Technical Memorandum

Date:	April 24, 2024
Project:	Chehalis River Basin Flood Damage Reduction Project
To:	Chehalis Basin Flood Control Zone District
From:	HDR
Subject:	**Permanent and Temporary FRE Impacts to Waters of the United States**

1.0 Background

The Chehalis River Basin Flood Damage Reduction project (Project) objective is to develop recommendations for a series of measures aimed at reducing damage to the communities of the Chehalis River Basin from Pe Ell to Centralia during major flood events. Among these measures 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) documents the relocation of and revisions to the proposed FRE facility and supporting infrastructure located within the Proposed Project area as originally documented within the Combined Dam and Fish Passage Conceptual Design Report (HDR Engineering, Inc. [HDR] 2017) and FRE Dam Alternative Report (HDR 2018).

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

2.0 Introduction

As Appendix O to the RPDR, this Technical Memorandum summarizes permanent and temporary FRE site physical impacts.

3.0 Summary of Permanent and Temporary FRE Site Physical Impacts to Waters of the United States

Construction and operation of the proposed FRE will cause temporary, permanent, and episodic impacts to waters of the United States (WOTUS). WOTUS within the project vicinity were delineated by Anchor QEA in 2018 and are summarized in *Wetland, Water, and Ordinary High Water Mark Delineation Report* (Anchor QEA 2018). WOTUS in the project vicinity include the Upper Chehalis River, associated tributaries such as Crim Creek, and associated wetlands. Table 3-1 through Table 3-4 summarize impact quantities to both wetlands and streams. Streams are identified by their given name; if no name for the stream exists, it is identified by its

closest associated wetland name. Wetland names were created during the 2018 Anchor QEA delineation. Impacts are categorized into permanent impacts (permanent conversion of streams or wetlands to uplands due to construction and/or fill), 5-year impacts (anticipated construction duration), and episodic and temporary (variable duration and recurrence). Impact area and cut/fill volume quantities are based on the current conceptual-level design and are subject to change as design progresses. Table 3-1 identifies the footprint of impacts to wetlands. Table 3-2 identifies the quantity of excavation and fill that will occur within wetlands. Table 3-3 identifies the footprint of impacts to streams. Table 3-4 identifies the quantity of dredge and fill that will occur within streams.

Table 3-1. Impact Areas from FRE Construction and Operation to Wetlands[1]

Activity/Impact	Wetland Information			Impact	
	Name	Type[2]	Ecology Rating	Area (SF)	Duration
FRE Facility Complete Disturbance Limits	CR-S02-WA	PFO/PSS/PEM	III	1,223	5 Years
	WA	PSS/PEM	III	2,205	
	WAJ	PEM	III	72	
	WB	PSS/PEM	III	1,360	
	WC	PSS/PEM	III	5,357	
	WD	PSS/PEM	III	17,193	
	WE	PEM	III	2,223	
	WF	PEM	III	1,051	
	WO	PEM	III	1,461	
	WP	PEM	III	297	
	WQ	PEM	III	485	
	WR	PSS/PEM	III	767	
FRE Facility Construction Spoil, Access, and Staging Areas - fill and staging	CR-S02-WA	PFO/PSS/PEM	III	3,570	Permanent
FRE Facility Permanent Footprint	CR-RB01-WA	PFO	III	177	Permanent
	CR-S01-WA	PSS/PEM	III	10,683	
	WAI	PEM	III	2,711	

Activity/Impact	Wetland Information			Impact	
	Name	Type[2]	Ecology Rating	Area (SF)	Duration
FRE Facility, Excavation Limits - excavation and fill	CR-RB01-WA	PFO	III	4,755	Permanent
	CR-S01-WA	PSS/PEM	III	3,396	
	WE	PEM	III	1,779	
	WF	PEM	III	45	
FRE Temporary Reservoir - Episodic temporary inundation	BC-WA	PEM	III	2,430	Episodic and temporary - variable duration and recurrence
	CC-LB01-WA	PEM	III	10,274	
	CC-LB03-T2-WA	PFO/PEM	III	1,336	
	CC-LB04-WA	PSS/PEM	III	15,581	
	CC-LB04-WB	PSS/PEM	III	3,238	
	CC-LB05-WA	PFO	III	9,622	
	CC-LB06-WA	PSS/PEM	II	7,930	
	CC-LB06-WB	PSS/PEM	III	1,293	
	CC-LB07-WA	PSS/PEM	III	10	
	CC-LB10-WA	PFO/PSS	III	2,612	
	CC-RB05-WA	PEM	III	375	
	CC-RB06-WA	PSS/PEM	III	1,959	
	CC-RB06-WB	PSS/PEM	III	19,197	
	CC-RB06-WC	PEM	III	480	
	CC-RB07-WA	PSS	III	10,348	
	CC-RB07-WB	PSS	III	685	
	CC-WA	PFO/PSS	II	2,436	
	CC-WB	PFO/PSS	III	3,158	
	CC-WC	PSS/PEM	III	3,936	
	CC-WD	PFO/PSS	III	4,941	
	CC-WE	PSS	III	1,540	
	CC-WF	PFO/PSS	III	961	

Activity/Impact	Wetland Information			Impact	
	Name	Type[2]	Ecology Rating	Area (SF)	Duration
	CC-WI	PSS/PEM	III	617	
	CC-WJ	PSS/PEM	II	376	
	CR-LB01-WA	PFO/PEM	III	7,800	
	CR-LB02-WA	PFO/PSS/PEM	II	25,181	
	CR-LB03-WA	PEM	III	4,463	
	CR-LB04-WA	PEM	III	1,281	
	CR-LB13-WA	PSS/PEM	III	2,235	
	CR-LB14-WA	PSS/PEM	III	4,943	
	CR-LB15-WA	PFO/PSS/PEM	III	2,690	
	CR-LB16-WA	PFO/PSS/PEM	III	8,850	
	CR-LB19-WA	PSS/PEM	III	257	
	CR-RB08-WA	PEM	III	3,563	
	CR-RB09-WA	PSS/PEM	III	19,587	
	CR-RB10-WA	PSS/PEM	III	1,746	
	CR-RB13-WA	PSS/PEM	III	3,916	
	CR-S02-WA	PFO/PSS/PEM	III	1,633	
	CR-S18-WA	PFO/PSS	II	4,282	
	CR-WA	PSS	III	236	
	CR-WB	PFO/PEM	III	1,864	
	CR-WC	PFO/PEM	III	240	
	CR-WD	PFO/PEM	III	45	
	CR-WE	PFO/PEM	III	3	
	CR-WF	PFO/PSS	III	4,196	
	CR-WG	PSS/PEM	III	1,013	
	CR-WH	PSS/PEM	III	641	
	CR-WI	PSS/PEM	III	703	
	CR-WJ	PSS/PEM	III	1,033	

Activity/Impact	Wetland Information			Impact	
	Name	Type[2]	Ecology Rating	Area (SF)	Duration
	CR-WK	PSS/PEM	III	1,444	
	CR-WL	PFO/PSS	III	288	
	CR-WM	PFO/PSS	III	34,420	
	HC-WA	PEM	III	1,081	
	HC-WB	PSS/PEM	III	763	
	HC-WC	PEM	III	1,815	
	HC-WD	PFO/PEM	III	2,021	
	HC-WE	PSS/PEM	II	1,448	
	LC-LB01-WA	PSS/PEM	III	10,762	
	LC-WA	PFO/PSS	III	2,563	
	LC-WB	PFO/PSS/PEM	III	11,440	
	WAA	PFO/PSS	II	2,774	
	WAC	PFO/PSS/PEM	II	9,310	
	WAD	PFO/PSS	III	3,395	
	WAE	PSS/PEM	III	1,874	
	WAF	PEM	III	6,346	
	WAG	PEM	II	790	
	WAI	PEM	III	107	
	WG	PEM	III	10,636	
	WH	PSS/PEM	III	1,333	
	WI	PFO/PEM	II	6,674	
	WK	PFO/PSS	III	2,390	
	WS	PEM	III	1,122	
	WT	PFO/PEM	II	10,479	
	WU	PEM	III	3,828	
	WV	PEM	III	2,219	
	WW	PFO/PSS/PEM	II	47,576	

Activity/Impact	Wetland Information			Impact	
	Name	Type[2]	Ecology Rating	Area (SF)	Duration
	WX	PFO/PEM	III	1,277	
	WY	PEM	II	3,204	
	WZ	PEM	III	1,404	
Permanent Access Roads	CR-S01-WA	PSS/PEM	III	1,392	Permanent
	WAJ	PEM	III	382	
	WC	PSS/PEM	III	592	
	WD	PSS/PEM	III	945	
	WE	PEM	III	416	
Permanent River Reroute	CR-S04-WA	PEM	III	1,121	Permanent
Sorting Building	WD	PFO	III	608	Permanent
Spillway	CR-RB01-WA	PSS/PEM	III	4,242	Permanent
Stilling Basin Permanent Footprint	WE	PEM	III	2,136	Permanent
Temporary Access Roads	WD	PSS/PEM	III	299	5 Years
	WE	PEM	III	524	

[1]Impacts to wetlands are based on available Anchor QEA wetland delineation data (Anchor QEA 2018)
[2]PEM=emergent marsh, fen or wet meadow
PFO=forested or wooded swamp
PSS=shrub swamp

Table 3-2. Excavation and Fill Quantities from FRE Construction and Operation within Wetlands[1]

Activity/Impact	Wetland Information			Impact		
	Name	Type[2]	Ecology Rating	Excavation (CY)	Fill (CY)	Duration
Fill of Existing River Channel	WAJ	PEM	III	5	15	Permanent
FRE Facility Permanent Footprint	CR-RB01-WA	PFO	III	240	4,405	Permanent
	CR-S01-WA	PSS/PEM	III	235	15,620	
	WAI	PEM	III	0	3,705	
	WE	PEM	III	0	3,985	
FRE Facility, Excavation Limits - excavation and fill	CR-RB01-WA	PFO	III	5,765	0	Permanent
	CR-S01-WA	PSS/PEM	III	23,080	0	
	WAI	PEM	III	5,060	0	
	WE	PEM	III	7,065	0	
	WF	PEM	III	5	0	
Permanent Access Roads	CR-S02-WA	PFO/PSS/PEM	III	5	0	Permanent
	WC	PSS/PEM	III	775	0	
	WD	PSS/PEM	III	0	1,170	
	WO	PEM	III	5	0	
	WQ	PEM	III	0	185	
	WR	PSS/PEM	III	0	15	
Permanent River Reroute	CR-S04-WA	PEM	III	0	355	Permanent
Temporary Open Channel Bypass	CR-RB01-WA	PFO	III	6,515	0	5 Years

[1]Impacts to wetlands are based on available Anchor QEA wetland delineation data (Anchor QEA 2018)

[2]PEM=emergent marsh, fen or wet meadow
PFO=forested or wooded swamp
PSS=shrub swamp

Table 3-3. Impact Areas from FRE Construction and Operation to Open Water Streams[1]

Activity/Impact	Stream Name	Impact		
		Area (SF)	Distance (LF)	Duration
Conduits Permanent Footprint	Upper Chehalis River	18,598	860	Permanent
Fill of Existing River Channel	Upper Chehalis River	24,462	921	Permanent
FRE Complete Disturbance Limits	Crim Creek	3,941	910	5 Years
	Upper Chehalis River	113,993	4,345	
FRE Facility Permanent Footprint	Upper Chehalis River	13,708	1,236	Permanent
FRE Facility, Excavation Limits - excavation and fill	CR-S01	158	78	Permanent
	Upper Chehalis River	8,259	1,362	
FRE Temporary Reservoir - Episodic temporary inundation	BC-RB01	55,869	316	Episodic and temporary - variable duration and recurrence
	Big Creek	52,744	2,550	
	Browns Creek	27,980	1,682	
	CC-LB01	602	302	
	CC-LB03	4,671	586	
	CC-LB03-T1	567	289	
	CC-LB03-T2	417	214	
	CC-LB03-T3	219	116	
	CC-LB04	942	471	
	CC-LB05	43	20	
	CC-LB06	1,233	201	
	CC-LB07	1950.97	325	
	CC-LB07-T1	83	50	
	CC-LB08	854	153	
	CC-LB09	3,849	406	
	CC-LB10	725	122	

Activity/Impact	Stream Name	Impact		
		Area (SF)	Distance (LF)	Duration
	CC-LB15	690	170	
	CC-RB03	240	118	
	CC-RB04	250	124	
	CC-RB05	1,315	391	
	CC-RB06	3,442	864	
	CC-RB07	3983	668	
	CC-RB08	876	291	
	CC-RB09	112	33	
	CC-RB16	21	33	
	CC-S07	449	224	
	CC-S08	97	21	
	CC-S09	243	38	
	CC-S10	93	49	
	CC-S11	63	31	
	Crim Creek	11,452	533,163	
	CR-LB01	70	334	
	CR-LB02	3,731	747	
	CR-LB02-T1	1,014	164	
	CR-LB02-T2	774	130	
	CR-LB02-T3	78	14	
	CR-LB03	1,151	288	
	CR-LB04	8,013	800	
	CR-LB04-T1	8,615	744	
	CR-LB04-T2	3,057	765	
	CR-LB04-T4	2,350	586	
	CR-LB05	489	123	
	CR-LB07	4,303	715	

Activity/Impact	Stream Name	Impact		
		Area (SF)	Distance (LF)	Duration
	CR-LB08	6,660	668	
	CR-LB09	417	210	
	CR-LB10	385	201	
	CR-LB11	1,467	367	
	CR-LB12	1,890	313	
	CR-LB13	4,117	687	
	CR-LB13-T1	454	76	
	CR-LB13-T2	2,150	549	
	CR-LB13-T3	216	53	
	CR-LB14	650	115	
	CR-LB15	54	26	
	CR-LB16	1,054	311	
	CR-LB17	2,674	361	
	CR-LB18	284	160	
	CR-LB20	49	21	
	CR-LB21	24	15	
	CR-LB22	25	12	
	CR-LB26	3,605	717	
	CR-LB26-T1	36	17	
	CR-RB02	4,253	717	
	CR-RB03	1,487	246	
	CR-RB04	795	199	
	CR-RB05	1,354	340	
	CR-RB05-T1	564	284	
	CR-RB06	1,094	180	
	CR-RB07	1,539	257	
	CR-RB08	2,570	427	

Activity/Impact	Stream Name	Impact		
		Area (SF)	Distance (LF)	Duration
	CR-RB08-T1	753	133	
	CR-RB08-T2	82	45	
	CR-RB09	5,611	704	
	CR-RB10	1,232	325	
	CR-RB11	747	191	
	CR-RB11-T1	2,343	585	
	CR-RB12	1,926	320	
	CR-RB13	2,375	403	
	CR-RB21	16,037	1,125	
	CR-RB21-T1	16,019	50	
	CR-S02	1,443	358	
	CR-S03	2,445	405	
	CR-S05	1,232	616	
	CR-S07	391	95	
	CR-S08	928	150	
	CR-S10	862	214	
	CR-S12	89	43	
	CR-S16-T	1,158	288	
	CR-S18	906	452	
	CR-S23	182	34	
	CR-S24	639	158	
	HC-RB01	1,346	340	
	HC-RB01-T1	628	160	
	HC-RB02	476	82	
	HC-RB03	2,335	394	
	Hull Creek	25,255	3,115	
	LC-LB01	1,262	313	

Activity/Impact	Stream Name	Impact		
		Area (SF)	Distance (LF)	Duration
	LC-RB01	3,311	414	
	LC-RB01-T1	49	28	
	LC-RB02	743	188	
	LC-RB04	767	192	
	LC-RB05	564	142	
	Lester Creek	115,744	3,158	
	NC-LB01	347	171	
	NC-LB02	407	100	
	NC-RB01	360	178	
	RC-RB01	308	90	
	Rogers Creek	88,293	2,090	
	Smith Creek	2,936	144	
	Upper Chehalis River	3,803,003	34,590	
Permanent River Reroute	CR-RB01	57	28	Permanent
	CR-S04	610	150	
	CR-S06	133	30	
	Upper Chehalis River	17,530	1,647	
Permanent River Reroute Disturbance Limits	Upper Chehalis River	42,022	2,408	Permanent
Spillway	Upper Chehalis River	2,147	285	Permanent
Stilling Basin Permanent Footprint	Upper Chehalis River	1,452	392	Permanent
Temporary Open Channel Bypass	Upper Chehalis River	7,217	1,138	5 Years
Temporary Open Channel Bypass and Permanent River Reroute	Crim Creek	15,116	290	Permanent
	Upper Chehalis River	150,400	3,163	

[1]Impacts to streams are based on available Anchor QEA OHWM data (Anchor QEA 2018)

Table 3-4. Dredge and Fill Quantities from FRE Construction and Operation within Open Water Streams[1]

Activity/Impact	Stream Name	Impact		
		Dredge (SF)	Fill (LF)	Duration
FRE Facility Permanent Footprint	CR-RB01	0	25	Permanent
	CR-S01	10	0	
	Upper Chehalis River	0	51,285	
FRE Facility, Excavation Limits - excavation and fill	CR-RB01	25	0	Permanent
	CR-S01	120	0	
	Upper Chehalis River	44,745	5	
Permanent River Reroute	CR-S04	0	445	Permanent
	CR-S06	0	100	
	Crim Creek	1,665	220	
	Upper Chehalis River	7,230	79,915	
Temporary Open Channel Bypass	Crim Creek	5	530	5 Years
	Upper Chehalis River	185	18,975	

[1]Impacts to streams are based on available Anchor QEA OHWM data (Anchor QEA 2018)

4.0 References

Anchor QEA, LLC

2018 Wetland, Water, and Ordinary High Water Mark Delineation Report. December 2018.

HDR Engineering, Inc. (HDR)

2017 Combined Dam and Fish Passage Conceptual Design Report. June 2017.

2018 Combined Dam and Fish Passage Supplemental Design Report FRE Dam Alternative Report. September 2018.

5.0 Acronyms/Abbreviations

HDR	HDR Engineering, Inc.
FRE	Flood Retention Expandable (FRE)
RPDR	Revised Project Description Report