Making tabular data spatial

Noel Perkins, GISP
US Army Corps of Engineers
Galveston District (SWG)
Background
How I got here

US Army Corps of Engineers (USACE) has a lot of tabular data that is of a known point on the ground

Still collect data about locations in a tabular format – we are getting better 😊
  - Put into a database
    - Manually and Automatically

Someone still puts it on a map (every time) 😞
  - Pulled out and put into a shapefile to be added to the map

We still reference historic data
  - Shapefiles (sometimes recreated because could not find the old one)
My Mission

Take automatic stream gage and reservoir gate readings (every 15 minutes) and add them to a database and map them automatically!
- Oracle database of gages and gates
- Read-Only access
- Not spatial (yet)

Curves in excel
- One for every reservoir
- Reservoir Manual
Example Area Curve
Example of Area/Capacity table

<table>
<thead>
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<th>Elevation (ft) NAVD 1988</th>
<th>Area (ft²) Capacity (Ac ft)</th>
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Example Gate Openings and field calculations

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<th>G4</th>
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<th>G1-Flow</th>
<th>G2-Flow</th>
<th>G3-Flow</th>
<th>G4-Flow</th>
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<th>Total Gate Flow</th>
<th>Storage Ac-Ft</th>
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Gate Calculation = IF($C11<$C$1,0,IF(+F11<=0.1,0,IF(+C11-($C$1+F11)<=0,2.87*8*(+C11-$C$1)^1.5,(0.7292311/(F11^0.07988726)*8*F11*((64.4*($C11-$C$1))^0.5))))) Different for each reservoir

24hr Flow = SUM((R11+R12)/2,(R13+R12)/2,(R14+R13)/2,(R15+R14)/2)/4

Macros run in background too
Step 1 through ..........

Extract data from Oracle and put into SQL Server we can add calculations and triggers

  USACE rules prevent me from adding triggers to the water control database
  Correct data
    USACE has raw and revised data

Load data in SQL Server tables

  Validate data
  Add date time stamp to incoming record
    Update previous elevation reading data time stamp

Perform calculations on data

  Verify those results
SQL Server Business Intelligence – Let the database do the work
More steps……….  

Create historic record of data, calculations and changes  
  data, data, data and more data  

Join data to spatial feature  
  Easiest part of the process  

Calculate symbology of action by query (Symbology Classes)  
  Increasing Levels  
  Decreasing Levels  
  Steady Levels
Map it to USACE requirements for higher ups

Everyone has a boss or three

Data display requirements
  Multiple formats

Extend it to other districts
Sample of print map
Live online page for viewing reservoir status and situation report

2017 Galveston District Situation

Current Situation: Record rainfall led to major flooding in southeast Texas. Additional rainfall exceeding 15" in some areas was received the last 48 hours. This precipitation has led to major and/or historic flooding in some rivers. Releases at Addicks and Barker are being adjusted. Flows at the Colorado River Locks (CLR) and Brazos River Floodgates (BFG) are being monitored for potential closure.

USACE Activities: EOC activated at Level III, partial activation, ensuring safe navigation, monitoring federal projects and river levels, providing support to the State.

District Report:
- No known impacts to federal projects
- Provided Ft. Bend County 37,500 sandbags (450K on hand)

State/Local Activities:
- Activated to Level III on 27 May 2016
- River Report: Colorado River at Wharton @ 32.4' (major occurs @ 43')
  - Expected to reach 46.6' on 30 May
  - 485 USGS impassable and 44 homes flooded
- Historic 91.9' 12/19/1913; Recent 42.7' 04/21/2015
- Brazos River at Richmond @ 44.14' (major occurs @ 50')
  - Crest expected at 53.5' on 31 May-RECORD
- Historic 50.3' 10/21/1994; Recent 49.9' 06/03/2016

Voluntary evacuations ongoing
- Spring Creek at Spring @ 107.75' MAJOR (occurs @ 102')
- Evacuations ongoing
- Historic 123.8' 10/10/1944; Recent 95.1' 05/28/2015
- Trinity River at Romley @ 38.21' (major occurs @ 43')
- Historic 45.6' 03/09/1942; Recent 34.7' 03/13/1997
- W Fork San Jacinto at Mumley @ 58.11' MAJOR (occurs @ 52.3')

Homes flooded:
- Historic 87.3' 10/18/1964; Recent 83.65' 06/28/2015
- Next 24-72 hours
- Continue to provide support to the State
- Adjust releases at Addicks and Barker

As Commanders' Assessment: SWG 5 AOR received excessive rainfall in already saturated locations in the past 48 hours. Ongoing flooding across most watersheds in SE Texas. Addicks and Barker releases are being adjusted. Addicks is being monitored 24/7 as it has returned to EV 2, anticipate EV 1 by 31 May. The CLR and BFG anticipate closure to navigation in the next 24-72 hours. Staff is monitoring all waterways to ensure safe navigation.