How Low Can You Go?

Alternative Inverted Siphon Construction Method Reduces Overall Construction Costs by Nearly $1M

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Introductions

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Project Manager

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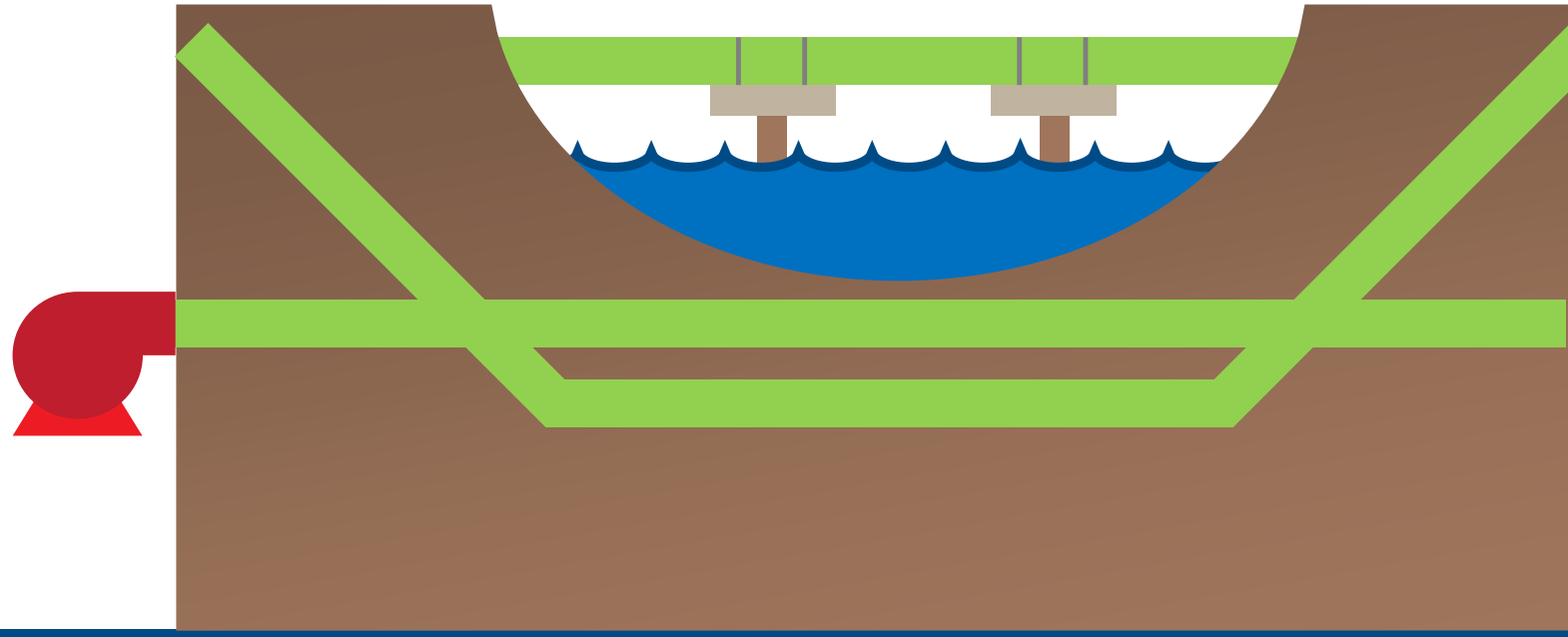
Project Engineer

Garver was contracted to design and construct the replacement of an existing aerial creek crossing

Force Main

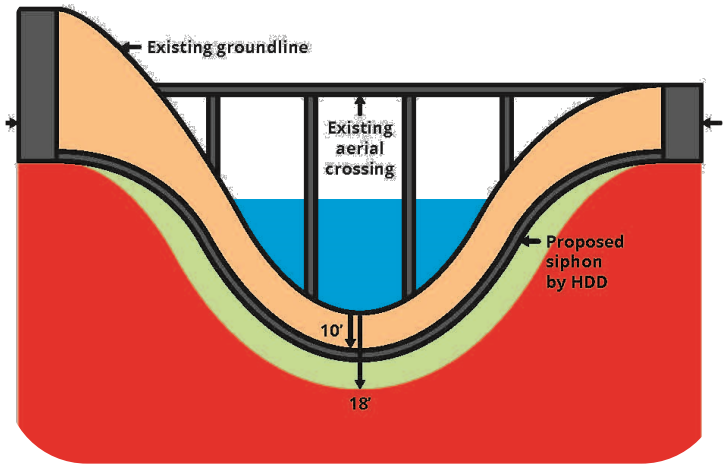
There are only
so many ways
to cross a creek



Each of these options bring challenges

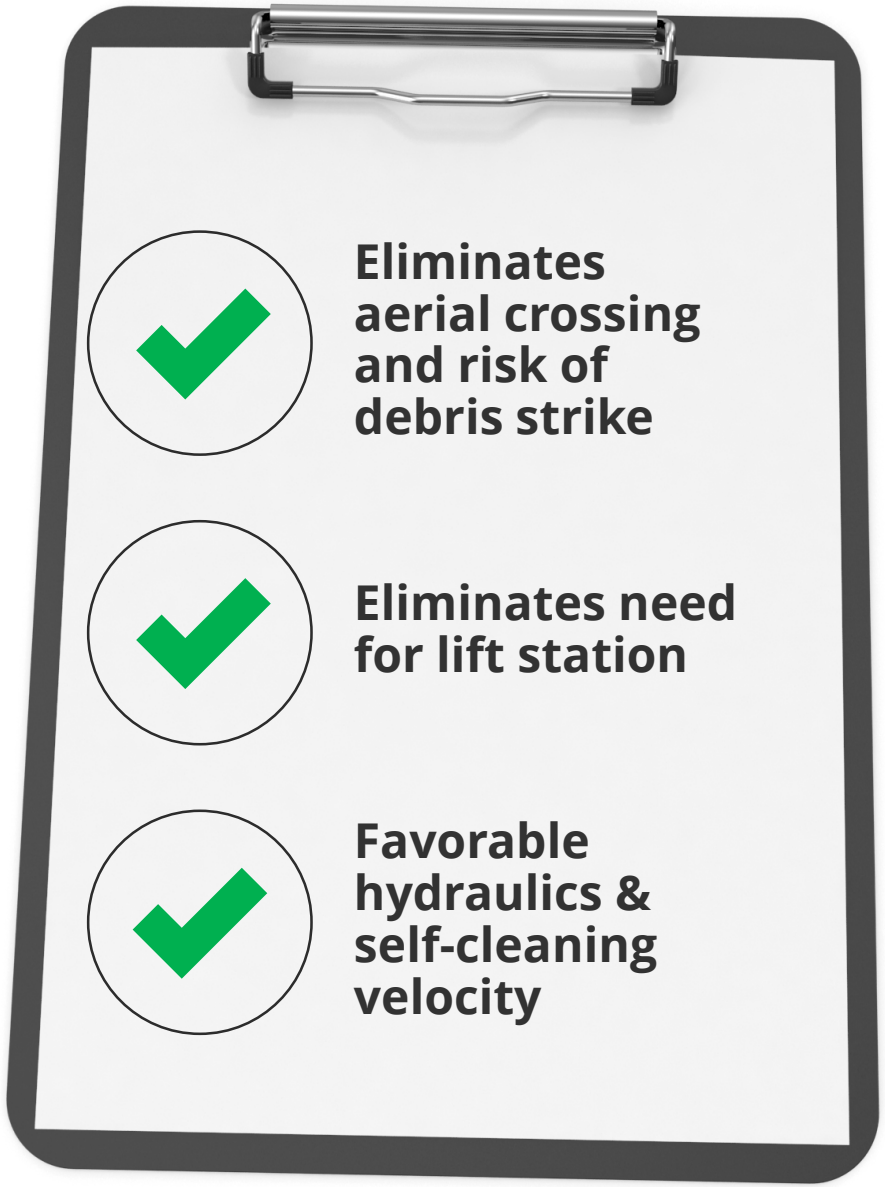
Aerial crossings risk debris hitting piers

Force mains require additional costs and maintenance



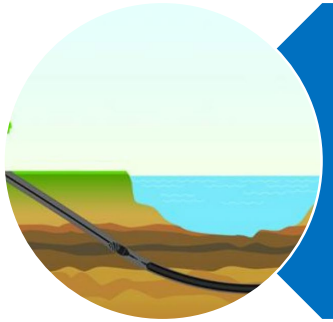
Siphons require sediment cleaning

Inverted siphon was chosen as the most favorable alternative



Creative project bidding addressed a $1M budget deficit constructing this inverted siphon

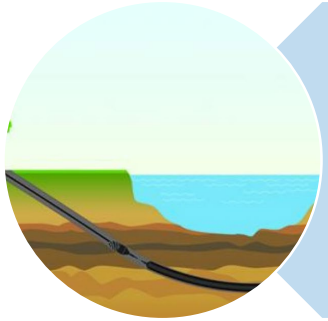
Jack and bore construction constraints



Exploring alternative construction methods

Path forward

Jack and bore construction constraints



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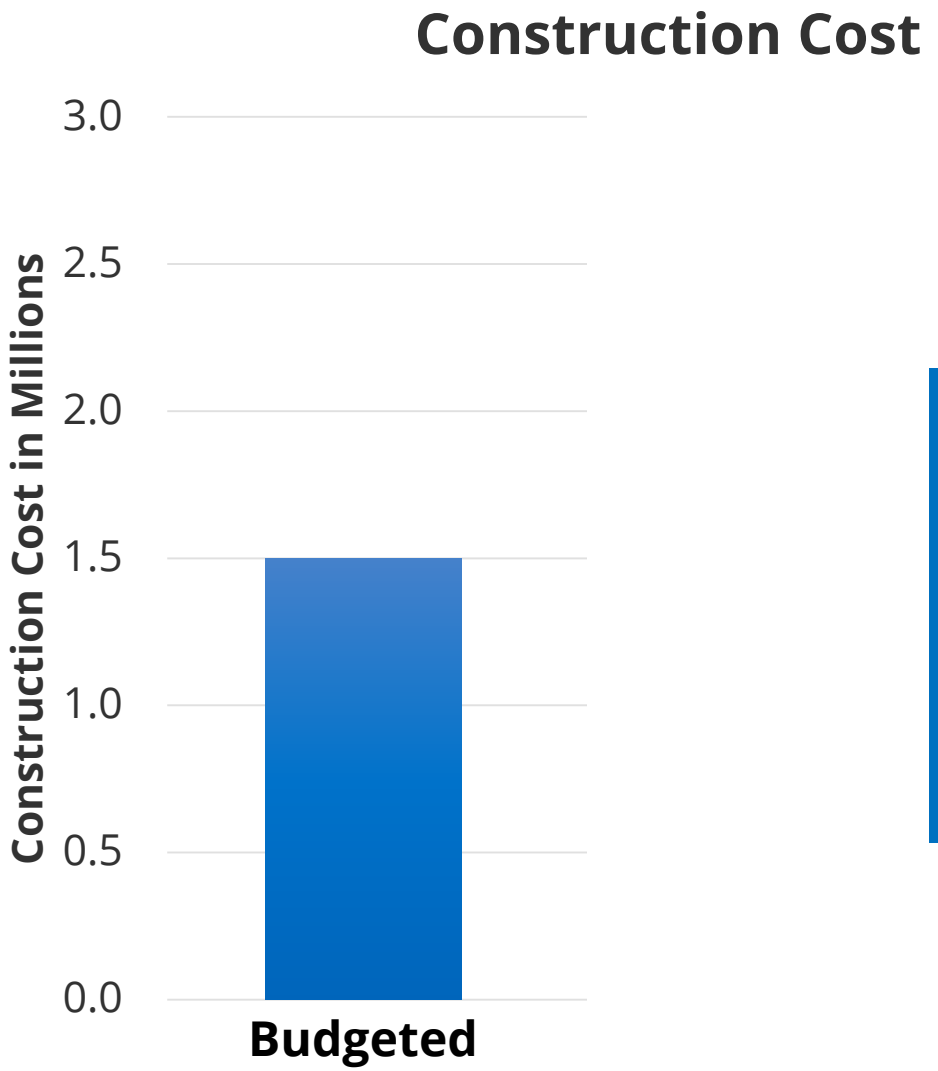
Path forward

Jack and bore is the traditional installation method for inverted siphons

Costs for constructing the inverted siphon came back greater than expected



Alternative construction methods are needed

Installation by jack and bore requires …

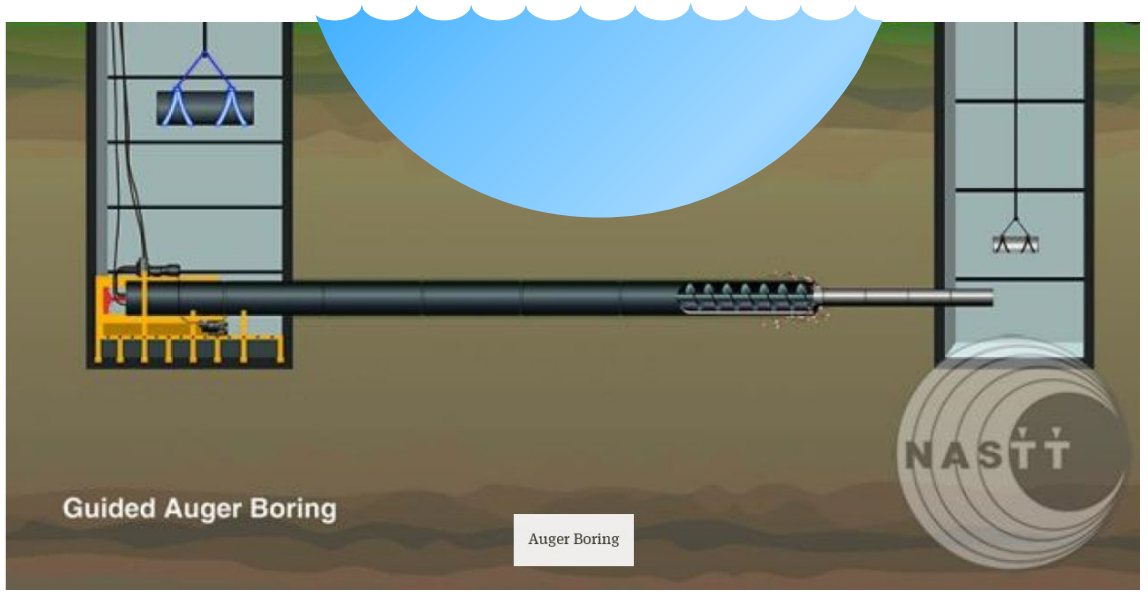
Engineered bore pits

Steel casing

Cathodic protection (utility dependent)

The depth of the bore pits can affect overall construction cost

- Excavate and shore a deep pit to maintain safety
- Space constraints make it difficult to construct
- Groundwater management

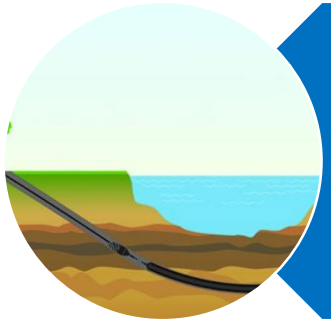


*NASTT

Steel casings and cathodic protection provide little benefit for the additional cost

The need to reduce estimated costs prompted alternative construction evaluations

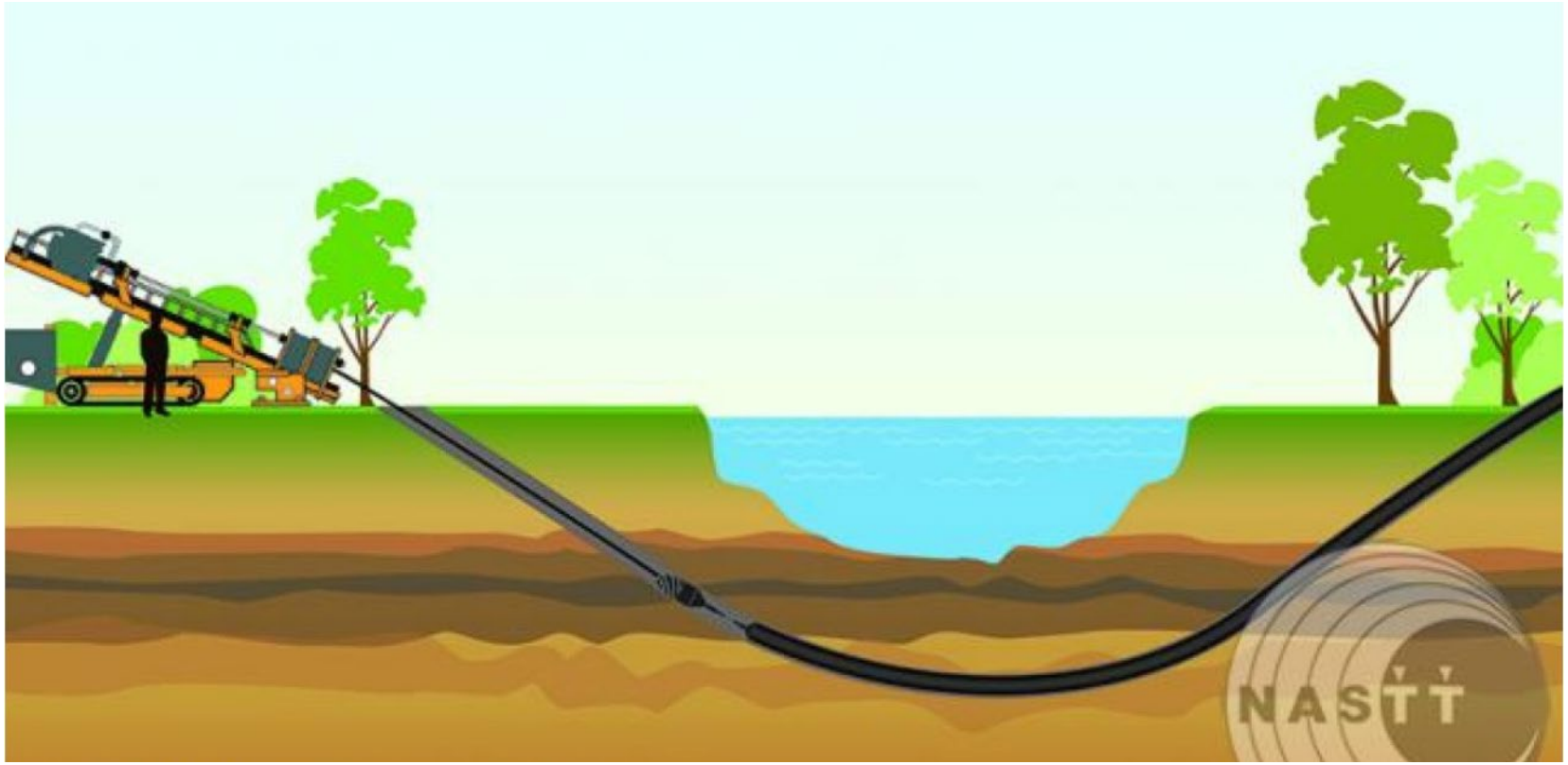
Jack and bore construction constraints



Exploring alternative construction methods

Path forward

Horizontal Directional Drilling (HDD) is a reliable construction method in many situations



*NASTT

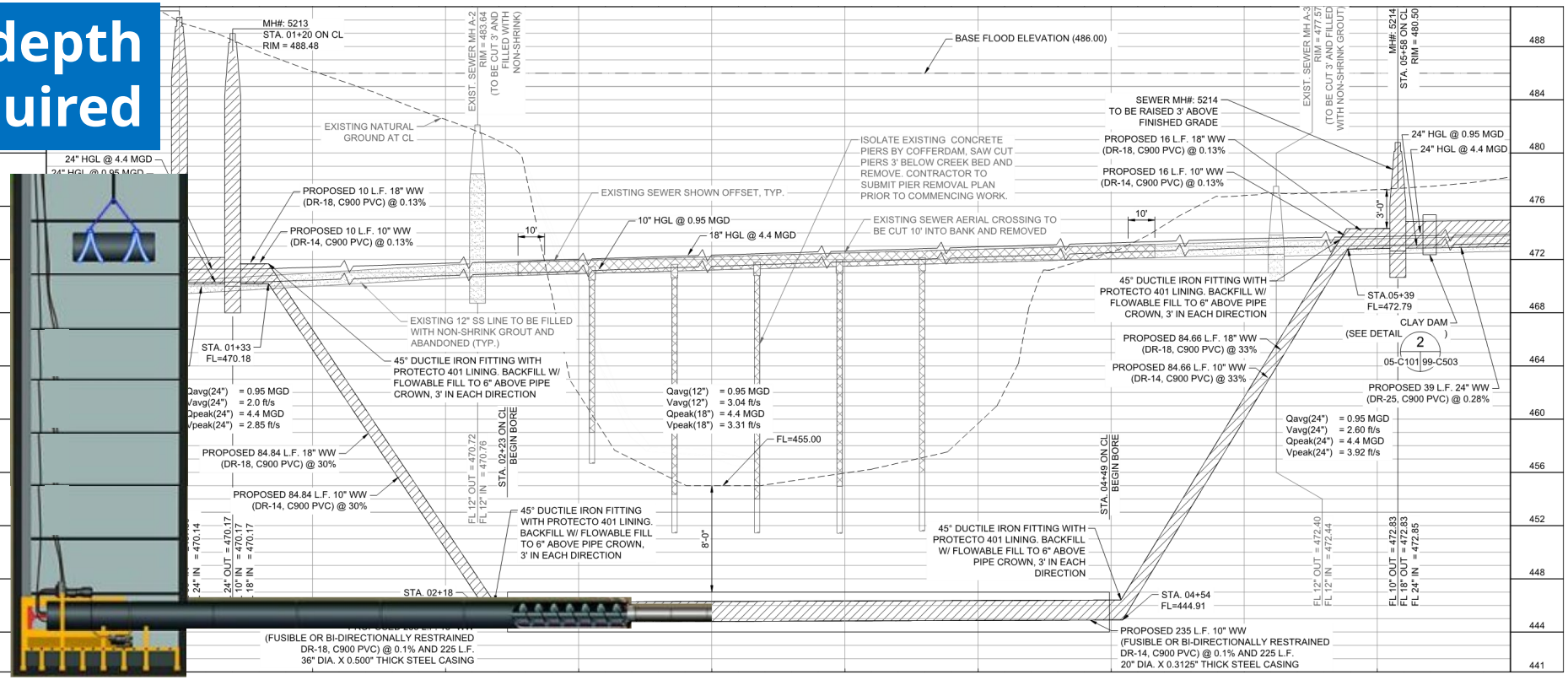
However, HDD is not typically used for constructing gravity sewer pipeline

+/- 4-inches flowline constraints

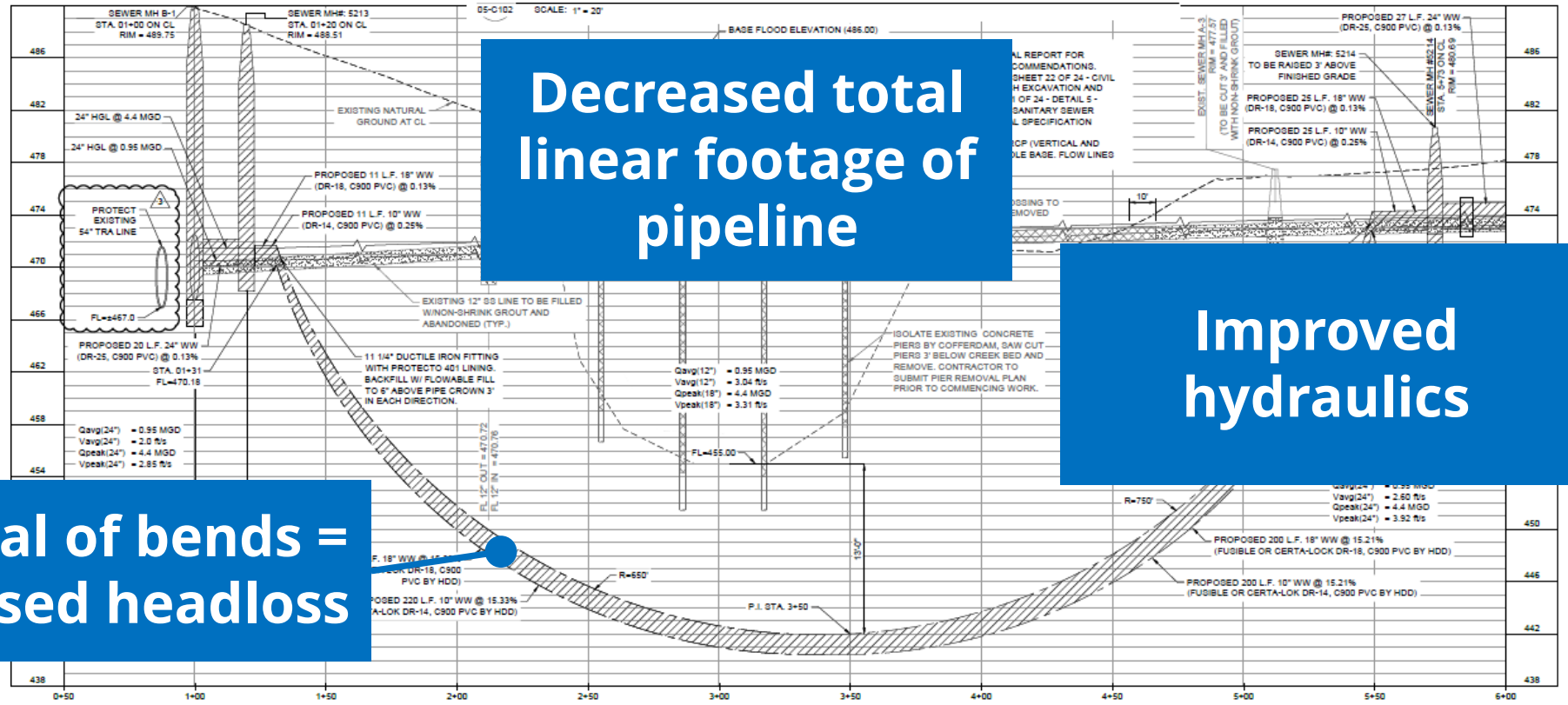
3 feet horizontal accuracy

An initial evaluation of HDD installation appeared to provide multiple benefits

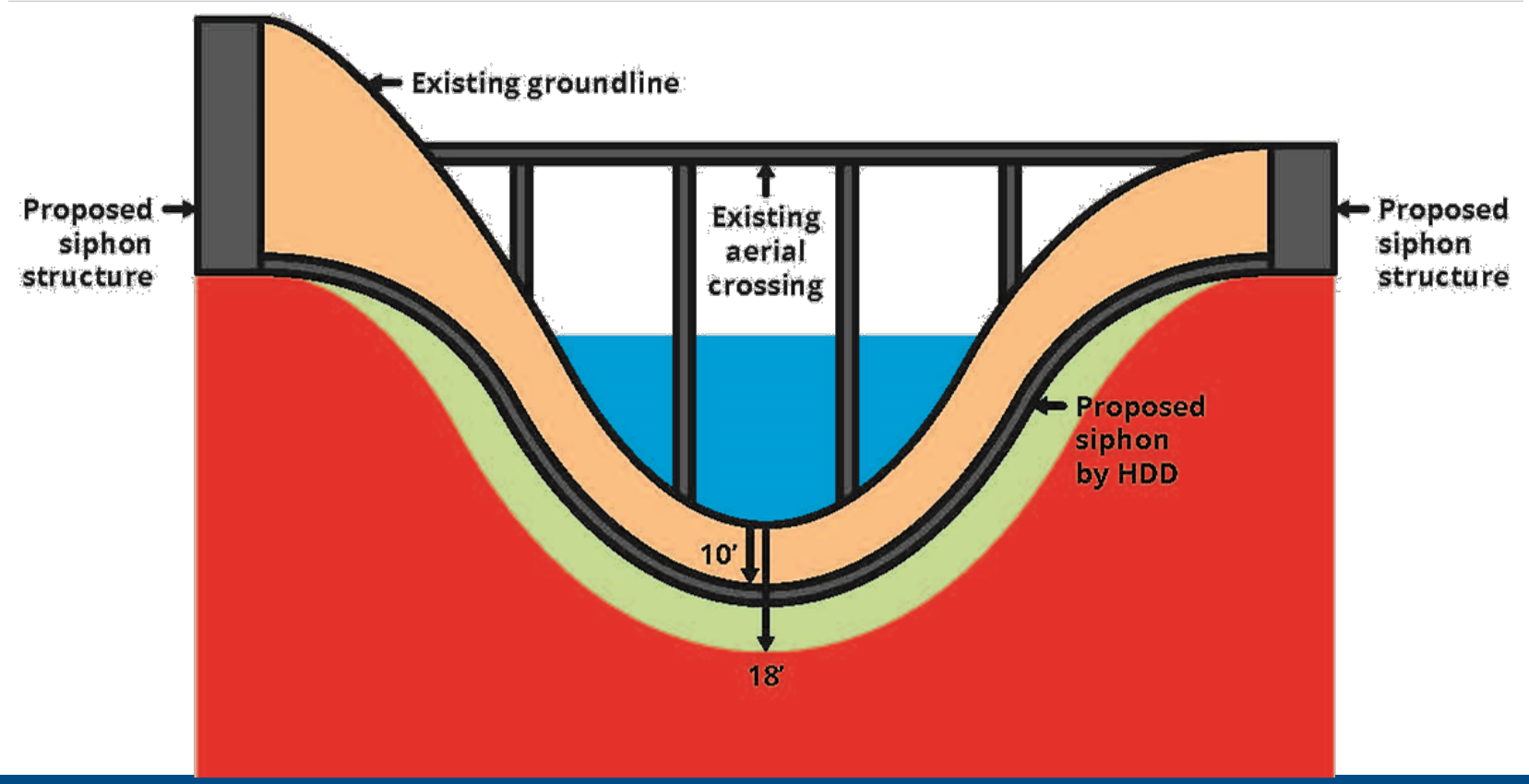
50-foot depth required



An initial evaluation of HDD installation appeared to provide multiple benefits



Flexibility on vertical location allowed for increased confidence



Jack & Bore bid

40	33 34 16	220	LF	Furnish & Install 18" C900 PVC Pipe (DR-18) By Open Cut	$ 144.00	$ 31,680.00
41	33 34 16	170	LF	Furnish & Install 10" C900 PVC Pipe (DR-14) Carrier Pipe in Steel Casing (Restrained Joint)	$ 93.00	$ 15,810.00
42	33 34 16	170	LF	Furnish & Install 18" C900 PVC Pipe (DR-18) Carrier Pipe in Steel Casing (Restrained Joint)	$ 140.00	$ 23,800.00
43	33 05 23.16	160	LF	Furnish & Install 20" Steel Casing by Bore	$ 542.00	$ 86,720.00
44	33 05 23.16	160	LF	Furnish & Install 36" Steel Casing by Bore	$ 837.00	$ 133,920.00
45	13 47 13	1	LS	Cathodic Protection for 20" Steel Casing	$ 9,248.00	$ 9,248.00
46	13 47 13	1	LS	Cathodic Protection for 36" Steel Casing	$ 9,248.00	$ 9,248.00
47	31 23 23.33	25	CY	Flowable Fill	$ 143.00	$ 3,575.00
					Total Base Bid	**$ 1,545,723.34**

Both construction methods were bid as true alternatives

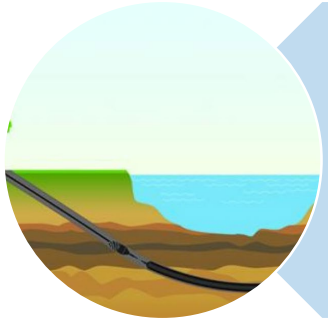
HDD alternative

True Bid Alternate: A

Item No.	Tech. Spec./Dwg.	Est. Qty	Unit	Unit Description	Unit Price Bid	Amount Bid
A.1	31 05 23.13/Plan Sheet 05-C102	420	LF	Furnish & Install 10" C900 PVC Pipe (DR-14) by HDD (Restrained Joint)	$ 270.00	$ 113,400.00
A.2	31 05 23.13/Plan Sheet 05-C102	420	LF	Furnish & Install 18" C900 PVC Pipe (DR-18) by HDD (Restrained Joint)	$ 480.00	$ 201,600.00
A.3	33 41 20/Plan Sheet 05-C102	36	LF	Furnish & Install 10" C900 PVC Pipe (DR-14) by Open Cut (Restrained Joint)	$ 230.00	$ 8,280.00
A.4	33 41 20/Plan Sheet 05-C102	36	LF	Furnish & Install 18" C900 PVC Pipe (DR-18) by Open Cut (Restrained Joint)	$ 240.00	$ 8,640.00
A.5	31 23 23.33	13	CY	Flowable Fill	$ 143.00	$ 1,859.00
		(220)	LF	Furnish & Install 10" C900 PVC Pipe (DR-14) By Open Cut (Restrained Joint)	$ 122.00	$ (26,840.00)
		(220)	LF	Furnish & Install 18" C900 PVC Pipe (DR-18) By Open Cut (Restrained Joint)	$ 144.00	$ (31,680.00)
		(170)	2	Furnish & Install 10" C900 PVC Pipe (DR-14) Carrier Pipe in Steel Casing (Restrained Joint)	$ 93.00	$ (15,810.00)
		(170)	LF	Furnish & Install 18" C900 PVC Pipe (DR-18) Carrier Pipe in Steel Casing (Restrained Joint)	$ 140.00	$ (23,800.00)
		(160)	LF	Furnish & Install 20" Steel Casing by Bore	$ 542.00	$ (86,720.00)
44	33 05 23.16	(160)	LF	Furnish & Install 36" Steel Casing by Bore	$ 837.00	$ (133,920.00)
45	13 47 13	(1)	LS	Cathodic Protection for 20" Steel Casing	$ 9,248.00	$ (9,248.00)
46	13 47 13	(1)	LS	Cathodic Protection for 36" Steel Casing	$ 9,248.00	$ (9,248.00)
47	31 23 23.33	(25)	CY	Flowable Fill	$ 143.00	$ (3,575.00)
					Total Bid Alternate A	**$ (7,062.00)**

Bidding HDD addressed the $1M deficit

Jack and bore construction constraints



Exploring alternative construction methods

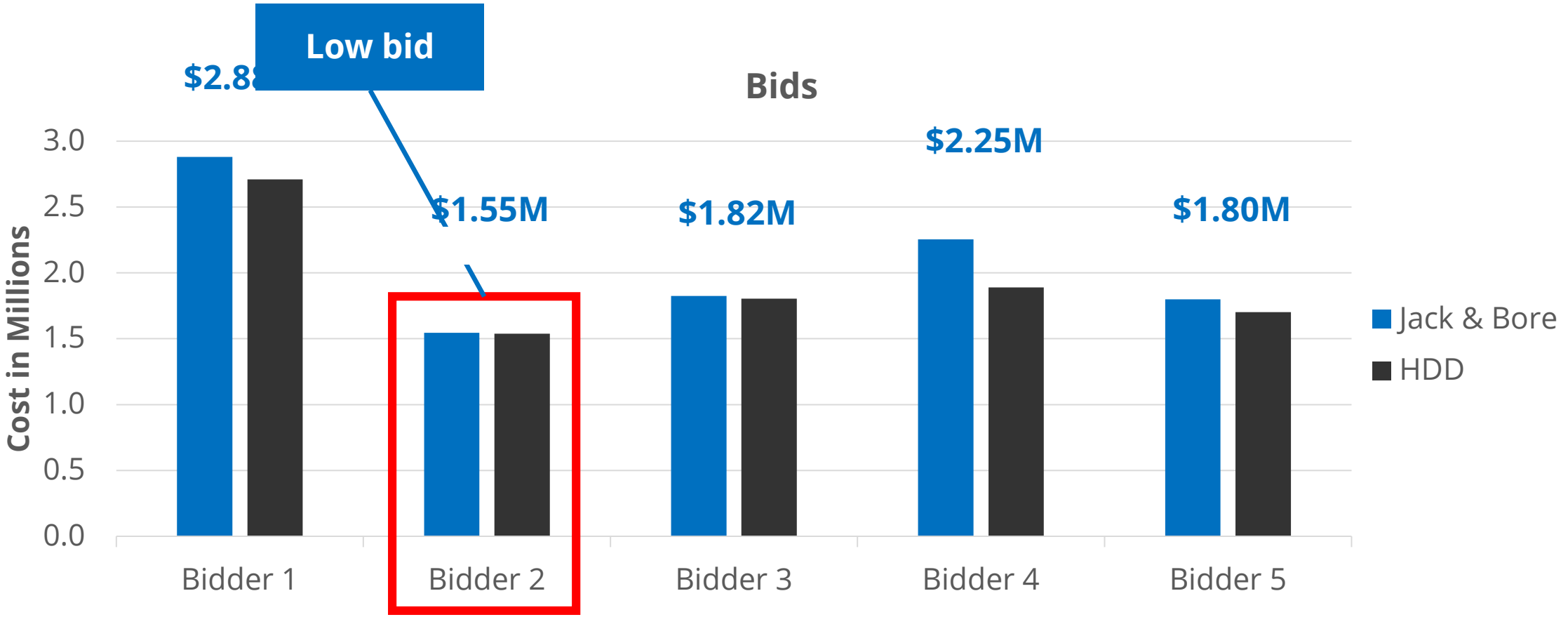
Path forward

The inclusion of multiple construction alternatives increased bid submittals and cost competition

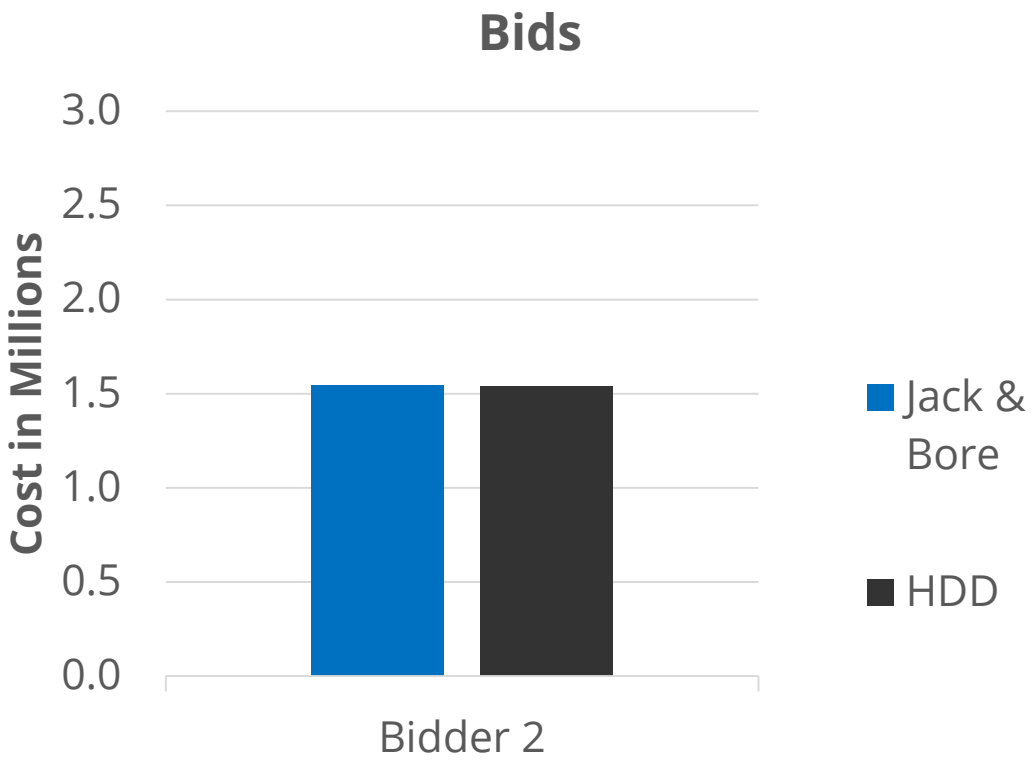
As bidders increased

Construction cost decreased

HDD was the lowest bid from each bidder



Cost difference in our low bid did not offset potential risks of HDD installation



Incorrect installation requires repeat drilling

Gravity sewer has small margin for error

While HDD contributed to covering the project's $1M deficit, the client moved forward with Jack & Bore

In conclusion, HDD is a viable and affordable inverted siphon installation method to reduce construction costs

Questions?

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