Kenya National Highways Authority

Quality Highways, Better Connections

ROADS FOR RURAL ECONOMIC DEVELOPMENT PROJECT (RREDP)

GRANT No.: IDA E5930

TERMS OF REFERENCE (TOR)

CONSULTANCY SERVICES FOR FEASIBILITY STUDIES AND PRELIMINARY ENGINEERING DESIGN OF EMBOMOSS – KOIWA – CHEBOLE – SIONGIROI – LABOTIET – GORGOR – AMBOSI – DIKKIRR – KILGORIS – ENOOSAEN – ANGANGA – MARIWA ROAD AND ENGINEERING DESIGN OF ASSOCIATED CIVIL WORKS FOR FIBRE OPTIC CABLE FOR DESIGN BUILD PROJECT DELIVERY (143 KM)

TENDER NO. KENHA/2929/2026

JANUARY 2026

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1 STUDY BACKGROUND

1.1 General

The Kenya Vision 2030 is the development blueprint through which Kenya plans to achieve its transformation into a newly industrialized middle-income country, providing a high standard of living to all its citizens, by the target year of 2030.

The Vision is founded on economic, social, and political pillars. The three pillars are anchored on macroeconomic stability; continuity in governance reforms; enhanced equity and wealth creation opportunities for the poor; infrastructure; energy; science, technology and innovation (STI); land reform; human resources development; security as well as public sector reforms. The infrastructure component of Vision 2030 aspires for a country firmly interconnected by various links and its fulfilment requires safe, cost-effective and reliable transport providing predictable travel times. In Kenya, roads are the predominant mode of transport for goods and passengers hence the role of providing transport services fall primarily upon this mode in the medium term.

The rapid expansion of the agricultural sector and increased rural economic activity over the past few decades, combined with insufficient investment in rural access roads, has led to a substantial backlog in the requirement for pavement upgrading and capacity enhancement. In high-potential agricultural zones such as the Great Highlands, the inadequate capacity of the existing earth and gravel network is manifested in high vehicle operating costs, unpredictable travel times, and significant post-harvest losses due to the inability to access markets efficiently.

The Government of Kenya has developed and is implementing several initiatives aimed at addressing these accessibility challenges to unlock the economic potential of rural regions. In particular, to address the poor connectivity in the productive tea and dairy belts, the government has initiated the Roads for Rural Economic Development Project (RREDP). This initiative aims to upgrade critical corridors that link production centres to market gateways. Following the identification of the South Rift – Lake Region Gateway Corridor (SR-LRG) as a strategic link, it has been established that there is a need to upgrade the Embomoss – Koiwa – Chebole – Siongiroi – Labotiet – Gorgor – Ambosi – Dikkirr – Kilgoris – Enoosaen – Anganga – Mariwa section to ensuring a seamless flow of agricultural produce and services across the Bomet, Narok, and Migori economic bloc. Uniquely, this project will also integrate the design of associated civil works for Fibre Optic Infrastructure to enhance digital connectivity in the region.

To this end, the Government of the Republic of Kenya (hereinafter called "Recipient") has received financing from the International Development Association (hereinafter called "Association") in the form of a Preparation Grant (hereinafter called "Grant") for use in engaging the services of a Consultancy Firms to undertake the feasibility and engineering design of selected roads, links and bridges in selected rural areas under the Roads for Rural Economic Development Project (RREDP). The Project will be implemented through the Kenya National Highways Authority (KeNHA).

The Consultant selected is expected to provide ALL the Consultancy Services needed for the successful Preliminary Engineering Design, Employer's Requirements, and Procurement Documentation for project appraisal and implementation. A detailed description of the required services is given in Section 4.0 of this Terms of Reference.

1.2 Project Description

The project corridor, known as the South Rift – Lake Region Gateway Corridor (SR-LRG), connects some of Kenya's most productive agricultural zones and key rural service centres across Bomet, Narok, and Migori Counties. The specific road sections under this assignment (approx. 143 km) are detailed below:

Roads for Rural Economic Development Project (RREDP), South Rift – Lake Region Gateway Corridor: Embomoss – Mariwa road section			
S/No.	**Road Section**	**Length (Km)**	**Counties Traversed**
1.	Embomoss – Koiwa – Chebole – Siongiroi – Labotiet	47.5	Bomet, Narok, Migori
2.	Gorgor – Ambosi – Dikkirr – Kilgoris	44.0	
3.	Enoosaen – Anganga – Mariwa	51.5	
	Total	**143 Km**	

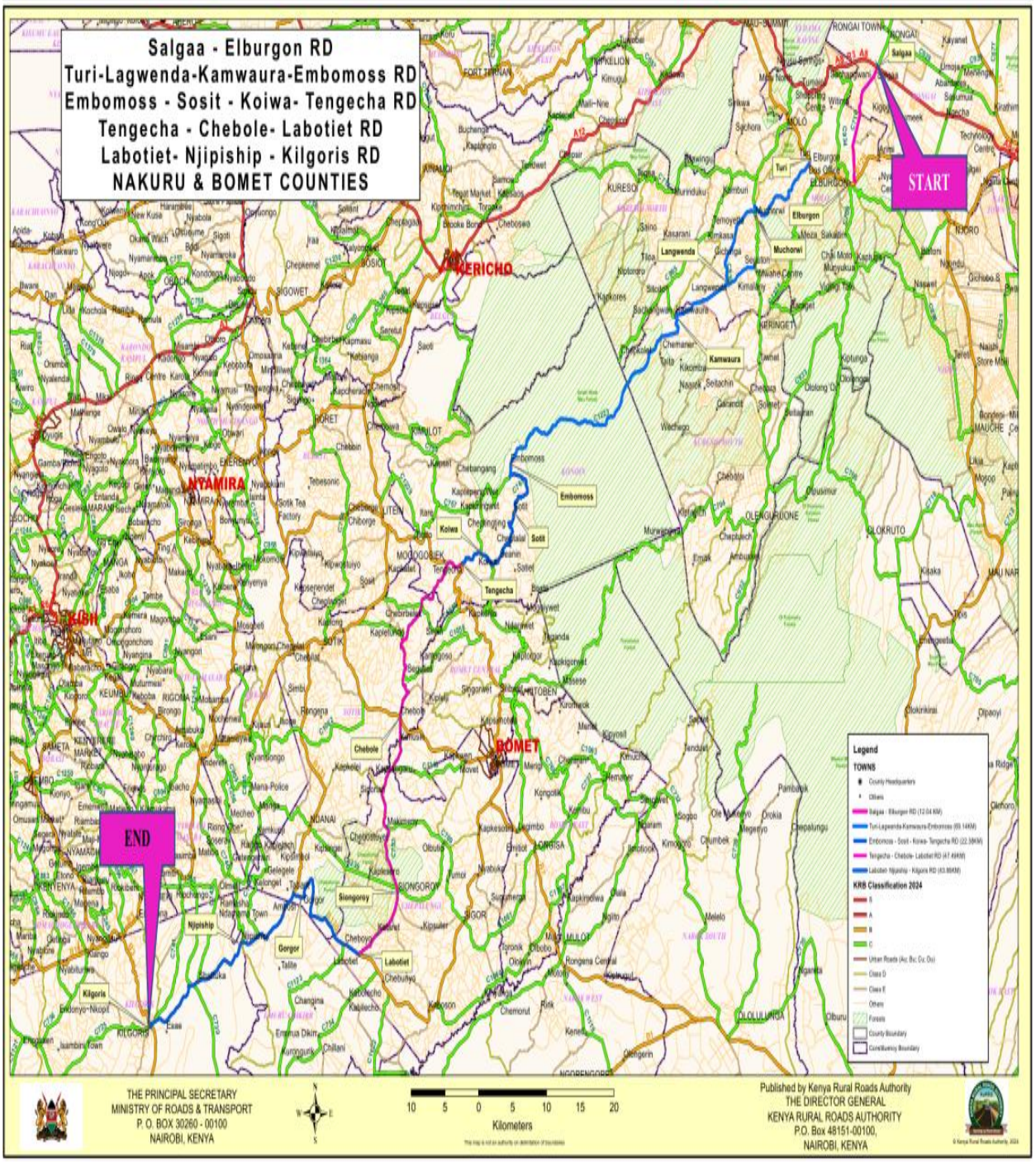
The existing corridor comprises a mix of earth and gravel roads in varying condition, with isolated short sections improved to bitumen near major towns. Most of the alignment is narrow, poorly drained, and prone to erosion and surface distress, leading to frequent washouts and rutting during rainy seasons. Critical drainage crossings are undersized or lacking, resulting in seasonal isolation of communities and disruption of agricultural supply chains. In Bomet County, the steep terrain within the tea and dairy belts amplifies maintenance challenges; heavily loaded milk and tea transporters face frequent breakdowns on soft or slippery sections. In Narok County, the gravel surface deteriorates rapidly due to high rainfall and heavy rural traffic, compromising access to schools, health facilities, and markets around Kilgoris and Enoosaen. The terminal section in Migori County (Anganga–Mariwa) is particularly degraded, with deep potholes and drainage failures, though it connects to the already-paved Awendo–Mariwa road.

The project aims to upgrade these roads to appropriate bitumen standards to enhance rural mobility, economic inclusion, and traffic flow. Additionally, the project will integrate the design of associated civil works for Fibre Optic Infrastructure to enhance digital connectivity in the region.

1.3 Location Map

Figures 1 shows the corridor and road section locations

Figure 1: Embomoss – Koiwa – Chebole – Siongiroi – Labotiet – Gorgor – Ambosi – Dikkirr – Kilgoris – Enoosaen – Anganga – Mariwa Road



2 OBJECTIVES OF THE ASSIGNMENT

2.1 Main objectives

The primary objective of this consulting assignment is to develop comprehensive preliminary engineering design and draft bidding documents for the Embomoss – Koiwa – Chebole – Siongiroi – Labotiet – Gorgor – Ambosi – Dikkirr – Kilgoris – Enoosaen – Anganga – Mariwa Road corridor. The assignment delivers design work to support Kenya National Highways Authority. The specific objectives are organized into five complementary areas addressing technical design, economic evaluation, procurement preparation, decision support, and stakeholder coordination.

2.2 Specific objectives

In particular, the study will include (but not be limited to) the specific objectives listed below:

1. **Fibre Optic Mapping:** Inspect and map out the location of existing fibre optic cables (if any) and utility corridors along the road alignment in consultation with the ICT Authority and relevant Service Providers to determine the optimal route for new infrastructure.

2. **Traffic and Economic Modelling:** Conduct comprehensive traffic surveys (motorized and non-motorized) and rigorous economic modelling to determine if the project's Economic Internal Rate of Return (EIRR) and Net Present Value (NPV).

3. **Alignment and Scope Optimization:** Identify the optimum road alignment and fibre optic route that maximizes Economic Internal Rate of Return (EIRR) while minimizing Land Acquisition as well as Social and Environmental impacts, with decision gate at Month 4 through Preliminary Concept Design Report presenting three evaluated alternatives enabling Kenya National Highways Authority to select preferred design approach.

4. **Preliminary Engineering Design:** Develop a Preliminary Engineering Design defining the horizontal/vertical alignment, typical cross-sections, and pavement structure sufficient to freeze the Right of Way (RoW) and define the Employer's Requirements and functional specifications for a future FIDIC Plant & Design-Build (Yellow Book) contract.

5. **Project Risk Structuring:** Formulate a comprehensive Project Risk Matrix and Project Risk Management Framework (Technical, Financial, Environmental and Social) to guide the risk allocation between the Employer and the Contractor in the future Design-Build contract.

6. **Cost Estimation:** Prepare a confidential, highly accurate Engineer's Cost Estimate and Unit Rate Analysis.

7. **Procurement Documentation:** Prepare comprehensive Employer's Requirements and draft bidding documents incorporating all environmental and social safeguards findings available during Phase 1, with documents structured for Kenya National Highways Authority.

8. **Stakeholder Engagement Support:** Support the Client in technical coordination and stakeholder engagement activities (public consultations, county government meetings) required for project appraisal.

9. **Training and Capacity Building:** Provide structured on-the-job training and capacity building for nominated KeNHA, KURA or KERRA staff in highway design, project

development, and Design-Build procurement through active participation in assignment activities.

3 SCOPE OF SERVICES

3.1 Feasibility Studies & Preliminary Engineering Design Tasks

Estimated Duration: 8 Months

The Consultant shall:

- Review existing data, maps, and studies to identify critical gaps and validate the project concept.
- Conduct a physical inspection and mapping of existing fibre optic cables and utility corridors along the road alignment in consultation with the ICT Authority to prevent conflict and determine the optimal route for new infrastructure.
- Carry out detailed field investigations (Traffic, Topographical, Geotechnical, Hydrological) and Economic Analysis to determine the optimum intervention that balances economic viability (EIRR/NPV) with social and environmental sustainability.
- Develop the Preliminary Engineering Design (horizontal/vertical alignment, typical cross-sections, pavement structure, drainage, and fibre duct locations).
- Formulate a Project Risk Framework and Risk Matrix identifying technical, geological, and financial risks to be allocated between the Employer and Contractor in the future FIDIC Yellow Book contract.
- Prepare a confidential Engineer's Cost Estimate (separated into Road Works and Fibre Optic Civil Works).
- Prepare Employer's Requirements, Initial Selection Document and Request for Proposals translating the Preliminary Engineering Design into performance-based specifications and procurement documentation suitable for Design-Build contractor selection.
- Conduct a Road Safety Audit of the Preliminary Engineering Design using internationally recognized approaches and standards, with findings shared with the Director (Highway Design and Survey, KeNHA) and the National Transport and Safety Authority, and recommendations incorporated into the final Preliminary Design Report.
- Provide structured on-the-job training and capacity building for Kenya National Highways Authority, Kenya Rural Roads Authority, and Kenya Urban Roads Authority counterpart staff through active participation in assignment activities, covering survey operations, traffic analysis, pavement design, economic evaluation using HDM-4, environmental considerations, Design-Build procurement, and technical report preparation.

4 DETAILED SCOPE OF WORK.

4.1 General

The Consultant shall perform all technical, economic, financial, and environmental analyses necessary. The Feasibility Studies and Preliminary Engineering Design shall be carried out in conformity with the current Kenya Road Design Manuals (Volumes 1–6, 2025 Edition), the Eurocodes (for Bridge Design), and the ICT Authority Standards (for Fibre Optic Infrastructure).

The economic analysis shall utilize the Highway Development and Management Model (HDM-4) software to determine the Economic Internal Rate of Return (EIRR), Net Present Value (NPV), and Benefit-Cost Ratio over a twenty-year evaluation period following the completion of construction. The HDM-4 analysis shall be conducted in accordance with international best practise methodologies and shall demonstrate whether the project meets the minimum EIRR threshold required for development partners financing.

The Preliminary Engineering Design shall be developed to a level of detail sufficient to achieve the following objectives: freeze the Right of Way corridor for land acquisition planning; define the Employer's Requirements that will form the basis for the future FIDIC Plant & Design-Build (Yellow Book); generate accurate quantities for preliminary cost estimation with an accuracy of ±20%; and support rigorous economic and financial analysis using verified road characteristic parameters.

The overall responsibility for administrative coordination of the study rests with the Kenya National Highways Authority. The execution of the study will be under the direct supervision of the Highway Design and Engineers Training Department of KeNHA, which will serve as the primary technical review authority for all design submissions and reports.

As the design progresses, the Consultant shall maintain close liaison with KeNHA and shall submit Preliminary Design proposals for approval at key milestones according to the agreed work programme. These submissions shall include proposals for horizontal and vertical alignment, typical cross-sections, pavement structure, drainage strategy, major structures layout, and other technical aspects of the Preliminary Design. KeNHA approval shall be obtained before proceeding to the next phase of design development or before finalizing the Preliminary Design Report.

4.2 Phase 1: Feasibility Study and Preliminary Engineering Design

Within the scope of the feasibility studies and preliminary design, the Consultant shall conduct all topographical surveys, hydrological studies, sub-surface soil exploration, material surveys, traffic surveys and modelling, and other field and laboratory investigations that are required for the examination of the proposed alignment and the location of suitable construction materials and water, and the preliminary engineering design. This shall comprise, inter alia:

a) Review of the existing data on the proposed road project and social and economic activities in the project study area, identifying critical information gaps that must be addressed to meet Development Partner appraisal standards;

b) Collection of social, environmental, and physical data that is necessary to assist in the design of the project road;

c) Preliminary Design survey and design work for the optimum alignment and design standards, including typical cross-sections, pavement structure, drainage strategy, and major structures layout. The design shall be developed to a level of detail sufficient to freeze the Right of Way and define the Employer's Requirements for the future FIDIC Plant & Design-Build (Yellow Book) contract. The Consultant shall submit all digital design files including CAD drawings,

traffic models, HDM-4 economic analysis files, and GIS databases in native editable formats for review and verification by the Engineer;

d) Carrying out traffic survey and traffic modelling using appropriate software along the project road and especially at intersections, proposed parking areas and other areas susceptible to traffic conflict. This shall inform economic analysis undertaken using the Highway Development and Management Model (HDM-4) software to determine the project's Economic Internal Rate of Return (EIRR), Net Present Value (NPV), and Benefit-Cost Ratio;

e) Topographical surveys covering the selected alignment corridor, including cross-sections at appropriate intervals, longitudinal profiles, and plans at scales specified in the Kenya Road Design Manuals;

f) Hydrological and hydraulic studies for the design of drainage systems and water crossings;

g) Geotechnical investigations, material testing, soil investigation, and pavement evaluation using design standards compliant with the Kenya Road Design Manuals for optimization of the road alignment;

h) Preliminary Materials Investigations for Pavement Design, including identification and testing of potential material sources along the alignment;

i) Analysis of capacity and structural soundness of existing structures along the alignment, including load capacity assessment and recommendations for rehabilitation or replacement;

j) Pavement evaluation for existing paved sections of the alignment if it is a standard pavement, including surface roughness, structural strength, and distress surveys;

k) Technical and Economic Feasibility Studies for fibre optic cable infrastructure, including network and route designs, economic assessment, and financial viability analysis, all prepared in compliance with the Kenya Information and Communications Act or any other specific relevant regulatory framework, ICT Authority and International Telecommunication Union – Telecommunication Standardization Sector (ITU-T) standards;

l) Preparation and submission of the Preliminary Engineering Design Report for the road works, including drawings, cost estimates, economic analysis results, and the Project Risk Matrix;

m) Preparation of the Preliminary Technical and Economic Feasibility Report for the proposed Fibre Optic network, including full financial modelling and business case analysis;

4.2.1 Climate, Topography, Geology and Vegetation.

The Consultant shall describe the climatic conditions of the study area by providing details of:

a) Rainfall (monthly distribution and intensity, including rain days per month);

b) Temperature (minimum, median, and monthly ranges throughout the year);

c) Other climatic features of importance (e.g. wind, erosion, effects of extreme temperatures on the selected pavement materials and drainage structures) to infrastructure.

The Consultant shall provide a topographical description of the area traversed by the road, including the effects of relief on the vertical alignment.

A catalogue of the relevant geological features of the study area including a description of the soils and rocks along the road's alignment and their effect and influence on such factors as route location and design shall be compiled by the Consultant. The influence of geology and the availability of road construction materials and water are to be regarded as of great importance by the Consultant. The Consultant shall provide, as far as possible, the information on the quantities, quality and potential sources of water required for construction purposes. Basic water abstraction requirements as per Ministry of Water and NEMA should be adhered to.

A description of the type and density of the vegetation as well as existing and potential agricultural land use within the study area, shall be provided by the Consultant.

4.2.1.1 Establishment of Survey Controls

The Consultant to establish both horizontal and vertical survey controls by any suitable method. The monument type for survey controls to be presented in the Inception Report of the project. The coordinates of all control points shall be tied to the National Survey Grid, (UTM) and levels tied to the National Bench Marks.

The adjustment techniques for controls establishment to be specified by the consultant. The established controls to be used for referencing all the survey works for the project including the aerial survey, and detailed ground survey.

It is a requirement that the established controls are submitted to the Survey of Kenya for approval before proceeding to detailed preliminary Engineering design.

4.2.2 Aerial Survey and Mapping

The Consultant shall carry out aerial photography and mapping covering at least a three (3) kilometre strip along any proposed alignment. The mapping shall be done at a scale of 1:2500. The consultant to provide a detailed methodology of how the survey will be done with details of how the survey will be controlled, the equipment to be used and accuracies of output data to be achieved.

The Consultants shall surrender all-Aerial mapping raw data and its outputs to the Client at the end of the contract. From the aerial map the consultant will propose different routes and carry out an economic appraisal to select the most cost-effective solution in terms of construction cost, social and long-term economic benefits. The consultant will then justify and recommend the best alignment choice, which, after approval by the Employer/Engineer, preliminary engineering design will commence.

The survey to highlight location of critical utilities such as power lines, major water pipes, pipeline, railway line etc. that may affect the road design.

4.2.2.1 Creation of GIS Databases

The Consultant shall develop a comprehensive GIS database ensuring all spatial data collected are captured in formats compatible with ESRI ArcGIS and QGIS. The GIS database shall serve as the primary repository for all spatial project information and shall be organized in accordance with KeNHA's standard data schemas and naming conventions.

Data requirements.

i) All spatial data shall be mapped in the UTM Arc 1960, Zone 37S coordinate system with horizontal accuracy of thirty millimetres or better. The Consultant shall ensure geometric

accuracy by establishing proper survey control networks as described in Section 4.2.1.1 of these Terms of Reference and by using survey-grade GNSS equipment or total station equipment for all spatial data collection.

ii) All enclosed areas including quarry sites, borrow pits, and land parcels shall be captured as polygon features with properly closed boundaries.

iii) All linear features including road alignments, drainage channels, and utility corridors shall be captured as continuous polyline features without gaps or overlaps.

iv) All point features including survey control monuments, culvert locations, and Project Affected Persons shall be captured as point features with accurate coordinates.

v) All land parcel features shall be populated with complete attribute data including parcel numbers, map sheet references, registered owner names as documented in official Title documents, land use classifications, and estimated land values.

vi) The proposed road alignment shall be tagged with complete design data including horizontal curve parameters, vertical curve parameters, design speed, typical section references, and chainage values at regular intervals.

vii) All attribute tables shall follow the data schema templates provided by KeNHA, ensuring consistency with the Authority's enterprise GIS database structure.

Deliverables for GIS databases.

The Consultant shall deliver the complete GIS database in both shapefile and geodatabase formats, organized in a logical folder structure with clear documentation. The GIS deliverables shall include but not limited to: -

i) topographical features layers showing existing ground conditions, drainage patterns, vegetation cover, and built environment **as per the provided KeNHA data schemas**;

ii) utility layers showing existing power lines, telecommunications cables, water supply pipelines, sewer lines, and other underground and overhead utilities identified during field surveys;

iii) road assets layers showing existing road infrastructure including pavement extents, culverts, bridges, road signs, guardrails, kilometre posts, and other road furniture;

iv) affected parcels layer showing all land parcels intersected by the proposed Right of Way with complete ownership and valuation data;

v) Project Affected Persons layer showing locations of businesses, residences, and other structures within the Right of Way that will require relocation or compensation.

vi) survey control layers showing all geodetic control points and project survey control monuments established during the topographical survey, with complete coordinate data and monument descriptions;

vii) scanned copies of all survey plans, cadastral maps, and other reference maps used during the project, provided as georeferenced JPEG or TIFF format images properly registered to the project coordinate system;

viii) complete metadata documentation describing data sources, collection dates, accuracy assessments, coordinate system specifications, and any limitations or caveats associated with the spatial data.

GIS database schemas

The Consultant shall provide a GIS Database User Guide explaining the database structure, attribute table schemas, file naming conventions, coordinate system specifications, and instructions for querying and analysing the spatial data. The User Guide shall enable KeNHA staff to effectively utilize the GIS database for land acquisition planning, stakeholder engagement, project monitoring, and eventual handover to the Design-Build Contractor.

Minimum details to be populated in the attribute tables (*The Authority will provide the shapefiles)* are as follows:

a) Survey controls

S. No	Name	Field type	Length	Precision
1	Easting	Double	10	3
2	Northing	Double	10	3
3	Height	Double	10	3
4	Remarks	Text	50	

b) Topographical data

Feature	**Data type**
Buildings	Polygon
Spot Heights	Point
Trees	Point
Rivers	Lines
Road Centreline	Line
Road Edge	Line
Road Reserve Extent	Line
Road Reserve Marker Post	Point
Fences	Line
Utilities	
Feature	**Data type**
Powerline	Line
Water Pipe	Line
Sewer line	Line
Fibre Cable	Line
Pipeline	Line
Advertisements signage/Bill boards	Points
Manholes	Points
Road Assets	**Data type**
Culverts	Points
Drainages	Line
Road Signage	Point
Kilometre Marker Post	Point

Feature	Data type
Road Humps	Line

c) Road design

	Field Name	Name	Field Type	Length	Precision
1	Road Class	Rdclass	Text	8	-
2	Road number	Rdnum	Text	8	-
3	Road Section	Rdsection	Text	50	-
4	Project name	Project	Text	200	
5	Contract Number	Contractno	Text	20	
6	start Date	Start_ Date	Date		
7	End Date	End_Date	Date		
8	Revised End Date	Revised_Date	Date		
9	Name of the Consultant	Consultant	Text	50	
10	Resident Engineer	RE	Text	50	
11	Amount Awarded	Award	Double	10	2
12	Contract period	Contract Period	Short integer	10	
13	Address	Address	text	50	
14	Remarks	Remarks	text	100	

d) Land acquisition

	Field Name	Name/Alias	Field Type	Length	Precision
1	Road Class	RdClass	Text	8	-
2	Road number	RdNum	Text	8	-
3	Road Section	RdSection	Text	50	-
4	Parcel No	Parcel Number	Text	50	-
5	Map_Reference (RIM or Fr No)	Map-reference	Text	50	-
6	RegisteredOwner	Reg_Owner	Text	200	-
7	AcquiredArea_Ha	Acq_Area	Double	8	3
8	Project Name	Project	Text	200	
9	ContractNumber	Contract No	Text	50	
10	Remarks	Remarks	Text	100	-

e) Project Affected Persons (PAPS)

Field Name	Name		Field Type	Length	Precision
Name	Name		Text	50	

Field Name	Name		Field Type	Length	Precision
Telephone Number	Tel No		short integer	10	
Nearby Parcel Number	Parcel No		text	50	
Road Number	Road No		text	50	
Project Name	Project		text	200	
Contract No	Contract No		text	50	
Development 1	Improv1		text	100	
Development 2	Improv2		text	100	
Development 3	Improv3		text	100	
Development 4	Improv4		text	100	
Development 5	Improv5		text	100	
Development 6	Improv6		text	100	
Development 7	Improv7		text	100	
Development 8	Improv8		text	100	
Development 9	Improv9		text	100	
Development 10	Improv10		text	100	

4.2.3 Hydrology and Drainage Investigations

The Consultant shall provide a complete description of the hydrological features of the area, including:

a) information about soils drainage along the alignments, such as sub-soils drain ability, drainage impedance, flooding of flat areas, etc.,

b) characteristics of required water crossings.

c) storm water drainages features and characteristics

Sufficient information shall be obtained by the Consultant based upon the guidelines provided in the Road Design Manuals and Supplemented by other relevant sources of information to justify, and provide the basis for the preliminary engineering design of all drainage systems and structures, and for preliminary costing purposes.

The Consultant shall be fully responsible for obtaining all the data and information necessary for him to carry out hydrological and drainage investigations and designs.

4.2.3.1 Drainage Structures

a) The Consultant shall provide complete inventory and condition survey of all existing structures within the alignment. The information shall include the type of structure, whether a bridge, a box culvert, Armco culverts, timber bridge or masonry bridge.

b) Sufficient details on the condition survey on the existing drainage structures shall be provided; that includes crack width and the distribution, condition of bridge bearings and any other structural deterioration.

c) The Consultant shall carry out flood estimate to ascertain the capacity of the existing structures and advice whether there is need for any replacement.

d) The Consultant shall carry out materials test on the existing structures and compute durability index that will enable the Client to make decision on whether or not to replace the structure with a new one.

e) The details required to facilitate the decision making on the existing structures shall be submitted at Preliminary design stage.

4.2.4 Traffic Analysis

The Consultant shall determine the type and volume of the existing traffic for the road by analysing all existing statistical data, and by conducting and analysing such traffic counts and origin-destination studies as are required to determine the nature of the traffic and the present volume of freight and passenger movements on the road. Other field investigations shall be undertaken by the Consultant as required.

Traffic studies will include:

(i) existing traffic composition, occupancy and classified volume counts

(ii) origin – destination studies

(iii) Forecasts of annual average daily traffic composed of normal, generated and diverted flows, by appropriate vehicle types

(iv) Axle load surveys

(v) Traffic modelling

Traffic surveys, including axle load survey, shall be done for one-week duration comprising day counts with at least two-night counts (1 on a week day and 1 on a weekend) and each traffic direction recorded separately. Where considered appropriate the Consultant shall divide the road into homogenous sections, and conduct the relevant traffic analyses and studies accordingly. Detailed proposals for the traffic surveys shall be submitted beforehand for approval by the Director (Highway Design and Survey).

Traffic surveys shall generally be carried out following the guidelines and recommendations of the TRL Overseas Road Note 40: *A guide to axle load surveys and traffic counts for determining traffic loading on pavements*, *TRL Ltd, Crowthorne, Berkshire, UK 2004*. and as highlighted below. The vehicles will be counted for at least 16 hours per day and at least one 24-hour count on a weekday and another one 24-hour count on a weekend. Traffic Counts for less than 24 hours will be grossed up to 24-hour values in the same proportion as the 24-hour/16-hour traffic split on those days when full 24-hour counts were taken. Axle load surveys will be carried out for seven consecutive days of at least 12 hours per day and more preferably 16 hours per day. Surveys containing less than seven days will NOT be accepted. Short periods of unusual traffic flow such as public holidays should also be avoided. Axle load surveys will include vehicles in both directions and should be clear as to whether wheel loads or axle loads have been recorded in the raw data form (as the formula for calculating the E.F is based on the axle load which is assumed to be twice the wheel load). Empty or partially loaded vehicles should be stopped, recorded and weighed. Roadside interviews will be conducted for a minimum of three days in each of the stations identified.

The Consultant shall identify, describe and quantify existing and potential traffic generating factors in the immediate areas served by the road, or in areas likely to be influenced by its future improvements, based on the economic development of the region, and future needs for road transport. Such needs will result inter alia from:

a) population growth and changes in rural urban population distribution;

b) national and regional economic growth;

c) development of agriculture, industry, commerce and tourism within the project area;

d) development of social services facilities and schools;

e) Other factors identified by the Consultant.

Based on the analysis, the Consultant shall make:

a) detailed annual traffic forecasts for a period of ten years after the completion of the road; and

b) More general projections of future traffic for the following 10 years.

Although greater emphasis is given to accurate forecasting in the earlier part of the project's life, all traffic forecasts shall be given at three growth rates, namely low, medium and high. The Consultant shall select one of the three levels of forecasts for use in the final evaluation of the project, indicating the reasons for the selection, and shall also use the other two levels in the sensitivity analysis.

In developing the final traffic forecasts, the Consultant shall give particular attention to the future mix of vehicles in the traffic population. Due attention should therefore be given to changes in vehicle sizes and types that will arise when improvements are made in the conditions of the road. Consultants should collect accident data for the entire length of the project road from police stations. The consultants should analyse the data and identify locations prone to accidents and recommend mitigation measures.

To conduct traffic modelling, the Consultant shall begin by defining study objectives and gathering relevant data like traffic counts and demographic information. They shall then select an appropriate modelling software and build a digital representation of the road network. Thereafter calibration of the model to ensure accuracy of the process. The Consultant is expected to validate the model against real-world data. Several scenarios are to be developed and simulated to analyse traffic flow and assess proposed interventions. The model should be subjected to sensitivity analysis to check model robustness.

4.2.5 Economic Costs

The Consultant shall prepare comprehensive estimates of vehicle operating costs, road maintenance costs, and other economic cost parameters required for the Highway Development and Management Model (HDM-4) economic analysis in its present and improved state. The HDM-4 software shall be used as the primary analytical framework for this assignment. All economic cost estimates developed under this section shall be prepared in formats compatible with HDM-4 input requirements and shall be used directly in the economic evaluation described in Section 4.2.6 of these Terms of Reference.

The Consultant shall undertake calibration of the HDM-4 model to ensure that all analytical relationships and parameters reflect conditions specific to Kenya and the project area. This calibration exercise is essential for producing reliable economic analysis results and shall include validation of vehicle operating cost relationships, pavement deterioration models, and maintenance effectiveness parameters against observed data from similar roads in Kenya. The Consultant shall collect primary data from the project area and from KeNHA's historical records to support the calibration process. The calibration methodology and results shall be documented in a standalone HDM-4 Calibration Report that will be submitted as a technical annex to the Feasibility Study Report and will be subject to review by KeNHA.

The development of vehicle operating cost estimates shall receive particular attention given that savings in vehicle operating costs typically constitute the largest quantifiable economic benefit from road improvement projects. The Consultant shall conduct comprehensive field surveys to collect current market data on all vehicle operating cost components including fuel prices, lubricant costs, tyre prices and lifespans, spare parts costs, maintenance labour rates, vehicle capital costs, insurance premiums, crew wages, and vehicle utilization patterns. This data collection shall cover a representative sample of vehicle types operating on rural roads in Kenya, including at minimum motorcycles, passenger cars, light commercial vehicles, medium trucks, heavy trucks, articulated trucks, and buses. The surveys shall be conducted in the project area and in nearby urban centres to capture regional price variations that may affect vehicle operating costs.

The vehicle operating cost data collected through field surveys shall be used to calibrate the HDM-4 vehicle operating cost models for Kenyan conditions. The Consultant shall ensure that all individual cost components input into the HDM-4 model are derived from direct investigation of local sources rather than from default values or international averages. Where significant regional variations in costs are identified, the Consultant shall use cost parameters representative of the project area. The Consultant shall also collect data on vehicle fleet characteristics including average vehicle ages, typical loading patterns, and maintenance practices, as these factors significantly influence vehicle operating costs and must be accurately represented in the HDM-4 model.

The Consultant shall ensure that road characteristic parameters input into the HDM-4 model accurately represent both the existing road condition and each of the design alternatives being evaluated. These parameters include pavement roughness measured using the International Roughness Index, horizontal and vertical alignment characteristics including gradient and curvature, road width and shoulder conditions, surface type, and altitude. Where design alternatives under evaluation have significantly different geometric or structural parameters, these differences shall be properly reflected in the HDM-4 model to ensure that vehicle operating cost calculations accurately capture the differential benefits of each alternative. The Consultant shall conduct field measurements of existing road roughness and shall use design geometry from the Preliminary Design to characterize the improved road scenarios.

Road maintenance cost estimates shall be developed for both the existing road condition and for each design alternative being evaluated. These estimates shall reflect the full range of maintenance activities including routine maintenance, periodic maintenance, and major rehabilitation over the twenty-year evaluation period. The Consultant shall base maintenance cost estimates on KeNHA's historical expenditure data, unit cost records, and maintenance standards, adjusted where necessary to reflect the specific characteristics of the project road. Maintenance frequencies and intervention triggers shall be determined using HDM-4 pavement performance models calibrated to Kenyan conditions. The Consultant shall ensure that maintenance cost estimates properly account for the relationship between traffic volumes, axle loads, pavement structural strength, and pavement deterioration rates.

All economic costs developed under this section shall be expressed in economic prices rather than financial prices. The Consultant shall convert financial costs to economic costs by removing all taxes, duties, value-added tax, and other transfer payments to government. The Consultant shall apply appropriate economic conversion factors including the Standard Conversion Factor for traded goods, the Shadow Wage Rate for unskilled labour, and the Shadow Exchange Rate if applicable, using values specified by the Kenya's National Treasury. For major cost components including fuel, cement, bitumen, and steel, the Consultant shall undertake detailed economic pricing analysis to determine the appropriate shadow prices that reflect the true economic cost to Kenya of using these resources in the project.

The Consultant shall prepare a comprehensive Economic Cost Analysis Report documenting all data sources, collection methodologies, survey results, calibration procedures, shadow pricing calculations, and assumptions underlying the economic cost estimates. This report shall include detailed tables presenting vehicle operating cost parameters for all vehicle types, road maintenance unit costs and frequencies, economic conversion factors applied, and HDM-4 calibration parameters. The report shall be submitted as a technical annex to the Feasibility Study Report and shall provide sufficient detail to allow independent verification of all economic cost estimates by KeNHA.

4.2.6 Economic Evaluation

The Consultant shall undertake comprehensive economic evaluation of the project using the Highway Development and Management Model (HDM-4) over a twenty-year evaluation period following completion of construction. The economic evaluation shall determine whether the project achieves the minimum Economic Internal Rate of Return required for International Development Association financing and shall identify the design alternative that maximizes net economic benefits while meeting environmental and social sustainability criteria.

The Consultant shall use HDM-4 to evaluate at least two, and preferably three, alternative design standards representing different levels of investment and service quality, and with or without the necessary feeder roads. The alternatives to be evaluated shall be identified during the Preliminary Engineering Design phase based on engineering feasibility, environmental considerations, and preliminary economic screening. For each design alternative, the HDM-4 analysis shall compare lifecycle costs and benefits under two scenarios: the without-project scenario representing the future condition of the road if no improvements are made, and the with-project scenario representing the condition after implementation of the proposed improvements. The comparison of these scenarios over the twenty-year evaluation period will determine the incremental economic benefits attributable to the project.

The economic costs to be included in the HDM-4 analysis shall comprise:

a) all capital costs for road construction including earthworks, pavement, drainage structures, bridges, road furniture, and fibre optic infrastructure;

b) all costs associated with land acquisition and resettlement; consultant fees for design and supervision;

c) and all recurrent costs for routine maintenance, periodic maintenance, and major rehabilitation over the evaluation period.

These costs shall be expressed in economic prices as developed in Section 4.2.5 of these Terms of Reference, with all taxes and transfer payments removed and appropriate shadow prices applied. The costs shall be distributed over time according to the anticipated construction schedule and maintenance programme, and shall be discounted to present value using the discount rate specified for IDA-funded projects in Kenya.

The economic benefits to be quantified in the HDM-4 analysis shall include all measurable improvements in transportation efficiency and road asset performance resulting from the project. The primary benefit categories shall be:

a) savings in vehicle operating costs for all vehicle types using the road, calculated using the calibrated HDM-4 vehicle operating cost models;

b) savings in travel time for passengers and freight, valued using appropriate Value of Time parameters for Kenya;

c) savings in road maintenance expenditure over the evaluation period resulting from improved pavement structural strength and reduced deterioration rates;

d) reductions in accident frequency and severity where reliable accident data permits quantification of this benefit; and

e) residual value of the road pavement structure at the end of the twenty-year evaluation period, representing the remaining service life of the investment beyond the evaluation horizon.

f) Any other factor that the Consultant may consider for the analysis, which must be of demonstrable transfer value within the Kenya economy.

All benefits shall be expressed in economic prices consistent with the economic cost estimates and shall be discounted to present value using the same discount rate applied to costs.

The Consultant shall undertake detailed qualitative analysis of indirect economic and social benefits that are difficult to quantify reliably through HDM-4 or other analytical tools. These indirect benefits may include improved access to markets, health facilities, and educational institutions for rural communities; facilitation of agricultural commercialization through reduced transport costs for farm inputs and outputs; stimulus to local economic development through improved business connectivity; enhanced resilience to climate shocks through provision of all-season road access; and contribution to poverty reduction through improved employment opportunities and service access. While these benefits are real and often constitute important justifications for rural road investments, they shall not be included in the quantitative economic evaluation unless the Consultant can demonstrate them through rigorously quantifiable terms with verifiable data. The qualitative assessment of indirect benefits shall be presented separately in the Feasibility Study Report as complementary justification for project implementation alongside the quantitative HDM-4 analysis results.

The HDM-4 economic evaluation results shall be expressed using four standard economic performance indicators i.e.;

a) the Economic Internal Rate of Return, representing the average annual economic return on the investment over the evaluation period;

b) the Net Present Value, discounted at the rate specified for IDA-funded projects, representing the absolute economic value added by the project in present value terms;

c) the Benefit-Cost Ratio, representing the economic return per unit of investment;

d) the First Year Rate of Return, providing an indicator of how quickly the project begins generating economic returns.

The design alternative recommended for implementation shall be the alternative that achieves the highest Net Present Value among all alternatives meeting the minimum EIRR threshold, subject to environmental and social acceptability. Economic efficiency, measured by NPV maximization, shall be the primary criterion for design selection, but this shall be balanced against other considerations including land acquisition requirements, environmental impacts, social displacement, construction risk, and consistency with sector policies. Where a lower-cost alternative achieves adequate economic returns but substantially reduces adverse environmental or social impacts compared to the economically optimal alternative, the Consultant may recommend the lower-impact alternative with appropriate justification in the Feasibility Study Report.

The Consultant shall undertake comprehensive sensitivity analysis to test the robustness of the economic evaluation results under varying assumptions and to identify the critical variables that most significantly affect project viability. The sensitivity analysis shall:

a) examine the impact of variations in traffic volumes, testing low growth, medium growth, and high growth scenarios as developed in the traffic forecasting analysis described in Section 4.2.4 of these Terms of Reference;

b) test the impact of capital cost variations of ±20% from the base estimate, reflecting the inherent uncertainty in preliminary cost estimates and the potential for cost overruns or savings during detailed design and construction;

c) test the impact of variations in vehicle operating costs and maintenance costs of ±20%, reflecting uncertainty in the calibrated HDM-4 cost parameters;

d) test the sensitivity of results to the discount rate by recalculating NPV at rates of ten percent, twelve percent, and fifteen percent; and

e) test the impact of construction delays by modelling scenarios with one-year and two-year delays in project completion, which would defer benefit streams and affect project viability.

The results of the sensitivity analysis shall be presented in both tabular and graphical formats to facilitate interpretation by decision-makers. The Consultant shall prepare sensitivity tables showing how each performance indicator varies across the range of tested scenarios. The Consultant shall also prepare spider diagrams showing graphically how EIRR and NPV respond to percentage changes in each critical variable, allowing easy identification of which variables have the greatest impact on project viability. Based on the sensitivity analysis results, the Consultant shall identify the critical risk factors that could cause the project to fall below minimum viability thresholds and shall recommend risk mitigation measures to be incorporated into project design and implementation planning.

The Consultant shall submit all HDM-4 model files including scenario definitions, input data files, calibration parameters, and results files in native HDM-4 format to KeNHA. These files shall be organized systematically with clear file naming conventions and shall be accompanied by a User Guide explaining the model structure, key assumptions, and instructions for running alternative scenarios. The provision of complete HDM-4 model files is essential to allow independent verification of the economic analysis by KeNHA during project appraisal and to enable sensitivity testing beyond the scenarios analysed by the Consultant.

The economic evaluation results shall be documented in a comprehensive Economic Analysis Report that will be submitted as a key component of the Feasibility Study Report. This report shall present the complete HDM-4 analysis methodology, all input assumptions and data sources, calibration results, evaluation results for each design alternative, sensitivity analysis findings, and the recommended design alternative with supporting justification. The report shall be structured to satisfy the requirements of the Project Appraisal Document Technical Annex on Economic and Financial Analysis.

4.2.7 Preliminary Soil Investigation and Pavement Evaluation

The Consultant shall undertake all preliminary soil investigations and tests and identify type and sources of construction materials necessary for preliminary design, detailed design, and construction phases of the project. These sources should be considered when selecting final alignments.

The Consultant shall carryout an evaluation of the existing pavement, if any, and determine appropriate intervention measures. The Evaluation shall include but not be limited to the following as appropriate:

- Visual inspection and assessment, recording and quantifying of defects
- Surface roughness measurements, IRI
- Deflection measurements using falling weight reflectometer (FWD), measurements being taken at 100m intervals for both directions.
- Subgrade strength and drainage analysis, may include Dynamic Cone Penetrator tests (DCP).
- Existing pavement structure analysis. Will include trenching sampling and testing

The availability of suitable conventional road construction materials and the appropriate and economic use of the same are viewed as key factors influencing the choice of alignment, pavement and wearing surface design. The possibility for specific problems arising from the use of proposed materials which may be particular to the area under study shall be assessed, quantified and appropriate countermeasures shall be recommended. The consultant shall identify possible material sites near and along the project road, preferably not more than 5km apart.

4.2.8 Design Standards

The Preliminary Engineering Design shall, unless otherwise agreed with KeNHA, be carried out in conformity with the standards contained in the 2025 Kenya Road Design Manuals Volumes 1 through 6, the Standard Specification for Road and Bridge Construction, relevant Eurocodes for structural design, and ICT Authority Standards for fibre optic infrastructure. The Consultant shall be responsible for all design details within this framework, ensuring that the Preliminary Design is sufficiently complete and well-documented to serve as the basis for Employer's Requirements in the future FIDIC Plant & Design-Build (Yellow Book) contract.

The methodologies used in the design of pavements, earthworks, drainage systems, and structures shall be based on sound engineering principles as codified in the Kenya Road Design Manuals and internationally accepted practice. The design shall optimize the use of locally available materials to minimize project costs while meeting required performance standards. The Consultant shall investigate potential material sources during the geotechnical investigation phase and shall design pavement structures, embankments, and other works to make maximum economic use of materials available within reasonable haul distances from the project site. At all times, the design shall achieve an appropriate balance between capital construction costs and whole-life maintenance costs, as demonstrated through the HDM-4 economic analysis described in Sections 4.2.5 and 4.2.6 of these Terms of Reference.

The metric SI system shall be used throughout all design calculations, drawings, cost estimates, and reports. The standards for design of different road classes and bridge types as stipulated in the Kenya Road Design Manuals shall be adhered to where technically feasible and economically justified. Where site-specific conditions, economic analysis results, or other technical considerations indicate that alternative standards or design approaches would be more appropriate than those specified in the design manuals, the Consultant shall provide detailed technical justification for the proposed alternatives and shall obtain written approval from KeNHA before incorporating such alternatives into the Preliminary Engineering Design.

4.2.9 Preliminary Concept Design

The Consultant shall prepare a Preliminary Concept Design representing the culmination of all field investigations, technical studies, and design analyses conducted during the first three and one-half months of Phase 1. The Preliminary Concept Design serves as a critical phase gate at which the Client will review and approve the fundamental project parameters before the Consultant proceeds with detailed design development. The concept design shall be developed to sufficient detail to enable the Client to make informed strategic decisions regarding alignment selection, design standards, major structures configurations, project scope, environmental and social feasibility, and economic viability.

The Consultant shall conduct comprehensive field investigations and technical studies to support development of the concept design. The aerial photography or LIDAR survey specified in Section 4.2.2 shall be completed with all products delivered to enable accurate terrain modelling and alignment evaluation. Topographical surveys shall cover a corridor of at least two kilometres width along all alignment alternatives under consideration to provide adequate data for comparative evaluation. Preliminary geotechnical investigations shall be conducted to identify major foundation challenges including very soft soils, rock outcrops, or landslide-prone areas that could affect alignment feasibility or construction costs. Preliminary materials investigations shall confirm availability of road construction materials including aggregates, embankment fill materials, and water sources within economic haul distances. Hydrological reconnaissance shall identify all major waterway crossings and shall provide preliminary estimates of required waterway openings based on catchment analysis and observations of high-water marks or local flooding patterns. Traffic surveys including classified vehicle counts, origin-destination surveys, and axle load surveys shall be completed to establish baseline traffic conditions and loading patterns. Cadastral surveys shall define land parcel boundaries along all alignment corridors under consideration to enable assessment of land acquisition requirements.

Based on the field data collected, the Consultant shall develop and evaluate at least two viable alignment alternatives and preferably three alternatives offering different approaches to achieving project objectives. Each alignment alternative shall be developed to sufficient detail to enable meaningful technical and economic comparison. The evaluation of alternatives shall consider technical feasibility including compliance with geometric design standards and ability to construct the road using conventional methods, capital cost differences reflecting variations in earthwork quantities, major structures requirements, and materials haul distances, land acquisition requirements with assessment of number of affected parcels and structures, environmental impacts including effects on protected areas, water resources, and sensitive ecosystems based on coordination with the ESIA consultant, social impacts including resettlement requirements and community severance effects based on coordination with the RAP consultant, and operational performance including travel time, road safety characteristics, and ease of future maintenance.

4.2.10 Final Engineering Design

The Consultant shall investigate alternative geometric, pavement, and structural design options with a view to identifying the optimum solution that balances technical feasibility, economic viability, environmental sustainability, and social acceptability. The design alternatives shall be developed in accordance with the Kenya Road Design Manuals while taking into account site-specific conditions including topography, climate, available materials, geotechnical conditions, hydrological characteristics, and aesthetic considerations. The Consultant shall advise the Director, Highway Design and Survey, Kenya National Highways Authority, of any proposed modifications to the design manuals based on conditions revealed during the design development process, providing technical

justification for any recommended changes and obtaining written approval before incorporating such modifications into the Preliminary Engineering Design.

Based on traffic studies and projections, economic analyses, and geotechnical investigations, the Consultant shall develop at least two and preferably three alternative design standards for evaluation. Each design alternative shall represent a distinct level of investment and service quality, allowing meaningful comparison of costs and benefits. The Consultant shall evaluate each alternative in terms of capital construction cost, whole-life maintenance cost over a twenty-year evaluation period, economic viability, environmental and social impacts, construction risk and complexity, implementation schedule, and land acquisition requirements. Priority shall be given to alternatives that minimize land acquisition and social displacement, provided such alternatives achieve adequate economic returns and meet required service standards.

The design life for all pavement alternatives shall be twenty (20 No.) years. Pavement design shall be based on projected traffic volumes and axle loading determined through the traffic surveys and forecasts described in Section 4.2.4 of these Terms of Reference. The Consultant shall conduct axle load surveys to determine appropriate Equivalent Standard Axles for pavement design in accordance with Kenya Road Design Manual Volume 3. The pavement design methodology shall follow the mechanistic-empirical procedures specified in the design manuals, with all assumptions and calculations fully documented to enable verification during project implementation appraisal mission.

The Consultant shall prepare Preliminary Engineering Design proposals for submission to KeNHA at key milestones during the design development process. These submissions shall include proposals for horizontal and vertical alignment showing the selected corridor and key geometric parameters; typical cross-sections for different road segments showing pavement structure, drainage features, and Right of Way requirements; drainage strategy showing the overall approach to surface water management and locations of major drainage structures; and conceptual layouts for major structures including bridges and large culverts with preliminary sizing and foundation concepts. KeNHA approval shall be obtained for these key design elements before proceeding to finalize the Preliminary Engineering Design Report.

The Preliminary Engineering Design work shall include but not be limited to: -

a) plan and profile drawings at scale 1:1000 horizontal and 1:100 vertical, or at alternative scales approved by KeNHA, showing the recommended alignment with all horizontal and vertical curve data, chainages, benchmark locations, and key features. The deliverables shall include but not be limited to: -

    i. typical cross-section drawings at scale 1:200 showing pavement layer thicknesses, side slopes, drainage features, Right of Way limits, and all relevant dimensions for different road segments.

    ii. critical cross-sections at scale 1:200 showing the relationship between existing ground and proposed road profile at representative locations along the alignment, particularly at major cut and fill sections, structure locations, and other areas of particular interest.

b) topographical survey maps at appropriate scales showing the selected alignment corridor with sufficient width to demonstrate that the design can be constructed within available Right of Way. All topographical survey data shall meet the accuracy requirements specified in the Kenya Road Design Manuals. The deliverables shall include but not be limited to: -

i. drainage layout drawings showing all culverts, side drains, catch basins, outfall locations, and erosion protection measures.

ii. structure layout drawings showing conceptual designs for all bridges and major culverts including spans, abutment locations, foundation depths, and waterway areas.

iii. pavement design calculations and materials test results supporting the recommended pavement structure for each design alternative.

The Consultant shall analyse existing and planned land use patterns along the alignment corridor and shall consider the potential impact of future development on road layout and design. This analysis shall identify locations where future roadside development may create access management challenges, areas where service roads or frontage roads may be needed to separate through traffic from local access, and locations where geometric design should anticipate future intersection improvements or capacity expansion. The land use analysis shall inform Right of Way requirements and shall be documented in the Preliminary Engineering Design Report to guide future access management needs during detailed design and implementation planning.

The level of design detail in all Preliminary Engineering Design deliverables shall be sufficient to freeze the Right of Way corridor for land acquisition planning, to define the Employer's Requirements for the future FIDIC Plant & Design-Build (Yellow Book) contract, to generate preliminary quantities for cost estimation with twenty percent accuracy, and to support rigorous economic evaluation using HDM-4 with reliable road characteristic parameters. The Preliminary Engineering Design shall demonstrate that the recommended solution is technically feasible, economically viable, environmentally acceptable, and socially sustainable. Specifically, the design documentation shall be complete and self-contained such that Kenya National Highways Authority can proceed to Design-Build procurement without requiring additional investigations or design development beyond the Contractor's detailed design responsibilities under FIDIC Sub-Clause 5.1.

4.2.11 Fibre Optic Connectivity Technical and Economic Feasibility

The Consultant shall conduct comprehensive Technical and Economic Feasibility Studies for fibre optic cabling infrastructure to be installed along the project road corridor. The feasibility studies shall determine whether fibre optic infrastructure installation is technically viable, economically justified, commercially sustainable, and compliant with regulatory requirements. The studies shall be conducted in accordance with ICT Authority of Kenya technical standards for national fibre optic infrastructure, International Telecommunication Union Recommendations (particularly ITU-T L.35 for installation of optical fibre cables in road infrastructure and ITU-T G.652.D for single-mode fibre characteristics), the Kenya Information and Communications Act (Cap 411A), and Communications Authority of Kenya licensing and interconnection regulations governing open-access infrastructure.

The Consultant shall conduct detailed route reconnaissance and Outside Plant surveys to assess the physical feasibility of fibre optic installation along the road corridor. The surveys shall document terrain characteristics including topography, soil types, rock outcrops, water crossings, and vegetation that may affect duct installation methods and costs. The surveys shall identify and map all existing utilities and infrastructure within the road corridor including power transmission lines, telecommunications cables, water pipelines, sewer lines, oil and gas pipelines, and any other underground or overhead infrastructure that may constrain fibre duct placement or create construction conflicts. The surveys shall be conducted in close coordination with the ICT Authority,

Kenya Power, telecommunications operators, water utilities, and other infrastructure owners to obtain accurate information on existing facilities and planned future installations.

The Consultant shall analyse the availability and condition of any existing telecommunications civil works infrastructure along the corridor that might be utilized for the project, assessing whether existing civil works have sufficient spare capacity, meet current required minimal technical standards, and are accessible under reasonable commercial terms. Where existing civil works infrastructure is inadequate or unavailable, the Consultant shall design new civil works installations integrated with the road civil works. The civil works design shall specify duct sizes, materials, burial depths, protection measures, and installation methods appropriate for the road construction methodology and soil conditions. The design shall provide for multiple ducts to accommodate future capacity expansion and shall include access chambers at appropriate intervals for cable installation, maintenance, and network branching.

The Consultant shall evaluate all environmental and regulatory constraints affecting fibre optic infrastructure deployment. The evaluation shall assess requirements for environmental impact licensing, wayleave permits, spectrum licensing if wireless backhaul is proposed, interconnection agreements with existing network operators, and compliance with ICT Authority technical standards. The evaluation shall identify any protected areas, cultural heritage sites, or environmentally sensitive zones along the corridor where special installation methods or routing adjustments may be required. The Consultant shall coordinate with the Environmental and Social Safeguards specialists to ensure that fibre optic infrastructure deployment is incorporated into the project Environmental and Social Management Plan.

The Consultant shall develop preliminary network architecture defining the technical configuration of the fibre optic network. The architecture shall specify whether the network will utilize single-mode or multi-mode fibre, the number of fibre cores required to meet capacity projections, the optical transmission technology and equipment specifications, the locations of network nodes and equipment shelters, the power supply arrangements for active equipment, and the network topology including backbone routes, distribution branches, and last-mile connectivity options. The architecture shall be designed to support open-access connectivity, allowing multiple service providers to utilize the infrastructure on non-discriminatory terms in accordance with ICT Authority open-access policy.

The Consultant shall assess telecommunications market demand in the project area through analysis of existing connectivity levels, identification of underserved communities and institutions, consultation with potential anchor customers including government offices, schools, health facilities, and businesses, and projection of future connectivity demand based on population growth and economic development trends. The demand assessment shall quantify potential revenue streams from wholesale capacity leasing to telecommunications operators, retail services to end users, and government network connectivity requirements. The assessment shall identify viable business models including infrastructure ownership by government with wholesale capacity leasing, public-private partnership arrangements, or private sector concession models.

The Consultant shall conduct detailed stakeholder consultation with ICT Authority, telecommunications operators, internet service providers, county governments, potential anchor customers, and community representatives to validate demand projections, identify partnership opportunities, assess willingness to pay for connectivity services, and gather input on network design and service delivery models. The consultation process shall document stakeholder interests, concerns, and recommendations, and shall inform both the technical design and the commercial structure of the proposed network.

The Consultant shall prepare comprehensive capital expenditure estimates covering all costs of fibre optic infrastructure deployment including duct installation as part of road civil works, fibre optic cable procurement and installation, network equipment and shelters, power supply systems, testing and commissioning, and project management and design costs. The CAPEX estimates shall clearly separate costs that will be incurred as part of the road construction contract from costs that will be incurred separately for fibre blowing and equipment installation. The estimates shall be based on current market prices verified through supplier quotations or recent comparable projects.

The Consultant shall prepare operating expenditure projections covering network operations and maintenance including fibre cable monitoring and repairs, equipment maintenance and upgrades, electricity costs for active equipment, staff costs for network operations, billing and customer service costs if retail services are provided, and network management system costs. The OPEX projections shall cover a twenty-year operating period and shall account for equipment lifecycle replacement requirements and technology evolution.

The Consultant shall develop a financial model projecting revenues, expenditures, and cash flows over a twenty-year period under different business model scenarios. The financial analysis shall calculate Net Present Value, Internal Rate of Return, and Payback Period to assess commercial viability. The analysis shall determine the minimum wholesale or retail pricing required to achieve financial sustainability and shall assess whether such pricing is competitive with alternative connectivity options and affordable for target customers. The financial model shall incorporate realistic assumptions about revenue growth, market penetration rates, operating cost trends, and capital replacement cycles.

The Consultant shall conduct economic analysis of the fibre optic investment to quantify broader socio-economic benefits beyond direct financial returns. The economic analysis shall assess impacts on business productivity through improved connectivity, improved access to government services, education, and healthcare through digital delivery channels, enhanced agricultural value chains through market information and digital payments, and stimulus to entrepreneurship and employment through digital economy opportunities. The economic analysis shall calculate economic NPV and EIRR incorporating both direct financial cash flows and quantified economic benefits valued using appropriate shadow prices and willingness-to-pay estimates.

The Consultant shall conduct sensitivity analysis testing the financial and economic viability under varying assumptions about capital costs, operating costs, demand uptake rates, pricing levels, technology costs, and competitive dynamics. The sensitivity analysis shall identify critical risk factors that could undermine project viability and shall recommend risk mitigation measures including phased implementation approaches, demand aggregation strategies, or public subsidy requirements to bridge viability gaps in underserved rural areas.

The Consultant shall prepare a comprehensive Fibre Optic Technical and Economic Feasibility Reports documenting all technical investigations, demand assessments, stakeholder consultations, cost estimates, financial projections, economic analysis results, and implementation recommendations. The report shall include network design drawings showing duct routes and network topology, technical specifications for ducts, cables, and equipment, financial model documentation with all assumptions and calculations transparent, economic analysis methodology and results, and a recommended implementation strategy including phasing, business model, financing arrangements, and institutional responsibilities. The report shall provide sufficient detail to enable KeNHA, and ICT Authority to assess the viability of the fibre optic component and to make informed decisions about whether to proceed with implementation as part of the road project or through alternative arrangements.

4.2.12 Preliminary Cost Estimates

The Consultant shall prepare comprehensive Preliminary Cost Estimates with an accuracy of plus or minus twenty percent for all project components. These cost estimates shall be sufficiently detailed and accurate to support determination of the Implementation Loan Amount during loan negotiations and to serve as the cost basis for economic evaluation using HDM-4. The cost estimates shall be prepared using current market prices and shall be presented in both financial prices and economic prices to support both loan amount determination and economic analysis.

The Consultant shall prepare preliminary quantities estimates for all major work items, with an accuracy of ± 20%, based on measurements taken from the Preliminary Engineering Design drawings and supported by calculations documented in the design reports. The quantity estimates shall include: -

a) earthworks quantities comprising clearing and grubbing, common excavation, rock excavation, and embankment fill, all calculated from cross-sections taken at appropriate intervals along the alignment;

b) pavement quantities comprising subgrade improvement materials, subbase materials, base course materials, and surface course materials, calculated based on pavement layer thicknesses from the pavement design and carriageway dimensions from the typical sections;

c) drainage structure quantities comprising pipe culverts of various sizes, box culverts, side drains, cross drains, and erosion protection measures, enumerated from the drainage layout drawings;

d) structures quantities comprising bridge deck areas, foundation volumes, pier and abutment concrete quantities, and reinforcement steel tonnages for all major bridges;

e) fibre optic infrastructure quantities comprising duct lengths, chamber numbers, cable lengths, and network equipment items.;

f) road furniture and appurtenances comprising road signs, pavement markings, guardrails, delineators, and other safety features.

The Consultant shall develop unit prices for all major work items, with an accuracy of ± 20%, through **detailed buildup from first principles** using basic resource costs including labour rates, equipment hire rates, material prices, and contractor overheads and profit margins appropriate for projects of this nature in Kenya. The unit price buildups shall be documented in sufficient detail to allow verification and adjustment if necessary, during loan negotiations or detailed design. The Consultant shall conduct market surveys to establish current prices for major materials including cement, bitumen, steel reinforcement, aggregates, fuel, and other significant cost items. The unit prices shall reflect conditions in the project area including haul distances for materials, availability of skilled labour, and any site-specific factors that may affect construction costs.

The cost estimates shall be presented with clear separation of foreign currency and local currency components to support development partner financing arrangements. The foreign currency component shall include: -

a) costs of imported equipment, materials and supplies that must be procured internationally;

b) identifiable foreign currency components of domestically manufactured equipment and materials;

c) salaries and allowances for expatriate key personnel; and

d) profit margins and overheads attributable to foreign contractors or suppliers where applicable.

The local currency component shall include: -

a) costs of land acquisition and resettlement compensation;

b) locally sourced materials, supplies, and services;

c) salaries and wages for local employees both skilled and unskilled; and

d) domestic contractor profit and overheads.

The Consultant shall prepare a detailed tax analysis showing all applicable taxes, levies, and duties included in the financial cost estimates. This analysis shall separately quantify Value Added Tax, import duties, withholding taxes, local government levies, and any other fiscal charges embedded in the cost estimates. This tax analysis is essential for determining the appropriate financing arrangements and for converting financial costs to economic costs for the HDM-4 economic analysis.

The Consultant shall provide justification for the recommended Variation of Price formula and percentage, based on analysis of the key cost components and their historical price volatility. The VOP analysis shall identify the major cost drivers including bitumen, cement, steel, fuel, and labour, and shall recommend appropriate weighting factors for each component based on their percentage contribution to total project cost. The analysis shall reference recent price trends for these commodities in Kenya and shall recommend the baseline date and price adjustment mechanism appropriate for a Design-Build contract anticipated to commence approximately eighteen to twenty-four months after completion of the Feasibility Study.

The cost estimates shall be summarized in clear tabular formats showing total costs by major work category, breakdown between foreign and local currency costs, identification of tax components, and comparison of financial prices versus economic prices. The documentation shall be structured to facilitate independent verification, with unit rates cross-referenced to source quotations or published price indices, quantities traceable to specific drawing references and calculation sheets, and all assumptions stated explicitly such that a reviewer unfamiliar with the project can reproduce the estimate from the supporting documentation alone.

4.2.13 Draft Procurement Documentation (Employer's Requirements and Request for Proposals)

The Consultant shall prepare the Employer's Requirements and Preliminary Technical Specifications that will form the technical foundation for the future FIDIC Plant & Design-Build (Yellow book) contract. These documents shall define the functional and performance requirements for the project while preserving appropriate design flexibility for the future Design-Build Contractor. The documents shall be prepared in accordance with FIDIC Yellow Book (Plant & Design-Build Contract, Second Edition, 2017) and the required Standard Procurement Documents for Works under Design-Build contracts.

4.2.13.1 Draft Employer's Requirements

The Consultant shall prepare draft Employer's Requirements defining functional and performance requirements for the project while preserving appropriate design flexibility for the Design-Build Contractor. The Employer's Requirements shall balance prescription and performance to achieve Kenya National Highways Authority objectives while enabling contractor innovation and value engineering.

The fundamental principle governing preparation of the Employer's Requirements is that requirements shall be prescriptive for functional standards, performance criteria, quality requirements, and safety and environmental compliance, but flexible regarding design solutions, construction methodology, and innovation opportunities. Requirements shall be sufficiently detailed to enable prospective Design-Build Contractors to understand project scope, assess risks, develop preliminary designs, and prepare competitive proposals, but not so prescriptive as to eliminate design flexibility, predetermine solutions, or erode the benefits of Design-Build procurement.

Document Structure and Contents

The Employer's Requirements shall be structured in accordance with the required Standard Procurement Document Section VII (Employer's Requirements) for Design-Build works. Table 4.2.13 specifies the required document structure and contents for each section.

Table 4.2.13: Employer's Requirements Document Structure

Section	Title	Required Contents
Part A	General Requirements	The General Requirements shall provide a comprehensive statement of Employer objectives including project purpose, connectivity improvements, economic development objectives, and service standards to be delivered. This section shall establish the contract administration framework defining the Engineer's role and authority in accordance with FIDIC Sub-Clauses 3.1-3.7, quality management system requirements per Sub-Clause 4.9, design submission and approval procedures per Sub-Clause 5.2, and programming and progress reporting requirements per Sub-Clause 8.3.
Part B	Environmental and Social Requirements	The Environmental and Social Requirements shall specify obligations derived from the Environmental and Social Impact Assessment and Resettlement Action Plan, addressing FIDIC Sub-Clauses 4.6 (co-operation with environmental and social monitoring), 4.8 (health and safety obligations), 4.18 (environment protection including the Contractor's Environmental and Social Management Plan), 4.21 (site security per ESS4), 4.23 (archaeological chance finds per ESS8), and 6.2/6.5 (labour conditions per ESS2). The section shall include SEA/SH prevention requirements including Code of Conduct, grievance mechanisms, and incident response protocols.
Part C	Scope of Works	The Scope of Works shall define functional and performance requirements rather than prescriptive design solutions, specifying geometric design standards with alignment corridor and mandatory control points, pavement performance criteria including design life, terminal International Roughness Index values, and structural capacity requirements, drainage system performance including design flood return periods, erosion

Section	Title	Required Contents
		control standards, and discharge requirements, structures load capacity and durability requirements in accordance with Kenya Road Design Manual and Eurocodes, fibre optic duct and network specifications per ICT Authority standards, and road safety feature requirements. The section shall include Key Performance Indicators and measurable completion criteria that the Design-Build Contractor must achieve for works acceptance, including drainage systems passing hydraulic performance tests, schedule milestones, quality assurance requirements, environmental compliance criteria, and social safeguards implementation requirements. All completion criteria shall be objective and verifiable through testing and inspection procedures specified in the contract documents.
Part D	Site Information	The Site Information section shall present factual data compiled from all investigations conducted during the Feasibility Study, provided without warranty for Contractor risk assessment and design development. The data shall include topographical survey data and control network information, geotechnical borehole logs and laboratory test results, hydrological data and flood records, traffic count data and axle load survey results, environmental and social baseline conditions, existing utilities records, and land ownership status and acquisition progress.
Part E	Contractor's Key Personnel	The Key Personnel section shall specify minimum qualifications including academic credentials, years of experience, and specific project experience requirements for the Contractor's Representative, Design Manager, Construction Manager, Environmental Specialist, Social Specialist, Health and Safety Specialist, SEA/SH Expert (for high-risk projects), and Survey Manager at minimum. The Consultant may propose additional Key Personnel for the Contractor.
Part F	Specifications	The Specifications shall define technical standards based on Standard Specification for Road and Bridge Construction (Kenya, 2023 Edition) adapted to reflect the Design-Build procurement approach. The section shall include materials quality standards and workmanship requirements for earthworks, pavement layers, drainage works, structural works, road furniture, and fibre optic civil works, together with testing methods, acceptance criteria, non-conformance procedures, and traffic management requirements during construction.

Section	Title	Required Contents
Part G	Drawings	The Drawings section shall include Preliminary Engineering Design drawings developed during the Preliminary Engineering Design phase, clearly labelled as guidance demonstrating feasible solutions rather than mandatory design requirements. The Preliminary Engineering Design shall provide sufficient detail to enable prospective Contractors to understand scope and prepare realistic cost estimates. Drawings shall include general arrangement showing project limits, plan and profile drawings at appropriate scales, typical cross-sections, pavement typical sections showing reference layer thicknesses and materials, drainage layout with major structure locations, preliminary bridge general arrangements, junction layouts, and fibre optic route alignment and network architecture.
Part H	Supplementary Information	The Supplementary Information section shall comprise supporting documents bound separately and cross-referenced to the main Employer's Requirements, including complete geotechnical investigation reports, hydrological analysis reports, traffic survey reports, materials source investigation reports, Environmental and Social Impact Assessment and Resettlement Action Plan executive summaries with reference to full documents, and the economic analysis report. This section shall also include the Project Risk Matrix identifying all significant technical, geological, environmental, social, and commercial risks that could affect project delivery. For each risk, the matrix shall specify which party bears primary responsibility, what mitigation measures are required, and what mechanisms exist for managing risks that materialize during implementation. The Risk Matrix shall reflect the Design-Build procurement approach where the Contractor assumes substantially more design and construction risk than in traditional Employer-design contracts.

4.2.13.2 Draft Request for Proposals Structure

The Consultant shall prepare complete draft Request for Proposals comprising all documents required for international competitive procurement. The Request for Proposals shall accommodate Design-Build procurement approach where proposers submit both technical proposals demonstrating design approach and capability to deliver works, and financial proposals providing price for executing project according to Employer's Requirements. The procurement documents shall comprise the following sections:

- Instructions to Proposers defining all procedural requirements for proposal preparation and submission, establishing timeline for procurement process from Request for Proposals issuance through contract award.

- Proposal Data Sheet providing project-specific information supplementing Instructions to Proposers.
- Evaluation and Qualification Criteria establishing methodology for assessing both technical and financial proposals, defining minimum qualification requirements that proposers must meet to be eligible for detailed evaluation.
- General Conditions of Contract incorporating FIDIC Yellow Book (Plant & Design-Build, Second Edition, 2017) as foundation for contractual relationship between Kenya National Highways Authority as Employer and selected Design-Build Contractor.
- Particular Conditions of Contract supplementing and where necessary amending FIDIC General Conditions to address project-specific requirements and adapt standard FIDIC provisions to Kenyan legal and regulatory context.
- Employer's Requirements as described in Section 4.2.13.1, either included within Request for Proposals or provided as cross-referenced separate document.
- Proposal Forms providing standard formats that proposers must complete and submit, standardizing presentation of information and facilitating evaluation by ensuring all proposers provide information in same format.
- Contract Forms providing standard formats for contract execution.

4.2.13.3 Quality Requirements and Coordination Protocol

The Consultant shall ensure draft procurement documents are internally consistent with all cross-references correctly specified, technically complete, compliant with the required Procurement Regulations and Standard Procurement Documents, and aligned with FIDIC Yellow Book contractual framework. Documents shall be clearly marked as drafts prepared during preparatory phase, noting that Kenya National Highways Authority will finalize documents during loan effectiveness period to incorporate final loan conditions, any adjustments required by loan negotiations, and final Environmental and Social Impact Assessment and Resettlement Action Plan requirements. Draft documents shall be of sufficient quality that Kenya National Highways Authority finalization work is limited to administrative updates and incorporation of specific requirements, not substantive redrafting of procurement strategy or contractual framework.

The Consultant shall coordinate with Environmental and Social Impact Assessment and Resettlement Action Plan consultants during draft procurement documentation preparation through joint coordination meetings in Months 5, 6, and 7 to review Environmental and Social Impact Assessment and Resettlement Action Plan progress, identify requirements ready for integration, and plan incorporation of findings into draft Employer's Requirements. The Consultant shall provide Preliminary Engineering Design information to Environmental and Social Impact Assessment and Resettlement Action Plan consultants to support their assessments, shall review Environmental and Social Impact Assessment and Resettlement Action Plan deliverables as they become available, and shall extract requirements for incorporation into draft Employer's Requirements including environmental management measures, social mitigation measures, resettlement requirements, and monitoring and reporting obligations.

The Consultant shall clearly document in Month 8 deliverable package which coordination activities were completed, which safeguards requirements were incorporated into draft procurement

documents, and which Environmental and Social Impact Assessment or Resettlement Action Plan requirements were not yet available for incorporation with notation that Kenya National Highways Authority will incorporate these during finalization. This documentation ensures Kenya National Highways Authority understands exactly what finalization work remains and can plan accordingly for completing procurement documents during loan effectiveness period. The coordination protocol recognizes that final Environmental and Social Impact Assessment and Resettlement Action Plan deliverables may not be available until after Month 8, and accommodates this reality while ensuring maximum integration of safeguards requirements based on information available during Phase 1.

All draft procurement documentation shall be professionally formatted with clear section numbering, comprehensive tables of contents, cross-referencing between related sections, and consistent terminology throughout. The Consultant shall submit complete sets of supporting documentation including all engineering investigation reports, analysis calculations, design reports, traffic models, economic analysis files, and other technical materials that underpin Employer's Requirements and specifications. This supporting documentation enables Kenya National Highways Authority to verify technical basis for all requirements and enables future refinement of documents during finalization following loan effectiveness. Documents shall be prepared in formats consistent with the required Standard Procurement Documents and shall be suitable for issuance to international Design-Build contractors upon Kenya National Highways Authority completion of finalization activities.

4.2.14 Design and Cost Estimate Refinements

The Consultant may be required to refine aspects of the Preliminary Design or cost estimates. Such refinements shall only be undertaken upon formal written authorization from Kenya National Highways Authority specifying the scope of refinements required, the rationale for the changes, and the expected timeline for completion.

Design refinements may be required for several reasons including adjustment of project scope to align with agreed loan amount if the available financing is less than the original cost estimate, revision of design standards or specifications, modification of the alignment or typical sections to reduce environmental or social impacts identified as unacceptable during appraisal, or revision of the Employer's Requirements based on procurement specialist advice to improve clarity or adjust risk allocation.

Cost estimate refinements may be required to reflect design scope changes authorized by KeNHA, to incorporate updated unit prices if significant time has elapsed since the original estimates were prepared, to adjust foreign versus local currency breakdowns based on financing arrangement agreements, or to revise the Variation of Price formula based on loan negotiation outcomes.

The Consultant shall conduct all design and cost refinements in accordance with the methodologies established during the Feasibility Study, maintaining consistency with the original approach while incorporating the specific adjustments required. Where refinements affect project economic viability, the Consultant shall update the HDM-4 economic analysis to demonstrate that the revised project continues to meet minimum EIRR thresholds for development partner financing.

The Consultant shall document all refinements in technical memoranda that clearly explain what changes have been made, why the changes were necessary, what methodology was used to develop the revised design or costs, and what impact the changes have on project viability, implementation

schedule, or other key parameters. These technical memoranda shall be submitted to KeNHA for review and approval before revised deliverables are finalized.

5 KEY STAFF REQUIREMENT AND QUALIFICATIONS

5.1 Key Staffing Inputs

The Consultant shall provide highly qualified and experienced professional staff to perform the services described in this Terms of Reference.

The staff-month estimates provided in Tables 5.1.1 and 5.1.2 represent the minimum acceptable inputs required to accomplish the scope of work with appropriate quality and within the specified timeframes. Consultants may propose staffing inputs equal to or greater than the minimum requirements for the Feasibility Study and Preliminary Engineering Design services, with staff-month allocations distributed appropriately across the assignment period to ensure adequate coverage of all technical activities. Consultants shall demonstrate in their Technical Proposal how the proposed staffing plan addresses all scope requirements including field investigations, design development, economic analysis, stakeholder engagement, report preparation, and quality assurance activities.

All proposed Key Experts as listed in Table 5.1.1 shall possess the minimum educational qualifications, professional registration credentials, and demonstrated experience as specified in Section 5.2 of this Terms of Reference. The proposed Key Experts shall be individually evaluated during technical proposal evaluation to verify that their qualifications and experience meet the minimum requirements and that they collectively constitute a team capable of delivering the assignment successfully. ***Consultants are advised to have each proposed Key Expert sign their Curriculum Vitae*** to confirm their commitment to the assignment and their acceptance of the experience claims made on their behalf.

Remuneration for support staff not explicitly listed as Support Staff in Table 5.1.2, including but not limited to laboratory technicians, survey chainmen, office administrators, secretaries, drivers, and any other personnel required for proper execution of the assignment, shall be incorporated into the financial rates proposed for the listed Key Experts. The Consultant is responsible for providing all support staff necessary to enable the Key Experts to perform their duties effectively and to ensure successful completion of all assignment activities within the specified timeframes and quality standards.

5.1.1 Feasibility Studies & Preliminary Engineering Design Phase Staffing Requirements

Table 5.1 presents the Key Expert positions and minimum staff-month inputs required for the Feasibility Study and Preliminary Engineering Design services. The total estimated effort is **42 staff-months** to be deployed over the eight-month design period. Consultants shall ensure that the proposed deployment schedule provides adequate staffing throughout the design period, with particular attention to peak activity periods such as field investigation campaigns, stakeholder consultation workshops, interim report preparation, and final deliverable compilation.

Table 5.1.1: Phase 1 Key Staffing Inputs (Design Phase – 8 Months)

S/No.	Description	Minimum Staff-Months
1.	Project Director	4
2.	Highway Engineer	5
3.	Pavement & Materials Engineer / Geotechnical Engineer	5
4.	Traffic Engineer / Transport Economist	5
5.	Drainage/Structural Engineer	5

S/No.	Description	Minimum Staff-Months
6.	Hydrologist	4
7.	Fibre Optic Design Engineer	4
8.	Road Safety Audit Expert	2
9.	Senior Surveyor	6
10.	Procurement and Contracts Specialist	2
	Total	**42**

Note to Consultants on Staffing:

Consultants are advised to distribute the staff-month allocations strategically across the eight-month design period to ensure adequate coverage of all technical activities. The deployment schedule presented in the Technical Proposal shall demonstrate how field investigation activities will be staffed during the initial months, how design development activities will be resourced during the middle months, and how report preparation and quality review activities will be adequately staffed during the final months. Particular attention shall be given to ensuring that the Project Director maintains effective oversight throughout the assignment period, that senior technical specialists are available for critical design decisions and stakeholder consultations, and that adequate assistant-level support is provided to enable efficient execution of field investigations, data processing, design calculations, and drawing production activities.

5.1.2 Support Staff Inputs

The following are the staff requirements and man-months for the design and supervision inputs in regards to the support staff for Feasibility Study and Preliminary Engineering Design Stage.

Table 5.1.3: Support Staffing Inputs (Feasibility Study and Preliminary Engineering Design – 8 Months)

S/No.	Description	Minimum Staff-Months
1.	Assistant Highway Engineer	8
2.	Assistant Traffic Engineer	8
3.	Assistant Pavement & Materials Engineer	8
4.	Assistant Drainage/Structural Engineer	8
5.	Assistant Fibre Optic Engineer	6
6.	Assistant Surveyor	8
7.	CAD Technicians (2 No.)	16
8.	Other Support Expert – 1 No.	8
9.	Other Support Expert – 1 No.	8
	Total	**78**

Note to Consultants on Staffing:

The Consultant will provide the necessary local support staff (To be identified by the Consultant/their local Partner and vetted by the Employer) – including junior engineers, draftsmen, field surveyor, laboratory technicians, inspectors/field supervisors and office support staff – needed in order to carry out the assignment and discharge the consultant's responsibilities effectively.

Evaluation of the Support Staff listed in Table 5.1.2 shall not contribute towards technical proposal scores for the Consultants. The support personnel/experts shall be engaged on a need basis with minimum qualifications depending on their areas of expertise. Assistant Engineers and Assistant Surveyors shall possess a minimum of a Bachelor's degree in a relevant engineering/surveying discipline with at least three years of post-graduation experience. Other Support Staff/ Technicians shall possess minimum qualifications of a degree, Kenya Higher National Diploma or Ordinary Diploma with extensive experience, Kenya Trade Test depending on their areas of expertise to be engaged upon approval by the employer. All Support Staff shall demonstrate competence in using relevant software and equipment applicable to their assigned duties.

The Consultant is responsible for verifying qualifications and deploying appropriately qualified Support Staff. Remuneration for Support Staff shall be incorporated into the Consultant's Lump Sum financial proposal. Kenya National Highways Authority reserves the right to request evidence of qualifications and to require replacement of Support Staff who lack the necessary competencies to perform their assigned duties effectively.

5.2 Key Staffing Qualifications

This section establishes the minimum qualification requirements for each Key Expert position listed in Tables 5.1.1 and 5.1.3. The qualifications are structured to define educational prerequisites, professional registration credentials, general professional experience thresholds, specific technical experience requirements relevant to the assignment scope, and key competencies that shall be demonstrated through the Curriculum Vitae and supporting documentation. All qualification requirements are minimum standards that must be met or exceeded by proposed Key Experts.

Professional registration requirements reference registration or accreditation by official regulatory bodies. Where a proposed Key Expert is registered in a jurisdiction outside Kenya, the consultant shall demonstrate that the foreign registration body is recognized by the corresponding Kenyan regulatory authority such that the Kenyan authority would, upon application, grant correspondent local accreditation. Alternatively, consultants may commit to obtaining Kenyan registration for foreign-registered Key Experts prior to contract commencement if such registration is legally required for performance of the services in Kenya.

(i) Key Expert 1: Project Director

The Project Director shall possess a Bachelor of Science degree in Civil Engineering or equivalent from a recognized university, with Master's degree in relevant field considered an advantage. The Project Director shall be a registered/accredited by a relevant official body in any country such that the Engineer's Board of Kenya, upon application, will be able to attest the accreditation and grant correspondent local accreditation as a Registered Consulting Engineer with valid practicing license. The Project Director shall possess minimum fifteen (15 No.) years' professional experience post- registration, including demonstrated experience in project management and team leadership for infrastructure projects. The Project Director shall have served as Project Director, Team Leader, or equivalent senior management position on at least three (3 No.) road infrastructure feasibility studies or design assignments successfully

completed within the past ten (10 No.) years, with each assignment involving road projects with total estimated construction costs exceeding USD 20 million. At least two (2 No.) assignments shall have been World Bank-financed or financed by other multilateral development banks, demonstrating familiarity with international financing institution requirements, procedures, and standards. At least one (1 No.) assignment shall have involved preparation of Employer's Requirements for Design-Build procurement under FIDIC-based contracts. The Project Director shall demonstrate capability to represent consulting firm at senior-level meetings with government authorities and development partners, evidenced by participation in appraisal missions, loan negotiations, or similar high-level engagements where technical findings were presented and defended.

(ii) Key Expert 2: Highway Engineer

The Highway Engineer shall possess Bachelor of Science degree in Civil Engineering from recognized university. The Highway Engineer shall be a registered/accredited by a relevant official body in any country such that the Engineer's Board of Kenya, upon application, will be able to attest the accreditation and grant correspondent local accreditation as a Registered Professional Engineer with valid practicing license. The Highway Engineer shall possess minimum twelve (12 No.) years' professional experience post-graduation, encompassing geometric design, pavement design, and preparation of construction drawings for road infrastructure projects. The Highway Engineer shall have served in senior design role on at least three (3 No.) road design assignments successfully completed within the past ten (10 No.) years, with each assignment involving preparation of detailed geometric designs for road sections totalling at least 30 kilometres. At least two (2 No.) assignments shall have involved rural road upgrading or highway improvement projects with total estimated construction costs exceeding USD 20 million per project. At least one (1 No.) assignment shall have involved preparation of Preliminary Engineering Design for Design-Build procurement under FIDIC Yellow Book or equivalent contract forms, demonstrating understanding of appropriate design detail level required to define Employer's Requirements while preserving contractor design flexibility. The Highway Engineer shall demonstrate experience using modern highway design software such as AutoCAD Civil 3D, Bentley OpenRoads Designer, or equivalent for three-dimensional alignment design, cross-section development, and earthwork quantity calculations.

(iii) Key Expert 3: Pavement & Materials Engineer / Geotechnical Engineer

The Pavement and Materials Engineer / Geotechnical Engineer shall possess Bachelor of Science degree in Civil Engineering or Geological Engineering from recognized university. The Pavement and Materials Engineer / Geotechnical Engineer shall be a registered/accredited by a relevant official body in any country such that the Engineer's Board of Kenya, upon application, will be able to attest the accreditation and grant correspondent local accreditation as a Registered Professional Engineer with valid practicing license. The Pavement and Materials Engineer / Geotechnical Engineer shall possess minimum twelve (12 No.) years' professional experience post-graduation encompassing pavement design, pavement evaluation, materials testing, geotechnical investigations, foundation design, and quality control for road construction projects. The Pavement and Materials Engineer / Geotechnical Engineer shall have served as Pavement Engineer, Materials Engineer, or Geotechnical Engineer on at least three (3 No.) road design or construction supervision assignments successfully completed within the past ten (10 No.) years, with each assignment involving projects with total estimated construction costs exceeding USD 20 million. At least two (2 No.) assignments shall have involved pavement structural design for new construction or major rehabilitation projects demonstrating

application of mechanistic-empirical design methods, traffic loading analysis, and materials property characterization. At least one (1 No.) assignment shall have involved comprehensive pavement evaluation of existing roads using deflection measurement equipment, surface roughness measurement, and pavement structure investigation through coring or trial pits. At least one (1 No.) assignment shall have involved comprehensive geotechnical investigation programs including borehole drilling, in-situ testing, laboratory testing, and preparation of geotechnical design reports providing foundation recommendations and earthworks specifications. The Pavement and Materials Engineer / Geotechnical Engineer shall demonstrate experience in materials source identification and testing, laboratory testing programs for pavement materials, bituminous materials testing including Marshall mix design or Superpave mix design methods, geotechnical investigation planning, supervision of drilling operations, interpretation of laboratory test results, and preparation of geotechnical design parameters for pavement design and foundation design.

(iv) Key Expert 4: Traffic Engineer / Transport Economist

The Traffic Engineer / Transport Economist shall possess Bachelor of Science degree in Civil Engineering, Transportation Engineering, Economics, Transport Economics, or related field from recognized university. The Traffic Engineer / Transport Economist shall be a registered/accredited by a relevant official body in any country such that the Engineer's Board of Kenya, upon application, will be able to attest the accreditation and grant correspondent local accreditation as a Registered Professional Engineer with valid practicing license. The Traffic Engineer / Transport Economist shall possess minimum ten (10 No.) years professional experience encompassing traffic surveys, traffic forecasting, traffic analysis, economic analysis of transport infrastructure investments, benefit-cost analysis, preparation of economic feasibility studies, and traffic engineering design for road projects. The Traffic Engineer / Transport Economist shall have served as Traffic Engineer, Transportation Planner, or Transport Economist on at least three (3 No.) road feasibility studies or design assignments successfully completed within the past ten (10 No.) years, with each assignment involving road projects with total estimated construction costs exceeding USD 20 million. At least two (2 No.) assignments shall have involved comprehensive traffic data collection programs including classified traffic counts, origin-destination surveys, and axle load surveys, followed by traffic forecasting over evaluation periods of at least twenty years. At least two (2 No.) assignments shall have involved economic evaluation using Highway Development and Management Model version four (HDM-4) software or equivalent pavement management and economic analysis tools, demonstrating proficiency in HDM-4 calibration, vehicle operating cost estimation, road maintenance cost forecasting, and economic performance indicator calculation. The Traffic Engineer / Transport Economist shall demonstrate experience using traffic forecasting software and conducting capacity analysis for intersections and road sections using recognized methodologies such as Highway Capacity Manual procedures. The Traffic Engineer / Transport Economist shall demonstrate experience in conducting field surveys to collect vehicle operating cost data and in shadow pricing and economic cost analysis including application of Standard Conversion Factors and Shadow Wage Rates.

(v) Key Expert 5: Drainage/Structural Engineer

The Drainage and Structural Engineer shall possess Bachelor of Science degree in Civil Engineering from recognized university. The Drainage and Structural Engineer shall be a registered/accredited by a relevant official body in any country such that the Engineer's Board

of Kenya, upon application, will be able to attest the accreditation and grant correspondent local accreditation as a Registered Professional Engineer with valid practicing license. The Drainage and Structural Engineer shall possess minimum twelve (12 No.) years' professional experience post-graduation, encompassing structural design of bridges and culverts, drainage design, and hydraulic analysis for infrastructure projects. The Drainage and Structural Engineer shall have served as Structural Engineer or Bridge Engineer on at least three (3 No.) road design assignments successfully completed within the past ten (10 No.) years, with each assignment involving structural design for multiple bridges or major culverts totalling combined deck area of at least 1000m^2 OR where bridges of at least 20m spans were designed/built. At least two (2 No.) assignments shall have involved preparation of structural design calculations and construction drawings for bridges in accordance with Eurocodes, AASHTO standards, or equivalent international structural design codes. The Drainage and Structural Engineer shall demonstrate experience in foundation design for structures, hydrological and hydraulic analysis for waterway crossings, and design of erosion protection works.

(vi) Key Expert 6: Hydrologist

The Hydrologist shall possess Bachelor of Science degree in Civil Engineering, Water Resources Engineering, Hydrology, or related field from recognized university. The Hydrologist shall be a registered/accredited by a relevant official body in any country such that the Engineer's Board of Kenya, upon application, will be able to attest the accreditation and grant correspondent local accreditation as a Registered Professional Engineer with valid practicing license. The Hydrologist shall possess minimum ten (10 No.) years professional experience post-graduation, encompassing hydrological analysis, flood frequency analysis, catchment modelling, and application of hydrological methods to infrastructure design projects. The Hydrologist shall have served as Hydrologist or Water Resources Engineer on at least three (3 No.) infrastructure projects successfully completed within the past ten (10 No.) years involving hydrological studies for road infrastructure, flood control works, or other civil works requiring hydrological analysis. At least two (2 No.) assignments shall have involved comprehensive hydrological studies for road projects including catchment delineation, rainfall data analysis, flood frequency analysis, determination of design flood flows, and assessment of flooding risks to road infrastructure. At least one (1 No.) assignment shall have involved application of hydrological modelling software such as HEC-HMS (Hydrologic Modelling System), HEC-RAS (River Analysis System), SWMM (Storm Water Management Model), or equivalent tools for catchment modelling, flood routing, or hydraulic analysis. The Hydrologist shall demonstrate experience in collection and analysis of rainfall data from meteorological stations and application of GIS tools for hydrological analysis including delineation of catchment boundaries and extraction of terrain parameters from digital elevation models.

(vii) Key Expert 7: Fibre Optic Design Engineer

The Fibre Optic Design Engineer shall possess Bachelor of Science degree in Telecommunications Engineering, Electrical Engineering, Electronics and Communication Engineering, Information and Communication Technology, or equivalent from recognized university. The Fibre Optic Design Engineer shall be Registered Engineer with Engineers Board of Kenya or equivalent regulatory body, or shall hold professional license issued by Communications Authority of Kenya or equivalent telecommunications regulatory body. The Fibre Optic Design Engineer shall possess professional certification in fibre optic technology from recognized certifying body such as Certified Fiber Optic Technician designation from The

Fiber Optic Association or Fiber to the Network Design certification. The Fibre Optic Design Engineer shall possess minimum ten (10 No.) years professional experience encompassing fibre optic network design, Outside Plant engineering, telecommunications infrastructure feasibility studies, and implementation of telecommunications projects. The Fibre Optic Design Engineer shall have served as Telecommunications Engineer, Network Design Engineer, or equivalent position on at least three (3 No.) telecommunications infrastructure projects successfully completed within the past ten (10 No.) years, with each project involving fibre optic network deployment for distances totalling at least 100 kilometres. At least two (2 No.) assignments shall have involved integration of fibre optic infrastructure with road or railway projects, demonstrating understanding of coordination requirements between civil works and telecommunications installations. At least one (1 No.) assignment shall have involved preparation of telecommunications feasibility study including demand assessment, technical design, capital cost estimation, operating cost forecasting, financial modelling, and economic evaluation of telecommunications investments.

(viii) Key Expert 8: Road Safety Audit Expert

The Road Safety Audit Expert shall possess Bachelor of Science degree in Civil Engineering, Transportation Engineering, Traffic Engineering, or equivalent from recognized university. The Road Safety Audit Expert shall be a registered/accredited by a relevant official body in any country such that the Engineer's Board of Kenya, upon application, will be able to attest the accreditation and grant correspondent local accreditation as a Registered Professional Engineer with valid practicing license. The Road Safety Audit Expert shall hold current certification as Road Safety Auditor from recognized training provider such as International Road Assessment Programme (iRAP), TRL Limited of the United Kingdom, or equivalent programs providing comprehensive road safety audit training with examination and competency assessment. Certification shall be at practitioner level or higher demonstrating capability to lead road safety audits independently. The Road Safety Audit Expert shall possess minimum eight (8 No.) years professional experience post-graduation, encompassing road design, traffic engineering, or road safety engineering. The Road Safety Audit Expert shall have served as Road Safety Auditor or Road Safety Specialist on at least four (4 No.) road safety audit assignments or road safety improvement projects successfully completed within the past eight (8 No.) years, with each assignment involving road sections totalling at least 50 kilometres. At least three (3 No.) assignments shall have involved conducting formal road safety audits in accordance with internationally recognized methodologies, with audits conducted at design stage, pre-opening stage, or existing road stage, and producing road safety audit reports documenting identified safety concerns and recommended treatments. At least one (1 No.) assignment shall have involved road safety audit of rural highway project demonstrating understanding of safety issues particular to rural roads including appropriate design speeds, alignment safety considerations, roadside hazard management, and vulnerable road user provisions.

(ix) Key Expert 9: Senior Surveyor

The Senior Surveyor shall possess Bachelor of Science degree in Survey and Photogrammetry, Geomatics Engineering, Land Surveying, or equivalent from recognized university. The Senior Surveyor shall be a registered/accredited by a relevant official body in any country such that the Institute of Surveyors of Kenya, upon application, will be able to attest the accreditation and grant correspondent local accreditation as a Registered Surveyor, Chapter of Engineering Surveyors, with valid practicing license. The Senior Surveyor shall possess minimum ten (10

No.) years professional experience post-graduation, encompassing topographical surveying, control surveying, engineering surveying, aerial photogrammetry or LIDAR survey processing, and preparation of topographical maps for infrastructure projects. The Senior Surveyor shall have served as Senior Surveyor or Chief Surveyor on at least three (3 No.) road design or infrastructure projects successfully completed within the past ten (10 No.) years, with each project involving topographical surveys for road corridors totalling at least 100 kilometres length or infrastructure sites covering at least 100 Hectares. At least two (2 No.) assignments shall have involved establishment of survey control networks tied to national geodetic reference systems, execution of topographical surveys using modern electronic survey equipment such as GPS receivers and Total Stations, and preparation of topographical maps at scales of 1:2500 or larger meeting accuracy requirements for highway design. At least one (1 No.) assignment shall have involved aerial survey by photogrammetry or LIDAR demonstrating capability to specify aerial survey requirements, supervise aerial survey contractors, establish ground control, and process or supervise processing of aerial survey deliverables into topographical maps and digital terrain models.

(x) Key Expert 10: Procurement and Contracts Specialist

The Procurement and Contracts Specialist shall possess Bachelor's degree in Civil Engineering, Transportation Engineering, or related field from recognized university, with Master's degree in relevant field considered an advantage. The Procurement and Contracts Specialist shall possess minimum eight (8 No.) years professional experience including preparation of procurement documentation for infrastructure projects, contract administration, claims management, and dispute resolution. The Procurement and Contracts Specialist shall have served as Contracts Specialist, Procurement Specialist, or equivalent position on at least three (3 No.) infrastructure projects successfully completed within the past eight (8 No.) years involving development of bidding documents and contract administration for projects with contract values exceeding USD 20 million. At least two (2 No.) assignments shall have involved preparation of Employer's Requirements for FIDIC-based Design-Build contracts under World Bank-financed projects, demonstrating capability to translate detailed technical designs into performance-based specifications suitable for Design-Build procurement. At least one (1 No.) assignment shall have involved coordination with environmental and social safeguards teams to integrate environmental and social requirements into procurement documentation. The Procurement and Contracts Specialist shall demonstrate thorough understanding of FIDIC contract forms particularly Yellow Book for Plant & Design-Build contracts, Procurement Regulations for IPF Borrowers (September 2025), and Standard Procurement Documents (SPDs) for Works contracts. The Procurement and Contracts Specialist shall demonstrate experience in drafting Special Conditions of Contract, developing evaluation criteria balancing technical and financial considerations, and structuring risk allocation provisions appropriate for Design-Build delivery.

6 REPORT AND TIME SCHEDULE

6.1 General Requirements for Reports and Deliverables

6.1.1 Purpose and Scope of Reporting Requirements

The Consultant shall prepare and submit to the Director, Highway Design & Survey, Kenya National Highways Authority, comprehensive reports and deliverables documenting all technical investigations, analyses, designs, and recommendations developed during the course of the assignment. These reports and deliverables serve multiple purposes including providing a documented record of all work performed, enabling the Client to monitor progress and quality of work, facilitating technical review and approval by the Client, supporting project appraisal and loan negotiation processes, and providing complete documentation for subsequent procurement of the Design-Build works contract. The reporting requirements specified in this Section establish the minimum deliverables that the Consultant must produce. The Consultant shall prepare additional reports, technical memoranda, or documentation as may be necessary to properly document the work performed and to facilitate effective communication with the Client and other stakeholders throughout the assignment.

6.1.2 Coordination with Environmental and Social Safeguards Consultants

The Environmental and Social Impact Assessment and the Resettlement Action Plan for this project are being prepared under separate consulting contracts. While the ESIA and RAP are not deliverables of the design consultant, certain deliverables under this design consultancy require coordination with and inputs from the Environmental and Social Safeguards consultants. The design consultant shall coordinate closely with the ESIA consultant and the RAP consultant throughout the assignment to ensure that environmental and social considerations are appropriately integrated into the design work. Specifically, the design consultant shall obtain and incorporate inputs from the ESIA consultant regarding environmental constraints that may affect alignment selection, environmental design requirements for drainage structures and roadside features, environmental mitigation measures that must be reflected in the Employer's Requirements and Technical Specifications, and cost estimates for implementation of the Environmental and Social Management Plan. The design consultant shall obtain and incorporate inputs from the RAP consultant regarding census data on affected persons and properties for preparation of Land Acquisition Plans, compensation and resettlement cost estimates for inclusion in the overall project cost estimates, and social safeguards requirements that must be reflected in the Employer's Requirements for the works contractor. The design consultant shall participate in joint coordination meetings with the ESIA and RAP consultants as convened by the Client to ensure consistency and integration of outputs across all consulting assignments. The design consultant shall allow adequate time in the work program for receipt of necessary inputs from the ESIA and RAP consultants and shall promptly notify the Client of any delays in receiving required information that may affect the design consultant's ability to meet reporting deadlines.

6.1.3 Quality Standards and Professional Accountability

All reports and deliverables shall meet the highest standards of professional quality appropriate for use in project appraisal and loan negotiation processes. Technical reports shall present clear and logical analysis supported by appropriate data, calculations, and references to recognized standards or methodologies. Design reports and drawings shall be internally consistent, properly coordinated across disciplines, and free from errors or ambiguities that could lead to misinterpretation during the subsequent works procurement and construction phases. Economic analyses shall employ internationally accepted methodologies and shall clearly document all assumptions, data sources, and

calculation procedures to facilitate independent verification. The Consultant shall implement appropriate quality assurance procedures including independent technical checking of calculations and drawings, peer review of reports by senior staff not directly involved in preparation of the work, and editorial review to ensure clarity and correctness of written communication. The Consultant remains professionally liable for the technical accuracy and quality of all deliverables regardless of any review or acceptance by the Client.

6.2 Feasibility Study and Preliminary Engineering Design Reporting Requirements

The Consultant shall prepare and submit the reports and deliverables specified in Table 5.2A during Feasibility Study and Preliminary Engineering Design Study period. Each deliverable shall be prepared in accordance with the general requirements established in Section 5.1 of this Terms of Reference and the specific requirements detailed in the table below. All reports shall be prepared in English on International A4 size paper. All original drawings shall be prepared on International A1 size sheets with A3 size reproductions provided for distribution. Unless otherwise specified in the table, the Consultant shall submit two hard copies and two soft copies of each deliverable. Soft copies shall be provided on USB flash drives in both portable document format and editable native file formats as specified in Section 6.7 of this Terms of Reference. Draft deliverables shall be clearly marked as "DRAFT" on the cover and footer of each page. Final deliverables shall be clearly marked as "FINAL" with the final submission date indicated on the cover page.

Table 6.2: Feasibility Study and Preliminary Engineering Design Reporting Requirements

Report No.	Report Type	Description	Format and Copies	Delivery Timeline
ADMINISTRATIVE REPORTS				
R1	Inception Report	This report shall summarize the Consultant's understanding of the assignment objectives and scope, present the proposed methodology and approach for conducting the feasibility studies and preliminary engineering design, provide a detailed work plan with activity schedules and milestones, present the deployment schedule for Key Experts showing when each expert will be mobilized, identify any issues or constraints that may affect the assignment, and propose solutions for addressing identified constraints.	2 hard copies + 2 soft copies (USB) in PDF and MS Word formats	Within 14 days of commencement of services
R2.1	First Stakeholder Consultation Workshop Report	This report shall document the proceedings of the first stakeholder consultation workshop held during the early stages of the assignment. The report shall include the date and venue of the workshop, list of participants, agenda and program, summary of presentations made by the Consultant, record of questions and comments raised by stakeholders, the Consultant's responses to stakeholder input, photographic documentation, and recommendations for incorporating stakeholder feedback into the design work. The workshop shall accommodate approximately fifty participants from national government agencies, county government, local communities, and civil society organizations.	2 hard copies + 2 soft copies (USB) in PDF and MS Word formats	Within 2 weeks following the first stakeholder workshop, approximately 2 months after commencement

Report No.	Report Type	Description	Format and Copies	Delivery Timeline
R2.2	Second Stakeholder Consultation Workshop Report	This report shall document the proceedings of the second stakeholder consultation workshop held during the latter part of the assignment to present draft preliminary design findings. The report shall include the same content elements as the first workshop report with particular emphasis on stakeholder feedback regarding the proposed alignment, typical cross-sections, major structures, land acquisition requirements, and project cost estimates. The workshop shall accommodate approximately fifty participants from national government agencies, county government, local communities, and civil society organizations.	2 hard copies + 2 soft copies (USB) in PDF and MS Word formats	Within 2 weeks following the second stakeholder workshop, approximately 7 months after commencement
TECHNICAL STUDY REPORTS				
R3	Aerial Survey Products Report	This report shall present all deliverables from the aerial photography or LIDAR survey conducted for the project including digital orthophotographs, Digital Terrain Model, topographical contour maps at one-meter vertical intervals, LIDAR point clouds if applicable, metadata documentation, and ground control survey report.	2 hard copies + 2 complete sets of digital spatial data on USB drives in GeoTIFF, LAS, GDB and SHP formats	3 months after commencement of services
R4	GIS Database and Comprehensive User Guide	The GIS database shall compile all spatial data collected and generated during the assignment into a comprehensive geodatabase with standardized data layers, metadata, and documentation enabling future users to access and utilize the data effectively. The GIS Database shall	2 hard copies of User Guide + 2 complete GIS database packages on USB drives	4 months after commencement of services (concurrent with R4 Preliminary Concept Design approval)

Report No.	Report Type	Description	Format and Copies	Delivery Timeline
		be instrumental in supporting land acquisition planning, Design-Build handover, and project monitoring.		
R5	Preliminary Concept Design Report	This report serves as the critical phase gate deliverable at Month 4. It shall present the recommended alignment, typical cross-sections, preliminary pavement design, major drainage and structural requirements, preliminary cost estimates, and economic indicators. Kenya National Highways Authority approval of this report is required before proceeding with detailed design development.	4 hard copies + 4 soft copies (USB) in PDF and MS Word formats	3.5 months (submission), 4 months (approval meeting)
DRAFT FINAL DELIVERABLES (Month 6)				
R6	Draft Final Preliminary Engineering Design Report	Consolidated report comprising: • Draft Engineering Design Report; • Draft Materials Investigation Report; • Draft Geotechnical Investigation Report; • Draft Hydrological and Drainage Report; • Draft Traffic Survey and Forecasting Report; • Draft Structural Design Report; • Draft Fibre Optic Feasibility Study and Design Report; • Draft Economic Feasibility Study Report; • Draft Road Safety Audit Report;	2 hard copies + 2 soft copies (USB) in PDF and native formats	6 months after commencement

Report No.	Report Type	Description	Format and Copies	Delivery Timeline
		• Draft Land Acquisition Plans; • Draft Engineer's Cost Estimates (confidential); • Draft Employer's Requirements and Bidding documents; • Draft Bills of Quantities; • Draft Book of Drawings.		
FINAL DELIVERABLES (Month 8)				
R7	Final Engineering Design Report	Final versions of all components listed above incorporating the Client's comments, plus Computer Output of All Setting Out Data.	10 hard copies + 10 soft copies (USB) in PDF and native formats	8 months after commencement

Note to Consultants:

The submission of the Preliminary Concept Design at Month 4, as well as the Draft Final Deliverables at Month 6 are critical milestone in the Feasibility Study and Preliminary Engineering Design period. The Client shall review all draft submissions and provide consolidated comments to the Consultant within two/three weeks of receipt. The Consultant shall revise all draft deliverables to address the Client's comments and shall submit Final Deliverables at Month 8. The final deliverables shall incorporate all agreed revisions and shall be of sufficient quality and completeness to support development partner appraisal of the project and subsequent loan negotiations.

6.3 Reporting Schedule

The reporting schedule for the consulting assignment is presented in Table 6.3 covering the eight-month Feasibility Study and Preliminary Engineering Design period. The timelines specified in Table 6.3 are measured from the effective date of commencement of services as defined in the Contract. The Consultant shall adhere to the reporting schedule and shall notify KeNHA immediately if any circumstances arise that may cause delay in submission of scheduled deliverables.

Table 6.3: Reporting Schedule (Feasibility Study and Preliminary Engineering Design)

Report No.	Report Type	Timeline After Commencement
R1	Inception Report	14 days (0.5 months)
R2.1	First Stakeholder Consultation Workshop Report	2 months
R3	Aerial Survey Products Report	3 months
R4	Preliminary Concept Design Report - Submission	3.5 months
	Preliminary Concept Design Report - Approval Meeting	4 months
R5	GIS Database and Comprehensive User Guide	4 months
R6	Draft Final Preliminary Engineering Report	6 months
	Client Review Period	Weeks 24-27 (3 weeks)
R2.2	Second Stakeholder Consultation Workshop Report	7 months
R21-R35	Final Preliminary Engineering Report	8 months

6.4 Cost of Production

The Consultant shall bear all costs of report production, printing, reproduction, courier services, and submission. These costs are included in Contract price and no separate payment shall be made. The Consultant shall provide satisfactory explanation for any delayed submissions beyond specified timeframes and shall implement remedial measures to address delays.

6.5 Return of Documents, Soft Copies and Software to the Client

Upon completion of the consulting assignment or upon termination of the Contract for any reason, the Consultant shall return to the Client all documents, data, reports, drawings, photographs, survey records, laboratory test results, computer files, and any other materials obtained from the Client or generated during the course of the assignment. This requirement applies to both hard copy materials and digital materials in the possession of the Consultant.

The Consultant shall deliver to the Client all original drawings prepared during the assignment including all A1 size original sheets in transparent material suitable for archival storage and subsequent reproduction. The Consultant shall deliver all field survey records including field survey books, level

books, survey computation sheets, and cadastral survey records in their original form as well as in scanned digital format. The Consultant shall deliver all laboratory test records including laboratory registers, test certificates, and raw data sheets documenting all materials testing and geotechnical investigations conducted for the project. The Consultant shall deliver all photographic records including digital image files organized and formatted as specified in Section 6.7 of this Terms of Reference.

The Consultant shall deliver to the Client all computer files and digital data generated during the assignment in native file formats as specified in Section 6.7 of this Terms of Reference as well as in portable document format. The Consultant shall deliver all specialized software, models, or analytical tools developed specifically for this assignment to the Client along with comprehensive user documentation enabling Client staff to operate the software or tools effectively. If proprietary third-party software was used during the assignment, the Consultant shall provide the Client with information regarding licensing requirements and sources for obtaining the software should the Client wish to acquire it for future use. However, the Consultant is not required to transfer licenses for commercial software packages to the Client.

The Consultant shall prepare and deliver to the Client a comprehensive inventory documenting all materials, documents, and digital files being returned. The inventory shall organize materials by category and shall provide sufficient description to enable the Client to locate and identify specific items within the delivered materials. The inventory shall clearly identify the storage location of all digital files using the folder structure and file naming conventions specified in Section 6.7 of this Terms of Reference.

All materials returned to the Client shall become the permanent property of the Client. The Consultant shall not retain copies of any confidential documents including cost estimates, commercially sensitive information, or materials marked as confidential by the Client. The Consultant may retain one archival copy of non-confidential technical reports and drawings for the Consultant's own records and for use in demonstrating experience and qualifications on future assignments. However, the Consultant shall not disclose or disseminate any project information or documentation to third parties without prior written authorization from the Client.

The return of documents and materials shall occur within two weeks following completion of Phase 2 services or within two weeks following termination of the Contract if termination occurs prior to completion. The Consultant shall coordinate with the Client regarding logistics for physical transfer of materials and shall obtain written acknowledgment from the Client confirming receipt of all returned materials.

6.6 Native File Formats and Digital Deliverables

All deliverables submitted in soft copy format shall be provided in both portable document format for viewing and distribution and in editable native file formats to enable the Client to modify or update documents and data as necessary for future project requirements. The native file formats shall be compatible with industry standard software packages commonly used by engineering organizations in Kenya and internationally. The Consultant shall ensure that all native file submissions preserve complete functionality including formulas, cell references, drawing layers, embedded graphics, and all other elements necessary for effective use and modification of the files by the Client.

Written reports including all technical reports, feasibility studies, and narrative documentation shall be provided in Microsoft Word format or equivalent word processing format that fully preserves all formatting, styles, tables, embedded graphics, headers, footers, and table of contents with active

hyperlinks. Report files shall be organized with appropriate use of styles and heading levels to facilitate navigation and subsequent editing. Large reports may be organized into multiple files by chapter or section to improve file manageability, with a master document provided that links all component files.

Spreadsheets including cost estimates, Bills of Quantities, traffic analysis worksheets, economic evaluation calculations, and HDM-4 input data shall be provided in Microsoft Excel format with all formulas and cell references intact to enable the Client to update input parameters or modify calculations. Spreadsheet files shall include clear labelling of all worksheets, appropriate use of cell formatting to distinguish input cells from calculated cells, and documentation either in separate worksheets or in cell comments explaining the purpose and methodology of complex calculations. Workbooks shall be organized logically with related worksheets grouped together and a contents or index worksheet provided for complex workbooks containing numerous worksheets.

Engineering drawings shall be provided in AutoCAD DWG format compatible with AutoCAD 2018 or later versions, or equivalent CAD format that preserves all layers, dimensions, annotations, hatching, line types, blocks, external references, and drawing properties. Drawing files shall be organized using a consistent layer naming convention with separate layers used for different element types such as centreline alignment, contours, structures, utilities, text annotations, and dimensions. All text within drawings shall use standard AutoCAD fonts or commonly available TrueType fonts to ensure proper display on systems that may not have specialized font libraries. Drawing templates, title blocks, and standard details shall be provided as separate reference files to enable the Client to use these standards for future drawing production.

The GIS geodatabase shall be provided in ESRI file geodatabase format compatible with ArcGIS 10.6 or later versions as well as in shapefile format for broader compatibility with other GIS software packages. The geodatabase shall include complete metadata complying with ISO 19115 standards and shall preserve all relationship classes, topology rules, domains, subtypes, and other advanced geodatabase functionality. Attribute tables shall use clear field names with appropriate field types and lengths. A data dictionary shall be provided documenting all feature classes, fields, domains, and coded values used within the geodatabase.

Economic analysis files shall include the complete Highway Development and Management Model Version 4 files with all input files, calibration parameters, traffic data, road network data, vehicle fleet data, economic parameters, and analysis scenarios preserved to enable the Client to run the model independently and conduct additional sensitivity analyses or scenario testing. All HDM-4 files shall be organized in a logical folder structure with clear naming conventions. A readme file shall be provided documenting the HDM-4 model structure and explaining how to execute the model runs.

Presentation materials including those prepared for stakeholder consultation workshops, concept design approval meetings, and final preliminary engineering design approval meetings shall be provided in Microsoft PowerPoint format or equivalent presentation software format that preserves all slide layouts, animations, embedded graphics, and multimedia elements. Presentation files shall be provided along with all linked or embedded media files to ensure presentations can be displayed correctly on systems other than the Consultant's computers.

Photographic records shall be provided as high resolution digital image files in JPEG format organized in folders by location, date, or subject matter as appropriate. Each photograph shall be accompanied by metadata either embedded in the image file or provided in a separate index file documenting the date, location, description of subject matter, and photographer. Photographs of critical technical features such as foundation conditions, materials sources, or existing structures shall be clearly labelled to facilitate future reference.

All digital deliverables shall be organized using a logical folder structure with clear folder names and consistent file naming conventions that enable the Client to locate specific files efficiently. A master index or readme file shall be provided at the root level of each USB drive or storage medium documenting the folder structure and describing the contents of major folders. File names shall be descriptive and shall avoid use of special characters that may cause compatibility issues across different operating systems. Version control shall be maintained for documents that undergo multiple revisions, with file names or folder organization clearly indicating draft versus final versions and the date or version number of each iteration.

The Consultant shall test all digital deliverables prior to submission to verify that files open correctly, that all links and references function properly, that formulas calculate correctly, and that no data corruption has occurred during file preparation or copying to storage media. The Client reserves the right to reject digital submissions that contain corrupted files, broken links, missing components, or files that cannot be opened using standard software packages, and to require resubmission of corrected digital deliverables at no additional cost.

6.7 Lateness in Reporting

Where a report required under any section of these Terms of Reference is delayed beyond the stipulated time for submission, the consultant shall provide to the Client an explanation satisfactory to the Client for the delay in submission and the remedial measures to be undertaken

6.8 Logistics and Timing

6.8.1 Project Contract period:

The Contract period for the Feasibility Study and Preliminary Engineering Design services shall be eight (8) months from the effective date of commencement of services.

7 DATA SERVICES, PERSONNEL, AND FACILITIES TO BE PROVIDED BY THE CLIENT

7.1 Documents and Data

The Client shall make available all relevant documents and data in possession of Kenya National Highways Authority or other government agencies including existing engineering studies, feasibility reports, and preliminary designs for project corridor; road condition surveys and pavement assessments; historical traffic count data; geotechnical investigation reports and materials testing results; previous environmental and social assessment documentation; land records and cadastral information; utility infrastructure records; and relevant county government development plans.

The Consultant shall review all Client-provided information and shall be responsible for verification, analysis, and professional interpretation. The Client makes no representation regarding completeness or accuracy of provided information. Where existing data are inadequate, the Consultant shall conduct additional surveys and investigations as specified in Section 4.

7.2 Services and Assistance

The Client shall provide liaison and coordination support with government ministries, departments, agencies, and county governments. The Client shall facilitate permits, approvals, and clearances from regulatory authorities including National Environment Management Authority, National Land Commission, utility companies, and county governments.

The Client shall assist obtaining customs and tax exemptions for Consultant's imported equipment and materials in accordance with Government of Kenya policy for donor-financed projects. The Client shall support obtaining work permits and entry visas for expatriate staff.

The Client shall facilitate security arrangements and coordination with relevant authorities where security considerations apply. The Client shall organize coordination meetings and provide meeting facilities as necessary. The Client shall facilitate arrangements for Consultant office space or provide compensation as specified in Contract.

7.3 Correspondence and Communication

All formal correspondence regarding the consulting assignment shall be addressed to the Director, Highway Design and Survey, Kenya National Highways Authority, who serves as Client's Representative for contract administration and has authority to issue instructions, approve deliverables, and make decisions within Contract scope.

The Consultant shall maintain professional communication protocols and respond to Client correspondence within reasonable timeframes appropriate to matter urgency. For urgent technical matters requiring immediate attention, the Consultant shall establish direct communication with Client's Project Technical Team as specified in Section 9.

All correspondence shall be documented and filed systematically by both parties. Electronic communication may be used for routine coordination subject to written confirmation for matters requiring formal record.

8 COST OF THE ASSIGNMENT

Shortlisted Consultants shall be required to prepare Financial Proposals costing the assignment activities under remuneration and reimbursable costs as guided within the Request for Proposal Document.

9 OVERSIGHT RESPONSIBILITY REPORTING

The Employer for the design contract will be the Director General, Kenya National Highways Authority (KeNHA). The Consultant will be reporting to the Director, Highway Design and Survey, Kenya National Highways Authority (KeNHA).

10 TRAINING AND CAPACITY BUILDING

10.1 Training Objectives

Capacity building through structured training is important secondary objective complementing primary technical consulting services. Training aims to enhance technical capabilities of Kenya National Highways Authority and Kenya Urban Roads Authority staff in highway design, project development, and Design-Build procurement. Training enables Client staff to better manage future design assignments, review consultant deliverables with enhanced technical understanding, and contribute more effectively to project development activities.

Training focuses on practical knowledge transfer through active participation in assignment activities rather than classroom instruction. Trainees work alongside Consultant key staff observing professional practices, participating in technical tasks under supervision, and gradually assuming greater responsibility as competence develops. This on-the-job training approach ensures knowledge transfer is grounded in real project experience rather than abstract theory.

10.2 Training Participants

The Client shall nominate up to three trainee engineers and up to three trainee technicians or inspectors to participate in assignment as counterpart staff receiving structured training. Nominees should be permanent Kenya National Highways Authority, Kenya Rural Roads Authority or Kenya Urban Roads Authority staff with relevant educational background and potential for career development in highway design and project management. Trainee engineers should have university degree in civil engineering and up to five years professional experience. Trainee technicians should have diploma in civil engineering technology and relevant field experience.

Trainees are assigned to work with Consultant team during Phase 1 participating in design activities and gaining exposure to professional practices. Trainee deployment schedule is coordinated with Consultant work program ensuring trainees participate when meaningful learning opportunities are available. Trainees are not merely observers but active participants in technical work under Consultant supervision. Training participation should not interfere with trainees' primary responsibilities to Client and deployment schedule accommodates Client operational requirements.

The Client remains responsible for all trainee emoluments including salaries, allowances, and benefits. The Consultant provides training supervision and technical guidance but does not provide financial compensation to trainees. Trainees remain Client staff throughout training period subject to Client personnel policies and administrative procedures.

10.3 Training Program Content

Training program covers multiple technical areas corresponding to major assignment components. Specific training content is tailored to individual trainee background and learning objectives but typically includes survey operations and data processing for highway projects, traffic surveys and forecasting methodologies, geotechnical investigation and materials testing, highway geometric design using modern design software, pavement structural design and materials selection, bridge and drainage structure design, economic evaluation using HDM-4 methodology, environmental and social considerations in highway design, Design-Build procurement and Employer's Requirements development, project management and quality assurance practices, and technical report preparation and presentation.

Training delivery emphasizes learning by doing. Trainees are assigned specific tasks under Consultant supervision with progressive increase in task complexity and responsibility as competence develops. Tasks might include survey data processing and quality checking, materials testing in laboratory and reporting of results, traffic count data analysis and preparation of traffic summary tables, geometric design of road sections using design software, preparation of drawing sections under supervision, quantity calculations from drawings, preparation of sections of technical reports, and review and checking of technical work. All trainee work products are reviewed by Consultant key staff with feedback provided on quality and areas for improvement.

In addition to hands-on technical work, trainees observe and participate in professional activities including coordination meetings with Client and other consultants, stakeholder consultation forums, technical presentations and workshops, and review and quality control processes. This exposure to professional practice complements technical skill development with understanding of project management, client relations, and teamwork requirements.

10.4 Training Supervision and Evaluation

The Team Leader designates senior key staff member as Training Coordinator responsible for training program implementation and trainee supervision. Training Coordinator develops individual training plans for each trainee based on background and learning objectives, assigns trainees to appropriate key staff for technical supervision, monitors training progress and trainee performance, provides feedback and coaching to trainees, and prepares training progress reports for Client.

Individual training plans document training objectives, technical areas to be covered, specific tasks and activities assigned, schedule and duration of training assignments, and evaluation criteria for assessing learning outcomes. Training plans are developed in consultation with trainees and Client's Representative ensuring alignment with Client capacity building priorities and trainee career development goals. Training plans are reviewed and updated quarterly based on progress and evolving learning needs.

Training progress is documented in monthly progress reports submitted to Client including summary of training activities during reporting period, description of tasks and responsibilities assigned to each trainee, assessment of trainee performance and learning progress, any issues or constraints affecting training effectiveness, and planned training activities for following month. This regular reporting enables Client to monitor training program and provide input on training priorities.

At assignment completion, the Consultant prepares comprehensive training completion report for each trainee documenting training duration and level of effort, technical areas covered with specific skills and knowledge gained, tasks and responsibilities successfully completed, assessment of competencies achieved, and recommendations for continued professional development. Training completion report serves as permanent record of training received and can support trainee career progression within Client organization.

10.5 Training Facilities and Resources

The Consultant shall provide trainees with access to necessary facilities and resources for effective learning. Trainees are accommodated in Consultant project office with desk space and computer access. Trainees have access to Consultant technical library including design standards, reference manuals, and technical publications. Trainees are provided with copies of relevant training materials including design guidelines, calculation examples, and procedure documents.

Trainees use Consultant software under supervision for design tasks and analysis including highway design software such as Civil 3D, economic analysis software including HDM-4, geotechnical analysis software, structural design software, and standard office software including Microsoft Office suite. Software use is supervised ensuring trainees learn proper application while protecting data security and quality control.

The Consultant provides reasonable safety equipment and protective gear for trainees participating in field activities including survey operations and site investigations. The Consultant ensures trainees receive appropriate safety briefing before field deployment and are supervised by experienced staff during field activities. The Consultant maintains appropriate insurance coverage for trainees participating in assignment activities.