Technical Memorandum

Date:	December 17, 2021
Project:	Chehalis River Basin Flood Damage Reduction Project
To:	Chehalis Basin Flood Control Zone District
From:	HDR– Justin Williams, Verena Winter
Subject:	Temporary Construction Facilities

1.0 Introduction

The Draft Environmental Impact Statements (EISs) prepared by the Washington State Department of Ecology (Ecology; pursuant to the State Environmental Policy Act) and the U.S. Army Corps of Engineers (USACE; pursuant to the National Environmental Policy Act) evaluate anticipated impacts associated with construction and operation of a proposed Flood Retention Only - Expandable (FRE) facility (i.e., the Chehalis River Basin Flood Damage Reduction Project [proposed project]) in the Chehalis Basin, Washington State. The Chehalis Basin Flood Control Zone District (District) is the project proponent. To inform development of the Final EISs, Ecology and USACE have requested additional information regarding the assumptions for temporary construction facilities associated with the FRE facility site. This technical memo provides further clarification on the conceptual layout of temporary construction facilities.

At this stage in the project design, the configuration of the temporary construction facilities can only be approximated based on a general understanding of construction processes and accompanying best management practices (BMPs) for environmental protection. During the final design phase geotechnical field work and testing, facilities specifications and layout and materials quantities will be further refined and more detailed plans for temporary facilities defined. The rough order of magnitude (ROM) estimates provided herein reflect the current conceptual level of design for the FRE facility and assumptions regarding the requirements for the temporary construction facilities. HDR has used professional judgement to provide the recommended value for the project description to be evaluated in the EIS; however, this value can only be used as a guideline at this point in time.

2.0 Conceptual Layout of Temporary Construction Facilities

HDR has developed a preliminary project site plan showing potential contractor staging, laydown, and spoil areas. In the end, it will be the contractor's responsibility to develop temporary facilities by their own means and methods in accordance with the contract documents that will provide performance specifications and BMP details.

Staging and construction laydown areas will be prepared with appropriate site grading, surfacing, and drainage provisions that allow construction equipment and materials to be stored,

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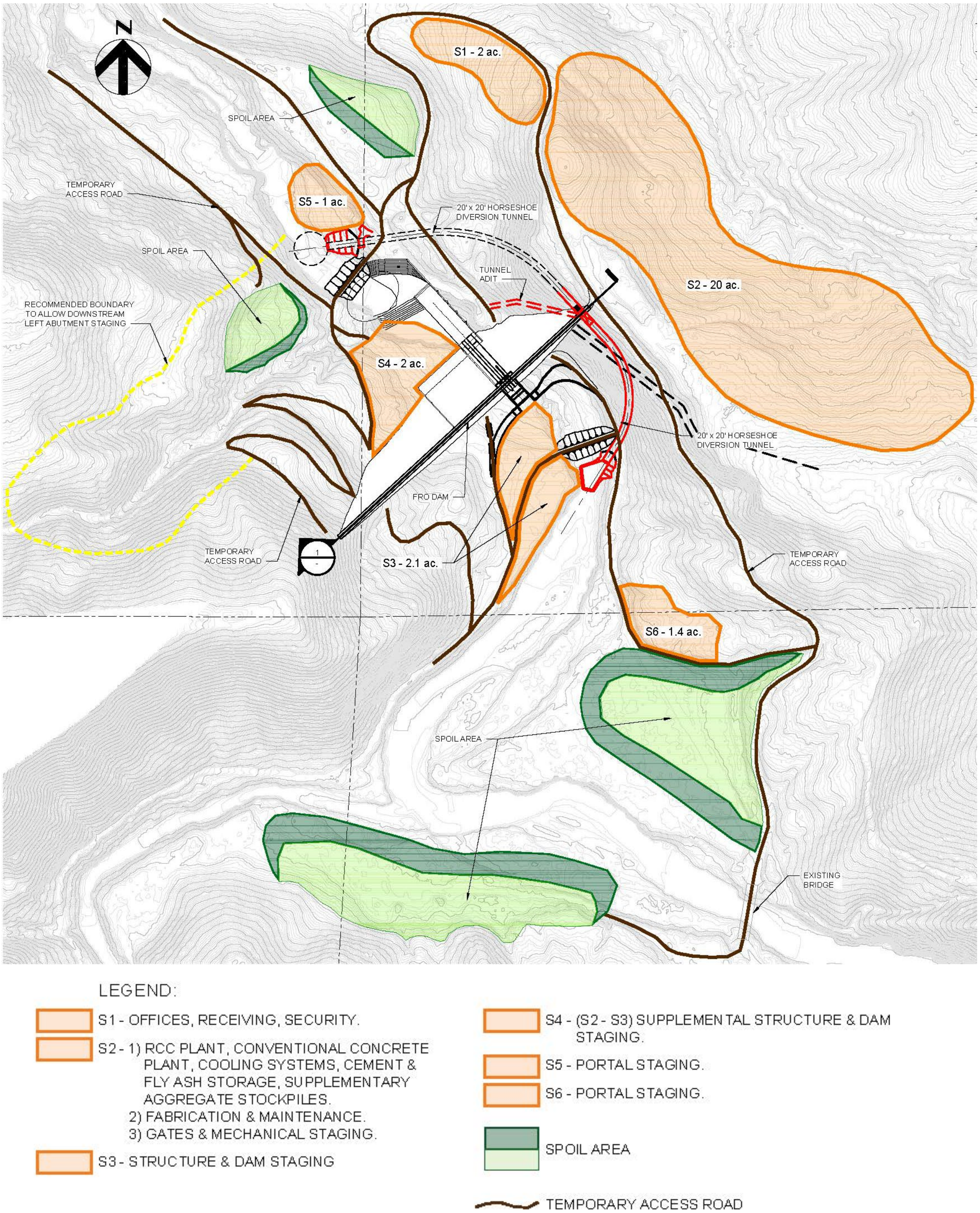
secured, and utilized. These areas will be located near the construction site and include construction offices, areas for material processing and storage, and parking for construction vehicles. Figure 1 shows a conceptual layout of staging and spoil areas. Refer to the *Access Road Technical Memorandum* for more detail on access road impacts.

Equipment used to develop staging areas may include large scrapers, large frontend loaders, large bull dozers, large excavators, dump trucks, water trucks, compactors, and road graders.

Materials from the construction of roads, FRE facility, staging area, and other construction activities that cannot be used as fill or reused, will be deposited in spoil areas. Figure 1 shows some possible spoil areas of the site. The exact location will be determined during further design. Most of the materials of the spoil areas are natural ground materials. Vegetation will eventually grow and populate these areas over time. Some of the spoil areas are located in the - inundation zone of the 100-year flood event. Further design and coordination with environmental agencies will define the exact measures of the treatment of the spoil areas after construction.

Figure 1. Chehalis Preliminary/Conceptual Layout of Staging and Spoil Areas



3.0 Material Estimate and Vehicle Use for the Staging Areas

The ROM for material and vehicle use associated with the staging areas is estimated in Table 1. The table summarizes the estimated impacts during construction of each staging area. Estimates are expected to be refined as a result of additional design and development and as the contractor's means and methods for construction are developed.

Table 1. Material Estimate and Vehicle Use for Staging Areas*

Staging Area		Area (acre)	Estimated Duration (weeks)	Estimated Crew Hours	Volume of Material (cubic yards)	Weight of Material - Quantity (tons)**	# of Truck Loads***
S1	Offices, Receiving, Security	2	2	120	6,500	10,800	260
S2	Initial S2 Surfacing Material	20	6	360	32,300	51,600	1230
S2	Embankment Material Production Operation of the FRE Structure	20	20	1,200	106,000	175,000	4170
S3	Structure & Dam Staging	2.1	2	120	16,500	27,000	650
S4	Supplemental Structure & Dam Staging	2	2	120	13,000	21,500	510
S5	Downstream Portal Staging	1	1	60	8,000	13,200	314
S6	Spoil Area	1.4	2	120	8,700	14,400	340

* All numbers are subject to change.
**Assumes 1.65 tons per cubic yard
***Each off-road dump truck is assumed to carry a payload of 85,000 (42 tons)

General Assumptions:

- Quarry operations to construct the staging areas will run 6 days a week at 10 hours a day, crew operations total 60 hours a week. Refer to Table 1 for duration for each staging area.
- Development of staging area S2 needs to take place before quarry materials can be processed. Initial surfacing materials to construct S2 need to come from an offsite source. Once S2 is in place, quarry materials for other staging areas can be processed and used for surfacing materials at other staging areas.
- No embankment material import to construct the staging areas is required. Only road base material import coming from offsite areas will be required for S2. Therefore no quantification of long haul truck trips is required for embankment materials for staging areas.
- To determine the air quality impact of the quarry operations, equipment selections would need to be determined from the equipment listed below in Section 2.0 and then applied to the anticipated duration of construction.
- Contractor is expected to design the staging area earthwork to balance cut and fill.
- The number of trucks quantified in Table 1 are to haul material less than 0.5 miles within the footprint of the staging areas. There is no consideration for transferring embankment

materials from one staging area to another, as it is assumed that each staging area can be developed with a balanced cut/fill earthwork approach.

After construction the staging areas will have to be reclaimed. Different staging areas will have different future purposes. Staging Area S2 for example can be used as a recreation site. In that case, the impact to S2 is minimal as the area is prepared for vehicle traffic. Other staging areas might have to be restored. The surface materials could be reused to repair roads and for parking areas for recreational sites. Vegetation could be planted on those sites once the ground materials is natural ground and surface materials have been removed. Detailed design and plans for the restoration or mitigation of the staging areas will be developed with further design in the future.

4.0 Environmental Control Efforts during Construction

4.1 Temporary Erosion and Sediment Control

Temporary Erosion and Sediment Control (TESC) measures will be implemented to minimize stormwater impacts such as storm flow runoff, soil erosion, waterborne sediment from exposed soils, and degradation of water quality from on-site pollutant sources. TESC BMPs will be implemented in accordance with Ecology's Construction Stormwater General Permit and *Stormwater Management Manual for Western Washington*. Supplemental BMP specifications will be obtained from the current version of Washington State Department of Transportation's Standard Specifications for Road, Bridge, and Municipal Construction and Lewis County standards. The BMPs which may be utilized to control and minimize storm water impacts include:

- Silt fence
- Vegetated strips
- Brush barriers
- Erosion control at culvert ends such as compost berms, sand bags, silt fence, and geotextile
- Compost socks
- Straw bales
- Check dams
- Catch basin and inlet protection
- Wheel wash stations
- Water quality and quantity BMPs, including
  - Baker tanks
  - Sediment traps
  - Flow control structures
  - Oil-water separators
  - Interceptor dikes and swales
  - Ditches
  - Level spreaders
- Temporary stockpile slope stabilization and coverings such as mulch, nets and blankets, plastic coverings, temporary seeding and sodding, and compost blankets

The construction general contractor will hold the permit for erosion and sediment control as well as the construction contract and be responsible for developing the plan, location, and maintenance for all required BMPs. A TESC plan will be developed during final design.

4.2 Fuel Storage and Containment Areas

Primary and secondary containment will be required as part of the permit and construction contract, and all fuel storage areas will be located where they cannot be affected by a flood event. A mobile fueling truck and large stationary fuel cell likely will be used. Fuel storage area design and locations will be based on contractor's means and methods.

4.3 Process Aggregate for Roller-Compacted Concrete

Quarry development, followed by quarry operations and aggregate production, will begin early in construction and proceed through much of the construction period. A separate memo has been developed to address quarry operations. (HDR December 2021, Quarry Operations)

4.4 Roller-Compacted Concrete Test Area Fill

A roller-compacted concrete (RCC) test fill will be completed a few weeks in advance of production RCC placement to confirm mix design properties and demonstrate plant operation and placement preparedness. This testing is required to confirm contractors means and methods and quality control of RCC placement prior to beginning bulk placement for the FRE facility. This testing area will likely be within the FRE facility footprint or maybe constructed at S2 staging area. After testing is complete, the testing remnants will be demolished and disposed.

4.5 Roller-Compacted Concrete Cofferdams

Final design will address river diversion requirements which will be noted in the design specifications along with design and risk responsibilities., Upstream and downstream cofferdams may be used to isolate the dam foundation area from the active river while allowing overtopping protection for lower-frequency flood flows. At this stage in the design, HDR is recommending RCC type cofferdams. These cofferdams may be constructed partially using the materials from the RCC testing procedure.

4.6 Roller-Compacted Concrete Dam Construction

RCC for the main dam will be placed on the prepared, competent rock foundation and constructed in horizontal lifts. Figure 1 details a 24-acre staging area S2 for the on-site RCC batching plant. Once hauled or conveyed to the final lift placement location, the RCC is spread by bulldozer and compacted by smooth drum vibratory rollers. Each lift surface requires proper bonding with successive RCC lifts. Lifts that are not covered quickly enough by fresh RCC require a combination of cleaning and bedding concrete placement, depending on age. Placement of the RCC is accompanied with typical stormwater management practices and concrete washout prevention practices to avoid environmental impacts.

Concurrent with the RCC placement, upstream and downstream dam faces, abutment preparation, dam contraction joints, drainage gallery construction, and other related tasks contribute to a dynamic and multi-disciplined construction operation. The preliminary design considers cast-in-place concrete for the upstream and downstream dam faces.

4.7 Water Use during Construction

Construction water will be required for dust control, aggregate processing, concrete production, embankment fill, offices, warehouses, shops, tunneling operations, and various unlisted uses. Dam projects require a considerable amount of water with usage varying due to concrete specifications, aggregate in-situ properties, aggregate processing specifications, embankment compaction requirements, seasonal climate, number of on-site workers/staff, and various other project requirements. Based on other project experiences, water demand requirements are estimated to be 2,000,000 gallons per day during construction activities. A water demand evaluation will be performed during final design to refine the estimate. The District is committed to avoid impacts to existing water supplies and water quality for local water withdrawals such as the City of Pe Ell while using water during construction.

4.8 Water Rights for Construction

A feasibility study will be performed to identify water rights requirements for construction following Ecology guidelines. Water may be pulled directly from the Chehalis River, from a well drilled to obtain water or a combination of both sources. Public water supply lines within the area for project construction use are assumed to be unavailable.

4.9 Contingency Protocols for Overtopping Cofferdams

Routing the river flow around the work area is a critical component of the project, and sizing the diversion for low frequency (e.g., >10- to 25-year recurrent flows) is impractical. Consequently, diversion cofferdam and tunnel capacity may be exceeded during construction and will require advance awareness and preparation to construct and provide downstream public safety. A river flow notification plan is the first line of defense required to provide the contractor advanced warning of a potential high-flow event. The plan should provide 24 to 36 hours of advanced notification to the contractor of the potential overtopping flow. The contractor would put monitoring in place upstream and demobilize all equipment from the work area until the upstream watershed has drained to a point where the river flows run back through the tunnel. In the event that an overtopping event occurs, the contractor would require time to recover from the event and rehabilitate cofferdams and foundation preparation areas back to a safe and operable condition. The contractor may elect to construct an RCC cofferdam, which would reduce the erodibility potential and may streamline recovery efforts.

4.10 Dewatering Needs

Unwatering (i.e., removing water from a surface hole or collection) will be required in the construction area between the upper and lower cofferdams to unwater slowly and facilitate safe and timely removal of any fish trapped between the cofferdams. Foundation dewatering (i.e., removing groundwater to manage the groundwater table and groundwater discharges into work area) during excavation, foundation preparation, and subsequent RCC dam and hydraulic structures construction will last several months and generally engage clean water from shallow sumps and wells located along the excavation between the cofferdam limits. Water is likely to be pumped upstream for initial discharge into the Chehalis River if clean, or alternatively into tanks for selective treatment as needed. Large mobile pumps likely will be used to preliminarily draw down the water level between the cofferdams. Select temporary wells or a series of temporary wells behind the cofferdams may be required to catch and handle any seepage through the cofferdams or their foundations. If seepage is minimal through the cofferdams, the contractor may elect to use sump pits to handle nuisance water. The downstream portal staging area likely will be used for any water quality settling tanks or additional required treatment. Depending on final design requirements, a detailed dewatering and unwatering plan will be developed to outline water quantity and duration and to identify quality thresholds that may require treatment. The overall dewatering plan will be up to the contractor's means and methods required to efficiently execute the project.

4.11 Potential Mahaffey Creek Diversion

The access road up the westerly abutment of the dam could provide construction access into the Mahaffey Creek canyon. If access is provided that way, a collection basin may be constructed to channel creek flows through a pipe beneath the access and staging, and along the western side of the Chehalis River to downstream of the lower cofferdam. Another option may be to create an open trench to carry Mahaffey Creek flows; however, the pipeline approach may be needed to best create needed abutment access and staging. A diversion analysis will be performed during final design to identify the expected flows on Mahaffey Creek; to determine pipeline sizing, pipeline routing, and whether small training walls or ponding areas are necessary; and to identify construction access required to divert Mahaffey Creek.

5.0 Impacts of Aggregate and Concrete Material Processing

This section provides an estimate for trucking impacts for material imports to the site. The estimate does not include any daily work force vehicular use or off-road hauling of materials from the quarry to the on-site staging areas. Load impact estimates for concrete production and construction activities are provided in Table 2. These estimates are expected to change as the design is refined and the contractor's means and methods for construction are developed.

Table 2. Impacts of Concrete Material Production and Construction Activities*

Materials	Base Weight - Quantity	# of Truck Loads**
Construction Mobilization	N/A	250
Concrete Sand for Conventional Concrete (from commercial supply)	28,000 tons	1,100
Concrete Sand for RCC (from quarry)	587,000 tons	23,500
Bulk Cement	273,000 tons	11,000
Fly Ash	68,000 tons	2,800
Rebar	4,200 tons	166
Gates	5 gates	30
Miscellaneous Metals	1,000 tons	40
Diversion Tunnel Excavation	22,000 cubic yards	1,700
Clearing	117,000 tons	3,600

* All numbers are subject to change.

** Truck loads are assumed to be 25-ton highway trucks

RCC and conventional concrete production likely will require two on-site, central mix, concrete batch plants. Near-continuous placement requirements for dam construction contribute to the need for two concrete batch plants to produce RCC and conventional concrete separately. A central mix plant includes components for aggregate, cement, and water and admixture supply and batching; mixing equipment; and often concrete heating and cooling systems. Truck deliveries from the plant to the dam placement site are impractical and often not allowed. Conveyor delivery from the plant to the dam's active lift surface, followed by conveyor and/or on-lift trucks to the final placement for spreading, is more common and should be assumed.

The material production location for aggregates, concrete, and RCC is currently assumed to come from either of two quarries: North Quarry site and South Quarry site (refer to Quarry Operations Technical Memo).

Aggregate processing equipment will involve drilling, blasting, off-road hauling, high production and multiple-shift crushing, screening, and potential washing operations. The aggregate processing equipment likely will involve primary, secondary, and tertiary crushing and be arranged in a system to produce between 400 and 800 tons per hour.

6.0 Temporary Fish Trap and Transport Facility

During construction and high flow events that occur during normal operation of the flood retention structure, the fish will be trapped at the downstream side of the FRE facility and transported upstream of the FRE facility. The estimated number of truck trips to transport adult steelhead and salmonids is 120 trucks per year during construction (Table 2). The number of truck trips per year during normal operation would vary based on the number and duration of flood retention operations. Further study is necessary to estimate average number of truck trips per year for the permanent facility, over the life of the facility, as the facility is estimated to operate approximately once every seven years.

During peak run times as many as 10 truck trips per day, or 2 truck trips per hour, may occur. For this memorandum a hauling distance of 8 miles, approximately 2 miles longer than the maximum inundation pool length, is assumed. Release points may vary by species and life stage of the fish. Additional field work will result in determining the most suitable upstream locations for release. Collaboration with Agencies and Tribes is anticipated in the selection of potential points of release.

These truck trip estimates reflect peak salmonid and steelhead abundance. Peak abundance is unlikely to be seen every year. Abundance estimates for juvenile and resident populations are unknown. Therefore, the truck trip values above do not include any additional trips that may be needed for the transport of juvenile and resident species. A more precise number of truck trips will be defined by the analysis and collaboration of the Agencies and Tribes.

7.0 Impacts of the Diversion Tunnel Construction

7.1 Diversion Tunnel Location

The location of the Chehalis River diversion tunnel was based on a variety of factors. One of the main factors was locating the inlet portal in a straight alignment to the existing river channel to improve the entry of river flows to the portal. Another notable driving factor was determining the shortest, most cost-effective tunnel length. The eastern abutment also has optimal underground geology to support the tunneling operation, including shallow underground solid rock for tunnel portals, no apparent soft ground, minimal apparent discontinuities/faults within the rock, and optimal construction access to tunnel portals. Final determination of diversion requirements and detailed diversion tunnel design will occur during the projects final design phase.

7.2 Diversion Tunnel Excavation

The diversion tunnel is being used to route the flow in the creek around the construction site during the duration of construction. HDR has utilized an estimate to calculate a baseline of the tunnel excavation to be 22,000 cubic yards of material to be excavated for the tunnel (Table 2). A dump truck can carry a load of 13 cubic yards of material. The disposal location is assumed to be within 1 mile from the tunnel portal. HDR suggests using 1,700 loads of excavated materials to be hauled in 25-ton highway trucks. Smaller highway dump trucks might need to be used as they will need to back into the tunnel and off-road trucks are too large for that operation. If that is the case, the number of truck loads will increase.

8.0 Clearing

Clearing activities to construct the FRE facility are required at the dam footprint, staging areas, quarry areas, and debris management sorting area. Refer to the Vegetation Management Plan for inundation area clearing activities within the reservoir pool. The debris management area is estimated to be 5 acres, the FRE dam site area 25 acres, and the staging sites 29 acres, equaling a total of 59 acres.

The tree density within these areas can vary significantly. A detailed site analysis will need to be conducted prior to permitting to provide more site specific detailed information. To provide Ecology a preliminary, conceptual clearing number, the following numbers should be used: Assume that each tree is 30 feet tall, with a diameter of 12 inches, and 1 tree per a 10-square-foot area; a 38 pounds per cubic foot live density; the weight of one tree is calculated by using its volume of 24 cubic feet times the live density which equals 912 pounds. This results in 257,000 trees for the total area of 59 acres. That equals a total weight of 117,000 tons. A log truck can load 32.5 tons. The base number of loads is estimated to be 3,600 loads (Table 2).