DRAFT ENVIRONMENTAL ASSESSMENT
BNSF Bridge 0050-37.80
South Approach Replacement

Everett, Washington

April 2015

U.S. Coast Guard
District Thirteen
Seattle, Washington

USCG

ENVIRONMENTAL ASSESSMENT

FOR

BNSF Bridge 0050-37.80 South Approach Replacement

This USCG environmental assessment was prepared in accordance with Commandant's Manual Instruction M16475.1D and is in compliance with the National Environmental Policy Act of 1969 (P.L. 91-190) and the Council of Environmental Quality Regulations dated 28 November 1978 (40 CFR Parts 1500-1508).

This environmental assessment serves as a concise public document to briefly provide sufficient evidence and analysis for determining the need to prepare an environmental impact statement or a finding of no significant impact.

This environmental assessment concisely describes the proposed action, the need for the proposal, the alternatives, and the environmental impacts of the proposal and alternatives. This environmental assessment also contains a comparative analysis of the action and alternatives, a statement of the environmental significance of the preferred alternative, and a list of the agencies and persons consulted during EA preparation.

APR 16, 2015		BRIDGE MGMT SPECIALIST
Date	Preparer/Environmental Project Manager	Title/Position
17 APR 2015		Bridge Administrator
Date	Environmental Reviewer	Title/Position

In reaching my decision/recommendation on the USCG's proposed action, I have considered the information contained in this EA on the potential for environmental impacts.

Date	Responsible Official	Title/Position

USCG

FINDING OF NO SIGNIFICANT IMPACT

FOR

BNSF Bridge 0050-37.80 South Approach Replacement

This action has been thoroughly reviewed by the USCG and it has been determined, by the undersigned, that this project will have no significant effect on the human environment.

This finding of no significant impact is based on the attached USCG prepared environmental assessment (reference other environmental documents as appropriate) which has been determined to adequately and accurately discuss the environmental issues and impacts of the proposed action and provides sufficient evidence and analysis for determining that an environmental impact statement is not required.

17 Apr 2015		Bridge Administrator
Date	Environmental Reviewer	Title/Position

I have considered the information contained in the EA, which is the basis for this FONSI. Based on the information in the EA and this FONSI document, I agree that the proposed action as described above, and in the EA, will have no significant impact on the environment.

Date	Responsible Official	Title/Position

EXECUTIVE SUMMARY

United States Coast Guard (USCG) as the lead agency, in coordination with BNSF Railway Company (BNSF) and their consultant Olsson Associates, has prepared this environmental document pursuant to the National Environmental Policy Act of 1969 (42 U.S.C. 4321 et seq.; NEPA). This Environmental Assessment (EA) examines the potential environmental effects of the proposed BNSF Bridge 0050-37.80 South Approach Replacement Project.

The purpose of the project is to replace the south approach of BNSF Bridge 0050-37.80 on Steamboat Slough, river mile 1.0, which has reached its structural life expectancy. Annual bridge inspections have revealed that the timber piles and caps of the south approach are reaching their structural life expectancy. BNSF is committed to the safety of the railways. The project is needed to protect life and health and the environment, as they can be impacted by a failing railroad bridge.

This National Environmental Policy Act (NEPA) Environmental Assessment (EA) evaluates a No Action Alternative and a Proposed Action Alternative with a replacement approach design. Both alternatives are along on the same alignment as the existing bridge approach. The No Action Alternative does not fulfill the project purpose of protecting life and health and the environment, all of which could be impacted by a failing railroad bridge. The Proposed Action Alternative is to replace the south approach with a new approach. This alternative meets the project purpose and need. It also reduces the in-water footprint of the bridge, removes creosote-treated timbers from the waterway, and introduces 24-inch steel pipe piles.

The Proposed Action alternative would prevent possible future life, health, and/or environmental impacts with a new approach segment for this bridge. This alternative has been designed to avoid impacts to land and water resources, floodplains, wetlands, and other environmental resources as well as minimize impacts to threatened and endangered species and/or habitat by utilizing construction methods and conducting construction within time periods that minimize impact. It is anticipated that the project would have no significant impacts to health and human resources as well as natural resources.

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ABBREVIATIONS AND ACRONYMS

ACHP	Advisory Council on Historic Preservation
ARPA	Archaeological Resources Protection Act Biological Opinion
BiOp	Biological Opinion
BMP	Best Management Practice
BNSF	BNSF Railway Company
CAA	Clean Air Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
CZMP	Coastal Zone Management Program
DAHP	Department of Historic Preservation
EA	Environmental Assessment
Ecology	Washington Department of Ecology
EFH	Essential Fish Habitat
EPA	U. S. Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
ESA	Endangered Species Act
JARPA	Joint Aquatic Resource Permit Application
MHHWM	Mean Higher High Water Mark
MBTA	Migratory Bird Treaty Act
MSA	Magnusson-Stevens Fishery Management and Conservation Act
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NLAA	Not Likely to Adversely Affect
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
ODTT	Open Deck Timber Trestle
Olsson	Olsson Associates
PSCAA	Puget Sound Clean Air Agency
ppsm	people per square mile
RCRA	Resource Conservation and Recovery Act
RM	River mile
TPG	Through Plate Girder
TMDL	Total Maximum Daily Load
TSCA	Toxic Substances Control Act
USACE	U.S. Army Corps of Engineers, Seattle District
USC	U.S. Code
USCG	U.S. Coast Guard
USFWS	U.S. Fish and Wildlife Service

WDNR	Washington State Department of Natural Resources
WQC	Water Quality Certification

1. INTRODUCTION

United States Coast Guard (USCG) as the lead agency, in coordination with BNSF Railway Company (BNSF) and their consultant Olsson Associates, has prepared this environmental document pursuant to the National Environmental Policy Act of 1969 (42 U.S.C. 4321 et seq.; NEPA). This Environmental Assessment (EA) examines the potential environmental effects of the BNSF Bridge 0050-37.80 South Approach Replacement Project. Where potential adverse impacts have been identified, this document discusses practical measures to avoid, minimize, or mitigate them.

1.1 Background and Site Description

The BNSF Bridge 0050-37.80 (bridge) crosses Steamboat Slough at river mile (RM) 1.0, near Everett, Washington (Figure 1). The bridge, originally owned and constructed by the Great Northern Railway, was initially permitted for construction by the Secretary of War on February 2, 1906. The existing bridge is comprised of the South Approach, an eight span, 109-foot Open Deck Timber Trestle (ODTT); a four-span, 521-foot Truss span over the main channel; a one-span, 82-foot Through Plate Girder (TPG); and a 14-span, 368-foot pre-stressed concrete t-girder North Approach (Figure 2). The North Approach, as it currently exists, was replaced ca. 2000-2001 without a permit upon approval from the U.S. Coast Guard (William Pratt, Personal Communication, March 16, 2000). The bridge is currently 1,079 feet long and will be 1,088 feet long after the proposed South Approach is constructed. The current proposal includes the replacement of the South Approach only. Bridge plans showing the updated North Approach, the previously permitted main span, and the proposed South Approach are located in Appendix A.

The bridge was constructed in 1908 and employs a swing span to allow for the passage of maritime traffic along the slough. The bridge has been modified over time, but retains the moveable span structure, which is considered historically valuable, as it is highly representative of this type of bridge and its period of construction. This central moveable span and the three steel through trusses, which are the most historic prominent features of the bridge, will not be affected by the south approach replacement (Figure 3).

Steamboat Slough is a major distributary[1] channel of the Snohomish River located within the Snohomish River Delta (Figure 1). It branches from the right bank of the Snohomish River at RM 3.8, curves northeast for about a mile then turns north and west flowing more than 5 miles to its discharge to Possession Sound (Washington Department of Fisheries, 1975). The Snohomish River watershed drains approximately 1,780 square miles of the western Cascades.

The Snohomish River discharges into the Possession Sound approximately one mile downstream of the BNSF tracks. The confluence of Steamboat Slough with Union Slough is approximately 2,000 feet downstream of the BNSF tracks.

[1] A distributary, or a distributary channel, is a stream that branches off and flows away from a main stream channel.

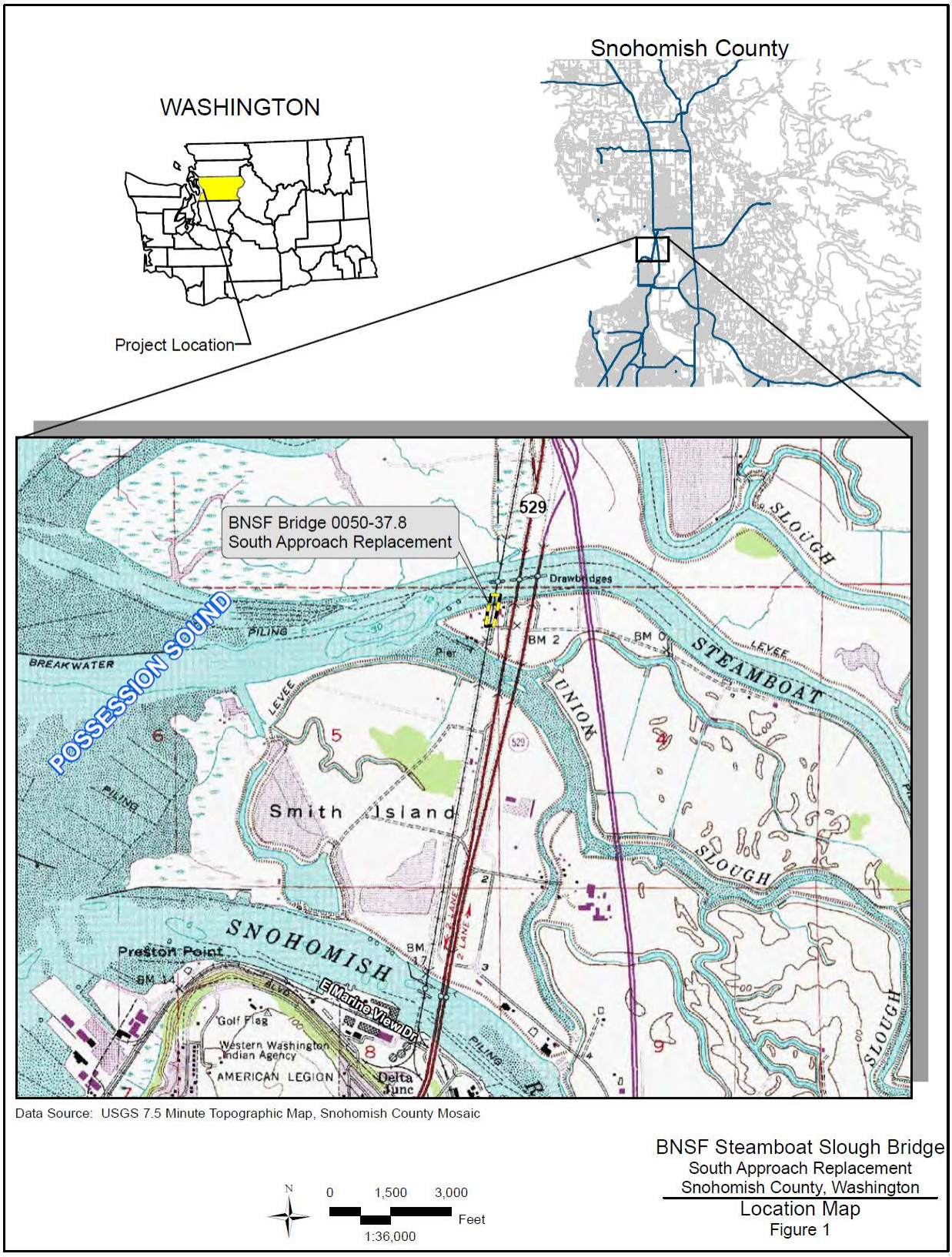

Figure 1. Location Map

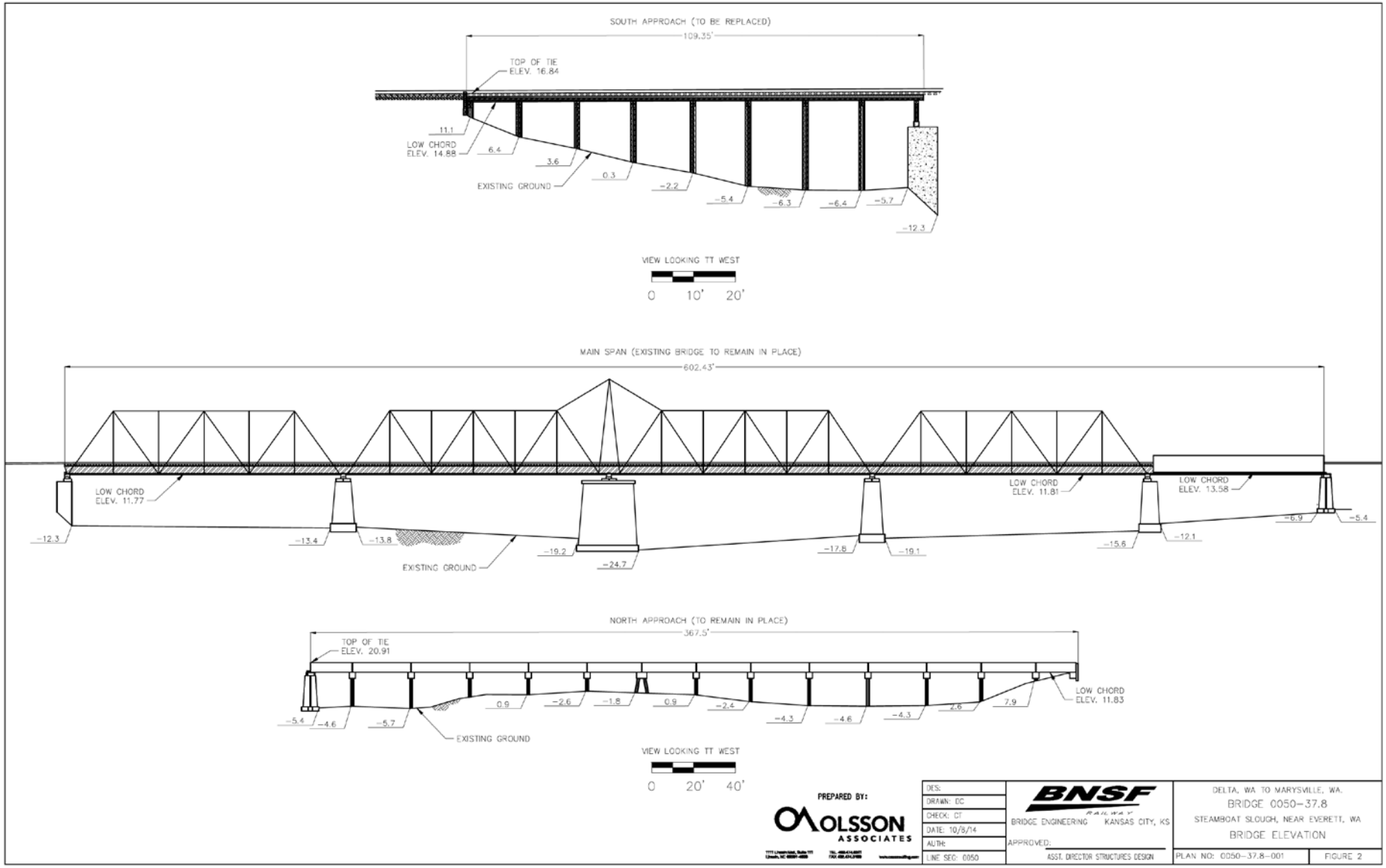

Figure 2. BNSF Steamboat Slough Bridge Diagram

Figure 3. View looking southwest at BNSF Bridge 0050-37.80 near Everett, Washington.

1.2 Purpose and Need

Recent inspections of the bridge's south approach found that the timber piles and caps were reaching their structural life expectancy and that they need to be replaced. Thus, in order to maintain efficient and safe travel along this line, the purpose of the project is to replace the south approach, which has reached its structural life expectancy.

The project is needed to protect life, health, and the environment. If BNSF were to leave the existing approach in place and make only minor repairs as necessary, the bridge approach could eventually fail, leading to an immediate threat to both human and faunal life, as well as impacting the existing slough and habitat both up and down stream.

2. ALTERNATIVES

2.1 Alternative 1 – No Action Alternative

The No Action Alternative involves continuing operation of the existing south approach. As the current structural conditions of the south approach continue to deteriorate, more work would be required for upkeep of the aging approach. Eventually new timber piles would be required. As new timber piles are required, the existing piles would need to be removed before installation of the new pile. In order to drive the timber pile correctly, the timber pile caps would need to be removed, which would leave an approximately one foot wide gap between the piles and superstructure. This gap would create a structurally unsound bridge, meaning that off track equipment would be needed to replace the piles. A temporary trestle or causeway would then be needed, thus requiring a federal action. This would not be feasible as a no-action alternative. Additionally, placing new creosote laden timber piles within the waterway would introduce fresh creosote into the sensitive environment. Leaving the bridge as is, conducting maintenance as needed, is not a viable alternative and could lead to a situation that is dangerous to life, health, and the environment. This alternative does not meet the purpose and need stated above.

2.2 Alternative 2 – Proposed Action Alternative

The proposed action alternative involves replacing the bridge's south approach, an 8-span, 104-foot open deck timber trestle, with a 4-span variable length 118-foot, pre-stressed concrete double cell box girder (Figure 4) on the existing alignment. The construction methodology would be limited to on-track construction with BNSF cranes and pile driving equipment. A staging area would be located on upland off the end of the approach on BNSF right-of-way.

Twenty-four (24) inch Steel Pipe Piles would be driven through the existing south approach using an impact hammer to get the piles to the appropriate load-bearing capacity. Pile driving activity would occur during low tide, "in-the-dry" with portable dam structures employed as necessary to guarantee isolation of this work from Steamboat Slough water. The existing approach span superstructure would be removed and placed in the upland staging area. Old timber piles would be removed to at least one foot below the ground surface or sediment/water interface. The new superstructure would be placed and attached accordingly.

Track panels would then be installed. This alternative would require a track closure of approximately two weeks, with on-going maintenance work after the bridge has been replaced and the track put back in service, total time estimated for completion of the project is four to six weeks. On-going maintenance work would include monthly inspections, right-of-way maintenance (includes debris removal, maintaining the vegetation to prevent line of sight issues, etc.), adding ballast when necessary and replacing ties as needed.

This alternative would reduce the in-water footprint of the bridge by removing 47.9 square feet of creosote-treated timbers from the waterway and replacing them with 28.26 square feet of steel pipe pile filled with rebar and concrete. Upland disturbance would be limited to approximately 20 cubic yards of excavation at the south end of the south approach within the existing alignment.

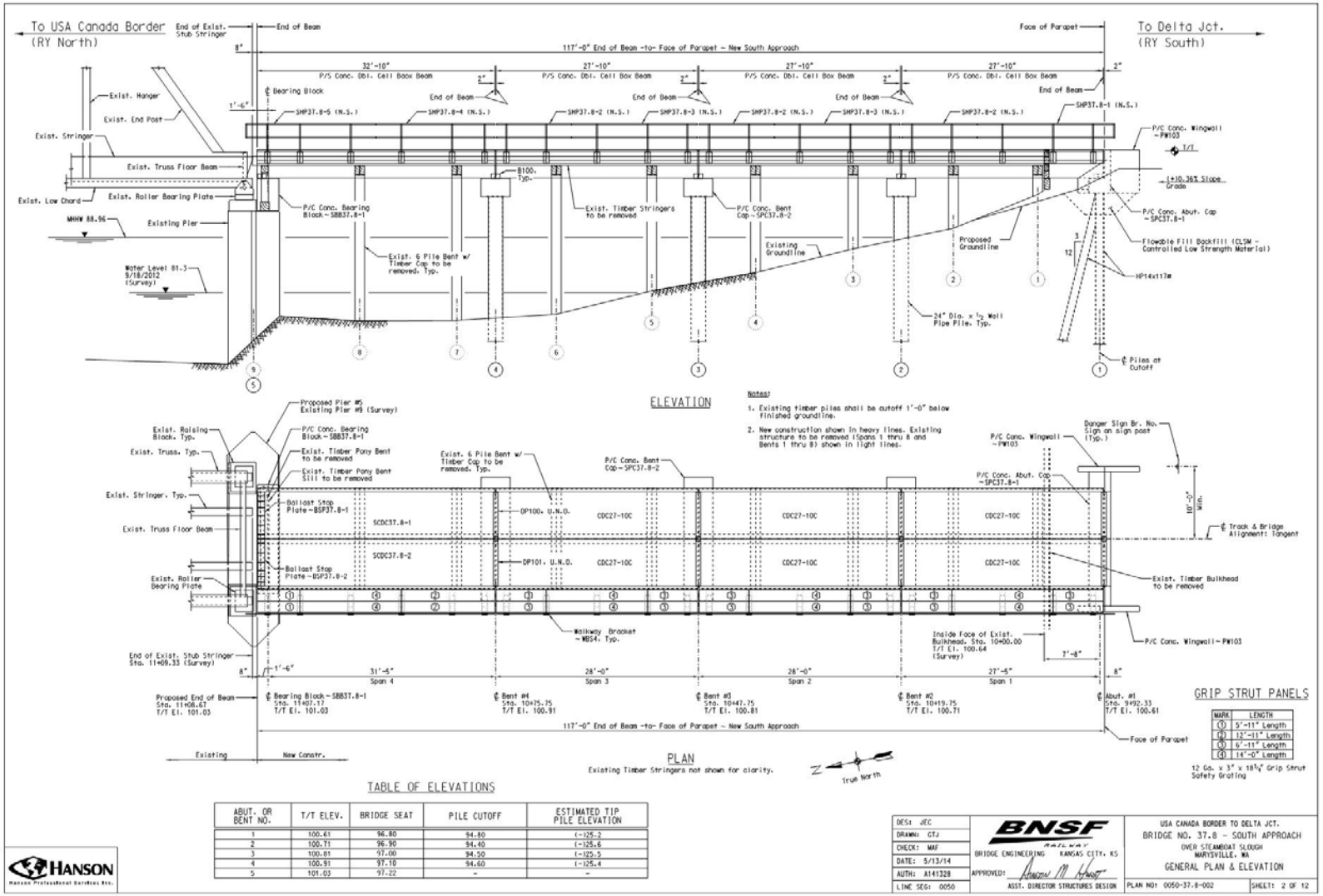

Figure 4. BNSF Bridge South Approach Diagram

2.3 Alternative Considered and Dismissed

An alternative considered and rejected would be to replace the south approach on alignment with like materials and configuration. This alternative would replace the existing south approach of the bridge, an 8-span, 104-foot open deck timber trestle with the same bridge type and materials. This alternative would significantly increase turbidity during construction as compared to the Proposed Action, and would involve the driving of more than 42 creosote treated timber piles, causing potentially greater environmental contamination and noise impacts. Additionally, this alternative would require a lengthy track closure due to the need to remove the existing bridge approach completely, remove all of the timber piles completely from the ground to ensure that the new piles can be driven to the appropriate depth, drive the new piles in the same locations, place new bent caps, and then place the superstructure (ties, rail, etc.).

This alternative would likely require a track closure of at least one month, thus shutting down or requiring the redirection of train traffic. This alternative is dismissed, as it would create greater turbidity and noise related issues during construction because of the driving of more than 42 timber piles, and increase the probability of water and sediment quality degradation from treated wood piles thus causing potential harm or harassment issues with local faunal populations, including Endangered Species Act listed species, and would involve excessive track closure.

3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 Air Quality

The Clean Air Act (CAA) established a comprehensive program for improving and maintaining air quality throughout the United States. The focus of the CAA is to reduce ambient concentrations of air pollutants and toxins that degrade air quality; the reduction of air pollution in turn improves the human and biologic environment. The intent of the act is achieved through permitting of stationary sources, restriction of toxic substance emissions from stationary and mobile sources, and the establishment of National Ambient Air Quality Standards (NAAQS) as set by US Environmental Protection Agency (EPA). The CAA prohibits federal agencies from funding, authorizing, or approving plans, programs, or projects that do not meet or conform to the NAAQS requirements.

The EPA sets the national air quality standards for six common pollutants (referred to as "criteria" pollutants) emitted by any stationary and mobile (marine and/or terrestrially based) source. These standards consist of threshold levels for carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter 2.5 (2.5 micrometers or less) and 10 (10 micrometers or less), and sulfur dioxide.

3.1.1 Affected Environment

The project area is located in an attainment area for all regulated air pollutants (PSCAA 2013; Ecology 2014a).

3.1.2 Environmental Consequences

No Action

Activities associated with maintenance of the existing south approach could result in temporary increase in localized air pollutant concentrations, primarily from operation of diesel and gasoline powered equipment, during the four to six week construction period. These potential localized pollutant increases would not be significant.

Proposed Action

Like the No Action alternative, the Proposed Action alternative would likely result in localized increase of air pollutants from the operation of diesel and gasoline powered equipment during construction. This could represent a slight increase over background concentrations because of the duration of construction activities. This temporary increase would not significantly affect regional air quality.

3.2 Geology, Soils and Topography

3.2.1 Affected Environment

The project site is within the Eastern Puget Riverine Lowland, a physiographic province characterized by unconsolidated deposits described as quaternary sediments, dominantly glacial drift, including alluvium. The Snohomish County Soil Survey identifies the site as consisting

primarily of Puget silty clay loam which is classified as a hydric soil. This very deep soil is found in depressional areas on flood plains and was formed in alluvium. This soil type generally has slopes between 0 and 2 percent and is characterized as having a slight erosion hazard.

According to the Washington State Department of Natural Resources (WDNR) the site has a moderate to high susceptibility to liquefaction (WDNR 2004) which classifies the site as a geological hazard area according to City of Everett regulations.

Site topography is generally flat at the southern terminus of the bridge's south approach then slopes downward to the north toward Steamboat Slough at about a 15% slope over approximately 27 feet.

3.2.2 Environmental Consequences

No Action

As stated in the alternatives description, the timber piles and caps of the south approach are degraded and reaching their structural life expectancy. Additionally, this structure was designed and constructed before modern building codes were in place. Thus, the south approach is at greater risk of structural damage from a seismic event than would a newly designed structure. In the event of an earthquake, local soils could liquefy, potentially resulting in structural failure of the south approach, rendering the bridge unusable.

Proposed Action

The proposed south approach design takes into account the current understanding of seismic risk and is compliant with modern building codes. In the event of an earthquake, the proposed south approach would be much less likely to fail than the current structure.

Approximately 20 cubic yards of soil would be excavated from an area immediately below the southern terminus of the south approach. This quantity of soil is below the threshold that would require a local clearing and grading permit. The excavated soil would be disposed of in an upland location, away from wetlands, waters, and outside the floodplain, at an approved facility or location.

3.3 Water Resources and Water Quality

The Clean Water Act (CWA) governs the release of pollutants into waterways. There are four potentially applicable sections to the No Action and Proposed Action: Sections 401, 402, 404, and 303(d).

Section 401 requires Water Quality Certificates (WQC) from the state where the discharge to waters of the US will occur. The certification is granted by the state certifying that the discharge will not violate the states' water quality standards. EPA retains jurisdiction in limited cases.

Section 402 authorizes the EPA, or states to which the EPA has delegated authority, to permit the discharge of pollutants under the National Pollutant Discharge Elimination System (NPDES) program. The Washington Department of Ecology administers the NPDES program within the state. Construction projects that disturb one or more acres of ground are required to obtain a

NPDES Construction Stormwater General Permit.

Section 303(d) of the CWA establishes that states are to list waters which are not meeting applicable water quality standards. The list includes priority rankings set by the states for the listed waters. Once the impaired waters are identified, Section 303(d) requires that the states establish total maximum daily loads (TMDLs) that would meet water quality standards for each listed water body.

The Safe Drinking Water Act (SDWA) is the main federal law that ensures the quality of Americans' drinking water. Under SDWA, EPA sets standards for drinking water quality and oversees the states, localities, and water suppliers who implement those standards. Recognizing that the best way to maintain high quality drinking water is to prevent contaminants from reaching drinking water sources. The SDWA was amended in 1986 to require states to develop Wellhead Protection Programs.

The Wild and Scenic Rivers Act was established to preserve certain rivers with outstanding natural, cultural, and recreational values in a free flowing condition. Executive Order 13061, Federal Support of Community Efforts Along American Heritage Rivers, allows for the designation of rivers that receive special attention regarding natural resource and environmental protection, economic revitalization, and historic and cultural preservation. Neither Steamboat Slough nor the Snohomish River are listed as Wild and Scenic or American Heritage Rivers.

3.3.1 Affected Environment

The proposed project area is located over and adjacent to Steamboat Slough, a distributary channel of the Snohomish River within the Snohomish River Estuary (Figure 1). Steamboat Slough at the bridge is tidally influenced with salinity and water elevation dependent on the ebb and flood of the tide.

The project area is listed on the current 303(d) list of impaired water bodies for the State of Washington for bacteria (Ecology 2014a). There are no other listed water quality concerns for Steamboat Slough.

The primary potable water source for the City of Everett, including the project area, is the Sultan River Watershed, located about 30 miles east of Everett in the Cascade Mountains (Everett 2014). Steamboat Slough is not a drinking water source. Also, the project site is not located within any critical aquifer recharge areas or wellhead protection areas (Snohomish County, 2007).

The proposed action alternative would require a Bridge Permit, issuance of which is a major Federal action requiring NEPA review and compliance with various federal regulations, including the Clean Water Act (CWA). The State of Washington Department of Ecology (Ecology) has determined the project will require a CWA Section 401 Water Quality Certification. Ecology will review the project to determine it is consistent with state and federal water quality regulations and standards. Ecology will issue permit conditions relating to water quality that the project must meet.

Construction projects in Washington State that disturb greater than one acre of ground must acquire a National Pollution Discharge Elimination System (NPDES) Permit. Ecology

administers the CWA Section 402(b) NPDES permit system in Washington State. The proposed action alternative does not meet the threshold requiring this permit.

3.3.2 Environmental Consequences

No Action

Under the No Action Alternative, 48 creosote-treated timber piles would remain in place, and the south approach creosote-treated timber trestle would remain over Steamboat Slough. It is likely that wood treatment chemicals are continuously leaching from these piles and trestle causing localized chronic contamination of local water and sediment. This would continue under this alternative.

Proposed Action

Under the proposed action alternative, creosote treated timber piles and trestle would be removed, eliminating a source of contamination to the water and sediment of Steamboat Slough. The concrete and steel materials that would replace the creosote treated timber would not be anticipated to degrade water quality.

Construction and operation of the project would not contribute to the bacterial load of the waterway.

The project does not meet the areal threshold that would require an NPDES Construction Stormwater General Permit.

3.4 Vegetation

Vegetation stabilizes soils, controls erosion, and reduces sedimentation. Vegetation also provides habitat and forage for wildlife.

3.4.1 Affected Environment

Upland vegetation present in the project area is typical of disturbed, industrial sites and is primarily invasive grass and shrub species such as reed canarygrass (*Phalaris arundinacea)* Scotch broom (*Cytisus scoparius*). Fringing intertidal salt marsh vegetation is found along the shore of Steamboat Slough. Typical native estuarine emergent species found in the lower Snohomish River estuary include Lyngby's sedge (*Carex lyngbyei*), pickleweed (*Salicornia virginica*), fleshy jaumea (*Jaumea carnosa*), tufted hairgrass (*Deschampsia caespitosa*), hard-stem bulrush (*Scirpus acutus*), and Pacific silverweed (*Potentilla pacifica*) (U.S. Army Corps of Engineers 2012).

3.4.2 Environmental Consequences

No Action

No clearing or excavation is anticipated under the No Action alternative. The only impact to on-site vegetation anticipated from activities associated with maintenance of the existing south approach would be from trampling by maintenance workers.

Proposed Action

No vegetation clearing is anticipated under the Proposed Action alternative. Approximately 20 cubic yards of excavation would occur. The excavation would be limited to the existing railroad footprint where vegetation is absent. Since all work under the Proposed Action alternative would be limited to on-track equipment, disturbance of on-site vegetation is anticipated to be minimal.

3.5 Wetlands

Executive Order 11990 – Protection of Wetlands, requires federal agencies take action to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands. Wetlands adjacent to navigable waters, tributaries of navigable waters, or within a significant nexus to interstate commerce are regulated pursuant to CWA. Section 404 of the CWA defines wetlands as areas that are "inundated or saturated by surface or groundwater at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions." Wetlands generally include swamps, marshes, bogs, and similar areas.

3.5.1 Affected Environment

City of Everett Critical Areas (Everett 2012) mapping indicates that there are no wetlands on or adjacent to the project site. National Wetland Inventory (NWI) (USFWS 2014a) maps Steamboat Slough as estuarine subtidal unconsolidated bottom (E1UBL).

3.5.2 Environmental Consequences

Wetland impacts would not occur as a result of either project alternative. Under the Proposed Action alternative, 47.9 square feet of creosote treated timber piles would be removed from Steamboat Slough and 28.26 square feet of steel pipe piles would be placed in the slough.

3.6 Floodplains

Executive Order 11988, Floodplain Management requires federal agencies to consider how their actions may encourage future development in floodplains, and to minimize such development.

3.6.1 Affected Environment

The project is located in the FEMA-designated floodway, Zone AE (areas within the 100-year floodplain with known water surface elevations) as shown on the Flood Insurance Rate Map (FIRM) for Snohomish County, Washington and Incorporated Areas (Community Number 53061C0716F, effective date 16 September 2005).

The 100-year flood elevation is 12.1 feet, and the proposed bridge low chord[2] elevation is 15.5 feet, both of which are the same as those for the existing bridge. The City of Everett determined that a floodplain development permit is not required for this project.

3.6.2 Environmental Consequences

No Action

As there is no change in material or structures located within the floodplain of Steamboat Slough under the No Action alternative, there would be no impact.

Proposed Action

Under the Proposed Action alternative, there would be a net decrease in material and structure within the floodplain of Steamboat Slough.

3.7 Fish and Wildlife

Fish and Wildlife Coordination Act (1934) directs federal agencies to prevent the loss and damage to fish and wildlife resources. Consultation with the U.S. Fish and Wildlife Service (USFWS) is required when activities result in the control of, diversion or modification to any natural habitat or associated water body, altering habitat quality and/or quantity for fish and wildlife.

Migratory Bird Treaty Act (MBTA) makes it unlawful to pursue, hunt, take, capture or kill; attempt to take, capture or kill; possess, offer to or sell, barter, purchase, deliver or cause to be shipped, exported, imported, transported, carried or received any migratory bird, part, nest, egg or product, manufactured or not. Provisions are in place for the protection of migratory bird, part, nest, egg or product. Under the MBTA, "migratory birds" essentially include all birds native to the U.S. and the Act pertains to any time of the year, not just during migration. The No and Proposed Action could displace birds by altering flight patterns, or cause other behavioral changes. It is not expected that effects from construction or operational activities in the project area associated with the bridge would rise to the level of prohibited conduct under the MBTA.

Bald and Golden Eagle Protection Act provides for the protection of bald and golden eagles by prohibiting the taking, possession, and commerce of such birds, except under certain specified conditions.

Marine Mammal Protection Act established a federal responsibility to conserve marine mammals within waters of the United States. With certain specified exceptions, the Act establishes a moratorium on the taking and importation of marine mammals, as well as products taken from them, and establishes procedures for waiving the moratorium and transferring management responsibility to the states.

[2] Low chord – That point on a bridge which is the lowest part of the superstructure.

3.7.1 Affected Environment

Birds

The Snohomish Estuary is a staging and stop-over area for bird migration along the West Coast Flyway. Delta habitats are also important to Puget Sound and resident bird populations. The shorelines and the waters of Snohomish Estuary provide habitat to a number of terrestrial and water dependent birds. These species include Canada geese, mallards, widgeon, goldeneye, cormorants, mergansers, coots, and gulls. Shorebirds include dunlins, sandpipers, dowitchers and killdeer. The Snohomish delta supports resident birds that may breed in the area, wintertime residents and migratory stopovers. Those over-wintering waterfowl species are generally found in the central Puget Sound region from early November through late April, with the highest concentrations during December through February. The remaining waterfowl are present throughout the year.

Osprey and bald eagle are frequently seen foraging for fish over the Snohomish Estuary and appear to be fairly tolerant of human disturbance when choosing nesting locations. Similarly, great blue herons are also seen frequently.

There is no evidence of nesting migratory birds on the structure of the south approach. There are three bald eagle nests within 2 miles of the project location. None of these are within 600 feet of the project area or within sight of the project (see Table 1).

Table 1. Eagle Nest Locations

Eagle Nest Locations		
Eagle Territory Number	**Territory Name**	**Distance from the project area (miles)**
506	Everett Golf Course	~1.75
716	Tulalip Bay	~1.77
1923	Sunnyside Blvd.	~1.90

Source: http://apps.wdfw.wa.gov/phsontheweb/

Marine Mammals

Harbor seals and Dall's porpoise are known to frequently forage in Port Gardner and are both State Monitor Species (U.S. Army Corps of Engineers 2011). Harbor seals are also common within the lower Snohomish River where they forage for fish. Similarly, Orca whales and Pacific harbor porpoise are also common within Port Gardner. Pacific harbor porpoise is a State Candidate Species (U.S. Army Corps of Engineers 2011). Harbor seals and California sea lion probably utilize the distributary channels of the Snohomish River. River otter are known to frequent the Snohomish River estuary. Stellar sea lion, the southern resident distinct population segment of killer whale, and humpback whale are the only marine mammal species potentially within the larger Possession Sound/Port Gardner area that are federally proposed or listed as threatened or endangered species.

Terrestrial Mammals

Due to its disturbed character, only a few disturbance-tolerant terrestrial mammals would be expected to occur within or around the proposed project site. Raccoons, opossums, rats, mice, and voles may inhabit or forage within the grass and shrub habitat onsite.

Fish

The Snohomish River estuary support runs of seven salmonid species: Chinook (*Oncorhynchus tshawytscha*), coho (*O. kisutch*), chum (*O. keta*), and pink salmon (*O. gorbuscha*), as well as steelhead (*O. mykiss*), sea-run cutthroat trout (*O. clarki*), native char - Dolly Varden (*Salvelinus malma*), and bull trout (*S. confluentus*). All of these species spawn in freshwater upstream of the estuary, and adult use of the estuary (and possibly Steamboat Slough in the vicinity of the bridge) is largely limited to a migration corridor and as a physiological transition area from salt to fresh water. In contrast, juvenile salmonids depend on estuarine environments for migration, physiological transition from fresh to salt water, feeding, and refuge from predation during migration. There is considerable variation by species in juvenile residence periods in the estuary, with coho, chum, and Chinook juveniles being relatively more dependent on the estuarine environment than pink, steelhead, sea-run cutthroat, and native char, which quickly move through the estuary to marine waters (U.S. Army Corps of Engineers 2012).

Juvenile starry flounder and peamouth chub are widely distributed and abundant non-salmonid species within the estuary. Also widely distributed in the project area are the Pacific staghorn sculpin and prickly sculpin which are relatively abundant in tidally-influenced parts of the lower estuary. Three-spined sticklebacks, shiner perch, juvenile smelts, Pacific and river lampreys are also found in the project vicinity. Less abundant species include candlefish, Pacific herring, white sturgeon and sunfish (Snohomish County 2011).

3.7.2 Environmental Consequences

Fish and wildlife species that inhabit the area in the vicinity of the bridge and south approach are expected to be tolerant to disturbances typical of industrial areas and railways. The area is susceptible to periodic noise and vibration generated by train traffic.

No Action

No impacts to wildlife and fish over the current conditions would be expected under the No Action alternative. Creosote-treated timber piles and the south approach trestle would remain. Only intermittent required maintenance would occur. Therefore, the existing fish and wildlife present in the vicinity of the south approach would continue to utilize the site.

Proposed Action

The activity and noise associated with removal of the existing south approach and construction of the new facility would likely cause fish and wildlife, that would typically be found at the site, to temporarily avoid the action area. Once construction activities were complete, fish and wildlife species currently inhabiting the area would return.

Noise within the Action Area

The action area is based on the outmost extent of all zones of effect combined. This project would have two zones of effect: aquatic and terrestrial. Since all work below the Mean Higher High Water Mark (MHHWM) is proposed to be done "in the dry" during low tide, the impacts from both sound and siltation are expected to be minimal or undetectable. Thus, terrestrial impacts will be the zone used in establishing the action area.

Several factors contribute to the background noise in the project area. These include light industry, agriculture, railroad, highway and boat traffic. For the purpose of this report background noise was based on the population density mapped within the project area. Noise from SR 529 and I-5 were also noted in this report as a reference to existing conditions. Railroad traffic was not analyzed in this report, but would also contribute to the background noise in the project area. The population density near the project area varies from 209 people per square mile (ppsm) next to SR 529, to 103,100 ppsm on the north side of the slough and 60,660 ppsm mapped in the project area (Snohomish County 2015 Comprehensive Plan http://2015update-snoco.org/alternatives/alternatives-map-portal/). Thus, the background noise levels would be 65 dBA (WSDOT 2013 http://www.wsdot.wa.gov/mapsdata/travel/annualtrafficreport.htm). Two highways are located to the east of the project area. SR 529 is approximately 350 feet to the east and approximately 1,420 feet further east is I-5. The average speed in the area is 55 to 60 miles per hour for SR 529 and I-5. SR 529 has an average of 32,000 vehicles per day/1,333 per hour (at milepost 5.77) and I-5 has an average of 126,000 vehicles per day/5,250 per hour (at milepost 198.27) near the project area (WSDOT 2013). Typical traffic noise in the project area is expected to be at least 71.0 dBA**.**

Construction equipment for the project is spilt into the loudest pieces of equipment for general construction, and pile driving. The three loudest pieces of equipment for general construction include: chain saw (84 dBA), crane (81 dBA) and excavator (81 dBA) with a combined dBA of 86. The three loudest pieces of equipment for pile driving include: impact pile driver (110 dBA), crane (81 dBA) and flat bed truck (74 dBA) with a combined dBA of 110. All of these measurements are based on the average maximum noise level at 50 ft (WSDOT 2013). Since the pile driving is the loudest combined noise it was used as the greatest impact in the terrestrial zone.

Both soft and hard site conditions exist along the railway. Soft site conditions include agricultural land, wetlands and forest. Hard site conditions include the industrial areas, highways, and water (Steamboat Slough). Since hard site conditions are dominant in the project area this was used for noise calculations. As a result there would be a 6 dBA reduction of construction noise and 3 dBA reduction of traffic noise per doubling distance from the source.

For the terrestrial impact zone, the action area is the area in which noise levels are elevated above ambient levels. For general construction activities for the south approach with the exception of pile driving, the action area extends out approximately five hundred feet. General construction is expected to last approximately four to six weeks.

Since the pile driving is the loudest noise produced by the project it will have a much larger terrestrial zone of effect and action area. Pile driving will be done over an approximately two week period, in intervals. The action area pile driving extends out a 1.7 mile radius from the location of pile driving proposed to construct the new bridge approach and support structure

(Figure 5; Table 2). These are conservative assumptions and do not take into account the existing highway noise and diminishing effects to sound propagation such as obstructions, topography, wind, and atmospheric absorption. The action area also includes potential direct and indirect effects of interrelated actions.

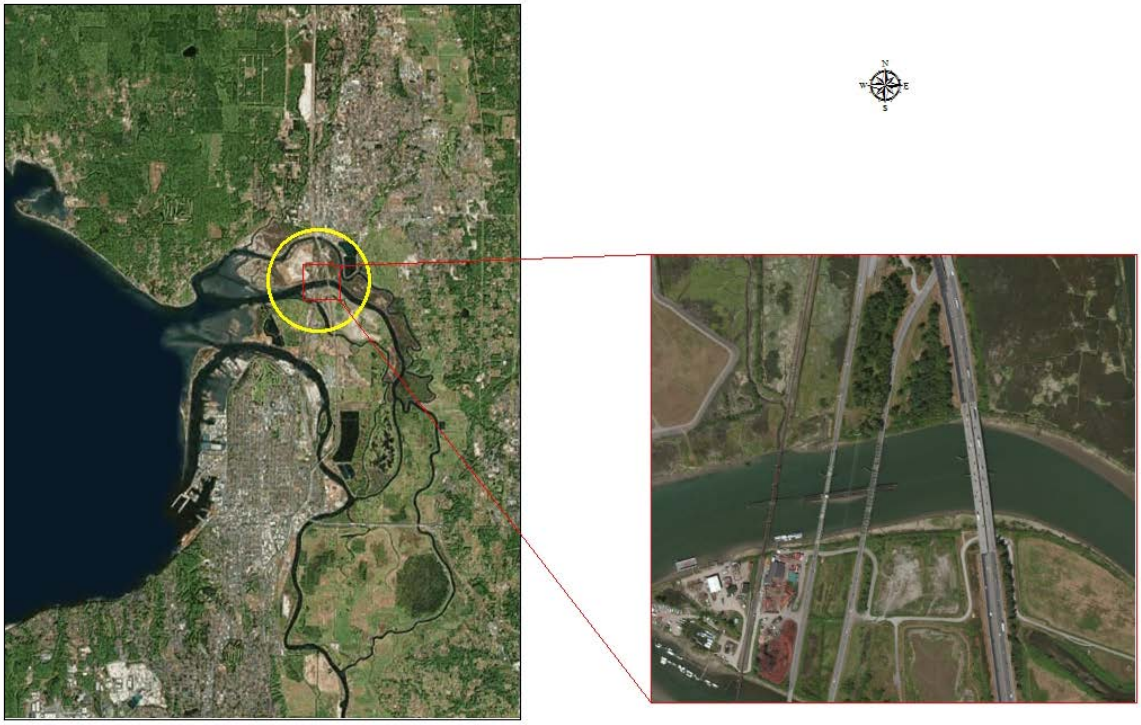

Figure 5. Action Area Map for South Approach Replacement Project.

Table 2. Noise Attenuation Rates of Construction (WSDOT 2013)

Distance from the source (ft)	Pile Driving Construction noise (6 dBA reduction per doubling distance)
50	110
100	104
200	98
400	92
800	86
1,600	80
3,200	74
6,400	68
12,800	62

Source: http://www.wsdot.wa.gov/Environment/Biology/BA/BAguidance.htm

Aquatic noise levels from pile driving are not expected to have any adverse effect on fish, marine mammals or birds, since it will be done at low tide (in the dry) when sound cannot attenuate through the water. Terrestrial noise will be less than the nearby highway noise levels at 3,200 feet, and will drop below ambient noise levels at approximately 1.7 miles from the action area. No adverse effect is expected to birds and marine mammals since they can avoid the area. Additionally it would be done at low tide when the likelihood of marine mammals being present in the project vicinity would be low.

Invasive Species

Aquatic invasive species are always a concern when working above, in or near water. Both invasive plants and invertebrates can spread by equipment. To help prevent the spread of invasive's, all equipment used over water or in the tidal zone will be cleaned to the greatest extent practical. Cleaning should include scraping/sweeping off any debris or soil and pressure washing, at an off-site location before transportation to the work site.

3.8 Endangered Species Act (ESA) Listed Species and Essential Fish Habitat (EFH)

The primary federal law protecting threatened and endangered species is the ESA, 16 United States Code (USC), Section 1531, et seq., as well as 50 CFR Part 402. The ESA and its subsequent amendments provide for the conservation and recovery of endangered and threatened species and the ecosystems upon which they depend. Under Section 7 of the ESA, federal agencies are required to consult with USFWS and/or the National Marine Fisheries Service (NMFS) (the Services) to ensure that they are not undertaking, funding, permitting, or authorizing actions likely to jeopardize the continued existence of listed species or destroy or adversely modify designated critical habitat. Critical habitat is defined as geographic locations essential for the conservation of threatened or endangered species. The outcome of consultation under Section 7 may include a Biological Opinion (BiOp) with an Incidental Take statement, a Letter of Concurrence and/or documentation of a no effect finding. Section 3 of the ESA defines "Take" as "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect or any attempt at such conduct."

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) of 1976, was established to conserve and manage fishery resources found off the coast, as well as anadromous species and continental shelf fishery resources of the United States. This act is implemented by exercising (a) sovereign rights for the purposes of exploring, exploiting, conserving and managing all fish within the exclusive economic zone established by Presidential Proclamation 5030, dated 10 March 1983, and (b) exclusive fishery management authority beyond the exclusive economic zone over such anadromous species, Continental Shelf fishery resources and fishery resources in special areas.

Essential Fish Habitat is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity. Adverse effects include the direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH." (50 CFR 600.810)

3.8.1 Affected Environment

The federally listed threatened and endangered species or managed fisheries under the jurisdiction of USFWS or NMFS that may occur in the proposed project area included the NMFS listed Puget Sound Chinook Salmon (*Onchorhynchus tshawytscha*), Puget Sound steelhead (*O. mykiss*), and southern resident killer whales (*Orcinus orca*), and the USFWS listed bull trout (*Salvelinus confluentus*) and marbled murrelet (*Brachrumphus marmoratus*) (Table 3).

Table 3. Listed ESA Species and Critical Habitat

Federal Jurisdiction For Endangered Species Act	Scientific Name	Federal Status	
NMFS Species ESU/DPS		**Species**	**Critical Habitat in Action Area**
Chinook salmon	*Oncorhynchus tshawytscha*	Threatened	Yes
Puget Sound DPS steelhead	*Oncorhynchus mykiss*	Threatened	Proposed
southern resident killer whale	*Orcinus orca*	Endangered	No[1]
USFWS Species			
bull trout	*Salvelinus confluentus*	Threatened	Yes
marbled murrelet	*Brachyramphus marmoratus*	Threatened	No

[1]Critical habitat includes all waters relative to a contiguous shoreline delimited by the line at a depth of 20 feet (6.1 m) relative to extreme high water in Puget Sound.

Steamboat Slough below the Mean Higher High Water mark provides EFH for Chinook salmon, coho salmon (*Oncorhynchus kisutch*), and pink salmon (*Oncorhynchus gorbuscha*) in the action area (see Table 4). Steamboat Slough provides transition waters for juvenile salmonids migrating to the ocean, and for adult salmon returning to spawn in the Skykomish, Snohomish and Snoqualmie Rivers. Based upon the project design, the minimal short-term impacts associated with pile driving, the construction windows for work below the MHHWM, the plan to work “in the dry”, and the extensive mitigation measures, there will not be any adverse effects to EFH for Pacific salmonids.

Table 4. MSA Species and Essential Fish Habitat

Species Covered by Magnuson-Stevens Fishery Conservation and Management Act	Scientific Name	Federal Status	Essential Fish Habitat in Action Area	Type of Essential Fish Habitat
Common Name				
Chinook salmon	*Oncorhynchus tshawytscha*	Threatened	Yes	Pacific Coast Fishery

Pink salmon	*Oncorhynchus gorbuscha*	NA	Yes	Pacific Coast Fishery
Coho salmon	*Oncorhynchus kisutch*	NA	Yes	Pacific Coast Fishery

ESA Consultation History

The U.S. Army Corps of Engineers (USACE), upon receipt of a Joint Aquatic Resource Permit Application (JARPA) for the BNSF Bridge 0050-37.80 South Approach project, initiated informal consultation with NMFS and USFWS. USACE sought concurrence with the Services that the proposed project would be not likely to adversely affect (NLAA) species listed as threatened or endangered or critical habitats designated under the Endangered Species Act (ESA). NMFS documented their concurrence with the USACE determination March 11, 2014 (NOAA 2014). USFWS documented their concurrence on March 4, 2014 (USFWS 2014).

USACE subsequently determined that the project did not have a CWA Section 404 or Rivers and Harbors Act Section 10 nexus and suspended its review (U.S. Army Corps of Engineers 2014). The U. S. Coast Guard assumed Lead Federal Agency status for ESA and other federal statutes upon receipt and review of the bridge permit application for the project from BNSF during March 2014.

The Coast Guard District 13 Bridge Program office was notified October 17, 2014 that BNSF had decided to change the pile installation strategy and pile materials. This was communicated to the Services by USCG during the week of October 20, 2014 at which time the Services informed USCG that ESA consultation would need to be reinitiated. The Services require submittal of a Biological Assessment (BA) for the project to reinitiate consultation. The BA was completed March 4, 2015 and submitted to the Services for their review..

3.8.2 Environmental Consequences

No Action

Under the No Action Alternative, pile driving for maintenance of the existing south approach would be conducted. This could have similar impacts to the proposed action. The food web interactions between benthic invertebrates, Puget Sound Chinook salmon, steelhead, Coastal/Puget Sound bull trout, and fish-eating birds such as the marbled murrelet would continue without any temporary disruptions to foraging behavior.

Proposed Action

Direct effects of the proposed project on listed species are related to temporary and permanent impacts within project area. Temporary impacts are associated with pile driving in the streambed, noise, and water quality from the potential release of contaminated sediment and turbidity. Permanent impacts include potential for permanent noise impacts on listed fish species, and the placement of permanent structures (nine new piles) below the MHHWM. The project will construct nine steel piles with a cumulative footprint of 28.26 ft^2 (3.14 ft^2 per pile) which will be located below the MHHWM, however, it will remove the existing thirty-six timber creosote piles, with a footprint of approximately 47.9 ft^2 . The overall permanent footprint below

the MHHWM will be reduced by 19.64 ft². Because the work will be done "in the dry" and when no surface water is present, direct effects are not likely to adversely affect Chinook salmon, steelhead, and bull trout juveniles present in Steamboat Slough during construction resulting from pile driving, disturbance of sediment, increases in turbidity and impacts to water quality. The term "in the dry" for the purpose of this report means when soils are saturated to the surface at low tide, but there is no standing water greater than 1.3 feet deep that could conduct noise. Since the dominant frequencies generated in pile driving are between 50 and 1,000 Hertz, most of the energy is not propagated in-water depths of 1.3 feet (0.4 meters) or less. These direct effects are also considered a temporary affect to critical habitat for Chinook salmon and bull trout and is not likely to have an adverse affect (WSDOT, 2013).

Indirect effects are those that may occur to listed species over time after the project has been completed. Indirect effects may result for listed species for the duration of time it takes to restore the estuarine wetlands in the footprint of removed piles following construction. Given that the impacts to these areas will be minimal, the in-water foot print of piles will be reduced and vegetation re-growth would be expected within about three years. All interrelated actions associated with the project are deemed insignificant or beneficial for ESA-listed salmonids.

Olsson Associates recommends a determination that the project **may affect, not likely to adversely affect** for Chinook salmon, steelhead, bull trout and marbled murrelets. Olsson Associates also recommends a determination of **may affect, not likely to adversely affect** for designated critical habitat for Chinook salmon and bull trout. In addition, the project will not have any adverse effects on Essential Fish Habitat (EFH) for Chinook, pink (*O. gorbushca*), and coho salmon (*O. kisutch*) during work below the MHHWM for similar reasons as the proposed impacts to ESA-listed species and critical habitat.

3.9 Archaeological and Historic Resources

The National Historic Preservation Act of 1966 (NHPA), as amended, sets forth national policy and procedures regarding historic properties, defined as districts, sites, buildings, structures, and objects included in or eligible for the National Register of Historic Places (NRHP). Section 106 of NHPA requires federal agencies to take into account the effects of their undertakings on such properties and to allow the Advisory Council on Historic Preservation (ACHP) the opportunity to comment on those undertakings, following regulations issued by the ACHP (36 CFR 800).

As part of the Section 106 process, Federal agencies must consult with Washington Department of Archaeology and Historic Preservation (DAHP) to assure that cultural resources are identified, and to obtain the formal opinion of the Office on each site's significance and the impact of its action upon the site.

The Archaeological Resources Protection Act (ARPA) applies when a project may involve archaeological resources located on federal or tribal land. ARPA requires that a permit be obtained before excavation of an archaeological resource on such land can take place.

3.9.1 Affected Environment

An evaluation of the significance in archaeology and history of the bridge structure was completed by Archaeological Investigations Northwest, Inc. (Archaeological Investigations Northwest, 2014). This evaluation was conducted to determine if the BNSF Steamboat Slough Bridge is likely eligible for listing on the National Registry of Historic Places and to assess potential project effects according to the requirements of Section 106 of the NHPA. A field survey was conducted and a Washington State Department of Archaeology and Historic Preservation inventory form was completed.

The bridge was constructed in 1908 which employed a swinging central truss with a central pivot point. According to the archaeological report, the bridge has maintained many of its original components, and the overall integrity of the bridge remains adequate, although the current condition appears to be poor.

It was noted that retention of the original swing span and three through trusses significantly contributed to the resource's integrity of design, materials and workmanship which have only been slightly diminished through the replacement of the original north approach and the control house at the center of the swing span. The bridge has managed to retain its integrity of location, setting, feeling, and association. This bridge was recommended to be eligible for listing in the NRHP under Criteria A and C (Appendix B). The results of this evaluation (no historic properties adversely affected), including the inventory form and photographs, are included in Appendix B.

3.9.2 Environmental Consequences

No Action

The No-Build Alternative would result in no impacts to the bridge or the south approach. The approach segment would have on-going maintenance required to ensure that train traffic would be able to continually move through the site. Maintenance would consist of monthly (or more frequent) inspections, right-of-way maintenance (includes debris removal, maintaining the vegetation to prevent line of sight issues, etc.), adding ballast when necessary, and replacing ties as needed.

Proposed Action

Similar to previous work done to replace the north approach, the south approach replacement would be visible, but would not serve to detract from the character-defining features of the bridge, and the bridge would not lose its functionality as a moveable span constructed in the early twentieth century. The replacement of the south approach would result in no adverse affect to the bridge. A finding of "No Historic Properties Adversely Affected" was recommended in the Archaeological Investigation report. Consultation with DAHP and interested Tribes regarding the Proposed Action was initiated by USCG District 13 Bridge Program Office September 2014.

3.10 Environmental Justice

Executive Order 12898 – Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations requires federal agencies to identify and address the disproportionately high and adverse human health or environmental effects of their actions on minority and low-income populations, to the greatest extent practicable and permitted by law.

The order also directs each agency to develop a strategy for implementing environmental justice. The order is also intended to promote nondiscrimination in federal programs that affect human health and the environment, as well as provide minority and low-income communities access to public information and public participation.

3.10.1 Affected Environment

Land use immediately adjacent to the south approach is heavy manufacturing. To the west of the project alignment is the Hanson Boat Company, a commercial marine vessel manufacturing facility. The property to the east of the alignment houses several businesses including Engineered Heavy Services, a heavy lift operation; Ledford Marine Construction and Camano Cruisers, Inc., boat manufacturing; and Everett Bark Supply, landscaping equipment and supply.

According to 2010 US. Census Bureau data, Snohomish County has approximately 20 percent minority population, whereas the Census Tract Block Group that this project is in has less than 10 percent minority population. In addition, both the County and the Census Tract that the project is located in have approximately 10 percent people living below the poverty level (http://www.census.gov/).

3.10.2 Environmental Consequences

Neither alternative would have a disproportionately adverse impact on minority or low-income populations. There will be no access disruptions or relocation of any businesses or residences as a result of the project.

3.11 Coastal Zone Management Act

The Coastal Zone Management Act (CZMA) encourages coastal states to develop and implement coastal zone management plans that are consistent with national policies to preserve, protect, develop, and where possible, restore or enhance, coastal zone resources. Section 307 of the CZMA requires that any federal action occurring in or outside of the coastal zone which affects coastal land or water uses or natural resources must be consistent with the state's Coastal Management Program.

Activities and development located within Washington's coastal counties that involve federal activities, federal licenses or permits, and federal assistance programs (funding) require a written CZMA Consistency Determination by Ecology. Activities and developments performed by or for federal agencies require a Coastal Zone Management determination be submitted stating that the project is consistent with Washington's Coastal Zone Management Program (CZMP) to the "maximum extent practicable." Federal permitted/licensed or federal funded projects require a certification that they are consistent with Washington's CZMP (Ecology 2014b).

3.11.1 Affected Environment

The south approach is located within Snohomish County, one of the State of Washington's coastal counties. The City of Everett has determined that the project is normal maintenance or repair and is specifically exempt from the Shoreline Permit process according to WAC 173-27-040(2)(b). The Washington Department of Ecology will verify the project is consistent with

Washington's CZMP.

3.11.2 Environmental Consequences

The bridge and its approaches represent an established use of Steamboat Slough. Neither alternative would result in a change of use. Therefore, there is no impact to coastal zone resources.

3.12 Prime and Unique Farmlands

The Farmland Protection Policy Act encourages federal agencies to minimize the impact of federal programs on the unnecessary and irreversible conversion of farmland (prime or unique) to nonagricultural uses. It follows that federal programs shall be administered in a manner that, as practicable, would be compatible with state and local government and private programs and policies to protect farmland.

3.12.1 Affected Environment

There are no prime farmlands within the project area. Surrounding properties in the upland area are commercial/industrial developments.

3.12.2 Environmental Consequences

Both the No Action and Proposed Action alternatives are in compliance with this Farmland Protection Policy Act because the activities would not occur on lands utilized for agricultural purposes, and there would be no conversion to alternative land uses.

3.13 Noise

The Noise Control Act of 1972 requires that activities of Federal agencies, such as issuing permits, must be consistent with Federal, state, interstate, and local requirements for the control and abatement of environmental noise. The primary responsibility of regulating noise is with state and local governments. In Washington, noise abatement and control rests primarily with the local government. The City of Everett has established regulations for control of noise in residentially zoned property, however the project site is located in an isolated area with industrial sites in the vicinity, and no noise impacts are anticipated to residential areas.

3.13.1 Affected Environment

The current noise source in the vicinity of the project is train traffic, nearby vehicular traffic on local roads and highways, boat traffic, and industrial production from the adjacent land uses. Sensitive noise receptors in the vicinity of the project include workers at the nearby businesses, pedestrians, and fish and wildlife species inhabiting the project vicinity. There is a single house boat.

3.13.2 Environmental Consequences

No Action

The No Action Alternative would not result in noise impacts over current conditions to residential

areas or listed species and forage fish over current levels.

Proposed Action

The Proposed Action alternative would result in temporary impacts to the single house boat located immediately east of the project. Elevated noise levels would be anticipated during construction. Steel piles will be driven through the existing bridge into sand/silt substrate of Steamboat Slough to resistance, and then the piles will be proofed with an impact hammer. The estimated number of pile strikes required per pile is approximately 900 with an estimated 900-1,800 pile strikes per day (1 to 2 piles per day).

Pile driving is planned for low tide when no surface water is present.

3.14 Hazardous Materials and Wastes

Several Federal laws, regulations, and executive orders relate to the control and handling of hazardous substances; clean-up of releases of hazardous wastes; and protection from harm of the public from these materials. These include the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the Resource Conservation and Recovery Act (RCRA), the Pollution Prevention Act (PPA) of 1990, the Emergency Planning and Community Right to Know Act (EPCRA), the Toxic Substances Control Act (TSCA), Executive Order 12088 – Federal Compliance with Pollution Control Standards, and Executive Order 12856 – Federal Compliance with Right-To-Know Laws & Pollution Prevention Requirements. Federal agencies are required to coordinate with the U.S. Environmental Protection Agency (EPA) and applicable State, interstate, and local environmental protection programs to ensure consistency of major Federal actions with all Federal hazardous substances and waste laws, regulations, and executive orders.

3.14.1 Affected Environment

There are no CERCLA, RCRA, or state hazardous waste cleanup sites in the immediate vicinity of the bridge south approach. Steamboat Slough water and shoreline are sensitive environmental receptors that could be impacted by hazardous materials spills.

3.14.2 Environmental Consequences

No Action

Under the No Action Alternative, there would be no change to the site with the exception of continued maintenance and repairs that would cause interaction with, or generation of hazardous materials or wastes. Maintenance and repairs would continue at the south approach as required. The long-term result of these actions would include the removal and replacement of creosote or otherwise hazardous-material treated piles and other portions of the timber trestle approach structure. The long-term reintroduction of new creosote or other toxins would result in continued exposure of hazardous substances to Steamboat Slough.

Proposed Action

The Proposed Action alternative includes excavation of 20 cubic yards of soil at the south end

of the south approach, within an upland area. There is no evidence to suggest that this material is contaminated. Upon excavation, the presence of obvious contamination would be assessed and the material would be disposed of appropriately.

The existing creosote-treated timbers (piles and trestle) would be temporarily stockpiled on BNSF property to the south of the work area. BMPs will be employed to isolate the timbers from the environment during temporary stockpiling, including placement of tarps in the staging area to prevent unintentional leaching from the timbers to permeate into the ground.

Ultimately, the creosote-treated timbers will be permanently disposed of at an off-site approved facility that is in compliance with applicable Federal, state, and local regulations. BMPs for maintenance construction equipment will include:

- All equipment would be cleaned of accumulated grease, oil, or mud at an off-site location before transportation to the work site.

- All leaks would be repaired prior to arriving on site. Equipment would be inspected daily for leaks, accumulations of grease, etc., and any identified problems would be fixed at the on-site staging location before operating over or in the water.

- Two oil absorbing floating booms, appropriate for the size of the work area, would be available onsite whenever heavy equipment operates within 150 feet of open water and there is a potential for hazardous materials to enter surface waters. The booms would be stored in a location that facilitates immediate deployment in the event of a spill.

- Fueling and servicing of equipment would be confined to an established staging area that is at least 150 feet from open water or wetlands. Spill containment systems must be adequate to contain all fuel leaks.

- Equipment and vehicles would be stored in established staging areas when not in use, excluding cranes, which cannot be easily moved. Spill containment measures would be implemented around the cranes to ensure containment, if a leak were to occur.

- Equipment would be inspected daily to check for leaks or problems with equipment. Any equipment found to be in disrepair would be moved away from the slough until such time as the equipment is repaired.

3.15 Traffic

Local traffic includes surface vehicle traffic on state and local roadways and vessel traffic on Steamboat Slough.

3.15.1 Affected Environment

The project area is somewhat isolated from regional surface vehicle traffic. Local traffic is limited to workers and visitors to the few business located in the immediate vicinity of the BNSF Steamboat Slough Bridge. Washington State Route 529 is located east and parallel to the bridge and approaches. The south end of the bridge can be accessed by exiting SR 529 at 34th NE, driving west to the railroad tracks, then north to the bridge.

Operation of bridge openings to accommodate vessel traffic would not be affected by either project alternative. Navigation through the slough will not be hindered by the proposed project.

3.15.2 Environmental Consequences

No Action

Under the No Action Alternative, there would be no change to the site that would affect local transportation routes or traffic volumes along those routes.

Proposed Action

Under the Proposed Action alternative, construction vehicles may temporarily increase the volume of traffic in the immediate project vicinity during project activities. Construction vehicles may include trucks carrying construction material to the site and removing pieces of the old south approach for ultimate disposal. This could result in a temporary minor impact to local traffic. It is anticipated that most of the transport of construction equipment and materials would be by rail thus minimizing potential impacts to local traffic.

Train traffic will be halted, or rerouted, during black outs for construction. These will occur while the piles are being driven, but in short intervals (4-6 hours). During the span switch outs, a longer period of down time will be required. Train traffic will be rerouted, as necessary, during these times. However, this will not create a substantial increase in train traffic on other lines.

3.16 Safety and Security

The Occupational Safety and Health Act (OSHA) was established to assure safe and healthful working conditions by providing workers a place of employment free from recognized hazards to safety and health, such as exposure to toxic chemicals, excessive noise levels, mechanical dangers, heat or cold stress, or unsanitary conditions. OSHA standards require that employers adopt certain practices, means, methods, or processes reasonably necessary and appropriate to protect workers on the job.

3.16.1 Affected Environment

Per BNSF requirements, all work associated with the BNSF approach must meet OSHA requirements.

3.16.2 Environmental Consequences

No Action

Work activities associated with maintenance of the currently configured south approach would be covered under OSHA requirements.

Proposed Action

Work activities associated with replacement of the south approach would be covered under OSHA requirements.

3.17 Cumulative Impacts

Cumulative impacts are defined as, “the impact on the environment which results from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions” (40 CFR 1508.7). Cumulative impacts can result from individually minor, but can collectively become a measureable impact, actions taking place over a period of time.

Resources determined not to have the potential to result in measurable cumulative effects were not addressed in this analysis.

The No Action alternative would consist of doing nothing to the south approach structure, however the approach would continue to deteriorate requiring periodic upkeep and maintenance with the possibility of bridge approach failure. This has the potential for future impacts to human health and safety, land and water resources, and threatened and endangered species utilizing Steamboat Slough.

The Proposed Action alternative would replace an existing approach structure to the BNSF bridge over Steamboat Slough. There would be temporary impacts due to noise and disruption during construction, however following completion the area would be returned to pre-construction conditions to the extent practicable. There are no anticipated indirect or cumulative impacts due to past, present, or future activities due to construction activities at the bridge.

3.18 Statement of Environmental Significance of Proposed Action

The Proposed Action alternative would prevent possible future life, health, and/or environmental impacts with a new approach segment for this bridge. This alternative has been designed to avoid impacts to land and water resources, floodplains, wetlands, and other environmental resources as well as minimize impacts to threatened and endangered species and/or habitat by utilizing construction methods and conducting construction within time periods that minimize impact. It is anticipated that the project would have no significant impacts to health and human resources as well as natural resources.

4. MITIGATION

Water and Soil Resources

The following BMPs will be followed to avoid impacts to soil and water during construction:

- All equipment would be cleaned of accumulated grease, oil, or mud at an off-site location before transportation to the work site.

- All equipment that will be used over and in water and the tidal zone would have all debris and soil removed to the greatest extent practical and pressure washed, at an off-site location before transportation to the work site.

- All leaks would be repaired prior to arriving on site. Equipment would be inspected daily for leaks, accumulations of grease, etc., and any identified problems would be fixed at the on-site staging location before operating over or in the water.

- No solvents or other chemicals would be used in or over the water during construction or operation of the Proposed Action.

- No waste materials, including materials associated with treated wood decks, would enter the waterbody.

- All waste material and construction debris would be collected and disposed of at an approved facility that is in compliance with applicable Federal, state, and local regulations.

- Any leftover construction materials would be collected and disposed of off-site.

- All floating debris generated during construction would be retrieved, removed, and disposed of at an approved upland location.

- Two oil absorbing floating booms, appropriate for the size of the work area, would be available onsite whenever heavy equipment operates within 150 feet of open water and there is a potential for hazardous materials to enter surface waters. The booms would be stored in a location that facilitates immediate deployment in the event of a spill.

- Fueling and servicing of equipment would be confined to an established staging area that is at least 150 feet from open water or wetlands. Spill containment systems must be adequate to contain all fuel leaks.

- Equipment and vehicles would be stored in established staging areas when not in use, excluding cranes, which cannot be easily moved. Spill containment measures would be implemented around the cranes to ensure containment, if a leak were to occur.

- Equipment would be inspected daily to check for leaks or problems with equipment. Any equipment found to be in disrepair would be moved away from the slough until such time as the equipment is repaired.

- A written spill prevention, control, and countermeasures plan would be prepared for all planned construction activities, including staging. The plan would describe measures to prevent or reduce impacts from accidental leaks or spills, and would contain a description of all hazardous materials that would be used, proper storage and handling, and monitoring methods. A spill kit would be available onsite during construction and stored in a location that facilitates immediate deployment if needed.

Hazardous Materials

Upon soil excavation, the presence of obvious contamination would be assessed and the material would be disposed of appropriately.

The removed creosote-treated timbers will be permanently disposed of at an off-site approved facility that is in compliance with applicable Federal, state, and local regulations.

Noise Impacts

Pile driving is planned for low tide when no surface water is present.

Threatened and Endangered Species

Conservation measures

The following conservation measures have been established for this project as discussed in the biological assessment. The conservation measures were created to enable the project to avoid and minimize impacts to listed species.

Pile driving/removal

- Pile driving will only occur ‘in the dry’ and at low tide when no surface water is present.
- Portable dam structures employed as necessary to isolate pile driving area from Steamboat Slough water.
- Existing piles located in estuarine wetlands will not be removed when they are surrounded by water.
- Existing piles located in the defined wetted channel will not be removed without the use of Best Management Practices (BMP) to contain the sediment.

5. REFERENCES

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Everett 2014. City of Everett Public Works web page. http://www.everettwa.org/default.aspx?ID=85 viewed August 25, 2014.

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Snohomish County 2007. Snohomish County Aquifer Recharge/Wellhead Protection Map.

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U.S. Army Corps of Engineers 2012. Final Environmental Assessment Routine Maintenance Dredging and Disposal Snohomish River Navigation Channel, Downstream and Upstream Settling Basins Everett, Washington for Fiscal Years 2012-2018. April 2012.

U.S. Army Corps of Engineers 2014. Letter from U.S. Army Corps of Engineers to Mr. Alan Bloomquist, BNSF Railway Company May 13, 2014 re: NWS-2013-1081 BNSF Bridge 0050-37.80.

USFWS 2014a. National Wetland Inventory webmap. http://www.fws.gov/wetlands/Data/Mapper.html viewed August 27, 2014.

USFWS 2014b. Letter from U.S. Fish and Wildlife Services to Michelle Walker, U.S. Army Corps of Engineers March 4, 2014 re: Project Name: BNSF – Snohomish County; Corps of Engineers Number: NWS-2013-1081 requesting determination concurrence.

WDNR 2004. Liquefaction Susceptibility Map of Snohomish County, Washington. Washington Department of Natural Resources, September 2004.

WSDOT 2013. Annual Traffic Report. Washington State Department of Transportation. http://www.wsdot.wa.gov/mapsdata/travel/annualtrafficreport.htm

6. COORDINATION

Archaeological Investigations Northwest, Inc.

Callahan, Sean, National Oceanic and Atmospheric Administration Fisheries West Coast Region

Federal Emergency Management Agency

Fischer, Steven, LCDR, Bridge Program Chief, U.S. Coast Guard, District 13, Seattle, Washington

Greene, John J., PMP, Environmental Policy Analyst, USCG, Seattle Washington

Holter, Russell, Washington Department of Archaeology and Historic Preservation Mario Pedroza, Washington Department of Ecology, Air Quality, http://www.ecy.wa.gov/programs/air/sips/plans/400_rule.htm

McReynolds, Danny, Bridge Management Specialist, U.S. Coast Guard, District 13, Seattle, Washington

Muck, Jim, U.S. Fish and Wildlife Service

National Oceanic and Atmospheric Administration, National Marine Fisheries Service National Wild and Scenic Rivers System, www.rivers.gov/washington.php

Padgett, Rebekah, Federal Permit Manager Washington Department of Ecology,

Ron Wilcox, Project Manager Regulatory Branch, U.S. Army Corps of Engineers, Seattle District

U.S. Fish and Wildlife Service

U.S. Geological Survey, http://cfpub.epa.gov/surf/locate/index.cfm\

Washington Department of Ecology, Water Resource Inventory, http://www.ecy.wa.gov/services/gis/maps/wria/wria.htm

Washington Department of Ecology, Surface Water Quality Standards, http://www.ecy.wa.gov/programs/wq/swgs/criteria.html

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Washington Department of Ecology, State Coastal Zone Management, www.ecy.wa.gov/programs/sea/czm/prgm.html

Washington Department of Ecology's Water Quality Assessment 303 (d) List, http://www.ecy.wa.gov/programs/wq/303d/

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Washington Department of Natural Resources, http://www.dnr.wa.gov/

Washington Department of Ecology, Chapter 173-60 WAC, Maximum Environmental Noise Levels, https://fortress.wa.gov/ecy/publications/publications/17360.pdf

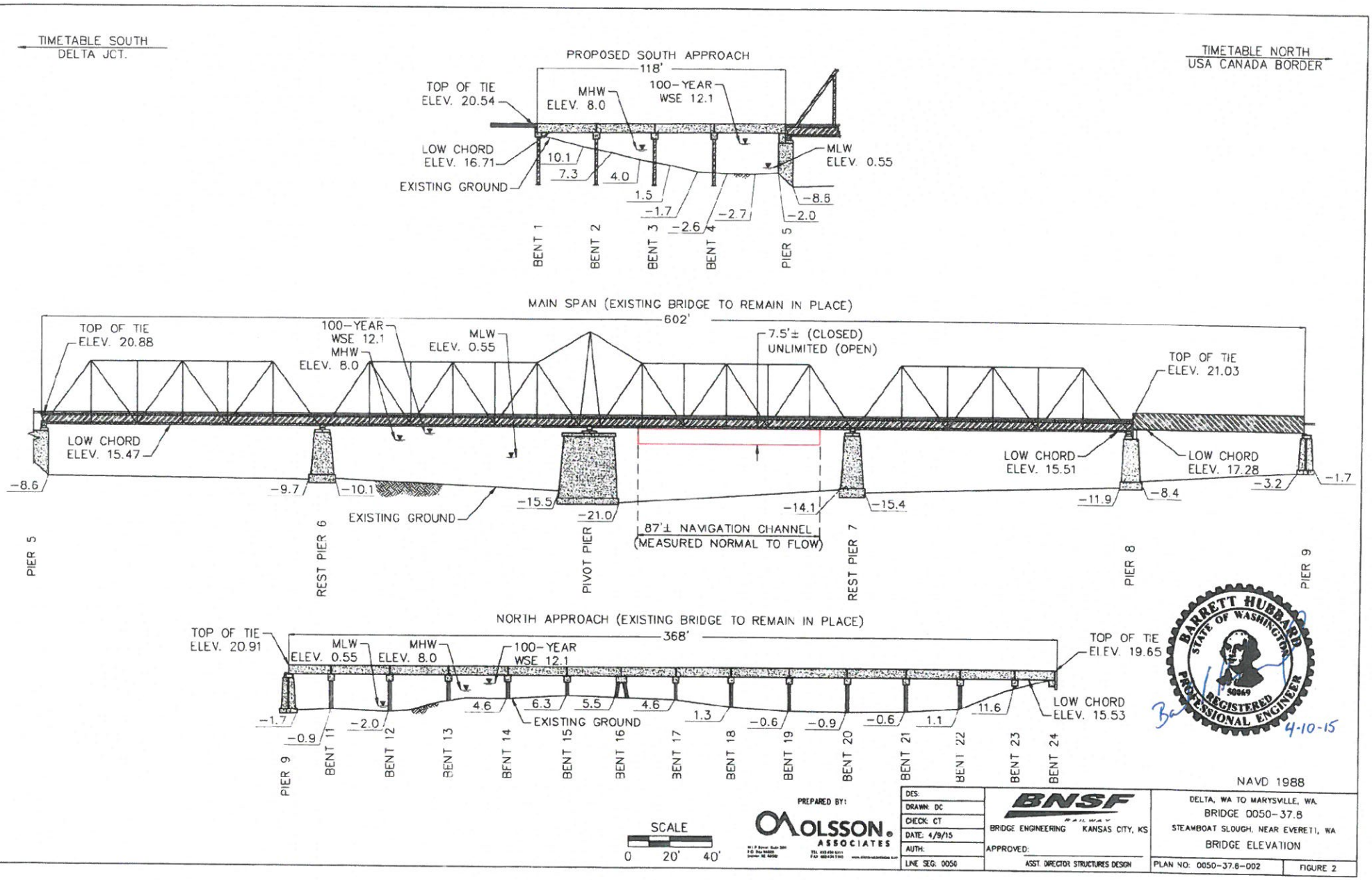
Washington Department of Ecology, Toxics Cleanup Program https://fortress.wa.gov/ecy/publications/publications/1409260.pdf

7. PREPARERS

The table below provides a list of individuals who collaboratively prepared this Environmental Assessment on behalf of the U.S. Coast Guard.

Name	Title/Affiliation	Years of Relevant Experience
John J. Greene, PMP	Environmental Policy Analyst ECS/USCG	29
Christopher J. Talley, PE	Senior Engineer Environmental Resources and Compliance Olsson Associates	16
Shelly Rae Watson	Senior Scientist Environmental Resources and Compliance Olsson Associates	26

Appendix A
Bridge Plans


TIMETABLE SOUTH
DELTA JCT.
TIMETABLE NORTH
USA CANADA BORDER
PROPOSED SOUTH APPROACH
118'
TOP OF TIE
ELEV. 20.54
MHW
ELEV. 8.0
100-YEAR
WSE 12.1
LOW CHORD
ELEV. 16.71
EXISTING GROUND
MLW
ELEV. 0.55
10.1
7.3
4.0
1.5
-1.7
-2.6
-2.7
-2.0
-8.6
BENT 1
BENT 2
BENT 3
BENT 4
PIER 5
MAIN SPAN (EXISTING BRIDGE TO REMAIN IN PLACE)
602'
TOP OF TIE
ELEV. 20.88
100-YEAR
WSE 12.1
MHW
ELEV. 8.0
MLW
ELEV. 0.55
7.5'± (CLOSED)
UNLIMITED (OPEN)
TOP OF TIE
ELEV. 21.03
LOW CHORD
ELEV. 15.47
LOW CHORD
ELEV. 15.51
LOW CHORD
ELEV. 17.28
-8.6
-9.7
-10.1
-15.5
-21.0
-14.1
-15.4
-11.9
-8.4
-3.2
-1.7
EXISTING GROUND
87'± NAVIGATION CHANNEL
(MEASURED NORMAL TO FLOW)
PIER 5
REST PIER 6
PIVOT PIER
REST PIER 7
PIER 8
PIER 9
NORTH APPROACH (EXISTING BRIDGE TO REMAIN IN PLACE)
368'
TOP OF TIE
ELEV. 20.91
MLW
ELEV. 0.55
MHW
ELEV. 8.0
100-YEAR
WSE 12.1
TOP OF TIE
ELEV. 19.65
LOW CHORD
ELEV. 15.53
-1.7
-0.9
-2.0
4.6
6.3
5.5
4.6
1.3
-0.6
-0.9
-0.6
1.1
11.6
EXISTING GROUND
PIER 9
BENT 11
BENT 12
BENT 13
BENT 14
BENT 15
BENT 16
BENT 17
BENT 18
BENT 19
BENT 20
BENT 21
BENT 22
BENT 23
BENT 24
BARRETT HUBBARD
STATE OF WASHINGTON
50649
REGISTERED
PROFESSIONAL ENGINEER
4-10-15
NAVD 1988
SCALE
0 20' 40'
PREPARED BY:
OLSSON ASSOCIATES
DES:
DRAWN: DC
CHECK: CT
DATE: 4/9/15
AUTH:
LINE SEG: 0050
BNSF
BRIDGE ENGINEERING KANSAS CITY, KS
APPROVED:
ASST. DIRECTOR STRUCTURES DESIGN
DELTA, WA TO MARYSVILLE, WA.
BRIDGE 0050-37.8
STEAMBOAT SLOUGH, NEAR EVERETT, WA
BRIDGE ELEVATION
PLAN NO: 0050-37.8-002
FIGURE 2

GENERAL NOTES:

GENERAL: ALL MATERIAL AND WORKMANSHIP SHALL BE AS PER THE CURRENT A.R.E.M.A. MANUAL FOR RAILWAY ENGINEERING: CHAPTER 8 - CONCRETE STRUCTURES AND FOUNDATIONS, CHAPTER 15 - STEEL STRUCTURES.

THE BNSF STANDARD CONSTRUCTION SPECIFICATIONS SUPPLEMENT THE ABOVE A.R.E.M.A. MANUALS AND SHALL GOVERN.

STRUCTURE EXCAVATION AND BACKFILL: ALL STRUCTURE EXCAVATION AND BACKFILL SHALL BE IN ACCORDANCE WITH SECTION 04100 OF THE BNSF STANDARD CONSTRUCTION SPECIFICATIONS.

PILING: PILES SHALL BE DRIVEN IN ACCORDANCE WITH THE DETAILS AND NOTES ON PLAN NO. 0050-37.8-003.

AFTER PILES ARE DRIVEN, THEY SHALL BE PULLED, IF NECESSARY, AND HELD IN THE PROPER LOCATION AND CUT OFF AT PROPER ELEVATION.

CAST-IN-PLACE CONCRETE: ALL CONCRETE, CONCRETE WORK AND PLACEMENT OF REINFORCEMENT SHALL BE IN ACCORDANCE WITH SECTION 04400 OF THE BNSF STANDARD CONSTRUCTION SPECIFICATIONS. DETAILED FALSEWORK PLANS IN ACCORDANCE WITH PARAGRAPH 2.11 ARE REQUIRED AS NECESSARY.

THE PORTLAND CEMENT USED IN ALL CONCRETE SHALL BE TYPE II OR TYPE IIA. ALL CONCRETE SHALL BE AIR-ENTRAINED CONTAINING NOT LESS THAN 5 PERCENT NOR MORE THAN 7 PERCENT AIR BY VOLUME.

CONCRETE SHALL BE CLASS 40 WITH AN ULTIMATE COMPRESSIVE STRENGTH OF NOT LESS THAT 4000 PSI IN 28 DAYS. MAXIMUM SIZE OF COARSE AGGREGATE SHALL BE ONE INCH. THE MINIMUM CONCRETE COVER ON REINFORCEMENT SHALL BE TWO INCHES UNLESS INDICATED OTHERWISE. EXPOSED CONCRETE EDGES SHALL BE BEVELED $^{3}/_{4}$".

REINFORCEMENT: STEEL BARS FOR REINFORCEMENT SHALL BE DEFORMED BILLET-STEEL BARS CONFORMING TO THE REQUIREMENTS OF THE CURRENT ASTM DESIGNATION: A615, GRADE 60 OR A706, GRADE 60.

FABRICATION OF REINFORCEMENT SHALL BE IN ACCORDANCE WITH CHAPTER 7 OF THE CURRENT C.R.S.I. MANUAL OF STANDARD PRACTICE.

REINFORCEMENT WIRE BAR SUPPORTS THAT ARE IN CONTACT WITH FORMS SHALL BE CLASS 1, PLASTIC PROTECTED, IN ACCORDANCE WITH CHAPTER 3 OF THE CURRENT C.R.S.I. MANUAL OF STANDARD PRACTICE.

PLACING PRECAST BEARING BLOCK ON EXISTING CONCRETE PIER (PIER #5): PRIOR TO PLACING THE BEARING BLOCK, FIELD VERIFY THE ELEVATION OF THE EXISTING CONCRETE PIER. THE ENGINEER SHALL BE NOTIFIED OF ANY VARIANCES FROM PLAN ELEVATIONS.

AREAS ON TOP OF THE EXISTING CONCRETE PIER WHERE THE PRECAST BEARING BLOCK WILL SIT SHALL BE THOROUGHLY CLEANED TO REMOVE ALL LOOSE PARTICLES AND DUST. THE PRECAST BEARING BLOCK SHALL THEN BE SET IN THE PROPER LOCATION, WITH THE TOP OF THE PRECAST BEARING BLOCK LEVEL AT THE CORRECT BRIDGE SEAT ELEVATION, USING STEEL SHIMS, AS NECESSARY, AND NON-SHRINK GROUT TO COMPLETELY FILL THE VOLUME BETWEEN THE BOTTOM OF THE BEARING BLOCK AND TOP OF THE EXISTING CONCRETE PIER.

THROUGH 2" DIA. HOLES IN THE PRECAST BEARING BLOCK, DRILL $1^{3}/_{4}$" DIA. HOLES TO A DEPTH OF 2'-0" BELOW TOP OF THE EXISTING CONCRETE PIER. HOLES SHALL BE THOROUGHLY CLEANED USING A WIRE BRUSH AND COMPRESSED AIR OR VACUUMING TO REMOVE ALL LOOSE PARTICLES AND DUST. THEN 8-#10 DOWELS SHALL BE SET IN HOLES OF THE PRECAST BEARING BLOCK USING NON-SHRINK GROUT, IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS, TO COMPLETELY FILL THE VOIDS.

RECESSES AT LIFT ANCHORS: AFTER THE WINGWALLS ARE SET, FILL RECESSES WITH CEMENT GROUT TO TOP OF SURROUNDING CONCRETE.

LIFTING LOOPS: AFTER PRECAST BEARING BLOCK IS SET, BURN OFF LIFTING LOOPS ONE INCH BELOW THE SURFACE OF THE CONCRETE AND PATCH THE RESULTING RECESSES WITH CEMENT GROUT TO THE TOP OF THE SURROUNDING CONCRETE,

PERVIOUS BACKFILL MATERIAL BEHIND ABUTMENTS: PERVIOUS BACKFILL MATERIAL BEHIND THE ABUTMENT SHALL BE IN ACCORDANCE WITH PARAGRAPHS 2.5 AND 3.6 OF SECTION 04100 OF THE BNSF STANDARD CONSTRUCTION SPECIFICATIONS.

DAMPPROOFING: THE BACK FACE OF THE NEW ABUTMENT SEAT, BACKWALL, AND WINGWALLS SHALL BE DAMPPROOFED IN ACCORDANCE WITH SECTION 04800 OF THE BNSF STANDARD CONSTRUCTION SPECIFICATIONS.

ELASTOMERIC BEARING PADS: ELASTOMERIC BEARING PADS SHALL BE IN ACCORDANCE WITH SECTION 04900 OF THE BNSF STANDARD CONSTRUCTION SPECIFICATIONS.

MORTAR FOR SETTING DOUBLE VOIDED BOX BEAMS: BEAMS SHALL HAVE FULL AND EVEN BEARING UPON THE BRIDGE SEAT AREAS. IF NEEDED, MORTAR CONSISTING OF EQUAL PARTS BY VOLUME OF CLASS B EPOXY AND DRY SILICA SAND, MIXED IN ACCORDANCE WITH MANUFACTURER'S DIRECTIONS, SHALL BE SPREAD ON TOP OF BEARING PADS TO OBTAIN UNIFORM BEARING. SCRAPE EXCESS MORTAR FROM AROUND THE BEARING PADS AFTER BEAMS ARE SET.

ERECTION OF DOUBLE VOIDED BOX BEAMS: BOX BEAMS SHALL BE SET IN THE PROPER LOCATION USING CARE NOT TO DAMAGE CONCRETE MEMBERS. AFTER BEAMS ARE SET, BURN OFF LIFTING LOOPS TWO (2) INCHES ABOVE THE CONCRETE SURFACE. THE REMAINING PORTION OF THE LIFTING LOOPS ARE TO BE COATED WITH PAINT. PATCH RECESSES, IF NECESSARY, AROUND THE LIFTING LOOPS WITH EPOXY MORTAR AS USED FOR SETTING THE BEAMS.

DECK PLATES: THE DECK PLATES SHALL BE ADJUSTED, AS NECESSARY, TO INSURE THE PLATES FIT TIGHT AGAINST THE BEAMS AND CURBS.

HANDRAIL: HANDRAIL PANELS ON WALKWAYS SHALL BE ERECTED PLUMB AND IN LINE.

PATCHING: PATCHING OR REPAIR OF SPALLED OR CHIPPED PRECAST CONCRETE MEMBERS SHALL BE DONE USING CONPATCH V/O MORTAR, MIXED AND INSTALLED IN ACCORDANCE WITH MANUFACTURER'S WRITTEN INSTRUCTIONS.

CONPATCH V/O MORTAR CAN BE ORDERED FROM:

CONSPEC MARKETING & MANUFACTURING CO., INC.
4226 KANSAS AVENUE
KANSAS CITY, KS 66106
TOLL FREE (877) 416 - 3439

EPOXY MATERIALS ARE AVAILABLE FROM EITHER:

PERMALITE PLASTICS CORP.
1537 MONROVIA AVENUE
NEWPORT BEACH, CA 92663
PHONE (949) 548-1137
FAX (949) 548-1130

OR:

DELTA PLASTICS COMPANY
10513 ROAD 236
TERRA BELLA, CA 93270
PHONE (559) 535-1332
FAX (559) 535-3723

ATTENTION !! - UTILITY NOTE

THE IMPLIED PRESENCE OR ABSENCE OF UTILITIES IS NOT TO BE CONSTRUED BY OWNER, ENGINEER, CONTRACTOR, OR SUBCONTRACTORS TO BE AN ACCURATE AND COMPLETE REPRESENTATION OF UTILITIES THAT MAY OR MAY NOT EXIST ON THE CONSTRUCTION SITE. BURIED AND ABOVEGROUND UTILITY LOCATION, IDENTIFICATION, AND MARKING ARE THE SOLE RESPONSIBILITY OF THE CONTRACTOR. REROUTING, DISCONNECTION, PROTECTION, ETC. OF ANY UTILITIES MUST BE COORDINATED AMONG THE CONTRACTOR, UTILITY COMPANY, AND OWNER. SITE SAFETY, INCLUDING THE AVOIDANCE OF HAZARDS, ASSOCIATED WITH BURIED AND ABOVEGROUND UTILITIES REMAINS THE SOLE RESPONSIBILITY OF THE CONTRACTOR.

DESIGN DATA:

2012 A.R.E.M.A. DESIGN SPECIFICATIONS
LOADING: COOPER E80 w/ DIESEL IMPACT

STRUCTURE HAS NOT BEEN DESIGNED FOR A.R.E.M.A. GROUND MOTION CRITERIA OF CHAPTER 9

LONGITUDINAL FORCE ACCORDING TO PRE-1995 A.R.E.M.A. DESIGN CRITERIA

PILE DESIGN INCLUDED CAPACITY CHECK FOR FULL LOSS OF STEEL PIPE PILE SUCH THAT CONCRETE INFILL ALONE CAN PROVIDE DESIGN CAPACITY

LIST OF SHEETS:

1. GENERAL NOTES & LIST OF SHEETS
2. GENERAL PLAN & ELEVATION
3. PILE LAYOUT PLAN
4. PILE DETAILS
5. TYPICAL SECTIONS & DETAILS
6. BEARING LAYOUT ELEVATION VIEW
7. P/C CONCRETE ABUTMENT CAP ~ SPC37.8-1
8. P/C CONCRETE BENT CAP ~ SPC37.8-2
9. PRECAST CONCRETE BEARING BLOCK ~ SBB37.8-1
10. MISCELLANEOUS STEEL DETAILS
11. HANDRAIL PANEL DETAILS
12. BILL OF MATERIAL & DETAILS

BENCH MARK DATA:

T.B.M.: PK NAIL, 8.32 FT EAST SOUTH TIMBER BULKHEAD BRIDGE 37.8 PAINTED ORANGE STATION 10+00, EL. = 100.00 (ASSUMED)

REFERENCES:

BNSF STANDARDS:

PLAN NO. 500000-BG1, BG2 & BG3
PLAN NO. 0000-17902-88, 91 & 94

SURVEY DRAWINGS:

Bridge Replacement Location
Survey by Parsons, Chicago, IL.
dated 9/18/12

GEOTECHNICAL REPORT:

PROJECT MEMORANDUM BY JACOBS ASSOCIATES, DATED 1/22/13.

LIFTING WEIGHTS:

SCDC37.8-1	= 52,900 LBS.
SCDC37.8-2	= 52,900 LBS.
CDC27-10C	= 44,800 LBS.
SPC37.8-1	= 25,400 LBS.
SPC37.8-2	= 27,400 LBS.
PW103	= 4,800 LBS.
SBB37.8-1	= 30,800 LBS.

LEGEND:

T/T	= Top of Tie
El.	= Elevation
RY	= Railway
F.S.	= Far Side
N.S.	= Near Side
B.S.	= Both Sides
U.N.O.	= Unless Noted Otherwise
E.F.	= Each Face
F.F.	= Front Face
B.F.	= Back Face
P/C	= Precast
P/S	= Prestressed

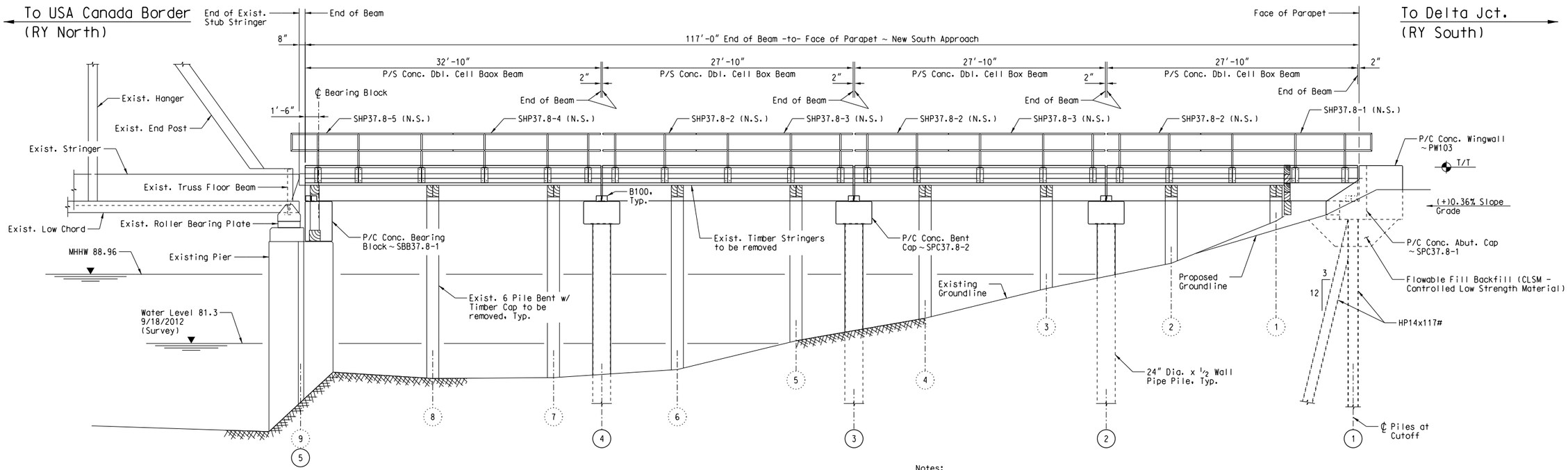
HANSON
Hanson Professional Services Inc.

DES: JEC	
DRAWN: GTJ	
CHECK: MAF	
DATE: 5/13/14	
AUTH: A141328	
LINE SEG: 0050	

BNSF RAILWAY
BRIDGE ENGINEERING KANSAS CITY, KS
APPROVED: Augustin M. Hurst
ASST. DIRECTOR STRUCTURES DESIGN

USA CANADA BORDER TO DELTA JCT.
BRIDGE NO. 37.8 - SOUTH APPROACH
OVER STEAMBOAT SLOUGH
MARYSVILLE, WA
GENERAL NOTES & LIST OF SHEETS

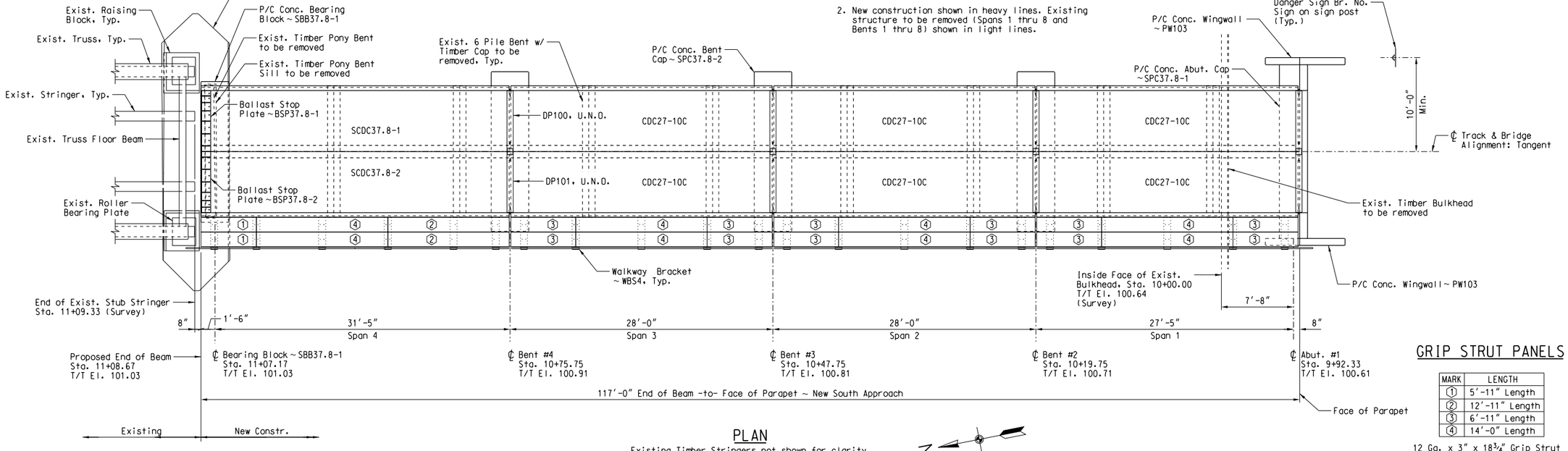
PLAN NO: 0050-37.8-001 | SHEET: 1 OF 12



ELEVATION

Notes:

1. Existing timber piles shall be cutoff 1'-0" below finished groundline.
2. New construction shown in heavy lines. Existing structure to be removed (Spans 1 thru 8 and Bents 1 thru 8) shown in light lines.



PLAN

Existing Timber Stringers not shown for clarity.

True North

GRIP STRUT PANELS

MARK	LENGTH
①	5'-11" Length
②	12'-11" Length
③	6'-11" Length
④	14'-0" Length

12 Ga. x 3" x 18¾" Grip Strut Safety Grating

TABLE OF ELEVATIONS

ABUT. OR BENT NO.	T/T ELEV.	BRIDGE SEAT	PILE CUTOFF	ESTIMATED TIP PILE ELEVATION
1	100.61	96.80	94.80	(-)25.2
2	100.71	96.90	94.40	(-)25.6
3	100.81	97.00	94.50	(-)25.5
4	100.91	97.10	94.60	(-)25.4
5	101.03	97.22	-	-

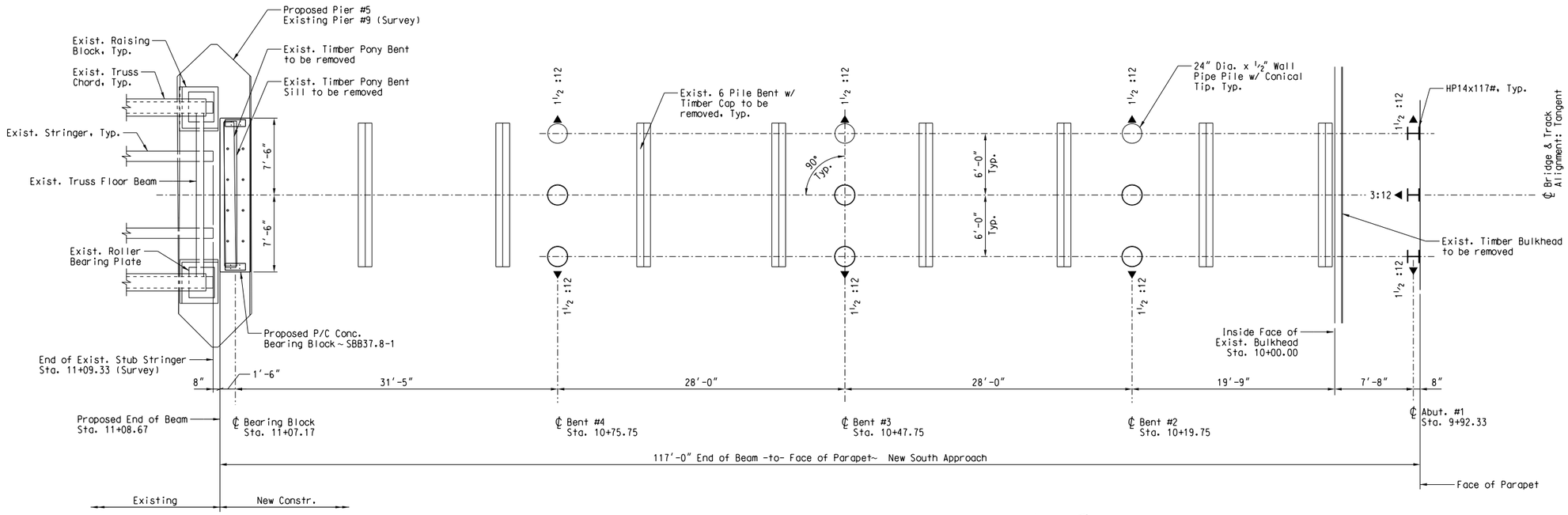
HANSON
Hanson Professional Services Inc.

DES:	JEC
DRAWN:	GTJ
CHECK:	MAF
DATE:	5/13/14
AUTH:	A141328
LINE SEG:	0050

BNSF RAILWAY
BRIDGE ENGINEERING KANSAS CITY, KS
APPROVED: Austin M Hurst
ASST. DIRECTOR STRUCTURES DESIGN

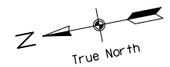
USA CANADA BORDER TO DELTA JCT.
BRIDGE NO. 37.8 - SOUTH APPROACH
OVER STEAMBOAT SLOUGH
MARYSVILLE, WA
GENERAL PLAN & ELEVATION

PLAN NO: 0050-37.8-002 | SHEET: 2 OF 12



PILE LAYOUT PLAN

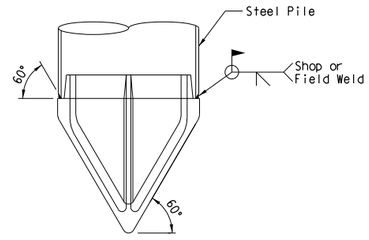
Pile spacing shown at cutoff elevations.



ATTENTION !
INFORMATION SHOWN ON THESE PLANS CONCERNING TYPE AND LOCATION OF UNDERGROUND OR ABOVE GROUND UTILITIES IS NOT GUARANTEED TO BE ACCURATE OR ALL INCLUSIVE. THE SUPERVISOR OF STRUCTURES OR THE FOREMAN IN CHARGE WILL VERIFY THE LOCATION OF UNDERGROUND AND OVERHEAD UTILITIES BEFORE BEGINNING CONSTRUCTION.

Notes:

1. ▼ - INDICATES DIRECTION OF BATTER.
2. X:12 - INDICATES AMOUNT OF BATTER.
3. ALL DIMENSIONS ARE GIVEN AT PILE CUTOFF.
4. PIPE PILES SHALL MEET THE MATERIAL REQUIREMENTS OF ASTM A252, GRADE 3 WITH A MINIMUM YIELD STRENGTH OF 50 KSI OR APPROVED EQUIVALENT AND SHALL HAVE A SHOP APPLIED COATING CONSISTING OF A SURFACE PREP OF SSPC SP10 FOLLOWED BY 2 COATS OF DEVOE DEVRAN 261OC EPOXY RESULTING IN A MINIMUM TOTAL DRY FILM THICKNESS OF 16 MILS.
5. EACH PIPE PILE SHALL HAVE REINFORCING CAGE CENTERED IN EACH PILE AND FILLED WITH CONCRETE HAVING AN ULTIMATE COMPRESSIVE STRENGTH OF NOT LESS THAN 4000 p.s.i. IN 28 DAYS. MAXIMUN SIZE OF COARSE AGGREGATE SHALL BE ONE INCH.
6. THE CONTRACTOR SHALL FURNISH CONICAL PILE POINTS CONSISTING OF A SINGLE PIECE AS SHOWN. THE PILE POINTS SHALL BE CAST IN ONE PIECE STEEL ACCORDING TO ASTM A 148 RADE 90-60 (A.A.S.H.T.O. M 103 GRADE 65-35) AND SHALL PROVIDE FULL BEARING OVER THE FULL CIRCUMFERENCE OF THE PILE. THE PILE POINT SHALL HAVE TAPERED LEADS TO ASSURE PROPER ALIGNMENT AND FITTING AND SHALL BE SECURED TO THE PILE WITH A CIRCUMFERENTIAL WELD. STEEL CONICAL PILE POINTS WITH DULL TIP SHALL BE WELDED ONTO BENT PILES. REINFORCED TIP SHALL BE FLUSH WITH OUTSIDE OF THE PILE.
7. STEEL H-PILES SHALL MEET THE MATERIAL REQUIREMENTS OF ASTM A572, GRADE 50. AND SHALL BE DRIVEN IN ACCORDANCE WITH BNSF CONSTRUCTION SPECIFICATIONS AND THESE NOTES.
8. AFTER PILES ARE DRIVEN, THEY SHALL BE PULLED, IF NECESSARY, AND HELD IN THE PROPER LOCATION AND CUTOFF AT PROPER ELEVATON.
9. ALL WELDING SHALL CONFORM TO THE REQUIREMENTS OF THE STRUCTURAL WELDING CODE AWS D1.1.
10. THE CENTRAL PILES AT EACH ABUTMENT AND BENT SHALL BE DRIVEN FIRST AND SUBSEQUENT PILES SHOULD BE INSTALLED FROM THE CENTER OUT.
11. ALL PILES SHALL BE DRIVEN TO THE ULTIMATE PILE CAPACITY OF 300 TONS AS DETERMINED BY PDA & CAPWAP ANALYSIS AND THE MINIMUM TIP ELEVATION OF APPROXIMATELY (-) 25.0. IN THE EVENT THE PILE DRIVING RESISTANCE HAS NOT BEEN MET UNDER NORMAL CONTINUOUS DRIVING CONDITIONS, THE PILE DRIVING OPERATIONS SHALL BE STOPPED WITHIN 3 FEET OF FINAL CUTOFF. THE DRIVING OPERATIONS SHALL BE DISCONTINUED FOR AT LEAST 24 HOURS AND REDRIVEN TO THE LESSER OF THE FINAL 3 FT OR UNTIL REFUSAL IS ACHIEVED. IF THE RESTRIKE RESISTANCE DOES NOT ACHIEVE THE SPECIFIED VALUES, THE ENGINEER WILL DETERMINE THE SUBSEQUENT PROCEDURES TO BE TAKEN. THE POSSIBILITY EXIST THAT THE ULTIMATE PILE CAPACITY MAY BE EXCEEDED SEVERAL TIMES DURING THE PILE DRIVING PROCESS. PILE DRIVING OPERATIONS SHALL CONTINUE TO MINIMUM TIP ELEVATION WITHOUT OVERSTRESSING THE PILE SECTION. PILE DRIVING OVER THE LAST 20 FEET MAY BE DIFFICULT.
12. THE FIRST PILE AT EACH ABUTMENT OR BENT SHALL HAVE DYNAMIC TESTING WITH A PDA (PILE DRIVING ANALYZER) AND CAPWAP ANALYSIS (CASE PILE WAVE ANALYSIS PROGRAM) TO ESTABLISH DRIVING CRITERIA AND DETERMINE LENGTHS FOR THE REMAINING PILES. A WEAP ANALYSIS SHOULD ALSO BE COMPLETED ONCE THE PILE DRIVING EQUIPMENT IS SELECTED.
13. FOR ADDITIONAL INFORMATION, SEE THE GEOTECHNICAL PROJECT MEMORANDUM BY JACOBS ASSOCIATES, DATED 1/22/13.
14. ALL PILES SHALL BE TEMPORARILY CAPPED AND MARKED AFTER DRIVING.
15. ANY ACCUMULATED WATER INSIDE THE PIPE SHALL BE REMOVED PRIOR TO FILLING OF CONCRETE.
16. PLACING THE CONCRETE IN EACH PILE SHALL BE CARRIED ON AS A CONTINUOUS OPERATION, PERFORMED IN SUCH A MANNER AS TO MINIMIZE SEGREGATION.
17. CHECK ALL PILES FOR POSSIBLE HEAVE PRIOR TO CUTOFF BY SURVEYING THE ELEVATION OF EACH PILE BUTT AFTER A PILE IS DRIVEN WITHIN THE GROUP. THE HEAVE DATA SHOULD BE PROVIDED TO THE ENGINEER TO DETERMINE IF REDRIVE IS REQUIRED. IN GENERAL, IF THE HEAVE IS GREATER THAN 0.25 INCH, THE PILE SHOULD BE REDRIVEN TO THE ORIGINAL PILE TIP ELEVATION.



CONICAL TIP

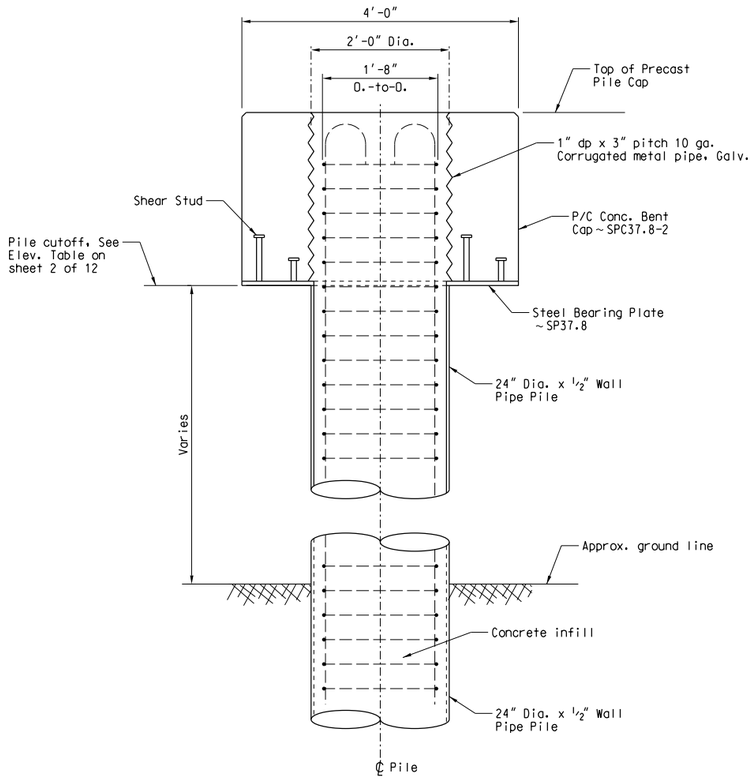
HANSON
Hanson Professional Services Inc.

DES: JEC	
DRAWN: GTJ	
CHECK: MAF	
DATE: 5/13/14	
AUTH: A141328	
LINE SEG: 0050	

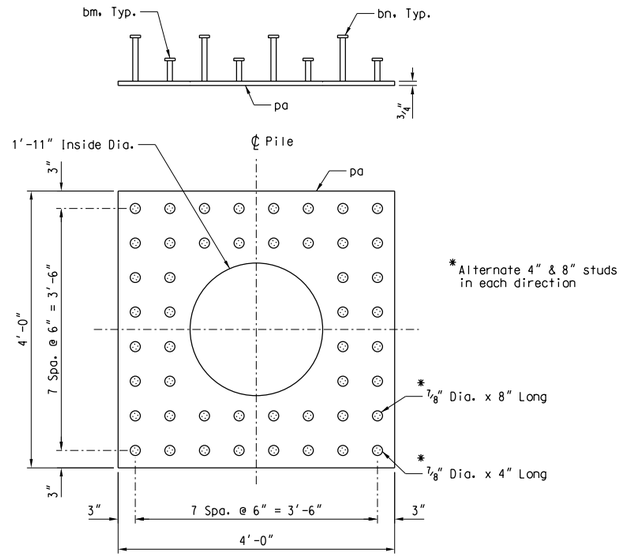
BNSF RAILWAY
BRIDGE ENGINEERING KANSAS CITY, KS
APPROVED: Hanson M Hurst
ASST. DIRECTOR STRUCTURES DESIGN

USA CANADA BORDER TO DELTA JCT.
BRIDGE NO. 37.8 - SOUTH APPROACH
OVER STEAMBOAT SLOUGH
MARYSVILLE, WA
PILE LAYOUT PLAN

PLAN NO: 0050-37.8-003 | SHEET: 3 OF 12



TYPICAL PIPE PILE CAP ELEVATION

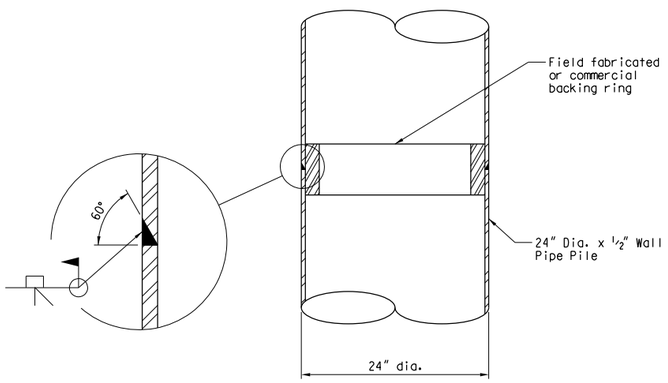


STEEL BEARING PLATE ~ SP37.8

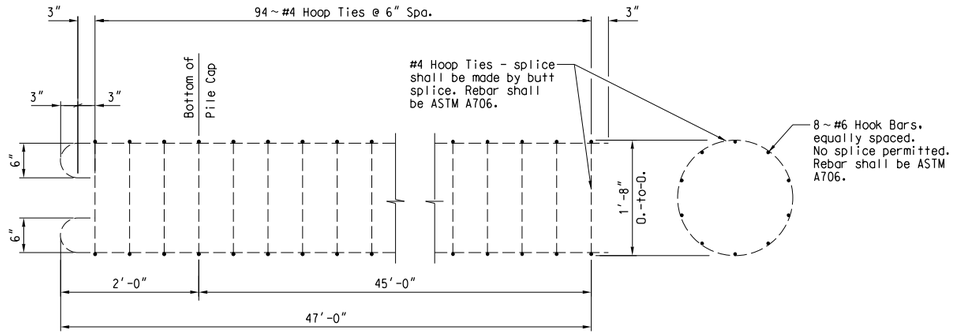
1 ~ Plate 3/4" x 48" x 4'-0" ~ pa
24 ~ 7/8" Dia. x 8" long stud ~ bn
24 ~ 7/8" Dia. x 4" long stud ~ bm
Weight = 550 lbs.
9 Required

NOTES:

1. See Steel General Notes on Plan No. 0050-37.8-010 for SP37.8.
2. See Plan No. 0050-37.8-003 for Pile Notes.



PILE SPLICE DETAIL



REINFORCING CAGE - RC1

8 ~ #6 Hook Bars
94 ~ #4 Hoop Ties
Weight (Each Cage) = 760 Lbs.

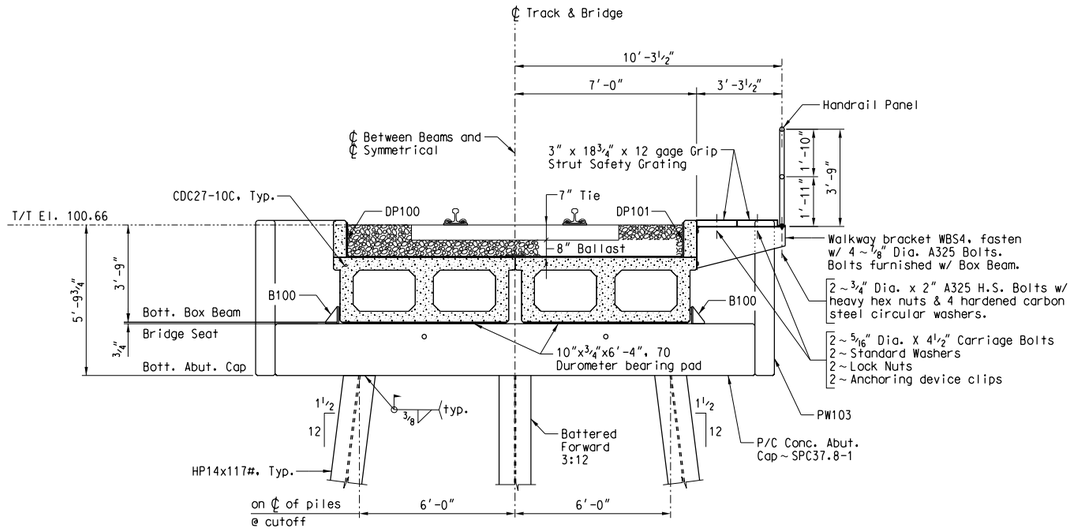
HANSON
Hanson Professional Services Inc.

DES: JEC	
DRAWN: GTJ	
CHECK: MAF	
DATE: 5/13/14	
AUTH: A141328	
LINE SEG: 0050	

BNSF RAILWAY
BRIDGE ENGINEERING KANSAS CITY, KS
APPROVED: Hanson M Hurst
ASST. DIRECTOR STRUCTURES DESIGN

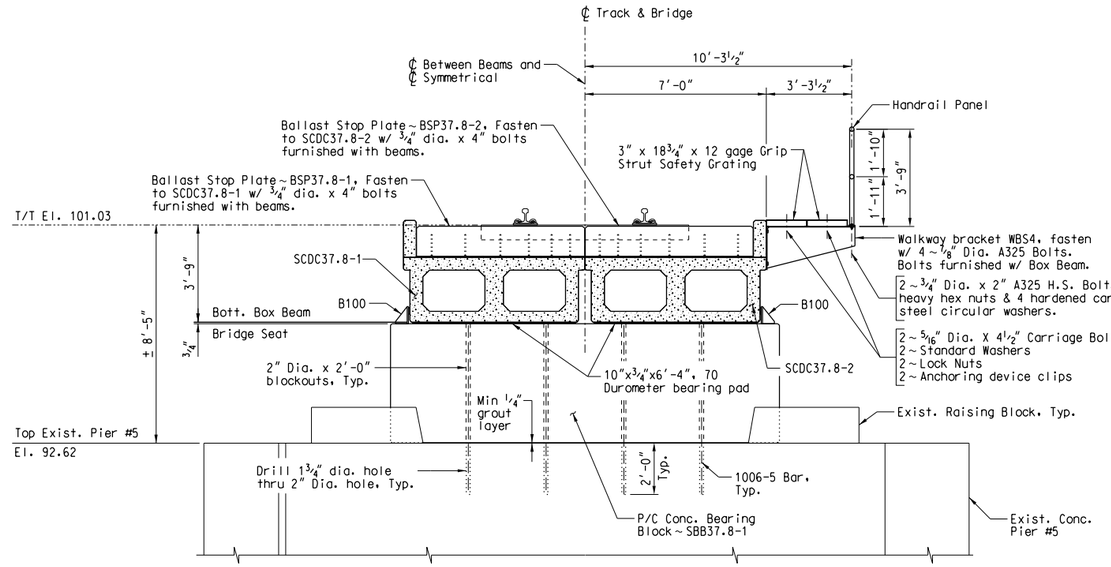
USA CANADA BORDER TO DELTA JCT.
BRIDGE NO. 37.8 - SOUTH APPROACH
OVER STEAMBOAT SLOUGH
MARYSVILLE, WA
PILE DETAILS

PLAN NO: 0050-37.8-004 | SHEET: 4 OF 12



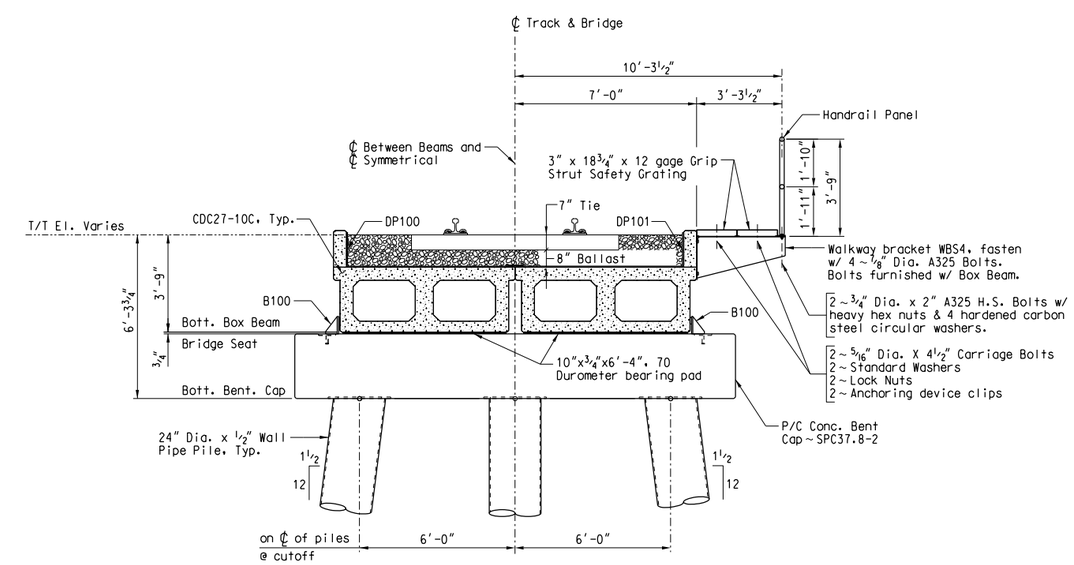
TYPICAL SECTION - ABUT. #1

(Looking RY South)



TYPICAL SECTION - EXIST. PIER #5

Existing Truss not shown for clarity.
(Looking RY South)



TYPICAL SECTION - BENT #2, #3, & #4

(Looking RY South)

HANSON
Hanson Professional Services Inc.

DES: JEC	
DRAWN: GTJ	
CHECK: MAF	
DATE: 5/13/14	
AUTH: A141328	
LINE SEG: 0050	

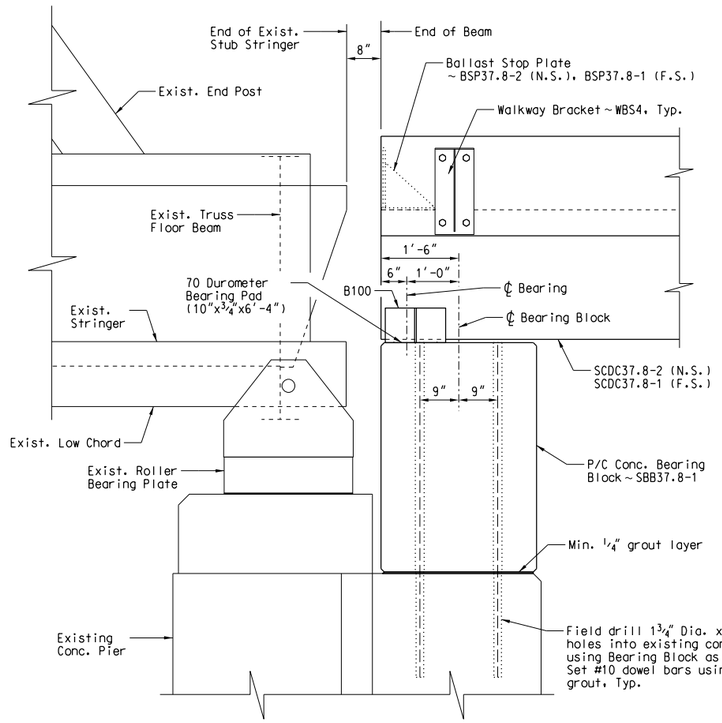
BNSF RAILWAY
BRIDGE ENGINEERING KANSAS CITY, KS
APPROVED: Augustin M Hurst
ASST. DIRECTOR STRUCTURES DESIGN

USA CANADA BORDER TO DELTA JCT.
BRIDGE NO. 37.8 - SOUTH APPROACH
OVER STEAMBOAT SLOUGH
MARYSVILLE, WA
TYPICAL SECTIONS & DETAILS

PLAN NO: 0050-37.8-005 | SHEET: 5 OF 12

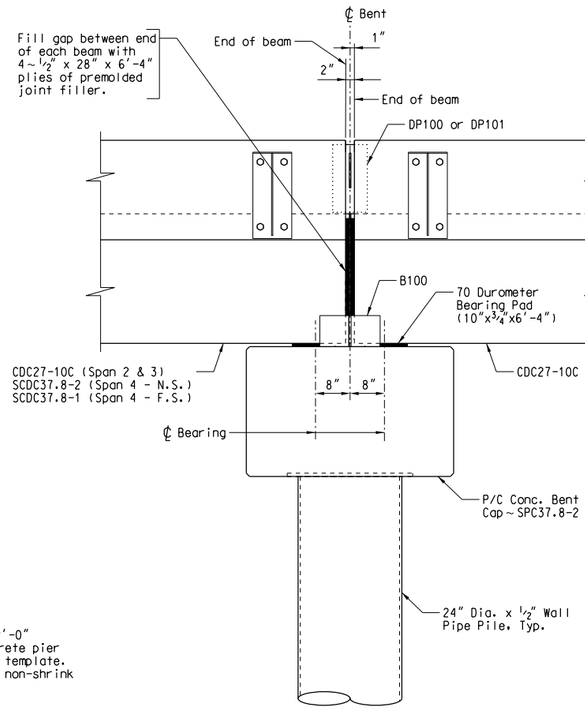
To USA Canada Border
(RY North)

To Delta Jct.
(RY South)



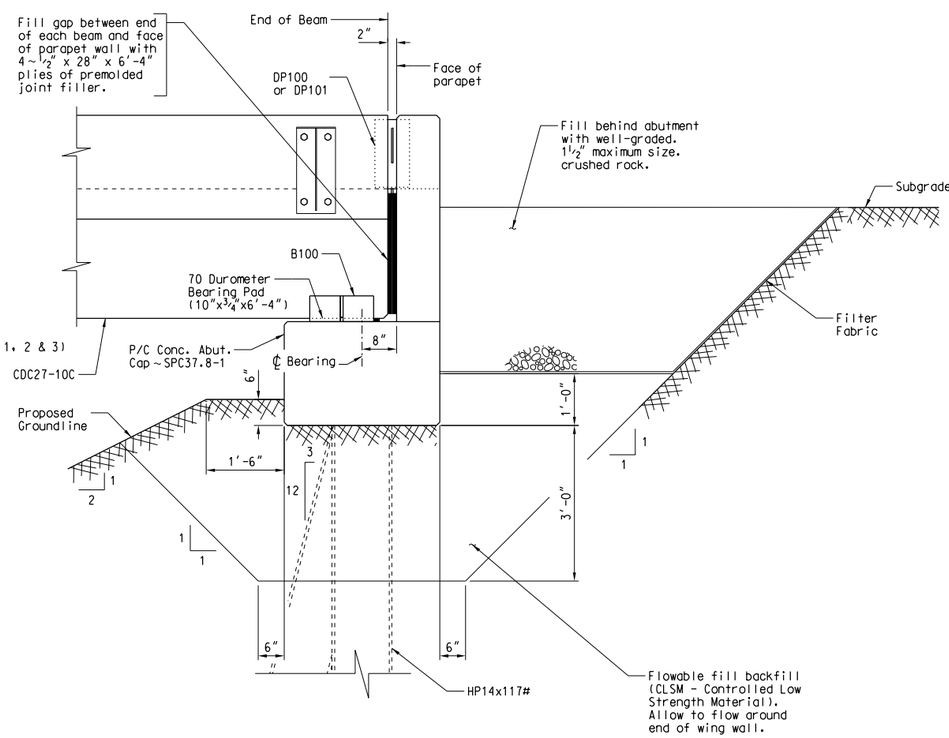
PROPOSED PIER #5

Exist. Pier #9 (Survey)
Handrails and walkway panels not shown for clarity.



BENT #2, #3 AND #4

Handrails and walkway panels not shown for clarity.



ABUT. #1

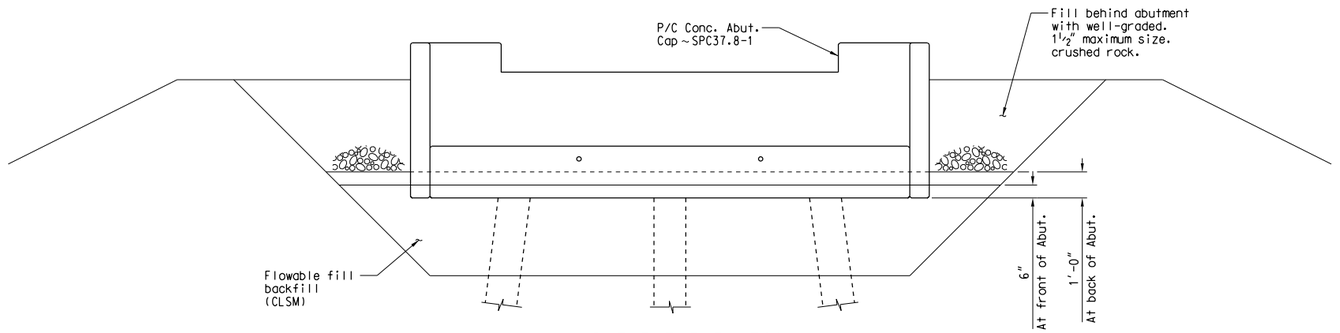
Handrails, walkway panels and PW103 not shown for clarity.

Example of Mix Proportions for Flowable Fill (CLSM)

Mix 1:	
Portland Cement	125 lb
Fine Aggregate - Saturated Surface Dry	2500 lb
Water	35-50 gal
Air Content	15-25%
Mix 2:	
Portland Cement	50 lb
Fly Ash - Class C or F	125 lb
Fine Aggregate - Saturated Surface Dry	2900 lb
Water	50-65 gal
Air Content	No air is entrained

Mix Design Criteria

Flow	Greater than 7 in.
Air Content	0-25%
Dynamic Cone Penetrometer (DCP) at 3 days	Less than 1.5 in./blow
Compressive Strength at 28 and 180 days	Greater than 30 psi to Greater than 150 psi



ABUTMENT ELEVATION

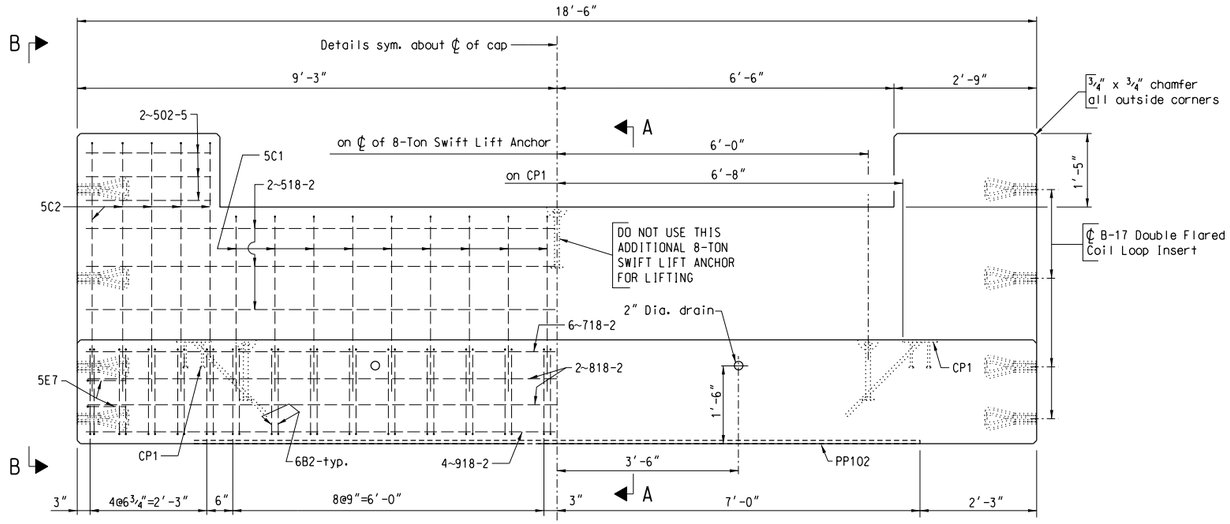
HANSON
Hanson Professional Services Inc.

DES: JEC	
DRAWN: GTJ	
CHECK: MAF	
DATE: 5/13/14	
AUTH: A141328	
LINE SEG: 0050	

BNSF RAILWAY
BRIDGE ENGINEERING KANSAS CITY, KS
APPROVED: Austin M. Hurst
ASST. DIRECTOR STRUCTURES DESIGN

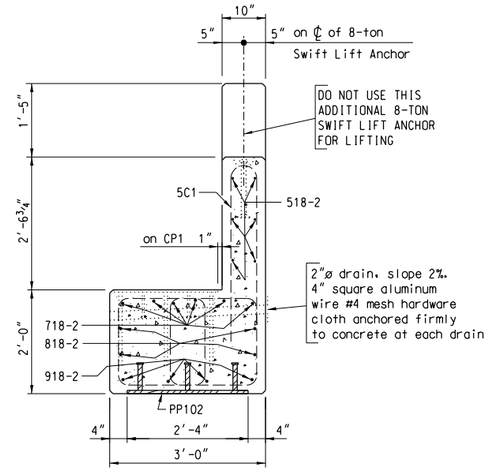
USA CANADA BORDER TO DELTA JCT.
BRIDGE NO. 37.8 - SOUTH APPROACH
OVER STEAMBOAT SLOUGH
MARYSVILLE, WA
BEARING LAYOUT ELEVATION VIEW

PLAN NO: 0050-37.8-006 | SHEET: 6 OF 12



ELEVATION - SPC37.8-1

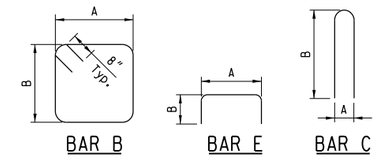
Wt. = 25,400 lbs., Vol. = 5.7 cu. yds., Reinf. Steel = 1,740 lbs.



SECTION A-A

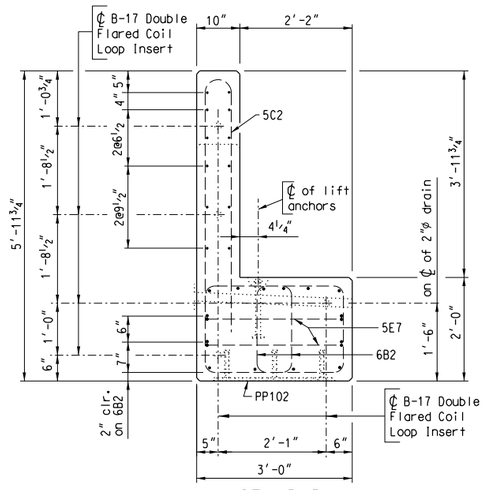
For further designation of horizontal bars see elevations of precast members

LIST OF REINFORCING BARS PER SPC37.8-1						
NO.	MARK	SIZE	TYPE	A	B	LENGTH
12	502-5	5	STR.	-	-	2'-5"
6	518-2	5	STR.	-	-	18'-2"
6	718-2	7	STR.	-	-	18'-2"
4	818-2	8	STR.	-	-	18'-2"
4	918-2	9	STR.	-	-	18'-2"
56	6B2	6	B	1'-8"	1'-8"	8'-0"
18	5C1	5	C	6"	3'-5"	7'-1"
10	5C2	5	C	6"	4'-10"	9'-11"
4	5E7	5	E	2'-6 1/2"	10"	4'-3"
STRUCTURAL STEEL						
PLATE CP1 (SEE STANDARD SHEET 0000-17902-094)						2 Req'd
PLATE PP102 (SEE STANDARD SHEET 0000-17902-094)						1 Req'd
1 1/4" x 12" DAYTON SUPERIOR B-17 DOUBLE FLARED COIL LOOP INSERT 1 1/4" x 12" LONG, 13,500 LBS. SWL (SAFE WORKING LOAD), PLAIN						8 Req'd
8-TON SWIFT LIFT ANCHOR						3 Req'd



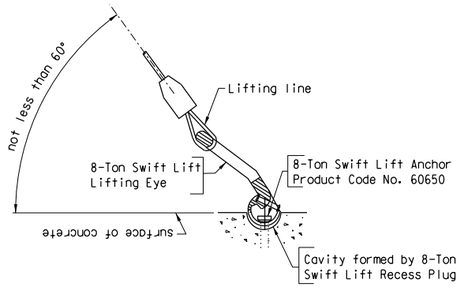
REINFORCING STEEL DETAILS

ALL DIMENSIONS ARE OUT-TO-OUT OF BARS



VIEW B-B

For further designation of horizontal bars, see elevations of precast members



LIFTING DETAIL

8-Ton Swift Lift Recess Plugs, Anchors and Lifting Eyes are available from Dayton/Richmond 721 Richard St., Miamisburg, Ohio 45342, Telephone (937) 866-0711. The materials for this lifting system are not included in the Bill of Material but are to be ordered as required.

NOTES:

GENERAL: ALL MATERIAL AND WORKMANSHIP SHALL BE AS PER THE CURRENT BNSF STANDARD SPECIFICATIONS.

COIL LOOP INSERTS ARE TO BE DOUBLE FLARED TYPE B17 1 1/4" DIA. x 12" AS MANUFACTURED BY DAYTON-SUPERIOR AND HAVE A SAFE WORKING LOAD OF 13,500 LBS. WITH A 4 TO 1 SAFETY FACTOR. THE INSERTS ARE TO BE COMPLETELY RECESSED WITH 1 1/4" DIA. x 13" SPIRAL BOLTS ATTACHED TO THE CAP FOR SHIPMENT.

CONCRETE: THE ULTIMATE COMPRESSIVE STRENGTH OF CONCRETE SHALL BE NOT LESS THAN 4000 p.s.i. IN 28 DAYS. CONCRETE MEMBERS SHALL NOT BE REMOVED FROM THE CASTING BED BEFORE THE CONCRETE REACHES A STRENGTH OF 2500 p.s.i.

ALL EXPOSED EDGES OF CONCRETE MEMBERS SHALL BE CHAMFERED 3/4 INCH.

REINFORCEMENT: MILD STEEL REINFORCEMENT SHALL MEET THE REQUIREMENTS OF THE CURRENT A.S.T.M. DESIGNATION: A615 OR A706, GRADE 60.

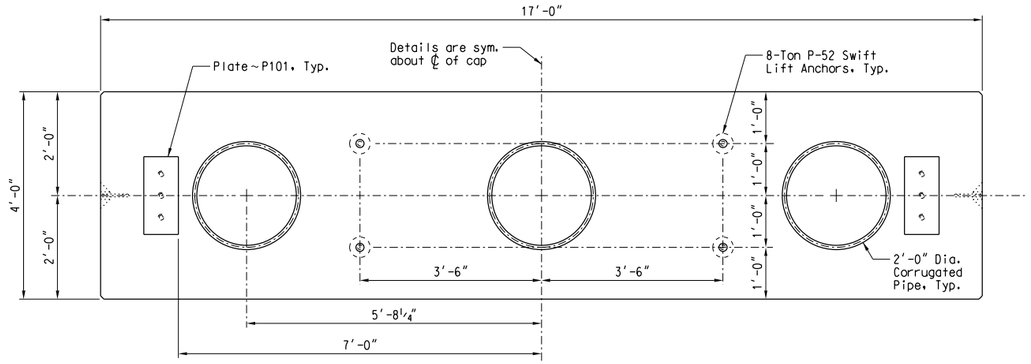
FABRICATION OF REINFORCEMENT SHALL BE IN ACCORDANCE WITH CHAPTER 7 OF THE CURRENT C.R.S.I. MANUAL OF STANDARD PRACTICE.

STEEL REINFORCEMENT MAY BE MOVED SLIGHTLY SO AS TO MISS PP102 OR CP1.

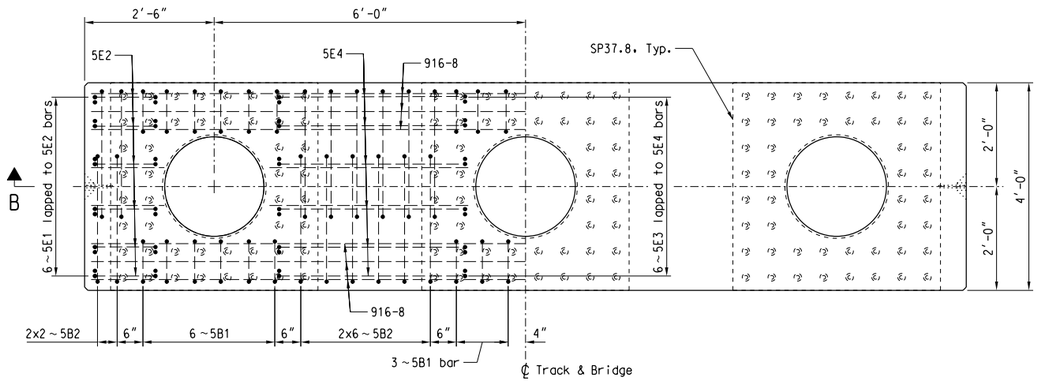
MINIMUM CONCRETE COVER ON REINFORCEMENT SHALL BE TWO (2) INCHES.

HANSON
Hanson Professional Services Inc.

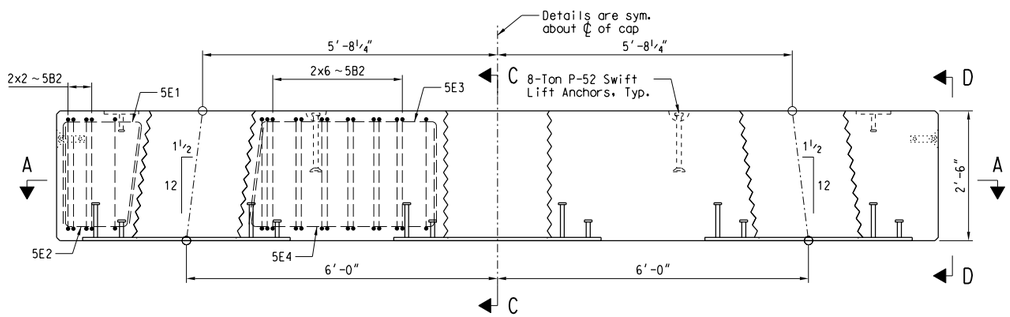
DES: JEC	BNSF RAILWAY	USA CANADA BORDER TO DELTA JCT.	
DRAWN: GTJ	BRIDGE ENGINEERING KANSAS CITY, KS	BRIDGE NO. 37.8 - SOUTH APPROACH	
CHECK: MAF		OVER STEAMBOAT SLOUGH MARYSVILLE, WA	
DATE: 5/13/14	APPROVED: Gregory M Harrist	P/C CONCRETE ABUTMENT CAP~SPC37.8-1	
AUTH: A141328	ASST. DIRECTOR STRUCTURES DESIGN	PLAN NO: 0050-37.8-007	SHEET: 7 OF 12
LINE SEG: 0050			



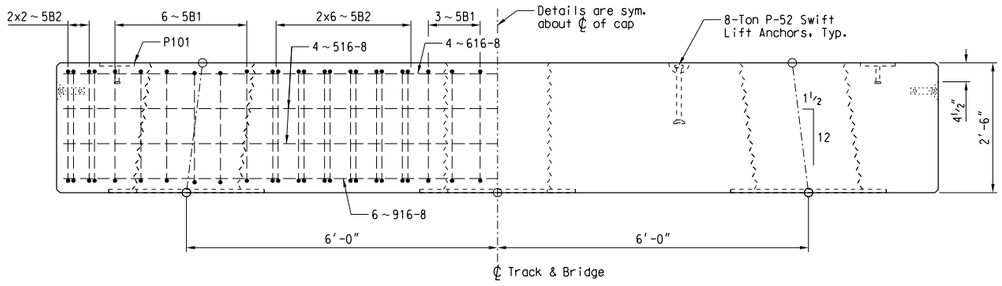
PLAN



SECTION A-A

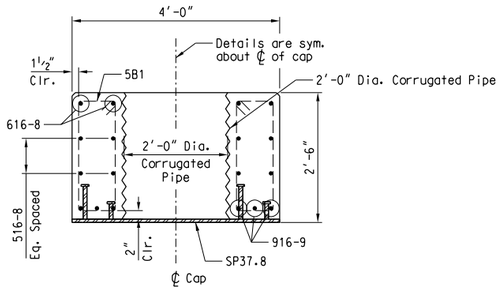


SECTION B-B

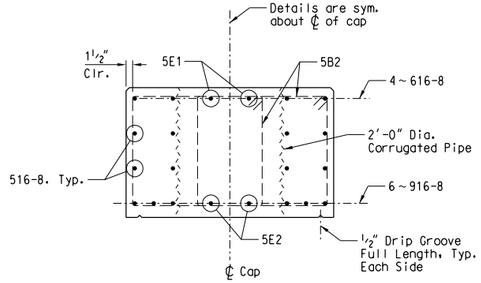


ELEVATION ~ SPC37.8-2

Wt. = 27,400 lbs., Vol. = 6.2 cu. yds., Reinf. Steel = 1,485 lbs.

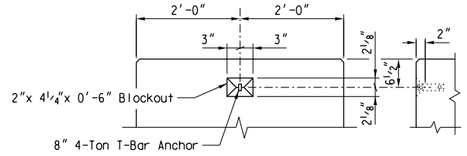


SECTION C-C



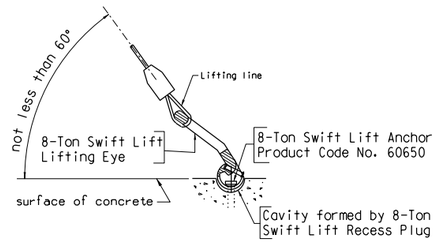
END VIEW D-D

SP37.8 not shown for clarity.



DETAIL

Typical at each end of cap



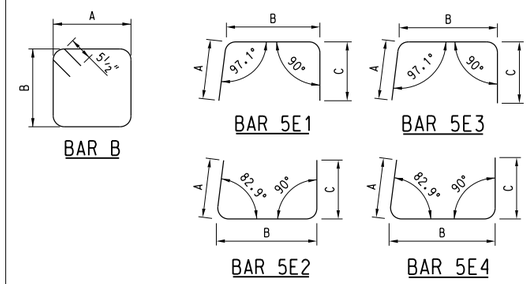
LIFTING DETAIL

8-Ton Swift Lift Recess Plugs, Anchors and Lifting Eyes are available from Dayton/Richmond 721 Richard St., Miamisburg, Ohio 45342, Telephone (937) 866-0711. The materials for this lifting system are not included in the Bill of Material but are to be ordered as required.

LIST OF REINFORCING BARS PER SPC37.8-2

NO.	MARK	SIZE	TYPE	A	B	C	LENGTH
8	516-8	5	STR.	-	-	-	16'-8"
4	616-8	6	STR.	-	-	-	16'-8"
6	916-8	9	STR.	-	-	-	16'-8"
36	5B1	5	B	8"	2'-1"	-	6'-5"
32	5B2	5	B	2'-6"	2'-1"	-	10'-1"
12	5E1	5	E	2'-1"	1'-6"	2'-1"	5'-8"
12	5E2	5	E	2'-1"	1'-2"	2'-1"	5'-4"
12	5E3	5	E	2'-0"	3'-4"	2'-1"	7'-5"
12	5E4	5	E	2'-0"	3'-7"	2'-1"	7'-8"

STRUCTURAL STEEL	
PLATE P101 (SEE DETAIL SHT. 0050-37.8-010)	2 Req'd
PLATE SP37.8 (SEE DETAIL SHT. 0050-37.8-004)	3 Req'd
2'-0" DIA. CORRUGATED PIPE	3 Req'd



REINFORCING STEEL DETAILS

ALL DIMENSIONS ARE OUT-TO-OUT OF BARS

NOTES:

GENERAL:
ALL MATERIAL AND WORKMANSHIP SHALL BE AS PER THE CURRENT BNSF STANDARD SPECIFICATIONS.

ALL EXPOSED EDGES OF CONCRETE MEMBERS SHALL BE CHAMFERED ¾" INCH.

CAST-IN-PLACE CONCRETE: THE ULTIMATE COMPRESSIVE STRENGTH OF CONCRETE SHALL BE NOT LESS THAN 4000 p.s.i. IN 28 DAYS.

REINFORCEMENT: MILD STEEL REINFORCEMENT SHALL MEET THE REQUIREMENTS OF THE CURRENT ASTM DESIGNATION: A615, GRADE 60 OR A706, GRADE 60.

FABRICATION OF REINFORCEMENT SHALL BE IN ACCORDANCE WITH CHAPTER 7 OF THE CURRENT C.R.S.I. MANUAL OF STANDARD PRACTICE.

STEEL REINFORCEMENT MAY BE MOVED SLIGHTLY SO AS TO MISS EMBEDDED ITEMS.

MINIMUM CONCRETE COVER ON REINFORCEMENT SHALL BE TWO (2) INCHES.

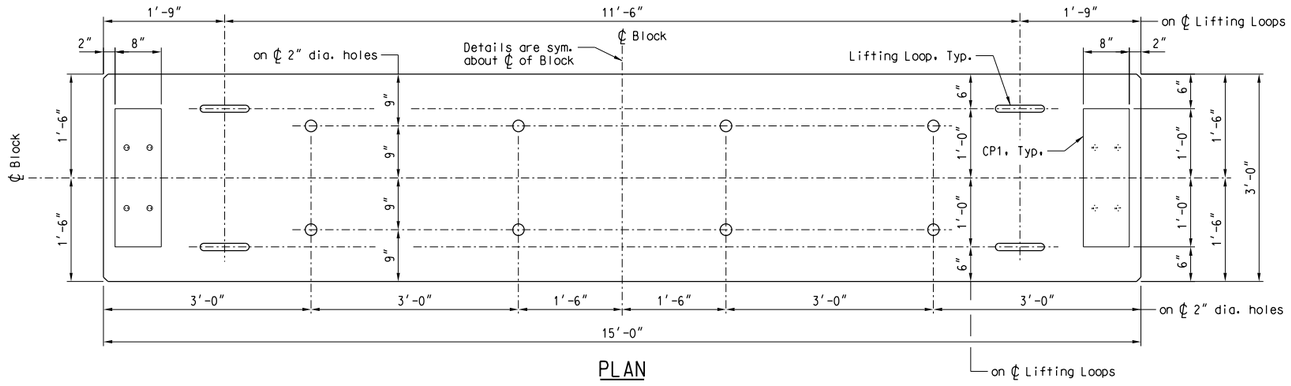
HANSON
Hanson Professional Services Inc.

DES: JEC	
DRAWN: GTJ	
CHECK: MAF	
DATE: 5/13/14	
AUTH: A141328	
LINE SEG: 0050	

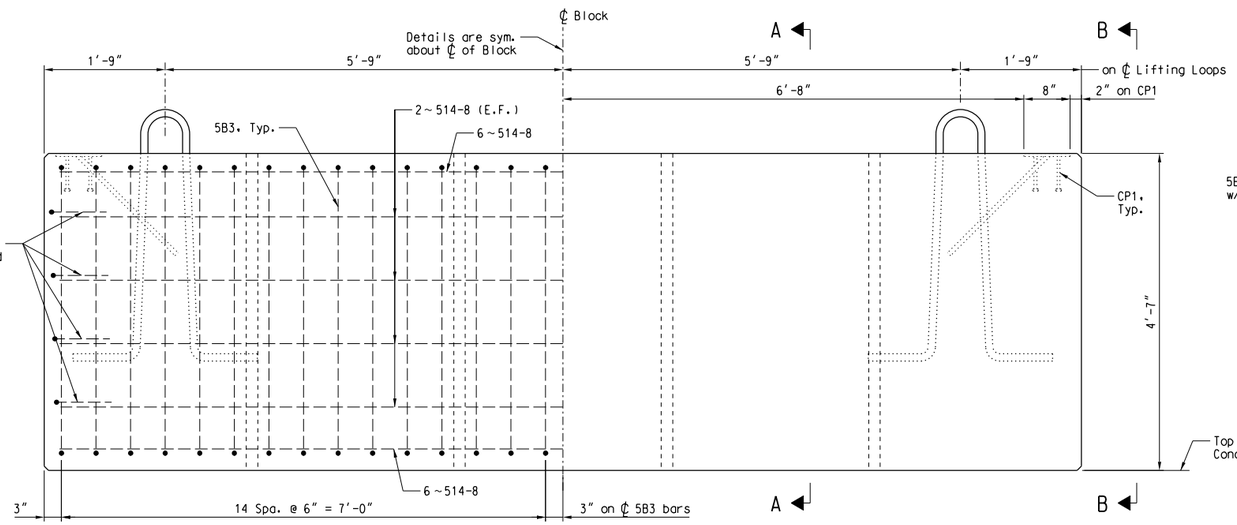
BNSF RAILWAY
BRIDGE ENGINEERING KANSAS CITY, KS
APPROVED: Kingston M Hurst
ASST. DIRECTOR STRUCTURES DESIGN

USA CANADA BORDER TO DELTA JCT.
BRIDGE NO. 37.8 - SOUTH APPROACH
OVER STEAMBOAT SLOUGH
MARYSVILLE, WA
P/C CONCRETE BENT CAP~SPC37.8-2

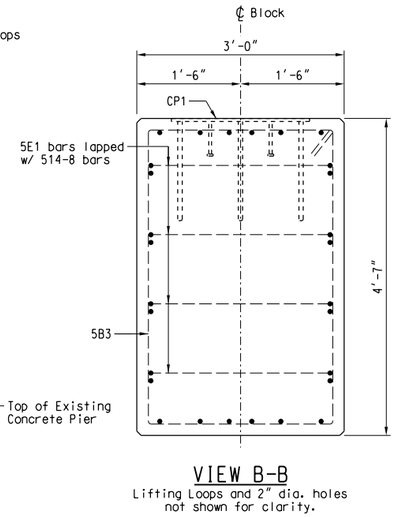
PLAN NO: 0050-37.8-008 | SHEET: 8 OF 12



PLAN



ELEVATION

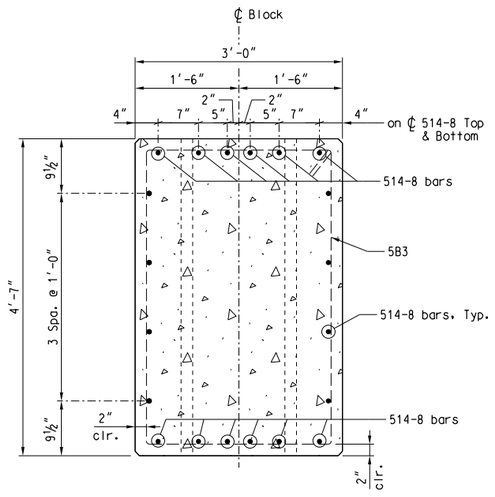


VIEW B-B

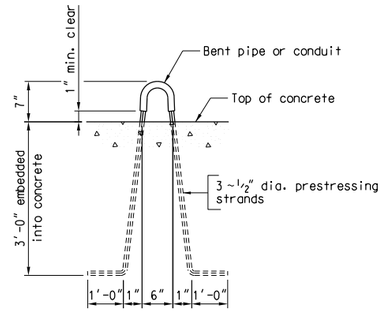
Lifting Loops and 2" dia. holes not shown for clarity.

PRECAST CONCRETE BEARING BLOCK ~ SBB37.8-1

Wt. = 30,800 lbs. Vol. = 7.6 cu.yds. Reinf. Steel = 810 lbs. Misc. Steel = 80 lbs.



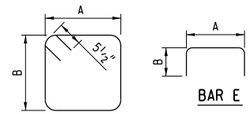
SECTION A-A



LIFTING LOOP DETAIL

LIST OF REINFORCING BARS REQUIRED PER SBB37.8-1						
NO.	MARK	SIZE	TYPE	A	B	LENGTH
30	5B3	#5	B	2'-8"	4'-3"	14'-9"
8	5E1	#5	E	2'-6½"	10"	4'-3"
20	514-8	#5	STR.	-	-	14'-8"

STRUCTURAL STEEL	
CP1 PLATE (See Standard Sheet 0000-17902-094)	2 REQ'D
#10 DOWELS x 6'-5" (Ship Loose)	8 REQ'D



REINFORCING STEEL DETAILS

All dimensions shown are out to out of bars.

NOTES:

GENERAL: ALL MATERIAL AND WORKMANSHIP SHALL BE AS PER THE CURRENT BNSF STANDARD SPECIFICATIONS.

ALL EXPOSED EDGES OF CONCRETE MEMBERS SHALL BE CHAMFERED ¾ INCH.

PRECAST CONCRETE: THE ULTIMATE COMPRESSIVE STRENGTH OF CONCRETE SHALL BE NOT LESS THAN 4000 p.s.i. IN 28 DAYS. CONCRETE MEMBERS SHALL NOT BE REMOVED FROM THE CASTING BED BEFORE THE CONCRETE REACHES A STRENGTH OF 2500 p.s.i.

REINFORCEMENT: MILD STEEL REINFORCEMENT SHALL MEET THE REQUIREMENTS OF THE CURRENT ASTM DESIGNATION: A615, GRADE 60 OR A706, GRADE 60.

FABRICATION OF REINFORCEMENT SHALL BE IN ACCORDANCE WITH CHAPTER 7 OF THE CURRENT C.R.S.I. MANUAL OF STANDARD PRACTICE.

STEEL REINFORCEMENT MAY BE MOVED SLIGHTLY TO MISS EMBEDDED ITEMS.

MINIMUM CONCRETE COVER ON REINFORCEMENT SHALL BE TWO (2) INCHES.

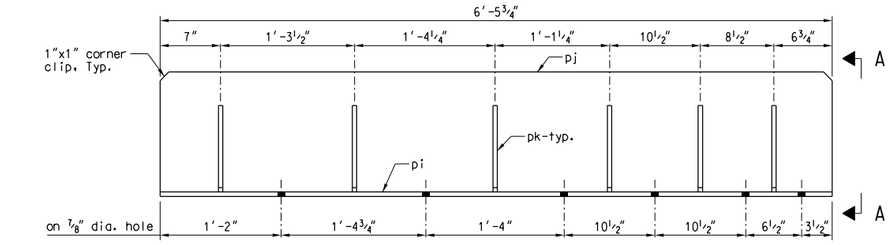
HANSON
Hanson Professional Services Inc.

DES: JEC	
DRAWN: GTJ	
CHECK: MAF	
DATE: 5/13/14	
AUTH: A141328	
LINE SEG: 0050	

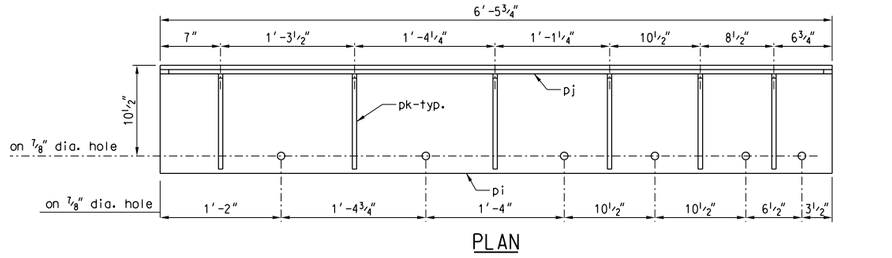
BNSF RAILWAY
BRIDGE ENGINEERING KANSAS CITY, KS
APPROVED: Huston M Hurst
ASST. DIRECTOR STRUCTURES DESIGN

USA CANADA BORDER TO DELTA JCT.
BRIDGE NO. 37.8 - SOUTH APPROACH
OVER STEAMBOAT SLOUGH
MARYSVILLE, WA
PRECAST CONCRETE BEARING BLOCK ~ SBB37.8-1

PLAN NO: 0050-37.8-009 SHEET: 9 OF 12



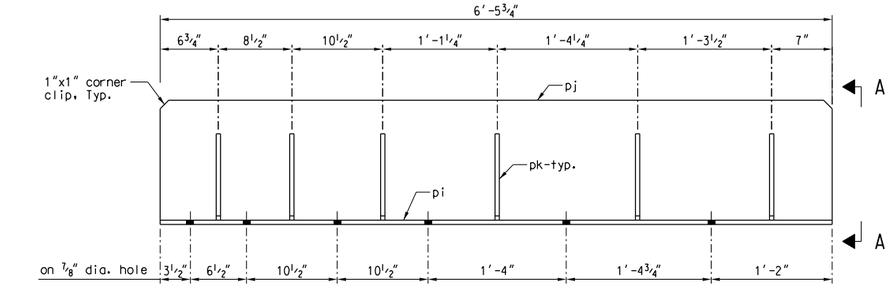
ELEVATION



PLAN

BSP37.8-1

1 - Plate ½″x12½″x6′-5¾″ ~ pi
1 - Plate ½″x13⅞″x6′-5¾″ ~ pj
6 - Plate ½″x11″x0′-10″ ~ pk
(1 Required)
Weight = 340 lbs.
ASTM A709, GR. 50
Galvanized after fabrication



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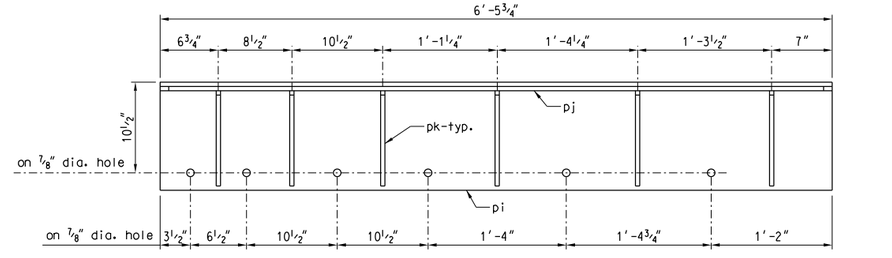
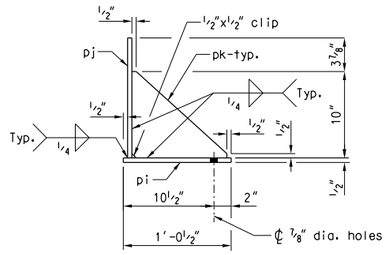


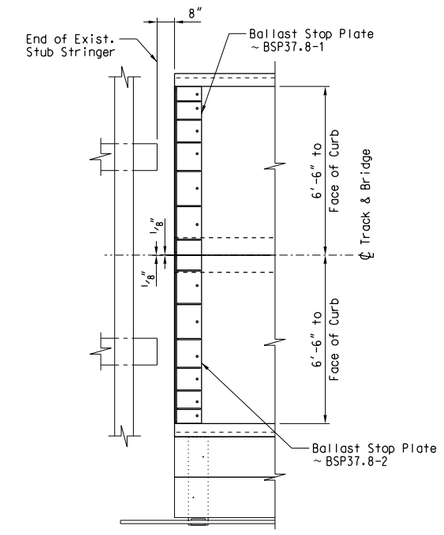
PLAN

BSP37.8-2

1 - Plate ½″x12½″x6′-5¾″ ~ pi
1 - Plate ½″x13⅞″x6′-5¾″ ~ pj
6 - Plate ½″x11″x0′-10″ ~ pk
(1 Required)
Weight = 340 lbs.
ASTM A709, GR. 50
Galvanized after fabrication



END VIEW A-A



PLAN - BALLAST STOP PLATE

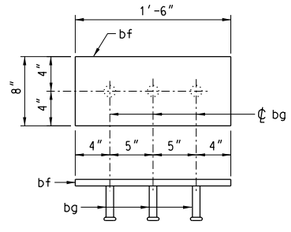
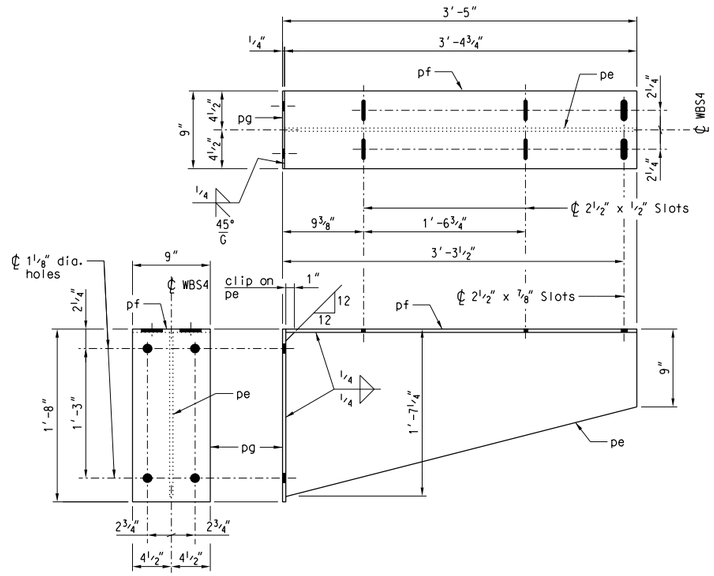


PLATE P101

1 - Bar 8″ x ¾″ x 1′-6″ ~ bf
3 - ⅞″ Dia. x 4″ Studs ~ bg
Weight = 32.7 lbs.



WALK BRACKET ~ WBS4

1 ~ Plate ¼″ x 19″ x 3′-4¾″ ~ pe
① 1 ~ Plate ¼″ x 9″ x 3′-4¾″ ~ pf
1 ~ Plate ¼″ x 9″ x 1′-8″ ~ pg
Weight = 80.0 lbs.
Galvanize after fabrication

① One (1) bent plate may be substituted for the two (2) plates shown. Minimum inside radii of bend in plate shall be 1.5 times the thickness of the plate for cold bending.

GENERAL NOTES:

MATERIAL: STRUCTURAL STEEL SHALL MEET THE REQUIREMENTS OF THE CURRENT A.S.T.M. DESIGNATION: A36, U.N.O.

FABRICATION NOTES:

SHOP NOTES: FABRICATION AND ARC WELDING OF STRUCTURAL STEEL SHALL BE IN ACCORDANCE WITH CHAPTER 15, PART 3 OF THE CURRENT A.R.E.M.A. MANUAL FOR RAILWAY ENGINEERING.

OPEN HOLES: AS NOTED.

SHEAR CONNECTOR STUDS SHALL BE AUTOMATICALLY END WELDED WITH COMPLETE FUSION IN ACCORDANCE WITH SECTION 7 OF THE CURRENT A.W.S. STRUCTURAL WELDING CODE D1.1.

GALVANIZING:

BSP37.8-1, BSP37.8-2 AND WBS4 SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH THE CURRENT A.S.T.M. DESIGNATION: A123.

AFTER GALVANIZING ALL ELEMENTS SHALL BE FREE OF FINS, ABRASIONS, ROUGH OR SHARP EDGES AND OTHER SURFACE DEFECTS.

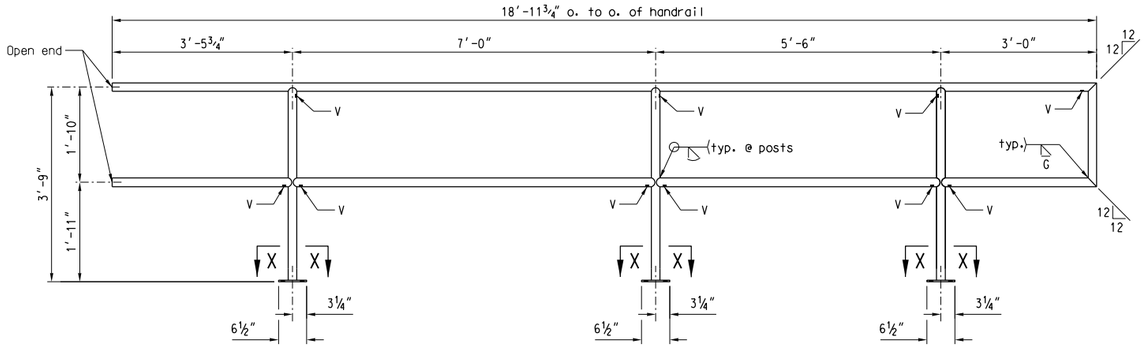
HANSON
Hanson Professional Services Inc.

DES: JEC	
DRAWN: GTJ	
CHECK: MAF	
DATE: 5/13/14	
AUTH: A141328	
LINE SEG: 0050	

BNSF RAILWAY
BRIDGE ENGINEERING KANSAS CITY, KS
APPROVED: Augustin M. Hurst
ASST. DIRECTOR STRUCTURES DESIGN

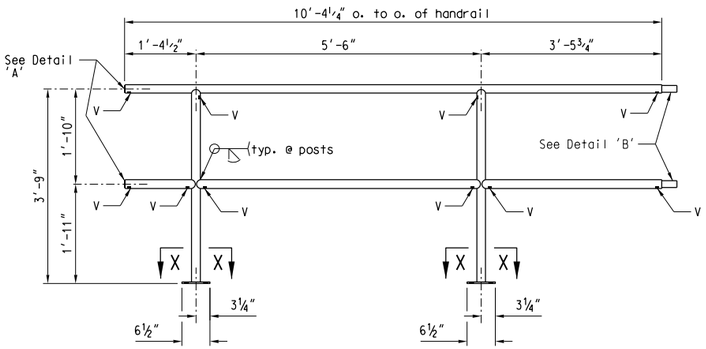
USA CANADA BORDER TO DELTA JCT.
BRIDGE NO. 37.8 - SOUTH APPROACH
OVER STEAMBOAT SLOUGH
MARYSVILLE, WA
MISCELLANEOUS STEEL DETAILS

PLAN NO: 0050-37.8-010 | SHEET: 10 OF 12



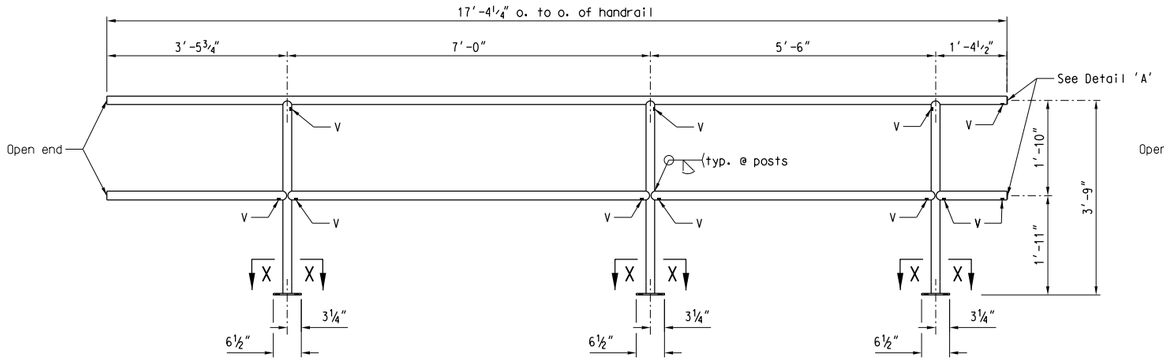
HANDRAIL PANEL ~ SHP37.8-1 (1 REQ'D)

Handrail panels are to be fabricated using 1½" dia.
std. black pipe. Galvanize after fabrication.
Weight = 146 lbs.



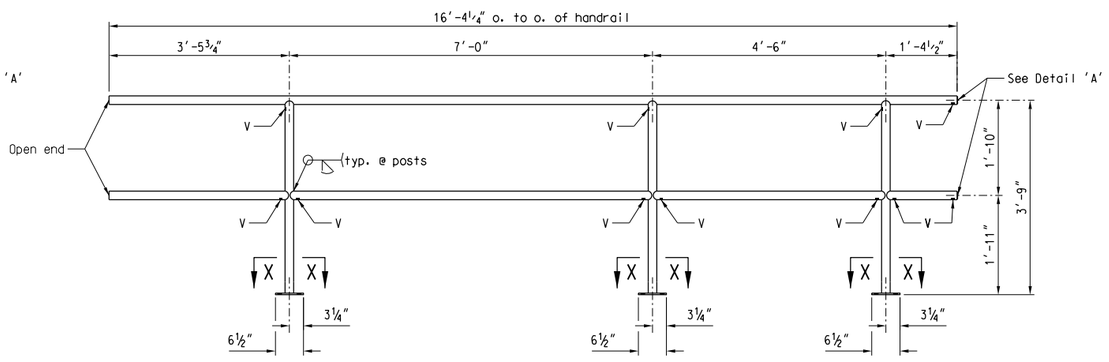
HANDRAIL PANEL ~ SHP37.8-2 (3 REQ'D)

Handrail panels are to be fabricated using 1½" dia.
std. black pipe. Galvanize after fabrication.
Weight = 87 lbs.



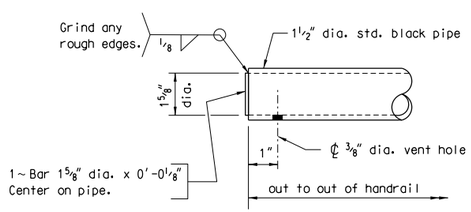
HANDRAIL PANEL ~ SHP37.8-3 (2 REQ'D)

Handrail panels are to be fabricated using 1½" dia.
std. black pipe. Galvanize after fabrication.
Weight = 132 lbs.

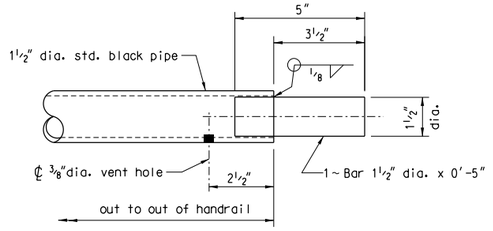


HANDRAIL PANEL ~ SHP37.8-4 (1 REQ'D)

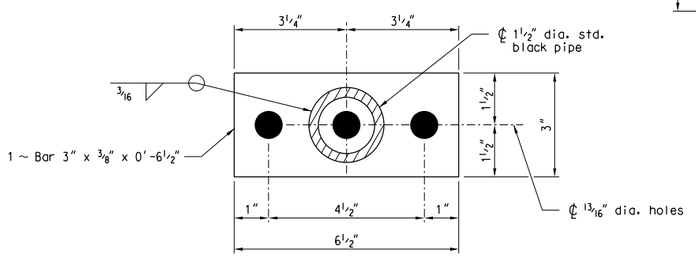
Handrail panels are to be fabricated using 1½" dia.
std. black pipe. Galvanize after fabrication.
Weight = 127 lbs.



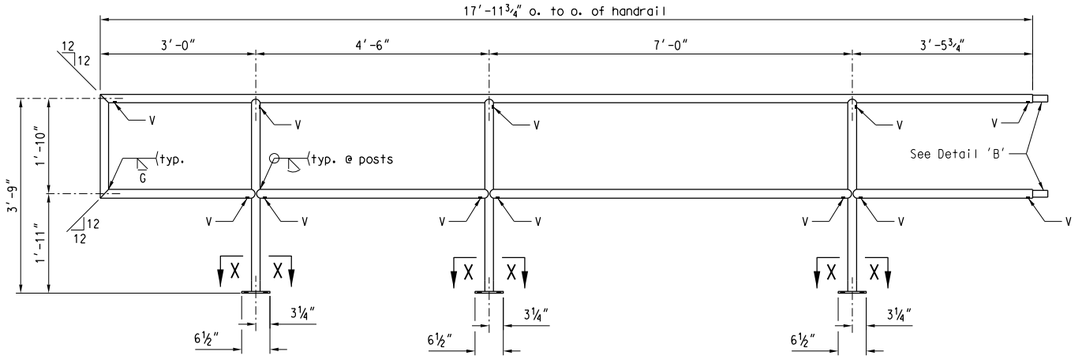
DETAIL 'A'



DETAIL 'B'



SECTION X-X



HANDRAIL PANEL ~ SHP37.8-5 (1 REQ'D)

Handrail panels are to be fabricated using 1½" dia.
std. black pipe. Galvanize after fabrication.
Weight = 145 lbs.

NOTES:

MATERIAL: STRUCTURAL STEEL BARS SHALL MEET THE REQUIREMENTS OF THE CURRENT ASTM DESIGNATION: A36.

STANDARD BLACK PIPE SHALL MEET THE REQUIREMENTS OF THE CURRENT ASTM DESIGNATION: A53. UNCOATED PIPE SHALL BE USED.

SHOP NOTES: FABRICATION AND ARC WELDING OF STRUCTURAL STEEL AND HANDRAIL PANELS SHALL BE IN ACCORDANCE WITH CHAPTER 15, PART 3 OF THE CURRENT A.R.E.M.A. MANUAL FOR RAILWAY ENGINEERING. MIG WELDING SHALL BE USED ON HANDRAIL PANELS.
OPEN HOLES: AS NOTED. SHOP PAINT: NONE.

GALVANIZING: HANDRAIL PANELS SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH THE CURRENT ASTM DESIGNATION: A123.

AFTER GALVANIZING, ALL ELEMENTS SHALL BE FREE OF FINS, ABRASIONS, ROUGH OR SHARP EDGES AND OTHER SURFACE DEFECTS.

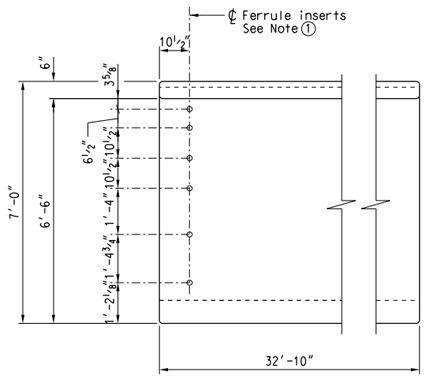
HANSON
Hanson Professional Services Inc.

DES:	JEC
DRAWN:	GTJ
CHECK:	MAF
DATE:	5/13/14
AUTH:	A141328
LINE SEG:	0050

BNSF RAILWAY
BRIDGE ENGINEERING KANSAS CITY, KS
APPROVED: Kristin M Hurst
ASST. DIRECTOR STRUCTURES DESIGN

USA CANADA BORDER TO DELTA JCT.
BRIDGE NO. 37.8 - SOUTH APPROACH
OVER STEAMBOAT SLOUGH
MARYSVILLE, WA
HANDRAIL PANEL DETAILS

PLAN NO: 0050-37.8-011 | SHEET: 11 OF 12



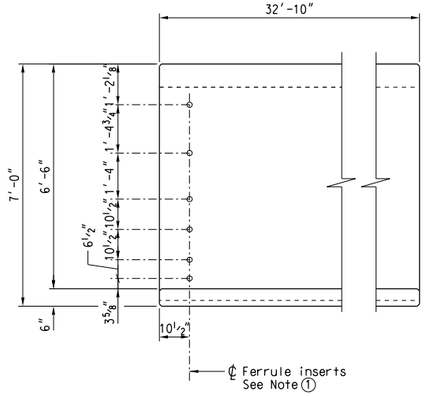
PLAN

Fabricator's Note:
For 32'-10" Double Cell Box Girder Details not shown on this plan, and Fabrication Notes, see BNSF/UP Combined Standard Plans 500000-BG1, Rev. F, BG2, Rev. F, & BG3, Rev. F.

① Cast-In-Place Ferrule Inserts, F-65, ¾" dia.x4", Type I, as manufactured by Dayton Superior Corp. or equal. Furnish with ¾" dia. bolts and washers. All items shall be galvanized.

32'-10" P/S CONC. DOUBLE CELL BOX GIRDER WITH CURB

1 Req'd. - Mk. SCDC37.8-1



PLAN

Fabricator's Note:
For 32'-10" Double Cell Box Girder Details not shown on this plan, and Fabrication Notes, see BNSF/UP Combined Standard Plans 500000-BG1, Rev. F, BG2, Rev. F, & BG3, Rev. F.

① Cast-In-Place Ferrule Inserts, F-65, ¾" dia.x4", Type I, as manufactured by Dayton Superior Corp. or equal. Furnish with ¾" dia. bolts and washers. All items shall be galvanized.

32'-10" P/S CONC. DOUBLE CELL BOX GIRDER WITH CURB

1 Req'd. - Mk. SCDC37.8-2

REQ. NO.: PR69668	REQUEST ID.: SB00	LINE SEG.: 0050	MILE POST: 37.8	DELIVERY DATE: JULY 7, 2014

SHIP TO: CHAD GORDON
SUPERVISOR STRUCTURES
DELTA YARD
EVERETT, WA
(425) 220-8097

SEND SHIPPING PAPERS TO: CHAD GORDON
SUPERVISOR STRUCTURES
BNSF RAILWAY
2900 BOND ST.
EVERETT, WA

ACCT.: ????	COST CLASS: ???
WORK REASON: ???	COST CTR.: ?????
LOC. NO.: ??????	TAX CODE: ??
AUTH.: A141328	P.O. NO.: -

SIGNATURE ALAN BLOOMQUIST TITLE: MGR STRUCTURES DESIGN DATE: MAY 2014

BILL OF MATERIAL

LINE	QUAN.	UNIT	DESCRIPTION	MARK	SIZE	LENGTH	REMARKS
1	135,700	LBS.	STEEL PIPE PILE, ASTM A252, GR. 3 w/ EPOXY COATING (18 PIECES)		24" Dia. x ½"	60'-0"	MINIMUM YIELD STRENGTH OF 50 KSI
2	42,120	LBS.	STEEL BEARING PILE, ASTM A572, GR. 50 (6 PIECES)		HP14X117#	60'-0"	
3	9	EA.	CONICAL PIPE PILE TIPS, ASTM A148		24" DIA.		PER PLAN 0050-37.8-003
4							
5	6	EA.	PRECAST P/S CONC. DBL. CELL BOX BEAM w/ CURB	CDC27-10C	30"x7'-0"	27'-10"	PER PLAN 500000 BG1, BG2 & BG3
6	1	EA.	PRECAST P/S CONC. DBL. CELL BOX BEAM w/ CURB	SCDC37.8-1	30"x7'-0"	32'-10"	PER PLAN 0050-37.8-012
7	1	EA.	PRECAST P/S CONC. DBL. CELL BOX BEAM w/ CURB	SCDC37.8-2	30"x7'-0"	32'-10"	PER PLAN 0050-37.8-012
8	1	EA.	PRECAST CONC. BEARING BLOCK	SBB37.8-1	3'-0"x4'-7"	15'-0"	PER PLAN 0050-37.8-009
9	1	EA.	PRECAST CONC. ABUTMENT CAP	SPC37.8-1	3'-0"x5'-11¾"	18'-6"	PER PLAN 0050-37.8-007
10	3	EA.	PRECAST CONC. BENT CAP	SPC37.8-2	4'-0"x2'-6"	17'-0"	PER PLAN 0050-37.8-008
11	2	EA.	PRECAST CONC. WINGWALL	PW103	9"x5'-11¾"	8'-6"	PER PLAN 0000-17902-091
12							
13	10	EA.	PLATE WASHER, ASTM A36, GALVANIZED	W100	4"x3¼"	4"	PER PLAN 0000-17902-094
14	4	EA.	DECK PLATE, ASTM A709, GR. 36, GALVANIZED	DP100	8"x⅜"	6'-5½"	PER PLAN 0000-17902-094
15	4	EA.	DECK PLATE, ASTM A709, GR. 36, GALVANIZED	DP101	8"x⅜"	6'-5½"	PER PLAN 0000-17902-094
16	10	EA.	RESTRAINER BRACKET	B100	PC OF HP14x89#	8"	PER PLAN 0000-17902-094
17	1	EA.	BALLAST STOP PLATE, ASTM A709, GR. 36, GALVANIZED	BSP37.8-1	14⅜"x12½"	6'-5¾"	PER PLAN 0050-37.8-010
18	1	EA.	BALLAST STOP PLATE, ASTM A709, GR. 36, GALVANIZED	BSP37.8-2	14⅜"x12½"	6'-5¾"	PER PLAN 0050-37.8-010
19							
20	1	EA.	HANDRAIL PANEL, ASTM A53, GALVANIZED	SHP37.8-1	1½" DIA. PIPE	18'-11¾"	PER PLAN 0050-37.8-011
21	3	EA.	HANDRAIL PANEL, ASTM A53, GALVANIZED	SHP37.8-2	1½" DIA. PIPE	10'-4¼"	PER PLAN 0050-37.8-011
22	2	EA.	HANDRAIL PANEL, ASTM A53, GALVANIZED	SHP37.8-3	1½" DIA. PIPE	17'-4¼"	PER PLAN 0050-37.8-011
23	1	EA.	HANDRAIL PANEL, ASTM A53, GALVANIZED	SHP37.8-4	1½" DIA. PIPE	16'-4¼"	PER PLAN 0050-37.8-011
24	1	EA.	HANDRAIL PANEL, ASTM A53, GALVANIZED	SHP37.8-5	1½" DIA. PIPE	17'-11¾"	PER PLAN 0050-37.8-011
25							
26	42	EA.	ASTM A325 H.S. BOLT w/ NUT		¾" DIA.	2"	HANDRAIL POST
27	84	EA.	HARDENED CARBON STEEL CIRCULAR WASHER		¾" DIA.		HANDRAIL POST
28	21	EA.	WALKWAY BRACKET, ASTM A709, GR. 36, GALVANIZED	WBS4	9"x1'-8"	3'-5"	PER PLAN 0050-37.8-010
29							
30	2	EA.	GRIP STRUT SAFETY GRATING, 12 GA., GALV.	①	3"x18¾"	5'-11"	PER PLAN 0050-37.8-002
31	2	EA.	GRIP STRUT SAFETY GRATING, 12 GA., GALV.	②	3"x18¾"	12'-11"	PER PLAN 0050-37.8-002
32	12	EA.	GRIP STRUT SAFETY GRATING, 12 GA., GALV.	③	3"x18¾"	6'-11"	PER PLAN 0050-37.8-002
33	8	EA.	GRIP STRUT SAFETY GRATING, 12 GA., GALV.	④	3"x18¾"	14'-0"	PER PLAN 0050-37.8-002
34							
35	84	EA.	CARRIAGE BOLT, ROUND HEAD, SQ. NECK, GALVANIZED		5/16" DIA.	4½"	FOR FASTENING GRATING
36	84	EA.	LOCK NUT, CENTER LOCKING, ZINC PLATED		5/16" DIA.		FOR FASTENING GRATING
37	84	EA.	WASHER, FLAT, ROUND 12 GA., GALVANIZED		⅜" I.D.	⅞" O.D.	FOR FASTENING GRATING
38	84	EA.	GRIP STRUT ANCHORING DEVICE CLIP, GALV.	12262			FOR FASTENING GRATING
39							
40	16	EA.	URETHANE BEARING PAD, DUROMETER 70		¾"x10"	6'-4"	PER PLAN 0050-37.8-005
41							
42	32	EA.	PREMOLDED JOINT FILLER, ASPH. IMPREG.		½"x28"	6'-4"	PER PLAN 0050-37.8-006
43							
44	1	EA.	BRIDGE NUMBER SIGN, NO. 103	37.8			DETAIL PLAN 3103.01.03
45	1	EA.	NO TRESSPASSING SIGN, NO. 70		18"x24"		DETAIL PLAN 3070.01.05
46	1	EA.	SIGN POST, NO. 1, BLACK			11'-0"	(TRACK STD. PLAN BOOK)

BNSF TO FURNISH BRIDGE ITEMS SHOWN IN ABOVE BILL OF MATERIAL.

SUPERVISOR STRUCTURES TO PROVIDE EPOXY, GROUT, CLSM, STRUCTURE BACKFILL, CLASS 40 CONCRETE, REINFORCEMENT FOR CAST-IN-PLACE CONCRETE, PLYWOOD, WELDING CONSUMABLES, STEEL SHIMS, FORMWORK, FALSEWORK AND MISC. HARDWARE AS REQUIRED.

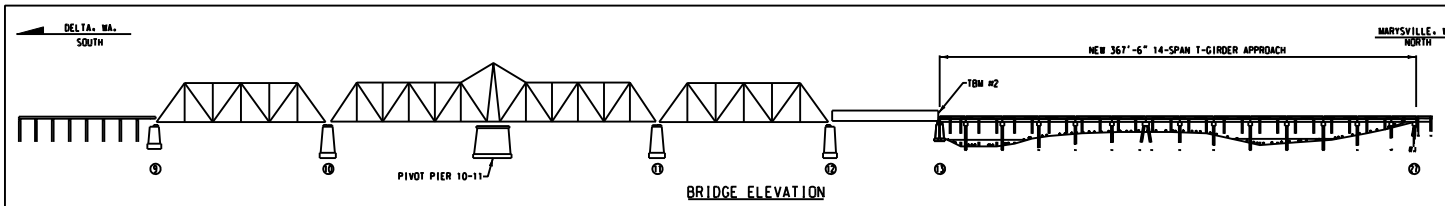
HANSON
Hanson Professional Services Inc.

DES: JEC
DRAWN: GTJ
CHECK: MAF
DATE: 5/13/14
AUTH: A141328
LINE SEG: 0050

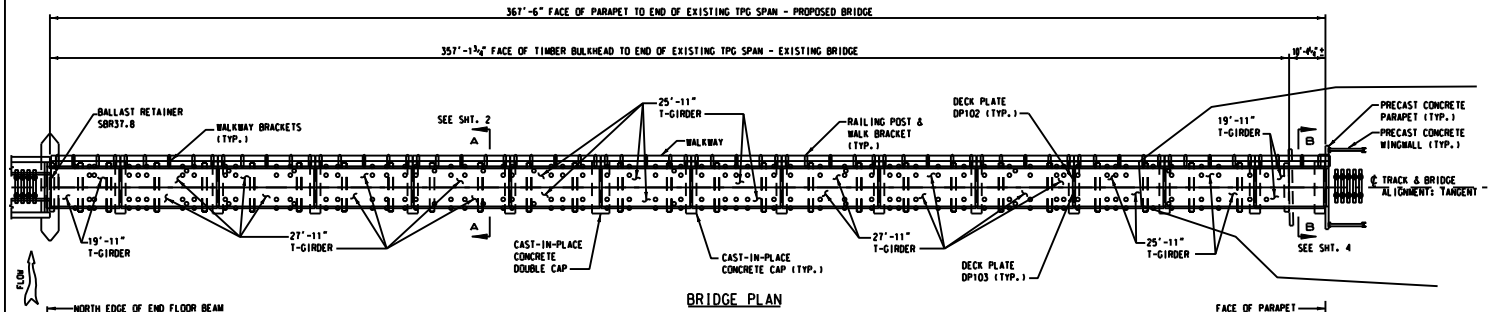
BNSF RAILWAY
BRIDGE ENGINEERING KANSAS CITY, KS
APPROVED: Hueston M Hurst
ASST. DIRECTOR STRUCTURES DESIGN

USA CANADA BORDER TO DELTA JCT.
BRIDGE NO. 37.8 - SOUTH APPROACH
OVER STEAMBOAT SLOUGH
MARYSVILLE, WA
BILL OF MATERIAL & DETAILS

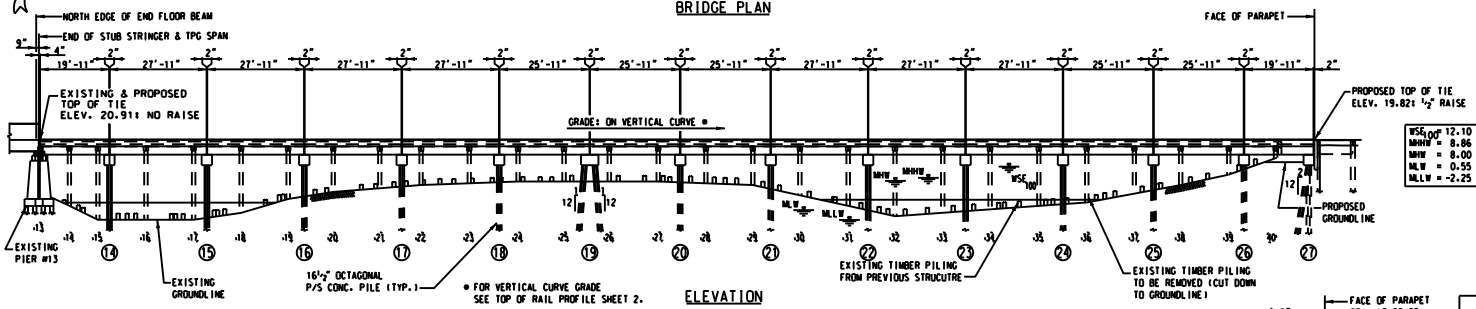
PLAN NO: 0050-37.8-012 SHEET: 12 OF 12



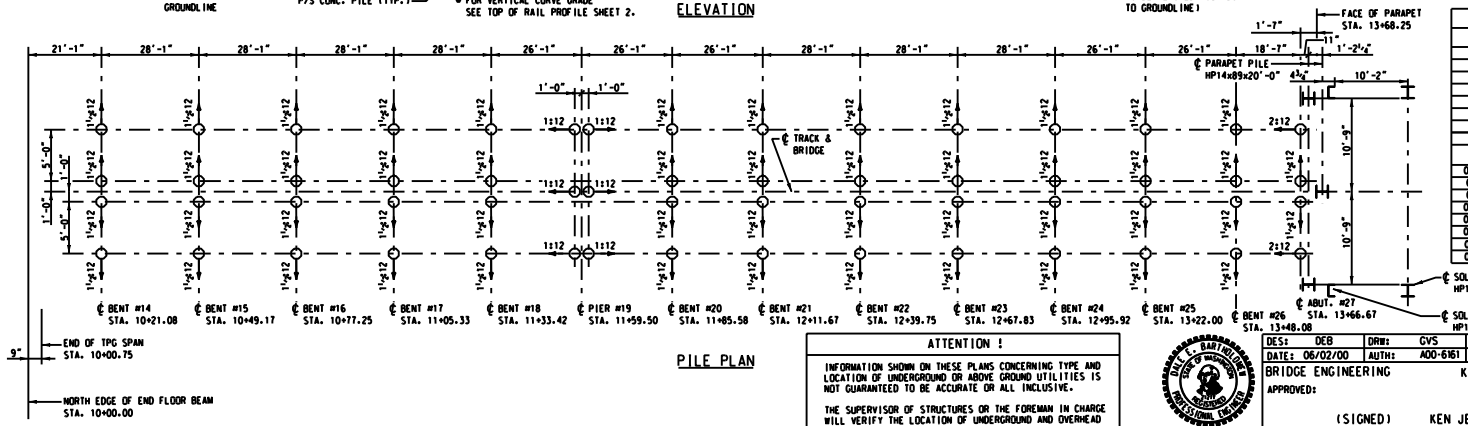
BRIDGE ELEVATION



BRIDGE PLAN



ELEVATION



PILE PLAN

GENERAL NOTES

DESIGN LOADING: COOPER E80 WITH DIESEL IMPACT FOR BALLASTED DECK.

NEW CONSTRUCTION SHOWN IN HEAVY LINES. EXISTING STRUCTURE TO REMAIN SHOWN IN LIGHT LINES.

TEMPORARY BENCH MARK: NORTH END OF BR. 37.8 ON TOP OF SOUTH CUTOFF VERTICAL RAIL SUPPORTING BULKHEAD WALL JUST EAST OF POINT OF DERAILER SWITCH STAND LOCATED AT STA. 15+23.95. (ELEV. 20.25)

TBM #2 TOP FLOOR BEAM. CHISELED "X" LOCATED AT STA. 9+99.50. (ELEV. 20.57)

SURVEY: GRADE AND ELEVATIONS ARE BASED ON PLAN AND PROFILE DATA PROVIDED BY TOKA. DATED OCT. 1999.

WATER SURFACE ELEVATIONS BASED ON NAVD 88 DATUM.
WSE100 = WATER SURFACE ELEVATION FOR 100-YR. EVENT.
MHHW = MEAN HIGHER HIGH WATER SURFACE ELEVATION.
MHW = MEAN HIGH WATER SURFACE ELEVATION.
MLW = MEAN LOW WATER SURFACE ELEVATION.
MLLW = MEAN LOWER LOW WATER SURFACE ELEVATION.

PILE NOTES

PILE SPACINGS SHOWN ARE AT PILE CUTOFF ELEVATIONS.
STEEL BEARING PILE PORTION OR COMBINATION STEEL/CONCRETE PILING SHALL BE DRIVEN TO REFUSAL, IF POSSIBLE, OR A MINIMUM ULTIMATE RESISTANCE OF 250 TONS AS DETERMINED BY THE MODIFIED ENGINEERING NEWS RECORD FORMULA.
SYMBOL X:12 SHOWS THE DIRECTION AND AMOUNT OF BATTER.
ESTIMATED PILE LENGTH BELOW CUTOFF = 100'.
MINIMUM CONCRETE PILE PENETRATION SHALL BE 15 FEET.
PILE DRIVING IS SUBJECT TO APPROVAL BY THE ENGINEER.
FOR ADDITIONAL PILING NOTES, SEE GENERAL NOTES ON PLAN NO. 0000-80801-01C.

TABLE OF LIFTING WEIGHTS - BRIDGE 37.8

COMPONENT	WEIGHT (LBS.)
19'-11" P/S CONCRETE SINGLE VOID T-GIRDER	28.500
25'-11" P/S CONCRETE SINGLE VOID T-GIRDER	37.000
27'-11" P/S CONCRETE SINGLE VOID T-GIRDER	39.900
16½" OCTAGONAL CONCRETE PILE	9.900
PRECAST CONCRETE BEARING BLOCK SBB37.8	12.000
PRECAST CONCRETE PARAPET WALL SPW37.8	13.200
PRECAST CONCRETE WINGWALL	4.000

TABLE OF ELEVATIONS - BRIDGE 37.8

LOCATION	NEW TOP/TIE	TOP/CAP	PILE CUTOFF
ABUT. 27	19.82	15.53	13.53
BENT 26	19.90	15.61	13.61
BENT 25	20.02	15.73	13.73
BENT 24	20.13	15.84	13.84
BENT 23	20.24	15.95	13.95
BENT 22	20.35	16.06	14.06
BENT 21	20.44	16.15	14.15
BENT 20	20.52	16.23	14.23
PIER 19	20.59	16.30	14.30
BENT 18	20.66	16.37	14.37
BENT 17	20.73	16.44	14.44
BENT 16	20.78	16.49	14.49
BENT 15	20.83	16.54	14.54
BENT 14	20.87	16.58	14.58

LIST OF DRAWINGS

PLAN NO.	TITLE
0050-37.8-32	GENERAL PLAN
0050-37.8-33	SECTIONS AND DETAILS
0050-37.8-34	CAST-IN-PLACE CONCRETE CAP DETAILS
0050-37.8-35	ERECTION DETAILS - ABUTMENT AND BENTS
0050-37.8-36	ERECTION DETAILS - WALKWAY
0050-37.8-37	ERECTION DETAILS - T-GIRDER AND BEARING BLOCK
0050-37.8-38	PRECAST PARAPET WALL AND BEARING BLOCK DETAILS
0050-37.8-39	BILL OF MATERIAL AND MISCELLANEOUS STEEL DETAILS
	REFERENCES
0000-10003-01A	PRESTRESSED CONCRETE SINGLE VOID T-GIRDER (SHEET 1 OF 3)
0000-10003-02	PRESTRESSED CONCRETE SINGLE VOID T-GIRDER (SHEET 2 OF 3)
0000-10003-03	PRESTRESSED CONCRETE SINGLE VOID T-GIRDER (SHEET 3 OF 3)
0000-10802-07B	MISCELLANEOUS DETAILS
0000-10802-34A	STEEL DETAILS
0000-10802-35A	GENERAL NOTES
0000-80801-01C	17"-4½" OCTAGONAL PRESTRESSED CONCRETE PILE (SHEET 1 OF 1)
0000-90899-01A	PRECAST CONCRETE WINGWALL EXTENSION

ATTENTION !

INFORMATION SHOWN ON THESE PLANS CONCERNING TYPE AND LOCATION OF UNDERGROUND OR ABOVE GROUND UTILITIES IS NOT GUARANTEED TO BE ACCURATE OR ALL INCLUSIVE.

THE SUPERVISOR OF STRUCTURES OR THE FOREMAN IN CHARGE WILL VERIFY THE LOCATION OF UNDERGROUND AND OVERHEAD UTILITIES BEFORE BEGINNING CONSTRUCTION.

DAVID E. BARTMESS — STATE OF WASHINGTON — REGISTERED PROFESSIONAL ENGINEER — EXPIRES: 10/03/01

DES: DEB	DRW: GVS	CHK: SG
DATE: 06/02/00	AUTH: A00-6161	LINE SEG: 0050

BRIDGE ENGINEERING — KANSAS CITY, KS

APPROVED:

(SIGNED) KEN JENNISON
ASSISTANT DIRECTOR STRUCTURES DESIGN

VANCOUVER, B.C. TO EVERETT JCT., WA.
BRIDGE 37.8
OVER STEAMBOAT SLOUGH
NEAR MARYSVILLE, WA.
GENERAL PLAN

BURLINGTON NORTHERN SANTA FE RAILWAY

PLAN NO.: 0050-37.8-32 | SHEET: 1 of 8

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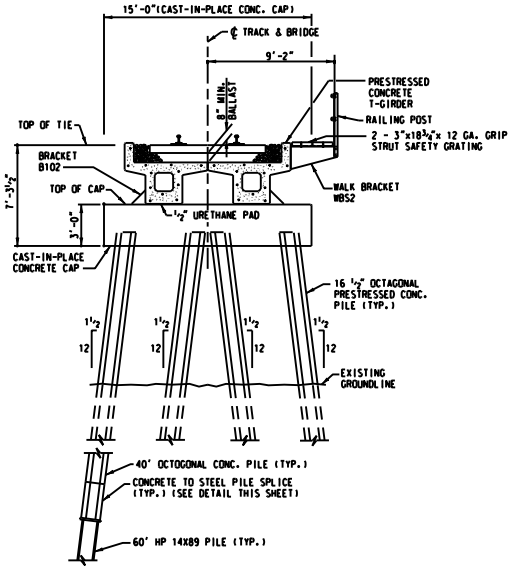
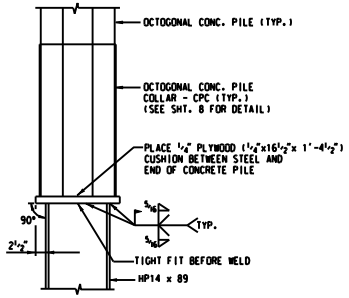
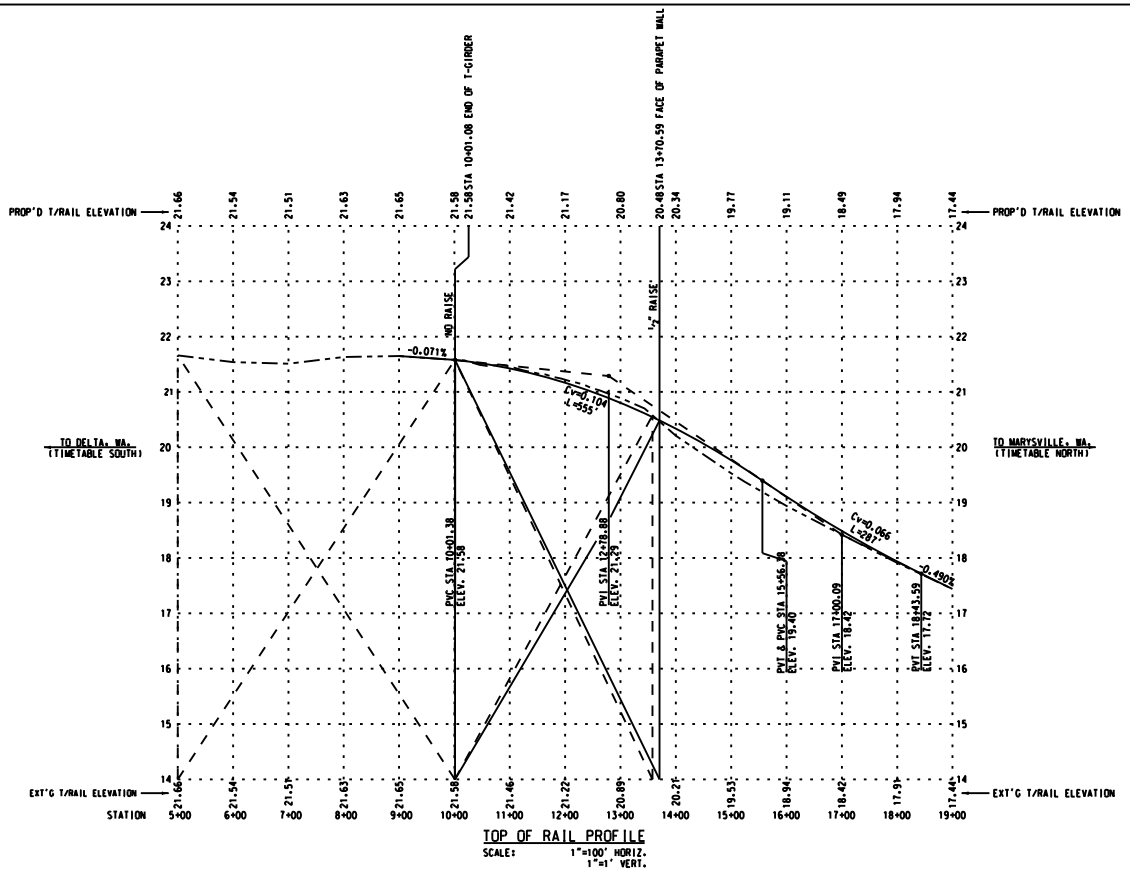


SECTION A-A
(DETAILS TYPICAL)
SEE SHEET 1 FOR LOCATION OF SECTION



TYPICAL CONCRETE PILE TO H-PILE SPLICE



TOP OF RAIL PROFILE
SCALE: 1"=100' HORIZ.
1"=1' VERT.

DES: OEB	DRW: GVS	CHK: SG			
DATE: 06/02/00	AUTH: A00-6161	LINE SEG: 0050			
BRIDGE ENGINEERING	KANSAS CITY, KS				
APPROVED:					
(SIGNED) KEN JENNISON					
ASSISTANT DIRECTOR STRUCTURES DESIGN					

STATE OF WASHINGTON — OLE E. BAUTZ — REGISTERED PROFESSIONAL ENGINEER
EXPIRES: 10/03/01

VANCOUVER, B.C. TO EVERETT JCT., WA.
BRIDGE 37.8
OVER STEAMBOAT SLOUGH
NEAR MARYSVILLE, WA.
SECTIONS AND DETAILS

BURLINGTON NORTHERN SANTA FE RAILWAY

PLAN NO.: 0050-37.8-33 | SHEET: 2 of 8

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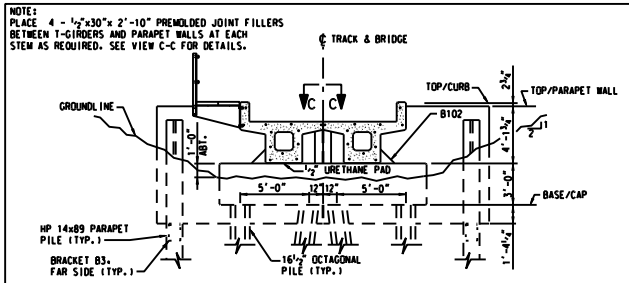
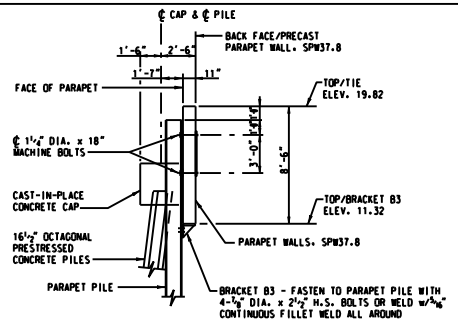


ELEVATION

SECTION B-B
TRACK NOT SHOWN FOR CLARITY
SEE SHEET 1 FOR LOCATION OF SECTION



END VIEW

FIELD NOTES

WELDING SHALL BE PERFORMED BY PERSONNEL QUALIFIED PER CURRENT A.W.S. CODE D1.1.

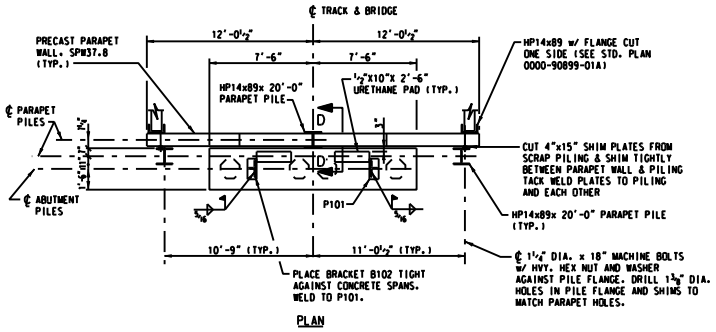
ERECTION OF BEAMS: BEAMS SHALL BE SET IN THE PROPER LOCATION USING CARE NOT TO DAMAGE CONCRETE MEMBERS. AFTER BEAMS ARE SET, BURN OFF LIFTING LOOPS TWO (2) INCHES ABOVE CONCRETE SURFACE. REMAINING PORTION OF LIFTING LOOPS ARE TO BE COATED WITH PAINT. PATCH RECESSES. IF NECESSARY, AROUND LIFTING LOOPS WITH EPOXY MORTAR AS USED FOR SETTING BEAMS.

MORTAR FOR SETTING BEAMS: BEAMS SHALL HAVE FULL AND EVEN BEARING UPON THE BRIDGE SEAT AREAS. IF NEEDED, MORTAR CONSISTING OF EQUAL PARTS BY VOLUME OF CLASS B EPOXY AND DRY SILICA SAND, MIXED IN ACCORDANCE WITH MANUFACTURER'S DIRECTION, SHALL BE SPREAD ON TOP OF BEARING PADS TO OBTAIN UNIFORM BEARING. SCRAPE EXCESS MORTAR FROM AROUND BEARING PADS AFTER BEAMS ARE SET.

DECK PLATES: THE DECK PLATES SHALL BE ADJUSTED AS NECESSARY TO INSURE THE PLATES FIT TIGHT AGAINST THE BEAMS AND CURBS.

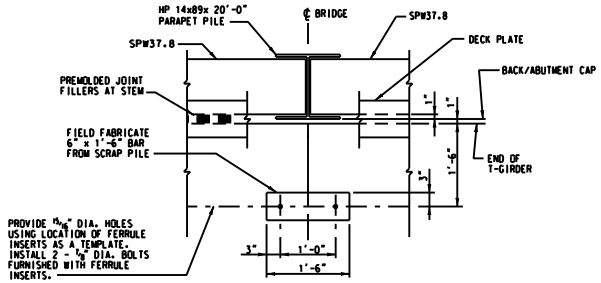
PAINTING: THE EXPOSED PORTION OF PARAPET PILING TO ONE FOOT BELOW GROUND LINE, CONNECTION BARS, ANGLE HANDRAIL AND ABRASIONS OR CUTS ON PAINTED STEEL SHALL BE PAINTED WITH ONE (1) FIELD COAT OF CHEMICAL-MASTIC CM-15, METALLIC ALUMINUM COLOR, APPLIED TO A DRY FILM THICKNESS OF 8 MILS, CORRESPONDING TO A WET FILM THICKNESS OF 10 MILS.

ALL AREAS TO BE PAINTED SHALL HAVE A "COMMERCIAL BLAST CLEANING" IN ACCORDANCE WITH THE STEEL STRUCTURES PAINTING COUNCIL SURFACE PREPARATION SPECIFICATION SSPC-SP6. PAINT APPLICATION SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.

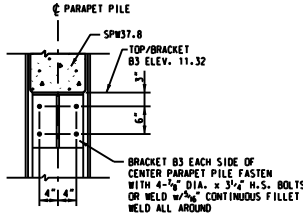


PLAN

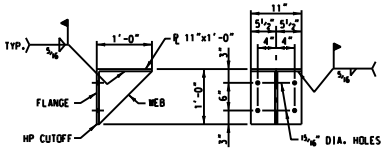
ABUTMENT DETAILS



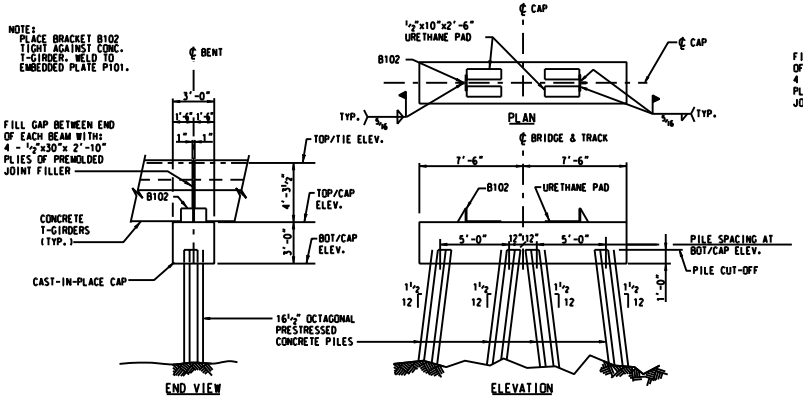
VIEW C-C



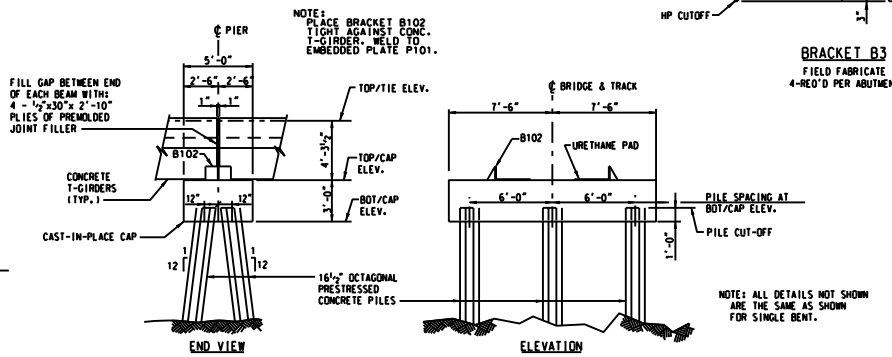
SECTION D-D



BRACKET B3
FIELD FABRICATE
4-REQ'D PER ABUTMENT



SINGLE BENT DETAILS
TYPICAL @ BENTS 14 THRU 18 & 20 THRU 27



DOUBLE BENT PIER DETAILS
TYPICAL @ PIER 19

EXPIRES: 10/03/01

DES: DEB	DRW: EAN	CHK: SG		
DATE: 06/02/00	AUTH: A00-6161	LINE SEG: 0050		
BRIDGE ENGINEERING		KANSAS CITY, KS		
APPROVED:				
(SIGNED) KEN JENNISON				
ASSISTANT DIRECTOR STRUCTURES DESIGN				

VANCOUVER, B.C. TO EVERETT JCT., WA.
BRIDGE 37.8
OVER STEAMBOAT SLOUGH
NEAR MARYSVILLE, WA.
ERECTION DETAILS-
ABUTMENT AND BENTS

PLAN NO.: 0050-37.8-35 | SHEET: 4 of 8

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Appendix B

National Registry of Historic Places Eligibility Report for BNSF Steamboat Slough Bridge

Archaeological Investigations Northwest, Inc.

3510 N.E. 122nd Ave. • Portland, Oregon 97230
Phone (503) 761-6605 • Fax (503) 761-6620

Vancouver Phone (360) 696-7473
E-mail: ainw@ainw.com
Web: www.ainw.com

MEMO

Date: May 29, 2014

To: Christopher Talley, Olsson Associates

From: Andrea Blaser, M.S., Senior Architectural Historian/Senior Historian

Re: BNSF Bridge 0050-37.8 Approach Replacement Project
Everett, Snohomish County, Washington
Bridge Evaluation and Assessment of Project Effects
AINW Report No. 3283

Introduction

Archaeological Investigations Northwest, Inc. (AINW), has completed a significance evaluation and level of effect recommendation for the 1908 BNSF Railway bridge over Steamboat Slough for the BNSF Bridge 0050-37.8 Approach Replacement project in Everett, Snohomish County, Washington (Figures 1 and 2; Photos 1 through 4). The project proposes to replace the existing south approach of the bridge, a structurally deficient 8-span, 104-foot (ft) open deck timber pile trestle, with a pre-stressed concrete double cell box girder. This portion of the bridge is located within the city of Everett in Section 5 of Township 29 North, Range 5 East, Willamette Meridian (U.S. Geological Survey 1956).

In order to complete the project, a Coast Guard Bridge Permit Amendment will be required, and the lead federal agency for project environmental review will be the U.S. Army Corps of Engineers. AINW has therefore conducted the following evaluation of the eligibility of the bridge for listing in the National Register of Historic Places (NRHP) and an assessment of potential project effects according to the requirements of Section 106 of the National Historic Preservation Act, as amended, and its implementing regulation, 36 CFR 800. This report was prepared for the review and concurrence of the Washington State Department of Archaeology and Historic Preservation (DAHP) in addition to an inventory form for the bridge that will be electronically submitted to DAHP using their Historic Property Inventory database system. A copy of this inventory form, which documents the physical characteristics of the bridge in addition to its historical significance, is attached in the report Appendix.

AINW senior architectural historian/senior historian Andrea Blaser, M.S., documented the bridge on May 15, 2014, and prepared all subsequent documentation required for the evaluation of NRHP eligibility and assessment of possible project effects. Ms. Blaser meets professional qualifications as outlined in the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation.

Historic Context

The subject railroad bridge was constructed by the Great Northern Railway Company in 1908, although Great Northern was not responsible for the original construction of the rail line that it serves. The Seattle & Montana Railway Company constructed the subject rail line between Seattle to the south and Blaine to the north in 1891 (Robertson 1995). A previous railroad

bridge was erected at the project location in 1891 as part of this original construction effort. The bridge was replaced in conjunction with the purchase of the Seattle & Montana Railroad (a later iteration of the Seattle & Montana Railway) by the Great Northern Railroad Company in 1907 (Cheever 1948; Robertson 1995). Construction of this original railroad bridge over Steamboat Slough was mentioned in a January 17, 1891, edition of *Engineering News and American Railway Journal,* which noted that "steady progress is being made by the San Francisco Bridge Co. with the bridge and trestle work for the Seattle & Montana…Of the bridges across the three mouths of the Snohomish, that over Ebey slough is practically finished; the foundations are finished on the main channel, and the spans are being placed over Steamboat Slough" (Stauffer and Wellington 1891).

Shortly thereafter, in 1892, the U.S. Army Corps of Engineers investigated the railroad bridges of the Seattle & Montana Railroad over the Snohomish River and Steamboat Slough due to their "obstructive character," which may explain the early need to replace the 1891 railroad bridge (U.S. Army Corps of Engineers 1892). The bridge constructed over Steamboat Slough in 1908 by the Great Northern Railway would employ a swing span to allow for the passage of traffic along the slough. At the time, this bridge type was common but it would later fall out of favor during the mid- to late-twentieth century as bridge engineering advanced towards avoidance of moveable spans and traffic on many of Washington's waterways began to reduce (Holstine and Hobbs 2005). This portion of Steamboat Slough is therefore unique in that two additional steel swing span bridges, a 1926 bridge that conveys southbound traffic on State Route (SR) 529 over the slough and a similar bridge constructed in 1953 for northbound SR 529 (Bridge Number 529/20E) that is listed in the NRHP, are immediately adjacent to and east of the subject bridge (George 2001) (Figures 1 and 2).

The Great Northern Railway was eventually merged with Northern Pacific Railway, the Spokane, Portland and Seattle Railway, and the Chicago, Burlington and Quincy Railroad to form Burlington Northern in 1970. In 1995, Burlington Northern was merged with Atchison, Topeka and Santa Fe Railway to create the Burlington Northern Santa Fe Railway, the name of which was shortened to BNSF Railway in 2005. BNSF Railway is the current owner of the bridge over Steamboat Slough.

Previous Documentation of BNSF Bridge 0050-37.8

A search of records available through the Washington Information System for Architectural and Archaeological Records Data (WISAARD) database revealed that the subject bridge was recorded circa 1979 by Lisa Soderberg as part of a Historic American Engineering Record statewide bridge survey (Soderberg ca. 1979). Only selected fields were completed for the inventory form and a date was not provided for its completion. Soderberg (ca. 1979) noted that the bridge was constructed in 1908, that it had a steel swing span, and that it went by the name Burlington Northern Bridge #11 at that time. No recommendation was given pertaining to its eligibility for listing in the NRHP, and its condition at that time was not noted.

Physical Description

AINW did not obtain engineering drawings for the 1908 bridge for the subject project, and has therefore compiled this physical description based on observations made during the field survey. These observations have been supplemented with information gathered by Soderberg (ca. 1979) from railroad archives, in addition to information pertaining to the existing bridge that was provided to AINW by the project proponent.

As previously noted, BNSF Bridge 0050-37.8 is a moveable span bridge that features a swinging central truss with a central pivot point. The bridge has three through trusses, all of which appear to be subdivided Warren types of riveted steel. Lattice cross-bracing was observed on all three trusses, but was most prominent on the central swing span, which is the longest of the three spans at approximately 250 ft in length (Soderberg ca. 1979). The central truss is center mounted atop an octagonal poured concrete pier while the two smaller trusses (at approximate 130 ft in length) to the north and south are supported at each end by rectangular poured concrete piers that exhibit evidence of extensive wear, indicating that they are original to the date of construction (Soderberg ca. 1979). It is unknown if the original machinery used to rotate the central span has been retained, or if it has been replaced over time. The control house at the center of the bridge is perched atop an original steel platform but appears to be a modular replacement that was added circa 1980s.

Leading into the northernmost truss is an approximately 82-ft-long through plate girder constructed of riveted steel. No such connection is present adjacent to the southernmost truss of the bridge but the through plate girder rests on poured concrete piers to both the north and south that appear to be original to construction, and the steel shows signs of significant wear. The north approach of the bridge, which is significantly longer than the southern timber pile trestle approach, appears to have been constructed sometime during the late-twentieth century. This northern approach is composed of concrete girders supported by what appears to be pre-cast concrete pile bents that mimic the appearance of timber pile bents.

The design choice for the replacement north approach hints to the possibility that it was once an over 300-ft-long timber pile trestle, as does the notation by Soderberg (ca. 1979) that the bridge had 35 sections of 14-ft-long timber pile trestle for a total of 490 ft. The only portion of the bridge that is currently comprised of a timber pile trestle is the south approach, which is structurally deficient and recommended for replacement. The south approach is 104 ft long and has eight total spans of open deck timber pile trestle. It is unknown if this southern section of the bridge is original to the 1908 date of construction, or if it represents an in-kind replacement constructed during the historic period. The timber trestle exhibits natural wear from exposure to Steamboat Slough and appears to roughly match the wear observed on the drawrest, which is also constructed of timber piles and extends east and west from the central span of the bridge in the closed position. The drawrest aligns with the swinging span when in the open position, providing a channel guide to help prevent ship collisions.

The overall integrity of the bridge remains adequate, although its current condition appears to be poor. The retention of the original swing span and three through trusses significantly contribute to the resource's integrity of design, materials, and workmanship, which have only slightly been diminished through the replacement of the original north approach during the late-twentieth century and the replacement of the original control house at the center of the swing span. The bridge resource has further managed to retain its integrity of location, setting, feeling, and association by avoiding major upgrades or changes to the three prominent steel trusses that serve as character-defining features of this resource in addition to its distinctive design as a moveable center swing span, few of which have survived and remain functional in the modern era.

Recommendation of NRHP Eligibility

The BNSF Bridge 0050-37.8 over Steamboat Slough is recommended to be eligible for listing in the NRHP under Criteria A and C. Constructed shortly after the purchase of the subject rail line by the Great Northern Railroad Company during the early twentieth century, it has been

operated since 1908 as part of an integral transportation link for western Washington, connecting it to Canada to the north, Oregon to the south, and Minnesota to the east. The bridge's association with the early construction and operation of the Great Northern Railroad system in Washington is recommended to contribute to its significance under Criterion A.

Furthermore, the resource is a representative example of a swing span bridge that has survived since its construction during the early twentieth century. Few swing span bridges constructed during this time period remain intact in Washington; river traffic on waterways such as Steamboat Slough no longer keep pace with historical levels and bridge technology has evolved over time to avoid the need for costly moveable spans except when necessary. Although the bridge has incurred some modifications over time, it retains an adequate level of integrity to convey its design as a moveable span structure and is highly representative of this type and its period of construction. The bridge is therefore recommended to be eligible for listing in the NRHP under Criterion C in addition to Criterion A.

Finding of Effect

The project proposes to replace the south approach of the bridge, which is structurally deficient. It is currently comprised of an 8-span, 104-ft open deck timber pile trestle that appears to have been constructed during the historic period, but it is unknown if it is original to the 1908 date of construction for the bridge. It will be replaced with a 4-span, 118-ft-long pre-stressed concrete double cell box girder.

This replacement of the south approach will result in no adverse effect to the NRHP-eligible BNSF Bridge 0050-37.8. Although the removal of the open deck timber pile trestle will somewhat affect the resource's integrity of design, materials, and workmanship, the most prominent features of the bridge, the three steel through trusses and the central moveable span, will remain intact. Similar to previous work done to replace the northern bridge approach, the replacement of the south approach would be visible but would not serve to detract from the character-defining features of the bridge that associate it with the early construction and operation of the Great Northern Railway system in western Washington, nor will the bridge lose its ability to convey its functionality as a moveable span that was constructed during the early twentieth century.

In summary, the deconstruction of the open deck timber pile trestle that currently serves as the south approach and the construction of a pre-stressed concrete box girder in its place will affect the historical appearance and integrity of the resource, but this effect will not be adverse. The bridge will retain its functionality as a moveable span, will continue to convey its historical character and period of construction, and will retain an adequate level of integrity to express its historical associations to significant patterns of events relating to the development of rail service in western Washington during the early twentieth century. A finding of "No Historic Properties Adversely Affected" and no further work is recommended.

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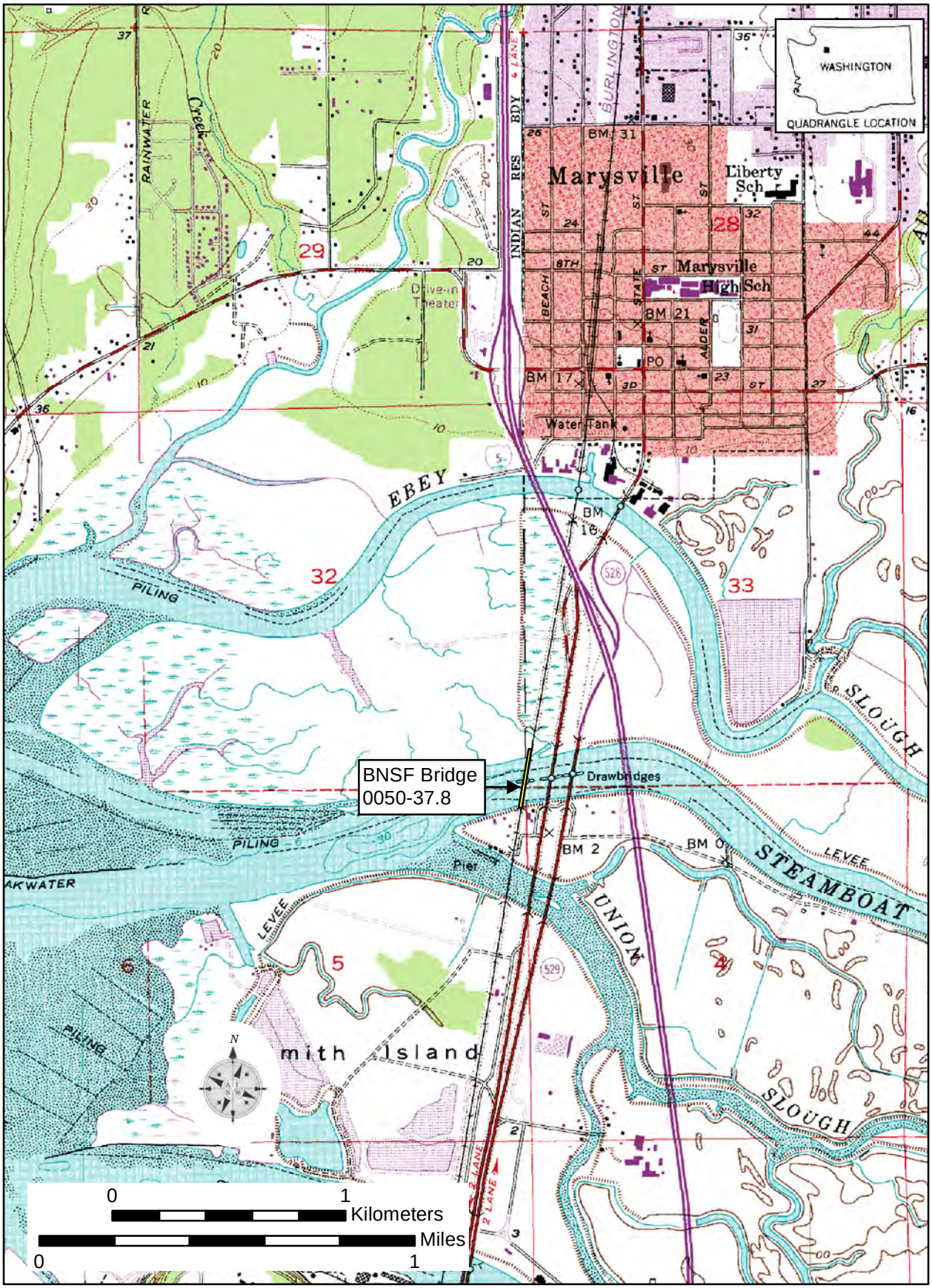

Figure 1. The BNSF Bridge 0050-37.8 Approach Replacement project will take place in Everett, Snohomish County, Washington.

Figure 2. The project proposes to replace the existing south approach of BNSF Bridge 0050-37.8, which is recommended to be eligible for listing in the NRHP. A finding of "No Historic Properties Adversely Affected" is recommended for the project.

Photo 1. Overview of BNSF Bridge 0050-37.8 at Steamboat Slough. The view is towards the southwest from southbound SR 529.

Photo 2. Detail view of the central swing span of BNSF Bridge 0050-37.8. The view is towards the south-southwest.

Photo 3. Detail view of the central swing span and control house looking west-northwest from the adjacent SR 529 southbound bridge over Steamboat Slough.

Photo 4. The south approach of the bridge, which currently consists of an 8-span timber pile trestle, will be replaced with a 4-span pre-stressed concrete double cell box girder. The view is towards the south-southwest.

APPENDIX

HISTORIC PROPERTY INVENTORY FORM FOR BNSF BRIDGE 0050-37.8

Historic Inventory Report

Location

Field Site No. DAHP No.

Historic Name: BN Bridge #11 over Steamboat Slough

Common Name: BNSF Bridge 0050-37.8

Property Address: N/A N/A, Everett, WA 98205

Comments:

Tax No./Parcel No. N/A

Plat/Block/Lot N/A

Acreage N/A

Supplemental Map(s)

Township/Range/EW	Section	1/4 Sec	1/4 1/4 Sec	County	Quadrangle
T29R05E	05			Snohomish	MARYSVILLE

Coordinate Reference

Easting: 1228381

Northing: 990056

Projection: Washington State Plane South

Datum: HARN (feet)

Identification

Survey Name: BNSF Bridge 0050-37.8 Approach Replacement Project 2014 Date Recorded: 05/15/2014

Field Recorder: Andrea Blaser

Owner's Name: BNSF Railway

Owner Address: 2650 Lou Menk Drive

City: Fort Worth State: TX Zip: 76131

Classification: Structure

Resource Status: Survey/Inventory Comments:

Within a District? No

Contributing? No

National Register:

Local District:

National Register District/Thematic Nomination Name:

Eligibility Status: Not Determined - SHPO

Determination Date: 1/1/0001

Determination Comments:

Description

Historic Use: Transportation - Rail-Related
Current Use: Transportation - Rail-Related
Plan: Other
Stories: N/A
Structural System: Mixed
Changes to Plan: Intact
Changes to Interior: Not Applicable
Changes to Original Cladding: Not Applicable
Changes to Windows: Not Applicable
Changes to Other: Not Applicable
Other (specify):

Style:	Cladding:	Roof Type:	Roof Material:
None	None	None	None

Foundation:	Form/Type:
Other	Bridge - Swing Bridge

Narrative

Study Unit	Other
Transportation Science and Engineering Commerce	

Date of Construction: 1908 Built Date
Builder: Unknown
Engineer: Unknown
Architect: N/A

Property appears to meet criteria for the National Register of Historic Places:Yes
Property is located in a potential historic district (National and/or local): unknown
Property potentially contributes to a historic district (National and/or local): Yes

Statement of Significance:

The BNSF Bridge 0050-37.8 over Steamboat Slough is recommended to be eligible for listing in the National Register of Historic Places (NRHP) under Criteria A and C. It was erected in 1908 to replace an 1891 bridge that conveyed the Seattle & Montana Railway over Steamboat Slough. In 1907 a later iteration of the Seattle & Montana Railway, the Seattle & Montana Railroad, was purchased by the Great Northern Railroad Company and the current bridge was constructed soon after. With the purchase of the Seattle & Montana Railroad the Great Northern Railway expanded upon their regional service, providing an important rail link between the major cities of western Washington to Canada, Oregon, and the Midwestern United States (Cheever 1948; Robertson 1995).

The subject bridge is a representative example of an early-twentieth century center-mounted swing span, which were much more prevalent at the time of construction but are now rarely built or retained during the modern era. Other examples of this bridge type are in the immediate area, although all appear to be highway bridges that were constructed later than the subject bridge, between 1925 and 1953 (George 2001). One such example, the adjacent State Route (SR) 529 Bridge Number 529/20E over Steamboat Slough, was constructed in 1953 and was listed in the NRHP in 2002 under Criteria A and C (George 2001). It conveys northbound traffic on SR 529 over Steamboat Slough, and an adjacent swing-span bridge constructed in 1926 conveys southbound traffic over the slough. The nomination form prepared for the SR 529 Bridge Number 529/20E notes that it was the last steel swing span bridge constructed in the state of Washington, and that it is one of four steel swing spans currently operating along Washington highways (George 2001).

The BNSF Bridge 0050-37.8 has incurred some modifications over time; the northern approach, which was likely a timber pile trestle much like the current south approach, appears to have been replaced sometime during the late-twentieth century with concrete girders resting on concrete bents, and a modern control house was observed on an original elevated platform at the center of the central swing span. In addition, it is unknown if the current timber piles of the south approach are original to the date of construction or if they were replaced in-kind during the historic period, as timber piles can wear quickly in the type of environmental setting in which the bridge is situated. Nonetheless, the bridge retains its historical appearance and its integrity of location, setting, feeling, and association. The bridge's integrity of design, materials, and workmanship have been somewhat diminished by aforementioned changes over time, but not to a degree that would impede upon the ability of the bridge to clearly express its historical appearance, use, or engineering design.

Few examples of early-twentieth century steel swing span bridges remain extant in the state of Washington, and many of the bridges that convey the current BNSF Railway over waterways such as Steamboat Slough have been replaced since the historic period. The subject bridge is therefore a representative example of what was once a common bridge type that is rarely seen or used during the modern era that helps to convey the age and history of use of the current BNSF Railway. It is therefore recommended that the BNSF Bridge 0050-37.8 is eligible for listing in the NRHP under Criterion A for its association with broad patterns of railroad development within this region during the early twentieth century in addition to meeting eligibility requirements for listing in the NRHP under Criterion C as a representative example of a steel swing span bridge, few of which remain intact and in use in the state of Washington.

Description of Physical Appearance:	The subject bridge features a swinging central truss with a central pivot point. In total, the bridge has three subdivided Warren steel trusses; the central moving span is 250 feet in length, while the adjacent stationary trusses to the north and south are approximately 130 feet long (Soderberg ca. 1979). The three trusses are supported by concrete piers that appear to be original to the date of construction, and a drawrest constructed of timber piles with wood boards attached to its north-facing side extends east and west from a central octagonal concrete pier that provides total support for the bridge when it is in the open position. It is unknown if the machinery that moves the bridge is original or if it has been replaced, but a control house located on an elevated platform of the central truss appears to have been constructed circa 1980s. To the north of the three trusses is an 82-foot-long through plate girder constructed of riveted steel; the steel shows significant wear, and the overall girder appears to be original to the date of construction of the bridge. It is accessed from the north by an approach that appears to have been constructed during the late-twentieth century, and likely replaced a timber pile trestle. The concrete bents that support concrete girders above mimic the appearance of timber pile trestles, and much of the approach blends in with the wetland area that it crosses over due to its low profile. The south approach of the bridge is 104 feet long and is an 8-span open deck timber pile trestle that connects directly to the southernmost Warren steel truss. It is unknown if this section is original to the construction of the bridge in 1908, or if it was replaced in-kind during the historic period. The timber trestle exhibits natural wear from exposure to Steamboat Slough and appears to roughly match the wear observed on the drawrest, indicating that it is likely original to the date of construction.
Major Bibliographic References:	Cheever, Bruce Bissell 1948 The Development of Railroads in the State of Washington 1860 to 1948. Master's thesis, University of Washington, Seattle. George, Oscar R. 2001 National Register of Historic Places Registration Form for the Steamboat Slough Bridge, Bridge Number 529/20E, Snohomish County, Washington. On file, Washington Department of Archaeology and Historic Preservation, Olympia. Robertson, Donald B. 1995 Encyclopedia of Western Railroad History, Volume III, Oregon Washington. The Caxton Printers, Ltd., Caldwell, Idaho. Soderberg, Lisa, ca. 1979 Historic American Engineering Record Inventory Form for the Steamboat Slough Bridge for the Washington State Bridge Inventory. On file, Washington Department of Archaeology and Historic Preservation, Olympia, Washington.

Photos

The view is towards the south.
The west elevation of the bridge.
2014

The view is towards the south-southwest from SR 529.
The east elevation of the bridge.
2014

The view is towards the southwest from SR 529.
The east elevation of the bridge.
2014

The view is towards the south-southwest from SR 529.
The southern approach.
2014

The view is towards the west-northwest from the adjacent southbound SR 529 bridge over Steamboat Slough.
Central swing span, control house, and drawrest.
2014

The view is towards the west-southwest from SR 529.
The through plate girder that connects the replacement north approach (right) to the northernmost steel truss (left).
2014

The view is towards the north-northwest from the south bank of Steamboat Slough.
The east elevation of the bridge, partially obscured by an adjacent houseboat.
2014

Appendix C

Biological Assessment BNSF Railway Company Bridge 0050-37.80 South Approach Replacement Everett, WA

Biological Assessment

BNSF Railway Company
Bridge 0050-37.80
South Approach Replacement

Everett, WA

Prepared for

BNSF Railway Company
Attn: Alan K. Bloomquist, P.E.
4515 Kansas Avenue
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Prepared by

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March 2015

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Alan Bloomquist, BNSF Project Manager

BIOLOGICAL ASSESSMENT COMMITMENTS

Conservation measures

The following conservation measures have been established for this project as discussed in the biological assessment. The conservation measures were created to enable the project to avoid and minimize impacts to listed species.

Pile driving/removal

1. Pile driving will only occur ‘in the dry’ and at low tide when no surface water is present.
2. Existing piles located in estuarine wetlands will not be removed when they are surrounded by water.
3. Existing piles located in the defined wetted channel will not be removed without the use of Best Management Practices (BMP) to contain the sediment.

EXECUTIVE SUMMARY

The BNSF Railway proposes to replace the south approach of BNSF Bridge 37.80, Line Segment (L.S.) 0050, over Steamboat Slough, in the City of Everett, Washington, to meet rail safety as this approach has been found to be reaching its structural life expectancy. This project requires a permit from the US Coast Guard, creating a federal nexus for this project.

The Endangered Species Act (ESA) requires federal agencies to ensure that their actions do not jeopardize the continued existence of threatened or endangered species or their critical habitats. Olsson Associates provides this Biological Assessment (BA) to examine the potential effects of the proposed project on listed threatened and endangered species and their habitats. Analyses of potential effects were made based on a review of plans for the proposed action, an on-site evaluation of existing habitat conditions, data on the current and historical distributions of each species, and personal communications with local agency biologists. Based on this review, determinations of effects were made for the proposed project. The BA also includes an analysis of Essential Fish Habitat for the Pacific Salmon Fishery in accordance with the Magnuson Stevens Fisheries Conservation and Management Act, reauthorized in 1996.

The replacement south approach will consists of a 4-span, variable length, 118-foot long Prestressed Concrete Double Cell Box Girders, supported by nine steel piles. The existing south approach is an 8-span, 104-foot open deck timber trestle, supported by forty-eight creosote-treated timber piles, of which thirty-six are located below the Mean Higher High Water Mark (MHHWM). The specific objectives of the project are to: (1) improve the safety of the existing approach and (2) maintain traffic volumes on the railway. The project will not add new impervious surface to the project area. Construction of the project is planned to begin in early 2015.

Olsson Associates biologists have researched the project site, reviewed proposed construction activities, identified minimization measures, planned conservation measures, and reviewed scientific literature to assess potential impacts the project may have on ESA-listed species. United States Fish and Wildlife Service has identified two listed species that may occur in the project action area: federally threatened marbled murrelet (*Brachyramphus marmoratus*) and threatened Puget Sound/Coastal Distinct Population Segment (DPS) bull trout (*Salvelinus confluentus*). Steamboat Slough has been designated in the project action area as critical habitat for bull trout. National Marine Fisheries Service has identified two listed species that may occur in the action area: federally threatened Puget Sound Evolutionary Significant Unit Chinook salmon (*Oncorhynchus tshawytscha*) and threatened Puget Sound DPS steelhead (*O. mykiss*). The project action area is designated critical habitat for Chinook salmon.

The project will install nine new (permanent) steel pipe piles and remove thirty-six existing creosote piles below the MHHWM. BNSF will avoid and minimize impacts to listed aquatic species by performing in-water work during the approved work window and work below the

MHHWM shall be done "in the dry[1]", at low tide when no surface water is present, following related construction permits, implementing Best Management Practices, and meeting conservation measures provided for the contract.

Direct effects of the proposed project on listed species are related to temporary and permanent impacts within project area. Temporary impacts are associated with pile driving in the streambed, noise, and water quality from the potential release of contaminated sediment and turbidity. Permanent impacts include potential for permanent noise impacts on listed fish species, and the placement of permanent structures (nine new piles) below the MHHWM. The project will construct nine steel piles with a cumulative footprint of 28.26 ft² (3.14 ft² per pile) which will be located below the MHHWM, however, it will remove the existing thirty-six timber creosote piles, with a footprint of approximately 47.9 ft² . The overall permanent footprint below the MHHWM will be reduced by 19.64 ft². Because the work will be done "in the dry" and when no surface water is present, direct effects are not likely to adversely affect Chinook salmon, steelhead, and bull trout juveniles present in Steamboat Slough during construction resulting from pile driving, disturbance of sediment, increases in turbidity and impacts to water quality. The term "in the dry" for the purpose of this report means when soils are saturated to the surface at low tide, but there is no standing water greater than 1.3 feet deep that could conduct noise. Since the dominant frequencies generated in pile driving are between 50 and 1,000 Hertz, most of the energy is not propagated in-water depths of 1.3 feet (0.4 meters) or less (WSDOT 2008b). These direct effects are also considered a temporary affect to critical habitat for Chinook salmon and bull trout and is not likely to have an adverse affect.

Indirect effects are those that may occur to listed species over time after the project has been completed. Indirect effects may result for listed species for the duration of time it takes to restore the estuarine wetlands in the footprint of removed piles following construction. Given that the impacts to these areas will be minimal, the in-water foot print of piles will be reduced and vegetation re-growth would be expected within about three years. All interrelated actions associated with the project are deemed insignificant or beneficial for ESA-listed salmonids.

Olsson Associates recommends a determination that the project **may affect, not likely to adversely affect** for Chinook salmon, steelhead, bull trout and marbled murrelets. Olsson Associates also recommends a determination of **may affect, not likely to adversely affect** for designated critical habitat for Chinook salmon and bull trout. In addition, the project will not have any adverse effects on Essential Fish Habitat (EFH) for Chinook, pink (*O. gorbushca*), and coho salmon (*O. kisutch*) during work below the MHHWM for similar reasons as the proposed impacts to ESA-listed species and critical habitat.

1. "In the dry" includes areas where the soil is saturated to the surface at low tide, but the site lacks standing water greater than 1.3 feet (0.4 meters) or less.

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APPENDICIES

Appendix A – Magnuson Stevens Fishery Conservation and Management Act
Appendix B – Project Plans
Appendix C – Life Histories of Listed Species

1. INTRODUCTION

1.1 Project Purpose

The BNSF Railway proposes to replace the south approach of BNSF Bridge 37.80, L.S. 0050, in the City of Everett, Washington, to meet rail safety. Recent inspections of the bridge's south approach found that the timber piles and caps were reaching their structural life expectancy and that they need to be replaced. Thus, in order to maintain efficient and safe travel along this line, the purpose of the project is to replace the south approach, which has reached its structural life expectancy. The project is needed to protect life, health, property, and the environment. If BNSF were to leave the existing approach in place and make only minor repairs as necessary, the south approach could eventually fail, leading to an immediate threat to both human lives and property and faunal life, as well as impacting the existing slough and habitat both up and down stream.

The existing south approach is an 8-span, 104-foot open deck timber trestle. The replacement south approach will consists of a 4-span, variable length, 118-foot long Prestressed Concrete Double Cell Box Girders.

This federally-funded project requires a federal permit (Bridge Permit) from the Coast Guard for construction; therefore, it has a federal nexus under the Endangered Species Act (ESA) of 1973, as amended. Olsson Associates prepared this Biological Assessment (BA) in accordance with section 7(c) of the ESA. The BA has been prepared to determine the potential impacts to listed species and their designated critical habitats and to coordinate U.S. Coast Guard consultation with the United States Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS). The BA also includes an analysis of Essential Fish Habitat for the Pacific Salmon Fishery in accordance with the Magnuson Stevens Fisheries Conservation and Management Act, reauthorized in 1996 (Appendix A).

1.2 Species Addressed in this Report

The following species are included in the USFWS or NMFS list for Snohomish County, but will not be addressed by this BA: Canada lynx (*Lynx canadensis*), gray wolf (*Canis lupus*), grizzly bear (*Ursus arctos*), killer whales (*Orcinus orca*), northern spotted owl (*Strix occidentalis caurina*), northern spotted owl critical habitat and marbled murrelet critical habitat. The reasons these species and critical habitats will not be addressed in this BA are described below:

Canada lynx distribution and suitable habitat in Washington is primarily limited to the north Cascades east of the Cascade crest and portions of the mountainous regions in northeastern Washington (Rodrick and Milner 1991; Johnson and Cassidy 1997), were there is a high density of snowshoe hare. The sub-alpine fir zone is considered potential den habitat. Suitable habitat is not located within the project vicinity. This project should have **no effect** on this species.

Gray wolves in the Pacific Northwest are expected to be limited to the Cascades away from towns and human activity. They prefer territories that contain ungulate calving, fawning or kidding grounds in the spring and ungulate wintering grounds in the winter. There are no known wolf territories, denning sites or high quality foraging areas within 0.5 miles of the project site and the site is within an industrial area adjacent to a transportation corridor. This project is expected to have **no effect** on gray wolfs.

Grizzly bear are wide-ranging mammals that could occur throughout the Cascades in Washington. They have the greatest probability of occurrence in the most remote parts of the Cascades. They generally seek areas at higher elevations well away from human activities for denning activities. They are rare in Washington State and only 36 sightings have occurred on the west slope of the Cascades (WDFW 2009). No Grizzly bear sightings have occurred near the project area. Due to the lack of cover, land use and human activity in the area of this project should have **no effect** on this species.

Killer whales (Southern Resident population) can be found in Possession Sound within 5 miles of the project area. Critical Habitat for the Southern Resident population includes inland waterways of Washington State and the transboundary waters between the United States and Canada. Areas less than 20 feet deep relative to extreme high water are not designated as critical habitat. Since no work is proposed within their critical habitat and no in-water work is proposed this project will have **no effect** on this species or its critical habitat.

Northern spotted owl can be found throughout Washington from the Olympic Peninsula. They occur at elevations ranging from sea level to 6,000 feet in old growth and mature forests. The habitat surrounding the project area is sparely vegetated and has a mix of land use consisting of industrial, transportation corridors (railroad and highway), and boating activates. **No effect** to Northern spotted owl is expected from this project. Northern spotted owl critical habitat is more than 15 miles from this proposed project. As a result this project will have **no effect** on critical habitat for this species.

Marbled murrelet critical habitat is more than 15 miles from this proposed project. As a result this project will have **no effect** on critical habitat for this species.

Table 1. Listed Species and Critical Habitat Addressed in this BA.

Federal Jurisdiction	Scientific Name	Federal Status	
NMFS Species ESU/DPS		**Species**	**Critical Habitat in Action Area**
Chinook salmon	*Oncorhynchus tshawytscha*	Threatened	Yes
Puget Sound DPS steelhead	*Oncorhynchus mykiss*	Threatened	Proposed
USFWS Species			
Bull trout	*Salvelinus confluentus*	Threatened	Yes
Marbled murrelet	*Brachyramphus marmoratus*	Threatened	No

2. PROJECT LOCATION

The project is located on the south approach of BNSF Bridge 37.80 Line Segment (L.S.) 0050 in the city of Everett (Figure 1). The project is located on the border of Section 4 and Section 5, Township 29 North, and Range 5 East and latitude 48° 2' 6" N and longitude 122° 11' 3" W.

All waterbodies affected by the project are located in Water Resource Inventory Area (WRIA) 7, the Snohomish River basin, and Latitude/Longitude Identification (LLID) 1221521480088. The majority of the project is located in 6th Field Hydrologic Unit Code (HUC) 171100110203. Work associated with the project will occur in portions of the wetted width of tidally influenced Steamboat Slough (RM 1.0). Major tributaries, distributaries, and anabranches to Steamboat Slough include the Snohomish River (LLID) 122208048202, Union Slough (LLID 1221901480344) and Ebey Slough (LLID 1221521480088). The confluence of Union Slough is approximately 2000 feet downstream. Ebey Slough has two connections with Steamboat Slough upstream of the project area.

3. PROJECT DESCRIPTION

3.1 Project Overview

Under the proposed project, BNSF will replace the existing south approach of BNSF Bridge 37.80, which is over Steamboat Slough, to comply with current BNSF design standards. The proposed project will:

- Remove the existing south approach, which consists of an 8-span, 104-foot open deck timber trestle.
- Remove the existing substructure, which consists of thirty-six timber piles, located within the MHHWM of Steamboat Slough.
- Placement of nine 24-inch steel pipe piles below the MHHWM.
- Construction of a new south approach which will consist of a 4-span, variable length, 118-foot long Prestressed Concrete Double Cell Box Girders.

3.2 Proposed Project Actions

3.2.1 Clearing and Grading

No clearing is being proposed for this project. All work will be done within the current un-vegetated portion of the railroad right-of-way. Best management practices (BMPs) will be applied to limit erosion or runoff from all activities.

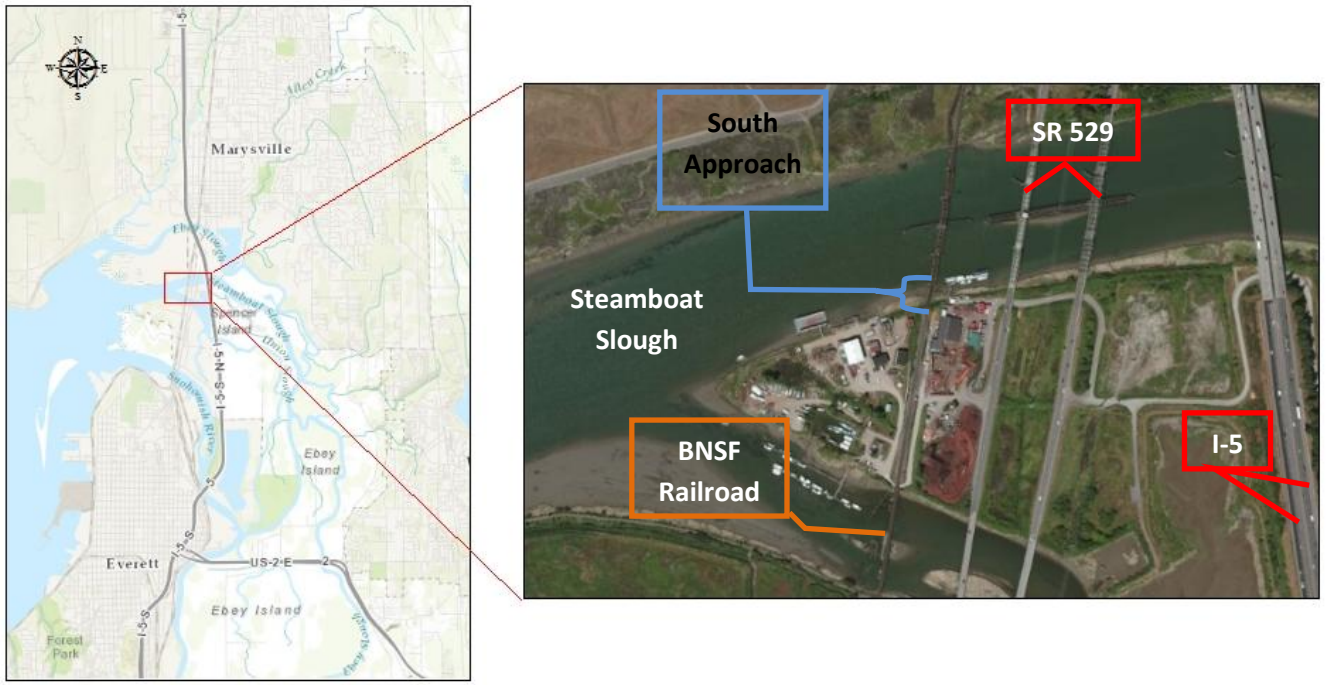

Figure 1. Project Vicinity Map

3.2.2 Construction of South Approach

BNSF will obtain track outage time in order to drive the 24-inch steel pipe piles. BNSF will begin with the central pile for each bent, taking readings while they drive the pile to ensure that the piles are getting the appropriate resistance levels. When the central pile for each pier is driven to the required bearing capacity, the outer piles will be driven to the same depth as the central pile. BNSF will conduct this effort while there is no water in the pile driving location. After completion of the pile driving activities, BNSF will prepare the new segments for placement. When the new spans are ready, a track curfew will be in effect to allow the contractor to deconstruct the existing approach, remove it to an upland location, and then place the new spans. Once the spans are in place, new subballast, ties, and rail will be placed in order to get the line functioning again. All work will be done from the existing track or upland area adjacent to the track.

Figure 2. Steamboat Slough Project Area.

3.2.3 Access

Access to the site will be from the existing structure and adjacent upland areas parallel to the track. No barges or in-water trestle will be used. Staging areas will be located in upland areas. During construction and operation of the temporary access areas, appropriate BMPs will be implemented to minimize runoff and sedimentation.

3.2.4 Temporary Work Trestles

BNSF will not require any temporary work trestles for this project. All work will be done from the existing structure and upland areas on either side of the track.

3.2.5 Stormwater Treatment

Existing and Proposed Conditions

There will be no increase in the existing impervious area within the project area as a result of this project.

3.2.6 Erosion and sediment control

High visibility fencing will be used to protect existing wetlands and sensitive areas from non-permitted impacts near the construction zone. Specific BMP guidance is provided in the permits, and some of the proposed BMPs may include, but will not be limited to the following:

- Stabilized construction entrances;
- Silt fencing; and
- Slope stabilization following construction by re-grading and planting.

3.2.7 Spill Prevention, Control, and Countermeasures

Before the start of work, the contractor will develop and implement BMPs that address spill prevention, control and countermeasures. One of the intents of developing and implementing this plan is to protect listed species and their critical habitat from any adverse effects that might result from the inadvertent discharge of contaminants from the project site.

At a minimum, the plan will address:

- Site information and project description.
- Spill prevention and containment.
- Spill response.
- Standby, on-site material and equipment requirements.
- Reporting information.
- Program management.
- Plans to contain pre-existing contamination (if necessary).
- Equipment for work below the MHHWM.

Materials that modify pH, such as cement, concrete grindings, and concrete saw cutting, will be managed so that they will not contaminate surface water runoff.

3.2.8 Detailed Project Sequencing and Timeline

The BNSF Project will be constructed in phases (Table 2).

Table 2. South Approach proposed construction schedule.

Construction phase - *Work below the MHHWM and over-water work activity*	Month Time period summary
Advertise for bid	February 2015
Contractor Mobilizes construction site	March 2015
Contractor prepares staging area for new approach span materials and old span.	March 2015
Contractor constructs BMPs as necessary to prevent degradation of water quality.	March 2015
Work below the MHHWM. Installation of the 24 inch steel piles with an impact pile driving, within approved track times. Work to be done at low tide, when there will be no contact with standing or flowing water. *Over-water work.* On-track crane	March 2015
Contractor completes pile driving efforts.	March 2015
Contractor confirms track outage time for switch out.	March 2015
Over-water work. On-track crane begins to move old superstructure.	March 2015
Over-water work. On-track crane removes old pile caps.	March 2015
Over-water work. On-track crane places new pile caps on new hybrid piles.	March 2015
Over-water work. On-track crane places new spans, ties, and rail.	March 2015
Over-water work and Work below the MHHWM. On-track crane removes old timber piles to 2 feet below mudline. Work to be done at low tide, when there will be no contact with standing or flowing water.	March 2015
Contractor cleans up site, removes old materials.	April 2015
Contractor seeds and mulches staging area (if appropriate).	April 2015
Project completed.	April 2015

Construction is tentatively scheduled to begin in early 2015, taking a total of four to six weeks (approximately 14 working days below MHHWM). All work below the MHHWM line will be done "in the dry" and at low tide when no surface water is present. Figure 3 illustrates pile driving locations in relation to Mean Low Low Water (MLLW) or low tide. Should in-water work not "in-th-dry" be required, it will occur during the in-water work window of August 1st to February 15th or as specified in the HPA from WDFW.

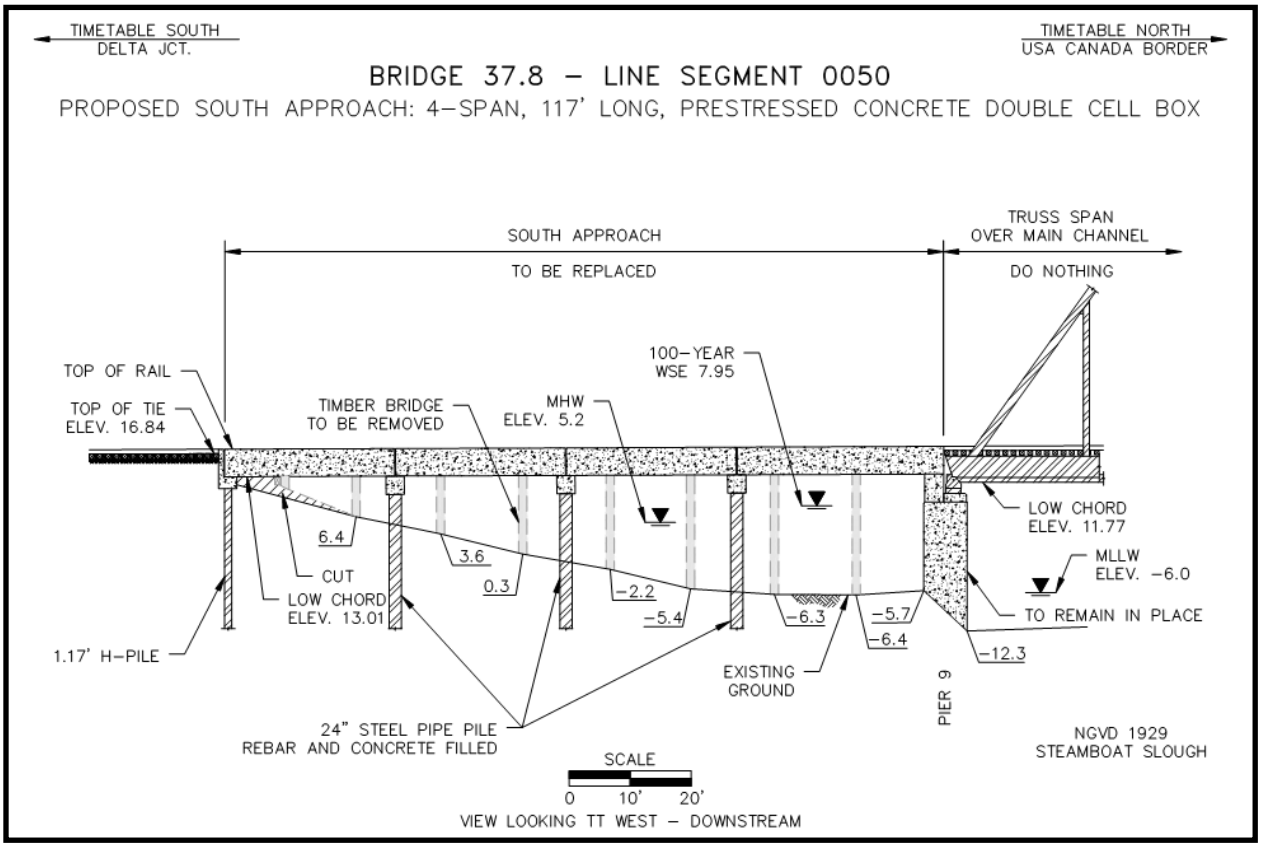

Figure 3. Bridge 0050-37.8 Upstream Face Profile with Relevant Information.

4. PROJECT VICINITY

The project site is defined as the area where the majority of the proposed action will occur. Descriptions of the action area, as well as existing conditions for aquatic, terrestrial and wetland resources are discussed in detail below.

4.1 Land Use

The project area is within Everett's city limits and includes mixed commercial and industrial properties (Figure 4). Also included in this area are houseboats, vacant industrial land, undeveloped tide flats and wetlands. Just to the east of the project area (within 350 feet and 1,420 feet respectfully) State Route (SR) 529 and Interstate 5 (I-5) parallel the railroad tracks.

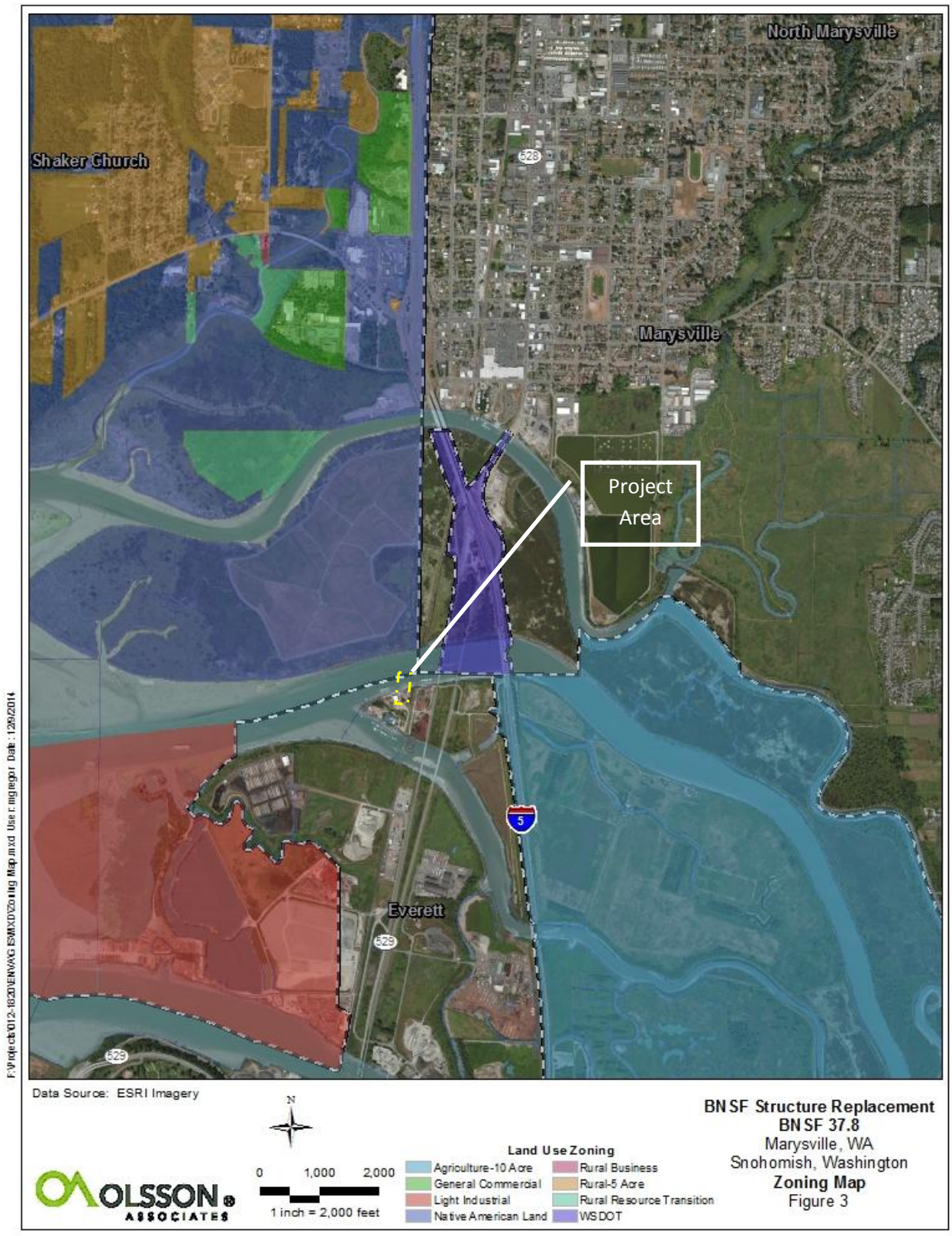

Figure 4. Land Use and Zoning Map for the Project Area.

4.2 Terrestrial Resources

4.2.1 Geography and soils

The project is located within the northern portion of the Puget Sound Lowland physiographic region. Topography in the area is generally flat, with surface elevations ranging from approximately 0 to 15 feet above mean sea level (MSL). Portions of the project are located within the tidally influenced section of the Snohomish River estuary.

Principal soils within 200 feet of the project are Urban land (78), Xerorthents nearly level (82), and Puget silty clay (55) (Debose and Klungland 1983, Figure 5). The soil type mapped within the action area is Urban land. Urban land consists of nearly level to gently sloping areas covered by streets, buildings and parking lots. Included in this unit are small areas of Alderwood, Everett, and Tokul soils. Xerorthents are mapped to the south of the project area. These are nearly level areas on till plains where the surface layer, subsoil, and substratum have been greatly disturbed, removed, or replaced with other soil material. Included in this unit are small areas of Alderwood, Tokul, Indianola soils. Also included are areas of debris, such as woodchips from lumber mills. Just east of the project area are Puget silty clay loam soils. These are a very deep soils, formed in alluvium. It is located in depressional areas on floodplains that have been artificially drained. Where this soil has been drained and protected from flooding, a seasonally high water table is present at a depth of 24 to 48 inches from November to April. In some areas, the soil is not drained and is not protected from flooding. The surface later of Puget silty clay loam is dark grayish brown silty clay loam, underlain by a subsurface layer of olive gray and gray, silty clay loam.

4.2.2 Vegetation

The project is within the western hemlock (*Tsuga heterophylla*) Forest Zone, which extends from the shoreline of Puget Sound to elevations of approximately 2,000 feet in the foothills of the Cascade Mountains (Franklin and Dyrness 1973). Principal forest species in this zone are western hemlock, Douglas fir (*Pseudotsuga menziesii*) and western red cedar (*Thuja plicata*). Hardwoods, including big-leaf maple (*Acer macrophyllum*), red alder (*Alnus rubra*), and black cottonwood (*Populus balsamifera*), are less common and are found primarily on disturbed sites and riparian habitats.

The project area is highly disturbed due to industrial use and the maintained railroad right - of – way. The undisturbed areas are vegetated with a mix of native and non-native shrubs and herbs (Figure 4, 7 and 8).

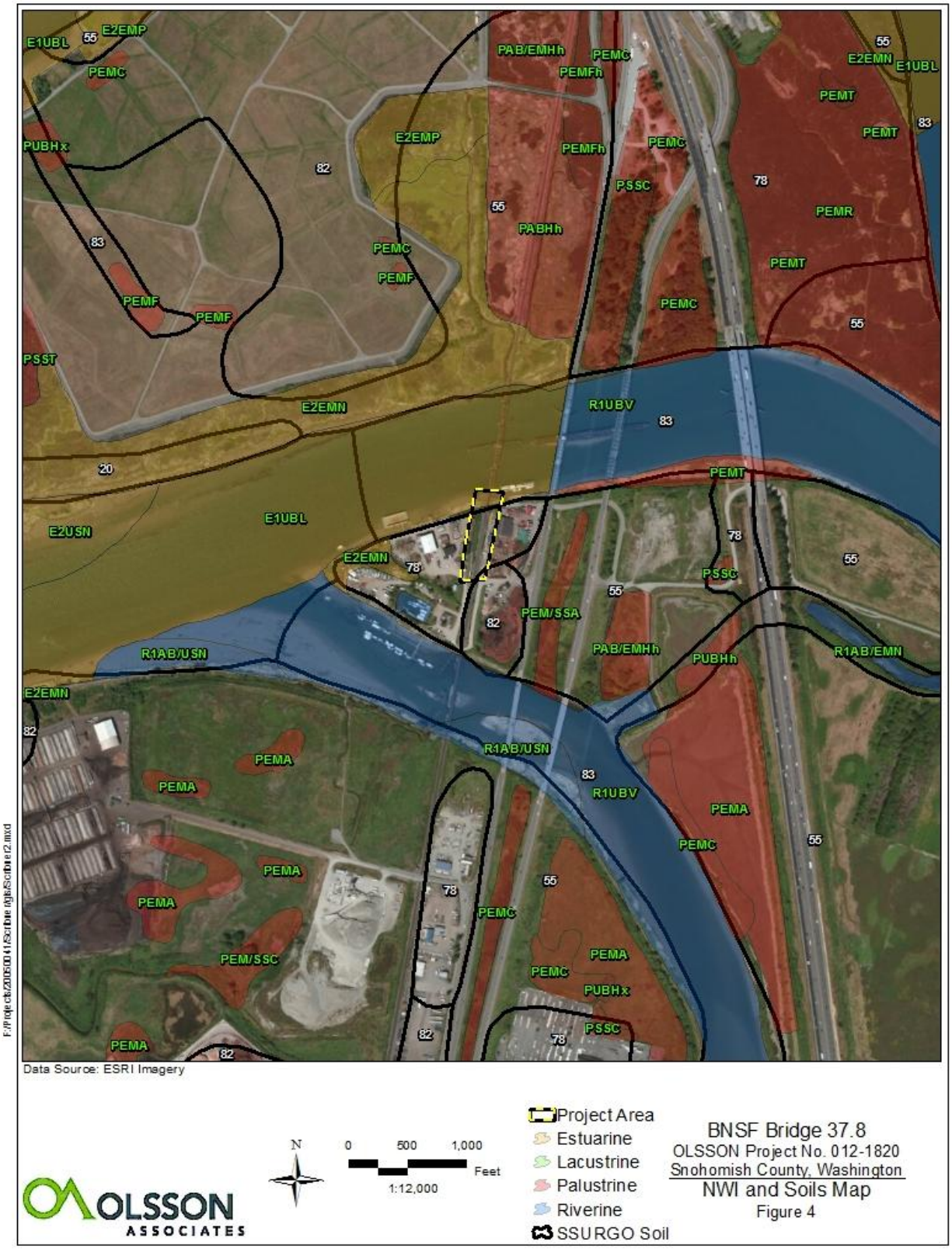

Figure 5. Soils Map

4.2.3 Wetlands

The National Wetland Inventory maps identified one wetland within the project area. The estuarine subtidal unconsolidated bottom saltwater tidal wetland (E1UBL) is below the MHHWM line in the project area. This type of wetland includes all wetlands and deepwater habitats with at least 25 percent cover of particles smaller than stones (less than 6-7 cm), and a salt tolerant vegetative cover less than 30 percent. Wetland functions include flood flow alteration, sediment removal, nutrient and toxicant removal, production of organic matter and its export and general fish habitat. The majority of the non-wetland areas in the project corridor are sparsely vegetated because they occur in an industrial area.

Typical estuarine wetland vegetation found in this area includes hard-stem bulrush (*Schoenoplectus acutus*), broadleaf cattail (*Typha latifolia*) and Lyngbye's sedge (*Carex lyngbyei*) (WSDOT 2008). Other wetland species include black twinberry (*Lonicera involucrata*), Pacific crabapple (*Malus fusca*), Douglas spirea (*Spiraea douglasii*), western grasswort (*Lilaeopsis occidentalis*), and seaside arrowgrass (*Triglochin maritima*) (WSDOT 2008a).

Figure 6. Photo Southwest Showing Wetland Vegetation, Unconsolidated Mud Bottom Under South Approach

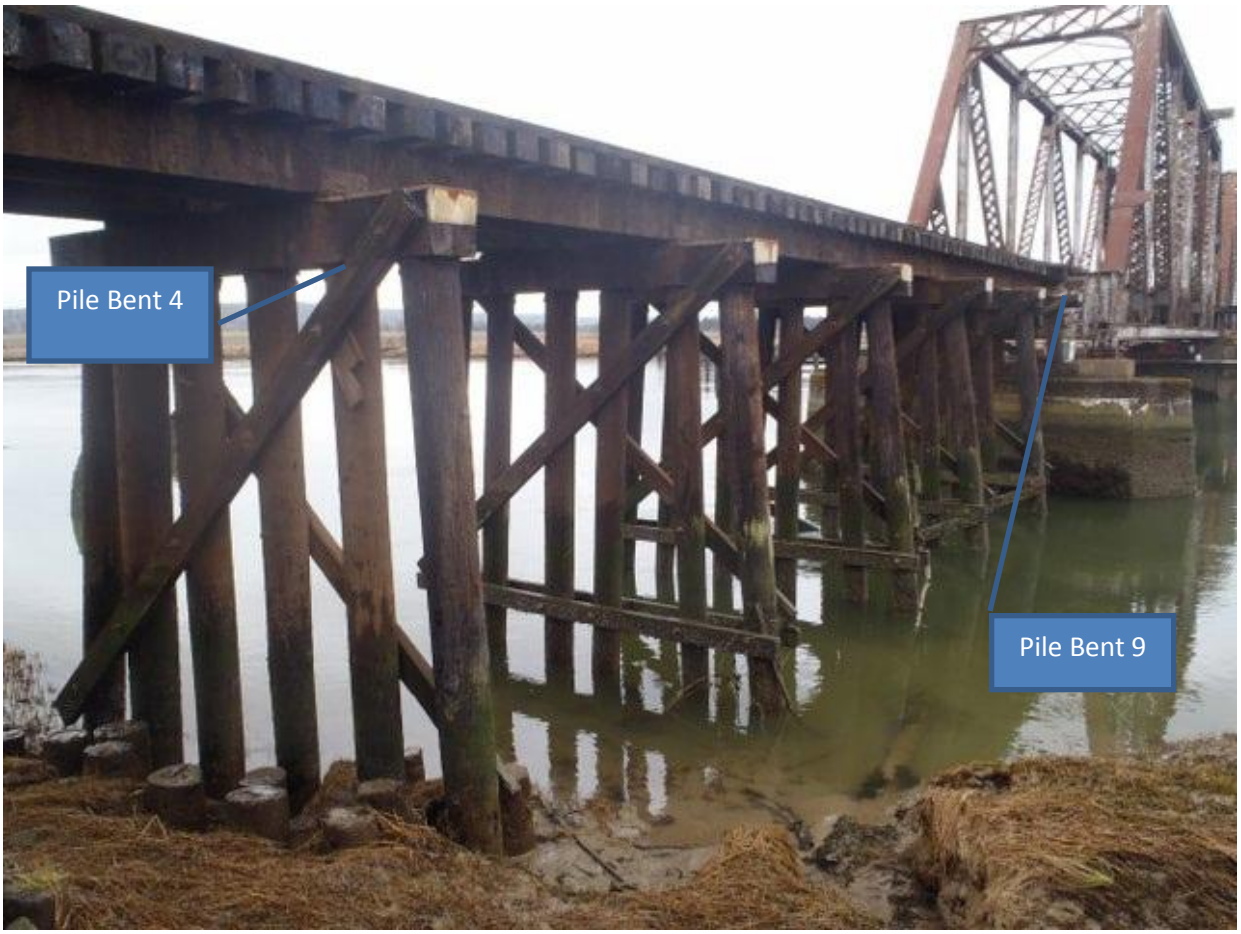

Figure 7. Photo Northwest Showing Wetland Vegetation, Unconsolidated Mud Bottom Under South Approach

4.2.4 Wildlife habitat

Natural areas within the project area include a mosaic of tidal marshes, emergent wetland, sloughs and mudflats. Steamboat Slough and associated tidal areas provide habitat for a variety of waterfowl, waterbirds, and aquatic furbearers. The estuarine areas support a diversity of saltwater fishes, freshwater fishes and migratory fish species. The wetland areas provide habitat for a variety of wildlife, including wintering waterfowl, birds, amphibians, and small mammals. The non-wetland areas may support a limited number of native and non-native wildlife species.

4.3 Aquatic Resources

The project area is located within the Snohomish River Basin. Water bodies in the project area include Steamboat Slough, a side channel to the Snohomish River.

4.3.1 Snohomish River Basin

The Snohomish River basin is located northeast of Seattle, Washington, within WRIA 7. The watershed encompasses about 1,780 square miles and is the second largest Puget Sound drainage. Two major tributaries, the Skykomish and Snoqualmie Rivers, originate in steep, narrow valleys in the Cascade Mountains, descend into broad alluvial floodplains, and merge

near Monroe at river mile 21.0 to form the Snohomish River. Below the confluence of the Skykomish and Snoqualmie Rivers at RM 20.55, the mainstem Snohomish River flows through a glacier-carved valley before emptying into Port Gardner Bay and Possession Sound between the city of Everett and the Tulalip Indian Reservation. The Snohomish River lower mainstem includes the lower 14 miles and consists of 24 miles of major side channels (sloughs), 14 tributaries with more than 121 linear stream miles, and more than 53 miles of interconnecting drainage ditches and backwater sloughs. Steamboat Slough is a side channel to Snohomish River.

4.3.2 Steamboat Slough

Steamboat Slough is located in the lower reaches of the Snohomish River watershed. It is the second longest side channel of the Snohomish River. It begins from the Snohomish River right bank at river mile (R.M.) 3.8, and flows for 6.2 miles before discharging into Possession Sound. The channel width averages 110 to 115 yards in its lower reaches. Union Slough diverges off its left bank at R.M. 6.1. Ebey Slough has two interconnections with Steamboat Slough at R.M. 5.5 and 6.0.

Steamboat Slough has complex flow conditions resulting from a branched channel network, tidal fluctuations, and floodplain flows that have been altered by levees built and maintained by independent diking and drainage districts. There are numerous diking districts that each maintain varying dike heights, which creates unnatural and unequal flood protection. High flows occur in November through January due to winter rainfall and in May and June due to snowmelt. The lowest flows occur in August (Pentec and NW GIS 1999).

Steamboat Slough provides migrating and rearing habitat for Chinook, coho, chum and pink salmon; steelhead, sea run cutthroat trout, Dolly Varden, and bull trout char. It provides an estuarial transition area for these salmonid adults returning to spawn and juvenile smolts out migrating to sea. Some non-salmonid fish that use this reach for migrating and feeding include green and white sturgeon, pacific and river lamprey and starry flounder.

5. LISTED SPECIES AND HABITAT

USFWS (2007) indicates that listed species and designated critical habitat under the ESA may be present in Snohomish County and species lists from NMFS indicate that listed species are present in the project vicinity (NMFS 2008). Site specific information indicates that at least four of these listed species have the potential to occur in the project vicinity. Steamboat Slough is designated critical habitat for two of the listed species. A discussion of the applicable life history of listed fish species is included in Appendix C.

5.1 Puget Sound Chinook Salmon (*Oncorhynchus tshawytscha*)

5.1.1 ESA and Stock Status

NMFS completed an ESA status review of Chinook salmon populations from Washington, Oregon, Idaho, and California, and defined 15 ESUs (each considered a species under the ESA) within the region. Naturally spawned spring, summer/fall, and fall Chinook salmon runs from the Puget Sound ESU are currently listed as threatened, but were considered likely to become endangered in the foreseeable future (Myers et al. 1998). The abundance of Chinook salmon in the Puget Sound ESU has declined substantially from historic levels, and there is concern over the effects of hatchery supplementation on genetic fitness of stocks, as well as severely degraded spawning and rearing habitats throughout the area (Myers et al. 1998). In addition, harvest exploitation rates in excess of 90 percent were estimated to occur on some Puget Sound Chinook salmon stocks. Subsequent to this status review, NMFS issued a ruling in May 1999 listing the Puget Sound ESU as threatened (Federal Register 1999). Primary factors contributing to declines in Chinook salmon in the Puget Sound ESU include habitat blockages, hatchery introgression, urbanization, logging, hydropower development, harvests, and flood control and flood effects (NMFS 1998).

Chinook salmon runs within the Snohomish River basin are considered part of the Puget Sound ESU. The 1992 Washington state salmon and steelhead stock inventory (SaSSI) divided the natural spawning populations of Snohomish River Chinook salmon into four distinct stocks: Snohomish summer Chinook, Snohomish fall Chinook, Bridal Veil Creek fall Chinook, and Wallace River summer/fall Chinook salmon (WDFW et al 1993). The four Snohomish River basin Chinook stocks have since been reorganized into two stocks, the Skykomish and the Snoqualmie, following the Chinook population delineation used by the Puget Sound Technical Recovery Team (Puget Sound TRT 2001; WDFW 2002).

The Skykomish Chinook stock primarily spawn throughout the mainstem and in some tributaries of the Skykomish and Snohomish Rivers. The stock status was rated depressed as of 2002 because of chronically low escapements (WSCC 2002). The Snoqualmie Chinook stock spawns in the Snoqualmie River and its tributaries, including the Tolt and Raging Rivers and Tokul Creek. Due primarily to low productivity, the status of the Snoqualmie stock was rated as depressed in 2002.

5.1.2 Occurrences of Chinook Salmon in the Project Area

Adult Chinook salmon will not be migrating through the action area and juveniles may be rearing in the action area during construction (Table 3). The tidally-influenced wetlands of the lower Snohomish River, including Steamboat Slough, provide essential estuarine conditions needed by juvenile salmonids to acclimate to marine conditions. Juvenile Chinook salmon use the slough for out-migrating to sea and rearing. Adult Chinook salmon use Steamboat Slough as transition waters when returning to spawn in the Skykomish, Snoqualmie, and Snohomish Rivers, several miles upstream of the project site. The potential presence of salmonids in Steamboat Slough would be associated with the specific run timing and life history phase of each.

Chinook may enter the Snohomish River system as early as May 1 to begin their upstream migration (Table 3, WSDOT 2008b). The spawning time for Skykomish Chinook takes place as early as late August, with the majority of spawning sometime between September 1 and October 31 (WDFW 2002). Snoqualmie Chinook spawn between September 15 and October, but they can spawn as late as November (WDFW 2002). During the juvenile out-migration, juvenile Chinook salmon migrate downstream through the project action area sometime between April 15 and July 15 (WSDOT 2008b). Juvenile Chinook salmon may use the estuarine wetlands and side channels as rearing habitat year round.

5.1.3 Critical Habitat

NMFS (Federal Register 2005) made a final critical habitat designation for 19 ESUs of salmon and steelhead in California and the Pacific Northwest, including the Puget Sound Chinook salmon ESU. The designation obligates federal agencies to give special consideration to their activities that take place in the designated critical habitat area. The entirety of Steamboat Slough, including the reaches within the action area of the proposed project, is designated as Chinook salmon critical habitat.

NMFS has defined specific Primary Constituent Elements (PCEs) as the known physical and biological features within occupied areas that are essential to the conservation of the species (Federal Register 2005).

The specific Primary Constituent Elements for Chinook salmon include:

1. Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation and larval development.

2. Freshwater rearing sites with water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; water quality and forage supporting juvenile development; and natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.

3. Freshwater migration corridors free of obstruction with water quantity and quality conditions and natural cover such as submerged and overhanging large wood,

aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival.

4. Estuarine areas free of obstruction with water quality, water quantity, and salinity conditions supporting juvenile and adult physiological transitions between fresh-and saltwater; natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels; and juvenile and adult forage, including aquatic invertebrates and fishes, supporting growth and maturation.

5. Nearshore marine areas free of obstruction with water quality and quantity conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation; and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels.

6. Offshore marine areas with water quality conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation.

The two PCEs that apply to the project action area include #4 estuarine areas and #5 nearshore marine areas that support habitat for Chinook salmon.

5.2 Puget Sound/Coastal bull trout (*Salvelinus confluentus*)

5.2.1 ESA and Stock Status

In 1998, USFWS completed a determination of the status of bull trout, identifying five DPSs in the continental U.S. (1998a). The Coastal-Puget Sound bull trout DPS is composed of 34 subpopulations (USFWS 1998a; USFWS 1999). USFWS listed bull trout in the Coastal-Puget Sound DPS as threatened under the ESA on November 1, 1999 (USFWS 1999).

Four life history forms are generally recognized for bull trout, which include resident (non-migratory), adfluvial (lake dwelling), fluvial (migratory stream and river dwelling), and anadromous (saltwater migratory) fish. The Coastal-Puget Sound DPS of bull trout, which includes the Skykomish River/Snohomish River subpopulation, is unique because it is thought to contain the only amphidromous forms of bull trout within the continental U.S. (USFWS 1998a). The status of the migratory forms (fluvial, adfluvial, and anadromous) is of greatest concern throughout most of their range. The majority of the remaining populations in some areas may be largely composed of resident bull trout (Leary et al. 1991; Williams and Mullan 1992).

Bull trout have a wide but very patchy distribution across their range, even in pristine environments (Rieman and McIntyre 1993). The species has been extirpated from many of the large rivers within its historic range, and exists primarily in isolated headwater populations. The decline of bull trout has been attributed to habitat degradation, blockage of migratory corridors by dams, poor water quality, the introduction of nonnative species, and the effects of past fisheries management practices (USFWS 1998a). The stock status of the Skykomish /Snohomish subpopulation is healthy (WDFW 1998; WDFW 2004; USFWS 1998b).

Bull trout within the Snohomish River system are part of the Skykomish Bull Trout/Dolly Varden stock (WDFW 2004). Spawning occurs in the South and North Fork Skykomish River and several of their tributaries.

5.2.2 Occurrences of Bull Trout in the Project Area

Bull trout adults and juveniles may be present in the action area at the time of construction. Anadromous, fluvial, and resident life history forms of bull trout migrate through and forage in the Snohomish River system (Goetz et. al. 2004). When bull trout enter or exit marine waters they make rapid, directed migrations usually along the nearshore marine shorelines (Goetz et. al. 2004). Steamboat Slough provides an important estuarial transition area for bull trout adults returning to spawn and juvenile smolts outmigrating to sea. Survey information from a bull trout capture and tagging study (Goetz et. al. 2004) indicates that "juvenile emigration to estuarine areas from other river basins [besides the Skagit River] is a relatively rare event." Reproducing populations of bull trout have been documented in the Upper Skykomish River basin. Bull trout migrate upstream to spawn in the connecting Skykomish River system.

Adult bull trout may enter the Snohomish River system as early as May 1 and may be present through September (Table 3; WSDOT 2008b). Spawning occurs from late August to early or mid-November; however, spawning more typically occurs between the first week in October and the first week in November. A study by the Army Corps of Engineers (Goetz et al. 2004) tagged bull trout, and tracked them in the Snohomish and Skagit Rivers. The study found that bull trout tagged in the Snohomish River Delta vicinity stayed in this area until July 1 before entering the Snohomish River. Some of the bull trout migrated between the Snohomish River and Skagit River systems foraging for food before returning to the Snohomish Watershed to spawn. Juvenile bull trout typically migrate downstream between mid-April and mid-June (Table 3).

5.2.3 Critical Habitat

Critical habitat for the Coastal-Puget Sound bull trout DPS was designated (USFWS 2010). The designation obligates federal agencies to give special consideration to their activities that take place in designated critical habitat areas. A significant portion of Steamboat Slough, including the portion within the action area of the proposed project, is designated as bull trout critical habitat.

Within the designated critical habitat areas, the PCEs for bull trout are those habitat components that are essential for the primary biological needs of foraging, reproducing, rearing of young, dispersal, genetic exchange, or sheltering (USFWS 2005). The specific PCEs for bull trout include:

1. Water temperatures that support bull trout use. Bull trout have been documented in streams with temperatures from 32 to 72 °F (0 to 22 °C) but are found more frequently in temperatures ranging from 36 to 59 °F (2 to 15 °C). These temperature ranges may vary depending on bull trout life history stage and form, geography, elevation, diurnal and seasonal variation, shade, such as that provided by riparian habitat, and local groundwater influence.

2. Complex stream channels with features such as woody debris, side channels, pools, and undercut banks to provide a variety of depths, velocities, and in-stream structures.

3. Substrates of sufficient amount, size, and composition to ensure success of egg and embryo overwinter survival, fry emergence, and young-of-the-year and juvenile survival. This should include a minimal amount of fine substrate less than 0.25 inch (0.63 centimeter) in diameter.

4. A natural hydrograph, including peak, high, low, and base flows within historic ranges or, if regulated, currently operate under a biological opinion that addresses bull trout, or a hydrograph that demonstrates the ability to support bull trout populations by minimizing daily and day-to-day fluctuations and minimizing departures from the natural cycle of flow levels corresponding with seasonal variation.

5. Springs, seeps, groundwater sources, and subsurface water to contribute to water quality and quantity as a cold water source;

6. Migratory corridors with minimal physical, biological, or water quality impediments between spawning, rearing, overwintering, and foraging habitats, including intermittent or seasonal barriers induced by high water temperatures or low flows;

7. An abundant food base including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish; and

8. Permanent water of sufficient quantity and quality such that normal reproduction, growth, and survival are not inhibited.

The three PCEs that are applicable to the project action area #1 water temperatures, #6 optimal migratory corridor, and #7 food base.

5.3 Puget Sound steelhead trout (*Oncorhynchus mykiss)*

5.3.1 ESA and Stock Status

On May 11, 2007, NMFS listed the Puget Sound steelhead DPS as a threatened species under the ESA (Federal Register 2007). In the Snohomish River watershed, three summer steelhead stocks and three winter steelhead stocks have been identified (WDF et al. 1993). Wild summer stocks occur in the forks of the Tolt River and the upper North and South Fork Skykomish River. Wild native winter steelhead include the Snohomish/Skykomish, Snoqualmie, and Pilchuck River stocks.

The Snohomish/Skykomish winter steelhead stock spawns in the mainstems of the Snohomish, Skykomish, Sultan, and Wallace Rivers and their associated tributaries, and is designated as a distinct stock based on geographical isolation of the spawning population (WDF et al. 1993).

The stock is native, and the 1992 SaSSI (WDF et al. 1993) designated the stock status as healthy. However, the stock status was rated depressed in 2002 due to a severe short-term decline in total escapements since 1999 (WSCC 2002). The total estimated spawner return to the Snohomish watershed of winter steelhead has ranged from 2,234 fish (2002) to 8,588 fish (1992).

5.3.2 Occurrences of Steelhead in the Project Area

Both Adult and juvenile Steelhead are expected to be in Steamboat Slough during construction. Adult steelhead use Steamboat Slough as transition waters when returning to spawn in the Snohomish, Skykomish, Sultan, and Wallace Rivers and their associated tributaries and smolts use the pass for out-migration to sea (WDFW 1998). Adult return timing of summer steelhead stocks is generally May through October, which is distinct from the return timing of winter steelhead stocks from November through April. Although there is no known steelhead spawning habitat within the study area, steelhead salmon are known to be present in Steamboat Slough (WDFW 1998). Winter steelhead spawn upstream at the Snoqualmie-Skykomish confluence. Summer steelhead spawn in the mainstem Snohomish River from the Snoqualmie-Skykomish confluence downstream to SR 9. Spawn timing for summer steelhead stocks may be similar to other steelhead stocks in the Puget Sound area, typically February through April. Spawn timing for winter steelhead stocks are generally from early March to early/mid-June. Juvenile outmigration of smolts is documented to occur between February and October (WSDOT 2008b).

5.3.3 Critical Habitat

NMFS has not designated critical habitat for the Puget Sound steelhead DPS (Federal Register 2007).

Table 3. General Life History Phases and Run Timing for Listed Species and EFH Species in the Snohomish River System, Including Steamboat Slough (Adapted From WDF 1975, WDFW 2002, WDFW 1998, WDF 1993, WSDOT 2008b, Goetz et. al. 2004).

Species/Event	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec
Project Work Schedule												
Skykomish Chinook												
Upstream migration												
Spawning												
Juvenile rearing												
Juvenile out migration												
Snoqualmie Chinook												
Upstream migration												
Spawning												
Juvenile rearing												
Juvenile out migration												

Species/Event	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec
Project Work Schedule												
Bull Trout												
Upstream migration												
Juvenile rearing												
Juvenile out migration												
Foraging Adults												
Snohomish/Skykomish Winter Steelhead												
Upstream migration												
Spawning												
Juvenile rearing												
Juvenile out migration												
North and South Fork Skykomish Summer Steelhead												
Upstream migration												
Spawning												
Juvenile rearing												
Juvenile out migration												

5.4 Marbled Murrelet (*Brachyramphus marmoratus*)

5.4.1 ESA Status

USFWS listed marbled murrelet as a Threatened species on October 1, 1992 (57 FR 45328). Critical habitat for this species was designated on May 24, 1996 (61 FR 26255); habitat requirements for this species include suitable nesting trees, food resources, and foraging habitat (Appendix C). Critical habitat has not been designated within 16 miles of the proposed construction.

5.4.2 Occurrences of Marbled Murrelets in the Project Area

The species list for Snohomish County documents that marbled murrelets forage in the nearshore areas adjacent to the coastlines. Generally, marbled murrelets are closely associated with mature or old growth coniferous forests for nesting, with foraging occurring in the nearshore marine waters and coastal lakes year round. Timing of winter foraging activities are from September through March. Strachang et al. (1995) documents that marbled murrelets usually forage within two miles of the shore in areas such as upwellings, mouths of bays, sills, tidal rips, narrow passages between islands, shallow banks, and kelp beds. Murrelets forage at all times of the day, but most active times are in the morning and in the evening, and sometimes foraging occurs at night. Behavior in the marine environment includes courtship, loafing (resting, preening, etc.), and foraging for food (Strachan et al. 1995). Adult and sub-adult marbled murrelets move away from breeding areas before they molt and select areas with a consistent prey base during their flightless periods.

Since Port Gardner Bay and Possession Sound include nearshore marine environments, there remains potential for marbled murrelets to be present in the action area during construction. It is highly unlikely that marbled murrelets would be present in the immediate vicinity of Steamboat Slough given the lack of suitable foraging habitat and lack of spawning habitat for their prey species including herring, surf smelt, and sand lances in the slough. The nearest location of spawning habitat for these prey species is located over 6 miles west of Steamboat Slough near Hat Island (WDFW 2014). Although marbled murrelets may pass over the action area during construction, they will likely be concentrated and more stationary at feeding sites far from the action area.

6. PROJECT ACTION AREA

The federal register defines the action area for a project as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50 CFR 17.11). The action area for this project includes the proposed right of way for the railroad, approach and staging areas sites (Figure 8). The action area also extends beyond the project footprint to include potential construction noise impacts on terrestrial or aquatic species.

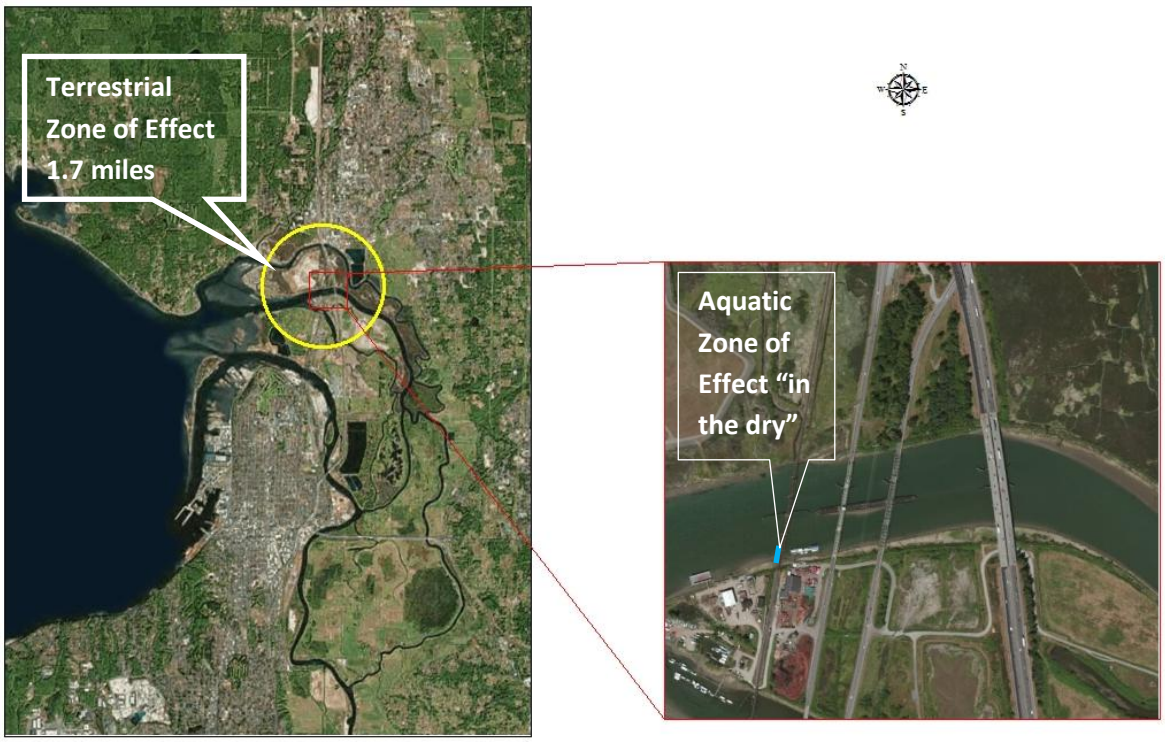

Figure 8. Action Area Map for South Approach Replacement Project

The action area is based on the outmost extent of all zones of effect combined. This project would have two zones of effect: aquatic and terrestrial. Since all work below the MHHWM is proposed to be done "in the dry" during low tide, the impacts from both sound and siltation are expected to be minimal or undetectable. Thus, terrestrial impacts will be the zone used in establishing the action area for this report.

All mixing zones and water quality monitoring will be in accordance with water quality regulations (RCW 90.48; WAC 173-201A). Construction method BMPs to treat or settle construction stormwater will likely be used for the project to remain in compliance with water quality standards. Selection of BMPs will be up to the contractor; however, all BMPs will be in accordance with the permits granted for the project.

Several factors contribute to the background noise in the project area. These include light industry, agriculture, railroad, highway and boat traffic. For the purpose of this report background noise was based on the population density mapped within the project area. Noise from SR 529 and I-5 were also noted in this report as a reference to existing conditions. Railroad traffic was not analyzed in this report, but would also contribute to the background noise in the project area. The population density near the project area varies from 209 people per square mile (ppsm) next to SR 529, to 103,100 ppsm on the north side of the slough and 60,660 ppsm mapped in the project area (Snohomish County 2015 Comprehensive Plan http://2015update-snoco.org/alternatives/alternatives-map-portal/). Thus, the background noise levels would be 65 dBA (WSDOT 2013 http://www.wsdot.wa.gov/mapsdata/travel/annualtrafficreport.htm). Two highways are located to the east of the project area. SR 529 is approximately 350 feet to the east and approximately 1,420 feet further east is I-5. The average speed in the area is 55 to 60 miles per hour for SR 529 and I-5. SR 529 has an average of 32,000 vehicles per day/1,333 per hour (at milepost 5.77) and I-5 has an average of 126,000 vehicles per day/5,250 per hour (at milepost 198.27) near the project area (WSDOT 2013). Typical traffic noise in the project area is expected to be at least 71.0 dBA.

Construction equipment for project is spilt into the loudest pieces of equipment for general construction, and pile driving. The three loudest pieces of equipment for general construction include: chain saw (84 dBA), crane (81 dBA) and excavator (81 dBA) with a combined dBA of 86. The three loudest pieces of equipment for pile driving include: impact pile driver (110 dBA), crane (81 dBA) and flat bed truck (74 dBA) with a combined dBA of 110. All of these measurements are based on the average maximum noise level at 50 ft from the noise source (WSDOT 2013). Since the pile driving is the loudest combined noise it was used as the greatest impact in the terrestrial zone.

Both soft and hard site conditions exist along the railway. Soft site conditions include agricultural land, wetlands and forest. Hard site conditions include the industrial areas, highways, and water (Steamboat Slough). Since hard site conditions are dominant in the project area this was used for noise calculations. As a result there would be a 6 dBA reduction of construction noise and 3 dBA reduction of traffic noise per doubling distance from the source.

For the terrestrial impact zone, the action area is the area in which noise levels are elevated above ambient levels. For general construction activities for the south approach with the exception of pile driving, the action area extends out approximately five hundred feet. General construction is expected to last approximately four to six weeks.

Since the pile driving is the loudest noise produced by the project it will have a much larger terrestrial zone of effect and action area. Pile driving will be done over an approximately two week period, in intervals. The **action area** pile driving extends out a **1.7 mile radius** from the location of pile driving proposed to construct the new bridge approach and support structure (Figure 8; Table 4). These are conservative assumptions and do not take into account the existing highway noise and diminishing effects to sound propagation such as obstructions, topography, wind, and atmospheric absorption. The action area also includes potential direct and indirect effects of interrelated actions.

Aquatic noise levels from pile driving are not expected to have any adverse effect on fish marine mammals or birds, since it will be done at low tide (in the dry) when sound cannot attenuate through the water. Terrestrial noise will be less than the nearby highway noise levels at 3200 feet, and will drop below ambient noise levels at approximately 1.7 miles from the action area. No adverse effect is expected to birds, and marine mammals since they can avoid the area. Additionally it would be done at low tide when the likelihood of marine mammals being present in the project vicinity would be low.

Table 4. Attenuation Rates of Construction and Traffic Noise (WSDOT 2013).

Distance from the source (ft)	Pile Driving Construction noise (6 dBA reduction per doubling distance)
50	110
100	104
200	98
400	92
800	86
1600	80
3200	74
6400	68
12800	62

Source: http://www.wsdot.wa.gov/Environment/Biology/BA/BAguidance.htm

7. ENVIRONMENTAL BASELINE CONDITIONS

Olsson Associates documents the existing environmental baseline by providing information about individual habitat features that may support listed species in the action area. The analysis determines how the project may directly impact the habitat features in the action area, and contribute to the environmental baseline condition following construction.

7.1 Aquatic Species

USFWS and NMFS provide a matrix of pathways and indicators to assist in defining the baseline habitat for listed fish species (Table 5). The best available scientific information about the environmental baseline in Steamboat Slough and the Snohomish River watershed comes from Olsson Associate biologists during site review and habitat information from WRIA 07 Salmonid Habitat Limiting Factors Analysis (WSCC 2002). The analysis applies to potential impacts the project may have on water quality, habitat access, habitat elements, channel conditions and dynamics in the project action area and on a watershed scale.

7.2 Sub-population Characteristics

The following indicators are specific to bull trout and potential impacts were only examined at the watershed scale.

7.2.1 Sub-population size

Sub-population characteristics are a baseline parameter established by the USFWS for bull trout. Sampling efforts have documented bull trout occurrence in Steamboat Slough. A study by the Army Corps of Engineers (2004) tagged bull trout and tracked them in the Snohomish and Skagit Rivers. The extent of the bull trout population in the Snohomish River watershed is unknown though it is considered much smaller than the Chinook or coho salmon populations (WDFW 1998). Steamboat Slough provides a migratory corridor, potential foraging habitat for bull trout, as well as potential refuge habitat during high tides. The project area supports habitat for salmonids, which are prey species for bull trout.

Based on the matrix of pathways and indicators, the baseline conditions are considered to be *at risk* for bull trout regarding population size, life history diversity and genetic integrity and *unknown* for growth/survival on a watershed scale.

The project may temporarily impact bull trout during work below the MHHWM as a result of sedimentation and turbidity, water quality, during piling removal and replacement; however, these are not significant enough impacts to change the sub- population size for this species. The project will *maintain* all sub-population baseline parameters on a watershed scale.

7.2.2 Growth/Survival

The growth and survival of any population of bull trout potentially using the lower Snohomish watershed habitat is *unknown*. Habitat degradation is a major factor affecting production, with agriculture and residential development contributing to poor water quality in the lower river (WSCC 2002).

The proposed project will include temporary construction below the MHHWM that may result in some temporary impacts to bull trout; however, it will not impact the growth and survival of the existing population. Therefore, the project will *maintain* the baseline conditions for this habitat parameter.

7.2.3 Life History Diversity/Isolation

Anadromous, fluvial, and resident life history forms of bull trout are found in the Snohomish River watershed and, in some cases, overlap geographically. The bull trout are considered at *risk* in this watershed. The project neither includes the installation of migration barriers nor other features that would affect the life history diversity/isolation of bull trout; therefore, the project will *maintain* baseline conditions for this habitat indicator.

7.2.4 Persistence and Genetic Integrity

WDFW has assigned a stock status of healthy to the Snohomish/Skykomish bull trout genetic stock, but they are considered at *risk*. The proposed project will *maintain* the baseline conditions because the project work does not include any proposed impacts that would further fragment bull trout populations.

7.3 Water Quality

Environmental baseline pathways and indicators for water quality include temperature, sediment and chemical contaminants and nutrients.

Table 5. USFWS and NOAA Fisheries Pathways and Indicator Matrix for Chinook Salmon, Steelhead, and Bull Trout in the Action Area and the Snohomish River Watershed.

DIAGNOSTICS	ENVIRONMENTAL BASELINE CONDITIONS			EFFECTS ON THE ACTION AREA			EFFECTS ON THE WATERSHED		
Pathways And Indicators	Properly Functioning	At Risk	Not Properly Functioning	Restore	Maintain	Degrade	Restore	Maintain	Degrade
Subpopulation Characteristics									
Subpopulation Size		**X**			**X**			**X**	
Growth/Survival		*unknown*			**X**			**X**	
Life History Diversity/ Isolation		**X**			**X**			**X**	
Persistence and Genetic Integrity		**X**			**X**			**X**	
Water Quality									
Temperature		**X**			**X**			**X**	
Sediment		**X**			**X** *long-term*	*temporary*		**X**	
Chemical Contaminants. /Nutrients			**X**	*long-term improve-ment*	**X**			**X**	

DIAGNOSTICS	ENVIRONMENTAL BASELINE CONDITIONS			EFFECTS ON THE ACTION AREA			EFFECTS ON THE WATERSHED		
Pathways And Indicators	Properly Functioning	At Risk	Not Properly Functioning	Restore	Maintain	Degrade	Restore	Maintain	Degrade
Habitat Access									
Physical Barriers		x			x			x	
Habitat Elements									
Substrate			x		x	*temporary*		x	
Large Woody Debris			x		x			x	
Pool Frequency/Quality			x		x			x	
Off-channel Habitat		x			x			x	
Refugia		x			x	*short-term*		x	
Channel Condition and Dynamics									
Width to Depth Ratio			x		x			x	
Streambank Condition		x			x			x	
Floodplain Connectivity		x			x			x	

DIAGNOSTICS	ENVIRONMENTAL BASELINE CONDITIONS			EFFECTS ON THE ACTION AREA			EFFECTS ON THE WATERSHED		
Pathways And Indicators	Properly Functioning	At Risk	Not Properly Functioning	Restore	Maintain	Degrade	Restore	Maintain	Degrade
Flow Hydrology									
Peak/ Base Flows		**x**			**x**			**x**	
Drainage Network Increase		**x**			**x**			**x**	
Watershed Conditions									
Road Density and Location		**x**			**x**			**x**	
Disturbance History/Regime			**x**		**x**			**x**	
Riparian Reserves			**x**		**x**			**x**	
Integration of Species and Habitat Conditions		*unknown*			**x**			**x**	

7.3.1 Temperature

Current research indicates that bull trout, especially, have among the lowest upper thermal limits and growth optima of North American salmonids. Food consumption declines significantly at temperatures greater than 16 C, and fish exposed to temperatures of 71.60 F and above did not feed (Selong and McMahon 2001). Temperatures in Steamboat Slough occasionally exceed the state water quality standard of 64°F (18°C) during the summer months (Ecology 2004). Such temperatures may impair salmonid migration and rearing activities in the reach. Based on the matrix of pathways and indicators criteria, the baseline conditions are *at risk*.

The proposed project will not impact temperature functions for Steamboat Slough. The dimensions of the new approach will not change shading or stormwater discharge into the slough. The project will *maintain* baseline conditions in the action area and at a watershed scale.

7.3.2 Sediment/Turbidity

Sediment and turbidity are a concern in the Snohomish River watershed due to human development activities. Turbidity levels in Steamboat Slough meet standards during baseflow conditions (11 NTU); however during storm events turbidity reaches 34 NTU (Snohomish County 2000). Land use activities such as agriculture, livestock, forestry and development have increased the fine sediment loading, thus likely affecting salmonid spawning and benthic productivity. Based on the matrix of pathways and indicators criteria, the baseline conditions are *at risk.*

The project will work below the MHHWM of Steamboat Slough to remove the existing piles and install the new piles; therefore, the project may temporarily degrade the environmental baseline for sediment in the action area during construction. The work is being proposed at low tide when no surface water is present and thus should not resuspend settled sediment or cause turbidity in flowing water. The temporary degradation of baseline sediment levels is likely given the temporary impacts to the soil that will occur for project construction, and presence of contaminated mud and silt below the MHHWM. Project construction could result in the disturbance of contaminates (specifically copper) in the sediment which has the potential to elevate water column concentrations of the contaminants. The project will incorporate erosion control BMPs to minimize sediment entry into the channel and resulting turbidity during construction and will comply with related project permits. Effects to sediment are expected to be temporary during construction, and this habitat parameter will be maintained over the *long-term*. The project will *maintain* baseline conditions for this parameter at the watershed scale.

7.3.3 Chemical Contamination/Nutrients

Steamboat Slough is listed on the 303(d) list for dissolved oxygen, temperature and bacteria (Ecology 2004). The Tulalip Indian Reservation Superfund site is immediately downstream of the project corridor and the Marysville Wastewater Treatment Plant Lagoons are immediately upstream. Copper has been identified as a pollutant of concern originating from wastewater treatment plants discharging to the lower Snohomish River and sloughs. Toxic contaminants, such as metals, have been found in runoff from road and commercial areas. Additional sources of chemical contaminants include agricultural land, pastoral land and livestock. Previous land uses, including timber, pulp and papermills, discharged significant quantities of contaminants into the Snohomish estuary. After 1975, discharging of contaminants into the system was greatly reduced and it is likely that sediment from the river buried some contaminated sediments (WSCC 2002). It is likely that localized areas still remain contaminated.

Based on the matrix of pathways and indicators criteria, the baseline conditions are *not properly functioning* within the action area and watershed.

There will be no increase in wastewater or pollution runoff as a result of the project. Temporary release of contaminants during pile removal and installation will be short-term and will not increase the current concentrations. The project is expected to *maintain* baseline conditions and should have a long-term benefit, due to the removal of creosote piles.

7.4 Habitat Access

7.4.1 Physical Barriers

There are no manmade barriers exist in Steamboat Slough that prevent upstream or downstream fish passage at all flows. The construction of dikes and levees has blocked access to historical side channel rearing and overwintering habitat for juvenile fish. Based on the matrix of pathways and indicators criteria, the baseline conditions are *at risk*.

This project will remove the existing approach structure, including forty-eight timber piles, thirty-six of which are typically below the MHHWM of Steamboat Slough. The existing structure will be replaced by nine steel pipe piles with an overall smaller footprint than the existing structure.

The project does not pose permanent significant changes to physical barriers; therefore, it will *maintain* this parameter over the long term in the action area and on a watershed scale.

7.5 Habitat Elements

Habitat elements to potentially support stream use by over-wintering or pioneering Chinook salmon and bull trout include gravel substrate, large woody debris (LWD), pool frequency and quality, and off-channel habitat.

7.5.1 Substrate

The project corridor is located near the Snohomish River delta and is characterized by a low and relatively consistent gradient. Finer-grained materials are present in the water column; gravels are not expected to be present in the substrate. The extensive levee construction in the Snohomish River floodplain has altered the natural deposition of sediment. The channel substrate in the project corridor is comprised of sands and silts, some of which is contaminated. The substrate in the estuarine wetland consists of organic material, fine sandy loams, and sand. Based on the matrix of pathways and indicators criteria, the baseline conditions are *not properly functioning*.

The project will include temporary impacts to the streambed substrate; therefore, it will temporarily degrade this habitat parameter in the project action area. *Temporary* impacts to Steamboat Slough include the removal of forty-eight total piles, and placement of nine 24-inch diameter steel pipe piles below the MHHWM to support the new approach.

The three newly proposed bents will be 9.42 ft² each (3.14 ft² per pile) of permanent impacts to the streambed substrate; however, the removal of the existing approach structures below the MHHWM will result in a removal of 47.9 ft² area of streambed coverage. The overall permanent approach footprint below the MHHWM, therefore, will be reduced by 19.64 ft². For these reasons, the project will *maintain* the baseline condition for impacts to stream substrate over the long-term in the action area and on a watershed scale.

7.5.2 Large Woody Debris

Much of the historical LWD in the Snohomish River watershed was removed to improve navigation in the late 1800s-early 1900s (WSCC 2002). Recruitment potential is impaired in Steamboat Slough by the lack of woody riparian vegetation, alteration of vegetation species diversity and the separation of Steamboat Slough from the floodplains by dikes, levees, roads and agricultural development. There is a spruce riparian forest on upper Steamboat Slough, but its ability to provide LWD is minimized due to the presence of a dike which separates the forest from the main channel of Steamboat Slough (WSCC 2002). In some areas, old pilings used for moorage function in a limited capacity as LWD, providing cover and velocity refuge and serve to trap additional LWD pieces (WSCC 2002). Due to tidal fluctuations, it is unlikely that LWD would remain for long periods even if there was recruitment potential. Based on the matrix of pathways and indicators criteria, the baseline conditions are *not properly functioning* in the action area and on a watershed scale.

The project limits are within the maintained railroad right-of way and does not support large trees. No trees are proposed to be removed as part of this project. The proposed project will *maintain* this indicator as a result of limited construction in the action area and on a watershed scale.

7.5.3 Pool Frequency and Quality

Channel conditions and complexity have been dramatically altered through most of the watershed by channelization, resulting in the loss of LWD and associated pools. Pools are

absent from this section of Steamboat Slough because LWD is not retained for any extended period due to tidal fluctuations. Based on the matrix of pathways and indicators criteria, the baseline conditions are *not properly functioning*. The project will not substantially affect the slough's hydrology or the recruitment of LWD in the action area, and will *maintain* baseline conditions.

7.5.4 Off-channel Habitat

Agricultural practices have also contributed to the loss of side channel areas and riparian vegetation in the floodplain. In the Snohomish River estuary, approximately 74% of the wetlands were diked and drained for agricultural activities over the past 150 years (WSCC 2002). Disconnection and destruction of off-channel habitat has significantly reduced rearing capacity of salmonids. Off-channel habitat is available in the immediate project area in the tidally influenced wetlands and side-channels that flow through the wetlands. Based on the matrix of pathways and indicators criteria, the baseline conditions are *at risk* in the action area and watershed scale.

This habitat indicator is at risk within the watershed and project action area because of the lack of LWD and channel complexity that has been substantially diminished with the creation of tide gates and artificial dikes. No removal of tide gates, dikes, or trees, is proposed nor is the planting or placement of large woody debris; therefore the project will *maintain* this parameter on a local scale and *maintain* this parameter on a watershed scale.

7.5.5 Refugia

Refugia, by definition, provide suitable habitats of appropriate temperature, which may include pool habitat. Wetlands provide several functions that directly affect salmonids, with refugia being one of them. The loss of riverine wetlands due to agriculture and residential development has decreased the amount of refugia habitat within the Snohomish Basin. In the action area, estuarine wetlands below the MHHWM of Steamboat Slough provide refuge habitat for juvenile salmonids during high tide. The wetlands are vegetated and during the summer months provide adequate hiding places and holding areas for salmonids when flooded with water. For these reasons, refugia are functioning *at risk* in the action area and on the watershed scale.

The project will not take place during juvenile out-migration, but may have a short-term effect on salmon movement due to the placement of sound attenuating devices, if required. As a result, the project will *maintain* refugia on the watershed scale and *maintain* the existing baseline conditions within the action area.

7.6 Channel Conditions and Dynamics

Habitat parameters to access channel conditions include width to depth ratio, streambank condition, and floodplain connectivity.

7.6.1 Width to Depth Ratio

In general, there appears to be a wide variety of width to depth conditions represented within the watershed because of the topography and variation in level of disturbance. The more developed

drainages within the watershed have been destabilized by adjacent land use such as agricultural, commercial, and residential development. The width-to-depth ratio for Steamboat Slough within the action area, which is generally greater than 12, has been altered by shoreline development. Based on the matrix of pathways and indicators criteria, the baseline conditions are *not properly functioning* in the action area and at risk on a watershed scale.

The project does not include construction of any structures that will modify the width-to-depth ratios in Steamboat Slough. The proposed project will *maintain* current width-to-depth ratios in both the action area and on a watershed scale.

7.6.2 Streambank Condition

Streambanks in the project corridor have undergone severe modifications from human disturbances that have displaced natural features and functions. In the action area, the streambanks of Steamboat Slough are relatively stable, although this condition is partially due to the presence of constructed dikes and levees along the length of the Slough. Based on the matrix of pathways and indicators criteria, the baseline conditions are *at risk.*

Streambanks of Steamboat Slough that are temporarily impacted for the installation of the approach removal will be stabilized and re-vegetated if needed, with native species in the project footprint to maintain the streambank condition in the action area. The project is not expected to alter streambank stability and will *maintain* baseline conditions in the action area and in the watershed.

7.6.3 Floodplain Connectivity

Diking and channelization in the early part of the 20th century eliminated a portion of Steamboat Slough's connection to its floodplain. There is a reduced linkage of wetlands, floodplains, and riparian areas to the main channel and a reduction in overflow banks relative to historic frequency. The isolation, filling and draining of habitat in the floodplain has also impacted Chinook and coho rearing (Haas and Collins 2001). Based on the matrix of pathways and indicators criteria, the baseline conditions are *at risk*.

The proposed project includes no off-channel habitat and wetland creation; thus the project will *maintain* floodplain connectivity on both the action area and the watershed scale.

7.7 Flow/Hydrology

Analysis of flow and hydrology includes individual analyses of peak/base flows and the drainage network.

7.7.1 Peak/Base Flows

The upper sections of the watershed are naturally susceptible to high peak flows and low base flows (Pentec and NW GIS 1999). Baseflows appear to be declining within the Snohomish River basin for which the cause is still undetermined (WSCC 2002). Withdrawals from Steamboat Slough associated with water rights impacts the peak and base flows. The amount of urbanization increases the frequency, magnitude and duration of stormwater runoff that

adversely impacts salmonid rearing habitat. Based on the matrix of pathways and indicators criteria, the baseline condition are *at risk* according to NMFS criteria.

The project area is exempt from flow control, because the site is tidally influenced and is located downstream of the confluence of the Skykomish and Snoqualmie Rivers. Improved treatment and drainage is not anticipated to significantly affect peak/base flows. The project will *maintain* baseline conditions in the action area and on a watershed scale.

7.7.2 Drainage Network

The Snohomish River basin and action area have experienced significant increases in the drainage network density due to road construction and development. For this reason, the baseline indicator is *at risk* at the watershed scale.

The project will add no impervious surface to the project area; thus the project is expected to *maintain* the overall drainage network in the action area and in the watershed.

7.8 Watershed Conditions

Analysis of the watershed condition relies on individual analyses of the disturbance regime, riparian reserves, and the integration of species and habitat conditions.

7.8.1 Road Density/Location

The drainage areas within the action are a mixture of developed and undeveloped land. Within the action area, high road densities (>5 miles of road per square mile of land) exist within the city of Everett, while lower road densities are present within unincorporated Snohomish County. Based on the matrix of pathways and indicators criteria, the baseline conditions are *at risk* in the action area and at the watershed scale.

This project will not add new roads. The project will *maintain* the baseline conditions in the action area and at the watershed scale.

7.8.2 Disturbance History/Regime

As previously discussed, the Snohomish River watershed and action area have undergone moderate to high levels of disturbance from past agricultural development, diking, dredging, and past and present residential and commercial development. For this reason, the baseline condition is *not properly functioning*. The project may change the level of service on the railroad line in the project area; however, it will not contribute to new development. The project will *maintain* the baseline conditions.

7.8.3 Riparian Reserves/Conservation Areas

The majority of the riparian reserves in the lower mainstem riparian corridor were harvested by 1898 (Pentec and NW GIS 1999). Natural vegetative communities have been lost to land clearing for agriculture and residential and commercial development. There is a spruce riparian forest on upper Steamboat Slough but the riparian function is minimized due to the presence of a dike which separates the forest from the main channel of the Snohomish River (WSCC 2002).

Thus, Steamboat Slough has diminished riparian function and limited potential for LWD recruitment. Based on the matrix of pathways and indicators criteria, the overall baseline conditions for riparian reserves in the action area are *not properly functioning*. As the project will not impact any forested areas located in existing riparian zones, it is expected to *maintain* baseline conditions in the action area and in the watershed.

7.8.4 Integration of Species and Habitat Conditions

This indicator is specific to bull trout. Agriculture and rural and urban development have caused habitat fragmentation in the Snohomish River Basin. A large number of culverts and bridges have been placed at private and public road crossings of the Snohomish River and its many tributaries throughout the basin. Extensive diking and tide gates in the Snohomish River estuary, including Steamboat Slough, restricts salmonid access to small side channels and adjacent wetlands. In many reaches in the watershed and action area, development encroaches upon streams, riparian wetlands, and the floodplain. Base flows have been impacted by increased withdrawal for wells and loss of groundwater recharge from development. However, because the size of the bull trout population is unknown, the integration of species (bull trout) and habitat conditions is also *unknown* according to USFWS criteria.

The proposed project will maintain the integration of species and habitat conditions in the action area. No riparian forested areas will be impacted by the project and there will be an increase in in-stream habitat by the removal of the thirty-six piles. The existing approach structure, including thirty-six piles, will be removed and replaced with nine piles for an overall smaller footprint following construction. This will have a slight increase in channel habitat and as result restore habitat features in the action area, but *maintain* this parameter in the watershed.

8. IMPACT AVOIDANCE, MINIMIZATION AND CONSERVATION MEASURES

Measures have been incorporated into the project to avoid and minimize impacts to listed species and to be in accordance with anticipated permits and project approvals. Generally the project will avoid and minimize impacts to listed species given the following efforts:

- Perform work below the MHHWM will be done at low tide when no surface water is present;
- Use BMPs during work below the MHHWM to minimize sediment and turbidity;
- Use alternate construction methods to minimize underwater noise attenuation, when possible;
- Construct the project in accordance with conservation measures; and
- Construct the project in accordance with regulatory permits.

Since the project may affect, but is not likely to result in adverse impacts to listed salmonid species and their critical habitat; conservation measures have also been proposed to address listed species recovery.

- Reduction in the bridge approach in-stream footprint.

9. CONSERVATION MEASURES

Conservation measures have been created to avoid and minimize impacts to listed species. Construction of the new bridge approach will require work below the MHHWM to install new piles and remove existing piles. Since the project area is tidally influenced, piles may be placed "in the dry" and at low tide at multiple locations.

Pile driving/removal:

1. Impact pile driving, or pile driving below the MHHWM will only occur 'in the dry' and at low tide when no surface water is present.

2. BNSF will utilize a portadam, if necessary, to maintain the "in the dry" condition on site while driving pile.

3. Existing piles located in estuarine wetlands will not be removed when they are surrounded by water.

4. Existing piles located in the defined wetted channel will not be removed without the use of a Best Management Practices (BMP) to contain the sediment.

10. ANALYSIS OF EFFECTS

The analysis of effects on listed species has been determined assuming that all conservation measures have been incorporated into the project. The analysis includes all direct and indirect effects, as well as analysis of interrelated and interdependent actions that may also cause an impact to listed species.

10.1 Direct Effects

Direct effects on listed species are related to temporary and permanent impacts within the project footprint. How temporary and permanent impacts may affect each listed species depends greatly on their life history phase during construction, their likelihood of presence in the action area, and type of construction being performed.

10.1.1 Temporary impacts

Temporary impacts are related to removal and placement of piles. The project will have a temporary impact to about 47.9 ft² of estuarine wetland below the MHHWM, directly below the existing south approach (Appendix B). The project will have a temporary impact on estuarine wetlands and Steamboat Slough from the installation of steel piles (24-inch diameter) below the MHHWM to construct new bridge approach.

10.1.1.1 Temporary noise impacts

Temporary impacts also include potential noise impacts. The only listed species documented to occur within the action area are aquatic; therefore, only below water construction activities were examined during the impact assessment. The maximum distance for in-water noise attenuation (of pile driving) is approximately 8000 feet west and 2700 feet east from the noise source output at the bridge. This estimation is based on the project being performed “in the wet” at a depth greater than 1.3 feet deep.

Construction will include the use of an impact hammer to drive the piles during low-tide when no surface water is present. These construction methods will be performed “in the dry”, because tide levels constantly fluctuate at the project site. Currently, there remain few quantitative and qualitative data for fish and the effects of exposure to sound from pile driving. In-water pile driving can generate considerable noise impacts for salmonids and driving steel pile has been found to cause both injury and behavioral changes in some specific cases. These effects have primarily occurred with large diameter steel piles driven through hard substrates at in-water locations. In the marine environment, it has been demonstrated that in-water pile driving does have tangible effects on the general behavior and distribution of salmonids, that salmonids may be affected by pile driving sound within a radius of 1970 feet of the sound source, and pile driving operations may affect salmonids (Feist et. al.1992). The same study indicated that although juvenile pink and chum salmon avoided the immediate area of pile driving activity, they did not change their shoreline orientation or cease foraging (Feist et al.1992).

The sensory capability of different fish species is variable and there is some evidence that relatively high levels of noise may not alter the behavior of some salmonid species. Mate et al. (1987) conducted neurological tests on coho salmon and determined that their hearing was most sensitive around 50 Hertz (Hz) with an upper limit of 800 Hz. Their work, plus that conducted at the Ballard Locks with Chinook salmon and steelhead (NMFS and WDW 1992) and acoustic devices capable of ensonifications up to 220 peak decibels (dB), conclusively showed no effect on fish behavior.

Laboratory fish tank studies by Mate et al. (1987) indicated that sound pressure levels of 195 dB peak in a frequency range of 8 to12 KHz had no effect on adult salmonids or egg and sperm viability. Frequencies above 1 KHz were shown to be beyond the normal “hearing” range of the fish.

Popper et al., (2005) found that there was no threshold shift in the hearing of the broad whitefish (*Coregonus nasus*) when exposed to approximately 210 dB for 20 airgun shots. Broad whitefish are hearing generalists like salmonids.

The potential for impact on listed species, as previously discussed, will vary greatly on channel depth, substrate composition, in-water temperatures, and noise reduction methods used during construction. In addition, the exposure of fish to sound levels would be determined by both a measure of the received levels and the duration of the signal. Although limited information is documented about how fish may be affected during the pile driving operations, the duration of pile driving can be estimated. The project will install a maximum of nine piles during the approved work window. All of the piles will be driven below the MHHWM. The project proposes to do work below the MHHWM at low tide. The duration of pile driving is estimated to be fourteen days.

Pile driving impacts will be more limited when carried out in shallower waters or when conducted “in the dry” in the action area as the tide levels fluctuate. Since the dominant frequencies generated in pile driving are between 50 and 1,000 Hertz, most of the energy is not propagated in water depths of 1.3 feet (0.4 meters) or less. Some noise does propagate, however, through sediment, especially the harder sediments such as clay and rock, escaping into the water column somewhere else (albeit at a lower level than the source) through noise flanking. Noise flanking is a common occurrence that has been observed by Battelle (2004) and WSDOT (Laughlin 2005). Battelle has monitored piles driving at various distances “in the dry” for WSDOT during the Hood Canal Project. During the monitoring, two of the piles had greater than 33 percent exceedences of the 180 dB peak criterion. Pile driving exceedences of peak levels appeared to be correlated with the distance from the hydrophone to the boat; however, this information was not specifically investigated or concluded in the study. The investigation did not record the substrate types or force of the hammer during the study, which also may account for the variable noise recordings.

Multiple years of work in the Lake Washington Ship Canal where a variety of acoustic deterrence devices were employed failed to show any evidence of delay in the migration of

steelhead (Infometrix 1994; Tabor et al. 1994). Migrating salmon and steelhead are accustomed to the noisy environment of turbulent streams, plunge pools at the base of cascades and waterfalls, etc. Low-intensity sound generated by work conducted out of the water, away from the river when fish may be rearing or migrating through the project area would not be expected to have any harmful effects.

Existing scientific information indicates that adverse effects are likely to listed salmonid species during pile driving operations in water deeper than about two feet; however, the exact impacts are unknown. It is expected that the use of a noise attenuation device can reduce the potential impacts. Based on known information, juvenile salmonids present in the channel during pile driving activities may receive a variety of noise levels relative to site conditions. Types of expected responses include temporary behavior modifications to avoid the project area or they may incur permanent physiological impacts that would alter future physiological behaviors necessary to their life history phases.

10.1.1.2 Sediment and turbidity

Sediment and turbidity will be minimized to the extent possible during construction; however, it is likely that sediment, some of it potentially contaminated, will be disturbed in the action area. Construction activities, below the MHHWM, that could result in the temporary resuspension of potentially contaminated sediments include the installation of piles for new approach piers, and removal of existing piles. When disturbed in wetland areas, sediment may be somewhat controlled by BMPs, however, release into the action area is likely given the tidal fluctuations that saturate the wetlands on a daily basis.

According to best available science, suspended sediment may impact adult and juvenile fish in the action area in various ways. Behavioral avoidance of turbid waters may be one of the most import effects of suspended sediments (DeVore et al.; 1980 Birtwell et al. 1984). Scientists have observed fish moving laterally and downstream to avoid turbid plumes (McLeay et al. 1984). Reported positive effects include sediment-providing refuge and cover from predation (Gregory and Levings 1988).

Salmonids have evolved in systems with periodic short-term pulses (days to weeks) of high-suspended sediment loads, often associated with flood events, and areas adapted to such high pulse exposures (Bjorn and Reiser 1991). The duration of turbidity exposure is the critical determinant of the occurrence and magnitude of physical and behavioral effects (Newcombe and McDonald 1991). Chronic exposure can cause physiological stress responses that can increase maintenance energy and reduce feeding and growth (Redding et al. 1987, Lloyd, et al. 1987, Servizi and Martens 1991).

In Steamboat Slough, given the base flow levels of suspended sediment in the action area, juvenile salmonids would be expected to exhibit some avoidance behavior to turbidity created by construction equipment. Impacts from turbidity are likely to affect any juvenile Chinook salmon, bull trout, or steelhead present in Steamboat Slough during construction by creating physiological stress that may affect feeding behavior and growth.

10.1.1.3 Water Quality

The potential for the presence of surface water contaminants due to the disturbance of contaminated sediment during construction is an issue of concern.

Sediment disturbance from the proposed project could produce localized plumes with Cu at concentrations in excess of risk criteria. The dilution zones are expected to be small and ephemeral. The risk of species exposure would be limited to periods in which a salmonid was present within a sediment plume. Because the work will be conducted "in the dry" during low tide when no surface water is present, impacts from surface water contamination are likely to have little to no effect on any Chinook salmon, bull trout, or steelhead present.

10.1.2 Permanent impacts

Permanent impacts include the placement of 9.42 ft² of permanent fill below the MHHWM for pier construction.

Channel substrate

The three new approach bents will result in the placement of 28.26 ft^2 of fill below the MHHWM; however, the removal of the existing bridge structures below the MHHWM will result in a removal of 47.9 ft² area of streambed coverage. The overall permanent footprint below the MHHWM, therefore, will be reduced by 19.64 ft². For these reasons, permanent impacts to the channel substrate will be insignificant to migratory Chinook salmon, steelhead, and bull trout.

10.2 Indirect effects

Indirect effects are those that may occur to listed species over time after the project has been completed. Indirect effects may result for listed species for the duration of time it takes to restore the estuarine wetlands in the footprint of removed piles following construction. Given that the impacts to these areas will be minimal, vegetation re-growth would be expected within about three years.

10.3 Interrelated and Interdependent actions

The project includes interrelated/interdependent actions to provide construction staging and stockpiling areas within the project limits. Temporary staging areas and access will be established on existing paved or gravel roads and railroad tracks. Any newly established staging areas will be located in developed, upland areas such as existing gravel roads, parking lots, and railway shoulders. For staging of equipment such as pile drivers and equipment planned for work below the MHHWM, all sensitive areas will be protected by appropriate BMPs to avoid impacts to listed aquatic species.

Wetland and stream buffer impacts have been avoided and minimized during the project planning process and will require compensatory mitigation, if impacted.

10.4 Effects on Critical Habitat

10.4.1 Chinook Salmon Critical Habitat

Both PCE's that apply to the project action area have the potential to be affected by the proposed project. The analysis includes a review of potential impacts on each PCE to determine potential impacts to critical habitat.

10.4.1.1 Estuarine areas

The project will temporarily impact estuarine wetlands in Steamboat Slough from the removal of the piles. The vegetation and substrate in these areas below MHHWM would be temporarily impacted due to the removal of existing timber piles during the approved work window.

It is unlikely this action will result in a temporary migration barrier since it will be constructed "in the dry". It should not impede migration or impact behavior of juvenile or adult Chinook salmon transitioning to marine or freshwaters, as previously discussed during impacts to Chinook salmon individuals. Although the project will install nine piles below the MHHWM, the final pile configuration of 9 rather than 36 piles will cover less area in critical habitat below the MHHWM of Steamboat Slough; therefore, impacts to substrate conditions in critical habitat are considered insignificant as compared to the baseline condition. Impacts to the vegetation, substrate, and fish migration within critical habitat are considered temporary due to the nature of the structures to complete construction.

10.4.2 Bull trout Critical Habitat

The analysis includes a review of potential impacts on bull trout PCEs to determine potential impacts to critical habitat.

10.4.2.1 Optimal Migratory Corridor

As discussed for Chinook salmon, pile installation and removal would occur over a short duration and would be done within the approved fish window. Since the work is being done "in the dry" the project should not impede migration or impact behavior of juvenile or adult Bull trout transitioning to marine or freshwaters. This is not considered an impact to the PCE for an optimal migratory corridor. Impacts to the vegetation, substrate, and fish migration within critical habitat are considered temporary due to the nature of the structures to complete construction.

11. EFFECTS DETERMINATIONS FOR LISTED SPECIES

Effect determinations have been recommended assuming all conservation measures have been applied and all Best Management Practices have been fully implemented during construction. Effect determinations are recommended with consideration to the direct effects, indirect effects and interrelated and interdependent actions. A "**may affect, not likely to adversely affect**" determination has been recommended for Chinook salmon, steelhead, bull trout and marbled murrelet.

Puget Sound ESU Chinook Salmon

The project warrants a "**may affect**" determination for Chinook salmon based on the following rationale:

- Juvenile and adult Chinook salmon are known to be present in Steamboat Slough within the action area. Steamboat Slough is a migratory corridor to and from spawning grounds upstream in the Snoqualmie and Skykomish Rivers and their tributaries.
- The project will require work below the MHHWM when Chinook salmon may be present in Steamboat Slough.

The recommended effect determination is "**may affect, not likely to adversely affect**" for Chinook salmon based on the following rationale:

- Juvenile Chinook salmon are not likely to be adversely affected by underwater noise associated with impact pile driving and removal, because the work will be done "in the dry".
- Chinook salmon are not likely to be adversely affected by turbidity in the action area during the work below the MHHWM, because the work will be done "in the dry".
- Construction and demolition work during the recommended fish window should not affect the juvenile out migration season; may temporarily affect migratory behavior of juvenile Chinook salmon.
- The installation of permanent bridge piles will result in a net gain of 19.64 ft^2 of migration habitat in the Steamboat Slough, once the existing piles are removed.
- Since the work is being proposed "in the dry" there would be no resuspension of sediments that could lead to the release of contaminants (specifically dissolved Cu) at concentrations above risk criteria for listed salmonid species.

Chinook salmon Critical Habitat

The project will have a temporary adverse impact on both PCE's for estuarine areas and nearshore areas; therefore, a determination of **may affect, not likely to adversely affect** is recommended for Chinook salmon critical habitat. Minimization measures have been included into the project to avoid and minimize potential impacts to critical habitat. Impacts to water quality (from turbidity) are considered short term adverse impacts on individuals of Chinook salmon; therefore, they are considered the same type of adverse impact for critical habitat. Since the environmental baseline conditions includes a substrate already dominated by mud

and silt; no long term impacts are expected to alter critical habitat. Impacts to the vegetation and substrate from removal of the piles also considered temporary adverse impacts to critical habitat. Long term impacts are not expected for vegetation and substrate as a result of the project. Although the project will install nine piles permanently below the MHHWM, the final pile configuration will cover less area in critical habitat below the MHHWM of Steamboat Slough; therefore, impacts to substrate conditions in critical habitat are considered insignificant as compared to the baseline condition.

Puget Sound DPS bull trout

The project warrants a "**may affect**" determination for bull trout based on the following rationale:

- Bull trout can be found throughout the Snohomish River basin, and foraging bull trout are known to occur in Steamboat Slough. Steamboat Slough is a migration corridor for anadromous bull trout moving to and from spawning grounds upstream in the Snoqualmie and Skykomish Rivers and their tributaries.

- The project will require work below the MHHWM when bull trout may be present in Steamboat Slough.

The recommended effect determination is "**may affect, not likely to adversely affect**" for bull trout based on the following rationale:

- Bull trout are not likely to be adversely affected by underwater noise associated with impact pile driving and removal, because the work will be done "in the dry".

- Bull trout are not likely to be adversely affected by turbidity in the action area during the work below the MHHWM, because the work will be done "in the dry".

- Construction and demolition work will be installed during the recommended fish window and should not affect juvenile out migration season; which may temporarily affect migratory behavior of juvenile bull trout.

- The installation of permanent bridge piles will result in a net gain of 19.64 ft^2 of migration habitat in the Steamboat Slough, once the existing piles are removed.

- Since the work is being proposed at low tide when no surface water is present there would be no re-suspension of sediments that could lead to the release of contaminants (specifically dissolved Cu) at concentrations above risk criteria for listed salmonid species.

Bull trout Critical Habitat

The project will have a temporary adverse impact on the PCE for optimal migratory corridor; therefore, a determination of **may affect, not likely to adversely affect** is recommended for bull trout critical habitat. Measures have been included in the project to avoid and minimize potential impacts to critical habitat. Impacts to water quality (from turbidity) are considered short term adverse impacts on individuals of bull trout; therefore, they are considered the same type of adverse impact for critical habitat. Since the environmental baseline conditions includes a

substrate already dominated by mud and silt; no long term impacts are expected to alter critical habitat. Impacts to the vegetation and substrate from removal of the piles also considered temporary adverse impacts to critical habitat. Long term impacts are not expected for vegetation and substrate as a result of the project. Although the project will install nine piles permanently below the MHHWM, the final pile configuration will cover less area in critical habitat below the MHHWM of Steamboat Slough; therefore, impacts to substrate conditions in critical habitat are considered insignificant as compared to the baseline condition.

Puget Sound DPS steelhead trout

The project warrants a "**may affect**" determination for steelhead based on the following rationale:

- Steelhead are known to be present in Steamboat Slough within the action area.
- Steamboat Slough is a migratory corridor to and from spawning grounds upstream in the Snoqualmie and Skykomish Rivers and their tributaries.
- The project will require work below the MHHWM, by the placement of a piles, when steelhead trout may be present in Steamboat Slough.

The recommended effect determination is "**may affect, not likely to adversely affect**" for steelhead based on the following rationale:

- Juvenile steelhead are not likely to be adversely affected by underwater noise associated with impact pile driving and removal, because the work will be done "in the dry".
- Steelhead are not likely to be adversely affected by turbidity in the action area during the work below the MHHWM, because the work will be done at low tide when no surface water is present.
- Construction and demolition work will remain installed during the recommended fish window and should not affect juvenile out migration season; which may temporarily affect migratory behavior of juvenile steelhead trout.
- The installation of permanent bridge piles will result in a net gain of 19.64 ft^2 of migration habitat in the Steamboat Slough, once the existing piles are removed.
- Since the work is being proposed at low tide when no surface water is present there would be no resuspension of sediments that could lead to the release of contaminants (specifically dissolved Cu) at concentrations above risk criteria for listed salmonid species.

Marbled murrelet

The project **may affect** marbled murrelet for the following reasons:

- Marbled murrelets forage in the marine waters of Port Gardner Bay and Possession Sound Snohomish County.
- Prey species for marbled murrelets are found greater than 6 miles from the site.

The project is **not likely to adversely affect** marbled murrelets for the following reasons:

- The project action area lacks suitable nesting habitat.
- Marbled murrelets may fly above or around construction noise to avoid impacts.

12. CONCLUSION

After a full review of field observations, scientific information, and project plans, Olsson Associates recommends that the project will have a **may affect, not likely to adversely affect** determination for **Chinook salmon, bull trout**, **steelhead and marbled murrelet**.

Olsson Associates recommends also that the project **may affect, not likely to adversely affect** Chinook salmon and bull trout critical habitat.

In regard to Magnuson Stevens Fishery Act, the direct impacts to listed species and critical habitat will be primarily short term in nature; therefore, Olsson Associates supports that the project will **not have any adverse effects** on Essential Fish Habitat of Chinook, pink, and coho salmon (see Appendix A for more details).

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APPENDIX A

Magnuson Stevens Fishery Conservation
and Management Act

The U.S. Senate passed the Magnuson-Stevens Fishery Conservation and Management Act (MSA) in 1976 and reauthorized it in 1996. It currently protects Essential Fish Habitat (EFH), defined as “those waters and substrate necessary to fish for spawning, breeding, or growth to maturity”.

The MSA includes a mandate that the NOAA Fisheries must identify EFH for federally managed marine fish, and federal agencies must consult with NOAA Fisheries on all activities that may adversely affect EFH. The Pacific Fisheries Management Council (PFMC) has designated EFH for the Pacific Salmon Fishery. The Pacific Salmon Management Plan includes Chinook, pink, and coho salmon.

The EFH designation for the Pacific Salmon Fishery includes all those streams, lakes, ponds, wetlands, and other water bodies currently or historically accessible to salmon in Washington, Oregon, Idaho, and California, except above the impassible barriers identified by PFMC (1999). The estuarine and marine areas, proposed EFH for salmon extends from near shore and tidal submerged environments within state territorial waters out to the extent of the exclusive economic zone offshore of Washington, Oregon, and California north of the Point of Conception (PFMC, 1999). EFH does not include tribal lands and areas above specific dams or longstanding, naturally impassable barriers.

Pacific Salmon Fishery

Steamboat Slough below the Mean Higher High Water mark provides EFH for Chinook salmon, coho salmon, and pink salmon in the action area. Steamboat Slough provides transition waters for juvenile salmonids migrating to the ocean, and for adult salmon returning to spawn in the Skykomish, Snohomish and Snoqualmie River.

EFH assessment

The federal register defines an adverse effect on EFH to include any impact, which reduces the quality and/or quantity of EFH. Adverse effects may include direct (e.g., contamination or physical disruption), indirect (e.g., loss of prey, or reduction in species' fecundity), site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810).

The BA includes a complete description of project activities for assessing impacts to EFH. **Based upon the project design, the minimal short-term impacts associated with pile driving, the construction windows for work below the MHHWM, the plan to work “in the dry”, and the extensive mitigation measures, we believe <u>there will not be any adverse effects to EFH for Pacific salmonids</u>.**

Beneficial effects on EFH

The removal of thirty-six timber piles and replacement with nine steel piles is expected to provide beneficial effects for all EFH species. The site will result in a smaller in-stream impact footprint; therefore, providing additional refuge and foraging opportunities for juvenile salmonids. In addition, the existing timber piles treated with creosote will be removed from the slough.

Conservation recommendations

Minimization measures and conservation measures have been designed to avoid and minimize impacts on EFH during construction, which are the same as proposed for ESA listed aquatic species.

Pacific salmon life histories

Life history information for Chinook salmon is included in Appendix B for ESA listed species.

PINK SALMON (*Oncorhynchus gorbuscha*)

Adult pink salmon enter Alaska spawning streams between late June and mid-October. Different races or runs with differing spawning times frequently occur in adjacent streams or even within the same stream (ADFG 2005). Most pink salmon spawn within a few miles of the coast and spawning within the intertidal zone or the mouth of streams is very common. Shallow riffles where flowing water breaks over coarse gravel or cobble-size rock and the downstream ends of pools are favored spawning areas. The female pink salmon carries 1,500 to 2,000 eggs depending on her size. She digs a nest, or redd, with her tail and releases the eggs into the nest. They are immediately fertilized by one or more males and then covered by further digging action of the female. The process is commonly repeated several times until all the female's eggs have been released. After spawning, both males and females soon die, usually within two weeks.

Sometime during early to mid-winter, eggs hatch. The alevins, or young fry, feed on the attached yolk sac material continuing to grow and develop. In late winter or spring, the fry swim up out of the gravel and migrate downstream into salt water. The emergence and out migration of fry is heaviest during hours of darkness and usually lasts for several weeks before all the fry have emerged.

Following entry into salt water, the juvenile pink salmon move along the beaches in dense schools near the surface, feeding on plankton, larval fishes, and occasional insects. Predation is heavy on the very small, newly emerged fry, but growth is rapid. By fall, at an age of about 1 year, the juvenile pink salmon are 4 to 6 inches long and are moving into the ocean feeding grounds in the Gulf of Alaska and Aleutian Islands areas.

COHO SALMON (*Oncorhynchus kisutch*)

Coho salmon are native to many of the drainages in the Pacific Rim from California to Alaska, and west to Japan, and are found in most streams in the Puget Sound drainage (Wydoski & Whitney 1979). They are found in a broader diversity of habitats than any other anadromous salmonid. Much like the cutthroat trout (*Oncorhynchus clarki*), coho manage to survive in the most unlikely of surroundings (urban/suburban ditch lines, chemically-impacted farmland creeks, etc.).

They have a relatively high threshold to habitat degradation, their numbers continue to decline. This may be an indication that human-caused impacts are greater than this species' resiliency (Wydoski & Whitney 1979).

In Washington, adult coho return from the ocean as early as August. Spawning occurs between October and early February. Depending upon temperature, eggs incubate in the gravel from three to four months. Coho fry emerge between February and June, and usually congregate in schools in the pools of a stream (Wydoski & Whitney 1979). The juvenile salmon generally rear in freshwater for the next 12-24 months. From May to June of their second year (occasionally their first), coho smolts migrate to the ocean. By fall, after just a few months of feeding in the marine environment, they have more than tripled their size (up to 20 inches long). While most coho will remain in the ocean for one more year, some males return to their natal streams in their first year to spawn as "jacks." Coho will begin their upstream migration as early as August, to begin the cycle again (Meehan 1991).

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APPENDIX B

Project Plans

GENERAL NOTES:

GENERAL: ALL MATERIAL AND WORKMANSHIP SHALL BE AS PER THE CURRENT A.R.E.M.A. MANUAL FOR RAILWAY ENGINEERING: CHAPTER 8 - CONCRETE STRUCTURES AND FOUNDATIONS, CHAPTER 15 - STEEL STRUCTURES.

THE BNSF STANDARD CONSTRUCTION SPECIFICATIONS SUPPLEMENT THE ABOVE A.R.E.M.A. MANUALS AND SHALL GOVERN.

STRUCTURE EXCAVATION AND BACKFILL: ALL STRUCTURE EXCAVATION AND BACKFILL SHALL BE IN ACCORDANCE WITH SECTION 04100 OF THE BNSF STANDARD CONSTRUCTION SPECIFICATIONS.

PILING: PILES SHALL BE DRIVEN IN ACCORDANCE WITH THE DETAILS AND NOTES ON PLAN NO. 0050-37.8-003.

AFTER PILES ARE DRIVEN, THEY SHALL BE PULLED, IF NECESSARY, AND HELD IN THE PROPER LOCATION AND CUT OFF AT PROPER ELEVATION.

CAST-IN-PLACE CONCRETE: ALL CONCRETE, CONCRETE WORK AND PLACEMENT OF REINFORCEMENT SHALL BE IN ACCORDANCE WITH SECTION 04400 OF THE BNSF STANDARD CONSTRUCTION SPECIFICATIONS. DETAILED FALSEWORK PLANS IN ACCORDANCE WITH PARAGRAPH 2.11 ARE REQUIRED AS NECESSARY.

THE PORTLAND CEMENT USED IN ALL CONCRETE SHALL BE TYPE II OR TYPE IIA. ALL CONCRETE SHALL BE AIR-ENTRAINED CONTAINING NOT LESS THAN 5 PERCENT NOR MORE THAN 7 PERCENT AIR BY VOLUME.

CONCRETE SHALL BE CLASS 40 WITH AN ULTIMATE COMPRESSIVE STRENGTH OF NOT LESS THAT 4000 PSI IN 28 DAYS. MAXIMUM SIZE OF COARSE AGGREGATE SHALL BE ONE INCH. THE MINIMUM CONCRETE COVER ON REINFORCEMENT SHALL BE TWO INCHES UNLESS INDICATED OTHERWISE. EXPOSED CONCRETE EDGES SHALL BE BEVELED $^{3}/_{4}$".

REINFORCEMENT: STEEL BARS FOR REINFORCEMENT SHALL BE DEFORMED BILLET-STEEL BARS CONFORMING TO THE REQUIREMENTS OF THE CURRENT ASTM DESIGNATION: A615, GRADE 60 OR A706, GRADE 60.

FABRICATION OF REINFORCEMENT SHALL BE IN ACCORDANCE WITH CHAPTER 7 OF THE CURRENT C.R.S.I. MANUAL OF STANDARD PRACTICE.

REINFORCEMENT WIRE BAR SUPPORTS THAT ARE IN CONTACT WITH FORMS SHALL BE CLASS 1, PLASTIC PROTECTED, IN ACCORDANCE WITH CHAPTER 3 OF THE CURRENT C.R.S.I. MANUAL OF STANDARD PRACTICE.

PLACING PRECAST BEARING BLOCK ON EXISTING CONCRETE PIER (PIER #5): PRIOR TO PLACING THE BEARING BLOCK, FIELD VERIFY THE ELEVATION OF THE EXISTING CONCRETE PIER. THE ENGINEER SHALL BE NOTIFIED OF ANY VARIANCES FROM PLAN ELEVATIONS.

AREAS ON TOP OF THE EXISTING CONCRETE PIER WHERE THE PRECAST BEARING BLOCK WILL SIT SHALL BE THOROUGHLY CLEANED TO REMOVE ALL LOOSE PARTICLES AND DUST. THE PRECAST BEARING BLOCK SHALL THEN BE SET IN THE PROPER LOCATION, WITH THE TOP OF THE PRECAST BEARING BLOCK LEVEL AT THE CORRECT BRIDGE SEAT ELEVATION, USING STEEL SHIMS, AS NECESSARY, AND NON-SHRINK GROUT TO COMPLETELY FILL THE VOLUME BETWEEN THE BOTTOM OF THE BEARING BLOCK AND TOP OF THE EXISTING CONCRETE PIER.

THROUGH 2" DIA. HOLES IN THE PRECAST BEARING BLOCK, DRILL $1^{3}/_{4}$" DIA. HOLES TO A DEPTH OF 2'-0" BELOW TOP OF THE EXISTING CONCRETE PIER. HOLES SHALL BE THOROUGHLY CLEANED USING A WIRE BRUSH AND COMPRESSED AIR OR VACUUMING TO REMOVE ALL LOOSE PARTICLES AND DUST. THEN 8-#10 DOWELS SHALL BE SET IN HOLES OF THE PRECAST BEARING BLOCK USING NON-SHRINK GROUT, IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS, TO COMPLETELY FILL THE VOIDS.

RECESSES AT LIFT ANCHORS: AFTER THE WINGWALLS ARE SET, FILL RECESSES WITH CEMENT GROUT TO TOP OF SURROUNDING CONCRETE.

LIFTING LOOPS: AFTER PRECAST BEARING BLOCK IS SET, BURN OFF LIFTING LOOPS ONE INCH BELOW THE SURFACE OF THE CONCRETE AND PATCH THE RESULTING RECESSES WITH CEMENT GROUT TO THE TOP OF THE SURROUNDING CONCRETE,

PERVIOUS BACKFILL MATERIAL BEHIND ABUTMENTS: PERVIOUS BACKFILL MATERIAL BEHIND THE ABUTMENT SHALL BE IN ACCORDANCE WITH PARAGRAPHS 2.5 AND 3.6 OF SECTION 04100 OF THE BNSF STANDARD CONSTRUCTION SPECIFICATIONS.

DAMPPROOFING: THE BACK FACE OF THE NEW ABUTMENT SEAT, BACKWALL, AND WINGWALLS SHALL BE DAMPPROOFED IN ACCORDANCE WITH SECTION 04800 OF THE BNSF STANDARD CONSTRUCTION SPECIFICATIONS.

ELASTOMERIC BEARING PADS: ELASTOMERIC BEARING PADS SHALL BE IN ACCORDANCE WITH SECTION 04900 OF THE BNSF STANDARD CONSTRUCTION SPECIFICATIONS.

MORTAR FOR SETTING DOUBLE VOIDED BOX BEAMS: BEAMS SHALL HAVE FULL AND EVEN BEARING UPON THE BRIDGE SEAT AREAS. IF NEEDED, MORTAR CONSISTING OF EQUAL PARTS BY VOLUME OF CLASS B EPOXY AND DRY SILICA SAND, MIXED IN ACCORDANCE WITH MANUFACTURER'S DIRECTIONS, SHALL BE SPREAD ON TOP OF BEARING PADS TO OBTAIN UNIFORM BEARING. SCRAPE EXCESS MORTAR FROM AROUND THE BEARING PADS AFTER BEAMS ARE SET.

ERECTION OF DOUBLE VOIDED BOX BEAMS: BOX BEAMS SHALL BE SET IN THE PROPER LOCATION USING CARE NOT TO DAMAGE CONCRETE MEMBERS. AFTER BEAMS ARE SET, BURN OFF LIFTING LOOPS TWO (2) INCHES ABOVE THE CONCRETE SURFACE. THE REMAINING PORTION OF THE LIFTING LOOPS ARE TO BE COATED WITH PAINT. PATCH RECESSES, IF NECESSARY, AROUND THE LIFTING LOOPS WITH EPOXY MORTAR AS USED FOR SETTING THE BEAMS.

DECK PLATES: THE DECK PLATES SHALL BE ADJUSTED, AS NECESSARY, TO INSURE THE PLATES FIT TIGHT AGAINST THE BEAMS AND CURBS.

HANDRAIL: HANDRAIL PANELS ON WALKWAYS SHALL BE ERECTED PLUMB AND IN LINE.

PATCHING: PATCHING OR REPAIR OF SPALLED OR CHIPPED PRECAST CONCRETE MEMBERS SHALL BE DONE USING CONPATCH V/O MORTAR, MIXED AND INSTALLED IN ACCORDANCE WITH MANUFACTURER'S WRITTEN INSTRUCTIONS.

CONPATCH V/O MORTAR CAN BE ORDERED FROM:

CONSPEC MARKETING & MANUFACTURING CO., INC.
4226 KANSAS AVENUE
KANSAS CITY, KS 66106
TOLL FREE (877) 416 - 3439

EPOXY MATERIALS ARE AVAILABLE FROM EITHER:

PERMALITE PLASTICS CORP.
1537 MONROVIA AVENUE
NEWPORT BEACH, CA 92663
PHONE (949) 548-1137
FAX (949) 548-1130

OR:

DELTA PLASTICS COMPANY
10513 ROAD 236
TERRA BELLA, CA 93270
PHONE (559) 535-1332
FAX (559) 535-3723

ATTENTION !! - UTILITY NOTE

THE IMPLIED PRESENCE OR ABSENCE OF UTILITIES IS NOT TO BE CONSTRUED BY OWNER, ENGINEER, CONTRACTOR, OR SUBCONTRACTORS TO BE AN ACCURATE AND COMPLETE REPRESENTATION OF UTILITIES THAT MAY OR MAY NOT EXIST ON THE CONSTRUCTION SITE. BURIED AND ABOVEGROUND UTILITY LOCATION, IDENTIFICATION, AND MARKING ARE THE SOLE RESPONSIBILITY OF THE CONTRACTOR. REROUTING, DISCONNECTION, PROTECTION, ETC. OF ANY UTILITIES MUST BE COORDINATED AMONG THE CONTRACTOR, UTILITY COMPANY, AND OWNER. SITE SAFETY, INCLUDING THE AVOIDANCE OF HAZARDS, ASSOCIATED WITH BURIED AND ABOVEGROUND UTILITIES REMAINS THE SOLE RESPONSIBILITY OF THE CONTRACTOR.

DESIGN DATA:

2012 A.R.E.M.A. DESIGN SPECIFICATIONS
LOADING: COOPER E80 w/ DIESEL IMPACT

STRUCTURE HAS NOT BEEN DESIGNED FOR A.R.E.M.A. GROUND MOTION CRITERIA OF CHAPTER 9

LONGITUDINAL FORCE ACCORDING TO PRE-1995 A.R.E.M.A. DESIGN CRITERIA

PILE DESIGN INCLUDED CAPACITY CHECK FOR FULL LOSS OF STEEL PIPE PILE SUCH THAT CONCRETE INFILL ALONE CAN PROVIDE DESIGN CAPACITY

LIST OF SHEETS:

1. GENERAL NOTES & LIST OF SHEETS
2. GENERAL PLAN & ELEVATION
3. PILE LAYOUT PLAN
4. PILE DETAILS
5. TYPICAL SECTIONS & DETAILS
6. BEARING LAYOUT ELEVATION VIEW
7. P/C CONCRETE ABUTMENT CAP ~ SPC37.8-1
8. P/C CONCRETE BENT CAP ~ SPC37.8-2
9. PRECAST CONCRETE BEARING BLOCK ~ SBB37.8-1
10. MISCELLANEOUS STEEL DETAILS
11. HANDRAIL PANEL DETAILS
12. BILL OF MATERIAL & DETAILS

BENCH MARK DATA:

T.B.M.: PK NAIL, 8.32 FT EAST SOUTH TIMBER BULKHEAD BRIDGE 37.8 PAINTED ORANGE STATION 10+00, EL. = 100.00 (ASSUMED)

REFERENCES:

BNSF STANDARDS:

PLAN NO. 500000-BG1, BG2 & BG3
PLAN NO. 0000-17902-88, 91 & 94

SURVEY DRAWINGS:

Bridge Replacement Location
Survey by Parsons, Chicago, IL.
dated 9/18/12

GEOTECHNICAL REPORT:

PROJECT MEMORANDUM BY JACOBS ASSOCIATES, DATED 1/22/13.

LIFTING WEIGHTS:

SCDC37.8-1	= 52,900 LBS.
SCDC37.8-2	= 52,900 LBS.
CDC27-10C	= 44,800 LBS.
SPC37.8-1	= 25,400 LBS.
SPC37.8-2	= 27,400 LBS.
PW103	= 4,800 LBS.
SBB37.8-1	= 30,800 LBS.

LEGEND:

T/T	= Top of Tie
El.	= Elevation
RY	= Railway
F.S.	= Far Side
N.S.	= Near Side
B.S.	= Both Sides
U.N.O.	= Unless Noted Otherwise
E.F.	= Each Face
F.F.	= Front Face
B.F.	= Back Face
P/C	= Precast
P/S	= Prestressed

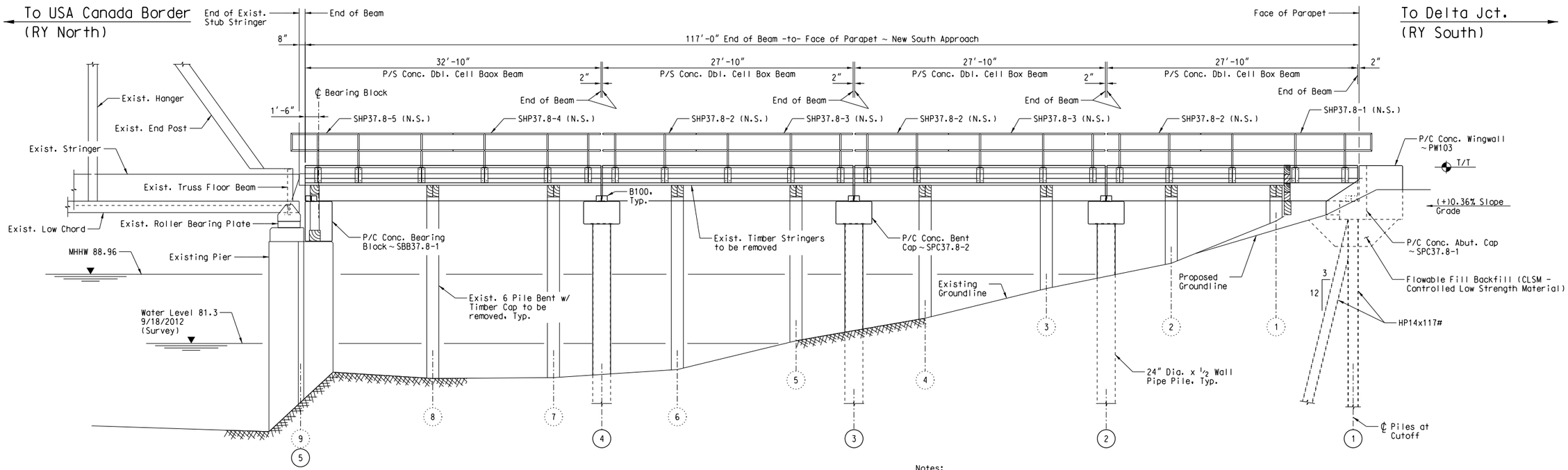
HANSON
Hanson Professional Services Inc.

DES: JEC	
DRAWN: GTJ	
CHECK: MAF	
DATE: 5/13/14	
AUTH: A141328	
LINE SEG: 0050	

BNSF RAILWAY
BRIDGE ENGINEERING KANSAS CITY, KS
APPROVED: Augustin M. Hurst
ASST. DIRECTOR STRUCTURES DESIGN

USA CANADA BORDER TO DELTA JCT.
BRIDGE NO. 37.8 - SOUTH APPROACH
OVER STEAMBOAT SLOUGH
MARYSVILLE, WA
GENERAL NOTES & LIST OF SHEETS

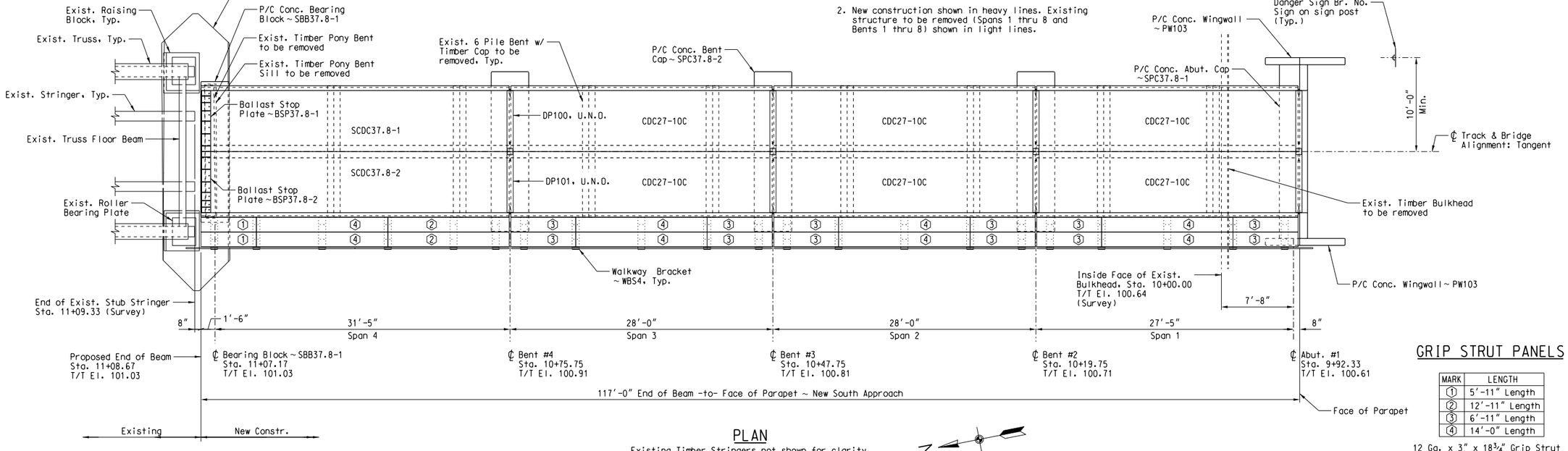
PLAN NO: 0050-37.8-001 | SHEET: 1 OF 12



ELEVATION

Notes:

1. Existing timber piles shall be cutoff 1'-0" below finished groundline.
2. New construction shown in heavy lines. Existing structure to be removed (Spans 1 thru 8 and Bents 1 thru 8) shown in light lines.



PLAN

Existing Timber Stringers not shown for clarity.

True North

GRIP STRUT PANELS

MARK	LENGTH
①	5'-11" Length
②	12'-11" Length
③	6'-11" Length
④	14'-0" Length

12 Ga. x 3" x 18¾" Grip Strut Safety Grating

TABLE OF ELEVATIONS

ABUT. OR BENT NO.	T/T ELEV.	BRIDGE SEAT	PILE CUTOFF	ESTIMATED TIP PILE ELEVATION
1	100.61	96.80	94.80	(-)25.2
2	100.71	96.90	94.40	(-)25.6
3	100.81	97.00	94.50	(-)25.5
4	100.91	97.10	94.60	(-)25.4
5	101.03	97.22	-	-

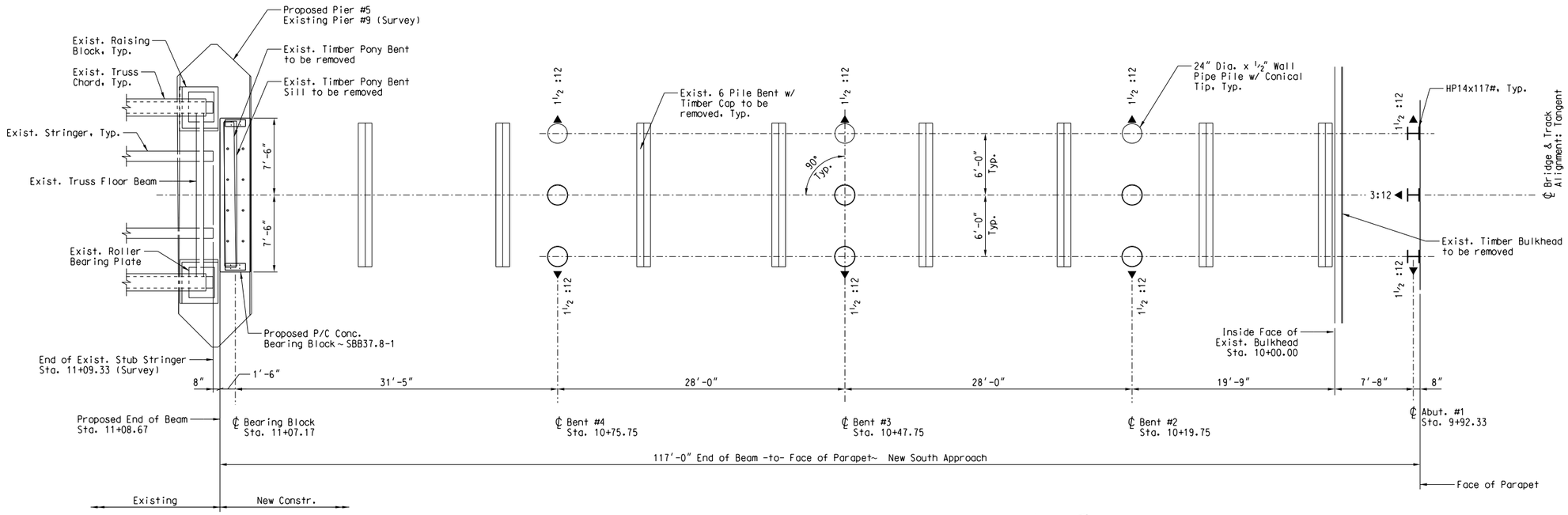
HANSON
Hanson Professional Services Inc.

DES:	JEC
DRAWN:	GTJ
CHECK:	MAF
DATE:	5/13/14
AUTH:	A141328
LINE SEG:	0050

BNSF RAILWAY
BRIDGE ENGINEERING KANSAS CITY, KS
APPROVED: Austin M Hurst
ASST. DIRECTOR STRUCTURES DESIGN

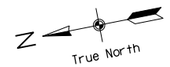
USA CANADA BORDER TO DELTA JCT.
BRIDGE NO. 37.8 - SOUTH APPROACH
OVER STEAMBOAT SLOUGH
MARYSVILLE, WA
GENERAL PLAN & ELEVATION

PLAN NO: 0050-37.8-002 | SHEET: 2 OF 12



PILE LAYOUT PLAN

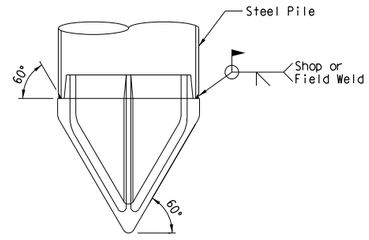
Pile spacing shown at cutoff elevations.



ATTENTION !
INFORMATION SHOWN ON THESE PLANS CONCERNING TYPE AND LOCATION OF UNDERGROUND OR ABOVE GROUND UTILITIES IS NOT GUARANTEED TO BE ACCURATE OR ALL INCLUSIVE. THE SUPERVISOR OF STRUCTURES OR THE FOREMAN IN CHARGE WILL VERIFY THE LOCATION OF UNDERGROUND AND OVERHEAD UTILITIES BEFORE BEGINNING CONSTRUCTION.

Notes:

1. ▼ - INDICATES DIRECTION OF BATTER.
2. X:12 - INDICATES AMOUNT OF BATTER.
3. ALL DIMENSIONS ARE GIVEN AT PILE CUTOFF.
4. PIPE PILES SHALL MEET THE MATERIAL REQUIREMENTS OF ASTM A252, GRADE 3 WITH A MINIMUM YIELD STRENGTH OF 50 KSI OR APPROVED EQUIVALENT AND SHALL HAVE A SHOP APPLIED COATING CONSISTING OF A SURFACE PREP OF SSPC SP10 FOLLOWED BY 2 COATS OF DEVOE DEVRAN 261OC EPOXY RESULTING IN A MINIMUM TOTAL DRY FILM THICKNESS OF 16 MILS.
5. EACH PIPE PILE SHALL HAVE REINFORCING CAGE CENTERED IN EACH PILE AND FILLED WITH CONCRETE HAVING AN ULTIMATE COMPRESSIVE STRENGTH OF NOT LESS THAN 4000 p.s.i. IN 28 DAYS. MAXIMUN SIZE OF COARSE AGGREGATE SHALL BE ONE INCH.
6. THE CONTRACTOR SHALL FURNISH CONICAL PILE POINTS CONSISTING OF A SINGLE PIECE AS SHOWN. THE PILE POINTS SHALL BE CAST IN ONE PIECE STEEL ACCORDING TO ASTM A 148 RADE 90-60 (A.A.S.H.T.O. M 103 GRADE 65-35) AND SHALL PROVIDE FULL BEARING OVER THE FULL CIRCUMFERENCE OF THE PILE. THE PILE POINT SHALL HAVE TAPERED LEADS TO ASSURE PROPER ALIGNMENT AND FITTING AND SHALL BE SECURED TO THE PILE WITH A CIRCUMFERENTIAL WELD. STEEL CONICAL PILE POINTS WITH DULL TIP SHALL BE WELDED ONTO BENT PILES. REINFORCED TIP SHALL BE FLUSH WITH OUTSIDE OF THE PILE.
7. STEEL H-PILES SHALL MEET THE MATERIAL REQUIREMENTS OF ASTM A572, GRADE 50. AND SHALL BE DRIVEN IN ACCORDANCE WITH BNSF CONSTRUCTION SPECIFICATIONS AND THESE NOTES.
8. AFTER PILES ARE DRIVEN, THEY SHALL BE PULLED, IF NECESSARY, AND HELD IN THE PROPER LOCATION AND CUTOFF AT PROPER ELEVATON.
9. ALL WELDING SHALL CONFORM TO THE REQUIREMENTS OF THE STRUCTURAL WELDING CODE AWS D1.1.
10. THE CENTRAL PILES AT EACH ABUTMENT AND BENT SHALL BE DRIVEN FIRST AND SUBSEQUENT PILES SHOULD BE INSTALLED FROM THE CENTER OUT.
11. ALL PILES SHALL BE DRIVEN TO THE ULTIMATE PILE CAPACITY OF 300 TONS AS DETERMINED BY PDA & CAPWAP ANALYSIS AND THE MINIMUM TIP ELEVATION OF APPROXIMATELY (-) 25.0. IN THE EVENT THE PILE DRIVING RESISTANCE HAS NOT BEEN MET UNDER NORMAL CONTINUOUS DRIVING CONDITIONS, THE PILE DRIVING OPERATIONS SHALL BE STOPPED WITHIN 3 FEET OF FINAL CUTOFF. THE DRIVING OPERATIONS SHALL BE DISCONTINUED FOR AT LEAST 24 HOURS AND REDRIVEN TO THE LESSER OF THE FINAL 3 FT OR UNTIL REFUSAL IS ACHIEVED. IF THE RESTRIKE RESISTANCE DOES NOT ACHIEVE THE SPECIFIED VALUES, THE ENGINEER WILL DETERMINE THE SUBSEQUENT PROCEDURES TO BE TAKEN. THE POSSIBILITY EXIST THAT THE ULTIMATE PILE CAPACITY MAY BE EXCEEDED SEVERAL TIMES DURING THE PILE DRIVING PROCESS. PILE DRIVING OPERATIONS SHALL CONTINUE TO MINIMUM TIP ELEVATION WITHOUT OVERSTRESSING THE PILE SECTION. PILE DRIVING OVER THE LAST 20 FEET MAY BE DIFFICULT.
12. THE FIRST PILE AT EACH ABUTMENT OR BENT SHALL HAVE DYNAMIC TESTING WITH A PDA (PILE DRIVING ANALYZER) AND CAPWAP ANALYSIS (CASE PILE WAVE ANALYSIS PROGRAM) TO ESTABLISH DRIVING CRITERIA AND DETERMINE LENGTHS FOR THE REMAINING PILES. A WEAP ANALYSIS SHOULD ALSO BE COMPLETED ONCE THE PILE DRIVING EQUIPMENT IS SELECTED.
13. FOR ADDITIONAL INFORMATION, SEE THE GEOTECHNICAL PROJECT MEMORANDUM BY JACOBS ASSOCIATES, DATED 1/22/13.
14. ALL PILES SHALL BE TEMPORARILY CAPPED AND MARKED AFTER DRIVING.
15. ANY ACCUMULATED WATER INSIDE THE PIPE SHALL BE REMOVED PRIOR TO FILLING OF CONCRETE.
16. PLACING THE CONCRETE IN EACH PILE SHALL BE CARRIED ON AS A CONTINUOUS OPERATION, PERFORMED IN SUCH A MANNER AS TO MINIMIZE SEGREGATION.
17. CHECK ALL PILES FOR POSSIBLE HEAVE PRIOR TO CUTOFF BY SURVEYING THE ELEVATION OF EACH PILE BUTT AFTER A PILE IS DRIVEN WITHIN THE GROUP. THE HEAVE DATA SHOULD BE PROVIDED TO THE ENGINEER TO DETERMINE IF REDRIVE IS REQUIRED. IN GENERAL, IF THE HEAVE IS GREATER THAN 0.25 INCH, THE PILE SHOULD BE REDRIVEN TO THE ORIGINAL PILE TIP ELEVATION.



CONICAL TIP

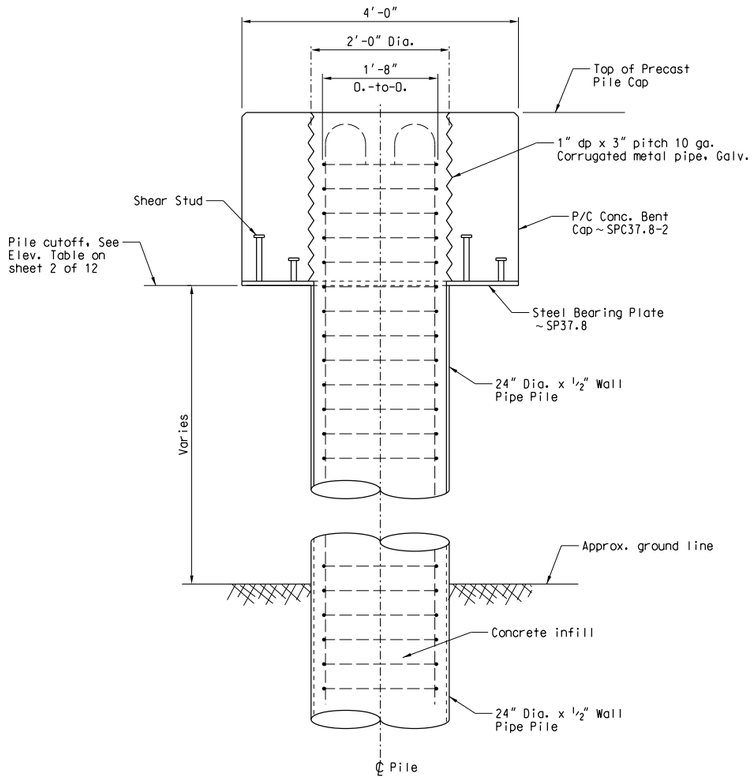
HANSON
Hanson Professional Services Inc.

DES: JEC	
DRAWN: GTJ	
CHECK: MAF	
DATE: 5/13/14	
AUTH: A141328	
LINE SEG: 0050	

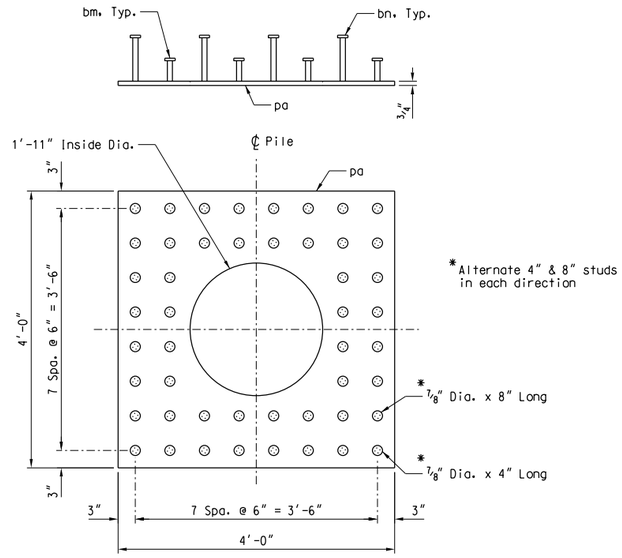
BNSF RAILWAY
BRIDGE ENGINEERING KANSAS CITY, KS
APPROVED: Hanson M Hurst
ASST. DIRECTOR STRUCTURES DESIGN

USA CANADA BORDER TO DELTA JCT.
BRIDGE NO. 37.8 - SOUTH APPROACH
OVER STEAMBOAT SLOUGH
MARYSVILLE, WA
PILE LAYOUT PLAN

PLAN NO: 0050-37.8-003 | SHEET: 3 OF 12



TYPICAL PIPE PILE CAP ELEVATION

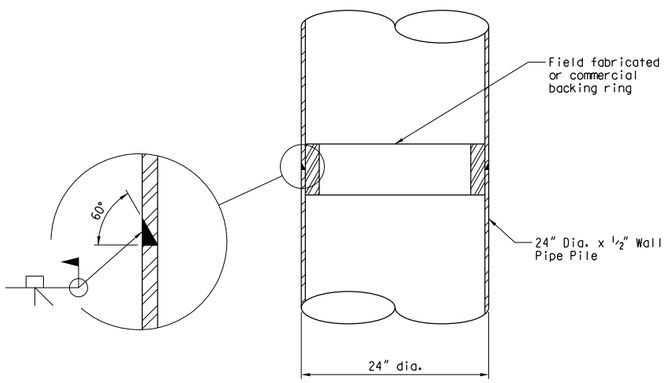


STEEL BEARING PLATE ~ SP37.8

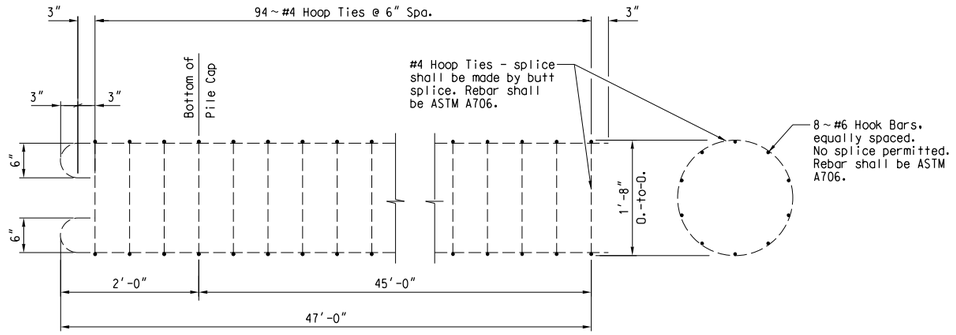
1 ~ Plate 3/4" x 48" x 4'-0" ~ pa
24 ~ 7/8" Dia. x 8" long stud ~ bn
24 ~ 7/8" Dia. x 4" long stud ~ bm
Weight = 550 lbs.
9 Required

NOTES:

1. See Steel General Notes on Plan No. 0050-37.8-010 for SP37.8.
2. See Plan No. 0050-37.8-003 for Pile Notes.



PILE SPLICE DETAIL



REINFORCING CAGE - RC1

8 ~ #6 Hook Bars
94 ~ #4 Hoop Ties
Weight (Each Cage) = 760 Lbs.

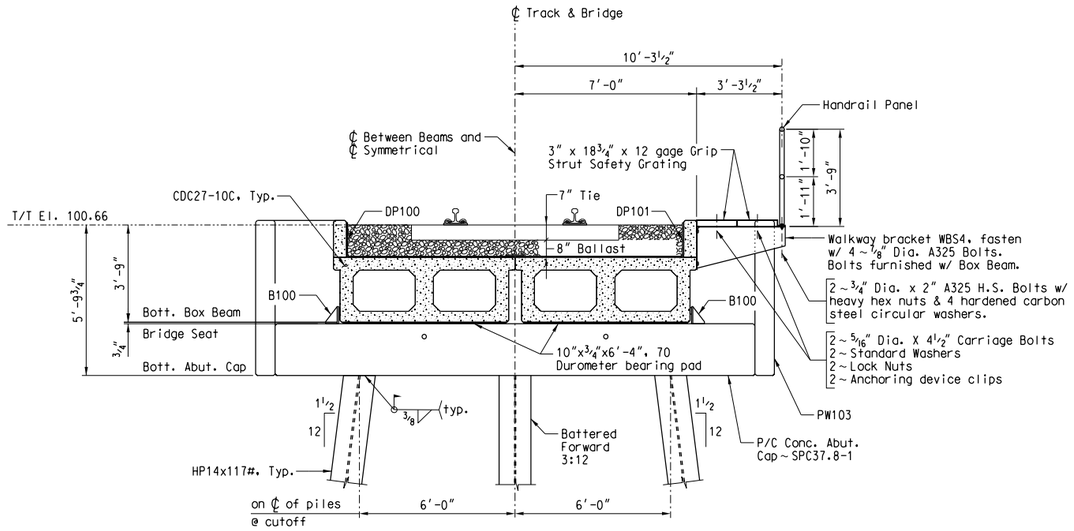
HANSON
Hanson Professional Services Inc.

DES: JEC	
DRAWN: GTJ	
CHECK: MAF	
DATE: 5/13/14	
AUTH: A141328	
LINE SEG: 0050	

BNSF RAILWAY
BRIDGE ENGINEERING KANSAS CITY, KS
APPROVED: Hanson M Hurst
ASST. DIRECTOR STRUCTURES DESIGN

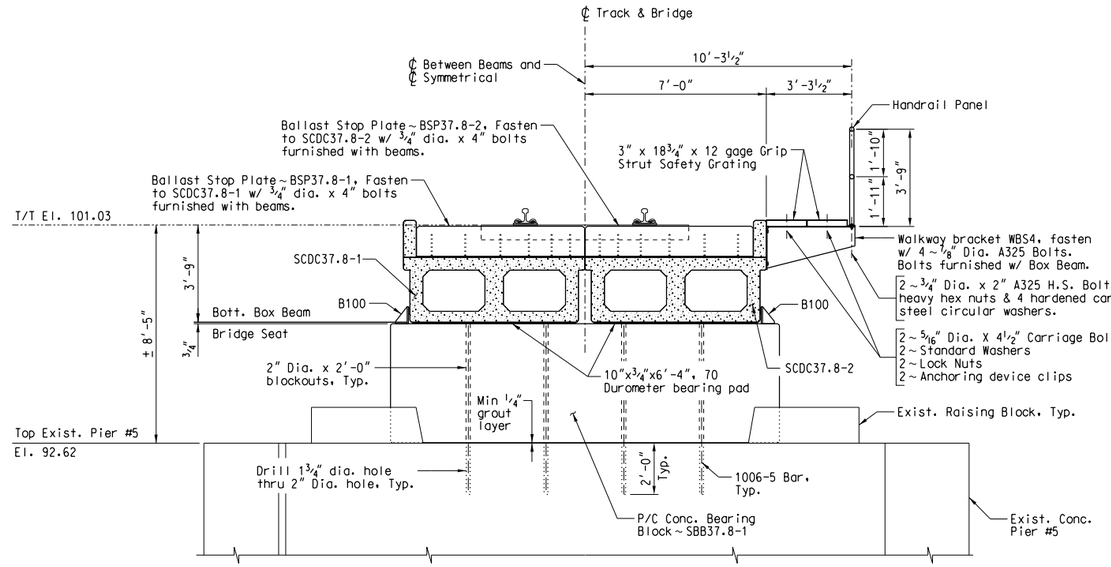
USA CANADA BORDER TO DELTA JCT.
BRIDGE NO. 37.8 - SOUTH APPROACH
OVER STEAMBOAT SLOUGH
MARYSVILLE, WA
PILE DETAILS

PLAN NO: 0050-37.8-004 | SHEET: 4 OF 12



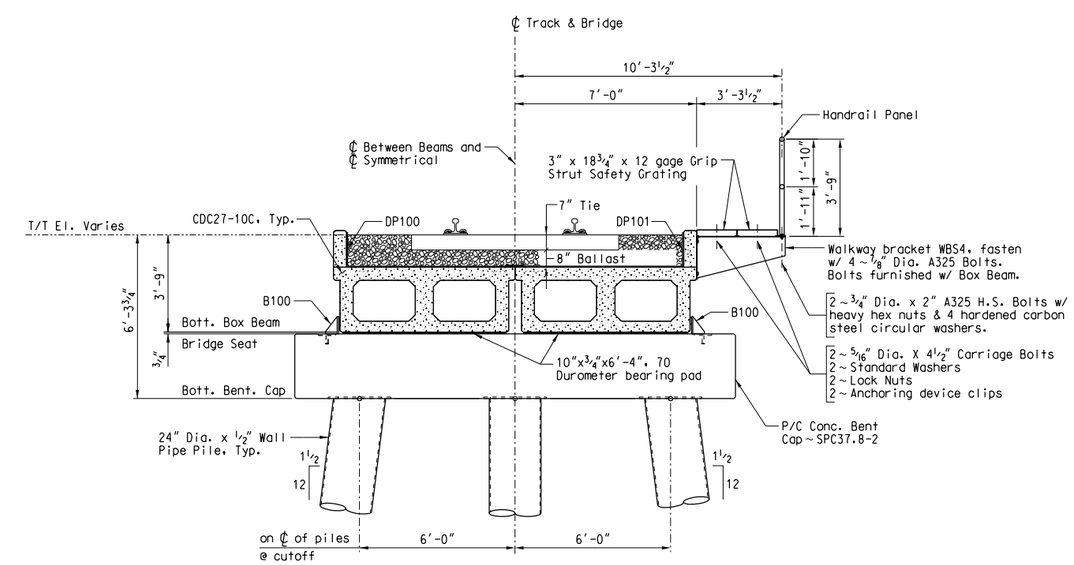
TYPICAL SECTION - ABUT. #1

(Looking RY South)



TYPICAL SECTION - EXIST. PIER #5

Existing Truss not shown for clarity.
(Looking RY South)



TYPICAL SECTION - BENT #2, #3, & #4

(Looking RY South)

HANSON
Hanson Professional Services Inc.

DES: JEC	
DRAWN: GTJ	
CHECK: MAF	
DATE: 5/13/14	
AUTH: A141328	
LINE SEG: 0050	

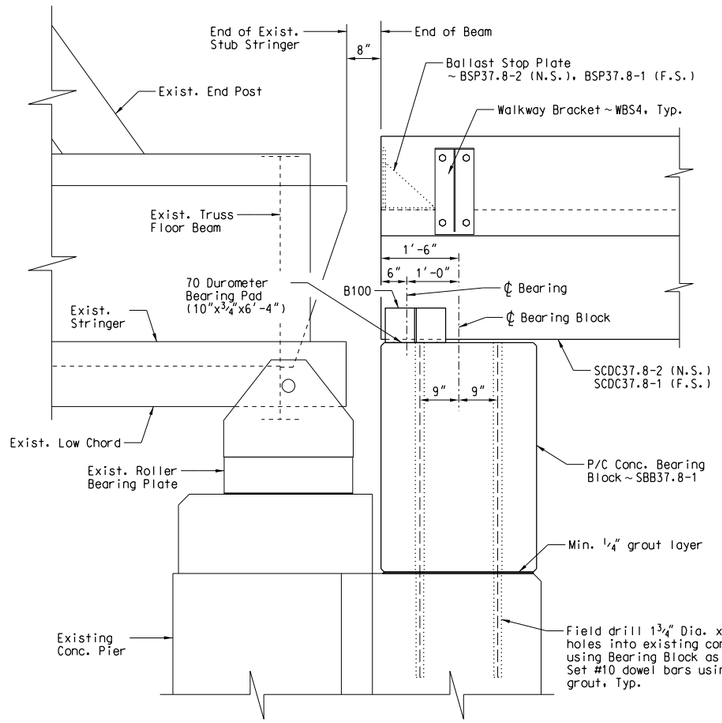
BNSF RAILWAY
BRIDGE ENGINEERING KANSAS CITY, KS
APPROVED: Augustin M Hurst
ASST. DIRECTOR STRUCTURES DESIGN

USA CANADA BORDER TO DELTA JCT.
BRIDGE NO. 37.8 - SOUTH APPROACH
OVER STEAMBOAT SLOUGH
MARYSVILLE, WA
TYPICAL SECTIONS & DETAILS

PLAN NO: 0050-37.8-005 | SHEET: 5 OF 12

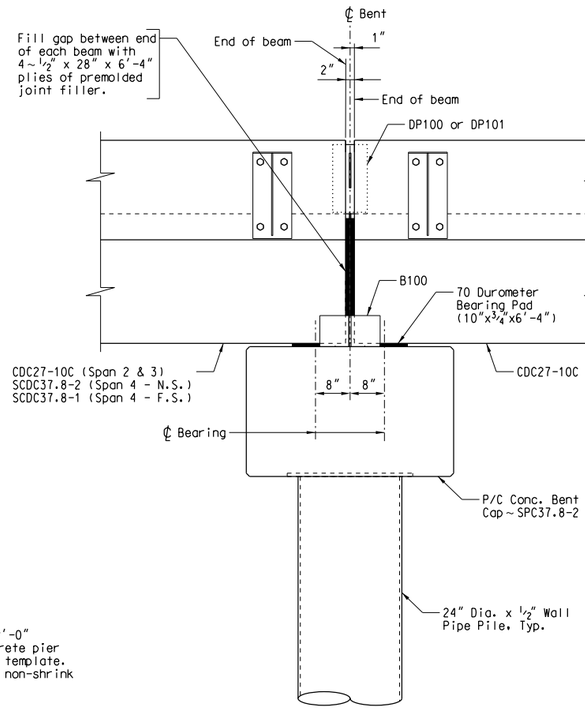
To USA Canada Border
(RY North)

To Delta Jct.
(RY South)



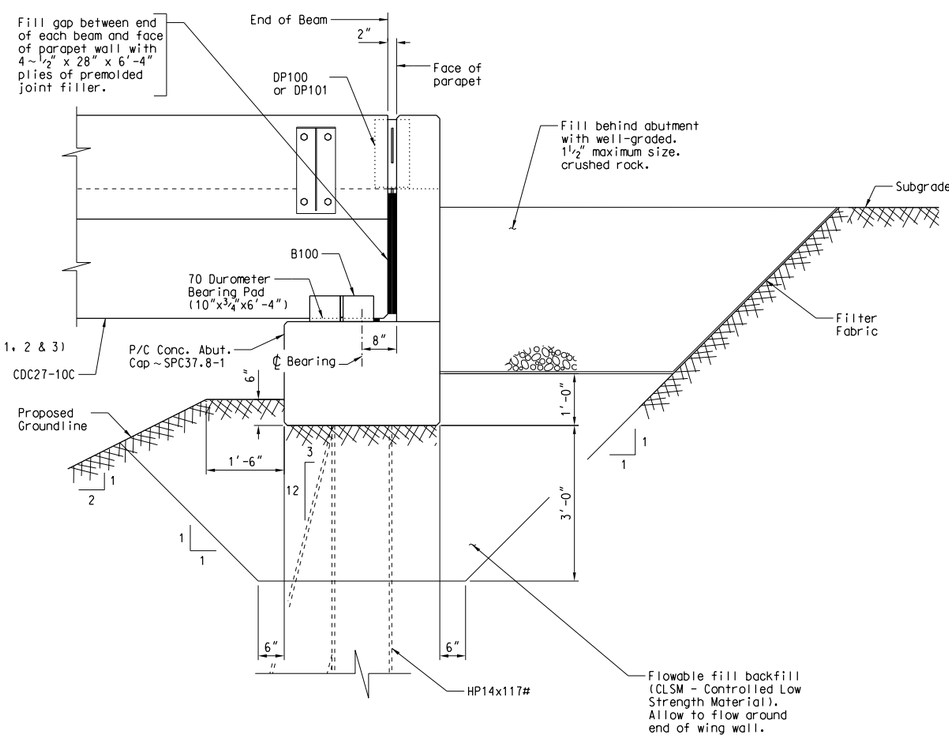
PROPOSED PIER #5

Exist. Pier #9 (Survey)
Handrails and walkway panels not shown for clarity.



BENT #2, #3 AND #4

Handrails and walkway panels not shown for clarity.



ABUT. #1

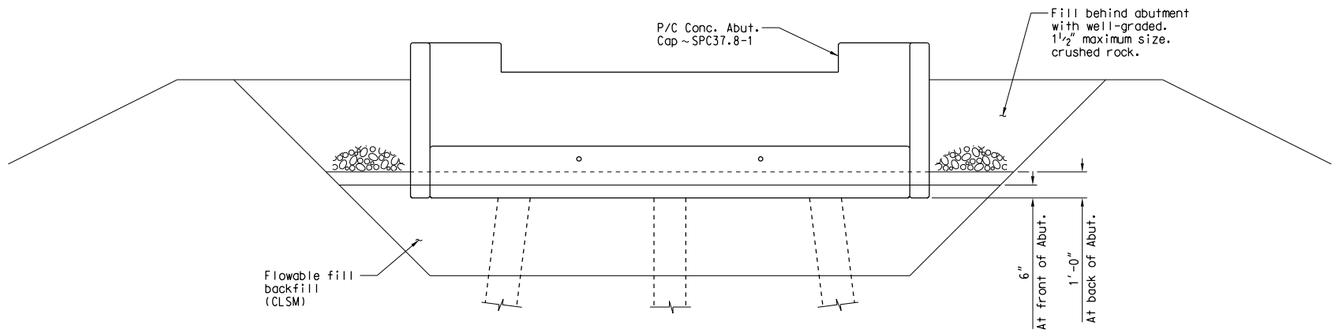
Handrails, walkway panels and PW103 not shown for clarity.

Example of Mix Proportions for Flowable Fill (CLSM)

Mix 1:	
Portland Cement	125 lb
Fine Aggregate - Saturated Surface Dry	2500 lb
Water	35-50 gal
Air Content	15-25%
Mix 2:	
Portland Cement	50 lb
Fly Ash - Class C or F	125 lb
Fine Aggregate - Saturated Surface Dry	2900 lb
Water	50-65 gal
Air Content	No air is entrained

Mix Design Criteria

Flow	Greater than 7 in.
Air Content	0-25%
Dynamic Cone Penetrometer (DCP) at 3 days	Less than 1.5 in./blow
Compressive Strength at 28 and 180 days	Greater than 30 psi to Greater than 150 psi



ABUTMENT ELEVATION

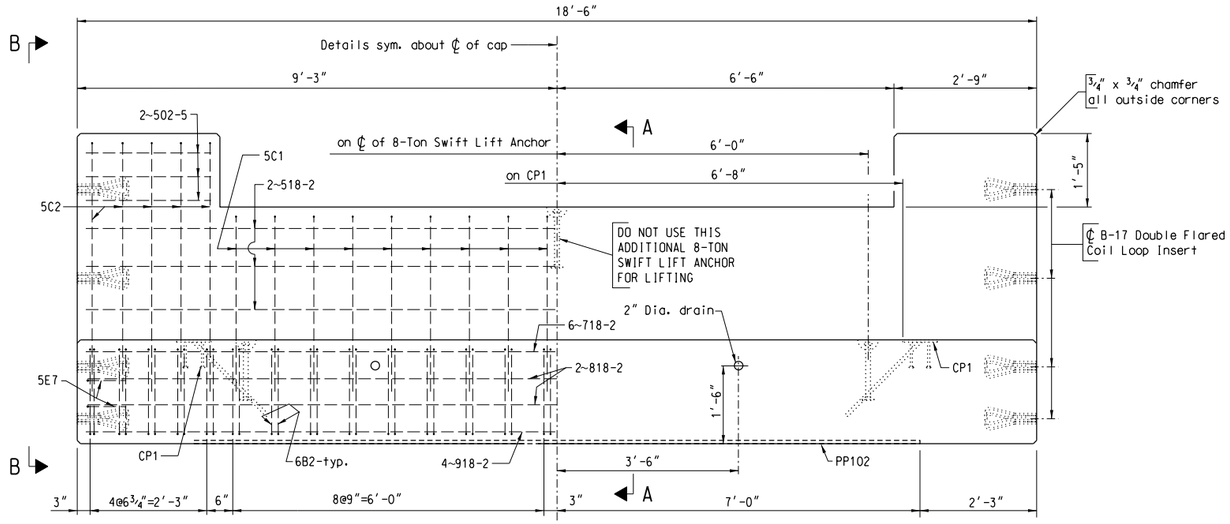
HANSON
Hanson Professional Services Inc.

DES: JEC	
DRAWN: GTJ	
CHECK: MAF	
DATE: 5/13/14	
AUTH: A141328	
LINE SEG: 0050	

BNSF RAILWAY
BRIDGE ENGINEERING KANSAS CITY, KS
APPROVED: Austin M. Hurst
ASST. DIRECTOR STRUCTURES DESIGN

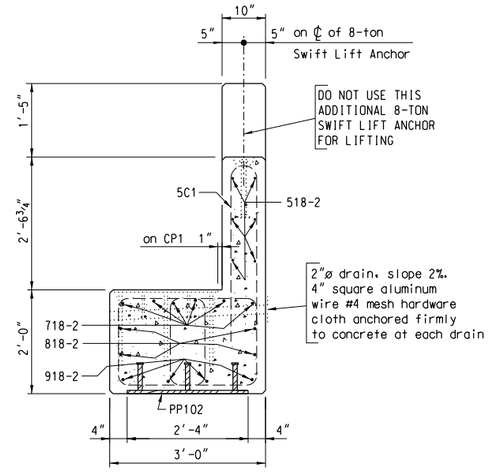
USA CANADA BORDER TO DELTA JCT.
BRIDGE NO. 37.8 - SOUTH APPROACH
OVER STEAMBOAT SLOUGH
MARYSVILLE, WA
BEARING LAYOUT ELEVATION VIEW

PLAN NO: 0050-37.8-006 | SHEET: 6 OF 12



ELEVATION - SPC37.8-1

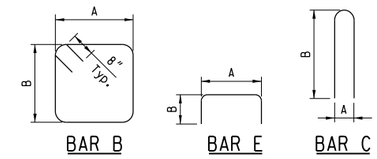
Wt. = 25,400 lbs., Vol. = 5.7 cu. yds., Reinf. Steel = 1,740 lbs.



SECTION A-A

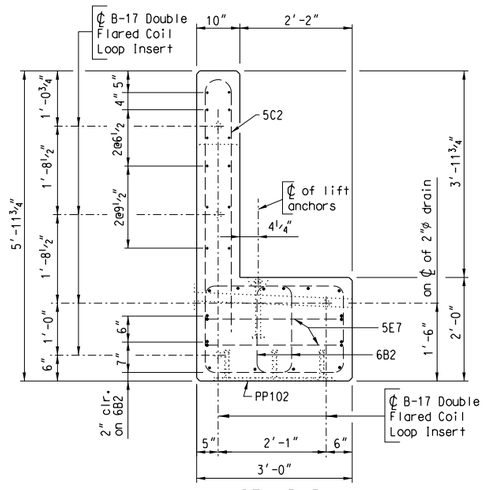
For further designation of horizontal bars see elevations of precast members

LIST OF REINFORCING BARS PER SPC37.8-1						
NO.	MARK	SIZE	TYPE	A	B	LENGTH
12	502-5	5	STR.	-	-	2'-5"
6	518-2	5	STR.	-	-	18'-2"
6	718-2	7	STR.	-	-	18'-2"
4	818-2	8	STR.	-	-	18'-2"
4	918-2	9	STR.	-	-	18'-2"
56	6B2	6	B	1'-8"	1'-8"	8'-0"
18	5C1	5	C	6"	3'-5"	7'-1"
10	5C2	5	C	6"	4'-10"	9'-11"
4	5E7	5	E	2'-6 1/2"	10"	4'-3"
STRUCTURAL STEEL						
PLATE CP1 (SEE STANDARD SHEET 0000-17902-094)						2 Req'd
PLATE PP102 (SEE STANDARD SHEET 0000-17902-094)						1 Req'd
1 1/4" x 12" DAYTON SUPERIOR B-17 DOUBLE FLARED COIL LOOP INSERT 1 1/4" x 12" LONG, 13,500 LBS. SWL (SAFE WORKING LOAD), PLAIN						8 Req'd
8-TON SWIFT LIFT ANCHOR						3 Req'd



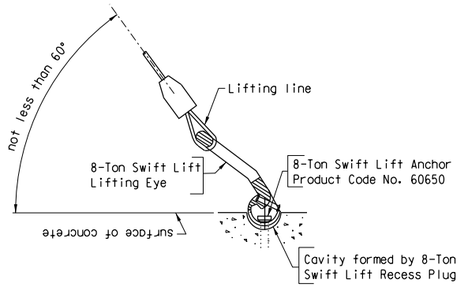
REINFORCING STEEL DETAILS

ALL DIMENSIONS ARE OUT-TO-OUT OF BARS



VIEW B-B

For further designation of horizontal bars, see elevations of precast members



LIFTING DETAIL

8-Ton Swift Lift Recess Plugs, Anchors and Lifting Eyes are available from Dayton/Richmond 721 Richard St., Miamisburg, Ohio 45342, Telephone (937) 866-0711. The materials for this lifting system are not included in the Bill of Material but are to be ordered as required.

NOTES:

GENERAL: ALL MATERIAL AND WORKMANSHIP SHALL BE AS PER THE CURRENT BNSF STANDARD SPECIFICATIONS.

COIL LOOP INSERTS ARE TO BE DOUBLE FLARED TYPE B17 1 1/4" DIA. x 12" AS MANUFACTURED BY DAYTON-SUPERIOR AND HAVE A SAFE WORKING LOAD OF 13,500 LBS. WITH A 4 TO 1 SAFETY FACTOR. THE INSERTS ARE TO BE COMPLETELY RECESSED WITH 1 1/4" DIA. x 13" SPIRAL BOLTS ATTACHED TO THE CAP FOR SHIPMENT.

CONCRETE: THE ULTIMATE COMPRESSIVE STRENGTH OF CONCRETE SHALL BE NOT LESS THAN 4000 p.s.i. IN 28 DAYS. CONCRETE MEMBERS SHALL NOT BE REMOVED FROM THE CASTING BED BEFORE THE CONCRETE REACHES A STRENGTH OF 2500 p.s.i.

ALL EXPOSED EDGES OF CONCRETE MEMBERS SHALL BE CHAMFERED 3/4 INCH.

REINFORCEMENT: MILD STEEL REINFORCEMENT SHALL MEET THE REQUIREMENTS OF THE CURRENT A.S.T.M. DESIGNATION: A615 OR A706, GRADE 60.

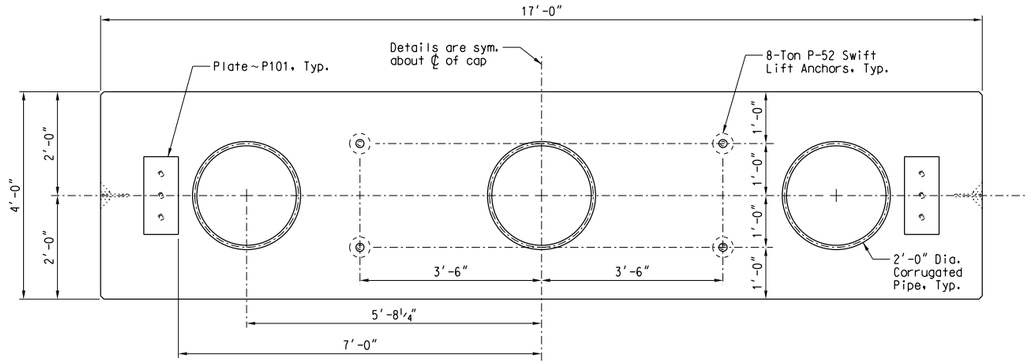
FABRICATION OF REINFORCEMENT SHALL BE IN ACCORDANCE WITH CHAPTER 7 OF THE CURRENT C.R.S.I. MANUAL OF STANDARD PRACTICE.

STEEL REINFORCEMENT MAY BE MOVED SLIGHTLY SO AS TO MISS PP102 OR CP1.

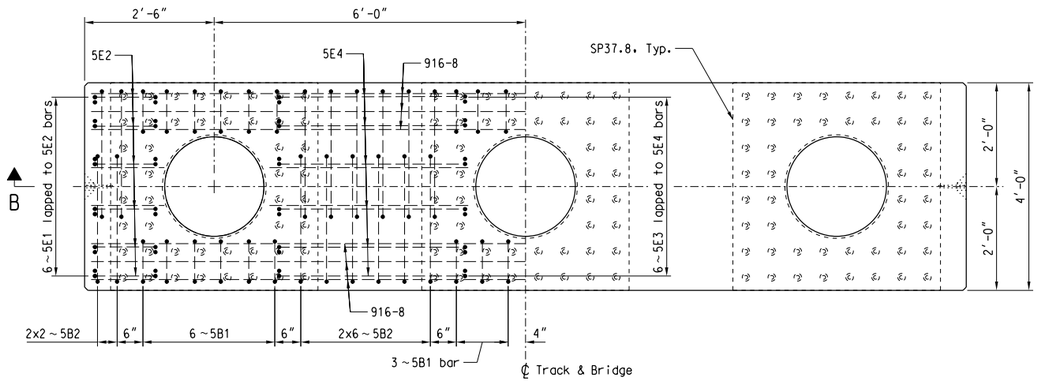
MINIMUM CONCRETE COVER ON REINFORCEMENT SHALL BE TWO (2) INCHES.

HANSON
Hanson Professional Services Inc.

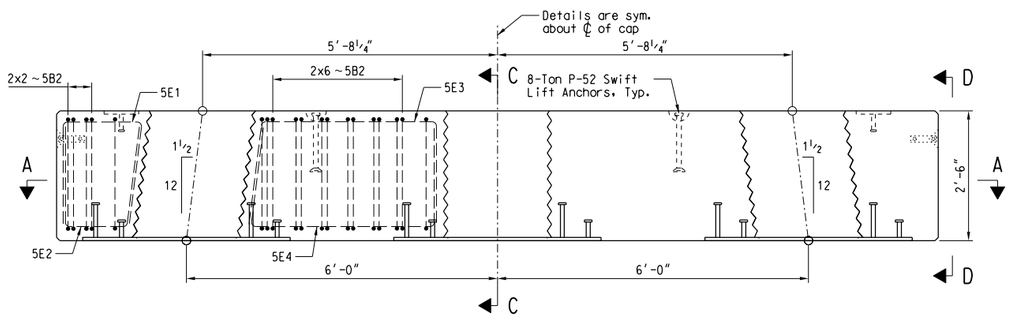
DES: JEC	BNSF RAILWAY	USA CANADA BORDER TO DELTA JCT.	
DRAWN: GTJ	BRIDGE ENGINEERING KANSAS CITY, KS	BRIDGE NO. 37.8 - SOUTH APPROACH	
CHECK: MAF		OVER STEAMBOAT SLOUGH MARYSVILLE, WA	
DATE: 5/13/14	APPROVED: Gregory M Harrist	P/C CONCRETE ABUTMENT CAP~SPC37.8-1	
AUTH: A141328	ASST. DIRECTOR STRUCTURES DESIGN	PLAN NO: 0050-37.8-007	SHEET: 7 OF 12
LINE SEG: 0050			



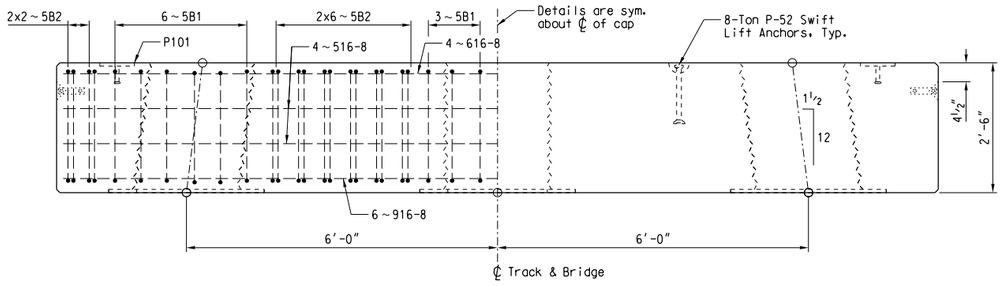
PLAN



SECTION A-A

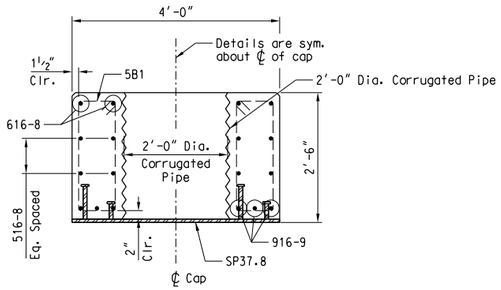


SECTION B-B

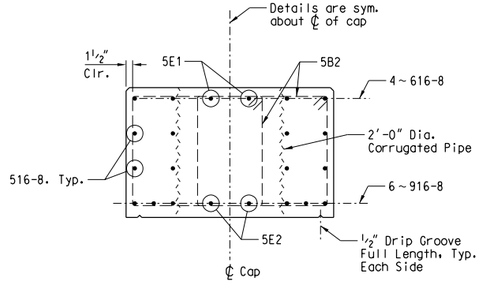


ELEVATION ~ SPC37.8-2

Wt. = 27,400 lbs., Vol. = 6.2 cu. yds., Reinf. Steel = 1,485 lbs.

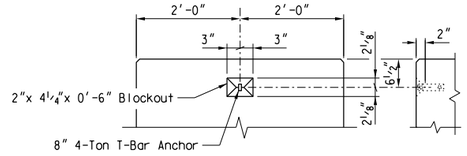


SECTION C-C



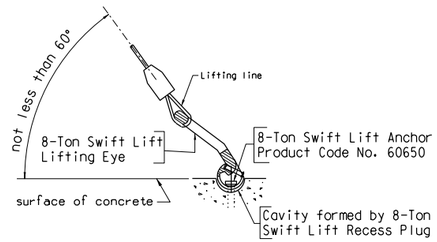
END VIEW D-D

SP37.8 not shown for clarity.



DETAIL

Typical at each end of cap



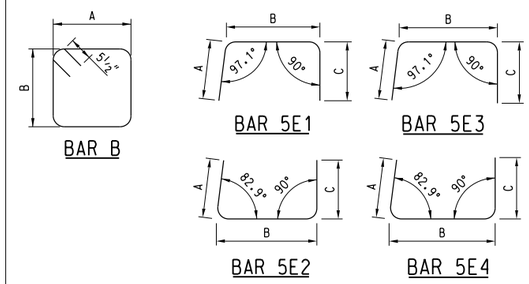
LIFTING DETAIL

8-Ton Swift Lift Recess Plugs, Anchors and Lifting Eyes are available from Dayton/Richmond 721 Richard St., Miamisburg, Ohio 45342, Telephone (937) 866-0711. The materials for this lifting system are not included in the Bill of Material but are to be ordered as required.

LIST OF REINFORCING BARS PER SPC37.8-2

NO.	MARK	SIZE	TYPE	A	B	C	LENGTH
8	516-8	5	STR.	-	-	-	16'-8"
4	616-8	6	STR.	-	-	-	16'-8"
6	916-8	9	STR.	-	-	-	16'-8"
36	5B1	5	B	8"	2'-1"	-	6'-5"
32	5B2	5	B	2'-6"	2'-1"	-	10'-1"
12	5E1	5	E	2'-1"	1'-6"	2'-1"	5'-8"
12	5E2	5	E	2'-1"	1'-2"	2'-1"	5'-4"
12	5E3	5	E	2'-0"	3'-4"	2'-1"	7'-5"
12	5E4	5	E	2'-0"	3'-7"	2'-1"	7'-8"

STRUCTURAL STEEL	
PLATE P101 (SEE DETAIL SHT. 0050-37.8-010)	2 Req'd
PLATE SP37.8 (SEE DETAIL SHT. 0050-37.8-004)	3 Req'd
2'-0" DIA. CORRUGATED PIPE	3 Req'd



REINFORCING STEEL DETAILS

ALL DIMENSIONS ARE OUT-TO-OUT OF BARS

NOTES:

GENERAL:
ALL MATERIAL AND WORKMANSHIP SHALL BE AS PER THE CURRENT BNSF STANDARD SPECIFICATIONS.

ALL EXPOSED EDGES OF CONCRETE MEMBERS SHALL BE CHAMFERED ¾" INCH.

CAST-IN-PLACE CONCRETE: THE ULTIMATE COMPRESSIVE STRENGTH OF CONCRETE SHALL BE NOT LESS THAN 4000 p.s.i. IN 28 DAYS.

REINFORCEMENT: MILD STEEL REINFORCEMENT SHALL MEET THE REQUIREMENTS OF THE CURRENT ASTM DESIGNATION: A615, GRADE 60 OR A706, GRADE 60.

FABRICATION OF REINFORCEMENT SHALL BE IN ACCORDANCE WITH CHAPTER 7 OF THE CURRENT C.R.S.I. MANUAL OF STANDARD PRACTICE.

STEEL REINFORCEMENT MAY BE MOVED SLIGHTLY SO AS TO MISS EMBEDDED ITEMS.

MINIMUM CONCRETE COVER ON REINFORCEMENT SHALL BE TWO (2) INCHES.

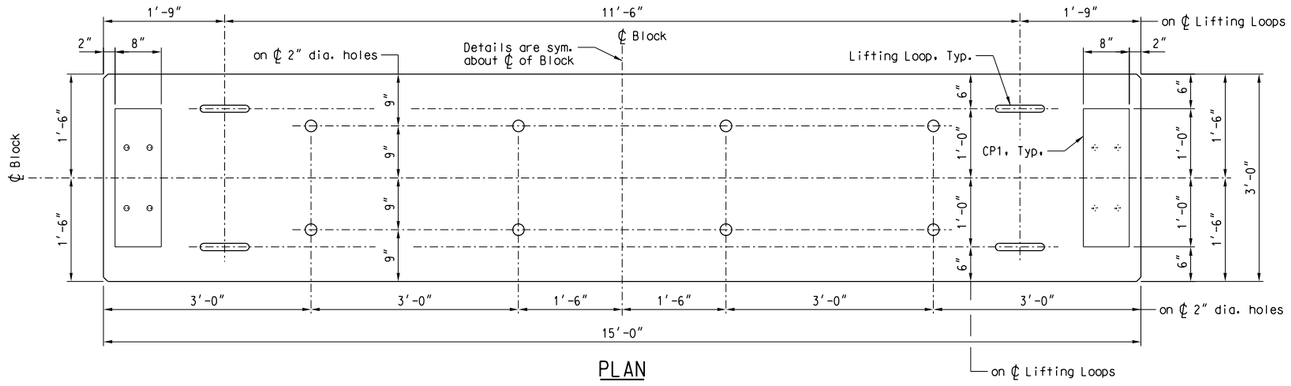
HANSON
Hanson Professional Services Inc.

DES: JEC	
DRAWN: GTJ	
CHECK: MAF	
DATE: 5/13/14	
AUTH: A141328	
LINE SEG: 0050	

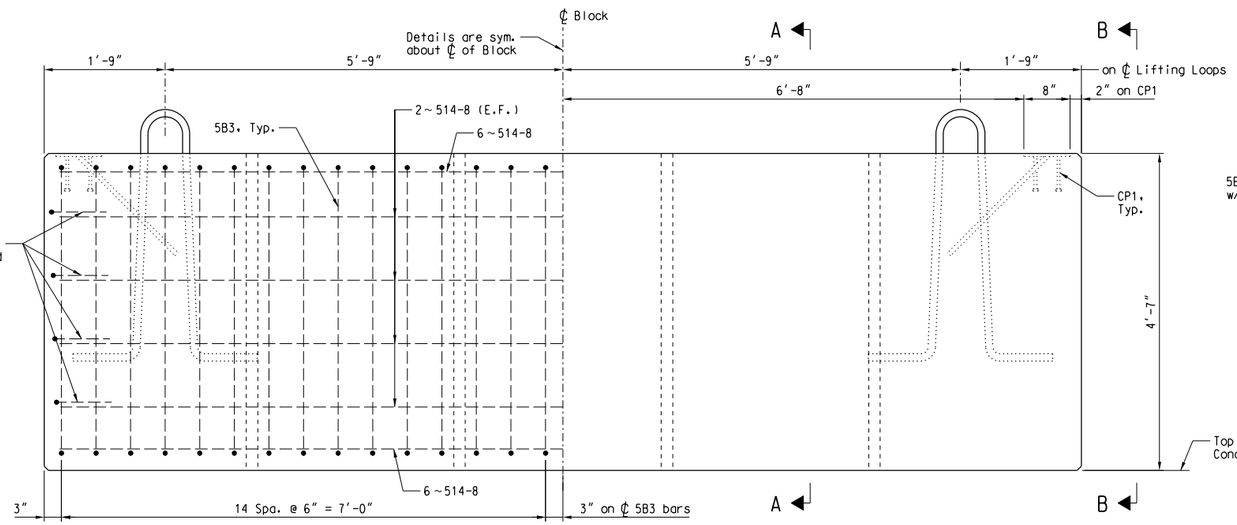
BNSF RAILWAY
BRIDGE ENGINEERING KANSAS CITY, KS
APPROVED: Kingston M Hurst
ASST. DIRECTOR STRUCTURES DESIGN

USA CANADA BORDER TO DELTA JCT.
BRIDGE NO. 37.8 - SOUTH APPROACH
OVER STEAMBOAT SLOUGH
MARYSVILLE, WA
P/C CONCRETE BENT CAP~SPC37.8-2

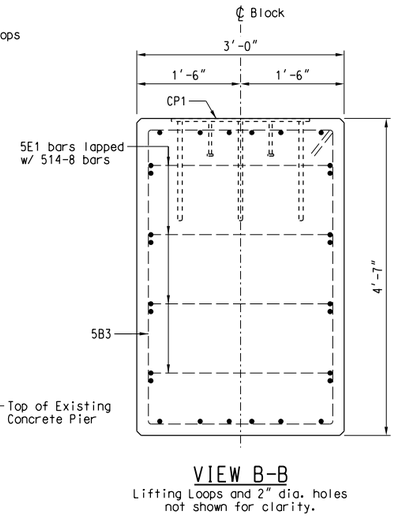
PLAN NO: 0050-37.8-008 | SHEET: 8 OF 12



PLAN



ELEVATION

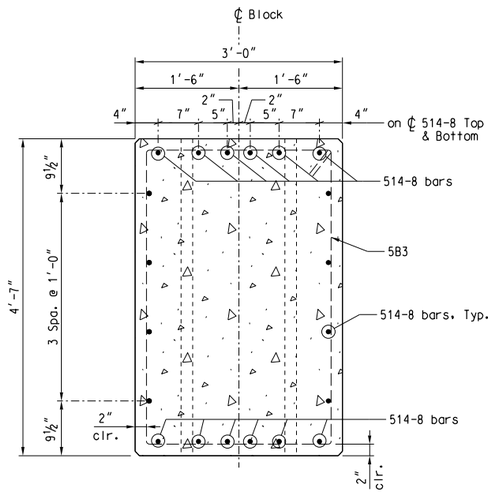


VIEW B-B

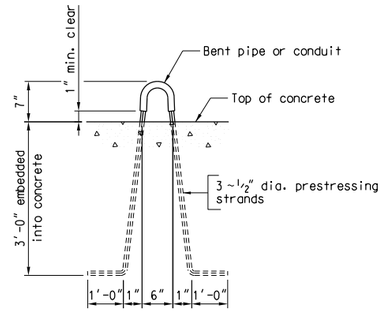
Lifting Loops and 2" dia. holes not shown for clarity.

PRECAST CONCRETE BEARING BLOCK ~ SBB37.8-1

Wt. = 30,800 lbs. Vol. = 7.6 cu.yds. Reinf. Steel = 810 lbs. Misc. Steel = 80 lbs.



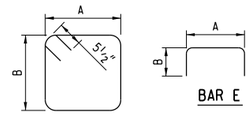
SECTION A-A



LIFTING LOOP DETAIL

LIST OF REINFORCING BARS REQUIRED PER SBB37.8-1						
NO.	MARK	SIZE	TYPE	A	B	LENGTH
30	5B3	#5	B	2'-8"	4'-3"	14'-9"
8	5E1	#5	E	2'-6½"	10"	4'-3"
20	514-8	#5	STR.	-	-	14'-8"

STRUCTURAL STEEL	
CP1 PLATE (See Standard Sheet 0000-17902-094)	2 REQ'D
#10 DOWELS x 6'-5" (Ship Loose)	8 REQ'D



REINFORCING STEEL DETAILS

All dimensions shown are out to out of bars.

NOTES:

GENERAL: ALL MATERIAL AND WORKMANSHIP SHALL BE AS PER THE CURRENT BNSF STANDARD SPECIFICATIONS.

ALL EXPOSED EDGES OF CONCRETE MEMBERS SHALL BE CHAMFERED ¾ INCH.

PRECAST CONCRETE: THE ULTIMATE COMPRESSIVE STRENGTH OF CONCRETE SHALL BE NOT LESS THAN 4000 p.s.i. IN 28 DAYS. CONCRETE MEMBERS SHALL NOT BE REMOVED FROM THE CASTING BED BEFORE THE CONCRETE REACHES A STRENGTH OF 2500 p.s.i.

REINFORCEMENT: MILD STEEL REINFORCEMENT SHALL MEET THE REQUIREMENTS OF THE CURRENT ASTM DESIGNATION: A615, GRADE 60 OR A706, GRADE 60.

FABRICATION OF REINFORCEMENT SHALL BE IN ACCORDANCE WITH CHAPTER 7 OF THE CURRENT C.R.S.I. MANUAL OF STANDARD PRACTICE.

STEEL REINFORCEMENT MAY BE MOVED SLIGHTLY TO MISS EMBEDDED ITEMS.

MINIMUM CONCRETE COVER ON REINFORCEMENT SHALL BE TWO (2) INCHES.

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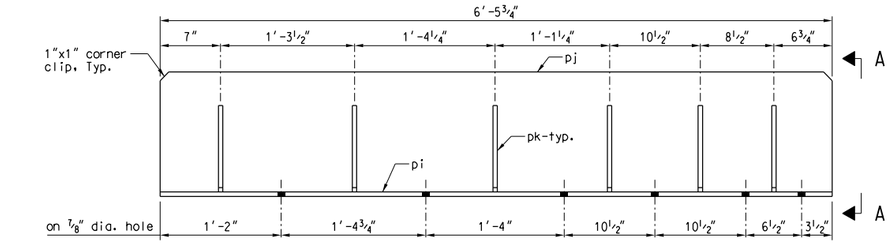
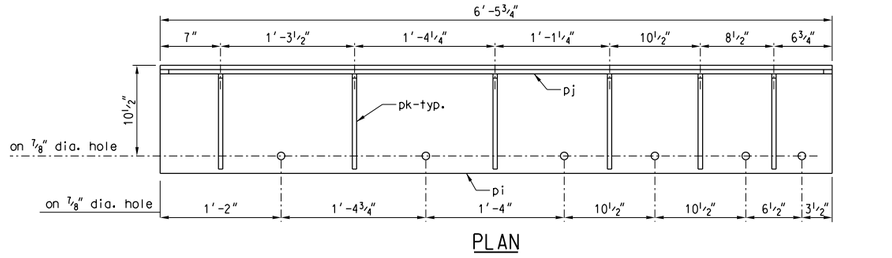
BNSF RAILWAY
BRIDGE ENGINEERING KANSAS CITY, KS
APPROVED: Huston M Hurst
ASST. DIRECTOR STRUCTURES DESIGN

USA CANADA BORDER TO DELTA JCT.
BRIDGE NO. 37.8 - SOUTH APPROACH
OVER STEAMBOAT SLOUGH
MARYSVILLE, WA
PRECAST CONCRETE BEARING BLOCK ~ SBB37.8-1

PLAN NO: 0050-37.8-009 SHEET: 9 OF 12



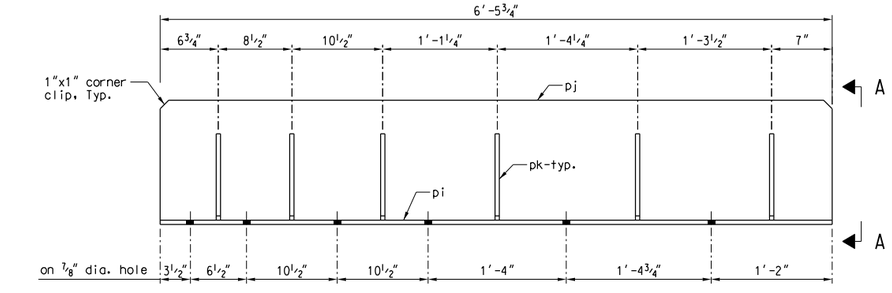
ELEVATION



PLAN

BSP37.8-1

1 - Plate ½″x12½″x6′-5¾″ ~ pi
1 - Plate ½″x13⅞″x6′-5¾″ ~ pj
6 - Plate ½″x11″x0′-10″ ~ pk
(1 Required)
Weight = 340 lbs.
ASTM A709, GR. 50
Galvanized after fabrication



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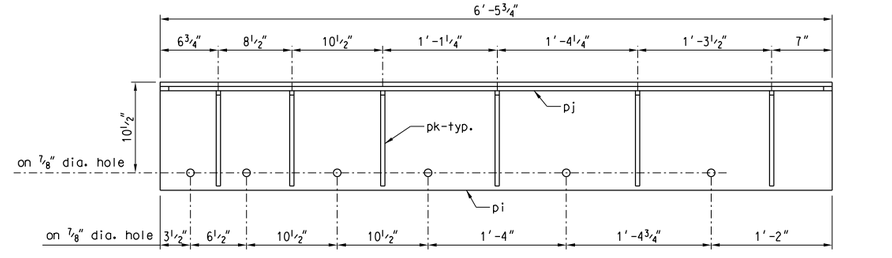
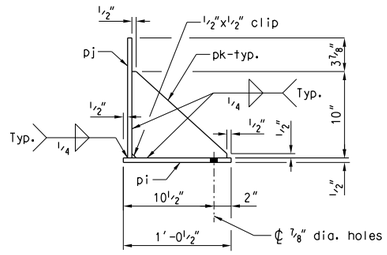


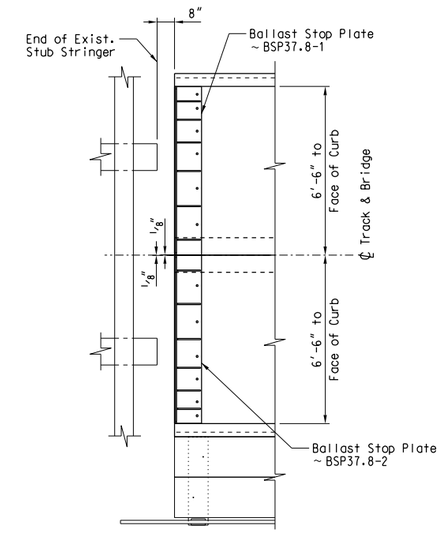
PLAN

BSP37.8-2

1 - Plate ½″x12½″x6′-5¾″ ~ pi
1 - Plate ½″x13⅞″x6′-5¾″ ~ pj
6 - Plate ½″x11″x0′-10″ ~ pk
(1 Required)
Weight = 340 lbs.
ASTM A709, GR. 50
Galvanized after fabrication



END VIEW A-A



PLAN - BALLAST STOP PLATE

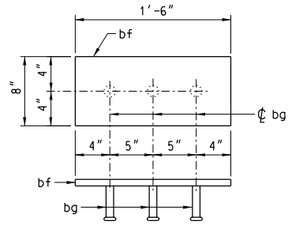
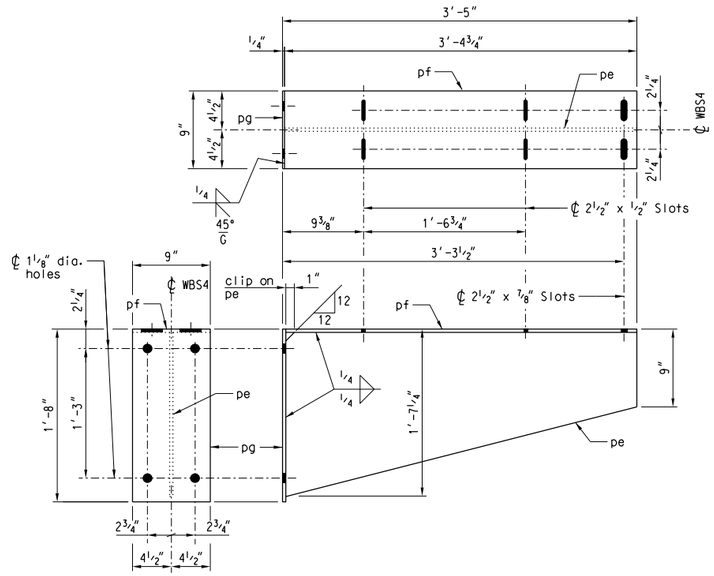


PLATE P101

1 - Bar 8″ x ¾″ x 1′-6″ ~ bf
3 - ⅞″ Dia. x 4″ Studs ~ bg
Weight = 32.7 lbs.



WALK BRACKET ~ WBS4

1 ~ Plate ¼″ x 19″ x 3′-4¾″ ~ pe
① 1 ~ Plate ¼″ x 9″ x 3′-4¾″ ~ pf
1 ~ Plate ¼″ x 9″ x 1′-8″ ~ pg
Weight = 80.0 lbs.
Galvanize after fabrication

① One (1) bent plate may be substituted for the two (2) plates shown. Minimum inside radii of bend in plate shall be 1.5 times the thickness of the plate for cold bending.

GENERAL NOTES:

MATERIAL: STRUCTURAL STEEL SHALL MEET THE REQUIREMENTS OF THE CURRENT A.S.T.M. DESIGNATION: A36, U.N.O.

FABRICATION NOTES:

SHOP NOTES: FABRICATION AND ARC WELDING OF STRUCTURAL STEEL SHALL BE IN ACCORDANCE WITH CHAPTER 15, PART 3 OF THE CURRENT A.R.E.M.A. MANUAL FOR RAILWAY ENGINEERING.

OPEN HOLES: AS NOTED.

SHEAR CONNECTOR STUDS SHALL BE AUTOMATICALLY END WELDED WITH COMPLETE FUSION IN ACCORDANCE WITH SECTION 7 OF THE CURRENT A.W.S. STRUCTURAL WELDING CODE D1.1.

GALVANIZING:

BSP37.8-1, BSP37.8-2 AND WBS4 SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH THE CURRENT A.S.T.M. DESIGNATION: A123.

AFTER GALVANIZING ALL ELEMENTS SHALL BE FREE OF FINS, ABRASIONS, ROUGH OR SHARP EDGES AND OTHER SURFACE DEFECTS.

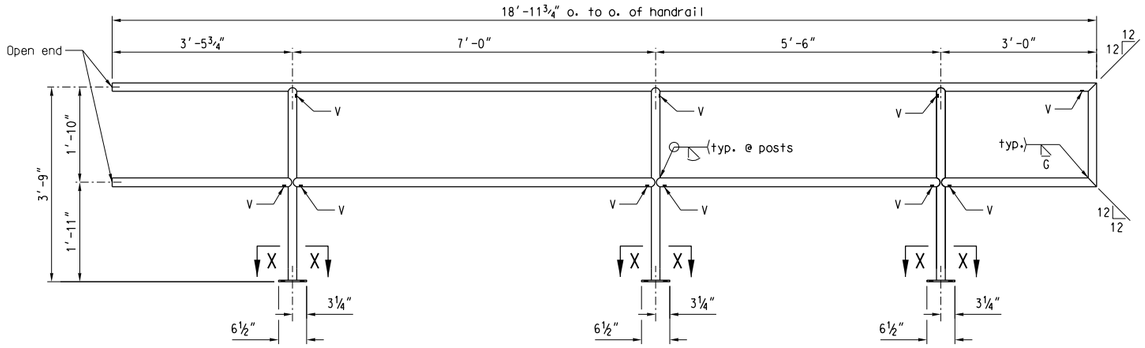
HANSON
Hanson Professional Services Inc.

DES: JEC	
DRAWN: GTJ	
CHECK: MAF	
DATE: 5/13/14	
AUTH: A141328	
LINE SEG: 0050	

BNSF RAILWAY
BRIDGE ENGINEERING KANSAS CITY, KS
APPROVED: Augustin M. Hurst
ASST. DIRECTOR STRUCTURES DESIGN

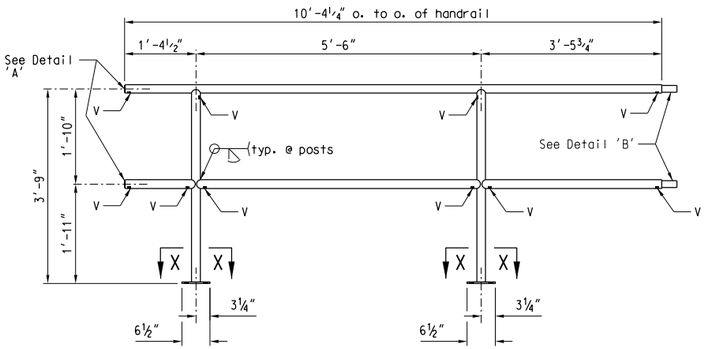
USA CANADA BORDER TO DELTA JCT.
BRIDGE NO. 37.8 - SOUTH APPROACH
OVER STEAMBOAT SLOUGH
MARYSVILLE, WA
MISCELLANEOUS STEEL DETAILS

PLAN NO: 0050-37.8-010 | SHEET: 10 OF 12



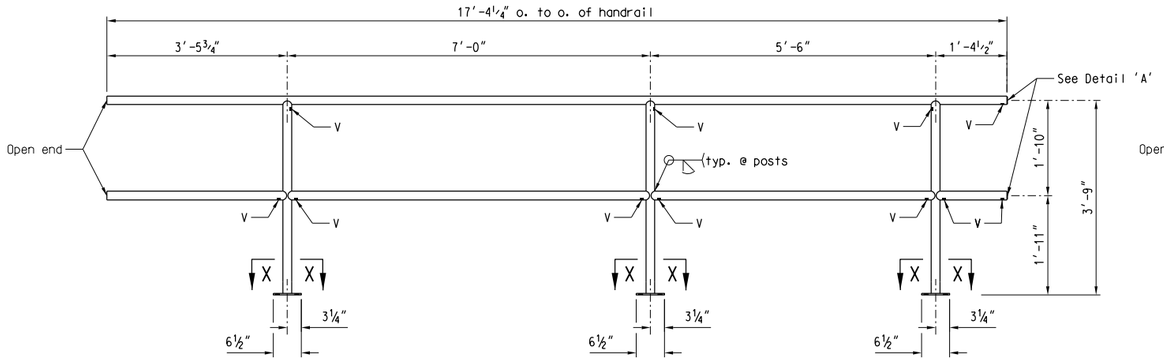
HANDRAIL PANEL ~ SHP37.8-1 (1 REQ'D)

Handrail panels are to be fabricated using 1½" dia.
std. black pipe. Galvanize after fabrication.
Weight = 146 lbs.



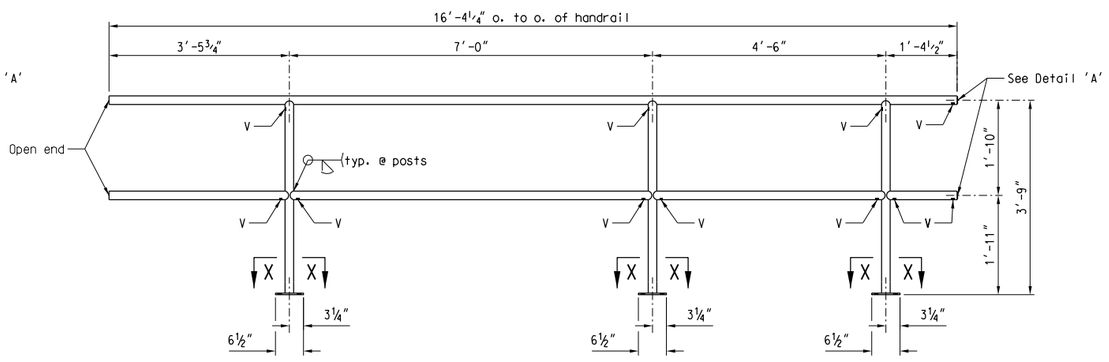
HANDRAIL PANEL ~ SHP37.8-2 (3 REQ'D)

Handrail panels are to be fabricated using 1½" dia.
std. black pipe. Galvanize after fabrication.
Weight = 87 lbs.



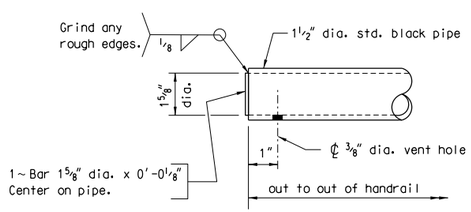
HANDRAIL PANEL ~ SHP37.8-3 (2 REQ'D)

Handrail panels are to be fabricated using 1½" dia.
std. black pipe. Galvanize after fabrication.
Weight = 132 lbs.

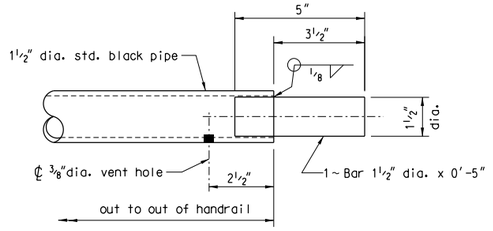


HANDRAIL PANEL ~ SHP37.8-4 (1 REQ'D)

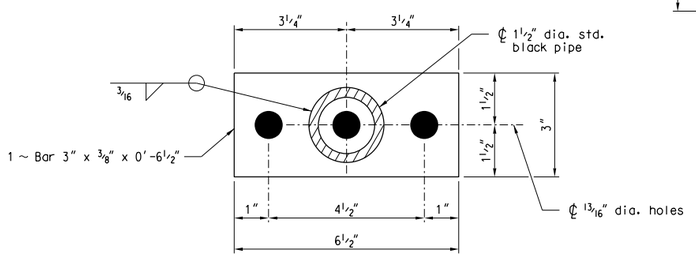
Handrail panels are to be fabricated using 1½" dia.
std. black pipe. Galvanize after fabrication.
Weight = 127 lbs.



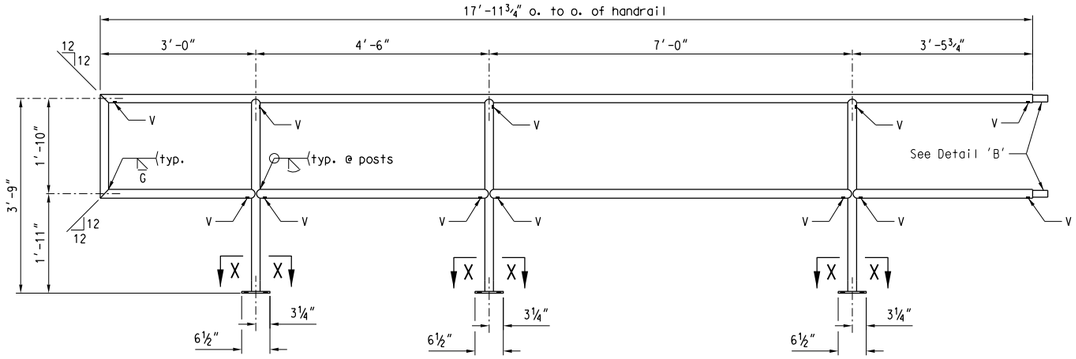
DETAIL 'A'



DETAIL 'B'



SECTION X-X



HANDRAIL PANEL ~ SHP37.8-5 (1 REQ'D)

Handrail panels are to be fabricated using 1½" dia.
std. black pipe. Galvanize after fabrication.
Weight = 145 lbs.

NOTES:

MATERIAL: STRUCTURAL STEEL BARS SHALL MEET THE REQUIREMENTS OF THE CURRENT ASTM DESIGNATION: A36.

STANDARD BLACK PIPE SHALL MEET THE REQUIREMENTS OF THE CURRENT ASTM DESIGNATION: A53. UNCOATED PIPE SHALL BE USED.

SHOP NOTES: FABRICATION AND ARC WELDING OF STRUCTURAL STEEL AND HANDRAIL PANELS SHALL BE IN ACCORDANCE WITH CHAPTER 15, PART 3 OF THE CURRENT A.R.E.M.A. MANUAL FOR RAILWAY ENGINEERING. MIG WELDING SHALL BE USED ON HANDRAIL PANELS.
OPEN HOLES: AS NOTED. SHOP PAINT: NONE.

GALVANIZING: HANDRAIL PANELS SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH THE CURRENT ASTM DESIGNATION: A123.

AFTER GALVANIZING, ALL ELEMENTS SHALL BE FREE OF FINS, ABRASIONS, ROUGH OR SHARP EDGES AND OTHER SURFACE DEFECTS.

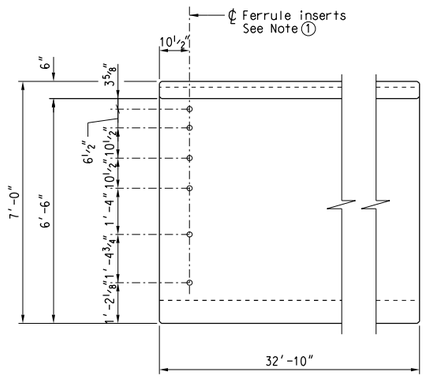
HANSON
Hanson Professional Services Inc.

DES:	JEC
DRAWN:	GTJ
CHECK:	MAF
DATE:	5/13/14
AUTH:	A141328
LINE SEG:	0050

BNSF RAILWAY
BRIDGE ENGINEERING KANSAS CITY, KS
APPROVED: Kristin M Hurst
ASST. DIRECTOR STRUCTURES DESIGN

USA CANADA BORDER TO DELTA JCT.
BRIDGE NO. 37.8 - SOUTH APPROACH
OVER STEAMBOAT SLOUGH
MARYSVILLE, WA
HANDRAIL PANEL DETAILS

PLAN NO: 0050-37.8-011 | SHEET: 11 OF 12



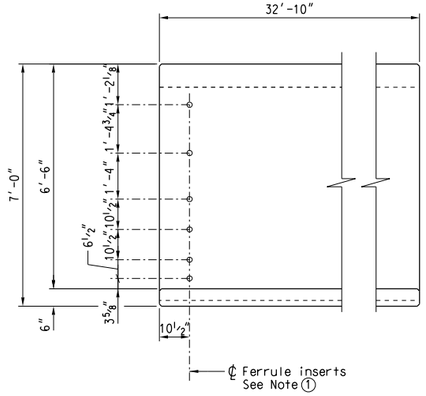
PLAN

Fabricator's Note:
For 32'-10" Double Cell Box Girder Details not shown on this plan, and Fabrication Notes, see BNSF/UP Combined Standard Plans 500000-BG1, Rev. F, BG2, Rev. F, & BG3, Rev. F.

① Cast-In-Place Ferrule Inserts, F-65, ¾" dia.x4", Type I, as manufactured by Dayton Superior Corp. or equal. Furnish with ¾" dia. bolts and washers. All items shall be galvanized.

32'-10" P/S CONC. DOUBLE CELL BOX GIRDER WITH CURB

1 Req'd. - Mk. SCDC37.8-1



PLAN

Fabricator's Note:
For 32'-10" Double Cell Box Girder Details not shown on this plan, and Fabrication Notes, see BNSF/UP Combined Standard Plans 500000-BG1, Rev. F, BG2, Rev. F, & BG3, Rev. F.

① Cast-In-Place Ferrule Inserts, F-65, ¾" dia.x4", Type I, as manufactured by Dayton Superior Corp. or equal. Furnish with ¾" dia. bolts and washers. All items shall be galvanized.

32'-10" P/S CONC. DOUBLE CELL BOX GIRDER WITH CURB

1 Req'd. - Mk. SCDC37.8-2

REQ. NO.: PR69668	REQUEST ID.: SB00	LINE SEG.: 0050	MILE POST: 37.8	DELIVERY DATE: JULY 7, 2014

SHIP TO: CHAD GORDON
SUPERVISOR STRUCTURES
DELTA YARD
EVERETT, WA
(425) 220-8097

SEND SHIPPING PAPERS TO: CHAD GORDON
SUPERVISOR STRUCTURES
BNSF RAILWAY
2900 BOND ST.
EVERETT, WA

ACCT.: ????	COST CLASS: ???
WORK REASON: ???	COST CTR.: ?????
LOC. NO.: ??????	TAX CODE: ??
AUTH.: A141328	P.O. NO.: -

SIGNATURE ALAN BLOOMQUIST TITLE: MGR STRUCTURES DESIGN DATE: MAY 2014

BILL OF MATERIAL

LINE	QUAN.	UNIT	DESCRIPTION	MARK	SIZE	LENGTH	REMARKS
1	135,700	LBS.	STEEL PIPE PILE, ASTM A252, GR. 3 w/ EPOXY COATING (18 PIECES)		24" Dia. x ½"	60'-0"	MINIMUM YIELD STRENGTH OF 50 KSI
2	42,120	LBS.	STEEL BEARING PILE, ASTM A572, GR. 50 (6 PIECES)		HP14X117#	60'-0"	
3	9	EA.	CONICAL PIPE PILE TIPS, ASTM A148		24" DIA.		PER PLAN 0050-37.8-003
4							
5	6	EA.	PRECAST P/S CONC. DBL. CELL BOX BEAM w/ CURB	CDC27-10C	30"x7'-0"	27'-10"	PER PLAN 500000 BG1, BG2 & BG3
6	1	EA.	PRECAST P/S CONC. DBL. CELL BOX BEAM w/ CURB	SCDC37.8-1	30"x7'-0"	32'-10"	PER PLAN 0050-37.8-012
7	1	EA.	PRECAST P/S CONC. DBL. CELL BOX BEAM w/ CURB	SCDC37.8-2	30"x7'-0"	32'-10"	PER PLAN 0050-37.8-012
8	1	EA.	PRECAST CONC. BEARING BLOCK	SBB37.8-1	3'-0"x4'-7"	15'-0"	PER PLAN 0050-37.8-009
9	1	EA.	PRECAST CONC. ABUTMENT CAP	SPC37.8-1	3'-0"x5'-11¾"	18'-6"	PER PLAN 0050-37.8-007
10	3	EA.	PRECAST CONC. BENT CAP	SPC37.8-2	4'-0"x2'-6"	17'-0"	PER PLAN 0050-37.8-008
11	2	EA.	PRECAST CONC. WINGWALL	PW103	9"x5'-11¾"	8'-6"	PER PLAN 0000-17902-091
12							
13	10	EA.	PLATE WASHER, ASTM A36, GALVANIZED	W100	4"x3¼"	4"	PER PLAN 0000-17902-094
14	4	EA.	DECK PLATE, ASTM A709, GR. 36, GALVANIZED	DP100	8"x⅜"	6'-5½"	PER PLAN 0000-17902-094
15	4	EA.	DECK PLATE, ASTM A709, GR. 36, GALVANIZED	DP101	8"x⅜"	6'-5½"	PER PLAN 0000-17902-094
16	10	EA.	RESTRAINER BRACKET	B100	PC OF HP14x89#	8"	PER PLAN 0000-17902-094
17	1	EA.	BALLAST STOP PLATE, ASTM A709, GR. 36, GALVANIZED	BSP37.8-1	14⅜"x12½"	6'-5¾"	PER PLAN 0050-37.8-010
18	1	EA.	BALLAST STOP PLATE, ASTM A709, GR. 36, GALVANIZED	BSP37.8-2	14⅜"x12½"	6'-5¾"	PER PLAN 0050-37.8-010
19							
20	1	EA.	HANDRAIL PANEL, ASTM A53, GALVANIZED	SHP37.8-1	1½" DIA. PIPE	18'-11¾"	PER PLAN 0050-37.8-011
21	3	EA.	HANDRAIL PANEL, ASTM A53, GALVANIZED	SHP37.8-2	1½" DIA. PIPE	10'-4¼"	PER PLAN 0050-37.8-011
22	2	EA.	HANDRAIL PANEL, ASTM A53, GALVANIZED	SHP37.8-3	1½" DIA. PIPE	17'-4¼"	PER PLAN 0050-37.8-011
23	1	EA.	HANDRAIL PANEL, ASTM A53, GALVANIZED	SHP37.8-4	1½" DIA. PIPE	16'-4¼"	PER PLAN 0050-37.8-011
24	1	EA.	HANDRAIL PANEL, ASTM A53, GALVANIZED	SHP37.8-5	1½" DIA. PIPE	17'-11¾"	PER PLAN 0050-37.8-011
25							
26	42	EA.	ASTM A325 H.S. BOLT w/ NUT		¾" DIA.	2"	HANDRAIL POST
27	84	EA.	HARDENED CARBON STEEL CIRCULAR WASHER		¾" DIA.		HANDRAIL POST
28	21	EA.	WALKWAY BRACKET, ASTM A709, GR. 36, GALVANIZED	WBS4	9"x1'-8"	3'-5"	PER PLAN 0050-37.8-010
29							
30	2	EA.	GRIP STRUT SAFETY GRATING, 12 GA., GALV.	①	3"x18¾"	5'-11"	PER PLAN 0050-37.8-002
31	2	EA.	GRIP STRUT SAFETY GRATING, 12 GA., GALV.	②	3"x18¾"	12'-11"	PER PLAN 0050-37.8-002
32	12	EA.	GRIP STRUT SAFETY GRATING, 12 GA., GALV.	③	3"x18¾"	6'-11"	PER PLAN 0050-37.8-002
33	8	EA.	GRIP STRUT SAFETY GRATING, 12 GA., GALV.	④	3"x18¾"	14'-0"	PER PLAN 0050-37.8-002
34							
35	84	EA.	CARRIAGE BOLT, ROUND HEAD, SQ. NECK, GALVANIZED		5/16" DIA.	4½"	FOR FASTENING GRATING
36	84	EA.	LOCK NUT, CENTER LOCKING, ZINC PLATED		5/16" DIA.		FOR FASTENING GRATING
37	84	EA.	WASHER, FLAT, ROUND 12 GA., GALVANIZED		⅜" I.D.	⅞" O.D.	FOR FASTENING GRATING
38	84	EA.	GRIP STRUT ANCHORING DEVICE CLIP, GALV.	12262			FOR FASTENING GRATING
39							
40	16	EA.	URETHANE BEARING PAD, DUROMETER 70		¾"x10"	6'-4"	PER PLAN 0050-37.8-005
41							
42	32	EA.	PREMOLDED JOINT FILLER, ASPH. IMPREG.		½"x28"	6'-4"	PER PLAN 0050-37.8-006
43							
44	1	EA.	BRIDGE NUMBER SIGN, NO. 103	37.8			DETAIL PLAN 3103.01.03
45	1	EA.	NO TRESSPASSING SIGN, NO. 70		18"x24"		DETAIL PLAN 3070.01.05
46	1	EA.	SIGN POST, NO. 1, BLACK			11'-0"	(TRACK STD. PLAN BOOK)

BNSF TO FURNISH BRIDGE ITEMS SHOWN IN ABOVE BILL OF MATERIAL.

SUPERVISOR STRUCTURES TO PROVIDE EPOXY, GROUT, CLSM, STRUCTURE BACKFILL, CLASS 40 CONCRETE, REINFORCEMENT FOR CAST-IN-PLACE CONCRETE, PLYWOOD, WELDING CONSUMABLES, STEEL SHIMS, FORMWORK, FALSEWORK AND MISC. HARDWARE AS REQUIRED.

HANSON
Hanson Professional Services Inc.

DES: JEC
DRAWN: GTJ
CHECK: MAF
DATE: 5/13/14
AUTH: A141328
LINE SEG: 0050

BNSF RAILWAY
BRIDGE ENGINEERING KANSAS CITY, KS
APPROVED: Hueston M Hurst
ASST. DIRECTOR STRUCTURES DESIGN

USA CANADA BORDER TO DELTA JCT.
BRIDGE NO. 37.8 - SOUTH APPROACH
OVER STEAMBOAT SLOUGH
MARYSVILLE, WA
BILL OF MATERIAL & DETAILS

PLAN NO: 0050-37.8-012 SHEET: 12 OF 12

APPENDIX C

Life Histories of Listed Species

CHINOOK SALMON PERTINENT LIFE HISTORY (*Oncorhynchus tshawytscha*) & CRITICAL HABITAT PCES

In general, summer/fall Chinook salmon migrate into freshwater in August and September (Wydoski and Whitney 1979). Spawn timing begins in late September and peaks in October, similar to other Chinook salmon stocks in south Puget Sound (WDF et al. 1993).

After emergence, juvenile Chinook salmon rear in freshwater from a few days to 3 years (Wydoski and Whitney 1979); however, most juvenile Chinook salmon in Puget Sound streams migrate to the marine environment during their first year (Myers et al. 1998). These Chinook are called "ocean type" due to their short freshwater residence and because they make extensive use of the nearshore marine environment for rearing. Ocean type Chinook salmon generally migrate downstream in the spring, just months after emerging from the gravel, or during the summer and autumn after a brief period of rearing in freshwater (Healey 1991; Myers et al. 1998). It is expected that most will have moved into the lower estuarine areas by July, as seen in other Puget Sound systems (Hayman et al. 1996).

Juvenile Chinook salmon that remain in freshwater after emergence may migrate to the ocean any time of year, though most Chinook salmon within a population tend to migrate at similar times and ages (Healey 1991). Migration commonly occurs during the night under the cover of darkness, although some fish may migrate during the day (Healey 1991). Chinook salmon fry tend to migrate along the banks and avoid the high velocity water near the center (thalweg) of the channel (Healey 1991).

BULL TROUT PERTINENT LIFE HISTORY (*Salvelinus confluentus*)

The amphidromous life-history form of bull trout is poorly studied (USFWS 1999a). Unlike strict anadromy, as exhibited by Pacific salmon, amphidromous individuals often return seasonally to freshwater as sub-adults, sometimes for several years, before returning to spawn (Wilson 1997). For bull trout, the amphidromous life history form is unique to the Coastal-Puget Sound population. For many years it was thought that amphidromous char[2] in Washington were Dolly Varden (*Salvelinus malma*) and that freshwater char were bull trout. There is conclusive evidence that amphidromous bull trout populate Puget Sound (Kraemer 1994), and anecdotal evidence suggests these native char were once much more abundant (USFWS 1999a). In Washington State, bull trout and Dolly Varden, two closely related char species, coexist and are managed as a single species. Separate inventories are not maintained by the WDFW due to the considerable biological similarities in life history and habitat requirements that exist between the two species. Although historic reports of char may have specified either bull trout or Dolly Varden, methodologies for reliably distinguishing between the two have only recently been developed and have not yet been widely applied (WDFW 1998).

[2] The biological similarities of bull trout and Dolly Varden make them virtually indistinguishable in the field. As a result, they are often referred to collectively as "native char." In fact, WDFW has combined information on their status and distribution into a common inventory (WDFW 1998).

Bull trout are considered to be optionally amphidromous, (i.e., the survival of individuals is not dependent upon whether they can migrate to sea), in contrast to obligate anadromous species like pink (*Oncorynchus gorbuscha*) and chum salmon (*O. keta*) (Pauley 1991). Nonetheless, the amphidromous life history form is important to the long-term persistence of bull trout and their meta-population structure. Amphidromous fish are generally larger and more fecund than their freshwater counterparts, and migratory forms play an important role in facilitating gene flow among sub-populations.

Bull trout are believed to be restricted in their spawning distribution by water temperature. Bull trout spawn in late summer and early fall (Bjornn 1991). Locally, amphidromous forms typically return to freshwater in late summer and fall to spawn in upper tributaries and headwater areas. In the Snohomish River system, all known spawning occurs in the upper portions of the Skykomish River (both forks). Puget Sound stocks typically initiate spawning in late October or early November as water temperature falls below 7 to 8º C. Spawning habitat almost invariably consists of very clean gravel, often in areas of groundwater upwelling or cold spring inflow (Goetz 1994). Neither of these conditions exists in the action area. Egg incubation temperatures needed for survival have been shown to range from 2 to 4º C (Willamette National Forest 1989). Bull trout eggs require approximately 100 to 145 days to hatch, followed by an additional 65 to 90 days of yolk sac absorption during alevin incubation. Thus, in-gravel incubation spans more than 6 months. Hatching occurs in winter or late spring, and fry emergence occurs from early April through May (Rieman and McIntyre 1993).

Generally, for their first 1 to 2 years, bull trout juveniles rear near their natal tributary and exhibit a preference for cool water temperatures (Bjornn 1991), although they appear less restricted by temperature than are spawners. Newly emerged bull trout fry are often found in shallow, backwater areas of streams that contain woody debris. Later, or in other habitats lacking woody debris for refugia, fry are bottom dwellers, and may occupy interstitial spaces in the streambed (Brown 1992). Since all known spawning occurs in the upper Skykomish sub-basin, these habitat requirements are not pertinent in the action area.

Resident forms of bull trout spend their entire lives in small streams, while migratory forms live in tributary streams for several years before migrating to larger rivers (fluvial form) or lakes (adfluvial form). Migratory individuals typically move downstream in the summer and often congregate in large, low-velocity pools to feed (Bjornn 1991). Anadromous bull trout usually remain in freshwater 2 or 3 years before migrating to saltwater in spring (Wydoski and Whitney 1979).

Bull trout life histories are plastic (i.e., variable and changeable between generations), and juveniles may develop a life history strategy that differs from their parents. The shift between resident and migratory life forms may depend on environmental conditions. For example, resident forms may increase within a population when survival of migratory forms is low (Rieman and McIntyre 1993). Char are generally longer-lived than salmon, and bull trout up to 12 years old have been identified in Washington (Brown 1992).

STEELHEAD PERTINENT LIFE HISTORY (*Oncorhynchus mykiss)*

Steelhead are the anadromous form of freshwater resident rainbow or redband *O. mykiss* trout species. The present distribution of steelhead extends from Asia, to Alaska, and south to the U.S. Mexico border (Busby et al 1996; 67 FR 21586, May 1, 2002). Unlike many salmonid species, the *O. mykiss* exhibit extremely complex and plastic life-history characteristics, such that their offspring can exhibit different life- history forms from the parental generation. For example, offspring of resident fish may migrate to sea, and offspring of anadromous steelhead may remain in streams as resident fish (Burgner et al. 1992).

Those that are anadromous can spend up to 7 years in freshwater before smoltification (the physiological and behavioral changes required for the transition to salt water), and then spend up to 3 years in salt water before returning to freshwater to spawn. However, they typically return to their natal stream to spawn as 4- or 5-year- old fish. Unlike Pacific salmon, steelhead are iteroparous or capable of spawning more than once before they die. However, it is rare for steelhead to spawn more than twice before dying, and those that do are usually females (Busby et al.1996).

Over their entire range, West Coast steelhead spawning migrations occur throughout the year, with seasonal peaks of migration activity varying by location. However, even in a given river basin there might be more than one seasonal migration peak, typically referred to as winter, spring, summer, or fall steelhead runs. Although there are generally four migration seasons, steelhead are typically divided into two basic reproductive ecotypes (summer and winter), based on the state of sexual maturity at the time they enter freshwater and the duration of spawning migration (Burgner et al. 1992). The summer or stream-maturing type enters fresh water in a sexually immature condition between May and October, and sexually matures in freshwater over several months. In contrast, the winter or ocean-maturing type enters fresh water in a sexually mature condition between November and April, and spawns shortly thereafter. In basins with ecotypes, the summer run generally spawns farther upstream than winter run fish. However, the winter run of steelhead is the predominant run in Puget Sound.

Depending on water temperature, fertilized steelhead eggs may incubate in redds for 1.5 to 4 months before hatching as “alevins.” Following yolk sac absorption, young juveniles or “fry” emerge from the gravel and begin active feeding. As they grow, steelhead move to deeper parts of the stream, establish territories, and change diet from microscopic aquatic organisms to larger organisms such as isopods, amphipods and aquatic and terrestrial insects, primarily associated with the stream bottom (Wydoski and Whitney 1979). Riparian vegetation and submerged cover (logs, rocks and aquatic vegetation) are important for providing cover, food, temperature stability, and protection from predators. As a result, densities of juvenile steelhead are highest in areas containing in-stream cover (Reiser and Bjornn 1979; Johnson and Kucera 1985).

Marbled murrelet *(Brachyramphus marmoratus marmoratus)*

The marbled murrelet is a small seabird of the Alcidae Family. The subspecies in our region (*Brachyramphus marmoratus marmoratus*) ranges from the Aleutian Archipelago in Alaska, eastward to Cook Inlet, Kodiak Island, Kenai Peninsula, and Prince William Sound, southward along the coast throughout the Alexander Archipelago of Alaska, and through British Columbia, Washington, Oregon, to central California (Federal Register 45328, 1992). Marbled murrelets feed primarily on fish and invertebrates in near-shore marine waters. The majority of them are found within or adjacent to the marine environment, although there have been detections of marbled murrelets on rivers and inland lakes (Carter and Sealy 1986).

In Washington State, critical habitat has been designated in Clallam, Cowlitz, Grays Harbor, Jefferson, King, Lewis, Mason, Pacific, Pierce, Skagit, Snohomish, Thurston, Wahkiakum, and Whatcom counties, but not in Island County (WSDOT 2002). In northwest Washington, marbled murrelets are mostly found at old-growth/mature sites (Hamer and Cummins 1990).

Little is known about marbled murrelet breeding habitats. Murrelets have been observed visiting nest sites throughout the year with the most activity occurring from April to August. The nesting season is generally considered to occur sometime from April 1 to September 15. heir tolerance to disturbance varies greatly. Some earlier known nest sites were located within campgrounds, near trails, or adjacent to highways. Conversely, it has been documented that disturbance by recreational and fishing boats has caused them to abandon productive feeding areas in nearshore waters (Rodrick and Milner 1991).

Locating nests for study has proved difficult because murrelets nest solitarily or in loose aggregations, and are active primarily in low light levels (Sealy and Carter 1984, Hamer and Nelson 1995). Out of twenty-three nests that have been located in North America, five are located in Washington State. Sixteen of the nests found in Washington, Oregon, and California were located in old-growth trees that ranged in diameter at breast height (dbh) from a 35-inch dbh to 210-inch dbh. All of the nest sites were situated above ground and usually had good overhead protection. The birds nested in sites dominated by Douglas fir (*Pseudotsuga menziesii*) in Oregon and Washington; and the birds chose the older Douglas fir trees in these stands.

For nesting sites to be accessible to marbled murrelets, they must occur close enough to the marine environment for murrelets to fly back and forth. The farthest inland distance for a known occupied site is 84 kilometers (52 miles) in Washington. Occupied sites are defined as forest stands where marbled murrelets have been observed exhibiting behaviors associated with nesting.

Marbled murrelet nests are difficult to locate for several reasons: the nests are natural depressions in existing material, located high in the canopy, adults and juveniles have cryptic plumage during most of the nesting season, adults are often (not always) extremely quiet in the vicinity of nests (Nelson and Peck 1995), and adults may show activity near the nest only once

per day, usually under low light conditions. Therefore, identification of occupied sites and suitable nesting habitat are the best indicators of potential nest sites.

The Pacific Seabird Group has begun work on redesigning and establishing the protocol for murrelet inland surveys (Pacific Seabird Group 1996). Guidance provided by the Pacific Seabird Group states that there are no standard forest characteristics used to assess nesting habitat conditions. Research shows that stand structure (the presence of nesting platforms) is significantly more important than tree diameter in predicting murrelet presence in an area (Grenier and Nelson 1995, Hamer and Nelson 1995). Large diameter trees do not always need to be present for a stand to be potential nesting habitat. Any stand with limb diameters or platform structures of 6 inches or more may have the potential of being suitable nesting habitat (Hamer and Nelson 1995; Pacific Seabird Group 1996).

The current Washington State Forest Practices regulatory definition uses a diameter equal to or greater than 7 inches including associated moss if present. However, for one third of the known nests, moss is not present, and so limbs do not need moss coverage to be classified as suitable nesting platforms (Pacific Seabird Group 1996).

Murrelets can also nest in larger residual trees that often remain in a stand from past fire and management activities (Grenier and Nelson 1995, Ralph et al. 1995, Washington State Forest Practice Rules Proposals, May 1996). These residual trees are often found at low densities, sometimes less than one tree per acre (Grenier and Nelson 1995, Nelson and Hardin 1993).

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