



# Utility Master Plan

## ALVIN CITY COUNCIL WORKSHOP

February 4th, 2016





- Introductions
- Population Projections
- Water System Overview
  - Water Demands
  - Water System Analyses
  - Water Capital Improvement Plan (Growth and Rehabilitation)
- Wastewater Overview
  - Wastewater Flows
  - Wastewater System Analyses
  - Wastewater Capital Improvement Plan (Growth and Rehabilitation)
- Questions

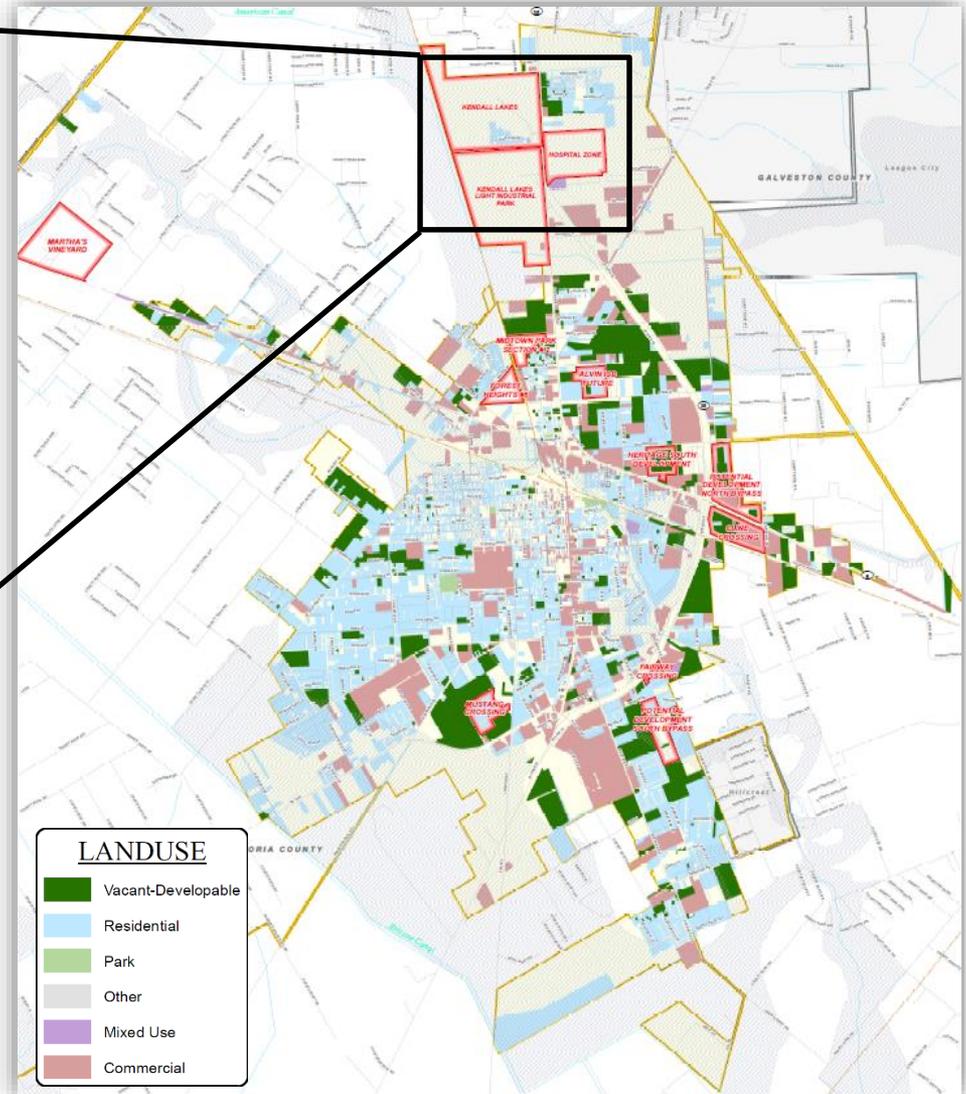


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# Population Projections



## Population Projections from City Comprehensive Plan



**2015 Population = 26,759**  
**2020 Population = 29,544**  
**2025 Population = 32,618**  
**2035 Population = 39,762**

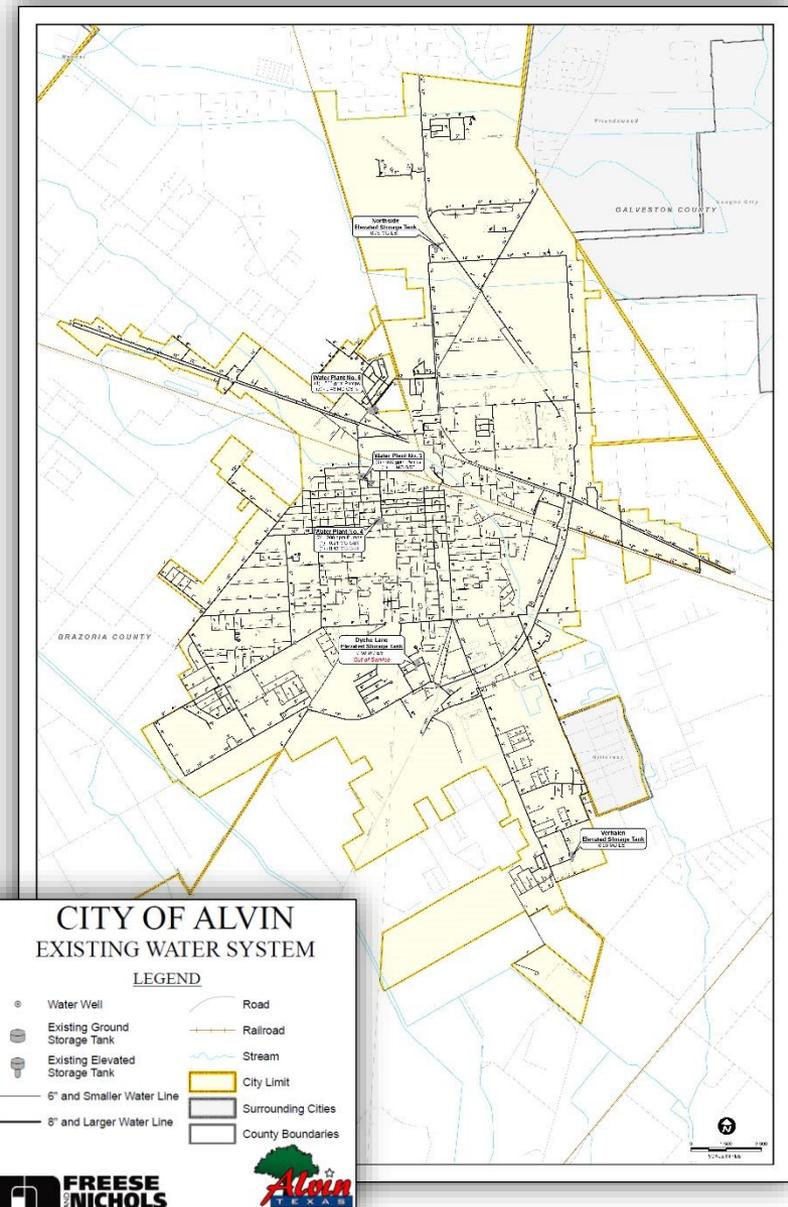
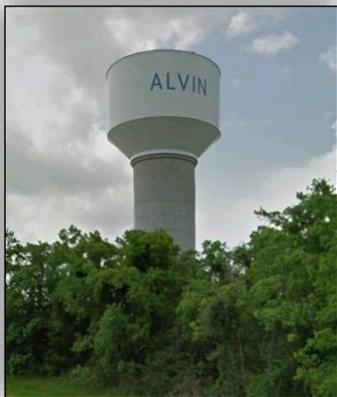


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# Alvin Existing Water System



- Water Supply Source
  - 5 Groundwater Wells
- 3 Water Plants
  - 6 ground storage tanks
  - 10 booster pumps
- 3 Elevated Storage Tanks
- Water Distribution Lines
  - 146 miles
  - 2-inch to 12-inch pipes



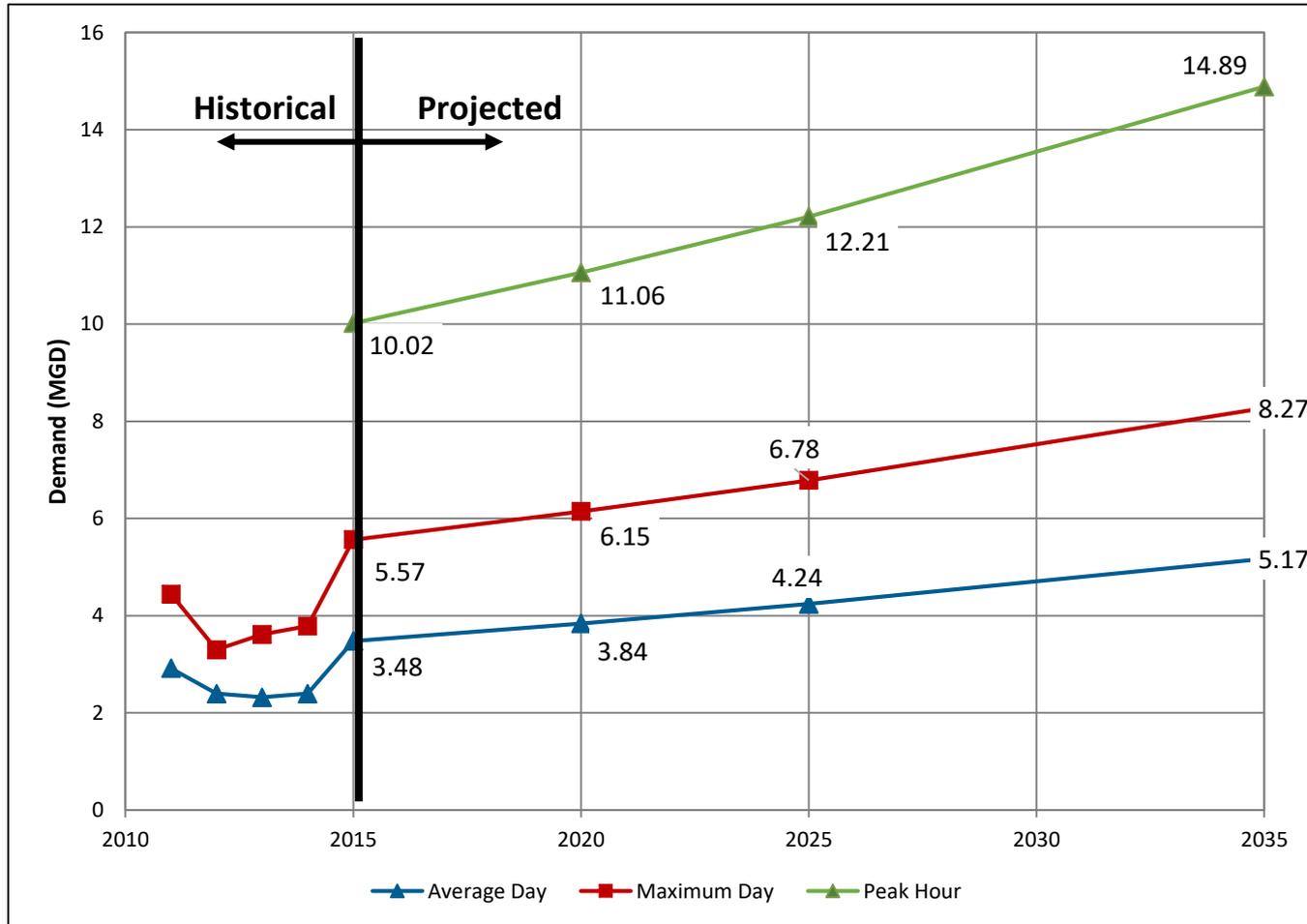
# Water System Design Criteria



- Texas Commission on Environmental Quality
  - Chapter 290 of Texas Local Government Code
- Minimum System Pressure = 35 psi under normal conditions
- Water Supply = 0.39 gpm/connection
- Elevated Storage = 100 gallons/connection
- Booster pump capacity must supply sufficient pressure during peak hour demand
- Fire Flows
  - Minimum residual pressure of 20 psi
  - Range of fire flow = 1,000 to 5,000 gallons per minute depending on land use type



# Water Demand Projections



## Design Criteria:

Average day per-capita = 130 gallons per capita-day

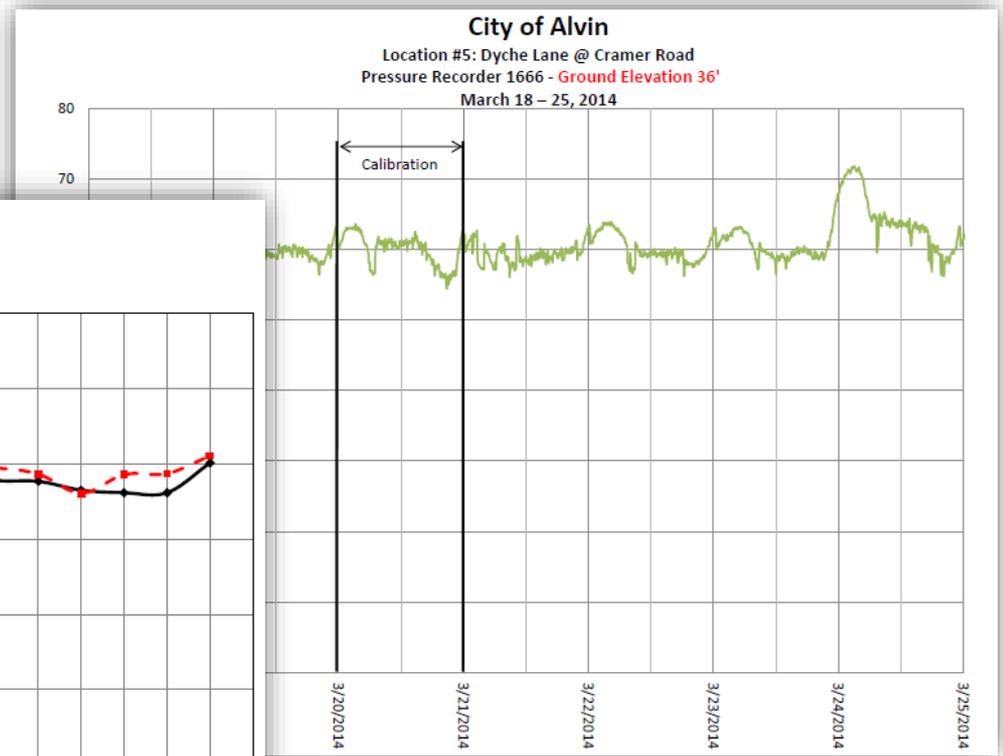
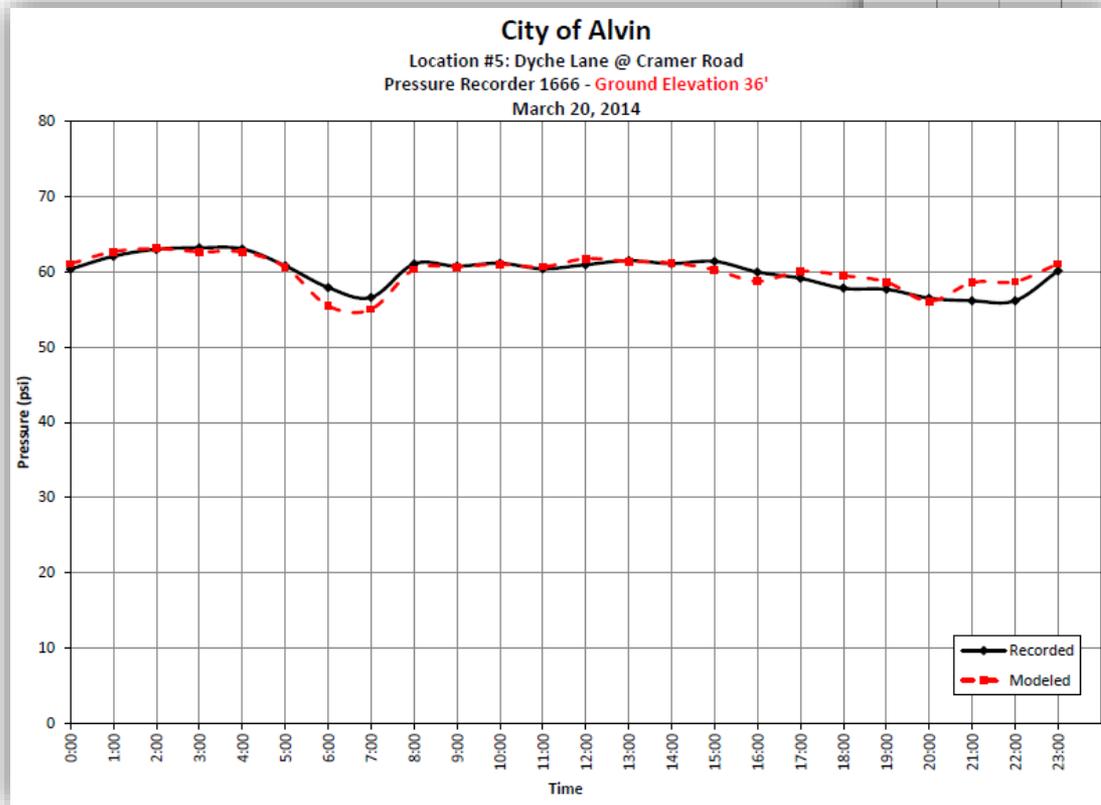
Maximum Day to Average Day Peaking Factor = 1.60

Peak Hour to Maximum Day Peaking Factor = 1.80

# Water Model Development

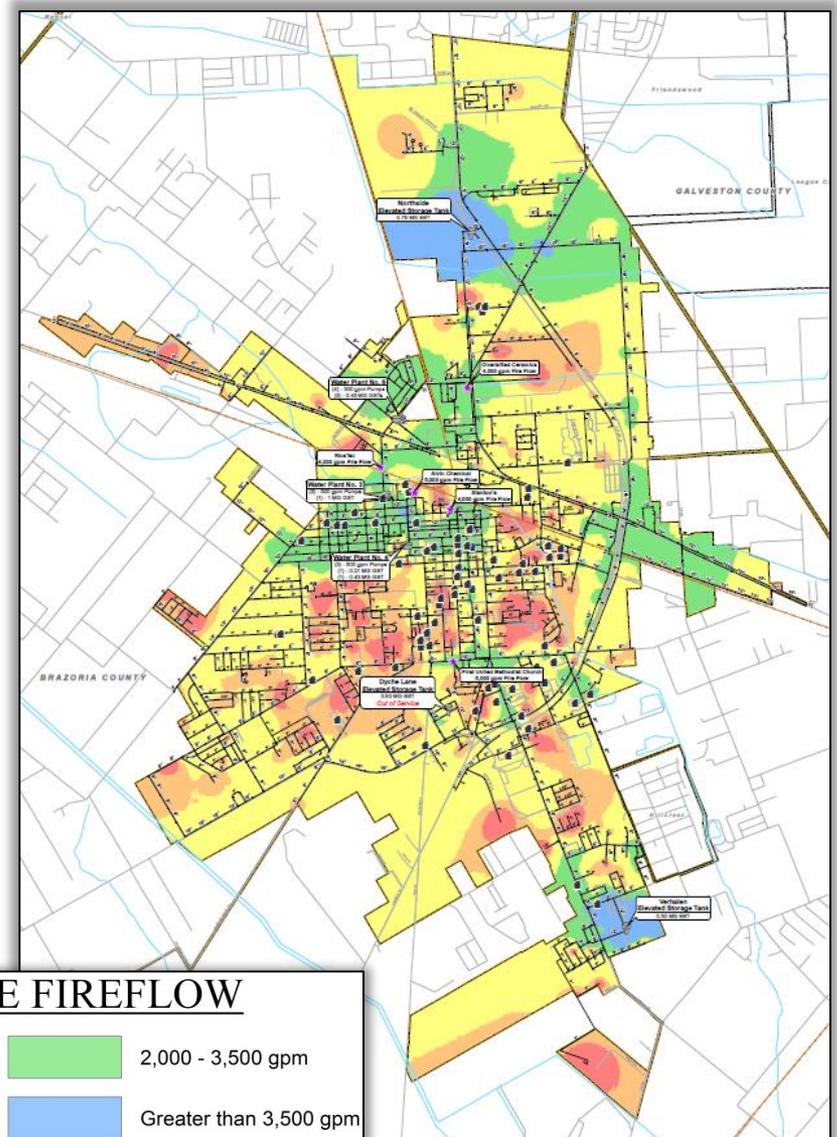


- Model developed based on City's GIS data
- 24-hour extended period simulation calibration
- Field pressure testing
- Very good calibration results



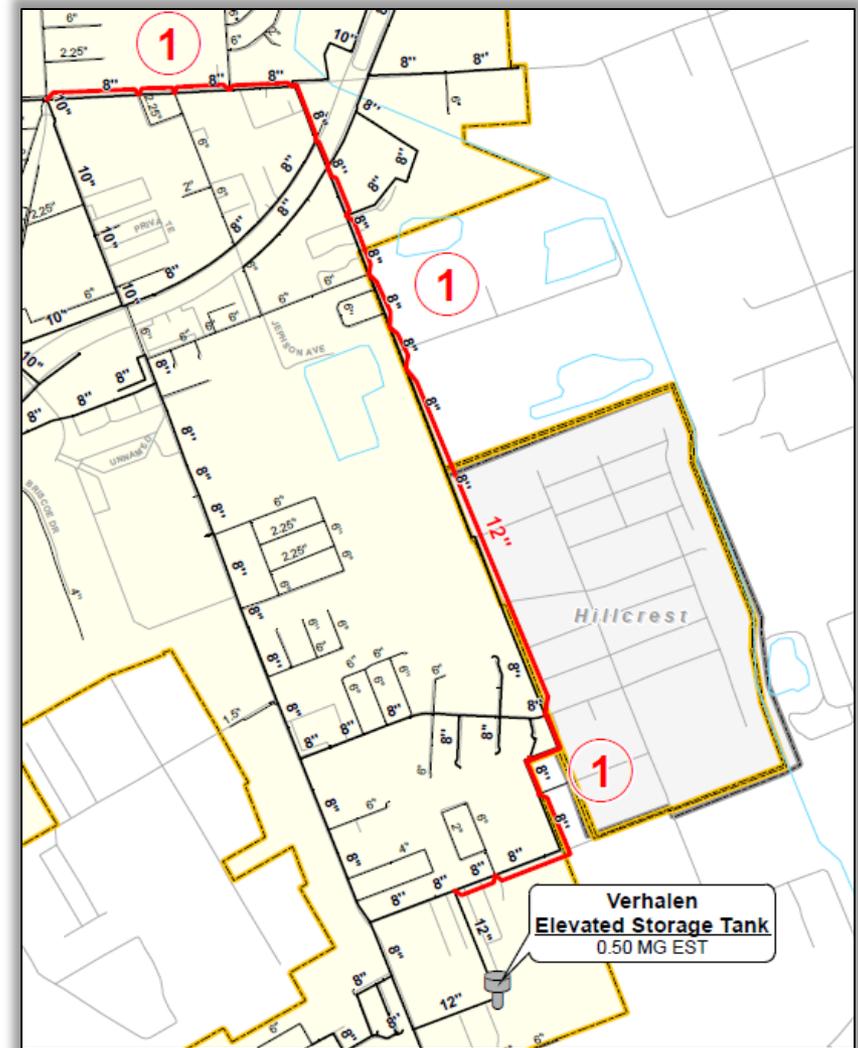
# Water System Analyses

- Existing system pressures exceed TCEQ requirements
- Fire Flow Analysis – many areas in system do not provide 1,000 gpm
- Additional 0.5 million gallons of elevated storage needed by 2020
- Additional distribution system pumping needed by 2025
- New groundwater well is needed by 2025

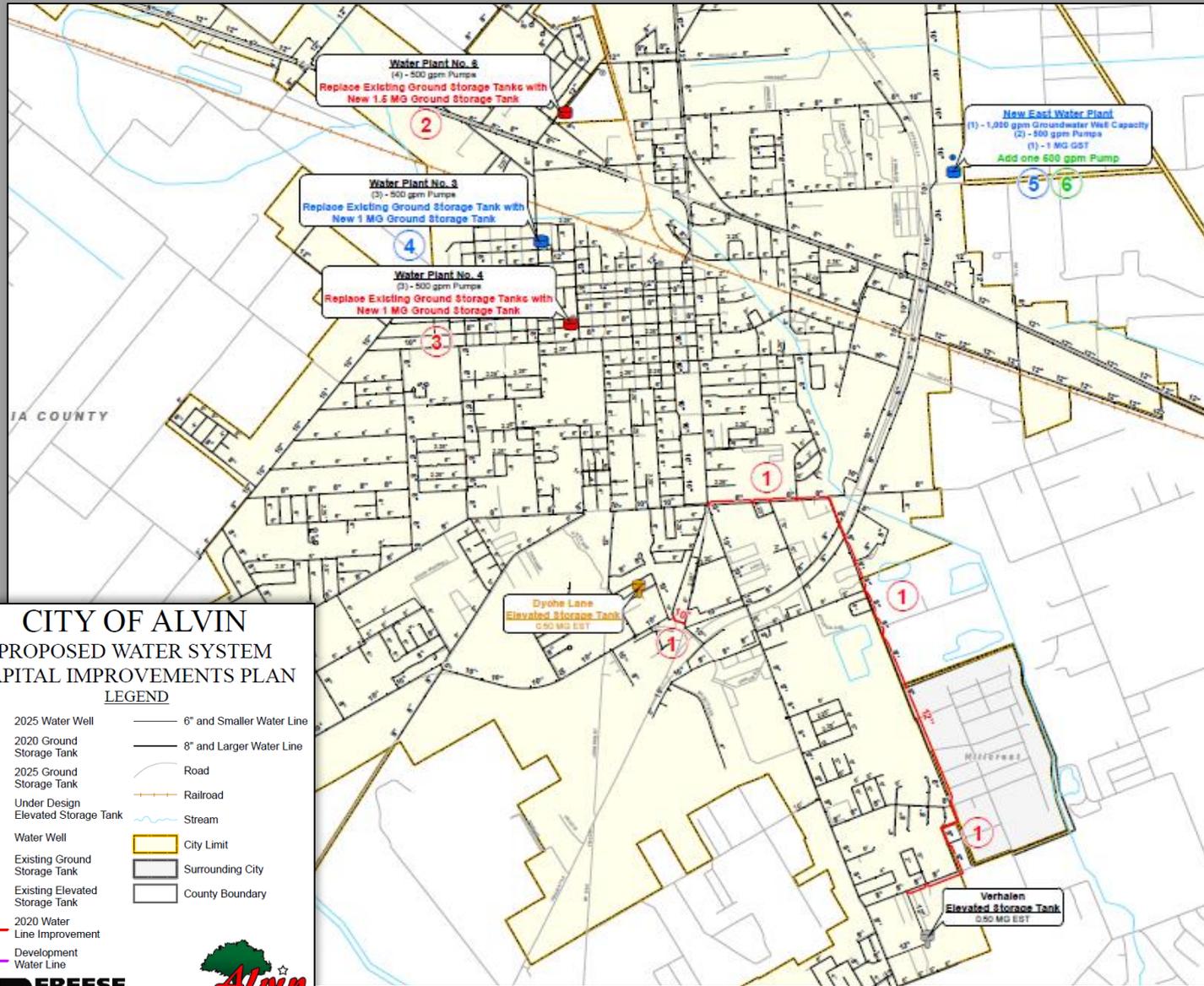


# Water System Analyses (cont'd)

- The model identified hydraulic issues keeping the Verhalen elevated tank full
  - Utilized model to evaluate sites and elevations for the new Dyche Lane tank
  - Recommend additional transmission line capacity to the Verhalen tank
- Water line pipe material, age and capacity were used to identify water lines to be replaced and/or rehabilitated



# Water Capacity Capital Improvement Plan



**CITY OF ALVIN**  
PROPOSED WATER SYSTEM  
CAPITAL IMPROVEMENTS PLAN  
LEGEND

- 2025 Water Well
- 2020 Ground Storage Tank
- 2025 Ground Storage Tank
- Under Design Elevated Storage Tank
- Water Well
- Existing Ground Storage Tank
- Existing Elevated Storage Tank
- 2020 Water Line Improvement
- Development Water Line
- 6" and Smaller Water Line
- 8" and Larger Water Line
- Road
- Railroad
- Stream
- City Limit
- Surrounding City
- County Boundary

**FREASE & NICHOLS**

**Alvin TEXAS**

# Water Capacity Capital Improvement Plan

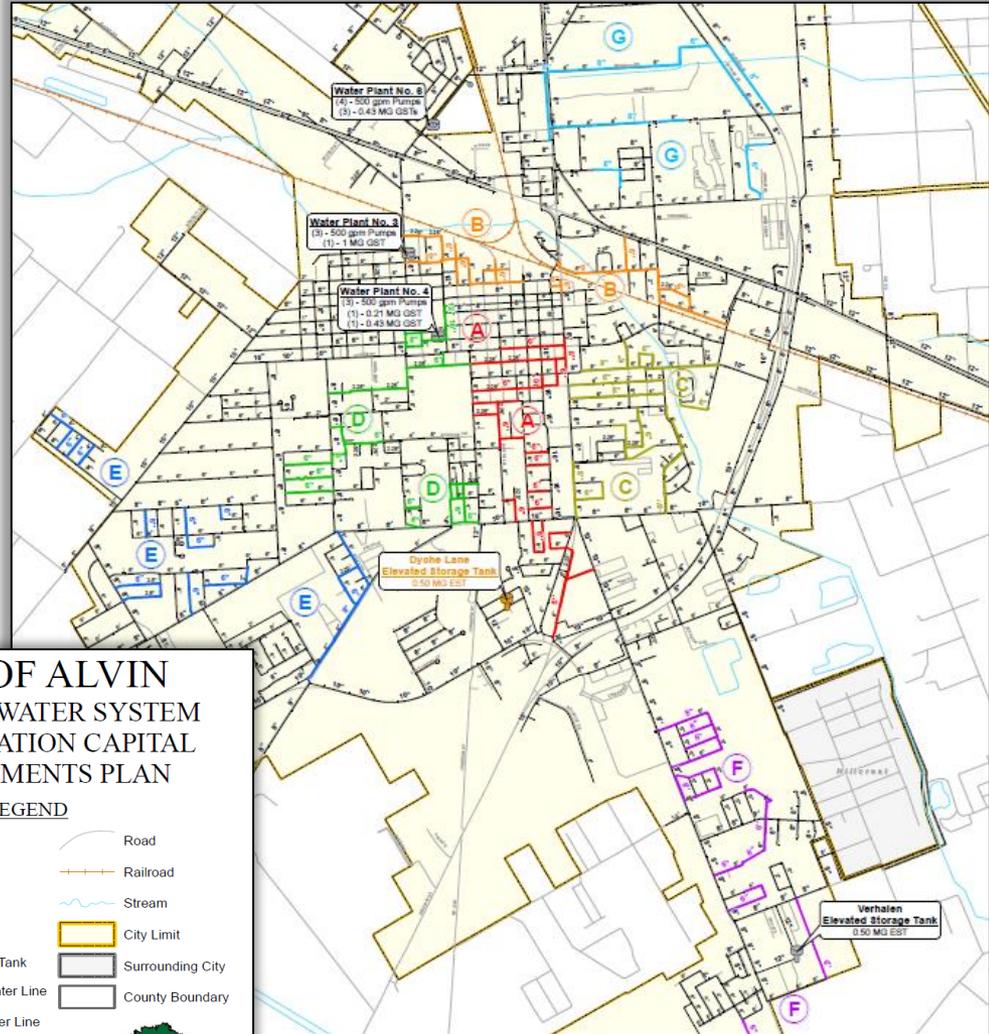


| Phase                    | Project | Water System Capacity Capital Improvements Plan        | Cost                 |
|--------------------------|---------|--------------------------------------------------------|----------------------|
| 2020                     | 1       | Fairway Drive and South Street Water Line Improvements | \$ 4,022,400         |
|                          | 2       | Water Plant No. 6 Ground Storage Tank Replacement      | \$ 3,159,000         |
|                          | 3       | Water Plant No. 4 Ground Storage Tank Replacement      | \$ 2,106,000         |
| <b>Total 2015 - 2020</b> |         |                                                        | <b>\$ 7,181,400</b>  |
| 2025                     | 4       | Water Plant No. 3 Ground Storage Tank Replacement      | \$ 2,106,000         |
|                          | 5       | East Water Plant                                       | \$ 5,304,000         |
| <b>Total 2020 - 2025</b> |         |                                                        | <b>\$ 7,410,000</b>  |
| 2035                     | 6       | East Water Plant Pump Expansion                        | \$ 78,000            |
|                          | 7       | Water Line Improvements to WWTP Area                   | \$ 1,565,100         |
| <b>Total 2025 - 2035</b> |         |                                                        | <b>\$ 1,643,100</b>  |
| <b>Total</b>             |         |                                                        | <b>\$ 16,234,500</b> |

# Water Rehabilitation Capital Improvement Plan



| Project | Water System Rehabilitation Capital Improvements Plan | Cost                 |
|---------|-------------------------------------------------------|----------------------|
| A       | Water Line Improvements Phase 1                       | \$ 3,064,600         |
| B       | Water Line Improvements Phase 2                       | \$ 2,531,900         |
| C       | Water Line Improvements Phase 3                       | \$ 3,063,900         |
| D       | Water Line Improvements Phase 4                       | \$ 2,795,300         |
| E       | Water Line Improvements Phase 5                       | \$ 2,444,000         |
| F       | Water Line Improvements Phase 6                       | \$ 2,592,800         |
| G       | Water Line Improvements Phase 7                       | \$ 3,114,800         |
| H       | Fire Hydrant Connection Retrofitting                  | \$ 397,800           |
|         | <b>Total</b>                                          | <b>\$ 20,005,100</b> |



**CITY OF ALVIN  
PROPOSED WATER SYSTEM  
REHABILITATION CAPITAL  
IMPROVEMENTS PLAN**

**LEGEND**

|                                    |                  |
|------------------------------------|------------------|
| ⊙ Water Well                       | — Road           |
| Existing Ground Storage Tank       | — Railroad       |
| Existing Elevated Storage Tank     | — Stream         |
| Under Design Elevated Storage Tank | City Limit       |
| — 6" and Smaller Water Line        | Surrounding City |
| — 8" and Larger Water Line         | County Boundary  |



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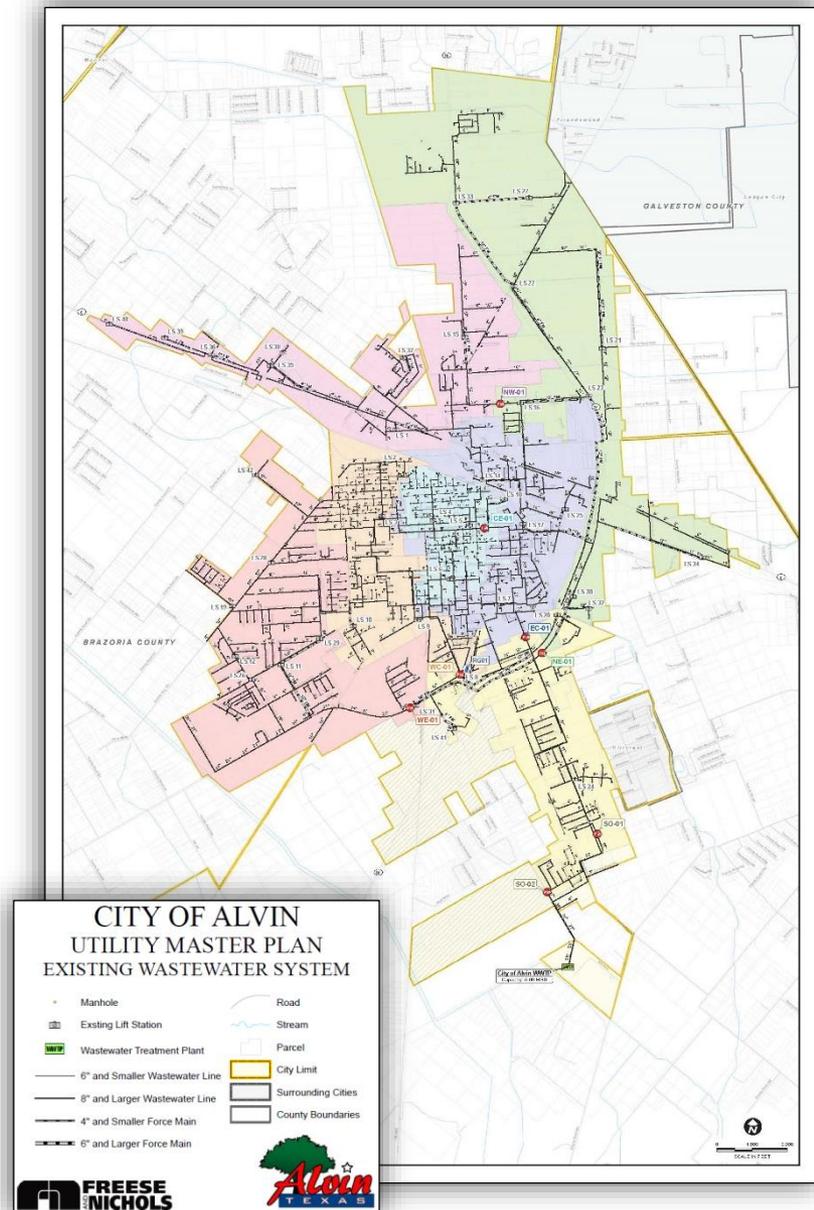
# Alvin Existing Wastewater System



- Wastewater Treatment Plant permitted at 5 million gallons per day
- 42 lift stations
- 7 wastewater basins
- Pipelines
  - 144 miles
  - 3-inch to 42-inch pipes



City of Alvin Wastewater Plant





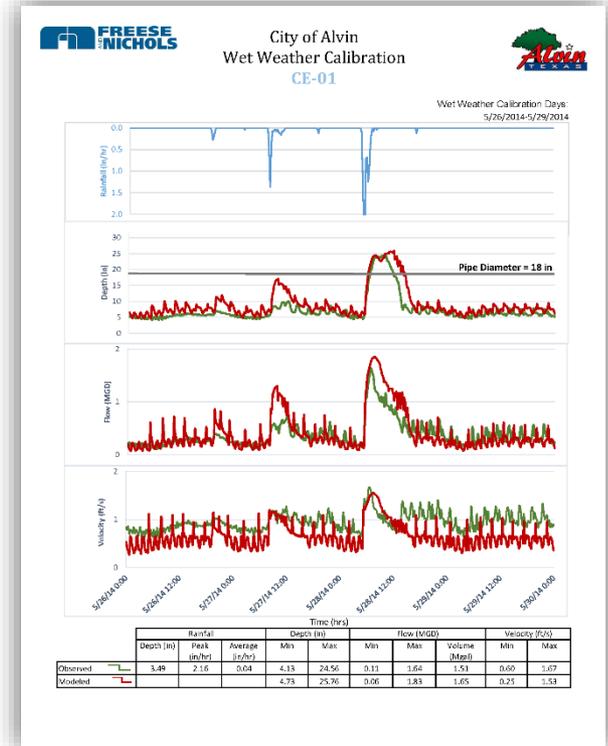
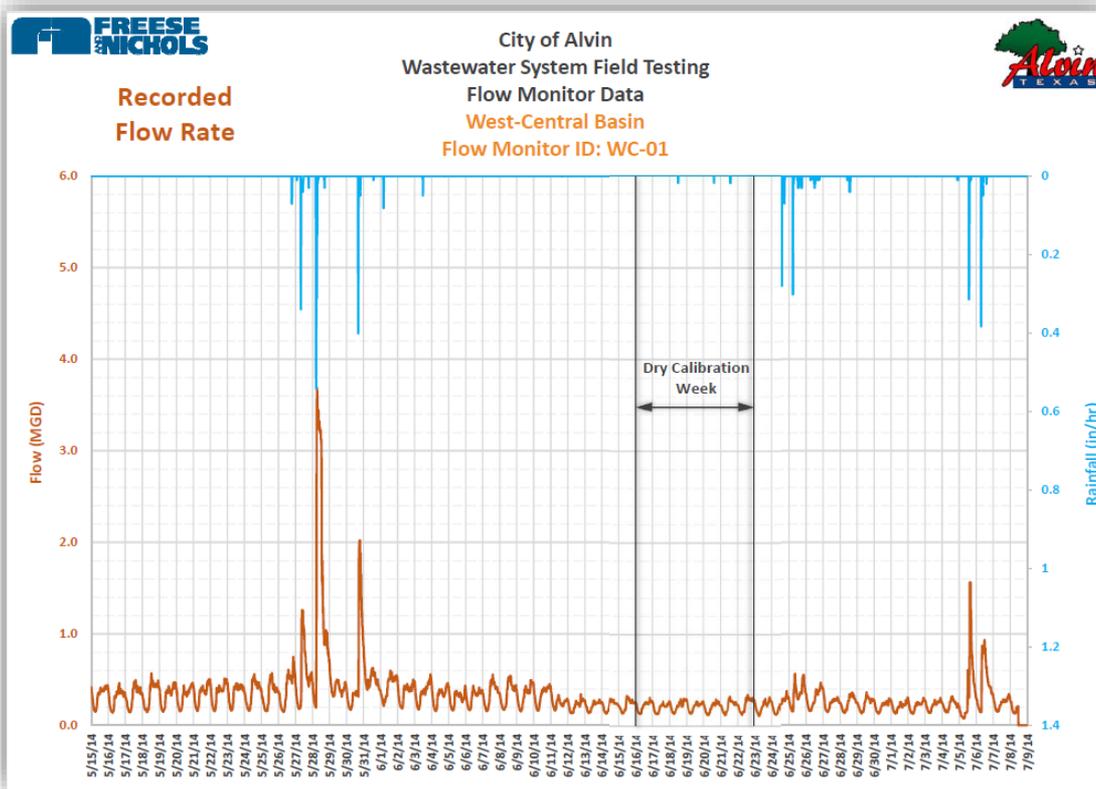
- Texas Commission on Environmental Quality
  - Chapter 217 of Texas Local Government Code
- Chapter 217 says:
  - §217.53 (j) (3) that “An owner must ensure that the collection system has capacity to prevent a surcharge.”
  - §217.61 (c) that “the firm pumping capacity of a lift station must handle the peak flow.”
- The peak flow includes the domestic wastewater contribution plus the wet weather infiltration and inflow (I/I)
- **Surcharging** occurs when a gravity pipe is full of wastewater and could cause an overflow
- An **Overflow** is an unauthorized discharge of untreated wastewater from the wastewater system



# Wastewater Model Development



- Model developed based on City's GIS data and field investigations
- 12 Flow Monitors installed in field to measure I/I levels
- 24-hour dry and wet weather modeling calibration
- Very good calibration results



# Wastewater Flow Projections



## City of Alvin 2015 Wastewater Flows

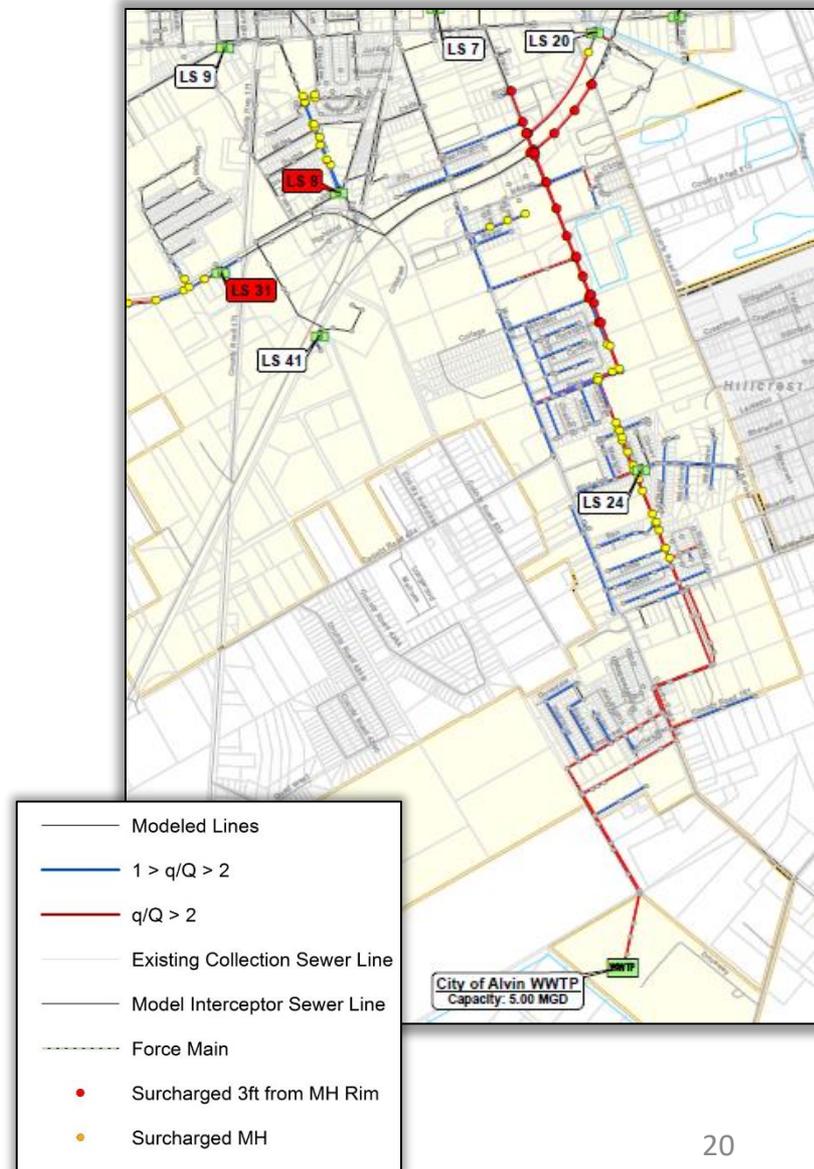
| Basin        | Average Day Flow (MGD) <sup>(1)</sup> | Peak Wet Weather Flow (MGD) |
|--------------|---------------------------------------|-----------------------------|
| Northwest    | 0.21                                  | 2.79                        |
| Northeast    | 0.50                                  | 3.38                        |
| West-Central | 0.38                                  | 4.09                        |
| Central      | 0.30                                  | 1.82                        |
| East-Central | 0.13                                  | 0.78                        |
| Western      | 0.75                                  | 3.68                        |
| Southern     | 0.20                                  | 0.93                        |
| <b>Total</b> | <b>2.46</b>                           | <b>-</b>                    |

## City of Alvin 2035 Wastewater Flows

| Basin        | Average Day Flow (MGD) | Peak Wet Weather Flow (MGD) |
|--------------|------------------------|-----------------------------|
| Northwest    | 0.74                   | 3.81                        |
| Northeast    | 1.10                   | 5.16                        |
| West-Central | 0.39                   | 3.53                        |
| Central      | 0.31                   | 1.84                        |
| East-Central | 0.21                   | 1.09                        |
| Western      | 0.87                   | 4.17                        |
| Southern     | 0.33                   | 1.45                        |
| <b>Total</b> | <b>3.95</b>            | <b>-</b>                    |

# Wastewater System Capacity Analyses

- The model identified surcharging under existing system wet weather conditions
- Eastside Interceptors that flow into WWTP are in poor condition and experiences significant surcharging
- Insufficient capacity at lift stations causes surcharging in upstream pipelines



# Wastewater System Condition Analyses



## Lift Stations

- Conducted field site visits of ten critical lift stations
  - Evaluated condition of each component
  - Provided recommendation and priority of rehabilitation

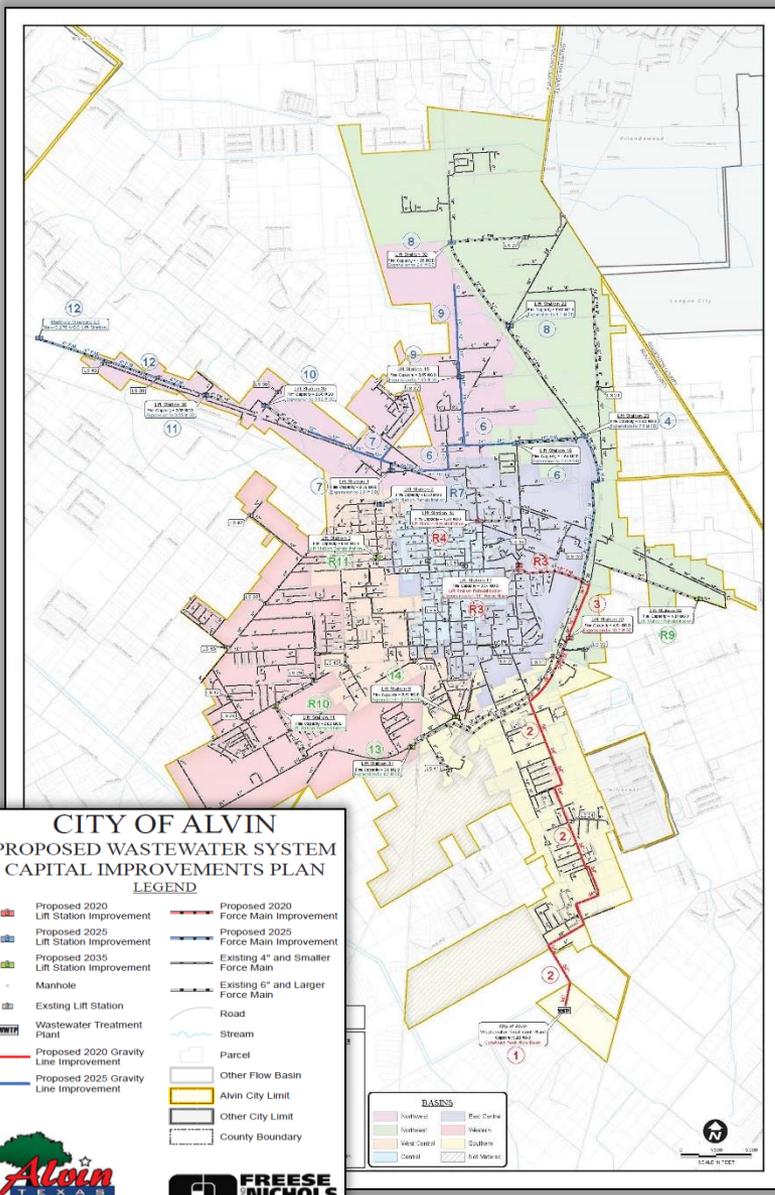
## Collection System

- Five out of seven wastewater basins experience high levels of I/I
  - Manhole and sewer line rehabilitation projects are recommended to reduce the amount of I/I in the system while extending the life of the existing infrastructure

| 2580 Koster Rd.<br>Lift Station No. 8                                                                                                                 |                  |                                                                                     |                           |                                                                                           |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-------------------------------------------------------------------------------------|---------------------------|-------------------------------------------------------------------------------------------|
| Inspection Date: 7/20/2015                                                                                                                            |                  |  |                           |                                                                                           |
| <b>Facility Information</b>                                                                                                                           |                  |                                                                                     |                           |                                                                                           |
| Address:                                                                                                                                              | 2580 Koster Rd.  |                                                                                     |                           |                                                                                           |
| Year in Service:                                                                                                                                      |                  |                                                                                     |                           |                                                                                           |
| Type of Facility:                                                                                                                                     |                  |                                                                                     |                           |                                                                                           |
| Number of Pumps:                                                                                                                                      | 3                |                                                                                     |                           |                                                                                           |
| Horsepower:                                                                                                                                           | 35               |                                                                                     |                           |                                                                                           |
| Wet Well Diameter (ft):                                                                                                                               | 18 x 19 box      |                                                                                     |                           |                                                                                           |
| Wet Well Depth (ft):                                                                                                                                  | 24               |                                                                                     |                           |                                                                                           |
| Incoming Pipe Depth (ft):                                                                                                                             | 17               |                                                                                     |                           |                                                                                           |
| <b>CONDITION ASSESSMENT</b>                                                                                                                           |                  |                                                                                     |                           |                                                                                           |
| Component Group                                                                                                                                       | Component Rating | Weight Factor                                                                       | Weighted Component Rating | Comments                                                                                  |
| Electrical – MCC, Back-up Power, Cables                                                                                                               | 3                | 25%                                                                                 | 0.75                      | On-site generator (running), New Panel                                                    |
| Pumps and Motors                                                                                                                                      | 4                | 25%                                                                                 | 1.00                      | Only 1 pump, 2 pumps being rebuilt                                                        |
| Structure - Hatches, Corrosion, Cracks, Leaking, Ventilation, Odor Control                                                                            | 3                | 25%                                                                                 | 0.75                      | Hoist system in the way, Gooseneck vent rusting, Concrete deterioration, No liner         |
| Piping and Valves                                                                                                                                     | 3                | 15%                                                                                 | 0.45                      | Heavy corrosion in wet well, Check Valve 2 not sealing?                                   |
| Site - Drainage, Access Drive, Security, Fencing                                                                                                      | 1                | 10%                                                                                 | 0.10                      | Asphalt driveway in OK condition, 6' Chain-link fence with barbed wire, No security light |
| <b>Condition Score</b>                                                                                                                                | -                | -                                                                                   | <b>3.05</b>               |                                                                                           |
| <b>OVERALL ASSESSMENT</b>                                                                                                                             |                  |                                                                                     |                           |                                                                                           |
| Relative Ranking ( / 12)                                                                                                                              | 7th              |                                                                                     |                           |                                                                                           |
| Priority Level                                                                                                                                        | Poor Condition   |                                                                                     |                           |                                                                                           |
| <b>ADDITIONAL COMMENTS / RECOMMENDATIONS</b>                                                                                                          |                  |                                                                                     |                           |                                                                                           |
| Notes:<br>Large volume of solids built up in wet well. Generator was running for the duration of the site visit; cause for this should be identified. |                  |                                                                                     |                           |                                                                                           |
| Recommendations:<br>Rebah within 3 years. Needs electrical work, wet well coating, new piping inside wet well, and some valve work.                   |                  |                                                                                     |                           |                                                                                           |

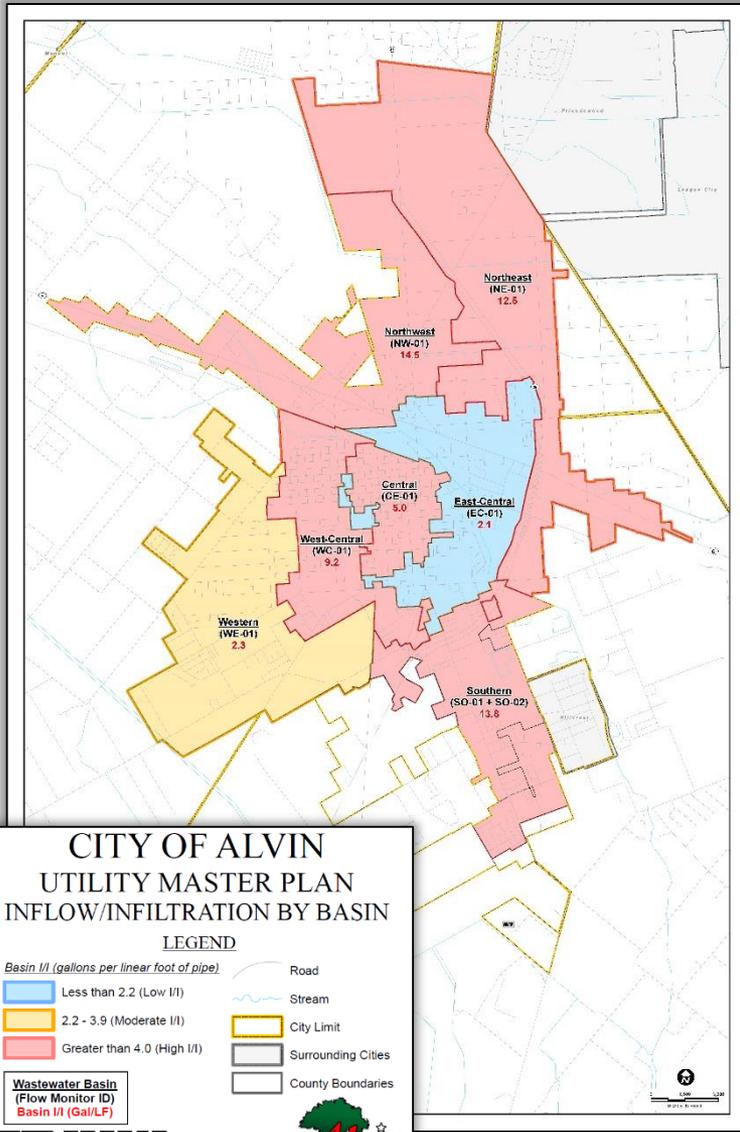
**Lift Station Site Visit Scoring Sheet**

# Wastewater Capacity Capital Improvement Plan



|                          | #  | Project Description                                          | Cost                 |
|--------------------------|----|--------------------------------------------------------------|----------------------|
| 2020                     | 1  | New 54" Eastside Interceptor                                 | \$ 12,991,700        |
|                          | 2  | Lift Station 30 Expansion and HWY 35 Bypass Gravity Mains    | \$ 8,975,200         |
|                          | 3  | Construct Peak Flow Storage Basin at WWTP                    | \$ 1,287,000         |
| <b>Total 2015 - 2020</b> |    |                                                              | <b>\$ 23,253,900</b> |
| 2025                     | 4  | Lift Station 23 Expansion                                    | \$ 7,176,500         |
|                          | 5  | Wastewater SCADA System                                      | \$ 2,373,600         |
|                          | 6  | Lift Station 16 Expansion and Replacement Gravity Mains      | \$ 7,253,400         |
|                          | 7  | Lift Station 1 Expansion and HWY 6 Replacement Gravity Mains | \$ 3,150,000         |
|                          | 8  | Lift Stations 22 and 33 Expansion                            | \$ 1,232,400         |
|                          | 9  | Lift Station 15 Expansion and Replacement Gravity Mains      | \$ 1,889,900         |
|                          | 10 | Lift Station 35 Expansion                                    | \$ 645,900           |
|                          | 11 | Lift Station 36 Expansion                                    | \$ 435,300           |
| <b>Total 2020 - 2025</b> |    |                                                              | <b>\$ 24,157,000</b> |
| 2035                     | 13 | Lift Station 31 Expansion                                    | \$ 3,223,500         |
|                          | 14 | Lift Station 8 Expansion                                     | \$ 1,519,200         |
| <b>Total 2025 - 2035</b> |    |                                                              | <b>\$ 4,742,700</b>  |
| <b>Total \$</b>          |    |                                                              | <b>\$ 52,153,600</b> |

# Wastewater Rehabilitation Capital Improvement Plan



|                          | #   | Project Description                                        | Cost                |
|--------------------------|-----|------------------------------------------------------------|---------------------|
| 2020                     | R1  | Northwest Basin Sanitary Sewer Evaluation Survey (SSES)    | \$ 47,100           |
|                          | R2  | Northeast Basin Sanitary Sewer Evaluation Survey (SSES)    | \$ 48,200           |
|                          | R3  | Lift Station 17 Rehabilitation                             | \$ 780,000          |
|                          | R4  | Lift Station 14 Rehabilitation                             | \$ 780,000          |
| <b>Total 2015 - 2020</b> |     |                                                            | <b>\$ 1,655,300</b> |
| 2025                     | R5  | West Central Basin Sanitary Sewer Evaluation Survey (SSES) | \$ 64,700           |
|                          | R6  | Southern Basin Sanitary Sewer Evaluation Survey (SSES)     | \$ 56,600           |
|                          | R7  | Lift Station 2 Rehabilitation                              | \$ 390,000          |
| <b>Total 2020 - 2025</b> |     |                                                            | <b>\$ 511,300</b>   |
| 2035                     | R8  | Central Basin Sanitary Sewer Evaluation Survey (SSES)      | \$ 44,900           |
|                          | R9  | Lift Station 34 Rehabilitation                             | \$ 546,000          |
|                          | R10 | Lift Station 11 Rehabilitation                             | \$ 624,000          |
|                          | R11 | Lift Station 3 Rehabilitation                              | \$ 561,600          |
| <b>Total 2025 - 2035</b> |     |                                                            | <b>\$ 1,776,500</b> |
| <b>Total</b>             |     |                                                            | <b>\$ 3,943,100</b> |

**\*Many condition related projects are included in the capacity CIP**

# Summary of Alvin Capital Improvements Plan



| Phase        | Water Cost (2015\$) |                     | Wastewater Cost (2015\$) |                    | Total Cost<br>(in 2015\$) |
|--------------|---------------------|---------------------|--------------------------|--------------------|---------------------------|
|              | Capacity            | Rehab               | Capacity                 | Rehab              |                           |
| 2015-2020    | \$7,181,400         | \$5,000,000         | \$23,253,900             | \$1,655,300        | \$37,090,600              |
| 2021-2025    | \$7,410,000         | \$5,000,000         | \$24,157,000             | \$511,300          | \$37,078,300              |
| 2026-2035    | \$1,643,100         | \$10,005,100        | \$4,742,700              | \$1,776,500        | \$18,167,400              |
| <b>Total</b> | <b>\$16,234,500</b> | <b>\$20,005,100</b> | <b>\$52,153,600</b>      | <b>\$3,943,100</b> | <b>\$92,336,300</b>       |



# Questions?

## CONTACT INFORMATION:

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