Creative Solutions to Meeting the City of Wolfforth's Water Demands

- Wolfforth is a GL city of approx. 5k in Lubbock Co.
- The city water supply is solely groundwater and is provided by 16 producing wells with 2 new ones to be added soon
- Wells are in the Ogallala formation at a depth of around 200' with saturated thickness around 45'
- The City has grown over 70% since the 2010 Census
- Annual growth rates are from 6% to 13%

City of Wolfforth Technologies

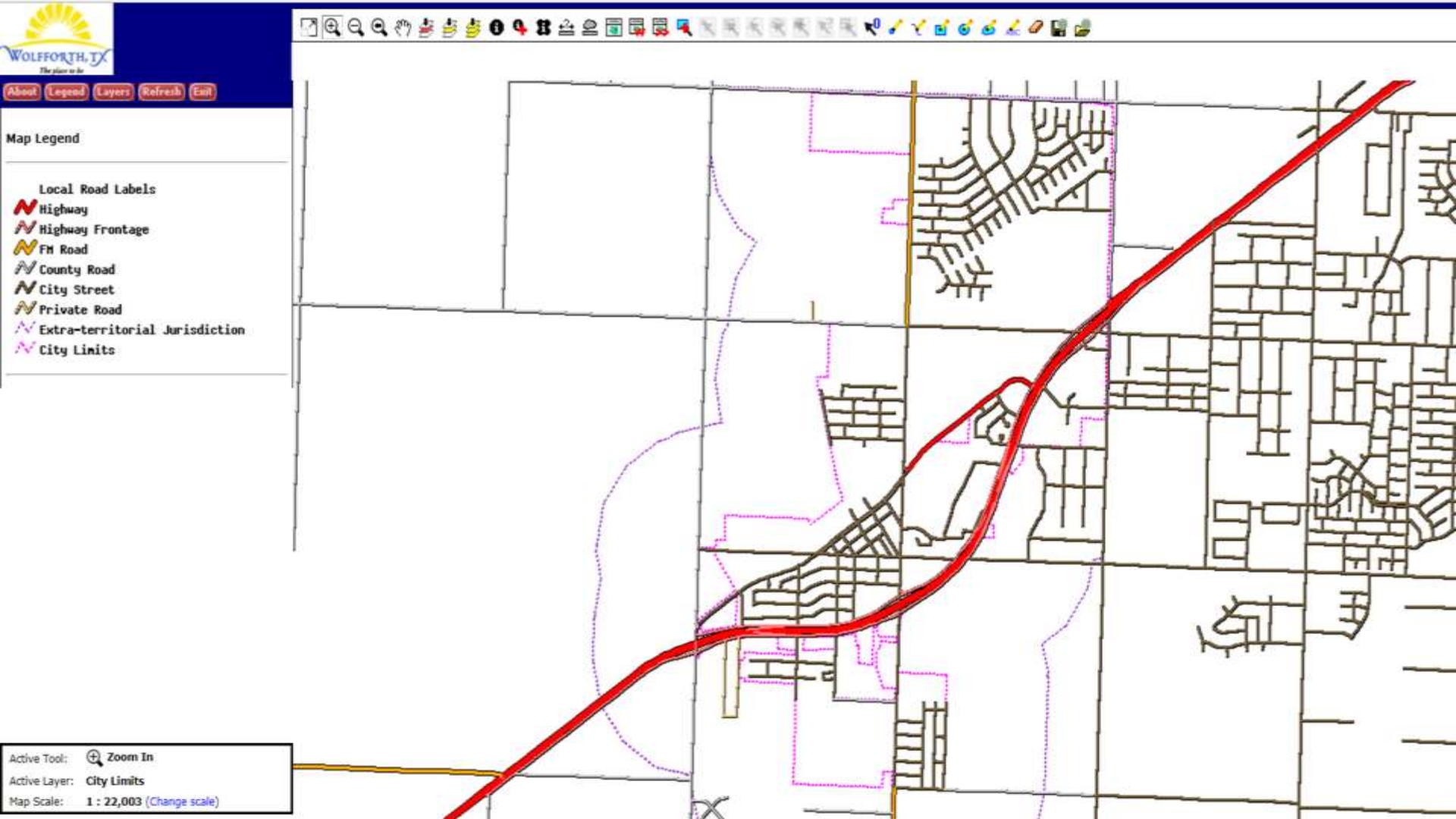
- GIS
- Supervisory Control and Data Acquisition
  - To ensure we can sell most of what we produce
  - Efficient production
- Storage
  - Allows the wells and system recovery time
- Electrodialysis Reversal
  - Provides high quality treated water at minimal loss
- Electronic and Radio Read meters
  - Ensures accuracy in meter reading and saves man power

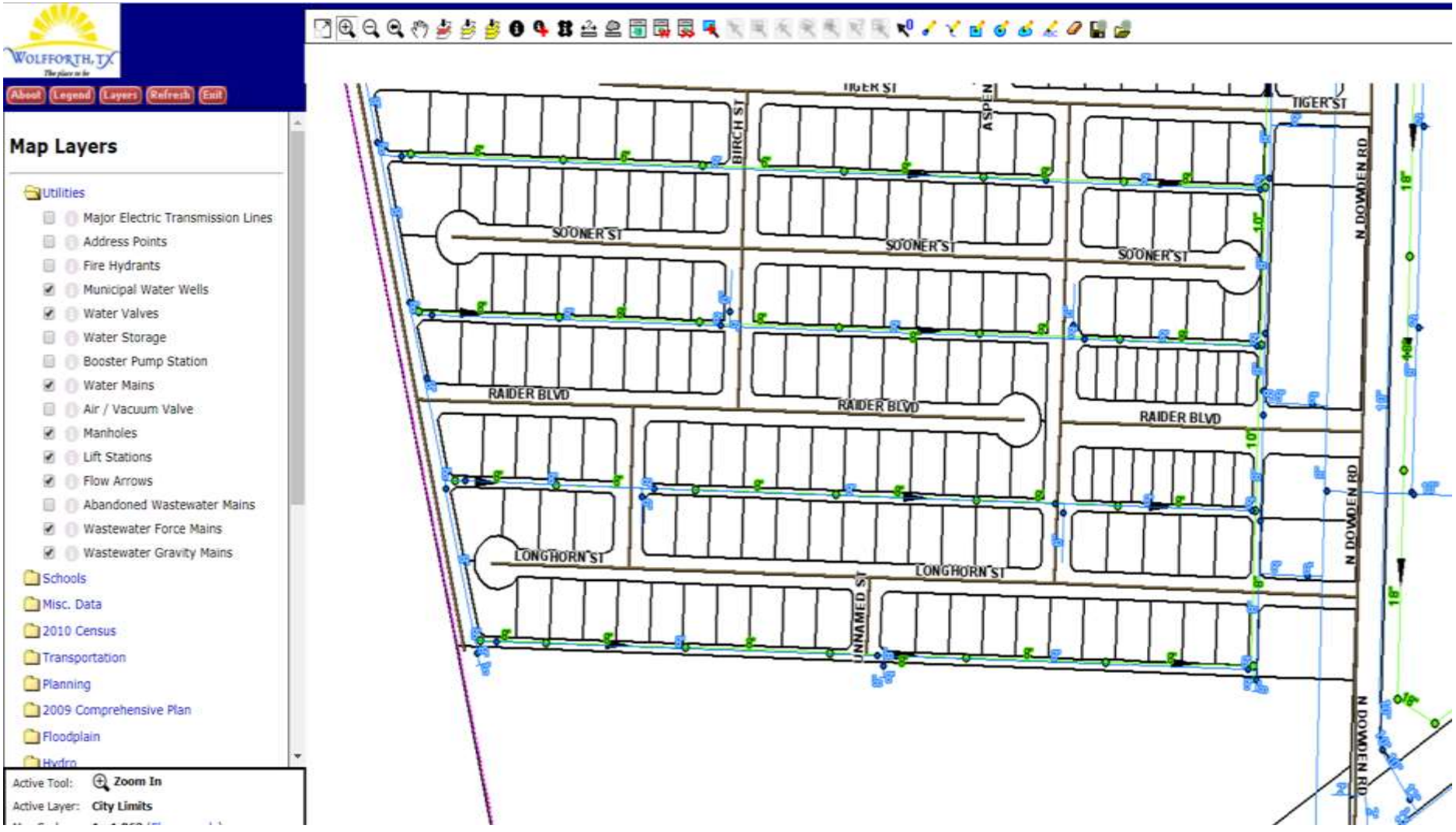
GIS

Wolfforth GIS Link

Well Management Websites

Well Management Site


Wolfforth, TX
The place to be
About
Legend
Layers
Refresh
Exit
Map Legend
Local Road Labels
Highway
Highway Frontage
FM Road
County Road
City Street
Private Road
Extra-territorial Jurisdiction
City Limits
Active Tool: Zoom In
Active Layer: City Limits
Map Scale: 1 : 22,003 (Change scale)


WOLFFORTH, TX
About
Legend
Layers
Refresh
Exit
Map Layers
Utilities
Major Electric Transmission Lines
Address Points
Fire Hydrants
Municipal Water Wells
Water Valves
Water Storage
Booster Pump Station
Water Mains
Air / Vacuum Valve
Manholes
Lift Stations
Flow Arrows
Abandoned Wastewater Mains
Wastewater Force Mains
Wastewater Gravity Mains
Schools
Misc. Data
2010 Census
Transportation
Planning
2009 Comprehensive Plan
Floodplain
Hydro
Active Tool: Zoom In
Active Layer: City Limits
TIGER ST
BIRCH ST
ASPEN
SOONER ST
RAIDER BLVD
LONGHORN ST
UNNAMED ST
N DOWDEN RD

WELL 18

WELL 7

Original—District Office Copy

High Plains Underground Water Conservation District No. 1

REGISTRATION and LOG of WELL

FOR USE OF COMMITTEEMAN — Field Well No. 4480-A

Near Well #7

1. Land Owner A. S. Meinecke — Address 1633 Broadway

3. Well located ... miles W of the town of Wolfforth

4. County Lubbock — NW 140 acres of — Section 25 — Block AK

DRILLER'S LOG OF WELL

Diameter of Well: 18 inches

From	To	Description of formation material
0	5	soil
5	15	caliche
15	70	clay
70	101	rock
101	145	dry sand
145	204	water sand
204	207	yellow & blue sand

REMARKS:

Driller Taylor & Weir Drlg.Co. — Address Abernathy, Texas — Date Drilled 6-15-63

DESCRIPTION OF WELL AND PRODUCTION EQUIPMENT

6. Casing: Diameter 18 in. Total casing length 208 ft.

7. Casing perforations: from 150 ft. to 206 ft. Number of rows 6

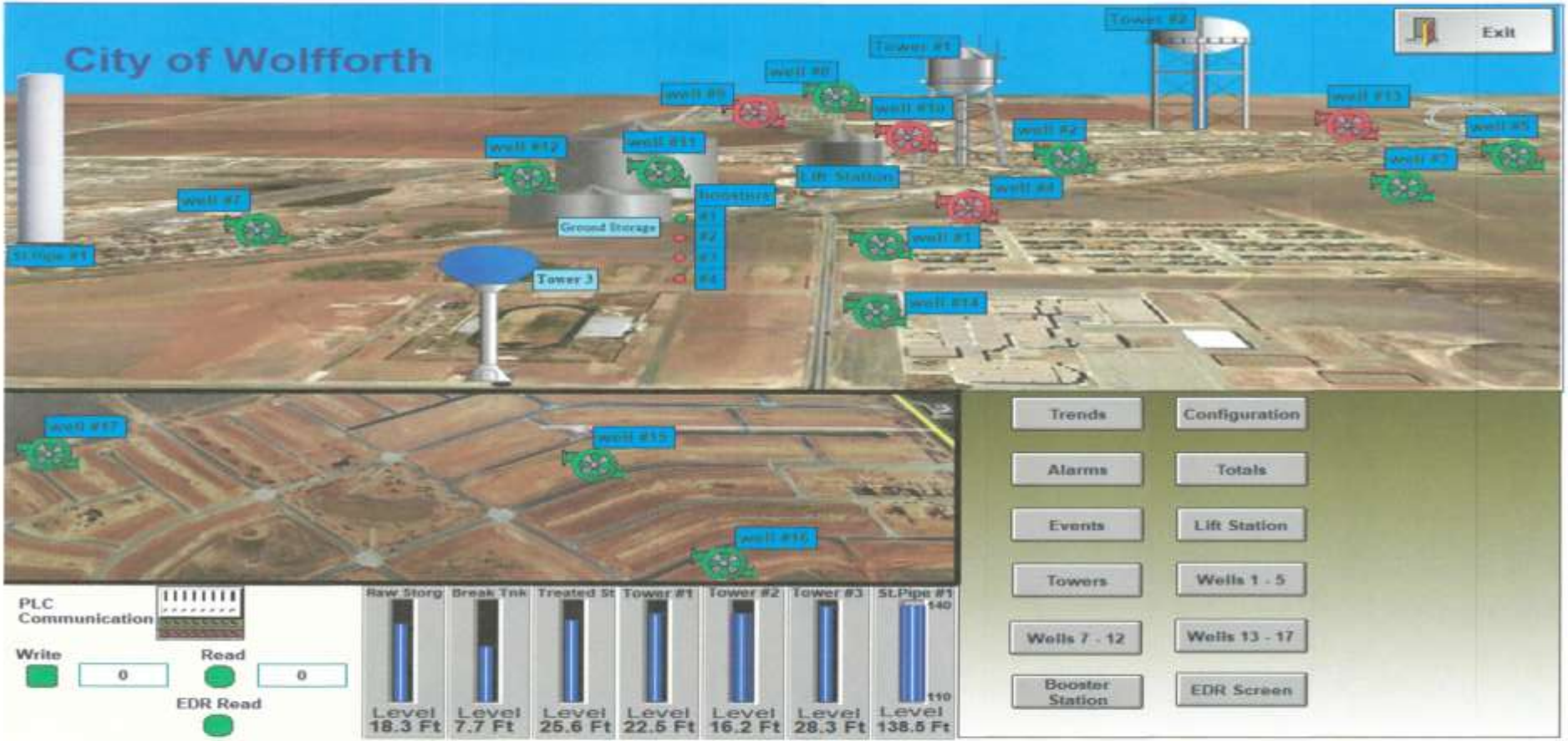
8. Pump Column: Size 5 in. ... shaft length 195 ft. Suction pipe size 5 in. Suction pipe length 20 ft.

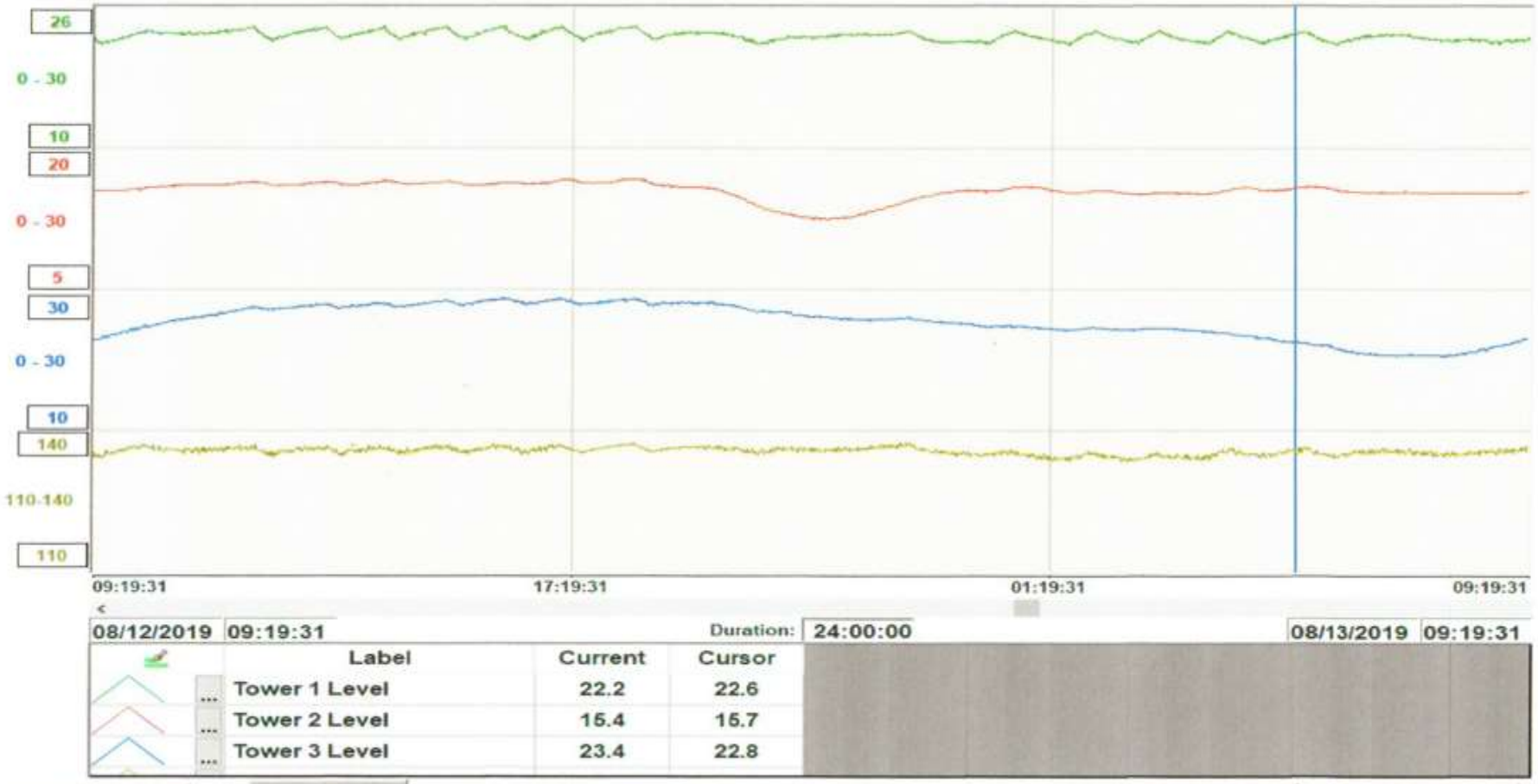
9. Pump bowls: Size 8 Number of stages 7 Pump discharge pipe: Size 5 in.

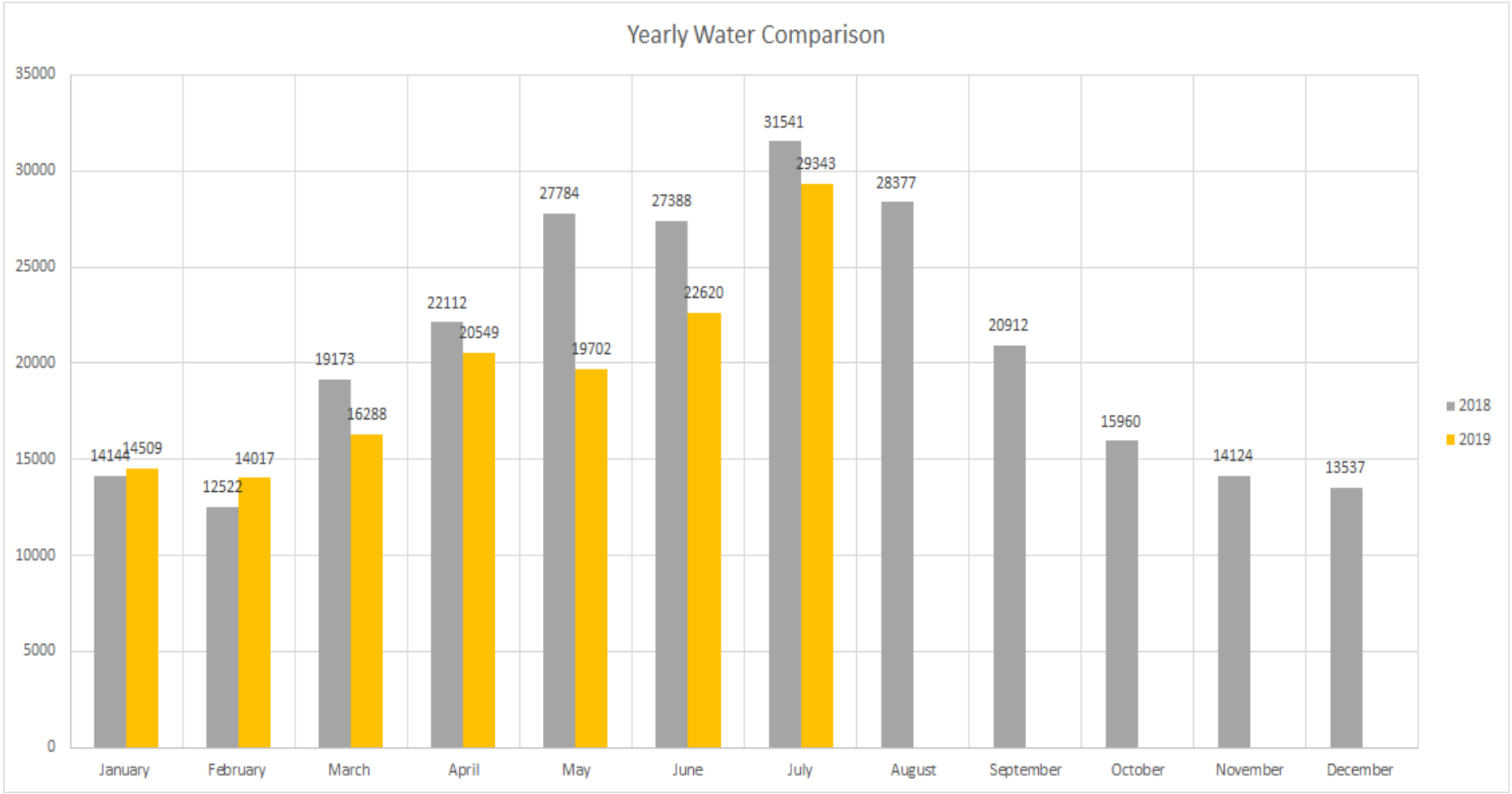
10. Depth to water level 140 ft. Pump yield 350 GPM. Pumping level 180 ft.

11. Power Unit: Electrical, Natural Gas, Butane, Other — Horsepower 20 H.P.

Signature H. P. Henderson — Tannant 297 Wolfforth


City of Wolfforth
Exit
Tower #1
Tower #2
well #8
well #9
well #10
well #11
well #12
well #13
well #2
well #3
well #4
well #5
well #7
well #1
well #14
well #15
well #16
well #17
Lift Station
Ground Storage
boosters
#1
#2
#3
#4
Tower 3
St.Pipe #1
Trends
Configuration
Alarms
Totals
Events
Lift Station
Towers
Wells 1 - 5
Wells 7 - 12
Wells 13 - 17
Booster Station
EDR Screen
PLC Communication
Write
0
Read
0
EDR Read
Raw Storg
Break Tnk
Treated St
Tower #1
Tower #2
Tower #3
St.Pipe #1
140
110
Level 18.3 Ft
Level 7.7 Ft
Level 25.6 Ft
Level 22.5 Ft
Level 16.2 Ft
Level 28.3 Ft
Level 138.5 Ft


26
0 - 30
10
20
0 - 30
5
30
0 - 30
10
140
110-140
110
09:19:31
17:19:31
01:19:31
09:19:31
08/12/2019 09:19:31
Duration: 24:00:00
08/13/2019 09:19:31
Label
Current
Cursor
Tower 1 Level
22.2
22.6
Tower 2 Level
15.4
15.7
Tower 3 Level
23.4
22.8
Print
Ground Storage Trends
Cursor Date/Time: 08/13/2019 05:23:46.36
Save settings
Close Screen


Yearly Water Comparison
35000
30000
25000
20000
15000
10000
5000
0
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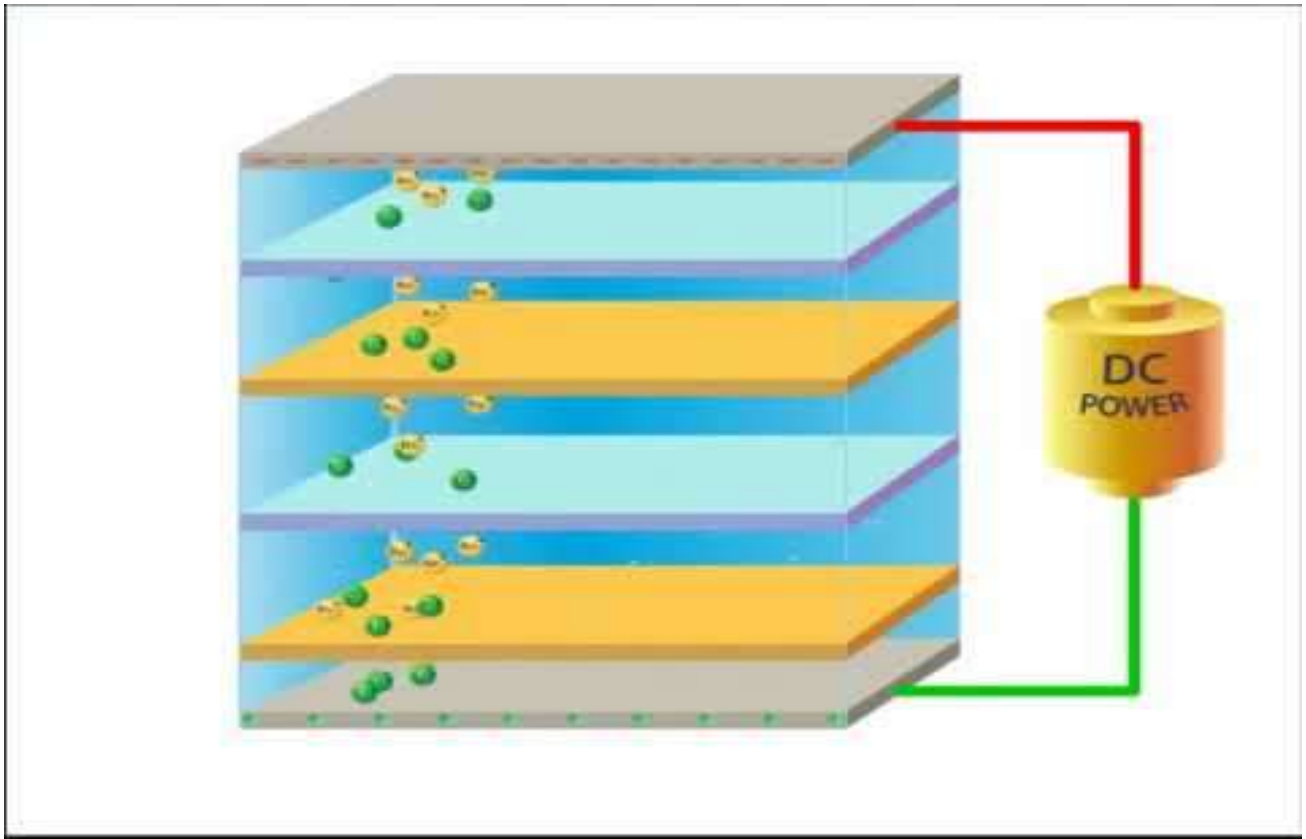
14509
12522
14017
19173
16288
22112
20549
27784
19702
27388
22620
31541
29343
28377
20912
15960
14124
13537
January
February
March
April
May
June
July
August
September
October
November
December
2018
2019

Electrodialysis Reversal



EDR Trains and Stacks

Stacks with Membranes Exposed

The EDR Timeline

- TCEQ moves arsenic MCL from 50 to 10 PPM
- Filtration options are investigated (early 2011)
- EDR established as favored technology
- Site trips made
- Discussions with TCEQ begin, as it is considered an Emerging Technology
- Rounds of discussions stall due to brine disposal
- EPA sends arsenic enforcement letter early in 2014
- EPA sends fluoride enforcement letter in February 2014

The EDR Timeline (cont.)

- Negotiations begin with GE to establish system design parameters and cost
- WATSYS samples are analysed to project design and end quality of product
- TCEQ establishes requirement to Pilot
- Pilot system order placed and 90 day pilot performed and completed December 2012
- Major projects established and C of O of $6.5 million issued, or $26/meter
    - Well Collection lines built
    - All ground and elevated storage refurbished and placed under TAP program
    - New 1.5 MG ground storage built
- EDR purchased and paid for so GE would release P&IDs and design

1.5 MG Storage

The EDR Timeline (cont.)

- Equipment for plant purchased as sole source under emergency conditions
- Construction begins prior to TCEQ approval in the Spring of 2014.
- All other projects finished prior to EDR completion
- EDR Construction finished with EDR fully functioning in Dec. of 2016
- Plant is released for production in May 2017 after citizen complains to TCEQ

EDR in production

- System has been up and running since May 2017 with little downtime other than maintenance
- Target blend is 75/25, Treated/Raw
- Off spec (brine) produced is from 6 to 10 percent of the total water that is sent through EDR
- All inputs increase with higher daily production
- pH levels have improved
- Total hardness has been decreased
- Citizens have remarked they have discontinued private water treatment
- Fluoride down to 3.31 mg/L and Arsenic down to .00556 mg/L in Q2 2019

Acid Pumps

EDR in production (cont.)

- Public works crews have been able to maintain the stacks, takes 2-3 employees most of a day
- Pre-filtration media has been costly, around $1100 per stack per change
- Chemical handling is an issue

EDR Future Mods

- Three new trains of stacks will be needed to keep up with growth
  - New capacity will add about 1.5 MG of treatment
- Full pre-filtration system is currently being designed
  - Objective is to reduce cartridge costs and improve life of membranes and plates in the stacks
- Separate acid handling facility is being designed

Challenges

- Blending of old/new technologies
- Regulatory issues
- Funding and debt
- Pre-filtration

Future options

- Deeper brackish groundwater requiring desal
- Sources farther from the City
- Purchasing from other Cities, regional systems
- Reuse
- Ice Pigging