Flood Warning and Water Quality Telemetry Design for Albuquerque

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– AMAFCA was created as a political subdivision of the State by the 1963 Legislature.

– To prevent injury or loss of life and to eliminate or minimize property damage due to flooding.
The AMAFCA Jurisdiction

– 353 Square Miles
– Over 670,000 People
– 21 Dams
– 46 Ponds
– 68 Miles of Channel
– 11 Miles of Pipe
– 10 Miles of Embankment
– 120 Storm Water Quality Facilities

– 5 Elected Officials
– 22 People
– 14.7 Billion Dollars of Assessed Value
AMAFCA Facilities

- Piedras Marcadas
- Amole
- Don Felipe
- McCoy
- Raymac
July 8, 2013 Storm
July 8, 2013 Storm
July 8, 2013 Storm
July 8, 2013 Storm
July 8, 2013 Storm
July 8, 2013 Storm
July 8, 2013 Storm
July 8, 2013 Storm
July 26, 2013
Need for Telemetry

– Lack of situation awareness based on time of day and staff availability
– Monitoring response delay due to storm effects
– Risk to staff
– Inefficient use of staff
Feasibility Study

- Identify potential Solutions
- Review other similar systems
- Understand current and long term needs of AMAFCA
- Construction requirements
- Initial/ Long term costs
- Data is Data, 3G/4G, Technology advances
Telemetry is the solution!

Lets Review some of the challenges!

• Dam locations remote, with marginal security, and no onsite power.
• Guns!
• High sediment load of detained waters
• Regular mucking of basins
• Arroyo locations readily accessible to the public
• Available Hardware limitations
• System Flexibility to grow in capacity and capability
Challenge: McCoy Dam
Challenge: McCoy Dam
Challenge: Amole Dam
Solutions:

Design Considerations: Dams

• Equipment can not be installed on outlet box
• Elevation and armoring to deter vandalism and theft
• Minimal disturbance to dam crest and face
• Unable to obtain oblique measurement of water surface
• Pressure sensors must be protected from equipment
• Maintenance Considerations
• Future Equipment on site.
Challenge: Prototypical Dam
Challenge: Prototypical Dam
Challenge: Prototypical Dam

CUSTOM GRATE FOR TOP

HUBBELL PT 1730 OR APPROVED EQUAL

STEEL LOCK BAR

SEE DTL. C, SHT. C-501

2" ID STEEL PIPE

EXIST. DAM FACE TO HAVE MINIMAL DISTURBANCE

CONCRETE BASE

RIPRAP AROUND BOX \( D_{50}=8" \)
Solutions:

Design Considerations: Arroyos

- Video transmission and power consumption
- Elevation and armoring to deter vandalism and theft
- Maintaining existing access points to Arroyo
- Maintenance Considerations
- Future Equipment on site.
Challenge: Northern Diversion

ADMIN BUILDING
On Roof:
1. Campbell antenna for Radar Sensor (dashed red)
2. Tipping Bucket rain gauge
Inside building:
A. CR-1000 and RF-401 to measure tipping bucket and Radar gauge.

Radar Sensor on bridge w/900 Mhz link to Admin

2. Cameras on roof of equipment building or tower
   Either PoP WiFi or direct POE wiring
Challenge: Camera Tower
Challenge: Northern Diversion

North Diversion
Water Height Sensor Mounting

NOTES:
1. ENCLOSURE CONTAINS SENSOR MECHANISM (ONLY HORN IS BELOW ENCLOSURE). SENSOR IS RADAR TYPE MEASURERS TO 85 FT.
2. ENCLOSURE HOUSES CR-206X DATALOGGER, BATTERY, ANTENNA, and SENSOR.
3. LOCATION MEASURERS WATER DIRECTLY BELOW. 10 DEGREE ANGLE GIVE 3.5 FT DIAMETER AT 20 FT BELOW.
4. SOLAR PANEL IS ON FACE OF ENCLOSURE. ENTIRE UNIT IS SELF CONTAINED.
5. MANY MOUNTING APPROACHES ARE POSSIBLE.
Challenge: Plan Layout

AMAFCA INSTRUMENTATION
ARCHITECTURAL OVERVIEW

Software:
1. Collects data from locations
2. Stores data in DB
3. Displays DB values in various scenarios
4. Graphs values as needed
5. Sends data in proper format to outside agencies

4G LTE

Rain gauge
CR200x w/ Ethernet
SDI-12 Pressure Sensor
Hahn Arroyo
North Diversion Channel

Radio 4G-LTE

CR200x
SDI-12 Pressure Sensor
Piedras Marcardas Dam

Radio 4G-LTE

CR200x
SDI-12 Pressure Sensor
Amole Dam

Radio 4G-LTE

CR200x
SDI-12 Pressure Sensor
Don Felipe Dam

Radio 4G-LTE

CR200x
SDI-12 Pressure Sensor
Ramac Dam

Radio 4G-LTE

CR200x
SDI-12 Pressure Sensor
McCoy Dam

Computer at AMAFCA

Inputs from each location Ethernet to AMAFCA

Near Fence or Vehicle Bldg

Wi-Fi Radio

2.4 or 5.8 GHz

Verizon Tower(s)

Rain gauge
CR1000 w/ Ethernet
Campbell Radios

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Solutions:

Capabilities

• Provide automatic alerts
• Allow remote access to data
• Catalog data
• Serve data to partner Agencies
• Real Time Video Streaming
• Expand to include additional sites, video, and other measurements
• Could be updated to allow for remote structure operation
Next Steps

– Complete 90-100 percent design
– Issue Bid and Design requirements
– Construct
– Additional Phases:
  – Add Locations
  – Add Video
  – Add Water Quality
Questions?

Thank You!

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