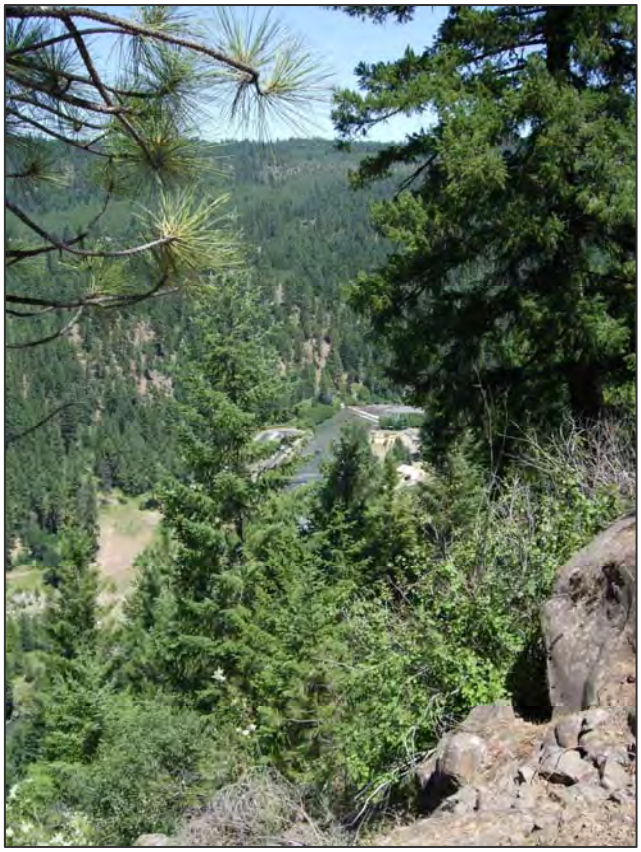
KLICKITAT HATCHERY
CONCEPTUAL DESIGN STUDY



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Klickitat Hatchery Redevelopment Basis of Design

Introduction

The Klickitat Hatchery is located near Glenwood, WA at approximate river mile 42.5 on the Klickitat River. This facility was located here for its large spring fed ground water supply.

Harbor Consulting Engineers, Inc., was tasked by the Yakama/Klickitat Fish Project (YKFP), Yakama Nation, through funding provided by Bonneville Power Administration (BPA), to accomplish a 30% conceptual design for the redevelopment of the Klickitat Salmon Hatchery. This effort focused on the following features and operations of the Hatchery:

- Spring and river water supply;
- Site access, planning and circulation;
- Fish handling and rearing facilities;
- Incubation facilities for Spring Chinook, Fall Chinook, Steelhead and Coho;
- Office facilities for hatchery operations;
- Maintenance and storage buildings;
- New dedicated chemical storage building;
- On site power turbine for hydroelectric power;
- Partial removal of the in river concrete sill;
- New hatchery staff housing.

Partial and full build out options were considered along with concurrent development of a new hatchery and rearing facility at the Wahkiacus site, located near Wahkiacus, WA.

History

The original hatchery construction was financed by the U.S. Department of the Interior in cooperation with the U.S. Fish and Wildlife Service. After being operated by the Washington Department of Fish and Wildlife since 1949, hatchery operations were turned over to the Yakama Nation in 2006.

Throughout its 61 year history, various modifications and renovations have been made in response to fish culture programming and technology. There were at least ten significant construction contracts from 1949 to 1993.

Summary of Hatchery Modifications

Year	Description
1973	Indian Ford Springs Addition
1973/75	Wonder Springs Intake & Pond
1977	Pollution Abatement Facilities Addition
1981	Rearing Pond 25 Addition
1983	Electrical Upgrades
1985	Pond & Building Addition/Rebuild
1990	Pumped Intake & Temporary Rearing Ponds
1990	Pond Lining & Pumped Intake
1992	Adult Holding Pumped River Supply
1993	Storage Building Addition
1993	Incubation Room Alterations

Property Ownership

The hatchery is located on property owned by the Washington Department of Fish and Wildlife (WDFW) and is operated by the Yakama Nation. Water for hatchery operations is partially supplied by pipelines from springs located on the hills above the left bank of the Klickitat River. The most northerly of these spring intake structures is 'Indian Ford A Upper'. The northerly boundary line of the WDFW property passes through this intake structure. The property immediately adjacent to the north which is held in trust for the Yakama Nation by the U.S. Department of the Interior, Bureau of Indian Affairs. Additional survey will be required to more precisely determine the property boundary location. The most easterly spring intake is 'Wonder Springs', located on an easement on property immediately adjacent to the east, which is owned by Manulife Insurance Company. Adjacent properties to the south and west are also owned by the Manulife Insurance Company. Refer to Appendix B for accompanying vicinity map.

Purpose of the Redevelopment Project

Guidelines and criteria developed by National Marine Fisheries Service require the hatchery facility to be improved. Fish culture improvements are required by technological advances in fish health, behavioral science and programmatic improvements. Other changes are needed to ensure facility longevity and dependability. Hatchery staff productivity and safety improvements are additional goals.

In addition, the Klickitat Hatchery's years of delayed maintenance are becoming more and more pronounced. Since 1993 only partial maintenance and minor improvements have occurred. During the time this hatchery operated under WDFW, lack of available state funding resulted in delayed maintenance of critical hatchery systems. In the last 3 years, several failures of water supply elements have occurred, risking the entire hatchery production.

Unless replacement and maintenance of critical water supply systems happens soon, the hatchery production will remain in jeopardy.

Permitting

Anticipated permits required for this project include:

- Dept of the Army, Corps of Engineers, Section 404 Permit;
- Washington Dept. of Fish and Wildlife, Hydraulic Project Approval;
- Washington Dept. of Ecology, Section 401 Water Quality Certification;
- Washington State Dept. of Natural Resources, Forest Practices Application if building more than 600 LF of new road, or cutting more than 5000 Board Feet (BF) of merchantable timber;
- Klickitat County Planning Dept., Shoreline Permit and State Environmental Policy Act (SEPA) approval;
- Klickitat County Building Dept., Building Permit;
- Klickitat County Health Dept., On-site Sewage Installation Permit.

Expected time needed to prepare applications and secure approval will range from 6 to 12 months, depending on the responsiveness of the agencies listed above.

Site Planning

Civil aspects of the site design were implemented with priorities placed on site functionality and environmental impact. Impervious surfaces are minimized, storm water runoff will be collected

and subjected to Washington State Department of Ecology Best Management Practices prior to discharge, and special attention has been given to minimizing site disturbance.

Vehicle traffic at the site will consist primarily of light passenger vehicles with occasional H-20 loading from fish transfer and feed supply trucks. As such, primary site paving will consist of crushed rock surfacing over 12 inches of 4 inch minus compacted base course. Impervious surfaces are limited to only those areas expected to experience frequent vehicle traffic and will consist of 4 inches of asphalt pavement over 6 inches of crushed rock base and will total approximately 1.65 acres in the vicinity of the main hatchery building and existing raceways. Storm water runoff on impervious surfaces and building roofs will be collected and directed to a catchment for primary treatment to isolate sediments and debris prior to discharge to the river. Hazardous material and fuel transfer areas on site will be isolated from the primary stormwater network and will include a dedicated spill containment system to prevent site contamination.

The existing adult holding facility, pollution abatement basin, portions of the hatchery building, three existing residences and various other physical features will be demolished and removed from the site.

Specific effort has been made to place new structures at existing ground elevations to minimize site excavation and grading. Existing acclimation facilities will be filled and replaced with above ground concrete raceways to minimize predation of fish populations and eliminate seepage of effluent waters into adjacent soils. A volume of approximately 10,000 cubic yards of material will be required to fill these existing basins. Adequate driveway clearance has been provided around all structures including spring intakes to allow drive through access for all required vehicle traffic including fish transfer trucks and emergency vehicles. Fill material will be obtained from an onsite borrow site. No offsite disposal of soil material is anticipated. Site grading will be designed to channel stormwater away from buildings by swales and/or slopes.

Sanitary waste water from hatchery buildings and residences will be conveyed to septic and drain field systems designed in accordance with Washington State and Klickitat County requirements. Manholes or surface cleanouts will be located at changes in grade or alignment of conveyance pipes and at connections of new to existing services.

Much of the existing hatchery water distribution piping is aging beyond a serviceable condition or is undersized for future distribution needs. New hatchery water collection and distribution piping will supply and drain new facilities and replace existing piping where required. Pipelines have been sized to minimize head loss using a maximum allowable velocity of five feet per second. New piping will be steel where exposed above ground or where subjected to high pressure or velocity head or where transient pressures (water hammer) are a possibility. All other piping will be thermoplastic, either PVC or HDPE. All buried piping will be placed on minimum six inches of bedding and backfill will be compacted to 95% maximum dry density. Pipe bedding and backfill will meet requirements of WSDOT Standard Specifications. Above ground piping will be steel and will be supported on restrained concrete supports placed at a maximum spacing of 40 feet. All trees greater than 10 inches diameter at breast height will be cleared within 50 feet of above ground piping. Flexible couplings will be provided at locations where pipes enter structures or where thermal expansion is of concern. Thrust blocks will be provided as required to restrain piping at changes in slope and alignment.

Contractor access during construction will be limited to the north access from River Route Road. Contractor material storage and staging areas are located to minimize site impacts. Temporary erosion and sediment control best management practices will be implemented at all disturbed areas and material storage locations. Following construction, all disturbed areas will be hydroseeded with a seed mix consisting of native grasses and forbs.

Klickitat Hatchery Bridge

The new Klickitat Hatchery Bridge will be completed in December 2010. Its design is in accordance with the requirements of the Washington State Department of Transportation Standard Specifications for Road, Bridge and Municipal Construction (2008). The structural design and loading criteria, including live, wind, and seismic, conform with the Standard Specifications for Highway Bridges, AASHTO (2002), and the Guide Specifications for Seismic Design of Highway Bridges, AASHTO (2007).

Although the bridge is single lane with low anticipated volume, it is designed to withstand HS25 loading, or two 24-kip axles at 4'-0" on center. This will insure it will be capable of transporting limited off-highway loads and will accommodate future hatchery needs.

Site Security

Public vehicular traffic will be restricted to Fish Hatchery Road, the main access road from the Glenwood-Goldendale Highway. Visitor parking will be located to the southwest of the existing hatchery building. The remote spring water intake locations, Indian Ford A Upper, Indian Ford A Lower, Indian Ford B and Wonder Springs, will be secured with chain link fencing, eight feet high with barbed wire outriggers and locking gates. Security cameras will be installed at these locations with a monitoring station located in the hatchery building. Monitoring alarms will also be installed. This security surveillance system will include remote monitoring via satellite internet connection.

Hatchery Water Supply

This water system is part of an overarching redesign of the facility and is aimed at expanding the capabilities of the hatchery in addition to improving its performance and reducing its environmental impact.

The proposed water system includes spring water from Indian Ford and Wonder Springs in addition to river water drawn directly from the Klickitat river. Facility water needs have been calculated based upon the biological demand of the proposed hatchery's capacity. Improvements to the inlets of the Indian Ford Springs are also incorporated to extend the life of the facility.

Design Criteria & Methodology

The Klickitat Hatchery Water System design is a combination of two goals: 1) meet the requirements for the biological demand of the design loading of fish; 2) to design a hatchery that is not only functional but has an improved environmental foot print. The newly proposed design is intended to provide for the needs of:

- 800,000 Spring Chinook,

- 4 million Fall Chinook,
- 200,000 Steelhead, and
- 1 million Coho.

The water requirements for the facility are anticipated to have a high of 60 CFS (during the month of March) and a low of 35 CFS (during the month of September). Preliminary hydrology research shows that approximately 33 CFS of spring water is available, leaving the remainder of water requirements to be met by pumped river water.

The Klickitat facility is in a unique position in that a significant hydraulic head (166ft) is available on the upper Indian Ford spring water intake. This intake has a nominal flow of approximately 17 CFS, equating to a power potential of approximately 200kW. The current installation uses a power dissipation building to dissipate this energy and utilizes electrical power from KPUD for all of its electrical power requirements. It is one of the design goals to make use of the available energy from Indian Ford via incorporating a power turbine which, after losses, will have a power output of approximately 160kW of electrical energy. Water flows throughout the facility are to be managed via gravity feed and their natural head in order to minimize pump losses, maintenance requirements, and reduce overall power consumption. The combination of these design features will result in a significant savings in facility operation costs in addition to significantly reducing the environmental impact of the installation.

Water Considerations

Harbor considered a variety of possible water flows/use patterns and decided upon one that would make the best possible use of the available water and energy. Specific focus was placed on offering a significant level of flexibility and safety to ensure that hatchlings and broodstock would have their biological water needs met. The system is designed to use gravity feeds whenever possible and to allow for spring & river water to be delivered independently throughout the facility. In order to minimize water consumption for the facility water recycling (passing water from juveniles to adults of the same species) is a key design implementation. This results in reducing the peak required water flow from in excess of 80 CFS to the aforementioned peak of 60 CFS. Since additional water would have to be taken from the Klickitat river, this lessens the impact on river flows in addition to reducing the amount of pumping required for the operation of the facility; thereby, improving the facility's energy efficiency.

The design intent Harbor utilized is that the facility will likely be in operation for 40+ years and may require a significant level of flexibility in the design. The system is designed to: minimize maintenance, reduce energy consumption, maximize flexibility, and maintain a high level of reliability throughout its lifetime. A separate set of incubation and rearing facilities is incorporated onto the north side of the river in order to provide for the isolation of species that could adversely affect the health of others.

Harbor held design charrettes with the Yakama Nation and concerned agencies to develop the Hatcheries layout. Participants also included USFWS, WDFW and USGS Primary concerns were ensuring hatchery production goals in addition to disease mitigation, biological needs, and a variety of environmental concerns.

Environmental

As with any hatchery, fish health/habitat (both within and outside the facility) were a major concern. Water flows are managed in such a manner as to prevent disease from spreading from one species to another. Additionally, techniques to mitigate contamination to the Klickitat River are incorporated to ensure that hatchery operations do not adversely affect it. All waste streams are contained and treated in an appropriate manner prior to release. Furthermore, flows to the river are consolidated to one outlet in order to simplify monitoring and ensure maximum attraction for returning broodstock. All intakes are designed in such a manner as to ensure safe passage for juvenile fish and minimize the impact on wildlife.

One of the primary goals of the design is to make the hatchery as 'green' as possible. The existing facility utilizes electrical power from KPUD and simply dissipates the hydro-energy available from the spring water. Harbor's design incorporates a power turbine to make use of the available hydroelectric power within the facility. Furthermore, it is the hope of the design team that a contract can be established with KPUD to place excess power onto the grid thereby turning the facility into an energy producer rather than an energy consumer. When compared to the US average grid mix, the facility would result in a savings of over 2.3 million pounds of CO_2 per year from power generation alone. Other design considerations were the use of surge tanks to provide water storage, in addition to the use of gravity fed systems, to reduce the number of pumps required, further improving the facility's environmental footprint.

Inspection & Maintenance

As with any major facility, continual maintenance and inspection will be required for operation. However, it has been a major design focus to reduce the need for this via two routes. The primary route is to remove unnecessary mechanical components (mainly pumps) from the design via careful attention to elevations. The facility is in an ideal location to use gravity to manage nearly all water flows throughout. This results in a reduction in the number of mechanical components required, thereby reducing any associated maintenance on those systems. Aside from minor subsystems, the only pumping required is for water drawn from the Klickitat River. This water is only pumped once (removing multiplicative efficiency losses) and then stored in a surge tank elevated such that the river water can be routed anywhere on the facility.

While the spring water is of an excellent quality, river water at the facility varies throughout the year. The previous design incorporated the use of a settling pond in an effort to reduce particle content of the water. This resulted in a significant maintenance issue of cleaning out the settling pond itself. The new design incorporates centripetal filtration units located at the river water intake in order to reduce the level of maintenance associated with river water use. While the filter units themselves will require periodic inspection and maintenance, the end result will be the elimination of the need for a settling pond and much cleaner water flowing throughout the system, thereby reducing fouling.

System redundancy is a key design feature meant to improve reliability, in addition to allowing for maintenance to be performed without compromising the continued operation of the system. Dual filtration skids, redundant water flows, and the ability to vary the amounts of spring and river water on either side of the facility are intended to allow for system isolation both for inspection and to facilitate repairs if necessary. Furthermore, the facility will remain connected to KPUD for electrical power both as a means to potentially market excess electrical power and

to provide a backup source of electrical energy in the event any power turbine maintenance is required.

Summary of Results

Harbor feels it has prepared a comprehensive design for Klickitat Hatchery. Harbor has had input from the current facility managers, biologists, and various other representatives of the Yakama Nation during the design process. The final design accommodates the fish production goals, curbs the potential for biological contamination, reduces the environmental footprint of the facility, incorporates a significant level of flexibility and safety, and improves the attraction of future broodstock to the facility. These much needed improvements to the facility will help ensure the successful production of fish and aid in reaching future production goals.

The following table summarizes our calculations for the number of juvenile rearing raceways.

Klickitat Hatchery Juvenile Rearing Raceway Arrangement

Species	Location	Dates	# Jumbo Raceways (net reqd)	Volume (net max required)	Flow (net max required)	Density Index	Flow Index
Spring Chinook	12 Jumbo Bank West of Pond 25	Sept-May	**9-10**	**88,300 ft^3**	**5,256 gpm**	**0.1**	**1.68**
Fall Chinook	Jumbos @ Pond 24 and 25	June & July	**7-8**	**151,939 ft^3**	**9,044 gpm**	**0.1**	**1.68**
Steelhead	Jumbos @ Pond 26	Jan-Dec	**2-3**	**28,124 ft^3**	**2,511 gpm**	**0.15**	**1.68**
Coho	Jumbos @ Pond 24 and/or 25	Sept-May	**9-10**	**88,205 ft^3**	**6,825 gpm**	**0.13**	**1.68**

River Water Intake

A new river intake has been designed to replace the existing river intake structure that is functionally inadequate for meeting the future needs of the hatchery. The existing screening structure does not provide for protection of juvenile fish that may be in the Klickitat River while the intake is in operation. The new intake structure takes special consideration to meeting National Marine Fisheries Service (NMFS) guidelines for juvenile fish protection set forth in the Anadromous Salmonid Passage Facility Design guide.

The new river intake has been located at the existing intake site in a pool upstream of an existing riffle and gravel bar. This stretch of river appears to be stable and has performed well as an intake site over the previous 30 years. The deck elevation of the intake has been set at existing grade, above the 100 year flood elevation, to eliminate concerns associated with overtopping.

A maximum water demand of 30 CFS at the 95% exceedance river flow was used as the basis for the river intake design. A screen area of 75 SF was determined to meet NMFS screen

approach velocity criteria. Screens are designed to be self cleaning, operating as required to maintain unobstructed flow. Airburst will be utilized to mobilize sediments that accumulate in the intake structure. The new intake design includes an oversized trashrack placed parallel to river flow in an effort to maximize sweeping velocity and minimize transverse water velocities at the intake entrance. This effort will minimize juvenile fish entrainment and reduce sediment loads in the intake.

The juvenile bypass system has been designed to provide egress for juvenile fish as well as debris that may become entrained in the intake. The bypass consists of a single vertical slot creating a critical depth condition that empties into a 48 inch diameter bypass pipe which returns to the river 600 feet downstream. A 10 inch vertical slot was selected to provide adequate sweeping velocities of at least double the approach velocity along the face of the screens. Trapping velocities of 8 to 10 feet per second (FPS) are present at the vertical slot constriction with 4 to 5 FPS transportation velocities in the juvenile bypass pipe. The vertical slot configuration is designed to be adjustable should bypass flows need to be modified.

Hatchery Facilities

Construction Phasing

Construction will take place in a number of phases to allow for continuous hatchery operations, and to minimize environmental impact. As the design of this hatchery matures, we will be creating a detailed phasing plan. Specific attention will be paid to ensuring that water flow to the facility is not interrupted or degraded. We plan on starting construction on the right bank, and have placed the new adult capture & spawning structure along with the new adult holding and fish ladder on available real estate. During the initial phases, the contractor can use the left bank for construction phasing. After this new facility is complete, the existing adult holding and spawning can be demolished. We plan on moving the existing vehicle storage building early on and using it for temporary incubation space, while work is being completed on additions to the existing main hatchery building.

Main Hatchery Building

The main hatchery building was constructed in 1949.

The present size of the building is approximately 7,092 sq ft, including:

Incubation room	3339 sq ft
Feed Room	1536 sq ft
Office/ Personnel Space	1632 sq ft
Storage Lofts	585 sq ft

Planned improvements to the Hatchery Building include the demolition of the east wing, and its re-development into personnel and storage spaces. This area will feature:

- a small lobby and work area for office equipment,
- 4 offices,
- a large conference room,
- men's & women's restrooms with showers,
- lunchroom,
- mudroom,

- mechanical room,
- server / IT room.

The total footprint added to the east wing of the building will be 1,816 square feet, bringing the total hatchery footprint to 8,908 square feet. A second story 800 square foot dry storage area is under consideration.

Construction for the addition will be CMU cavity wall with light gage steel stud interior walls. Steel framing will also be used as the interior framing system.

At the west wing of the hatchery, current offices, restrooms, mudroom, lunchroom shop and mechanical room will be demolished, but the exterior structure will remain intact. No additional footprint will be added to the west wing of the hatchery building.

A new incubation prep room will be built in this area with work tables, wash down capability, new floor drains, adjacent lab and freezer. New doors and windows will be installed, including an 8 ft. wide roll-up door at the north end of the room and a new 8 ft. wide roll up door between the incubation prep space and the incubation room. Space is also provided in this end of the building for mechanical and electrical functions.

Currently, the incubation room has 12 windows which are filled with glass block. Past hatchery operation protocols required the incubation rooms to be dark. Currently, incubation at the Klickitat Hatchery is done in vertical stacks of incubation trays. The arrangement of these trays does not allow light to reach the incubating eggs. One option under consideration is to replace the glass block with windows, armed with window film that filters 99% of uv light. Providing windows would allow for ventilation, and improve the work environment for hatchery staff. This type of window will also provide energy savings. Discussions are underway with Yakama Nation Biologists on how providing windows in the incubation space will impact expected incubation protocols.

Also considered was the potential need for isolated incubation in the future. There is currently no need for incubation isolation in the hatchery. Should the need arise in the future, freestanding aluminum frame with acrylic wall panels are available for less than $5,000. These can be quickly assembled using hand tools. One company who provides these systems is 80/20 http://8020.net/Contact-Info.asp.

The incubation room will receive electrical and mechanical updates, as well as new lighting. Security and operational alarms are under consideration for the entire hatchery complex. Interior finishes will also be updated.

Existing Vehicle Storage Building

The existing vehicle storage building will be moved from its current location to a new location northwest of the hatchery building and will be used for general storage. The wood framed sheds standing near rearing raceways ‘C’ are in very poor condition. They will be demolished. A new foundation will be placed at the site where the sheds are demolished. The existing vehicle storage building will be moved to the new location by the contractor. It can be moved in one piece, or dismantled and reassembled at the contractor’s option.

Vehicle and Maintenance Facility

A new vehicle and maintenance building will be located 35 feet east of the hatchery building. The hatchery building and Vehicle Maintenance Facility will be attached by a covered vehicle drive-through (porte cochere).

This facility will include the following features:

- maintenance workshop area,
- one office,
- unisex restroom,
- locked shop storage room,
- open storage shelves for parts storage,
- welding shop,
- wood shop,
- vehicle storage for 5 large vehicles.

Five vehicle bays are provided with 13 foot tall roll-up doors. The bays can accommodate vehicles up to 40 ft. long. Consideration was given to the possibility of providing a vehicle lift, or lift pit. It was determined that major vehicle maintenance would not be done at this facility, so a pit lift would rarely be needed. Also, worker safety would be a major concern around vehicle lift equipment. A three ton overhead bridge crane will be installed to assist with equipment maintenance.

A steel / welding and carpentry shop will be included in the Vehicle and Maintenance building. Features of the shops will include:

- Compressed Air;
- 220 volt power;
- Fire suppression;
- Exhaust system;
- Emergency eye wash station.

The construction of this facility will be:

- Concrete slab on grade, with radiant heat incorporated into the slab;
- Concrete Masonry Unit (CMU) walls, with interior steel framing;
- Wood frame or CMU interior partitions;
- Aluminum windows;
- Steel trusses;
- Standing seam metal roof over insulation and steel roof decking;

This facility will be “Keep From Freezing” (KFF), which means we want to keep the interior temperature above 40°. The radiant hot water heat should be able to accomplish this. We will supplement that with electric wall heaters in the office and restroom. Radiant overhead heaters can be located for on demand work shop heat in shop areas.

Chemical Storage

The facility uses the following chemicals in their hatchery operations:

- Virkon Aquatic;
- "Parasite-s" (Formalin mixture);
- Ovadine (PVP Iodine).

The critical chemical relative to storage is the Parasite-s. This preparation is a "Class III A" combustible. According to the 2009 International Building Code, the maximum allowable quantity per control area (a fire separated area within another structure) is 330 liquid gallons (6 barrels). This facility requires 12 barrels of storage. The code requirements dictate a separate chemical storage structure. The chemical storage building will be a CMU structure 23 ft. x 15 ft. (345 square feet) with a containment vault in the floor and a metal roof. It will be located 35 ft. north of the hatchery building, and near the vehicle maintenance building, where the forklift used to transport the barrels will be stored.

Sorting and Spawning Facility

The new sorting and spawning facility will be built to the southwest of the existing adult capture facility. The existing adult capture facility will remain in operation until the new sorting and spawning facility is fully operational.

The Adult Sorting and Spawning Facility will be 2,400 square feet, with a 1,250 square foot 'basement'. The basement area will be used to house PIT tag transceivers, and for storage. Fish return chutes will also pass through this space.

The features of this facility will include:

- Concrete fish lift, with mechanical stainless steel lifting brail;
- Shock tank;
- Stainless steel work tables;
- Fish return chutes (16" pipes – 8 to the adult holding bays, 1 back to the river and one to the fish transport truck)
- Wire tag reader;
- Egg take area;
- Biological sampling work area;
- Carcass holding racks;
- Gear wash down area with floor drain;
- Mud room with gear lockers;
- Men's and women's ADA restrooms;
- Flake ice machine and storage;
- Freezer.

The construction of this structure would include:

- Concrete slab on grade in the basement, with radiant heat incorporated into the slab;
- Concrete filled metal deck with floor / trench drains;
- Concrete masonry unit (CMU) walls, with interior steel framing;
- Wood frame or CMU interior partitions;
- Aluminum windows;
- Steel trusses;
- Standing seam metal roof over insulation and steel roof decking;

The floor drains in the spawning area will have a two-way valve to control drainage. The default position will send wash-down water to the river. When sanitizing the spawning area becomes necessary, the valve can be turned, and water used along with sanitizing chemicals can be allowed to drain into an underground dry well.

Fish Ladder

The existing fish ladder concrete has deteriorated and is inferior quality leading to structural and functional deficiency. Its useful life has passed and requires replacement. The new fish concrete fish ladder will combine both vertical slot and pour and pool weirs to efficiently pass adult fish. Fish enumeration using current PIT tag detection methods are anticipated. Fish attraction water will be introduced at the fish ladder entrance pool, Water from both right and left bank facilities will return at the fishway entrance. Only Wonder Springs, Pond 26 water will return to the right bank down-stream of pond 26 steelhead facilities.

The abandoned adult fish collection picket sill located adjacent to the existing fish ladder entrance will be modified to allow lamprey and fish passage. It appears that during the mid-1980's, a steel plate scour protection installation occurred to reinforce the original river sill. The steel plate reinforcement had to varying degrees detatched from it's concrete foundation causing passage impediments. This project will remove the steel plate and provide passage ports through the concrete sill.

Adult Holding

The fish will enter through a new fish ladder, built next to the existing ladder. A holding channel will lead to 8 adult holding bays. These concrete holding ponds are 7'-6" wide, 41 ft. long and 10 ft. high. Actual water depth will be 3 to 5 feet, depending on species being held. Each pond will have water supply & elevation control. A crowder will also be provided in the channel to move the fish into the fish lift. The fish lift will raise 14 ft. with a mechanical brail. This will bring the fish into the adult sorting and spawning facility. Adult holding facilities will accommodate truck transported fish of various species.

Steelhead Incubation Building

A new 36 foot by 60 foot steelhead incubation building will be placed on the left bank. 2,160 square foot structure will be CMU construction with steel trusses and a standing seam metal roof. This facility is oversized, to allow for future research and development opportunities. Restroom facilities are not included because a suitable septic site is not available on the left bank.

Freezer Building

Updates will be made to the interior finishes of this building. Electrical and HVAC systems will be updated and replaced as necessary. The freezer portion of this structure will be reconfigured as cold storage. The remainder of the building will be changed from a cooler to dry storage.

Covers For Existing Rearing Raceways

New steel roofs will be built over existing raceways A and B, located to the south of the Hatchery building. These covers will shade the fish to prevent sunburn. In addition, these raceways will be surrounded by chain link fence for predator control. Concrete 'marking trailer' pads will be provided, along with power supply for the trailers.

Turbine Building

The existing Energy Dissipation Building will be re-named the Turbine Building since the new primary function will be to house the new turbine generator. The building will continue to house the altitude valve for energy dissipation during times of turbine generation shut down. During turbine shut down for maintenance, Klickitat County PUD power would serve the needs of the hatchery. The existing building will be enlarged from 1,040 square feet to 1,420 square feet to accommodate hydro-turbine, generator, controls and switchgear. New penstock piping and valves are required for the turbine.

The building addition requires construction of substantial concrete foundations and a slab on grade floor. The existing concrete masonry unit (CMU) construction will be followed with a timber framed roof. A new double wide door will accommodate equipment placement, maintenance and equipment change out.

The Turbine Building's sound proofing will be improved as will lighting and environmental controls. The existing headbox timber construction will be improved.

Turbine controls and equipment will be monitored in the main hatchery building. Remote monitoring will also be available.

Water Distribution Building

The Water Distribution building will be located adjacent to the river water intake structure on the left bank. Water distribution functions will be associated with river water pumping, water sediment removal and equipment associated with intake screen cleaning. Screen cleaning features will include compressed air, hydraulic fluid pumping, security & monitoring systems and electrical controls. A cast-in-place concrete pump well containing four turbine pumps will supply up to 25 CFS of rearing water to the left bank raceways and steelhead incubation. The pump manifold and discharge 36" diameter piping are planned to be placed below finish floor in trenches covered with steel grating. The slab-on-grade building will use spread footings and walls constructed of CMU, with a 12' eave height. The 6:12 pitch roof will be constructed of steel trusses and insulated metal deck sheathed with standing seam metal roof. A two ton overhead bridge crane will be installed to assist with equipment maintenance.

An overhead coiling door, 10 feet wide by 10 feet tall will provide equipment and maintenance access. Personnel egress will be code compliant. Lighting will be a combination of natural daylight, and artificial. Power generated on site will be sufficient for pumping and control equipment requirements.

Juvenile Rearing Raceways

Ponds 24 and 25 will be replaced with new concrete rearing raceways. These raceways will include the following features:

- Independent water supply;
- Individual pond depth control;
- Crowders;
- 'Kettle' on drain end.

Pollution Abatement Facilities

Pollution abatement facilities require substantial modification or replacement. Further design and economical analysis is required to assess the biological oxygen demand reduction and water quality discharging to the receiving waters. A new two-part settling basin coupled with aeration is anticipated to reduce dissolved and settle-able solid discharge. Vacuumed fish pond sediments from both sides of the river will be pumped to the re-developed pollution abatement facilities. Currently, two 8 inch diameter spring water pipes cross the river through the concrete sill. One of these pipes will serve as passage for a pressure conduit carrying waste water from the left bank raceways to the new facilities.

Staff Housing

The facility currently has 3 houses on-site for hatchery staff and their families. The existing homes were built in 1954. They are wood frame , one story and have asbestos siding. Although new heat pumps have been installed, the houses are in poor repair and too small to comfortably house today's family needs. Although they have 3 bedrooms, one of the bedrooms lacks code compliant egress. The garages are one car, and actually too small for a family car. The Yakama Nation wishes to attract long term professional hatchery staff. Upgraded housing, appropriate for long term residency, is needed to motivate hatchery employees and their families. Use of manufactured homes was investigated and not recommended. Conventional home construction will:

- The trades needed to build conventional wood framed homes will be on site working on other hatchery elements;
- Life cycle costs are favorable with conventional construction;
- Conventional wood frame homes require less maintenance;
- Conventional wood framed homes will be more pleasant and better for employee morale;
- Site access is not conducive to pre-manufactured home delivery;
- Conventional wood frame homes lend themselves to proper remodeling in the out year;
- In this forest environment, fire hardened homes will be required.

The existing houses will be demolished. Asbestos abatement measures will need to be in place during demolition and clean-up. Stick-framed, two story, four bedroom, two bathroom, with a two car garage homes are proposed. The houses will receive power from on-site power generation. Electric power will be used for residential heat. Wood burning fireplace/ stove will serve for added comfort and heat in the event of a power outage.

Structural Design Criteria:

This site has been examined for structural design criteria. The current code is the 2009 International Building Code(IBC). Site specific load criteria is as follows:

Seismic:	Design Criteria Site Class B (IBC & ASCE 7) Ss = 0.48, S1 = 0.18
Ground Snow Load:	155 PSF (Per Klickitat County Planning Department)
Wind:	In accordance with ASCE 7, Min Design Load for Building and other Structures. Basic wind speed (3-second gust) = 85 MPH, exposure B and I, Wind Importance Factor,Iw = 1.0

Live Loads: Per IBC

Limited geotechnical information is available from the March 2009 report prepared for the Klickitat Hatchery Bridge abutments. Additional geotechnical investigation and recommendations will be required for building additions and new building and structures.

C&N Consultants Inc
Construction Cost Consultants
119 Pine Street, Suite 301
Seattle, WA 98101
Telephone 206-624-8539
Fax 206-624-8955

KLICKITAT HATCHERY REDEVELOPMENT

YAKAMA KLICKITAT FISHERIES PROGRAM

November 18, 2010

KLICKITAT COUNTY, WASHINGTON

30% DESIGN ESTIMATE

Prepared for:

Harbor Consulting Engineers
3006 Fuhrman Avenue East
Seattle, WA 98102
Tel:- 206-709-2397

KLICKITAT HATCHERY REDEVELOPMENT Date: November 18, 2010
YAKAMA KLICKITAT FISHERIES PROGRAM Prep: DN
YAKAMA COUNTY, WASHINGTON

30% DESIGN ESTIMATE

INTRODUCTION

Scope of the Project

Upgrade and expansion of existing fish hatchery facility on the Yakama Indian Reservation

Documentation

The estimate has been produced by measuring and pricing unit quantities obtained from Harbor Consultants Engineering 30% design documents dated October 28, 2010,

Contingency

Due to the stage of the design and current information available for the 30% design level a 10% estimating contingency has been added to the estimate.

Schedule

Construction performed will be in three phases commencing April 1st 2011 and completing by October 1st 2011.

Escalation:

All construction costs used in the 30% design estimate are in October 2010 dollars. A 2.5% annual escalation amount has been allowed for Mid Construction Point of July 2011 giving a 1.88% cost increase.

Exclusions From Construction Cost

Design fees

Owners administration costs

Building and land acquisition fees

Legal and accounting fees

Removal of unforeseen underground obstructions

Owner's furniture, furnishings and equipment

Owners supplied materials

Utility provided cabling and equipment

Work outside the construction site boundary.

Moving owners equipment and furniture

Any hazardous waste removal

Compression of schedule, premium or shift work, and restrictions on the contractor's working hours for Option 1.

Assessments, finance, legal and development charges

Cost escalation beyond the start dates stated in this report

Builder's risk, project wrap-up and other owner provided insurance program

Items that may affect the cost estimate:

Modifications to the scope of work included in this estimate.
Special phasing requirements other than mentioned above.
Restrictive technical specifications or excessive contract conditions.
Any non-competitive bid situations.
Bids delayed beyond the projected schedule.

KLICKITAT HATCHERY REDEVELOPMENT
YAKAMA KLICKITAT FISHERIES PROGRAM
YAKAMA COUNTY, WASHINGTON
30% Design Estimate

Date: November 18, 2010
Prepared By: DN

MAIN COST SUMMARY

No.	DESCRIPTION OF PAVING WORK	DIRECT CONSTRUCTION COST CURRENT November 2010	TOTAL CONSTRUCTION COST CURRENT [Including GC Mark-Ups & 10% Contingency]	TOTAL CONSTRUCTION COST ESCALATED TO MID CONSTRUCTION MARCH 2012
	HATCHERY SECTIONS			
	Residential Building	**648,086**	**795,525**	**820,584**
	Hatchery Building	**1,774,035**	**2,177,627**	**2,246,223**
	Vehicle Maintenance	**1,186,834**	**1,456,839**	**1,502,729**
	Adult Capture Building	**924,161**	**1,134,407**	**1,170,141**
	Fish Feed Storage Building	**25,596**	**31,419**	**32,409**
	Energy Dissipation Building	**100,361**	**123,194**	**127,074**
	Chemical Storage Building	**70,756**	**86,853**	**89,589**
	Storage Building	**97,229**	**119,349**	**123,109**
	Water Distribution Building	**1,194,354**	**1,466,069**	**1,512,250**
	Existing Rearing Raceways A,B&C	**1,807,859**	**2,219,147**	**2,289,050**
	Rearing Raceway	**2,962,650**	**3,636,652**	**3,751,207**
	Rearing Ponds	**1,360,624**	**1,670,166**	**1,722,777**
	Adult Holding Facility	**427,076**	**524,236**	**540,749**
	Fishway to Adult Holding	**450,746**	**553,291**	**570,719**
	Indian Ford Spring 'A' Upper Intake	**347,236**	**426,233**	**439,659**
	Indian Ford Spring ;A' Upper Supply	**1,487,398**	**1,825,781**	**1,883,293**
	Indian Ford Spring ;A' Lower Supply	**291,455**	**357,760**	**369,030**
	Indian Ford Spring 'B' Intake	**15,529**	**19,062**	**19,663**
	Indian Ford Spring ;B' Supply	**441,660**	**542,137**	**559,215**
	Shared Trench Raceway	**89,027**	**109,280**	**112,723**
	Water Supply Vaults	**128,061**	**157,195**	**162,147**
	Water Distribution System	**757,047**	**929,275**	**958,547**
	Water Power Electrical Generator	**704,500**	**864,774**	**892,014**
	River Water Intake	**678.733**	**833.145**	**859.389**
	Site Drainage System	**512,832**	**629,501**	**649,330**
	Site Preparation & Site Demolition	**469,165**	**575,900**	**594,041**
	Site Development including roads pathway etc	**937,651**	**1,150,966**	**1,187,221**
	Site Electrical	**1,300,000**	**1,595,750**	**1,646,016**
	Total Construction Cost	**21,190,659**	**26,011,534**	**26,830,897**

KLICKITAT HATCHERY REDEVELOPMENT *Date:* November 18, 2010
YAKAMA KLICKITAT FISHERIES PROGRAM *Prepared By:* DN
YAKAMA COUNTY, WASHINGTON
30% Design Estimate

MAIN COST SUMMARY

General Contractors Mark-Ups & Contingency

General Contractors General Conditions		**8.50%**
General Contractors Profit OH & Fee		**4.25%**
	Sub-Total	**12.75%**
Yakama Tribe Tax		**3.00%**
		15.75%
Design Contingency		**10.00%**
	Total Mark-Ups	**22.75%**

Note

Escalation assumptions

A 2.5% annual escalation amount has been allowed for up to Mid Construction Point of March 2012 giving a 3.15% cost increase.

Pond 26 Scope of Work is included on a Separate Summary Sheet

KLICKITAT HATCHERY REDEVELOPMENT
YAKAMA KLICKITAT FISHERIES PROGRAM
YAKAMA COUNTY, WASHINGTON
30% Design Estimate

Date: November 18, 2010
Prepared By: DN

SUMMARY POND 26

No.	DESCRIPTION OF PAVING WORK	DIRECT CONSTRUCTION COST CURRENT November 2010	TOTAL CONSTRUCTION COST CURRENT [Including GC Mark-Ups & 10% Contingency]	TOTAL CONSTRUCTION COST ESCALATED TO MID CONSTRUCTION MARCH 2012
1	Rearing Raceway	**296,265**	**363,665**	**375,121**
2	Rearing Ponds	**609,459**	**748,111**	**771,677**
3	Water Distribution System	**35,365**	**43,410**	**44,778**
4	Site Drainage System	**37,420**	**45,932**	**47,379**
5	Site Preparation & Site Demolition	**9,000**	**11,048**	**11,395**
6	Site Development including roads pathway etc	**15,500**	**19,026**	**19,626**
7	Site Electrical	**12,000**	**14,730**	**15,194**
	Total Construction Cost	**1,015,009**	**1,245,923**	**1,285,170**

General Contractors Mark-Ups & Contingency

General Contractors General Conditions		**8.50%**
General Contractors Profit OH & Fee		**4.25%**
	Sub-Total	**12.75%**
Yakama Tribe Tax		**3.00%**
		15.75%
Design Contingency		**10.00%**
	Total Mark-Ups	**22.75%**

Note
Escalation assumptions
A 2.5% annual escalation amount has been allowed for up to Mid Construction Point of March 2012 giving a 3.15% cost increase.

Klickitat Hatchery Redevelopment
Klickitat, WA
Conceptual Design Cost Estimate

Gross Floor Area: **7,200 SF**
Date: **November 18, 2010**
Prepared By: AC

Residential Buildings (3/EA)
DETAIL OF ESTIMATE

	Item Description	Quantity	Unit	Unit Cost Incl	Totals	
A10	**FOUNDATIONS**					
A1010	**Standard Foundation**					
	A1011 Wall foundations					
	Reinforced concrete continuous footings					
	Excavate for continuous footings	171	CY	16.00	2,736	
	Backfill, assume native fill	76	CY	7.50	570	
	Fine grade bottom of footing	1,283	SF	0.20	257	
	Formwork to foundations - sides	3,420	SF	5.00	17,100	
	Reinforcing steel in foundations, allow 100#/CY	9,500	LB	0.70	6,650	
	Concrete, 4,000 psi	95	CY	260.00	24,700	
	A1013 Perimeter drainage and insulation					
	Perforated drain pipe and rock	855	LF	12.50	10,688	
	Crawl space vapor barrier, 8 mil polyethylene	7,200	SF	0.48	3,456	
	Total For Standard Foundations				**66,156**	
A1020	**Special Foundation**					
	No work anticipated				N/A	
	Total For Special Foundations					
A1030	**Slab on Grade**					
	No work anticipated				N/A	
	Total For Slab on Grade					
A20	**BASEMENT CONSTRUCTION**					
A2010	**Basement Excavation**					
	No work anticipated				N/A	
	Total For Basement Excavation					

Klickitat Hatchery Redevelopment
Klickitat, WA *Gross Floor Area:* **7,200 SF**
Conceptual Design Cost Estimate *Date:* **November 18, 2010**
Prepared By: AC

Residential Buildings (3/EA)
DETAIL OF ESTIMATE

	Item Description	Quantity	Unit	Unit Cost Incl	Totals	
A2010	**Basement Walls**					
	No work anticipated				N/A	
	Total For Basement Walls					
B10	**SUPERSTRUCTURE**					
B1010	**Floor Construction**					
	B1012 floor construction					
	TJI framing and sheathing 3/4" thick	7,200	SF	4.85	34,920	
	Batt insulation	7,200	SF	0.60	4,320	
	Total For Floor Construction				**39,240**	
B1020	**Roof Construction**					
	B1022 Pitched roof construction					
	Roof framing / wood truss and sheathing, 1/2" thick	10,180	SF	5.10	51,918	
	Insulation for ceilings	7,200	SF	0.60	4,320	
	Total For Roof Construction				**56,238**	
B20	**EXTERIOR CLOSURE**					
B2010	**Exterior Walls**					
	B2011 Exterior wall construction					
	Wood studs at walls	7,775	SF	2.22	17,261	
	Plywood sheathing at walls, 1/2" thick	7,775	SF	1.00	7,775	
	Wall cavity insulation	7,775	SF	0.60	4,665	
	Weather resistant barrier (vapro wall shield and cement board / hardi siding, painted	7,775	SF	5.35	41,596	
	Exterior wood trim, painted	1	LS	8,000.00	8,000	
	Gypsum board at interior of exterior walls	7,775	SF	1.50	11,663	
	B2016 Exterior soffits					
	Allow for finish at exterior soffits	1	LS	3,000.00	3,000	

Item Description	Quantity	Unit	Unit Cost Incl	Totals
Caulking, sealants and firestopping				
Caulking, sealants and firestopping	7,200	SF	0.40	2,880
Total For Exterior Walls				**96,839**
B2020 Exterior Windows				
B2021 Windows				
Fiberglass windows with screens, energy star rated with Low E clear insulated glass	1,350	SF	29.00	39,150
Total For Exterior Windows				**39,150**
B2030 Exterior Doors				
B2032 Solid exterior doors including frames and hardware				
Single at entrances	6	EA	720.00	4,320
Total For Exterior Doors				**4,320**
B30 ROOFING				
B3010 Roof Covering				
B3011 Roof finishes				
Weather resistant barrier and metal roof panels, 22ga.	10,180	SF	8.60	87,548
B3014 Flashings and trim				
Sheet metal flashing	7,200	SF	0.30	2,160
Total For Roofing				**89,708**

Klickitat Hatchery Redevelopment
Klickitat, WA *Gross Floor Area:* **7,200 SF**
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Residential Buildings (3/EA)
DETAIL OF ESTIMATE

	Item Description	Quantity	Unit	Unit Cost Incl	Totals	
C10	**INTERIOR CONSTRUCTION**					
C1010	**Partitions**					
	C1011 Fixed partitions					
	Wood stud framing	8,500	SF	2.20	18,700	
	Gypsum board, 5/8"	17,000	SF	1.22	20,740	
	Total For Interior Partitions				**39,440**	
C1020	**Interior Doors**					
	C1021 Interior doors					
	Interior doors, frames and hardware					
	Solid core wood doors					
	Single	30	EA	475.00	14,250	
	Hollow core wood doors at closet					
	Single	6	EA	215.00	1,290	
	Double	3	EA	310.00	930	
	Miscellaneous					
	Wood trim at windows, doors and at gathering room	7,200	SF	0.80	5,760	
	Total For Interior Doors				**22,230**	
C1030	**Specialties**					
	C1037 General fittings and misc. metals					
	Residential bathroom accessories	6	RM	135.00	810	
	Recessed medicine cabinets	6	EA	140.00	840	
	Shower rod and curtain	6	EA	70.00	420	
	Mirrors at bathrooms with schluter trim	6	EA	68.00	408	
	House numbers	1	LS	300.00	300	
	Fire extinguisher semi recessed cabinet, lockable with breakable glass	3	EA	190.00	570	
	Wall closet system at bedroom closets	9	EA	70.00	630	
	Wall closet system at utility room	3	EA	45.00	135	

	Item Description	Quantity	Unit	Unit Cost Incl	Totals
	Miscellaneous metals	7,200	SF	0.45	3,240
	Total For Fittings and Specialty Items				**7,353**
C20	**STAIRS**				
C2010	**Stair Construction**				
	No work anticipated				N/A
	Total For Stair Construction				
C30	**INTERIOR FINISHES**				
C3010	**Wall Finishes**				
	C3011 Wall finishes to inside exterior walls				
	Paint to interior side of exterior walls	7,775	SF	0.55	4,276
	C3012 Wall finishes to interior walls				
	Paint to walls	17,000	SF	0.55	9,350
	Total For Wall Finishes				**13,626**
C3020	**Floor Finishes**				
	C3024 Flooring including base				
	Floor finishes, allow	7,200	SF	2.50	18,000
	Total For Floor Finishes				**18,000**
C3030	**Ceiling Finishes**				
	C3031 Ceiling finishes				
	Gypsum board, painted	7,992	SF	6.20	49,550
	Total For Ceiling Finishes				**49,550**

Klickitat Hatchery Redevelopment
Klickitat, WA
Conceptual Design Cost Estimate

Gross Floor Area: **7,200 SF**
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Residential Buildings (3/EA)
DETAIL OF ESTIMATE

	Item Description	Quantity	Unit	Unit Cost Incl	Totals	
D10	**CONVEYING**					
D1010	**Elevator & Lift**					
	No work anticipated					
	Total For Elevator & Lifts					
D20	**PLUMBING**					
D2010	**Plumbing**					
	D 2010 Plumbing Fixtures					
	Water closets	6	EA	390.00	2,340	
	Lavatories	12	EA	210.00	2,520	
	Sinks	3	EA	260.00	780	
	Showers, including base, stall, valve and head	3	EA	750.00	2,250	
	Baths with shower over	3	EA	550.00	1,650	
	D 2020 Domestic Water Distribution					
	Domestic water piping, fittings, valves and insulation - to sanitary fixtures	27	EA	162.00	4,374	
	Domestic water connections to appliances (fridge, washing machine, dishwasher)	9	EA	73.75	664	
	Domestic hot water heaters, electric	1	LS	510.00	510	
	D 2030 Sanitary Waste					
	Waste/vent piping and fittings - to sanitary fixtures	27	EA	150.00	4,050	
	Waste connections to appliances (washing machine, dishwasher)	9	EA	70.00	630	
	Total For Plumbing				**19,768**	
	HVAC					
D3010	**HVAC**					
	D 3020 Heat Generating Systems					
	Heat pumps, electric	3	EA	4,500.00	13,500	

Klickitat Hatchery Redevelopment
Klickitat, WA *Gross Floor Area:* **7,200 SF**
Conceptual Design Cost Estimate *Date:* **November 18, 2010**
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Residential Buildings (3/EA)
DETAIL OF ESTIMATE

Item Description	Quantity	Unit	Unit Cost Incl	Totals
D 3040 Distribution Systems				
Air distribution systems				
Whole house ventilation system	3	EA	1,500.00	4,500
Galvanized steel ductwork and fittings	1	LS	5,800.00	5,800
Grilles, registers and diffusers	42	EA	70.00	2,940
Exhaust ventilation systems				
Exhaust fans				
Bathroom exhaust	6	EA	198.00	1,188
Laundry room exhaust	3	EA	185.00	555
Range exhaust	3	EA	342.00	1,026
Total For HVAC				**29,509**
D40 FIRE PROTECTION				
D4010 Fire Protection				
No work anticipated				N/A
Total For Fire Sprinkler System				
D50 ELECTRICAL				
D5000 Electrical				
D 5010 Electrical Service and Distribution				
Panelboard, 208/120V	3	EA	1,400.00	4,200
D 5020 Lighting and Branch Wiring				
Lighting fixtures including branch wiring and switching	80	EA	88.00	7,040
Receptacles including branch wiring	115	EA	52.00	5,980
D 5030 Communications and Security				
Telephone/data systems				
Telephone outlets including cable	12	EA	55.00	660
Television system				
CATV outlets including cable	12	EA	55.00	660

Klickitat Hatchery Redevelopment
Klickitat, WA *Gross Floor Area:* **7,200 SF**
Conceptual Design Cost Estimate *Date:* **November 18, 2010**
Prepared By: AC

Residential Buildings (3/EA)
DETAIL OF ESTIMATE

Item Description	Quantity	Unit	Unit Cost Incl	Totals
Fire alarm system				
Smoke detectors	12	EA	80.00	960
Total For Electrical				**19,500**
E10 EQUIPMENT				
E1010 Equipment				
E1094 Residential equipment				
Kitchen appliances (Refrigerator, range, microwave, dishwasher, washer and dryer), hood included under mechanical scope	3	EA	3,600.00	10,800
Total For Equipment				**10,800**
E20 FURNISHINGS				
E2010 Fixed Furnishing				
E2012 Fixed casework				
Base cabinets, bathrooms	33	LF	85.00	2,805
Base cabinets, kitchen	42	LF	95.00	3,990
Upper cabinets, kitchen	42	LF	83.00	3,486
Plastic laminate countertop	84	LF	32.00	2,688
Island counter, 3'-6" wide	27	LF	72.00	1,944
E2013 Blinds and other window treatments				
Horizontal plastic blinds	4,050	SF	2.90	11,745
Total For Furniture				**26,658**
F10 SPECIAL STRUCTURES				
F1010 Special Structure				
No work anticipated				N/A
Total For Special Structure				

Klickitat Hatchery Redevelopment
Klickitat, WA
Conceptual Design Cost Estimate

Gross Floor Area: **7,200 SF**
Date: **November 18, 2010**
Prepared By: AC

Residential Buildings (3/EA)
DETAIL OF ESTIMATE

Item Description	Quantity	Unit	Unit Cost Incl	Totals	
F1020 Special Construction					
No work anticipated				N/A	
Total For Special Construction					
F20 SELECTIVE BUILDING DEMOLITION					
F2010 Building Element Demolition					
No work anticipated				N/A	
Total For Selected Demolition					
TOTAL DIRECT COST FOR RESIDENTIAL				**648,086**	

Klickitat Hatchery Redevelopment
Klickitat, WA
Conceptual Design Cost Estimate

Gross Floor Area: **16,778 SF**
Date: **November 18, 2010**
Prepared By: AC

Hatchery Building Addition & Renovation
DETAIL OF ESTIMATE

Item Description	Quantity	Unit	Unit Cost Incl	Totals	
A10 FOUNDATIONS					
A1010 Standard Foundation					
A1011 Wall foundations					
Reinforced concrete continuous footings					
Excavate for continuous footings	80	CY	15.00	1,200	
Backfill, assume imported fill	48	CY	26.00	1,257	
Disposal of excavated material off-site within 8 miles, assumed a 33% swell factor	106	CY	14.00	1,490	
Fine grade bottom of footing	570	SF	0.70	399	
Formwork to foundations - sides	855	SF	7.00	5,985	
Reinforcing steel in foundations	3,958	LB	0.75	2,969	
Concrete, 4,000 psi	32	CY	265.00	8,392	
Finish to top of footing	570	SF	0.75	428	
Tie into existing structure, allow	1	LS	700.00	700	
A1013 Perimeter drainage and insulation					
Perforated drain pipe and rock	150	LF	18.20	2,730	
Total For Standard Foundations				**25,548**	
A1020 Special Foundation					
No work anticipated				N/A	
Total For Special Foundations					
A1030 Slab on Grade					
A1031 Standard slab on grade					
Reinforced concrete slab on grade, 6" thick					
Fine grade	1,688	SF	0.25	422	
Concrete, 4,000 psi	31	CY	260.00	8,127	
Vapor barrier	1,688	SF	0.53	895	
Crushed rock base, 6"	31	CY	30.00	938	
Compaction to rock base	1,688	SF	0.20	338	
Edge forms	236	LF	5.00	1,182	
Reinforcing Steel	2,026	LB	0.75	1,519	

	Item Description	Quantity	Unit	Unit Cost Incl	Totals
	Finish, cure and protect	1,688	SF	0.55	928
	Shrinkage joint	203	LF	1.15	233
	Tie into existing structure, allow	1	LS	1,500.00	1,500
	Total For Slab on Grade				**16,082**
A20	**BASEMENT CONSTRUCTION**				
A2010	**Basement Excavation**				
	No work anticipated				N/A
	Total For Basement Excavation				
A2010	**Basement Walls**				
	Reinforced concrete stem walls				
	Formwork	600	SF	9.50	5,700
	Reinforcing steel	2,322	LB	0.75	1,742
	Concrete	12	CY	280.00	3,422
	Excavation at concrete stem walls	40	CY	15.00	600
	Backfill at concrete stem walls	28	CY	10.00	278
	Total For Basement Walls				**11,742**
B10	**SUPERSTRUCTURE**				
B1010	**Floor Construction**				
	Floor structure, allow	800	SF	25.00	20,000
	Total For Floor Construction				**20,000**
B1020	**Roof Construction**				
	Roof structure, allow	2,194	SF	22.00	48,268
	Total For Roof Construction				**48,268**

Klickitat Hatchery Redevelopment
Klickitat, WA *Gross Floor Area:* **16,778 SF**
Conceptual Design Cost Estimate *Date:* **November 18, 2010**
Prepared By: AC

Hatchery Building Addition & Renovation
DETAIL OF ESTIMATE

	Item Description	Quantity	Unit	Unit Cost Incl	Totals	
B20	**EXTERIOR CLOSURE**					
B2010	**Exterior Walls**					
	B2011 Exterior wall construction					
	Wood stud framing	3,208	SF	4.75	15,238	
	Batt insulation	3,208	SF	0.80	2,566	
	Split face CMU, assume fully grouted	3,208	SF	18.50	59,348	
	Reinforcing steel at CMU walls, allow 1.2#/VSF	3,850	LB	0.70	2,695	
	Gypsum board to interior side of exterior walls	3,208	SF	2.00	6,416	
	Total For Exterior Walls				**86,263**	
B2020	**Exterior Windows**					
	B2021 Windows					
	Fixed storefront glazed windows	471	SF	65.00	30,615	
	Remove and replace existing windows	386	SF	75.00	28,950	
	Total For Exterior Windows				**59,565**	
B2030	**Exterior Doors**					
	B2032 Solid exterior doors including frames and hardware					
	Single	3	EA	1,950.00	5,850	
	Double	1	EA	3,700.00	3,700	
	Overhead coiling door, 7'-0" x 7'-0"	1	EA	4,200.00	4,200	
	Total For Exterior Doors				**13,750**	
B30	**ROOFING**					
B3010	**Roof Covering**					
	B3011 Roof finishes					
	Standing seam metal roof	2,194	SF	17.00	37,298	
	Remove and replace existing roofing	16,690	SF	18.65	311,273	
	Snowguards	1	LS	1,350.00	1,350	
	B3014 Flashings and trim					

Item Description	Quantity	Unit	Unit Cost Incl	Totals
Sheet metal flashing	1	LS	1,850.00	1,850
Caulking, sealants and firestopping				
Caulking and sealants	1	LS	1,500.00	1,500
Firestopping	1	LS	800.00	800
Miscellaneous				
Rough carpentry	1	LS	1,000.00	1,000
Total For Roofing				**355,071**
C10 INTERIOR CONSTRUCTION				
C1010 Partitions				
C1011 Fixed partitions				
CMU walls	3,468	SF	17.00	58,956
Wood stud framing	1,850	SF	2.20	4,070
Gypsum board, 5/8"	3,700	SF	2.40	8,880
Total For Interior Partitions				**71,906**
C1020 Interior Doors				
C1021 Interior doors				
Interior doors, frames and hardware				
Hollow metal doors				
Single	18	EA	1,670.00	30,060
Double	1	EA	2,890.00	2,890
Total For Interior Doors				**32,950**
C1030 Specialties				
C1033 Storage shelving and lockers				
Shelving, allow	1	LS	3,500.00	3,500
Lockers, dual height	16	EA	460.00	7,360
C1035 Identifying devices				
Code required signage	16,778	SF	0.10	1,678

	Item Description	Quantity	Unit	Unit Cost Incl	Totals
	Wayfinding and room identification signage	16,778	SF	0.12	2,013
	C1037 General fittings and misc. metals				
	Miscellaneous metals, allow 0.4#/SF	6,711	LB	2.50	16,778
	Restroom and shower accessories	1	LS	2,000.00	2,000
	ADA partitions	2	EA	1,150.00	2,300
	STD partitions	1	EA	1,050.00	1,050
	Shower compartment	2	EA	1,850.00	3,700
	Grab bars	2	EA	185.00	370
	Mirrors at restrooms	2	EA	125.00	250
	Fire extinguisher cabinets	2	EA	242.00	484
	Benches	1	LS	1,600.00	1,600
	Janitors mop rack and shelf	2	EA	510.00	1,020
	Total For Fittings and Specialty Items				**44,103**
C20	**STAIRS**				
C2010	**Stair Construction**				
	Wood framed stair with handrails and finish	1	FLT	5,900.00	5,900
	Total For Stair Construction				**5,900**
C30	**INTERIOR FINISHES**				
C3010	**Wall Finishes**				
	C3011 Wall finishes to inside exterior walls				
	Paint to interior side of exterior walls	3,208	SF	0.75	2,406
	C3012 Wall finishes to interior walls				
	Paint to walls	10,636	SF	0.75	7,977
	Allow for tile at restrooms	1	LS	4,000.00	4,000
	Total For Wall Finishes				**14,383**
C3020	**Floor Finishes**				
	C3024 Flooring including base				

Item Description	Quantity	Unit	Unit Cost Incl	Totals
Floor finishes, allow	2,676	SF	4.50	12,042
Patch existing floor finishes, allow	1	LS	5,000.00	5,000
Total For Floor Finishes				**17,042**
C3030 Ceiling Finishes				
C3031 Ceiling finishes				
Ceiling finishes, allow	2,676	SF	8.00	21,408
Patch existing ceiling finishes, allow	1	LS	5,000.00	5,000
Total For Ceiling Finishes				**26,408**
D10 CONVEYING				
D1010 Elevator & Lift				
No work anticipated				
Total For Elevator & Lifts				
D20 PLUMBING				
D2010 Plumbing				
Sanitary fixtures including connection piping				
Water closets	3	EA	1,250.00	3,750
Urinals	1	EA	1,150.00	1,150
Lavatories	4	EA	950.00	3,800
Janitors sinks	2	EA	1,350.00	2,700
Break room sinks	1	EA	1,025.00	1,025
Sinks - allow	3	EA	1,025.00	3,075
Showers	2	EA	1,750.00	3,500
Domestic water systems				
Water heater, electric	1	LS	5,000.00	5,000
Recirculation pumps	1	EA	1,250.00	1,250
Domestic hot and cold water piping, fittings, valves and insulation - to sanitary fixtures and hose bibbs	21	EA	1,500.00	31,500
Hose bibbs	5	EA	500.00	2,500

	Item Description	Quantity	Unit	Unit Cost Incl	Totals	
	Sanitary waste systems					
	Floor drains and sinks	10	EA	750.00	7,500	
	Waste/vent piping, fittings, valves and insulation - to sanitary fixtures and floor drains	31	EA	1,500.00	46,500	
	Total For Plumbing				**113,250**	
	HVAC					
D3010	**HVAC**					
	HVAC installations - heat pump system	16,778	SF	22.00	369,116	
	Total For HVAC				**369,116**	
D40	**FIRE PROTECTION**					
D4010	**Fire Protection**					
	No work anticipated				N/A	
	Total For Fire Sprinkler System					
D50	**ELECTRICAL**					
D5000	**Electrical**					
	Electrical installations	16,778	SF	20.00	335,560	
	Total For Electrical				**335,560**	

Klickitat Hatchery Redevelopment
Klickitat, WA
Conceptual Design Cost Estimate

Gross Floor Area: **16,778 SF**
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Hatchery Building Addition & Renovation
DETAIL OF ESTIMATE

	Item Description	Quantity	Unit	Unit Cost Incl	Totals	
E10	**EQUIPMENT**					
E1010	**Equipment**					
	E1025 Audio-visual equipment					
	Projection screen	1	EA	4,200.00	4,200	
	Total For Equipment				**4,200**	
E20	**FURNISHINGS**					
E2010	**Fixed Furnishing**					
	E2012 Fixed casework					
	Vanity, including support framing	10	LF	130.00	1,300	
	Break room cabinetry	1	LS	2,000.00	2,000	
	E2013 Blinds and other window treatments					
	Window treatments, allow	857	SF	7.70	6,599	
	E2014 Fixed floor grilles and mats					
	Walk-off mats, allow	1	LS	750.00	750	
	Total For Furniture				**10,649**	
F10	**SPECIAL STRUCTURES**					
F1010	**Special Structure**					
	No work anticipated				N/A	
	Total For Special Structure					
F1020	**Special Construction**					
	No work anticipated				N/A	
	Total For Special Construction					

Klickitat Hatchery Redevelopment
Klickitat, WA
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Hatchery Building Addition & Renovation
DETAIL OF ESTIMATE

Item Description	Quantity	Unit	Unit Cost Incl	Totals	
F20 SELECTIVE BUILDING DEMOLITION					
F2010 Building Element Demolition					
Selective interior demolition including HAZMAT abatement, allow	16,778	SF	5.50	92,279	
Total For Selected Demolition				**92,279**	
TOTAL DIRECT COST FOR HATCHERY				**1,774,035**	

Klickitat Hatchery Redevelopment
Klickitat, WA *Gross Floor Area:* **7,283 SF**
Conceptual Design Cost Estimate *Date:* **November 18, 2010**
Prepared By: AC

Vehicle and Maintenance Shop
DETAIL OF ESTIMATE

Item Description	Quantity	Unit	Unit Cost Incl	Totals	
A10 FOUNDATIONS					
A1010 Standard Foundation					
A1011 Wall foundations					
Reinforced concrete continuous footings					
Excavate for continuous footings	102	CY	15.00	1,530	
Backfill, assume imported fill	59	CY	26.00	1,534	
Disposal of excavated material off-site within 8 miles, assumed a 33% swell factor	136	CY	14.00	1,904	
Fine grade bottom of footing	708	SF	0.70	496	
Formwork to foundations - sides	849	SF	7.00	5,943	
Reinforcing steel in foundations	5,805	LB	0.75	4,354	
Concrete, 4,000 psi	43	CY	265.00	11,395	
Finish to top of footing	708	SF	0.75	531	
A1012 Column foundations and pile caps					
Reinforced concrete spread footings					
Excavate for continuous footings	112	CY	15.00	1,680	
Backfill, assume imported fill	70	CY	26.00	1,820	
Disposal of excavated material off-site within 8 miles, assumed a 33% swell factor	149	CY	14.00	2,085	
Fine grade bottom of footing	888	SF	0.70	622	
Formwork to foundations - sides	728	SF	7.00	5,096	
Reinforcing steel in foundations, allow 100#/CY	4,200	LB	0.75	3,150	
Concrete, 4,000 psi	42	CY	270.00	11,340	
Finish to top of footing	888	SF	0.75	666	
A1013 Perimeter drainage and insulation					
Perforated drain pipe and rock	432	LF	18.20	7,862	
Total For Standard Foundations				**62,008**	
A1020 Special Foundation					
No work anticipated				N/A	
Total For Special Foundations					

Klickitat Hatchery Redevelopment
Klickitat, WA
Conceptual Design Cost Estimate

Gross Floor Area: **7,283 SF**
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Vehicle and Maintenance Shop
DETAIL OF ESTIMATE

Item Description	Quantity	Unit	Unit Cost Incl	Totals	
A1030 Slab on Grade					
A1031 Standard slab on grade					
Reinforced concrete slab on grade, 8" thick					
Fine grade	7,283	SF	0.25	1,821	
Concrete, 4,000 psi	178	CY	260.00	46,288	
Vapor barrier	7,283	SF	0.53	3,860	
Crushed rock base, 6"	135	CY	30.00	4,046	
Compaction to rock base	7,283	SF	0.20	1,457	
Edge forms	1,020	LF	5.00	5,098	
WWF / Reinforcing Steel	7,283	LB	0.75	5,462	
Finish, cure and protect	7,283	SF	0.55	4,006	
Shrinkage joint	583	LF	1.15	670	
Total For Slab on Grade				**72,707**	
A20 BASEMENT CONSTRUCTION					
A2010 Basement Excavation					
No work anticipated				N/A	
Total For Basement Excavation					
A2010 Basement Walls					
No work anticipated				N/A	
Total For Basement Walls					
B10 SUPERSTRUCTURE					
B1010 Floor Construction					
No work anticipated				N/A	
Total For Floor Construction					

Klickitat Hatchery Redevelopment
Klickitat, WA *Gross Floor Area:* **7,283 SF**
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Vehicle and Maintenance Shop
DETAIL OF ESTIMATE

Item Description	Quantity	Unit	Unit Cost Incl	Totals	
B1020 Roof Construction					
B1022 Pitched roof construction					
Reinforced concrete stem walls					
Formwork	1,728	SF	8.00	13,824	
Reinforcing steel	6,688	LB	0.80	5,350	
Concrete	35	CY	255.00	8,976	
Steel columns	5	TN	3,000.00	15,000	
Steel roof truss framing	9,171	SF	15.00	137,565	
Metal decking	9,171	SF	3.00	27,513	
B1023 Canopies					
Canopy framing	507	SF	14.00	7,098	
Metal decking	507	SF	3.00	1,521	
Standing seam metal roof	507	SF	17.00	8,619	
Total For Roof Construction				**225,466**	
B20 EXTERIOR CLOSURE					
B2010 Exterior Walls					
B2011 Exterior wall construction					
Split face CMU, assume fully grouted	6,062	SF	18.50	112,147	
Reinforcing steel at CMU walls, allow 1.2#/VSF	7,274	LB	0.08	582	
Paint to paint	6,062	SF	1.00	6,062	
B2013 Exterior louvers, screens and fencing					
Mechanical louvers	36	SF	36.00	1,296	
Total For Exterior Walls				**120,087**	

	Item Description	Quantity	Unit	Unit Cost Incl	Totals	
B2020	**Exterior Windows**					
	B2021 Windows					
	Fixed storefront glazed windows	640	SF	65.00	41,600	
	Total For Exterior Windows				**41,600**	
B2030	**Exterior Doors**					
	B2032 Solid exterior doors including frames and hardware					
	Single	3	EA	2,250.00	6,750	
	Overhead coiling door, 10'-0" x 13'-0"	7	EA	6,100.00	42,700	
	Total For Exterior Doors				**49,450**	
B30	**ROOFING**					
B3010	**Roof Covering**					
	B3011 Roof finishes					
	Standing seam metal roof	9,171	SF	17.00	155,907	
	Snowguards	1	LS	4,500.00	4,500	
	B3014 Flashings and trim					
	Sheet metal flashing	1	LS	5,000.00	5,000	
	Caulking, sealants and firestopping					
	Caulking and sealants	7,283	SF	0.60	4,370	
	Firestopping	7,283	SF	0.33	2,403	
	Miscellaneous					
	Rough carpentry	1	LS	4,000.00	4,000	
	Total For Roofing				**176,180**	
C10	**INTERIOR CONSTRUCTION**					
C1010	**Partitions**					
	C1011 Fixed partitions					

Item Description	Quantity	Unit	Unit Cost Incl	Totals
CMU walls	584	SF	17.00	9,928
Wood stud framing	1,248	SF	2.20	2,746
Gypsum board, 5/8"	2,496	SF	2.40	5,990
Total For Interior Partitions				**18,664**
C1020 Interior Doors				
C1021 Interior doors				
Interior doors, frames and hardware				
Hollow metal doors				
Single	3	EA	1,670.00	5,010
Double	1	EA	2,890.00	2,890
Closet storage door	1	EA	600.00	600
Total For Interior Doors				**8,500**
C1030 Specialties				
C1033 Storage shelving and lockers				
Shelving, allow	1	LS	2,500.00	2,500
Lockers, allow	1	LS	1,500.00	1,500
C1035 Identifying devices				
Code required signage	7,283	SF	0.10	728
Wayfinding and room identification signage	7,283	SF	0.12	874
C1037 General fittings and misc. metals				
Miscellaneous metals, allow 0.4#/SF	2,913	LB	2.50	7,283
Restroom accessories	1	LS	400.00	400
Grab bars	1	EA	185.00	185
Mirrors at restrooms	1	EA	125.00	125
Fire extinguisher cabinets	2	EA	242.00	484
Bollards	14	EA	360.00	5,040
Welding curtains, excluded				
Total For Fittings and Specialty Items				**19,119**
C20 STAIRS				

Item Description	Quantity	Unit	Unit Cost Incl	Totals
C2010 Stair Construction				
No work anticipated				N/A
Total For Stair Construction				
C30 INTERIOR FINISHES				
C3010 Wall Finishes				
C3011 Wall finishes to inside exterior walls				
Paint to interior side of exterior walls	6,062	SF	0.75	4,547
C3012 Wall finishes to interior walls				
Paint to walls	3,664	SF	0.75	2,748
Total For Wall Finishes				**7,295**
C3020 Floor Finishes				
C3024 Flooring including base				
Sealed concrete	7,283	SF	1.30	9,468
Total For Floor Finishes				**9,468**
C3030 Ceiling Finishes				
C3031 Ceiling finishes				
Gypsum board, painted at office and restroom	260	SF	8.00	2,080
Assume remaining ceilings are exposed				
Total For Ceiling Finishes				**2,080**

Klickitat Hatchery Redevelopment
Klickitat, WA
Conceptual Design Cost Estimate

Gross Floor Area: **7,283 SF**
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Vehicle and Maintenance Shop
DETAIL OF ESTIMATE

	Item Description	Quantity	Unit	Unit Cost Incl	Totals	
D10	**CONVEYING**					
D1010	**Elevator & Lift**					
	No work anticipated					
	Total For Elevator & Lifts					
D20	**PLUMBING**					
D2010	**Plumbing**					
	Plumbing installations	7,283	SF	9.50	69,189	
	Total For Plumbing				**69,189**	
	HVAC					
D3010	**HVAC**					
	HVAC installations	7,283	SF	22.50	163,868	
	Total For HVAC				**163,868**	
D40	**FIRE PROTECTION**					
D4010	**Fire Protection**					
	No work anticipated				N/A	
	Total For Fire Sprinkler System					
D50	**ELECTRICAL**					
D5000	**Electrical**					
	Electrical installations	7,283	SF	18.50	134,736	
	Total For Electrical				**134,736**	

Klickitat Hatchery Redevelopment
Klickitat, WA
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Vehicle and Maintenance Shop
DETAIL OF ESTIMATE

	Item Description	Quantity	Unit	Unit Cost Incl	Totals	
E10	**EQUIPMENT**					
E1010	**Equipment**					
	E1091 Maintenance Equipment					
	Vehicle maintenance equipment, excluded					N/A
	Total For Equipment					
E20	**FURNISHINGS**					
E2010	**Fixed Furnishing**					
	E2012 Fixed casework					
	Vanity, including support framing	3	LF	130.00	390	
	E2013 Blinds and other window treatments					
	Window treatments, allow	640	SF	7.70	4,928	
	E2014 Fixed floor grilles and mats					
	Walk-off mats, allow	1	LS	1,100.00	1,100	
	Total For Furniture					**6,418**
F10	**SPECIAL STRUCTURES**					
F1010	**Special Structure**					
	No work anticipated					N/A
	Total For Special Structure					
F1020	**Special Construction**					
	No work anticipated					N/A
	Total For Special Construction					
F20	**SELECTIVE BUILDING DEMOLITION**					
F2010	**Building Element Demolition**					
	No work anticipated					N/A
	Total For Selected Demolition					

Klickitat Hatchery Redevelopment
Klickitat, WA
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Vehicle and Maintenance Shop
DETAIL OF ESTIMATE

Item Description	Quantity	Unit	Unit Cost Incl	Totals	

TOTAL DIRECT COST FOR VMS **1,186,834**

Klickitat Hatchery Redevelopment
Klickitat, WA
Conceptual Design Cost Estimate

Gross Floor Area: **2,432 SF**
Date: **November 18, 2010**
Prepared By: AC

Adult Capture Building
DETAIL OF ESTIMATE

Item Description	Quantity	Unit	Unit Cost Incl	Totals	
A10 FOUNDATIONS					
A1010 Standard Foundation					
A1011 Wall foundations					
Reinforced concrete continuous footings					
Excavate for continuous footings	110	CY	15.00	1,650	
Backfill, assume imported fill	62	CY	26.00	1,602	
Disposal of excavated material off-site within 8 miles, assumed a 33% swell factor	146	CY	14.00	2,048	
Fine grade bottom of footing	594	SF	0.70	416	
Formwork to foundations - sides	792	SF	7.00	5,544	
Reinforcing steel in foundations	6,050	LB	0.75	4,538	
Concrete, 4,000 psi	48	CY	265.00	12,826	
Finish to top of footing	594	SF	0.75	446	
A1013 Perimeter drainage and insulation					
Perforated drain pipe and rock	198	LF	18.20	3,604	
Total For Standard Foundations				**32,672**	
A1020 Special Foundation					
No work anticipated				N/A	
Total For Special Foundations					
A1030 Slab on Grade					
A1031 Standard slab on grade					
Reinforced concrete slab on grade, 6" thick					
Fine grade	2,432	SF	0.25	608	
Concrete, 4,000 psi	50	CY	180.00	8,916	
Vapor barrier	2,432	SF	0.53	1,289	
Crushed rock base, 6"	45	CY	30.00	1,351	
Compaction to rock base	2,432	SF	0.20	486	
Edge forms	340	LF	5.00	1,702	
WWF / Reinforcing Steel	2,432	LB	0.80	1,945	
Finish, cure and protect	2,432	SF	0.55	1,337	

Klickitat Hatchery Redevelopment
Klickitat, WA
Conceptual Design Cost Estimate

Gross Floor Area: **2,432 SF**
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Adult Capture Building
DETAIL OF ESTIMATE

	Item Description	Quantity	Unit	Unit Cost Incl	Totals	
	Shrinkage joint	292	LF	1.15	336	
	Miscellaneous					
	Allowance for curbs and pads	1	LS	4,000.00	4,000	
	Total For Slab on Grade				**21,971**	
A20	**BASEMENT CONSTRUCTION**					
A2010	**Basement Excavation**					
	No work anticipated				N/A	
	Total For Basement Excavation					
A2010	**Basement Walls**					
	Reinforced concrete walls					
	Formwork	5,434	SF	9.50	51,623	
	Reinforcing steel	22,692	LB	0.75	17,019	
	Concrete	111	CY	280.00	30,994	
	Excavation at concrete stem walls	310	CY	15.00	4,650	
	Backfill at concrete stem walls	199	CY	10.00	1,993	
	Total For Basement Walls				**106,279**	
B10	**SUPERSTRUCTURE**					
B1010	**Floor Construction**					
	Exterior deck structure and deck	352	SF	48.00	16,896	
	Exterior railings	60	LF	165.00	9,900	
	Total For Floor Construction				**26,796**	

Klickitat Hatchery Redevelopment
Klickitat, WA
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Adult Capture Building
DETAIL OF ESTIMATE

Item Description	Quantity	Unit	Unit Cost Incl	Totals
B1020 Roof Construction				
B1022 Pitched roof construction				
Roof framing	2,541	SF	22.00	55,904
Total For Roof Construction				**55,904**
B20 EXTERIOR CLOSURE				
B2010 Exterior Walls				
B2011 Exterior wall construction				
Wood stud framing	2,377	SF	4.75	11,291
Batt insulation	2,377	SF	0.80	1,902
Split face CMU, assume fully grouted	2,377	SF	18.50	43,975
Reinforcing steel at CMU walls, allow 1.2#/VSF	2,852	LB	0.08	228
Gypsum board to interior side of exterior walls	2,377	SF	2.00	4,754
B2013 Exterior louvers, screens and fencing				
Mechanical louvers	11	SF	36.00	396
Total For Exterior Walls				**62,545**
B2020 Exterior Windows				
B2021 Windows				
Fixed storefront glazed windows	246	SF	65.00	15,990
Total For Exterior Windows				**15,990**
B2030 Exterior Doors				
B2032 Solid exterior doors including frames and hardware				
Single	2	EA	2,250.00	4,500
Overhead coiling door, 10'-0" x 13'-0"	1	EA	6,100.00	6,100
Total For Exterior Doors				**10,600**

Klickitat Hatchery Redevelopment
Klickitat, WA *Gross Floor Area:* **2,432 SF**
Conceptual Design Cost Estimate *Date:* **November 18, 2010**
Prepared By: AC

Adult Capture Building
DETAIL OF ESTIMATE

	Item Description	Quantity	Unit	Unit Cost Incl	Totals	
B30	**ROOFING**					
B3010	**Roof Covering**					
	B3011 Roof finishes					
	Standing seam metal roof	2,541	SF	17.00	43,199	
	Snowguards	1	LS	1,400.00	1,400	
	B3014 Flashings and trim					
	Sheet metal flashing	1	LS	2,250.00	2,250	
	Caulking, sealants and firestopping					
	Caulking and sealants	2,432	SF	0.60	1,459	
	Firestopping	2,432	SF	0.33	802	
	Miscellaneous					
	Rough carpentry	1	LS	1,500.00	1,500	
	Total For Roofing				**50,610**	
C10	**INTERIOR CONSTRUCTION**					
C1010	**Partitions**					
	C1011 Fixed partitions					
	CMU walls	605	SF	17.00	10,285	
	Total For Interior Partitions				**10,285**	
C1020	**Interior Doors**					
	C1021 Interior doors					
	Interior doors, frames and hardware					

Adult Capture Building
DETAIL OF ESTIMATE

Item Description	Quantity	Unit	Unit Cost Incl	Totals
Hollow metal doors				
Single	3	EA	1,670.00	5,010
Total For Interior Doors				**5,010**
C1030 Specialties				
C1033 Storage shelving and lockers				
Shelving, allow	1	LS	2,500.00	2,500
Lockers, allow	1	LS	5,000.00	5,000
C1035 Identifying devices				
Code required signage	2,432	SF	0.10	243
Wayfinding and room identification signage	2,432	SF	0.12	292
C1037 General fittings and misc. metals				
Miscellaneous metals, allow 0.4#/SF	973	LB	2.50	2,432
Restroom accessories	1	LS	400.00	400
Grab bars	1	EA	185.00	185
Mirrors at restrooms	1	EA	125.00	125
Fire extinguisher cabinets	2	EA	242.00	484
Benches	1	LS	850.00	850
Total For Fittings and Specialty Items				**12,511**
C20 STAIRS				
C2010 Stair Construction				
Exterior stairs including railings	1	EA	11,500.00	11,500
Total For Stair Construction				**11,500**
C30 INTERIOR FINISHES				
C3010 Wall Finishes				
C3011 Wall finishes to inside exterior walls				
Paint to interior side of exterior walls	2,377	SF	0.75	1,783

Klickitat Hatchery Redevelopment
Klickitat, WA
Conceptual Design Cost Estimate

Gross Floor Area: **2,432 SF**
Date: **November 18, 2010**
Prepared By: AC

Adult Capture Building
DETAIL OF ESTIMATE

	Item Description	Quantity	Unit	Unit Cost Incl	Totals	
	C3012 Wall finishes to interior walls					
	Paint to walls	1,210	SF	0.75	908	
	Total For Wall Finishes				**2,690**	
C3020	**Floor Finishes**					
	C3024 Flooring including base					
	Floor finishes	2,432	SF	1.50	3,648	
	Total For Floor Finishes				**3,648**	
C3030	**Ceiling Finishes**					
	No work anticipated				N/A	
	Total For Ceiling Finishes					
D10	**CONVEYING**					
D1010	**Elevator & Lift**					
	No work anticipated				N/A	
	Total For Elevator & Lifts					
D20	**PLUMBING**					
D2010	**Plumbing**					
	Sanitary fixtures including connection piping					
	Water closets	2	EA	1,250.00	2,500	
	Urinals	1	EA	1,150.00	1,150	
	Lavatories	2	EA	950.00	1,900	
	Janitors sinks	1	EA	1,350.00	1,350	
	Sinks - allow	2	EA	1,025.00	2,050	

Klickitat Hatchery Redevelopment
Klickitat, WA
Conceptual Design Cost Estimate

Gross Floor Area: **2,432 SF**
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Adult Capture Building
DETAIL OF ESTIMATE

	Item Description	Quantity	Unit	Unit Cost Incl	Totals	
	Domestic water systems					
	Water heater, electric	1	LS	3,000.00	3,000	
	Recirculation pumps	1	EA	1,250.00	1,250	
	Domestic hot and cold water piping, fittings, valves and insulation - to sanitary fixtures and hose bibbs	10	EA	1,250.00	12,500	
	Hose bibbs	2	EA	500.00	1,000	
	Sanitary waste systems					
	Floor drains and sinks	3	EA	750.00	2,250	
	Waste/vent piping, fittings, valves and insulation - to sanitary fixtures and floor drains	13	EA	1,250.00	16,250	
	Miscellaneous					
	Allowance for tranch and floor drains	1	LS	6,750.00	6,750	
	Total For Plumbing				**51,950**	
	HVAC					
D3010	**HVAC**					
	HVAC installations	2,432	SF	20.00	48,634	
	Total For HVAC				**48,634**	
D40	**FIRE PROTECTION**					
D4010	**Fire Protection**					
	No work anticipated				N/A	
	Total For Fire Sprinkler System					
D50	**ELECTRICAL**					
D5000	**Electrical**					
	Electrical installations	2,432	SF	25.00	60,792	
	Total For Electrical				**60,792**	

Klickitat Hatchery Redevelopment
Klickitat, WA
Conceptual Design Cost Estimate

Gross Floor Area: **2,432 SF**
Date: **November 18, 2010**
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Adult Capture Building
DETAIL OF ESTIMATE

	Item Description	Quantity	Unit	Unit Cost Incl	Totals	
E10	**EQUIPMENT**					
E1010	**Equipment**					
	No work anticipated				N/A	
	Total For Equipment					
E20	**FURNISHINGS**					
E2010	**Fixed Furnishing**					
	E2012 Fixed casework					
	Vanity, including support framing	6	LF	130.00	780	
	E2013 Blinds and other window treatments					
	Window treatments, allow	246	SF	7.70	1,894	
	E2014 Fixed floor grilles and mats					
	Walk-off mats, allow	1	LS	1,100.00	1,100	
	Total For Furniture				**3,774**	
F10	**SPECIAL STRUCTURES**					
F1010	**Special Structure**					
	No work anticipated				N/A	
	Total For Special Structure					
F1020	**Special Construction**					
	Fish lift, allow	1	LS	50,000.00	50,000	
	Fish pit tag, allow	1	LS	280,000.00	280,000	
	Total For Special Construction				**330,000**	
F20	**SELECTIVE BUILDING DEMOLITION**					
F2010	**Building Element Demolition**					
	No work anticipated				N/A	
	Total For Selected Demolition					

Klickitat Hatchery Redevelopment
Klickitat, WA
Conceptual Design Cost Estimate

Gross Floor Area: **2,432 SF**
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Adult Capture Building
DETAIL OF ESTIMATE

Item Description	Quantity	Unit	Unit Cost Incl	Totals	

TOTAL DIRECT COST FOR ADULT CAPTURE **924,161**

Klickitat Hatchery Redevelopment
Klickitat, WA
Conceptual Design Cost Estimate

Gross Floor Area: **1,388 SF**
Date: **November 18, 2010**
Prepared By: AC

Fish Feed Storage Building
DETAIL OF ESTIMATE

	Item Description	Quantity	Unit	Unit Cost Incl	Totals	
A10	**FOUNDATIONS**					
A1010	**Standard Foundation**					
	No work anticipated				N/A	
	Total For Standard Foundations					
A1020	**Special Foundation**					
	No work anticipated				N/A	
	Total For Special Foundations					
A1030	**Slab on Grade**					
	No work anticipated				N/A	
	Total For Slab on Grade					
A20	**BASEMENT CONSTRUCTION**					
A2010	**Basement Excavation**					
	No work anticipated				N/A	
	Total For Basement Excavation					
A2010	**Basement Walls**					
	No work anticipated				N/A	
	Total For Basement Walls					
B10	**SUPERSTRUCTURE**					
B1010	**Floor Construction**					
	No work anticipated				N/A	
	Total For Floor Construction					

Klickitat Hatchery Redevelopment
Klickitat, WA
Conceptual Design Cost Estimate

Gross Floor Area: **1,388 SF**
Date: **November 18, 2010**
Prepared By: AC

Fish Feed Storage Building
DETAIL OF ESTIMATE

Item Description	Quantity	Unit	Unit Cost Incl	Totals	

B1020 Roof Construction

No work anticipated N/A

Total For Roof Construction

B20 EXTERIOR CLOSURE

B2010 Exterior Walls

No work anticipated N/A

Total For Exterior Walls

B2020 Exterior Windows

No work anticipated N/A

Total For Exterior Windows

B2030 Exterior Doors

No work anticipated N/A

Total For Exterior Doors

B30 ROOFING

B3010 Roof Covering

No work anticipated N/A

Total For Roofing

C10 INTERIOR CONSTRUCTION

Klickitat Hatchery Redevelopment
Klickitat, WA
Conceptual Design Cost Estimate

Gross Floor Area: **1,388 SF**
Date: **November 18, 2010**
Prepared By: AC

Fish Feed Storage Building
DETAIL OF ESTIMATE

	Item Description	Quantity	Unit	Unit Cost Incl	Totals	
C1010	**Partitions**					
	No work anticipated				N/A	
	Total For Interior Partitions					
C1020	**Interior Doors**					
	No work anticipated				N/A	
	Total For Interior Doors					
C1030	**Specialties**					
	No work anticipated				N/A	
	Total For Fittings and Specialty Items					
C20	**STAIRS**					
C2010	**Stair Construction**					
	No work anticipated				N/A	
	Total For Stair Construction					
C30	**INTERIOR FINISHES**					
C3010	**Wall Finishes**					
	C3011 Wall finishes to inside exterior walls					
	Paint to interior side of exterior walls	1	LS	1,500.00	1,500	
	C3012 Wall finishes to interior walls					
	Paint to walls	1	LS	500.00	500	
	Total For Wall Finishes				**2,000**	

Klickitat Hatchery Redevelopment
Klickitat, WA
Conceptual Design Cost Estimate

Gross Floor Area: **1,388 SF**
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Fish Feed Storage Building
DETAIL OF ESTIMATE

	Item Description	Quantity	Unit	Unit Cost Incl	Totals	
C3020	**Floor Finishes**					
	No work anticipated				N/A	
	Total For Floor Finishes					
C3030	**Ceiling Finishes**					
	No work anticipated				N/A	
	Total For Ceiling Finishes					
D10	**CONVEYING**					
D1010	**Elevator & Lift**					
	No work anticipated				N/A	
	Total For Elevator & Lifts					
D20	**PLUMBING**					
D2010	**Plumbing**					
	Plumbing installations	1,388	SF	2.00	2,776	
	Total For Plumbing				**2,776**	
	HVAC					
D3010	**HVAC**					
	HVAC installations	1,388	SF	5.00	6,940	
	Total For HVAC				**6,940**	

Klickitat Hatchery Redevelopment
Klickitat, WA
Conceptual Design Cost Estimate

Gross Floor Area: **1,388 SF**
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Fish Feed Storage Building
DETAIL OF ESTIMATE

	Item Description	Quantity	Unit	Unit Cost Incl	Totals	
D40	**FIRE PROTECTION**					
D4010	**Fire Protection**					
	No work anticipated				N/A	
	Total For Fire Sprinkler System					
D50	**ELECTRICAL**					
D5000	**Electrical**					
	Electrical installations	1,388	SF	10.00	13,880	
	Total For Electrical				**13,880**	
E10	**EQUIPMENT**					
E1010	**Equipment**					
	No work anticipated				N/A	
	Total For Equipment					
E20	**FURNISHINGS**					
E2010	**Fixed Furnishing**					
	No work anticipated				N/A	
	Total For Furniture					
F10	**SPECIAL STRUCTURES**					
F1010	**Special Structure**					
	No work anticipated				N/A	
	Total For Special Structure					
F1020	**Special Construction**					
	No work anticipated				N/A	
	Total For Special Construction					

Klickitat Hatchery Redevelopment
Klickitat, WA
Conceptual Design Cost Estimate

Gross Floor Area: **1,388 SF**
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Fish Feed Storage Building
DETAIL OF ESTIMATE

Item Description	Quantity	Unit	Unit Cost Incl	Totals	
F20 SELECTIVE BUILDING DEMOLITION					
F2010 Building Element Demolition					
No work anticipated				N/A	
Total For Selected Demolition					
TOTAL DIRECT COST FOR FISH FEED				**25,596**	

Klickitat Hatchery Redevelopment
Klickitat, WA
Conceptual Design Cost Estimate

Gross Floor Area: **1,410 SF**
Date: **November 18, 2010**
Prepared By: AC

Energy Dissipation Building
DETAIL OF ESTIMATE

Item Description	Quantity	Unit	Unit Cost Incl	Totals
A10 FOUNDATIONS				
A1010 Standard Foundation				
A1011 Wall foundations				
Reinforced concrete continuous footings				
Excavate for continuous footings	20	CY	15.00	300
Backfill, assume imported fill	13	CY	24.00	312
Disposal of excavated material off-site within 8 miles, assumed a 33% swell factor	26	CY	10.00	260
Fine grade bottom of footing	114	SF	0.70	80
Formwork to foundations - sides	171	SF	6.95	1,188
Reinforcing steel in foundations	875	LB	0.72	630
Concrete, 4,000 psi	7	CY	270.00	1,890
Finish to top of footing	114	SF	0.75	86
Tie into existing foundation	1	LS	500.00	500
A1013 Perimeter drainage and insulation				
Perforated drain pipe and rock	57	LF	18.20	1,037
Total For Standard Foundations				**6,283**
A1020 Special Foundation				
No work anticipated				N/A
Total For Special Foundations				
A1030 Slab on Grade				
A1031 Standard slab on grade				
Reinforced concrete slab on grade, 4" thick				
Fine grade	380	SF	0.25	95
Concrete, 4,000 psi	8	CY	260.00	2,013
Vapor barrier	380	SF	0.53	201
Crushed rock base, 6"	7	CY	30.00	211
Compaction to rock base	380	SF	0.20	76
Edge forms	53	LF	5.00	266
WWF / Reinforcing Steel	475	LB	0.80	380

Item Description	Quantity	Unit	Unit Cost Incl	Totals
Finish, cure and protect	380	SF	0.55	209
Shrinkage joint	46	LF	1.15	53
Tie into existing structure	1	LS	420.00	420
Total For Slab on Grade				**3,924**
A20 BASEMENT CONSTRUCTION				
A2010 Basement Excavation				
No work anticipated				N/A
Total For Basement Excavation				
A2010 Basement Walls				
Reinforced concrete stem walls				
Formwork	257	SF	9.50	2,437
Reinforcing steel	1,055	LB	0.75	792
Concrete	5	CY	280.00	1,463
Excavation at concrete stem walls	26	CY	15.00	396
Backfill at concrete stem walls	21	CY	10.00	212
Total For Basement Walls				**5,299**
B10 SUPERSTRUCTURE				
B1010 Floor Construction				
No work anticipated				N/A
Total For Floor Construction				
B1020 Roof Construction				
B1022 Pitched roof construction				
Roof framing	503	SF	22.00	11,066
Modifications to existing roof structure	1	LS	1,500.00	1,500

	Item Description	Quantity	Unit	Unit Cost Incl	Totals	
	B1023 Canopies					
	Canopy framing and posts	84	SF	14.00	1,176	
	Metal decking	84	SF	5.00	420	
	Standing seam metal roof	84	SF	17.00	1,428	
	Total For Roof Construction				**15,590**	
B20	**EXTERIOR CLOSURE**					
B2010	**Exterior Walls**					
	B2011 Exterior wall construction					
	Split face CMU, assume fully grouted	818	SF	18.50	15,133	
	Reinforcing steel at CMU walls, allow 1.2#/VSF	982	LB	0.75	736	
	B2013 Exterior louvers, screens and fencing					
	Mechanical louvers	6	SF	65.00	390	
	Total For Exterior Walls				**16,259**	
B2020	**Exterior Windows**					
	B2021 Windows					
	No work anticipated				N/A	
	Total For Exterior Windows					
B2030	**Exterior Doors**					
	B2032 Solid exterior doors including frames and hardware					
	Double	1	EA	3,550.00	3,550	
	Total For Exterior Doors				**3,550**	

Klickitat Hatchery Redevelopment
Klickitat, WA *Gross Floor Area:* **1,410 SF**
Conceptual Design Cost Estimate *Date:* **November 18, 2010**
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Energy Dissipation Building
DETAIL OF ESTIMATE

	Item Description	Quantity	Unit	Unit Cost Incl	Totals	
B30	**ROOFING**					
B3010	**Roof Covering**					
	B3011 Roof finishes					
	Standing seam metal roof	540	SF	17.00	9,180	
	Snowguards	1	LS	400.00	400	
	B3014 Flashings and trim					
	Sheet metal flashing	1	LS	700.00	700	
	Caulking, sealants and firestopping					
	Caulking and sealants	1,410	SF	0.60	846	
	Firestopping	1,410	SF	0.33	465	
	Miscellaneous					
	Rough carpentry	1	LS	500.00	500	
	Total For Roofing				**12,091**	
C10	**INTERIOR CONSTRUCTION**					
C1010	**Partitions**					
	No work anticipated				N/A	
	Total For Interior Partitions					
C1020	**Interior Doors**					
	No work anticipated				N/A	
	Total For Interior Doors					

Klickitat Hatchery Redevelopment
Klickitat, WA
Conceptual Design Cost Estimate

Gross Floor Area: **1,410 SF**
Date: **November 18, 2010**
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Energy Dissipation Building
DETAIL OF ESTIMATE

	Item Description	Quantity	Unit	Unit Cost Incl	Totals	
C1030	**Specialties**					
	No work anticipated				N/A	
	Total For Fittings and Specialty Items					
C20	**STAIRS**					
C2010	**Stair Construction**					
	No work anticipated				N/A	
	Total For Stair Construction					
C30	**INTERIOR FINISHES**					
C3010	**Wall Finishes**					
	No work anticipated				N/A	
	Total For Wall Finishes					
C3020	**Floor Finishes**					
	C3024 Flooring including base					
	Allow for concrete sealer	1,410	SF	1.50	2,115	
	Total For Floor Finishes				**2,115**	
C3030	**Ceiling Finishes**					
	C3031 Ceiling finishes					
	No work anticipated				N/A	
	Total For Ceiling Finishes					

Klickitat Hatchery Redevelopment
Klickitat, WA
Conceptual Design Cost Estimate

Gross Floor Area: **1,410 SF**
Date: **November 18, 2010**
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Energy Dissipation Building
DETAIL OF ESTIMATE

	Item Description	Quantity	Unit	Unit Cost Incl	Totals	
D10	**CONVEYING**					
D1010	**Elevator & Lift**					
	No work anticipated				N/A	
	Total For Elevator & Lifts					
D20	**PLUMBING**					
D2010	**Plumbing**					
	No work anticipated				N/A	
	Total For Plumbing					
	HVAC					
D3010	**HVAC**					
	HVAC installations	1,410	SF	10.00	14,100	
	Total For HVAC				**14,100**	
D40	**FIRE PROTECTION**					
D4010	**Fire Protection**					
	No work anticipated				N/A	
	Total For Fire Sprinkler System					
D50	**ELECTRICAL**					
D5000	**Electrical**					
	Electrical installations	1,410	SF	15.00	21,150	
	Total For Electrical				**21,150**	

Klickitat Hatchery Redevelopment
Klickitat, WA
Conceptual Design Cost Estimate

Gross Floor Area: **1,410 SF**
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Energy Dissipation Building
DETAIL OF ESTIMATE

	Item Description	Quantity	Unit	Unit Cost Incl	Totals	
E10	**EQUIPMENT**					
E1010	**Equipment**					
	No work anticipated				N/A	
	Total For Equipment					
E20	**FURNISHINGS**					
E2010	**Fixed Furnishing**					
	No work anticipated				N/A	
	Total For Furniture					
F10	**SPECIAL STRUCTURES**					
F1010	**Special Structure**					
	No work anticipated				N/A	
	Total For Special Structure					
F1020	**Special Construction**					
	No work anticipated				N/A	
	Total For Special Construction					
F20	**SELECTIVE BUILDING DEMOLITION**					
F2010	**Building Element Demolition**					
	No work anticipated				N/A	
	Total For Selected Demolition					
	TOTAL DIRECT COST FOR ENERGY DISSIPATION				**100,361**	

Klickitat Hatchery Redevelopment
Klickitat, WA
Conceptual Design Cost Estimate

Gross Floor Area: **332 SF**
Date: **November 18, 2010**
Prepared By: AC

Chemical Storage Building
DETAIL OF ESTIMATE

Item Description	Quantity	Unit	Unit Cost Incl	Totals	
A10 FOUNDATIONS					
A1010 Standard Foundation					
A1011 Wall foundations					
Reinforced concrete continuous footings					
Excavate for continuous footings	20	CY	15.00	300	
Backfill, assume imported fill	12	CY	24.00	288	
Disposal of excavated material off-site within 8 miles, assumed a 33% swell factor	26	CY	10.00	260	
Fine grade bottom of footing	150	SF	0.70	105	
Formwork to foundations - sides	225	SF	6.95	1,564	
Reinforcing steel in foundations	958	LB	0.72	690	
Concrete, 4,000 psi	8	CY	270.00	2,250	
Finish to top of footing	150	SF	0.75	113	
Containment pit / vault	1	EA	2,800.00	2,800	
A1013 Perimeter drainage and insulation					
Perforated drain pipe and rock	75	LF	18.20	1,365	
Total For Standard Foundations				**9,734**	
A1020 Special Foundation					
No work anticipated				N/A	
Total For Special Foundations					
A1030 Slab on Grade					
A1031 Standard slab on grade					
Reinforced concrete slab on grade, 6" thick					
Fine grade	332	SF	0.25	83	
Concrete, 4,000 psi	6	CY	260.00	1,599	
Vapor barrier	332	SF	0.53	176	
Crushed rock base, 6"	6	CY	30.00	184	
Compaction to rock base	332	SF	0.20	66	
Edge forms	46	LF	5.00	232	
WWF / Reinforcing Steel	332	LB	0.80	266	

Item Description	Quantity	Unit	Unit Cost Incl	Totals
Finish, cure and protect	332	SF	0.55	183
Shrinkage joint	583	LF	1.15	670
Total For Slab on Grade				**3,459**
A20 BASEMENT CONSTRUCTION				
A2010 Basement Excavation				
No work anticipated				N/A
Total For Basement Excavation				
A2010 Basement Walls				
Reinforced concrete stem walls				
Formwork	338	SF	9.50	3,206
Reinforcing steel	1,389	LB	0.75	1,042
Concrete	7	CY	280.00	1,925
Excavation at concrete stem walls	35	CY	15.00	521
Backfill at concrete stem walls	28	CY	10.00	278
Total For Basement Walls				**6,972**
B10 SUPERSTRUCTURE				
B1010 Floor Construction				
No work anticipated				N/A
Total For Floor Construction				
B1020 Roof Construction				
B1022 Pitched roof construction				
Roof framing	503	SF	22.00	11,066
Total For Roof Construction				**11,066**

Klickitat Hatchery Redevelopment
Klickitat, WA
Conceptual Design Cost Estimate

Gross Floor Area: **332 SF**
Date: **November 18, 2010**
Prepared By: AC

Chemical Storage Building
DETAIL OF ESTIMATE

	Item Description	Quantity	Unit	Unit Cost Incl	Totals
B20	**EXTERIOR CLOSURE**				
B2010	**Exterior Walls**				
	B2011 Exterior wall construction				
	Split face CMU, assume fully grouted	822	SF	18.50	15,207
	Reinforcing steel at CMU walls, allow 1.2#/VSF	986	LB	0.75	740
	B2013 Exterior louvers, screens and fencing				
	Mechanical louvers	5	SF	65.00	325
	Total For Exterior Walls				**16,272**
B2020	**Exterior Windows**				
	B2021 Windows				
	Fixed storefront glazed windows	11	SF	65.00	715
	Total For Exterior Windows				**715**
B2030	**Exterior Doors**				
	B2032 Solid exterior doors including frames and hardware				
	Single	1	EA	1,950.00	1,950
	Overhead coiling door, 10'-0" x 10'-0"	1	EA	4,700.00	4,700
	Total For Exterior Doors				**6,650**
B30	**ROOFING**				
B3010	**Roof Covering**				
	B3011 Roof finishes				
	Standing seam metal roof	503	SF	17.00	8,551
	Snowguards	1	LS	550.00	550
	B3014 Flashings and trim				
	Sheet metal flashing	1	LS	750.00	750

Item Description	Quantity	Unit	Unit Cost Incl	Totals
Caulking, sealants and firestopping				
Caulking and sealants	332	SF	0.60	199
Firestopping	332	SF	0.33	110
Miscellaneous				
Rough carpentry	1	LS	250.00	250
Total For Roofing				**10,410**
C10 INTERIOR CONSTRUCTION				
C1010 Partitions				
No work anticipated				N/A
Total For Interior Partitions				
C1020 Interior Doors				
No work anticipated				N/A
Total For Interior Doors				
C1030 Specialties				
No work anticipated				N/A
Total For Fittings and Specialty Items				
C20 STAIRS				
C2010 Stair Construction				
No work anticipated				N/A
Total For Stair Construction				
C30 INTERIOR FINISHES				
C3010 Wall Finishes				
No work anticipated				N/A

Klickitat Hatchery Redevelopment
Klickitat, WA
Conceptual Design Cost Estimate

Gross Floor Area: **332 SF**
Date: **November 18, 2010**
Prepared By: AC

Chemical Storage Building
DETAIL OF ESTIMATE

Item Description	Quantity	Unit	Unit Cost Incl	Totals	
Total For Wall Finishes					
C3020 Floor Finishes					
C3024 Flooring including base					
Allow for concrete sealer	332	SF	1.50	498	
Total For Floor Finishes				**498**	
C3030 Ceiling Finishes					
C3031 Ceiling finishes					
No work anticipated				N/A	
Total For Ceiling Finishes					
D10 CONVEYING					
D1010 Elevator & Lift					
No work anticipated				N/A	
Total For Elevator & Lifts					
D20 PLUMBING					
D2010 Plumbing					
No work anticipated				N/A	
Total For Plumbing					

Klickitat Hatchery Redevelopment
Klickitat, WA
Conceptual Design Cost Estimate

Gross Floor Area: **332 SF**
Date: **November 18, 2010**
Prepared By: AC

Chemical Storage Building
DETAIL OF ESTIMATE

	Item Description	Quantity	Unit	Unit Cost Incl	Totals	
	HVAC					
D3010	**HVAC**					
	HVAC installations	332	SF	7.50	2,490	
	Total For HVAC				**2,490**	
D40	**FIRE PROTECTION**					
D4010	**Fire Protection**					
	No work anticipated				N/A	
	Total For Fire Sprinkler System					
D50	**ELECTRICAL**					
D5000	**Electrical**					
	Electrical installations	332	SF	7.50	2,490	
	Total For Electrical				**2,490**	
E10	**EQUIPMENT**					
E1010	**Equipment**					
	No work anticipated				N/A	
	Total For Equipment					
E20	**FURNISHINGS**					
E2010	**Fixed Furnishing**					
	No work anticipated				N/A	
	Total For Furniture					
F10	**SPECIAL STRUCTURES**					
F1010	**Special Structure**					
	No work anticipated				N/A	
	Total For Special Structure					

Klickitat Hatchery Redevelopment
Klickitat, WA
Conceptual Design Cost Estimate

Gross Floor Area: **332 SF**
Date: **November 18, 2010**
Prepared By: AC

Chemical Storage Building
DETAIL OF ESTIMATE

Item Description	Quantity	Unit	Unit Cost Incl	Totals	
F1020 Special Construction					
No work anticipated				N/A	
Total For Special Construction					
F20 SELECTIVE BUILDING DEMOLITION					
F2010 Building Element Demolition					
No work anticipated				N/A	
Total For Selected Demolition					
TOTAL DIRECT COST FOR CHEMICAL STORAGE				**70,756**	

Klickitat Hatchery Redevelopment
Klickitat, WA
Conceptual Design Cost Estimate

Gross Floor Area: **1,920 SF**
Date: **November 18, 2010**
Prepared By: AC

Storage Building
DETAIL OF ESTIMATE

Item Description	Quantity	Unit	Unit Cost Incl	Totals
A10 FOUNDATIONS				
A1010 Standard Foundation				
A1012 Column foundations and pile caps				
Reinforced concrete spread footings				
Excavate for continuous footings	33	CY	15.00	499
Backfill, assume imported fill	25	CY	24.00	599
Disposal of excavated material off-site within 8 miles, assumed a 33% swell factor	44	CY	10.00	443
Fine grade bottom of footing	192	SF	0.70	134
Formwork to foundations - sides	225	SF	6.95	1,561
Reinforcing steel in foundations, allow 100#/CY	4,200	LB	0.72	3,024
Concrete, 4,000 psi	8	CY	275.00	2,288
Finish to top of footing	192	SF	0.75	144
A1013 Perimeter drainage and insulation				
Perforated drain pipe and rock	185	LF	18.20	3,367
Total For Standard Foundations				**12,060**
A1020 Special Foundation				
No work anticipated				N/A
Total For Special Foundations				
A1030 Slab on Grade				
A1031 Standard slab on grade				
Reinforced concrete slab on grade, 7" thick				
Fine grade	1,920	SF	0.25	480
Concrete, 4,000 psi	46	CY	260.00	11,864
Vapor barrier	1,920	SF	0.53	1,018
Crushed rock base, 6"	36	CY	30.00	1,067
Compaction to rock base	1,920	SF	0.20	384
Edge forms	269	LF	5.00	1,344
Reinforcing steel	2,496	LB	0.80	1,997
Finish, cure and protect	1,920	SF	0.55	1,056

Klickitat Hatchery Redevelopment
Klickitat, WA
Conceptual Design Cost Estimate

Gross Floor Area: **1,920 SF**
Date: **November 18, 2010**
Prepared By: AC

Storage Building
DETAIL OF ESTIMATE

Item Description	Quantity	Unit	Unit Cost Incl	Totals
Shrinkage joint	583	LF	1.15	670
Total For Slab on Grade				**19,879**
A20 BASEMENT CONSTRUCTION				
A2010 Basement Excavation				
No work anticipated				N/A
Total For Basement Excavation				
A2010 Basement Walls				
Reinforced concrete stem walls				
Formwork	833	SF	9.50	7,909
Reinforcing steel	3,426	LB	0.75	2,569
Concrete	17	CY	280.00	4,748
Excavation at concrete stem walls	74	CY	15.00	1,110
Backfill at concrete stem walls	57	CY	10.00	570
Total For Basement Walls				**16,907**
B10 SUPERSTRUCTURE				
B1010 Floor Construction				
No work anticipated				N/A
Total For Floor Construction				
B1020 Roof Construction				
B1022 Pitched roof construction				
Remove and reassemble existing roof structure	1,920	SF	3.50	6,720
Total For Roof Construction				**6,720**

Klickitat Hatchery Redevelopment
Klickitat, WA
Conceptual Design Cost Estimate

Gross Floor Area: **1,920 SF**
Date: **November 18, 2010**
Prepared By: AC

Storage Building
DETAIL OF ESTIMATE

	Item Description	Quantity	Unit	Unit Cost Incl	Totals	
B20	**EXTERIOR CLOSURE**					
B2010	**Exterior Walls**					
	B2011 Exterior wall construction					
	Remove and reassemble existing cladding including windows and doors	1,920	SF	5.20	9,984	
	Total For Exterior Walls				**9,984**	
B2020	**Exterior Windows**					
	B2021 Windows					
	Included in exterior wall construction				N/A	
	Total For Exterior Windows					
B2030	**Exterior Doors**					
	B2032 Exterior doors including frames and hardware					
	Included in exterior wall construction				N/A	
	Total For Exterior Doors					
B30	**ROOFING**					
B3010	**Roof Covering**					
	B3010 Roof covering					
	Remove and reinstall existing roof covering	1,920	SF	5.40	10,368	
	Total For Roofing				**10,368**	
C10	**INTERIOR CONSTRUCTION**					
C1010	**Partitions**					
	No work anticipated				N/A	
	Total For Interior Partitions					

Klickitat Hatchery Redevelopment
Klickitat, WA
Conceptual Design Cost Estimate

Gross Floor Area: **1,920 SF**
Date: **November 18, 2010**
Prepared By: AC

Storage Building
DETAIL OF ESTIMATE

	Item Description	Quantity	Unit	Unit Cost Incl	Totals	
C1020	**Interior Doors**					
	No work anticipated				N/A	
	Total For Interior Doors					
C1030	**Specialties**					
	No work anticipated				N/A	
	Total For Fittings and Specialty Items					
C20	**STAIRS**					
C2010	**Stair Construction**					
	No work anticipated				N/A	
	Total For Stair Construction					
C30	**INTERIOR FINISHES**					
C3010	**Wall Finishes**					
	No work anticipated				N/A	
	Total For Wall Finishes					
C3020	**Floor Finishes**					
	C3024 Flooring including base					
	Concrete sealer at slab on grade	1,920	SF	1.50	2,880	
	Total For Floor Finishes				**2,880**	
C3030	**Ceiling Finishes**					
	No work anticipated				N/A	
	Total For Ceiling Finishes					

Klickitat Hatchery Redevelopment
Klickitat, WA
Conceptual Design Cost Estimate

Gross Floor Area: **1,920 SF**
Date: **November 18, 2010**
Prepared By: AC

Storage Building
DETAIL OF ESTIMATE

	Item Description	Quantity	Unit	Unit Cost Incl	Totals	
D10	**CONVEYING**					
D1010	**Elevator & Lift**					
	No work anticipated				N/A	
	Total For Elevator & Lifts					
D20	**PLUMBING**					
D2010	**Plumbing**					
	No work anticipated				N/A	
	Total For Plumbing					
	HVAC					
D3010	**HVAC**					
	No work anticipated				N/A	
	Total For HVAC					
D40	**FIRE PROTECTION**					
D4010	**Fire Protection**					
	No work anticipated				N/A	
	Total For Fire Sprinkler System					
D50	**ELECTRICAL**					
D5000	**Electrical**					
	Electrical systems, complete	1,920	SF	7.50	14,400	
	Total For Electrical				**14,400**	

Klickitat Hatchery Redevelopment
Klickitat, WA
Conceptual Design Cost Estimate

Gross Floor Area: **1,920 SF**
Date: **November 18, 2010**
Prepared By: AC

Storage Building
DETAIL OF ESTIMATE

	Item Description	Quantity	Unit	Unit Cost Incl	Totals	
E10	**EQUIPMENT**					
E1010	**Equipment**					
	No work anticipated				N/A	
	Total For Equipment					
E20	**FURNISHINGS**					
E2010	**Fixed Furnishing**					
	No work anticipated				N/A	
	Total For Furniture					
F10	**SPECIAL STRUCTURES**					
F1010	**Special Structure**					
	No work anticipated				N/A	
	Total For Special Structure					
F1020	**Special Construction**					
	No work anticipated				N/A	
	Total For Special Construction					
F20	**SELECTIVE BUILDING DEMOLITION**					
F2010	**Building Element Demolition**					
	Demolish and remove existing slab on grade and footings	1,920	SF	2.10	4,032	
	Total For Selected Demolition				**4,032**	
	TOTAL DIRECT COST FOR STORAGE BUILDING				**97,229**	

Klickitat Hatchery Redevelopment
Klickitat, WA
Conceptual Design Cost Estimate

Gross Floor Area: **4,750 SF**
Date: **November 18, 2010**
Prepared By: AC

Water Distribution Building (Pump House)
DETAIL OF ESTIMATE

	Item Description	Quantity	Unit	Unit Cost Incl	Totals	
A10	**FOUNDATIONS**					
A1010	**Standard Foundation**					
	A1011 Wall foundations					
	Foundation system	4,750	SF	7.50	35,625	
	A1013 Perimeter drainage and insulation					
	Perforated drain pipe and rock	290	LF	18.20	5,278	
	Total For Standard Foundations				**40,903**	
A1020	**Special Foundation**					
	No work anticipated				N/A	
	Total For Special Foundations					
A1030	**Slab on Grade**					
	A1031 Standard slab on grade					
	Reinforced concrete slab on grade	4,750	SF	8.50	40,375	
	Miscellaneous					
	Allowance for grating, curbs and pads	1	LS	45,000.00	45,000	
	Total For Slab on Grade				**40,375**	
A20	**BASEMENT CONSTRUCTION**					
A2010	**Basement Excavation**					
	No work anticipated				N/A	
	Total For Basement Excavation					
A2010	**Basement Walls**					
	Reinforced concrete stem walls	1,450	SF	35.00	50,750	
	Excavation and backfill	1	LS	8,000.00	8,000	

Klickitat Hatchery Redevelopment
Klickitat, WA
Conceptual Design Cost Estimate

Gross Floor Area: **4,750 SF**
Date: **November 18, 2010**
Prepared By: AC

Water Distribution Building (Pump House)
DETAIL OF ESTIMATE

Item Description	Quantity	Unit	Unit Cost Incl	Totals	
Total For Basement Walls				**58,750**	
B10 SUPERSTRUCTURE					
B1010 Floor Construction					
No work anticipated				N/A	
Total For Floor Construction					
B1020 Roof Construction					
Roof construction	4,750	SF	20.00	95,000	
Total For Roof Construction				**95,000**	
B20 EXTERIOR CLOSURE					
B2010 Exterior Walls					
B2011 Exterior wall construction					
Cladding systems	4,350	SF	20.00	87,000	
Total For Exterior Walls				**87,000**	
B2020 Exterior Windows					
No work anticipated				N/A	
Total For Exterior Windows					
B2030 Exterior Doors					
Exterior doors	1	LS	8,000.00	8,000	
Total For Exterior Doors				**8,000**	
B30 ROOFING					
B3010 Roof Covering					

Item Description	Quantity	Unit	Unit Cost Incl	Totals
B3011 Roof finishes				
Standing seam metal roof	5,000	SF	17.00	85,000
Snowguards	1	LS	1,500.00	1,500
B3014 Flashings and trim				
Sheet metal flashing	1	LS	5,000.00	5,000
B3016 Gutters and downspouts				
Guttering	190	LF	24.00	4,560
Downspouts	6	EA	244.00	1,464
Caulking, sealants and firestopping				
Caulking and sealants	4,750	SF	0.60	2,850
Firestopping	4,750	SF	0.33	1,568
Miscellaneous				
Rough carpentry	1	LS	2,250.00	2,250
Total For Roofing				**104,192**
C10 INTERIOR CONSTRUCTION				
C1010 Partitions				
C1011 Fixed partitions				
CMU walls	360	SF	17.00	6,120
Total For Interior Partitions				**6,120**
C1020 Interior Doors				
C1021 Interior doors				
Interior doors, frames and hardware				
Hollow metal doors				
Single	1	EA	1,670.00	1,670
Total For Interior Doors				**1,670**
C1030 Specialties				

Item Description	Quantity	Unit	Unit Cost Incl	Totals
C1033 Storage shelving and lockers				
Shelving, allow	1	LS	2,500.00	2,500
C1035 Identifying devices				
Code required signage	4,750	SF	0.10	475
Wayfinding and room identification signage	4,750	SF	0.05	238
C1037 General fittings and misc. metals				
Miscellaneous metals, allow 0.4#/SF	1,900	LB	2.50	4,750
Fire extinguisher cabinets	2	EA	242.00	484
Bollards	2	EA	360.00	720
Total For Fittings and Specialty Items				**9,167**
C20 STAIRS				
C2010 Stair Construction				
No work anticipated				N/A
Total For Stair Construction				
C30 INTERIOR FINISHES				
C3010 Wall Finishes				
C3011 Wall finishes to inside exterior walls				
Paint to interior side of exterior walls	4,350	SF	0.75	3,263
C3012 Wall finishes to interior walls				
Paint to walls	720	SF	0.75	540
Total For Wall Finishes				**3,803**
C3020 Floor Finishes				
C3024 Flooring including base				
Concrete sealer	4,750	SF	1.50	7,125

Water Distribution Building (Pump House)
DETAIL OF ESTIMATE

	Item Description	Quantity	Unit	Unit Cost Incl	Totals	
	Total For Floor Finishes				**7,125**	
C3030	**Ceiling Finishes**					
	No work anticipated					
	Total For Ceiling Finishes					
D10	**CONVEYING**					
D1010	**Elevator & Lift**					
	No work anticipated					
	Total For Elevator & Lifts					
D20	**PLUMBING**					
D2010	**Plumbing**					
	Piping and fittings	360	LF	750.00	270,000	
	Pumps	4	EA	35,000.00	140,000	
	Screen wash piping	100	LF	85.00	8,500	
	Screen wash pumps, duplex	1	EA	20,000.00	20,000	
	Screen wash filter, duplex	1	EA	15,000.00	15,000	
	Liquid/solid separator	2	EA	17,500.00	35,000	
	Hydraulic power module (pumps & reservoir)	1	EA	25,000.00	25,000	
	Valves	1	LS	50,000.00	50,000	
	Total For Plumbing				**563,500**	
	HVAC					
D3010	**HVAC**					
	HVAC installations	4,750	SF	5.00	23,750	
	Total For HVAC				**23,750**	

Klickitat Hatchery Redevelopment
Klickitat, WA
Conceptual Design Cost Estimate

Gross Floor Area: **4,750 SF**
Date: **November 18, 2010**
Prepared By: AC

Water Distribution Building (Pump House)
DETAIL OF ESTIMATE

	Item Description	Quantity	Unit	Unit Cost Incl	Totals	
D40	**FIRE PROTECTION**					
D4010	**Fire Protection**					
	No work anticipated				N/A	
	Total For Fire Sprinkler System					
D50	**ELECTRICAL**					
D5000	**Electrical**					
	Electrical installations	4,750	SF	10.00	47,500	
	Connections to pumps and equipment	1	LS	75,000.00	75,000	
	Total For Electrical				**122,500**	
E10	**EQUIPMENT**					
E1010	**Equipment**					
	No work anticipated				N/A	
	Total For Equipment					
E20	**FURNISHINGS**					
E2010	**Fixed Furnishing**					
	No work anticipated				N/A	
	Total For Furniture					
F10	**SPECIAL STRUCTURES**					
F1010	**Special Structure**					
	No work anticipated				N/A	
	Total For Special Structure					
F1020	**Special Construction**					
	No work anticipated				N/A	

Klickitat Hatchery Redevelopment
Klickitat, WA
Conceptual Design Cost Estimate

Gross Floor Area: **4,750 SF**
Date: **November 18, 2010**
Prepared By: AC

Water Distribution Building (Pump House)
DETAIL OF ESTIMATE

Item Description	Quantity	Unit	Unit Cost Incl	Totals	
Total For Special Construction					
F20 SELECTIVE BUILDING DEMOLITION					
F2010 Building Element Demolition					
No work anticipated				N/A	
Total For Selected Demolition					
G BUILDING SITE WORK					
G10 Site Preparation					
Sitework in separate estimate				N/A	
				-	
Total For Site Preparation					
G20 Site Improvements					
Sitework in separate estimate				N/A	
Total For Site Improvement					
G30 Site Mechanical Utilities					
Sitework in separate estimate				N/A	
Total For Site Mechanical Utilities					
G40 Site Electrical Utilities					
Sitework in separate estimate				N/A	
Total For Site Electrical Utilities					
TOTAL DIRECT COST FOR WATER DISTRIBUTION (PUMP HOUSE) BUILDING				**1,194,354**	

Klickitat Hatchery Redevelopment
Klickitat, WA
Conceptual Design Cost Estimate

Gross Floor Area: **33,988 SF**
Date: **November 18, 2010**
Prepared By: AC

Rearing Raceway A, B & C
DETAIL OF ESTIMATE

Item Description	Quantity	Unit	Unit Cost Incl	Totals	
A10 FOUNDATIONS					
A1010 Standard Foundation					
A1011 Wall foundations					
Reinforced concrete continuous footings					
Excavate for continuous footings	132	CY	15.00	1,980	
Backfill, assume imported fill	72	CY	24.00	1,736	
Disposal of excavated material off-site within 8 miles, assumed a 33% swell factor	176	CY	10.00	1,756	
Fine grade bottom of footing	976	SF	0.70	683	
Formwork to foundations - sides	1,356	SF	6.95	9,424	
Reinforcing steel in foundations	7,458	LB	0.72	5,370	
Concrete, 4,000 psi	60	CY	270.00	16,109	
Finish to top of footing	976	SF	0.75	732	
A1012 Column foundations and pile caps					
Reinforced concrete spread footings					
Excavate for continuous footings	340	CY	15.00	5,100	
Backfill, assume imported fill	186	CY	24.00	4,464	
Disposal of excavated material off-site within 8 miles, assumed a 33% swell factor	452	CY	10.00	4,522	
Fine grade bottom of footing	1,890	SF	0.70	1,323	
Formwork to foundations - sides	2,268	SF	6.95	15,763	
Reinforcing steel in foundations, allow 100#/CY	15,400	LB	0.72	11,088	
Concrete, 4,000 psi	154	CY	275.00	42,350	
Finish to top of footing	1,890	SF	0.75	1,418	
A1013 Perimeter drainage and insulation					
Perforated drain pipe and rock	704	LF	18.20	12,813	
Total For Standard Foundations				**136,630**	
A1020 Special Foundation					
No work anticipated				N/A	
Total For Special Foundations					

Klickitat Hatchery Redevelopment
Klickitat, WA
Conceptual Design Cost Estimate

Gross Floor Area: **33,988 SF**
Date: **November 18, 2010**
Prepared By: AC

Rearing Raceway A, B & C
DETAIL OF ESTIMATE

	Item Description	Quantity	Unit	Unit Cost Incl	Totals	
A1030	**Slab on Grade**					
	Patch to existing slabs, allow	1	LS	30,000.00	30,000	
	Total For Slab on Grade				**30,000**	
A20	**BASEMENT CONSTRUCTION**					
A2010	**Basement Excavation**					
	No work anticipated				N/A	
	Total For Basement Excavation					
A2010	**Basement Walls**					
	Reinforced concrete stem walls, 0'-10" thick					
	Formwork	7,040	SF	9.50	66,880	
	Reinforcing steel	23,975	LB	0.75	17,982	
	Concrete	119	CY	280.00	33,233	
	Reinforced concrete stem walls, 0'-6" thick					
	Formwork	2,100	SF	9.50	19,950	
	Reinforcing steel	6,060	LB	0.75	4,545	
	Concrete	30	CY	280.00	8,400	
	Excavation at concrete stem walls	652	CY	15.00	9,778	
	Backfill at concrete stem walls	503	CY	30.00	15,095	
	Reinforced concrete plinths					
	Formwork	672	SF	9.50	6,384	
	Reinforcing steel	3,628	LB	0.75	2,721	
	Concrete	14	CY	295.00	4,038	
	Total For Basement Walls				**189,005**	
B10	**SUPERSTRUCTURE**					
B1010	**Floor Construction**					
	No work anticipated				N/A	
	Total For Floor Construction					

Klickitat Hatchery Redevelopment
Klickitat, WA
Conceptual Design Cost Estimate

Gross Floor Area: **33,988 SF**
Date: **November 18, 2010**
Prepared By: AC

Rearing Raceway A, B & C
DETAIL OF ESTIMATE

Item Description	Quantity	Unit	Unit Cost Incl	Totals	

B1020 Roof Construction

Total For Roof Construction

B20 EXTERIOR CLOSURE

B2010 Exterior Walls

No work anticipated N/A

Total For Exterior Walls

B2020 Exterior Windows

No work anticipated N/A

Total For Exterior Windows

B2030 Exterior Doors

No work anticipated N/A

Total For Exterior Doors

B30 ROOFING

B3010 Roof Covering

No work anticipated N/A

Total For Roofing

C10 INTERIOR CONSTRUCTION

C1010 Partitions

No work anticipated N/A

Total For Interior Partitions

Klickitat Hatchery Redevelopment
Klickitat, WA
Conceptual Design Cost Estimate

Gross Floor Area: **33,988 SF**
Date: **November 18, 2010**
Prepared By: AC

Rearing Raceway A, B & C
DETAIL OF ESTIMATE

	Item Description	Quantity	Unit	Unit Cost Incl	Totals	
C1020	**Interior Doors**					
	No work anticipated				N/A	
	Total For Interior Doors					
C1030	**Specialties**					
	No work anticipated				N/A	
	Total For Fittings and Specialty Items					
C20	**STAIRS**					
C2010	**Stair Construction**					
	No work anticipated				N/A	
	Total For Stair Construction					
C30	**INTERIOR FINISHES**					
C3010	**Wall Finishes**					
	No work anticipated				N/A	
	Total For Wall Finishes					
C3020	**Floor Finishes**					
	No work anticipated				N/A	
	Total For Floor Finishes					
C3030	**Ceiling Finishes**					
	No work anticipated				N/A	
	Total For Ceiling Finishes					
D10	**CONVEYING**					

Klickitat Hatchery Redevelopment
Klickitat, WA *Gross Floor Area:* **33,988 SF**
Conceptual Design Cost Estimate *Date:* **November 18, 2010**
Prepared By: AC

Rearing Raceway A, B & C
DETAIL OF ESTIMATE

Item Description	Quantity	Unit	Unit Cost Incl	Totals	
D1010 Elevator & Lift					
No work anticipated				N/A	
Total For Elevator & Lifts					
D20 PLUMBING					
D2010 Plumbing					
Rearing raceway piping systems - at raceway A&B					
Supply riser piping and fittings	140	LF	125.00	17,500	
Gate valves, flanged	14	EA	2,750.00	38,500	
Valve box, 3' dia, 2.5' deep	14	EA	3,750.00	52,500	
Flex couplings	14	EA	500.00	7,000	
Supply manifold piping and fittings	168	LF	125.00	21,000	
Pipe-o-lets	256	EA	100.00	25,600	
Swinging standpipe	14	EA	1,500.00	21,000	
Winch and motor	14	EA	550.00	7,700	
Spray system					
Spray supply piping and fittings	290	LF	60.00	17,400	
Spray riser piping and fittings	50	LF	40.00	2,000	
Spray distribution piping and fittings	1,000	LF	40.00	40,000	
Y-strainer	10	EA	250.00	2,500	
Gate valve	10	EA	185.00	1,850	
Sprinkler head - rainjet 73C - install only (supplied by others)	24	EA	50.00	1,200	
Sprinkler head - rainjet 62C	12	EA	85.00	1,020	
Sprinkler head - rainjet 61C	8	EA	85.00	680	
Pressure gauges	6	EA	375.00	2,250	
Flex couplings	2	EA	500.00	1,000	
Basket strainer, 4"	2	EA	2,000.00	4,000	
Basket strainer, 2"	2	EA	550.00	1,100	
Pressure reducing valves	2	EA	3,250.00	6,500	
Gate valves	4	EA	1,750.00	7,000	
Basket strainer drain pipe	120	LF	45.00	5,400	
Effluent drains					
Piping at raceway	30	LF	55.00	1,650	
Piping from raceway to drain	168	LF	55.00	9,240	
Manholes	2	EA	3,750.00	7,500	

Klickitat Hatchery Redevelopment
Klickitat, WA *Gross Floor Area:* **33,988 SF**
Conceptual Design Cost Estimate *Date:* **November 18, 2010**
Prepared By: AC

Rearing Raceway A, B & C
DETAIL OF ESTIMATE

Item Description	Quantity	Unit	Unit Cost Incl	Totals	
Eductor system					
Piping and fittings - at raceway	30	LF	45.00	1,350	
Piping and fittings - supply from high pressure system	150	LF	85.00	12,750	
Gate valves, install only	4	EA	80.00	320	
Quick disconnect	2	EA	275.00	550	
Fish transfer					
Piping and fittings at raceway- allow	260	LF	65.00	16,900	
Piping and fittings - raceway to hatchery - allow	270	LF	65.00	17,550	
High pressure water supply to rearing pond spray systems - allow	500	LF	85.00	42,500	
Rearing raceway piping systems - at raceway C					
Supply riser piping and fittings	80	LF	125.00	10,000	
Gate valves, flanged	8	EA	2,750.00	22,000	
Valve box, 3' dia, 2.5' deep	8	EA	3,750.00	30,000	
Flex couplings	8	EA	500.00	4,000	
Supply manifold piping and fittings	84	LF	125.00	10,500	
Pipe-o-lets	128	EA	100.00	12,800	
Swinging standpipe	8	EA	1,500.00	12,000	
Winch and motor	8	EA	550.00	4,400	
Spray system					
Spray supply piping and fittings	145	LF	60.00	8,700	
Spray riser piping and fittings	25	LF	40.00	1,000	
Spray distribution piping and fittings	500	LF	40.00	20,000	
Y-strainer	5	EA	250.00	1,250	
Gate valve	5	EA	185.00	925	
Sprinkler head - rainjet 73C - install only (supplied by others)	12	EA	50.00	600	
Sprinkler head - rainjet 62C	6	EA	85.00	510	
Sprinkler head - rainjet 61C	4	EA	85.00	340	
Pressure gauges	3	EA	375.00	1,125	
Flex couplings	1	EA	500.00	500	
Basket strainer, 4"	1	EA	2,000.00	2,000	
Basket strainer, 2"	1	EA	550.00	550	
Pressure reducing valves	1	EA	3,250.00	3,250	
Gate valves	2	EA	1,750.00	3,500	
Basket strainer drain pipe	60	LF	45.00	2,700	
Effluent drains					
Piping at raceway	15	LF	55.00	825	

	Item Description	Quantity	Unit	Unit Cost Incl	Totals
	Piping from raceway to drain	84	LF	55.00	4,620
	Manholes	1	EA	3,750.00	3,750
	Eductor system				
	Piping and fittings - at raceway	15	LF	45.00	675
	Piping and fittings - supply from high pressure system	75	LF	85.00	6,375
	Gate valves, install only	2	EA	80.00	160
	Quick disconnect	1	EA	275.00	275
	Fish transfer				
	Piping and fittings at raceway- allow	130	LF	65.00	8,450
	Piping and fittings - raceway to hatchery - allow	135	LF	65.00	8,775
	High pressure water supply to rearing pond spray systems - allow	250	LF	85.00	21,250
	Total For Plumbing				**602,815**
	HVAC				
D3010	**HVAC**				
	No work anticipated				N/A
	Total For HVAC				
D40	**FIRE PROTECTION**				
D4010	**Fire Protection**				
	No work anticipated				N/A
	Total For Fire Sprinkler System				
D50	**ELECTRICAL**				
D5000	**Electrical**				
	Rearing raceway electrical systems at Raceway A & B				
	Electrical service to raceways	1	LS	30,000.00	30,000
	Electrical connections to equipment	1	LS	20,000.00	20,000
	Receptacles including conduit and wire	40	EA	500.00	20,000
	Lighting fixtures including conduit and wire	1	LS	70,000.00	70,000

	Item Description	Quantity	Unit	Unit Cost Incl	Totals	
	Rearing raceway electrical systems at Raceway C					
	Electrical service to pond	1	LS	15,000.00	15,000	
	Electrical connections to equipment	1	LS	10,000.00	10,000	
	Receptacles including conduit and wire	20	EA	500.00	10,000	
	Lighting fixtures including conduit and wire	1	LS	35,000.00	35,000	
	Total For Electrical				**210,000**	
E10	**EQUIPMENT**					
E1010	**Equipment**					
	No work anticipated				N/A	
	Total For Equipment					
E20	**FURNISHINGS**					
E2010	**Fixed Furnishing**					
	No work anticipated				N/A	
	Total For Furniture					
F10	**SPECIAL STRUCTURES**					
F1010	**Special Structure**					
	F1012 Pre-engineered structures					
	New pre-engineered framing and roofing at rearing ponds	27,720	SF	22.00	609,840	
	Chain link fencing <=10'-0" high	704	LF	42.00	29,568	
	Total For Special Structure				**639,408**	
F1020	**Special Construction**					
	No work anticipated				N/A	
	Total For Special Construction					
F20	**SELECTIVE BUILDING DEMOLITION**					
F2010	**Building Element Demolition**					
	No work anticipated				N/A	

Klickitat Hatchery Redevelopment
Klickitat, WA
Conceptual Design Cost Estimate

Gross Floor Area: **33,988 SF**
Date: **November 18, 2010**
Prepared By: AC

Rearing Raceway A, B & C
DETAIL OF ESTIMATE

Item Description	Quantity	Unit	Unit Cost Incl	Totals	
Total For Selected Demolition					
TOTAL DIRECT COST FOR REARING RACEWAY BUILDING				**1,807,859**	

KLICKITAT HATCHERY REDEVELOPMENT
YAKAMA KLICKITAT FISHERIES PROGRAM *Date:* **November 18, 2010**
YAKAMA COUNTY, WASHINGTON
30% Design Estimate *Prepared By:* DN

DETAIL OF ESTIMATE

Item Description	Quantity	Unit	Unit Cost Incl. Subcont.	Totals	
1 INDIAN FORD UPPER SPRING 'A' INTAKE					
Site Preparation					
Clear grub and remove trees	250	SY	1.00	250	
Excavate to reduce level	74	CY	8.50	629	
Remove excavated material and spread on site	74	CY	4.00	296	
Rough grade and compact soil	81	SY	2.25	183	
Extra for rock removal	1	LS	500.00	500	
Demolition					
Saw cut 8" diameter reinforced concrete butress column	4	EA	65.00	260	
Break out and remove existing 8" diameter reinforced concrete butress column	10	CF	50.00	508	
Break out and remove existing reinforced concrete butress column footing size 1'-8" x 1'-8" x 1'-6"	4	EA	111.56	446	
Saw cut 6" thick reinforced concrete wall [connected to dam wall being demolished	17	LF	45.00	743	
Saw cut 8" thick reinforced concrete wall [connected to dam wall being demolished	6	LF	55.00	303	
Break out and remove existing 8" thick reinforced concrete wall	22	SF	24.00	528	
Break out and remove existing 1'-6" thick reinforced concrete wall	87	SF	40.50	3,523	
Break out and remove existing reinforced concrete butress column footing size 2'-0" x 1'-8"	25	LF	26.00	659	
Miscellaneous demolition work	1	LS	1000.00	1,000	
Remove demolished reinforced concrete from site	10	CY	100.00	1,000	
Temporary Work					
Allow for cofferdam and temporary re-directing water flow and connecting to existing 19" diameter steel down pipe	1	LS	50000.00	50,000	
Secant Piles					
Drilled Piers					
Mobilization of piling rig	1	LS	20,000.00	20,000	
Set up	56	EA	50.00	2,800	
18" diameter drilled secant plies	1,780	LF	48.00	85,440	
Prepare top of 18" diameter pier for connection to grade beam	56	EA	50.00	2,800	
Remove excavated soil from site	116	CY	4.50	522	
Micropiles					
Mobilization of piling rig	1	LS	10,000.00	10,000	
Set up	17	EA	60.00	1,020	
8" diameter steel micropiles pipe set vertically	225	LF	85.00	19,125	
8" diameter steel micropiles pipe set to batter	200	LF	100.00	20,000	
Prepare top of 8" diameter micropile for connection to grade beam	17	EA	100.00	1,700	
Support Platform To Dam Wall					
6" thick drain rock base to platform	10	CY	30.00	300	
Fine grade for concrete platform	534	SF	0.50	267	
Concrete 4000 psi in 12' tick platform slab	20	CY	263.92	5,278	

KLICKITAT HATCHERY REDEVELOPMENT
YAKAMA KLICKITAT FISHERIES PROGRAM *Date:* **November 18, 2010**
YAKAMA COUNTY, WASHINGTON
30% Design Estimate *Prepared By:* DN

DETAIL OF ESTIMATE

Item Description	Quantity	Unit	Unit Cost Incl. Subcont.	Totals
Trowel finish to concrete platform	534	SF	1.25	668
Formwork 12" deep to side of platform	71	LF	8.00	570
Steel bar reinforcement to concrete platform	2,600	LB	0.80	2,080
Extra for jointing new 12' thick slab to existing concrete wall	62	LF	35.00	2,165
Support Platform grade beams To Dam Wall				
Excavate for grade beam	57	CY	20.00	1,140
Remove excavated material and spread on site	17	CY	4.00	67
Backfill in compact layers excavated material	40	CY	12.00	482
Fine grade for grade beam	260	SF	0.50	130
Concrete 4000 psi in grade beam	21	CY	277.91	5,836
Formwork to side of grade beam	761	SF	8.00	6,087
Steel bar reinforcement in grade beam	7,350	LB	0.80	5,880
Extra for jointing new grade beam to existing concrete wall	60	LF	50.00	2,993
Counterfort Wall To Dam Wall				
Concrete 4000 psi in 8" thick wall	3	CY	308.95	927
Trowel top of 8' wall to slope	24	LF	2.50	60
Formwork to side of wall	216	SF	8.50	1,836
Steel bar reinforcement in wall	1,350	LB	0.80	1,080
Extra for jointing new 8" wall to existing concrete wall	18	LF	35.00	630
Construction joint between wall and slab	24	LF	8.50	204
New Dam Wall				
Excavate for dam wall foundation	81	CY	20.00	1,620
Remove excavated material and spread on site	32	CY	4.00	128
Backfill in compact layers excavated material	49	CY	12.00	588
Fine grade for foundation	247	SF	0.50	124
Concrete 4000 psi in foundation	32	CY	268.59	8,595
Formwork to side of foundation	433	SF	8.00	3,464
Steel bar reinforcement in foundation	3,200	LB	0.80	2,560
Concrete 4000 psi in dam wall	26	CY	281.16	7,310
Trowel top of wall 2'-1" wide	62	LF	10.50	649
Formwork to dam wall	680	SF	10.50	7,144
Steel bar reinforcement in dam wall	5,200	LB	0.80	4,160
Extra for connecting existing wall to new dam wall	22	LF	35.00	770
Extra for forming opening for sliding doors	3	EA	400.00	1,200
Extra for closing wall at sides	13	LF	50.00	650
To Existing				
Remove existing 2'-4" x 5'-0" sliding release doors including frame	3	EA	600.00	1,800
Install new 2'-4" x 5'-0" sliding release doors including support frame	3	EA	7000.00	21,000
New Access Road				
Clear grub and remove trees	2,400	SY	1.00	2,400
Allow for excavation fill and grade for new road including gravel surfacing	1,920	SY	10.50	20,160
Total Indian Ford Upper Spring 'A' Intake				**347,236**

KLICKITAT HATCHERY REDEVELOPMENT
YAKAMA KLICKITAT FISHERIES PROGRAM *Date:* **November 18, 2010**
YAKAMA COUNTY, WASHINGTON
30% Design Estimate *Prepared By:* DN

DETAIL OF ESTIMATE

Item Description	Quantity	Unit	Unit Cost Incl. Subcont.	Totals	
1 INDIAN FORD UPPER SPRING 'A' SUPPLY					
Demolition					
Saw cut existing 19" diameter pipe	1	EA	260.00	260	
Remove section of 19" diameter steel pipe to allow capping of pipe	1	EA	100.00	100	
Cap existing 19" diameter steel pipe	1	EA	550.00	550	
Allow for removing 19" pipe connection at dam	1	EA	500.00	500	
30" Diameter Supply Pipe Above Ground					
Allow for construction access road for equipment to install piping	1,016	SY	5.00	5,080	
Clear grub and remove trees for a distance of 50'-0" within pipe run	10,448	SY	1.00	10,448	
Remove trees large than 10" diameter	20	EA	250.00	5,000	
30" Diameter schedule 40 A-53 ERW steel weld water pipe exposed	941	LF	598.50	563,189	
Extra for 30" diameter bend	6	EA	6950.00	41,700	
Extra for 30" to 24" pipe reducer	2	EA	5850.00	11,700	
Extra for 30" diameter pipe connection	1	EA	3000.00	3,000	
Extra for expansion joint in pipe	941	LF	5.00	4,705	
Polyurethane paint coating to 30" diameter pipe	941	LF	18.00	16,938	
Pipe Support to 30" Diameter Down Pipe Above Ground					
Excavate for base for pipe support	462	CY	20.00	9,240	
Remove excavated material and spread on site	423	CY	4.00	1,692	
Backfill in compact layers excavated material	39	CY	12.00	468	
Fine grade for base	1,360	SF	0.50	680	
Concrete 4000 psi in pipe support base	101	CY	268.59	27,128	
Formwork to side of base	1,768	SF	7.50	13,260	
Key joint in base for support pier	136	LF	2.50	340	
Steel bar reinforcement in base	6,650	LB	0.80	5,320	
1 1/2" rock anchors 30'-0" long including drilling	68	EA	2100.00	142,800	
Concrete 4000 psi in pipe support pier 1'-6" thick	462	CY	317.38	146,629	
Splayed top to concrete pier	89	SF	4.00	356	
Formwork to side of pier	935	SF	8.00	7,480	
Steel bar reinforcement in pier	6,650	LB	0.80	5,320	
Extra for forming indentation cup for 30" diameter pipe	34	EA	25.00	850	
1/4" x 6" wide half round galvanized steel pipe strap to 30" pipe	34	EA	40.80	1,387	
1/2" x 9" long anchor bolts cast into top of support pier	68	EA	15.00	1,020	
Support sleeve to 30" diameter pipe	34	EA	55.00	1,870	
L3" x 3" x 3/8" steel pipe ring top 30" pipe welded to pipe	34	EA	264.94	9,008	
30" Diameter Pipe Buried					
Excavate trench for 30" diameter pipe	107	CY	18.00	1,926	
Remove excavated material and spread on site	80	CY	4.00	320	
Backfill in compact layers excavated material	27	CY	14.00	378	
Excavation were pipe shares trench included in Raceway Pipe Trench					
30" Diameter schedule 40 A-53 ERW steel weld water pipe in trench	676	LF	578.50	391,231	

Item Description	Quantity	Unit	Unit Cost Incl. Subcont.	Totals
Extra for 30" diameter bend	6	EA	6950.00	41,700
Extra for 30" diameter pipe connection	1	EA	3000.00	3,000
Granular bed and surround to 30" diameter pipe	55	CY	34.00	1,870
Concrete bed and surround to 30" diameter pipe	4	CY	210.00	840
Polythene wrap to 30" diameter buried pipe	676	LF	12.00	8,115
Total Indian Ford Upper Spring 'A' Supply				**1,487,398**
2 LOWER INDIAN FORD 'A' SPRING SUPPLY				
14" Diameter Supply Pipe Above Ground				
Demolition				
Saw cut existing 9" diameter pipe	2	EA	150.00	300
Remove section of 9" diameter steel pipe to allow capping of pipe	2	EA	50.00	100
Cap existing 9" diameter steel pipe	2	EA	250.00	500
Allow for removing 9" pipe connection at dam	2	EA	150.00	300
14" Diameter Supply Pipe Above Ground				
Allow for construction access road for equipment to install piping	122	SY	5.00	610
Clear grub and remove trees for a distance of 50'-0" within pipe run	3,378	SY	1.00	3,378
14" Diameter schedule 40 A-53 ERW steel weld water pipe exposed	304	LF	189.00	57,456
Extra for 14" diameter bend	4	EA	1050.00	4,200
Extra for 14" to 12" pipe reducer	2	EA	900.00	1,800
Extra for 14" diameter pipe connection	1	EA	600.00	600
Extra for expansion joint in 14" pipe	304	LF	3.00	912
Polyurethane paint coating to 14" diameter pipe	304	LF	7.00	2,128
Pipe Support to 14" Diameter Down Pipe Above Ground				
Excavate for base for pipe support	79	CY	20.00	1,580
Remove excavated material and spread on site	69	CY	4.00	276
Backfill in compact layers excavated material	10	CY	12.00	120
Fine grade for base	245	SF	0.50	123
Concrete 4000 psi in pipe support base	16	CY	268.59	4,297
Formwork to side of base	417	SF	7.50	3,124
Key joint in base for support pier	42	LF	2.50	105
Steel bar reinforcement in base	2,000	LB	0.80	1,600
1 1/2" rock anchors 30'-0" long including drilling	28	EA	2100.00	58,800
Concrete 4000 psi in pipe support pier 1'-0" thick	4	CY	322.38	1,290
Splayed top to concrete pier	12	SF	4.00	48
Formwork to side of pier	280	SF	8.00	2,240
Steel bar reinforcement in pier	1,400	LB	0.80	1,120
Extra for forming indentation cup for 14" diameter pipe	14	EA	25.00	350
1/4" x 6" wide half round galvanized steel pipe strap to 14" pipe	14	EA	20.40	286
1/2" x 9" long anchor bolts cast into top of support pier	28	EA	15.00	420
Support sleeve to 14" diameter pipe	14	EA	35.00	490
	14	EA	137.77	1,929
L3" x 3" x 3/8" steel pipe ring top 14" pipe welded to pipe				
14" Diameter Pipe Buried				

DETAIL OF ESTIMATE

Item Description	Quantity	Unit	Unit Cost Incl. Subcont.	Totals
Excavate trench for 16" diameter pipe	59	CY	18.00	1,062
Remove excavated material and spread on site	35	CY	4.00	140
Backfill in compact layers excavated material	24	CY	14.00	336
Excavation were pipe shares trench included in Raceway Pipe Trench				
14" Diameter schedule 40 A-53 ERW steel weld water pipe in trench	699	LF	184.00	128,537
Extra for 14" diameter bend	6	EA	900.00	5,400
Extra for 14" diameter pipe connection	1	EA	600.00	600
Granular bed and surround to 14" diameter pipe	29	CY	34.00	986
Concrete bed and surround to 14" diameter pipe	2	CY	210.00	420
Polythene wrap to 14" diameter buried pipe	699	LF	5.00	3,493
Total Indian Ford Lower Spring 'A' Supply				**291,455**
1 INDIAN FORD SPRING 'B' INTAKE				
Site Preparation				
Clear grub and remove trees	125	SY	1.00	125
Excavate to reduce level	37	CY	8.50	315
Remove excavated material and spread on site	37	CY	4.00	148
Rough grade and compact soil	41	SY	2.25	92
Head Wall				
Excavate for base for footing	20	CY	18.00	360
Remove excavated material and spread on site	6	CY	4.00	24
Backfill in compact layers excavated material	14	CY	14.00	196
Fine grade for base	100	SF	0.50	50
Concrete 4000 psi in pipe support base	4	CY	268.59	1,074
Formwork to side of base	58	SF	7.00	406
Key joint in base al wall	25	LF	2.50	63
Steel bar reinforcement in base	400	LB	0.80	320
Concrete 4000 psi in 12" thick wall	6	CY	320.38	1,922
Trowel top of 12' wall to	25	LF	3.00	75
Formwork to side of wall	300	SF	8.00	2,400
Steel bar reinforcement in wall	1,200	LB	0.80	960
Outlet				
Precast concrete outlet chamber with collection grating and 14" pipe outlet	1	EA	7000.00	7,000
Total Indian Ford Lower Spring 'B' Intake				**15,529**
3 INDIAN FORD 'B' SPRING SUPPLY				
14" Diameter Supply Pipe Above Ground				
Demolition				
Saw cut existing 9" diameter pipe	1	EA	150.00	150
Remove section of 9" diameter steel pipe to allow capping of pipe	1	EA	50.00	50
Cap existing 9" diameter steel pipe	1	EA	250.00	250
Allow for removing 9" pipe connection at dam	1	EA	150.00	150
14" Diameter Supply Pipe Above Ground				

DETAIL OF ESTIMATE

Item Description	Quantity	Unit	Unit Cost Incl. Subcont.	Totals
Allow for construction access road for equipment to install piping	813	SY	5.00	4,065
Clear grub and remove trees for a distance of 50'-0" within pipe run	7,571	SY	1.00	7,571
14" Diameter schedule 40 A-53 ERW steel weld water pipe exposed	697	LF	189.00	131,734
Extra for 14" diameter bend	6	EA	1050.00	6,300
Extra for 14" to 12" pipe reducer	2	EA	900.00	1,800
Extra for 14" diameter pipe connection	1	EA	600.00	600
Extra for expansion joint in 14" pipe	697	LF	3.00	2,091
Polyurethane paint coating to 14" diameter pipe	697	LF	7.00	4,879
Pipe Support to 14" Diameter Down Pipe Above Ground				
Excavate for base for pipe support	153	CY	18.00	2,754
Remove excavated material and spread on site	29	CY	4.00	116
Backfill in compact layers excavated material	124	CY	14.00	1,736
Fine grade for base	473	SF	0.50	236
Concrete 4000 psi in pipe support base	31	CY	5.00	155
Formwork to side of base	803	SF	7.50	6,024
Key joint in base for support pier	81	LF	2.50	203
Steel bar reinforcement in base	3,875	LB	0.80	3,100
1 1/2" rock anchors 30'-0" long including drilling	54	EA	2100.00	113,400
Concrete 4000 psi in pipe support pier 1'-0" thick	8	CY	5.00	40
Splayed top to concrete pier	24	SF	4.00	96
Formwork to side of pier	540	SF	8.00	4,320
Steel bar reinforcement in pier	2,800	LB	0.80	2,240
Extra for forming indentation cup for 14" diameter pipe	24	EA	25.00	600
1/4" x 6" wide half round galvanized steel pipe strap to 14" pipe	27	EA	20.40	551
1/2" x 9" long anchor bolts cast into top of support pier	54	EA	15.00	810
Support sleeve to 14" diameter pipe	27	EA	35.00	945
L3" x 3" x 3/8" steel pipe ring top 14" pipe welded to pipe	27	EA	137.77	3,720
14" Diameter Pipe Buried				
Excavate trench for 16" diameter pipe	59	CY	18.00	1,062
Remove excavated material and spread on site	35	CY	4.00	140
Backfill in compact layers excavated material	24	CY	14.00	336
Excavation were pipe shares trench included in Raceway Pipe Trench				
14" Diameter schedule 40 A-53 ERW steel weld water pipe in trench	699	LF	184.00	128,537
Extra for 14" diameter bend	6	EA	900.00	5,400
Extra for 14" diameter pipe connection	1	EA	600.00	600
Granular bed and surround to 14" diameter pipe	29	CY	34.00	986
Concrete bed and surround to 14" diameter pipe	2	CY	210.00	420
Polythene wrap to 14" diameter buried pipe	699	LF	5.00	3,493
			Total Indian Ford Lower Spring 'B' Supply	**441,660**
4 WATER POWER ELECTRIC GENERATOR				
Water powered generator	1	LS	600000.00	600,000

Item Description	Quantity	Unit	Unit Cost Incl. Subcont.	Totals
Piping in turbine room	1	LS	12500.00	12,500
Control water waters	2	EA	38500.00	77,000
Concrete pad	1	LS	5000.00	5,000
Miscellaneous work	1	LS	10000.00	10,000
Total Water powered Electrical Generator				**704,500**
3 SHARED TRENCH RACEWAY				
Excavate trench for multi-pipes	1,189	CY	12.50	14,863
Grade bottom of trench	611	SY	1.65	1,008
Remove excavated material and spread on site	782	CY	4.00	3,128
Backfill in compact layers excavated material	407	CY	14.00	5,698
Granular bed and surround to multi-pipes	385	CY	34.00	13,090
Concrete bed and surround to multi-pipes	244	CY	210.00	51,240
Total For Shared Trench Raceway				**89,027**
4 WATER SUPPLY VAULTS				
Small Size 2No				
Excavate for vault	342	CY	12.00	4,104
Grade bottom of excavation	20	SY	2.00	40
Remove excavated material and spread on site	85	CY	4.00	340
Backfill in compact layers excavated material	257	CY	10.00	2,570
Fine grade	256	SF	0.50	128
Bentonite waterproof panel under base	256	SF	2.25	576
6" drain gravel base	5	CY	34.00	163
Concrete 4000 psi in vault base including formwork and reinforcement	8	CY	465.00	3,720
Concrete 4000 psi in vault wall including formwork and reinforcement	24	CY	900.00	21,600
Concrete 4000 psi in vault slab roof including formwork and reinforcement	8	CY	600.00	4,800
Water stop joint	96	LF	15.00	1,440
Bentonite waterproof panel to side of vault	929	SF	2.25	2,091
Ductile iron manhole access cover and frame	1	EA	450.00	450
Galvanized steel vault ladder	8	LF	65.00	520
Valves and pipe fittings in vault	1	LS	25000.00	25,000
Large Size 1No				
Excavate for vault	243	CY	12.00	2,916
Grade bottom of excavation	36	SY	2.00	72
Remove excavated material and spread on site	85	CY	4.00	340
Backfill in compact layers excavated material	158	CY	10.00	1,580
Fine grade	256	SF	0.50	128
Bentonite waterproof panel under base	256	SF	2.25	576
6" drain gravel base	5	CY	34.00	163
Concrete 4000 psi in vault base including formwork and reinforcement	8	CY	465.00	3,720
Concrete 4000 psi in vault wall including formwork and reinforcement	16	CY	900.00	14,400

Item Description	Quantity	Unit	Unit Cost Incl. Subcont.	Totals
Concrete 4000 psi in vault slab roof including formwork and reinforcement	8	CY	600.00	4,800
Water stop joint	64	LF	15.00	960
Bentonite waterproof panel to side of vault	620	SF	2.25	1,394
Ductile iron manhole access cover and frame	1	EA	450.00	450
Galvanized steel vault ladder	8	LF	65.00	520
Doghouse on top of vault	1	LS	3500.00	3,500
Valves and pipe fittings in vault	1	LS	25000.00	25,000
Total For Water Supply Vault Chambers				**128,061**
5 WATER DISTRIBUTION				
Site Distribution Piping				
Excavate trench for water pipe	3,591	CY	13.50	48,479
Remove excavated material and spread on site	2,282	CY	4.00	9,128
Backfill in compact layers excavated material	1,309	CY	12.00	15,708
Granular bed and surround to water pipes	1,724	CY	34.00	58,625
Concrete bed and surround to multi-pipes	91	CY	210.00	19,058
2" diameter pvc water pipe	419	LF	4.00	1,678
Extra for 2" diameter pipe connection	3	EA	50.00	150
2" sprinkler including connection	1	EA	150.00	150
16" diameter pvc water pipe	699	LF	40.30	28,187
Extra for 16" pipe bend	4	EA	700.00	2,800
Extra for 16" branch	20	EA	850.00	17,000
Extra for 16" pipe end cap	14	EA	250.00	3,500
24" diameter pvc water pipe	818	LF	82.42	67,396
Extra for 24" pipe bend	3	EA	1200.00	3,600
Extra for 24" branch	6	EA	1650.00	9,900
30" diameter pvc water pipe	1,563	LF	111.80	174,791
Extra for 30" pipe bend	10	EA	1650.00	16,500
Extra for 30" branch	7	EA	2350.00	16,450
Extra for 2" tap connection	3	EA	125.00	375
Extra for 30" -24" reducer	1	EA	1100.00	1,100
36" diameter pvc water pipe	137	LF	145.60	19,968
Extra for 36" pipe bend	1	EA	2350.00	2,350
Extra for 36" branch	1	EA	3980.00	3,980
Extra for 36" pipe end cap	1	EA	600.00	600
36" diameter steel water pipe	57	LF	850.00	48,571
Extra for 36" pipe bend	1	EA	5000.00	5,000
Allowance for pipe connection	1	LS	25442.79	25,443
Total For Site Water Distribution				**757,047**
6 RIVER WATER INTAKE				
Chamber and Intake				
Clear grub and remove trees	556	SY	0.75	417
Rough grading to site area	263	SY	1.00	263
Excavate to reduce level	2,270	CY	9.00	20,430
Remove excavated material and spread on site	905	CY	4.00	3,620
Backfill excavated material in consolidated layers	1,365	CY	10.00	13,650

DETAIL OF ESTIMATE

Item Description	Quantity	Unit	Unit Cost Incl. Subcont.	Totals
Rough grade and compact soil	220	SY	2.00	440
Extra for rock removal	1	LS	1000.00	1,000
Fine grade	1,894	SF	0.50	947
6" drain gravel base	33	CY	34.00	1,122
Concrete 6000 psi in chamber base	80	CY	305.71	24,457
Concrete 6000 psi in intake base	36	CY	305.71	11,005
Concrete 6000 psi in chamber & intake walls	147	CY	330.16	48,534
Concrete 6000 psi in intake slab roof	46	CY	305.71	14,063
Trowel finish to chamber and intake slab	1,894	SF	1.50	2,841
Formwork edge of slab to chamber	482	SF	8.50	4,097
Formwork edge of slab to intake	148	SF	8.50	1,259
Formwork to sides of wall	1,794	SF	9.00	16,150
Formwork to soffit of suspended slab	831	SF	15.00	12,458
Construction joint between wall and slab	203	LF	10.50	2,136
Steel bar reinforcement in base, walls and roof slab	30,986	LB	0.80	24,789
Waterstop stop joint	102	LF	18.00	1,831
Concrete support column to belt screen 10'-9" high	9	EA	913.75	8,224
Steel framing to support roof grating	6	TON	4000.00	24,000
Galvanized steel removable floor grating	900	SF	50.00	45,000
Intake trash rack	162	SF	65.00	10,530
Removable steel fabricated vertical slot	1	LS	3500.00	3,500
Galvanized steel vault ladder	11	LF	65.00	715
Paint finish to steel framing	1	LS	400.00	400
Extra for embeds	1	LS	1000.00	1,000
Vertical belt rotating screen	1	LS	250000.00	250,000
Juvenile Fish Bypass Pipe				
Excavate trench for water pipe	682	CY	13.50	9,207
Remove excavated material and spread on site	521	CY	4.00	2,084
Backfill in compact layers excavated material	161	CY	12.00	1,932
Granular bed and surround to water pipes	346	CY	34.00	11,764
48" diameter pvc water pipe	376	LF	245.00	92,120
Extra for 48" pipe bend	3	EA	3250.00	9,750
Extra for 36" pipe outlet	1	EA	3000.00	3,000
			Total For River Water Intake	**678,733**
1 SITE DRAINAGE				
To Fish Rearing and Holding Facilities				
Excavate trench for water pipe	3,163	CY	15.00	47,445
Remove excavated material and spread on site	2,146	CY	4.00	8,584
Backfill in compact layers excavated material	1,017	CY	14.00	14,238
Granular bed and surround to water pipes	1,610	CY	34.00	54,749
Concrete bed and surround to multi-pipes	85	CY		
6" diameter pvc drain pipe	46	LF	18.00	823
Extra for 6" pipe bend	2	EA	80.00	160
Extra for 6" pipe outlet	1	EA	100.00	100
16" diameter pvc drain pipe	403	LF	38.00	15,330
Extra for 16" pipe bend	18	EA	600.00	10,800
Extra for 16" branch	6	EA	1000.00	6,000
24" diameter pvc drain pipe	1,975	LF	63.00	124,416

KLICKITAT HATCHERY REDEVELOPMENT
YAKAMA KLICKITAT FISHERIES PROGRAM *Date:* **November 18, 2010**
YAKAMA COUNTY, WASHINGTON
30% Design Estimate *Prepared By:* DN

DETAIL OF ESTIMATE

Item Description	Quantity	Unit	Unit Cost Incl. Subcont.	Totals
Extra for 24" pipe bend	16	EA	1050.00	16,800
Extra for 24" branch	2	EA	1400.00	2,800
Extra for 24"-16" reducer	2	EA	1050.00	2,100
Extra for 24" pipe end cap	4	EA	400.00	1,600
Extra for 24" pipe outlet	1	EA	500.00	500
36" diameter pvc drain pipe	762	LF	102.00	77,753
Extra for 36" pipe bend	4	EA	2500.00	10,000
Extra for 36" branch	5	EA	3000.00	15,000
Extra for 36"-24" reducer	1	EA	2250.00	2,250
60" diameter manholes	5	EA	5250.00	26,250
Allowance for pipe connection branches ext	1	LS	15634.11	15,634
To Sanitary Drainage to Residential Building				
Septic tank and drain field including piping	3	EA	6500.00	19,500
To Sanitary Drainage to Hatchery Building				
Septic tank and drain field including piping	2	EA	20000.00	40,000
			Total For Site Drainage	**512,832**

KLICKITAT HATCHERY REDEVELOPMENT
YAKAMA KLICKITAT FISHERIES PROGRAM *Date:* **November 18, 2010**
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DETAIL OF REARING POND

Item Description	Quantity	Unit	Unit Cost Incl. Subcont.	Totals	
1 REARING POND [PAIR] Size 90' x 42'					
Structural Base					
Excavate to reduced level	686	CY	8.00	5,488	
Remove excavated material and spread on site	567	CY	4.00	2,268	
Backfill in compact layers excavated material	119	CY	14.00	1,666	
Rough grade to contours and compact soil for slab	645	SY	1.50	968	
Sand bed 3" thick to slab	38	CY	32.00	1,216	
Vapor barrier	3,913	SF	0.22	861	
Fine grade to falls	3,913	SF	0.40	1,565	
Concrete 6000 psi in 8" thick sloped structural slab	77	CY	310.71	23,924	
Concrete 6000 psi in sloped slab thickening to 8" slab	5	CY	310.71	1,554	
Concrete 6000 psi in 10" thick sloped structural slab	15	CY	310.71	4,661	
Concrete 6000 psi in sloped slab thickening to 10" slab	2	CY	310.71	621	
Concrete 6000 psi in 12" thick sloped structural slab	9	CY	310.71	2,796	
Trowel smooth finish to falls	3,913	SF	1.75	6,848	
Formwork to edge of slab 8" thick	187	LF	6.50	1,218	
Formwork to edge of slab 10" thick	28	LF	7.50	210	
Formwork to edge of slab 12" thick	97	LF	8.50	822	
Formwork to edge of slab 14" thick	43	LF	10.50	452	
Steel bar reinforcement in structural slab	11,931	LB	0.80	9,544	
Steel bar reinforcement in structural slab thickening	595	LB	0.80	476	
Construction joint between 10" & 8" thick slab	43	LF	7.50	323	
Construction joint between 10" & 12" thick slab	43	LF	9.00	387	
Water stop joint at slab construction joint	86	LF	22.00	1,892	
Galvanized steel edge angle 5" x 3" x 1/4" cast into edge of slab	42	LF	35.00	1,470	
Extra for guide insert cast into concrete slab	6	EA	65.00	390	
Outer Walls					
Concrete 6000 psi in 9" thick walls	47	CY	330.16	15,518	
Trowel smooth to of 9" wall	263	LF	2.50	657	
Extra for chamfer to top of wall	525	LF	2.10	1,103	
Formwork to side of wall	3,360	SF	8.00	26,876	
Steel bar reinforcement in wall	15,636	LB	0.80	12,508	
Water stop joint at slab and wall joint	263	LF	22.00	5,779	
Construction joint between structural slab and wall	263	LF	6.50	1,707	
Water stop joint at wall construction joint	133	LF	22.00	2,937	
Construction wall joint	133	LF	6.50	868	
Inner Walls					
Concrete 6000 psi in 9" thick walls	19	CY	330.16	6,273	
Trowel smooth to of 9" wall	131	LF	2.50	328	
Extra for chamfer to top of wall	263	LF	2.10	552	
Formwork to side of wall	1,336	SF	8.00	10,690	
Steel bar reinforcement in wall	6,219	LB	0.80	4,975	
Water stop joint at slab and wall joint	131	LF	22.00	2,889	
Construction joint between structural slab and wall	131	LF	6.50	854	
Water stop joint at wall construction joint	45	LF	22.00	979	
Construction wall joint	45	LF	6.50	289	
Inner Framing					

KLICKITAT HATCHERY REDEVELOPMENT
YAKAMA KLICKITAT FISHERIES PROGRAM *Date:* **November 18, 2010**
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DETAIL OF REARING POND

Item Description	Quantity	Unit	Unit Cost Incl. Subcont.	Totals
Steel plate guide post 7'-10" high type G-1	3	EA	245.00	735
Steel plate guide post 7'-10" high type G-6	2	EA	245.00	490
Steel plate guide post 7'-10" high type G-8	6	EA	365.00	2,190
Steel plate guide post 7'-10" high type G-9	3	EA	365.00	1,095
Steel plate guide post 7'-10" high type G-10	2	EA	285.00	570
Steel plate guide post 7'-10" high type G-11	2	EA	240.00	480
Extra for anchor plate to to G-8 and drilling for and including expansion anchor	6	EA	86.00	516
Steel bottom plate catch plate	25	LF	48.00	1,204
Steel grating support beams	79	LF	36.00	2,851
Steel center wall grating 1'-6" wide 14 gauge 3" deep galvanized steel floor grating including support framing 3" x 6" T&G treated wood boarding screen	81	LF	95.00	7,695
Steel support beam to winch 3'-0" long including anchor bolts	1	EA	465.00	465
Rearing pond stair including railing	1	FLT	2250.00	2,250
Extra for pipe sleeves in wall	1	LS	500.00	500
Removable screen	242	SF	35.00	8,483
Allow for paining to exposed steel	1	LS	1000.00	1,000
Mechanical				
Supply risers piping and fittings	40	LF	175.00	7,000
Butterfly valves with actuator	4	EA	1,250.00	5,000
Flex couplings	4	EA	750.00	3,000
Supply manifold piping and fittings	40	LF	125.00	5,000
Threadolets	64	EA	185.00	11,840
High pressure wash piping and fittings	40	LF	60.00	2,400
Hydrants, frost free	2	EA	650.00	1,300
Plant piping and fittings	48	LF	175.00	8,400
Alfalfa valves	2	EA	750.00	1,500
Pond cleaning piping and fittings	66	LF	50.00	3,300
Swinging standpipes	2	EA	2,000.00	4,000
Winch and motor	2	EA	750.00	1,500
Drain piping and fittings	10	LF	300.00	3,000
ADS drain piping and fittings - allow	20	LF	55.00	1,100
Allowance for connection	1	LS	5,000.00	5,000
Electrical				
Electrical service to pond	1	LS	10,000.00	10,000
Electrical connections to equipment	1	LS	5,000.00	5,000
Receptacles including conduit and wire	10	EA	500.00	5,000
Lighting fixtures including conduit and wire	1	LS	15,000.00	15,000
Total for Rearing Pond Pair Size 90' x 42'				296,265

KLICKITAT HATCHERY REDEVELOPMENT
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DETAIL OF REARING POND

Item Description	Quantity	Unit	Unit Cost Incl. Subcont.	Totals	
10 No Pair the Same	296,265	10		2,962,650	
2 REARING POND [QUAD] Size 280' x 62'					
No design Information for this Rearing Pond					
Using cost obtained from 90' x 42'	17,360	SF	78.38	1,360,624	
3 ADULT HOLDING FACILITY					
No design Information for this Rearing Pond					
Using cost obtained from 90' x 42' Rearing Pond	5,449	SF	78.38	427,076	
4 NEW FISHWAY					
No design Information for this Rearing Pond					
Using cost obtained from 90' x 42' Rearing Pond plus 15%	3,834	SF	117.57	450,746	

Klickitat Hatchery Redevelopment
Klickitat, WA
Conceptual Design Cost Estimate

Gross Site Area: **500,000 SF**
Date: **November 18, 2010**
Prepared By: AC

SITEWORK
DETAIL OF ESTIMATE

Item Description	Quantity	Unit	Unit Cost	Totals	
G BUILDING SITE WORK					
G10 Site Preparation					
G1012 Tree removal and thinning					
Allowance for tree removal and thinning	1	LS	15,000.00	15,000	
G1022 Demolition of site components					
Demolition and removal, off-site					
Existing residential buildings, <= 1,500 square feet	3	EA	7,200.00	21,600	
Existing adult holding facility	4,500	SF	7.50	33,750	
Existing pollution abatement basin	4,110	SF	7.50	30,825	
Existing ponds	1	LS	85,000.00	85,000	
Existing sheds	1,680	SF	5.00	8,400	
Retaining wall and footing	101	LF	50.00	5,050	
Miscellaneous site demolition and relocations	1	LS	50,000.00	50,000	
Remove, salvage and relocate					
Existing propane storage	1	LS	1,000.00	1,000	
G1031 Site grading excavation					
Rough grading	1	LS	200,000.00	200,000	
G1033 Soil stabilization and treatment					
Assumed not required				N/A	
G1034 Site dewatering					
Assumed not required				N/A	
G1037 Erosion control					
Erosion control	1	LS	14,000.00	14,000	
Tree protection fencing with signage	1	LS	2,500.00	2,500	
Construction entrances	800	SF	2.55	2,040	
G1041 Removal of contaminated soil					
Assumed not required				N/A	
G1042 Soil restoration and treatment					
Assumed not required				N/A	
Total For Site Preparation				**469,165**	

Klickitat Hatchery Redevelopment
Klickitat, WA
Conceptual Design Cost Estimate

Gross Site Area: **500,000 SF**
Date: **November 18, 2010**
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SITEWORK
DETAIL OF ESTIMATE

Item Description	Quantity	Unit	Unit Cost	Totals	
G20 Site Improvements					
G 2010 Roadways					
Resurface existing road with crushed rock, compacted to existing road to wonder springs raceways	7,230	SF	1.25	9,038	
Vehicular paving at residential development	17,390	SF	2.20	38,258	
Vehicular paving driveways at new rearing raceways, crushed rock	51,000	SF	2.10	107,100	
AC paving and base	72,600	SF	2.65	192,390	
Modifications to existing surfacing following utility installation and at existing gravel roadways	1	LS	45,000.00	45,000	
Trailer pads with roof	1,500	SF	25.00	37,500	
G2016 Markings and signage					
Road / stall markings	1	LS	3,500.00	3,500	
G2044 Signage					
Exterior signage	1	LS	3,500.00	3,500	
G2045 Site furnishings					
Site furnishings, allow	1	LS	6,000.00	6,000	
G2049 Miscellaneous structures					
Visitor kiosk	200	SF	70.00	14,000	
Steelhead hatchery building	2,360	SF	200.00	472,000	
G2051 Fine grading and soil preparation					
Fine grading and soil preparation	4,500	SF	0.30	1,350	
G2053 Top soil and planting beds					
Topsoil and fertilizer at softscape planting, allow at residences	4,500	SF	0.47	2,115	
G2054 Seeding and sodding					
Sod, turf at residences	4,500	SF	0.20	900	
G2055 Planting					
Trees, allow	1	LS	2,000.00	2,000	
Shrubs and groundcover planting, allow	1	LS	3,000.00	3,000	

Item Description	Quantity	Unit	Unit Cost	Totals	
G2057 Irrigation system					
Irrigation system to softscape planting areas assumed not required					
Total For Site Improvement				**937,651**	
G30 Site Mechanical Utilities					
Vacuum system equipment and piping	1	LS	250,000.00	250,000	
Compressed air system equipment and piping	1	LS	200,000.00	200,000	
Flow and monitoring systems	1	LS	300,000.00	300,000	
Pump temperature monitoring systems	1	LS	75,000.00	75,000	
Total For Site Mechanical Utilities				**825,000**	

Klickitat Hatchery Redevelopment
Klickitat, WA
Conceptual Design Cost Estimate

Gross Site Area: **500,000 SF**
Date: **November 18, 2010**
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SITEWORK
DETAIL OF ESTIMATE

Item Description	Quantity	Unit	Unit Cost	Totals
G40 Site Electrical Utilities				
Electrical site distribution	1	LS	275,000.00	275,000
Site lighting	1	LS	100,000.00	100,000
Site CCTV	12	EA	7,500.00	90,000
Alarm system	1	LS	10,000.00	10,000
Total For Site Electrical Utilities				**475,000**

KLICKITAT HATCHERY REDEVELOPMENT
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DETAIL OF POND 26

Item Description	Quantity	Unit	Unit Cost Incl. Subcont.	Totals
1 REAREING POND [PAIR] Size 90' x 42'				
Standard 90' x 42' rearing pond	1	EA	Total	**296,265**
2 REAREING POND [SEVERN] Size 90' x 42'				
Rearing pond size 108' x72'	7,776	SF	78.38	**609,459**
3 WATER DISTRIBUTION				
Allow for cutting and preparing existing pipe for connection to new	1	LS	500.00	500
Excavate trench for water pipe	198	CY	13.50	2,673
Remove excavated material and spread on site	120	CY	4.00	480
Backfill in compact layers excavated material	78	CY	14.00	1,092
Granular bed and surround to water pipes	97	CY	34.00	3,298
Concrete bed and surround to multi-pipes	9	CY	450.00	4,050
18" diameter pvc water pipe	219	LF	61.00	13,385
Extra for 18" pipe bend	2	EA	900.00	1,800
Extra for 18" pipe end cap	2	EA	350.00	700
24" diameter pvc water pipe	37	LF	82.42	3,014
Extra for 24" pipe bend	1	EA	1200.00	1,200
Extra for 24" branch	1	EA	1650.00	1,650
Allowance for pipe connection	1	LS	1522.46	1,522
			Total For Site Water Distribution	**35,365**
4 DRAINAGE				
Excavate trench for water pipe	249	CY	13.50	3,362
Remove excavated material and spread on site	166	CY	4.00	664
Backfill in compact layers excavated material	83	CY	14.00	1,162
Granular bed and surround to water pipes	129	CY	34.00	4,386
Concrete bed and surround to multi-pipes	7	CY	450.00	3,150
24" diameter pvc drain pipe	269	LF	63.00	16,920
Extra for 24" pipe bend	4	EA	1050.00	4,200
Extra for 24" branch	1	EA	1400.00	1,400
24" diameter pipe connection to existing	1	EA	1000.00	1,000
Allowance for pipe connection	1	LS	1176.00	1,176
			Total For Site Drainage	**37,420**
			check	525,646
5 SITE PREPARATION				
Erosion control, allow	1	LS	3500.00	3,500
Site preparation, allow	1	LS	5500.00	5,500
			Total For Site Preparation	**9,000**

KLICKITAT HATCHERY REDEVELOPMENT
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DETAIL OF POND 26

Item Description	Quantity	Unit	Unit Cost Incl. Subcont.	Totals
6 SITE DEVELOPMENT				
Modifications to existing crushed rock roadways	1	LS	8000.00	8,000
Marking trailer pad	1	LS	2500.00	2,500
Miscellaneous paving modifications	1	LS	5000.00	5,000
			Total For Site Development	**15,500**
7 SITE ELECTRICAL				
Site electrical utilities and lighting	1	LS	12000	12,000
			Total For Site Electrical	**12,000**

1

Upper Indian Ford Springs Intake A

2

Lower Indian Ford Springs Intake A

Indian Ford Springs B

Wonder Springs

Klickitat River Concrete Sill

Klickitat River Water Intake

Pond 25

Pond 25 & Shed

9

Rearing Pond 24

10

Rearing Raceways A

11

Adult Capture

12

Pollution Abatement Basin

Hatchery Building Exterior

Hatchery Building Interior

15

Storage Building

16

Turbine Building & Fish Feed Storage

17

Staff Housing

18

Visitor Area

19

Bridge & Water Supply Lines

20

Propane Storage & Hatchery Building

Jumbo Raceway - Volume & Flow Calculations - Klickitat

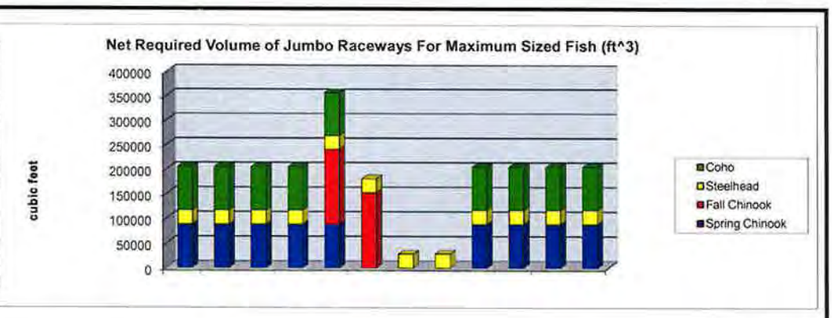
<<indicates value may be varied by user

Species	Number of	Minimum Size (lbs)	Minimum Size (as per curve fit of Piper Table I-4&5 - inches)	Maximum Size (lbs)	Maximum Size (as per curve fit of Piper Table I-4&5 - inches)	D (as per Piper 1982 rec for broodstock-- lbs/ft^3/in)	Flow index (1.5 corrected to altitude of 2000ft & 50 deg H2O temp)	Percentage being held
Spring Chinook	800000	0.0500	5.501	0.0666	6.034	0.1	1.68	100.00%
Fall Chinook	4000000	0.0125	3.427	0.0133	3.501	0.1	1.68	100.00%
Steelhead	200000	0.1000	6.548	0.1660	7.870	0.15	1.68	100.00%
Coho	1000000	0.0500	5.270	0.0660	5.756	0.13	1.68	100.00%

Species	Jumbo Raceway Length (ft)	Jumbo Raceway width (ft)	Jumbo Raceway depth (ft)	Jumbo Raceway volume (ft^3)	Net Minimum Required flow (GPM)	Net Minimum Required Volume (ft^3)	Net Maximum Required flow (GPM)	Net Maximum Required Volume (ft^3)	Min scenario # of Jumbo raceways required	Max scenario # of Jumbo raceways required
Spring Chinook	90	20	5	9000	4328	72709	5256	88300	9	10
Fall Chinook	120	30	6	21600	8685	145902	9044	151939	7	8
Steelhead	90	20	6	10800	1818	20364	2511	28124	2	3
Coho	90	20	5	9000	5648	72985	6825	88205	9	10

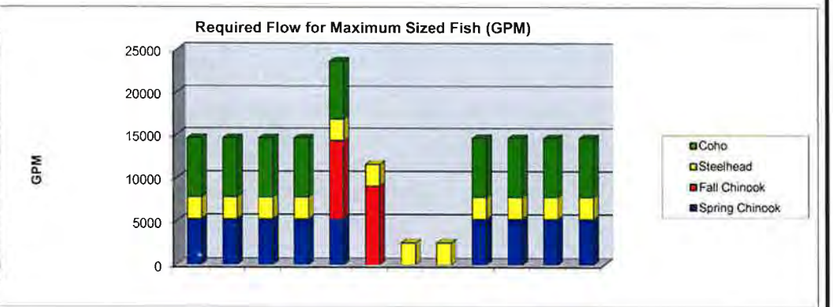
Required Volume for Maximum Sized Fish (ft^3)

Dates	Spring Chinook	Fall Chinook	Steelhead	Coho
January	88300		28124	88205
February	88300		28124	88205
March	88300		28124	88205
April	88300		28124	88205
May	88300	151939	28124	88205
June		151939	28124	
July			28124	
August			28124	
September	88300		28124	88205
October	88300		28124	88205
November	88300		28124	88205
December	88300		28124	88205



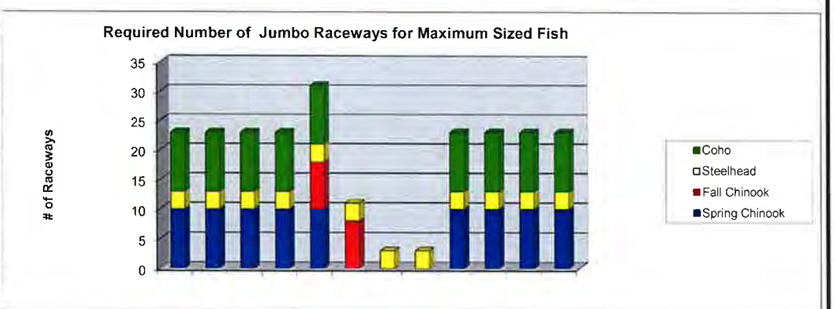
Required Flow for Maximum Sized Fish (GPM)

Dates	Spring Chinook	Fall Chinook	Steelhead	Coho
January	5256		2511	6825
February	5256		2511	6825
March	5256		2511	6825
April	5256		2511	6825
May	5256	9044	2511	6825
June		9044	2511	
July			2511	
August			2511	
September	5256		2511	6825
October	5256		2511	6825
November	5256		2511	6825
December	5256		2511	6825



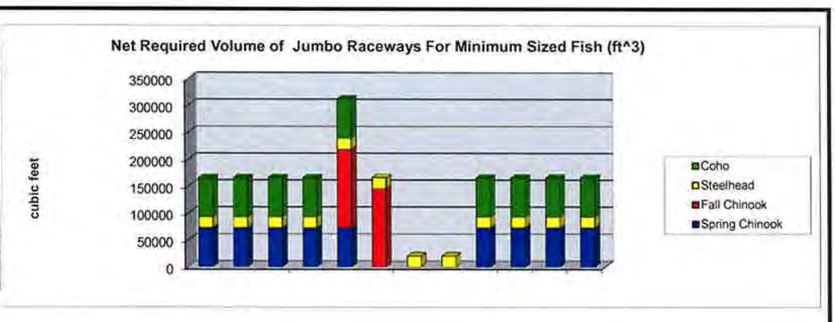
Required # of Jumbo Raceways for Maximum Sized Fish

Dates	Spring Chinook	Fall Chinook	Steelhead	Coho
January	10		3	10
February	10		3	10
March	10		3	10
April	10		3	10
May	10	8	3	10
June		8	3	
July			3	
August			3	
September	10		3	10
October	10		3	10
November	10		3	10
December	10		3	10



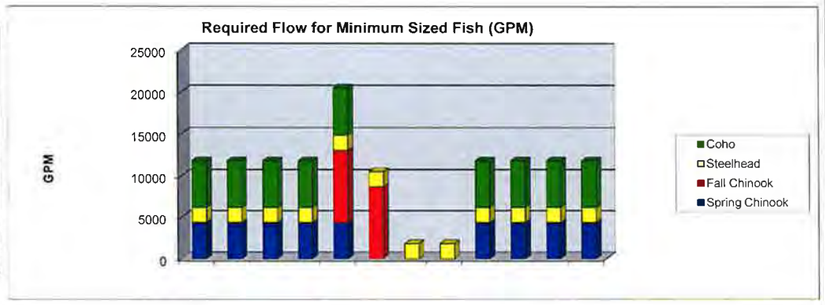
Required Volume for Minimum Sized Fish (ft^3)

Dates	Spring Chinook	Fall Chinook	Steelhead	Coho
January	72709		20364	72985
February	72709		20364	72985
March	72709		20364	72985
April	72709		20364	72985
May	72709	145902	20364	72985
June		145902	20364	
July			20364	
August			20364	
September	72709		20364	72985
October	72709		20364	72985
November	72709		20364	72985
December	72709		20364	72985



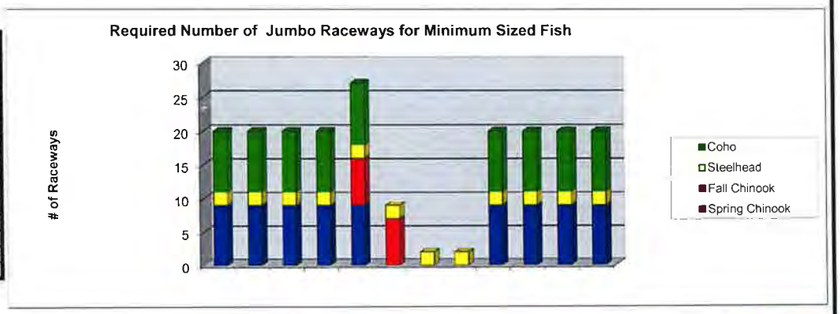
Required Flow for Minimum Sized Fish (GPM)

Dates	Spring Chinook	Fall Chinook	Steelhead	Coho
January	4328		1818	5648
February	4328		1818	5648
March	4328		1818	5648
April	4328		1818	5648
May	4328	8685	1818	5648
June		8685	1818	
July			1818	
August			1818	
September	4328		1818	5648
October	4328		1818	5648
November	4328		1818	5648
December	4328		1818	5648



Required # of Jumbo Raceways for Minimum Sized Fish

Dates	Spring Chinook	Fall Chinook	Steelhead	Coho
January	9		2	9
February	9		2	9
March	9		2	9
April	9		2	9
May	9	7	2	9
June		7	2	
July			2	
August			2	
September	9		2	9
October	9		2	9
November	9		2	9
December	9		2	9



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Adult Holding - Volume & Flow Calculations - Klickitat

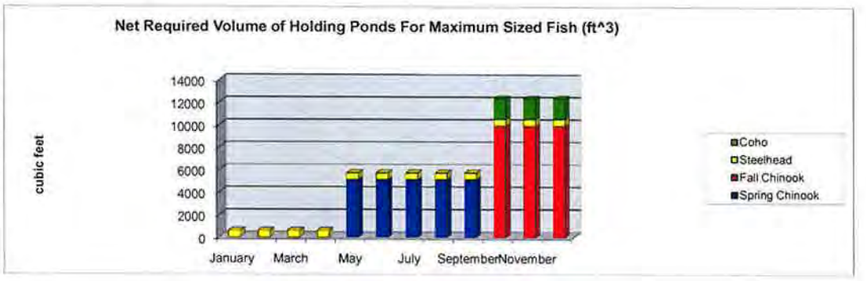
<<indicates value may be varied by user

Species	Number of adults	Minimum Size (lbs)	Minimum Size (as per curve fit of Piper Table I-4&5 - inches)	Maximum Size (lbs)	Maximum Size (as per curve fit of Piper Table I-4&5 - inches)	D (as per Piper 1982 rec for broodstock--lbs/ft^3/in)	Flow index (1.5 corrected to altitude of 2000ft & 50 deg H2O temp)	Percentage of Broodstock being held
Spring Chinook	658	30	46.6	40	51.3	0.1	1.68	100.00%
Fall Chinook	2000	15	36.7	20	40.4	0.1	1.68	100.00%
Steelhead	170	15	35.0	20	38.6	0.15	1.68	100.00%
Coho	842	10	30.6	10	30.6	0.15	1.68	100.00%

Species	Adult holding Pond Length (ft)	Adult holding Pond width (ft)	Adult holding Pond depth (ft)	Adult holding Pond volume (ft^3)	Net Minimum Required flow (GPM)	Net Minimum Required Volume (ft^3)	Net Maximum Required flow (GPM)	Net Maximum Required Volume (ft^3)	Minimum scenario # of ponds required	Maximum scenario # of ponds required
Spring Chinook	48	9	6	2592	252	4236	305	5129	2	2
Fall Chinook	48	9	6	2592	486	8172	590	9905	4	4
Steelhead	48	9	6	2592	43	486	52	588	1	1
Coho	48	9	6	2592	164	1833	164	1833	1	1

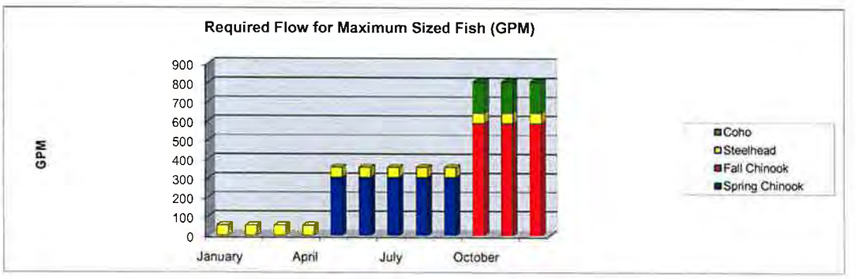
Required Volume for Maximum Sized Fish (ft^3)

Dates	Spring Chinook	Fall Chinook	Steelhead	Coho
January			588	
February			588	
March			588	
April			588	
May	5129		588	
June	5129		588	
July	5129		588	
August	5129		588	
September	5129		588	
October		9905	588	1833
November		9905	588	1833
December		9905	588	1833



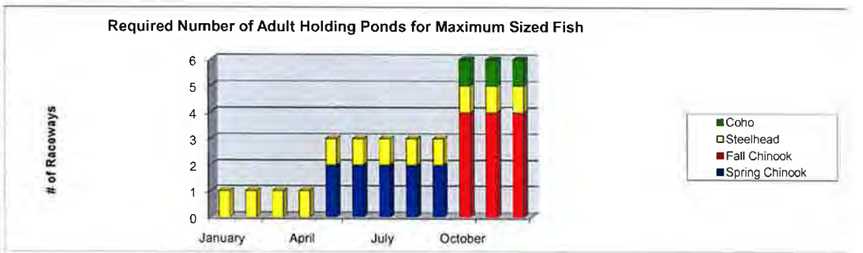
Required Flow for Maximum Sized Fish (GPM)

Dates	Spring Chinook	Fall Chinook	Steelhead	Coho
January			52	
February			52	
March			52	
April			52	
May	305		52	
June	305		52	
July	305		52	
August	305		52	
September	305		52	
October		590	52	164
November		590	52	164
December		590	52	164



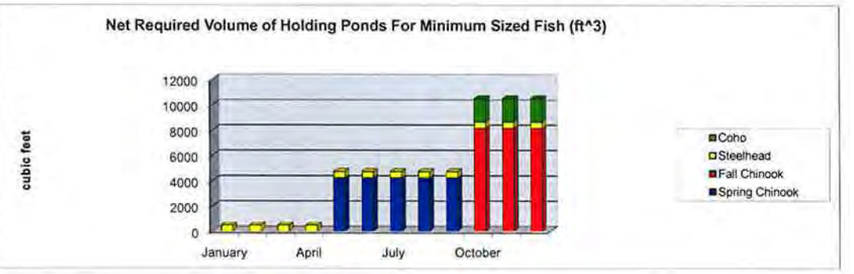
Required # of Adult Ponds for Maximum Sized Fish

Dates	Spring Chinook	Fall Chinook	Steelhead	Coho
January			1	
February			1	
March			1	
April			1	
May	2		1	
June	2		1	
July	2		1	
August	2		1	
September	2		1	
October		4	1	1
November		4	1	1
December		4	1	1



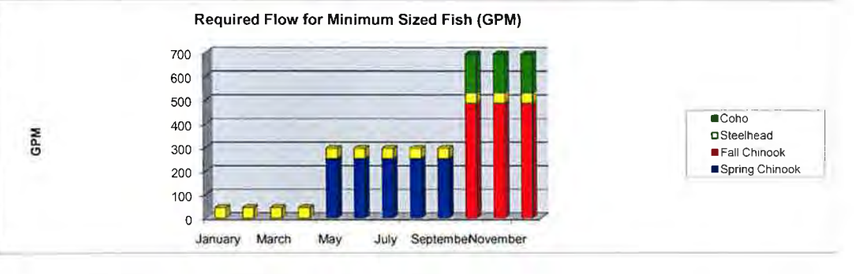
Required Volume for Minimum Sized Fish (ft^3)

Dates	Spring Chinook	Fall Chinook	Steelhead	Coho
January			486	
February			486	
March			486	
April			486	
May	4236		486	
June	4236		486	
July	4236		486	
August	4236		486	
September	4236		486	
October		8172	486	1833
November		8172	486	1833
December		8172	486	1833



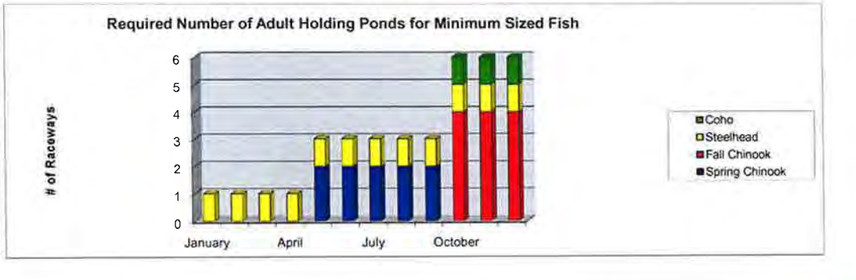
Required Flow for Minimum Sized Fish (GPM)

Dates	Spring Chinook	Fall Chinook	Steelhead	Coho
January			43	
February			43	
March			43	
April			43	
May	252		43	
June	252		43	
July	252		43	
August	252		43	
September	252		43	
October		486	43	164
November		486	43	164
December		486	43	164



Required # of Adult Ponds for Minimum Sized Fish

Dates	Spring Chinook	Fall Chinook	Steelhead	Coho
January			1	
February			1	
March			1	
April			1	
May	2		1	
June	2		1	
July	2		1	
August	2		1	
September	2		1	
October		4	1	1
November		4	1	1
December		4	1	1



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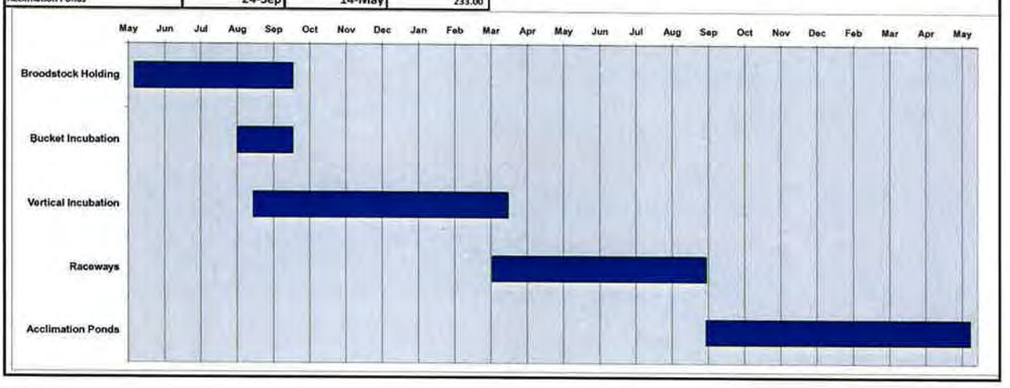
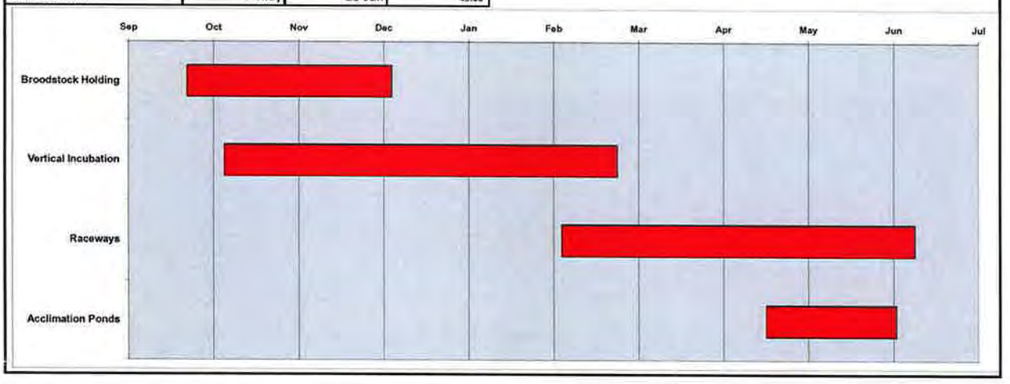
Spring Chinook

Task	Start date	End Date	duration (days)
Broodstock Holding	7-May	24-Sep	140.00
Bucket Incubation	6-Aug	24-Sep	49.00
Vertical Incubation	20-Aug	2-Apr	225.00
Raceways	19-Mar	24-Sep	189.00
Acclimation Ponds	24-Sep	14-May	233.00



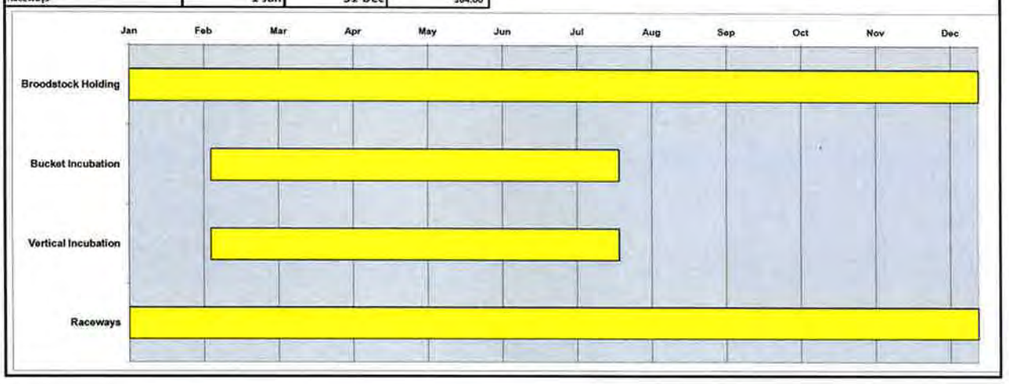
Fall Chinook

Task	Start date	End Date	duration (days)
Broodstock Holding	1-Oct	17-Dec	77.00
Vertical Incubation	15-Oct	12-Mar	148.00
Raceways	19-Feb	2-Jul	133.00
Acclimation Ponds	7-May	25-Jun	49.00



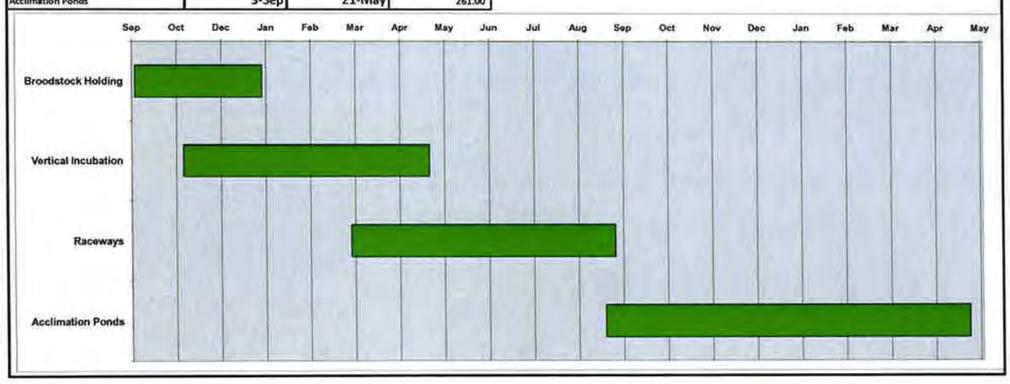
Steelhead

Task	Start date	End Date	duration (days)
Broodstock Holding	1-Jan	31-Dec	364.00
Bucket Incubation	5-Feb	30-Jul	175.00
Vertical Incubation	5-Feb	30-Jul	175.00
Raceways	1-Jan	31-Dec	364.00



Coho

Task	Start date	End Date	duration (days)
Broodstock Holding	1-Oct	31-Dec	91.00
Vertical Incubation	5-Nov	30-Apr	176.00
Raceways	5-Mar	10-Sep	189.00
Acclimation Ponds	3-Sep	21-May	261.00



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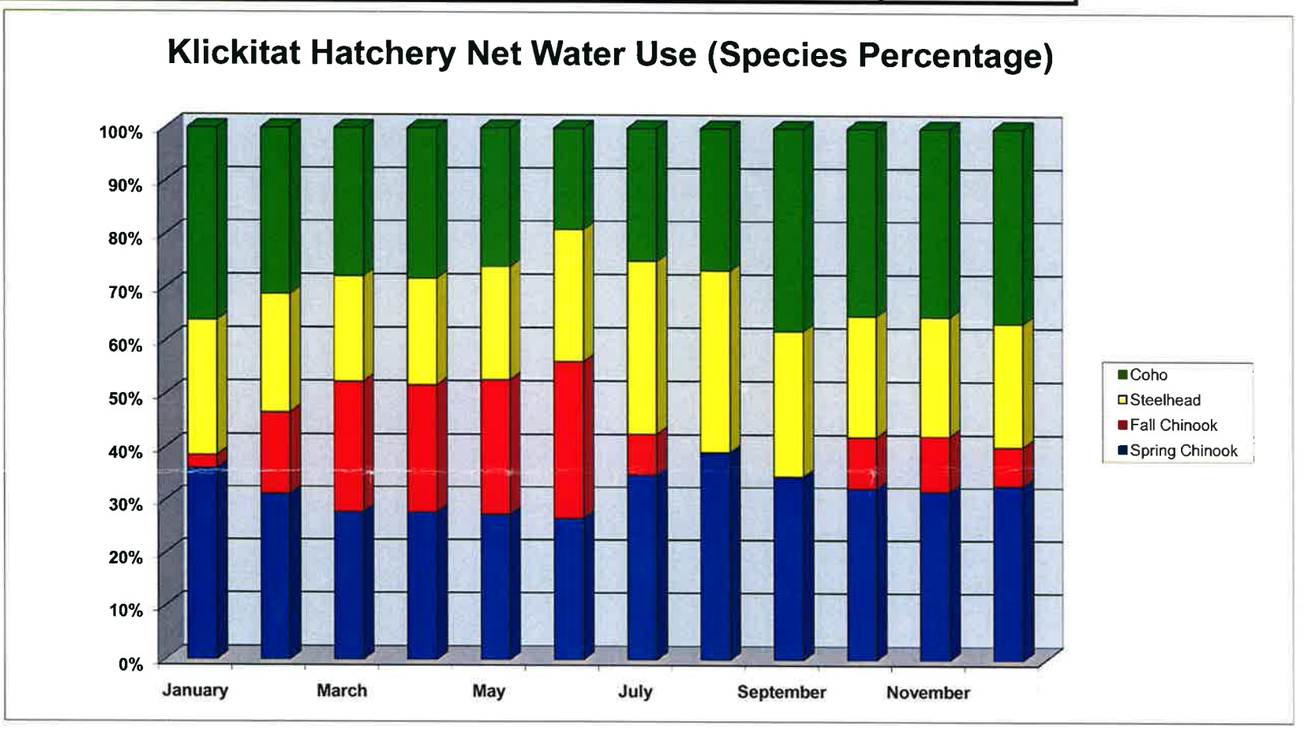
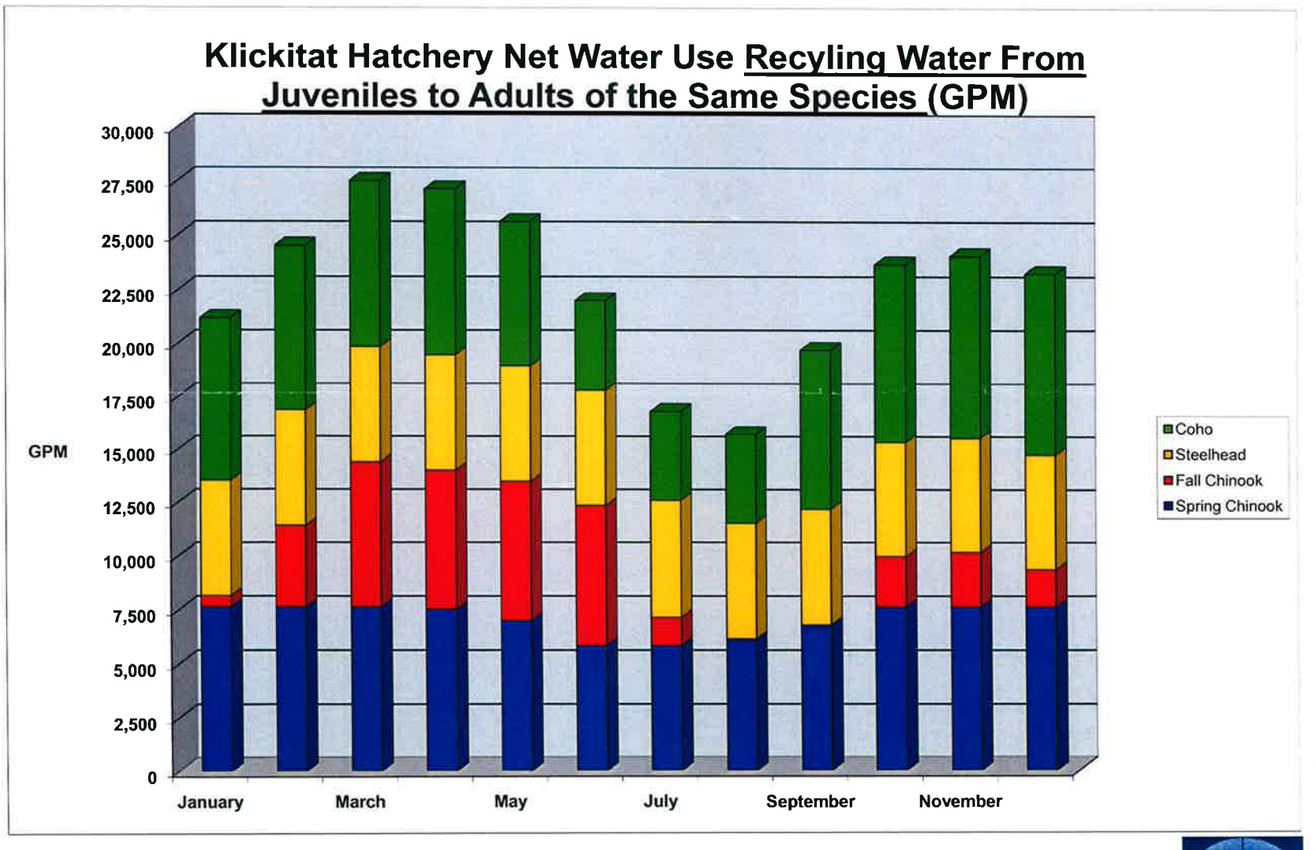
Net Monthly Water flows (GPM)

Dates	Spring Chinook (Monthly avg GPM)	Fall Chinook (Monthly avg GPM)	Steelhead (Monthly avg GPM)	Coho (Monthly avg GPM)
January	7648.81	523.81	5370.00	7663.27
February	7648.81	3773.81	5452.86	7663.27
March	7648.81	6761.90	5452.86	7663.27
April	7529.76	6500.00	5452.86	7663.27
May	7007.89	6500.00	5452.86	6675.00
June	5857.89	6500.00	5452.86	4200.00
July	5857.89	1300.00	5452.86	4200.00
August	6162.56	0.00	5370.00	4200.00
September	6811.97	0.00	5393.36	7500.00
October	7648.81	2314.29	5393.36	8342.11
November	7648.81	2523.81	5393.36	8505.37
December	7648.81	1723.81	5393.36	8505.37





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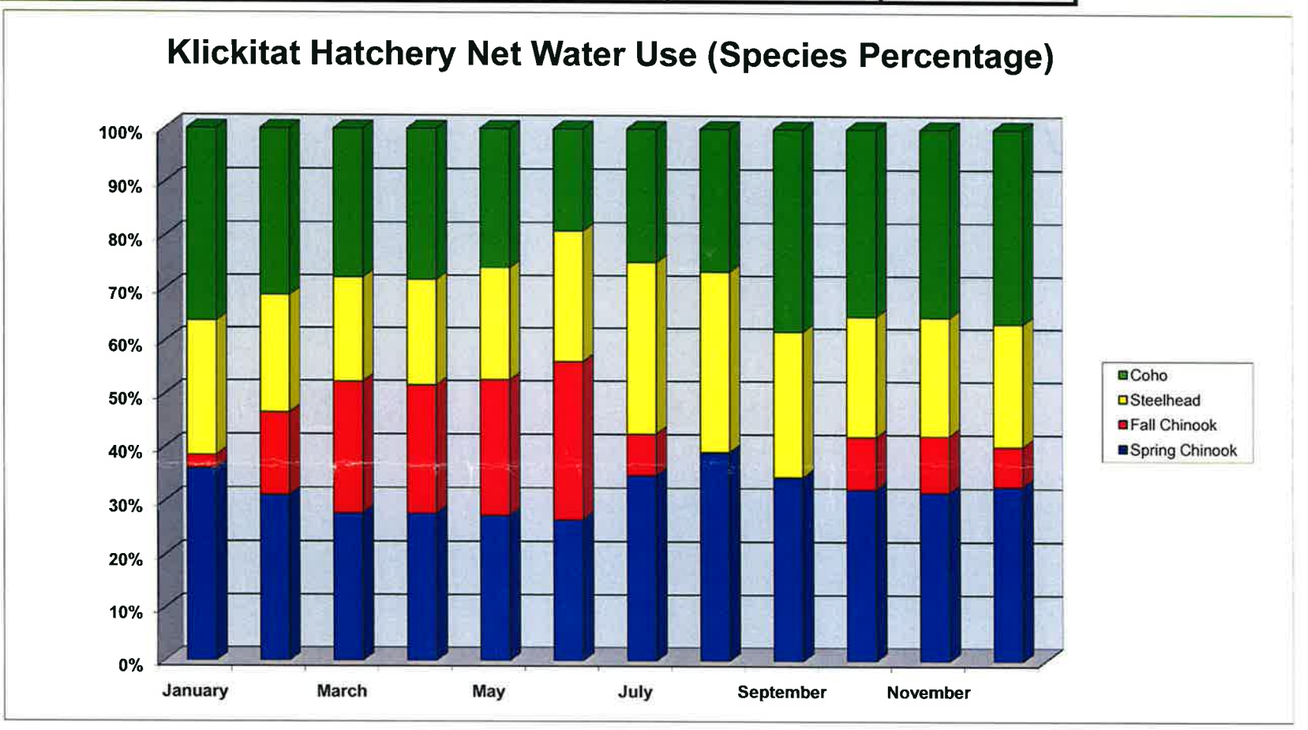
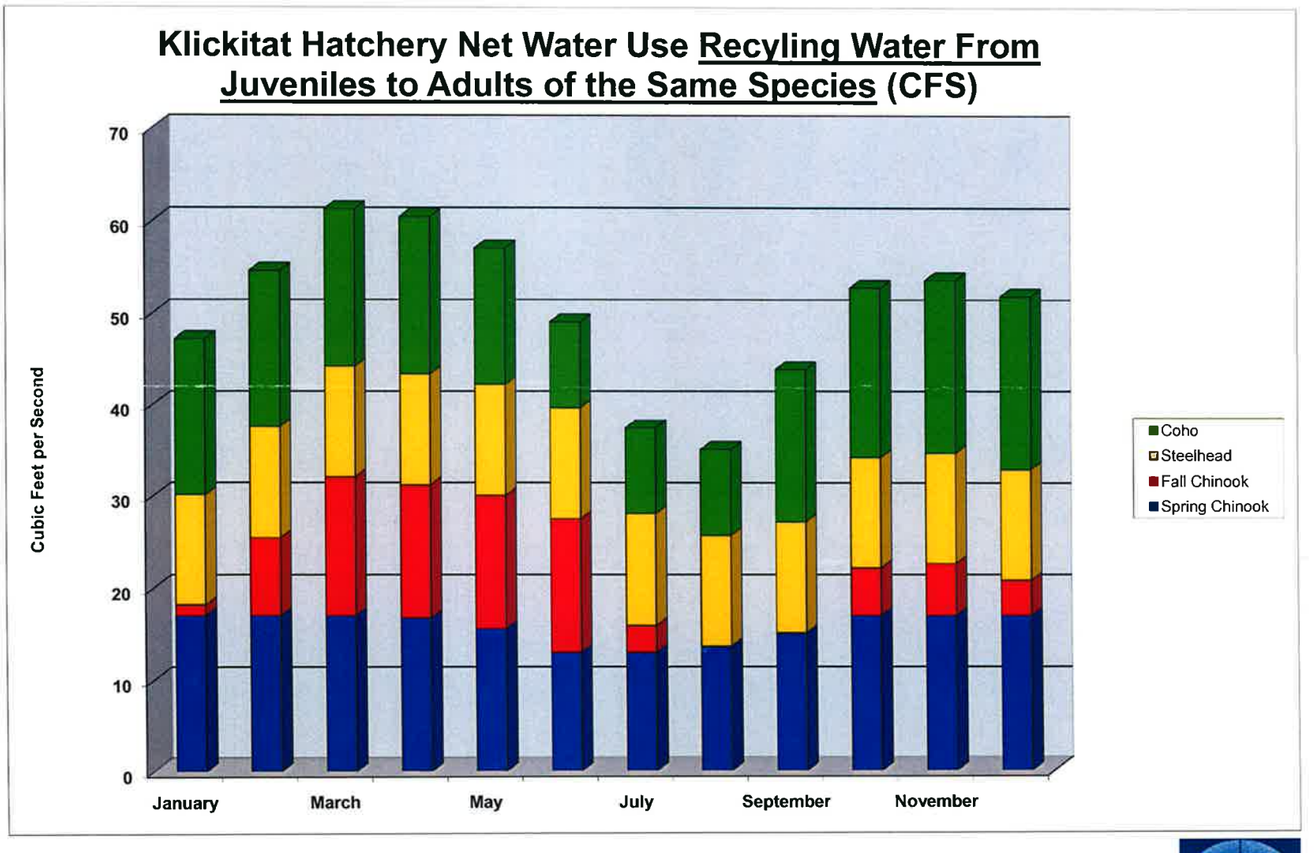
Net Monthly Water flows (CFS)

Dates	Spring Chinook (Monthly avg CFS)	Fall Chinook (Monthly avg CFS)	Steelhead (Monthly avg CFS)	Coho (Monthly avg CFS)
January	17.04	1.17	11.96	17.07
February	17.04	8.41	12.15	17.07
March	17.04	15.07	12.15	17.07
April	16.78	14.48	12.15	17.07
May	15.61	14.48	12.15	14.87
June	13.05	14.48	12.15	9.36
July	13.05	2.90	12.15	9.36
August	13.73	0.00	11.96	9.36
September	15.18	0.00	12.02	16.71
October	17.04	5.16	12.02	18.59
November	17.04	5.62	12.02	18.95
December	17.04	3.84	12.02	18.95





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[F] TABLE 307.1(1)
MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA OF HAZARDOUS MATERIALS POSING A PHYSICAL HAZARD[a, j, m, n, p]

MATERIAL	CLASS	GROUP WHEN THE MAXIMUM ALLOWABLE QUANTITY IS EXCEEDED	STORAGE[b]			USE-CLOSED SYSTEMS[b]			USE-OPEN SYSTEMS[b]	
			Solid pounds (cubic feet)	Liquid gallons (pounds)	Gas (cubic feet at NTP)	Solid pounds (cubic feet)	Liquid gallons (pounds)	Gas (cubic feet at NTP)	Solid pounds (cubic feet)	Liquid gallons (pounds)
Combustible liquid[e, i]	II IIIA IIIB	H-2 or H-3 H-2 or H-3 N/A	N/A	120[d, e] 330[d, e] 13,200[e, f]	N/A	N/A	120[d] 330[d] 13,200[f]	N/A	N/A	30[d] 80[d] 3,300[f]
Combustible fiber	Loose Baled[o]	H-3	(100) (1,000)	N/A	N/A	(100) (1,000)	N/A	N/A	(20) (200)	N/A
Consumer fireworks (Class C, Common)	1.4G	H-3	125[d, e, l]	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cryogenics, flammable	N/A	H-2	N/A	45[d]	N/A	N/A	45[d]	N/A	N/A	10[d]
Cryogenics, inert	N/A	N/A	N/A	N/A	NL	N/A	N/A	NL	N/A	N/A
Cryogenics, oxidizing	N/A	H-3	N/A	45[d]	N/A	N/A	45[d]	N/A	N/A	10[d]
Explosives	Division 1.1 Division 1.2 Division 1.3 Division 1.4 Division 1.4G Division 1.5 Division 1.6	H-1 H-1 H-1 or H-2 H-3 H-3 H-1 H-1	1[e, g] 1[e, g] 5[e, g] 50[e, g] 125[d, e, l] 1[e, g] 1[d, e, g]	(1)[e, g] (1)[e, g] (5)[e, g] (50)[e, g] N/A (1)[e, g] N/A	N/A N/A N/A N/A N/A N/A N/A	0.25[g] 0.25[g] 1[g] 50[g] N/A 0.25[g] N/A	(0.25)[g] (0.25)[g] (1)[g] (50)[g] N/A (0.25)[g] N/A	N/A N/A N/A N/A N/A N/A N/A	0.25[g] 0.25[g] 1[g] N/A N/A 0.25[g] N/A	(0.25)[g] (0.25)[g] (1)[g] N/A N/A (0.25)[g] N/A
Flammable gas	Gaseous Liquefied	H-2	N/A	N/A (150)[d, e]	1,000[d, e] N/A	N/A	N/A (150)[d, e]	1,000[d, e] N/A	N/A	N/A
Flammable liquid[c]	1A 1B and 1C	H-2 or H-3	N/A	30[d, e] 120[d, e]	N/A	N/A	30[d] 120[d]	N/A	N/A	10[d] 30[d]
Flammable liquid, combination (1A, 1B, 1C)	N/A	H-2 or H-3	N/A	120[d, e, h]	N/A	N/A	120[d, h]	N/A	N/A	30[d, h]
Flammable solid	N/A	H-3	125[d, e]	N/A	N/A	125[d]	N/A	N/A	25[d]	N/A
Inert gas	Gaseous Liquefied	N/A N/A	N/A N/A	N/A N/A	NL NL	N/A N/A	N/A N/A	NL NL	N/A N/A	N/A N/A
Organic peroxide	UD I II III IV V	H-1 H-2 H-3 H-3 N/A N/A	1[e, g] 5[d, e] 50[d, e] 125[d, e] NL NL	(1)[e, g] (5)[d, e] (50)[d, e] (125)[d, e] NL NL	N/A N/A N/A N/A N/A N/A	0.25[g] 1[d] 50[d] 125[d] NL NL	(0.25)[g] (1) (50)[d] (125)[d] NL NL	N/A N/A N/A N/A N/A N/A	0.25[g] 1[d] 10[d] 25[d] NL NL	(0.25)[g] (1)[d] (10)[d] (25)[d] NL NL
Oxidizer	4 3[k] 2 1	H-1 H-2 or H-3 H-3 N/A	1[e, g] 10[d, e] 250[d, e] 4,000[e, f]	(1)[e, g] (10)[d, e] (250)[d, e] (4,000)[e, f]	N/A N/A N/A N/A	0.25[g] 2[d] 250[d] 4,000[f]	(0.25)[g] (2)[d] (250)[d] (4,000)[f]	N/A N/A N/A N/A	0.25[g] 2[d] 50[d] 1,000[f]	(0.25)[g] (2)[d] (50)[d] (1,000)[f]

(continued)

Outline
Specifications

Klickitat Hatchery Conceptual Design
Klickitat, Washington

The Confederated Tribes & Bands of the Yakama Nation

Prepared by,
Harbor Consulting Engineers
Seattle Washington

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Division 00 Procurement & Contracting Requirements

SECTION 000101 – Introductory Information

Project Title Page, Table of Contents, list of drawings, list of schedules.

SECTION 001000 – Solicitation

Advertisement and Invitations for Bids, Request for Proposals, Request for Qualifications

SECTION 002000– Instructions for Procurement

Instructions for Bidders, proposers. Supplementary Instructions, scope of Bids, pre-bid meetings, pre-proposal meetings

SECTION 003000 – Available Information

Preliminary Schedules, project schedules, construction schedules, project phasing, sequencing, project milestones. Project budgeting, survey information, Environmental assessment information, existing material Information & Geotechnical Information

SECTION 004000 – Procurement Forms & Supplements

Bid forms, stipulated sum, construction management, cost-plus-fee, Unit price, Design/Build & purchase contract. Proposal forms, stipulated sum, construction management, cost-plus-fee, Unit price, design/Build & purchase contract. Bid security form, allowance Form, Unit Price Form, Alternate Forms, Substitution request form, wage rate form proposed schedule of values from, proposed construction schedule form, proposed work plan form, bid submittal checklist. Bidders Qualifications, proposers' qualification, non-collusion Affidavit Statement, Worker's Compensation Certificate Schedule, Non-segregated Facilities Affidavit, Equal Employment Opportunity Affidavit, Minority Business Enterprise Affidavit, Corporate Resolutions, Governmental Certifications

SECTION 005000 – Contracting Forms & Supplements

Agreement forms such as Stipulated Sum, Construction Management, Cost Plus-Fee, Unit Price, Design/Build, Purchase, Allowances, Unit Prices.

SECTION 005000.1 – SAMPLE FORMS

The following forms are referenced in the Specifications, and, as amended by or otherwise approved by the Owner, will be used in the execution of this Contract.

Form of Agreement
- 005200 AIA form A101 - Standard Form of Agreement Between Owner and Contractor, 2007 edition
  - AIA form A201 General Conditions of the Contract for Construction (2007)
- 006100 AIA document A310 - Bid Bond (1970)
- 006113 AIA document A312 – Performance Bond and Payment Bond (1984)
- 006116 Labor and Material Payment Bond
- 006216 Certificate of Insurance
- 006313 Section 01043 - Request for Information

Architect approved Request for Information form
- 006211 Submittals
- 006286 Contractor initiated form for Daily Construction Reports

Architect approved Submittal Transmittal form
- 004383 Bar Chart Schedule
- 013216 Contractor initiated form for Preliminary and Detailed Construction Schedules
- 004326 Substitutions
- 006325 Architect approved Substitution Request Form
- 006500 Project Closeout
  - AIA form G702 - Applications and Certificate for Payment, 1992 edition
  - AIA form G703 - Continuation Sheets, 1992 edition
  - AIA form G704 - Certificate of Substantial Completion, 2002 edition
  - AIA form G706 - Contractor's Affidavit of Payment of Debts and Claims, 1994 edition
  - AIA form G706A - Contractor's Affidavit of Release of Liens, 1994 edition
  - AIA form G707 - Consent of Surety To Final Payment, 1994 edition
  - AIA form G707A - Consent of Surety To Reduction in or Partial Release of Retainage, 1994 edition

SECTION 006000 – Project Forms

Bond Forms, Certificates and other forms, Clarification & Modification Forms, Closeout forms.

SECTION 007000 – Conditions of the Contract

General Conditions, Supplementary Conditions

SECTION 009000 – Revisions, Clarifications & Modifications

Pre-contract revisions such as Addenda, Bid Revisions & Proposal Revisions, Record Clarifications & Proposals such as Record Proposal Request, Record Change Order Requests

Division 01 General Requirements

SECTION 010000 - GENERAL REQUIREMENTS

Evaluations: Role Division 1 Sections, their preparation & Coordination

SECTION 011000 - SUMMARY

Summary of the Work, this project includes preparatory work and modifications to the existing structures in a phased sequence. Phased construction, purchase contracts, Owner furnished products, access to site & work restrictions.

SECTION 012100 - ALLOWANCE

Provisions for cash allowances including lump-sum, unit cost, contingency, testing & inspection allowances.

SECTION 012200 – UNIT PRICING

Provisions for unit pricing, if required.

SECTION 012300 - ALTERNATES

Provisions for change-of-scope & cost comparison type alternates.

SECTION 012500 – SUBSTITUTIONS

This Section describes product options available to the Contractor, plus procedures for securing approval of proposed substitutions during construction.

SECTION 012600 – CONTRACT MODIFICATION PROCEEDURES

Procedural requirements for changes to the Contract.

SECTION 012900 – PAYMENT PROCEEDURES

Administrative requirements for Contractor's Application for Payments

SECTION 013100 – PROJECT MANAGEMENT & COORDINATION

Administrative requirements for project meetings; preconstruction, pre-installation, and project closeout conferences; RFIs; and project Web sites

SECTION 013200 – CONSTRUCTION PROGRESS DOCUMENTATION

Contractor's Construction Schedule including Gantt charts and CPM schedules; Contractor's reports

SECTION 013300 – SUBMITTAL PROCEDURES

Procedures for Action and Informational Submittals including Delegated-Design Submittals and Submittals Schedule.

SECTION 013543– ENVIRONMENTAL REGULATORY REQUIREMENTS

State and other environmental statutes, ordinances regulations permits and approvals which deal with the prevention of environmental pollution and the preservation of public natural resources that affect or may affect this Project. This list is not to be considered as all-inclusive, nor shall the absence of a law from this list be construed to relieve the Contractor from complying with such law, to the extent it is applicable to the Contractor.

SECTION 014000 – QUALITY REQUIREMENTS

Quality-assurance and Control requirements, special tests and inspections, and Contractor's quality-control plan.

SECTION 014200 - REFERENCES

Common definitions and terms. Acronyms and trade names of associations, government agencies, and other entities referenced in MasterSpec.

SECTION 014516.13 – CONTRACTOR'S QUALITY CONTROL PROGRAM

Quality Control Program that details the methods and procedures that will be taken to assure that all materials and completed construction conform to contract plans, technical specifications and other requirements, whether manufactured by the Contractor, or procured from subcontractors or vendors. Although guidelines are established and certain minimum requirements are specified herein and elsewhere in the contract technical specifications, the Contractor shall assume full responsibility for accomplishing the stated purpose.

SECTION 015000 – TEMPORARY FACILITIES & CONTROLS

Temporary utilities and facilities for construction support, security & protection. This item shall consist of planning, installing, inspecting, maintaining, and removing temporary erosion and sediment control Best Management Practices (BMPs) as shown in the Contractor's Erosion and Sediment Control Plan or as ordered by the Engineer, to prevent pollution of air and water, and control, respond to, and dispose of eroded sediment and turbid water during the life of the Contract.

SECTION 016000 – PRODUCT REQUIREMENTS

Administrative and procedural requirements for product, material, and equipment selection and handling; warranties; and comparable products.

SECTION 017836 – WARRANTIES & BONDS

This Section specifies general administrative and procedural requirements for warranties and bonds required by Contract Documents, including manufacturers' standard warranties on products and special warranties for the systems.

SECTION 017839 – PROJECT RECORD DOCUMENTS

Throughout progress of the Work of this Contract, the Contractor shall maintain an accurate record of all Project Record Documents including As-Built Drawings, Project Schedule, and Submittals.

SECTION 017700 – CLOSEOUT PROCEEDURES

Contract closeout including Substantial Completion and Final Completion procedures, warranties and final cleanup.

SECTION 017823 – OPERATION & MAINTENANCE DATA

Emergency, operation and maintenance manuals for products and equipment.

SECTION 017839 – PROJECT RECORD DOCUMENTS

Record Drawings, Specifications & Product Data

SECTION 018816 –CONSTRUCTION PHASING & DEWATERING

The site phasing plan will include, but not be limited to, the specific construction activities outlined in this section.

SECTION 018900 – CONSTRUCTION SURVEY

This work consists of furnishing qualified personnel and necessary equipment and material to survey, stake, calculate, and record data for the control of work. The contractor shall provide a detailed survey control plan that identifies the construction and a temporary plan that identifies the temporary bench marks and shall update any changes.

Division 02 Existing Conditions

SECTION 024113 – SITE DEMOLITION

Extent of Work: The extent and location of the "Demolition" work is indicated on the drawings. The work includes the requirements for the removal, wholly or in part and satisfactory disposal of concrete debris, piping, broken pavements and household debris as shown or described within these specifications.

SECTION 024116 – STRUCTURE DEMOLITION

Complete Structure removal. Demolition and removal of buildings and site improvements. Abandoning in-place, Removing below-grade construction. Disconnecting, capping or sealing, and abandoning in-place, removing site utilities. Salvaging items for reuse by Owner.

SECTION 024119 – SELECTIVE STRUCTURE DEMOLITION

Demolition and removal of selected portions of building or structure. Demolition and removal of selected site elements. Salvage of existing items to be reused or recycled. Construction debris shall be hauled to an approved disposal site.

SECTION 028300 – REMOVAL/CONTROL & DISPOSAL OF PAINT WITH LEAD

The removal of lead-based paint and lead-contaminated dust, the permanent containment or encapsulation of lead-based paint, the replacement of lead-painted surfaces or fixtures, and the removal or covering of lead contaminated soil; and all preparation, cleanup, disposal, and post-abatement clearance testing activities associated with such measures.

Division 03 Concrete

SECTION 030130.51 – WET SAND BLASTED CONCRETE

Wet sandblasted finish shall be required for existing concrete where new concrete is to be placed. This surface preparation shall be performed prior to the placement of re-steel and/or concrete forms.

SECTION 031500 – INTEGRAL WATERPOOFING OF CONCRETE

Crystalline waterproofing admixture for concrete. Crystalline waterproofing treatment of construction joints between successive concrete pours. The work of this section applies to concrete in the following locations: Ground water and water contact surfaces.

SECTION 032000 – CONCRETE REINFORCEMENT

Extent of Work: The Work includes the requirements for manufacture, detailing, cutting, bending, transporting and placing of all concrete reinforcement and associated items required or indicated on the drawings. The PIT Tag Antenna: This area will require the use of fiber-reinforced polymer (FRP) material systems. The structural bar cut sheets shall be prepared by an experienced firm in the structural design when using FRP reinforcement.

SECTION 033000 – CAST-IN-PLACE CONCRETE

General building & structural applications; concrete mixtures, formwork, reinforcing, finishing & curing. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

SECTION 033816 – UNBONDED POST-TENSION CONCRETE

Summary of the Work, phased construction, purchase contracts, Owner furnished products, access to site & work restrictions. Section includes post-tensioning reinforcement and accessories and post-tensioning operations including stressing.

SECTION 034000 – PRECAST CONCRETE

Extent of Work: The extent and location of the “Precast Concrete” work is indicated on the drawings. The work includes the requirements for manufacturing, transporting and placing the precast concrete and associated items required or indicated on the drawings. The work may include, but is not limited to, underground handholds and vaults, ecology block, catch basins, deck panels, column and beams or other items approved by the Engineer.

Division 04 Masonry

SECTION 040519.16 – MASONRY ANCHORS & ACCESSORIES

Masonry veneer anchors and ties. Acceptable Manufacturer: Heckmann Building Products Inc., 1501 N. 31st Avenue, Melrose Park, IL 60160 800-621-4140 or 708-865-2403 FAX: 708-865-2640 email: Heckmann@worldnet.att.net. Website: www. heckmannbuildingprods.com. or an approved equal.

04220 SECTION 042000 – UNIT MASONRY

Extent of Work: The extent and location of the "Concrete Unit Masonry" work is indicated on the drawings. The work includes the requirements for providing all items and components of a completed masonry system in conformance with these specifications and the dimensions and sections indicated on the drawings or as established by the Engineer. All masonry work shall be performed by a certified mason contractor who has experience in integral patterns, textures and color of CMUs and CMUs veneer.

SECTION 042200 – CONCRETE UNIT MASONRY

Single-wythe CMU including decorative units.

SECTION 042300 – GLASS UNIT MASONRY

Glass block installed with mortar, glass block installed with spacers and sealant, and glass block grid system.

Division 05 Metals

SECTION 050800 - WELDING

Extent of Work: Provide the welding materials and methods of joining miscellaneous and structural metals. Installer Qualifications: All welders are required to be currently certified by AWS or Washington Association of Building Officials (WABO) for structural welding.

SECTION 051000 – STRUCTURAL STEEL

Extent of Work: The extent and location of the "Structural Steel" work is indicated on the drawings. The work includes the requirements for providing all structural steel and associated work in conformance with these specifications and to the dimensions indicated on the drawings.

SECTION 051200 – STRUCTURAL STEEL FRAMING

Structural steel framing for buildings.

SECTION 053123 – STEEL ROOF DECK

Extent of Work: The extent and location of the "Steel Roof Deck" work is indicated on the drawings. The work includes the requirements for providing all the ribbed steel roof decking with all accessories required, complete and in place.

SECTION 052100 – STEEL JOIST FRAMING

Standard manufactured open-web units, including steel joists, long-span steel joists & joist girders.

SECTION 053100 – STEEL DECKING

Roof, floor & form steel decking.

SECTION 053113 – STEEL FLOOR DECK

Extent of Work: The extent and location of the "Steel Floor Deck" work is indicated on the drawings. The work includes the requirements for providing all galvanized corrugated or ribbed steel floor decking with all accessories required, complete and in place.

SECTION 055000 – METAL FABRICATION

Metal items (not sheet metal) made from iron & steel shapes, stainless steel & non-ferrous metals.

SECTION 055000.1 – VERTICAL TRAVELING SCREENS & SPARE PARTS

This section describes the concept for vertical hydraulic motor driven traveling screens specifically designed for this project. The selected fabricator shall provide detailed shop drawings for the structural and mechanical operational systems.

SECTION 055100 – METAL STAIRS & LADDERS

Steel; with pan, plate & grating treads. Manufacturers shall have a minimum of one year experience in manufacturing metal stairs. Installers shall have a minimum of one year experience in installing prefabricated metal stairs. Welders shall be qualified in accordance with the welding section.

SECTION 055213 – STEEL PIPE HANDRAIL &RAILING

Extent of Work includes preparation, material, fabrication, coating & installation .All exterior handrails and railings exposed to the 100 year flood waters shall be fabricated from schedule 80 pipe.

SECTION 055300 – METAL GRATING

Metal & glass-fiber-reinforced plastic grating.

Division 06 Wood, Plastics & Composites

SECTION 061000 – ROUGH CARPENTRY

Wood framing, furring, grounds, nailers & blocking. Extent of Work: The work includes the requirements for shop or field fabrication, detailing, cutting, transporting and placing of lumber and associated items required or indicated on the drawings. The extent and location of "Rough Carpentry" work is indicated on the drawings.

SECTION 064023 – INTERIOR ARCHITECTURAL WOODWORK

Extent of Work: The extent and location of the "Finish Carpentry" work is indicated on the drawings and includes the installation of all wood trim cabinets, tops, paneling, stairs, ornamental items & other items not specifically described as being installed under other sections of the specifications.

Division 07 Thermal Moister Protection

SECTION 071113 – BITUMINOUS DAMPPROOFING

Hot & Cold applied asphaltic dampproofing.

SECTION 072100 – THERMAL INSULATION

General building insulation installed at project site, excluding roof insulation. Extent of Work: Batt insulation, rigid insulation, vapor barrier/retardersand insulation fasteners.

SECTION 072500 – WEATHER BARRIERS

Building paper and building wrap weather-resistive barriers and flexible flashing.

SECTION 072616 – UNDERSLAB VAPOR RETARDER

Extent of Work: The Work includes the requirements for manufacture and placing of sheeting membrane overlaying gravel fill, and under specified concrete slabs on grade & Cast-In-Place Concrete.

SECTION 074113 – METAL ROOF PANELS

Factory formed lap-seam, exposed fasteners. Standing-seam, concealed fasteners, Batten-seam, horizontal-seam & foamed-and laminated-core metal roof panels.

SECTION 074213 – PRE-FORMED METAL FASCIA

Extent of work includes exposed-fastener, lap-seam metal wall panels, concealed-fastener, lap-seam metal wall panels, metal liner panels, metal soffit panels. Location is indicated on the drawings.

SECTION 076000 – FLASHING & SHEET METAL

Extent of Work: Provide all flashing, sheet metal, fasteners, manufactured reglets and counterflashing, formed roof drainage sheet metal fabrications, formed low-slope roof sheet metal fabrications, formed steep-slope roof sheet metal fabrications, formed wall sheet metal fabrications & flashing.

SECTION 076200 – SHEET METAL FLASHING & TRIM

Custom-fabricated roof & wall flashing and roof-drainage system, and manufactured through-wall flashing & reglets.

SECTION 078413 – PENETRATION FIRESTOPPING

System installed in fire-resistance-rated construction, at exterior curtain walls/floor intersections & smoke barriers.

SECTION 079200 – JOINT SEALANT & WATERSTOPS (THERMAL MOISTURE PROTECTION)

Elastomeric, latex, solvent-release-curing, preformed & acoustical sealants. The work includes the requirements necessary to provide all caulking and sealing as indicated on the drawings and as specified or required for a complete installation. Waterstops: Non-metallic polyvinyl chloride waterstops shall be used on all construction joints for water retaining structures.

SECTION 079500 – EXPANSION CONTROL

For building interiors & exteriors & open aired structures.

Division 08 Openings

SECTION 081113 – HOLLOW METAL DOORS & FRAMES

Hollow-metal doors, frames, anchors & fasteners. Exterior, interior, fire rated, smoke and draft assemblies, finishes, physical performance requirements, anchor system, stops & molding and accessories. Work includes installation and adjusting.

SECTION 083323 – OVERHEAD COILING DOORS

Galvanized-steel, stainless-steel, and aluminum curtain assemblies. Overhead coiling doors to be counterbalanced doors by methods of manufacturer's standard mechanism. Doors to be coiling type, with interlocking slats, complete with anchoring and door hardware, guides, hood, and operating mechanisms, and designed for use on openings as indicated.

SECTION 084113 – ALUMINUM-FRAMED ENTRANCES & STOREFRONT

Storefront framing, entrance doors, and hardware; and framing for window walls, ribbon walls, and punched openings.

SECTION 085113 – ALUMINUM WINDOWS

Stock aluminum windows and all necessary appurtenances. Comply with applicable requirements of AAMA 101. All aluminum windows, components and hardware shall be manufactured or distributed by a single company unless specified otherwise.

SECTION 087100 – DOOR HARDWARE

The extent and location of the Door hardware work is indicated on the drawings. The work includes providing all necessary architectural hardware and specialty items for the proper operation, fastening and locking of doors or other moveable closures.

SECTION 088000 - GLAZING

Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section: Windows, Doors, Glazed curtain walls, Storefront framing, Glazed entrances, Sloped glazing, Skylights, Interior borrowed lites.

SECTION 088300 - MIRRORS

Wall mounted, unframed, silvered flat glass mirrors.

SECTION 089000 – LOUVERS & VENTS

Fixed and adjustable louvers; wall vents. Comply with SMACNA (Sheet Metal and Air Conditioning Contractor's National Association) recommendations for fabrication, construction details and installation procedures, except as shown or specified.

SECTION 089119 – WALL LOUVERS

Comply with SMACNA (Sheet Metal and Air Conditioning Contractor's National Association) recommendations for fabrication, construction details and installation procedures, except as shown or specified.

Division 09 Finishes

SECTION 092900 – GYPSUM BOARD

Interior gypsum board, exterior gypsum board for ceilings and soffits, and tile backing boards & textured finishes. Performance requirements include fire resistance rated assemblies, Sound Transmission Rating (STC), low emitting materials, moisture and mold resistance. Trim, joint treatment, adhesive & fasteners.

SECTION 093000 - TILING

Ceramic mosaic, quarry, paver, and wall tile.

SECTION 095123 – ACOUSTICAL TILE CEILINGS

Mineral-based tile with concealed suspension system, and direct-attached acoustical tile.

SECTION 096500 – RESILIENT FLOORING

Vinyl and rubber sheet floor coverings.

SECTION 096513 – RESILIENT BASE & ACCESSORIES

Resilient base, stair accessories, and molding accessories.

SECTION 099100 - PAINTING

Exterior & interior painting. Section includes surface preparation and the application of paint systems on exterior and interior substrates such as: Concrete, clay masonry, concrete masonry units (CMU), steel, galvanized metal, aluminum (not anodized or otherwise coated), stainless-steel flashing, wood, plastic trim fabrications, exterior siding. Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."

Division 10 Specialties

SECTION 101200 – DISPLAY CASE

Illuminated and non illuminated type

SECTION 101400 - SIGNAGE

Exterior & interior signs, letters & plaques. panel signs, illuminated panel signs, room-identification signs.. Qualifications of Sign Fabricator:

SECTION101453 – TRAFFIC SIGNS

Extent of Work: The work includes the requirements for providing manufactured traffic control signs as indicated on the drawings.

SECTION 102113 – TOILET COMPARTMENTS

Steel, stainless-steel, plastic laminate, phenolic-core and solid polymer toilet enclosures, entrance screens & urinal screens

SECTION 102800 – TOILET, BATH & LAUNDRY ACCESSORIES

Standard commercial, institutional & residential units

SECTION 104416 – PORTABLE FIRE EXTINGUISHERS & CABINETS

Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers." Coordinate type and capacity of fire extinguishers with fire protection cabinets to ensure fit and function.

SECTION 105113 – METAL LOCKERS

Standard, heavy-duty athletic, open front athletic.

SECTION 107500 - FLAGPOLES

Aluminum, steel, stainless steel & fiberglass flagpoles.

Division 11 Equipment

SECTION 111313 – DOCK BUMPER

Dock bumpers shall be made from resilient, uniform-size, fabric-reinforced rubber pads pressure-laminated between structural steel angles and secured with steel tie rods or bars. Dock bumpers shall be of the size indicated and suitable for mounting directly to a concrete loading dock & include mounting hardware.

SECTION 114000 – FOODSERVICE EQUIPMENT

Commercial food service equipment.

SECTION 115213 – PROJECTION SCREENS

Front & rear projection screens.

Division 12 Furnishings

SECTION 123623.13 – PLASTIC-LAMINATE-CLAD COUTERTOPS

Plastic-laminate countertops.

SECTION 124813 – ENTRANCE FLOOR MATS & FRAMES

Recessed treads with various surfaces; recessed metal frames.

SECTION 124816 – ENTRANCE FLOOR GRILLES

Work includes furnishing and installing grilles, frames and support systems.

Division 13 Special Construction

SECTION 131100 – CONCRETE FORMS

Extent of Work: The Work includes providing the structural support and physical barriers or forms which control the shape and location of the concrete. Also included in this section are the requirements for the removal of the forms and their support.

SECTION 133419 – METAL BUILDING SYSTEMS

Systems consisting of structural framing, roofing &siding panels, and standard components.

Division 14 Conveying Equipment

Division 15 Mechanical

RESERVED FOR FUTURE EXPANSION

Division 16 Electrical

RESERVED FOR FUTURE EXPANSION

Facility Services Subgroup

Division 21 Fire Suppression

SECTION 211200 – STANDPIPE & HOSES

Section includes entire standpipe system from fire department connection to fire hose connection. Factory Mutual System NFPA 14 (National Fire Protection Association) - Installation of Standpipe and Hose Systems.

Division 22 Plumbing

SECTION 220529 – HANGERS & SUPPORTS

Section includes pipe and equipment supports, hangers, anchors, bases sleeves and the sealing of work to adjacent construction.

SECTION 221100 – UNFILTERED WATER SUPPLY SYSTEM

Section includes unfiltered water piping, pumps, valves, valve actuators, fittings, water filters, vertical traveling screen, controls and accessories.

SECTION 223200 – FILTERED WATER SYSTEM

Section includes filtered water piping, pumps, valves, valve actuators, fittings, water filters, vertical traveling screens, controls and accessories.

SECTION 220800 – WELDED STEEL PIPE

Work includes detailing, furnishing, fabricating, shop testing, delivering, installing and testing of welded steel pipe 6” and larger and appurtenances,

SECTION 226119 – COMPRESSED AIR SYSTEM

Section includes compressed air piping, air compressors, valves, fittings, filters, air receivers, controls and accessories that comprise the Compressed Air System. Work includes preparation, trenching and backfilling, installation, interface with other products, erection tolerances, cleaning and testing.

Division 23 Heating Ventilation & Air Conditioning

SECTION 230000 – HEATING, VENTILATION, & AIR-CONDITIONING (HVAC)

Section includes fans, heaters, duct heaters, air conditioning equipment along with controls and accessories that comprise the heating, ventilation and air conditioning system

SECTION 230100 – MECHANICAL WORK-GENERAL

Piping materials and installation instructions common to most piping systems, joining Materials, escutcheons, dielectric fittings, flexible connectors, mechanical sleeve seals, piping Specialties, concrete base construction requirements, non-shrink grout for equipment installations, field fabricated metal and wood equipment supports, installation requirements common to equipment specification sections, mechanical demolition, cutting and patching, touchup painting and finishing.

SECTION 233713– DIFFUSERS, REGISTERS & GRILLES

Work includes: Round ceiling diffusers, rectangular and square ceiling diffusers, perforated diffusers, louver face diffusers, linear bar diffusers, linear slot diffusers, adjustable bar registers and grilles, fixed face registers and grilles & linear bar grilles.

SECTION 236400 – PACKAGED WATER CHILLERS

This section includes cooling water system piping and fittings along with controls and accessories that comprise the cooling system.

Division 25 Integrated Automation

Division 26 Electrical

SECTION 260000 – ELECTRICAL PROVISIONS

The work under this Division includes furnishing all permits, materials, equipment, labor, supervision, tools and items necessary for the construction, installation, connection, testing and operation of all electrical work for this project, as intended by the Contract Documents.

SECTION 260500 – BASIC ELECTRICAL MATERIALS & METHODS

Section includes grounding electrodes and conductors; equipment grounding conductors; bonding methods and materials; conduit and equipment supports; anchors and fasteners; nameplates and labels; wire markers; raceway markers; underground warning tape; sealing and fireproofing of sleeves and annular spaces between conduits, cable trays, wireways, troughs, cable bus, busduct and building element openings.

SECTION 260533 – RACEWAYS & BOXES

Section includes conduit and tubing, surface raceways, wireways, outlet boxes, pull and junction boxes, electrical connections to equipment, and handholes.

SECTION 260543 – UNDERGROUND DUCTS, HANDHOLES & VAULTS

This Section includes the requirements for trenching, backfilling and installation of underground conduits, ducts and ductbanks, and the design, fabrication, delivery and installation of pull boxes, handholes and manholes.

SECTION 260546 – ELECTRICAL UTILITY SERVICES

Section includes arrangement with Utility Company for permanent electric service; service provisions; and utility metering equipment. Products include but are not limited to: Utility meters, utility meter base, metering transformer cabinet & transformer pad.

SECTION 260573 – SURGE PROTECTION DEVICES

Section includes Surge Protection Devices (SPD) equipment for switchgear, switchboards. The suppression system shall incorporate a hybrid designed Metal-Oxide Varistors (MOV) surge suppressor for the service entrance and other distribution level.

SECTION 260620.13 - SWITCHBOARDS

Section includes main and distribution switchboards, Which includes, but is not limited to Switchboards, device mounts, bus, ground bus, line and load terminations & Utility metering compartment.

SECTION 260620.16 - PANELBOARDS

Section includes distribution and branch circuit panelboards, electronic grade branch circuit panelboards.

SECTION 260900 – WIRING DEVICES

Section includes wall switches, wall dimmers, receptacles, occupancy sensors, multi-outlet assembly, device plates, and decorative box covers.

SECTION 260913 – MOTOR STARTERS

Section includes manual, magnetic and solid state motor starters in individual enclosures. Full-voltage non-reversing starters, combined starters, NEMA 250 enclosure, solid state soft starters, 24 volts DC control voltage, overload protection, combination starters with field quality control and performance requirements.

SECTION 261000 – WIRE & CABLE (600 VOLTS OR LESS)

Section includes building wire; wiring connectors and connections. System description methods, preparation & installation.

SECTION 262716 – CABINETS & ENCLOSURES

Section includes hinged cover enclosures, cabinets, terminal blocks, and accessories

SECTION 262900 – LOW VOLTAGE LIGHTING CONTROL

Section includes switching controls, remote control switching relays, remote switches, remote sensors, power supplies, and relay/dimmer cabinets.

SECTION 263613 – MANUAL TRANSFER SWITCHES

Section includes manual transfer switches in individual enclosures and remote. Manufacturer: Company specializing in manufacturing products specified in this section with minimum five years documented experience, and with service facilities within 100 miles of Project. Supplier: Authorized or franchised distributor of specified manufacturer with minimum five years documented experience.

SECTION 263623 – SAFETY SWITCHES

Section includes fusible and non-fusible safety switches, fusible switch assemblies, Switch ratings : Horsepower rated for AC or DC as indicated on Drawings.

SECTION 265100 – INTERIOR LIGHTING

Section Includes: Interior lighting fixtures, lamps, and ballasts, Emergency lighting units, Exit signs, Lighting fixture supports, Retrofit kits for fluorescent lighting fixtures.

SECTION 265600 – EXTERIOR LIGHTING

Section Includes: Exterior luminaires with lamps and ballasts, Luminaire-mounted photoelectric relays, Poles and accessories.

Division 27 Communications

SECTION 270000 – COMMUNICATION CIRCUITS

Section includes arrangement with Telecommunications Utility Company for telecommunication

service; backboards, cabinets, pathways, termination devices, outlets and premises wiring. Including but not limited to telephone termination backboards, cross connect, 24-port remotely managed switch, data cable patch panel, optical fiber patch panel, telephone outlet jacks, data outlet jacks, faceplates, unshielded backbone cable, shield backbone cable, optical fiber backbone cable, unshielded horizontal cable, optical fiber horizontal cable, mounting rack, mounting cabinet & ground wire.

SECTION 274000 – VIDEO SURVEILLANCE SYSTEM

Section includes Security cameras, Security control equipment. Fixed cameras, video sensor, submersible cameras, video surveillance, video recording, jacks , connections, faceplates, Cables and accessories.

Division 28 Electronic Safety & Security

SECTION 284000– PROGRAMMABLE LOGIC CONTROL SYSTEM

Programmable logic controller (PLC), Human machine interface (HMI), Uninterruptable power supplies, Ultrasonic level transmitters, Insertion flow meters, Electromagnetic flow meters, and Submersible pressure and temperature transmitters. Materials and equipment shall be standard unmodified products of a manufacturer regularly engaged in the manufacturing of such products. Units of the same type of equipment shall be products of a single manufacturer. Items of the same type and purpose shall be identical and supplied by the same manufacturer, unless replaced by a new version approved by the Architect.

Site & Infrastructure Subgroup

Division 31 Earthwork

SECTION 310000 - EARTHWORK

This work consists of excavation and backfill as required to attain grades shown on the contract documents, as well as for the construction of all concrete and other elements such as pipelines and structural modifications. The work includes preparation of subgrade for building foundations, slabs, walks and pavements, shoring and bracing, sealing foundations, dewatering, excavating, preparing foundations, bedding and backfilling of utility trenches.

SECTION 311000 – SITE CLEARING

Clearing and grubbing as required to permit installation of new construction, vegetation protection, topsoil stripping, and proper disposal of waste materials.

SECTION 311100 – CLEARING, GRUBBING & CLEANUP

The extent and location of the “Clearing, Grubbing and Cleanup” work is indicated on the drawings. The work includes the requirements for clearing, grubbing and cleanup of the areas indicated or as staked by the Engineer. The work is to be accomplished by removing and disposing of trees, brush, downed timber, stumps, roots, rubbish and debris, except such objects as are designated to remain or are to be removed in accordance with other sections of these specifications. The work also includes preservation from damage or defacement of trees, bushes, shrubs, or other objects designated to remain.

SECTION 312000 – EARTH MOVING

Excavating, filling and backfilling, compaction, and grading. Definition of satisfactory and unsatisfactory soils, geotextiles and warning tape. Field quality control.

SECTION 312319 - DEWATERING

Construction dewatering and ground water controls

Division 32 Exterior Improvements

SECTION 321000 – BASE COURSE

Extent of Work: The extent of "Base Course" work is indicated on the drawings. The work includes the requirements for producing, transporting, placing, shaping and compacting base courses of one or more materials in conformance with these specifications and the dimensions and sections indicated on the drawings or within the lines and grades established by the Engineer.

SECTION 321200 – FLEXIBLE PAVING

Includes placement of hot-mixed asphalt paving over prepared subbase and proof-rolling of subbase where indicated on the drawings, submittal of product data for each product specified, wuality assurance by an experienced installer. Also includes application of pavement markings and installation of wheel stops where shown.

SECTION 323116 – FABRICATED SLIDING GATES

Fabricated gate, gate-frame with anchors, and gate operator. ASTM A 276, Standard Specification for Stainless and Heat-Resisting Steel Bars and Shapes; ASTM F 593, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs; ASTM F 594, Standard Specification for Stainless Steel Nuts; American National Standards Institute (ANSI)/American Water Works Association (AWWA): ANSI/AWWA C 561, Fabricated Stainless Steel Slide Gates; American National Standards Institute (ANSI)/American Welding Society (AWS): ANSI/AWS D1.1 Structural Welding Code—Steel

SECTION 329200 – TURF & GRASSES

Seeding, sodded, plugged, and sprigged turf and meadows; planting soils, pesticides, and erosion-control materials; turf renovation; and grass paving.

SECTION 329219.16 – HYDROSEEDING FOR EROSION CONTROL

This work shall consist of the application of seed, fertilizer and mulch with tackifier in areas shown on the plans or as directed by the Engineer in accordance with these specifications. The extent and location of seeding work includes all areas not paved in this project which are disturbed by construction, grading, pavement removal, utility installation and any other of the Contractor's operations or as directed by the Engineer in accordance with these specifications.

SECTION 329300 - PLANTS

Plants, planting soils, pesticides, tree-stabilization materials, edging, planting soils and mulches.

Division 33 Utilities

SECTION 330110 – WATER SUPPLY PIPING

Extent of Work: The extent of "Water Supply Piping" work is indicated on the drawings. The work includes the requirements for providing the system in place complete, including excavation, laying, bedding, backfill, concrete and compaction, all in conformance with these specifications and the dimensions, sections and lines and grades established by the drawings or by the engineer.

SECTION 334000 – STORM DRAINAGE

Extent of Work: The location and extent of Storm Drainage work is indicated on the drawings. The work includes the requirements for providing culverts, storm sewers and storm drainage structures.

Storm drain connections will be required for roof drains from new buildings and building additions, storm drainage piping shall be PVC per ASTM D 3034, SDR 35.

SECTION 334700 – FISH CROWDERS

Section includes furnishing and installing Crowder assemblies where indicated on the drawings, including but not limited to: crowder frames, crowder chain drive equipment, and crowder chain drive base and (concrete) anchors.

SECTION 335213 – HYDRAULIC OIL SYSTEM

Section includes hydraulic oil piping and fittings, hydraulic oil power module (pumps, filters and valves), system valves, valve actuators, along with controls and accessories that comprise the hydraulic oil system.

Division 34 Transportation

Process Equipment Subgroup

Division 35 Water & Marine Construction

Division 40 Process Integration

Division 41 Material Processing & Heating Equipment

SECTION 412323 – FISH LIFT BRAIL SYSTEM

Section includes furnishing and installing one (1) Fish Lift Brail assembly, including but not limited to: brail frame, brail winch and associated rigging, and brail support structure and related fasteners.

Division 42 Process Heating, Cooling & Drying Equipment

Division 43 Process Gas & Liquid Handling, Purification & Storage Equipment

Division 44 Pollution Control Equipment

Division 45 Industry Specific Manufacturing Equipment

Division 48 Electrical Power Generation

Yakama Nation
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KLICKITAT RIVER
KLICKITAT HATCHERY BRIDGE & ACCESS IMPROVEMENTS

DRAFT
Hydraulic Conditions Report

November 2010

Prepared for:

Yakama Nation

Report Prepared by

HARBOR CONSULTING ENGINEERS
3006 Fuhrman Avenue East
Seattle, Washington 98102

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Appendix C: Klickitat River Flow Regime – Additional Figures
Appendix D: HEC-RAS Model – Klickitat Hatchery Existing Conditions

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INTRODUCTION

Klickitat Hatchery, operated by Yakama Nation Fisheries, is located in a deeply incised canyon on the Klickitat River at approximately river mile 42.6, (see Vicinity Map, Figure 1). Access to the hatchery is achieved via a narrow, 20% grade, gravel access road from Glenwood-Goldendale Highway. A majority of the hatchery facilities including the hatchery building, rearing raceways, pollution abatement basin, and adult capture/holding facility are located on the right bank of the Klickitat River. An additional rearing raceway and river water intake are located on the left bank. Pedestrian access to the left bank is currently achieved by traversing a narrow suspension bridge originally constructed in 1955. Vehicle traffic must currently travel 16 miles one-way over a downstream bridge to reach the left bank at the hatchery. The proposed improvements include a new vehicle bridge over the Klickitat River at the Hatchery as well as approximately 5200 feet of improved access road on the left overbank, (see Appendix B).

The following report summarizes the existing hydraulic and hydrologic conditions on the Klickitat River in the vicinity of Klickitat Hatchery.

BACKGROUND

The Klickitat basin (HUC 17070106) is drained by the Klickitat River whose headwaters are founded at Goat Rocks, north of Mount Adams. The river discharges 95.7 miles downstream to the Columbia River near Lyle, Washington. The Klickitat basin is markedly diverse with flow distributions varying significantly in the western and eastern portions of the basin. Proximity to Mount Adams strongly influences runoff from the northwestern portion of the basin where substantially higher annual precipitation as well as seasonal storage in the form of snow and ice occurs. The southeastern portion of the basin is characterized by much dryer foothills with summertime runoff flows near zero. Summertime low flows in the Klickitat River are almost entirely comprised of groundwater base flow from the upper basin above Summit Creek. Flood flows in the basin tend to vary, with upper basin peaks generally occurring during the spring thaw, whereas peaks in the lower basin tend to occur mostly in January or February, the result of heavy rain combined with melting snowpack.

There are currently three flow monitoring gauges operated by the United States Geological Survey (USGS) on the Klickitat River. An additional site, located at approximately river mile 50.3, was operated from 1910 through 1979. No flow monitoring station is present at the hatchery site. A description of the available data is presented below in Table 1.

Table 1. USGS Flow Monitoring Sites

Gauge No.	Description	River Mile	Elevation NGVD29	Drainage Area	Length of Record
14107000	Klickitat River above West Fork	64.7	2,720 ft.	151 sq. mi.	50 years
14110000	Klickitat River near Glenwood, WA	50.3	1,703 ft.	360 sq. mi.	69 years
14111400	Klickitat River below Summit Creek	34.3	900 ft.	749 sq. mi.	12 years
14113000	Klickitat River near Pitt, WA	7.0	289 ft.	1,297 sq. mi.	82 years

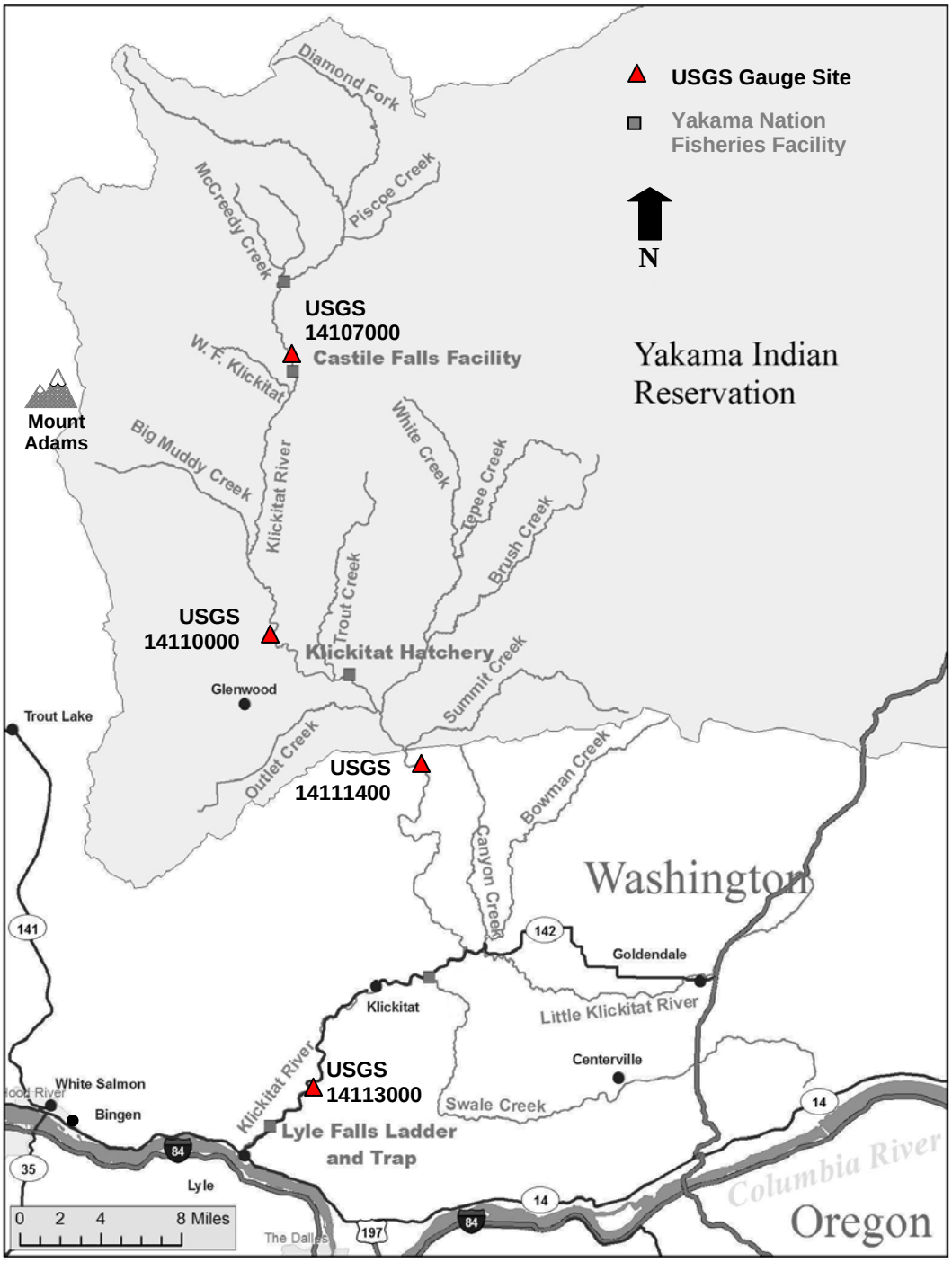

Figure 1. Vicinity Map

HYDROLOGY

Klickitat Hatchery is located at river mile 42.6 on the Klickitat River on an existing alluvium fan overlaying bedrock. The slopes near the hatchery site contain several groundwater-fed springs that discharge to the Klickitat River and tributary streams along the reach. Groundwater discharge from the springs in this reach is a significant contributor to flows in the Klickitat River. Three of these springs are utilized by the hatchery as a regular water supply for fish production.

Initially, Harbor Consulting Engineers reviewed the available data for all four gauging stations on the Klickitat River. A weighted Log Pearson Type III (LP3) flood frequency analysis was performed using annual peak flow data in accordance with USGS Bulletin 17b guidelines for all four gauging stations. Refer to Appendix C for additional information.

Klickitat Hatchery is bound upstream by USGS gauging station 14110000, Klickitat River near Glenwood, WA and downstream by USGS 14111400, Klickitat River below Summit Creek, as shown in Figure 1. These sites were chosen for further analysis.

USGS 14110000 Klickitat River near Glenwood, WA is located at river mile 50.3, approximately 7.7 miles upstream from Klickitat Hatchery. This gauging station has a drainage area of 360 square miles and a record of annual peaks from 1910 through 1979. Flow Duration and Mean Monthly Streamflow curves for this site are presented in Figures 2 and 3 respectively. Refer to Appendix C-2 for additional figures.

USGS 14111400, Klickitat River below Summit Creek is located at river mile 34.3, approximately 8.3 miles downstream from Klickitat Hatchery. The gauging station has a drainage area of 749 square miles and a record of annual peaks from 1997 to 2007. The minimal length of the record at this site makes it undesirable for predicting flood flows; however, an LP3 flood frequency analysis was performed for comparison purposes. In addition, Flow Duration and Mean Monthly Streamflow curves for this site are presented in Figures 2 and 3 respectively. Refer to Appendix C-3 for additional figures.

No overlap in the USGS records for the two sites is available for comparison of flows; however, historical field measurements and comparison of flow duration curves for the two sites indicates that the flow in the Klickitat River can nearly double in volume between the two stations. For this reason, determination of the drainage area at the hatchery is critical to developing an accurate flow regime for the hatchery site. It should be noted that flow per square mile of drainage area is reduced by approximately 80% between the two gauging stations for the full range of mean daily flows. This is likely the result of a transition from the upper basin hydrology in the vicinity of Mount Adams, where an average annual precipitation of 140 inches contributes to a substantial snowpack that sustains flow year round, to the lower basin where average annual precipitation is less than 30 inches.

Steady base flow discharge from the upper basin dominates the Klickitat River hydrograph for much of the year. However, a secondary peak in the Mean Monthly Discharge curve for USGS 1411400 (Figure 3) occurs in January, indicating an increase in runoff discharging to the river between the two gauging stations at this time. This is likely due to precipitation predominately in the form of snow falling in the upper basin, whereas lower elevations experience rain. This effect must be accounted for when adjusting peak flows.

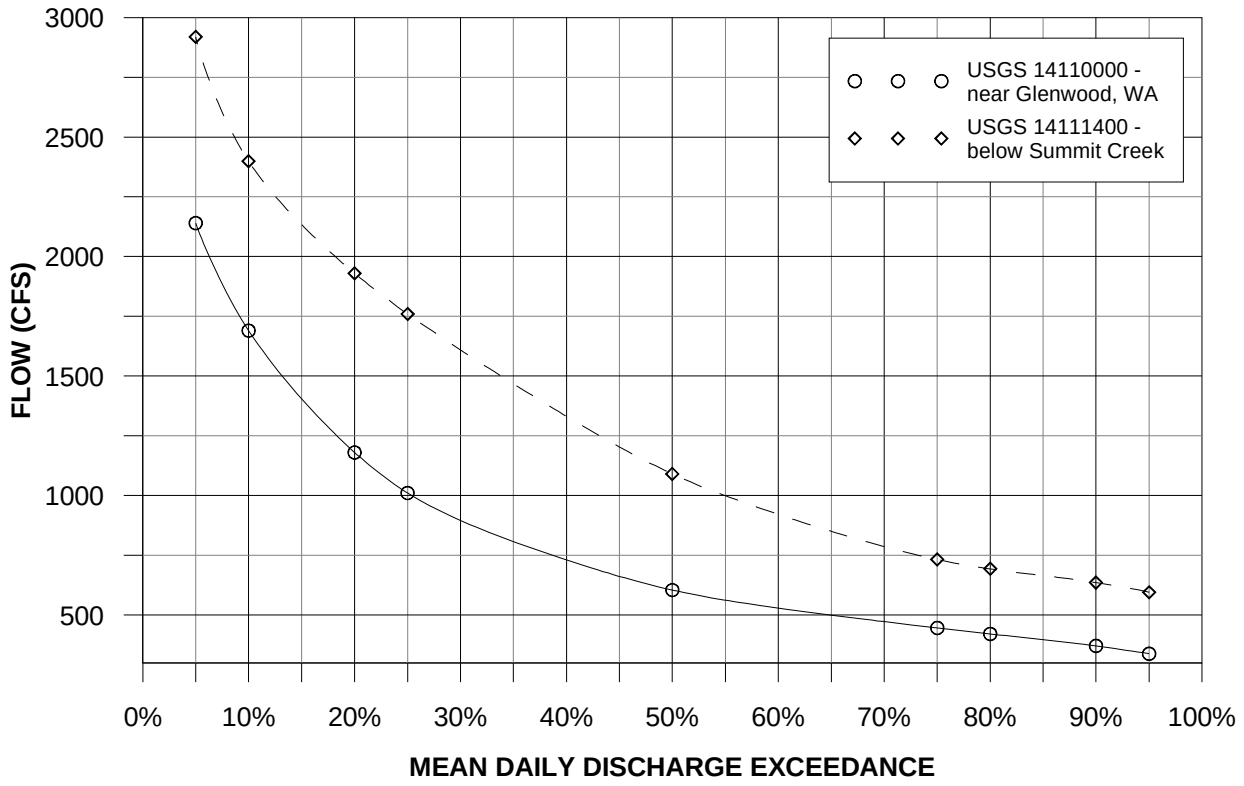

Figure 2. Annual Flow Duration Curve for period of record.

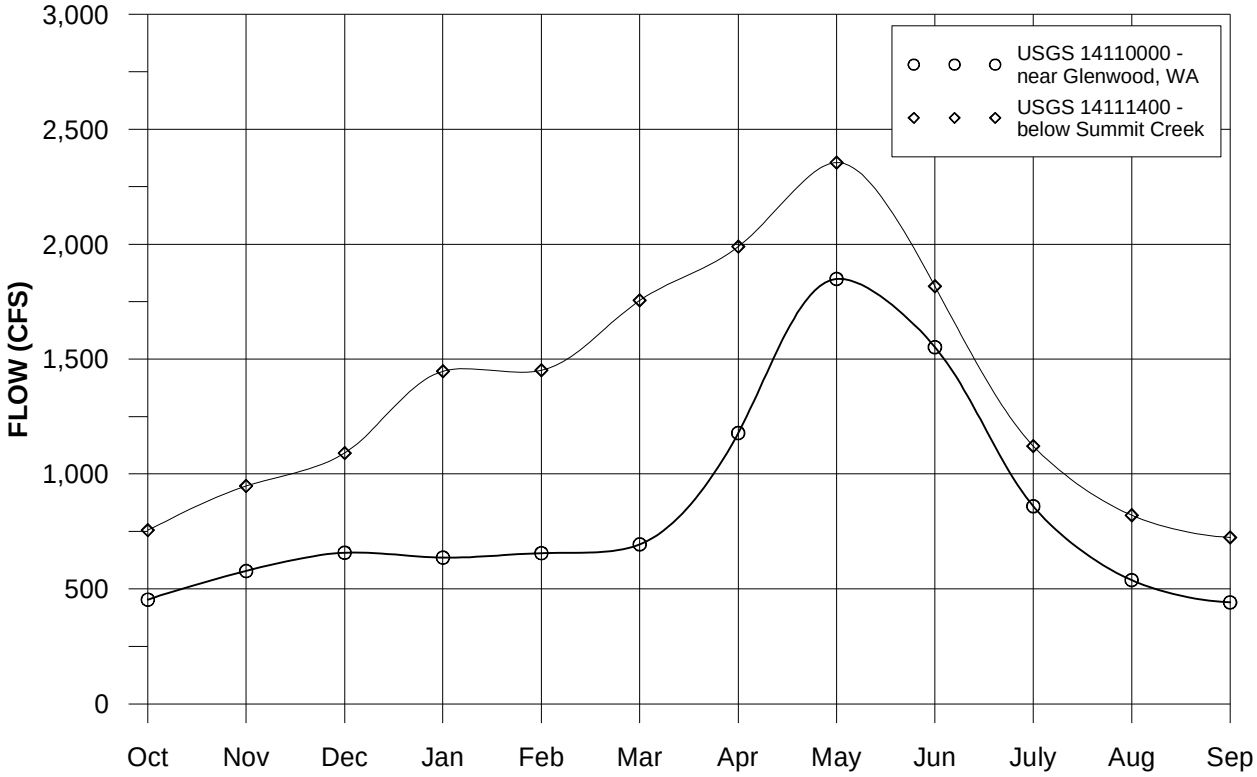

Figure 3. Mean Monthly Streamflow for period of record.

Between the two stations, there are four major tributary stream confluences with the Klickitat River as shown in Table 2 and Figure 1.

Table 2. Significant Tributary Streams to Klickitat River Between USGS 14111400 & USGS 14110000

Stream	Drainage Area (sq. mi.)	River Mile*
Summit Creek	44.8	37.3
White Creek	130	39.7
Outlet Creek	130	39.8
Trout Creek	34	43.5

*River Miles are for Klickitat River at stream confluence

The four streams listed in Table 2 account for 87% of the drainage area between the two gauging stations. The remaining 50.2 square miles was assumed to be evenly distributed along the reach between the two gauging sites. This assumption resulted in an additional 3.1 square miles of drainage area per river mile between the gauging sites.

Drainage area at the hatchery was estimated as 418 square miles by calculating drainage area both upstream from USGS 14111400 and downstream from USGS 14110000 to the hatchery site.

USGS 14110000 was selected as the base site for determination of the flow regime at Klickitat Hatchery due to a superior length of record and similarities in drainage area. A direct drainage area ratio of 1.16 was calculated to adjust peak flood flows. However due to the reduction in flow per square mile discussed earlier, a ratio of 1.12 was calculated to adjust mean daily flows obtained at the gauging site to those likely to be experienced at the hatchery.

Using the conversion ratios above, the following flow regime was calculated for the Klickitat River at Klickitat Hatchery:

Table 3. Klickitat Hatchery Flow Regime

Exceedance	Return Period	Flow (cfs)	Description
.95 MDD	-	377	Mean Daily Discharge
.50 MDD	-	676	Mean Daily Discharge
.05 MDD	-	2,397	Mean Daily Discharge
.50	2 years	3,700	Peak Flood Discharge
.10	10 years	6,450	Peak Flood Discharge
.04	25 years	8,100	Peak Flood Discharge
.02	50 years	9,400	Peak Flood Discharge
.01	100 years	10,800	Peak Flood Discharge

Peak flood flows were rounded up to the nearest 50 cfs. See Figures 4 through 6 on the following pages for additional discharge information.

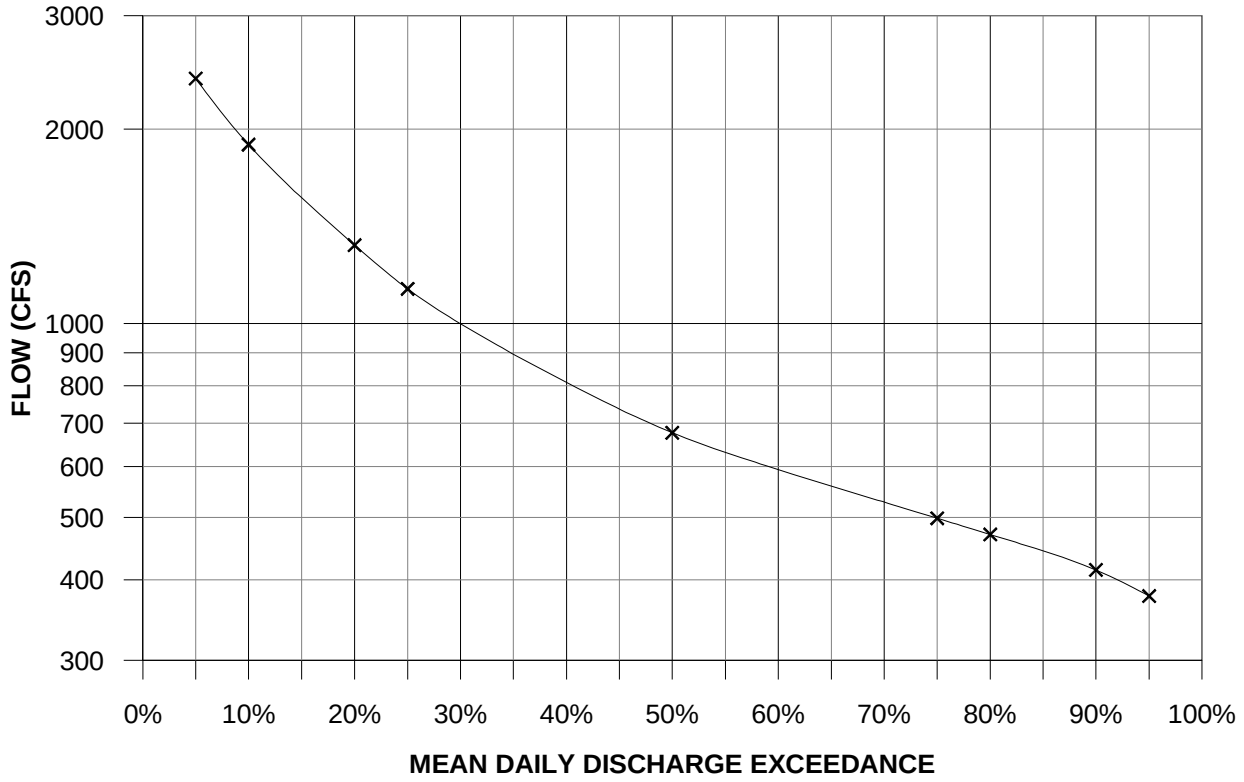

Figure 4. Estimated Annual Flow Duration Curve for Klickitat River at Klickitat Hatchery

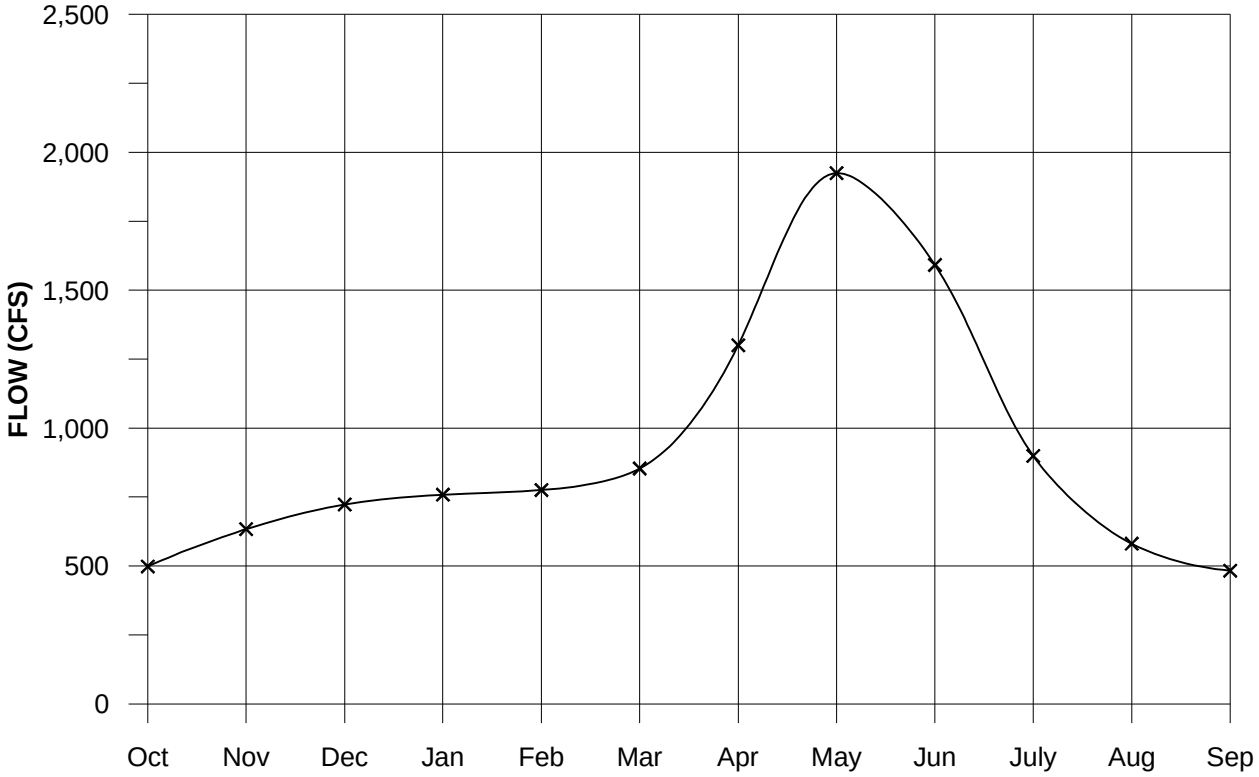

Figure 5. Estimated Mean Monthly Streamflow for Klickitat River at Klickitat Hatchery

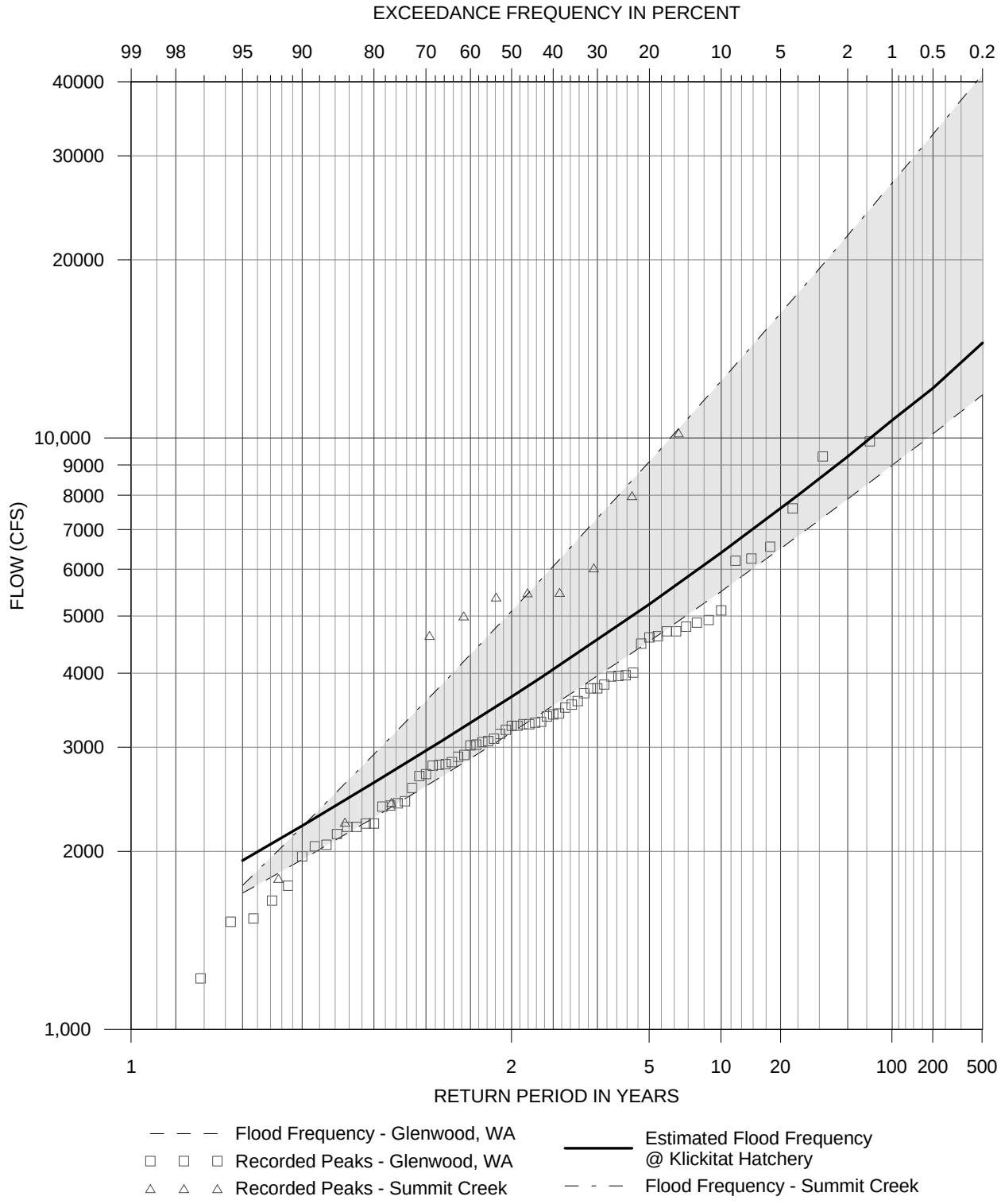

Figure 6. Estimated Flood Frequency Curve for Klickitat River at Klickitat Hatchery

Hydraulics

The United State Army Corps of Engineers (USACE) Hydrologic Engineering Center's River Analysis System (HEC-RAS) was used to develop a one dimensional, steady state flow model for the Klickitat River at Klickitat Hatchery. The basic computational procedure is based on the solution of the one dimensional energy equation for steady, gradually varied flow. Energy losses are evaluated using Manning's Equation for frictional components and contraction/expansion coefficients for changes in velocity head.

Survey data for the model was collected during October and November of 2008 by Pioneer Surveying. 20 river transects were collected between river mile 42.3 and 42.8 as shown in Appendix D-1. The HEC-RAS model was developed using the available survey and hydrology data together with multiple field investigations performed by Harbor Consulting Engineers.

A steady flow analysis was performed using a mixed flow regime. The model was then calibrated using known water surface elevations collected during the site survey as well as approximate elevations provided by hatchery personnel from the February 1996 flood, which is believed to be a 100-year recurrence flood throughout the entire basin.

A stage-discharge curve for the proposed bridge site is presented below in Figure 7. Complete results from the model including water surface profiles and cross sectional outputs are presented in Appendix D.

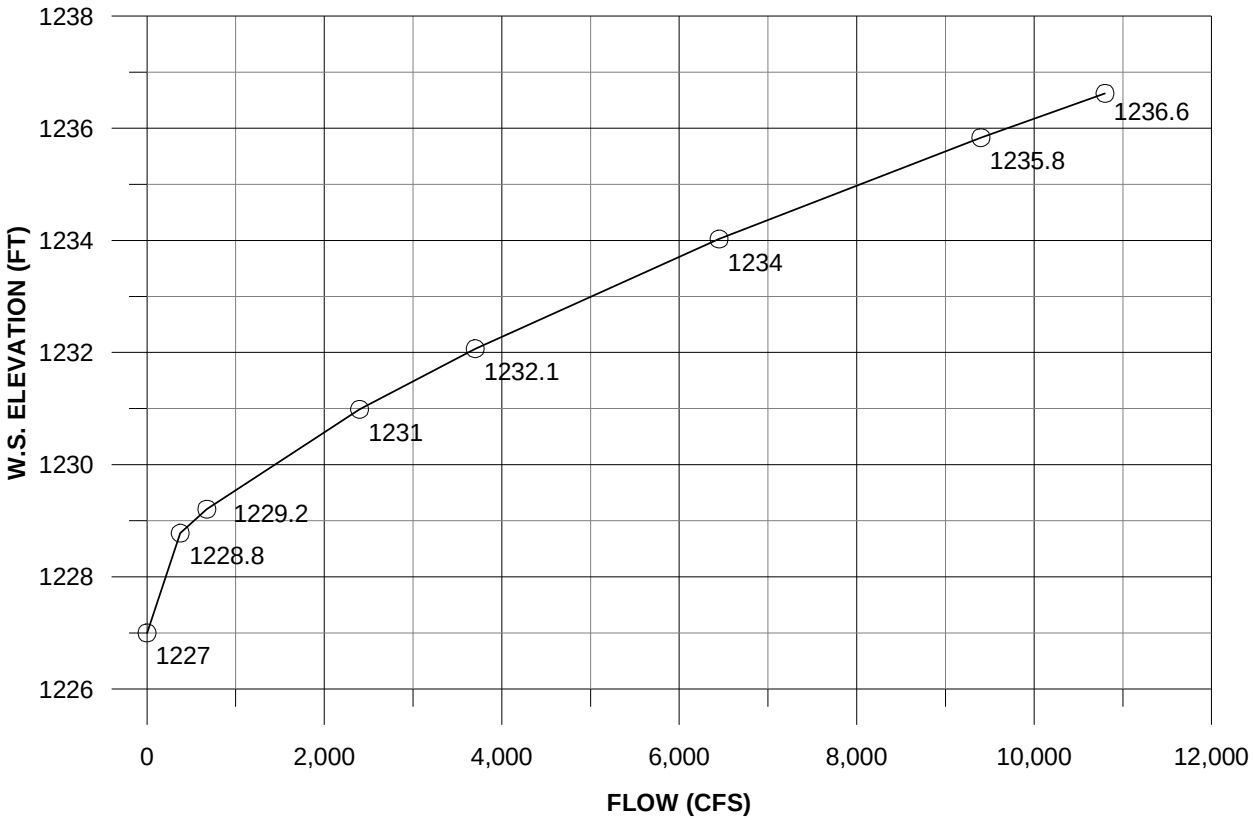

Figure 7. Estimated Stage-Discharge Curve for Klickitat River at Klickitat Hatchery Bridge Site

PROPOSED IMPROVEMENTS

The proposed improvements in the vicinity of the Klickitat River include a 165-foot, single span, steel box girder bridge over the Klickitat River at Klickitat Hatchery, immediately downstream of the existing suspension bridge. The proposed bridge and abutments are located above the 100-year recurrence flood water surface elevation as determined from the rating curve in Figure 7. The bridge has been designed to allow a minimum of five feet of vertical clearance between the 100-year recurrence water surface elevation and the proposed bridge soffit. This will permit large woody debris to pass under the bridge during a significant hydraulic event. No backwater effects will occur at the site for flows within the design range as a result of the proposed bridge.

The north and south bridge abutments are located outside of the 100-year recurrence flood boundary. The existing banks are heavily armored with existing riprap and boulder alluvium. Scour at the abutments is not anticipated to be a concern at this site, however each bridge abutment has been supported by ten micropile founded in bedrock. In the event of a severe scour occurrence, the multiple pile system will insure the abutments remain stable at each bridge end.

REFERENCES

1. Cline, Denzel R. USGS Open-File Report 75-518, Reconnaissance of the Water Resources of the Upper Klickitat River Basin, Yakama Indian Reservation, Washington. 1976.
2. Richardson, Don. Washington State Department of Ecology Office Report #48, Monthly Streamflow in the Klickitat Basin. May 1976.
3. United State Geological Survey. Bulletin #17B, Guidelines for Determining Flood Flow Frequency. March 1982.

Appendix A

Photograph Log

1

Klickitat River at Klickitat Hatchery looking downstream. Note existing suspension bridge at center and existing concrete sill visible at top of photo.

2

Klickitat River at Klickitat Hatchery looking downstream of existing concrete sill.

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View looking upstream from existing suspension bridge.

View looking downstream from existing suspension bridge.

5

View of existing concrete sill from Klickitat River left bank.

6

View looking upstream from existing concrete sill towards existing suspension bridge.

Appendix B

Project Drawings

FIGURE 1 PROPOSED BRIDGE SITE PLAN

FIGURE 2 PROPOSED BRIDGE PLAN & PROFILE

FIGURE 3 PROPOSED BRDIGE TYPICAL SECTION

JUVENILE FISH RACEWAY

CONCRETE SILL

FISHWAY

HATCHERY POLLUTION ABATEMENT BASIN

ADULT HOLDING FACILITY

REARING POND

GRAVEL BAR

SHED

NEW BRIDGE

EXIST. SUSPENSION BRIDGE

NEW ACCESS ROAD

49+00

50+00

51+00

52+00

53+00

54+00

55+00

56+00

57+18.75

1270

1260

1250

1240

1230

1228

1220

1350

K L I C K I T A T R I V E R

GRAVEL BAR

SHED

SHED

REARING RACEWAY

HATCHERY BUILDING

STORAGE BLDG

PLAN

SCALE: 1" = 60'

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Klickitat Hatchery Bridge & Access Improvements

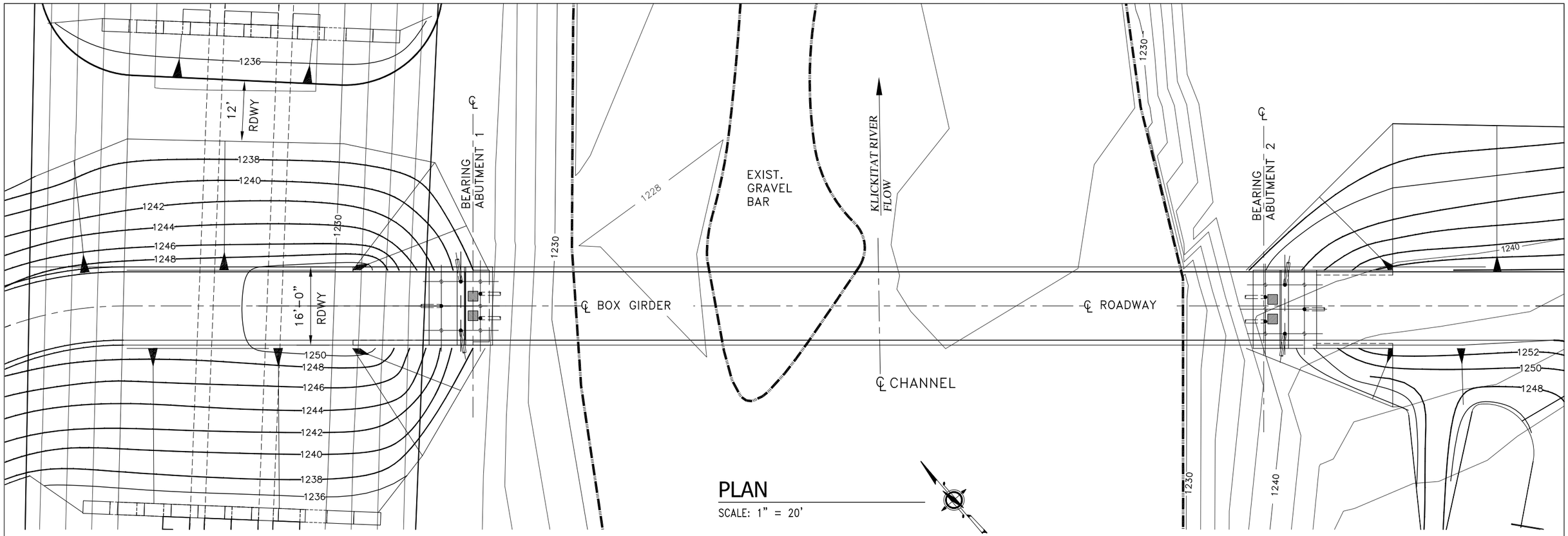
Yakama Nation
Toppenish, Washington

River Mile
42.6

Proposed Bridge Site Plan

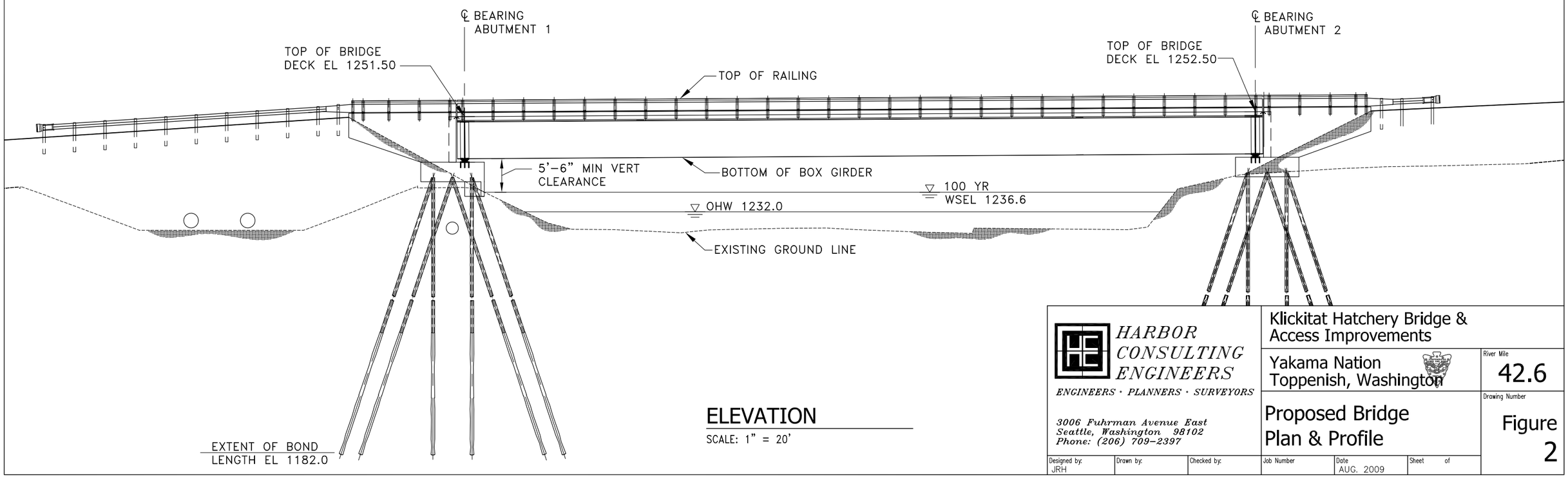
Drawing Number
Figure 1

Designed by:	Drawn by:	Checked by:	Job Number	Date	Sheet of
JRH				AUG. 2009	



PLAN

SCALE: 1" = 20'



ELEVATION

SCALE: 1" = 20'

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Klickitat Hatchery Bridge & Access Improvements

Yakama Nation
Toppenish, Washington

River Mile
42.6

Proposed Bridge
Plan & Profile

Drawing Number
Figure 2

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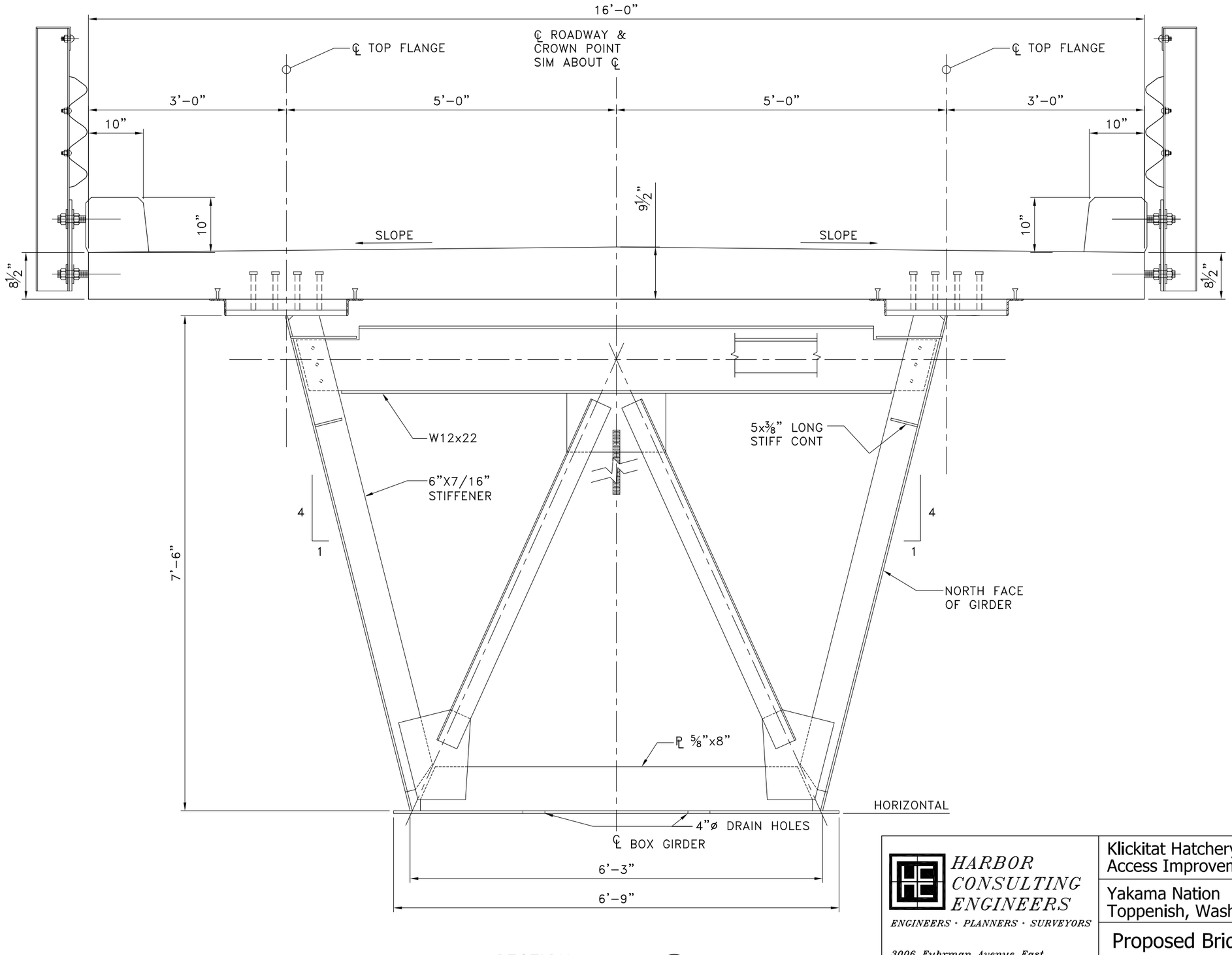
JRH				AUG. 2009	



SECTION
TYP. GIRDER GEOMETRY
A

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Klickitat Hatchery Bridge & Access Improvements

Yakama Nation
Toppenish, Washington

River Mile
42.6

Proposed Bridge
Typical Section

Drawing Number
Figure 3

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JRH				AUG. 2009	

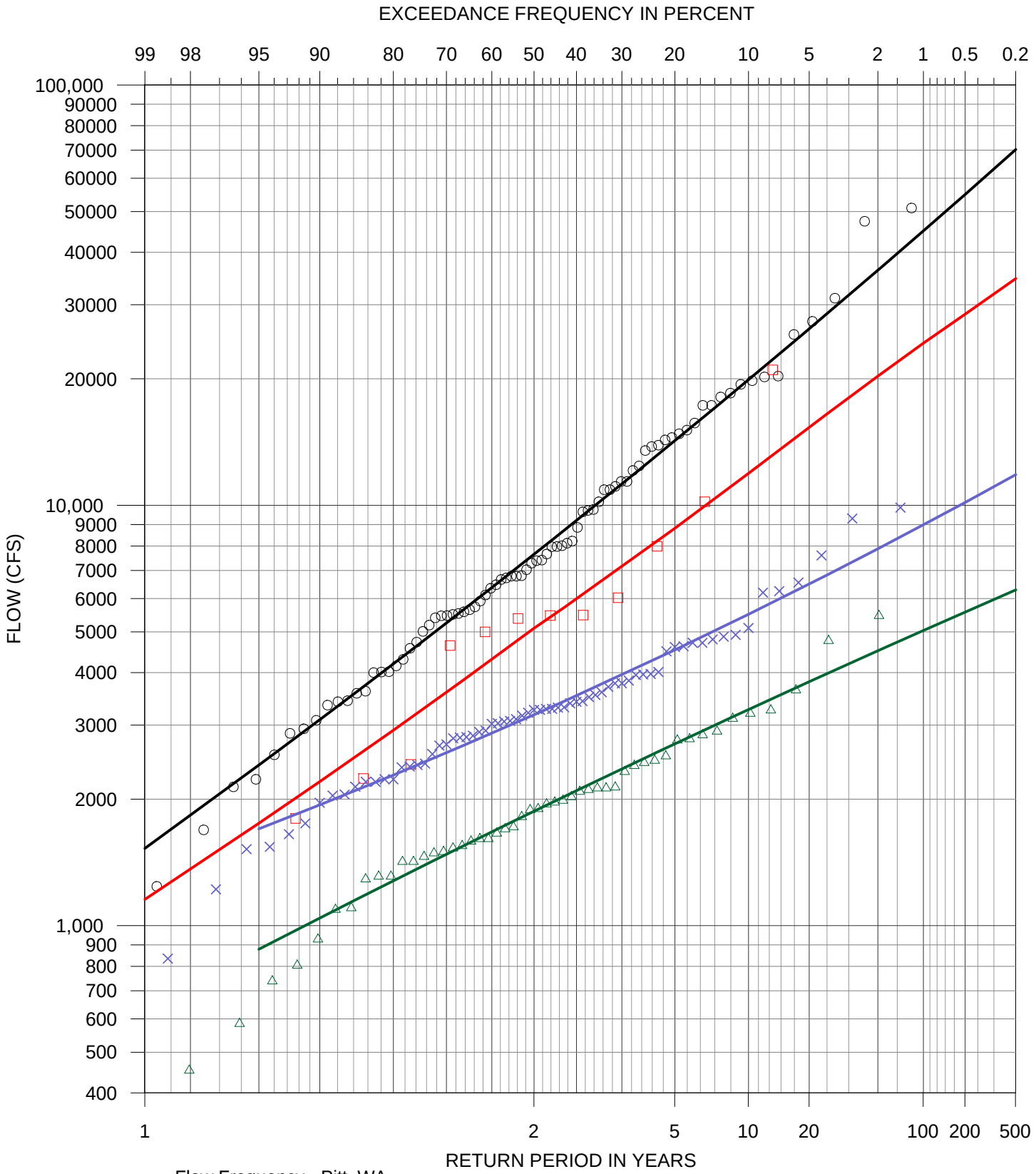
Appendix C

Klickitat River Flow Regime
Additional Figures

C-1 COMBINED FLOOD FREQUENCY GRAPH

C-2 USGS 14110000 -
KLICKITAT RIVER NEAR GLENWOOD, WA

C-3 USGS 14111400 -
KLICKITAT RIVER BELOW SUMMIT CREEK



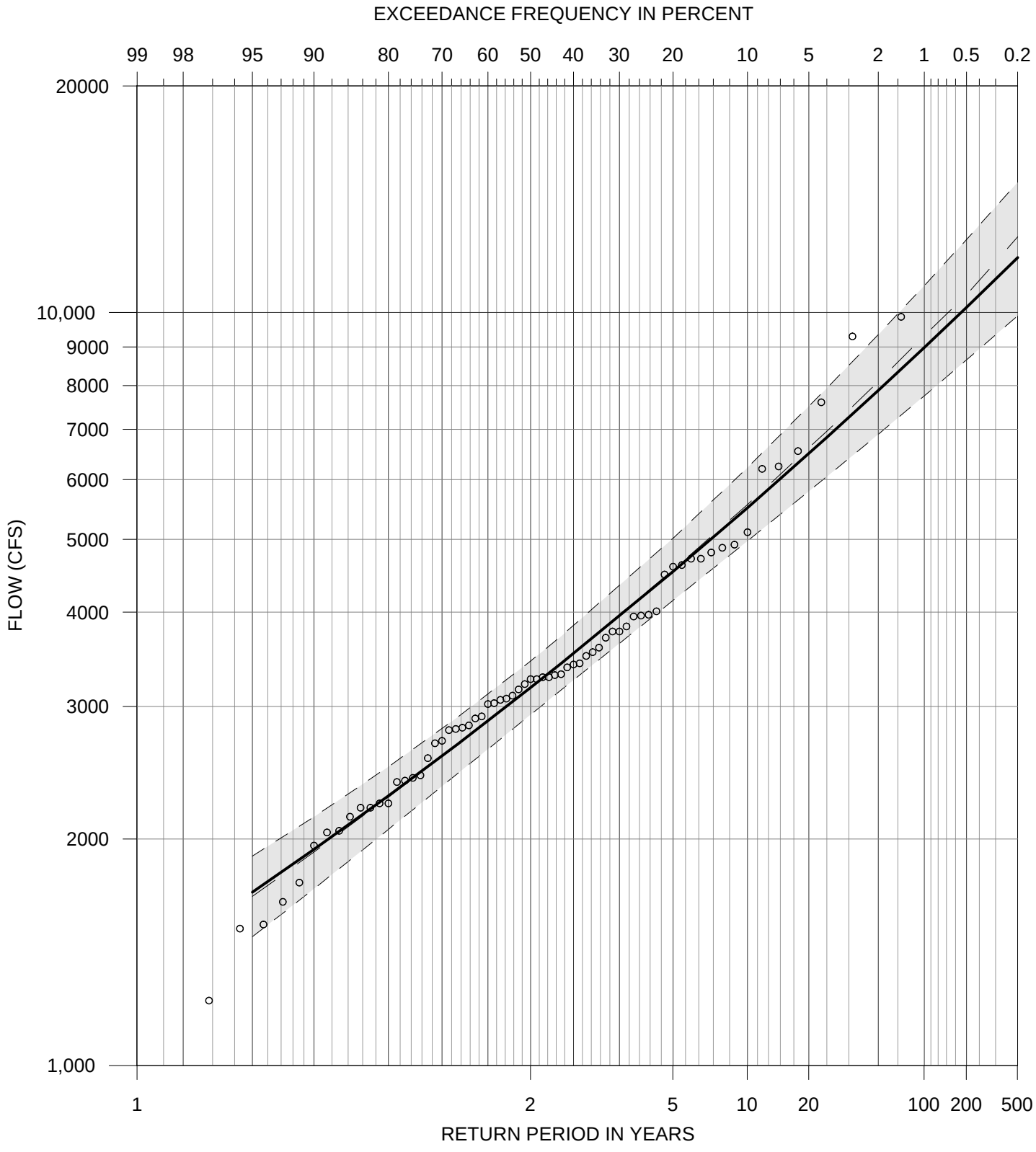
Flow Frequency - Pitt, WA
Recorded Peaks - Pitt, WA
Flow Frequency - West Fork
Recorded Peaks - West Fork
Flow Frequency - Summit Creek
Recorded Peaks - Summit Creek
Flow Frequency - Glenwood
Recorded Peaks - Glenwood

LP3 FLOOD FREQUENCY CURVES

USGS 1413000, RM 7.0
Klickitat River Near Pitt, WA
USGS 14111400, RM 34.3
Klickitat River Below Summit Creek
USGS 14110000, RM 50.3
Klickitat River Near Glenwood
USGS 14107000, RM 64.7
Klickitat River Above West Fork

Appendix C-2

USGS 14110000
KLICKITAT RIVER NEAR GLENWOOD, WA



95% Confidence Limit

Flow Frequency (Bull.17B)

Flow Frequency (Expected)

Recorded Peaks

FLOOD FREQUENCY CURVE

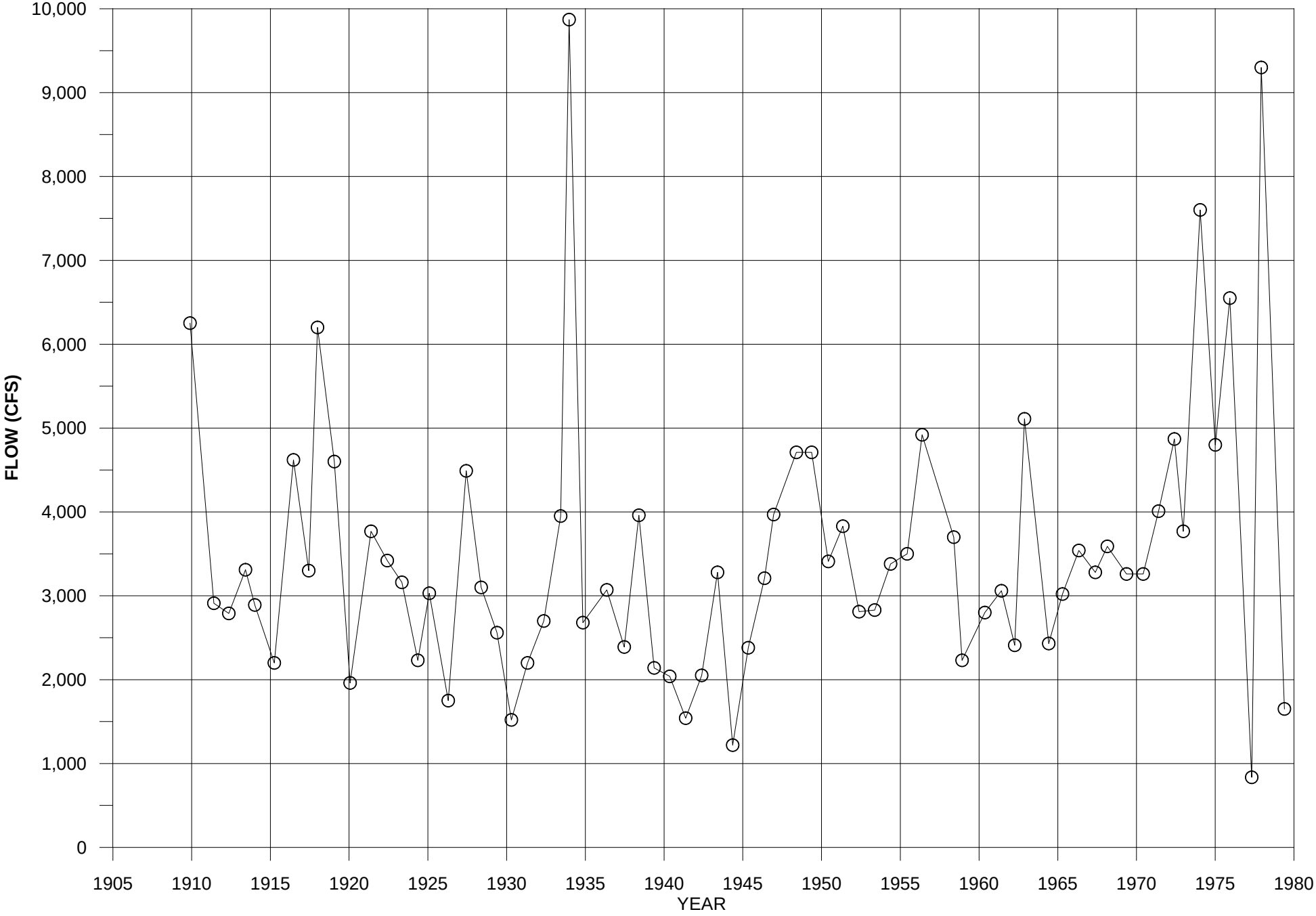
Klickitat River Near Glenwood, WA
USGS 14110000
River Mile = 50.3
Basin Area = 360 SQ MI
Annual Peak Discharge
Water Years in Record:
1910 - 1979

FREQUENCY STATISTICS
WEIGHTED LP3 TRANSFORM OF FLOW, CFS

MEAN	3.5092	HISTORIC EVENTS	0
STANDARD DEV	0.1774	HIGH OUTLIERS	0
SKEW	0.245	LOW OUTLIERS	1

ANNUAL PEAK DISCHARGE VALUES

Klickitat River Near Glenwood, WA
USGS Station 14110000
RM = 50.3



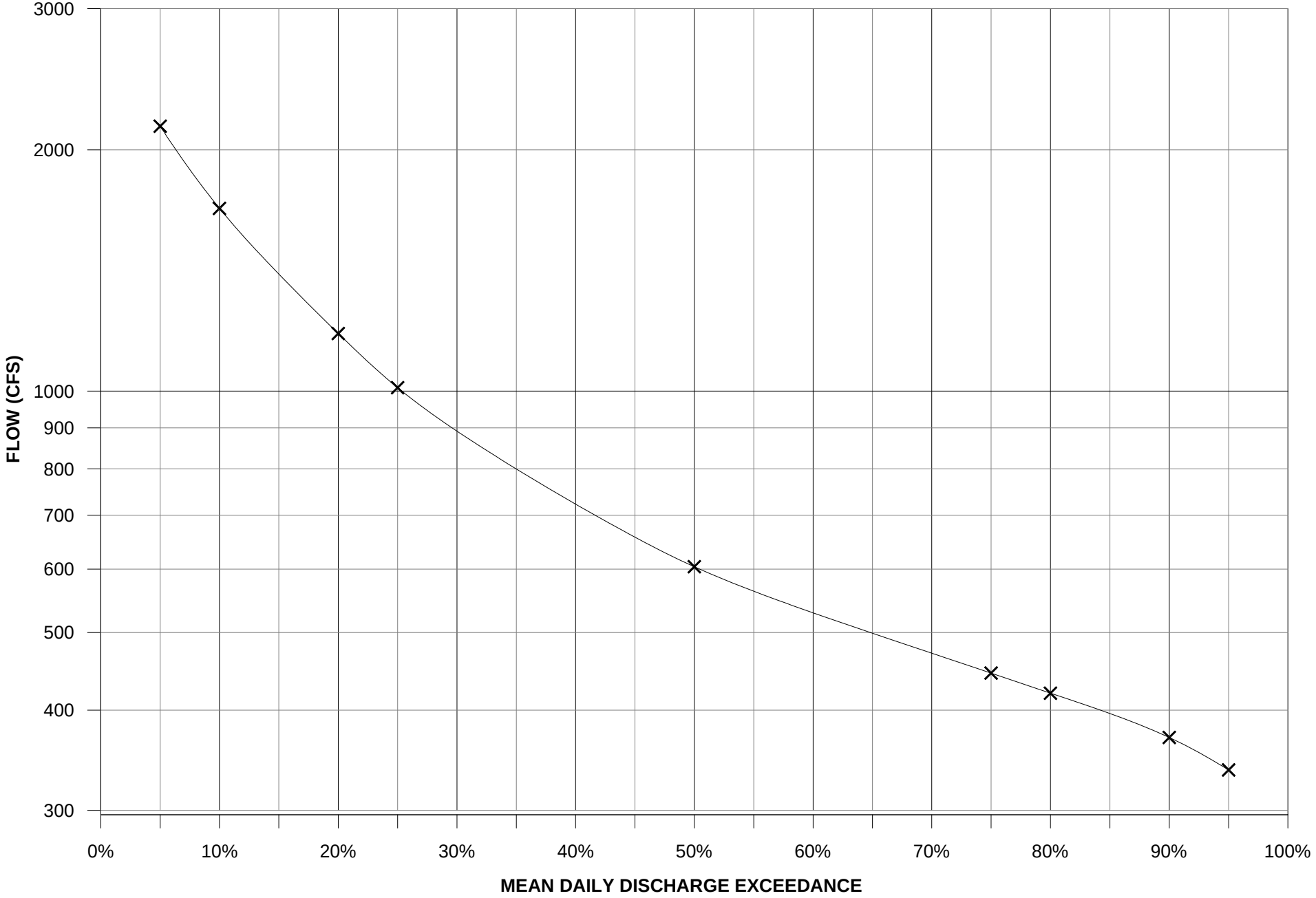
FLOW DURATION CURVE FOR PERIOD OF RECORD

1910 - 1971

Klickitat River Near Glenwood, WA

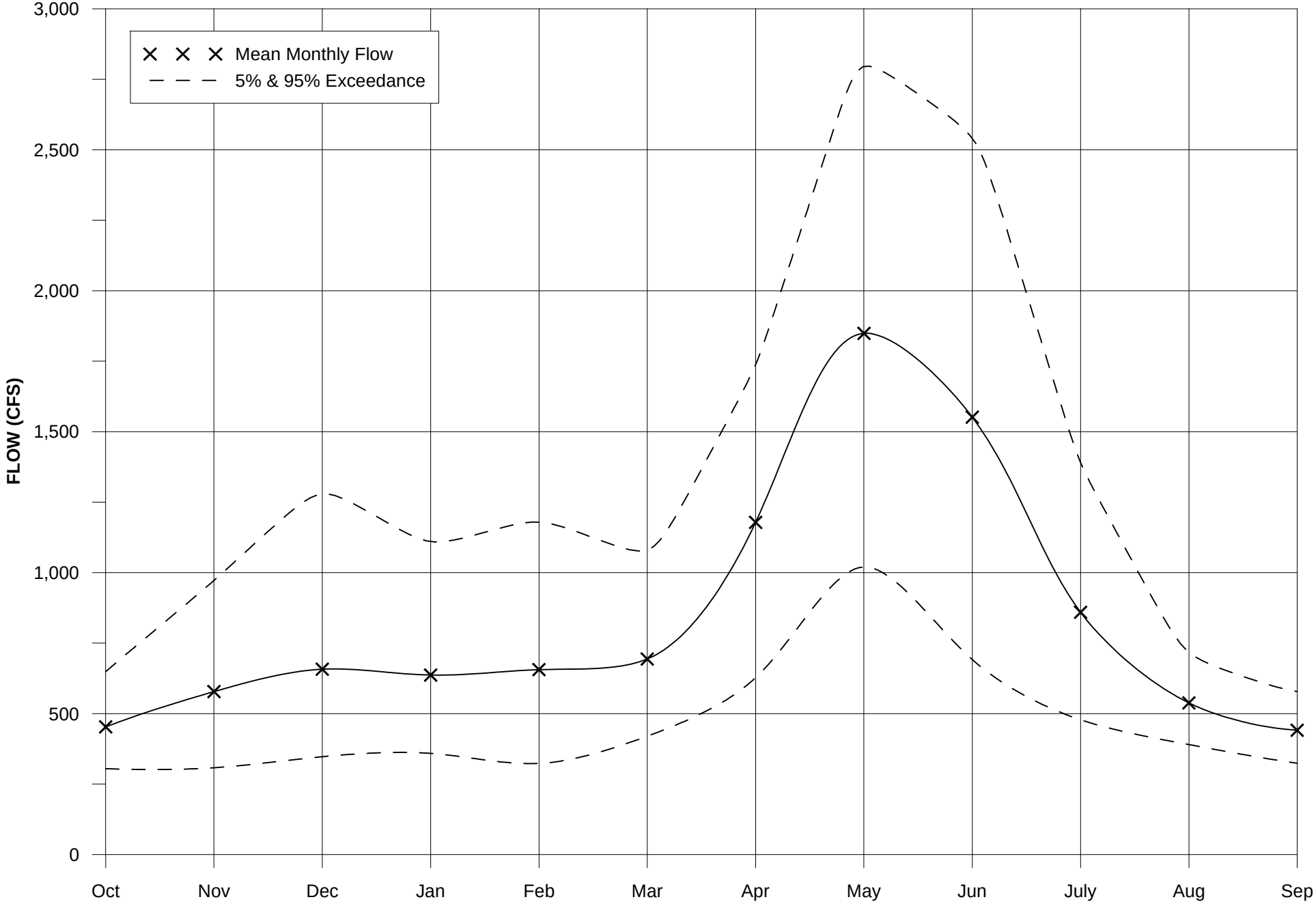
USGS 14110000

RM = 50.3



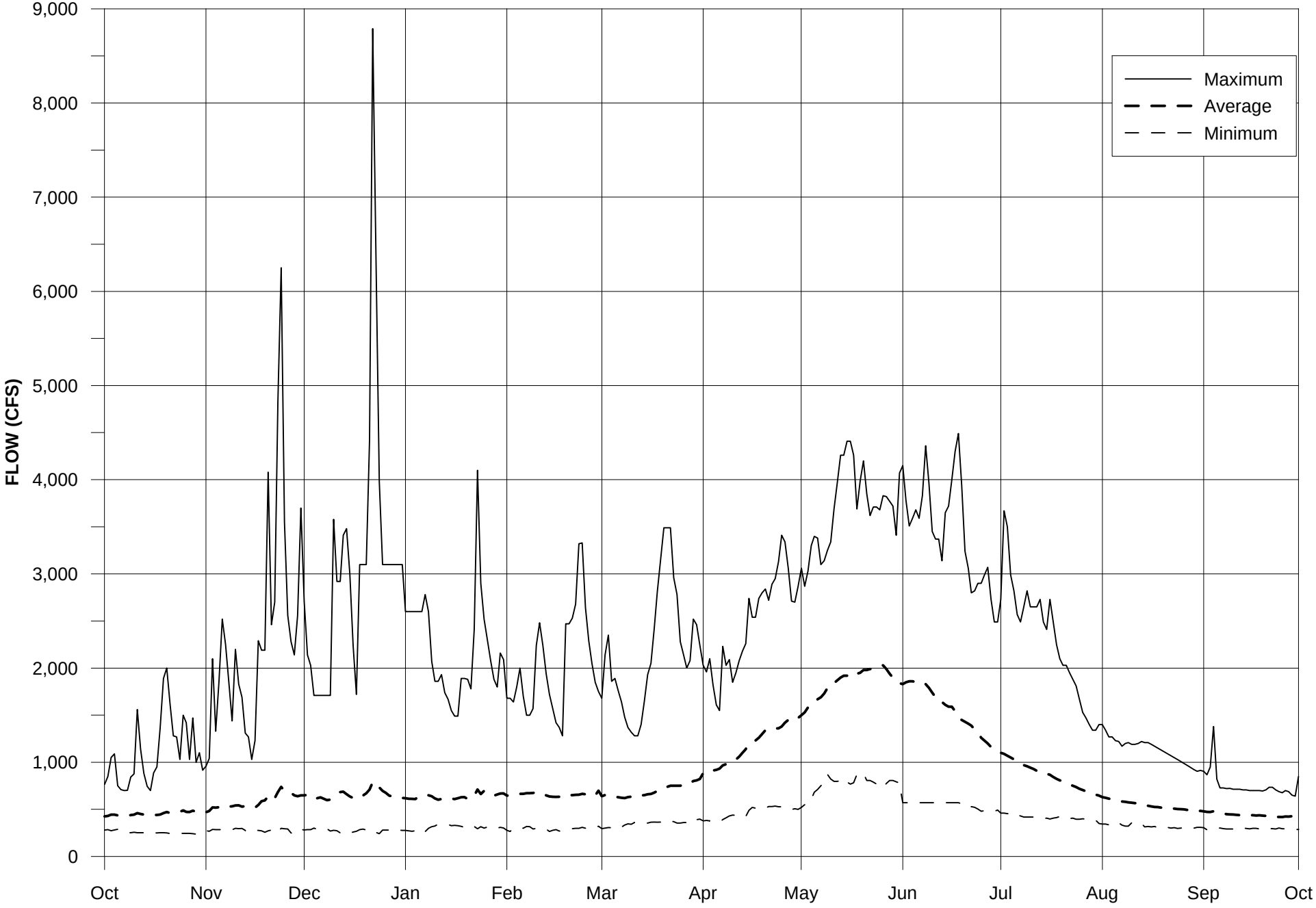
MEAN MONTHLY STREAM FLOW

Klickitat River Near Glenwood, WA
USGS Station 14110000
RM = 50.3



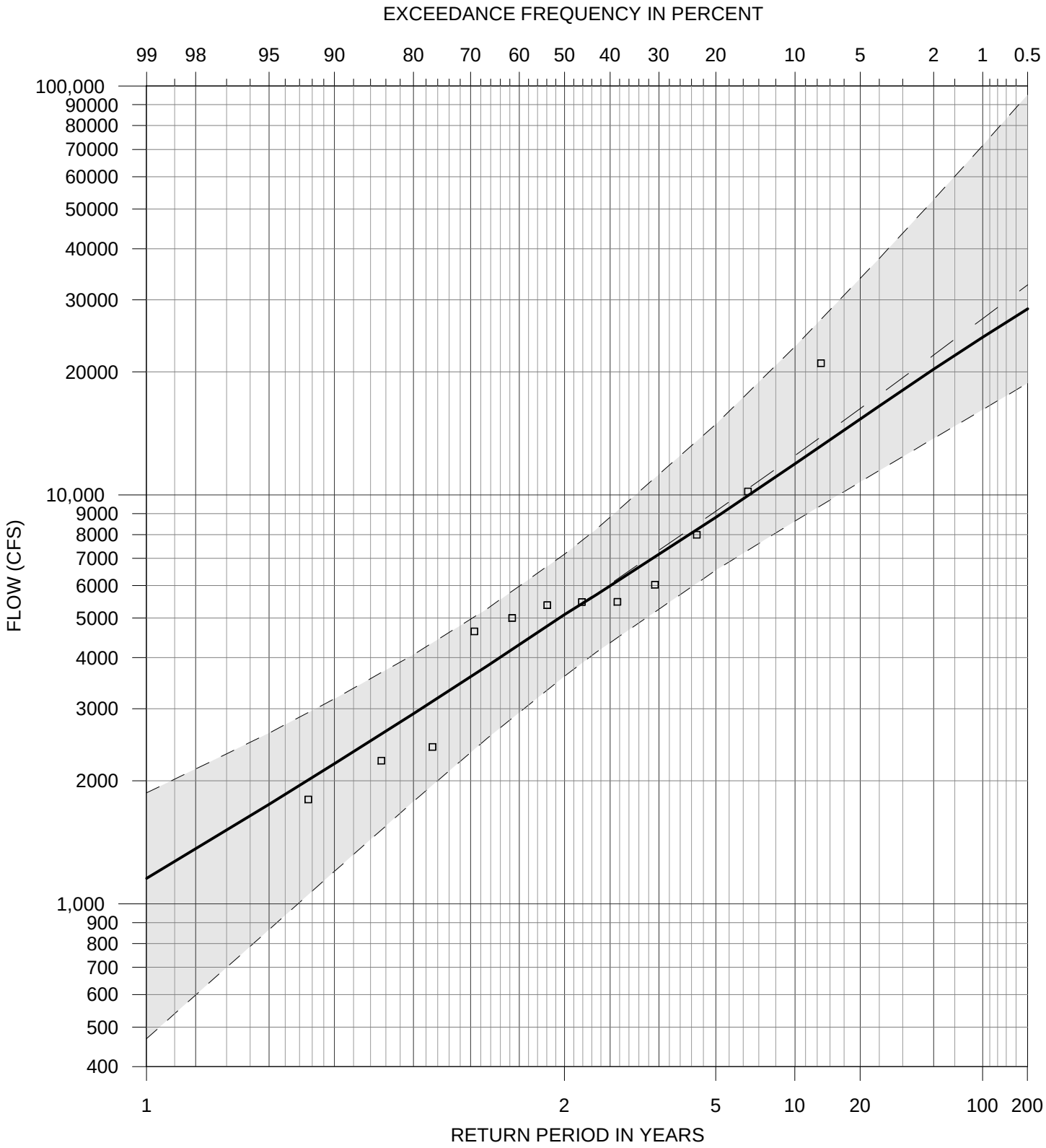
MEAN DAILY FLOW VALUES

Klickitat River Near Glenwood, WA
USGS Station 14110000
RM = 50.3



Appendix C-3

USGS 14111400
KLICKITAT RIVER BELOW SUMMIT CREEK



95% Confidence Limit

Flow Frequency (Adjusted)

Flow Frequency (Bull.17B)

Recorded Peaks

FREQUENCY STATISTICS
WEIGHTED LP3 TRANSFORM OF FLOW, CFS

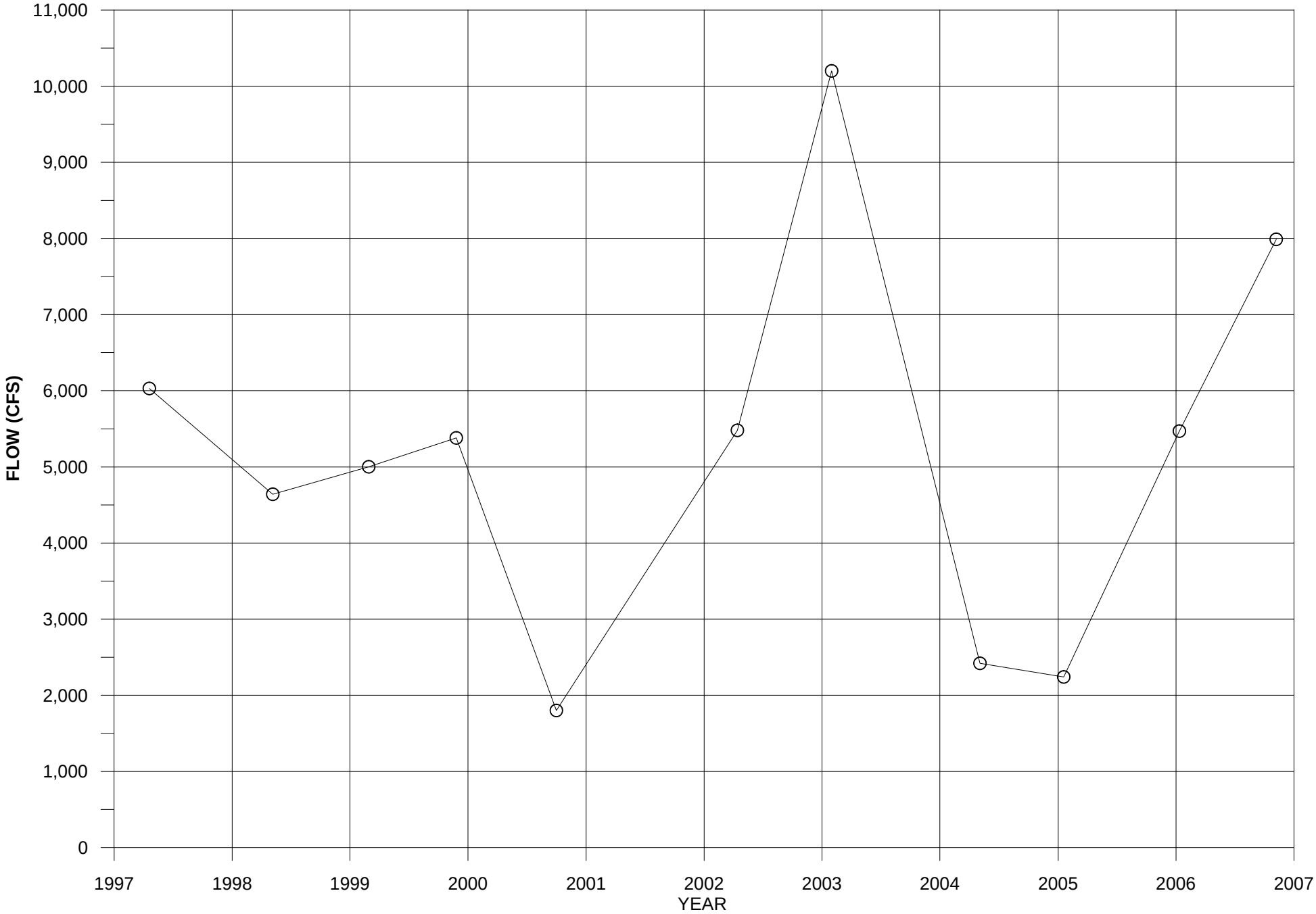
MEAN	3.7147	HISTORIC EVENTS	0
STANDARD DEV	0.2942	HIGH OUTLIERS	0
SKEW	0.149	LOW OUTLIERS	0

FLOOD FREQUENCY CURVES

Klickitat River Below Summit Creek
USGS 14111400
River Mile = 34.3
Basin Area = 749 SQ MI
Annual Peak Discharge
Water Years in Record:
1997 - 2007

ANNUAL PEAK DISCHARGE VALUES

Klickitat River below Summit Creek
USGS Station 14111400
RM = 34.3



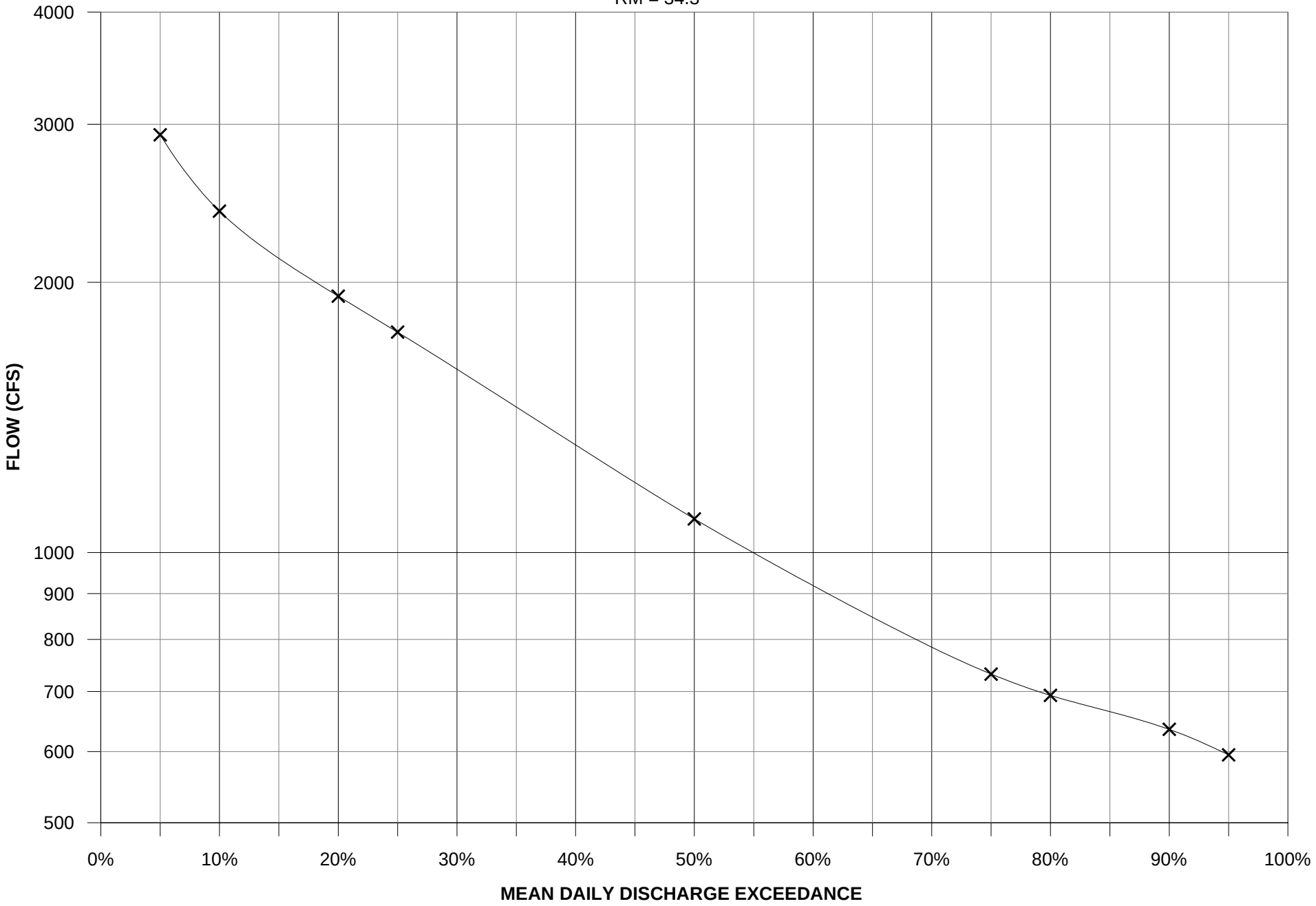
FLOW DURATION CURVE FOR PERIOD OF RECORD

1997 - 2007

Klickitat River Below Summit Creek

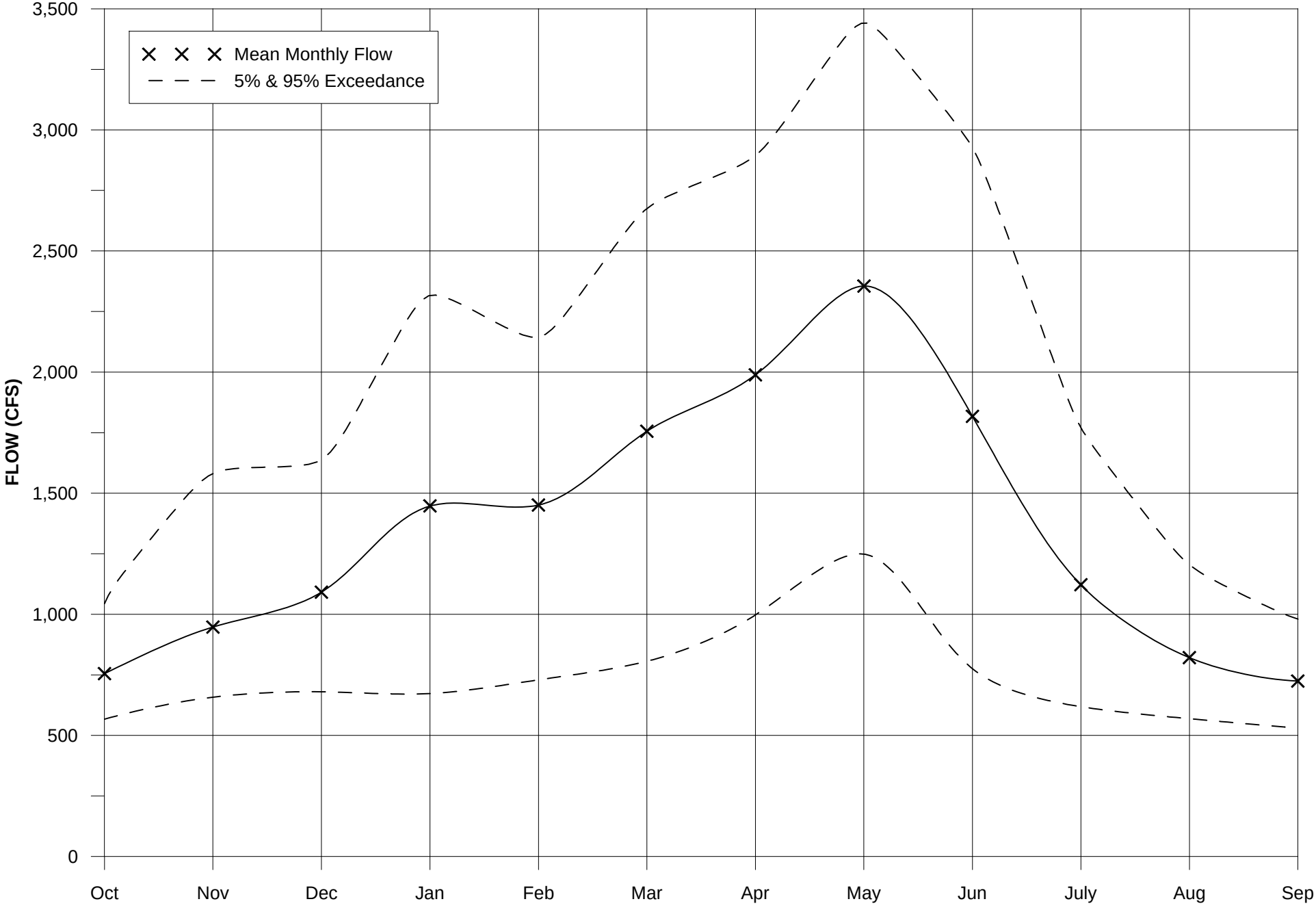
USGS 14111400

RM = 34.3



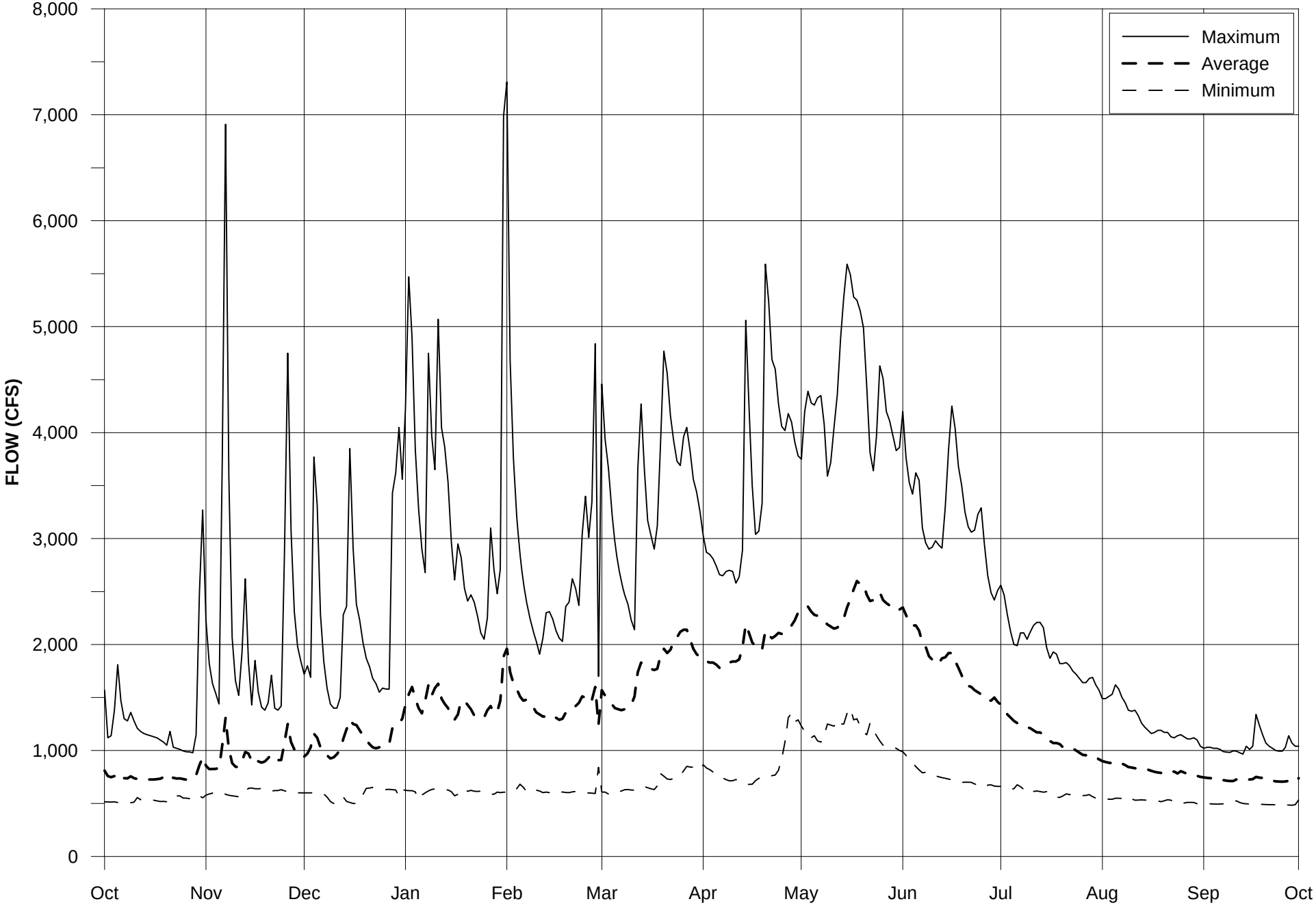
MEAN MONTHLY STREAM FLOW

Klickitat River Below Summit Creek
USGS Station 14111400
RM = 34.3



MEAN DAILY FLOW VALUES

Klickitat River below Summit Creek
USGS Station 14111400
RM = 34.3



Appendix D

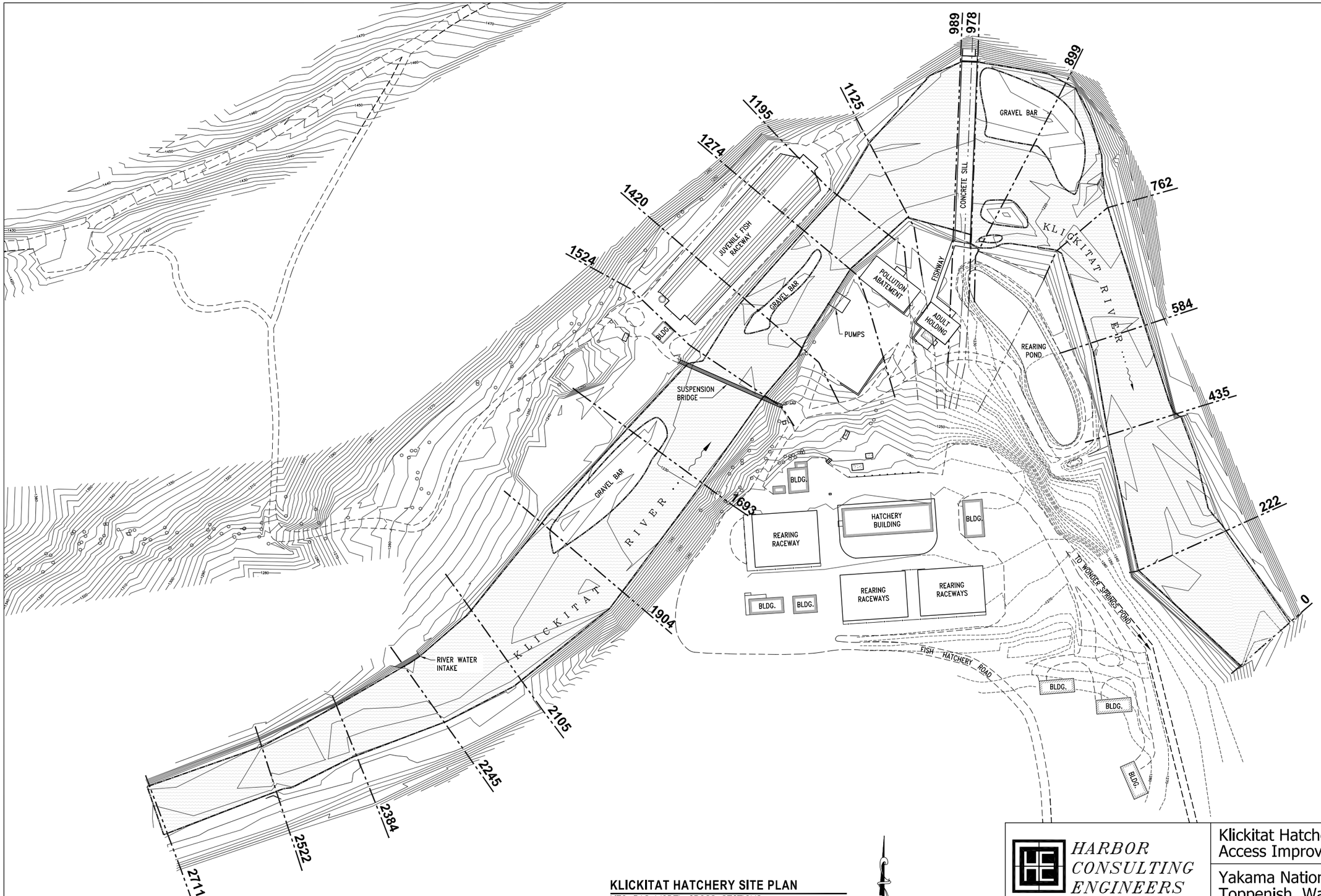
HEC-RAS Model Output
Klickitat Hatchery Existing Conditions

D-1 HEC-RAS MODEL:
CROSS SECTION LOCATIONS
WATER SURFACE PROFILES
VELOCITY PROFILES

D-2 CROSS SECTION WATER SURFACE ELEVATIONS

D-3 CROSS SECTION DATA TABLES

D-4 CROSS SECTION 100-YEAR WATER SURFACE ELEVATIONS



KLICKITAT HATCHERY SITE PLAN

HEC-RAS MODEL CROSS SECTIONS

SCALE: 1" = 75'

HARBOR CONSULTING ENGINEERS

ENGINEERS · PLANNERS · SURVEYORS

3006 Fuhrman Avenue East
Seattle, Washington 98102
Phone: (206) 709-2397

Klickitat Hatchery Bridge & Access Improvements

Yakama Nation
Toppenish, Washington

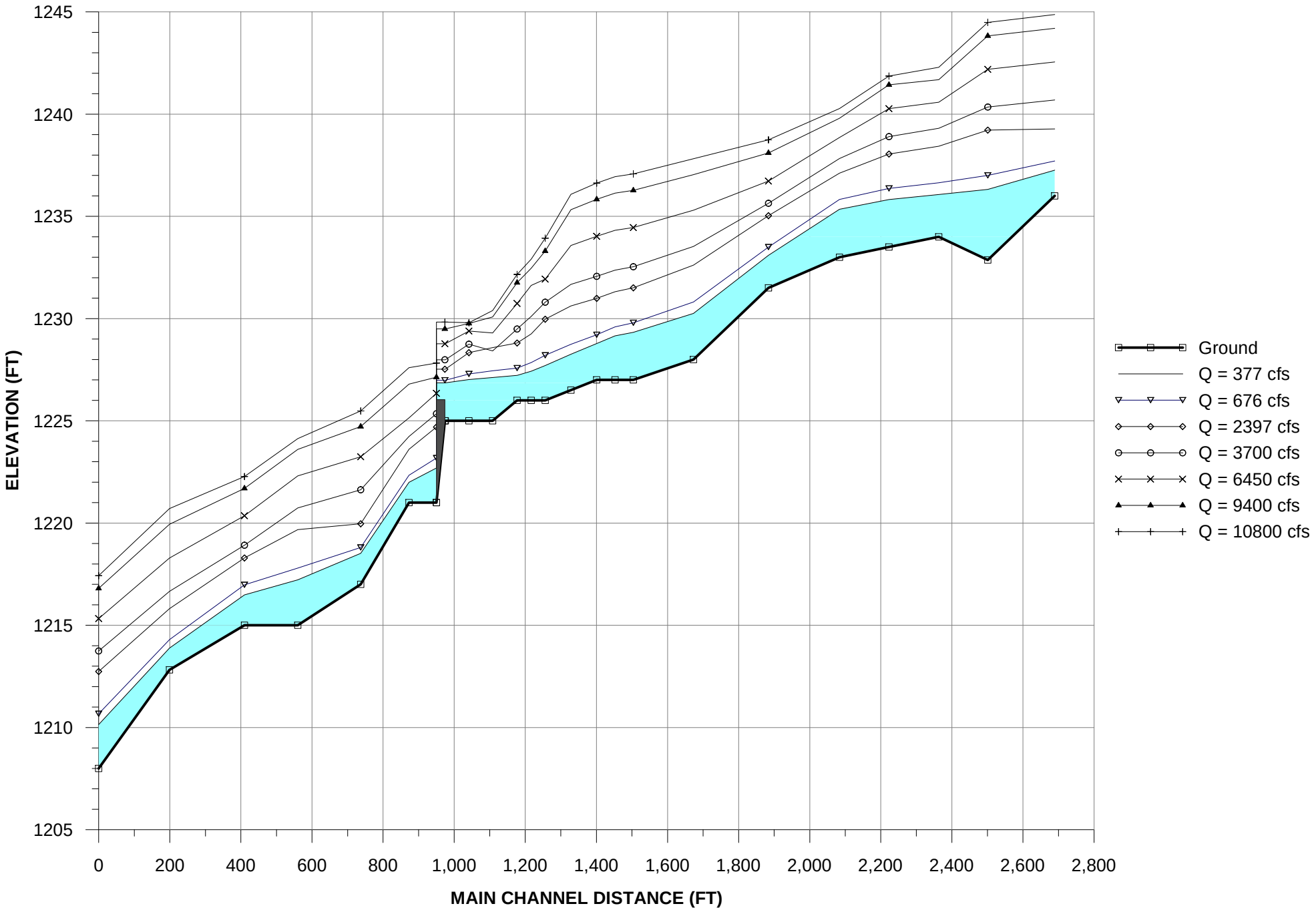
River Mile 42.6

HEC-RAS MODEL CROSS SECTION LOCATIONS

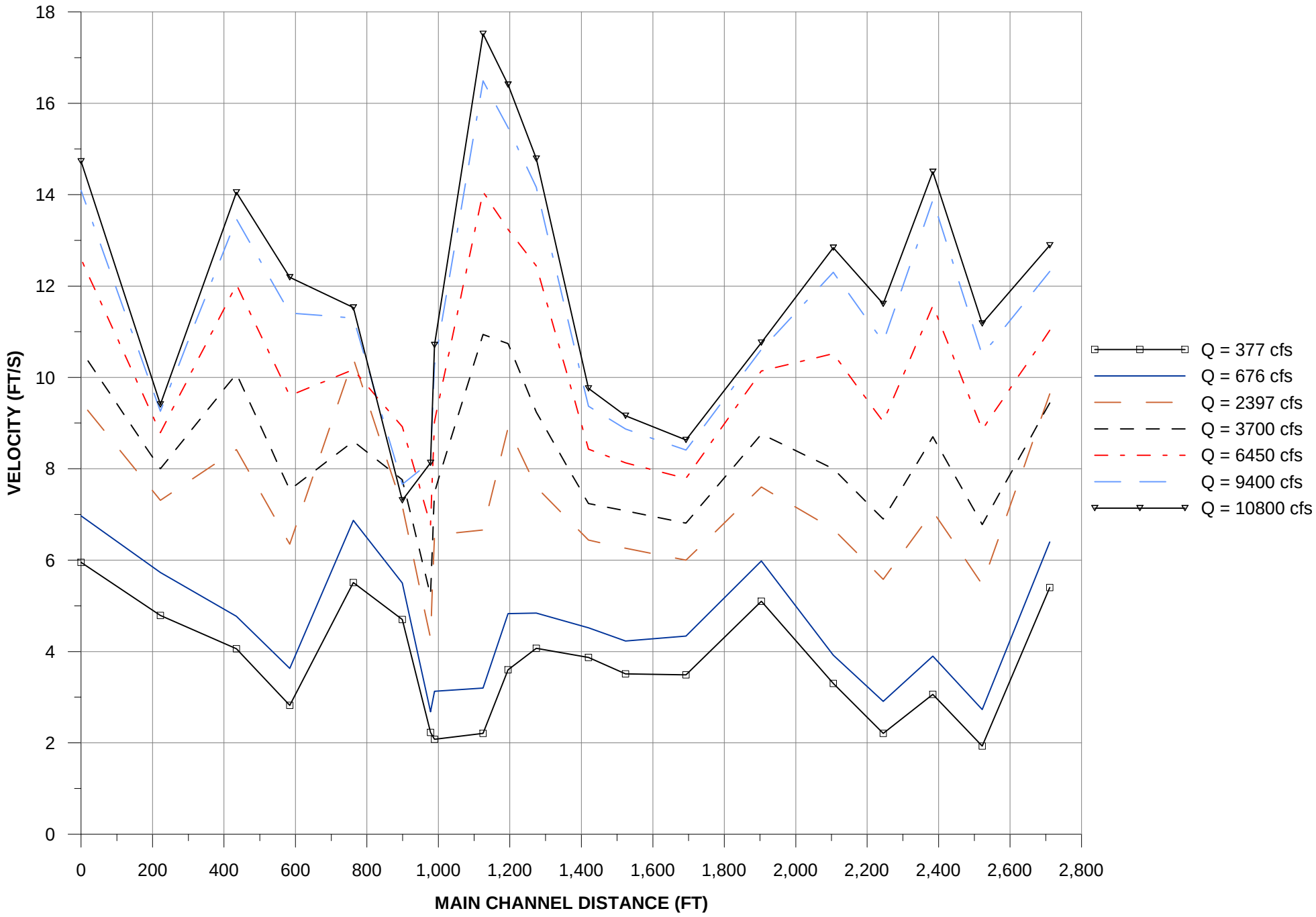
Drawing Number Figure 4

Designed by:	Drawn by:	Checked by:	Job Number	Date	Sheet of
JRH				AUG. 2009	

Klickitat River at Klickitat Hatchery
Water Surface Profiles

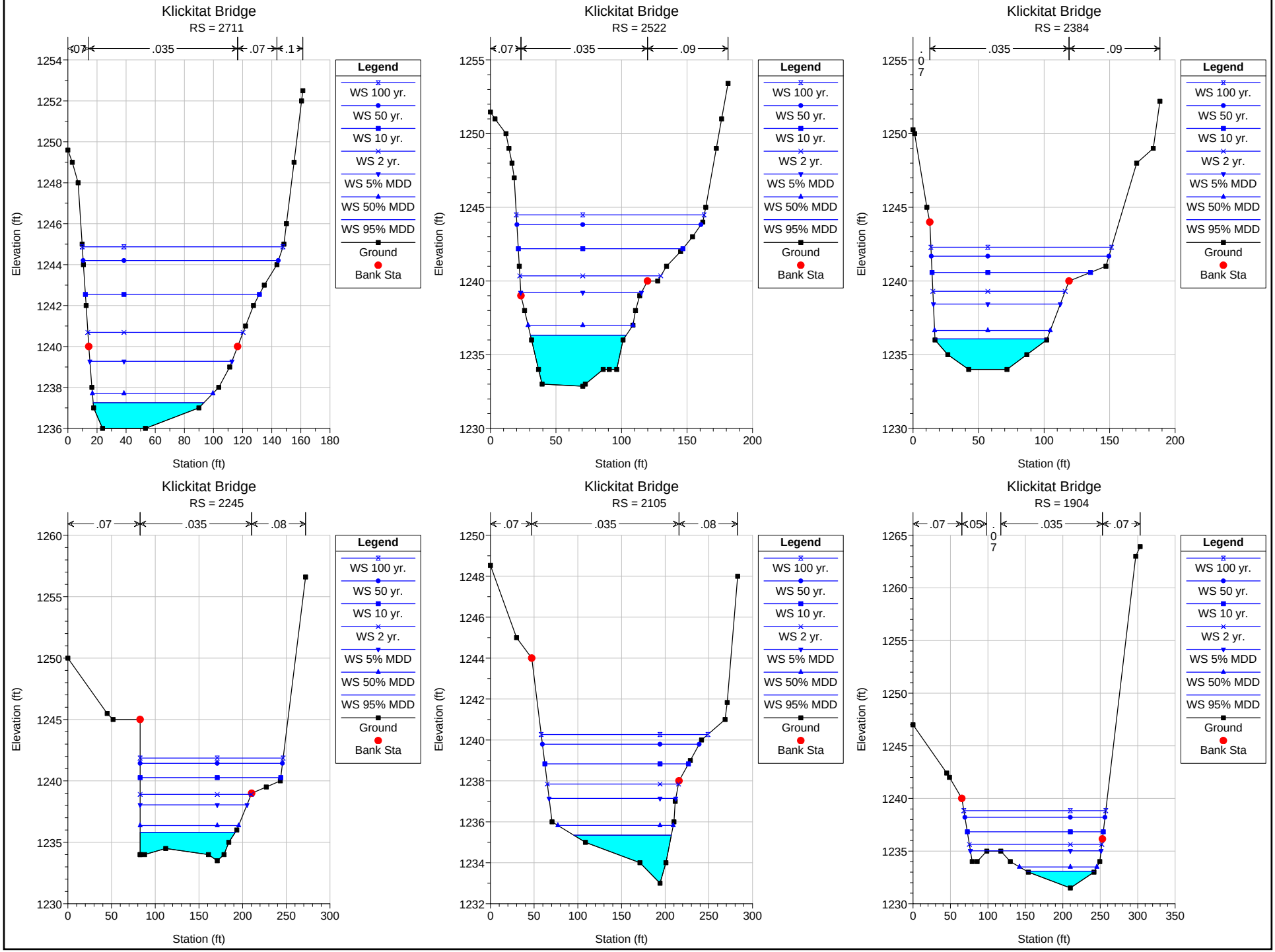


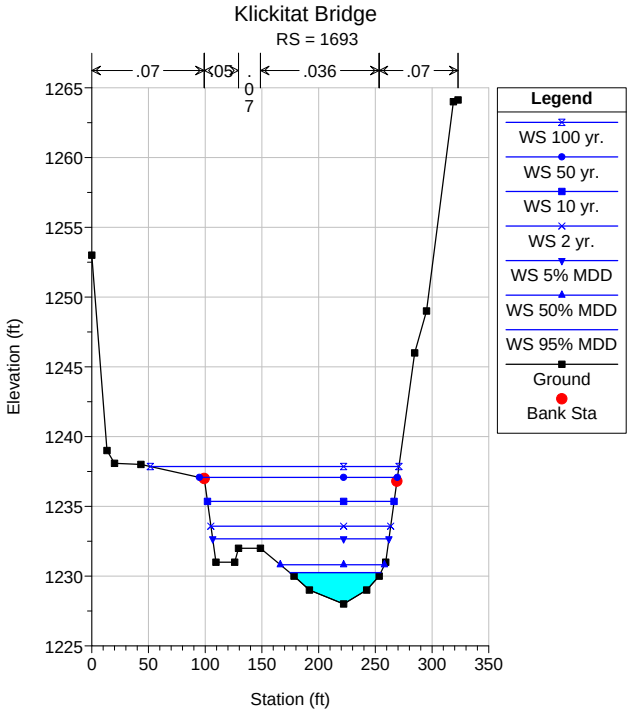
Klickitat River at Klickitat Hatchery
Water Velocity Profiles

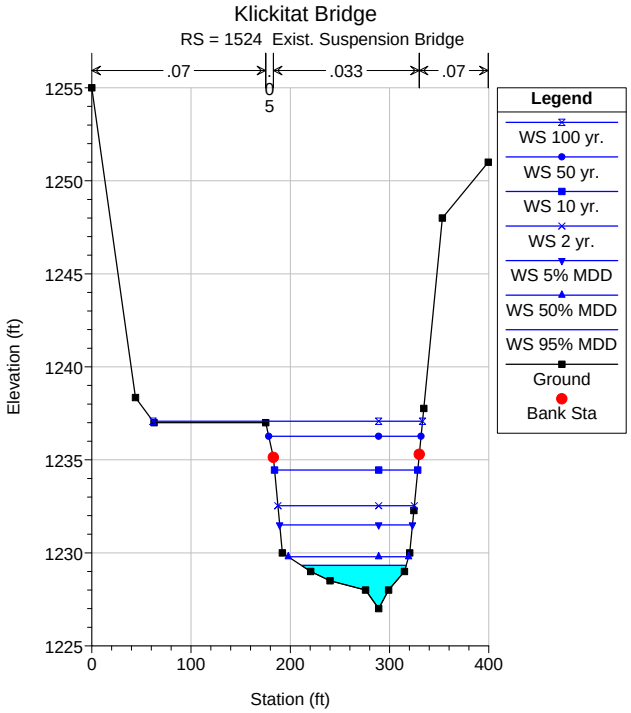


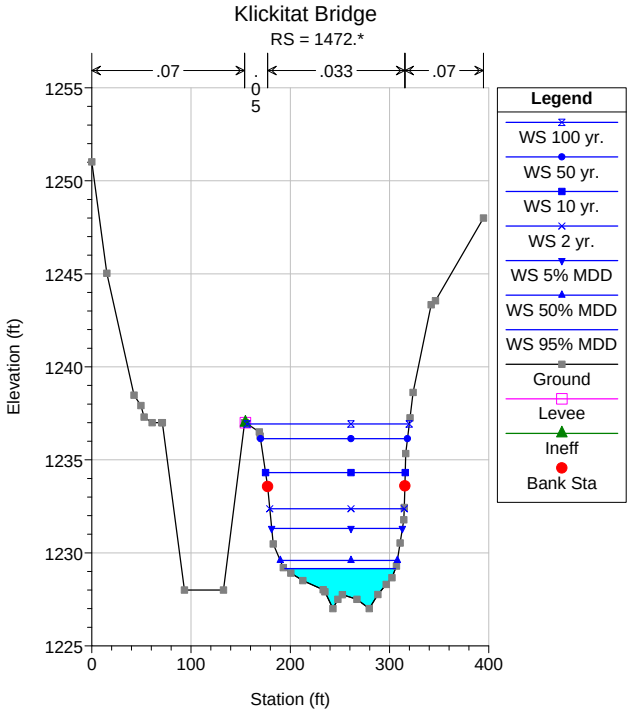
Appendix D-2

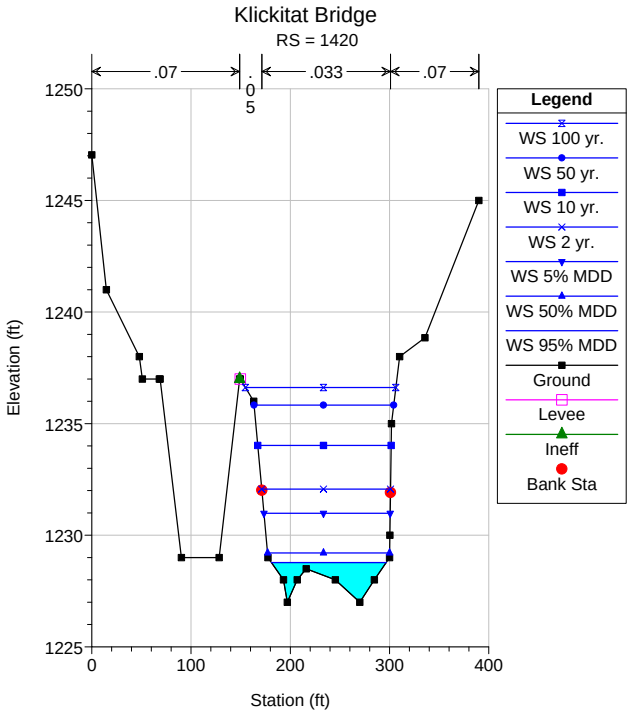
CROSS SECTION WATER SURFACE ELEVATIONS

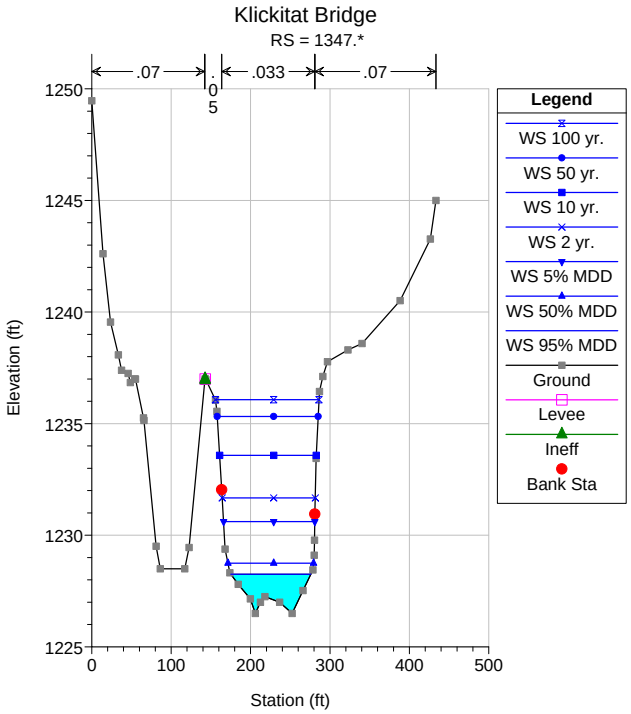

Klickitat Bridge
RS = 2711
.07
.035
.07
.1
Elevation (ft)
Station (ft)
Legend
WS 100 yr.
WS 50 yr.
WS 10 yr.
WS 2 yr.
WS 5% MDD
WS 50% MDD
WS 95% MDD
Ground
Bank Sta
Klickitat Bridge
RS = 2522
.07
.035
.09
Elevation (ft)
Station (ft)
Legend
WS 100 yr.
WS 50 yr.
WS 10 yr.
WS 2 yr.
WS 5% MDD
WS 50% MDD
WS 95% MDD
Ground
Bank Sta
Klickitat Bridge
RS = 2384
.035
.09
Elevation (ft)
Station (ft)
Legend
WS 100 yr.
WS 50 yr.
WS 10 yr.
WS 2 yr.
WS 5% MDD
WS 50% MDD
WS 95% MDD
Ground
Bank Sta
Klickitat Bridge
RS = 2245
.07
.035
.08
Elevation (ft)
Station (ft)
Legend
WS 100 yr.
WS 50 yr.
WS 10 yr.
WS 2 yr.
WS 5% MDD
WS 50% MDD
WS 95% MDD
Ground
Bank Sta
Klickitat Bridge
RS = 2105
.07
.035
.08
Elevation (ft)
Station (ft)
Legend
WS 100 yr.
WS 50 yr.
WS 10 yr.
WS 2 yr.
WS 5% MDD
WS 50% MDD
WS 95% MDD
Ground
Bank Sta
Klickitat Bridge
RS = 1904
.07
.05
.035
.07
Elevation (ft)
Station (ft)
Legend
WS 100 yr.
WS 50 yr.
WS 10 yr.
WS 2 yr.
WS 5% MDD
WS 50% MDD
WS 95% MDD
Ground
Bank Sta

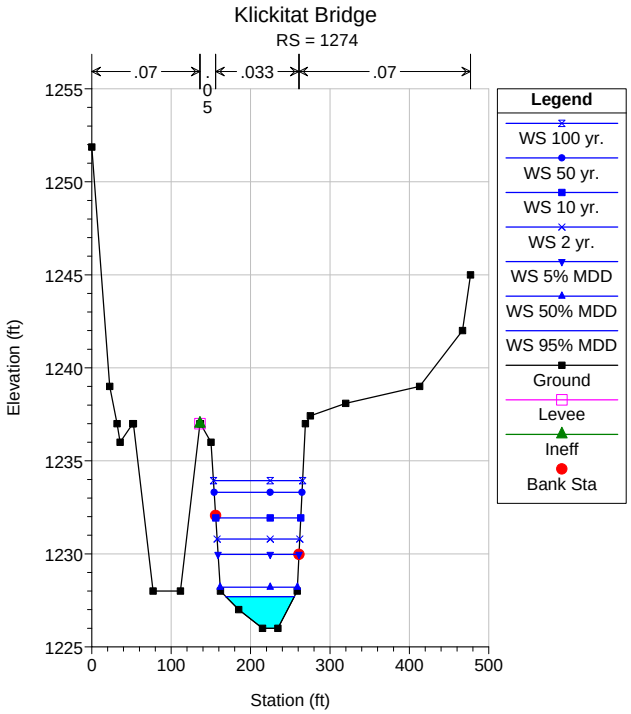

Klickitat Bridge
RS = 1693
.07
.05
.036
.07
Legend
WS 100 yr.
WS 50 yr.
WS 10 yr.
WS 2 yr.
WS 5% MDD
WS 50% MDD
WS 95% MDD
Ground
Bank Sta
Elevation (ft)
Station (ft)

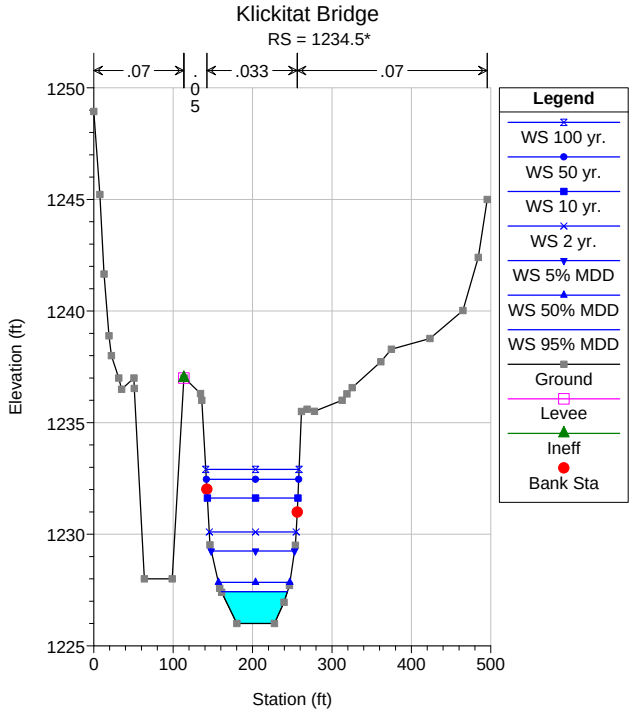

Klickitat Bridge
RS = 1524 Exist. Suspension Bridge
.07
.033
.07
Legend
WS 100 yr.
WS 50 yr.
WS 10 yr.
WS 2 yr.
WS 5% MDD
WS 50% MDD
WS 95% MDD
Ground
Bank Sta
Elevation (ft)
Station (ft)

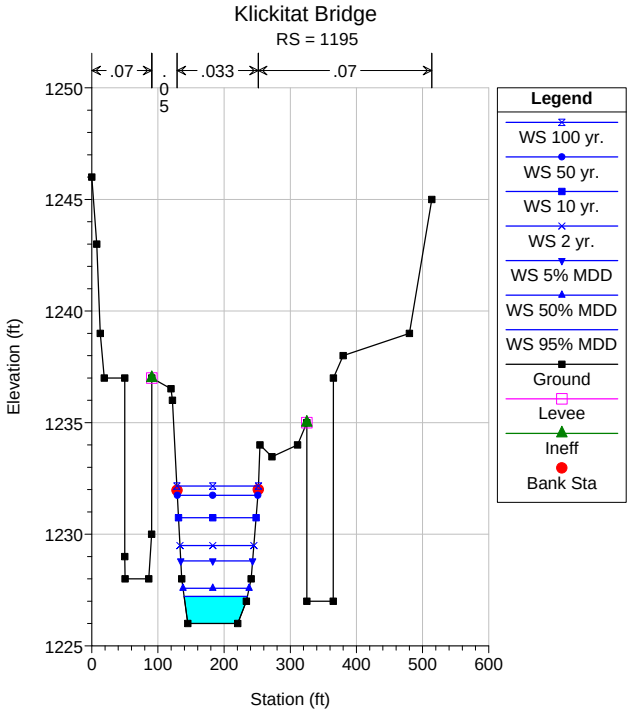

Klickitat Bridge
RS = 1472.*
.07
.033
.07
Legend
WS 100 yr.
WS 50 yr.
WS 10 yr.
WS 2 yr.
WS 5% MDD
WS 50% MDD
WS 95% MDD
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)

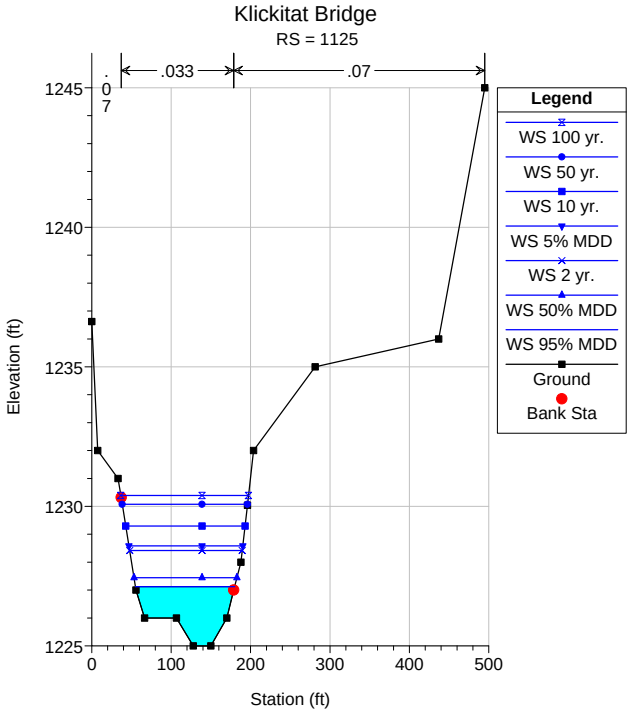

Klickitat Bridge
RS = 1420
.07
.033
.07
Legend
WS 100 yr.
WS 50 yr.
WS 10 yr.
WS 2 yr.
WS 5% MDD
WS 50% MDD
WS 95% MDD
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)

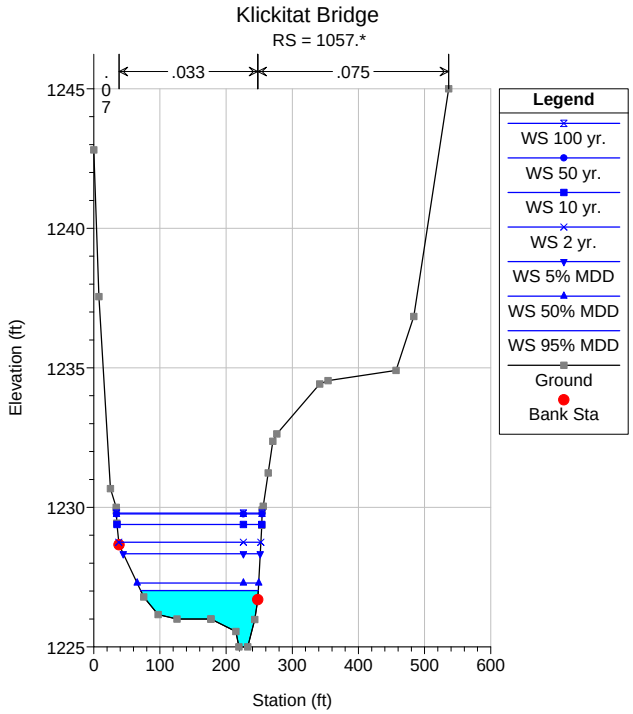

Klickitat Bridge
RS = 1347.*
.07
.033
.07
Legend
WS 100 yr.
WS 50 yr.
WS 10 yr.
WS 2 yr.
WS 5% MDD
WS 50% MDD
WS 95% MDD
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)

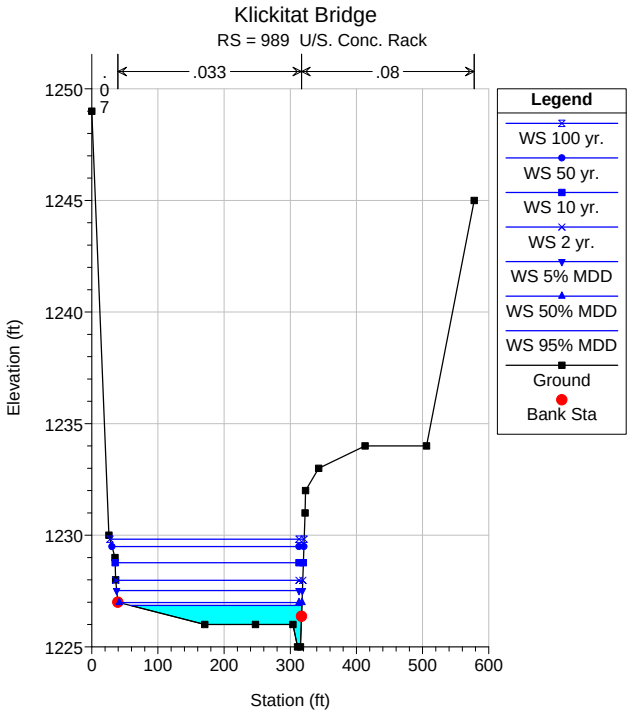

Klickitat Bridge
RS = 1274
.07
.033
.07
Legend
WS 100 yr.
WS 50 yr.
WS 10 yr.
WS 2 yr.
WS 5% MDD
WS 50% MDD
WS 95% MDD
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)

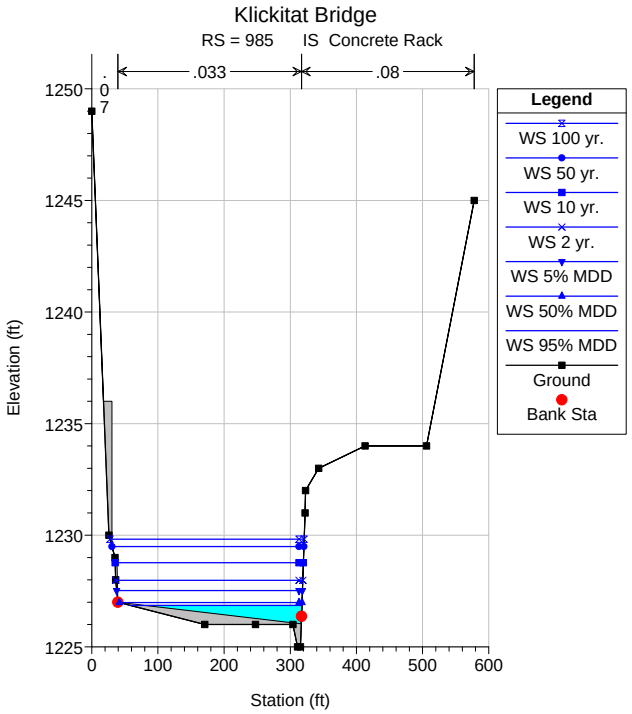

Klickitat Bridge
RS = 1234.5*
.07
.05
.033
.07
Elevation (ft)
Station (ft)
Legend
WS 100 yr.
WS 50 yr.
WS 10 yr.
WS 2 yr.
WS 5% MDD
WS 50% MDD
WS 95% MDD
Ground
Levee
Ineff
Bank Sta

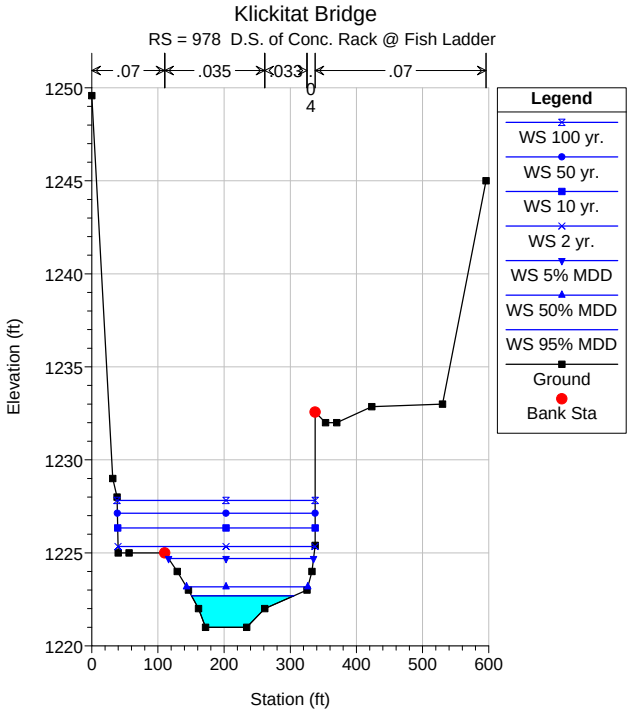

Klickitat Bridge
RS = 1195
.07
.05
.033
.07
Elevation (ft)
Station (ft)
Legend
WS 100 yr.
WS 50 yr.
WS 10 yr.
WS 2 yr.
WS 5% MDD
WS 50% MDD
WS 95% MDD
Ground
Levee
Ineff
Bank Sta

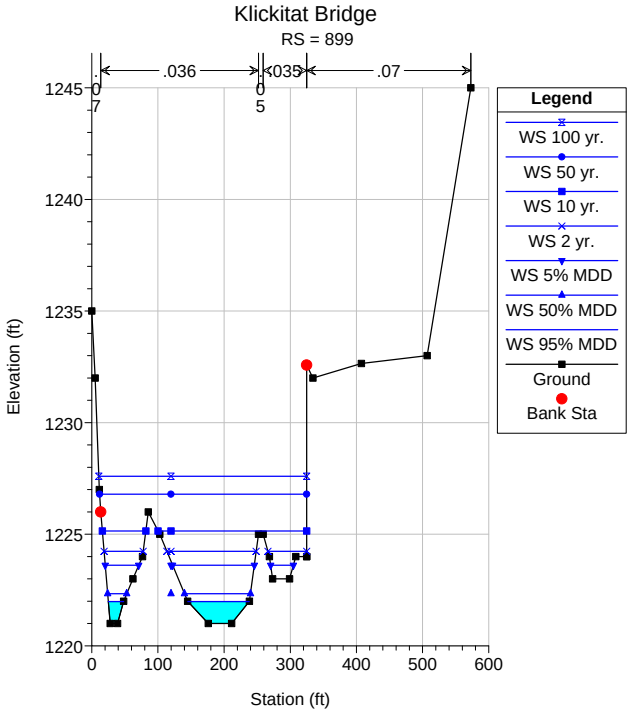

Klickitat Bridge
RS = 1125
.07
.033
.07
Elevation (ft)
Station (ft)
Legend
WS 100 yr.
WS 50 yr.
WS 10 yr.
WS 5% MDD
WS 2 yr.
WS 50% MDD
WS 95% MDD
Ground
Bank Sta

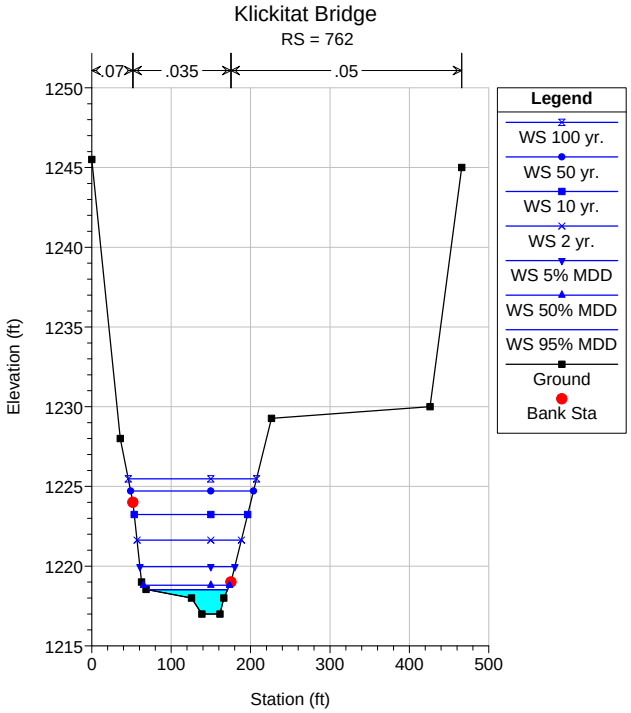

Klickitat Bridge
RS = 1057.*
.07
.033
.075
Elevation (ft)
Station (ft)
Legend
WS 100 yr.
WS 50 yr.
WS 10 yr.
WS 2 yr.
WS 5% MDD
WS 50% MDD
WS 95% MDD
Ground
Bank Sta

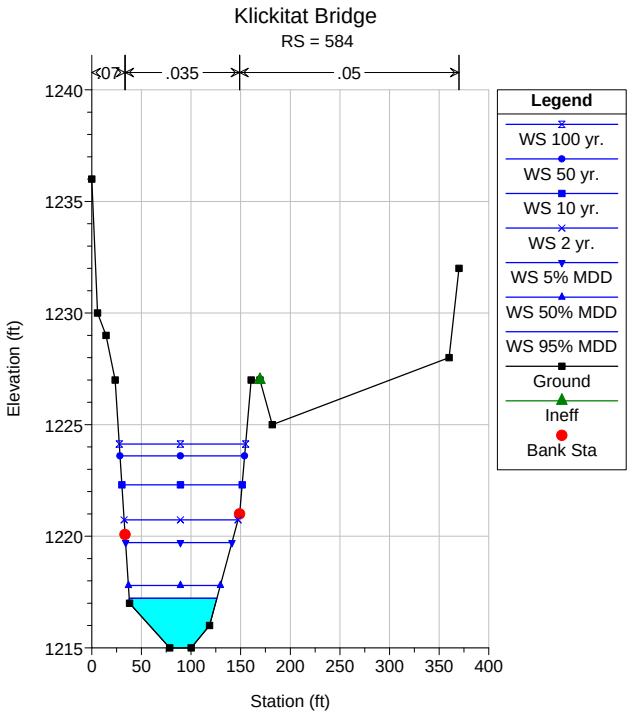

Klickitat Bridge
RS = 989 U/S. Conc. Rack
.07
.033
.08
Elevation (ft)
Station (ft)
Legend
WS 100 yr.
WS 50 yr.
WS 10 yr.
WS 2 yr.
WS 5% MDD
WS 50% MDD
WS 95% MDD
Ground
Bank Sta

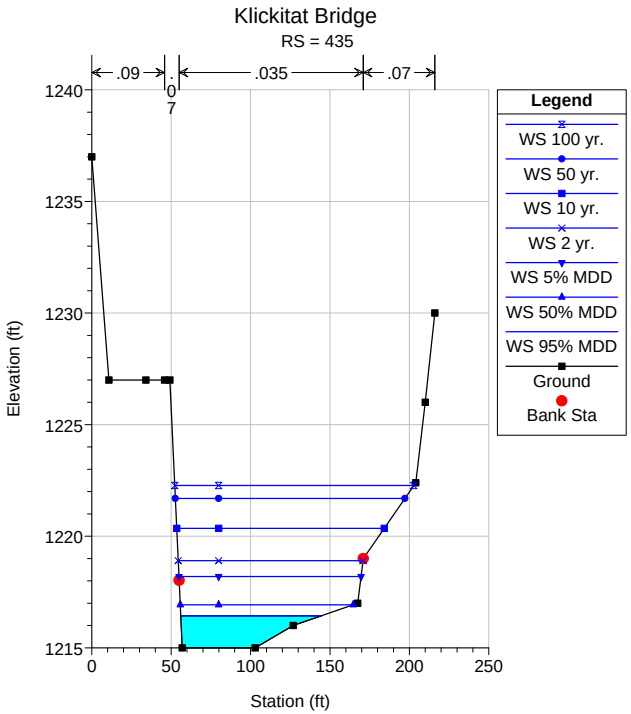

Klickitat Bridge
RS = 985 IS Concrete Rack
.07
.033
.08
Elevation (ft)
Station (ft)
Legend
WS 100 yr.
WS 50 yr.
WS 10 yr.
WS 2 yr.
WS 5% MDD
WS 50% MDD
WS 95% MDD
Ground
Bank Sta

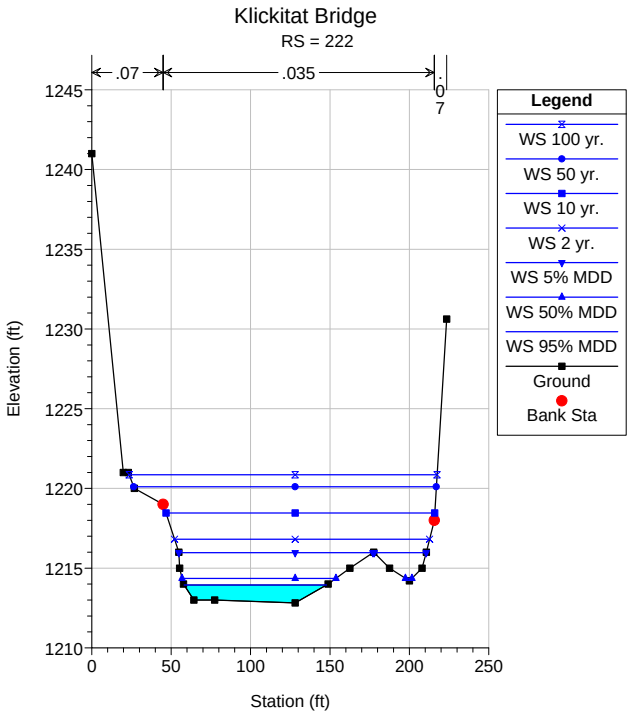

Klickitat Bridge
RS = 978 D.S. of Conc. Rack @ Fish Ladder
.07
.035
.033
.07
Legend
WS 100 yr.
WS 50 yr.
WS 10 yr.
WS 2 yr.
WS 5% MDD
WS 50% MDD
WS 95% MDD
Ground
Bank Sta
Elevation (ft)
Station (ft)

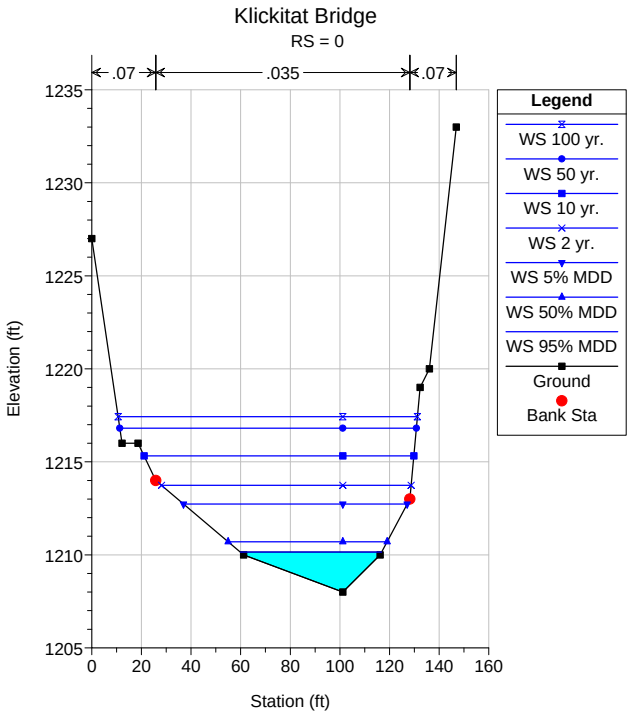

Klickitat Bridge
RS = 899
.036
.035
.07
Legend
WS 100 yr.
WS 50 yr.
WS 10 yr.
WS 2 yr.
WS 5% MDD
WS 50% MDD
WS 95% MDD
Ground
Bank Sta
Elevation (ft)
Station (ft)


Klickitat Bridge
RS = 762
.07
.035
.05
Legend
WS 100 yr.
WS 50 yr.
WS 10 yr.
WS 2 yr.
WS 5% MDD
WS 50% MDD
WS 95% MDD
Ground
Bank Sta
Elevation (ft)
Station (ft)


Klickitat Bridge
RS = 584
.07
.035
.05
Legend
WS 100 yr.
WS 50 yr.
WS 10 yr.
WS 2 yr.
WS 5% MDD
WS 50% MDD
WS 95% MDD
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


Klickitat Bridge
RS = 435
.09
.035
.07
Legend
WS 100 yr.
WS 50 yr.
WS 10 yr.
WS 2 yr.
WS 5% MDD
WS 50% MDD
WS 95% MDD
Ground
Bank Sta
Elevation (ft)
Station (ft)


Klickitat Bridge
RS = 222
.07
.035
Legend
WS 100 yr.
WS 50 yr.
WS 10 yr.
WS 2 yr.
WS 5% MDD
WS 50% MDD
WS 95% MDD
Ground
Bank Sta
Elevation (ft)
Station (ft)


Klickitat Bridge
RS = 0
.07
.035
.07
Elevation (ft)
1235
1230
1225
1220
1215
1210
1205
0
20
40
60
80
100
120
140
160
Station (ft)
Legend
WS 100 yr.
WS 50 yr.
WS 10 yr.
WS 2 yr.
WS 5% MDD
WS 50% MDD
WS 95% MDD
Ground
Bank Sta

Appendix D-3

CROSS SECTION DATA TABLES

HEC RAS Data Output
Klickitat River at Klickitat Hatchery
River Q = 377 cfs

River Station	Q Total (cfs)	Minimum Channel Elevation (ft)	Water Surface Elevation (ft)	Critical Water Surface (ft)	Energy Grade Elevation (ft)	Energy Grade Slope (ft/ft)	Channel Velocity (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude Number
2711	377	1236	1237.26	1237.26	1237.71	0.018196	5.4	69.83	76.08	0.99
2522	377	1232.86	1236.32	1234.36	1236.38	0.000564	1.93	195.74	73.09	0.21
2384	377	1234	1236.07		1236.21	0.0032	3.06	123.24	85.53	0.45
2245	377	1233.5	1235.82		1235.89	0.001518	2.21	170.93	109.01	0.31
2105	377	1233	1235.35	1234.97	1235.52	0.005895	3.3	114.1	111.54	0.58
1904	377	1231.5	1233.09	1233.09	1233.5	0.01892	5.1	73.93	90.55	0.99
1693	377	1228	1230.26	1229.7	1230.45	0.005045	3.49	107.96	80.35	0.53
1524	377	1227	1229.33		1229.52	0.005973	3.51	107.28	105.56	0.61
1472.*	377	1227	1229.15	1228.57	1229.28	0.003199	2.85	132.31	111.59	0.46
1420	377	1227	1228.78	1228.61	1229.01	0.009276	3.87	97.53	115.6	0.74
1347.*	377	1226.5	1228.26	1227.93	1228.46	0.006173	3.62	104.25	100.72	0.63
1274	377	1226	1227.7	1227.42	1227.96	0.007476	4.07	92.54	86.35	0.69
1234.5*	377	1226	1227.43	1227.12	1227.68	0.006747	4.01	94.04	83.23	0.66
1195	377	1226	1227.22	1226.89	1227.42	0.005683	3.6	104.67	95.59	0.61
1125	377	1225	1227.12		1227.2	0.001566	2.21	170.87	124.84	0.33
1057.*	377	1225	1227.02		1227.08	0.00169	1.96	192.73	177.72	0.33
989	377	1225	1226.85	1226.5	1226.92	0.003437	2.08	181.36	259.08	0.44
985	Inl Struct									
978	377	1221	1222.69		1222.77	0.00198	2.23	169.1	154.75	0.38
899	377	1221	1221.99	1221.99	1222.33	0.021208	4.7	80.25	115.89	0.99
762	377	1217	1218.52	1218.6	1218.99	0.028207	5.51	68.41	100.5	1.18
584	377	1215	1217.22	1216.41	1217.34	0.002533	2.82	133.92	88.32	0.4
435	377	1215	1216.44	1216.16	1216.69	0.008669	4.06	92.92	88.54	0.7
222	377	1212.82	1213.94	1213.89	1214.3	0.015207	4.79	78.68	89.76	0.9
0	377	1208	1210.15	1210.15	1210.7	0.017131	5.95	63.33	56.92	0.99

HEC RAS Data Output
Klickitat River at Klickitat Hatchery
River Q = 676 cfs

River Station	Q Total (cfs)	Minimum Channel Elevation (ft)	Water Surface Elevation (ft)	Critical Water Surface (ft)	Energy Grade Elevation (ft)	Energy Grade Slope (ft/ft)	Channel Velocity (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude Number
2711	676	1236	1237.71	1237.71	1238.34	0.016502	6.4	105.67	82.8	1
2522	676	1232.86	1237	1234.86	1237.11	0.000933	2.73	247.84	80.04	0.27
2384	676	1234	1236.64		1236.88	0.003475	3.9	173.17	88.28	0.49
2245	676	1233.5	1236.37		1236.5	0.001854	2.91	232.08	112.79	0.36
2105	676	1233	1235.83		1236.07	0.005989	3.92	172.49	132.1	0.6
1904	676	1231.5	1233.5	1233.5	1234.05	0.017654	5.98	113.03	103.44	1.01
1693	676	1228	1230.81	1230.21	1231.11	0.006112	4.34	155.88	91.78	0.59
1524	676	1227	1229.79		1230.07	0.006123	4.23	159.81	121.27	0.65
1472.*	676	1227	1229.59	1228.99	1229.81	0.003757	3.69	183.05	117.98	0.52
1420	676	1227	1229.21	1228.96	1229.53	0.007833	4.52	149.39	122.98	0.72
1347.*	676	1226.5	1228.75	1228.35	1229.04	0.005698	4.34	155.78	107.73	0.64
1274	676	1226	1228.21	1227.89	1228.57	0.007168	4.84	139.64	97.32	0.71
1234.5*	676	1226	1227.85	1227.58	1228.26	0.008104	5.18	130.38	89.95	0.76
1195	676	1226	1227.58	1227.29	1227.94	0.007357	4.83	140.01	99.92	0.72
1125	676	1225	1227.44		1227.6	0.002527	3.2	212.15	129.61	0.43
1057.*	676	1225	1227.29		1227.41	0.002671	2.8	241.6	183.72	0.43
989	676	1225	1226.98	1226.73	1227.14	0.006728	3.13	215.93	276.19	0.62
985	Inl Struct									
978	676	1221	1223.18		1223.29	0.002175	2.68	252.66	183.51	0.4
899	676	1221	1222.34	1222.34	1222.81	0.018985	5.5	122.8	128.57	0.99
762	676	1217	1218.8	1218.98	1219.54	0.029923	6.87	98.39	108.53	1.27
584	676	1215	1217.8	1216.89	1218	0.002904	3.63	186.2	92.66	0.45
435	676	1215	1216.93		1217.28	0.008996	4.77	141.79	108.97	0.74
222	676	1212.82	1214.36	1214.3	1214.87	0.01486	5.73	117.94	100.99	0.93
0	676	1208	1210.71	1210.71	1211.46	0.015596	6.97	97.01	64.07	1

HEC RAS Data Output
Klickitat River at Klickitat Hatchery
River Q = 2,397 cfs

River Station	Q Total (cfs)	Minimum Channel Elevation (ft)	Water Surface Elevation (ft)	Critical Water Surface (ft)	Energy Grade Elevation (ft)	Energy Grade Slope (ft/ft)	Channel Velocity (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude Number
2711	2,397	1236	1239.28	1239.4	1240.72	0.015005	9.64	248.75	97.53	1.06
2522	2,397	1232.86	1239.22	1236.94	1239.68	0.002135	5.47	437.88	92.05	0.44
2384	2,397	1234	1238.43		1239.21	0.005363	7.07	338.91	96.83	0.67
2245	2,397	1233.5	1238.05		1238.53	0.003394	5.58	429.56	122.35	0.52
2105	2,397	1233	1237.15		1237.84	0.007455	6.68	358.78	144.96	0.75
1904	2,397	1231.5	1235.03	1235.03	1235.93	0.011776	7.6	315.35	174.5	1
1693	2,397	1228	1232.67	1231.93	1233.23	0.009547	6	399.45	155.35	0.66
1524	2,397	1227	1231.51		1232.11	0.004791	6.26	383.18	133.74	0.65
1472.*	2,397	1227	1231.31	1230.41	1231.87	0.004057	5.99	400.13	131.71	0.61
1420	2,397	1227	1230.99	1230.27	1231.63	0.005004	6.44	372.15	127.26	0.66
1347.*	2,397	1226.5	1230.62	1229.79	1231.28	0.0046	6.55	366.02	114.89	0.65
1274	2,397	1226	1229.97	1229.45	1230.87	0.006437	7.6	315.43	101.93	0.76
1234.5*	2,397	1226	1229.25	1229.24	1230.5	0.011423	8.96	267.51	104.84	0.99
1195	2,397	1226	1228.81	1228.81	1230.04	0.011743	8.9	269.24	108.56	1
1125	2,397	1225	1228.58	1228.04	1229.27	0.005798	6.66	368.25	143.39	0.71
1057.*	2,397	1225	1228.34		1228.79	0.0051	5.4	446.07	206.97	0.64
989	2,397	1225	1227.52	1227.52	1228.19	0.014663	6.55	367.22	280.77	1
985	Inl Struct									
978	2,397	1221	1224.69	1223.57	1224.98	0.002765	4.29	558.75	219.01	0.47
899	2,397	1221	1223.61	1223.61	1224.41	0.014649	7.18	333.7	208.33	1
762	2,397	1217	1219.96	1220.34	1221.64	0.023934	10.41	232.03	119.55	1.3
584	2,397	1215	1219.71	1218.57	1220.34	0.004232	6.35	377.5	107.06	0.6
435	2,397	1215	1218.2	1218.11	1219.3	0.011949	8.42	284.79	114.7	0.94
222	2,397	1212.82	1215.97	1215.78	1216.8	0.011027	7.31	327.98	155.01	0.89
0	2,397	1208	1212.73	1212.73	1214.12	0.012634	9.46	253.42	90.14	0.99

HEC RAS Data Output
Klickitat River at Klickitat Hatchery
River Q = 3,700 cfs

River Station	Q Total (cfs)	Minimum Channel Elevation (ft)	Water Surface Elevation (ft)	Critical Water Surface (ft)	Energy Grade Elevation (ft)	Energy Grade Slope (ft/ft)	Channel Velocity (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude Number
2711	3,700	1236	1240.69	1240.29	1242.08	0.008401	9.44	393.29	106.62	0.85
2522	3,700	1232.86	1240.35		1241.06	0.00261	6.78	548.98	107.5	0.5
2384	3,700	1234	1239.31		1240.48	0.00639	8.7	425.22	101	0.75
2245	3,700	1233.5	1238.9		1239.64	0.004102	6.9	536.06	127.21	0.59
2105	3,700	1233	1237.85		1238.84	0.007993	8	462.49	150.09	0.8
1904	3,700	1231.5	1235.64	1235.64	1236.83	0.012192	8.76	422.6	176.92	1
1693	3,700	1228	1233.58	1232.7	1234.3	0.008571	6.81	542.94	158.49	0.65
1524	3,700	1227	1232.54		1233.31	0.004222	7.08	522.83	137.42	0.64
1472.*	3,700	1227	1232.37	1231.18	1233.1	0.003685	6.83	541.38	135.44	0.6
1420	3,700	1227	1232.07	1231.04	1232.88	0.004287	7.24	510.98	129.79	0.64
1347.*	3,700	1226.5	1231.67	1230.63	1232.56	0.004306	7.58	488.47	117.17	0.65
1274	3,700	1226	1230.8	1230.32	1232.12	0.007067	9.24	400.61	104.09	0.83
1234.5*	3,700	1226	1230.1	1230.1	1231.75	0.010859	10.3	359.06	109.48	1
1195	3,700	1226	1229.49	1229.66	1231.28	0.012801	10.74	344.56	111.61	1.08
1125	3,700	1225	1228.42	1228.77	1230.27	0.016834	10.94	345.13	141.83	1.2
1057.*	3,700	1225	1228.75	1228.33	1229.51	0.007005	6.98	533.85	214.74	0.77
989	3,700	1225	1227.98	1227.98	1228.85	0.012894	7.49	496.5	282.83	0.99
985	Inl Struct									
978	3,700	1221	1225.35	1224.17	1225.77	0.003186	5.23	729.16	297.57	0.52
899	3,700	1221	1224.24	1224.24	1225.17	0.013521	7.76	477.05	252.63	0.99
762	3,700	1217	1221.63	1221.17	1222.76	0.007564	8.6	441.06	131.42	0.8
584	3,700	1215	1220.74		1221.62	0.004577	7.54	490.69	114.73	0.64
435	3,700	1215	1218.91	1218.91	1220.49	0.01241	10.08	367.37	116.41	1
222	3,700	1212.82	1216.82	1216.48	1217.81	0.008794	8	462.31	160.64	0.83
0	3,700	1208	1213.74	1213.74	1215.48	0.01188	10.59	349.48	100.61	1

HEC RAS Data Output
Klickitat River at Klickitat Hatchery
River Q = 6,450 cfs

River Station	Q Total (cfs)	Minimum Channel Elevation (ft)	Water Surface Elevation (ft)	Critical Water Surface (ft)	Energy Grade Elevation (ft)	Energy Grade Slope (ft/ft)	Channel Velocity (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude Number
2711	6,450	1236	1242.55	1241.87	1244.42	0.006773	11.03	602.18	119.49	0.81
2522	6,450	1232.86	1242.19		1243.4	0.003061	8.86	761.99	125.59	0.57
2384	6,450	1234	1240.58	1240.16	1242.66	0.008328	11.57	562.14	120.96	0.88
2245	6,450	1233.5	1240.27		1241.53	0.00491	9.03	736.53	160.95	0.67
2105	6,450	1233	1238.83	1238.65	1240.55	0.009825	10.52	616.9	164.36	0.93
1904	6,450	1231.5	1236.83	1236.72	1238.43	0.010834	10.14	636.35	181.65	0.95
1693	6,450	1228	1235.35		1236.29	0.006945	7.79	828.37	164.55	0.61
1524	6,450	1227	1234.46		1235.48	0.00344	8.13	793.29	144.29	0.61
1472.*	6,450	1227	1234.31	1232.51	1235.3	0.003051	7.98	809.55	140.72	0.58
1420	6,450	1227	1234.02	1232.39	1235.13	0.003393	8.43	769.32	134.37	0.61
1347.*	6,450	1226.5	1233.58	1232.05	1234.85	0.003747	9.05	716.15	121.7	0.65
1274	6,450	1226	1231.93	1231.86	1234.33	0.009305	12.44	520.33	107.05	0.99
1234.5*	6,450	1226	1231.62	1231.62	1233.93	0.009587	12.2	528.8	113.98	1
1195	6,450	1226	1230.74	1231.14	1233.46	0.013153	13.24	487.22	117.16	1.14
1125	6,450	1225	1229.3	1230.1	1232.33	0.019626	14.06	473.4	150.29	1.36
1057.*	6,450	1225	1229.39	1229.32	1230.85	0.010045	9.71	671.61	218.78	0.96
989	6,450	1225	1228.77	1228.77	1230.04	0.011502	9.03	719.96	284.6	0.99
985	Inl Struct									
978	6,450	1221	1226.34	1225.23	1227.04	0.003739	6.77	1025.69	298.36	0.59
899	6,450	1221	1225.15	1225.15	1226.38	0.012847	8.92	723.02	290.3	1
762	6,450	1217	1223.24	1222.58	1224.81	0.006681	10.17	661.51	142.87	0.8
584	6,450	1215	1222.3		1223.73	0.004973	9.6	676.19	121.15	0.7
435	6,450	1215	1220.36	1220.36	1222.6	0.010724	12.03	545.5	130.66	0.99
222	6,450	1212.82	1218.46	1217.64	1219.66	0.006159	8.79	733.46	169.26	0.74
0	6,450	1208	1215.32	1215.32	1217.78	0.010415	12.59	516.47	108.75	0.99

HEC RAS Data Output
Klickitat River at Klickitat Hatchery
River Q = 9,400 cfs

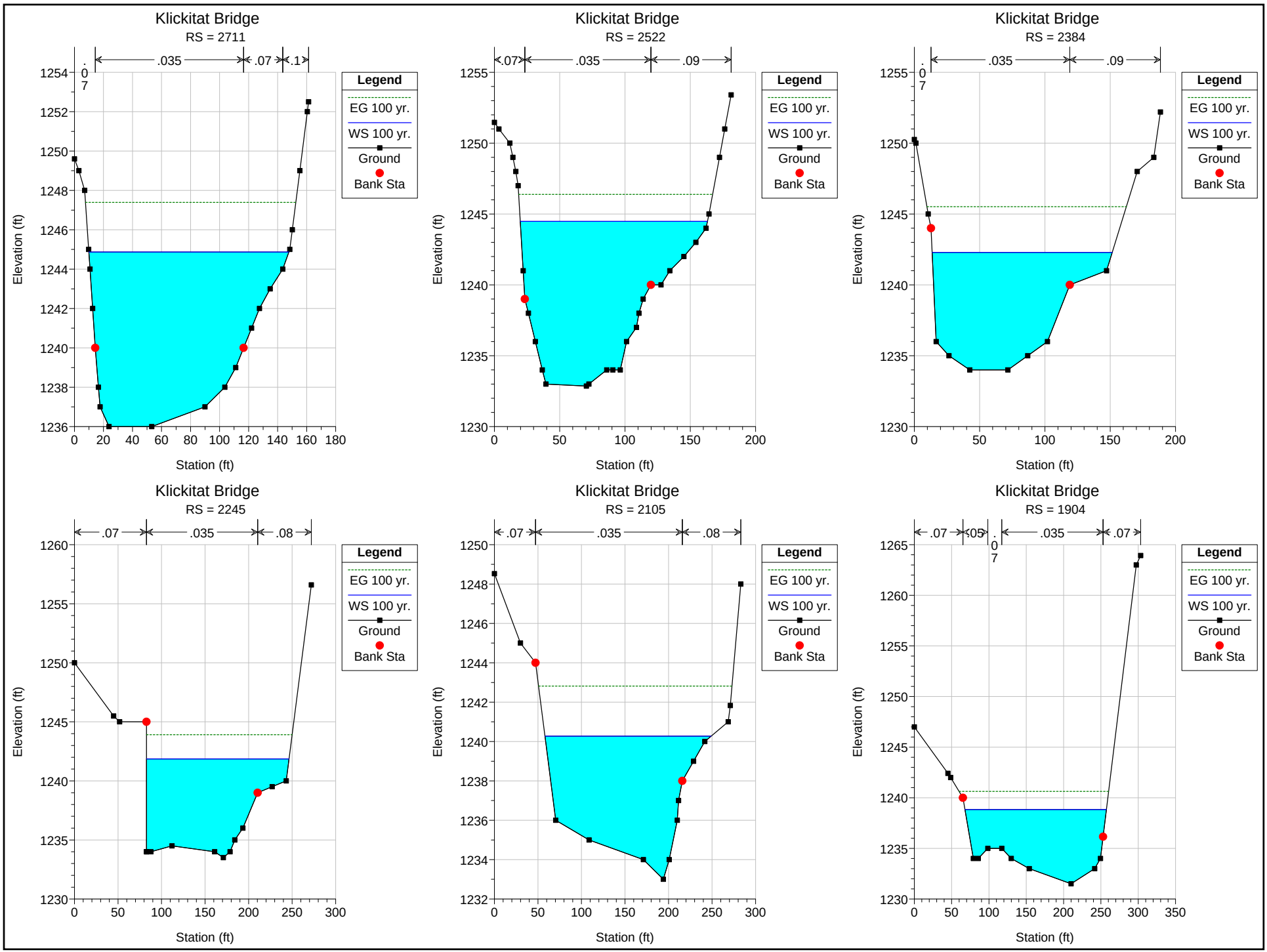
River Station	Q Total (cfs)	Minimum Channel Elevation (ft)	Water Surface Elevation (ft)	Critical Water Surface (ft)	Energy Grade Elevation (ft)	Energy Grade Slope (ft/ft)	Channel Velocity (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude Number
2711	9,400	1236	1244.2	1243.32	1246.52	0.006022	12.32	811.76	133.99	0.8
2522	9,400	1232.86	1243.83		1245.51	0.003292	10.49	980.37	140.47	0.61
2384	9,400	1234	1241.68	1241.68	1244.66	0.009476	13.88	706.9	135.53	0.97
2245	9,400	1233.5	1241.43	1240.31	1243.21	0.005498	10.78	924.57	162.97	0.73
2105	9,400	1233	1239.79	1239.79	1242.13	0.010294	12.3	782.05	179.52	0.98
1904	9,400	1231.5	1238.2	1237.72	1239.95	0.008213	10.61	889.19	187.09	0.85
1693	9,400	1228	1237.08		1238.18	0.005835	8.41	1117.61	174.6	0.58
1524	9,400	1227	1236.27		1237.49	0.002865	8.87	1062.74	153.53	0.58
1472.*	9,400	1227	1236.14	1233.72	1237.35	0.002616	8.85	1071.7	148.04	0.56
1420	9,400	1227	1235.83	1233.62	1237.19	0.002937	9.37	1017.1	140.67	0.59
1347.*	9,400	1226.5	1235.32	1233.36	1236.94	0.003416	10.23	932.75	127.1	0.64
1274	9,400	1226	1233.31	1233.31	1236.42	0.008701	14.16	670.32	110.64	0.99
1234.5*	9,400	1226	1232.46	1232.94	1235.98	0.011796	15.06	625.54	116.27	1.13
1195	9,400	1226	1231.75	1232.48	1235.46	0.014113	15.47	607.81	121.66	1.22
1125	9,400	1225	1230.08	1231.22	1234.24	0.021222	16.49	593.21	157.78	1.45
1057.*	9,400	1225	1229.76	1230.2	1232.23	0.014642	12.63	754.06	219.99	1.18
989	9,400	1225	1229.49	1229.49	1231.13	0.010677	10.27	926.83	290.16	1
985	Inl Struct									
978	9,400	1221	1227.13	1226.08	1228.13	0.004313	8.15	1262.36	298.85	0.65
899	9,400	1221	1226.8		1227.71	0.005487	7.66	1227.78	313.09	0.68
762	9,400	1217	1224.72		1226.63	0.005962	11.3	881.04	154.73	0.78
584	9,400	1215	1223.6	1222.4	1225.62	0.005362	11.41	836.73	125.58	0.75
435	9,400	1215	1221.7	1221.7	1224.49	0.009575	13.47	730.05	144.55	0.97
222	9,400	1212.82	1220.1	1218.72	1221.43	0.004502	9.26	1025.84	190.6	0.67
0	9,400	1208	1216.81	1216.81	1219.87	0.009221	14.09	686.67	119.52	0.98

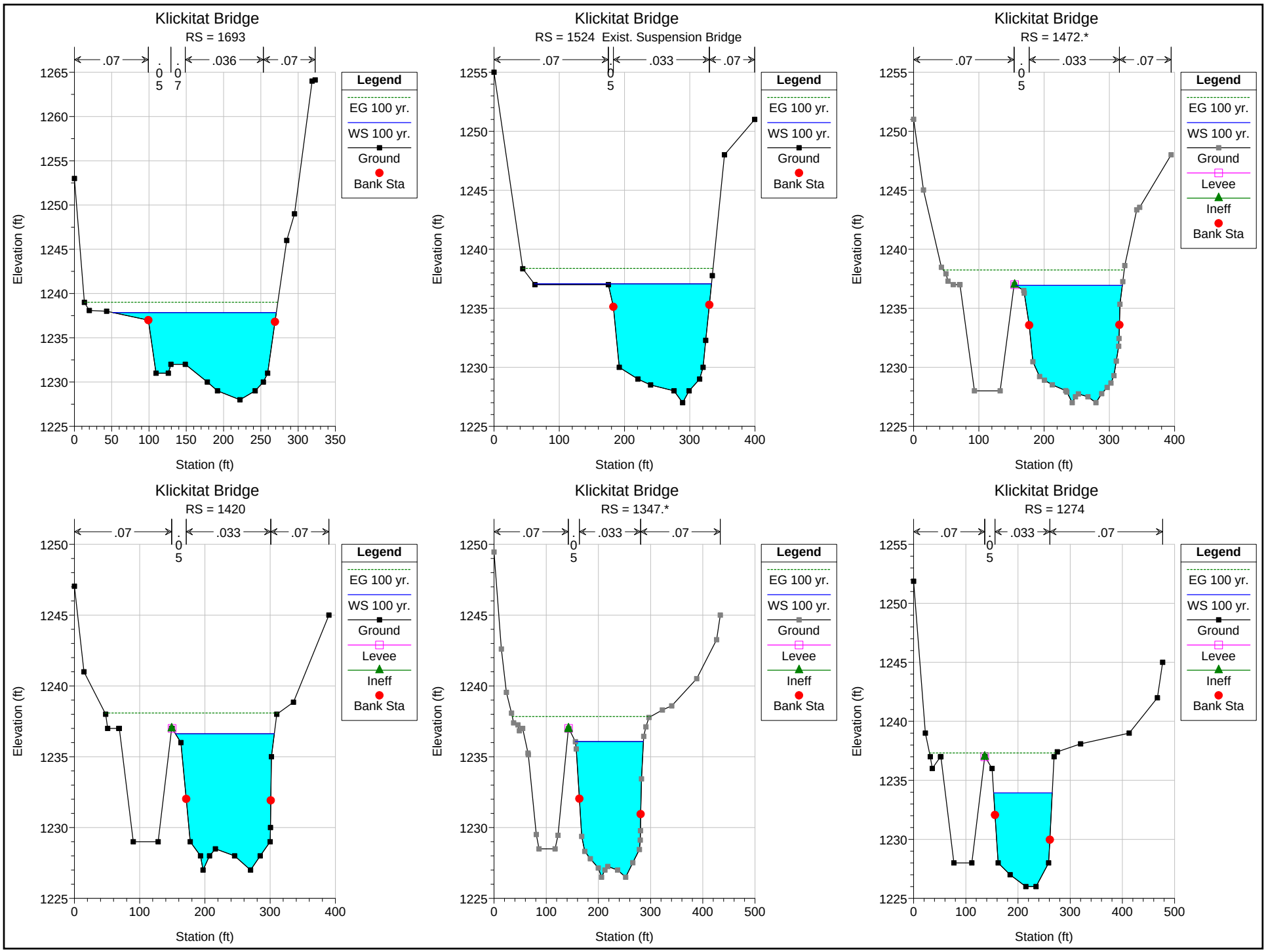
HEC RAS Data Output
Klickitat River at Klickitat Hatchery
River Q = 10,800 cfs

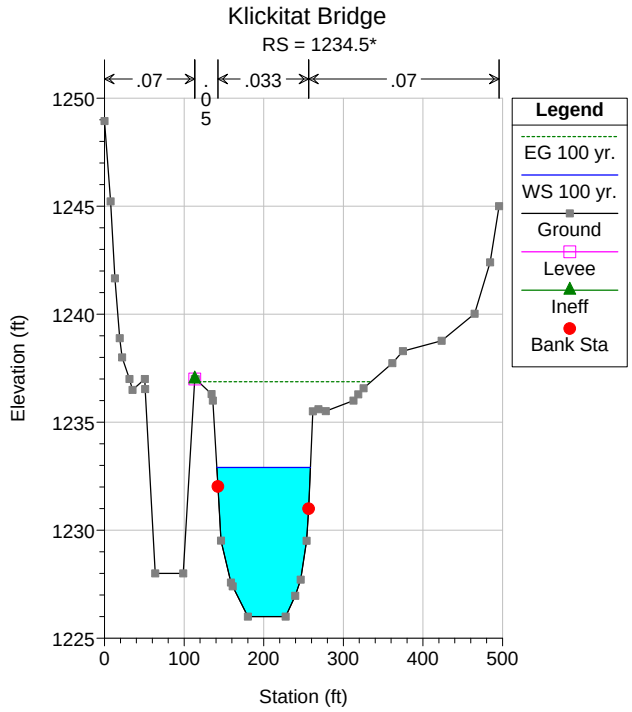
River Station	Q Total (cfs)	Minimum Channel Elevation (ft)	Water Surface Elevation (ft)	Critical Water Surface (ft)	Energy Grade Elevation (ft)	Energy Grade Slope (ft/ft)	Channel Velocity (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude Number
2711	10,800	1236	1244.87	1243.97	1247.39	0.005856	12.89	903.22	137.83	0.8
2522	10,800	1232.86	1244.48		1246.38	0.00341	11.18	1073.76	143.34	0.63
2384	10,800	1234	1242.29	1242.29	1245.52	0.009233	14.5	789.93	137.87	0.97
2245	10,800	1233.5	1241.86	1240.87	1243.92	0.005898	11.61	994.04	163.71	0.76
2105	10,800	1233	1240.27	1240.27	1242.82	0.010028	12.84	869.75	190.81	0.98
1904	10,800	1231.5	1238.84	1238.16	1240.63	0.007347	10.76	1008.63	189.61	0.81
1693	10,800	1228	1237.85		1239.01	0.005298	8.63	1269.96	219.17	0.56
1524	10,800	1227	1237.07		1238.38	0.002653	9.16	1196.24	271.55	0.57
1472.*	10,800	1227	1236.93	1234.23	1238.24	0.002477	9.2	1194.08	163.29	0.56
1420	10,800	1227	1236.62	1234.15	1238.09	0.002797	9.76	1131.69	151.59	0.59
1347.*	10,800	1226.5	1236.07	1233.95	1237.84	0.003308	10.7	1029.61	130.45	0.64
1274	10,800	1226	1233.93	1233.93	1237.32	0.00837	14.79	739.98	112.27	0.99
1234.5*	10,800	1226	1232.91	1233.55	1236.88	0.01199	15.99	677.7	117.51	1.16
1195	10,800	1226	1232.16	1233.03	1236.34	0.014464	16.41	658.29	123.26	1.25
1125	10,800	1225	1230.39	1231.75	1235.08	0.021911	17.52	643.58	160.82	1.49
1057.*	10,800	1225	1229.8	1230.59	1233	0.018758	14.38	761.04	220.08	1.34
989	10,800	1225	1229.83	1229.83	1231.6	0.010209	10.71	1023.88	293.57	0.99
985	Inl Struct									
978	10,800	1221	1227.82	1226.42	1228.8	0.003617	8.13	1467.71	299.27	0.61
899	10,800	1221	1227.6		1228.43	0.00394	7.31	1479.85	314.3	0.59
762	10,800	1217	1225.48		1227.47	0.00535	11.53	1002.06	161.59	0.76
584	10,800	1215	1224.13	1223.01	1226.43	0.005568	12.19	903.13	127.36	0.78
435	10,800	1215	1222.27	1222.27	1225.3	0.009208	14.05	815.06	150.52	0.97
222	10,800	1212.82	1220.86	1219.17	1222.23	0.003961	9.41	1171.56	193.93	0.64
0	10,800	1208	1217.43	1217.43	1220.77	0.008916	14.73	761.16	120.64	0.97

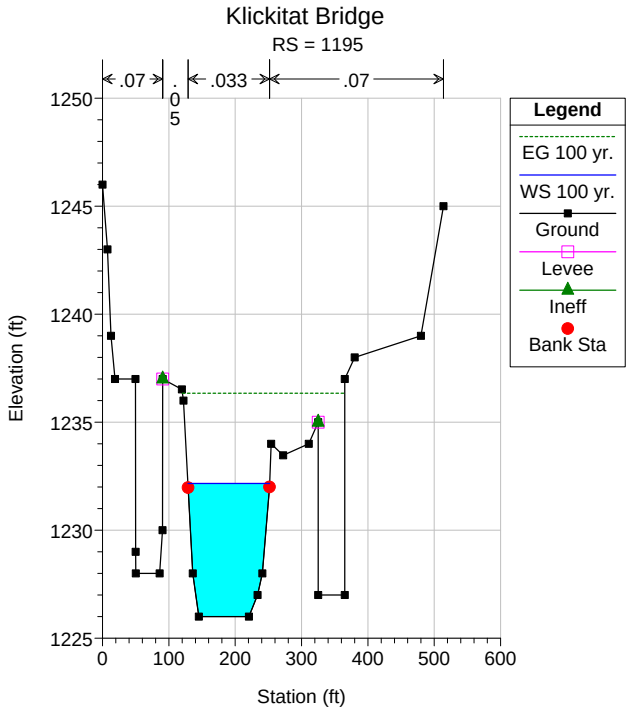
Appendix D-4

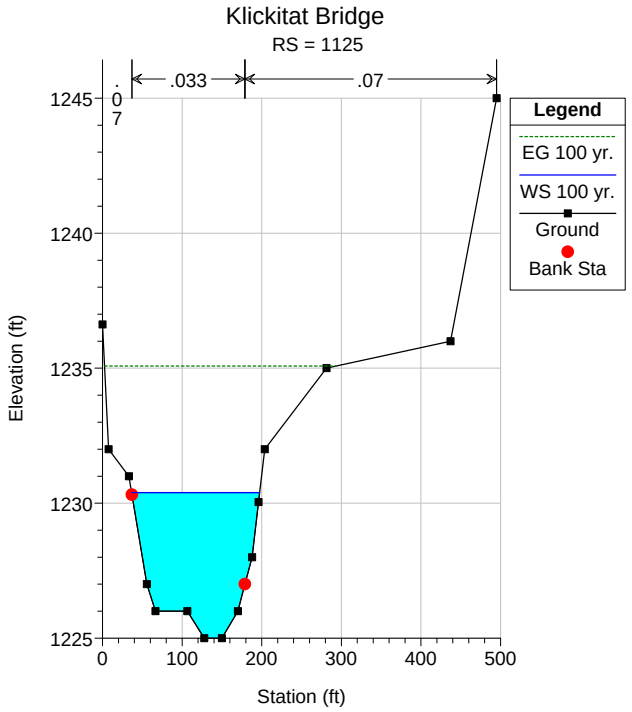
CROSS SECTION
100-YEAR WATER SURFACE ELEVATIONS

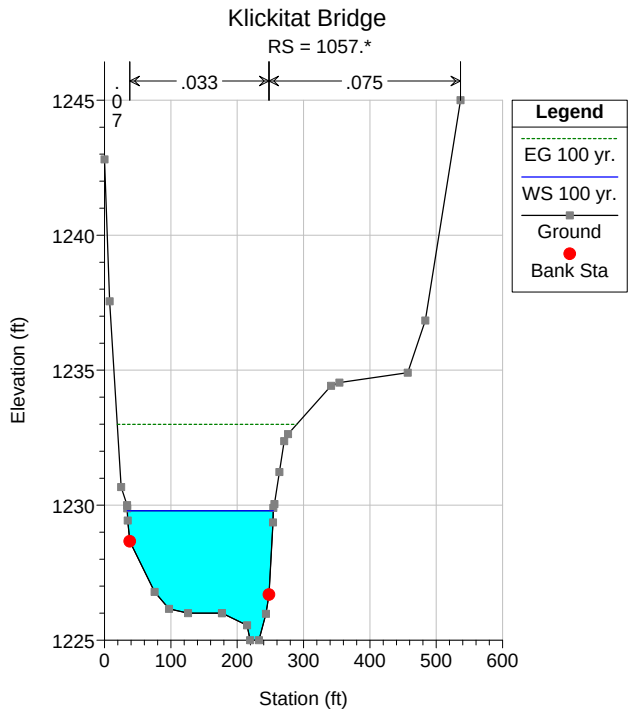

Klickitat Bridge
RS = 2711
.07
.035
.07
.1
Legend
EG 100 yr.
WS 100 yr.
Ground
Bank Sta
Elevation (ft)
Station (ft)
Klickitat Bridge
RS = 2522
.07
.035
.09
Legend
EG 100 yr.
WS 100 yr.
Ground
Bank Sta
Elevation (ft)
Station (ft)
Klickitat Bridge
RS = 2384
.07
.035
.09
Legend
EG 100 yr.
WS 100 yr.
Ground
Bank Sta
Elevation (ft)
Station (ft)
Klickitat Bridge
RS = 2245
.07
.035
.08
Legend
EG 100 yr.
WS 100 yr.
Ground
Bank Sta
Elevation (ft)
Station (ft)
Klickitat Bridge
RS = 2105
.07
.035
.08
Legend
EG 100 yr.
WS 100 yr.
Ground
Bank Sta
Elevation (ft)
Station (ft)
Klickitat Bridge
RS = 1904
.07
.05
.07
.035
.07
Legend
EG 100 yr.
WS 100 yr.
Ground
Bank Sta
Elevation (ft)
Station (ft)

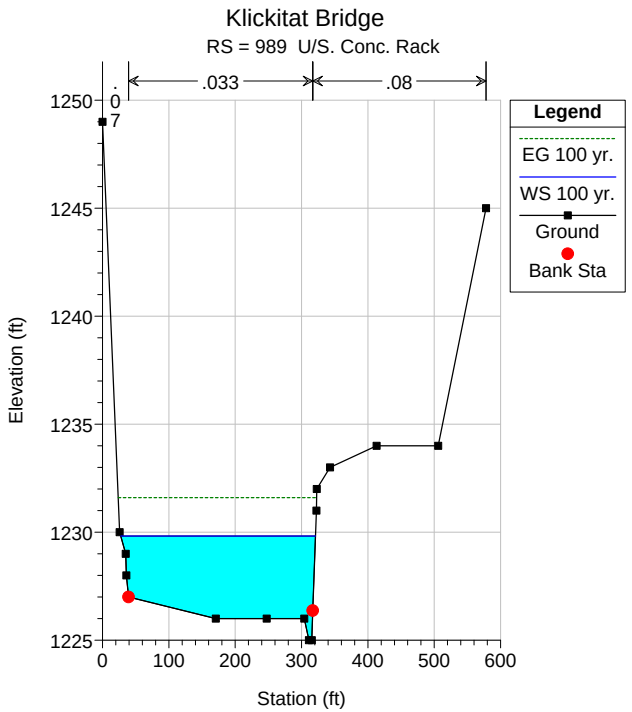

Klickitat Bridge
RS = 1693
.07
.05
.07
.036
.07
Legend
EG 100 yr.
WS 100 yr.
Ground
Bank Sta
Elevation (ft)
Station (ft)
Klickitat Bridge
RS = 1524 Exist. Suspension Bridge
.07
.05
.033
.07
Legend
EG 100 yr.
WS 100 yr.
Ground
Bank Sta
Elevation (ft)
Station (ft)
Klickitat Bridge
RS = 1472.*
.07
.05
.033
.07
Legend
EG 100 yr.
WS 100 yr.
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Klickitat Bridge
RS = 1420
.07
.05
.033
.07
Legend
EG 100 yr.
WS 100 yr.
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Klickitat Bridge
RS = 1347.*
.07
.05
.033
.07
Legend
EG 100 yr.
WS 100 yr.
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Klickitat Bridge
RS = 1274
.07
.05
.033
.07
Legend
EG 100 yr.
WS 100 yr.
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)

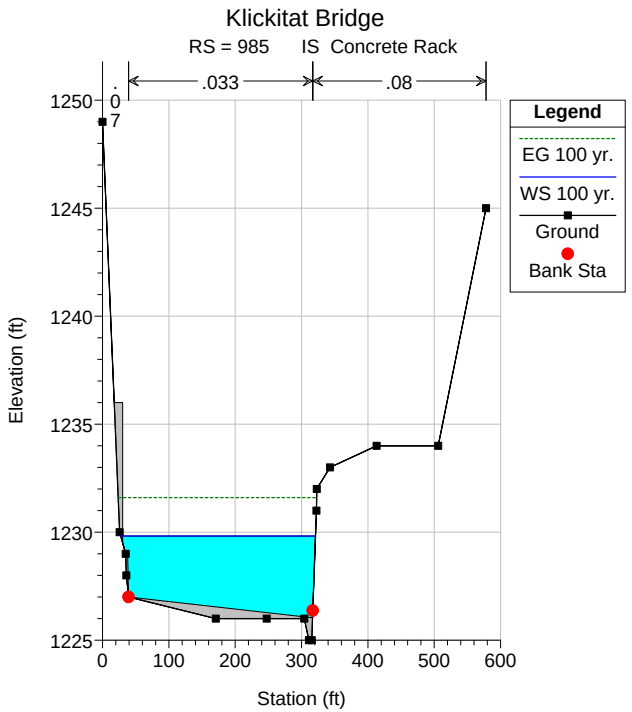

Klickitat Bridge
RS = 1234.5*
.07
.05
.033
.07
Legend
EG 100 yr.
WS 100 yr.
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)

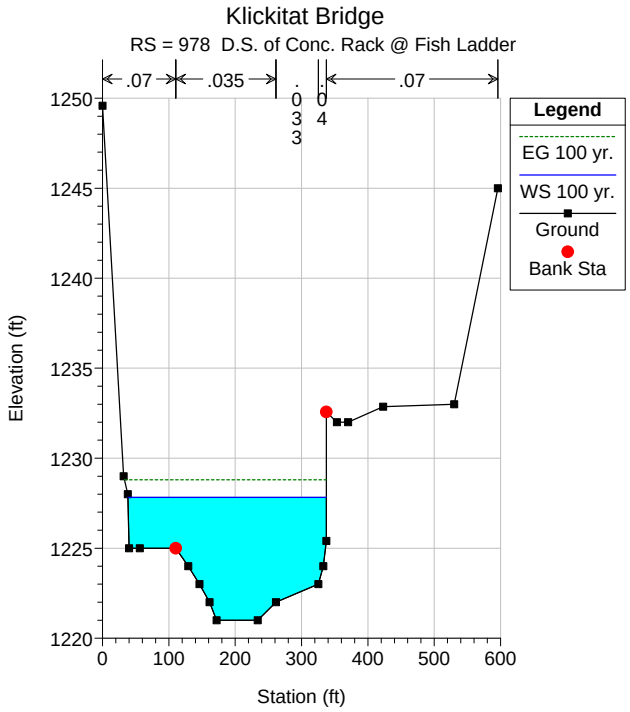

Klickitat Bridge
RS = 1195
.07
.05
.033
.07
Legend
EG 100 yr.
WS 100 yr.
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)

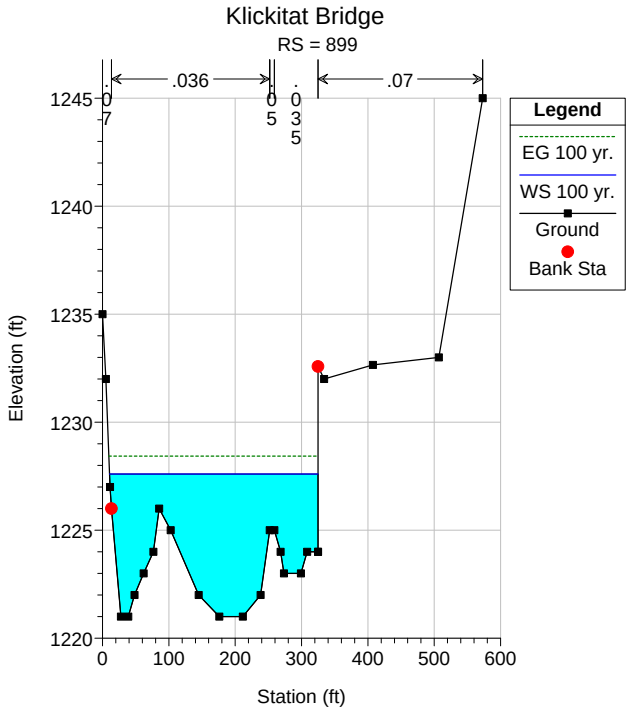

Klickitat Bridge
RS = 1125
.07
.033
.07
Legend
EG 100 yr.
WS 100 yr.
Ground
Bank Sta
Elevation (ft)
Station (ft)

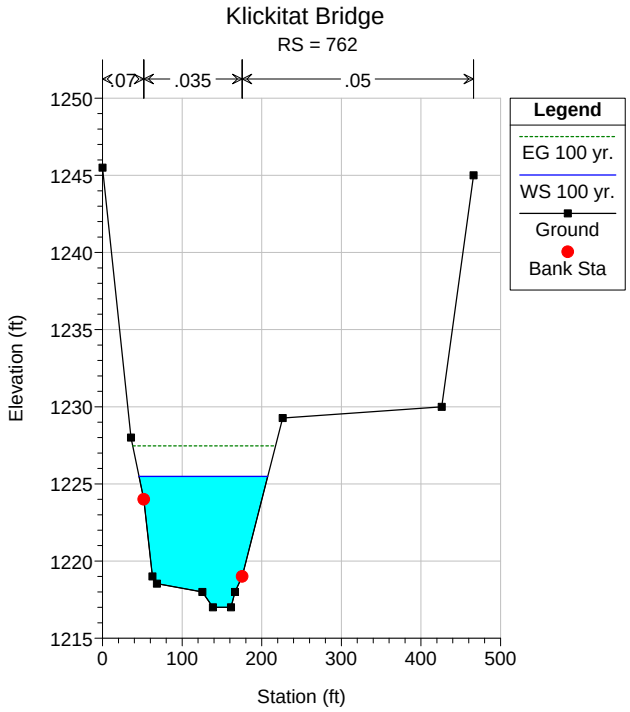

Klickitat Bridge
RS = 1057.*
.07
.033
.075
Legend
EG 100 yr.
WS 100 yr.
Ground
Bank Sta
Elevation (ft)
Station (ft)

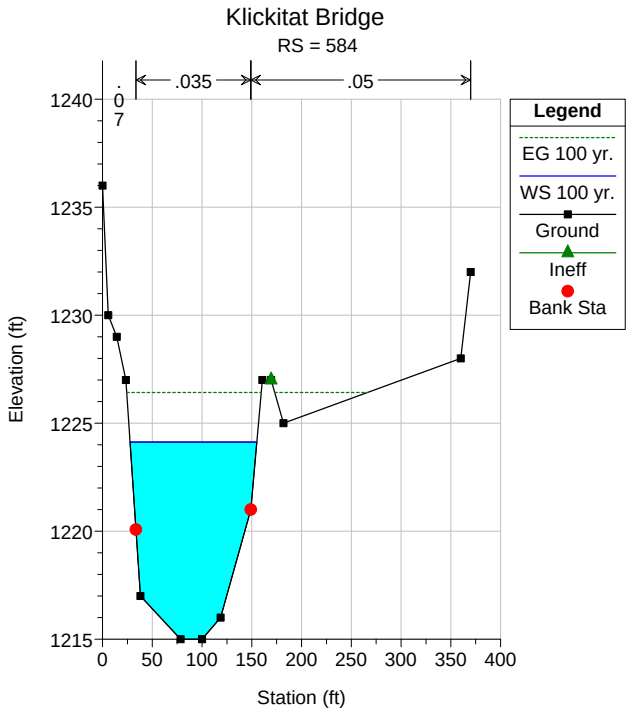

Klickitat Bridge
RS = 989 U/S. Conc. Rack
.07
.033
.08
Legend
EG 100 yr.
WS 100 yr.
Ground
Bank Sta
Elevation (ft)
Station (ft)

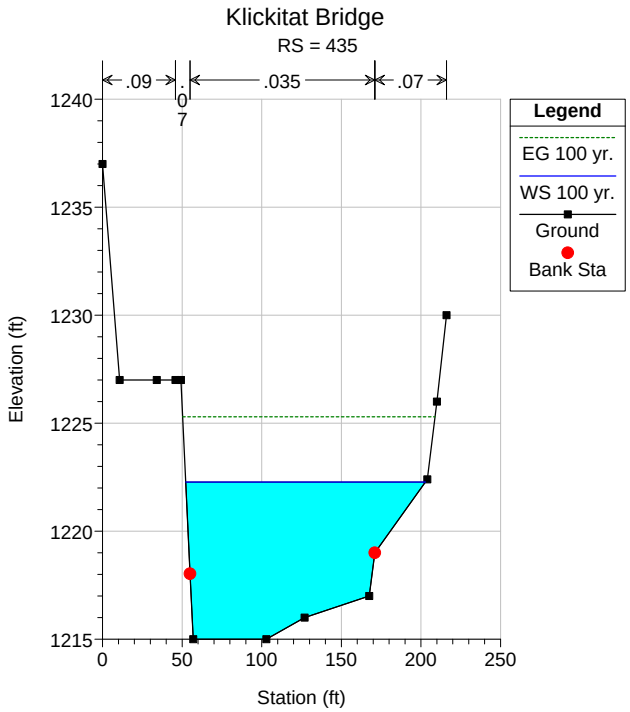

Klickitat Bridge
RS = 985 IS Concrete Rack
.07
.033
.08
Legend
EG 100 yr.
WS 100 yr.
Ground
Bank Sta
Elevation (ft)
Station (ft)

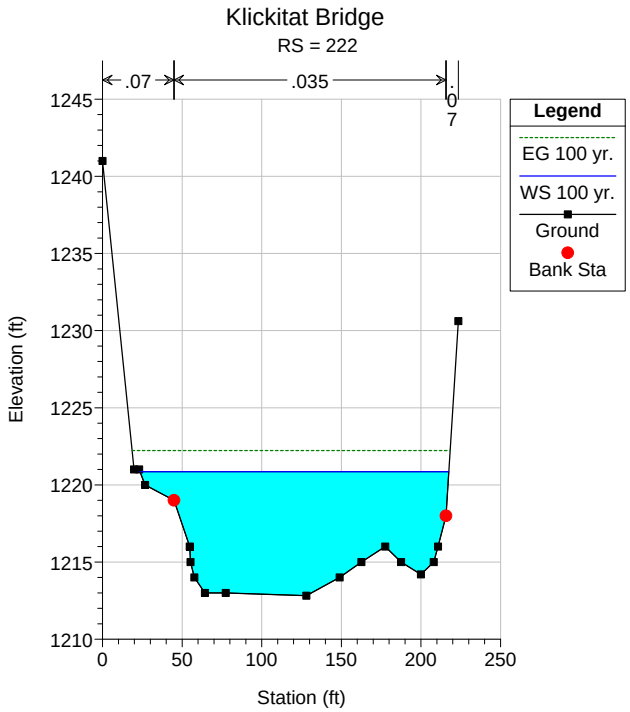

Klickitat Bridge
RS = 978 D.S. of Conc. Rack @ Fish Ladder
.07
.035
.033
.04
.07
Legend
EG 100 yr.
WS 100 yr.
Ground
Bank Sta
Elevation (ft)
Station (ft)

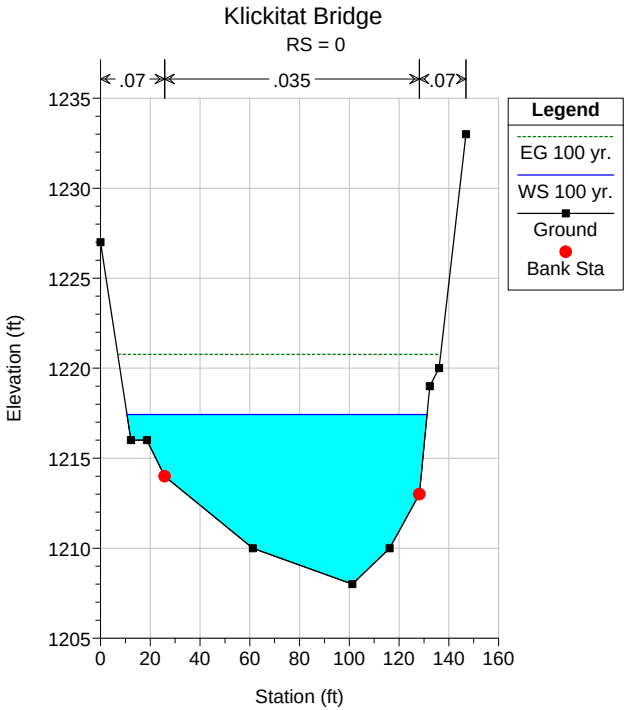

Klickitat Bridge
RS = 899
.07
.036
.05
.035
.07
Legend
EG 100 yr.
WS 100 yr.
Ground
Bank Sta
Elevation (ft)
Station (ft)


Klickitat Bridge
RS = 762
.07
.035
.05
Legend
EG 100 yr.
WS 100 yr.
Ground
Bank Sta
Elevation (ft)
Station (ft)


Klickitat Bridge
RS = 584
.07
.035
.05
Legend
EG 100 yr.
WS 100 yr.
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


Klickitat Bridge
RS = 435
.09
.07
.035
.07
Legend
EG 100 yr.
WS 100 yr.
Ground
Bank Sta
Elevation (ft)
Station (ft)


Klickitat Bridge
RS = 222
.07
.035
.07
Legend
EG 100 yr.
WS 100 yr.
Ground
Bank Sta
Elevation (ft)
Station (ft)


Klickitat Bridge
RS = 0
.07
.035
.07
Legend
EG 100 yr.
WS 100 yr.
Ground
Bank Sta
Elevation (ft)
Station (ft)
1235
1230
1225
1220
1215
1210
1205
0
20
40
60
80
100
120
140
160

GEOTECHNICAL REPORT
Klickitat Fish Hatchery Bridge Project
Yakama tribe
Glenwood, Washington

PROJECT NO. 08-119
March 2009

Prepared for:
Harbor Consulting Engineers

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March 30, 2009
Project No. 08-119

GEOTECHNICAL REPORT
KLICKITAT FISH HATCHERY BRIDGE PROJECT
GLENWOOD, WASHINGTON

PROJECT DESCRIPTION

Yakama Nation plans to construct a new bridge across the Klickitat River at the Klickitat Fish Hatchery to provide direct vehicular access to components of the hatchery that are located on both sides of the river. The major components of the hatchery site are located on the right (south) bank of the Klickitat River, near the northern margin of Klickitat County, approximately 4 miles east of town of Glendale (Figure 1). Presently, access from the hatchery to fish rearing ponds on the left (north) side of the river is by means of a suspended foot bridge. The new bridge is planned as one-lane structure, approximately 162 feet long, which will provide direct vehicular access to the rearing ponds and other components of the hatchery.

SITE DESCRIPTION

The hatchery is located in the northern portion of Klickitat County, in the NE¼ of Section 4, Township 6N, Range 13E. The valley of the Klickitat River forms a narrow canyon incised into the relative level topography of Camas Prairie. The river flows toward the northeast in the reach where the new bridge is to be constructed, although the general trend of the valley is toward the southeast.

The valley side above the right bank of the river is very steep and the river is incised roughly 500 to 600 feet below the south rim of the valley (Figure 1). Above the left bank to the northeast of the river, moderately sloped, rolling hills rise up to the Simcoe Mountains. Average stream gradient in the vicinity of the hatchery is on the order of 1 to 2 percent.

The area immediately adjacent to the river consists of low gradient terraces along a cobbly river bed (Figure 2). The hatchery is situated on a northward projecting point on the right bank of the river that contains two terraces. The upper terrace, on which the main hatchery buildings are located, is at approximate elevation 1,264, while the lower terrace, with Rearing Pond 24 and other facilities, is at El. +1,240. The lower terrace is approximately 8 to 10 feet above the summer flow of the river.

On the left bank of the river is a sloped terrace roughly 100 to 150 feet wide, on which Rearing Pond 25 is situated. At present, the upper surface of the terrace around the pond is at approximately the same elevation above the river level as the lower right bank terrace; however, the geomorphology of the site suggests that fill was placed on a lower level terrace during construction of the pond, raising the surface grade to the present elevation. The original terrace grade appears to be roughly two to three feet above the summer river level. Including the terraces, the river floodplain at the fish hatchery site varies from 500 to 1,000 feet wide. Downstream of the hatchery, the valley floor is often little wider than the river, with steep valley walls falling straight down to the river banks.

The proposed site of the new bridge is approximately 100 feet downstream of the existing foot bridge. The right bank abutment area is located on the lower terrace, near the river water intake structure (Figure 2, Plate 1a). The left bank abutment is located in the area of Rearing Pond 25, roughly one third of the way from the south end of the pond.

The river banks through the hatchery reach are armored with large (3 to 5 foot) boulders, both imported and locally derived (Plate 1b). A concrete sill check dam spans the river about 400 feet downstream of the bridge site. The river bed is over 100 feet across in this reach, and consists mainly of cobbles, interspersed with occasional large boulders. The river bed contains several gravel and cobble bars that form islands during low water periods.

GEOLOGY

The project site is located along the southern margin of the Simcoe Mountains, an east-west trending structural anticline on the west side of the Colombia River Basalt (CRB) province. The project area is on the western edge of the CRB province known as the Yakima Fold Belt, a zone of broad anticlines and synclines that encompasses most of the western portion of the CRB.

The materials in the project area consist generally of basalt and andesite bedrock from Mount Adams on the right side of the river valley, and volcanic rocks from the Simcoe Mountains volcanic field on the left bank. The glacial advances of the Pleistocene did not reach this area; however, large volumes of runoff from the glacial cap on Mount Adams carried large amounts of coarse, bouldery sediment into the Klickitat valley. The important geologic units in the project area are described below.

Older Alluvium: Hildreth and Fierstein (1995) have mapped a unit of older alluvium on a point bend in the Klickitat River upstream of the project site, which is similar in morphology to the hatchery site. The older alluvium includes unconsolidated, river transported cobbles and boulders, including exotic lithologies, with sand, gravel and fines. The older alluvial deposits may be attributed to the temporary impoundment of the river by intracanyon flows. As indicated by the exotic lithologies, it seems likely that some of these deposits are glacial outwash materials. Other authors did not map alluvial materials separately; however, Bentley, et al (1980) describes the presence of glaciofluvial deposits in the Klickitat valley.

Landslide Debris: Bentley, et al (1980) have mapped the left bank of the river in the project area as being underlain by a large landslide which covers the entire left bank slope from a point some 10,000 feet upstream of the hatchery to a point roughly 7,000 feet downstream and extends upslope as much as 6,500 feet. They describe the landslide deposits as comprised of unstratified and unsorted material derived from both slumps and debris flows. They do not describe the Klickitat River slide in any detail.

Camas Prairie Basalt: Bentley, et al (1980) have mapped the right bank of the Klickitat valley as underlain by basalt and andesite of Mount Adams. They describe this unit as generally gray, with olivine or plagioclast phenocrysts. Korosec (1987) calls the basalt in the project area the Camas Prairie Basalt, which he describes as a medium to dark gray, intracanyon olivine basalt flows, blocky jointed, with breccia along the base and vesicular tops, up to 120 meters thick. Korosec maps the Camas Prairie Basalt as extending onto the left bank also, and indicates that these flows came from the area of Kings Mountain, west of Glenwood. Hildreth and Fierstein (1995) conducted even more detailed mapping of the Mount Adams volcanic units. Their map stops just to the west of the project site, but the reach of the Klickitat River upstream of the site is shown as underlain by a unit they call the Basalt of Outlet Falls which is described as a low potassium, olivine basalt that underlies Camas Prairie. The unit consists of thin, 1 to 5 meter thick flows, deposited to a thickness of up to 160 meters along the valley walls.

Simcoe Mountain Basalt: Except where the Camas Prairie basalt laps up onto the left bank of the valley, or the mapped landslide deposit obscures the underlying strata, the left bank is comprised of rocks of the Simcoe Mountains. Korosec (1087) describes these flows as gray to black, fine grained, aphanitic, slightly porphyritic, olivine basalt flows and flow breccias. Bentley, et al (1980) suggests that the basalts may range in age from 4.5 million to 900,000 years old.

FIELD EXPLORATIONS

Three borings were drilled at the proposed alignment of the bridge, including two borings on the right bank and one on the left bank (Figure 2). The right bank borings were drilled October 6 and 7, 2008, with a truck mounted, Mobile B-50 drill rig (Plate 2a). Due to inclement weather, the truck mounted equipment could not access the left bank boring and a track mounted CME 850 was mobilized for the left bank exploration on October 8 and 9, 2008 (Plate 2b). All drilling equipment was provided by Boart / Longyear of Tualatin, Oregon. An engineering geologist of PanGEO was on site to direct drilling activities, collect drive samples and core, and log the test borings.

The soils encountered in the explorations were sampled using conventional Standard Penetration Test (SPT) split spoon samplers in the finer grained alluvial soils. The first 6 feet of drilling at BH-1 was accomplished using a hollow stem auger. Otherwise, all drilling was conducted using triple tube, wireline, diamond rotary coring, using water as the drilling medium. The borings, designated BH-1 through BH-3, were advanced to depths of 50 feet (both right bank borings) and 65 feet (BH-3 on the left bank). The borings on the right bank are believed to have penetrated bedrock in the form of basalt and volcanic breccia /conglomerate. Appendix A contains summary logs of boreholes and describes the field exploration methodology in greater detail.

LABORATORY TESTING

The site soils encountered in the test borings consist mainly of coarse materials, in particular basalt gravel, cobbles and boulders. Laboratory testing was deemed inappropriate for the soil samples recovered from the borings as the results would not be representative of the full range of particle sizes in the alluvial deposits.

SUBSURFACE CONDITIONS

SOILS

The site soils, as encountered in the test borings, consist of fill overlying native alluvial materials, glacial outwash material and/or bedrock. Fill soils were encountered on the right bank in the top 6 feet. We understand that the right bank location was formerly the site of a rearing pond, which was backfilled with sandy alluvium. Bouldery material, interpreted as glacial outwash, was found below the fill. The left bank material consisted of gravelly fill, underlain by gravelly and cobbly alluvium. The subsurface conditions at the bridge site are illustrated in subsurface profile developed for the site (Figure 3).

Fill: Test boring BH-1, on the right bank, encountered 6 feet of fill consisting of medium dense, brown, sandy silt with gravel. The fill was non-plastic and contained fine to coarse, angular sand. On the left bank, it appears that fill was brought in to raise the river bank for the construction of the rearing ponds. Boring BH-3 on the left bank encountered about 8 feet of fill consisting of medium dense, dark gray, sandy gravel with cobbles. The clasts were rounded, and blocky to prismatic in shape.

Holocene Gravel: On the left bank, alluvium consisting of very dense, dark gray, sandy gravel with cobbles was encountered below the fill and extended to at least the bottom of test boring BH-3 which was terminated at a depth of 65 feet. The sand fraction of the alluvium was fine to coarse grained and angular, while the gravel with the alluvium was rounded to subrounded, mainly gray and red, aphanitic, vesicular basalt and andesite (see Plate 3a). Some boulders were encountered in the alluvium, but the extent of the boulders appeared to be less than on the right bank.

Glacial Outwash Gravels: On the right bank, glacial outwash gravel was encountered in BH-1 below the fill and in BH-2 from the surface to a depth of approximately 29 feet in BH-1 and 31 feet in BH-2. The outwash consisted of very dense, dark gray gravel, cobbles and boulders in an angular sand matrix. Some core runs recovered traces of silt / clay matrix. The coarse clastic material consisted of reddish or dark gray aphanitic, vesicular basalt to porphyritic basalt or andesite and occasional granitic clasts were observed.

Volcanic Bedrock: Bedrock, consisting of dark gray, moderately weathered and moderately weak (R2) volcanic breccia to conglomerate, was encountered underlying the glacial outwash on the right bank at a depth of about 30 feet. The bedrock included clasts ranging from angular to rounded, gravel to boulders, mainly basalt and andesite, including aphanitic and vesicular to porphyritic. Some boulders graded from vesicular at the top to holocrystalline at the bottom. Most of the matrix washed away leaving only clean gravel in the recovered core, but occasionally

well preserved sections of conglomerate were recovered (Plate 3b). Calcite veins were observed cutting through large clasts. Some of the material penetrated could be thin flow units.

GROUND WATER

We anticipate that groundwater levels at the proposed abutments will be controlled by the surface elevation of the river and that water levels at the abutments will be at or slightly above the river level. We were unable to reliably observe groundwater levels in the borings because the drilling was conducted using rotary techniques and drilling fluid. In boring BH-3 on the left bank, the drilling fluid was lost at a depth of approximately 6 feet indicating that the gravels were relatively open without matrix material. Groundwater levels are expected to fluctuate with seasonal flow changes in the river.

CONCLUSIONS AND RECOMMENDATIONS

SITE SEISMICITY

The bridge sites are located along the eastern margin of the Cascade Range where it joins with the Columbia Plateau Basalt province. This area is not as seismically active as is the area west of the Cascades, but does experience minor seismic activity. The site is situated south of the Simcoe Mountains a roughly east-west trending fold separating the Yakima Valley from the Columbia River Gorge. Other folds related to the Simcoe Mountains include the Toppenish Ridge and Horse Heaven Hills. These structures are the westernmost expression of the Yakima Fold Belt. Seismicity in the area tends to be generally shallow and associated with thrust faults along the north limbs of the anticlinal structures.

The closest fault to the project site is the Horse Heaven Hills structure, one strand of which passes approximately 3.9 miles to the south of the hatchery (Personius and Lidke, 2003a). This fault, however, is not known to be active. The closest mapped active fault is the Toppenish Ridge structures, located roughly 10 miles north of the hatchery (Lidke and Bucknam, 2002). The section of this fault known to be active is called the Mill Creek fault and this strand is situated northeast of the project site south of Toppenish. In addition, a northwest trending, unnamed, right lateral strike slip fault is located about 8 miles to the southwest of the project site (Personius and Lidke, 2003b). This fault is one of a group of similar faults in the area around The Dalles. This fault, however, is not known to be active.

SEISMIC DESIGN PARAMETERS

For seismic design, an acceleration coefficient of 0.15g is recommended per the current acceleration map in AASHTO (2007/2008). The recommended acceleration coefficient is based on expected ground motion at the project site that has a 7 percent probability of exceedance in a 75-year period for non-critical structures.

Design response spectra presented in AASHTO (2007/2008) are considered appropriate for seismic design of the bridge. A horizontal response spectral acceleration coefficient at a period

of 0.2 seconds (S_S) is 0.35 and the horizontal response spectral acceleration coefficient at a period of 1.0 seconds (S_1) is 0.13.

The soils at the site are considered Site Class B due to the shallow bedrock, with associated site factors F_{pga}, F_a and F_v all equal to 1.00. The site is therefore in Seismic Performance Zone 1.

LIQUEFACTION POTENTIAL

Liquefaction is not expected to develop at the site under the design earthquake conditions due to the very dense nature of the gravel and cobbles in the alluvial valley deposits and the relatively low peak ground acceleration of the design event. Therefore, no special design considerations are recommended relative to the potential occurrence of liquefaction.

APPROACH FILLS

This section provides geotechnical engineering recommendations for design and construction of the approach fills for the new bridges. Approach embankments for the new bridge will be required on the left bank, where a portion of the existing fish rearing pond will be filled. Approach fills on the right bank is anticipated to be minimal, and may mainly consist of fills as needed to construct the road across a gentle slope.

The new fills should consist of good quality granular material and compacted to the requirements of Section 2-03 of the *2008 WSDOT Standard Specifications for Road, Bridge and Municipal Construction*. New footprint areas to be covered by the fills should stripped of organic debris such as wood and brush. Any soft or loose overbank materials should be stripped from the fill area to expose dense gravel material. New embankment materials should consist of Select or Gravel Borrow in accordance with Section 9-03 of the *Standard Specifications*. Common Borrow materials may also be used to construct the new embankments, but it should be noted that Common Borrow is not considered an all-weather construction material, and may be difficult to place and compact during periods of inclement weather.

We recommend that the embankment fill be sloped no steeper than 1¾H:1V, if constructed using Gravel Borrow. If Select or Common Borrow is used, the slope should not be steeper than 2H:1V.

Global Stability of New Approach Fills

Given the granular nature of the foundation soils, embankment fill sloped at 1¾H:1V (2H:1V for Select or Common Borrow) will have adequate factor of safety (>1.5) against global instability.

Settlement of New Approach Fills

Provided the construction and material requirements recommended above are met, any embankment settlement of will occur rapidly as fills are placed, and fine grading can be completed without a waiting period. Post-construction settlement in the approach fills should be less than one inch. Therefore, it is our opinion that approach slabs will not be required to

mitigate potential settlement of the approach embankment foundations. However, poor compaction of the abutment backfill can also cause a bump at the end of the bridge. Care should be taken to properly place and compact abutment backfill to mitigate the potential for settlement within the backfill.

LATERAL EARTH PRESSURES ON ABUTMENT WALLS

If a joint is provided at the abutment so that the abutment wall is free to deflect slightly, active pressures can be used in design. An equivalent fluid pressure of 35 pounds per cubic foot (pcf) may be used to calculate lateral earth pressures on the abutments. This equivalent fluid pressure does not include live load surcharge. A lateral earth pressure coefficient, K_A, of 0.3 may be used to calculate the lateral load due to surcharge.

If abutment walls are fixed against lateral deflection, at-rest pressures will be appropriate for design. An equivalent, at-rest fluid pressure of 45 pcf may be used to calculate at-rest passive earth pressures on the abutments. This equivalent fluid pressure does not include live load surcharge. An at-rest lateral earth pressure coefficient, K_O, of 0.4 may be used to calculate the lateral load due to surcharge.

BRIDGE APPROACH SLABS

Due to the relatively small amount of additional fill to be placed and the low potential for long-term settlement at the site, approach slabs are not considered an essential addition to this bridge.

BRIDGE FOUNDATION RECOMMENDATIONS

Bridge Foundation Alternatives

From a geotechnical perspective, spread footings are considered suitable for support of the abutments at the bridge site. Spread footings also represent the lowest overall cost and lowest constructability risk as compared to other abutment support options. However, a certain level of scour risk would be present in the event of very high river flows. The river in the reach where the new bridge is to be constructed is well trained and not actively working to alter its channel. The banks are also relatively well armored with large material. Hence, the risk of scour may be low.

Of the driven pile options available, only steel H-piles with tip protection are considered feasible, but the potential for pile damage is high. A percentage of piles should be expected to experience damage during driving to the extent that they are structurally compromised. Pipe sections are not recommended.

Drilled shafts and other drilled foundation elements such as micropiles are likely to be considerably more costly then either spread footings or driven H-piles.

Design recommendations are provided below for spread footings, driven H-piles, and micropiles.

Spread Footings

Spread footings should bear at or below El. +1226 on the left bank and El. +1234 on the right bank. For footings bearing at or below these elevations, the charts in Figure 4 may be used to determine Service and Strength Limit state bearing resistances for spread footings as a function of least effective footing dimension, B'. The resistance factors in Table 1 should be used in conjunction with Figure 4, LRFD Design – Spread Footing Nominal Bearing Resistance to evaluate all applicable limit states.

Table 1
Recommended Spread Footing Resistance Factors (LRFD)

Limit State	Resistance Factors, φ Spread footings
Service	1.0
Strength	0.45
Extreme	1.0
Sliding	0.8[(1)]

[(1)]Assumes concrete cast against ground.

Soil-Structure Interaction Parameters for Spread Footings

The values presented in Table 2 for dynamic shear modulus (G) and Poisson's Ratio (ν) (needed for static and dynamic design) are recommended for the material below the footing level.

Table 2
Recommended Spread Footing Spring Constants

G (0.02%)	**G (0.2%)**	**ν**
2500 ksf	750 ksf	0.30

This range of values for the dynamic shear modulus (G) is for strain magnitudes between 0.02% and 0.2%; hence, a linear relationship should be assumed over the given range.

Driven Pile Foundations

Either 12- or 14-inch H-piles may be designed using a nominal ultimate axial resistance of 420 and 600 kips, respectively. Due to the potential for damage during driving, we recommend selecting a relatively heavy pile section and having allowance for up to half of the piles to be structurally compromised due to damage. For either of the above pile sections the estimated tip elevation is +1220 feet on the left bank and +1225 on the right bank. Over driving up to 200 kips may be required to achieve the minimum pile penetration of 10 feet as required by Article 6-

05.3(11)D of the WSDOT Standard Specifications (2008). This overdriving estimate should be indicated in the contract. Pile tip protection is recommended.

Provided the piles are driven to bearing as determined by the dynamic formula in Article 6-05.3(12) of the WSDOT Standard Specifications, the LRFD strength limit state resistance factor is 0.55. Settlement under service limit state loads is expected to be negligible, therefore a separate service limit state deflection check is not required. The LRFD resistance factor at the extreme limit state is 1.0.

Lateral Pile Resistance

Recommended parameters for analysis of lateral pile resistance using the program LPILE or COM 624 are presented in Tables 3 and 4 for the left and right bank abutments, respectively. Note that the soil layers are referenced to the existing ground surface and do not take into consideration the depth of the pile cap or any free standing pile length.

Table 3
Recommended p-y Curve Parameters: Left Bank Abutment (Boring BH-3)

Ground Surface or Reference Elevation: +1236 feet[1]									
Layer	**Soil Type**	**Layer Thickness (ft)**	**Bottom of Layer Elevation (ft)**	**Effective Unit Weight (pcf)**	**Friction Angle ϕ (deg)**	**ε_{50} (%)**	**Liquefiable ?**	**Soil Cohesion (psf)**	**Modulus of Subgrade Reaction (pci)**
1	Sand	6	+1230	125	32	0.7	No	0	75
2	Sand	4	+1226	67	34	0.7	No	0	70
3	Sand	34	+1190	63	45	0.7	No	0	220

[1] – Adjust thickness / elevation of the top of first layer according to the elevation of the bottom of pile cap.

Table 4
Recommended p-y Curve Parameters: Right Bank Abutment (Boring BH-2)

Ground Surface or Reference Elevation: +1240 feet[1]									
Layer	**Soil Type**	**Layer Thickness (ft)**	**Bottom of Layer Elevation (ft)**	**Effective Unit Weight (pcf)**	**Friction Angle ϕ (deg)**	**ε_{50} (%)**	**Liquefiable ?**	**Soil Cohesion (psf)**	**Modulus of Subgrade Reaction (pci)**
1	Sand	10	+1230	125	42	0.7	No	0	305
3	Sand	40	+1190	63	45	0.7	No	0	220

[1] – Adjust thickness / elevation of the top of first layer according to the elevation of the bottom of pile cap.

Pile Group Reduction Factors

For the proposed pile groups consisting of a single row of piles, the group reduction factors for lateral analysis presented in Table 5 should be used. The factors account for pile interaction effects due to proximity and are a function of pile spacing based on pile diameter, D, and the direction of loading. Group effects for axial loads will not be significant so long as piles are spaced at least 2.5D. These factors are consistent with those presented in the WSDOT Bridge Design Manual, as revised July, 2000.

Table 5
Recommended Group Reduction Factors for Lateral Analysis

Pile Spacing[(1)]	Reduction Factor for Load Applied Parallel to Pier Cap	Reduction Factor for Load Applied Perpendicular to Pier Cap
6D	0.9	1.0
5D	0.8	1.0
4D	0.65	0.9
3D	0.5	0.8
2D	0.4	0.6

[(1)] As a function of pile diameter, D.

Micropile Foundations

Considering the relatively light loads of the bridge abutments, micropiles may be a viable foundation support option that may readily drill through boulders and develop ultimate load capacities on the order of 200 kips. Also, when considering the relatively remote conditions of the site, the micropile foundation system, which uses relatively small and mobile equipment for the pile installation and grouting, will provide a foundation system that can be installed relatively quickly with a low risk of foundation failures or construction delays.

The micropiles should be installed by a specialty contractor to meet performance specifications established to meet structural support requirements as well as various geotechnical considerations. These performance specifications would include the nominal (ultimate) required capacity of the micropile, minimum bond length of the pile, minimum cased length, and requirements for test loading to demonstrate the pile can achieve the required ultimate load with an acceptable creep rate. Additionally, the piles will need to be analyzed to safely support the design loads without buckling, which would correspond to conditions where the micropile is exposed beneath the abutment in the event of scour.

Micropiles are typically installed using track mounted air rotary and percussion drills to advance 7.625 inch diameter N80 threaded, segmental casing. The micropile is drilled to the tip elevation selected by the specialty installation contractor that is needed to achieve the required pile capacity. After the designated tip elevation is reached, the contractor installs a threaded central

bar in the pile that is capable of transmitting the required pile load for testing. Depending on loading requirements, such central bars could consist of #18 Grade 75 thread bars. The installation is then tremie backfilled with grout. The casing is then extracted, while placing the grout under pressure, until the casing tip is at the minimum tip elevation required for geotechnical and/or structural considerations. Typically, the casing would extend about 10 feet below the anticipated scour level with the remaining length of the pile providing load transfer between the grout and the adjacent soil.

We recommend that all micropiles be designed for the following:

- Ultimate Resistance: 200 kips
- Strength Resistance Factor: 0.6
- Service Resistance: N/A – expected movement <1”
- Service Resistance Factor: 1.0

The ultimate resistance of the micropiles should be specified as not exceeding 200 kips. Structural resistance factors should be determined in accordance with Table 10.5.5.2.5-2 in AASHTO (2007/2008). All micorpiles should be tested in accordance with the WSDOT GDM (2006), which includes proof tests to 1.67 FDL .

After verification testing has been satisfactorily completed, the contractor would install the remaining production piles. The verification pile, however, if not tested to failure, could be included as a production pile.

We anticipate that the micropile support scheme for the abutment would include drilling a minimum of 4 micropiles for vertical support. Micropiles can also be installed on a batter, if needed to resist lateral loading.

Nominal parameters for preliminary sizing of the micropiles include the following:

Micropile Equipment:	Track mounted air rotary/percussion drill with compression and support truck for casing and grout plant.
Micropile Capacity:	200 kips Nominal (ultimate)
Min. Bond Length:	25 feet (beyond grouted scour depth) Final grouted length to be the responsibility of the micropile specialty contractor to meet performance specification requirements.
Minimum Cased Length:	25’ assuming 15’ of scour and 10’ of casing beyond the scour zone

Drill Casing Steel:	N-80 (80 ksi yield) 7-5/8 inch O.D. 0.5 inch wall thickness
Spring Constant: (Individual Pile)	650 kips per inch – Installed micropile section below base of new foundation

Construction considerations with the use of micropiles include the following:

Unsupported Length – The micropiles may have unsupported lengths corresponding to the assumed depth of scour beneath the abutment.

Casing Size – Micropiles are installed using API N-80 threaded steel casing with typical section lengths of 3 or 5 feet. The most commonly used casing size has an outside diameter of 7.625 inches and a wall thickness of 0.50 inches. While N-80 steel comes in a larger diameter (9.625 inches), it is not commonly used in micropile installations and will increase installation costs. Hence, we recommend basing the design on the commonly used steel casing size (7.925 inch O.D.).

Center Bar – All micropiles should be designed using a #18 center bar for load transference over the full length of the pile.

CONSTRUCTION CONSIDERATIONS

The following items should be considered during the foundation design and development of the contract specifications.

1. Numerous boulders were encountered in the test borings and observed on the native surfaces surrounding the project area. The contract special provisions should alert the contractor to the potential presence of boulders and the possible need to remove boulder obstructions during foundation excavations. Some boulders may be large enough to require breaking before removal. Breaking could include using an impact hoe ram or light blasting for removal.

2. Temporary shoring and/or slopes will be required during construction of the abutment foundations. The design and construction of temporary shoring/slopes should be the responsibility of the contractor. Groundwater inflow should be expected in footing excavations that extend below the level of the water in the river. Dewatering will likely be required for all foundation construction excavations deeper than about 10 feet below present grade at both abutments, depending on the water level in the river. Cofferdams and seals will not be practical to construct in the cobbles and boulders.

3. Hard driving conditions are expected in order to reach minimum penetration at both abutments. Pile tip protection should be required. The Contractor should select a

hammer size capable of driving and proving bearing resistance for up to 800 kips of driving resistance (i.e., 600 kips of required axial geotechnical resistance plus 200 kips of overdriving as defined article 6-05.3(1) in the WSDOT Standard Specifications, 2008).

4. Micropiles will need to be installed using a top drive air rotary drill that is capable of drilling through cobbles and boulders. Because of the potential for open work gravel, full depth casing may be required during drilling (i.e. no open hole drilling).

LIMITATIONS AND UNIFORMITY OF CONDITIONS

PanGEO, Inc. (PanGEO) prepared this report for Harbor Consulting Engineers and the Yakama Nation Department of Public Works. The recommendations contained in this report are based on a site reconnaissance, a subsurface exploration program, review of pertinent subsurface information, and our understanding of the project.

Variations in soil conditions may exist between the locations of the explorations and the actual conditions underlying the site. The nature and extent of soil variations may not be evident until construction occurs. If any soil conditions are encountered at the site that are different from those described in this report, PanGEO should be immediately notified to review the applicability of the recommendations presented herein. Additionally, PanGEO should also be notified to review the applicability of these recommendations if there are any changes in the project scope.

This report has been prepared for planning and design purposes for specific application to the proposed bridge project in accordance with the generally accepted standards of local practice at the time this report was written. No warranty, express or implied, is made.

This report may be used only by the client and for the purposes stated, within a reasonable time from its issuance. Land use, site conditions (both off and on-site), or other factors including advances in our understanding of applied science, may change over time and could materially affect our findings. Therefore, this report should not be relied upon after 36 months from its issuance. PanGEO should be notified if the project is delayed by more than 36 months from the date of this report so that the applicability of the conclusions and recommendations presented herein may be evaluated considering the time lapse.

Within the limitations of scope, schedule and budget, PanGEO engages in the practice of geotechnical engineering and endeavors to perform its services in accordance with generally accepted professional principles and practices at the time this report and/or its contents was prepared. No warranty, express or implied, is made. The scope of PanGEO's work did not include environmental assessments or evaluations regarding the presence or absence of wetlands or hazardous or toxic substances in the soil, surface water or ground water at this site. PanGEO does not practice or consult in the field of safety engineering. PanGEO does not direct the

contractor's operations, and cannot be held responsible for the safety of personnel other than our own on the site; the safety of others is the responsibility of the contractor.

It is the client's responsibility to see that all parties to this project, including the designer, contractor, subcontractors, etc., are made aware of this report in its entirety. The use of information contained in this report for bidding purposes shall be at the contractor's sole option and risk. Any party other than the client who wishes to use this report shall notify PanGEO of such intended use and for permission to copy this report. Based on the intended use of the report, PanGEO may require that additional work be performed and that an updated report be reissued. Noncompliance with any of these requirements will release PanGEO from any liability resulting from the use this report.

CLOSURE

PanGEO is pleased to support the Harbor Consulting design team and the Yakama Nation Public Works Department with geotechnical engineering recommendations. If you have any questions regarding this report, please call (206) 262-0370.

Robert E. Kimmerling, P.E.
Principal Geotechnical Engineer

W. Paul Grant, P.E.
Principal Geotechnical Engineer

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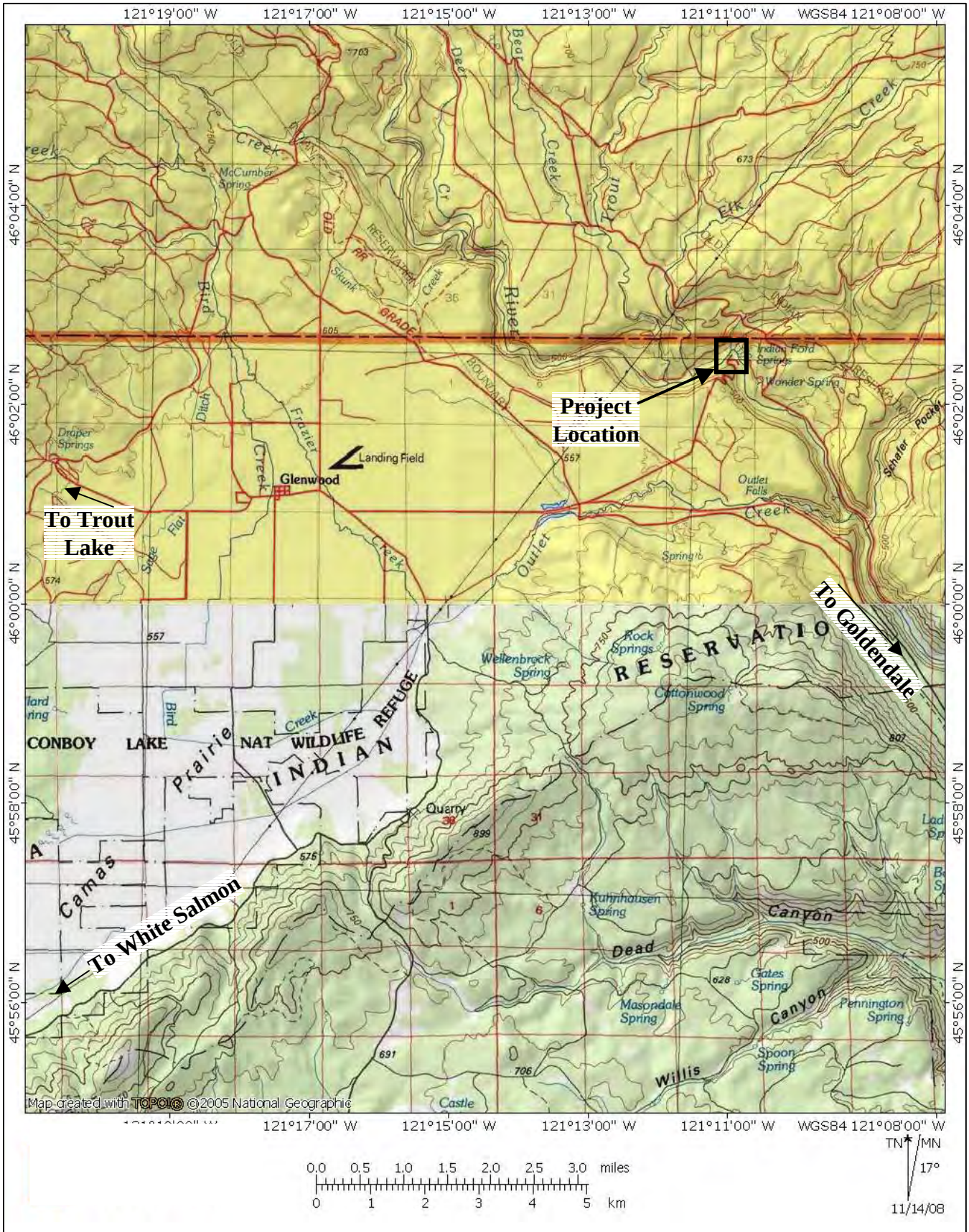
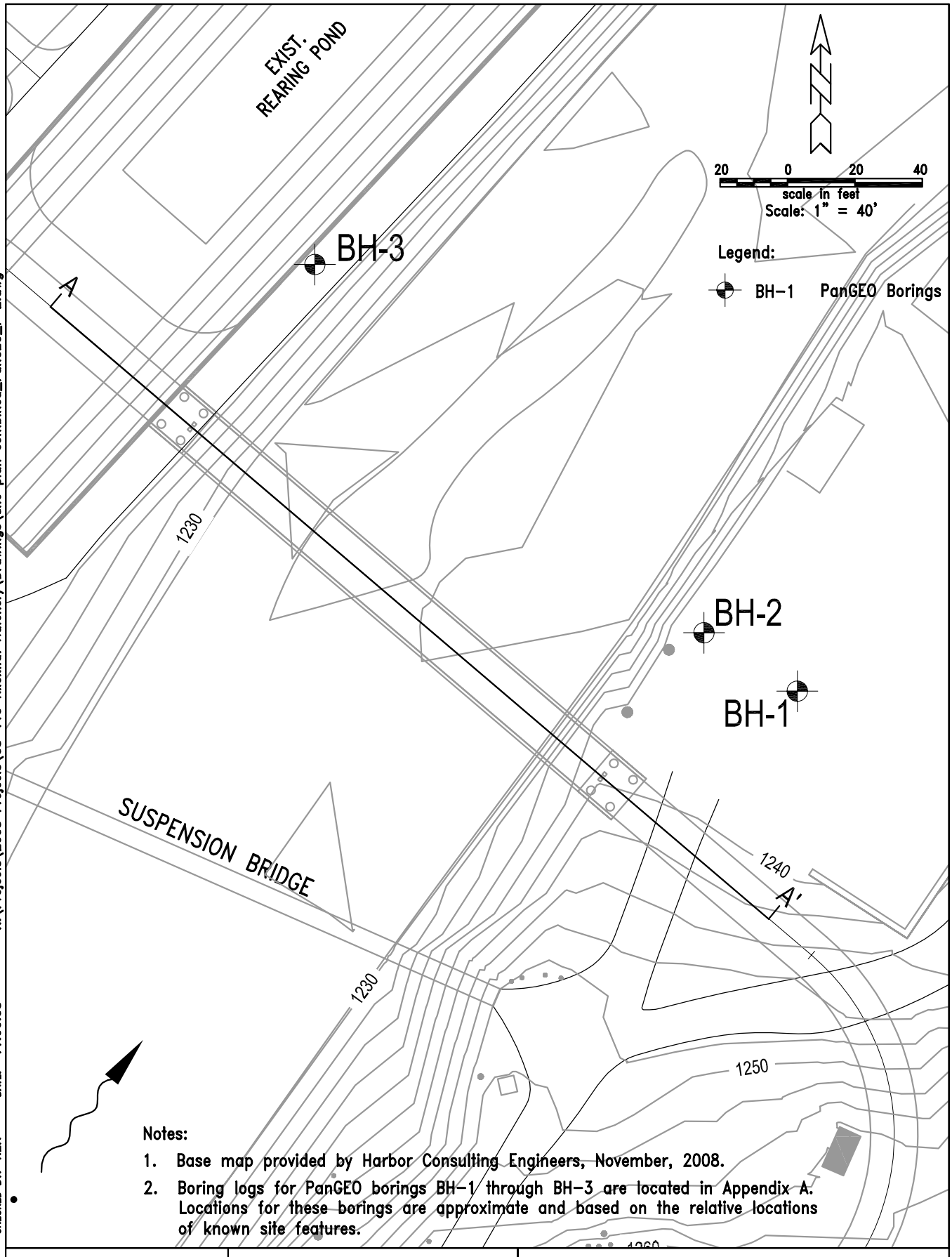
FIGURES



PanGEO INCORPORATED	**Klickitat Hatchery Bridge Project Yakama Tribe Glenwood, Washington**	**VICINITY MAP**
		Project No. 08-119 / Figure No. 1

08-1119_Plate 1.ppt 11/20/2008(10:12 AM) SHE



Notes:

1. Base map provided by Harbor Consulting Engineers, November, 2008.
2. Boring logs for PanGEO borings BH-1 through BH-3 are located in Appendix A. Locations for these borings are approximate and based on the relative locations of known site features.

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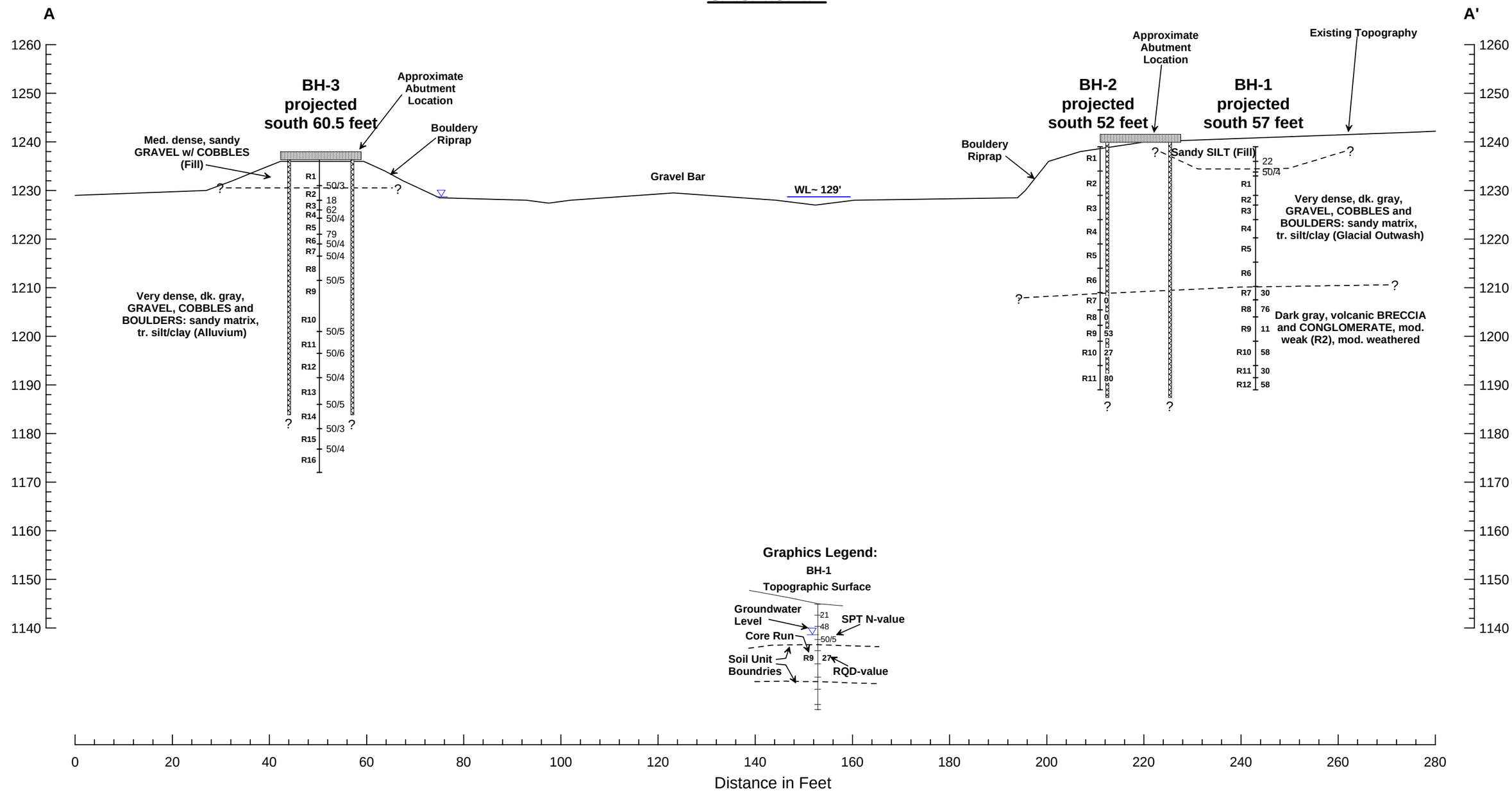
PanGEO INCORPORATED

Klickitat Hatchery Bridge Project, RM 42.6
Yakama Tribe
Glenwood, Washington

SITE AND EXPLORATION PLAN

PROJECT NO.	FIGURE NO.
08-119	2

SECTION A



Graphics Legend:

Notes:

1. Site topography based on survey data provided by Harbor Consulting Engineers, October 2008.
2. Vertical datum NAVD 88.

PanGEO INCORPORATED

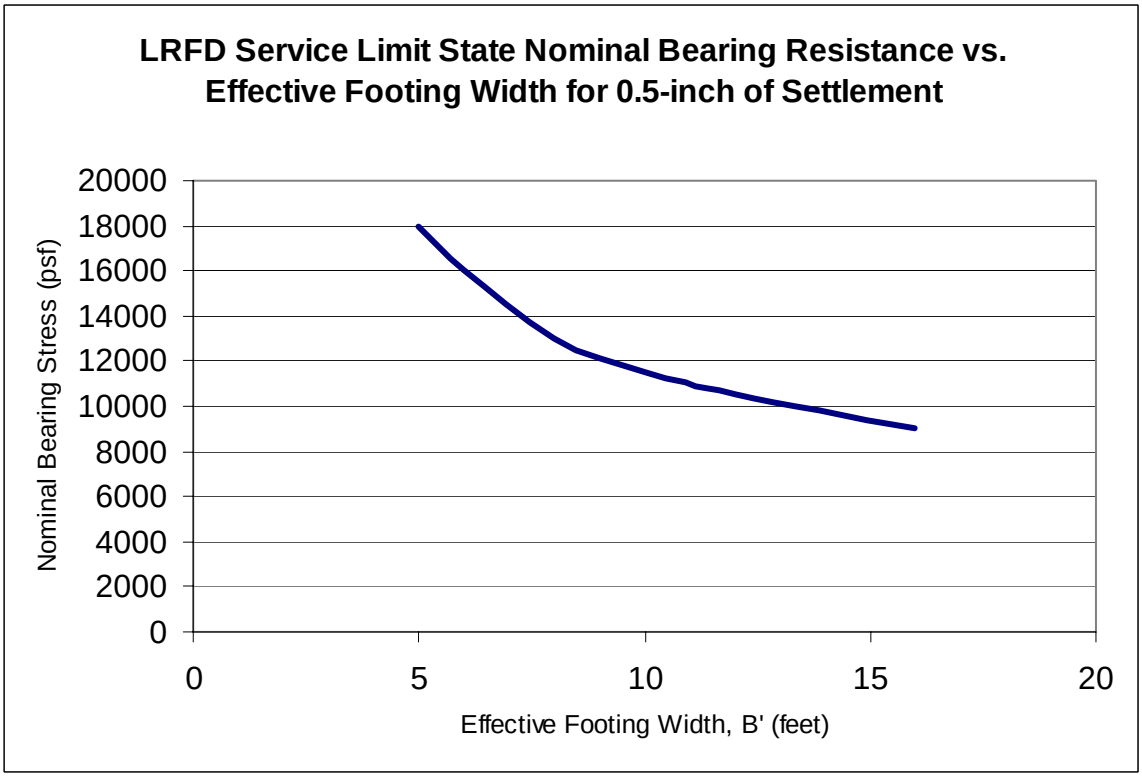
Klickitat Hatchery Bridge Project
Yakama Tribe
Glenwood, Washington

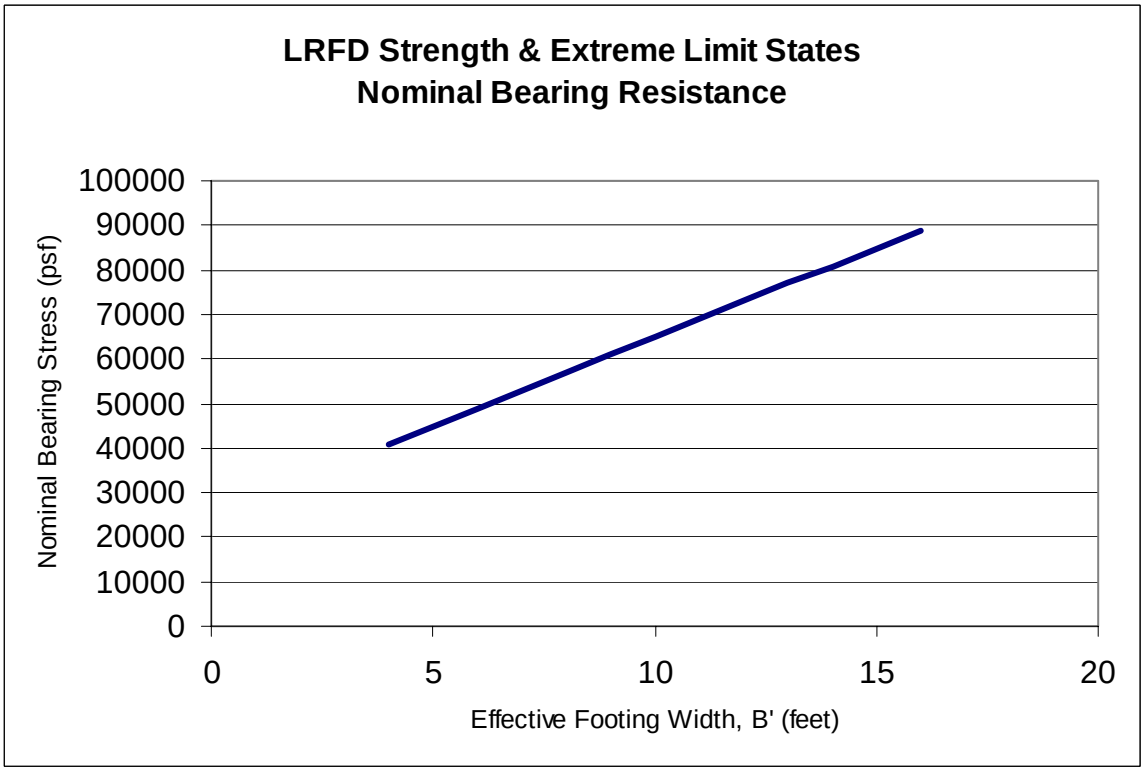
GENERALIZED SUBSURFACE PROFILE SECTION A

Project No. **08-119**

Figure No. **3**

08-119 Profile.grf w/ 08-119 Profiles.xls and 08-119 stick logs.xls 11/20/08(10-18) SHE





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Klickitat Hatchery
Bridge Project
Yakama Tribe
Glenwood, Washington

LRFD DESIGN - SPREAD FOOTING NOMINAL RESISTANCES

Project No.	Figure No.
08-119	4

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PLATES

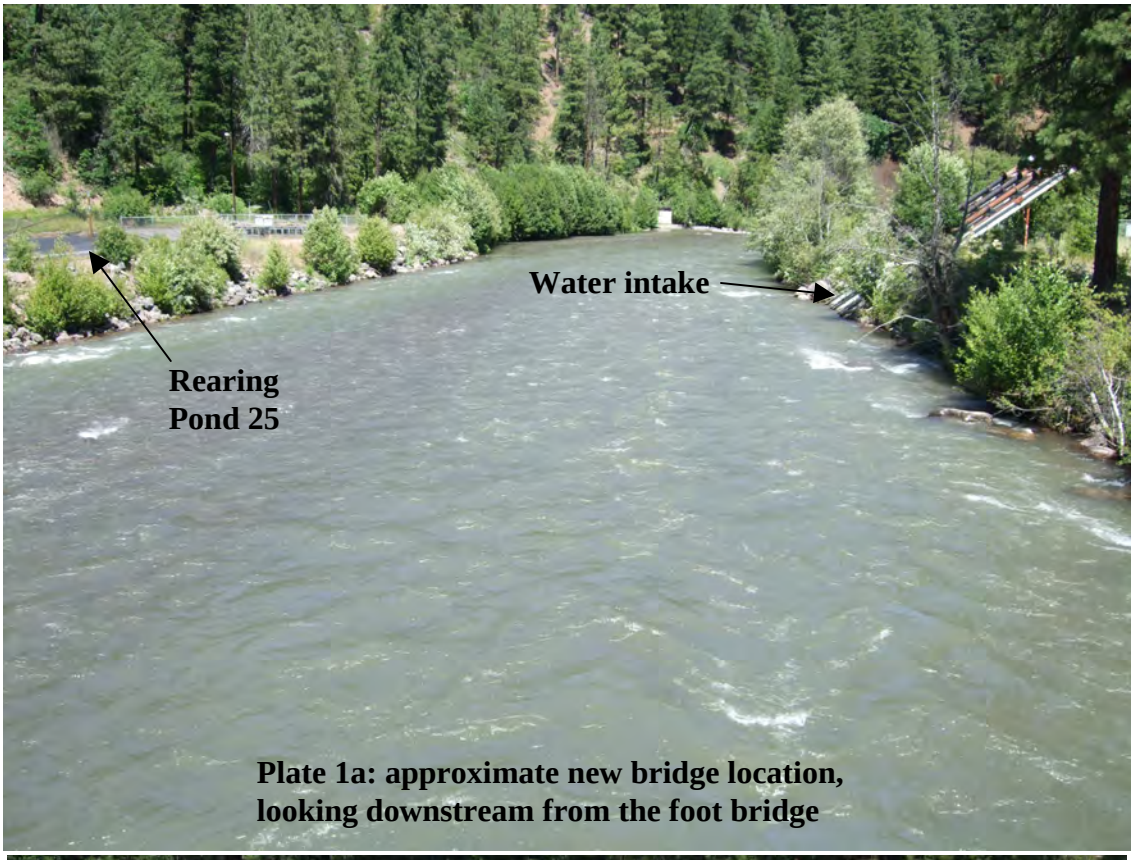

Plate 1a: approximate new bridge location, looking downstream from the foot bridge

Plate 1b: looking across river from right bank, showing armoring on left bank.

PanGEO INCORPORATED	**Klickitat Hatchery Bridge Project Yakama Tribe Glenwood, Washington**	**PLATE 1**	
		Project No. 08-119	Figure No. Plate 1

08-1119_Plate 1.ppt 11/20/2008(10:12 AM) SHE

Plate 2a: BH-2 location on right bank

Plate 2b: BH-3 location on left bank dike by rearing pond 25.

PanGEO INCORPORATED	**Klickitat Hatchery Bridge Project Yakama Tribe Glenwood, Washington**	**PLATE 2**	
		Project No. 08-119	Figure No. Plate 2

08-1119_Plate 2.ppt 11/20/2008(10:12 AM) SHE

Plate 3a: BH-3 mixed lithology gravel, cobbles and sand.

Plate 3b: BH-2 volcanic conglomerate / breccia bedrock.

PanGEO INCORPORATED	**Klickitat Hatchery Bridge Project Yakama Tribe Glenwood, Washington**	**PLATE 3**	
		Project No. 08-119	Figure No. Plate 3

PanGEO INCORPORATED	**Klickitat Hatchery Bridge Project Yakama Tribe Glenwood, Washington**	**CORE PHOTOS BH-1, 6.0' – 28.75', BOXES 1 & 2**	
		Project No. 08-119	Figure No. Plate 4

08-1119_CorePhotos.ppt 11/20/2008(10:12 AM) SHE

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Klickitat Hatchery
Bridge Project
Yakama Tribe
Glenwood, Washington

CORE PHOTOS
BH-1, 28.75' – 50', BOXES 3 & 4

Project No.	Figure No.
08-119	Plate 5

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08-1119_CorePhotos-3.ppt 1/20/2008(10:12 AM) SHE

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Glenwood, Washington

CORE PHOTOS
BH-2, 0.0' – 25.5', BOXES 1 & 2

Project No.	Figure No.
08-119	Plate 6

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Yakama Tribe
Glenwood, Washington

CORE PHOTOS
BH-2, 25.5' – 48', BOXES 3 & 4

Project No.	Figure No.
08-119	Plate 7

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Glenwood, Washington

CORE PHOTOS
BH-2, 48' – 50', BOX 5

Project No.	Figure No.
08-119	Plate 8

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Bridge Project
Yakama Tribe
Glenwood, Washington

CORE PHOTOS
BH-3, 0.0' – 36.5', BOXES 1 & 2

Project No.	Figure No.
08-119	Plate 9

PanGEO INCORPORATED	**Klickitat Hatchery Bridge Project Yakama Tribe Glenwood, Washington**	**CORE PHOTOS BH-3, 36.5' – 65', BOXES 3 & 4**	
		Project No. 08-119	Figure No. Plate 10

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APPENDIX A

FIELD EXPLORATIONS

APPENDIX A: FIELD EXPLORATIONS

Appendix A contains written and graphical borehole logs presenting the factual and interpretive results of our exploratory drilling program. The descriptions of the materials encountered in the subsurface explorations are based on the soil and rock samples extracted from the borings. The sample descriptions are augmented by observation of the drilling action and drill cuttings brought to the surface during field operations. The paragraphs below describe the field operations and sampling procedures used during the geotechnical field explorations.

FIELD EXPLORATIONS

The subsurface exploration program consisted of drilling three test borings at bridge site, two on the right bank and one on the left bank. The drilling was conducted between October 6 and 9, 2008. The borings were drilled on the projected alignment of the bridge and access road. The bridge was initially planned as a three span structure and the drilling program called for a boring at each of the piers and abutments or two boring on each bank. During site drilling, the bridge configuration was changed to a single span structure, so only one left bank boring was required. Following the field exploration, the projected bridge alignment was shifted approximately 50 feet to the south. The borings, designated BH-1, BH-2 and BH-3, were advanced to depths of 50, 50 and 65 feet, respectively.

The approximate boring locations are shown on Figure 2 of the main text. A representative of PanGEO logged the test borings. Soil samples were collected from selected intervals in each boring. The right bank borings were drilled with a truck mounted, Mobile B-50 drill rig. Due to inclement weather, a track mounted CME 850 was required to drill the left bank exploration. All drilling equipment was provided by Boart / Longyear of Tualatin, Oregon. The fine grained soils were sampled using conventional Standard Penetration Test (SPT) split spoon samplers. With the exception of the first 6 feet of boring BH-1 which was drilled with a hollow stem auger, all borings were drilled using triple tube, wireline, diamond rotary coring, where water was used as the drilling medium.

SAMPLING METHODS

Standard penetration tests were taken in BH-1 at depths of 2.5 feet and 5 feet after which it was impractical to drive a sampler. Standard penetration tests were taken in BH-3 at 2.5 and 5-foot intervals to a depth of 60 feet. Because of the coarseness of the soil, SPT recoveries were generally below 50 percent. The number of blows to drive the sampler each 6 inches over an 18-inch interval was recorded and indicated on the boring logs. The number of blows to drive the sampler the final 12 inches is termed the SPT resistance, or N-value, and is used to evaluate the strength and consistency/relative density of the soil. The hammer used to perform SPT sampling was an automatic trip-release mechanism, which generally delivers a higher energy than a "standard" hammer equipped with a rope and cathead mechanism. The efficiency of the hammer mechanism is considered when evaluating the liquefaction potential of a soil. The SPT N-values reported on the borehole logs are field values, and are therefore not corrected for hammer efficiency, overburden stress or rod lengths.

The drill rigs were equipped with 5-foot core barrels. The drill bit was advanced into the soil and rock material until the end of the 5-foot run, or until drilling action indicated that the bit or core barrel was plugged. The inner core barrel was extracted from the drill string and split open. Recovered core was transferred to core boxes for transport and storage. After being transferred, the recovered core was logged, the length of recovered material recorded, and, for rock, the RQD was measured. The core boxes were designed to hold a maximum of 10 feet of core. The beginning and end of each core run was recorded, and tags with that information were placed in the core boxes as appropriate. Each core box was photographed. All recovered core was transported to the PanGEO office for storage and review as needed.

An engineering geologist from PanGEO was present throughout the field exploration program to observe the borings, assist in sampling, and to prepare descriptive logs of the explorations. Soils were classified in general accordance with the guidelines shown on Figure A-1. Summary boring logs are included as Figures A-2 through A-4. The stratigraphic contacts shown on the summary logs represent the approximate boundaries between soil types; actual stratigraphic contacts encountered at other locations in the field may differ from the contact elevations shown on the logs, and may be gradual rather than abrupt. The soil and groundwater conditions depicted are only for the specific date and locations reported, and therefore, are not necessarily representative of other locations and times.

RELATIVE DENSITY / CONSISTENCY

SAND / GRAVEL			SILT / CLAY		
Density	SPT N-values	Approx. Relative Density (%)	Consistency	SPT N-values	Approx. Undrained Shear Strength (psf)
Very Loose	<4	<15	Very Soft	<2	<250
Loose	4 to 10	15 - 35	Soft	2 to 4	250 - 500
Med. Dense	10 to 30	35 - 65	Med. Stiff	4 to 8	500 - 1000
Dense	30 to 50	65 - 85	Stiff	8 to 15	1000 - 2000
Very Dense	>50	85 - 100	Very Stiff	15 to 30	2000 - 4000
			Hard	>30	>4000

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS		GROUP DESCRIPTIONS	
Gravel 50% or more of the coarse fraction retained on the #4 sieve. Use dual symbols (eg. GP-GM) for 5% to 12% fines.	GRAVEL (<5% fines)	GW	Well-graded GRAVEL
		GP	Poorly-graded GRAVEL
	GRAVEL (>12% fines)	GM	Silty GRAVEL
		GC	Clayey GRAVEL
Sand 50% or more of the coarse fraction passing the #4 sieve. Use dual symbols (eg. SP-SM) for 5% to 12% fines.	SAND (<5% fines)	SW	Well-graded SAND
		SP	Poorly-graded SAND
	SAND (>12% fines)	SM	Silty SAND
		SC	Clayey SAND
Silt and Clay 50%or more passing #200 sieve	Liquid Limit < 50	ML	SILT
		CL	Lean CLAY
		OL	Organic SILT or CLAY
	Liquid Limit > 50	MH	Elastic SILT
		CH	Fat CLAY
		OH	Organic SILT or CLAY
Highly Organic Soils		PT	PEAT

Notes:

1. Soil exploration logs contain material descriptions based on visual observation and field tests using a system modified from the Uniform Soil Classification System (USCS). Where necessary laboratory tests have been conducted (as noted in the "Other Tests" column), unit descriptions may include a classification. Please refer to the discussions in the report text for a more complete description of the subsurface conditions.

2. The graphic symbols given above are not inclusive of all symbols that may appear on the borehole logs. Other symbols may be used where field observations indicated mixed soil constituents or dual constituent materials.

DESCRIPTIONS OF SOIL STRUCTURES

Layered: Units of material distinguished by color and/or composition from material units above and below

Laminated: Layers of soil typically 0.05 to 1mm thick, max. 1 cm

Lens: Layer of soil that pinches out laterally

Interlayered: Alternating layers of differing soil material

Pocket: Erratic, discontinuous deposit of limited extent

Homogeneous: Soil with uniform color and composition throughout

Fissured: Breaks along defined planes

Slickensided: Fracture planes that are polished or glossy

Blocky: Angular soil lumps that resist breakdown

Disrupted: Soil that is broken and mixed

Scattered: Less than one per foot

Numerous: More than one per foot

BCN: Angle between bedding plane and a plane normal to core axis

COMPONENT DEFINITIONS

COMPONENT	SIZE / SIEVE RANGE	COMPONENT	SIZE / SIEVE RANGE
Boulder:	> 12 inches	Sand	
Cobbles:	3 to 12 inches	Coarse Sand:	#4 to #10 sieve (4.5 to 2.0 mm)
Gravel		Medium Sand:	#10 to #40 sieve (2.0 to 0.42 mm)
Coarse Gravel:	3 to 3/4 inches	Fine Sand:	#40 to #200 sieve (0.42 to 0.074 mm)
Fine Gravel:	3/4 inches to #4 sieve	Silt	0.074 to 0.002 mm
		Clay	<0.002 mm

TEST SYMBOLS

for In Situ and Laboratory Tests listed in "Other Tests" column.

CBR	California Bearing Ratio
Comp	Compaction Tests
Con	Consolidation
DD	Dry Density
DS	Direct Shear
%F	Fines Content
GS	Grain Size
Perm	Permeability
PP	Pocket Penetrometer
R	R-value
SG	Specific Gravity
TV	Torvane
TXC	Triaxial Compression
UCC	Unconfined Compression

SYMBOLS

Sample/In Situ test types and intervals

- 2-inch OD Split Spoon, SPT (140-lb. hammer, 30" drop)
- 3.25-inch OD Spilt Spoon (300-lb hammer, 30" drop)
- Non-standard penetration test (see boring log for details)
- Thin wall (Shelby) tube
- Grab
- Rock core
- Vane Shear

MONITORING WELL

- Groundwater Level at time of drilling (ATD)
- Static Groundwater Level
- Cement / Concrete Seal
- Bentonite grout / seal
- Silica sand backfill
- Slotted tip
- Slough
- Bottom of Boring

MOISTURE CONTENT

Dry	Dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water

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Terms and Symbols for Boring and Test Pit Logs

Figure A-1

RELATIVE DENSITY / CONSISTENCY

SAND / GRAVEL			SILT / CLAY		
Density	SPT N-values	Approx. Relative Density (%)	Consistency	SPT N-values	Approx. Undrained Shear Strength (psf)
Very Loose	<4	<15	Very Soft	<2	<250
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Dense	30 to 50	65 - 85	Stiff	8 to 15	1000 - 2000
Very Dense	>50	85 - 100	Very Stiff	15 to 30	2000 - 4000
			Hard	>30	>4000

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS		GROUP DESCRIPTIONS	
Gravel 50% or more of the coarse fraction retained on the #4 sieve. Use dual symbols (eg. GP-GM) for 5% to 12% fines.	GRAVEL (<5% fines)	GW	Well-graded GRAVEL
		GP	Poorly-graded GRAVEL
	GRAVEL (>12% fines)	GM	Silty GRAVEL
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		SP	Poorly-graded SAND
	SAND (>12% fines)	SM	Silty SAND
		SC	Clayey SAND
Silt and Clay 50%or more passing #200 sieve	Liquid Limit < 50	ML	SILT
		CL	Lean CLAY
		OL	Organic SILT or CLAY
	Liquid Limit > 50	MH	Elastic SILT
		CH	Fat CLAY
		OH	Organic SILT or CLAY
Highly Organic Soils		PT	PEAT

Notes:

1. Soil exploration logs contain material descriptions based on visual observation and field tests using a system modified from the Uniform Soil Classification System (USCS). Where necessary laboratory tests have been conducted (as noted in the "Other Tests" column), unit descriptions may include a classification. Please refer to the discussions in the report text for a more complete description of the subsurface conditions.

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Fissured: Breaks along defined planes

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Gravel		Medium Sand:	#10 to #40 sieve (2.0 to 0.42 mm)
Coarse Gravel:	3 to 3/4 inches	Fine Sand:	#40 to #200 sieve (0.42 to 0.074 mm)
Fine Gravel:	3/4 inches to #4 sieve	Silt	0.074 to 0.002 mm
		Clay	<0.002 mm

TEST SYMBOLS

for In Situ and Laboratory Tests listed in "Other Tests" column.

CBR	California Bearing Ratio
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%F	Fines Content
GS	Grain Size
Perm	Permeability
PP	Pocket Penetrometer
R	R-value
SG	Specific Gravity
TV	Torvane
TXC	Triaxial Compression
UCC	Unconfined Compression

SYMBOLS

Sample/In Situ test types and intervals

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- Non-standard penetration test (see boring log for details)
- Thin wall (Shelby) tube
- Grab
- Rock core
- Vane Shear

MONITORING WELL

- Groundwater Level at time of drilling (ATD)
- Static Groundwater Level
- Cement / Concrete Seal
- Bentonite grout / seal
- Silica sand backfill
- Slotted tip
- Slough
- Bottom of Boring

MOISTURE CONTENT

Dry	Dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water

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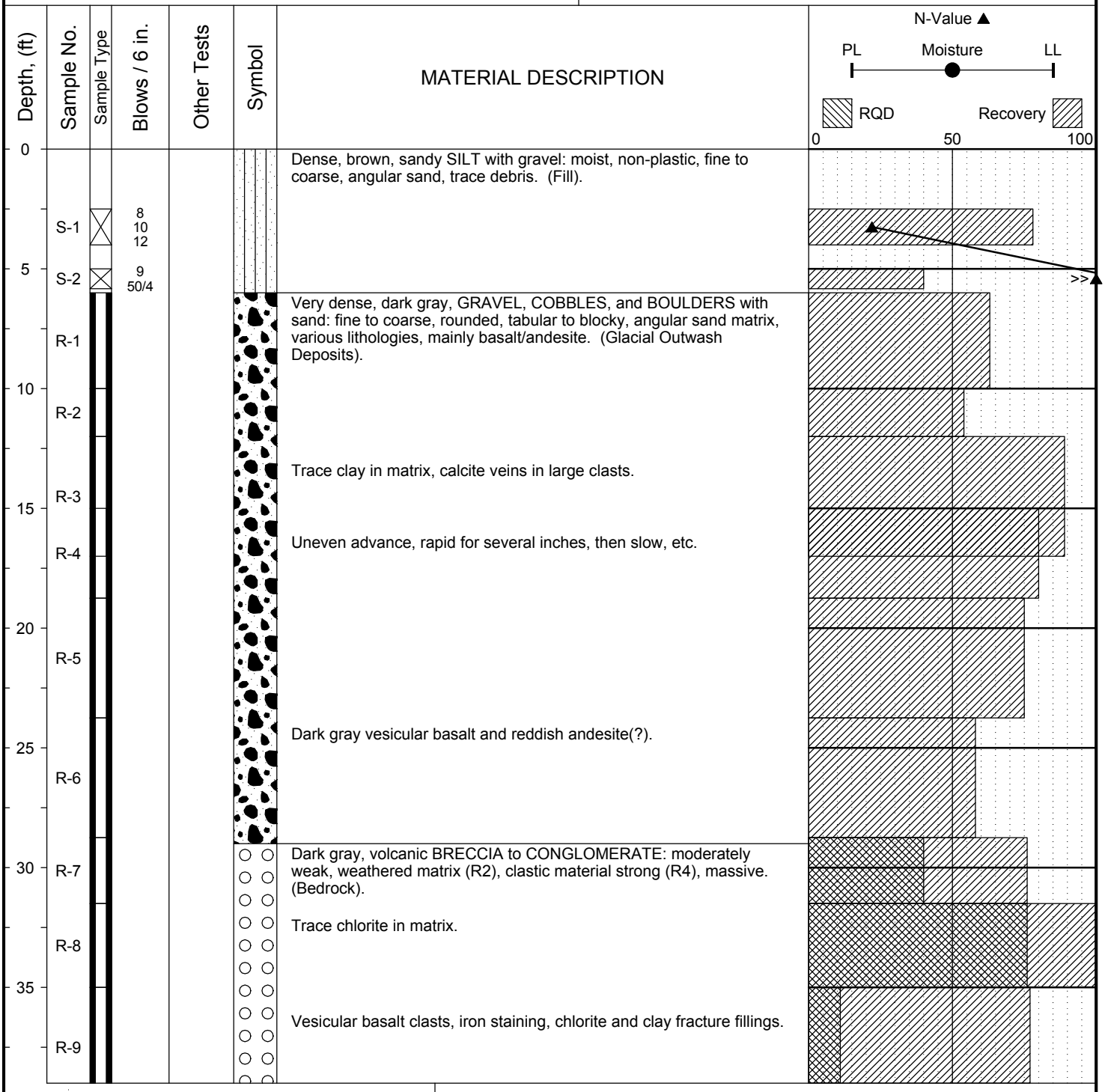
Terms and Symbols for Boring and Test Pit Logs

Figure A-1

Project:	Klickitat Fish Hatchery Improvements	Surface Elevation:	1,239.0ft
Job Number:	08-119	Top of Casing Elev.:	
Location:	Glenwood, Washington	Drilling Method:	HSA/Diamond Rotary
Coordinates:	Northing: , Easting:	Sampling Method:	Core/SPT



Completion Depth:	50.0ft
Date Borehole Started:	10/6/08
Date Borehole Completed:	10/6/08
Logged By:	S. Evans
Drilling Company:	Boart/Longyear

Remarks: STA 4+78, 57 ft. Lt. Drilled with a Mobile B-50 equipped with hollow stem augers and triple tube wireline core drilling equipment.

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LOG OF TEST BORING BH-1

Figure A-2

The stratification lines represent approximate boundaries. The transition may be gradual.

Project:	Klickitat Fish Hatchery Improvements	Surface Elevation:	1,239.0ft
Job Number:	08-119	Top of Casing Elev.:	
Location:	Glenwood, Washington	Drilling Method:	HSA/Diamond Rotary
Coordinates:	Northing: , Easting:	Sampling Method:	Core/SPT

Depth, (ft)	Sample No.	Sample Type	Blows / 6 in.	Other Tests	Symbol	MATERIAL DESCRIPTION
40						Dark gray, volcanic BRECCIA to CONGLOMERATE: moderately weak, weathered matrix (R2), clastic material strong (R4), massive. (Bedrock). *(Continued)*
	R-10					Porphyritic and vesicular basalt clasts.
45	R-11					
	R-12					
50						Bottom of Boring.
55						
60						
65						
70						
75						

N-Value ▲

PL Moisture LL

RQD Recovery

0 50 100

Completion Depth:	50.0ft
Date Borehole Started:	10/6/08
Date Borehole Completed:	10/6/08
Logged By:	S. Evans
Drilling Company:	Boart/Longyear

Remarks: STA 4+78, 57 ft. Lt. Drilled with a Mobile B-50 equipped with hollow stem augers and triple tube wireline core drilling equipment.

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LOG OF TEST BORING BH-1

Figure A-2

The stratification lines represent approximate boundaries. The transition may be gradual.

Project:	Klickitat Fish Hatchery Improvements	Surface Elevation:	1,239.0ft
Job Number:	08-119	Top of Casing Elev.:	
Location:	Glenwood, Washington	Drilling Method:	Diamond Core
Coordinates:	Northing: , Easting:	Sampling Method:	Core

Depth, (ft)	Sample No.	Sample Type	Blows / 6 in.	Other Tests	Symbol	MATERIAL DESCRIPTION
0	R-1					Very dense, dark gray and red GRAVEL, COBBLES and BOULDERS: fine to coarse, rounded, tabular to blocky, multiple lithologies, main basalt/andesite. (Glacial Outwash Deposits).
5	R-2					37 inch porphyritic andesite boulder with planar fractures, iron stained, 30° dip.
10	R-3					Return water milky gray, moderately muddy to thin, coarse grained granitic boulder.
15	R-4					Boulder, multicolor basalt/andesite, reddish and vesicular at top, grading to porphyritic, then greenish and aphanitic at bottom. fractures with possible clay coatings.
20	R-5					Fine to coarse. angular sand matrix.
25	R-6					
30	R-7					Dark gray, volcanic BRECCIA and CONGLOMERATE, moderately weathered, moderately weak (R2) matrix, very strong clasts, mainly vesicular, aphanitic or porphyritic basalt/andesite, rounded gravel and cobbles with angular sand with clay matrix. (Bedrock).
35	R-8					Clasts green, red and gray.
	R-9					Cemented sand matrix.

N-Value ▲
PL Moisture LL
RQD Recovery
0 50 100

Completion Depth:	50.0ft
Date Borehole Started:	10/7/08
Date Borehole Completed:	10/7/08
Logged By:	S. Evans
Drilling Company:	Boart/Longyear

Remarks: STA 4+49, 52 ft. Lt. Drilled with a Mobile B-50 equipped with hollow stem augers and triple tube wireline core drilling equipment.

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LOG OF TEST BORING BH-2

Figure A-3

The stratification lines represent approximate boundaries. The transition may be gradual.

Project:	Klickitat Fish Hatchery Improvements	Surface Elevation:	1,239.0ft
Job Number:	08-119	Top of Casing Elev.:	
Location:	Glenwood, Washington	Drilling Method:	Diamond Core
Coordinates:	Northing: , Easting:	Sampling Method:	Core

Depth, (ft)	Sample No.	Sample Type	Blows / 6 in.	Other Tests	Symbol	MATERIAL DESCRIPTION
40						Dark gray, volcanic BRECCIA and CONGLOMERATE, moderately weathered, moderately weak (R2) matrix, very strong clasts, mainly vesicular, aphanitic or porphyritic basalt/andesite, rounded gravel and cobbles with angular sand with clay matrix. (Bedrock). *(Continued)*
	R-10					Aphanitic to highly vesicular, amygdaloidal basalt/andesite.
45						Flow banding in vesicules, dip 30°.
	R-11					
50						Bottom of Boring.
55						
60						
65						
70						
75						

N-Value ▲

PL Moisture LL

RQD Recovery

0 50 100

Completion Depth:	50.0ft
Date Borehole Started:	10/7/08
Date Borehole Completed:	10/7/08
Logged By:	S. Evans
Drilling Company:	Boart/Longyear

Remarks: STA 4+49, 52 ft. Lt. Drilled with a Mobile B-50 equipped with hollow stem augers and triple tube wireline core drilling equipment.

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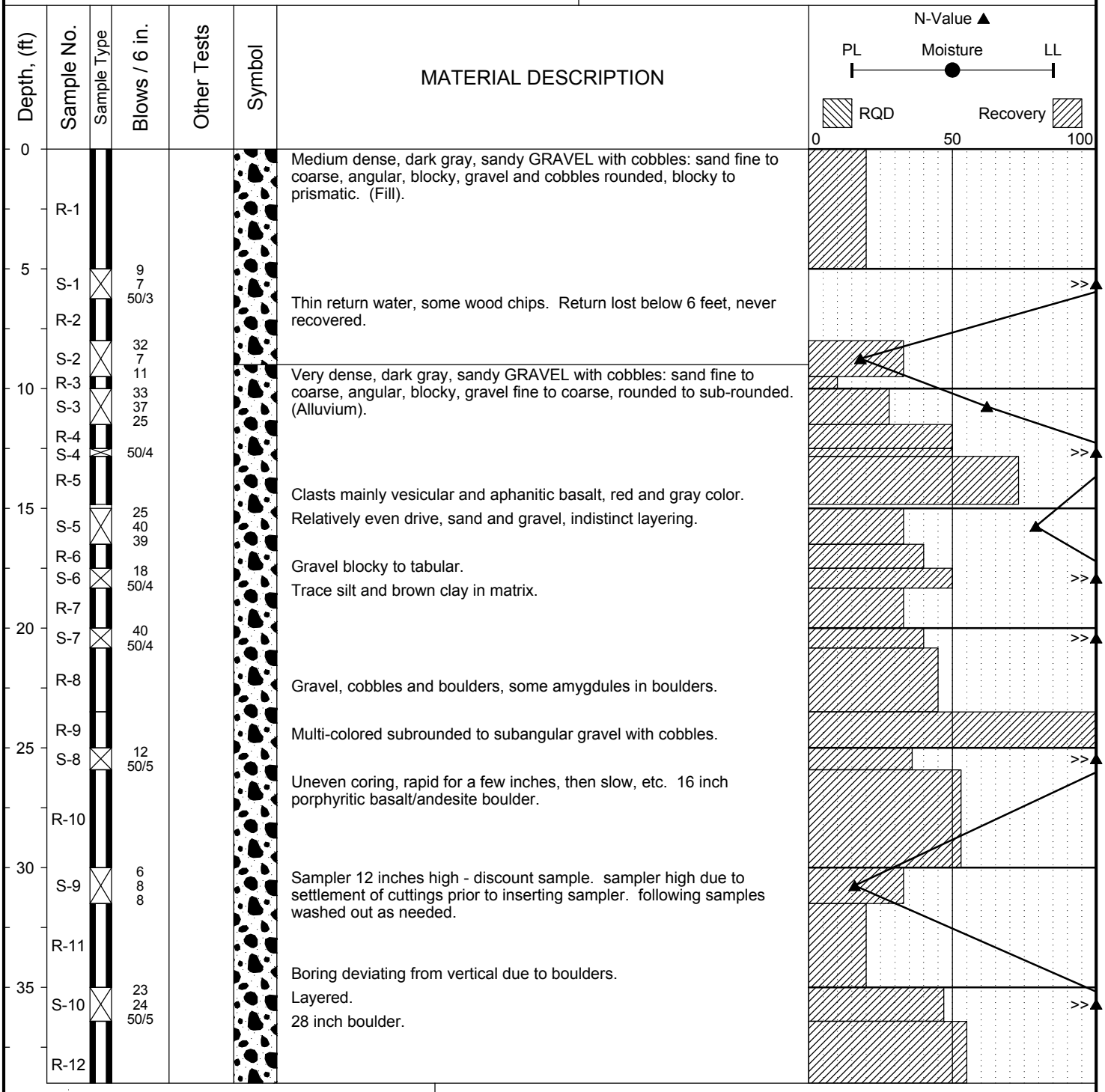
LOG OF TEST BORING BH-2

Figure A-3

The stratification lines represent approximate boundaries. The transition may be gradual.

Project:	Klickitat Fish Hatchery Improvements	Surface Elevation:	1,237.0ft
Job Number:	08-119	Top of Casing Elev.:	
Location:	Glenwood, Washington	Drilling Method:	Diamond Core
Coordinates:	Northing: , Easting:	Sampling Method:	Core/SPT



Completion Depth:	65.0ft
Date Borehole Started:	10/7/08
Date Borehole Completed:	10/8/08
Logged By:	S. Evans
Drilling Company:	Boart/Longyear

Remarks: STA 2+89, 60.5 ft. Lt. Drilled with a CME 850 equipped with triple tube wireline core drilling equipment.

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LOG OF TEST BORING BH-3

Figure A-4

The stratification lines represent approximate boundaries. The transition may be gradual.

Project:	Klickitat Fish Hatchery Improvements	Surface Elevation:	1,237.0ft
Job Number:	08-119	Top of Casing Elev.:	
Location:	Glenwood, Washington	Drilling Method:	Diamond Core
Coordinates:	Northing: , Easting:	Sampling Method:	Core/SPT

Depth, (ft)	Sample No.	Sample Type	Blows / 6 in.	Other Tests	Symbol	MATERIAL DESCRIPTION
40	S-11		14 50/6			Very dense, dark gray, sandy GRAVEL with cobbles: sand fine to coarse, angular, blocky, gravel fine to coarse, rounded to sub-rounded. (Alluvium). *(Continued)*
	R-13					5 inch red vesicular basalt, 14 inch dark gray vesicular basalt with amygdules.
45	S-12		19 29 50/4			Indistinct layering.
	R-14					Cobbles with gravel, granitic clast.
	R-15					
50	S-13		4 31 50/5			Dense, fine to coarse gravel and cobbles, multi-lithologies, rounded to subrounded.
	R-16					
55	S-14		9 26 50/3			
	R-17					
60	S-15		50/4			Rounded gravel and cobbles, one volcanic breccia clast.
	R-18					
65						Bottom of Boring.
70						
75						

N-Value ▲
PL Moisture LL
RQD Recovery
0 50 100

Completion Depth:	65.0ft
Date Borehole Started:	10/7/08
Date Borehole Completed:	10/8/08
Logged By:	S. Evans
Drilling Company:	Boart/Longyear

Remarks: STA 2+89, 60.5 ft. Lt. Drilled with a CME 850 equipped with triple tube wireline core drilling equipment.

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Phone: 206.262.0370

LOG OF TEST BORING BH-3

Figure A-4

The stratification lines represent approximate boundaries. The transition may be gradual.

KEY PLAN

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

8 NEW JUMBO REARING RACEWAYS
DRIVEWAY
DRIVEWAY
GRAVEL BAR
DEMO EXIST POND 25
DEMO EXIST SHED
EXIST BRIDGE
EXIST WATER SUPPLY LINE & UTILITIES
EXISTING HATCHERY ACCESS ROAD
ABANDONED ROAD
12 NEW JUMBO REARING RACEWAYS
NEW STEELHEAD HATCHERY
GRAVEL BAR
KLICKITAT RIVER FLOW
FILL ELEV. 1242
NEW PUMP HOUSE
40"ø JUVENILE BYPASS
NEW RIVER WATER INTAKE STRUCTURE
JUVENILE FISH SCREEN
RIVER WATER INTAKE
MATCHLINE SEE C0.03

GRAVEL BAR
REMOVE PARTIAL FISH BARRIER
EXIST. CONCRETE SILL
DEMO EXIST POLLUTION ABATEMENT BASIN
NEW POLLUTION ABATEMENT BASIN
DEMO EXISTING POND
NEW FISHWAY TO ADULT HOLDING
NEW JUMBO RACEWAYS
DEMO EXIST. REARING POND 24
EXIST INTAKE PUMPS
ADULT HOLDING
DEMO EXIST. ADULT HOLDING FACILITY
NEW ADULT HOLDING FACILITY
NEW SPAWNING BUILDING
CRUSHED ROCK SURFACE
EDGE OF AC PAVEMENT
AC PAVEMENT
DEMO EXIST RETAINING WALL
EXIST PROPANE STORAGE TO BE RELOCATED
NEW CHEMICAL STORAGE BUILDING
NEW MAINTENACE & VEHICLE SHOP
RELOCATED STORAGE BUILDING
NEW HATCHERY BUILDING ADDITION
PARKING AREA 20 SPACES
DEMO EXIST. SHEDS
EXIST. HATCHERY
EXISTING STORAGE BUILDING TO BE RELOCATED
EXIST. REARING RACEWAY C
EDGE OF AC PAVEMENT
NEW COVERED OUTDOOR DRIVE THRU
MARKING TRAILER PAD
NEW STEEL ROOF OVER EXIST.REARING RACEWAYS B
NEW STEEL ROOF OVER EXIST.REARING RACEWAYS A
CONTRACTOR STAGING AREA
MARKING TRAILER PAD, TYP. w/ ROOF
TO WONDER SPRINGS POND
VISITOR PARKING
EDGE OF AC PAVEMENT
CONTRACTOR STAGING AREA
FISH FEED STORAGE
TURBINE BUILDING
MARKING TRAILER PAD
VISITOR KIOSK
EXIST. SHED
GENERATOR BUILDING
EXIST ACCESS
MATCHLINE SEE C0.03

CONCEPTUAL DESIGN
SITE DEVELOPEMENT PLAN
SCALE: 1" = 40'
40 0 40 80
SCALE IN FEET 1" = 40'

REVISED	DATE
DESCRIPTION	

SCALE: 1 : 40
CHK BY: MC
DRW BY: CP
REF: X

HARBOR CONSULTING ENGINEERS
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3006 FUHRMAN AVENUE EAST
SEATTLE WASHINGTON 98102
PHONE: (206) 709-8397

KLICKITAT HATCHERY REDEVELOPMENT
YAKAMA KLICKITAT FISHERIES PROGRAM
SITE DEVELOPMENT PLAN
MAIN HATCHERY

JOB NO. 08038.01
DATE: 10.29.10
SHEET: X OF X
DWG.# FIG 1

DESIGN DRAWINGS – NOT FOR CONSTRUCTION

MATCHLINE
SEE FIG 5

MATCHLINE
SEE FIG 5

LEGEND

HDPE OR PVC (UNO) — W — W —
HDPE OR PVC DRAINAGE — D — D —
EXIST UTILITIES — W — W —

NEW PIPELINE

16" HDPE OR PVC

24" HDPE OR PVC

1240

1250

1260

16" HDPE
OR PVC

24" HDPE
OR PVC

30" STEEL PIPE

24" HDPE OR PVC

NEW CHEMICAL STORAGE
BUILDING

RELOCATED STORAGE
BUILDING

NEW HATCHERY
BUILDING ADDITION

NEW MAINTENANCE AND
VEHICLE SHOP

24" HDPE OR PVC

EXIST HATCHERY

REARING RACEWAYS C

24" HDPE OR PVC

30" HDPE OR PVC

30" STEEL PIPE

REARING RACEWAYS B

REARING RACEWAYS A

FISH FEED STORAGE

TURBINE BUILDING

24" HDPE OR PVC

30" HDPE OR PVC

2" HDPE
OR PVC

24" HDPE OR PVC

MATCHLINE
SEE FIG 7

MATCHLINE
SEE FIG 7

SITE UTILITIES PLAN A

SCALE: 1" = 20'

20 0 20 40
SCALE IN FEET 1" = 20'

KEY PLAN

VERIFY SCALE

BAR IS ONE INCH ON ORIGINAL DRAWING
0 1

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

SCALE: 1 : 20
CHK BY: MC
DRW BY: JVL
REF: X

REVISED DESCRIPTION	DATE

HARBOR CONSULTING ENGINEERS
ENGINEERS · PLANNERS · SURVEYORS
3006 FUHRMAN AVENUE EAST
SEATTLE WASHINGTON 98102
PHONE: (206) 709-2397

KLICKITAT HATCHERY REDEVELOPMENT
YAKAMA KLICKITAT FISHERIES PROGRAM

SITE DEVELOPMENT PLAN
SITE UTILITIES PLAN A

JOB NO.	08038.01
DATE:	10.29.10
SHEET:	X OF X
DWG.#	FIG 2

DESIGN DRAWINGS – NOT FOR CONSTRUCTION

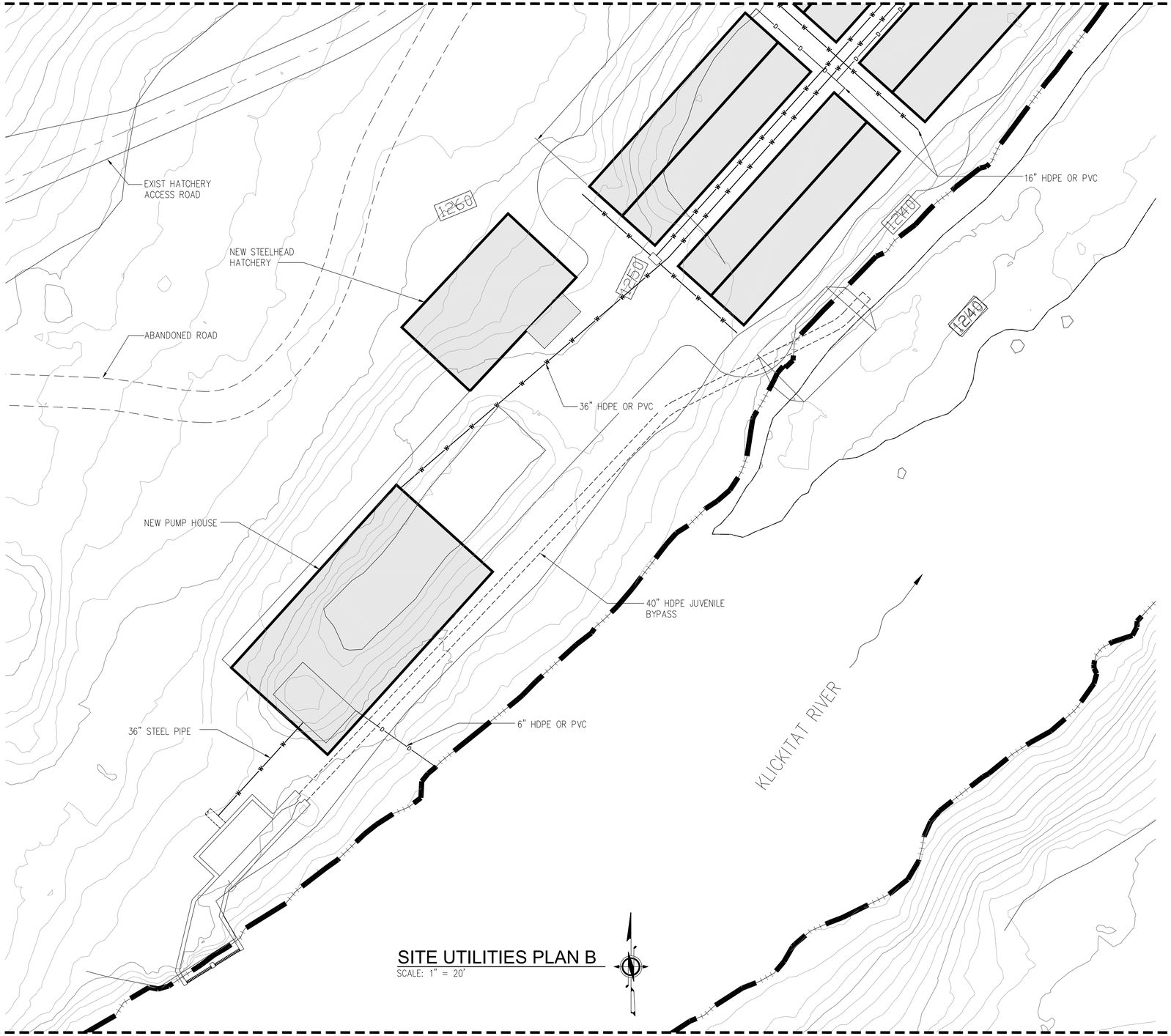
VERIFY SCALE

BAR IS ONE INCH ON ORIGINAL DRAWING 0 1

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

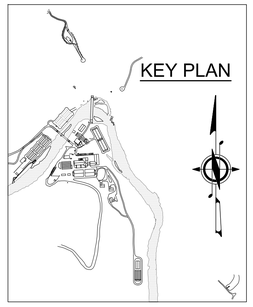
MATCHLINE SEE FIG 4

MATCHLINE SEE FIG 4



SITE UTILITIES PLAN B

SCALE: 1" = 20'



LEGEND

HDPE OR PVC (UNO)

HDPE OR PVC DRAINAGE

EXIST UTILITIES

MATCHLINE SEE FIG 2

MATCHLINE SEE FIG 2

20 0 20 40

SCALE IN FEET 1" = 20'

SCALE: 1 : 20

CHK BY: MC

DRW BY: JVL

REF: X

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KLICKITAT HATCHERY REDEVELOPMENT

YAKAMA KLICKITAT FISHERIES PROGRAM

SITE DEVELOPMENT PLAN
SITE UTILITIES PLAN B

JOB NO. 08038.01

DATE: 10.29.10

SHEET: X OF X

DWG.# FIG 3

DESIGN DRAWINGS – NOT FOR CONSTRUCTION

MATCHLINE
SEE FIG 5

LEGEND

HDPE OR PVC (UNO)
HDPE OR PVC DRAINAGE
EXIST UTILITIES

KEY PLAN

30" HDPE OR PVC
36" PVC DRAINAGE
60" MH
12 NEW JUMBO REARING RACEWAYS
16" HDPE OR PVC
NEW STEELHEAD HATCHERY
1260
1250
1240
36" HDPE OR PVC
NEW PIPELINE
EXIST PIPELINE
EXIST HATCHERY WATER SUPPLY LINE & UTILITIES
EXIST 12" STEEL PIPE
EXIST 24" STEEL PIPE
EXIST BRIDGE
16" HDPE OR P
24" HDPE OR P
NEW SPAWNING BUILDING
EXIST PIPELINE
NEW
KLICKITAT RIVER
16" H
OR P
24" HDPE OR PVC
30" STEEL PIPE
RELOCATED STORAGE BUILDING

MATCHLINE
SEE FIG 2

SITE UTILITIES PLAN C
SCALE: 1" = 20'

20 0 20 40
SCALE IN FEET
1" = 20'

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

SCALE: 1 : 20
CHK BY: MC
DRW BY: JVL
REF: X

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SITE DEVELOPMENT PLAN
SITE UTILITIES PLAN C

JOB NO.	08038.01
DATE:	10.29.10
SHEET:	X OF X
DWG.#	FIG 4

DESIGN DRAWINGS – NOT FOR CONSTRUCTION

MATCHLINE
SEE FIG 6

MATCHLINE
SEE FIG 6

VERIFY SCALE

BAR IS ONE INCH ON ORIGINAL DRAWING
0 1

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

14" STEEL PIPE

1280

1270

1260

1250

8 NEW JUMBO REARING RACEWAYS

30" STEEL PIPE

36" PVC DRAINAGE

1240

EXIST CONCRETE SILL

LEGEND

HDPE OR PVC (UNO)

HDPE OR PVC DRAINAGE

EXIST UTILITIES

KEY PLAN

EXIST 19" STEEL PIPE

KLICKITAT RIVER

16" HDPE OR PVC

60" MH

NEW POLLUTION ABATEMENT BASIN

24" HDPE OR PVC

24" PVC DRAINAGE

1230

60" MH

NEW JUMBO RACEWAYS

NEW ADULT HOLDING FACILITY

NEW PIPELINE

EXIST PIPELINE

6" PVC DRAINAGE

EXIST HATCHERY WATER SUPPLY LINE & UTILITIES

EXIST 12" STEEL PIPE

EXIST 24" STEEL PIPE

EXIST BRIDGE

16" HDPE OR PVC

24" HDPE OR PVC

NEW SPAWNING BUILDING

EXIST PIPELINE

NEW PIPELINE

16" HDPE OR PVC

24" HDPE OR PVC

SITE UTILITIES PLAN D

SCALE: 1" = 20'

MATCHLINE
SEE FIG 2

MATCHLINE
SEE FIG 2

20 0 20 40
SCALE IN FEET 1" = 20'

SCALE: 1 : 20
CHK BY: MC
DRW BY: JVL
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SITE DEVELOPMENT PLAN D
SITE UTILITIES PLAN

JOB NO. 08038.01
DATE: 10.29.10
SHEET: X OF X
DWG.# FIG 5

DESIGN DRAWINGS – NOT FOR CONSTRUCTION

MATCHLINE

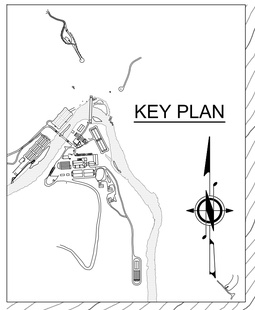
MATCHLINE

LEGEND

HDPE OR PVC (UNO) — W — W

HDPE OR PVC DRAINAGE — D — D

EXIST UTILITIES — W — W



NEW 30"ø WATER SUPPLY PIPE

EXIST INDIAN FORD A LOWER SPRING INTAKE

EXIST 19" STEEL PIPE TO BE ABANDONED

14" STEEL WATER SUPPLY PIPE

EXIST INDIAN FORD B SPRING INTAKE & PIPING

CUT AND CAP EXIST PIPE

14" PIPELINE
NOTE: 10" DBH & UP TREES WITHIN 50' OF PIPELINE SHALL BE

60" MH

EXIST 19" STEEL PIPE

EXIST CONCRETE SILL

14" STEEL PIPE

36" PVC DRAINAGE

RACEWAYS

1370 1360 1350 1340 1330 1320 1310 1300 1290 1280 1270 1260 1250 1240 1230 1220 1210

MATCHLINE
SEE FIG 5

MATCHLINE
SEE FIG 5

SITE UTILITIES PLAN E

SCALE: 1" = 20'

20 0 20 40
SCALE IN FEET 1" = 20'

VERIFY SCALE

BAR IS ONE INCH ON ORIGINAL DRAWING
0 1

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

SCALE: 1 : 20
CHK BY: MC
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SITE DEVELOPMENT PLAN
SITE UTILITIES PLAN E

JOB NO. 08038.01
DATE: 10.29.10
SHEET: X OF X
DWG.# FIG 6

DESIGN DRAWINGS – NOT FOR CONSTRUCTION

MATCHLINE
SEE FIG 2

MATCHLINE
SEE FIG 2

4" HDPE OR PVC

REARING RACEWAYS B

REARING RACEWAYS A

24" HDPE OR PVC

2" HDPE
OR PVC

2" HDPE OR PVC

24" HDPE OR PVC

30" HDPE OR PVC

SPRINKLER
CONNECTION

1280

1290

1300

1310

1320

1330

1340

1350

1360

1370

1380

1390

1400

1410

1420

NEW RESIDENCES.
DEMO EXIST, TYP
(3) PLACES

RE-SURFACE EXIST
ROAD W/ CRUSHED
ROCK, TYP

TO WONDER SPRINGS
RACEWAYS

LEGEND

HDPE OR PVC (UNO) — W — W

HDPE OR PVC DRAINAGE — D — D

EXIST UTILITIES — w — w

KEY PLAN

SITE UTILITIES PLAN F

SCALE: 1" = 20'

MATCHLINE
SEE FIG 8

MATCHLINE
SEE FIG 8

20 0 20 40
SCALE IN FEET 1" = 20'

VERIFY SCALE

BAR IS ONE INCH ON ORIGINAL DRAWING
0 1

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

SCALE: 1:20
CHK BY: MC
DRW BY: JVL
REF: X

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SITE DEVELOPMENT PLAN
SITE UTILITIES PLAN F

JOB NO. 08038.01
DATE: 10.29.10
SHEET: X OF X
DWG.# FIG 7

DESIGN DRAWINGS – NOT FOR CONSTRUCTION

MATCHLINE
SEE FIG 7

MATCHLINE
SEE FIG 7

TO THE HATCHERY

18" HDPE OR PVC

NEW PIPELINE

EXIST PIPELINE

NEW JUMBO RACEWAYS

7 NEW RACEWAYS

24" HDPE OR PVC

MARKING TRAILER PAD

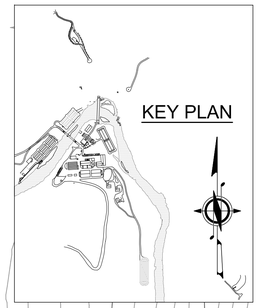
EXIST 24" DRAIN PIPE

KLICKITAT RIVER

EXIST WONDER SPRINGS WATER SUPPLY

MATCHLINE

MATCHLINE



SITE UTILITIES PLAN G

SCALE: 1" = 20'

LEGEND

HDPE OR PVC (UNO)

HDPE OR PVC DRAINAGE

EXIST UTILITIES

20 0 20 40

SCALE IN FEET 1" = 20'

VERIFY SCALE

BAR IS ONE INCH ON ORIGINAL DRAWING 0 1

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

SCALE: 1 : 20

CHK BY: MC

DRW BY: JVL

REF: X

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SITE DEVELOPMENT PLAN
SITE UTILITIES PLAN G

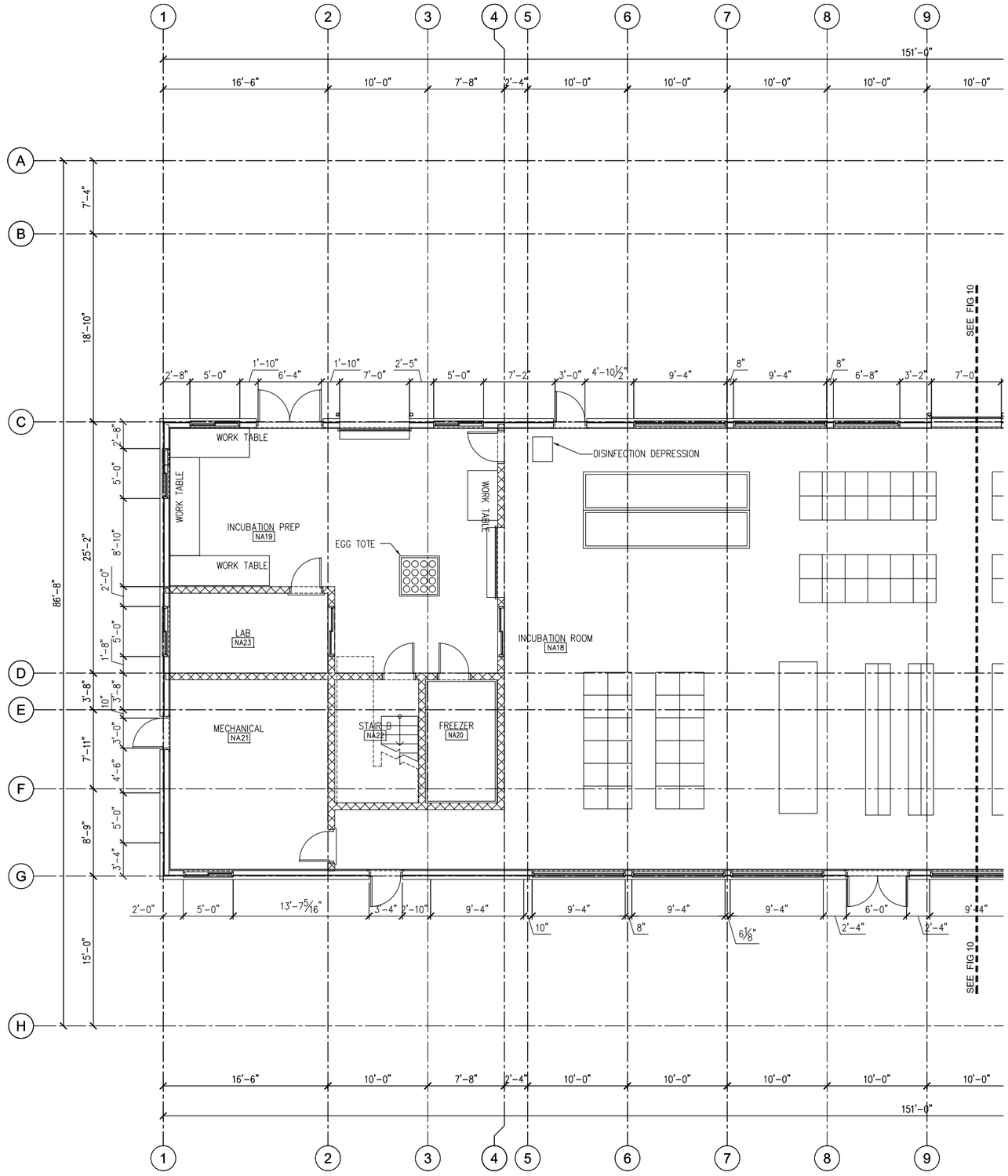
JOB NO. 08038.01

DATE: 10.29.10

SHEET: X OF X

DWG.# FIG 8

DESIGN DRAWINGS – NOT FOR CONSTRUCTION



HATCHERY LEVEL 1	
INCUBATION ROOM	3,060 SF NET
INCUBATION PREP	661 SF NET
LAB	127 SF NET
MECHANICAL ROOM	301 SF NET
FREEZER	68 SF NET
OFFICE MECHANICAL ROOM	115 SF NET
SERVER & IT ROOM	72 SF NET
MUD ROOM	250 SF NET
BREAK ROOM	311 SF NET
CONFERENCE ROOM	324 SF NET
HATCHERY MANAGER	194 SF NET
FOREMAN OFFICE	139 SF NET
BIOLOGIST	217 SF NET
MAINTENACE MANAGER	158 SF NET
WORK ROOM	91 SF NET
MEN'S RESTROOM	264 SF NET
WOMAN'S RESTROOM	268 SF NET
JANITOR CLOSET 1	22 SF NET
JANITOR CLOSET 2	21 SF NET
CLOSET	11 SF NET
STAIR A	94 SF NET
STAIR B	104 SF NET
LOBBY	127 SF NET
CORRIDOR	329 SF NET
TOTAL NET AREA	7,407 SF NET
TOTALGROSS AREA	8,389 SF GROSS

FIRST FLOOR PLAN

SCALE: 3/16" = 1'-0"
WEST AREA

SCALE IN FEET 2 0 2 4 6 8 10 12 14
3/16" = 1'-0"

VERIFY SCALE

BAR IS ONE INCH ON ORIGINAL DRAWING (0 — 1)
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

SCALE: 3/16"=1'-0" | CHK BY: X | DRW BY: X | REF: X

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HATCHERY BUILDING
FIRST FLOOR PLAN – WEST AREA

JOB NO. 08038.01
DATE: 10.29.10
SHEET: X OF X
DWG.# FIG 9

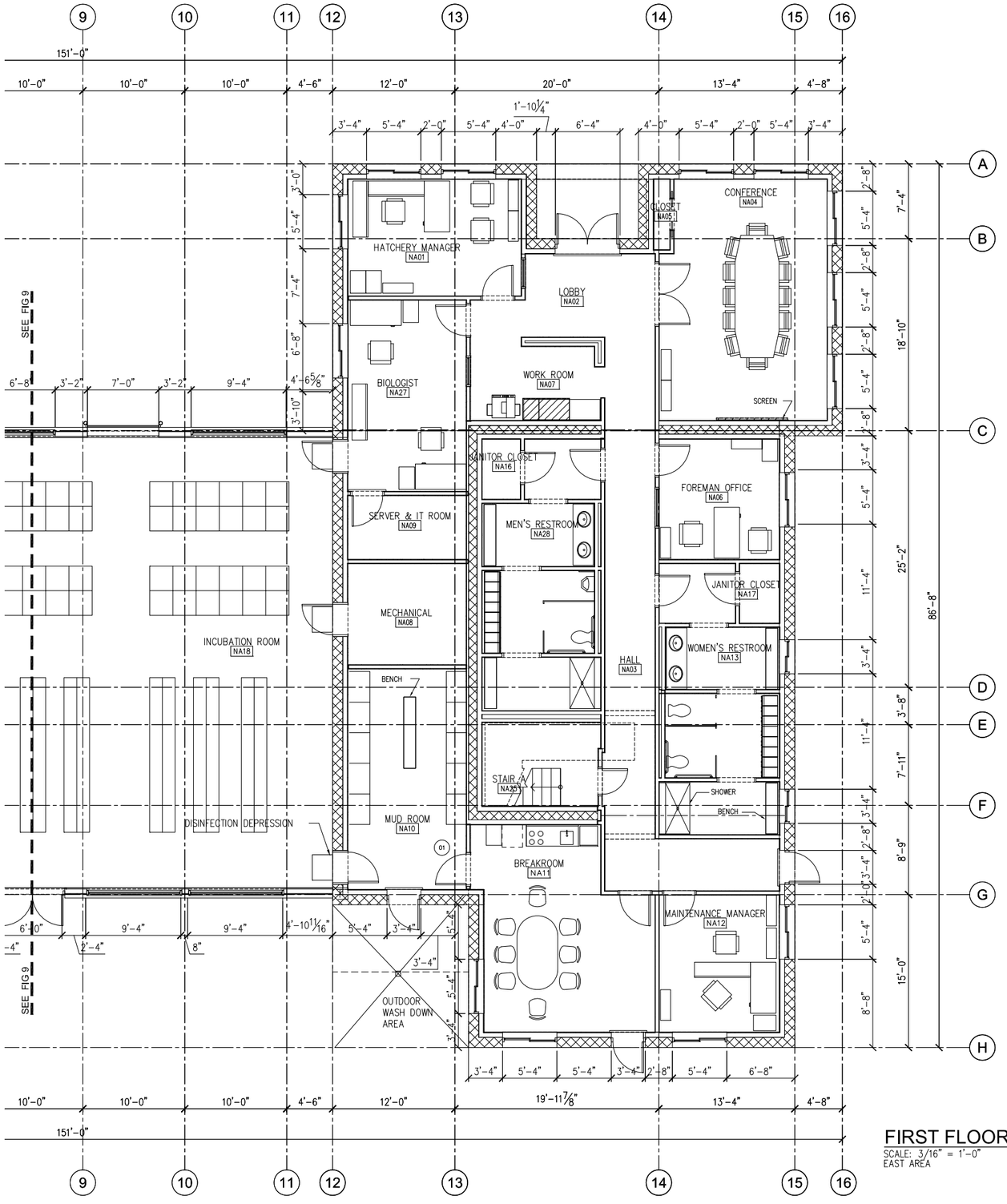
DESIGN DRAWINGS – NOT FOR CONSTRUCTION

VERIFY SCALE

BAR IS ONE INCH ON ORIGINAL DRAWING (0 — 1)

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

HATCHERY LEVEL 1	
INCUBATION ROOM	3,060 SF NET
INCUBATION PREP	661 SF NET
LAB	127 SF NET
MECHANICAL ROOM	301 SF NET
FREEZER	89 SF NET
OFFICE MECHANICAL ROOM	115 SF NET
SERVER & IT ROOM	72 SF NET
MUD ROOM	250 SF NET
BREAK ROOM	313 SF NET
CONFERENCE ROOM	378 SF NET
HATCHERY MANAGER	194 SF NET
FOREMAN OFFICE	139 SF NET
BIOLOGIST	217 SF NET
MAINTENACE MANAGER	158 SF NET
WORK ROOM	91 SF NET
MEN'S RESTROOM	264 SF NET
WOMAN'S RESTROOM	268 SF NET
JANITOR CLOSET 1	22 SF NET
JANITOR CLOSET 2	23 SF NET
CLOSET	11 SF NET
STAIR A	94 SF NET
STAIR B	104 SF NET
LOBBY	127 SF NET
CORRIDOR	329 SF NET
TOTAL NET AREA	7,407 SF NET
TOTALGROSS AREA	8,389 SF GROSS



FIRST FLOOR PLAN

SCALE: 3/16" = 1'-0"
EAST AREA

SCALE IN FEET 2 0 2 4 6 8 10 12 14 — 3/16" = 1'-0"

REVISED	DESCRIPTION	DATE

SCALE: 3/16"=1'-0"
CHK BY: X
DRW BY: X
REF: X

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HATCHERY BUILDING
FIRST FLOOR PLAN – EAST AREA

JOB NO. 08038.01
DATE: 10.29.10
SHEET: X OF X
DWG.# FIG 10

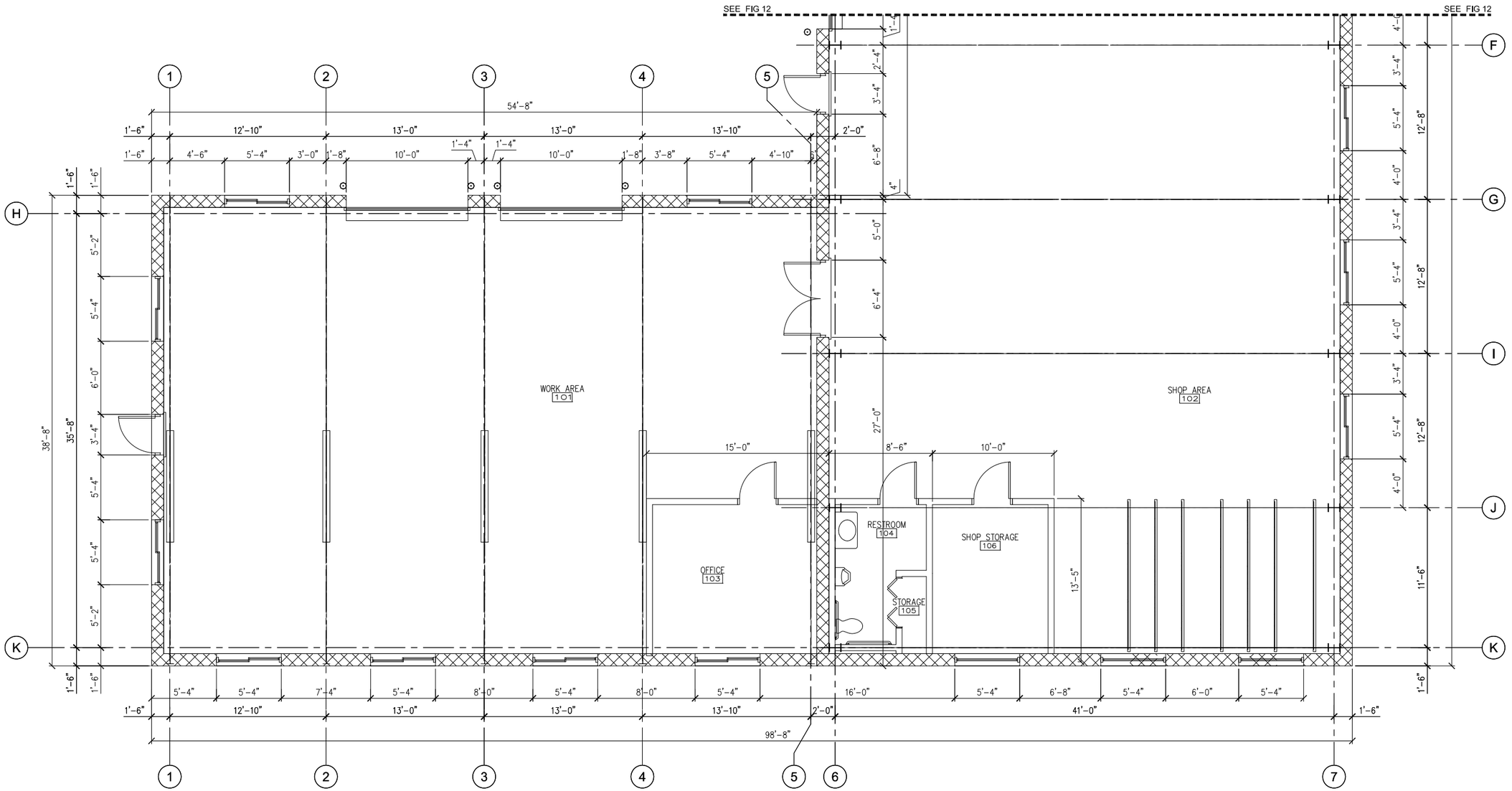
DESIGN DRAWINGS – NOT FOR CONSTRUCTION

VERIFY SCALE

BAR IS ONE INCH ON ORIGINAL DRAWING (0 — 1)

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

VEHICLE MAINTENACE	
SHOP AREA	4,594 SF NET
WORK AREA	1,790 SF NET
OFFICE	166 SF NET
SHOP STORAGE	97 SF NET
RESTROOM	73 SF NET
CLOSET	13 SF NET
TOTAL NET AREA	6,733 SF NET
TOTALGROSS AREA	7,262 SF GROSS



FLOOR PLAN A

SCALE: 1/4" = 1'-0"
VEHICLE MAINTENANCE
PARTIAL FLOOR PLAN

SCALE IN FEET 2 0 2 4 6 8 10 — ¼" = 1'-0"

SCALE: 1/4"=1'-0" | CHK BY: X | DRW BY: JVL | REF: X

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VEHICLE & MAINTENANCE SHOP
FLOOR PLAN A

JOB NO. 08038.01
DATE: 10.29.10
SHEET: X OF X
DWG.# FIG 11

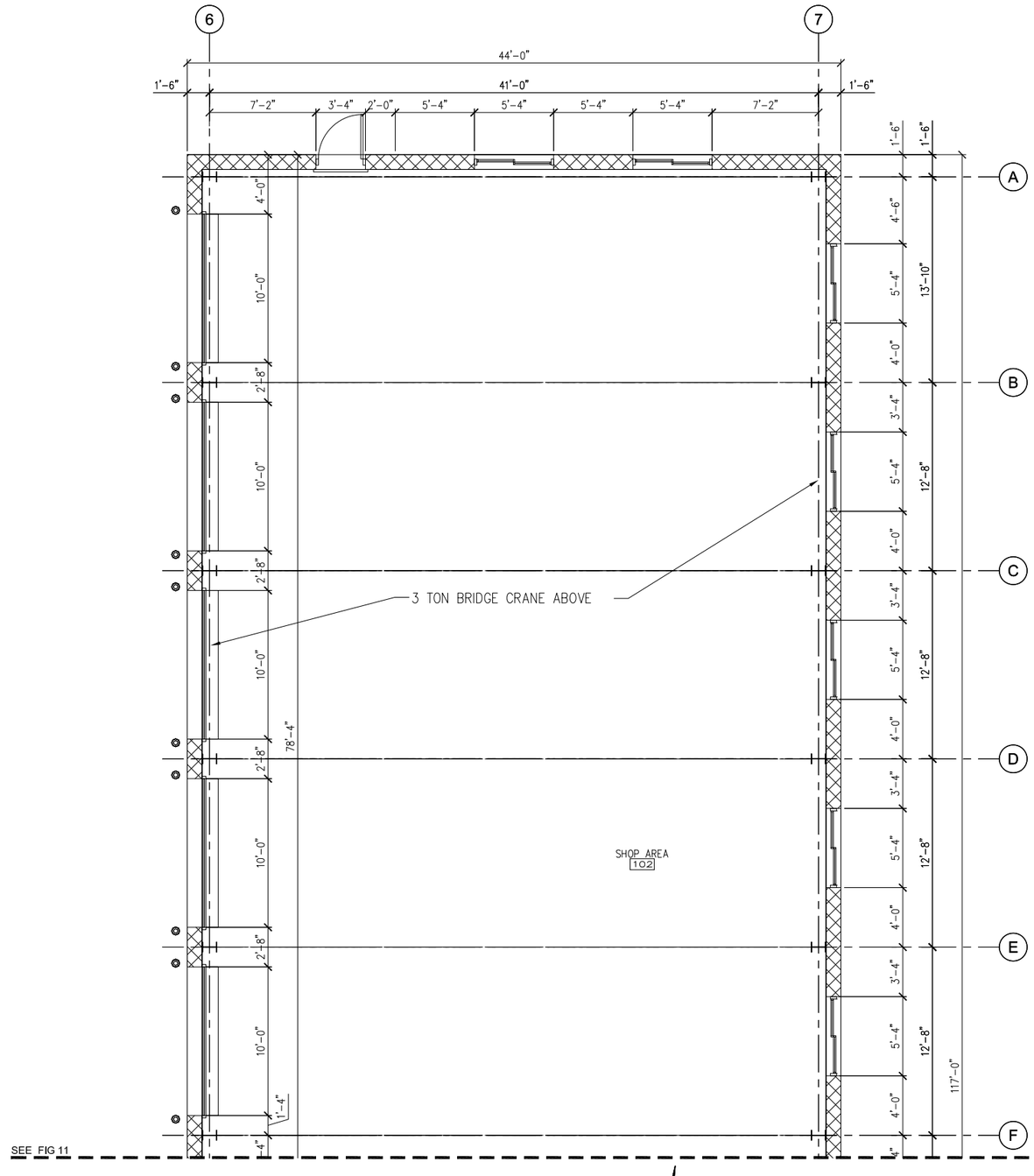
DESIGN DRAWINGS – NOT FOR CONSTRUCTION

VERIFY SCALE

BAR IS ONE INCH ON ORIGINAL DRAWING (0 — 1)

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

VEHICLE MAINTENACE	
SHOP AREA	4,594 SF NET
WORK AREA	1,790 SF NET
OFFICE	166 SF NET
SHOP STORAGE	97 SF NET
RESTROOM	73 SF NET
CLOSET	13 SF NET
TOTAL NET AREA	6,733 SF NET
TOTALGROSS AREA	7,262 SF GROSS



FLOOR PLAN B

SCALE: 1/4" = 1'-0"
VEHICLE MAINTENANCE
PARTIAL FLOOR PLAN

SCALE IN FEET 2 0 2 4 6 8 10 — ¼" = 1'-0"

REVISED DESCRIPTION	DATE

SCALE: 1/4"=1'-0"
CHK BY: X
DRW BY: JVL
REF: X

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VEHICLE & MAINTENANCE SHOP
FLOOR PLAN B

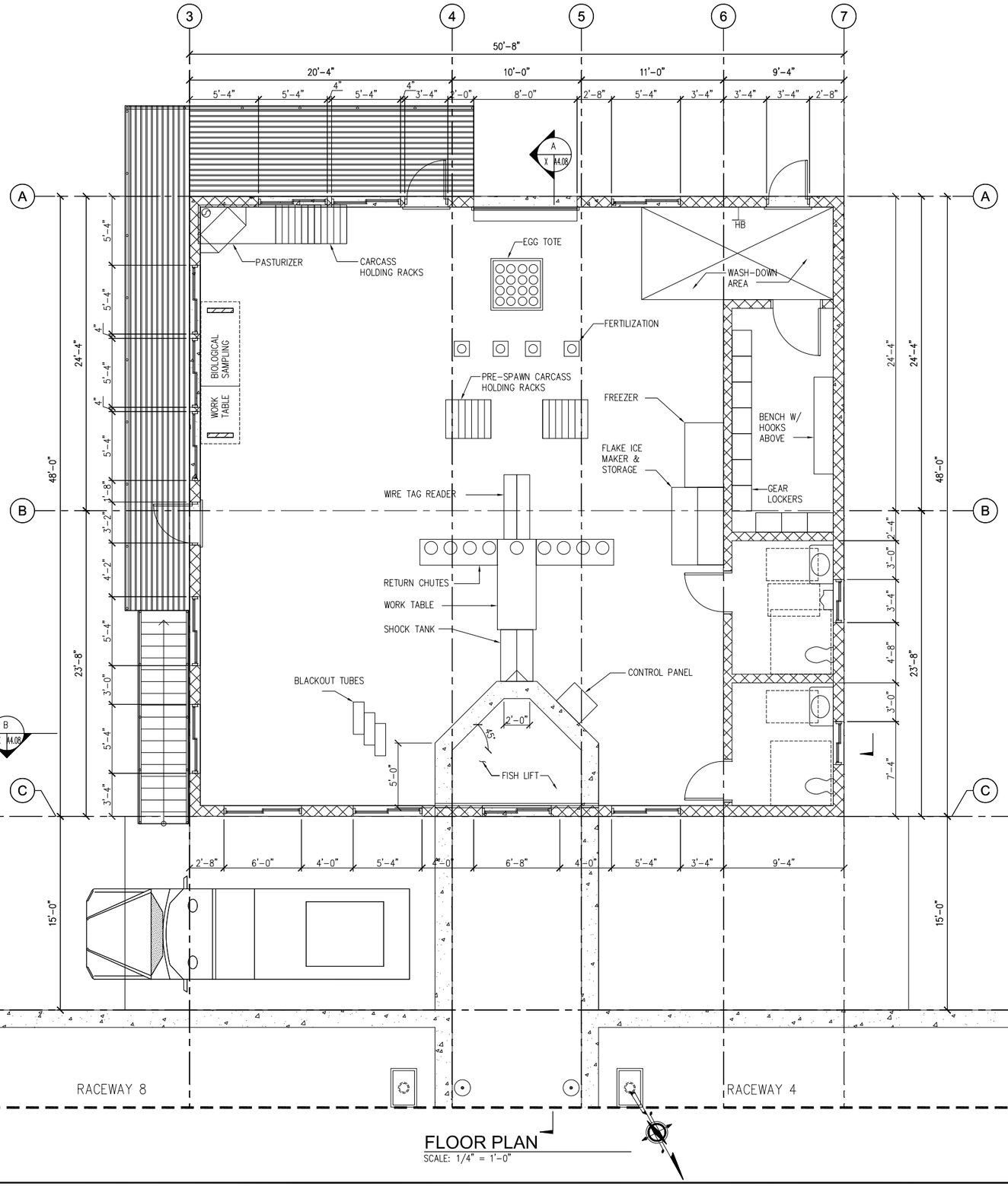
JOB NO. 08038.01
DATE: 10.29.10
SHEET: X OF X
DWG.# FIG 12

DESIGN DRAWINGS – NOT FOR CONSTRUCTION

VERIFY SCALE

BAR IS ONE INCH ON ORIGINAL DRAWING (0 — 1)

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY



FLOOR PLAN

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

SCALE IN FEET 2 0 2 4 6 8 10 — ¼" = 1'-0"

ADULT CAPTURE LEVEL 1

SORTING & SPAWNING	1,942 SF NET
MUD ROOM	139 SF NET
MENS RESTROOM	79 SF NET
WOMANS RESTROOM	74 SF NET
TOTAL NET AREA	2,234 SF NET
TOTAL GROSS AREA	2,432 SF GROSS

SCALE: 1/4"=1'-0" | CHK BY: X | DRW BY: X | REF: X

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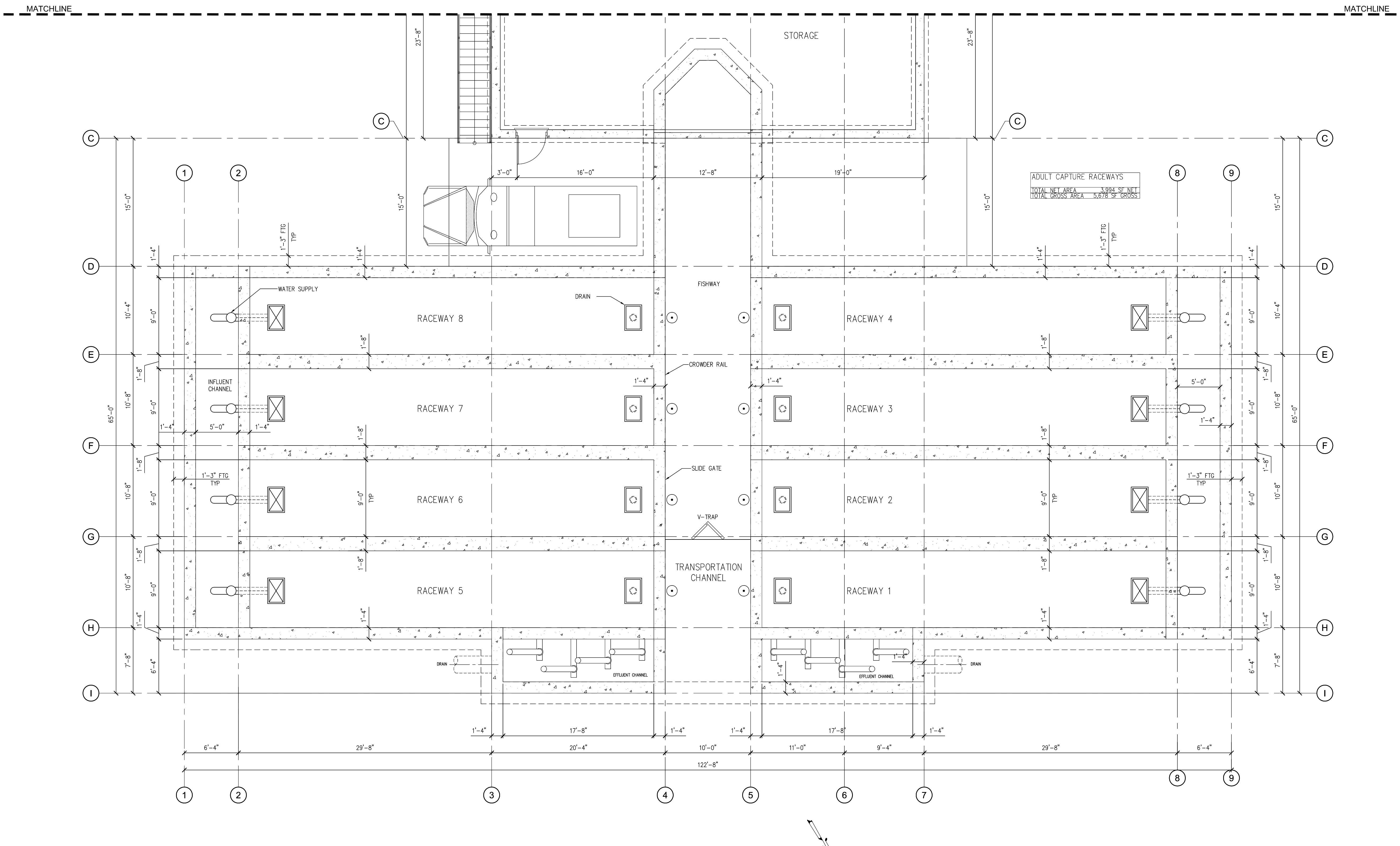
SORTING & SPANNING BUILDING
FLOOR PLAN

JOB NO. 08038.01
DATE: 10.29.10
SHEET: X OF X
DWG.# FIG 13

DESIGN DRAWINGS – NOT FOR CONSTRUCTION

VERIFY SCALE	
BAR IS ONE INCH ON ORIGINAL DRAWING 0 1	IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY



FOUNDATION PLAN

SCALE: 3/16" = 1'-0"

SCALE:	3/16"=1'-0"
CHK BY:	X
DRW BY:	JVL
REF:	X

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ADULT CAPTURE
RACEWAY FOUNDATION PLAN

JOB NO.	08038.01
DATE:	10.29.10
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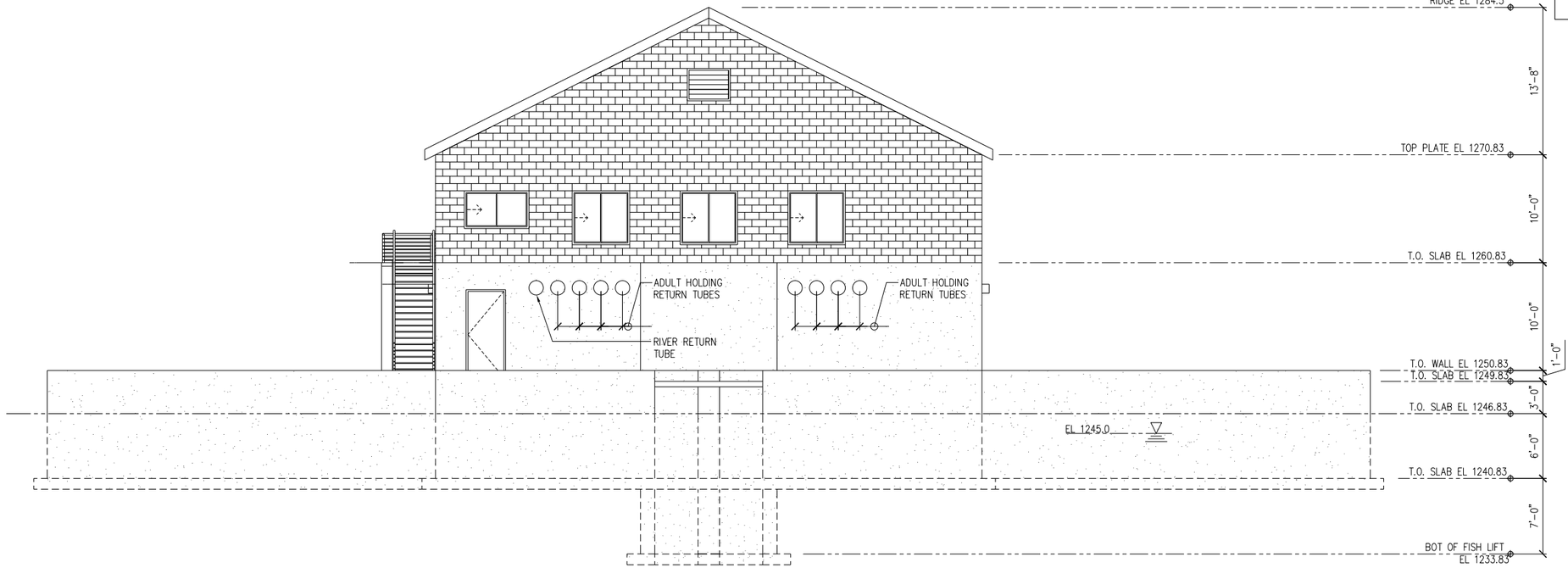
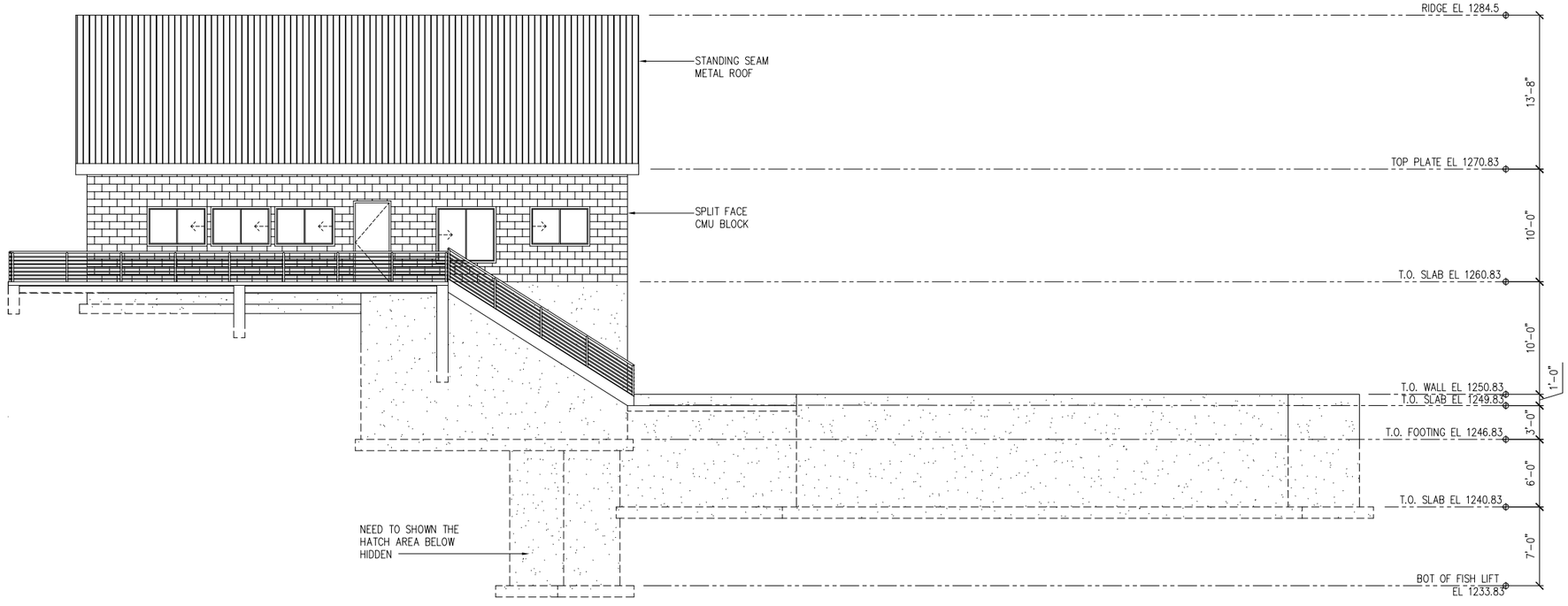
DWG.#	FIG 14

DESIGN DRAWINGS – NOT FOR CONSTRUCTION



NORTH ELEVATION
SCALE: 3/16" = 1'-0"



EAST ELEVATION
SCALE: 3/16" = 1'-0"

2 0 2 4 6 8 10 12 14
SCALE IN FEET 3/16" = 1'-0"

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

SCALE: 3/16"=1'-0"
CHK BY: X
DRW BY: JVL
REF: X

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ADULT CAPTURE ELEVATIONS

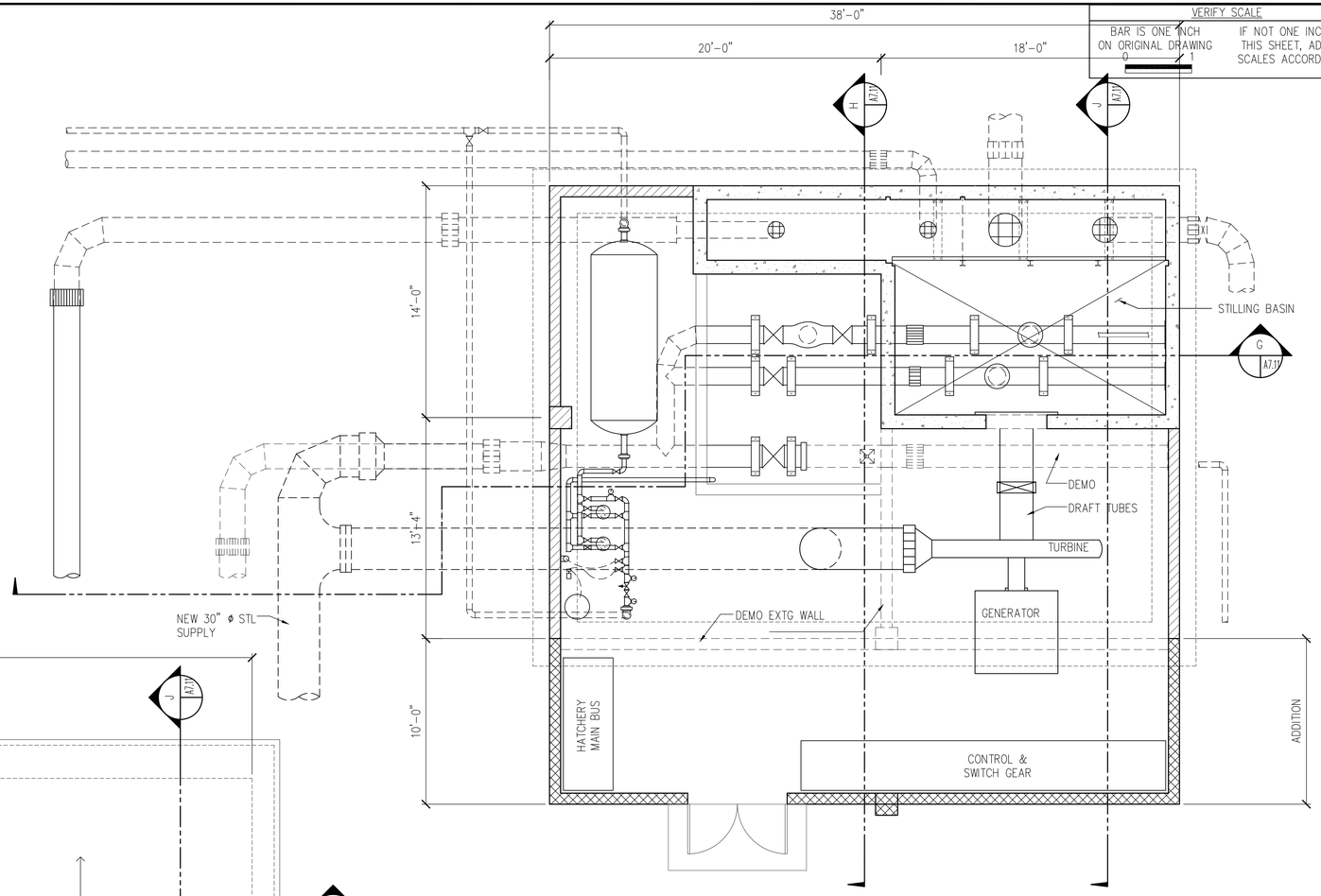
JOB NO. 08038.01
DATE: 10.29.10
SHEET: X OF X
DWG.# FIG 15

DESIGN DRAWINGS – NOT FOR CONSTRUCTION

VERIFY SCALE

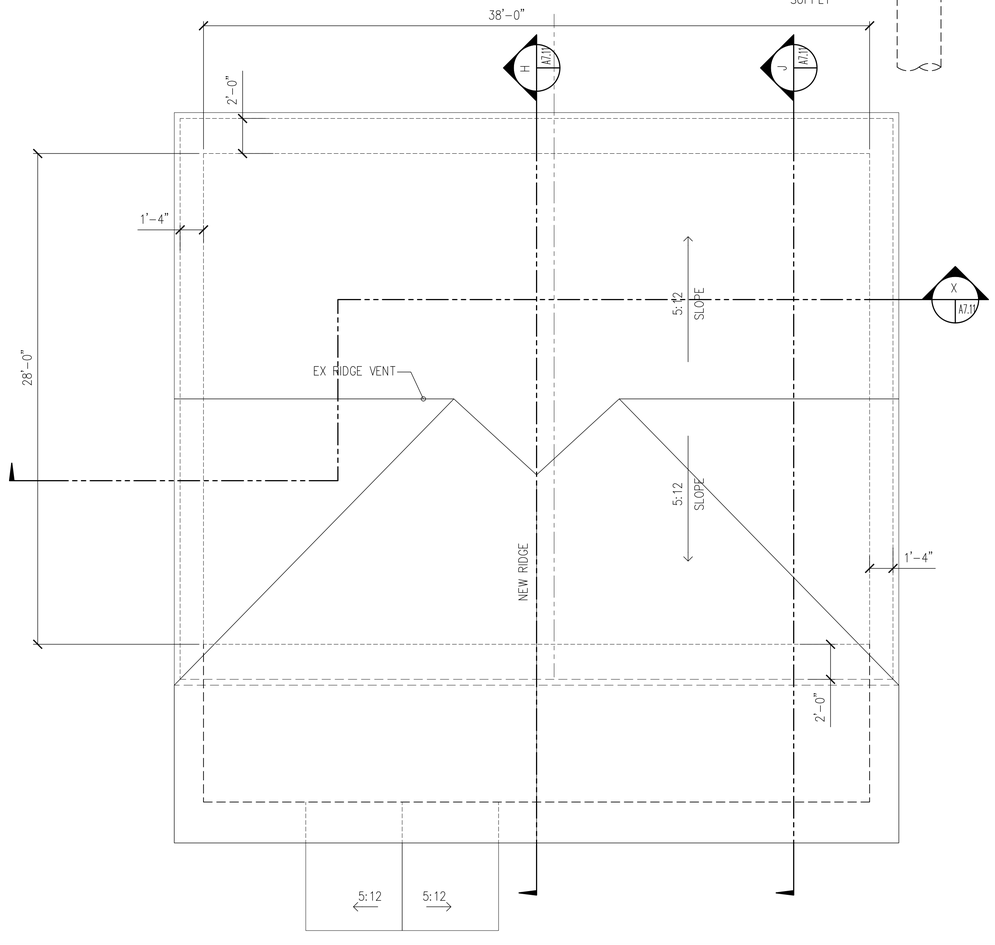
BAR IS ONE INCH ON ORIGINAL DRAWING (0 — 1)

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY



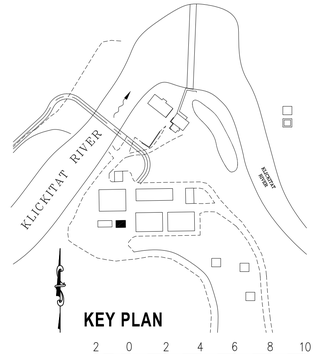
FLOOR PLAN

SCALE: 1/4" = 1'-0"
ENERGY DISIPATION BUILDING



ROOF PLAN

SCALE: 1/4" = 1'-0"
ENERGY DISIPATION BUILDING



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SCALE: X
CHK BY: X
DRW BY: CP
REF: X

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KLICKITAT HATCHERY REDEVELOPMENT
YAKAMA KLICKITAT FISHERIES PROGRAM

ENERGY DISSIPATIUON BUILDING
FLOOR PLAN & ROOF PLAN

JOB NO.	08038.01
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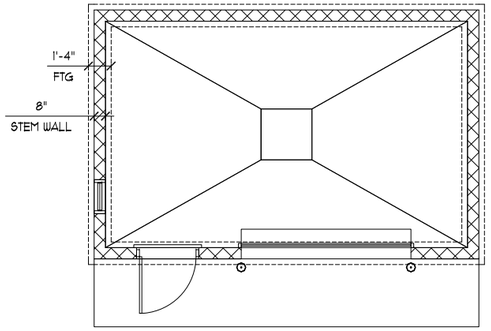
SHEET:	X OF X
DWG.#	FIG 16

DESIGN DRAWINGS – NOT FOR CONSTRUCTION

VERIFY SCALE

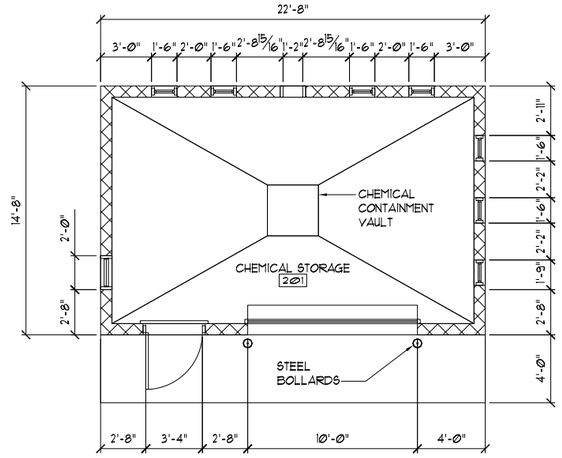
BAR IS ONE INCH ON ORIGINAL DRAWING

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY



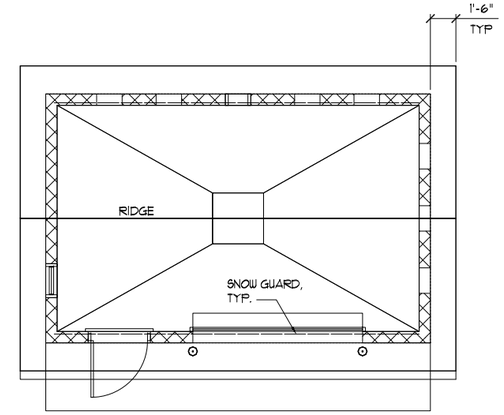
FOUNDATION PLAN

SCALE: 1/4" = 1'-Ø"



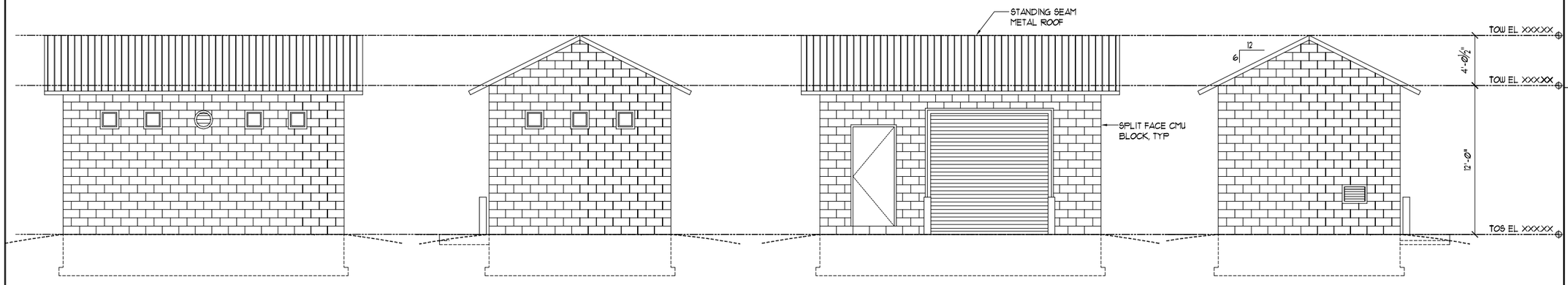
FLOOR PLAN

SCALE: 1/4" = 1'-Ø"



ROOF PLAN

SCALE: 1/4" = 1'-Ø"



NORTH ELEVATION

SCALE: 1/4" = 1'-Ø"

EAST ELEVATION

SCALE: 1/4" = 1'-Ø"

SOUTH ELEVATION

SCALE: 1/4" = 1'-Ø"

WEST ELEVATION

SCALE: 1/4" = 1'-Ø"

REVISED	DESCRIPTION	DATE

SCALE: 1/4"=1'-Ø"
CHK BY: X
DRW BY: JVL
REF: X

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KLICKITAT HATCHERY REDEVELOPMENT
YAKAMA KLICKITAT FISHERIES PROGRAM

CHEMICAL STORAGE BUILDING
PLANS AND ELEVATIONS

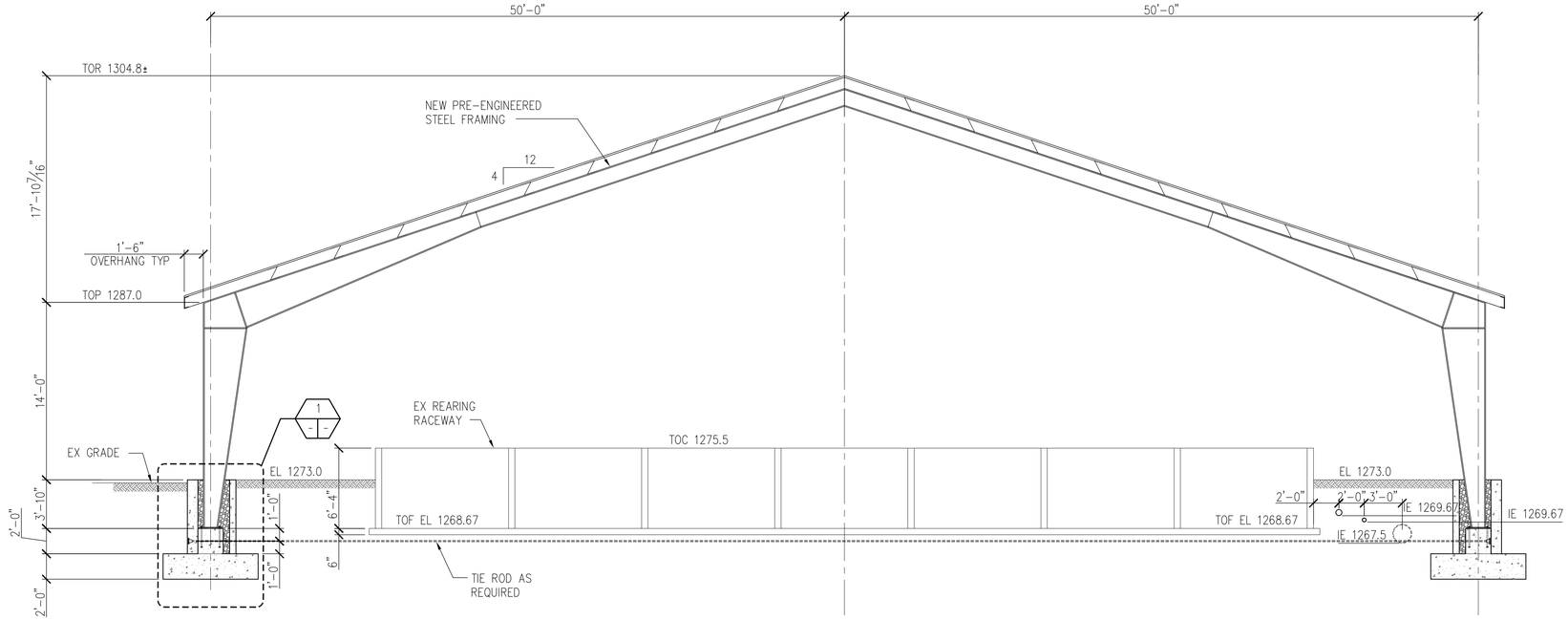
JOB NO. 08038.01
DATE: 10.29.10
SHEET: X OF X
DWG.# FIG 17

DESIGN DRAWINGS - NOT FOR CONSTRUCTION

VERIFY SCALE

BAR IS ONE INCH ON ORIGINAL DRAWING (0 — 1)

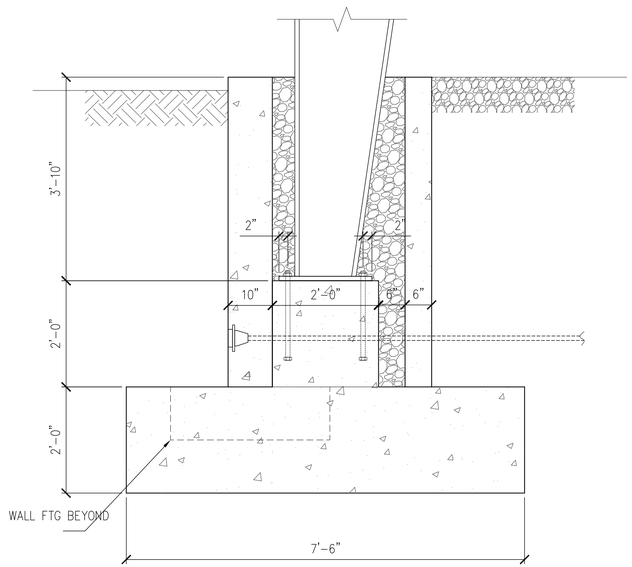
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY



SECTION

SCALE: 3/16" = 1'-0"

A (A14.01/A14.02)

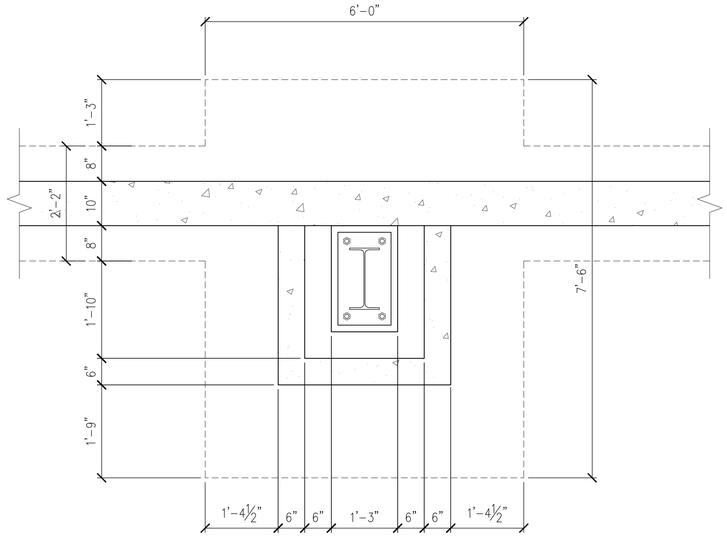


DETAIL

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

NEW WALL/FTG ASSEMBLY

1

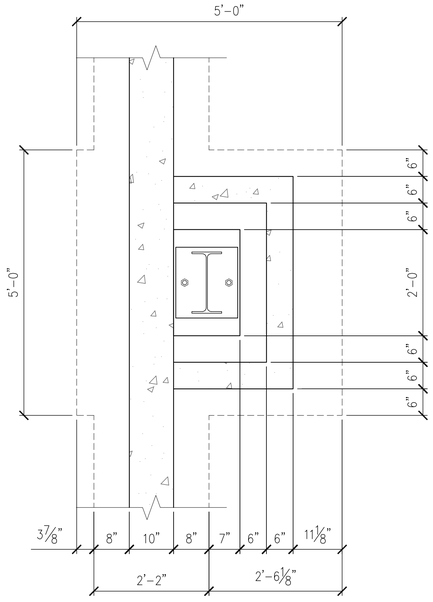


PLAN VIEW

DETAIL

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

2



PLAN VIEW

DETAIL

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

3

2 0 2 4 6 8 10 12 14
SCALE IN FEET 3/16" = 1'-0"

1 0 1 2 3
SCALE IN FEET 3/4" = 1'-0"

REVISED	DATE

SCALE: AS SHOWN
CHK BY: X
DRW BY: JVL
REF: X

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KLICKITAT HATCHERY REDEVELOPMENT
YAKAMA KLICKITAT FISHERIES PROGRAM

REARING RACEWAY
SECTION AND DETAIL

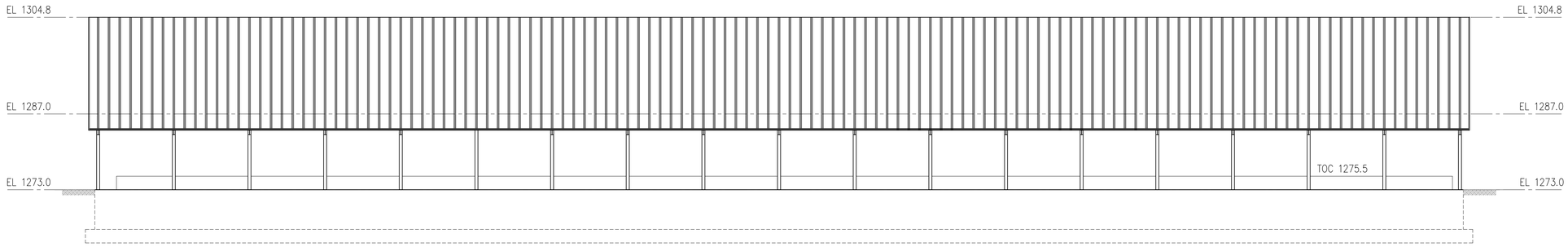
JOB NO. 08038.01
DATE: 10.29.10
SHEET: X OF X
DWG.# FIG 18

DESIGN DRAWINGS — NOT FOR CONSTRUCTION

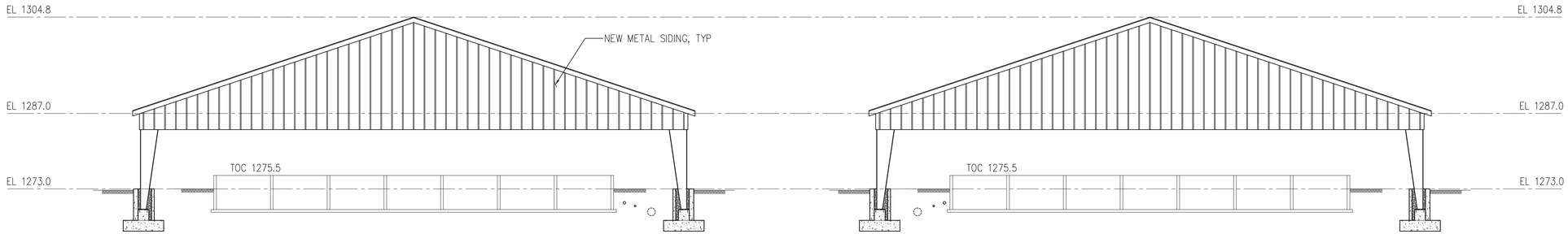
VERIFY SCALE

BAR IS ONE INCH ON ORIGINAL DRAWING (0 — 1)

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

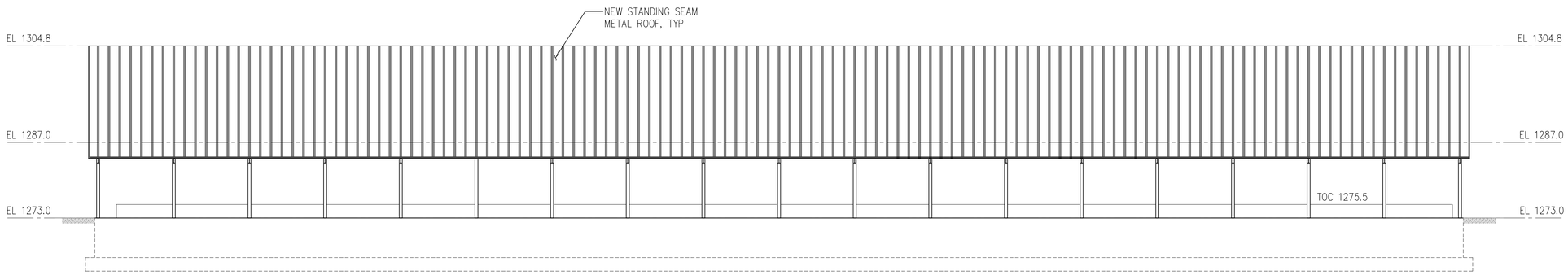


NORTH ELEVATION (X / X)
SCALE: 3/32" = 1'-0"



WEST ELEVATION (X / X)
SCALE: 3/32" = 1'-0"

EAST ELEVATION (X / X)
SCALE: 3/32" = 1'-0"



SOUTH ELEVATION (X / X)
SCALE: 3/32" = 1'-0"

REVISED

DATE	DESCRIPTION

SCALE: 3/32" = 1'-0"
CHK BY: X
DRW BY: JWL
REF: X

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REARING RACEWAY
ELEVATIONS

JOB NO. 08038.01
DATE: 10.29.10
SHEET: X OF X
DWG.# FIG 19

DESIGN DRAWINGS – NOT FOR CONSTRUCTION

VERIFY SCALE

BAR IS ONE INCH ON ORIGINAL DRAWING 0 1

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

KLICKITAT RIVER FLOW

1210

1220

1230

1240

CONCRETE REARING POND ACCESS ROAD

90'-0"

CONCRETE REARING POND REFER S15.01

FIN GRADE EL 1240.0

FIN GRADE EL 1240.0

42'-0"

POND A

POND B

FIN GRADE EL 1240.0

TOW EL 1243.50

FIN GRADE EL 1240.0

12'-0"

POND C

POND D

40'-0"

CONC TAGGING TRAILER PAD

EXIST POND TO BE FILLED

REARING POND GROUP C ALTERNATE

TO HATCHERY

OVERALL PLAN

SCALE: 1" = 10'

10 0 10 20

SCALE IN FEET 1" = 10'

SCALE: 1:40

CHK BY: MC

DRW BY: JVL

REF: X

REVISED DESCRIPTION	DATE

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CONCRETE REARING PONDS

OVERALL PLAN

JOB NO. 08038.01

DATE: 10.29.10

SHEET: X OF X

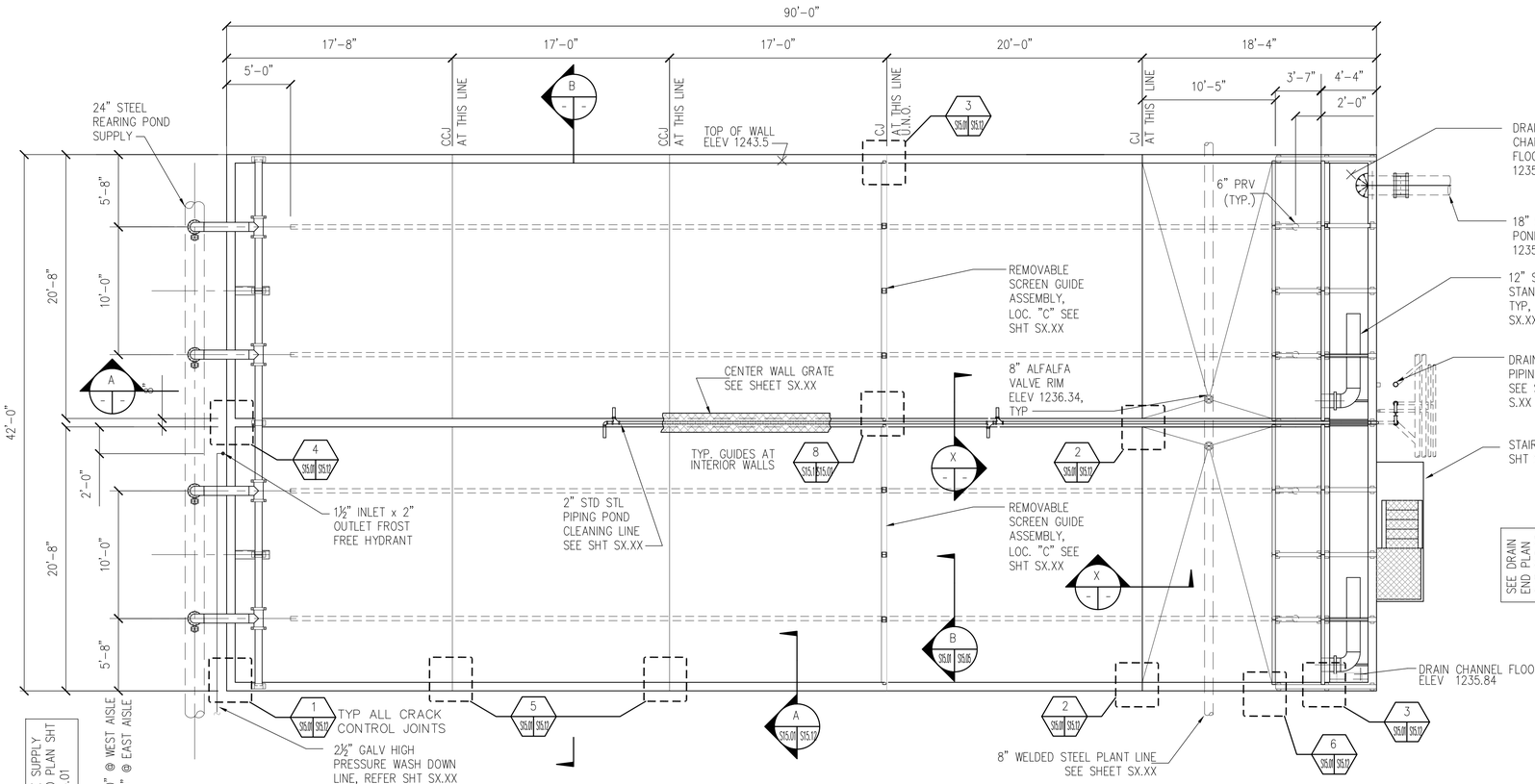
DWG.# FIG 20

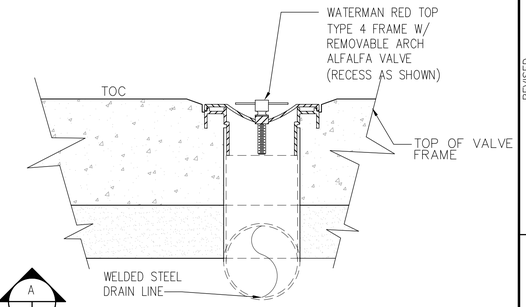
DESIGN DRAWINGS – NOT FOR CONSTRUCTION

VERIFY SCALE

BAR IS ONE INCH ON ORIGINAL DRAWING (0 — 1)

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY





DETAIL

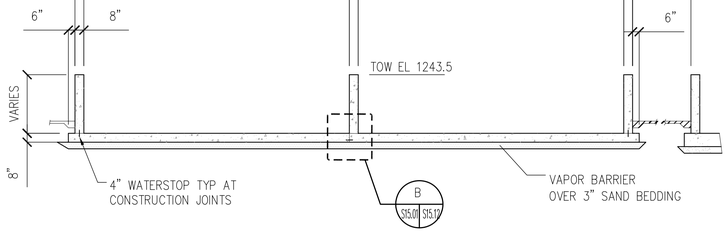
SCALE: 1 1/2" = 1'-0"

NOTE:
THE FOLLOWING ITEMS ARE NOT SHOWN FOR CLARITY:

1.	POND FENCING	SEE SHT SX.XX
2.	GRATING AND GRATING SUPPORTS	SEE SHT SX.XX
3.	CLEANING WATER PIPING	SEE SHT SX.XX

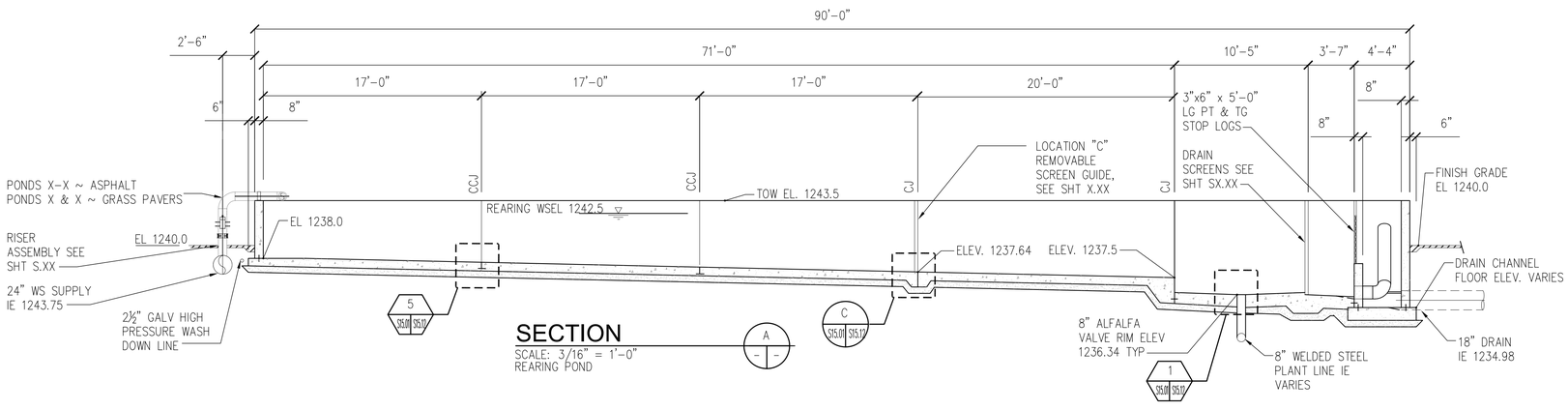
PLAN

SCALE: 3/16" = 1'-0"
REARING POND



SECTION

SCALE: 3/16" = 1'-0"
REARING POND



SECTION

SCALE: 3/16" = 1'-0"
REARING POND

SCALE IN FEET 1 9 6 3 0 1 — 1½" = 1'-0"

SCALE IN FEET 2 0 2 4 6 8 10 12 14 — 3/16" = 1'-0"

REVISED DESCRIPTION	DATE

SCALE: X | CHK BY: X | DRW BY: JWL | REF: X

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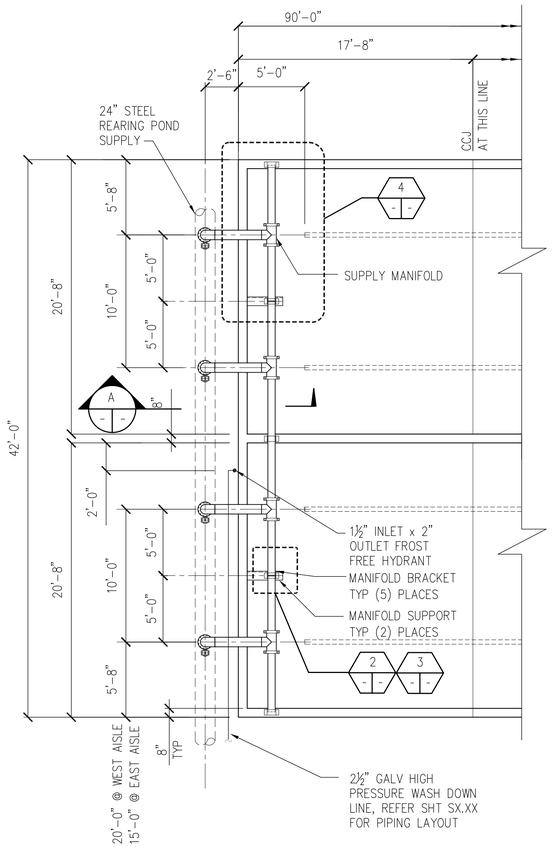
YAKAMA KLICKITAT FISHERIES PROGRAM

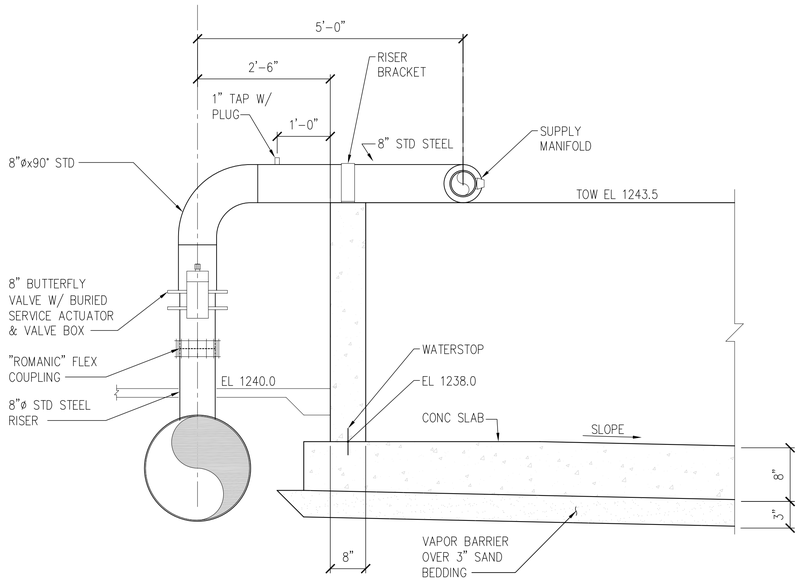
CONCRETE REARING PONDS
PLANS AND SECTIONS

JOB NO.	08038.01
DATE:	10.29.10
SHEET:	X OF X
DWG.#	FIG 21

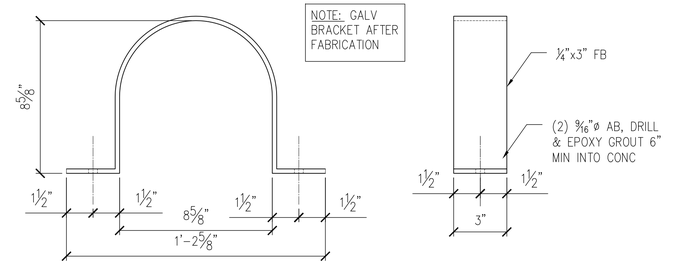
DESIGN DRAWINGS – NOT FOR CONSTRUCTION



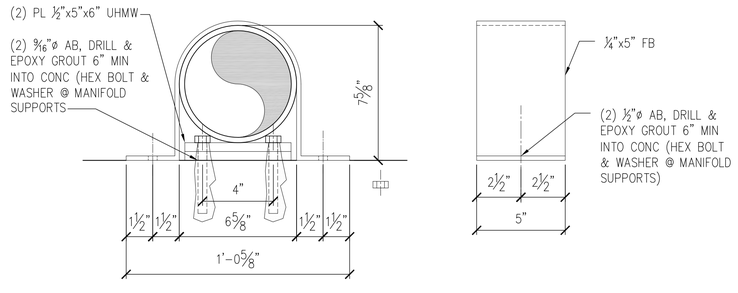
PLAN
SCALE: 3/16" = 1'-0"
SUPPLY END



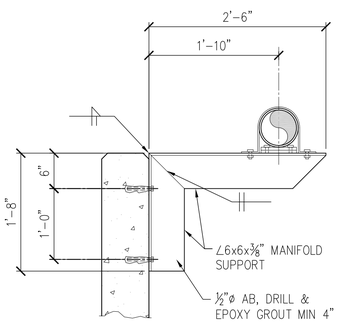
SECTION
SCALE: 3/4" = 1'-0"
RISER



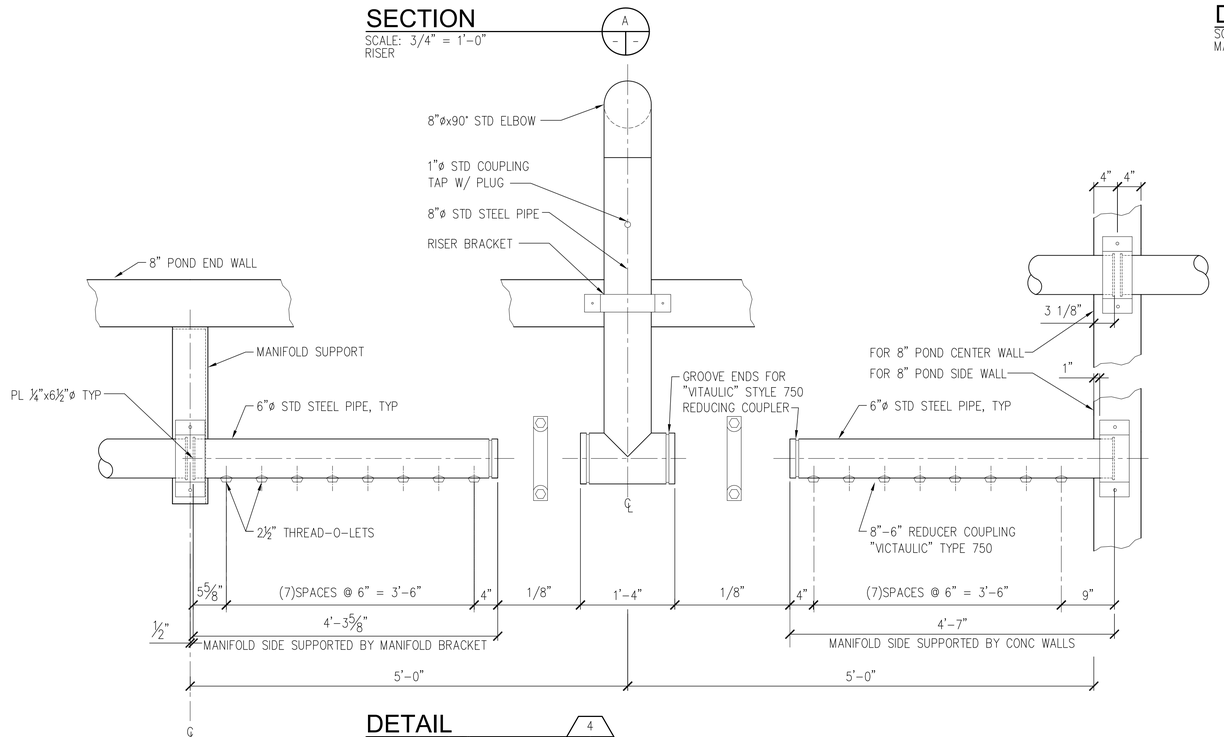
DETAIL
SCALE: 3" = 1'-0"
RISER BRACKET



DETAIL
SCALE: 3" = 1'-0"
MANIFOLD BRACKET



DETAIL
SCALE: 1" = 1'-0"
MANIFOLD SUPPORT



DETAIL
SCALE: 1" = 1'-0"
SUPPLY MANIFOLD

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

DETAIL
SCALE: 3" = 1'-0"
MANIFOLD BRACKET

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

SCALE: X
CHK BY: X
DRW BY: JWL
REF: X

REVISED
DESCRIPTION
DATE

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CONCRETE REARING PONDS
SUPPLY END PLAN, SECTION & DETAILS

DESIGN DRAWINGS – NOT FOR CONSTRUCTION

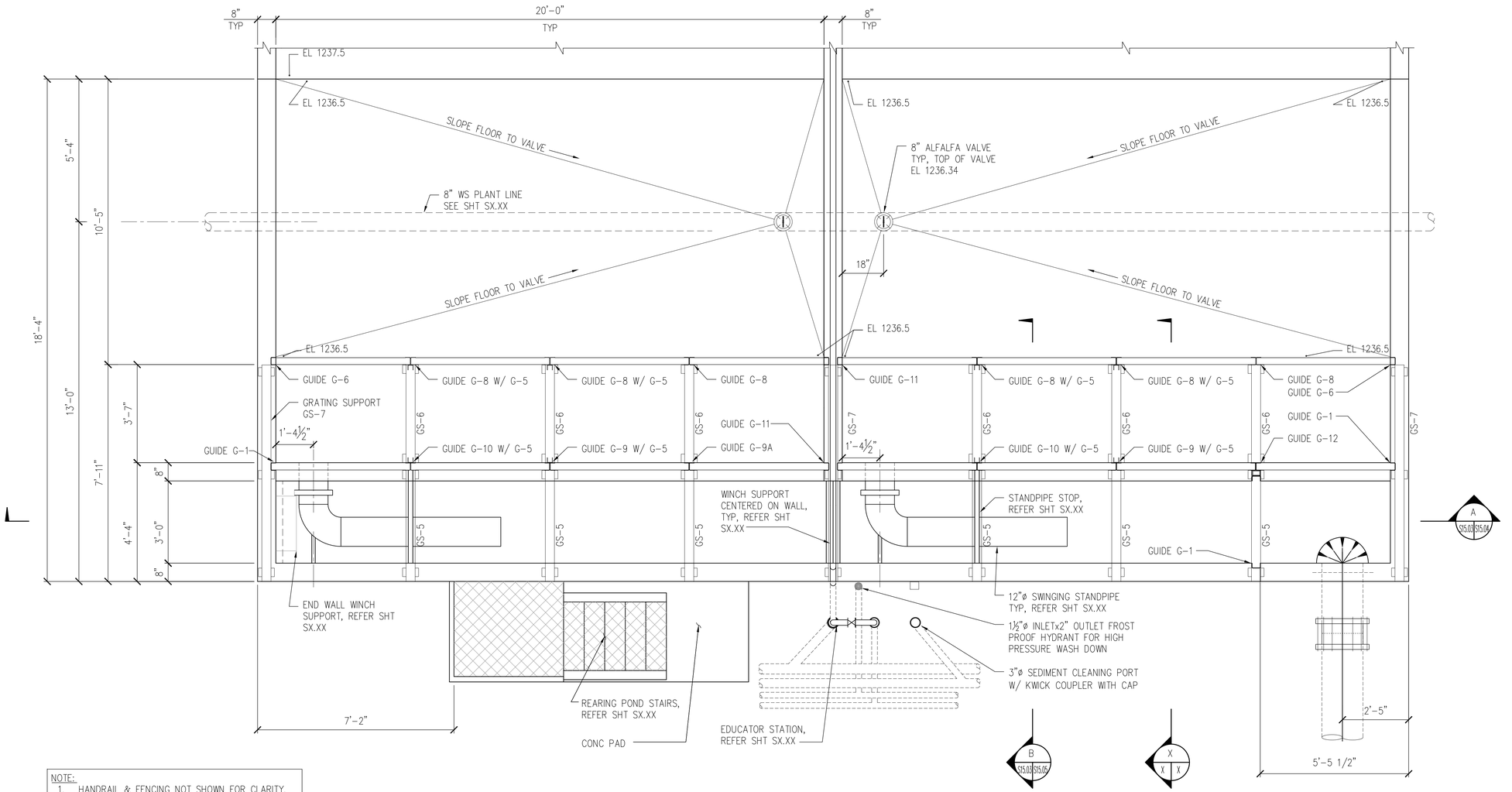
SCALE IN FEET 0 3 6 1 — 3" = 1'-0"
SCALE IN FEET 1 0 1 2 — 1" = 1'-0"
SCALE IN FEET 1 0 1 2 3 — ¾" = 1'-0"
SCALE IN FEET 2 0 2 4 6 8 10 12 14 — 3/16" = 1'-0"

JOB NO. 08038.01
DATE: 10.29.10
SHEET: X OF X
DWG.# FIG 22

VERIFY SCALE

BAR IS ONE INCH ON ORIGINAL DRAWING 0 1

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY



NOTE:

1. HANDRAIL & FENCING NOT SHOWN FOR CLARITY, REFER SX.XX
2. GRATING NOT SHOWN FOR CLARITY, REFER SX.XX
3. UNDERGROUND PIPING NOT SHOWN, REFER SX.XX
4. FOR GUIDE AND GRATING SUPPORT DETAILS REFER S15.06.
5. GUIDES WITH THE SAME DESIGNATIONS MAY HAVE DIFFERENT LENGTHS.

PLAN

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

1 0 1 2 3 4 5
SCALE IN FEET ½" = 1'-0"

SCALE: X | CHK BY: X | DRW BY: X | REF: X

REVISED DESCRIPTION	DATE

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YAKAMA KLICKITAT FISHERIES PROGRAM

CONCRETE REARING PONDS
DRAIN END PLAN

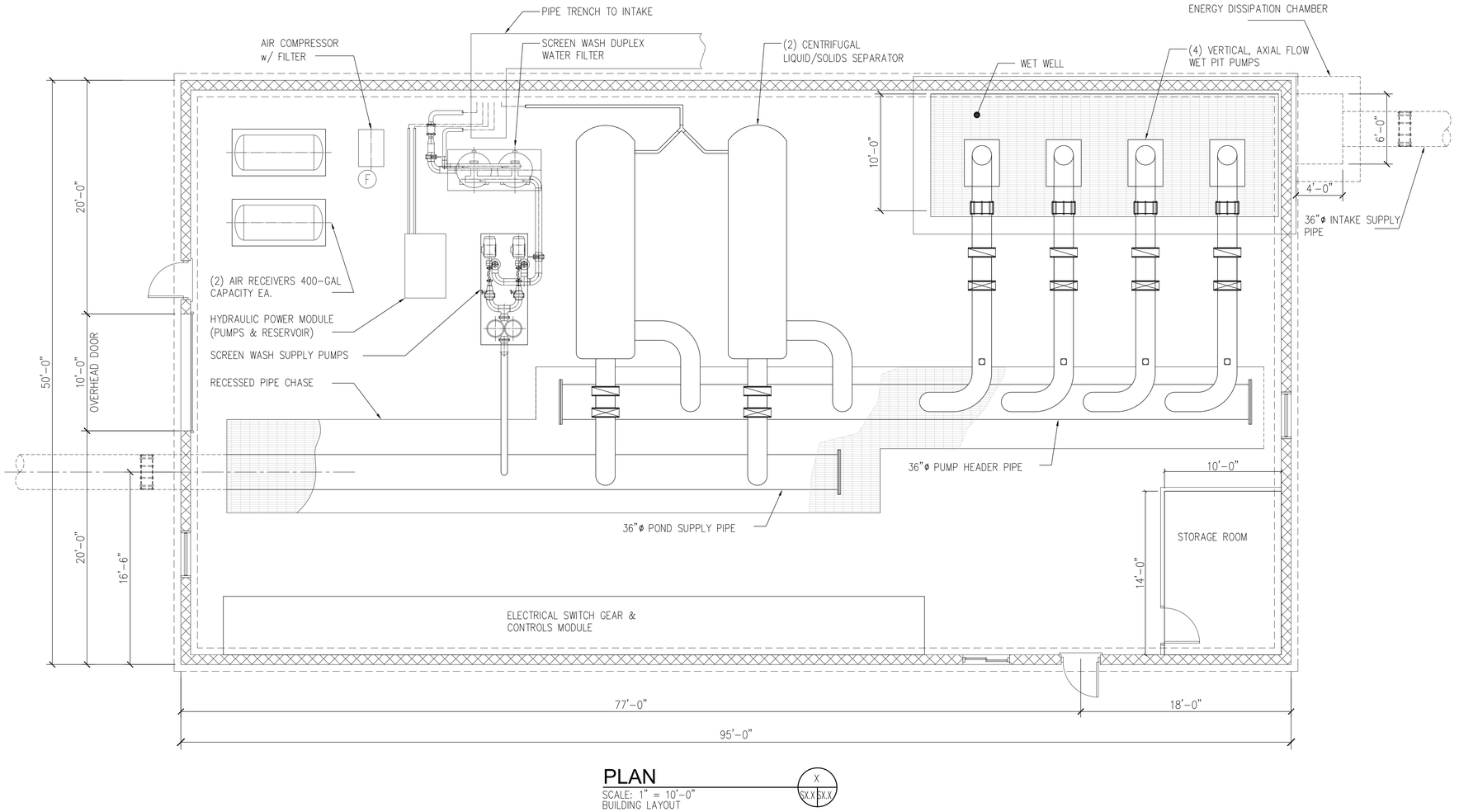
JOB NO. 08038.01
DATE: 10.29.10
SHEET: X OF X
DWG.# FIG 23

DESIGN DRAWINGS – NOT FOR CONSTRUCTION

VERIFY SCALE

BAR IS ONE INCH ON ORIGINAL DRAWING (0 — 1)

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY



PLAN

SCALE: 1" = 10'-0"

BUILDING LAYOUT

X

SX.X SX.X

SCALE: AS SHOWN

CHK BY: X

DRW BY: BA

REF: X

REVISED	DATE
DESCRIPTION	

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KLICKITAT HATCHERY REDEVELOPMENT

YAKAMA KLICKITAT FISHERIES PROGRAM

WATER DISTRIBUTION BUILDING LAYOUT PLAN

JOB NO. 08038.01

DATE: 10.29.10

SHEET: X OF X

DWG.# FIG 24

DESIGN DRAWINGS — NOT FOR CONSTRUCTION