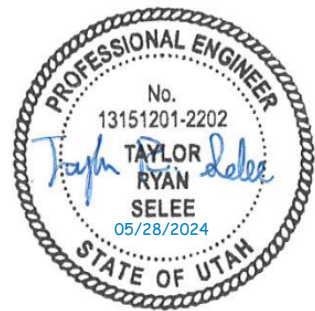


SPANISH FORK CITY

TRANSMISSION LINE FEASIBILITY STUDY

May 28, 2024

Project #: 2308-011



Prepared by:



www.jonesanddemille.com
1.800.748.5275

TABLE OF CONTENTS

1.	Executive Summary	1
2.	Background	1
3.	Definitions.....	1
4.	Existing System.....	2
4.1.	Existing Pressures	2
5.	Alternatives.....	2
5.1.	Alternative 1 – Fairway Drive Alignment	3
5.2.	Alternative 2 – Irrigation Pipe Easement Alignment	4
5.3.	Preferred Alternative.....	5
6.	Conclusion and Recommendations	6
	Appendix A. Exhibits.....	A-1
	Appendix B. Cost Estimates	B-1
	Appendix C. Calculations	C-1

FIGURES

Figure 1 - Peak Hour Pressures.....5

TABLES

NO TABLE OF FIGURES ENTRIES FOUND.

1. EXECUTIVE SUMMARY

Spanish Fork City has interest in replacing a failing existing drinking water transmission line along Spanish Oaks Dr that supplies water to the water tank and residents in that area and customers further west along Powerhouse Road. The primary purposes are to replace the aging pipe, mitigate the risk of a dangerous break on the line, and improve the efficiency of pumping now or in the future. This study analyzed several possible solutions through water modeling and high-level cost estimates.

2. BACKGROUND

Spanish Fork City currently utilizes the Darger Springs Pumphouse booster pump station near the golf course clubhouse on Powerhouse Road to pump water up to a culinary water tank near Spanish Oaks Reservoir on Spanish Oaks Drive. From the tank the water is delivered through four pressure reducing valves (PRVs) to supply water to homes along Spanish Oaks Drive and Fairway Drive. The flow from the tank continues down Spanish Oaks Drive to feed homes further west on Powerhouse Road. The transmission line that conveys the water from the pump station to the culinary tank is a 10-inch ductile iron pipe (DIP). When the pump is not running it can also reverse flow to supply water to the PRVs from the culinary tank.

The service area of this transmission line and tank are growing in the neighborhoods near Spanish Oaks Drive and Fairway Drive as well as further west on Powerhouse Road. In recent years, the transmission line has had several breaks which have required emergency repairs. The existing transmission line climbs a steep hill behind houses on Fairway Drive and uses an aerial crossing over the Strawberry Water Users Association (SWUA) canal part way up that hill to reach Spanish Oaks Drive. Strawberry Water Users Association has begun plans to enclose their existing canal.

Spanish Fork City desires to replace the pipe in the transmission line, mitigate the risk of a dangerous break on the line, and improve the efficiency of pumping now or in the future while reducing the impact of shutdowns on existing residents. To meet these desires this feasibility study has been conducted to look at multiple alternatives and select the best approach.

3. DEFINITIONS

PRV	pressure reducing valve	DIP	ductile iron pipe
HDPE	high-density polyethylene	psi	pounds per square inch
EPA	Environmental Protection Agency	gpm	gallons per minute
SWUA	Strawberry Water Users Association		

4. EXISTING SYSTEM

The alignment of the culinary water transmission line is southwest down Powerhouse Road, then south on Fairway Drive where the 1st PRV is encountered. The transmission line turns southwest again going up a steep hill and over the Strawberry Water Users canal in an aerial crossing and continues up the hill until it reaches the cul-de-sac of Oak Crest Circle. Oak Crest Circle contains one PRV that supplies water to the Spanish Oaks Drive neighborhood. Nearby, in the intersection of Spanish Oaks Drive and Oak Crest Circle, is a PRV that supplies water for a line that continues northwest on Spanish Oaks Drive until reconnecting with Powerhouse Road and supplying water to several homes continuing west. The transmission line continues south on Spanish Oaks Drive and encounters one more PRV south of the existing neighborhood until it terminates at the culinary water tank west of the Spanish Oaks Reservoir.

4.1. EXISTING PRESSURES

The booster pumps receive pressures as high as 128 psi and boosts pressures as high as 262 psi. The PRV on Fairway Drive receives pressures as high as 220 psi and reduces to a pressure of 73 psi. Homes on that street receive pressures between 53 psi and 78 psi with very limited fluctuation at any specific location on the street. The PRV in Oak Crest Circle receives pressures as high as 172 psi and reduces to a pressure of 108 psi. The service area of this PRV extends up the hill significantly resulting in pressures as low as 51 psi and as high as 108 psi delivered to homes. The PRV that feeds back to Powerhouse Road receives pressures as high as 173 psi and reduces to a pressure of 30 psi. The first customer on that line receives water at about 83 psi. The PRV on Spanish Oaks Drive south of the existing homes receives pressures as high as 107 psi and reduces to a pressure of 75 psi. Homes in the service area of this PRV receive pressures as low as 53 psi and as high as 123 psi with limited variability at any specific location.

5. ALTERNATIVES

Multiple alternative alignments were identified which included looking at options to relocate the existing booster pump station. A couple of the initial alignments considered included moving the booster station to a city owned property on Fairway Drive (Parcel 48:409:0018) with the intent to feed the homes lower on a gravity system and potentially eliminate a PRV. The modeling for this initial concept showed that the homes on Fairway Drive before the booster station would experience pressure swings of more than 20 psi when the relocated booster station would turn on and off. That option was determined to be untenable.

Spanish Fork City provided their existing culinary water model for their complete system, which is maintained by Hansen, Allen and Luce Inc. Using EPA Net, 12 different scenarios were modeled. After reviewing multiple model results from various scenarios with the City, two alternatives were identified as the most feasible and described in further detail in the following subsections. Both alternative alignments removed the need for the aerial crossing of the canal and identified potential locations for the booster pump relocation.

5.1. ALTERNATIVE 1 – FAIRWAY DRIVE ALIGNMENT

Alternative 1 would use Fairway Drive as the primary alignment of the transmission line. The 10" ductile iron pipe transmission line would continue from the intersection of Powerhouse Road and Fairway Drive southeast along Fairway Drive and follow the curve of the road to the intersection with Eagle Drive, see Appendix A. The transmission line would then follow Eagle Drive and the proposed future alignment of Eagle Drive until reaching Spanish Oaks Drive south of the existing homes where it would connect to the existing transmission line.

The proposed location of the booster pump relocation for Alternative 1 would be approximately 2476 South Fairway Drive, south of the last house on the west of Fairway Drive and before the bridge over the canal on Spanish Fork City Property. Relocating the booster pump with this alternative does not provide significant benefit; the system would continue to operate in the Spanish Oaks area as it historically has. If approximately 1,500 feet of transmission line were to be installed on Powerhouse Road, it would allow customers on Powerhouse Road to be fed by gravity rather than be fed by the booster pump. However, that was not considered in this alternative since it is more cost effective to do it in Alternative 2 discussed later.

Alternative 1's alignment allows for the abandonment of the existing aerial crossing and the existing pipe traversing the steep grade behind homes; however, the existing transmission line in Spanish Oaks Drive will need to remain in order to supply water to the homes further west on Powerhouse Drive. If the additional 1,500 feet of transmission line mentioned above were to be installed in Powerhouse Road, it would allow for the abandonment of the existing transmission line in Spanish Oaks Drive. The extra room in Spanish Oaks Drive would also provide room for replacing the distribution line.

With alternative 1, all of the affected customers will receive culinary water at similar operating pressures to what they currently receive and fire flows of 1,500 gpm for two hours during peak water usage times can continue to be provided.

The majority of this alignment is in existing residential roads. This would cause more disruption to the homeowners and would require installation of DIP rather than HDPE to reduce the length of exposed trench at any given time. This alternative also would result in more utility conflicts. The alignment provides the advantage of less traffic impact because lower functional classification roads would be disturbed. Alternative 1 will also require more asphalt trench repairs.

The Utah County Hazards Map identifies a fault line paralleling Powerhouse Road on the southeast side. It is recommended that all DIP within the identified fault rupture zone be additionally restrained with TR-Flex piping equivalent, which have had success in handling earthquake loads. Specialized flexible expansion joints such as FLEX-TEND Force Balanced Flexible Expansion Joints could be used for an increased price.

The PRV in Oak Crest Circle would be abandoned and two new PRVs would need to be installed. One in Spanish Oaks Drive and one in Eagle Drive. These would maintain the pressures that the existing customers currently receive. The estimated cost of Alternative 1 is \$1,598,300.00.

5.2. ALTERNATIVE 2 – IRRIGATION PIPE EASEMENT ALIGNMENT

Alternative 2 is to use Powerhouse Road and an existing Pressurized Irrigation Pipe Easement as the alignment for the transmission line, see Appendix A. Due to high pressures, the pipe material will be HDPE with a standard dimensional ratio of DR-9 until the highest modeled pressure is less than 125 psi where the pipe will transition to a DR-17. The transmission line will connect at the intersection of Fairway Drive and Powerhouse Road as a 16" DR-9 and continue southwest along Powerhouse Road. The line will need to loop under two existing culverts for the Strawberry Water Users Association Power Plant in Powerhouse Road and continue southwest down the road until the intersection with Spanish Oaks Drive. An existing pressure irrigation easement exists at the intersection, the transmission line will turn southeast within the existing pressurized irrigation easement and go up the hill as a 12" DR-9 until it reaches a maximum internal pressure of 125 psi where it will transition to a 10" DR-17 and continue to Spanish Oaks Drive and connect with the existing transmission line. The transmission line will need to loop under the SWUA canal within the existing utility pipe easement.

Where the pipeline transitions from 16" HDPE to 12" HDPE, it also crosses a fault line. The Utah County Hazards Map identifies a fault line paralleling Powerhouse Road on the southeast side. Fused HDPE pipelines have experienced success in handling earthquake loads.

The pump station does not need to be moved from its current location, however, as the land continues to develop west of this location there could be some advantages to moving the booster directly southeast of the intersection of Powerhouse Road and Spanish Oaks Drive on SWUA property.

Relocating the booster station to the recommended location would provide the opportunity to supply water to Powerhouse Road without the use of a booster pump, which would reduce the demand on the booster pump and increase the overall system efficiency. The relocation can happen with the transmission line extension or later when there is increased demand on Powerhouse Road.

With alternative 2, all of the affected customers will receive culinary water at similar operating pressures to what they currently receive and fire flows of 1,500 gpm for two hours during peak water usage times can continue to be provided. Comparative pressures from the model are shown in Figure 1 - Peak Hour Pressures. By moving the transmission line with the existing pressure irrigation easement, the old transmission line can be abandoned without having to adjust or relocate the existing booster station with existing or build out conditions. The extra room in Spanish Oaks Drive will also provide room for replacing the distribution line.

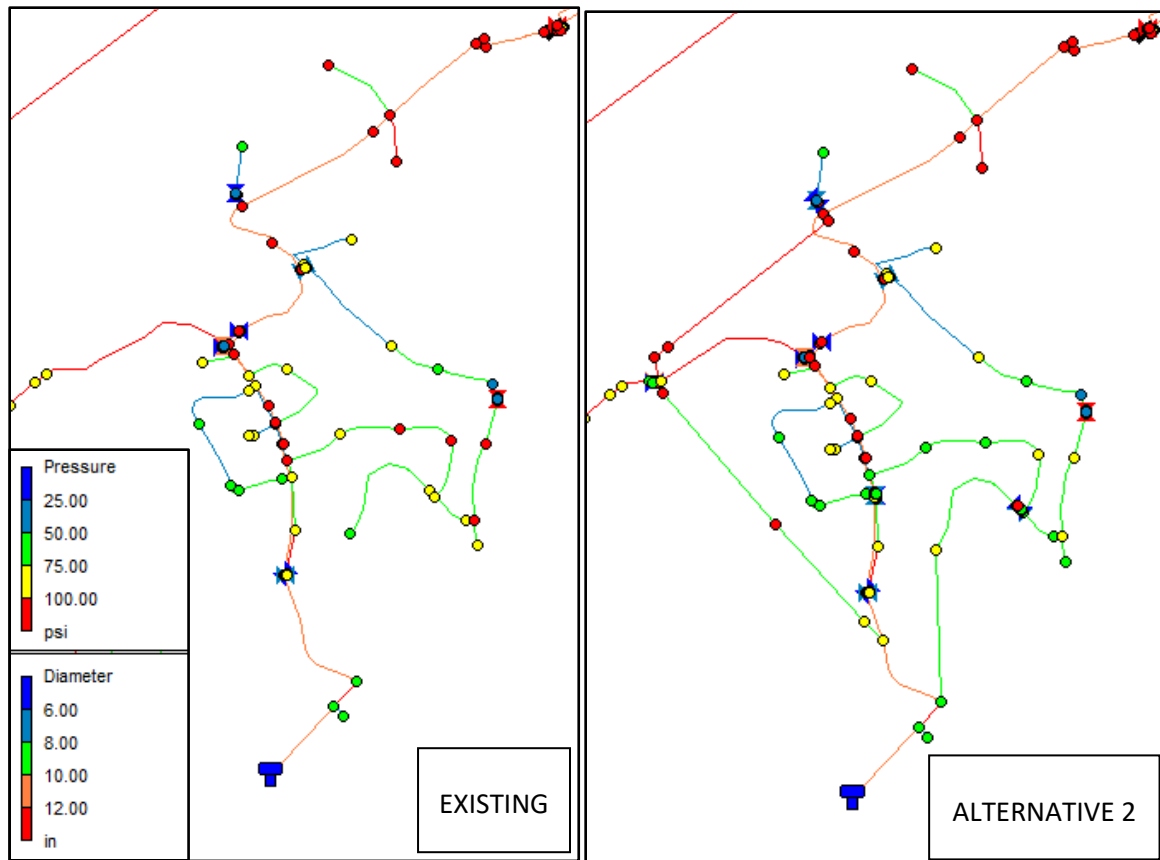


Figure 1 - Peak Hour Pressures

The new alignment will traverse up a hill with significantly less grade than the current transmission line alignment, and the need for an aerial crossing is removed. There is also the advantage of putting the transmission line in an alignment with less existing utilities and within an existing easement. This would allow for HDPE pipe to be used and reduce the cost of the pipe installation. Alternative 2 can be installed while keeping the existing transmission line and distribution lines operational, thus minimizing the water shutoffs to customers.

The disadvantages to Alternative 2 are that three SWUA structures will need to be crossed. These will require some form of boring or horizontal directional drilling, which will add to the cost. The section of Powerhouse Road that the alignment parallels is currently a narrow two-lane road and any impacts to traffic would be significant; however, the majority of construction along Powerhouse Road should be able to be contained to the shoulder. The estimated cost of Alternative 2 is \$1,669,800.00. Alternatively, 12" and 10" DIP could be used rather than HDPE for an estimated cost of \$1,869,300.00.

5.3. PREFERRED ALTERNATIVE

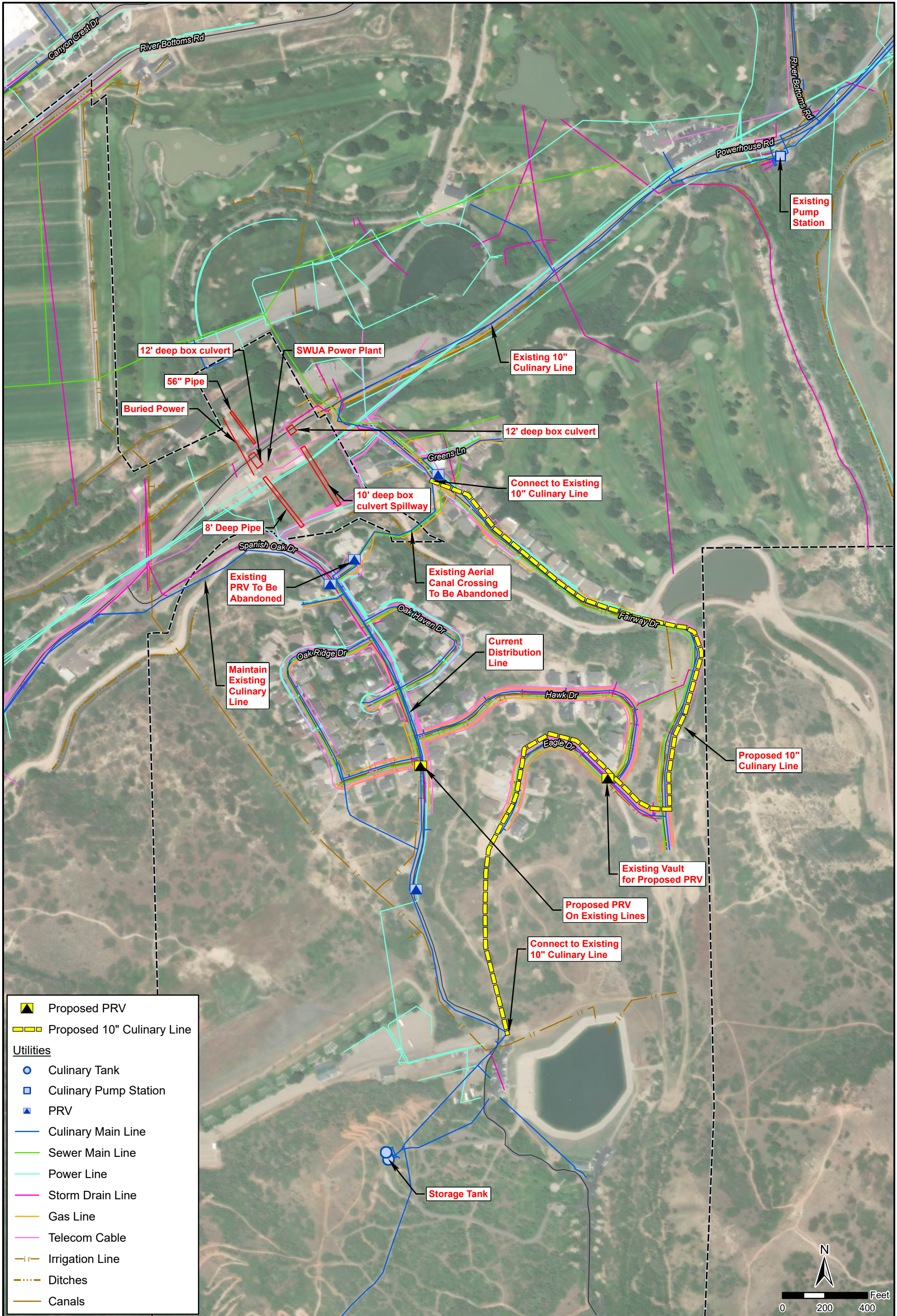
After presenting these alternatives with the City and weighing the advantages and disadvantages it was decided that Alternative 2 with HDPE is the preferred alternative. Alternative 2 with HDPE is estimated to cost \$71,500.00 more than Alternative 1; however, Alternative 1 only provides a partial solution.

Alternative 2 allows for the abandonment of the existing transmission line in Spanish Oaks Drive while still supplying water to the customers further west on Powerhouse Road, which in turn provides more space for replacing the existing distribution line in Spanish Oaks Drive, while Alternative 1 does not provide that possibility. Alternative 2 also provides means for the future customers downstream of Powerhouse Road to be fed by gravity if the pump station were to be moved, which would reduce the demand on the booster pumps and increase the overall system efficiency.

6. CONCLUSION AND RECOMMENDATIONS

This study analyzed several possible solutions for replacing the water transmission line in the area south of the golf course. Only one solution best met the aims of the City to replace the aging pipe, mitigate the risk of a dangerous break on the line, and improve the efficiency of pumping now or in the future. Alternative 2 which realigns the transmission line through Powerhouse Road and up an existing pressurized irrigation pipe easement west of the subdivision to reach the water tank, best meets the aims of the City in replacing the existing water transmission line.

APPENDIX A. EXHIBITS



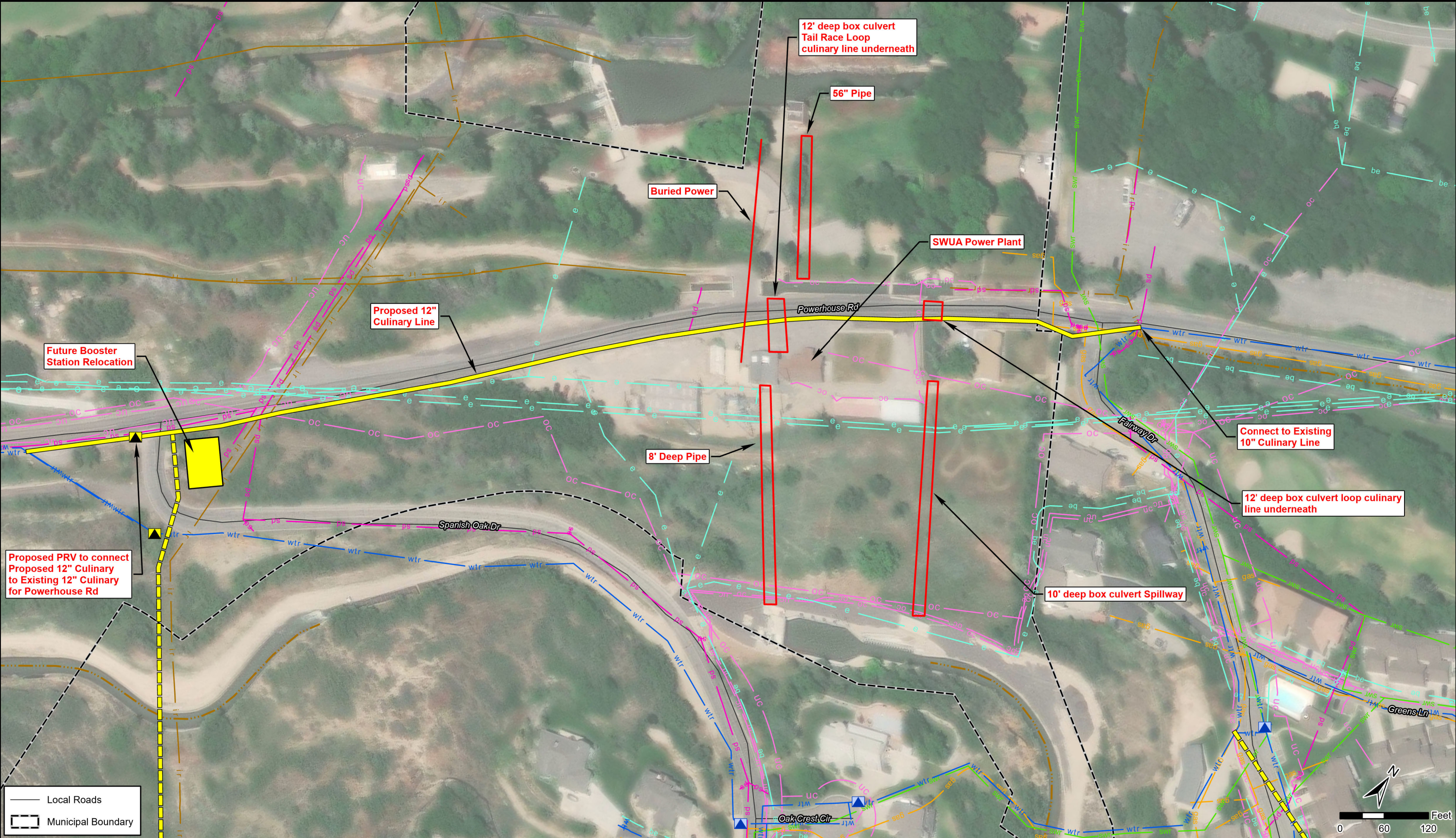
—	Local Roads
- - -	Municipal Boundary



**Jones & DeMille
Engineering**

Spanish Fork City		
<i>Transmission Line Feasibility Study Proposed Alignment - Alternate 1 Overview</i>		
Map Name: H:\UD\Proj\2308-011\GIS\Projects\2308-011_Study\aprx - Exh Spanish Fork - Culinary Water - Transmission Line Study - Alternate 1 11x17P	Project Number: 2308-011	Drawn by: JEM 02-24
		Last Edit: 05/28/2024

Utah County, Utah
Scale: 1" = 400'
1



Proposed PRV	PRV	Storm Drain Line	Irrigation Line
	Culinary Main Line	Gas Line	Ditches
	Sewer Main Line	Overhead Telecomm Cable	Canals
Future Booster Station	Overhead Power Line	Underground Telecomm Cable	
	Underground Power Line		

Jones & DeMille Engineering

Spanish Fork City			Utah County, Utah
Transmission Line Feasibility Study			Scale: 1" = 120'
Proposed Alignment Overview			1
Map Name: H:\UD\Proj\2308-011\GIS\Projects\2308-011_Study\2308-011_Study.aprx - Exh Spanish Fork - Culinary Water - Transmission Line Study - Focused Extent 11x17L			
Project Number: 2308-011	Drawn by: JEM 03-24	Last Edit: 05/28/2024	

APPENDIX B. COST ESTIMATES

Owner: Spanish Fork City
Project: Transmission Line Alternative 1 DIP
Project #: 2308-011
PM: Matt Laurendeau
Date: 4/9/2024

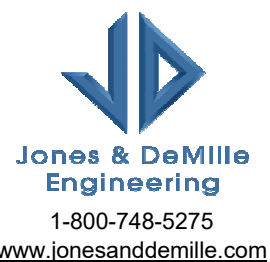


ENGINEER'S OPINION OF PROBABLE COST

Item No.	Item Description	Unit	Estimated Quantity	Unit Price	Price
1-1	Mobilization	L.S.	1	\$70,000.00	\$ 70,000.00
1-2	Traffic Control	L.S.	1	\$47,000.00	\$ 47,000.00
1-3	Construction Staking	L.S.	1	\$23,000.00	\$ 23,000.00
1-4	Quality Control	L.S.	1	\$23,000.00	\$ 23,000.00
1-5	10 Inch DIP Culinary Water Pipe	L.F.	4580	\$84.60	\$ 387,468.00
1-6	Jack and Bore Under Canal	L.F.	85	\$3,000.00	\$ 255,000.00
1-7	10 Inch Butterfly Valve	Each	2	\$5,500.00	\$ 11,000.00
1-8	Cap & Abandon Existing Waterline	Each	1	\$2,000.00	\$ 2,000.00
1-9	Abandon Existing Valves	Each	1	\$1,000.00	\$ 1,000.00
1-10	Abandon Existing Pressure Reducing Valves	Each	1	\$3,000.00	\$ 3,000.00
1-11	Pressure Reducing Valves	Each	2	\$60,000.00	\$ 120,000.00
1-12	Remove & Replace Asphalt	S.Y.	3720	\$90.00	\$ 334,800.00
1-13	Remove & Replace Curb & Gutter	L.F.	80	\$83.00	\$ 6,640.00
1-14	Connection to Existing 10 Inch Line Detail D1/C-501	Each	2	\$9,000.00	\$ 18,000.00
1-15	Air/Vacuum Relief Valves	Each	2	\$15,000.00	\$ 30,000.00
1-16	20% Contingency	L.S.	1	\$266,382.00	\$ 266,382.00
Total Probable Construction Cost					\$ 1,598,290.00

In providing estimates of probable construction cost, the Client understands that the Consultant has no control over the cost or availability of labor, equipment or materials, or over market conditions or the Contractor's method of pricing, and that the Consultant's estimates of probable construction costs are made on the basis of the consultant's professional judgement and experience. The Consultant makes no warranty, express or implied, that the bids or negotiated costs of the Work will not vary from

Owner: Spanish Fork City
Project: Transmission Line Alternative 2 HDPE
Project #: 2308-011
PM: Matt Laurendeau
Date: 4/9/2024



ENGINEER'S OPINION OF PROBABLE COST

Item No.	Item Description	Unit	Estimated Quantity	Unit Price	Price
1-1	Mobilization	L.S.	1	\$73,000.00	\$ 73,000.00
1-2	Traffic Control	L.S.	1	\$49,000.00	\$ 49,000.00
1-3	Construction Staking	L.S.	1	\$24,000.00	\$ 24,000.00
1-4	Quality Control	L.S.	1	\$24,000.00	\$ 24,000.00
1-5	16 Inch DR9 HDPE Culinary Water Pipe (12.231 ID)	L.F.	1485	\$96.28	\$ 142,968.67
1-6	12 Inch DR9 HDPE Culinary Water Pipe (9.747 ID)	L.F.	1240	\$61.14	\$ 75,818.06
1-7	10" Inch DR17 HDPE Culinary Water Pipe (9.409 ID)	L.F.	850	\$24.35	\$ 20,694.10
1-8	Jack and Bore Under Canals	L.F.	210	\$3,000.00	\$ 630,000.00
1-9	12 Inch Butterfly Valve	Each	2	\$6,060.00	\$ 12,120.00
1-10	10 Inch Butterfly Valve	Each	1	\$5,500.00	\$ 5,500.00
1-11	Cap & Abandon Existing Waterline	Each	4	\$2,000.00	\$ 8,000.00
1-12	Abandon Existing Valves	Each	1	\$1,000.00	\$ 1,000.00
1-13	Abandon Existing Pressure Reducing Valves	Each	2	\$3,000.00	\$ 6,000.00
1-14	Pressure Reducing Valves	Each	3	\$60,000.00	\$ 180,000.00
1-15	Gravel Roadway Repair	S.Y.	50	\$50.00	\$ 2,500.00
1-16	Remove & Replace Asphalt	S.Y.	949	\$90.00	\$ 85,410.00
1-17	Remove & Replace Curb & Gutter	L.F.	30	\$83.00	\$ 2,490.00
1-18	Connection to Existing 12 Inch Line Detail D1/C-501	Each	1	\$10,000.00	\$ 10,000.00
1-19	Connection to Existing 10 Inch Line Detail D1/C-501	Each	1	\$9,000.00	\$ 9,000.00
1-20	Air/Vacuum Relief Valves	Each	2	\$15,000.00	\$ 30,000.00
1-21	20% Contingency	L.S.	1	\$278,300.00	\$ 278,300.00
Total Probable Construction Cost					\$ 1,669,800.84

In providing estimates of probable construction cost, the Client understands that the Consultant has no control over the cost or availability of labor, equipment or materials, or over market conditions or the Contractor's method of pricing, and that the Consultant's estimates of probable construction costs are made on the basis of the consultant's professional judgement and experience. The Consultant makes no warranty, express or implied, that the bids or negotiated costs of the Work will not vary from

Owner: Spanish Fork City
Project: Transmission Line Alternative 2 DIP
Project #: 2308-011
PM: Matt Laurendeau
Date: 4/9/2024



1-800-748-5275
www.jonesanddemille.com

ENGINEER'S OPINION OF PROBABLE COST					
Item No.	Item Description	Unit	Estimated Quantity	Unit Price	Price
1-1	Mobilization	L.S.	1	\$79,000.00	\$ 79,000.00
1-2	Traffic Control	L.S.	1	\$53,000.00	\$ 53,000.00
1-3	Construction Staking	L.S.	1	\$26,000.00	\$ 26,000.00
1-4	Quality Control	L.S.	1	\$26,000.00	\$ 26,000.00
1-5	12 Inch TR-Flex DIP Culinary Water Pipe	L.F.	100	\$150.00	\$ 15,000.00
1-6	12 Inch DIP Culinary Water Pipe	L.F.	1385	\$108.60	\$ 150,411.00
1-7	10 Inch DIP Culinary Water Pipe	L.F.	2090	\$84.60	\$ 176,814.00
1-8	Jack and Bore Under Canals	L.F.	210	\$3,000.00	\$ 630,000.00
1-9	12 Inch Butterfly Valve	Each	2	\$6,060.00	\$ 12,120.00
1-10	10 Inch Butterfly Valve	Each	1	\$5,500.00	\$ 5,500.00
1-11	Cap & Abandon Existing Waterline	Each	4	\$2,000.00	\$ 8,000.00
1-12	Abandon Existing Valves	Each	1	\$1,000.00	\$ 1,000.00
1-13	Abandon Existing Pressure Reducing Valves	Each	2	\$3,000.00	\$ 6,000.00
1-14	Pressure Reducing Valves	Each	3	\$60,000.00	\$ 180,000.00
1-15	Gravel Roadway Repair	S.Y.	40	\$50.00	\$ 2,000.00
1-16	Remove & Replace Asphalt	S.Y.	949	\$90.00	\$ 85,410.00
1-17	Remove & Replace Curb & Gutter	L.F.	30	\$83.00	\$ 2,490.00
1-18	Connection to Existing 12 Inch Line Detail D1/C-501	Each	1	\$10,000.00	\$ 10,000.00
1-19	Connection to Existing 10 Inch Line Detail D1/C-501	Each	1	\$9,000.00	\$ 9,000.00
1-20	Air/Vacuum Relief Valves	Each	2	\$15,000.00	\$ 30,000.00
1-21	20% Contingency	L.S.	1	\$301,549.00	\$ 301,549.00
Base Bid / Schedule 1 - Subtotal					\$ 1,809,294.00
ALTERNATIVE NO. 1 / SCHEDULE 2					
ALT 1	12 Inch FLEX-TEND Force Balanced Flexible Expansion Joint	Each	3	\$20,000.00	\$ 60,000.00
Alternate No. 1 / Schedule 2 - Subtotal					\$ 60,000.00
Total Probable Construction Cost					\$ 1,869,294.00

In providing estimates of probable construction cost, the Client understands that the Consultant has no control over the cost or availability of labor, equipment or materials, or over market conditions or the Contractor's method of pricing, and that the Consultant's estimates of probable construction costs are made on the basis of the consultant's professional judgement and experience. The Consultant makes no warranty, express or implied, that the bids or negotiated costs of the Work will not vary from