The Nature Conservancy
Skagit Field Office, Washington Chapter

Fisher Slough Floodgate Replacement Project SEPA Checklist

Skagit County, WA

June 2008

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Fisher Slough Floodgates Retrofit Project
SEPA CHECKLIST

Draft, Prepared - May 28, 2008

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A. BACKGROUND

1. *Name of proposed project:* "Fisher Slough Floodgates Retrofit Project"

2. *Name of applicant:* The Nature Conservancy.

3. *Address and phone number of applicant and contact person:* 410 North 4th Street, Mount Vernon, WA 98273. Jenny Baker, Project Manager.

4. *Date checklist prepared:* May 28, 2008.

5. *Agency requesting checklist:* Washington Department of Fish and Wildlife (WDFW).

6. *Proposed timing or schedule:* Phase I – Floodgate Replacement September 2008
a. Phase II – Big Ditch Realignment and Siphon Crossing, Levee Setback and Tidal Marsh Restoration (Summer 2009 or 2010 depending upon funding).
b. Phase II is described at the end of this document as a future action. Therefore, effects analysis in this document is limited to impacts from implementing Phase I.

7. *Plans for future additions, expansion, or further activity related to or connected with this proposal:* There are some "Non Project Actions" in the Fisher Slough area that are likely to follow the Floodgates retrofit project. These are briefly described in the "Non Project" portion of this SEPA Checklist. The timing and sequencing of the non project actions have not been determined, and are dependent upon future funding and other factors.

8. *Environmental information that has been prepared, or will be prepared, directly related to this proposal:*

   (a) Fisher Slough – Preferred Restoration Plan, Skagit County, WA, Draft Report, October 2006, prepared for The Nature Conservancy by Tetra Tech.

   (b) Fisher Slough – Floodgate Final Design Recommendations, May 2008, prepared for The Nature Conservancy by Tetra Tech

   (c) Fisher Slough – Floodgate DRAFT Performance Specification Design Report, May 2008, prepared for The Nature Conservancy by Tetra Tech

   (d) Skagit Delta Tidegates and Fish Initiative Implementation Agreement, Working Draft, December 2007, WWAA, NOAA, WDFW

   (e) Draft Biological Assessment, sent to USFWS (Lacey, WA office) on May 28 for completion.

9. *Applications pending for governmental approvals of other proposals directly affecting the property covered by proposal:* None, as far as is known by applicant.

10. *Government approvals or permits that will be needed for this proposal:*
    - US Army Corps of Engineers CWA Section 404 Dredge and Fill Permit
    - US Army Corps of Engineers Rivers and Harbors Act Section 10 Permit

- Washington DOE Section 401 Water Quality Certification
- Skagit County Shoreline Permits Exemption
- WDFW Hydraulic Project Approval (HPA)
- US Fish and Wildlife Section 7 Letter of Concurrence of No Effects to Listed Species

11. *Brief description of proposal, including proposed uses and the size of the project and site:* The existing floodgates are a critical piece of infrastructure in protecting interior agricultural and rural residential areas from Skagit River flooding. The primary need to replace the floodgates is to improve fish passage, water quality conditions, and operability while maintaining flood control function. It has been identified and documented that the existing floodgates create two types of fish barriers: (a) during periods when the Skagit River tides fluctuate above an approximate elevation of 7-8ft NAVD88, when the gates typically close; and (b) during low tide conditions when the Skagit drops below 4ft NAVD88, which is lower than the sill elevation of the existing gates structure.

    During an August 2006 meeting with Dike District #3, dike personnel indicated that currently the barn-door style gates are difficult to operate, and at times can be dangerous. They further indicated an interest in having the gates retrofit/replaced. A number of alternative designs were investigated, and the preferred floodgate design chosen for the proposed retrofit is side-hinge gates with a lateral hydraulic arm or piston that can be programmed to shut at various river stages. Several regulated floodgate/tidegates have been installed at other locations in the Skagit River Delta including Fornsby Creek, McElroy and Edison Sloughs, which improve fish passage conditions while maintaining flood control.

    The proposed project to replace the existing floodgates includes removing the six existing doors and installing stainless steel, side-hinge swing gates, with hydraulics or other mechanical devices that can be programmed to resist shutting until certain river stages are exceeded (Appendix A, Figures 1-3). This will allow Dike District personnel to better operate the gates for both fish passage and flood control. Replacing gates on all three openings is critical to the successful implementation of future upstream levee setback and tidal marsh restoration and flood control objectives. A second element of the floodgates replacement involves modification of the submerged flapgates to further enhance fish passage during low flow/low tide periods. Another element of the project is to excavate sediment deposits and vegetation that has grown in front of the north flap gates, due to lack of maintenance, and rendered them ineffective. The final piece of work being performed for this project is placement of 40 CY of rock at the base of the sheet pile wall to protect the wall from scour and seepage. This is to protect the structure from adverse seepage and piping which could affect the stability of the levee and flood wall structure.

    Operation and maintenance of the retrofitted gates structure will be monitored and evaluated annually, and adaptive management with Dike District #3, WDFW and The Nature Conservancy will be applied to optimize fish passage and flood control on Fisher Slough on an ongoing basis. Annual reviews of fish passage and flood control operations will be performed as part of the monitoring process.

    The proposed gate replacement will be performed during low tide conditions and does not require installation of a water diversion structure. The contractor will time the work with the late summer ebb slack tides. Replacement of the gates will be performed using a crane and floating deck, barge or boat.

    Work on the submerged flap gates will be performed by a diver, as the gates are well below the low tide level.

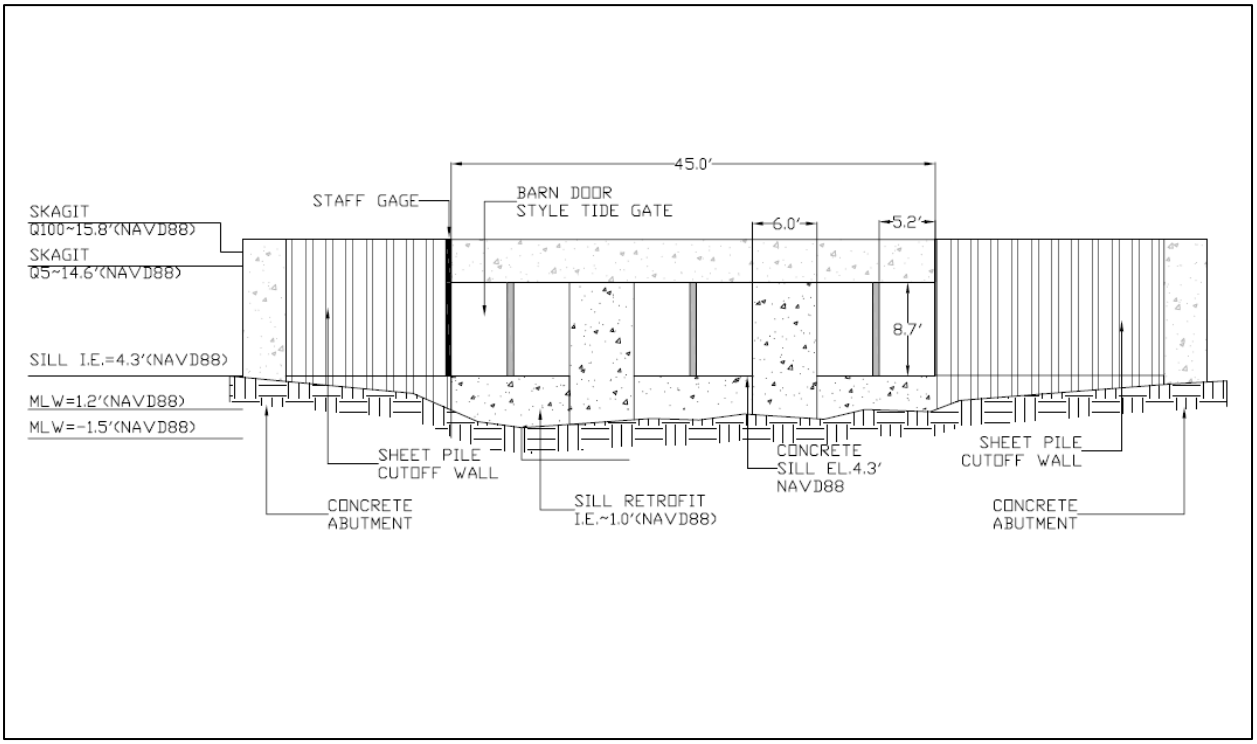

Figure 1. Fisher Slough Existing Floodgate Schematic

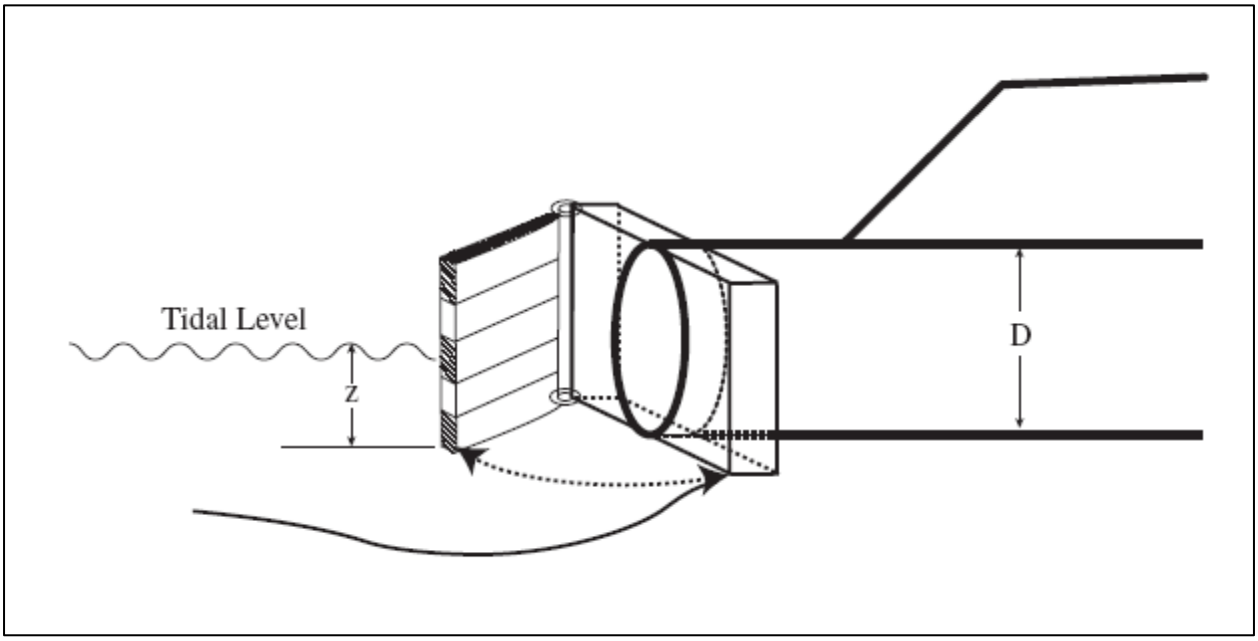

Figure 2. Side Hinge Flood Gate Schematic (Gianico, 2005)

Figure 3. Recent Side-Hinge Flood Gate Installation (Golden Harvest, 2006)

12. *Location of the proposal:* The Fisher Slough Floodgates Retrofit Project is located approximately 1 mile south of Conway, WA, along Pioneer Highway, at the site where the highway and the Burlington Northern Santa Fe (BNSF) rail lines cross on parallel bridges over Fisher Slough, in the vicinity of the confluence of Tom Moore Slough and the South Fork of the Skagit River. Figure 4 depicts the general location.

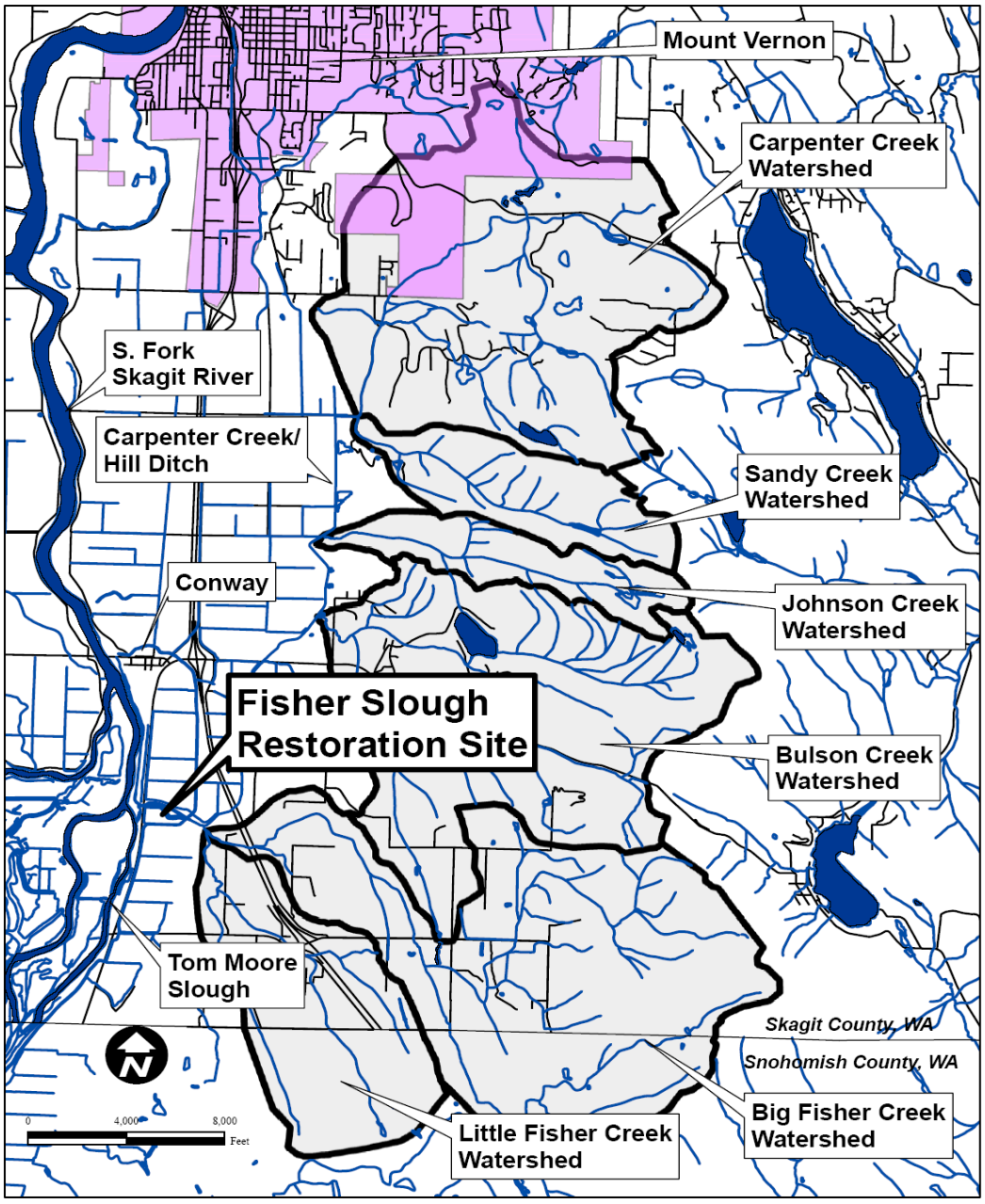

Figure 4. Fisher Slough Floodgates General Location

B. ENVIRONMENTAL ELEMENTS

1. Earth

a. *General description of the site:* Flat farmland.

b. *Steepest slope on the site (approximate percent slope):* Steepest slopes are along the banks of Fisher Slough; generally a 1:2 slope.

c. *General types of soils found on the site:* Site is underlain with thick glacial deposits and poorly drained alluvium. Bridge abutments and bed material for highway and rail line are comprised of mainly compacted gravel and till.

d. *Surface indications or history of unstable soils in the immediate vicinity:* None apparent.

e. *Purpose, type, sources, and approximate quantities of any filling or grading proposed:* Phase I Floodgate Replacement – 40 CY of rock for scour and seepage protection will be placed along the base of the floodgate sheet pile wall. Approximately 20 CY of muddy sediments will be excavated from this same location prior to placing rock.

Phase II Big Ditch Alignment, Siphon Crossing, Levee Setback and Tidal Marsh Restoration – Fill quantities TBD. This phase of the project will occur at a future date, and is not the subject of this SEPA checklist.

f. *Erosion potentially occurring as a result of clearing, construction, or use:*
There is little to no potential for creek bank and channel erosion during the floodgate replacement project. The gates are currently left open during summer irrigation operations, which will remain the case. A small construction pad will be cleared in the adjacent, flat, upland area for installing the floodgates. This area will have silt fence protection and crushed rock surfacing per WDOE construction BMP standards. Minor excavation of the channel bed for removal of sediment deposits and placement of protective rock could cause turbidity. Contractor is required to install floating silt curtains to protect from turbidity.

g. *Percent of the site will be covered with impervious surfaces after project construction:*
Percent of site composed of impervious surfaces will not change from existing conditions. The only impervious surfaces at the site are the highway, the top of the floodgate structure, and the closed portions of the nearby BNSF rail line bridge (approximately 15% of project site).

h. *Proposed measures to reduce or control erosion, or other impacts to the earth:* Best management practices will be employed to minimize potential for erosion during construction including access along existing levee road, installation of construction pad stabilization rock, deployment of floating silt curtains and installation of silt fences. Upon completion, the site will be reclaimed with removal of installed structures and plantings as needed to replace plants from clearing and grubbing activities.

All construction work is planned during September 2008. A fish window variance is requested to extend beyond August 30th for the lower Skagit River. Floodgate replacement work, scour protection and sediment excavation maintenance will occur during low tide to limit potential turbidity. Scour protection materials will be placed on the bed of the channel.

2. Air

a. *Potential types of emissions to the air resulting from the proposal:* Air quality would meet the standards as set forth by the Washington Department of Ecology and would not be permanently or significantly affected by the construction of the project.

The construction area is not located in a non-attainment area. Effects on air quality could occur from release of combustion emissions from construction equipment and from fugitive dust generated during the 30-day construction period. Exhaust emissions and PM 10 would be the primary air pollutants emitted during construction activities. These emissions are not anticipated to exceed EPA's de minimus threshold levels (100 tons/year for carbon monoxide and 50 tons/year for ozone) or affect the implementation of Washington's Clean Air Act implementation plan. The quantities of the emissions during construction are anticipated to be relatively small because of the confined project site area, limited number of construction vehicles required and the limited amount of work to be performed.

b. *Off-site sources of emissions or odor that may affect the proposal:* None anticipated or known.

c. *Proposed measures to reduce or control emissions or other impacts to air:* Construction vehicles would be properly maintained, and not left idling at standby to help minimize emissions. Fugitive dust would be controlled by water applications as required during construction.

3. Water

a. Surface:

1) *Surface water body on or in the immediate vicinity of the site:* The floodgates are located at the site where the Pioneer Highway and the BNSF rail line cross on parallel bridges over Fisher Slough (south of Conway) in the vicinity of the confluence of Tom Moore Slough and the South Fork of the Skagit River. Fisher Slough flows into the South Fork of the Skagit River. See figure 4.

2) *Work required as part of proposal over, in, and adjacent to the previously-described waters:* The retrofit project will require work over, in, and adjacent to Fisher Slough. Please refer to description in Item A-11, above.

3) *Amount and location of fill and dredge material to be placed in or removed from surface water or wetlands, and source of fill material:* Approximately 40 CY of rock will be placed in existing scour holes located just upstream and downstream of the floodgates (see Appendix A, Figures 1-3). Rock will be placed below the Ordinary High Water (OHW) mark in unvegetated waters. No wetlands will be filled for this project.

4) *Surface water withdrawals or diversions required by the project, including purpose and approximate quantities:* None

5) *Relationship of project site to the 100-year floodplain:* The site is entirely within the 100-year floodplain.

6) *Discharges of waste materials to surface waters required by proposed project:* None are anticipated.

b. Ground:

1) *Ground water to be withdrawn, or water discharged to ground water associated with the project:* None anticipated. Not applicable.

2) *Waste material that will be discharged into the ground from septic tanks or other sources:* None. Not applicable.

c. Water runoff (including stormwater):

1) *Source of runoff, method of collection and disposal associated with project:* None. Not applicable.

2) *Potential for waste materials to enter ground or surface waters:* Potential for spills of vehicle and construction equipment fuels is possible, but considered low with the BMPs listed below.

d. *Proposed measures to reduce or control surface, ground, and runoff water impacts, if any:* Any refueling of vehicles and equipment will be done in a controlled environment. Standard fuel spill prevention measures will be employed at construction/laydown site. BMPs to reduce or control include:

- turbidity will be monitored and work will be halted if signs of high turbidity or of fish in distress are observed;
- biodegradable hydraulic fluids will be used in the machinery at the site;
- refueling will occur in the staging area on the backside of the levee, located landward of the work area;
- at least one fuel spill kit with absorbent pads will be onsite at all times; and,
- drive trains of equipment will not operate in the water.

4. Plants

a. *Types of vegetation found on the site:* Predominant vegetation on the project site is riparian. Predominant plant species present include Pacific willow *(Salix lasiandra)*, dogwood *(Cornus sp.)*, salmonberry *(Rubus spectabilis)*, skunk cabbage *(Lysichiton americanum)*, reed canary grass *(Phalaris arundinaceae)*, Indian plum (*Oemlaria cerasiformis*), and red alder *(Alnus rubra).*

b. *Kind and amount of vegetation to be removed or altered by the project:* A single Pacific willow will be removed to allow for proper functioning of the northernmost floodgate. A few small specimens of horsetail *(Equisetum arvense)* may also be affected. Minor impacts to weedy species such as reed canary grass (*Phalaris arundinacea)* will occur at the staging area.

c. *Threatened or endangered species known to be on or near the project site:* The USFWS list of threatened and endangered species for Washington was accessed during preparation of the Biological Assessment for this project (USFWS 2008). No threatened or endangered plant

species are known to the habitat types found in the area, nor are they likely to occur there. A Biological Assessment documenting effects to listed species has been prepared and submitted to USFWS for concurrence.

d. *Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site:* Since only a single specimen of a native species will be removed for this project, and to minimize the need to clear vegetation in the future to maintain the floodgates, no revegetation is proposed.

5. Animals

a. *Birds and animals which have been observed on or near the site or are known to be on or near the site (Birds, Mammals, Fish):* Little wildlife has been observed at the proposed project site. Most of the species of wildlife observed have been birds, including great blue heron *(Ardea herodias),* mallard ducks *(Anas platyrhynchos),* northern pintail *(Anas acuta),* and black phoebee *(Sayornis nigricans).* Evidence of pocket gophers (*Thomomys bottae)* was observed, and western fence lizards *(Sceloporus occidentalis*) were also observed.

b. *Threatened or endangered species known to be on or near the site:* Listed species known to the area include steelhead trout *(Onchorhynchus mykiss),* Chinook salmon *(O. tshawytscha),* and bull trout *(Salvelinus confluentus)* (USFWS 2008). Effects to steelhead and Chinook species are covered by "Limit 8", which is a programmatic NMFS Biological Opinion (BO) covering projects funded by the Salmon Funding Recovery Board (SFRB) (Longenbaugh, 2008; Sibley, 2008). This BO allows SRFB-funded projects to occur without additional consultation beyond completion of a self-certification form, which was completed and submitted to the US Army Corps of Engineers as part of the Sections 404/10 application process. Effects to bull trout have been documented in a draft Biological Assessment provided to the US Fish and Wildlife Service (Lacey, WA, field office) in May, 2008. No adverse effects to bull trout from the proposed action were identified in the Biological Assessment.

c. *Relationship of site to migration routes:* Fisher Slough is on the Pacific flyway, which is the main north-south migration route for migratory birds. The slough itself may be used by waterfowl for resting and foraging and the surrounding fields are likely used for foraging.

Anadromous fish including Chinook salmon and cutthroat trout use Fisher Slough as a migration pathway to spawning grounds in streams higher in the watershed.

d. *Proposed measures to preserve or enhance wildlife:* The purpose of this project is to enhance wildlife (fish) habitat. Although mild short-term effects may occur during installation of the new floodgates, the overall effect will be of benefit to wildlife. Specific measures to protect aquatic species include installing a silt curtain below the work area and working at low tide to the degree possible.

6. Energy and Natural Resources

a. *Kinds of energy to be used to meet the completed project's energy needs:* During operation, electrical power will be required to open and close the floodgates when the river reaches selected stages.

b. *Potential effect of the project on use of solar energy by adjacent properties:* None.

c. *Energy conservation features included in the plans, and proposed measures to reduce or control energy impacts:* None

7. Environmental Health

a. Health Hazards.

1) *Potential environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous wastes that could occur as a result of this proposal:* None anticipated.

2) *Special emergency services that might be required:* None anticipated.

3) *Proposed measures to reduce or control environmental health hazards:* None required.

b. Noise

1) *Types of noise exist in the area which may affect project:* None. Setting is rural agricultural, with intermittent vehicle traffic on Pioneer Highway and railroad traffic on BNSF rail line, both crossing through the project site.

2) *Types and levels of noise created by or associated with the project on a short-term or a long-term basis:* There are no sensitive receptors such as schools, hospitals, or wildlife areas in the project area, and the nearest house is approximately 400 yards away from the project location. During the 30-day construction period, intermittent noise would be generated during daylight hours at the project site from construction equipment. Levels of noise would be typical of those associated with bulldozer, crane, trucks, and occasional short duration jack hammer (if required) to remove the sill from the existing gates structure. These noise levels generally do not exceed 80 decibels at 50 yards. Construction equipment and vehicles would be properly muffled, and noise levels are not expected to exceed county and local noise regulations for such work. During the occasional intermittent operation of the gates as selected river stages occur, local short-duration noise would accompany the opening and closing of the gates.

3) *Proposed measures to reduce or control noise impacts:* Construction equipment and vehicles would be properly muffled, and construction would take place only during daylight hours, and would not occur on weekends.

8. Land and Shoreline Use

a. *Current use of the site and adjacent properties:* The site is currently used for a floodgates structure on Fisher Slough. The Pioneer Highway and BNSF rail line cross over the site on parallel bridges. Land uses on adjacent properties include the Skagit River and riparian area to the west, cultivated agricultural land to the north, east, and south, and vegetated levees to the north and south of the Fisher Slough riparian area (see Figure 5).

b. *Use of the site for agriculture:* The project location is not used for agriculture, although fields on the opposite (east) side of the Pioneer Highway support agriculture.

c. *Description of existing structures on the site:* Site comprises existing Fisher Slough Floodgates Structure (Figure 5, below). Refer also to discussion in item A-11, previously.

Figure 5. Existing Fisher Slough Floodgates (looking upstream from railroad bridge)

d. *Structures to be demolished:* None. Existing wooden Fisher Slough floodgates and concrete sill will be replaced.

e. *Current zoning classification of the site:* Agricultural, Ag-NRL.

f. *Current comprehensive plan designation of the site:* Natural Resource Lands.

g. *Current shoreline master program designation of the site:* The project site is designated as shoreline as defined by the Shoreline Management Act and the Skagit County Master Plan. However, Skagit County has determined that this project is exempt from shoreline regulations.

h. *Relationship of project site to any "environmentally sensitive" area:* The proximity to wetlands makes this site a Critical Area as defined by Skagit County's Critical Areas Ordinance. However, because this project is exempt from shoreline permit requirements, it is also exempt from the Critical Areas ordinance.

i. *Approximate number of people residing or working in the completed project:* None, not applicable.

j. *Approximate number of people displaced by the project:* None, not applicable.

k. *Proposed measures to avoid or reduce displacement impacts:* None, not applicable.

l. *Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans:* None. Project is retrofit of existing floodgates structure, and as such is implicitly compatible with existing and projected land uses and plans.

9. Housing

Not applicable, since project does not involve housing units.

10. Aesthetics

The proposed project is a replacement of existing Fisher Slough Floodgates structure, and the overall appearance and materials comprising the structure (wood, concrete, metal) would be similar to those that currently exist. During the 30-day construction period, the aesthetics of the site would be temporarily altered by the presence of construction equipment, materials, and activities. Following construction, the site would be restored to former aesthetics, and over time, aesthetics would be potentially enhanced when additional vegetative plantings become established. No views in the immediate vicinity of the project site would be altered.

11. Light and Glare

Not applicable, since the project does not involve any creation of sources of light and glare.

12. Recreation

The project vicinity comprises mostly private agricultural land, an active BNSF railroad right-of-way, Nature Conservancy lands, and channels and riparian areas associated with Fisher Slough and Skagit River. No formal recreation opportunities are designated in the immediate project vicinity. However, informal access to the slough and river for fishing, and occasional walking/hiking along the levees and a historical abandoned railroad line in the general area may occur. The proposed project would not displace any existing recreational uses.

13. Historic and Cultural Preservation

A cultural and archaeological resources field investigation was performed at the site in May and June of 2008 by Archaeological Investigations Northwest (AINW). This survey revealed no resources of cultural, historical, or archaeological value at or near the site.

a. *Places or objects listed on, or proposed for, national, state, or local preservation registers known to be on or next to the site:* None, see above.

b. *Landmarks or evidence of historic, archaeological, scientific, or cultural importance known to be on or next to the site:* None, see above.

c. *Proposed measures to reduce or control impacts to cultural resources:* No resources were identified at the site during field surveys, therefore no measures to reduce impacts are proposed.

14. Transportation

The project site is located on Pioneer Highway, south of Conway. Site is not served by public transit, and no parking would be created or affected by the project. No new roads or other modes of transportation would be created or affected. During the 30-day construction period, there would be a minor and intermittent increase in construction vehicle traffic on Pioneer Highway, and traffic may need to be controlled at the project site for brief periods to allow for specific construction activities (e. g. crane placement of new gates). Proper methods for traffic control would be employed as necessary to optimize safety and efficiency. This will include acquiring a right-of-way permit from Skagit County and use of traffic control personnel, including flaggers, as needed and as required by the County.

15. Public Services

The project would not result in an increased need for public services (e.g., fire protection, police protection, health care, schools, other).

16. Utilities

A utilities map of the area has been obtained from Skagit County and was used during the planning process to ensure that there would be no effect on sewer or water facilities or electrical lines. Construction of the proposed project will not draw upon any utilities. All construction equipment is self-contained and will not require power from the grid. Cell phones will be used when phone service is needed. Operation of the completed project will require electricity from the grid to power a small motor that will open and close the floodgates.

References Cited:

Bates, Ken. 2006. Personal Communication with Peter Skidmore (The Nature Conservancy) regarding fish passage through fully submerged siphon structures.

Longenbaugh, Matt. 2008. Personal Communication with Matt Longenbaugh, Supervisory Fish Biologist, National Marine Fisheries Service. Central Puget Sound Habitat Branch. Lacey, WA. May 1, 2008.

Sibley, Tom. 2008. Personal Communication with Tom Sibely, Supervisory Fish Biologist, National Marine Fisheries Service. North Puget Sound Habitat Branch. Lacey, WA. May 1, 2008.

U.S Army Corps of Engineers (Corps). 2006. Levee Owner's Manual For Non-federal Flood Control Works.

USFWS. 2008. US Fish and Wildlife Service Threatened and Endangered Species System. Internet website located at http://ecos.fws.gov/tess_public//pub/stateListing.jsp?status=listed&state=WA.

C. SIGNATURE

The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

Signature: _____

Date Submitted: _____

D. SUPPLEMENTAL SHEET FOR NON PROJECT ACTIONS

There are some "Non Project Actions" in the Fisher Slough area that are likely to follow the currently-proposed Floodgates retrofit project. These actions have been consolidated into two potential follow-on "phases", which together with this current proposal to retrofit the Fisher Slough Floodgates, comprise an overall restoration plan for Fisher Slough that will enhance salmonid fisheries in the estuary and marsh areas, while maintaining a high level of flood protection for adjacent agricultural lands. The timing and sequencing of the non project actions (two phases) have not been determined, and are somewhat dependent upon future Nature Conservancy funding and other factors. At the time in the future when these planned phases become proposed projects, separate SEPA documents will be prepared for each. The following paragraphs and accompanying maps present a brief description of the two follow-on phases planned for the Fisher Slough area. Those phases are the Big Ditch Realignment and the Levee Setback.

Big Ditch Realignment

The major feature (structure) controlling the overall layout of Phase II is the Big Ditch Crossing. Approximately 2,000ft upstream from the Pioneer Highway crossing and the location of the floodgates, Fisher Slough encounters a structural crossing at Big Ditch. Big Ditch is the primary drainage canal owned and operated by Irrigation and Drainage District #17 (**Figure 6**). Big Ditch crosses directly under Fisher Slough through a series of 4-foot x 4.5-foot concrete box culverts. The top of the Big Ditch culvert is exposed along the Fisher Slough channel bed and the crossing structure acts as a hydraulic control creating upstream backwater conditions, which can exacerbate upstream flooding and sedimentation conditions. Along the levee at the Big Ditch crossing, the levee profile dips and this area is designed as the flood overtopping and overflow area. The Big Ditch flows underneath Fisher Slough in a large culvert, known locally as "the siphon" and continues four miles further south before reaching Skagit Bay 1.5 miles north of Stanwood. The structure is not actually a siphon but a culvert structure. In its current state, the crossing is a choke point creating sedimentation upstream along Hill Ditch and is a fish passage barrier when the stages drop below 6-ft. If the crossing remains in its current configuration, then levees must tie into this point. If the crossing is extended, then the levees can be moved further apart at this location, providing more flexibility in the levee alignment. The option which allows the most flexibility with levee alignment is to move the crossing from its current location, for which a final alignment will be determined during final design in coordination with Drainage District #17 and local landowners whose property is affected by the Big Ditch Realignment.

The three primary project alternatives (levee setback alignments) were developed based on the concepts for addressing issues with Big Ditch. The following is a list of the realignment alternatives and the associated modifications to the Big Ditch Crossing.

- Alternative 1 - South Levee Realignment with Big Ditch Crossing Remaining in Place
- Alternative 2 - South Levee Realignment with Big Ditch Crossing Extension Along Existing Alignment
- Alternative 3 - South Levee Realignment with Big Ditch Realignment to Pioneer Highway Crossing (upstream crossover at Pioneer Highway, exact location to be determined depending upon landowner considerations)

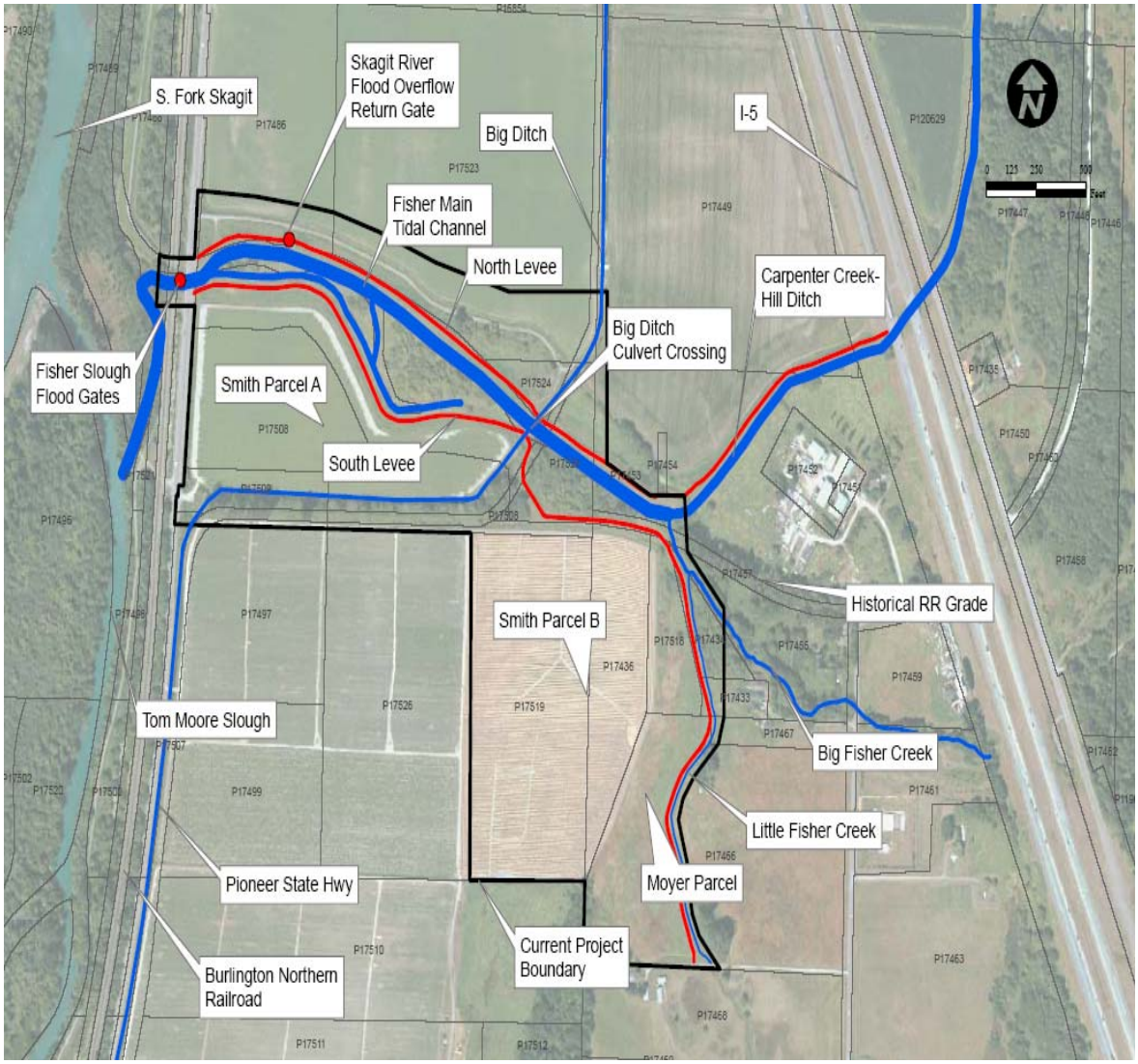

Figure 6. Fisher Slough Restoration Project Features

For Alternative 1, keeping the existing Big Ditch Crossing would involve realigning the South Levee and connecting to the Crossing with a peninsula shaped levee. This configuration would still have fish passage and upstream sedimentation issues due to the hydraulic constriction at the center of the project site.

The Alternative 2 Big Ditch Crossing Extension extends 500ft across the existing project footprint to the edge of the existing project land easements. The siphon extension would eliminate the fish passage barrier and reduce upstream sedimentation issues. The hydraulic constriction is less than Alternative 1 and similar to Alternative 3 and will allow transport of sediment further down into the floodplain and Slough than the existing conditions. The potential downside of this structure is that it effectively locks the Fisher Slough levee realignment into place. Future opportunities for additional expansions to the north or south are limited with this configuration as the structure would need additional modifications in the future.

Construction of the Big Ditch extension would involve diverting the existing drainage, demolition and disposal of the existing structure and installation of a siphon structure (**Figure 6**)

approximately 4 feet underneath the bed of the Fisher Slough main channel. The siphon structure would be composed of (6) 48-inch reinforced concrete pipes (RCP), an inlet weir box and outlet spill apron and wingwalls.

The installation of a siphon structure will be an improvement over the current structure in many regards. Currently, fish passage is limited both along Fisher Slough when flows drop below 6-ft due to the crown of the concrete structure. Fish passage along Big Ditch proper is limiting especially when flows are low and local irrigators install flashboard dams to raise local groundwater tables for sub-irrigation practices in the spring and summer months. The proposed siphon will likely improve fish passage conditions due to the structure being completely submerged compared to the existing crossing that frequently has minimal flow depths along the culvert pipes. Also, the inlet/outlet structures will have hydraulic controls that will allow the Drainage District to actively manage flow releases for both fish passage and maintenance through the siphons. The length of the fully submerged siphon and light should not be a hinderance to fish passage (Bates, 2006).

The method of construction will likely involve diversion of flow from big ditch, demolition of the existing structure, a large trench cut and installation of the pipes and inlet/outlet flow control structures. The inlet works to the structure would include a concrete weir box with slide gates and stop logs for controlling head and flow into the structure and providing an inflow sediment trap. This would allow for improved management of sub-drainage irrigation used in the Big Ditch and simple maintenance for the siphon. The outlet structure would consist of a concrete protective apron and wingwalls.

Alternative 3 realigning the Big Ditch Crossing would involve rerouting Big Ditch in a westerly direction. The exact location of the reroute will be determined in final design depending upon landowner needs and preferences. For the purposes of this study an alignment was developed along the existing drainage lateral on the Junquist property just to the north of the project site. Big Ditch then turns southward along the edge of Pioneer Highway, where the Ditch would cross under Fisher Slough with a 100ft long siphon. The Alternative 3 siphon configuration is similar to Alternative 2 in most ways, with the exception of the length and construction methods. The construction technique would likely be different involving construction of two deep pits, and possibly jacking pipes underneath the Fisher Slough crossing near the highway, which affects the cost of the project. If water diversion and coffering structures were to be coordinated with on the floodgate replacement and Alternative 3 Big Ditch Crossing of Fisher Slough, an open trench construction method would be a viable alternative. This method is less viable, from a cost and permitting perspective, if two separate coffer structures must be built and operated for each project element.

Realigning Big Ditch allows for additional setback of the South Levee along the abandoned railroad alignment. This additional setback is beneficial in it provides additional area for floodplain habitat, but will likely have very minor differences in flood storage and sediment characteristics compared to Alternative 2. Alternative 3 Big Ditch Realignment offers more flexibility for future expansion of the Fisher Slough site to both the north and south. However, it also exposes the project owner to more risks associated with unknowns related to constructing on the abandoned railroad grade. There is potential that the railroad grade may have some historical significance and possibly some hazardous materials. Also, the current cost approach assumes that railroad grade material can be pushed into the existing Big Ditch as fill, but may be unsuitable due to seepage concerns at the base of the levee.

Levee Setback

Upstream from the floodgates and Pioneer Highway, the Slough is diked on both sides with earthen levees on both the north and south sides of the Slough. These levee structures are fairly

old, predating the historical aerial photos taken in the 1930s. These levees protect adjacent farmland from frequent flooding along the Skagit River, as well as providing improved drainage (via drainage canals and pumps). The adjacent agricultural lands are 3 feet to 4 feet lower than the floodplain within Fisher Slough, but not lower than the existing invert of the Slough channel.

The levee system is owned and operated by Dike District #3. The levees are currently part of the Corps of Engineers, PL84-99, Non-federal Flood Control Works Rehabilitation and Inspection program. This program is a federal assistance program that will aid the Diking District and county for emergency flood control operations and funding assistance for repairs from flood damages (USACE, 2006). The levees are tied to a larger network of levees that provide flood control throughout the Skagit River Valley. These flood control works are being evaluated as part of a larger process in the more comprehensive Skagit River Flood Damage Reduction Feasibility Study (USACE, 2004).

The south levee setback realignment and removal is a function of each of the Big Ditch Crossing alternatives. It is likely that each of the alternatives will need to phase construction by first building the levee setback structure, and then demolishing the existing levee. This sequence ensures flood protection throughout construction.

For all three alternatives, the levee setback structure will be built at a profile elevation of approximately 16-ft NAVD88, with an overflow structure positioned at 14.5ft which is 0.5ft lower than upstream levee notches on Hill Ditch. The elevation overall is roughly equal in elevation to the north levee. The proposed levee section has a 3:1 backslope and a 4:1 front slope to allow for positive drainage, minimal seepage through the levee, and minor landscaping along the front edge and toe of the structure. For all three alternatives it was assumed that the structures will be completely constructed of clean, imported fill material from an offsite location.

Alternative 1 South Levee Realignment follows Big Ditch along the south edge of the Smith Parcel A property, adjacent to Big Ditch, and turns north-easterly to connect with the existing Big Ditch Crossing. The realignment then starts back towards the south along Smith Parcel B, eventually connecting with high ground at the southeastern corner of the project footprint. The configuration has a peninsula shape constriction the floodplain and does not fully allow for fish passage and sediment transport through the site, due to the current Big Ditch Crossing limitations. Total marsh floodplain acreage (including existing areas) provided by Alternative 1 is the least of all three alternatives at 59.1 acres.

Alternative 2 South Levee Realignment is very similar to Alternative 1, with the exception that the Big Ditch Crossing extension removes the “peninsula” constriction and fish passage barrier thereby allowing better hydraulics and sediment transport conditions (similar to those for Alternative 3). Alternative 2 provides the second highest total marsh floodplain acreage with 57.0 acres. A subtle nuance between Alternatives 2/3 and Alternative 1 is that the open space over the crossing affords room for migration of the channels, as well as wildlife species. With Alternative 1 the constriction is very much limited in width for these uses and functions.

Alternative 3 South Levee Realignment utilizes the full extent of the project footprint by setting back the levee onto the abandoned railroad alignment on the opposite (southerly) side of Big Ditch. The flood storage and sediment transport characteristics are similar to Alternative 2, with some additional space for channel migration and as a wildlife corridor. This provides the Alternative with the largest marsh floodplain acreage with 59.2 acres. Preliminary design of Alternative 3 assumes that soils excavated from the abandoned railroad into the proposed abandoned length of Big Ditch downstream from the crossing. The unknowns associated with this assumption are the quality and character of the railroad embankment soils. If the abandoned railroad has too porous materials, then placement is not recommended along the front edge of the newly constructed levee due to seepage conditions that could affect levee stability. Also, there is

a potential risk for finding haz-waste materials along the embankment. Both of these unknowns could create the need for soils disposal and identifying fill material for the abandoned length of the downstream Big Ditch section.