Drought Impact on Small PWS Systems
-The Oklahoma Experience-

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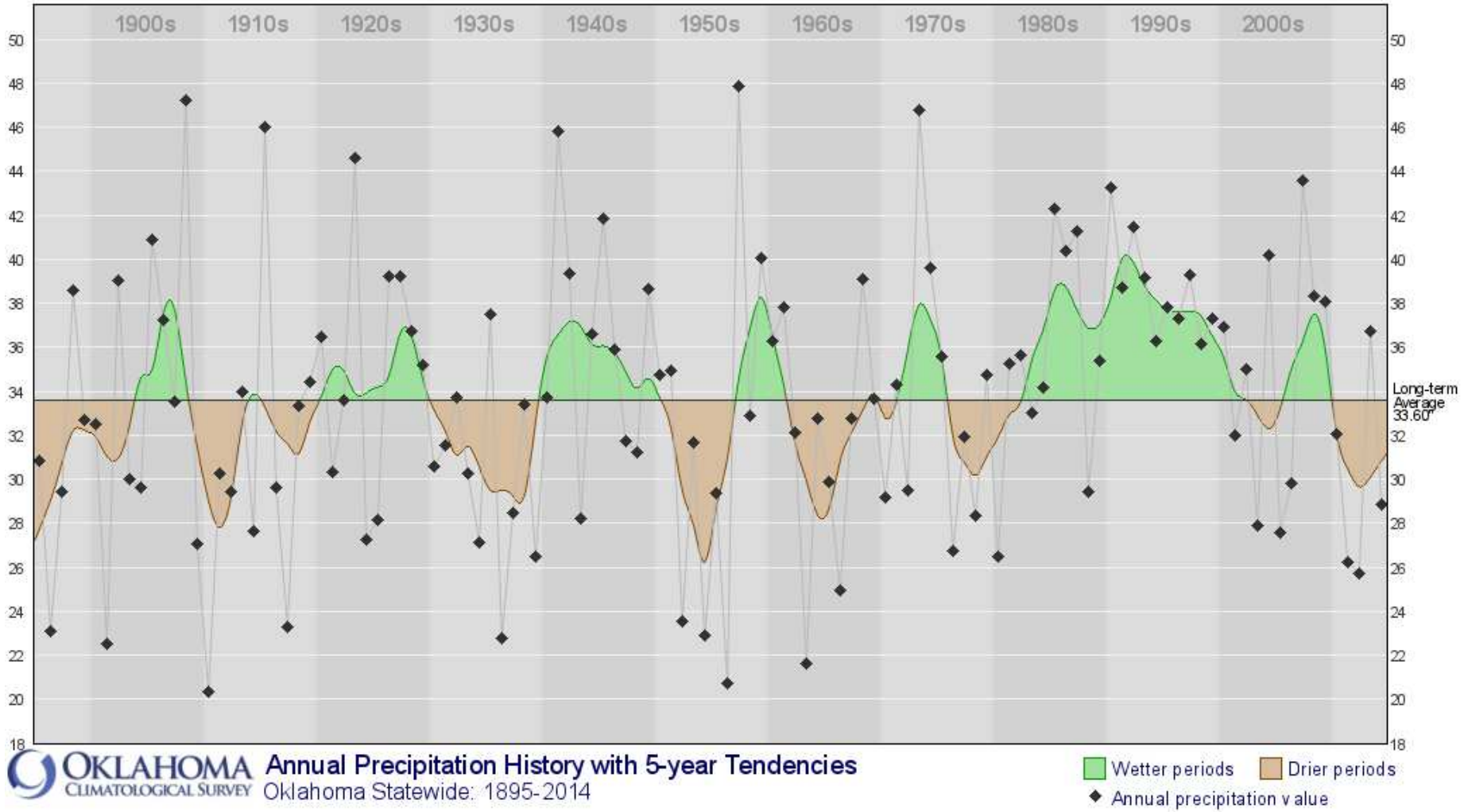
Oklahoma Department of Environmental Quality

Drought Response & Mitigation Strategies for States
Presented by ASDWA-EPA
February 10, 2016

What are we going to cover?

- City of Clinton Case Study
- Lone Chimney Water Association Case Study
- Water Loss Pilot Study
- Water Re-use

Periods of drought are nothing new to Oklahoma…



Utility Responses to Drought

- Community Involvement
  - Voluntary Water Conservation
- Mandatory Conservation
  - Enact City Ordinances or Bylaws
  - Implement Various Stages of Water Rationing
  - Impact on water revenues
- Search for Additional Water Sources

Alternative Water Sources

- Interconnection with nearby utilities?
- Construct new groundwater well(s)?
- Reactivate historic PWS wells?
- DEQ staff worked closely with PWS's
- Expedited permitting reviews & well analyses

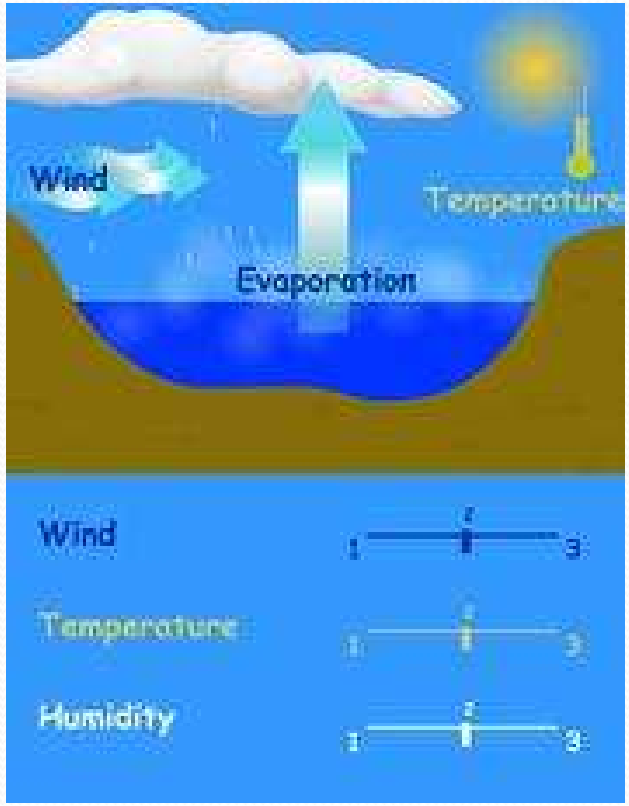

PRAY
FOR
RAIN

- Drought in 2011-2014 revealed vulnerability of OK surface water sources for small PWSs…
  …particularly in Western OK.

OKLAHOMA

Where the wind comes sweeping down the plains…

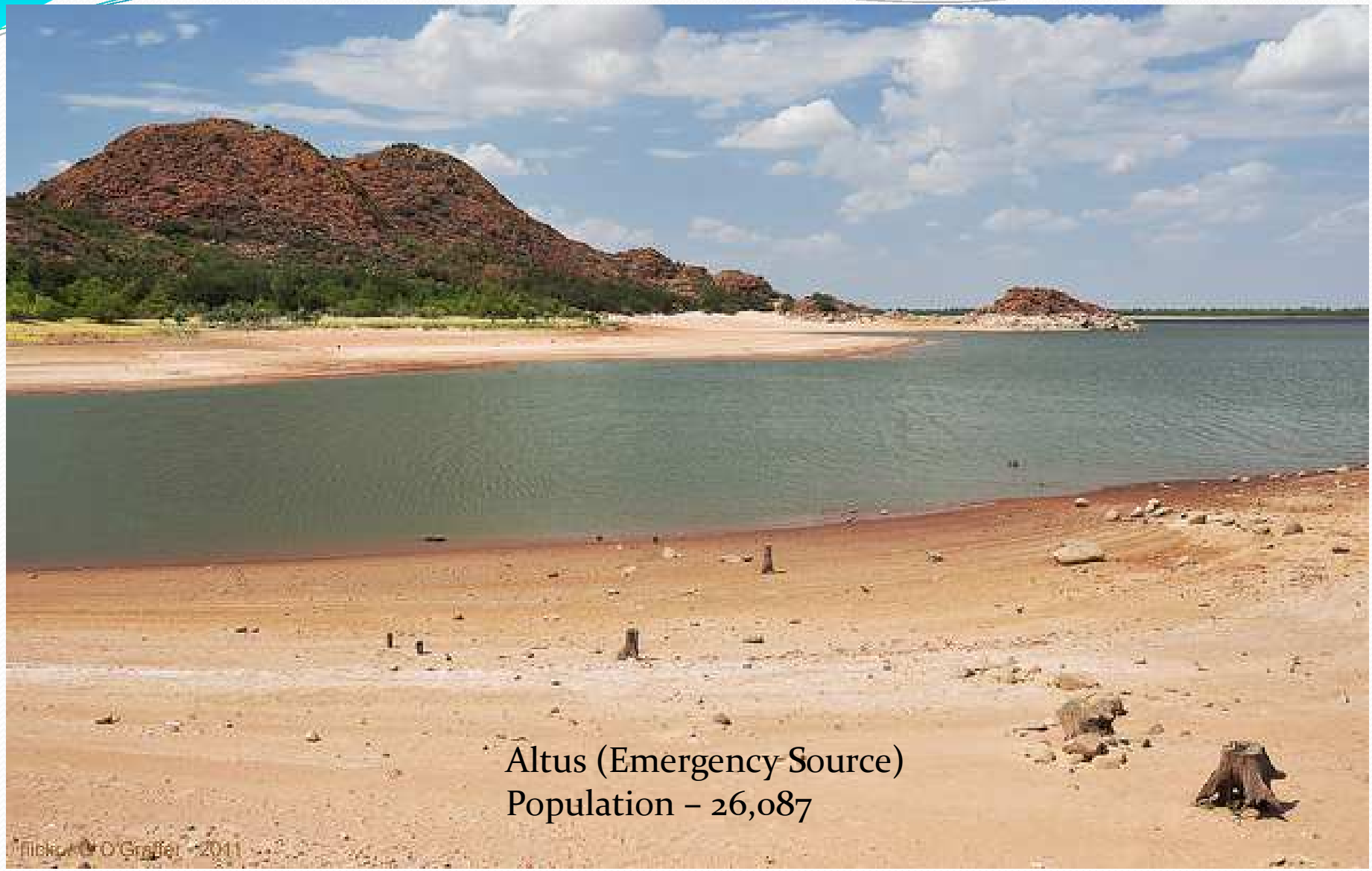
…and evaporates surface water.



Lake Murray (south of Ardmore)

Southern OK Water Corp.
Population 11,250

Lake Altus-Lugert



Rocky Lake (Hobart)

Clinton, OK

Clinton, OK

Community PWS Populations

- Clinton – 9,033
- Arapaho – 748
- Golden West Mobile Home Park - 102
- Two NC PWS as well…

Total Population Approximately 10,000

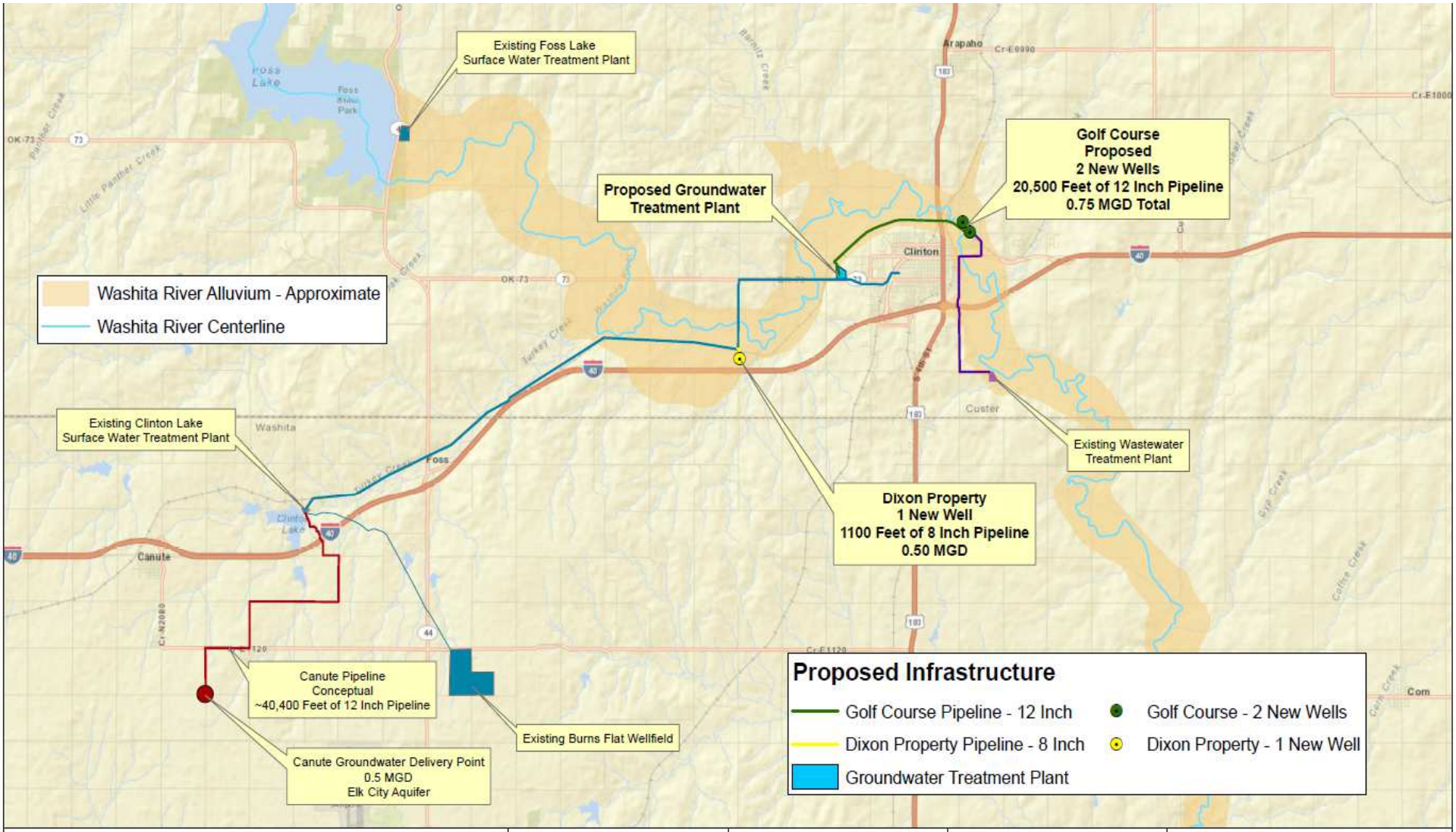
Clinton – Historically water from 2 sources

1. Clinton Lake
   - City has 2.0 MGD surface water treatment plant

2. Foss Reservoir
   - City has a Connection to Foss Reservoir Master Conservancy District (“MCD”)
   - City is part of the MCD Board

Clinton

- Discontinued WTP operations in 2011 due to persistently-low lake level (2015, WTP operating)
- At that time, Clinton Lake held ~ 2 months water supply in reserve
- Began purchasing nearly all of Clinton's public water supply from Foss Reservoir MCD (treated water)
- The search for groundwater began….



Existing Infrastructure

- Clinton Lake Pipeline Existing (24 Inch)
- Burns Flat Pipeline Existing (12 Inch)
- Existing Source / Treatment
- Wastewater Treatment Plant

1:125,000

N

0 0.5 1 2 Miles

Clinton
High City of Western Oklahoma

Burns & McDonnell
SINCE 1898

Exhibit 4

GWTP Associated Infrastructure

Clinton

- Each GW source has its own “problem”
  - Rads
  - Nitrate
  - Iron and manganese
  - Hardness
  - TDS
  - Lack of confining layer (GWUDI?)

Clinton

Dixon Well (60 ft. deep - 300 gpm, 0.4 MGD)

- Initially suspected of being GWUDI
  - Drilled in Washita River alluvium with no confining clay layer
  - MPN GW sample showed 13 CFU/100 mL

  - MPA (collected on 3/9/15) indicated:
    - Low-risk rating
    - No *Cryptosporidium* oocysts or *Giardia* cysts
  - Post-rainfall MPA to be conducted as well

- Iron, Manganese, Hardness, TDS

- Over MCL for Gross Alpha (39.7 +/- 6.14 pCi/L, sampled on 3/9/15)

Clinton

- Presently blending with Clinton Lake treated SW
- Blending Challenges
  - DEQ requires daily contaminant testing when blending
  - Not feasible to test for Gross Alpha daily
  - WQD Variance Committee granted hardness tests as a surrogate to Gross Alpha testing

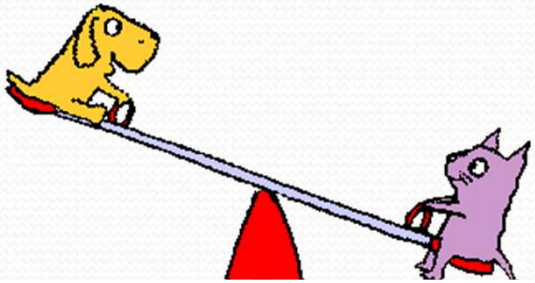
- GWUDI testing continues (2nd MPA to be done)
  - MPN of TC/EC
  - pH
  - Temperature
  - Turbidity

- Planning to construct a ground water treatment plant
  - Greensand/Reverse Osmosis
  - Note: deep well injection for RO waste stream

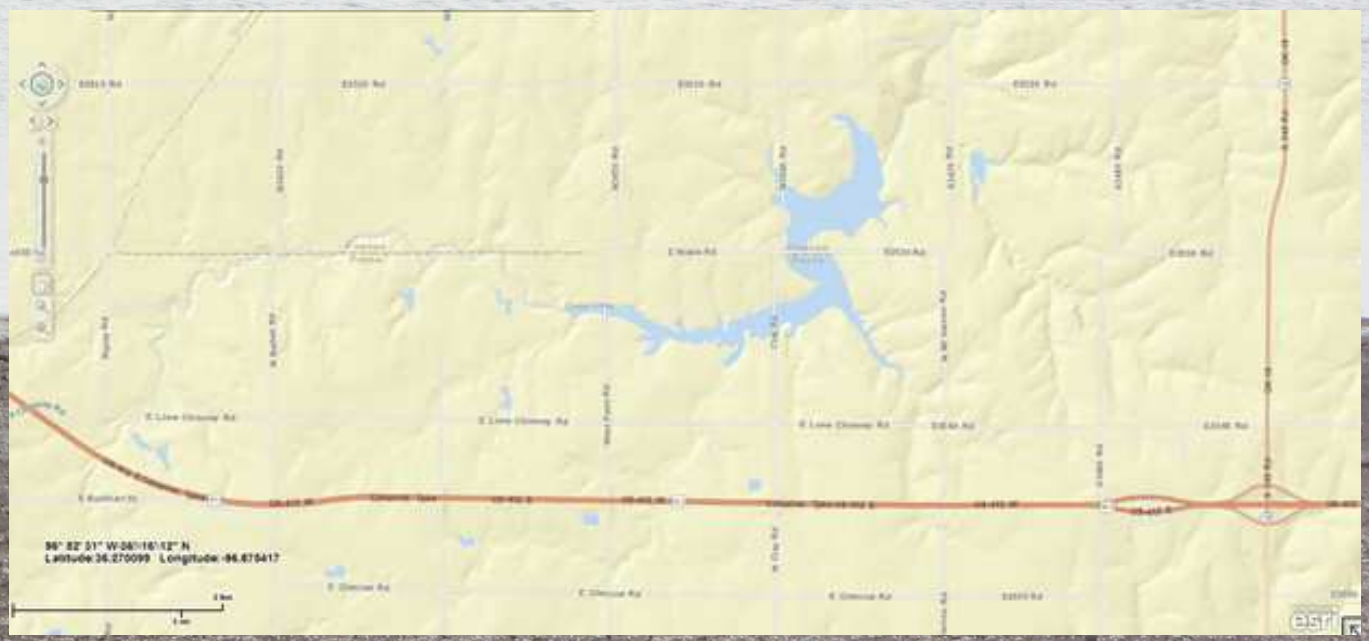
Clinton

DEQ Experience

- WORKLOAD…!
- Many internal and external meetings
- “Approve as you go” approach
- Affirmed need to formalize GWUDI SOP



Drought Impact on the Lone Chimney Water Association/Lone Chimney Lake



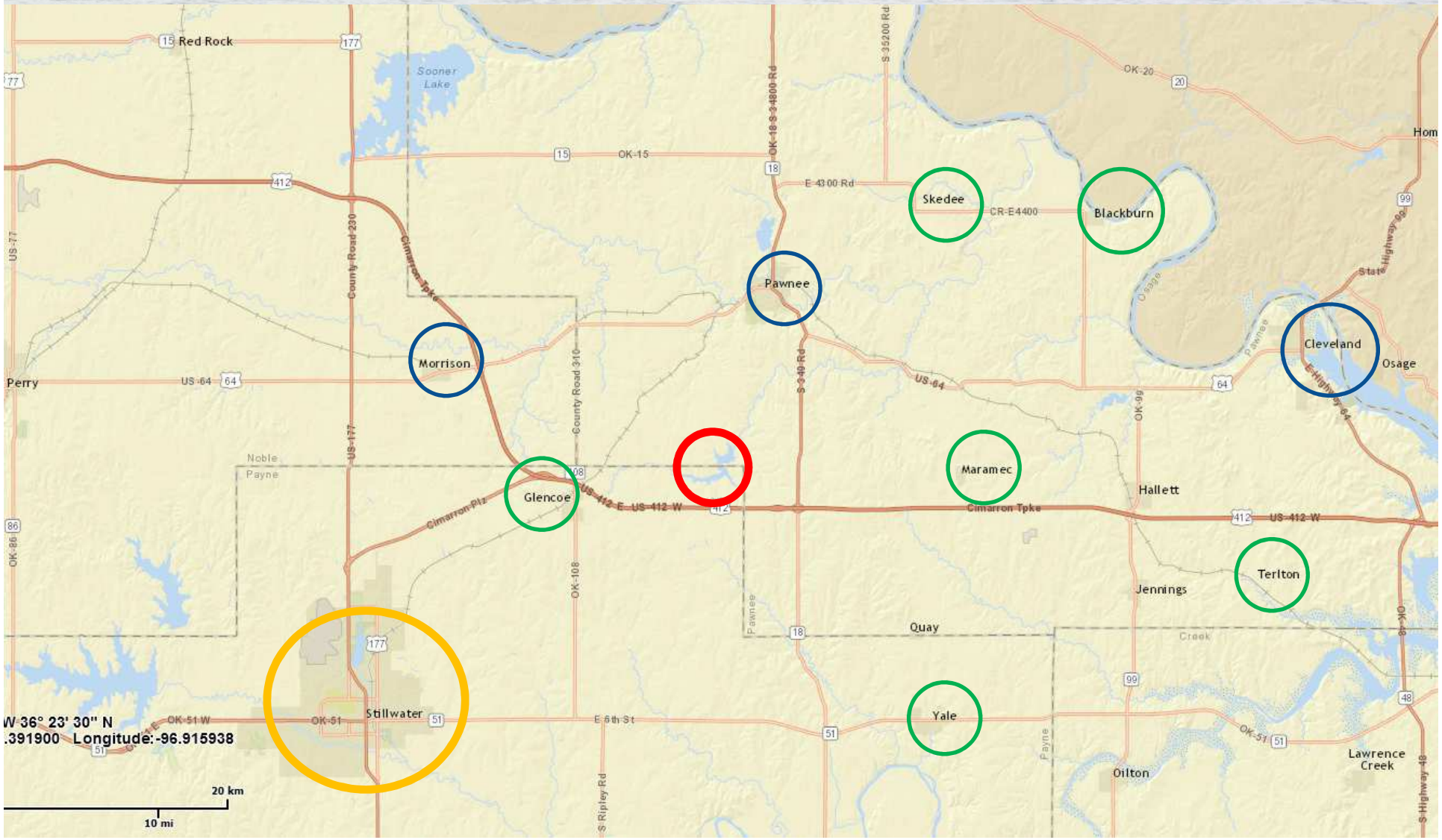
Lone Chimney Water Association

- Lake and PWS date to early 80's
- Regional water supplier for an area which includes customers in 4 counties
- 150 residential connections
- 10,000+ wholesale connections

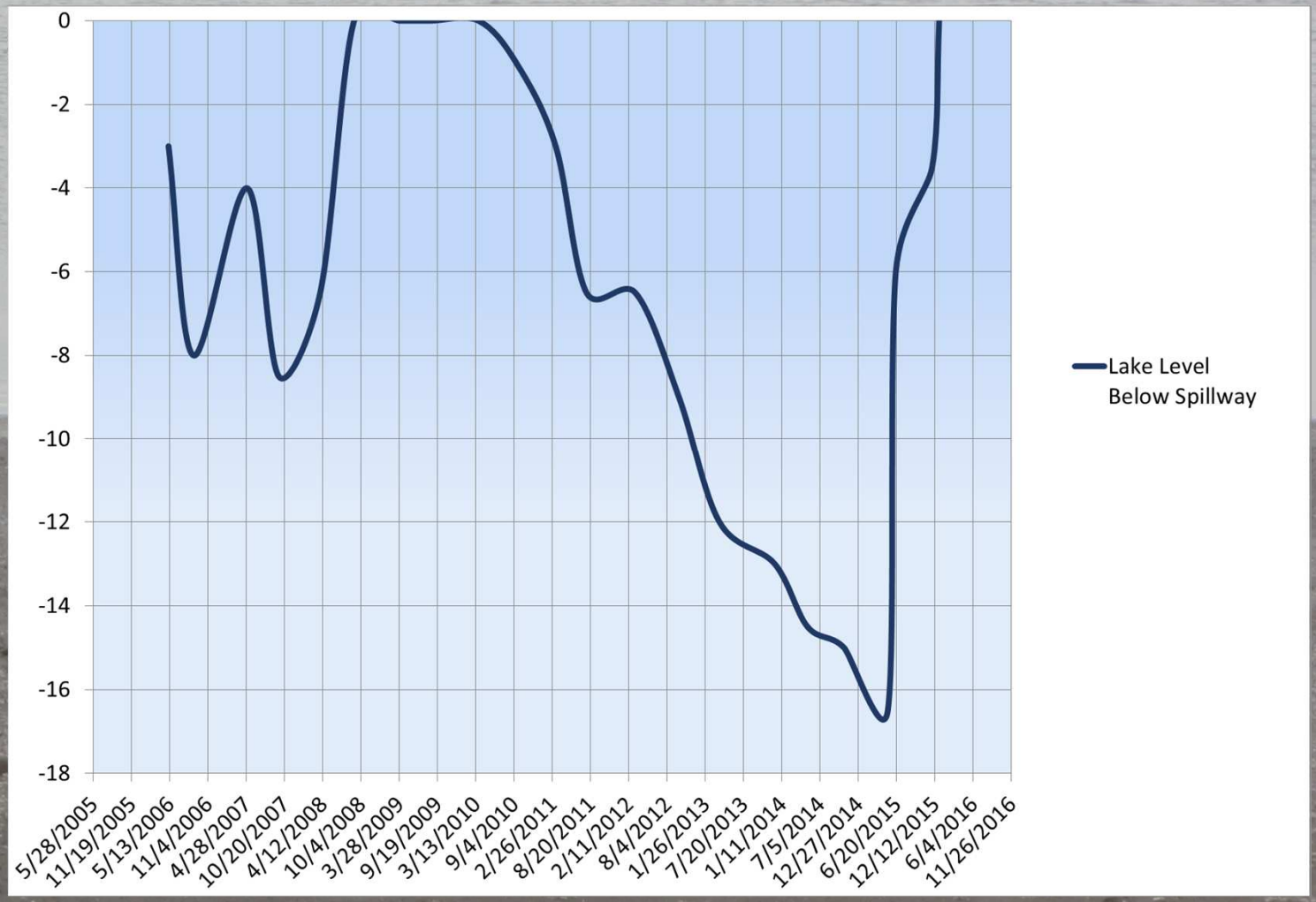
Who drinks the water?

- Association composed of the following 8 systems…
  - City of Pawnee***
  - Pawnee Co. RWD No. 3***
  - Payne Co. RWD No. 4
  - Pawnee Co. RWD No. 4
  - Noble County RWD No. 2***
  - Lincoln Co. RWD No. 4***
  - City of Glencoe
  - City of Yale
- Also sells to the following systems…
  - Pawnee County Rural Water District No. 2
  - City of Cleveland***
  - City of Morrison***
  - 51 East Water Corp.***

The Lone Chimney Universe



Lone Chimney: A Decade of Lake Level Data



Lone Chimney

Lone Chimney

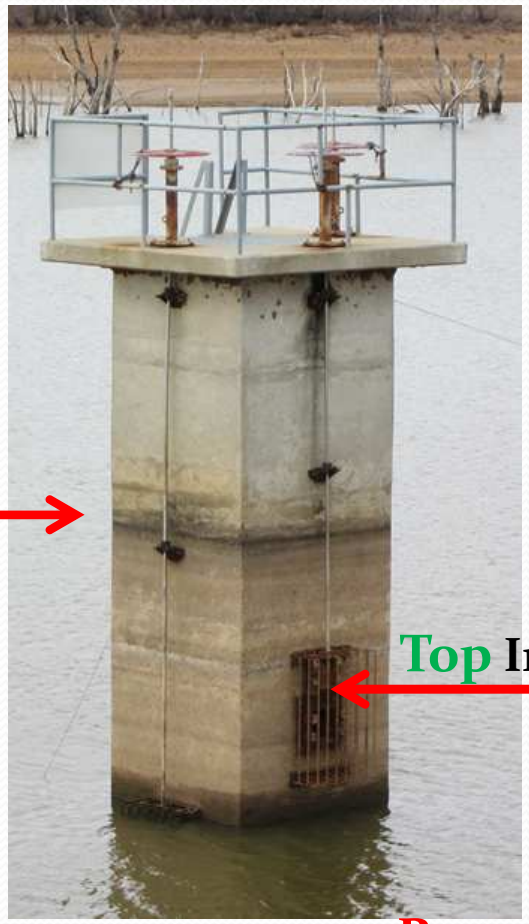
Lake Outlet Structure - 16.5 feet difference in water level

January 2009

October 2014

Lone Chimney

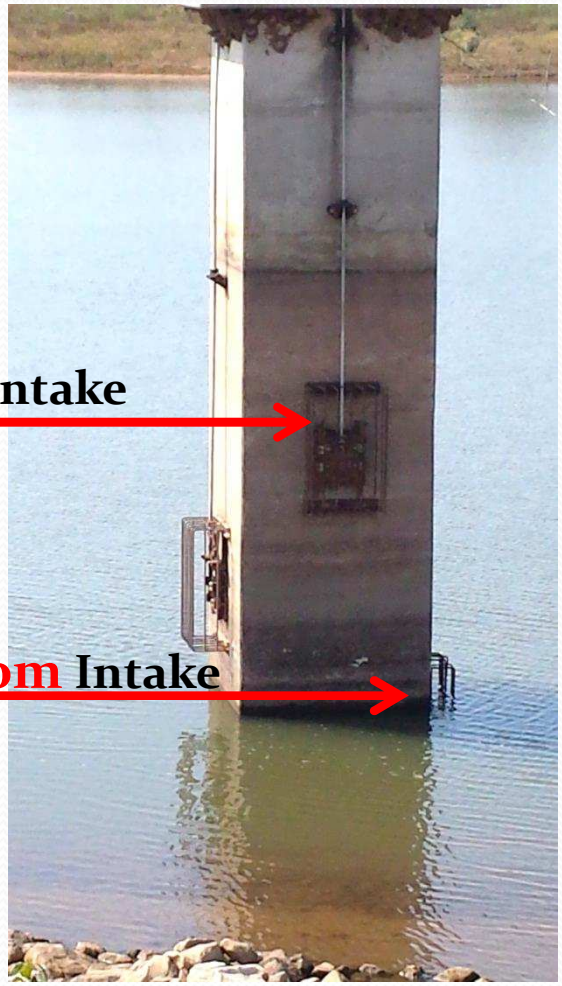
Primary Raw Water Intake
3 Levels



Watermark

January 2012

October 2014



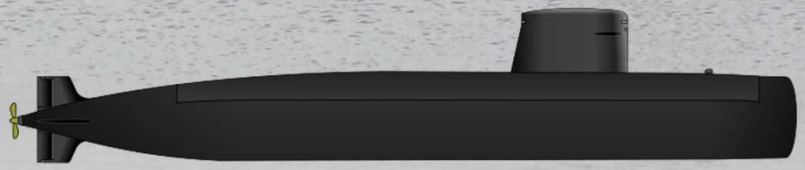
Top Intake

Bottom Intake

Lone Chimney

January 2012

Polyethylene Line Coming From Submersible Intake Set in the Original Creek Channel



(Not an actual submarine)

Pipe It In


DEQ
OKLAHOMA
DEPARTMENT OF ENVIRONMENTAL QUALITY
WATER SYSTEM
IMPROVEMENTS
State of Oklahoma
OWRB
WATER RESOURCES BOARD
the water agency
LONE CHIMNEY WATER ASSOCIATION
Loan Amount $3.355 Million
Drinking Water State Revolving Fund
Myers Engineering, Inc.
13911 Quail Pointe Dr.
Oklahoma City, OK 73124
Cherokee Pride Construction
P.O. Box 28
Sapulpa, OK 7406
Funded by the
Oklahoma Department of Environmental Quality
in cooperation with the
Oklahoma Water Resources Board
Senator Ann Griffin
Senator James E. Halligan
Representative Dennis Casey
Representative Cory T. Williams


12” line
11 miles long
Constructed over a year's time
KOMATSU

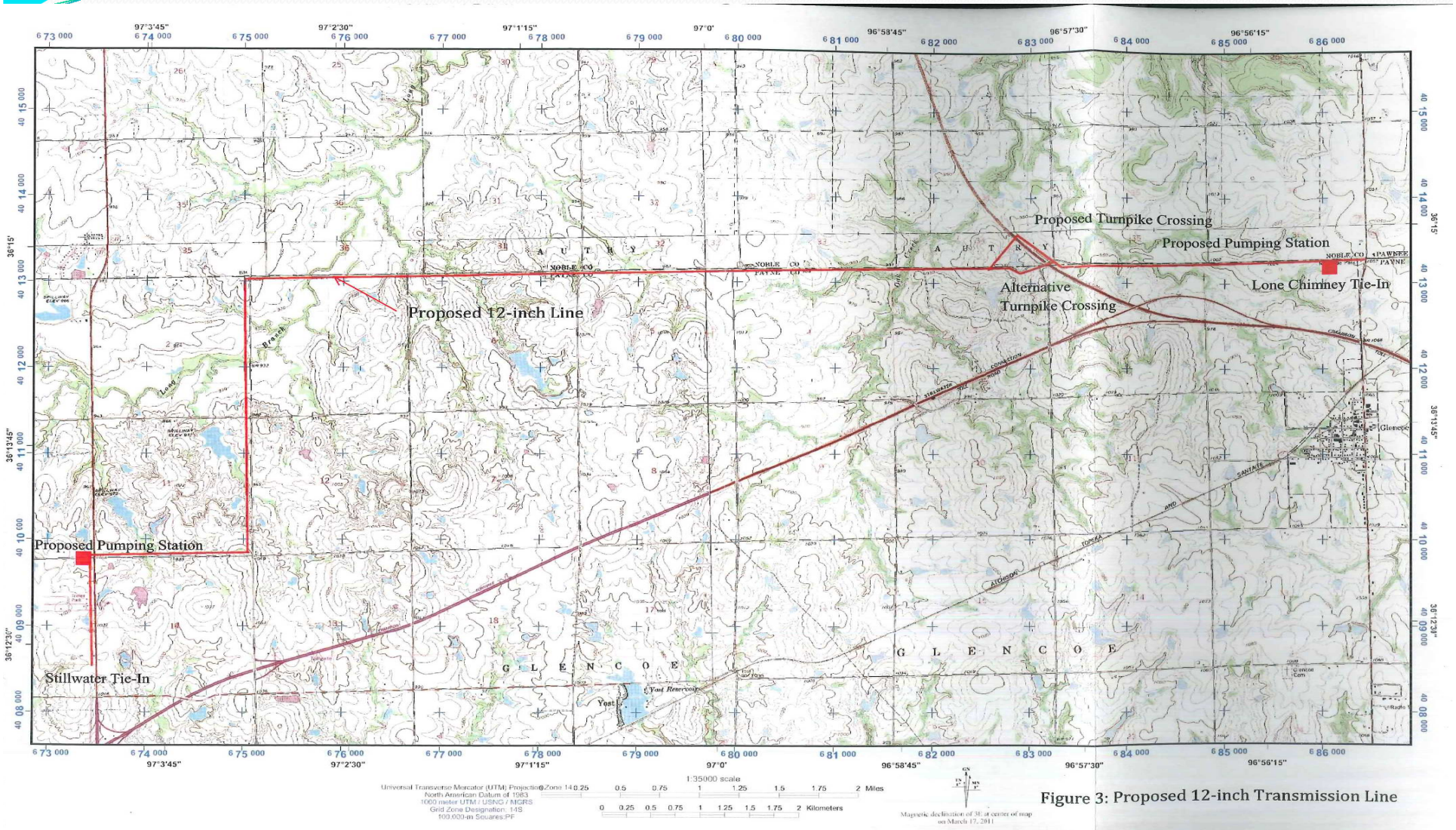


Figure 3: Proposed 12-inch Transmission Line

Financial Hardship

- LCWA still paying on loans, previous to borrowing funds to construct line
- LCWA depends on revenue from sale of water produced to pay debt and operate
- Additional debt to pay for 12" Stillwater line

Financial Hardship

- **Stillwater's water costs considerably more…**
- **Conservation versus financial viability…**
- **Purchasers looked for alternate sources…**

Communities Seeking Alternate Sources

- City of Pawnee – drilled a well, in addition to the LCWA connection and their own SWTP
- Pawnee County RWD No. 2 – built a WTP to treat undesirable groundwater
- City of Yale – has wells that produce undesirable groundwater, previously was pursuing a permit for a water plant

Pawnee Co. RWD No. 2

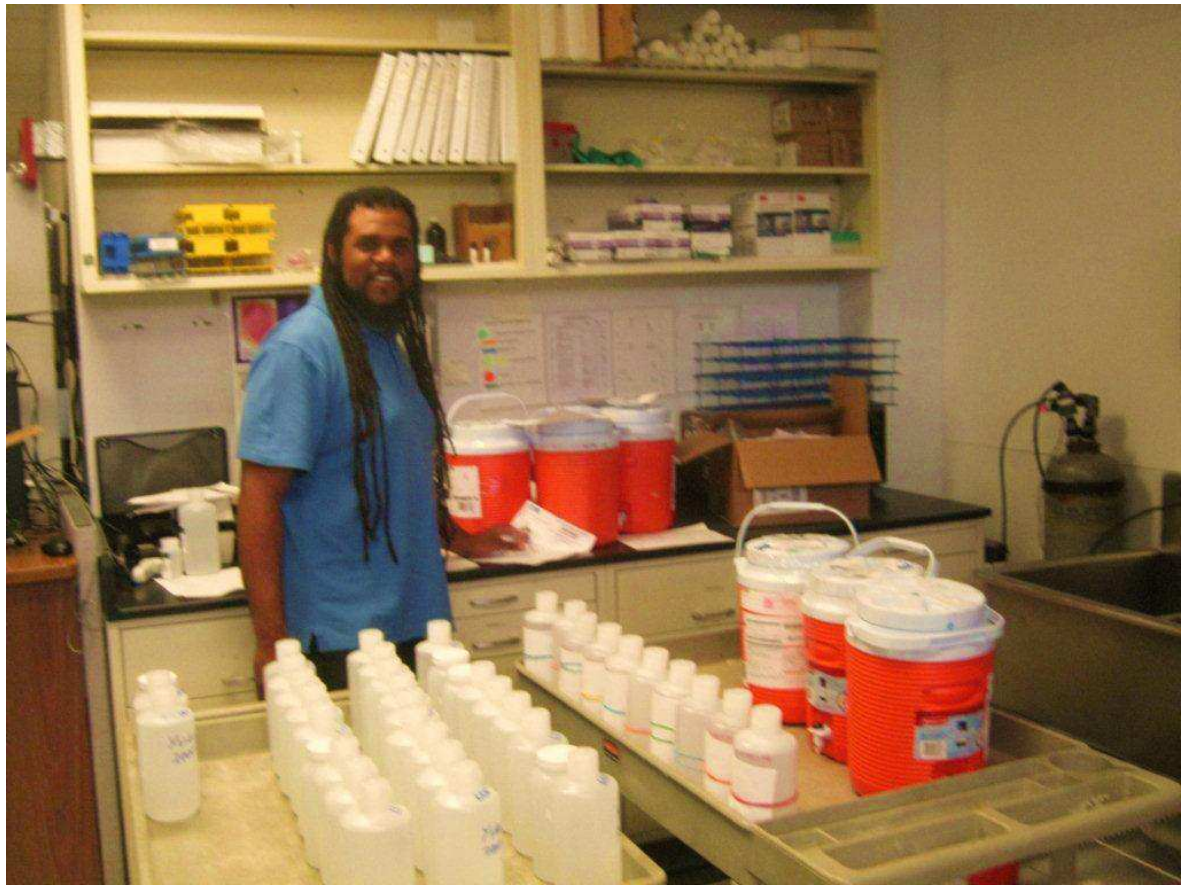
Lone Chimney

DEQ Experience

- Addition to Workload
- Ensuring DEQ was an asset to the PWSs
- DEQ worked with LCWA and its consecutive system to perform public notice for switch to chloramines
  - Made phone calls
  - Sent an informational letter to each system
  - Done to ensure smooth sailing through 30 day PN period with ‘no system left behind’


And then it rained.....
and rained.....
and rained some more!

Spring 2015 Flooding – Customer Assistance



State Environmental Laboratory

Provided free coliform testing of 331 private wells

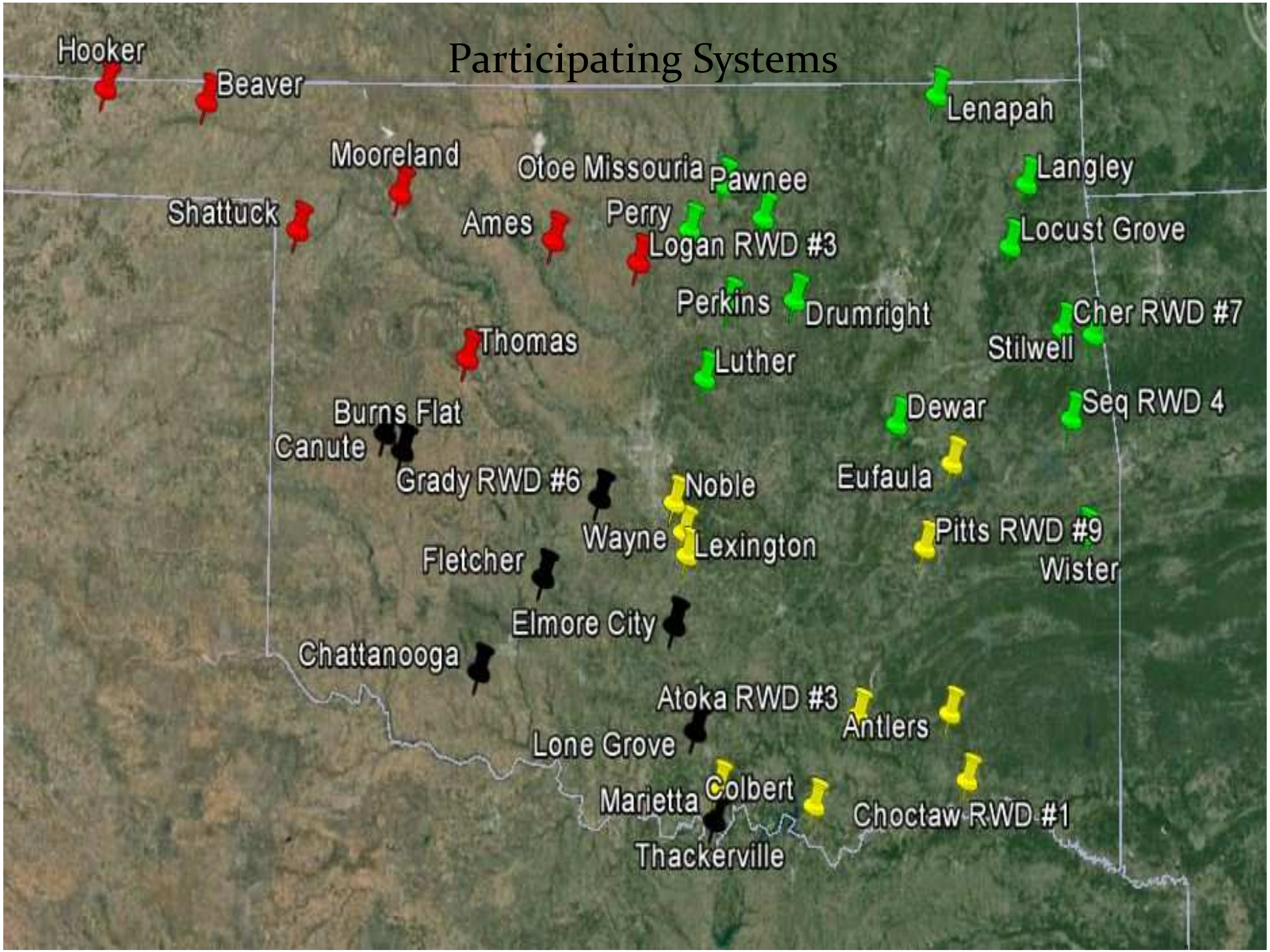
Water Loss Auditing Pilot Program

- Using AWWA Water Loss auditing method
- Funded with DWSRF set-asides

Water Loss Auditing Pilot Project

40 small community participants

- Types and amounts of non-revenue water
- Recommendations to address problems
- Coordination with contractor to pinpoint and address sources of water loss
- Information on funding for projects to address water loss


Participating Systems
Hooker
Beaver
Mooreland
Shattuck
Ames
Otoe Missouria
Pawnee
Perry
Logan RWD #3
Lenapah
Langley
Locust Grove
Perkins
Drumright
Cher RWD #7
Stilwell
Thomas
Luther
Dewar
Seq RWD 4
Burns Flat
Canute
Grady RWD #6
Noble
Eufaula
Wayne
Lexington
Pitts RWD #9
Wister
Fletcher
Elmore City
Chattanooga
Atoka RWD #3
Antlers
Lone Grove
Marietta
Colbert
Choctaw RWD #1
Thackerville

Water Reuse

- In 2010, municipalities began approaching DEQ regarding water reuse, as a response to extreme drought.
- ODEQ worked with stakeholders (municipal, oil and gas, engineers) to develop standards.
- In July 2012, water reuse standards became effective.

Water Reuse
Categories of Reclaimed Water

Category	Treatment	Reuses
1	Reserved (for direct and indirect potable reuse)	Potable reuse
2	Secondary Treatment (nutrient removal, coagulation, filtration and disinfection)	Drip irrigation on orchards & vineyards; spray or drip on sod farms, public landscapes, golf courses, and toilets, fire protection, vehicle washing, and range cattle watering
3	Secondary Treatment (nutrient removal and disinfection)	Subsurface irrigation of orchards or vineyards; restricted access landscapes; livestock pasture, concrete mixing, dust control, restricted golf course irrigation
4	Primary Lagoon Treatment (disinfection and storage detention)	Soil compaction, similar construction activities, and restricted access golf course irrigation
5	Primary Lagoon Treatment and Lagoon Storage	Restricted access pasture irrigation for range cattle, fiber, seed, forage, silviculture
6		Wastewater treatment plant use only

Water Reuse Facilities in Oklahoma

Oklahoma has approximately 140 existing facilities with the following categories:

Category 2	1 in process
Category 3	≤ 10 facilities
Category 4	≤ 10 facilities
Category 5	≅ 125 facilities

Rainfall doesn't alleviate the need to prepare for drought, it only gives us a break while we get ready for the next drought.

Acknowledgements

- Dawn Hoggard, P.E. – Clinton Case Study
- Brandon Bowman – Water Loss Pilot Study
- Wendy Sheets, E.I. – Water Re-use Material

Q & A TIME