

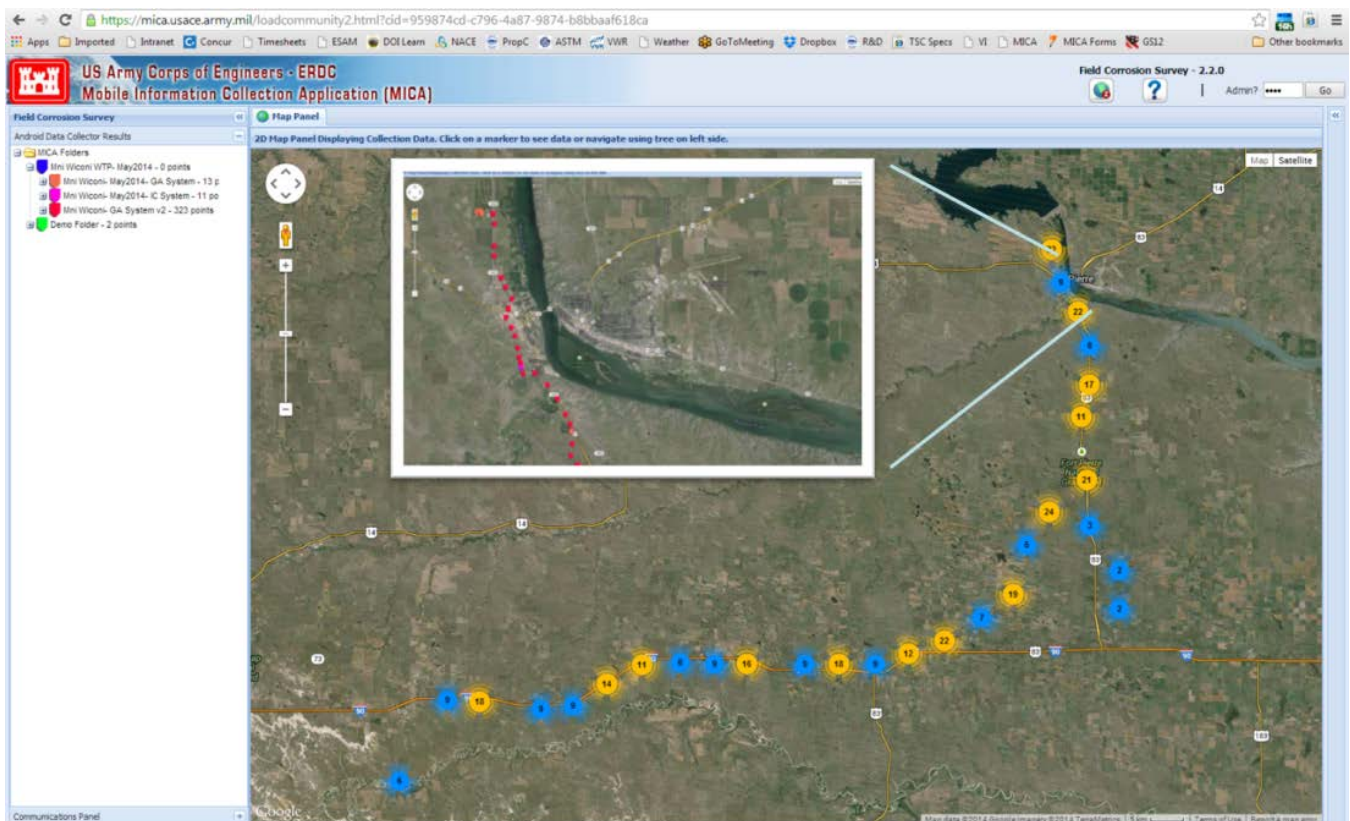
RECLAMATION

Managing Water in the West

Technical Memorandum No. 8540-2016-015

MICA Implementation Plan

Research and Development Office
Science and Technology Program ST-2016-7876-01



U.S. Department of the Interior
Bureau of Reclamation
Technical Service Center
Denver, Colorado

September 2016

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MICA Implementation Plan


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Executive Summary

Data and information can be challenging to collect and manage in field applications. Use of tablets in the field is a simpler and more portable option than the use of laptops. This research investigated solutions to find or develop tablet applications which collect and store data, notes, and photos associated with a Global Positioning System (GPS) location. The Mobile Information Collection Application (MICA) developed by the Information Technology Laboratories (ITL) at the U.S. Army Corps of Engineers was introduced as a possible application for use. This app was pilot-tested during field work on three Bureau of Reclamation (Reclamation) projects in FY14.

This report documents how field tests determined that MICA is a useful tool for data collection and storage during inspections on Reclamation projects. Work included beta testing of the cross-platform version of MICA. Reclamation continues to work with U.S. Army Corps of Engineers (USACE) to develop a long-term implementation and data management plan for the use of MICA and to determine the ability to secure and improve upon MICA for a wide range of field data collection.

Acronyms

app	application
FY	fiscal year
GIS	geographic information system
GPS	Global Positioning System
ITL	Information Technology Laboratory
MICA	Mobile Information Collection Application
OS	operating system
PVC	polyvinyl chloride
Reclamation	Bureau of Reclamation
TESSEL	
U.S.	United States
USACE	U.S. Army Corps of Engineers
USACE-ITL	U.S. Army Corps of Engineers- Information Technology Laboratory

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Introduction

This project evolved from a 2014 Research Jam idea with the goal of answering questions as to “if” and “how” the Bureau of Reclamation (Reclamation) could effectively implement tablet computers, such as the iPad, as efficient and functional tools for field and lab work. Tablets offer a cheaper and more portable alternative to laptops, and with the growing number of available applications (apps), there is something available for almost every task: data collection, photo storage and organization, high resolution image and drawing viewing, note-taking, literature search, and tap-and-transfer file sharing. On the data collection side, many Reclamation iPad users were interested in a field data collection app with some combination of Global Positioning System/Geographic Information System (GPS/GIS) locating, form data, photos, video, and notes for tasks ranging from field inspections of infrastructure, to geotechnical surveys, to emergency response.

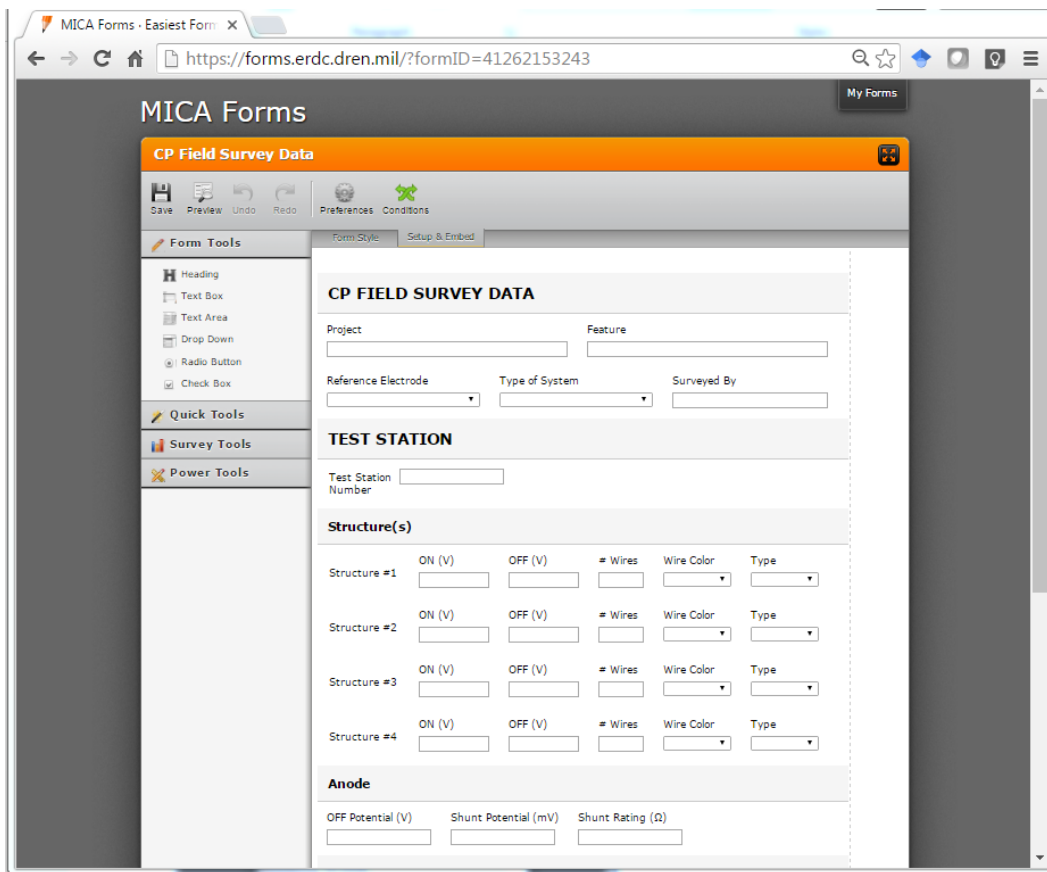
One goal of the original study was to develop a Reclamation-specific app for corrosion fieldwork that combined all of the functionality mentioned above into a single easy-to-navigate app. Avenues for app development were investigated, including internal development, commercial purchase, hack-a-thon challenge, and collaboration with a university, but all had obstacles to implementation. At a collaboration meeting co-hosted by the Research Offices of Reclamation and the U.S. Army Corps of Engineers (USACE), USACE introduced a tool developed by their Information Technology Laboratory (ITL) that was ideal for field data collection across a variety of Reclamation departments, as well as tailorable to specific tasks: Mobile Information Collection Application, or MICA.

MICA proved to be a useful tool for data collection, and the current study was proposed to outline steps and hurdles for possible implementation across Reclamation. Topics presented in this report include a review of the capabilities of MICA, field and beta testing of MICA, and a review-to-date of discussions on the challenges and possible pathways for wide-spread implementation and data management solutions using MICA.

What is MICA?

The Mobile Information Collection Application, or MICA, was designed by the USACE-ITL to collect form data, photos, video, sketches, and other notes, all linked to a GPS point. It is capable of real-time data updating to a central web-based server. It was originally designed for emergency management situations, for example it was deployed following Hurricane Sandy, to pull the functions of a GPS device, camera, phone, and paper notebook all onto one device.

Additionally, by eliminating paper forms and collecting all relevant information digitally, the data/photos/video/etc. can be automatically organized to a given GPS point, which can then be updated in real-time to a central web-based server and mapped. Information can be analyzed and decisions made in a much timelier manner than if data had to be transcribed by hand. Field personnel can also sync to the central server and view data points collected by other colleagues with MICA-enabled devices, which can be useful to avoid duplicate site testing and track progress throughout a day. Users can easily build customized forms for data collection in a variety of project types (figures 1 and 2).



The screenshot displays a web browser window with the URL <https://forms.erdc.dren.mil/?formID=41262153243>. The page title is "MICA Forms" and the form is titled "CP Field Survey Data". The interface includes a top navigation bar with "Save", "Preview", "Undo", "Redo", "Preferences", and "Conditions" buttons. A left sidebar contains "Form Tools" (Heading, Text Box, Text Area, Drop Down, Radio Button, Check Box), "Quick Tools", "Survey Tools", and "Power Tools". The main form area is divided into sections: "CP FIELD SURVEY DATA" with fields for Project, Feature, Reference Electrode, Type of System, and Surveyed By; "TEST STATION" with a Test Station Number field; "Structure(s)" with four rows for Structure #1 through #4, each containing ON (V), OFF (V), # Wires, Wire Color, and Type fields; and "Anode" with OFF Potential (V), Shunt Potential (mV), and Shunt Rating (Ω) fields.

Figure 1.—A customized form created with MICA used on the testing of the Mni Wiconi pipeline cathodic protection system.

The screenshot displays a software interface with two main sections: 'RECTIFIER' and 'JUNCTION BOX'. The 'RECTIFIER' section contains several input fields: 'Rectifier Number' (Bridge Rectifier), 'Tap or Dial Setting (Coarse/Fine)' (16), 'Panel Meter Voltage (V)' (4), 'Panel Meter Current (A)' (1.9), 'Measured Output Voltage (V)' (3.458), 'Measured Shunt (mV)' (21.6), 'Shunt Rating (mV)' (10), and 'Shunt Rating (A)' (1). The 'JUNCTION BOX' section contains three rows of data for 'Anode #1', 'Anode #2', and 'Anode #3', each with 'Shunt Potential (mV)' and 'Resistor Setting (Ω or %)' fields.

RECTIFIER				
Rectifier Number	Bridge Rectifier	Tap or Dial Setting (Coarse/Fine)	16	
Panel Meter Voltage (V)	4	Panel Meter Current (A)	1.9	
		Measured Output Voltage (V)	3.458	
Measured Shunt (mV)	21.6	Shunt Rating (mV)	10	
		Shunt Rating (A)	1	
JUNCTION BOX				
Anode #1	Shunt Potential (mV)	1.2	Resistor Setting (Ω or %)	none
Anode #2	Shunt Potential (mV)	4.6	Resistor Setting (Ω or %)	
Anode #3	Shunt Potential (mV)	5.9	Resistor Setting (Ω or %)	

Figure 2.—Data input on a form developed in MICA to test a corrosion mitigation system.

The original version of MICA was written for the Android operating system (OS). USACE-ITL came out with a cross-platform version 3 of MICA in September 2015 that runs on Android OS, iOS, and Microsoft OS (figure 3). Both allow the collection of routes and points, as well as map views (figures 4 and 5). The cross-platform version enables MICA to be used on iPads, the approved tablets for use in Reclamation.



Figure 3.—Image of original MICA interface on an Android device.

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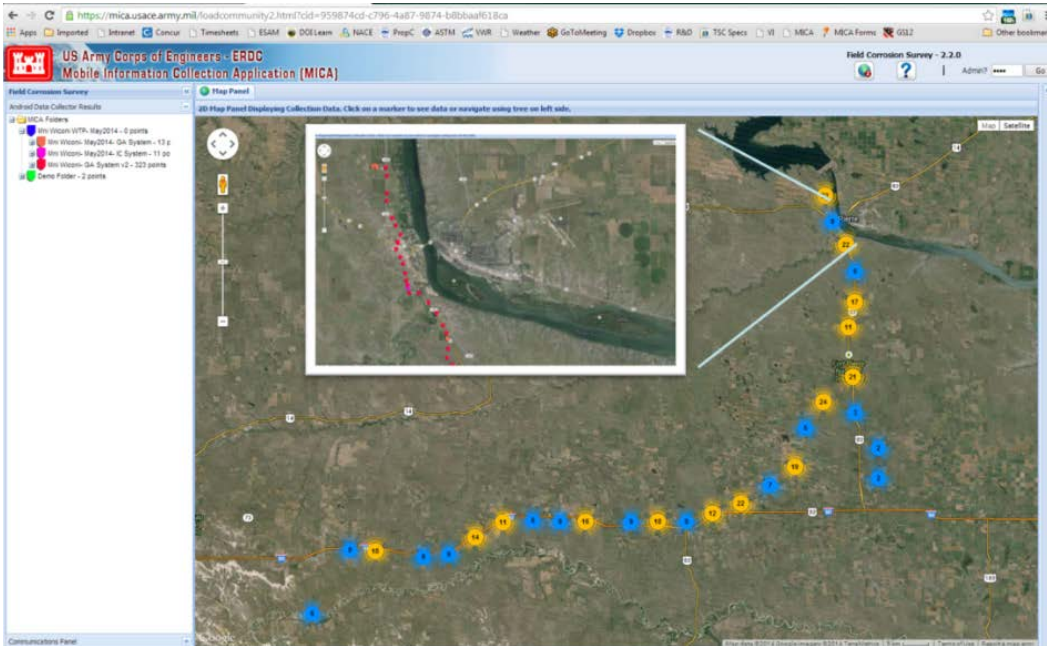


Figure 4.—Map with integrated GPS of over 300 testing stations along a pipeline used during pilot testing of MICA on the Mni Wiconi project.

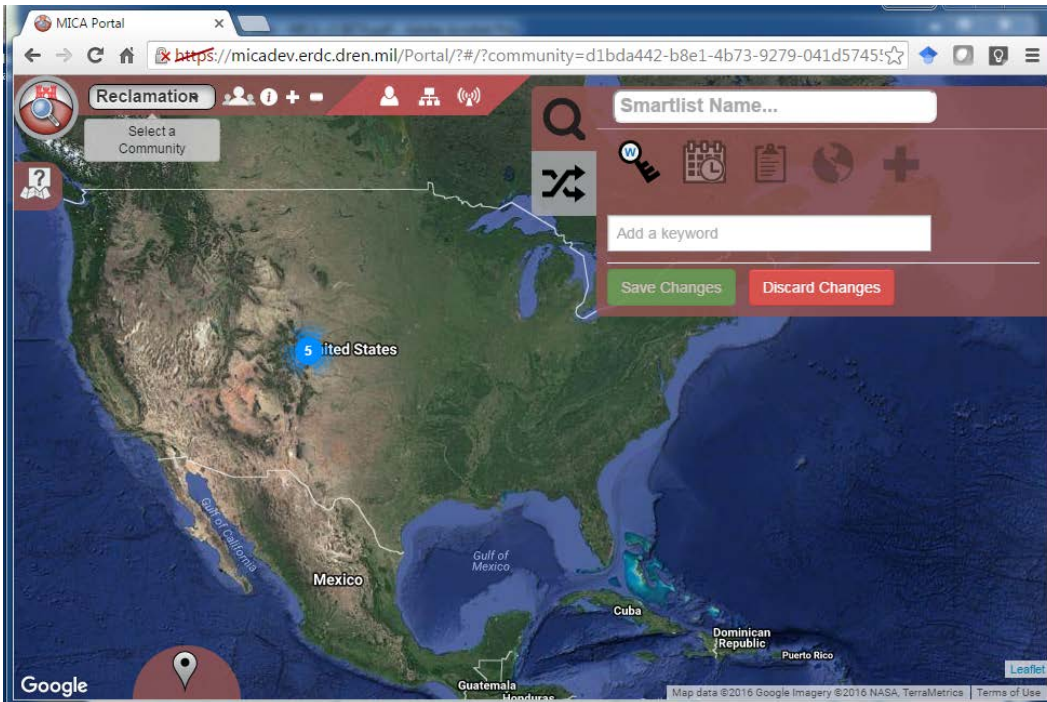


Figure 5.—Online access to the MICA database organized by agency and location to store information for individual projects or agencies.

MICA Field Test

MICA is not only useful for emergency management. As part of the FY14 work, it was used to collect data on the cathodic protection system of the Mni Wiconi Core Pipeline in Pierre, South Dakota. This was well over 100 miles of steel pipe with impressed current cathodic protection and additional polyvinyl chloride (PVC) pipe with metallic fittings and a galvanic anode cathodic protection system. The MICA form interface was used to create custom data-entry forms for cathodic protection system testing. Data was collected at over 300 test stations and rectifiers (cover image), with photos and test data GPS-located and uploaded to a map each evening to track progress. MICA was also used to test the Navajo Indian Irrigation Project Block 8 cathodic protection system, near Farmington, New Mexico, and for a corrosion inspection at Little Oso Dam in Pagosa Springs, Colorado. The GPS coordinates at each test site can now be used to guide yearly testing, saving time in locating hard-to-find test stations, and data is already organized electronically, ready for analysis. A few bugs were discovered in the software, and the USACE-ITL staff was very responsive with solutions.

Implementation Challenges and Future Work

Before integrating use of MICA at Reclamation, there is need for a long-term storage and access solution to manage data collected using the app. Data collected on MICA is stored on USACE servers and then released to the agencies for storage after one year. Linking the current GIS or TESSEL databases at Reclamation with the data collected using MICA is a possible solution. If Reclamation develops a new database, the Spatial Data Standards for Facilities, Infrastructure, and Environment from the Department of Defense was identified as a possible starting point.

In addition, in order to reach the full potential of MICA across the many disciplines at Reclamation, researchers would ideally have some access to tailor the app to the specific data to be collected. This would require USACE to open the software code for modification. At a 2016 meeting of various interested persons within Reclamation, it was concluded that having an open source version of MICA available to Reclamation staff and collaborators would be the best avenue to obtain an app with widespread use across disciplines.

This idea has been proposed to USACE, along with the idea to incorporate MICA and database integration into the Prize Competition Program at Reclamation. Ongoing discussions with USACE are investigating the possibility of making an un-tethered open source version of the app available to participating federal agencies to build upon or tailor for their purposes. If such a version can be released, Reclamation can provide the code in a Prize Competition for further development by the general public for use in specific Reclamation projects.

One current challenge is determining a cost and distribution plan for the app through USACE. When this plan is released, the challenge at Reclamation will be adapting the long-term implementation plan to meet the USACE requirements. If USACE determines that they can release the code to Reclamation for use in Prize Competitions, cost and distribution information will not need to be determined. Including funding for use of MICA in projects and developing a method to make the associated technology available for projects will be an important part of Reclamation's implementation plan.

Reclamation will continue to work with USACE on MICA usage through the Prize Competition avenue.

Project Information

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