Pacific Rivers (Liz Gilliam)

Thank you for the opportunity to comment. Please see the attached document.

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SEPA Revised Draft EIS for Chehalis Flood Damage Reduction Project
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From: Liz Gilliam, Pacific Rivers

Submitted electronically
Subject: Key Issues – Technical Review of the Revised Draft EIS (RDEIS)

We submit the following comments on the geomorphic, sediment-transport, floodplain, and river-process analyses in the Revised Draft Environmental Impact Statement (RDEIS) for the proposed Chehalis River Flood Reduction Project.

These comments focus on fundamental analytical deficiencies that materially affect the reliability of the RDEIS conclusions, particularly with respect to sediment continuity, channel evolution, habitat-forming processes, long-term flood risk, and the evaluation of alternatives. While these issues are discussed in multiple locations within the DEIS, they are not coherently analyzed as an interconnected system, resulting in conclusions that are not scientifically defensible.

Sediment Transport Modeling Is Not Adequate for Decision-Making

The sediment transport modeling used in the DEIS is not adequate for decision-making and cannot support the conclusions drawn regarding geomorphic stability, habitat impacts, or long-term flood risk. The sediment model is uncalibrated, relies on outdated and inappropriate transport equations, and is based on limited datasets that do not reflect observed system behavior. Because this model is a foundational analytical tool used to assess impacts to aquatic and terrestrial habitats, all downstream impact analyses that rely upon it are likewise unreliable.

The model developers themselves acknowledge that the 2007 flood “was not modeled well by the sediment transport equations,” yet this same framework is used to support long-term conclusions about sediment continuity through the proposed facility. This alone should disqualify the model from use in predicting future channel evolution.

Critically, the analysis fails to answer a central physical question: **how effectively will sediment move through a single 12-foot-wide, approximately 320-foot-long primary conduit and associated stilling basin during moderate and large events?** Although

multiple conduits are proposed, only the lowest conduit is capable of passing sediment; the two higher-invert conduits would remain inactive for sediment transport. This effectively constrains sediment continuity to a single narrow pathway. Appendix 1, Figure 1-6 presents a misleading depiction of sediment passage that does not reflect this physical constraint.

Agency modeling indicates that sediment transport capacity downstream of the dam would be reduced by approximately 63–65 percent during major storm events, with a modeled net decrease in sediment storage downstream to approximately river mile 85 under both mid- and late-century scenarios. These results indicate a long-term sediment deficit—commonly referred to as sediment starvation—yet the DEIS concludes that operational impacts to the river are insignificant. With accurate data and an appropriate sediment budget analysis, this conclusion would likely increase in significance rather than diminish.

Long-Term Channel Incision and Floodplain Disconnection Are Not Adequately Evaluated

A river is more than a conduit for water; it is a conveyor of sediment, wood, and nutrients that build and maintain complex habitats. Under existing conditions, sediment is transported from upstream sources into downstream spawning and rearing reaches, maintaining channel structure, floodplain connectivity, and habitat complexity. Bankfull and near-bankfull flows—moderate, relatively frequent events—are the dominant drivers of sediment transport and channel maintenance over time.

Under the proposed project, these channel-forming flows would continue to occur while sediment supply would be substantially reduced. As discussed above, the sediment transport model underestimates coarse sediment storage upstream of the dam and fine sediment delivery downstream. The result is the same channel-reworking flows operating on a sediment-starved system.

This condition predictably leads to streambed erosion, channel incision, loss of spawning gravels, floodplain disconnection, and cascading geomorphic impacts throughout the river corridor. These cascading impacts are not speculative; they represent well-documented responses of alluvial rivers to sediment supply disruption.

SEPA requires that an EIS fully evaluate direct, indirect, and cumulative impacts (WAC 197-11-060(4)(d); WAC 197-11-792(c)). Despite this requirement, the DEIS does not adequately analyze the indirect and cumulative impacts associated with long-term channel adjustment and sediment starvation. Failure to analyze these effects renders the DEIS noncompliant with SEPA.

River systems are complex, non-linear, and highly sensitive to perturbations. In the Chehalis River, sediment supply would be interrupted not only during extreme floods but

also during frequent, moderate-magnitude storms that are critical for transporting landslide-derived sediment into downstream spawning reaches. When flows exceed the capacity of the conduit, backwatering will occur upstream of the dam and coarse sediment will readily deposit. That coarse sediment is then unlikely to be entrained in subsequent storms. Over time, spawning gravels downstream will be eroded and not replenished, leading to surface armoring and hardened streambeds unsuitable for salmon spawning. At the same time, increased fine sediment delivery may fill pore spaces, reducing egg survival.

As noted previously, it is highly speculative to assume balanced sediment throughflow through a narrow, rectangular concrete conduit and stilling basin. Unlike a natural streambed, this structure does not allow for distributed sediment transport across a channel width, further increasing uncertainty and risk. This is the condition present immediately downstream of every dam in the region, and it is yet to be proven that this structure is the exception.

When sediment supply is reduced, channel incision lowers the river's base level and disconnects it from its floodplain. This leads to loss of side channels, tributary down-cutting, perched culverts, infrastructure instability, and paradoxically increased downstream flood risk as floodplain storage capacity declines. Although the DEIS suggests that bedrock controls near river mile 85 will limit sediment impacts, increased flooding downstream—particularly in the town of Chehalis—and continued fine sediment delivery are still expected. These consequences are not adequately evaluated.

The DEIS also fails to account for reduced large wood recruitment and transport through the facility. Large wood plays a critical role in reducing flow velocity, stabilizing substrates, and maintaining habitat complexity. Its absence will further exacerbate bed scour and habitat degradation downstream.

The long-term channel adjustment trajectory described above has serious implications for flood risk, infrastructure stability, habitat quality, and future public expenditures. Once initiated, these processes are not readily mitigated and often require decades of costly intervention. <u>These risks warrant far more rigorous analysis than provided in the DEIS</u>.

Hyporheic and Streambed Function Are Absent from the Analysis

One of the most significant omissions in the DEIS is the lack of analysis of hyporheic function. Hyporheic exchange depends on the interaction between flow regime, sediment size distribution, and gravel mobility. Altered sediment supply and regulated hydrographs downstream of dams commonly result in bed coarsening, embeddedness, and clogging of the hyporheic zone.

Loss of hyporheic function reduces water-quality buffering, thermal regulation, invertebrate production, and salmon egg survival. While the DEIS assumes hyporheic

function is minimal or absent at the dam site, it fails to evaluate the many alluvial reaches downstream where hyporheic processes are essential and should be protected or enhanced under state and federal salmon recovery objectives.

There is no demonstrated method to mitigate hyporheic loss at a watershed scale once sediment processes are disrupted. This omission represents a serious analytical gap and further undermines the DEIS conclusions.

The Sediment Transport Model Is Inappropriate for a Mixed-Grain River System

The DEIS relies on the Ackers and White (1973) sediment transport equation implemented within HEC-RAS. This equation was developed using flume studies with uniform, fine-grained sediment and does not account for mixed-grain gravel-bed rivers, surface armoring, or grain-size sorting processes characteristic of the Chehalis River.

State-of-the-art practice requires multi-grain-size sediment transport modeling calibrated to observed surface and subsurface grain-size distributions, combined with effective discharge analysis and a quantitative sediment budget. None of these analyses were performed.

As detailed in expert comments submitted by Paul Bakke (January 5, 2026), failure to apply appropriate sediment transport methods has historically resulted in widespread and expensive degradation of river corridors. Without a calibrated, multi-grain sediment budget addressing sediment inputs, storage, and transport under both existing and proposed conditions, the only defensible assumption is that alluvial reaches downstream of the dam face a significant risk of adverse geomorphic change.

Key unanswered questions include whether the streambed will coarsen or fine, whether spawning-sized sediment will be maintained, and how sediment storage upstream of the dam will evolve over time. The DEIS does not provide the analyses necessary to answer these questions.

Upstream Base-Level Effects and Channel Instability Are Not Analyzed

The proposed reservoir would impose a new, unstable base level upstream of the dam, triggering long-term channel adjustments well beyond the limits of inundation. These base-level effects can propagate upstream for decades to centuries, altering channel stability, sediment supply, and habitat condition.

The DEIS does not analyze these upstream responses, despite their relevance to habitat protection and long-term geomorphic stability. Once initiated, such adjustments cannot be effectively mitigated.

Alternatives Analysis Does Not Meet SEPA Requirements

The DEIS does not provide a meaningful, apples-to-apples evaluation of alternatives as required under SEPA. Neither the Local Action Alternative presented in the DEIS nor the Local Actions Non-Dam (LAND) alternatives currently under development were evaluated with comparable engineering detail, modeling rigor, or performance metrics.

A defensible alternatives analysis would apply the same hydrologic, geomorphic, sediment, and risk-reduction modeling to non-dam options, including levees, floodplain reconnection, buyouts, and infrastructure elevation. Without this level of analysis, decision-makers and the public cannot determine whether the proposed dam represents the least damaging practicable alternative, nor can environmental impacts be meaningfully compared across alternatives.

Mitigation Is Undefined and Cannot Replace Channel Form and Function

The DEIS repeatedly references proposed mitigation measures yet fails to include the Mitigation Plan for public review. No substantive technical analysis of mitigation feasibility or effectiveness is provided. Reliance on undefined or speculative mitigation does not satisfy SEPA requirements, particularly where impacts involve irreversible geomorphic processes that cannot be adaptively managed once initiated. As a technical specialist for mitigation projects, the benefits never equal the conservation of a free-flowing natural river. Rivers and wetlands are too complex.

Impacts to Tribal Resources and Treaty Rights

The RDEIS acknowledges significant and unavoidable adverse impacts to Tribal cultural resources, including archaeological sites and traditional cultural properties. These impacts permanently transform the cultural landscape and are not adequately disclosed or evaluated. Mitigation measures remain undefined and subject to the Section 106 process, with no guarantee of effectiveness.

The Confederated Tribes of the Chehalis Reservation and the Quinault Indian Nation have stated that the revised dam design and mitigation approach remain insufficient to protect treaty-reserved rights and sovereign resources.

Summary and Recommendations

Taken together, the DEIS relies on incomplete and outdated analytical tools that understate long-term geomorphic risk, sediment disruption, habitat degradation, and infrastructure consequences. Prior to any permitting decision, the agencies should:

- Require a calibrated, multi-grain sediment budget and transport analysis
- Conduct effective discharge and streambed evolution modeling

- Explicitly analyze hyporheic and floodplain processes
- Evaluate upstream base-level and channel stability effects
- Re-evaluate project alternatives using equivalent analytical rigor
- Disclose and technically evaluate mitigation measures

Without these analyses, the conclusions of the DEIS are not scientifically defensible and do not provide a reliable basis for decision-making.

Expensive and Ineffective

The 2025 revised DEIS, like the 2020 DEIS, arrives at conclusions of probable significant adverse environmental impacts from both construction and operation of the FRE, in portions of the Chehalis Basin both upstream and downstream of the FRE. The levels of flood reduction as presented in the DEIS still leave most Chehalis Basin residents unprotected from major or catastrophic flood damage and do nothing to prevent flood damage from more frequent local flooding.

The money spent to date on the FRE project (using approximately $100 million in state dollars spent) could have been utilized to reduce flood damage in the Chehalis Basin, for example, those same funds could have already resulted in these benefits had they not been spent pursuing this dam:

- For properties that experience less than one foot of flooding, 5,000 homes or 3,300 commercial / agricultural properties could have been floodproofed (per structure cost from Office of Chehalis Basin, 2025), or
- For properties that experience 1-5 feet of flooding, 660 valuable structures could have been elevated (per structure cost from Office of Chehalis Basin, 2025), or
- For properties that experience more than 5 feet of flooding, 250 valuable structures could have been acquired (per structure cost from Office of Chehalis Basin, 2025), or
- The entire length of the LAND North Skookumchuck levee or approximately half of the South Skookumchuck levee could have been constructed using the high-end cost estimate (Moffat & Nichol, 2025), or
- Some combinations of the above could have been implemented.

According to the DEIS, the Community Flood Assistance and Resilience (CFAR) program, the Office of the Chehalis Basin's technical and financial assistance program for floodproofing, elevations, and buyouts has had only modest success to date. The DEIS reported that 26 properties received technical assistance through CFAR in the 2021-2023 state biennium, that resulted in 12 home elevations and 2 buyouts (DEIS Appendix 1, Section 5.2.4, pg. 71). Elevation of four additional homes is currently planned or recently completed in the current biennium. Yet, the Chehalis Basin Board is still only funding the program at a $3 million level for the 2025-2027 biennium, which would only enable a similarly modest level of activity.

We encourage the Office of the Chehalis Basin and Chehalis Basin Board to refocus its efforts on these proven, cost-effective flood damage reduction strategies that are implementable and will provide near-term relief to basin residents.

Greater progress could be made in the years between now and 2042 (the best-case scenario for dam completion) to reduce the flood damage risk of current structures and to change the land use laws to prevent construction and development of structures in harm's way, providing relief to residents and properties in the basin. It is time to stop pouring money into a dam that will have limited benefits and significant environmental impacts and instead develop alternatives that will provide clear and immediate benefit to both community residents and ecological systems throughout the basin and that are compliant with Treaty rights, and respectful of cultural resources.

Thank you for the opportunity to comment.

Respectfully,

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