KAMPALA CAPITAL CITY AUTHORITY

KAMPALA INSTITUTIONAL AND INFRASTRUCTURE DEVELOPMENT PROGRAMME (KIIDP), Cr. 4367-UG

CONSULTANCY SERVICES FOR

DIAGNOSTIC ASSESSMENT, MODELLING AND MAPPING OF SUB-SURFACE STORM WATER NETWORK IN THE NAKIVUBO CATCHMENT AND DETAILED DESIGN FOR REHABILITATION AND EXPANSION OF THE NAKIVUBO CHANNEL

(Procurement Reference No: KCCA/CONS-KIIDP2/17-18/00213)

Terms of Reference

KAMPALA CAPITAL CITY AUTHORITY,

P. O. BOX 7010,

KAMPALA,

UGANDA.

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List of Acronyms

CBD	Central Business District
CCTV	Closed Circuit Television
EIA	Environmental Impact Assessment
ESIA	Environment and Social Impact Assessment
IBRD	International Bank for Reconstruction and Development
IDA	International Development Association
ISO	International Standards Organisation
KCCA	Kampala Capital City Authority
KDMP	Kampala Drainage Master Plan
MoWT	Ministry of Works and Transport
NEMA	National Environmental Management Authority
RAP	Resettlement Action Plan
SUE	Sub-Surface Utility Engineering
WB	World Bank

1 Background

1.1 Introduction

Kampala City is the economic and political capital of Uganda with a total population of 1.72 million and an estimated annual population growth rate of 5.6% (UBOS, 2012). The Greater Kampala Metropolitan Area which extends beyond the gazetted city boundaries to Mukono, Wakiso, Entebbe, Lugazi and Gayaza satellite towns covers an estimated land area of 1,895 km^2. The city is located in Central Uganda on the shores of Lake Victoria. It experiences a tropical climate and receives relatively high annual average rainfall of 1,290 mm. The rainfall regime is bimodal, with seasonal convective rainfall occurring mainly during the months of March – May (main rainy season) and October – December (secondary rainy season). Typical rainfall events are characterised by high intensities of short duration and high temporal and spatial variability which leads to pluvial flooding (Kigobe et al., 2011; START, 2006).

1.1.1 Causes of urban flooding

Over the last 10 years there has been an increase in the frequency, magnitude and duration of urban flash flooding incidences in Kampala City during or after occurrence of extreme convective rainfall events. This has been mainly attributed to a multiplicity of factors that include among others: (a) Impacts of climate change and variability on urban rainfall patterns; (b) Rapid and often unplanned urban development and (c) Inadequate solid waste management.

Global climate model projections for Uganda indicate a 10 – 20% increase in rainfall over most parts the country and a decrease in the semi-arid cattle corridor (UN-Habitat, 2009). The increase in rainfall intensity and magnitude has led to increased run-off that in turn overwhelms the already constructed major and minor drainage systems leading to urban flooding. Many urban poor populations tend to reside in low lying, flood prone areas (flood plains and reclaimed wetlands) which increases their vulnerability to negative flooding impacts and consequences that include property damage, traffic disruption, shallow ground water contamination and structural failure of existing paved road network due to ingress of water (CDKN, 2015; Mugume and Butler, 2016).

In addition, Kampala has in recent years experienced rapid urbanisation trends that have led to very high increase urban imperviousness levels (Mugume, 2015). In a recent study, it is estimated that between 1989 and 2010, the built-up area in Kampala quadrupled (444% increase) and will continue to present a significant challenge to flood management if left unchecked (Vermeiren et al., 2012). Furthermore, the frequent disposal of solid waste in open drainage channels is a key factor that has contributed immensely to localised flooding in Kampala (due to blockage of inlets, drainage channels & culvert crossings). KCCA has made significant improvements in improving solid waste management which have resulted in an increase in solid waste collection has increased from 140,000 tonnes/year (2011) to 360,000 tonnes/year (2013). However, the volume of solid waste generated in Kampala is estimated at 730,000 tons/year implying that only 50% is collected and disposed-off in designated landfills. The uncollected waste is dumped indiscriminately; most of it is ends up in already constructed drainage channels which further reduces the hydraulic conveyance capacity of existing storm water channels resulting in frequent flooding, loss of livelihoods and spread of communicable diseases.

In a recent study, it is estimated that flooding damages caused by the prevailing extreme rainfall regime in Kampala (without incorporating future climate change impacts) will increase from US$ 1 – 7 million (2013) to between US $ 33 – 102 million by 2050. Furthermore, the study projected that a doubling of the frequency of extreme rainfall events could double the anticipated flood damages (CDKN, 2015).

1.1.2 Background information of Kampala Drainage Systems

Kampala is drained by 8 main drainage systems (primary channels served by numerous secondary and tertiary systems) with a total catchment area of 278.71 km^2 (Table 1 and Figure 1). Human settlement and industrial development are extending from the many hills within Kampala City to the lower lying areas on the banks of the drainage channels which are part of wetlands and floodplains.

Table 1: Kampala's main drainage systems (KCCA, 2016)

#	Drainage system	Catchment area (Km^2)
1.	Nakivubo	38.27
2.	Lubigi	64.03
3.	Nalukolongo	33.75
4.	Kansanga	16.77
4a.	Gaba	5.33
5.	Mayanja/Kaliddubi	41.68
6.	Kinawataka	29.21
7.	Nalubaga	12.24
7a.	Nakelere	9.43
8.	Walufumbe	17.69
9.	Mayanja North	10.31
	Total Catchment Area	**278.71**

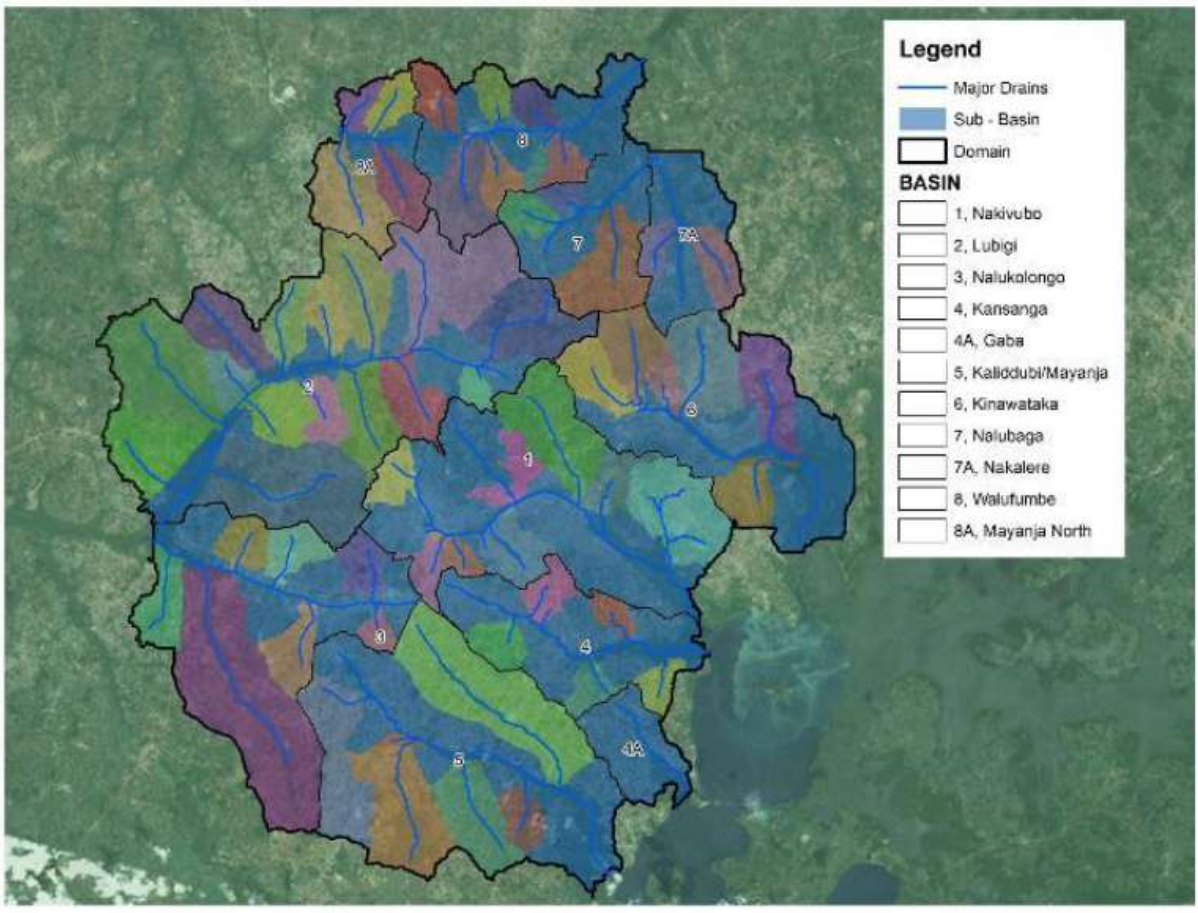

Figure 1: Delineation of Kampala's major drainage systems (KCCA, 2016)

The natural and constructed drainage channels along the floodplains and low-lying areas are regularly overtopped by floodwaters, causing damage to people's homes and industrial properties, disruption of traffic flow and economic activity in the city and increasing water pollution. The frequency of flooding has increased in recent years. This is attributed to:

i) Increased runoff caused by climate-related and land use changes in the catchments;
ii) Reduction of the buffer capacity of wetlands due to encroachment;
iii) Frequent disposal of solid was in open storm water channels leading to blockage;
iv) Inadequately design and constructed road side drainage channels and culverts among others.

These challenges have increased the frequency and magnitude of flooding which has led to negative impacts and consequences that include high property damages, traffic disruption, loss of lives, destruction of livelihoods, and recurring costs to Kampala's socio-economy. Investment in upgrading drainage infrastructure is therefore of dire importance so as to protect people and their property and also spur economic development.

1.1.3 Earlier Studies and Ongoing Drainage Interventions

The Kampala Drainage Master Plan (KDMP), prepared in 2003, presented an implementation programme for upgrading drainage systems in Kampala so as to reduce the frequency of flooding due to increased urbanisation and development and counter the negative effects of floods on property, livelihoods and the economy. During Phase 1 of KIIDP, one primary drain, namely Lubigi Channel, was upgraded. This, together with Nakivubo Channel that was upgraded earlier using World Bank funding, means that only 2 of the 8 primary Channels have been upgraded to date. The remaining 6 channels and the majority of the secondary and tertiary systems are still undeveloped and frequently flood causing damage to property and lives.

Due to rapid urban development coupled with the emerging impacts of climate change and variability, there was need to update the Kampala Drainage Master Plan so as to provide a more accurate reference document that would guide KCCA's plans for upgrading of key drainage systems and consequently reduction of flooding impacts and consequences. Consequently, with funding from the Kampala Institutional and Infrastructure Development Project (KIIDP2), an update of the Kampala Drainage Master Plan was undertaken (KCCA, 2016). The updated KDMP contains a new implementation program for upgrading of storm water drainage systems in Kampala City that reflects the current city socio-economic status whilst addressing emerging challenges to drainage management in Kampala City. The new implementation programme follows a two pronged approach that aims at targeting investments in:

(a) Construction of new drainage and flood management infrastructure in order to mitigate the impacts and consequences of flooding in Kampala City.
(b) Rehabilitation and expansion of existing (already constructed) drainage and flood management infrastructure such as the Nakivubo Channel to take into account for the emerging climate related and urbanisation threats.

In respect to construction of new drainage and flood management infrastructure, KCCA through KIIDP 2 Project (described in more detail in section 1.2) has completed the detailed design of key drainage systems that include Lubigi, Kansanga/Gaba and Kinawataka Drainage Systems including the attendant Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP). In addition, KCCA has prepared 3 priority investiment packages (lots) for the drainage works totaling 14.3km, following the completion of the update on the Drainage Master Plan. These packages include: Lot 1: Lubigi primary drain (2,526m) and Nakamiro secondary drain (3,280m); Lot 2: Nalukolongo primary drain (4,650m); Lot 3: Kasanga primary drain (1,723m) and

Gaba primary drain (5,380m). Furthermore, KCCA is in the process of procuring consultants to carry out Design Review and Update of Nalukolongo Drainage System design, update of RAP and ESIA

As an accompanying measure (which this TOR focuses on), KCCA has also prioritised the design of rehabilitation and expansion of the Nakivubo Channel to ensure that the rehabilitated and expanded design take into account the extreme loading conditions caused by climate change/variability and recent urbanisation impacts on urban run-off generation within the Nakivubo Catchment.

1.2 The Second Kampala Institutional and Infrastructure Development Project

Kampala Capital City Authority (KCCA) is mandated, among other things, to plan, develop and maintain the city infrastructure. Good infrastructure plays a major role in promoting economic growth and poverty reduction. For long, the City's infrastructure has largely received inadequate attention and funding resulting in its dilapidation yet the population and demand for services have been steadily growing.

With loan financing from International Development Association (IDA), The World Bank, the Kampala Institutional and Infrastructure Development Project (KIIDP) was developed to address the institutional and infrastructure challenges of Kampala City. The overall Project Development Objective of Phase 2 of KIIDP is to enhance city infrastructure to improve urban mobility and deepen the institutional reforms for economic growth.

Under the KCCA Infrastructure development component, the Phase 2 of KIIDP seeks to construct and upgrade identified roads and junctions and drainage channels that are central to enhancing mobility and reducing flooding thereby increasing the useful life of city infrastructure. The main objective of KIIDP2 is to enhance infrastructure and institutional capacity of Kampala Capital City Authority (KCCA) to improve urban mobility for inclusive economic growth. The project consists of two components

Component 1: City wide road infrastructure and associated investments. This component will enhance the quality of roads infrastructure and associated investments in Kampala City for improved city mobility. The component will focus mainly on the construction and rehabilitation of the existing roads network and associated infrastructure (drainage, street lights, walkways, street furniture, landscaping, etc.) in the five KCCA divisions. The long list of roads includes roads with traffic volumes exceeding 300 vehicles per day. The prioritization of roads and selection of the sub-projects will be based on economic criteria.

Component 2: Institutional and systems development support. This component will focus mainly on three core directorates: engineering and technical services, physical planning, and revenue which are integral to the implementation of component one and their outputs are directly linked to the achievement of the project development objective.

In this respect, The Government of Uganda (GoU) intends to spend part of the KIIDP2 loan financing on eligible payments under a contract for **Diagnostic Assessment, Modelling and Mapping of Sub-Surface Storm Water Network in Kampala Central Business District (CBD) and Design for Rehabilitation and Expansion of the Nakivubo Channel.** The contract will be executed by the Government of Uganda through Kampala Capital City Authority

1.3 Project Information

1.3.1 Project Locality

The drainage systems to be studied, designed and expanded are in the Nakivubo Catchment which drains Kampala's City Centre and surrounding areas. Figure 2 below shows the extent of the study area.

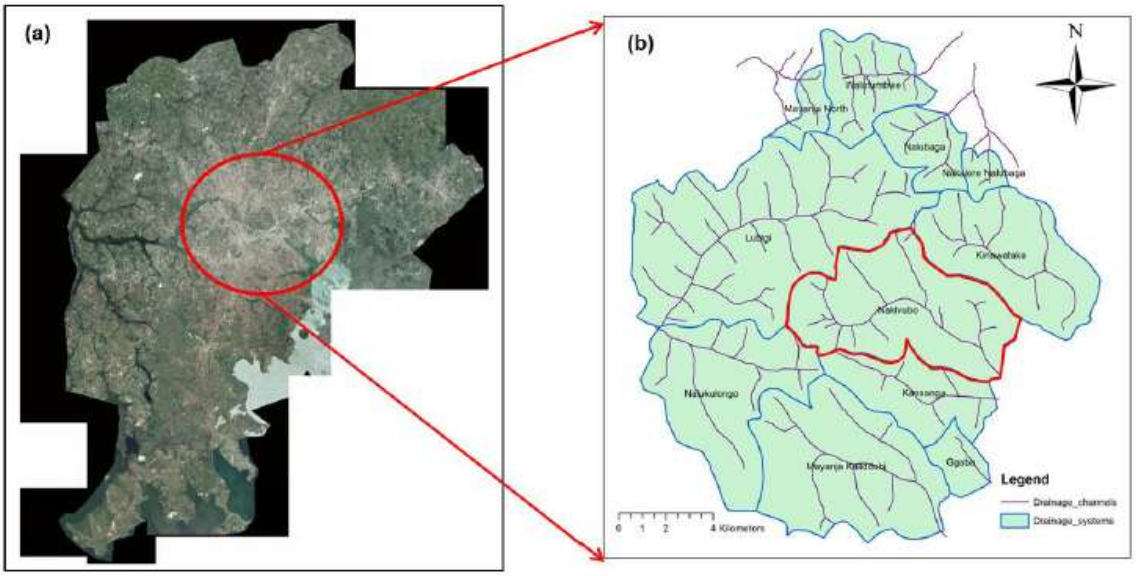

Figure 2: (a) Satellite Image of Kampala City (b) Extent of Nakivubo Catchment which drains Kampala's Central Business District

1.3.2 Site Climatic Conditions

Kampala features a tropical wet and dry climate. However, due to city's higher altitudes, average temperatures are noticeably cooler than is typical for other towns with this type of climate. Kampala seldom gets very hot during the course of the year, the warmest month being January. The average temperature for Kampala is 21.9°C, with an annual range of 2.4°C with relative humidity of about 53 to 89%.

Another aspect of Kampala's weather is its two distinct wet seasons (Figure 3). There is a long rainy season from August to December and a shorter one between February and May. The site falls within climatic Zone B according to the Uganda Hydro-climatic Study (2001). The zone receives an average of 1,270 mm of rainfall per year which is principally spread over two (2) rainy seasons. During wet period some impacts including soil erosion are prone to occur while dust emission would be suppressed to a certain extent.

This understanding is important when planning for the construction schedules with regard to environmental impact mitigation.

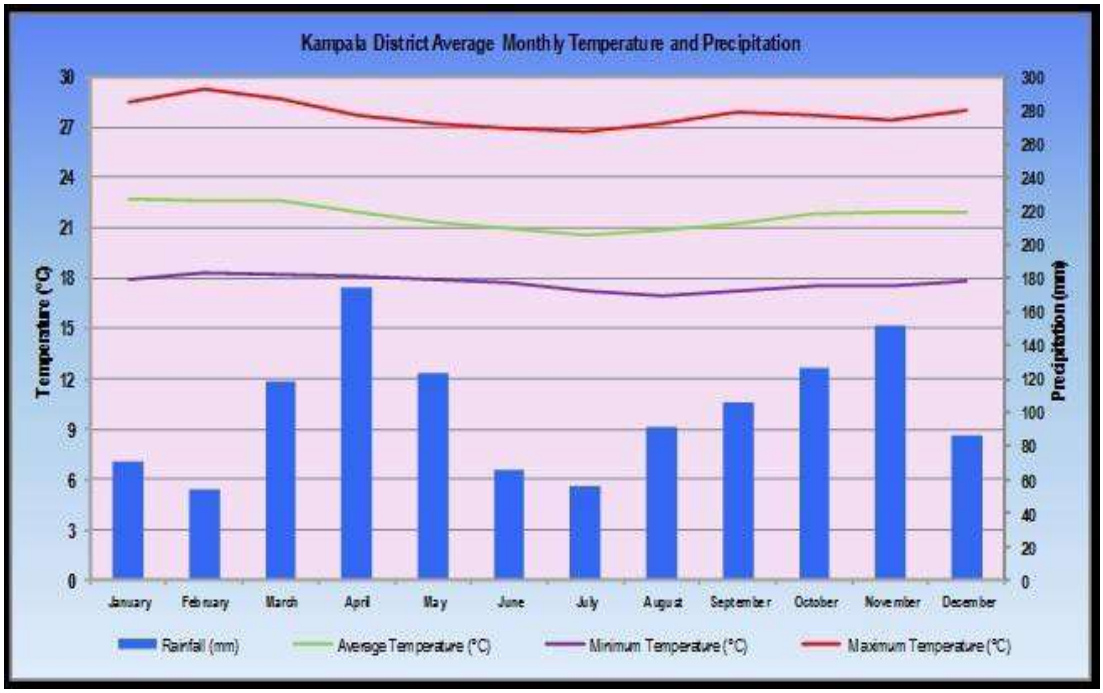

Figure 3: Graph of Kampala temperature and rainfall data

1.3.3 Topography

Kampala is located 1120 m above sea level within a series of hills of flat summits and undulating slopes ending into broad valleys dissected by perennial streams/channels. Topography varies in a general east to west direction. The channels are drained within the wetlands located in the valleys.

1.3.4 Geology

Kampala city is underlain by pre-Cambrian rock systems of undifferentiated gneiss and granite. Kampala's soils are ferralitic soils with no minerals and mainly characterized by Buganda Catena, and Kabira/katena and kaku series. In low lying areas however, soils are clayey with poor drainage and difficult to construct through.

2 Assignment Objectives

As part of the City Drainage Improvement and Flood Risk Management Interventions, KCCA intends to undertake rehabilitation and expansion works on the Nakivubo Channel.

This assignment is for provision of consultancy services for '**Diagnostic Assessment, Modelling and Mapping of sub-surface storm water network in Kampala Central Business District (CBD) and Detailed Design for Rehabilitation and Expansion of the Nakivubo Channel'.**

The aforementioned consultancy has the following specific objectives:

(i) To undertake a comprehensive diagnostic assessment of the existing subsurface storm water drainage network in Kampala's Central Business District
(ii) To undertake an analysis of the solid waste management practices in KCCA (CBD) and how it impacts on the operations and maintenance of the subsurface drainage and the Nakivubo channel;
(iii) To undertake the Detailed Designs for Rehabilitation and Expansion of the Nakivubo Channel including preparation of Environmental and Social Impact Assessments (ESIA) and Resettlement Action Plan (RAP) and Bidding Documents.

The specific objectives of assignment are expounded upon in two work packages.

a) Package 1: Diagnostic Assessment, Modelling and Mapping of sub-surface storm water network in Kampala CBD

(i) To undertake a diagnostic assessment of the sub-surface storm water network in Kampala's Central Business District (CBD)
(ii) To undertake data collection and mapping of the existing underground storm water network in the Kampala CBD
(iii) To undertake an analysis of the solid waste management practices in KCCA (CBD) and how it impacts on the operations and maintenance of the subsurface drainage and the Nakivubo channel;
(iv) Integrate the data in the Kampala Drainage System GIS Database that was developed as part of the Kampala Drainage Master Plan Update project
(v) To undertake model build and simulation based performance evaluation of the sub-surface storm water network including interactions with the surface minor and major systems using specified design hydraulic loading conditions in accordance with the Drainage Design Manual and incorporating the impacts of climate change
(vi) To carry out detailed design for rehabilitation and/or expansion of the subsurface/underground storm network system based on the modelling findings.
(vii) To recommend work packages for rehabilitation and/or expansion of the underground storm water drainage network within the CBD. Based on the modelling and design findings, the consultant shall propose and seek KCCA approval on the packaging strategy. The work packages shall include detailed designs, bills of quantities, costs estimates and tender documents.

b) **Package 2: To Undertake Detailed Designs for Rehabilitation and Expansion of the Nakivubo Drainage System.**

The consultant shall be responsible for the following:

(i) Undertake a condition assessment of the Main Nakivubo Channel which will entail walk over surveys to record features such as wall/slope failures, channel bed sediment materials, culvert/bridge crossing condition among others.

(i) Based on the recommendations of the condition assessment and findings of the diagnostic assessment, recommend measures for rehabilitation of the existing main Nakivubo channel
(ii) Extreme rainfall frequency analysis.
    a) Undertake statistical analysis of existing (recorded) rainfall time series using suitable statistical analysis techniques
    b) Derive intensity duration frequency curves/relationships for the study area
    c) Estimate and applied applicable change factors for upscaling of design rainfall to take into account the effects of climate change on Kampala rainfall extremes
(iii) Undertake detailed hydrological studies to accurately estimate design peak flows necessary for design of channels (primary, secondary and tertiary), bridge and culvert crossings. This shall include but not limited to:
    a) Delineation of sub catchments and estimation of contributing areas
    b) Determination of topographic and land use parameters including key sub catchment parameters (sub catchment width, slopes, percentage imperviousness etc.)
(iv) Undertake design/sizing of drainage channels and key hydraulic structures (culverts and bridge crossings)
(v) Undertake structural design of all drainage structures
(vi) Landscape designs of the drainage reserves to enhance the general aesthetics and promote sustainable utilization of the resources
(vii) Preparation of a Resettlement Action Plan in conformity with World Bank guidelines and national legislation including associated surveys to identify and value property that will be affected by the drainage rehabilitation and expansion works and establishment of a drainage reserve
(viii) Undertake an Environment and Social Impact Assessment of the Project in conformity with World Bank Guidelines and national legislation.
(ix) Preparation of specifications, drawings and Bills of Quantities,
(x) Preparation of tender documents including the Invitation for Bids, Instructions to Bidders, Specifications, all covering the scope of works for efficient implementation of the project components. All documents shall have sufficient details for contractors to bid for and construct the works. Procurement will be based on the World Bank's Guidelines: Procurement under IBRD Loans and IDA Credits, latest edition;
(xi) Preparation of project cost estimates and estimation of the time required to undertake the works based on the project scope, bidding documents and current market rates.
(xii) Incorporation of the Environmental Management Plan in the bidding and Contract documents

3 Scope Of Consultancy Services

The scope of the consultancy services shall be as follows

3.1 Diagnostic Condition Assessment of sub-surface storm water network in Kampala's CBD

Kampala's CDB has a considerable and ageing network of sub-surface storm water drainage in addition to the open channel drains that run alongside the main roads. KCCA intends to undertake an assessment of the existing underground storm water network in order to gain good

understanding of the structural condition of these assets and to prioritise measures for their repair, rehabilitation or expansion.

The scope of the services shall include but not necessarily be limited to:

(i) The consultant, in liaison with the Client shall set the objectives for the condition assessment. Condition assessment shall commence with proposition of the key methods that will be employed by the consultant (e.g. Risk-Based Condition Assessment, Sub-Surface Utility Engineering (SUE) Process) and validation of the scope of the condition assessment. Selection of condition assessment methods and scope of condition assessment shall be agreed upon with the Client during project inception.

(ii) Undertake a comprehensive identification of assets and available data on the underground drainage system in Kampala CBD. This shall entail review of existing documents, maps and models of the drainage network in the Project Area

a. To undertake an analysis of the solid waste management practices in KCCA (CBD) and how it impacts on the operations and maintenance of the subsurface drainage and the Nakivubo channel;

(iii) Asset inspection. This shall entail following activities:

a) Walk over surveys that will be jointly undertaken with seconded KCCA staff
b) Survey and plotting of visible above ground utilities in combination with professional engineering judgement
c) Precise inspection of sub surface drainage systems using non-destructive methods such as CCTV, Acoustic Methods or other applicable shall geophysical methods and minimally intrusive excavation equipment. The precise extent of the sub-surface inspection shall be informed by the risk-based analysis results
d) Limited ground truthing exercise shall be undertaken through checking of existing storm sewer manholes, excavation of trial pits to ascertain the condition of the existing underground drainage network at key points in the network. The total number of trial pits is estimated at 100 and the selection of these points shall be planned and agreed upon with the client. If not undertaken by him/herself, the consultant shall appoint and supervise sub-contractors to:
    - Undertake the field investigations necessary to obtain the requisite data for model build and verification.
    - Carry out all the necessary reinstatements on the trial pits excavated during the exercise.
    - As such, the consultant in his/her proposal shall separately quote for the associated civil works for excavation and reinstatement of 100 trial pits with approximate dimensions 0.75 m x 0.75 m x 1.0 – 1.5 m.

(iv) Predict the current physical state of the underground storm sewer network based on a suitable statistical sample agreed upon with the Client and in line with the proposed risk-based methodology

(v) Carry out topographic surveys or obtain relevant topographical data using high quality global positioning system or using contour maps from digital terrain orthophotogrammetry to clearly and accurately map the existing sub-surface stormwater network in sufficient detail for the subsequent modelling exercise. Here, the use of KCCA's LIDAR data may also be considered as one of the options. The topographic detail shall be to a plan accuracy of +/- 0.5 m, and a vertical accuracy of +/- 0.1 m when related to the control net. The surveys shall aim at accurately establishing the following:

a) Eastings (XX) and Northings (YY) coordinates of key inlets, manholes, storm sewers and outlets
b) Elevation (Z) data (in MASL) of sources, manhole inverts, storm sewers, culverts, road/bridge crossings etc.
c) Accurate lay out and connectivity of the existing underground storm water network.

3.2 Data analysis, analysis and mapping of the existing storm water network

(i) Having undertaken the condition assessment, the consultant shall analyse the data using suitable data analysis tools.

(ii) The consultant shall also undertake mapping of the existing sub surface drainage network including its interactions with the minor and major systems

3.3 Modelling of the storm water network in Kampala's Central Business District including the existing sub-surface storm water network

(i) Undertake model build of a GIS accurate storm water network 1D-1D or coupled 1D-2D model that accurately represents the status quo of the existing underground drainage network and its interactions with the above ground (minor and major systems) and the receiving (primary) channels using a suitable software such as MIKE-URBAN, INFOWORKS CS, SWMM etc. or any other comparable software that can be seamlessly integrated with KCCA's existing GIS software. The final choice of modelling software shall be approved by the client at project inception

(ii) Undertake simulation based performance evaluation of the storm water network (minor and major systems) in Kampala CBD including its interactions with sub-surface storm water network. In addition, the design hydraulic loading conditions that shall be applied shall be in accordance with the with the Drainage Design Manual and the recommendations of the Updated Kampala Drainage Master Plan (KDMP 2016). If required, the consultant shall purchase and install Automated Tipping Bucket rain guages and data loggers premised at the Client's offices for use in collection high temporal resolution rainfall data. The collected data shall be used in the simulation based performance evaluation of the drainage network.

(iii) Model and investigate the impact of climate change/variability and urbanisation on the performance of the existing drainage system in Kampala CBD and to identify key bottlenecks that require urgent rehabilitation.

(iv) Design of improvements to the existing underground storm network that are to be undertaken in the current KIIDP 2 investment period ('future network' model).

(v) To undertake intervention option analysis and to recommend work packages for rehabilitation and expansion of the underground storm water drainage network within the CBD. The recommended drainage improvement measures should focus on innovative inner city drainage designs that:
a) meet pedestrian safety requirements
b) have provisions (e.g. sediment traps, trash racks at inlet points) for collection and removal of sediments/silt

3.4 The consultant shall carry out detailed design for rehabilitation and/or expansion of the underground/underground storm network system based on the modelling findings.

3.5 Detailed Design for Rehabilitation and Expansion works for Nakivubo Channel

The scope of the services shall include but not necessarily be limited to;-

(i) Review of the recommendations of the 2016 Updated Kampala Drainage Master Plan to identify priority interventions (strategies) for rehabilitation and expansion of the Nakivubo Drainage System.

(ii) Undertake detailed surveys and investigations to collect all the data required for the designs including topographic surveys, surveys of right of way, geotechnical investigations, identification of services that may be affected by the proposed works, etc.

(iii) Undertake detailed design of Nakivubo Channel Rehabilitation and Expansion Interventions. Specifically, the consultant shall execute the following activities: detailed hydrological studies, flood risk analysis, flood estimation and hydraulic design including sizing and structural design of hydraulic structures. The key steps entailed in this design shall include but not limited to:

a) Extreme rainfall frequency analysis.
   - Undertake statistical analysis of existing (recorded) rainfall time series using suitable statistical analysis techniques
   - Derive intensity duration frequency curves/relationships for the study area
   - Estimate and applied applicable change factors for upscaling of design rainfall to take into account the effects of climate change on Kampala rainfall extremes

b) Selection of appropriate design storms in line with the Uganda Drainage Design Guidelines and 2016 KDMP Design Standards for Storm Water Facilities

c) Quantification of the physical properties of the storm contributing areas

d) Estimation of run-off flows generated by the specified design rainfall

e) Hydraulic design of the storm water conveyance structures and crossings

(iv) Undertake landscape designs of the drainage reserves to enhance the general aesthetics and promote sustainable utilization of the resources

(v) Preparation of Specifications, Drawings and Bills of Quantities.

(vi) Preparation of cost estimates and the time required to undertake the works. The Consultant shall prepare cost estimates of the drainage improvement works based on the project scope, bidding documents and current market rates.

(vii) Preparation of tender documents including the Invitation for Bids, Instructions to Bidders, Specifications, all covering the scope of works for efficient implementation of the project components. All documents shall have sufficient details for contractors to bid for and construct the works. Procurement will be based on the World Bank's Guidelines: Procurement under IBRD Loans and IDA Credits, latest edition;

(viii) Undertake an Environmental and Social Impact Assessment (ESIA) for the proposed construction works in accordance with Ugandan legislation and NEMA guidelines

(ix) Incorporate the Environmental Management Plan in the bidding and contract documents

(x) Development of Resettlement Action Plan for the project. This will include surveys to identify and value property affected by the drainage improvement works and establishment of drainage reserves, capturing of project affected persons, land take computations, compensation award amounts, and production of strip maps. The UTM coordinate system shall be followed with Arc1960 as the reference ellipsoid. The RAP report shall be prepared according to Ugandan legislation and World Bank guidelines. The consultant shall submit and seek approval of the RAP report by the Chief Government Valuer.

3.6 Technical Requirements

The following sub-sections summarize the technical requirements of the services and key deliverables to be provided by the Consultant. Each sub-section is supported by an Annex that provides detailed information on the tasks and activities to be carried out. The Consultant is expected to respond to all of these technical requirements in their proposal as a minimum level of compliance and to:

(i) Demonstrate the depth of understanding of the technical requirements and their implementation in the Ugandan context,
(ii) Identify where quality and performance improvements can be made,
(iii) Identify where technical innovations and creative solutions may be appropriately introduced to provide added value to the project

a) Detailed Engineering Design

The Consultant shall consult all relevant Ministries, Departments and Agencies (MDAs) and interested parties who may have a bearing on the successful design and construction of the project. The Consultant shall collect and analyze all relevant data and undertake any investigations necessary to carry out the detailed design services to the required standards. The Consultant shall produce detailed designs of all aspects of the project works, using the Kampala Drainage Master Plan (KCCA, 2016), MoWT's technical design manuals (MoWT, 2010), and other relevant design standards. The design shall include identification of material sources, outline construction plans and reviews of typical rates to enable accurate preparation of bills of quantities and cost estimates.

b) Environmental and Social Impact Assessment

The Consultant shall carry out a comprehensive Environmental and Social Impact Assessment. The Consultant shall consult all relevant Ministries, organizations and interested parties who may have a bearing on the successful design and construction of the project. The Consultant shall collect and analyze all relevant data and undertake any investigations necessary to carry out the design services to the required standard.

c) Preparation of Resettlement Action Plan

The Consultant shall prepare Resettlement Action Plan (RAP) in accordance with the government's institutional, legal and policy framework and the World Bank Guidelines. The Consultant shall aim at minimizing the need for involuntary resettlement and adopt best practice in community participation at all stages of preparation of RAP. This is aimed at minimizing the potential for future grievances and disputes.

3.7 Transfer of Knowledge

KCCA wishes to promote skills development, lesson learning and knowledge sharing across the consulting and contracting community in Uganda. As such, we consider Transfer of Knowledge to be about supporting KCCA to improve and increase the knowledge base and performance in the Ugandan Drainage Sector as a whole.

KCCA shall require the consultant to submit a training plan to be embedded in the proposal and clearly articulating how nominated trainees from KCCA shall be trained by the consultant. The training should cover all the aspects of drainage engineering from feasibility stage to the detailed design process. Nominated trainees shall include 2 No. Fresh Graduates who will be attached to the consultant's office.

3.8 Logistics and Timing

(i) Timing

The services shall be completed within 9 Months of commencement of the services

(ii) Facilities, Services and Resources to be provided by KCCA

KCCA shall provide the consultant with all available information on the drainage systems if available. KCCA shall provide the consultant with the existing design documents. Copies of all relevant technical manuals and standards shall be provided on a CD to the selected consultant. KCCA shall provide electronic copies of revisions or updated technical manuals, standard reporting formats and other documentation as and when they become available for use.

KCCA will facilitate liaison with, and the cooperation of, Government Ministries and other organizations as necessary for the Consultant to perform the services and to follow protocols to ensure effective and efficient implementation of the services and subsequent works.

(iii) Facilities, services and resources to be provided by the Consultant

In addition to details in Part C of Section 8 of the bidding document (Conditions of Contract) and appendices to this ToR, the Consultant is encouraged to have at least 30% of the professional fees paid to local staff in accordance with Government of Uganda Construction Policy.

The Consultant shall:

a) Make all necessary arrangements for carrying out the services and supporting the staff assigned to the project. This shall include office and living accommodation, equipment, transport, telecommunications, office and other supplies etc.
b) Ensure that the Team Leader and professional staff have the full authority, in country, to make any technical decisions necessary to complete the services as required.
c) Acquisition of relevant national design manuals from Ministry of Works and Transport

3.9 Management and Administration

(i) Quality Management

The Consultants shall implement an acceptable Quality Management System (e.g. ISO 9001) for the, either within the framework of their own organization's quality management systems or specifically for this assignment. In particular, the Consultant shall prepare a Project Quality Control Plan that shall define how they intend to ensure Key Deliverables are produced on time, within budget and to the technical standards required. The Project Quality Control Plan shall include:

(i) Work schedule and timeliness controls;

(ii) Budget and cost controls (earned value analysis);

(iii) Technical verification and quality controls;

(iv) Risk management controls;

(v) Document controls;

(vi) Project reviews and progress reporting requirements;

(vii) Quality Records to be maintained.

The Consultant shall submit the Project Quality Control Plan to KCCA for review and approval. KCCA reserves the right to carry out audits to assess whether the Consultant is complying with their Quality Management System and Project Control Plan. The Consultant shall include Quality Management issues in their Quarterly Reports.

3.10 Reporting Requirements

(i) Progress reports

KCCA will provide standard progress reporting formats and the Consultant will be expected to adopt the agreed formats and assist KCCA in making sure they are appropriate and useful for monitoring and measuring project progress. The Consultant shall prepare the following project planning and progress reports (5 hard copies and 2 electronic copies.)

Table 2: Planning and Progress Reports to be Submitted by Consultant

Report	**Description**	**Timing in months after commencement**
Inception Report	The report shall outline the Consultant's mobilization, the proposed methodology and work plan, project team and staffing schedule, project log frame, software to be used, initial findings, first assessment of available data and timetable for the services.	1
Project Quality Control Plan	The Project Quality Control Plan shall define all quality and performance controls for the assignment. The project quality assurance plan shall include the following: (i) A quality policy statement setting out the objectives of the plan and (ii) The personnel who will implement the plan, their responsibilities and authority.	1.5
Monthly Progress Reports	The consultant will submit Monthly Progress Reports commencing with the end of Month 2. The Monthly reports shall detail the key activities undertaken during the month, and the planned activities for the preceding month. The reports shall also contain information resources expended, challenges encountered and a review of project time and budget progress. Following the submission of the inception report, the consultant will avail appropriate personnel in Kampala for monthly progress review meetings with KCCA during the diagnostic study, model build & mapping, and detailed design activities. The review meetings shall be for the purposes of: a) Engaging the Client's team and obtain sign-off on the technical aspects of the assignment b) Assessing progress c) Exchanging information and data relevant for the successful accomplishment of the entire assignment.	5 days preceding the end of each month
Draft Environmental and Social	Draft ESIA report shall include the project description, national policy, legal, and regulatory framework relevant to	6

Impact Assessment (ESIA) and RAP Report	the project, environmental and social baseline findings, minutes of meetings with project affected persons, impact analysis, the comprehensive Environmental and Social Management and Monitoring Plan, conclusions and recommended actions. An updated ESIA report should also include the references used. Draft RAP report shall include statement of objectives, institutional, legal and policy framework, socio-economic baseline information, census of project affected persons, project impact, compensation systems, monitoring and evaluation.	
Draft Detailed Design Report and bidding documents	The Draft Detailed Design Report shall include a summary of data collection and engineering investigations including analysis and interpretation of findings, and design drawings, unit rate analysis, project cost estimates, and risk assessment. The Report shall include a concise Design Statement, that provides a summary of all design standards, criteria and assumptions used to prepare the design, and the dates and scope of all survey and data collection activities. This shall be prepared in tabular form and act as an Executive Summary to the design report. The report shall also include all drawings. The bidding documents shall be prepared using the latest World Bank procurement guidelines and standard documents	7

The reports shall be submitted within 5 days of the end of the reporting period.

(ii) Technical Reports

The Consultant shall prepare and submit to the Client the following principal reports (7 hard copies and 2 electronic copies) in the quantities and timelines specified. The reports shall be written English.

Table 3: Technical Reports to be submitted by the Consultant

Name of Report	**Content of Report**	**Timelines for submission from commencement**
Design Base Statement Report	This shall define the set of design criteria and assumptions that are agreed with KCCA as the basis of the design for rehabilitation and expansion of the Nakivubo drainage systems.	2 months

Name of Report	Content of Report	Timelines for submission from commencement
	This may include revisions and alternatives to the relevant technical manuals where appropriate.	
Diagnostic Study, Modelling and Mapping report	This report shall detail the findings of the diagnostic study/assessment of the underground drainage network, the model build and verification results, simulation-based performance evaluation of existing drainage network and the generated underground drainage network maps	6 months
Environmental and Social Scoping Report	This shall provide the baseline information on the social and environmental impact assessment for the drainage systems, including policies and laws, public consultations with project affected persons, and significant the environmental impact assessment which the study will focus on.	4 months
Final RAP/Valuation for Compensation report approved by the Chief Government Valuer (CGV) and World Bank/IDA.	The report shall contain details on the methods of surveying and valuation; land take computations; valuation schedules and strip maps; the report shall be endorsed by a registered land surveyor and a registered land valuer; the report should be standards acceptable by World Bank/IDA and the CGV.	7 months
Final Environmental and Social Impact Assessment Reports and Resettlement Action Plan	Clear environmental management plan for project. RAP should be exhaustive regarding affected properties and values	7 months
Final Detailed Design Report, and Bidding Documents	As above, updated with incorporation of comments from KCCA	9 months

All reports shall be submitted both in hard copy (7 copies of each) and electronic copies (2 CDs of each). The final reports including drawings shall be submitted in hard copy (14 copies of each) and an electronic CD. The reports shall be submitted to the client at the following address.

The Executive Director,

Kampala Capital City Authority,

Attention: The Director, Engineering and Technical Services

City Hall, Plot 1-3 Apollo Kaggwa Road

P. O. Box 7010 Kampala

Tel: +256 204 660600/ +256 204 660601

Fax: +256 414 232807

Country: Uganda,

The Consultant shall submit a copy of each document (both hard and soft copy) to the Task Team Leader, World Bank office, 4th Floor, Rwenzori House, Plot 1, Lumumba Avenue, Kampala.

The consultant will be required to revise the reports addressing any issues that may be raised by the Client on the reports submitted.

The Consultant will also be required to make presentations of their findings in the course of the study, and as requested by the client, for each of the technical reports. The Consultant and the Client shall agree on what report to present at the end of each of the execution stages. KCCA shall arrange for the venue and provide the necessary facilities for such presentations. The consultants' presentations shall be succinct and shall depict the key salient issues at hand (maximum 20 slides).

(iii) Client Liaison and Feedback

The Consultant shall report to the KCCA Directorate of Engineering and Technical Services, on all matters relating to this assignment, working closely with the nominated representative of the Directorate to ensure the smooth execution and timely completion of the assignment.

(iv) Handover of data, models and manuals

The consultant shall hand over all data collected during the course of the assignment to the client in formats approved by the client. This includes all drainage network data, measurement and calibration results, all verified network models and all option models that shall lead to final design and construction. Furthermore, all calculation sheets must be made available to the client at any stage and at the end of the project. The consultant shall also prepare a manual that clearly specifies the model build and simulation procedures This data shall also form part of a final data pack for handover with contents and format as requested by the client.

3.11 Professional Staff

The table below shows the estimated inputs necessary for the Key Experts to deliver the services to the required standards. These inputs are estimates only. The Consultant is free to fix the amount of input needed based on the Consultant's methodology.

Key Expert	No of persons required	Minimum Input (person months) and key expert
Team Leader/ Drainage Engineer	1	7.0
Urban Drainage Modeller	1	3.0
GIS/Mapping Expert	1	3.0
Structural Engineer	1	3.0
Land Surveyor	1	4.0

Measurement Engineer	1	1.5
Geotechnical/Materials Engineer	1	3.5
Environmental Expert	1	3.5
Land/Property Valuer	1	3.0
Socio-economist	1	3.5
Total	**10**	**35.0**

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ANNEXES TO THE TOR

ANNEX 1: GENERAL DESIGN/DESIGN UPDATE GUIDELINES

INTRODUCTION

The services shall be carried out in a phased manner as detailed above. The consultant will seek KCCA approval of the outputs of each phase before proceeding to the subsequent phase.

All design documentation and associated reports, quantities and cost estimates etc. shall be submitted to KCCA and the World Bank in draft format for review, comment and approval.

Technical Standards

All designs and documentation shall be in accordance with the Design Standards for Stormwater Drainage Facilities (T2): Kampala Drainage Master Plan (2016), Ministry of Works and Transport, Design Manuals (2010) supplemented by any other applicable international standards that may be proposed by the Consultant which will be subject to KCCA approval.

In addition, the Consultant shall follow the requirements of the following documents in carrying out the services:

(i) Guidelines for Environmental Impact Assessment in Uganda (NEMA)

(ii) World Bank Operational and Safeguard Procedures

Design Base Statement

Where the Consultant feels other internationally recognized standards are more applicable, the consultant shall make a comparison of the designs and present the report for the client's review.

The consultant shall prepare a Design Base Statement that summarizes the key design criteria to be used and shall produce a Design Departures Report to ensure it is documented and clear where the final design departs from the agreed design criteria.

DOCUMENT REVIEW, CONSULTATIONS AND RISK ASSESSMENT

The Consultant shall review the updated Kampala Drainage Master Plan (2017) and/ or detailed designs (if available) and other relevant reports and shall identify and study all relevant Manuals and Design Guides. The Consultant shall identify any issues that are considered inadequate or inappropriate to the project, advice KCCA of the implications of such issues and recommend measures to address them, to allow KCCA to decide how to proceed.

The Consultant shall hold discussions with interested parties, such as the Ministry of Water and Environment, National Environmental Management Authority (NEMA), the Ministry of Lands,

Housing and Urban Development (MLHUD), National Water and Sewerage Corporation (NWSC), Uganda National Roads Authority to identify issues having a bearing on the progress of the consultancy and to collect available data relevant to the design process.

The Consultant shall hold preliminary discussions with the relevant utilities to ascertain the extent and capacity of their infrastructure and the potential need for such to be protected or relocated as a result of the project works. The Consultant shall obtain costs of utility works taking into account possible improvements to be initiated by the utilities.

Written records are to be kept of all consultation meetings summarizing the issues arising and any actions identified.

Visual Assessment and Site Inventory

The Consultant shall visit the proposed site location, conduct a walkover survey to familiarize themselves with the area, discuss the project with the KCCA technical Staff, and hold preliminary discussions with the local authorities to inform them of the proposed project.

The consultant shall gather relevant information and mapping and undertake, for each drainage system, a visual assessment of the prevailing conditions along the drainage routes and talk to local authorities and people in the area, in order to:

(i) Identify and propose the design standards;

(ii) Identify major issues e.g. risk of flooding, accessibility, extent of encroachment;

(iii) Determine approximate extent of drainage re-alignment required, both horizontal and vertical, and indicate on available mapping;

(iv) Identify locations along the channels which require improvement;

(v) Prepare a detailed programme for data collection and analysis, and;

(vi) Prepare a detailed programme for detailed engineering investigations.

Project Risk Assessment

The consultant shall carry out a risk assessment of the project, develop a risk assessment matrix to include information relating to the likelihood of a risk occurring, the severity of the impact of a risk on the project, and how a risk shall be managed. Throughout the project, the Consultant shall update the risk assessment matrix and, as appropriate, include for identified risks in the project cost estimates.

Initial Assessment

The Consultant shall include in the inception report, an Initial Assessment of the project summarizing the findings from their visual assessment and risk assessment, and shall include a detailed site inventory and photographic record. The Consultant shall liaise with KCCA to agree on the actions and priorities recommended in their report.

DATA COLLECTION AND ANALYSIS

The Consultant shall collect and analyze all necessary supportive data required to complete the design services. The amount of supportive data to be collected will depend on:

- the extent and accuracy of data contained within the Pre-Feasibility Report if available;
- the elapsed time since that data was collected;
- the availability of data from other sources; and
- the relative importance of available data to the design process.

As the consultant derives rainfall intensities, return period for the drainage structures, and other parameters, he will agree them with KCCA to ensure a consistent approach is being used by all consultants working for KCCA.

Climate

The Consultant shall examine existing available meteorological data and provide project specific climate information relating to:

(i) Rainfall (length of records, monthly distribution and intensity, storm intensities for different return period, etc);

(ii) Temperature (length of records, monthly minimum, maximum and average value); and

(iii) Any other climate features of importance.

The Consultant shall indicate the possible effects of climate conditions on the permanent design and the construction programme. Where there is insufficient data available, the consultant will propose and agree with KCCA what data and assumptions will be used in the design.

Geology

The Consultant shall make use of maps and aerial photographs from the Department of Lands and Surveys and from other internationally recognized sources in order to compile a catalogue of the relevant geological features of the project area, including a description of the soils and rocks encountered along the existing and new alignments and their effect and influence on factors such as route location and design.

Mapping, Land Use and Aerial Photography

The Consultant shall assemble all necessary mapping and documentation for the purposes of compiling details of land use and vegetation within watercourse catchments and within the anticipated project boundaries. The consultant is not expected to provide any additional aerial mapping than is available, unless the consultant chooses to use this process to undertake a topographical survey of the route.

Development Pattern

The Consultant shall review the Kampala Physical Development Plan (2012) to identify the likely mode and extent of development within the project affected areas and hence the need to provide or plan for additional drainage capacity.

Utilities and Wayleaves

The Consultant shall obtain from the utilities authorities maps showing the locations, dimensions and capacities of their existing underground and overhead infrastructure/equipment within the drainage reserve, or potential drainage reserve extension. The consultant shall show all utilities and data on a draft set of utility drawings to later be incorporated into the design drawings. Where shown on the authorities maps, the data shall include the above ground height or buried depth of all services, including cross services to adjacent properties.

The consultant should also obtain information on the utilities' companies future plans for upgrades of development of new utilities networks within the project area. The accuracy of all such records shall be verified on site by the Consultant both by observation and by use of non-intrusive detection equipment.

In addition, the Consultant shall obtain details of utility proposals for short and medium term service enhancement proposals, and consider the implications of these in the design.

Where the project drainage systems lie in proximity to industrial development the Consultant shall make enquiries as to any private services in or crossing the drainage reserve. In all cases the existence of any wayleaves or other specific legal instrument shall be detailed.

The consultant shall include in the project specification a requirement for the contractor to locate these services early on in the construction contract.

Environmental and Social Impact Assessment

The consultant shall carry out an update of the Environmental and Social Impact Assessment (ESIA) to ensure that the final output/ESIA report is in accordance with the Government of Uganda and World Bank Guidelines for Environmental and Social Impact Assessment. This shall include a baseline environmental and social survey, consultation meetings with relevant local agencies and stakeholders, and identification and analysis of environmental and social impacts.

Identification of impacts shall include factors such as geology, biological resources, aesthetics, water quality and hydrology, land use and planning, population and housing, air quality, noise, public services, utilities and service systems, energy, public health and safety (including STD transmission from construction workers), hazards and risks, recreation, economic activities, transportation and traffic, cultural resources. Positive as well as negative impacts shall be identified.

FEASIBILITY STUDY

If the services include a feasibility study stage, the Consultant shall thoroughly inspect and assess the existing condition of the project area and prepare a detailed Feasibility Study report. The consultant shall provide a procedure for economic feasibility assessment and provide updated data as required to undertake the economic study. The data is to be agreed with KCCA as the project proceeds.

The consultant shall pay particular attention to the following specific issues and shall consider the following aspects:

Drainage Route Assessment

(i) **Drainage channels**; define each project drainage system and identify where improvements in alignment and/or structure to meet the project objectives as part of the Feasibility Study. Where improvement in horizontal alignment is required, the consultant shall prepare options that show the re-alignment and required land take.

(ii) **Geographical and Agro-ecological**: include topographical and climatic features, vegetation and land-use pattern, potential natural resources, and development potentials and constraints of the drainage route corridor.

(iii) **Demographic and Settlement Pattern**: include population size and characteristics, density, and market centers, employment, income level/ poverty condition, gender issues and socio-cultural aspects of the people living in the drainage corridor of at least 1 km or either side of the proposed drainage lines.

(iv) **Socio-economic**: identify and assess existing and potential socio-economic activities, services and projects, agricultural and other production, consumption and surplus/deficit situation, infrastructure, energy, water and other social services, and socio-economic needs, sources and potentials of the corridor based on sample surveys on selected representative homogenous geophysical, distances and socio-economic environments.

(v) **Environmental**: the scoping of the area of influence, generate baseline data and the relevant environmental and social characteristics of the drainage corridor and compiling existing data and studies on the biophysical and socio-economic environment and possible impacts and need for mitigation measures.

(vi) **Land Acquisition**: assessment of the extent of land acquisition and resettlement impacts based on alignment options and associated land take boundaries, preliminary public consultations, and cost estimates for land acquisition and mitigation measures.

DETAILED ENGINEERING INVESTIGATIONS

Stage 1 Review of existing design: If applicable, the consultant shall carry out document review and sufficiently detailed engineering investigations to allow a review of the existing design and identification of the shortcomings and updates required.

It is envisaged that, through careful planning, the consultant will be able to collect the majority of the data during the stage 1 investigations and will only have to enhance the data for some areas as will be agreed between the consultant and KCCA.

Stage 2 investigations for detailed design: Once the elements for the detailed design have been agreed with KCCA, the Consultant shall carry out further detailed engineering investigations for the drainage route sections. The Consultant's proposal shall allow for additional surveys and data analysis/ interpretation as required to complete the stage 2 investigations.

Topographical Surveying

The Consultant shall carry out detailed survey along the length of the proposed drainage alignment options and covering the width of the right of way (ROW) as a minimum using the most up to date surveying techniques, procedures and equipment. The consultants should also cater for realignments and alternative routes in their survey. More extensive surveys shall be undertaken at bridges and culvert sites.

The consultant may make use of one or more of the following survey systems to undertake the topographical surveys of the drainage systems. He must ensure accuracy of the survey results is maintained. Systems include:-

- •Aerial photographic mapping;
- •Terrestrial photogrammetry;
- •Light Detection and Ranging (Lidar);
- •Terrestrial survey using conventional survey procedures and
- •GPS, using Static and Real-Time-Kinematic procedures.

The consultant shall in his proposal give full details of the proposed survey system(s) and procedure(s), e.g. procedures for establishing and extending survey control, the number of primary and secondary stations that will be installed. The consultant shall include details of the number of teams of surveyors and survey equipment he shall deploy to complete the survey work within the timescale. The cost of procuring, operating and maintaining this system should be included in the financial proposal.

The consultant shall clearly demonstrate that he can mobilize sufficient manpower and equipment to undertake this work in the defined timescale.

Establishment of Survey Control

Primary reference beacons and benchmarks shall be established in pairs at approximately 1.5 km intervals within the limits of the drainage reserve. The beacons shall be tied to the National Survey Grid. Benchmark orthometric heights shall be referenced to the national datums. Digital level instruments shall be to take levelling measurements following the differential levelling technique. GPS height measurements for benchmarks are not allowed. Beacons and benchmarks shall be established in the field by permanent Iron in concrete markers and identification posts. They shall

be shown on plan and profile drawings and referenced appropriately. Description cards for beacons installed and used on the project will be developed.

Coordinate/ positional values of survey control/beacon points within the final survey data file must be true final adjusted position i.e. they must not be field-captured radiation or RTK GPS position. Where GPS techniques are used to extend survey control, the preferred method is Post Processing.

The same grid control network shall be used to reference topographic, cadastral and construction surveys. Establishing and extending control beacons shall be done in accordance with the guidelines set by the Department of Surveys and Mapping, Entebbe. The consultant will be required to register and obtain approval of the Primary control network from the department of Surveys and Mapping Entebbe.

Accuracy Requirement for Survey Control

LEVELLING:	
Checks between fixed elevations of a loop misclosure shall not exceed -	10√k (in mm)
TRAVERSE:	
Maximum number of courses between checks for azimuth	15
Azimuth misclosure shall not exceed	3.0” per station
Position misclosure (after azimuth adjustments) shall not exceed. Whichever formula gives the smallest permissible error)	1.67’√1.609K or 1/10,000
Distance measurement shall be accurate to within	1/10,000
K = distance in kilometres	

The survey methodology used for establishing and extending control, and the accuracy attained shall be included in the Survey Report. The report shall include traverse field and computation sheets, GPS computation and rinex raw data files, differential levelling computations etc. Secondary survey stations shall be similarly established along the alignment at frequencies necessary to ensure the survey tolerances are achieved and provide intervisibility. Beacons shall be constructed outside the construction zone. Secondary beacons may be placed between 300-700m intervals. Traverse surveys to establish the secondary control stations shall be recorded along with the accuracies thereof and reported in the final survey report. Elevations shall be extended across the control network using differential levelling methods.

Survey Control Marks (Benchmark) Register

The Consultant shall maintain an up to-date survey control marks/benchmarks register of all permanent beacons that make up the survey control network on the project. The register forms part of the quality control records of the project and must be controlled in accordance with the Project Quality Plan. The following information should be included in the register::

a) A unique number/identifier for each survey control mark/beacon;

b) Any other identifier such as Primary or Secondary;

c) Easting, Northing and Height/Elevation of each survey control mark, except marks used for reference sightings only;

d) Chainage and offset of each survey control mark in relation to the channel centreline;

e) The side of the drain on which the survey control mark is located;

f) A description of the physical nature of each survey control mark, such as peg/pin drilled in tarmac, concrete etc;

g) Picture and sketch map showing the location of the beacon shall be drawn. Include details like offset from easily identifiable features etc on a description card.

Survey of details

Topographic data shall be captured in a manner suitable for the creation of a 3 dimensional digital ground model in an appropriate modelling system (Engineering design software e.g. ACAD Civils, or similar). The model so produced shall accurately represent the existing drain and natural ground features when a cross section is generated from the data. The start and end of all linear features must be recorded as well as their cross sectional shape. (see tolerance table below). All single point features e.g. signs shall also be geo-referenced and recorded.

Elevation data shall be recorded at a maximum of 10m intervals along the proposed drain centrelines. Both the proposed alignment and existing routes will be surveyed and mapped.

Spot levels along the cross-section shall be taken at maximum 10m intervals picking up all the manmade and natural topographic features and changes along the cross section. However, the interval of the spot levels shall be varied based on the condition/topology on site. Closer spacing shall be surveyed where the terrain is not uniform such as deep gullies and creeks. The width of the survey corridor shall extend beyond the right of way (ROW) and take into account the layout of the existing alignment and the general ground profile.

All Access and Public roads, rail lines and other services crossing the proposed alignment shall be geo-referenced. The survey shall extend a minimum of 50m (or as will be agreed with KCCA) either side of the proposed drainage centre line. At road crossings, the survey will be of sufficient width and detail to allow improvements to be designed. Underground services and conduits shall be mapped.

Details of all features such as structures (bridges, culverts, feeder channels etc.), utilities, existing roads, electric and telephone installations, huts, buildings, fencing and trees (with girth greater than 0.3 metre) etc falling within the extents of the survey shall be recorded.

All natural and artificial features (including underground) occurring within the survey project area shall be captured and represented as points or strings / polygons in the digital model. Features shall be captured at ground level unless specified.

Survey Quality Plan

Survey procedures should be included in the overall project quality plan drawn by the Consultant. These procedures shall describe how the survey process will be controlled so that all the requirements of drawings, design, construction and specifications will be met. The project quality plan should include the responsibilities of registered surveyors for cadastral and survey control establishment.

Survey procedures and equipment used must be appropriate for the attainment of the tolerances stated in the contract and specifications. The procedures should be able to address all errors introduced by the survey methods, including due allowance for the effects of:

a) Survey equipment capability and adjustment, include recent calibration certificate;

b) Integrity of the survey control network;

c) Vertical refraction;

d) The grid scale factor; and

e) The earth's curvature.

Digital Terrain Model Triangulation Dimensions

In addition to satisfying all other accuracy requirements, side lengths of triangles forming the Digital Terrain Model generated from the survey data must not exceed 20. Survey capture density and spacing must ensure that this condition is met; a closer interval shall be adopted for hilly, horizontal and vertical curves, and mountainous areas.

Deliverables related to Surveying

Control, topographical and cadastral surveys undertaken by the Consultant shall be to acceptable international standards for such works. Data from the surveys shall be available in (x, y, z) format for production of a digital terrain model (DTM) which shall become the property of KCCA upon the completion of the study. The following information will be required from the consultant;

- Spot heights at the stipulated intervals
- Detailed site topographic plans for population centres, road crossings and entire drainage layout etc;
- Major contours at 5m interval and minor contours at 0.5m interval;
- Project site (right of way) boundary coordinates;
- Digital Ground model in a suitable format (i.e. 3D lines or triangles), showing coordinates and levels;

- Schedule of benchmarks and beacons, with reference numbers, coordinates and heights. Description and location of benchmarks shall also be submitted. Clearly distinguished between primary and secondary control. Location Photo and sketch map for the primary survey control beacons;
- Detailed Survey report;

At the end of the design project, all topographical and design data shall be supplied in a format suitable for input to Engineering design software e.g. Civil 3D design software and loaded onto KCCA's server. The design shall be referenced to a line or string which shall contain details of chainage (or station), horizontal and vertical geometry information.

Hydrological Studies and Hydraulic Designs

The Consultant shall undertake hydrological for all drainage catchments with careful analysis of stereoscopic aerial photography, available maps and field investigations.

The calculation of catchment run off and channel discharge characteristics shall be based on rainfall intensity and duration for return periods identified in the Kampala Drainage Master Plan for the various drainage elements and bridges. The capacity of existing waterways and drainage structures shall be checked and their deck levels shall be compared with anticipated flood levels. The likelihood of blockage by debris shall be assessed.

The hydraulic designs of proposed drains and their lining shall be carried out using an acceptable design software (subject to KCCA approval). All input and output data will be submitted together with the hydrology/hydraulic reports. Slopes and capacities of drains shall be surveyed in areas where erosion or flooding presently occurs, in order to ensure adequate design of the drainage systems, erosion control measures and the protection of side slopes.

Geometric Investigation

The Consultant shall develop optimum vertical and horizontal alignments having regard to:

(i) design manual criteria or such other criteria agreed with KCCA;

(ii) the need to minimise land take beyond the existing drainage reserve;

(iii) the need to protect vulnerable the drainage systems from abuse;

(iv) a requirement for accommodation works to be affordable and acceptable to frontagers;

(v) the need to minimise the need to protect or relocate utility services;

(vi) the need to avoid geological, hydrological and environmental problems; and

(vii) the need to avoid extensive and expensive bridge and structural works.

Where alternative horizontal alignments beyond the drain reserve limits are to be evaluated, the Consultant shall develop and cost options at an early stage and prepare a report for consideration by interested parties and KCCA. The Consultant shall propose target dates for the presentation

of such options and selection of the preferred option in their work plan, ensuring sufficient time to complete the detailed design of the preferred solution within the assignment timescale.

Detailed site investigation and surveys shall be carried out for areas susceptible to flooding or landslide, and at all proposed new or replacement drainage structure locations, including a sufficient length upstream and downstream to the structures. Structural design shall be undertaken with a view to fixing vertical and horizontal alignments at those structures. Vertical and horizontal alignment data shall be computed for the centre line at a maximum of 20m intervals and at all vertical and horizontal transition points.

Materials Investigations

The consultant is to clearly demonstrate that he can mobilize sufficient manpower and equipment to undertake the soils and material investigations in the defined timescale. The Consultant shall as a minimum take samples along the drainage centre line at intervals of 1000 m. Field and laboratory tests shall include soil classification (sieve analysis and Atterburg limits), 5 point modified proctor test, moisture content, and other tests as may be agreed with KCCA. In instances where geotechnical information may be required for depths up to 8m for deep foundations such as bridges, SPT tests may be required.

Culvert and Bridge Inspection and Assessment

The Consultant shall undertake a detailed condition survey of all existing drainage culverts and all bridges to be retained to determine their hydraulic capacity, structural adequacy and traffic load capacity. Assessments shall be made of their residual life, and the cost of repairs or reconstruction to increase capacity. The Consultant shall make recommendations as to their retention, reconstruction or replacement.

The Consultant shall carry out any necessary non-destructive testing of the culverts and or bridges and shall include a draft non-destructive testing programme, and structural investigations for the culverts and bridges, including cost estimates, in their proposal. This shall be refined and updated once the assignment commences.

DESIGN UPDATE DETAILS

The consultant shall consider the following aspects:

(i) Topographic Surveys:- The Consultant shall take account of his surveys undertaken to include sections of the drainage systems proposed for re-alignment.

(ii) Geotechnical Investigation:- The Consultant shall take account of his soil and geotechnical investigations of the proposed channel routes.

(iii) Hydrology/Hydraulics Study:- The consultant shall analyse and document Hydrology/Hydraulics assumptions, check the size of existing drainage structures and propose the main drainage requirements for the channnels. The consultant shall document the Drainage Design in the Hydrology/Hydraulics report.

The study shall include a narrative description and schedules of proposed channel lining and shapes, other drainage structures, conditions, and facilities. All Hydrologic and Hydraulic drainage computations for the design presented in the plans shall be included along with supporting design information such as drainage maps.

(iv) Design criteria:- The Consultant shall design the drains according to the agreed design criteria. The consultant shall investigate various alignments, assess and design the horizontal and vertical alignments, taking into account:-

a) Agreed design criteria;

b) Hydrological and drainage characteristics;

c) Current and/or anticipated flood flow volumes;

d) Existing terrain, infrastructure and land use;

e) Local fixed points;

f) Geotechnical and soils investigations;

g) Environmental Impact;

h) Social impact; and

i) Land-take requirements.

j) Agreed safety requirements and standards;

(v) As the project proceeds, the consultant shall present to KCCA alternatives for improvement in alignment of the drains.

(vi) Drawings to include:

a) Plan drawings at a scale of 1:1000 or as agreed with KCCA to show alignments, vegetation type, other drainage elements, right of way and clearly show areas of land-take

b) Profile drawings to scale 1:1000/1:100 or as agreed with KCCA to include existing features (e.g. road crossings) or natural ground level and proposed vertical alignment.

(vii) The consultant shall undertake the hydraulic design of the drains using a modern and comprehensive modelling software. This software must be capable of allowing the designer to assess different options. All topographical and design data shall be supplied in a format suitable for input to drainage design software or similar. The design shall be referenced to a line or string which shall contain details of chainage (or station), horizontal and vertical geometry information.

(viii) Design of Structures. Based on the full topographic survey, geotechnical investigation, hydrological study and other studies, prepare structurally sound and cost effective design layouts for all bridges and culverts. The design will include:-.

- Location plans for bridge / structure and approaches;
- Longitudinal sections of approaches;
- Elevation of the structure;
- General arrangement to show type of foundations, abutments, piers and deck;
- Scour protection measures to bridge/culvert foundations;
- River training works to protect river banks and bridge abutments/ culvert wing walls, and;
- Short report on main issues in building the bridge/culvert and how these will be mitigated e.g. wide fast flowing stream, access for maintenance and scour.

Construction quantities and cost estimate

The consultant shall;

a) Calculate quantities for the items of construction based on the design drawings and shall prepare a bill of quantities;

b) Analyse current construction rates, trends in inflation for different local and imported materials, labour and plant costs determine suitable rates for this contract and then discuss and agree the rates with KCCA;

c) Make a realistic evaluation of the cost of the project, taking into account the location and size of the project as well as the current status of construction market, and;

d) Consider land acquisition, environmental / social mitigation measures, and items identified in the project risk matrix in the cost estimate.

DETAILED ENGINEERING DESIGN REPORT

The consultancy services in this regard shall include, but not be limited to the following;

a) Detailed engineering design, preparation of estimate of quantities, plans and, drawings;

b) Carrying out the necessary topographic surveys in order to establish the drain alignment and to accurately determine the centerline;

c) Preparation of cost estimates for the proposed work, based on the estimated quantities. The cost estimates will be based on the unit cost analysis, broken down into foreign and local cost components. Also a detailed comparison of the overall bid price/km of other similar contracts awarded by international competitive bidding shall be included;

d) Engineering activities shall be carried out as necessary to complete the engineering design and bidding documents. The activities shall include but not be limited to all necessary topographic surveys, location of centerline, leveling of profile and cross sections, soils and materials investigations, lining, drainage and bridge deep soil and site investigations as appropriate, and location and testing of sources of sand, gravel and rock required for construction.

e) Bidding documents suitable for international competitive bidding, following the current WB's Standard Bidding Documents for procurement of Works, shall be prepared including Conditions of Contract, specifications, plan and profile drawings, cross sections, bridge and culvert drawings, bills of quantities, forms of bids and performance bonds/bank guarantees.

Design Responsibility: At the end of the detailed design stage, the Consultant shall assume responsibility for all aspects of the design covered by this phase.

As the design progresses the Consultant shall maintain close liaison with KCCA and shall submit for approval from time to time, according to the work programme, draft design proposals for the drainage alignment, structures and other technical aspects of the design prior to proceeding to the detailed design drawings. Where a number of options have been considered these shall be described and analysed in the Design Options Report. Similarly the Consultant shall submit draft technical specifications and bills of quantities prior to producing the draft final bidding documents.

Design Standards

The Design shall be undertaken according to Design Standards for Stormwater Drainage Facilities (T-2): Kampala Drainage Master Plan (2017), MOWT standards (2010) and the agreed Design Base Statement. The Consultant shall prepare a Design Departures Report that clearly identifies all instances where these design standards have been deviated from in their design, with justification for the deviation. These deviations shall include instances where the Consultant considers the design standards to be lacking or inappropriate to the project.

The metric system shall be used throughout and the design should focus on making best economic use of locally available natural and manufactured materials and resources.

Drainage design

The Consultant shall use the recommendations of the Kampala Drainage Master Plan (2016), MOWT standards, international best practices in preparing the drainage designs. The Consultant shall engage with local communities and local authorities to raise awareness of the need to offer easement rights for drainage to run-off over adjoining land to ensure adequate drainage. Where such easement rights are required, the Consultant shall submit details for inclusion in the Resettlement Action Plan.

In designing channel cross-sections, culverts and bridges the Consultant should have regard to providing as much standardization as possible and offsite pre-casting or fabrication of components. The choice of design must reflect seasonal constraints to construction, whether culverts/bridges are likely to be on the construction programme's critical path and the cost and practicality of providing temporary bridging.

The Consultant shall propose a strategy for temporary storm water diversion to allow for construction. The strategy should aim at minimising any occurrence of flooding for areas surrounding the construction sites.

The engineering design shall be undertaken using appropriate computer aided design software. The Consultant's proposal must state the software they intend to use, and ensure it is compatible with KCCA software and IT systems in the early stages of the design assignment.

All topographical and design data shall be supplied in a format suitable for input to agreed civil engineering design software. The consultant shall load the data onto KCCA's server and prove the data is complete. The design shall be referenced to a line or string which shall contain details of chainage (or station), horizontal and vertical geometry information.

Potential Borrow Pits, Quarries and Gravel Pits

Following identification of borrow gravel pit and quarry locations the Consultant shall consult with NEMA and other authorities as to possible locations and legal requirements, prepare detailed proposals and plans for their opening, operation and restoration. Such plans shall cover, but not be limited to:

(i) precise locations and boundaries of each pit/rock source;

(ii) land ownership;

(iii) material quantities to be extracted and their location;

(iv) the stockpiling of overburden;

(v) allowable pit working times;

(vi) provisional extraction phases;

(vii) site security and safety;

(viii) provisional royalty payments, and other compensation and legal agreements;

(ix) necessary planning consents; and

(x) public roads to be used for haulage purposes and their protection

a) condition report

b) upgrading and maintenance proposals;

c) limits on truck size and capacity

d) noise and dust mitigation measures

e) draft Agreements with the relevant road authorities.

(xi) Environmental compliance.

Quarries

The Consultant shall examine existing quarries and crushing plants and their capacity to supply aggregates and granular mixes to the required specifications. Should a need be identified for the Contractor to open his own quarry, or quarries, the Consultant shall consult with NEMA and other authorities as to possible locations and legal requirements. Full evaluation of each option shall be carried out including planning requirements and consents and their necessary timescales.

Depending on the outcome of such evaluation the Consultant shall either detail options open to bidders for the works contract or advise KCCA of the preferred option and the action necessary to ensure quarry availability by the anticipated start of works.

Design of Ancillary Features

Utility Services and ICT ducts

The consultant shall liaise with utility service providers on the need to provide ducts across the drains for present or future use

Drainage Reserve Furniture

The Consultant shall clearly mark on design drawings the extents of the existing and proposed drainage reserves and design permanent signage to indicate the extents of the drainage channel reserve. The design of such signage should consider the risks of vandalism, be sustainable and blend in with the surrounding environment.

The Consultant shall pay particular attention to the provision of safety features such as fences and the like, and hold consultations with KCCA to ensure effective provision and siting of these features.

The Consultant shall engage with communities along the improved drainage channel and local authorities to raise awareness of the importance of protecting the drains.

Traffic Diversions

Construction of culverts and/or bridges across existing roads will require provisions for traffic diversions. The consultant shall prepare a provisional traffic management plan detailing how traffic and pedestrians shall be accommodated during the construction phase. The plan shall:

(i) develop a phased approach to construction which minimises road user disruption;

(ii) detail which public roads shall or shall not be used for construction or diverted traffic;

(iii) locate and detail temporary diversion roads;

(iv) lay down conditions for one way traffic working;

(v) detail required provisions for temporary bus bays and lay by facilities;

(vi) ensure that frontagers, particularly commercial frontagers, shall have reasonable access at all times;

(vii) detail the temporary signing that must be provided and maintained;

(viii) specify speed limits to be applied, and specify where and when speed humps may or shall be provided;

(ix) specify the minimum standards of riding quality to be provided on the existing and diversion roads; and specify special facilities to be provided for pedestrians and other vulnerable road users.

This plan shall be incorporated into bidding documents for works and bidders shall submit a lump sum price for its implementation. The Consultant shall ensure the works contract documents make it clear that the successful bidder may present modifications to the plan during the various stages of implementation to suit precise construction requirements, but will not be permitted to over-ride the main provisions of the plan.

Technical and Quality Audit of Detailed Design

The consultant is advised that an independent Technical and Quality Audit may be carried out at this stage. The consultant shall provide all information requested and shall address any issues raised by the audit as agreed by KCCA.

DESIGN DRAWINGS

The consultant shall prepare the following detailed engineering drawings in A0 size for each section for which a detailed design is prepared. For client review purposes, the drawings shall be reduced in scale and submitted in A2 size.

(i) Plan and profile drawings to a scale of 1:1000 horizontal and 1:100 vertical for A0 size drawings and 1:2000 horizontal and 1:200 vertical for A1 size drawings showing running chainages, natural ground levels and design levels all at 20m intervals, descriptions and references to all culvert and bridge works, location and values of benchmarks and traverse stations, contour lines superimposed on plans, the boundaries of the drainage

reserve (including setting out) and any other relevant information, in a format approved by the client.

(ii) Typical cross-sections, scale 1;25 or as agreed with KCCA showing all details of channel cross sections and reserve.

(iii) For road crossings, typical cross-sections, scale 1;25 or as agreed with KCCA showing all details of road cross section, side drains, pavement thickness, camber and super elevation and shoulders.

(iv) Typical culverts: showing details of all types of culverts and other drainage structures, their inlets and outlets including the protection works necessary for the project.

(v) Major structures: for all bridge structures and major culverts, detailed engineering design plans will be produced at appropriate scales, including contoured site plans, substructures and foundation details, protection or ancillary works and bar bending schedules.

(vi) Soils plan or table showing the characteristics of soils for various sections of the route.

(vii) Ancillary works: showing plans of all other ancillary works including related works

(viii) The bill of quantities shall include a provisional sum for laying services duct for future installation of Information and Communication Technology (ICT).

The Consultant shall prepare and submit contract drawings in Autocad or similar software as agreed with KCCA.

For bidding purposes the drawings shall be reduced in scale as indicated in the section on preparation of bidding documents. The consultant is to submit and agree the layout of all drawings prior to preparation of any drawings including the proposed structure of layers in Autocad or similar software.

CONSTRUCTION QUANTITIES AND COST ESTIMATE

The Consultant shall recommend for KCCA's approval the Method of Measurement proposed for the taking off of quantities to match the general specification.

The Consultant shall be advised by KCCA whether any facilities provided for the purposes of the construction contract, such as offices, houses, laboratories, vehicles etc, are to be retained by KCCA or are to be owned by the Contractor.

In order to make a fair and reasonable estimate of the construction costs the Consultant shall prepare a unit price analysis of each major item using basic cost elements (labour, material, equipment, overhead, risks and profit) but excluding and showing separately the cost for taxation. Costs shall be broken down into foreign and local currency components.

The Consultant shall consider the Government of Uganda economic and fiscal indicators and prepare the above construction cost estimates for the current base year and also prepare an adjusted cost estimate for + 1 years, + 2 years and +3 years to enable KCCA understand the cost implications. The consultants Estimate model should include unit rate analysis and also provision for unit rate adjustment.

Cost comparisons shall be made in respect of both unit rates and per km costs with similar ongoing projects both in Uganda and elsewhere within the East African Community. These comparisons will be presented in tabular form supplemented by possible explanations for significant variances. The price model shall also be submitted to KCCA in electronic format.

Work Program and Cash Flow Forecast

In order to assist in preparing the required construction period and forward budget needs, the consultant shall prepare a work program and cash flow requirements as follows:-

- A bar chart showing the proposed sequencing and duration of the major activities for the construction period;
- Anticipated monthly value of work executed presented in the form of an S-curve.

In preparing this program, the consultant shall take into account the climatic conditions prevailing in the areas concerned.

CONSTRUCTION PROGRAMME

The consultant shall prepare a construction programme and, in the process, identify the following:

(i) list of required construction equipment with their size/capacity-which shall be also used as the basis for identifying the minimum required equipment to be stated in the prequalification documents;

(ii) combination of the construction equipment assumed in estimating works production rate per major activities assumed;

(iii) major activities and their duration;

(iv) network programme showing the proposed ordering or sequencing of the major activities;

(v) duration of the entire project in the form of a bar chart; and

(vi) monthly cost of each major activity and anticipated expenditure forecast;

(vii) method statements;

The consultant shall also prepare a total parametric cost estimates that includes both the unit rates and operational rates for undertaking the activities.

In carrying out the analysis, the consultant shall take into account the climatic conditions (rainy and dry seasons, etc) of the areas concerned.

Detailed Engineering Design Report

The Report shall include a concise **Design Statement**, that provides a summary of all design standards, criteria and assumptions used to prepare the design, and the dates and scope of all survey and data collection activities. This shall be prepared in tabular form and act as an Executive Summary to the design report.

The main report shall fully detail:

- horizontal and vertical alignment design including the identification of key constraints and considerations;
- drainage design including evaluation of whole life cost options;
- assumptions, approaches, options and design philosophies considered and used for structural design of the drainage channel; and

The report shall include a list, in each section, the relevant design standards followed and a **Departures Report** identifying all instances where these standards have been deviated from and the reason for such deviation.

The report shall include the estimated Construction Quantities, Cost Estimate and Economic Analysis of the presented design.

The report shall include a provisional **traffic management plan** detailing how motorised and non motorised traffic and pedestrians shall be accommodated during the construction phase.

Environmental &Social Impact Assessment and Resettlement Action Plan

The Consultant shall prepare an Environmental and Social Impact Assessment (ESIA) that reports on the findings, conclusions and recommended actions, supported by summaries of the data collected and citations for any references used in interpreting those data, including a full Environmental and Social Mitigation and Monitoring Plan (ESMMP).

The ESIA should be concise and clearly address significant social, environmental and economic issues. The ESIA should be prepared in accordance with the Guidelines for Environmental Impact

Assessment in Uganda and in accordance with the guidelines which are appended as Attachment No. 1

Special Specification

The Consultant shall therefore review the General MOWT Specification and recommend specific options, or possibly additional options, which shall be incorporated into a Special Specification.

The Consultant shall further consider the sourcing of all major materials, sand, aggregates, reinforcing steel, structural steel etc and determine whether Manufacturer's certificates concerning composition and strength will be obtainable or adequate and as such whether sampling and testing will be needed. In the latter case such testing must be covered in the General or Special Specification.

The consultant shall determine if additional clauses are required to cover such elements as:-

- Access and issues with regard RAP and Land Acquisition
- Environmental
- Utilities
- Culvert/Bridge construction
- Issues from the risk matrix
- Any other issues specific to the contract that need to be defined

BIDDING DOCUMENTS

The bidding documents shall be prepared fully in accordance with the World Bank's (WB) Standard Bidding Documents for the Procurement of Works (latest version).

ANNEX 2 - ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

The Consultant shall undertake an update of the Environmental and Social Impact Assessment (ESIA) and propose appropriate safeguard and mitigating measures to be carried out during design, construction and operation of the project in order to minimise any negative impacts and enhance positive impacts which the upgrading of the drainage systems may have on local people and the natural/physical environment.

The study shall reassess the positive and negative social impacts possible from the drainage works and social and environmental baseline conditions and shall detail mitigating measures and project management strategies and actions to reduce or avoid threats to local ecological systems, wildlife areas, water catchments and the social and cultural environment. The Consultant shall also assess impacts from temporary auxiliary infrastructure including camps, quarries, borrow pits, material storage areas, road diversions and runoff drainage outlets.

The Consultant shall update the methodology used to ensure that the updating of the ESIA report is consistent with the relevant national and international guidelines and legislation and the World Bank safeguard policies. The Consultant should further adequately consult with NEMA, and relevant lead agencies, the public and other stakeholders to ensure that their concerns are clearly identified and fully addressed in the ESIA. ESIA studies relating to neighbouring projects shall be reviewed, to inform the process of updating the ESIA.

The ESIA Report shall be very specific in its recommendations and assignment of responsibilities so that there is a clear linkage between the report, the design drawings, the special specification and the bills of quantity.

Detailed Guidelines for the ESIA for proposed Infrastructure Works shall be obtained by the Consultant from the relevant agencies.

The consultant shall carry out a comprehensive update of the Environmental and Social Impact Assessment (ESIA) which will be in line with the proposed detailed engineering design review, in accordance with the guidelines which are appended as attachment No. 1, including a full Environmental and Social Mitigation and Monitoring Plan (EMMP).

The consultant shall further update a full Resettlement plan (RAP) in accordance with the guidelines which are appended as attachment No. 2. The Consultant shall ensure that preparation of the Resettlement Action Plan takes into account any relevant findings from the ESIA and any other consultations and impacts on nearby communities identified during the design process.

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CDKN, 2015. Integrated Flood Management in Kampala - Briefing Note: Infrastructure in the Kampala Urban Area. Kampala.

KCCA, 2016. Kampala Drainage Master Plan 2016: Final Technial Report. Kampala.

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MoWT, 2010. Road design Manual, Volume 2: Drainage Design. Entebbe, Uganda.

Mugume, S.N., 2015. Modelling and Resilience-based Evaluation of Urban Drainage and Flood Management Systems for Future Cities. University of Exeter.

Mugume, S.N., Butler, D., 2016. Evaluation of functional resilience in urban drainage and flood management systems using a global analysis approach. Urban Water J. 1–10. doi:http://dx.doi.org/10.1080/1573062X.2016.1253754

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Vermeiren, K., Van Rompaey, A., Loopmans, M., Serwajja, E., Mukwaya, P., 2012. Urban growth of Kampala, Uganda: Pattern analysis and scenario development. Landsc. Urban Plan. 106, 199–206. doi:10.1016/j.landurbplan.2012.03.006

ANNEX 3: GUIDELINES FOR THE PREPARATION OF A RESETTLEMENT ACTION PLAN (RAP)

INTRODUCTION

The guidelines outline the objectives to be achieved and tasks to be performed by the ESIA Consultant in preparing the resettlement Action Plan (RAP). The resettlement study shall be conducted in accordance with the requirements of the Resettlement/ Land Acquisition Policy Framework for Uganda and The World Bank.

Objectives

The objectives of a Resettlement Action Plan are to:

a) Raise awareness of the project and its consequences among the general public and particularly among those people who will be directly affected by it;

b) Estimate the costs necessary for resettlement/ land acquisition; and;

c) Prepare a RAP that sets out strategies and schedules to mitigate adverse effects. The RAP will establish the parameters and entitlements for project affected people (PAP), institutional frameworks, mechanisms for consultation and grievance resolution, time schedules and a budget. A proposed monitoring and evaluation system is also required. The agreed entitlements package will detail compensation and appropriate measures to restore the economic and social base of PAPs. The requirements of the Government of Uganda and the World Bank for land acquisition and resettlement will be addressed.

Description and Scope of Work

The work to be carried out includes;

- Part A: Socio-economic studies, which were conducted in part for the ESIA, and preparation of the RAP
- Thorough gender analysis
- Part B: Survey and valuation of affected properties, statistics of affected men, women and children. The work shall be carried out in close collaboration with, and in accordance with the requirements of, the Valuation Division and the Department of Surveys and Mapping, Ministry of Lands, Housing and Urban Development (MLHUD), in co-operation with the KCCA and the Ministry of Works and transport.

PART A: SOCIO-ECONOMIC STUDIES AND PREPARATION OF THE RAP

Scope of Land Acquisition and Resettlement

The following tasks are to be undertaken:

- Document any steps taken to minimize land acquisition and resettlement impacts;
- Describe any alternative options and their effects that were considered to minimise land acquisition and the reasons why the remaining effects are unavoidable;
- Summarise key effects in terms of land acquired, assets lost, and people displaced from homes or livelihoods – disaggregated data on displaced women, men, children (boys, girls).

Policy, Legal and Administrative Framework

Based on the Resettlement/ Land Acquisition Policy Framework for Uganda, the following tasks should be undertaken and their effects on women and men clearly noted:

- Review policies, laws and practices that relate to civil engineering works, wetlands, and reserves that apply to drainage works within the boundaries of urban local governments and through emerging population growth centers often referred to as trading centers.
- Establish in detail land tenure regimes, compensation frameworks, grievance mechanisms, and local government compensation rates in the project area- costs and benefits to women and men;
- Review the statutory procedures for valuation and assessment of the market values for urban properties and the valuation and assessment of rural properties;
- Explain the manner in which Uganda's development partners' requirements for involuntary resettlement will be met and propose measures to harmonise those requirements with GOU and local government laws, policies and practices.

Socio-Economic Baseline Survey

When conducting the survey, the following should be undertaken ensuring that all data is disaggregated by gender and age:

- Identify and conduct a census of all potentially affected people;
- List the anticipated losses, i.e. land, buildings, trees and crops, infrastructure and social services;
- Conduct a socio-economic survey of PAPs to identify the impact on individual livelihood and property;
- Establish a baseline of incomes and expenditures, livelihood patterns and social organisation.

Community Consultation and Participation

When carrying out community consultation and participation, the following tasks should be done;

- Identify key stakeholders and any vulnerable groups;
- Outline a strategy to ensure participation (equal participation of male and female) of all stakeholders in the process of planning and implementation;
- Specify the procedures for redress of grievances.

Compensation System

When preparing the system of compensation, the following tasks should be completed:

- Identify and prepare an inventory of impacted properties and livelihoods for each household whether land owner licensee, tenant, or illegal occupant (female headed, male headed, number of males and females per household).
- Establish compensation criteria and strategies.

Implementation

To assure implementation, the following measures must be taken:

- Prescribe the mitigation measures for the resettlement/ land acquisition impacts – mitigation measures paying attention to the different needs of female, male, etc.;
- Prepare a timeframe and implementation schedule for land acquisition and resettlement;
- Make provisions for infrastructure and social services where applicable;
- Specify procedures for compensation payment – paying attention to gender aspects/ power/ control;
- Provide for assistance to vulnerable groups – specify who are vulnerable and the type of assistance;
- Tailor the ESIA plan for health-awareness campaigns (particularly for HIV/AIDS) within the ZOI to any special RAP needs, particularly for any construction camps near community or residential areas;
- Collaborate with district officials in identifying agencies capable of carrying out the health-awareness campaigns, e.g., established NGOs in the area;
- Prepare a health-awareness implementation plan that can be incorporated into the overall project implementation plan – gender sensitivity in the plan.

Budget

Using information obtained from Part B below, the following shall be done:

- Prepare a budget for RAP implementation;

- Prepare budgetary allocation and timing;
- Specify financial responsibilities and the approval process.

Monitoring and Evaluation

For monitoring and evaluation, the following shall be accomplished:

- Identify key indicators and specify the timeframe for monitoring and reporting;
- Prepare a monitoring and evaluation plan.

PART B: IMPACT SURVEY AND VALUATION

Scope of Impact Survey and Valuation

The following tasks shall be undertaken:

- Carry out Cadastral Survey and value all land affected both within and outside the existing project reserve and assets to be acquired and livelihoods lost;
- Obtain all cadastral and other relevant information necessary to identify all property owners and other persons that are likely to be affected by the project, using maps and drawings that show the land tenure system and affected land along the alignment. List all the registered plots whose properties are not traceable. Each type of tenure system is to be uniquely demarcated;
- Secure and verify copies of all the registered land titles, digital maps of the site and immediate neighborhoods (for purposes of injurious effects), including full cadastral survey(s) of the site;
- Prepare strip maps, drawings and data complying with the requirements of the valuation division and the Department of Surveys and Mapping, MLHUD, for purposes of acquiring properties and relocation of utilities falling within the site;
- Map sub-division of plots traversed by the drainage systems to the stage of certified planning, clearly showing the lots whose owners are untraceable and whose owners have not effected name changes;
- Prepare a cadastral survey of the site;
- Using procedures approved by and working in close liaison with the Valuation division, carry out detailed valuation of all land, properties and livelihoods affected by the project (disaggregated data) in order to provide the basis for compensation/resettlement;
- Immediately notify KCCA of any cases of absentee land owners and of those whose land tenure claims are unsubstantiated giving reasons why;
- Compile land acquisition and resettlement costs;
- Deposit KCCA and other relevant agencies, the resultant strip maps and drawings showing the alignment property boundaries, including plot numbers, ownership and land tenure systems for their comments;

- After approval, display the resultant strip maps (at a planning scale of 1:1000) at the KCCA headquarters, division offices and LCIII offices.

Reporting

The consultant shall prepare and submit **(7 copies)** of a draft report for each of the two assigned components (Part A and Part B) for review and comment by the Client.

Part A reports shall contain the following information;

- Executive summary
- Statement of objectives;
- Institutional, legal and policy framework;
- Socio-economic baseline information;
- Project impacts;
- Community participation and consultation;
- Compensation system;
- Implementation of resettlement/ compensation;
- Budgets;
- Monitoring and evaluation;

Part B reports shall contain the following:

- A comprehensive list of land ownership and valuation of all affected properties. This list will be presented as Annex 1 of the RAP;
- An annex containing strip maps, to the scale 1:2,500 generally and 1:1000, particularly for townships and trading centers. This information will be presented as Annex 2 of the RAP.

ANNEX 4: GUIDELINES FOR AN ENVIRONMENTAL IMPACT ASSESSMENT OF PROPOSED WORKS

INTRODUCTION

These guidelines for the Environmental and Social Impact Assessment (ESIA) are meant to direct the Consultant undertaking the study. The ESIA shall be conducted in accordance with the requirements of the Environmental Impact Assessment Regulations, 1998 (Supplement No. 8). The following tasks are to be undertaken during the ESIA.

Description of the Proposed Drainage Works

The description of the proposed drainage works shall include the following aspects and any other information regarded as relevant by the Consultant who is conducting the study:

- The location of the project including all off-site and/or ancillary works (described verbally and mapped)
- The zone of influence of the project including all off-site and/or ancillary works (the rationale described verbally and areal extent delineated on the location map)
- Project development objectives
- Technical description of the project works including all off-site and/or ancillary works
- Activities to be undertaken during the project works including site preparation, construction, operation and maintenance
- Scheduling of project activities
- Work force requirements including support staff and skilled/unskilled construction labour
- Accommodation of employees including support staff and construction workers, refer to attachment 3.
- Sources of materials to be used during the proposed drainage works
- Generation and disposal of wastes including solid, liquid and construction
- Generation and disposal of hazardous/toxic wastes
- Indication of need for any resettlement plan, refer to attachment 3
- Local STD and HIV/AIDS facilities and capacity including programmes for public awareness and prevention, refer to attachment 3
- National HIV/AIDS programme, refer to attachment 3

REVIEW OF POLICIES, LEGISLATION AND ADMINISTRATIVE FRAMEWORK

The Consultant shall review the policies, legislation, and administrative framework within which the environmental and social management of the proposed drainage works will be carried out.

The following and any other relevant legislation shall be reviewed:

- The Constitution of Uganda 1995
- National Environment Act
- Environmental Impact Assessment Regulations
- Local Government Act
- Uganda Wildlife Statute
- Land Act
- Water Act
- Roads Act
- Forests Act
- Mining Act
- Town and Country Planning Act
- Urban Authorities Act

DESCRIPTION OF THE ENVIRONMENTAL SETTING

Collect and analyze baseline data that describe relevant environmental attributes (biophysical, socio-economic and cultural) in the zone influenced by the proposed drainage works and that will affect or be affected by the proposed works. The Specialist will ensure incorporating gender – disaggregated data and thorough gender analysis in the description of the Environmental setting specifically under the socio – economic and cultural attributes. The zone of influence (ZOI) encompasses the proposed drainage channels as well as off-site and/or ancillary works such as borrow pits, rock quarries, construction-water sources, road diversions, etc. Please also refer to Attachment 3. The environmental elements to be surveyed include but are not limited to the following:

Biophysical elements that consist of:

Physical attributes including the physical location of the proposed works; topography; geology; climate and meteorology; drainage patterns; soils; soil erosion (existing and potential); ambient air quality; existing air-pollution sources; surface-water and groundwater hydrology; water quality; and existing water pollution discharges.

Biological attributes including flora; fauna; rare and endangered species; environmental trends affecting flora and fauna, including aquatic ecosystems; species of commercial importance; species with potential to become nuisances, vectors or dangerous; sensitive habitats including protected areas, parks, preserves, significant natural sites etc.

Socio-economic attributes include population statistics, together with any relevant historical background; demographic characteristics; special needs of particular groups such as low income, minority and/or vulnerable; community structure; land tenure regimes; land uses including educational, religious and medical facilities; economic activities including agriculture (small/large scale and subsistence/commercial), industry, commercial, tourism, etc.; planned development

activities; employment; local labor force; distribution of income, goods and services; modes of transport; administrative structures in the project ZOI; public health including incidence of and programmes to prevent/treat STDs and HIV/AIDS within the project ZOI; community facilities and access to national programmes for HIV/AIDS awareness and prevention; recreation facilities and/or resources; and any known attitudes about the project.

Cultural attributes include location and classification of archaeological and/or historical features or sites; cultural features and/or properties including monuments or other significant sites of national, regional or local merit; important geological and scenic places; and ethnic groups or tribal peoples and their customs, aspirations and attitudes.

PUBLIC PARTICIPATION

The Consultant will be required to identify different groups of stakeholders, ensure women's and men's views are fairly represented and use appropriate method(s) of establishing the views of these stakeholders about the potential impacts associated with the proposed drainage works. The Consultant should pay particular attention to disadvantaged groups (e.g., children, women, people with disabilities, and the elderly) who may be affected by the proposed project. Please refer to attachment 3.

In the course of consulting the public, the Consultant is to collect and communicate information relevant to the stakeholders: how many people may potentially be affected by the proposed drainage works; what environmental impacts are predicted; what, if any, uncertainties exist about the probable effects from the predicted environmental impacts; what the duration of the predicted environmental impacts is expected to be; how the environmental impacts can be reduced or enhanced; what, if any, predicted impacts are reversible or irreversible; and what the benefits and costs to the stakeholders are assumed to be. All data should be disaggregated with a clear presentation on how the different genders are affected. Clear presentation on impact on women, men, based on age (boy, girl, women, men, elderly women, and elderly men) should also be given.

Through the stakeholder consultations, the Consultant will assist the public, including the decision-makers, in understanding the proposed drainage works. Likewise, the Consultant will help the Developer in understanding the public's perceptions of the project's value—its costs and benefits to them (women and men). The Consultant will also determine and communicate controversial issues to the Developer as well as predict the influence and attitudes of leaders within groups of project-affected people (PAP); the adaptability of PAPs; and the continuity of PAPs' livelihoods.

The Consultant undertaking the ESIA will be required to participate in any public hearing(s) that may take place.

Reporting requirements. The minutes of meetings conducted in the course of all public consultations are to be recorded for submission as part of the Environmental and Social Impact Statement (ESIS), the written record of the ESIA.

IDENTIFICATION, ANALYSIS AND ASSESSMENT OF POTENTIAL ENVIRONMENTAL IMPACTS

The Consultant shall identify, analyze and assess significant environmental impacts from the proposed works. Although the ESIA should not be limited to the issues listed below, the ESIA

should investigate in detail the potential for the following impacts to arise because of the proposed works:

Impacts to the Biophysical Environment

- Soil resources including erosion, degradation and contamination
- Water quality including sedimentation and contamination (sources and constituents) of watercourses, water bodies and wetlands
- Water quantity including surface-water runoff or aquifer recharge
- Wetlands (water quality, quantity and movement)
- Drainage patterns
- Vegetation
- Biodiversity
- Habitats including aquatic and terrestrial
- Wildlife movement/migration
- Protected area(s) status
- Noise generation (sources and levels)
- Air quality (emission sources and constituents)
- Landscape integrity (visual and compatibility)

Impacts to the Socio-Economic Environment

- Land uses in the project ZOI including residential, agricultural, commercial, etc.
- Infrastructure including water, sewer, electricity, telephone, etc.
- Settlement patterns including any unplanned/involuntary
- Circulation patterns (local residents and livestock)
- Social cohesion
- Community structure
- Population demographics
    - Employment characteristics
    - Local economy including income distribution
    - Household incomes
    - Transportation cost and availability
    - Social services
    - Public health and safety
    - Sanitation

- Noise
- Airborne dust
- Toxic/hazardous materials (occurrence and disposal)
- Road-related accidents
- Disease vectors
- STDs and HIV/AIDS including community awareness/prevention programmes and their interface with national STDs and HIV/AIDS programmes

The Consultant shall quantify and assess the impacts of STDs and HIV/AIDS on the community (data on impacts on women, men and by age) along the project drainage channels and propose mitigation measures in accordance with the Government policy. The community's STDs and HIV/AIDS facilities and access to national programmes will also be assessed. In the context of this requirement, "community" is construed to mean any and all people—staff employed by the Consultant and the Contractor, construction workers, PAPs, Army personnel, etc.—potentially exposed to and affected by STDs and HIV/AIDS during the course of the construction project. Please refer to attachment 3.

All recommended HIV/AIDS mitigation measures must indicate the arrangements necessary to assure future sustainability of the mitigation plan or programme. These sustainability arrangements must be investigated by the Consultant to assure their practicality/feasibility and thereafter reported in the ESIS. The sustainability plan should be disaggregated for women and men.

Impacts to the Cultural Environment

- Significant sites (historic and cultural of national, regional or local merit)
- Archaeological sites and artifacts
- Important geological or scenic places
- Ethnic or tribal customs, traditions and value

Environmental impacts shall be analyzed and described in terms of the following and any other relevant characteristics:

- Significance
- Positive (beneficial) or negative (adverse)
- Magnitude
- Scope
- Direct or indirect
- Duration (intermittent or continuous, short-term or long-term)
- Reversibility or irreversibility
- Likelihood of occurrence

- Cumulative

The significance of environmental impacts from the proposed drainage works shall be assessed, and the basis of this assessment shall be specified. The Consultant shall consider any national and international environmental standards, legislation, treaties and conventions that may affect the significance of identified impacts.

The Consultant shall use current data and methods of analyzing and assessing environmental impacts. The extent and quality of unavailable data should be reported in the ESIS, explaining significant information deficiencies. The uncertainty of any predicted impact is also to be indicated.

When possible, the above and any other relevant impact characteristics shall be analyzed quantitatively in terms of their environmental costs and benefits. Assign economic values when feasible.

All collected data will be presented in hard copy (as appendices to the ESIS) and electronic format.

ANALYSIS OF ALTERNATIVES

The Consultant will describe and compare feasible alternatives that would achieve the same project objectives. The concept of alternatives extends to citing, design, technology selection and construction techniques and phasing as well as operating and maintenance procedures. The Consultant will include in the alternative analyses the “no-project” alternative. The alternative of not constructing the project is *required* in order to establish and document environmental conditions without any project. The reasons for not selecting any or all alternatives must be stated.

Compare the alternatives in terms of potential environmental impacts; capital and operating costs; suitability under local conditions; and institutional, training and monitoring requirements. When describing the impacts, indicate which are irreversible or unavoidable and which can be mitigated. To the extent possible, quantify the costs and benefits of each alternative, incorporating the estimated costs of any associated mitigating measures.

ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP) FOR IMPACT MITIGATION AND MONITORING

The Consultant shall recommend cost-effective measures for minimizing or eliminating significant adverse environmental and social impacts predicted in the ESIA. In addition, measures for enhancing significant beneficial impacts should be recommended.

If compensation is recommended as one form of mitigation, the Consultant shall identify and provide all the names and physical addresses of people to be compensated. Similarly, if relocation of properties is recommended, the names and physical addresses of owners of affected properties shall be presented. Appended to the ESIS, these data form the basis for a comprehensive resettlement plan, the Resettlement Action Plan (RAP). The consultant shall present names of affected people in each household, clearly indicating female headed, male headed household, number of children, and age groupings.

EMP for Impact Mitigation

The ESIA study team will prepare an ESMP for impact mitigation in the form of a table that will include:

- Environmental and social impacts to be mitigated or enhanced
- Mitigation measures to reduce or enhance the environmental and social impacts, including any actions required to ensure the sustainability of the recommended measures
- Scheduling and timing for ESMP mitigation implementation
- Institutional arrangements required for ESMP implementation

Additionally, the ESMP for impact mitigation must address in accompanying text the following items:

- Community liaison procedures to ensure implementation of the mitigation ESMP
- Institutional requirements over and above those arrangements tabulated above
- Work programmes
- Staffing requirements
- Budget for staff and training

Impact Mitigation Costs. The costs to implement the impact-mitigation ESMP are to be detailed according to:

- cost of *each* mitigation/enhancement measure, including costs for institutional and training requirements, and
- total costs to implement the impact-mitigation ESMP.

ESMP for Impact Monitoring

The Consultant shall prepare a detailed monitoring plan, including appropriate indicators and/or parameters, which will enable

- tracking the expected impacts during construction and operation;
- implementing the mitigation/enhancement measures properly;
- ensuring that the recommended mitigation/enhancement measures are effective;
- indicating the occurrence of impacts that may not have been identified in the ESIA; and
- providing disaggregated data for use in environmental audits.

Impact Monitoring Costs. The costs of implementing the monitoring programmes must also be specified. Where the monitoring will require training, institutional strengthening, or inter-agency collaboration, these additional requirements and their costs should be indicated in the impact monitoring plan.

ENVIRONMENTAL AND SOCIAL IMPACT STATEMENT

The Consultant shall prepare an environmental and social impact statement (ESIS) that reports on the findings, conclusions and recommended actions, supported by summaries of the data collected and citations for any references used in interpreting those data.

Detailed or uninterrupted data are not appropriate in the main text and should be presented in appendices or a separate volume.

The ESIS should be concise and limited to significant environmental and social issues. The ESIS is to include and be organized according to the outline below.

- Executive summary
- Policy, legal and administrative framework
- Description of the proposed drainage works
- Description of the environment
- Description of the material inputs into the project and their potential environmental and social effects
- Analysis of alternatives
- Description of significant environmental and social impacts
- Description of the measures proposed for mitigating or enhancing the significant impacts
- Environmental and social management plan including items described in Section 9.0 above
- Monitoring and Social plan
- Public consultation/involvement
- List of references
- Appendices
    - List of names and signatures of EIA Consultant(s)
    - Records and/or minutes of public consultations
    - Data and unpublished reference documents
    - Technical explanations of assessment methodologies used (optional)
    - Terms of Reference

ANNEX 5: FACILITIES, SERVICES, AND RESOURCES TO BE PROVIDED BY THE CLIENT

KCCA shall provide the consultant with all available reports on the design of the project if available. Copies of all relevant technical manuals and standards shall be provided on a CD to the selected consultant. KCCA shall provide electronic copies of revisions or updated technical manuals, standard reporting formats and other documentation as and when they become available for use.

KCCA will facilitate liaison with, and the cooperation of, Government Ministries and other organizations as necessary for the Consultant to perform the services and to follow protocols to ensure effective and efficient implementation of the services and subsequent works.

KCCA has prepared the Update of the Kampala Drainage Master Plan (2017) which provides guidance for investment in drainage infrastructure in Kampala. The Consultant will be required to perform their services within the framework of the Updated Master Plan and provide feedback for future revisions. The Consultant will also be required to utilize the Ministry of Works and Transport (MoWT) Technical Manuals and Specifications dated of 2010.