table>
<thead>
<tr>
<th>Noise level (dB(A))</th>
<th>Maximum exposure (times per day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>16 hours</td>
</tr>
<tr>
<td>85</td>
<td>8 hours</td>
</tr>
<tr>
<td>90</td>
<td>4 hours</td>
</tr>
<tr>
<td>95</td>
<td>2 hours</td>
</tr>
<tr>
<td>100</td>
<td>1 hour</td>
</tr>
<tr>
<td>105</td>
<td>1/2 hours</td>
</tr>
<tr>
<td>110</td>
<td>1/4 hours</td>
</tr>
<tr>
<td>115</td>
<td>1/8 hours</td>
</tr>
</tbody>
</table>

“day time” from 06.00 hours to 18.00 hrs.;

“night time” means from 18.00 to 06.00 hours

“Noise sensitive area” includes any area in which a courthouse, hospital, public library, school, zoo, sacred area and areas set a part for recreation or environmental purposes are depicted in a noise zone map;
3. Interim Vibration Standards

Interim standards for Vibration Control

Table 2.1: Interim Standards vibration of the Operation of Machinery, Construction Activities and Vehicle Movements Traffic

<table>
<thead>
<tr>
<th>Category of the structure as given in Table 1.1</th>
<th>Type of Vibration</th>
<th>Frequency of Vibration (Hz)</th>
<th>Vibration in PPV (mm/Sec.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 1</td>
<td>Continuous</td>
<td>0 – 10</td>
<td>5.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 – 50</td>
<td>7.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Over 50</td>
<td>15.0</td>
</tr>
<tr>
<td></td>
<td>Intermittent</td>
<td>0 – 10</td>
<td>10.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 – 50</td>
<td>15.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Over 50</td>
<td>30.0</td>
</tr>
<tr>
<td>Type 2</td>
<td>Continuous</td>
<td>0 – 10</td>
<td>2.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 – 50</td>
<td>4.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Over 50</td>
<td>8.0</td>
</tr>
<tr>
<td></td>
<td>Intermittent</td>
<td>0 – 10</td>
<td>4.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 – 50</td>
<td>8.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Over 50</td>
<td>16.0</td>
</tr>
<tr>
<td>Type 3</td>
<td>Continuous</td>
<td>0 – 10</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 – 50</td>
<td>2.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Over 50</td>
<td>4.0</td>
</tr>
<tr>
<td></td>
<td>Intermittent</td>
<td>0 – 10</td>
<td>2.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 – 50</td>
<td>4.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Over 50</td>
<td>8.0</td>
</tr>
<tr>
<td>Type 4</td>
<td>Continuous</td>
<td>0 – 10</td>
<td>0.25</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 – 50</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Over 50</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>Intermittent</td>
<td>0 – 10</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 – 50</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Over 50</td>
<td>2.0</td>
</tr>
</tbody>
</table>

Notes

1. Please see separate measurement methods
2. The values given above are in such a way that minor damage is unlikely as the nearby house/buking
Table 2.2: Interim Standards on Air Blast Over Pressure and Ground Vibration for Blasting Activities

<table>
<thead>
<tr>
<th>Category of the structure as given in Table 1.1</th>
<th>Type of Vibration</th>
<th>Type of Blasting</th>
<th>Ground Vibration in PPV (mm/sec.)</th>
<th>Air blast over Pressure (dB (L))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 1</td>
<td>Impulsive</td>
<td>Single bore hole</td>
<td>8.0</td>
<td>105</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Multi bore hole with delay detonators</td>
<td>10.0</td>
<td>115</td>
</tr>
<tr>
<td>Type 2</td>
<td>Impulsive</td>
<td>Single bore hole</td>
<td>6.0</td>
<td>105</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Multi bore hole with delay detonators</td>
<td>7.0</td>
<td>11.5</td>
</tr>
<tr>
<td>Type 3</td>
<td>Impulsive</td>
<td>Single bore hole</td>
<td>4.0</td>
<td>115</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Multi bore hole with delay detonators</td>
<td>5.0</td>
<td>120</td>
</tr>
<tr>
<td>Type 4</td>
<td>Impulsive</td>
<td>Single bore hole</td>
<td>0.5</td>
<td>95</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Multi bore hole with delay detonators</td>
<td>0.75</td>
<td>100</td>
</tr>
</tbody>
</table>

**Note**
1. Please see separate measurement methods
2. The values given above are in such a way that minor damage is unlikely as the nearby house/buking
4. Wastewater Discharge Standards

4.1 GENERAL STANDARDS FOR DISCHARGE OF EFFLUENTS INTO INLAND SURFACE WATERS

<table>
<thead>
<tr>
<th>No</th>
<th>Determinant</th>
<th>Tolerance limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Total suspended solids, mg/l, max</td>
<td>50</td>
</tr>
<tr>
<td>2</td>
<td>Particle size of total suspended solids</td>
<td>Shall pass sieve of aperture size 850 micro m.</td>
</tr>
<tr>
<td>3</td>
<td>P11 value of ambient temperature</td>
<td>6.0 to 8.5</td>
</tr>
<tr>
<td>4</td>
<td>Biochemical Oxygen Demand-BOD5 in 5 days At 20 °C, mg/l max</td>
<td>30</td>
</tr>
<tr>
<td>5</td>
<td>Temperature of Discharge</td>
<td>Shall not exceed 40 °C in any of Section of the Stream form the effluent outlet.</td>
</tr>
<tr>
<td>6</td>
<td>Oils and greases, mg/ I max</td>
<td>10.0</td>
</tr>
<tr>
<td>7</td>
<td>Phenolic Compounds (as phenolic OH)mg/I, max</td>
<td>1.0</td>
</tr>
<tr>
<td>8</td>
<td>Cyanides as (CN) mg/I, max</td>
<td>0.2</td>
</tr>
<tr>
<td>9</td>
<td>Sulfides, mg/I, max</td>
<td>2.0</td>
</tr>
<tr>
<td>10</td>
<td>Fluorides, mg/I, max</td>
<td>2.0</td>
</tr>
<tr>
<td>11</td>
<td>Total residual chlorine mg/I, max</td>
<td>1.0</td>
</tr>
<tr>
<td>12</td>
<td>Arsenic, mg/I, max</td>
<td>0.2</td>
</tr>
<tr>
<td>13</td>
<td>Cadmium total, mg/I, max</td>
<td>0.1</td>
</tr>
<tr>
<td>14</td>
<td>Chromium total, mg/I, max</td>
<td>0.1</td>
</tr>
<tr>
<td>15</td>
<td>Copper total, mg/I, max</td>
<td>3.0</td>
</tr>
<tr>
<td>16</td>
<td>Lead, total, mg/I, max</td>
<td>0.1</td>
</tr>
<tr>
<td>17</td>
<td>Mercury total, mg/I, max</td>
<td>0.0005</td>
</tr>
<tr>
<td>18</td>
<td>Nickel total, mg/I, max</td>
<td>3.0</td>
</tr>
<tr>
<td>19</td>
<td>Selenium total, mg/I, max</td>
<td>0.5</td>
</tr>
<tr>
<td>20</td>
<td>Zinc total, mg/I, max</td>
<td>5.0</td>
</tr>
<tr>
<td>21</td>
<td>Ammoniacal nitrogen, mg/I, max</td>
<td>50.0</td>
</tr>
<tr>
<td>22</td>
<td>Pesticides</td>
<td>Undetectable</td>
</tr>
<tr>
<td>23</td>
<td>(a) Alpha-emitters micro curie/ml</td>
<td>10⁻⁷</td>
</tr>
<tr>
<td></td>
<td>(b) Beta-emitters micro curie/ml</td>
<td>10⁻⁸</td>
</tr>
<tr>
<td>25</td>
<td>Chemical Oxygen Demand (COD), mg/I, max</td>
<td>250</td>
</tr>
</tbody>
</table>

**Note 1:** All efforts should be made to remove colour and unpleasant odour as far as practicable.

**Note 2:** These values are based on dilution of effluents by at least 8 volumes of clean receiving water. If the dilution is below 8 times, the permissible limits are multiplied by 1/8 of the actual dilution.

**Note 3:** The above mentioned General Standards shall cease to apply with regard to a particular industry when industry specific standards are notified for that industry.
4.2 DISCHARGED ON LAND FOR IRRIGATION PURPOSE

<table>
<thead>
<tr>
<th>No</th>
<th>Determinant</th>
<th>Tolerance Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Total dissolved solid, mg/I, max</td>
<td>2100</td>
</tr>
<tr>
<td>2</td>
<td>PH value at ambient temperature</td>
<td>5.5 to 9.0</td>
</tr>
<tr>
<td>3</td>
<td>Biochemical Oxygen demand (BOD$_5$) in 5 days at 20 °C, mg/I, max</td>
<td>250</td>
</tr>
<tr>
<td>4</td>
<td>Oils and grease, mg/I, max</td>
<td>10</td>
</tr>
<tr>
<td>5</td>
<td>Chloride (as Cl), mg/I, max</td>
<td>600</td>
</tr>
<tr>
<td>6</td>
<td>Sulfate (as SO$_4$) mg/I, max</td>
<td>1000</td>
</tr>
<tr>
<td>7</td>
<td>Boron (as B) mg/I, max</td>
<td>2.0</td>
</tr>
<tr>
<td>8</td>
<td>Arsenic (as As), mg/I, max</td>
<td>0.2</td>
</tr>
<tr>
<td>9</td>
<td>Cadmium as (as Cd) mg/I, max</td>
<td>2.0</td>
</tr>
<tr>
<td>10</td>
<td>Chromium (as Cr ) mg/I, max</td>
<td>1.0</td>
</tr>
<tr>
<td>11</td>
<td>Lead (as Pb), mg/I, max</td>
<td>1.0</td>
</tr>
<tr>
<td>12</td>
<td>Mercury (as Hg) mg/I, max</td>
<td>0.01</td>
</tr>
<tr>
<td>13</td>
<td>Sodium adsorption ratio: (SAR)</td>
<td>10 to 15</td>
</tr>
<tr>
<td>14</td>
<td>Residual Sodium Carbonate, mol/I, max</td>
<td>2.5</td>
</tr>
<tr>
<td>15</td>
<td>Radioactive material:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(a) Alpha emitters, micro curie/ml</td>
<td>$10^9$</td>
</tr>
<tr>
<td></td>
<td>(b) Beta emitters, micro curie/ml</td>
<td>$10^8$</td>
</tr>
</tbody>
</table>
Annex 8: Factory Ordinance, SCDP Environmental Management & Assessment Framework (EMF) and ILO Guidelines

1. Factory ordinance can be downloaded from this link:

http://www.employers.lk/factories-ordinance-i

2. SCDP - Environmental Management and Assessment Framework Guidelines

2.1 Health and Safety Guidelines
Health and safety of workers and the public should be designed into constructions, before and during and after the building phase. It is cheaper and easier to control risks in construction to workers as well as the public before work starts on site by proper planning, training, site induction, worker consultation and incorporating strict safety procedures in construction plans. The proposed project interventions will mostly involve small to medium scale construction sites. As such, extreme dangers posed by working in environments such as great heights, deep water and involving dangerous chemicals and radioactive material will not be present. Potential dangers associated with SCDP sites will include falling from moderate heights, vehicle/pedestrian accidents, falling into trenches, being buried in tunnels/excavations, breathing dust and other air pollutants, back aches caused by handling heavy material, suffering hearing loss from noise etc and can be mitigated with following safety guidelines.

EA for each site should mandatorily include a risk assessment as to what are the hazards involved in the work site, who might be harmed and how seriously, how likely this harm might happen and what actions are required to eliminate or reduce the risk and incorporate such measures in the EMP and clearly set out in the tender documents. All sub-projects must observe health and safety regulations, hence during implementation it is important to check if these control measures are put in place and are meeting the legal requirement.

2.2 Training
• Ensure constructors carry out suitable training programs on occupational health and safety for workers prior to commencement of construction.
• Ensure only experienced and well trained workers are used for the handling of machinery, equipment and material processing plants
• Ensure all persons, including managers, are trained and able to carry out their work without risk to the safety or health of themselves, other workers or the public

2.3 Personal Protective Equipment
• Ensure appropriate safety equipment, tools and protective clothing are provided to workers and that safe working methods are applied. A safety inspection checklist should be prepared taking into consideration what the workers are supposed to be wearing and monitored.
• Any person who works or operates in an area where there is a risk of flying objects, such as splinters, should wear safety goggles at all time. These should be securely fitted to the face. Welders should protect the entire face from hot sparks and bright rays by using a welding mask.
• Any person exposed to high levels of dust or hazardous gases (when working in tunnels) should wear respiratory protection in the form of disposal masks or respiratory masks which fit more snugly around the nose and mouth.
• Any person working in an area where there is the risk of being struck on the head by a falling or flying object should wear a hard hat at all times. These should be well maintained in order to be fully effective, and any helmets or hard hats that are damaged or cracked should immediately be replaced.
• All workers will be required to wear shoes or strong boots to prevent sharp objects from penetrating or crushing the foot. Those working in muddy conditions and in canals with polluted water should avoid hand/foot contact with water and should never wear slippers.
• Road workers should wear reflective vests to avoid being hit by moving vehicular traffic.
2.4 Site Delineation and Warning Signs
- Ensure delineation devices such as cones, lights, tubular markers, orange and white strips and barricades are erected to inform oncoming vehicular traffic and pedestrians in the area about work zones.
- Ensure all digging and installing work items that are not accomplished are isolated and warned of by signposts and flash lamps in nighttime.
- Ensure dangerous warning signs are raised to inform public of particular dangers and to keep the public away from such hazards.
- Ensure rehabilitation of trenches progressively once work is completed.
- The safety inspection checklist must look to see that the delineation devices are used, whether they are appropriately positioned, if they are easily identifiable and whether they are reflective.

2.5 Equipment safety
- Work zone workers use tools, equipment and machinery that could be dangerous if used incorrectly or if the equipment malfunctions. Inspections must be carried out to test the equipment before it is used, so that worker safety can be secured. Inspections should look for evidence of wear and tear, frays, missing parts and mechanical or electrical problems.

2.6 Traffic management
- Ensure traffic control plans and procedures are in place when work zone is set up and how to handle full or partial road closure, blocked intersections, sidewalk closure etc
- Ensure installation of transport signs and lighting systems in conspicuous places to assure transport safety. Transport signs should be installed at places where accidents may be easily happened (populated centers, schools, hospitals, commercial areas etc)

2.7 Material management
- Ensure easily flammable materials are not be stored in construction site and that they are transported out of project site

2.8 Emergency Procedures
- Ensure an emergency aid service is in place in the work zone.
- Ensure all site staff is properly briefed as to what to do in the event of an emergency, such as who to notify and where to assemble for a head count. This information must be conveyed to employees by the site manager on the first occasion a worker visits the site.

2.9 Construction camps
- Ensure installation of adequate construction camps and sanitation facilities for construction workers to control of transmission of infectious diseases.

2.10 Information management
- Develop and establish contractor’s own procedure for receiving, documenting and addressing complaints that is easily accessible, culturally appropriate and understandable to affected communities.
- Provide advance notice to local communities by way of information boards about the schedule of construction activities.

2.11 Worker consultation
- Consulting the workforce on health and safety measures is not only a legal requirement, it is an effective way to ensure that workers are committed to health and safety procedures and improvements. Employees should be consulted on health and safety measures and before the introduction of new technology or products.

SCDP - Environmental Management and Assessment Framework Guidelines also can be downloaded from
3. ILO Guidelines

The occupational safety and health management system in the organization

Occupational safety and health, including compliance with the OSH requirements pursuant to national laws and regulations, are the responsibility and duty of the employer. The employer should show strong leadership and commitment to OHS activities in the organization, and make appropriate arrangements for the establishment of an OHS management system. The system should contain the main elements of policy, organizing, planning and implementation, evaluation and action for improvement, as shown in figure 2.

Figure 2. Main elements of the OHS management system

3.1. Occupational safety and health policy

3.1.1. The employer, in consultation with workers and their representatives, should set cost in writing an OHS policy, which should be:

(a) Specific to the organization and appropriate to its size and nature of its activities;
(b) Concise, clearly written, dated and made effective by the signature or endorsement of the employer or the most senior accountable person in the organization;
(c) Communicated and readily accessible to all persons at their place of work;
(d) Reviewed for continuing suitability; and
(e) Made available to relevant external interested parties, as appropriate.

3.1.2. The OSH policy should include, as a minimum, the following key principles and objectives to which the organization is committed:
(a) Protecting the safety and health of all members of the organization by preventing work – related injuries, ill health, diseases and incident;
(b) Complying with relevant OHS national laws and regulation, voluntary programs, collective agreements on OHS and other requirements to which the organization subscribes;
(c) Ensuring that workers and their representative are consulted and encouraged to participate actively in all elements of the OSH management system; and
(d) Continually improving the performance of the OSH management system.

3.1.3. The OSH management system should be compatible with or integrated in other management systems in the organization.

3.2. Worker participation
3.2.1. Worker participation is an essential elements of the OSH management system in the organization.
3.2.2. The employer should ensure that workers and their safety and health representatives are consulted, informed and trained on all aspects of OSH, including emergency arrangements, associated with their work.

3.2.3. The employer should make arrangements for workers and their safety and health representatives to have the time and resources to participate actively in the processes of organizing, planning and implementation, evaluation and action for improvement of the OSH management system.

3.2.4. The employer should ensure, as appropriate, the establishment and efficient functioning of a safety and health committee and the recognition of workers safety and health representatives, in accordance with national laws and practice.

3.3. Responsibility and accountability
3.3.1. The employer should have overall responsibility for the protection of workers’ safety and health, and provide leadership for OSH activities in the organization.
3.3.2. The employer and senior management should allocate responsibility, accountability and authority for the development, implementation and performance of the OSH management system and the achievement of the relevant OSH objectives. Structures and processes should be established which;
(a) Ensure that OSH is a time – management responsibility which is known and accepted at all levels;
(b) Define and communicate to the members of the organization the responsibility, accountability and authority of person who identify, evaluate or control OSH hazards and risks;
(c) Provide effective supervision, as necessary, to ensure the protection of workers’ safety and health;
(d) Promote cooperation and communication among members of the organization, including workers and their representatives, to implement the elements of the organization's OSH management system;
(e) Fulfil the principles of OSH management system contained in relevant national guidelines, tailored guidelines or voluntary programs, as appropriate, to which the organization subscribes;
(f) Establish and implement a clear OSH policy and measurable objectives;

(g) Establish effective arrangements to identify and eliminate or control work-related hazards and risks, and promote health at work;

(h) Establish prevention and health promotion programmers;

(i) Ensure effective arrangements for the full participation of workers are their representatives in the fulfilment of the OSH policy;

(j) Provide effective arrangements for the full participation of workers and their representatives in safety and health committees, where they exist.

3.3.3. A person or persons at the senior management level should be appointed, where appropriate, with responsibility, accountability and authority for:

(a) The development, implementation, periodic review and evaluation of the OSH management system;

(b) Periodic reporting to the senior management on the performance of the OSH management system; and

(c) Promoting the participation of all members of organization.

3.4. Competence and training

3.4.1. The necessary OSH competence requirements should be defined by the employer, and arrangements established and maintained to ensure that all person are competent to carry out the safety and health aspects of their duties and responsibilities.

3.4.2. The employer should have, or should have access to, sufficient OSH competence to identify and eliminate or control work-related hazards and risks, and to implement the OSH management system.

3.4.3. Under the arrangement referred to in paragraph 3.4.1, training programmes should:

(a) Cover all members of the organization, as appropriate;

(b) Be conducted by competent persons;

(c) Provide effective and timely initial and refresher training at appropriate intervals;

(d) Include participants’ evaluation of their comprehension and retention of the training;

(e) Be reviewed periodically. The review should include the safety and health committee, where it exists, and the training programmes, modified as necessary to ensure their relevance and effectiveness; and

(f) Be documented, as appropriate and according to the size and nature of activity of the organization.

3.4.4. Training should be provided to all participants at no cost and should take place during working hours, if possible.

3.5. Occupational safety and health management system documentation

3.5.1. According to the size and nature of activity of the organization, OSH management system documentation should be established and maintained, and may cover:

(a) The OSH policy and objectives of the organization;

(b) The allocated key OSH management roles and responsibilities for the implementation of the OSH management system;

(c) The significant OSH hazards/risks arising from the organization’s activities, and the arrangements for their prevention and control; and

(d) Arrangements, procedures, instructions or other internal documents used within the framework of the OSH management system.

3.5.2. The OSH management system documentation should be:

(a) Clearly written and presented in a way that is understood by those who have to use it; and

(b) Periodically reviewed, revised as necessary, communicated and readily accessible to all appropriate or affected members of the organization.
3.5.3. OSH records should be established, managed and maintained locally and according to the needs of the organization. They should be identifiable and traceable, and their retention times should be specified.

3.5.4. Workers should have the right to access records relevant to their working environment and health, while respecting the need for confidentiality.

3.5.5. OSH records may include:
(a) Records arising from the implementation of the OSH management system;
(b) Records of work-related injuries, ill health, diseases and incidents;
(c) Records arising from national laws or regulations dealing with OSH;
(d) Records of workers’ exposures, surveillance of the working environment and workers’ health; and
(e) The results of both active and reactive monitoring.

3.6. Communication

3.6.1. Arrangement and procedures should be established and maintained for:
(a) Receiving, documenting and responding appropriately to internal and external communications related to OSH;
(b) Ensuring the internal communication of OSH information between relevant levels and functions of the organization; and
(c) Ensuring that the concerns, ideas and inputs of workers and their representatives on OSH matters are received, considered and responded to.

3.7. Initial review

3.7.1. The organization’s existing OSH management system and relevant arrangements should be evaluated by an initial review, as appropriate. In the case where no OSH management system exists, or if the organization is newly established, the initial review should serve as a basis for establishing an OSH management system.

3.7.2. The initial review should be carried out by competent persons, in consultation with workers and/or their representatives, as appropriate. It should:
(a) Identify and current applicable national laws and regulations, national guidelines, tailored guidelines, voluntary programmes and other requirements to which the organization subscribes;
(b) Identify, anticipate and assess hazards and risks to safety and health arising from the existing or proposed work environment and work organization; and
(c) Determine whether planned or existing controls are adequate to eliminate hazards or control risks; and
(d) Analyze the data provided from workers’ health surveillance.

3.7.3. The result of the initial review should:
(a) Be documented;
(b) Become the basis for making decisions regarding the implementation of the OSH management system; and
(c) Providing a baseline from which continual improvement of the organization’s OSH management system can be measured.
3.8. System planning, development and implementation

3.8.1. The purpose of planning should be to create an OSH management system that supports:

(a) As the minimum, compliance with national laws and regulations;
(b) The elements of the organization’s OSH management system; and
(c) Continual improvement in OSH performance.

3.8.2. Arrangement should be made for adequate and appropriate OSH planning, based on the results of the initial review, subsequent reviews or other available data. These planning arrangements should contribute to the protection of safety and health at work, and should include:

(a) A clear definition, priority setting and quantification, where appropriate, of the organization’s OSH objectives;
(b) The preparation of a plan for achieving each objective, with defined responsibility and clear performance criteria indicating what is to be done by whom and when;
(c) The selection of measurement criteria for confirming that the objectives are achieved; and
(d) The provision of adequate resources, including Harran and financial resources and technical support, as appropriate.

3.8.3. The OSH planning arrangements of the organization should cover the development and implementation of all the OHS management system elements, as described in Chapter 3 of these guidelines and illustrated in figure 2.

3.9. Occupational safety and health objectives

3.9.1. Consistent with the OSH policy and based on the initial or subsequent reviews, measurable OSH objectives should be established, which are:

(a) Specific to the organization, and appropriate to and according to its size and nature of activity;
(b) Consistent with the relevant and applicable national laws and regulations, and the technical and business obligations of the organization, with regard to OSH;
(c) Focused towards continually improving workers’ OSH Protection to achieve the best OSH performance;
(d) Realistic and achievable;
(e) Documented, and communicated to all relevant functions and levels of the organization; and
(f) Periodically evaluated and if necessary updated.

3.10 Hazard prevention

3.10.1. Prevention and control measures

3.10.1.1. Hazards and risks to workers’ safety and health should be identified and assessed on an ongoing basis. Preventive and protective measures should be implemented in the following order of priority:

(a) Eliminate the hazard/risk;
(b) Control the hazard/risk at source, through the use of engineering controls or organizational measures;
(c) Minimize the hazard/risk by the design of safe work systems, which include administrative control measures; and
(d) Where residual hazard/risk cannot be controlled by collective measures, the employer should provide for appropriate personal protective equipment, including clothing, at no cost, and should implement measures to ensure its use and maintenance.

3.10.1.2. Hazard prevention and control procedures of arrangements should be established and should:

(a) Be adapted to the hazards and risks encountered by the organization;
(b) Be reviewed and modified if necessary on a regular basis;
(c) Comply with national laws and regulations, and reflect good practice; and
(d) Consider the current state of knowledge, including information or reports from organizations, such as labour inspectorates, occupational safety and health services, and other services as appropriate.

3.10.2. Management of change

3.10.2. The impact on OSH of intimal changes (such as those in staffing or due to new processes, working procedures, organizational structures or acquisitions) and of external changes (for example, as a result of amendments of national laws and regulations, organizational mergers, and developments in OSH knowledge and technology) should be evaluated and appropriate preventive steps taken prior to the introduction of changes.

3.10.2.2. A workplace hazard identification and risk assessment should be carried out before any modification or introduction of new work methods, materials, processes or machinery. Such assessment should be done in consultation with and involving workers and their representatives, and the safety and health committee, where appropriate.

3.10.2.3. The implementation of a “decision to change” should ensure that all affected members of the organization are properly informed and trained.

3.10.3. Emergency prevention, preparedness and response

3.10.3.1. Emergency prevention, preparedness and response arrangements should be established and maintained. These arrangements should identify the potential for accidents and emergency situations, and address the prevention of OSH risks associated with them. The arrangements should be made according to the size and nature of activity of the organization. They should;

(a) Ensure that the necessary information, internal communication and coordination are provided to protect all people in the event of an emergency at the worksite;
(b) Provide information to, and communication with the relevant competent authorities, and the neighborhood and emergency response services;
(c) Address first – aid and medical assistance, firefighting and evacuation of all people at the worksite; and
(d) Provide relevant information and training to all members of the organization, at all levels, including regular exercises in emergency prevention, preparedness and responses procedures.

3.10.3.2. Emergency prevention, preparedness and response arrangements should be established in cooperation with external emergency services and other bodies where applicable.

3.10.4. Procurement

3.10.4.1. Procedures should be established and maintained to ensure that:

(a) Compliance with safety and health requirements for the organization is identified, evaluation and incorporated into purchasing and leasing specifications;
(b) National laws and regulations and the organization’s own OSH requirements are identified prior to the procurement of goods and services; and
(c) Arrangement are made to achieve conformance to the requirements prior to their use.

3.10.5. Contracting

3.10.5.1. Arrangements should be established and maintained for ensuring that the organization’s safety and health requirements, or at least the equivalent, are applied to contractors and their workers.

3.10.5.2. Arrangements for contractors working on site should:

(a) Include OSH criteria in procedures for evaluating and selecting contractors;
(b) Establish effective ongoing communication and coordination between appropriate levels of the organization and the contractor prior to commencing work. This should include provisions for communicating hazards and the measures to prevent and control them;
(c) Include arrangement for reporting of work-related injuries, ill health, diseases and incidents among the contractors’ workers while performing work for the organization;
(d) Provide relevant workplace safety and health hazard awareness and training to contractors or their workers prior to commencing work and as work progresses, as necessary;
(e) Regularly monitor OSH performance of contractor activities on site; and
(f) Ensure that on-site OSH performance of contractor activities on site; and
(g) Ensure that on-site OSH procedure and arrangements are followed by the contractor(s).

Evaluation

3.11. Performance monitoring and measurement

3.11.1. Procedures to monitor, measure and record OSH performance on a regular basis should be developed, established and periodically reviewed. Responsibility, accountability and authority for monitoring at different levels in the management structure should be allocated.

3.11.2. The selection of performance, indicators should be according to the size and nature of activity of the organization and the OSH objectives.

3.11.3. Both qualitative and quantitative measures appropriate to the needs of the organization should be considered. These should;
(a) Be based on the organization’s identified hazards and risks, the commitments in the OSH policy and the OSH objectives; and
(b) Support the organization’s evaluation process, including the management review.

3.11.4. Performance monitoring and measurement should:
(a) Be used as a means of determining the extent to which OSH policy and objectives are being implemented and risks are controlled;
(b) Include both active and reactive monitoring, and not be based only upon work-related injury, ill health, disease and incident statistics; and
(c) Be recorded.

3.11.5. Monitoring should provide;
(a) Feedback on OSH performance;
(b) Information to determine whether the day-to-day arrangements for hazard and risk identification, prevention and control are in place and operating effectively; and
(c) The basis for decisions about improvement in hazard identification and risk control, and the OSH management system.

3.11.6. Active monitoring should contain the elements necessary to have a proactive system and should include;
(a) monitoring of the achievement of specific plans, established performance criteria and objectives;
(b) the systematic inspection of work systems, premises, plant and equipment;
(c) surveillance of working environment, including work organization;
(d) surveillance of workers’ health, where appropriate, through suitable medical monitoring or follow-up of workers for early detection of signs and symptoms of harm to health in order to determine the effectiveness of prevention and control measures; and
(e) compliance with applicable national laws and regulations, collective agreements and other commitments on OSH to which the organization subscribes.

3.11.7. Reactive monitoring should include the identification, reporting and investigation of;
(a) work-related injuries, ill health (including monitoring of aggregate sickness absence records),
diseases and incidents;
(b) other losses, such as damage to property;
(c) deficient safety and health performance, and OSH management system failures; and
(d) Workers’ rehabilitation and health-restoration programmes.

3.12. Investigation of work-related injuries, ill health, diseases and incidents, and their impact on safety and health performance

3.12.1. The investigation of the origin and underlying causes of work-related injuries, ill health, diseases and incidents should identify any failures in the OSH management system and should be documented.
3.12.2. Such investigations should be carried out by competent persons, with the appropriate participation of workers and their representatives.
3.12.3. The results of such investigations, should be communicated to the safety and health committee, where it exists, and the committee should make appropriate recommendations.
3.12.4. The results of investigations, in addition to any recommendations from the safety and health committee, should be communicated to appropriate persons for corrective action, included in the management review and considered for continual improvement activities.
3.12.5. The corrective action resulting from such investigations should be implemented in order to avoid repetition of work-related injuries, ill health, diseases and incidents.
3.12.6. Reports produced by external investigative agencies, such as inspectorates and social insurance institutions, should be acted upon in the same manner as internal investigations, taking into account issues of confidentiality.

3.13 Audit

3.13.1. Arrangements to conduct periodic audits are to be established in order to determine whether the OSH management system and its elements are in place, adequate, and effective in protecting the safety and health of workers and preventing incidents.
3.13.2. An audit policy and programme should be developed, which including designation of auditor competency, the audit scope, the frequency of audits, audit mythology and reporting.
3.13.3. The audit includes an evaluation of the organization’s OSH management system elements or a subset of these, as appropriate. The audit should cover.

(a) OSH policy;
(b) Worker participation;
(c) Responsibility and accountability;
(d) Competence and training;
(e) OSH management system documentation;
(f) Communication;
(g) System planning, development and implementation;
(h) Prevention and control measures;
(i) Management of change;
(j) Emergency prevention,
(k) Procurement;
(l) Contracting;
(m) Performance monitoring and measurement;
(n) Investigation of work-related injuries, ill health diseases and incidents, and their impact on safety and health performance;
(o) Audit;
(p) Management review;
(q) Preventive and corrective action;
(r) Continual improvement; and
(s) any other audit criteria or elements that may be appropriate.

3.13.4. The audit conclusion should determine whether the implemented OSH management system elements or a subset of these:
(a) are effective in meeting the organization’s OSH policy and objectives;
(b) are effective in promoting full worker participation;
(c) respond to the results of OSH performance evaluation and previous audits;
(d) enable the organization to achieve compliance with relevant national laws and regulations; and
(e) fulfil the goals of continual improvement and best OSH practice.

3.13.5. Audits should be conducted by competent persons internal or external to the organization who are independent of the activity being audited.

3.13.6. The audit results and audit conclusions should be communicated to those responsible for corrective action.

3.13.7. Consultation on selection of the auditor and all stages of the workplace audit, including analysis of results, are subject to worker participation, as appropriate.

3.14. Management review

3.14.1. Management reviews should:
(a) evaluate the overall strategy of the OSH management system to determine whether it meets planned performance objectives;
(b) evaluate the OSH management system’s ability to meet the overall needs of the organization and its stakeholders, including its workers and the regulatory authorities;
(c) evaluate the need for changes to the OSH management system, including OSH policy and objectives;
(d) identify what action is necessary to remedy any deficiencies in a timely manner, including adaptations of other aspects of the organization’s management structure and performance measurement;
(e) provide the feedback direction, including the determination of priorities, for meaningful planning and continual improvement;
(f) evaluate progress towards the organization’s OSH objectives and corrective action activities; and
(g) evaluate the effectiveness of follow-up actions from earlier management reviews.

3.14.2. The frequency and scope of periodic reviews of the OSH management system by the organization’s needs and conditions.

3.14.3. The management review should consider;
(a) the results of work-relate injuries, ill health, diseases and incident investigations; performance monitoring and measurement; and audit activities; and
(b) additional internal and external inputs as well as changes, including organizational changes, that could affect the OSH management system.

3.14.4. The findings of the management review should be recorded and formally communicated to;
(a) the persons responsible for the relevant element(s) of the OSH management system so that they many take appropriate action; and
(b) the safety and health committee, workers and their representatives.
Action for improvement

3.15. Preventive and corrective action
3.15.1. Arrangements should be established and maintained for preventive and corrective action resulting from OSH management system performance monitoring and measurement, OSH management system audits and management reviews. These arrangements should include;
(a) identifying and analyzing the root causes of any non-conformities with relevant OSH regulations and/or OSH management systems arrangements; and
(b) initiating, planning, implementing, checking the effectiveness of and documenting corrective and preventive action, including changes to the OSH management system itself.
3.15.2. When the evaluation of the OSH management system or other sources show that preventive and protective measures for hazards and risks are inadequate or likely to become inadequate, the measures should be addressed according to the recognized hierarchy of prevention and control measures, and completed and documented, as appropriate and in a timely manner.

3.16. Continual improvement
3.16.1. Arrangements should be established and maintained for the continual improvement of the relevant elements of the OSH management system and the system as a whole. These arrangements should take into account;
(a) the OSH objectives of the organization;
(b) the results of hazard and risk identifications and assessments;
(c) the results of performance monitoring and measurements;
(d) the investigation of work-related injuries, diseases, ill health and incidents, and the results and recommendations of audits;
(e) the outcomes of the management review;
(f) the recommendations for improvement from all members of the organization, including the safety and health committee, voluntary programmes and collective agreements;
(g) changes in national laws and regulations, voluntary programmes and collective agreements;
(h) new relevant information; and
(i) the results of health protection and promotion programmes.
3.16.2. The safety and health processes and performance of the organization should be compared with others in order to improve health and safety performance.
Annexure 9: Chance Finds Procedures

Contracts for civil works involving earth moving and excavation activities, especially in known archaeological and heritage areas, should normally incorporate procedures for dealing with situations in which buried PCRs are unexpectedly exposed.

Recognition of unknown PCRs – This is the most difficult aspect to cover, especially if the contractor is not full-time accompanied by a specialist. For SCDP contracts, an initial consultation with the Department of Archaeology should be held before work commencement to identify the likelihood of such material being uncovered, especially where trenching work is expected for pipe laying etc.

Upon discovery of such material during execution of work, the contractor should carry out the following;

- Immediately stop construction activities.
- With the approval of the resident engineer delineate the discovered site area.
- Secure the site to prevent any damage or loss of removable objects. In case of removable antiquities or sensitive remains, a night guard should be present until the responsible authority takes over.
- Through the Resident Engineer, notify the responsible authorities, the Department of Archaeology and local authorities within 24 hours.
- Submit a brief chance find report, within a specified time period, with date and time of discovery, location of discovery, description of finding, estimated weight and dimension of PCR and temporary protection implemented.
- Responsible authorities would be in charge of protecting and preserving the site before deciding on the proper procedures to be carried out.
- An evaluation of the finding will be performed by the Department of Archaeology who may decide to either remove the PCR deemed to be of significance, further excavate within a specified distance of the discovery point and conserve on-site, and/or extend/reduce the areas demarcated by the contractor etc. This should ideally take place within about 7 days.
- Construction work could resume only when permission is given from the Department of Archaeology after the decision concerning the safeguard of the heritage is fully executed.
Annexure 10: Terms of Reference for Recruitment of Environmental and Social Safeguard Officer

The contractor through an appointment of dedicated / qualified Environmental and Social Safeguard Officer shall be responsible in implementation of Environmental Management Plan (EMP), Social Impact Mitigation Plan (SIMP) of Social Screening Report (SSR) requirement by

a) Maintaining up-to-date records on actions taken by the Contractor with regards to implementation of EMP and SSR recommendations.

b) Timely (weekly) submission of progress reports (Environmental and Social), information and data to the Project Management Unit (PMU) / Deputy Project Director (Technical) of SCDP through Supervision Consultant (SC).

c) Participating in the meetings conveyed by the Engineer and

d) Any other assistance requested by the Engineer.

The Environmental and Social Safeguard Officer will be the primary focal point of contact for the assistance with all environmental and social issues during the pre-construction and construction phases. He/ She shall be responsible for ensuring the implementation of EMP, SIMP and SSR recommendations. The appointed officer should be available on the site fulltime basis during the project period. In addition, Environmental and Social Safeguard Officer should prepare an Environmental Management Action Plan and Social Impact Mitigation Action Plan in line with EMP and SIMP of SSR and submit to the Engineer along with the construction method statement.

The Environmental and Social Safeguard Officer will promptly investigate and review environmental and social related complaints and implement the appropriate corrective actions to arrest or mitigate the cause of the complaints as specified in the Environmental Management and Assessment Framework (EMAF) and Resettlement Policy Framework (RPF) of SCDP. A register of all complaints is to be passed to the Engineer within 24 hrs. they are received, with the action taken by the Safeguard Officer on complains thereof. In addition, Environmental & Social Safeguard Officer required to perform following tasks as well;

1. Participation for the periodic Grievance Redress Committee Meetings at Village Level, Local and PMU Level

2. Coordinate and liaise with Local PMU at Galle related environmental and social activities

3. Support and coordinate with PMU Environmental and Social Safeguard team in carrying out the monitoring assessments such as baseline surveys, progress review, mid-term review, etc.

4. Take actions to mainstream project activities during the period

5. Identify the potential environment and social safeguards issues in accordance provided EMP/SIMP/SSR/ EMAF/RPF

Qualifications required

Environmental & Social Safeguard Officer preferably possessing a Bachelor Degree with minimum of 3 years experiences in the relevant field or minimum of eight (8) years of experiences in the similar capacity. Preferably, experiences in specific project related works is required. It is essential to have both Sinhala & English language ability (Writing /Speaking) and Computer Knowledge of MS Office.