

Appendix C

Mitigation Impact Crosswalk Tables

Table 1

Crosswalk Table from Direct Impacts for the Original FRE Facility Design Presented in the SEPA DEIS (Ecology 2020) and NEPA DEIS (Corps 2020) to the Applicant’s Updated Potential Effects of the Proposed Action, Avoidance and Minimization Measures, and Proposed Mitigation.

ACTION	ENVIRONMENTAL DISTURBANCE	SEPA DEIS ORIGINAL PROJECT DIRECT IMPACT	NEPA DEIS ORIGINAL PROJECT DIRECT IMPACT	POTENTIAL EFFECTS OF PROPOSED ACTION	AVOIDANCE, MINIMIZATION, AND RESTORATION MEASURES	POTENTIAL UNAVOIDABLE EFFECTS	MITIGATION
Construction	Construction noise, blasting, ground disturbance, spoil placement, dewatering, temporary and permanent removal or disturbance of vegetation or habitats during construction activities.	Disturbance/Injury/mortality to low-mobility individuals of aquatic and terrestrial species from dewatering, ground disturbing activities, blasting, and tree removal. Disturbance to species from noise and blasting; potential decreased production from sensitive species such as marbled murrelets, bald eagles, and other raptors.	Moderate impacts through injury or death of plants. Injury or harassment of terrestrial wildlife species that are less capable of relocating or avoiding disturbance (e.g., reptiles, amphibians, non-winged invertebrates).	No revised effects.	<ul style="list-style-type: none"> Minimize timing-related effects by following WDFW guidelines for in-water work. Minimize the duration of the overall construction effect due to a phased approach that allows for work in the dry and reduces in-water work to cofferdam install and removal. Minimize area of effect as the new design incorporates phased construction that supports working in the dry and minimizes the need for temporary dewatering less than 0.5 miles of the mainstem (RM 108.26 to 108.62). Follow BMPs for protection of fish and wildlife species from noise and blasting, avoid sensitive nesting season. Restore of all temporarily disturbed habitats immediately following construction. Begin implementing the VMP during construction by in-planting native flood-tolerant species in inundation area that will not be disturbed during construction. 	<ul style="list-style-type: none"> Potential effect, mortality of individuals of low-mobility species. 	<ul style="list-style-type: none"> Enhancement of natural forest habitat and natural processes within 1,921 acres of Forest Conversion area, includes approximately 35 acres immediately upstream/upslope of the construction area. This measure provides protection and enhancement of mature trees to enhance habitat for amphibians, marbled murrelets, bald eagles, raptors. Gravel retention structures in inundation area would enhance spawning and rearing habitat for Western toad.
Construction	Temporary dewatering of FRE site during construction and in-water work.	Temporary loss of Chehalis River stream habitat in dewatered area during construction.	Temporary loss of 4.83 acres of stream habitat from dewatering the construction site and placement of cofferdams and staging areas during construction.	No revised effects.	<ul style="list-style-type: none"> Minimize timing-related effects by following WDFW guidelines for in-water work. Minimized the duration of the overall construction effect due to a phased approach that allows for work in the dry and reduces in-water work to cofferdam install and removal. Minimized area of effect as the new design incorporates phased construction that supports working in the dry and minimizes the need for temporary dewatering less than 0.5 miles of the mainstem (RM 108.26 to 108.62). Develop and implement aquatic species salvage plan. 	<ul style="list-style-type: none"> Potential effect, mortality of aquatic species not salvaged. No significant effect anticipated after Avoid and Minimize measures. 	<ul style="list-style-type: none"> No mitigation proposed.

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Construction	Use of construction diversion tunnel with capacity to convey flows up to the 2.8-year flood event.	Pooling of water upstream of FRE facility during construction when flows exceed 2.8-year flood event.	<p>Permanent disturbance of 0.36 acre of the Chehalis River Channel to construct the diversion tunnel inlet and outlet.</p> <p>At flows greater than tunnel design storm (2.8-year), temporary reduction of downstream flows, pooling of water upstream of tunnel, potential for increased erosion, changes to sediment transport and fining of bed substrate, and reduction in the transport of LWM.</p>	No construction effect expected as no diversion tunnel in Proposed Action.	<ul style="list-style-type: none"> • Avoided effects associated with use of a diversion tunnel designed to convey up to the 2.8-year flood event as the diversion tunnel is not part of the Proposed Action. 	<ul style="list-style-type: none"> • No unavoidable effects. 	<ul style="list-style-type: none"> • No mitigation proposed.
Construction	Impeded upstream fish passage at FRE site via temporary trap-and-transport (TTT) system; downstream fish passage via bypass tunnel during 32-month construction period.	Reduced upstream fish passage survival for salmon and steelhead and resident fish above the FRE site.	No construction impact noted.	<p>No construction effect expected as no TTT system in Proposed Action.</p> <p>Volitional passage for all species all the time provided throughout the construction period.</p>	<ul style="list-style-type: none"> • Avoided survival effects to fish as the temporary bypass channel eliminates the need for a TTT system and will provide full volitional passage. 	<ul style="list-style-type: none"> • No unavoidable effects associated with fish passage. 	<ul style="list-style-type: none"> • No mitigation proposed as no TTT system effects in Proposed Action.
Construction	Temporary disturbance of the floodplain and uplands from construction activities.	Temporary impact to wetlands and wetland buffers, riparian/stream buffers and floodplain, and non-buffer uplands.	<p>Temporary impacts during construction to:</p> <ul style="list-style-type: none"> • 2.9 acres of floodplain at the FRE facility construction site • 139 acres of the inundation area. 	<p>Temporary effects within construction disturbance limits to:</p> <ul style="list-style-type: none"> • 56.4 acres stream buffer (including 14.1 acres of overlapping stream and wetland buffer¹) • 21.8 acres of wetland buffer (excluding 14.1 acres of overlapping stream and wetland buffer accounted for under stream buffer¹) • 90.0 acres of uplands (removing acreage of wetland buffer and stream buffer noted above). 	<ul style="list-style-type: none"> • Minimize the duration of the overall construction effect due to a phased approach that allows for work in the dry and reduces in-water work to cofferdam install and removal. • Restore all temporarily disturbed habitats (wetlands, stream buffers, wetland buffers, and uplands) after construction following Washington State BMPs. • Plant fast growing flood-tolerant species along streams and within the inundation area. 	<ul style="list-style-type: none"> • Effects to wetlands are unavoidable and permanent due to construction duration. 	<ul style="list-style-type: none"> • Mitigation quantified under Development of Proposed FRE facilities.

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Development of proposed FRE facilities	Excavation, grading, and fill to construct the proposed FRE facility.	Permanent loss of 0.32 acres of stream habitat.	<p>Permanent conversion of 2.05 acres of natural river channel into a concrete-lined conveyance.</p> <p>Permanent loss of 1.45 acres of unnamed intermittent streams and drainages:</p> <ul style="list-style-type: none"> • 0.74 acres from placement of excavation spoils • 0.6 acres outside inundation area from construction of haul and access roads • 0.11 acres in inundation area from construction of haul roads. 	<p>Permanent loss of 2.7 acres of the Chehalis River natural channel and <0.01 acre of intermittent Type N stream under the FRE facility and stilling basin.</p> <p>Permanent loss of 0.01 acres of Type N stream from construction of new roads and improvements to existing roads.</p> <p>Permanent replacement of 2.48 acres of stream habitat with Chehalis River and Crim Creek engineered channel and new roads in the inundation area.</p>	<ul style="list-style-type: none"> • Minimize impact of final design by minimizing FRE facility footprint. • Minimize the duration of impact to stream habitat within engineered channel by using reach design that mimics natural channel and substrate. 	<ul style="list-style-type: none"> • 2.7 acres of stream habitat. 	<ul style="list-style-type: none"> • 0.75 acres (0.3 acres x 2.5) off-channel habitat enhancement at RM 104.6-104.9 creating 0.75 acres of mainstem rearing habitat over time and 0.2 acres of new spawning habitat for Chinook salmon and steelhead. • 6.0 acres (2.4 acres x 2.5) of tributary access enhancements that will open 0.9 miles of new fish-bearing stream channel and over 8.4 miles of stream habitat, 4.2 miles of which contain spawning habitat for Steelhead and Coho salmon.
Development of proposed FRE facilities	Excavation, grading, and fill to construct the proposed FRE facility.	Permanent loss of 10.79 acres of riparian area/stream buffers and floodplain.	Permanent effect to about 11.4 acres within the 100-year floodplain, including approximately 11.12 acres of combined wetland and stream buffer from excavation, grading, and fill placement to construct the FRE facility.	Permanent loss of 19.7 acres of stream buffer (including 12.6 acres of overlapping stream and wetland buffer).	<ul style="list-style-type: none"> • Use of BMPs to minimize disturbance. • Restore all temporarily disturbed areas with native plants. 	<ul style="list-style-type: none"> • Permanent loss of 19.7 acres of stream buffer (including 12.6 acres of overlapping stream and wetland buffer). 	<ul style="list-style-type: none"> • 19.7 acres (19.7 acres x 1) of riparian buffer enhancement with native riparian plantings along the mainstem as part of the Riparian and Stream Buffer Expansion Plan.
Development of proposed FRE facilities	Excavation, grading, and fill to construct the proposed FRE facility.	<p>Permanent loss of 1.08 acres of wetlands:</p> <ul style="list-style-type: none"> • 0.65 acres within the FRE structure footprint and construction disturbance areas outside the inundation area • 0.43 acres within the inundation area. 	<p>Permanent loss of 1.23 acres of wetlands:</p> <ul style="list-style-type: none"> • 0.05 acres Category II • 1.18 acres Category III. 	<p>Permanent loss of 1.85 acres of wetlands consisting of 16 Category III wetlands:</p> <ul style="list-style-type: none"> • 0.82 acres within the FRE facility footprint • 0.81 acres within temporary construction disturbance areas outside the inundation area • 0.22 acres temporary construction disturbance area within inundation area. 	<ul style="list-style-type: none"> • Use of BMPs to minimize disturbance. • Restore all temporarily disturbed areas with native plants. 	<ul style="list-style-type: none"> • Permanent loss of 1.85 acres of Category III wetlands. 	<ul style="list-style-type: none"> • Wetland mitigation at RM 87.6-89.3 provides 3.7 acres (1.85 x 2.0) of created wetland.

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Development of proposed FRE facilities	Excavation, grading, and fill to construct the proposed FRE facility.	Permanent loss of 30.14 acres of wetland buffer.	Permanent loss of approximately 11.12 acres of combined stream-wetland buffer from excavation, grading, and fill placement to construct the FRE facility.	Permanent loss of 13.7 acres of wetland buffer (excluding 12.6 acres of overlapping stream and wetland buffer accounted for under stream buffer).	<ul style="list-style-type: none"> Use of BMPs to minimize disturbance. Restore all temporarily disturbed areas with native plants. 	<ul style="list-style-type: none"> Permanent loss of 13.7 acres of wetland buffer (excluding 12.6 acres of overlapping stream and wetland buffer accounted for under stream buffer). 	<ul style="list-style-type: none"> Wetland mitigation at RM 87.6-89.3 provides 13.7 acres (13.7 x 1) of wetland buffers.
Development of proposed FRE facilities	Excavation, grading, and fill to construct the proposed FRE facility.	Permanent loss of 3.78 acres of non-buffer upland habitats.	No development impact separately quantified for non-buffer upland habitats.	Permanent loss of 13.3 acres of non-buffer upland habitats.	<ul style="list-style-type: none"> Use of BMPs to minimize disturbance. Restore all temporarily disturbed areas with native plants. 	<ul style="list-style-type: none"> Permanent loss of 13.3 acres upland habitat. 	<ul style="list-style-type: none"> 13.3 acres (13.3 acres x 1) of total Forest Conversion acreage including non-buffer uplands (1,558.5 acres).
Development of proposed FRE facilities	Impeded upstream and downstream fish passage through volitional passage facilities at the FRE facility outside of flood retention events.	Permanent reduced upstream and downstream fish passage survival of salmon, steelhead, and resident fish at the FRE site outside of flow retention events.	Reduced fish passage.	No effects are anticipated with dedicated fish passage conduits designed to meet NMFS and WDFW passage criteria would provide volitional fish passage.	<ul style="list-style-type: none"> Avoided effect as volitional upstream and downstream passage will be provided with new bypass that will be designed to meet NMFS and WDFW passage criteria. 	<ul style="list-style-type: none"> No unavoidable effects. 	<ul style="list-style-type: none"> No mitigation proposed.
Development of FRE facilities	Impeded flows of flood events less than major but greater than the conveyance capacity of the FRE Facility gate outlets.	No development impact noted.	Temporary pooling of water upstream of FRE facility at flows >8,000 cfs that exceed the conveyance capacity of the FRE gated outlets. Maximum predicted size of the pool would have elevation of 436.7 feet (about 12 feet above the riverbed elevation of 425 feet). Depending on storm event, the pool could be up to 700 feet long and could last for about 1 day.	New conduits will pass flow up to 10,000 cfs. Above this, water will pool temporarily and result in limited coarse and fine sediment deposition. Once flows drop below 10,000 cfs and the river is free flowing, transport capacity at or upstream of that location is sufficient to mobilize any deposits quickly.	<ul style="list-style-type: none"> Avoided effect as Proposed Action includes FRE facility designed with sufficient conveyance capacity. Design of conduits for the revised project would pass flows up to 10,000 cfs. 	<ul style="list-style-type: none"> No unavoidable effects. 	<ul style="list-style-type: none"> No mitigation proposed.

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Pre-operation tree removal	Pre-operation tree removal and implementation of VMP in inundation area Zones 1 and 2 (600 acres).	Loss of stream buffer tree cover/shade and ground disturbance in riparian/stream buffers in Zones 1 and 2: <ul style="list-style-type: none"> • 18.2 miles stream buffer (both sides of stream): <ul style="list-style-type: none"> – 11.51 miles Chehalis River – 6.69 miles tributaries. • 312.8 acres stream buffer: <ul style="list-style-type: none"> – 252.6 acres along fish-bearing streams. Loss of trees/shade along 11.44 miles of stream: <ul style="list-style-type: none"> • 5.79 miles Chehalis River • 5.65 miles of tributaries • 8.79 miles are fish-bearing. 	Permanent disturbance of 340.44 acres of combined stream-wetland buffer from the removal of trees and other vegetation in the inundation area Zones 1 and 2.	Loss of stream buffer tree cover/shade and ground disturbance in the inundation area would be limited to in the construction disturbance area accounted for above under Development of Proposed FRE facilities: <ul style="list-style-type: none"> • 0.5 miles of stream: <ul style="list-style-type: none"> – 0.38 miles Chehalis River – 0.06 miles of Crim Creek and non-fish-bearing tributaries. • 23.3 acres of stream buffer (including 9.3 acres of overlapping stream and wetland buffer): <ul style="list-style-type: none"> – 22.3 acres along fish-bearing streams. 	<ul style="list-style-type: none"> • Minimize the extent and severity of effect by removing only those trees required for construction and staging or inspection of the FRE facility. • Minimize the extent and severity of the effect through the implementation of the revised VMP pre-operations: <ul style="list-style-type: none"> – Initiate planting of native, flood-tolerant species within the 60-ft zone as early as possible in the permitting period to maximize years of growth prior to the proposed FRE facility operation – Conduct invasive species management during construction and pre-operation as needed – Leave stumps and standing dead wood for wildlife. • Restoration of stream buffer along 0.38 mi of Chehalis River and 0.06 miles of Crim Creek; and 0.04 miles of non-fish-bearing tributaries (total of 23.4 acres) following Washington State BMPs. 	<ul style="list-style-type: none"> • No unavoidable effects. 	<ul style="list-style-type: none"> • No mitigation proposed.
Pre-operation tree removal	Pre-operation tree removal and implementation of VMP in inundation area Zones 1 and 2 (600 acres).	Loss of tree cover and ground disturbance in wetlands in Zones 1 and 2: <ul style="list-style-type: none"> • 6.5 acres of wetlands: <ul style="list-style-type: none"> – 2.76 acres Category II wetlands – 3.74 acres Category III wetlands. • 213.85 acres of wetland buffer. 	Permanent disturbance of the vegetation, soils, and hydrology in 4.20 acres of wetlands from the removal of trees and other vegetation: <ul style="list-style-type: none"> • 1.03 acres of Category II • 3.17 acres of Category III. Permanent disturbance of 340.44 acres of combined stream-wetland buffer from the removal of trees and other vegetation in the temporary reservoir area.	Tree removal within the inundation area would be limited to the temporary construction disturbance area (accounted for above under Construction): <ul style="list-style-type: none"> • 0.22 acres of Category III wetlands • 18.3 acres of wetland buffer (excluding 9.3 acres of overlapping stream and wetland buffer accounted for under stream buffer). 	<ul style="list-style-type: none"> • Minimize the extent and severity of effect by removing only those trees required for construction and staging or inspection of the FRE facility. • Minimize the extent and severity of the effect through the implementation of the revised VMP pre-operations: <ul style="list-style-type: none"> – Initiate planting of native, flood-tolerant species within the 60-ft zone as early as possible in the permitting period to allow to maximize years of growth prior to the proposed FRE facility operation – Conduct invasive species management during construction and pre-operation as needed – Leave stumps and standing dead wood for wildlife – Restoration of 18.3 acres of wetland buffer following Washington State BMPs. 	<ul style="list-style-type: none"> • No additional unavoidable effect (loss of 0.22 acres of wetlands accounted for under Development of Proposed FRE facilities). 	<ul style="list-style-type: none"> • No additional mitigation for wetlands accounted for under Development of Proposed FRE facilities construction disturbance area.

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Pre-operation tree removal	Pre-operation tree removal and implementation of VMP in inundation area Zones 1 and 2 (600 acres).	<p>Permanent removal of 90% of tree cover (426 acres) in Zones 1 and 2 (600 acres).</p> <p>426 acres of upland forest and forested wetland convert to scrub-shrub dominated by young alder, willows, dogwood, elderberry, salmonberry:</p> <ul style="list-style-type: none"> • Douglas fir or mixed forest (369.4 acres) • Deciduous forest (50.5 acres) • Wetlands (6.5 acres). 	485 acres of tree removal.	<p>Tree removal within the inundation area would be limited to the 53.1-acre construction disturbance area:</p> <ul style="list-style-type: none"> • 49.0 acres of upland forest and forested wetland may convert to scrub-shrub: <ul style="list-style-type: none"> – Commercial Douglas fir timberlands or mixed forest (44.2 acres) – Deciduous forest (4.7 acres) – Wetlands (0.22 acres). 	<ul style="list-style-type: none"> • Minimize the extent and severity of effect by removing only those trees required for construction and staging or inspection of the FRE facility. • Minimize the extent and severity of the effect through the implementation of the revised VMP pre-operations: <ul style="list-style-type: none"> – Initiate planting of native, flood-tolerant species within the 60-ft zone as early as possible in the permitting period to allow to maximize years of growth prior to the proposed FRE facility operation – Conduct invasive species management during construction and pre-operation as needed – Leave stumps and standing dead wood for wildlife. • Restoration and replanting of 49.0 acres of forested areas with flood-tolerant tree species following Washington State BMPs. 	<ul style="list-style-type: none"> • No additional unavoidable effect to wetlands (loss of 0.22 acres of wetlands already accounted for under Development of Proposed FRE facilities construction disturbance area). • Conversion of 49.0 acres of forested habitat to earlier successional stage and native flood-tolerant plant community. 	<ul style="list-style-type: none"> • No additional mitigation for wetlands accounted for under Development of Proposed FRE facilities construction disturbance area. • Enhance complex wildlife habitat within the 1,921-acre Forest Conversion area, including the 1558.5 acres of Conversion block being transitioned to a native, multi-canopied, successional forest and 362.5 acres of expanded riparian habitat. A diversity of wildlife habitat will be created with native vegetation and restored natural forest processes. This will provide habitat for ground dwelling species with low mobility including small mammals, amphibians, reptiles and invertebrates.
Pre-operation tree removal	Pre-operation tree removal and implementation of VMP in inundation area Zones 1 and 2 (600 acres).	Reduced large woody material from tree removal in 426 forested acres within inundation area Zones 1 and 2.	Decrease of LWM recruitment from the removal of trees within the footprint of the temporary reservoir as part of pre-construction vegetation management activities.	Reduced large woody material from tree removal in 49.0 forested acres within 53.1-acre construction disturbance limits within the inundation area.	<ul style="list-style-type: none"> • Minimize the extent and severity of effect by removing only those trees required for construction and staging or inspection of the FRE facility. • Minimize the extent and severity of the effect through the implementation of the revised VMP pre-operations: <ul style="list-style-type: none"> – Initiate planting of native, flood-tolerant species within the 60-ft zone as early as possible in the permitting period to allow to maximize years of growth prior to the proposed FRE facility operation – Leave stumps and standing dead wood for wildlife. 	<ul style="list-style-type: none"> • Reduced large wood material. 	<ul style="list-style-type: none"> • 6 flood fences to be installed within in VMP area to capture and retain LWM in the stream channel. • Translocation of LWM captured above the FRE to locations downstream of the FRE. • 14 mitigation actions that use LWM to improve habitat complexity downstream of the proposed FRE facility. • LWM is a component of 6 mitigation actions upstream of the proposed FRE facility for spawning habitat enhancement.

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Pre-operation tree removal	Pre-operation tree removal and implementation of VMP in inundation area Zones 1 and 2 (600 acres).	Injury/mortality to low-mobility individuals of aquatic and terrestrial species from ground-disturbing activities, and tree removal. Disturbance to species from noise.	Impacts in the temporary reservoir area from 485 acres of tree clearing and habitat disturbance. In general, terrestrial wildlife species that are less capable of relocating or avoiding disturbance (e.g., reptiles, amphibians, non-winged invertebrates) would have a higher potential of injury or harassment. More mobile wildlife species (e.g., mammals, birds, winged invertebrates) would have a higher potential of avoiding injury or harassment.	No revised effects.	<ul style="list-style-type: none"> • Minimize the extent and severity of effect by removing only those trees required for construction and staging or inspection of the FRE facility. This is expected to be an area extending approximately 30 to 350 feet out from the FRE facility (approximately 25 acres). • Minimize the extent and severity of the effect through the implementation of the revised VMP pre-operations: <ul style="list-style-type: none"> – Initiate planting of native, flood-tolerant species within the 60-ft zone as early as possible in the permitting period to allow to maximize years of growth prior to the proposed FRE facility operation – Conduct invasive species management during construction and pre-operation as needed – Leave stumps and standing dead wood for wildlife. 	<ul style="list-style-type: none"> • Some injury/mortality to individuals of sessile or low-mobility species. 	<ul style="list-style-type: none"> • Enhance complex wildlife habitat within the 1,921-acre Forest Conversion area, including the 1558.5 acres of Conversion block being transitioned to a native, multi-canopied, successional forest and 362.5 acres of expanded riparian habitat. A diversity of wildlife habitat will be created with native vegetation and restored natural forest processes. This will provide habitat for ground dwelling species with low mobility including small mammals, amphibians, reptiles and invertebrates.

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Periodic flood retention of major or greater floods and vegetation management	Inundation of up to 16.8 miles of stream habitat for up to 35 days (at spillway elevation of 628 ft MSL).	Periodic and temporary conversion of up to 16.8 miles (113.43 acres) of stream channel to pool: <ul style="list-style-type: none"> • 16.83 miles/113.43 acres of stream: <ul style="list-style-type: none"> – 6.79 miles mainstem Chehalis River – 10.04 miles of tributaries – 11.74 miles are fish-bearing – Includes the 11.44 miles of stream impacted by tree removal in Zones 1 and 2 prior to operations. 	Disturbance of up to 94.09 acres of rivers and streams from periodic prolonged inundation when the FRE facility is retaining water: <ul style="list-style-type: none"> • 89.76 acres in Zone 1 (up to 25 days inundation once every 10 years) • 3.89 acres in Zone 2 (4 days inundation every 4 years) • 11.80 acres in Zone 3 (1% chance inundation in a given year and up to 1 day inundation once every 100 years) • 7.33 acres in Zone 4 (<1% chance of being inundated in any given year with inundation lasting <1 day). Change from free-flowing stream in a channel to pool of water with a substantial increase in water surface elevation, depth, and surface water area: <ul style="list-style-type: none"> • 10-yr event: 568 ft elevation, 518-acre max area, 5.6 mi max length, 143 ft max depth, 27-day duration of inundation • 100-yr event: 604 ft elevation, 709 ac max area, 6.1 mi max length, 179 ft max depth, 32-day duration of inundation. 	Periodic and temporary conversion of stream channel to pool during a catastrophic flood event up to the spillway elevation of 628 feet MSL with increased water surface elevation, depth, and surface water area: <ul style="list-style-type: none"> • 16.66 miles/109.89 acres of stream: <ul style="list-style-type: none"> – 6.6 miles mainstem Chehalis River – 10.0 miles of tributaries – 11.79 miles are fish-bearing. • Includes 0.48 miles affected by temporary construction disturbance: <ul style="list-style-type: none"> – 0.38 miles of the Chehalis River – 0.06 miles of Crim Creek – 0.04 miles of non-fish-bearing tributaries. 	<ul style="list-style-type: none"> • Minimize the extent of effect with new alignment an approximate 0.25-mile reduction in the length of the inundation area. • Minimize extent of salmon spawning and rearing habitat affected through operations that minimize inundation volume and the duration that the upper 2 miles of the pool are inundated. • Minimize operational events, inundation volume, and retention duration to what is necessary to reduce effects from major or greater floods downstream of the project by improving flow projection information, relying on an increased number of stream gages, and improving storm monitoring at the onset of a flood event. • Minimize sediment transport and erosion risk with operational flow releases that maintain sediment transport capacity, clear out potential fine sediment deposits upstream of the FRE facility, and reduce the potential for shoreline erosion during evacuation. • Minimize water temperature effects by minimizing tree clearing to the immediate area around the FRE facility and in-planting of flood-tolerant vegetation under the VMP. • Minimize erosion and water quality effects with continual in-planting of native plant species suited to the inundation duration/depths experienced during flood event operations under the VMP. 	<ul style="list-style-type: none"> • Total stream miles inundated will be reduced to 16.7 miles, 11.6 miles of which are fish bearing and 5.1 of which are non-fish-bearing streams. • After VMP implementation, thermal load associated with shade loss will be reduced by 112,019,000 average kcal/day or 24%, for a minimized effect of 360,048,000 average kcal/day. 	<ul style="list-style-type: none"> • Open access to 39.34 miles of fish-bearing stream ((11.79 X 2.5) + 10 miles) through removal of fish passage barriers/ culverts. • 6 spawning enhancement mitigation actions related to gravel retention upstream of the proposed FRE facility. • Native shade tolerant trees will be planted along 21.3 miles of fish-bearing stream banks downstream of the proposed FRE facility to reduce thermal loading by 880,606,300 average kcal/day (360,048,000 average kcal/day X 2.45). • Turbidity. Forest Conversion area including 362 acres of non-fish bearing stream buffer and complete multilayered canopy forest that would reduce runoff and erosion, reducing fine sediments reaching the river. • In the Forest Conversion area, decommissioning of 6 miles of existing forest road and restricting access to up to 12 miles of existing forest roads will reduce road-related erosion. Mitigation access only for restricted roads.

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Periodic flood retention of major or greater floods and vegetation management	Prolonged inundation; post-inundation removal of dead trees and management of tree size in some zones of temporary inundation area and planting of flood-tolerant species.	<p>Mortality of flood-intolerant trees and other vegetation in stream buffer from inundation and ground disturbance from tree removal and planting of young flood-tolerant plants.</p> <p>25.5 miles (along both sides of stream)/441.3 acres of stream buffer:</p> <ul style="list-style-type: none"> • Includes 18.2 miles/312.8 acres of stream buffer impacted by tree removal in Zones 1 and 2 prior to operations • 348.29 acres along fish-bearing streams • 13.51 miles mainstem Chehalis River • 12.04 miles of tributaries. 	<p>Disturbance of 487.04 acres of combined stream-wetland buffer:</p> <ul style="list-style-type: none"> • 340.45 acres in Zones 1 and 2 • 146.59 acres in Zones 3 and 4. 	<p>No tree removal outside of construction disturbance area as described above and no management of tree size proposed.</p> <p>Mortality of some flood-intolerant trees and other vegetation in stream buffer from inundation and ground disturbance from planting of young flood-tolerant plants.</p> <p>16.6 miles of stream/441.7 acres of stream buffer (including 181.8 acres of overlapping stream and wetland buffer):</p> <ul style="list-style-type: none"> • Includes 23.3 acres of stream buffer within construction disturbance area characterized above under Development of Proposed FRE facilities that would be restored and planted with flood-tolerant species • 6.6 miles mainstem Chehalis River • 10.0 miles of tributaries • 11.8 miles of fish-bearing streams. 	<ul style="list-style-type: none"> • Minimize inundation effect on trees and vegetation associated with riparian and stream buffer through operational measures: <ul style="list-style-type: none"> – Minimize inundation volume and retention duration to what is necessary to reduce effects from major or greater floods downstream of the project – Minimize unnecessary flood retention by improving flow projection information, relying on an increased number of stream gages, and improving storm monitoring at the onset of a flood event – Manage the Proposed FRE facility outflows to minimize the amount of time the upper 2 miles of the inundation pool is flooded. • Implement Revised VMP Pre- and Post-Operations including minimizing tree and vegetative loss in riparian and stream buffer habitats across 441.7 acres: <ul style="list-style-type: none"> – Continual in-planting of native, flood-tolerant plant species – Minimize tree removal to only trees necessary to protect the structure and health and safety of personnel, invasive species management – Minimize shade-related temperature effects. • Minimize effects to soil erosion and sediment or pollutant delivery to wetlands during tree removal activities by implementing standard BMPs. 	<ul style="list-style-type: none"> • Change in vegetation composition to flood-tolerant species and younger seral stage within 441.7 acres of stream buffer. 	<ul style="list-style-type: none"> • Beyond the VMP, 362.5 acres of stream buffer in the Forest Conversion area will be enhanced. • Riparian expansion would also occur across 16.8 miles (122 acres of riparian habitat with 60' buffer) of the mainstem Chehalis River and one fish bearing tributary downstream of the FRE location.

ACTION	ENVIRONMENTAL DISTURBANCE	SEPA DEIS ORIGINAL PROJECT DIRECT IMPACT	NEPA DEIS ORIGINAL PROJECT DIRECT IMPACT	POTENTIAL EFFECTS OF PROPOSED ACTION	AVOIDANCE, MINIMIZATION, AND RESTORATION MEASURES	POTENTIAL UNAVOIDABLE EFFECTS	MITIGATION
Periodic flood retention of major or greater floods and vegetation management	Prolonged inundation; post-inundation removal of dead trees and management of tree size in some zones of temporary inundation area and planting of flood-tolerant species.	<p>Mortality of flood-intolerant trees and other vegetation in wetlands and wetland buffers from inundation and ground disturbance from tree removal and planting of young flood-tolerant plants.</p> <p>85 wetlands (9.76 acres):</p> <ul style="list-style-type: none"> • 13 Category II wetlands (2.81 acres) • 72 Category III wetlands (6.95 acres) • Includes 62 wetlands disturbed during tree removal construction activities Zones 1 and 2: <ul style="list-style-type: none"> – 11 Category II wetlands (2.76 acres) – 51 Category III wetlands (3.74 acres). • Includes 23 wetlands in Zones 3 and 4: <ul style="list-style-type: none"> – 2 Category II wetlands (0.5 acres) – 21 Category III wetlands (3.21 acres). <p>303.15 acres of wetland buffer:</p> <ul style="list-style-type: none"> • 213.85 acres wetland buffer in Zones 1 and 2 impacted by tree removal • 89.30 acres wetland buffers in Zones 3 and 4 that will be inundated during 100-year and greater than 100-year flood events, respectively (Table O-14). 	<p>Permanent disturbance of the vegetation, soils, and hydrology in 4.20 acres of wetlands from periodic prolonged inundation:</p> <ul style="list-style-type: none"> • 1.03 acres of Category II • 3.17 acres of Category III. 	<p>Mortality of flood-intolerant trees and other vegetation in wetlands and wetland buffers from inundation and ground disturbance from planting of young flood-tolerant plants.</p> <p>85 wetlands (9.21 acres):</p> <ul style="list-style-type: none"> • 13 Category II wetlands (2.80 acres) • 72 Category III wetlands (6.41 acres) • Includes 7 Category III wetlands (0.22 acres) disturbed during construction activities accounted for under Development of Proposed FRE facilities. <p>64.6 acres of wetland buffer (excluding 181.8 acres of overlapping stream and wetland buffer included above as stream buffer):</p> <ul style="list-style-type: none"> • Includes 9.0 acres of wetland only buffer within temporary construction disturbance area characterized above under Development of Proposed FRE facilities. 	<ul style="list-style-type: none"> • Minimize inundation effect on trees and vegetation associated with wetlands and wetland buffers through operational measures: <ul style="list-style-type: none"> – Minimize inundation volume and retention duration to what is necessary to reduce effects from major or greater floods downstream of the project – Minimize unnecessary flood retention by improving flow projection information, relying on an increased number of stream gages, and improving storm monitoring at the onset of a flood event – Manage the Proposed FRE facility outflows to minimize the amount of time the upper 2 miles of the inundation pool is flooded. • Implement Revised VMP Pre- and Post-Operations in wetland and wetland buffer habitats on 64.6 acres: <ul style="list-style-type: none"> – Continual in-planting of native, flood-tolerant plant species – Minimize tree removal to only trees necessary to protect the structure and health and safety of personnel, invasive species management – Minimize shade-related temperature effects. • Minimize effects to soil erosion and sediment or pollutant delivery to wetlands during tree removal activities by implementing standard BMPs for wetland protections. • Restoration of 9 acres of wetland buffer within the temporary construction disturbance area. 	<ul style="list-style-type: none"> • Loss of 8.99 acres of wetlands (loss of 0.22 acres of wetlands already accounted for under Development of Proposed FRE facilities construction disturbance area). • Conversion of 64.6 acres of wetland buffer to earlier successional stage and native flood-tolerant plant community. 	<ul style="list-style-type: none"> • New depressional wetland habitat will be created at RM 87.6-89.3 under the Wetland Enhancement Plan to provide 8.4 acres (2.8 x 3.0) of new Category II wetlands and 12.4 acres of Category III wetlands (6.2 x 2.0). • 64.6 acres of wetland buffer associated with new wetlands at RM 87.6-89.3.

ACTION	ENVIRONMENTAL DISTURBANCE	SEPA DEIS ORIGINAL PROJECT DIRECT IMPACT	NEPA DEIS ORIGINAL PROJECT DIRECT IMPACT	POTENTIAL EFFECTS OF PROPOSED ACTION	AVOIDANCE, MINIMIZATION, AND RESTORATION MEASURES	POTENTIAL UNAVOIDABLE EFFECTS	MITIGATION
Periodic flood retention of major or greater floods and vegetation management	Prolonged inundation; post-inundation removal of dead trees and management of tree size in some zones of temporary inundation area and planting of flood-tolerant species.	Mortality of flood-intolerant trees and other vegetation from inundation in non-buffer uplands (area not quantified) and ground disturbance from tree removal and planting of young flood-tolerant plant.	Impacts from vegetation maintenance and periodic flooding in the inundation area.	Mortality of flood-intolerant trees and conversion to younger, earlier successional stages of flood-tolerant plant species in non-buffer uplands (187.2 acres) from inundation would depend on the frequency and duration of inundation.	<ul style="list-style-type: none"> • Minimize inundation effect on trees and vegetation associated with uplands through operational measures: <ul style="list-style-type: none"> – Minimize inundation volume and retention duration to what is necessary to reduce effects from major or greater floods downstream of the project – Minimize unnecessary flood retention by improving flow projection information, relying on an increased number of stream gages, and improving storm monitoring at the onset of a flood event – Manage the Proposed FRE facility outflows to minimize the amount of time the upper 2 miles of the inundation pool is flooded. • Implement Revised VMP Pre- and Post-Operations including minimizing tree and vegetative loss in 187.2 acres of non-buffer upland habitats: <ul style="list-style-type: none"> – Continual in-planting of native, flood-tolerant plant species – Minimize tree removal to only trees necessary to protect the structure and health and safety of personnel, invasive species management – Minimize shade-related temperature effects. • Minimize effects to soil erosion and sediment or pollutant delivery to wetlands during tree removal activities by implementing standard BMPs. 	<ul style="list-style-type: none"> • 187.2 acres of non-buffer uplands. 	<ul style="list-style-type: none"> • Beyond the VMP, the Forest Conversion block includes 1,558.6 acres of non-buffer uplands out of 1,921 acres of total commercial timberlands proposed for conversion to multi-canopied successional old-growth forest with diverse vegetation types.

ACTION	ENVIRONMENTAL DISTURBANCE	SEPA DEIS ORIGINAL PROJECT DIRECT IMPACT	NEPA DEIS ORIGINAL PROJECT DIRECT IMPACT	POTENTIAL EFFECTS OF PROPOSED ACTION	AVOIDANCE, MINIMIZATION, AND RESTORATION MEASURES	POTENTIAL UNAVOIDABLE EFFECTS	MITIGATION
Periodic flood retention of major or greater floods and vegetation management	Prolonged inundation; post-inundation removal of dead trees and management of tree size in some zones of temporary inundation area and planting of flood-tolerant species.	<p>847 acres would be submerged during operations: approximately 63% scrub-shrub as a result of the tree removal that would occur during construction and existing shrub areas; approximately 1% wetlands; 31% forested; 5% herbaceous areas and roads.</p> <p>600 acres in Zones 1 and 2 convert to scrub-shrub (dominated by young alder, willows, dogwood, elderberry, salmonberry):</p> <ul style="list-style-type: none"> • Forested habitat (426 acres total): <ul style="list-style-type: none"> – Douglas fir forest or mixed forest (369.4 acres) – Deciduous forest (50.5 acres) – Wetlands (6.5 acres). <p>247 acres in Zone 3 and Zone 4 convert to young mixed deciduous and evergreen forest (154 acres) and young Douglas fir dominated forest (~94 acres):</p> <ul style="list-style-type: none"> • Forested habitat (180.5 acres total): <ul style="list-style-type: none"> – Douglas fir forest or mixed forest (164.5 acres) – Deciduous forest (12.3 acres) – Wetlands (3.2 acres). 	485 acres of tree removal and 226 acres of tree retention (pre-operations); replanting in areas susceptible to increased risk of landslides and erosion but high plant mortality from prolonged inundation; increased potential for colonization of invasive species; removal of all riparian shade with a complete reset of vegetation communities after each retention event; changes to plant diversity.	<p>Up to 824.9 acres would be submerged during operations that post-construction and pre-operations would be comprised of: approximately 21% scrub-shrub as a result of vegetation clearing during construction in up to 53.1 acres; 60% forested; 6% herbaceous and developed area; and 14% open water.</p> <p>Conversion of up to 676.8 acres of vegetated cover to younger, earlier successional stages of flood-tolerant plant species would depend on the frequency and duration of inundation.</p>	<ul style="list-style-type: none"> • Minimize inundation impact on trees and vegetation through operational measures: <ul style="list-style-type: none"> – Minimize inundation volume and retention duration to what is necessary to reduce impacts from major or greater floods downstream of the project – Minimize unnecessary flood retention by improving flow projection information, relying on an increased number of stream gages, and improving storm monitoring at the onset of a flood event – Manage the Proposed FRE facility outflows to minimize the amount of time the upper 2 miles of the inundation pool is flooded. • Implement Revised VMP Pre- and Post-Operations including minimizing tree and vegetative loss: <ul style="list-style-type: none"> – Continual in-planting of native, flood-tolerant plant species – Minimize tree removal to only trees necessary to protect the structure and health and safety of personnel, invasive species management – Minimize shade-related temperature impacts. • Minimize impacts to soil erosion and sediment or pollutant delivery to wetlands during tree removal activities by implementing standard BMPs. 	<ul style="list-style-type: none"> • Conversion of up to 676.8 acres of vegetated cover to younger, earlier successional stages of flood-tolerant plant species to varying degrees depending on the frequency and duration of inundation. 	<ul style="list-style-type: none"> • Enhance complex wildlife habitat within the 1,921-acre Forest Conversion area, including the 1,558.5 acres of Conversion block being transitioned to a native, multi-canopied, successional forest and 362.5 acres of expanded riparian habitat. A diversity of wildlife habitat will be created with native vegetation and restored natural forest processes. This will provide habitat for ground dwelling species with low mobility including small mammals, amphibians, reptiles and invertebrates.

ACTION	ENVIRONMENTAL DISTURBANCE	SEPA DEIS ORIGINAL PROJECT DIRECT IMPACT	NEPA DEIS ORIGINAL PROJECT DIRECT IMPACT	POTENTIAL EFFECTS OF PROPOSED ACTION	AVOIDANCE, MINIMIZATION, AND RESTORATION MEASURES	POTENTIAL UNAVOIDABLE EFFECTS	MITIGATION
Periodic flood retention of major or greater floods and vegetation management	Removal of dead trees and management of tree size post-flood retention operations in some zones of temporary inundation area.	Reduced large wood supply from post-operations tree removal.	<p>Reductions in the supply of large wood.</p> <p>Decrease of LWM recruitment and transport within the footprint of the inundation area.</p> <p>Decrease in amount of LWM downstream of the FRE facility to the South Fork Chehalis River confluence.</p>	No revised effects.	<ul style="list-style-type: none"> No management of tree size proposed. Removal of dead trees would be limited to maintain the safety of the FRE facility structure and staff. 	<ul style="list-style-type: none"> Reduced large wood supply. 	<ul style="list-style-type: none"> 6 flood fences to be installed within in VMP area to capture and retain LWM in the stream channel. Post-operations recovery and storage of LWM captured above the FRE for use in mitigation actions and restoration at locations downstream of the FRE. Maintain 14 mitigation actions that use LWM to improve habitat complexity downstream of the proposed FRE facility. LWM is a component of 6 mitigation actions upstream of the proposed FRE facility for spawning habitat enhancement. Translocation of wood debris from trash rack and flood fences to downstream of the FRE facility during non-operational periods.
Periodic flood retention of major or greater floods and vegetation management	Implementation of the VMP: in-planting of flood-tolerant species; removal of dead trees and management of tree size in some zones of temporary inundation area.	Injury/mortality to low-mobility individuals of aquatic and terrestrial species from inundation, ground-disturbing activities, and tree removal. Disturbance to species from noise; potential decreased production from sensitive species such as marbled murrelets, bald eagles and other raptors.	No VMP mortality impact noted.	No revised effects.	<ul style="list-style-type: none"> No management of tree size proposed. Removal of dead trees would be limited to maintain the safety of the FRE facility structure and staff. Follow BMPs for protection of fish and wildlife species from noise. 	<ul style="list-style-type: none"> Some mortality of individuals with low mobility. 	<ul style="list-style-type: none"> Enhance complex wildlife habitat within the Forest Conversion block, including the 1558.5 acres of Conversion block being transitioned to a native, multi-canopied, successional forest and 362.5 acres of expanded riparian habitat. A diversity of wildlife habitat will be created with native vegetation and restored natural forest processes. This will provide habitat for ground dwelling species with low mobility including small mammals, amphibians, reptiles and invertebrates.

ACTION	ENVIRONMENTAL DISTURBANCE	SEPA DEIS ORIGINAL PROJECT DIRECT IMPACT	NEPA DEIS ORIGINAL PROJECT DIRECT IMPACT	POTENTIAL EFFECTS OF PROPOSED ACTION	AVOIDANCE, MINIMIZATION, AND RESTORATION MEASURES	POTENTIAL UNAVOIDABLE EFFECTS	MITIGATION
Fish passage during flood retention operations	Impeded upstream fish passage at FRE site via CHTR trap-and-transport system during flood retention and volitional downstream fish passage through FRE outlet tunnel(s).	Temporary reduced upstream fish passage survival for salmon and steelhead and resident fish above the FRE site during flood retention; and delayed downstream fish passage during flood retention.	Reduced fish passage.	No revised effects.	<ul style="list-style-type: none"> Minimize inundation-related effects to fish passage: <ul style="list-style-type: none"> Minimize inundation volume and retention duration to what is necessary to reduce effects from major or greater floods downstream of the project Minimize unnecessary flood retention by improving flow projection information, relying on an increased number of stream gages, and improving storm monitoring at the onset of a flood event. Minimize effect to upstream fish passage with design of the FFPF to meet all NMFS and WDFW passage criteria. 	<ul style="list-style-type: none"> No unavoidable effects. 	<ul style="list-style-type: none"> No mitigation proposed.
Flood retention of major or greater floods at FRE and subsequent drawdown operations	Inundation during major or greater flood event.	Direct disturbance, injury, or mortality of some individuals of species with low mobility from inundation.	No inundation mortality impact noted.	No revised effects.	<ul style="list-style-type: none"> Minimize inundation volume and retention duration to what is necessary to reduce effects from major or greater floods downstream of the project. Minimize unnecessary flood retention by improving flow projection information, relying on an increased number of stream gages, and improving storm monitoring at the onset of a flood event. 	<ul style="list-style-type: none"> Some mortality of individuals with low mobility. 	<ul style="list-style-type: none"> Enhance wildlife habitat within the 1558.5 acres of Conversion block being transitioned to a successional old-growth forest. A diversity of wildlife habitat will be created with native vegetation and restored natural forest processes.
Flood retention of major or greater floods at FRE and subsequent drawdown operations	Periodic temporary inundation of slopes and roads.	Increased risk of landslides during impoundment event; increased slope instability and risk in erosion potential during drawdown of temporary pool; increased instability of forest roads.	Increased risk of landslides during impoundment event; increased slope instability and risk in erosion potential during drawdown of temporary pool; increased instability of forest roads.	No revised effects.	<ul style="list-style-type: none"> Implement temporary pool draw down rates to minimize risk. Restoration of decommissioned roads used for construction includes slope stabilization, armoring, and drainage slope engineering to minimize erosion and sediment input to watershed. Minimize erosion and water quality effects with continual in-planting and maintaining of native plant species suited to the inundation duration/depths experienced during flood event operations under the VMP. 	<ul style="list-style-type: none"> Some risk of landslides associated with roads. 	<ul style="list-style-type: none"> In the Forest Conversion block, decommissioning of 6 miles of existing logging road and restricting access to up to 12 miles of existing forest roads will reduce road-related erosion. Mitigation access only for restricted roads.

ACTION	ENVIRONMENTAL DISTURBANCE	SEPA DEIS ORIGINAL PROJECT DIRECT IMPACT	NEPA DEIS ORIGINAL PROJECT DIRECT IMPACT	POTENTIAL EFFECTS OF PROPOSED ACTION	AVOIDANCE, MINIMIZATION, AND RESTORATION MEASURES	POTENTIAL UNAVOIDABLE EFFECTS	MITIGATION
Flood retention of major or greater floods at FRE and subsequent drawdown operations	Reduction in peak flows downstream of FRE during major and larger floods.	Reduction in peak flows downstream of FRE during major and larger floods.	Reduction in the frequency, extent, and depth of overbank flood inundation and decrease to channel migration downstream of FRE during major and larger floods: <ul style="list-style-type: none"> • Between FRE and RM 33, the area of flooding downstream of the FRE facility during operations would decrease: <ul style="list-style-type: none"> - 2,842 acres (10%) for 10-year flood - 4,083 acres (11%) for 100-year flood. • Depth reduction: <ul style="list-style-type: none"> - 10-year flood- 23,682 acres (83.3%) up to 1.9 feet; 4,763 acres (16.7%) >1.9 feet; some areas up to 14 feet - 100-year flood- 29,686 acres (80%) up to 1.9 feet; 7,400 acres (20%) >1.9 feet; some areas up to 22 feet. 	No revised effects.	<ul style="list-style-type: none"> • Minimize unnecessary flood retention by improving flow projection information, relying on an increased number of stream gages, and improving storm monitoring at the onset of a flood event. • Minimize inundation volume and retention duration to what is necessary to reduce effects from major or greater floods downstream of the project. 	<ul style="list-style-type: none"> • Reduction in peak flows during major or greater floods as described in the Proposed Action Purpose and Need. 	<ul style="list-style-type: none"> • No mitigation proposed.
Flood retention of major or greater floods at FRE and subsequent drawdown operations	Retention of sediment upstream of FRE during flood retention operations.	Retention of sediment upstream of FRE during flood retention operations; changes to sediment transport.	Increase in fine sediment accumulation upstream of the FRE of up to 240,000 tons. Sediment influx downstream of the FRE due to sediment trapping in the temporary pool.	Analysis indicates that the FRE facility will not affect 2-year flood flows (~9,500 cfs) which are capable of moving more sediments over time than operational flood flows. Analyses indicate that the natural channel upstream of the proposed FRE has a sufficiently high transport capacity to clear fine sediments from the reservoir area, this occurs even during the smaller and more frequent events where the FRE would not be in operation (see Appendix A).	<ul style="list-style-type: none"> • Minimize unnecessary flood retention by improving flow projection information, relying on an increased number of stream gages, and improving storm monitoring at the onset of a flood event. • Minimize inundation volume and retention duration to what is necessary to reduce effects from major or greater floods downstream of the project. • Minimize sediment transport and erosion risk with operational flow releases that maintain sediment transport capacity, clear out potential fine sediment deposits upstream of the FRE facility, and reduce the potential for shoreline erosion during evacuation. • Minimize erosion and water quality effects with continual in-planting of native plant species suited to the inundation duration/depths experienced during flood event operations under the VMP. 	<ul style="list-style-type: none"> • Unavoidable effect to fine sediment transport. 	<ul style="list-style-type: none"> • The conversion of 1,921 acres of timberlands to diverse and complex native forests includes decommissioning of up to 6 miles of existing road and restricted use for up to 12 miles of existing roads that would reduce the risk of erosion and landslides.

ACTION	ENVIRONMENTAL DISTURBANCE	SEPA DEIS ORIGINAL PROJECT DIRECT IMPACT	NEPA DEIS ORIGINAL PROJECT DIRECT IMPACT	POTENTIAL EFFECTS OF PROPOSED ACTION	AVOIDANCE, MINIMIZATION, AND RESTORATION MEASURES	POTENTIAL UNAVOIDABLE EFFECTS	MITIGATION
Earthquake	Earthquake greater than the design occurs at same time FRE Facility is impounding water.	Adverse effect on communities, environment, and infrastructure downstream of the FRE facility if earthquake greater than the design standard occurs during FRE flood retention.	Adverse effect on communities, environment, and infrastructure downstream of the FRE facility if earthquake greater than the design standard occurs during FRE flood retention.	No revised effects.	<ul style="list-style-type: none"> The FRE facility is design to the is Maximum Credible Earthquake standard. The probability of a catastrophic earthquake co-occurring while the FRE facility is temporarily storing flood water is 1:2,500,000,000 (Ecology 2020²). 	<ul style="list-style-type: none"> Adverse effect on communities, environment, and infrastructure downstream of the FRE facility if earthquake greater than the design standard occurs during FRE flood retention and the structure fails. 	<ul style="list-style-type: none"> No mitigation proposed.
Levee development	Loss/disturbance of habitat under levee.	Permanent loss of 6.63 acres of wetlands (6.26 acres Category II and 0.37 acres Category III). Permanent loss of 44.2 acres of wetland buffers.	Permanent loss of 4.45 acres of Category II wetland and 0.09 acres of Category III wetlands from levee base widening. Permanent disturbance of 16.61 acres of wetland buffers from levee base widening.	No revised effects.	<ul style="list-style-type: none"> The levee construction would be avoided by working within the existing disturbed area. No effect to wetlands or buffers. 	<ul style="list-style-type: none"> No unavoidable effects. 	<ul style="list-style-type: none"> No mitigation proposed.

Notes:

- As described in Section 5 of the RMP, vegetative cover in the DEISs included an overlap of wetlands, wetland buffer, and stream buffer.
- Ecology (Washington State Department of Ecology), 2020. State Environmental Policy Act Draft Environmental Impact Statement. Chehalis River Basin Flood Damage Reduction Project. Shorelines and Environmental Assistance Program. Publication 20-06-002. February 2020.

Table 2 includes a chronological list (oldest to newest) of mitigation-related, informational documents submitted post-issuance of the DEIS. The submittals were delivered by the Applicant to Washington Department of Ecology, Washington Department of Natural Resources, and the United States Army Corps of Engineers. A listing of additional document submittals associated with the proposed project description can be found in HDR’s Revised Project Description Report, Appendix N.

Table 2
Informational Submittals Submitted Post-Issuance of SEPA DEIS (February 27, 2020).

AGENCY SUBMITTAL DATE	DOCUMENT TITLE (DATE COMPLETED)	DESCRIPTION	DOCUMENT STATUS
May 2020	SEPA DEIS Review: FRE Facility Temporary Reservoir Inundation and Vegetation Analysis Clarification (May 2020)	Presents a refined spatial analysis of existing hydrologic data for operating the FRE, land cover in the inundation area, and duration and extent of inundation.	Superseded by Revised Vegetation Management Plan
July 2020	Draft Aquatic and Terrestrial Mitigation Opportunities Assessment (July 2020)	Presents a remote-imagery based assessment to develop a list of potential mitigation opportunities to address impacts associated with the FRE facility.	Superseded by Revised Mitigation Plan
August 2020	Wetland Mitigation Opportunities Assessment (August 2020)	Identifies opportunities and evaluates options to develop wetland mitigation for unavoidable impacts to wetlands and wetland buffers that may result.	Superseded by Revised Mitigation Plan
November 2020	Conceptual Vegetation Management Plan (November 2020)	A draft conceptual plan to minimize the extent of tree clearing and vegetation removal in the inundation area, while balancing the need to reduce wood material that may be generated in that area during FRE operation.	Superseded by Revised Vegetation Management Plan
June 4, 2021	Mitigation Capacity and Species Benefits (February 26, 2021)	Presents updated mitigation related information regarding mitigation capacity on the landscape and potential species-specific benefits from mitigation actions presented in the July 2020 mitigation opportunity assessment.	Superseded by Revised Mitigation Plan

AGENCY SUBMITTAL DATE	DOCUMENT TITLE (DATE COMPLETED)	DESCRIPTION	DOCUMENT STATUS
June 4, 2021	Task 2: Short Term Aquatic Species Benefits (February 1, 2021)	A viability assessment of potential short-term measures to increase salmonid species abundance in the Chehalis River mainstem from RM 108 to 114, and tributaries.	Standing Memorandum
3-Sep-21	Plant Replacement Plan (August 26, 2021)	Additional information to support revised assumptions regarding expected vegetation survivability based on the frequency and duration of inundation.	Superseded by Revised Vegetation Management Plan
3-Sep-21	Commitment to No Net Loss of Aquatic Habitat (August 6, 2021)	A memo to establish and describe the Applicant's commitment to not net loss of aquatic habitat function in the context of mitigation development.	Standing Memorandum
3-Sep-21	Large Woody Material Downstream Passage and Placement Clarification (August 20, 2021)	Additional information regarding passage and handling of large woody material at the FRE and potential uses of salvaged wood for mitigation measures.	Superseded by Revised Mitigation Plan
10-Sep-21	Water Temperature Model Sensitivity Analysis (August 2021)	Reviews the SEPA and NEPA DEISs water temperature impact findings and reports on an analysis to assess the sensitivity of water temperature increases to vegetation and shading assumptions used in past temperature models as well as under the conceptual VMP.	Standing Memorandum
17-Dec-21	Vegetation Management Plan (December 2021)	Builds upon previous memoranda to clarify how vegetation management can minimize tree and vegetative loss associated with the FRE facility, includes a selective tree removal plan, plant replacement strategy, implementation timeline, and a proposed adaptive management plan.	Superseded by Revised Vegetation Management Plan

AGENCY SUBMITTAL DATE	DOCUMENT TITLE (DATE COMPLETED)	DESCRIPTION	DOCUMENT STATUS
16-Jun-22	Draft Flood Retention Expandable Facility Mitigation Plan: Aquatic Species and Habitat, Riparian and Stream Buffer, Large Woody Material, Surface Water Quality (June 2022)	Present a draft plan to avoid, minimize and then mitigate for residual impacts associated with the construction and operation of a FRE facility (2020 design and location). Includes reach scale mitigation actions, feasibility analyses, and a monitoring and adaptive management framework.	Superseded by Revised Mitigation Plan
16-Jun-22	Draft Wetland Mitigation Plan (June 2022)	Present a draft plan to mitigate for wetland impacts associated with the construction and operation of a FRE facility (2020 design and location). Includes reach scale mitigation actions, feasibility analyses, and a monitoring and adaptive management framework.	Superseded by Revised Mitigation Plan