Setting up Projects with More Bid Appeal for Contractors: Friendswood's Trenchless Trio of Methods

Maureen Carlin, PhD & Karina Diaz, EIT

OUR AGENDA

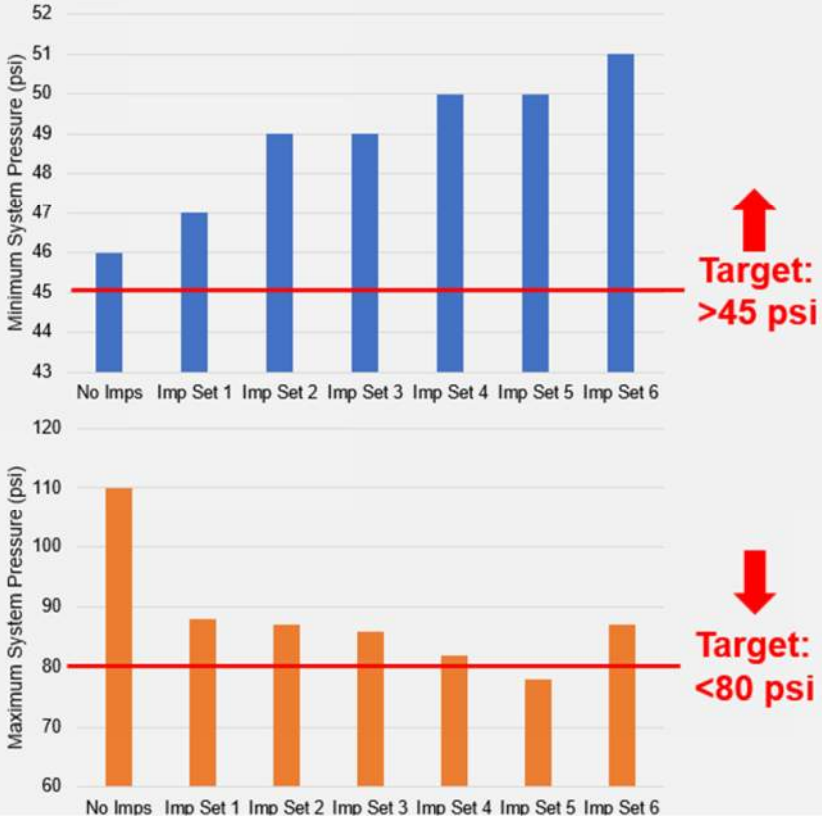
1. Overview of Project
2. Trenchless Methods Considered
3. Permitting and Contractor Bid Strategy

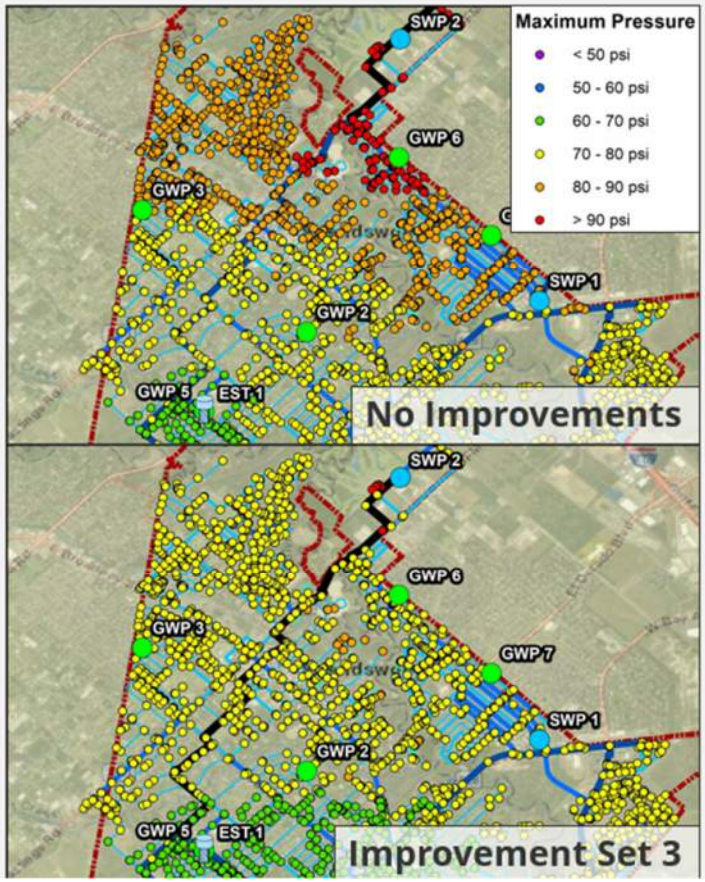
01.

Overview of Project

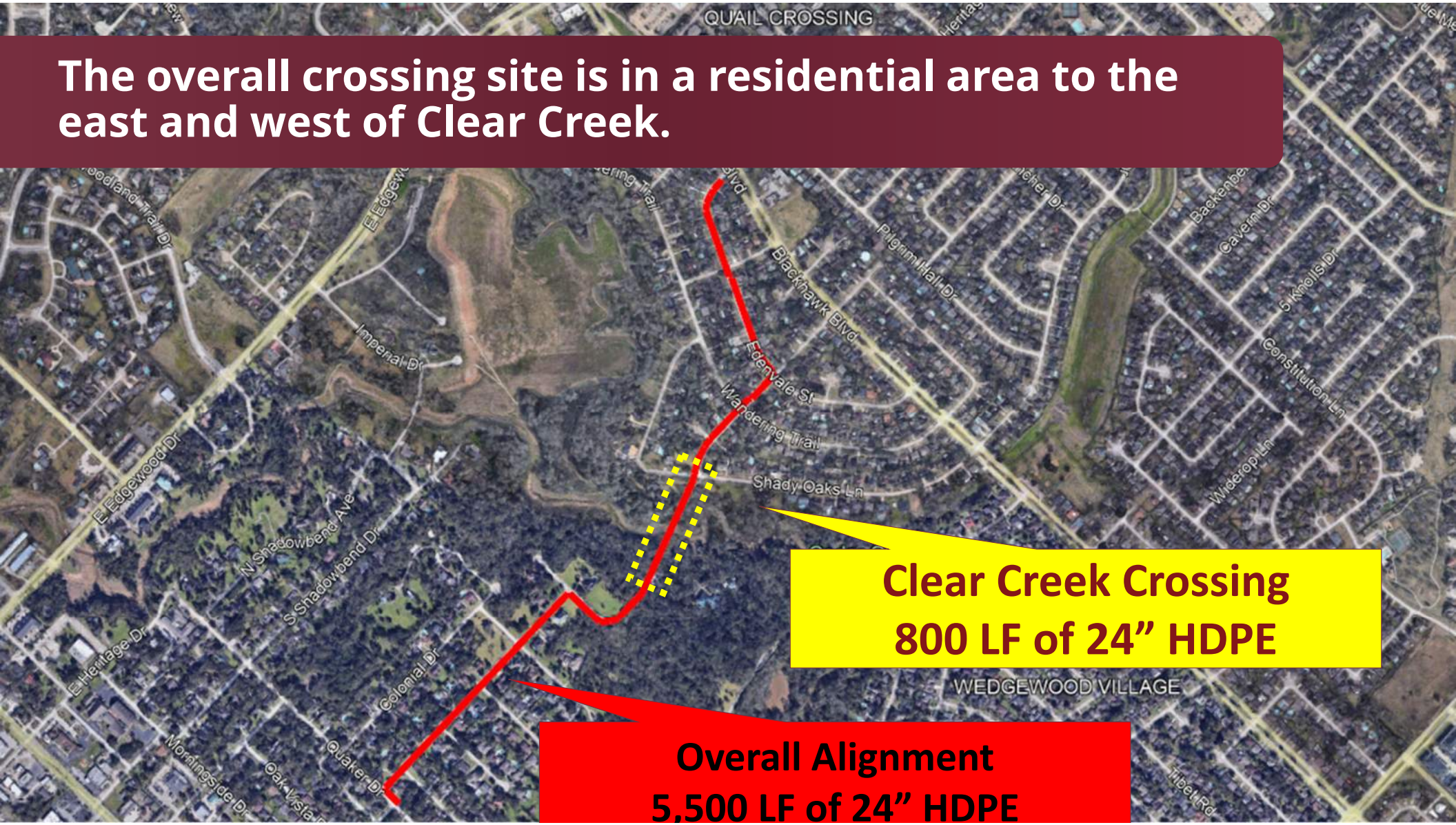
The goal of the overall project is to eliminate an existing hydraulic bottleneck at Clear Creek and increase the water distribution capacity to Friendswood.

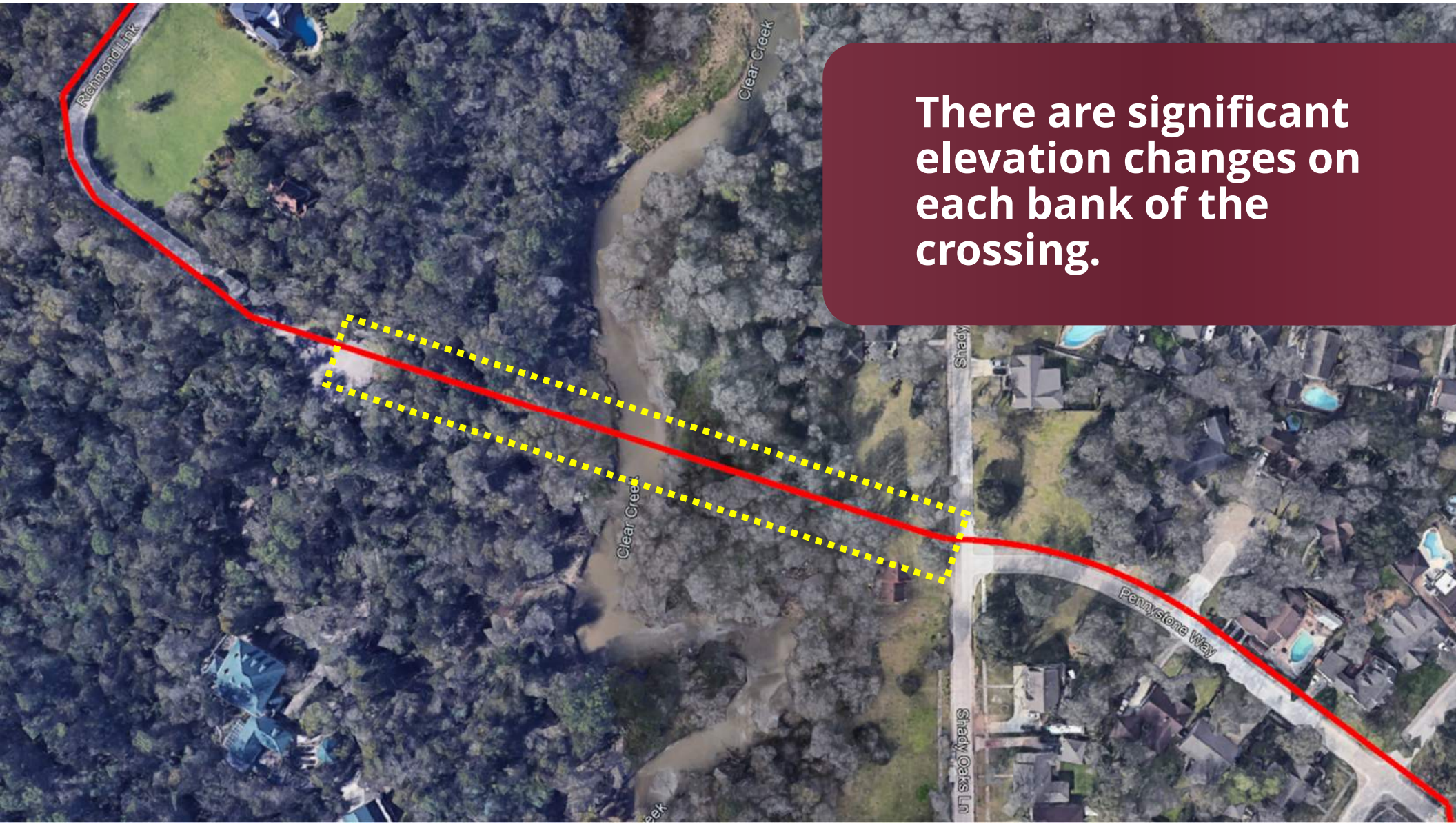
Improvement Results



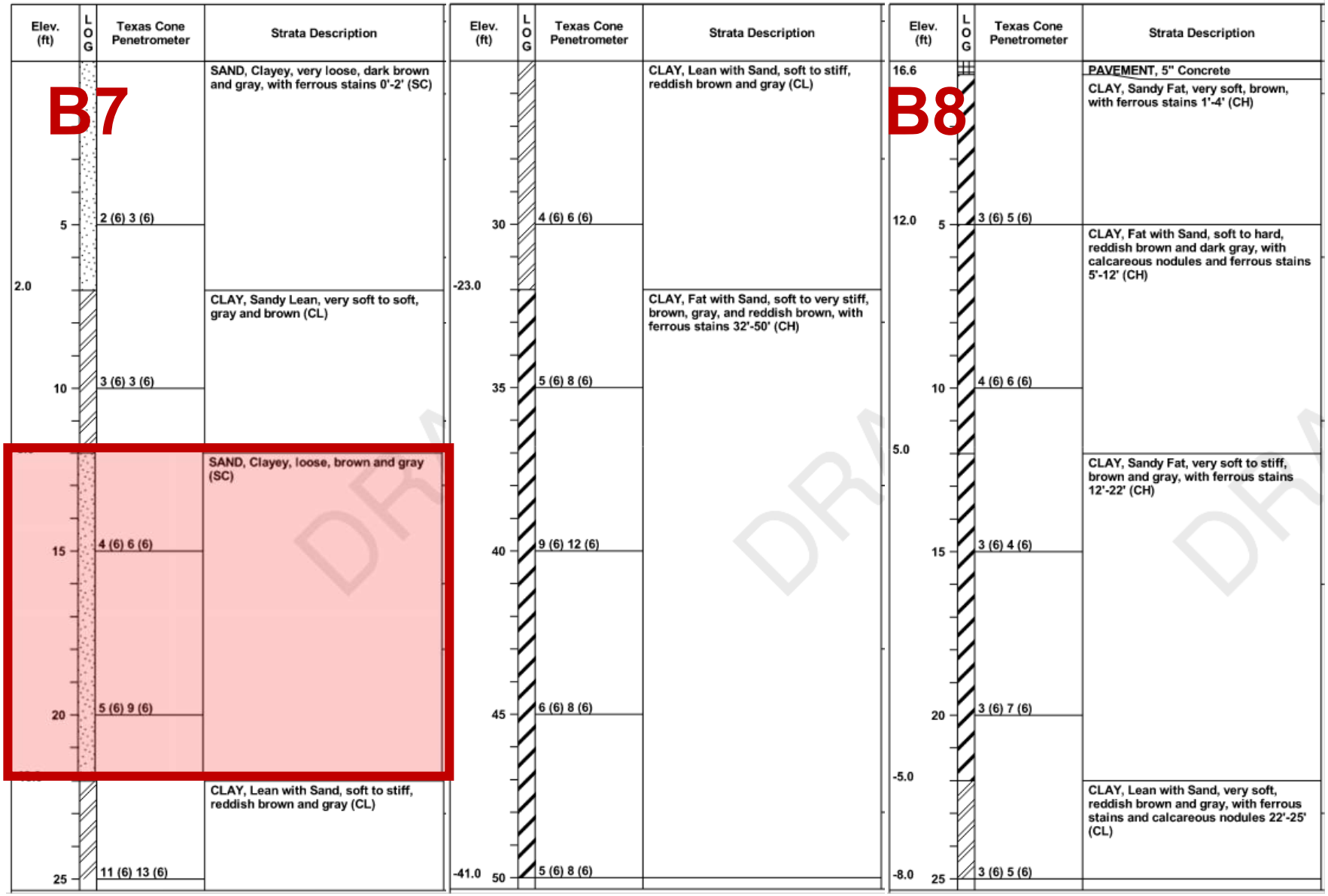


The overall crossing site is in a residential area to the east and west of Clear Creek.




There are significant elevation changes on each bank of the crossing.
Richmond Lnk
Clear Creek
Clear Creek
Shady Oaks Ln
Pennystone Way
Shady Oaks Ln


Geotechnical bore holes B-7 and B-8 were near the crossing and provide valuable geotechnical information.
B7
B8
B-9 (PZ-3) (25')
Independence Dr
Richmond Link
Google Earth
N
200 ft


B7
Elev. (ft)
LOG
Texas Cone Penetrometer
Strata Description
2.0
-23.0
-41.0
5
10
15
20
25
30
35
40
45
50
2 (6) 3 (6)
3 (6) 3 (6)
4 (6) 6 (6)
5 (6) 9 (6)
11 (6) 13 (6)
4 (6) 6 (6)
5 (6) 8 (6)
9 (6) 12 (6)
6 (6) 8 (6)
5 (6) 8 (6)
SAND, Clayey, very loose, dark brown and gray, with ferrous stains 0'-2' (SC)
CLAY, Sandy Lean, very soft to soft, gray and brown (CL)
SAND, Clayey, loose, brown and gray (SC)
CLAY, Lean with Sand, soft to stiff, reddish brown and gray (CL)
CLAY, Lean with Sand, soft to stiff, reddish brown and gray (CL)
CLAY, Fat with Sand, soft to very stiff, brown, gray, and reddish brown, with ferrous stains 32'-50' (CH)
B8
16.6
12.0
5.0
-5.0
-8.0
3 (6) 5 (6)
4 (6) 6 (6)
3 (6) 4 (6)
3 (6) 7 (6)
3 (6) 5 (6)
PAVEMENT, 5" Concrete
CLAY, Sandy Fat, very soft, brown, with ferrous stains 1'-4' (CH)
CLAY, Fat with Sand, soft to hard, reddish brown and dark gray, with calcareous nodules and ferrous stains 5'-12' (CH)
CLAY, Sandy Fat, very soft to stiff, brown and gray, with ferrous stains 12'-22' (CH)
CLAY, Lean with Sand, very soft, reddish brown and gray, with ferrous stains and calcareous nodules 22'-25' (CL)

Groundwater levels were observed in borings during the drilling operations between depths of ~14 feet to ~28 feet below grade.

Table 5-3 - Groundwater Observations

Boring	Groundwater Depth below Existing Grade (El.), Feet						
	During Drilling	24-hour after drilling	7-day after PZ installation	14-day after PZ installation	21-day after PZ installation	28-day after PZ installation	30-day after PZ installation
B-1 (PZ-1) (1)	14.0 (El. 10.0)	10.3 (El. 13.7)	--	--	--	--	9.9 (El. 14.1)
B-2 (1)	16.0 (El. 9.0)	--	--	--	--	--	--
B-6 (PZ-2)	28.0 (El. -8.0)	14.6 (El. 5.4)	14.4 (El. 5.6)	14.8 (El. 5.2)	14.6 (El. 5.4)	14.7 (El. 5.3)	--
B-7 (1)	16.0 (El. -7.0)	7.7 (El. 1.3)	--	--	--	--	--
B-9 (PZ-3)	24.0 (El. -7.0)	10.1 (El. 6.9)	--	--	--	--	10.3 (El. 6.7)

1. Borehole caved in at approximately 10.8 feet, 10.6 feet and 15.3 feet at boring locations B-1 (PZ-1), B-2 and B-7 respectively.

DRAFT

US Army Corps of Engineers®

Permitting will prove challenging as the crossing footprint has special flood zoning requirements.

02.

Trenchless Methods Considered

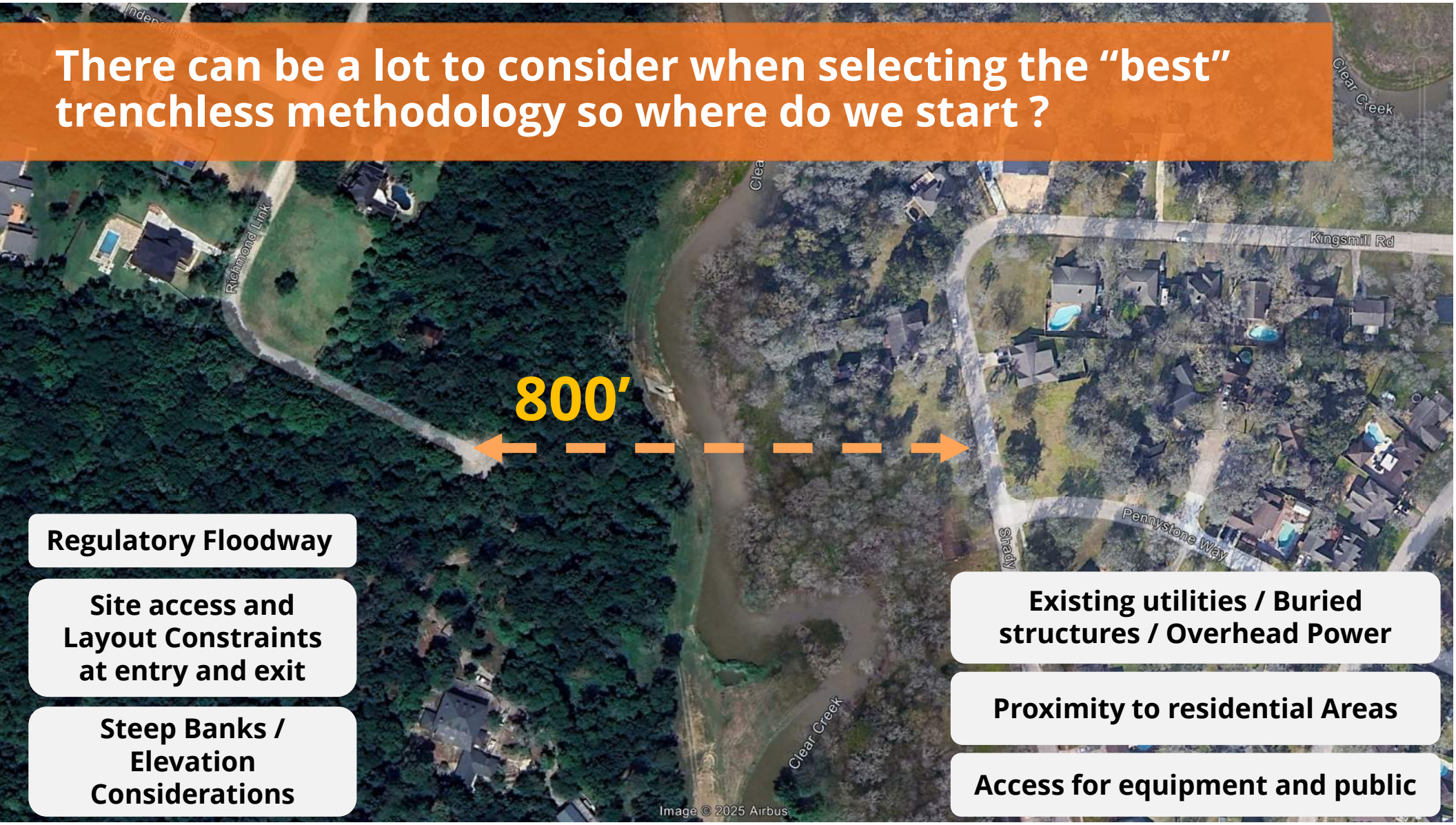
Trenchless methodologies rely on three (3) critical quality components for project success.

EQUIPMENT - VENDORS
Methodologies, Systems, Equipment and Tooling

PIPE - MANUFACTURERS
Pipe Materials, Sizing, Usage and Quality

ENGINEERS & CONTRACTORS
Skilled and Reliable Crews and Managers

There can be a lot to consider when selecting the “best” trenchless methodology so where do we start ?



- Regulatory Floodway
- Site access and Layout Constraints at entry and exit
- Steep Banks / Elevation Considerations
- Existing utilities / Buried structures / Overhead Power
- Proximity to residential Areas
- Access for equipment and public

NORTH AMERICAN SOCIETY FOR TRENCHLESS TECHNOLOGY

TRENCHLESS TECHNOLOGY OVERVIEW GUIDE: NEW INSTALLATIONS

TYPICAL CRITERIA	HDD	Direct Steereable Pipe Thrusting	Microtunneling	Pilot Tube Guided Auger Boring	Auger Boring	Pipe Ramming	Pipe Jacking	Hand Mining/ Tunneling
Pipe Diameter	2 - 48 inches	30 - 60 inches	30 - 120 inches	4 - 48 inches	12-72 inches	12 - 120 inches	42 - 144 inches	42 - 144 inches
Depth Range	15 - 200 feet	25 - 130 feet	15 - 100 feet	8 - 30 feet	8 - 30 feet	5 - 25 feet	10 - 40 feet	10 - 40 feet
Length Range	200 - >10,000 feet	500 - 4,000 feet	200 - 3,000 feet	50 -300 feet	50 - 300 feet	50 - 300 feet	200 - 1,000 feet	100 - 600 feet
Maximum Length	>10,000 feet	>5,000 feet (7,500 feet maximum)	2,000 feet with intermediate jacking stations	+/- 400 feet	+/- 500 feet w/ guidance	+/- 400 feet w/ guidance	1,500 feet with intermediate jacking stations	1,000+ feet
Minimum Depth of Cover	>25 feet	As low as 2X pipe diameter	As low as 2X pipe diameter	As low as 40-inches	As low as 2X pipe diameter	As low as 1X pipe diameter	As low as 2X pipe diameter	As low as 2X pipe diameter
Design Angles	Entry: 8 to 14 degrees / Exit: 8 to 16 degrees	Launch: 0 to 8 degrees / Reception: 2 to 10 degrees	Typically < 2.5%	Typically < 2.5%	Typically < 2.5%	Typically < 2.5%	Typically < 2.5%	Typically < 2.5%
Entry/Launch Approach	Surface entry	Near surface launch	Shaft launch	Shaft launch	Shaft launch	Shaft launch	Shaft launch	Shaft launch
Min. Install Radii	Governed by installation & operating stresses	Governed by installation & operating stresses	Generally flat or sloped	Generally flat or sloped	Generally flat or sloped	Generally flat or sloped	Generally flat or sloped	Generally flat or sloped
Pit/Shaft Design	Shallow pit, non-engineered	Engineered shoring for shallow launch pit; shallow, non-engineered reception	Engineered shoring for launch & reception shaft	Engineered shoring for launch & reception shaft	Engineered shoring for launch & reception shaft	Engineered shoring for launch & reception shaft	Engineered shoring for launch & reception shaft	Engineered shoring for launch & reception shaft
Foundation	Traditional deadman	Engineered for site conditions & anticipated loads	Engineered for site conditions & anticipated loads	Engineered for site conditions & anticipated loads	Engineered for site conditions & anticipated loads	Engineered for site conditions & anticipated loads	Engineered for site conditions & anticipated loads	Engineered for site conditions & anticipated loads
Pipe Stringing	Typically exit side	Launch side	Pipe segment storage on launch side	Pipe segment storage on launch side	Pipe segment storage on launch side	Pipe segment storage on launch side	Pipe segment storage on launch side	Tunnel liner segment storage on launch side
Installation Stresses	Tension, bending, hydrostatic buckling & combined	Compression, bending, & combined; column buckling	Compression & buckling	Compression & buckling	Compression & buckling	Compression & buckling	Compression & buckling	Compression & buckling
Annular Pressures	Hydrostatic drilling fluid pressure & cutting transport pressure	Hydrostatic lubricating pressure & slurry over pressure	Hydrostatic lubricating pressure & slurry over pressure	Hydrostatic lubricating pressure	Hydrostatic lubricating pressure	Hydrostatic lubricating pressure	Hydrostatic lubricating pressure	Hydrostatic lubricating pressure
Gravel, Cobbles and Boulders	High risk of failure for > ~30-40% gravel	Can negotiate limited rocks up to 1/3 size of the cutterhead, and up to ~30 - 40% gravel	Can negotiate limited rocks up to 1/3 size of the cutterhead, and up to ~30 - 40% gravel	High risk of failure	Can negotiate up to 1/3 size of the cutterhead	Casing can be sized to swallow up cobbles & boulders	Medium risk of failure. Can access tunnel heading for removal of obstructions	Medium risk of failure. Can access tunnel heading for removal of obstructions
Clay Soils	Risk of hydraulic fracture	Low risk of hydraulic fracture	Low risk of hydraulic fracture	Low risk of hydraulic fracture	Low risk of hydraulic fracture	Low risk of hydraulic fracture	Low risk of hydraulic fracture	Low risk of hydraulic fracture
Relative Cost	$$	$$$$	$$$$	$$	$	$$	$$$	$$$

Let's discuss trenchless applications and limitations.

COMMON

COMPLEX

Method	Steerable	Beneath Water Table	Diameter	Length
~~Impact Moling~~	~~No~~	~~No~~	~~2" – 12"~~	~~150'~~
~~Pipe Ramming~~	~~No~~	~~No~~	~~8" – 72"~~	~~300'~~
~~Auger Boring (Jack and Bore)~~	~~Limited~~	~~No~~	~~12" – 84"~~	~~500'~~
~~Conventional Tunneling~~	~~No~~	~~Limited~~	~~>60"~~	~~Any length~~
~~Pilot Tube~~	~~Yes~~	~~Limited~~	~~12" – 24"~~	~~300'~~
~~Down-The-Hole-Hammering~~	~~Yes~~	~~Limited~~	~~6" – 42"~~	~~300'~~
~~Pipe Jacking~~	~~Limited~~	~~Limited~~	~~>54"~~	~~3,000'~~
Microtunneling (MT)	Limited	Yes	12" – 108"	7,000'
Direct Steerable Pipe Thrusting (DSPT)	Yes	Yes	24" – 36" – 48"	7,500'
Horizontal Directional Drilling (HDD)	Yes	Yes	2" – 54"	20,000'

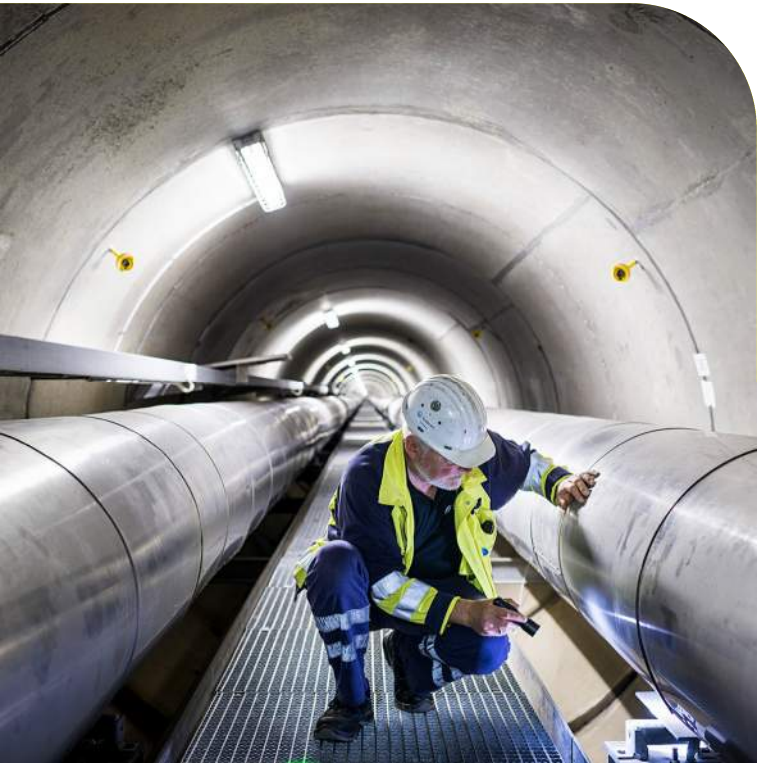
Three (3) technologies have been identified as potential methodologies to cross Clear Creek.

Microtunneling

Direct Steerable Pipe Thrusting

Horizontal Directional Drilling

Method	Length & Depth	Pros	Cons
Microtunnelling	1000’ Long @ ~35’ Depth	Limited disruption at entry and less at exit **Low Risk of Hydraulic Fracture**	**Deep Shafts Required** Casing Required



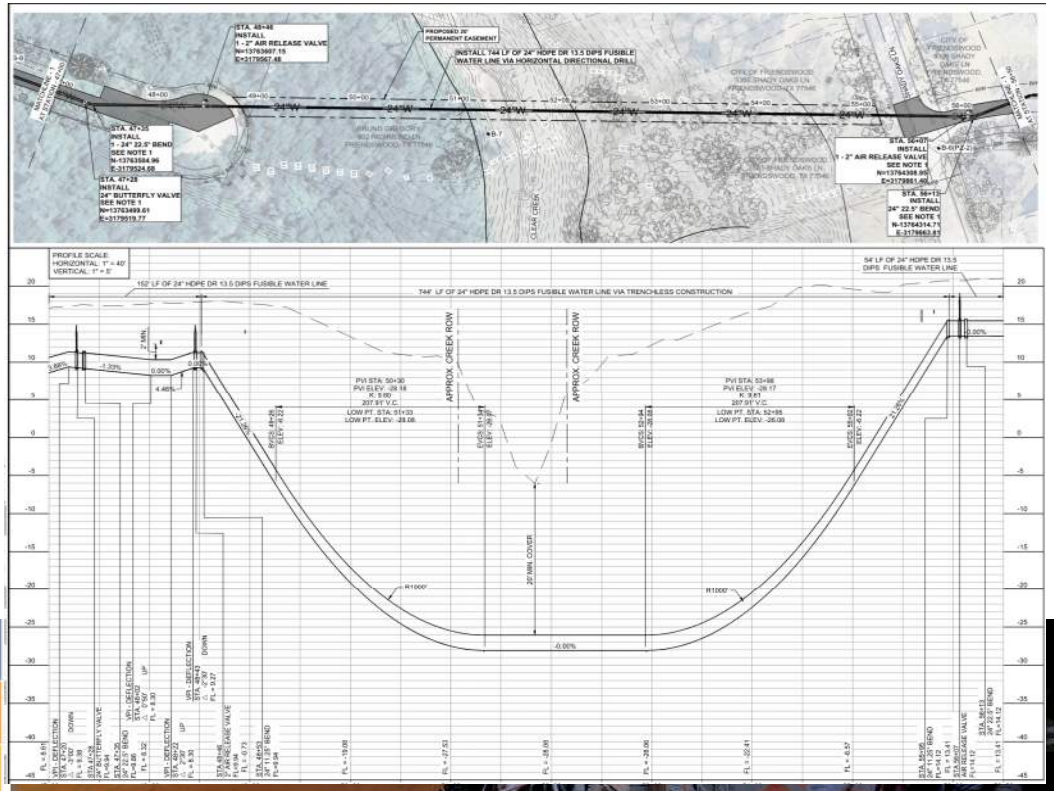
03.

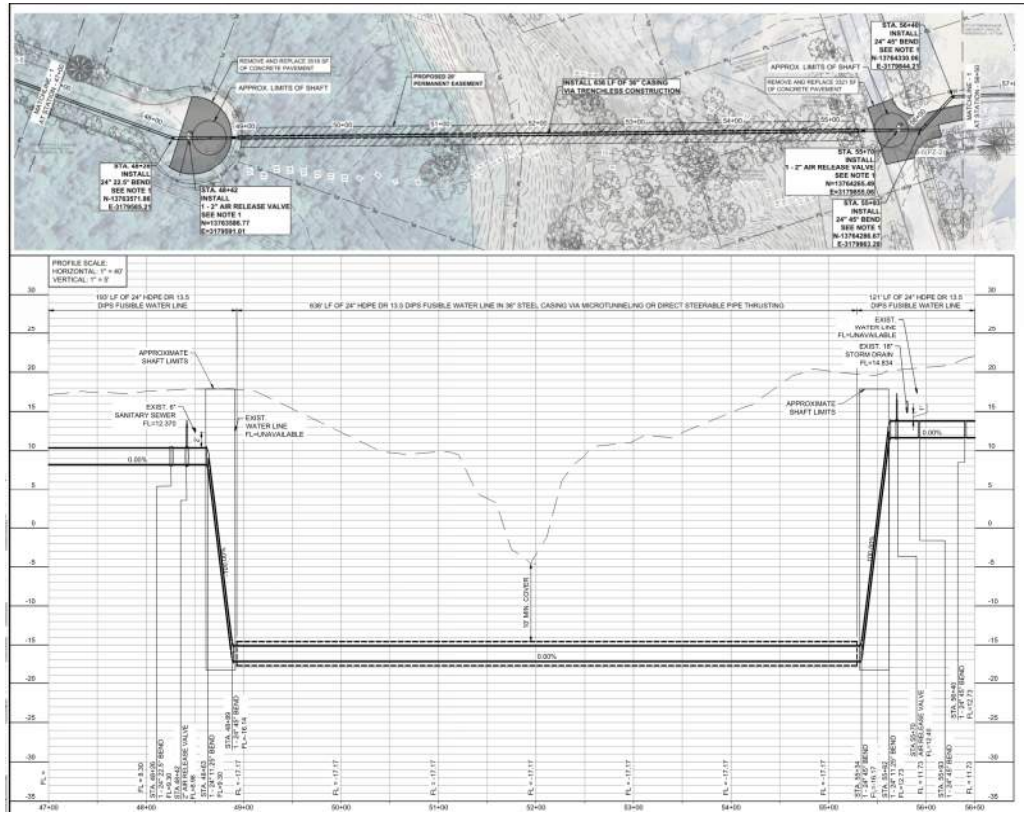
Permitting and Contractor Bid Strategy

The trenchless industry is moving away from prescriptive specifications with exact details and instruction to performance specifications with desired results that offer the contractor flexibility.

Our goal is to ensure the contractor is best set up for success in order to design, engineer, construct and maintain a project that provides the best value to our client.

Alternative *Schematics* for HDD & Microtunneling were included for bid.





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Engineering requirements were treated as a stand-alone line item and an allowance was included for additional footage.

UNIT PRICE BID FORM

Item No.	Specification No.	Description of Item w/Unit Bid Price Written in Words	Qty.	Unit	Unit Bid Price	Extended Amount
2	02280	24-inch HDPE (DR, 13.5 DIPS) Water Transmission Main Installed Via Horizontal Directional Drilling	804	LF		
	02280	Engineering requirements for trenchless crossing requirements via Horizontal Directional Drilling	1	LS		
	02280	Allowance for up to 500-feet additional length of Horizontal Directional Drill	1	LS		

Because of the contracting timing and permit uncertainty alternative methods were included at bid time.

Bid Alternative				
2A	02272	24" HDPE (DR, 13.5 DIPS) in greater than 36"Steel Casing Via Microtunneling including cost of casing pipe.	805	LF
	02272	Engineering requirements for trenchless crossing requirements via Microtunneling	1	LS
	02271	Horizontal Directional Drill Deduct	805	LF
@ _____				
2B	02272	24" HDPE (DR, 13.5 DIPS) in greater than 36" Steel Casing Via Direct Steerable Pipe Thrusting (DSPT) including cost of casing pipe.	805	LF
	02272	Engineering requirements for trenchless crossing requirements via Direct Steerable Pipe Thrusting (DSPT)	1	LS
	02271	Horizontal Directional Drill Deduct	805	LF

Alternative means and methods allow for flexibility in design, permitting and construction.

Lends towards current market conditions and equipment availability.

Achieves cost savings by having consistency in approach.

Allows for pivot during construction challenges.

Takes into account cost of pipe, lead times and availability.

Bid Results

				Contractor #1		Contractor #2		Contractor #3 (Low)		Average	
				UNIT	TOTAL	UNIT	TOTAL	UNIT	TOTAL	UNIT	UNIT
A	**BASE UNIT PRICES:**										
2	24-inch HDPE (DR, 13.5 DIPS) Water Transmission Main Installed Via Horizontal Directional Drilling	LF	$804	$750	$603,000	$1,184	$952,306	$560	**$450,240**	$831	$668,515
	Engineering requirements for trenchless crossing requirements via Horizontal Directional Drilling	LS	$1	$5,000	$5,000	$39,000	$39,000	$40,000	**$40,000**	$28,000	$28,000
	Allowance for up to 500-feet additional length of Horizontal Directional Drill	LS	$1	$40,000	$40,000	$165,780	$165,780	$145,000	**$145,000**	$116,927	$116,927
2A	24" HDPE (DR, 13.5 DIPS) in greater than 36"Steel Casing Via Microtunneling including cost of casing pipe.	LF	$805	$3,400	$2,737,000	$5,004	$4,028,389	$4,800	$3,864,000	$4,401	$3,543,130
	Engineering requirements for trenchless crossing requirements via Microtunneling	LS	$1	$20,000	$20,000	$37,645	$37,645	$34,000	$34,000	$30,548	$30,548
	Horizontal Directional Drill Deduct	LF	$805	-$583	-$469,315	-$1,201	-$966,966	-$560	-$450,800	-$781	-$629,027
2B	24" HDPE (DR, 13.5 DIPS) in greater than 36" Steel Casing Via Direct Steerable Pipe Thrusting (DSPT) including cost of casing pipe.	LF	$805	$4,000	$3,220,000	$1,184	$953,490	$9,000	$7,245,000	$4,728	$3,806,163
	Engineering requirements for trenchless crossing requirements via Direct Steerable Pipe Thrusting (DSPT)	LS	$1	$20,000	$20,000	$39,000	$39,000	$58,000	$58,000	$39,000	$39,000
	Horizontal Directional Drill Deduct	LF	$805	-$583	-$469,315	-$1,201	-$966,966	-$560	-$450,800	-$781	-$629,027

Contract was awarded for $4,401,136.53 in time to meet the federally fund award December 31, 2024, deadline.

Cost of 800’ HDD @ 750/ft
Cost of 4,800’ Open @ 490/ft
HDD ~50% More Per LF

GARVER

12141 Wickchester Lane
Suite 200
Houston, TX 77079

TEL 713.491.8333
FAX 713.395.5486

www.GarverUSA.com

November 15, 2024

Mr. Jildardo Arias, P.E.
Director of Engineering
City of Friendswood
940 S. Friendswood Drive
Friendswood, TX 77546

Re: New Ground Storage Tank at Surface Water Plant #1 Project
Friendswood Project # 2024-12
Recommendation of Award

Dear Mr. Arias:

Bids were received and opened for the subject project at the City of Friendswood, Texas at 2:00 PM on Thursday, October 31, 2024. A total of three proposals were received on the project. The proposals have been checked for accuracy and for compliance with the contract documents. The submitter IECON, Inc. was missing the System for Award Management registration and we were unable to verify an active registration online. Since this is a federally funded project and the project must be awarded soon to meet the December 31, 2024 deadline, Garver recommends disqualifying IECON, Inc. A tabulation of the proposals received is enclosed with this letter. No tabulation errors were observed by the bidders.

The proposal submitted by IECON, Inc. was the apparent low bidder but was disqualified due to an incomplete submittal. The second low bidder, Servox, LLC, has experience in the surrounding area. We recommend the construction contract for the subject project to be awarded to Servox, LLC for a Base Bid amount of $4,401,136.53.

Please call me if you have any questions.

Sincerely,

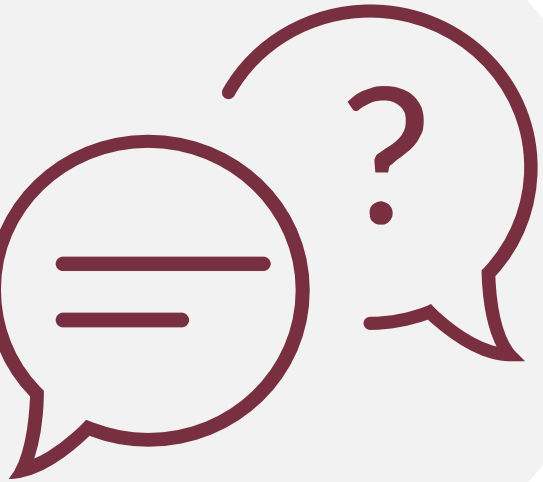
GARVER

Wade P. Parks, P.E.
Senior Project Manager

Attachments: Proposal Review and Bid Tabulation

Copies: Jildardo Arias (City of Friendswood)
Steve Vavrecka (City of Friendswood)

Clear Creek crossing is a tricky but executable crossing.



- Consider working out the license agreement and coordination steps prior to bidding
- The longer the project goes, the more time there is for site conditions to change
- Regularly communicate and perform site visits throughout the lifecycle

QUESTIONS?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