



## PIPELINES 2019 CONFERENCE Nashville, TN July 21 – 24

#### Replacement of Raw Water Transmission Line with Fused Pipe System Provides Stable Water Supply to Historical City

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## Stamford, TX

- Established in 1900 when Texas Central Railroad extended from Albany, TX to lands owned by SMS Ranches
- 640 acre townsite donated by sons of Svante Magnus Swenson, owner of SMS Ranches
- Named after Stamford, CT hometown of railroad president Henry McHarg
- Became a stop on north-south Wichita
  Valley Railroad and new rail lines extended to Rotan and Spur
- Intersection of rail lines made Stamford a regional trade/shipping visitors to area
- Stamford remains a regional economic hub for Rolling Plains area north of Abilene







## City of Stamford – Lake Stamford



- City located on the edge of Tornado Alley
- Officials needed to provide a local, permanent water source accessible during hazardous weather
- Stamford Dam construction began July 14, 1951, completed March 1953
  - Used to impound Paint Creek into Lake Stamford
  - Located ~10 miles northeast of the city
- Lake Stamford is the sole municipal water source forStamfordLuedersEricksdahlPaint CreekSagertonAvoca

**Two Rural Water Suppliers** 



Pipeline Engineering – Concepts in Harmony

Corinth



## Lake Stamford

- City of Stamford only owns the water rights to half the lake
  - Other half owned by American Electric Power
- Significant drought in 2000
  - Water diversion on California Creek diverted rainfall to Lake Stamford
  - Ensured maintenance of services
  - Now only used sporadically
- Additional water supply now comes from College Lake
  - Located within the City
  - Water main installed after drought in 1997







### Water Line Replacement

- Lake Stamford transmission main was original to start of service
  - 15 mile 18-inch concrete steel cylinder pipe
  - As time passed, leaks became more frequent
  - 6 recorded incidents between 2010 and end of 2017
  - Each repair cost the city between \$10-15 thousand
  - Areas of depth required large equipment required outside contractors
- City worked with Enprotec / Hibbs & Todd (eHT) to design the replacement beginning in 2013
  - Also intended to replace the treatment plant and elevated storage
- Full replacement deemed necessary
  - Transmission main was the primary conduit of water into city – could not be shut off
  - Prior leaks proved level of deterioration







## **Determining Alignment**



- Easiest to follow existing line
  - Already had easement
  - Only 25-feet wide
- City and eHT required permissions from private landowners along the right of way (ROW)
  - Temporarily expand ROW additional 25-feet
  - All owners were willing and compensated
  - No liens required
- Substantial brush and tree growth clearing needed







# Installation Methodology

- Open Cut
  - Majority of alignment was through open field and ranchland
  - Most cost effective option
  - Required few surface improvements
  - Private land owners allowed trenched crossing of private roads
  - Allowed access to existing line
    - Repairs could be made as needed during installation of new line
    - Easier air valve removal process
- Boring
  - 2 steel cased bores required for highway crossings
  - 3 slick bores required for county road crossings







#### Soil Conditions

- eHT ordered a series of 16 test bores to check soil composition along alignment
  - One mile apart along full length of alignment
  - 10-foot depth
- Bores 14-16
  - Limestone located at 5-foot depth
- Bore 16
  - 6-inches of gravel at surface
- Confirmed open trenching was appropriate methodology
  - Pipe depth would be between 4-6 feet
  - Variant depending on terrain
  - Minimize number of required air relief valves







### **Pipe Material Options**

- Either fusible polyvinyl chloride pipe (FPVCP) or high density polyethylene (HDPE)
  - Offered internally restrained systems
  - City crews familiar with both
- Project designed with decreasing pressure classes of pipe
  - Each pipe had different sizing requirements
    - HDPE required thicker pipe, with an overall ID change of 1.3-inches
    - FPVCP required thinner pipe, with an overall ID change of 0.5-inches

| Pressure | Length of Pipe | 14-inch FPVCP | 16-inch HDPE |
|----------|----------------|---------------|--------------|
| Low      | 55,000 LF      | DR-25         | DR-13        |
| Medium   | 22,000 LF      | DR-21         | DR-11        |
| High     | 2,600 LF       | DR-18         | DR-9         |

- Fittings
  - FPVCP could be directly connected to valves using Megalug<sup>®</sup>
  - HDPE would require adapter kits to connect to to standard mechanical joints or flanged fittings





## Financing

- Engineer's estimate was \$6,067,000
- Stamford applied to the Texas Water Development Board (TWDB) for assistance
  - TWDB approved funding
  - 51.8% grant
  - 48.2% low interest loan through TWDB Drinking Water State Revolving Fund







### **Bidding and Award**

- TWDB BWSRF Water System Improvements Contract A Raw Water Transmission Line
  - Bid on December 12, 2017
- MH Civil Constructors, Inc. (MH Civil) of Amarillo, TX declared lowest responsible bidder
  - \$5,152,000
  - Utilized base bid option
- MH Civil had not previously worked with FPVCP
  - Significant research and education in best onsite practices, tensile strength, and potential pitfalls with supplier company's regional manager





#### **Construction - Adjustments**

- Received notice to proceed January 8, 2018
- Submitted a request to adjust lateral spacing of pipe from existing pipeline
  - Constructability review determined that loads of construction equipment could cause additional failures in existing pipeline
- Two solution scenarios analyzed
  - 1. Utilize an excavator
  - 2. Utilize a trencher
- CAT 345 excavator weighed 109,000 pounds, width of 11 feet 5-inches
- Vermeer T955 trencher weighed 110,000 pounds, width of 11 feet 6-inches
- Expanded pipe spacing from 5-7 feet to 3-10 feet minimized loads on existing pipe
  - Allowed contractor more latitude to make alignment adjusts due to field conditions





#### Construction

- Between 1,000 and 3,000 feet of trench could be opened per day
  - Utilized Vermeer T955 trencher, CAT 345 and 320 excavators
  - ~2,000 feet of trench was left open for pipe laying to resume next day
- Vermeer 100x140 horizontal directional drill (HDD) machine used for shorter HDD sections









## **Pipe Fusion**

- McElroy T-618 fusion machines
  - Up to 5 technicians
  - Up to 6 machines
- Total of 79,600 LF of FPVCP fused
- Technicians on site from February to July of 2018
- Multiple fusion stations along alignment
  - Less pipe movement required
  - Sites were generally located at max pull lengths of pipe or new valves









#### Atmos Gas and Texas Electric Service Company



- Atmos Gas
  - High-pressure gas line
  - Located a third of the way up the transmission line
  - Had a 50-foot easement
  - Water line crossed below gas line by open trench
  - Gas company representative on site
- Texas Electric Service Company
  - High-voltage powerlines
  - 150-foot easement
  - No on site representative, but 48-hour notice of intent to dig required





#### **Meter Boxes**

- Electronic radio-read water meters
  - Serve customers previously provided unmetered raw water
- Longer and more frequent droughts
  - Regulatory agencies and water systems increasing priority of water accountability
- Higher production and delivery costs
  - Growing need to monitor usage
  - Minimize water loss





#### Pressure Testing and Completion



- Pressure testing occurred in 5,000-foot long segments
  - 150 psi
  - 2 hours
- Began early July
- 15-mile pipeline
  - Zero loss in pressure
  - Zero make-up water required
- Testing completed July 18, 2018
- City began pumping water on July 27, 2018
  - Declared substantially complete
- Final inspection August 20, 2018





## Conclusion

- Project completed 5 months ahead of schedule
- Cost of fixing leaks in existing pipe brought cost above bid price
  - Final cost of \$5,175,639.23
- Overall cost savings to city were substantial
  - Ability to abandon older line much earlier than anticipated
- Both owner and engineer very pleased with success









#### **Questions?**



