USE OF GIS AS A REAL TIME DECISION SUPPORT SYSTEM FOR IRRIGATION DISTRICTS

USCID Water Management Conference

Meeting Irrigation Demands in a Water-Challenged Environment
SCADA and Technology: Tools to Improve Production

Fort Collins, Colorado  September 28 - October 1, 2010
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BROWNSVILLE I.D.

- 4,200 acres irrigated
- Water delivered through pipelines under low pressure
- Resacas to store water delivered from the Rio Grande
- Predominate furrow irrigation
DEMONSTRATION PROJECT

- **General purpose:** develop web-based tools for improving information management in irrigation districts

- **Objectives:**
  - Improve access to pump, flow, water level data, gate status
  - Enable account holders to access their data directly via the Internet
  - Use GIS to link different sources of data and to serve as interactive display tool
  - Determine training requirements of District personnel for effective use of web-based tools
EXISTING SITUATION

- Pump, flow, water level, gate status is monitored and controlled via a SCADA system
- Water sales are recorded daily into a water account database on separate computers
- GIS is mainly used to create static maps
EXISTING SITUATION

- Identified problems:
  - Not all computers are interconnected
  - Formats of Databases are not suitable for GIS applications
  - Water account database lacks precised field location information
  - Insufficient data collected on crops (such as planting and harvesting date, irrigation method) to allow for planning, modeling and improved management
  - Water account database not updated frequently enough
## EDUCATION AND TRAININGS

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Procedures

- Added Internet access to some machines
- Instituted automatic generation of output files in appropriate formats
  - every 15 minutes for pump operation, flows, gates, etc.
  - every day for water accounts
- Instituted data transfer of output data every 15 minutes to server
- Created a new database with received data
- Created GIS projects to synthesize data
- Created links to the database in the district web site
- Created “Web GIS projects” for remote access
Material and methods

- **Output/transfer files:**
  - Scripts were written in *FilePro* and *Wanderware* to produce output files for transfer in CSV file format

- **Transfer of data:**
  - *Secure Shell Protocol* was used for automatic data transfer to server

- **Storage of received data:**
  - SQL Server database

- **Management of geo-database:**
  - *ArcInfo 9.3.1* (projects and geodatabases)
  - *ArcGIS Server 9.3.1* (services, web applications, and ArcSDE database)

- **Management of database:**
  - *PHP* queries
Account Holders & Landowners

The "Interactive Map" link allows Landowners and the Growers to access:
- Last week meter flow readings
- Water account data

Interactive Map: Tips and Terminology
The following will be displayed on map:
- The **Table of Contents** (TOC) lists the features or themes displayed on the map (shown on the left side of the screen)
- The **Map** in the center of the screen displays the information from the TOC
- The **Tool Bar** is located on the above the Map to find additional information

- Click here to view example -

**Meter Readings**
1. Click your meter from the yellow link on the top bar
2. Enter Meter Password

- Click here to view example -

**Account Location and Data**
1. Click "Owner Map" on the top bar
2. Enter Owner/Grower/Account Password and click "Find"
   (accounts will highlight in the map, and a legend will display in the table of contents)

- Click here to view example -

Tip: To see account data click on the map or expand results on the table of contents

- Click here to view example -

3. Zoom in to the desired area
4. Click "Print" on top bar
ACCOUNT HOLDERS:

METERS

Meter Reading: 1, 2, 3, 4, 5, 6, 7, 8
ENTER PASSWORD: ******  Log In
Pumps & Meters

Pump Station: Select a Station..........  Farm Meters: Select a Meter..........  

You may either select the pump or farm meter from the drop down menu above, or click on the station icon on the maps below.

District Pump Stations

Unit Flows (GPM) & Resaca Water Levels (WL) (In)
DISTRICT PERSONNEL:
PUMPS FLOW AND WATER LEVELS
DISTRICT PERSONNEL:
ACCOUNTS AND WATER SALES
All sales
Locating accounts
Brownsville Irrigation District - Water Tickets Sales and Flow Meters

Map Contents:
- 2008 Delivered Water (IN)
- Soil Survey
- Urbanization
- Soil Moisture Model
- Labels
- Crop
- Soil moisture (% av.w. 0-3 ft)
  - 0-0.25
  - 0.26-0.50
  - 0.51-0.75
  - 0.76-1
  - >1
- Background
  - Owner Maps
  - Tickets
  - Annotation
  - Fields 2003 flat rate
  - Boundaries < 22500
  - Water Bodies
  - Boundaries
  - NE_Mexico
  - Aerial photographs
- WaterOrders
- Tickets
Unit Flows (GPM) & Resaca Water Levels (WL) (In)
Pumps & Meters

Pump Station: [Dropdown]

Farm Meters: [Dropdown]

You may either select a pump station from the drop down menu above, or click on the station icon on the map.

Unit Flows (GPM) & Resaca Water Levels (WL) (In)

Online Management
- District
  - Pumps & Meters
  - Water Orders
- Forms
- Maps
- Links

Home
About Us
District Directory
Board of Directors
Water Policies & Documents

Office Hours
Mon-Fri: 8:00-5:00
Closed: 12-1pm

September 30, 2010

Brownsville Irrigation District
6925 Coffee Port Rd
Brownsville, Texas 78521
956/831-8462

BID
Brownsville Irrigation District

Historical Data

Pump Stations: Select a Station

Farm Meters: Select a Meter

Water Orders: Select by Year
- 2004
- 2005
- 2006
- 2007
- 2008
- 2009
- 2010
- 1996-2010
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SUMMARY

- Web-based information management tools were successfully implemented and allows internet access to all data.
- District personnel are pleased with the system.
- Account holders can access their personal water account and meter reading information, reducing the need for help from District personnel.
Future Work

- Conduct surveys of district personnel to obtain detailed evolutions of system and suggestions on improvement
- Develop a similar information management system in a large district with more complete databases
- Develop additional tools to link water orders, canal capacity and gate operations