# Terms of Reference

## Measurement of new roads data in the field

(Contract Ref. number: XK-KCA-340446-CS-CQS)

## Background

The Government of Kosovo (GoK) has received a Credit from the World Bank Group's International Development Association (IDA) in the amount of EUR 14.60 million to finance the Real Estate Cadaster & Geospatial Infrastructure Project (REGIP), which is expected to be implemented within a five-year period. REGIP aims to assist the GoK to increase the transparency and quality of land administration and geospatial data and services. The Kosovo Cadastral Agency (KCA) is the implementing agency for REGIP, under which a Project Implementation Units (PIU) has been established. The PIU will be responsible for day-to-day project implementation and for providing specific technical oversight to project activities. The PIU is responsible for all fiduciary aspects, such as procurement, financial management, monitoring and evaluation, and safeguards under REGIP.

The Components of the project are Component A - Policy, Legal and Institutional Support; Component B - Cadastre Modernization; Component C - ICT and Geospatial Infrastructure and Component D - Project Management, Capacity Building, Public Outreach, and Monitoring & Evaluation.

Component C (ICT and Geospatial Infrastructure) has the objective of supporting the implementation of the Information Technology Strategy of the KCA, where main activity in the component is finalisation of Address System. The component also will invest in the further development of the Kosovo Cadastral Land Information System with a Service Oriented Architecture (KCLIS-SOA) to support the simplification of business processes, implementation of legal changes and institutional reform during the project period, development of electronic services, greater interoperability with other government systems and registers through e-Gateway , technical assistance for quality assurance, quality control and cyber security improvement, hardware supply and technical training.

The project of establishing the Address System started in 2010 and continues to be implemented now, initially supported by the EU Office in Kosovo and later by the Norwegian Cartography Authority (Statens Kartverk).

Activities carried out during this period (2010-2021) are:

- Preparation of the legal basis (Law on Address System, five Administrative Instructions and Address Manual),
- Capacity building at municipal and central level,
- Data collection and digitalization of Public Circulation Areas (PCAs), street, square, park, boulevard, etc.,

- Collecting and digitizing of buildings entrances data in the field (about 450,000 entries), development of the ARIS application for address maintenance,
- Street naming in 33 municipalities,
- Signalization with road name signs in 31 municipalities,
- Signalization with entrance number signs in 12 municipalities,
- Sharing of address data to 16 local and international institutions such as TomTom and OpenStreetMap,

As a very important process of the Address System is the completion of digital address registry through updating the address data in the field, including the street centerlines. This process is important for the Address Registry, in order to digitize the address data such as street names and address points.

**Objectives**

The overall objective of the project is to collect the data in the field for new roads currently missing in the Address register (ARIS), with measurements using satellite receiver. It is assumed that the data will be collected by driving the relevant roads, with a receiver mounted to the car

**Scope of the work**

The production of the road centerlines shall comprise (1) measuring and (2) generation of road centerlines for about 821 km of newly built roads in all municipalities in Kosovo, for KCA to add to and merge with the network of centerlines already registered in ARIS

The work consists of two activities:

| Activity 1 | Measurements of new road centerlines in the field | Approx. 821 km |
|---|---|---|
| Activity 2 | Generating continuous centerlines (PolyLines) from the data captured in the field and presenting the data as shape files per municipality | Approx. 821 km |

The KCA will merge the generated PolyLines with existing road centerline data contained in ARIS.
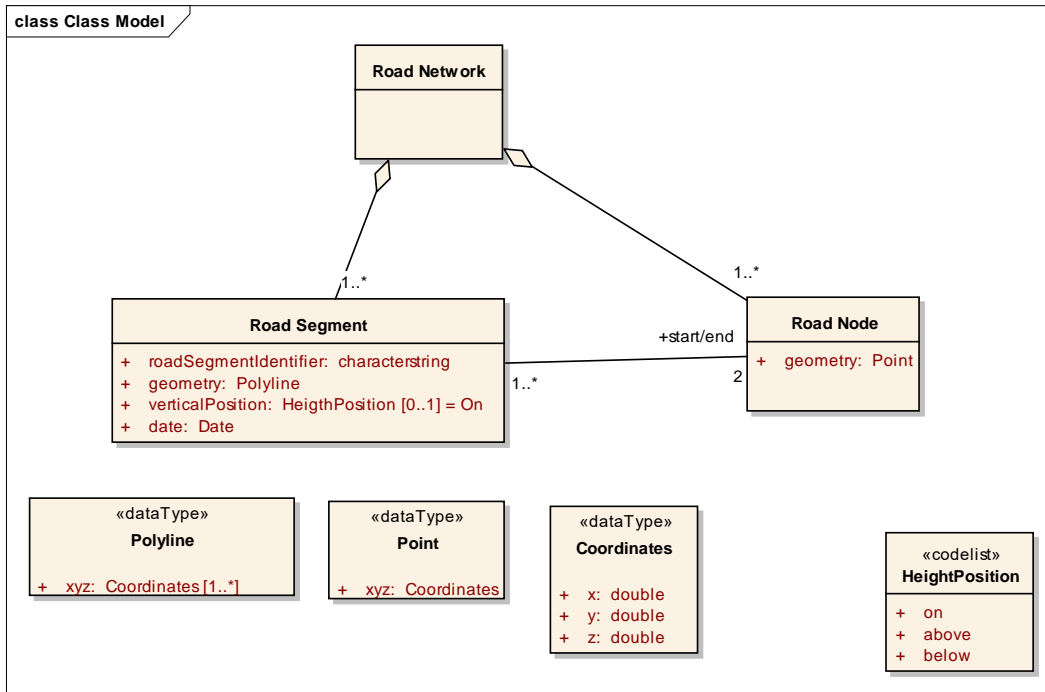
**Data model**



Figure 1. *Data Model*

**Specification of the Road Network centerlines be produced**

Overall requirements

The generated road centerlines (= a collection of Road Segments) shall be delivered as a node/edge structured data set. The Road Segments are represented with its centerlines as PolyLines, where first and last coordinates are the positions of the Road nodes. There shall always be a Road Node where a centreline of one road is crossing physically the centreline of another road. Accordingly, there will be no node where roads are crossing on different levels (for example bridge), and a roundabout will have several road nodes and small road segments. See figure.

Road Segments shall have a unique identifier.

Requirements:

1. Specifications:
    a. Centreline of roads (x,y,z ), i.e. it shall not be measured centerlies for  each lane

      i.   Datum/coordinate system: Kosovaref01

   b.  Crossing with another road or end of road shall be identified by a node

   c.  Arc/node topology

   d.  Road Segments shall be represented with its centerline as a PolyLine where first and last coordinates are the position of the Road nodes

   e.  No attributes shall be recorded, except for:

      i.   Road Segment Identifier

         1.  Each segment shall have a unique identifier

      ii.  Height Position, i.e. position of point for z values,

         1.  On the ground

         2.  In the air, i.e. bridges = mandatory when the road is crossing another road

         3.  Below the terrain surface, i.e. tunnel = mandatory

     iii.  Date= optional (fixed date for the whole production of road network)

   f.  Centerlines shall be produced for roads longer than 50 meters as recorded by sketches in ARIS

2.  Production method

   a.  Measurement of points in the field representing centerlines of new roads using satellite receiver

   b. Generation of PolyLines and delivery of shape files per municipality

3.  Positional accuracy of centerlines:

   a.  Positional accuracy and elevation accuracy shall be better than +- 1 meter. The mean square error should be less than one meter observed as the difference between the generated centerline and the true centerline at any point of any line

   b.  There shall be no gross errors

4.  Data provided by KCA to the contractor:

   a.  KCA will provide the data set of existing road centerlines and sketches of the roads where centerlines are missing in ARIS.
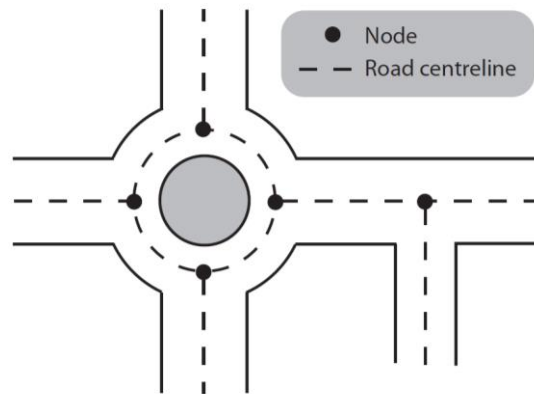
Figure 2. *Position of centerlines and nodes*

## Implementation arrangements

1. KCA will ensure the needed data to be used as reference data for the process of measurement and generation of the new centerlines
2. The data that KCA will provide for the process are:
   - Road centerlines for roads already registered in ARIS;
   - Road sketches for roads not yet registered in ARIS (sketches that municipalities have digitized end recorded in ARIS)
3. The new data will be measured based on the road sketches having in consideration the road centerlines;
4. In some few cases Municipalities have already measured and registered centerlines along with sketches. These centerlines shall not be measured, and is shall not be generated new centerlines
5. The measured data should go through the process of generating PolyLines:
   - Height reduction (Ellipsoid - Orthometric)
   - Generation of measured road centerline points as a Polyline with nodes.
   - The data delivered to KCA shall be in the format, Line shape File. Data shall be delivered to KCA as a file per municipality

The consulting company shall document and report their procedure for executed quality control before delivery to KCA

## Duration of the assignment

It is assumed that the duration of this assignment which include all the specified tasks will be finished during three (3) month-period of time. This period of time includes all activities from collecting information until delivery the final deliverables.

The consulting company must demonstrate capacity to make a realistic implementation plan. The offer must therefore contain an implementation plan with timeline.

## Deliverables

The consulting company will be required to provide these key deliverables:

| | Main Activities and Deliverables | Length of centerlines to be produced | Deadline |
|---|---|---|---|
| Activity 1 | Measurements of new road centerlines in the field | Approx. 821 km | Week 10 |
| Activity 2 | Generating continuous centerlines (PolyLines) from the data captured in the field and presenting the data as shape files per municipality | Approx. 821 km | Week 12 |

## Acceptance Criteria

A deliverable will be accepted by KCA if:
- It satisfies the scope of the work described in these Terms of Reference and contains the content described in the Deliverables section of this document; and
- KCA signs the Acceptance Document (Acceptance Form available at KCA).

The payment will be done after the work is completed and accepted by KCA through Acceptance Form.

## Minimum Required Qualifications

The consulting company must provide evidence that during the last three years until the announcement of the contract, has successfully completed at least three projects with geodetic measurements.

## Qualification requirements for Staff

- The Consulting company must have 1 project manager graduated in related fields, with 2 years of work experience.
- The Bidder must have 2 graduate Bsc. in geodesy with 1 years of work Experience in surveying;

  Evidence: Diplomas, CV and references that show the experience

## Qualification requirements for technical capacities

The Consulting Company must have technical capacities (two GPS, Computers, GIS software). Must provide evidence that at the time of presenting the offer has the required technical capacities for surveying and generating centerlines.

## Selection Process

The consulting company will be selected based on work experiences in the fields of geodesy and geographic information systems (GIS), including geodetic measurements using satellite receivers.

"Experienced and qualified Consultants will be selected under the provisions of the World Bank's Procurement Regulations for Investment Project Financing (IPF) Borrowers, July 2016, based on the selection method for Consultants Qualification Selection (CQS), (Open Competitive Consultants Qualification Selection)".

## Reporting

The company will work closely with the Project Manager appointed from KCA. Written reports and deliveries will be provided in agreed formats on dates as may be mutually agreed during the inception meeting.