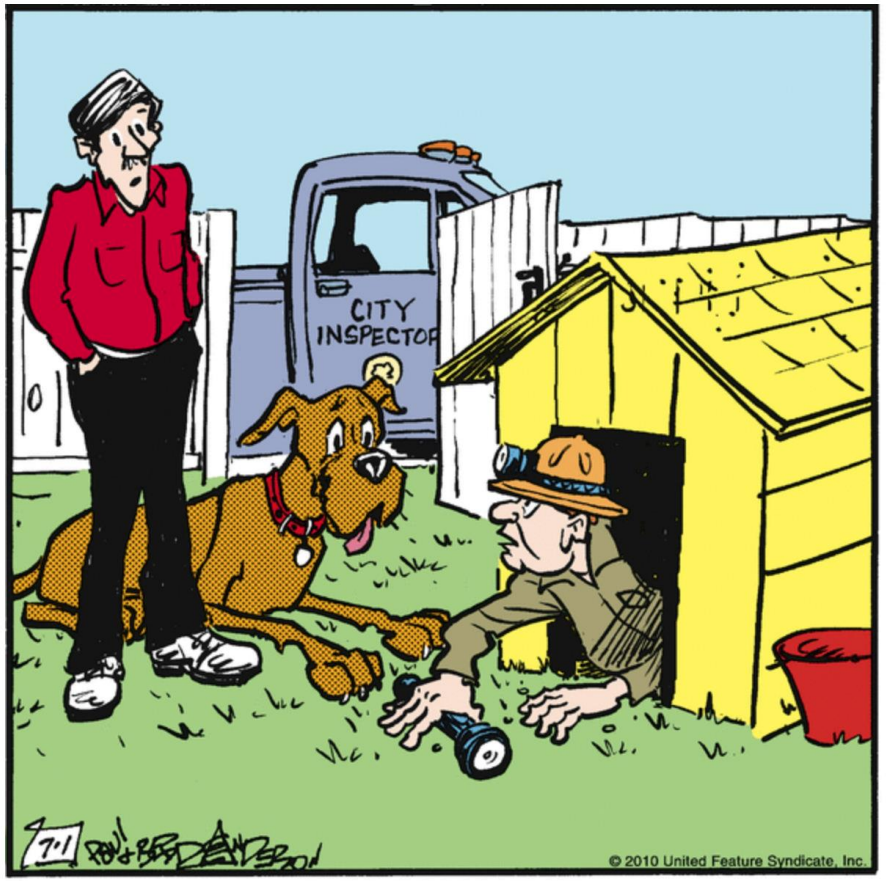
WHY TUNNEL WHEN YOU CAN OPEN CUT?

A Case Study to Debunk the Myth that Tunneling is Always More Expensive



"How long has this tunnel system been in here?"

Agenda

- NTMWD Review
- Project Overview
- Tunneling Versus Open Cut
- Hypothetical Review

Punchline: Is Tunneling Ever more Cost Effective???

History of NTMWD

10 Original Member Cities

Farmersville, Forney, Garland, McKinney, Mesquite, Plano, Princeton, Rockwall, Royse City, and Wylie

"We decided we were all in this together. We couldn't do it separately."

- **1951 – Created by Texas Legislature to Provide Water Service**
- **1956 – Began Providing Treated WATER to Member Cities**
- **1970s – Expanded to WASTEWATER Service**
- **1973 – Richardson added as Member City**
- **1980s – Expanded to SOLID WASTE Service**
- **1998 – Allen added as Member City**
- **2001 – Frisco added as Member City**

Regional Provider: Water, Wastewater and Solid Waste

NORTH TEXAS MUNICIPAL WATER DISTRICT

BY THE NUMBERS

SERVE up to 80 COMMUNITIES

Service area of 2,200 square miles in 10 counties

Serving 1.8 million people in one of the fastest-growing regions in the country

18 MAJOR RAW & TREATED WATER PUMP STATIONS

6 WATER TREATMENT PLANTS
876 MGD Capacity
(million gallons/day)

610+ MILES WATER TRANSMISSION PIPELINES

226+ MILES LARGE-DIAMETER WASTEWATER PIPELINES

13 WASTEWATER TREATMENT PLANTS

163+ MGD WASTEWATER TREATMENT CAPACITY
MGD (million gallons/day)

DID YOU KNOW?

3 TRANSFER STATIONS
up to 3,295 tons of solid waste/day

around 1 million tons/year accepted at landfill

Rev. Feb. 2021

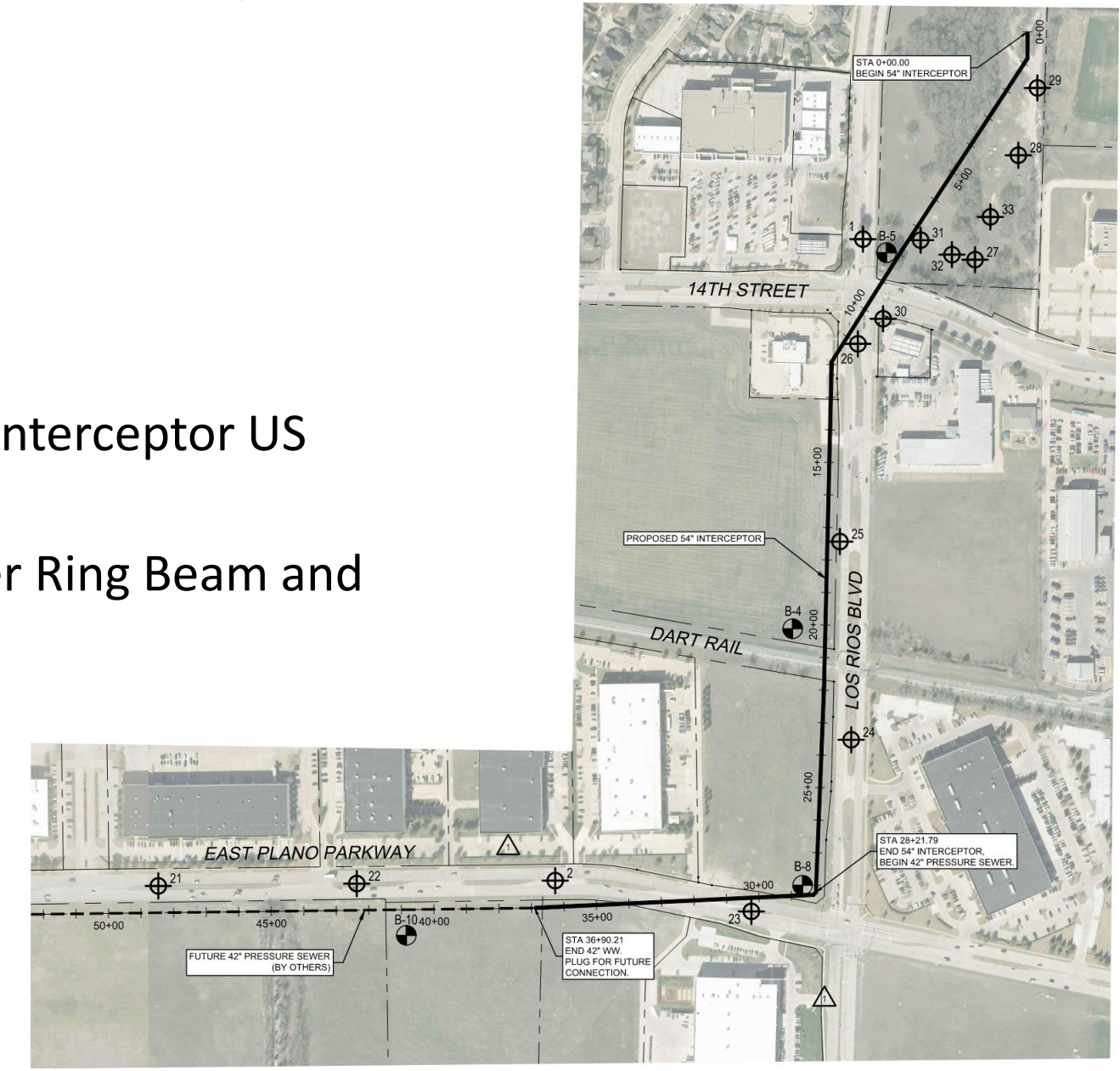
Wastewater System

- **Entities Served**
  - 80 Communities
  - Approximately 2.0 Million North Texas Residents

- **Facilities**
  - Over 226+ miles of large diameter pipe to transfer flow from communities to regional treatment facilities
  - 13 Treatment Plants
  - Total Capacity of +163.5 MGD
  - Leader in Reuse

Project Overview

- Beck Branch Parallel Interceptor
  - 3,700 LF of 42-inch to 54-inch
  - Fiberglass Reinforced Pipe SN 72
  - Connects to WWTP DS and future interceptor US
  - Max Depth: 41 Feet
  - Tunnel Boring Machine with Timber Ring Beam and Lagging



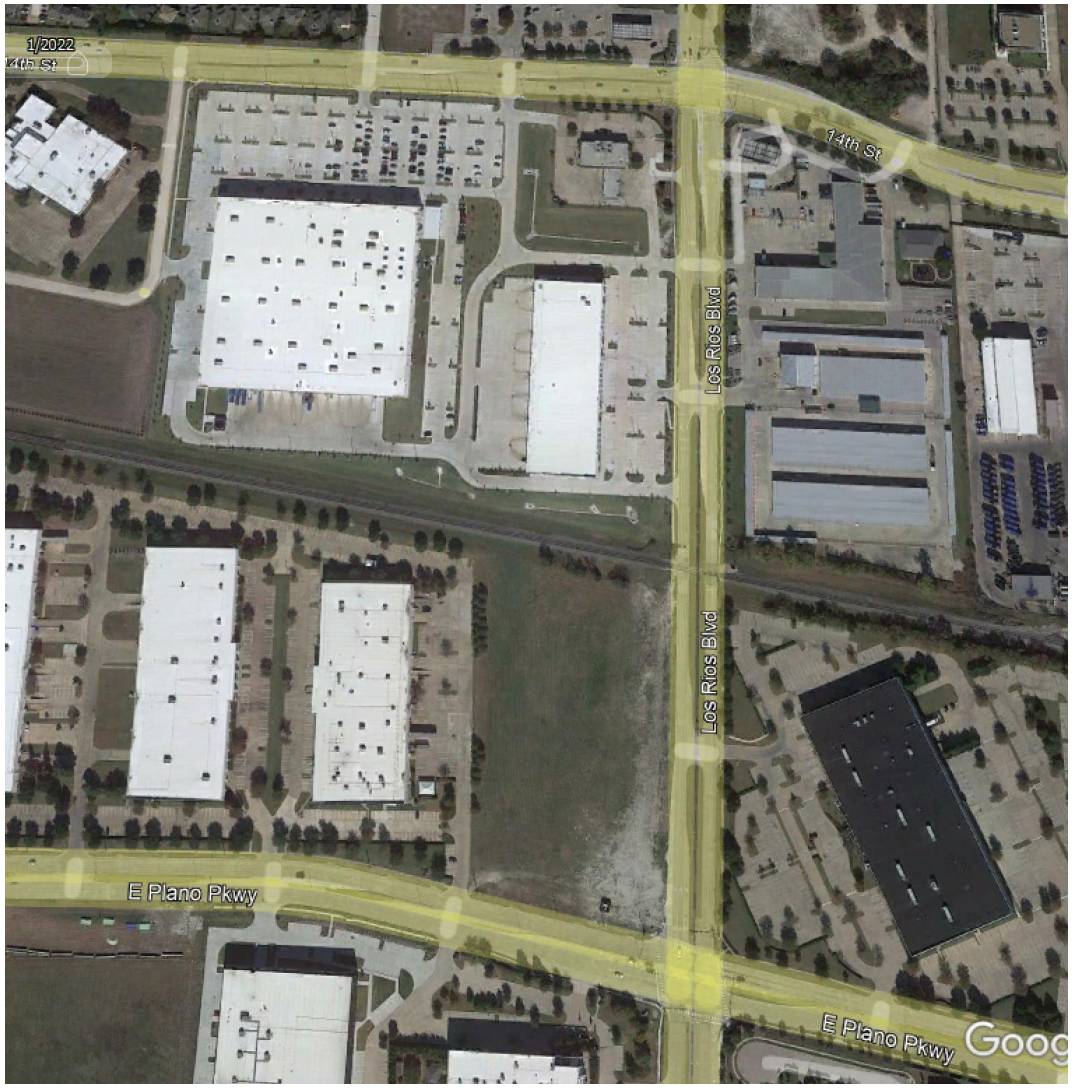
Case Study

- What are the Constraints Impacting Schedule and Cost?
  - Easements/Right-of-way
  - Depth
  - Subsurface Condition
  - Above Ground Improvements
  - Adjacent and Crossing Infrastructure
  - Alignment

Site Plan Overview

- Where did we Tunnel and Why?

Before and ~~After~~ During



Comparative Analysis if We Open Cut

- Contractor Bid: $5.5 MM
  - Typical Cost Differences, Open Cut is $1,000 per LF less than Tunneling
  - Therefore, the cost difference to overcome was **$1.5 MM**

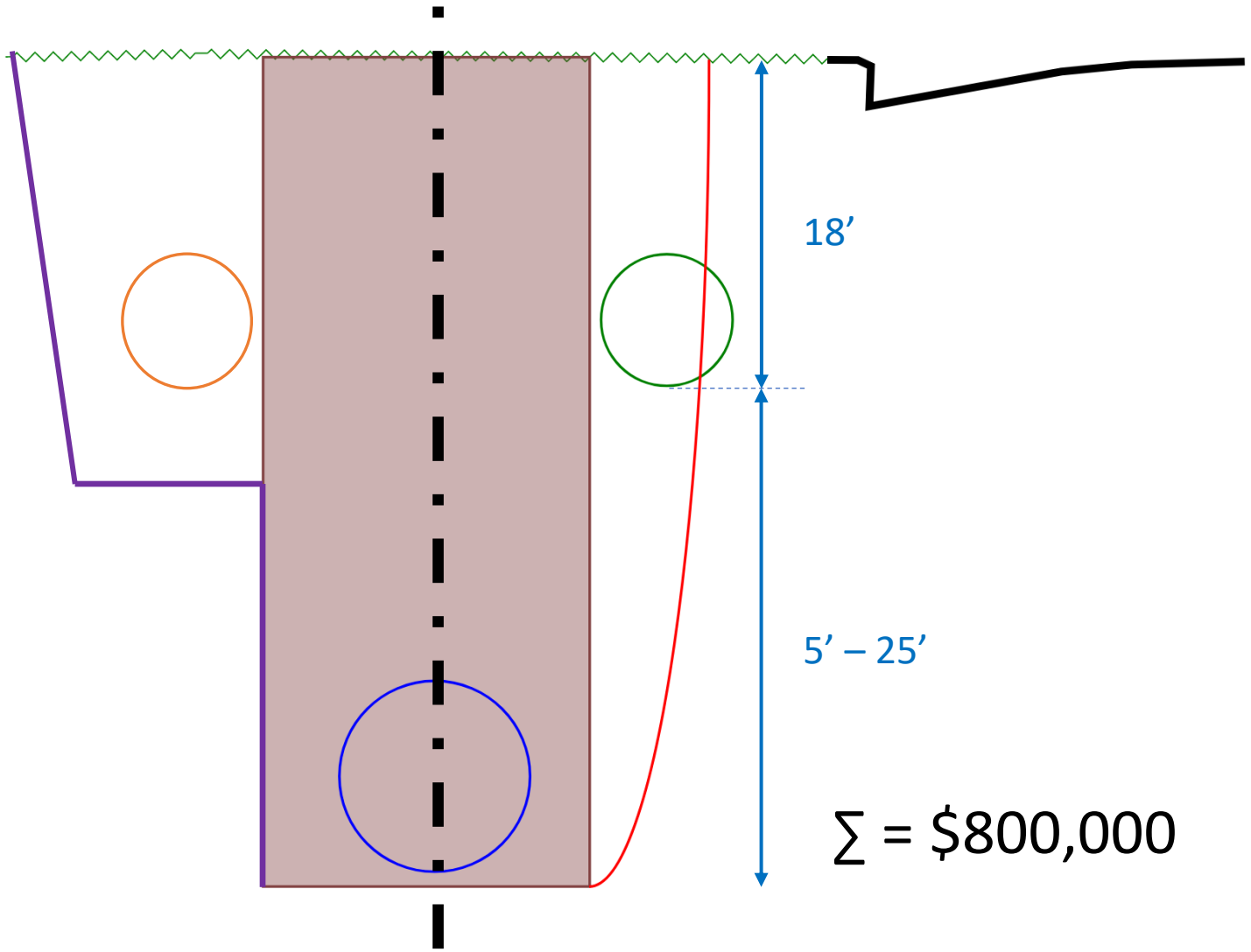
- So Why Did We Do It?
  - Risk
  - Long-Term Maintenance
  - Changing Development

Let's See If We Can Justify The Costs of Tunneling

- Adjacent 36-Inch Force Main
  - Risk of Failure
  - Bypass Pumping Costs
- Additional Easement Costs
- ~~Removal and Replacement of Improvements~~
- ~~Railroad and Roadway Crossings~~
- Depth
- Subterranean Conditions
- Tunnels

Adjacent Utilities

- Avoid Trench Slough
- Avoid Excavation of Hard Materials Adjacent to the Existing Pipeline
- Bypass Pumping Costs
  - RR Crossing $400,000
  - Bypass Pumping $400,000



Easement Costs

- Trench Separation Calculations
- Additional Easement Area
- Assuming a 50’ Wide Permanent Easement
  - Cost of $192,000

∑ = $992,000

Pavement Repair

- Additional Parking Lot Built During Construction
- Concrete Repair Costs
- Assuming a 50’ Wide Permanent Easement
  - Cost of $300,000

∑ = $1,292,000

Labor and Equipment Costs

- Deep Excavation
- Hard Materials
- Benching
  - 8 CY extra x $50/CY for excavation and embedment
- Shoring
  - 40 SF extra x $3/SF

- Depth and Material Anticipated to Add 2 Hours per LF

- Added labor to Open Cut is $832,000

∑ = $2,124,000

Phase 2 Results

UNIT PRICE	EXTENDED AMOUNT	UNIT PRICE	EXTENDED AMOUNT	UNIT PRICE	EXTENDED AMOUNT	UNIT PRICE	EXTENDED AMOUNT	UNIT PRICE	EXTENDED AMOUNT
BASE BID ITEMS									
$ 1,310	$ 14,279,000.00	$ 950	$ 10,355,000.00	$ 712	$ 7,760,800.00	$ 881	$ 9,602,900.00	$ 1,234	$ 13,450,600.00

- Additional Differentiating Costs:
  - Tunnels
  - Pavement Repair

Tunnelling Benefits

- Minimal Maintenance Anticipated
- Easier Easement Acquisition
- Done with a Tunnel Boring Machine at 22’ per Day
- Railroad was to be tunneled anyway


12/9/19, 1:42 PM
33.0138° N, 96.6547° W
4024 14th St
Plano TX 75074
United States

QUESTIONS?


10/24/19, 8:08 AM
33.0121° N, 96.6547° W
1141 Los Rios Blvd
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