



**Training Services on the Use of the DCP Pavement  
Design Method for Low Volume Sealed Roads in Kenya  
Ref: AFCAP/KEN/112/A**



Republic of Kenya

## Inception Report

**Prepared for:**

Crown Agents for Overseas  
Governments and Administrations  
St. Nicholas House, St. Nicholas Road  
Sutton, Surrey  
SMI IEL  
United Kingdom

**Prepared by:**

IT Transport Ltd  
The Old Power Station  
Ardington, Nr. Wantage  
Oxfordshire  
OX12 8QJ  
United Kingdom

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This project is 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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For further information visit

The Kenya Rural Roads Authority's (KeRRA) Road Research Strategic Plan includes a strong component for the training of personnel at various levels in the use of the DCP Pavement Design Method for low volume sealed roads (LVSRs). Such training is aimed at consolidating the capacity building efforts that were initiated under the initial stages of the project and will enable wider uptake and application of this innovative design methodology for cost-effective provision of LVSRs in Kenya.

An application-oriented training approach is proposed in which reference materials will be prepared for each training session with clearly defined topics, objectives and learning outcomes.

The categories of staff being trained, about 80 in all, include:

- Senior Management – 10 No.
- Project Management – 10 No
- Designers/Practitioners – 30 No.
- Technicians – 30 No.

The training programme will allow the staff to become fully conversant with both the theoretical and practical aspects of the DCP design method in a manner that is relevant to the substantive jobs held by the staff.

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# 1. INTRODUCTION

## 1.1 Background

The Government of Kenya commits significant funding for the improvement of road infrastructure in the country, particularly in rural areas where a substantial proportion of the population live and work. It is therefore important that such funding is utilized efficiently and effectively by all roads agencies so as to maximize its contribution to national economic growth and development and poverty alleviation.

One of the major challenges faced by the various Roads Authorities in the country, such as the Kenya Rural Roads Authority (KeRRA), is the management of a large network of unpaved roads which has become increasingly difficult to sustain in that they:

- Impose a logistical, technical and financial burden on most road agencies due to constraints on physical, human, financial and natural resources.
- Require the continuous use of a non-renewable resource (gravel) which is being seriously depleted in many countries and, in the process, is causing serious environmental problems.

As a result of the above, the many rural communities cannot be provided with reliable access, especially during the rainy season when the roads become impassable to motorized traffic.

In keeping with the Ministry of Transport and Infrastructure's (MoTI's) goal of improving access to rural communities, plans are afoot through the Roads 2000 Programme to upgrade a substantial proportion of the rural road network that is of earth/gravel standard to an all-weather bitumen standard. However, the cost of doing so following traditional standards and specifications is prohibitive. Fortunately, research carried out in the region has resulted in the development of more appropriate, innovative design methods and materials specifications that significantly reduce the cost of road provision and upkeep.

One approach which provides the potential for cost-effectively upgrading unpaved roads to a paved standard in a manner not possible with the more traditional approaches is by the adoption of a regionally research-based pavement design method using the portable Dynamic Cone Penetrometer (DCP). This method lends itself ideally to evaluating in situ road conditions and, by integrating the design strength profile optimally with the in situ strength profile, to designing light road pavement structures, in a highly cost-effective manner. This approach allows maximum use to be made of the natural gravels in the unpaved road and, as a result, construction costs be reduced significantly thereby enabling the sealing of gravel roads to be economically justified in terms of life cycle costs often at traffic levels of less than 100 vehicles per day (vpd).

Fortunately, as part of KeRRA's Road Research Strategic Plan, provision has been made for the training of personnel at various levels in the use of the DCP Pavement Design Method. Such training is aimed at consolidating the capacity building efforts that were initiated under the initial stages of the project and will enable wider uptake and application of this innovative design methodology for cost-effective provision of LVSRs in Kenya.

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## 1.2 Objective and Scope of Training Programme

The main objective of the training programme, as stated in the Terms of reference (ToR) is: *“To provide training to personnel at various levels in the relevant government institutions and agencies, academia, and private sector on the use of the DCP Pavement Design Guide to enable wider application of this innovative design methodology for cost-effective provision of low volume sealed roads in Kenya”.*

This training will be carried out across different staff categories and levels as follows:

- Senior Management
- Project Management
- Designers/Practitioners
- Technicians

The target organizations are to include:

- KeRRA
- KeNHA
- KURA
- MTRD
- KRB
- KIBIT
- Consultants working with above agencies.

## 1.3 General Approach

The general approach to undertaking the DCP training as inferred from the ToR is presented in Table 1 below which shows the grouping of the main tasks to be undertaken by the consultants in order to achieve the programme outcomes.

**Table 1: Matrix of activities identified from the TOR**

1	Preliminary Training Issues	2	Preparation for Training	3	Execution of Training	4	Review and Evaluation of Training
1.1	Hold meetings with stakeholders	2.1	Procure DCP equipment	3.1	Undertake field training	4.1	Produce training report
1.2	Determine training categories & numbers	2.2	Develop training methodology	3.2	Undertake classroom training	4.2	Carry out assessment of training courses
1.3	Prepare training programme	2.3	Prepare training material/modules				
1.4	Select training site						
1.5	Produce Inception Rpt						

## 1.4 Objective of Report

The main objective of this Inception Report is to provide feedback to stakeholders on the outcome of the activities undertaken so far on Phase 1 of the project (Activities 1.1 to 1.4 in Table 1) and to indicate the way forward for the remaining phases of the project, particularly as regards any changes in approach compared with that indicated in the consultant’s technical proposal.

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## **2. PRELIMINARY TRAINING ISSUES**

### **2.1 Meetings with Stakeholders**

An inaugural visit was made by the consultants, together with the AFCAP project coordinator (Eng. N. Leta), from Tuesday 27<sup>th</sup> to Friday 30<sup>th</sup> August, 2013. The main objectives of this visit were to sensitize all stakeholders to the details of the training programme and to seek their agreement on the way forward to undertaking all the supporting activities required to achieve the envisaged outcomes of the project.

During the visit, meetings were held separately with key representatives of the following organizations:

- KeRRA
- KeNHA
- KURA
- MTRD
- KRB

A wrap-up meeting was also held with representatives of the above organizations on Friday 30<sup>th</sup> August, 2013, to summarize the outcome of the agreements reached with stakeholders during the visit and to confirm the way forward for undertaking the training. The outcome of the various stakeholder meetings is summarized below whilst the persons who participated in the stakeholder meetings are presented in Annex A:

#### **2.1.1 Summary of discussions with stakeholders**

The subject matter discussed at the meetings with the various stakeholders was very similar and the views expressed were also quite similar as summarized below:

- All stakeholders expressed keen interest in the DCP training programme and see the need for cost effective designs for low volume roads (LVRs) in pursuit of the Ministry of Transport and Roads' goal of upgrading large portions of the existing network of earth and gravel roads to a paved standard.
- KeNHA and KURA have extensive networks of LVRs and would both benefit from an appropriate design approach.
- KeRRA and KURA do not currently have budgets available other than for salaries. This could adversely affect their ability to send participants to the training programme.
- Ongoing discussions regarding the devolution under the new constitution need to be resolved and budgets made available to KeRRA and KURA before the start of the training courses.
- KeNHA is not affected by budget constraints in the same way as KeRRA and KURA and will have funds available for sending participants to the training programme.
- KRB was optimistic that the budget constraint situation would be resolved in time for the training programme which is proposed to commence.

- MTRD will determine at the appropriate time the categories of personnel who will participate in the training programme, and the respective numbers.

## 2.2 Training Categories and Numbers

The staff categories and number of staff to be trained to various competency levels as agreed with stakeholders is presented in Table 2 below.

**Table 2 – Training levels and staff categories**

Training Level	Staff Category	No. of Staff	Competency Level
1	Senior managerial - Director General - General managers Project managerial - Regional managers	10  10	- General knowledge of design principles and methods. Some practical exposure on site. -Reasonably conversant with design principles and methods. Limited practical exercise in field survey, data analysis and project design.
2	Designers/ Practitioners*	30	- Fully conversant with design principles and methods. - Full practical exercise in detailed field survey, data analysis and project design.
3	Technicians	30	General knowledge of design principles and methods. Ability to carry outfield survey (under supervision); use DCP software including data entry.; carry out materials sampling and laboratory testing and compile reports.
Total		80	

\* Future trainers will be selected from this group

The indicative breakdown of staff categories amongst the various road sector organizations was discussed and agreed with stakeholders at the wrap-up meeting held on 30<sup>th</sup> August, 2013, and is presented in Table 3 below:

**Table 3 – Training categories by organization and by number**

Organization	Training categories by numbers		
	Senior/project Managers	Designers/Practitioners	Technicians
KeRRA	5	6	8
KeNHA	3	6	4
KURA	3	6	4
MTRD	2	4	5
KRB	1	-	-
KIBIT	1	2	3
Consultants	5	6	6
Total	20	30	30

## 2.3 Training Schedule and Programme

Based on discussions with stakeholders during the wrap-up meeting held on Friday 30<sup>th</sup> August, 2013, the proposed training programme is shown in Figure 1 and is self-explanatory.





## 2.4 Selection of Training Site

During the inaugural visit to Kenya, the consultants held discussions with KeRRA regarding the choice of an appropriate site for undertaking the field training. The criteria that guided the selection of the site included a broad range of factors which would allow comprehensive field training related to the data required for undertaking a comprehensive LVR design based on the DCP design method. These factors included:

- Soil Conditions
- Volume of Traffic
- Load of Traffic
- Drainage

Based on the above approach, and following site visits to a number of potential sites, Road E1641 in Kirinyaga Region has been selected for the practical field training (see Figure 1 below). The road is scheduled to be upgraded to Low Volume Sealed Road standard under the GoK/AfD Roads 2000 Programme in Central Province (see photographs below).

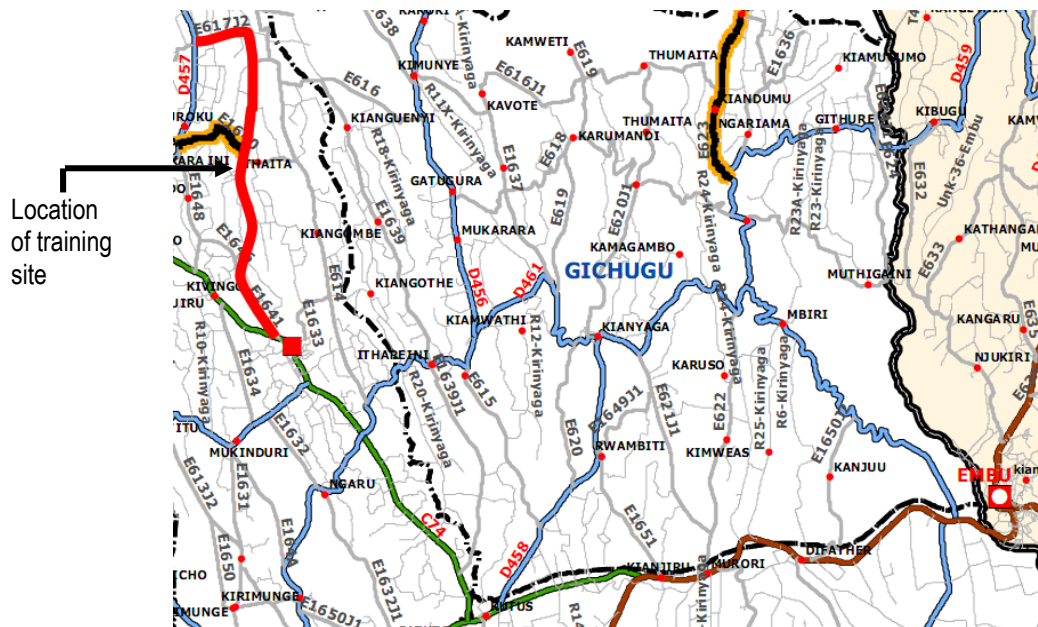


Figure 2 – Location of Road E1641 in Kirinyaga Region



Photo 1: The start of E1641 at Kirugoya



Photo 2: Relatively narrow section of road

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### 3. PREPARATION FOR TRAINING

#### 3.1 DCP Procurement

The consultants have initiated the procurement of the DCP equipment and accessories including cones and an extruder. It is anticipated that this equipment will be delivered before the commencement of the field training which is expected to commence in the third week of October, 2013. However, should this target date not be met by the supplier, then recourse will be made to the use of DCPs procured previously for another AFCAP project in Kenya.

#### 3.2 Training Methodology

An application-oriented training approach will be adopted with clearly defined topics, objectives and learning outcomes that are relevant to the substantive jobs held by the staff. This approach will allow the trainees to actually undertake DCP data collection in the field and to subsequently use this data in the classroom to design a LVR pavement based on the DCP methodology and, also, to assess the suitability of the borrow pit materials for incorporation in the road pavement by undertaking or witnessing, as appropriate, laboratory DCP-DN measurements. Thus, the training methodology has been devised in such a manner that the field, classroom and laboratory training will be complementary to each other in a mutually reinforcing way.

#### 3.3 Training Materials and Modules

The AFCAP DCP Design Manual will provide the necessary reference materials for each training session. This manual provides an in-depth explanation of the underlying development of the DCP design method, as well as a fully illustrated step-by-step guide to the design of LVR pavements based on this method.

The development of the training modules is currently under development by the consultants. Each training module will focus on a specific aspect of the overall programme with a specific learning outcome. Table 4 provides an indication of the format that will be followed on a typical day of the programme.

**Table 4 – Proposed typical format for presenting training modules**

Day 1			
Time	Session No.	Module No./Title	Learning Outcome
08.30	1	1.1:	Outcome 1.1
10.00		1.2: Q & A Session	Outcome 1.2
	Coffee/Tea break		
10.30	2	2.1:	Outcome 1.1
12.00		2.2: Q & A Session	Outcome 1.2
	Lunch break		
13.00	3	3.1:	Outcome 1.1
14.30		3.2: Q & A Session	Outcome 1.2
	Coffee/Tea break		
15.00	4	4.1:	Outcome 1.1
16.30		4.2: Q & A Session	Outcome 1.2

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## **4. EXECUTION OF TRAINING**

### **4.1 Field Training**

The DCP data to be used in the classroom training module pertaining to the design of a LVR pavement will be collected by trainees during the field training exercise. The analysis of the DCP field data will determine whether and to what extent material must be imported for additional pavement layer(s). The likely source to be used is quarry waste from Sagana. It has been agreed with the Regional Manager for Kirinyaga that representative samples of this material will be collected and tested at the laboratory in Kirugoya to determine the Lab DN value which is needed for exercise on pavement design.

The timing and duration of the practical field training is indicated in figure 2 and is self – explanatory. In essence, this aspect of the training programme will commence on 21<sup>st</sup> October, 2013, with the designers, practitioners and technician categories. Each group will be trained on the demonstration road for a duration of one day during which they will be guided in the assembling of the DCP equipment and its correct use for recording the DCP measurements. This exercise will be repeated, but to a lesser depth, for the senior/project managers on the 29<sup>th</sup> October, 2013, and will be combined on the same day with the classroom training which will take place at the training venue (Izaak Walton Inn in Embu).

An important aspect of the field training will be for the trainees to actually collect the data that will be used in the classroom training module pertaining to the design of a LVR pavement.

### **4.2 Classroom Training**

The timing and duration of the classroom training is indicated in figure 2 and is self-explanatory. In essence, this aspect of the training programme will commence with the designers/practitioners category on 30<sup>th</sup> October, 2013, for a duration of 3 days. During this period, each group of 15 trainees (there will be two groups in all) will be exposed to the theoretical and practical aspects of DCP design including:

- DCP design principles
- Use of the Win DCP design software
- Data entry (using the data collected previously during the field training exercise)
- Data analysis
- Pavement design
- Materials selection – based on laboratory determination of DN values.

The above exercise will be repeated, but to a lesser depth, for the technicians over a 2-day period commencing on 7<sup>th</sup> November, 2013. The training focus for this category will be in DCP data entry into the WinDCP software (data collected previously from the fieldwork exercise) and materials testing related to the various DCP design parameters (DN determination at various densities and moisture contents).

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Sufficient time has been allowed during the classroom training for question and answer sessions so that a full understanding is obtained of all aspects of DCP pavement design.

The AFCAP DCP Design Manual will provide the necessary reference materials for each training session. This manual provides an in-depth explanation of the underlying development of the DCP design method, as well as a fully illustrated step-by-step guide to the design of LVR pavements based on this method.

The final output of the training programme will be the issuance of certificates of attendance and competency to those trainees who have successfully completed the programme.

## **5. REVIEW AND EVALUATION OF TRAINING**

### **5.1 Training Report**

This activity will consist of a detailed report of the achievements, challenges of the assignment and will provide recommendation for the future training as well as identifying potential candidates for the future trainers' course

### **5.2 Assessment of Training Programme**

At the end of the training programme, an assessment of the training courses will be carried out using the AFCAP training evaluation form which will be filled in by all the trainees.

## **6. WAY FORWARD**

### **6.1 Pre-training Action Issues**

In line with the training schedule and programme presented in Figure 2, and based on discussions held with stakeholders during the wrap-up meeting on 30<sup>th</sup> August, the following action items are highlighted for the parties indicated:

1. National coordination of the training programme will be provided by KeRRA (Eng. Korir).
2. The national coordinator will oversee the following:
  - a. The collection of the names of those trainees whose participation in the training programme has been confirmed by their respective organizations. **(Action: Eng. Korir).**
  - b. The confirmed list of trainees to be sent to the consultants by 30<sup>th</sup> September, 2013, as a basis for obtaining the DCP software license from the CSIR. There is a preference for those trainees who participated in the DCP sensitization workshop in November, 2012. **(Action: Eng. Korir).**

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- c. The consultants to alert CSIR to the list of trainees who will be requesting license codes to use the DCP software (this will be provided free of charge to all trainees). **(Action: Eng. M. Pinard on 1<sup>st</sup> October, 2013).**
  - d. Trainees to download the DCP software from the CSIR website ([WWW.CSIR.org](http://WWW.CSIR.org)) and to send an e-mail to CSIR ([rcastely@csir.co.za](mailto:rcastely@csir.co.za)) requesting the issuance of a license code for using the DCP software. **(Action: All trainees well before the start of the classroom training on 30<sup>th</sup> October, 2013).**
  - e. All trainees through their respective organizations will be responsible for covering the cost of their transport to site, accommodation and meals (except lunch) for the field and classroom training. **(Action: Eng. Korir to follow-up).**
  - f. The consultants to secure the training venue (Izaak Walton Inn in Embu) by making a down payment to the organization. **(Action: Eng. J. Hongve by 11<sup>th</sup> October, 2013)**
  - g. The consultants to be responsible for providing lunch for all trainees. **(Action: J. Hongve).**

## 6.2 Project Timeline

The key milestone dates for the remaining phases of the project are as follows:

- Training Modules: - 15<sup>th</sup> October, 2013.
- Delivery of Practical Training - 21<sup>st</sup> October, 2013.
- Delivery of Classroom Training – 29<sup>th</sup> October, 2013.
- Final Report – 13<sup>th</sup> December, 2013

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## **Annex A – Stakeholder Meetings**

### **Tuesday 27<sup>th</sup> August, 2013:**

#### **1. Meeting with keRRA**

Present: Eng. F. D. Karanga – KeRRA: General Manager – P & R2000  
Eng. A. Korir – KeRRA: manager - Planning  
Eng. N. Leta – AFCAP: Technical Services Manager  
Eng. M. Pinard - IT Transport (Consultants)  
Eng. J. Hongve - IT Transport (Consultants)

### **Wednesday 28<sup>th</sup> August, 2013:**

#### **1. Meeting with KeRRA**

Present: Eng. Mwangi Maingi – KeRRA: Director General  
Eng. F. D. Karanga – KeRRA: General Manager - P&R2000  
Eng. A. Korir – KeRRA: Manager - Planning  
Eng. N. Leta – AFCAP: Technical Services Manager  
Eng. M. Pinard - IT Transport (Consultants)  
Eng. J. Hongve - IT Transport (Consultants)

#### **2. Meeting with KeNHA**

Present: Eng. Ogage – KeNHA: GM Design and Construction  
Eng. Obou – Head of Design  
Eng. Korir – KeRRA: Manager - Planning  
Eng. N. Leta – AFCAP: Technical Services Manager  
Eng. M. Pinard – IT Transport (Consultants)  
Eng. J. Hongve - IT Transport (Consultants)

#### **3. Meeting with KRB**

Present: Eng. F. Nyangaga – KRB: Executive Director  
Eng. F. Ndinika – KRB: General Manager – Technical Compliance  
Eng. J. Ruwa – KRB: General Manager – Planning & Programming  
Eng. A. Korir – KeRRA: Manager - Planning  
Eng. N. Leta – AFCAP: Technical Services Manager  
Eng. M. Pinard – IT Transport (Consultants)  
Eng. J. Hongve - IT Transport (Consultants)

### **Thursday 29<sup>th</sup> August, 2013:**

#### **1. Meeting with KURA**

Present: Eng. J. N. Nkadayo – Director General/CEO  
Eng. J. M. Onyinkwa – KURA: Manager (D & C)  
Eng. W. R. Oginga – KURA: manager (D & C)  
Eng. P. M. Mundinia – KURA: Manager (M)  
Eng. P. Kamanele – KURA: Senior Engineer  
Eng. I. Mureithi – KURA: Senior Engineer

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Eng. V. N. Ntereng – KURA: Engineer  
Eng. K. Mutemi – KURA: Assistant Engineer  
Eng. T. Nyomboi – KURA:  
Eng. A. Korir – KeRRA: Manager - Planning  
Eng. N. Leta – AFCAP: Technical Services Manager  
Eng. M. Pinard – IT Transport (Consultants)  
Eng. J. Hongve - IT Transport (Consultants)

**Friday 30<sup>th</sup> August, 2013:**

**Wrap-Up Meeting at KeRRA Conference Room**

Eng. F. D. Karanga – KeRRA: General Manager – P & R2000  
Eng. A. Korir – KeRRA: Manager – Planning  
Eng. S. Mindiri – KURA  
Eng. J. M. Onyinkwa – KURA  
Eng. H. Gakuru – KeNHA  
Eng. E. Goss – RECO Central  
Etale Tunya - Max & Partners-R2000  
Eng. N. Leta – AFCAP: Technical Services Manager  
Eng. M. Pinard – IT Transport (Consultants)  
Eng. J. Hongve - IT Transport (Consultants)