



AFCAP



**Preparation of a Route Selection Manual for the
Ethiopian Roads Authority
AFCAP/ETH/005/V**

FINAL REPORT

URS Infrastructure & Environment UK Limited

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URS

This project was funded by the Africa Community Access Programme (AFCAP) which promotes safe and sustainable access to markets, healthcare, education, employment and social and political networks for rural communities in Africa.

Launched in June 2008 and managed by Crown Agents, the five year-long, UK government (DFID) funded project, supports research and knowledge sharing between participating countries to enhance the uptake of low cost, proven solutions for rural access that maximise the use of local resources.

The programme is currently active in Ethiopia, Kenya, Ghana, Malawi, Mozambique, Tanzania, Zambia, South Africa, Democratic Republic of Congo and South Sudan and is developing relationships with a number of other countries and regional organisations across Africa.

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TABLE OF CONTENTS

| | | |
|-------|--|---|
| 1 | INTRODUCTION | 1 |
| 1.1 | Background | 1 |
| 1.2 | Purpose and Scope of Project | 1 |
| 1.3 | Structure of Report | 1 |
| | | |
| 2. | PROJECT IMPLEMENTATION | 2 |
| 2.1 | Introduction | 2 |
| 2.2 | Team Composition | 2 |
| 2.3 | Implementation Design | 2 |
| 2.4 | Meetings between the Consultant, ERA and Stakeholders | 3 |
| 2.4.1 | Inception Meeting | 3 |
| 2.4.2 | Technical Working Group (TWG) | 3 |
| 2.5 | Interface with ERA | 7 |
| 2.6 | Programme | 8 |
| | | |
| 3. | THE ROUTE SELECTION MANUAL | 8 |
| 3.1 | Introduction | 8 |
| 3.2 | Has the Manual Satisfied the Intended Scope and Content? | 8 |
| 3.3 | How does the Manual Fit with other ERA Documentation and Previous Working Practices? | 9 |

1. INTRODUCTION

1.1 Background

This report summarises the activities undertaken on AFCAP Project AFCAP/ETH/005/V *Preparation of a Route Selection Manual for the Ethiopian Roads Authority*. The contract was signed between Crown Agents and URS on 15 March 2012 and is completed upon the submission of this report.

With road construction taking place rapidly in Ethiopia and with the provision of road access featuring high in future development planning in the country, the need for such a manual was recognised by the Ethiopian Roads Authority (ERA) and it was requested that it form part of the sequence of manuals updated under AFCAP.

1.2 Purpose and Scope of Project

This report summarises the work undertaken to develop the Route Selection Manual. As indicated above, the preparation of a Route Selection Manual forms part of the sequence of ERA manuals and is the first time such a manual has been prepared in Ethiopia. In fact, the Consultant was unable to find any examples outside Ethiopia where a similarly scoped document has been prepared. Consequently, this manual will not only be important for future practice in Ethiopia, but may well be of interest to other road authorities, both in Africa and elsewhere.

1.3 Structure of Report

This Report contains summary description of the following:

- Project Implementation
 - Introduction
 - Team Composition
 - Implementation Design
 - Meetings between the Consultant, ERA and Stakeholders
 - Interface with ERA
 - Programme

- The Route Selection Manual
 - Introduction
 - Has the Manual Satisfied the Intended Scope and Content?
 - How does the Manual Fit with Other ERA Documents and Previous Working Practices?

2. PROJECT IMPLEMENTATION

2.1 Introduction

The approach adopted in the compilation of the manual was designed to engage with local consultants and to seek discussion and comments from as wide a stakeholder audience as possible in Ethiopia. The programme identified in the Terms of Reference to complete the exercise was very short (the original intention was to complete the manual within 8 months) and, although the actual programme was a little over 11 months, this would not have been achieved without the commitment of ERA to ensure smooth interaction with stakeholders and to assist in logistical arrangements.

2.2 Team Composition

The Consultant team comprised the following personnel:

Dr Gareth Hearn – Team leader and Principal Editor

Tim Hunt – Assistant Editor and Civil/Geotechnical Engineer

Steve Crudge – Transport Economist

Alexander Wilson – Highway Engineer

Amanuel Abreham – Highway Engineer and Local Project Co-ordinator

Dr Fekerte Arega Yitagesu – Engineering Geologist

Geoff Pettifer – Engineering Geologist

Peter Mansell – Hydrologist/Drainage Engineer

Sintayehu Argaw – Hydrologist/Drainage Engineer

Mekuria Tassew – Environmentalist

Tesera Zelalem – Environmentalist

James Mitchell – Satellite Imagery Specialist

Bob Weekes – Peer Reviewer

Tsige Tegegn – Administrator, Addis Ababa

In forming this team the intention was to maximise the contribution of local specialists. One point to note is that the original ToR understandably did not require the need for specialist contributions from a satellite remote sensing specialist. In the event this was needed because of the extent to which satellite data is used in Ethiopia for preliminary ground modelling.

The ERA Counterpart Engineer, responsible for all interface with stakeholders and logistical support for Technical Working Groups was Mr Frew Bekele.

2.3 Implementation Design

The implementation of the project was designed around the need to maximise the interface between the Consultant, ERA and relevant stakeholders, and to use illustrations taken from Ethiopian practice wherever possible. In addition a system of text production was required

that enabled specialist authors to prepare draft text that was then reviewed by sub-authors, modified accordingly, and then forwarded to the editorial team for review.

One of the first stages in the programme was to prepare an Execution Plan for use by the author team that described the current situation with regard to route selection in Ethiopia, the various factors that applied and the resulting requirements of the manual. In addition, copies of the existing ERA manuals, and other relevant documents were distributed to the author team and reviewed in terms of their coverage and content. The Geometric Design Manual, the Site Investigation Manual and the Environmental and Social Management Manual were among the most relevant in this regard.

The actual task schedule is given in Figure 1 at the end of this report.

2.4 Meetings between the Consultant, ERA and Stakeholders

2.4.1 Inception Meeting

An Inception Meeting was held with ERA and AFCAP in ERA central office, Addis Ababa on 22 March 2012. At this meeting the scope of the manual was discussed, its interface with other manuals was confirmed and the possible range of members for the Technical Working Group (see below) was reviewed. ERA confirmed that the manual should be an over-arching document, drawing upon the content and guidelines of the other ERA manuals.

2.4.2 Technical Working Group (TWG)

The Technical Working Group was devised as the principal means of stakeholder consultation. The composition of the TWG was discussed during the Inception Meeting and then finalised by ERA. The TWG comprised practitioners in the public sector, private sector and University sector, each with a key role to play in route selection. The TWG comprised a range of contributors including practicing design and maintenance engineers on the one hand to senior technical managers within the Geological Survey of Ethiopia and the Geology and Earth Science departments of Addis Ababa University. Other important regulatory and public sector bodies represented included the Environmental Protection Authority (EPA) and the Ethiopian Mapping Agency (EMA). Table 1 lists the various affiliations that were represented.

Four TWG meetings were held:

- TWG1 - 2 May 2012 in the Dreamliner Hotel, Addis Ababa
- TWG2 - 18-21 June 2012 in Arba Minch, Southern Ethiopia
- TWG3 - 24 August 2012 in ERA Central Office, Addis Ababa
- TWG4 - 9 October 2012 in the Dreamliner Hotel, Addis Ababa

The format of each TWG normally comprised a presentation by the Consultant on proposals and progress, together with issues and questions to be raised and discussed. During the

presentations the TWG members were invited to contribute and this was followed by a discussion period afterwards. The main points arising from each TWG, along with a copy of the presentation, were circulated to AFCAP, ERA and the TWG for comment.

Table 1 List of TWG Members

| Name | Name of Organization | Position |
|--------------------|------------------------|--------------------------------|
| Bakele Jebessa | ETHIO Infra | General Manager |
| Teshome Worku | CORE Con.eng | Director General Manager |
| Amanuel Haddush | CORE Con.eng | Highway Engineer |
| Taruk K.Raghoranri | AAU | Assistant Professor |
| Alemayehu Ayele | ERA | Director Road & Design |
| Rob Geddes | AFCAP | Technical Manager |
| Gareth Hearn | URS | Team Leader |
| Tim Hunt | URS | Geotechnical Engineer |
| Amanuel Abreham | URS | Highway Engineer |
| Getnet Mewa | GSE | Deputy Head |
| Mulugeta Demissie | ERA | Highway Engineer |
| Frew Bekele | ERA | Project Engineer |
| Abdu Mohammad | ERA | Deputy Direct General |
| Gezahegne G.M | EMA | Head of Research & Development |
| Daniel Nebso | DNH Engineer | General Manager |
| Dessalegn Bezabih | SC/USA | Technical Advisor |
| Andualam H/georgis | STADIA Engineering plc | Highway Engineer |
| Muse Belew | ERA | DB Director |
| Dr Fererte Arega | URS | Engineering Geologist |
| Dr Manaye Ewunetu | ME Consulting | Drainage Specialist |
| Dr Alemgena Alene | ERA | Technical Advisor |
| Les Sampson | Sampson Consulting | |
| Nebil Hassen | ERA | |
| Steve Crudge | URS | Transport Economist |
| Alexander Wilson | URS | Highway Engineer |
| Kibrom W/Gebrial | ERA | Project Engineer |
| Mekonnen Shibus | TCDSCO | Resident Engineer |
| Hussen Felk | TCDSCO | A/Resident Engineer |
| Dr RK Verma | AMU | Associate professor |
| Addisu Chubaro | AMU | |
| Mohammed Abdureham | ERA | P/Director |
| Getinet Asefaw | A.A.U | Engineering Geologist |
| Dawit Dejene | Freelancer | Drainage Engineer |
| Guelie Guie | AMU | V/P/R/C/S |

| | | |
|-------------------|-----|-------------------|
| Bishal Nathupreti | AMU | Professor Geology |
| Zelalem Tesera | EPA | Environmentalist |
| Samson Tesfaye | ERA | Team leader |

TWG1

TWG 1 presented the concept of the Route Selection Manual. It commenced with an Introduction by Rob Geddes to AFCAP and the ERA Manuals and followed with a review of the issues that relate to route selection in Ethiopia, outlined the scope of the manual and explained the purpose of the TWGs. It also introduced the Consultant team and the manner in which information would be exchanged and discussed. The project programme, including the main project milestones, was also described.

The meeting yielded some useful feedback in terms of which issues TWG members considered to be the more important, and where they suggested focus was given. A lot of the discussion in this and other TWG meetings related to geometric design and points of detail regarding highway design and traffic safety. While this was very relevant, members were advised that a wider view had to be taken by the manual in terms of route selection rather than just simply design. An initial draft contents for the manual was presented and discussed.

It was recommended by the TWG that the Manual attempt to deliver the following:

- a) a flow chart of activity that relates to route corridor selection and differentiates between new road construction and road realignments undertaken for road improvements
- b) an indication as to the type and depth of studies that should be undertaken for route corridor selection according to road category
- c) recommendations on the weightings to be applied to various factors in the multi-criteria analysis.

Nineteen TWG members took part in TWG1, along with administrators from the Consultant and Crown Agents.

TWG2

TWG2 took place in Arba Minch and comprised a two-day meeting that involved a visit to the Wozeka – Gato road on 19 June and a full day of workshop discussion at the University on 20 June. The field visit was accompanied by ERA staff involved in the road construction project and some extremely useful site discussion took place. The main issue related to the selection of the alignment in ground significantly affected by landslides and the various merits of possible alternatives. The field visit was accompanied by Professor B Upreti (visiting Professor at Arba Minch University-AMU). Professor Upreti had assisted the Consultant in organising the field trip along with his colleagues at the University and this assistance is gratefully acknowledged.

On 20 June Ato Abdo Mohammed, Deputy Director General Engineering Operations, ERA opened the workshop and this was followed by a discussion of the previous day's field visit

and more detailed issues concerning the Route Selection Manual. A presentation was given by the Consultant's specialists on the various subject and chapter headings and outline content of the manual. Each outline chapter was discussed in turn with TWG members offering suggestions for points of inclusion. One of the first issues for clarification was the differentiation between corridor selection and route selection. Further discussion took place concerning the use of multi-criteria analysis and the derivation of factor weightings for it. A draft factor weighting schedule was tabled by the Consultant for discussion.

Thirty TWG members took part in the meeting.



TWG2 Field discussions and workshop

TWG3

TWG3 took place in ERA's central office and involved the Consultant and senior staff from ERA. The revised contents list for the Route Selection Manual was presented and discussed, along with a rapid review of the draft text itself. Among the points to arise from this meeting was the need to ensure that environmental and geotechnical factors were given prominence in the discussion. The point was reiterated that the manual should be a step-by-step guide with maximum use of flow charts.

TWG4

Prior to TWG4 the draft Route Selection Manual had been issued via ERA to all stakeholders in order to give them time to review it before it was discussed at the meeting. The meeting commenced with a presentation by the Consultant describing chapter by chapter how previous comments from the TWG had been incorporated into the text. This was followed by a discussion by TWG members on specific aspects of the text, referring to sections and figures.

Nineteen TWG members took part in the meeting.

Conclusions Regarding the TWG Meetings

The TWG meetings provided a very useful forum for gauging practitioner views on the content and scope of the manual as well as some very useful points of detail. One noticeable aspect was the widely differing views on which issues were more important than others, with

some members focusing on geometric constraints and others pursuing issues of mapping and satellite imagery. What was most obvious from all of the meetings was the level of importance that all members held in the development of the manual and how it should encompass all relevant issues relating to engineering and the environment.

The final 'Working Draft' of the Route Selection Manual includes, wherever collective opinion considered it appropriate, as many of the issues raised at the TWG meetings as possible. In some cases, however, these have been omitted because they were not consistent with the level of detail in the manual, or they were considered to be too site-specific to apply. Some of these comments were also more relevant to other ERA manuals, such as the Geometric design Manual, for example.

For future exercises such as this, it is recommended that the TWG approach be followed, as it is a very effective way of gaining comment and opinion. The experience from the Route Selection Manuals is that the discussions are quite open and frank, and this is precisely what is required. If the TWG process for this project is to be criticised in any way, it is probably the fact that there may have been insufficient time given to members to digest detail before being asked to discuss it. This was a function of the short time scale given to develop the manual and the fact that large amounts of material were presented during TWGs, having only been prepared a few days before by the Consultant.

2.5 Interface with ERA

This worked very well, at all levels and ERA staff were particularly helpful in ensuring that the project ran smoothly from their side. The Consultant also visited the Kombolcha District Office of ERA on 27 June 2012 to discuss route selection issues. Comments raised are summarised below:

- The District office does not get involved in corridor or route selection
- Landslides are a major issue affecting roads in the District
- Road alignments suffer from tight geometry and poor sight distances
- There is often insufficient cross-drainage
- The lag time between design and construction can be problematic in terms of traffic forecasts
- There is a lack of bus stands and stations in urban areas
- There is a lack of truck parking facilities in urban areas, leading to double parking and traffic hazards to pedestrians
- There is a lack of facilities for the disabled.

While all of these points appear quite valid, they have little to do with route selection, and this perhaps sums up the situation. There may be a general lack of awareness in ERA, especially at District level, as to the issues involved in route selection for new road construction.

Following the visit to Kombolcha it was decided not to pursue this line of enquiry. Other meetings had been organised on the same visit, but these did not take place, and it was concluded that this was not an efficient use of the Consultant's time.

2.6 Programme

The final programme of activities is shown in Figure 1. There has been approximately three months of overrun in the production of the final draft compared to the original ToR programme of eight months. The process of producing internal drafts, internal peer reviews and editorial reviews has been more or less adhered to, though it is probably fair to say that a significantly longer period of time has been spent by the editors in developing the final document than originally envisaged. Although some of this time was spent on formatting, much of it was related to the need to gain consistency between chapters, harmonise writing styles and expand on some of the technical details.

3. THE ROUTE SELECTION MANUAL

3.1 Introduction

Following discussion with the Technical Officer, the Route Selection Manual was issued in early January 2013 as a 'Working Draft'. The reason for this is that, while the document is final as a contract deliverable, it is the first time that such a document has been circulated for use in Ethiopia, and there will need to be a period during which its use can be assessed. Some elements of the manual are, to an extent, experimental, especially with respect to the recommended environmental assessment methodology and the weighting of factors included in the Multi-Criteria Analysis. In addition, some practitioners may find that the level of detail provided is not enough in some respects and there may be a need to strengthen certain areas. By issuing the document as a working draft it also gives practitioners the sense that their use and feed-back are valued for further strengthening of the document. It is recommended that a two-year period is allowed for before this feedback is compiled and the contents reviewed and updated.

3.2 Has the Manual Satisfied the Intended Scope and Content?

The stated project outcome in the ToR is as follows:

The outcome of the project will be more efficient selection of road alignments, lower construction costs, fewer negative environmental impacts and increased benefits to rural communities in Ethiopia.

It cannot be guaranteed of course that the Route Selection Manual will automatically lead to these savings, reduced impacts and increased benefits. However, it does cover all of these aspects and does provide advice as to how to investigate and assess each of them. The main issue to be borne in mind is the fact that the manual can be prescriptive only to a certain extent, i.e. it cannot cater for every situation and it requires a degree of lateral thinking and interpretation on the part of the practitioner. There may be situations, for example, where the Multi-Criteria Analysis ratings need to be modified to suit certain

circumstances. The manual allows for this, but it will be up to the practitioner to allocate and justify these ratings. Furthermore, while some aspects of route comparison are quite straightforward, such as route length and cost, others are less so, such as social impact categories and these still require the application of judgement, supported by as much quantified and factual data as possible.

Whether or not a 'step-by-step' guide has been created in this manual will need to be seen in the fullness of time; but this requirement has been borne in mind by all authors and editors in the course of its preparation.

3.3 How does the Manual Fit with other ERA Documentation and Previous Working Practices?

The structure of the manual, including the discussion relating to sequencing of project activities, is largely consistent with current practice in Ethiopia as reflected in other ERA manuals. However, in reading through the majority of these it is apparent that there are some inconsistencies, and clearly there are cases where a different approach to project cycle procurement has been adopted, depending, for example, on project funding and implementation. Generally, route selection is treated as a first stage feasibility exercise, whereby route options are identified and then compared in a sufficient level of detail to enable a viable and preferred route to be selected. The preliminary design of this selected route would be the following stage, along with more detailed costs estimates and more detailed economic analysis.

With respect to other manuals, an attempt has been made to minimise overlap, although it is inevitable that there will be some. Cross-referencing has been maximised, and all detailed technical content that is not the prime focus of the thread of discussion of the manual has been placed in appendices.

The tendency in Ethiopia at the present time is for there to be too much 'design' included in route selection. Furthermore, ERA should take the lead role in confirming the corridor in which route options are then identified by consultants and in providing access to the necessary information (including relevant satellite imagery) that consultants will need to select the preferred route. This may require a more pro-active role in corridor selection and data provision than ERA is perhaps currently carrying out.

To conclude, the general impression during TWG4 was that most, if not all, members felt satisfied that the draft manual suited their requirements. The proof of this will be in its take-up and feed-back.

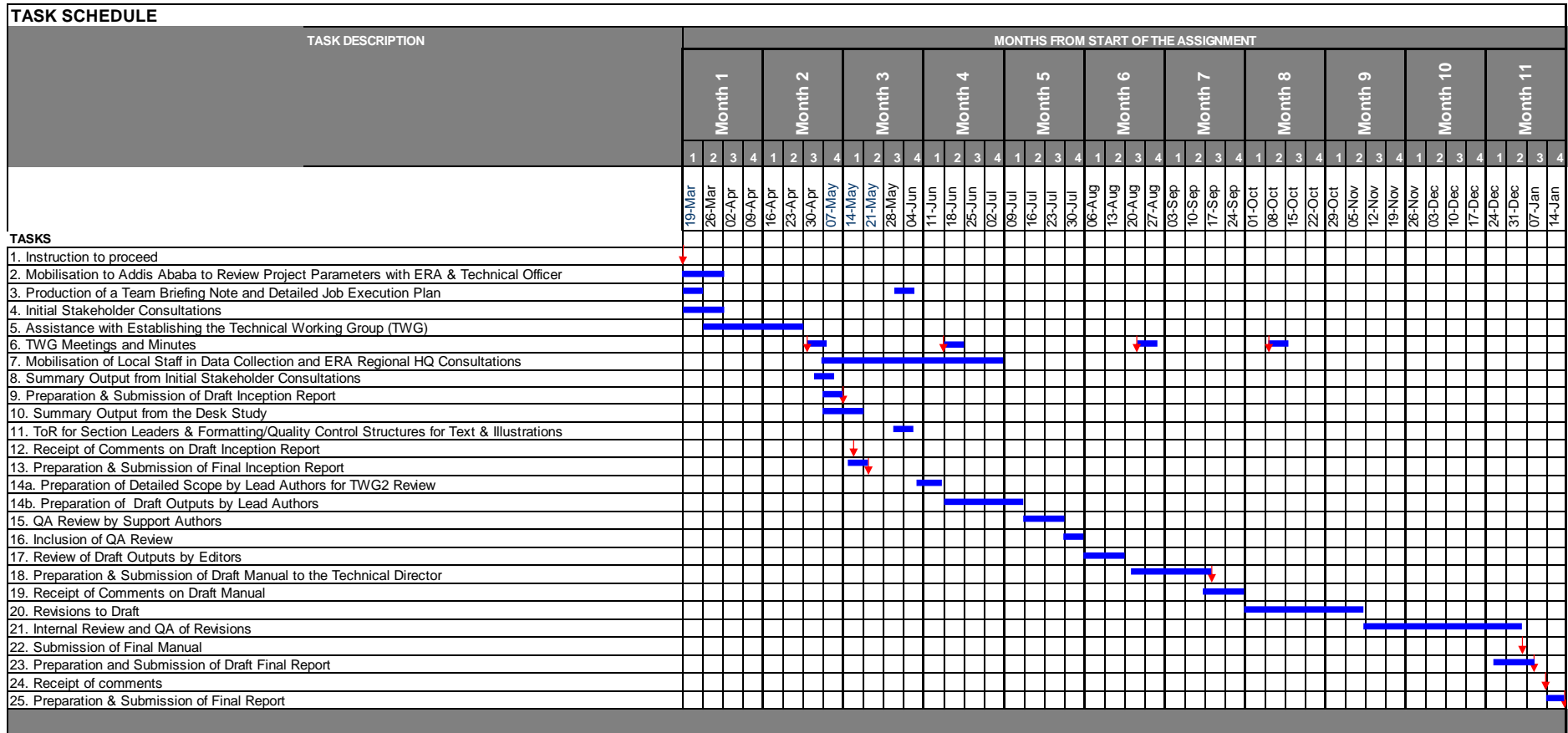


Figure 1 Task Schedule