

Naneum, Wilson, and Cherry Creek Watershed Assessment

Project Draft Scope of Work

This scope of work describes the tasks required to complete an existing condition assessment of the Naneum, Wilson, and Cherry Creek watersheds within the Kittitas valley of eastern Washington. This is the first phase (Phase 1) in producing a watershed plan that will be used to guide future enhancements to improve fish passage, use and productivity, improve water quality, improve irrigation reliability, reduce the impact of irrigation facilities on streams, and reduce flood hazards within the three watersheds. The purpose of Phase 1 is to develop a baseline understanding of the existing condition of each stream as it relates to fish, irrigation, water quality, and flooding in order to plan and prioritize future projects with a goal addressing limiting factors to recovery and enhancement of steelhead, salmon, and other aquatic species within the study watersheds. Most streams within the three watersheds have been significantly altered to accommodate irrigation and transportation infrastructure, development, and to reduce flooding. Legacies of these fragmented actions are streams that have degraded habitat, contain barriers to fish passage, poor water quality, insufficient flow and create unintended flood hazards. Results of the Phase 1 existing condition assessment will be critical to development of a geospatial decision management framework and a plan for future improvements (to be completed in Phase 2). The estimated schedule for Phase 1 is approximately 2.5 years - with completion by November 2016.

Kittitas County Flood Control Zone District is the lead agency and will manage the project. Funding for the project is provided by the Washington State Salmon Recovery Funding Board (SRFB), the Kittitas County Flood Control Zone District (FCZD), and in-kind services and funding by the Kittitas County Conservation District (KCCD), the United States Bureau of Reclamation-Yakima River Basin Water Enhancement Project (USBR), and the Mid-Columbia Fisheries Enhancement Group (MCFEG). Additional project partners who will participate as members of the project's technical advisory group include: USDA Forest Service, US Fish and Wildlife Service, Washington Department of Fish and Wildlife, Washington Department of Natural Resources, City of Ellensburg, City of Kittitas, Central Washington University, the Yakama Nation, Trout Unlimited, Washington Department of Ecology, Washington Water Trust, and all key irrigation entities including the Kittitas Reclamation District (KRD), Cascade Irrigation District, and the Ellensburg Water Company.

Most land within the watersheds and bordering the streams is privately held and the landowners are typically protective of their property and the streams that pass through them. To achieve success, landowner and community input will be critical; therefore, an effective stakeholder engagement plan will be developed and will be led by the FCZD and KCCD.

The following provides a description of the tasks to be carried out to complete Phase 1. Multiple project partners have agreed to participate in the project. Therefore, the partner responsible for completing or leading each task along with key assumptions and anticipated deliverables are listed. A consultant will be retained to manage the project and to complete certain technical tasks. At this time it is not clear whether the funds available are sufficient to complete all of the tasks described below. If they are not,

the FCZD, consultant, and select members of the TAG will work together to prioritize tasks. It is possible that certain low priority tasks could be delayed until additional funds can be secured or they may be moved to Phase 2.

Scope of Work

Phase 1 – Existing Condition Assessment

The objective of Phase 1 is to develop a thorough understanding of fish, habitat, irrigation, water quality, flow conditions, and flood issues present within each watercourse within each sub-basin. This information will be required to identify and develop a plan/strategy for future improvement projects within the project area (Phase 2). Phase 1 will include the following tasks.

Task 1 – Project Goals and Objectives

A clear set of project goals and objectives are required to ensure that the Phase 1 assessment produces the information needed to implement Phase 2. These goals and objectives must be developed in collaboration between project proponents, landowners, and community representatives to ensure that they address the potential diverse interests of the affected community.

Project goals and objectives will be developed through a series of three meetings. Prior to the first meeting, phone calls will be held with key project proponents to seek their goals, concerns, and anticipated outcomes for the project. Input will be used to develop a draft set of project goals and objectives. The first meeting will include only the key proponents with the purpose to refine the draft project goals and objectives, and to identify a small number of key stakeholders that must be engaged in the project to achieve a successful outcome. A second phone meeting will be held with the key project proponents to finalize the project goals and objectives and to refine a plan to present project goals to the broader group of stakeholders. The third meeting will be with the key stakeholder group with the purpose to describe the project, present the draft project goals and objectives and to seek input. Following this meeting, the final set of project goals and objectives will be written.

Lead: Consultant

Assumptions:

- The two face-to-face meetings will take place in Ellensburg

Deliverables:

- Problem statement
- Draft project goals and objectives
- Final project goals and objectives
- Meeting minutes

Task 2 – Stakeholder Engagement

Active stakeholder participation will be essential throughout the duration of the project. It will focus on engagement of three stakeholder groups: 1) a technical advisory group (TAG), 2) landowner /

community member advisory group (LAG), and 3) the general public. FCZD and KCCD staff will partner to lead this task.

It is anticipated that the stakeholder engagement effort will include the following tasks. These are in addition to the targeted meetings proposed above to define the project goals and objectives.

Task 2.1 Selection of Participants for the TAG and Key Landowner / Community Advisory Groups

The FCZD and KCCD will identify and invite key stakeholders to participate in the TAG and Landowner/Community Advisory Groups.

Task 2.2 Project Kick-Off and Overview Meetings

- TAG: A two hour meeting will be held to provide an overview of the goals and objectives of the project and seek input from members of the TAG.
- LAG: A two hour meeting will be held to provide an overview of the project and seek input from members of the LAG.
- General Public: A two hour meeting will be held to provide an overview of the project to the general public. The public will be encouraged to provide information and data they believe will be helpful to achieve the project goals and objectives.

Task 2.3 Project Website

A project website will be created to provide the general public with status updates. Anticipated schedules and locations for field data collection will be provided on the website.

Task 2.4 Progress Report Meetings and/or Conference Calls

Phase 1 will take 2.5 years to complete, therefore, general project updates will be provided to the TAG and LAG groups quarterly via meetings and/ or telephone conference calls. Updates will also be posted to the website. The TAG will also review of specific technical products throughout the course of the project. These reviews are identified within the task descriptions below.

Task 2.5 Presentation of Phase 1 Results

- TAG: A two hour meeting will be held to provide the TAG with an overview of the Phase 1 findings.
- LAG: A two hour meeting will be held to provide the TAG with an overview of the Phase 1 findings.
- General Public: A two hour meeting will be held to provide the TAG with an overview of the Phase 1 findings.

Task 2.6 Alternative Screening and Evaluation Criteria

- TAG/LAG: A two hour meeting will be held to present and seek input to the draft alternative screening and evaluation criteria developed in Task 4.

Lead: FCZD and KCCD with significant support by Consultant

Assumptions:

- Meeting materials will be provided to participants in advance in order to maximize meeting time.

- Each set of meetings will take place on the same day.
- FCZD and KCCD staff will organize each meeting and will invite participants
- FCZD and KCCD staff will prepare meeting minutes if required.
- Progress report meetings may occur more frequently if necessary.

Deliverables:

- Communication strategy
 - Brochure communicating problem statement, goals and objectives and how this project links to salmon recover and community benefits
- Power Point Presentations and other meeting materials
- Website content

Task 3 – Watershed Inventory and Condition Assessment

To develop a baseline understanding of the existing condition of each watercourse as it relates to fish, habitat, irrigation, and floods, the following will be identified/assessed.

- Stream channel locations and tributary connections
- Irrigation channels and ditch locations
- Stream flow rates -- Instantaneous peak floods, bank-full (channel-forming), and low flows as they relate to fish passage and habitat.
- Stream temperature and turbidity
- Irrigation control structures that affect stream hydraulics
- Fish passage barriers
- Water rights, including legal points of diversion, and overlapping water right holders
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- Fish presence
- Riparian and Aquatic habitat conditions
- Flood, erosion, and sedimentation hazard locations

The tasks required to develop this information are described below:

Task 3.1 Data Collection

Task 3.1.1 Collect & Review Existing Data & Information

Existing data and information necessary for the Phase 1 assessment will be collected, reviewed, organized, and made accessible to team members. Data and information may include, but not be limited to:

- Topographic mapping and LiDAR data
- Historical aerial photographs
- Planning level spatial data including:

- Stream channels
- Irrigation canals, ditches, and structures
- Mapped floodplains and channel migration zones
- Parcel, easement, and right-of-way boundaries
- Roads and trails
- Major utility corridors
- Sensitive areas
- Fish and habitat data
 - Stream assessment reports prepared between 2003 and 2005 by KCCD for 75 miles of channel within the three watersheds
 - Completed fish habitat improvement projects
 - Historical and existing fish presence data
- Flood history and photographs
- FEMA digital flood maps
- Stream flow data
 - USGS and DOE stream gage records
- Water quality data
- Water right data
- Ecology Water Rights Tracking System and water rights confirmed in the Conditional Final Order for the adjudication
- Groundwater reports and data
- USFS post forest fire sediment / runoff model results
- Surficial geology maps and reports
- TMDL Monitoring Reports
- Studies
 - 1975 Wilson Creek Study
 - Irrigation studies
 - City of Ellensburg study
 - Total maximum daily load (TMDL) studies

Lead: Consultant

Assumptions:

- FCZD, KCCD, and partners will provide a significant portion of the information and data

Deliverables:

- Geodatabase approved by the TAC for use with data from all tasks listed below.
- Decision management framework for addressing the problem statement with goals and objectives for each task.
- Project website where the data will be stored, organized, and will allow easy access by project partners.

Task 3.1.2 – LiDAR Data for Upper Watershed Areas

LiDAR data exists for portions of the watersheds that occupy the floor of the Kittitas Valley. LiDAR data does not exist for the upper portion of each watershed extending from the valley floor to the stream headwaters along Mission Ridge. LiDAR for the upper watersheds will be collected by a selected consultant, and will include LiDAR elevation data, aerial imagery, and feature data including creek centerlines, roads, bridges, and identifiable culverts.

Lead: LiDAR Consultant

Assumptions:

- Project funds will allow for complete coverage of the upper watersheds. If adequate funds are not available, LiDAR will be collected for the primary stream corridors only.

Deliverables:

- LiDAR data set in LAS format, 1' or 2' Contours, and as an ASCII point file
- Feature data including creeks, edge of road, bridges, identifiable culverts, etc.
- Aerial Imagery (if project funds allow)

Task 3.1.3 – Stream Flow Data Collection

There is a critical need for year-round stream flow data for most channels within the three watersheds. Currently, the Washington State Department of Ecology operates stream gages at several locations that provide either 15 minute or daily discharges and the USGS operates gages on Naneum Creek, Cherry Creek, and Wilson Creek. These data sets are useful, but significantly more data is needed. Data loggers and/or crest stage gages will be installed at strategic locations within the watersheds to help the project team determine how flow distributes through each channel network as it moves from the upper watershed to the outlet. The number and locations of the gages will be determined based upon review of channel network configurations, input from TAC members, and available budget.

It is not within the project budget to establish rating curves for each stream gage, for this would require multiple physical discharge measurements at each site. Instead, simple channel cross section and longitudinal profile surveys will be collected and normal depth calculations performed to create an approximate stage discharge rating curve for each gage site. This will allow discharges to be estimated up to bankfull events. It will be difficult to produce reliable discharge estimates for large floods that over top the channel banks, however, in siting the gages, to the extent possible, locations will be selected where overbank flows can be estimated.

Lead: Consultant with input from FCZD and TAG

Assumptions:

- Gage data will be download every two months
- Crest stage gages will be reset following relatively large floods.

Deliverables:

- Data logger data and flow estimates
- Gage normal depth rating curves

Task 3.2 -- GIS Mapping

The consultant will develop a GIS project for the study area. It will include a GIS geodatabase that will serve as the repository for all key spatial data obtained or generated in Phase 1, and a project area based map that will provide the primary platform from which Phase 1 project maps and other deliverables will be generated. To the extent the budget allows, the GIS project will include:

- *Project Area Base Map*

A base map will be created onto which spatial data created or generated during Phase 1 can be overlaid. The base map will include aerial imagery, topography, planning level data such as roads, trails, parcels, and jurisdictional boundaries.
- *Watercourses*

Existing GIS watercourse location data will be obtained from Kittitas County. Channel locations will be reviewed and refined by comparing the mapped locations to aerial imagery and LiDAR data. Some watercourse segments will be too small to map via this process and therefore, field verification of select sites will be required to the extent the budget allows. The field effort is covered in a later task.
- *Irrigation Infrastructure – canals and ditches, diversion structures*

GIS irrigation infrastructure layers will be obtained from appropriate sources. Irrigation channel locations will be reviewed and refined by comparing the mapped location to aerial imagery and LiDAR data. Irrigation structures that influence stream hydraulics will be identified and mapped. Stream crossing types will be identified (siphon, undershot, etc). Limited field verification of structure location and impact to the stream will be required.
- *Water Crossings*

GIS data for water crossings (bridges, culverts) will be obtained from Kittitas County and the City of Ellensburg.
- *Fish passage barriers*

A map showing fish passage barriers will be created based upon examination of aerial imagery, LiDAR data and existing photographs. Field verification of select sites will be completed to the extent the budget and property access allow.
- *Water rights and points of diversion*

Water rights within the streams will be identified and locations mapped. Overlapping water rights will be noted where stream rights and irrigation district rights share a place of use.
- *Riparian habitat type and condition*

GIS polygons will be created to identify riparian areas along the banks of the streams. Mapping will be general and will not identify specific species. Polygons will also be created to identify areas along streams where there is no significant riparian buffer.
- *Existing and historic side channels, off-channel ponds, and other floodplain habitat features*
- *WDFW Habitat Assessment Protocol Site Data*

Stream segments will be identified where WDFW Habitat Assessment protocols can be applied to collect representative habitat characteristic data. This will include identification of

sites that were evaluated by the KCCD between 2003 and 2005, as well as sites that will be evaluated as part of this project. Key data for each sample site will be entered into tables can be queried within the GIS project.

- *Water quality 303(d) (impaired waterbody) data*
A GIS layer will be created to identify existing point source water quality pollutant sites. This will be done only if point source data is available.
- *Historical flood sites and inundation areas*
A GIS layer will be created to identify points along streams where flooding originates, flow paths and inundated land. This task will only be completed if reliable flood information is available.
- *FEMA flood mapping*
Digital versions of existing FEMA flood maps will be input into the GIS project geodatabase and included on the project map.
- *Flood and erosion control facilities*
A GIS layer will be created that identifies known flood and erosion control facilities (e.g., levee, revetments). Facilities will be identified by examining aerial imagery, LiDAR data, and through discussions with FCZD and KCCD staff.

Figures will be created within the GIS project to allow project team members to print physical maps to be taken into the field for site verification and to provide a consistent format for figures generated for the project report. ArcGIS Online maps will be used to allow the public and partners to view the collected data.

Figures showing the data generated above will be provided to the TAG for review and comment.

Lead: Consultant with GIS data input provided by project partners

Assumptions:

- The level of effort for this task cannot be fully determined until the project team has a clear understanding of which data sets exist in a compatible GIS format and which do not. The consultant will work with the project team to determine the GIS layers/data to create and who will create them.
- Many of the TAG members have firsthand knowledge of the watercourses and therefore, it is assumed that they will provide additional detail to improve the accuracy of the maps.

Deliverables:

- Integrate data into geodatabase per task 3.1
- Metadata for each GIS data file
- Figures showing key project data

Task 3.3 - Channel Characterization

General Channel Type Classification

All watercourses mapped in Task 3.3 will be assigned a channel type classification based upon the general categories below.

Primary irrigation canals and laterals that are owned, operated and maintained by a defined owner. ,

- Secondary irrigation channels that do not have a clear owner responsible for maintenance or managing flow
- Channels that convey natural flow generated from the watershed runoff. These channels may also convey irrigation return flows.
- Channels that convey water generated from springs,
- Seasonal ditches, etc.

Habitat Classification

All watercourses mapped in Task 3.3 will be assigned a habitat classification following the completion of the field data collection, hydrology, hydraulic, and sediment tasks described below. Classification categories will be determined by the consultant and members of the TAG.

Lead: FCZD and TAG

Assumptions:

- A characterization committee made of FCZD staff and TAG members will be formed to work on this task.

Deliverables:

- GIS layers will be updated / created to display the characterization information.
- A companion report to the GIS data will be produced with additional information.

Task 3.4 - Field Work

Significant field work is required to complete the Phase 1 assessment. A strategic field inspection plan will be developed to target key sites. The watersheds cover 394 square miles and contain approximately 270 stream miles which is very large. In addition, some landowners will not grant access, therefore, a strategic plan will be required. The field program will be comprised of two main components, a habitat survey and verification of GIS data.

Habitat Surveys

Physical habitat surveys will be conducted using the WDFW Habitat Assessment protocol from the Fish Passage Barrier and Surface Water Diversion Screening Assessment and Prioritization Manual (2009). Similar surveys have already been conducted by KCCD on Coleman Creek, Cherry Creek, and several of their tributaries between 2003 and 2005, and new habitat surveys will focus on areas that have not previously been analyzed. The WDFW habitat assessment methodology involves walking each stream

up to the end of fish use, evaluating all man-made features and assigning fish passage Priority Index (PI) and Screening Priority Index (SPI) scores. Each stream will be divided into reaches at each man-made feature and at significant changes in gradient, bed form, channel size, streamflow, or riparian condition. Each reach will be assessed for:

- Overall habitat quality
- Magnitude of spring flow influence
- Water temperature and turbidity
- Percent of each reach shaded by riparian vegetation
- In-stream cover density, including large woody debris (LWD), undercut banks, close overhanging vegetation, etc.
- Floodplain connectivity and extent of disconnected off-channel/side channel habitat.

More detailed measurements of habitat characteristics will be taken at representative sample sections within each reach. Where feasible, the Full Survey (FS) methodology will be used, resulting in sample sections totaling approximately 20% of total stream length. However, due to the scale of the project, the Reduced Sampling Full Survey (RSFS) may be used, which specifies one 180-foot long sample section in each reach. Habitat characteristics to be measured include:

- Length of each pool, riffle, and rapid in the sample section
- Wetted and scour line widths at the first two pools, riffles, and rapids found in each sample section
- Average channel depth
- Substrate composition for each habitat type (riffle, pool, or rapid)
- Channel gradient
- Channel entrenchment (floodprone width/bankfull width)

The data collected will be input into the "Survey X4" spreadsheet from WDFW. This spreadsheet will be used to calculate and summarize the total survey length, rearing area, spawning area, and adjusted production areas for each reach. The stream reaches examined will be identified in a GIS layer and key data will be placed in a GIS data table linked to each reach.

Lead: KCCD

Assumptions:

- Habitat survey will focus on areas that were not previously surveyed as part of the habitat surveys on Coleman and Cherry Creek conducted by KCCD from 2003 to 2005.
- Field inspections will only be completed for stream reaches where access is granted by the landowner.

Deliverables:

- Survey X4 spreadsheet
- GIS Layer with data tables.
- Integrate data into geodatabase per task 3.1

Fish Surveys

In coordination with the habitat surveys, the USFWS will conduct fish surveys of the study streams to determine fish presence, species diversity, and relative abundance. Surveys will be conducted via appropriate methods that may include backpack electrofishing, seining, tagging, and/or video monitoring. The objectives of these surveys are to (1) increase landowner knowledge and participation by establishing fish survey reaches on private and public property in the agricultural and forested areas of the watersheds, (2) collect baseline fish data for a Before-After Control Impact study protocol for monitoring the effectiveness of fish passage barrier removal projects, and (3) to determine if certain sub-watersheds are currently more or less productive for target species such as rainbow trout, which are a good indicator species for determining habitat suitability and production potential for other anadromous salmonids.

Lead: USFWS via a funding agreement with USBR. USFWS has equipment, trained personnel, and permits for conducting fish surveys. WDFW will be consulted and included in study plans where there is a potential for PIT tagging of fish in areas of interest to the steelhead Viable Salmonid Population project.

Assumptions:

- Enough landowners with significant streamside property will grant access to establish long term monitoring sites; MCFEG and/or KCCD can provide assistance via student interns.

Deliverables:

- Fish survey data will be collected and maintained in a spreadsheet or database and made available;
- An annual progress report for year 1 and a final report for year 2 will be prepared and disseminated to the stakeholders.

Verification of GIS Mapping

As part of the Habitat Survey field work described above, the KCCD will take the GIS Project maps created in Task 3.2 into the field to verify the accuracy of the feature data. Specific data to verify will include:

- Watercourse location and classification (includes all natural and man-made watercourses (irrigation canals, ditches, etc.)
- Irrigation diversion or intake structures
- Fish passage barriers
- Riparian habitat type and condition
- Water crossing dimensions (culverts, bridges, etc.)
- Flood and Erosion control features or facilities

Lead: KCCD and/or other team members and/or consultant

Assumptions:

- Sites where access is denied will not be examined.
- The KCCD field program may not cover all reaches and therefore, additional team partners or the consultant may complete additional verification site inspections.

Deliverables:

- Marked up maps will be provided to the consultant, who will use them to update the GIS project information.
- Integrate data into geodatabase per task 3.1

Task 3.5 – Water Rights Research

Water rights will be researched to identify points of diversion, ditch use and overlapping water rights holders and how it impacts potential water available from irrigation districts and private sources. Opportunities for water saving and efficiencies will be identified in order to increase in-stream flows.

Lead: KCCD and/or other team members or consultant.

Assumptions:

Deliverables:

- Map showing points of diversion, water rights and low-flow reaches, spreadsheet of water rights and scanned documents.

Task 3.6 – Stream Flow -- Hydrology

Stream discharges will be estimated to evaluate both habitat conditions and flood risk. For habitat, the primary goal will be to estimate “critical” low flows that impact fish passage, rearing, and migration. For flood hazards, the goal will be to estimate annual instantaneous peak flood discharges for each channel segment.

Stream gage records (from both existing and proposed gages) should provide significant insight into how flow distributes within each channel network. This gage data will be the primary source of data for low flow habitat assessment and for estimating bankfull or channel forming discharges which are important for both habitat and channel capacity assessments. The gages may provide some data that can be used to help predict flood magnitude and frequency; however, because large floods can be relatively rare, there may not be a significant event during the study period. Therefore, an alternative approach to estimating peak flood discharges is to build a hydrologic model of the combined watershed and to use it to create synthetic annual instantaneous peak discharge records at key sites. These records would be used to create flood frequency curves which would be used to estimate flood frequency discharges at the key sites. Because most major floods within the watershed are generated by rain-on-snow events, a model capable of simulating rain-on-snow runoff should be used. A hydrologic model will only be constructed if the input data required for the model are available and if the project budget is sufficient. Selection of the model will be done in consultation with members of the TAG.

Climate change may impact the magnitude, duration, and timing stream discharges. Information on climate change is evolving and changing rapidly. The consultant will conduct a limited review of the latest climate change prediction data and literature relevant to the Kittitas Valley, and will offer an opinion as to how stream habitat and flood hydraulic conditions may be affected. If a hydrologic model is developed for the combined watershed, it may be possible to use it estimate how stream flows will change under certain climate change scenarios. The findings of the climate change review will be discussed with the TAG to determine how to apply the findings to the investigation.

Lead: Consultant with input and review by TAG members

Assumptions:

- Discharge estimates will have a high degree of uncertainty due to limited gage data, groundwater, and inter-channel exchange.
- Climate change impacts will be based upon readily available opinions offered by climate change experts and agencies such as the USBR, USACE, WSDOT, etc.

Deliverables:

- Stream discharge estimates to the extent feasible) – low flow values important for habitat, bankfull / channel forming discharges, and annual instantaneous peak flood discharges.
- Description of methods and results, as well as identification of key physical features that influence stream flow.

Task 3.7 – Channel Hydraulics

Due to overwhelming number and length of streams within the study area, it will not be possible to develop detailed hydraulic models of all stream reaches; therefore, the following approaches will be utilized to estimate hydraulic characteristics to evaluate both ecological conditions and flood hazards.

For Habitat –

- Hydraulic characteristics (flow depth and velocity) will be estimated at key locations throughout each channel network to classify hydraulic conditions for fish habitat. The locations will be selected by the consultant with input from TAG members. The focus of the habitat hydraulic analysis will be to estimate hydraulic conditions (depth and velocity) for critical low or other flows that limit or impact fish passage, rearing, and migration, as well as bankfull channel forming discharges. Normal depth calculations will be used to estimate depth and velocity at most sites, however, HEC-RAS numerical modeling may be used within reaches if, for example, a model is also needed to assess flood risk. For reaches with impaired or inadequate hydraulic conditions, hydraulic analysis will be used to test opportunities to improve conditions.

For Flood --

- The scope for this task will be developed following the identification of known flood problem sites and areas. Flood risk assessments will focus on areas currently or planned for

development and have known flooding issues (eg. Wilson Creek as it passes through the City of Ellensburg). The Consultant will work with the FCZD, KCCD, the City of Ellensburg and others to identify which areas should be evaluated and to determine whether numerical modeling or simpler methods are appropriate. The results will be presented as spatial data in the GIS project.

- Once enough information is gathered to identify flow changing barriers, structures and facilities, flood water routing will be identified and the flow accommodation needs of the system will be reviewed to determine the needs of the system to carry the 2-year, 10-year and 100-year flows.

Lead: Consultant with input from the FCZD

Assumptions:

- Topographic data sufficient for hydraulic calculations can be obtained from the LiDAR data or from the stream measurements obtained as part of the field habitat surveys.
- No topographic surveys will be completed, unless approved by the FCZD

Deliverables:

- Hydraulic calculations
- Hydraulic models and results
- GIS layers showing habitat and flood hydraulic characteristics integrated into geodatabase per task 3.1
- Channel accommodation needs will be determined.
- Written description of methods, assumptions and uncertainties.

Task 3.8 – Sediment Transport and Deposition

Sediment transport and deposition and its influence on channel morphology, habitat quality, and flood and erosion risk will be examined. General sediment transport and deposition trends along with substrate quality will be documented during the habitat field inspection task. This data will be considered when habitat quality is defined for each watercourse and sub-reach. For reaches with impaired or inadequate sediment conditions to support fish, opportunities to improve sediment conditions will be sought. For example in reaches devoid of gravel bed material, wood could be added to the channel bed to capture and retain coarse bed material.

For flooding, areas of excessive sediment deposition will be identified and the processes that are responsible for the deposition identified. An assessment will be completed to determine the impact the sediment has on flooding and erosion to determine if sediment management of some form should be considered as part of the overall plan to reduce flood and erosion risk.

Lead: Consultant

Assumptions:

Deliverables:

- Written description of sediment deposition sites, characteristics, and the impact the deposition is having on channel geomorphology, habitat, and flood/erosion risk.
- GIS maps showing sediment deposition areas.

Task 3.9 - Fire Impact to Habitat and Flood Hazards

Fire impacts and its influence on habitat, flood and erosion risk will be examined. Recent forest fires in portions of the upper watershed may produce elevated sediment transport levels to watershed streams and have destroyed habitat and changed the environment within the watersheds. The USFS has completed an analysis of potential sediment production and transport levels caused by the Table Mountain Fire. A new assessment of the impacts of the Snag Canyon Fire will be completed. The reports and assessments will be used to draw conclusions as to how the fires have affected habitat and flood characteristics within the basin streams, and future implications to the watershed.

Lead: Consultant

Assumptions:

- USFS reports will be provided by the FCZD
- If ample time exists to assess the impacts of future fires that cause significant damage the study area, those fires will be assessed

Deliverables:

- Assessment, based upon a review of the USFS report and completion of study for new fire burned areas, of the likely impact the recent forest fires will have on sediment transport and deposition
- Assessment of the impacts to habitat within and downstream of the fire burned area
- Written description of the impacts of the fire upon habitat, flood and erosion risk.
- GIS maps showing fire burned areas.

Task 4 – Alternative Screening and Evaluation Criteria

Screening and evaluation criteria will be developed to guide the selection of proposed actions in Phase 2. The 2009 Yakima Steelhead Recovery Plan lists the return of steelhead into the Upper Naneum Creek through the removal of fish passage barriers and other constraints as a priority action. The path to the Upper Naneum Creek is complicated and alternatives will need to be reviewed, discussed and consensus found in the form of a common path forward for fish management strategies. Based on the outcome, criteria will be chosen to guide the implementation of projects within the watershed. The consultant will lead discussions with the TAG and LAG to develop alternatives for discussion and to choose the best path forward, and will work closely with the FCZD and KCCD to develop draft criteria which will then be provided to the TAG and LAG for review and input.

Screening criteria will likely include:

- Feasibility
- Unacceptable risk to damage to property, infrastructure, or habitat.
- Current conditions/use

Evaluation criteria will be weighted and likely include:

- Salmon and Salmon Habitat benefit
- Irrigation benefit
- Flood and/or erosion benefit
- Impact to fluvial processes
- Impact to salmon and salmon habitat
- Impact to irrigation systems
- Sustainability
- Implementation feasibility
 - Permitability
 - Design complexity and cost
 - Construction complexity and cost
 - Maintenance requirements and cost

Lead: Consultant

Assumptions:

- None

Deliverables:

- Agreed to screening and evaluation criteria for Phase 2

Task 5 – Identification of Initial List of Actions

Task 3 will provide the project team with sufficient information and knowledge to identify limiting factors to salmon recovery, the most significant sites where habitat should be preserved or improved, and where flood and erosion hazards should be reduced. Limiting factors to salmon recovery should take into account all data collected in Task 3, including opportunities to preserve and enhance water quality; in-stream flow; in-stream, riparian, and off-channel habitat quality and abundance; floodplain connectivity; fish passage; and fish screening. One of the highest priorities for fish is to determine if there is a preferred route that should be preserved and/or enhanced to provide a path for fish to access upper portions of the watershed. The FCZD, TAG and consultant will use the information developed in Task 3 to determine if there is a path. If there is, and if improvements are needed to allow unobstructed fish passage, the team will identify and prioritize the improvements. In addition there may be other sites where early actions should be taken to improve habitat or to reduce flood / erosion risk. Up to three habitat and two flood and erosion projects will be identified for early action. For these sites, concept drawings, and cost estimates for design, permitting and construction will be prepared so that grant funding can be pursued.

Lead: FCZD, TAG, consultant

Assumptions:

- None

Deliverables:

- GIS layer that shows preferred fish passage route
- Early action concept sketches and cost estimates

Task 6 – GIS Project Database and Summary Report

The final products for Phase 1 will be the GIS project database, a companion summary report, and as needed individual task specific technical reports prepared by project partners. The GIS project will provide a comprehensive database that will be used to identify potential project sites in Phase 2. The summary report will document Phase 1 methods, results, and will present information that cannot be presented in spatial form.

Lead: Consultant

Assumptions:

- The FCZD will distribute the draft and final reports to the stakeholders.
- The FCZD will assemble all report comments and will provide them to the consultant

Deliverables:

- GIS Project as specified in Task 3.1
- Draft project report will be provided in PDF format to the FCZD.
- Final project report will be provided to the FCZD

Task 7 – Presentations of Results

Following the preparation of the project report, the findings will be presented to the TAG, LAG, and General public as specified in Task 2 above.

Lead: Consultant with assistance in and input from key partners.

Assumptions:

- Presentation will be in the form of Power Point

Deliverables:

- Power point presentations and other graphics

Task 8 – Phase 2 Scope Development

It is anticipated that Phase 2 will commence immediately following the completion of Phase 1, assuming required funding has been secured. The consultant will prepare a draft scope of work for Phase 2, and provide it to the FCZD and KCCD for review. An updated draft will then be presented to the TAG and LAG for review and comment.

Lead: Consultant

Assumptions:

- None

Deliverables:

- Draft Phase 2 scoping document for FCZD and KCCD review
- Updated Phase 2 scoping document for TAG and LAG review

Task 9 – Project Management

A consultant will be retained to manage Phase 1. This will include setting up the project schedule, coordinating all tasks including those to be carried out by the consultant and partner agencies. The consultant project manager will report directly to the FCZD project lead and will keep him/her informed on progress, issues, and budget. The consultant and FCZD project managers will determine the desired update method(s) and frequency.

Lead: Consultant

Assumptions:

- The consultant will strive to keep the project moving at a pace that will meet key project milestone dates. It is recognized, however, that due to the extensive collaborative work efforts that will be completed by partner agencies, it will be the responsibility of the partners to meet milestones for which they are responsible.

Deliverables:

- Project schedule with key milestone dates
- Progress reports
- Invoices