Attachment 4:

Water Demand During Construction (Draft) Technical Memorandum

Chehalis River Basin Flood Control Zone District

February 4, 2026

Technical Memo

Date:	February 4, 2026
Project:	Chehalis River Basin Flood Damage Reduction Project
To:	Chehalis Basin Flood Control Zone District
From:	HDR
Subject:	**Water Demand During Construction (Draft)**

1.0 Background

The Proposed Chehalis River Basin Flood Damage Reduction project (Proposed Project) objective is to implement a series of measures aimed at reducing damage to the communities of the Chehalis River Basin from Pe Ell to Cosmopolis during major flood events. Among these measures is a proposed Flood Retention Expandable (FRE) structure on the Chehalis River, south of Pe Ell, Washington.

Following submittal of the Revised Project Description Report (HDR Engineering, Inc. [HDR] 2024), a Chehalis River Basin Flood Damage Reduction draft Preliminary Design Report (PDR) was initiated to document ongoing draft design refinements, as the design process iterates toward a future 30 percent design that will be documented in a completed PDR. The draft PDR records ongoing draft design decisions, assumptions, and methods related to the development of the design of the FRE structure and related elements and collects technical details of the main features of the Proposed Project elements as they continue to develop.

A SEPA Revised Draft Environmental Impact Statement (RDEIS) for the Proposed Project was issued on November 20, 2025 with comments due February 4, 2026. To support the submission of comments on the SEPA RDEIS, some draft design elements are being formalized in reports and memoranda to describe the current state of the project design. While still not at a full 30 percent preliminary design level, these elements are at a point at which they can reasonably inform tribal governments, state and federal agencies, partners, stakeholders, and the public about the nature of the project.

2.0 Introduction

This Technical Memorandum documents a construction water demand assessment to inform evaluation of the Proposed Project's environmental impacts. The water demand assessment includes the evaluation of the peak and average water demand anticipated throughout construction. This document concludes with suggested next steps in the development of this portion of the project's design.

3.0 Water Demand During Construction

3.1 Introduction

Construction will require water to support concrete production, aggregate processing, embankment compaction, construction offices, and various other requirements. The demand flow rate for construction water will vary throughout the construction period. Seasonal influences will also affect water demand. HDR evaluated the average monthly and annual water demand as well as a potential peak demand based on construction operations for the Proposed Project. This chapter introduces key assumptions for these water demands.

3.2 Peak Daily Demand

The peak construction water demand is based on mixing and placement of roller-compacted concrete (RCC) and conventionally placed concrete (CVC) at the same time. Production rates are based on HDR's project experience from other similar projects. The daily peak water demand for these activities is uncertain. A likely daily peak would be approximately 0.54 cubic feet per second (cfs). A conservatively low daily peak estimate should not be considered to be lower than 0.49 cfs. Similarly, a conservatively high daily peak estimate is unlikely to be more than 1.08 cfs. Uncertainty comes from RCC production variability, seasonal weather variability, contractor water storage facilities, RCC temperature requirements and the placement season, and other potentially significant factors. The water use estimates seek to reasonably assess peak uses that should be expected at this early stage of design and planning. Peak demand per month (1.08 cfs) for an average month (22 working days) equals 47 acre-feet (ac-ft).

Table 1. Peak Water Demand Assumptions

Assumptions
14,000 cubic yards (cy) RCC/day
10% Water/cy RCC
1,000 CVC cy/day
60 lb water/cy CVC

Table 2. Peak Daily Water Demand Volumes

100%	90%	200%
0.54 cfs	0.49 cfs	1.08 cfs

3.3 Average Monthly Demand

To preliminarily assess the water demand, HDR identified 17 activities throughout construction that cause most of the water consumption during construction. The construction water demand varies by activity over the duration of the project. The activities are listed as follows:

- Haul Road Dust Control
- Excavation/Embankment and Staging Area Dust Control
- Embankment and Borrow Moisture Conditioning
- Potable Water for Warehouses, Offices, Shops
- Staging and Work Area Maintenance
- Dam Foundation Cleaning
- Foundation Drilling and Grouting
- Slope Stabilization
- Drilling for Instrumentation
- Aggregate Crushing/Dust Control
- Aggregate Wet Screening/Washing
- RCC Mixing
- RCC Mix Cooling (Aggregate/ Equipment)
- RCC Curing
- CVC Mix Cooling
- CVC Mixing and Delivery
- Project/Equipment Cleaning and Maintenance

Each of the activities has water consumption, quantity, and duration assigned. These values are based on HDR's construction professionals' judgments of similar activities during other construction projects as well as the FRE Opinion of Probable Construction Cost and unfinished draft biological assessment.

The summary of key assumptions of all 17 activities is provided in Table 3. Each activity's water demand has a low and high range. The low range is typically 80 percent of the calculated water demand, the high range is about 150 percent respectively.

Table 3. Key Water Consumption Assumptions Associated with Each Construction Activity

Summary of Tasks that Require Water		Quantity		Consumption Rate		Application Frequency		Duration	
1	Haul Road Dust Control	696,960	sq ft	0.1	ga/sq ft/pass	2	passes/shift	750	shifts
2	Excavation/Embankment and Staging Area Dust Control	1,150,000	sq ft	0.1	ga/sq ft/pass	2	passes/shift	425	shifts
3	Embankment and Borrow Moisture Conditioning	12,516	ton	3.0	% per dry weight	22	each/month	5	months
4	Potable Warehouses, Offices, Shops	75	ppl	15.0	gpd/person	–	–	1,500	days
5	Staging and Work Area Maintenance	3,632,920	sq ft	0.0	ga/sq ft/pass	1	passes/shift	1,500	shifts
6	Dam Foundation Cleaning	600,000	sq ft	200.0	each	1.2	ga/min	100	shifts
7	Foundation Drilling and Grouting	80,000	ft	50.0	ga/LF	–	–	–	–
8	Slope Stabilization	520	LF	5.0	ga/LF	–	–	–	–
9	Drilling for Instrumentation	4,000	ft	5.0	ga/LF	–	–	–	–
10	Aggregate Crushing / Dust Control	–	–	100.0	gpd	–	–	558	days
11	Aggregate Wet Screening / Washing	–	–	21,600.0	gpd	–	–	–	–
12	RCC Mixing	1,815,000	cy	33.0	ga/cy RCC	–	–	–	–
13	RCC Mix Cooling (Aggregate/ Equipment)	217,800	cy	–	–	20	ga/cy	–	–
14	RCC Curing	43,578,720	sq ft	0.1	ga/sq ft of lift	–	–	–	–
15	CVC Mix Cooling	19,320	cy	–	–	20	ga/cy	–	–
16	CVC Mixing and Delivery	161,000	cy	50.3	ga/cy CVC	–	–	–	–
17	Project/Equipment Cleaning and Maintenance	–	–	423.3	gpd AVER	–	–	–	–

Notes: sq ft: square feet; LF: linear feet; cy: cubic yards; ga: gallon(s); gpd: gallons per day; ppl: people

Each activity is then assigned a schedule. The construction schedule is 5 years. The water demand schedule is shown in Attachment 1. The total high water demand of each activity is divided by the number of months of that activity occurring. Table 4 provides the monthly high water demand by month. The maximum monthly high water demand for each month is selected for further analysis. Restoration activities will continue in Year 6 with 40 ac-ft to cover dust control, plant watering, and equipment cleaning.

Table 4. Monthly High Water Demand

Month	Y1	Y2	Y3	Y4	Y5	MAX
	(ac-ft)					
January	3.1	5.2	16.2	3.1	16.0	16
February	6.9	5.2	16.2	3.1	16.0	16
March	6.9	5.2	18.2	3.1	16.0	18
April	25.1	5.2	18.2	21.3	27.0	27
May	36.1	36.4	29.2	32.3	27.0	36
June	36.1	36.4	29.2	32.3	27.4	36
July	32.3	52.6	34.7	32.3	14.1	53
August	32.3	34.3	34.7	34.2	14.1	35
September	32.3	29.1	29.6	34.2	14.1	34
October	32.3	27.2	29.2	47.3	3.1	47
November	3.1	16.2	18.2	18.0	3.1	18
December	5.2	16.2	18.2	17.8	3.1	18

3.4 Summary of Preliminary Monthly Demand

HDR assumes a weighted average of 70 percent of the high monthly average demand and 30 percent of the peak monthly demand to cover the average and peak demand throughout construction. The weighted average of the maximum average monthly demand and peak monthly demand is shown in Table 5. The demand volume over the course of a peak demand year is broken down into periods corresponding with the minimum instream flow periods (Table 19 below) to facilitate direct comparison. Weighted average volumes below are also provided in units of acre-feet for general size comparison to the proposed, full temporary inundation pool for the permanent project (62,000 ac-ft). The weighted average January water demand of 25.5 ac-ft, for example, originates from 70 percent of 16.2 ac-ft plus 30 percent of 47.3 ac-ft.

Table 5. Weighted Average Peak Water Demand During Construction

Periods	70%	30%	Weighted Average Demand (ac-ft)	Weighted Average Demand (cfs)*
	Needed By Month (MAX) (ac-ft/period)	Needed Assuming 22d x Peak (ac-ft/period)		
Jan 1–Jan 31	16.2	47.3	25.5	0.43
Feb 1–Feb 28	16.2	42.5	24.1	0.45
Mar 1–Mar 31	18.2	47.3	26.9	0.45
Apr 1–Apr 30	27.0	45.7	32.6	0.57
May 1–May 14	16.3	20.5	17.6	0.68
May 15–May 31	20.1	25.2	21.6	0.68
Jun 1–Jun 14	16.9	20.5	18.0	0.70
Jun 15–Jun 30	19.5	23.6	20.7	0.70
Jul 1–Jul 14	23.6	20.5	22.6	0.88
Jul 15–Jul 31	29.0	25.2	27.9	0.88
Aug 1–Aug 14	15.5	20.5	17.0	0.66
Aug 15–Aug 31	19.1	25.2	20.9	0.66
Sep 1–Sep 30	34.2	45.7	37.6	0.65
Oct 1–Oct 14	21.2	20.5	21.0	0.81
Oct 15–Oct 31	26.1	25.2	25.8	0.81
Nov 1–Nov 14	8.4	20.5	12.0	0.47
Nov 15–Nov 30	9.7	23.6	13.9	0.47
Dec 1–Dec 30	18.2	45.7	26.4	0.46
Average	**19.7**	**30.3**	**22.9**	**0.63**

* Assumed 24hr/day for every day in the period
Note: Periods are chosen to match WAC Base Inflow Requirement Periods
Source: Washington State Legislature (2023)

3.5 Buffer Factor and Peak Demand Conclusion

Although construction water demands per period are not expected to exceed weighted peak estimates (Table 5), it is technically possible that multiple needs and factors will align concurrently. Such conditions may occur if mixing and placement of roller-compacted concrete (RCC) and conventionally placed concrete (CVC) are completed simultaneously, and compounding conditions requiring more water are present, such as elevated air temperatures. While it is reasonably certain to conclude that the weighted average peak values presented in Table 5 will support construction needs, in the unlikely event that all compounding factors occur simultaneously, a conservative estimate is that these conditions could occur for up to 10 days per construction year, requiring up to 20 percent of water in addition to the weighted average peak estimates.

As an example, for the month of January, the weighted average peak construction water need is 0.43cfs. In a highly unlikely scenario in which multiple high water-use activities occurred simultaneously, application of a 20 percent buffer would result in the need for up to 0.52 cfs for that construction day, returning to the average high or average weighted peak requirement the following day. For the month of July, when average weight peak construction water needs are expected to be the greatest (0.88 cfs), application of an additional 20 percent buffer on top of the already-conservative weighted average peak would equate to approximately 1.06 cfs for that month only. The Yearly Average weighted average peak construction water need is 0.63 cfs per Table 5, and 0.76 cfs respectively with the applied buffer.

4.0 Next Steps

Future phases of design development should continue to analyze sources of water supply in relation to demand, in conjunction with a water rights legal consultant, to develop a plan for construction water supply and potential mitigation. Potential multi-purpose and temporary-turned-permanent water storage options should be considered as they may have the potential to provide mitigation benefits at longer timescales than temporary storage needed for construction.

Future phases of design development should also include a risk analysis considering natural variability in water supply availability. A risk analysis for different exceedance flow rates should include how risks could be mitigated in future. The risk analysis should refine and identify potential water supply sources and consider the process for obtaining temporary water rights through the Washington State Department of Ecology. Risk mitigation should consider how much risk is delegated to the construction contractor, how much risk the owner/operator will take on, and what risk mitigation measures and temporary infrastructure to include in the design documents. Possible scenarios, including risk reduction and mitigation measures, should be considered for cost and schedule impacts.

5.0 References

HDR Engineering, Inc. (HDR)

2024 *Revised Project Description Report: Flood Retention Expandable Structure*, Chehalis River Basin Flood Control Zone District, Lewis County, Washington. April.

2025 *Draft Preliminary Design Report: Flood Retention Expandable Structure*, Chehalis River Basin Flood Damage Reduction Project, Lewis County, Washington, June 30.

Washington State Legislature

2023 Washington Administrative Code 173-522-020 Establishment of Base Flows. https://app.leg.wa.gov/WAC/default.aspx?cite=173-522-020. Certified on February 20.

6.0 Acronyms/Abbreviations

ac-ft	acre-feet
cfs	cubic feet per second
CVC	conventionally placed concrete
cy	cubic yards
HDR	HDR Engineering, Inc.
RCC	roller-compacted concrete
FRE	Flood Retention Expandable
PDR	Preliminary Design Report
RDEIS	Revised Draft Environmental Impact Statement

Attachment 1. Construction Activities and Schedule

		Year 1												Year 2											
		January	February	March	April	May	June	July	August	September	October	November	December	January	February	March	April	May	June	July	August	September	October	November	December
1	Haul Road Maintenance					x	x	x	x	x	x							x	x	x	x	x	x		
2	Excavation/Embankment Dust Control				x	x	x	x	x	x	x							x	x	x					
3	Embankment and Borrow Moisture Conditioning		x	x	x	x	x																		
4	Potable Warehouses, Offices, Shops	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
5	Staging and Work Area Maintenance	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
6	Dam Foundation Cleaning																			x	x				
7	Foundation Drilling and Grouting																	x	x	x	x	x			
8	Slope Stabilization																		x	x					
9	Drilling for Instrumentation																								
10	Aggregate Crushing / Dust Control												x	x	x	x	x	x	x	x	x	x	x	x	x
11	Aggregate Wet Screening / Washing												x	x	x	x	x	x	x	x	x	x	x	x	x
12	RCC Mixing																			x	x	x	x	x	x
13	RCC Mix Cooling (Aggregate/ Equipment)																			x	x				
14	RCC Curing																			x	x	x	x	x	x
15	CVC Mix Cooling																								
16	CVC Mixing and Delivery																								
17	Project/Equipment Cleaning and Maintenance	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
18	Demolition and Saw Cutting Dust Control																								

		Year 3												Year 4											
		January	February	March	April	May	June	July	August	September	October	November	December	January	February	March	April	May	June	July	August	September	October	November	December
1	Haul Road Maintenance					x	x	x	x	x	x							x	x	x	x	x	x		
2	Excavation/Embankment Dust Control																x	x	x	x	x	x	x		
3	Embankment and Borrow Moisture Conditioning																								
4	Potable Warehouses, Offices, Shops	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
5	Staging and Work Area Maintenance	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
6	Dam Foundation Cleaning																						x	x	
7	Foundation Drilling and Grouting																				x	x	x	x	x
8	Slope Stabilization																					x	x		
9	Drilling for Instrumentation																								
10	Aggregate Crushing / Dust Control	x	x	x	x	x	x	x	x	x	x	x	x												
11	Aggregate Wet Screening / Washing	x	x	x	x	x	x	x	x	x	x	x	x												
12	RCC Mixing	x	x	x	x	x	x	x	x	x	x	x	x										x	x	x
13	RCC Mix Cooling (Aggregate/ Equipment)							x	x																
14	RCC Curing	x	x	x	x	x	x	x	x	x	x	x	x										x	x	x
15	CVC Mix Cooling							x	x	x															
16	CVC Mixing and Delivery			x	x	x	x	x	x	x	x	x	x										x	x	x
17	Project/Equipment Cleaning and Maintenance	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

		Year 5											
		January	February	March	April	May	July	August	September	October	November	December	January
1	Haul Road Maintenance				x	x	x	x	x	x			
2	Excavation/Embankment Dust Control												
3	Embankment and Borrow Moisture Conditioning												
4	Potable Warehouses, Offices, Shops	x	x	x	x	x	x	x	x	x	x	x	x
5	Staging and Work Area Maintenance	x	x	x	x	x	x	x	x	x	x	x	x
6	Dam Foundation Cleaning												
7	Foundation Drilling and Grouting												
8	Slope Stabilization												
9	Drilling for Instrumentation										x	x	
10	Aggregate Crushing / Dust Control												
11	Aggregate Wet Screening / Washing												
12	RCC Mixing	x	x	x	x	x	x						
13	RCC Mix Cooling (Aggregate/ Equipment)												
14	RCC Curing	x	x	x	x	x	x						
15	CVC Mix Cooling						x						
16	CVC Mixing and Delivery	x	x	x	x	x	x						
17	Project/Equipment Cleaning and Maintenance	x	x	x	x	x	x	x	x	x	x	x	x