



COIC ALTERNATIVES ANALYSIS

Greg McLaughlin, Washington Water Trust

Dave Rice, Anchor QEA

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Purpose of Alternatives Analysis

This analysis aims to identify opportunities and constraints of alternatives for enhancing Icicle Creek flows by improving the Cascade Orchards Irrigation Co. delivery system. Goals include:

- Conduct technical reviews of alternatives for enhancing Icicle Creek flows by improving the efficiency of the COIC delivery system
- Provide a basis for comparing the costs, benefits, opportunities, and constraints of the identified alternatives
- Summarize the analysis in enough detail to enable COIC and other stakeholders to weigh the alternatives, plan for future improvements and pursue funding for an improvement project.

Thanks to: Ecology Office of the Columbia River and the Icicle Work Group for supporting this analysis.

Background

In October of 2014, COIC and WWT signed an MOA to evaluate conservation alternatives and complete a review of water rights. The intent was to:

- Provide technical information and water rights information to COIC
- Conduct a feasibility study to explore four alternatives that would enhance flows in lower Icicle Creek
- Identify instream flow benefits and construction costs for each alternative
- Evaluate both environmental and administrative benefits of replacing the COIC diversion on Icicle Creek with a pumped on the Wenatchee River or improving the efficiency of the COIC delivery system



Description of Alternatives

Alt.	Description	Water Supply	Delivery System
1	Replace existing system with a pressurized, on-demand, system supplied by a river pump station. Discontinue operation of COIC diversion. Put water into trust. 4-8 cfs benefit to Icicle Creek.	A pump station on the Wenatchee River or on Icicle Creek near Shore Street.	Pressurized delivery pipeline in alignment of existing ditch and existing laterals.
2	Add additional capacity to Alternative 1 for other needs, such as fire protection, or supply for LNFH. 12-24 cfs benefit to Icicle Creek.	Same as Alternative 1.	Same as Alternative 1, but sized to 12-24 cfs.
3	Improve existing infrastructure by piping or lining to improve efficiency. .5 – 2 cfs benefit to Icicle Creek.	Maintain operation of existing diversion.	Replace existing open ditch with gravity pipelines or line existing ditch. Existing laterals to remain.
4	Evaluate consumptive use and identify opportunities to provide additional water savings via water user conservation.	Could be combined with Alternative 1, 2, or 3.	Could be combined with Alternative 1, 2, or 3.

Alternative 1 – up to 12 cfs benefit

- A pressurized, on-demand system supplied via a pump station on the Wenatchee River or Icicle Creek near Shore Street.
- The COIC portion of the diversion on Icicle Creek would no longer operate, and saved water would be put into trust.



Alternative 1

Summary of Hydraulic Analysis

Item	4 cfs Capacity	6 cfs Capacity	8 cfs Capacity
Pumping Station Design Flow	4cfs	6 cfs	8 cfs
Pumping, TDH	183 feet	188 feet	192 feet
Main Line Sizing	6-inch to 15-inch	6-inch to 15-inch	6-inch to 18-inch
Main Line Pressures	20 psi to 73 psi	20 psi to 76 psi	20 psi to 77 psi
Lateral Sizing	6-inch to 8-inch	6-inch to 8-inch	8-inch to 10-inch
Lateral Pressures	31 psi to 64 psi	30 psi to 65 psi	34 psi to 67 psi

Alternative 2 – 12 - 24 cfs benefit

- A pressurized, on-demand system supplied via a pump station on the Wenatchee River or Icicle Creek near Shore Street.
- Infrastructure sized for additional pumping and other COIC needs such as fire protection or increase water delivery to LNFH from Icicle or Wenatchee sources below Reach 2.
- COIC portion of the historical Icicle Creek diversion would no longer operate, and saved water would be put into trust.



Alternative 2

Summary of Hydraulic Analysis

Item	12 cfs Capacity	24 cfs Capacity
Pumping Station Design Flow	12 cfs	24 cfs
Pumping, TDH	180 feet	180 feet
Main Line Sizing	6-inch to 21-inch	6-inch to 30-inch
Main Line Pressures	20 psi to 72 psi	20 psi to 72 psi
Lateral Sizing	6-inch to 21-inch	8-inch to 30-inch
Lateral Pressures	31 psi to 62 psi	34 psi to 62 psi

Alternative 3 – 0.5 - 2 cfs benefit

- Use existing infrastructure, reduce seepage losses with piping or lining the ditch.
- Lower construction costs, but few funding opportunities with less water available to put into trust

Alternative 3

COIC Seepage Analysis Summary

		Team 1			Team 2	
Location	Flow	Total Gain/Loss	Total Gain/Loss	Flow	Gain/Loss	Gain/Loss
Top Weir	5.61	-	-	6.47	-	-
Bayne	-	-	-	6.45	0.02	0.3%
Wilkinson	5.35	0.26	4.6%	6.15	0.32	4.9%
Shore Street	5.36	0.25	4.5%	-	-	-
DS End of Open Ditch	4.80	0.81	16.9%	4.57	1.90	29.4%

1 Staff from Washington Water Trust/Washington Department of Fish and Wildlife

2 Staff from Chelan County Natural Resources Department

3 Represents water loss measured from Top Weir to measurement location.

4 The loss measured below Shore Street was largely due to ditch overtopping

Alternative 4

- Evaluate consumptive use at COIC to identify opportunities for additional consumptive use water via efficiencies, landscaping, conservation—made available for future growth, or marketed for municipal or mitigation uses.
- Alternative 4 would be considered only in conjunction with Alternatives 1, 2 and 3.



Summary of Probable Implementation Costs

Item	Alternative 1		
	4-cfs	6-cfs	8-cfs
Site and Preparation Work	\$109,000	\$104,000	\$104,000
Pressurized Delivery Pipelines	\$697,000	\$774,000	\$878,000
Gravity Delivery Pipelines	\$0	\$0	\$0
Ditch Lining	\$0	\$0	\$0
River Pump Station	\$431,000	\$569,000	\$673,000
Subtotal – Construction Cost	\$1,237,000	\$1,447,000	\$1,655,000
Mobilization/Demobilization (10%)	\$123,700	\$144,700	\$165,500
Sales Tax (8.2%)	\$101,434	\$118,654	\$135,710
Total Construction Cost ²	\$1.68M – \$1.90M	\$1.97M – \$2.22 M	\$2.25M - \$2.54M
Total Non-construction Costs ^{2, 3}	\$386K – \$430K	\$443K - \$495K	\$505K - \$564K
Total Project Implementation Cost ²	\$2.07M – \$2.33M	\$2.41M - \$2.72M	\$2.75M – \$3.11M

Notes:

- 1 Costs are in 2015 dollars.
- 2 The high end of the range of Total Construction/Non-Construction with 30% contingency.
- 3 The low end of the range includes a 15% construction contingency.
- 4 Non-construction costs include an allowance for engineering, permitting, and administration

Summary of Probable Implementation Costs

Item	Alternative 2	
	12-cfs	24-cfs
Site and Preparation Work	\$104,000	\$104,000
Pressurized Delivery Pipelines	\$1,074,000	\$1,470,000
Gravity Delivery Pipelines	\$0	\$0
Ditch Lining	\$0	\$0
River Pump Station	\$882,000	\$1,472,000
Subtotal – Construction Cost	\$2,060,000	\$3,046,000
Mobilization/Demobilization (10%)	\$206,000	\$304,600
Sales Tax (8.2%)	\$168,920	\$249,772
Total Construction Cost ²	\$2.80M - \$3.17M	\$4.14M - \$4.68M
Total Non-construction Costs ^{2, 3}	\$620K - \$693K	\$898K - \$1.01M
Total Project Implementation Cost ²	\$3.42M - \$3.86M	\$5.04m - \$5.69M

Notes:

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- 3 The low end of the range includes a 15% construction contingency.
- 4 Non-construction costs include an allowance for engineering, permitting, and administration

Summary of Long-term Operating Costs

Item	Alternative 1		
	4-cfs	6-cfs	8-cfs
Annual O&M/Administration	\$62,000	\$63,000	\$64,000
Annual Pumping Power Cost ²	\$5,114	\$8,046	\$10,559
Subtotal – Operating Costs	\$67,114	\$71,046	\$74,559
Annual Replacement Fund Cost ³	\$26,410	\$33,659	\$39,236
Total with Replacement Fund Costs	\$93,500	\$104,700	\$113,800
Capital investment for Operating Costs ⁴	\$1.17M	\$1.31M	\$1.42M
Total Max Project Cost	\$3.50M	\$4.03M	\$4.53M

Notes: O&M = operations and maintenance

- 1 Costs shown are in 2015 dollars. Long-term cost analysis assumes that costs will increase with inflation.
- 2 Pumping power costs are based on Chelan County PUD Rate Schedule 5 for Irrigation Service.
- 3 The annual replacement fund cost represents the deposit required during the first year of funding to fund replacement of 25% of all pipe and infrastructure during a 50-year design life cycle and 100% of pumps and electrical equipment during a 25-year design life cycle.
- 4 This is a fund designed to cover all operating costs with interest and grow at the estimated rate of inflation.

Summary of Long-term Operating Costs

Item	Alternative 2	
	12-cfs	24-cfs
Annual O&M/Administration	\$66,000	\$70,000
Annual Pumping Power Cost ²	\$15,167	\$29,408
Subtotal – Operating Costs	\$81,167	\$99,408
Annual Replacement Fund Cost ³	\$50,303	\$81,146
Total with Replacement Fund Costs	\$131,500	\$180,600
Capital investment for Operating Costs ⁴	\$1.64M	\$2.26M
Total Max Project Cost	\$5.50M	\$7.95M

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- 4 This is a fund designed to cover all operating costs with interest and grow at the estimated rate of inflation.

Summary of Long-term Operating Costs

Item	Alternative 3	
	Full Piping	Full Lining
Annual O&M/Administration	\$62,000	\$66,000
Annual Pumping Power Cost ²	\$0	\$0
Subtotal – Operating Costs	\$62,000	\$66,000
Annual Replacement Fund Cost ³	\$6,638	\$4,908
Total with Replacement Fund Costs	\$68,600	\$70,900
Capital investment for Operating Costs ⁴	\$858K	\$886K
Total Max Project Cost	\$2.39M	\$1.84M

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- 3 The annual replacement fund cost represents the deposit required during the first year of funding to fund replacement of 25% of all pipe and infrastructure and all pumps/electrical during a 50-year design life.
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