Spring 2010

Mt. Baker Highway SR 542-East Church Mountain Road realignment

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Mt. Baker Highway SR 542- East Church Mountain Road Realignment

ESTU 436 Spring 2010
Huxley College of the Environment
Western Washington University
Environmental Impact Assessment
Huxley College of the Environment

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Signature ____________________________          Signature ____________________________
   Titilayo Ala                                      Tristan Bull

Signature ____________________________          Signature ____________________________
   Will Olsen                                   Katherine Rohrer

Signature ____________________________
   Kirsten Werner
May 24, 2010

Dear Concerned Citizen:

This Environmental Impact Assessment was performed as an ESTU 436 class project through Huxley College of the Environment at Western Washington University. A team of student researchers analyzed the environmental effects of the realignment of a portion of Mount Baker Highway (State Route 542) near Church Mountain, in order to prevent continued erosion of the road by the Nooksack River. The section of the highway between mileposts 38.67 and 39.04 will be moved about 80 feet further away from the North Fork Nooksack River and an 80-foot long culvert will be removed and replaced with a bridge over Chain Up Creek in order to improve fish passage.

In addition to the proposed realignment, two alternative actions are also evaluated in this EIS. The first alternative involves armoring the riverbank to prevent further erosion instead of moving the road. The ArmorMax system would be used, which consists of a High Performance Turf Reinforcement Mat (HPTRF) with compression anchors for stabilization. This heavy-duty mesh mat would prevent erosion of the bank while allowing native vegetation to grow through, further stabilizing the bank. The second alternative that is examined is a no action alternative. This option assesses the potential environmental impacts of leaving the area in its current state.

This area is a “chronic environmental deficiency” area according to the Washington Department of Transportation (WDOT), due to continual bank erosion by the river. In 2005, a portion of the road eroded into the river, requiring emergency repairs. As a result of this unsafe and costly erosion and repair cycle, the WSDOT has made the realignment proposal and this EIS was created to holistically examine its effects and possible alternatives.

A public presentation of the EIS for this project will be held on June 3, 2010 at 7 pm at the WECU Education Center at 511 E Holly St in Bellingham, Washington. All citizens are welcome to come and participate in this presentation to ensure that all public concerns are addressed.

Sincerely,

Tristan Bull
Kirsten Werner
Will Olsen
Titi Ala
Katie Rohrer
Fact Sheet

Title

State Route 542, East Church Mountain Road – Roadway Realignment and Culvert Replacement

Description of Proposed Action

The Washington State Department of Transportation (WSDOT) proposes to realign State Route 542 away from the North Fork Nooksack River in order to reduce environmental impacts from repetitive roadway maintenance, and to improve fish passage at Chain-up Creek.

Work includes: realigning approximately 1,600 linear feet of roadway up to 80 feet away from the North Fork Nooksack River, replacing a 5-foot diameter, 80-foot long culvert with a 30-foot long, 40-foot wide bridge over Chain-up Creek, and installing 5 porous weirs and 2 anchored large woody debris structures in the restored stream channel.

Proponent

Washington State Department of Transportation

Responsible Official

Kerry Ruth, P.E.
Regional Environment Program Manager
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(206) 440-4548

Contact Person

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Seattle, WA 98133-9710
(360) 757-5994
# Required Licenses and Permits

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| United States Army Corps of Engineers (USACOE) Section 404 Nationwide Permit (NW) 14, Linear Transportation Projects | Any construction, expansion, modification, or improvement of linear transportation projects in waters of the U.S. | Washington State Department of Ecology  
(425) 649 - 7201                                                                 |
| **STATE**                                                                  |                                                                                   |                                                                                 |
| Washington State Department of Ecology (WSDOE) Section 402 National Pollutant Discharge Elimination System (NPDES) Construction Stormwater General Permit | Any action that may result in stormwater pollution and runoff during construction | Washington State Department of Ecology  
(425) 649-7201                                                                     |
| Washington Department of Fish and Wildlife (WDFW) Hydraulic Project Approval (HPA) | Any construction activity that will use, divert, obstruct, or change the natural flow or bed of state waters | Washington Department of Fish and Wildlife  
(425) 775-1311                                                                    |
| Washington State Department of Transportation (WSDOT) Biological Assessment Commitments & Service Concurrences | Alterations to vegetation and wildlife during and after construction | Washington Department of Transportation  
(360) 788-7400                                                                      |
| Department of Archaeology and Historic Preservation (DAHP) Section 106 Cultural Resources (includes USFS and Lummi Nation concurrences) | Any activity on a site that may contain archaeological or historical materials | Washington State Department of Archaeology & Historic Preservation  
(360) 586-3065                                                                         |
| **LOCAL**                                                                  |                                                                                   |                                                                                 |
| Whatcom County Shoreline Substantial Development Permit                     | Construction on or near a shoreline                                               | Whatcom County Planning and Development Services  
(360) 676 - 6907                                                                   |
| Whatcom County Critical Areas Review                                        | Any proposed land use or development within an area that meets the definitions and criteria for critical areas as established in the Critical Areas Ordinance | Whatcom County Planning and Development Services  
(360) 676 - 6907                                                                   |
Authors
Titilayo Ala, Tristan Bull, Will Olsen, Katherine Rohrer, and Kirsten Werner.

Distribution List
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Public Presentation
June 3, 2010, 7:00pm – 8:00pm
WECU Education Center
511 East Holly Street
Bellingham, WA 98225-4711
(360) 676-1168

Issue Date
June 3, 2010

Acknowledgements
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Brian West
Kevin Stuber
Huxley College of the Environment
Western Washington University
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SR 542 / Mount Baker HWY Realignment and Bridge Construction at Chain Up Creek

Project Location
Washington State - Whatcom County
SR 542 - Mile Posts 38 - 39

Legend
- Major Highways
1.0 - Executive Summary

1.1 - Project objectives and proposal summary

The proposed action to move the area between mile posts 38.67 and 39.04 on State Route 542 (the Mount Baker Highway) approximately 75 - 80 feet to the north away from the North Fork Nooksack River and to replace the roadway over Chain Up Creek with a bridge is necessary in order to preserve the highway and keep it open to automobile travel and to improve fish passage up Chain Up Creek. The objectives include moving the roadway away from the presently eroding area of riverbank (identified by the Washington Department of Transportation as a chronic environmental deficiency area, where continued environmental damage is unavoidable), rebuild an improved road that will ensure motorist safety and continued open travel along the highway, and to remove the existing 80 foot culvert from Chain Up Creek and replace it with a bridge to allow the passage of fish up-stream.

The proposed action is necessary due to the inevitable erosion damage that will occur to the roadway in its present location due to the action of the North Fork Nooksack River. The area beyond the proposed road realignment includes several popular recreational locations, including the North Cascades National Park and the Mount Baker Ski Area, both of which are only accessible via SR 542. The culvert removal and bridge construction is necessary in order to preserve any possible fish runs on Chain Up Creek, as the currently existing culvert does not allow for any fish passage.

The proposed action will see the removal of approximately 37,000 cubic yards of earth, and the removal of vegetation from the construction site, which will be re-vegetated afterwards. The alternative action covers the armoring of the riverbank along the chronic environmental deficiency area that is actively eroding, using the ArmorMax system to reinforce the river bank and soil, and to stop any further erosion. The alternative involves extensive removal of existing vegetation along the river bank and its eventual re-vegetation. The alternative will also involve removal of the culvert from Chain Up Creek and the construction of a bridge to allow fish passage. The no action alternative will see no work done to prevent any erosion of the road, meaning the inevitable erosion will damage the roadway to the point of
needing closure and extensive repairs. Likewise, the no action alternative will mean the continued blockage of fish passage on Chain Up Creek.

In summary, the greatest impacts will be those done to the existing vegetation in the area, with approximately 2.6 acres of Douglas Fir, Cedar, Western Hemlocks, and understory vegetation being removed for the construction of a new road bed. There will be a temporary closure of Forest Service Road 3040 to the Church Mountain Trailhead, impacting any possible recreational users in that area. Due to construction, traffic will be temporarily slowed in the construction area, with delays of up to 10 minutes. There will also be significant water runoff issues associated with the construction project, which will be mitigated through storm water controls including silt fences and barriers, re-pumping of water runoff up the northern hillside to allow for natural ecological filtration and control of runoff, and the stopping of construction if precipitation and water runoff becomes uncontrollable.

1.2 - Summary of impacts, mitigations, and significant adverse impacts

Impacts to the earth and vegetation environment will be mitigated by the re-vegetation of the old roadway, and re-vegetation of any areas around the new road bed that were impacted. Only native trees and plants will be used for re-vegetation. An alternate route to the Church Mountain trailhead will be established while FS Road 3040 is closed, with users able to use FS Road 3035 and hike 1.25 miles to the trailhead. All construction workers will be confined to the construction area, and will not enter the riverine environment or go beyond the construction area borders, limiting any human impacts beyond the project area. All runoff water will be blocked and pumped back uphill to allow for natural filtration, and reduce any sediment from entering the North Fork Nooksack River. Likewise, barriers will be constructed to limit and filter any runoff that cannot be physically blocked from leaving the project site.
1.3 - Areas of Controversy/uncertainty

The project does not solve the issue of inevitable continued erosion at the site location, and only focuses on making Chain Up Creek passable to fish and fixing the road damage issues on SR 542 for the immediate future, not permanently.
2.0 - Summary of Proposal and Alternatives

2.1 - Proposed Action

The proposed action for this project involves the removal of an existing portion of Mount Baker Highway (State Route 542), realigning the portion approximately 75 - 80 feet to the north away from the North Fork Nooksack River, and subsequent reconstruction. The project will also involve the removal of an 80 foot long culvert from Chain Up Creek at the end of the road realignment, and the construction of a bridge over Chain Up Creek to allow for safe fish passage.

Currently, the area along SR 542 between mileposts 38.67 and 39.04 is a chronic environmental deficiency area according to the Washington State Department of Transportation. Due to the activity of the North Fork Nooksack River, the river bank is continually eroding, damaging the portion of the road and leading to the need for constant repairs and temporary closures.

The proposed project will involve the clearing of trees and vegetation between mile posts 38 and 39, removal of 37,000 cubic yards of rock and soil from the site (transported to a Forest Service dump site), the use of 6,400 cubic yards of fill (consisting of crushed rock and gravel), the creation of a new roadbed approximately 75 - 80 feet from the existing SR 542 roadway, and the realignment of the road to the new location. The old roadway will be removed from the site, and a re-vegetation project will be completed to mitigate areas where vegetation and roadway were removed. The new roadway will be constructed with wider shoulders, new guardrails, improved drainage infrastructure, and will stop the need for constant repairs and temporary closures of the roadway due to erosion damage. All necessary measures will be taken to control runoff from the construction site with the use of silt fences, stormwater controls (including pumping any water back above the construction site to use natural soil filtration), Best Management Practices, and road cleaning to control sediment and dust.

The project will also include the removal of an 80 foot culvert from Chain Up Creek at the east end of the road realignment. The culvert currently acts as a fish barrier for fish
migrating upstream on Chain Up Creak from the North Fork Nooksack River. The project will see
the removal of the culvert and the construction of a 30 foot long, 40 foot wide bridge over
Chain Up Creek to allow safe fish passage. The creek will be temporarily diverted away from the
bridge construction site during construction to avoid any pollution reaching the North Fork
Nooksack River, and any part of the site that is cleared of vegetation will be re-vegetated.

2.2 - No Action Alternative

The no action alternative in this situation involves leaving State Route 542 as it is. The
area is currently identified by the Washington State Department of Transportation as a chronic
environmental deficiency area, with the constant need for road repairs.

This situation is not only expensive, requiring continual temporary closures of the road
for repairs, putting motorists in danger, but it also presents an environmental concern due to
the erosion of roadway into the North Fork Nooksack River and construction repair activity in
the area.

No action would represent no environmental impact from a complete realignment
construction project, however, the road’s erosion and closure will be inevitable. In 2005, the
road was temporarily closed when a portion eroded into the river and was required to have
emergency repairs done. This constant erosion and repair cycle causes damage to the riverine
environment and also impacts recreational activities beyond this location on SR 542 (the road
serves as the only entrance to the Mount Baker Ski Area and a main access point for the North
Cascades National Park).

No action on Chain Up Creek would allow the continued impediment of fish migrating
up Chain Up Creek. The current state consists of an 80 foot culvert running under the roadway,
allowing the flow of Chain Up Creek to the North Fork Nooksack River. The constraint of the
culvert and steep uphill gradient it creates impedes any possible fish passage.

The impacts of continued road erosion and repair, and continued fish passage
impediment, will inevitably continue if no action is taken on the area between mile posts 38
and 39 on the Mount Baker Highway and Chain Up Creek.
2.3 - Alternative Action

The alternative action solution to the chronic environmental deficiency found on SR 542 between mile posts 38 and 39 is to armor the river bank and prevent any further erosion from continuing. For the approximately 1600 feet of river bank that is actively eroding and presenting an issue to the road, the alternative action will focus on using the ArmorMax system to armor the river bank.

The ArmorMax system approach will use a High Performance Turf Reinforcement Mat (HPTRF) that will be laid down on the river bank and locked into place using compression anchors to hold both the supportive mat and soil in place, while allowing vegetation to naturally regrow and further support the hillside.

The alternative approach was chosen as the simplest, most environmental approach to possible river armoring systems. For the stretch of road where it will be placed on the bank, all vegetation will be removed from the road to the edge of the North Fork Nooksack River. The construction phase will involve manual labor to cut and remove vegetation from the hillside, and use needed machinery to carry up and remove it from the riverbank hillside. All removed vegetation will be taken to an acceptable Forest Service dumping site. Silt fences will be used to control any possible sediment from reaching the Nooksack River and workers will not come into contact with the river or riverine environment unless absolutely necessary. There will be an increase in traffic along SR 542 due to construction, and drivers may experience slight delays.

The ArmorMax system allows the mesh mat to be placed on uneven ground with minimal environmental change (with the exception of vegetation removal). While the riverbank is prepared, SR 542 will be reduced to one lane between mile post 38 and 39 with flaggers controlling traffic. Once in place, it will be anchored to the ground using compression anchors, a system locking both the soil and mesh mat into place. The area will then be re-vegetated, allowing native grasses, shrubs, and brush to grow into place within one year, and native trees to grow and take hold within five years.

The alternative action will see, upon installation of the ArmorMax system on the river bank, the repaving and upgrade of the road that has been continually damaged and repaired between mile posts 38 and 39, complete with a guardrail, wider shoulder, and improved
drainage systems for storm water runoff. The final goal of this alternative will be to halt riverbank erosion entirely, eliminating the need for road realignment and continual temporary closures and repairs.

The alternative action will also see the removal and replacement of the 80 foot culvert from Chain Up Creek and the construction of a bridge over Chain Up Creek to allow for the passage of salmon upstream. A 30 foot long, 40 foot wide bridge will be built over Chain Up Creek, and the creek will be temporarily diverted away from the bridge construction site during construction to avoid any pollution reaching the North Fork Nooksack River, and any part of the site that is cleared of vegetation will be re-vegetated.
### 3.0 - Decision Matrix

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-- significant adverse impacts
- adverse impacts
0 no impact
+ positive impact
++ significant positive impact
4.0 - Impacted Environmental Elements

4.1- Earth

Soils:

*Existing Conditions:*
There are various types of soils identified within the proposed work site area: slightly silty to silty and slightly sandy to sandy gravel, and silty sandy gravel. The bedrock is identified as the Nooksack formation and consists of high strength, fine to coarse grained, highly cemented sandstone.

Neither the proposed action nor alternative actions will affect the existing soil conditions or composition

*Topography:*

*Existing Conditions:*
The topography of the proposed work site is generally described as mountainous with deep valleys and steep slopes. The steepest slope grade in the immediate work site is approximately 50 percent. Approximately 1.5 acres of land are covered by impervious surface (asphalt).

*Proposed Action:*
In order to realign the roadway, new area will need to be flattened and/or graded, cutting into the slope to the north of the existing roadway. This grading will be limited to minimal slope, and should not increase the possibility of mass wasting events to the south (down slope) side of the new roadway. An additional 0.2 acres of impervious surface will be constructed, totaling 1.7 acres of impervious surface (asphalt).
**Alternative Action:**
Armoring the river bank will not lead to any significant change in the topography of the proposed project site.

**No Action:**
No immediate change would be made to the topography of the site. With the site left susceptible to wasting events due to high flood events of the North Fork Nooksack River, however, eventual degradation of river banks and bluffs would occur.

**Erosion**

**Existing Conditions:**
The soils within the proposed action site, especially the bluff created by the edge of the existing roadway, have historically been subject to high levels of erosion due to high flow events of the North Fork Nooksack River. A high flow event in 2005 lead to roadway failure in which a portion of the existing roadway collapsed into the North Fork Nooksack River, and emergency action was taken to realign approximately 350 feet of roadway away from the river.

**Proposed Action:**
Temporarily increased erosion could result from the clearing, grubbing, and grading involved in the roadway realignment process. The realignment will not decrease river bank and bluff erosion during high flow events of the North Fork Nooksack River, but will eliminate the possibility of roadway failure leading to collapse of the highway into the river during such events.

**Mitigation:**
In order to minimize erosion during the construction process, and to minimize the possibility of contaminants or other construction related sediment from leaving the site, the contractor will
be required to adhere to a Temporary Erosion and Sediment Control Plan (TESCP) and Best Management Practices (BMP) (See Appendix B).

*Alternative Action:*
Similarly, temporarily increased erosion could result from the construction process. Armoring the river bank, however, would ultimately create conditions in which there would neither be erosion of the river banks and bluffs due to normal flow nor high flow events of the North Fork Nooksack River.

*No Action:*
No action would allow for the continued erosion of riverbanks and bluffs due to both normal flow and high flow events of the North Fork Nooksack River. The existing roadway will be vulnerable to failure due to erosion of bluffs, which can lead to roadway collapse into the river.

**Fill**

*Existing Conditions:*
Fill from previous roadway construction projects is present at the proposed action site. This fill consists of gravel borrow and crushed rock surfacing material.

*Proposed Action:*
Fill material for roadway construction will consist of gravel borrow and crushed rock surfacing material. Fill material for steam channel reconstruction will consist of sand, streambed sediment, pebbles, and cobles. A total of approximately 6,400 cubic yards of fill will be required for both roadway construction and stream channel reconstruction.

Excavation will be necessary for the new roadway location, existing roadway removal, and culvert removal. Excavated materials will consist of gravel borrow and crushed rock surfacing material. Approximately 37,000 cubic yards of material will be excavated.
Mitigation:
All fill material to be either deposited or excavated from the proposed action site will be provided by or disposed of at WSDOT approved source or site, respectively.

Alternative Action:
Construction of a bridge to replace the culvert and the SR 542 crossing of Chain Up Creek will require the use of both temporary and permanent fill. Fill material will consist of only earth or rock material and will be both provided by and disposed of at WSDOT approved source and site.

No Action:
Fill will be neither added, nor removed, from the site.

4.2 - Air

Existing Conditions:
Air quality meets all requirements of the Clean Air Act.

Proposed Action:
Construction activities will lead to increased dust particles and engine emissions. These conditions are temporary, and air quality will return to pre-construction conditions when the project is completed.

Mitigation:
The contractor will be required to adhere to all federal, state, and local air quality regulations, including temporary construction conditions such as dust, smoke, and emissions. The WSDOT will also require compliance with a “No Idle Policy” to avoid unnecessary emissions. Green house gas emissions will be calculated and recorded, as described in the Greenhouse Gas worksheet provided in Appendix D.
**Alternative Action:**
Construction activities will lead to increased dust particles and engine emissions. These conditions are temporary, and air quality will return to pre-construction conditions after completion of the project.

**No Action:**
There would be no change in air quality conditions.

4.3 - Water

**Surface Water**

**Existing Conditions:**
There are three streams, both listed as fish-bearing year round streams, and three wetlands located within the proposed project area boundaries. Chain-Up Creek is a tributary of the North Fork Nooksack River and flows under SR 542 (Mt. Baker Highway) through an existing 5 foot diameter culvert. North Fork Nooksack River flows approximately 75 miles from Mt. Baker to Bellingham. The North Fork Nooksack runs adjacent and parallel to SR 542, and project limits are within the designated shoreline zone of the river. Fossil Creek is a tributary of North Fork Nooksack River. It flows through the project site limits, and crosses under SR 542 west of the project site. Based on the 2004 Department of Ecology (DEO) Wetlands Rating System and Whatcom County’s Critical Area Ordinance (CAO), and as determined by a WSDOT wetlands ecologist, the three wetlands present within the proposed project area boundaries are designated and delineated as Category III wetlands.

**Proposed Action:**
See vicinity map provided in Appendix A
Roadway realignment will occur within 200 feet of both North Fork Nooksack River and Fossil Creek, in portions of wetlands 1 and 2, adjacent to wetland 3, and on the banks and within the Ordinary High Water Mark of Chain-Up Creek. There will be permanent and unavoidable
impact to 0.14 acres of wetland, 0.27 acres of wetland buffer, and 0.14 acres of stream buffer.

Approximately 1,200 cubic yards of fill material will be placed in wetlands 1 and 2, and approximately 62 cubic yards of excavation and 170 cubic yards of fill will be necessary for Chain-Up Creek restoration after the culvert is removed.

Chain-Up Creek will be temporarily diverted in order to isolate the project area for re-grading and restoration.

**Mitigation:**
Wetland impacts will be mitigated at an off-site pre-existing WSDOT mitigation site, located near Potter Road and the Lower Nooksack River. Wetland impact mitigation will include 0.14 acres of wetland construction and 0.28 acres of wetland enhancement at said site. See map provided in Appendix A.

Stream buffer impacts will be mitigated through channel reconstruction, re-planting, streambed gravel placement on-site, along with downstream Large Woody Debris placement.

**Alternative Action:**
Armoring the riverbank will improve water quality by lowering turbidity caused from river bank erosion.

**No Action:**
There will be no immediate change to surface water conditions. When, however, the existing roadway, or portions of, erode to the point of collapsing into the North Fork Nooksack River, surface water quality will be adversely affected by increased turbidity and suspended particles.
Groundwater

**Existing Conditions:**
The most recent measurement collected from a piezometer of the western slope, taken 10/19/2009, indicates that groundwater is present at about 6 ft. The eastern slope was measured on 2/11/2009 to have a groundwater depth of 23 ft. At the proposed action site surrounding Chain Up Creek, and aquifer exists above the bedrock at a depth of 15 – 20 feet below ground surface. Perched groundwater was also found in wet samples taken near Chain Up Creek. The near-surface perched groundwater could be attributed to surface water flowing in the creek, or to heavy rainfall and snowmelt draining through the rapidly infiltration characteristics of the sandy and gravelly soils.

**Proposed Action:**
Although no groundwater was encountered during pre-project boring, it is possible that groundwater could be reached with the proposed cuts to the western slope, and could potentially lead to localized instability.

**Mitigation:**
An erosion control mat and vegetation should be placed on the slope soon after excavation to minimize the possibility of wasting events if groundwater should be reached.

**Alternative Action:**
The alternative action plan both would not necessitate cutting deep into the slope, and includes the placement of erosion control mats.

**No Action:**
If no action is taken to the proposed project site, there will be no affect to groundwater conditions.
Runoff Water

*Existing Conditions:*
Storm water runoff flows off SR 542 onto vegetated side slopes, then passes through cross culverts to adjacent property or streams that eventually reach North Fork Nooksack River.

*Proposed Action:*
The realigned section of highway will have the same dimensions as the existing section of highway, and the existing section will be completely removed and replanted with native vegetation, making the net area of impervious surface equal before and after the construction is complete. The most likely result of moving the roadway farther away from North Fork Nooksack River would be for runoff to have more time to filter through vegetation and soils before reaching the river’s surface water. This would lead to less polluted water with less suspended solids reaching the river.

*Mitigation:*
All disturbed areas outside the new roadway will be re-planted with native species upon completion of construction. The contractor will be required to adhere to a Temporary Sediment and Erosion Plan and the use of BMPs as described in the Highway Runoff Manual during construction (see Appendix B)

*Alternative Action:*
Armoring the river bank will prevent any farther erosion of the bank into the river from occurring, leading to less suspended solids from entering the North Fork Nooksack River. Additionally, the armored bank will be able to support vegetation growth, which will aid in filtering runoff before entering the river, increasing particle removal and leading to cleaner water.
**No Action:**
No change would be made to runoff water conditions

**4.4 - Plants**

*Existing Conditions:*
The project area is located within Western Washington’s western hemlock vegetation zone. True to form, the zone is a coniferous forest with an abundance of western hemlock, western red cedar, and Douglas fir. Grand fir can be found along the banks of the North Fork Nooksack River. In addition, the forest also contains a mixture of deciduous species such as red alder, big leaf maple, and black cottonwood. The understory is comprised of vine maple, salmonberry, thimbleberry, red huckleberry, Indian plum, Scouler willow, sword fern, and bracken fern.

*Proposed Action:*
The project proposal roadway realignment will require approximately 2.60 acres of clearing and grubbing vegetation. The clearing will take place in the area designated for the newly aligned roadway. The vegetation that will be displaced for the new roadway includes Douglas firs, cedars, hemlocks, as well as the understory species. The installation of the bridge in place of the culvert will allow for natural riparian vegetation to strive.

*Mitigation:*
The project proposal roadway realignment will leave the existing roadway useless. The removal of the impervious surface will leave a natural bed that will be replanted with native vegetation. The revegetation will serve as a filter for runoff from the new roadway as well as a stream buffer. The project will restore 0.77 acres of stream buffer, 125 linear feet of stream channel, and replant approximately 1.83 acres of disturbed area by relocating the roadway away from the Nooksack River.
**Alternative Action:**
Although ArmorMax allows vegetation to grow through the woven three-dimensional turf reinforcement mat, larger plant species such as trees along the Nooksack River, may damage the reinforcement mat as they grow and mature. In such an event the armoring alternative may lose some of its stability and essentially the mat’s effectiveness.

**Mitigation:**
Scheduled inspections of the ArmorMax and vegetation growing through the reinforcement mat will allow for alterations to be made if deemed necessary. This will ensure that the armor system works as efficiently as possible.

**No Action:**
Taking no action will result in further erosion of the existing roadway, which is damaging to the vegetation along the Nooksack River. It will also allow for more roadway runoff to directly enter the Nooksack River and the beds of the adjacent riparian vegetation.

**4.5 - Animals**

**Existing Conditions**
The project area is home to many different species of animals including multiple small bird species, bear, deer, and other small mammals and rodents. Federally listed threatened or endangered species can be found in and around the site throughout the year, often at different times. The protected species include the northern spotted owl, marbled murrelet, grizzly bear, gray wolf, bull trout, Chinook salmon, and steelhead trout. In addition, the project site is adjacent to the Nooksack River, which is a migration route for aquatic species in the region. There are 70 species of salmon, trout, char and whitefish that utilize the Nooksack River. There is currently a culvert installed in Chain up Creek for the purpose of maintaining riparian flow. The steep culvert presently does not allow for any fish passage.
**Proposed Action:**

The clear cutting associated with the proposed project roadway realignment will impede and disturb approximately 2.60 acres of animal habitat, some of which is utilized by threatened and endangered species. The rerouting of the stream during the construction phase has the potential to temporarily disrupt the aquatic species. There are 10 native salmonid species in the Nooksack River. All of the stocks are especially adapted to local conditions of the river, which can be seen in the differences in their life histories and physical characteristics. The construction of the proposed project is scheduled to take place in between most salmon runs. The most common fish species that inhabit the Nooksack River are Chum salmon, Pink salmon, Coho salmon, Sockeye salmon, Steelhead trout, Coastal cutthroat trout, Chinook salmon, Native char and Mountain whitefish. All but the last two species listed are anadromous. The species that are most likely to be temporarily affected spawn in or around the time of the construction of the proposed action. Chinook salmon spawn in July and September, one of the two races has a spring run. Steelhead trout spawn between February and early July, they prefer faster water in rivers. Lastly, the Coastal cutthroat trout spawn December through June, although they prefer smaller streams.

The installation of the bridge in the place of the culvert will create a more natural habitat for both the animals and aquatic species. The current culvert is too steep to allow for any fish passage. The removal of the culvert will eliminate the current issue regarding fish passage.

**Mitigation:**

To preserve and enhance wildlife, an erosion and sediment control plan will be temporarily implemented. The incorporation of large woody debris in the stream channel will aid in the natural succession of the Nooksack River. In addition, planting native vegetation along the stream bank and in the area of the existing roadway will add additional shading to the river, helping it to maintain the optimal temperature for the riparian environment and aquatic species. Construction will take place during the time the least fish species are scheduled to spawn, between the months of March and June. This will allow for the least amount of human interruption to the inhabitants of the adjacent Nooksack River.
Alternative Action:
ArmorMax is considered to be wildlife friendly for species living on top of the armor. The woven three-dimensional turf reinforcement mat may serve as a barrier for some of the larger animal species that habituate both above and below the vegetation layer.

Mitigation:
Scheduled inspections of the ArmorMax will identify any areas of concern and ensure that the reinforcement mat is not serving as a blockade for any animal species.

No action:
If no action is taken the current roadway will continue to erode. Sediments and other products of the erosion will enter the Nooksack River potentially disrupting the aquatic species.

4.6 - Recreation

Existing Conditions:
The area of construction along the Mt. Baker Highway (SR 542) lies approximately 6 miles from the town of Glacier, Washington, and is between mileposts 38 and 39. The Mt. Baker Highway serves as the only access point for individuals to travel to the Mount Baker Ski Area, and is one of the main access points for the North Cascades National Park. The impacted area currently has no major recreational activities present. The Nooksack River serves as a route for kayaking and river rafting. Bicyclists do travel along the Mount Baker Highway. The Church Mountain trailhead is accessed via Forest Service Road 3040 which lies in the vicinity of the project.

Proposed Action:
The proposed project will not impact any recreational activities severely or in any permanent manner. The project will limit and slow traffic on the road during construction, which will in turn apply bicyclists traveling along the Highway. It will have no affect on any recreation done in
the Nooksack River. For approximately one month the project will close Forest Service Road 3040, from which the Church Mountain trailhead is accessed, however potential users will be able to access the trail via Forest Service Road 3035 and hike 1.25 miles East to the trailhead instead.

Overall, the project will widen the road and improve safety for bicyclists, create a safer road and reduce closure risk from erosion, which in turn severely impacts recreational opportunities beyond the project location. It will also retain the chain-up area at Chain Up Creek for vehicles to place chains on their vehicles during the winter months.

_Mitigation:_
The only impacts from the proposal to recreation will directly lie in the temporary closure of Forest Service Road 3040 which accesses the Church Mountain trailhead. An alternate route to the trailhead will be established and advertised to potential users.

_Alternative Action:_
The alternative action to the proposed action will impact recreational users of the Nooksack River (river rafting, kayaking, canoeing) as closure will be necessary while armoring is completed on the river bank.

Likewise, the nature of the area will require the road to be limited to one lane, which will temporarily slow down all recreational users traveling east of the project area to the North Cascades National Park and Mount Baker Ski Area.

_No Action:_
For the no-action alternative, there will be impacts to recreation. As the location is currently a chronic environmental deficiency where the road is actively eroding away into the Nooksack River, it is inevitable that the road will be damaged severely enough to require closure for repairs. Any such closure will impact bicyclists who use the Highway, and will hinder the travel of outdoor users traveling to the North Cascades National Park or Mount Baker Ski Area. If
damage should occur during the winter, a road closure at that point will impact users traveling for winter-snow related activities at the Mount Baker Ski Area, impacting potential recreational users and incurring economic damage to the Mount Baker Ski Area.

4.7 - Historic and Cultural Preservation

Existing Conditions:
As of the 2008 Cultural Resources Survey, the current area has no known ties to any historic elements, cultural features, or other features that need to be preserved from any impacts.

Proposed Project Impacts:
The proposed project will not impact any historic or cultural elements, as none are known in the area.

Mitigation:
Should any cultural elements be discovered during the process of the project and its construction, all work in the area of the discovery will immediately stop and the necessary contacts will be made to preserve any elements and investigate further as needed.

Alternative Action:
The alternative action will not impact any known cultural or historic elements. Should any be found during the process of the project and construction, work in the area will be stopped and the necessary contacts will be made to preserve and investigate any elements as needed.

No Action Impacts:
For the no-action alternative, no impacts will occur to any historic or culturally significant elements as no construction will occur.
4.8 - Transportation

Existing Conditions:
The existing area is approximately 6 miles east of Glacier, Washington, and serves as the only access road to the Mount Baker Ski Area, and one of the main access points to the North Cascades National Park. Within the project area is Forest Service Road 3040 to the Church Mountain trailhead. There is no current public transportation present in the area, no parking, and no river transportation traffic. The Mount Baker Highway is also used as a bicycling route, mainly for recreational purposes. There is a chain-up area at Chain Up Creek for winter drivers to move off the road and put on tire chains during the winter months. The existing state of the road between mile posts 38 and 39 is such that the river is actively eroding the river bank, and in turn actively damaging and eroding the road (as a chronic environmental deficiency) and requiring the need for recurring repairs and temporary closures.

Proposed Project:
The proposed action will temporarily close Forest Service Road 3040 to the Church Mountain trailhead. It will limit traffic for approximately April through October 2010 during construction. Traffic will be limited to one lane of road during construction hours, with flaggers working traffic control during the day to ensure the safety of motorists. Drivers will expect 10 minute delays at most, and will be required to share the road with increased traffic of dump trucks working to transport removed dirt and rock from the project site, and increased traffic from construction and Department of Transportation workers. Bicyclists will also be temporarily delayed on the road by the project. The chain-up area at Chain Up Creek will not be closed or altered in any way for winter chain-up needs. The final outcome of the proposed project will ensure the structural integrity and safety of the road from further erosion damage (preventing further closures and repairs), and will widen the road to increase safety for bicyclists.
**Mitigation:**
The temporary closure of Forest Service Road 3040 will be mitigated by directing potential users of the Church Mountain trailhead to use Forest Service Road 3035 and hike 1.25 miles east to the Church Mountain trailhead. All traffic traveling past the project area on the Mount Baker Highway will be controlled by flaggers and directed in order to ensure safety during daytime construction hours, as only one lane will be open during construction. During non-construction hours, both lanes will be open and no traffic delayed. The road will be constantly cleaned via a StreetSweeper vehicle to ensure no large amounts of rock or dirt will be on the road. The project outcome will ensure the safe passage of traffic and mitigating the potential for road closure due to erosion and road damage.

**Alternative Action:**
The alternative-action will impact traffic with the need to limit traffic to one lane during construction, requiring traffic controls to ensure safety and temporarily delaying traffic. It will likewise impact any possible river traffic or recreational users during construction of the river bank armoring, in order to ensure the safety of potential river traffic. Construction-related traffic will also add to the normal traffic levels on the Mount Baker Highway, leading to small traffic delays during construction hours.

**No Action:**
The impacts from the no-action alternative to transportation will be the inevitable erosion damage to the roadway (due the the area being a chronic environmental deficiency) by the Nooksack River which will lead to the need to close the road for more extensive repairs. This will impact users from reaching the North Cascades National Park and Mount Baker Ski Area, and impact individuals who live beyond the project area. Repeated costly repairs will be required to the road between mile posts 38 and 39 due to the continuing erosion.
4.9 - Energy and Resources

*Existing Conditions:*
No energy needs are required to be met by the project site as it currently exists. The proposed action as well as the alternatives would require general road maintenance as roads endure wear and tear as well as weather over time.

*Proposed Action:*
There are no energy needs that are required to be met by the completed project. Aside from general road maintenance, the main expenditure of energy will take place during the construction of the newly realigned roadway and the deconstruction of the existing roadway.

*Alternative Action:*
There are no continuous energy requirements for the armoring alternative aside from the implementation of the armoring in the structuring process.

*No action:*
There are no energy requirements for the existing conditions.

4.10 - Public Services

*Existing Conditions:*
The project site does not require any public services.

*Proposed Action:*
The proposed project will not result in an increased need for public services of any kind.

*Mitigation:*
Emergency vehicles will be given the highest priority during traffic-controlled events.
**Alternative Action:**

The alternative will not result in an increased need for public services.

**No action:**

The current conditions do not call for public services.

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**4.11 - Housing**

**Existing Conditions:**

Currently there is no housing on the site, and no housing will be eliminated or added for this project. None proposed action, alternative action, and no action alternatives would affect housing.

---

**4.12 - Aesthetics**

**Existing conditions:**

This section of the highway runs through a thickly forested corridor. A view of the North Fork Nooksack River can be seen from this section of the road in its current location.

**Proposed Action:**

Views of the roadside, as seen by motorists, will be altered by the removal of mature native vegetation. This will make the new and existing steep slopes more visible. Since the project is realigning the road away from the river, river-viewing opportunities from the road will decrease. However, the jersey barriers along the existing roadway will be removed, decreasing roadside viewing obstructions.

**Alternative Action:**

If the bank was armored, there could be initial negative aesthetic impacts, as the ArmorMax High Performance Turf Mat (HPTM) is first installed. However, vegetation would be able to
grow through the armoring, resulting in little aesthetic impact within five years.

**No action:**
Views of the river from the road would remain, if the road stayed in its current location. However, the jersey barriers in place would obstruct views. Also, mature native vegetation along the roadside would be seen, as opposed to views of surrounding slopes that would result from vegetation removal.

**Mitigations:**
The proposed action will need to limit all disturbances to only those areas needed for construction. Affected areas will be re-planted with native vegetation that will blend with the surrounding highway corridor.

### 4.13 - Light and Glare

**Existing Conditions:**
Currently, the only source of light and glare on this site is the sun and its reflection off of the native water, and the road. None of the proposed action, alternative action, or no action options would have an effect on light and glare, since no lighting would be installed.

### 4.14 - Utilities

**Existing conditions:**
There are no utilities at this site, including electricity, natural gas, sewer, septic, water, etc. None of the three plans involve the addition of any utilities, so existing conditions will remain.
4.15 - Environmental Health

**Proposed Action:**

While environmental health hazards including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste are unlikely, the risk of an environmental incident is always present during any construction.

**Mitigation:**

Standard construction methods and traffic control measures will be employed to minimize the risk of an incident. Additionally, the contractor will be required to submit a Spill Prevention, Control, and Countermeasure (SPCC) plan for approval before starting construction. In the unlikely event of an environmental incident, the contractor would be responsible to immediately implement the SPCC plan, notify the project engineer, and evaluate the incident. WSDOT would then follow notification procedures to jurisdictional agencies as outlined in the WSDOT Environmental Compliance Assurance Procedure. Otherwise, standard construction practices, safety measures, and traffic control measures will be required of the contractor. In the event that potentially hazardous waste is discovered on site, it will be handled in accordance with EPA, Department of Ecology, and local health regulations. No special emergency services will be required as a result of this project.

Concerning the issue of noise, during construction noise levels may temporarily increase due to equipment use and project activities. The contractor will be required to adhere to all applicable federal, state, and local noise regulations governing construction activity. Upon completion, noise would return to pre-project levels.

**Alternative Action:**

The risk of adverse impacts from noise, explosion, or toxic substances will be unchanged for the alternative action.

**No Action:**

There is no known preexisting risk of explosion or toxic substances.
4.16 - Land and Shoreline Use

Proposed Action:
Currently, SR 542 is a state highway that is designated as a Scenic and Recreational highway, and as a transportation corridor. Adjacent land is property of the US Forest Service. Parts of the site have been classified by Whatcom County as environmentally sensitive. These areas include: Chain-Up Creek, on-site wetlands, the North Fork Nooksack River, and Fossil Creek (Which is west of the project limits). The proposed realignment project is compatible with existing and projected land uses to maintain essential transportation infrastructure in Whatcom County.

Mitigation:
There will be no specific mitigation for land and shoreline use.

Alternative Action:
There are no foreseeable adverse impacts relating to land and shoreline use that would result from the alternative action.

No Action:
There are no foreseeable adverse impacts relating to land and shoreline use that would result from a no action alternative.
5.0 - Conclusion

The proposed action meets all of the goals of the project in an environmentally sound manner. Realigning the highway will improve transportation safety and benefit protected species. The removal of the culvert and installation of a bridge at Chain Up Creek will allow for fish passage that was previously blocked. The proposed action will confine construction impacts to the immediate roadway and cleared area, employing mitigation measures that protect the surrounding aquatic and terrestrial environments. Any native vegetation that is disturbed during the construction process will be replanted, providing terrestrial habitat and ecological services, such as a filtration buffer. It will ensure continued use of the highway and access to recreational areas beyond the project location.

While armoring the river bank with ArmorMax technology and replacing the culvert with a bridge at Chain Up Creek may also meet the goals of the project, the durability and longevity of this system is uncertain. Although The High Performance Turf Mat (HPTM) allows for re-growth of vegetation, it may act as a barrier to larger animal and plant species. ArmorMax would stop erosion, but requires more construction on the river bank, making mitigation of impacts more difficult. Because the ArmorMax installation would occur on the bank, a more environmentally-sensitive location, there is an increased likelihood of adverse impacts.

The no action alternative would have detrimental effects on both the highway and the environment. The erosion-repair cycle would continue, leading to costly and unsafe conditions. Future road closures associated with maintenance would lead to traffic congestion and potential inaccessibility to Mt. Baker. Also, fish passage would remain blocked at Chain Up Creek if the culvert was left in place.
Appendices
Appendix A:
Maps
Appendix B: Temporary Erosion and Sediment Control Plan

TEMPORARY EROSION AND SEDIMENT CONTROL PLAN

SR 542

SR 542/CED
E. Church Mt. Rd. Highway Realignment
MP 38.67 to MP 39.04

For

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
Northwest Region
Seattle, Washington

This report was prepared by Heather Thurston under my direct supervision as defined in WAC 196-25-070.

Shane Spahr, P.E.
Assistant Project Engineer

Lorena Eng, P.E.
Region Administrator

November 2009
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FIGURES

FIGURE 1 - VICINITY MAP

Appendix

A
1.0 Project Overview
The Temporary Erosion and Sediment Control (TESC) Plan describes the measures to be used during construction to protect Waters of the State from degradation due to sediment transport or water pollution. These measures may include the use of temporary Best Management Practices (BMPs).

During construction field conditions may require additional temporary BMPs or a change in placement of the temporary BMPs. The Contractor Erosion and Sediment Control (ESC) Lead and WSDOT Construction Project Office Inspectors shall modify the plan if necessary to meet field conditions. This plan shall be provided to the Project Engineer, and placed in the site logbook.

1.1 Site Description
The E. Church Mt Road project is located at approximately 1300 feet on the lower slopes of Church Mountain along State Route (SR) 542 between mileposts 38.67 and 39.04 in the Mount Baker-Snoqualmie National Forest. The project area includes steep and locally unstable slopes that lead from SR 542 down to the North Fork Nooksack River (NF Nooksack). In 2004 an unstable slopes eroded at the toe and collapsed into the river and created a washout along the eastbound shoulder. An emergency realignment was completed in March 2005 to stabilize the roadway temporarily.

SR 542 is a non-NHS Route that extends from I-5 in Bellingham to the Mount Baker National Recreational Area. SR 542 is designated as a National Forest Byway and a Washington State Scenic Byway. The state log classifies this segment of SR 542 as an R-3 Rural-Collector located in mountainous terrain. The project is 5.51 miles east of the town of Glacier. A vicinity map is located in Appendix A.

1.2 Scope of Work
This project will relocate SR 542 northerly away from the NF Nooksack to prevent additional erosion of the roadway prism and to remove a sight distance hazard created by the 2005 emergency realignment. The work activities will include clearing and grubbing, grading, roadway excavation and embankment, culvert placement, paving with asphalt concrete, constructing temporary BMPs, constructing permanent stormwater treatment BMPs, constructing a bridge and fish passable stream, landscape, pavement marking, traffic control, and installation of guardrail and permanent signing.

The development of this TESC Plan has been coordinated with Mr. Chris Damitio of the Bellingham Construction Office.

1.3 Areas Impacted
Total area of new impervious surface added 0.964 acres
Total area of existing impervious surface 1.812 acres
Total area of disturbed soil 4.94 acres

1.4 Existing Conditions
This section presents the existing conditions within and surrounding the project site. Included are descriptions of soils, drainage, off-site water, outfalls, sensitive areas, existing water quality, WRIA, adjacent construction and affected utilities.

1.4.1 Soils or Surface Conditions
The major soil types identified along the project as identified from the USDA Soil Conservation Service are VanZandt, Elwell, and Montborne. The Soil Survey of Whatcom County does not identify soil types located within the National Forest. Other soil types identified along the project from the geotechnical investigation performed by Shannon & Wilson, Inc are Bedrock composed of conglomerate, sandstone, and shale; Dacitic Volcanic rock; Holocene alluvium and colluvium; and alpine glacial deposits.

1.4.2 Drainage
The project has three contributing drainage basins as seen in Appendix A-X. Basins 1, 2, and 3 mainly consist of forested lands on south facing slopes with a maximum elevation change of approximately 4,000 feet. The drainage runoff from Basin 1 is collected by overland flows and is concentrated into vegetated ditches, Chain-Up Creek, and three existing wetlands. Runoff that is not infiltrated is then conveyed into the NF Nooksack by culverts that pass under SR 542. Runoff generated in Basin 2 is collected by overland flows and vegetated ditches along the north side of SR 542 and the west side of E. Church Mt. Rd. The ditch along SR 542 west of E. Church Mt. Rd. infiltrates while the ditch along the west side of E. Church Mt. Rd. and along SR 542 east of E. Church Mt. Rd. discharges through a culvert into Wetland 3. Wetland 3 discharges runoff into the NF Nooksack. The runoff collected on the south side of the road flows directly into the NF Nooksack. Runoff from Basin 3 is collected by overland flows and is discharged into Fossil Creek.

1.4.3 Off-Site Water
There is the potential for off-site water to enter the project limits. If a rainstorm occurs a cross culvert beneath E. Church Mt. Rd. discharges into a ditch at the intersection of SR 542 and E. Church Mt. Rd. From that ditch it travels through the cross culvert located at approximate STA 15+65 and discharges on to slopes directly above the NF Nooksack. There is also potential for runoff generated from the above hillsides to travel into the project site. The cross culvert at Wetland 2 located at STA 21+25 often has water flowing through it. Chain Up Creek at the east end of the project passes under SR 542 at approx STA 27+50. The measures that will be taken to prevent offsite water from mixing with onsite water are:
- Install the new drainage cross culverts early in the project. Grade cut slopes to drain into ditches and catchments that can be bypassed through the project.

- Install the Chain Up Creek stream bypass system during bridge construction and stream restoration work.

The Design Office is not aware of any illicit connections to the state drainage system within the project limits.

### 1.4.4 Sensitive Areas

Three class III palustrine emergent wetlands were identified within the project limits. These three wetlands are fed by a combination of overland runoff, precipitation, and groundwater. The wetlands are classified hydraulically as slope wetlands and are regulated by Whatcom County. A basic summary of the wetlands is provided in Table 1. The project environmental compliance sheets are located in Appendix A.

<table>
<thead>
<tr>
<th>Wetland</th>
<th>Location and Offsets (ft)</th>
<th>Size (acres)</th>
<th>Size (acres) remaining</th>
<th>Buffer Impact (acres)</th>
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<tbody>
<tr>
<td>1</td>
<td>20+00.71 LF 35.41 ft</td>
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<td>0.13</td>
<td>0.13</td>
<td>+0.22</td>
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</table>

**Table 1: Existing Wetlands**

There are two creeks located within the project limits. Fossil Creek passes under a bridge between Mile Post 38.65 and 38.66 and will have temporary buffer impacts. Chain Up Creek is conveyed under SR 542 via a 5ft diameter concrete culvert. This culvert is considered to be a fish barrier because the velocity, slope, and vertical drop at the culvert outfall exceed the maximum thresholds for fish passage. A bridge and fish passable stream will replace the culvert.

One jurisdictional ditch that is 35 feet long, 18 inches wide, and 2 inches deep is located within the project between Wetland 2 and the adjacent hillside. It will be completely removed as a result of the roadway realignment and a new ditch will be constructed that is 25 feet long, 2 feet wide and 2 feet deep to replace the jurisdiction ditch.

### 1.4.5 Existing Water Quality

The North Fork of the Nooksack River and its tributaries above and including Maple Creek are considered to be Char Spawning/Rearing Areas according to the Washington State Department of Ecology (WSDOE) and WAC 173-201A. The North Fork of the Nooksack River in the vicinity of the project is not listed as an impaired water body on the WSDOT 303d assessment.

### 1.4.6 Affected Utilities

There are no utilities within the project limits.
1.5 Permits and Associated Reports

1.5.1 Permits
Permits and issuing agencies required for this project are:

<table>
<thead>
<tr>
<th>Permit</th>
<th>Agency</th>
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</thead>
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<tr>
<td>Section 404 Clean Water Act</td>
<td>Army Corps of Engineers</td>
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<tr>
<td>Coastal Zone Management</td>
<td>Washington State Department of Ecology</td>
</tr>
<tr>
<td>Certification</td>
<td></td>
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<tr>
<td>NPDES Permit</td>
<td>Washington State Department of Ecology</td>
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<tr>
<td>Water Quality Certification</td>
<td>Washington State Department of Ecology</td>
</tr>
<tr>
<td>Section 401</td>
<td>Whatcom County</td>
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<td>Shoreline Permit</td>
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<tr>
<td>Hydraulic Project Approval</td>
<td>Washington State Department of Fisheries/Wildlife</td>
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1.5.2 Associated Reports
Other reports and studies conducted and prepared in conjunction with this project includes:

<table>
<thead>
<tr>
<th>Report</th>
<th>Author</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydraulic Report</td>
<td>WSDOT (Heather Thurston)</td>
</tr>
<tr>
<td>Biological Assessment</td>
<td>US Forest Service</td>
</tr>
<tr>
<td>Wetland Analysis</td>
<td>WSDOT (Kristin Fredericks)</td>
</tr>
<tr>
<td>Geotechnical Reports</td>
<td>Shannon &amp; Wilson, Inc.; WSDOT</td>
</tr>
<tr>
<td>Spill Prevention, Control,</td>
<td>To be prepared by Contractor</td>
</tr>
<tr>
<td>and Countermeasures Plan</td>
<td></td>
</tr>
<tr>
<td>Collection, Containment, and</td>
<td>To be prepared by Contractor</td>
</tr>
<tr>
<td>Disposal Plan</td>
<td></td>
</tr>
</tbody>
</table>
2.0 TEMPORARY EROSION AND SEDIMENT CONTROL PLAN

2.1 Purpose of Plan
The stand-alone Temporary Erosion and Sediment Control (TESC) Plan describes the temporary BMPs selected for stormwater detention and water quality treatment during construction of this project. A BMP is a physical, structural, and/or managerial practice that prevents or reduces the pollution of water. The goal of the TESC Plan is to prevent turbid discharges and sediments from leaving the site and be compliant with permit requirements. Should field conditions during construction require additional temporary BMPs or if a change in placement of temporary BMPs is needed, this plan shall be modified by the Contractor ESC Lead and WSDOT Project Office Inspector(s), and approved by the Engineer. The objectives of this TESC Plan are to:

- Implement BMPs to minimize erosion and sedimentation from rainfall at construction sites, and to identify, reduce, eliminate, or prevent the pollution of stormwater.
- Prevent violations of surface water quality, ground water quality, or sediment management standards.
- Prevent, during the construction phase, adverse water quality impacts including impacts on beneficial uses of the receiving water by controlling peak rates and volumes of stormwater runoff at WSDOT’s outfalls and downstream of the outfalls.

During active work, the Contractor shall keep the TESC Plan and BMP inspection reports on site. When construction activity is complete, the WSDOT Project Office shall retain the TESC Plan, inspection reports, and all other reports required by the contract and permit authorities.

2.2 Erosion and Sediment Control Elements
WSDOT Highway Runoff Manual Erosion and Sediment Control Elements will be implemented during the design and construction of this project. These elements include the following:

2.2.1 Mark Clearing Limits
Prior to land clearing activities, mark all clearing limits on the plan and in the field with high visibility fences, to protect sensitive areas and their buffers, as well as adjacent properties. Retain duff layer, native topsoil and existing vegetation to the maximum extent practicable.

Physical BMPs
- Preserving natural vegetation
- Buffer zones
- High visibility fence
2.2.2 Establish Construction Entrance

Install stabilized construction access points prior to major grading operations and limit access points to the fewest number possible, only one whenever feasible. Whenever possible, slope entrances downward into the site to reduce track-out of sediments onto the roadway. If sediment is tracked off site, roads are to be cleaned thoroughly at the end of each day by shoveling or sweeping. Removed sediment is transported to a controlled disposal area. When applicable, a wheel wash should be used and the wash water should be treated separately on site, or discharged to a sanitary sewer if allowed by permit. If streets are washed with water, treat wash water prior to discharge.

**Physical BMPs**

- Stabilized construction entrance
- Construction road stabilization
- Street cleaning

2.2.3 Control Flow Rates

Protect downstream properties and waterways from erosion by preventing increases in the volume, velocity, and peak flow rate of stormwater runoff from the site during construction. Install the permanent sediment control facilities to provide flow control as early in construction as feasible.

Install retention/detention facilities as one of the first steps in grading, for use as infiltration or sedimentation facilities prior to mass grading and the construction of site improvements. Temporary drainage conveyances should account for both on- and off-site water sources. Use vegetated areas that are not identified as wetlands or other sensitive features to infiltrate and dispose of water whenever possible, and mark those areas on the TESC plan sheets.

Non-stormwater (i.e., dewatering, line flushing, etc.) must also be controlled to protect downstream properties. When non-stormwater discharges are routed through separate storm sewer systems, the flow rate must be controlled to minimize scouring and flushing of sediment trapped in the system.

**Physical BMPs**

- Sediment trap
- Stormwater infiltration

2.2.4 Install Sediment Controls

Install sediment control BMPs prior to soil disturbing activities, whenever feasible. Prior to leaving a construction site or discharging to an infiltration facility, concentrated stormwater runoff from disturbed areas must pass through sediment ponds or traps. Sheet flow runoff must...
pass through sediment control BMPs specifically designed to remove sediment from sheet flows, such as filter berms, vegetated strips, silt fencing, etc. As maintaining sheet flows greatly reduces the potential for erosion, runoff should be maintained and treated as sheet flow whenever possible.

Physical BMPs

- Silt fence
- Preserving natural vegetation
- Check dam
- Street cleaning
- Wattles
- Compost Sock

All TESC plans including stormwater chemical treatment, whether originally planned or added after construction begins, must notify WSDOT Region Water Quality Program.

2.2.5 Stabilize Soils

Stabilize all exposed and unworked soils by applying effective BMPs that protect the soil from wind, raindrops, and flowing water. Selected soil stabilization measures must be appropriate for the time of year, site conditions, estimated duration of use, and the water quality impacts that stabilization agents may have on downstream waters or ground water.

Soil stockpiles are especially vulnerable to slumping when saturated and must be stabilized and protected with sediment trapping measures. Plastic may be necessary on silty stockpiles, as it is the only BMP that can prevent soil saturation.

In western Washington, cover erodible soil that is not being worked, whether at final grade or not, within the following time limits, using approved soil cover practices.

October 1 through April 30  2 days maximum, no more than 5 acres
May 1 through September 30  7 days maximum, no more than 17 acres

Expose no more soil than can be covered within the above time limits. Construction activities should never expose more erodible earth than the amounts shown below for the specified locations.
### 2.2.6 Protecting Slopes

Design and construct cut and fill slopes in a manner that will minimize erosion by: 1) reducing continuous lengths and steepness of slopes with terracing and diversions; and 2) roughening slope surfaces, considering soil type and its potential for erosion. In addition, all soil must be protected from concentrated flows through temporary conveyances, such as diversions and pipe slope drains. Best professional judgment should be used when sizing the conveyance, so consult the Project Engineer for guidance when runoff or ground water is intercepted. Conveyances exceeding 10 percent in slope should have a solid lining.

To capture sediment and runoff when cutting trenches, place excavated soil on the uphill side of the trench (when consistent with safety and space considerations).

- Check dam
- Wattles
- Stabilized construction entrance
- Construction road stabilization
- Preserving vegetation
- Placing erosion control blanket
- Seeding and planting
- Compost Socks
- Compost Blanket
- Bonded Fiber Matrix
- Preserving Vegetation
- Erosion Control Blanket
- Seeding and Planting
- Compost Socks
- Wattles

### 2.2.7 Protect Drain Inlets

Protect all operable storm drain inlets from sediment with approved inlet BMPs.

- Check dams

### 2.2.8 Stabilize Channels and Outlets

Design, construct, and stabilize all temporary conveyance channels to withstand the 2-year, 24-hour frequency storm for the developed condition. The outlets of all conveyance systems must
be adequately armored to prevent erosion around the outfall structure, adjacent slopes, stream banks, and downstream reaches.

**Physical BMPs**
- Check dams
- Erosion control blanket

2 year 24 hour frequency storm is 1.9 inches/24 hours and the 10 year 24 hour frequency storm is 2.0 inches/24 hours for this project area.

### 2.2.9 Control Pollutants

All pollutants, including construction materials, waste materials, and demolition debris, must be handled and disposed of in a manner that does not cause contamination of stormwater. Wood debris may be chipped and spread on site.

Methods for controlling pollutants that can be considered hazardous materials, such as hydrocarbons and pH-modifying substances, must be described in the contractor’s Spill Prevention Control and Countermeasures (SPCC) plan. The SPCC plan must be prepared to meet Standard Specification 1.07.15(1) and Ecology’s Standards as described in WSDOT SPCC Plan Preparation Instructions and Spill Plan Reviewers Protocols located at [http://www.wsdot.wa.gov/environment/hazmat/spillprevention.htm](http://www.wsdot.wa.gov/environment/hazmat/spillprevention.htm)

Stormwater or groundwater that has come in contact with curing concrete must be sampled to ensure water quality standards are not violated. Process water (concrete washout, slurry water, hydrodemolition, etc.) must be contained and can not be discharged to waters of the State.

### 2.2.10 Control Dewatering

If groundwater is encountered in the excavation of the bridge, it will be pumped to an area east of the bridge and infiltrated. This area can be seen on Sheet TESC 4. The culvert in the ditch between this area and Chain Up Creek will need to be blocked to prevent the water from running back into the stream.

If groundwater is encountered in an excavation or other area, control, treat, and discharge it as described in Standard Specification 8-01.3(1)C.

### 2.2.11 Maintain BMPS

Inspect BMPs per Standard Specification 8-01.3(1)B to ensure they perform their intended function properly until the Project Engineer determines that final stabilization is achieved. Final stabilization means completion of all soil disturbing activities and establishment of a permanent vegetative cover or permanent stabilization measures (such as riprap) to prevent erosion.
Maintain BMPs in accordance with Standard Specification 8-01.3(15). When the depth of accumulated sediment and debris reaches approximately one-third the height of the device, the contractor must remove the deposits. BMP implementation and maintenance should be documented in the Site Log Book. Clean sediments may be stabilized on site if the Project Engineer approves.

2.2.12 Manage the Project

To the maximum extent possible, apply the following actions on all projects:

1. Preserve vegetation and minimize disturbance and compaction of native soil, except as needed for construction.

2. Where feasible, stage work to minimize the amount of soil exposed at any one time and prevent the transport of sediment from the site during construction.

3. Time sediment control BMP installation in accordance with TESC Element 4.

4. To minimize erosion, follow soil cover timing requirements and exposure limits in TESC Element 5 and Standard Specification 8-01.3(1). Projects that infiltrate all runoff are exempt from the above restrictions. Individual contract special provisions and Project Engineer directives may be more stringent, based on specific location characteristics or changing site and weather conditions.

5. The work of utility contractors and subcontractors is coordinated to meet requirements of both the TESC and SPCC plans.

6. All BMPs are inspected, monitored, and maintained in accordance with TESC Element 11. Sampling may be initiated to ensure compliance.

7. If permit conditions require a Certified Erosion Control Lead (CESCL), the CESCL is on site or on call at all times.

8. The TESC and SPCC plans are kept on site or within reasonable access to the site. Due to the unpredictable nature of weather and construction conditions, the TESC plan is a living document that is open to modifications during construction. Whenever inspections and/or monitoring reveal that the BMPs identified in the TESC plan are inadequate due to the actual discharge of or potential to discharge pollutants, the plans must be modified, as appropriate, within ten (10) days. The plans must also be updated whenever there are significant changes in the project design or in construction methods that could affect the potential for erosion or spills.

2.3 Temporary Erosion and Sediment Control BMPS

This section presents the temporary BMPs that were selected to control erosion and sediment during construction of this project. The BMPs selected include Source Control BMPs, Sediment Control BMPs, Structural Erosion Control BMPs, and Experimental and Other BMPs.
The BMPs were selected based on the potential for erosion at the site and the potential for impacts to surrounding sensitive areas (i.e., wetlands and water bodies). The erosion potential for this project was determined to be (low, moderate, high). Describe what factors led to the selection of the erosion potential. (Slope, slope length, amount of disturbed soil, proximity to receiving water bodies, outfalls, etc.) The designer should discuss how the project will be “staged” to the extent possible to disturb as little of the site for the shortest amount of time during construction.

The type and location of TESC BMPs used during construction may vary from those presented below. This plan may be modified by the Contractor in the field as necessary to control erosion and the migration of sediments at the project site.

The proposed locations of the selected TESC BMPs are presented on the TESC Plan Sheets presented in Appendix A, Plan Sheets TESC 1 – TESC 4, and TD1 – TD2

2.2.3.1 Source Control BMPS

Source control BMPs selected for this project include Temporary Erosion Control Blankets, Compost Blankets, Bark or Woodchip Mulch, and Bonded Fiber Matrix will be used on the north side of the roadway. Compost Blankets, and bonded fiber matrix will be used on the south side of the roadway.

Minimize natural vegetation removal. Street sweeping proper storage and handle of potential pollutants will be covered in the Spill Prevention, Control and Countermeasures Plan.

2.4.2 Sediment Control BMPS

The BMPs selected for the control of sediment include check dams, compost socks, straw wattles and silt fence.

2.4.3 Structural Erosion Control BMPS

Structural Erosion Control BMPs selected include stabilized construction entrance and swales.

2.4.4 Experimental and Other BMPS

No experimental BMPs are proposed for this work.

3.0 Water Quality Monitoring

The Contractor ESC Lead, Environmental Construction Liaison, or Water Quality Engineer may determine that water quality monitoring is warranted. If needed, WSDOT shall measure and record turbidity and pH (if applicable) at all identified site discharge points per the permit conditions and/or Highway Runoff Manual. Turbidity will be measured with a HACH 2106P portable turbidity meter or equivalent and reported in Nephelometric Turbidity Units (NTUs).
Appendix C: Washington Department of Transportation Plans
DETAIL A
HIGH VISIBILITY SILT FENCE AND WATTLE
FRONT VIEW
N.T.S.

LOCATION TABLE

<table>
<thead>
<tr>
<th>POST</th>
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<tbody>
<tr>
<td>SUPPORT FOR WATTLE</td>
<td></td>
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<tr>
<td>2 X 4 X 4 FENCE</td>
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<td>DETAIL B</td>
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</table>

DETAIL B
HIGH VISIBILITY SILT FENCE AND WATTLE
PLACEMENT IN WETLANDS
SECTION VIEW
N.T.S.

DETAIL C
HIGH VISIBILITY SILT FENCE AND WATTLE
PLACEMENT ADJACENT TO ROADWAY
SECTION VIEW
N.T.S.

NOTES:
1. PLACE WOODEN SCALES 2 X 4 X 4 WATTLE AT 2 X 4 X 4 FENCE TO FORM A WATERPROOF BARRIER WITH THE EXISTING DRAINAGE CONDUIT.
2. A PLASTIC TARP MAY BE USED IN PLACE OF WOODEN SCALES AMONG OTHERS AS DESIDED.
3. RADIUS SPACING IS 2 FEET BETWEEN WOODEN SCALES USED TO INCREASE WATTLE.
4. ENSURE THAT EACH END OF WATTLE ADJACENT WITHIN SIDES TIGHTLY TIE TO TENSION STRUCTURE AND SITE WALL.

TYPICAL SECTION
WATTLE DETAIL
N.T.S.

DETAIL D
TYPICAL SECTION
WATTLE DETAIL
N.T.S.

LOCATION TABLE

<table>
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<tbody>
<tr>
<td>SUPPORT FOR WATTLE</td>
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<td>DETAIL B</td>
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</table>

WASHINGTON STATE
DEPARTMENT OF TRANSPORTATION
TEMPORARY EROSION CONTROL DETAIL
Appendix D: ArmorMax System Plans
## Appendix D: GHG Worksheet

### Mount Baker Highway Church Mountain Realignment: Greenhouse Gas Worksheet

#### Section I: Buildings

<table>
<thead>
<tr>
<th>Type (Residential) or Principal Activity (Commercial)</th>
<th># Units</th>
<th>Square Feet (in thousands of square feet)</th>
<th>Embodied</th>
<th>Energy</th>
<th>Transportation</th>
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</table>

#### Section II: Pavement

| Pavement                                             | 50.00   | 2500 |

**Total Project Emissions:** 2500
Appendix E: Glossary of Terms

**Anadromous:** Fish that spawn in freshwater but spend at least part of their life cycle in the ocean.

**Category III wetlands:** Wetlands assigned to category 3 support superior habitat, or hydrological or recreational functions as determined by an appropriate wetland evaluation methodology. Wetlands assigned to category 3 may be typified by some or all of the following characteristics: high levels of diversity, a high proportion of native species, or high functional values. Wetlands assigned to category 3 may include, but are not limited to: wetlands which contain or provide habitat for threatened or endangered species; high quality forested wetlands, including old growth forested wetlands, and mature forested riparian wetlands; vernal pools; and wetlands which are scarce regionally and/or statewide including, but not limited to, bogs and fens.

**Culvert:** A sewer or drain crossing under a road or embankment.

**Geotextile:** Woven or non-woven fabrics used with foundations, soils, rocks, earth, or other.

**Gravel borrow:** describes an area where material (usually soil, gravel or sand) has been dug for use at another location.

**High flow event:** Any event that creates conditions in which the water of a river or stream is flowing higher and/or faster than normal conditions would induce, such as a storm or seasonal flood.

**High performance Turf Mat (HPTM):** The HPTRM is a woven-three dimensional fabric that exhibits a high tensile strength surface protection layer of 4000 lb/ft (58.4 kN/m), which exceeds the U.S. EPA’s definition of a High Performance Turf Reinforcement Mat.

**Jersey barrier:** A three-to-five-foot tall moveable concrete barrier commonly used to divide multiple lanes on freeways during construction projects. It was originally developed by the state of New Jersey.

**Mass wasting event:** Downhill movement of soil and rock fragments induced by gravity.

**Salmonid:** Of, belonging to, or characteristic of the family Salmonidae, which includes the salmon, trout, and whitefish.

**Salmon run:** The time at which salmon swim back up the rivers in which they were born to spawn.

**Spawn:** The eggs of aquatic animals such as bivalve mollusks, fishes, and amphibians.
**Stocks**: Fish species that are adapted to local conditions unique to each watershed that produces differences in life history and physical characteristics. Many stocks can be combined to make up a single species, but not the other way around.

**Acronyms**

**BMP**: Best Management Practices

**DAHP**: Department of Archaeology and Historic Preservation

**GHG**: Greenhouse Gas

**HPA**: Hydraulic Project Approval

**NPDES**: National Pollutant Discharge Elimination System

**TESCP**: Temporary Erosion and Sediment Control Plan

**WSDOE**: Washington State Department of Ecology

**WDFW**: Washington Department of Fish and Wildlife

**WSDOT**: Washington State Department of Transportation

**USACOE**: United States Army Corps of Engineers
7.0 - Sources


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