

Capacity Building and Mentorship for the Establishment and Implementation of Monitoring & Evaluation Programmes on Experimental and Long-Term Pavement Performance (LTPP) Sections in Six African Countries and Myanmar

Field Visit Report No. 1 (Final)



Civil Design Solutions and IMC Worldwide

GEN2132A

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For further information, please contact: Francis Dangare, Francis.Dangare@imcworldwide.com

ReCAP Project Management Unit
 Cardno Emerging Market (UK) Ltd
 Level 5, Clarendon Business Centre
 42 Upper Berkeley Street, Marylebone
 London W1H 5QL, United Kingdom
 Email: recap@cardno.com



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Cover photo: Inspecting edge drop in Malawi

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Abstract

The Research for Community Access Partnership (ReCAP) is providing support to Road Research Centres (RRC) in sub-Saharan Africa and Asia to collect performance-based data from existing trial/demonstration road sections. The data will provide evidence for the establishment of appropriate specifications for Low Volume Roads. Monitoring is being carried out in accordance with existing guidelines for the establishment and monitoring of experimental and LTPP sections, which will be updated under the project.

The CDS advisory team visited Malawi, Kenya, Uganda and Ethiopia in May 2018 to meet the participating roads agency staff and the local consultants, visit a selection of roads earmarked for monitoring, and assess monitoring work already carried out. Discussions were held on the selection of monitoring sections, implementation of the monitoring protocols, the programme of monitoring activities, and the reporting requirements of the project.

A key objective of the project is to develop capacity within each RRC to independently manage the monitoring programme in the longer term. Local consulting firms are assisting the RRCs in the African countries with the field monitoring activities and to build capacity and interest in research in the local consulting industry.

Key words

Performance Monitoring, Low Volume Roads, Capacity Building

Acknowledgements

The authors would like to acknowledge the significant contribution of the partner roads agencies and the national consultants to ensuring the success of the initial visit to the participating countries.

Research for Community Access Partnership (ReCAP)

Safe and sustainable transport for rural communities

ReCAP is a research programme, funded by UK Aid, with the aim of promoting safe and sustainable transport for rural communities in Africa and Asia. ReCAP comprises the Africa Community Access Partnership (AfCAP) and the Asia Community Access Partnership (AsCAP). These partnerships support knowledge sharing between participating countries in order to enhance the uptake of low cost, proven solutions for rural access that maximise the use of local resources. The ReCAP programme is managed by Cardno Emerging Markets (UK) Ltd.

www.research4cap.org

Acronyms, Initialisms, Units and Currencies

| | |
|----------|-------------------------------------------------------------------|
| AA | Across Africa Consultants |
| AASHTO | American Association of State Highway Officials |
| ADB | Asian Development Bank |
| AE | Alert Engineering |
| AfCAP | Africa Community Access Partnership |
| AsCAP | Asia Community Access Partnership |
| BI | Bump Integrator |
| BS | British Standard |
| CDS | Civil Design Solutions |
| CMA | Cold Mix Asphalt |
| DCP | Dynamic Cone Penetrometer |
| DF | Drainage Factor |
| DFID | Department for International Development |
| DN | Depth of Penetration of the DCP (mm/blow) |
| DR Congo | Democratic Republic of Congo |
| DSD | Double Surface Dressing |
| ERA | Ethiopia Roads Authority |
| FNP | Francis Namonjeza and Partners |
| FWD | Falling Weight Deflectometer |
| GoE | Government of Ethiopia |
| GoK | Government of Kenya |
| GoM | Government of Malawi |
| GoU | Government of Uganda |
| GPS | Global Positioning System |
| IRIM | Inter-Regional Implementation Meeting |
| LTPP | Long-Term Pavement Performance |
| LVR | Low Volume Road |
| LVSR | Low Volume Sealed Road |
| MTRD | Materials Testing and Research Department |
| PLC | Private Limited Company |
| RA | Roads Authority (Malawi) |
| ReCAP | Research for Community Access Partnership |
| RRC | Road Research Centre |
| SANS | South Africa National Standards |
| TMH | Technical Methods for Highways |
| UNRA | Uganda National Roads Authority |
| UK | United Kingdom (of Great Britain and Northern Ireland) |
| UKAid | United Kingdom Aid (Department for International Development, UK) |

1 Introduction

1.1 Purpose of the Report

- This report covers the Field Visit No. 1 for the project for Capacity Building and Mentorship for the Establishment and Implementation of Monitoring and Evaluation Programmes on Experimental and Long-Term Pavement Performance (LTPP) Sections in Six African Countries and Myanmar. The report covers the visit of the CDS advisory team to Malawi, Kenya, Uganda and Ethiopia. This visit was carried out in accordance with the requirements of the contract. The initial visit formed part of the inception mission and the objectives were to: introduce the LTPP monitoring programme to the participating countries;
- present overall project approach and objectives including roles and responsibilities and lines of reporting;
- agree the overall programme of project activities and delivery dates;
- present the draft regional Monitoring Guidelines;
- carry out site visits to selected LTPP monitoring sections; and
- discuss technical and management matters and agree the programme for follow on work.

The initial visit to Myanmar is covered under a separate report¹.

1.2 Background

The Research for Community Access Partnership (ReCAP) is a six-year programme of applied research and knowledge dissemination funded by a grant from the UK Government through the Department for International Development (DFID). The overall aim of ReCAP is to promote safe and sustainable rural access in Africa and Asia through research and knowledge sharing between participating countries and the wider community.

ReCAP is providing support to various Road Research Centres to collect performance-based data from existing trial/demonstration road sections. This data is expected to provide evidence for the establishment of appropriate, cost-effective standards and specifications for Low Volume Roads. The road sections are being monitored and evaluated in terms of their performance related to pavement design, materials and surfacing, drainage design, geometric design and road safety, in accordance with existing guidelines for the establishment and monitoring of experimental and LTPP road sections.

Civil Design Solutions was contracted by Cardno to provide capacity building and mentorship support to the participating roads agencies and national consultants that have been engaged to collect data on the trial/demonstration road sections. Support will also be provided for the analysis of the data and reporting of the results.

The African countries that are participating in the project are Malawi, Kenya, Uganda, Ethiopia, South Sudan and DR Congo. Local consultants have been appointed in Malawi, Kenya and Ethiopia for the collection of data on the research sites as follows:

¹ Geddes, R.N, CDS (2018). Capacity Building and Mentorship for the Establishment and Implementation of Monitoring & Evaluation Programmes on Experimental and Long-Term Pavement Performance (LTPP) Sections in Six African Countries and Myanmar, Report on Initial Visit to Myanmar. GEN2132A. London: ReCAP for DFID.

- Malawi: FN & Partners;
- Kenya: Across Africa Consultants; and
- Ethiopia: Alert Engineering.

ReCAP has commenced the procurement of the monitoring consultant for Uganda. The consultant is expected to be appointed in August 2018.

1.3 Research objectives

The research objectives of the project include:

- Support the participating Road Research Centres with managing the establishment and implementation of monitoring programmes on selected road sections;
- Provide in-service training and mentorship to RRC personnel and local consulting firms conducting the monitoring of the trial sections;
- Support the RRCs with the analysis and reporting of data obtained from the sites;
- Further develop and customise existing regional guidelines for the establishment and monitoring of experimental and LTPP Sections to ensure harmonised implementation in the region and consistency of methodologies for collecting performance data to facilitate compatibility and comparability of data for analysis; and
- Recommend modifications to the existing design standards and specifications for Low Volume Roads (LVRs).

1.4 Methodology

1.4.1 Tasks of the Advisory Team

The tasks to be carried out by the CDS Advisory Team under the assignment are as follows:

1. Accompany the local consultants and RRC research teams on their visits to selected sites during the initial visit and subsequent rounds of monitoring. A total of five visits will be made to Malawi, Kenya, Uganda and Ethiopia and one visit to South Sudan. There will be no visits to DR Congo but DR Congo representatives will participate in project workshops and field visits.
2. Advise the RRCs and local consultants on tests and data collection to be carried out on the monitoring sections and a programme for the field surveys.
3. Assist the RRCs and local consultants to identify and prioritise new trial sections and to mark out the sections in accordance with the monitoring guidelines.
4. Identify and characterise the field equipment that is being used to assess the condition of the existing trial sections and recommend, where appropriate, additional equipment necessary for collection of performance data.
5. Review all data collected at the research sites, advise the local monitoring consultants and RRC research staff on the evaluation of the data, and check the output of the evaluation.
6. Assist the local monitoring consultants and RRC research teams to develop a format for reporting of the results of the monitoring based on the current regional guidelines.

7. Review the draft reports prepared by the local monitoring consultants and RRCs and ensure they meet the required standard.
8. Review and analyse all available national and international guidelines and protocols on the establishment and monitoring of trial sections and customise the standard regional protocols for specific investigations including structural design, materials usage, surfacing types, traffic loading, evaluation of gravel loss on unpaved roads, drainage effectiveness, societal impacts, etc.
9. Organise a 2-day regional stakeholder workshop in one of the participating countries to discuss the monitoring programme in each participating country. This workshop will be held at the end of the project. An initial project workshop which is expected to be held during the ReCAP Inter-Regional Implementation Meeting (IRIM) in early 2019.
10. Advise the RRCs on recommendations for modifications to the existing design standards and specifications for LVSRs based on the outcome of the evaluation of the monitoring.
11. Assist with the compilation of construction and maintenance costs to facilitate computation of life-cycle costs for the sections for comparison with existing gravel roads or upgrading to a surfaced standard using traditional standards and specifications generally applied to higher volume roads.

1.4.2 Reporting

A technical report is required following each in-country visit. It must include details of any training carried out. This Field Visit Report follows the Inception Report which was submitted in draft form on 22nd June 2018 and the final version on 17th July 2018.

Data collected on the monitoring sites and any analysis of the data is included in separate monitoring reports prepared by the local consultants. The monitoring reports will be reviewed by the RRCs and the CDS advisory team. CDS will prepare separate Monitoring Reports, which will include a review of the reports and data submitted by the local consultants.

Reporting on the Myanmar component of the project will be carried out separately from the reporting on the Africa component.

1.5 Field Visit No. 1

The Field Visit was carried out by the following CDS team members:

- Francis Dangare – Team Leader;
- Robert Geddes – Project Director; and
- Mike Pinard – Materials Expert.

The Team Leader visited Malawi, Kenya, Uganda and Ethiopia. The other team members visited only Malawi. It was intended that the Team Leader would visit South Sudan, but the South Sudan Roads Authority was unable to provide documentation in time for the Team Leader to obtain an entry visa.

The CDS team was accompanied by the ReCAP Technical Manager for East and Southern Africa on the Malawi and Kenya parts of the visit.

The activities carried out during the country visits and the principal findings are summarised in Chapters 2 to 5. The list of people met is included in Annex A.

2 Malawi Country Visit

2.1 Visit Programme

The Malawi visit was undertaken from the 29th of April to the 5th of May 2018. The itinerary for the visit is given in Table 1.

Table 1: Itinerary for Malawi Visit

| Sunday/Monday | 29/30 April | Arrival of CDS team in Lilongwe |
|---------------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Monday | 30 April | 14:00H: Kick-Off Meeting with Malawi Road Authority (RA) and FN & Partners (FNP) and arrangements for site visits. |
| Tuesday | 1 May | Public holiday Internal CDS team meeting |
| Wednesday | 2 May | Site Visit with RA and FN&Partners to T357 Parachute Battalion – Lifuwu Road. Mark out monitoring sections and commence data collection. Overnight Salima. |
| Thursday | 3 May | Continue site work at Salima. Proceed to Lilongwe via S134 Kasinje - Kandeu Road in Ntcheu District). |
| Friday | 4th May | 9am: Wrap Up meeting with RA and FNP. |
| Friday | 4th May | Departure of Project Director and Materials Expert. |
| Saturday | 5th May | Departure of Team Leader for Kenya |

2.2 Tasks Carried Out

2.2.1 Kick-off Meeting

The Kick-off Meeting was held at the RA offices in Lilongwe on 30th April. It was attended by the ReCAP Regional Technical Manager, RA staff, FN & Partners staff and the CDS team. The purpose of the meeting was to meet the project team, agree on the objectives of the project and the roles and responsibilities, and make plans for the site visits over the following two days. The local consultant, FN & Partners (FNP), had been appointed but had not yet carried out any monitoring activities. The following issues were discussed:

- Overall project approach and objectives;
- Roles and responsibilities of the RA, FNP and CDS;
- Lines of reporting;
- Overall programme of project activities and delivery dates for key outputs;
- Presentation of draft regional Monitoring Guidelines for LTPP and Experimental Sites (Mozambique version);
- Overview of Malawi research sites: location, date of construction and design standards adopted;
- The project research objectives;
- Arrangements for the site visits; and
- Availability of as-constructed information on the trial sections.

2.2.2 Site Visits

The first site visited was the T357 Parachute Battalion – Lifuwu Road near Salima. FNP had mobilised a team on site with all required equipment including Falling Weight Deflectometer (FWD), Bump Integrator (BI), tape measures, GPS, road marking paint, tools for digging, sand replacement test apparatus, nuclear gauge, etc. Two monitoring sections were identified, one with a Cold Mix Asphalt (CMA) surfacing and one with a Cape Seal surfacing. Both sections have a natural gravel base of laterite. The monitoring sections are adjacent to each other and on straight sections of road and with few existing defects.

Marking of the section on the CMA was carried out in accordance with the monitoring guidelines (Mozambique version) and training was provided for each of the required tests. This included visual condition assessment, rut depth measurements, one test pit (including layer density measurements, materials logging, sample extraction and bagging) and Dynamic Cone Penetrometer (DCP). FWD and roughness measurements were being carried out on the road using equipment hired from the Central Materials Laboratory (CML). Photographs of the site work are included in Figure 1.

Figure 1: Site work on T357 Parachute Battalion – Lifuwu Road



The FNP field team was left to complete the measurements on the T357 while the rest of the group proceeded to the S134 Kasinje - Kandeu Road in Ntcheu District. The purpose of the visit to S134 was to assist the RA and FNP to select a section for monitoring. The road is surfaced with a Cape Seal on a natural gravel base. Marking out of the section and data collection will be carried out by FNP.

Figure 2: Section selected for monitoring on the S134 Kasinje - Kandeu Road



2.2.3 Wrap-up Meeting

The Wrap-up Meeting was held at the RA offices on the last day of the Malawi visit. It was attended by the ReCAP Regional Technical Manager, RA staff, FN & Partners staff and the CDS Team Leader and Materials Expert. The purpose of the meeting was to consolidate the work done during the week, provide some additional training on the LVR design philosophy, and agree on the way forward for the project.

It was noted at the meeting that FNP had performed well during the field work, including their understanding of their assignment, and planning and execution of their monitoring responsibilities in accordance with the ToR. The equipment and materials provided for marking of the monitoring sites and collection of data was mainly new and all in good working order. The marking out of the section on the T357 and data collection work had been a useful learning exercise for all.

FN & Partners have competent staff to undertake the assignment, but additional resources are required to complete the site work in the time required. Whilst the FNP Director participated in the meetings and field visits, it was accepted by all parties in the meeting that his role would revert to mainly coordination and training of the field personnel engaged in the field work.

The background to the design philosophy for low volume roads (LVR) was discussed, including the important influence of the environment on road performance. The main contributors to pavement performance are traffic in association with environmental factors such as high moisture in the pavement and poor drainage. For low volume roads, the environmental factors are more influential in determining pavement performance than on high volume roads. Moisture infiltration must be controlled, for example through the construction of an embankment and the required Drainage Factor (DF) achieved with a crown height normally greater than 0.75m. This allows the moisture on the pavement to equilibrate at lower than the optimum moisture content.

Given the importance of moisture levels in the road pavement to the performance of Low Volume Sealed Roads (LVSR), it was recommended that seasonal variation of moisture should be monitored across the carriageway. Moisture sensors should be installed at each monitoring site and funded from the Provisional Sum provided in the FNP Contract.

It was agreed that additional information was required in the monitoring guidelines to assist inspectors to assess the degree and extent of defects during the visual condition assessment and ensure consistency and

reproducibility. This should include photographs and could be in the form of a separate “Raters’ Manual”. The Visual Condition Assessment forms need to be revised to eliminate some ambiguities.

Test Pits need to be dug in accordance with the monitoring guidelines. The FNP ToR state that test pits are to be done for the baseline survey only. It was agreed that the two similar trial pits on a uniform section will need to be clearly identified. The frequency of testing of materials in the test pits was discussed. It was proposed that three moisture content and Atterberg Limit samples should be taken from each pavement layer. The site exercise on T357 involved the use of a nuclear gauge for density and moisture readings at three locations on each layer as well as a sand replacement test and laboratory moisture determination. There is a need to clarify in the monitoring guideline the minimum requirements for density and moisture content measurements.

There is a need to adopt consistent standards for materials testing on the project. The RA currently uses BS, AASHTO and TMH/SANS testing standards, but these give different results for the same material. Reference was made to the AfCAP research paper “Comparison of Test Methods and Implications on Materials Selection for Road Construction” (Pinard and Netterberg, 2012) and the findings of the AfCAP research project on “Protocols for Improving the Proficiency of Material Testing Laboratories in Mozambique”.

Good data management practice was identified as critical to the delivery of the project. A document register is necessary to ensure the collection, handover and use of data. This register should be maintained by FNP. As-built drawings for the project roads are not currently available but the RA agreed to search their archives and hand over any details to FNP.

The FNP ToR specify DCP baseline surveys at 50 m intervals for the entire road, but there is no follow-on monitoring by DCP specified. It was explained that the data will be useful for Long Term Pavement Performance Monitoring as DCP tests could be carried out at a later date.

FNP stated that their ToR do not specify the format for reporting of data obtained from the monitoring sites. CDS confirmed that Section 14 of the ToR specify that “... the overseeing engineer shall ensure that all the monitoring measurements are carried out accurately and recorded in the appropriate forms/templates as provided in the draft Guideline for the Monitoring of Experimental and LTPP Road Sections.” CDS will assist the monitoring consultants in this regard.

Lack of as-constructed information on the trial sections resulted in the need to rely on the information contained in the audit reports on the trial sections carried out under a separate AfCAP project.

2.3 Key Observations and Recommendations

The following are comments, observations and recommendations from the Malawi visit:

1. Whilst the ultimate purpose of the monitoring project in Malawi is well understood and embraced, the identification of dedicated researchers within the country team would contribute to the ownership of the project by the RRC and enhance the usefulness of the project outputs. It is not clear who will use the initial analysis of the data from the monitoring sites to derive recommendations for modifying standards for LVRs in Malawi. CDS will provide the local consultants with training on basic data analysis. This training will include analysis of the data to show trends in deterioration, but it is not expected that it will include training for the detailed analysis needed to develop recommendations for modifying standards. The detailed scope of the training will be discussed and agreed with the ReCAP PMU. At the Kick-Off Meeting it was suggested that post graduate students from the University of Blantyre could be involved through the T2 Centre to participate in the project as part of their academic research. This would need to be organised by the RA. It is understood that the T2 Centre is currently short of resources, but the RA

indicated that it might be able to mobilise resources to support two post graduate students. In the absence of any short-term research objectives, the monitoring data will simply provide a baseline against which future long-term performance can be assessed. The RA and AfCAP management need to form linkages between the monitoring project and the separate AFCAP project to establish a road research facility in Malawi.

2. It is unlikely that Malawi will be able to make a policy decision on which materials test method to adopt as a standard within the lifetime of this project. BS methods have been used since the colonial era and laboratories in Malawi are generally equipped with BS equipment. However, SADC standards are being promoted in the region that are based on South African test methods, which are more closely aligned to AASHTO standards. For purposes of the monitoring project it is important that for each test conducted the test method and equipment type used should be recorded and, if possible, a consistent test method should be adopted for each relevant test. For Malawi it is recommended that all testing should be carried out to British Standards.
3. Moisture sensors should be installed on each monitoring section to measure variations of in situ moisture content.
4. A Rater’s Manual is needed to facilitate the monitoring consultant’s interpretation of degree and extent of visual assessments of the surfacing.
5. The RA should make further efforts to obtain the as-constructed information from the design and supervision consultants for the trial sections.
6. The ToR for FNP specify in detail the tests that are to be carried out, but these are not fully aligned with the regional monitoring guidelines. This includes the standard length of the monitoring sections and the type and frequency of testing. Whilst the FNP ToRs appear to be prescriptive in terms of the expected work to be carried out on site, the ReCAP PMU expects the consultant to be flexible, within reasonable limits.
7. The agreed timelines for FN and Partners activities are summarised in Table 2 and Table 3. On each site the full range of baseline survey measurements will be taken in accordance with the FNP TORs.

Table 2: FN & Partners Programme of site activities

| Date | Activity |
|-----------------|----------------------------------------------|
| 18-23 June 2018 | D11 Kalenge Bridge-Misiku, at Chitipa |
| 25-30 June 2018 | T357 Parachute Battalion – Lifuwu at Salima. |
| 2-7 July 2018 | S134 Kasinje - Kandeu in Ntcheu District. |
| 9-14 July 2018 | S135 Mwanza - Kunenekude in Mwanza District |
| 16-20 July | D387 Nsangwe-Dolo |

Table 3: FN and Partners Monitoring and Evaluation Tasks and Timing (Revised)

| Pavement Monitoring and Evaluation Tasks | Baseline | Year 1 (first 12 months) | | Year 2 (second 12 months) | |
|-----------------------------------------------------|--------------|--------------------------|--------------|---------------------------|------------|
| | June/July-18 | Sep/Oct-18 | Mar/April-19 | Sep/Oct-19 | Mar/Apr-20 |
| Review of Design Documents and Construction Records | √ | | | | |
| Classified Traffic Counts | √* | √* | √* | √* | √* |
| Axle Load Survey | √* | √* | | | |
| Visual Condition Survey | √ | √ | √ | √ | √ |
| Roughness Measurement | √ | | √ | | √ |
| Rut Depth Measurement | √ | √ | √ | √ | √ |
| Elastic Modulus/Deflection/FWD | √ | √ | | | |
| DCP Tests | √ | √ | | | |
| Base Layer Moisture Content | √ | √ | √ | √ | √ |
| Trial Pits and Laboratory Testing | √ | √ | | | |
| Drainage Assessment | √ | √ | √ | √ | √ |
| Reporting | √ | √ | √ | √ | √ |

√* To allow for seasonal variations these may be carried out in different months.

3 Kenya Country Visit

3.1 Visit Itinerary

The Kenya visit was undertaken from the 5th to the 16th of May 2018. The itinerary for the visit is given in Table 4.

Table 4: Itinerary for Kenya Visit

| Day | Date | Activity |
|-----------|----------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| Saturday | 5 th May | Arrival in Nairobi. |
| Sunday | 6 th May | Preparation for Country Visit. |
| Monday | 7 th May | 09:00H: Kick-off Meeting with Materials Testing and Research Division (MTRD) and Across Africa Consultants (AA). |
| Tuesday | 8 th May | Review of Baseline and First Monitoring Report. |
| Wednesday | 9 th May | Site Visit with MTRD and AA to Site 2, 3 and 4 (Muranga, Nyeri and Nyandarua). |
| Thursday | 10 th May | Site Visit with MTRD and AA to Site 1 (Kiambu). |
| Friday | 11 th May | Continuation of review of Baseline Survey and First Monitoring Reports (ReCAP PMU, CDS, AA). |
| Saturday | 12 th May | Continuation of Baseline Survey and First Monitoring Reports (ReCAP PMU, CDS, AA). |
| Sunday | 13 th May | Continuation of Baseline Survey and First Monitoring Reports, (CDS, AA). Departure of AfCAP Regional Technical Manager for Accra. |
| Monday | 14 th May | Preparation of Baseline Survey and First Monitoring Reports (CDS, AA). |
| Tuesday | 15 th May | Presentation of Baseline Survey and First Monitoring Reports to MTRD. |
| Wednesday | 16 th May | Wrap Up Meeting Departure of Team leader for Uganda. |

3.2 Tasks Carried Out

3.2.1 Kick-Off Meeting

The Kick-off Meeting was held at the Materials Testing and Research Division (MTRD) offices in Nairobi. Participants included the AfCAP Regional Technical Manager, E & S Africa, MTRD staff and Across Africa Consultants (AA). The issues discussed included:

- Overall project approach and objectives;
- Roles and responsibilities of MTRD, AA and CDS;
- Lines of reporting;
- Overall programme of project activities and delivery dates for key outputs;
- Presentation of draft regional Monitoring Guidelines;
- Kenya research sites: location, date of construction, design standards adopted, monitoring activities already carried out;
- Project research objectives; and

- The arrangements for the site visits.

The Kenya monitoring programme is ongoing as a continuation from monitoring carried out by the Transport Research Laboratory (TRL) of UK under the first phase of AFCAP. The monitoring consultant, AA Consultants, was appointed in 2017 under AFCAP2, but the AA Baseline Report and First Monitoring Report have not been completed to the approval of ReCAP management. It was reported that there are missing field and laboratory test results. No wet season monitoring has been carried out to date by AA - the wet season monitoring is planned for the period June-July 2018. A review of the Construction Report for the roads included in the Baseline and Monitoring surveys has not been carried out by AA. AA will follow up with the MTRD for a copy of the report.

The MTRD stated that their expectation of the Regional Monitoring project is that it would provide evidence for the evaluation of the DCP DN pavement design method and updating the Kenya Monitoring Guidelines. The Kenya Monitoring Guidelines were prepared by TRL in 2015.

The principles of the LVSR Design Guidelines developed for Kenya under ReCAP by TRL in 2017 were not considered when the LTPP sections were being selected, designed, constructed and monitored, since the guidelines had not yet been developed at the time of the selection of the LTPP sites. Consequently, the LTPP monitoring project cannot be used to validate the Kenya LVSR Design Guideline. A separate project under ReCAP, KEN2040A (ReCAP, 2018), is being implemented to validate this document.

3.2.2 Site Visits

In accordance with the AA ToR, the sections that were monitored during the baseline survey and (in some cases) the first monitoring round are listed in Table 5.

Table 5: Monitoring Requirements for Kenya Trial sections

| Road/Site Name | Length (m) | Monitoring Requirements |
|------------------------------------|-----------------------------|----------------------------------------------------------------------------|
| D379 Kiambu | 400 | Whole section, Including 200 m LTPP |
| E511 Murang'a | 900 | Whole section, Including 200 m LTPP |
| D382 Nyandarua | 600 | Whole section, Including 200 m LTPP |
| D435 Nyeri | 600 | Whole section, Including 200 m LTPP |
| E1531 Kanyoo – Kamwangi | 5600 | Baseline monitoring only of 1000 m including 200 m LTPP |
| D415 Muruka – Kandara | 7500 | Baseline monitoring only of 1000 m including 200 m LTPP |
| E579 JnC70 Ruringu – D434 Kiriunga | 5300 | Baseline monitoring only of 1000 m including 200 m LTPP |
| D419 Muranga | 5700 | Baseline monitoring only of 1000 m including 200 m LTPP. R2000 Batch 1. |
| D420 Muranga | 13700 | Baseline monitoring only of 1000 m including 200 m LTPP. GoK. |
| D421 Muranga | 3300 | Baseline monitoring only of 1000 m including 200 m LTPP. R2000 Batch 1. |
| D381 Nyandarua | Completed. sections 8500 | Baseline monitoring only of 1000 m including 200 m LTPP. R2000 Batch 1. |
| D388 Nyandarua | Completed. Sections 8500 | Baseline monitoring only of 1000 m including 200 m LTPP. GoK. |

On the 9th of May a visit was made with AA staff to Site 2 (Muranga), Site 3 (Nyeri) and Site 4 (Nyandarua) to review the location and marking of monitoring section. No data collection was carried out because the visit was not part of the scheduled 6-monthly monitoring rounds.

On the 10th of May 2018 the team visited Site 1 at Kiambu. The purpose of the visit was to review the location and marking of monitoring section, and re-mark the monitoring section where necessary. No data was collected because the visit was not part of the scheduled 6-monthly monitoring rounds.

3.2.3 Summary of findings

Road D382 (Nyandarua) Lord-Kona-Bakati

- This section was last monitored in June 2017 and the markings on the LTPP sections are still visible.
- Structural failures in the form of crocodile cracks and potholes are evident on the LTPP section.
- The traffic volume (AADT) for the first monitoring survey was 853. This is almost three times the 300 AADT threshold for a low volume road. This may have contributed to the premature failures observed on the road.

Typical photographs are given in Figure 3.

Figure 3: Road condition D382



D435 Muthuaini – Mununguaini Road (Nyeri)

- The markings of the monitoring sections are no longer clearly visible and need to be re-marked.
- There are a range of surfacing and structural defects which include cracking, ravelling and potholes.

Typical photographs are given in Figure 4.

Figure 4: Road Condition on Muthuaini-Mununguaini Road



E511 Kangari – Kinyona Road (Murang’a)

This road is currently subjected to heavy construction traffic for a new water transfer tunnel which will intercept three rivers to the north of Nairobi and transfer the water to the Thika Dam. Total pavement failure is evident at the start of the research section, which could be attributed to heavy traffic loading and inadequate drainage. No detailed traffic survey was carried out during the baseline or first monitoring. The unforeseen heavy traffic at the bottom end of the section has contributed to the deterioration of this section and the road cannot be classified as low volume. An axle load survey needs to be carried out to capture the influence of this traffic.

The rockfill waste from the tunnelling works appears to be high quality material but there is no evidence to suggest that it is being stockpiled for further processing or use. Discussions regarding its possible use were held with the MTRD.

The drains were filled with trimmed vegetation which needs to be cleared as part of routine maintenance and some failures have occurred on steep cut slopes along the side of the road.

Typical photographs are given in Figures 5, 6 and 7.

Figure 5: Kangari-Kinyona Road



Figure 6 : Construction traffic on Kangari-Kinyona Road and Slope Failure



Figure 7: Failures induced by heavy vehicles at the junction with main road





D379 Wamwangi – Karatu Road (Kiambu)

The road has been subjected to extensive crack sealing which was carried out as part of periodic maintenance.

- The LTPP section markings are still visible.
- The road is well drained with the drains well maintained and clear of overgrown vegetation.
- There are some pothole failures evident.

Typical photographs are given in Figure 8.

Figure 8: Wamwagi Karatu Road Monitoring Section



3.2.4 Baseline Survey and First Monitoring Reports

The CDS Team Leader provided assistance to AA to revise the Baseline Survey Report and the First Monitoring Report, which had been rejected by ReCAP management. Updated versions of both the Baseline and First Monitoring Surveys reports were submitted on the 12th of June 2018. It was noted that

the updated reports did not have all the initially required information, some field survey and laboratory test results were missing, and more text should have been provided on the interpretation of data.

3.2.5 Wrap-Up Meeting

This meeting was planned primarily to confirm the timeline for the wet season monitoring during the May-June period. Unfortunately, due to the non-attendance of Eng Waswa (AA) and apologies from MTRD, the meeting did not take place as planned on the 16th of May. However, most of the issues had been discussed during the presentation of the Baseline Survey and Monitoring Report on the 15th of May.

3.3 Observations and Recommendations

The following are observations and recommendations arising from the visit to Kenya.

1. AA is yet to carry out a full monitoring survey during the wet season. It was agreed during the visit that the next monitoring would be done during May 2018, which was towards the end of the wet season, but if this was not possible the monitoring would be carried out in September. (Note: The May monitoring was not achieved so the next monitoring will be carried out in September/October 2018, which is dry season. The next opportunity for wet season monitoring will be March/April 2019).
2. MTRD carries out specific field measurements and laboratory testing on behalf of AA, including Visual Condition Surveys, non-destructive testing, trial pit profiling and laboratory testing. AA receives the data from MTRD and prepares the monitoring reports.
3. The MTRD is well organised and is a well-resourced and equipped department. The laboratory is equipped with state-of-the-art testing equipment.
4. The MTRD uses both BS and AASHTO standards for materials testing although most tests are carried out to British Standards. Typical tests where AASHTO standards are adopted include bitumen and compaction tests. The testing standard used must be recorded in the monitoring reports.
5. Concerns have been raised on the commitment of the monitoring consultants to execute their tasks in accordance with their Terms of Reference. Their performance is expected to improve with the support of the CDS team. AA was encouraged not to limit their MTRD consultation to the Project Engineer, but to include all key members of the Division.
6. It is recommended that the Kenya monitoring work should continue to refer to the TRL monitoring guideline to ensure that there is no confusion in the monitoring in Kenya and that the baseline data already collected does not become redundant. However, it is noted that the differences between the Kenya monitoring guidelines and the draft regional guidelines are not significant.
7. A drainage monitoring form, which has been identified as missing in the draft Regional Guidelines, will need to be introduced. CDS is developing this form.
8. The performance of AA does not fulfil the requirements of the contract. They were appointed in 2015 and yet the baseline report was only submitted in 2017. The first monitoring report falls short of the minimum standards. There is a risk that the performance of AA will adversely impact on the delivery of the LTPP project in Kenya.

4 Uganda Country Visit

4.1 Visit Itinerary

The visit to Uganda was undertaken from the 16th to the 19th of May 2018. The itinerary for the visit is given in Table 6.

Table 6: Itinerary for Uganda Visit

| Day | Date | Task |
|-----------|----------------------|------------------------------------------------------------------------|
| Wednesday | 16 th May | Arrival in Entebbe |
| Thursday | 17 th May | Meeting with UNRA |
| Friday | 18 th May | Site Visit to Matugga-Semuto-Kapeeka Pilot/Demonstration Project (PDP) |
| Saturday | 19 th May | Depart for Addis Ababa |

4.2 Tasks Carried Out

4.2.1 Meeting at UNRA

The AfCAP Country Coordinator was unable to attend the meeting because he was in Ghana attending the ReCAP Steering Committee meeting. The Team Leader met with Research Fellows Leah Musenero and Rodgers Mugume who are members of the research department at UNRA.

The monitoring consultant for Uganda has not yet been appointed by ReCAP but the procurement process is underway. Until the Uganda monitoring consultant is appointed, the baseline and follow on monitoring phases cannot be accurately factored into the Regional Monitoring programme. CDS will programme the next visit to Uganda to coincide with the baseline data collection activities, which will need to be aligned with the timing of the combined visit to the other participating countries.

UNRA mentioned that it has benefitted from participation in AfCAP projects, with another project in the pipeline to investigate the geotechnical failures on roads and use of the road reserve.

UNRA staff have been involved in the training of trainers in the use of the DCP DN method of pavement design and UNRA would like these staff to form part of the capacity building team that works with the CDS team and the local consultant.

4.2.2 Site Visit to Matugga-Semuto-Kapeeka Trial Sections

This road was constructed in 2009. It was funded by the Nordic Development Fund (NDF) under a Pilot Project for the Demonstration of Innovative Technologies for the Construction of Low Traffic Volume Bitumen Sealed Roads. The objective was to investigate more economical approaches to LVR design taking into account local conditions, including locally available pavement construction materials, and testing more appropriate materials specifications for lower traffic sealed roads. There are 16 pavement research trial sections, each of which is 350m long. During the construction, the 16 trial sections were further split into two or three sub-trial sections, resulting in the actual number of trial sections increasing to 26, including reference sections with lengths varying from 25m to 75m. The LTPP sections are located between Kalasa (Km 19.05) and Mawale (Km 26.10). The sections comprise various combinations of subgrade, subbase and

base course materials with different types of bituminous surfacing. A construction report for the trial sections was obtained from the consultants that supervised the works².

Kapeeka has been designated as an industrial park with industries that include quarrying, sand mining, car assembly and tiles manufacturing. This has subjected the road to heavy traffic which has accelerated the deterioration and failure of some sections. Patching is in progress and drainage works are planned for the new financial year. The performance of the trial section ranges from good to poor. Typical photographs are shown in Figure 9.

Figure 9: Uganda Site Visit - Matugga-Semuto-Kapeeka Road



4.2.3 Kasiso-Lwogi Trial Section

The Kasiso-Lwogi Road was built as part of the CrossRoads/UNRA Mechanised Low-Cost Seals Trial, which was funded by DFID and the European Union. It is near to the Matugga-Semuto-Kapeeka Road. There is currently no regular monitoring of these trials. Photographs of the road are included in Figure 10.

² Uganda National Roads Authority (2011). Consultancy Services for Feasibility Study, Detailed Engineering Design and Construction Supervision of Matugga - Semuto - Kapeeka Road Using Innovative Technologies Third Research Report (RR-3) Road Pavement Baseline Study. Cowi.

Figure 10: Uganda Site Visit Kasiso-Logwi Road



4.3 Observations and Recommendations

The following are observations and recommendations arising from the Uganda visit.

1. The appointment of the local monitoring consultant is a priority for Uganda. Ideally, this should precede the monitoring work. If there are further delays with the appointment of the monitoring consultant CDS will assist UNRA to carry out preparation and reconnaissance work including the selection of the research sections to be monitored. However, it is expected that the monitoring consultant will be in place at the time of the next round of country visits.
2. The Uganda component of the project is not synchronised with activities in Malawi, Kenya and Ethiopia where baseline data collection has already been carried out.
3. The CDS team received the ToRs for the local monitoring consultant from the ReCAP PMU. The LTPP sections previously established on the Matugga-Semuto-Kapeeka Road form part of the monitoring consultant's scope of works. UNRA requested that the roads built under the Crossroads project in the vicinity be included in the monitoring programme. This may require an addendum to the monitoring consultant's contract.
4. At the time of the visit UNRA had advertised separately for a monitoring consultant on the Matugga-Semuto-Kapeeka Road. It is not known yet how the work of this consultant will be coordinated with the work of the monitoring consultant appointed under ReCAP. Clarification has been requested from UNRA.

5 Ethiopia Country Visit

5.1 Visit Itinerary

The visit to Ethiopia was undertaken from the 19th to the 25th of May 2018. The itinerary for the visit is included in Table 9.

Table 7: Itinerary for Ethiopia Visit

| Day | Date | Task |
|-----------|----------------------|------------------------------------------------------------------------------------------------------|
| Saturday | 19 th May | Arrival in Addis Ababa |
| Sunday | 20 th May | Preparation for Country Visit |
| Monday | 21 st May | 09:00H: Meeting with ERA RRC and Alert Engineering PLC (AE). • Arrangements for site visits (AE). |
| Tuesday | 22 nd May | Site Visit with ERA and AE to Site 1- Otta Seal Section in Gerado Village. Overnight in Dessie. |
| Wednesday | 23 rd May | Completion of site data collection in Gerado. Travel to Addis Ababa |
| Thursday | 24 th May | Site Visit with ERA and AE to Site 2. – Otta Seal in the village of Combel. |
| Friday | 25 th May | Site Visit to RRC Wrap up meeting with ERA RRC |
| | | Evening – Departure of Team Leader to London |

5.2 Tasks Carried Out

5.2.1 Meeting at ERA

The Kick-off Meeting was held with staff of the ERA Road Research Centre (RRC) and the local monitoring consultant, Alert Engineering PLC (AE). The discussions included:

- The overall project approach and objectives;
- Roles and responsibilities of ERA, AE and CDS;
- Lines of reporting;
- The overall programme of project activities and delivery dates for key outputs;
- A presentation of draft regional monitoring guidelines;
- Ethiopia research sites: their location, date of construction, design standards adopted, monitoring activities already carried out to date; and
- Arrangements for the site visits.

The monitoring programme for Ethiopia is already ongoing as part of the continuation from where the TRL project ended under AfCAP1 in 2014. TRL was providing assistance directly to the RRC. Under AfCAP2, TRL provided a brief oversight to the monitoring consultant (AE) and this oversight ended in early 2017.

The Ethiopia Monitoring Guidelines, which were prepared by TRL under AfCAP 1 in 2014, were discussed at the meeting. The ERA RRC staff and the monitoring consultant advised that they would familiarise themselves with both the local and draft regional guidelines to identify both commonalities and inconsistencies.

5.2.2 Site Visit

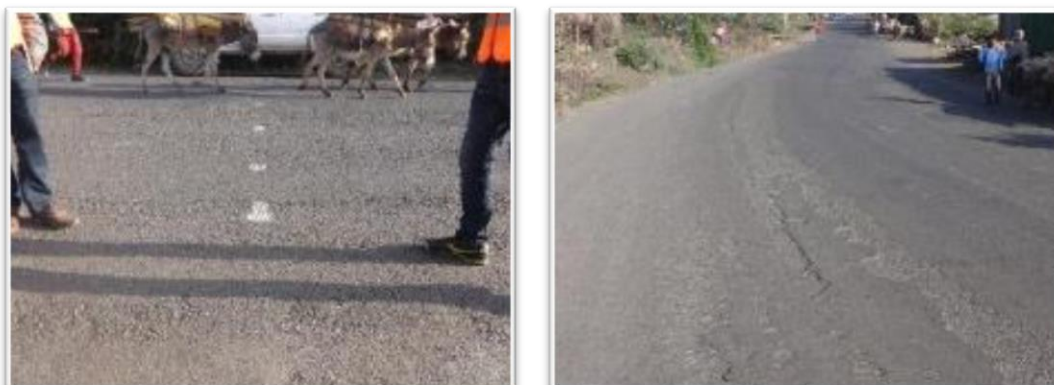
A site visit was carried out with ERA and AE staff to the Otta Seal Section in Gerado Village (Site 1). Site discussions included compliance of existing monitoring sections with the regional protocol and the need for additional monitoring sections. No data collection was carried out because this was a site familiarisation visit and did not form part of the routine monitoring programme.

General observations from the site visit included:

- Portions of the trial section were patched by the ERA Regional Office as part of spot improvements. This was not communicated to the RRC prior to the intervention.
- The double Otta Seal sections are performing relatively well compared to the double sand seal sections.
- The primed and un-primed double Otta seal sections seem to be performing comparably the same. The effect of the cutback bitumen that was applied on the un-primed section could have contributed to the good performance.
- Observations made on site show that a significant volume of heavy goods traffic uses the road and it can no longer be categorised as a low volume road. This will need to be substantiated by traffic surveys.
- A lot of residential access construction is encroaching onto the carriageway - this has created road safety risks and affects the roughness survey because a consistent path cannot be maintained.
- The monitoring tasks are being executed in accordance with the monitoring consultant's ToR.

Typical site conditions are shown in Figure 11.

Figure 11: Ethiopia Site Visit – Otta Seal Section in Gerado Village





A second site visit was made to the Otta Seal Tulubolo - Kela section in the village of Combel. The location and marking of the LTPP section was reviewed but no data collection was carried out because this was a site familiarisation visit and did not form part of the routine monitoring programme.

General observations from the site visit included:

- The road section was built as a trial under the first phase of AfCAP, but no LTPP sections have been established on this road. Although no LTPP sections were demarcated, monitoring is ongoing and is limited to road condition surveys. Furthermore, the road is due for upgrading during the 2018/19 financial year. Despite the pending upgrade, monitoring will continue because the data collected up to the time of the intervention will be relevant and useful for the current monitoring project and post ReCAP. The site is on the list of roads to be monitored under the contract between Cardno and Alert Engineers.
- The traffic volume on this road is low and no heavy goods vehicles were encountered except buses and construction traffic.
- The double Otta seal sections are performing relatively well compared to the double sand seal sections.
- As in the sections in Gerado Village above, the primed and un-primed double Otta seal sections seem to be performing comparably the same. The effect of the cutback bitumen that was applied on the un-primed section could have contributed to the good performance.

Typical site conditions are shown in Figure 12.

Figure 12: Ethiopia Site Visit – Otta Seal Section in Combel



5.2.3 Wrap-up Meeting

A wrap-up meeting was held at the end of the visit to Ethiopia. It was attended by the following:

| | | |
|---------------------|--------------------------------|-----------------|
| Yitagesu Desalegn | Road Research Director | ERA RRC |
| Dr. Alemgena Araya | Managing Director | Alert Engineers |
| Asmera Mussa Yassir | Team Leader Materials Research | ERA RRC |
| Francis Dangare | Team Leader | CDS |

The issues that were discussed included:

- The Ethiopia Monitoring Guidelines prepared by TRL in 2015 are a useful and relevant resource. An initial review of both the Ethiopia and draft regional guidelines was carried out and it has been observed that the inconsistencies are not significant. Modifications will be made to both documents where necessary.
- Ethiopia is planning to establish additional LTPP sites constructed using conventional methods for baseline studies and general pavement performance monitoring but needs assistance from AfCAP. This assistance would be over and above the establishment and maintenance of a database for the management of road pavement performance data which is being carried out under the ReCAP Regional Back Analysis Project³.
- The Ethiopia monitoring consultant contract ends in March 2019 with the final monitoring scheduled for late 2018. There is a need to continue monitoring up to and beyond the end of the current phase of ReCAP. ERA may present a case to the ReCAP PMU for further support for the monitoring to the end of the current phase of ReCAP. However, AfCAP is in the process of encouraging more “mature” countries such as Ethiopia to use their own resources to continue with the monitoring⁴.
- Ethiopia is building capacity in its research centre but would benefit from ongoing programmes and initiatives. Capacity building issues for ERA include:
 - High staff turnover and lack of an effective staff retention strategy;
 - Training for entry level staff who lack experience; and
 - Stimulating an appetite for research.

5.3 Key Observations and Recommendations

Key observations and recommendations arising from the Ethiopia visit are as follows:

1. The ToR for the Monitoring Consultant specify the use of the draft Regional Monitoring Guidelines. It is assumed that this refers to the guidelines prepared for Mozambique. It is recommended that the Ethiopia monitoring work should continue to refer to the TRL guideline to avoid confusion on site and to ensure that the baseline data already collected remains relevant. In the longer term it is expected that there will be a harmonised regional monitoring guideline, which is a key output of this project.

³ It is noted that a database has already been established under the ReCAP Regional Back Analysis project and ERA RRC is inputting performance data from the LTPP sections into the database. CDS will assist the participating countries in this process.

⁴ Source: ReCAP Deputy Team Leader.

2. A drainage monitoring form needs to be incorporated into the draft guidelines which requires a quantitative measure of the drainage situation in terms of the Drainage Factor, which is based on the distance between the crown of the road and the invert of the side drain and the depth of the drain.
3. Clarification (and subsequent harmonisation in the final Regional Guidelines) is required for some of the terminology used in the draft Regional Guidelines, including a separation of measurements for edge break and edge drop.
4. The use of moisture sensors to monitor moisture changes across the carriageway and within the pavement layers (base, subbase and subgrade) on a seasonal basis is recommended.
5. The last monitoring round for Ethiopia is programmed for October/November 2018 in accordance with the current contract between Cardno and Alert Engineers. In order to maintain continuity throughout the ReCAP phase, it is recommended that ERA finance the continuation of the monitoring using their own resources.
6. The RRCs and the monitoring consultants should jointly enter the LTPP monitoring data into the regional database which is being developed under the Regional Back Analysis project.

6 South Sudan Country Visit

The visit to South Sudan was planned for the 12th to the 16th of May 2018. Unfortunately, due to the delays by the partner institution to send invitation letters to facilitate the visa application process, it was not possible to conduct the country visit as planned. The days were utilised in Kenya to support the monitoring consultant to finalise their Baseline and First Monitoring reports. A visit to South Sudan will be included in the next round of country visits. The CDS contract allows for a single visit to South Sudan.

7 Conclusions and Recommendations

The objectives of Field Visit No. 1 were met apart from the failure to visit South Sudan. The key findings of the country visits are as follows:

- In Malawi, the monitoring consultants (FN & Partners) seem well prepared and motivated to undertake the project. They have mobilized the required equipment and staff for the project. They have previous experience with undertaking similar surveys for the RA in terms of rutting, roughness, deflections (using RA FWD), but not DCPs. They have limited experience in analysing monitoring data.
- The quality of the monitoring by AA Consultants in Kenya needs significant improvement. The principal of the firm was available only for a limited time during the country visit and all the responsibilities relating to the project were delegated to the Project Engineer. The field work and materials testing, and reporting are being carried out by the MTRD who have the capacity and competency to undertake the tasks. However, AA needs to be more proactive in organising, coordinating and executing the various tasks in accordance with the ToR and, ultimately, in assuming responsibility for the outcome of the project. CDS will continue to provide support to the AA team during the routine monitoring visits.
- In Ethiopia, Alert Engineers have been successfully carrying out the monitoring, with the final round scheduled for the period September- December 2018. The reports that are produced are of good quality.

Technical issues that relate to the implementation of the project were identified and discussed with the stakeholders in each country. The key issues are as follows:

- There is a need to make use of existing national monitoring guidelines, such as exist in Ethiopia and Kenya, and to update and harmonise them in line with international best practice contained in the draft Regional Guidelines.
- An initial review of the existing monitoring guidelines (Mozambique version) is that they could be improved through the inclusion of photographs depicting each defect that must be monitored in the visual condition surveys. It may be beneficial to produce a stand-alone “Raters’ Manual” for this purpose, possibly in A5 format for easy use on site.
- Clarity is needed on the materials testing standards and specification to be adopted on the LTPP monitoring projects. Participating countries use either the BS or AASHTO test methods interchangeably and in most cases both of them depending on the test being carried out. This can result in different results for the same material tested by the two methods. The Regional Guidelines should allow flexibility in the use of different testing standards while stressing the importance of consistency in their use.
- The timeline for the monitoring in Ethiopia is not aligned to the Regional Monitoring Programme. The monitoring consultant’s final monitoring round is planned for December 2018.
- It is recommended that moisture sensors should be installed on all monitoring sites and the Drainage Factor should be measured.
- Some sites selected for monitoring have already suffered significant deterioration. In some cases, this is due to much higher levels of traffic and heavier vehicles using the road than was expected. It

may be advisable to abandon some of these sites if the data from the monitoring is no longer useful, though continued monitoring might be beneficial for training and capacity building purposes.

- A review of the project related documents shows that there is a data gap relating to construction and maintenance costs on the project roads. These costs will be sought from the RRCs and will also include the costs of other equivalent roads if available.
- The ToRs for the Research Consultant and the respective Monitoring Consultants are silent about the interpretation of data. The only indication given in the ToR for this requirement is-for joint collection and analysis of data and report preparation. None of the RRCs that were visited has in-house capacity to manage the data being collected on the sites and to analyse it to derive any conclusions on the performance of the roads that could be used to verify or modify standards and specifications for low volume roads. It is expected that the RRCs will outsource some of the research responsibilities in the short and medium term. Support will be provided by the CDS team to researchers in the roads agencies, tertiary educational institutions or individual researchers in the project countries when requested.
- The CDS team is not aware of any strategic research projects being carried out on any of the experimental sections visited in any of the participating countries. The data could be used for a range of valuable research projects examining different aspects of the design and construction of LVRs. It is recommended that ReCAP management and the RRCs should engage with universities to identify post graduate students or other individuals and organisations that could make use of the data. CDS will assist the RRCs to identify relevant and useful research topics.

8 Planned Activities

8.1 Monitoring Consultants

Malawi

FN and Partners has undertaken to send the field data collected to date to CDS by 14 July 2018 and the draft Baseline Report by 30 July 2018. It is expected that the Final Baseline Report to be submitted to ReCAP PMU by 10 August 2018. The first round of monitoring is expected to be carried out in October 2018.

Kenya

The next (second) round of monitoring is programmed for September/October 2018.

Uganda

Assuming that the procurement process for the local consultant is successful, it is recommended that the marking out of sections and baseline data collection be carried out in September to coincide with the proposed next visit of the CDS team.

Ethiopia

The next monitoring round is programmed for September 2018.

Myanmar

The initial visit to Myanmar was carried out between 9th and 13th July 2018. Three monitoring sections were established, and some data collected. The second visit is scheduled for October/November 2018 when two or three further monitoring sections will be established, and further data collected.

8.2 CDS Country Visits

The next visit of the CDS Team Leader to all participating countries is scheduled for September 2018. This will coincide with the monitoring activities planned in Kenya, Ethiopia and Malawi and the establishment of monitoring sites in Uganda. The focus of the next visit will be to ensure that the monitoring surveys are being carried out in compliance with guidelines and standards, and resolve issues identified during the initial and follow on monitoring visit. This does not preclude the remote resolution of issues that arise in between the visits.

It is recommended that a variation be made to the TORs for the CDS contract to permit the option of one visit to a monitoring site during each country visit rather than the “minimum of two sites” currently specified. This would enable the CDS team to spend more time with the RRC staff and local consultants on the analysis of data from the sites and preparing it for entry to the Regional Monitoring Database. It would also enable more discussion on the development of research projects in order to fully utilise the data. Where time permits, two (or more) sites would be visited.

8.3 Monitoring Reports

CDS is preparing the first Monitoring Report, which will:

- summarise the review carried out in Kenya of the AA Baseline and Monitoring reports; and
- provide a review of Alert Engineering’s last monitoring report.

A review of the first monitoring report by FNP for Malawi will be issued as an addendum when it becomes available or will be included in the next Monitoring Report.

The Monitoring Report will focus on the quality and completeness of data presented by the local consultants to ensure that it contains all relevant information on the location of measurements and the values measured. This will ensure that the data are adequate to be uploaded to the Regional Back-Analysis database.

8.4 Other Activities

Other project activities in the medium term include:

- Coordination with other consultants and organisations engaged in monitoring of LTPP sections to ensure a common approach and to assist with the development of a Raters' Manual including a possible meeting of the consultants in Pretoria in August 2018;
- Project workshop at the ReCAP IRIM event planned for early 2019; and
- Third visit of the CDS team to the participating countries in April/May 2019.

Annex I - People Met

| NAME | DESIGNATION | ORGANISATION | EMAIL |
|------------------------|--------------------------------------------|-----------------|------------------------------------------------------------------------------|
| MALAWI | | | |
| Henry Nkwanga | Regional Technical Manager, E & S Africa | ReCAP PMU | Henry.nkwanga@cardno.uk.com |
| Sharmey Banda | Acting Chief Engineer | Roads Authority | sbanda@ra.org.mw |
| C. D Kauma | RDM - Engineer | Roads Authority | ackauma@gmail.com |
| H. Shaba | Technician | Roads Authority | hkshaba@gmail.com |
| Francis Namonjeza | Overseeing Engineer | FN and Partners | info@fnconsultants.mw.com |
| KENYA | | | |
| Eng. Stephen Kogi | Chief Engineer | MTRD | kogiskw@yahoo.com |
| Eng. Maurice Ndeda | Deputy Chief Engineer | MTRD | Ndeda.maurice@yahoo.com |
| Eng. Joachim Mbarua | Project Engineer | MTRD | Jmbaura3@gmail.com |
| Eng. A. O. Ndege | Operations Manager | | andege@yahoo.com |
| Veronica Akinyi | Project Engineer | MTRD | awerengugi@gmail.com |
| Obadiah Muthaka | | MTRD | Muthaka2008@yahoo.com |
| Geoffrey Yussuf Omondi | Head of Research | MTRD | geoffreyyusuf@gmail.com |
| Eng. Ambrose Waswa | Director | Across Africa | ambrosewaswa@gmail.com |
| George Onguko | Project Engineer | Across Africa | ongukogeorge1@gmail.com |
| UGANDA | | | |
| Leah Musenero | Research Fellow | UNRA | Leah.musenero@unra.go.ug |
| Rodgers Mugume | Research Fellow | UNRA | Rodgers.mugume@unra.go.ug |
| Moses Nyakaana | Station Manager Luneero | UNRA | Moses.nyakaana@unra.go.ug |
| Haggy Gytaka | Maintenance Technician | UNRA | gytakacity@gmail.com |
| ETHIOPIA | | | |
| Alemayehu Endale | Deputy Director General - Asset Management | ERA | alemnhm@gmail.com |
| Yitagesu Desalegn | Road Research Director ERA | ERA RRC | desalegnyitagesu@yahoo.com |
| Dr. Alemgena Araya | MD Alert Engineers | Alert Engineers | alemgena@yahoo.com |
| Asmera Mussa Yassir | Team Leader Materials Research | ERA RRC | asmeranassir@gmail.com |
| Adebay Gitay | Research Engineer | ERA RRC | yitaiking19@gmail.com |
| Hayredin Nesro | Project Engineer | Alert Engineers | hayredinnesro@gmail.com |