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ANCHOR QEA

Memorandum

December 9, 2024

To: Nat Kale, Office of Chehalis Basin; Merri Martz, Anchor QEA

From: Bob Montgomery, PE, Anchor QEA

Re: Water Storage Replacement for Skookumchuck Reservoir

Introduction

TransAlta operates the Centralia Steam Generation Plant with a current water right of 51.6 cfs and 28,033 acre-feet per year (AF/year). TransAlta owns and operates the Skookumchuck Reservoir with a full-pool (elevation 477 feet) storage capacity of 34,790 acre-feet with water from the reservoir released to satisfy its demand for cooling water for power generation. TransAlta diverts water downstream of the reservoir at river mile (RM) 7.2 and conveys water through a pipeline to the power plant. TransAlta has converted its water right into a water bank with the Washington Department of Ecology (Ecology). With water bank approval, there are 24.1 cubic feet per second (cfs) and 16,033 AF/year available for instream flows and other purposes until December 31, 2025. After 2025, there would be 51.6 cfs and 28,033 AF/year available, assuming the second turbine ceases operation.

The purpose of this memorandum is to calculate water storage needs for the case of the Skookumchuck Dam and Reservoir being removed. If the Skookumchuck Reservoir is removed, the intent is to replace current diversions from the Skookumchuck River and the demands of the water bank to maintain instream flows. That could be accomplished by constructing another reservoir and serving demands from the reservoir or releasing water into the Skookumchuck River to offset diversions. The new reservoir would not be constructed on the Skookumchuck River but would be supplied by water from the river. This type of reservoir is called an "off-channel" reservoir. This memorandum estimates current and future water demands from the Skookumchuck River and the volume of storage needed in an off-channel reservoir to offset those demands.

Water Demands and Water Storage Needs

An estimate of water storage needs in an off-channel reservoir was made by reviewing current water rights, identifying potential changes in water rights, and estimating future municipal and industrial demands that would use current water rights. The demand estimates were split into dry season demands and wet season demands to further refine the water storage estimate.

Current surface water rights with a primary source listed as the Skookumchuck River are summarized in the Skookumchuck Dam Phase 2 Analysis Summary Report (Anchor QEA et al. 2023). The largest

water rights are owned by TransAlta, part of which have been enrolled in the Trust Water Rights program for use in a water bank. A portion of these water rights are planned to be sold to the cities of Centralia and Chehalis (the Cities).

For this estimate of water demands and storage, only water use and water rights that pre-date the construction of Skookumchuck Dam are considered.

Municipal and Industrial Water Demands

There are 12.1 cfs of surface water rights owned by the Town of Bucoda. The town also holds a 1.1 cfs groundwater right permit (with annual quantity equal to 157 acre-feet), which it uses for its water supply. The town is forecasted to reach its current water right limit in 2028 and needs just 29 acre-feet more water supply until 2035 (Town of Bucoda 2016). For this memorandum and to be conservative, a doubling of the town's current water demand (1.1 cfs, 157 AF/year) was used for its future water demand, which would be offset by water storage. That future demand was assumed to come from surface water as the town has surface water certificates for 12.1 cfs. However, it is likely groundwater would be the preferred source for the town because of the costly treatment required for surface water. Surface water could be released from Skookumchuck Reservoir to offset groundwater demands.

The Cities project that municipal and industrial water demands will increase by approximately 8 million gallons per day (MGD) by 2070 (Mott MacDonald 2024). To meet these demands, the City of Centralia filed an Application for a New Water Right G2-30763 with Ecology for 8,337 gallons per minute (18.6 cfs) and 8,961 AF/year on January 31, 2020. The City of Centralia plans to expand their existing wellfields at Borst Park, possibly at Riverside Park, and/or develop a new wellfield near their Wastewater Treatment Plant (WWTP) to meet these future demands. At Ecology's request, the Cities updated Centralia's initial application to add a separate Application for a New Water Right for the City of Chehalis (G2-30862), requesting the 3 MGD allocated to it in the City of Centralia's application for municipal use within the City of Chehalis's service area. The City of Centralia has also requested that application G2-30862 be phased in two parts for processing and decision; G2-30763(A) is to be processed currently for 3 MGD for Centralia's projected municipal water growth demands, while G2-30763(B) will remain in application status (and on hold) for industrial and/or municipal reserve capacity until the timing and nature of this future growth can more reliably be projected. Thus, the combination of Centralia's and Chehalis's currently projected water demands to be served by applications G2-30763(A) and G2-30862 is 6 MGD, or 6,720 AF/year. The Cities plan to mitigate streamflow impacts from future wellfield pumping through a purchase of instream flow volumes from the TransAlta water bank equal to the total groundwater pumping volume (Mott MacDonald 2024).

Irrigation

Irrigation water rights total 7.16 cfs with irrigated area equal to 717 acres. Annual quantities are listed in some of the water right certificates and range up to 2 acre-feet per acre. Using a conservatively high value of 2 acre-feet per acre as a water duty, the water rights would total about 1,434 acre-feet. Current water needs are likely higher, about 2.5 acre-feet per acre, based upon data from AgWeatherNet for the Chehalis station for pasture with a water use efficiency of 65%. The efficiency estimate is based upon the use of pressure sprinkler systems (big gun or periodic roll types) typically in use for small, irrigated acreage in Western Washington (Ecology 2005). The annual quantity to be supplied through an off-channel reservoir could be up to 2.5 acre-feet per acre if current water demands for all irrigated acreage is met. That equals an annual quantity of about 1,800 acre-feet.

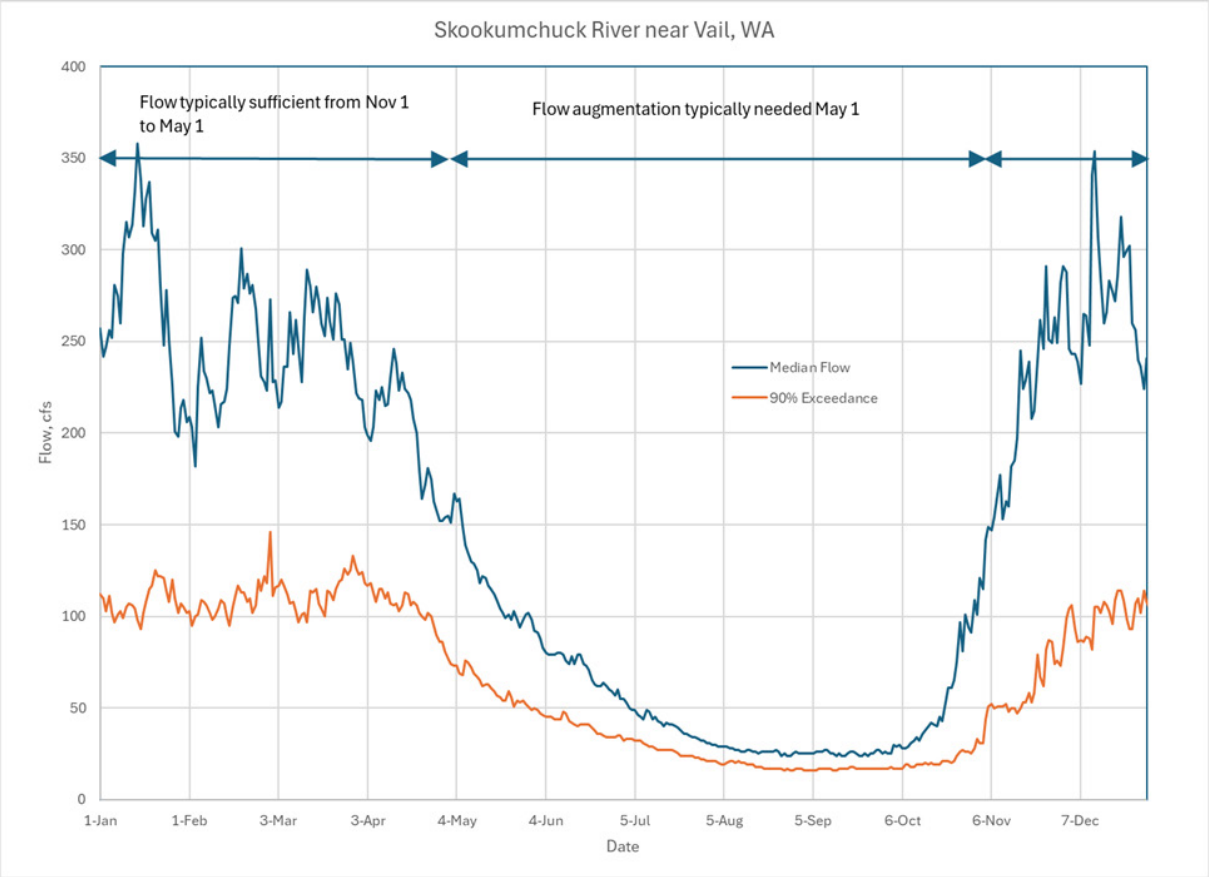
Commercial Use

Sylvan Products, Inc. was granted a water right for 2 cfs in 1950, making it senior to the TransAlta right. The company became Centralia Plywood, Inc. and eventually closed in 1978. The right was issued to support a log pond and the quantity allowed was 2 cfs for 48 hours per week (8 acre-feet per week). Diversions were not allowed when Skookumchuck River flows dropped below 20 cfs. The water right would have a small component of consumptive use because of evaporation from the log pond but most of the water right would be non-consumptive. There is no record of a transfer of this water right in Ecology records available online, so it is unclear whether the right is still legally viable. It is assumed that no quantity of storage is needed to offset this water right.

Seasonal Water Supply and Use

Water right quantities and water demands vary seasonally, with highest demands in summer, which is also the period of time of lowest streamflow. A review of Skookumchuck River flow records was performed at the Vail gage (USGS 2024), which is located upstream of the Skookumchuck Reservoir. Figure 1 shows median flows and 90% exceedance flows (1 in 10-year low flows) by date. It appears streamflow would typically be sufficient to provide for demands without storage from about November 1 to May 1 and water storage would be needed to meet demands from May through October. May through October is the period of peak municipal demands and all irrigation demands. This assumption does not account for setting of instream flows at levels that would reduce the potential of diversions into storage between November and May.

Figure 1
Skookumchuck River Near Vail Streamflow



TransAlta Water Right Seasonal Use

The draft Record of Examination for the TransAlta Water Bank (Ecology 2021) lists monthly quantities of water rights that will be available for the Water Bank. Table 1 lists the primary reach and secondary reach quantities of water available for transfer. The primary reach extends from Skookumchuck Dam to Hanaford Creek, and the secondary reach extends from Hanaford Creek to the confluence with the Chehalis River.

Table 1
Proposed TransAlta Water Bank Quantities

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Primary Reach Quantities												
Qa (AF/Y)	1,249.6	2,152.6	2,229.7	1,898.2	1,646.7	1,669.3	2,780.8	3,025.5	2,989.9	2,870.3	2,776.2	2,744.1
Qi (cfs)	43.24	35.60	35.97	29.34	30.08	30.05	45.10	46.50	46.72	41.92	39.85	40.29
Secondary Reach Quantities												
Qa (AF/Y)	1,237	2,131	2,207	1,879	1,630	1,653	2,753	2,995	2,960	2,842	2,749	2,717
Qi (cfs)	42.80	35.25	35.61	29.04	29.77	29.75	44.65	46.04	46.25	41.50	39.46	39.89

The total volume of TransAlta Water Rights is 28,033 acre-feet in the primary reach and 26,631 acre-feet in the secondary reach. Dry season only (May 1 through October 31) TransAlta water rights are about 15,000 acre-feet in the primary reach and 13,600 acre-feet in the secondary reach.

Estimate of Total Storage Needed to Meet Water Demands and Water Rights

Table 2 summarizes the storage needed to offset estimated irrigation and municipal demands from existing water rights. For the municipal needs, it is assumed that all demand would occur between May and the end of October, which is a conservative assumption for water storage estimating. Data from the City of Centralia's Water System Plan (HDR 2022) indicates about 60% of the annual demand is used in the 5-month period from May through October.

Table 2
Estimated Irrigation and Municipal Storage Needs

Type of Use	Estimated Quantity (acre-feet)	Estimated Instantaneous Demand (cfs)
Irrigation	1,434–1,800	7.16
Municipal – Centralia/Chehalis	6,720–8,961	18.6
Municipal – Town of Bucoda	157	1.1
Commercial	0	0
Totals	**8,311–10,918**	**26.86**

If only May through October municipal demands are stored in addition to irrigation demands, the total storage volume needed would be 5,560 to 7,271 acre-feet.

There could be an estimated 6,040 acre-feet of water remaining in TransAlta's Water Bank between May and November after fulfilling the Cities' purchase. Adding that volume to the quantities in Table 2 gives a total of about 14,300 to 17,000 acre-feet of storage. With storage, the instantaneous demand can be met with sufficiently sized delivery pipelines. The water storage requirements should be refined in the future to reflect the outcome of the water rights processing for Centralia and Chehalis, the proposed seasonality of use (currently assumed municipal demand to all occur in May to November), how the water is withdrawn from the Skookumchuck River (groundwater withdrawals can cause delayed effects on streamflow, which are both positive and negative), and potential instream flow requirements in the Skookumchuck River.

Recommendations

Anchor QEA recommends reservoirs be analyzed that can store the currently forecasted municipal and irrigation demands, which is approximately 5,600 acre-feet to 7,300 acre-feet. Larger reservoirs will be more expensive and the cost may cause the project to be infeasible at an early stage of the alternatives review process. It is our opinion that even reservoirs of the recommended size may be conservatively sized as municipal demands are forecast decades out and the Cities desire to use groundwater. Groundwater withdrawals typically result in less immediate impact to streamflow than direct withdrawal from surface water. Impacts to streamflow are attenuated which may extend impacts into winter when the relative change in flow would be small.

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