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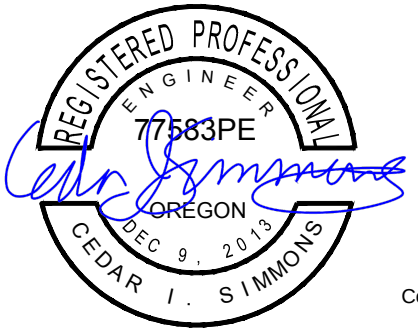
TECHNICAL MEMORANDUM

DATE: January 8, 2018
TO: Frank Day, CRRWC
FROM: Cedar Simmons, PE

SUBJECT: Technical Memorandum - Final
PROJECT NUMBER: 297-7379-003
PROJECT NAME: Water System Upgrades Study



EXPIRES 06/30/18

Cedar Simmons
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Reason: I am the author of this document
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Crooked River Ranch Water Company (CRRWC) completed a new 1,200 gpm production well and 1 MG elevated water tank project in 2017. The completion of this project puts CRRWC in a strong planning position moving forward. There are a variety of improvement project options to consider. All must be considered based on the positive impacts the new well and elevated tank have had on the water system. Parametrix was tasked with updating the capital improvement project recommendations made in the 2012 Master Plan and prioritizing remaining projects.

This memorandum describes the results obtained from evaluating the remaining water system improvement project alternatives for CRRWC. Three categories of alternatives were analyzed:

1. Improvements to the supply, storage, and distribution system for the lower plateau,
2. Improvements to the aging main along the upper plateau, and
3. Looping projects, as identified in the Preliminary Engineering Report (WHPacific, January 2014)

A structural analysis of the existing cistern was performed, including identifying reinforcing steel and concrete compressive strength of the interior and exterior walls. Two potential sites for a new cistern were considered. A new lower plateau water well and booster pump station were also considered. Replacement of the main 8-inch waterline running from Well 4 to the cistern were evaluated, as well as two upper plateau looping projects. Cost estimates for all alternatives in each category have been developed and are presented herein. Attached to this memo is a project alternatives site map as well as line item cost estimates.

EVALUATION OF ALTERNATIVES

In order to prioritize the capital improvement projects evaluated in this study, driving factors for decision-making must be identified. Decision-making factors that are important to CRRWC include:

- Health and safety,
- Reliability,
- Capital cost,
- Lower plateau fire safety,
- Operation and maintenance cost, and
- Ease of operation

Alternatives within each category have been prioritized using these criteria, weighted by priority, to form a decision-making framework. Projects across categories have also been prioritized.

IMPACT OF NEW WELL 5 AND 1 MG ELEVATED TANK

Successful completion of CRRWC's new Well 5 and 1 MG elevated storage tank have eliminated many problems previously plaguing the water system. To prioritize remaining capital improvement projects, it is worth noting the impacts these improvements have had on the system, and how issues identified in the Preliminary Engineering Report (PER) have been affected. As stated in the 2014 PER, the main water system deficiencies identified were:

1. Water service pressure below 20 psi in upper zone during peak day summer use,
2. Inadequate fire flow in upper zone,
3. Inadequate storage capacity to meet existing and build-out service area demand,
4. Inadequate fire hydrant spacing,
5. Aging infrastructure,
6. Lack of adequate sources for build-out demands, and
7. Lack of reliability of Well 2 as a source due to repeated coliform hits.

Successful completion of Well 5 and the elevated tank eliminated deficiencies 1, 2, 3, and 6. All water services have 45 psi or greater pressure. Adequate storage capacity for peak hour demands has been achieved. With Well 4 and Well 5 supplying water to the tank, CRRWC is now achieving production to meet current water rights. Remaining deficiencies include inadequate fire hydrant spacing and aging infrastructure. This update to system deficiencies was considered when evaluating future capital improvement alternatives presented herein.

PROJECT ALTERNATIVES

1. Supply, Storage and Distribution for the Lower Plateau

Based on the discussion at the project kick-off meeting, five alternative projects were evaluated to improve the reliability of the supply, storage, and distribution system for the lower plateau. These are identified as:

1a. Do Nothing – keep existing cistern as is.
1b. Rehabilitate existing cistern and replace existing water supply line.
1c. Provide new cistern at existing site and replace existing water supply line.
1d. Provide new cistern sited at top of Hill road and provide new water supply line.
1e. Provide new cistern sited at the end of Outlook Place and provide new water supply line.
1f. Remove existing cistern from water system.

An additional alternative was added to this category: "1f: Remove cistern from water system." It is worth noting the new storage tank in the upper zone provides enough sufficient build-out capacity for peak hour demand, but not for fire-flow. Constructing, operating, and maintaining a 100,000-gallon cistern with pump station is not necessary from an overall system capacity standpoint. Fire flow demand that occurred over the summer of 2017 indicated the additional storage provided by the cistern was needed.

Supply

CRRWC currently has three production wells, two on the upper plateau and one on the lower. Well 4 produces at about 800 gpm, Well 5 at 1,200 gpm, and Well 2, located on the lower plateau, is currently shut in due to repeated coliform hits. CRRWC currently has water rights for three wells, with a production of 2.5 cfs per well, and a maximum of 5.0 cfs. Wells 4 and 5 are producing at high enough rates to meet current peak hour demand and build-out peak hour demand, including fire flows.

Constructing a new production well sited in the lower plateau was evaluated. Assuming well and pump construction costs incurred for the construction of Well 5 with a construction cost index escalation of 1.03 per Engineering News

Record, as well as assuming an additional lower plateau well would be approximately the same construction as existing Well 2, it is estimated that the capital cost of a new lower plateau well and pump would be about $700,000.

There are advantages and disadvantages to evaluate when considering the addition of a lower plateau supply well. From a cost standpoint, as will be shown later in this report, there is less operational cost associated with supplying the lower plateau with water from Well 5 rather than constructing a new well. Further, it is likely that the State will require chlorination within the planning period of this study. Chlorinating water from a new production well in the lower zone would create operational challenges.

There is an inherent benefit to having supply wells located at different locations in the system. Spreading supply throughout the system increases reliability, as the lower and upper zones are not dependent upon each other for water. As will be shown later, given the decision-making criteria and weighting system supplied by CRRWC, this option ranks highest in priority overall.

Lower Plateau New Well and Pump v. Well 5 and Elevated Tank

Currently, the lower plateau is supplied water using Well 5 and the existing elevated tank. The unnecessary energy-use to pump to upper plateau's hydraulic grade line versus installing a new well and pump at the lower plateau was evaluated. Power consumption to supply the lower plateau with water using Well 5 is estimated to be about $18,000 annually. Over a 20-year planning period, the total operations cost to use the existing Well 5 for lower plateau water supply is about $400,000. To install, operate, and maintain a new well and pump located in the lower plateau is almost three times this cost. Therefore, from a cost standpoint, continuing to supply the lower plateau with water using Well 5 is preferred over a new well and pump. Qualitative, intangible benefits to a new well and pump are also significant. These are discussed and evaluated in the next section.

Storage

In short, the existing cistern with pump station does not meet current design standards and is likely near the end of its useful design life. During a significant seismic event, the columns would likely fail causing the roof to collapse and the perimeter walls would also likely crack. The resulting damage would potentially be severe enough to remove the cistern from service indefinitely. The below narrative provides supporting details that led to this result.

Existing Conditions

The existing storage structure is a below-grade two chamber concrete cistern constructed sometime during the 1970s, with an approximate capacity of 87,000 gallons. There are no existing design or as-constructed drawings of the cistern available. In order to analyze the integrity of the existing structure, Carlson Testing was retained to perform both destructive and non-destructive testing to determine the structural properties of the existing structure. Structural properties of the existing cistern were determined to be as follows:

- The perimeter walls and the center divider wall are all 6 inches thick, with a single mat of No. 4 reinforcement at 12 inches on center each direction (horizontal and vertical).
- The floor slab is 6 inches thick, with a single mat of No. 3 reinforcement at 12 inches on center each direction.
- The roof slab is comprised of two lifts. The lower lift is approximately 5-1/2 inches thick, with a single mat of No. 4 reinforcement at 12 inches on center each direction. The top lift is approximately 2-1/2 inches thick, without any observable reinforcement. There are No. 4 corner bars at the top of the walls that connect into the roof slab, but embedment length was indeterminable.
- Within each chamber there are two 10-inch diameter concrete columns supporting the roof slab, with two No. 4 vertical bars and no horizontal confining reinforcement.
- Compression testing of the removed concrete cores resulted in concrete strengths ranging from 3,270 psi to 5,590 psi.

Structural properties of the existing pump room were determined to be as follows:

- The perimeter walls are 6 inches thick, with a single mat of No. 4 reinforcement at 24 inches on center each direction (horizontal and vertical).
- The floor slab is 5 inches thick, with a single mat of No. 3 reinforcement at 24 inches on center each direction.
- The roof slab is 7 inches thick, with a single mat of No. 4 reinforcement at 24 inches on center each direction.
- Within pump room there are two 6-inch diameter wood posts that have been added after the room was constructed to provide additional support for the roof slab.

The following conditions were noted during visual inspection of the cistern and pump room:

- Freeze-thaw cracking on the cistern roof slab.
- Flexural cracking on the cistern roof slab and on the north and south walls of the west tank.
- Cracked and loose concrete on the perimeter of the roof slab at the connection the cistern walls.
- Multiple locations of exposed and rusted reinforcement on the roof slab in the west tank. Similar but less severe conditions noted on the roof slab in the east tank.
- In the roof slabs of both tanks there were sign of water leaking through the tank (chalky white residue and with stalactite-like droplets).
- Flexural cracking on the roof and walls in the NW corner of the pump house.
- Signs of the west tank leaking into the pump house.

Structural Capacity

Based on the observed conditions and structural properties, the cistern was evaluated using current codes for liquid-containing structures, which incorporates impulse loading from seismic events. Results of the review are as follows:

- The existing concrete perimeter walls are of sufficient thickness to resist shear forces at their base and sides.
- The vertical reinforcement in the walls is insufficient to resist flexural bending forces.
- The horizontal reinforcement in the walls is insufficient to resist flexural bending forces.
- Reinforcement in the roof slab is insufficient to resist flexural bending.
- Reinforcement in both the roof and walls is insufficient to resist temperature and shrinkage cracking forces.
- The vertical reinforcement in the concrete columns is insufficient to resist vertical loading.
- The concrete columns do not have any horizontal confinement reinforcement.
- There is insufficient concrete cover over the reinforcement in the roof slab.

Rehabilitation Considerations

Rehabilitation of the concrete roof slab and minor repairs to the perimeter walls could extend the service life of the structure, however, it would not address the inadequacy of the structure to resist seismic forces. In order for the cistern to provide resiliency for the supply system, a major retrofit or replacement of the cistern is recommended. Project Alternative 1b includes a major retrofit of the cistern at the existing location. Key structural considerations of this alternative include the following:

- Demolition of the existing cistern roof slab and interior dividing wall.
- Construct new floor slab, walls, and roof slab within the walls of the existing cistern.
- Building within the existing cistern minimizes excavation and reduces construction time and cost.
- Reduces capacity to 70,000 gallons, could be increased if the existing roof elevation is raised.
- Pump house to be completely demolished and rebuilt.
- The vertical reinforcement in the walls is insufficient to resist flexural bending forces.

The estimated cost to rehabilitate the cistern at the existing location is included with Alternative 1b.

Replacement Options

Options 1d and 1e include the construction cost for a new 100,000 gallon at grade glass fused to steel bolted tank, completed turn-key with earth-tone color (slightly more expensive than blue) to satisfy HOA CC&R's. The estimated

cost for installation of this capacity is $2.25/gallon, or $225,000. A new booster pump station, assuming same horsepower as existing, is estimated at $67,000, for materials and installation.

Replacement Timeline

Given the existing conditions of the cistern and the lack of design criteria and as-built plans, it is difficult to estimate the remaining useful life of the cistern with any certainty. Based on analysis of the results from the site testing performed, the cistern does not meet current design standards, however, it can be assumed that it met the design standards at the time of construction. One of the primary differences in the current code versus the codes present when the cistern was constructed is seismic design. If a design-level seismic event were to occur, the cistern would likely suffer significant structural damage and be non-operational for an extended period. Assuming a design-level seismic event does not occur in the immediate future, the cistern will likely continue to function as it does currently.

Outside of seismic concerns, the existing condition of the concrete roof slab is the cistern's largest vulnerability. The existing cracks will continue to increase in size as the cistern undergoes seasonal freeze-thaw temperature swings. As cracks open, there is the potential for surface water to migrate through the concrete into the tank, possibly affecting water quality. Additionally, water penetrating the concrete will continue to degrade the steel reinforcing, reducing the capacity of the roof slab to support its own weight. Repairing the loose concrete on the perimeter of the roof slab and sealing the entire slab with an elastomeric type membrane will help prolong cistern life.

With continued maintenance to the roof slab to limit moisture intrusion, it is anticipated that the cistern will function in its current condition for the next 3 to 5 years. Annual inspections should be performed by CRRWC to note any change in conditions, specifically any deflection of the roof slab. For the cistern to remain in service for the next 5 to 10 years, it is possible that the existing concrete roof slab would need to be strengthened. Additional posts inside the tanks or exterior steel beams could be installed to help support the roof slab and limit growth of existing cracks.

Distribution

Each alternative in this category except for 1a – Do Nothing, includes changes to CRRWC's existing water distribution infrastructure. Modifications associated with each alternative are included in the construction cost estimates and are shown on the Project Alternative Site Map included as Attachment 1 in this memorandum. The addition of a second distribution line from the upper plateau to the lower plateau without a cistern was also evaluated.

2. Replacement of Aging Main along Upper Plateau

An original CRR water main that connects the upper plateau to the lower plateau is 22,100 lineal feet of 8 inch that runs from the intersection of Basalt Drive and Cinder Drive at Well 4, east and southeast along Shad Road, to Mustang Road, and along Rim Road to the cistern. There is no backup to this main. If a break occurs, there is potential for services, especially located in the lower plateau, to go without water until the break is fixed. Significant breaks have occurred in recent past. Leaks are primarily occurring at joint connections, where a double-ended bell joint coupler has root intrusion. Incorrect pipe bedding has also been discovered. Cost to replace this main line pipe and upsize from 8 to 12 inch is included.

Aging Main Replacement v Maintaining Existing

Replacing over 22,000 lineal feet of 12-inch mainline is a capital cost of about $2.8 million. This capital cost was compared to current maintenance of the main line, which averages about two leak fixes annually, at an average of $3,500 per leak (includes materials and labor). Over the 20-year planning period, replacing the main is almost 20 times more costly than maintaining the existing line at a rate of two leaks per year. In fact, if it is assumed that the number of leaks escalates over the planning period at a rate of n + 1 per year, replacing the line in full is still about 3.5 times more expensive than the yearly cost of maintenance.

3. Looping Projects

Two looping projects on the upper plateau were identified in the PER. These projects consist of 3,225 lineal feet of 8 inch waterline on Quail Road between Chickadee Road and Shad Road, and 2,400 lineal feet of 8 inch waterline on Mustang Road between Haddock Road and Rim Road. The objective of looping projects is to increase reliability in the event of a break, improve fire flows, as well as increase overall public health and safety due to the reduced potential for stagnant water in a dead-end watermain. To date, there have not been any known issues with health and safety due to these two dead end mains.

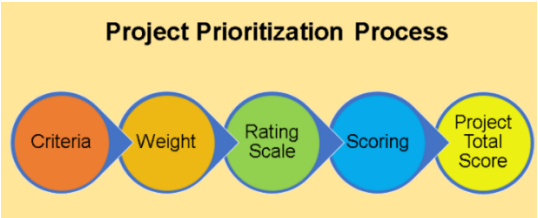
SUMMARY OF PROJECT COSTS

Capital Improvement Projects - Summary

Option	Description	Total Cost
1a	Do Nothing - Leave Existing Cistern and Piping as is	$ -
1b	Rehabilitate Existing Cistern at Existing Locatior	$ 309,270.00
1c-1	New Cistern and Pump at Existing Location	$ 831,064.00
1c-2	New Discharge Piping for Cistern at Existing Location (4,900 LF, 8-Inch)	$ 490,516.00
1d-1	New Cistern and Pump at Hill Road and New Discharge Piping (3,700 LF, 8-Inch)	$ 1,096,082.00
1d-2	New Discharge Piping for New Cistern at Hill Road (3,700 LF, 8-Inch)	$ 369,408.00
1e-1	New Cistern and Pump at Outlook Place and New Discharge Piping (2,550 LF, 8-Inch)	$ 1,147,181.60
1e-2	New Discharge Piping for Cistern at Outlook Place (2,550 LF, 8-Inch)	$ 252,813.60
2	Waterline Replacement Cistern to Well 4 (22,100 LF, 12-Inch	$ 2,756,377.00
3a	Loop Completion: SW Quail Rd - SW Shad Rd to SW Chickadee Rd (3,225 LF, 8-Inch)	$ 289,666.00
3b	Loop Completion: SW Mustang Rd - SW Buckskin Ln to SW Haddock Dr (2,400 LF, 6-Inch)	$ 242,684.00
4	New Lower Plateau Supply Well and Pump	$ 700,000.00

ALTERNATIVES EVALUATION MATRIX

Any evaluation of alternatives that results in a useful prioritization of identified capital improvement projects begins with a clear and active understanding of what factors are most important to an organization, and what criteria are used in the decision-making process. Project prioritization generally involves five steps:



Selected criteria and rank order to prioritize the capital improvement projects herein are as follows:

Criteria	Rank Order of Priority	Assigned Weight
Health and Safety	1	1
Reliability	2	0.8
Ease of Maintenance	3	0.6
Capital Cost	4	0.5
Lower Plateau Fire Safety	5	0.5
Operations and Maintenance Cost	6	0.4

Based on the rank order priority of decision-making criteria provided by CRRWC, weighting was applied to each criteria. Health and Safety, the highest priority criteria for CRRWC, was given a weighting of 1. The other criteria were ranked relative to Health and Safety. Reliability is the second most important criteria for decision-making, and was given a weight of 0.8. Capital Cost and Lower Plateau Fire Safety were given equal weightings of 0.5 compared to Health and Safety. Both are weighted as half as important for making decisions as Health and Safety. It should be noted that Fire Safety is of paramount importance to CRRWC. However, the decision-making criteria identified is Lower Plateau Health and Safety. There are two commercial buildings located in the lower plateau which require adequate fire flow in case of a fire emergency. Fire Safety for the lower plateau is therefore ranked lower due to the minimal fire flow services located in the lower plateau. The final two criteria, Operations and Maintenance Cost and Ease of Maintenance, are weighted at 0.4 and 0.6, respectively.

Each project was assigned points (1 = lowest points) in each category, then the number of points assigned was multiplied by the weighting of that criteria. This was done across all projects and all criteria and the matrix including resultant weighted priority is provided in the following table.

		Decision-Making Criteria and Weighting Points Assigned (1 = lowest possible points)							
	Criteria Weights:	**1**	**0.8**	**0.5**	**0.5**	**0.4**	**0.6**		
Projects for Supply, Storage and Distribution for the Lower Plateau		**Health and Safety**	**Reliability**	**Capital Cost**	**Lower Plateau Fire Safety**	**O&M Cost**	**Ease of Maintenance**	**Overall Rank Order (highest score = highest rank)**	**Resultant Weighted Priority**
1a	Do Nothing	1	1	6	2	1	1	5.8	**6**
1b	Rehabilitate Existing cistern, replace existing water supply line	2	2	4	3	2	2	8.7	**5**
1c	New Cistern at existing site, replace existing water supply line	3	3	1	4	3	3	12.7	**4**
1d	New Cistern at Hill Road, new water supply line	3	3	3	4	3	4	14.1	**2**
1e	New Cistern at Outlook Place, new water supply line	3	3	2	4	3	4	13.6	**3**
1f	Remove Cistern from system	4	4	5	1	4	5	20.2	**1**
Distribution Projects									
2	Replace Aging Main along upper plateau	2	2	1	2	1	2	6.1	**1**
3	looping projects	1	1	2	1	2	1	3.9	**2**
Overall Project Types									
1	Storage - lower plateau (1c, 1d, or 1e)	3	4	2	4	1	1	13.6	**2**
2	Distribution - replace aging main	2	2	1	2	4	4	8.7	**3**
3	Distribution - looping projects	2	1	4	1	4	4	8.1	**4**
4	Supply - new well and pump, lower plateau	1	3	3	3	2	2	7.4	**5**
5	Distribution - new discharge piping from upper to lower plateau - no cistern	3	5	5	5	3	3	20	**1**

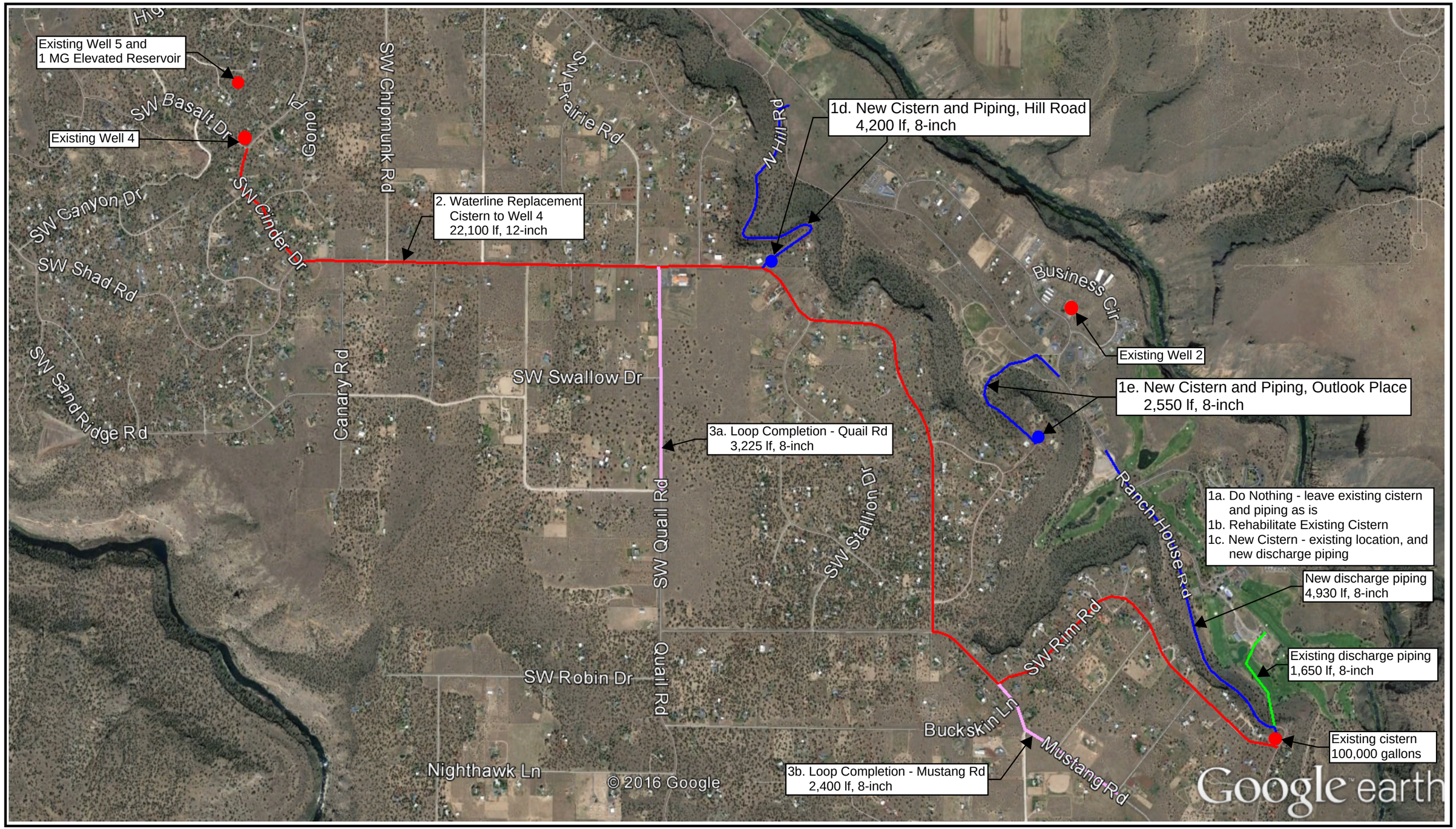
Based on the decision weighting assigned to decision-making criteria, new distribution piping from upper to lower plateau without cistern received the highest ranking when ranking overall project types, followed by storage. Distribution projects are ranked third and fourth, with the new lower plateau well and pump ranking last.

Of the lower plateau storage options, removal of the cistern is highest ranked followed by a new cistern at Hill Road with a new water supply line.

Capital improvement cost spreadsheets, life cycle cost spreadsheets, and alternative evaluation matrix spreadsheet have been submitted electronically with this report for future use by CRRWC. These spreadsheets are meant to be interactive and modified as needed and required.

ATTACHMENTS

1. Project Alternatives Site Map
2. Cost Estimates (electronic also submitted)
3. Ranking Spreadsheet (electronic)
4. Life Cycle Cost Spreadsheet (electronic)



Parametrix DATE: 11/09/2017

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NOT TO SCALE

Water System Upgrades Study

Crooked River Ranch Water Company

Attachment 1: Project Alternatives Site Map

Crooked River Ranch Water Company
Water System Upgrades Study
9-Nov-17
Engineer's Construction Cost Opinion

Option 1b. Rehabilitate Existing Cistern at Existing Location
Construct new 70K gallon cistern within existing walls
Does not include PE, CE, or permitting

No.	Description	Specification Number	Qty	Unit	Unit Price	Total Cost
1	Mobilization (10%)		1	LS	$ 21,625.00	$ 21,625.00
2	Demo existing roof slab and center divider wal		50	CUYD	$ 200.00	$ 10,000.00
3	New concrete floor slab, walls, & roof slab		160	CUYD	$ 500.00	$ 80,000.00
4						
5	Demo existing control building		20	CUYD	$ 200.00	$ 4,000.00
6	Control Building Excavation and Backfil		1	LS	$ 15,000.00	$ 15,000.00
7	New 650 sqft CMU control building		650	SQFT	$ 165.00	$ 107,250.00
8						$ -
9						$ -
10						$ -
11						$ -
12						$ -
13						$ -
14						$ -
15						$ -
16						$ -
17						$ -
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20						$ -
21						$ -
22						$ -
23						$ -
24						$ -
25						$ -
26						$ -
27						$ -
					Subtotal	$ 237,900.00
					Contingency (30%)	$ 71,370.00
					Engineer's Construction Cost Opinion	**$ 309,270.00**

Crooked River Ranch Water Company
Water System Upgrades Study
11/9/2017
Engineer's Construction Cost Opinion

Option 1c-1. New Cistern at Existing Location

No.	Description	Qty	Unit	Unit Price	Total Cost
1	Mobilization	1	Lump Sum	$ 58,030.00	$ 58,030.00
2	Project Permitting	1	Lump Sum	$ 5,000.00	$ 5,000.00
3	Field Explorations	1	Lump Sum	$ 2,000.00	$ 2,000.00
4	Construction Staking	1	Lump Sum	$ 1,000.00	$ 1,000.00
5	Demolition Existing Cistern and Building, Complete	1	Lump Sum	$ 20,000.00	$ 20,000.00
6	Furnish and Install Cistern with Attached Equipment Building, Complete	1	Lump Sum	$ 355,250.00	$ 355,250.00
7	Furnish and Install Booster Pump System and Controls, Complete	1	Lump Sum	$ 67,000.00	$ 67,000.00
8	Program and Connect New Cistern to Existing SCADA System	1	Lump Sum	$ 10,000.00	$ 10,000.00
9	Furnish and Install Equipment Room Piping, Magmeter, and Appertenances, Complete	1	Lump Sum	$ 30,000.00	$ 30,000.00
10	Furnish and Install New Electrical Equipment, Complete	1	Lump Sum	$ 20,000.00	$ 20,000.00
11	Clearing and Grubbing	1	Lump Sum	$ 2,000.00	$ 2,000.00
12	General Excavation		Cubic Yards	$ 6.00	$ -
13	Embankment in Place		Cubic Yards	$ 20.00	$ -
14	Site Paving - 6", 3/4" Aggregate Base	750	Square Feet	$ 1.00	$ 750.00
15	Site Paving - 3" AC Pavement	750	Square Feet	$ 2.00	$ 1,500.00
16	Construction Entrance	1	Lump Sum	$ 2,000.00	$ 2,000.00
17	Site Detention Pond	1	Lump Sum	$ 10,000.00	$ 10,000.00
18	Furnish and Install ODOT Class 100 Rip Rap	50	Cubic Yards	$ 15.00	$ 750.00
19	Furnish and Install 6-foot Chain Link Fencing with Privacy Slats	400	Lineal Foot	$ 25.00	$ 10,000.00
20	Furnish and Install Chain Link Gates (1 motorized slide and 1man	1	Lump Sum	$ 10,000.00	$ 10,000.00
21	Furnish and Install Temporary Erosion Control and Dust Abatemen	1	Lump Sum	$ 5,000.00	$ 5,000.00
22	Landscape Rehabilitation	1	Lump Sum	$ 1,000.00	$ 1,000.00
23	Permanent Seeding	1	Lump Sum	$ 1,000.00	$ 1,000.00
24	Temporary Irrigation	1	Lump Sum	$ 1,000.00	$ 1,000.00
25	Traffic Control	1	Lump Sum	$ 1,000.00	$ 1,000.00
26	Fire Hydrant Assembly	1	Each	$ 5,000.00	$ 5,000.00
27	Yard Piping, Complete	1	Lump Sum	$ 20,000.00	$ 20,000.00
				Subtotal	$ 639,280.00
				Contingency (30%)	$ 191,784.00
				Engineer's Construction Cost Opinion	**$ 831,064.00**

Crooked River Ranch Water Company
Water System Upgrades Study
11/9/2017
Engineer's Construction Cost Opinion

Option 1c-2. New Discharge Piping for Cistern at Existing Location

No.	Description	Qty	Unit	Unit Price	Total Cost
1	Mobilization	1	Lump Sum	$ 34,670.00	$ 34,670.00
2	Temporary Work Zone Traffic Control, Complete (Includes R/W Permits	1	Lump Sum	$ 10,000.00	$ 10,000.00
3	Erosion Control	1	Lump Sum	$ 2,000.00	$ 2,000.00
4	Construction Survey Work	1	Lump Sum	$ 2,000.00	$ 2,000.00
5	Asphalt Pavement Saw Cutting	4,900	Foot	$ 2.00	$ 9,800.00
6	Removal of Structures and Obstructions	1	Lump Sum	$ 2,000.00	$ 2,000.00
7	Clearing and Grubbing	1	Lump Sum	$ 2,000.00	$ 2,000.00
8	Filling Abandoned Structures	1	Lump Sum	$ 1,000.00	$ 1,000.00
9	Trench Resurfacing (T-Cut and Patch w/ 6" AC)	1,100	Square Yards	$ 25.00	$ 27,500.00
10	Trench Resurfacing (Outside of Street)	550	Square Yards	$ 20.00	$ 11,000.00
11	Field Explorations	1	Lump Sum	$ 2,000.00	$ 2,000.00
12	Record Drawings	1	Lump Sum	$ 1,000.00	$ 1,000.00
13	Cold Plane Pavement Removal, 3 Inches deep	550	Square Yards	$ 2.00	$ 1,100.00
14	Emulsified Asphalt for Tack Coat (Incidental)		Incidental	$ -	$ -
15	Restore Landscaping and Permanent Seeding	1	Lump Sum	$ 3,000.00	$ 3,000.00
16	8-Inch C900 PVC Potable Water Pipe, Restrained Fittings and Couplings and Class A Backfill	4,930	Foot	$ 50.00	$ 246,500.00
17	8-Inch Bend	16	Each	$ 400.00	$ 6,400.00
18	8-Inch Tee-In Connection to 6-Inch Existing Main	0	Each	$ 1,500.00	$ -
19	8-Inch Tee-In Connection to 8-Inch Existing Main	1	Each	$ 1,500.00	$ 1,500.00
20	Blow-off Assembly, 2-Inch	1	Each	$ 4,000.00	$ 4,000.00
21	8-Inch Gate Valve	2	Each	$ 1,000.00	$ 2,000.00
22	Hydrant Assemblies	2	Each	$ 5,000.00	$ 10,000.00
23	Crossing - County Paved - 30-foot width	1	Each	$ 1,500.00	$ 1,500.00
24	Crossing - County Gravel - 30-foot width	0	Each	$ 1,000.00	$ -
25	Crossing - Private Paved - 20-foot width	2	Each	$ 1,200.00	$ 2,400.00
26	Crossing - Private Concrete - 20-foot width	0	Each	$ 1,500.00	$ -
27	Crossing - Private Gravel - 20-foot width	0	Each	$ 800.00	$ -
	Paved Crossings include sawcutting, cold-planing pavement removal, and trench resurfacing including tack coat and T-cut with 6" AC Patch			Subtotal	$ 383,370.00
				Contingency (30%)	$ 115,011.00
				Engineer's Construction Cost Opinion	**$ 498,381.00**

Crooked River Ranch Water Company
Water System Upgrades Study
11/9/2017
Engineer's Construction Cost Opinion

Option 1d-1. New Cistern at Hill Road

No.	Description	Qty	Unit	Unit Price	Total Cost
1	Mobilization	1	Lump Sum	$ 50,730.00	$ 50,730.00
2	Project Permitting	1	Lump Sum	$ 5,000.00	$ 5,000.00
3	Field Explorations	1	Lump Sum	$ 2,000.00	$ 2,000.00
4	Construction Staking	1	Lump Sum	$ 1,000.00	$ 1,000.00
5	Furnish and Install Cistern with Attached Equipment Building, Complete	1	Lump Sum	$ 307,250.00	$ 307,250.00
6	Furnish and Install Booster Pump System and Controls, Complete	1	Lump Sum	$ 67,000.00	$ 67,000.00
7	Program and Connect New Cistern to Existing SCADA System	1	Lump Sum	$ 10,000.00	$ 10,000.00
8	Furnish and Install Equipment Room Piping, Magmeter, and Appertenances, Complete	1	Lump Sum	$ 30,000.00	$ 30,000.00
9	Furnish and Install New Electrical Equipment, Complete	1	Lump Sum	$ 20,000.00	$ 20,000.00
10	Clearing and Grubbing	1	Lump Sum	$ 2,000.00	$ 2,000.00
11	General Excavation	0	Cubic Yards	$ 6.00	$ -
12	Embankment in Place	0	Cubic Yards	$ 20.00	$ -
13	Site Paving - 6", 3/4" Aggregate Base	750	Square Feet	$ 1.00	$ 750.00
14	Site Paving - 3" AC Pavement	750	Square Feet	$ 2.00	$ 1,500.00
15	Construction Entrance	1	Lump Sum	$ 2,000.00	$ 2,000.00
16	Site Detention Pond	1	Lump Sum	$ 10,000.00	$ 10,000.00
17	Furnish and Install ODOT Class 100 Rip Rap	50	Cubic Yards	$ 15.00	$ 750.00
18	Furnish and Install 6-foot Chain Link Fencing with Privacy Slats	200	Lineal Foot	$ 25.00	$ 5,000.00
19	Furnish and Install Chain Link Gates (1 motorized slide and 1man	1	Lump Sum	$ 10,000.00	$ 10,000.00
20	Furnish and Install Temporary Erosion Control and Dust Abatemen	1	Lump Sum	$ 5,000.00	$ 5,000.00
21	Landscape Rehabilitation	1	Lump Sum	$ 1,000.00	$ 1,000.00
22	Permanent Seeding	1	Lump Sum	$ 1,000.00	$ 1,000.00
23	Temporary Irrigation	1	Lump Sum	$ 1,000.00	$ 1,000.00
24	Traffic Control	1	Lump Sum	$ 1,000.00	$ 1,000.00
25	Fire Hydrant Assembly	1	Each	$ 5,000.00	$ 5,000.00
26	Yard Piping, Complete	1	Lump Sum	$ 20,000.00	$ 20,000.00
				Subtotal	$ 558,980.00
				Contingency (30%)	$ 167,694.00
				Engineer's Construction Cost Opinion	**$ 726,674.00**

Crooked River Ranch Water Company
Water System Upgrades Study
11/9/2017
Engineer's Construction Cost Opinion

Option 1d-2. New Discharge Piping for New Cistern at Hill Road

No.	Description	Qty	Unit	Unit Price	Total Cost
1	Mobilization	1	Lump Sum	$ 26,020.00	$ 26,020.00
2	Temporary Work Zone Traffic Control, Complete (Includes R/W Permits	1	Lump Sum	$ 2,000.00	$ 2,000.00
3	Erosion Control (Incl. Sediment Fence and Construction Entrance if req'd	1	Lump Sum	$ 2,000.00	$ 2,000.00
4	Construction Survey Work	1	Lump Sum	$ 1,000.00	$ 1,000.00
5	Asphalt Pavement Saw Cutting	1,235	Foot	$ 2.00	$ 2,470.00
6	Removal of Structures and Obstructions	1	Lump Sum	$ 1,000.00	$ 1,000.00
7	Clearing and Grubbing	1	Lump Sum	$ 5,000.00	$ 5,000.00
8	Filling Abandoned Structures	1	Lump Sum	$ 1,000.00	$ 1,000.00
9	Trench Resurfacing (T-Cut and Patch w/ 6" AC)	550	Square Yards	$ 25.00	$ 13,750.00
10	Trench Resurfacing (Outside of Street)	550	Square Yards	$ 20.00	$ 11,000.00
11	Field Explorations	1	Lump Sum	$ 1,000.00	$ 1,000.00
12	Record Drawings	1	Lump Sum	$ 1,000.00	$ 1,000.00
13	Cold Plane Pavement Removal, 3 Inches deep	275	Square Yards	$ 2.00	$ 550.00
14	Emulsified Asphalt for Tack Coat (Incidental)	0	Incidental	$ -	$ -
15	Restore Landscaping with Native Seeding	1	Lump Sum	$ 3,000.00	$ 3,000.00
16	8-Inch C900 PVC Potable Water Pipe, Fittings and Couplings with Restrained Joints and Class A Backfill	3,700	Foot	$ 50.00	$ 185,000.00
17	8-Inch Bend	10	Each	$ 400.00	$ 4,000.00
18	8-Inch Tee-In Connection to 6-Inch Existing Main	1	Each	$ 1,500.00	$ 1,500.00
19	8-Inch Tee-In Connection to 8-Inch Existing Main	1	Each	$ 1,500.00	$ 1,500.00
20	Blow-off Assembly, 2-Inch	1	Each	$ 4,000.00	$ 4,000.00
21	8-Inch Gate Valve	2	Each	$ 1,000.00	$ 2,000.00
22	Hydrant Assemblies	2	Each	$ 5,000.00	$ 10,000.00
23	Crossing - County Paved - 30-foot width	2	Each	$ 1,500.00	$ 3,000.00
24	Crossing - County Gravel - 30-foot width	3	Each	$ 1,000.00	$ 3,000.00
25	Crossing - Private Paved - 20-foot width	0	Each	$ 1,200.00	$ -
26	Crossing - Private Concrete - 20-foot width	0	Each	$ 1,500.00	$ -
27	Crossing - Private Gravel - 20-foot width	3	Each	$ 800.00	$ 2,400.00
	Paved Crossings include sawcutting, cold-planing pavement removal, and trench resurfacing including tack coat and T-cut with 6" AC Patch			Subtotal	$ 287,190.00
				Contingency (30%)	$ 86,157.00
				Engineer's Construction Cost Opinion	**$ 373,347.00**

Crooked River Ranch Water Company
Water System Upgrades Study
11/9/2017
Engineer's Construction Cost Opinion

Option 1e-1. New Cistern at Outlook Place

No.	Description	Qty	Unit	Unit Price	Total Cost
1	Mobilization	1	Lump Sum	$ 50,730.00	$ 50,730.00
2	Project Permitting	1	Lump Sum	$ 5,000.00	$ 5,000.00
3	Field Explorations	1	Lump Sum	$ 2,000.00	$ 2,000.00
4	Construction Staking	1	Lump Sum	$ 1,000.00	$ 1,000.00
5	Furnish and Install Cistern with Attached Equipment Building, Complete	1	Lump Sum	$ 307,250.00	$ 307,250.00
6	Furnish and Install Booster Pump System and Controls, Complete	1	Lump Sum	$ 67,000.00	$ 67,000.00
7	Program and Connect New Cistern to Existing SCADA System	1	Lump Sum	$ 10,000.00	$ 10,000.00
8	Furnish and Install Equipment Room Piping, Magmeter, and Appertenances, Complete	1	Lump Sum	$ 30,000.00	$ 30,000.00
9	Furnish and Install New Electrical Equipment, Complete	1	Lump Sum	$ 20,000.00	$ 20,000.00
10	Clearing and Grubbing	1	Lump Sum	$ 2,000.00	$ 2,000.00
11	General Excavation	0	Cubic Yards	$ 6.00	$ -
12	Embankment in Place	0	Cubic Yards	$ 20.00	$ -
13	Site Paving - 6", 3/4" Aggregate Base	750	Square Feet	$ 1.00	$ 750.00
14	Site Paving - 3" AC Pavement	750	Square Feet	$ 2.00	$ 1,500.00
15	Construction Entrance	1	Lump Sum	$ 2,000.00	$ 2,000.00
16	Site Detention Pond	1	Lump Sum	$ 10,000.00	$ 10,000.00
17	Furnish and Install ODOT Class 100 Rip Rap	50	Cubic Yards	$ 15.00	$ 750.00
18	Furnish and Install 6-foot Chain Link Fencing with Privacy Slats	200	Lineal Foot	$ 25.00	$ 5,000.00
19	Furnish and Install Chain Link Gates (1 motorized slide and 1man	1	Lump Sum	$ 10,000.00	$ 10,000.00
20	Furnish and Install Temporary Erosion Control and Dust Abatemen	1	Lump Sum	$ 5,000.00	$ 5,000.00
21	Landscape Rehabilitation	1	Lump Sum	$ 1,000.00	$ 1,000.00
22	Permanent Seeding	1	Lump Sum	$ 1,000.00	$ 1,000.00
23	Temporary Irrigation	1	Lump Sum	$ 1,000.00	$ 1,000.00
24	Traffic Control	1	Lump Sum	$ 1,000.00	$ 1,000.00
25	Fire Hydrant Assembly	1	Each	$ 5,000.00	$ 5,000.00
26	Yard Piping, Complete	1	Lump Sum	$ 20,000.00	$ 20,000.00
				Subtotal	$ 558,980.00
				Contingency (30%)	$ 167,694.00
				Engineer's Construction Cost Opinion	**$ 726,674.00**
				Engineer's Construction Cost Opinion	**$ 894,368.00**

Crooked River Ranch Water Company
Water System Upgrades Study
11/9/2017
Engineer's Construction Cost Opinion

Option 1e-2. New Discharge Piping for Cistern at Outlook Place

No.	Description	Qty	Unit	Unit Price	Total Cost
1	Mobilization	1	Lump Sum	$ 17,550.00	$ 17,550.00
2	Temporary Work Zone Traffic Control, Complete (Includes R/W Permits	1	Lump Sum	$ 1,000.00	$ 1,000.00
3	Erosion Control (Incl. Sediment Fence and Construction Entrance if req'd	1	Lump Sum	$ 2,000.00	$ 2,000.00
4	Construction Survey Work	1	Lump Sum	$ 2,000.00	$ 2,000.00
5	Asphalt Pavement Saw Cutting	500	Foot	$ 2.00	$ 1,000.00
6	Removal of Structures and Obstructions	1	Lump Sum	$ 1,000.00	$ 1,000.00
7	Clearing and Grubbing	1	Lump Sum	$ 5,000.00	$ 5,000.00
8	Filling Abandoned Structures	1	Lump Sum	$ 1,000.00	$ 1,000.00
9	Trench Resurfacing (T-Cut and Patch w/ 6" AC)	112	Square Yards	$ 25.00	$ 2,800.00
10	Trench Resurfacing (Outside of Street)	56	Square Yards	$ 20.00	$ 1,120.00
11	Field Explorations	1	Lump Sum	$ 2,000.00	$ 2,000.00
12	Record Drawings	1	Lump Sum	$ 1,000.00	$ 1,000.00
13	Cold Plane Pavement Removal, 3 Inches deep	56	Square Yards	$ 2.00	$ 112.00
14	Emulsified Asphalt for Tack Coat (Incidental)	0	Incidental	$ -	$ -
15	Restore Landscaping with Native Seeding	1	Lump Sum	$ 5,000.00	$ 5,000.00
16	8-Inch C900 PVC Potable Water Pipe, Fittings and Couplings with Restrained Joints and Class A Backfill	2,550	Foot	$ 50.00	$ 127,500.00
17	8-Inch Bend	10	Each	$ 400.00	$ 4,000.00
18	8-Inch Tee-In Connection to 8-Inch Existing Main	2	Each	$ 1,500.00	$ 3,000.00
19	Blow-off Assembly, 2-Inch	0	Each	$ 4,000.00	$ -
20	8-Inch Gate Valve	2	Each	$ 1,000.00	$ 2,000.00
21	Hydrant Assemblies	3	Each	$ 5,000.00	$ 15,000.00
22	Crossing - County Paved - 30-foot width	0	Each	$ 1,500.00	$ -
23	Crossing - County Gravel - 30-foot width	1	Each	$ 1,000.00	$ 1,000.00
24	Crossing - Private Paved - 20-foot width	0	Each	$ 1,200.00	$ -
25	Crossing - Private Concrete - 20-foot width	0	Each	$ 1,500.00	$ -
26	Crossing - Private Gravel - 20-foot width	0	Each	$ 800.00	$ -
	Paved Crossings include sawcutting, cold-planing pavement removal, and trench resurfacing including tack coat and T-cut with 6" AC Patch			Subtotal	$ 195,082.00
				Contingency (30%)	$ 58,524.60
				Engineer's Construction Cost Opinion	**$ 253,606.60**

Crooked River Ranch Water Company
Water System Upgrades Study
11/9/2017
Engineer's Construction Cost Opinion

Option 2. Waterline Replacement Cistern to Well 4

No.	Description	Qty	Unit	Unit Price	Total Cost
1	Mobilization	1	Lump Sum	$ 194,890.00	$ 194,890.00
2	Temporary Work Zone Traffic Control, Complete (Includes R/W Permits	1	Lump Sum	$ 15,000.00	$ 15,000.00
3	Erosion Control (Incl. Sediment Fence and Construction Entrance if req'd	1	Lump Sum	$ 2,000.00	$ 2,000.00
4	Construction Survey Work	1	Lump Sum	$ 4,000.00	$ 4,000.00
5	Asphalt Pavement Saw Cutting	22,100	Foot	$ 2.00	$ 44,200.00
6	Removal of Structures and Obstructions (includes removal of 2-Inch hydrants)	1	Lump Sum	$ 10,000.00	$ 10,000.00
7	Clearing and Grubbing	1	Lump Sum	$ 2,000.00	$ 2,000.00
8	Filling Abandoned Structures	1	Lump Sum	$ 2,000.00	$ 2,000.00
9	Trench Resurfacing (T-Cut and Patch w/ 6" AC)	5,000	Square Yards	$ 25.00	$ 125,000.00
10	Trench Resurfacing (Outside of Street)	2,500	Square Yards	$ 20.00	$ 50,000.00
11	Field Explorations	1	Lump Sum	$ 10,000.00	$ 10,000.00
12	Record Drawings	1	Lump Sum	$ 1,000.00	$ 1,000.00
13	Cold Plane Pavement Removal, 3 Inches deep	2,500	Square Yards	$ 2.00	$ 5,000.00
14	Emulsified Asphalt for Tack Coat (Incidental)	0	Incidental	$ -	$ -
15	Restore Landscaping with Native Seeding	1	Lump Sum	$ 5,000.00	$ 5,000.00
16	12-Inch C900 PVC Potable Water Pipe, Fittings and Couplings with Restrained Joints and Class A Backfill	22,100	Foot	$ 60.00	$ 1,326,000.00
17	12-Inch x 8-Inch Tee	7	Each	$ 1,000.00	$ 7,000.00
18	12-Inch x 8-Inch Reducer	1	Each	$ 500.00	$ 500.00
19	12-Inch x 6-Inch Tee	9	Each	$ 1,000.00	$ 9,000.00
20	12-Inch Bend	45	Each	$ 500.00	$ 22,500.00
21	12-Inch x 4-Inch Tee	2	Each	$ 1,000.00	$ 2,000.00
22	Blow-off Assembly, 2-Inch	1	Each	$ 4,000.00	$ 4,000.00
23	12-Inch Butterfly Valve	16	Each	$ 1,000.00	$ 16,000.00
24	8-Inch Gate Valve	2	Each	$ 1,000.00	$ 2,000.00
25	Hydrant Assemblies	21	Each	$ 5,000.00	$ 105,000.00
26	Reconnecting Existing Hydrants	1	Each	$ 1,000.00	$ 1,000.00
27	Reconnecting Existing 1-Inch Water Service (Includes excavating, tapping the main, laying and jointing the pipe and fittings and appurtenances, backfilling, testing, flushing of the water service connection. Includes tap at main to the meter	145	Each	$ 500.00	$ 72,500.00
28	Crossing - County Paved - 30-foot width	4	Each	$ 1,500.00	$ 6,000.00
29	Crossing - County Gravel - 30-foot width	6	Each	$ 1,000.00	$ 6,000.00
30	Crossing - Private Paved - 20-foot width	7	Each	$ 1,200.00	$ 8,400.00
31	Crossing - Private Concrete - 20-foot width	22	Each	$ 1,500.00	$ 33,000.00
32	Crossing - Private Gravel - 20-foot width	71	Each	$ 800.00	$ 56,800.00
	Paved Crossings include sawcutting, cold-planing pavement removal, and trench resurfacing including tack coat and T-cut with 6" AC Patch			Subtotal	$ 2,147,790.00
				Contingency (30%)	$ 644,337.00
				Engineer's Construction Cost Opinion	**$ 2,792,127.00**

Crooked River Ranch Water Company
Water System Upgrades Study
11/9/2017
Engineer's Construction Cost Opinion

Option 3a. Loop Completion: SW Quail Rd - SW Shad Rd to SW Chickadee

No.	Description	Qty	Unit	Unit Price	Total Cost
1	Mobilization	1	Lump Sum	$ 20,170.00	$ 20,170.00
2	Temporary Work Zone Traffic Control, Complete (Includes R/W Permits	1	Lump Sum	$ 2,000.00	$ 2,000.00
3	Erosion Control (Incl. Sediment Fence and Construction Entrance if req'd	1	Lump Sum	$ 1,000.00	$ 1,000.00
4	Construction Survey Work	1	Lump Sum	$ 1,000.00	$ 1,000.00
5	Asphalt Pavement Saw Cutting	0	Foot	$ 2.00	$ -
6	Removal of Structures and Obstructions	1	Lump Sum	$ 1,000.00	$ 1,000.00
7	Clearing and Grubbing	1	Lump Sum	$ 1,000.00	$ 1,000.00
8	Filling Abandoned Structures	1	Lump Sum	$ 1,000.00	$ 1,000.00
9	Trench Resurfacing (Outside of Street)	720	Square Yards	$ 20.00	$ 14,400.00
10	Field Explorations	1	Lump Sum	$ 1,000.00	$ 1,000.00
11	Record Drawings	1	Lump Sum	$ 1,000.00	$ 1,000.00
12	Cold Plane Pavement Removal, 3 Inches deep	0	Square Yards	$ 2.00	$ -
13	Emulsified Asphalt for Tack Coat (Incidental)	0	Incidental	$ -	$ -
14	Restore Landscaping with Native Seeding	1	Lump Sum	$ 1,000.00	$ 1,000.00
15	8-Inch C900 PVC Potable Water Pipe, Fittings and Couplings with Restrained Joints and Class A Backfill	3,225	Foot	$ 50.00	$ 161,250.00
16	8-Inch Bend	0	Each	$ 400.00	$ -
17	8-Inch Connection to 8-Inch Existing Main	1	Each	$ 1,500.00	$ 1,500.00
18	8-Inch Connection to 6-Inch Existing Main	1	Each	$ 1,500.00	$ 1,500.00
19	Blow-off Assembly, 2-Inch	0	Each	$ 4,000.00	$ -
20	8-Inch Gate Valve	1	Each	$ 1,000.00	$ 1,000.00
21	Hydrant Assemblies	2	Each	$ 5,000.00	$ 10,000.00
22	Crossing - County Paved - 30-foot width	2	Each	$ 1,500.00	$ 3,000.00
23	Crossing - County Gravel - 20-foot width	0	Each	$ 1,000.00	$ -
24	Crossing - Private Paved - 20-foot width	0	Each	$ 1,200.00	$ -
25	Crossing - Private Concrete - 20-foot width	0	Each	$ 1,500.00	$ -
26	Crossing - Private Gravel - 20-foot width	0	Each	$ 800.00	$ -
	Paved Crossings include sawcutting, cold-planing pavement removal, and trench resurfacing including tack coat and T-cut with 6" AC Patch			Subtotal	$ 222,820.00
				Contingency (30%)	$ 66,846.00
				Engineer's Construction Cost Opinion	**$ 289,666.00**

Crooked River Ranch Water Company
Water System Upgrades Study
11/9/2017
Engineer's Construction Cost Opinion

Option 3b. Loop Completion: SW Mustang Rd - SW Buckskin Ln to SW Haddock Dr

No.	Description	Qty	Unit	Unit Price	Total Cost
1	Mobilization	1	Lump Sum	$ 16,880.00	$ 16,880.00
2	Temporary Work Zone Traffic Control, Complete (Includes R/W Permits	1	Lump Sum	$ 4,000.00	$ 4,000.00
3	Erosion Control	1	Lump Sum	$ 1,000.00	$ 1,000.00
4	Construction Survey Work	1	Lump Sum	$ 1,000.00	$ 1,000.00
5	Asphalt Pavement Saw Cutting	0	Foot	$ 2.00	$ -
6	Removal of Structures and Obstructions	1	Lump Sum	$ 1,000.00	$ 1,000.00
7	Clearing and Grubbing	1	Lump Sum	$ 1,000.00	$ 1,000.00
8	Filling Abandoned Structures	1	Lump Sum	$ 1,000.00	$ 1,000.00
9	Trench Resurfacing (T-Cut and Patch w/ 6" AC)	0	Square Yards	$ 25.00	$ -
10	Trench Resurfacing (Outside of Street)	550	Square Yards	$ 20.00	$ 11,000.00
11	Field Explorations	1	Lump Sum	$ 1,000.00	$ 1,000.00
12	Record Drawings	1	Lump Sum	$ 1,000.00	$ 1,000.00
13	Cold Plane Pavement Removal, 3 Inches deep	0	Square Yards	$ 2.00	$ -
14	Emulsified Asphalt for Tack Coat (Incidental)	0	Incidental	$ -	$ -
15	Restore Landscaping with Native Seeding	1	Lump Sum	$ 1,000.00	$ 1,000.00
16	6-Inch C900 PVC Potable Water Pipe, Fittings and Couplings with Restrained Joints and Class A Backfill	2,400	Foot	$ 50.00	$ 120,000.00
17	6-Inch Bend	4	Each	$ 400.00	$ 1,600.00
18	6-Inch Connection to 6-Inch Existing Main	2	Each	$ 1,500.00	$ 3,000.00
19	Blow-off Assembly, 2-Inch	0	Each	$ 4,000.00	$ -
20	6-Inch Gate Valve	2	Each	$ 1,000.00	$ 2,000.00
21	Hydrant Assemblies	3	Each	$ 5,000.00	$ 15,000.00
22	Crossing - County Paved - 30-foot width	0	Each	$ 1,500.00	$ -
23	Crossing - County Gravel - 20-foot width	2	Each	$ 1,000.00	$ 2,000.00
24	Crossing - Private Paved - 20-foot width	0	Each	$ 1,200.00	$ -
25	Crossing - Private Concrete - 20-foot width	0	Each	$ 1,500.00	$ -
26	Crossing - Private Gravel - 20-foot width	4	Each	$ 800.00	$ 3,200.00
	Paved Crossings include sawcutting, cold-planing pavement removal, and trench resurfacing including tack coat and T-cut with 6" AC Patch			Subtotal	$ 186,680.00
				Contingency (30%)	$ 56,004.00
			Engineer's Construction Cost Opinion		**$ 242,684.00**