Chapter 9 – Flood Management Goals and Criteria

9.0 Problems, Opportunities, Objectives, and Constraints

Major flooding has occurred in the Skagit River Basin. Because of its geographic location, the Skagit River Basin is subject to winter rain floods and an increase in discharge during the spring due to snowmelt runoff. Rain-type floods usually occur in November or December, but may occur as early as October or as late as February.

Antecedent precipitation serves to build up ground water reserves. Frequently, a light snow pack is then formed over most of the entire basin. A heavy rainfall accompanied by warm winds completes the sequence, which produces major floods. The heavy rainfall and accompanying snowmelt result in a high rate of runoff, as the ground is already nearly saturated from earlier precipitation. Two or more crests may be experienced within a period of a week or two as a series of storms move across the basin from the west. The winter floods have a considerably higher magnitude than the average annual spring high water.

Flood damages have been reduced in recent years with a well-maintained local levee and dike system on the Lower Skagit River, and a well organized and effective flood fighting effort. These floods have been under 30-year events. It is expected that flood fighting will not be able to stop larger hydrologic events and there is potential for devastating flooding throughout the valley.

Additionally, floodplain development and hydrologic modifications in the Skagit River Basin have resulted in ecosystem degradation. Construction of sea dikes, Skagit River levees, and agricultural drainage projects have converted the once broad Skagit River Delta tidal estuary into one of the most productive agricultural production areas in the nation. However, the floodplain developments have also had adverse impacts on native fish and wildlife including multiple salmonid species currently listed as threatened and endangered under the Endangered Species Act.

The following statements describe the problems and opportunities identified for the Skagit River Flood Damage Reduction and Ecosystem Restoration Feasibility Study:

- The urban areas of the floodplain, principally portions of Hamilton, Mount Vernon, Burlington, and La Conner are at high risk of severe flooding.
- Rich and productive agricultural lands in the Skagit Valley are prone to severe flooding due to levee overtopping and failure.
- Major transportation corridors (including Interstate 5, State Route 20, and Burlington Northern-Santa Fe Railroad) and public infrastructure are also prone to severe flooding.
- Skagit River ecosystem structures, functions, and processes are degraded.

- The Skagit River basin has a number of separate Diking Districts that oversee levees providing at a maximum 35 year recurrence interval flood protection. There is an opportunity to provide the basin with an overall flood risk management system.
- Ecosystem functions and processes in the Skagit River and delta can be improved to benefit fish and wildlife, including listed salmonids.

The following planning objectives are statements that describe the desired results of a project in terms of solving stated problems and taking advantage of opportunities:

- Reduce flood hazards and flood damage costs in the project area to the maximum extent practicable.
- Reduce the adverse effects of flooding in the towns and cities of the Skagit River floodplain to the maximum extent practicable.
- Reduce the adverse effects of flooding on transportation delays to critical transportation corridors including, but not limited to, Interstate 5, State Routes 9, 20 and 536, and Burlington Northern-Santa Fe Railroad to the maximum extent practicable.
- Provide a systems wide approach to reducing flood damages in the populated areas of the basin to the maximum extent practicable.
- Protect existing public utility infrastructure from flood hazards to the maximum extent practicable.
- Reduce the threat of catastrophic levee failure and reduce flood damages to the agricultural community and rural residents to the maximum extent practicable.
- Restore existing degraded riverine habitats for salmonid and improve Skagit River ecosystem functions and processes.

Planning constraints are statements about things we want to avoid, or things you cannot change, while striving to meet objectives.

- A project must comply, to the extent possible, with the objective of Executive Order (EO) 11988, Floodplain Management. It is the intent of EO 11988–and Corps policy – to: reduce the hazards and risk associated with floods; minimize the impact of floods on human safety, health and welfare; restore and preserve natural floodplain values; and avoid inducing floodplain development unless it is the only practicable alternative.
- A project must comply with all other Federal, State, and local regulations, including environmental regulations.
- Design the project with features compatible with existing agricultural and open space uses in rural areas to the maximum extent practicable.
- Flood risk management measures must be formulated to be in compliance with Wild and Scenic River designation of significant portions of the Skagit River system upstream of Sedro-Woolley.
- Recommended projects must support Corps Environmental Operating Principles.

- Future climate change may raise sea levels in Puget Sound 2-4 feet within 50 years and needs to be considered in the design of the projects.
- Avoid adverse impacts to the socio-economic and cultural aspects of the basin.
- Avoid adverse impacts to the aquatic and terrestrial environment to the maximum extent practicable. Minimize and compensate for unavoidable adverse impacts to the aquatic and terrestrial environment.

Planning assumptions are statements defining the parameters of the study scope, and provide guidelines, decision milestones, and boundaries for the study scope. Projects are formulated to meet the objectives, subject to constraints. Assumptions are modified as needed during the study process to reflect changing conditions.

- The life of proposed flood risk management and environmental projects is considered 50 years for the basis of economic, environmental, and benefit analysis. The base year for the 50 year period of analysis begins when project construction is completed and the project is put into service.
- Areas being evaluated for flood risk management consist of the town of Hamilton and the area downstream from Sedro-Woolley to the mouth of the Skagit River.
- The impact evaluation area for the study goes from the training area of the Upper Baker Dam and reservoir to the tidelands of the Skagit River and Padilla Bay.
- Hamilton is being considered for nonstructural flood risk management and relocation. A Section 205 study completed by the Corps in the 1980s indicated that a structural solution for Hamilton is not feasible.
- Measures that have been dropped from the feasibility study by previous screening for economic or environmental reasons are: dredging of the Skagit River main stem to Sedro-Woolley and modifications to the Seattle City Light dams (excepting operational changes at Ross Dam).
- The PMP will be reevaluated at key phases throughout the feasibility study as well as at the initiation of each fiscal year.
- Hydropower losses to Baker Dams or Ross Dam from additional flood risk management storage are considered a project cost.
- The Baker Dams alternative is being carried as a “locally preferred plan”. If it is recommended for Federal implementation (based on environmental, socio-economic, cultural impacts, engineering feasibility and risks), costs greater than the alternative identified by the Corps as the National Economic Development Plan (least cost, most net benefits) will be paid 100% by the local sponsor. The local sponsor will pay all operation and maintenance costs for any recommended project, including hydropower losses, if pertinent.
- Climate change is not included in the HH model. There is currently no accepted protocol for dealing with potential climate change on basin hydrology. Some sensitivity studies can be included during Planning, Engineering, and Design if needed to provide “worst case” scenarios as a result of various climate outcomes. Potential increases in tidal flooding will be

evaluated in project design to determine whether projects could fully function in a reasonable climate change situation.

- It is assumed that the Corps will not conduct detailed, expensive scientific and sediment studies of the impacts of a Padilla Bay bypass to eelgrass beds. The Corps will attempt to provide potential scenarios based on historic records
- Presumes no permanent floodwall/levee system in Mount Vernon, nor a setback of Diking District 12 levees. Constructed projects will be incorporated into the Corps without project condition analysis as appropriate. Only flood reduction projects having obtained appropriate permits and project funding will be included in the future without project condition.
- The GI study will evaluate ecosystem restoration projects compatible with selected FDR projects. Preference will be give to restoration that is associated with the recommended flood risk management plan. All restoration projects need to have a hydraulic nexus, and be incrementally justified. Primary consideration will be give to providing necessary mitigation for the recommended plan. Ecosystem restoration projects, to count as increased project benefits, will need to exceed the requirements for mitigation.

(USACE, 2009)

9.1 Short-Term and Long-Term Term Goals

Ecology's "Comprehensive Planning for Flood Hazard Management Guidebook" notes that "goals" are generally the broadest expression of a jurisdiction's desires. "Objectives" are more specific targets or benchmarks to be achieved in the ongoing implementation of the stated goals. In addition to the use of short-term and long-term goal statements, some plans blend or further split goals and objectives into associated terms, such as: mission statements, project purpose statements, guiding principles, performance standards, prioritization criteria, strategies, and evaluation criteria, etc. For the purposes of this plan, "goals" are defined as the benefits that the plan is trying to achieve. The success of the plan, once implemented, should be measured by the degree to which its goals have been met (i.e., by the actual benefit that occurs on the ground). "Objectives" are defined as short-term aims which, when combined, form a strategy or course of action to meet a goal. (Ecology, 1991)

With the aid of Tetra Tech Consultants, the following short-term and long-term goals were established and agreed upon by the Flood Control Zone District in order to develop a comprehensive approach to flood hazard reduction and management.

9.1.1 Short-Term Goals

- Establish and maintain a planning process that encourages and supports coordinated, county-wide flood hazard risk reduction management that includes both structural and non-structural measures.
- Continually improve flood warning, emergency response, and evacuation capabilities
- Support the completion of the U.S. Army Corps of Engineer's Skagit River Flood Damage Reduction and Ecosystem Restoration Feasibility Study with input from the Skagit FCZD Advisory Committee (Skagit GI).

- Support County participation in the FEMA flood insurance program and encourage communities and individuals to remain in or join the program.
- Support continued county-wide participation in the federal Community Rating System (CRS) of the National Flood Insurance Program if it is determined to be effective in reducing flood damages/risks and is not actually promoting development outside the urban growth areas of Skagit County.
- Support local efforts to improve flood risk reduction efforts consistent with the Comprehensive Flood Hazard Management Plan.
- Improve public understanding of, and support for, flood hazard management through multi-media public outreach and education efforts using the Public Involvement Plan as a tool for guiding efforts.
- Integrate flood hazard risk reduction management with other land use plans and regulations to minimize flood risk and to reduce need for in-stream flood control works.
- Identify at-risk properties, with special attention to those experiencing repetitive losses, and look for ways to acquire, and assist with removal or relocation.
- Develop a holistic set of criteria that prioritize strategies for flood risk reduction that balance engineering, economic, environmental, and social factors.
- Ensure flood risk reduction projects do not have negative upstream or downstream impacts without compensation
- Strive to increase the level of communication among governmental and nongovernmental entities and individuals regarding flood risk management.
- Ensure projected changes in sea level rise, hydrology, and sediment delivery are incorporated into selection and design of flood hazard reduction projects.
- Evaluate the impacts of the flood risk reduction projects on growth and expansion of development into flood risk areas.
- Evaluate opportunities to reduce flood hazards via salmon recovery or other environmental restoration projects.
- Look for opportunities to restore lost habitat and improve diversity of habitat for all wildlife species.
- Impacts to fish and wildlife habitat associated with flood reduction efforts will be addressed.
- Cumulative effects analysis associated with multiple flood damage reduction efforts should be undertaken to ensure protection of ecosystem function
- In comparing similar projects, prioritize flood reduction measures that maximize ecosystem restoration opportunities
- Increase the natural flood water and sediment storage capacity of the floodplain through the protection and restoration of natural river, bank, tidal marsh, off channel, and wetland habitats
- Protect and restore natural riverine, riparian and estuarine processes.
- Incorporate wetland restoration when possible.
- Minimize water quality contamination during flood events.

- Develop flood risk management actions that will not encourage development in the floodplain outside existing unincorporated UGAs.
- No negative impacts or net loss of farmland except as pertains to implementation of flood hazard reduction measures and to benefit or restore ecosystem functions.
- Work toward a balance in projects that provides multiple benefits (i.e. parks, open space, trails, economic vitality) that will be useful in creating broad public support.
- Develop broad public awareness and support for projects that allow for smoother approval of such projects.
- Ensure that structures built in the floodplain are constructed in a way that risk is minimized and does not impact surrounding landowners or natural resources either upstream or downstream.
- Encourage more consistent implementation and enforcement of local flood damage regulations
- Using information from the past, support good fiscal decisions for future flood risk management efforts and minimize the future cost to the taxpayer.
- A stable, adequate, and publicly acceptable long-term source of financing should be established and maintained for flood risk reduction.
- Establish a stable funding mechanism to support county-wide flood hazard management. Secure community-wide support for local, state, and federal funding to implement flood risk reduction measures.

9.1.2 Long-Term Goals

- Establish and adopt a systematic, coordinated, comprehensive approach to flood hazard risk reduction management for the Skagit River.
- Ensure flood damage reduction efforts result in improvements to the natural assets of Skagit Valley by incorporating ecosystem protection, restoration and natural resource considerations into flood hazard management solutions.
- Develop recommendations that protect/enhance the local quality of life and garner broad public support.
- Develop a funding plan that is fiscally responsible and that draws from various funding sources for flood hazard risk reduction and floodplain management.

9.2 Criteria for Screening Projects and Measures Background – The Three Es

With the aid of Tetra Tech Consultants, the following criteria was established and agreed upon by the Flood Control Zone District in order to review and evaluate the alternatives for flood hazard reduction and management. The following list of criteria for screening projects and measures in the Comprehensive Flood Hazard Management Plan (CFHMP) was approved by consensus at the Advisory Committee (AC) meeting on October 19, 2009.

Generally, all projects should have affirmative answers to the criteria listed below. It is understood that additional technical information on individual and combined measures will need to be developed to answer all the criteria questions. More detailed technical and ranking criteria

will need to be developed after projects with promise have advanced in analysis and design. These criteria will continue to be reviewed and updated as more information becomes available on the existing flood risk, design and environmental impacts/benefits to name a few.

9.2.1 Engineering Criteria

1. Does the project maintain or improve Public Safety and critical infrastructure protection when compared to existing flood risk?
    a. No less than existing flood risk (no project should reduce the existing level of flood risk protection for a given area)?
    b. Reduce the potential for levee failures?
    c. Increase conveyance efficiency of the existing levee system?
    d. Does not create a greater risk of catastrophic failure due to inadequate interior drainage (overland flow, increase in sheet flow, floodplain inundation etc.)?
2. Can the project be implemented without increasing the flood risk up and downstream of the project area? If no, can the increased risk be addressed (redesigned or mitigated)?
3. Can the project maintenance and operations be sustained (i.e., the cost of permitting, repair, and mitigation) locally?
4. Does the project reduce risk to soils and drainage in agricultural resource lands?
5. Can project effectiveness be maintained regardless of which hydrology is eventually used (local vs Corps) for project design?
6. Does the project reduce water surface elevation and/or peak flow?
    a. Increase / maximize conveyance and reduce the water surface elevation (WSE) throughout project location?
    b. Increase or decrease the WSE and or flood risk upstream or downstream of project location?
    c. Increase off-channel storage capacity?
7. Does the project address safety valves where the excess flow will need to exit the system?
    a. Identify overland pathways and locations for properly sized outlet structures? i.e. Gages, Joe Leary, Higgins sloughs and impacts to other existing drainage infrastructure
    b. Incorporate natural topographic features of the project location? i.e. natural swales and high ground, off channel storage etc?
    c. Require modification or relocation of infrastructure that may impede overland flow?

8. Does the project increase debris conveyance, in-channel and through bridge structures?

9.2.2 Environmental Criteria

1. Does the project demonstrate a significant net gain in natural riverine processes? In particular, does the project:
    a. Improve natural flood water conveyance?; and
    b. Preserve or improve channel migration, and floodplain processes and reduce bank hardening?; and
    c. Improve / restore riparian processes?
2. Does the project improve or preserve estuarine, near shore and marine processes, habitats, and resources?
3. Does the project demonstrate improvements to flood related water quality and contamination problems?
4. Can the project work in synergy with other planned actions i.e. up and downstream effects need to be evaluated and addressed?

9.2.3 Economic and Land Use Criteria

1. Does the project impacts to agricultural viability? Can any loss of agricultural land be mitigated, such as being used to balance the need for an additional 2700 acres of restored estuarine habitat identified in the salmon recovery plans?
2. Does the project provide continued and/or improved risk reduction for cities, towns, and other urban growth areas?
3. If necessary does the project provide for evacuation routes and early warning systems for high risk areas?
4. Is the project cost effective?
5. Does the project support Corps guidance preference for non-structural methods of flood control?
6. Does the project support preservation of existing rural and resource land use designations?
7. Are critical infrastructure and critical facilities protected?
8. Will project avoid any known land use or regulatory conflicts?
9. Is the project designed to benefit multiple objectives in addition to flood risk reduction and ecosystem restoration, i.e., open space?
10. Does the project meet perceived community acceptance?
    a. Shared burden
    b. Minimized impacts to privately-owned land

c. Public Safety flood risk reduction potential of the project outweigh the environmental costs

d. Can the project maintenance and operations be sustained (i.e., the cost of permitting, repair, and mitigation) locally?

(FCZD, 2009)

9.3 References:

Skagit County Flood Control Zone District (FCZD). 2009. *Mission, Goals and Objectives for the Skagit River Comprehensive Flood Hazard Management Plan*. Contributing Consultant: Tetra Tech.

United States Army Corps of Engineers (USACE). 2009. *Skagit River Flood Risk Management and Ecosystem Restoration Feasibility Study - Read Ahead Draft*. Skagit County, WA. Consulting Engineers: Tetra Tech.

Washington State Department of Ecology (Ecology). 1991. *Comprehensive Planning for Flood Hazard Management Guidebook*. Washington State.