WATERWATCH OF OREGON * STEAMBOATERS * THE NORTH UMPQUA FOUNDATION
UMPQUA WATERSHEDS * UMPQUA VALLEY FLY FISHERS * NATIVE FISH SOCIETY
SOUTH UMPQUA RURAL COMMUNITY PARTNERSHIP * CASCADIA WILDLANDS
ROGUE FLYFISHERS * INSTITUTE FOR FISHERIES RESOURCES * MCKENZIE FLYFISHERS
PACIFIC COAST FEDERATION OF FISHERMEN'S ASSOCIATIONS
THE CONSERVATION ANGLER

Curt Melcher
Director
Oregon Department of Fish and Wildlife
4034 Fairview Industrial Drive SE
Salem, OR 97302

Via Electronic Mail

February 26, 2023

Re: Petition for Reconsideration, Fish Passage Authorization #PA-17-0138 (Winchester Dam)

Dear Director Melcher,

We respectfully submit this petition for reconsideration of Fish Passage Authorization #PA-17-0138 (hereinafter "Authorization") an agency order related to proposed repairs to Winchester Dam on the North Umpqua River and issued by the Oregon Department of Fish and Wildlife (ODFW) on December 29, 2022. ORS 183.484(2) and OAR 137-004-0080 provide 60 days to submit a petition for reconsideration of such an agency order, therefore this petition is timely submitted.

Members of our organizations and our families live, work, fish, and/or recreate in and along the North Umpqua River above and below Winchester Dam, including in coastal communities. We depend upon the salmon and steelhead runs from this river for our livelihoods, for world-class recreational opportunities, for the economic well-being of our communities, and for our cherished traditions. We believe ODFW's Authorization will adversely impact us by causing needless waste of and harm to the North Umpqua's salmon and steelhead runs through, among other causes, the temporary dewatering and closure of Winchester Dam's fish ladder from August 7th through 28th, 2023.

The reasons we contend ODFW should withdraw and reconsider this Authorization are as follows:

1. The needless additional stress, loss of reproductive capacity, and mortality inflicted on already dangerously low salmon and steelhead runs by three weeks interruption of passage to the 160 miles of high quality habitat and cold-water refugia upstream of Winchester Dam cannot be justified, is not in the public interest, will likely violate the federal Endangered Species Act, and would result in economic and other harm

our communities and livelihoods. Moreover, there are readily available project design alternatives using cofferdams which have been previously implemented successfully in Oregon, and would allow the proposed repairs to Winchester Dam with little or no interruption of upstream fish migration and little or no resulting harm for fisheries and our communities.

According to the ODFW plaque of fish migration timing posted on Winchester Dam's fish ladder viewing area, the period of interruption green-lit by ODFW for this project overlaps the peak period of North Umpqua summer steelhead migration as well as the migrations of spring Chinook. Please see a photo of this plaque attached as Exhibit A. Adult Pacific lamprey also cross Winchester Dam during this period. The North Umpqua's summer steelhead populations have yet to meaningfully improve after falling to an all time record low in 2021, while spring run Oregon coast Chinook are a candidate species for listing under the federal Endangered Species Act (ESA). Pacific lamprey will not only face migration interruption, but mass mortality of thousands of ammocetes in exposed reservoir sediment.

Allowing needless harm and losses to these depressed populations for the convenience of a handful of private recreational dam owners seeking to make minimal repairs as cheaply as possible would violate the public interest as well as ODFW's mission. Again, there is no justification to cause harm to our native fisheries if other far less harmful cofferdam design alternatives are readily available for this project.

Please also see attached Exhibit B for assessment using ODFW data of past fish passage during the Authorization's proposed blockage of fish passage function. The record shows that in any given year a number of adult Coho salmon listed under the federal ESA attempt to cross Winchester Dam during the project's period of fish passage interruption. The delay, injury, or killing of Coho by this project would likely constitute a violation of federal law.

The North Umpqua in August typically experiences low flows and high temperatures, which cause significant stress and mortality among native fish, as well as angling closures in recent years. In addition, the river reach below Winchester Dam is generally lacking in cold water refugia, so fish stranded below the dam by the project's interruption period will be even more likely to be highly stressed or die before they can reach the protection of cold water. Migratory fish crowded into refugia downstream by this passage interruption may be more susceptible to predation, poaching, and the spread of disease. The drawdown of the reservoir before repair may draw additional fish towards the dam by temporarily increasing river flows downstream, then strand these fish for three weeks in low, hot water below an impassable dam. Any fish that survive being bottled up against the dam will then face even lower and hotter water when reservoir refill depletes downstream flows. As noted below, this would likely not only harm fish including federally-listed Coho, but also violate state water law.

2. This project should at a minimum meet the same fish passage, monitoring, and reporting requirements ODFW set in their passage authorization for the Gold Ray Dam removal project on the Rogue River in 2010. ODFW has set inexplicably less stringent passage standards for the Winchester Dam project as compared with the Gold Ray project. We have found no apparent legal or scientific justification for this in the documents received from ODFW related to this Authorization. Attached as Exhibit C is the Gold Ray project's passage approval for reference (#PA-15-0015), which allowed no period of interruption of fish passage, even for a dam project providing the maximum possible benefit for fisheries – the dam's removal. Again, there is no justification for ODFW setting vastly different and unequal passage standards for the Winchester and Gold Ray projects, especially given the minimal, temporary, and/or non-existent fisheries and passage benefits provided by the proposed limited repairs to Winchester Dam compared with the many permanent and valuable fisheries, boating, and other public benefits provided by the Gold Ray Dam project. North Umpqua fisheries and fishery dependent communities are no less deserving of ODFW protection than Rogue fisheries and fishery dependent communities. We also note under item 4 of the Gold Ray authorization requirement for monitoring and reporting "of the effectiveness of fish passage during, throughout and after the completion of the project," to "be performed by a qualified fisheries biologist" and "based on visual observations, established photo points, flow velocity characteristics, or other means." This requirement seems especially prudent for Winchester Dam given the applicant previously conducted dam repairs in 2018 without following known best management practices, even after ODFW and other agencies provided the dam owners with information in advance on how to protect water quality and fish. As documented by ODFW, the botched 2018 repairs at the dam degraded aquatic habitat and killed fish, among other harms to the river and public resources. We request ODFW establish similar passage monitoring and reporting requirements for the Winchester project as for the Gold Ray project, in addition to the same no fish passage interruption requirement.

3. ODFW's Authorization likely violates OAR 635-412-0035(1)(f). Federal approval is required for this project, including consultation by NOAA Fisheries for compliance with the federal Endangered Species Act. The federal permitting process for this project was already underway when ODFW received the fish passage application for this project, dated October 18, 2022. ODFW's subsequent approval letter states on page 4 that "the project... shall take into account federal requirements..." This language fails to meet the requirement in statute. Statute requires that ODFW itself shall take the federal requirements into account when considering a fish passage application. ODFW could not and did not consider the requirements of any Biological Opinion before issuing this Authorization, because as of the date of this writing, NOAA Fisheries has not issued a Biological Opinion. It is also our understanding that ODFW further failed to review the Biological Assessment prepared for the project consultation. During a meeting requested by North Umpqua advocates to discuss this Authorization with ODFW's Umpqua District Fish Biologist Greg Huchko on January 25, 2023, Mr. Huchko informed the group that he did not have and had not read the project's Biological Assessment. Attached as Exhibit D

and for ODFW's future reference are the project Biological Assessment and a relevant accompanying letter. We request that ODFW comply with the law and consider the Biological Opinion for this project before issuing any new fish passage authorization for this project.

4. ODFW's Authorization approved a project that cannot be implemented without violating state water law, including violations that would simultaneously harm fish and/or impair certificated instream water rights intended to protect native fish. The Oregon Water Resources Department (OWRD) informed the Winchester Dam owners on January 13, 2023 that they were in violation of their reservoir storage claim and must either lower the reservoir elevation or apply for a limited license or a new water right to come into compliance. ODFW was copied on OWRD's notice. It is attached here as Exhibit E for ease of reference. As a result, ODFW must withdraw their Authorization and reconsider when presented with a project application that does not propose to violate state water law, as well as risk violations of federal law noted above. Again, it is probable a lawful project design may be achieved by an alternative dewatering and isolating only the work area through cofferdam construction. This design option would be largely or entirely the same as the no passage interruption alternative we advocate for in #1 above, and the Gold Ray design alternative we advocate in #2 above.

In closing, we urge ODFW to accept this petition for reconsideration. Please require a project alternative, which maintains fish passage and avoids violations of law harmful to native fish and our communities and livelihoods while achieving the dam owner's stated goal of minimum adequate dam repairs for dam safety. Again, ODFW should evaluate an alternative consisting of a cofferdam that isolates a large portion of the dam while maintaining fish passage at the ladder. This common approach to work area isolation is regularly used throughout the state of Oregon and would allow for construction of the improvements while not impacting fish passage. Once improvements are made to the isolated portion of dam, the cofferdam could be removed and relocated to finish up any additional work.

Please take corrective action now by withdrawing and reconsidering this Authorization. Please don't cause needless harm to us, our invaluable salmon and steelhead runs, and the North Umpqua simply so that a handful of wealthy landowners around a private water ski lake can save a few dollars on dam repairs. Thank you for your attention to this important matter.

Sincerely,

Jim McCarthy
Southern Oregon Program Director
WaterWatch of Oregon

Jeff Dose
Vice President

Steamboaters

Becky McRae
Chair
The North Umpqua Foundation

Kasey Hovik
Executive Director
Umpqua Watersheds

Stanley Petrowski
President/Director
South Umpqua Rural Community Partnership

Mike McCoy
President
Umpqua Valley Fly Fishers

Kirk Blaine
Southern Oregon Coordinator
Native Fish Society

Glen Spain
Northwest Regional Director
Pacific Coast Federation of Fishermen's Associations
Institute for Fisheries Resources

David Moskowitz
Executive Director
The Conservation Angler

Steve Day
President
Rogue Flyfishers

Grace Brahler
Wildlands Director
Cascadia Wildlands

Jeff DeVore
President
McKenzie Flyfishers

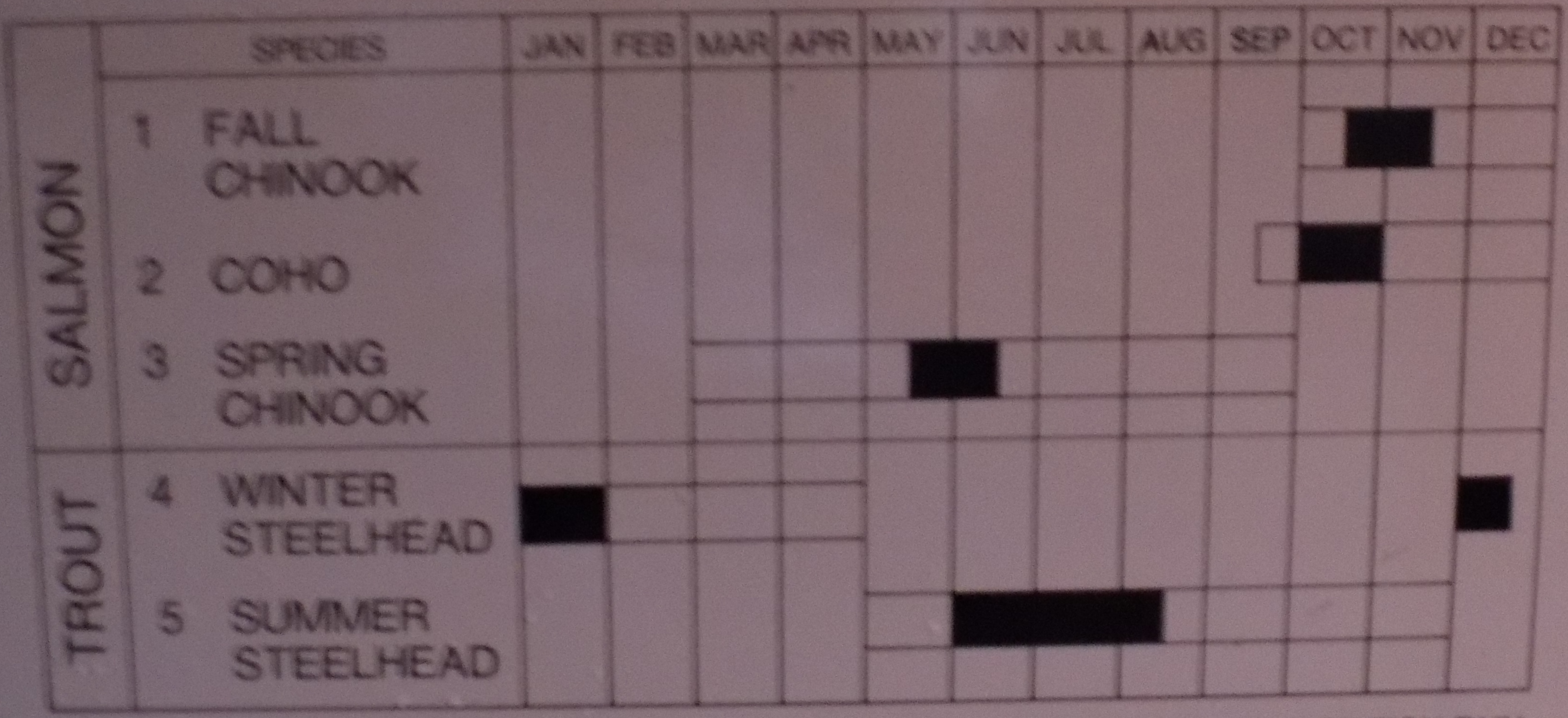
Cc:
The Honorable Tina Kotek, Governor
Oregon Fish and Wildlife Commission

Oregon Water Resources Commission
ODFW Staff
OWRD Staff
Oregon Dept. of Environmental Quality
Oregon Dept. of State Lands
NOAA Fisheries
U.S. Fish and Wildlife Service
U.S. Army Corps of Engineers
Cow Creek Tribe
Winchester Water Control District
City of Roseburg
Umpqua Basin Water Association
The Honorable Ron Wyden, U.S. Senate
The Honorable Jeff Merkley, U.S. Senate
The Honorable Val Hoyle, U.S. House of Representatives

EXHIBIT A

WHO'S MIGRATING UPSTREAM WHEN?

NORTH UMPQUA GAME FISHES



DARKER SHADE INDICATES PEAK OF FISH RUN

Best time of year to view the fish: Late May through mid-July.

Best time of day to view the fish: Mid to late afternoon.

EXHIBIT B

YEAR	Period of August 1-15, 2014	Period of August 16-31, 2014	Total Count	Total fish August	Days in August 31	Fish Per Day	Days during FPPA 22	Fish Blocked durig FPPA	Percent total run
				SPRING CHINOOK * Jack Count = 4415					
2005	3	93	9013	96		3.10		68.13	1%
2006	240	180	6081	420		13.55		298.06	5%
2007	141	67	6634	208		6.71		147.61	2%
2008	213	183	7677	396		12.77		281.03	4%
2009	505	506	14261	1011		32.61		717.48	5%
2010	382	241	13887	623		20.10		442.13	3%
2011	356	316	16603	672		21.68		476.90	3%
2012	304	441	16868	745		24.03		528.71	3%
2013	603	605	15157	1208		38.97		857.29	6%
2014	36	189		225		7.26		159.68	
AVERAGE	278	282	11798	560		18.08		397.70	3%
				SUMMER STEELHEAD					
2005	11	213	6987	224		7.23		158.97	2%
2006	485	602	7669	1087		35.06		771.42	10%
2007	284	404	4552	688		22.19		488.26	11%
2008	493	211	6674	704		22.71		499.61	7%
2009	467	388	4993	855		27.58		606.77	12%
2010	498	244	5415	742		23.94		526.58	10%
2011	535	415	6597	950		30.65		674.19	10%
2012	329	132	6347	461		14.87		327.16	5%
2013	653	406	3885	1059		34.16		751.55	19%
2014	87	160		247		7.97		175.29	
AVERAGE	384	318	5902	702		22.64		497.98	10%
				CUTTHROAT					
2005-06	1	1	62	2		0.06		1.42	2%
2006-07	3	16	83	19		0.61		13.48	16%
2007-08	10	3	96	13		0.42		9.23	10%
2008-09	27	9	182	36		1.16		25.55	14%
2009-10	10	5	109	15		0.48		10.65	10%
2010-11	8	7	153	15		0.48		10.65	7%
2011-12	122	44	433	166		5.35		117.81	27%
2012-13	42	10	210	52		1.68		36.90	18%
2013-14	2	10	209	12		0.39		8.52	4%
2014-15	4	2		6		0.19		4.26	
AVERAGE	23	11	171	34		1.08		23.85	12%
				COHO					
2005-06		0	13260	0		0.00		0.00	0%
2006-07		2	11247	2		0.06		1.42	0%
2007-08		2	4684	2		0.06		1.42	0%
2008-09		1	4274	1		0.03		0.71	0%
2009-10		2	8915	2		0.06		1.42	0%
2010-11		1	10878	1		0.03		0.71	0%
2011-12		1	6667	1		0.03		0.71	0%
2012-13		0	4178	0		0.00		0.00	0%
2013-14		1	3619	1		0.03		0.71	0%
2014-15		0		0		0.00		0.00	
Average		1	7525	1		0.03		0.71	0%

Top Percentage migration years

2013

2009

Lower precentage years

2012

2008

EXHIBIT C

1859

Oregon
Theodore R. Kulongoski, Governor

Department of Fish and Wildlife
Fish Division
3406 Cherry Avenue NE
Salem, OR 97303
503-947-6228
Fax: 503-947-6202
TTY: 503-947-6339
greg.d.apke@state.or.us

OREGON
Fish & Wildlife

John Vial, Director
Jackson County Roads and Parks
200 Antelope Road
White City, OR 97503
Phone: (541) 774-6238
Fax: (541) 774-6295
vialjn@jacksoncounty.org

June 14, 2010

Re: Fish Passage Approval at Gold Ray Dam Removal Project (PA-15-0015)

Mr. Vial,

The Oregon Department of Fish and Wildlife (ODFW) has reviewed and approves, as required by Oregon Fish Passage Law 509.585, the fish passage design plans proposed for the Gold Ray Dam Removal Project (Project). ODFW Fish Passage program and District staff has reviewed the Fish Passage and Salvage Plan and corresponding designs, which we received May 24, 2010, and we find that the project is consistent with Oregon Fish Passage statutes and meets Oregon Fish Passage design criteria (OAR 635-412-0035(8) and (10)). The proposed project will remove the full channel spanning dam along the mainstem Rogue River at river mile 125.7.

Gold Ray Dam, a 38-foot high, 360-foot long, defunct hydroelectric facility, was constructed in 1904. The hydroelectric power house closed permanently in 1972. The dam is a major liability concern for Jackson County and a maintenance burden for Jackson County taxpayers. Gold Ray Dam has been identified by the ODFW as fifth in priority for removal and/or fish passage improvement on Oregon's Statewide Fish Passage Priority List.

The Gold Ray Dam Removal Project's fish passage approval is contingent on specific provisional items which include the following:

1. All in-water work associated with the project will be performed during the ODFW in-stream work widow (June 15th - August 21st) or as negotiated with ODFW.
2. Jackson County (Applicant) shall be responsible for all maintenance required such that the project provides adequate passage for native migratory fish. If monitoring by the Applicant or the ODFW indicates that fish passage is not being provided, the Applicant, in consultation with ODFW, shall determine the cause and, during a work period approved by ODFW, shall modify the project to rectify problems as necessary. Failure to maintain fish passage for the duration of this

approval shall constitute a violation of this approval and applicable fish passage rules (OAR 635-412-0025(3)).

3. Jackson County shall develop and implement contingency plans to provide fish passage as needed during emergencies that may develop during the proposed project.
4. Jackson County shall monitor and report the effectiveness of fish passage during, throughout and after completion of the project. This shall entail monitoring of the existing fishway during construction as well as throughout the project area(s) after construction and project completion. Monitoring will be performed by a qualified fisheries biologist to determine whether or not the project is functioning as it was designed to function for fish passage. Fish passage monitoring reports shall report on the effectiveness of fish passage of native migratory fish at a variety of passage flows when these fish are migrating through the project area. Monitoring and reporting shall coincide with the time of the year when native migratory fish species are migrating in the Rogue River throughout the project area. Monitoring and reporting shall consist of a summary of the fish passage conditions and fish passage performance with particular emphasis on flow velocities, water depths and the volitional unimpeded passage of native migratory fish during the appropriate fish passage design flows. Monitoring and reporting shall be based on visual observations, established photo points, flow velocity characteristics, or other means; particularly with regards to fish passage conditions and fish passage performance through the project area during and after the completion of the project.
5. Monitoring reports shall be completed and submitted by Jackson County, or your designee, to the ODFW Fish Passage Program Coordinator and the District Fish Biologist annually for a period of 5-years after the completion of the project. Monitoring reports shall be submitted by January 31 of each year for the previous years reporting period.
6. The ODFW shall be allowed to inspect the project at reasonable times for the duration of this approval. Unless prompted by emergency or other exigent circumstances, inspection shall be limited to regular and usual business hours, including weekends.

We appreciate the cooperation and partnership(s) that have developed among the stakeholder groups for this dam removal project. Jackson County has done a remarkable job facilitating meetings, project planning and development and now implementation of the project. We also want to acknowledge the design-build team of Slayden Construction Group, Inc., River Design Group Inc., and HDR, Inc. who performed the environmental studies, dam removal design and permitting and deconstruction of the Gold Ray Dam. We look forward to the continued support and cooperation of Jackson County and their design-build team during and after the deconstruction phase of this much anticipated project. Please continue to coordinate with ODFW District staff as appropriate during the deconstruction phase(s) of the project as appropriate or as issues develop.

Please retain this correspondence for your records, as this documents ODFW's approval of fish passage at this site. Please pass this information along to the appropriate Jackson

County and Rogue Valley Council of Government staff as appropriate. Please notify me if you have any questions regarding the content of this fish passage approval. Thank you for cooperation and patience as we worked through the fish passage approval for this project. If you have any questions, please contact me by calling 503-947-6228.

Sincerely,

Greg Apke
ODFW - Statewide Fish Passage Program Coordinator

c.c
Ray Hartlerode
Bruce McIntosh
Larry Cooper
Russ Stauff
Dan VanDyke
Jay Doino
Ken Phippen
Bethany Harrington
Project File (PA-15-0015)

EXHIBIT D

January 2, 2022

Melanie O’Meara
U.S. Army Corps of Engineers
Portland District
211 East 7th Avenue, Suite 105
Eugene, Oregon 97401-2763

Subject: **Winchester Dam Repairs Biological Assessment**
WCRO-2022-02717

Dear Ms. O’Meara:

This is in response to a letter dated December 14, 2022, addressed to you from Kate Wells, Willamette Branch Chief with National Marine Fisheries Service. In addition to addressing her questions, we provide information on proposed changes to project timing and sequencing that resulted from a meeting with the Oregon Department of Fish and Wildlife (ODFW) on December 14, 2022.

Ms. Wells’ letter requested additional information prior to initiating formal consultation. Her information requests and our responses are presented below:

1) *The proposed action is missing information on how the log boom would be removed, and how the concrete would be transferred to the fish ladder, for example heavy machinery such as a crane, and where would staging for that equipment occur?*

   Response: The existing log boom will be lifted from its current location by an excavator or similar equipment operating from the work platform either upstream or downstream of the dam (see sheet TW01 in Appendix 2 of the BA) . This will be done once the reservoir water level is lowered and prior to commencing repairs to the false attraction flow. Once concrete forms, anchors, and reinforcing steel are in place at the false attraction flow near the fish ladder, concrete will be pumped to fill the forms from a truck parked at the construction access road or staging area nearest the fish ladder on the north end of the dam.

2) *If the reservoir is drained for work in the dry, can you confirm that the spill gates near the south power building will be used for dewatering and that they will remain open to maintain downstream flow during construction on the north side of the dam?*

   Response: The reservoir will be lowered over a period of days to facilitate fish salvage – especially salvage of lamprey ammocoetes. Reservoir level lowering will be achieved by adjusting the spill gates to allow the reservoir to drain slowly. Once the reservoir is lowered, the gates will remain open for the duration of repairs to the dam face and north end of the dam (approximately three weeks).

3) *The proposed action states that timber supports would be repaired if necessary but does not include information on how those repairs would be carried out.*

Response: Most repairs will be done with the steel posts, whalers and tie-backs as shown on the plans (see S04 and S05). Timber post repair is limited to construction phase stability while steel is installed – see detail “S” on Sheet S08. It is possible that once work begins, additional existing timber components may need to be repaired, replaced, or trimmed to facilitate required bearing and retention of the dam materials. These existing timber components will be cut and/or unbolted and replaced in kind with untreated timber components and bolted back into place. This work takes place within the identified isolation or drawdown areas.

4) *The proposed action includes the use of polyurethane foam; however, there is no information on how the polyurethane foam is applied, for example, pumped from a nearby truck or injected by hand.*

Response: Polyurethane foam is injected into voids with a “gun” equipped with a nozzle of varying length. The gun is connected via hoses to either stand-alone or truck-mounted tanks. It is injected as a two-part polymer that mixes at the nozzle of the gun. As the foam cures, it expands, effectively filling voids.

5) *The proposed action states the polyurethane foam is "water resistant". It is NMFS’ understanding that at least some portions of the foam will be in constant direct contact with water; therefore, should the foam instead be waterproof?*

Response: The BA should state that the URETEK brand deep injection (UDI) foam is waterproof, rather than just water resistant. URETEK’s high-density polymer is light weight, yet capable of exceeding 10,000 pounds per square foot of expansive pressure. It will displace water and seals against water intrusion. It is environmentally inert, has excellent adhesion and is highly chemical resistant.

6) *The proposed action lacks information on the overall durability of the polyurethane foam. Toxicity is covered well in the BA, but durability is not mentioned. NMFS requires assurance that the product won't contribute to microplastic pollution over time, which can be taken up by fish through the food chain.*

Response: Once cured, the UDI foam is durable, resists erosion, and breaks down only from UV light. Therefore, the release of particles from the foam is not anticipated. There will be no erosive force against the foam inside the voids of the dam, as the foam will preclude the movement of water through the dam and no foam is expected to “daylight” on either the upstream or downstream side of the dam. Should some of the expanding foam follow the path of least resistance through voids to the surface, it will be coated with a UV-resistant epoxy or protected from the light by something as simple as a stainless-steel plate. Since the late 1980s, URETEK has completed more than 75,000 successful polymer injection projects nationwide, including repairs to earthen dams in Texas (Addicks and Barker Dams) and Ohio (Lake White Dam).

7) *The BA states that a barge will be launched from the north side of the reservoir to conduct the work on the south side of the dam. Can the launch ramp as it exists support launching the barge or will the existing launch ramp need to be rehabilitated, upgraded, or expanded?*

Response: The existing launch ramp is adequate and will not require any alterations.

Please let us know if these responses do not adequately address the concerns expressed by NMFS.

Representatives of ODFW, the Winchester Water Control District (WWCD) and DOWL met on December 14, 2022, to discuss a fish passage plan that was submitted to ODFW on October 19, 2022. Based on several previous meetings with ODFW, DOWL and WWCD were confident that the ODFW preferred in-water work period for the project, was July 22 to September 15 as outlined in the BA. At the December 14 meeting, ODFW revised the preferred in-water work window based on concerns about summer steelhead migration timing and the potential for early returning coho to be present in September. As a result of this meeting, the final proposed in-water work period was set at July 7th to August 28th. Due to this schedule change, the sequencing of the project was modified, with the two phases of construction described in the BA swapped temporally. All activities described in the BA as Phase II work (occurring at the south end of the dam at the former powerhouse) will now be conducted prior to Phase I work (repairs to the north end of the dam and dam face). This change also requires that the concrete remaining from an earlier repair located in the vicinity of the sheet pile wall (see Sheet S06) will be removed by an excavator stationed on a construction barge. Concrete removal done in the wetted channel will be done within a silt curtain barrier when necessary and in the dry after reservoir draw-down as is described in the BA.

The schedule and sequencing changes do not alter any of the potential effects of the Project or result in additional impacts to ESA-listed coho salmon. In fact, the earlier in-water work period presents less risk that early migrating adult coho will be present in the North Umpqua River during fish ladder shut-down.

Sincerely,
DOWL

James Stupfel
Senior Environmental Specialist

BIOLOGICAL ASSESSMENT

Winchester Dam Repair

October 2022

Prepared for:
Winchester Water Control District
P.O. Box 661
Winchester, Oregon 97495

Prepared by:
David DeKrey
Senior Biologist – Primary Author

Austin Bloom
Environmental Manager – Senior Reviewer

DOWL
5 Centerpoint Drive, Suite 350
Lake Oswego, Oregon 97035

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FIGURES

TABLES

APPENDICES

EXECUTIVE SUMMARY

This Biological Assessment was prepared for Winchester Water Control District in accordance with Section 7(c) of the Endangered Species Act to address the potential effects of the proposed dam repair on federally listed fish, wildlife, and plant species, and their habitats. This document serves, in part, as consultation with National Marine Fisheries Service and U.S. Fish and Wildlife Service. The proposed project requires a Section 404 fill and removal permit from the U. S. Army Corps of Engineers, which constitutes the federal nexus for the project. Conservation measures are identified in the BA to avoid and minimize adverse effects of the proposed action. Also included in this document is an assessment of the project effects on Essential Fish Habitat as required under the Magnuson-Stevens Act.

Winchester dam is located approximately five miles north of Roseburg, Douglas County, Oregon, immediately east of the I-5 and US 99 bridges at River Mile 7.0 of the North Umpqua River. The dam is currently owned and maintained by the Winchester Water Control District. The existing dam consists of a rock-filled timber crib weir flanked by a concrete fish ladder on the north end and a concrete spillway-powerhouse structure on the south end.

This dam repair project includes four separate components:

1. **Repair the dam face near the fish ladder to eliminate false attractant flows.** There is currently water infiltrating the dam, and discharging near the fish ladder side entrance, potentially creating a false attraction flow. The area will be repaired with concrete following drainage of Winchester Reservoir.
2. **Repair timber faced portions of the dam.** This repair will take place on the downstream side of the dam while Winchester Reservoir has been drawn down. Repairs include vertical steel supports and horizontal steel whalers. The vertical steel components will be located on concrete sills, which will also be repaired during reservoir draw down.
3. **Fill voids in the existing dam embankment using polyurethane foam.** There are several known areas where embankment material has been washed out of the dam creating voids behind the wall face. These areas need to be filled with polyurethane foam to stop additional erosion.
4. **Arrest subsurface water migration below the southern portion of the dam and south powerhouse.** This repair will be conducted after the repairs above, once the spillway gates are closed, and water is again flowing through the fish ladder and over the crest of the dam. A sheet pile coffer dam will first be driven upstream of the dam, and then concrete will be placed within the coffer dam, effectively sealing the riverbed and stopping water infiltration through the powerhouse. After the concrete has cured, the sheet piles will be cut off even with the top of the concrete.

In assessing the potential effects of the proposed project on listed fish, wildlife, and plant species, and their habitats, the environmental baseline was documented, the proposed action was evaluated to assess the effect on the environmental baseline, and the results of these evaluations were used to arrive at a determination of effect. Indirect, interrelated, interdependent and cumulative effects of the various project components were also considered.

Based on the analysis of effects and consideration of conservation measures that would be implemented to avoid and reduce effects we determined the following:

Fish Species

The listed species known or suspected to occur in the vicinity of the project Action Area include only the threatened Oregon Coast Coho salmon.

The primary effects of the action will be stress from fish salvage, pile driving noise, short-term and localized sediment disturbance during and immediately following construction, and delayed migration due to the shutting down of the fish ladder for three weeks. There may also be a short-term decrease in aquatic invertebrates in areas of the reservoir that are exposed during project construction. Fish salvage will be required both at the north end for repairs of the dam face and timber components, and at the south end within the sheet pile cofferdam.

The water in the North Umpqua River is very warm (typically over 20° C) during the proposed in-water work window of July 22 to September 15. Therefore, very few Oregon Coast Coho (adults or juveniles) are expected to be in the vicinity during project construction. Thus, increased turbidity, pile driving noise, and fish salvage will likely have only minor effects on a few individuals. A few adult Oregon Coast Coho may be delayed very early in the migration season, but it is possible that they could navigate the spill gates during the period of lake drawdown and thus experience no migration delays. The repairs may improve conditions long-term over the environmental baseline by eliminating a false attraction flow, which may currently be delaying upstream migration.

The proposed repairs will extend the life of the dam. However, the project will have no effects on the environmental baseline (aside from the potential improvements from eliminating the false attraction flow) as Winchester Dam has been part of the environmental baseline since its construction in 1890. The proposed project will also have no effect on Oregon Coast Coho critical habitat, except in the short term, during and immediately after construction.

After completing analyses of the potential effects of the proposed construction project on listed species and their habitat, the following effects determinations were made:

Oregon Coast Coho Salmon: Likely to Adversely Affect

A few adult Oregon Coast Coho salmon may experience migration delays, and any Coho juveniles present in the reservoir during construction would experience habitat alterations during Phase I. Those juveniles in the construction zone may be subjected to fish salvage and pile driving noise, but due to expected high water temperatures during project construction, few if any Oregon Coast Coho juveniles are expected to be present. With the implementation of conservation measures, the project is unlikely to have negative effects on Oregon Coast Coho at the population scale.

Invertebrate, Wildlife, and Plant Species: No Effect

Franklin's Bumble bee and Kincaid's lupine were identified as potentially present in the Action Area. After review of the habitat requirements of these species, their known present distributions, and observations of conditions at the proposed construction site we concluded that these species are unlikely to occur at the proposed construction site or in nearby areas that could be impacted by the project. Based on these findings the proposed project will have No Effect on ESA-listed wildlife, insect, or plant species.

Essential Fish Habitat: Likely to Adversely Affect

Based on consideration of the EFH requirements of the Coastal Pelagic Species (CPS) fishery, West Coast groundfish fishery, and the Pacific coast salmon fishery, the potential direct, indirect, and cumulative effects of the proposed project are Likely to Adversely Affect identified EFH for Pacific Salmon (Coho salmon and spring and fall Chinook) in the short-term. The implementation of appropriate conservation measures would help avoid and minimize impacts to EFH.

1.0 BACKGROUND/HISTORY

1.1 Project Background

This Biological Assessment (BA) was completed to address the effects of the proposed Winchester Water Control District Dam Repair (the “Project”) on species listed as endangered or threatened under the Endangered Species Act (ESA), or their designated critical habitat.

The existing dam consists of a rock-filled timber crib weir flanked by a concrete fish ladder on the north end and a concrete spillway-powerhouse structure on the south end. The current fish ladder was constructed or modified in 1983, but fish ladders have been present at the dam since 1923 (see below). The entire structure is founded on bedrock, with a reinforced concrete sill extending the full length under the downstream face of the timber cribbing. The original timber-capped weir has been replaced with a concrete cap for the southerly 202 feet and rebuilt with a timber cap for the remaining 165 feet. The north abutment is a concrete fish ladder and fish viewing building, operated and maintained by the Oregon Department of Fish and Wildlife (ODFW).

The dam is located approximately five miles north of Roseburg, Douglas County, Oregon, immediately east of the I-5 and US 99 bridges at River Mile (RM) 7.0 of the North Umpqua River (N. Umpqua). The dam is currently owned and maintained by the Winchester Water Control District (WWCD) – a group of private landowners who reside on or near the reservoir upstream of the dam.

The Winchester Water Treatment Plant is located on the left (south) bank immediately downstream of the dam, with a mobile home park immediately downstream from there. The right bank is undeveloped land for several hundred feet downstream. Winchester Reservoir (water surface elevation 435.2 feet) extends upstream to the beginning of an “S” shaped bend, approximately 1.45 miles upstream of the dam.

The dam is run-of-the-river, with virtually no control of river flows. There are two spillway gates at the south abutment between the ogee section and old powerhouse, but they are difficult to operate and only raised to lower the lake for dam repairs.

Original construction of the Winchester Dam was completed in 1890 with a powerhouse on the southern abutment. The dam was originally built to provide power for a lumber mill immediately downstream. In 1903 Winchester Dam became the source for Roseburg’s domestic water supply and, by 1907, the sawmill was expanded, and the power generation upgraded.

On May 1, 1911, the powerhouse was destroyed by fire, interrupting water and electrical service to Roseburg and the local area. In July 1923 Winchester Dam was acquired by the California-Oregon Power Company (COPCO), a regional utility based in Medford, Oregon. In August 1923, COPCO built a “...new concrete fishway at their Winchester dam, on the Umpqua River,” possibly the first such facility to be constructed at the site (Oregonian, 7-August-1923). In 1939, with support from the Oregon state fish and game commissions, the fishway at the dam’s north side was, “...reconstructed to provide better facilities for passing fish over the obstruction” (Roseburg News-Review, 15-September-1939).

In 1964 major flooding resulted in severe damage to the Winchester Powerhouse and the following year Pacific Power & Light, (which had merged with COPCO in 1961), ceased electrical generation. In 1969 Pacific Power transferred the property to the WWCD, which retains ownership.

Following its acquisition by WWCD, the old wooden powerhouse on the south abutment and the generation equipment were removed. In 1982 there were “extensive repairs to the timber portion of the dam” including reinforcement of vertical posts and the addition of plywood to the timber cap on the north side. In 1983 a new concrete powerhouse was built at the north abutment by the Electro Power Corporation of Palo Alto. Their alterations for power generation included a significant upgrade to the fish ladder (Roseburg News-Review, 16-June-1983). Electrical generation at Winchester Dam ended in 1985. Additional repair to both the timber and concrete elements of the dam occurred in Summer 1986.

In 1991 the WWCD addressed long-delayed maintenance issues, which had become critical. Holes had formed in the dam, with some reported as large as two square feet in size. About seventy feet of deteriorated wood cribbing was removed and replaced with large wooden timbers. In 1993 the generation equipment in the north powerhouse was removed and sold.

In 1996, Winchester Dam was listed in the National Register of Historic Places for its significance and association with the area’s development. Since 1996 on-going repair work to both timber and concrete elements of the dam have occurred periodically to address on-going deterioration. The reservoir was dewatered for repairs in 2005, 2009, and 2013. The Winchester Dam fish counts indicated that the dam was “De-watered for repairs” between September 1, and November 30 each of those years. However, fish were still being counted as they passed the dam, so the fish ladder must have been able to pass fish, at least for periods during those times. In September 2013, the powerhouse was filled with crushed rock to address leakage, and repairs were made to the crest of the dam where previously-installed Ultra High Molecular Weight (UHMW) Polyethylene had been damaged. In October 2018, a concrete apron and shallow cutoff wall were installed adjacent to the South Power Building in an attempt to eliminate significant seepage that was occurring under the South Power Building and spillway gates.

A detailed description of the currently proposed Project is included in Section 2.5.

1.2 Relevant Previous Correspondence

Meetings and correspondence with USACE and/or NMFS relative to this project include:

A multi-agency “Kaizen” meeting was held on July 21, 2020. Attendees included James Stupfel-DOWL, Brian Meunier-DOWL, Ryan Beckley-Terra Firma, Chris Castelli-Oregon Department of State Lands (DSL), Lauren Brown-DSL, Jaimee Davis-US Army Corps of Engineers (USACE), Melanie O’Meara-USACE, Anita Andazola-USACE, Kate Mott-USACE, Tera O’Rourke-National Marine Fisheries Service (NMFS), Yvonne Vallette Environmental Protection Agency (EPA), Alan Ritchey, ODFW, Greg Huchko-ODFW, Steve Mrazik Oregon Department of Environmental Quality (DEQ), Jeff Brittain, DEQ, Chance Plunk, DEQ, Doug Baer, Oregon State Marine Board (OSMB). The Project was described and opened for discussion.

Topics covered included:

- Project scheduling and duration
- Materials and methods
- Fish passage during construction
- Logistics
- Water Quality
- Fish Salvage
- Future consultation

A meeting was held with ODFW on January 20, 2022. ODFW attendees included: Greg Huchko, Alan Ritchey, Joel Watts, and Greg Apke. Topics discussed included:

- Materials and methods
- Work duration
- Work timing. At this meeting an in-water work period (IWWP) was agreed upon from July 22 to September 15.
- Regulatory requirements for ODFW fish-passage review (the project does not meet the 30 % modification trigger for fish passage review).
- Fish passage during construction
- Fish salvage

A meeting was held on February 22, 2022. Attendees included Anita Andazola (USACE), Lauren Brown (DSL), Tony Janicek and Keith Mills (OWRD), James Stupfel, Brian Meunier, and Jeremy Doschka (DOWL)

- Project materials, methods, footprint, timing and impacts
- Permitting requirements under SLOPES and Nationwide Permit 3

A meeting was held on May 6, 2022. Agency attendees included: Kathleen Wells of NMFS and Anita Andazola of USACE. Topics discussed included the following:

- Project Construction
- Polyurethane Grout
- How the presence and continued existence of the dam will be assessed as part of the Environmental Baseline

A meeting was held on May 31, 2022. Agency attendees included: Jeff Young of NMFS, Kathleen Wells of NMFS and Anita Andazola of USACE. Topics discussed included the following:

- Fish ladder analysis
- BA terminology

A meeting was held on June 28, 2022. Agency attendees included: Jeff Young of NMFS, Kathleen Wells of NMFS, and Anita Andazola of USACE. Topics discussed included the following:

- Concerns regarding underwater steel cutoff
- Consultation timing
- NMFS stated that from submittal to issuance of the Biological Opinion would likely be six months,

Draft Environmental Baseline and Effects Analysis sections were provided to NMFS and USACE on 1 July 2022. Comments were received from NMFS and have been incorporated into this BA.

1.3 Federal Action History

As stated above, Winchester Dam has been in existence since the late 1800s and has undergone many modifications and repairs. However, no previous formal or informal consultations have been conducted with NMFS or USFWS.

2.0 DESCRIPTION OF THE ACTION AND ACTION AREA

2.1 Legal Authority/Agency Discretion

The Project will require an individual permit under Section 404 of the Clean Water Act from the USACE. Due to potential impacts to Coho salmon, the USACE has requested formal consultation with NMFS. Therefore, the required USACE permit constitutes the federal nexus for the project

This BA addresses the proposed Project in compliance with Section 7(c) of the Endangered Species Act (ESA) of 1973, as amended. Section 7 of the ESA assures that, through consultation (or conferencing for proposed species) with NMFS and U.S. Fish and Wildlife Service (USFWS), – collectively known as the “Services” – federal actions do not jeopardize the continued existence of any threatened, endangered or proposed species, or result in the destruction or adverse modification of critical habitat.

Conservation measures are identified in this BA to avoid or minimize any adverse effects of the proposed project on listed species or their habitat. In this BA, “conservation measures” include avoidance and minimization measures, and best management practices (BMPs).

The Magnuson-Stevens Act (MSA), which was reauthorized and amended in 1996, requires NMFS to recommend conservation and enhancement measures for any federal or state activity that may adversely affect Essential Fish Habitat (EFH). A description of EFH potentially impacted by the Project is included in Section 6.

2.2 Project Purpose and Need

The purpose of the proposed Project is to repair the existing structure so that the dam continues to function in line with state dam safety requirements. No changes to the dam height, footprint, or operation are proposed. The dam is inspected annually by the Oregon Water Resources Department, and structural deficiencies have been noted. Namely, water is infiltrating the dam, leading to false attraction flows near the fish ladder; some existing timber elements are in poor condition and need repair; voids have developed in the dam embankment, leading to water infiltration; and water is migrating below the southern portion of the dam and south powerhouse. Without the proposed repairs, the dam could eventually fail, leading to significant negative upstream and downstream effects. Regular inspection and maintenance are also a requirement of Oregon Water Resources Department (OWRD). WWCD and DOWL have been coordinating with OWRD to plan inspections, prepare designs for necessary fixes, and to update the emergency action plan for the dam.

2.3 Project Location and Extent

The dam is located at Latitude 43.284233 N, Longitude 123.353963 W in the North Umpqua 5th Field Hydrologic Unit Code (HUC) 1710030111, and the Lower North Umpqua 6th Field HUC 171003011105 in Township 26W, Range 6S, Section 25, Lots 0200 and 0300.

The “Project site” includes all portions of the dam, riverbed and bank to be disturbed, along with upland staging areas. The Project Site is illustrated on Figure 2-1. Photos of the portions of the dam to be maintained, and the dam and reservoir during drawdown are included in Appendix 1.

2.4 Project Action Area

The “Action Area” is defined as “all areas affected directly or indirectly by the proposed action and not merely the immediate area involved in the action” (50 CFR § 402.02). “Direct Effects” are defined as the direct or immediate effects of the project on the species or its habitat. “Indirect effects” are defined as “those that are caused by the proposed action and are later in time, but still are reasonably certain to occur.” As such, the Action Area is frequently larger than the Project site.

The Action Area includes the bed, banks, and water column of the North Umpqua River in the location of in-water work, as well as areas affected by all other project actions. The Project activity with the greatest geographical reach is reservoir draw down. As such, the Action Area extends across the entire width of the North Umpqua River and extends 1.45 miles upstream to the first “S” bend which is the upstream extent of the backwater effects of the dam and 500 feet downstream, which is the likely maximum extent of turbidity-related effects. The Project Action Area is illustrated on Figure 2.2. Justification for determining the extent of the Action Area is provided in the “Effects” section of this BA (Section 5.0).

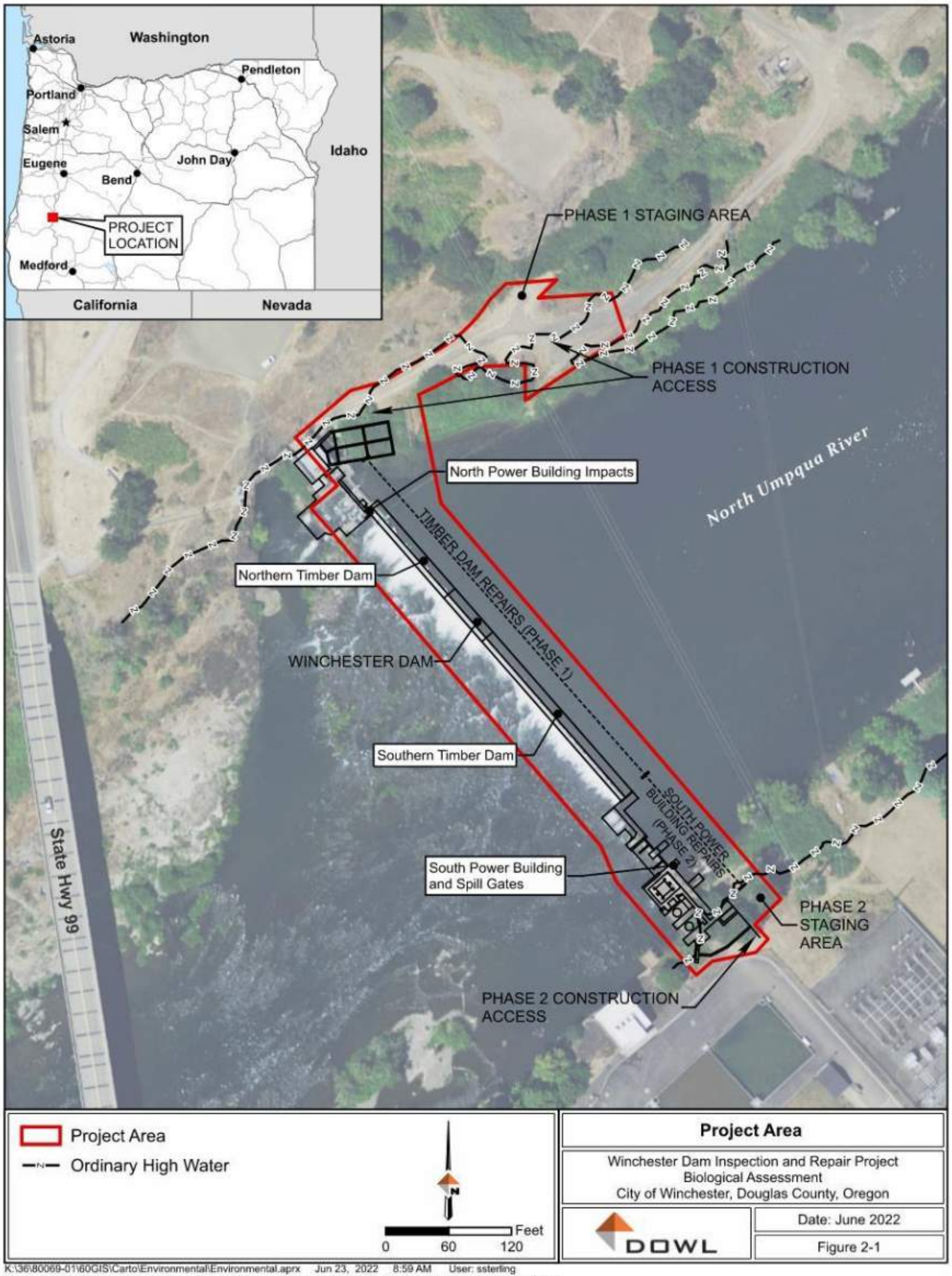

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Figure 2-1: Project Area Location.

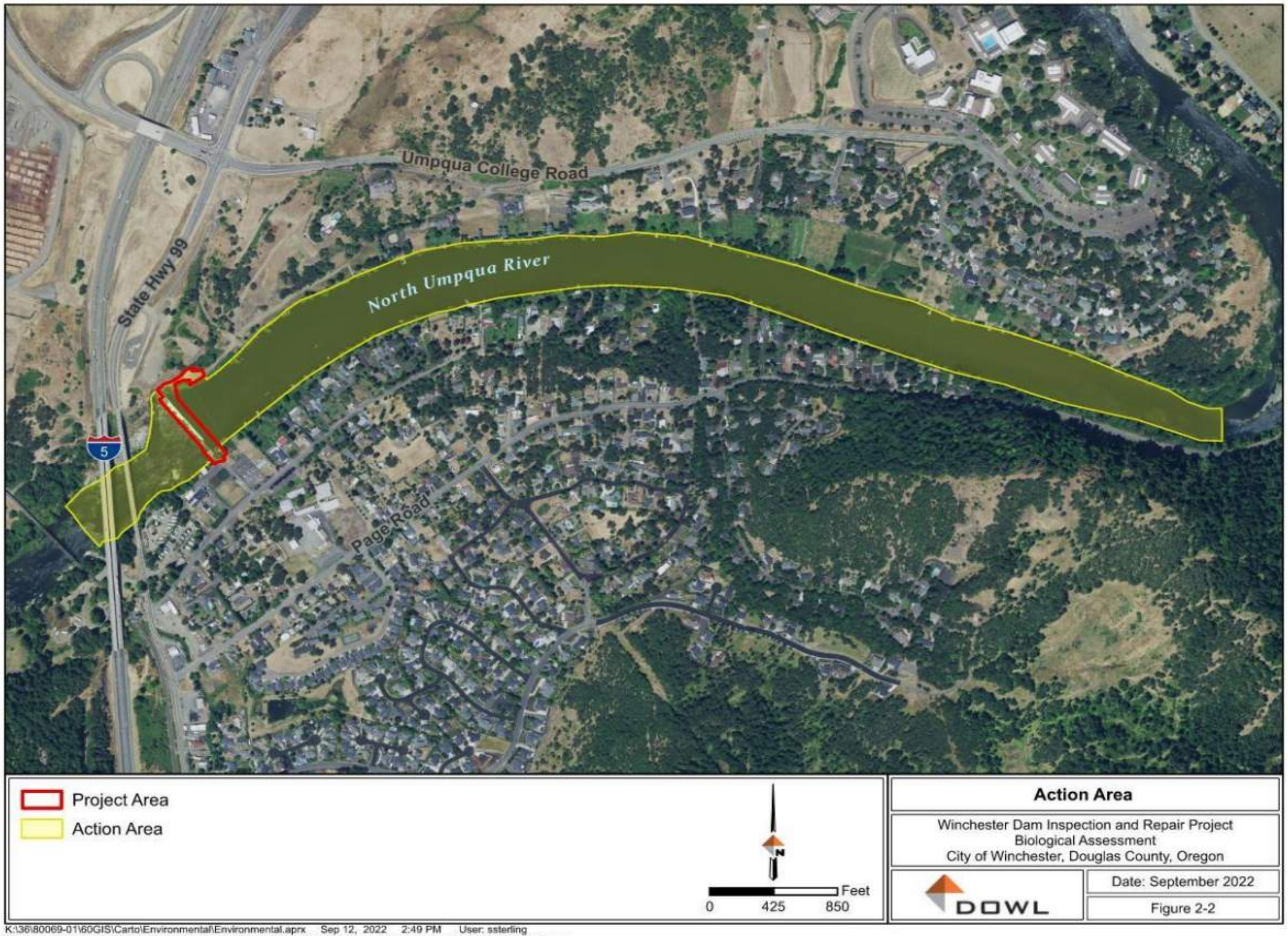

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Figure 2-2: Project Action Area

2.5 Project Description

2.5.1 Description of Project Activities

Construction-related Figures are included in Appendix 2. The proposed work can be broken down into four main components:

1. **Repair the dam face near the fish ladder to eliminate false attractant flows.** This involves removing an existing log boom and replacing a small section of the dam face with new concrete. This work will substantially reduce or eliminate unintended flows into the adjacent fish ladder which may be creating a false attractant for migrating fish. There will be no impact to the existing fish ladder. To complete this repair, and the repair of the dam below, Winchester Reservoir will be drained by opening the spillway gates. Once the lake is drained, this construction will take place in the dry. This is the first repair that will be performed during the IWWP.

2. **Repair timber faced portions of the dam**. There are areas of the timber dam that are deteriorating. This repair will take place on the downstream side of the dam while Winchester Reservoir has been drawn down. Prior to construction the work area will be isolated with a sandbag and supersack cofferdam. The cofferdam will isolate the repair location and a temporary work platform. Fish will be salvaged, and the water will be pumped to an upland settling basin. Repairs to the dam will then be accomplished by installing intermediate vertical steel supports and horizontal steel whalers that tie them together. The vertical steel components will be located on repaired concrete sills (on which the existing vertical timber components rest). Along with this repair, some of the existing timber elements may need to be repaired or replaced depending on conditions encountered during construction.

3. **Fill voids in the existing dam embankment using polyurethane foam**. There are several known areas where embankment material has been washed out of the dam creating voids behind the wall face. These areas need to be filled to stop additional erosion. Filling the voids with polyurethane foam has been selected as the least intrusive and most effective solution, given site constraints. Once injected, the proposed polyurethane composite quickly cures into a strong, dimensionally stable, and water-resistant geo-material.

4. **Arrest subsurface water migration below the southern portion of the dam and south powerhouse**. This repair will be conducted after the repairs above, once the spillway gates are closed, and water is again flowing through the fish ladder and over the crest of the dam. Construction will first involve the installation of a sheet pile cutoff wall/cofferdam. Sheet piles will be installed upstream of the spillway/gate section of the dam and south powerhouse. In order to achieve the correct alignment, the sheet pile wall will be driven through a template. The template will be supported with eight 14-inch H-piles. Only vibratory driving will be used to set the H-piles. The sheets will be advanced into the bedrock to cut off the flow of water. The sheet pile will be installed with a crane on a barge and will act as a coffer dam while the concrete is placed and cures. Sheet piles will be driven with a vibratory hammer and proofed to bedrock with an impact hammer. Once the coffer dam is sealed, the water will be pumped to an upland settling basin. Fish salvage will occur as the water within the coffer dam is pumped out in stages. The concrete surfacing will then be re-configured in the area, to bridge the gap between the dam face and the sheet pile cutoff wall. This will prevent river water from migrating through the stream bottom in the space between the

cutoff wall and the dam face. The sheet piles will then be cutoff even with the surface of the concrete. Care will be taken to cut the piles off so that they are smooth as possible.

Staging and construction access to the riverbed will be via previously disturbed areas on both banks of the river on the upstream side of the dam. There are existing gravel access roads on both sides of the dam leading to the riverbank. From the northern riverbank, access will be via existing fill material immediately upstream of the dam. Some minor temporary grading may be necessary to transition from the upstream gravel roads to the instream work areas and may include importing temporary work area surfacing material (e.g., aggregate). Work at the south Powerhouse will be via barge. The barge will be launched from the north bank of the river above the dam from an existing access/boat launch.

2.5.2 Construction Phasing and Schedule

Repairs to the dam will occur in two phases:

1. Phase 1 work will consist of work on the timber portion of the dam (components 1-3 described above) and includes lowering water levels above and below the dam to expose the upstream and downstream work areas. Phase 1 dam repairs will be performed during low water with the reservoir behind the dam lowered a minimum of four feet to expose the structure. The use of temporary cofferdams and water management systems will allow sufficient dewatering of the downstream face for repairs. After Phase 1 work is complete, water levels will be returned to pre-work levels. **During Phase 1 repairs, the fish ladder will be shut down for up to three weeks, as flow through the ladder stops once the water drops approximately four feet below the dam crest.**
2. Phase 2 work will include repairs near the south powerhouse/spillway gates. Water levels will not be lowered, rather, a permanent sheet pile cut-off wall will be used for temporary water management before the sheet piles are cut off.

It is anticipated that the structural repairs of the dam will occur during the Oregon Department of Fish and Wildlife's (ODFW) recommended in-water work period or preapproved extensions. For this location, the window is established on a case-by-case basis. A work window has been established through consultation with ODFW and will be from July 22 – September 15.

2.5.3 Temporary Impacts

Temporary impacts will occur over 15,470 SF of riverbanks and bottom. This will include no net removal or fill, as there will be 1,395 cubic yards (CY) of fill and the same amount of removal. Table 2-1 includes the project footprint and removal/fill volumes. Tables 2-2 and 2-3 include additional detail on fill and removal volumes, materials, locations and duration of impact.

Table 2-1: Project Component Footprints and Removal/Fill Volumes

Project Impacts			
Activity	Footprint (SF)	Removal (CY)	Fill (CY)
Temporary			
Water Management	4,440	987	987
Temporary Access Road and Work Platforms[1] (grading, vegetation removal, aggregate placement)	11,030	408	408
Totals	15,470	1,395	1,395
Permanent			
Dam Repair at Fish Ladder Interface	20	2	
	18		10
Timber Dam Repair	2,003		97
Void filling	150		22
Spillway/Gate	1,100	41	
	2,200	41	82
Concrete Apron	1,100	One-to-one replacement	
Totals	2,200 removal, 4,221 fill.	84	211

[1]these are maximum amounts, actual amounts may be less.

Table 2-2: Removal Dimensions, Materials, and Duration of Impact.

Removal Volumes and Dimensions

Location/Activity	Removal Dimensions					Duration of Impact	Material
	Length (FT)	Width (FT)	Depth (FT)	Area (SF)	Volume (CY)		
DS Isolation	370	12	6	4,440	987	3 Weeks	Sandbags
DS Aggregate Base	370	8	1	2,960	110	3 Weeks	Aggregate
North Access Road	115	12	1	1,380	51	3 Weeks	Aggregate
South Access Road	Varies	Varies	1	2,250	83	3 Weeks	Aggregate/Concrete/Native Material
Dam Work Platform	370	12	1	4,440	164	3 Weeks	Native Material
North Side Log Removal	10	2	2	20	1	Permanent	Wood
Concrete Removal - South Dam Fill Gates	Varies	Varies	1	1,100	41	Permanent	Concrete
Concrete Removal for In-kind Replaced - South Dam Fill Gates	Varies	Varies	1	1,100	41	Permanent	Concrete
Total Removal Below OHW				15,470 (temp) 2,220 (perm.)	1,395 (temp) 83 (perm.)		

Table 2-3: Fill dimensions, materials, and duration of impact.

Fill Volumes and Dimensions

Location/Activity	Fill Dimensions					Duration of Impact	Material
	Length (FT)	Width (FT)	Depth (FT)	Area (SF)	Volume (CY)		
Downstream isolation	370	12	6	4,440	987	3 Weeks	Sandbags
Downstream aggregate base	370	8	1	2,960	110	3 Weeks	Aggregate
North Access Road	115	12	1	1,380	51	3 Weeks	Aggregate
South Access Road	Varies	Varies	1	2,250	83	3 Weeks	Aggregate/Concrete/Native Material
Dam Work Platform	370	12	1	4,440	164	3 Weeks	Native Material
North Side Existing Wall	6	1.5	16	9	5	Permanent	Concrete
North Side New Wall	6	1.5	16	9	5	Permanent	Concrete
Dam Vertical Supports	850	0.75	0.75	638	18	Permanent	Steel
Dam Horizontal Supports	950	0.5	0.083	475	2	Permanent	Steel
Concrete Sill	370	2	2	740	55	Permanent	Concrete
Timber Dam Embankment	Varies	Varies	Varies	150	22	Permanent	Foam
In-kind Concrete Fill - South Dam Fill Gates	Varies	Varies	1	1,100	41	Permanent	Concrete/Granular sub-base/Sheet pile
New Concrete Fill - South Dam Fill Gates	Varies	Varies	1	1,100	41	Permanent	Concrete/Granular sub-base/Sheet pile
Total Fill Below OHW				15,470 (temp) 4,221 (perm.)	1,395 (temp) 189 (perm.)		

Temporary Access Road and Work Platform Construction

Temporary roads will be required to access the work areas from the north and south banks. Construction of the access road may involve improvements with the following impacts (all amounts below are included in the aggregate in Tables 2-2 and 2-3):

1. The temporary access road on the north bank will connect to the existing work platform on the upstream side of the dam. Vegetation removal, minor grading, and the installation of aggregate material to stabilize the road may be required (up to 1,380 SF footprint, 51 CY fill, 51 CY of removal.)

   a. Temporary access on the south bank for removal of existing concrete may involve minor grading or installation of aggregate material to stabilize the access road or require temporary impacts below OHW from equipment during concrete removal activities (up to 2,250 SF footprint, 83 CY fill and 83 CY removal). Work platforms used during the repair work on the timber dam section will result in the following impacts:

   b. The existing work platform on the upstream side of the dam may need to be stabilized with aggregate (up to 4,440 SF footprint, 164 CY fill, 164 YDS3 of removal.

   c. Below the dam between the temporary isolation barrier and the dam, a temporary aggregate work base will be installed resulting in 2,960 SF of impacts including 110 CY of fill and 110 CY of removal. All aggregate will be removed after construction activities are complete

Water Management

During Phase 1, water levels will be lowered to expose the upstream part of the dam, and temporary isolation will be required for construction activities below the dam. It is anticipated that isolation will consist of sandbags, super-sacks, and plastic sheeting; however, other materials may be used depending on the contractor’s temporary water management design. If required by site conditions, pumps equipped with a fish screen may be installed to pump water out of the isolation area to a temporary water quality facility placed in an upland area on the south bank. Fish salvage will occur within the isolated area as needed before repairs begin. Permanent removal (83 CY) will occur over a 2,220 SF footprint, and permanent fill (189 CY) will occur over a 4,221 SF footprint.

2.5.4 Permanent Impacts

Concrete Dam Repair at Fish Ladder Interface

Once the water levels have been lowered and temporary isolation has been installed for Phase 1 work, the contractor will remove an existing log flow-diverter, install a concrete slab against the existing dam face and construct a concrete wall perpendicular to the dam face to stop the flows coming through the dam.

Timber Dam Repair

Steel vertical and horizontal whalers will be installed to reinforce the existing dam (1,113 SF, 20 CY fill) with minor repair work done to expand the existing concrete sill where the vertical posts will be anchored (740 SF, 55 CY fill). The vertical posts will be anchored to the concrete sill as well as the existing dam and into the bedrock. Additionally, tie rods will be inserted through the vertical posts and anchored into bedrock. All repairs and replacement of dam components will be within the existing footprint of the structure.

Void Filling

Several voids/seepage paths along the dam will be filled with hydrophobic polyurethane foam below the wood cap or in the existing timbers behind the dam face. Foam repairs will include roughly 150 SF and 22 CY of foam placed under or within voids identified within the existing structure.

South Dam Repair

During Phase 1, when the water levels are lowered, a portion of the concrete paving above the south power building will be removed. The water level will then be brought back up for Phase 2 work. Work will occur from a 40- by 60-foot barge stationed next to the dam and secured with several spud piles. Sheet pile will then be installed parallel to the dam face to form a sheet pile cutoff wall approximately 120 feet long, approximately 18 feet upstream of the spill gates. The sheet pile will be installed with a vibratory hammer and seated with an impact hammer into bedrock. This sheet pile wall will provide isolation between the sheet pile and the spill gates during construction. Pumps, equipped with a fish screen, will be used to pump water out of the isolation area to a temporary water quality facility in an upland area on the south bank, to allow filtered water to flow back into the North Umpqua River. Fish salvage will occur within the isolated area before the area is fully dewatered or other work begins. After the isolated area is dewatered, the remaining concrete pavement between the sheet pile wall and the dam face will be removed and replaced with a concrete apron. Approximately 1,100 SF of concrete will be permanently removed outside of the sheet pile cutoff wall area during Phase 1 when water levels are low. Approximately 2,200 SF of concrete will be placed within the sheet pile wall. All concrete will be allowed to cure for seven days before contact with free-flowing river water.

Concrete Apron

During Phase 2, 1,100 SF of concrete will be replaced in-kind and 1,100 SF of new concrete apron will be installed. The permanent removal of the existing concrete will offset the permanent installation of new concrete, resulting in no net addition of concrete surfacing area below OHW downstream of the dam in the North Umpqua River.

2.6 Operational Characteristics of the Proposed Project

Following construction, the “operation” of the dam will not change. Therefore, there will be no operational impacts to ESA-listed species in excess of those that have existed since the dam and current fish ladder were installed.

2.7 Proposed Conservation Measures

Conservation measures are defined as “measures taken to help recover listed species” (USFWS and NMFS 1998). Herein, we use the term “conservation measures” to include avoidance and minimization measures, and BMPs.

Throughout the design process, consideration was given to avoiding and minimizing effects on ESA-listed species, as well as other fish and wildlife in the Action Area. In every instance, priority was given to the least “impactful” materials and methods. Table 2-4 includes avoidance and minimization techniques and BMPs that will be implemented to avoid and reduce impacts to ESA-listed species.

Table 2-4: Impact Avoidance and Mitigation Measures and BMPs to be Implemented during Project Construction.

Activity	Avoidance and Minimization Measures/Best Management Practices (BMPs)
Pre-Construction	Inform contractor of all permit conditions.
	Have emergency spill response materials on-site prior to construction
	Prepare a Spill Prevention, Control, and Countermeasures Plan
Upland Work (Temporary Access Road and Work Platform Construction)	Install erosion control devices, such as check dams, silt mats and other erosion and sediment control measures.
	Minimize clearing and grubbing activities when preparing staging, and construction, to the extent possible. There will be little or no new clearing associated with construction.
	Select heavy equipment that will have the least possible adverse effect to the environment, considering factors including, but not limited to, equipment that has the ability to conduct work from existing disturbed areas, exert the least soil compaction impact, and minimize the amount of vibration and noise that could disturb aquatic species.
	Establish staging areas for storage of equipment, project-derived material and supplies as far from the OHW line as practicable..
	Locate temporary construction/staging areas within already disturbed/developed areas.
	Restrict construction vehicles and equipment to roads and designated work areas.
	Conduct soil-disturbing activities during dry conditions to greatest extent practicable.
	To the extent feasible, work with heavy equipment from the top of the riverbank, unless work from another location would result in less habitat disturbance
	Obtain a wildlife salvage permit from ODFW for salvage/relocation of non-listed wildlife.
	Periodically monitor the perimeter of the construction zone for wildlife that have inadvertently moved inside exclusion fencing or silt fences. Relocate any identified wildlife to outside the work zone.
	Minimize construction noise to the extent possible by verifying all equipment is outfitted with appropriate sound-control devices (mufflers).
	Store trash in wildlife-proof garbage containers and remove trash daily from the project site
	Remove aggregate and reseed disturbed areas with certified weed-free native seed appropriate to the area.

Activity	Avoidance and Minimization Measures/Best Management Practices (BMPs)
	Confirm equipment is clean (e.g., power-washed) and that it does not have fluid leaks prior to contractor mobilization of heavy equipment to site. Inspect equipment and tanks for drips or leaks daily and make necessary repairs within 24 hours.
	Develop and implement a spill prevention/response plan. In the event of a spill, immediately contain the spill, eliminate the source, and deploy appropriate measures to clean/dispose of spilled materials in accordance with federal, state, and local regulations.
	Supply portable refueling storage tanks or station equipment containing fuel (i.e., generators or pumps) with portable containment equal to at least 100% of the fuel tanks they contain.
	Maintain emergency spill control materials, such as oil booms and spill response kits, on-site at each work area, ready for immediate deployment.
Water Management	Isolate in-water work zones prior to any work below Ordinary High Water (OHW). The work area will be isolated from the N. Umpqua River by supersack cofferdams and sheet pile.
	Dewater work area slowly to minimize turbidity and reduce stress to aquatic organisms.
	If pumps are needed for dewatering. Outfit the pump with an appropriately sized fish screen.
All In water Work	Adhere to seasonal timing restrictions for work below ordinary high water: The IWWP for the Action Area is July 22 through September 15. If in-water work cannot be completed within the IWWP, then a 1-week extension would be requested as soon as it is determined that an extension is required to complete the scope of work.
	Make the in-water work zone as small as possible to complete the project
	Obtain a joint ODFW/NMFS scientific collection permit for fish rescue/salvage
	Conduct fish salvage during dewatering and exclude fish from the in-water work zone using block nets or fish-tight turbidity curtains both upstream and downstream.
	Minimize incidental take due to capture of individual fish during work area isolation and salvage efforts by following NMFS's guidelines for safe fish capture and release, and NOAA Fisheries Guidelines for Electrofishing Waters Containing Salmonids Listed Under the Endangered Species Act (NMFS 2000)
	Do not discharge turbid water to streams. Establish an upland location for discharge of project-derived water (from dewatering, for instance), where water can infiltrate and not return to the stream.
	Comply with applicable Clean Water Act permits for work in wetlands or streams.

Activity	Avoidance and Minimization Measures/Best Management Practices (BMPs)
Dam Repair at Fish Ladder Interface,	All concrete will be placed in the dry and allowed to cure before contact with surface water.
	Concrete will cure for as long as possible, give construction schedule constraints. In this instance, fresh concrete will cure a minimum of seven days before contact with surface water. During the continuous wet cure, the Contractor shall keep all exposed concrete surfaces saturated with water. Formed concrete surfaces shall be kept in a continuous wet cure by leaving the forms in place for seven days. If forms are removed during the continuous wet cure period, the Contractor shall treat the concrete as an exposed concrete surface. Runoff water shall be collected and disposed of in accordance with all applicable regulations. In no case shall runoff water be allowed to enter any lakes, streams, or other surface waters.
	A dry work area will be maintained to prevent conveyance of runoff from curing concrete to the N Umpqua.
	Containment procedures for use in concrete pouring will be included in the SPCC plan.
Timber Dam Repair	Comply with all upland and in-water work BMPs as applicable
Spillway/Gate	Sheet piles (rather than H-piles) will be used to reduce underwater sound pressure.
	A vibratory hammer will be used to the extent possible to drive steel piles to minimize noise levels.
	The minimum size and weight hammer will be used in proofing the piles into bedrock.
Concrete Apron	Comply with all BMPs listed above for Dam Repair at Fish Ladder Interface.

2.8 Underlying Action / Broader Context / Interdependent and Interrelated Actions

“Interdependent actions” are defined as those actions having no independent utility on their own. “Interrelated actions” are part of a larger action. The proposed project is a “stand alone” action not tied to other current or planned actions. Therefore, there are no interdependent or interrelated actions identified.

2.9 Ongoing and Previous Projects in the Action Area

No ongoing or previous projects that underwent Agency consultation have been identified in the Action Area.

3.0 STATUS OF SPECIES AND CRITICAL HABITAT

3.1 Sensitive Species

Information pertaining to threatened, endangered, and candidate species that may occur within a two-mile radius of the proposed project site was obtained from the Oregon Biodiversity Information Center (ORBIC). ORBIC policy is that endangered species location information is confidential and not to be distributed. Therefore, it is not included in this report. The USFWS Information for Planning and Consultation (IPaC) system was also accessed to determine what endangered species may occur in the Action Area and the search results are included in Appendix 3. Database searches were also conducted using Streamnet (www.streamnet.org), the NMFS web site (https://www.fisheries.noaa.gov/species-directory/threatened-endangered), and EFH mapper (https://www.habitat.noaa.gov/apps/efhmapper/?page=page_4) for fish species occurrence, EFH presence, and critical habitat data. The species identified as potentially present in the Action Area are included in Table 3-1.

Table: 3-1. ESA-listed species potentially present in the Action Area

Species/Habitat	Status	Listing agency	Species/Habitats Potentially Affected by the Action
Mammals			
Columbian White-tailed Deer (Virginiana leucurus)	Delisted	USFWS	
Insects			
Franklin's Bumble Bee (Bombus franklini)	Endangered	USFWS	
Monarch Butterfly (Danaus plexippus)	Candidate	USFWS	
Fish			
Oregon Coast Coho salmon (Oncorhynchus kisutch)	Threatened	NMFS	X
Plants			
Kincaid's Lupine (Lupinus oreganus var. Kincaidii).	Threatened	USFWS	
Critical Habitat			
Oregon Coast Coho salmon (Oncorhynchus kisutch)	Established	NMFS	X
EFH			
Pacific Coast Salmon (Chinook and Coho)	Established	NMFS	X

3.1.1 Insects

Two Insect species were identified as potentially occurring in the Action Area on the USFWS IPaC database search, Franklin's bumble bee (endangered) and Monarch butterfly (candidate).

Franklin's Bumblebee

Franklin's bumble bee (*Bombus franklini*) was proposed for listing in 2019 (84 FR 40006 to 40019) and listed as endangered on September 23, 2021 (86 FR 47221 to 47238). The Action Area is located near the north end of the historic range of Franklin's bumble bee.

The following biological and range information comes from the ESA listing (86 FR 47221 to 47238). Franklin's bumble bee is a highly social (rather than solitary) bee and adults have flexible roles in their social order. They live in colonies made up of a queen and her male and worker offspring, and adult females can switch from worker to queen roles. Franklin's bumble bee typically nests underground in abandoned rodent burrows or other cavities that offer resting and sheltering places, food storage, nesting, and room for the colony to grow. The species may also occasionally nest on the ground or in rock piles and has been found nesting in a residential garage in the city limits of Medford, Oregon.

Historically, the species has always been rare and has one of the narrowest distributions of any *Bombus* species in the world. Even so, the abundance and distribution of Franklin's bumble bee has declined significantly, and no Franklin's bumble bees have been observed since 2006, despite intensive survey efforts in select portions of its historical range. Only twenty bees were found in 1999; nine individuals were observed in 2000; and one individual was observed in 2001. Although 20 Franklin's bumble bees were observed in 2002, only 3 were observed in 2003 (all at a single locality), and a single worker bee was observed in 2006. Despite continued intensive search efforts in these areas through 2019, there have been no confirmed observations of the Franklin's bumble bee since 2006.

The Project will disturb very little upland where Franklin's bumble bee would be likely to occur, and bumble bees that may be present are unlikely to be disturbed by in-water work. Given the nature of the Project and the rarity (and possible extinction) of Franklin's bumble bee, the Project will have ***no effect*** on Franklin's bumble bees, and they are not discussed further in this BA.

Monarch Butterfly

Monarch butterflies (*Danaus plexippus*) are a candidate species for listing under the ESA. Candidate species are those for which the USFWS has enough information to warrant proposing them for listing as endangered or threatened but have not yet been proposed for listing. Section 7 of the ESA requires agencies to consult on species listed as endangered, threatened, or proposed for listing. As a candidate species, the ESA does not require that the agencies consult on potential project effects to Monarch butterflies. However, in the spirit of completeness, we are including a brief description of the species, and the likelihood of its occurrence the Action Area.

Monarch butterflies are found throughout Oregon but require milkweed (*Asclepias spp*.) for reproduction. Three milkweed species are known to occur in Douglas County: Purple Milkweed (*Asclepias cordifolia*), the narrow-leaved milkweed (Asclepias fascicularis) and showy milkweed (*Asclepias speciosa*) (Xerces Society et al., 2012), all of which are found in dry to moist soil in meadows, fields, roadsides, open woods, and along waterways (Xerces Society et al., 2012). Further, the Project will disturb very little upland where Monarch butterflies are likely to occur (especially as larvae, which are more sensitive to disturbance), and any butterflies that may be present are unlikely to be disturbed by in-water work. The only potential project effects would be to any milkweed present at the time of construction. Prior to project construction, all areas to be disturbed will be surveyed for milkweed, and any milkweed found will be protected during construction. .

3.1.2 Mammals

One mammal species, Columbian white-tailed deer (*Odocoileus virginianus leucurus*) was identified on the IPaC database search. However, the Douglas County Distinct Population Segment (DPS) was delisted from the Federal List of Endangered and Threatened Wildlife on February 24, 2003 (68 FR 43647). Because it is no longer listed, and because there have been no recent observations within two miles of the Action Area (ORBIC 2022) the Project will have ***no effect*** on ESA-listed mammals.

3.1.3 Birds

The IPaC database search identified two federally listed bird species that are known to occur in the Project vicinity: marbled murrelet (*Brachyramphus marmoratus*), and northern spotted owl (*Strix occidentalis caurina*). The nearest critical habitat for marbled murrelet is located approximately six miles northwest of the Action Area, and the nearest critical habitat for Northern spotted owl is approximately nine miles northwest of the Action Area (https://fws.maps.arcgis.com/home/index.html).

Neither of these species were identified within two miles of the Action Area on the ORBIC database search (ORBIC, 2022) and no suitable habitat (mature and old-growth forest) is available in the vicinity of the project. Thus, the project is expected to have ***no effect*** on Northern spotted owl, and Marbled murrelet.

3.1.4 Plants

One Federally listed plant species, Kincaid's Lupine, (*Lupinus sulphureus* ssp. *Kincaidii*). was identified as potentially occurring the Action Area. Kincaid's lupine was listed as threatened on January 25, 2000 in the Federal Register (65 FR 3875), and critical habitat was designated on October 31, 2006 (71 FR 63862). At the time of its listing, Kincaid's lupine occupied 54 sites across 370 acres of remnant prairie habitat; 48 of these sites were located in the Willamette Valley. In 2010, there were 164 total sites with approximately 608 acres of occupied habitat. The 2019 5-Year Review noted that although there are indications that new populations have been discovered or established and some populations have increased in abundance since 2010, other populations have declined (USFWS 2020). Kincaid's lupine is strongly associated with upland native prairie. In the southern portion of its range (such as the Action Area), it occurs adjacent to serpentine rock outcrops beneath scattered oaks (65 FR 3875). The nearest Kincaids lupine critical habitat to the Action Area is located over 45 miles north, 10 miles southwest of Eugene, OR.

Due to a lack of suitable habitat, the distance to critical habitat, and no recent observations in the vicinity of the proposed project (ORBIC, 2022), Kincaid's lupine are not expected to occur within the Action Area and the Project will have ***no effect*** on ESA-listed plant species.

3.1.5 Fishes

Based on the information sources cited above, Oregon Coast Coho salmon (*Oncorhynchus kisutch*) is the only threatened or endangered fish species/ESU that is expected to utilize the Action Area (an ESU, or "evolutionarily significant unit" of Pacific salmon is considered a "species" as defined in Section 3 of the ESA of 1973, and ESU policy guidance [56 FR 58612]).

The project Action Area is also known to support the federal species of concern: Oregon Coast Cutthroat trout (*Oncorhynchus clarki clarki*), and Oregon Coast Steelhead (*O. mykiss*) as well as Pacific lamprey (*Lampetra tridentata*). It is anticipated that the steps taken to avoid and minimize impacts to listed species would also provide benefits to these species of concern.

3.2 Oregon Coast Coho (*Threatened*)

3.2.1 History of Regulatory Action

The history of Oregon Coast Coho salmon (OC Coho) listing is long and contentious. In 1995, NMFS completed a comprehensive status review of West Coast Coho salmon (Weitkamp et al., 1995) that resulted in proposed listing determinations for three Coho ESUs, including the OC Coho ESU as a threatened species (60 FR 38011; July 25, 1995). A six-month extension of the determination was announced on October 31, 1996 due to substantial disagreement on the sufficiency and accuracy of available data. Following this extension, the proposal to list the OC Coho ESU was withdrawn on May 6, 1997 because the Oregon Coastal Salmon Restoration Initiative (later renamed the Oregon Plan for Salmon and Watersheds, or the “Oregon Plan”) was established, and a Memorandum of Agreement regarding salmon conservation was implemented between the state of Oregon and NMFS. What followed was several years of investigation, disagreement, and litigation.

After multiple petitions, interim listing decisions and court battles, NMFS listed the OC Coho salmon ESU as threatened on February 11, 2008 (73 FR 7816) (Table 3-2).

Table 3-2: Listing Status for OC Coho

Species	Listing Classification and Date	Recovery Plan	Most recent status review	Status summary
OC Coho	Threatened 6/20/11; reaffirmed 4/14/14	NMFS 2016a	NWFSC 2015	This ESU comprises 56 populations including 21 independent and 35 dependent populations. The last status review indicated a moderate risk of extinction. Significant improvements in hatchery and harvest practices have been made for this ESU. Most recently, spatial structure conditions have improved in terms of spawner and juvenile distribution in watersheds; none of the geographic area or strata within the ESU appear to have considerably lower abundance or productivity. The ability of the ESU to survive another prolonged period of poor marine survival remains in question.

3.2.2 Species Description

The ESU includes all naturally spawned populations of Coho salmon in Oregon coastal streams south of the Columbia River and north of Cape Blanco, including the Cow Creek Coho hatchery program (ODFW stock # 37). NMFS concluded in listing the Oregon Coast Coho that this ESU is “likely to become an endangered species in the foreseeable future throughout all or a significant portion of its range.” Coho salmon in the Action Area were classified in the North Umpqua historical population by the Oregon Coast Coho Technical Recovery Team (Lawson et al. 2007) and in the Upper Umpqua population by ODFW (ODFW, 2005)

3.2.3 Critical Habitat

Critical habitat for this ESU was designated in February 2008 in Federal Register (73 FR 7816) and includes the North Umpqua River in the project area encompassing all waterways, substrate, and adjacent riparian zones within the Action Area, up to the bankfull elevation (Table 3-3).

Table 3-3: Critical Habitat Designation

Species	Designation date and citation	Recovery Plan	Critical Habitat Status Summary
OC Coho	2/11/08 73 FR 7816	NMFS 2016a	Critical habitat encompasses 13 subbasins in Oregon. The long-term decline in Oregon Coast Coho salmon productivity reflects deteriorating conditions in freshwater habitat as well as extensive loss of access to habitats in estuaries and tidal freshwater. Many of the habitat changes resulting from land use practices over the last 150 years that contributed to the ESA-listing of Oregon Coast Coho salmon continue to hinder recovery of the populations; changes in the watersheds due to land use practices have weakened natural watershed processes and functions, including loss of connectivity to historical floodplains, wetlands and side channels; reduced riparian area functions (stream temperature regulation, wood recruitment, sediment and nutrient retention); and altered flow and sediment regimes (NMFS 2016). Several historical and ongoing land uses have reduced stream capacity and complexity in Oregon coastal streams and lakes through disturbance, road building, splash damming, stream cleaning, and other activities. Beaver removal, combined with loss of large wood in streams, has also led to degraded stream habitat conditions for Coho salmon (Stout et al. 2012).

3.2.4 Use of the Action Area and Biological Requirements

In general, adult Coho salmon migrate into fresh water in the fall to spawn, often waiting for freshets before entering rivers. Therefore, a delay in fall rains delays river entry and, potentially, spawn timing. Delays in river entry of over a month are not unusual (Weitkamp, 1995). However, this general rule of thumb may not hold true for OC Coho in the Umpqua River. LovellFord et al. (2020) found that Coho migration was more strongly correlated with water temperature than discharge, stating, “main-stem migration of Coho Salmon as they pass Winchester Dam began 7 to 15 [days] after peak annual water temperature, when mean daily temperatures cooled to 18°C, but before the increases in discharge that are associated with autumn rains. Although migration timing appeared to be strongly related to river temperature, spawn timing of Coho Salmon in tributaries of the Smith River subbasin appeared to respond to a combination of both discharge and temperature thresholds. Spawning occurred after initial annual peak discharge events and when stream temperatures fell below a threshold of 12°C.” Spawning of wild Coho salmon usually occurs from mid-November through February. Spawning Coho salmon are typically 3 years old but are often accompanied by 2-year-old jacks (precocious males).

Adult Coho salmon enter the mouth of the Umpqua River from September through December. Most spawning occurs in small to medium-size tributaries in areas with low to moderate gradient. For OC Coho, random spawning ground surveys are conducted in most areas throughout its range, except for the North Umpqua River above Winchester Dam and above the Alsea Hatchery weir. Winchester Dam counts and results of surveys below the dam are used to document the number of adult Coho salmon spawners in the North Umpqua population.

Spawning occurs from October through January in the North Umpqua River (Table 3-4). Juvenile Coho emerge from the gravel in early spring, with emergence complete by the end of May. Juveniles rear year-round in the N. Umpqua and begin to out-migrate in March, with peak outmigration in April and May.

Adult Coho salmon are likely to be present in the N. Umpqua from September through January, and juveniles are likely present year-round, with yearlings being least common in February and March (ODFW, 2020a) (Table 3-4). Therefore, rearing juveniles and early returning adults (depending on weather conditions) may be present in the Action Area during the IWWP (Table 3-4).

Some Coho have passed Winchester Dam by September 15 in every year since 2005. Between 2004 and 2014/15, up to two Coho passed the dam between August 16 and August 31, and between 0 and 72 Coho have passed by September 15. These fish represented between 0.03% and 0.70% of the total Coho run. In 2015/16, reporting methods changed to lumping counts for the entire period between July 19 or 20 and September 15, 26 or 27. During that period between 0.0% and 10.5% of the Coho run passed the dam from late July to late September. The 10.5% was an outlier in 2019. All other years had a maximum of 6.8% passage by September 27 (ODFW, 2022). These percentages include zero to 289 individual fish. Based on this information, there could be a few adult Coho present in the Action Area in late September. The fish ladder will be dewatered for three weeks early in the IWWP but will again be operational by August 15 at the latest.

Table 3-4: Approximate Timing of OC Coho Salmon in the Action Area (North Umpqua River Below Slide Creek Dam, ODFW, 2020).

ESU: Lifestage	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Oregon Coast Coho								**IWWP**				
Adult Migration									▤ ■	■	■ ▤	▤
Adult Holding	▤									▤ ■	■	■
Spawning	▤									▤ ■	■	■
Egg Incubation	■	■	▤							■	■	■
Juvenile Rearing	■	▤	▤	■	■	■	■	■	■	■	■	■
Juvenile Migration			▤	■	■	▤						

■ **Represents peak level of use.**

▤ **Represents lesser level of use.**

3.2.5 Factors of Decline

In the Federal Register notice listing the OC Coho, NMFS states, "in our 1998 threatened listing determination for the Oregon Coast Coho ESU (63 FR 42588; August 10, 1998), we concluded that the decline of Oregon Coast Coho populations is the result of several longstanding, humaninduced factors (e.g., habitat degradation, water diversions, harvest, and artificial propagation) that exacerbate the adverse effects of natural environmental variability (e.g., floods, drought, and poor ocean conditions)." These factors are both historical and on-going.

Historical Pressures

The historical pressures on Pacific salmon in general and OC Coho in particular, include overharvest, habitat modification, introduced predators, and intra-specific competition from hatchery stocks. Habitat modification (logging, water diversions, draining of coastal wetlands, agricultural production, urbanization, etc.) has resulted in direct loss of habitat, passage impediments, reduction of stream complexity (channelization, removal of large woody debris, etc.), increased sediment loads, reduced water quality and quantity, loss of riparian vegetation, and loss/degradation of lowland, estuarine, and wetland Coho rearing habitats.

Overharvest of OC Coho populations was a problem through the 1980s, as Coho salmon harvest was not prohibited until 1994. Harvest rates of OC Coho populations ranged between 60 and 90 percent of the entire population between the 1960s and 1980s (Good et al., 2005 in 73 FR 7816).

Past species introductions have resulted in non-native predator populations, and historic stocking efforts may have resulted in a reduction in genetic diversity and a corresponding reduction in fitness.

Current Pressures

Today, Oregon Coast Coho salmon are primarily affected by threats that reduce the quantity and quality of Coho salmon rearing habitat. Reviews by NMFS' biological review teams in 2011 and 2015 found that the long-term decline in Oregon Coast Coho salmon productivity reflected deteriorating conditions in freshwater habitat, and that the remaining habitat may not be adequate to sustain the species productivity during cycles of poor ocean conditions (NMFS 2016).

Limiting Factors

The Oregon Coast Coho Technical Recovery Team identified primary and secondary limiting factors for the N. Umpqua population as water quality (excess fine sediment and high summer water temperatures), and stream complexity respectively (ODFW, 2019). Additionally, poor ocean conditions may be limiting in some years to all species of West Coast Salmonids (ibid).

NMFS (2016) identified the following factors as limiting for the ESU as a whole:

- Reduced amount and complexity of habitat;
- Degraded water quality;
- Blocked/impaired fish passage; and
- Potentially inadequate voluntary and regulatory mechanisms to ensure success.

NMFS (2016) identified the following as Priority Actions to be undertaken for species recovery in the North Umpqua watershed:

1. Instream Flows
    a. Organize an interagency stream flow assessment team to evaluate and identify:

        i. Refugia areas that have adequate stream flow, water temperature, and riparian protections to support Coho salmon.
        ii. Existing stream flow needs.
        iii. A strategy to address flow restoration, which will protect existing refugia, expand refugia to adjacent reaches, and provide a connection to a larger network of refugia areas.
    b. Assess the potential success of a pilot program and implement the water conservation and instream flow program in the South or Middle Umpqua populations first. Develop a pilot flow restoration effort to implement the protection and restoration strategy and test the program feasibility in the South or Middle Umpqua populations.

2. State and Private Timber Lands
    a. Increase protection of riparian forests with no-touch buffer widths with voluntary programs or increased regulatory mechanisms.
    b. Eliminate the construction of permanent new roads, unless constructed to relocate another permanent road which has greater impacts on Oregon Coast Coho salmon habitat.
    c. Decommission roads where practicable.
    d. Increase placement of large wood into stream channels.
3. Rural (including residential and agricultural) Lands
    a. Plant, restore, and protect riparian areas adjacent to stream channels using voluntary actions with regulatory backstops in place.
    b. Improve lateral connectivity from the stream channels to adjacent wetlands.
    c. Conserve water usage to allow more instream water.
4. Federal Lands
    a. Maintain a strong aquatic conservation strategy of some form within future management plans that protects ecological processes that form high quality Coho salmon habitat.
    b. Improve the transportation network that includes reducing the road network, minimizing the hydrologic connection of the roads to streams, reducing road related fish passage barriers, and minimizing any new road development, especially in riparian zones.

3.2.6 Viability

The NMFS Biological Review Team (BRT) have, over the last few decades, used a risk matrix as a method to organize and summarize the professional judgment of a panel of knowledgeable scientists on the risk of extinction of species and populations. In this risk matrix approach, the collective condition of individual populations is summarized at the ESU level according to four demographic risk parameters: abundance, growth rate/productivity, spatial structure and connectivity, and diversity.

"Spatial structure" refers both to the spatial distributions of individuals in the population and the processes that generate that distribution. A population's spatial structure depends on habitat quality and spatial configuration, and the dynamics and dispersal characteristics of individuals in the population.

"Diversity" refers to the distribution of traits within and among populations. These range in scale from DNA sequence variation in single genes to complex life history traits (McElhany et al. 2007).

"Abundance" generally refers to the number of naturally-produced adults (i.e., the progeny of naturally-spawning parents) in the natural environment (e.g., on spawning grounds).

"Productivity," as applied to viability factors, refers to the entire life cycle (i.e., the number of naturally-spawning adults produced per parent). When progeny replace or exceed the number of parents, a population is stable or increasing. When progeny fail to replace the number of parents, the population is declining.

Considerations for species viability include having multiple populations that are viable, ensuring that populations with unique life histories and phenotypes are viable, and that some viable populations are both widespread to avoid concurrent extinctions from mass catastrophes and spatially close to allow functioning as metapopulations (McElhany, 2007).

The following is their most recent assessment of the N. Umpqua population (Ford, 2022): "Taken as a whole, the Oregon Coast Coho salmon ESU continues to be at "moderate-to-low" risk of extinction, but the N. Umpqua population is likely doing somewhat worse than the entire ESU."

Abundance and Productivity

The total abundance of spawners within the Oregon Coast ESU generally increased between 1999 and 2014, before dropping in 2015 and remaining low. The 2014 OC Coho salmon return (355,600 natural and hatchery spawners) was the highest since at least the 1950s (2011 was the second highest, with 352,200), while the 2015 return (56,000 fish) was the lowest since the late 1990s (Ford, 2022). Within the North Umpqua population, the percent change between the two most recent five-year periods was negative 57%. The overall population persistence scores for individual populations in the ESU from the most recent run were positive (i.e., with varying certainty, the population was persistent) for all but three populations (Necanicum, Salmon, and Sixes). This is an improvement over previous years, when four populations had negative scores (Necanicum, Salmon, Sixes, and North Umpqua).

BRT Scores for population productivity increased in 11 of 21 populations of OC Coho between calculations in 2012 and 2015. Between 2015 and 2020, scores increased in seven populations, stayed constant in two, and the rest declined. The average productivity score across all populations increased from 0.69 in 2012 to 0.71 in 2015, and then declined to 0.58 in 2020 (the numerical scores are unitless and based on several metrics). The productivity score for the N. Umpqua population was below average at -0.96 in 2012, -0.50 in 2015, and 0.38 in 2020. While below average for the ESU as a whole, productivity did show an increasing trend from 2012 to 2020.

Spatial Structure and Diversity

Spatial structure is the geographic distribution of individuals in a population or populations. Diversity (i.e., variability in traits) associated with anadromous Pacific salmon is considered at three levels: ecological, genetic, and phenotypic (i.e., life history diversity). Several types of evidence are used to infer the spatial structure and diversity of Coho salmon in Oregon Coast ESU. Taken together, they all indicate that spatial structure and diversity in 2020 were similar to previous assessments, or improved in some cases (Ford, 2022). The spatial structure of Coho salmon populations within the ESU can also be inferred from population-specific spawner abundances and productivity. There is no geographic area or stratum within the ESU that appears to have considerably lower abundances or to be less productive than other areas or strata. Spatial Structure and Diversity scores for artificial influence assesses the proportion of naturally produced fish over two generations or six years. The scores for this factor have increased with each year's data in response to reduced hatchery production in the ESU. Average scores have increased from 0.55 in 2012, to 0.87 in 2015, to 0.88 in 2020. However, in the 2020 assessment, the North and South Umpqua populations failed to have either high or complete certainty that hatchery influence does not adversely affect natural populations (indicated by scores >0.70). Hatchery production in North Umpqua was terminated in the late 1990s, and scores have increased from –0.96 in 2012 to 0.34 in the 2020 run (Ford, 2022).

3.2.7 Local Empirical Information

As stated previously, OC Coho in the project Action Area belong to the North Umpqua population. Table 3-5 provides the total native spawners for the most recently available ten years (2011 to 2020) for the North Umpqua population (Sounheim et al., 2021). The average return of native spawners over that 10-year period was 3,063.

Table 3-5: Recent North Umpqua OC Coho spawner abundance

Population	Year									
North Umpqua	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Native spawners	6,020	3,134	2,774	3,979	3,012	1,148	1,772	2,481	3,302	3,003

Figure 3-1 illustrates the wild and hatchery spawner populations for the North Umpqua population, and for the ESU as a whole. Note that the data is displayed with different Y axes. Figure 3-2 illustrates the yearly and 10-year running average for wild adult Coho passage at Winchester Dam (excluding jacks).

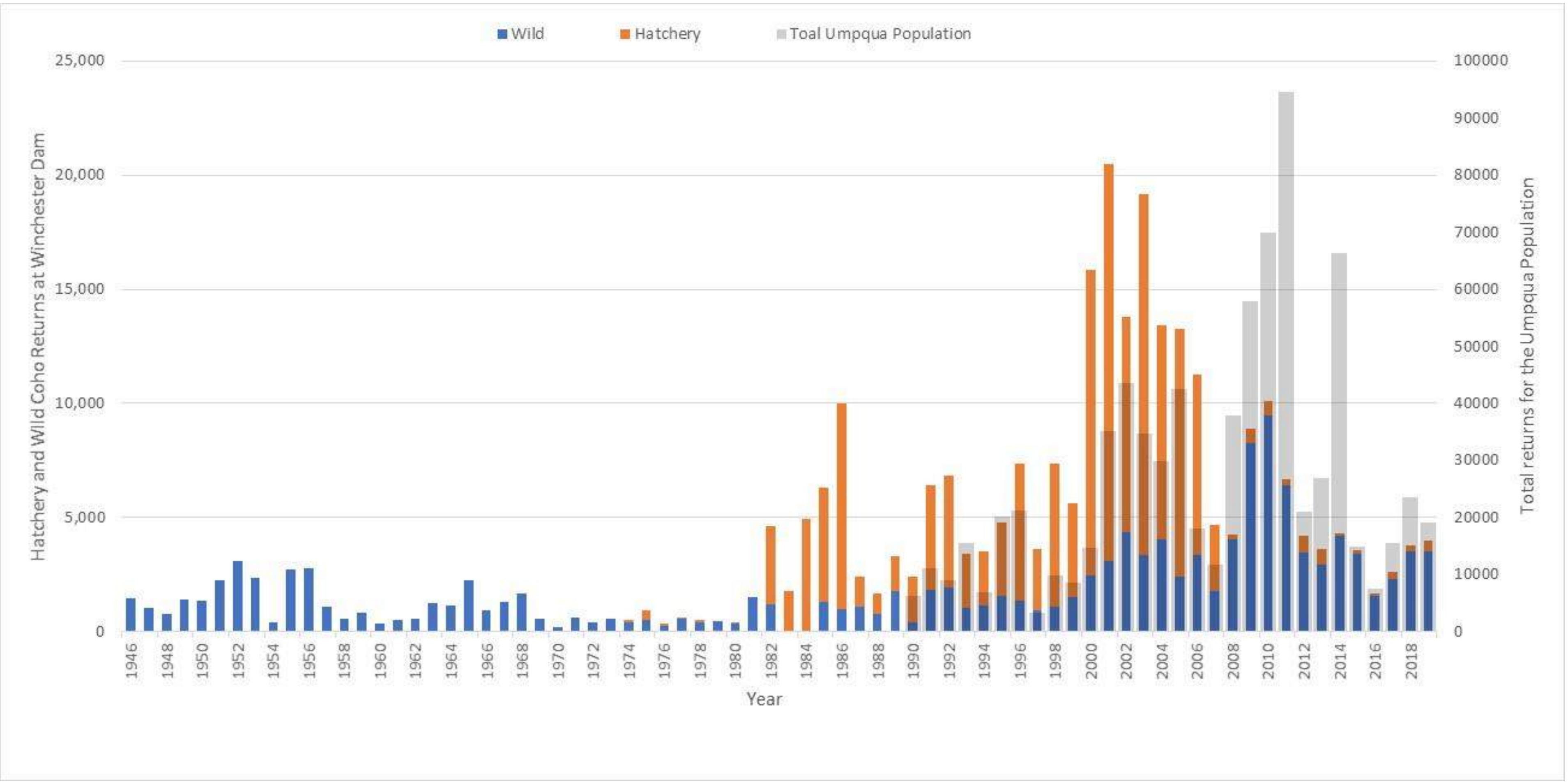


Figure 3-1: Coho passage at Winchester Dam compared to the entire Umpqua Basin population

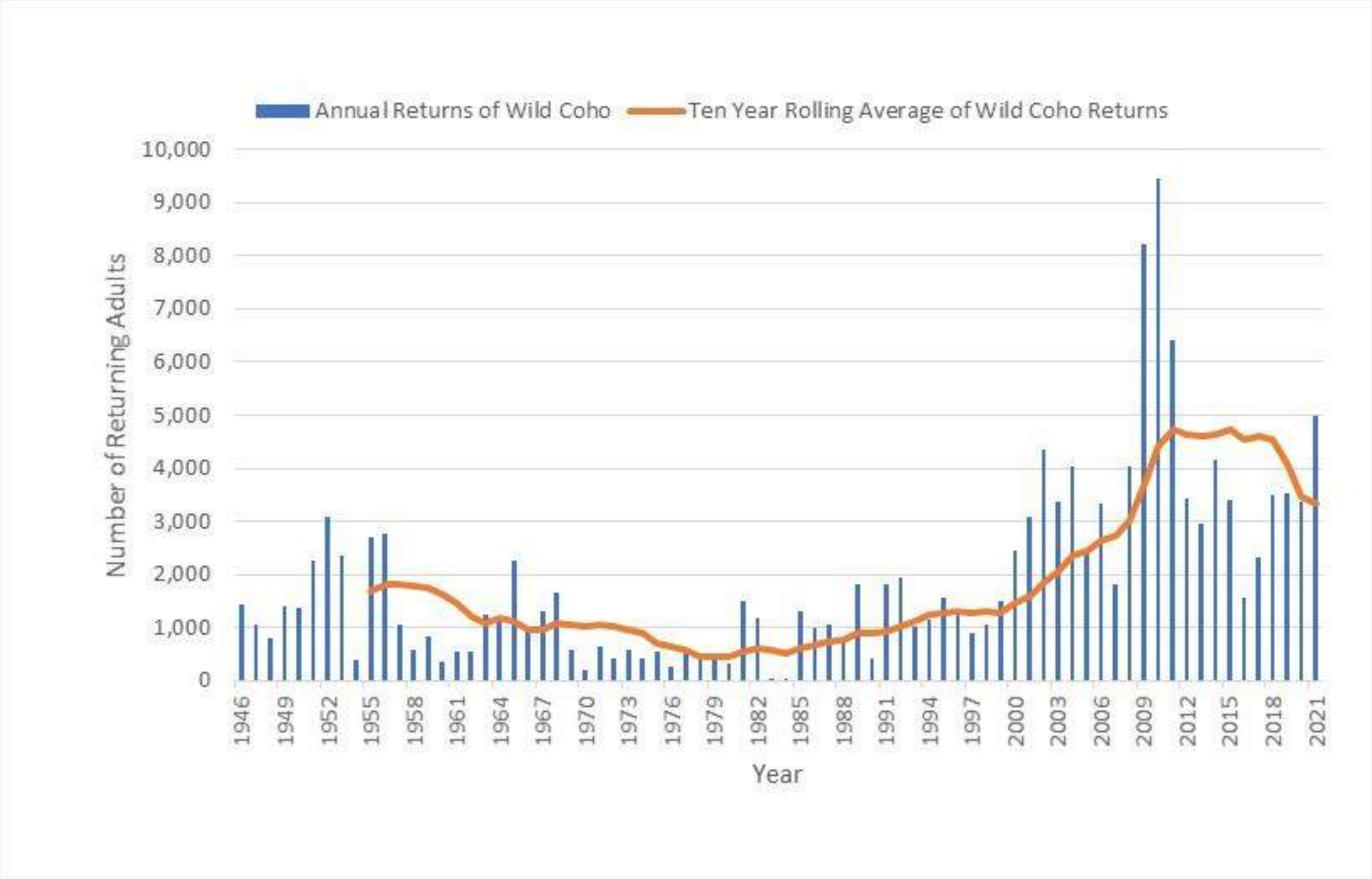


Figure 3-2: Wild Coho passage at Winchester Dam, 1946 to 2021

Juvenile Coho spend approximately one year in their natal streams, rearing in pools and slower water habitats around instream structure. Table 3-6 illustrates the total juvenile abundance, density (fish/ m^2), and percent of the habitat surveyed that qualified as “fully seeded” in the entire Umpqua “stratum.” “Fully seeded” is the percent of sites with a fish density (determined by snorkel surveys) of >0.7 Coho salmon/m^2. This value is regarded as full seeding following Nickelson et al. (1992), where full seeding was estimated to be 1.0 fish/m^2 based on electrofishing removal estimates, and Rodgers et al. (1992), where snorkelers observed 70% of the Coho Salmon that were present (based on subsequent electrofishing removal). Stated another way, snorkelers likely miss 30% of the juvenile Coho present. Therefore, a snorkel result of 0.7 Coho salmon/m^2 represents an actual density of 1.0 Coho salmon/m^2.

The numbers in Table 3-6 are based on snorkel survey results in 1st through 3rd order streams in the Umpqua Basin. (Constable and Suring, 2022).

Table 3-6: Recent juvenile OC Coho abundance in the ODFW Umpqua Stratum

Year	Estimated Total Abundance	Density (fish/m^2)	Percent Total Seeded
2011	1,115,480	0.477	15
2012	716,040	0.349	10
2013	666,602	0.498	15
2014	617,845	0.295	12
2015	959,413	0.401	12
2016	751,757	0.174	7
2017	556,851	0.164	5
2018	713,140	0.226	8
2019	682,272	0.128	6
2020	619,890	0.237	8
2021	476,275	0.203	4

DOWL did not identify any information on juvenile Coho density in Winchester Reservoir. Data on one fish salvage project in the vicinity of the Action Area was identified on the NMFS/ODFW permit website (https://apps.nmfs.noaa.gov/index.cfm, accessed 05/10/2022). This salvage was conducted the third week of August, 2006 by The Umpqua Basin Water Association (Permit OR2006-3468) approximately five river miles downstream of the Project site. Salvage was conducted inside a coffer dam during a water intake upgrade. The size of the salvaged area was not provided. No Coho were collected. Fish collected included two lamprey, 27 dace, one *O. mykiss*, and three sculpin.

3.2.8 Population Trend

The trend in abundance and habitat seeding of juvenile OC Coho is generally decreasing over the last ten years, although there is year-to-year variation (Table 3-6). The rolling ten-year average of wild adult returns shows a peak from 2011 to 2018, with some declines since then. Abundance for the N. Umpqua population, peaked in the early 2000s, but that peak abundance was driven by hatchery releases, with over half (and in some cases well over half), of returning adults being of hatchery origin until 2008. Between 1990 and 2008, the percentage of hatchery-origin fish returning over Winchester Dam ranged from 62% to 86% (ODFW, 2022). Since 2008 the percentage of hatchery-origin fish returning over Winchester Dam has ranged from 3% to

18%. No hatchery OC Coho smolts have been released in the North Umpqua since 2006 (ODFW, 2019)

3.2.9 Critical Habitat

Geographic Extent of Critical Habitat

Critical habitat for OC Coho includes all occupied habitats at the time of listing. Lateral extent of the critical habitat extends to the bankfull elevation or ordinary high water (OHW) mark. The specific unit of OC Coho critical habitat that will be affected by the project is the 5th field HUC Lower North Umpqua River Watershed 1710030112: the mainstem North Umpqua River (43.2682, -123.4448) upstream to an endpoint in the North Umpqua River at the confluence with Rock Creek (43.3322, -123.0025). Coho distribution extends farther up into the watershed, but this particular unit of Critical Habitat, as defined, ends at that point. Note that there is a discrepancy between the HUC number for the Lower North Umpqua in the Critical Habitat Designation and the HUC number used for that watershed by the EPA and OregonExplorer. We have used the EPA HUC number (1710030111) elsewhere throughout this report.

Oregon Explorer (https://oregonexplorer.info/) indicates the Action Area provides spawning, rearing and migration habitat for OC Coho. The rearing and migration habitat extends downstream from the dam to the confluence of the North and South Forks. Spawning and rearing habitat extends upstream from the dam to the limits of Coho distribution high in the watershed.

The Action Area also provides spawning habitat for Fall and Spring Chinook (unlisted Oregon Coast ESU), rearing habitat for summer and winter Steelhead (unlisted Oregon Coast DPS), and habitat with unknown use for Coastal Cutthroat Trout. Spring Chinook in the Oregon Coast ESU were petitioned for, but denied, a listing as a separate ESU in 2021 (Ford et al., 2022). Umpqua River coastal cutthroat trout were listed as threatened in 1996. However, in 2000, NMFS determined that the Umpqua River cutthroat trout population was not a distinct ESU, but rather is part of the larger Oregon Coast cutthroat ESU, which was previously determined to be neither endangered nor threatened. Therefore, NMFS determined that the Umpqua River cutthroat trout should be removed from listing.

Essential Physical and Biological Features

The critical habitat designation for OC Coho uses the term “Primary Constituent Element” (PCE) or “essential features.” The 2016 critical habitat regulations (81 FR 7413) replaced this term with “Physical or Biological Features” (PBFs). The shift in terminology does not change the approach used in conducting a “destruction or adverse modification” analysis. In this BA, we use the term PBF to mean PCE or essential feature, except when quoting and older document.

PBFs are defined as the physical and biological features essential to the conservation of the listed species. The entire suite of PBFs for OC Coho include freshwater spawning and rearing locations, migration corridors, and estuarine, nearshore marine and offshore marine areas. Freshwater spawning and rearing sites and freshwater migration corridors are the PBFs present in the Action Area for OC Coho and are shown in Table 3-7. The potential effects on the critical habitat PBFs are discussed in Section 5.0. Estuarine and marine habitats do not occur within the project Action Area and would not be affected by the proposed project. Thus, no further information on these PBFs is included.

Table 3-7: Types of habitats and essential physical and biological features for salmonid critical habitat within the project Action Area.

Habitat	Essential Physical and Biological Features	Species Life Stage
Freshwater spawning	Water quantity	Spawning, incubation and larval development
	Water quality	
	Substrate	
Freshwater rearing	Water quantity and floodplain connectivity	Juvenile growth and mobility
	Water quality and forage	Juvenile development
	Natural cover	Juvenile mobility and survival
Freshwater migration	Free of artificial obstructions, water quality and quantity, and natural cover	Juvenile and adult mobility and survival

4.0 ENVIRONMENTAL BASELINE

4.1 Description of the Environmental Baseline

The Action Area as described in Section 2.0 is located in the North Umpqua 5th Field HUC 1710030111, and the Lower North Umpqua 6th Field HUC 171003011105. The Environmental Baseline in the Action Area is influenced by all areas upstream.

The Environmental Baseline includes the effects of past and ongoing human and natural factors leading to the current status of the species, its habitat (including designated critical habitat), and ecosystem, within the Action Area. The environmental baseline is a “snapshot” of a species’ health at a specified point in time. The following description of the Environmental Baseline focuses on habitat in the Lower North Umpqua watershed. The condition of the listed species is discussed in Section 3.2.

The National Marine Fisheries Service (NMFS) and the United States Fish and Wildlife Service (USFWS) (1998) use the Matrix of Pathways and Indicators (MPI) to summarize important environmental parameters and define the Environmental Baseline. The matrix is divided into six pathways and 18 indicators and is shown in Table 4-1.

The pathways are further subdivided into indicators of two types: 1) metrics that can be empirically measured (e.g., “six pools per mile”); and 2) descriptions (e.g., “adequate habitat refugia do not exist”). Based on the metrics and descriptions, the indicators are then described as being: “properly functioning,” “at risk,” or “not properly functioning.”

This Biological Assessment (BA) focuses on those aspects of the Environmental Baseline that the proposed Project may affect. Table 4-1 includes the Pathways and Indicators that may be affected by the proposed project in **bold**.

Table 4-1: Pathways and Indicators of the Environmental Baseline

PATHWAY	INDICATOR
Water Quality	**Temperature**
	Sediment/Turbidity
	Chemical Contamination/Nutrients
Habitat Access	**Physical Barriers**
Habitat Elements:	**Substrate**
	Large Woody Material
	Pool Frequency
	Pool Quality
	Off-channel Habitat
	Refugia
Channel Condition & Dynamics:	Width/Depth Ratio
	Streambank Condition
	Floodplain Connectivity
Flows/Hydrology	**Change in Peak/ Base Flows**
	Increase in Drainage Network
Watershed Conditions:	Road Density & Location
	Disturbance History
	Riparian Reserves

4.2 General Watershed Condition

The North Umpqua subbasin is comprised of 879,000 acres, mostly in Douglas County. Ninety-one percent of the subbasin is forestland, and three-fourths of that is public land (Natural Resource Conservation Service [NRCS], 2006). The Lower North Umpqua comprises 106,395 of those acres and is the most urbanized watershed in the North Umpqua Basin, with 29% of the watershed being non-forested, and an additional 7% being urban (NLCD, 2019). The watershed contains 35.1 miles of the North Umpqua River (Geyer, 2003). The Lower North Umpqua is located in the Umpqua Interior Foothills, an ecoregion with narrow interior valleys, broad floodplains, and terraces with gentle to moderate slopes. Elevations are from 500 to 1,000 feet. Precipitation in the ecoregion ranges from 30 to 50 inches.

The Umpqua Valley was first explored by fur traders in 1826, and European settlement increased following the California Goldrush. Most importantly, from a watershed perspective, logging of the watershed began in 1850, and greatly expanded in the early 1900s. Splash dams and log drives were still used in Douglas County into the 1940s (Markers, 2000, quoted in Geyer 2003). Waterways used to transport logs were often scoured down to bedrock, widened, and channelized. Debris jams and other Large Woody Material (LWM) was removed. More than 150 miles of logging roads were constructed in Douglas County between 1905 and 1947, and log drives were phased out as more roads were built. Landslides and erosion associated with logging roads added sediment to the waterways, silting in spawning gravels and filling pools. Riparian logging increased solar radiation to valley bottoms, elevating water temperatures.

Peak timber production was during the 1950s and 1960s, when annual timber harvest from National Forest Lands in Douglas County ranged from 149.6 to 637.6 million board feet. Log production from public lands decreased substantially after 1988 when management emphasis shifted from timber production to habitat protection. For comparison, log production in 1988 was 397 million board feet, but annual average harvest diminished to 6.7 million board feet during 2001 to 2003 (Wallick et al., 2010). The net effect of logging and log drives was greatly simplified fish habitat, with fewer pools, less instream cover, more uniform substrate, and higher water temperatures.

Intensive commercial fishing began in 1870, when a cannery ship first anchored at the mouth of the Umpqua (Geyer, 2003). Fish were harvested at the start of their upstream migration by deploying seines across the lower Umpqua River. Intensive commercial fishing for Coho continued in waters off the Oregon Coast through the 1980s. A fish hatchery was built on the North Umpqua River in 1900. In its first year of operations 200,000 salmon eggs were harvested, and another 600,000 chinook salmon eggs were brought in from a federal hatchery on the Little White Salmon River, a tributary of the Columbia in Washington (Geyer, 2003). These out-of-basin introductions ultimately influenced the genetic makeup of future generations, and out-of-basin transfers continued into and out of the watershed for decades. The hatchery produced 700,000 fry its first year, which were released in the Umpqua river system. Numerous hatcheries have been operated in the basin since that time. The Rock Creek Hatchery operated at the confluence of the Rock Creek and the North Umpqua River from 1925 until it was destroyed by the Archie Creek Fire in 2020. Throughout its history, it produced fall and spring Chinook, Coho, summer and winter steelhead, and rainbow trout. Prior to its destruction, high water temperatures were a chronic problem at the facility dating back to at least 1992 (Loomis and Anglin, 1992). Extreme temperatures led to fish kills and disease at the hatchery twice in 2015 alone (House, 2015).

More than 185 river miles inland on the North Umpqua River, a series of dams known collectively as PacifiCorp's North Umpqua Hydroelectric Project (NUHP) were built in the 1950s. The NUHP occupies about 3,460 acres on the Umpqua National Forest and consists of eight dams, eight powerhouses, several reservoirs, and about 43 miles of waterways. Most of the NUHP is located upstream from the 130-foot-high Toketee Falls, which is the historic barrier to anadromous fish migration on the North Umpqua River at approximately RM 75. However, the 77-foot-high Soda Springs Dam at RM 70, downstream of Toketee Falls, is the second highest dam in the project and blocked all passage from 1952 until new fish passage facilities became operational in 2014. These dams affect baseflows, sediment delivery, LWM supply, water quality and water temperature.

4.3 Water Quality

The North Umpqua River is 303d listed for fish and aquatic life and private, public domestic water supply impaired use, flow modification, temperature year-round, spawning temperature and turbidity.

4.3.1 Temperature

The North Umpqua River in the late 1940s and 1950s was still clear and cold (Johnson et al., 1994) By the late 1960s, the Oregon State Game Commission (Lauman et al. 1972, reported in Johnson et al., 1994) found that water temperatures over 21°C were common in the summer. Maximum water temperatures (not 7-day averages) from the Umpqua River Basin were reported as 27°C on the Umpqua River near Elkton, 34.4°C on the South Umpqua River near Winston, 26°C at RM 1.8 on the North Umpqua River, and 25.7°C on Steamboat Creek near its confluence with the North Umpqua River. (Johnson et al., 1994)

Johnson et al., (1994) reviewed multiple analyses of water temperature in the North Umpqua from 1946 to 1993. Water temperatures showed a clear increasing trend from 1946 to 1968, with less (or no detectable) increase from 1969 to 1993. The sustained increases in river temperatures coincided with a collapse of cutthroat trout numbers crossing Winchester Dam. Prior to 1954, the highest maximum July temperature was 21.7°C; but by July 1958, the maximum temperature was 25°C. The authors speculated that temperature increases earlier in the period of record were due to clear-cut logging up until the 1950s. As riparian vegetation recovered, water temperatures moderated somewhat.

Water Temperature in the Umpqua Basin was addressed in the 2008 temperature Total Maximum Daily Load (TMDL). Modelling of the North Umpqua showed that the seven-day average maximum water temperature exceeded the natural thermal potential by one to three degrees from Steamboat Creek (river mile [RM] 53) to the mouth. The “Natural Thermal Potential” is the temperature attainable given the potential riparian vegetation, stream geomorphology, stream flows and other conditions that would exist in a more “natural” state. The report concluded that The NUHP (described in Section 1.2 above) impacts stream temperatures and therefore the current condition is warmer than the natural thermal potential all the way to the mouth of the river.

Temperature data has been recorded intermittently at Winchester Dam since 1971; unfortunately, water temperatures were not collected between October 1991 and August 2016. Figure 4-2 illustrates the 7-day average maximum temperature for three years: the hottest year since 2016, the coolest year since 2016, and 2022 to date.

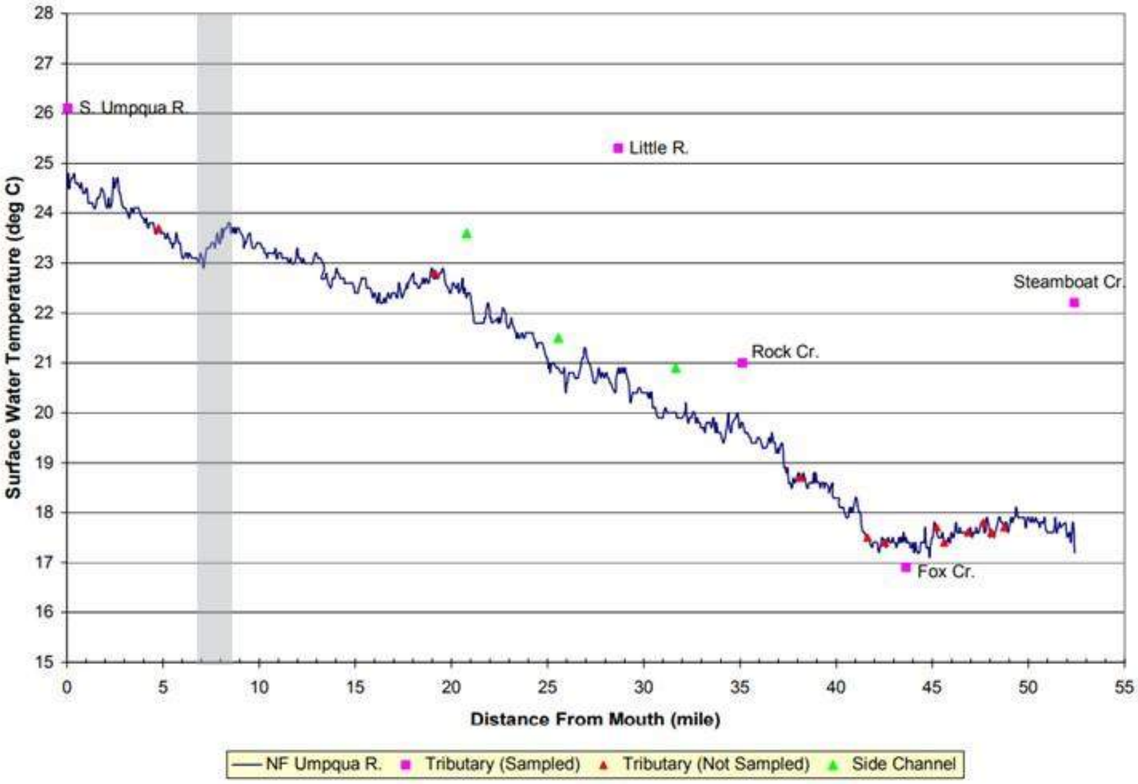
Note: In water work window is indicated by blue vertical lines.

Figure 4-1: 7-day average maximum water temperatures at Winchester Dam for the coldest and warmest years on record, and for 2022 to date.

The state of Oregon water quality standard for salmon and steelhead spawning is a seven-day-average maximum water temperature of 13°C; the maximum temperature is 16°C for salmon and trout rearing and migration, and 20°C in areas used for migration alone. During the coolest year since 2016, (2017) water temperatures exceeded 20°C on all but six days between June 25 and September 2 (Figure 4-2). The highest 7-day average maximum temperature was 24.13°C in 2017 and 27.39°C in 2021.

The upper lethal limit for the salmonid species that occur in the North Umpqua River ranges from 22.8°C for Cutthroat trout to 26.2°C for Chinook salmon (Bjornn and Reiser 1991, Bell 1986). However, McCullough (1999) found that adult chinook salmon and steelhead died at temperatures of 21-22°C in the Columbia River, and upstream migration ceased at temperatures over 20°C. NMFS and USFWS (1998) characterized properly functioning temperature conditions for adult Pacific salmon as between 10-13.9° C and rated temperatures from 13.9 to 15.5° C as “at risk.” McCullough (1999) noted that egg size and development was substantially altered when adults were exposed to temperatures over 17.5° C. The lethal temperature limit for salmonids as a whole is generally considered to be 24°C. Given this assumption, water temperatures at Winchester Dam have exceeded lethal limits every year since at least 2016.

Winchester Dam and its associated reservoir presumably contribute to the water temperature Environmental Baseline. In general, reservoirs increase water temperatures by slowing the water and exposing more surface area to solar radiation. The temperature TMDL does not identify Winchester Reservoir as a contributor to elevated water temperatures in the N. Umpqua River. In fact, water temperatures collected, and infrared aerial surveys done by the Oregon Department of Environmental Quality (ODEQ) indicate that, Winchester Reservoir has a cooling effect on the River. Figure 4-3 illustrates the results of these surveys (Watershed Sciences, 2003). The gray bar indicates the location of Winchester Reservoir from approximately RM 7 to RM 8.5. A distinct cooling trend is evident from upstream to downstream in the Winchester Reservoir reach.



Note: The gray bar indicates the location and extent of Winchester Reservoir (from Watershed Sciences LLC, 2003).

Figure 4-2: Surface water temperatures in the N. Umpqua River.

This is counter to the usual reservoir effect. The reason for the observed temperature reductions could be a result of cool groundwater discharge to Winchester Reservoir or may simply be an artifact of the collection methods or timing (for instance, if the downstream thermal imagery was collected earlier in the day than the upstream thermal imagery, the earlier data could be cooler). DOWL contacted ODEQ regarding the observed temperature decline from upstream to downstream in Winchester Reservoir. According to Natural Resources Specialist, Heather Tugaw (personal communication, 06/15/2022):

> *A more robust reservoir modeling exercise is needed to understand why temperature is observed to decrease… I inquired with a few coworkers who are familiar with the location and they had a few ideas as to why, but again, a more involved assessment should be completed.*
>
> *Possible explanations that would require more study:*
>
> - *Warm(ed) water from upstream the river is flowing into the reservoir but is mixing with cooler water already in storage. The reservoir has a huge heat capacity/thermal mass in contrast to the incoming river*
> - *There may be groundwater exchange along/within the reservoir length. If so, it's likely to be significantly greater than segments above and below the reservoir that are scoured to bedrock.*
> - *Upstream & downstream: The North Umpqua is wide and shallow with bedrock in reaches above and below the dam which significantly increases solar thermal gain. Lots of solar exposure and bedrock.*
> - *The USGS station 14319500 shows that Q [river discharge] in June-July 2002 was well below median Q. This indicates that river water entering the reservoir is receiving lots of direct sunlight, and that after flowing over the dam water would warm rapidly downstream of the dam.*
> - *TIR [Thermal InfraRed] was flown July 25-26, 2002. Warmer water would be on the surface (because it is less dense than cooler water), and therefore detected by TIR.*

DOWL also obtained water temperature data that is periodically collected by the Partnership of the Umpqua Rivers. Water temperature data is collected every month or two at Echo Drive (located at approximate RM 16.26, 11.26 river miles upstream of Winchester Dam) and Whistler's Bend (located at approximate RM 22.23 or 5.97 river miles upstream of Echo Drive and 15.2 river miles upstream of Winchester Dam). Those water temperatures were compared to water temperatures collected at the Winchester Dam gage by the USGS. Collection times differed by less than 10 minutes between Winchester Dam and either Echo Drive or Whistler's Bend. Figure 4-3 illustrates the results of this comparison.

Figure 4-3: Comparative Water temperatures collected concurrently at Winchester Dam, Echo Drive and Whistler's Bend.

During the hottest parts of the year, temperatures are generally hotter as you move downstream (although this doesn't appear to be the case in 2020, note that no temperatures were recorded in July to September). The average temperature increase per mile between Winchester Dam and Whistler's Bend was 0.037°C; and 0.043°C between Echo Drive and Whistler's Bend. This indicates that Winchester Reservoir does not increase water temperatures beyond what is seen in a free-flowing section of river upstream. Looking at only the hottest days sampled each year, the temperature increased an average of 0.093°C per mile between Winchester Dam and Echo Drive, and 0.084°C per mile between Echo Drive and Whistler's Bend. This indicates that Winchester Reservoir may have a very minor effect on water temperature during the hottest parts of the year, but that conclusion is tentative at best.

4.3.2 Sediment and Turbidity

Turbidity data is not collected at the Winchester Dam gage. The North Umpqua River is listed as impaired for turbidity on the ODEQ 303d list. This listing is due to data indicating that the level of turbidity was greater than 5 Nephelometric Turbidity Units (NTUs) for greater than 45 days for ten years. Other streams in the watershed also listed for turbidity include three segments of the South Umpqua; Canon Creek/Little River in the North Umpqua watershed; and Wind Creek in the Umpqua subbasin. Previous assessments by the United States Forest Service (USFS) and ODEQ have shown that sediment and turbidity are negatively affecting fish and aquatic life in portions of the Umpqua Basin. Benthic macroinvertebrates assemblages at 57 percent of sample sites in the Umpqua Basin were dominated by taxa with high tolerance for fine sediments (ODEQ, 2014). Sediment delivered to the stream channel above background conditions is attributed mainly to mid-1900s land management practices related to forest harvest in upland and riparian areas and roads used to gain access to these areas (ibid).

In 2001 TMDLs were established for the Little River (whose confluence is at RM 26 of the North Umpqua). The TMDLs covered temperature, pH and sedimentation on two stream reaches in Cavitt Creek and Little River. The TMDLs cited excessive amounts of fine sediment being delivered to streams from increased slope failure rates on lands associated with past timber harvests (ODEQ 2006). Since development of the Little River TMDLs, additional data was provided to ODEQ by the Umpqua National Forest that analyzed stream spawning gravel conditions using sediment core samples from riffle crest sites. The mean percent fine values <0.85 mm in size for five Little River sampling stations was 13.7 percent (below the 14 percent threshold) and 17.9 percent for the two locations sampled in Cavitt Creek (2006). This led to uncertainty in the sedimentation conditions, and further TMDLs for sedimentation were put on hold.

4.3.3 Chemical Contaminants and Nutrients

According to Stillwater Sciences (1998), although the North Umpqua River was historically nitrogen-limited, it is undergoing progressive eutrophication. Observed eutrophication is a result of:

1. increased nitrogen loading from recreational use and timber harvest;
2. trapping of organic material in reservoirs and subsequent decomposition and release of nutrients downstream; and
3. discharge of nutrient-rich hypolimnetic water from the reservoirs and its subsequent routing to project waterways rather than stream channels.

Two streams and/or their associated reservoirs in the North Umpqua watershed are 303d listed for Chemical Contaminants or Nutrients. Cooper Creek Reservoir is listed for iron and mercury. Sutherlin Creek and its Platt Reservoir are listed for Arsenic, Biodiversity, Copper, and Iron. However, there are no 303d listing for chemical contaminants or nutrients in the North Umpqua River itself.

4.4 Physical Migratory Barriers

Until 2014 when new fish passage facilities became fully operational, Soda Springs Dam blocked all fish migration upstream in the North Umpqua River at RM 70, but there are no passage barriers in the Umpqua River mainstem or the North Umpqua River, between Winchester Dam and the Pacific Ocean. There were originally no fish passage facilities at Winchester Dam, but between its construction in the 1890s and 1907, fish could reportedly pass upstream during high flows (LovellFord et al., 2020). In 1907, the dam was raised from its original height of four feet to a height of 16 feet (ibid). The dam then represented a complete barrier to fish migration (except perhaps at the very highest discharges) until construction of the initial ladder 1923. The current fish ladder was upgraded in 1984 with the construction of a second entrance (see below)). Unspecified upgrades were also made to the fish ladder in 1992 (Loomis and Anglin, 1992) and a lamprey ramp was added to the fish ladder in 2013 (https://www.dfw.state.or.us/news/2013/june/060613b.asp). Although minor upgrades and maintenance have been conducted on the fish ladder, the fundamental operation of the fish ladder has not changed since 1984, and therefore, the Environmental Baseline for physical migratory barriers has remained essentially unchanged since that time.

According to ODFW District Fish Biologist Greg Huchko, in his professional opinion, fish are delayed at the ladder, but that delay has not been quantified by any studies of which he is aware (Greg Huchko personal communication with DOWL 06/04/2022). According to Mr. Huchko, the fish ladder is actively manipulated by ODFW staff, but there is no formal protocol for ladder management. ODFW staff install and remove flashboards to optimize passage, attempting to maintain a “happy medium” where attraction flows are adequate during low water periods and velocities are navigable to adult salmon during high discharges. Most fish move through the fish ladder via submerged holes, and there are “not too many” jumps in the ladder. ODFW staff attempt to keep jump heights below eight inches through water management. Mr. Huchko also stated that Coho salmon with apparently fresh “gashes” on their sides have been observed at the counting facility. Mr. Huchko speculated that these gashes were due to exposed rebar in the fish ladder.

Other authors have previously reported additional anecdotal information regarding the fish ladder. Johnson et al., (1994) stated that according to Dave Loomis, ODFW District fish Biologist at that time, “present fish passage facilities [at Winchester Dam] are reported to be satisfactory at all flow levels.” Likewise, LovellFord et al., (2020) reported that, “assessments that are made by ODFW, who manage the fish-ladder operations, indicate that velocity and temperature do not restrict fish movement through the fish ladder. A large pool is located directly below the ladder, and water flow through the ladder is consistently maintained (ODFW, personal communication).” Long-time fisheries technician Fabian Carr stated in a video produced by the University of Oregon for their “Science and Memory” project, that, all dams regardless of size impede fish passage “not very much.” He further stated that he has seen fish move through the entire ladder in 40 seconds (https://scienceandmemory.uoregon.edu/no-dam-reason.html accessed 06/08/2022).

4.4.1 Previous Investigations

DOWL identified one study from 1984 and 1985 that did attempt to describe the efficacy of the fish ladder (ODFW 1985) more systematically, and to investigate other aspects of a hydro project that began operations at the dam in 1983. The 1983 hydro project was a partnership between WWCD and Elektra, and included a new powerhouse, tailrace and fish screen/bypass system. The ODFW study was undertaken to assess the effects of power generation on both adult and juvenile salmon. It was a requirement of agreements between ODFW, the Federal Energy Regulatory Commission (FERC), NMFS and the Winchester Water Control District (WWCD) (Blum and Kloos,1986). Two reports were produced on the results of this study. Unfortunately, ODFW could not locate the first-year study report in either their files, or the State of Oregon Library (Jacob Chambers. Personal communication with DOWL, June 1, 2022).

Initially spurred by federal and state subsidies that encouraged the development of renewable resources, the WWCD entered into an agreement with power generation company Elektra in 1982. Under the agreement, Elektra would finance the design, construction, and operation of a new powerhouse on the north abutment of the old dam and would keep ninety percent of the power revenues for a twenty-year period. The WWCD was to use its ten percent share of project revenues to construct a new concrete dam by December 31, 1984. The project was controversial from the beginning and precipitated extensive legal battles between FERC, ODFW, NMFS, and the Steamboaters fly fishing group. These battles continued during project planning, construction, and start-up (Blum and Kloos, 1986).

Construction of the powerhouse and associated facilities began in June 1983, and power production commenced later that year. In addition to the powerhouse, a fish screen, diversion facility, and bypass were constructed upstream, and a tailrace was blasted through bedrock downstream of the powerhouse. The tailrace joined the N. Umpqua near the entrance to the fish ladder (Figure 4-4) creating significant artificial attraction when the powerhouse was operational. The bypass deposited juvenile fish downstream via a 12-foot freefall into the “turbine boil” of the tailrace (Blum and Kloos 1986, ODFW 1985).

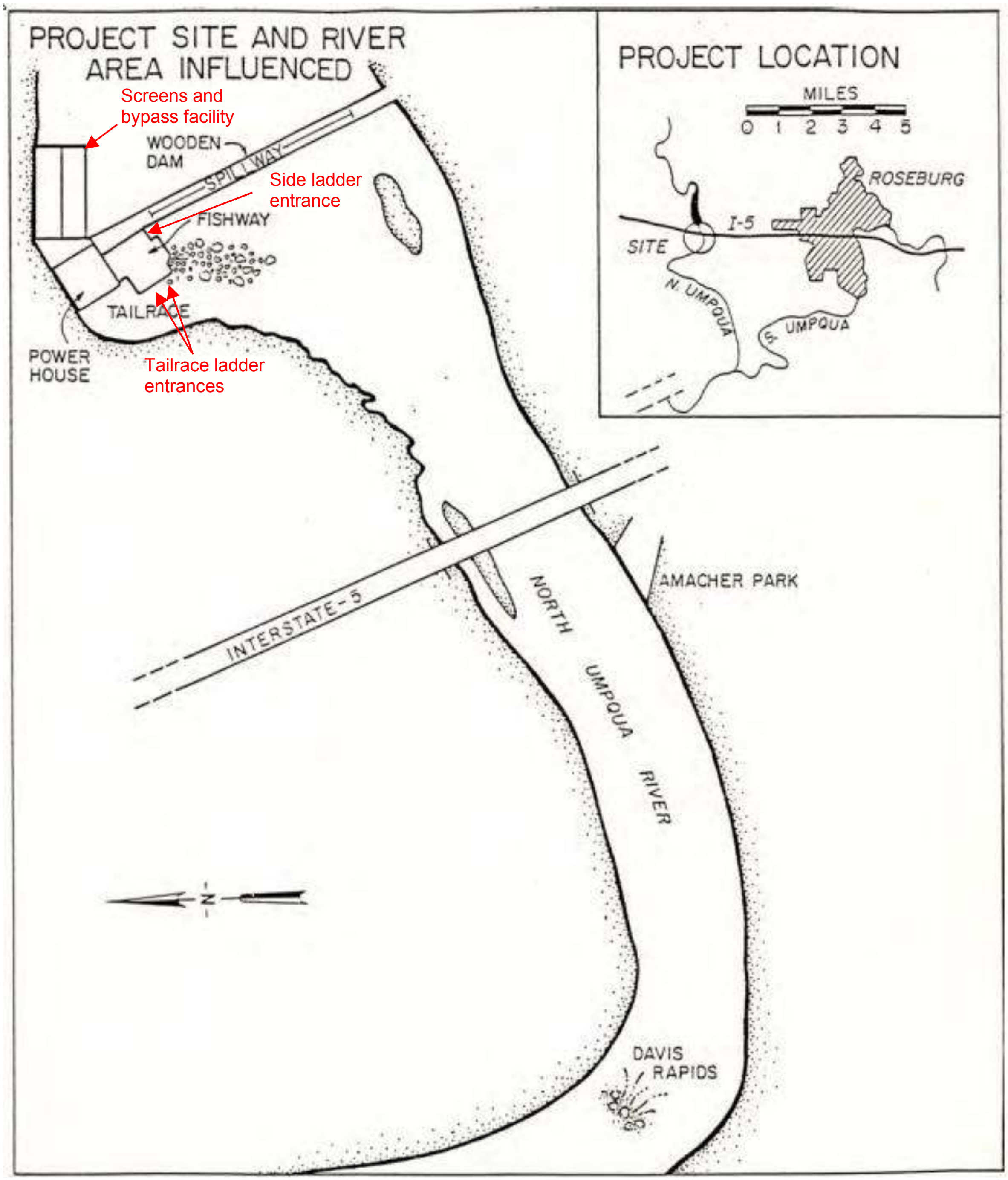


Figure 4-4: Dam facilities as they were in 1984/1985 (from Williams 1985).

In 1984, it was determined that adult salmon were being killed when they attempted to ascend the tailrace into the powerhouse outlet (a.k.a. the “draft tubes”) and encountered the turbines. This was remedied by installing adult exclusion grates, but operator error caused additional fish kills until the grates were bolted in place (ODFW, 1985).

The 1985 ODFW study had multiple objectives including investigation of adult harm at project facilities (which led to the 1984 fish kills); juvenile salmonid impingement on the screens; injury of downstream migrants passing though the turbines; and the proportion of downstream migrants bypassing or passing through the project.

Because there has been no power generation since 1985, the consequences of operating the power project have no bearing on the current Environmental Baseline. However, the final three objectives of the study are of continuing interest. These objectives were:

1. Describe the Interaction of Aquatic Predators and Salmonids Immediately Downstream of the Project
2. Determine the Relative Efficiencies of the Fish Ladder Entrances
3. Determine if Upstream Migrants are Unduly Delayed by the Project

Predation Immediately Downstream of the Project

During the 1985 ODFW study, predation of juvenile salmonids was studied through direct observation (snorkel surveys) and stomach contents analysis of Umpqua pikeminnow, which were known to congregate in the tailrace. The study found that Umpqua pikeminnow congregated in the tailrace after 1 July and remained there in large numbers until early fall. Their presence in the tailrace coincided with the annual low flow period and began just after pikeminnow spawning. No predation on juvenile salmon was observed during snorkel surveys. The Umpqua pikeminnow were observed to move between the tailrace and open water and “comprised one group.”

Twelve percent of the 51 pikeminnow stomachs analyzed from the tailrace contained salmonids, compared to 13 percent of the 31 pikeminnow collected from the open river away from the tailrace. The study authors could not determine if pikeminnow in the power plant tailrace were more successful at capturing salmonids than those inhabiting the open river away from the influence of the power plant.

Relative Efficiencies of the Fish Ladder Entrances

Because of potential migration delays reportedly observed in 1984 (see Section 4.4.1.3 below), a second entrance was constructed on the tailrace side of the fish ladder (ODFW, 1985; Williams, 1985). The new “entrance” appears to have actually been two entrances, since “it” is often (but not always) referred to in the plural. The previously existing ladder entrance was called the “side” entrance while the new entrance(s) were called the “tailrace” entrance(s).

The study authors theorized that if adult salmonids were congregating in the tailrace, and the new fish ladder entrance was inefficient at attracting fish, they would expect to see more salmonids jumping at the tailrace and fewer salmonids using the tailrace entrance than the side entrance. During summer low-flow this problem would be especially acute because a much higher percentage of the river discharge would be going through the tailrace than either over the dam or though the fish ladder. If the tailrace was influencing passage through the ladder, the authors expected to see most of the fish that eventually made it over the dam using the old side entrance (since the new entrance would be masked by the tailrace flow).

Between May 6 and November 30, 1984, investigators spent a combined total of 48.4 hours snorkeling at the Winchester Hydro Project counting fish in one of four areas: entering the side entrance; entering the tailrace entrances; jumping at the dam; and jumping at the powerplant outfall in the tailrace. Presumably, “jumping at the dam” meant that fish were jumping into the flow coming over the dam crest.

Investigators counted 159 adult salmonids entering the tailrace ladder entrance and 120 entering the side ladder entrance. They counted 143 fish jumping at the dam and 190 fish jumping at the outfall of the flumes in the tailrace. They observed that fish who initially jumped at the tailrace, could nonetheless find the tailrace ladder entrance and ascend the ladder.

The authors concluded that, “the adult fish did not have difficulty in locating the new ladder entrances from the tailrace area. Although adult migrants were seen swimming and jumping in the turbine outfall, they circulated freely back into the tailrace and were seen to enter the new ladder entrances readily. The attraction to the fishway appears to be sufficient in this area to prevent undue delay of adult salmonids that swim into the tailrace” (ODFW, 1985).

Upstream Migration Delay

In 1984, during the winter steelhead run, numerous fish were seen jumping at the “spill from the dam” (presumably the tailrace outfall). Investigators determined that blasting of the tailrace and construction of other project facilities had changed the topography near the side entrance to the fish ladder such that adult fish could not find the entrance quickly. This precipitated the construction of the tailrace ladder entrances discussed above. Following the 1985 migration, investigators attempted to determine the actual degree of the presumed delay. The authors were handicapped in their investigation by a lack of pre-project information on the amount of time adult salmonids spent ascending the relevant portion of the river. Therefore, an indirect method to determine passage delay was attempted.

The authors established a base period from 1973 to 1982 as the pre-project comparison period. Maximum and minimum passage percentages from that ten-year period were graphed by date for each species and run. Passage timing was then graphed against these historical averages for summer steelhead and spring chinook (1983, 1984, and 1985), and winter steelhead (1983 to 1984, and 1984 to 1985). If the post-project run timing fell outside the previously observed minima and maxima, the authors theorized that it may indicate that the hydro project had affected the run timing. This is clearly not definitive, as a multitude of factors other than the operation of the hydro project could have affected run timing. The results of this comparison for winter steelhead are present in Figure 4-5 as an example.

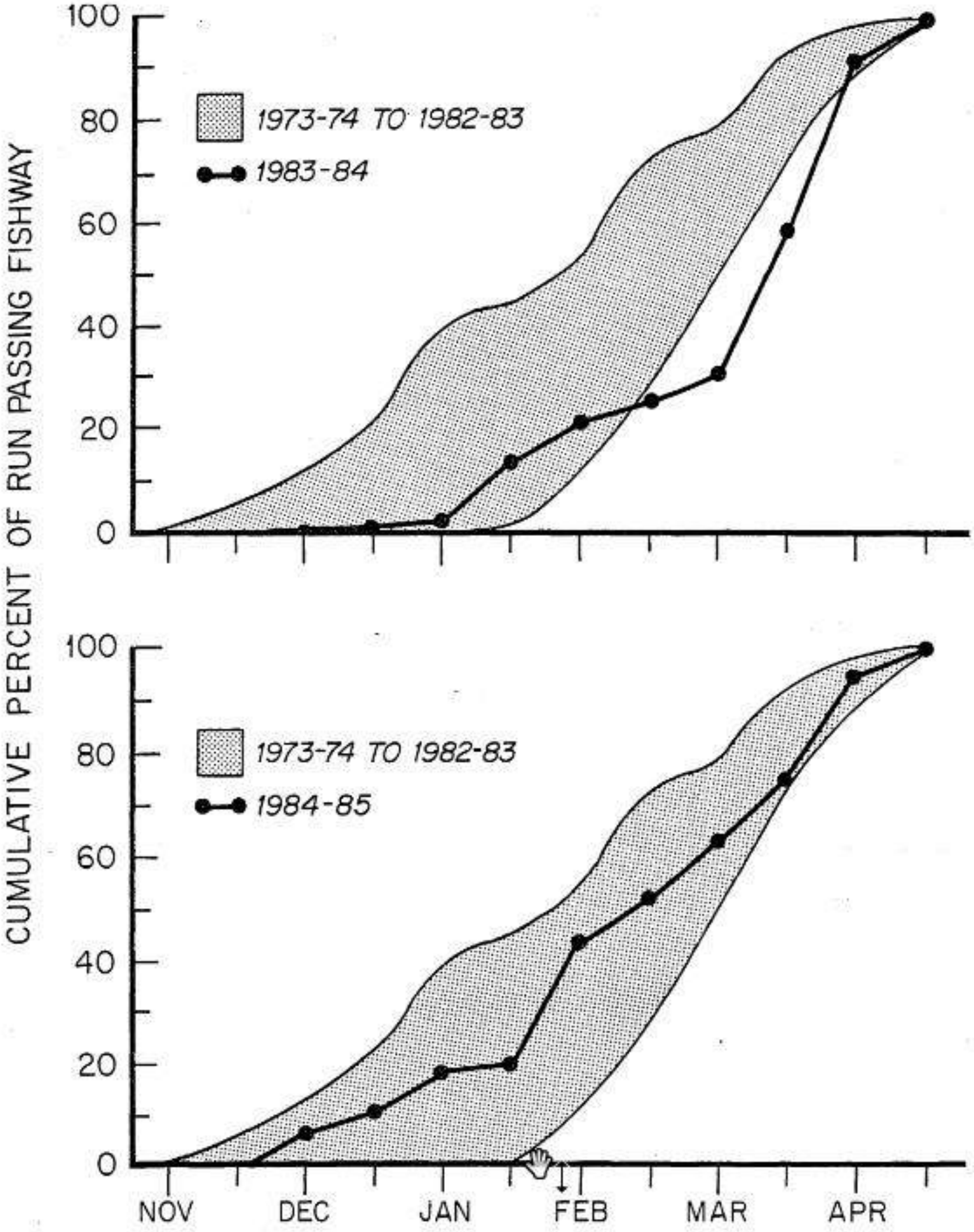


Figure 1. Counts of winter steelhead passing Winchester Dam fishway by 15-day periods in 1983-84 and 1984-85 compared with maximum and minimum 15-day counts during a 10-year period prior to project installation.

Figure 4-5: Fish passage timing figure from ODFW (1985).

The authors concluded that:

> *In the winter of 1983-84 winter steelhead appeared to be delayed in early spring. The problem leading to this delay was corrected and in 1984-85 the run was not delayed [by "corrected," they are referring to the new ladder entrance]. The spring chinook salmon runs of 1983 and 1984 were delayed during a 3-week period in early summer. Construction could have caused some delay in 1983, but the power plant was not operating during part of the time that the delay occurred in 1984. The spring chinook salmon run was not delayed in 1985. None of the summer steelhead runs showed a change in timing from the pre-project period. Along with the other information, these comparisons do not indicate any unusual delay in the migration of adult salmonids at the Winchester Hydro Project when all fish passage facilities are functioning as designed" (ODFW, 1985).*

4.4.2 Current Ladder Effectiveness

The current fish ladder passes fish, and those fish do not ***appear*** to be delayed in their migration based on the 1985 ODFW study and anecdotal accounts from ODFW staff. The apparent effectiveness of the ladder is reinforced by the passage of non-game species. ODFW staff count several non-game species as they ascend the ladder. Figure 4-6 illustrates sucker passage at Winchester dam since counting began in 1965. Prior to the upgrade of the fish ladder in 1985, the annual maximum passage of Largescale sucker at Winchester Dam was 86,460 fish (1967). Their numbers declined precipitously in the 1970s, which is mirrored by lamprey and pikeminnow declines (although the pikeminnow decline was more gradual). The reason for these declines is unclear, but likely multifaceted and related to the effects of clearcut logging through the 1950s. Since the new ladder entrances were added in 1985, an average of 12,323 largescale sucker have ascended the ladder each year at Winchester Dam. These robust passage numbers indicated that the dam and fish ladder are not impeding sucker movements, and Largescale sucker, while fine swimmers and jumpers in their own right, are certainly less effective at ascending fish ladders than salmonids. Sucker passage at the dam is significantly greater than any salmonid species during that same time frame. The salmonid species that most closely approaches the average annual sucker passage is winter steelhead, with an average passage of 8,576 fish (hatchery and wild combined) during the same period.

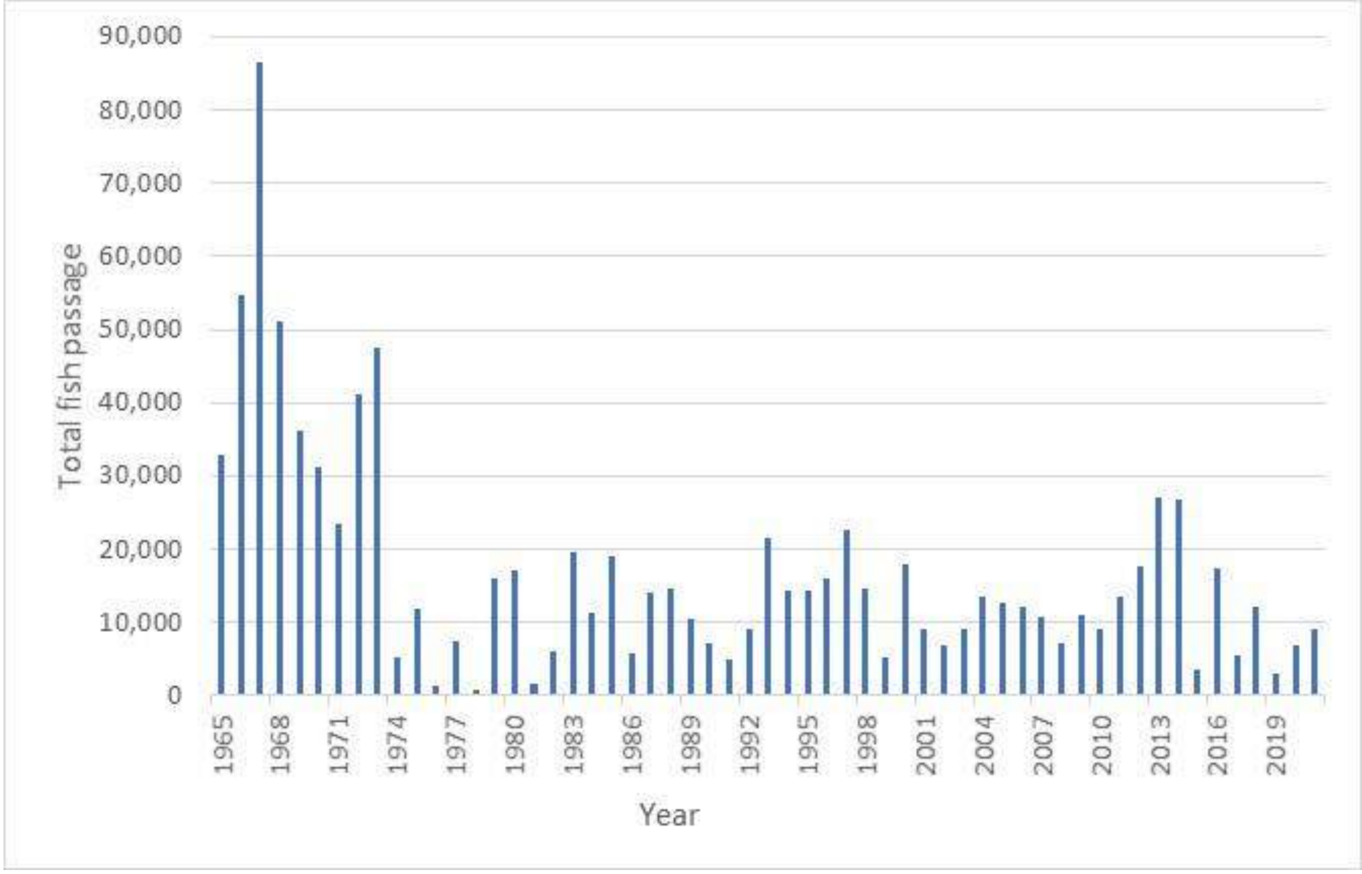


Figure 4-6: Annual passage of Largescale suckers at Winchester Dam.

4.4.3 Downstream Migration

On their downstream migration, juvenile OC Coho must either go down the fish ladder or over the crest of the dam. Once over the dam crest, there is a freefall of approximately 15 to the river below, and the potential for injury exists from this fall. However, no discussion of downstream passage at Winchester Dam was identified in any of the documents reviewed, and DOWL found no data on juvenile fish condition downstream of Winchester Dam. Therefore, the actual nature of the downstream passage Environmental Baseline is unknown.

4.4.4 Barrier Summary

The Environmental Baseline in the Action Area includes Winchester Dam, and its associated fish ladder. The nature and operation of the dam and fish ladder have been unchanged since the hydropower project was shut down in 1985.

Taken as a whole, the admittedly limited evidence suggests that under current ODFW management, the existing ladder passes fish at all flows without obvious or significant delay. The ladder should be operating more effectively than was observed in 1985 (when it seemingly did not delay migration) because the lack of tailrace flows eliminates the false attractant that may have interfered with the tailrace ladder entrances. However, the baseline also includes a leak in the dam which is currently creating a potential artificial attraction flow which may interfere with fish using the side ladder entrance.

4.5 Substrate/Sediments

Substrate and sediments in the Lower North Umpqua basin have been affected by log drives (which scoured many areas down to bedrock) and the upstream dams of the NUHP (which starve downstream reaches of sediment to replenish sediments lost to erosion). Historically, placer and gravel mining have also disrupted natural sediment delivery processes in the Umpqua basin. According to Wallick et al. (2010):

> *Repeat mapping from multiple aerial-photograph sets spanning 1939–2009 shows that the fluvial reaches of the Umpqua, South Umpqua, and North Umpqua Rivers flow within largely stable, single-thread channels of bedrock or coarse boulder and cobble substrates. Coarse bed-material sediment locally mantles the bedrock, forming shallow bars in and flanking the low-flow channel, whose position and overall size are dictated primarily by valley geometry rather than channel migration processes…Although bedrock rapids and channel flanking bedrock shoals are common features throughout the study area [Umpqua Mainstem, North and South Umpqua], they are most abundant along the Umpqua and North Umpqua Rivers, where 2005 aerial photographs show 3–5 times more exposed bedrock (by area) than mapped gravel…For the North Umpqua River, the 59-percent decrease in gravel between 1967 and 2005 is probably due to a combination of trapping of bed material by hydropower dams constructed in 1952–55 and climate-driven decreases in peak flows, as detected for the gaging station at Winchester. For this reach, decreased gravel bar area has led to much more exposure of active channel bedrock*

Anecdotal accounts indicate that some gravel passes over Winchester Dam, although most bed-material sediment is likely trapped in Winchester Reservoir, which has aggraded approximately two meters since dam construction (Timothy Brady, City of Roseburg Water Plant Superintendent, oral communication November 15, 2010, referenced in Wallick et al., 2010).

Based on the available information, the substrate and sediment Environmental Baseline in the Project Area is dominated by bedrock, with some gravel bars. Substrates in the Action Area are primarily weathered basalt bedrock, gravel, and cobble, with smaller amounts of finer sediments.

4.6 Large Woody Material

Large woody material (LWM) dissipates stream energy, retains gravel, diversifies stream habitat and provides structure leading to the formation of pools. To be stable in high energy stream flows during winter storms, large woody debris should be at least 24 inches in diameter and greater than 50 feet in length.

The Lower North Umpqua River is not wadable, and therefore habitat survey data for the North Umpqua itself is limited (ODFW systematically surveys stream habitat in wadable streams). According to Geyer (2003), the majority of streams within the Lower North Umpqua Watershed have low gradients with few stream miles in source areas, where most LWM is recruited into the stream system. This may naturally limit instream LWM abundance. Stream habitat surveys farther up in the basin indicate that lack of adequate LWM, poor riffles, poor pools, and poor riparian area tree composition, limit Coho habitat in Lower North Umpqua tributaries. Decades of lost LWM recruitment have starved the system of LWM and were a result of logging that was conducted until Oregon’s riparian protection rules were enacted in 1994 under the Forest Practices Act.

Winchester Dam may affect the existing LWM Environmental Baseline by blocking LWM to the lower seven miles of the North Umpqua River. However, that blockage in not absolute. During high river flows, LWM recruited from upstream may be carried over the crest of the dam and delivered downstream, and there are no obvious accumulations of LWM upstream of the dam, or on the dam crest. Figure 4-7 shows flows in December 2014 (Google maps, 2022). Discharge records are not available for Winchester Dam in 2014, but gage heights are available from USGS. It is unknown if the photo in Figure 4-7 was taken at the peak discharge, but gage height did reach 22.4 feet on December 21, which was the highest gage height in the available record (2007 to 2022). It appears that a discharge of this magnitude would be capable of transporting LWM over Winchester Dam, and while a flood this large is rare, the N. Umpqua River has reached a gage height of 19 feet or above four times since 2007. Furthermore, the largest LWM would only be transported during the highest flows in a natural system, thus limiting the dam’s negative effects on LWM.

Figure 4-7: Winchester Dam at high flow in 2014.

4.7 Change in Peak and Base Flows

Instream flows in the North Umpqua watershed are strongly influenced by variations in geology, elevation, and the relative influence of rainfall versus snowmelt in generating runoff (Stillwater, 1998). In the upper basin, where snowfall is the main form of precipitation, high flows are dominated by spring snowmelt runoff, with peaks occurring from May to early June. Peak flows are not substantially larger than baseflows in the upper basin, because a large amount of precipitation is stored as groundwater and is released throughout the year. The lower basin has rainfall-dominated precipitation regimes. In these areas, high flows occur as flashy (short duration, high magnitude) winter floods which are significantly larger than baseflows (ibid).

Annual flows in the North Umpqua at Winchester are lowest from early July through October, and the highest flows occur in December and January. Figures 4-8, and 4-9 illustrate the mean and minimum daily flows (Figure 4-8) and maximum daily flows (Figure 4-9) for the entire period of record (1908 to 2021) for the U.S. Geological Survey (USGS) Winchester gage (USGS 14319500). Note that the scales are an order of magnitude different.

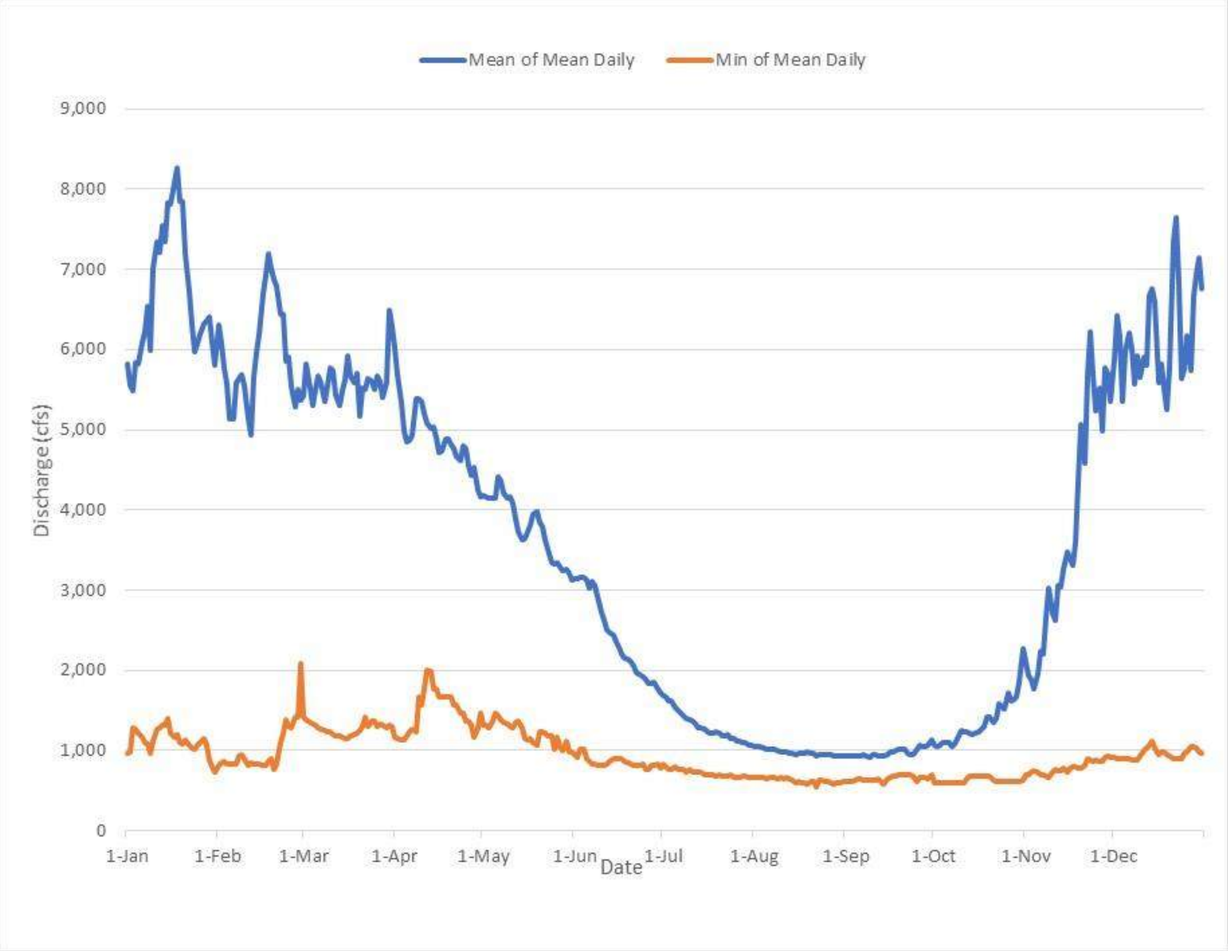


Figure 4-8: Mean and Minimum Daily Discharge for the N. Umpqua River at Winchester.

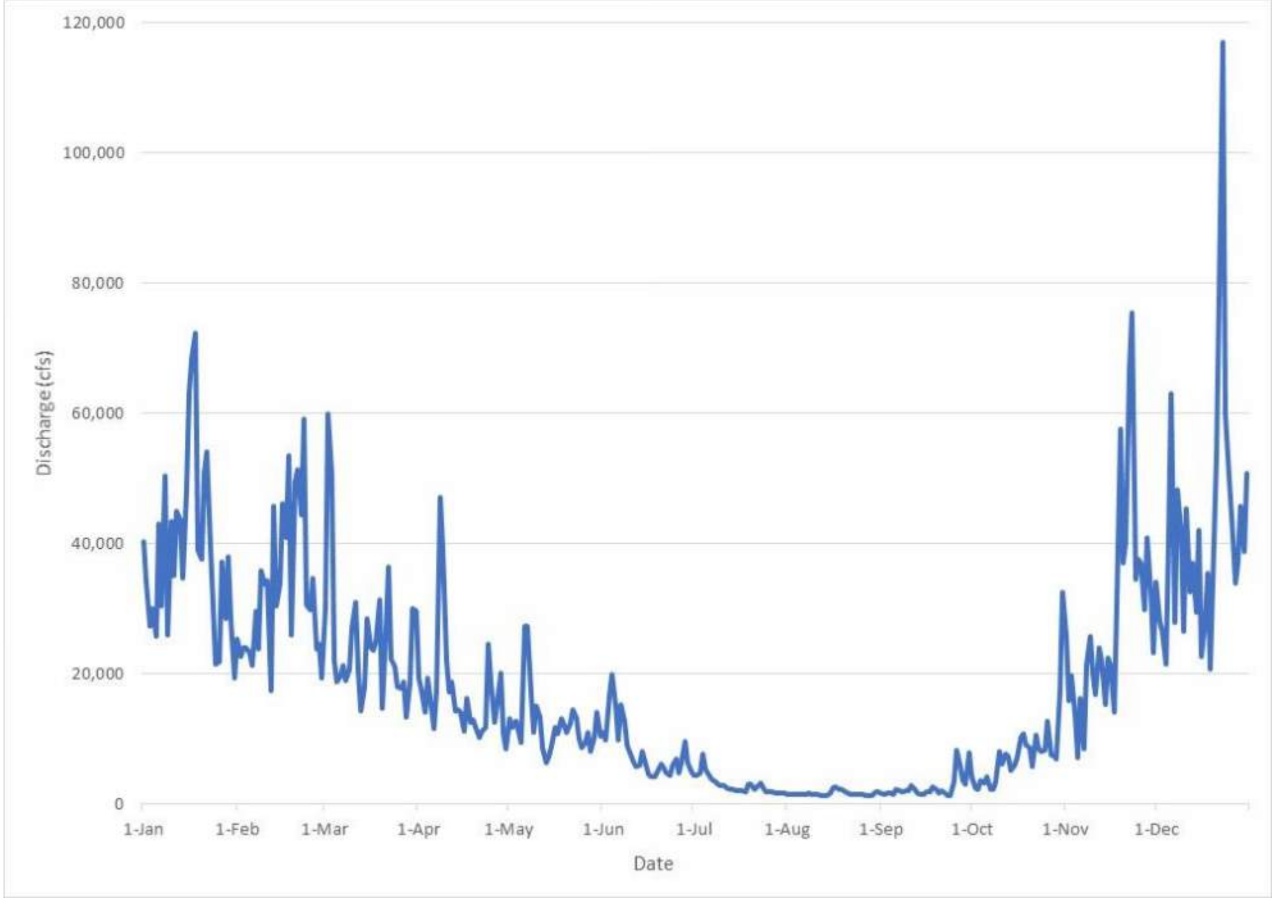


Figure 4-9: Maximum Mean Daily Discharge at Winchester.

The upstream dams of the NUHP influence flows in the North Umpqua River, but primarily in bypass reaches (river reaches around which water is diverted for power generation). Baseflows are largely unchanged from pre-project conditions in the mainstem reaches below the NUHP, and any observed changes are short-term and due to discharge variability resulting from load regulation (Stillwater 1998). Farther down in the system, at Winchester Dam for instance, these changes are likely not biologically significant, if they are detectable at all.

The frequency and magnitude of winter floods are slightly different for pre-NUHP conditions. Flood frequency changes are more dramatic for higher-magnitude floods than for those of lower magnitude. The five-year flood discharge increased from 1,698 cubic meters per second (cms) to 2,066 cms (60,000 cubic feet squared [cfs] to 73,000 cfs) in the period after regulation. According to Stillwater (1998) these changes are likely caused by climatic differences between pre- and post-dam periods rather than by project operations.

As a run-of-the-river dam, Winchester Dam does not affect flows day to day. Rather, the dam affects the flow regime Environmental Baseline only during the periods of reservoir draining and filling that happen periodically as a consequence of dam repair. These changes affect only the lower seven river miles of the North Umpqua River and last a period of hours, rather than days. It’s unlikely that the briefly increased flow would be biologically significant downstream of the confluence of the North and South Forks.

4.8 Disturbance History

As described in Section 4.2, the Lower North Umpqua basin has undergone extensive anthropogenic disturbance. A non-exhaustive list of human disturbance includes the effects of logging, damming, mining, road building, fishing, fires (which can be exacerbated by human activity), flow diversion, stormwater and wastewater discharge, agricultural activities, and urban development. Many of these activities are on-going, while the lingering effects of historical impacts persist.

Winchester Dam has contributed to the disturbance history Environmental Baseline since it's construction. Hydropower operations and periodic facilities operations and repairs have affected the Lower North Umpqua Watershed from the dam to the river's confluence with the South Umpqua.

4.9 Climate

The climate is an integral part of the environmental baseline. Given their preferred cold-water environments, salmonids are especially vulnerable to the effects of warming climates, changing precipitation and hydrologic regimes.

Climate change in the Pacific Northwest, includes rising air temperature, changes in the timing of streamflow related to changing snowmelt, increases in extreme precipitation events, lower summer stream flows, and other changes (Mote et al, 2014). During the last century, average annual air temperatures in the Pacific Northwest increased by 1 to 1.4°, and up to 2°F in some seasons (Abatzoglou et al., 2004, Kunkel et al., 2013). Warming will continue in the 21st century, with average temperature increases of 3° to 10 °F predicted to occur in summer. Temperature increases shift timing of key life cycle events for salmonids and salmon food organisms (Crozier et al. 2011, Tillmann and Siemann 2011, Winder and Schindler 2004). Higher stream temperatures will also cause decreases in dissolved oxygen and may also cause earlier onset of stratification and reduced mixing between layers in lakes and reservoirs. In 2015, warm water temperatures were catastrophic for Columbia River sockeye, leading to a die off of 250,000 fish.

Decreases in summer precipitation of as much as 30 percent by the year 2100 are predicted in the Pacific Northwest across many climate models (Mote et al. 2014). Shifts in timing are also predicted, with most rain forecast to fall from October through March and less during the already dry summer months. More winter precipitation is expected to be rain than snow (Independent Scientific Advisory Board [ISAB] 2007, Mote et al. 2014). Earlier snowmelt will cause lower stream flows in late spring, summer, and fall, and water temperatures will be warmer (ISAB 2007, Mote et al. 2014).

Late summer streamflow in Pacific coastal ranges and the central Rockies have declined approximately 20 percent on average since the middle of the 20th Century. This is caused by a combination of a warmer and drier climate, smaller snowpacks, and earlier melt (Leppi et al. 2012; Sawaske et al. 2014). In the Pacific Northwest during this period, high-elevation precipitation has decreased as westerly winds have slowed, and this decrease is projected to continue, if not increase, over the 21st century (Luce et al. 2013). Variability in annual streamflow has also increased as intense storms bring high flows, and drier summers lead to reductions in base flow (Luce and Holden 2009).

Overall, about one-third of the current cold-water salmonid habitat in the Pacific Northwest is likely to exceed water temperature thresholds by the end of the 21st century (Mantua et al. 2009). Reduced flows will make it more difficult for migrating fish to pass physical and thermal obstructions, limiting their access to available habitat (Mantua et al. 2010).

Sensitivity of stream temperature to changes in air temperature is complex and is influenced by geological and vegetation factors such as topography, groundwater recharge, glaciation history, and riparian vegetation (Isaak et al. 2010, Isaak and Rieman 2013). Nonetheless, the effects of climate change have caused or exacerbated challenges affecting salmonids, including range contractions; threats to redds and juvenile habitat from stream scouring caused by increased extreme winter precipitation events and increased rain in lower elevations; lower summer flows restricting rearing habitat and inhibiting movements from spawning and rearing habitat to foraging habitat. The increased frequency, intensity, and extent of wildfires is at least partially attributable to climate change, and has contributed to loss and fragmentation of habitat, increased sediment inputs, decreased LWM recruitment over time, and more intense exposure to solar radiation.

These are only the freshwater effects of climate change. Predicted changes for coastal waters in the Pacific Northwest include increasing surface water temperature, increasing but highly variable acidity, and increasing storm frequency and magnitude (Mote et al. 2014). Elevated ocean temperatures already documented for the Pacific Northwest are highly likely to continue during the next century, with sea surface temperature projected to increase by 1.0 to 3.7°C by the end of the century (IPCC 2014). Habitat loss, shifts in species' ranges and abundances, and altered marine food webs could have substantial consequences to anadromous, coastal, and marine species in the Pacific Northwest (Tillmann and Siemann 2011).

A recent assessment of the vulnerability of ESA-listed salmonids to climate change indicated that Oregon Coast Coho salmon had high overall vulnerability, high biological sensitivity and high climate exposure, and only moderate adaptive capacity (Crozier et al. 2019, as summarized in Ford 2022). Because young Coho salmon spend a full year in freshwater before ocean entry, the juvenile freshwater stage is considered to be highly vulnerable. OC Coho also scored high in sensitivity at the marine stage due to expected changes due to ocean acidification.

4.10 Summary

The Environmental Baseline in the Action Area is degraded, and climate change will likely exacerbate that degradation. Table 4-2 provides a summary of the environmental baseline on each of the Pathways and Indicators. Several of the indicators were not analyzed because the proposed Project has no potential to affect them, and/or Winchester Dam has not historically altered the Environmental Baseline of those indicators. The effects of the proposed project have not yet been discussed, but the justification for their ranking in Table 4-2 (restore, maintain, or degrade) is provided in Section 5.0 below.

Table 4-2: Current condition of the environmental baseline.

Pathways Indicators	**Environmental Baseline Condition in the Lower North Umpqua Watershed**
Water Quality	
Temperature	Water temperatures have increased due to climate change and disturbance of the watershed (primarily logging). Temperature increase are such that late summer temperatures are not conducive to any life stage of OC Coho.
Turbidity	Except during flood events, turbidity is generally low, although likely elevated from historic conditions as a consequence of logging and road building.
Contamination/Nutrients	While some streams in the watershed have experienced elevated contamination and nutrient loads, the watershed as a whole has generally good water quality (aside from temperature)
Habitat Access	
Physical Barriers	There are no physical barriers downstream of Winchester Dam. Winchester Dam has posed a physical barrier since 1890, although the amount that barrier may delay fish is unknown
Habitat Elements	
Substrate	Sediments are dominated by bedrock, boulder, and large cobble. Gravels have been reduced as a result of past logging practices and the effects of upstream dams.
LWM	LWM is scarce and likely significantly below historic levels throughout the watershed
Pool Frequency	These habitat indicators were not analyzed as the Project has no potential to affect them either during construction or operation.
Pool Quality	
Off-channel habitat	
Refugia	
Channel Condition	
Width/depth ratio	These habitat indicators were not analyzed as the Project has no potential to affect their baseline conditions either during construction or operation.
Streambank condition	
Floodplain connectivity	
Flows/Hydrology	
Peak/base flows	Peak and baseflows have been altered over the historic conditions by land use, water diversions and upstream dams.
Drainage Network Incr.	This habitat indicator was not analyzed as the Project has no potential to affect their baseline conditions either during construction or operation.
Watershed conditions	
Disturbance history	The watershed has undergone extensive anthropogenic disturbance.
Road density	These habitat indicators were not analyzed as the Project has no potential to affect their baseline conditions either during construction or operation.
Riparian reserves	
Climate	The current climate is the warmest in recorded history. The climate baseline will continue to change as climate change intensifies.

5.0 EFFECTS OF THE PROPOSED ACTION

Under the ESA, “effects of the action” means the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline (50 CFR 402.02). Effects are caused by the proposed action if they would not occur but for the proposed action and are also reasonably certain to occur (see 50 CFR 402.17).

The following sections address the environmental effects of the proposed action on listed species and critical habitats. Effects can occur at or very close (days to weeks) to the time of the action itself (which are the Direct Effects or Effects of Project construction) or can occur later in time (which are the Indirect Effects or Effects of Project operation). Interrelated actions are those “that are part of a larger action and depend on the larger action for their justification” (ibid.). Interdependent actions are defined as those “with no independent utility apart from the proposed action” (ibid.). Cumulative impacts as defined by rule “are those effects of future State or private activities, not involving Federal activities that are reasonably certain to occur within the Action Area of the Federal action subject to consultation” (ibid.). In conducting a jeopardy analysis, USFWS and NMFS determine “whether the action, taken together with cumulative effects, is likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat” (50 CFR § 402.14(g)(3)-(4)).

Evaluation for potential impacts of the proposed action on listed species and critical habitats were conducted following the general guidelines described in: “Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Watershed Scale” (NMFS 1996) and the “Endangered Species Consultation Handbook” (USFWS and NMFS 1998).

5.1 Direct Effects

Direct Project Effects to OC Coho or its critical habitat resulting from this project may include:

- Fish salvage
- Increased turbidity
- Reduction of salmonid food organisms and available habitat
- Chemical spills or releases (from equipment or materials used in repairs)
- Construction noise
- Delayed migration

5.1.1 Fish Salvage

Fish will be salvaged from two areas during work below OHW. The first area will be at the north end of the dam, inside a sandbag isolation area where work will occur to repair the face of the dam and its associated concrete footing. The second area will be within the sheet pile cutoff wall/coffer dam at the south abutment. In-water work area isolation with sandbags, supersacks, and the sheet pile cutoff wall is, in part, a conservation measure intended to reduce potential effects to water quality and fish from instream construction. Fish present in the isolation areas will be captured, handled, and released after installation of the work area isolation, immediately prior to in-water construction.

Immediate or delayed death or injury of juvenile salmonids from capture and relocation stress may occur during fish salvage. Depending on conditions during isolation, it may not be possible to capture, remove, and relocate all of the individual fish within the isolated in-water work areas. Any individual juvenile salmonids remaining within the isolated work area after fish capture, removal, and relocation would not be expected to survive. Fish salvage will occur at the north isolation area (4,440 square feet) the first week of construction, and in the sheet pile cutoff wall (2,200 square feet) in late August, given current project schedules.

As stated in Section 3.2 above, data on one fish salvage project in the vicinity of the Action Area was identified on the NMFS/ODFW permit website (https://apps.nmfs.noaa.gov/index.cfm, accessed 05/10/2022). During this salvage effort in the third week of August 2006, no Coho were collected.

Unfortunately, DOWL was unable to find any information on Coho rearing density in Winchester Reservoir. During the mid-July to mid-September IWWP, the previous year's juveniles are expected to have migrated downstream past Winchester Dam (with peak outmigration in April and May) while the juveniles from the winter/spring of that year will be rearing higher up in the watershed in their natal streams. In the Clackamas River, many Coho reared in tributaries throughout their first year, while others overwintered in the reservoir (Beamesderfer et al., 2001).

Some juveniles that were produced near Winchester Reservoir, or driven out of upstream rearing habitats, may rear in Winchester Reservoir, but summer water temperatures above 20°C likely severely limit late-summer Coho rearing.

Accurately estimating the number of juvenile Coho potentially affected by any in-water work is impossible. However, during snorkel surveys of the Umpqua basin from 2011 to 2021, the density of Coho juveniles in surveyed habitats ranged from 0.203 fish/m^2 (in 2021) to 0.498 fish/m^2 (in 2013). The mean density was 0.287 fish/m^2 (0.027 fish/SF) (Constable and Suring, 2022). These surveys were conducted in smaller streams with much more favorable habitat for Coho juveniles than the Lower North Umpqua. If the mean ten-year density of Coho were to occur in the isolated salvage areas, 147 OC Coho would be present and require salvage. Assuming 10% salvage mortality (a higher rate than is expected to occur), 15 juvenile Coho could be killed by salvage. The target smolt-to-adult return (SAR) rate for Oregon Coast Coho is 1.1% (ODFW, 2019). If all of these very conservative estimates are true for the Action Area (density of 0.27 fish/SF, 15 juvenile fish killed by salvage, SAR of 1.1%) fish salvage would result in the loss of much less than one (0.165) adult OC Coho. The juvenile Coho density in the Action Area is likely to be much lower than this estimate due to expected high water temperature, construction activity prior to isolation, and active efforts to "herd" fish out of the isolation areas prior to salvage. This assumption is reinforced by the results of the 2006 salvage downstream, when no Coho were encountered (the density of juvenile Coho during snorkel surveys in 2006 when the previous salvage effort occurred was 0.368 fish/m^2 in the entire Umpqua basin – higher than the density assumed for our estimates).

Conservation Measures

Fish salvage will be conducted during the negotiated IWWP of July 22 to September 15. Construction noise, high water temperature, and seasonal low abundance of fish will limit the number of fish likely to be stranded within the sheet pile and sandbag-isolated work zones. A pump, outfitted with a fish screen conforming to NMFS standards, will be used to dewater the interior of the cutoff wall/coffer dam, until the water depth is low enough to allow effective dipnetting and/or electrofishing. The water will be discharged to a settlement basin at the top of the slope. All water discharge will conform to applicable ODEQ permits. Lowering the water level inside the coffer dam will concentrate what fish may be present, facilitating salvage.

Electrofishing and/or seining passes will be made until no more fish are captured, and then the isolated areas will be further dewatered. As water levels drop, fish capture will again be conducted in stages to verify that as many fish as possible are removed from inside the isolated areas. All fish will be identified to species and counted.

The following additional conservation measures will be employed:

- When practicable, attempts will be made to first "herd" fish from the in-water work areas using seines prior to full work area isolation.
- All fish will be captured and released from the isolated areas by the method likely to result in the least injury to salvaged fish (e.g., seines are preferable to electrofishing).
- A person experienced with work area isolation and who is competent to verify the safe handling of all ESA-listed fish will conduct or supervise the entire capture and release operation.
- If electrofishing equipment is used to capture fish, the capture team will comply with NMFS's electrofishing guidelines.
- The capture team will handle ESA-listed fish with extreme care, keeping fish in water to the maximum extent possible during seining, electrofishing, and transfer procedures to prevent the added stress of out-of-water handling. If buckets are used to transport fish, the following precautions will be taken:
    - Minimize the time fish are in a transport bucket.
    - Keep buckets in shaded areas or, if no shade is available, covered by a canopy.
    - Limit the number of fish within a bucket; fish will be of relatively comparable size to minimize predation.
    - Use aerators or replace the water in the buckets at least every 15 minutes with cold clear water.
- Captured fish will be released as close to capture sites as possible.
- In extraordinary circumstances that preclude fish release immediately back in the N. Umpqua, ESA-listed fish will be transferred only to NMFS personnel.
- A joint NMFS/ODFW fish salvage permit will be obtained prior to fish salvage. It will describe in detail conservation measures to be employed.
- The ODFW District Fish Biologist will be notified at least 24 hours before fish salvage is to take place.
- NMFS and ODFW or their designated representatives will be allowed to accompany the capture team during the capture and release activity, should they request to do so.

Although not applicable to ESA-listed fish, a large shallow bench, composed of sand and finer sediments, will be exposed during lake drawdown. This area has been identified by ODFW as an important rearing area for Lamprey spp. In addition, adult lamprey have previously been identified holding in voids within the dam. Project sponsors will work with ODFW to develop a salvage plan for lamprey.

5.1.2 Increased Turbidity and Total Suspended Solids

Salmonids evolved in systems with periodic high suspended sediment loads, caused by floods, high flows, and glacial outwash, and are adapted to tolerate high turbidity and suspended sediments. Nonetheless, increased fine sediment can affect fish in a variety of ways. High concentrations of suspended sediment can disrupt normal feeding behavior and efficiency

(Cordon and Kelley 1961; Bjornn et al. 1977; Berg and Northcote 1985), reduce growth rates (Crouse et al. 1981), and increase plasma cortisol levels (Servizi and Martens 1992). High and prolonged turbidity concentrations can reduce dissolved oxygen in the water column, result in reduced respiratory functions, reduce tolerance to diseases, and can also cause fish mortality (Sigler et al. 1984; Berg and Northcote 1985; Waters 1995). Coho juveniles exposed to suspended sediment and turbidity levels that can occur naturally in the Fraser River showed increased cough rates and stress responses (Servizi and Martens 1992).

Even small pulses of turbid water can cause salmonids to disperse from established territories (Waters 1995), which can displace fish into less suitable habitat and/or increase competition and predation. Increased sedimentation can fill pools thereby reducing the amount of potential cover and habitat available, and smother coarse substrate particles which can impair macroinvertebrate composition and abundance (Sigler et al. 1984; Alexander and Hansen 1986). However, exposure duration is the major determinant of the severity of effects from elevated TSS (Newcombe and Jensen, 1996). Behavioral avoidance of turbid water may be the most likely effect of elevated suspended sediment (Birtwell et al, 1984; Scannell 1988). If the turbidity is severe enough to affect the entire river cross-section, this could delay migration and/or force fish into unfavorable habitats.

In-water and near-water construction activities, such as cutoff wall/cofferdam installation, removal of aggregate from temporary road and staging areas, and heavy equipment usage on the bank are likely to temporarily increase concentrations of total suspended solids (TSS) and turbidity. Installation of the sheet pile wall will dislodge sediment, which will temporarily elevate suspended sediments (a source of turbidity). However, substrates at the in-water construction zone are primarily weathered basalt bedrock, gravel, and cobble. The relative lack of fine-grained sediments in this location would limit the amount of turbidity likely to be released to the water column. Short-term pulses of sediment are likely to occur during installation and removal of the sheet pile wall and again when in-water work areas are re-inundated. The substrate at the fish ladder work location is bedrock, and therefore, no turbidity increases are expected when that area is rewatered. The increases in turbidity are expected to be minor, localized, and of short duration (a few hours to a day).

Following construction, all of the temporary work pad materials will be removed and should not result in increased suspended sediments. The streambed beneath the work pad will be restored to pre-construction contours.

The exposure of Coho to increased suspended sediment is reasonably certain to elicit behavioral responses. Any Coho present will likely respond to the increased suspended sediment by attempting to move to locations with lower turbidity. Failure to avoid increased suspended sediment could result in gill irritation or abrasion, which can reduce respiratory efficiency or lead to infection and a reduction in juvenile feeding efficiency due to reduced visibility. However, suspended sediments' concentrations are unlikely to reach the levels that would cause these results. The fish responses to changes in suspended sediment are likely to persist for only as long as the pulses of increased suspended sediment occur. The nature of the work (conducted inside isolation, with turbid water pumped upland) is expected to result in elevated sediment plumes of minutes to hours. A small number of individual juvenile Coho could reasonably be expected to experience short pulses of elevated turbidity during and immediately following in-water work. However, due to the expected short duration of increased suspended sediments, the coarse-grained nature of sediments in the Action Area, and the small areas to be disturbed, no population-level effects are expected to OC Coho.

Conservation Measures

All instream work will be conducted during the agreed-upon IWWP (July 22 to September 15) to minimize interference with migrating and rearing Coho. Work platforms will be constructed over a maximum of 7,400 square feet and will not involve net removal or fill. Work pads and work areas below OHW have been designed to be as small as possible, and large aggregate with a very small percentage fines will be used below OHW. Pile driving activities will take place within a containment boom/silt curtain to minimize release of fine sediments. Turbidity monitoring will be conducted during project construction in accordance with a ODEQ and NMFS requirements.

5.1.3 Temporary Reduction in Benthic Invertebrates and Physical Habitat

The effects of dam de-watering extend approximately 1.45 miles upstream, where the backwater effects end at an “S” bend. The extent of exposed sediments decreases steadily from downstream to upstream when the reservoir is drained. When the lake is drained, juvenile salmonids will be restricted to the historic river channel and will not have access to previously inundated areas which may be productive locations for benthic invertebrates and zooplankton. The benthic macroinvertebrate community would also be temporarily diminished following re-flooding of the lake in areas that were exposed during drawdown. This localized reduction in benthic food production is unlikely to affect the rearing density of juvenile Coho in the Action Area, as food resources have not been identified as a limiting factor. Due to high seasonal water temperatures, the density of rearing Coho in Winchester Reservoir is expected to be very low. Therefore, the loss of benthic macroinvertebrates associated with the proposed action is not expected to result in any negative effects to rearing Coho. Recovery of the benthic community would be expected to occur within a few weeks to months through recolonization by organisms drifting down from upstream.

Conservation Measures

Drawing down the reservoir late in the in-water work period, and the short duration of lake drawdown (three weeks) is likely to result in minimal effects to OC Coho. The re-watered Winchester Reservoir is expected to be quickly recolonized by benthic invertebrates.

5.1.4 Chemical Spills or Releases

Construction Equipment

Releases of diesel fuel, lubricants, hydraulic fluid, and other contaminants contained in construction equipment could potentially result in acute negative impacts to fish, invertebrates, and critical habitat.

Conservation Measures

All construction activities will comply with a spill prevention plan and a stormwater discharge plan to be completed by the contractor in compliance with Clean Water Act Section 401. Proper execution of these plans and consistent implementation of construction BMPs will maximize the potential that any spills which do occur are immediately and effectively remediated. The following specific conservation measures will be implemented:

- All personnel will be made aware of spill prevention and response procedures.

- All equipment used will be clean and inspected daily prior to use to verify that the equipment has no fluid leaks. Should a leak develop during use, the leaking equipment will be removed from the project site immediately and not used again until it has been adequately repaired. At no time will fuels or oils be allowed to enter any waterbody.
- Stationary equipment, such as generators, with fuel tanks larger than five gallons will be placed in containment while in use. The containment vessel will have a receiving volume at least as large as the volume of all fluids in the equipment being contained.
- Non- stationary construction equipment will be serviced, stored, and fueled at least 100 feet away from the shoreline. Location of vehicles, equipment and fuel storage areas, and fuel containment measures, will be approved and monitored by the Project Engineer.
- Floating hazardous material containment booms and spill containment booms will be maintained on site during all phases of construction to facilitate the cleanup of hazardous material and equipment liquid spills.

Exposure to Uncured Concrete

Uncured or partially-cured concrete can leach hydroxyl ions into surrounding waters raising the pH. Law et al., (2013) found that increased pH was primarily a concern in areas where the volume of water and rate of flow are relatively low such as culverts in small streams. In confined areas with small volumes of water, the pH can increase to levels toxic to fish. The effects of uncured concrete in larger natural systems is poorly studied (CTC and Associates, LLC. 2016), and few agencies have guidelines for appropriate curing times before ambient water comes in contact with recently placed concrete (ibid).

Conservation measuresThe Washington Department of Transportation (WSDOT) minimization measure MM-29 states that “all concrete will be placed in the dry, or within confined waters not being dewatered to surface waters and will be allowed to cure a minimum of 7 days before contact with surface water.” The WSDOT Standard Specification for Road, Bridge and Municipal Construction (WSDOT 2022) requires a continuous wet cure for a minimum of three days, and states, “contractor shall keep all exposed concrete surfaces saturated with water. Formed concrete surfaces shall be kept in a continuous wet cure by leaving the forms in place. If forms are removed during the continuous wet curing period, the Contractor shall treat the concrete as an exposed concrete surface. Runoff water shall be collected and disposed of in accordance with all applicable regulations. In no case shall runoff water be allowed to enter any lakes, streams, or other surface waters.” The British Columbia Ministry of Environment requires cast-in-place concrete to remain isolated from fish-bearing waters “for a minimum of 48 hours if ambient air temperature is above 0°C and for a minimum of 72 hours if ambient air temperature is below 0°C” (MWLAP 2004).

Concrete in the Action Area will be allowed to cure for three days before being exposed to ambient waters. Prior to cutting off the sheet pile wall, the newly cured concrete will be flooded with river water, effectively “washing” the concrete. This water will be pumped to an upland infiltration basin. Concrete truck chute cleanout areas will be established to properly contain wet concrete and wash water and prevent it from entering wetlands and other waterbodies.

Given the large volume of flow past the north concrete repair, the fact that concrete will be allowed to cure for a minimum of 7 days, and the “washing” of the newly installed concrete, no effect to pH is expected. Water residence time may be longer at the south repair location than in freer flowing portions of the river but should still be high enough to dilute any high pH water that remains after “washing.” This, coupled with the turbulent mixing of the water after flowing over the dam crest, should effectively neutralize pH increases.

Exposure to Polyurethane Grout

Polyurethane grout will be injected into voids within the dam and will be exposed to water during curing. The proposed product is Uretek brand deep injection (UDI) foam, which is a lightweight, expansive geo-polymer material. The polymer is certified for conforming to the requirements of NSF/ANSI Standard 61, Drinking Water System Components – Health Effects. This is the standard that establishes minimum health effect requirements for materials, components, products, or systems that contact drinking water, drinking water treatment chemicals, or both by NSF International. In general terms, NSF 61 Certification means that UDI is safe to use around potable water.

EA Engineering, Science, and Technology, Inc. conducted acute and chronic toxicity testing on Uretek USA foam at the request of the Minnesota Department of Transportation (MNDOT) for product hazard evaluation (Appendix 4). Testing was done for metals, total organic carbon and chemical oxygen demand. In addition, toxicity testing was completed on Fathead minnow (*Pimephales promelas*), as well as *Ceriodaphnia dubia* and redworm (*Eisenia fetida*). The testing was done at double the MNDOT criteria (200 ppm TCLP leachate vs. the required 100 ppm). Following the testing period, there was 100% survival of daphnia in the control and all test concentrations (18, 32, 56,100, and 200 mg/L leachate). Fathead minnow survival was 95 to 98% at the various test concentrations, versus 95 percent survival in the control, and redworm survival was 100 percent in the control group and 97 to 100 percent at the various test concentrations (with the 97 percent survival occurring in the 32 and 52 mg/L test concentrations – survival in the 100 and 200 mg/L test concentrations was 100 percent). These results indicate that the proposed polyurethane grout is environmentally benign.

Conservation measures

The Uretek foam is a two-part product that is mixed as it is injected into voids. Upon contact with water, the foam cures rapidly and is biologically inert. Any “spilled” foam would cure almost immediately and not harm aquatic organisms. All foam will also be within isolated or dewatered areas until fully cured.

Effects from Cutting Off the Sheet Pile Wall

The sheet pile wall will be cut off at the surface of the concrete following concrete curing. The cuts will be accomplished with a torch, pneumatic saw, or other methods. Regardless of method, the only potential effects would be disturbance of any OC Coho in the immediate vicinity, and indirect effects from the steel to be left in place.

Conservation measures

Sheet-pile cutoff will be accomplished as quickly as possible during the IWWP. Construction personnel will grind smooth the edges of the cutoff wall so as to eliminate the threat to OC Coho or other aquatic species.

5.1.5 Construction noise

OC Coho will not be negatively affected to the point of take by general construction noise, such as that generated by heavy equipment and ground disturbance activities. However, repairs at the south powerhouse, designed to arrest water infiltration, require the installation of a sheet pile cutoff wall.

Pile driving will be required to drive the interlocking sheet piles and H-piles used to support the sheet pile template. Vibratory driving will be used to set the piles, but impact driving will be required to seat or “proof” the sheet piles into bedrock (the H-piles will be driven only with the vibratory hammer).

As stated in Hanson et al. (2003), numerous variables control the effect of noise on individual fish:

- Species of fish
- Fish size
- Presence of a swim bladder
- Physical condition of the fish
- Peak sound pressure and frequency
- Shape of the sound wave (rise time)
- Depth of the water around the pile
- Depth of the fish in the water column
- Amount of air in the water
- Size and number of waves on the water surface
- Bottom substrate composition and texture
- Effectiveness of bubble curtain sound or other pressure attenuation technology
- Tidal currents
- Presence of predators

Furthermore, the intensity of underwater noise produced from pile driving depends on many other factors, including the type and size of the pile, the firmness of the substrate, the depth of water, and the type of hammer.

The effects of sound on fish are varied and range from acute and sometimes fatal effects (damage to auditory receptors and rupture of the swim bladder) (Abbott and Bing-Sawyer, 2002; Caltrans, 2020) to chronic effects such as behavioral changes and long-term stress (Hastings and Popper, 2005). Behavioral changes resulting from increased noise may include avoidance of the area, changes in migratory routes, or interruption of reproduction. Juvenile salmonids and other fish species may move away from protected shoreline habitat or delay migratory progress because of increased noise, and the noise may also increase predation by masking the sound of approaching predators (Anderson, 1990). However, attempts to quantify the level of sound at which these effects occur are few and largely inconclusive (Hastings and Popper, 2005).

Vibratory or impact hammers are commonly used to drive piles into the substrate. Sounds produced by impact hammers and those produced by vibratory hammers evoke different responses in fishes due to the differences in the duration and frequency of the sound pressure waves. A vibratory hammer uses a combination of a stationary, heavy weight, and vibration in the plane perpendicular to the long axis of the pile. Vibratory hammers produce sounds of lower intensity, with a rapid repetition rate. When exposed to sounds that are similar to those of a vibratory hammer, fishes consistently displayed an avoidance response and did not habituate to the sound, even after repeated exposure (Dolat 1997; Enger et al. 1993; Knudsen et al. 1997; Sand et al. 2000). Conversely, fish may respond to the first few strikes of an impact hammer with a startle response, but then the startle response wanes, and some fish remain within the potentially harmful area. Dolat (1997), and Carlson et al. (2001) found that impact pile driving does not produce an adequate stimulus for sustained avoidance responses by salmonids.

The low-level continuous noise of vibratory pile driving is assumed to not injure fish. Vibratory pile drivers are often employed as a minimization/avoidance measure to reduce the potential for adverse effects on fish that could result from impact pile driving (Caltrans 2015). NMFS does not have an established injury threshold criteria for vibratory pile driving for fish (meaning that there is no level at which fish injuries are presumed to occur) (Caltrans 2020). Therefore, adverse effects from vibratory pile driving are not expected to occur. However, the vibratory sound waves will carry, likely throughout much of Winchester Reservoir and may “drive” fish away from the more harmful impact driving.

Bubble curtains are often used to attenuate sound during pile driving. A bubble curtain is simply a perforated manifold connected to air pumps that completely surrounds a pile and creates a “curtain” of bubbles around the pile as it is being driven. This interferes with sound propagation through the water. Bubble curtains are used with individual round or H-piles. Sheet piles are individual pieces of steel, typically ½ inch thick, that are “Z” shaped in profile. When the individual piles are combined in pairs, they are vaguely “A” shaped in profile. They interlock along their entire length to create a continuous corrugated wall of piling. In order for a bubble curtain to surround a sheet pile wall, the manifold would need to be lengthened with the addition of each pile. This presents significant design and construction challenges that result in bubble curtains not typically being used when installing sheet pile. In addition, GRI (2021) conducted test driving of sheet pile in the Portland Harbor and found bubble curtains to be ineffective. They drove one ½-inch-thick, 55-inch-wide steel sheet pile pair in 20 feet of water. They recorded a total of 263 pile strikes with a hydrophone placed 24.4 meters from the pile; 122 pile strikes were recorded with the bubble curtain turned on, and 141 pile strikes with the bubble curtain turned off. They found that the areas encompassed by the injury and behavioral sound thresholds were actually greater with the bubble curtain in use than without. The authors stated that “there may be several reasons for this, such as a problem with the bubble curtain itself potentially generating noise through its operation. Also, the sheet pile may have encountered a denser sediment layer toward the middle and end of the drive or the pile could have struck an obstruction.” Based on the specific patterns of sound pressure levels observed, the authors concluded that the most likely explanation for their results was a problem with the bubble curtain itself.

Because of the difficulties in deploying a bubble curtain around sheet piles, no sound attenuation is proposed for this project.

Peak sound pressure level (SPL) and sound exposure level (SEL) are used to correlate physical injury to fish from underwater sound pressure. "SPL" is defined as the maximum absolute value of the instantaneous pressure and "SEL" is a measurement of the accumulated noise energy from a single event, such as pile driving. Current NMFS pile driving noise thresholds for fish less than two grams in size are a peak pressure of 206 dB and an accumulated sound exposure level (SEL), of 183 dB (NMFS 2022a); for all other fish, thresholds are a peak pressure of 206 dB and an accumulated SEL of 187 dB. These limits are based on their potential to cause physical injury and are referred to as the “harm” thresholds. In addition, a 150 dB root mean square (rms) threshold for potential behavioral effects is also applied and is referred to as the “harassment” threshold. The distance from the pile driving to the maximum extent of each threshold is the sound “isopleth.” Stated another way, an isopleth is simply a line showing the maximum distance out from the pile that noise will meet or exceed each threshold.

NMFS provides a calculator to estimate the distance to the harm and harassment thresholds from pile driving noise. Inputs required for the calculator include the single-strike sound pressure levels for a given distance from the pile, and the estimated number of pile strikes. The assumed single strike sound pressure levels for a particular pile type are available from various sources, including IFC Jones and Stokes et al., (2009), and Caltrans (2020) and are provided in the calculator spreadsheet. We completed the model with sound monitoring results from Oakland Harbor (in Caltrans 2020), and from the results of the GRI sheet pile bubble curtain study discussed above.

DOWL obtained the estimated pile driving conditions and duration from Ballard Marine Construction. The assumptions used in assessing the effects of pile driving noise on fish were:

- OC Coho present will be greater than 2 grams in weight;
- Water depth will be zero to 15 feet;
- Sediments are 10 to 20 feet of medium-density sand, silt, and gravel over bedrock;
- Eight 14-inch H-piles will be used as spuds to anchor the sheet pile template;
- Only vibratory hammering will be used to set and remove the spud piles
- AZ sheet piles will be use, and each pair of sheet piles will comprise three feet of the wall;
- 40 pairs of sheet piles will be required (120 feet of sheet pile wall);
- The sheet piles will be vibrated to bedrock and proofed with an impact hammer;
- 20 minutes will be required to vibrate each of the sheet pile pairs to bedrock;
- Pile driving will take three days;
- 40 hammer blows will be required to proof each sheet pile pair;
- Ten minutes will be required to proof each sheet pile pair (for a total duration of 20 minutes for each pile pair of combined vibratory and impact driving);
- Twelve pairs will be installed per day on the longest pile driving day; and
- Sound pressure for the sheet piles will be:
    - Based on Caltrans (2020): 205 dB peak, 180 dB SEL, and 190 dB RMS, measured 10 meters from the pile
    - Based on GRI (2021) without attenuation: 185 dB peak, 159 dB SEL, and 173 dB RMS, measured 24.4 meters from the pile (these are the peak measured values, the mean measured values are lower). The sheet pile tested by GRI is larger than the sheet pile proposed for the Project, but larger piles typically produce greater sound pressure levels.

The results of the calculator given the above assumptions are provided in Table 5.1.

Table 5-1: Distance to various noise thresholds.

	NMFS Regulatory Thresholds			
	Onset of physical injury			Behavior RMS threshold (dB)
	Peak (dB)	Cumulative SEL threshold (dB)		
		Fish ≥ 2 g	Fish < 2 g	
	206	**187**	**183**	**150**
NMFS Calculator Results (distance to the threshold isopleth)				
Caltrans (2020)	**28.1 ft.**	**686.8 ft.**	**1,269.1 ft.**	**15,228.3 ft. (2.9 miles)**
GRI (2021)	**3.2 ft.**	**66.7 ft.**	**123.3 ft.**	**2,733.4 ft. (0.52 mile)**

The modeling results differ by approximately an order of magnitude, illustrating that site-specific conditions can have a huge effect on pile driving noise propagation. Given the site-specific conditions in the Action Area, and the inherent assumptions of the model, even the modeling based on GRI (2021) noise monitoring may be conservative. The site-specific conditions and violations of the model assumptions include:

- In the Action Area, both the water and the fish will be moving (the calculator assumes calm water and stationary fish);
- The initial vibratory pile driving and construction activity will likely cause fish to leave the immediate vicinity of the pile driving – this will not reduce the distance to the various isopleths, but will reduce the sound exposure of individual fish;
- The water will be shallower in the Action Area than the modeled assumptions. The water depth at the GRI pile driving location was 20 feet, while it will range from zero to 15 feet in the Action Area (the water depth for the Caltrans 2020 monitoring was 33 feet). Therefore, there will be much less pile length in contact with the water column than the assumption. With less pile length exposed to the water, noise propagation will be decreased;
- Greater ambient noise. Water falling over the crest of the dam immediately downstream of the in-water work zone creates a higher level of background sound than is typically encountered in pile driving situations;
- Highly turbulent water downstream. Water falling over the dam crest creates a great deal of turbulence and introduces air to the water, essentially acting like a bubble curtain; and
- The presence of the dam. The dam itself is made of timber cribbing with aggregate fill, which is likely to transmit sound with lower efficiency than water alone. In addition, between the top of the dam and the water surface downstream is a 16-foot vertical drop. There are only a few feet of water in contact with the dam on the downstream side. This vertical drop, combined with the water turbulence and ambient sound of the water falling over the dam suggests that little pile driving noise will be propagated downstream.

The behavioral threshold in the Caltrans example is nearly three miles. However, the Caltrans 2015 Pile Driving Compendium states, “it is not possible to reliably predict audibility (or detectability) with any certainty at distances beyond 500 to 1,000 meters. Consequently, the Project Action Area based on pile driving sound should never be considered to extend more than 1,000 meters (3,280 ft. or 0.62-mile) from the pile driving activity” (NMFS, 2022c, and Caltrans, 2015). Additionally, the maximum anticipated distances to the harm or behavioral thresholds are constrained by a bend in the river channel upstream. Substantial noise from pile-driving activity is not anticipated to propagate past these bends. We have included in the Action

Area the N. Umpqua River from bank to bank for 2,200 feet, the longest straight-line distance between pile driving activities and the opposite bank at the nearest upstream bend.

Given the dam’s assumed masking and blocking effects on in-water noise, we have not extended the Action Area downstream based on noise effects. Instead, we have included the N. Umpqua River from bank-to-bank for 500 feet downstream in the Action Area to account for the potential negative effects of suspended sediment.

OC Coho present in the Action Area will, at a minimum be harassed by exposure to pile driving noise. Coho modify their behavior and experience harm through reduced feeding success and altered habitat usage. The behavioral modifications may result in reduced fitness and survival of any OC Coho juveniles present. Any fish present within the injury threshold of impact driving may be injured or killed. Estimating the specific number of fish injured or killed by pile driving is not possible because of the site-specific conditions that influence noise propagation; the range of responses that individual fish will have; and the unknown density of OC Coho in Winchester Reservoir.

Conservation measures

The primary conservation measures for pile driving noise will be the use of the vibratory hammer to the maximum extent possible, and the observance of the IWWP. As discussed in Section 5.1.1, the density of Coho in Winchester Reservoir during the IWWP is expected to be very low. During the last two weeks of August (when pile driving is most likely to occur) the 7-day average maximum water temperature at Winchester Dam ranged from 19.6°C to 22.7°C in 2017 (the coolest year since 2016); and from 21.1°C to 24.3°C in 2121 (the hottest year during that period.). These temperatures are above (and in hot years, much above) the preferred temperatures for rearing and migrating OC Coho.

5.1.6 Delayed Upstream Migration

The fish ladder will be dewatered from the last week of July through the second week of August (for a total period of three weeks). As stated in Section 3.2.4, from mid-July to mid/late September, between 0.0% and 10.5% of the Coho run passed Winchester Dam (in the period of 2015 to 2021). The 10.5% was an outlier in 2019. All other years had a maximum of 6.8% passage by September 27. These percentages represent zero to 289 individual fish (ODFW 2022). Therefore, some number of Coho adults (likely less than 289 fish) could be delayed in their migration while the ladder is shut down.

During the fish ladder shutdown, all of the N. Umpqua discharge will pass through two 13-foot-wide spill gates. Just downstream of the gates is a concrete bench approximately 15 feet wide (horizontal distance), beyond which is a deep pool. The distance from the surface of the water downstream to the top of the bench (which will be covered by at least a foot of water itself) is expected to be less than four feet. Water velocities through the spillway are calculated to be eight to 13 feet per second. The horizontal distance of high velocity water through the spill way is a maximum of 40 feet, and more likely to be 20 feet or less.

These conditions are similar to natural chutes and falls adult OC Coho navigate throughout their range. Adult Coho salmon are capable of jumping 7 vertical feet and have a burst swimming speed (the speed they are able to reach for short periods of time) from 10.6 to 21.5 feet per second (Reiser et al., 2006). According to Metsker (1970, quoted in Wightman and Taylor, 1976.) salmon (species undefined) and steelhead, may travel distances up to 100 feet against water velocities nearly 27 feet per second.

Conditions through the spillway, including the deep downstream pool, expected velocities, modest jump height and short distance of elevated velocities suggest that adult Coho may be able to pass through the spillway during ladder shutdown. The worst-case scenario suggests that a few adult Coho could be delayed in their upstream migration for a short period of time (days, rather than weeks).

Conservation measures

The fish ladder will be dewatered for the shortest amount of time possible to affect repairs. This will be done early in the IWWP when the fewest number of OC Coho will be present.

5.2 Indirect Effects

Following dam repair, the “operation” of the dam will continue as before project implementation. Once any effects from project construction have abated (for instance, once turbidity has dissipated or been diluted downstream of the dam) there will be no indirect effects to the Environmental Baseline. Because the Environmental Baseline will be unchanged by the proposed Project, there will be no medium to long term effects on OC Coho Critical Habitat, or individual OC Coho. ODFW will continue to operate the fish ladder in the same manner as it has been operated for many years, and the dam will continue to exist in the same configuration as it has since its most recent significant alteration in1984.

5.2.1 Continued Existence of the Dam

Hydro projects on low-head, run-of-river, dams have historically been viewed as a generally low-impact method of clean energy generation (Kuriqi et al., 2021). However, the effects are poorly studied, and what studies of run-of-river dams do exist, tend to focus on hydropower facilities at such dams, rather than just the effects of the dams themselves (Bilotta et al., 2016). The most common identified impacts of run of river hydropower projects and dams include water depletion downstream of the diversion, water quality deterioration, loss of longitudinal connectivity, habitat degradation, and simplification of the biota community composition (Kuriqi et al., 2021).

The effects of Winchester Dam on the water quality Environmental Baseline; the longitudinal connectivity Environmental Baseline (as it affects fish migration, LWM and sediment transport); and habitat Environmental Baseline (as it affects the baseline pathways and indicators) are discussed in Section 4.0.The Proposed action would result in the continuation of those effects for the life of the structure. Water depletion does not occur in any reach due to Winchester Dam.

Winchester Dam almost certainly causes a shift from stream-oriented aquatic invertebrates above and below Winchester Reservoir to lake-oriented invertebrates within Winchester Reservoir itself (Stanley et al., 2002). Simplification of the biotic community may occur in Winchester Reservoir, but invertebrate productivity is as likely to be higher than lower when compared to upstream and downstream reaches. However, DOWL was unable to identify any data on macroinvertebrate composition or productivity in the North Umpqua River. It is possible that in winter and spring, downstream migrating Coho, or Coho displaced from the limited pools and other rearing habitats upstream, take advantage of Winchester Reservoir invertebrate productivity and rear in the lake prior to outmigration. This is supported by the fact that Coho juveniles have been observed to rear extensively in reservoirs during winter (Beamsderfer et al., 2005). It is also possible that Winchester Reservoir negatively affects juvenile and adult Coho by transforming a more complex river channel to a uniform lake-like environment. Unfortunately, due to a lack of data, any conclusions regarding macroinvertebrate or fish rearing effects of Winchester Dam would be speculation.

Winchester Dam has been in existence since 1890 and has had fish passage since 1923 (representing the equivalent of over 30 generations of Coho salmon). Winchester Dam was not identified as a Priority Action for species recovery in the N. Umpqua watershed in 2016 (see Section 3.2.5). The dam is number 26 on the 2019 ODFW Fish Passage Prioritization List, but DOWL identified no empirical evidence confirming that the dam is negatively affecting population numbers of OC Coho. Rather, high water temperatures, lack of rearing habitat, and poor ocean conditions are likely much more deleterious to OC Coho populations in the N. Umpqua than is Winchester Dam. That being said, Winchester Dam clearly presents more of a passage impediment than would that section of the N. Umpqua River in an unaltered state. Determining the degree to which Winchester Dam impedes upstream migration would require extensive and carefully planned field investigations. These field investigations would not be benign, and would lead to direct take from handling, tagging, and tracking adult OC Coho.

In determining whether a proposed action is reasonably likely to result in take, the Services use a simple causation principle: “but for” the implementation of the proposed action, would actual injury, mortality, or harassment to individuals of a species be reasonably likely to occur? Clearly the construction-derived effects of the proposed Project (short term increases in turbidity, noise effects, etc.) would not affect ESA-listed species “but for” the Project. However, were the proposed Project not undertaken, whatever negative effects there are from the mere existence of the dam would continue, at least for several years. The proposed action will likely extend the life of Winchester Dam. However, it cannot necessarily be said that the existence of the dam, and its attendant consequences, would not continue “but for” the proposed Project.

Without the proposed action, the dam would continue to exist, and its condition would steadily deteriorate. This continued deterioration could lead to conditions worse for OC Coho than the proposed Project. If water were to infiltrate the dam at accelerating rates, this could lead to multiple areas of false attraction flow, and eventually render the fish ladder inoperable. If deterioration continued beyond that point, the dam may eventually collapse or be removed, but it isn’t clear the degree to which dam removal would benefit populations of OC Coho. Dam removal would likely have greater short-term impacts to OC Coho than the Proposed project, given that it would be a much more extensive in-water construction project with a longer duration, much larger footprint, and more significant construction effects. Removal of the dam may also benefit Coho long-term, but the degree to which removal of the dam would benefit OC Coho populations is unknowable without field investigation.

Winchester Dam has utility beyond just the formation of Winchester Reservoir for the benefit of the WWCD. These benefits would be lost should the dam be removed or allowed to deteriorate to the point that the ladder no longer functions. Fish counts at Winchester Dam are a valuable tool for assessing fish population numbers and trends and are one of the longest-term passage data sets anywhere in Oregon. Invasive small mouth bass (a documented predator of juvenile salmonids) have not colonized the North Umpqua above Winchester Dam even though the S. Umpqua has had a robust population since at least the mid-1970s (although at least a few smallmouth bass have been identified in the North Umpqua River, ODFW, 2022b) and it is possible that Winchester Dam has at least played a role in keeping them out of the basin (Fabian Carr, anecdotal information in University of Oregon, 2017; Gates, 2013).

In conclusion, the Proposed project will likely extend the life of Winchester Dam, which must be navigated by migrating OC Coho. However, the degree to which impeded passage and other potential Dam effects have reduced OC Coho populations, or even negatively affected individual fish in the North Umpqua River, is unknown.

Conservation measures

Given its age and initial construction methodology, Winchester Dam has required relatively frequent maintenance, resulting in direct effects to OC Coho and other fish species in the North Umpqua River. The design of the proposed Project is robust and is intended to be a long-term solution to reduce the need for frequent dam repairs. The Project, as designed, will reduce impacts to OC Coho over the long term from in-water work that would otherwise be required.

As was stated in Section 4.4.2, adult Coho have been observed in the fish ladder with apparently fresh “gashes” on their sides. The source of these gashes has not been definitively identified, but it is suspected that they may be from exposed rebar or other sharp surfaces in the fish ladder. WWCD will coordinate with ODFW to grind-down or otherwise eliminate sharp surfaces in the fish ladder during the period that it is shut down for dam repairs. Taken together, these actions will provide more safe and effective fish passage than is currently the case. The Project will improve passage over the dam by eliminating the false attraction flow, repairing sharp surfaces that may be present, and reducing future maintenance of the dam that would result in cumulative effects.

5.2.2 Interference with Natural Stream Geomorphological Processes

When gravel is removed from streams, this can change the bed elevations, width/depth ratio, and the bank erosion and channel stability dynamics. Winchester dam could be blocking gravel recruitment to areas below the dam from upstream locations. Fine sediments are carried over the dam during high flows, and it is possible that gravels are also transported downstream during floods.

Because it is run-of-the-river, Winchester Dam does not regulate flow and therefore should have no observable effect on aggradation, channel migration, or LWM recruitment either below or above the dam. The dam does create the relatively slack-water Winchester Reservoir, which reduces bank erosion and LWM recruitment, and increases fine sediment deposition in the pool itself, but those effects extend 1.45 stream miles out of 1,380 accessible stream miles in the Upper Umpqua basin, (ODFW 2005) and 6,568 miles of OC Coho critical habitat throughout its range. The negative effects to geomorphological processes caused by Winchester Dam do not extend upstream past the Winchester Reservoir and are likely so minor as to be biologically benign downstream of the lake.

5.2.3 Climate

Winchester Dam presumably as little to no effect on climate, but any warming of the N. Umpqua River in Winchester Reservoir may exacerbate the effects of climate change on OC Coho.

However, there is no strong evidence that Winchester Dam is increasing water temperature in the N. Umpqua River. The presence of the dam may lead to increased recreation on the water, and an accompanying increase in emissions. However, it’s not certain whether the absence of Winchester Reservoir would lead to a net decrease in emissions, or if that recreation would be displaced elsewhere, leading to greater travel distances (and thus increase emissions).

5.3 Relevance of Effects on Individual Fish to Salmonid Population Viability

Any instream project affects individual fish. And while a given activity may harass, injure, or kill individual fish, it may still have no measurable effect to the status or viability of an ESU. Viable Salmonid Populations (VSPs) have sufficient abundance, productivity (population growth rate), spatial structure, and diversity. The potential project effects on each of these criteria are discussed below.

5.3.1 Abundance

The proposed project may have a very minor effect on abundance. Any effects on abundance would be caused by losses of juvenile fish from fish salvage, exposure to construction noise, or other project effects. This loss is not expected to appreciably alter the abundance of the North Umpqua River population or appreciably affect population trends. Altered behavior from temporary increases in turbidity or other project effects is not expected to reduce returns of adult steelhead to the basin, nor affect population trends.

5.3.2 Productivity

The proposed Project may have a very small effect on freshwater productivity should it lead to the death of juvenile salmonids from project construction or reduce reproductive success by delaying upstream migrants. However, the scale of impact is expected to be so small that it will not appreciably affect species productivity.

5.3.3 Spatial Structure and Diversity

The proposed Project will not restrict the geographic distribution of OC Coho or constrain their ecological, genetic, and phenotypic diversity. Therefore, the Project will have no effect on spatial structure or diversity above the affect already included in the Environmental Baseline.

5.4 Effects from Interdependent and Interrelated Actions

An interdependent activity is an activity that has no independent utility apart from the proposed action. We did not identify interdependent effects of the proposed action on listed fish species.

Interrelated actions include “actions that are part of a larger action and depend on the larger action for justification.” We did not identify any interrelated actions. No interrelated actions that would affect any designated critical habitat PCEs for listed salmonids are anticipated.

5.5 Cumulative Effects

Cumulative impacts as defined by rule “are those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the Action Area of the Federal Action subject to consultation” (50 CFR Part 402.02).

Additional projects within the watershed are anticipated as population growth continues in the region. Associated road and commercial development, as well as maintenance and upgrading of the existing infrastructure, are therefore likely to occur in the foreseeable future. Within the project Action Area, gradual habitat and water quality improvements may also occur over time as federal, state, and private conservation and habitat enhancement efforts are implemented.

A standard of “reasonably certain to occur” is clarified as “those actions that are likely to occur, bearing in mind the economic, administrative, or legal hurdles which remain to be cleared”. Further, NMFS provides that “speculative actions that are factored into the cumulative effects analysis add needless complexity into the consultation process…” (51 FR 19933).

Recurring Winchester Dam maintenance has been an on-going effect leading to cumulative effects for OC Coho salmon. This Project has been designed robustly to minimize future maintenance effects at Winchester Dam. No other specific actions that would result in Cumulative Effects were identified.

5.6 Effects on the Environmental Baseline

The effects on the environmental baseline are summarized in Table 5-2.

Table 5-2: Potential Effects of the Project on the Environmental Baseline

Pathways and Indicators	Comments
Water Quality	
Water Temperature	No direct effects. Continued existence of the dam may contribute to elevated water temperatures in the lower N. Umpqua River, but no effect over the existing baseline is anticipated.
Sediment/Turbidity	Construction will cause short-term increases in turbidity. However, the number of OC Coho in the Action Area during the in-water work period is expected to be low, and increased turbidity is expected to be minor and of short duration.
Contamination/Nutrients	The project is not expected to negatively affect the nutrient/contaminant load.
Habitat access	
Physical Barriers	There will be a three-week period when the fish ladder is dewatered during construction. This may affect upstream migration for a few adult Coho, but those fish should still be able to migrate upstream through the spillway. The project will affect salmonid access in the long term, in that it will facilitate continued existence of the dam.
Habitat elements	
Substrate	There will be no direct negative effects on substrate composition, quality or availability. Continued existence of the dam will affect substrates in Winchester Reservoir and downstream of Winchester Dam, but a lack of spawning gravels has not been identified as limiting to OC Coho in the basin. No effects above the existing Environmental Baseline are anticipated.
Large Woody Material	Because no trees will be removed, there should be no effect to LWM recruitment. Continued existence of the dam may affect LWM recruitment in the Winchester Reservoir, but few trees exist on the margins of the lake, and therefore, this effect is not expected to be biologically meaningful.
Pool Frequency/Quality	No negative effects anticipated.
Off-channel habitat	The project will have no effect on off-channel habitat.
Refugia	The project will have no effect on refugia.
Channel conditions	
Width/Depth Ratio	The project will have no effect on Width/Depth ratio. Continued existence of the dam does affect the Width/Depth ratio of Winchester Reservoir, but no effects above the Environmental Baseline are anticipated.
Streambank Condition	The streambank condition will be unchanged.
Floodplain Connectivity	Floodplain connectivity will be unaffected.
Flows/Hydrology	
Change in Peak/Base Flow	No effects are anticipated.
Increase in Drainage Network	No effects are anticipated.
Watershed conditions	
Road Density and Location	No effects are anticipated.
Disturbance History	The site will be further disturbed during in-water work, but the negative effects of this disturbance will be mitigated through the use of construction BMPs and timing of the in-water work. The proposed project should reduce routine maintenance long-term.
Riparian Reserves	The riparian reserves in the Action Area will be unaffected by the proposed action.

5.7 Effects on Critical Habitat

PBFs of OC Coho Critical Habitat present in the Action Area and the project effects on those PBFs are summarized in Table 5-2. The proposed project is "***likely to adversely affect***" water quality and forage PBFs. The proposed project would not destroy or adversely modify critical habitat for listed salmonids.

Table 5-3: Potential project effects on specific critical habitat PCEs for listed salmonids that are known to use the project Action Area.

Habitat Type	PBFs	Potential Project Effects
Freshwater rearing	Water Quantity	No effects are anticipated.
	Floodplain Connectivity	Floodplain connectivity will not be affected.
	Water Quality	There would be a short-term increase in turbidity during periods when rearing juveniles are expected to be rare.
	Forage	Forage at the site will be negatively impacted by initial reservoir drawdown. However, benthic invertebrates should quickly recolonize areas following refilling of the pool. Thus, the amount of available food resources is unlikely to decrease post-project.
	Natural Cover	Natural cover will not be affected by the proposed action.
Freshwater migration	Free Passage	Passage through critical habitat will not be affected above the environmental baseline, except during the three-week construction period when the ladder is shut down.
	Water Quantity	No effects are anticipated.
	Water Quality	There would be a short-term increase in turbidity during periods when upstream and downstream migrants are expected to be rare.
	Natural Cover	No negative effects are anticipated.

5.8 Effect of the Proposed Action on Tribal Resources and Interests

The Cow Creek Band of Umpqua Tribe of Indians is one of nine federally recognized Indian Tribal Governments in the State of Oregon. The Cow Creek Tribal Nation, located in southwestern Oregon, has nearly 1,390 members. The Cow Creek Band of Umpqua Tribe of Indians historically occupied the entire N. Umpqua basin (https://www.cowcreek-nsn.gov/tribal-story/pre-contact/, accessed 05/10/2022) and are actively involved in salmon restoration and management. Since 2010, the tribe has received $1.8 million in grants from the Pacific Coastal Salmon Recovery Fund to restore 3 miles of instream habitat, improve six acres of stream miles, remove 5 fish passage barriers, and assess habitat conditions, fish and lamprey presence and distribution on 77 miles of stream. WWCD will work with the tribe and ODFW to insure robust salvage of lamprey from previously-identified lamprey habitat in Winchester Reservoir.

The tribe is currently working with ODFW and other Native American tribes on a "Rogue-South Coast Multi-Species Conservation and Management Plan." In addition, tribal staff work with ODFW to address low returns of Spring Chinook in the S. Umpqua, partners with OWEB, ODFW, non-profit organizations and local Watershed Councils in the Umpqua Basin Partnership to obtain funding for restoration projects, and actively participates in many other planning and regulatory activities with other tribes and governmental partners (ODFW 2020). Although no Indian lands are present in the project Action Area, it is expected that the tribes are concerned with the status of OC Coho salmon populations and their habitat as a whole. As the project will not significantly degrade OC Coho habitat, and have little negative effect to individual OC Coho salmon, the proposed project should have only very limited effects on tribal resources and interests.

5.9 Use of Best Scientific and Commercially Available Data

The most recent and up-to-date information available was utilized in the preparation of this BA. No on-going research projects likely to provide significant useful data were identified or are known to exist. No significant data gaps were identified that are likely to affect the conclusions of this BA. All relevant information obtained was utilized and cited as appropriate in the text.

5.10 Effects Determination

The USFWS and NMFS have published guidelines for making determinations of effect for listed species and critical habitats protected under the federal ESA. A determination of ***"no effect"*** is the appropriate conclusion when "the proposed action will not affect (i.e., harm or harass) listed species or critical habitat." "Harm" is an act that actually injures or kills listed species (50 CFR § 17.3). "Harassment" is defined as an "intentional or negligent act or omission which creates the likelihood of injury to listed species by annoying it to such an extent as to **significantly** disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering" (50 CFR § 17.3).

A determination of ***"is not likely to adversely affect"*** is "the appropriate conclusion when effects on listed species or critical habitats are expected to be discountable, or insignificant, or completely beneficial." The guidelines offer further clarification indicating that; "***insignificant effects*** relate to the size of impact and should never reach the scale where take occurs. ***Discountable effects*** are those extremely unlikely to occur. Based on best judgment, a person would not (1) be able to meaningfully measure, detect, or evaluate insignificant effects; or (2) expect discountable effects to occur." A ***"likely to adversely affect"*** determination is "the appropriate conclusion if any adverse effect to listed species may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effect is not: discountable, insignificant, or beneficial" (NMFS 1996, USFWS and NMFS 1998).

After evaluating the potential effects and available scientific and commercial data, we conclude that the proposed action is ***likely to adversely affect*** OC Coho.

A determination of *"likely to adversely affect"* is the appropriate conclusion since the potential project effects cannot be classified as "discountable, insignificant, or beneficial" (NMFS 1996, USFWS and NMFS 1998). The potential project effects can't be termed "insignificant" since insignificant effects are defined as "effects that should never reach the scale where take occurs" (ibid). Under the ESA definition, "take" includes both harm and harassment (50 CFR § 17.3). Because a few migrating adults and a few rearing or migrating juveniles may be present during in-water work, take in the form of harassment from pile-driving noise, fish salvage, and increased turbidity levels could occur. The proposed Project will also extend the life of the dam, affecting OC Coho. However, these effects will not be above the current environmental baseline. There will be no significant long-term adverse impacts (months to years) that would affect the survival and/or recovery of any listed salmonids that utilize the project Action Area.

The proposed action will not significantly “hinder the attainment of relevant functioning indicators” as defined in “Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Watershed Scale” (NMFS 1996). The proposed project would not result in the *“destruction or adverse modification”* of designated critical habitat. No significant cumulative effects were identified and no negative effects from interrelated or interdependent actions on listed salmonids or their critical habitats were identified within the proposed Project Action Area.

6.0 ESSENTIAL FISH HABITAT

The Magnuson-Stevens Act (MSA) requires proposed projects with a federal nexus to evaluate their impacts on the habitat of commercially managed fish populations. EFH has been defined for the purposes of the MSA as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity” (16 U.S.C. 1802(10)). NMFS has further added the following interpretations to clarify this definition:

> *“Waters” include aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and may include areas historically used by fish where appropriate;*
>
> *“Substrate” includes sediment, hard bottom, structures underlying the waters, and associated biological communities;*
>
> *“Necessary” means the habitat required to support a sustainable fishery and the managed species’ contribution to a healthy ecosystem; and*
>
> *“Spawning, breeding, feeding, or growth to maturity” covers the full life cycle of a species (50 CFR § 600.10).*

The analysis of the effects provided below regarding the proposed project is made pursuant to Section 305(b)(2) of the MSA. Under this act, Federal agencies are required to consult with NMFS regarding any of their actions authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken that may “adversely affect” EFH. “Adverse effect” means any impact that reduces the quality and/or quantity of EFH, which can include direct (e.g., contamination or physical disruption), indirect (e.g., loss of prey, reduction in species’ fecundity), site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR § 600.810).

Cumulative impacts are incremental impacts, occurring within a watershed or marine ecosystem context, which may result from individually minor but collectively significant actions. The assessment of cumulative impacts is intended in a generic sense to examine actions occurring within the watershed or marine ecosystem that adversely affects the ecological structure or function of EFH. The assessment should specifically consider the habitat variables that control or limit a managed species’ use of a habitat. It should also consider the effects of all impacts that affect either the quantity or quality of EFH (50 CFR § 600.815).

For any Federal action that may adversely affect EFH (except those activities covered by a General Concurrence), federal agencies must provide NMFS with a written assessment of the effects of that action on EFH. EFH consultations can be completed using the ESA Section 7 consultation process provided that the action agency supplies the information required by 50 CFR § 600.920 (NMFS 2001).

An EFH assessment must contain:

- a description of the proposed action;
- an analysis of the effects, including cumulative effects, of the proposed action on EFH, the managed species, and associated species, such as major prey species, including affected life history stages;
- the Federal agency’s views regarding the effects of the action on EFH; and
- proposed mitigation, if applicable (50 CFR § 600.920).

The earlier sections of this document present a detailed description of the proposed project and all potential impacts to species listed as threatened or endangered under the ESA. In broad terms, the effects and conservation measures discussed in earlier sections of this report in relation to UWR Chinook salmon are also applicable to the species covered under the MSA. The following section presents an identification of EFH within the Action Area, an analysis of effects, and a determination of these effects on EFH.

6.1 Identification of EFH

6.1.1 Coastal Pelagic Fish Species

The CPS fishery includes four finfish species [Pacific sardine (*Sardinops sagax*), Pacific mackerel (*Scomber japonicus*), northern anchovy (*Engraulis mordax*), and jack mackerel (*Trachurus symmetricus*)] and the invertebrate, market squid (*Logigo opalescens*). All of these species are restricted to marine and saline estuarine waters. EFH for Coastal Pelagic species does extend up the mouth of the Umpqua River and connected waterways to approximately RM 12.5 (https://www.fisheries.noaa.gov/resource/map/essential-fish-habitat-mapper). However, the Action Area is located well above the maximum extent of saltwater intrusion and does not include EFH for Coastal Pelagic Species.

6.1.2 West Coast Groundfish

The West Coast Groundfish Fisheries Management Plan (FMP) manages 83 species over a large and ecologically diverse area. The EFH for Pacific coast groundfish is defined as the aquatic habitat necessary to allow for groundfish production to support long-term sustainable fisheries for groundfish and for groundfish contributions to a healthy ecosystem. The boundaries for West Coast groundfish EFH are generally defined as all waters from the mean higher highwater (MHHW) line, and the upriver extent of saltwater (>0.5 parts per thousand [ppt] salinity) intrusion in river mouths along the coasts of Washington, Oregon and California seaward to the boundary of the U.S. EEZ (64 FR 49092). EFH for West Coast Ground fish does extend a bit farther than Coastal Pelagic EFH up the Umpqua River mainstem (to approximately RM 12.75), but as with Coastal Pelagic EFH, the Action Area is located well above the maximum extent of saltwater intrusion and does not include EFH for West Coast Groundfish.

6.1.3 Pacific Coast Salmon

In September 2000, NMFS approved the Pacific Fishery Management Council's Amendment 14 to the Pacific Coast Salmon Plan. Appendix A to Amendment 14 defines freshwater EFH for chinook salmon and Coho salmon as including all streams, lakes, ponds, wetlands, tributaries and other water bodies currently viable and most of the habitat historically accessible to these species in Washington, Oregon and California within specific hydrologic units.

The Action Area includes habitats that have been designated as EFH for Coho salmon and Chinook salmon. Both fall and spring chinook salmon are present in the Umpqua River watershed and belong to the non-listed Oregon Coast Chinook ESU. Chinook use the Umatilla River and its tributaries high into the upper watershed. According to OregonExplorer, the Action Area provides spawning habitat for Fall and Spring Chinook. Thus, the Action Area is designated as EFH for listed (threatened) Coho salmon and unlisted Chinook salmon.

There is a long history of stocking both Chinook and Coho in the N. Umpqua. The Rock Creek Hatchery was located just upstream of the confluence of Rock Creek and the North Umpqua but was destroyed by the Archie Creek Fire in September 2020. The hatchery was operated by ODFW for adult collection, spawning, incubation, and rearing of Chinook, Coho, Steelhead, and Rainbow Trout (ODFW, 2019b). The Coho produced at the facility were released into Cow Creek, a tributary of the South Umpqua south of Roseburg. Fall chinook produced at the hatchery were released near the mouth of the Umpqua River at Gardiner and to Winchester Bay. Spring chinook and summer steelhead eggs harvested and fertilized at the hatchery were transferred to Salmon and Trout Enhancement Programs (STEP) and/or released into the North Umpqua River.

Both Spring and Fall Chinook are counted as they transit Winchester Dam. Figures 6-1, and 6-2 illustrate yearly returns and ten-year rolling average returns at Winchester Dam for Fall Chinook, total Spring Chinook and wild Spring Chinook (all excluding jacks). Note that the two charts are at different scales.

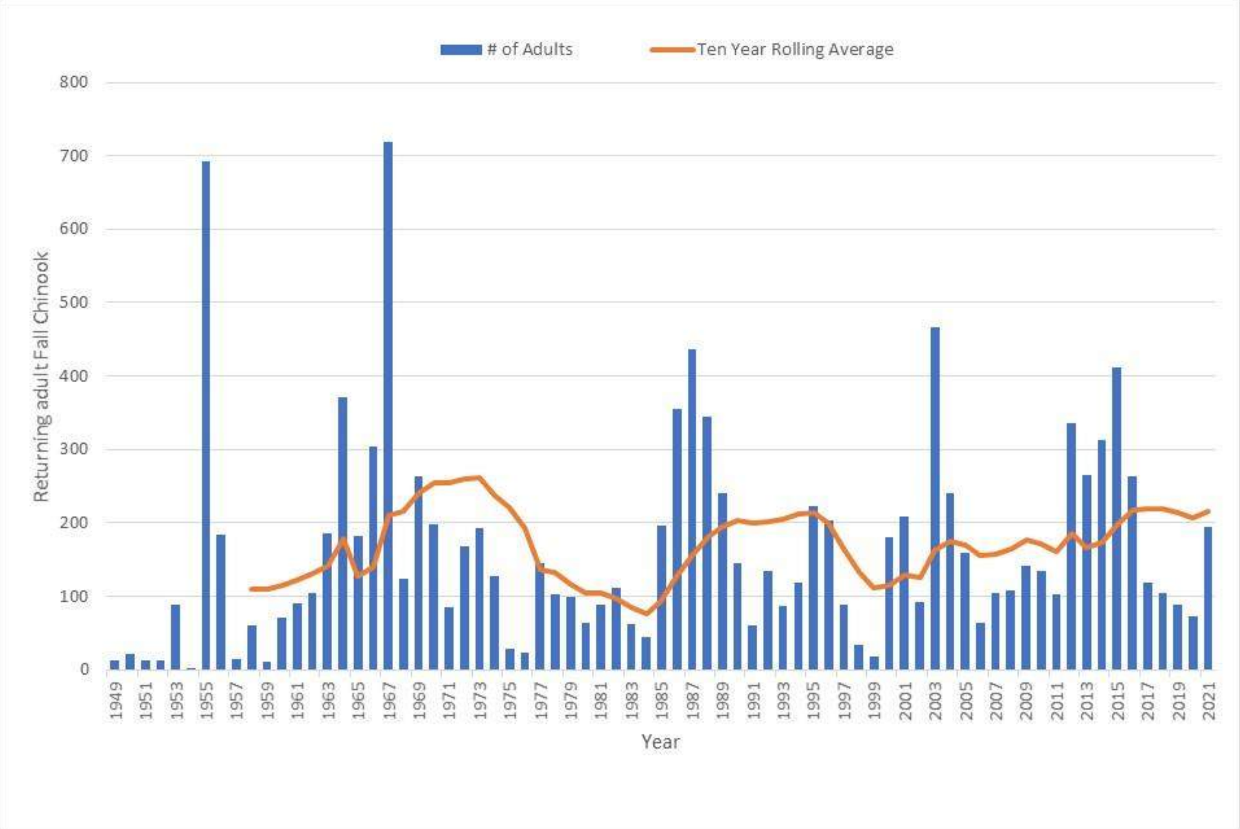


Figure 6-1: Fall Chinook passage at Winchester Dam, 1949 to 2021

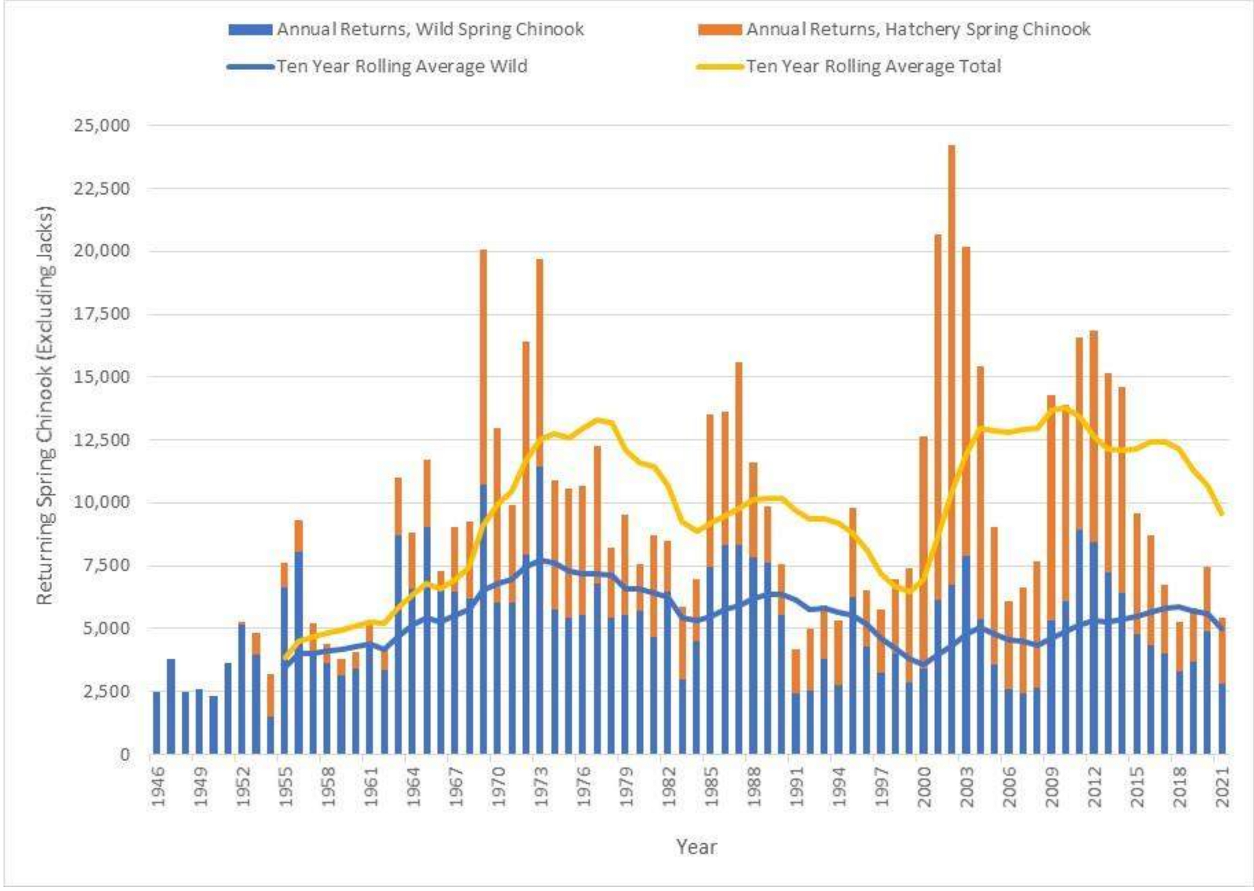


Figure 6-2: Spring Chinook passage at Winchester Dam, 1949 to 2021

Timing of use by Spring and Fall Chinook differs from that of Coho (in Section 3.2.6 above). Table 6-1 illustrates timing of use for all life stages of Spring and Fall Chinook in the Action Area. Based on this life stage timing, early returning fall adults, migrating juvenile fall chinook, and migrating Spring chinook could be present in the July 22 to September 15 IWWP for the Action Area.

Table 6-1: Typical Timing of Chinook Salmon Usage of the North Umpqua River below Slide Creek Dam (ODFW, 2021).

ESU: Lifestage	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Oregon Coast Fall Chinook								**IWWP**				
Adult Migration									▨	■	■	▨
Adult Holding									▨	■	■	▨
Spawning	▨								▨	■	■	▨
Egg Incubation	■	■	▨							■	■	■
Juvenile Rearing			■	■	▨							
Juvenile Migration			▨	■	■	■	■	■	■			
Oregon Coast Spring Chinook												
Adult Migration		▨	■	■	■	■	▨	▨	▨			
Adult Holding					▨	■	■	■	■	▨		
Spawning								▨	▨ ■	■	▨	
Egg Incubation	■	■	▨					▨	▨ ■	■	■	■
Juvenile Rearing	▤	▤	▤	▤	▤	▤	▤	▤	▤	▤	▤	▤
Juvenile Migration				▨	■	■	■	■	■			

■ Represents peak level of use.

▨ Represents lesser level of use.

▤ Represents known presence with uniform or unknown level of use.

Note: Information collected from ODFW.

Between 2005 and 2015, between 3% and 8.9% of the Spring chinook run passed Winchester Dam between July 15 and September 15. From 2005 to 2015, between July 16 and August 15, (the period when the fish ladder will be dewatered), between 89 and 1,420 spring Chinook passed through the Winchester Dam fish ladder. In the years 2015 to 2021, between 182 and 289 spring Chinook passed through the Winchester Dam fish ladder in the interval from July 19/20 to September 15, 26, or 27. Numbers were not reported annually for fall Chinook until November 16 of each year from 2005 to 2014, indicating that Fall Chinook migrate after the IWWP for the Action Area.

6.1.4 EFH Effects Analysis

Construction Consequences

The EFH for Coho and Chinook salmon consists of the water and substrate within the Action Area. Construction effects to OC Coho are described in Section 5.1 above and are essentially identical to the effects to Chinook. Therefore, the analysis of effects is valid for both species.

There may be more Chinook present in the N. Umpqua during the period of fish ladder dewatering, than there are OC Coho. However, swimming and jumping abilities of Chinook are superior to those of Coho. Chinook can jump up to 2.38 meters (7.8 feet) vertically and achieve burst swimming speeds of 3.29 to 6.82 m/sec (10.8 to 22.4 ft/sec) (Reiser et al., 2006). Therefore, Chinook salmon should be able to navigate the flows through the spillway and continue their upstream migration during work at the fish ladder.

Indirect and Cumulative Effects

Potential indirect and cumulative effects of the proposed project on OC Coho salmon were discussed in the BA (Section 5.0). The findings for Coho salmon are also applicable to Chinook salmon.

Cumulative effects associated with the proposed actions are unlikely to affect EFH. Any cumulative or indirect impacts associated with other projects planned in the vicinity of the project area would be required to comply with existing or emerging development standards required to protect habitat for fish species. These standards are intended to protect water quality, hydrologic conditions, stream habitat conditions, riparian buffers, and wetlands.

6.2 EFH Effects Determination

As with the effects to OC Coho, the potential direct, indirect, and cumulative effects of the proposed project are "***likely to adversely affect***" identified EFH in the short-term for the project Action Area evaluated, based on consideration of the EFH requirements of the CPS fishery, West Coast groundfish fishery, and the Pacific Coast salmon fishery. No adverse long-term effects on EFH are anticipated. It is expected that the conservation measures described in the BA are also applicable to EFH and would satisfy the requirements pursuant to Section 305(b)(4)(A) of the MSA.

7.0 REFERENCES

Abatzoglou, J. T., D. E. Rupp, and P. W. Mote. 2014. Seasonal climate variability and change in the Pacific Northwest of the United States. Journal of Climate 27(5):2125–2142

Abbott, R. and E. Bing-Sawyer. 2002. Assessment of Pile Driving Impacts on the Sacramento Blackfish (*Orthodon microlepidotus*). Draft report prepared for Caltrans District 4.

Alexander, G. R., and E. A. Hansen. 1986. Sand bed load in a brook trout stream. North American Journal of Fisheries Management 6:9-23.

Anderson, J.J. 1990. Assessment of the Risk of Pile Driving to Juvenile Fish. Fisheries Research Institute, University of Washington. Seattle, Washington.

Beamesderfer, R., B. Romey, B. Taylor, A. Kalin, and S.P. Cramer. 2001. Issue F2 Documentation of Existing and Historic Habitat and Native and Introduced Fish in the Clackamas Basin. Prepared for Portland General Electric, Portland, OR.

Bell, M.C.. 1986. Fisheries handbook of engineering requirements and biological criteria. Fish Passage Development and Evaluation Program. U.S. Army Corps of Engineers. 209pp.

Berg, L., and T.G. Northcote. 1985. Changes in territorial, gill-flaring, and feeding behavior in juvenile Coho salmon (Oncorhynchus kisutch) following short-term pulses of suspended sediment. Canadian Journal of Fisheries and Aquatic Sciences 42:1410-1417.

Berg, L., and T.G. Northcote. 1985. Changes in territorial, gill-flaring, and feeding behavior in juvenile Coho salmon (Oncorhynchus kisutch) following short-term pulses of suspended sediment. Canadian Journal of Fisheries and Aquatic Sciences 42:1410-1417.

Bilotta GS, Burnside NG,Gray JC, Orr HG (2016) The Effects of Run-of-River Hydroelectric Power Schemes on Fish Community Composition in Temperate Streams and Rivers.PLoSONE11(5):e0154271.doi:10.1371/journal.pone.0154271

Birtwell I.K., G.F. Hartman, B. Anderson, O.J. McLeay, and J.G. Malick. 1984. A brief investigation of Arctic Grayling (Thymallus arcticus) and Aquatic Invertebrates in the Minto Creek Drainage, Mayo, Yukon Territory: an Area Subjected to Placer Mining. Department of Fisheries and Oceans, Fisheries Research Branch, West Vancouver Laboratory. Canadian Technical Report, Fisheries and Aquatic Sciences. No. 1287.

Bjornn, T. and D. Reiser. 1991. Habitat requirements of salmonids in streams. In Meehan, W. ed., Influences of Forest and Rangeland Management on Salmonids Fishes and Their Habitat. American Fisheries Society Special Publication 19. pp. 83-138.

Bjornn, T.C., M.A. Brusven, M.P. Molnau, J.H. Milligan, R.A. Klamt, E. Chacho, and C. Schaye. 1977. Transport of granitic sediment in streams and its effect on insects and fish. University of Idaho, College of Forestry, wildlife and Range Sciences, Forest, Wildlife and Range Experiment Station Bulletin 17, Moscow, Idaho.

Blumm, M.C. and B. Kloos. 1986. Small Scale Hydropower and Anadromous Fish: Lessons and Questions from the Winchester Dam Controversy. *Environmental Law.* Vol. 16, No. 3, SYMPOSIUM ON SALMON LAW (Spring 1986), pp. 583-637 (55 pages). Published by: Lewis & Clark Law School

Caltrans 2015. Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish California Department of Transportation Division of Environmental Analysis Environmental Engineering Hazardous Waste, Air, Noise, Paleontology Office 1120 N Street, Room 4301 MS27 Sacramento, CA 95814 Contact: Bruce Rymer 916/653-6073

Caltrans 2020. Technical Guidance for the Assessment of the Hydroacoustic Effects of Pile Driving on Fish. California Department of Transportation Division of Environmental Analysis Sacramento, CA.

Carlson, T.J., G.R. Ploskey, R.L. Johnson, R.P. Mueller, M.A. Weiland and P.N. Johnson. 2001. Observations of the behavior and distribution of fish in relation to the Columbia River navigation channel and channel maintenance activities. PNNL-13595. Pacific Northwest National Laboratory. Richland, WA.

Constable, R., Suring, E. 2022. Juvenile Salmonid Monitoring in Coastal Oregon and Lower Columbia Streams, 2021 Field Season. Project Number: OPSW-ODFW-2022-1. Project Period: 2021.Oregon Department of Fish and Wildlife, 4034 Fairview Industrial Drive SE Salem, OR 97302

Cordone, A.J., and D.W. Kelley. 1961. The influences of inorganic sediment on the aquatic life of streams. Cal. Fish and Game 47:189-228.

Crouse, M.R., C.A. Callahan, K.W. Malueg, and S.E. Dominguez. 1981. Effects of fine sediments on growth of juvenile Coho salmon in laboratory streams. Transactions of the American Fisheries Society 110:281-286.

Crozier, L. G., M. D. Scheuerell, and R. W. Zabel. 2011. Using time series analysis to characterize evolutionary and plastic responses to environmental change: a case study of a shift toward earlier migration date in sockeye salmon. American Naturalist 178:755-773

CTC and Associates. 2016. Determining the Appropriate Amount of Time to Isolate Portland Cement Concrete from Receiving Waters. Prepared for the Caltrans Division of Research, Innovation, and System Information. February, 2016.

Dolat, S.W. 1997. Acoustic measurements during the Baldwin Bridge demolition. Prepared for White Oak Construction by Sonalysts, Inc. Waterford, CT. 34p. plus Appendices

Enger, P.S., H.E. Karlsen, F.R. Knudsen, and O. Sand. 1993. Detection and reaction of fish to infrasound. Fish behavior in relation to fishing operations. ICES Marine Science Symposia. 196:108-112

Law, D, S. Setunge, R. Adamson and L. Dutton. 2013. Effect of Leaching from Freshly Cast Concrete on pH. Magazine of Concrete Research, Vol. 65, No. 15, pages 889-897.

Ford, M., Anderson, E., Garza, JC., Myers, J., Williams, TH, Waples, R. 2022. Report on a review of the Oregon coast and Southern Oregon Northern California Coastal spring Chinook salmon ESU configuration. NMFS Northwest and Southwest Fisheries Science Centers. 27pp. https://media.fisheries.noaa.gov/2021-08/OC_SONCC%20spring%20Chinook%20ESU%20report%20060221.pdf (Accessed 05/02/2022.

Gates, B. 2013. Finding Bass in the Umpqua. The Madras Pioneer. https://pamplinmedia.com/msp/132-sports/157578-finding-bass-in-the-umpqua

Geyer, Nancy A. 2003. Lower North Umpqua Watershed Assessment and Action Plan. July, 2003. Prepared for the Umpqua Basin Watershed Council and the USDI Bureau of Land Management, Roseburg, Oregon.

Good, T.P., R.S. Waples, and P. Adams (editors). 2005. Updated status of federally listed ESUs of West Coast salmon and steelhead. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-66, 598 p.

Google maps. 2022. https://www.google.com/maps/place/Winchester+Dam,+Oregon+97470/@43.2842088,-123.3539496,3a,75y,90t/data=!3m8!1e2!3m6!1sAF1QipMrB5qX0LSdHSrbl0TPFbip4qdiPbnHcBMcNqc9!2e10!3e12!6shttps:%2F%2Flh5.googleusercontent.com%2Fp%2FAF1QipMrB5qX0LSdHSrbl0TPFbip4qdiPbnHcBMcNqc9%3Dw360-h270-k-no!7i4128!8i3096!4m12!1m5!8m4!1e2!2s113989029832838767488!3m1!1e1!3m5!1s0x54c418e7848decaf:0x17e6b72cc53c5c09!8m2!3d43.2842088!4d-123.3539496!16s%2Fm%2F0z8lkwx Accessed 06/09/2022

GRI (Grette Associates, Environmental Consultants). 2021. Technical Memorandum, “Sheet Pile Testing Program: Underwater Noise Monitoring Results,” prepared by Grette Associates, LLC

Hanson, J., M. Helvey, and R. Strach (eds). 2003. *Non-fishing Impacts to Essential Fish Habitat and Recommended Conservation Measures*. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, version 1. Southwest Region, Long Beach, California.

Hastings, M.C. and A.N. Popper. 2005. Effects of Sound on Fish. Prepared under subcontract to Jones & Stokes under California Department of Transportation Contract No. 43A0139, Task Order 1. Funding Provided by the California Department of Transportation. August 23, 2005. *http://www.dot.ca.gov/hq/env/bio/files/Effects_of_Sound_on* Fish23Aug05.pdf.

House, K. 2015. Disease kills 150,000 fish in hatchery's 2nd major die-off this year. Oregonian/OregonLive. August 21, 2015. https://www.oregonlive.com/environment/2015/08/disease_kills_150000_fish_in_h.html Accessed 06/06/2022.

IPCC (Intergovernmental Panel on Climate Change). 2014. Contribution of working groups I, II and III to the fifth assessment report of the intergovernmental panel on climate change [Core Writing Team, R. K. Pachauri and L.A. Meyer (eds.)] IPCC, Geneva, Switzerland.

Isaak, D.J., C.H. Luce, B.E. Rieman, D.E. Nagel, B.E. Peterson, D.L. Horan, S. Parkes, and G.L. Chandler. 2010. Effects of climate change and wildfire on stream temperatures and salmonid thermal habitat in a mountain river network. Ecological Applications 20:1350-1371.

Isaak, Daniel J.; Rieman, Bruce E. 2013. Stream isotherm shifts from climate change and implications for distributions of ectothermic organisms. Global Change Biology. 19: 742-751.

ISAB (Independent Scientific Advisory Board). 2007. Climate change impacts on Columbia River Basin fish and wildlife, Portland, Oregon

ICF Jones and Stokes, and Illingworth and Rodkin. 2009. Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish. Prepared for the California Departmentof Transportation.

Johnson~ O. W., R. S. Waples, T. C. Wainwright, K. G. Neely, F. W. Waknitz, and L. T. Parker. 1994. Status review for Oregon's Umpqua River sea-run cutthroat trout. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-NWFSC-15, 122 p.

Kunkel, K. E., L. E. Stevens, S. E. Stevens, L. Sun, E. Janssen, D. Wuebbles, K. T. Redmond, and J. G. Dobson. 2013. Regional Climate Trends and Scenarios for the U.S. National Climate Assessment: Part 6. Climate of the Northwest U.S. NOAA Technical Report NESDIS 142-6. 83 pp. National Oceanic and Atmospheric Administration, National Environmental Satellite, Data, and Information Service, Washington, D.C.

Kuriqi, A., Pinheiro, A.N., Sordo-Ward, A., Bejarano, M.D. and Garrote, L., 2021. Ecological impacts of run-of-river hydropower plants—Current status and future prospects on the brink of energy transition. *Renewable and Sustainable Energy Reviews*, *142*, p.110833.

Knudsen, F.R., C.B. Schreck, S.M. Knapp, P.S> Enger, and O. Sand. 1997. Infrasound produces flight and avoidance responses in Pacific Juvenile Salmonids.

Laufle, J.C., G.B. Pauley, and M.F. Shepard. 1986. Species profiles: life histories and environmental requirements of coastal fishes and invertebrates (Pacific Northwest)--Coho salmon. U.S. Fish Wildl. Serv. Biol. Rep. 82(11.48). U.S. Army Corps of Engineers, TR EL-82-4. 18 pp.

Lauman, J., K. Thompson, and J.D. Fortune. 1972. Fish and wildlife resources of the Umpqua Basin, Oregon, and their water requirements." Oregon Game Commission.

Law, D.W., Setunge, S., Adamson, R. and Dutton, L., 2013. Effect of leaching from freshly cast concrete on pH. Magazine of Concrete research, 65(15), pp.889-897.

Lawson, Logerwell, Mantua, Francis, and Agostini. 2004. Environmental factors influencing freshwater survival and smolt production in Pacific Northwest Coho salmon (Oncorhynchus kisutch). Canadian Journal of Fisheries and Aquatic Science 61:360-373.

Lawson, P. W., E. Bjorkstedt, M. Chilcote, C. Huntington, J. Mills, K. Moore, T. E. Nickelson, G. H. Reeves, H. A. Stout, and T. C. Wainwright. 2007. Identification of Historical Populations of Coho Salmon (Onchorhynchus kisutch) in the Oregon Coast Evolutionarily Significant Unit. NOAA Technical Memorandum NMFS-NWFSC-79. US Department of Commerce. 149 p.

Leppi, J.C., T.H. DeLuca, S.W. Harrar, and S.W. Running. 2012. Impacts of climate change on August stream discharge in the Central-Rocky Mountains. Climatic Change 112:997-1014.

Lewis, S.K. 2013. Reconnecting Aquatic Habitats: Validating Historical Habitat Use by Anadromous Fishes using Telemetry and Stable Isotope Analysis above Barriers. OSU Master's Thesis.

Loomis, D. and R. Anglin. 1992. North Umpqua River Fish Management Plan. ODFW. December 1992.

LovellFord, R.M., Flitcroft, R.L., Lewis, S.L., Santelmann, M.V. and Grant, G.E., 2020. Patterns of river discharge and temperature differentially influence migration and spawn timing for Coho Salmon in the Umpqua River Basin, Oregon. Transactions of the American Fisheries Society, 149(6), pp.695-708.

Luce, C.H., and Z.A. Holden. 2009. Declining annual streamflow distributions in the Pacific Northwest United States, 1948-2006. Geophysical Research Letters 36. Luce, C.H., J.T. Abatzoglou, and Z.A. Holden. 2013. The Missing Mountain Water: Slower Westerlies Decrease Orographic Enhancement in the Pacific Northwest USA. Science DOI: 10.1126/science.1242335.

Luce, C.H.; Abatzoglou, J.T.; Holden, Z.A. 2013. The missing mountain water: Slower westerlies decrease orographic enhancement in the Pacific Northwest USA. Science. 342:1360–1364.

Mantua, N., I. Tohver, and A. Hamlet. 2009. Impacts of climate change on key aspects of freshwater salmon habitat in Washington State. Chapter 6 in: Washington Climate Change Impacts Assessment: Evaluating Washington's future in a changing climate. Climate Impacts Group, University of Washington, Seattle, pp 217–254

Mantua, N., I. Tohver, and A. Hamlet. 2010. Climate change impacts on streamflow extremes and summertime stream temperature and their possible consequences for freshwater salmon habitat in Washington State. Climate Change 102:187–233.

Markers, A.G. 2000. Footsteps on the Umpqua. Lebanon, Oregon: Dalton Press.

McCullough, D. 1999. A Review and Synthesis of Effects of Alterations to the Water Temperature Regime on Freshwater Life Stages of Salmonids, with Special Reference to Chinook Salmon. Columbia Intertribal Fisheries Commission, Portland, OR. Prepared for the U.S. Environmental Protection Agency Region 10. Published as EPA 910-R-99-010.

McElhany, P., M. Chilcote, J. Myers, and R. Beamesderfer. 2007. Viability Status of Oregon Salmon and Steelhead Populations in the Willamette and Lower Columbia Basins. Prepared for Oregon Department of Fish and Wildlife and National Marine Fisheries Service

Metsker, H.E. 1970. Fish versus culverts – some considerations for resource managers. Engineering Technical Report 7700-5. USDA Forest Service, Ogden, UT.

Mote, P., A.K. Snover, S. Capalbo, S.D. Eigenbrode, P. Glick, J. Littell, R. Raymondi, and S. Reeder. 2014. Chapter 21: Northwest. Pages 487-513 in Climate Change Impacts in the United States: The Third National Climate Assessment, J.M. Melillo, Terese (T.C.) Richmond, and G.W. Yohe, Eds., U.S. Global Change Research Program doi:10.7930/J04Q7RWX.

MWLAP (Ministry of Water, Land and Air Protection). 2004. Standard and Best Practices for Instream Works. Ecosystem Standards and Planning Biodiversity Branch. https://www.env.gov.bc.ca/lower-mainland/ecosystems/instream_works/index.htm?msclkid=0679a019d0a011ec9778e615e44a9e8b Accessed 05/10/2022.

National Marine Fisheries Service (NMFS). 1998. *The Coastal Pelagic Species Fishery Management Plan*. National Oceanic and Atmospheric Administration (NOAA). Pacific Fishery Management Council. December. EIS-13.

National Marine Fisheries Service. 1996. Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Watershed Scale. National Marine Fisheries Service, Environmental and Technical Services Division, Habitat Conservation Division, Portland, Oregon.

Newcombe, C.P., and J.O.T. Jensen. 1996. Channel suspended sediment and fisheries: a synthesis for quantitative assessment of risk and impact. North American Journal of Fisheries Management. 16:693-727.

Nickelson, T. E., B. Rodgers, S. L. Johnson, and M. F. Solamzi. 1992. Seasonal changes in habitat use by juvenile Coho salmon (Oncorhynchus kisutch) in Oregon coastal streams. Can. 1. Fish. Aquat. Sci. 49: 783-789.

NLCD (National Land Cover Database). 2019. https://www.usgs.gov/centers/eros/science/national-land-cover-database Accessed 10/04/2022.

NMFS 2020. Endangered Species Act Section 7(a)(2) Biological Opinion, and Magnuson-StevensFishery Conservation and Management Act Essential Fish Habitat Response for the Port of Bellingham’s Blaine Harbor Bulkhead Repairs (Corps No.: NWS-2019-347)

NMFS. 2016. Recovery plan for Oregon Coast Coho salmon evolutionarily significant unit. West Coast Region, Portland, Oregon.

NMFS. 2022a. Pile Driving Effects Calculator. https://www.fisheries.noaa.gov/southeast/consultations/section-7-consultation-guidance

NMFS. 2022b. Pacific Coastal Salmon and Recovery Funding Website. https://www.webapps.nwfsc.noaa.gov/apex/f?p=309:13:::::P13_CATEGORY:, accessed May 10, 2022.

NMFS 2022c. Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson–Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Miner Slough Bridge Replacement Project Reinitiation 2021

NRCS (National Resources Conservation Service). 2006. North Umpqua – 17100301 8-Digit Hydrologic Unit Profile

ODEQ (Oregon Department of Environmental Quality). 2006. Chapter I Umpqua Basin TMDL Overview and Background

ODEQ. 2014. Umpqua Basin Status Report and Action Plan July 30, 2014

ODFW (Oregon Department of Fish and Wildlife). 2022b. 2022 assessment of naturally produced summer steelhead in the Umpqua River basin. Science Bulletin 2022-1. ODFW, Salem.

ODFW 2005. Oregon Native Fish Status Report. ODFW. https://www.dfw.state.or.us/fish/crp/native_fish_status_report.asp (accessed 05/04/2022).

ODFW 2019a. Oregon Coast Coho Conservation Plan for the State of Oregon: 12-year Assessment. https://www.dfw.state.or.us/fish/CRP/docs/coastal_Coho/economic_reports/OCCohoCP%202019%2012-Year%20Plan%20Assessment.pdf (accessed 05/05/2022).

ODFW, 2019b. Rock Creek Hatchery Program Management Plan 2020. https://www.dfw.state.or.us/fish/hatchery/docs/HPMP/Rock%20Creek%20HPMP%202020.pdf. Accessed 05/03/2022.

ODFW. 1985. Evaluation of the Impact of Operation of the Winchester Hydroelectric Project on Salmonids of the North Umpqua River, Oregon. Annual Progress Report. Fish Research Project, Oregon. Sponsored by the Elektra Power Corporation and ASEA-Stall Company Inc. 193 pp. https://nrimp.dfw.state.or.us/DataClearinghouse/default.aspx?pn=ViewFile&att=ODFW/ODFW_1857_2_WinchesterHydroelectricProject1985.pdf

ODFW. 2020b. ODFW and Tribal Partnerships in 2020. Memo to Governor Roberts. Oregon Department of Fish and Wildlife, December 2020. https://www.oregonlegislature.gov/cis/GovToGovReports/2020%20(ODFW).pdf, Accessed 05/10/2022.

ODFW. 2022a. Winchester Dam Fish Counts. https://myodfw.com/winchester-dam-fish-counts?msclkid=8851d98ed07e11ecaa7aeda40dc2cdd6 Accessed 06/10/2022.

ORBIC (Oregon Biodiversity Information Center). 2022. Data system search for rare, threatened, and endangered plants and animals for Winchester Dam Project. Letter of Correspondence. June 16, 2022.

ODFW 2020a. ODFW Timing Tables. Supplied by: John Bowers, ODFW (not yet publicly released).

Pacific Northwest Ecosystem Research Consortium. 2002. Willamette River Basin: trajectories of environmental and ecological change by The Pacific Northwest Ecosystem Research Consortium.-- 1st OSU Press ed. p. cm.

Pert, Heather Anne. 1993. Winter food habits of coastal juvenile steelhead and Coho salmon in Pudding Creek, northern California. M.S. thesis, University of California, Berkeley. 65 p.

Petts, G.E., 1984. Impounded Rivers, New York, USA: Wiley

Reiser, D. W., C.M. Huang, S. Beck, M. Gagner, and E. Jeanes. 2006 Defining flow windows for upstream passage of adult anadromous salmonids at cascades and falls. Transaction of the American Fisheries Society. 135:668-679.

Rodgers, J. D., M. F. Solazzi, S. L. Johnson, and M. A. Buckman. 1992. Comparison of three techniques to estimate juvenile Coho Salmon abundances in small streams. North American Journal of Fisheries Management 12:79-86

Sand, O. P.S. Enger, H.E. Karlsen, F. Knudsen and T Kvernstuen. 2000. Avoidance responses to infrasound in downstream migrating European silver eels, Anguilla Anguilla. Environmental Biology of Fishes, 57:327-336

Sawaske, S.R., and D.L. Freyberg. 2014. An analysis of trends in baseflow recession and low-flows in rain-dominated coastal streams of the Pacific Coast. Journal of Hydrology doi: http//dx.doi.org/10.1016/j.jhydrol.2014.07.046.

Scannell, P.O. 1988. Effects of Elevated Sediment Levels rom Placer Mining on Survival and Behavior of Immature Arctic Grayling. Alaska Cooperative Fisher Unit, University of Alaska.

Scott, WB and E. J. Crossman: Freshwater Fishes of Canada. Bulletin 184. Fisheries Research Board of Canada 1973. 966 pp

Servizi, J.A., and D.W. Martens. 1992. Sublethal responses of Coho salmon (Oncorhynchus kisutch) to suspended sediments. Canadian Journal of Fisheries and Aquatic Sciences 49(7):1389-1395.

Sigler, J.W., T.C. Bjornn, and F.H. Everest. 1984. Effects of chronic turbidity on density and growth of steelheads and Coho salmon. Transactions of the American Fisheries Society 113:142-150.

Sounhein, B., M. Lewis and M. Weeber. 2021. Western Oregon adult Coho Salmon, 2020 spawning survey data report. Monitoring Program Report Number OPSW-ODFW-2021-3, Oregon Department of Fish and Wildlife, Salem, Oregon.

Stanley, E.H., Luebke, M.A., Doyle, M.W. and Marshall, D.W., 2002. Short-term changes in channel form and macroinvertebrate communities following low-head dam removal. *Journal of the North American Benthological Society*, *21*(1), pp.172-187.

Stillwater Sciences. 1998. North Umpqua Watershed Analysis Synthesis Report. Prepared by Stillwater Sciences, Berkeley, California for PacifiCorp, Portland, Oregon.

Stout, H.A., P.W. Lawson, D.L. Bottom, T.D. Cooney, M.J. Ford, C.E. Jordan, R.J. Kope, L.M. Kruzic, G.R. Pess, G.H. Reeves, M.D. Scheuerell, T.C. Wainwright, R.S. Waples, E. Ward, L.A. Weitkamp, J.G. Williams, and T.H. Williams. 2012. Scientific conclusions of the status review for Oregon Coast Coho salmon (Oncorhynchus kisutch). U.S. Department of Commerce. NOAA Technical Memorandum NMFS-NWFSC-118. 242 p.

Tillmann, P., and D. Siemann. 2011. Climate Change Effects and Adaptation Approaches in Marine and Coastal Ecosystems of the North Pacific Landscape Conservation Cooperative Region. National Wildlife Federation.

University of Oregon. 2017. No Dam Reason. Science and Memory, A University of Oregon School of Journalism and Communication Project. https://scienceandmemory.uoregon.edu/no-dam-reason.html

USFWS (US Fish and Wildlife Service). 2020. 5-YEAR REVIEW Kincaid’s lupine (Lupinus sulphureus ssp. kincaidii). https://ecos.fws.gov/docs/tess/species_nonpublish/2743.pdf Accessed 07/01/2022

USFWS and NMFS (United States Fish and Wildlife Service and National Marine Fisheries Service). 1998. Endangered Species Act Consultation Handbook - Procedures for Conducting Section 7 Consultations and Conferences. March 1998.

Wallick, J.R., O'Connor, J.E., Anderson, Scott, Keith, Mackenzie, Cannon, Charles, and Risley, John C., 2010, Channel change and bed-material transport in the Umpqua River basin, Oregon: U.S. Geological Survey Open-File Report 2010–1314, 135 p. and 3 appendices.

Waters, T.F. 1995. Sediment in streams: sources, biological effects, and control. American Fisheries Society Monograph 7.

Watershed Sciences, LLC. 2003. Aerial Surveys in the Umpqua River Basin Thermal Infrared and Color Videography May 2, 2003Report to: Oregon Department of Environmental Quality 811 SW 6th Avenue Portland, OR 97204 by: Watershed Sciences, LLC 230 SW 3rd Street, Suite 202 Corvallis, OR 97333 Final Report

Weitkamp, L. A., T. C. Wainwright, G. J. Bryant, G. B. Milner, D. J. Teel, R. G. Kope, and R. S. Waples. 1995. Status review of Coho salmon from Washington, Oregon, and California. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-NWFSC-24, 258 p

Wightman, J.C. and G.D. Taylor, Salmonid Swimming Performance in Relation to Passage Through Culverts. Fish Habitat Improvement Section, Fish and Wildlife Branch, Ministry of Recreation and Conservation, Victoria, BC.

Williams, R. 1985. Report on the Identifiable Loss of Salmonid Fish at the Winchester Hydroelectric Project in 1984. Oregon Department of Fish and Wildlife Research and Development Section. https://nrimp.dfw.state.or.us/DataClearinghouse/default.aspx?pn=ViewFile&att=ODFW/ODFW_2054_2_Winchester1984.pdf

Winder, M., and Daniel E. Schindler. 2004. Climate change uncouples trophic interactions in an aquatic ecosystem. Ecology 85: 2100–2106

WSDOT (Washington Department of Transportation) Standard Specifications for Road, Bridge, and Municipal Construction M 41-10 2022.

Xerces Society, Monarch Joint Venture, and Natural Resources Conservation Service. 2012. A guide to the native milkweeds of Oregon. Xerces Society, 9pp.

APPENDIX 1:
PROJECT PHOTOS

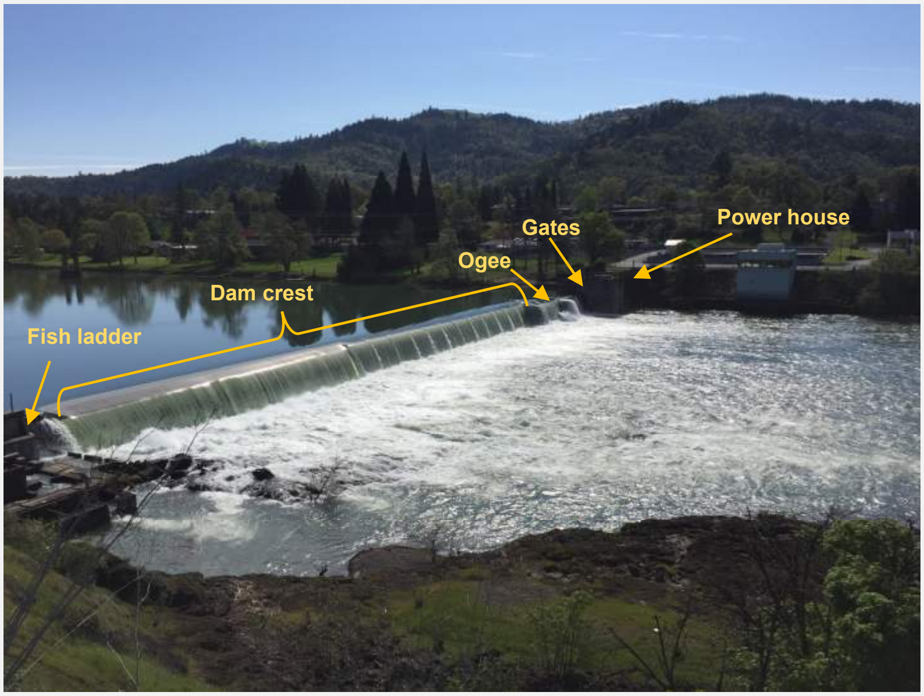


Figure A1-1: Winchester Dam, looking south (04/19/2019)

Figure A1-2: Powerhouse and gates, looking north (10/25/2017)

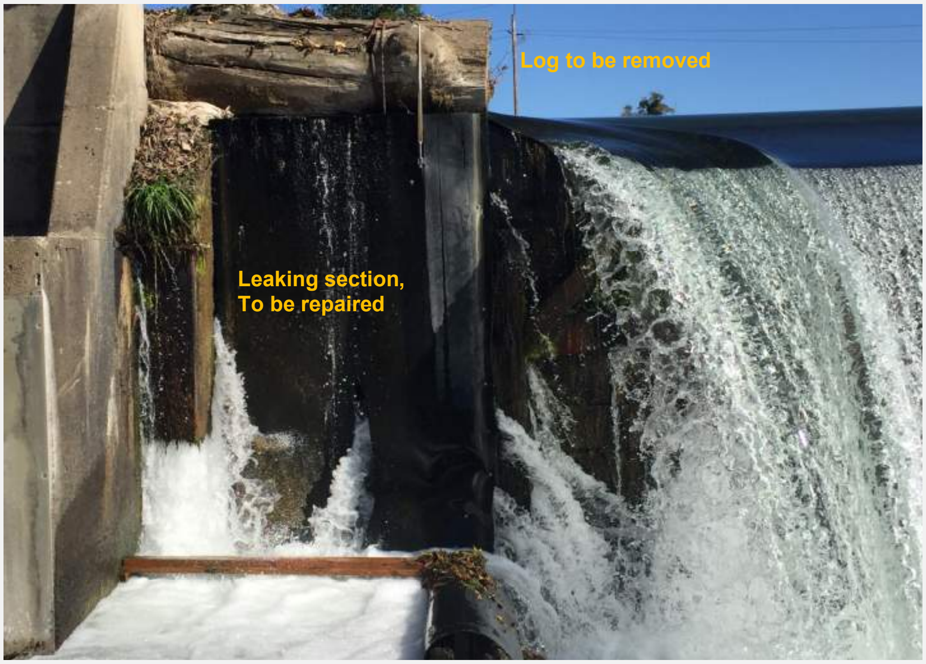


Figure A1-3: Leak creating false attraction flow at fish ladder (10/10/2019)

Figure A1-4: Fish ladder during normal operation (05/30/2019)

Figure A1-5: Fish ladder during normal operation (03/31/2009)

Figure A1-6: Concrete shelf at gates during normal operation (10/03/2018)

Figure A1-7: Gates open during lake drawdown (09/05/2013)

Figure A1-8: Downstream dam face during drawdown (09/01/2009)

Figure A1-9: Upstream view of the gates during drawdown (09/01/2009)

Figure A1-10: Fish ladder during drawdown (09/01/2009).

Figure A1-11: Upstream dam face during drawdown (09/01/2009)

Figure A1-12: Water infiltration leaking from powerhouse (10/10/2012).

APPENDIX 2:
CONSTRUCTION FIGURES

DRAWINGS INDEX

SHT. NO.	TITLE
A01	TITLE SHEET
C01	SITE PLAN
C02	TIMBER DAM - EMBANKMENT REPAIRS
S01	GENERAL STRUCTURAL NOTES
S02	MATERIALS TESTING AND INSPECTIONS PLAN
S03	NORTH POWER BUILDING AND FISH LADDER
S04	NORTH TIMBER DAM REPAIR
S05	SOUTH TIMBER DAM REPAIR
S06	SOUTH POWER BUILDING AND SPILL GATES
S07	STRUCTURAL REPAIR DETAILS
S08	STRUCTURAL REPAIR DETAILS
TW01	PHASE 1 - TEMPORARY WATER MANAGEMENT
TW02	PHASE 2 - TEMPORARY WATER MANAGEMENT

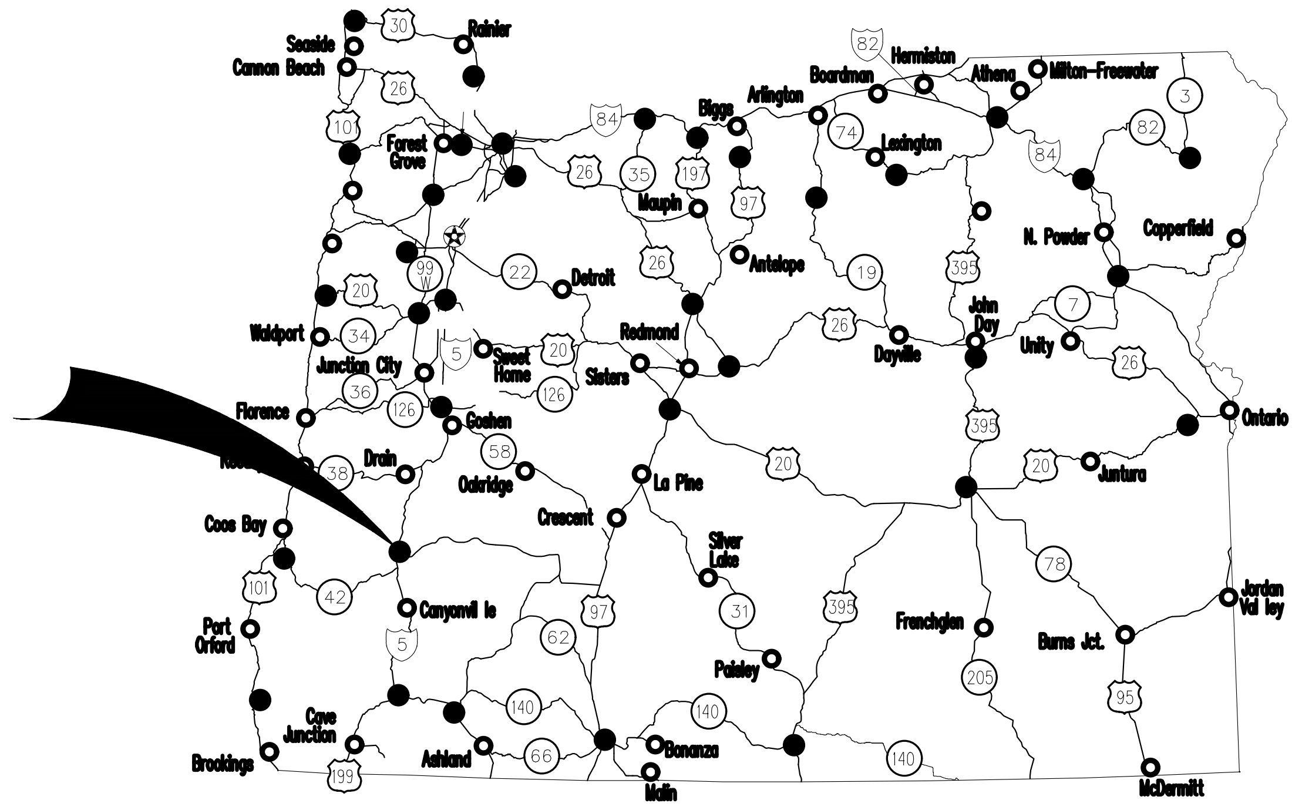
WINCHESTER WATER CONTROL DISTRICT

PLANS FOR PROPOSED PROJECT

WINCHESTER DAM INSPECTION AND REPAIR

DOUGLAS COUNTY

AUGUST 2022



Overall length of project - 1900 ft.

SAFETY FIRST

LET'S ALL WORK TOGETHER TO MAKE THIS JOB SAFE

GENERAL NOTE:

This design complies with ORS 92.044 (7) in that no utility infrastructure is designed to be within one (1) foot of a survey monument location shown on a subdivision or partition plat. No design exceptions nor final field location changes shall be permitted if that change would cause any utility infrastructure to be placed within the prohibited area.

ATTENTION:

Oregon Law Requires You To Follow Rules Adopted By The Oregon Utility Notification Center. Those Rules Are Set Forth In OAR 952-001-0010 Through OAR 952-001-0090. You May Obtain Copies Of The Rules By Calling The Center. (Note: The Telephone Number For The Oregon Utility Center Is (503) 232-1987.)

REV	DATE	REVISIONS DESCRIPTION	BY

BRIAN J. MEUNIER

60% DESIGN NOT FOR CONSTRUCTION

EXPIRES: 12/31/

DOWL
WWW.DOWL.COM

WINCHESTER DAM INSPECTION AND REPAIR PROJECT
WINCHESTER, OREGON

WINCHESTER DAM

PROJECT	80069
DATE	10/08/2021

SHEET
A01

C:\dowl_pw\d0393446\80069-01_A01.dwg PLOT DATE 2021-12-13 07:32 SAVED DATE 2021-11-11 06:03 USER: jwilliams

WINCHSTER DAM - SITE PLAN

SCALE: 1" = 60'

SCALE WARNING

If scale bar doesn't measure one inch then drawing is not to scale

C:\dowl_pw\d0393446\80069-01_C01.dwg PLOT DATE 2021-12-13 10:26 SAVED DATE 2021-12-13 09:23 USER: jbehling

REV	DATE	DESCRIPTION	BY

REVISIONS

60% DESIGN NOT FOR CONSTRUCTION

EXPIRES: 12/31/

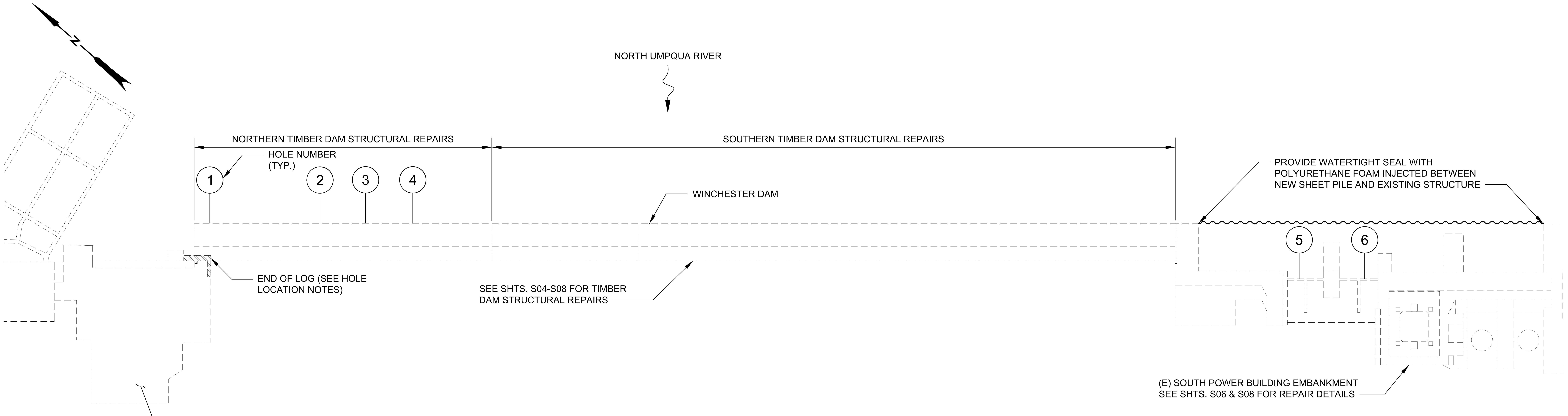
DOWL
WWW.DOWL.COM

WINCHESTER DAM INSPECTION AND REPAIR PROJECT
WINCHESTER, OREGON

SITE PLAN

PROJECT	80069
DATE	10/08/2021

SHEET
C01

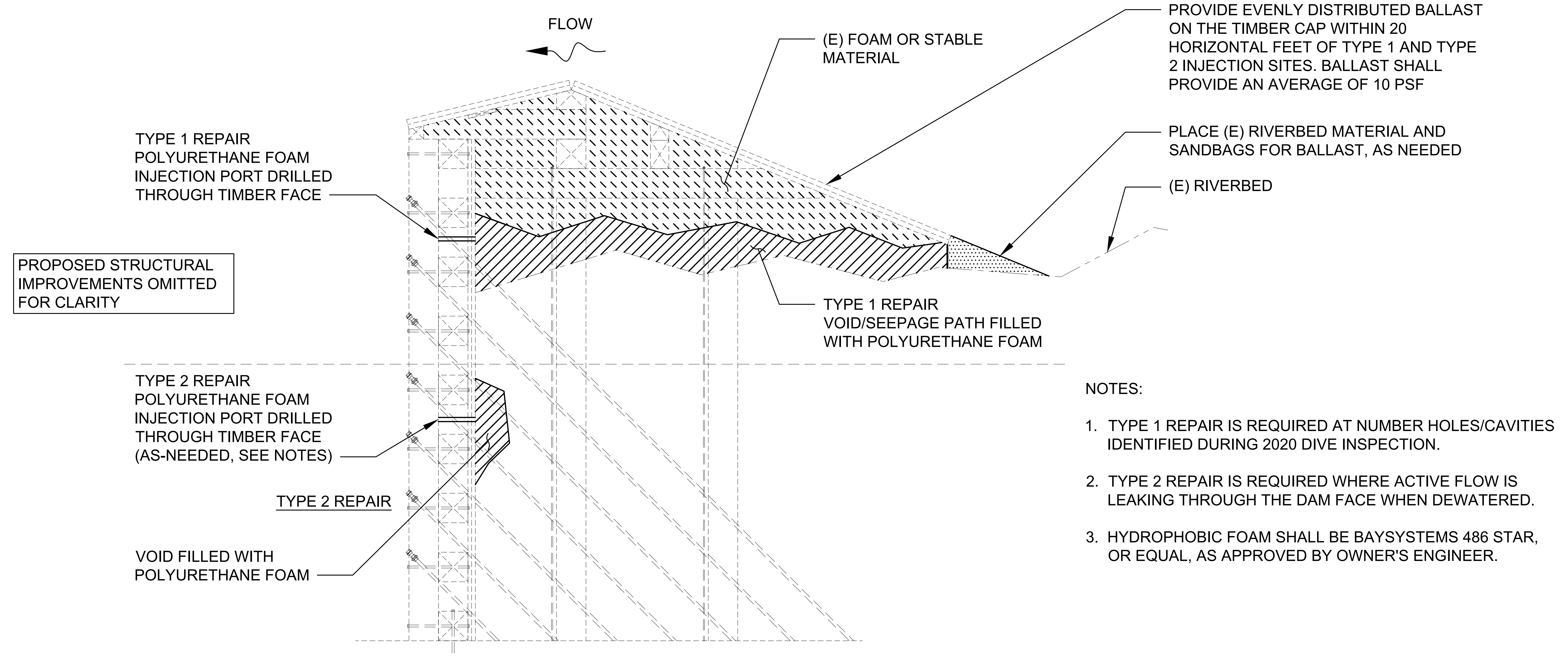


TIMBER DAM EMBANKMENT - PLAN VIEW

SCALE: 1" = 20'

TYPE 1 REPAIR LOCATION NOTES:

①	10 FT UPSTREAM FROM CENTER OF LOG TO CENTER OF HOLE. HOLE IS 10 FT WIDE.
②	56 FT FROM END OF LOG TO CENTER OF HOLE. HOLE IS 5 FT WIDE BY 1 FT DEEP.
③	70 FT FROM END OF LOG TO CENTER OF HOLE. HOLE IS 3 FT WIDE BY 1 FT DEEP.
④	79 FT FROM END OF LOG TO CENTER OF HOLE. HOLE IS 5 FT WIDE BY 2 FT DEEP.
⑤	2 FT WEST FROM FACE OF CONCRETE BLOCK (BELOW WATER LINE). HOLE IS 2 FT WIDE.
⑥	14 FT UPSTREAM FROM DAM FACE AND 2 FT TOWARD CHANNEL FROM FACE OF WALL. HOLE IS 5 FT WIDE.

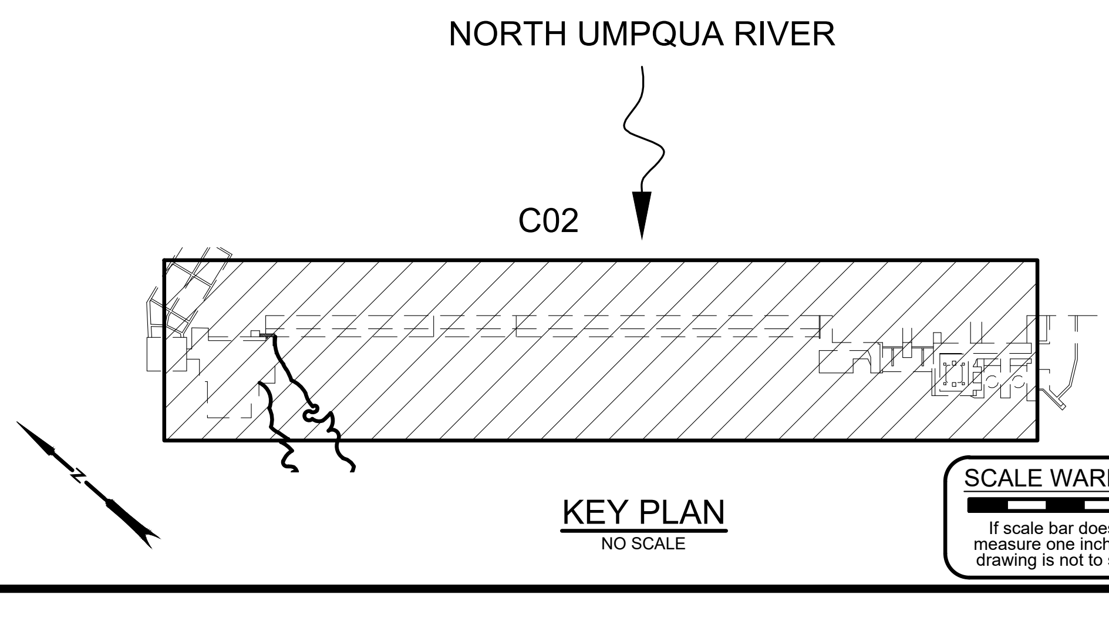


POLYURETHANE FOAM HOLE REPAIR DETAIL

NO SCALE

NOTES:

1. TYPE 1 REPAIR IS REQUIRED AT NUMBER HOLES/CAVITIES IDENTIFIED DURING 2020 DIVE INSPECTION.
2. TYPE 2 REPAIR IS REQUIRED WHERE ACTIVE FLOW IS LEAKING THROUGH THE DAM FACE WHEN DEWATERED.
3. HYDROPHOBIC FOAM SHALL BE BAYSYSTEMS 486 STAR, OR EQUAL, AS APPROVED BY OWNER'S ENGINEER.



KEY PLAN

NO SCALE

SCALE WARNING
If scale bar doesn't measure one inch then drawing is not to scale

REVISIONS

REV	DATE	DESCRIPTION	BY

REGISTERED PROFESSIONAL ENGINEER
OREGON
NOVEMBER 12, 20
BRIAN J. MEUNIER
90% DESIGN NOT FOR CONSTRUCTION
EXPIRES: 12/31/

DOWL
WWW.DOWL.COM

WINCHESTER DAM INSPECTION AND REPAIR PROJECT
WINCHESTER, OREGON

TIMBER DAM EMBANKMENT REPAIRS

PROJECT 80069
DATE 10/08/2021

SHEET
C02

STRUCTURAL GENERAL NOTES

STANDARDS OR REFERENCES

- STATE OF OREGON WATER RESOURCES DEPARTMENT; DAM SAFETY RULES, 2020 AS APPLICABLE
- STATE OF OREGON STRUCTURAL SPECIALTY CODE, 2019
- SPECIFICATIONS FOR STRUCTURAL STEEL BUILDINGS; AISC 360-16
- DESIGN OF SMALL DAMS; US BUREAU OF RECLAMATION, 3RD/ EDITION 1987
- ODOT STANDARD SPECIFICATIONS FOR CONSTRUCTION 2021
- DESIGN OF GRAVITY DAMS; US BUREAU OF RECLAMATION, 1976

DESIGN LOADS AND CRITERIA

1. DEAD LOADS
   a. TIMBER = 50 PCF (SATURATED)
   b. CONCRETE = 145 PCF
2. FLUID / HYDRAULIC LOADS
   a. SUBMERGED EQUIVALENT FLUID PRESSURE = 85 PSF / FT
   b. DAM BASE ELEVATION REFERENCE (LOWEST TIER) = 418.2 FEET (NGVD29)
   c. DAM CREST ELEVATION REFERENCE = 435.2 FEET (NGVD29)
   d. ANALYSIS WATER SURFACE PROFILES

FLOW EVENT	UPSTREAM WATER SURFACE ELEVATION (FT) [HEAD ABOVE CREST]	DOWNSTREAM WATER SURFACE ELEVATION (FT) [HEAD ABOVE CREST]	MEAN VELOCITY (FPS)
10 YR	EL. 447.4 [12.2]	EL. 440.4 [5.2]	9.1
50 YR	EL. 451.6 [16.4]	EL. 445.6 [10.4]	9.9
100 YR	EL. 453.3 [18.1]	EL. 447.5 [12.3]	10.2

3. ICE LOADS - DEEMED INSIGNIFICANT IF PRESENT
4. EARTHQUAKE - NOT INCLUDED IN THIS WORK SCOPE

PROJECT CONDITIONS

1. EXISTING CONDITIONS
   a. REFERENCE TO OTHER PROJECT DOCUMENTS FOR SCHEDULE OF DEWATER AND REPAIR ACTIVITIES BASED ON DURATION OF EXPECTED LOW FLOW.
   b. REFERENCE THE PROJECT "MATERIALS TESTING & INSPECTIONS PLAN" FOR A SUMMARY OF THAT WORK. REPAIR ACTIVITIES WILL BE TAILORED BASED ON OUTCOMES OF THAT WORK AND SHALL BE COMPLETED WITHIN THE DE-WATER SCHEDULE.
   c. DIMENSIONS, ELEVATIONS, AND DETAILS OF EXISTING CONSTRUCTION HAVE BEEN OBTAINED FROM ORIGINAL CONSTRUCTION DOCUMENTS AND/OR OTHER DOCUMENTATION OR OBSERVATIONS THAT MAY OR MAY NOT ACCURATELY REFLECT CURRENT CONDITIONS IN EVERY CIRCUMSTANCE. THEREFORE, THE CONTRACTOR MUST VERIFY ALL EXISTING CONDITIONS AND DIMENSIONS NECESSARY TO PROPERLY COORDINATE REPAIR ACTIVITIES.
   d. THE CONTRACTOR SHALL NOTIFY THE ENGINEER OF ANY VARIATIONS IN THE DETAILS, DIMENSIONS AND ELEVATIONS OF EXISTING CONSTRUCTION THAT DON'T CORRELATE WITH INFORMATION ON THESE DRAWINGS.

2. PROTECT EXISTING STRUCTURE(S) AND ENVIRONMENT FROM DAMAGE DURING REPAIR ACTIVITIES.

EXISTING OR NEW/PROPOSED MATERIALS TESTING & INSPECTIONS

1. SEE PROJECT MATERIALS TESTING & INSPECTIONS PLAN

EXISTING MATERIAL PROPERTY ASSUMPTIONS

1. CONCRETE
   a. CONCRETE FOUNDATION SILL COMPRESSIVE STRENGTH, F'C > 2,500 PSI
   b. CONCRETE STRUCTURE COMPRESSIVE STRENGTH, F'c > 2,500 PSI
   c. ALLOWABLE ROCK BEARING CAPACITY > 12,000 PSF UN-WEATHERED

2. STEEL TIE-BACK RODS
   a. YIELD STRENGTH, FY = 33 KSI
   b. ROCK ANCHORAGE CAPACITY ASSUMED SUFFICIENT TO DEVELOP WORKING TIE-BACK ROD CAPACITY

3. SOLID SAWN TIMBER POSTS OR WHALERS -
   ADJUSTED ALLOWABLE VALUES FOR DF NO.1 OR BETTER
   a. COMPRESSIVE STRESS PARALLEL TO GRAIN, FCP = 1,000 PSI
   b. BENDING STRESS, Fb = 1,200 PSI
   c. SHEAR STRESS, Fv = 170 PSI
   d. MODULUS OF ELASTICITY = 1,600,000 PSI

4. SOLID SAWN PLANKS / LAGGING - ADJUSTED ALLOWABLE VALUES FOR DF NO.1 OR BETTER
   a. BENDING STRESS, Fb = 1,000 PSI
   b. SHEAR STRESS, Fv = 170 PSI
   c. MODULUS OF ELASTICITY = 1,600,000 PSI

NEW/REPLACEMENT MATERIAL SPECIFICATIONS

1. CONCRETE CLASS A - PRE-BLENDED FOR SURFACE REPAIRS. CURED COLOR TO MATCH EXISTING WEATHERED 'LIGHT GRAY' CONCRETE TO BEST EXTENT POSSIBLE.
   a. TROWELED REPAIR SECTION ¾" UP TO 2" THICKNESS (TWO EQUAL THICKNESS LIFTS): PRE-BLENDED, TWO- COMPONENT, POLYMER MODIFIED CEMENTITIOUS TROWEL GRADE PATCH MIX WITH FREEZE-THAW RESISTANCE AND CORROSION INHIBITOR THAT EXHIBITS A 7-DAY COMPRESSIVE STRENGTH OF 4,500 PSI SUCH AS SIKATOP-122 PLUS BY SIKA USA OR APPROVED ALTERNATE.
   b. PLACED (FORMED) REPAIR SECTION 2" UP TO 4" THICKNESS: PRE-BLENDED, SINGLE COMPONENT, CEMENTITIOUS, AIR-ENTRAINED CONCRETE MIX (CONTAINS BLENDED COARSE AGGREGATE) WITH CORROSION INHIBITOR THAT EXHIBITS A 7-DAY COMPRESSIVE STRENGTH OF 4,500 PSI SUCH AS SIKACRETE-100 CL BY SIKA USA OR APPROVED ALTERNATE.
   c. PLACED / FORMED REPAIR OR RESTORATION SECTIONS 4" THICK AND THICKER USE CONCRETE CLASS B - REDI-MIX CONCRETE AS SPECIFIED BELOW.
   d. MIX, PLACE AND CONSOLIDATE MATERIALS IN ACCORDANCE WITH REPAIR MATERIAL MANUFACTURER'S INSTRUCTIONS.

2. CONCRETE CLASS B - REDI-MIX FOR FOUNDATION / SILL / DEEP REPAIRS
   a. AMERICAN CONCRETE INSTITUTE STANDARDS:
      i. ACI 301 "SPECIFICATIONS FOR STRUCTURAL CONCRETE"
      ii. ASTM C94 "STANDARD SPECIFICATION FOR REDI-MIX CONCRETE"
   b. 28-DAY COMPRESSIVE STRENGTH F'C = 4,500 PSI
   c. PORTLAND CEMENT, ASTM C150 TYPE I/II
   d. MAXIMUM WATER/CEMENTITIOUS RATIO = 0.45
   e. TOTAL AIR CONTENT = 6.0%, + 1.5%, ADMIXTURE PER ASTM C260
   f. ¾" NORMAL WEIGHT AGGREGATE, ASTM C33, CLASS 3S, SIZE #67 -NO REACTION WITH ALKALIES IN CEMENT PERMITTED
   g. SLUMP RANGE = 3" TO 5"

3. CONCRETE CLASS C - SHOTCRETE FOR BUILDUP REPAIRS (WET MIX). AN ALTERNATEE TO CLASS B FOR USE AT CONTRACTOR'S DISCRETION. CURED COLOR TO MATCH EXISTING WEATHERED 'LIGHT GRAY' CONCRETE TO BEST EXTENT POSSIBLE.
   a. AMERICAN CONCRETE INSTITUTE STANDARDS:
   i. ACI 506.2 "SPECIFICATION FOR SHOTCRETE"
   ii. ASTM C94 "STANDARD SPECIFICATION FOR REDI-MIX CONCRETE"
   iii. ASTM C1141 "SPECIFICATION FOR ADMIXTURES FOR SHOTCRETE"
   iv. ASTM C1436 "SPECIFICATION FOR MATERIALS FOR SHOTCRETE"
   b. 28-DAY COMPRESSIVE STRENGTH F'C = 4,500 PSI
   c. PORTLAND CEMENT, ASTM C150 TYPE I/II
   d. MAXIMUM WATER/CEMENTITIOUS RATIO = 0.45
   e. TOTAL 'AS-SHOT' AIR CONTENT = 6.0%, + 1.5% PER ASTM C231
   f. 3/8" NORMAL WEIGHT AGGREGATE, ASTM C33, CLASS 3S -NO REACTION WITH ALKALIES IN CEMENT PERMITTED

4. CONCRETE ACCESSORIES
   i. EPOXY ADHESIVE FOR ANCHOR ROD OR DOWEL FASTENING TO CONCRETE: HIT-RE 500 V3 BY HILTI
   j. CEMENTITIOUS GROUT FOR ANCHOR ROD FASTENING TO BEDROCK: ASTM C1107 PRE-BLENDED NON-SHRINK, NON-METALLIC HAVING 7-DAY F'C > 5,000 PSI SUCH AS MASTERFLOW 100AN BY BASF
   k. JOINT SEALANT, ONE COMPONENT LOW MODULUS SILICONE SUCH AS DOW 888
   l. WATER-STOP, SELF-EXPANDING SUCH AS VOLCLAY RX-101 WITH CONCRETE PRIMER

5. REINFORCING STEEL
   a. ASTM A615, GRADE 60 DEFORMED BARS, BARE - NO COATING
   b. ASTM A497, GRADE 70 WELDED WIRE REINFORCING (WWR) SHEETS, DEFORMED WIRE, BARE
   c. REBAR LAP LENGTH 1'-10", 2'-4" & 2'-10" MINIMUM FOR #4, #5 & #6 RESPECTIVELY,WWR SHEET LAP LENGTH IS 1'-0" OR TWO PANEL WIDTHS (THREE LONGITUDINAL WIRES)
   d. CONCRETE COVER: 2" TO FORMED SURFACE, 3" TO UNFORMED SURFACE

6. STRUCTURAL STEEL
   a. ALL SHAPES, BARS & PLATE, ASTM A588, FY = 50 KSI, NO COATING

7. FASTENERS
   a. ANCHOR RODS: ASTM F1554 GR 36 WITH WASHER TYPE AS INDICATED AND HEAVY HEX NUT. HOT-DIP GALVANIZE ALL COMPONENTS IN ACCORDANCE WITH ASTM F2329.
   b. HIGH STRENGTH BOLTS: ASTM F3125 GRADE A325 TYPE 3, Fu = 125 KSI
   c. HARDENED WASHERS: ASTM F436; HEAVY HEX NUTS: ASTM A563 TYPE 3
   d. WELD FILLER METAL: LOW HYDROGEN SUCH AS AWS A5.1, Fu = 70 KSI
   e. LAGS, U-BOLTS, MISC. HARDWARE FOR TIMBER: ASTM A307 OR ASTM A36

8. TIE-BACK ANCHORS
   a. DESIGN/ALLOWABLE TENSILE LOAD OF 46,000 LBS., MINIMUM SAFETY FACTOR OF 2.0
   b. TIE-BACK ASSEMBLY (SINGLE SOURCE SUPPLY): 1 3/8" MINIMUM DIAMETER R1H HOLLOW-CORE SPIN-LOCK ANCHOR BY WILLIAMS ENG. OR APPROVED ALTERNATE
   c. ROCK ANCHOR GROUT: CEMENTITIOUS SUCH AS WIL-X BY WILLIAMS ENG. OR APPROVED ALTERNATE
   d. HOT-DIP GALVANIZE ALL COMPONENTS IN ACCORDANCE WITH ASTM F2329 OR EPOXY COATED

9. SHEET PILE
   a. HOT ROLLED STEEL: ASTM A572 GRADE 50, FY = 50 KSI, NO COATING
   b. PROVIDE CAST STEEL SHEET PILE PROTECTORS CONFORMING TO ASTM A148 GRADE 90/60 OR APPROVED EQUAL FOR OPTIMUM PENETRATION. WELD SHEET PILE PROTECTOR AS RECOMMENDED BY THE MANUFACTURER.

10. SOLID SAWN TIMBER POSTS OR WHALERS - ADJUSTED ALLOWABLE VALUES FOR DF NO.1 OR BETTER
    a. COMPRESSIVE STRESS PARALLEL TO GRAIN, Fcp = 1,000 PSI
    b. BENDING STRESS, Fb = 1,200 PSI
    c. SHEAR STRESS, Fv = 170 PSI
    d. MODULUS OF ELASTICITY = 1,600,000 PSI
    e. COATING / TREATMENT: NONE
    f. PLYWOOD SHEATHING, ¾" NOMINAL, APA RATED - MARINE GRADE B-B

11. SOLID SAWN PLANKS / LAGGING - ADJUSTED ALLOWABLE VALUES FOR DF NO.1 OR BETTER
    a. BENDING STRESS, Fb = 1,000 PSI
    b. SHEAR STRESS, Fv = 170 PSI
    c. MODULUS OF ELASTICITY = 1,600,000 PSI
    d. COATING / TREATMENT: NONE

NOTE:
ELEVATIONS SHOWN ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM (NGVD29).

NEW/REPLACEMENT MATERIAL SUBMITTALS

1. THE CONTRACTOR SHALL SUBMIT FABRICATION DRAWINGS (WHERE APPLICABLE) AND NEW MATERIALS / PRODUCT DATA CERTIFICATIONS TO THE ENGINEER OF RECORD FOR THE FOLLOWING ITEMS:
   a. TIE BACK ASSEMBLIES INCLUDING GROUT MIX DESIGN AND PLACEMENT PROCEDURES
   b. MIX DESIGN AND ASSOCIATED MATERIALS CERTIFICATIONS FOR CONCRETE CLASSES USED
   c. REINFORCING STEEL MATERIALS CERTIFICATIONS
   d. STRUCTURAL STEEL COMPONENTS AND FASTENERS
   e. TIMBERS AND FASTENERS

NEW/REPLACEMENT MATERIAL INSTALLATION

CONCRETE SURFACE REPAIR

1. WHILE AREAS AND APPROXIMATE LIMITS OF AREAS TO RECEIVE CONCRETE REPAIR ARE SHOWN GRAPHICALLY ON THESE PLANS, THEY PROVIDE A BID BASIS ONLY. ACTUAL EXTENTS WILL BE DEFINED IN THE FIELD BY ENGINEER BASED ON ACTUAL CONDITIONS OBSERVED AT THE TIME OF REPAIRS.

2. SURFACE CONCRETE REMOVAL AND PREPARATION.
   a. REMOVE DETERIORATED CONCRETE TO SOUND CONCRETE BY MEANS OF HAND-HELD CHIPPING TOOLS. CHIPPING TOOLS SHALL BE CATEGORIZED AS LIGHT DUTY, BLOW ENERGY LIMITED SUCH AS TOOLS IN THE 12-15 LBS. CLASS. (NOTE THAT 'SOUND' CONCRETE FOR THIS REPAIR MAY EXHIBIT SOME LEVEL OF DETERIORATION AS DEEMED ACCEPTABLE BY THE ENGINEER OF RECORD).
   b. REPAIR SURFACE AREA TO BE ROUGHENED TO AT LEAST ¼" AMPLITUDE AND OF SUFFICIENT DEPTH TO PROVIDE A MINIMUM REPAIR THICKNESS OF ¾" FOR TROWELED OR 1 ½" FOR PLACED MATERIALS.
   c. LEAVE EXISTING REINFORCING THAT IS NOT SEVERELY CORRODED TO THE EXTENT POSSIBLE. REMOVE AND REPLACE SEVERELY CORRODED REINFORCING THAT EXHIBITS MORE THAN 30% SECTION LOSS OR IS HEAVILY PITTED.
   d. CLEAN SURFACE WITH WATER JET OR COMPRESSED AIR.
   e. PRE-WET PREPARED CONCRETE SURFACE WITH POTABLE WATER TO SATURATED SURFACE DRY CONDITION (SSD), SCRUB SURFACE WITH A CEMENT SLURRY.

CONCRETE PLACEMENT (REDI-MIX)

1. CONCRETE CLASS B
   a. PLACE AND CURE IN ACCORDANCE WITH THE FOLLOWING AMERICAN CONCRETE INSTITUTE STANDARDS:
      i. ACI 308.1 "SPECIFICATIONS FOR CURING CONCRETE"
      ii. ACI 347 "GUIDE TO FORMWORK FOR CONCRETE"

SHOTCRETE PLACEMENT (WET-MIX) -

AN ALTERNATE TO CLASS B FOR BUILD-UP REPAIRS FOR USE AT CONTRACTOR'S DISCRETION

1. CONCRETE CLASS C
   a. PLACE AND CURE IN ACCORDANCE WITH THE FOLLOWING AMERICAN CONCRETE INSTITUTE STANDARDS:
      i. ACI 506R "GUIDE TO SHOTCRETE"
      ii. ACI 308.1 "SPECIFICATIONS FOR CURING CONCRETE"

STRUCTURAL STEEL

1. FABRICATE AND INSTALL IN ACCORDANCE WITH THE FOLLOWING AMERICAN INSTITUTE OF STEEL CONSTRUCTION
   a. AISC 303 "CODE OF STANDARD PRACTICE FOR STEEL BUILDINGS AND BRIDGES"
   b. AWS D1.1 "STRUCTURAL WELDING CODE"
   c. RCSC "SPECIFICATION FOR STRUCTURAL JOINTS USING HIGH STRENGTH BOLTS"
2. ALL BOLTED STEEL TO STEEL CONNECTIONS SHALL USE HIGH STRENGTH BOLTS AND BE FULLY PRE-TENSIONED UNLESS INDICATED OTHERWISE.
   a. INSTALL HARDENED WASHER ON NUT SIDE OF STANDARD HOLES
   b. INSTALL HARDENED WASHER ON NUT AND HEAD SIDE OF SHORT-SLOTTED HOLES.
   c. PRE-TENSION 5/8" A325 BOLTS BY NUT ROTATION OF 90 DEGREES BEYOND SNUG TIGHT.
3. FABRICATION QC SHALL INCLUDE VISUAL INSPECTION OF ALL WELDS.

TIE BACKS

1. INSTALL IN ACCORDANCE WITH MANUFACTURER SPECIFICATIONS AND PROCEDURES APPROVED BY THE ENGINEER OF RECORD.

TEXT LEGEND:

(E) TEXT PRECURSOR INDICATES EXISTING ITEMS
(N) TEXT PRECURSOR INDICATES NEW/PROPOSED ITEMS

LINE TYPE LEGEND:

EXISTING ITEM LINE TYPE IS DASHED AND GREYSCALE
NEW/PROPOSED ITEM LINE TYPES ARE SOLID AND DARK

STRUCTURAL DRAWINGS INDEX	
SHT. NO.	TITLE
S01	GENERAL STRUCTURAL NOTES
S02	MATERIALS TESTING AND INSPECTIONS PLAN
S03	NORTH POWER BUILDING AND FISH LADDER
S04	NORTHERN TIMBER DAM REPAIR, PLAN, ELEVATION & SECTION
S05	SOUTHERN TIMBER DAM REPAIR, PLAN, ELEVATION & SECTION
S06	SOUTH POWER BUILDING AND SPILL GATES
S07	STRUCTURAL REPAIR DETAILS
S08	STRUCTURAL REPAIR DETAILS

REV	DATE	REVISIONS DESCRIPTION	BY

NICHOLAS PAUL ROBERTSON
EXPIRES: 12/31/

90% DESIGN
NOT FOR
CONSTRUCTION

DOWL
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WINCHESTER DAM INSPECTION AND REPAIR PROJECT
WINCHESTER, OREGON
GENERAL STRUCTURAL NOTES

PROJECT 80069
DATE 10/08/2021

SHEET
S01

C:\dowl_pw\d0383145\SC18-ST-CV-80069-01.dwg PLOT DATE 2021-12-17 14:22 SAVED DATE 2021-12-15 08:39 USER: jwilliams

MATERIALS TESTING AND INSPECTION PLAN

PRE-CONSTRUCTION PHASE ACTIVITIES

MATERIALS TESTING RELATED TO REPAIR DESIGN

1. RESISTOGRAPH ® DRILLING IN TIMBER DAM COMPONENTS THAT ARE DOUGLAS FIR NO.1 OR BETTER, SUBMIT DENSITY RESULTS TO ENGINEER:
   a. 2X TIMBER CAP PLANK, NORTHERN SECTION: APPROXIMATELY TEN TESTS TOTAL,
   b. 6X TIMBER BEAM NORTHERN SECTION OR 12X SOUTHERN SECTION RUNNING UNDER CAP AND SPANNING OVER POSTS: APPROXIMATELY TWENTY TESTS TOTAL,
   c. 12X12 SOLDIER POSTS, NORTHERN SECTION (WITHOUT TIE BACK RODS): APPROXIMATELY TWELVE TESTS TOTAL, TWO LOCATIONS ON SIX POSTS.
   d. 12X12 SOLDIER POSTS WITH 4X REINFORCING EACH SIDE OF POST, SOUTHERN SECTION (WITH TIE BACK RODS): APPROXIMATELY TWENTY TESTS TOTAL IN 4X REINFORCING, TWO LOCATIONS ON TEN POSTS.
   e. 12X12 HORIZONTAL WHALERS (BEHIND 2X LAGGING LAYERS): APPROXIMATELY TWENTY TESTS TOTAL THROUGHOUT DAM FACE - CAPTURE LAGGING AND WHALER SEPARATELY.

2. ACTUAL DRILL LOCATIONS SHALL BE MAPPED / ANNOTATED ON A SCALED DRAWING BUT DOES NOT REQUIRE DIMENSIONING.

INSPECTIONS BY CONTRACTOR RELATED TO REPAIR DESIGN

1. SURVEY OF EXISTING CONDITIONS ON TIMBER DAM TO BE SUBMITTED TO ENGINEER AND FOR CONTRACTOR'S USE:
   a. APPROXIMATE BEDROCK GRADE AT CONCRETE SILL FACE TO FACILITATE SILL RESTORATION DESIGN AND PROVIDE BASIS FOR CONCRETE QUANTITY ESTIMATE,
   b. CONCRETE SILL TOP ELEVATION PROFILE (INCLUDES EACH STEP HEIGHT AND ANY VARIATION FROM LEVEL MORE THAN 0.04',
   c. UNDERSIDE OF CAP ELEVATION PROFILE ON DOWNSTREAM SIDE TO FACILITATE TOP OF NEW STEEL POST ELEVATIONS FOR STRUCTURAL STEEL DETAILER,
   d. EXISTING TIMBER POST LAYOUT TO FACILITATE NEW STEEL POST SPACING FOR STRUCTURAL STEEL DETAILER.
   e. CONTRACTOR TO ESTABLISH PROJECT SURVEY CONTROL.

2. SURVEY EXISTING CONDITIONS UPSTREAM OF THE SOUTH POWER BUILDING RELATED TO THE PROPOSED SHEET PILE CUTOFF WALL LOCATION TO BE SUBMITTED TO DOWL AND FOR CONTRACTOR'S USE.

3. SURVEY EXISTING DAM CREST IN PLAN AND ELEVATION AT ~10 FOOT INTERVALS.

INSPECTIONS BY ENGINEER RELATED TO REPAIR DESIGN

1. NORTH POWER BUILDING & FISH LADDER:
   a. VISUAL INSPECTION OF UPSTREAM CONCRETE SURFACES,
   b. DETERMINE IF ANY CONCRETE REPAIRS OR RESTORATION IS NECESSARY AFTER REMOVING THE EXISTING LOG BOOM,
   c. VISUAL INSPECTION OF DOWNSTREAM, SOUTHERN CONCRETE FISH LADDER SURFACE WHERE NEW CONCRETE WINGWALL IS PROPOSED.

2. TIMBER DAM - NORTHERN TIMBER CAP PORTION
   a. VISUAL INSPECTION OF TIMBER CAP FOCUSED ON IDENTIFYING NECESSARY WOOD REPLACEMENTS,
   b. VISUAL INSPECTION OF TIMBER DAM FACING FOCUSED ON IDENTIFYING SEVERE TIMBER LAGGING DEFICIENCIES (NOTE THAT NEW STRUCTURE WILL REPLACE POST & TIE BACK SYSTEM AND REDUCE EXISTING HORIZONTAL WHALER SPAN BY HALF)
   c. VISUAL INSPECTION OF TIMBER DAM FACING FOCUSED ON IDENTIFYING POTENTIAL INTERFERENCES WITH NEW STEEL STRUCTURE.
   d. NOTE AREAS OF SEVERE BEDROCK EROSION, IF ANY, ALONG FACE OF CONCRETE SILL.

3. TIMBER DAM - SOUTHERN CONCRETE CAP PORTION
   a. VISUAL INSPECTION OF CONCRETE CAP FOCUSED ON IDENTIFYING NECESSARY SURFACE REPAIRS,
   b. SEE ITEMS B THROUGH D IN SECTION 2 ABOVE.

4. SOUTH POWER BUILDING & GATES:
   a. VISUAL INSPECTION OF UPSTREAM CONCRETE SURFACES,
   b. DETERMINE IF ANY CONCRETE REPAIRS OR RESTORATION IS NECESSARY FOR OPERABILITY OF GATES.

CONSTRUCTION PHASE ACTIVITIES

MATERIALS TESTING

1. SEE STRUCTURAL GENERAL NOTES SHEET S01 FOR ITEMS OTHER THAN NEW TIE BACKS.

2. NEW TIE BACK ANCHORS:
   a. ROCK EMBEDMENT FOR EACH TIE BACK SHALL BE OF SUFFICIENT DEPTH, DETERMINED BY A LICENSED GEOTECHNICAL ENGINEER RETAINED BY THE CONTRACTOR, TO DEVELOP THE DESIGN LOAD AND SAFETY FACTOR SPECIFIED IN THE STRUCTURAL GENERAL NOTES.
   b. PROOF TEST EACH TIE BACK BEFORE GROUTING THE ROCK EMBEDMENT AS FOLLOWS, HOLD PROOF TEST AT LEAST TEN MINUTES, SUBMIT RESULTS TO DOWL:
      i. PROOF TEST LOAD NORTHERN SECTION TIEBACKS, SINGLE PER POST = 40,000 LBS. WORKING LOAD X 120% PROOF = 48,000 LBS.
      ii. PROOF TEST LOAD SOUTHERN SECTION TIEBACKS, PAIR PER POST = 46,000 LBS. WORKING LOAD X 120% PROOF = 55,000 LBS.
      iii. TENSION LOSS EXCEEDING 0.5% OF TEST LOAD DURING THE PROOF TEST CONSTITUTES FAILURE AND TRIGGERS REMOVAL, ROCK EMBEDMENT EXTENSION, RE-INSTALLATION, AND RE-TEST.
3. CONTRACTOR IS RESPONSIBLE FOR TESTING EQUIPMENT INCLUDING A REACTION BRACKET THAT SUITS THE (2) MC8 STEEL POST DESIGNED FOR THE PROJECT. REACTION FRAME MUST DISTRIBUTE TEST LOAD TO ADJACENT TIMBER POSTS EACH SIDE OF NEW STEEL POST.

NEW/REPLACEMENT MATERIAL INSTALLATION INSPECTIONS

1. UNDER THE DIRECTION OF THE ENGINEER OF RECORD:
   (SEE IBC 2018 BLDG CODE FOR INSPECTION DEFINITIONS)
   a. FULL TIME INSPECTION OF TIE BACK INSTALLATIONS AND ANCHOR GROUTING.
   b. FULL TIME INSPECTION OF POST INSTALLED ANCHOR RODS.
   c. PERIODIC INSPECTION OF CONCRETE REINFORCING PLACEMENT.
   d. PERIODIC INSPECTION OF PRE-BLENDED CONCRETE MATERIALS MIXING AND PLACEMENT.
   e. FULL TIME INSPECTION OF REDI-MIX CONCRETE.
   f. PERIODIC INSPECTION OF STRUCTURAL STEEL INSTALLATION AND CONNECTIONS.
   g. PERIODIC INSPECTION OF TIMBER REINFORCEMENTS OR REPLACEMENTS AND CONNECTIONS.

2. CONCRETE CLASS B TESTING IN ACCORDANCE WITH ASTM E329:
   a. SLUMP, ONE TEST EACH SET
   b. TOTAL AIR CONTENT, ONE TEST EACH SET
   c. TEMPERATURE, ONE TEST EACH SET
   d. COMPRESSIVE STRENGTH, ONE SET FOR EACH DAY'S PLACEMENT.

3. CONCRETE CLASS C - SHOTCRETE TESTING:
   a. SHOOT ONE TEST CONSTRUCTION PANEL FOR EACH DAY'S PRODUCTION
   b. COMPRESSIVE STRENGTH, ONE SET OF CORES FROM ONE CONSTRUCTION PANEL SELECTED BY THE MATERIALS TESTING REPRESENTATIVE

REFERENCE DRAWINGS AND DOCUMENTS

*DOCUMENTS DOWL REFERENCED TO DEVELOP BACKGROUND DRAWINGS AND STRUCTURAL REPAIR DESIGNS.

- DRAWING, E-56934
- DRAWING, AA-35863
- DRAWING, C5706
- DRAWING PB-27411
- CROSS-SECTION OF WINCHESTER DAM PROPOSED REPAIR (1976) SKETCH 7601-7602
- OREGON WATER RESOURCES INSPECTION REPORT, 2009
- OREGON WATER RESOURCES INSPECTION REPORT, 2012
- OREGON WATER RESOURCES INSPECTION REPORT, 2013
- OREGON WATER RESOURCES INSPECTION REPORT, 2014
- OREGON WATER RESOURCES INSPECTION REPORT, 2015
- OREGON WATER RESOURCES INSPECTION REPORT, 2016
- OREGON WATER RESOURCES INSPECTION REPORT, 2017
- OREGON WATER RESOURCES INSPECTION REPORT, 2018
- OREGON WATER RESOURCES INSPECTION REPORT, 2019
- WINCHESTER DAM INSPECTION AND STABILITY ANALYSIS REPORT - OBEC 1987
- WINCHESTER DAM NATIONAL REGISTER OF HISTORIC PLACES REGISTRATION FORM

REVISIONS

REV	DATE	DESCRIPTION	BY

90% DESIGN
NOT FOR
CONSTRUCTION

NICHOLAS PAUL ROBERTSON
EXPIRES: 12/31/

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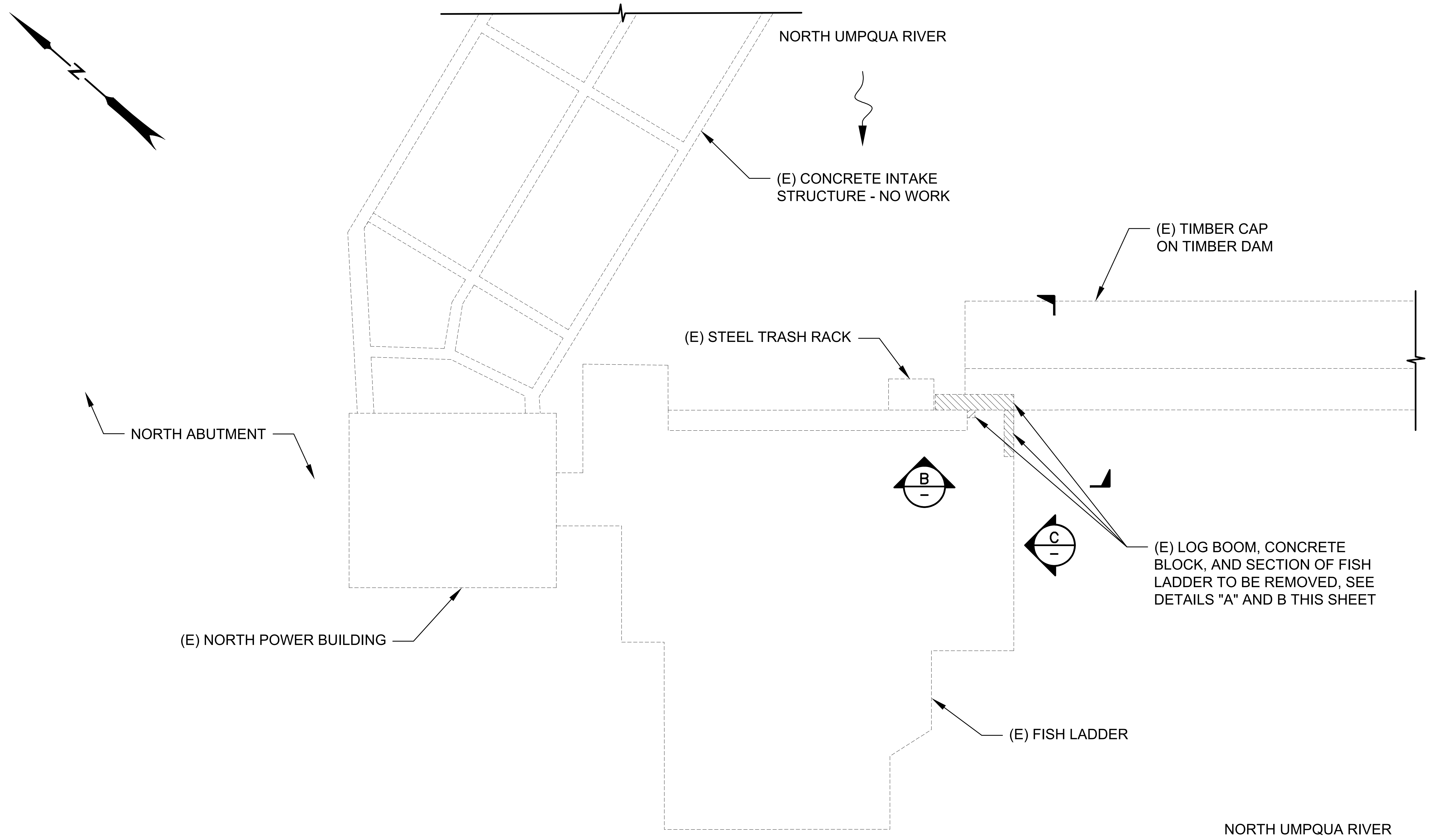
WINCHESTER DAM INSPECTION AND REPAIR PROJECT
WINCHESTER, OREGON

MATERIAL TESTING & INSPECTIONS PLAN

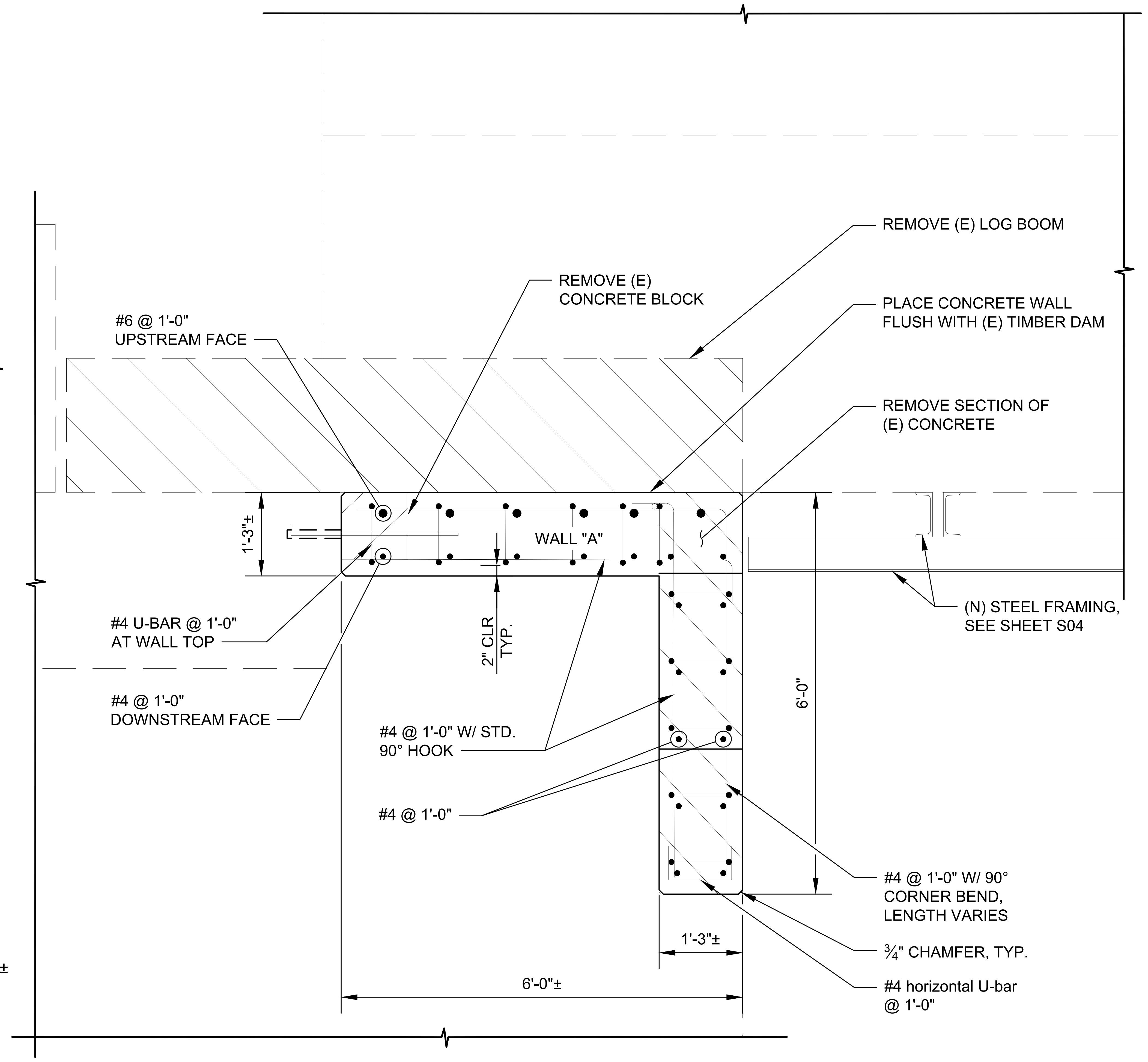
PROJECT 80069
DATE 10/08/2021

SHEET
S02



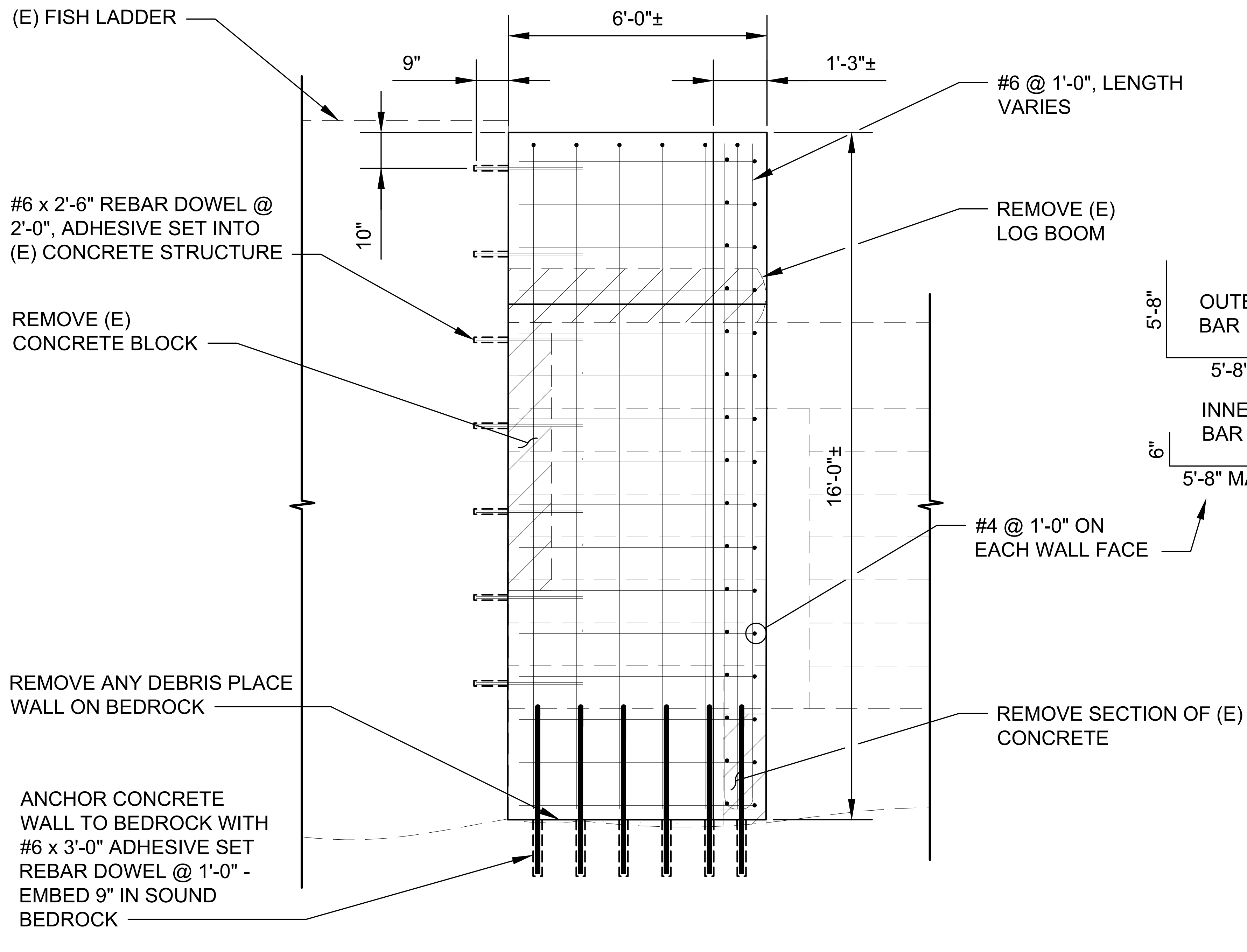
NORTH POWER BUILDING AND FISH LADDER PLAN

SCALE: 1" = 10'



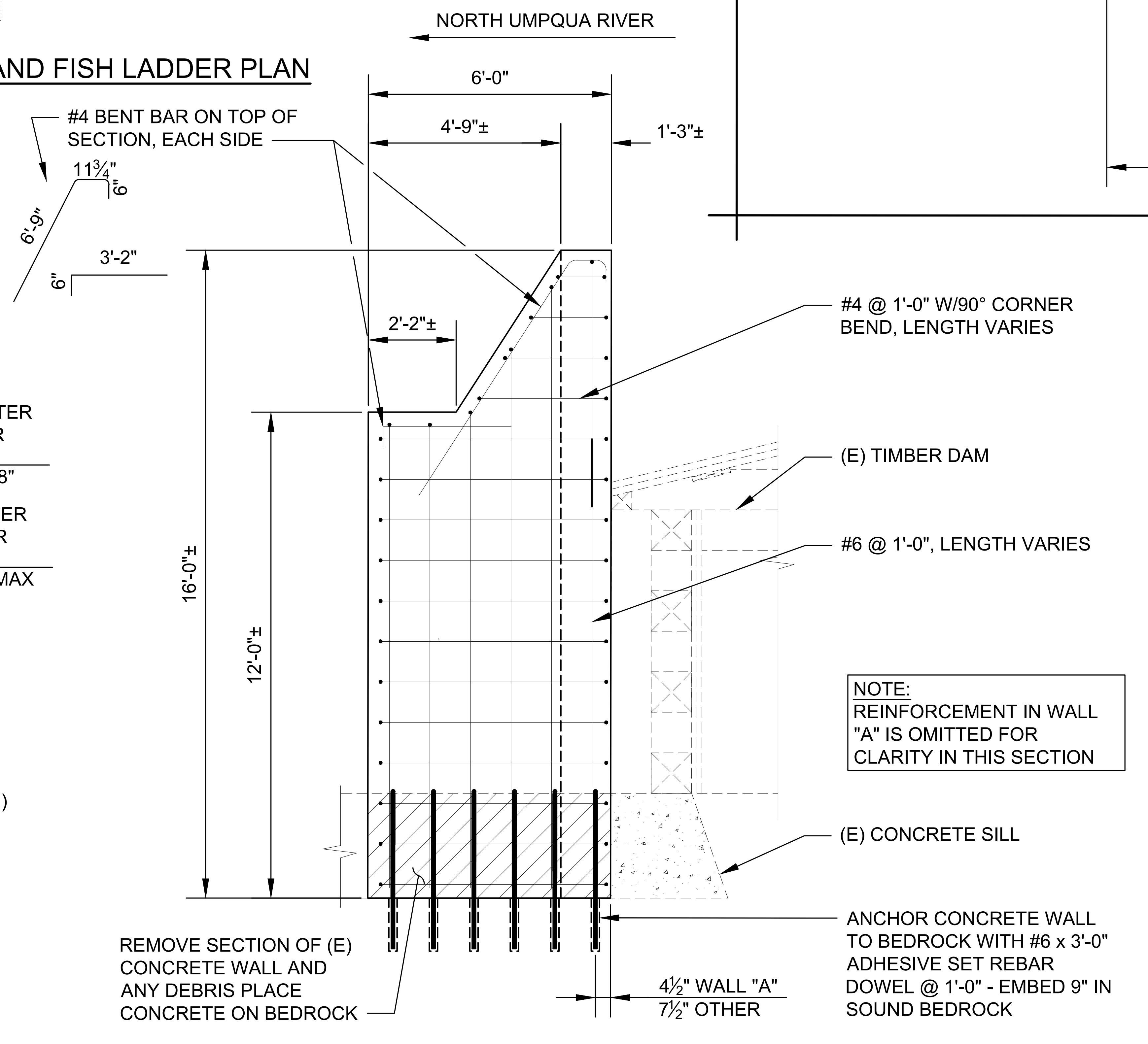
A - REINFORCED CONCRETE WALL PLAN

SCALE: 3/4" = 1'-0"



B - REINFORCED CONCRETE WALL ELEVATION - LOOKING UPSTREAM

SCALE: 3/8" = 1'-0"'

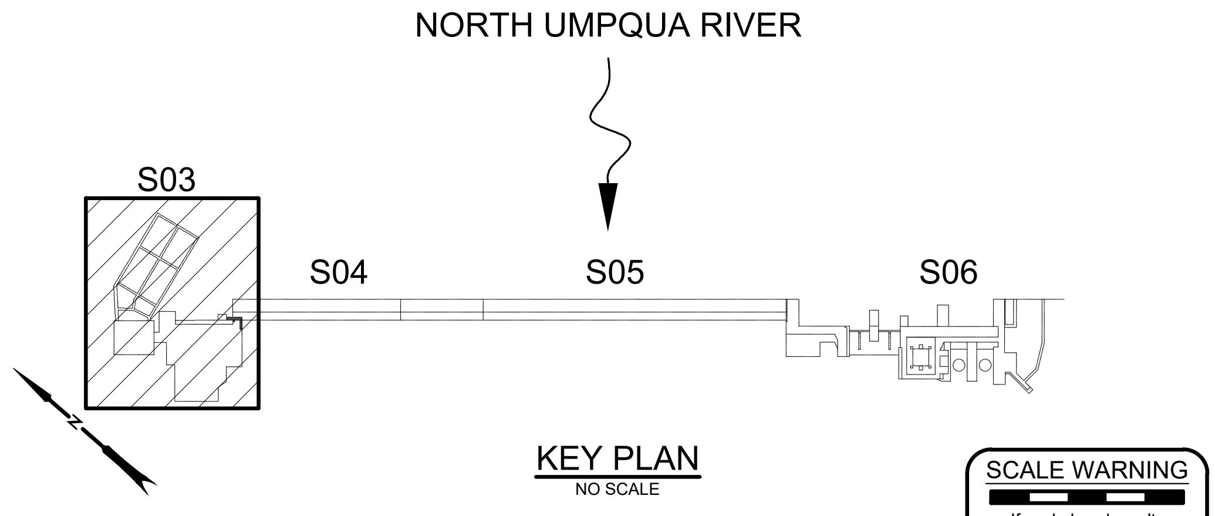


C - REINFORCED CONCRETE WALL SECTIONS

SCALE: 3/8" = 1'-0"

NOTES:

1. THIS SECTION OF EXISTING STRUCTURE HAS NO DRAWINGS, MEASUREMENTS ARE APPROXIMATE. CONTRACTOR TO FIELD VERIFY ALL DIMENSIONS.
2. CONCRETE WALL DIMENSIONS ARE ESTIMATED BASED ON INFORMATION AVAILABLE - DESIGN INTENT IS THAT WALL TOP TAPER IS SIMILAR TO THE EXISTING CONCRETE STRUCTURE AND UPSTREAM WALL TOP NOMINALLY MATCHES EXISTING STOP LOG HEIGHT. FIELD ADJUST OF THESE DIMENSIONS ACCORDINGLY TO REALIZE DESIGN INTENT.



KEY PLAN

NO SCALE

SCALE WARNING

If scale bar doesn't measure one inch then drawing is not to scale

REV	DATE	REVISIONS DESCRIPTION	BY

NICHOLAS PAUL ROBERTSON

EXPIRES: 12/31/

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WINCHESTER DAM INSPECTION AND REPAIR PROJECT

WINCHESTER, OREGON

NORTH POWER BUILDING AND FISH LADDER PLANS, ELEVATIONS AND SECTIONS

PROJECT 80069

DATE 10/08/2021

SHEET

S03

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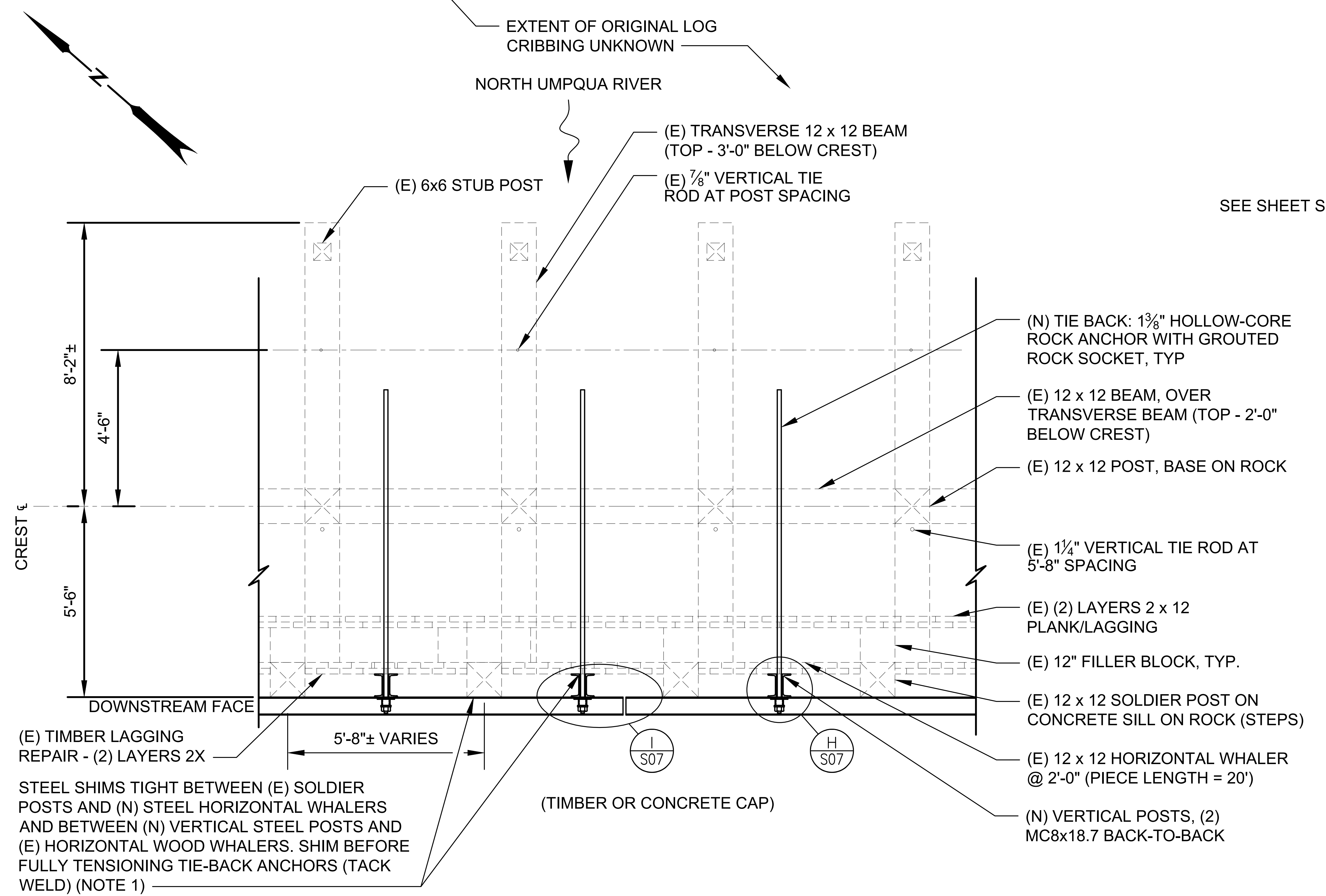
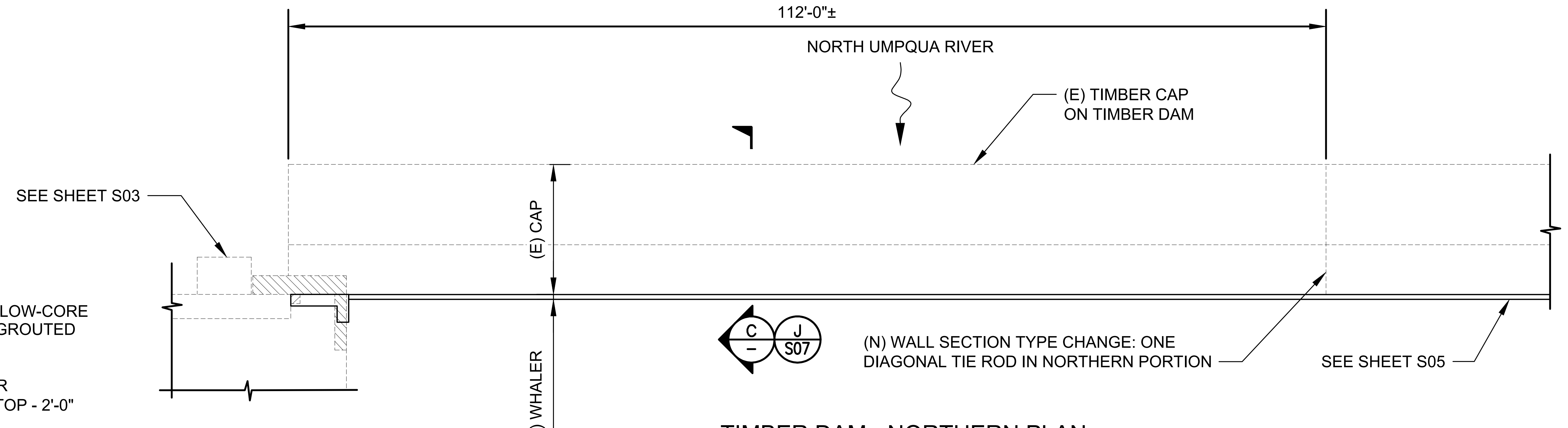


D -

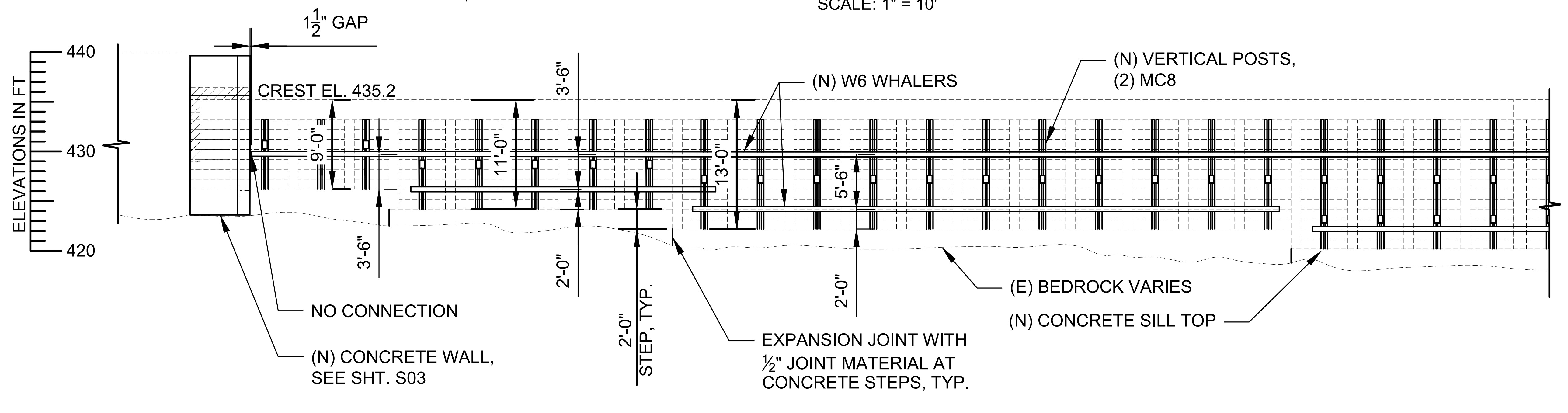
TIMBER DAM - PARTIAL FRAMING PLAN

SCALE: 3/8" = 1'-0"



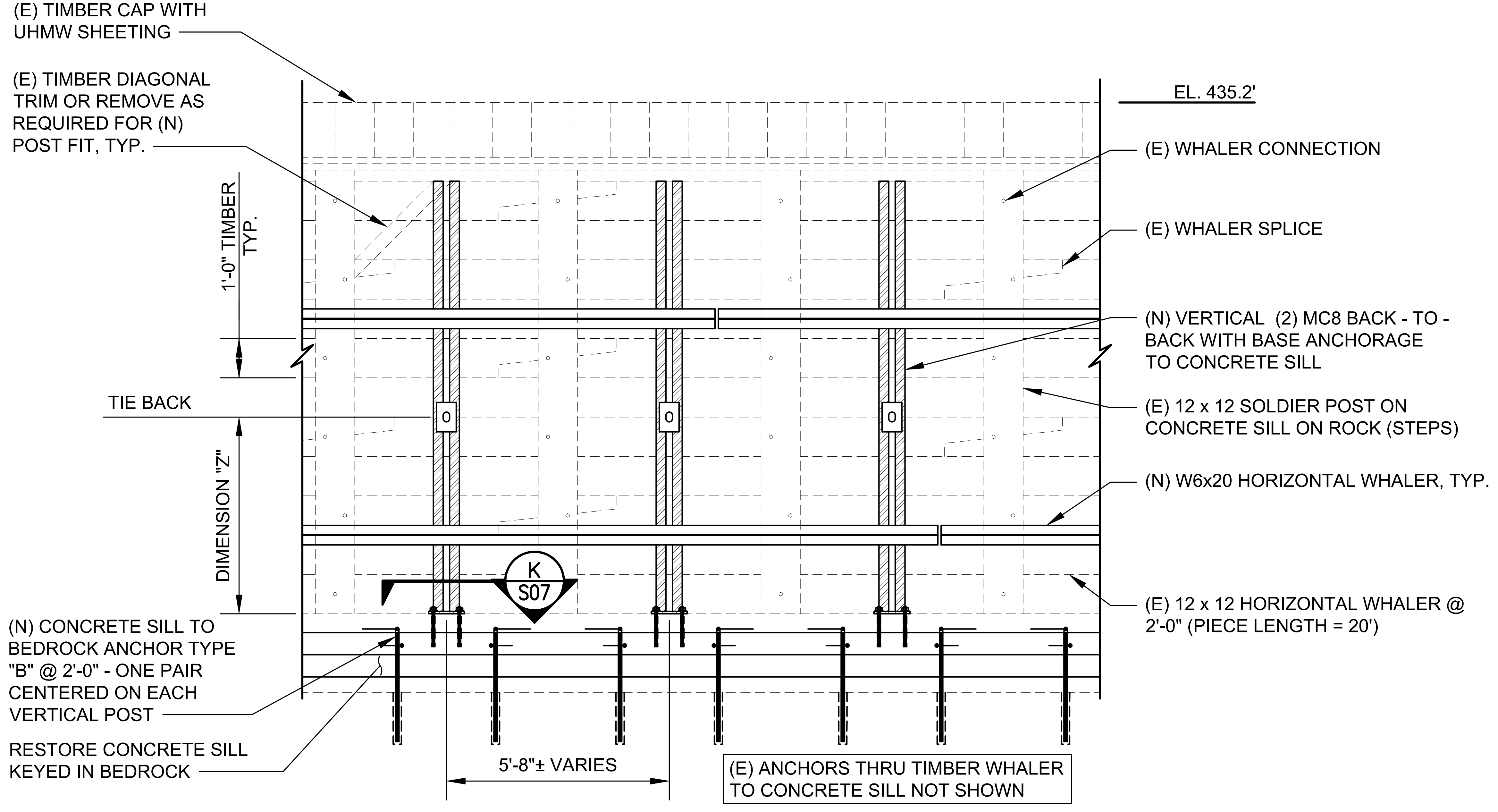
TIMBER DAM - NORTHERN PLAN

SCALE: 1" = 10'



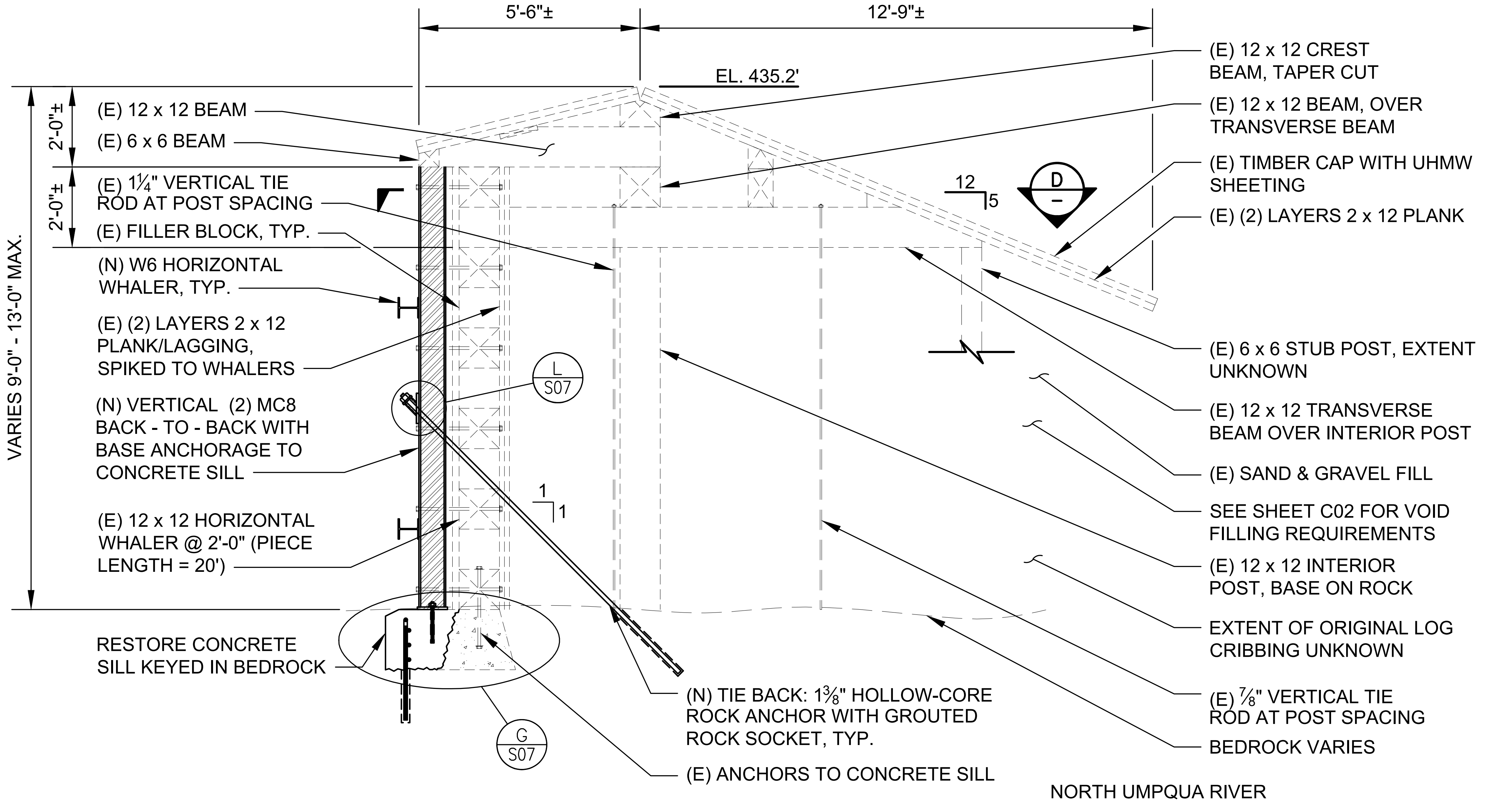
TIMBER DAM - NORTHERN ELEVATION - LOOKING UPSTREAM

SCALE: 1" = 10'



NORTHERN TIMBER DAM - PARTIAL ELEVATION, LOOKING UPSTREAM

SCALE: 3/8" = 1'-0"



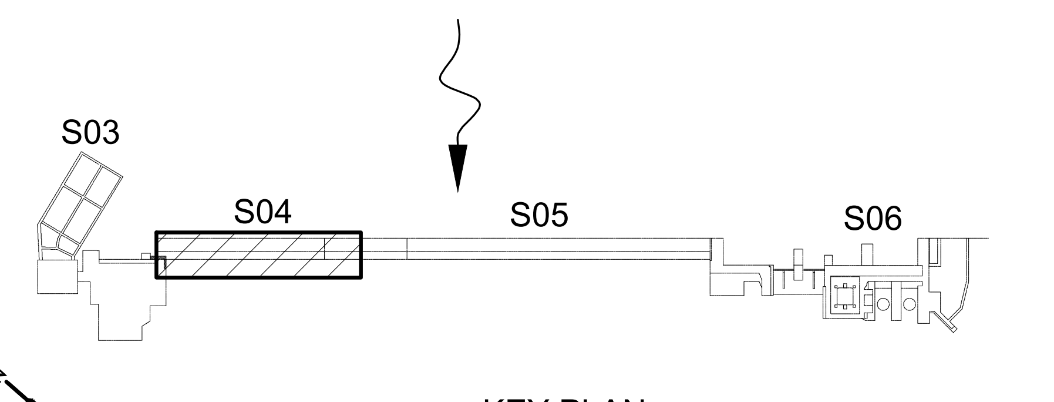
C -

NORTHERN TIMBER DAM SECTION

SCALE: 3/8" = 1'-0"

DAM HEIGHT SEE ELEV. VIEW	DIMENSION "Z"
9'-0"	4'-6"
11'-0"	4'-6"
13'-0"	5'-0"

NOTES:
1. REMOVE (E) BOLT HEADS, TIE BACK ROD ENDS/BRACKETS (SOUTHERN) OR OTHER INTERFERENCES TO FACILITATE INSTALLATION OF NEW MEMBERS



KEY PLAN

NO SCALE

SCALE WARNING
If scale bar doesn't measure one inch then drawing is not to scale

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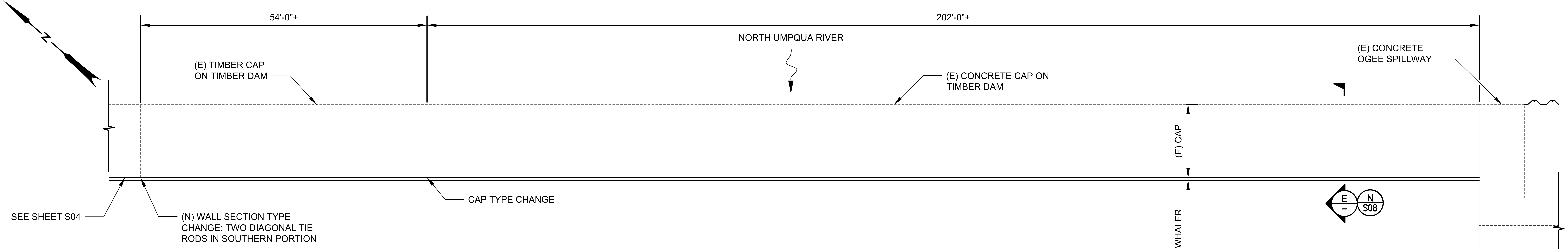
WINCHESTER DAM INSPECTION AND REPAIR PROJECT
WINCHESTER, OREGON

NORTHERN TIMBER DAM REPAIR
PLANS, ELEVATIONS & SECTION

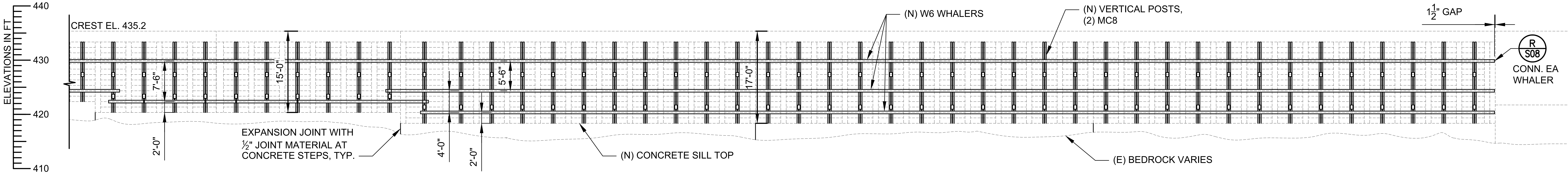
PROJECT 80069
DATE 10/08/2021

SHEET
S04



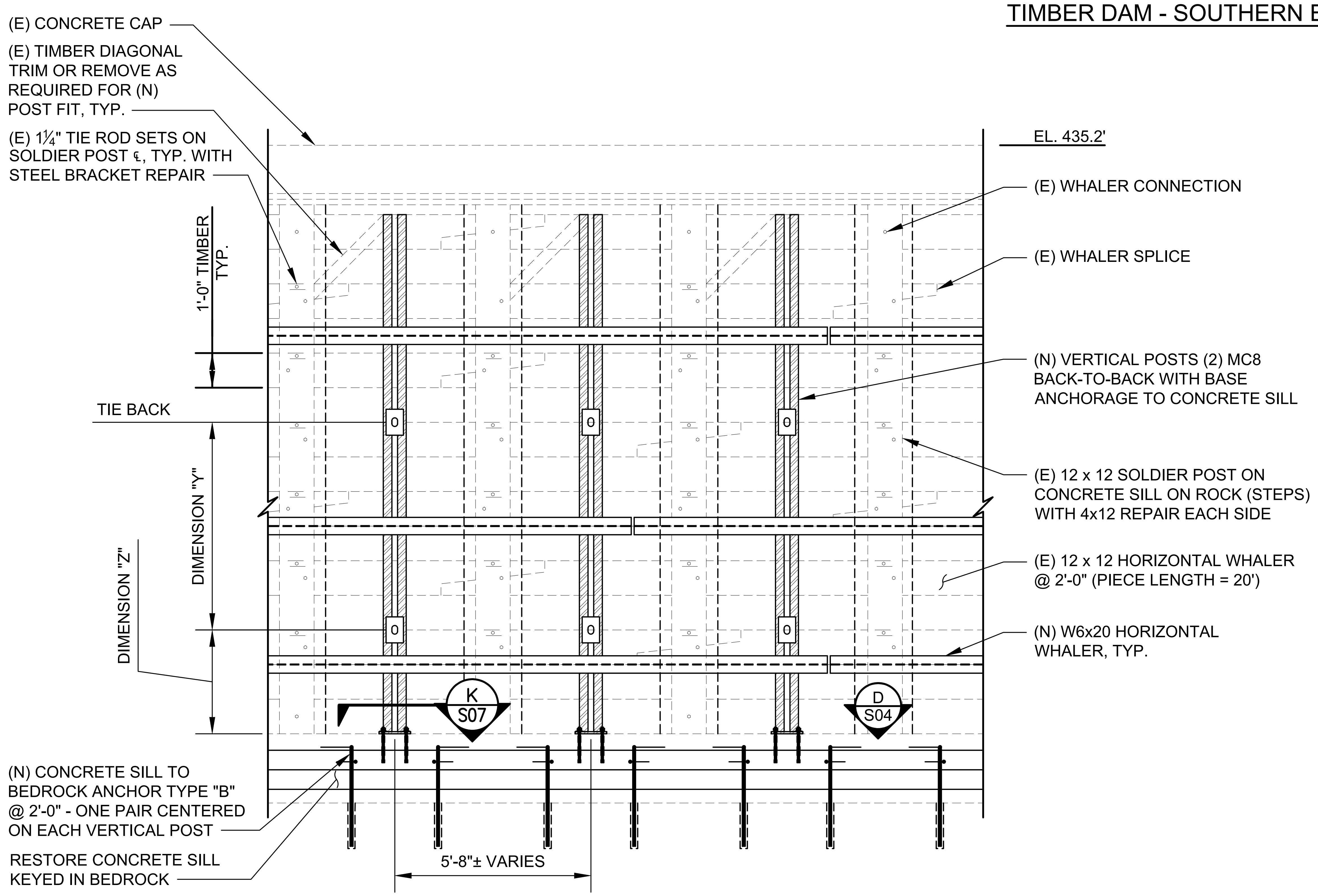
TIMBER DAM - SOUTHERN PLAN

SCALE: 1" = 10'



TIMBER DAM - SOUTHERN ELEVATION - LOOKING UPSTREAM

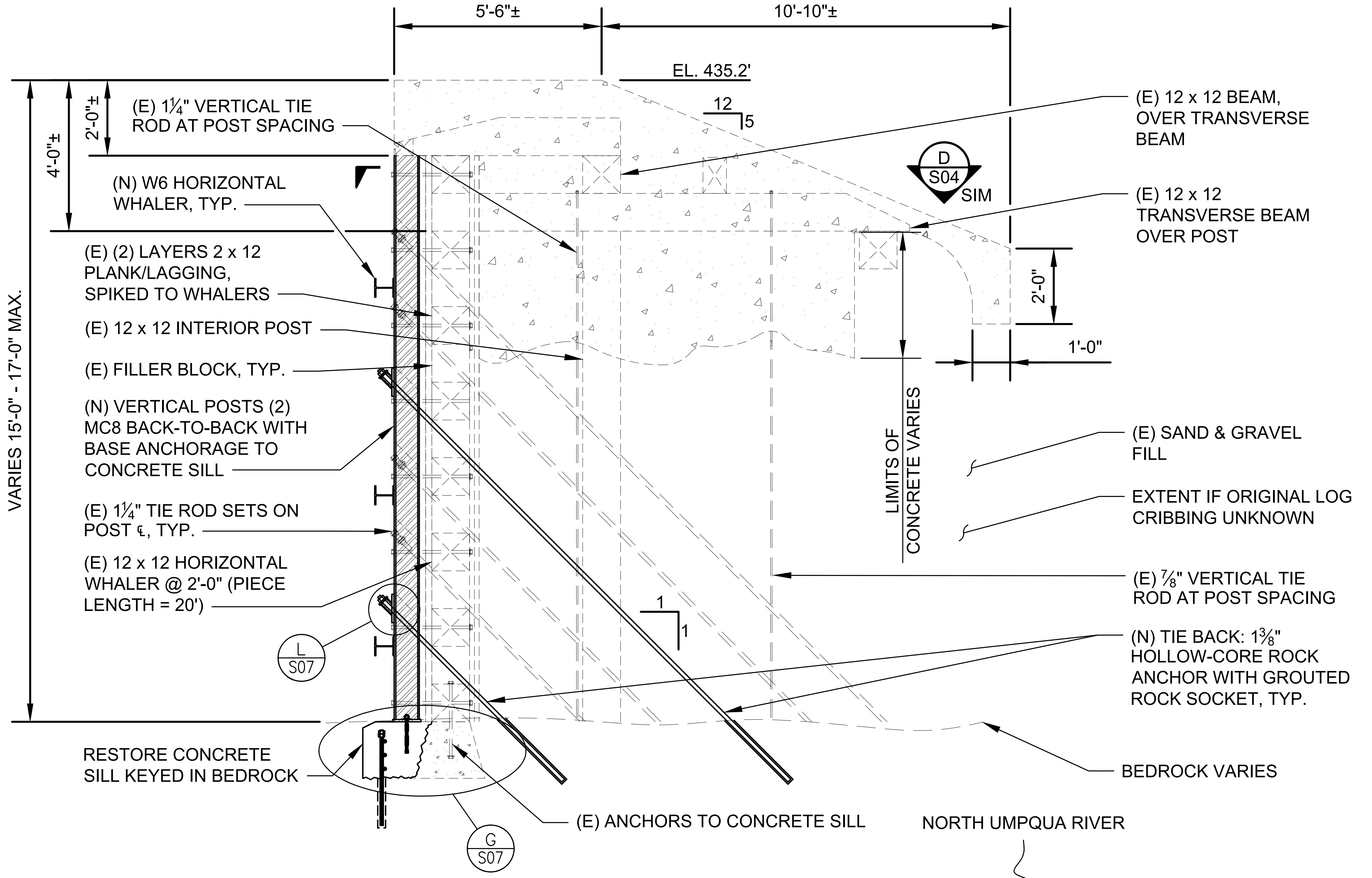
SCALE: 1" = 10'



SOUTHERN TIMBER DAM PARTIAL ELEVATION - LOOKING UPSTREAM

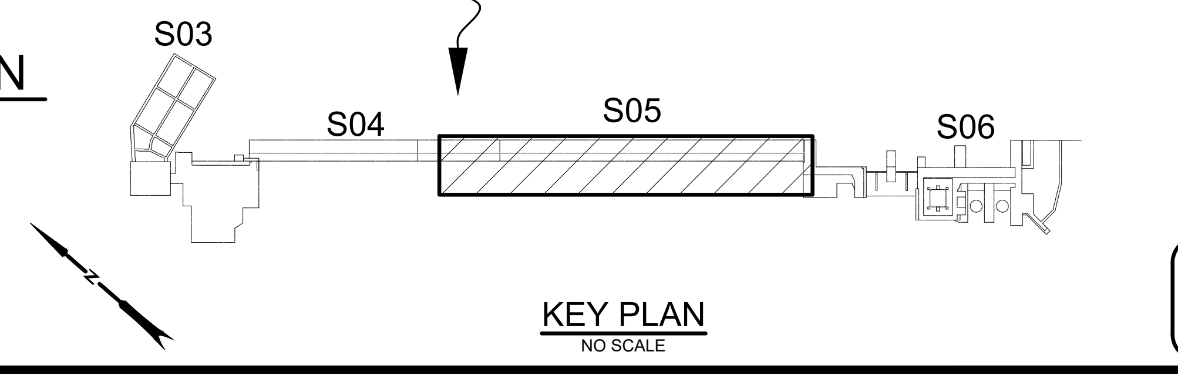
SCALE: 3/8" = 1'-0"

DAM HEIGHT SEE ELEV. VIEW	DIMENSION "Y"	DIMENSION "Z"
15'-0"	4'-0"	3'-0"
17'-0"	6'-0"	3'-0"



E - SOUTHERN TIMBER DAM SECTION

SCALE: 3/8" = 1'-0"



KEY PLAN

NO SCALE

SCALE WARNING

If scale bar doesn't measure one inch then drawing is not to scale

REVISIONS

REV	DATE	DESCRIPTION	BY

REGISTERED PROFESSIONAL ENGINEER

OREGON

NICHOLAS PAUL ROBERTSON

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WINCHESTER DAM INSPECTION AND REPAIR PROJECT

WINCHESTER, OREGON

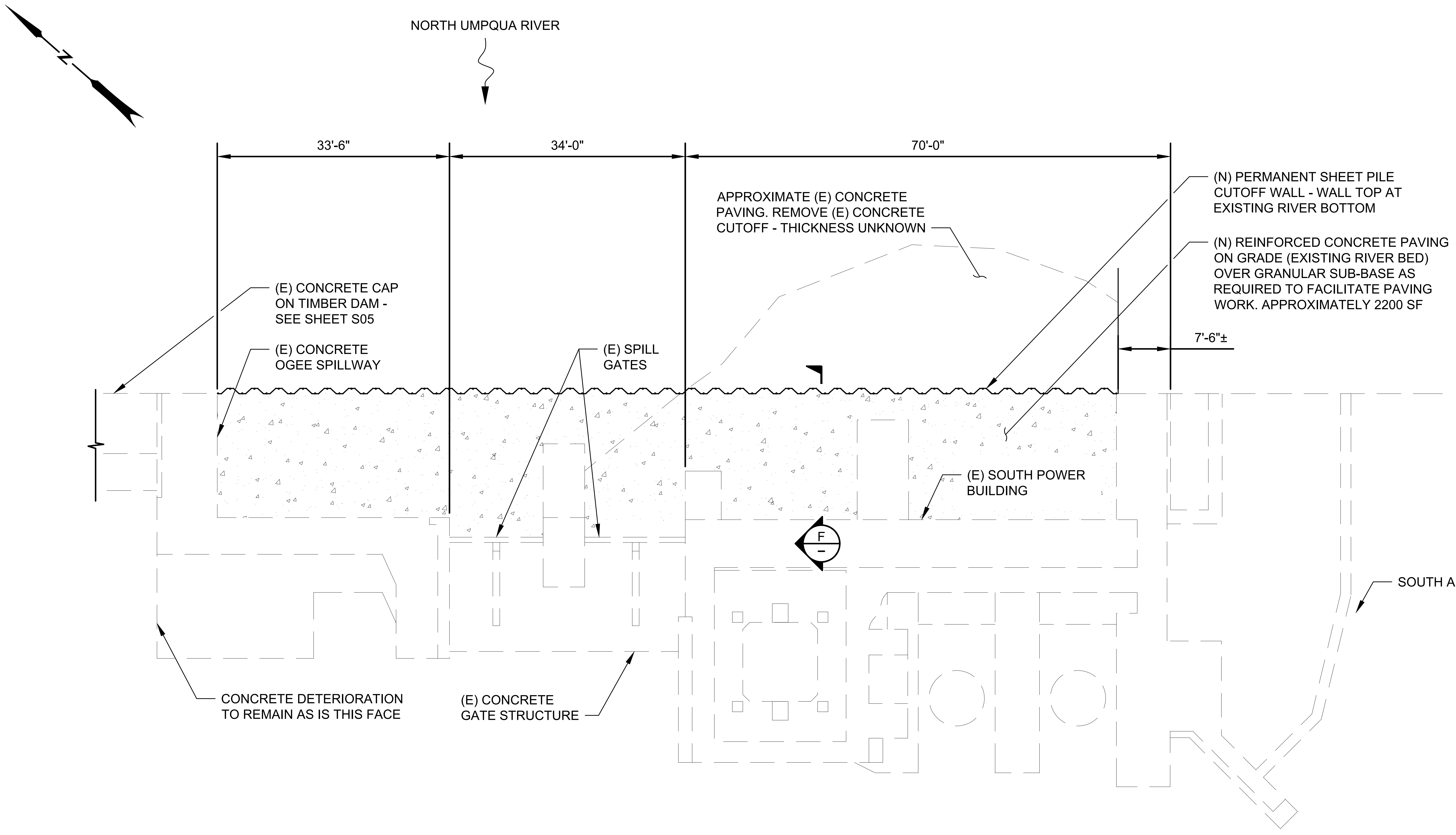
SOUTHERN TIMBER DAM REPAIR PLANS, ELEVATIONS & SECTION

PROJECT 80069
DATE 10/08/2021

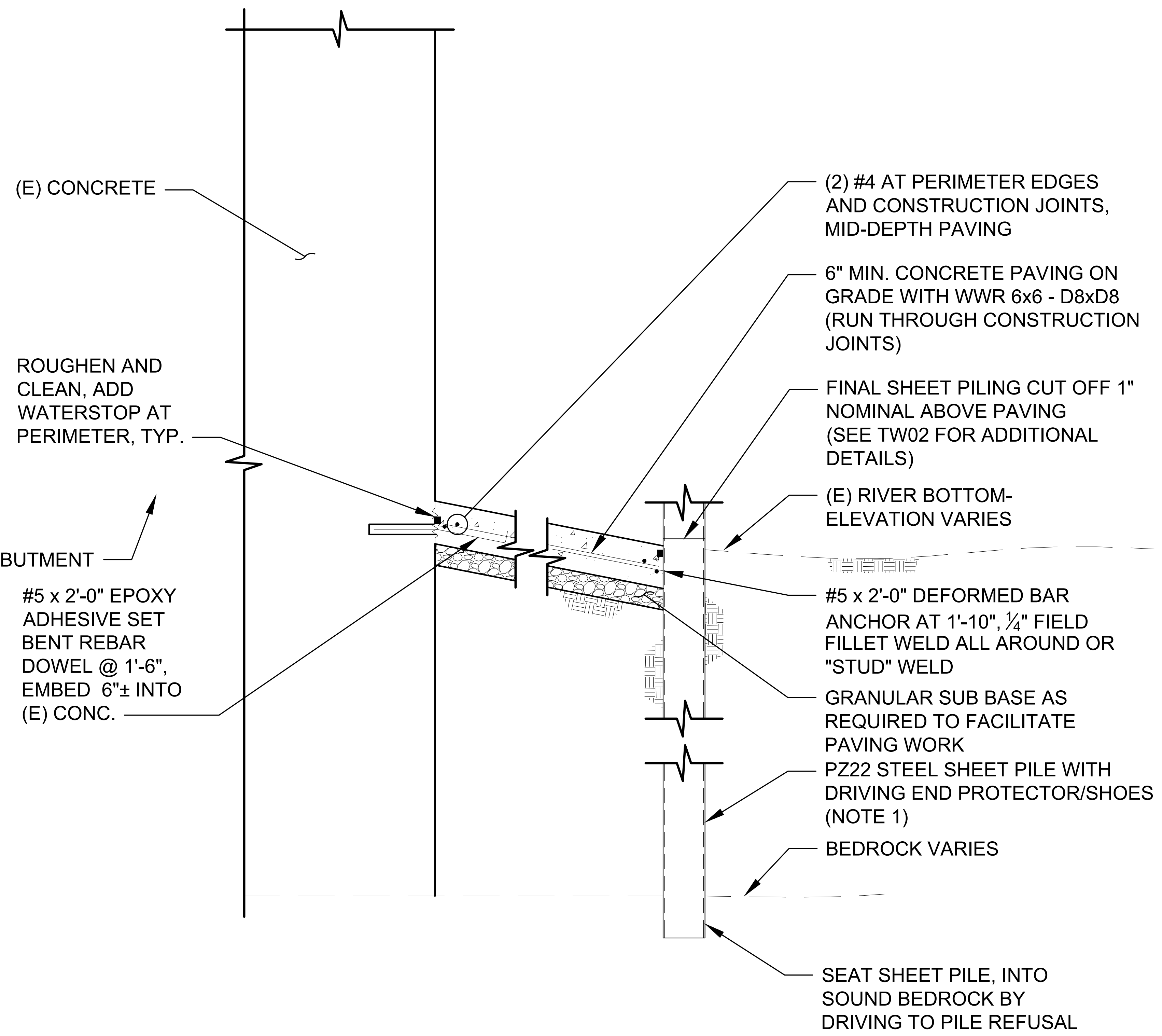
SHEET

S05

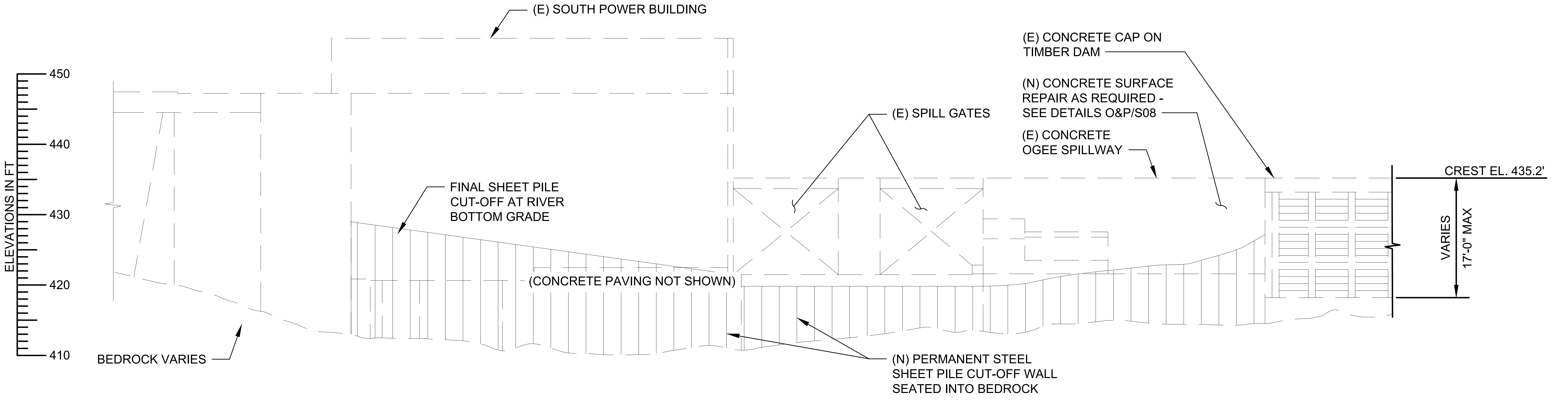
NOTES:
1. MINIMUM SHEET PILE DEPTH IS 9", THICKNESS IS ⅜" AND SECTION PROPERTIES:
   AREA = 6.45 IN^2/FT
   SECTION MODULUS = 18.0 IN^3/FT
2. SEE CIVIL SHEET TW02 FOR PILING REQUIREMENT RELATED TO TEMPORARY WATER MANAGEMENT.



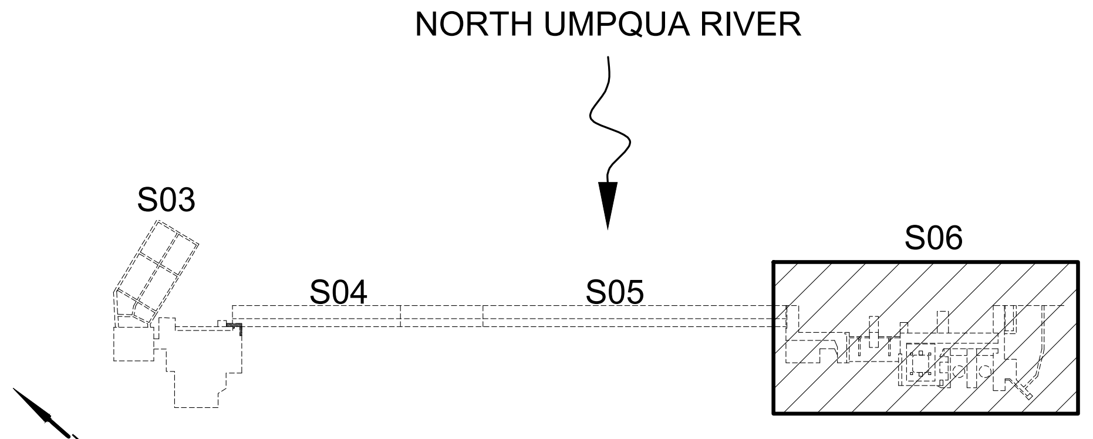
SOUTH POWER BUILDING AND SPILL GATES - PLAN
SCALE: 1" = 10'



F
-
SECTION
SCALE: 3/4" = 1'-0"



SOUTH POWER BUILDING AND SPILL GATES - ELEVATION - LOOKING DOWNSTREAM
SCALE: 1" = 10'



KEY PLAN
NO SCALE

SCALE WARNING
If scale bar doesn't measure one inch then drawing is not to scale

REV	DATE	REVISIONS DESCRIPTION	BY

REGISTERED PROFESSIONAL ENGINEER
OREGON
NICHOLAS PAUL ROBERTSON
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EXPIRES: 12/31/

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WINCHESTER DAM INSPECTION AND REPAIR PROJECT
WINCHESTER, OREGON

SOUTH POWER BUILDING AND FILL GATES
PLAN, ELEVATION & SECTION

PROJECT 80069
DATE 10/08/2021

SHEET
S06

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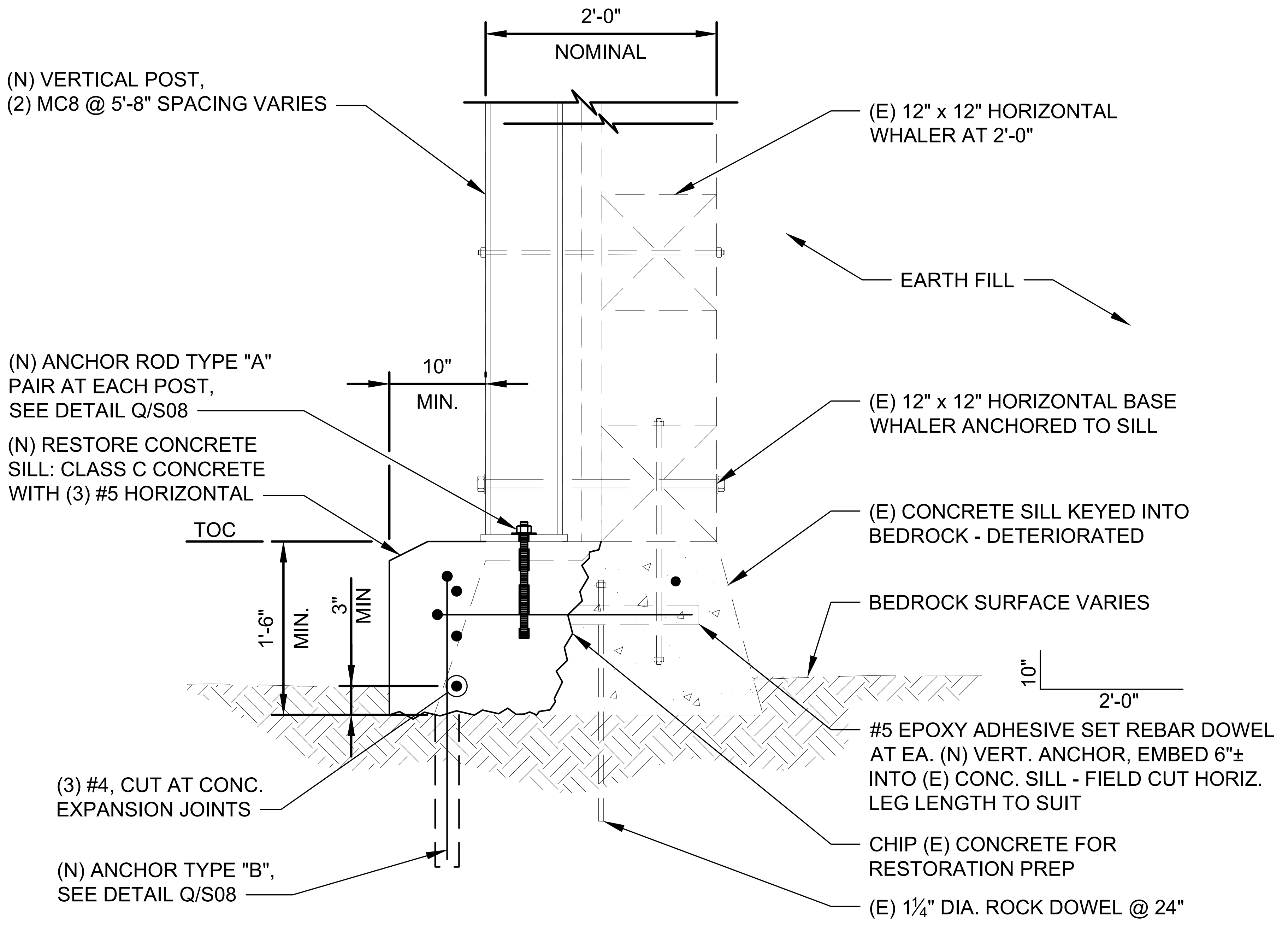
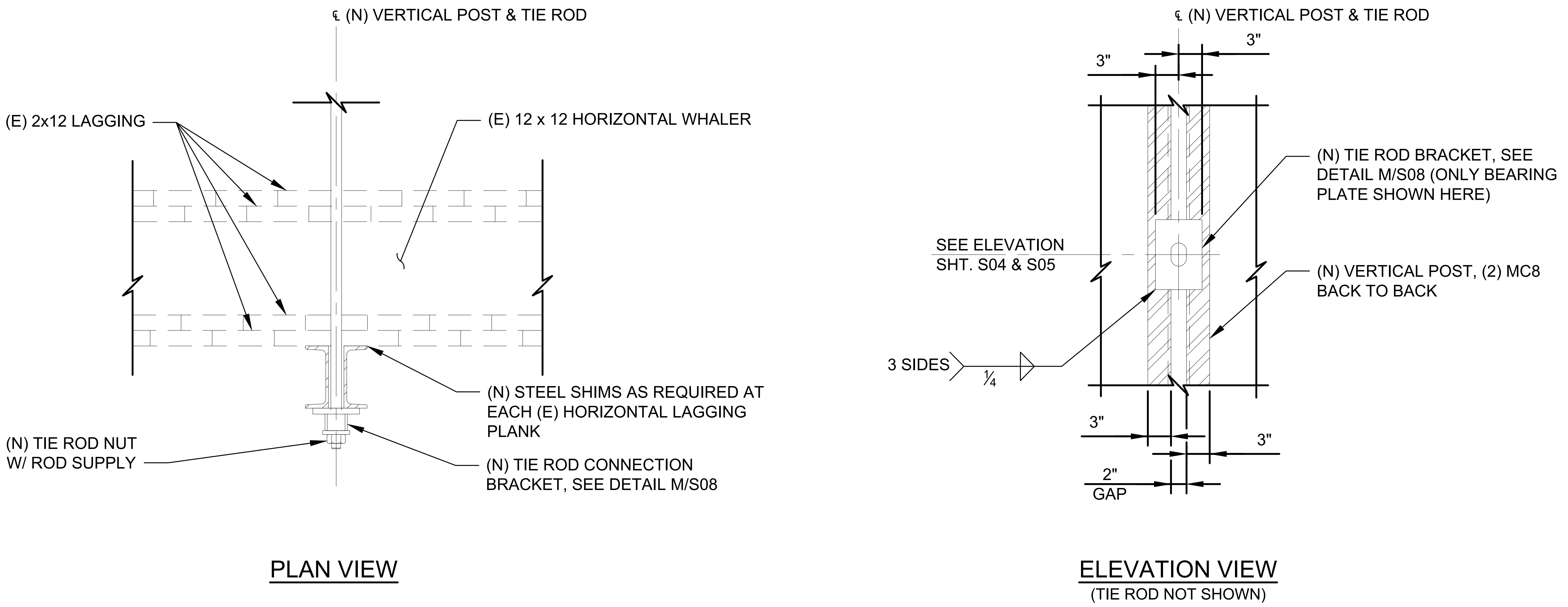


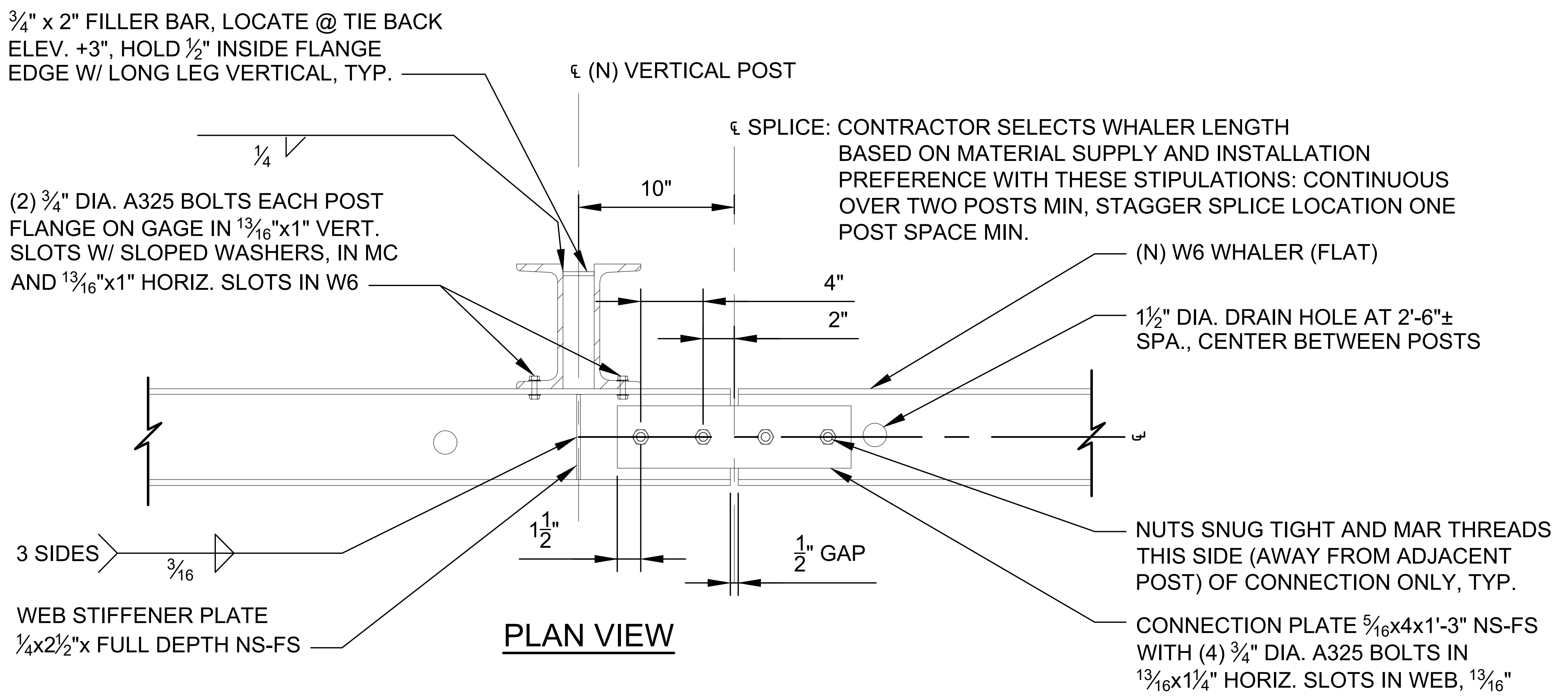
G
-
CONCRETE SILL RESTORATION
SCALE: 1" = 1'-0"



PLAN VIEW

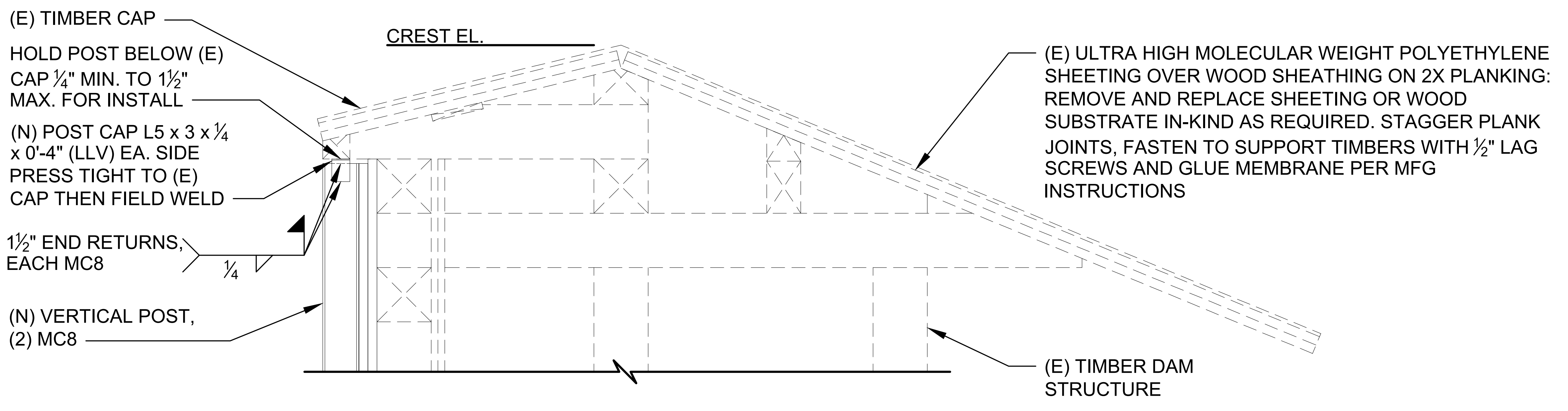
ELEVATION VIEW
(TIE ROD NOT SHOWN)

H
-
VERTICAL POST AT TIE ROD
SCALE: 1" = 1'-0"

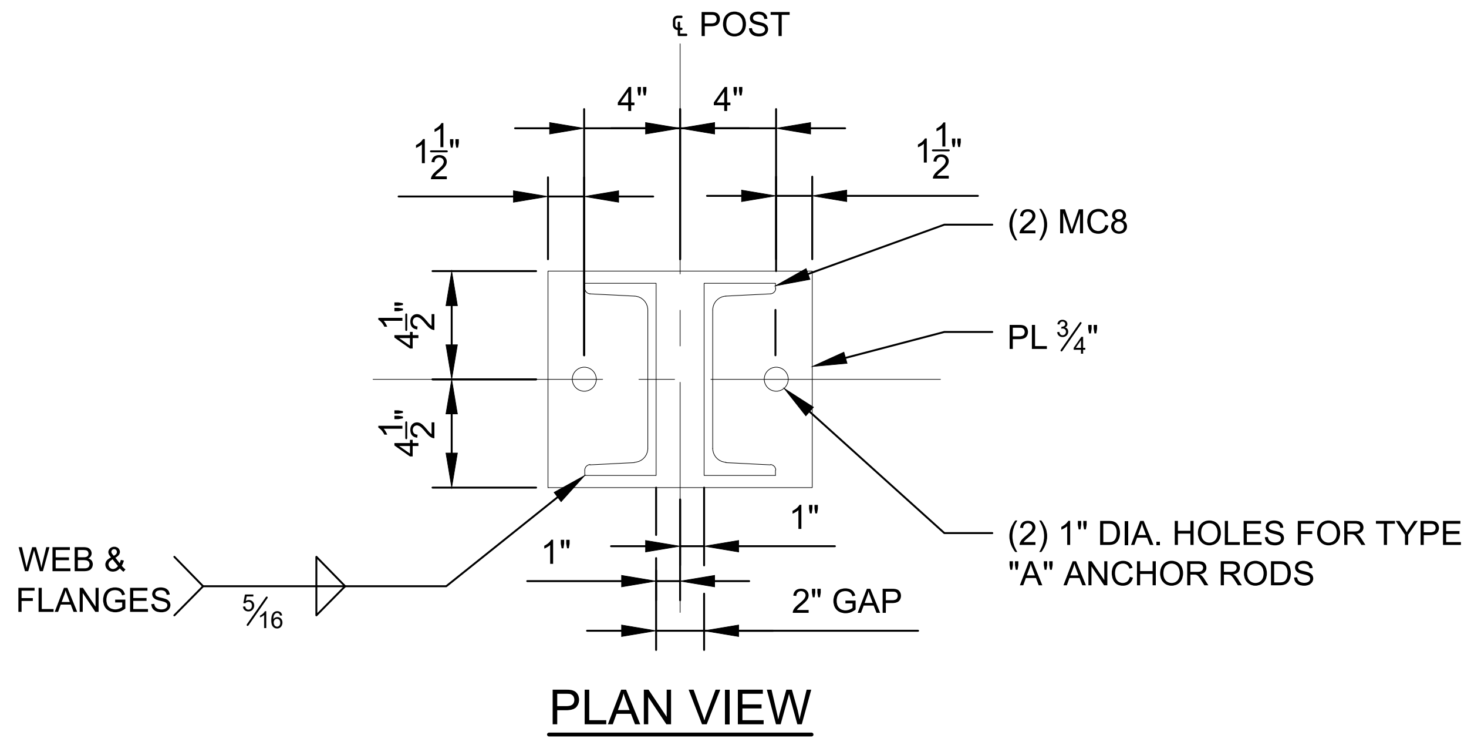


PLAN VIEW

I
-
HORIZONTAL WHALER CONNECTION AND SPLICE
SCALE: 1-1/2" = 1'-0"

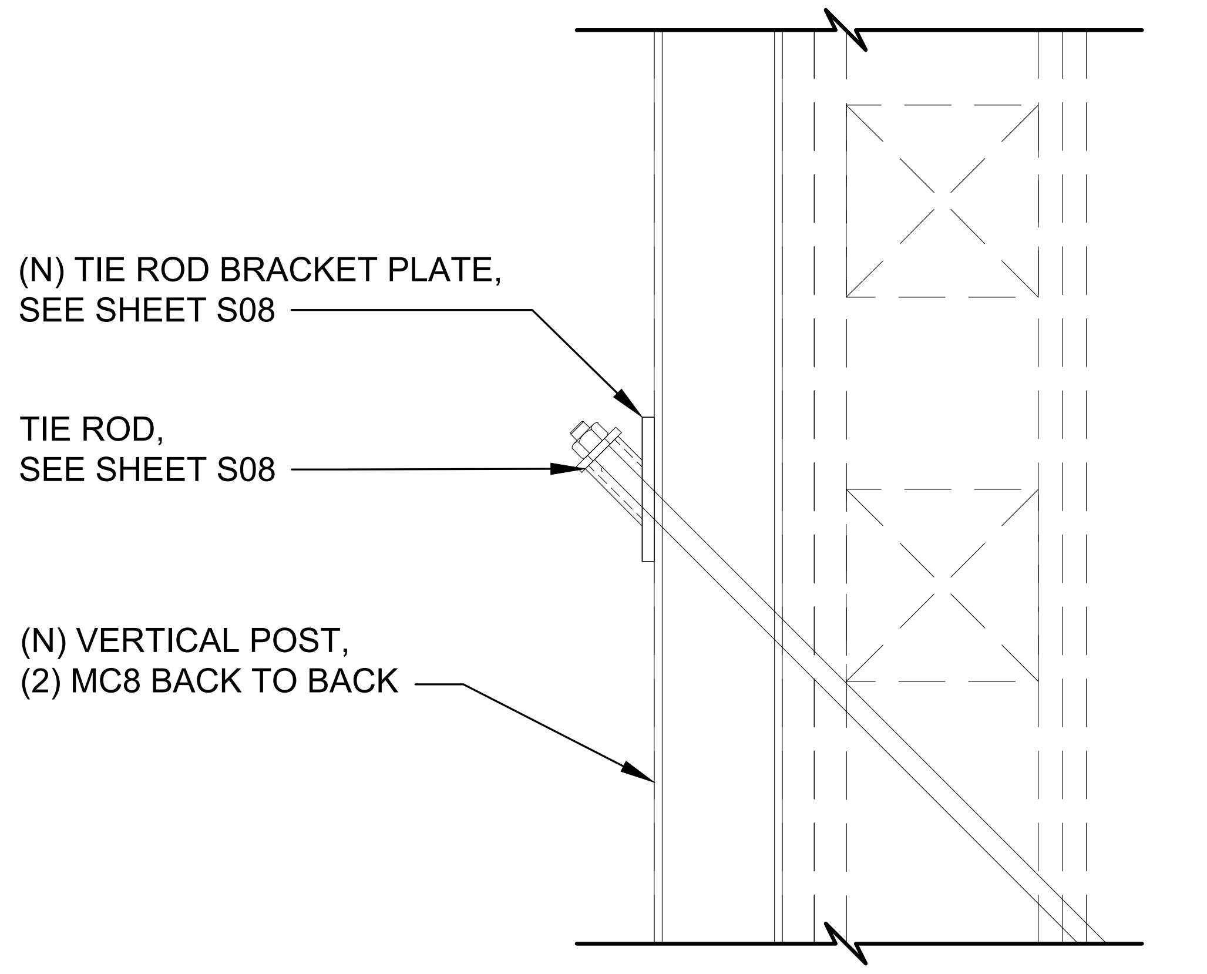


J
-
TIMBER DAM - WOOD CAP REPAIR
SCALE: 1/2" = 1'-0"



PLAN VIEW

K
-
POST BASE DETAIL
SCALE: 1-1/2" = 1'-0"



L
-
TIE BACK ROD DETAIL
SCALE: 1/2" = 1'-0"

SCALE WARNING
If scale bar doesn't
measure one inch then
drawing is not to scale

REV	DATE	REVISIONS DESCRIPTION	BY

REGISTERED PROFESSIONAL
ENGINEER
90% DESIGN
NOT FOR
CONSTRUCTION
PAUL ROBERTSON
EXPIRES: 12/31/

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WINCHESTER DAM INSPECTION AND REPAIR PROJECT
WINCHESTER, OREGON

STRUCTURAL REPAIR DETAILS

PROJECT 80069
DATE 10/08/2021

SHEET
S07

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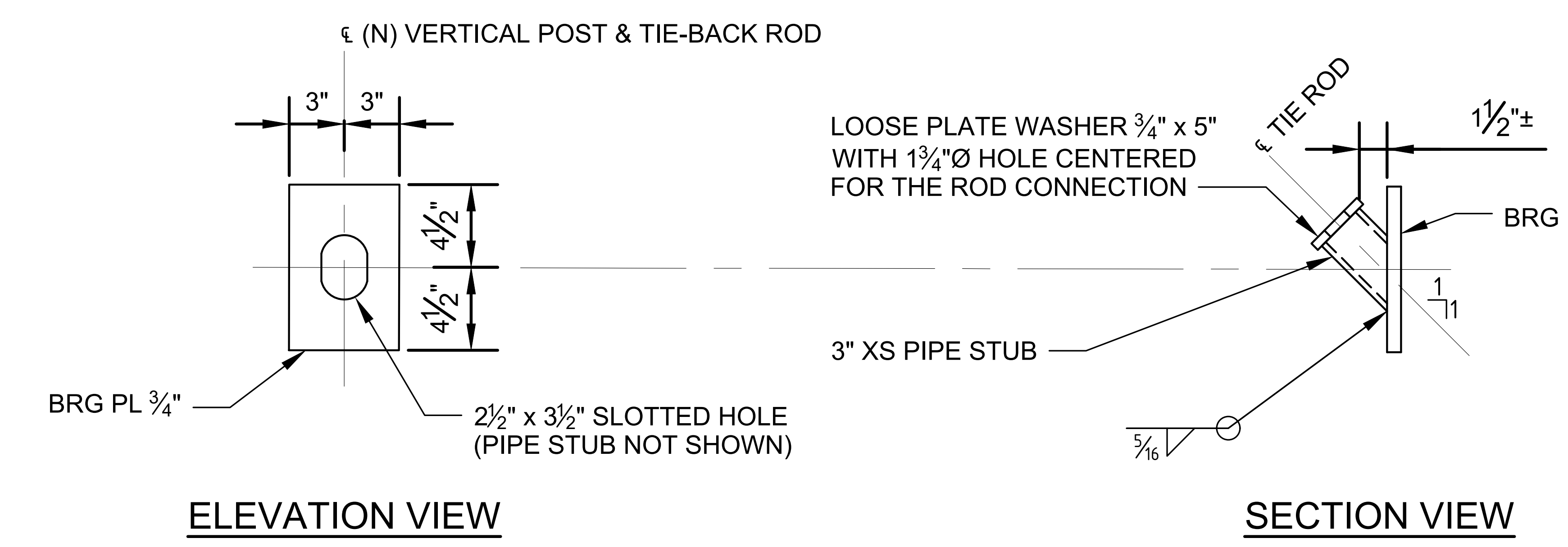
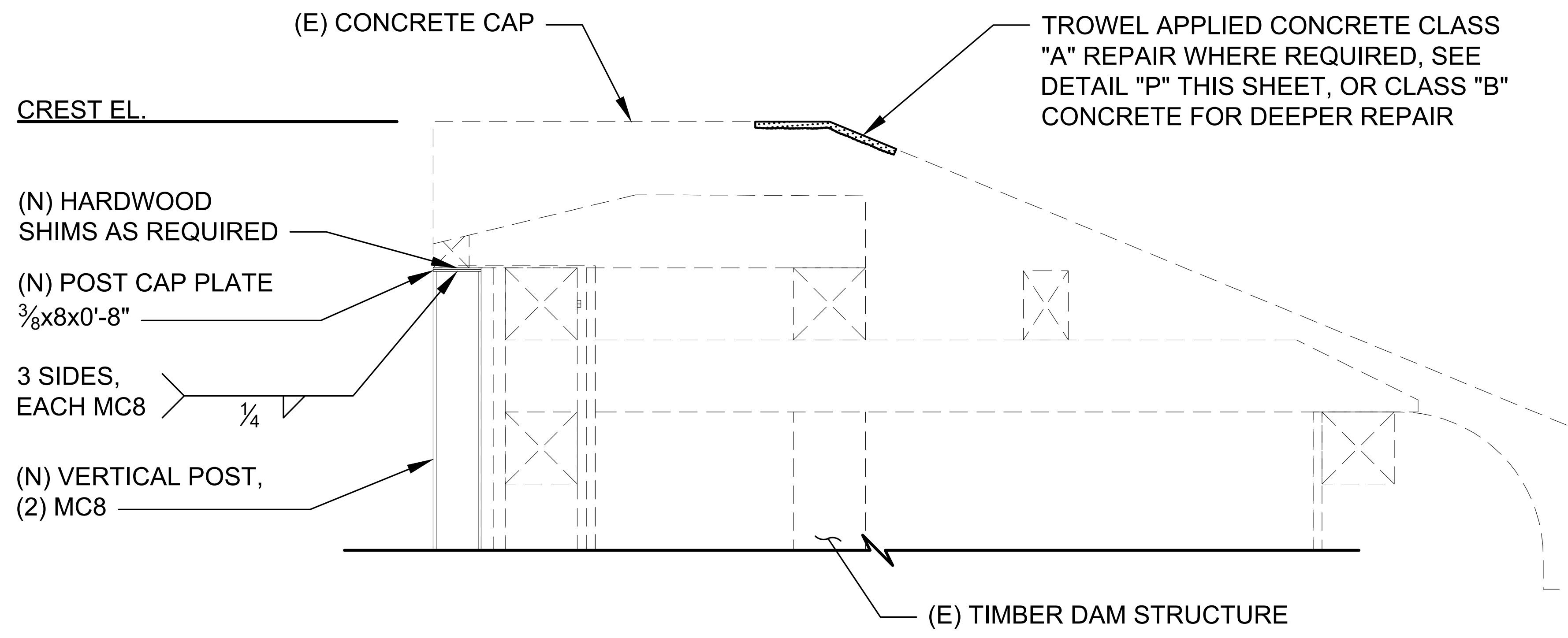
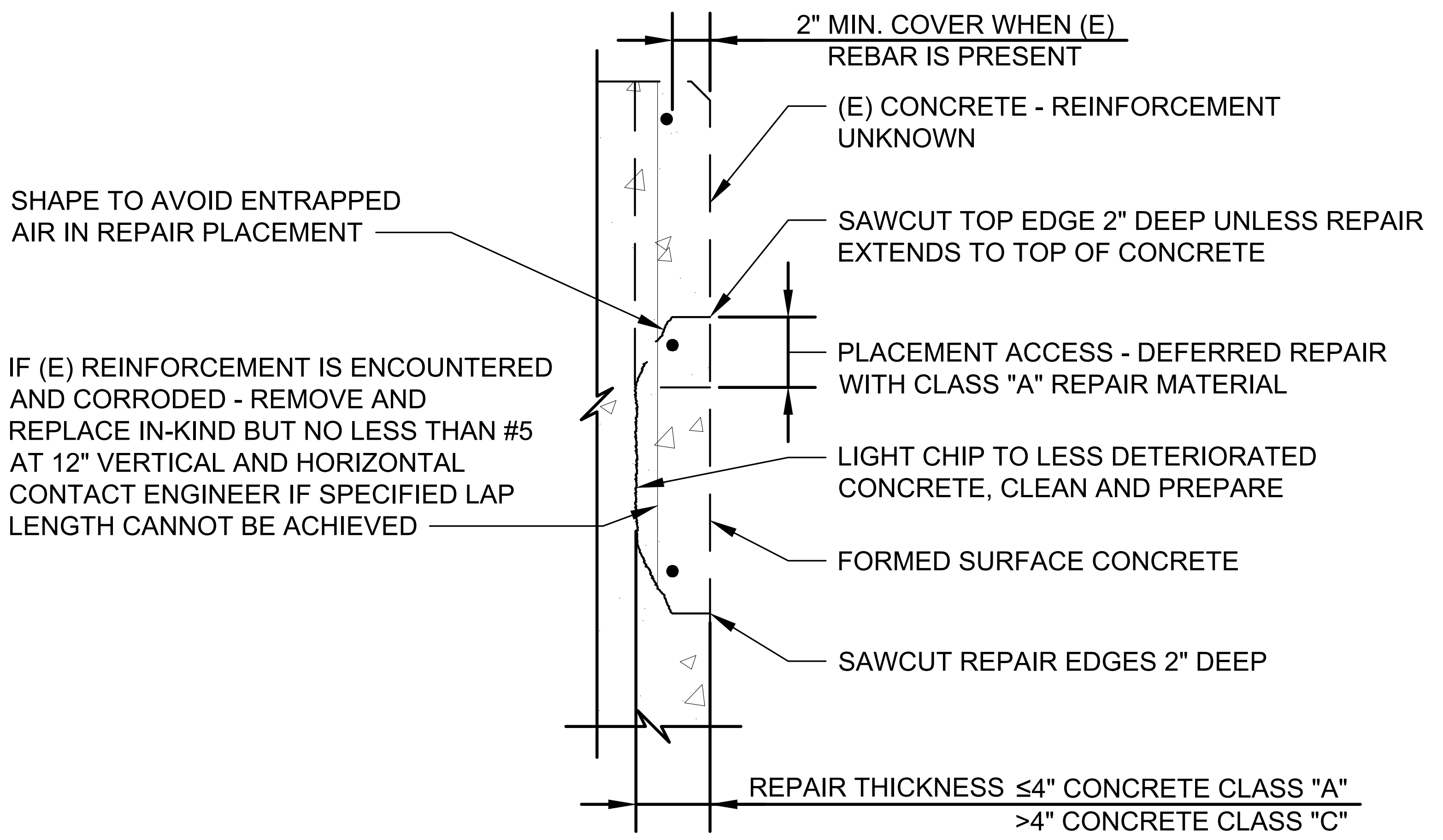


M TIE ROD CONNECTION BRACKET DETAIL
SCALE: 1-1/2" = 1'-0"

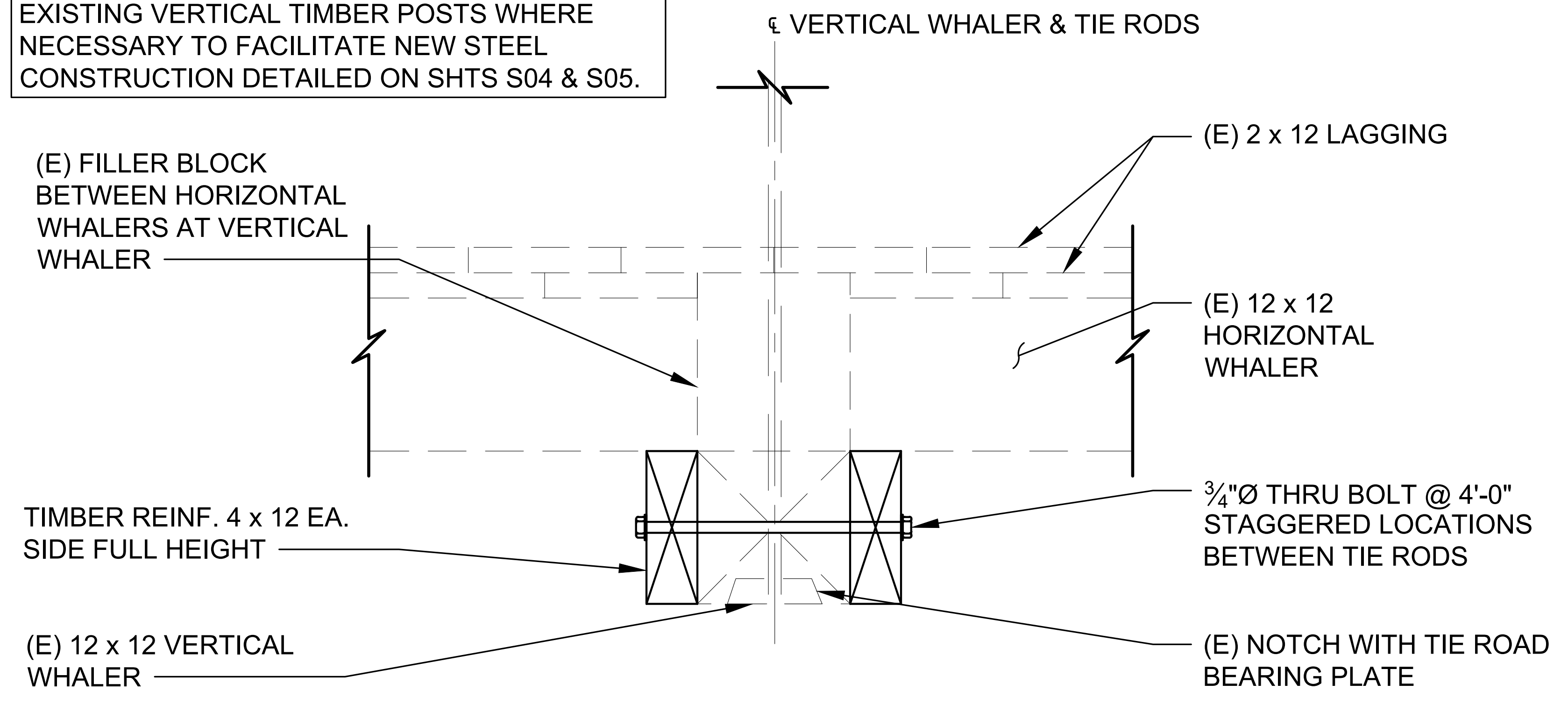


N TIMBER DAM - CONCRETE CAP REPAIR
SCALE: 1/2" = 1'-0"

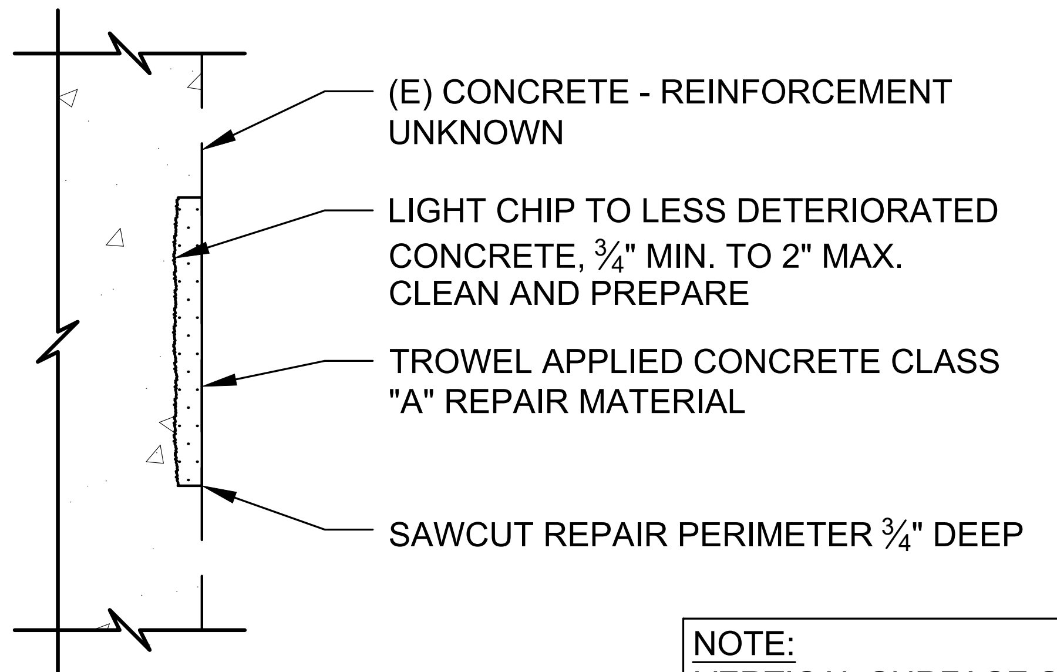


O CONCRETE - VERTICAL SECTION REPAIR
NO SCALE

NOTE:
CONSULT THE ENGINEER ON LOCATIONS OF USE DETERMINED IN FIELD - ONLY REINFORCE EXISTING VERTICAL TIMBER POSTS WHERE NECESSARY TO FACILITATE NEW STEEL CONSTRUCTION DETAILED ON SHTS S04 & S05.

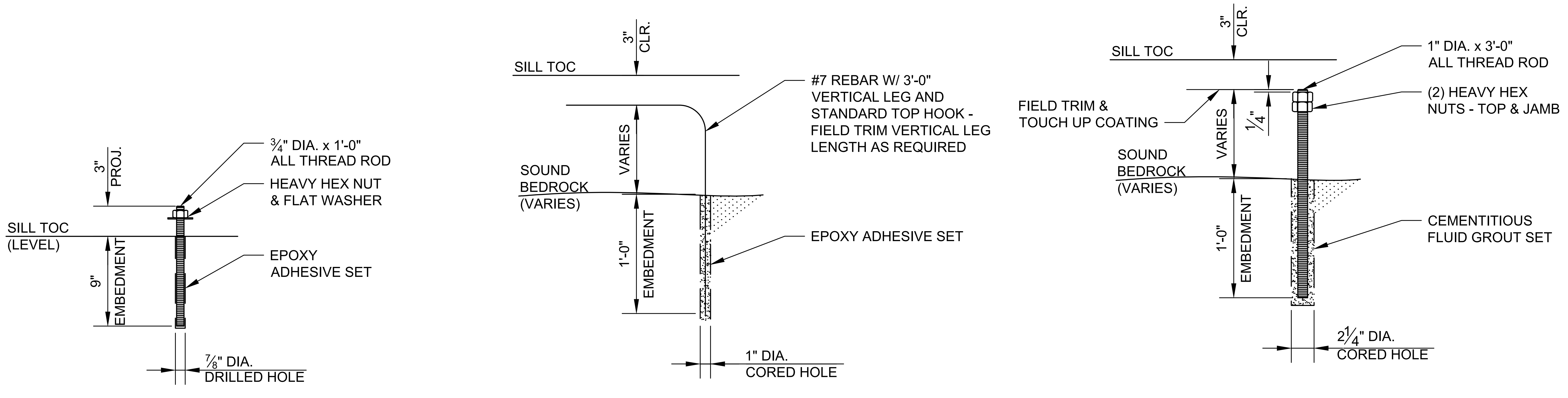


S EXISTING VERTICAL POST REINFORCEMENT
NO SCALE



NOTE:
VERTICAL SURFACE SHOWN, HORIZONTAL SIMILAR.

P CONCRETE - SURFACE REPAIR
NO SCALE

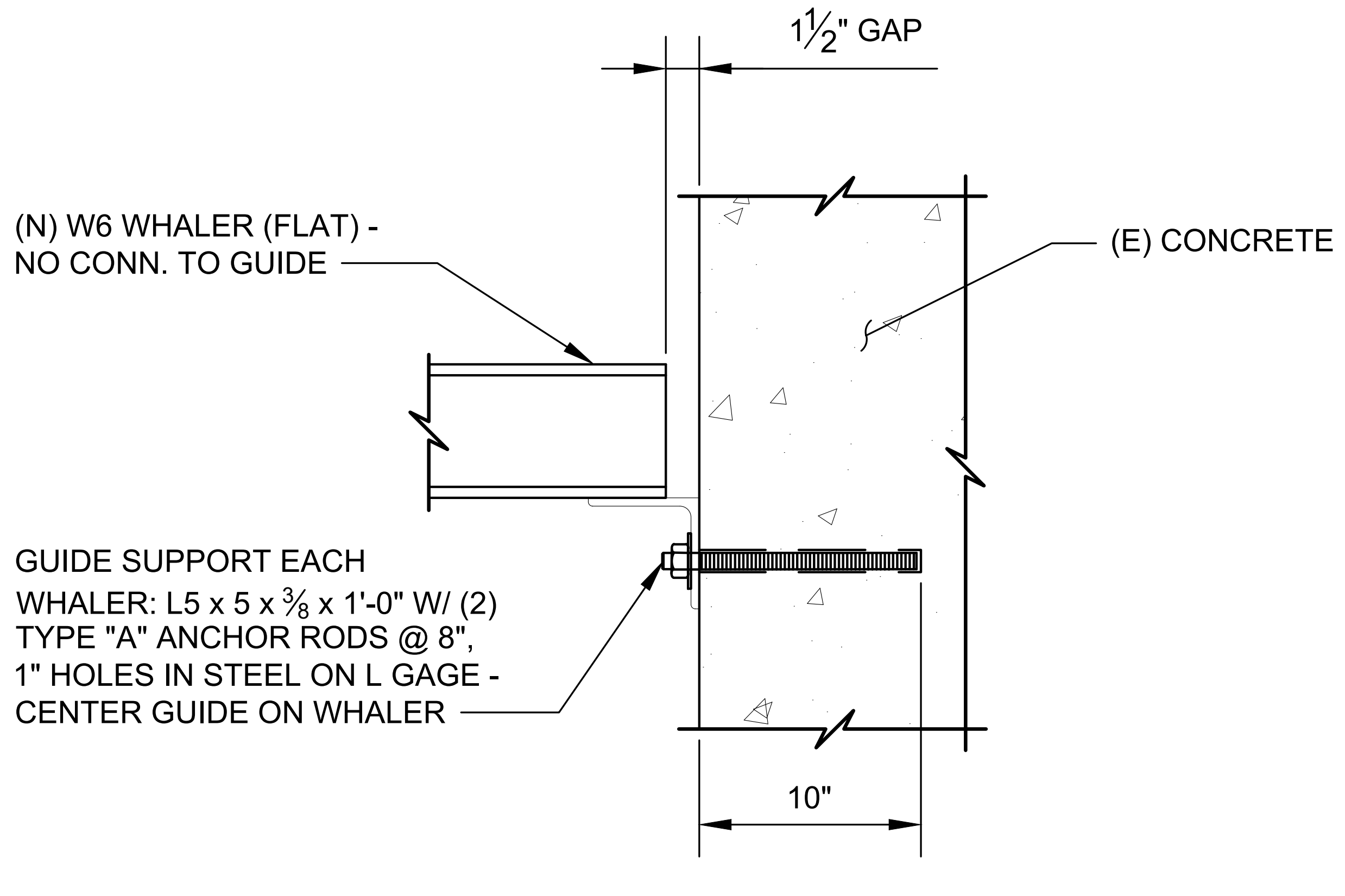


TYPE "A" ANCHOR
(EPOXY ADHESIVE SET IN CONCRETE)

TYPE "B" ANCHOR - ALTERNATE
(EPOXY ADHESIVE SET IN BEDROCK)

TYPE "B" ANCHOR - ALTERNATE
(CEMENTITIOUS GROUT SET IN BEDROCK)

Q ANCHOR ROD DETAILS
SCALE: 1-1/2" = 1'-0"



R HORIZONTAL WHALER END CONNECTION
SCALE: 1-1/2" = 1'-0"

REVISIONS
REV | DATE | DESCRIPTION | BY

REGISTERED PROFESSIONAL ENGINEER
NICHOLAS PAUL ROBERTSON
EXPIRES: 12/31/
90% DESIGN NOT FOR CONSTRUCTION

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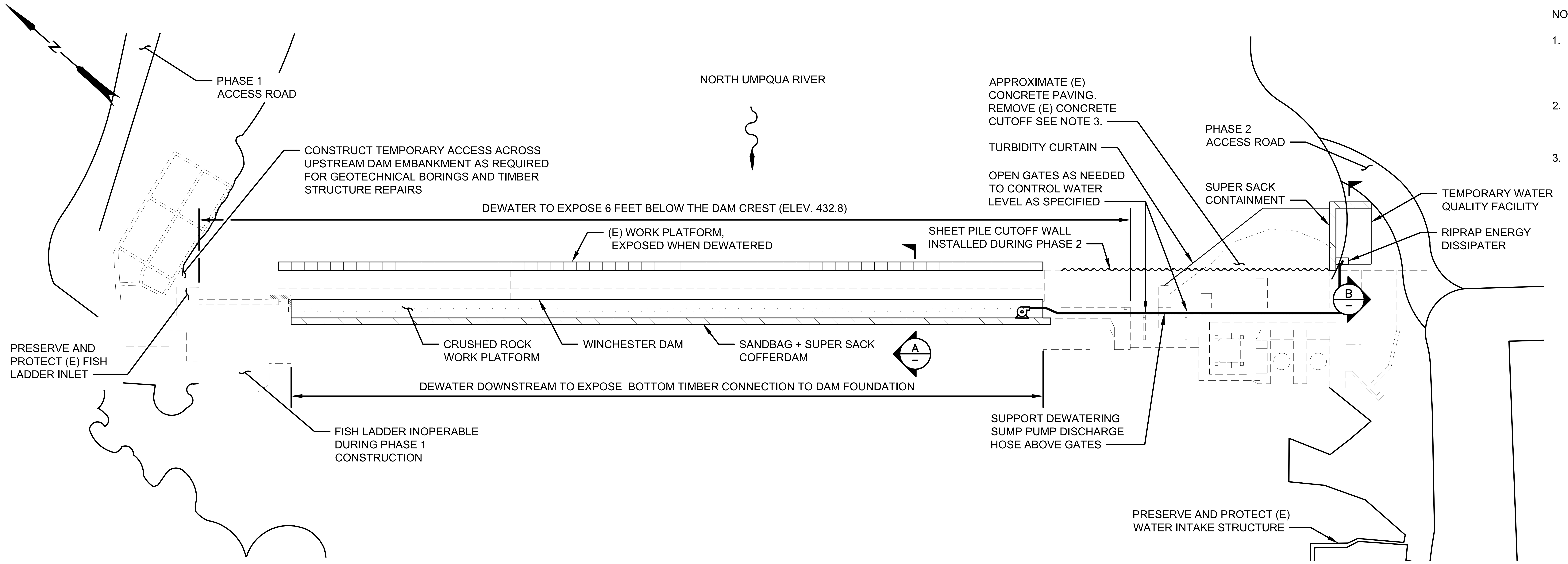
WINCHESTER DAM INSPECTION AND REPAIR PROJECT
WINCHESTER, OREGON
STRUCTURAL REPAIR DETAILS

PROJECT 80069
DATE 10/08/2021

SHEET
S08

SCALE WARNING
If scale bar doesn't measure one inch then drawing is not to scale

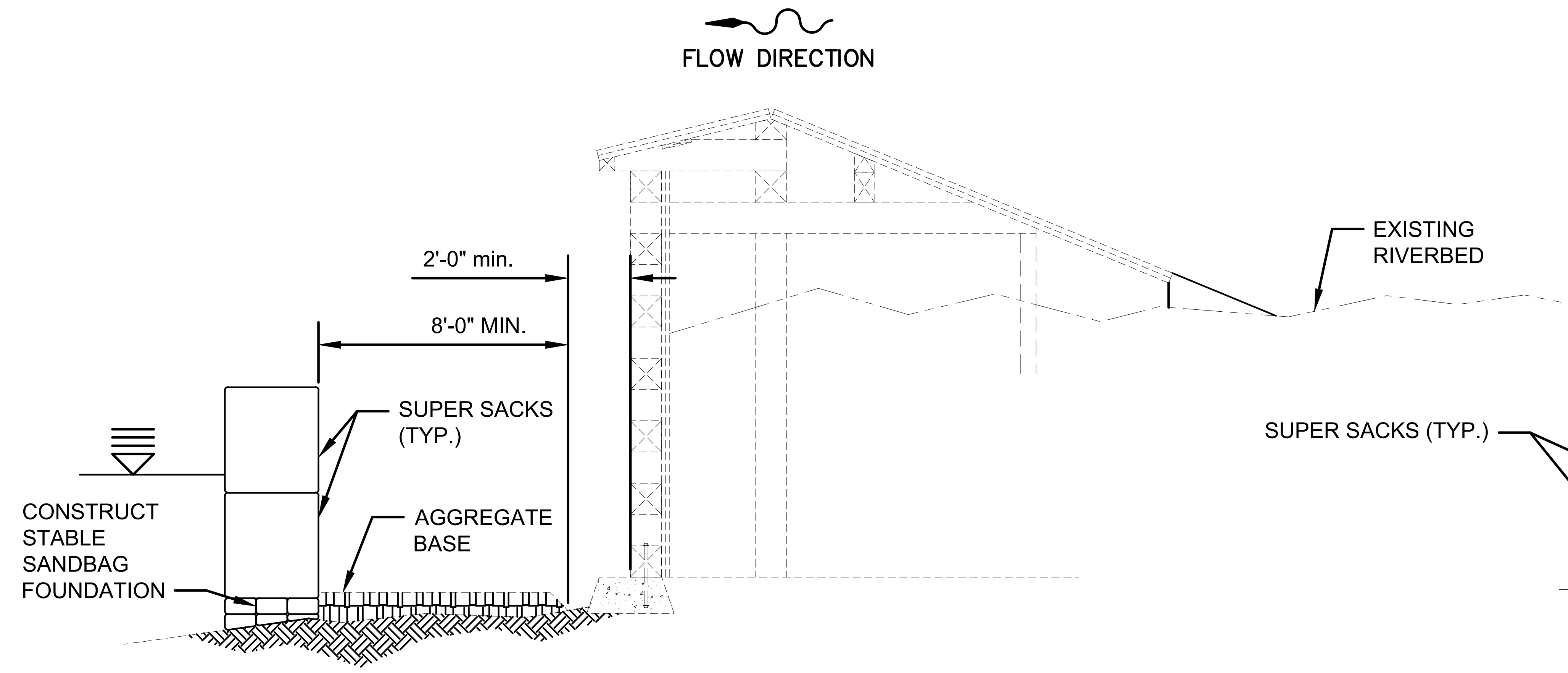


PHASE 1 TEMPORARY WATER MANAGEMENT - PLAN VIEW

SCALE: 1" = 30'

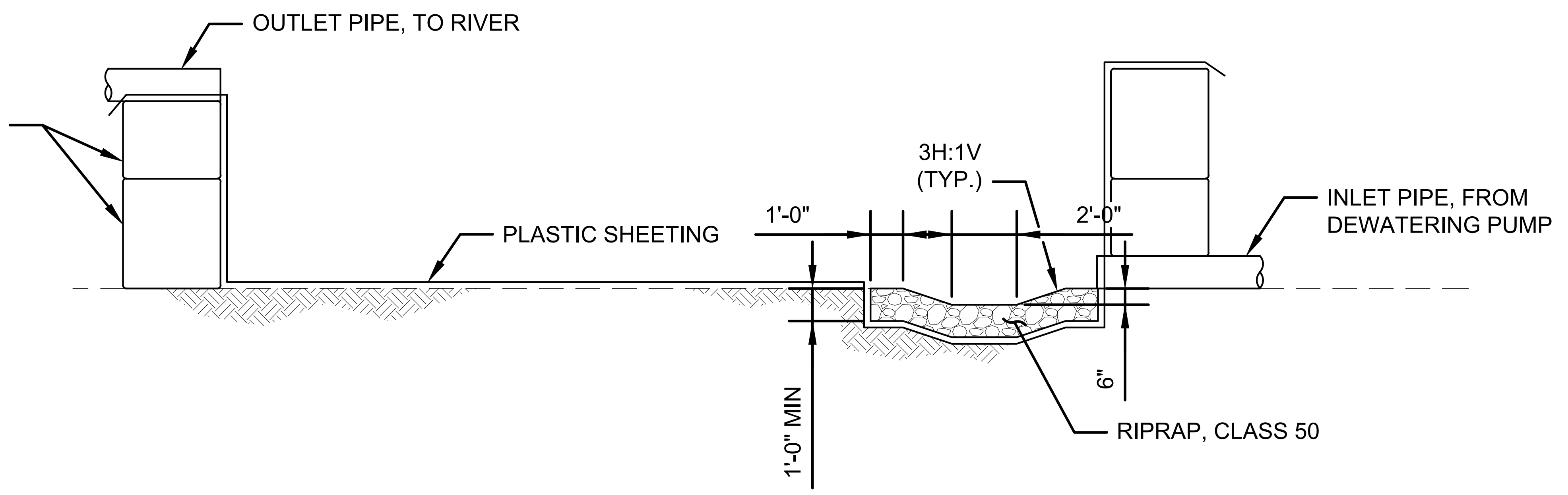
NOTES:

1. COFFERDAMS SHALL BE INSTALLED TO PROVIDE A MINIMUM OF 1 FOOT OF FREEBOARD TO THE SPECIFIED NORMAL WATER LEVEL FOR THE UPSTREAM AND DOWNSTREAM AREAS.
2. MATERIAL AND EQUIPMENT STAGING AND OVERNIGHT STORAGE SHALL BE LOCATED A MINIMUM OF 1 FOOT ABOVE THE SPECIFIED NORMAL WATER LEVEL.
3. REMOVE ALL (E) CONCRETE CUTOFF THAT IS EXPOSED WHILE THE RESERVOIR IS DRAWN DOWN DURING PHASE 1. REMOVAL OF BELOW WATER PORTION MUST BE COMPLETE AFTER TURBIDITY CURTAIN IS IN PLACE, OR DURING PHASE 2 WHEN THE AREA IS DEWATERED



A - TEMPORARY COFFERDAM SECTION

SCALE: 1/4" = 1'-0"



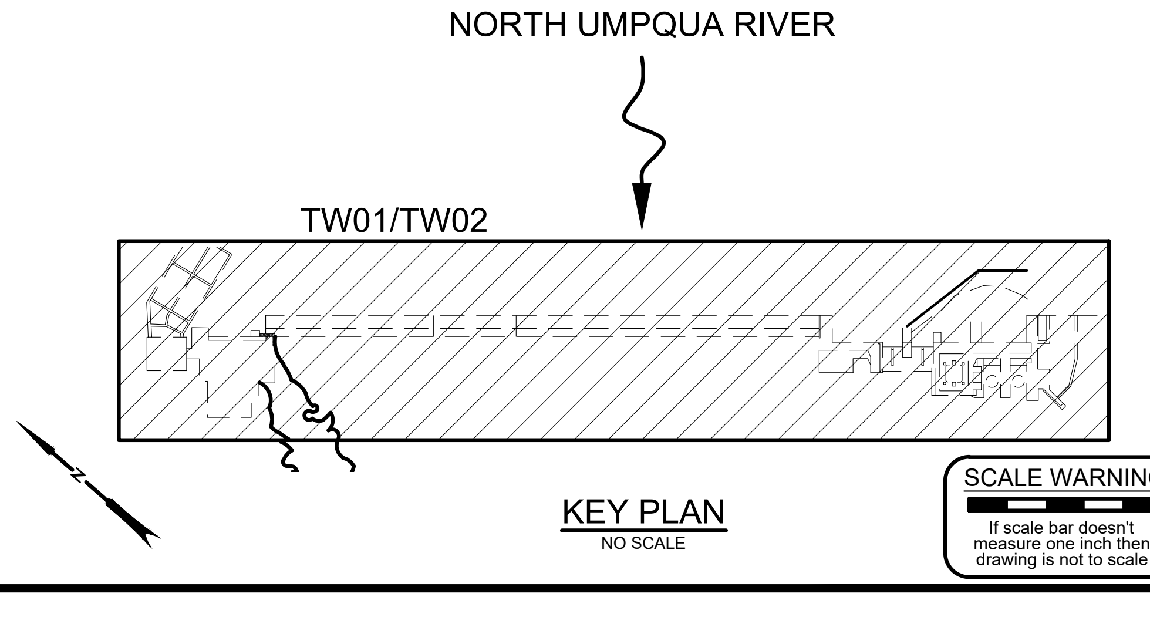
B - TEMPORARY SETTLING BASIN SECTION

SCALE: 1/4" = 1'-0"

LEGEND

DEWATERING SUMP PUMP

▨ WATER BLADDER/SUPER SACK COFFERDAM



KEY PLAN

NO SCALE

SCALE WARNING

If scale bar doesn't measure one inch then drawing is not to scale

REV	DATE	REVISIONS DESCRIPTION	BY

90% DESIGN NOT FOR CONSTRUCTION

BRIAN J. MEUNIER

EXPIRES: 12/31/

DOWL
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WINCHESTER DAM INSPECTION AND REPAIR PROJECT
WINCHESTER, OREGON

PHASE 1 - TEMPORARY WATER MANAGEMENT

PROJECT 80069
DATE 10/08/2021

SHEET
TW01

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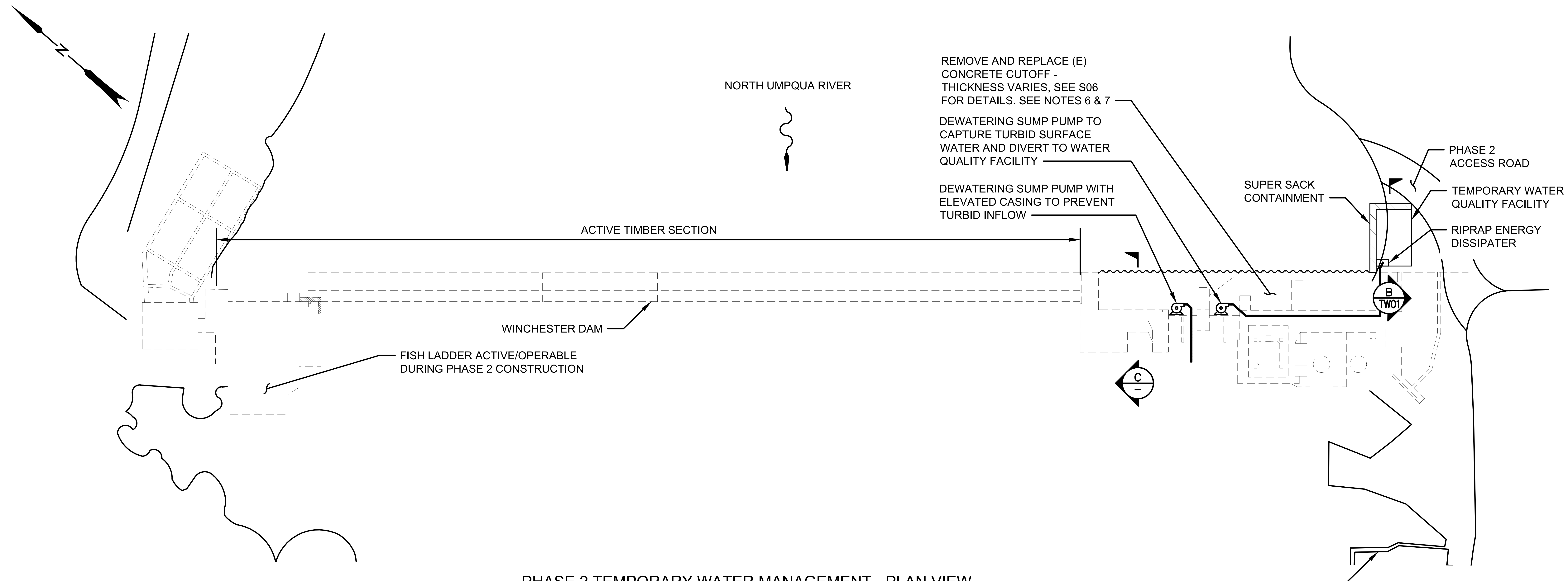


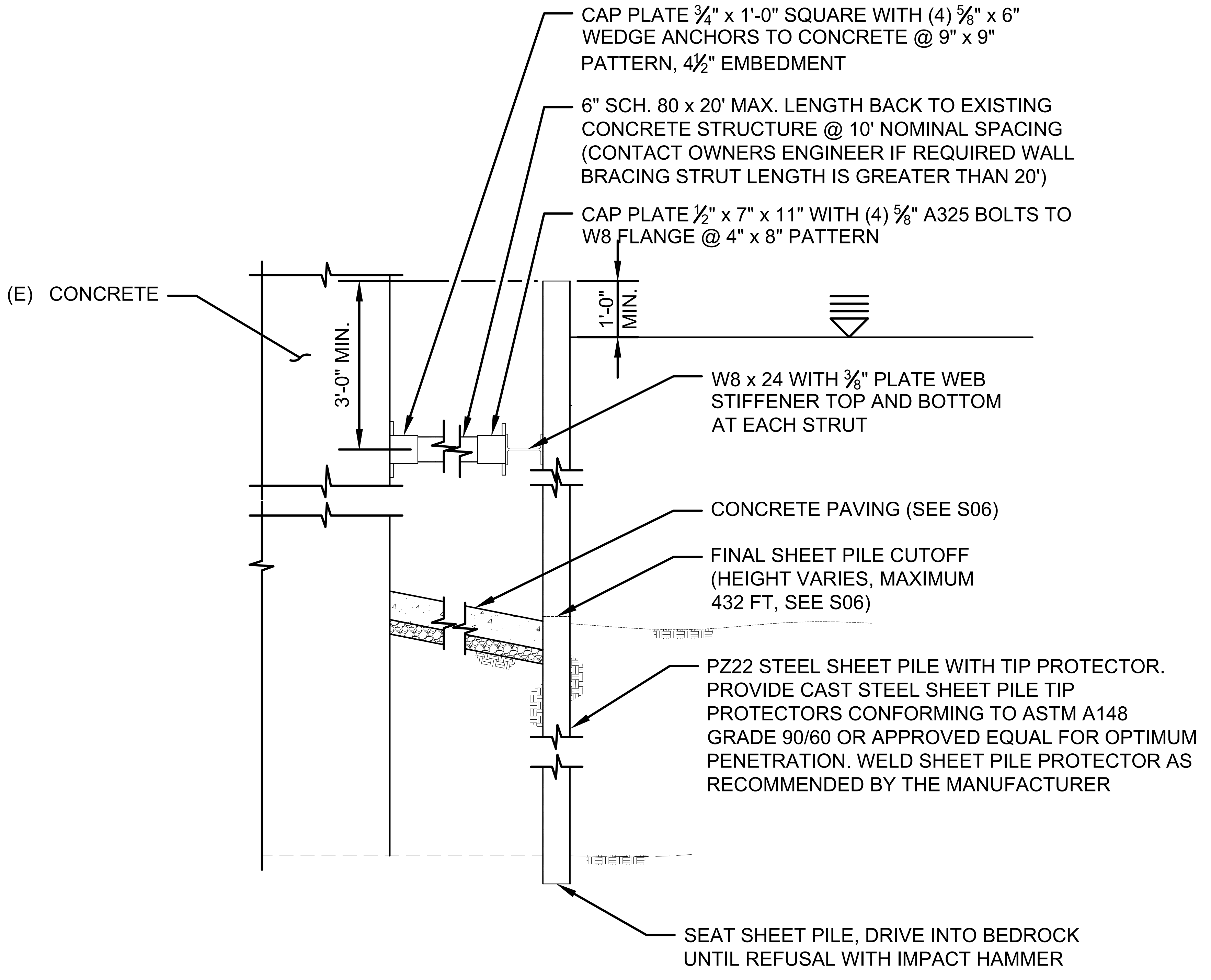
PRESERVE AND PROTECT (E) WATER INTAKE STRUCTURE

PHASE 2 TEMPORARY WATER MANAGEMENT - PLAN VIEW

SCALE: 1" = 30'

NOTES:

1. FISH SALVAGE MUST BE COMPLETE PRIOR TO INITIAL DEWATERING OF THE ISOLATED AREAS.
2. DEWATERING PUMPS SHALL BE ADEQUATELY SIZED TO CONVEY THE LEAKAGE AND UNDERSEEPAGE FROM THE COFFERDAM.
3. COFFERDAM SHALL BE INSTALLED TO PROVIDE A MINIMUM OF 1 FOOT OF FREEBOARD TO THE ESTIMATED NORMAL WATER LEVEL FOR THE UPSTREAM AND DOWNSTREAM AREAS.
4. MATERIAL AND EQUIPMENT STAGING AND OVERNIGHT STORAGE SHALL BE LOCATED A MINIMUM OF 1 FOOT ABOVE THE ESTIMATED NORMAL WATER LEVEL.
5. CONTRACTOR SHALL ENGINEER AND CONSTRUCT COFFERDAM TO MEET OSHA GUIDELINES.
6. REMOVE ALL (E) CONCRETE CUTOFF THAT IS EXPOSED WHILE THE RESERVOIR IS DRAWN DOWN DURING PHASE 1. REMOVAL OF BELOW WATER PORTION MUST BE COMPLETED AFTER TURBIDITY CURTAIN IS IN PLACE, OR DURING PHASE 2 WHEN THE AREA IS DEWATERED
7. REMOVAL OF (E) CONCRETE CUTOFF MATERIAL REQUIRED WHERE CONFLICT WITH (N) SHEET PILE CUTOFF WALL ELEMENTS.



C
-

SHEET PILE COFFERDAM SECTION

SCALE: 1/2" = 1'-0"

LEGEND

	DEWATERING SUMP PUMP
▨	WATER BLADDER/SUPER SACK COFFERDAM

NORTH UMPQUA RIVER

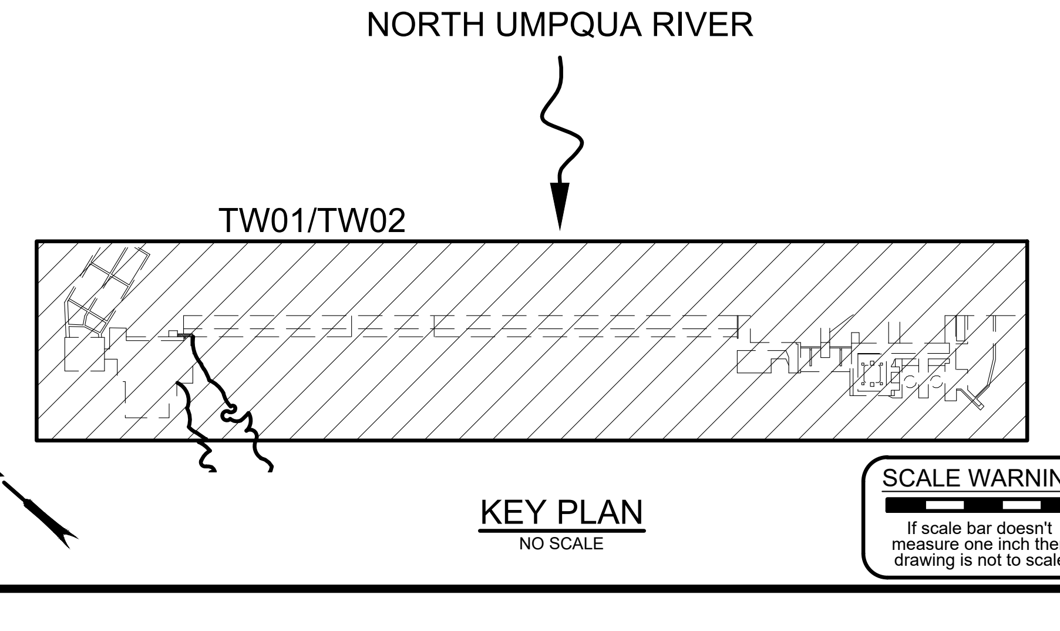
ESTIMATED DISCHARGES AND WATER SURFACE ELEVATIONS FOR TEMPORARY WATER MANAGEMENT

1			2			3		
Q	US WSE	DS WSE	Q	US WSE	DS WSE	Q	US WSE	DS WSE
1,800	436.5	432.5	1,500	436.4	423.2	1,200	436.2	422.9

1. AVERAGE DAILY DISCHARGE EXPECTED TO BE EXCEEDED 2 DAYS EACH MONTH.
2. AVERAGE DAILY DISCHARGE EXPECTED TO BE EXCEEDED 8 DAYS EACH MONTH.
3. AVERAGE DAILY DISCHARGE EXPECTED TO BE EXCEEDED 16 DAYS EACH MONTH.

IN-WATER WORK PERIOD EXTENDS FROM 1 AUGUST THROUGH 30 SEPTEMBER

Q = AVERAGE DAILY FLOW RATE IN CUBIC FEET PER SECOND FOR THE GIVEN EXCEEDENCE
US WSE = APPROXIMATE WATER SURFACE ELEVATION UPSTREAM OF THE DAM UNDER THE GIVEN FLOW.
DS WSE = APPROXIMATE WATER SURFACE ELEVATION DOWNSTREAM OF THE DAM UNDER THE GIVEN FLOW.



KEY PLAN

NO SCALE

SCALE WARNING

If scale bar doesn't measure one inch then drawing is not to scale

REV	DATE	REVISIONS DESCRIPTION	BY

90% DESIGN NOT FOR CONSTRUCTION

BRIAN J. MEUNIER

EXPIRES: 12/31/

DOWL
WWW.DOWL.COM

WINCHESTER DAM INSPECTION AND REPAIR PROJECT
WINCHESTER, OREGON

PHASE 2 - TEMPORARY WATER MANAGEMENT

PROJECT 80069
DATE 10/08/2021

SHEET
TW02

APPENDIX 3:
IPAC DATABASE SEARCH

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Oregon Fish And Wildlife Office
2600 Southeast 98th Avenue, Suite 100
Portland, OR 97266-1398
Phone: (503) 231-6179 Fax: (503) 231-6195

In Reply Refer To:
Project Code: 2022-0059226
Project Name: Winchester Dam

June 29, 2022

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*). This is not a consultation.

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2) (c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Migratory Birds: In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts see https://www.fws.gov/birds/policies-and-regulations.php.

The MBTA has no provision for allowing take of migratory birds that may be unintentionally killed or injured by otherwise lawful activities. It is the responsibility of the project proponent to comply with these Acts by identifying potential impacts to migratory birds and eagles within applicable NEPA documents (when there is a federal nexus) or a Bird/Eagle Conservation Plan (when there is no federal nexus). Proponents should implement conservation measures to avoid or minimize the production of project-related stressors or minimize the exposure of birds and their resources to the project-related stressors. For more information on avian stressors and recommended conservation measures see https://www.fws.gov/birds/bird-enthusiasts/threats-to-birds.php.

In addition to MBTA and BGEPA, Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/birds/policies-and-regulations/executive-orders/e0-13186.php.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Code in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Migratory Birds
- Wetlands

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Oregon Fish And Wildlife Office
2600 Southeast 98th Avenue, Suite 100
Portland, OR 97266-1398
(503) 231-6179

Project Summary

Project Code:	2022-0059226
Event Code:	None
Project Name:	Winchester Dam
Project Type:	Dam - Maintenance/Modification
Project Description:	Winchester dam repair

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@43.2845316,-123.35329662485594,14z

Counties: Douglas County, Oregon

Endangered Species Act Species

There is a total of 6 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Columbian White-tailed Deer *Odocoileus virginianus leucurus* Population: Columbia River DPS No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/154	Threatened

Birds

NAME	STATUS
Marbled Murrelet *Brachyramphus marmoratus* Population: U.S.A. (CA, OR, WA) There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/4467	Threatened
Northern Spotted Owl *Strix occidentalis caurina* There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/1123	Threatened

Insects

NAME	STATUS
Franklin''s Bumble Bee *Bombus franklini* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/7022	Endangered
Monarch Butterfly *Danaus plexippus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9743	Candidate

Flowering Plants

NAME	STATUS
Kincaid's Lupine *Lupinus sulphureus ssp. kincaidii* There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/3747	Threatened

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

USFWS National Wildlife Refuge Lands And Fish Hatcheries

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

Migratory Birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

---

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Jan 1 to Sep 30
Evening Grosbeak *Coccothraustes vespertinus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 15 to Aug 10

NAME	BREEDING SEASON
Golden Eagle *Aquila chrysaetos* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1680	Breeds Jan 1 to Aug 31
Rufous Hummingbird *selasphorus rufus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8002	Breeds Apr 15 to Jul 15
Wrentit *Chamaea fasciata* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Mar 15 to Aug 10

Probability Of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (🟩)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.

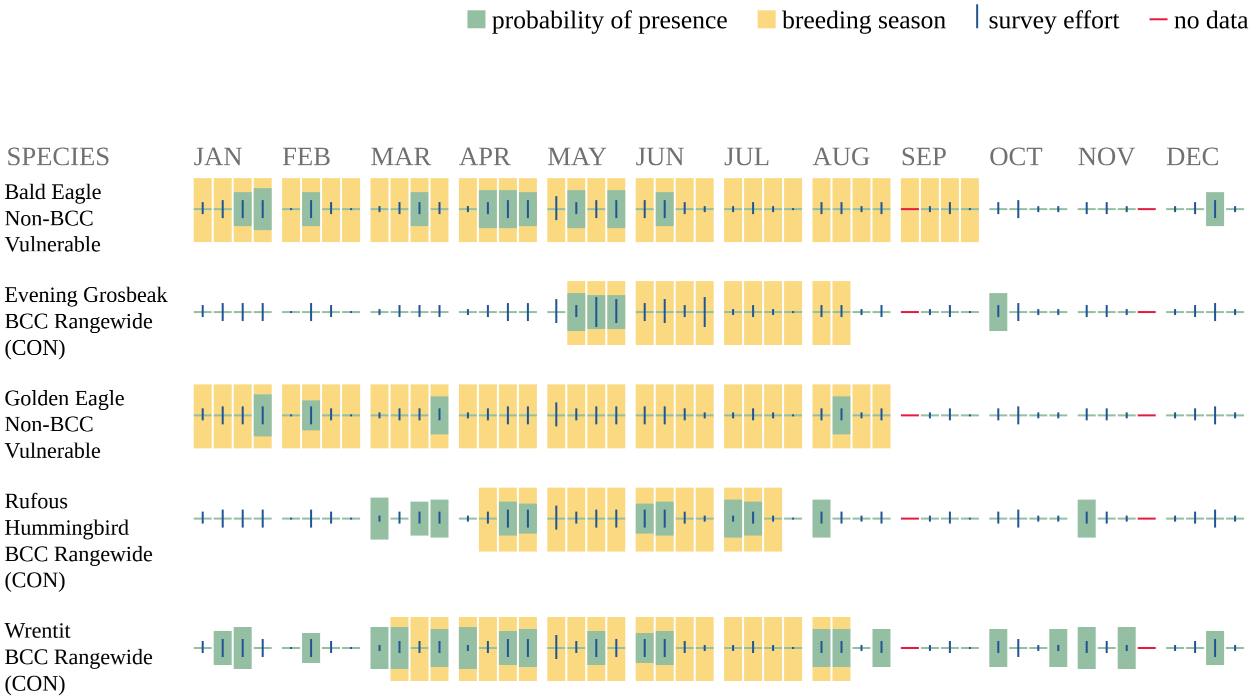
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

Breeding Season (🟨)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

No Data (−)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



Additional information can be found using the following links:

- Birds of Conservation Concern https://www.fws.gov/program/migratory-birds/species
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds

- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf

Migratory Birds FAQ

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?
Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects
For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?
If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report
The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be

aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Wetlands

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

WETLAND INFORMATION WAS NOT AVAILABLE WHEN THIS SPECIES LIST WAS GENERATED. PLEASE VISIT HTTPS://WWW.FWS.GOV/WETLANDS/DATA/MAPPER.HTML OR CONTACT THE FIELD OFFICE FOR FURTHER INFORMATION.

IPaC User Contact Information

Agency: DOWL
Name: David DeKrey
Address: 5000 Meadows Road, Suite 420
City: Lake Oswego
State: OR
Zip: 97035
Email ddekrey@dowl.com
Phone: 5033305741

Lead Agency Contact Information

Lead Agency: Army Corps of Engineers

APPENDIX 4:
URETEK FOAM INFORMATION

OFFICIAL LISTING

NSF International Certifies that the products appearing on this Listing conform to the requirements of
NSF/ANSI Standard 61 - Drinking Water System Components - Health Effects

This is the Official Listing recorded on August 2, 2016.

Accella Polyurethane Systems, LLC
2500 Adie Road
Maryland Heights, MO 63043
770-528-9556

Facility: Cartersville, GA

Joining and Sealing Materials

Trade Designation	**Size**	**Water Contact Temp**	**Water Contact Material**
Grouts			
URETEK [1]	[2]	CLD 23	PUR
URETEK Geopolymer [1]	[2]	CLD 23	PUR

[1] Certified for product with the following densities and reaction speeds:
2 pounds per cubic foot (regular speed)
2 pounds per cubic foot (fast speed)
3 pounds per cubic foot (regular speed)
3 pounds per cubic foot (fast speed)
4 pounds per cubic foot (regular speed)
4 pounds per cubic foot (fast speed)
5 pounds per cubic foot (regular speed)
5 pounds per cubic foot (fast speed)
8 pounds per cubic foot (regular speed)
8 pounds per cubic foot (fast speed)

Mix ratio is 1:1 (A:B) by volume or 8.1:6.9 (A:B) by weight.
Minimum cure time is 60 minutes at ambient temperatures.

[2] Certified for a maximum surface area to volume ratio of 0.375 square inches per liter.

Protective (Barrier) Materials

Trade Designation	**Water Contact Size Restriction**	**Water Contact Temp**	**Water Contact Material**
Coatings - Tank [1] [G]			
BPL 7161	>= 10,000,000 gal.	CLD 23	PUA

[1] Colors: Part A: Yellow, Part B: Black, medium gray, tan,white
Number of Coats: 1
Maximum Field Use Dry Film Thickness (in mils): 180 (50 minimum)
Final Cure Time and Temperature: 24 hours at 70°F
Special Comments: Mix ratio of Part A:B is 1:1 by volume.

[G] Product is Certified to NSF/ANSI 372 and conforms with the lead content requirements for “lead free” plumbing as defined by California, Vermont, Maryland, and Louisiana state laws and the U.S. Safe Drinking Water Act.

Note: Additions shall not be made to this document without prior evaluation and acceptance by NSF International.

7 June 2019

URETEK USA
P.O. Box 1929
Tomball, TX 77377

The purpose of this letter is to provide a summary of the results reported in EA Engineering, Science, and Technology's final report titled "Results of Acute and Chronic Toxicity Testing on a TCLP Leachate Sample Prepared from a Uretek USA Foam Sample" (EA Report # 7002). The testing was conducted in order to satisfy the requirements of the Minnesota Department of Transportation Product Hazard Evaluation Process. The testing consisted of aquatic and terrestrial toxicity testing, and chemical analyses (RCRA metals, TOC and COD). As a part of the MNDOT requirements the toxicity test results needed to show a lack of toxicity at 100 ppm TCLP leachate, and the testing indicated that for all three test species, there was no observed toxicity. Furthermore, at MNDOT's request, we also tested 200 ppm TCLP leachate, and the Uretek samples tested were also non-toxic for all test species at double the pass/fail criterion.

Sincerely,

Michael K. Chanov II

Director,
Ecotoxicology Laboratory

EA Engineering, Science,
and Technology, Inc.

RESULTS OF ACUTE AND CHRONIC TOXICITY TESTING ON A TCLP LEACHATE SAMPLE PREPARED FROM A URETEK USA FOAM SAMPLE

Prepared for:

Uretek USA
P.O. Box 1929
Tomball, Texas 77377

Prepared by:

EA Engineering, Science, and Technology, Inc.
231 Schilling Circle
Hunt Valley, Maryland 21031
For questions, please contact Wayne McCulloch
ph: 410-584-7000

Results relate only to the items tested or to the samples as received by the laboratory.

This report shall not be reproduced, except in full, without written approval of EA Engineering, Science, and Technology, Inc.

This report contains 15 pages plus 3 attachments.

Wayne McCulloch

Wayne L. McCulloch
Laboratory Director

15 October 2014
Date

EA Project Number 70005.08

Printed on sustainable wood forest paper using soy-based ink

ID# E87550

EA Report Number 7002

1. INTRODUCTION

At the request of Uretek USA, EA Engineering, Science, and Technology, Inc. performed toxicity testing on a sample of TCLP Leachate prepared by Eurofins Lancaster Laboratories Environmental (hereafter, Eurofins) on a sample of Uretek final foam product. The toxicity tests included definitive, multi-concentration chronic toxicity tests with *Ceriodaphnia dubia* (water flea), and *Pimephales promelas* (fathead minnow), and a 10-day acute toxicity test with the redworm, *Eisenia fetida.* The objective of the testing was to evaluate the acute and chronie effects on the organisms exposed to the TCLP Leachate sample, as compared to the organisms exposed to the laboratory control. Additionally, Eurofins performed selected chemical analyses (RCRA metals, TOC and COD) on the TCLP Leachate. Eurofins also performed RCRA metal analysis of the Part A and Part B components of the foam product. The results of the toxicity testing and the chemical analyses are included in this report.

2. METHODS AND MATERIALS

2.1 TEST MATERIAL DESCRIPTIONS

Eurofins provided a TCLP Leachate sample prepared from a Uretek foam sample to EA's Ecotoxicology Laboratory. The sample was couriered to EA's Ecotoxicology Laboratory in Hunt Valley, Maryland, and arrived on 19 September 2014. Upon receipt at EA, the sample was logged in and assigned EA laboratory accession number AT4-460. The initial pH of the TCLP Leachate sample upon receipt was 5.0. The pH of the sample was adjusted up to 7.5 with NaOH per guidance from Dr. Robert Edstrom (MNDOT).

2.2 TEST ORGANISMS

The *Ceriodaphnia dubia* (water flea) were obtained from EA's Culture Facility in Hunt Valley, Maryland. The *C. dubia* were cultured in moderately hard synthetic freshwater, and the cultures were kept in an environmentally controlled room at 25°C with a 16-hour light/8-hour dark photoperiod. Organisms were fed daily a suspension of yeast/cereal leaves/trout chow supplemented with the algae *Pseudokirchneriella subcapitata* as described in US EPA (2002a). Individual adults were maintained in 30 ml cups. Gravid adults were reisolated during the day prior to the initiation of toxicity testing to ensure that neonates (young) produced were less than 24 hours old, had all been released within an 8-hour period, and all neonates were produced in broods of 8 or more from individual females.

The *Pimephales promelas* (fathead minnow) were obtained from EA's Culture Facility in Hunt Valley, Maryland. Brood organisms were maintained in recirculating dechlorinated tap water at 25°C in 20-gallon aquaria. Eggs produced from the brood system were removed from the brood aquaria and placed into culture water at 25°C until hatched. Hatched larvae were acclimated to the test temperature of 25°C prior to testing. The larvae utilized for testing were all less than 24 hours old at test initiation.

The adult redworm *Eisenia fetida* were obtained from Carolina Biological Supply Company, Burlington, North Carolina. The lot of *E. fetida* (EF-037) was received at EA on 17 September 2014.

2.3 DILUTION WATERS AND ARTIFICIAL SOIL

Test solutions for the *C. dubia* and *P. promelas* chronic toxicity tests were prepared with moderately hard synthetic freshwater (80-100 mg/L $CaCO_3$). Batches of this water were made by passing deionized water through activated carbon and adding reagent grade chemicals per US EPA guidance (2002a), and aerating overnight. The water was stored up to 14 days at 25°C under gentle aeration, until needed. Moderately hard synthetic freshwater was also used as the control water for these tests, and as culture water for the *C. dubia*.

Dechlorinated tap water was used as culture water for the *P. promelas*. The source of the tap water was the City of Baltimore municipal water system. Upon entering the laboratory, the water passed through a high-capacity, activated-carbon filtration system to remove any possible contaminants such as chlorine and trace organic compounds. This water source has proven safe for aquatic organism toxicity testing at EA as evidenced by maintenance of the multigeneration *H. azteca*, and fathead minnow cultures with no evident loss of fecundity.

An artificial soil was used as the control for the redworm toxicity test. The artificial soil was prepared by combining 10 percent sphagnum peat moss, 20 percent kaolinite clay, and 70 percent fine silica sand on a dry weight basis. The pH of the artificial soil was adjusted to pH 7.0 ± 0.5 with the addition of calcium carbonate. Prior to use in testing, the soil was hydrated to a target of 45 percent moisture at test initiation with dechlorinated tap water.

2.4 TOXICITY TEST OPERATIONS AND PERFORMANCE

Toxicity testing was conducted following EA's standard operating procedures (EA 2013) which are in accordance with US EPA guidance (2002a, 2002b). The results of the acute and chronic toxicity tests were analyzed using the ToxCalc statistical software package (Version 5.0, Tidepool Scientific Software) and follow US EPA guidance (US EPA 2002a, 2002b). The acute toxicity test endpoint is expressed as the 10-day (*E. fetida*) median lethal concentration (LC50). The short-term chronic toxicity test endpoints are expressed as the No Observed Effect Concentration (NOEC), the Lowest Observed Effect Concentration (LOEC), the Chronic Value (ChV), and the 25 Percent Inhibition Concentration (IC25).

The definitions of the chronic toxicity test endpoints are as follows:

- No Observed Effect Concentration (NOEC) - The highest concentration of toxicant to which organisms are exposed in a full life-cycle or partial life-cycle test, that causes no statistically significant adverse effect on the observed parameter (usually hatchability, survival, growth, or reproduction).

- Lowest Observed Effect Concentration (LOEC) - The lowest concentration of toxicant to which organisms are exposed in a life-cycle or partial life-cycle test, which causes a statistically significant adverse effect on the observed parameter (usually hatchability, survival, growth, or reproduction).

- Chronic Value (ChV) - A point estimate of the presumably safe (no-effect) concentration, lying between the NOEC and LOEC, and derived by calculating the geometric mean of the NOEC and LOEC.

- 25 Percent Inhibition Concentration (IC25) – A point estimate of the concentration that causes a 25 percent decrease in the observed parameter (usually hatchability, survival, growth, or reproduction).

Attachment I contains copies of the original data sheets and statistical analyses. The Eurofins analytical report is included as Attachment II. The Report Quality Assurance Record is included as Attachment III.

2.4.1 *Ceriodaphnia dubia* Chronic Toxicity Testing

The *Ceriodaphnia dubia* chronic toxicity test was conducted in 30 ml cups with 15 ml of test solution per cup. The definitive toxicity test utilized a test concentration series of control, 18, 32, 56, 100 and 200 mg/L TCLP Leachate. The test had 10 replicates per concentration and control, with one organism per replicate, for a total of 10 organisms exposed per test concentration and control. To initiate the chronic toxicity test, neonates (<24 hours old) were assigned to the test chambers using the known parentage (blocking) procedure. The test were maintained at 25±1°C with a 16-hour light/8-hour dark photoperiod. Daily renewals of test solutions were performed by transferring the test organisms to new cups containing freshly prepared test solutions. Test organisms were fed daily with trout chow/yeast/cereal leaves solution supplemented with algae (*S. capricornutum*) as described in US EPA (2002). Temperature, dissolved oxygen, conductivity, and pH were measured in one replicate of each concentration and the controls for new and old test solutions daily during the test. Water quality measurements, mortality observations and young counts were made daily throughout the study and were recorded on the data sheets.

2.4.2 *Pimephales promelas* Chronic Toxicity Testing

The *P. promelas* chronic toxicity test was conducted in 1,000 ml beakers, with each beaker containing 250 ml of test solution. For the definitive chronic toxicity tests, each test concentration and the control had four replicates of ten organisms, for a total of 40 organisms exposed per test concentration and control. The test concentration series for the *P. promelas* chronic toxicity test was: control, 18, 32, 56, 100 and 200 mg/L TCLP Leachate. The tests were performed at 25±1°C with a 16-hour light/8-hour dark photoperiod. The test solutions were renewed each day by siphoning approximately 80 percent of the old test solution from the beaker, and replacing with freshly prepared test solution. Observations of mortality were recorded daily, and dead organisms were removed when observed. Temperature, pH, dissolved oxygen, and conductivity measurements were recorded on one replicate of each concentration daily on the new and old test solutions. The *P. promelas* larvae were fed 0.10 ml of a 0.05 g/ml suspension of newly hatched brine shrimp nauplii (*Artemia* sp., less than 24 hours old) daily.

2.4.4 *Eisenia fetida* Acute Toxicity Testing

The 10-day soil toxicity test with *Eisenia fetida* was conducted in accordance with ASTM Standard E 1676-04. The definitive acute toxicity test utilized a test concentration series of control, 18, 32, 56, 100 and 200 mg/L TCLP Leachate.

The toxicity test was performed in 500 ml wide-mouth glass jars equipped with screw-top lids with a screened hole for air exchange. The test concentrations were added to the test chambers a minimum of 24 hours before the worms were introduced to allow the temperature of the soils to reach the target test temperature. The test concentrations were hydrated with dechlorinated tap water in order to achieve a water holding capacity of 35-45 percent at test initiation.
Each test concentration and control had three replicate test chambers, with 10 worms per replicate. Organisms were selected for testing based on maturity, uniformity of size, and absence of morphological abnormalities. The organisms used in the test were a minimum of 300 mg each. At test initiation, ten worms were randomly loaded into the test chambers. The test chambers were maintained in an environmentally controlled laboratory at 20±1°C with a 16 hour light:8 hour dark photoperiod. The worms were not fed during the 10-day exposure period.

On Day 10, the soil from each replicate was removed from the test chamber and spread out in a 9 x 11 inch Pyrex baking dish. Adult worms were removed from the soil and the number of surviving adult worms was recorded. Death was defined by lack of response to a gentle prod.

2.5 REFERENCE TOXICANT TESTS

In conformance with EA's quality assurance/quality control program, reference toxicant tests were performed on the in-house cultured organisms (*Ceriodaphnia dubia*, and *Pimephales promelas*) and on the acquired organism stock of *Eisenia fetida*. The results of each reference toxicant test were compared to EA's established control chart limits. The reference toxicants used were potassium chloride (KCl) for *C. dubia* and *P. promelas* and 2-chloroacetamide for *E. fetida*.

2.6 ARCHIVES

Original data sheets, records, memoranda, notes, and computer printouts are archived at EA's Baltimore Office in Hunt Valley, Maryland. These data will be retained for a period of 5 years unless a longer period of time is requested by Uretek USA.

3. RESULTS AND DISCUSSION

The goal of the toxicity testing program was to evaluate the acute and chronic toxicity of the TCLP Leachate sample prepared by Eurofins for Uretek to selected test species. The results of these toxicity tests comply with current NELAC standards where applicable.

3.1 *Ceriodaphnia dubia* CHRONIC TOXICITY TEST

The results of the *C. dubia* definitive chronic renewal toxicity tests are presented in Table 1. At test termination at the end of six days there was 100 percent survival in all of the test concentrations and in the laboratory control. The 6-day LC50 value for the chronic toxicity test was >200 mg/L TCLP Leachate. Mean young production in the TCLP Leachate concentrations ranged from 27.0 to 30.2 neonates per organism, none of which were significantly different (p=0.05) from the control mean young production of 30.1 neonates per organism. Based on this data for the chronic toxicity test, the 6-day NOEC was 200 mg/L TCLP Leachate. The LOEC, ChV and IC25 were all >200 mg/L TCLP Leachate. Water quality parameters (temperature, pH, dissolved oxygen and conductivity) measured on the new and old test solutions of the chronic toxicity test are also presented in Table 1.

3.2 *Pimephales promelas* CHRONIC TOXICITY TEST

Table 2 presents the results of the *Pimephales promelas* definitive chronic renewal toxicity test. At test termination on day 7, there was a minimum of 95 percent survival in all of the TCLP Leachate concentrations and in the control. The resulting 7-day LC50 value for the chronic toxicity test was >200 mg/L TCLP Leachate. At test termination, mean biomass in the TCLP Leachate concentrations ranged from 0.755 to 0.824 mg per organism, and none were significantly different from the control mean biomass of 0.838 mg per organism. The 7-day NOEC for the *P. promelas* chronic toxicity test was 200 mg/L TCLP Leaehate. The LOEC, ChV and IC25 were all > 200 mg/L. Water quality parameters (temperature, pH, dissolved oxygen and conductivity) measured on the new and old test solutions of the chronic toxicity test are also presented in Table 2.

TCLP Leachate concentrations ranged from 0.755 to 0.824 mg per organism, and none were significantly different from the control mean biomass of 0.838 mg per organism. The 7-day NOEC for the *P. promelas* chronic toxicity test was 200 mg/L TCLP Leachate. The LOEC, ChV and IC25 were all > 200 mg/L. Water quality parameters (temperature, pH, dissolved oxygen and conductivity) measured on the new and old test solutions of the definitive chronic toxicity test are also presented in Table 2.

3.3 *Eisenia fetida* ACUTE TOXICITY TEST

The results of the definitive acute toxicity test with *Eisenia fetida* are presented in Table 3. At the end of the 10-day test, there was a minimum of 97 percent survival in all TCLP Leachate concentrations, and there was 100 percent survival in the control. Therefore, in the definitive acute toxicity test, the 10-day LC50 was >200 mg/L TCLP Leachate. A summary of the test temperature measurements recorded during the 10-day test period are also presented on Table 3.

3.6 REFERENCE TOXICANT TESTING

The results of the reference toxicant tests conducted on the EA-cultured and acquired organisms used in the definitive toxicity tests for this study are reported in Table 4. The reference toxicant test results were within acceptable control charts limits for the test species.

4. REFERENCES

American Society for Testing and Materials (ASTM). 2004. Standard Guide for Conducting Laboratory Soil Toxicity or Bioaccumulation Tests with the Lumbricid Earthworm *Eisenia fetida* and the Enchytraeid Potworm *Enchytraeus albidus*. ASTM Designation: E1676-04, Philadelphia, Pennsylvania.

EA. 2013. EA Ecotoxicology Laboratory Quality Assurance and Standard Operating Procedures Manual. EA Manual ATS-102. Internal document prepared by EA's Ecotoxicology Laboratory, EA Engineering, Science, and Technology, Inc., Hunt Valley, Maryland.

US EPA. 2002a. Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms. Fifth Edition. EPA-821-R-02-012. U.S. Environmental Protection Agency, Office of Water, Washington, DC.

US EPA. 2002b. Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms. Fourth Edition. EPA-821-R-02-013. U.S. Environmental Protection Agency, Office of Water, Washington, DC.

TABLE 1 RESULTS OF *Ceriodaphnia dubia* CHRONIC TOXICITY TESTING ON A TCLP LEACHATE SAMPLE FROM URETEK USA

Test Species:	***Ceriodaphnia dubia* (water flea)**
Sample Description:	TCLP Leachate Sample
Sample Receipt:	19 September 2014
EA Test Number:	TN-14-439

Test Concentration (mg/L TCLP Leachate)	6-Day Percent Survival	Mean Young Production as Neonates/Organism (±S.D.)
Control	100	30.1 (±3.5)
18	100	28.6 (±4.5)
32	100	28.2 (±2.9)
56	100	28.6 (±6.0)
100	100	27.0 (±5.2)
200	100	30.2 (±5.0)

Chronic Toxicity Test Endpoints (as mg/L TCLP Leachate)	
NOEC:	200
LOEC:	>200
ChV:	>200
IC25	>200
PSMD:	15.7

Water Quality Parameters on Test Solutions	Range
Temperature (°C):	24.0 – 25.1
pH:	7.6 – 8.4
Dissolved Oxygen (mg/L):	7.9 – 8.7
Conductivity (µS/cm):	318 – 349

TABLE 2 RESULTS OF *Pimephales promelas* CHRONIC TOXICITY TESTING ON A TCLP LEACHATE SAMPLE FROM URETEK USA

Test Species:	***Pimephales promelas* (fathead minnow)**
Sample Description:	TCLP Leachate Sample
Sample Receipt:	19 September 2014
EA Test Number:	TN-14-440

Test Concentration (mg/L TCLP Leachate)	7-Day Percent Survival	Mean Biomass as mg/Organism (±S.D.)
Control	95	0.838 (±0.043)
18	95	0.755 (±0.072)
32	98	0.801 (±0.060)
56	95	0.816 (±0.078)
100	98	0.824 (±0.111)
200	98	0.802 (±0.064)

Chronic Toxicity Test Endpoints (as mg/L TCLP Leachate)

NOEC:	200
LOEC:	>200
ChV:	>200
IC25:	>200
PMSD:	15.1

Water Quality Parameters on Test Solutions	Range
Temperature (°C):	24.0 – 25.4
pH:	7.6 – 8.4
Dissolved Oxygen (mg/L):	6.1 – 8.4
Conductivity (µS/cm):	318 – 341

TABLE 3 RESULTS OF *Eisenia fetida* ACUTE TOXICITY TESTING ON A TCLP LEACHATE SAMPLE FROM URETEK USA

Test Species:	***Eisenia fetida* (redworm)**
Sample Description:	TCLP Leachate Sample
Sample Receipt:	19 September 2014
EA Test Number:	TN-14-436

Test Concentration (mg/L TCLP Leachate)	10-Day Percent Survival
Control	100
18	100
32	97
56	97
100	100
200	100
10-day LC50 (mg/L)	>200

Selected Test Parameter	Range
Temperature (°C):	20.4 – 21.9

TABLE 4 RESULTS OF REFERENCE TOXICANT TESTS ASSOCIATED WITH URETEK USA TESTING

Test Species	Reference Toxicant	Endpoint	Acceptable Control Chart Limits
Ceriodaphnia dubia			
September 2014	Potassium chloride (KCl)	IC25: 436 mg/L KCl	149-459 mg/L KCl
Pimephales promelas			
September 2014	Potassium chloride (KCl)	IC25: 611 mg/L KCl	496-717 mg/L KCl
Eisenia fetida			
September 2014	2-Chloroacetamide	96-Hour LC50: 141 mg/L 2-Chloroacetamide	14-249 mg/L 2-Chloroacetamide

TABLE 5 RESULTS OF CHEMICAL ANALYSES PERFORMED ON URETEK USA FOAM PRODUCTS[(a)]

Analyte	TCLP Leachate	Uretek 4R ISO (Part "A")	Uretek 4R Resin (Part "B")
Arsenic	<0.0072 mg/L	<0.634 mg/kg	<0.610 mg/kg
Barium	0.147 mg/L	<0.0327 mg/kg	0.0514 mg/kg[(b)]
Cadmium	<0.00033 mg/L	<0.0327 mg/kg	<0.0314 mg/kg
Chromium	0.0018 mg/L[(b)]	<0.109 mg/kg	<0.105 mg/kg
Lead	<0.0047 mg/L	<0.495 mg/kg	<0.476 mg/kg
Selenium	<0.0048 mg/L	<0.436 mg/kg	<0.419 mg/kg
Silver	<0.0018 mg/L	<0.188 mg/kg	<0.181 mg/kg
Tin	0.02117 mg/L	0.638 mg/kg[(b)]	28.3 mg/kg
Mercury	<0.000060 mg/L	<0.0097 mg/kg	<0.0097 mg/kg
TOC	2,650 mg/L	N/A	N/A
BOD	17.4 mg/L	N/A	N/A

(a) For detailed analyses, see Eurofins report in Attachment II.
(b) Estimated Value – The results is ≥ the Method Detection Limit (MDL) and < the Limit of Quantitation (LOQ).

ATTACHMENT I

Data Sheets and Statistical Analyses
(32 pages)

SAMPLE CHECK-IN
FOR TESTING

Client: Uretek

EA Accession Number: AT4-460 TCLP Leachate

Parameter	Acceptable Range	Measurement*	Date	Time	Initials
Temperature (°C)	≤4	1.3°C	9/19/14	1004	WJM
Is ice present?	---	YES	↓	↓	↓
pH	6.0-9.0	5.0	↓	↓	↓
TRC (mg/L)	<0.01	NA	↓	↓	↓
Visual Description	---	CLEAR	↓	↓	↓

***If outside acceptable range, contact project manager.**

OTHER PARAMETERS IF REQUIRED (SEE STUDY PLAN):

Parameter	Acceptable Range	(✓)	Date	Time	Initials
Ammonia (preserve aliquot)	--				
Parameter	**Acceptable Range**	**Measurement***	**Date**	**Time**	**Initials**
Salinity (ppt)	--				

ATS-Q25
03/01/00

C. dubia CHRONIC TOXICITY TEST DATA SHEET

Test Method: EPA 821-R-02-013 (1002.0)
Project Number: 70005.08
Client: Uretek
QC Test Number: TN-14-439
Test Material: Leachate
Accession Number: AT4-460
Dilution Water: Mod Hard
Accession Number: LD4-408
Test Container: 30 mL cup Test Volume: 15 mL

Beginning Date: 9/23/14 Time: 1015
Ending Date: 9/29/14 Time: 1410
Adults Isolated Date: 9/22/14 Time: 1209
Neonates Pulled Date: 9/22/14 Time: 1620
Age of Neonates: <24 hrs Brood Size: 8+
Source: EA
Culture Water Temperature: 24.7 °C
Photoperiod: 16 l, 8 d Light Intensity: 50 - 100 fc

TEST SET-UP

TEST INITIATION

Date	Time	Initials	Activity
9/23/14	0930	vy	Dilutions Made
↓	0938	↓	Test Vessels Filled
	1015		Organisms Transferred
	1041	MJ	Head Counts

CONCENTRATION SERIES

Test Concentration	Volume Test Material	Final Volume 200ml
Mod Hard Control		↓
18 ppm	SEE ATTACHED	
32 ppm		
56 ppm		
100 ppm		
200 ppm		

Comments:

INTERMEDIATE DILUTION PREPARATION AND FEEDING

DILUTION PREPARATION

Day	Date	Time	Initials	Sample / Diluent
0	9/23/14	0930	vy	AT4-460 LD4-408
1	9/24/14	0836	MJ	AT4-460 LD4-409
2	9/25/14	0847	vy	AT4-460 LD4-411
3	9/26/14	1005	MJ	AT4-460 LD4-412
4	9/27/14	0914	MJ	AT4-460 LD4-416
5	9/28/14	0940	vy	AT4-460 LD4-417
6				

FEEDING

Food: YCT + *Selenastrum capricornutum*

Day	Date	Time	Initials	Amount
0	9/23/14	1017	vy	200ul
1	9/24/14	0911	MJ	200µL
2	9/25/14	1030	vy	200ul
3	9/26/14	1115	MJ	200µL
4	9/27/14	1302	MJ	200µL
5	9/28/14	1200	vy	200ul
6				

ATS-T3
07/03/06

Ceriodaphnia dubia CHRONIC TOXICITY TEST

Client: Uretek

QC Test Number: TN-14-439

First column=# neonates ; Second column = 0 (female), 1 (dead female), 2 (male), 3 (dead male), 9 (lost replicate)

Concentration	Day	1		2		3		4		5		6		7		8		9		10		Time/Initials
Mod Hard Control	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0903 MJ
	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1012 vy
	3	4	0	6	0	5	0	5	0	3	0	3	0	5	0	4	0	5	0	5	0	1109 MJ
	4	0	0	8	0	8	0	7	0	8	0	6	0	4	0	9	0	9	0	2	0	1254 MJ
9/29 MJ	5	13	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	12	0	1125 vy
	6	19	0	16	0	15	0	17	0	18	0	14	0	21	0	17	0	17	0	15	0	1410 vy
	7																					
Total # Neonates:		36		30		28		29		29		23		31		30		31		34		

Concentration	Day	1		2		3		4		5		6		7		8		9		10		Time/Initials
18 ppm	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	MJ
	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	vy
	3	7	0	2	0	5	0	6	0	4	0	5	0	3	0	5	0	5	0	6	0	MJ
	4	8	0	6	0	6	0	8	0	9	0	9	0	6	0	8	0	8	0	2	0	MJ
	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0	vy
	6	15	0	16	0	18	0	18	0	13	0	19	0	14	0	14	0	12	0	17	0	vy
	7																					
Total # Neonates:		~~28~~ 30		24		29		32		26		33		23		27		25		37		

Concentration	Day	1		2		3		4		5		6		7		8		9		10		Time/Initials
32 ppm	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	MJ
	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	vy
	3	3	0	4	0	6	0	5	0	2	0	4	0	4	0	5	0	4	0	2	0	MJ
	4	9	0	8	0	7	0	2	0	10	0	8	0	8	0	5	0	10	0	0	0	MJ
	5	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	12	0	vy
	6	16	0	14	0	15	0	17	0	16	0	14	0	15	0	14	0	17	0	16	0	vy
	7																					
Total # Neonates:		28		26		28		34		28		26		27		24		31		30		

Concentration	Day	1		2		3		4		5		6		7		8		9		10		Time/Initials
56 ppm	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	MJ
	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	vy
	3	3	0	3	0	5	0	4	0	0	0	5	0	4	0	5	0	3	0	2	0	MJ
	4	9	0	8	0	11	0	6	0	6	0	8	0	0	0	0	0	9	0	4	0	MJ
	5	0	0	0	0	0	0	0	0	0	0	0	0	12	0	11	0	0	0	14	0	vy
	6	15	0	16	0	16	0	12	0	16	0	14	0	15	0	12	0	15	0	23	0	vy
	7																					
Total # Neonates:		27		27		32		22		22		27		31		28		27		43		

Concentration	Day	1		2		3		4		5		6		7		8		9		10		Time/Initials
100 ppm	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	MJ
	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	vy
	3	6	0	3	0	4	0	3	0	3	0	4	0	4	0	3	0	4	0	6	0	MJ
	4	0	0	9	0	10	0	8	0	10	0	5	0	11	0	0	0	10	0	0	0	MJ
	5	11	0	0	0	0	0	0	0	0	0	0	0	0	0	13	0	0	0	14	0	vy
	6	14	0	14	0	16	0	11	0	13	0	16	0	12	0	3	0	12	0	18	0	vy
	7																					
Total # Neonates:		31		26		30		22		26		25		27		19		26		38		

Concentration	Day	1		2		3		4		5		6		7		8		9		10		Time/Initials
200 ppm	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	MJ
	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	vy
	3	5	0	4	0	4	0	4	0	3	0	7	0	5	0	4	0	4	0	5	0	MJ
	4	0	0	8	0	11	0	9	0	0	0	0	0	10	0	0	0	1	0	0	0	MJ
	5	13	0	0	0	0	0	0	0	9	0	9	0	0	0	13	0	14	0	7	0	vy
	6	17	0	8	0	17	0	18	0	12	0	14	0	21	0	13	0	16	0	17	0	vy
	7																					
Total # Neonates:		35		20		32		31		24		30		36		30		35		29		

Neonate totals checked (date, initials): 4/30/14 CH

ATS-T4
04/19/13

1,500 ml Total Volume

Leachate = 1,000,000 ppm
Stock A (1 ml leachate: 99 ml mod hard) = 10,000 ppm (10 mg/ml)

200 mg/L Add 30 mls of **Stock A** to graduated cylinder and bring to a total of 1,500 ml with mod hard.

100 mg/L Add 15 mls of **Stock A** to graduated cylinder and bring to a total of 1,500 ml with mod hard.

56 mg/L Add 8.4 mls of **Stock A** to graduated cylinder and bring to a total of 1,500 ml with mod hard.

32 mg/L Add 4.8 mls of **Stock A** to graduated cylinder and bring to a total of 1,500 ml with mod hard.

18 mg/L Add 2.7 mls of **Stock A** to graduated cylinder and bring to a total of 1,500 ml with mod hard.

Mod Hard Control

1,000 ml Total Volume

Leachate = 1,000,000 ppm
Stock A (1 ml leachate: 99 ml mod hard) = 10,000 ppm (10 mg/ml)

200 mg/L Add 20 mls of **Stock A** to graduated cylinder and bring to a total of 1,000 ml with mod hard.

100 mg/L Add 10 mls of **Stock A** to graduated cylinder and bring to a total of 1,000 ml with mod hard.

56 mg/L Add 5.6 mls of **Stock A** to graduated cylinder and bring to a total of 1,000 ml with mod hard.

32 mg/L Add 3.2 mls of **Stock A** to graduated cylinder and bring to a total of 1,000 ml with mod hard.

18 mg/L Add 1.8 mls of **Stock A** to graduated cylinder and bring to a total of 1,000 ml with mod hard.

Mod Hard Control

TOXICITY TEST WATER QUALITY DATA SHEET - NEW SOLUTIONS

Project Number: 70005.08

Client: Uretek

QC Test Number: TN-14-439

TEST ORGANISM

Common Name: Water flea

Scientific Name: *C. dubia*

Beginning Date: 9/23/14 Time: 1015

Ending Date: 9/29/14 Time: 1410

TARGET VALUES: Temp: 25±1 °C pH: 6.0 - 9.0 DO: ≥4.0 mg/L Salinity: 0 ppt Photoperiod: 16 l, 8 d Light Intensity: 50 - 100 fc

Test Conc	Rep	Temperature (°C)							pH							Dissolved Oxygen (mg/L)							Conductivity (µS/cm) Salinity (ppt)						
		0	1	2	3	4	5	6	0	1	2	3	4	5	6	0	1	2	3	4	5	6	0	1	2	3	4	5	6
MH Control		24.1	24.3	24.0	24.0	24.5	24.5		8.4	7.7	8.1	7.9	7.6	7.7		8.2	8.4	8.3	8.4	8.2	8.3		323	324	322	323	319	320	
18 ppm		24.1	24.5	24.0	24.0	24.6	24.5		8.3	7.7	8.0	7.9	7.7	7.8		8.4	8.4	8.4	8.4	8.2	8.3		323	325	323	322	319	320	
32 ppm		24.1	24.6	24.0	24.4	24.9	24.5		8.2	7.7	8.0	7.9	7.7	7.7		8.4	8.4	8.5	8.4	8.3	8.3		324	324	323	321	319	321	
56 ppm		24.1	24.5	24.0	24.4	25.0	24.5		8.1	7.7	8.0	7.9	7.7	7.7		8.4	8.4	8.6	8.4	8.2	8.3		324	324	323	322	318	322	
100 ppm		24.1	24.6	24.0	24.4	25.1	24.5		8.1	7.7	8.0	7.9	7.8	7.8		8.4	8.3	8.6	8.4	8.3	8.3		325	324	323	323	318	321	
200 ppm		24.1	24.6	24.0	24.4	25.0	24.5		8.0	7.7	8.0	7.9	7.8	7.9		8.4	8.4	8.6	8.4	8.3	8.3		326	325	325	323	319	323	
Meter Number		678	678	678	678	678	678		678	678	678	678	678	678		678	678	678	678	678	678		678	678	678	678	678	678	
Time		0935	0845	0855	1011	0920	1017		0935	0845	0855	1011	0920	1017		0935	0845	0855	1011	0920	1017		0935	0845	0855	1011	0920	1017	
Initials		VY	MJ	VY	MJ	MJ	VY		VY	MJ	VY	MJ	MJ	VY		VY	MJ	VY	MJ	MJ	VY		VY	MJ	VY	MJ	MJ	VY	

ATS-T13
06/21/06

TOXICITY TEST WATER QUALITY DATA SHEET - OLD SOLUTIONS

Project Number: 70005.08
Client: Uretek
QC Test Number: TN- 14-439

TEST ORGANISM
Common Name: Water flea
Scientific Name: *C. dubia*

Beginning Date: 9/23/14 Time: 1015
Ending Date: 9/29/14 Time: 1410

TARGET VALUES: Temp: 25±1 °C pH: 6.0 - 9.0 DO: ≥4.0 mg/L Salinity: 0 ppt Photoperiod: 16 l, 8 d Light Intensity: 50 - 100 fc

Test Conc	Rep	Temperature (°C)							pH							Dissolved Oxygen (mg/L)							~~Conductivity (µS/cm)~~ Salinity (ppt)						
		1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7
MH Control		24.0	24.1	24.4	24.7	24.7	24.3		7.9	7.9	8.0	8.2	8.1	7.9		8.5	8.5	8.6	8.5	7.9	8.1		334	349	339	333	328	333	
18 ppm		24.0	24.1	24.4	24.7	24.7	24.5		7.8	7.9	8.0	8.0	7.9	7.8		8.6	8.7	8.5	8.5	8.1	8.1		339	336	333	331	325	333	
32 ppm		24.0	24.4	24.6	24.9	24.6	24.7		7.8	7.9	7.9	7.9	7.8	7.8		8.8	8.6	8.5	8.5	8.1	8.1		343	330	335	332	328	338	
56 ppm		24.0	24.5	24.7	25.0	24.6	24.7		7.8	7.9	7.9	7.8	7.7	7.9		8.9	8.6	8.4	8.4	8.2	8.2		333	330	333	332	323	335	
100 ppm		24.1	24.6	24.7	24.9	24.6	24.7		7.8	7.9	7.9	7.8	7.7	7.9		8.9	8.5	8.4	8.4	8.2	8.2		336	333	337	342	329	339	
200 ppm		24.0	24.6	24.7	24.8	24.6	24.9		7.8	7.9	7.9	7.8	7.7	7.9		8.8	8.6	8.4	8.4	8.3	8.2		334	329	334	331	326	349	
Meter Number		678	678	678	678	678	678		678	678	678	678	678	678		678	678	678	678	678	678		678	678	678	678	678	678	
Time		0917	1020	1332	1306	1132	1419		0917	1020	1332	1306	1132	1419		0917	1020	1332	1306	1132	1419		0917	1020	1332	1306	1132	1419	
Initials		MJ	VY	MJ	MJ	VY	VY		MJ	VY	MJ	MJ	VY	VY		MJ	VY	MJ	MJ	VY	VY		MJ	VY	MJ	MJ	VY	VY	

ATS-T14
06/21/06

RANDOMIZATION CHART
(*C. dubia* Chronic Toxicity Test)

Project Number: 70005.08

Client: Uretek

QC Test Number: TN- 14-439

(*White Boards*)

1	4	6	3	5	2
4	3	6	1	2	5
6	1	5	2	4	3
6	2	1	4	5	3
3	6	2	4	1	5
3	5	4	6	2	1
5	4	1	3	6	2
1	5	3	2	4	6
6	2	4	1	5	3
4	1	2	6	3	5

ATS-T48a
03/01/00

TOXICOLOGY LABORATORY BENCH SHEET

Project Number: 70005.08

Client: Uretek

QC Test Number: TN-14-439

Date/Time/Initials	Comments/Activity

ATS-T29
03/01/00

Ceriodaphnia Survival and Reproduction Test-6 Day Survival

Start Date:	9/23/2014	Test ID:	TN-14-439	Sample ID:	Uretek
End Date:	9/29/2014	Lab ID:		Sample Type:	TCLP Leachate AT4-460
Sample Date:		Protocol:	EPAF 91-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Conc-mg/L	1	2	3	4	5	6	7	8	9	10
Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
18	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
32	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
56	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
100	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
200	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Conc-mg/L	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical
Control	1.0000	1.0000	0	10	10	10		
18	1.0000	1.0000	0	10	10	10	1.0000	0.0500
32	1.0000	1.0000	0	10	10	10	1.0000	0.0500
56	1.0000	1.0000	0	10	10	10	1.0000	0.0500
100	1.0000	1.0000	0	10	10	10	1.0000	0.0500
200	1.0000	1.0000	0	10	10	10	1.0000	0.0500

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	200	>200		

Reviewed by: 10/14/14 MM

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	9/23/2014	Test ID:	TN-14-439	Sample ID:	Uretek
End Date:	9/29/2014	Lab ID:		Sample Type:	TCLP Leachate AT4-460
Sample Date:		Protocol:	EPAF 91-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:					

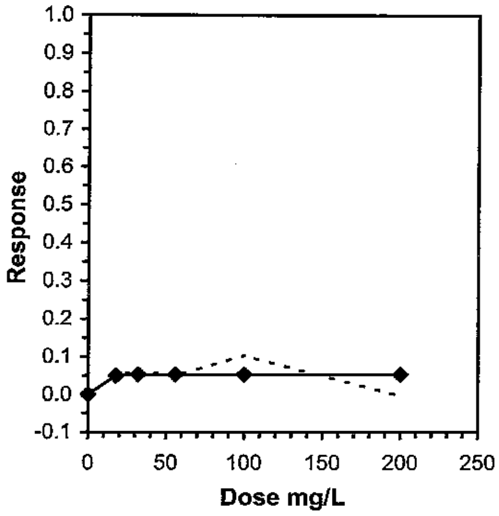
Conc-mg/L	1	2	3	4	5	6	7	8	9	10	s.d.
Control	36.000	30.000	28.000	29.000	29.000	23.000	31.000	30.000	31.000	34.000	3.47851
18	30.000	24.000	29.000	32.000	26.000	33.000	23.000	27.000	25.000	37.000	4.45222
32	28.000	26.000	28.000	34.000	28.000	26.000	27.000	24.000	31.000	30.000	2.85968
56	27.000	27.000	32.000	22.000	22.000	27.000	31.000	28.000	27.000	43.000	5.98517
100	31.000	26.000	30.000	22.000	26.000	25.000	27.000	19.000	26.000	38.000	5.18545
200	35.000	20.000	32.000	31.000	24.000	30.000	36.000	30.000	35.000	29.000	5.02881

			Transform: Untransformed						1-Tailed		Isotonic	
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
Control	30.100	1.0000	30.100	23.000	36.000	11.556	10				30.100	1.0000
18	28.600	0.9502	28.600	23.000	37.000	15.567	10	0.726	2.287	4.725	28.600	0.9502
32	28.200	0.9369	28.200	24.000	34.000	10.141	10	0.919	2.287	4.725	28.500	0.9468
56	28.600	0.9502	28.600	22.000	43.000	20.927	10	0.726	2.287	4.725	28.500	0.9468
100	27.000	0.8970	27.000	19.000	38.000	19.205	10	1.500	2.287	4.725	28.500	0.9468
200	30.200	1.0033	30.200	20.000	36.000	16.652	10	-0.048	2.287	4.725	28.500	0.9468

Auxiliary Tests					Statistic		Critical		Skew	Kurt
Kolmogorov D Test indicates normal distribution (p > 0.01)					0.91533		1.035		0.55692	1.45688
Bartlett's Test indicates equal variances (p = 0.32)					5.90304		15.0863			
Hypothesis Test (1-tail, 0.05)	**NOEC**	**LOEC**	**ChV**	**TU**	**MSDu**	**MSDp**	**MSB**	**MSE**	**F-Prob**	**df**
Dunnett's Test	200	>200			4.72516	0.15698	14.6567	21.35	0.63571	5, 54

Linear Interpolation (200 Resamples)

Point	mg/L	SD	95% CL	Skew
IC05	18.700			
IC10	>200			
IC15	>200			
IC20	>200			
IC25	>200			
IC40	>200			
IC50	>200			



Reviewed by: 10/14/14 MD

TOXICITY TEST SET-UP BENCH SHEET

Project Number: 70005.08

Client: Uretek

QC Test Number: TN- 14-440

TEST ORGANISM INFORMATION

Common Name: Fathead minnow

Scientific Name: *P. promelas*

Lot Number: FH4-9/22-23

Source: EA

Adults Isolated (Time, Date):

Neonates Pulled & Fed (Time, Date):

Acclimation: <24 hrs

Age: <24 hrs

Culture Water (T/S): 24.6 °C 0 ppt

TEST SET-UP

TEST INITIATION

Date	Time	Initials	Activity
9/23/14	0930	Wy	Dilutions Made
↓	1456	MJ	Test Vessels Filled
↓	1456	MJ	Organisms Transferred
↓	1620	MC	Head Counts

CONCENTRATION SERIES

Test Concentration	Volume Test Material	Final Volume
Mod Hard Control		1000ml
18 ppm	SEE ATTACHED	↓
32 ppm		↓
56 ppm		↓
100 ppm		↓
200 ppm		↓

Comments:

INTERMEDIATE DILUTION PREPARATION AND FEEDING

DILUTION PREPARATION

Day	Date	Time	Initials	Sample / Diluent
0	9/23/14	0930	Wy	AT4-460 LD4-408
1	9/24/14	0836	MJ	AT4-460 LD4-409
2	9/25/14	0847	Wy	AT4-460 LD4-411
3	9/26/14	1005	MJ	AT4-460 LD4-412
4	9/27/14	0914	MJ	AT4-460 LD4-416
5	9/28/14	0940	Wy	AT4-460 LD4-417
6	9/29/14	0929	Wy	AT4-460 LD4-419

FEEDING

Food: *Artemia*

Day	Time, Initials, Amount	Time, Initials, Amount	Time, Initials, Amount
0			1620 MC 3 drops
1	0740 MJ 3drops	1200 MJ 3drops	1555 MJ 3drops
2	0755 MJ 4drops	1200 MJ 4drops	1642 Wy 4 drops
3	0805 MJ 4drops	1155 MJ 4drops	1707 MJ 4drops
4	0755 MJ 5drops	1150 MJ 5drops	1550 MJ 5drops
5	0830 Wy 5drops	1202 Wy 5drops	1715 Wy 5drops
6	0810 Wy 5drops	1210 Wy 5drops	1730 Wy 5drops

ATS-T27
09/22/08

1,500 ml Total Volume

Leachate = 1,000,000 ppm
Stock A (1 ml leachate: 99 ml mod hard) = 10,000 ppm (10 mg/ml)

200 mg/L Add 30 mls of **Stock A** to graduated cylinder and bring to a total of 1,500 ml with mod hard.

100 mg/L Add 15 mls of **Stock A** to graduated cylinder and bring to a total of 1,500 ml with mod hard.

56 mg/L Add 8.4 mls of **Stock A** to graduated cylinder and bring to a total of 1,500 ml with mod hard.

32 mg/L Add 4.8 mls of **Stock A** to graduated cylinder and bring to a total of 1,500 ml with mod hard.

18 mg/L Add 2.7 mls of **Stock A** to graduated cylinder and bring to a total of 1,500 ml with mod hard.

Mod Hard Control

1,000 ml Total Volume

Leachate = 1,000,000 ppm
Stock A (1 ml leachate: 99 ml mod hard) = 10,000 ppm (10 mg/ml)

200 mg/L Add 20 mls of **Stock A** to graduated cylinder and bring to a total of 1,000 ml with mod hard.

100 mg/L Add 10 mls of **Stock A** to graduated cylinder and bring to a total of 1,000 ml with mod hard.

56 mg/L Add 5.6 mls of **Stock A** to graduated cylinder and bring to a total of 1,000 ml with mod hard.

32 mg/L Add 3.2 mls of **Stock A** to graduated cylinder and bring to a total of 1,000 ml with mod hard.

18 mg/L Add 1.8 mls of **Stock A** to graduated cylinder and bring to a total of 1,000 ml with mod hard.

Mod Hard Control

TOXICITY TEST WATER QUALITY DATA SHEET - OLD SOLUTIONS

Project Number: 70005.08
Client: Uretek
QC Test Number: TN-14-440

TEST ORGANISM
Common Name: Fathead minnow
Scientific Name: *P. promelas*

Beginning Date: 9/23/14 Time: 1456
Ending Date: 9/30/14 Time: 1447

TARGET VALUES: Temp: 25±1 °C pH: 6.0 - 9.0 DO: ≥4.0 mg/L Salinity: 0 ppt Photoperiod: 16 l, 8 d Light Intensity: 50 - 100 fc

Test Conc	Rep	Temperature (°C)							pH							Dissolved Oxygen (mg/L)							Conductivity (µS/cm) ~~Salinity (ppt)~~						
		1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7
MH Control		24.0	24.0	24.0	24.0	24.0	24.6	25.0	7.7	8.1	8.2	8.4	8.3	8.4	8.0	7.9	7.6	7.2	7.8	7.3	7.3	7.5	330	335	339	341	334	335	332
18 ppm		24.4	24.0	24.0	24.4	24.0	24.5	25.2	7.7	7.9	8.1	8.3	8.2	8.3	7.9	7.7	7.8	7.1	7.3	7.2	6.9	7.0	329	333	337	338	334	334	331
32 ppm		24.4	24.3	24.0	24.4	24.0	24.6	25.4	7.7	7.8	8.0	8.1	8.1	8.1	7.8	7.5	7.6	7.2	7.0	7.1	6.8	6.1	328	331	335	338	331	333	330
56 ppm		24.4	24.4	24.0	24.2	24.0	24.6	25.2	7.1	7.8	8.0	7.9	8.0	8.0	7.8	7.6	7.7	7.1	6.9	7.1	6.8	6.6	328	330	335	337	329	333	330
100 ppm		24.5	24.4	24.0	24.3	24.0	24.6	25.2	7.7	7.7	8.0	7.9	8.0	7.9	7.7	7.7	7.6	7.0	6.9	7.1	6.8	6.7	329	332	335	338	331	332	333
200 ppm		24.5	24.4	24.0	24.3	24.0	24.7	25.2	7.7	7.7	7.9	7.9	7.9	7.8	7.7	7.6	7.6	7.0	7.0	7.1	6.9	6.8	329	332	336	338	332	336	331
Meter Number		678	678	678	678	678	678	678	678	678	678	678	678	678	678	678	678	678	678	678	678	678	678	678	678	678	678	678	678
Time		0848	0820	0948	0909	1015	1006	1120	0848	0820	0948	0909	1015	1006	1120	0848	0820	0948	0909	1015	1006	1120	0848	0820	0948	0909	1015	1006	1120
Initials		MJ	VX	MJ	MJ	VX	VX	CH	MJ	VX	MJ	MJ	VX	VX	CH	MJ	VX	MJ	MJ	VX	VX	GI	MJ	VX	MJ	MJ	VX	VX	GI

ATS-T14
06/21/06

TOXICITY TEST WATER QUALITY DATA SHEET - NEW SOLUTIONS

Project Number: 70005.08
Client: Uretek
QC Test Number: TN-14-440

TEST ORGANISM
Common Name: Fathead minnow
Scientific Name: *P. promelas*

Beginning Date: 9/23/14 Time: 1456
Ending Date: 9/30/14 Time: 1447

TARGET VALUES: Temp: 25±1 °C pH: 6.0 - 9.0 DO: ≥4.0 mg/L Salinity: 0 ppt Photoperiod: 16 l, 8 d Light Intensity: 50 - 100 fc

Test Conc	Rep	Temperature (°C)							pH							Dissolved Oxygen (mg/L)							Conductivity (µS/cm) Salinity (ppt)						
		0	1	2	3	4	5	6	0	1	2	3	4	5	6	0	1	2	3	4	5	6	0	1	2	3	4	5	6
MH Control		24.1	24.3	24.0	24.0	24.5	24.5	24.5	8.4	7.7	8.1	7.9	7.6	7.7	7.8	8.2	8.4	8.3	8.4	8.2	8.3	8.2	323	324	322	323	319	320	318
18 ppm		24.1	24.5	24.0	24.0	24.8	24.5	24.7	8.3	7.7	8.0	7.9	7.7	7.8	7.8	8.4	8.4	8.4	8.4	8.2	8.3	8.2	323	325	323	322	319	320	318
32 ppm		24.1	24.6	24.0	24.4	24.9	24.5	24.7	8.2	7.7	8.0	7.9	7.7	7.7	7.7	8.4	8.4	8.5	8.4	8.3	8.3	8.2	324	324	323	321	319	321	319
56 ppm		24.1	24.5	24.0	24.4	25.0	24.5	24.7	8.1	7.7	8.0	7.9	7.7	7.7	7.8	8.4	8.4	8.6	8.4	8.2	8.3	8.2	324	324	323	322	318	322	320
100 ppm		24.1	24.6	24.0	24.4	25.1	24.5	24.6	8.1	7.7	8.0	7.9	7.8	7.8	7.8	8.4	8.3	8.6	8.4	8.3	8.3	8.2	325	324	323	323	318	321	320
200 ppm		24.1	24.6	24.0	24.4	25.0	24.5	24.6	8.0	7.7	8.0	7.9	7.8	7.9	7.8	8.4	8.4	8.6	8.4	8.3	8.3	8.2	326	325	325	323	319	323	322
Meter Number		678	678	678	678	678	678	678	678	678	678	678	678	678	678	678	678	678	678	678	678	678	678	678	678	678	678	678	678
Time		0935	0845	0855	1011	0920	1017	1008	0935	0845	0855	1011	0920	1017	1008	0935	0845	0855	1011	0920	1017	1008	0935	0845	0855	1011	0920	1017	1008
Initials		VY	MJ	VY	MJ	MJ	VY	VY	VY	MJ	VY	MJ	MJ	VY	VY	VY	MJ	VY	MJ	MJ	VY	VY	VY	MJ	VY	MJ	MJ	VY	VY

ATS-T14
06/21/06

TOXICITY TEST OBSERVATION DATA SHEET

Project Number: 70005.08

Client: Uretek

QC Test Number: TN-14-440

Test Material: Leachate

Accession Number: AT4-460

Dilution Water: Mod Hard

Accession Number: LD4-408

TEST ORGANISM

Common Name: Fathead minnow

Scientific Name: *P. promelas*

TEST TYPE: [✓ Static] / Flowthrough

[✓ Renewal] / Non-renewal

Photoperiod: 16 l, 8 d Light Intensity: 50 - 100 fc

Beginning Date: 9/23/14 Time: 1456

Ending Date: 9/30/14 Time: 1447

Test Container: 1-L Beaker

Test Volume: 250 ml

Test Duration: 7 days

Concentration	Rep	Number of Surviving Organisms							
		Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Mod Hard Control	A	10	10	9	9	9	9	9	9
	B	10	10	9	9	9	9	9	9
	C	10	10	10	10	10	10	10	10
	D	10	10	10	10	10	10	10	10
18 ppm	A	10	10	10	10	10	10	10	10
	B	10	10	10	9	9	9	9	9
	C	10	10	10	10	10	10	10	10
	D	10	9	9	9	9	9	9	9
32 ppm	A	10	10	10	10	10	10	10	10
	B	10	10	9	9	9	9	9	9
	C	10	10	10	10	10	10	10	10
	D	10	10	10	10	10	10	10	10
Time / Initials		1620 MC	0951 MJ	0927 Vg	1401 MJ	1342 MJ	1100 Vg	1042 Vg	1447 CH

EPA TEST METHOD: (FW) EPA 821-R-02-013/(SW) EPA 821-R-02-012(CHECK ONE):

Fathead: (1000.0) X Cyprinodon: (1004.0)____ Menidia: (1006.0)____ Americamysis: (1007.0)____ OTHER:____

ATS-T10
12/02/08

TOXICITY TEST OBSERVATION DATA SHEET

Project Number: 70005.08
Client: Uretek
QC Test Number: TN-14-440
Test Material: Leachate
Accession Number: ATY-460
Dilution Water: Mod Hard
Accession Number: LD4-408

TEST ORGANISM
Common Name: Fathead minnow
Scientific Name: *P. promelas*

TEST TYPE: [✓ Static] / Flowthrough
[✓ Renewal] / Non-renewal
Photoperiod: 16 l, 8 d Light Intensity: 50 - 100 fc

Beginning Date: 9/23/14 Time: 1456
Ending Date: 9/30/14 Time: 1447

Test Container: 1-L Beaker
Test Volume: 250 ml
Test Duration: 7 days

Concentration	Rep	Number of Surviving Organisms							
		Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
56 ppm	A	10	10	10	10	10	10	10	10
	B	10	9	8	8	8	8	8	8
	C	10	10	10	10	10	10	10	10
	D	10	10	10	10	10	10	10	10
100 ppm	A	10	10	9	9	9	9	9	9
	B	10	10	10	10	10	10	10	10
	C	10	10	10	10	10	10	10	10
	D	10	10	10	10	10	10	10	10
200 ppm	A	10	10	10	10	10	10	10	10
	B	10	10	10	10	10	10	10	10
	C	10	10	10	10	9	9	9	9
	D	10	10	10	10	10	10	10	10
Time / Initials		1620 MC	0951 MJ	0927 VY	1401 MJ	1342 MJ	1100 VY	1042 VY	1447 CH

EPA TEST METHOD: (FW) EPA 821-R-02-013/(SW) EPA 821-R-02-012(CHECK ONE):

Fathead: (1000.0) X Cyprinodon: (1004.0)____ Menidia: (1006.0)____ Americamysis: (1007.0)____ OTHER:____

ATS-T10
12/02/08

WEIGHT DATA (Test Species: *P. promelas*)

Project Number: 70005.08

Client: Uretek

QC Test Number: TN-14-440

Tin Lot: Blue 134

Oven Temp (°C): Start: 102 End: 102.0

	Date	Time	Initials
Loaded tins placed in oven:	9/30/14	1500	CH
Loaded tins removed from oven:	10/1/14	1404	vy
Loaded tins weighed:	10/1/14	1445	vy

Oven Number: BLM-01

Balance Number: P0115825

Test Concentration	Rep	Tin #	**A** Weight of Tin (mg)	**B** Weight of Tin and Dried Organisms (mg)	**B-A** Total Dry Organism Weight (mg)	**C** Number of Organisms Weighed	**(B-A)/C** Mean Dry Organism Weight (mg)	**(if applicable)** Mean Biomass (mg/exposed org.)
MH Control	A	1	30.91	39.49	8.58	9	0.953	0.858
	B	2	29.83	37.72	7.89	9	0.877	0.789
	C	3	31.31	39.48	8.17	10	0.817	0.817
	D	4	30.03	38.89	8.86	10	0.886	0.886
18 ppm	A	5	30.57	39.04	8.47	10	0.847	0.847
	B	6	29.52	36.80	7.28	9	0.809	0.728
	C	9	31.91	39.61	7.70	10	0.770	0.770
	D	10	30.71	37.47	6.76	9	0.751	0.676
32 ppm	A	11	33.60	41.32	7.72	10	0.772	0.772
	B	12	31.41	40.00	8.59	9	0.954	0.859
	C	13	31.52	38.83	7.31	10	0.731	0.731
	D	14	30.53	38.95	8.42	10	0.842	0.842

Dry wt. calculations checked (date, initials): 10/2/14 Wm

Biomass calculations checked (date, initials): 10/2/14 Wm

ATS-T46
09/29/08

WEIGHT DATA (Test Species: *P. promelas*)

Project Number: 70005.08

Client: Uretek

QC Test Number: TN- 14-440

Tin Lot: Blue 134

Oven Temp (°C): Start: 102 End: 102.0

	Date	Time	Initials
Loaded tins placed in oven:	9/30/14	1500	CH
Loaded tins removed from oven:	10/1/14	1404	VY
Loaded tins weighed:	10/1/14	1445	VY

Oven Number: BLM-01

Balance Number: P0115825

Test Concentration	Rep	Tin #	A Weight of Tin (mg)	B Weight of Tin and Dried Organisms (mg)	B-A Total Dry Organism Weight (mg)	C Number of Organisms Weighed	(B-A)/C Mean Dry Organism Weight (mg)	(if applicable) Mean Biomass (mg/exposed org.)
32 ppm	A	15	31.92	40.50	8.58	10	0.858	0.858
	B	16	32.17	39.17	7.00	8	0.875	0.700
	C	17	31.77	40.39	8.62	10	0.862	0.862
	D	18	29.51	37.95	8.44	10	0.844	0.844
100 ppm	A	19	31.62	38.22	6.60	9	0.733	0.660
	B	21	29.91	38.42	8.51	10	0.851	0.851
	C	22	30.97	39.84	8.87	10	0.887	0.887
	D	23	30.91	39.89	8.98	10	0.898	0.898
200 ppm	A	24	31.32	40.10	8.78	10	0.878	0.878
	B	25	31.36	38.95	7.59	10	0.759	0.759
	C	26	30.69	38.10	7.41	9	0.823	0.741
	D	27	31.76	40.07	8.31	10	0.831	0.831

Dry wt. calculations checked (date, initials): 10/2/14

Biomass calculations checked (date, initials): 10/2/14

ATS-T46
09/29/08

RANDOMIZATION CHART

Project Number: 70005.08

Client: Uretek

QC Test Number: TN-14-440

5	6	2	3	1	4
4	3	2	1	5	6
2	1	4	3	5	6
1	6	3	2	5	4

ATS-T48d
03/01/00

TOXICOLOGY LABORATORY BENCH SHEET

Project Number: 70005.08

Client: Uretek

QC Test Number: TN-14-440

Date/Time/Initials	Comments/Activity

ATS-T29
03/01/00

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	9/23/2014	Test ID:	TN-14-440	Sample ID:	Uretek
End Date:	9/30/2014	Lab ID:		Sample Type:	TCLP Leachate AT4-460
Sample Date:		Protocol:	EPAF 91-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:					

Conc-mg/L	1	2	3	4
Control	0.9000	0.9000	1.0000	1.0000
18	1.0000	0.9000	1.0000	0.9000
32	1.0000	0.9000	1.0000	1.0000
56	1.0000	0.8000	1.0000	1.0000
100	0.9000	1.0000	1.0000	1.0000
200	1.0000	1.0000	0.9000	1.0000

			Transform: Arcsin Square Root					Rank	1-Tailed
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical
Control	0.9500	1.0000	1.3305	1.2490	1.4120	7.072	4		
18	0.9500	1.0000	1.3305	1.2490	1.4120	7.072	4	18.00	10.00
32	0.9750	1.0263	1.3713	1.2490	1.4120	5.942	4	20.00	10.00
56	0.9500	1.0000	1.3358	1.1071	1.4120	11.411	4	19.00	10.00
100	0.9750	1.0263	1.3713	1.2490	1.4120	5.942	4	20.00	10.00
200	0.9750	1.0263	1.3713	1.2490	1.4120	5.942	4	20.00	10.00

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.80063	0.884	-1.0391	0.04285
Bartlett's Test indicates equal variances (p = 0.86)	1.89771	15.0863		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	200	>200		

Reviewed by: 10/14/14

Larval Fish Growth and Survival Test-7 Day Biomass

Start Date:	9/23/2014	Test ID:	TN-14-440	Sample ID:	Uretek
End Date:	9/30/2014	Lab ID:		Sample Type:	TCLP Leachate AT4-460
Sample Date:		Protocol:	EPAF 91-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:					

Conc-mg/L	1	2	3	4	s.d.
Control	0.8580	0.7890	0.8170	0.8860	0.04299
18	0.8470	0.7280	0.7700	0.6760	0.07225
32	0.7720	0.8590	0.7310	0.8420	0.05996
56	0.8580	0.7000	0.8620	0.8440	0.07772
100	0.6600	0.8510	0.8870	0.8980	0.11116
200	0.8780	0.7590	0.7410	0.8310	0.06374

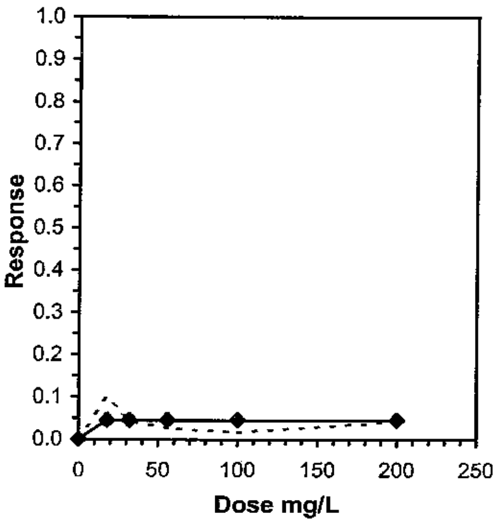
			Transform: Untransformed						1-Tailed		Isotonic	
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
Control	0.8375	1.0000	0.8375	0.7890	0.8860	5.133	4				0.8375	1.0000
18	0.7553	0.9018	0.7553	0.6760	0.8470	9.566	4	1.566	2.410	0.1266	0.7997	0.9549
32	0.8010	0.9564	0.8010	0.7310	0.8590	7.486	4	0.695	2.410	0.1266	0.7997	0.9549
56	0.8160	0.9743	0.8160	0.7000	0.8620	9.524	4	0.409	2.410	0.1266	0.7997	0.9549
100	0.8240	0.9839	0.8240	0.6600	0.8980	13.490	4	0.257	2.410	0.1266	0.7997	0.9549
200	0.8023	0.9579	0.8023	0.7410	0.8780	7.945	4	0.671	2.410	0.1266	0.7997	0.9549

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.93465	0.884	-0.802	0.10838
Bartlett's Test indicates equal variances (p = 0.76)	2.62914	15.0863		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	200	>200			0.12662	0.15118	0.00322	0.00552	0.71192	5, 18

Linear Interpolation (200 Resamples)

Point	mg/L	SD	95% CL(Exp)	Skew
IC05	>200			
IC10	>200			
IC15	>200			
IC20	>200			
IC25	>200			
IC40	>200			
IC50	>200			



Reviewed by: 10/14/14

TOXICITY TEST SET-UP BENCH SHEET

Project Number: 70005.08

Client: Uretek

QC Test Number: TN-436
14-
wm 9/19/14

TEST ORGANISM INFORMATION

Common Name: Red worm

Scientific Name: *E. fetida*

Lot Number: EF-037

Source: Carolina Biological

Adults Isolated (Time, Date):

Neonates Pulled & Fed (Time, Date):

Acclimation:

Age: Adult

Culture Water (T/S): °C 0 ppt

TEST INITIATION

Date	Time	Initials	Activity
9/19/14	1330	WM	Dilutions Made
9/19/14	1330	WM	Test Vessels Filled
9/19/14	1515	WM	Organisms Transferred
		N/A	Head Counts

TEST SET-UP

Sample Number: AT4-460

Dilution Number: ARTIFICIAL SOIL

Test Concentration	Volume Test Material	Final Volume
Control	See Attached	
18 mg/L		
32 mg/L		
56 mg/L		
100 mg/L		
200 mg/L		

ATS-T26
11/06/00

Leachate = 1,000,000 ppm
Stock A (1 ml leachate: 99 ml mod hard) = 10,000 ppm (10 mg/ml)

200 mg/L Add 12.0 mls of **Stock A** to 588 grams of Control Soil in a stainless steel bowl and mix well.

100 mg/L Add 6.0 mls of **Stock A** to 594 grams of Control Soil in a stainless steel bowl and mix well.

56 mg/L Add 3.36 mls of **Stock A** to 596.6 grams of Control Soil in a stainless steel bowl and mix well.

32 mg/L Add 1.92 mls of **Stock A** to 598.1 grams of Control Soil in a stainless steel bowl and mix well.

18 mg/L Add 1.08 mls of **Stock A** to 598.9 grams of Control Soil in a stainless steel bowl and mix well.

Control Soil

SOIL TOXICITY TEST OBSERVATION DATA SHEET

Project Number: 70005.08
Client: Uretek
QC Test Number: TN-14-436
Test Material(s): Leachate
Accession Number(s): AT4- 460
Overlying Water: Artificial Soil
Accession Number: N/A

TEST ORGANISM
Common Name: Red worm
Scientific Name: *E. fetida*

TEST TYPE: [✓ Static] / Flowthrough
Renewal / [✓ Non-renewal]
Photoperiod: 16l, 8d
Light Intensity: 50 - 100 fc

Beginning Date: 9/19/14 Time: 1515
Ending Date: 9/29/14 Time: 1558

Test Container: 500ml beaker
Test Volume: 200g sediment
Test Duration: 10 days

Treatment	Rep	Number of Surviving Organisms										
		Day 0 Date	Day Date	Day Date	Day Date	Day Date	Day Date	Day Date	Day Date	Day Date	Day Date	Day 10 Date 9/29
Control	A	10										10
	B	10										10
	C	10										10
18 mg/L	A	10										10
	B	10										10
	C	10										10
32 mg/L	A	10										10
	B	10										9
	C	10										9 *
56 mg/L	A	10										10
	B	10										9
	C	10										10
100 mg/L	A	10										10
	B	10										10
	C	10										10
200 mg/L	A	10										10
	B	10										10
	C	10										10
Time / Initials		1515 WM										1558 VY

Test Method: ASTM E1676-04

ATS-T12
06/15/10

ACUTE TOXICITY TEST DATA SHEET

Project Number: 70005.08
Client: Uretek
QC Test Number: TN-14-436
Test Material Leachate
Accession Number: AT4-460
Dilution Water ARTIFICIAL SOIL
Accession Number:

TEST ORGANISM
Common Name: Red worm
Scientific Name: *Eisenia fetida*
TARGET VALUES
Temp: 20±1 °C DO N/A mg/L
pH: 6.0 - 9.0 Salinity: 0 ppt
Photoperiod: 16 l, 8 d Light Intensity: 50 - 100 fc

Beginning Date: 9/19/14 Time: 1515
Ending Date: 9/29/14 Time: 1558
TEST TYPE: [✓ Static] / Flowthrough
[✓ Non-renewal] / Renewal
Test Container: 500 ml glass jar
Test Volume: 200 ml
Test Duration: 10 days

Concentration	Rep	Number of Live Organisms					Temperature (°C)					pH					Dissolved Oxygen (mg/L)					Conductivity (µS/cm)				
		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96
Control												7.4														
18 mg/L												7.4														
32 mg/L												7.4														
56 mg/L												7.4														
100 mg/L												7.4														
200 mg/L												7.4														
Meter Number												678														
Time												1340														
Initials												GM														

EPA Test Method: EPA 821-R-02-012 (CHECK ONE)

Ceriodaphnia: 2002.0____ Fathead:2000.0__ Americamysis: 2007.0_____ Menidia:2006.0
Magna/pulex: 2021.0____ Trout: 2019.0_____ Cyprinodon: 2004.0_____ OTHER: X Eisenia fetida

12/02/08
ATS-T01

TOXICOLOGY LABORATORY BENCH SHEET - TEMPERATURE RECORD

Project Number: 70005.08

Client: Uretek

QC Test Number: TN-14-436

Day	Date	Time	Initials	Temperature (°C)
0	9/19/14	1608	Wm	21.9
1	9/20/14	1000	CH	21.5
2	9/21/14	1602	VJ	21.6
3	9/22/14	0805	CH	21.5
4	9/23/14	0810	CH	20.6
5	9/24/14	0932	VJ	21.0
6	9/25/14	0830	MJ	21.4
7	9/26/14	1151	MJ	20.7
8	9/27/14	0805	MJ	20.4
9	9/28/14	0841	VJ	20.6
10	9/29/14	1545	VJ	20.8
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				

ATS-T34
03/01/00

TOXICOLOGY LABORATORY BENCH SHEET

Project Number: 70005.08

Client: Uretek

QC Test Number: TN-14-436

Date/Time/Initials	Comments/Activity
9/19/14 1110 WM	Initial pH of leachate AT4-460 was 5.0. pH adjusted sample to 7.5 w/ NaOH per conversation with Dr. Robert Edstrom - MN DOT.
9/29/14 1558 vy	worm was impinged on outside of jar.

ATS-T29
03/01/00

PERCENT MOISTURE ANALYSIS

Project Number: 70005.08 Client: Urefck QC Test Number: TN-14-436

Oven Temp. (°C): 103 Drying Duration (hours): 8

Wet Weights Measured (date/time/initials): 9/18/14 1030 Dry Weights Measured (date/time/initials): 9/18/14 1630

Sample ID	Tin #	**A** Weight of Tin (g)	**B** Wt. of Tin & Wet Sample (g)	**C=B-A** Total Wet Sample Wt. (g)	**D** Wt. of Tin & Dry Sample (g)	**E=D-A** Total Dry Sample Wt. (g)	**(C-E)100 / C** Moisture Content (%)
Artificial Soil	—	1.400	40.740	39.340	26.012	24.612	37.4%

ATS-T35
03/01/00

ATTACHMENT II

Eurofins Analytical Report
(10 pages)

ANALYTICAL RESULTS

Prepared by:	Prepared for:
Eurofins Lancaster Laboratories Environmental 2425 New Holland Pike Lancaster, PA 17601	EA Science & Technology 225 Schilling Circle suite 400 Hunt Valley MD 21031

October 02, 2014

Project: Spray Products Testing

Submittal Date: 09/09/2014
Group Number: 1503039
PO Number: SERVICE ORDER 13167
State of Sample Origin: GA

Client Sample Description	Lancaster Labs (LL) #
URETEK 4R Resin (Part "B") Foam	7597869
URETEK 4R Iso (Part "A") Foam	7597870
URETEK 4R Foam (Finished Product) Foam	7597871

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

ELECTRONIC COPY TO	EA EST	Attn: Michael Chanov
ELECTRONIC COPY TO	EA EST	Attn: Wayne McCulloch

Respectfully Submitted,

Nicole L. Maljovec
Principal Specialist Group Leader

(717) 556-7259

Sample Description: **URETEK 4R Resin (Part "B") Foam Spray Product Testing**

LL Sample # G5 7597869
LL Group # 1503039
Account # 04756

Project Name: Spray Products Testing

Collected: 09/04/2014 08:15 by DM

Submitted: 09/09/2014 09:30
Reported: 10/02/2014 14:28

EA Science & Technology
225 Schilling Circle
suite 400
Hunt Valley MD 21031

PARTB

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
Metals	**SW-846 6010B**		**mg/kg**	**mg/kg**	
06935	Arsenic	7440-38-2	N.D.	0.610	1
06946	Barium	7440-39-3	0.0514 J	0.0314	1
06949	Cadmium	7440-43-9	N.D.	0.0314	1
06951	Chromium	7440-47-3	N.D.	0.105	1
06955	Lead	7439-92-1	N.D.	0.476	1
06936	Selenium	7782-49-2	N.D.	0.419	1
06966	Silver	7440-22-4	N.D.	0.181	1
06969	Tin	7440-31-5	28.3	0.410	1
	SW-846 7471A		**mg/kg**	**mg/kg**	
00159	Mercury The mercury result was performed by the Method of Standard Addition.	7439-97-6	N.D.	0.0097	1

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/15.

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
06935	Arsenic	SW-846 6010B	1	142595708002	09/17/2014 20:05	Katlin N Cataldi	1
06946	Barium	SW-846 6010B	1	142595708002	09/17/2014 20:05	Katlin N Cataldi	1
06949	Cadmium	SW-846 6010B	1	142595708002	09/17/2014 20:05	Katlin N Cataldi	1
06951	Chromium	SW-846 6010B	1	142595708002	09/19/2014 02:43	Elaine F Stoltzfus	1
06955	Lead	SW-846 6010B	1	142595708002	09/17/2014 20:05	Katlin N Cataldi	1
06936	Selenium	SW-846 6010B	1	142595708002	09/17/2014 20:05	Katlin N Cataldi	1
06966	Silver	SW-846 6010B	1	142595708002	09/17/2014 20:05	Katlin N Cataldi	1
06969	Tin	SW-846 6010B	1	142595708002	09/17/2014 20:05	Katlin N Cataldi	1
00159	Mercury	SW-846 7471A	2	142595711001	09/19/2014 10:45	Damary Valentin	1
05708	SW SW846 ICP/ICP MS Digest	SW-846 3050B	1	142595708002	09/16/2014 12:47	James L Mertz	1
05711	SW SW846 Hg Digest	SW-846 7471A modified	1	142595711001	09/16/2014 16:02	James L Mertz	1

Sample Description: **URETEK 4R Iso (Part "A") Foam Spray Product Testing**

LL Sample # G5 7597870
LL Group # 1503039
Account # 04756

Project Name: Spray Products Testing

Collected: 09/04/2014 08:15 by DM

Submitted: 09/09/2014 09:30
Reported: 10/02/2014 14:28

EA Science & Technology
225 Schilling Circle
suite 400
Hunt Valley MD 21031

PARTA

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
Metals		**SW-846 6010B**	**mg/kg**	**mg/kg**	
06935	Arsenic	7440-38-2	N.D.	0.634	1
06946	Barium	7440-39-3	N.D.	0.0327	1
06949	Cadmium	7440-43-9	N.D.	0.0327	1
06951	Chromium	7440-47-3	N.D.	0.109	1
06955	Lead	7439-92-1	N.D.	0.495	1
06936	Selenium	7782-49-2	N.D.	0.436	1
06966	Silver	7440-22-4	N.D.	0.188	1
06969	Tin	7440-31-5	0.638 J	0.426	1
		SW-846 7471A	**mg/kg**	**mg/kg**	
00159	Mercury	7439-97-6	N.D.	0.0097	1
	The mercury result was performed by the Method of Standard Addition.				

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/15.

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
06935	Arsenic	SW-846 6010B	1	142595708002	09/17/2014 19:39	Katlin N Cataldi	1
06946	Barium	SW-846 6010B	1	142595708002	09/17/2014 19:39	Katlin N Cataldi	1
06949	Cadmium	SW-846 6010B	1	142595708002	09/17/2014 19:39	Katlin N Cataldi	1
06951	Chromium	SW-846 6010B	1	142595708002	09/17/2014 19:39	Katlin N Cataldi	1
06955	Lead	SW-846 6010B	1	142595708002	09/17/2014 19:39	Katlin N Cataldi	1
06936	Selenium	SW-846 6010B	1	142595708002	09/17/2014 19:39	Katlin N Cataldi	1
06966	Silver	SW-846 6010B	1	142595708002	09/17/2014 19:39	Katlin N Cataldi	1
06969	Tin	SW-846 6010B	1	142595708002	09/17/2014 19:39	Katlin N Cataldi	1
00159	Mercury	SW-846 7471A	2	142595711001	09/19/2014 10:49	Damary Valentin	1
05708	SW SW846 ICP/ICP MS Digest	SW-846 3050B	1	142595708002	09/16/2014 12:47	James L Mertz	1
05711	SW SW846 Hg Digest	SW-846 7471A modified	1	142595711001	09/16/2014 16:02	James L Mertz	1

Sample Description: **URETEK 4R Foam (Finished Product) Foam Spray Product Testing**

LL Sample # TL 7597871
LL Group # 1503039
Account # 04756

Project Name: Spray Products Testing

Collected: 09/04/2014 08:15 by DM

Submitted: 09/09/2014 09:30
Reported: 10/02/2014 14:28

EA Science & Technology
225 Schilling Circle
suite 400
Hunt Valley MD 21031

FINSH

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
Metals	**SW-846 6010B**		mg/l	mg/l	
07035	Arsenic	7440-38-2	N.D.	0.0072	1
07046	Barium	7440-39-3	0.147	0.00033	1
07049	Cadmium	7440-43-9	N.D.	0.00033	1
07051	Chromium	7440-47-3	0.0018 J	0.0013	1
07055	Lead	7439-92-1	N.D.	0.0047	1
07036	Selenium	7782-49-2	N.D.	0.0048	1
07066	Silver	7440-22-4	N.D.	0.0018	1
07069	Tin	7440-31-5	0.0217	0.0024	1
	SW-846 7470A		mg/l	mg/l	
00259	Mercury	7439-97-6	N.D.	0.000060	1
Wet Chemistry	**SM 5310 C-2000**		mg/l	mg/l	
00273	Total Organic Carbon	n.a.	2,650	50.0	100
	SM 5210 B-2001		mg/l	mg/l	
00235	Biochemical Oxygen Demand	n.a.	17.4	0.80	1
	The DO uptake for the unseeded blank is greater than 0.20 mg/L.				

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/15.
For trial 2 of the TCLP analysis, D.I.H2O was used for the extraction fluid for TOC and BOD analyses.

If the analysis is for determination of Hazardous Waste Characteristics, see Table 1 in EPA Code of Federal Regulations 40 CFR 261.24.

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07035	Arsenic	SW-846 6010B	1	142605705004	09/19/2014 01:01	Elaine F Stoltzfus	1
07046	Barium	SW-846 6010B	1	142605705004	09/19/2014 01:01	Elaine F Stoltzfus	1
07049	Cadmium	SW-846 6010B	1	142605705004	09/19/2014 01:01	Elaine F Stoltzfus	1
07051	Chromium	SW-846 6010B	1	142605705004	09/19/2014 01:01	Elaine F Stoltzfus	1
07055	Lead	SW-846 6010B	1	142605705004	09/19/2014 01:01	Elaine F Stoltzfus	1
07036	Selenium	SW-846 6010B	1	142605705004	09/19/2014 01:01	Elaine F Stoltzfus	1
07066	Silver	SW-846 6010B	1	142605705004	09/19/2014 01:01	Elaine F Stoltzfus	1

Sample Description: **URETEK 4R Foam (Finished Product) Foam Spray Product Testing**

LL Sample # TL 7597871
LL Group # 1503039
Account # 04756

Project Name: Spray Products Testing

Collected: 09/04/2014 08:15 by DM

Submitted: 09/09/2014 09:30
Reported: 10/02/2014 14:28

EA Science & Technology
225 Schilling Circle
suite 400
Hunt Valley MD 21031

FINSH

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07069	Tin	SW-846 6010B	1	142605705004	09/19/2014 01:01	Elaine F Stoltzfus	1
00259	Mercury	SW-846 7470A	1	142605713006	09/19/2014 10:37	Damary Valentin	1
05705	WW/TL SW 846 ICP Digest (tot)	SW-846 3010A	1	142605705004	09/18/2014 13:15	James L Mertz	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	142605713006	09/18/2014 14:24	James L Mertz	1
00273	Total Organic Carbon	SM 5310 C-2000	1	14261049503A	09/24/2014 05:25	James S Mathiot	100
00235	Biochemical Oxygen Demand	SM 5210 B-2001	1	14267023502A	09/24/2014 14:28	Susan A Engle	1
00947	TCLP Non-volatile Extraction	SW-846 1311	1	14259-482-0947	09/16/2014 12:40	Darin P Wagner	n.a.
00947	TCLP Non-volatile Extraction	SW-846 1311	2	14266-482-0947	09/23/2014 15:00	Darin P Wagner	n.a.

Quality Control Summary

Client Name: EA Science & Technology Group Number: 1503039
Reported: 10/02/14 at 02:28 PM

Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

All Inorganic Initial Calibration and Continuing Calibration Blanks met acceptable method criteria unless otherwise noted on the Analysis Report.

Laboratory Compliance Quality Control

Analysis Name	Blank Result	Blank MDL	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: 142595708002	Sample number(s): 7597869-7597870							
Arsenic	N.D.	0.640	mg/kg	100		82-111		
Barium	N.D.	0.0330	mg/kg	104		83-113		
Cadmium	N.D.	0.0330	mg/kg	103		82-113		
Chromium	N.D.	0.110	mg/kg	100		85-113		
Lead	N.D.	0.500	mg/kg	102		81-112		
Selenium	N.D.	0.440	mg/kg	103		78-111		
Silver	N.D.	0.190	mg/kg	101		82-112		
Tin	1.13 J	0.430	mg/kg	97		80-120		
Batch number: 142595711001	Sample number(s): 7597869-7597870							
Mercury	N.D.	0.0100	mg/kg	95		80-124		
Batch number: 142605705004	Sample number(s): 7597871							
Arsenic	N.D.	0.0072	mg/l	105		87-113		
Barium	0.00043 J	0.00033	mg/l	97		88-113		
Cadmium	N.D.	0.00033	mg/l	104		88-113		
Chromium	N.D.	0.0013	mg/l	100		90-113		
Lead	N.D.	0.0047	mg/l	102		86-113		
Selenium	N.D.	0.0048	mg/l	111		83-114		
Silver	N.D.	0.0018	mg/l	112		84-115		
Tin	N.D.	0.0024	mg/l	98		88-115		
Batch number: 142605713006	Sample number(s): 7597871							
Mercury	N.D.	0.000060	mg/l	98		80-120		
Batch number: 14261049503A	Sample number(s): 7597871							
Total Organic Carbon	N.D.	0.50	mg/l	105		91-113		
Batch number: 14267023502A	Sample number(s): 7597871							
Biochemical Oxygen Demand				91		85-115		

Sample Matrix Quality Control

Unspiked (UNSPK) = the sample used in conjunction with the matrix spike
Background (BKG) = the sample used in conjunction with the duplicate

Analysis Name	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD MAX	BKG Conc	DUP Conc	DUP RPD	Dup RPD Max
Batch number: 142595708002	Sample number(s): 7597869-7597870 UNSPK: 7597870 BKG: 7597870								

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: EA Science & Technology   Group Number: 1503039
Reported: 10/02/14 at 02:28 PM

Sample Matrix Quality Control

Unspiked (UNSPK) = the sample used in conjunction with the matrix spike
Background (BKG) = the sample used in conjunction with the duplicate

Analysis Name	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD MAX	BKG Conc	DUP Conc	DUP RPD	Dup RPD Max
Arsenic	100	102	82-111	4	20	N.D.	N.D.	0 (1)	20
Barium	99	99	83-113	2	20	N.D.	N.D.	0 (1)	20
Cadmium	101	102	82-113	3	20	N.D.	N.D.	0 (1)	20
Chromium	93	92	85-113	1	20	N.D.	N.D.	0 (1)	20
Lead	102	101	81-112	1	20	N.D.	N.D.	0 (1)	20
Selenium	106	105	78-111	2	20	N.D.	N.D.	0 (1)	20
Silver	98	97	82-112	1	20	N.D.	N.D.	0 (1)	20
Tin	86	89	80-120	5	20	0.638 J	0.826 J	26* (1)	20
Batch number: 142595711001	Sample number(s): 7597869-7597870 UNSPK: 7597869 BKG: 7597869								
Mercury	69*	69*	80-124	3	20	N.D.	N.D.	0 (1)	20
Batch number: 142605705004	Sample number(s): 7597871 UNSPK: 7597871 BKG: 7597871								
Arsenic	94	92	87-113	2	20	N.D.	N.D.	0 (1)	20
Barium	89	85*	88-113	4	20	0.147	0.143	3	20
Cadmium	89	87*	88-113	3	20	N.D.	N.D.	0 (1)	20
Chromium	88*	86*	90-113	3	20	0.0018 J	0.0021 J	16 (1)	20
Lead	86	83*	86-113	3	20	N.D.	N.D.	0 (1)	20
Selenium	97	95	83-114	2	20	N.D.	N.D.	0 (1)	20
Silver	72*	69*	84-115	4	20	N.D.	N.D.	0 (1)	20
Tin	89	86*	88-115	4	20	0.0217	0.0204	6 (1)	20
Batch number: 142605713006	Sample number(s): 7597871 UNSPK: 7597871 BKG: 7597871								
Mercury	86	89	80-120	3	20	N.D.	N.D.	0 (1)	20
Batch number: 14261049503A	Sample number(s): 7597871 UNSPK: P602021 BKG: P602021								
Total Organic Carbon	99		63-142			25.4	25.6	1	4
Batch number: 14267023502A	Sample number(s): 7597871 UNSPK: P610372 BKG: P610687								
Biochemical Oxygen Demand	107	109	59-139	2	8	36.3	37.0	2	15

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Environmental Analysis Request/Chain of Custody

eurofins | Lancaster Laboratories Environmental

Acct. # 4756 Group # 1503039 Sample # 7597869-71

Client: **EA Engineering**			
Project Name/#: EA Engineering	Site ID #:		
Project Manager: Wayne McCulloch	P.O. #:		
Sampler: David Mulkey	PWSID #:		
Phone #: 770-528-9556	Quote #:		
State where sample(s) were collected: GA			

Matrix: Sediment ☐ Ground ☐ Surface ☐ Soil ☐ Water: Potable ☐ NPDES ☐ Other:

Analyses Requested — **Preservation Codes**

For Lab Use Only
SF #: ________
SCR #: ________

Preservation Codes
H = HCl T = Thiosulfate
N = HNO_3 B = NaOH
S = H_2SO_4 P = H_3PO_4
O = Other

Sample Identification	Collection Date	Collection Time	Grab	Composite	Soil	Sediment	Water	Other:	Total # of Containers	Remarks
URETEK 4R Resin (Part "B")	9/4/2014	8:15am								
URETEK 4R Iso (Part "A")	9/4/2014	8:15am								
URETEK 4R Foam (Finished Product)	9/4/2014	8:15am								

Turnaround Time Requested (TAT) (please check): Standard ☐ Rush ☐
(Rush TAT is subject to laboratory approval and surcharges.)

Date results are needed:

Rush results requested by (please check): E-Mail ☐ Phone ☐

E-mail Address:

Phone:

Data Package Options (please check if required)
Type I (Validation/non-CLP) ☐ MA MCP ☐
Type III (Reduced non-CLP) ☐ CT RCP ☐
Type VI (Raw Data Only) ☐ TX TRRP-13 ☐
NYSDEC Category ☐ A or ☐ B

EDD Required? Yes ☐ No ☐ If yes, format: ________

Relinquished by:	Date	Time	Received by:	Date	Time
Dand Mulky	9/4/14	11:32 am			
			Bianely Mn	9.9.14	930

Relinquished by Commercial Carrier:
UPS ______ FedEx ______ Other ______

Temperature upon receipt N/A °C

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7045 0614

Page 8 of 9

eurofins

Lancaster Laboratories Environmental

Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

RL	Reporting Limit	**BMQL**	Below Minimum Quantitation Level
N.D.	none detected	**MPN**	Most Probable Number
TNTC	Too Numerous To Count	**CP Units**	cobalt-chloroplatinate units
IU	International Units	**NTU**	nephelometric turbidity units
umhos/cm	micromhos/cm	**ng**	nanogram(s)
C	degrees Celsius	**F**	degrees Fahrenheit
meq	milliequivalents	**lb.**	pound(s)
g	gram(s)	**kg**	kilogram(s)
µg	microgram(s)	**mg**	milligram(s)
mL	milliliter(s)	**L**	liter(s)
m3	cubic meter(s)	**µL**	microliter(s)
		pg/L	picogram/liter

<	less than - The number following the sign is the limit of quantitation, the smallest amount of analyte which can be reliably determined using this specific test.
>	greater than
ppm	parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg), or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter per liter of gas.
ppb	parts per billion
Dry weight basis	Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture. All other results are reported on an as-received basis.

Data Qualifiers:

C – result confirmed by reanalysis.

J - estimated value – The result is ≥ the Method Detection Limit (MDL) and < the Limit of Quantitation (LOQ).

U.S. EPA CLP Data Qualifiers:

	Organic Qualifiers		**Inorganic Qualifiers**
A	TIC is a possible aldol-condensation product	**B**	Value is <CRDL, but ≥IDL
B	Analyte was also detected in the blank	**E**	Estimated due to interference
C	Pesticide result confirmed by GC/MS	**M**	Duplicate injection precision not met
D	Compound quantitated on a diluted sample	**N**	Spike sample not within control limits
E	Concentration exceeds the calibration range of the instrument	**S**	Method of standard additions (MSA) used for calculation
N	Presumptive evidence of a compound (TICs only)	**U**	Compound was not detected
P	Concentration difference between primary and confirmation columns >25%	**W**	Post digestion spike out of control limits
		*****	Duplicate analysis not within control limits
U	Compound was not detected	**+**	Correlation coefficient for MSA <0.995
X,Y,Z	Defined in case narrative		

Analytical test results meet all requirements of NELAC unless otherwise noted under the individual analysis.

Measurement uncertainty values, as applicable, are available upon request.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. This report shall not be reproduced except in full, without the written approval of the laboratory.

Times are local to the area of activity. Parameters listed in the 40 CFR part 136 Table II as "analyze immediately" are not performed within 15 minutes.

WARRANTY AND LIMITS OF LIABILITY - In accepting analytical work, we warrant the accuracy of test results for the sample as submitted. THE FOREGOING EXPRESS WARRANTY IS EXCLUSIVE AND IS GIVEN IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED. WE DISCLAIM ANY OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING A WARRANTY OF FITNESS FOR PARTICULAR PURPOSE AND WARRANTY OF MERCHANTABILITY. IN NO EVENT SHALL EUROFINS LANCASTER LABORATORIES ENVIRONMENTAL, LLC BE LIABLE FOR INDIRECT, SPECIAL, CONSEQUENTIAL, OR INCIDENTAL DAMAGES INCLUDING, BUT NOT LIMITED TO, DAMAGES FOR LOSS OF PROFIT OR GOODWILL REGARDLESS OF (A) THE NEGLIGENCE (EITHER SOLE OR CONCURRENT) OF EUROFINS LANCASTER LABORATORIES ENVIRONMENTAL AND (B) WHETHER EUROFINS LANCASTER LABORATORIES ENVIRONMENTAL HAS BEEN INFORMED OF THE POSSIBILITY OF SUCH DAMAGES. We accept no legal responsibility for the purposes for which the client uses the test results. No purchase order or other order for work shall be accepted by Eurofins Lancaster Laboratories Environmental which includes any conditions that vary from the Standard Terms and Conditions, and Eurofins Lancaster Laboratories Environmental hereby objects to any conflicting terms contained in any acceptance or order submitted by client.

ATTACHMENT III

Report Quality Assurance Record

(2 pages)

REPORT QUALITY ASSURANCE RECORD

Client: Uretek USA

Project Number: 70005.08

Author: Wayne McCulloch

EA Report Number: 7002

REPORT CHECKLIST

QA/QC ITEM	REVIEWER	DATE
1. Samples collected, transported, and received according to study plan requirements.	W McCulloch	10/6/14
2. Samples prepared and processed according to study plan requirements.	W McCulloch	10/6/14
3. Data collected using calibrated instruments and equipment.	W McCulloch	10/6/14
4. Calculations checked:		
- Hand calculations checked	W McCulloch	10/6/14
- Documented and verified statistical procedure used.	W McCulloch	10/6/14
5. Data input/statistical analyses complete and correct.		10/14/14
6. Reported results and facts checked against original sources.		10/14/14
7. Data presented in figures and tables correct and in agreement with text.		10/14/14
8. Results reviewed for compliance with study plan requirements.	W McCulloch	10/6/14

	AUTHOR	DATE
9. Commentary reviewed and resolved.	W McCulloch	10/15/14

10. All study plan and quality assurance/control requirements have been met and the report is approved:

W McCulloch 10/15/14

PROJECT MANAGER DATE

10/14/14

QUALITY CONTROL OFFICER DATE

10/14/14

SENIOR TECHNICAL REVIEWER DATE

ATS-Q8
01/25/02

APPENDIX 5:

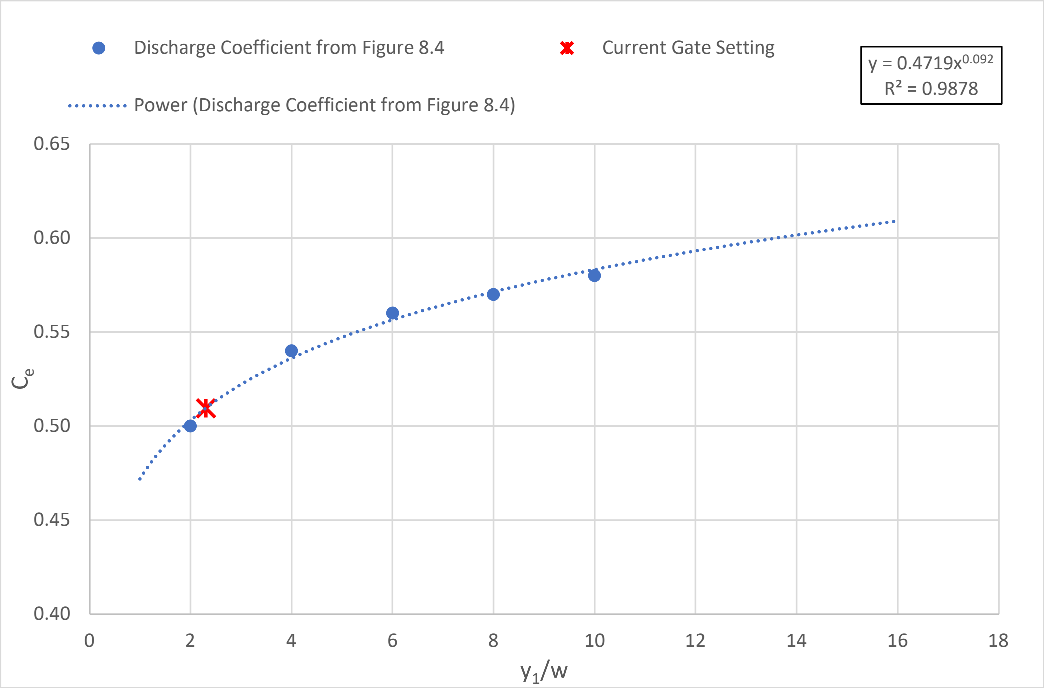
WATER VELOCITY CALCULATIONS

Gate Position	Velocity (ft/s)	
Both gates open 2.6 ft (reservoir lowered 4 ft)	12.7	
Both gates open 3.0 ft (reservoir lowered 6 ft)	10.8	<<Minimum dewatering
Fully open (or more than 3.2 ft) (water passing below the gate without touching; reservoir lowered ~10 ft)	10.2	<<Maximum dewatering

Reservoir Lowered 6 ft

Gate 1	
Width (b_c, ft)	13.0
Opening (w, ft)	3.0
Area (A, ft^2)	39.6
Head (y_1, ft)	7.0
y_1/w (ft/ft)	2.3
C_e (-)	0.51
Discharge (Q, cfs)	**428**
Velocity (V, ft/s)	**10.8**

Gate 2	
Width (b_c, ft)	13.0
Opening (w, ft)	3.0
Area (A, ft^2)	39.6
Head (y_1, ft)	7.0
y_1/w (ft/ft)	2.3
C_e (-)	0.51
Discharge (Q, cfs)	**428**
Velocity (V, ft/s)	**10.8**



Reservoir Lowered 10 ft (Gates completely out of the water)

Gate 1	
Width (bc, ft)	13.0
Head (y_1, ft)	3.2
Discharge (Q, cfs)	**428**
Velocity (V, ft/s)	**10.2**

Gate 2	
Width (bc, ft)	13.0
Head (y_1, ft)	3.2
Discharge (Q, cfs)	**428**
Velocity (V, ft/s)	**10.2**

* Calculations assume that critical depth occurs at the gate openings.

EXHIBIT E

Oregon
Tina Kotek, Governor

Water Resources Department
North Mall Office Building
725 Summer St NE, Suite A
Salem, OR 97301
Phone (503) 986-0900
Fax (503) 986-0904
www.Oregon.gov/ OWRD

January 13, 2023

TO: Winchester Water Control District
c/o Ryan Beckley

FROM: Justin Dillon, Southwest Region Manager
Oregon Water Resources Department
503-507-8108

SUBJECT: Winchester Dam Storage Survey Report

A bathymetric survey of the North Umpqua River upstream of Winchester Dam was conducted by West Consultants over two days on Nov. 28th and 29th of 2022. The Final Report (Attachment 1) was received by Water Resources on January 3rd, 2023. The elevation of the top of the dam was surveyed and found to be 439.1 feet above mean sea level (asl). The stored water volume measured from the bathymetric survey yielded 391 acre-feet. Winchester Water Control District (WWCD) filed two claims for storage behind Winchester Dam (Attachment 2). One hundred acre-feet in 1890 and an additional 200 acre-feet in 1908. The recent bathymetric survey measured 91 acre-feet of excess storage behind Winchester Dam. The department has identified two options for the WWCD to come into compliance.

I. Lower the Pool Level

Lowering the pool level to 438 asl will bring the stored water volume behind Winchester Dam to 300 acre-feet, meeting the combined claimed storage of 300 acre-feet as filed in 1890 and 1908. We recommend that the Water Control District consult with the Oregon Department of Fish and Wildlife and NOAA as needed regarding the operation of the fish ladder, and preferred alternatives to lower the pool, maintain that lowered pool, and not create false fish attractants.

II. Apply for Additional Storage

The Winchester Water Control District may apply for additional storage. This can be accomplished in two ways: through a Limited License first and then file a permanent Standard Application for the additional stored water volume.

Please reach out to me with any questions regarding addressing the additional storage.

Regards,

\- Justin Dillon

Attachments:

1. Bathymetric Survey of Winchester Dam Technical Memo – West Consultants
2. Water Rights Claims

CC: Susan Douthit, District 13 Watermaster OWRD (Email)
Chris Kern, ODFW West Region Administrator ODFW (Email)
Tony Janicek, Dam Safety Engineer OWRD (Email)
Jake Johnstone, Interim Field Services Division Administrator (OWRD (Email)
Katie Ratcliffe, Water Rights Manager OWRD (Email)
Ryan Herinckx, Design and Construction Manager City of Roseburg (Email)
Kate Wells, Interim Willamette OR Coast Branch Chief NOAA (Email)