Amon Creek Fish Passage
Amon Creek, Tributary to Yakima River
Richland, Washington, Benton County

Biological Assessment for ESA Listed Species
Upper Columbia River Spring Chinook
Upper Columbia River Steelhead
Middle Columbia River Steelhead
Ute Ladies Tresses
Bald Eagle
Bull Trout
Pygmy Rabbit
Umtanum wild buckwheat (Candidate)

Essential Fish Habitat Assessment for Above Project
Chinook and Coho Salmon

Amon Creek immediately down stream of the Meadow Springs Country Club, Richland, Washington

August 2003

Executive Summary

Meadow Springs Country Club, an 18-hole private golf course, in Richland, Washington, proposes to restore fish passage and fish habitat on the West Fork (WF) Amon Creek, a tributary to the Main Fork (MF) Amon Creek, which is a tributary to the Yakima River.

The private golf course was built in 1970. During golf course construction the entire WF Amon Creek (on the golf course only) was modified for irrigation purposes. The golf course required 700,000 gallons for peak withdrawal. The WF channel was converted into a reservoir to meet the irrigation demand. The EF Amon Creek was left intact. The golf course placed a stop log weir on the WF (figure 1) in order to establish a withdrawal point. This action blocked adult and juvenile fish passage, except during extreme high water events. The golf course modified the reservoir further by crossing it with tees and fairways, which created four cells or ponds (see color schematic). Each crossing required fill and each fill represented an elevation drop between cells. Culverts were used for stream conveyance under the fairways and tees.

The habitat conditions worsened in June 1998 when a main Kennewick Irrigation Distrct (KID) canal collapsed in the upper WF watershed resulting in a massive amount of water flowing down the WF. The reservoir and the golf course performed as a floodplain should, resulting in a high amount of sediment deposition. Despite the wetlands above the golf course, the upper two cells in the reservoir filled (up to 4 ft) with sediment. The WF system eventually stabilized, but the depth in the upper two cells of the modified reservoir remained at 12 to 18 inches, thus creating a temperature barrier during hot summer days.

Chinook and coho salmon utilize the MF Amon Creek currently for spawning and rearing. Steelhead have never been sampled or observed, but quality steelhead habitat exists throughout the Amon Creek drainage. In 2001, the Washington Department of Fish & Wildlife (WDFW) staff observed adult coho on the MF Amon Creek wanting to pass further upstream for spawning but were unable to because of the fish passage barrier at the confluence of the WF and EF.

Meadow Spring Country Club secured partnerships and funding for the project. The partners include, Benton Conservation District, WDFW, and the Tapteal Greenway Association. Each partner is contributing cash or in-kind services. Meadow Springs obtained grants from WDFW's SHEAR program (fish passage) and United States Fish & Wildlife Service (USFWS) FRIMA (Fisheries Restoration and Irrigation Mitigation Act (PL. 106-502) funds.

The federal funds combined with the potential presence of Mid Columbia River Steelhead and the associated critical habitat in Amon Creek trigger federal consultation. This Biological Assessment (BA) is intended to provide the information required to comply with the 1973 federal Endangered Species Act (ESA) Section 7 (c), consultation requirements.

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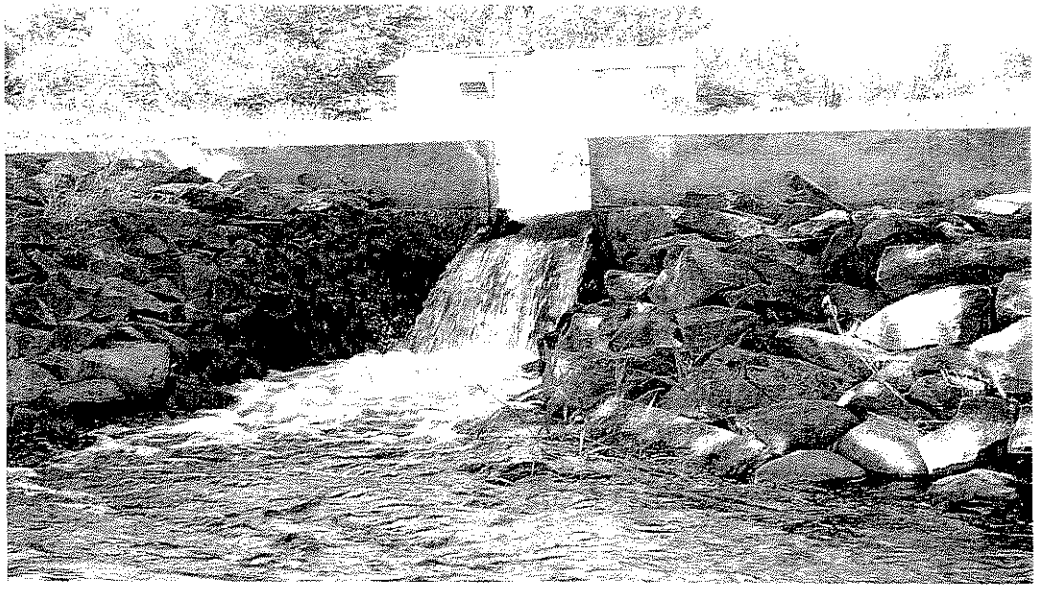

Figure 1. Existing fish barrier at West Fork Amon Creek confluence with the East Fork Amon Creek.

Description of Proposed Action

The Meadow Spring Country Club fish passage project involves four major fish enhancement components to the project: **1.** Construction of two small fish ladders; **2.** Restore over 230 feet of stream habitat by culvert removal and stream reconstruction; **3.** Improve water quality by deepening two small in-stream wetlands that were filled during a major irrigation canal break in 1998; and **4.** Construct in-stream structures such as, large woody debris piles and large boulders, in the Main Fork Amon to improve stream habitat.

The primary benefits from the project:

- Improve or restore over 1,100 m of in-stream salmonid spawning habitat.
- Restore fish passage to 2,500 m of high quality salmonid rearing habitat on the WF Amon
- Improve water quality on the lower WF Amon Creek and the MF Amon Creek.
- Restore flood plain functions on the WF Amon Creek.
- Restore near shore and riparian habitat on 3 acres of wetland and along 150 m of stream.

Meadow Springs Country Club proposes to restore natural stream and wetland functions in West Fork (WF) Amon Creek by constructing two small fish ladders, replace a series of damaged undersized culverts, build natural in-stream structures, and improve water quality by deepening the riverine wetlands that are operated as an irrigation reservoir. Coho, Chinook, and Steelhead are the primary benefactors.

Listed Species

Communication with the U. S Army Corps of Engineers (COE) informed the project proponents the need to complete a Biological Assessment due the federal funding nexus and the potential presence of federally listed species. For the project area, we requested subsequently information on federal Threatened and Endangered (T&E) species, the State of Washington Natural Heritage Information System for information on significant natural features, and the State of Washington Department of Ecology for wetland issues. All these communications are included in Appendix C of this report. The respective responses are included in Appendix C also.

An endangered species listing for this project was received August 26, 2003 from the United States Fish & Wildlife Service (USFWS) with a reference number of 03-SP-W0346. The letter indicated the following species might be present in the vicinity of the project area.

Species	Status
Bald Eagle (Haliaeetus leucocephalus)	Threatened
Bull Trout (Salvelinus confluentus)	Threatened
Pygmy Rabbit (Brachylagus idahonesis) Columbia Basin Type	Endangered
Ute ladies'-tresses (Spiranthes diluvialis), plant	Threatened

Table 1.

The National Oceanic and Atmospheric Administration (NOAA) Fisheries lists the following species that might be present in the vicinity of the project area.

Species	Status
Upper Columbia River Chinook - Spring Chinook (Oncorhynchus tshawytscha)	Endangered
Upper Columbia River Steelhead (Oncorhynchus mykiss)	Endangered
Middle Columbia River Steelhead (Oncorhynchus mykiss)	Threatened

Table 2.

This report covers all the proposed action. Projects are listed below, starting from the lower parts of the stream moving upstream.

Construction Equipment

The types of construction equipment to be utilized on the removal of existing culverts, dredging Cells 16 and 17, excavation of the stream restoration area include but are not limited to medium to large track hoes, loaders, and dump trucks. Pick up trucks hauling different construction materials can be expected.

Associated Conservation Measures
Erosion Control will be required as a part of the WDFW Hydraulics Project Approval (HPA) to help reduce sediment near the riparian zones or mitigate any deleterious material spills. The HPA also requires daily equipment checks for petroleum or hydraulic fluid leaks. No stream crossings will occur.

Table 3.

	2003	2004	2004	2004
	Dec	Jan	Feb	Mar
Task				
Mobilize				
Site Prep				
Cell 16 Inlet				
Dredge Cell 16				
Dredge Cell 17				
Stream Simulation Construction between Cells 16 & 17				
Small Culvert Removal				
Upper Fish Ladder				
Lower Fish Ladder				
In-stream Structures				
Planting				
Finish				

Construction Schedule

In-stream structures: All in-stream structures will be placed in the MF Amon Creek, below the EF and WF confluence. We will follow installation guidelines described in the Integrated Streambank Protection Guidelines published by the Washington State Aquatic Habitat Guidelines Program in 2003. One structure is proposed for every four to six stream widths. A total of 35 structures are funded. The structures consist of LWD piles and boulder placement.

Boulders
Boulder sizes are determined by the expected 100-year flood event. Sizes will range from two to four feet across. Assuming one-half of the total number of in-stream structures will be boulders, we plan on placing 17 large boulders directly in the stream's wetted perimeter. Boulders will be placed by a suspended boom, or large back hoe bucket. There is no excavation planned. Most of the stream bed material is 1.5 to 3.0 inch gravel/cobble or a sand and small cobble mix. Small areas of bedrock exist, but we will avoid boulder placement on bedrock, as well as important in-stream aquatic plant communities.

Stream side access for placement is not difficult. A standard size back hoe can extend its boom over the existing riparian zone to minimize riparian zone impacts. As stated previously, this part of Amon Creek, is the only extended area of the drainage without an intact healthy riparian zone. Within the golf course, the streams flows across a number of fairways. Otherwise, Amon Creek flows along the border of different holes. Some sediment disturbance is expected during

placement. Initially, the boulders should settle into the bed material causing a small sediment plume. The sediment plume from each boulder placement should be reduced to background sediment levels within 50 to 100 meters downstream. Placement is scheduled during the winter months, when flow is minimal. Placement should take one to two days.

Coho adult have been observed in this area of the stream. No redds were observed though. The adults dropped back downstream where there was better cover and habitat for resting to construct the redds. This area is considered critical habitat for juvenile and adult Mid Columbia River steelhead. Steelhead have not been observed in the Amon Creek drainage to date.

The benefits of boulder placement are numerous. Natural scouring will occur. Scouring creates holes downstream of each boulder. The holes provide resting habitat for juveniles and adults. Scouring is also important for gravel recruitment utilized for spawning. The boulders help dissipate energy during high water events, resulting in less streamside erosion or property damage. Further stream meandering is possible within the golf course, as the gradient is less than .3% for greater than 800 meters. Boulders are a natural stream habitat, and it's expected that after placement Amon Creek will reach an in-stream habitat equilibrium with minimal impacts.

Large Woody Debris Piles

This type of habitat represents the other half of the in-stream habitat enhancements. We estimate 18 LWD piles will placed in the same stretch of stream as the boulders. Placement logistics are similar to the boulders. The pile structures will vary with the use of root wads, 12-inch diameter logs, and/or branch complexes that will be held together with small cable and anchored into the stream bed or stream bank with barbs.

Complex debris piles provide interstitial spaces that juvenile salmonids utilize for refuge. Woody debris also provides organic material recruitment. As noted in the boulder description section, LWD piles promote scouring and provide energy dissipation during high water events. Both boulders and LWD piles will add stream complexity and therefore improve fish habitat, for both juvenile and adult fish.

There will be minimal impacts during placement. Handling and installation requires a person to be in the stream. The resulting sediment plume is expected to reach background sediment levels within 100 to 150 meters of the placement site. The construction will be timed to avoid the presence of juvenile and adult salmonids. The LWD piles will be built outside of the stream and riparian zone area. Placement should take one to two days.

In both cases, boulder placement and LWD pile construction, we will conduct surveys for adult fish before placement. If adults are discovered, the project would be put on hold until the fish have left the stream area and remain no closer than 300 meters up or downstream. No work will be done where there are salmon redds or steelhead redds. Depending on stream conditions, such as flow, each placement site can be isolated with minimal disturbance to the stream bed or stream bank. Work area isolation methods include small wooden boxes or inflatable bladders. Both are light enough to handle with minimal stream bed disturbance. Both methods will help minimize project sediment and help keep fish from the work area.

Lower Fish Ladder

The lower fish ladder is intended to pass fish from the MF Amon Creek into the first reservoir cell. The elevation change is estimated at less than five feet (see Appendix E). The WF Amon Creek flow varies little, between 6 cfs (winter) and 8 cfs (summer). The WDFW hydraulics engineer, Bruce Heiner, recommended a weir-pool design for the lower ladder. Currently, there is no fish passage into the WF due to a complete barrier (figure 1).

The location of the ladder is immediately adjacent to (within 10 to 15 feet) the existing weir (figure 1). The location allows for a proper alignment and discharge into the MF. The ladder will be constructed in isolation from the stream. Small barriers will be constructed at the top and the bottom of the fish ladder. Fish passage during construction is not an issue, because of the existing barrier. Flow will be maintained over the existing weir until the lower ladder is constructed. The existing weir will remain as an overflow for use only during extreme high water events.

Construction is planned during the winter months. As stated above, most of the work will be done in isolation. Access for labor and equipment is possible without further adverse effects on the stream or stream bank. Stream crossings are unnecessary. Erosion control measures are planned between the work area and the stream. This includes the treatment of any potential fuel or hydraulic oil spill.

Sediment is likely to enter the stream when the lower barrier is removed. The lower barrier must be removed to complete the connection of the lower fish ladder pools to the stream. The upper barrier will be removed before the lower barrier, thereby eliminating any chance of sediment of entering the stream waters. There is very little shoreline vegetation, so vegetation loss will be minimal. The amount of sediment is expected to be less than one cubic yard. The sediment plume is expected to dissipate and reach stream background levels within 200 meters. No other deleterious materials are known to exist in the area, nor do they will they cause an impact during or after construction.

Construction of the lower fish ladder is planned last amongst all the project components. Construction of the remaining components, except the in-stream structures, can therefore be built in isolation of salmonid fish life. The barrier at the mouth of the WF eliminates the possibility of juvenile or adult salmonids from entering the WF waters. There has been no exchange of surface water between the EF and the WF since the June 1998 irrigation canal break. Subsequently, salmonid life expectancy in this fresh water environment implies very little chance for a presence, and therefore very unlikely for related impacts.

The benefits of the lower fish ladder combined with all the other project elements are primarily fish passage. Adult access is important. There are some spawning areas (< 200 m of gravel habitat) above the golf course, in addition to, added areas for refuge. Juvenile salmonids will benefit the most. Access to more stream habitat and to the high valued wetlands above the golf course is expected. Most of this habitat will function as rearing habitat. The cool waters from the Meadow Springs and all the water sources in the WF Amon Creek wetlands will provide a

year round refuge until out migration as age 1+ (coho, chinook, and steelhead) and 2+ (steelhead) juveniles.

Upper Fish Ladder

The upper fish ladder is intended to pass fish from the small first reservoir cell into the largest reservoir cell. It will replace two small culverts that are impassable due to velocity and gradient. The location will be immediately adjacent to the existing culverts (figures 2 and 3). The culverts will be removed after completion of the fish ladder. A weir-pool ladder design is planned. The elevation change between the bodies of water is less than three feet.

Construction is planned before the lower fish ladder in order to avoid any impacts to salmon and their associated habitat. Due to the existing barrier, we assume there is no salmon present in the project area. By completing construction during the winter and before completion of the lower fish ladder, this project is expected to have *no effect* on salmon and their critical habitat.

The benefits of the upper fish ladder are the same as the lower fish ladder. It competes the fish ladder component of the Meadow Springs Country Club project and provides passage into the upper WF Amon Creek. Meadow Springs Country Club staff will operate and maintain both fish ladders. The design is intended to allow fish passage, even during irrigation (Heiner, WDFW Engineer, and Cleary, Benton Conservation District Engineer).

Figure 2. Location of Upper Fish Ladder on WF Amon Creek, looking up stream. Meadow Springs Country Club, Richland, Washington 2003.

Figure 3. Location of upper fish ladder on WF Amon Creek. Culverts will be removed.

Cell 17 Outlet, Small Culvert Replacement

The existing culvert (figure 4) will be removed and replaced with a larger one. The existing conditions are not a barrier to fish, but present a water conveyance problem during high flows. The resulting impacts to surrounding shorelines, such as head cutting or erosion, can lead to a lower quality fish habitat. The new culvert will be placed immediately next to the existing one. The existing one will then be removed. The WF Amon Creek flow, between the two reservoir cells will not interrupted.

The project work will be completed during the winter months. Culvert placement will occur before completion of the lower fish ladder.

Sediment deposition will be minimal downstream. The WF flow and thalweg fans out after the culvert. Flow is not concentrated until the lower end of the cell, which is over 300 meters downstream. This project component is expected to take one to three days to construct. It expected to have no effect on any listed fish species or their associated critical habitat.

Figure 4. Small submerged culvert to be replaced at cell 17 outlet.

Cell 16 and 17 Dredging

Despite the fish barrier, the transformation of the WF Amon Creek into a reservoir for irrigation purposes had many positive effects on fish and wildlife habitat. Reservoir construction led to the creation of over six acres of riverine wetlands. After restoring fish passage, these riverine wetlands can provide rearing habitat for coho and steelhead juveniles. These wetlands perform flood plain functions, such as energy dissipation and fish refuge. They also improve water quality on the WF.

During the June 1998 irrigation canal break, the WF wetlands served as catch basins for the large load of sediment that accompanied the high water. Cells 16 and 17 (the upper two reservoir cells) encountered the last load of sediment before overflowing into the EF and MF Amon Creek. Initially, deposits ranged from one to three feet. Since 1998, the WF and upper WF wetlands continued to scour back down to normal conditions. The stream and wetlands have reached a natural equilibrium. The excess scour material ended up in Cells 16 and 17, resulting in one to two feet of sediment. Both water bodies functioned properly as flood plain wetlands. Unfortunately, due to the unnatural weir and lack of natural stream functions between these water bodies, over four feet of sediment remains. The shallow water bodies produce low dissolved oxygen (DO) and high temperatures for the water. The dredge proposal is for removal of four feet of sediment in Cell 16 and 17 (figures 5 and 6, respectively). A total between six thousand and eight thousand cubic yards will be removed. When combined with the other elements of the project, we expected an improvement in water quality (higher DO and cooler water temperature) for the wetlands and the WF and MF Amon Creek.

Project impacts should have *no effect* on any ESA Threatened or Endangered fish. Dredging will be completed before construction of the fish ladders. Therefore, the presence of salmonids is

excluded. Regardless, both areas will be isolated during dredge operations with standard stream flow bypass techniques. A downstream sediment plume is eliminated with the proper use of flow bypass techniques.

There are beneficial uses planned for some of the dredge material. The project involves construction of an island in Cell 16. The island will be vegetated with emergent and some woody plants. The island shoreline, along with most of the Cell 16 outer perimeter shoreline will

be lined with appropriately size gravel or cobble. The shoreline depth contour will vary vertically and horizontally. The habitat design is intended to benefit juvenile salmonids.

Some of the dredge material is planned for placement along the fairway. The fairway must be graded adequately and functionally to cover the new stream culvert. The remaining dredge material will be disposed of at an approved upland disposal site.

Figure 5. Cell 16 reservoir (1.54 acres) on WF Amon Creek, Meadow Springs Country Club.

Figure 6. Cell 17 (0.7 acres) on WF Amon Creek. Downstream of Cell 17. Meadow Springs Country Club, Richland, Washington. 2003.

Stream Simulation Culvert and Culvert Removal at Cell 16 Inlet

Restoring natural stream functions is planned in two different stream areas. Complete removal of existing culverts at the inlet to Cell 16 (figures 7 and 8) is the first stream restoration project. The second project involves installation of a 150 long by 12 to 14 foot wide, bottomless arch culvert between Cell 16 and 17.

Figure 7. Inlet culvert to Cell 16 on WF Amon Creek. Meadow Springs Country Club, Richland, Washington 2003.

Figure 8. Inlet culvert to Cell 16 on WF Amon Creek. Earthen area will be removed and natural stream flow restored. Meadow Springs Country Club, Richalnd, WA.

The WF Amon Creek has only partial flow into Cell 16. The flow can be controlled with gates (figure 9). The remaining stream flow is piped through small culverts into Cell 17. Meadow Springs intends to block off flow through the small culverts and divert the entire stream into Cell 16. The stream inlet location will remain the same. The existing culverts will be removed and natural stream flow restored.

Figure 9. Existing culverts and control gates on WF Amon Creek near Cell 16 inlet. The stream flow will be diverted completely into Cell 16. Meadow Springs Country Club.

Figure 10. Existing outlet to Cell 16 on WF Amon Creek. Note the shallow sediment level. Meadow Springs Country Club, Richland, Washington 2003.

The existing outlet to Cell 16 is piped (figure 10) presenting a complete barrier for fish passage. The existing outlet location also limits circulation of the WF waters that enter Cell 16. The new outlet is located and designed to maximize circulation and improve water quality within Cell 16. A 25-foot natural outlet will flow from Cell 16 into the 150-foot bottomless arch culvert. A single stream grade control structure designed for fish passage is planned at the culvert outlet, and before the WF flows into Cell 17. The grade control structure is necessary because of the total elevation change within the 150-foot culvert. See figure 11 for location of the stream simulation model culvert constructed between Cells 16 and 17.

A stream simulation model recommended by the WDFW Habitat Program (Fish Passage Design at Road Culverts Manual, September 2001) will be utilized within the culvert. The culvert is designed for the 100-year flood event. Natural stream habitat elements are incorporated into the culvert. They include, bed material such as gravel or cobble, boulders, and LWD. The width of the culvert will allow the WF Amon Creek at normal flows to meander and scour. Additional stream functions include woody debris accumulation. The stream simulation model will provide quality habitat for juvenile salmonids.

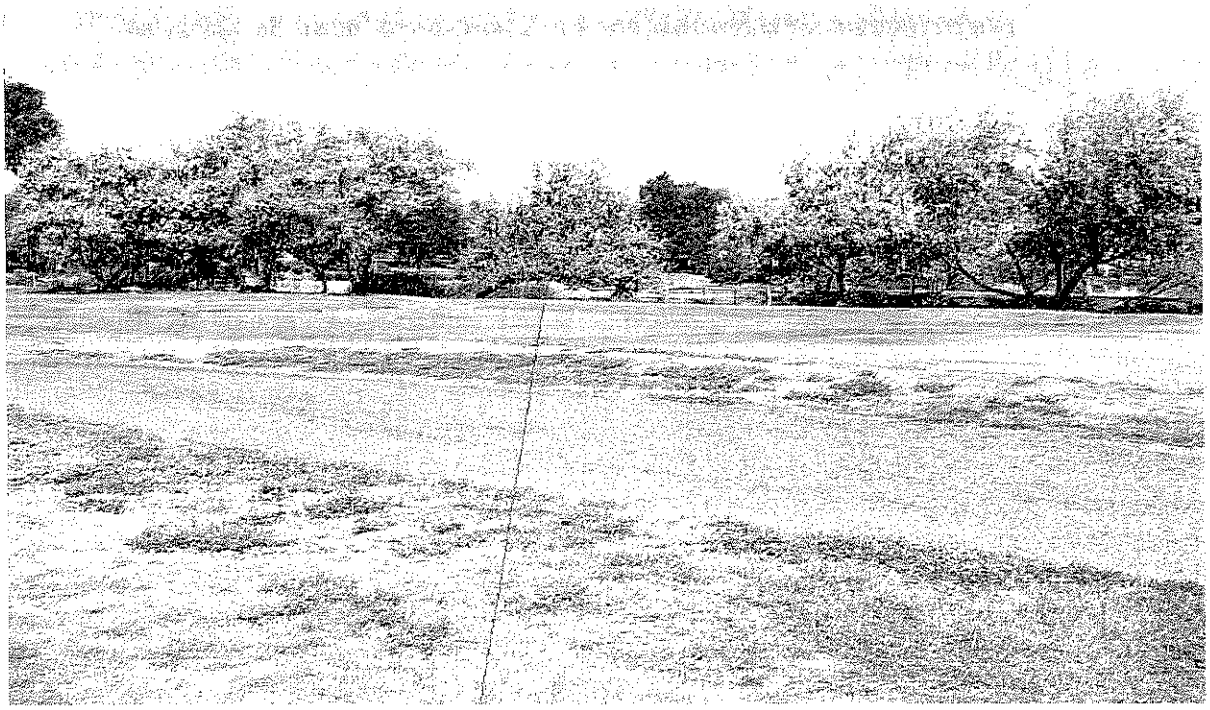

Figure 11. Fairway 16 between reservoir cells 16 and 17. Red line indicates location of planned 12- foot bottomless arch culvert. Meadow Springs Country Club, Richland, Washington 2003.

The culvert removal (small culvert at inlet) and stream simulation construction will be constructed before completion of the fish ladders at the WF and EF confluence. Therefore, the projected can be completed with *no effect* on any ESA Threatened or Endangered fish species. Each project can also be isolated from the WF flow, through the use of standard stream bypass techniques and through the use of earthen plugs upstream and downstream of each project. The plugs will be removed and the WF flow will be restored through the culverts before completion of the fish ladder. A sediment plume is likely to develop when the plugs are removed. The sediment plume is likely to dissipate to background sediment levels before ever exiting the WF system (approximately 400 meters downstream).

Figure 11. Inlet to cell17 on WF Amon Creek. This picture is near the location of the New stream simulation culvert outlet. Meadow Springs Country Club, Richland, WA.

Figure 12. Upper WF Amon as it enters the Meadow Springs Country Club, Richland, Washington above cell16. The project includes riparian zone restoration on this section of he stream.

Project Area

The project area is located on property owned and managed by the Meadow Springs Country Club. The project is on the West Fork Amon Creek (Appendices A and B), which is a high quality second order tributary to the MF Amon Creek that flows into the lower Yakima River near RM 1.0 in Richland, Washington in Benton County. Placement of in-stream structures, LWD and boulders are planned for the MF Amon Creek, immediately below the EF and WF confluence.

Appendix A is a topography map of this area. It shows the action area being delineated by a quarter mile area around the Meadows Springs Country Club. A quarter mile area from the project in an urban setting for noise disturbances is common. For water quality and aquatic species disturbance issues, there is a culvert up stream of the project construction area underneath Broadmore Blvd, which is 300 feet, and culvert down stream, at Gage Blvd, which is about 400 feet up stream.

Latitude and longitude coordinates for the project area are N 46.21916 x W 19.25711. The township/range/section of the work site is T9 North, Range 28 East, Section 36.

WF Amon Creek is 2,500 meters (m) in length, has 900 m of tributaries, and is fed by a series of natural springs that produce about six cubic feet per second (6 cfs) year round. The WF has some of the highest scoring Type II depression stream-wetlands in southeast Washington. The WF flows into the East Fork (EF) Amon Creek on the Meadow Springs Country Club golf course to form MF Amon Creek. The MF flows another 4,600 m to the Yakima River. The lower 1,000 meters of the MF Amon Creek flows through U. S. Army Corps of Engineer (COE)

owned land. The COE land is almost exclusively within the Yakima River flood plain and delta area and remains in protected natural habitat.

The majority of the area was mapped by the Natural Resource Conservation Service (NRCS) as Hezel fine loamy sand. According to the Benton County Soil Survey (NCRS, 1971) this soil develops under grass, sagebrush, and rabbitbrush on a mantle of windblown sand on silty lacustrine sediments. Because it is so deep and well drained it is likely that, even in an area with less disturbance, the dominant shrub species would be Wyoming big sagebrush (*Artemisis tridentate* var. *wyomingensis*). Hezel soils are associated with Wyoming Big Sagebrush/Sandberg's bluegrass (*Poa sandbergii*) plant communities on the Hanford Reservation (Downs, 2001 unpublished research). Other co-dominant species in Wyoming big sage shrub-steppe communities at Hanford include: spiny hopsage (*Grayia spinosa*), Indian ricegrass (*Oryzopsis hymendoides*), needle-and-tread grass (*Stipa comata*) and Carey's balsamroot (*Balsamorhiza careyana*).

The entire project area, because it is located within a private golf course and within the city of Richland is subject to various forms of disturbance. These forms of disturbance include: off-road vehicle use, domestic animal and human intrusion, noise, vehicle traffic, and residential units. This type of urban development is associated with water quality problems, fragmented upland habitats and discontinuous tracts of similar habitat types. These factors influence conditions observed at the site and influence potential long-term species use of the study area.

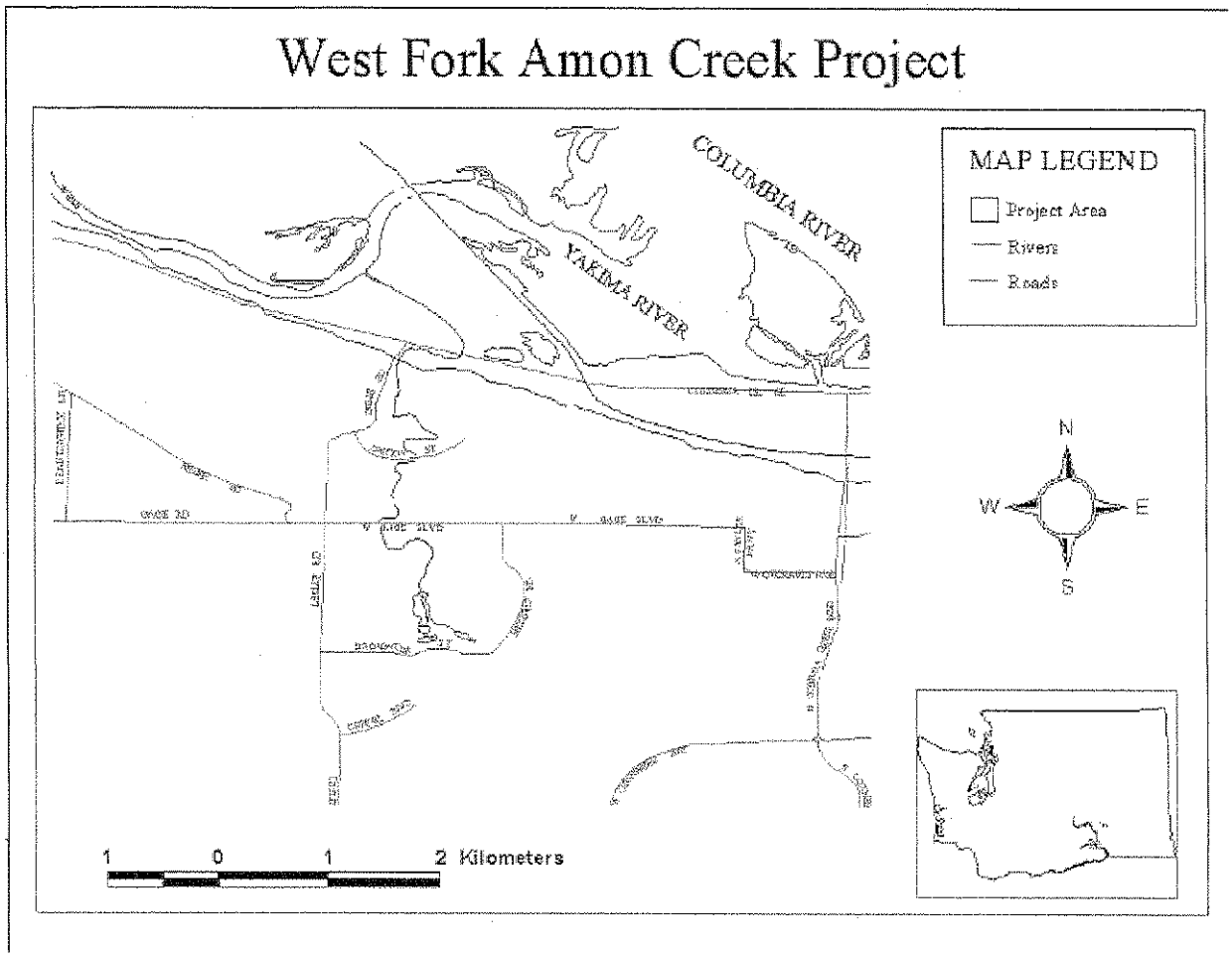

Figure 14. Project Area Map, Richland, Washington.

DESCRIPTION OF BASELINE CONDITIONS

Amon Creek was formally known as Amon Wasteway until the Washington Department of Fish & Wildlife (WDFW) reclassified the body of water. The Amon Creek watershed is approximately 70 square miles, of which less than 20 square miles contains perennial streams. The drainage basin is south and southwest of the cities of Richland and Kennewick.

The East Fork Amon Creek (EF) originates at Amon Wells and flows through Amon Canyon crossing at milepost 111.1 on Interstate I-82. Amon Wells has been dry for the past five years because of the drought in Eastern Washington. On the north side of freeway, the Kennewick Irrigation District introduces tailwater from the end of a small canal from April to October. During extreme weather events such as a snowmelt or rainstorm, water also flows into the EF. The flow follows around the west side of Thompson Hill crossing Clearwater Avenue and through an elevated culvert (fish passage barrier) at the Burlington Northern Santa Fe Railroad.

The West Fork Amon Creek (WF) flows from the hillsides surrounding the Meadow Springs Golf Course and Rancho Reata housing area. The WF is significant biologically in that the water temperature coming from the source springs is significantly cooler. The EF and WF confluence is on the north side of the Meadow Springs residential area and within the golf course area. The Main Fork Amon Creek (MF) follows a northerly course from the proposed project area and into the Yakima River.

Flows

The WF Amon Creek is fed by a series of natural springs that produce about 6 cfs year round. Due to a lack of rainfall, flow variance is minimal. The WF summer flows are nearly the same as winter flows. Very little irrigation tail-water dumps into the WF Amon Creek. The upper East Fork (EF) Amon Creek is an ephemeral stream, with flow usually only during irrigation season. The primary EF flow during irrigation season is managed overflow from the Kennewick Irrigation District's main canal. EF flow fluctuations average between 20 cfs to 40 cfs. During non irrigation season, the EF flow is from groundwater seepage, and occurs only in the lower 400 m of the fork. Non irrigation flow in the EF is usually less than three cfs.

The WF and the EF Amon Creek join in the middle of the Meadows Springs Country Club golf course to form the MF Amon Creek. The MF flows 900 m through the golf course before exiting their property into a series of incised canyons. All 900 m of the MF has spawning gravel deposits. The WF has some of the highest scoring Type II (possibly Type I) depression stream-wetlands in southeast Washington (Washington Department of Ecology, 2002, Shannon & Wilson, Inc. 2002). Except for areas on the golf course, both forks and the MF have healthy intact riparian areas.

The Amon Creek habitat in the immediate vicinity of the project is a riverine wetlands and riffles. As a result many NMFS habitat parameters are at risk (Table 6). The creek substrate is composed primarily of gravels and cobble. The gradient through the project area 500 feet upstream to 500 feet downstream of is 0.23% as measured by GPS. The most significant expected impact of this project will be potential to impact water quality during construction from an unexpected weather event or equipment operator error. Disturbance to golf course grounds is expected outside of the riparian corridor. The project will improve water quality at the project site and downstream because the existing shallow water and lack of wetland and stream circulation will be improved.

Salmonid stocks

Preliminary surveys conducted by WDFW staff in 2001 indicated the presence of salmonids. Coho and Chinook juvenile salmon were sampled during the summer months in the lower 2,000 m of the stream. WDFW staff also observed a small number of coho adults throughout the MF Amon Creek, including immediately at the WF and EF confluence, during the 2000 and 2001 spawning seasons. Very little biological and physical assessment surveys have been conducted on the Amon Creek drainage. Historically, the Washington Department of Game (WDG) planted German Brown trout (Salmo trutta) for put-and-take fisheries. Records are scarce, but anecdotal information indicates WDG ceased out-planting into Amon Creek over 20 years ago.

The stock origin of the juvenile Chinook sampled in 2001 is unknown. There are large populations of fall Chinook in both the main stem Columbia River and the Yakima River within close proximity. None of the fall, spring, or summer Chinook life histories exclude their presence in the Amon Creek drainage for rearing.

The stock origin of the coho is likely Yakima River hatchery stock. Coho were extirpated within the Yakima River decades ago, until reintroduction in the 1990's. Whether the coho entered Amon Creek because of natural straying behavior or were attracted falsely to Yakima River water flowing down the EF Amon Creek, is unknown. The observation of coho redds and juvenile coho indicate the establishment of at least one natural cohort (F1). This project is expected to result in a large increase in salmon rearing habitat and over 900 meters of improved spawning habitat.

Sediment

Spring runoff, irrigation overflow, and other events produce visible levels of turbidity throughout the drainage system. The present conditions have stabilized and do not contribute sediment beyond natural levels the enter Amon Creek. However, dredging can improve water quality and water quantity compared to the present conditions. Sediment from construction activity will not change the baseline conditions. After project construction, sediment levels will increase slightly and for a short period of time downstream from the golf course. Thereafter, the project is expected to maintain baseline conditions.

Chemical Contaminants/Nutrients

No Clean Water Act 303 d designations have been identified for Amon Creek in either the project area or action area. In spite of this, the proximity of urban and rural areas along with open space designated land uses puts Amon Creek at risk for contamination. Non point pollution from pesticides, herbicides, fertilizers and automotive usage result in elevated levels being present in the environment. Based upon a matrix of pathways and indicators criteria baseline conditions within the project area are at risk. The project effects are expected to improve and at least maintain existing baseline conditions.

Physical Barriers

There are man-made physical barriers present in the watershed that do not allow fish passage. They are within the project area. The current barrier on the WF Amon Creek does represent a complete fish passage barrier. The construction project is expected to restore fish passage.

Substrate

The construction project area in which Amon Creek flows under Gage Boulevard being widened is characterized by high energy spring flows during the irrigation season with only a moderate bedload transport. The substrates are reasonably embedded with a matrix of fine sized material in pools. The riffle sections are characterized by large gravel (60%), cobble (15%), small gravel (15%) and sand (10%). Sediment transport in Amon Creek is not a risk in the project area and will maintain existing conditions downstream.

Large Woody Debris

Large Woody Debris (LWD) criteria in eastern Washington is wood pieces with a diameter of twelve inches and a length of thirty five feet. For a watershed to be functioning properly, it is expected to count twenty pieces of LWD within a mile. In the Amon watershed there exists areas where recruitment and sustainability are in jeopardy. These are upstream of the project area. The project area will have no removal of large woody debris. The project will maintain this function.

Pool Frequency and Quality

In the project area of Amon Creek, very few pool areas are present, except the riverine wetlands. The dominant habitat type is that of a riffle stream with few shallow pools. The upstream housing development and the golf course dominate the habitat land use. Because of physical modifications through the urban area the baseline is functioning marginally and at risk. The project is expected to restore and improve baseline conditions

Off-Channel Habitat

There is a significant amount of backwater areas along Amon Creek. Presently, a number of areas down stream and up stream of the project area has beaver dens and dams. The baseline pathway indicators for off-channel habitat are to be considered as properly functioning within the project area and watershed.

Refugia

The riparian area/corridor adjacent to Amon Creek has unique characteristics (i.e., Russian olive trees and incised canyons). It is buffered from human intrusion except through the golf course and a surrounding housing addition. Setbacks generated from planning departments from the creek and surrounding refugia allow for a continuation of riparian area through out the watershed area. The effects of the project are expected to maintain the baseline conditions for refugia.

Average Wetted Width/Maximum Depth Ratio

The average wetted width/maximum depth ratio has been altered through much of the project area. Above and below the golf course natural stream widths and depths are maintained. The disturbed area's outside the project area are less frequent. The areas at most at risk on the Amon system exist within the golf course and project area. The remaining areas will maintain existing conditions.

Stream Bank Condition

Certain areas of the watershed have undergone severe impacts from human disturbance that have replaced natural features and functions. The area within the project requires stabilization or restoration to improve their functions. The project will restore baseline conditions on the project site.

Floodplain Connectivity

The historic floodplain of Amon Creek has not been modified by revetment and levee systems built to protect development. The baseline condition indicators for floodplain connectivity on the project site is at risk. The project effects are anticipated to restore baseline conditions.

Changed Peak/Base Flows
The Amon Creek basin has undergone some substantive hydrology-altering land-use changes. Significant amounts of Kennewick Irrigation District tailwater is introduced April to October each year. The flows will increase during inclement weather resulting in significant increases of water flow through the basin. Land use in and around the Meadow Springs area where a golf course and residential community have been built up, over and almost onto the Amon Creek have resulted in at risk indicators. However, the project effects are expected to maintain the current baseline conditions.

Increases in Drainage Network
During the past twenty-five years there has been a significant increase in the drainage network due to urban streets in the Amon Creek watershed. The majority of this activity has occurred in the action area of this project and within the Cities of Richland and Kennewick. The fish passage project will not increase impervious surface levels. The project effects are expected to maintain the current baseline conditions in the watershed.

Road Density/Location
Within the Amon basin there are roadways built over and around the creek. For local planning purposes the land use designation is mostly open space, residential and commercial. The roadway system in the City of Richland is extensive in the residential area of Meadow Springs and Canyon View. Adjacent areas are being developed. The existing baseline conditions are at risk. Project effects will maintain the baseline conditions.

Disturbance Regime
The entire project area, because it is located within a rapidly developing part of Kennewick and Richland is subject to various forms of disturbance. These forms of disturbance include, off-road vehicle use, domestic animal and human intrusion, and noise and traffic effects. Also, because of this rapid development, important habitat areas that are present have been fragmented and dissociated from larger tracts of similar habitat types. Both factors influence conditions observed near the site and influence potential long-term species use of the study area.

Riparian Reserves
Riparian reserves within the watershed are at risk. Currently, most stream areas have critical area ordinance setbacks in land usage from development. Currently, setbacks in the Amon are 100 - 150 feet in the City of Richland and a proposed 150 feet in the City of Kennewick. Large areas of shrub-steppe habitat are shrinking within the fast developing areas of this watershed. Bare ground that was once covered with sage brush and grasses is being replaced with residential urban subdivisions. Keeping the Amon riparian corridor undeveloped is essential to keeping at risk conditions from not functioning properly.

Table 4 Matrix for Environmental Baseline Conditions

	Environmental Baseline			Effects of the Action(s)		
Indicators	**Properly Functioning**	**At Risk**	**Not Properly Functioning**	**Restore**	**Maintain**	**Degrade**
Water Quality						
Temperature	X			X		
Sediment		X			X	
Chem. Contam./Nutrients		X		X		
Habitat Access Physical Barriers			X	X		
Habitat Elements						
Substrate	X				X	
Large Woody Debris	X				X	
Pool Frequency		X		X		
Pool Quality		X		X		
Off Channel Habitat	X				X	
Refugia		X			X	
Channel Condition						
Width/Depth Ration		X		X		
Stream Bank Condition		X		X		
Floodplain Connectivity		X		X		
Flow/Hydrology						
Peak/Base		X		X		
Drainage Network Increase		X			X	
Watershed Conditions						
Road Density & Location		X			X	
Disturbance History		X			X	
Riparian Reserves		X			X	
Other Parameters						
Fish Presence			X	X		
Bull Trout Indicators	**Functioning Appropriately**	**At Risk**	**Unacceptable Risk**			
Sub population Size			X			
Growth & Survival		X				
Life History, Diversity, and Isolation			X			
Persistence and Genetic Integrity			X			

Bull Trout Indicators within the Amon Watershed

Historically, Bull trout occurred throughout the Columbia Basin. Today, Bull trout are found primarily in upper mountainous watershed streams and lakes and upper watershed reservoir systems. Bull trout have been eliminated from the main stems of most large rivers in eastern Washington. Habitat requirements include cold, clean, and clear water located in clean gravel and cobble substrate with gentle stream slopes. Even with the Amon Creek being fed with cold water springs, year round populations have not been identified living in or around the Amon Creek basin. According to the WDFW they are non existent in the Lower Yakima River Basin.

Sub population Size

The species are functioning at risk within the Amon watershed. The adults have a sub population less than 50 and more closely associated with the number zero. The project will maintain existing conditions within the watershed.

Growth and Survival

Present data within the Amon drainage is non-existent for Bull trout. If trends cannot be confirmed, a sub population will be considered at risk until enough data is available to determine accurately the population trend. The project within the watershed will maintain existing situations for growth and survival of Bull trout.

Life History Diversity and Isolation

Presently, the migratory form is absent and any sub population would be isolated to the Amon Creek. Amon Creek is also not likely to support more than 2,000 fish. Neighboring sub populations are so few or non existent that there would be a high likelihood that stray adults will inhabit the Amon within one generation (5 years). Within the Amon watershed the project will not affect existing conditions for Bull trout.

Persistence and Genetic Integrity

There are competitive species in Amon Creek that would displace Bull trout by shear strength in numbers. There is little connectivity to greater sub populations in this area of the Yakima and Columbia River systems. Also, there is also a probability that hybridization with different sub basins stocks would occur. There is no documented evidence of hybridization though in the watershed. The project actions would keep existing conditions present within the Amon watershed.

Many activities in this project intended to protect declining salmonids may also help Bull trout. Habitat restoration, water quality improvements, and fish passage restoration into a cool water source do provide some assurances that the effects of the project will help or at least maintain existing conditions.

LISTED SPECIES OCCURRENCE

ENDANGERED

Upper Columbia River Spring-Run Chinook Salmon (*Oncorhynchus tshawytscha*)
Listed as an endangered species on March 24, 1999 (Federal Register, Vol.64, No.56, March 24, 1999, p.14308). The ESU (evolutionarily significant unit) includes all naturally spawned populations of chinook salmon in all river reaches accessible to chinook salmon in Columbia River tributaries upstream of the Rock Island Dam and downstream of Chief Joseph Dam in Washington, excluding the Okanogan River. Chinook salmon (and their progeny) from the following hatchery stocks are considered part of the listed ESU: Chiwawa River (spring run); Methow River (spring run); Twisp River (spring run); Chewuch River (spring run); White River (spring run); and Nason Creek (spring run). The Columbia River flows past the Cities of Kennewick and Richland. This is over 2,500 meters from the project area.

The local WDFW habitat biologist reported that this species uses the near shore area for rearing habitat. They sampled Amon Creek in 2001 but could not ascertain whether the juvenile chinook were spring or fall stock. Amon Creek has salmon-tolerable temperatures throughout the year, which is one of the most critical limiting factors (Washington Conservation Commission, 2001) for salmonids, especially during the summer period when the main stem Yakima River is uninhabitable due to high temperatures. Amon Creek is also at the lowest point in the Yakima River watershed and may provide refuge and rearing for other main stem Columbia River salmon stocks. Additional References: http://www.nwr.noaa.gov/1salmon/salmesa/chinucrs.htm.

CRITICAL HABITAT:
Current Status - Under development. On April 30, 2002, the U.S. District Court for the District of Columbia approved a NMFS consent decree withdrawing a February 2000 critical habitat designation for this and 18 other ESUs. Critical habitat is proposed to include all river reaches accessible to chinook salmon in Columbia River tributaries upstream of the Rock Island Dam and downstream of Chief Joseph Dam in Washington, excluding the Okanogan River.

PROTECTIVE REGULATIONS: The take prohibitions of section 9 of the Endangered Species Act apply to this ESU.

Upper Columbia River Steelhead (*Oncorhynchus mykiss*)
Listed Endangered under ESA, Federal Register Vol. 62, No. 159, 43937, Monday, August 18, 1997. The major spawning areas of the Upper Columbia River are far upstream from Kennewick and Richland, which include for examples the Wenatchee, Methow and Okanogan Rivers.

Steelhead migrate to marine waters after spending two years in fresh water and then reside in the ocean for two or three years; however, the life history is considerably more variable than for other salmonid species. Unlike salmon and cutthroat trout, steelhead may not die after spawning. They can migrate back out to sea and return in later years to spawn again. This stock of adult steelhead migrate upstream in mid-May through October, and typically spawn between February and June. Juveniles rear in fresh water from one to four years before migrating to the sea (greater than 70% out nmigrate as age 2+; Wydoski and Whitney 1979). The coastal and inland subspecies are considered the two major genetic groups. Both Upper Columbia River and Middle

Columbia River Steelhead are considered to be the inland subspecies *O. mykiss*. In general, steelhead migrating through this section of the Columbia River will be in deep waters.

The habitat in the Amon Creek area is considered excellent for rearing steelhead by the WDFW. Steelhead smolts and juveniles migrating downstream the Columbia may occur in April through June. Without detection of spawning adults, it's assumed that if the species is present, that they enter the Amon drainage for refuge or feeding while traversing one mile up the Yakima River.

Additional references: http://www.nwr.noaa.gov/1salmon/salmesa/stlhucr.htm

CRITICAL HABITAT:
Current Status - Under development. On April 30, 2002, the U.S. District Court for the District of Columbia approved a NMFS consent decree withdrawing a February 2000 critical habitat designation for this and 18 other ESUs. Critical habitat is proposed to include all river reaches and estuarine areas accessible to listed steelhead in Columbia River tributaries upstream of the Yakima River and downstream of Chief Joseph Dam, Washington.

PROTECTIVE REGULATIONS: The Endangered Species Act's Section 9 take prohibitions apply to this ESU.

THREATENED
Middle Columbia River Steelhead (*Oncorhynchus mykiss*)
Listed Threatened under ESA, Federal Register Vol. 64, No. 57, 14571, March 25, 1999. Middle Columbia River Steelhead are prevalent in the Columbia River adjacent to the City of Kennewick and Richland during migration. The major spawning areas of the Middle Columbia River are up the Yakima River in Yakima County tributaries, such as Toppenish Creek and Satus Creek. Some adults remain in the river all year as an overwintering population in the McNary Pool. Steelhead smolts migrating along the shoreline may occur in April through June. According to the WDFW environmental factors that limit Steelhead from spawning and rearing, do not prevail in Amon Creek. There are plenty of spawning gravels, wetlands, ponds and pools for rearing, and ripple habitat, with a healthy macro invertebrate food source (Early 2001). The fish passage project area may function as some of the best spawning and rearing Steelhead habitat in the entire lower Yakima River.

CRITICAL HABITAT:
Current Status - Under development. On April 30, 2002, the U.S. District Court for the District of Columbia approved a NMFS consent decree withdrawing a February 2000 critical habitat designation for this and 18 other ESUs.

PROTECTIVE REGULATIONS: The Endangered Species Act's Section 9 take prohibitions apply to this ESU.

Bald Eagle (*Haliaeetus leucocephalus*)
The bald eagle is a member of the family Accipitridae and was initially listed on February 14, 1978 as an endangered species throughout the lower 48 states, except in Minnesota, Michigan, Wisconsin, Washington, and Oregon, where it was listed as a threatened species. On July 12,

1995, the U.S. Fish and Wildlife Service announced that the bald eagle would be reclassified from endangered to threatened in the lower 48 states, effective August 11, 1995. USFWS is currently reviewing this species for possible de-listing.

Bald Eagles usually perch, roost, and build nests in mature trees near water bodies where there is an abundance of prey. Eagles are primarily fish eaters but will also feed on waterfowl, small mammals and dead animal carcasses. Breeding habitat commonly includes large conifer trees near water.

Bald eagles are migrants through the City of Kennewick and Richland. Eagle populations are highest in the winter in Columbia Park and Yakima River Delta. Columbia Park is over two miles from the project area and occupies approximately four linear miles of land between the Columbia River and State Highway Route 240. Columbia Park is not visible from the project area. The Yakima River Delta area is over 2,500 meters and is not visible from the project area. According to WDFW Heritage data base, there is no record of bald eagles breeding below the Hanford Reach of the Columbia River to it junction with the Snake River.

CRITICAL HABITAT: Currently there is no designated critical habitat for bald eagles in Washington State.

Bull Trout *(*Salvelinus confluentus*)*

On June 10, 1998, the Bull trout was designated as Threatened in the U.S.A., conterminous, (lower 48 states). Within the area covered by this listing, this species is known to occur in: Idaho, Montana, Nevada, Oregon, Washington. The U.S. Fish & Wildlife Service Pacific Region (Region 1) is the lead region for this entity.

Bull trout are native to the Pacific Northwest, including Washington, Oregon, California, Idaho, Montana, Nevada, Alaska, Alberta, and British Columbia. They have been eliminated from the main stem of most large rivers where they historically occurred. Many remaining populations are isolated in headwater streams. Resident bull trout reside within or near spawning areas, but migratory bull trout can travel over 155 miles and utilize lakes, reservoirs, or large river systems for migratory corridors and over wintering habitats.

They are a member of the North American salmon family, which includes salmon, trout, whitefish, char, and grayling. Members of this family tend to prefer cold, clear waters, and the bull trout is exceptional for its demand for especially cold--no more than 64° F water. Spawning, incubation and juvenile rearing are the bull trout life history stages that require the coldest water temperatures and lowest fine sediment levels. These activities usually occur in the small tributaries and headwater streams of the Columbia River. Quality riparian areas are important to for Bull trout spawning and rearing. Protection of high quality water downstream of the Bull trout is even important in non-fish bearing streams. Bull trout can live up to ten years and are sexually mature after four. They spawn every year or every other year and require clean gravel bars for their redds (nests for eggs). If 20% of the solids in a gravel bar are fine sediments, spawning success falls by more than 50%; 40% fine sediments reduce success by 99%. Spawning success is even more sensitive to temperature. Although adults can stand water temperatures up to 64° F, eggs do best with temperatures of no more than 36° F. Temperatures

above 46° F can reduce survival by at least 75%. The project area definitely lacks suitable habitat.

According to the WDFW, there are no resident populations of Bull trout reported in Benton County. Populations in the lower Columbia River, below the confluence with the Snake River, are fragmented and remnants of a much wider distribution. Populations in the upper Yakima River Basin are stressed to the level that it is estimated that there are somewhere between 2,500 to less than 3,100 remaining.

CRITICAL HABITAT: Over the next three years (January 16, 2002 Press Release), the U.S. Fish and Wildlife Service will make critical habitat determinations for five populations of bull trout, a threatened species protected under the federal Endangered Species Act. The Service is currently in the public information stages of addressing this issue as of November 21, 2002. They are seeking comments and holding public meetings.

In determining which areas are most essential to the conservation of Bull trout, the Service will conduct a comprehensive assessment of a large geographic area covering the range of bull trout. This area includes the Columbia River Basin and portions of northwestern Washington around Puget Sound, north-central Montana, northern Nevada and the Klamath Basin in southern Oregon. The Service will identify and locate the types of habitat that are essential to the conservation of bull trout, which may require special management consideration.

Ute ladies'-tresses (*Spiranthes diluvialis*)
On January 17, 1992, the Ute ladies'-tresses was designated as Threatened in the Entire Range. Within the area covered by this listing, this species is known to occur in: Colorado, Idaho, Montana, Nebraska, Utah, Washington, Wyoming. The U.S. Fish & Wildlife Service Mountain-Prairie Region (Region 6) is the lead region for this entity.

Ute ladies'-tresses, which is a member of Orchidaceae family, was found in the Snake River Basin in southeastern Idaho in 1996 and subsequently in Okanogan and Chelan Counties of Washington. It is a perennial herb with a flowering stem, 2-5 dm tall, arising from a basal rosette of grass-like leaves. The flowers are ivory-colored, arranged in a spike at the top of the stem. This plant blooms from late July through August. It prefers moist to very wet meadows along streams or in abandoned stream meanders that still retain ample ground water. It can occur near springs, seeps, and lakeshores. Most plants are found in 1300-1600 m elevation. Given these recent discoveries and the lack of adequate survey experience in Washington, the USFWS determined that Ute ladies'-tresses should be expected in areas with suitable habitat throughout Idaho and Washington. Typical habitat is inundated frequently early in the growing season with plants often emerging from shallow water (Sheviak 1984). Habitat that supports Ute ladies'-tresses are wet meadows fed by groundwater discharge, along meandered wetlands and in seeps, and in open valley bottoms often with clay intermixed with limestone.

There have been no documented occurrences of Ute lady's tresses in Benton County. The species is not found in the herbarium of Washington State University at Tri-Cities. It is not listed in Sackschewsky et al (1992), which describes species on the Hanford Reservation and nearby areas. The only habitat that potentially could support Ute ladies' tresses is along the waterway of Amon Creek. The project area has an elevation of less than 200 m in elevation and the wetted

area of the stream has a solar blockage due to tree cover during the blooming season. The project area lacks suitable habitat.

CRITICAL HABITAT: There is no critical habitat designated for Ute ladies'-tresses.

Pygmy Rabbit *(Brachylagus idahonesis)*
The Columbia Basin pygmy rabbit is a distinct population of native rabbit that once occupied Douglas, Grant, Lincoln, Adams, and Benton Counties in central Washington. Pygmy rabbits occur in other areas of the West, but the Columbia Basin population is genetically unique, has been isolated from other populations for thousands of years, and occupies an unusual ecological setting. The ESA allows the listing of distinct population segments of vertebrate species.

The current Washington population is estimated to be fewer than 250 rabbits. Of the five pygmy rabbit areas known to remain in Washington, the largest may be comprised of fewer than 150 rabbits. The other four populations are significantly smaller. In 1990, the Washington Wildlife Commission listed the pygmy rabbit as a threatened species. The Commission reclassified the species to endangered in 1993. The USFWS listed it as a Candidate Category 2 species when in November of 2001 the status was upgraded to "Endangered" status.

The pygmy rabbit is the only rabbit native to North America that digs its own burrows. It is also dependent upon sagebrush, which comprises up to 99% of its winter diet. Dense sagebrush and relatively deep, loose soil are important characteristics of pygmy rabbit habitat. The primary factor contributing to the decline of the pygmy rabbit in Washington has been loss of habitat due to agricultural conversion. Because of low numbers and limited distribution, pygmy rabbit populations in Washington are vulnerable to fire, disease, intense predation, and the random variation in birth and death rates, sex ratios, and combinations of demographic parameters that sometimes cause the collapse of small populations. Habitat degradation and loss are likely to continue without active prevention efforts. Before the pygmy rabbit can be considered at low risk of extirpation in Washington, numbers and distribution must increase. In addition, adequate habitat must be managed for the long-term protection of features that support pygmy rabbits.

Recovery strategies for this species include protection of existing habitat, identification and management of lands for creation of new habitat, monitoring of the pygmy rabbit population, and research to better understand the effects of management actions. Grazing, if it occurs in pygmy rabbit areas, should be managed to be compatible with pygmy rabbit habitat needs. In all pygmy rabbit areas, steps should be taken to reduce the risk of range fire. To increase the extent of pygmy rabbit habitat, efforts should be directed at identifying lands where soil conditions are suitable for pygmy rabbits. If necessary, lands with appropriate soil conditions should be restored or enhanced to provide pygmy rabbit habitat. Pygmy rabbits should be introduced to selected vacant habitat. Other strategies, including enforcement, data management, cooperative work with landowners and other agencies, research, and public information should all play a role in pygmy rabbit recovery efforts.

There is deep soil shrub steppe habitat in the upper Amon Drainage. Most of it is fragmented to areas less than 600 acres. The project area lacks suitable habitat. This project is not expected to impact any pygmy rabbit habitat.

CRITICAL HABITAT: This rare inhabitant of Washington's fragmented shrub-steppe landscape is found at just a few sites in Douglas County. Currently, 3,600 acres of shrub-steppe habitat are being transferred from the Department of Natural Resources to WDFW for monitoring and management of pygmy rabbits.

Candidate Species

Umtanum wild buckwheat (*Eriogonum codium*)
On June 13, 2002 as listed in 67 FR 40657-40679, Umtanum wild buckwheat was listed as a candidate species by USFWS. This species is only indigenous to Benton County in the state of Washington. Because it is endemic to a small area in Washington state, perhaps the plant is best considered as a single occurrence, but with more than 10,000 individuals.

This plant is a low growing perennial herb. Its growth habit (low, matted, caespitose perennial), tomentose flowers and achenes readily distinguish the new species from other members of the genus within its range. The only known population of this species occurs at elevations ranging between 338 m to 406 m on flat to gently sloping sites near the top of the steep, north-facing basalt cliffs overlooking the Columbia River.

This species is found with spiny hopsage (*Grayia spinosa*), grayball sage (*Salvia dorrii*), threadleaf scorpionweed (*Phacelia linearis*), winged crptantha (*Cryptantha pterocaary*), small evening primrose (*Camissonia minor*), and cheat grass *(Bromus tectorum*). The only known site in Benton County recently burned in a wildfire. The project area definitely lacks suitable habitat.

CRITICAL HABITAT: There is no critical habitat designated for Umtanum wild buckwheat.

ANALYSIS OF EFFECTS

DIRECT (Potential Impacts to listed or proposed species)
Direct effects to threatened and endangered species listed can result from project construction activity. The use of large equipment, in-stream work, excavation of sediment, water quantity, elevated noise levels and water quality degradation from erosion of soils if not properly managed can cause a take. Through engineering design and controls, Best Management Practices (BMP's), construction timing and adequate ongoing project oversight and inspection, the effects to T&E species will be discountable.

Large Equipment Use
Dredging, Channel Excavations, Culvert Removals and Installations, In-stream Structures
2.74 acres of open water; large track hoe used to remove 6,000 cubic yards of sediment 12,000 square feet of golf course fairway and tee-off areas disturbed and replaced with commercial turf after filling and grading over culverts; small bulldozer and backhoe used. Temporary Erosion and Sediment Control (TESC) Plan (Contractor) before construction can start and during construction with all thirteen requirements met

Except for the in-stream structure placement, this portion of the project and the use of large equipment, can be isolated by control of flow with gates, flow bypass systems, and through the use of earthen plugs.
The in-stream structures will be place with a suspension boom or small backhoe.
Equipment operators familiar with spill prevention and spill cleanup procedures. Hydraulic fluid or oils can spill directly into the stream during project work.
Project Inspector on site during construction hours

In-stream Work
In-stream Structures Below Fish Ladder
In-stream structures placed in the MF Amon Creek will cause sediment plumes. Small wooden work boxes or bladders can be used to limited down stream sediment deposition and direct impacts to fish. Each individual structure will require one to two hours for placement. Fish scare tactics will be employed. No work will be conducted during the presence of adult spawners. No structure will be placed on existing spawning areas. Seine nets deployed downstream can minimize juvenile salmonid presence. The remaining project components will be constructed before completion of the lowest fish ladder.
Workers will be walking in the stream during installation.
Project Inspector on site during construction hours

Grading, cutting and filling
Dredging, Culvert Installations, Fish Ladders
Dredge material used on fairway fill area and disposed of at approved upland disposal site.
Erosion control measures required (i.e., straw bales with matted fencing surrounding all work areas.
TESC Plan (Contractor) before construction can start and during construction with all thirteen requirements met.
Project Inspector on site during construction hours
No large woody debris or riparian habitat will be disturbed
This portion of the project, even the fish ladders, can be isolated by control of flow with gates, flow bypass systems, and through the use of earthen plugs.
Removal of earthen plugs or construction boxes on lower fish ladder will result in sediment plumes that will temporarily increase deposition rates. It should take less than one day for deposition rates to reach background levels.

Construction Activity; Fish Work Window and Noise
Construction activity will be limited to the daylight hours between 7:00 am to 5:00 pm on weekdays. The work window is between mid-December to early March. This window will minimize impacts to the chinook, coho, and steelhead listed fish species that are rearing or migrating through the Amon. It is the preferred work window of the local habitat biologist from the WDFW.

INDIRECT EFFECTS
Fish Passage, Dredging, Revegetation, and In-stream Structures
The golf course is used daily by many people. This project does not produce new access points or new roads. No new residential units will result from project activities. It increases the

amount of functioning habitat. Golf course managers intend to protect any adults or juveniles from disturbance by Country Club members. The new habitat will provide cover for the fish.

Currently the Amon Creek corridor is considered a Critical Area with the GMA Planning Boundaries of both cities. There are protective measures within these ordinances to reduce or minimize the full potential of development occurring within the action and project area. The project actions will maintain the watershed baseline criteria.

BENEFICIAL EFFECTS

Water Quantity and Floodplain Functions

The dredging will increase the holding capacity for the Meadow Springs Country Club irrigation needs. The dredging also improves the flood plain function and capacity of the WF Amon Creek, so that high flow events won't be as damaging downstream, or as erosive on the golf course. The new culverts will convey a higher flow meaning the golf course will sustain less erosion and head cutting caused by floodwaters occurring outside the channel or culvert. The in-stream structure will act to attenuate flood energy during high flows and decrease shoreline erosion.

Fish Passage

Remove barriers and restore fish passage to WF Amon Creek. The existing irrigation withdrawal pond has a lower weir and upper culvert that will be removed and replaced with weir/pool fish ladders. One undersized culvert at the cell 17 outlet (40 ft) will be replaced with a WDFW fish passage standard culvert. The existing culvert at the inlet to cell 16 inlet (40 ft) will be removed and the natural stream flow restored. Additionally, an existing 200 ft undersized culvert (figures 10 and 11) will be replaced by a 150 ft of culvert designed for stream simulation.

Water Quality

Improve water quality for WF and MF Amon Creek. Deepening two reservoir cells from 12 inches to 48 inches. Revegetate stream and pond riparian area with native plants. Improvements in circulation within the cell would restore natural spring water connectivity to WF and MF Amon Creek. The project would also improve natural water conveyance between reservoir cells.

Increase spawning area

Restore spawning habitat on the WF Amon Creek. Restore natural stream functions for a total of 280 ft of the WF Amon Creek that is currently in culverts. Provide access to spawning grounds in the upper WF Amon Creek. Provide cover, LWD, and improve scour functions on over 900 m of stream.

Increase rearing area

Improve salmon rearing habitat in WF and MF Amon Creek. Restore passage for adults and juveniles to the numerous high quality stream wetlands in the upper WF Amon Creek and to the 6.5 acres of WF reservoir on Meadow Springs CC. Place in-stream structures on the MF throughout the golf course to provide cover, refuge, and food for juveniles. Create an island in the upper cell of the reservoir. Revegetate with native plants and provide debris on the shoreline of the island to for cover, food and refuge.

Restore riparian areas
Restore riparian function along the riverine wetlands and along much of the upper WF on Meadow Springs Country Club. Revegetate stream corridor. Revegetate reservoir shoreline. Create an island on the upper reservoir cell that is revegetated and lined with gravels.

Biological Information
Monitor biological improvements as a result of the physical improvements. Determine the area of suitable spawning and rearing habitat in WF and MF Amon Creek. Monitor in stream flows and water quality to assess beneficial and limiting factors for salmon usage. Monitor adult salmon spawning activity to determine presence, origin, number of redds, and estimate fry production. Evaluate juvenile utilization of WF and MF Amon Creek.

Potential Impacts to Candidate Species and Species of Concern

Umtanum Wild Buckwheat:
Any impacts this project may have are negligible for habitat or candidate of this listed candidate species. The ability of this species to adapt and survive outside of specific habitat is very poor. The project area lacks suitable habitat. There is no affect to species or habitat from this project.

CONCLUSIONS AND EFFECT DETERMINATIONS

Bald Eagle: No Effect

The areas for winter roosting are not visible from the project area. There will be no blasting or excessive loud noises from this project. Adverse impacts to bald eagles due to construction and miscellaneous noise emanating are not anticipated due to limited potential for use of the project area. Impacts to the eagles food supply because of construction activities of this project will be limited to possible displacement of a few individual rodents or other small mammals. No populations of eagle prey items will be impacted. This project will have no effect on bald eagles, their habitat, or prey base.

Ute ladies' tresses: No Effect
This species is found in wet meadows fed by groundwater discharge, along meandered wetlands and in seeps, in alkaline, open inter-mountain valley bottoms, often with marl. Marl is a crumbly mixture of clays, calcium and magnesium carbonates, and remnants of shells that is sometimes found under desert sands and used as fertilizer for lime-deficient soils. Typically inundated early in growing season, becoming drier but retaining subsurface moisture late in season.

There has been no documented occurrence of Ute Ladies' Tresses in Benton County (WDNR, 1999). There are no documented soils associated with marl in Benton County (USDA). The immediate project area next to Amon Creek certainly has a wet environment. It lacks suitable soils to support this species of plant. Due to lack of suitable habitat and no documented occurrence there will be no effect to this species or habitat from this project.

Pygmy Rabbit: No Effect
The pygmy rabbit once inhabited Benton County in Washington State. Currently, the species only occurs on state land and are known to survive in five isolated fragments of suitable habitat in Douglas County. However, the Foster Creek Conservation District is developing a Habitat Conservation Plan for private agricultural interests in Douglas County. The plan will address ranching, farming, and orchard activities, and will likely also include conservation measures for Columbia Basin pygmy rabbits on private lands.

Recovery strategies for this species include protection of existing habitat, identification and management of lands for creation of new habitat, monitoring of the pygmy rabbit population, and research to better understand the effects of management actions. Grazing, if it occurs in pygmy rabbit areas, should be managed to be compatible with pygmy rabbit habitat needs. In all pygmy rabbit areas, steps should be taken to reduce the risk of range fire. To increase the extent of pygmy rabbit habitat, efforts should be directed at identifying lands where soil conditions are suitable for pygmy rabbits. If necessary, lands with appropriate soil conditions should be restored or enhanced to provide pygmy rabbit habitat. Pygmy rabbits should be introduced to selected vacant habitat. Other strategies, including enforcement, data management, cooperative work with landowners and other agencies, research, and public information should all play a role in pygmy rabbit recovery efforts.

Due to the lack of species in the action and project area and lack of suitable habitat for reintroduction of the species, we conclude that the project has no effect on the pygmy rabbit.

Bull Trout: No Effect
This species is found in the Upper Yakima River and Columbia River systems. The distance from the immediate project area is over 1.5 miles. No documented occurrences of this species have been noted by WDFW. It is highly unlikely to occur in the project or action area. Water exiting the project area and flowing to the Yakima River Delta on the Columbia River will not affect the Columbia or Yakima River for quantity or quality. This project will have no effect on bull trout and their habitat.

Anadromous Fish:
Potential impacts to all fish species in Amon Creek include both beneficial and detrimental impacts. The detrimental impacts include disturbance during construction. There is a potential for temporary water quality degradation during a weather event. Terrestrial insect sources and nutrient input losses will be minor due to the temporary loss of habitat.

Amon Creek area has habitat necessary for chinook and steelhead survival. The determination of effects for the listed protected fish species to follow is contingent upon the implementation of previously identified engineering designs, conservation measures and adherence to construction standards. There is work planned in, over, and next to the Amon Creek. Any short-term increases in water quality and quantity **may affect, but not likely to adversely affect** the species present. Restoring fish passage, improving water quality, increasing juvenile rearing areas, and increasing spawning opportunity will enhance existing conditions in the project area. These are beneficial effects of this project for habitat of fish.

Upper Columbia River Spring-Run Chinook Salmon: May Affect, But Not Likely to Adversely Affect
This species is found in the Columbia River and this distance from the immediate project area is over 1.5 miles. Chinook Salmon in the juvenile life stages have been observed in the Amon Watershed. The species is in the vicinity but not in the project area. Water exiting the Amon Creek area and flowing to the Yakima River Delta on the Columbia River will not affect the Columbia for quantity or quality. Short-term noise disturbances and potential water quality/quantity concerns during construction are at issue. Water Quality will be slightly improved by removing sediments. This project may affect, but not likely to adversely affect Upper Columbia River Spring-Run Chinook or their habitat.

Upper Columbia River Steelhead: May Affect, Not Likely to Adversely Affect
There are no known spawning areas within 10 miles of the project area. Some adults may remain in the Columbia River all year as an over wintering population in the McNary Pool. It's believed that a small number of over wintering steelhead may exist in the Columbia River. Steelhead smolts migrating along the shoreline may occur in April through June. However, rearing habitat is virtually absent along the shoreline of Columbia River but found in the Amon Creek area. The project will not have any direct impacts on the riverbank or near bank environment of the Yakima River Delta on Columbia River. It will have a minor impact upon the Amon Creek.

The project is not anticipated to result in any measurable degradation of water quality in the Amon, leading into the Yakima and then Columbia River, which might affect Columbia River Steelhead. Therefore, we conclude that the project will may affect but not likely adversely affect this species or its habitat.

Middle Columbia River Steelhead: May Affect, Not Likely to Adversely Affect
This species is found in the Columbia River and Yakima River. This distance from the immediate project area is over 1.5 miles. There is steelheadle habitat in the action and project area. Rearing habitat is along the shoreline of Amon Creek. The project may have direct impacts on the riverbank or near bank environment during construction as stated before. There will be noise and disturbance concerns during construction. These are temporary and discountable. The project will slightly improve water quality in Amon Creek after construction. Therefore, we conclude that the project may effect, not likely to adversely effect Middle Columbia River Steelhead.

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