

Technical Memorandum

Date: October 11, 2024

Project: Chehalis River Basin Flood Damage Reduction Project

To: Chehalis Basin Flood Control Zone District

From: Jacob Hyles, PE

Subject: **Potential FFPF Fish Release Concept and Route Desktop Analysis**

1.0 Introduction

1.1 Background

The Chehalis River Basin Flood Damage Reduction project (Project) objective is to develop recommendations for a series of measures aimed at reducing major flood event damage to the Chehalis River Basin communities from Pe Ell to Centralia. Among these recommendations is a proposed Flood Retention Expandable (FRE) structure on the Chehalis River, south of the town of Pe Ell.

The Chehalis River Basin Flood Damage Reduction, Revised Project Description Report (RPDR) is a supplemental report documenting the relocation of and changes to the FRE facility as originally documented within the Combined Dam and Fish Passage Conceptual Design Report (HDR Engineering, Inc. [HDR] 2017) and FRE Dam Alternative Report (HDR 2018a).

The RPDR describes, supports, contrasts, and illustrates the changes to the proposed upstream FRE in a single comprehensive document.

1.2 Document Scope and Purpose

As a supplement to Appendix I: Fish Passage Design to the RPDR, this technical memorandum (TM) provides additional detail for the District's response to Request for Information 1-46 received from the Washington State Department of Ecology (Ecology) on June 10, 2024. This information informs Ecology, the Washington Department of Fish and Wildlife, and the U.S. Army Corps of Engineers on the level of effort, anticipated transportation improvements, and potential reliability of the fish transport from the Flood Fish Passage Facility (FFPF). This TM describes aspects of truck transport of fish from the FFPF at a conceptual level to include:

- Potential release sites and presentation of a fish release concept informed by FRE operation
- Desktop analysis of the existing road network and identification of proposed routes/travel times to support the fish release concept

- Discussion of next steps and items for future consideration.

1.3 Previous Related Documentation

The proposed approach to the transport and release of fish collected in the FFPF has been advanced to a conceptual level of design development. The approach is described primarily in RPDR, Appendix I, Section 4.2 (HDR 2024) with supporting information provided throughout Appendix I. RPDR, Appendix G, Section 5.5 (HDR 2024) erroneously states fish collected in the FFPF will be transported to release locations by air or water transport. While it is possible that fish may be transported to release locations via air transport (e.g., helicopters), water transport (e.g., boats), or off-road vehicles, the primary transport strategy for fish collected in the FFPF likely will be via truck. A description of the trucks, including life support systems and the transfer of collected aquatic species to transport trucks, is provided in Section 3.1.4 of the CHTR Preliminary Design Report (HDR 2018b). As of the publication of this TM, RPDR Section 5.5 of Appendix G (HDR 2024) is replaced with information provided herein.

2.0 Site Conditions

2.1 Land Ownership

Future trap and transport operations will require the use of the current public and private road network and could involve the creation of new roads to ensure safe, effective, and reliable access by transport vehicles. For private roads, negotiated access with private landowners, property acquisition, and/or rights of use may be necessary. Most watershed land upstream of the FRE is privately owned by Weyerhaeuser Corporation and used primarily for forestry harvest and management purposes.

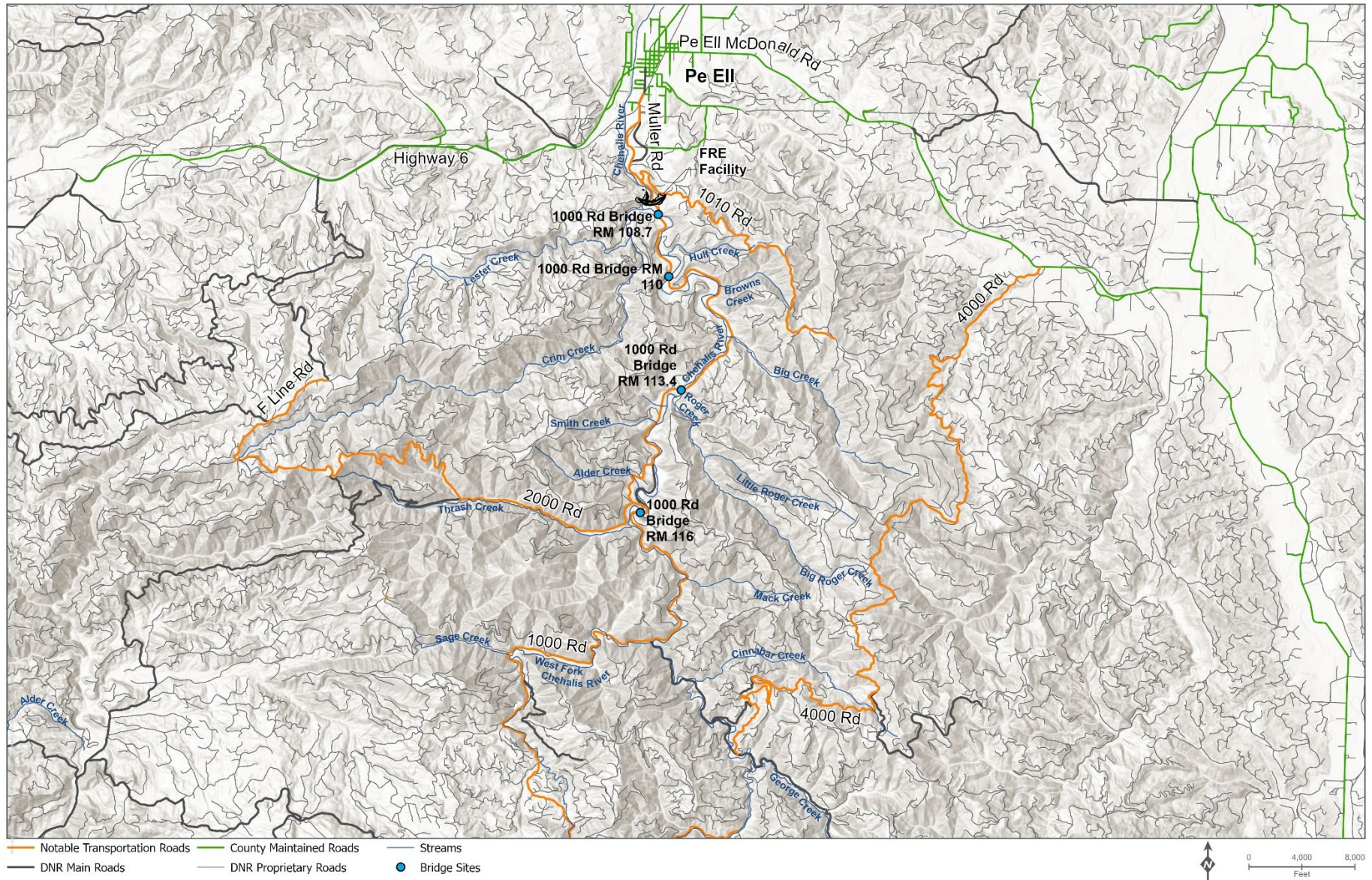
2.2 Transportation

2.2.1 Existing Road Network

Currently, no public road provides direct access to the FFPF site. The nearest public road is Muller Road, located north of the FRE site, and connects to Highway 6 in the town of Pe Ell. Highway 6 is the primary route providing access to the private road network in the western portion of the upper Chehalis watershed. Similarly, the Pe Ell – McDonald Road provides access to the private road network in the eastern portion of the upper Chehalis watershed.

The Weyerhaeuser property which would be acquired for the project and its environs includes a dense network of roads throughout the upper watershed and presumably a mix of maintained unimproved roads and less trafficable, less maintained roads used for intermittent access during logging operations. While, the likely release locations are on land currently owned by Weyerhaeuser, the best access routes to these sites may involve other privately owned roads. Figure 1 provides a depiction of the public and private road network in the Project area. Note the density of the private road network.

Figure 1. Existing Road Network



2.2.2 Existing Bridge Locations

There are three Weyerhaeuser bridges upstream of the FRE site that cross the mainstem Chehalis River located along the route identified as “1000 Road.” For this TM, the bridges will be designated by river mile (RM) location. These bridges serve as important nodes connecting road networks on the west and east side of the watershed, which provides additional access alternatives to release sites.

Bridge RM 108.7 - Approximately 0.3 miles upstream of the FRE alignment, the deck will be overtopped by the FRE pool at an elevation of approximately 460 feet.

Bridge RM 110.0 - Approximately 1.6 miles upstream of the FRE alignment, the deck will be overtopped by the FRE pool at an elevation of approximately 500 feet.

Bridge RM 113.4 - Approximately 3.0 miles upstream of the FRE alignment, the deck will be overtopped by the FRE pool at an elevation of approximately 588 feet.

3.0 Fish Release Locations and Transport Route Analysis

3.1 Fish Release Concept

Selection of release locations for fish collected in the FFPF will be influenced by many factors (RPDR, Appendix I, HDR 2024), including location of potential habitat, seasonality, species, number of fish, size of fish, and stage of life history. Fish release sites have been identified within this TM to present a conceptual approach to fish release upstream of the FRE and inform a desktop analysis of transportation routes. Final release locations will be identified during future collaborations with fisheries regulatory agencies (i.e., Washington Department of Fish and Wildlife, National Marine Fisheries Service, and U.S. Fish and Wildlife Service). For this assessment, several tenets are proposed to better inform the fish release concept and desktop analysis:

1. **Fish will not be released within the FRE pool.** Fish will be released above the area inundated by FRE operations at that time to reduce potential fallback into the pool area.
2. **Fish will be released within the mainstem of the Chehalis River.** Fish released just upstream of the current FRE pool will be allowed to self-select mainstem and tributary habitat. Fish released within the mainstem supports volitional transit or navigation to upstream tributaries.
3. **Route Redundancy.** Multiple access routes to release sites will provide transport vehicles and drivers alternative transportation pathways should roadways become impassable due to unforeseen damage or obstruction.
4. **Release sites will be improved to support fish release.** Additional road segments, turnaround areas, ramps, temporary return flumes, process water supply, in-river features that promote recovery areas, and other improvements necessary for safe fish release are assumed possible at or near the identified release locations within this TM.
5. **Chehalis River bridges submerged temporarily by FRE pool will not be used for fish transport following pool drawdown.** Submerged structures may be deemed

trafficable following pool drawdown based on future studies, however the design team is not prepared to make this assumption at this time.

6. **All transport vessels will be equipped with water conditioning and life support systems.** Transport vessels will be equipped with temperature control, oxygenation, segregation, and hydraulic dampening devices/equipment to maintain preferred water conditions for fish throughout proposed travel times. Presence of these features will foster a safe, lower-stress environment over longer haul distances and durations resulting from unexpected travel and road conditions.

3.1.1 Release Site Identification

Fish operations will be conducted at multiple release sites along the mainstem of the Chehalis River and informed by FRE operations and pool elevation observed at the time of transport and release. The following release sites identified, and the approach to determining which site to use, are based on a conceptual approach of conducting shifting release operations upstream, and then downstream, as the FRE pool elevation rises and recedes. The FFPF will operate throughout the FRE operational window and until run-of-river operations have been restored. Additionally, the FFPF may operate within 24 hours of the FRE operations trigger/threshold and following pool evacuation.

Release Site 1 (RM 108.5)

Located on river left (looking downstream) of the Chehalis mainstem at the mouth of Crim Creek, Release Site (RS) 1 would serve as the primary release site when the FFPF is operational, but the FRE is not impounding flow.

Release Site 2 (RM 109.4)

Located on river left of the Chehalis mainstem, approximately 0.2 miles downstream of the Hull Creek confluence, RS2 would serve as the primary release site when the FRE begins to impound water and could support fish release operations when FRE pool elevations are below 471 feet.

Release Site 3 (RM 110.7)

Located on river right of the Chehalis mainstem, approximately 0.6 miles downstream of the Browns Creek confluence, RS3 would provide a release location along the mainstem after RS2 if the 1000 Road Bridge at RM 110 is inundated. RS3 could support fish release operations when FRE pool elevations are below 504 feet.

Release Site 4 (RM 111.1)

Located on river right of the Chehalis mainstem, approximately 0.2 miles downstream of the Browns Creek confluence, RS4 would provide a release location downstream of Browns Creek when RS 3 is inundated. RS4 could support fish release operations when FRE pool elevations are below 515 feet.

Release Site 5 (RM 112.2)

Located on river right of the Chehalis mainstem, immediately downstream of the Big Creek confluence, RS5 could support fish release operations when FRE pool elevation is below 542 feet.

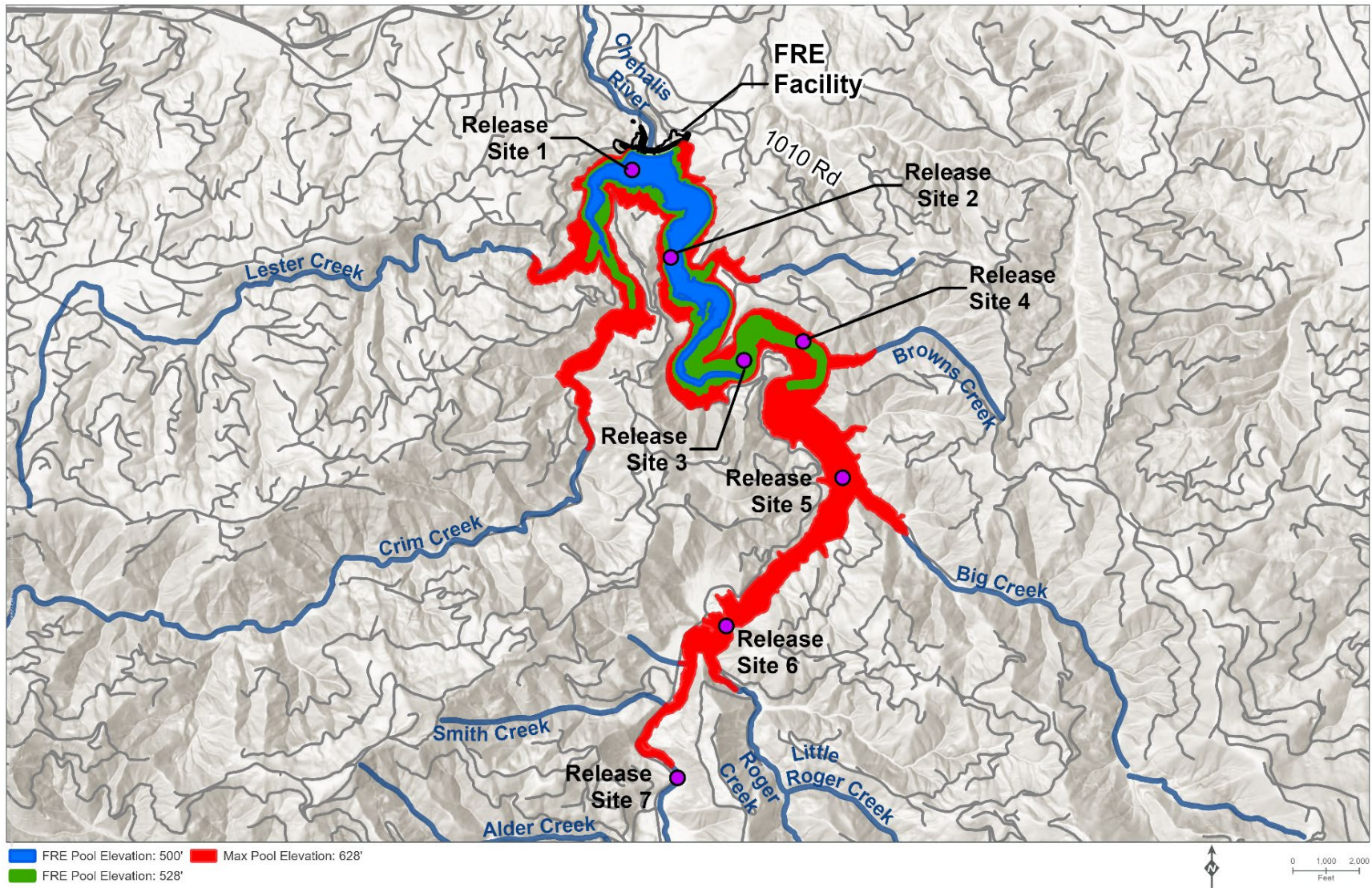
Release Site 6 (RM 113.4)

RS6 is located on river left of the Chehalis mainstem, just upstream of 1000 Road Bridge at RM 113.4, and approximately 0.1 miles below the Roger Creek confluence. This location is afforded access across the bridge from east of the mainstem when FRE pool elevation is rising, and from west of the mainstem as flows are receding. RS6 could provide fish release operations when FRE pool elevation is below 564 feet.

Release Site 7 (RM 114.6)

Located on river left of the Chehalis mainstem and just upstream of the maximum FRE pool elevation of 628 feet, RS 7 would be the furthest upstream release site.

Figure 2. Potential Release Sites



3.1.2 FRE Operations

In the proposed fish release concept, FRE operations and pool elevation will determine which of the identified release sites are employed during fish release operations. The location and sequencing of release sites can be described in conjunction with a conceptual FRE operation based on the flood event experienced in the Upper Chehalis watershed in January 2009. Figure 3 illustrates conceptual FRE inflows, FRE pool elevation, and FRE release outflow for the event. FRE operational analyses are underway and presenting this conceptual operation is not intended to exactly reflect future proposed operations. For the fish release concept, the important element presented is the FRE pool elevation and corresponding release site likely to be used during the rise and fall of the pool. Below are several FRE pool elevations to provide a framework for describing the fish release concept. The anticipated timing is provided in a conceptual context, actual timing may vary dependent on the significance of an individual storm hydrograph.

The FFPF will be operating within 24-hours of the FRE operations trigger/threshold. Fish trapped during this time may require release prior to commencement of FRE operations and would be released at RS1, which affords access to both Crim Creek and the Chehalis mainstem.

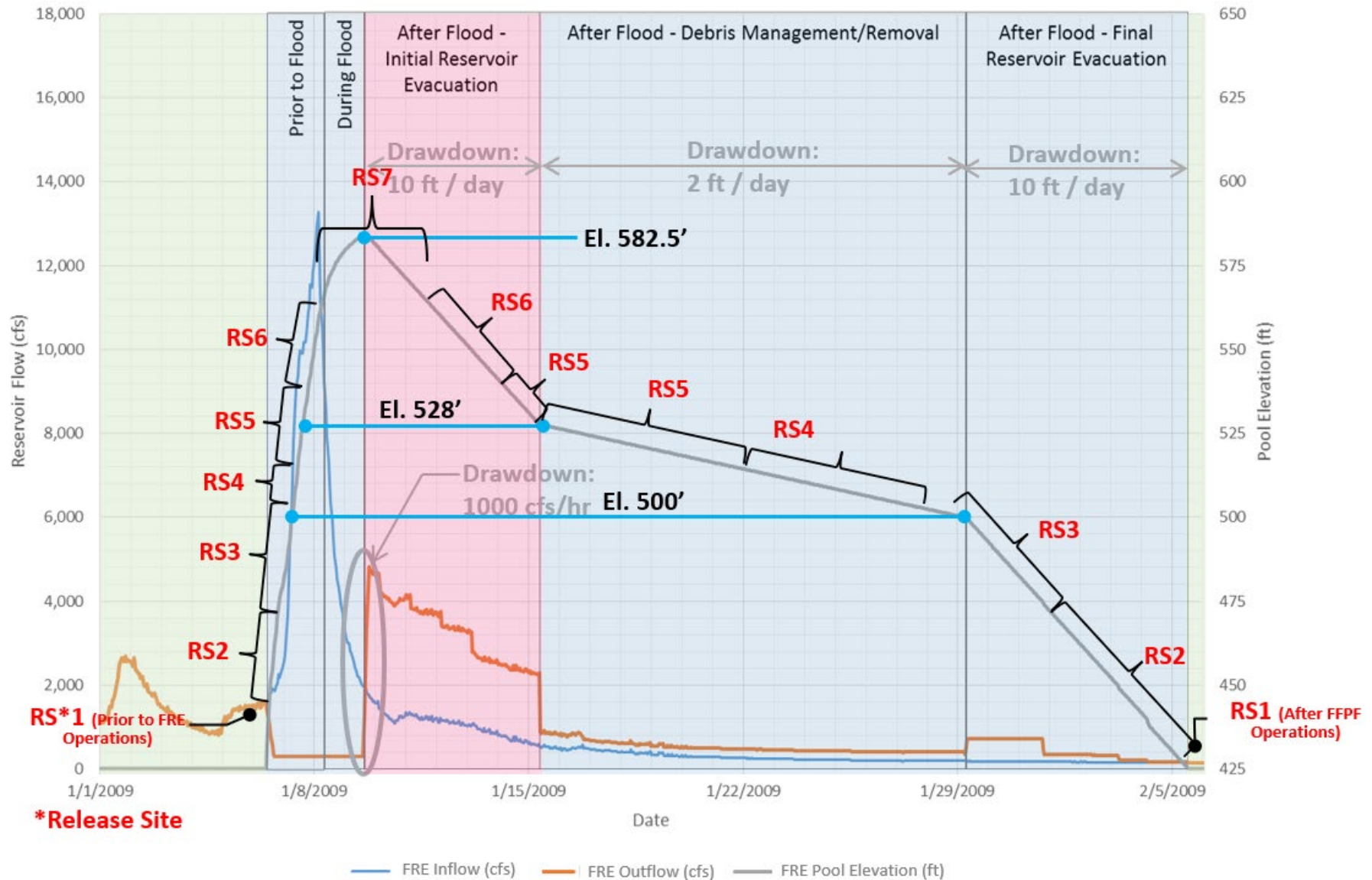
In the first 24 hours (Day 1) of FRE operation, the pool elevation is expected to be near 500 feet (Figure) and releases would be conducted at RS2, followed by RS3. Once the pool elevation exceeds 504 feet, RS4 would be employed.

From 24 to 48 hours of FRE operation, fish releases would occur at RS4, RS5, and then RS6. At 48 hours, the pool elevation may exceed 565 feet and subsequent fish releases would be conducted at RS7.

In the example storm event, FRE pool elevations are anticipated to exceed 582.5 feet at about 72 hours after FRE operations commence. This begins the initial reservoir evacuation procedures/operations. At Day 5 (120 hours of operation), the pool elevation would have receded enough to again use RS6. For the following 24 days, release operations would be conducted at release sites further and further downstream.

After the reservoir is evacuated and FRE operations cease, the FFPF would be operational for a minimum of 24 hours as river flows return to a run-of-river condition. During this period, collected fish would be released at RS1.

Figure 3. Conceptual FRE Operational Scenario: Jan 2009 Event





3.2 Route Selection and Transport Times

A desktop review of existing roads in the project area was performed to identify initial proposed routes to each release site. The selected routes are initial and utilize the existing road network. These routes are subject to field verification. The purpose of identifying initial routes is to provide an estimate of travel time, provide a starting point for assessing existing infrastructure, and identify shortfalls in available routes.

During FFPF operation, when a temporary reservoir is held upstream of the FRE structure, access to upstream release sites would be primarily through the town of Pe Ell and via Highway 6 and Pe Ell McDonald Road. From these two public roads, trucks would follow improved, existing logging roads to upstream release sites.

One tenet of this analysis is route redundancy, which for route selection means a primary and alternate route to each release site. Selected routes are illustrated and attached at the end of this TM. Travel times were computed for each route assuming an average speed of 35 miles per hour for improved, public roads. While higher speeds are possible in places, this assumed average accommodates varying speed limits, slowing for turns, and stop signs. For unimproved logging roads, an average of 15 miles per hour was assumed.

Transport times are not limited to travel durations. At the beginning of the transport operation, time is needed for fish transfer into the transport vessel. Similarly, time is needed at the release site to accommodate full release into the receiving water body. To provide estimates of the total transport time per route, 30 minutes was assumed for fish transfer operations at the FFPF, and 15 minutes was assumed for release operations at the release site.

Table 1. Release Site Transport Times

Release Site	Primary Route Travel Time	Alternate Route Travel Time
1	51min	1 hr 34min
2	50 min	1 hr 34 min
3	1 hr 8 min	2 hr 10 min
4	1 hr 8 min	2 hr 8 min
5	2 hr 5 min	2 hr 13 min
6	1 hr 56 min	2 hr 9 min
7	2 hr 5 min	2 hr 5 min

To provide true redundancy, routes are completely different to prevent road conditions at one location closing access to the destination, where possible. This was not achieved for all sites. Below is general discussion about access routes for sites during FRE operation.

For RS1, the primary route traverses around the east shoulder of the FRE and approaches RS1 from river right. The alternate route uses Highway 6 and approaches the Chehalis River via a wide loop to the west.

For RS2, the primary route traverses around the east shoulder of the FRE and crosses the Chehalis River at Bridge RM 108.7. The alternate route uses Highway 6 and approaches the Chehalis River via a wide loop to the west. The alternate route, which does not rely on Bridge RM 108.7, would become the primary route to access RS2 during reservoir drawdown, after Bridge RM 108.7 has been inundated.

For RS3 and RS4, the primary route circumvents the FRE in an eastward direction, using privately held logging roads. The alternate route uses Highway 6 and approaches the Chehalis River via a wide loop to the west. The alternate route crosses the Chehalis River at Bridge RM 113.4 and follows 1000 Road along the right bank of the river. The primary route would become inundated at a FRE pool elevation of approximately 504 feet, which is the same elevation where release operations would be relocated from RS3 to RS4, upstream. Consequently, access to RS4 would be limited to the alternate route for most periods during FRE pool impoundment and release.

RS5 and RS6 share the same primary and alternate routes. The primary route uses an eastward loop along the Pe Ell McDonald Road and into private logging roads. The alternate route circles west via Highway 6 and private logging roads. Both routes would join together east of the Chehalis River at Bridge RM 113.4 and continue downstream toward the two release sites.

For RS7, the primary and alternate routes would loop west and east, joining together, near Bridge RM 116. From this bridge, both routes would use 1000 Road to approach RS7.

The selected routes, based on the existing road network, do not provide perfect redundancy as the FRE pool elevation rises and falls. Below is a summary of the major issues and potential solutions:

1. As pool elevation rises, RS4 is isolated and can only be approached from the south, along the alternate route.

Potential Solution: Identify an existing route approaching RS4 from the west and construct a short access route to RS4 on the west bank.

2. If Bridge RM 113.4 is inundated, using it would violate Tenet #5 above. In this case, access to RS3, RS4, and RS5 would be limited to one route coming in from the east once the FRE pool begins to recede.

Potential Solution: Identify an existing route approaching RS 3, RS4, and RS5 from the west. This may require a new road graded to the west bank of the river.

4.0 Release Plan Further Development

This TM documents an initial fish release concept and desktop route analysis. Both warrant refinement as the Project design and associated operational procedures progress. Several items for future consideration and resolution are provided in the following subsections.

4.1 Confirmation of Release Sites

Release site locations need to be identified and accepted by Project stakeholders and regulatory agencies. Site identification will aid in developing the broader FFPF operational concept, serve as the basis of formulating site improvements that need to be accounted for within the Project design, justify access requirements, and inform efforts to evaluate Project effects. The first step is gaining consensus on the general approach to fish release operations, which would include review and confirmation of tenets identified in Section 3.1 to build an operational framework for release operations. Identification of specific release sites would follow.

4.2 Engineered Improvements

4.2.1 Route Assessment and Improvements

A detailed evaluation of identified roads needs to be completed to determine existing trafficability and suitability for proposed use. Suitability can be assessed based on standards set for the safety, timeliness, and reliability of each transport pathway. Next steps would include discussions with Weyerhaeuser staff to validate the most suitable routes into the release sites and inquire with Weyerhaeuser drivers as to road conditions throughout the year and typical mechanisms for road failure, and to solicit any recommendation(s) related to access and facility improvements. This could include turnouts, turnarounds, new roads to connect existing routes and shorten drive times, safety barriers such as guardrails, and access to release sites. Routes must support maintenance vehicles and maintenance equipment in addition to fish transport trucks. The following items are for future consideration:

- Additional improvements for roads periodically inundated by FRE operation.
- New roads may be needed to provide redundant access or safer travel. Road sections with steeper slopes (>12%) may require pavement.
- Roadbeds cut into hill slopes can be subject to obstruction due to upslope slides. Existing slope cuts may need to be evaluated for stability and improved to lower the risk of obstruction.

- Occasional snow removal may be required on transport routes and transport vehicles must be equipped to drive in snow conditions. Road improvements or new roads could be required to ensure access.

4.2.2 Drainage Improvements

Many roadway failure mechanisms or causes of roadway obstruction can be attributed to inadequate drainage facilities and improper handling of runoff. Poorly maintained, poorly sited, and undersized roadway culverts can cause roadway flooding and damage to the roadbed which can preclude vehicle traffic. Improper energy dissipation at culverts can cause damage to the downstream channel and toe of the roadbed. Sheet flows from upslope, entering onto the road, can be concentrated and discharged onto the roadbed and slope below – providing unnatural slope saturation and raising the risk of slope failure. Slope failures and roadbed collapse of this kind risk making the road impassable for long periods of time.

The private road network providing access to the release sites supports forestry operations. Comparatively, fish release operations will require more robust drainage infrastructure as access routes must be open during severe weather. The existing drainage infrastructure should be assessed to ensure its functionality during large storm events. Road culverts may need to be replaced and upsized. Roadside ditches may be required to prevent roadway washout and slope failure. Bridges will require a structural assessment to evaluate effects of FRE pool inundation and may require replacement.

4.2.3 Release Site Improvements

The identified release sites in this TM do not currently afford ready access to the Chehalis River. An access road and parking location will need to be designed and constructed. If new release sites are identified, it is likely that each of these will require improvements as well. There may be other improvements to support fish recovery and acclimation at each point of release.

4.3 Operations and Maintenance Requirements

Fish transport and release are the final phases of FFPF operation to be included with the FFPF operations and maintenance (O&M) plan. Fish release operations will be informed by FRE operations and release site selection, as discussed above, but also by the frequency of fish release driven by FFPF criteria such as fish holding capacity and duration. The O&M plan will detail required maintenance activities such as regular condition assessments of the fish transport roads, regular road maintenance activities to keep roads functional during storm events, and emergency repair activities when a road is damaged during a storm event. O&M requirements may include route reconnaissance in advance of each release to confirm trafficability and clear routes for transport crews. Downed trees and rock fall are other potential mechanism for road obstruction requiring crews available and equipped to clear roads.

4.4 Monitoring and Adaptive Management

The present release sites are conceptual. Final release sites will be determined in collaboration with regulatory agencies and Tribes. During the life of the Project, release sites are expected to change based on environmental and biological considerations. It is anticipated that a team of experts from the agencies and Tribes will meet regularly to discuss as part of the adaptive management plan.

4.5 Securing Site Access

The privately held road network in the upper basin is necessary for the proposed truck transport fish release operation. Access to select roads will be required. Property acquisition, easement agreement, memorandum of use, or other method will be required to assure necessary access to release sites.

5.0 References

HDR Engineering, Inc. (HDR)

- 2017 Combined Dam and Fish Passage Conceptual Design Report. June 2017.
- 2018a Combined Dam and Fish Passage Supplemental Design Report FRE Dam Alternative Report. September 2018.
- 2018b Fish Passage: CHTR Preliminary Design Report. February 2018.
- 2024 Revised Project Description: Flood Retention Expandable Structure Report. Chehalis River Basin Flood Drainage Reduction Project, Lewis County, Washington. April 25, 2024.

6.0 Acronyms/Abbreviations

Ecology	Washington State Department of Ecology
FFPF	Flood Fish Passage Facility
FRE	Flood Retention Expandable
HDR	HDR Engineering, Inc.
O&M	operations and maintenance
RPDR	Revised Project Description Report
RM	river mile
RS	release site

Attachments – Selected Routes

Route Overview (Sites 1-7)

Site 1 and Site 2 Access

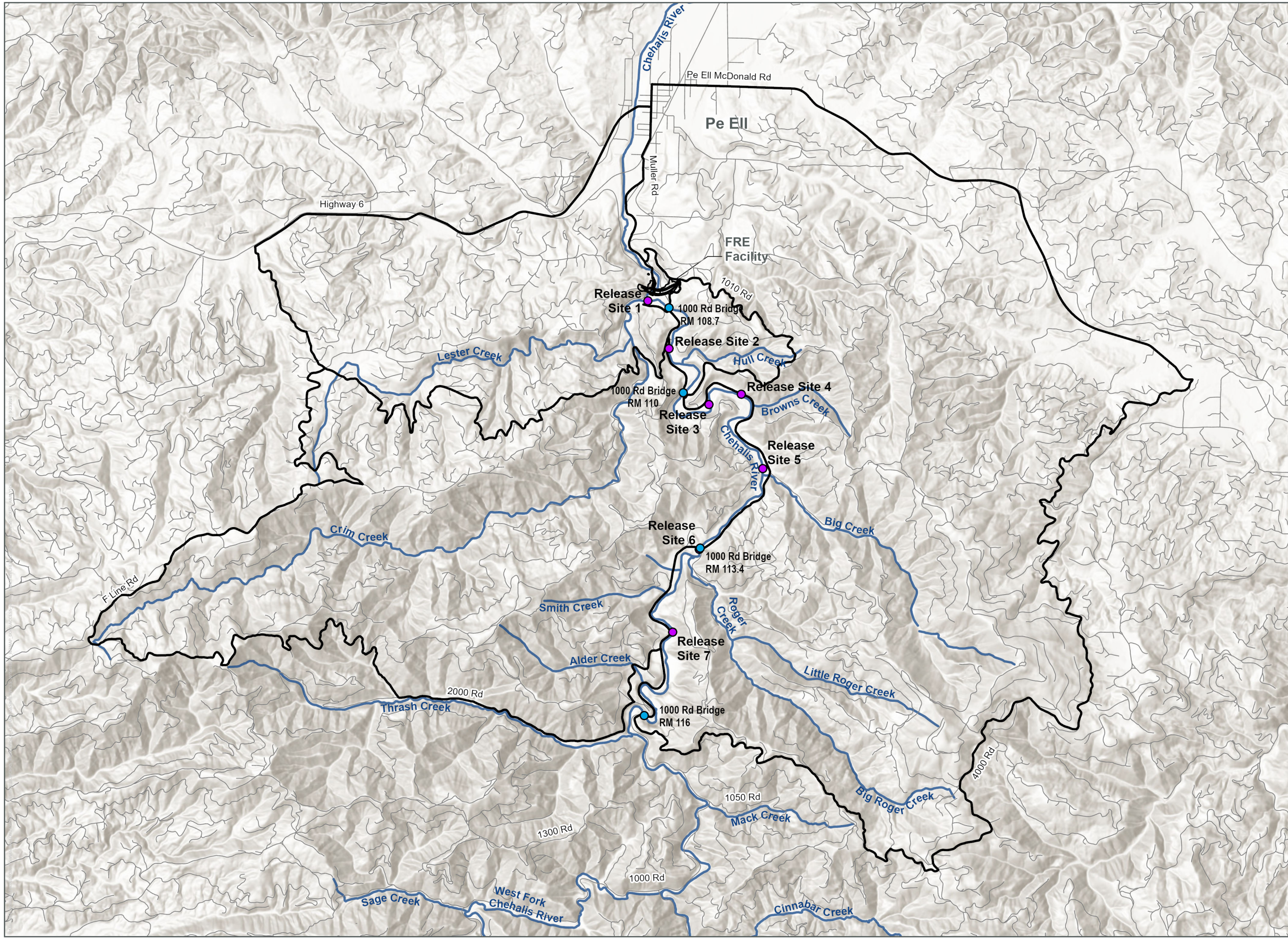
Site 3 and Site 4 Access

Site 5 and Site 6 Access

Site 7 Access

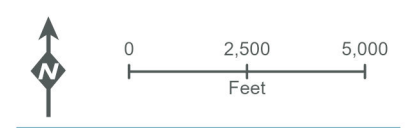
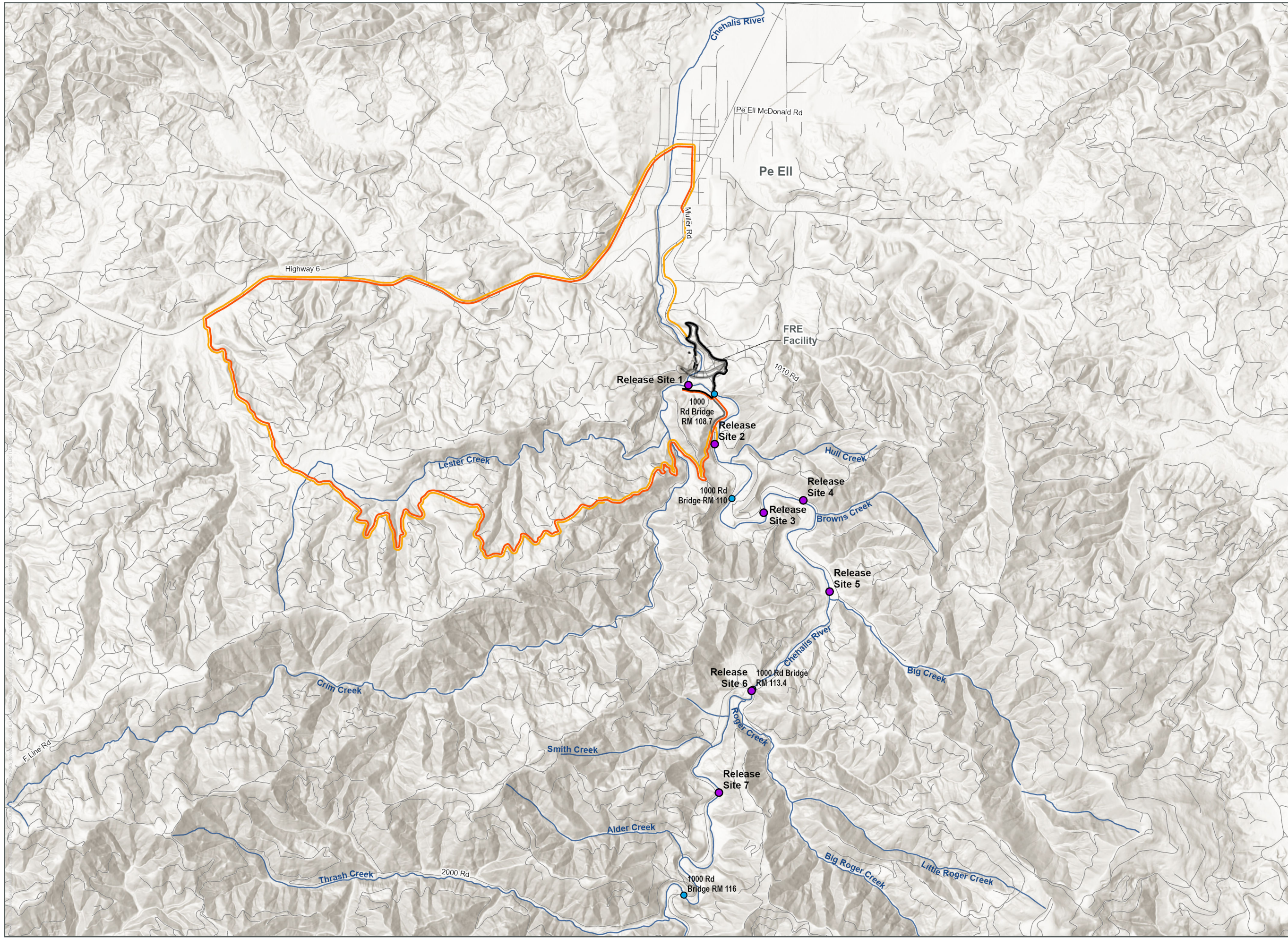
CHEHALIS ACCESS ROUTE OVERVIEW

- Fish Release Site
- Bridge Sites
- Fish Release Site Routes
- Streams



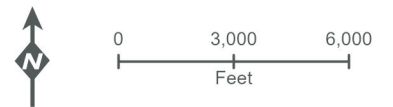
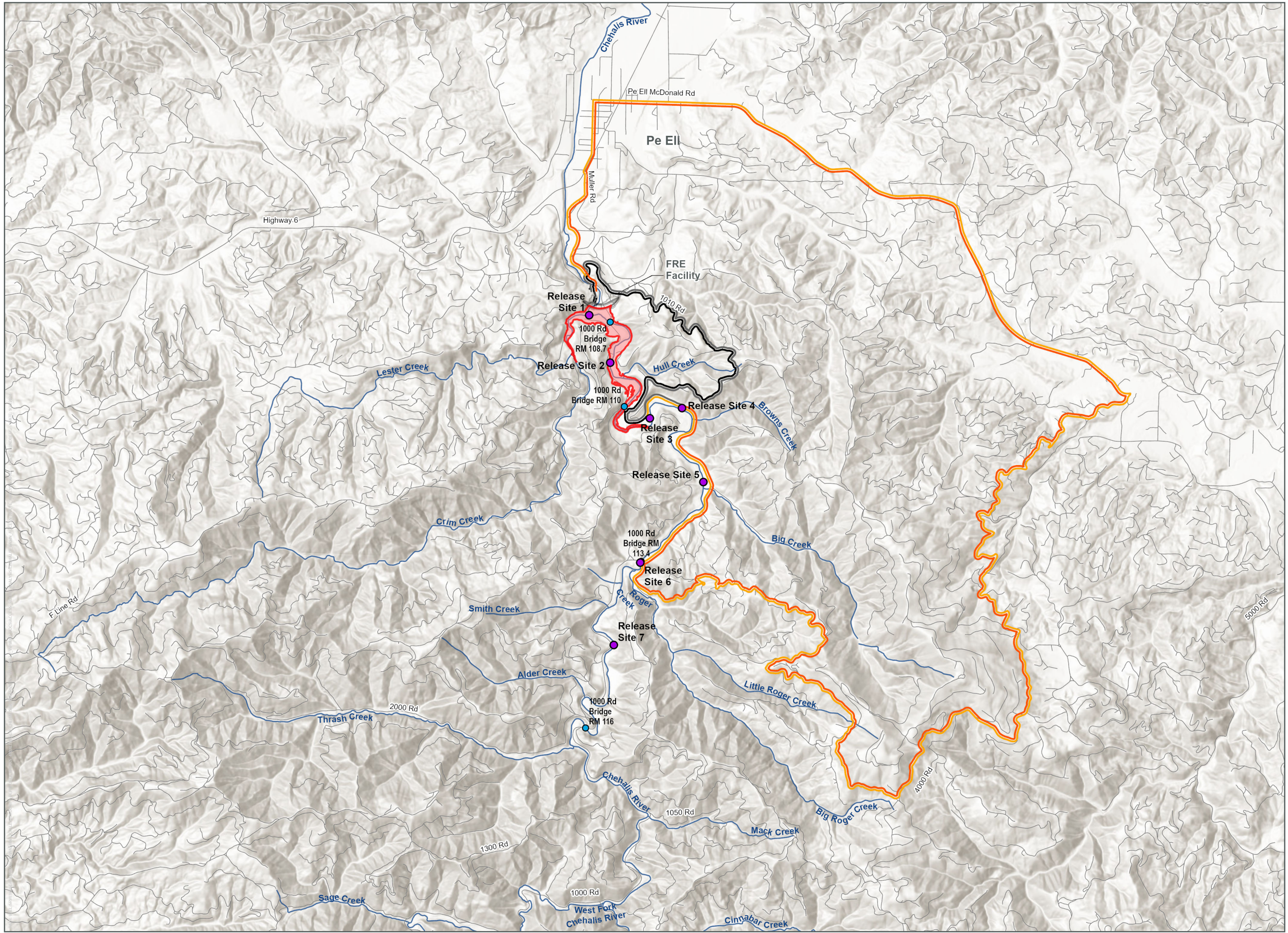
SITE 1 & SITE 2 ACCESS

- Fish Release Site
- Bridge Sites
- Release Site 1 - 6 min
- Release Site 1 Alternative - 42 min
- Release Site 2 - 8 min
- Release Site 2 Alternative - 41min
- Streams



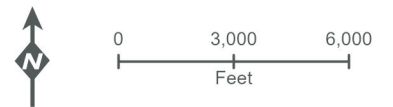
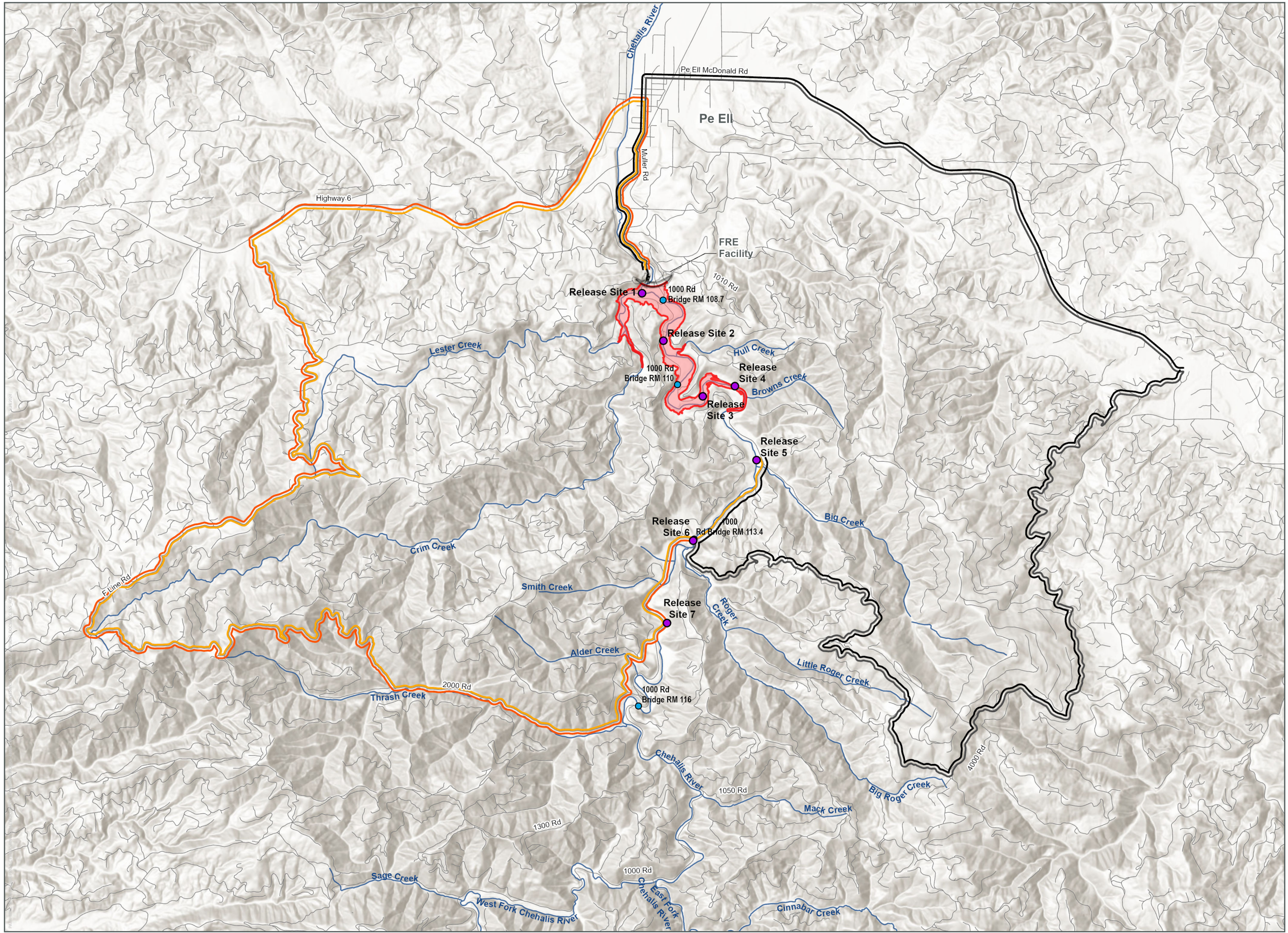
SITE 3 & SITE 4 ACCESS

- Fish Release Site
- Bridge Sites
- Temporary Reservoir Inundation Area- 500 ft
- Release Site 3 - 23 min
- Release Site 3 Alternative - 1 hr 21 min
- Release Site 4 - 23 min
- Release Site 4 Alternative - 1 hr 19 min
- Streams



SITE 5 & SITE 6 ACCESS

- Fish Release Site
- Bridge Sites
- Temporary Reservoir Inundation Area- 528 ft
- Release Site 5 - 1 hr 15 min
- Release Site 5 Alternative - 1 hr 29 min
- Release Site 6 - 1 hr 18 min
- Release Site 6 Alternative - 1 hr 21 min
- Streams



SITE 7 ACCESS

- Fish Release Site
- Bridge Sites
- Temporary Reservoir Inundation Area - 628ft
- Release Site 7 - 1 hr 17 min
- Release Site 7 Alternative - 1 hr 14 min
- Streams

