

Pacific Northwest Project Technical Memorandum

DATE: October 24, 2022

TO: Mr. Brian Cartwright, CIP Project Manager, City of Pasco
Mr. Steve Worley, Director of Public Works, City of Pasco

FROM: Darryll Olsen, Ph.D., Principal, PNP

SUBJECT: Water Market Information—Value of Water Market Purchases and Sales, Determining “Fair Market Value” for Pasco Needs

The City of Pasco asks some salient questions regarding how to understand current water market—water right—purchases and sales: what is the range of the water market values, and what constitutes “fair market value” for the development needs of Pasco? The questions are applicable to either levying development impact fees or securing water rights for new City growth.

Although water markets are subject to considerable price variability, adequate information and market knowledge exist to answer Pasco’s questions.

Information Sources/and Values:

The following information sources include:

- Water right change/transfers completed or reviewed by the Benton County Water Conservancy Board.
- Water right market information reviewed by the Columbia-Snake River Irrigators Association (CSRIA); this includes general inquiries and communications with buyers and sellers, and some purchase and sales agreements.
- Direct communications with buyers and sellers.
- Information provided by the Office of Columbia River, Ecology.
- Information received from discussions with credible water right consultants.
- Some public information surrounding water market sales (public notices/listings).

General Project Location:

- Water market sources must be surface (or groundwater) hydraulically connected to water flows passing into the McNary Pool, Columbia River—some level of direct hydraulic continuity must exist for management purposes.
- The water delivery pump station, point of diversion, for Pasco is in the McNary Pool.

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Water Market Value Range:

The estimated/actual market values under consideration are displayed in Table 1. It can be observed that the overall price range depends on:

- The size of the water block allocated for sale—the number of acre-ft included in the sale.
- The timing of the sale during the 2015-2022 period—time value of money, some real value changes in more recent years.
- Whether the sale is based on capital values versus leases; the sale payment structure.
- The escalation rates for leases, if applied.
- The term-duration of the lease.
- Whether the lease is “callable” during the term period; or revocable.

Interpreting the Market Values:

Tables 1 and 2, and interrelated fiscal factors, may be viewed on a common value basis given some adjustments:

- Limiting the time horizon to 2015-2022; the more recent years likely suggest structural increases in value within the water market, likely to persist in future years.
- The values are presented on a common value basis, all estimates/transactions have been adjusted to 2022\$ using an implicit price deflator (based on real GDP changes).
- The lease values also are “capitalized” based on net present value terms, where the discount rate is equivalent to Pasco’s cost of capital—manifest by the interest rate for a municipal bond offering, here estimated at 4.5% (nominal rate).¹
- The estimated capital equivalent values allow for a common comparison between water right capital values.

Recommendations:

A fair market value estimate:

- Given the value range in Table 1, and some appreciation for real-time changes to a fair market value, Pacific Northwest Project recommends that a reasonable estimate would be about \$4,150/acre-ft., capital value in 2022\$.
- Long-term annual lease values can differ based on varying base values (\$/Acre-ft./year), term periods, escalators, and expectations for net present value (capitalization).
- As Table 2 indicates, a baseline capital value (NPV) can be the same for leases structured with the same 20-year term period, but with different initial \$/acre-ft. and escalators.

¹ Books have been literally written on what is the “correct” discount rate that should be applied to different public or private time streams of money. Many economists prefer real discount rates for alternative comparisons. The real discount rate depicts real value changes over time affecting for what is being valued; whereas nominal value discount rates add some measure of inflation. In Table 2, the discount rate is based on Pasco’s cost of capital (municipal bonds), that also embed local-state-federal tax exemptions.

- Applying an equivalent discount rate of 4.5% for twenty-years, an initial lease value of about \$252/acre-ft./year, with a 2.5% escalator/year, has the same NPV (capitalized value) as a lease with an initial \$310/acre-ft., with no escalators. The estimated, capitalized value being about \$4,150/acre-ft.

Further:

- The Western U.S. is experiencing significant climate change impacts that will reduce water supplies for both irrigated agriculture and municipal demands. This factor will drive U.S. population and the Irrigated Agriculture Industry to the Greater Columbia River Basin region. This means water supplies will increase further in real value terms during the next decade.²
- Given that long-term leases are more readily acquired than capital purchases, the City should consider a long-term, twenty-year lease.
- The Pacific Northwest Project recommends a baseline lease rate of \$310/acre-ft./year, with no escalators during the lease term.
- The lease should be irrevocable to reduce purchase risk to the City.
- The best way to confirm market value is to engage the market with a fixed price point, the market value and terms preferred by the City. This can be accomplished with a simple request for proposals (RFP) issuance with specific terms acceptable to the City, without a negotiation process.

Regulatory Factors:

- Water markets are affected by the type of regulatory oversight imposed by Ecology for making water right change/transfers from buyer to seller. The more complex the regulatory hurdles, the less certainty surrounding market transactions and increased costs.
- It is recommended that the City rely on the Franklin County Water Conservancy Board to complete its water right change/transfers.

Attachments:

- 1) Table 1 Market Value Range.
- 2) Table 2 Lease Value Capitalization Example for Pasco.
- 3) Table 3 Amortization for Capital Values—Lease Value Comparison (for information).

² CSRIA review of Western U.S. Irrigated Agriculture Water Supplies and Assets (proprietary report).

Table 1

**Selected Range of Estimated Water Market Values, 2015-2022
Water Lease and Capital Values (Approximate Adjusted 2022\$)**

Water Source/Use For	Amount Acre-ft.	Annual Lease \$/Acre-ft.	Lease Cap. Equiv. \$/Acre-ft.	Capital \$/Acre-ft	Comments
Yakima Valley	<25	-----	-----	\$9,000	Outlier transaction.
Lt. Production Wine Gr.					High Transaction Costs.
Kittitas Valley	<200	-----	-----	=>\$5,000	Initial water banking for domestic wells.
Exempt Well Mitigation					Kittitas County.
Upper Yakima Valley	>200	-----	-----	\$4,500	Yakima County exempt well use.
Exempt Well Mitigation					
Upper Yakima Valley	<400	-----	-----	>\$4,000	Sale pending.
Likely Small Muni.				Anticipated	High Transaction Costs.
Upper Yakima Valley	>1,000	??	-----	>\$4,000	Sale pending.
Likely Small Muni.				Anticipated	High Transaction Costs.
Upper Okanagon R.	>400	\$300	>\$4,000	>\$4,000	Term lease with escalators.
Multiple Use-Ag.?		20-Year Term			OCR Water Bank.
Benton County	<200	-----	-----	\$4,390	Water banking for exempt well use.
Exempt Well Mitigation					
Upper Yakima Valley	>100	-----	-----	\$3,950	Production agriculture-wine grape use.
Red Mt. Wine Grapes					High Transaction Costs.
McNary-John Day Pool	<100	-----	-----	\$3,950	Production agriculture-wine grape use.
HHH Wine Grapes					High Transaction Costs.
John Day Pool	>500	-----	-----	\$1,900	Production agriculture-wine grape use.
HHH Wine Grapes					Low Transaction Costs.
John Day Pool	>500	-----	-----	\$1,790	Production agriculture-wine grape use.
HHH Wine Grapes					Low Transaction Costs.
McNary-John Day Pool	>700	-----	-----	\$3,075	Production agriculture row crops.
Production Ag.					P&SA signed.
Lower Yakima R.-McNary Pool	>2,000	\$220	\$3,000	\$3,000	Term lease with escalators.
Production Ag.		20-Year Term			Low Transaction Costs.
Mid-Columbia-McNary Pool	>1,000	\$220	\$1,360	\$1,360	Term lease with escalators.
Production Ag.		7-Year Term			OCR Water Bank.
McNary-John Day Pool	>1,000	\$135	\$850	\$850	Callable water rights-OCR Water Bank.
Multi-Use		10-Year Term			(Moderate Risk).
McNary-John Day Pool	<200	\$135	\$850	\$850	Callable water rights-OCR Water Bank.
Multi-Use		10-Year Term			(Moderate Risk).
Ice Harbor-McNary Pools	About 470	\$250	\$4,150	\$4,150	Term lease with escalators.
Multi-Use		20-Year Term			OCR Water Bank? Low Transaction Costs.
Pacific NW Project Market Value	>1,000	\$310	\$4,150	\$4,150	Fixed Rate Payment (4.5% Discount Rate)
Estimate-Financial Structure		20-Year Term			Low Transaction Costs.

Source-Market Data: Pacific NW Project relying on information from the Benton County Water Conservancy Board and Columbia-Snake River Irrigators Association; and with multiple communications with water right holders and water right consultants.

Dollar values converted to 2022\$ per BEA GDP implicit price deflators.

Pacific NW Project is responsible for all assumptions or market price estimate errors, given best available data and communications.

Real discount rates refer to real value changes over time, separate from inflation changes. Nominal discount rates usually include some amount of inflation.

Table 2

**Annual Payments Analysis (2022\$)
City of Pasco Water Lease Example**

Alt. 1					Alt. 2				
	Base	Annual	Pasco			Base	Annual	Pasco	
	Annual	Escalation	Nominal			Annual	Escalation	Nominal	
Acre-ft.	\$/Acre-ft.	Rate	Discount		Acre-ft.	\$/Acre-ft.	Rate	Discount	
1,500.0	\$252	2.50%	4.50%		1,500.0	\$310	0.00%	4.50%	
Real Discount Rate*:		4.50%			Real Discount Rate*:		0.00%		
Implicit Inflation Rate:		4.00%			Implicit Inflation Rate:		0.00%		
Nominal \$:		\$9,655,881			Nominal \$:		\$9,300,000		
NPV:		\$6,218,950			NPV:		\$6,218,920		
NPV/Acre-ft.**:		\$4,146			NPV/Acre-ft.**:		\$4,146		
20 Years			Nominal		20 Years			Nominal	
Payment	Annual	Total	Discount	NPV Value	Payment	Annual	Total	Discount	NPV Value
Schedule	Payment	Cost	Factor+	Stream+	Schedule	Payment	Cost	Factor+	Stream+
3/2024	\$252	\$378,000	1.00	\$378,000	3/2024	\$310	\$465,000	1.00	\$465,000
3/2025	\$258	\$387,450	0.96	\$370,015	3/2025	\$310	\$465,000	0.96	\$444,075
3/2026	\$265	\$397,136	0.91	\$362,198	3/2026	\$310	\$465,000	0.91	\$424,092
3/2027	\$271	\$407,065	0.87	\$354,547	3/2027	\$310	\$465,000	0.87	\$405,008
3/2028	\$278	\$417,241	0.83	\$347,057	3/2028	\$310	\$465,000	0.83	\$386,782
3/2029	\$285	\$427,672	0.79	\$339,725	3/2029	\$310	\$465,000	0.79	\$369,377
3/2030	\$292	\$438,364	0.76	\$332,549	3/2030	\$310	\$465,000	0.76	\$352,755
3/2031	\$300	\$449,323	0.72	\$325,524	3/2031	\$310	\$465,000	0.72	\$336,881
3/2032	\$307	\$460,556	0.69	\$318,647	3/2032	\$310	\$465,000	0.69	\$321,721
3/2033	\$315	\$472,070	0.66	\$311,915	3/2033	\$310	\$465,000	0.66	\$307,244
3/2034	\$323	\$483,872	0.63	\$305,326	3/2034	\$310	\$465,000	0.63	\$293,418
3/2035	\$331	\$495,969	0.60	\$298,876	3/2035	\$310	\$465,000	0.60	\$280,214
3/2036	\$339	\$508,368	0.58	\$292,562	3/2036	\$310	\$465,000	0.58	\$267,604
3/2037	\$347	\$521,077	0.55	\$286,382	3/2037	\$310	\$465,000	0.55	\$255,562
3/2038	\$356	\$534,104	0.52	\$280,332	3/2038	\$310	\$465,000	0.52	\$244,062
3/2039	\$365	\$547,457	0.50	\$274,410	3/2039	\$310	\$465,000	0.50	\$233,079
3/2040	\$374	\$561,143	0.48	\$268,613	3/2040	\$310	\$465,000	0.48	\$222,591
3/2041	\$383	\$575,172	0.46	\$262,939	3/2041	\$310	\$465,000	0.46	\$212,574
3/2042	\$393	\$589,551	0.44	\$257,384	3/2042	\$310	\$465,000	0.44	\$203,008
3/2043	\$403	\$604,290	0.42	\$251,947	3/2043	\$310	\$465,000	0.42	\$193,873

*The real discount rate reflects the expected annual rate of return, separate from inflation. The "real" value increase over time.

**The NPV is roughly equivalent to the capitalized value of the water right, given the above escalation and discount rate assumptions (in 2023\$).

+The nominal discount rate used here reflects Pasco's estimated cost of capital for real capital investments.

Note: Above NPV value discounting starts in year two; year one (2024) discount rate is 1.0.

Table 3

**Annual Capital Equivalent Payment Analysis
Pasco Water Lease**

<u>Base</u> <u>\$/Acre-ft.</u>	<u>Amort.</u> <u>Period</u>	<u>Interest</u> <u>Rate</u>	<u>Annual</u> <u>\$/Acre-ft.</u>
\$850	7	4.50%	\$138
<u>\$2,000</u>	<u>20</u>	6.00%	\$164
\$2,500	20	4.50%	\$184
<u>\$2,500</u>	<u>20</u>	6.00%	\$206
\$3,000	20	4.50%	\$221
<u>\$3,000</u>	<u>20</u>	6.00%	\$247
\$3,500	20	4.50%	\$257
<u>\$3,500</u>	<u>20</u>	6.00%	\$288
\$4,000	20	4.50%	\$294
<u>\$4,000</u>	<u>20</u>	6.00%	\$329
\$4,146	<u>20</u>	4.50%	\$305
Term Inter.			
\$4,500	20	4.50%	\$331
<u>\$4,500</u>	<u>20</u>	6.00%	\$370
\$5,000	20	4.50%	\$368
<u>\$5,000</u>	<u>20</u>	6.00%	\$411
\$9,000	20	4.50%	\$662
<u>\$9,000</u>	<u>20</u>	6.00%	\$740