



November 16, 2023

**TO:** Flood Authority Members  
**FROM:** Scott Boettcher, Staff  
**SUBJECT:** NWS and Skookumchuck Gage

Following will be discussed at today's Flood Authority meeting. Please feel free to contact me (360/480-6600, [scottb@sbgh-partners.com](mailto:scottb@sbgh-partners.com)) with questions.

### Background

1. The National Weather Service is, at the request of the Flood Authority ([here](#)), developing a river forecast model for the Skookumchuck river. Key to the NWS's model is accurate, reliable, daily data regarding the Skookumchuck reservoir (water volume, water height, change over time, spillage, etc.).
2. Currently the existing gaging/reporting system is not reliable – not reliable for the NWS, and not reliable for the Flood Authority and its Flood Warning System. Problems include:
  - a. Accuracy – *“Additionally, looking back at the last 3 years of peak water levels, the two sensors disagree by about 0.5 ft.”* [Jeff Budnick, WEST, 11-14-2023 email]
  - b. Reliability – Reporting was out for 23 days of the 2021-22 flood season. [See Attachment A]
  - c. These issues are not expected to improve.

### Opportunity/Need/Cost

3. A new gage is needed at a cost of ~\$37K to ~\$42K to meet the needs of the NWS and the Flood Warning System for accurate, reliable, daily data. Doing so will:
  - a. Enable the NWS to set accurate river forecasts for the Skookumchuck.
  - b. Assist Bucoda and Centralia in their flood awareness and flood mitigation.
  - c. Pave the way for developing inundation maps for Bucoda.
  - d. Provide another gage alert opportunity.
4. New gage can be purchased, installed, calibrated December 2023 if approved. Funds can be procured from existing local projects. O&M will need to be covered by Flood Authority as typical for Flood Warning System gages. See Attachment B and C -- Projected O&M Costs and O&M Comparison.

### Recommendation

5. Flood Authority staff should seek approval to immediately implement this new “project” (i.e., Purchase/Install/Calibrate new Skookumchuck Reservoir gage) from the Chehalis Basin Board at their 12-07-2023 meeting.

## Attachment A – Reliability

Skookumchuck gage reporting outages during 2021-23 flood season – 23 days total!



## Attachment B – Projected O&M Costs

Operations & Maintenance (O & M)												Projection			
2023/24 Theme --> Transition: New people; New methods; New ideas; Greater prominence.															
Breakdown of Annual O & M Costs		2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
WEST Consultants (Jeff et al)	<b>Gage/Webcam maintenance</b> -- 2024 (13 gages, 3 webcam locations). 2025 (13 gages, 3 webcam locations). 2026 (14 gages, 3 webcam locations). 2027 (15 gages, 3 webcam locations).	\$38,438	\$38,438	\$38,438	\$38,438	\$39,207	\$39,991	\$46,391	\$53,031	\$56,212	\$64,585	\$68,460	\$72,568	\$83,282	\$94,639
WEST Consultants (Dave, Cheryl, Peter, Andreas)	<b>Operational/Administrative support</b> -- On-going support for website monitoring and updates for both routine operations and during potential flood events.	\$11,336	\$11,336	\$11,336	\$11,336	\$11,563	\$11,794	\$12,030	\$12,270	\$13,007	\$13,787	\$14,614	\$24,696	\$26,178	\$27,749
WEST Consultants (Dave, Cheryl, Peter, Andreas)	<b>GIS support</b> -- On-going support, training for FWS GIS elements (ArcGIS gage alerts dashboard, ArcGIS Survey 123 alerts sign-up, Data.Wa.Gov "handshake," etc.) at \$8,684.											\$8,684			
WEST Consultants (Jeff et al)	<b>Spare parts inventory</b> -- Extra parts in event of broken or malfunctioning gages.		\$6,000	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000
Mobility Help Desk	<b>Webcam cell fees</b> -- 3 cell data plans.							\$1,500	\$1,500	\$1,500	\$1,500	\$1,500	\$1,500	\$1,500	\$1,500
OneRain (Contrail)	<b>Webcam subscription fees</b> -- 4 subscriptions.							\$1,260	\$1,260	\$1,260	\$1,680	\$1,848	\$1,848	\$1,848	\$1,848
OneRain (Contrail)	<b>Website</b> -- One-rain annual subscription (291 basin sensors).	\$3,811	\$3,811	\$5,261	\$5,261	\$5,500	\$5,877	\$6,000	\$6,500	\$6,500	\$6,500	\$7,000	\$7,000	\$7,000	\$7,000
WEST Consultants (Jeff et al)	<b>Physical Gages (New, Remove, Relocate)</b> -- O&M begins after two-year installation and calibration.												O&M begins: new China Creek Gage 2025; new Skookumchuck Reservoir Gage 2026; and relocated Chehalis River below Thrash Creek gage 2027.		
Lewis County (Lee, Sarah)	<b>Billing and processing.</b>		\$900	\$900	\$900	\$900	\$900	\$900	\$900	\$900	\$900	\$900	\$900	\$900	\$900
<b>Total --&gt;</b>		\$53,585	\$60,485	\$57,935	\$57,935	\$59,169	\$60,562	\$70,081	\$78,461	\$82,379	\$91,952	\$106,007	\$111,512	\$123,708	\$136,635

Note 1 -- **Gage maintenance** and **Operational/Administrative support** increased 2% for 2018-21, 6% for 2022-23, and are proposed to increase 6% for 2024. **Operational/Administrative support** is additionally proposed to increase \$8,684 for ongoing GIS support.

Note 2 -- Contrail webcam subscription fee increased \$168 for 2024.

Note 3 -- Contrail website subscription fee increase \$500 for 2024.

Note 4 -- Thrash Creek gage relocation estimate = ~\$47K. 2023 (~\$5K for reconnaissance of three locations and GOES testing). 2025 (~\$42K for demo of existing site, installation of new site with radar sensor, installation of WWG, updating Weyerhaeuser access agreement, and two-years calibration).

**Attachment C – O&M Comparison**  
With and Without New Skookumchuck Reservoir Gage

<b><u>With</u> New Skookumchuck Reservoir Gage (15 gages by 2027)</b>				
	<b>2024</b>	<b>2025</b>	<b>2026</b>	<b>2027</b>
Grays Harbor County (22%)	\$ 23,321	\$ 24,533	\$ 27,216	\$ 30,060
Lewis County (64%)	\$ 67,844	\$ 71,368	\$ 79,173	\$ 87,447
Thurston County (14%)	\$ 14,841	\$ 15,612	\$ 17,319	\$ 19,129
	<b>\$106,007</b>	<b>\$ 111,512</b>	<b>\$ 123,708</b>	<b>\$ 136,635</b>
<b><u>Without</u> New Skookumchuck Reservoir Gage (14 gages by 2027)</b>				
	<b>2024</b>	<b>2025</b>	<b>2026</b>	<b>2027</b>
Grays Harbor County (22%)	\$ 23,321	\$ 24,533	\$ 27,216	\$ 28,661
Lewis County (64%)	\$ 67,844	\$ 71,368	\$ 79,173	\$ 83,376
Thurston County (14%)	\$ 14,841	\$ 15,612	\$ 17,319	\$ 18,239
	<b>\$106,007</b>	<b>\$ 111,512</b>	<b>\$ 123,708</b>	<b>\$ 130,275</b>
<b><u>Difference</u></b>				
	<b>2024</b>	<b>2025</b>	<b>2026</b>	<b>2027</b>
Grays Harbor County (22%)	\$ -	\$ -	\$ -	\$ 1,399
Lewis County (64%)	\$ -	\$ -	\$ -	\$ 4,071
Thurston County (14%)	\$ -	\$ -	\$ -	\$ 890
	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 6,360</b>

## Attachment D – O&M Schedule

WEST Site Visit Location (O&M)	2022	2023	2024	2025	2026	2027
<a href="#">1. BEEVILLE RAIN GAGE - (MATLOCK 3NE) (D15015CE)</a>	Y	Y	Y	Y	Y	Y
<a href="#">2. CEDAR CREEK RAIN GAGE NR LITTLEROCK, WA (D1503322)</a>	Y	Y	Y	Y	Y	Y
<a href="#">3. CHEHALIS RIVER AT CENTRALIA, WA (GOES) (D1501B1C)</a>	Y	Y	Y	Y	Y	Y
<a href="#">4. CHEHALIS RIVER BELOW THRASH CREEK NEAR PE ELL, WA (D15080AC)</a>	Y	Y	Y	Calibrate	Calibrate	Y
<a href="#">5. CHINA CREEK ABOVE FCS AT CENTRALIA, WA (D1503DFo)</a>	n/a	Calibrate	Calibrate	Y	Y	Y
<a href="#">6. DOTY HILLS RAIN GAGE (D150635E)</a>	Y	Y	Y	Y	Y	Y
<a href="#">7. MASON FD13 AT CLOQUALLAM (D1502E86)</a>	Y	Y	Y	Y	Y	Y
<a href="#">8. NEWAUKUM RIVER FOOTHILLS (D1507028)</a>	Y	Y	Y	Y	Y	Y
<a href="#">9. RIVERSIDE RAIN GAGE (RFA-STA8) (D15045B2)</a>	Y	Y	Y	Y	Y	Y
<a href="#">10. SKOOKUMCHUCK RAIN GAGE (D15056C4)</a>	Y	Y	Y	Y	Y	Y
<b>11. SKOOKUMCHUCK RESERVOIR GAGE</b>	n/a	n/a	Calibrate	Calibrate	Y	Y
<a href="#">12. SKOOKUMCHUCK RIVER AT CENTRALIA, WA (GOES) (D150086A)</a>	Y	Y	Y	Y	Y	Y
<a href="#">13. WEATHERMAX RIDGE RAIN GAGE (D15006B8)</a>	Y	Y	Y	Y	Y	Y
<a href="#">14. WEST FORK SATSOP RIVER AT COUGAR SMITH ROAD NEAR SATSOP 13NNW (D1502054)</a>	Y	Y	Y	Y	Y	Y
<a href="#">15. Willapa Hills (D15093DA)</a>	Y	Y	Y	Y	Y	Y
<a href="#">16. WEBCAM -- Wynoochee River at Montesano, WA</a>	Y	Y	Y	Y	Y	Y
<a href="#">17. WEBCAM -- Chehalis River at Centralia, WA</a>	Y	Y	Y	Y	Y	Y
<a href="#">18. WEBCAM -- Wishkah River at Aberdeen, WA</a>	Y	Y	Y	Y	Y	Y
Gages -->	13	13	13	13	14	15
Webcams -->	3	3	3	3	3	3

### Attachment E – Location

<https://lewiswa.maps.arcgis.com/apps/mapviewer/index.html?webmap=899dafb23d6f4a638fo60b242125f126>

