

**TVWD Long-Term Water Supply Planning  
Technical Memorandum 6 – Evaluation of Supply Options**

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To: TVWD Board of Commissioners  
From: Mark Knudson, P.E., Tualatin Valley Water District  
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Date: April 12, 2013  
RE: **Technical Memorandum 6 – Evaluation of Supply Options – *FINAL***



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## **1.0 INTRODUCTION**

Tualatin Valley Water District (TVWD, the District) is considering four long-term water supply options to serve projected water supply needs through the year 2050. The purpose of this memorandum is to summarize the TVWD Board of Commissioners' (Board's) evaluation of the four options and the decision process leading to the Board's preferred supply strategy.

## **2.0 EVALUATION PROCESS**

As presented in TM 4, the overall approach to the evaluation of the water supply options consisted of the following steps:

1. Develop evaluation criteria reflecting the values of the TVWD Board and TVWD's customers.
2. Evaluate each of the water supply options according to the criteria.
3. Use the results of the non-financial criteria evaluation to help inform the TVWD Board and aid in their decision regarding a preferred supply strategy.

Steps 1 and 2, the criteria and evaluations, are described in detail in TM 4. This memorandum describes a proposed approach for Step 3, a decision framework for incorporating the evaluations in the Board's decision process.

The TVWD Board's decision on a preferred water supply strategy scheduled for April 2013.

## **3.0 DECISION FRAMEWORK**

At the January 8, 2013 Board Work Session, staff proposed an approach to help the TVWB Board of Commissioners in identifying the District's preferred long-term supply option. This approach of "narrowing the decision space" is intended to help focus on the criteria that differentiate between the options and provide focus on those factors that have the greatest significance on the final decision.

Table 1 below summarizes the non-financial evaluation ratings as developed in TM 4. For the purposes of this evaluation, the individual options are based on the following:

- Portland Option – Assumes TVWD only (Hillsboro is not a partner) and Portland adds UV treatment in 2022.

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- Mid-Willamette Option – Assumes TVWD and Hillsboro partner on proposed improvements and TVWD continues to use the Portland supply to serve the Metzger service area.
- TBWSP – Assumes project is developed in full partnership with TVWD, Hillsboro, Beaverton and Clean Water Services, assumes no federal funding for seismic improvements to existing dam and continues to use the Portland supply to serve the Metzger service area.
- Northern Groundwater – Assumes TVWD and Hillsboro partner on proposed improvements and TVWD continues to use the Portland supply to serve the Metzger service area.

**Table 1. Summary of Final Evaluation Ratings of Water Supply Options**

Criteria		Portland	Mid-Willamette	TBWSP	Northern Groundwater
1	Demand Uncertainty	+	0	-	0
2	Source Reliability	0	+	+	+
3	Source Redundancy	0	+	0	+
4	Implementation Risk	0	0	-	-
5	Public Acceptance	+	0	0	-
6	Community Impacts	0	0	0	0
7	Metzger Fluoridation	0	0	0	0
8	Finished Water Quality	0	+	+	0
9	Sustainability	+	0	-	-
10	Governance	-	+	0	+

Starting from Table 1, it is noted that criteria 6 and 7, Community Impacts and Metzger Fluoridation, have the same ratings for each of the four options, as highlighted in Table 2. Since the ratings are the same for all options, these criteria will not affect on the final decision and can be removed from consideration without affecting the outcome.

**Table 2. Summary of Final Evaluation Ratings of Water Supply Options**

Criteria		Portland	Mid-Willamette	TBWSP	Northern Groundwater
1	Demand Uncertainty	+	0	-	0
2	Source Reliability	0	+	+	+
3	Source Redundancy	0	+	0	+
4	Implementation Risk	0	0	-	-
5	Public Acceptance	+	0	0	-
6	Community Impacts	0	0	0	0
7	Metzger Fluoridation	0	0	0	0
8	Finished Water Quality	0	+	+	0
9	Sustainability	+	0	-	-
10	Governance	-	+	0	+

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Financial and economic factors are now introduced into the decision space to begin the process of making tradeoffs between financial and non-financial criteria. Table 3 presents an updated comparison, with Criteria 6 and 7 removed from the decision space and including the relative present value and relative rate impacts of each option, as presented in TM 3. Relative present value is presented as a percentage greater than the option with the least present value. Relative rate impact is presented as dollars per month above or below the resulting typical monthly water bill for the base option (TBWSP without federal funding) in the year 2036.

<b>Table 3. Updated Evaluation of Water Supply Options, Including Cost</b>					
<b>Criteria</b>		<b>Portland</b>	<b>Mid-Willamette</b>	<b>TBWSP</b>	<b>Northern Groundwater</b>
1	Demand Uncertainty	+	0	-	0
2	Source Reliability	0	+	+	+
3	Source Redundancy	0	+	0	+
4	Implementation Risk	0	0	-	-
5	Public Acceptance	+	0	0	-
8	Finished Water Quality	0	+	+	0
9	Sustainability	+	0	-	-
10	Governance	-	+	0	+
	Relative Present Value	26% higher	Least PV	25% higher	22% higher
	Rate Impact over Base	\$4.52/mo more	\$2.81/mo less	\$23.97/mo more	\$15.84/mo more

By inspection of Table 3, it is noted that the TBWSP and Northern Groundwater options both include three negative scores; by comparison, Portland includes only one negative score and the Mid-Willamette includes no negative scores. In addition, both the TBWSP and Northern Groundwater options have the highest relative present values and greatest rate impacts as compared to the Portland and Mid-Willamette options. Given these limitations, it is proposed the TBWSP and Northern Groundwater options be “sidelined” or set aside for further consideration at this point in the process. Table 4 presents the narrowed comparison of the two remaining options.

<b>Table 4. Narrowed Evaluation of Water Supply Options</b>			
<b>Criteria</b>		<b>Portland</b>	<b>Mid-Willamette</b>
1	Demand Uncertainty	+	0
2	Source Reliability	0	+
3	Source Redundancy	0	+
4	Implementation Risk	0	0
5	Public Acceptance	+	0
8	Finished Water Quality	0	+
9	Sustainability	+	0
10	Governance	-	+
	Relative Present Value	25% higher	Least PV
	Rate Impact over Base	\$4.52/mo more	\$2.81/mo less

Table 4 reflects that both of the remaining options received equal ratings for Implementation Risk, allowing that criterion to be deleted from further consideration. Table 5 presents the updated and narrowed decision space.

<b>Table 5. Narrowed Evaluation of Water Supply Options</b>			
<b>Criteria</b>		<b>Portland</b>	<b>Mid-Willamette</b>
1	Demand Uncertainty	+	0
2	Source Reliability	0	+
3	Source Redundancy	0	+
5	Public Acceptance	+	0
8	Finished Water Quality	0	+
9	Sustainability	+	0
10	Governance	-	+
	Relative Present Value	25% higher	Least PV
	Rate Impact over Base	\$4.52/mo more	\$2.81/mo less

In reviewing Table 5, the two remaining options have notable differences based on the remaining evaluation criteria. These difference and their associated risks and tradeoffs are summarized below:

Criteria that were more favorable for the Portland supply consisted of:

- **Demand Uncertainty** – The Portland option is somewhat “scalable” in that demand could be increased over time in response to growth to take full advantage of the existing infrastructure such as the existing Washington County Supply Line (WCSL). In addition, the Portland option provides flexibility by allowing the implementation of a second WCSL when needed, based on

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demands. And the second WCSL would be more accurately sized based on future demands rather than existing long-term estimates of future demands. In contrast, the Mid-Willamette option must initially be designed and initially constructed to its intended full capacity based on existing long-term demand estimates.

- **Public Acceptance** – Portland’s Bull Run source has enjoyed very strong public acceptance over the years. In contrast, questions and concerns have been raised in the past regarding the Mid-Willamette supply. However, the City of Wilsonville has successfully used the Willamette supply for over 10 years with no regulatory violations and a high degree of public acceptance.
- **Sustainability** – The Portland option would supply TVWD by gravity, requiring no pumping beyond TVWD’s existing distribution pump stations. In contrast, the Mid-Willamette option would require significant pumping of all water supplied to the District.

Criteria that were more favorable for the Mid-Willamette supply consisted of:

- **Source Reliability** – The Mid-Willamette option provides significant benefits as compared to the Portland option since the Willamette River has significant excess capacity as compared to Portland’s Bull Run source. Further, the Mid-Willamette improvements would be designed and constructed to current seismic standards. Although the WCSL2 would be designed to current standards, many of the critical supply components of Portland’s Bull Run supply are over 50 years old and were not designed to withstand an earthquake. In addition, there is no assurance that Portland would renew the wholesale water supply contract at some point in the future, leaving TVWD searching for a new source in the future with as little five years notice.
- **Source Redundancy** – The Mid-Willamette option would become a new source of supply for TVWD, providing a third source that is completely independent of the District’s existing two sources. In contrast, further reliance on the Portland option would not add any redundancy to the existing system.
- **Finished Water Quality** – In general, based on analytical data for the existing supplies, the finished water quality of the Willamette supply is superior to the Portland option. This is reflected in the Willamette having much lower turbidity, lower disinfection byproducts, lower suspended solids, and consistently low levels of total organic carbon. This finished water is largely the result of the treatment provided at the Willamette River Water Treatment Plant. In contrast, Portland’s unfiltered Bull Run source is subject to turbidity excursions as high as 5.0 NTU and requires the use of chloramine residual disinfection to remain in compliance with existing disinfection byproduct rules.
- **Governance** – TVWD and its partners, such as the City of Hillsboro, would own the Mid-Willamette option; TVWD would have full authority for establishing policies, programs, procedures, financial strategies and levels of investment in this option. In contrast, the Portland option would rely on a wholesale water supply contract between TVWD and Portland and Portland would retain full authority for establishing policies, programs, future investments and rates for purchased water.
- **Cost** – As described in *TM 3 – Economic and Financial Evaluation*, the Mid-Willamette supply had the lowest present value of the viable options, with the present value of the Portland option 25% greater than this low cost option. The Mid-Willamette option was projected to decrease rates, relative to the TBWSP 2007 Decision, over a 30-year period. The Portland option was projected to decrease rates similar to the Mid-Willamette option through 2026, at

which point rates were projected to increase relative to both the Mid-Willamette and the TBWSP 2007 Decision through the end of the evaluated period (2036).

It is suggested the TVWD Board focus on these differences and tradeoffs in reaching a final recommendation for a preferred long-term water supply option.

#### **4.0 RISKS & UNCERTAINTIES**

To document the relative risks and unknowns associated with the Portland and Mid-Willamette options, the following “what if” assessment was prepared. This “what if” assessment consisted of: (i) identifying a series of potential risks or unknowns, (ii) evaluating each supply option to consider how the risk might impact the option and how the option might be able to mitigate or adapt to the given risk, and then (iii) identify which of the two options considered is the “more resilient” supply option. The potential risks and their respective evaluations are as follows:

1. **Water Quality Event** – For the Portland option, this risk considers a potential contamination event such as a fire, flood or pest infestation in the Bull Run Watershed or a spill incident in the Columbia South Shore Wellfield. For the Mid-Willamette source, this risk considers a potential contamination event or spill incident on the Willamette River upstream of the treatment plant intake. For the Portland option, simultaneous contamination of both the Bull Run and groundwater sources would be unlikely; hence supply would be anticipated to continue uninterrupted during a contamination event. However, depending on the affected source and the duration of the event, it the supply may not be available at full capacity. For the Mid-Willamette option, a water quality event may limit supply capacity of the Willamette source but the Portland source would still be available as an emergency backup supply. Therefore, the Mid-Willamette provides greater resiliency in this category of risk.
2. **Future Regulations** – This risk considers potential new, future regulation(s) requiring additional treatment and/or controls as related to source water. The Portland supply currently has minimal treatment and new regulations focused on minimum treatment requirements or emerging pathogens could require implementation of filtration or other treatment technologies. However, no such regulations are under current consideration by the U.S. Environmental Protection Agency (USEPA). The Willamette has a relatively greater potential for the presence of future-regulated constituents due to its larger, more populated watershed. However, the anticipated use of best available treatment technology would mitigate the risk posed by a wide range of constituents. Therefore, although Portland has a reduced risk of contamination, the Willamette treatment plant will use best available treatment technology and would presumably be more effective in reducing or responding to added regulatory requirements. Therefore, the Mid-Willamette provides greater resiliency in this category of risk.
3. **Seismic Event** – This factor considers potential impacts of a Cascadia Subduction Zone Earthquake on the supply option. The existing Portland supply system is approximately 30 to 100 years old and, although some improvements to the supply system have been made recently (e.g., Sandy River Crossing, conduit interties, groundwater pump station structural upgrades), key supply components (e.g., major conduit segments and the existing WCSL) have not been seismically upgraded. Therefore, it is assumed that the Portland system could be severely

impacted by a large seismic event. In contrast, the Mid-Willamette supply improvements would be built to current standards for seismic design. Therefore, the Mid-Willamette provides greater resiliency in this category of risk.

4. **Source Quality Changes** – This factor considers potential long-term changes in source water quality as a result of climate change or other phenomena. Portland’s Bull Run source relies on source water protection and may be vulnerable to long-term changes in water quality that could require implementation of filtration or other additional treatment. The Mid-Willamette option includes a state-of-the-art water treatment plant based on a multi-barrier protection strategy and provides greater adaptability to changes in source water quality changes. Therefore, the Mid-Willamette provides greater resiliency in this category of risk.
5. **Source Quantity Changes** – This factor considers potential long-term changes in the availability of source quantity as a result of climate change or increased demands. Portland’s Bull Run source relies on two existing reservoirs plus the Columbia South Shore Wellfield. These sources have consistently proven adequate to meet recent demands; however, the Bull Run system could be vulnerable to extreme, sustained drought and the full capacity of the wellfield can be sustained for a limited duration of continuous pumping (i.e., wellfield capacity drops off with sustained, long-term pumping). The Mid-Willamette supply relies on run of river flows supported by over one million acre-feet of stored water in 12 federal storage projects throughout the Willamette basin. The Willamette system could also be subject to extreme, sustained drought, but water rights on the Willamette are currently not fully allocated. In addition, the Mid-Willamette option results in a new source of supply for the region and enhances the overall redundancy of the regional water supply system. Therefore, the Mid-Willamette provides greater resiliency in this category of risk.
6. **Schedule** – This factor considers vulnerability to potential delays to the schedule for implementation of the supply option. The Portland option has few critical milestone dates; timing for implementation of the second Washington County Supply Line (WCSL-2) could be delayed (although delay would sustain the existing seismic vulnerability and reduce total capacity) and it is assumed that the existing supply agreement could continue to be renewed without changes in the contract terms. The Mid-Willamette option assumes completion of needed infrastructure by 2026 in order to avoid an additional 10-year renewal of the existing supply agreement with Portland. Because of its greater schedule flexibility, the Portland option provides greater resiliency in this category of risk.
7. **Capital Costs** – This factor considers risks associated with uncertainty in the total capital costs of each supply option. Estimated capital cost for the Mid-Willamette option is about 10 percent greater than the Portland option and timing of the cash flow for the Portland option is delayed as compared to the schedule for the Mid-Willamette option. In addition, it may be possible to further delay expenditures for the WCSL-2 (with no improvement in the current seismic vulnerability or supply capacity). Both supplies require implementation of long transmission pipelines with each pipeline representing significant cost risks; however, a greater portion of the capital costs for the Mid-Willamette supply are associated with new treatment and pumping facilities at the existing treatment plant site, resulting in somewhat lower uncertainty of those

costs. Given the relatively similarity of capital costs and uncertainties, the two options have relatively equal capital cost risk.

8. O&M Costs – This factor considers uncertainty in future costs associated with operations and maintenance (O&M), including costs for purchased water. The Portland option has relatively high O&M costs reflecting the cost of future water purchases under the existing water supply agreement. Uncertainty in future wholesale rates includes the possibility that Portland could insist on revised contract terms as a condition of renewing the existing agreement, which would increase future costs of purchased water. The wholesale rate is also affected by water purchases by other wholesale users; reductions in both total usage and peaking (ratio of peak day to average day usage) by other wholesale customers would increase costs to TVWD. It is also possible that future costs could be lower than assumed; Portland could offer TVWD a reduced wholesale rate to maintain TVWD as a wholesale customer. The Mid-Willamette option has moderate O&M costs (less than purchased water costs under the Portland option) and has exposure to potential increases in future energy costs. However, ownership of the Mid-Willamette supply assets provides greater control over future rate increases as compared to the Portland option. In addition, it would be possible for the Mid-Willamette option to serve Metzger, resulting in reduced unit costs for this option. Therefore, the Mid-Willamette option provides greater resiliency in this category of risk.
9. Ownership – This factor considers the relative risks associated with ownership of the supply option. The Portland supply option assumes that the City of Portland would continue to own the majority of the supply assets including the Bull Run and wellfield supply systems, conduits, and Powell Butte Reservoirs. Under the existing water supply agreement, Portland retains authority for all policy decisions related to these assets; however, TVWD would have no requirements associated with ongoing maintenance of the assets. The Mid-Willamette option assumes TVWD would be a joint owner, in partnership with at least one other water provider, in the Willamette water treatment plant and pipeline. Under the Mid-Willamette option, TVWD would be responsible for ensuring the operation and maintenance of the supply system and would have joint authority for all policy decisions related to these assets. While there is some benefit associated with the Portland option by not being responsible for ownership (e.g., simplified staffing and lower potential liability), there is a notable risk that Portland could decide to not renew the existing water supply agreement or impose more costly contract terms as a condition of renewal. This potential risk of non-renewal or more costly contract terms as a condition of renewal associated with the Portland option is avoided by owning the supply system assets under the Mid-Willamette option. Therefore, the Mid-Willamette option provides greater resiliency in this category of risk.
10. Political – This factor reflects the potential political risks associated with the two options. The Portland option may be perceived by the public as being a preferable option. In addition, the City of Portland may actively resist loss of TVWD as Portland’s largest customer given the potential financial significance to Portland wholesale and retail customers. Alternatively, the City of Hillsboro has already identified the Mid-Willamette as their preferred supply option and TVWD’s selection of the Mid-Willamette option is seen by many Washington County leaders as an integral part of a comprehensive solution to meet the county’s long-term regional water needs. In addition, the Mid-Willamette option will help enhance political relationships between

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partners in the supply improvements, including the Willamette River Water Coalition. After discussion with the TVWD Board, it was determined that the two supply options have relatively equal political risks.

11. **Changes in Regional Economy** – This factor reflects the risks associated with changes, either up or down, in the regional economy. The Portland option has delayed capital investment and therefore results in greater flexibility and lower risks in the event of a significant downturn in the economy of Washington County prior to implementation of the WCSL-2. The Mid-Willamette option requires a higher level of initial capital investment and there would be a relatively short window (~ 5 years) during which the project could be scaled back or delayed in response to reduced projections of future water demands. However, the Mid-Willamette option also provides a higher level of certainty for supply and more predictable water rates in the event of future growth of economy of Washington County. It appears the two supply options are relatively equal in their ability to accommodate uncertainties of the regional economy.
  
12. **Regional Opportunity** – This factor reflects the relative risks associated with the opportunity to select a water supply option to help meet the water supply needs of the Washington County region. The Portland option increases the total conveyance capacity from the Portland system to Washington County but otherwise maintains the status-quo of purchasing water from the City of Portland. In contrast, the Mid-Willamette option represents a unique opportunity to establish a partnership with other water providers in to provide a new, long-term water source for the Washington County region. The Mid-Willamette takes full advantage of the opportunity to diversify regional water supplies and reduce overall costs to TVWD and its partners. Therefore, the Mid-Willamette option provides greater resiliency in this category of risk.

This evaluation of potential risks and uncertainties is summarized in Table 6, which reflects the TVWD staff analysis and Board comments from the April 2, 2013 work session.

<b>Table 6. Summary of Risks &amp; Uncertainties</b>		
	<b>Risk or Uncertainty</b>	<b>“More Resilient” Option</b>
1.	Water Quality Event	Willamette
2.	Future Regulations	Willamette
3.	Seismic Event	Willamette
4.	Source Quality Changes	Willamette
5.	Source Quantity Changes	Willamette
6.	Schedule	Portland
7.	Capital Costs	~ Equal
8.	O&M Costs	Willamette
9.	Ownership	Willamette
10.	Political	~ Equal
11.	Changes in Regional Economy	~ Equal
12.	Regional Opportunity	Willamette