



Sustainability

 Facilities Services

- Markus Hogue
- Program Coordinator: Irrigation & Water Conservation
- The University of Texas at Austin

President's Sustainability Steering Committee

- In May 2007, President William Powers established the University Task Force on Sustainability
- University adopted a policy regarding sustainability in April 2008
- By August 31, 2020, UT Austin will reduce domestic water use by 20% with at least 40% of total water use coming from reuse/reclaimed sources



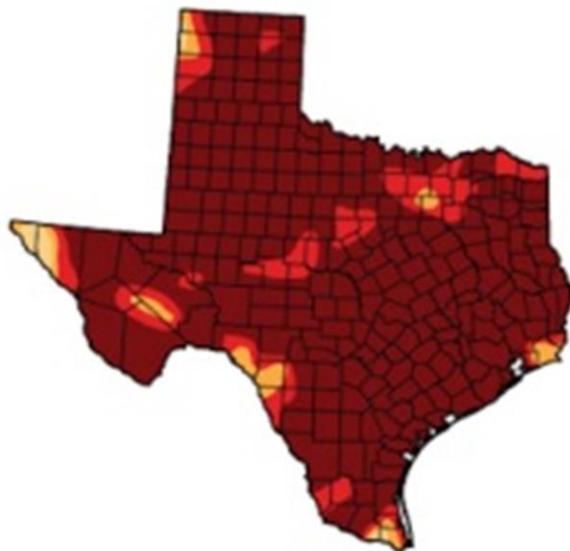
U.S. Drought Monitor

Texas

September 20, 2011
Valid 7 a.m. EST

Drought Conditions (Percent Area)

| | None | D0-D4 | D1-D4 | D2-D4 | D3-D4 | D4 |
|---|-------|--------|--------|-------|-------|-------|
| Current | 0.00 | 100.00 | 100.00 | 99.03 | 96.10 | 85.43 |
| Last Week (09/13/2011 map) | 0.00 | 100.00 | 100.00 | 99.17 | 96.75 | 87.83 |
| 3 Months Ago (06/21/2011 map) | 3.33 | 96.67 | 96.71 | 94.52 | 91.31 | 70.61 |
| Start of Calendar Year (12/28/2010 map) | 7.89 | 92.11 | 69.43 | 37.46 | 9.59 | 0.00 |
| Start of Water Year (09/28/2010 map) | 75.57 | 24.43 | 2.43 | 0.99 | 0.00 | 0.00 |
| One Year Ago (09/14/2010 map) | 77.93 | 22.07 | 3.37 | 0.97 | 0.00 | 0.00 |



Intensity:



The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

<http://drought.unl.edu/dm>

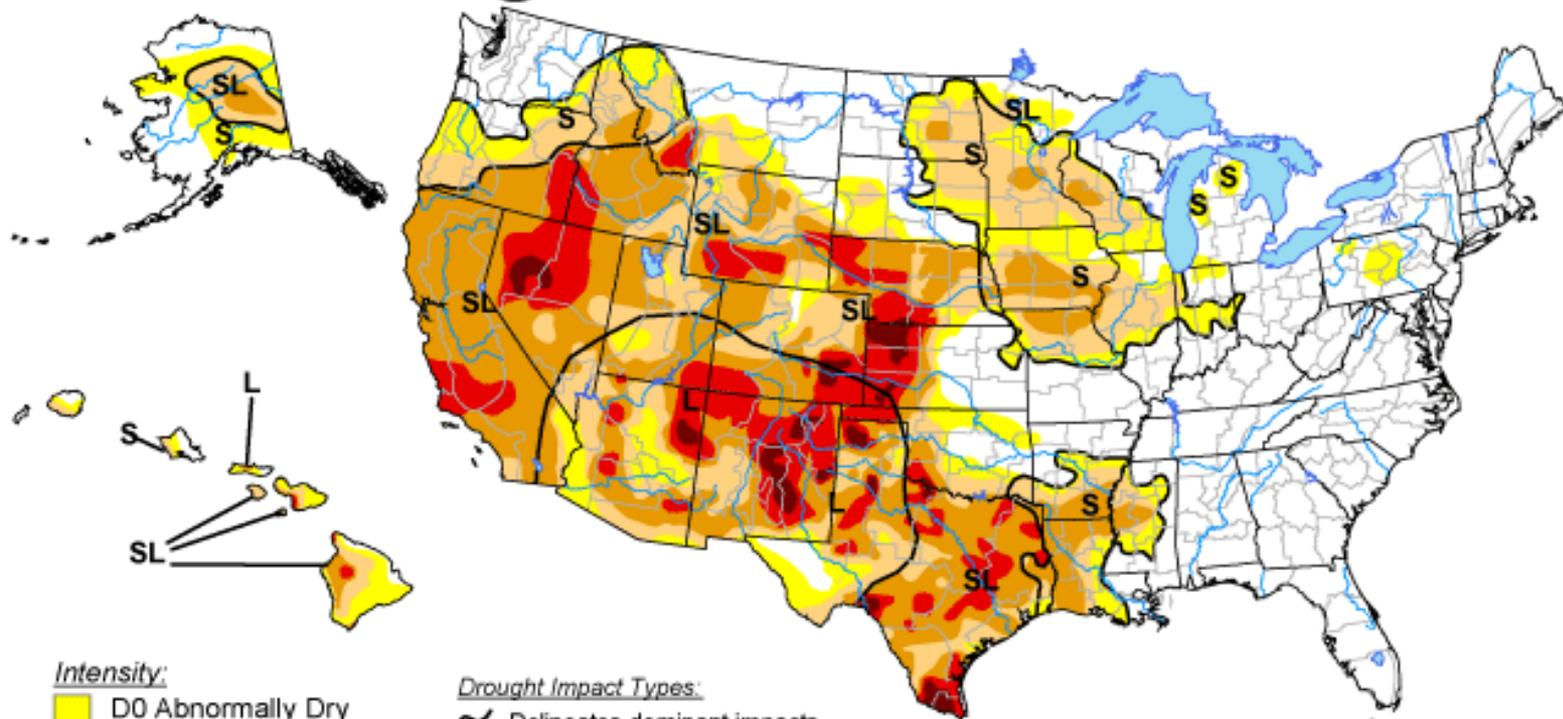


Released Thursday, September 22, 2011
Michael Brower, National Climatic Data Center/NOAA

U.S. Drought Monitor

September 3, 2013

Valid 7 a.m. EDT



Intensity:

-  D0 Abnormally Dry
-  D1 Drought - Moderate
-  D2 Drought - Severe
-  D3 Drought - Extreme
-  D4 Drought - Exceptional

Drought Impact Types:

-  Delineates dominant impacts
- S = Short-Term, typically <6 months (e.g. agriculture, grasslands)
- L = Long-Term, typically >6 months (e.g. hydrology, ecology)

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

<http://droughtmonitor.unl.edu/>



Released Thursday, September 5, 2013

Author: David Miskus, NOAA/NWS/NCEP/CPC

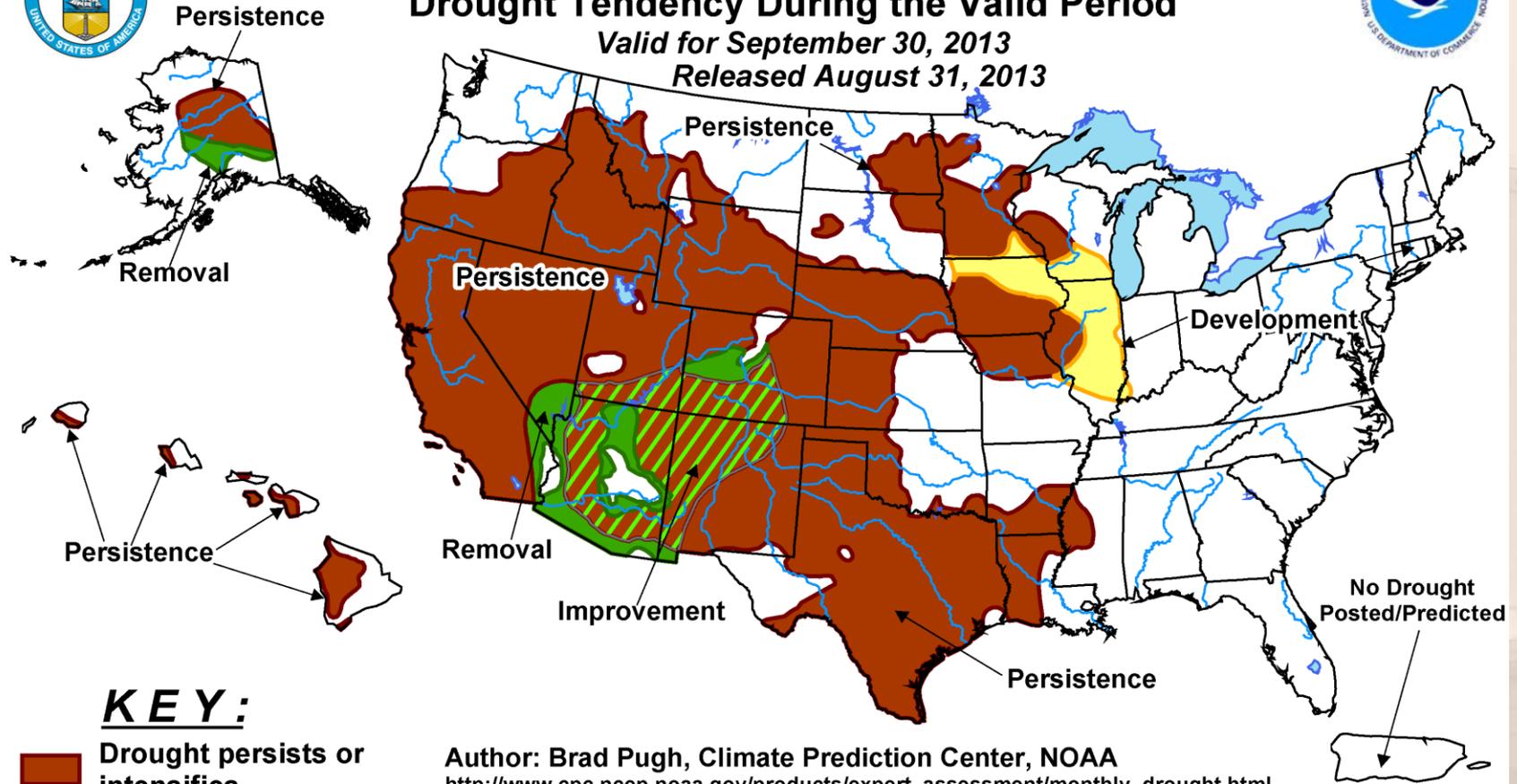


U.S. Monthly Drought Outlook

Drought Tendency During the Valid Period

Valid for September 30, 2013

Released August 31, 2013



KEY:

-  Drought persists or intensifies
-  Drought remains but improves
-  Drought removal likely
-  Drought development likely

Author: Brad Pugh, Climate Prediction Center, NOAA

http://www.cpc.ncep.noaa.gov/products/expert_assessment/monthly_drought.html

Depicts large-scale trends based on subjectively derived probabilities guided by short- and long-range statistical and dynamical forecasts. Short-term events -- such as individual storms -- cannot be accurately forecast more than a few days in advance. Use caution for applications -- such as crops -- that can be affected by such events. "Ongoing" drought areas are approximated from the Drought Monitor (D1 to D4 intensity). For weekly drought updates, see the latest U.S. Drought Monitor.

NOTE: The Green and Brown hatched areas imply at least a 1-category improvement in the Drought Monitor intensity levels by the end of the period although drought will remain. The Green areas imply drought removal by the end of the period (D0 or none)

UT Main Campus

109 Automatic Irrigation Controllers

2,288 irrigation zones

29,744 irrigation heads

53 manual zones

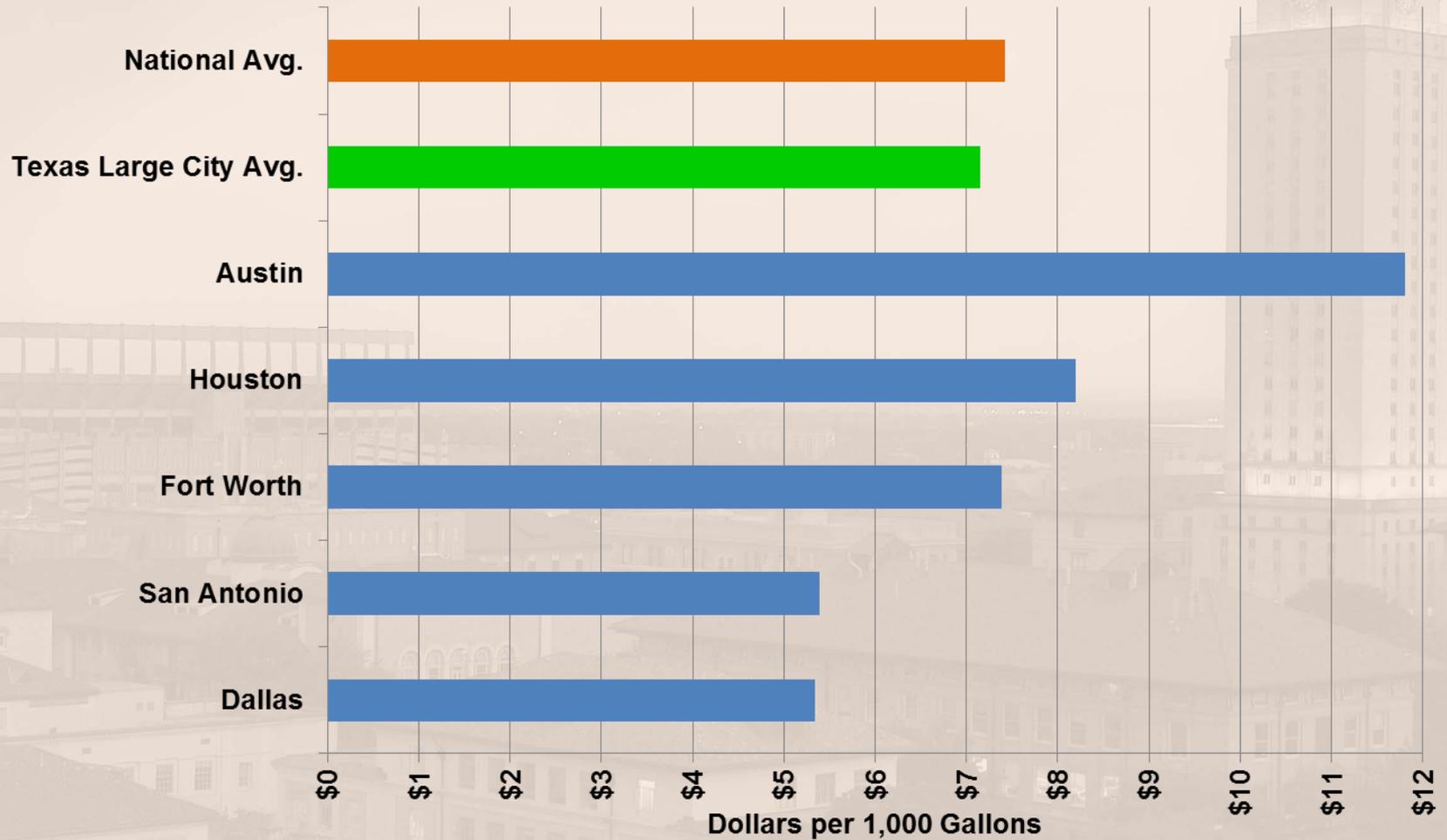
Past yearly irrigation consumption

175 million gallons of water

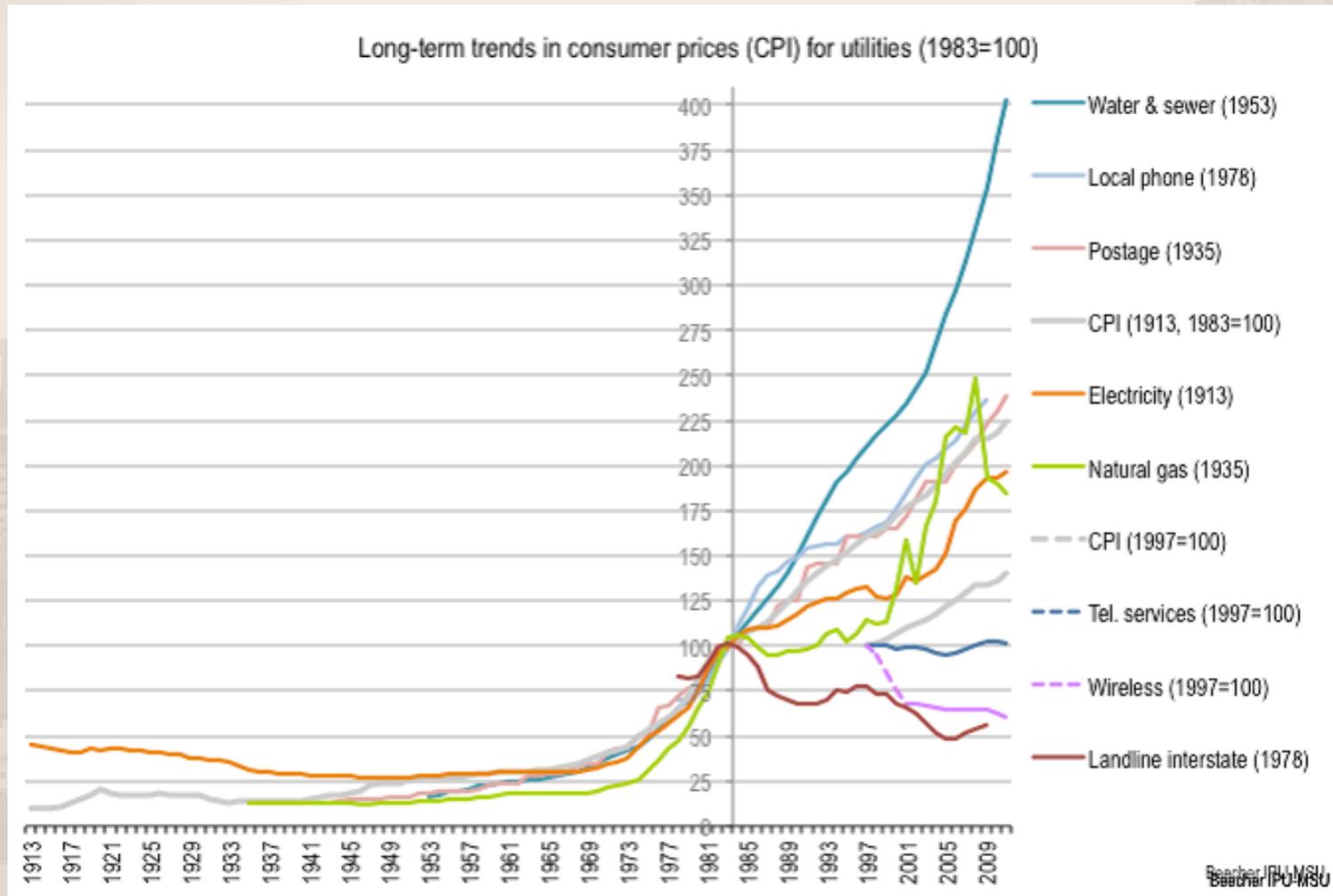
2012 consumption was 66% lower
on automated systems



2010 Combined Commercial Water & Sewer Rates



Pricing trend comparison



Irrigation and Water Management

- Distribution methods
- Central Irrigation System
- Live Weather data
- Flow Sensors
- Data analysis
- Transparency
- Xeriscaping
- Internships



Replaced over
18,000 nozzles

AFTER:

No Misting

+ No Drifting

**= Minimal Water
Waste**



Nozzles



Nozzles



Drip Irrigation

- Water applied where it is needed
- Reduced water waste



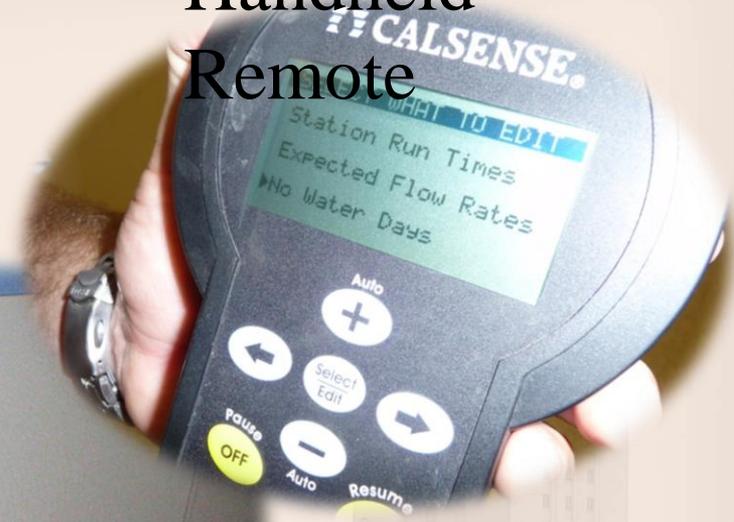
Irrigation and Water Management

- 2.1 million dollar modernization of UT's Irrigation system
- Adhere to City Watering Regulations
- Maintenance/Repair
- High Water usage Systems

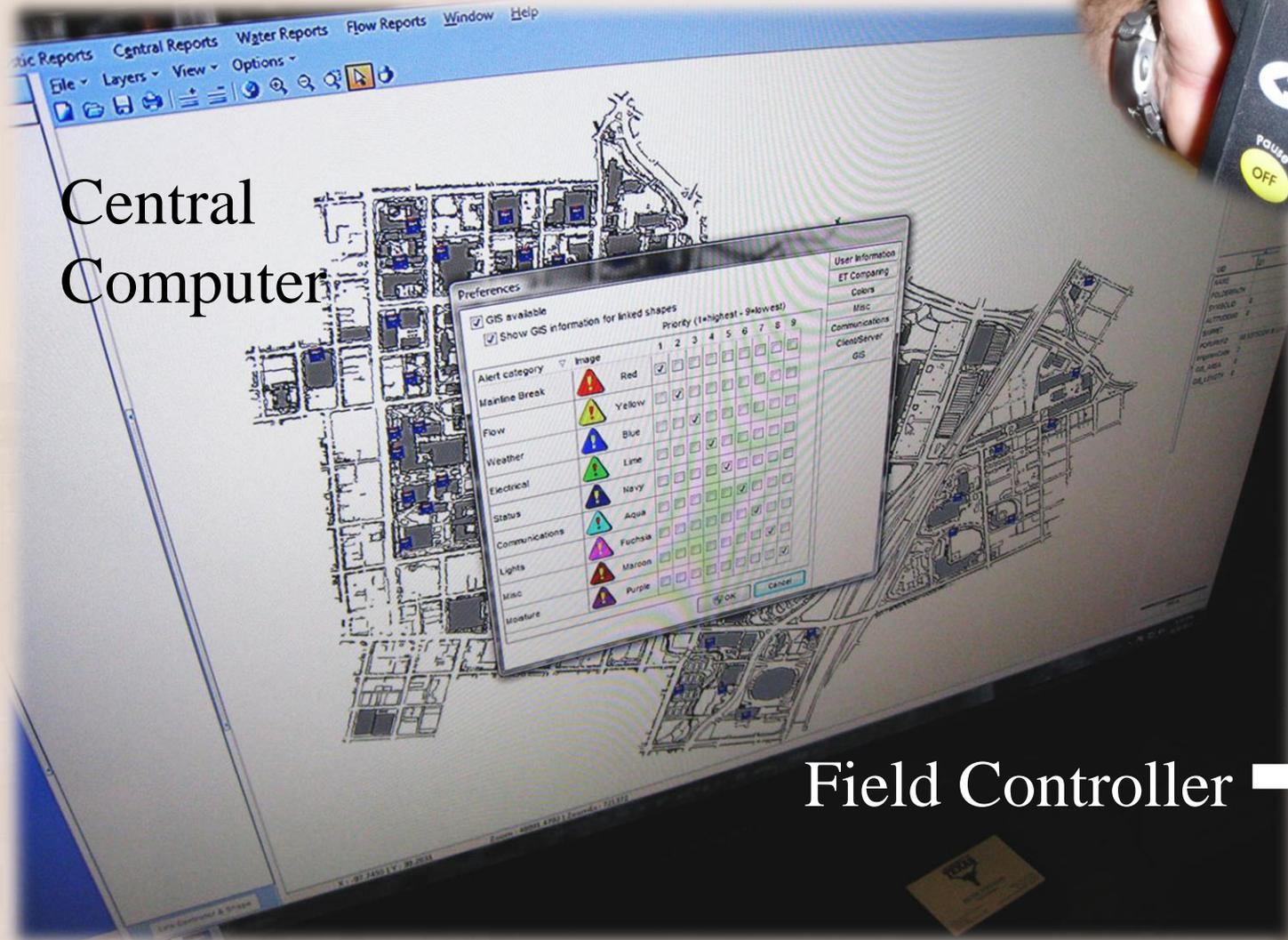


Centralized Irrigation Management

Handheld Remote



Central Computer



Field Controller →



Universal Control and Data Access

The screenshot displays the Calsense Command Center software interface. The title bar reads "Calsense Command Center {Administrator} - [Speed Communications]". The menu bar includes "File", "RR", "Setup", "Communications", "Program Data", "Diagnostic Reports", "Central Reports", "Water Reports", "Flow Reports", "Window", and "Help".

The interface is divided into several sections:

- Left Sidebar:** Contains expandable sections for "Setup" (Site/Controller, Tasks, Alert Filters & Repo..., Access Control, Controller Assignment, User Log, Rain Polling), "Communications" (Speed Communicati..., Task Scheduler, Communications Log, Winter Shutdown, Terminate Winter S...), "Program data" (Program Data), "Diagnostic repo..." (Alerts, Station History), "Central reports" (Controller List, Task List, Disabled Communic..., No Report Gathering), "Water reports" (Water Management, Water Usage, Controller Summary, Station Summary, POC Summary, Station Costing), and "Flow reports". A "Latest Alerts" section is at the bottom.
- Tree View:** Shows a hierarchy of "Sites/Controllers". Under "All Controllers", there are "HUB", "Training", and "Zone 1" (with sub-items: ADH, ARC, Belo, CMB, CPE, ETC, KIN, LFH, LLC, LTD, LTD Courtyard, SAG, SEA, SSB, SWO, TSG). Below "Zone 1" are "Zone 2", "Zone 3", "Zone 4", "Zone 5", "Zone 6", "Zone 7", and "Zone 8".
- Main Panel:** Titled "Select controller then select option to perform:", it contains a grid of 16 icons with labels: "Get Alerts", "Get Program Data", "Get Station History", "Get All Diagnostics", "Send No Water Days", "Controller ON", "Controller OFF", "Direct Access", "Get Manual Programs", "Send Access Control Codes", "Get Lights", "Clear Mainline Break", "Master Valve Override", "Clear Hold Over", "Set Time And Date", "Send Program Tag Operations", "Lights Override", and "Get Flow Recording".

Calsense Controllers



Hand Held Remote



Communication Method

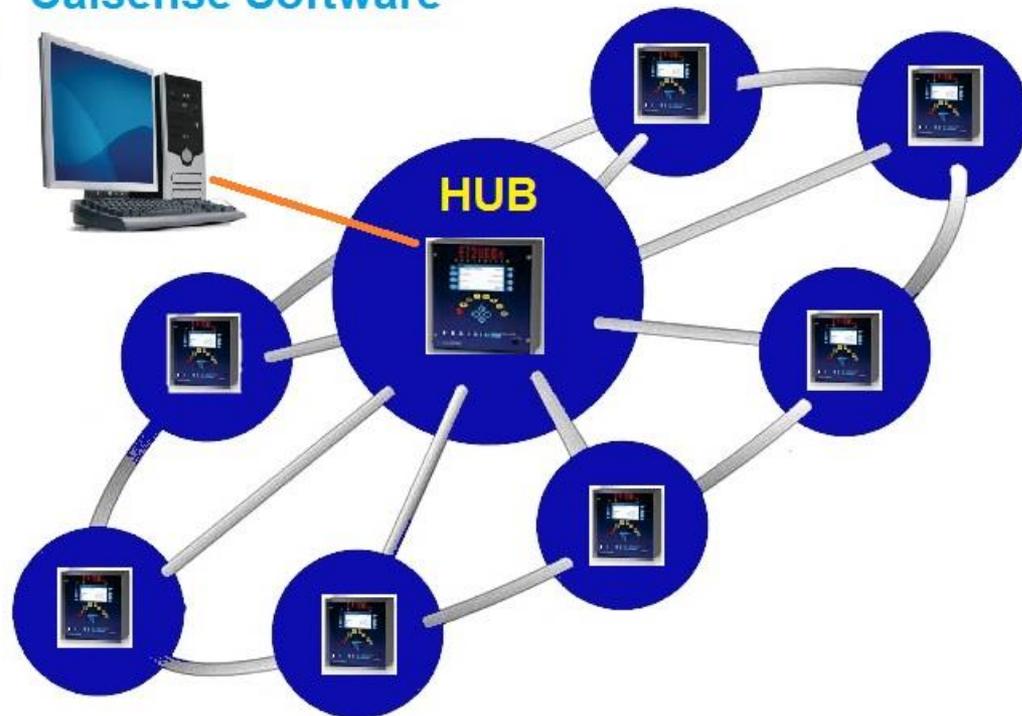
Laptop



Calsense Software



iPad or Phone



Offsite Management



GIS Map with Alert Notification

Calsense Command Center (Administrator) - [GIS Viewer]

File BRe Setup Communications Program Data Diagnostic Reports Central Reports Water Reports Flow Reports Window Help

File Layers View Options

Setup

Communications

Program data

Diagnostic repo...

Central reports

Water reports

Flow reports

Sites/Controllers

- <All Controllers>
- HUB
- Zone 1
- Zone 2
- Zone 3
- Zone 4
- Zone 5
- Zone 6
- Zone 7
- Zone 8

Preferences

GIS available

Show GIS information for linked shapes

Priority (1=highest - 9=lowest)

| Alert category | Image | Color | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|----------------|-------|---------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|--------------------------|
| Mainline Break | | Red | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Flow | | Yellow | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Weather | | Blue | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Electrical | | Lime | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Communications | | Aqua | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Status | | Navy | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Lights | | Fuchsia | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Misc | | Maroon | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Moisture | | Purple | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

User Information

ET Comparing

Colors

Misc

Communications

Client/Server

GIS

OK Cancel

Latest Alerts

Link Controller -> Shape

X: -97.7470 | Y: 30.2501

Zoom: 49011.8378 | ZoomEx: 735177.5

Alerts

Alerts By Site

February 05, 2013 7:37 AM

Zone 1

TSG

609.c

| Time Stamp | Alert Message |
|---------------------|---|
| 02/04/2013 10:02 PM | LOW FLOW: Programmed irrigation, station 1, Measured 6 gpm, Expected 13 gpm |
| 10:05 PM | LOW FLOW: Programmed irrigation, station 2, Measured 8 gpm, Expected 14 gpm |
| 10:07 PM | LOW FLOW: Programmed irrigation, station 3, Measured 7 gpm, Expected 18 gpm |
| 10:09 PM | HIGH FLOW: Programmed irrigation, station 4, Measured 33 gpm, Expected 22 gpm |
| 10:11 PM | LOW FLOW: Programmed irrigation, station 5, Measured 16 gpm, Expected 22 gpm |
| 10:13 PM | LOW FLOW: Programmed irrigation, station 6, Measured 6 gpm, Expected 15 gpm |

*Broken head west side
by entrance
2-6-13
EV*

- Location
- Time
- Savings

Above water loss

4,620 gallons

\$33 a month

Right water loss

17,820 gallons

\$128 a season

Alerts By Site

February 05, 2013 7:37 AM

Zone 1

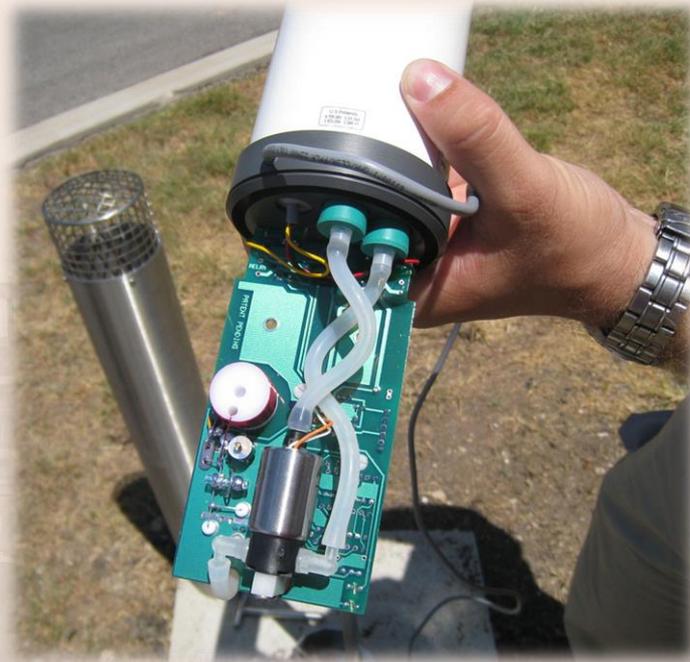
LLC

609.c

| Time Stamp | Alert Message |
|---------------------|--|
| 02/04/2013 10:02 PM | NO FLOW: Programmed irrigation, station 9, Measured 0 gpm, Expected 5 gpm |
| 11:51 PM | LOW FLOW: Programmed irrigation, station 3, Measured 5 gpm, Expected 8 gpm |
| 11:53 PM | LOW FLOW: Programmed irrigation, station 10, Measured 8 gpm, Expected 11 gpm |
| 11:59 PM | LOW FLOW: Programmed irrigation, station 11, Measured 13 gpm, Expected 16 gpm |
| 02/05/2013 12:01 AM | HIGH FLOW: Programmed irrigation, station 2, Measured 17 gpm, Expected 7 gpm |
| 12:03 AM | HIGH FLOW: Programmed irrigation, station 6, Measured 21 gpm, Expected 10 gpm |
| 12:05 AM | HIGH FLOW: Programmed irrigation, station 12, Measured 21 gpm, Expected 10 gpm |
| 12:07 AM | HIGH FLOW: Programmed irrigation, station 1, Measured 25 gpm, Expected 14 gpm |
| 12:09 AM | HIGH FLOW: Programmed irrigation, station 4, Measured 19 gpm, Expected 11 gpm |
| 12:12 AM | HIGH FLOW: Programmed irrigation, station 5, Measured 19 gpm, Expected 9 gpm |
| 12:14 AM | HIGH FLOW: Programmed irrigation, station 7, Measured 19 gpm, Expected 10 gpm |
| 12:16 AM | HIGH FLOW: Programmed irrigation, station 8, Measured 22 gpm, Expected 11 gpm |

*Valve # 11 stuck and
2-6-13
EV
Repaired
2-11-13
EV*

Adjusting for Climate by Gauging Evapotranspiration



Evapotranspiration ET definition: is a term used to describe the sum of evaporation and plant transpiration from the Earth's land surface to atmosphere.

Rain Buckets

Locations : MAI

JON

Facilities Services

Turns off irrigation due to rain

**Uses rain amount to modify
program operating times**

**Shares data with controllers that are
near the Rain Bucket's location**

**Rain Buckets at MAI and Facilities
Services have had different
amounts of up to half an inch**



Measurement & Automatic Shut-Off

Installed flow sensors & master control valves



Old irrigation control box

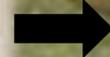
New irrigation controls



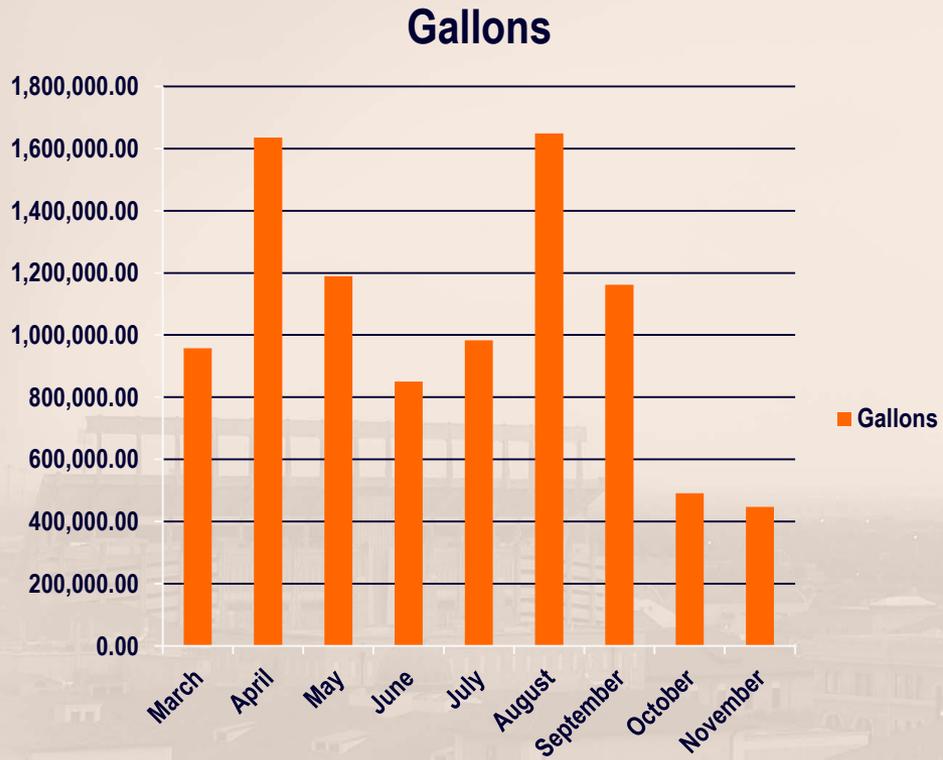
Flow sensor



Master control valve

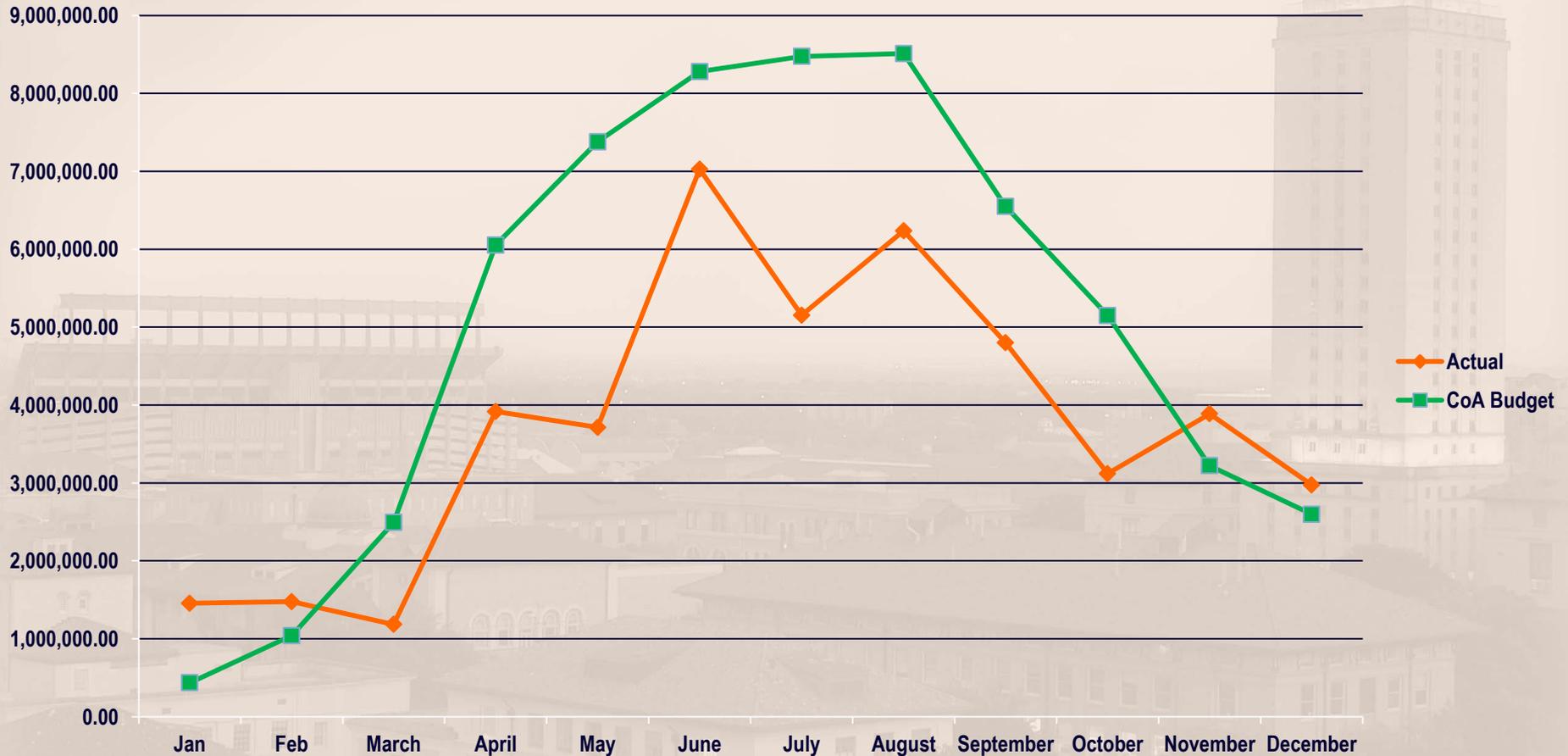


Water Savings from Flow Sensor



- Over 9.3 Million gallons saved so far!!!!

UT vs. City of Austin Budget



Past Irrigation Information

Water Meter Data from Irrigation Meters

- 285 million gallons average for past 3 years

Calculation based on nozzle precipitation

- 182 million gallons per year

WMI Irrigation Audit in 2007-2008

- 176 million gallons per year

Present Data Collection

| <u>Water Usage</u> | July 27, 2012 10:04:09 AM | Jun/01/2012 - Jun/30/2012 | |
|--------------------|---------------------------|---------------------------|------------------------|
| | Usage (Gallons) | ET Table (Inches) | Rain Table (Inches) |
| Zone 1 | | | |
| LFH | | | |
| Jun-2012 | 61,043 | 7.93 | 0.00 |
| Total | 61,043 | 7.93 | 0.00 |
| LLC | | | |
| Jun-2012 | 53,175 | 8.28 | 0.00 |
| Total | 53,175 | 8.28 | 0.00 |
| LTD | | | |
| Jun-2012 | 352 | 8.28 | 0.00 |
| Total | 352 | 8.28 | 0.00 |
| LTD Courtyard | | | |
| Jun-2012 | 4,716 | 7.93 | 0.00 |
| Total | 4,716 | 7.93 | 0.00 |
| SAG | | | |
| Jun-2012 | 3,788 | 8.28 | 0.00 |
| Total | 3,788 | 8.28 | 0.00 |
| SEA | | | |
| Jun-2012 | 138,540 | 8.28 | 0.00 |
| Total | 138,540 | 8.28 | 0.00 |
| SSB | | | |
| Jun-2012 | 51,392 | 8.28 | 0.00 |
| Total | 51,392 | 8.28 | 0.00 |
| SMC | | | |

Water Usage Data



Calsense
2075 Corte del Nogal
Carlsbad, CA 92011
(800) 572-8608
July 17, 2012 6:43 AM

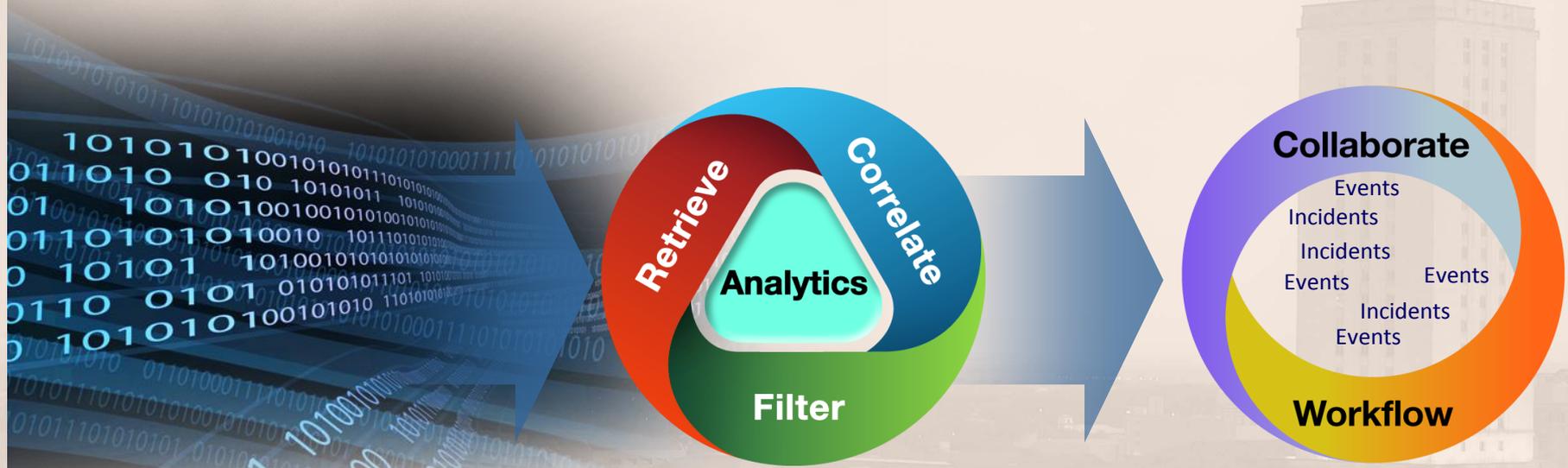
Controller Summary
Zone 7
MMS

Jun/01/2012 - Jun/30/2012

| Date | Hist. | ET | Total | Rain | Budget | Irrigation | Irrigation | Manual | Manual | Test | Test | Remote | Remote | Non-Controller | Non-Controller |
|----------------------|-------------|-------------|-------------|-------------|----------------|----------------|----------------|--------------|--------------|------------|------------|------------|------------|----------------|----------------|
| 06/01/2012 | 0.28 | 0.28h | 0.00 | 0.00o | 317,529 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 2 | 0.1 |
| 06/02/2012 | 0.28 | 0.28h | 0.00 | 0.00o | 317,529 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 12,922 | 260.3 |
| 06/03/2012 | 0.28 | 0.28h | 0.00 | 0.00o | 317,529 | 13,235 | 248.5 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 396 | 85.3 |
| 06/04/2012 | 0.28 | 0.28h | 0.00 | 0.00o | 317,529 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 12,804 | 260.3 |
| 06/05/2012 | 0.28 | 0.28h | 0.00 | 0.00o | 317,529 | 9,555 | 180.3 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 12,723 | 259.1 |
| 06/06/2012 | 0.28 | 0.28h | 0.00 | 0.00o | 317,529 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 12,871 | 260.3 |
| 06/07/2012 | 0.28 | 0.28h | 0.00 | 0.00o | 317,529 | 14,094 | 265.8 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 2 | 0.1 |
| 06/08/2012 | 0.28 | 0.28h | 0.00 | 0.00o | 317,529 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 2 | 0.1 |
| 06/09/2012 | 0.28 | 0.28h | 0.00 | 0.00o | 317,529 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 19,015 | 385.3 |
| 06/10/2012 | 0.28 | 0.28h | 0.00 | 0.00o | 317,529 | 14,144 | 268.6 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 597 | 73.9 |
| 06/11/2012 | 0.28 | 0.28h | 0.00 | 0.00o | 317,529 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 19,499 | 401.3 |
| 06/12/2012 | 0.28 | 0.28h | 0.00 | 0.00o | 317,529 | 9,750 | 248.1 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.1 |
| 06/13/2012 | 0.28 | 0.28h | 0.00 | 0.00o | 317,529 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 11,096 | 401.1 |
| 06/14/2012 | 0.28 | 0.28h | 0.00 | 0.00o | 317,529 | 10,126 | 258.3 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 1 | 0.1 |
| 06/15/2012 | 0.28 | 0.28h | 0.00 | 0.00o | 317,529 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 1 | 0.1 |
| 06/16/2012 | 0.28 | 0.28h | 0.00 | 0.00o | 317,529 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 11,059 | 401.1 |
| 06/17/2012 | 0.28 | 0.28h | 0.00 | 0.00o | 317,529 | 9,922 | 259.8 | 0 | 0.0 | 0 | 0.0 | 317 | 8.6 | 342 | 77.4 |
| 06/18/2012 | 0.28 | 0.28h | 0.00 | 0.00o | 317,529 | 0 | 0.0 | 0 | 0.0 | 139 | 4.3 | 0 | 0.0 | 10,847 | 401.1 |
| 06/19/2012 | 0.28 | 0.28h | 0.00 | 0.00o | 317,529 | 10,130 | 252.4 | 980 | 45.0 | 0 | 0.0 | 0 | 0.0 | 7,243 | 348.2 |
| 06/20/2012 | 0.28 | 0.28h | 0.00 | 0.00o | 317,529 | 0 | 0.0 | 1,014 | 45.1 | 0 | 0.0 | 0 | 0.0 | 15,241 | 497.0 |
| 06/21/2012 | 0.28 | 0.28h | 0.00 | 0.00o | 317,529 | 13,935 | 268.1 | 1,576 | 45.0 | 0 | 0.0 | 0 | 0.0 | 2 | 0.1 |
| 06/22/2012 | 0.28 | 0.28h | 0.00 | 0.00o | 317,529 | 0 | 0.0 | 1,646 | 45.3 | 0 | 0.0 | 0 | 0.0 | 2 | 0.1 |
| 06/23/2012 | 0.28 | 0.28h | 0.00 | 0.00o | 317,529 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 19,779 | 401.3 |
| 06/24/2012 | 0.28 | 0.28h | 0.00 | 0.00o | 317,529 | 14,123 | 268.5 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 4,032 | 148.3 |
| 06/25/2012 | 0.28 | 0.28h | 0.00 | 0.00o | 317,529 | 9,815 | 180.7 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 19,503 | 398.3 |
| 06/26/2012 | 0.28 | 0.28h | 0.00 | 0.00o | 317,529 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 2,772 | 60.1 |
| 06/27/2012 | 0.28 | 0.28h | 0.00 | 0.00o | 317,529 | 9,973 | 180.7 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 18,542 | 368.3 |
| 06/28/2012 | 0.28 | 0.28h | 0.00 | 0.00o | 317,529 | 13,952 | 262.1 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 2 | 0.1 |
| 06/29/2012 | 0.28 | 0.28h | 0.00 | 0.00o | 317,529 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 3 | 0.1 |
| 06/30/2012 | 0.28 | 0.28h | 0.00 | 0.00o | 317,529 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 18,878 | 371.3 |
| Jun-2012 | 8.28 | 8.28 | 0.00 | 0.00 | 317,529 | 152,754 | 3,141.9 | 5,216 | 180.4 | 139 | 4.3 | 317 | 8.6 | 230,178 | 5,860.0 |
| Totals: | 8.28 | 8.28 | 0.00 | 0.00 | 317,529 | 152,754 | 3,141.9 | 5,216 | 180.4 | 139 | 4.3 | 317 | 8.6 | 230,178 | 5,860.0 |
| Site Totals: | | | | | 317,529 | 152,754 | 3,141.9 | 5,216 | 180.4 | 139 | 4.3 | 317 | 8.6 | 230,178 | 5,860.0 |
| Grand Totals: | | | | | 317,529 | 152,754 | 3,141.9 | 5,216 | 180.4 | 139 | 4.3 | 317 | 8.6 | 230,178 | 5,860.0 |

Intelligent Operations

Collecting and analyzing data, while automating a collaborative response



Element Blue™

Data

Insight

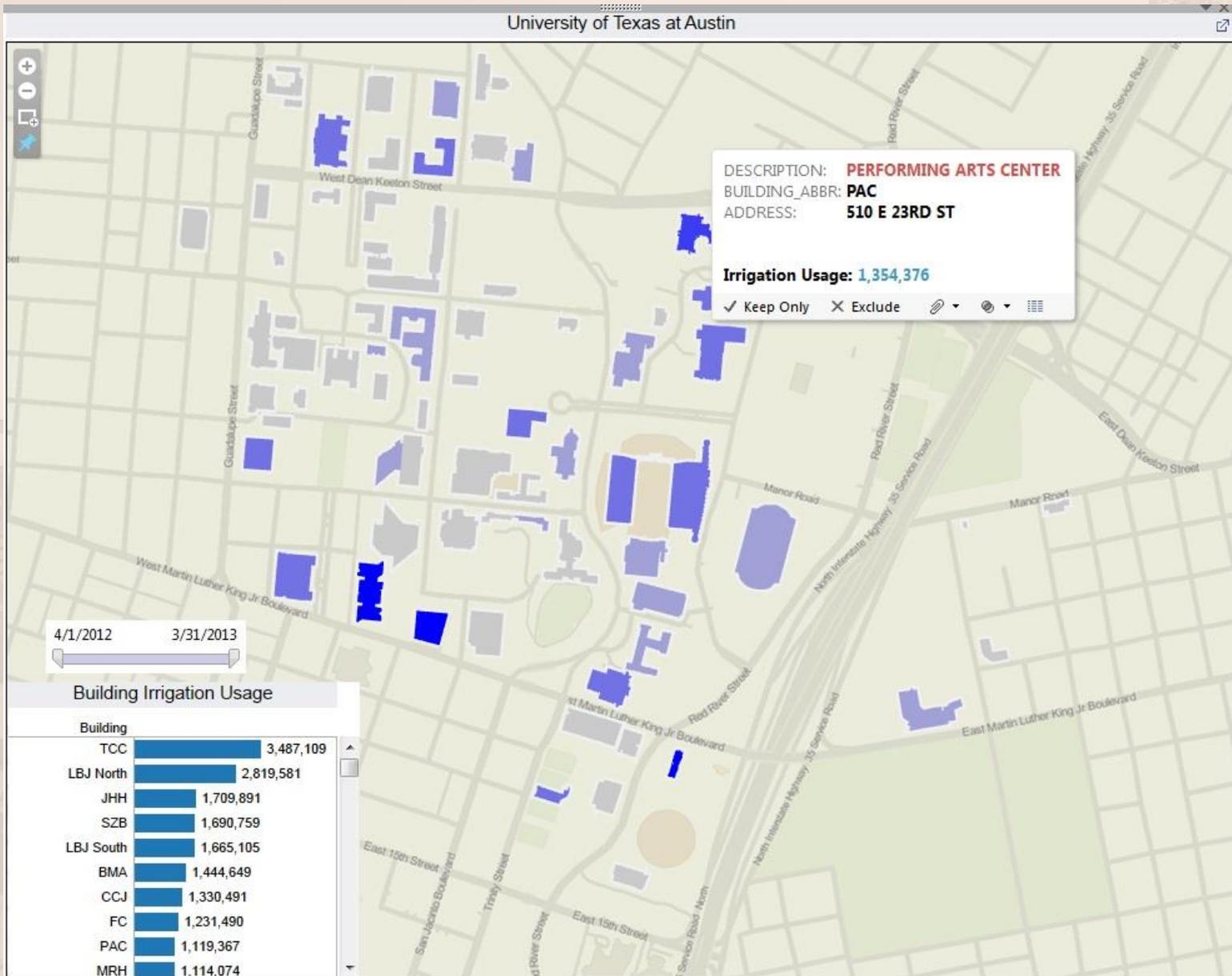
Focused Response

Leverage
Information

Anticipate problems
through analytics

Coordinate resources
and response using
actionable intelligence

Transparency



Sustainable Landscaping

Lower Maintenance

Requires less water

Can be very colorful

Local plant material



Xeriscaping



Utilizing Interns

Hands on experience!!!

Combining class lessons with
real life applications



What Starts Here Changes the World

Contact Information

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