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REG. NO: 2014/HD08/1295U
COURSE UNIT: PROJECT REPORT
PROJECT: UPGRADING OF KYENJOJO-KABWOYA ROAD TO BITUMENT STANDARD (100KM)

PROJECT REPORT ON THE UPGRADING OF KYENJOJO – KABWOYA ROAD FROM GRAVEL TO PAVED (BITUMEN) STANDARD (100KM) SUBMITTED TO THE SCHOOL OF BUILT ENVIRONMENT DEPARTMENT OF CONSTRUCTION ECONOMICS AND MANAGEMENT IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF A MASTERS OF SCIENCE DEGREE IN CONSTRUCTION MANAGEMENT OF MAKERERE UNIVERSITY

JULY 2018
DECLARATION

I, the undersigned, hereby declare that this report, which I herewith submit to the best of my knowledge, is a true representation of what transpired in the project in which I was attached. It is my original work and that I have not previously in its entirety or in part submitted for the same purpose. It has never been submitted to any academic institution for the award of a Master of Science in Construction Management.

Sign …………………………………………………………………………………………………………………………….. Date……………………………………………………………. 17/07/2018

Olara Churchill Basilio

2014/U/HD08/1295U
This report has been submitted with the approval of the undersigned supervisor.

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Signature

Date 12/7/18
ACKNOWLEDGEMENTS

My grateful acknowledgement is made for several individuals who have provided considerable encouragement and assistance in producing this report.

I would like to express my sincere appreciation to my lecturers Dr. Dans Nshekanabo Naturinda and Dr. Mwesige Godfrey with their professional guidance that has made this report successful.

I don’t forget my family members, especially my Wife Mrs Akayo Felda who tolerated me during this time.

May God bless you all.
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<th>Description</th>
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<tr>
<td>AIDS</td>
<td>Acquired Immune Deficiency Syndrome</td>
</tr>
<tr>
<td>BoQ</td>
<td>Bill of Quantities</td>
</tr>
<tr>
<td>CAD</td>
<td>Computer Aided Design</td>
</tr>
<tr>
<td>CEC</td>
<td>Consulting Engineering Centre</td>
</tr>
<tr>
<td>CML</td>
<td>Central Materials Laboratory</td>
</tr>
<tr>
<td>CEPA</td>
<td>Comptran Engineering &amp; Planning Associates</td>
</tr>
<tr>
<td>CRS</td>
<td>Crushed Rock</td>
</tr>
<tr>
<td>DBST</td>
<td>Double Bituminous Surface Treatment</td>
</tr>
<tr>
<td>DLP</td>
<td>Defects Liability Period</td>
</tr>
<tr>
<td>DRE</td>
<td>Deputy Resident Engineer</td>
</tr>
<tr>
<td>ESIA</td>
<td>Environmental and Social Impact Assessment</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
</tr>
<tr>
<td>IDA</td>
<td>International Development Agency</td>
</tr>
<tr>
<td>IPC</td>
<td>Interim Payment Certificate</td>
</tr>
<tr>
<td>LHS</td>
<td>Left Hand Side</td>
</tr>
<tr>
<td>MoWT</td>
<td>Ministry of Works and Transport</td>
</tr>
<tr>
<td>MTN</td>
<td>Mobile Telecommunications Network</td>
</tr>
<tr>
<td>NSP</td>
<td>Nominated Services Provider</td>
</tr>
<tr>
<td>NEMA</td>
<td>National Environmental Management Agency</td>
</tr>
<tr>
<td>NRDMP</td>
<td>National Roads Development and Maintenance</td>
</tr>
<tr>
<td>OHS</td>
<td>Occupational Health and Safety</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Full Form</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>OSH</td>
<td>Occupational Safety and Health</td>
</tr>
<tr>
<td>OHSMP</td>
<td>Occupational Health and Safety Management Plan</td>
</tr>
<tr>
<td>PAP</td>
<td>Project Affected Persons</td>
</tr>
<tr>
<td>PPE</td>
<td>Personal Protective Equipment</td>
</tr>
<tr>
<td>PPDA</td>
<td>Public Procurement and Disposal Agency</td>
</tr>
<tr>
<td>QAP</td>
<td>Quality Assurance Plan</td>
</tr>
<tr>
<td>QCS</td>
<td>Quality Control Sheet</td>
</tr>
<tr>
<td>RAP</td>
<td>Resettlement Action Plan</td>
</tr>
<tr>
<td>RDC</td>
<td>Resident District Commissioner</td>
</tr>
<tr>
<td>RFI</td>
<td>Request for Instruction</td>
</tr>
<tr>
<td>RGC</td>
<td>Rural Growth Centre</td>
</tr>
<tr>
<td>RHS</td>
<td>Right Hand Side</td>
</tr>
<tr>
<td>RE</td>
<td>Resident Engineer</td>
</tr>
<tr>
<td>SC</td>
<td>Supervising Consultant</td>
</tr>
<tr>
<td>STD</td>
<td>Sexually Transmitted Diseases</td>
</tr>
<tr>
<td>TFV</td>
<td>Ten Percent Fines Value</td>
</tr>
<tr>
<td>TOR</td>
<td>Terms of Reference</td>
</tr>
<tr>
<td>UNBS</td>
<td>Uganda National Bureau of Standards</td>
</tr>
<tr>
<td>UNRA</td>
<td>Uganda National Roads Authority</td>
</tr>
</tbody>
</table>
EXECUTIVE SUMMARY

The study was done specifically to this project to undertake a design review and construction supervision of the physical construction of the works on behalf of the Uganda National Roads Authority while ensuring that the works are completed on time, within budget and meeting the required specifications.

The works consist of upgrading to Class II paved Standard paved road, with double surface dressed carriageway of 7.0m width throughout, and 1.5m wide double surface dressed shoulders on each side, widened 2.0m in trading centres. They include earthworks for improvements to alignment geometry and side ditches, construction of a mechanically modified sub-base (chemically stabilized sub-base where the PI for gravel cannot be reduced using mechanical modification), a base course with crushed stone material, construction of culverts and bridges and ancillary works.

The Contractor’s Financial Cash Flow forecast for the reporting month based on Work program approved on 30th Oct 2017 was UGX 80,924,778,190. This report also covered the traffic management aspect by the contractor; a team of traffic management has been established as shown in the establishment of organization and personnel assignment of traffic management in figure 10

Quality management and control was measured through inspection and testing of materials intended for use in concrete works, earthworks (fill) and swamp treatment has been done on a regular basis. Field Density tests were carried out on completed sections of fill and roadbed preparation.

The main social impact of the project was land take for road diversions. This was mitigated by working within the ROW as much as possible. In the event that road diversion falls outside the ROW, land owners were adequately compensated.

The Contractor’s Environmental and Social Management Plan (ESMP) was submitted on April 05, 2016. However, after review by UNRA and the World Bank Team, the Contractor was requested to incorporate comments and re-submit for approval.
CHAPTER ONE
INTRODUCTION

1.0 General background

The Uganda National Roads Authority (UNRA) became a legal entity in 2006 and began its operations in July 2008 with the mission to develop and maintain a national road network that is responsive to the economic development needs of Uganda. UNRA became a legal entity in 2006, but officially began operations on 1st July 2008. Much of the network requires substantial improvement or development to meet current and forecast traffic demands, and to promote equal distribution of, and access to, economic and social development across the country.

The Contractor’s work programme and physical progress S-curve was approved by the Engineer on April 30, 2016. The Government of Uganda has earmarked funds for the International Development Agency (IDA), applied part of the funds towards the payments under the contract for upgrading to bituminous standard of the Kyenjojo – Kagadi – Kabwoya Road (100km). Having a carriageway width of 7m and 1.5m wide bituminous surfaced shoulders

The main objective of this project report is to give an account on the procedures taken during the start, design review and implementation including environmental and health requirements and risk analysis of this contract.

The objective of this project was to undertake a design review and construction supervision of the physical construction of the works on behalf of the Uganda National Roads Authority while ensuring that the works are completed on time, within budget and meeting the required specifications pursuant to the objectives of IDA.

1.1 Specific objectives

The works consist of upgrading to Class II paved Standard paved road, with double surface

Carriageway of 7.0m width throughout, and 1.5m wide double surface dressed shoulders on each side, widened 2.0m in trading centres.

The Project was to enhance the flow of inter – regional traffic and trade, and reduce road user costs, thereby strengthening regional economic integration. The road safety measures that will be
put in place will enhance safety standards on the project road. The project objectives were looked upon in two perspectives, at national level and at local level as follows:

1.1.1 At a national level, the project objectives are:
1. To promote equal access to economic and social development opportunities across the country,
2. To improve the quality of the National Road Network and improve connectivity to all areas of the country,
3. To promote the continual improvement of the National Road Sector in Uganda.
4. To improve access to goods/ passenger transport services and reduce transport costs along the route,
5. To improve access to social and economic development opportunities along the route.

1.1.2 At local level UNRA’s objectives are:
1. To improve access to goods/passenger transport services and to reduce transport costs along the route;
2. To improve access to social and economic development opportunities along the route by providing high capacity infrastructure;
3. To ensure no roadside communities become worse off as a result of the road upgrading works

1.2 Authors involvement and roles in the project
The author participated in the mobilisation, design review, preparation and the technical supervision of the project.

Detailed Tasks Assigned: General supervision of the Works; inspection/verification of materials sources; maintenance of daily Site records, including photographs; advising Contractor on basic operational procedures; monitoring of work progress and reporting to measurements/surveying/materials teams; measurement of completed work.

The consultants Organograms are provided in Appendices A-14.
1.3 Overview of the project
The Government of Uganda (GoU) has received funding from the International Development Association (IDA) towards the cost of the Albertans Region Sustainable Development project.

The GoU, acting through the Uganda National Roads Authority (UNRA) intends to apply a portion of the funds towards the Construction Supervision of the Upgrading of Kyenjojo – Kagadi – Kabwoya Road (100km) to Bituminous Standard.

The works consist of upgrading the existing 100km gravel road to bituminous standard between the two towns of Kyenjojo and Kabwoya. The completed road will have an overall carriageway width of 7.0m, shoulder width of 1.50m and in-situ concrete edge beam on each side.

The carriageway and shoulders were sealed with Double Bituminous Surface Treatment (DBST) Wearing course. Comptran Engineering & Planning Associates was awarded the Consultancy Services for the Construction Supervision of the Upgrading of Kyenjojo – Kagadi – Kabwoya Road (100km) to Bituminous Standard.

1.4 Project description

Table 1: Project description

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Civil Works for Upgrading of Kyenjojo-Kabwoya Road (100km) from Gravel to Paved (Bituminous) Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employer</td>
<td>Government of the Republic of Uganda represented by the Uganda National Roads Authority (UNRA)</td>
</tr>
<tr>
<td>Implementing Agency</td>
<td>Uganda National Roads Authority (UNRA)</td>
</tr>
<tr>
<td>Funding Agency</td>
<td>Government of Uganda (GOU)</td>
</tr>
<tr>
<td>A. Works Construction</td>
<td></td>
</tr>
<tr>
<td>Contractor</td>
<td>M/S Shengli Engineering Construction</td>
</tr>
<tr>
<td></td>
<td>(Group) Co. Ltd of Shengli Fields</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>Contract Amount</td>
<td>UGX 214,563,989,426</td>
</tr>
<tr>
<td>Contract Period</td>
<td>36 Months</td>
</tr>
<tr>
<td>Contract Award</td>
<td>March 13, 2015</td>
</tr>
<tr>
<td>Signing of Agreement Date</td>
<td>April 24, 2015</td>
</tr>
<tr>
<td>Commencement date</td>
<td>April 5, 2016</td>
</tr>
<tr>
<td>Scheduled Completion date</td>
<td>April 4, 2019</td>
</tr>
<tr>
<td>Defects Liability Period (OLP)</td>
<td>365 days</td>
</tr>
<tr>
<td><strong>B. Supervision Services</strong></td>
<td>M/s Comptran Engineering and Planning Associates</td>
</tr>
</tbody>
</table>
1.5 Project location

The Kyenjojo – Kabwoya road forms an important link in the national road network, and contributes significantly to the economic prosperity of Western Uganda. The project road is currently a Class C gravel road located in Kyenjojo, Kibaale and Hoima districts of Western Uganda. It starts from Kyenjojo town at the intersection with Kyenjojo to Fort Portal road (Km0+000), traverses through Kagadi town and ends in Kabwoya town at the intersection with Kabwoya to Kituti road (Km100+400).

The road crosses the Muzizi River, and River Nguse (Km83+500). There are a number of trading centres along the project road, notably Kinyara, Katooke, Katara, Kyamutunzi, Nyamange, Ikuma(on Kyenjojo – Kagadi section) and Kagadi, Kitemuzi, Pachwa, Ndama, Kitchanga, (on Kagadi –Kabwoya section). The total project road length is approximately 100.0km.
The Kyenjojo – Hoima – Masindi – Kigumba roads cross through the districts of Kyenjojo, Kibale, Hoima and Masindi. There are a number of rural towns/trading centres with considerable populations along the roads. The Kyenjojo to Kigumba road is a key strategic route in western Uganda, connecting international travel between countries to the south east of Uganda, such as Rwanda, the Democratic Republic of Congo and Zambia, to countries in the north east, such as Sudan. It also provides the only direct route between the major towns of Kyenjojo and Hoima.

1.6 Scope of works

The works consist of upgrading to Class II paved Standard paved road, with double surface dressed carriageway of 7.0m width throughout, and 1.5m wide double surface dressed shoulders on each side, widened 2.0m in trading centres. They include earthworks for improvements to alignment geometry and side ditches, construction of a mechanically modified sub-base (chemically stabilized sub-base where the PI for gravel cannot be reduced using mechanical modification), a base course with crushed stone material, construction of culverts and bridges and ancillary works.

The works will also include construction of one (1) single span composite bridge on River Nguse (Km83+490). The in-situ reinforced concrete abutment will sit on in-situ reinforced concrete spread footings.

The scope of works comprises the following:

a) Route survey and mapping to clearly identify the areas of road alignment;

b) Clearance of the Contractor’s camp site for the storage of plant equipment, medical facilities, workshop, filed laboratory, construction materials and related equipment storage;

c) Construction of the support facilities in the Camp Site. Such facilities include access roads to the camp site, sanitary provisions, a perimeter fence and generator house;

d) Earthworks including cut and fill in low areas where embankments will be needed for the formation of proper alignments;

e) The material supply sites will be cleared of the vegetation and the overburden materials which will all be stockpiled for the restoration of borrow pits after road works;
f) The transportation of the road construction materials. The routes to be used by trucks are either existing or are to be constructed. Minimal negative impact to the environment shall be ensured in either case. During the transportation of materials, it is desired that the trucks be covered by tarpaulins to minimize wind blowing off loose soils from the trucks;

g) Establishment of stone quarries for the processing and supply of stone aggregates;

h) Disposal of cut to spoil sub-grade materials especially from the swamp areas;

i) Grading and compaction of the road in layers using specified mechanical procedures and to the specifications;

j) Installation of drainage infrastructures such as culverts of varying capacities depending on the need of the specific points;

k) Stone layers laid down for road foundation especially in areas which are swampy;

l) Double Bitumen Surface Treatment on carriageway and shoulders;

m) Roadside drainage including off-shoots to drains;

n) Installation of road furniture;

o) Provision of a traffic management system for safe accommodation of traffic on the bypasses/detours; and p) Implementation of Health and Safety; and Environmental and Social Management Plans

1.7 Traffic loading and construction

1.7.1 Traffic loading

Weighted average traffic was calculated for aggregated sections that were later used for pavement design and/or economic evaluation. Base year traffic is shown in table 2.5.

Traffic is heaviest immediately north and south of Hoima (600-700 veh/day excluding motorcycles) and at its lightest over the southern sections north of Kyenjojo (300 veh/day). Large buses are confined to the section between Masindi and Kigumba, where the project road joins the main north-south road (the A11) from Kampala to Gulu and South Sudan. The proportion of goods traffic rises from south (46 percent) to north (57 percent). Almost no articulated goods vehicles are found south of Kiziranfumbi
1.7.2 Construction
Where soft spots are encountered where the road is at grade (i.e. founding the pavement layers upon the natural ground), a selected fill material will be necessary to achieve the design S5 Subgrade class designation required for the pavement design. To achieve the required Subgrade strength the selected layer will need to be a minimum depth of 550mm and care should be taken to ensure that there are no weak materials underlying this layer which may lead to detrimental performance.

1.7.2.1 Pavement Structure
The road pavement structure is summarized below

Table 2: Pavement Structure

<table>
<thead>
<tr>
<th>Depth</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>300mm</td>
<td>Double Bituminous Surface Treatment</td>
</tr>
<tr>
<td>150mm</td>
<td>Crushed Stone Base</td>
</tr>
<tr>
<td>150mm</td>
<td>Natural Gravel Subbase</td>
</tr>
<tr>
<td>550mm</td>
<td>Improved Subgrade Layer (G15)</td>
</tr>
<tr>
<td></td>
<td>Fill G7 Layer</td>
</tr>
</tbody>
</table>

Subgrade - In accordance with the pavement design, the Subgrade shall have a minimum California Bearing Ratio (CBR) of 15% as determined by DCP correlations and laboratory CBR tests.

Rock fill - Rock fill shall be utilised as an embankment founding layer and/or drainage blanket and is based upon the requirements for dump rock (DR) as outlined within the General Specifications but with additional requirements for grading as outlined within the Special Specifications.
General Fill - General fill utilized in earthworks construction is expected to be derived from cuttings excavated for the Works. Typical Cross section of the drawing of the proposed standard cross-section is provided in Figure 2.

1.8 Contract documents
The works contract documents are still undergoing review. However, the following amendment to the works contract has been proposed though it has not yet been finalized:

The Employer proposed an amendment in Clause 1412 of the Special Specifications such that all the facilities to be provided by the Contractor for use by the Engineer/Employer which include Vehicles, Houses, Offices, Laboratory/ Equipment and Survey Equipment’s revert to the Contractor at the end of the contract instead of to the Employer as originally stated in the contract. This would imply that the Contractor only bills the Employer for the operation and maintenance of the facilities.

1.8.1 Document control
Project documentation will include both hard-copy documents, as well as electronic data. Documents available in both hard-copy and electronic format require specific protocols to avoid confusion concerning latest version.

A document register system will record all documents entering and leaving the Consultant's office.

1.9 Environmental and social impact
1.9.1 Environmental impact mitigation
The Construction Environmental and Social Management Plan (C-ESMP) was originally submitted on April 05, 2016. However, after review by UNRA and the World Bank Team, the Contractor was requested to incorporate comments and re-submit for approval. The C-ESMP was re-submitted to the Engineer. The RE forwarded the re-submitted C-ESMP to UNRA Environmentalist for review and consent (by letter ref. KKK/UNRA/Comptran/007/2016/RE), before approval will be given by the Engineer.
1.9.2 Social impact

Land Acquisition Consultant is compiling updated progress records in accordance with format in UNRA Reporting Guidelines. Updated records will be provided in subsequent submissions.

The main social impact of the project is land take for road diversions. This will be mitigated by working within the ROW as much as possible. In the event that road diversion falls outside the ROW, land owners will be adequately compensated.

The Contract provides for OHS, HIV/AIDS and Gender management on the project. HIV/AIDS Service Provider had not been provided by UNRA.

The Contractor has been constantly encouraged to ensure that all workers are supplied with adequate and appropriate PPEs at all times as work progresses.

The contractor has secured relevant statutory permits including Water Abstraction Permit, Petroleum Facility Construction Permit, Wetland Construction Permit and Osh Blaster’s Permit.
CHAPTER TWO
PROJECT LIFE CYCLE

2.0 Technical feasibility

2.1 Topography
The topography of the project area is relatively flat with high ridges and isolated hills, adulating low lands and perch vents with a few higher residual features. The lowest points of about 1,200m above sea level. A topographical survey was essential for the accurate alignment design of the project roads and also determining realistic land acquisition requirements. Therefore, very early in the project, a topographical survey was commissioned based on a notional 30m distance on either side of the existing road’s centerline.

Figure 1: Typical succession of tight bends between Kyenjojo and Hoima

2.1.1 Soils
Granular soils are the most common soil type found between Kyenjojo and Hoima however are quite varying in their percentages of particle sizes, ranging from slightly clayey sand’s to very clayey very sandy gravel’s.

2.1.2 Geology
The project area is made up of Precambrian rocks with bare granitic rocks at several places heavily eroded. Deposits of eroded soil can be witnessed in some parts of the low lands on farmer’s gardens and these trend to increase as one move to the low lands.

2.1.3 Climate
Kyenjojo receives rainfall totaling between 750 mm to 1000 mm per annum. It has no major water basin save for some rivers and streams in wetlands like River Muzizi, River Mpanga, Aswa, Katonga and Kamurabara.
2.2 Economic viability
The economic evaluation of Road E1 indicated the upgrading of these roads to bitumen standards to be economically viable with the following Economic Internal Rates of Return:

Significant traffic diversion will only take place if the entire Kyenjojo-Hoima road is upgraded; upgrading sections north of Hoima will have little effect on diversion. There are thus two cases to evaluate. The first assumes that Kyenjojo-Hoima is upgraded and diversion takes place. Analysis of Kyenjojo-Hoima and Kyenjojo-Hoima-Kigumba is by project. Base case results for Kyenjojo-Hoima are as follows:

1. For an AC pavement the EIRR is 15.4 and 14.8 percent for one or two contract packages south of Hoima respectively (the use of two contract packages increases project costs by approximately 6 percent)

2. For a DBST pavement the EIRR is 16.3 and 15.6 percent for one or two contract packages south of Hoima respectively

For the economic assessment 2011 is adopted as the base year for prices and traffic.

Construction is expected to start in 2013 and take up to three years for completion of all sections. A 20 year evaluation period from the end of construction is adopted, i.e. 25 years including construction (2011-2035 inclusive). A 12 percent discount rate is adopted; although high for rural roads projects its use is customary in Uganda. HDM4 (v2.08) was used as the principal appraisal tool.

The proposed project offers enormous distance and journey time savings for traffic with trip ends in zones SW of Kyenjojo (Fort Portal, SW Uganda and eastern DRC) and in zones north of Kigumba (Gulu, Sudan and NE DRC)

The second case evaluated is by the four principal sections; there is no diverted traffic. Base case results are as follows (based on two contract packages south of Hoima where appropriate):

1. For Kyenjojo-Kagadi: EIRRs of 13.8 and 14.6 percent for AC and DBST pavement respectively

2. For Kagadi-Hoima: EIRRs of 15.2 and 16.0 percent for AC and DBST respectively
3. For Hoima-Masindi: EIRRs of 23.0 and 24.4 percent for AC and DBST respectively

4. For Masindi-Kigumba: EIRRs of 19.3 and 20.5 percent for AC and DBST respectively

All the base cases evaluated had EIRRs in excess of the threshold 12 percent

Estimates of oil-related traffic are based on information provided by the Ministry of Energy and Mineral Development and Tallow Oil. The estimates are predicated on the construction of a refinery that is expected to open in 2016 (output 17,000 barrels/day) and be expanded by 15,000 barrels/day in a second phase in 2020. Oil-related transport will add substantially to project road traffic, with the busiest section expected to be between Kiziranfumbi and Hoima

2.3 Environmental and social impact

2.3.1 General

An Environmental and Social Impact Assessment was carried out for the project roads and surrounding areas during 2010/2011, with a summary of the findings presented below.

Detailed assessment of the impacts upon the project and the mitigation measures are given in the Final ESIA Report.

2.3.2 Geographical location

The Kyenjojo to Kigumba road is a key strategic route in western Uganda, connecting international travel between countries to the south east of Uganda, such as Rwanda, the Democratic Republic of Congo and Zambia, to countries in the north east, such as Sudan. It also provides the only direct route between the major towns of Kyenjojo and Hoima

Kyenjojo – Hoima – Masindi - Kigumba road is located in a hilly / rolling region for the first 150km (Kyenjojo to Hoima) while the remaining 88km (Hoima to Kigumba) is located in a flat region. As such, the first 150km have been designed using a 70kph design speed while the remaining 88km have been designed to a 90kph design.

2.3.3 Socio-economic and cultural environment

According to Uganda Population and Housing census (2002), the population of Kyenjojo was 377,171 of which 186,571 were males and 190,600 females. The population projection for 2009 put the population of Kyenjojo at 450,000 people with 222,400 males and 227,600 females. The
district population growth rate is 3.7 percent, slightly higher than the national one of 3.3 percent. Mwenge sub-county has the highest density of 115 while Kyaka has only 63.

The majority of people in Kyenjojo live in rural areas. This growth in population density above the national average is attributed to increasing immigrants from districts of Kibaale, Hoima, Mubende and other neighboring districts. Ethnic group in Kyenjojo district are mainly Batoro, Banyoro and Bakiga.

Vulnerable groups in the project area include female- and child-headed households dependent on a single source of income, the elderly and disabled. Another category of vulnerable people is households dependent on natural resources that maybe affected by the project, such as sand quarries, trading centres along the proposed alignment and households affected by HIV/AIDS. These groups will be less able to cope with changes to their environment and livelihoods, and less able to recover from impacts resulting from the project.

2.3.4 Predicted environment and social impacts

Impact prediction and analysis utilized a project lifecycle approach: identifying and analysing impact from construction, through operation (post-construction) phases. Impact analysis aimed at developing recommendations that maximize benefits and avoid/reduce/minimize adverse environmental and social

There are several positive impacts that might accrue as a result of the upgraded the road and these include the following:

☐ Creation of job opportunities to the local unskilled persons as well as skilled persons in the community.

☐ Improved accessibility to markets.

☐ Easy and comfortable transportation.

☐ Improved transport and communication after construction of the road.

☐ Improved market for locally available resources needed for road construction e.g. stones, sand, gravel among others.

☐ Land value appreciation
Increased retention of qualified personnel

Increase beauty of the area.

2.3.5 Gender issues
The project encourages women and people with disabilities participation in the economic development. This is reflected in the design, recruitment and other programmes to ensure that overall developmental efforts are directed to achieve impacts that are equally beneficial to both men and women.

2.3.6 Engineering design

2.3.6.1 Geometric design
Design Standards

Early in the project a comprehensive review was undertaken of the Ugandan Road Design Manual published by the Ministry of Works and Transport (MoWT) in July 2005 with the view to assess its suitability for this project (refer to Design Base Statement October 2009).

Therefore in developing the design, the requirements of the MoWT Design Manual were considered as the highest level of provision to be achieved. In cases where the Manual gave insufficient guidance or requirements for a given design parameter, then international standards and norms as well as best practice (UK, AASHTO, etc) have been used in agreement with UNRA below.

2.3.6.2 Traffic growth and projected traffic
Deriving traffic growth from traffic data involves analysis of the growth of the various traffic classes over a long period of say 10-20 years

It was assumed that road construction shall commence in the year 2011 and end in 2015. Projections were made for a design period of 15 years and 20 years. Therefore projections were made up to the year 2030 and 2035 using the corresponding growth factors.
Table 3: Design Traffic loading for 5 homogeneous pavement sections are shown:

<table>
<thead>
<tr>
<th>Route</th>
<th>Pavement section</th>
<th>Homogeneous for Design (based on traffic flow)</th>
<th>Design traffic loading</th>
<th>Millions ESA</th>
<th>Traffic Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kyenjojo to Kigumba</td>
<td>1</td>
<td>Kyenjojo - Kagadi</td>
<td>12.4</td>
<td>T7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Kagadi - Kiziranfumbi</td>
<td>10.9</td>
<td>T7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Kiziranfumbi - Hoima</td>
<td>30.5</td>
<td>T8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Hoima – Masindi</td>
<td>15.2</td>
<td>T7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Masindi - Kigumba</td>
<td>11.4</td>
<td>T7</td>
<td></td>
</tr>
</tbody>
</table>

The majority of the road sections have a traffic class T7 and the pavement comprises 50mm asphalt concrete or double seal surface dressing, 150mm thick graded crushed stone base, 125mm thick modified/stabilised natural gravel Subbase and an additional 550mm thick selected fill layer where subgrade is <15% CBR. The section of road between Kiziranfumbi and Hoima, which will be carrying the increased traffic loading from the proposed oil refinery traffic, has the thickness of the Subbase increased to 150mm.

2.4 Mobilisation
1. Clarifying objectives, access criteria and implementation modalities
2. Encouraging other stakeholders participation
3. Inspiring and bring determination among the target groups.

2.5 Project identification and preparation
The identification and preparation of UNRA projects follows different stages which include namely; feasibility study, technical analysis, determination of the source of funds and prioritisation.

2.6 Project appraisal
1. Conformity with the clients, technical specification, drawings, BOQ and the environmental requirements.
2. Conformity with the project guidelines
3. Completeness at sub project requirement
4. Appropriation of the sub project budget
5. Carryout an assessment of the site conditions in respect to technical design requirements
6. Assesses the accuracy of costing
7. Assess the environmental and social impacts
8. Assess the economic benefits of the project
9. Assess the ability of the project to sustain its design life
10. Asses gender responsiveness and equity sensitisation

2.7 Project approval

The consultant Comptran Engineering and Planning Associates on behalf of the client approves all subproject requirements and endorsed by the client with view of confirming with the following:

1. Conformity with the clients, technical specification, drawings, BoQ and the environmental requirements.
2. Conformity with the project guidelines
3. Completeness at sub project requirement
4. Appropriation of the sub project budget
5. Carryout an assessment of the site conditions in respect to technical design requirements
6. Assesses the accuracy of costing
7. Assess the environmental and social impacts
8. Assess the economic benefits of the project
9. Assess the ability of the project to sustain its design life
10. Asses gender responsiveness and equity sensitisation
The Engineer monitored Contractor’s compliance with Statutory Permits/Approvals/Licenses.

2.8 Funds disbursement
1. The sub project team is trained to carry out approvals for the payments to be effected by the client.

2.9 Implementation
1. Sub project launch
2. Providing technical support

2.10 Monitoring and supervision
1. Field visits to project sites
2. Providing technical support
3. Documenting, Progress reporting and implementation
4. Feasibility, viability and functionality

2.11 Commissioning
1. Preparation and submission of subproject certificates
2. Formal hand over of sub project to the client and road users.
3. Inaugurations of Maintenance and operations committee
CHAPTER THREE
DESIGN REVIEW

3.0 Overview

3.1 Objective
In developing the design for upgrading Kyenjojo-Hoima-Masindi-Kigumba roads, the main project objectives set in the Terms of Reference were to improve the horizontal and vertical alignment by considering road realignment options where appropriate.

Where improvements in the road alignment to meet UNRA’s design standards were deemed appropriate, a number of route options were looked at with due regard to the following considerations as stated in the project’s Terms of Reference:

1. Design manual criteria;
2. Balance between cut and fill;
3. Minimisation of land take;
4. Affordability and acceptance accommodation works to frontages;
5. Minimisation of required utility protection / relocation;
6. Avoidance of geological, hydrological and environmental problems;
7. Avoidance of extensive and expensive bridge works;
8. Protection of vulnerable road users;
9. Provision of inbuilt safety measures; and

Furthermore, the project’s Terms of Reference also request that in upgrading the roads to bituminous standards, in order to ensure an ‘optimum horizontal and vertical alignment’ consideration should also be given to:

11. Pavement Construction Options;
12. Improving Junctions Arrangements;
3.2 Scope of design review
Design Review is aimed at checking the detailed designs to confirm their correctness and applicability which is to include all conformity and other additional investigations as necessary. To also make all changes to the documents as agreed with the Client.

The review is to check for soundness and efficiency of the Detailed Engineering Design and Bidding Documents, to ensure the design is safe, it is not to try and find fault with the design. In addition, it is to ensure the details as included in the contract are sufficient for the Contractor to build the works and where not, the Consultant id to further develop the details and information required.

3.3 Engineering studies
3.3.1 Topographical survey
A topographical survey was essential for the accurate alignment design of the project roads and also determining realistic land acquisition requirements. Therefore, very early in the project, a topographical survey was commissioned, based on a notional 30m distance on either side of the existing road’s centerline. The main obvious outcome from the topographical survey was that the existing road geometry comprises several sub-standard sections that required realigning / corrections. Below is only an illustration of some sharp bends in the project.

3.3.2 Traffic studies
A comprehensive set of 12h manual classified counts, starting at 06h00, were carried out at eight stations for seven days, from 16 to 22 Dec 2009.

Weighted average traffic was calculated for aggregated sections that were later used for pavement design and/or economic evaluation.

OD surveys were carried out at points where traffic was likely to divert to the project road, were it is to be upgraded. This involved identifying through traffic that currently uses the trunk roads from northern Uganda via Kampala to western and south-western Uganda.
3.3.3 Hydrological studies
A detailed hydrological study of the Kyenjojo-Hoima-Masindi-Kigumba roads was carried out in accordance with the MOWT Drainage Design Manual. The design philosophy and methodologies used were as described and approved in the submission of the Preliminary Design Report. An inventory of existing culverts was prepared as part of the documentation process during field investigations which was also included in the Preliminary Design Report.

1. Review of Design Criteria and Practice
2. Outline of the Adopted Methodology
3. Hydrometeorological Records
4. Catchment Area Estimation for Culverts

3.3.4 Geometric investigations
The Kyenjojo to Hoima road can be described as being in a poor condition with difficult and irregular geometrical elements such as tight bends, steep longitudinal gradients and uneven cross sections. This is due to the local terrain which generally displays hilly characteristics and prevents the existing road alignment from providing a consistent riding platform. The roads between Hoima, Masindi and Kigumba are also in poor condition characterised by an irregular uneven surfacing and cross section, occasional tight bends and steep gradients.

Following on from the work done on the Rukungiri-Ishasha/Kanungu road upgrading scheme which formed Sections I and II of Lot D1, the links for this road have been divided into the following sections:

1. Section III: Kyenjojo – Hoima (144km)
2. Section IV: Hoima – Masindi (52 km)
3. Section V: Masindi – Kigumba (39 km).

In developing the design for upgrading Kyenjojo – Hoima – Masindi - Kigumba Road, the main project objectives with regards to highway alignment set in the Terms of Reference were to improve the horizontal and vertical alignment by considering road realignment options where appropriate.
Where improvements in the road alignment to meet UNRA’s design standards were deemed appropriate, a number of route options were looked at with due regard to the following considerations as stated in the project’s Terms of Reference:

1. Design manual criteria
2. Balance between cut and fill
3. Minimise land take
4. Affordable and acceptable accommodation works to frontages
5. Minimise utility protection / relocation
6. Avoid geological, hydrological and environmental problems
7. Avoid extensive and expensive bridge works
8. Protect vulnerable road users
9. Provide inbuilt safety measures
10. Provide adequate road users facilities

3.3.5 Soils, materials and pavement investigations

3.3.5.1 Engineering Geology
The topography of the existing gravel road generally traverses rolling terrain, occasionally running sidelong to some steeply inclined slopes between Kyenjojo and Hoima. The terrain generally becomes flatter to the east of Hoima and this therefore also allows for a straighter horizontal profile. Along the route numerous rivers, marshes and swamps are crossed all of which pose specific geotechnical challenges

3.3.5.2 Centerline Soil Investigation
Trial pits were excavated alternately on the left hand and right hand sides of the roadway at 2km intervals and to a depth of 1000mm. Samples were taken of each horizon encountered and tested for particle size distribution and Atterberg limits, and subsequently for derivation of the California Bearing Ratio (CBR) s shown in appendices A11 and A12.
3.3.5.3 Deep Trial Pits
In addition to the trial pits at 2km intervals, a further 23 deeper trial pits were excavated in between Kyenjojo-Hoima in areas where deep cuttings are proposed up to depth of 5.5m.

3.3.5.4 Dynamic Cone Penetration (DCP) Survey
DCP tests were carried out at 500m intervals along the centerline of the proposed road and the penetration rate was used to determine the CBR for the upper and lower layers

3.3.5.5 Borrow Pits
A large number of potential sites in the immediate vicinity of the alignment were identified and samples taken for laboratory classification and testing.

3.3.6 Swamp investigations
As part of a scheme wide engineering geological site walkover, the locations of swamps along the project route were visited in order to provide a preliminary assessment of their likely impacts upon the design of the road, including recording the approximate extents of the swamp, vegetation types, presence and depth of standing water and watercourses, any exposures of the underlying soil or rock, and the existing method of road crossing being used if any (e.g. rock fill, gabions etc.).

3.3.7 Bridge site investigations
There are two major structures on Section III, Kyenjojo-Hoima road:

1. Muzizi River Bridge, Ch 36+700

2. Nguse River Bridge, Ch 83+500

Due to the presence of very strong rock close to or at the surface in the vicinity of the Nguse River, and the lack of suitable ground investigation plant and testing facilities within Uganda, no samples were able to be collected for laboratory analysis and subsequent geotechnical appraisal

3.3.8 Environmental and social studies
An Environmental and Social Impact Assessment was carried out for the Kyenjojo-Hoima-Masindi-Kigumba roads and surrounding areas during 2010, with a summary of the findings presented below. Further detailed assessment of the impacts upon the project and the design
decisions made are included within the Environmental and Social Impact Assessment Report issued separately.

Impact prediction and analysis utilized a project lifecycle approach: identifying and analysing impacts from construction, through operation (post-construction) phases. Impact analysis aimed at developing recommendations that maximize benefits and avoid/reduce/minimize adverse environmental and social impacts.

3.3.9 Public utilities
Topographic surveys indicated a number of utility installations in the project area which potentially need to be relocated or diverted. Utility companies were contacted to find out whether some of their apparatus in the project area would be affected. Utility companies contacted included:

1. Electricity
   − UMEME Ltd
   − Ferdsult Engineering Services Ltd

2. Water
   − National Water and Sewerage Cooperation (NWSC)
   − Directorate of Water Development (DWD)

3. Telecommunication
   − Uganda Telecoms Limited

3.4 Detailed design
3.4.1 Road geometry
3.4.1.1 Design Standards
Early in the project a comprehensive review was undertaken of the Ugandan Road Design Manual published by the Ministry of Works and Transport (MoWT) in July 2005 with the view to assess its suitability for this project (refer to Design Base Statement October 2009).
3.4.1.2 Road Design Speed
According to the MoWT Road Design Manual, Section IV, the design speed is a function of the ‘road design class’ and the terrain characteristics of the region.

3.4.1.3 Horizontal Alignment Design
The approach adopted was to provide a horizontal alignment that removes existing sub-standard geometrical elements while harmonises with the local surroundings and keeps the impact on properties to a minimum.

3.4.1.4 Transition Curves
Transition curves (clothoids) have been used where required to link tangent and circular curves in accordance with the requirements of the Geometric Design Manual (Section 6) to reduce the abrupt introduction of the lateral accelerations at curves.

3.4.1.5 Sight Distance on Horizontal Curves
In order to ensure that adequate forward visibility is permitted across the inside of the horizontal curves, thorough checking was carried out in accordance with the principles listed in Section 6.2.5 of the Geometric Design Manual.

3.4.1.6 Vertical Alignment Design
Although great efforts were made to accommodate standard gradients throughout the project roads, there were situations where due to the difficult relief encountered, gradients above the desirable maximum value had to be adopted.

3.4.1.7 Typical Cross-Sections
Based on the requirements of Section 7.17 of the Design Manual for the Design Class Paved II, the elements of the standard cross-section for the project roads are shown below

I. 6.0m carriageway (2no x 3.0m lane)

II. 2no x 2.0m paved shoulders

III. 2.5% normal cross-fall for carriageway

IV. 2.5% normal cross-fall for shoulders.
3.4.1.8 Super elevations

Super elevations were provided at curves following the requirements of the Design Manual (Section 6) in order to assist drivers negotiating tight bends.

3.4.1.9 Widening on Curves

Section 6.2.4 of the Design Manual requires that the carriageway is widened on sharp curves and / or high embankments (fill) to allow for additional room for large vehicles reducing risk of collisions while increasing the ‘physiological comfort of the driver’.

3.4.2 Traffic signs and road markings

3.4.2.1 Traffic Signs

The Republic of Uganda, Ministry of Works, Housing and Communications, Traffic Signs Volume 1 and Volume 2, were used in conjunction with the Ugandan Road Design Manual to provide comprehensive guidance on the use, positioning and placement of traffic signs and road markings.
3.4.2.2 Trading Centre Signage
As described above, it was determined that a combination of speed calming methods should be used on the approach to and throughout the 61 vulnerable trading centres, determined during site visits.

3.4.3 Safety barriers
Therefore in the design process it was decided that, beside the Ugandan Design Manual, to also make use of the latest specifications for safety barriers provided by the ‘TD 19/06 Requirements for Road Restraint Systems’ which is part of the UK Design Manual for Roads and Bridges (DMRB).

3.4.4 Earthworks
3.4.4.1 Surveys and Investigations
An engineering geological appraisal was undertaken and as part of this the design alignment was followed and assessed in terms of the proposed cut and fill locations, the geological strata they were due to be excavated within or placed upon, and any initial geotechnical issues that could be related to their construction and serviceability.

3.4.4.2 Construction
Where soft spots are encountered where the road is at grade (i.e. founding the pavement layers upon the natural ground), a selected fill material will be necessary to achieve the design S5 subgrade class designation required for the pavement design.

3.4.4.3 Topsoil and Vegetation
On roads adjoining the project road which have been upgraded to bituminous standards within the past 3 years, it can be seen that vegetation establishes itself extremely quickly upon newly exposed cut slopes and constructed fills, and as such provides an additional stabilising effect upon the slope.

3.4.5 Pavement design
For the design of the upgraded project road it is important to consider local experiences and resources. Initially it was assumed that various pavement design methodologies would be considered in developing a design solution.

1. Pavement Design Approach
The detailed pavement design has been undertaken in accordance with:


II. The “General Specification for Road and Bridge Works”, published by The Republic of Uganda, Ministry of Works, Housing and Communications

3.4.6 Drainage design
The TRRL method has been adopted to determine the 25 – 50 year design discharge for culverts associated with large drainage areas and those deemed to have been inadequate based on the field observations in accordance to the methodology prescribed by the Drainage manual (MWHC, 2005).

3.4.7 Bridge design
Limited availability of concurrent records of rainfall and runoff for Nkusi catchment is a key constraint to rainfall runoff analysis and hence, one can only rely on a direct comparison of the annual flood peaks in order to determine flood magnitudes required for bridge opening designs.

3.4.8 Traffic management
The TM principles are based upon the UK - Traffic Signs Manual - Chapter 8 (Traffic Safety Measures and Signs for Road Works and Temporary Situations). The sections and layouts shown on the Contract Drawings are indicative only as the Contractors are fully and solely responsible to develop detailed TM systems and techniques that are safe to implement, maintain and operate as well as suitable for the works required under the project.

3.4.9 ROAD SAFETY AUDIT FINDINGS AND RESPONSES
Crash not Solutions LLP has been commissioned by Mott MacDonald to prepare an independent Stage3 (Detailed Design Stage) Road Safety Audits in response to the upgrading of the Kyenjojo – Hoima – Masindi - Kigumba Roads Project in accordance with the project Terms of Reference(TOR).

3.4.10 Construction cost estimate
Earthwork quantities were produced by the MX model used to design the road alignment. Quantities for the pavement layers and other items were measured from the Auto Cad drawings.
Using these quantities, Bills of quantities were prepared for the detailed design and rates from a previously tendered road project in Uganda (Fort Portal-Bundibugyo-Lamia Road) was inserted to produce estimated construction costs.

### 3.5 Economic assessment

This report presents the economic appraisal of a proposal to upgrade, i.e. pave, the road between Kyenjojo and Kigumba via Hoima and Masindi. The length of the upgraded road is 233.5km. HDM4 (v2.08) was used as the principal appraisal tool. Guidance was taken from the Procedural Guide to Economic Road Feasibilities Studies (referred to subsequently as the procedural guide).

The proposed upgrade has three rationales. First, it will provide a strategic link between the northern corridor (specifically SW Uganda, Rwanda and Burundi and eastern DRC) and the Kampala-Gulu-Juba corridor.

All predicted project costs and benefits are measured in economic prices using an international price numeracies and a US dollar unit of account.

#### 3.5.1 Economic profile

Growth of GDP or GDP per head is needed in order to forecast traffic. Inflation forecasts, needed for cost estimates, are included here for convenience.

Border traffic and its growth are relevant to project viability. Border traffic comprises transit traffic, intraregional traffic and local traffic.

#### 3.5.2 Costs and benefits

##### 3.5.2.1 Maintenance costs

In the reference (without project) case the general maintenance regime comprises:

i) Light grading twice a year and annual bush cutting and clearing of drains

ii) 150mm re-gravelling, including mechanical compaction, approximately every three years.
3.5.2.2 Construction disbenefits
There are costs associated with road improvement works. They may impose delays on existing road users. They may also cause environmental and social damage that persists beyond the construction period and extends further than the immediate vicinity of the works.

3.5.2.3 Benefits
i) Road user cost savings: VOCs
ii) Road user benefits: generated traffic
iii) Road user benefits: accident cost reductions
iv) Road user benefits: non-motorised traffic

Table below presents the Work Breakdown Structure for the Design Review phase:

**Table 4: Tasks to be conducted during Design Review**

<table>
<thead>
<tr>
<th>Task</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Series C1.0 - Design Review Phase</strong></td>
<td></td>
</tr>
<tr>
<td>Task C1.0.1</td>
<td>Review of Design Assumptions</td>
</tr>
<tr>
<td>Task C1.0.2</td>
<td>Liaison with Client</td>
</tr>
<tr>
<td><strong>Series C1.1 – Overview of Detailed Design Review</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Series C1.2 – Data Collection And Analysis</strong></td>
<td></td>
</tr>
<tr>
<td>Task C1.2.1</td>
<td>Traffic Data</td>
</tr>
<tr>
<td>Task C1.2.2</td>
<td>Axle Load Data</td>
</tr>
<tr>
<td><strong>Series C1.3 – Detailed Engineering Investigations</strong></td>
<td></td>
</tr>
<tr>
<td>Task C1.3.1</td>
<td>Topographic Survey</td>
</tr>
<tr>
<td>Task C1.3.2</td>
<td>Reference Beacons</td>
</tr>
<tr>
<td>Task C1.3.3</td>
<td>Soils and Materials - Investigations</td>
</tr>
<tr>
<td><strong>Series C1.4 – Pavement Design Review</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Series C1.5 – Horizontal and Vertical Alignment</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Series C1.6 – Drainage Structures</strong></td>
<td></td>
</tr>
<tr>
<td>Task C1.6.1</td>
<td>Bridges</td>
</tr>
<tr>
<td><strong>Series C1.7 – Road Safety Assessment</strong></td>
<td></td>
</tr>
<tr>
<td>Task</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
</tr>
<tr>
<td>Series C1.8 – Review of Environmental and Social Mitigation Plan</td>
<td></td>
</tr>
<tr>
<td>Series C1.9 – Road Safety Assessment Report</td>
<td></td>
</tr>
<tr>
<td>Series C1.10 – Design Review Report</td>
<td></td>
</tr>
<tr>
<td>Task C1.10.1</td>
<td>Task Risk Assessment and Mitigation Plan</td>
</tr>
<tr>
<td>Series C1.11 – Contract Document Review Report</td>
<td></td>
</tr>
<tr>
<td>Task C1.11.1</td>
<td>Specifications, Drawings and Bill of Quantities, Target Quantities, Outturn Cost</td>
</tr>
<tr>
<td>Task C1.11.2</td>
<td>Value Engineering</td>
</tr>
<tr>
<td>Series C1.12 – Plan for Additional Soil Site Investigations at Construction</td>
<td></td>
</tr>
<tr>
<td>Series C2.0 – Training and Technology Transfer</td>
<td></td>
</tr>
</tbody>
</table>

3.5.3 Work breakdown structure

The flow chart in Figure 3 below illustrates, in chronological order, the major activities involved in design the review:
Figure 3: Task Flow Chart for Design Review
CHAPTER FOUR
PROJECT IMPLEMENTATION

4.0 Progress overview

Actual physical progress of works in June 2016 with respect to the Work Programme (approved by the Engineer on 30th Oct 2017) was 0.15% against 0.02% planned. Cumulative physical progress at the end of June 2016 was 0.15% against 0.02% planned.

Table 5: Stockpiled Aggregates

<table>
<thead>
<tr>
<th>Aggregate Size (mm)</th>
<th>Stockpiled Quantity (m$^3$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 6</td>
<td>4,019</td>
</tr>
<tr>
<td>6 - 10</td>
<td>12,865</td>
</tr>
<tr>
<td>10 - 14</td>
<td>703</td>
</tr>
<tr>
<td>14 - 20</td>
<td>2,709</td>
</tr>
</tbody>
</table>
Table 5: Aggregates Test Results

<table>
<thead>
<tr>
<th>TEST</th>
<th>AGGREGATE SIZE</th>
<th>RESULTS</th>
<th>SPECIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRADING</td>
<td>20/14mm</td>
<td>Compliant</td>
<td>Envelope</td>
</tr>
<tr>
<td>FI</td>
<td>20/14mm</td>
<td>15</td>
<td>&lt; 20%</td>
</tr>
<tr>
<td></td>
<td>14/10mm</td>
<td>19</td>
<td>&lt; 25%</td>
</tr>
<tr>
<td>TFV</td>
<td>Unsoaked (20/14mm)</td>
<td>207</td>
<td>&gt; 160 KN</td>
</tr>
<tr>
<td></td>
<td>Soaked</td>
<td>215</td>
<td>&gt; 160 KN</td>
</tr>
<tr>
<td></td>
<td>Wet /Dry Ratio (20/14mm)</td>
<td>104</td>
<td>&gt; 75%</td>
</tr>
<tr>
<td>Water Absorption</td>
<td>14 /10mm</td>
<td>0.30</td>
<td>&lt; 0.5%</td>
</tr>
<tr>
<td>ACV</td>
<td>20 /14mm</td>
<td>Not Specified</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14 /10mm</td>
<td>20.00</td>
<td>&lt; 21% (Special Specs)</td>
</tr>
<tr>
<td>Bitumen Affinity</td>
<td>20 /14mm</td>
<td></td>
<td>&gt; 95%</td>
</tr>
<tr>
<td>ALD</td>
<td>20/14mm</td>
<td>11 - 15mm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14/10mm</td>
<td>8 - 10mm</td>
<td></td>
</tr>
</tbody>
</table>

A physical progress S-Curve showing planned and accomplished progress is presented in Figure 4 (K).
Figure 4 (K) – Financial S-Curve

4.1 Current status of mobilization

4.1.1 Site office for the engineer’s staff
The Engineer’s temporary offices and mobile laboratory have been provided in Contractor’s site camp and are in use. Laboratory equipment for use by the Engineer has been supplied.

4.1.2 Houses for the engineer’s staff
Accommodation for the Engineer has been provided in Kagadi Town.

4.1.3 Equipment for the engineer
13 vehicles, comprising 3 Station Wagon and 10 Double Cabin Pickups have been supplied for the Engineer. 3 Station Wagons have been supplied for the Employer’s use.

4.1.4 Laboratory for the engineer
Laboratory equipment for use by the Engineer has been supplied and it’s in use.
4.1.5 Contractor’s camp site

Contractor has set up main site camp at Mabaale at Km69+070 (RHS). Facilities at the camp include Contractor’s Offices, accommodation for Contractor’s expatriate personnel, Contractor’s laboratory, Engineer’s mobile laboratory, Engineer’s temporary offices, pre-cast concrete yard, workshops, stores, security post, workers’ washrooms, etc.

4.2 Relocation of services

A Services Inventory has been prepared by the contractor but relocation of services has not yet commenced for the following reasons among others:

- Design review that was still in progress
• Delay of client to approve design drawings

4.3 Current progress status
Cumulative physical progress at the end of the reporting quarter was 20.6% against planned progress of 30.8%.

Works accomplished to date are:

i) 46.2Ha of clearing and grubbing;

ii) 44,280m³ of topsoil removal;

iii) Removal and grubbing of 97no. large trees;

iv) 9,720m³ of G7 fill; and

v) 912m³ of Roadbed preparation

The crucial issues are tabulated below:

Table 6: Crucial Issues

<table>
<thead>
<tr>
<th>Wearing Course</th>
<th>30mm Double Surface Dressing Treatment on carriageway, shoulders, climbing lanes and bus-bays.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base course</td>
<td>150mm thick graded crushed stone aggregates</td>
</tr>
<tr>
<td>Subbase</td>
<td>150mm thick mechanically stabilized</td>
</tr>
<tr>
<td>Earthworks</td>
<td>Clearing and grubbing and removal of topsoil; Cut and Fill: all suitable materials from cut shall be used for fill and surplus spoiled according to the Contract provisions; Cut to spoil of surplus materials or unsuitable materials; Roadbed preparation and compaction to 150mm thickness where instructed by the Engineer; 550mm Improved subgrade layer; G7 Fill;</td>
</tr>
<tr>
<td>Category</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>-------------</td>
</tr>
<tr>
<td>Borrow Pits and Quarries</td>
<td>The borrow areas will be cleared of the vegetation and the overburden materials which will all be stockpiled and reserved for later use in restoration of the borrow pits; Haulage of construction materials: Contractor shall minimize negative impact on the environment. During the transport of materials, it is desired that trucks be covered with tarpaulins to minimize wind blowing off loose materials from the trucks; Establishment of stone quarries.</td>
</tr>
<tr>
<td>Drainage Structures</td>
<td>Construction and installation of drainage structures/systems including: Composite bridge (1No.); Concrete pipe culverts; Corrugated metal pipes (CMP); Covered lined drainage channels in trading centres; Concrete lined open drains on very steep gradients; Stone pitched drains on steep gradients; Scour checks in earth drains on moderate gradients; Offshoot earth drains; and Catch water earth drains</td>
</tr>
<tr>
<td>Ancillary Works</td>
<td>Installation of Road signs, Road Markings, Speed humps, Rumble strips and Guardrails</td>
</tr>
</tbody>
</table>
Figure 7: Ongoing Earthworks (Spreading of material for 2nd layer G7 fill)

Figure 8: Maintenance of Existing Road Spreading CRS at graded section of existing road Km63+940 - Km64+200
CHAPTER FIVE

OCCUPATIONAL HEALTH AND SAFETY

5.0 Overview
The main objective of this OHSE plan is to promote Health, Safety & Environment of a person working with M/S Shengli and prescribe certain rules, procedures and safe practices in order to create a working environment free of condition and factors that might contribute to an accident or injury /Illness.

5.1 Policies
It is policy of M/S Shengli to carry out all its work in a way that provides healthy and safe working practices and avoids risks of injury to anyone as a result of the activity for which the company is responsible

5.1.1 Specific objectives of the company OHSE policy
1. Prompt accident notification, investigation and reporting.
2. The establishment and maintaining of Healthy, Safe and Productive Working Environment.
3. Protection of property equipment and material from all down grading incidents.
4. Protection of Environment by removing all hazardous wastes and by proper housekeeping

5.1.2 Zero accident tolerance policy
All endeavours to adopt a zero accident tolerance attitude to any occurrence threatening the Health, Safety & Environment of our work force and the general public.

Accident Record for the reporting quarter is summarized in Table 35(K).
Table 7(K) – Occupational Health & Safety

<table>
<thead>
<tr>
<th>Category</th>
<th>This month</th>
<th>To date</th>
<th>Average Monthly Total</th>
<th>Issue / Cause</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Along ROW or adjacent</td>
<td>Contractor's Labour / Equipment involved</td>
<td>No of Injuries</td>
<td>Along ROW or adjacent</td>
<td>Contractor's Labour / Equipment involved</td>
</tr>
<tr>
<td></td>
<td>Slight</td>
<td>Serious</td>
<td>Fatal</td>
<td>Total</td>
<td>Slight</td>
</tr>
<tr>
<td>ROAD ACCIDENT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Involving Employees</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Involving Third Parties</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>WORKS SITES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Involving Employees</td>
<td>6</td>
<td>5</td>
<td>1</td>
<td>6</td>
<td>28</td>
</tr>
<tr>
<td>Involving Third Parties</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>OFF-WORKS SITES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Involving Employees</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Involving Third Parties</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes (Issues/Cause & Actions)

1. Fatigue

2. Incompetence of equipment usage which is being mitigated by organising meetings and emphasising training before use of the equipment

4. Erant drivers not respecting road signs and traffic controls. Road safety sensitization to be intensified along the road under construction

Figure 9: Safety ware used during earthworks.
5.1.3 Traffic management plan

This plan therefore serves as formal safety assurance and traffic management methods for the process control of the Upgrading of Kyenjojo-Kabwoya Road (100km) Project.

In order to efficiently manage the traffic in construction sections, a team of traffic management has been established as shown in the establishment of organization and personnel assignment of traffic management in following chart.

Figure 10: Traffic Management Chart & Personnel

![Traffic Management Organization Chart]

5.2 Specific objectives of the company OHSE policy

1. Prompt accident notification, investigation and reporting.

2. The establishment and maintaining of Healthy, Safe and Productive Working Environment

3. Protection of property equipment and material from all down grading incidents.

4. Protection of Environment by removing all hazardous wastes and by proper storage.
5. The integral part of effective management in Shipping & Transport industry is awareness that high standards of Health, Safety & Environment is required.

**Figure 11: safety organization chart**

![Safety Organization Chart](image)
6.0 Quality control

Inspections and testing of materials intended for use in concrete works, earthworks (fill) and swamp treatment have been done on a regular basis. Field Density tests were carried out on completed sections of fill and roadbed preparation. Works which complied with specification requirements have been granted approvals, whereas sections which failed were reworked to satisfy specification requirements.

Sample of Ordinary Portland Cement (42.5) delivered to site for use in concrete works has been sent to UNBS for testing for confirmatory testing.

Contractor’s Quality Control Plan (QCP) was approved by the Engineer on May 12, 2016.

Project Control Plan (PCP) was submitted to UNRA on May 05, 2016. Management System Documentation (MSD) is under preparation and will be submitted to UNRA when completed.

6.1 Quarry acquisition

Figure 12: quarrying of rock Km69+060 (LHS)

6.2 Approval for engineer’s laboratory

Inspections and testing of materials intended for use in concrete works, earthworks (fill) and swamp treatment have been done on a regular basis.

Sample of Ordinary Portland Cement (42.5) delivered to site for use in concrete works has been sent to UNBS for testing for confirmatory testing.
The major activities performed as at end of the reporting quarter include confirmatory tests on samples from borrow pits and existing road, field density tests on existing road and G7 fills, concrete mix design for C25/20 and C30/20 concrete, routine sampling and testing of stockpiled aggregates, etc

6.3 Borrow area sourcing and testing

6.3.1 Borrow material
During the reporting quarter, one (1) natural gravel borrow pit was established and is operational at Km96+080 (RHS). Representative samples have been taken from 6 other proposed borrow pits (Km70+870, Km90+872, Km92+540, Km96+580, Km97+107 and Km99+906) for testing to ascertain suitability for use in the works.

<table>
<thead>
<tr>
<th>Table 8: Testing standards used for tests carried out on gravel</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Test</strong></td>
</tr>
<tr>
<td>Particle Size Distribution</td>
</tr>
<tr>
<td>Plastic Limit</td>
</tr>
<tr>
<td>Liquid Limit</td>
</tr>
<tr>
<td>Linear Shrinkage</td>
</tr>
<tr>
<td>Moisture Density Relationship</td>
</tr>
<tr>
<td>California Bearing Ratio</td>
</tr>
</tbody>
</table>

6.3.2 Aggregate produced from quarry
Crushing of aggregates at the quarry (Km69) commenced in the reporting quarter. Aggregates intended for use in concrete works are being produced and stockpiled at the quarry. Routine sampling and testing for compliance with specifications is being done.

6.3.3 Field testing
Field Density tests were carried out on completed sections of fill and roadbed preparation. Works which complied with specification requirements have been granted approvals, whereas sections which failed were reworked to satisfy specification requirements.
6.3.4 Swamp investigation

We received revised culvert locations and are now finalizing with preparation of schedules for detail investigation of the in situ soils at large culvert foundations.

Table 9: summary of test results during this period

<table>
<thead>
<tr>
<th>Test</th>
<th>New No.</th>
<th>New % failed</th>
<th>Re-Test No.</th>
<th>Re-Test % failed</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density</td>
<td>6 4 67 6 0 0 6 4 6 7</td>
<td></td>
<td></td>
<td>6 0 0 9 3</td>
<td>94.9</td>
</tr>
<tr>
<td>M/C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fill</td>
<td>1 0 0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBR</td>
<td>2 2 2 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Field</td>
<td></td>
<td></td>
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<td>LL/PI</td>
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<tr>
<td>Expan</td>
<td>sive</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Soils</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
CHAPTER SEVEN
PROJECT EVALUATION AND ANALYSIS

7.0 Progress details and analysis

Progress Photographs

Progress photographs taken during the reporting month are presented in Appendices in Part 2 of this report.

Figure 14 (K) – Physical Progress vs. Actual performance

Physical progress in June 2016 was 0.15% actual against 0.02% planned. Details of quantities and location of works planned and actual accomplished by the Contractor during the reporting month are summarised in

7.1.1 Possession of site and landtake

The Contractor was granted access to and possession of that part of the site from Km56+700 to Km100+034 by UNRA on March 22, 2016. (Letter ref: UNRA/PR96/210). Within this part of the project road is the section (Km70+000 – Km100+000) where the Contractor plans to substantially complete and hand-over in 60% of the contract period (as indicated in the Work Programme).
7.1.2 Survey, design and contract drawings
Confirmatory checks of location and condition of existing and re-established control stations during Design Review have been completed and Contractor is working with confirmed and newly established controls. To date, proposed culvert locations have been confirmed from Km85+000 to Km100+400. Setting-out of width of clearing and grubbing was carried out in the reporting month from Km90+300 to Km94+000. To date setting-out of the clearing width has been completed from Km90+300 to Km100+400 on both sides.

Engineer’s Laboratory
Mobile laboratory for the Engineer has been provided within the Contractor’s site camp at Km69+070 (RHS). Laboratory equipment (CONTROLS – Italy) have been supplied. Supplied equipment as at end of the reporting quarter was approximately 60% of the total capacity specified in the Contract. Contractor has indicated to the Engineer that the remaining equipment will be supplied by 1st September, 2016.

7.1.3 Materials and approvals
The major activities performed in the reporting month include confirmatory tests on samples from borrow pits existing road, field density tests on existing road and G7 fills, concrete mix design for C25/20 and C30/20 concrete, routine sampling and testing of stockpiled aggregates, etc.

The average compaction achieved for G7 fill layers ranges between 95 and 96.4. Average compaction achieved for roadbed preparation was 95%. Results of Concrete Mix Design for C30/20 and C25/20 have not yet been submitted to the Engineer for confirmation and subsequent approval.

7.1.4 Progress of major work items to date
Earthworks comprise 96% of the physical works. To date, 54% of earthworks have been completed against a planned 60%. Drainage, pavement, structural and ancillary have commenced.
7.1.5 Quantities progress – summary & analysis

Table 10 (K) – Planned vs. Actual Progress

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Unit</th>
<th>Rev.</th>
<th>Original Chainage</th>
<th>Length (m)</th>
<th>Quantity</th>
<th>Plan Status</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Clearing and grubbing</td>
<td>Ha</td>
<td>393</td>
<td>95+000 to 100+400</td>
<td>5,400</td>
<td>5.00</td>
<td>√</td>
<td>Achieved more than planned</td>
</tr>
<tr>
<td>2</td>
<td>Removal of Topsoil</td>
<td>m³</td>
<td>350,000</td>
<td>99+800 to 100+034</td>
<td>10,034</td>
<td>11.25%</td>
<td>√</td>
<td>Achieved more than planned</td>
</tr>
<tr>
<td>3</td>
<td>Removal and grubbing of Large Trees</td>
<td>No</td>
<td>850</td>
<td>90+000 to 95+000</td>
<td>5,000</td>
<td>50</td>
<td>√</td>
<td>Achieved more than planned</td>
</tr>
<tr>
<td>4</td>
<td>G7 Fill</td>
<td>m³</td>
<td>1,720</td>
<td>95+000 to 100+000</td>
<td>11,250</td>
<td>11,250</td>
<td>√</td>
<td>Achieved more than planned</td>
</tr>
</tbody>
</table>

7.1.5.1 Progresses of quantities accomplished to date are:

- Clearing and grubbing (16.2Ha);
- Topsoil Removal (11,250m³);
- Removal and grubbing of large trees and tree stumps (431no.);
- G7 Fill (1,720m³);
- Roadbed preparation (612m³)

7.1.5.2 Independent Checks on Quantities

Quantities Check Sheet (QCS) is used to control and check quantities as physical works progress

7.2 Essential activities monitor

The current status of Essential Activities at the end of the reporting time is discussed below.
7.3 Contractors cash flow

7.3.1 Projected cash flow 6 months

The figures have been extracted (by the Consultant) from the Contractor’s overall cash flow projection.

The Contractor’s Cash Flow projections for the reporting period of July 2013 and the subsequent six months (August to January) is presented in Table 11(S)

Table 11(S) – Contractor Projected Cash Flow

<table>
<thead>
<tr>
<th></th>
<th>August</th>
<th>September</th>
<th>October</th>
<th>November</th>
<th>December</th>
<th>January</th>
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<tbody>
<tr>
<td>Monthly</td>
<td>3.702</td>
<td>3.087</td>
<td>2.246</td>
<td>2.302</td>
<td>2.976</td>
<td>3.544</td>
</tr>
<tr>
<td>Cumulative</td>
<td>187.515</td>
<td>190.602</td>
<td>192.848</td>
<td>195.15</td>
<td>198.126</td>
<td>201.67</td>
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Table 12(S) - Weighted Financial Progress
<table>
<thead>
<tr>
<th>Description</th>
<th>Tendered BoQ</th>
<th>Works up to April 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cost</td>
<td>Weighting</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cost</td>
</tr>
<tr>
<td>General Requirement and Provision</td>
<td>2,836,070,750</td>
<td>2.06%</td>
</tr>
<tr>
<td>Contractor's Establishment on Site and General Obligation</td>
<td>1,318,555,320</td>
<td>0.96%</td>
</tr>
<tr>
<td>Engineers Accommodation and Attendance upon Engineer and His Site Personnel</td>
<td>5,548,658,170</td>
<td>4.03%</td>
</tr>
<tr>
<td>Accommodation of Traffic</td>
<td>149,683,137</td>
<td>0.11%</td>
</tr>
<tr>
<td>Environmental Protection and Waste Disposal</td>
<td>154,555,320</td>
<td>0.11%</td>
</tr>
<tr>
<td>Occupational Health and Safety HIV/AIDS and Gender</td>
<td>587,266,764</td>
<td>0.45%</td>
</tr>
<tr>
<td><strong>Sub-total</strong></td>
<td>10,694,783,461</td>
<td>7.76%</td>
</tr>
<tr>
<td><strong>DRAINAGE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drains</td>
<td>781,351,800</td>
<td>0.57%</td>
</tr>
<tr>
<td>Prefabricated Culvert</td>
<td>7,335,126,405</td>
<td>5.32%</td>
</tr>
<tr>
<td>Concrete kerbing, Chutes and Lining of Drains</td>
<td>3,051,547,600</td>
<td>2.22%</td>
</tr>
<tr>
<td>Stone Pitching and Erosion Protection including Kerbs</td>
<td>3,929,962,600</td>
<td>2.85%</td>
</tr>
<tr>
<td>Gabions</td>
<td>302,797,600</td>
<td>0.22%</td>
</tr>
<tr>
<td><strong>Sub-total</strong></td>
<td>15,400,786,005</td>
<td>11.18%</td>
</tr>
<tr>
<td><strong>EARTHWORKS AND PAVEMENT LAYER OF GRAVEL OR CRUSHED ROCK</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clearing, Grabbing and Removal of Top soil</td>
<td>3,141,616,000</td>
<td>2.43%</td>
</tr>
<tr>
<td>Removal of Existing Structures</td>
<td>144,930,100</td>
<td>0.11%</td>
</tr>
<tr>
<td>Earthworks</td>
<td>37,739,100,760</td>
<td>27.09%</td>
</tr>
<tr>
<td>Pavement Layers of Natural Gravel Material (Sub base)</td>
<td>5,690,000,000</td>
<td>2.68%</td>
</tr>
<tr>
<td>Stabilisation</td>
<td>7,791,200,000</td>
<td>5.76%</td>
</tr>
<tr>
<td>Crushed Aggregates Road Base</td>
<td>18,000,000,000</td>
<td>13.07%</td>
</tr>
<tr>
<td><strong>Sub-total</strong></td>
<td>70,488,947,360</td>
<td>51.17%</td>
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<tr>
<td><strong>BITUMINOUS LAYERS AND SEALS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prime and Curing Membranes</td>
<td>5,463,581,500</td>
<td>3.97%</td>
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<tr>
<td>Double Surface Dressings</td>
<td>18,795,865,400</td>
<td>13.65%</td>
</tr>
<tr>
<td><strong>Sub-total</strong></td>
<td>24,262,449,900</td>
<td>17.61%</td>
</tr>
<tr>
<td><strong>ANCILLARY ROAD WORKS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marker and kilometre post</td>
<td>607,033,600</td>
<td>0.44%</td>
</tr>
<tr>
<td>Guardrails</td>
<td>3,652,919,000</td>
<td>2.65%</td>
</tr>
<tr>
<td>Road signs</td>
<td>337,507,600</td>
<td>0.25%</td>
</tr>
<tr>
<td>Road Marking</td>
<td>3,048,419,332</td>
<td>1.49%</td>
</tr>
<tr>
<td>Landscaping and grassing</td>
<td>1,570,864,940</td>
<td>1.14%</td>
</tr>
<tr>
<td>Finishing the road and Road Reserve and Treating old Roads</td>
<td>369,000,000</td>
<td>0.27%</td>
</tr>
<tr>
<td><strong>Sub-total</strong></td>
<td>8,583,754,472</td>
<td>6.23%</td>
</tr>
<tr>
<td><strong>STRUCTURES</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foundation for structures</td>
<td>365,297,400</td>
<td>0.27%</td>
</tr>
<tr>
<td>False work, formwork and concrete finish</td>
<td>35,837,000</td>
<td>0.02%</td>
</tr>
<tr>
<td>Steel reinforcement for structures</td>
<td>454,608,000</td>
<td>0.33%</td>
</tr>
<tr>
<td>Concrete for structures</td>
<td>247,625,000</td>
<td>0.18%</td>
</tr>
<tr>
<td>No-Fines Concrete; Joints; Bearings; Parapets and Drainage for Structures</td>
<td>353,037,320</td>
<td>0.26%</td>
</tr>
<tr>
<td>Structural Steel</td>
<td>296,332,440</td>
<td>0.22%</td>
</tr>
<tr>
<td>Painting</td>
<td>4,527,800</td>
<td>0.00%</td>
</tr>
<tr>
<td><strong>Sub-total</strong></td>
<td>1,752,264,960</td>
<td>1.27%</td>
</tr>
<tr>
<td><strong>TOLERANCES, TESTING AND QUALITY CONTROL</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Testing of materials and workmanship</td>
<td>344,623,815</td>
<td>0.25%</td>
</tr>
<tr>
<td><strong>Sub-total</strong></td>
<td>344,623,815</td>
<td>0.25%</td>
</tr>
<tr>
<td><strong>DAY WORKS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Labour</td>
<td>97,245,000</td>
<td>0.07%</td>
</tr>
<tr>
<td>Materials</td>
<td>571,895,000</td>
<td>0.41%</td>
</tr>
<tr>
<td>Equipment</td>
<td>556,200,000</td>
<td>0.40%</td>
</tr>
<tr>
<td><strong>Sub-total</strong></td>
<td>1,225,336,500</td>
<td>0.89%</td>
</tr>
<tr>
<td><strong>UPGRADING OF TOWN ROADS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provisional Sum for miscellaneous drainage works to be carried out on town roads at the direction of the Engineer</td>
<td>1,250,000,000</td>
<td>0.91%</td>
</tr>
<tr>
<td>Provisional Sum for miscellaneous earthworks and graveling to be carried out on town roads at the direction of the Engineer</td>
<td>1,250,000,000</td>
<td>0.91%</td>
</tr>
<tr>
<td>Provisional Sum for miscellaneous surfacing works to be carried out on town roads at the direction of the Engineer</td>
<td>2,500,000,000</td>
<td>1.81%</td>
</tr>
<tr>
<td><strong>Sub-total</strong></td>
<td>5,000,000,000</td>
<td>3.63%</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>137,752,946,473</td>
<td>100.00%</td>
</tr>
</tbody>
</table>
### 7.3.2 Progress of major work items to date

Weighted financial progress of the Works is summarized in Tables 13 (S) below.
7.4 Variation orders
No variation orders were issued during this quarter since the permanent works are yet to commence.

7.5 Summary
1. Project time progress is 63.8%
2. Financial Progress is 37.7%
3. Physical progress is 29.8%
CHAPTER EIGHT
LESSONS LEARNT

8.0 Increased project costs due to increased quantities
Possible increase in the works contract quantities will consequently lead to possible project cost overruns.

The risk is high. Draft Design Review indicates project cost may increase by at least 14% due to increased quantities

Mitigation
Routine reviews of the works quantities will be conducted as part of the cost control.

Minimize changes to approved design resulting in increased quantities

8.1 Increased Consultancy Supervision
Additional supervision staff requirements lead to increased supervision costs. Risk is moderate. Additional input required for Environmentalist and Sociologist. Awaiting UNRA approval

Mitigation
Additional staff will be mobilized only if deemed necessary and with prior approval of UNRA

8.2 Early structural failure of the works
Early structural failure of the works due to inaccurate traffic projections and consequently an inadequate pavement design Under-designed pavement as a consequence of using an underestimated pavement design traffic loading leading to Premature pavement failure.

Risk was moderate. Option of Asphaltic concrete is being considered due to anticipated high oil related traffic along the project corridor.

Mitigation
Ensure accurate traffic projections are used Design Review

Review pavement design appropriately to ensure adequacy of pavement strength to carry estimated traffic loading.
8.3 Delayed access to funding
Unavailability of funding for implementation of project as a result of delayed access to loan from the World Bank since the Government of Uganda was depending on the loan

This may result in a default by the Contracting Authority to effect payments to the Contractor, resulting in delay to project implementation and claims.

Risk is high due to suspension of funding by World Bank.

8.4 Procurement strategies/approaches
Any significant construction project will involve various stakeholders who arrive on the project at defined stages as parties to the construction process with a collective aim of delivering the project to meet the client's requirement of delivery on time, to the required quality and at a defined budget.

The Kyenjojo – Kabwoya Road Upgrading project involved procuring the parties listed hereafter and followed the PPDA guidelines and was based on the traditional procurement route as opposed to the Design and Build or Management routes.

Parties include;

1) Consultants
   • For the Original Designs
   • For Design Review
   • For Construction supervision
   • For Land Acquisition
   • Sub consultants for other activities

2) Contractors
   • Main Contractor
   • Sub-Contractors
From its characteristics the traditional procurement route is designed for use by public organizations that are accountable and is based on linear processes in its activities with little or no parallel working. In construction, the normal linear process would involve the completion of the design process before appointing a contractor to start the construction works.

On the Kyenjojo – Kabwoya Road project, the linear progression was missed and the main contractor was appointed, awarded possession of part of the site and mobilized to site before appointment of the Design Review and Supervision Consultant as well as the Land Acquisition Consultant.

On the Kyenjojo – Kabwoya Road Project the appointment of the Main Contractor before the Design Review and Supervision Consultant led to stagnation of progress as the Contractor could not get approvals of necessary documents. Secondly, when it became necessary to revise certain key parts of the design, further delay was registered. The absence of the Land Acquisition Consultant meant that the Contractor could not access the required right of way for the works.

8.5 Co-ordination of development activities

In the project area, aside from the road upgrading project there are various other on-going projects from different Government bodies for example Rural Electrification and Piped Water connection. It was realized, during design review that the Electricity lines and water pipes were being placed within the proposed right of way of the road project therefore there was a need for relocation of these services at a cost to the Client.

In addition to disrupting the electricity and water supply to the community as during the relocation, the cost of relocation of these services is a high extra expenditure that could be avoided.

The various infrastructure development projects in the same project area could benefit from having common activities carried out jointly e.g.:

• Resettlement Action Plan/Land Acquisition since the right of way is shared
• HIV/AIDS Awareness Programme
• Environmental and Social Impact Assessments
8.1 Mitigations

1. UNRA can engage independent bodies to verify as well as reassess both the language and technical qualification documents submitted by potential contractors for example

2. Makerere University for both English Language proficiency and technical capability

3. Uganda Institution of Professional Engineers (UIPE) for technical capability.

4. There is need for UNRA and other relevant Authorities and Ministries like i.e. Rural Electrification Agency (REA), Directorate of Water Development(DWD) and National Water and Sewerage Corporation(NWSC)to co-ordinate their activities/programs probably through sharing of plans for futures developments with one another in order to prevent double work.

5. To successfully deliver a project, the parties to the construction process need to arrive on the project at the right stages in order to progress the works in a logical sequence It is recommended that UNRA should evaluate individual projects to merit the procurement route to adopt for its supply chain.

Conclusion

We believe that UNRA shall take the following issues in consideration in the new contract

1. Commencement of the consultant services prior the commencement of the contractor

2. To complete the design review before the commencement date of the contractor.

3. To avoid mixing the responsibilities. To keep all subcontractor for execution of the works under the contractor responsibility such as Land Acquisition subcontractor
### APPENDICES

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
</table>
| **A-1** | Earthworks  
Clearing and  
Grubbing from  
Km92+000 to Km  
94+000 |
| **A-2** | Earthworks  
Dumping of  
murram for roadbed  
preparation  
between  
Km96+000 and  
Km96+200 (LHS) |
### A-3
**Quality Control**

Sampling of existing road by pitting

Km99+000 - Km100+400 (LHS)

### A-4
**Stone Quarry**

Stockpiled aggregates at quarry site at Km69+060 (LHS)

### A-5
**Section**

III A Location Map
A-6
Section
IIIB Location Map

A-7
Nguse
Bridge
from the East

A-8
Narrow Existing
Road Cross Section
and
Steep Gradients
A-9
End of Project Road at Kigumba

A-10
Kyenjojo - Hoima: Laboratory CBR variation along the route

A-11
Masindi-Kigumba: Laboratory CBR variation along the route
RA-14: Organisation chart of Consultant’s team

**A-12**
Maintenance works on Existing Road Opening of drainage channel Km68+000

Legend
Trainee
Olara Churchill Basilio

UNRA
Team leader/Resident Engineer

- Bridge/structural engineer
  - Stephen K. Magezi

- Environmentalist
  - Olara Churchill

- Pavement/Soils & Materials engineer
  - Daniel N. Frimpong

- Dep. Resident/Measurement Eng
  - Willian K. Disckson

- Senior Land Surveyor
  - Gertrude Binta

- Highway Design Engineer
  - Albert Hammond

- Social Scientist
  - Apollo Mugabi

- Senior Works Inspectors
  - Richard Kugonza

- Laboratory Inspectors
  - Johnmary Kaweesa

- Ayub Nabongo

- Peter Labu Kibeto

- Programmer
  - Clarence cobbold

- Road safety engineer

- Secretary
A-14 (K) – Physical Progress S-Curve
A-15 (K) – Planned vs. Actual Progress

<table>
<thead>
<tr>
<th>No</th>
<th>Description</th>
<th>Unit</th>
<th>Contract Quantities</th>
<th>Month Plan</th>
<th>Month Actual</th>
<th>Difference</th>
<th>Cumulative Quantity</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Original from To</td>
<td>Change</td>
<td>Length (m)</td>
<td>Quantity</td>
<td>%</td>
<td>Planned To Date Balance</td>
</tr>
<tr>
<td>1</td>
<td>Clearing &amp; grubbing</td>
<td>ha</td>
<td></td>
<td>52–000</td>
<td>54–000</td>
<td>2,400</td>
<td>4</td>
<td>4</td>
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<tr>
<td>2</td>
<td>Removal of soil</td>
<td>m3</td>
<td>232,000</td>
<td>241,000</td>
<td>47+000</td>
<td>51+000</td>
<td>4,000</td>
<td>6,000</td>
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<td>3</td>
<td>Road bed preparation</td>
<td>m3</td>
<td>47+000</td>
<td>48+000</td>
<td>1,000</td>
<td>5,000</td>
<td>-3,000</td>
<td>-2,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>49–000</td>
<td>51+000</td>
<td>2,000</td>
<td>6,000</td>
<td>-4,000</td>
<td>-4,000</td>
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<td>4</td>
<td>Rock Excavation</td>
<td>m3</td>
<td></td>
<td>16+000</td>
<td>17+200</td>
<td>300</td>
<td>20,000</td>
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<td></td>
<td></td>
<td></td>
<td>18+400</td>
<td>19+400</td>
<td>1,400</td>
<td>25,000</td>
<td>-1350</td>
<td>-25%</td>
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<td>5</td>
<td>Common excavation to spoil</td>
<td>m3</td>
<td></td>
<td>48+075</td>
<td>48+375</td>
<td>100</td>
<td>-400</td>
<td>-400</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>48+600</td>
<td>48+000</td>
<td>200</td>
<td>10,000</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>47+725</td>
<td>47+700</td>
<td>20</td>
<td>27,000</td>
<td>200</td>
<td>200</td>
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<tr>
<td>6</td>
<td>D45 Layers</td>
<td>m3</td>
<td></td>
<td>45+100</td>
<td>49+000</td>
<td>3,000</td>
<td>40,000</td>
<td>3,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>45+100</td>
<td>49+000</td>
<td>3,000</td>
<td>40,000</td>
<td>3,000</td>
<td>39,000</td>
</tr>
<tr>
<td>7</td>
<td>SRR</td>
<td>m3</td>
<td>34+700</td>
<td>38+000</td>
<td>3,000</td>
<td>4,000</td>
<td>3,000</td>
<td>4,000</td>
</tr>
<tr>
<td>8</td>
<td>Framing</td>
<td>m3</td>
<td>34+700</td>
<td>38+000</td>
<td>3,000</td>
<td>4,000</td>
<td>3,000</td>
<td>4,000</td>
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<td>9</td>
<td>Double surface dressing 1st seal</td>
<td>m2</td>
<td>35+500</td>
<td>39+000</td>
<td>3,000</td>
<td>27,000</td>
<td>3,000</td>
<td>-27,000</td>
</tr>
<tr>
<td>10</td>
<td>Excavation &amp; Install for Pipe Culverts of access road</td>
<td>m3</td>
<td>0–2km</td>
<td>5</td>
<td>0–2km</td>
<td>5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>11</td>
<td>Excavation &amp; Install for PVC Pipe Culverts and OPC</td>
<td>m3</td>
<td>54+150; 55+225; 56+875; 57+675; 57+126; 67+000; 67+515; 67+498; 68+098; 69+492; 70+235, 50+350</td>
<td>10+408; 44+424; 45+029; 50+250; 55+075; 56+048; 56+485; 57+112</td>
<td>5</td>
<td>0</td>
<td>-3%</td>
<td>-27%</td>
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<tr>
<td>12</td>
<td>Excavation for Box Culverts &amp; Bridge</td>
<td>m3</td>
<td>160+500</td>
<td>1</td>
<td>100+500</td>
<td>4</td>
<td>0</td>
<td>0%</td>
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<tr>
<td>13</td>
<td>Reinforcement &amp; Concrete for bridges &amp; box culverts</td>
<td>m3</td>
<td>100+500; 53+564; 56+225; 57+373</td>
<td>4</td>
<td>100+500; 53+564; 56+225; 57+373</td>
<td>4</td>
<td>0</td>
<td>0%</td>
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<tr>
<td>14</td>
<td>Reinforcement &amp; Concrete for inlet &amp; outlet structures of Pipe Culverts</td>
<td>m3</td>
<td>47+315; 47+425; 49+150</td>
<td>3</td>
<td>44+278; 47+315; 47+425; 49+150</td>
<td>6</td>
<td>1</td>
<td>33%</td>
</tr>
<tr>
<td>15</td>
<td>Crush Aggregate Preparations</td>
<td>m3</td>
<td>24km Quartz; 45km Quartz</td>
<td>6,000</td>
<td>24km Quartz; 45km Quartz</td>
<td>6,000</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>16</td>
<td>Ancillary Road Works</td>
<td>m3</td>
<td>24km Quartz; 45km Quartz</td>
<td>6,000</td>
<td>24km Quartz; 45km Quartz</td>
<td>6,000</td>
<td>0</td>
<td>0%</td>
</tr>
</tbody>
</table>

**Remarks**
REFERENCES

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