Low Vertical Clearance Truss Bridges: Risk Assessment and Retrofit Mitigation Study

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LOW VERTICAL CLEARANCE TRUSS BRIDGES: RISK ASSESSMENT AND RETROFIT MITIGATION STUDY

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### 15. SUPPLEMENTARY NOTES

This study was conducted in cooperation with the U.S. Department of Transportation, Federal Highway Administration.

### 16. ABSTRACT

The Washington State Department of Transportation (WSDOT) has over 60 steel truss bridges in its inventory with vertical clearances less than the minimum 16’-6” required for new bridges. This study evaluates the risks of oversized vehicle impacts to existing truss bridges with low vertical clearances. The Skagit River Bridge SR5/712 was hit by an oversized load on May 23rd, 2013 resulting in a catastrophic collapse. At the time of the collapse, the Skagit River Bridge had less than the minimum vertical clearance. WSDOT undertook this study to evaluate the risks of a similar occurrence happening and to evaluate potential mitigation schemes. Scoping level construction estimates for each scheme were then developed for all structures with substandard vertical clearance. All bridges were prioritized based on risk using a range of evaluation criteria. The goal and eventual purpose of the study is to be used as an asset management tool for programming future retrofit projects and for procuring the necessary funding.

### 17. KEY WORDS

Steel Trusses, Vertical Clearance, Portals, Sways, Vehicle Over Height Impact

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EXECUTIVE SUMMARY

On May 23rd, 2013 span 8 of the Skagit River Bridge SR5/712 was hit by an oversized load and collapsed into the river. The truck carrying the oversized load proceeded across the span prior to its collapse; however two vehicles following the truck went down with the bridge. Luckily no serious injuries occurred. The height of the truck load was 15'-11" and would have had sufficient clearance if it crossed the bridge on the inside lane, however the truck crossed in the outer lane where the clearance is reduced by the curved geometry of the truss portal and sway braces (See Figure 1). This is a common detail for the vast majority of existing truss structures in Washington State.

Figure 1 – Skagit River Bridge Clearances at Time of Incident

Consequently, the Washington State Department of Transportation Bridge and Structures Office (WSDOT BSO) initiated a project to study the inventory of steel truss bridges with vertical clearances below 16'-6" (current standard) at any point in the cross section, i.e. from curb to curb. The study revealed there are 63 additional truss bridges with clearances at 16'-5" or below. The lowest clearance was found to be 14'-3” on the White River Bridge SR410/101 in Buckley, WA. Washington has a total of 104 through-truss bridges on the State system and this number rises to 158 when considering local bridges.

A multitude of data was gathered on each of the 63 bridges including, vertical clearances, average daily truck traffic, number of members with low vertical clearance, sufficiency rating of the structure, date constructed, previous recorded high load impacts, and several other elements to be used in the study. It was found that 57 of the 63 bridges (>90%) had documented reports of high load impacts. In many cases several members on several different occasions were reported to have been hit. The impacts ranged from severe enough to require immediate repair with a Critical Damage Bridge Repair Report (CDBRR) being sent to the Federal Highway Administration (Skagit River) to minor structural damage.

The data gathered was used to assess all the structures and then group into 3 priority categories. Structures included in Group 1 are deemed having the highest risk of a future high load impact and are the top priority for a potential retrofit. Group 1 includes 25 structures; Group 2 includes 29 structures and there are 9 in Group 3. There was no attempt to prioritize the structures within each Group. The Group 1 structures generally have clearances below 15'-0", have significant truck traffic, are on main routes within the State, or have numerous recorded high load hits. The Group 2 structures generally have clearances between 15'-0" and 15'-11" and have reports of previous high load hits. The remaining Group 3 structures did not meet the 16'-6" desired minimum vertical
clearance but generally had minimum clearances equal to or greater than 16’-0” or had limited or no reports of high load hits. Although structures within each Group were not intentionally prioritized, there are a number of structures that would be targeted as highest priority for retrofit if limited funding was available.

The primary retrofit scheme for all the structures is to raise the portal and sway braces up to or greater than the minimum desired 16’-6” clearance.

A 2-page summary sheet was developed for each structure in each group and is presented in Appendix A through C. Included in the summary are specific recommendations for retrofit and a scoping level construction estimate. The estimates included the direct structure costs, Region add-on costs, and a rating scale factor to account for difficulty of construction, staging, traffic control, and available detour routes. These 2-page summary sheets can be used by the WSDOT BSO Asset Management Engineer for programming future projects. The total estimated scoping cost for all of the 25 Group 1 structures is $24,300,000. Total estimated scoping cost for the 29 Group 2 structures is $39,200,000 and the 9 Group 3 structures is $10,000,000. Total cost for all structures is $73,500,000. These are structure construction costs only and do not include design costs.

As a result of this study, the WSDOT BSO recommends a program be developed to procure funding and begin retrofitting the highest priority and most vulnerable structures in the Group 1 priority list. The cost for these retrofits is significant, however in comparison the total estimated cost incurred for the Skagit River collapse was over $20 million, with and additional $8.3 million estimated in road-user direct costs during the closures. These estimates don’t include the economic impacts that were felt by the local communities and businesses.
The structure type for the bridge structures being evaluated in this study are typically referred to as through-trusses because the majority of the structure is above the roadway and traffic passes through the bridge. Through-truss type bridges made with steel and iron were constructed as early as the 1850s and became a common type of bridge between the 1870s and 1930’s. Trusses constructed of timber date back to the early 1800’s. Truss bridges are very economical in their design and construction. They are beneficial in their ability to accommodate long spans, are efficient in use of materials, and consist primarily of tension and compression members (see Figure 3). There are numerous types or styles of through-truss bridges that have been used in the past. Common members of a typical through-truss bridge are presented in Figure 2.

A common structural behavior for most truss bridges is they are considered fracture critical. Fracture critical structures are generally defined as structures with steel members in tension whose failure would probably cause a portion of or the entire bridge to collapse. These types of structures are considered non-redundant in that there is no alternative load path for distributing loads within the bridge. In comparison, a girder bridge consisting of 3 or more steel or concrete girders is considered redundant. If one of the girders were to be damaged or fail, the remaining girders and roadway deck would prevent its total collapse. The bridge may be unusable, but a catastrophic failure would likely be avoided.

Although the common definition for a fracture critical member is a tension member whose failure could cause collapse, loss of a compression member in a truss, particularly a top chord, can also lead to a catastrophic failure.
This was the case for the Skagit River Bridge. The National Transportation Research Board’s (NTSB) Highway Accident Report concluded that “the bridge span collapse sequence began when the oversize load struck sway brace 4 in span 8 on the west truss, causing the deformation of the adjacent vertical member (L4-U4), which pulled the attached upper chord member (U3-U5) downward, causing a buckling failure in the upper chord member at node U4. The NTSB further concludes that, because the Skagit River Bridge was a non-load-path-redundant structure, buckling of the upper chord on the west truss resulted in the failure of the east truss and the collapse of span 8.”

In most cases, previous over height vehicle impacts to sway and portal braces in through-truss bridges have caused only local damage to the member and adjacent connected members, however this type of more catastrophic, sequential failure is possible for all through-truss bridges with substandard vertical clearances. This is the principal concern for WSDOT and the main purpose for completing this study. However, in addition to the concerns for a catastrophic failure, there are also concerns from impacts causing debris, pieces of truss members, or pieces of the
over height vehicle or load falling down into traffic. Although not a catastrophic failure, there is still risk of damage to following vehicles and/or serious injuries to occupants. Finally, the cost of repairs to impacted trusses and the disruption to traffic during repairs is a secondary concern and another reason for undertaking this study.

**EVALUATION CRITERIA FOR RISK ASSESSMENT**

The following evaluation criteria were used to screen and identify structures to be included in this study. The current vertical clearance and evidence of previous high load impacts were the primary factors in prioritizing the structures into groups, however all of the evaluation criteria discussed below was utilized in the assessment of the structures. The structures were grouped into Groups 1, 2 and 3, with Group 1 structures being of the highest priority.

**CURRENT VERTICAL CLEARANCE**

The first order of work for this project was to develop a list of bridge structures in WSDOT’s inventory that had documented vertical clearances below 16’-6” and were categorized as through-truss type bridges. There are numerous other structures in WSDOT’s inventory that have vertical clearances less than 16’-6”, but typically these are overpass structures that are not fracture critical or non-redundant. WSDOT has had numerous concrete girder type bridges that have experienced over height impacts requiring repair or even girder replacement, but as discussed previously are much less susceptible to catastrophic type failures. For this reason, this study concentrates on and is limited to only steel through-truss bridges.

The lowest vertical clearance documented in WSDOT’s inventory is the SR 410/101 White River Bridge at 14’-03”. The initial screening divided the structures into 3 groups. The first group being all bridges 14’-11” and less, bridges with vertical clearances from 15’-0” to 15’-11” and those between 16’-0” and 16’-5”. It must be noted that there are bridges structures with 16’-6” clearance or greater that have experienced high load impacts. Nevertheless, this study is limited to those structures below the minimum clearance required for a new bridge if it were constructed today. The risk of a structure with clearance at or above the 16’-6” minimum is still real, but has a much lower risk and considered an outlier for this study. It is unlikely that a through-truss bridge at 16’-6” clearance or greater would be the first structure encountered by an over height load.

The WSDOT Bridge Preservation Office records a “Vertical Clearance Card” for each bridge, which documents the vertical clearances to the portal and sway braces along the length of the bridge. The clearance cards also document the clearances across the bridge width. This is necessary due to the geometry of the vast majority of steel truss bridge portal and sways. These braces are typically on a parabolic curve, providing more clearance at centerline of the bridge than at the edge of traveled lane and curb lines. A typical Vertical Clearance Card with varying geometry is shown in Figure 5. These cards were used in developing the list of bridges with low vertical clearance.

These clearances are field measured to ensure accuracy and do not rely on as-built or original plans. The plans do not always capture actual roadway and bridge deck geometry. For instance many structures have received deck overlays during their lifespan that changes the clearances to members.

Vertical clearances are reported to the Federal Highway Administration (FHWA) National Bridge Inventory for each bridge. These clearances are also tied to the low vertical clearance signing policy for bridges in Washington. Any
bridge with clearance of 15'-3" or less are required to have low vertical clearance signing. Signing is always posted at 3 inches less than the actual minimum clearance. WSDOT’s policy is to report the minimum vertical clearance at the extreme curb line if the shoulder width is 2'-0" or less. If the shoulders are greater than 2'-0" the vertical clearance reported, and used for determination of the need for signing, is based on the edge of traveled lane, often called the fog line. For this study the lowest minimum clearance at the curb line is used regardless of the shoulder width. The risk of an over height vehicle traveling within the shoulder and in a lower clearance zone is possible and is conservatively considered the minimum for this study. However, shoulder width is one of the items utilized in this study and consideration was given during the prioritization process.

**Figure 5 – Typical Vertical Clearance Card – SR 410/101 White River Bridge**

<table>
<thead>
<tr>
<th>Location</th>
<th>Measurement</th>
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<tbody>
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<td>West Portal</td>
<td>A</td>
</tr>
<tr>
<td>P92</td>
<td>15'-3&quot;</td>
</tr>
<tr>
<td>P93</td>
<td>14'-3&quot;</td>
</tr>
<tr>
<td>P94</td>
<td>14'-4&quot;</td>
</tr>
<tr>
<td>P95</td>
<td>14'-3&quot;</td>
</tr>
<tr>
<td>P96</td>
<td>16'-3&quot;</td>
</tr>
<tr>
<td>East Portal</td>
<td>16'-4&quot;</td>
</tr>
</tbody>
</table>

*(North curb/fog line average offset - "F" = 3'-5"; South curb/fog line average offset - "G" = 4'-0")
DAILY TRAFFIC VOLUMES, SIGNIFICANCE OF ROUTE, AND DETOUR LENGTH

A second key component used in the risk analysis is the amount of average daily truck traffic (ADTT) each bridge experiences. The ADTT is just a portion of the average daily traffic (ADT), which includes all traffic utilizing the bridge. The data collected is not specific enough to differentiate as to how high or wide the truck traffic is but is an indicator of the amount of potential risk. In addition to considering the total amount of ADTT in the analysis, the percentage of ADTT as a function of the total ADT was considered.

The average ADTT as a percentage of ADT was 16% for the Group 1 priority structures with a high of 34 percent. Group 2 was less than 15 percent and Group 3 less than 13 percent.

Again, these values are used as indicators but don’t always correlate to the potential risk. For instance the SR410/101 White River Bridge has only 4 percent of ADTT but has the lowest vertical clearance and recently received a serious high load hit requiring an emergency repair project. This illustrates that it only takes one over height vehicle and any structure with substandard vertical clearance is at risk.

Another consideration for prioritization of structures is the significance of the route and the length of an alternate detour route. Structures with high ADT, regardless of ADTT were considered due to the impact on traffic if a serious high load hit were to occur requiring closure or partial closure of the structure. The impact on an Interstate 5 structure with high ADT will obviously have more impact on the traveling public than a structure on a less used route. However, structures on less used routes often have much longer detour routes, which again can impact the traveling public. These items were also considered in the retrofit estimating process, which will be discussed later in this report.

The ADT, ADTT, and length of the detour route are all reported on the 2-page summary sheets for each bridge so these elements can be considered when evaluating the need and priority within a group for expenditure of funds on a retrofit.

The total number of lanes and overall bridge width must also be considered when evaluating for a retrofit. The fewer lanes the more difficult the construction traffic control will be for a retrofit project. Having several lanes allows for staged construction versus full closure of the bridge.

PREVIOUS HIGH LOAD IMPACTS

Over 90 percent (57 of 63) bridges had documented high load impacts to various members in the bridge. This data is not readily documented in a database or specific report and was extracted from review of inspection reports, repair lists (both completed and needed repairs), photo documentation, and review of previous contract documents.

Data on the severity and frequency of impacts is also not readily available and was qualitatively reviewed and extracted from the documents and sources previously listed. If a structure was noted to have had several high load impacts and was not currently in the Group 1 structures, it was moved into that group. Conversely, structures with the lowest clearances (below 15’-0”) but did not have a history of frequent or severe high load hits was moved down to a lower group.

A photo of a typical severe impact is shown in Figure 6 and an impact that would be considered minor is shown in Figure 7. Frequency and severity were considered in the priority grouping.
Figure 6 – Severe Damage Example: Sway Bent out of Plane. Sol Duc River #2 Bridge SR101/314

Figure 7 – Minor Damage Example: Sol Duc River #2 Bridge SR101/314
AGE OF STRUCTURE

The age of the structure must be considered in this study for the obvious reason that a structure nearing its usable lifespan would have a lower priority than a newer structure with the same level of risk. It is more prudent to use funding for a bridge replacement than to invest in a retrofit. However, many structures and even those beyond 75 years, which is a typical lifespan for a bridge structure, are still in relatively good shape and wouldn’t be listed as a high priority in the bridge replacement program. Therefore, it may still be prudent to invest funds in a retrofit to raise portals and sways and reduce the risk of over height impacts.

Another consideration is whether the bridge is designated Functionally Obsolete (FO) or Structurally Deficient (SD). These items along with the structure Sufficiency Ratings will be discussed in the next section.

FUNCTIONALLY OBSOLETE, STRUCTURALLY DEFICIENT AND SUFFICIENCY RATING

As part of the Washington State Bridge Inventory System (WSBIS), structures may be designated as Functionally Obsolete (FO) or Structurally Deficient (SD). Bridges are considered Functionally Obsolete when the deck geometry, load carrying capacity, clearance, or approach roadway alignment no longer meet the usual criteria for the system of which it is an integral part. In other words, FO means the bridge was built to standards that are no longer used today. Rating of FO is calculated automatically based on appraisal ratings of various elements of the bridge. One of these items is insufficient horizontal and vertical clearances, which is rated as Underclearances. For vertical clearance to be rated a 3 as part of the Underclearance evaluation, the clearance must be less than 15’-0” for interstate and other freeways, and less than 14’-0” for minor arterials and local roads. If the structure spans over a railroad, it would receive a rating of 3 if less than 20’-0”. The highest rating is an 8, for which there is no concerns. A complete list of items used in the evaluation and appraisal rating for a structure to be considered FO is shown in Table 1.

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<tr>
<th>WSBIS Item</th>
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<tr>
<td>Structural Evaluation</td>
<td>3</td>
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<tr>
<td>Deck Geometry</td>
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</tr>
<tr>
<td>Underclearances</td>
<td>≤ 3</td>
</tr>
<tr>
<td>Approach Roadway Alignment</td>
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</tr>
<tr>
<td>Waterway Adequacy</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 1 – Functionally Obsolete Guide

For a bridge to be rated as Structurally Deficient, significant load carrying elements must be in poor condition due to either deterioration and/or damage, or the adequacy of the waterway opening provided by the bridge is extremely insufficient to the point where overtopping is possible. This could occur if the waterway is wider upstream of the structure and is narrowed by the bridge crossing so that in a flood condition the water could submerge and overtop the bridge. This could cause intolerable traffic interruptions. Specifically, a structure is SD if a bridge component (deck, superstructure or substructure) has a condition rating of 4 or less. Ratings range from 8 as no issues to a low of 1 being the worst condition. Structures can also be designated as SD if the Structural Evaluation (load rating) or Waterway Adequacy (potential for overtopping) is rated at 2 or less. A complete list of items used in the Structural Deficiency rating is shown in Table 2. The Structural Evaluation takes into account the overall condition of the superstructure, substructure, inventory load rating, and the Average Daily Traffic (ADT).
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<th>WSBIS Item</th>
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<tr>
<td>Waterway Adequacy</td>
<td>≤ 2</td>
</tr>
<tr>
<td>Deck</td>
<td>≤ 4</td>
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<td>Superstructure</td>
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<tr>
<td>Substructure</td>
<td>≤ 4</td>
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<tr>
<td>Culvert</td>
<td>≤ 4</td>
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Table 2 – Structurally Deficient Guide

Of the 63 structures included in this study, 36 are considered Functionally Obsolete, 13 are considered Structurally Deficient and 14 are neither.

In addition to the FO and SD evaluations, the Sufficiency Rating of the structure is also calculated by evaluating the highway bridge data. The evaluation is based on a formula that considers 4 factors to obtain a numerical value that is indicative of the bridge sufficiency to remain in service. The rating is based on a percentage from 100 percent down to 0 percent. If a bridge is rated 100 percent, it would be entirely sufficient and 0 percent would entirely insufficient. The 4 factors considered in the formula for computing the Sufficiency Rating include structural adequacy, functional obsolescence, level of service, and essentiality for public use. The structural adequacy has the highest weighting in the equation at 55%.

It must be noted that the Federal Highway Administration is moving away from utilizing ratings and having the States report ratings for each bridge. However, historically a sufficiency rating of 80 or less would indicate a bridge needs some rehabilitation work, and a rating of 50 or less would indicate it needs replacement. Of the 63 structures included in the study, 62 have a sufficiency rating below 80 and 25 have a rating below 50. The Sufficiency Rating was considered in the evaluation and prioritization of the structures and is reported in the 2-page summary report for each bridge. When a bridge is considered for rehabilitation, a close look at these ratings should be considered. A bridge may currently be designated as FO and have a low Sufficiency Rating, but improving the vertical clearance may remove the FO rating and improve the Sufficiency Rating. An evaluation will need to be made for each structure. Having a rating less than 50 may not necessarily mean it is not a good candidate for a rehabilitation project.
SUMMARY OF PRIORITY GROUPS

Following in Tables 3, 4 and 5 is a summary of the priority groupings for Groups 1, 2 and 3, with Group 1 having the highest priority. The 2-page detailed summary sheets for each structure are presented in Appendices A, B and C with Group 1 structures being located in Appendix A and so on. Included in the list of groupings are the bridge names, bridge number, Region it is located in, min. vert. clearance, and estimated retrofit cost. An example of the first page of the 2-page summary sheet is shown in Figure 8 after the summary of priority groups. An example of the second page of the 2-page summary can be found in the following section on scoping level cost estimating.

PRIORITY GROUP 1 STRUCTURES

<table>
<thead>
<tr>
<th>Bridge Name</th>
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<th>Region</th>
<th>Min. Vert Clear At Curb</th>
<th>Scoping Level Construction Costs</th>
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<td>Northwest</td>
<td>14' 03</td>
<td>$ 577,000.00</td>
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<td>SNOHOMISH RIVER BRIDGE</td>
<td>529/10E</td>
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<td>COWLITZ RIVER BRIDGE</td>
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<td>S FK SKYKOMISH RIVER BRIDGE</td>
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<td>Northwest</td>
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<td>GREEN RIVER (NEELEY BRIDGE)</td>
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Table 3 – Priority 1 Group of Structures
## Table 4 – Priority 2 Group of Structures

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### PRIORITY GROUP 3 STRUCTURES

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<th>Min. Vert Clear At Curb</th>
<th>Scoping Level Construction Costs</th>
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</thead>
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</table>

**Table 5 – Priority 3 Group of Structures**
Following is an example of page one of the 2-page summary sheets for each bridge located in the Appendices.

Figure 8 – Example Page 1 of the 2-page summary sheet – White River Bridge No. 410/101
BRIDGE RETROFIT METHODS AND DETAILS

The primary retrofit scheme for increasing vertical clearances on deficient structures is to remove, raise, and replace all the portal and sway frames so the minimum clearance is 16'-6" or greater. As discussed previously, most of the portal and sway frames on these through-type truss structures have parabolic shapes where the greatest clearance is at the centerline of the structure and the least is at the curb line.

The typical retrofit is to remove the entire parabolic portal or sway member, modify the secondary members attached to the portal or sway, and install a new beam with a straight horizontal profile. An example of this type of retrofit is shown in Figure 9. It must be noted that these types of retrofits may require approval from the Historic Bridge interests due to the age and nature of many of these through-truss bridges.

In most cases, the end posts of the truss (see Figure 2 for location) must be strengthened due to raising of the portal frame. The horizontal portal member acts as a brace point for the end post, which is a member under high compression loads. The capacity of the member is reduced due to an increase in the unbraced length. When the portal is raised, the distance from the bottom chord connection point to the portal horizontal connection to the end post is increased, thus increasing the unbraced length. In most instances, the end posts are strengthened by adding side plates to the member. These are typically bolted on, but have also been field welded in the past. Strengthening of the members the sway braces are attached to are typically not required due to very low demands or the members are in tension. Changing the unbraced length doesn’t affect the capacity of a tension member.
Alternatively and because the portal or sway members often have sufficient clearance for a portion of the length, the members can be cut at the 16'-6" height and a short member be added to each side in a straight horizontal profile. Refer to Figure 10. For a structure with several lanes (greater than 2), this method may prove to be more economical and easier to construct in the field. However, in previous retrofit projects, Contractor’s when given this option have chosen to just install a new member full width of the bridge. For estimating purposes, it is assumed a new full width member is installed. The cost for each method is assumed to be nearly the same. Although less steel is fabricated and installed for this alternative scheme, the complexity of making connections to the remaining members adds cost and time.
WSDOT has successfully constructed several of these types of portal and sway retrofit projects in the past. The design is typically straightforward but complexity is added in the sequencing and construction staging. The Contractor is typically required to field measure existing members and connections prior to ordering steel for fabrication. Because of local deformations due to previous impacts, it is often necessary to modify lengths of members from the original contract plans or asbuilts to fit the current condition. In addition, it is also common to require heat straightening of existing members to remain, to bring them into or close to the original alignment for attaching to newly installed members. Heat straightening is a difficult, almost art form construction technique for which there are limited Contractors with the necessary experience.

Figure 10 – Alternate Portal or Sway Retrofit
Localized painting is required when new members are installed and when existing ones to remain are modified. Containment of cleaning and blasting operations for painting can add to the complexity and duration of the project. WSDOT has recently adopted the highest level containment requirements and zero emissions from the containment for our painting projects. This can be challenging for these types of retrofit projects and can add cost. The complexity of these construction elements were captured by a weighting factor in the construction estimate, which will be discussed in the next section.

In some cases WSDOT Bridge Maintenance crews have performed portal and sway replacements and/or repairs. This could be an option for some bridge structures that are straightforward and have less traffic control constraints.

**SCOPING LEVEL CONSTRUCTION COST ESTIMATES**

For scoping level estimating purposes, the costs were computed using the following method. These estimates are meant to be used at a scoping level and have a likely range of +/-30% and will require further refinement during a plans, specification, and estimate process. However, for procuring funding, these give reasonable estimates for order of magnitude funds required so programming decisions can be made.

**DIRECT BRIDGE CONSTRUCTION COSTS**

For each bridge structure, the number of portal frames, sway frames, and end posts were identified and tabulated. The total width of the bridge, which will be the span width of the portal and sway horizontal members, was also obtained from asbuilt plans and records. Based on past experience with similar retrofit projects, reasonable replacement member sizes were determined and assumed for each portal and each sway frame to be removed and replaced. As discussed in the *Bridge Retrofit Methods and Details* section, it was assumed for estimating that a new portal and/or sway member equal to the full width of the bridge would be installed. The alternate retrofit method whereby only a portion of the portal or sway is removed will require less steel, but will also require more connections, field fitting and construction time. Therefore it was assumed for this study the cost differences between the two retrofit methods would be minor and all estimating was based on full removal and replacement of all portal and sway horizontal members.

For each end post that will have a portal raised, a typical plate size was assumed to be added to two sides of the end post. The length was assumed to be the original vertical clearance plus an additional 5 feet.

Using the assumptions as described above, total pounds of steel was estimated for the retrofit of each bridge. Again, based on previous experience for these types of projects, a cost per pound of steel of $12.50 was assumed for direct costs for the rehabilitation. The cost per pound includes the procurement of the steel, field measuring, removal and installation of existing members, and final painting.

This estimated amount is assumed to be the direct cost for structural rehabilitation of the portals, sways and end posts. However, this does not capture the total potential cost of the project. Additional add-on costs will be
required and were addressed in this scoping level by using cost adjustment multipliers, which will be described in the next section.

**COST ADJUSTMENT MULTIPLIERS**

The first cost adjustment multiplier for the estimate was a factor assumed for additional miscellaneous steel connection members, gusset plates, and fasteners. When attaching the new portal or sway to the existing truss and when attaching the existing secondary members back to the new portal and sway horizontal members, gusset plates and miscellaneous connection members such as angles will be required. These additional members and plates were accounted for by multiplying the direct cost obtained as described in the previous section by a percentage increase. In most cases this increase was on the order of 10%.

The second cost adjustment multiplier was used to account for repair of other members on the truss and for any heat straightening of existing members. The value of this adjustment factor was dependent on review of the inspection reports and bridge repair lists. In most cases this was a nominal 5% percentage increase, but in some cases, several additional members were identified as needing repair and the percentage was increased accordingly. This adjustment multiplier was applied to the sum of the direct costs and the additional adjusted amount for the miscellaneous members and connections.

The third cost adjustment factor was intended to be a catch-all for the complexity of the rehabilitation project. It accounts for difficulty in construction access and/or location of the bridge, length of a detour route, number of lanes available for staged construction, overall impacts to the traveling public, ADT and ADTT. These percentage multipliers varied and were qualitatively determined by the author. This multiplier was applied to the sum of the direct costs, and the first and second cost adjustment multipliers.

The fourth and final cost adjustment factor was for what is typically called “Region add-ons.” These are secondary costs to the structural work, such as traffic control and civil design elements necessary for the project and any other items normally accounted for by the Region design team. Historically this value has generally been equal to 100 percent of the bridge only costs. Therefore, for all bridge estimates, the sum of the total costs previously described were doubled to account for these additional project costs.

The total scoping level construction estimate was the sum of all these estimates. An example work sheet, which is page 2 of the 2-page summary sheet developed for each bridge, is shown in Figure 11.

A few of the bridge structures with low vertical clearance are moveable bridges consisting of either a swing span or a lift span. These structures have additional elements that would need to be raised if the portal and sway frames were raised. Specifically, lift beams for the lift spans and control houses for both lift spans and swing spans would need to be raised. It would not be prudent to raise just the portals and sways and leave these other elements at a lower elevation, making them more vulnerable to an over height load. Currently there are several sway or portal frames either side of the lift beams and control houses that would likely be hit and cause the vehicle to stop prior to reaching these more critical elements.

This work was estimated as a lump sum and added to the total bridge only costs.
### TRUSS PORTAL AND SWAY RETROFIT ESTIMATE

**Truss Name:** WHITE RIVER BRIDGE  
**Truss Bridge Number:** 410/101

#### Assumptions:
- Existing portal beams will be removed and replaced with built-up box section
- Existing end posts will be strengthened with added plates
- Existing sway beams will be removed and replaced with rolled I-beam section
- Existing diagonal bracing will remain and will be cut to fit
- Existing gusset plates will be replaced at connections.

Cost is based on the total pounds of steel at = 12.50 $/LB

#### Cost Adjustment Factors:
- 10% = Factor to account for gussets & misc. steel
- 5% = Factor if significant heat straightening or repair of other members is anticipated
- 30% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
- 100% = Factor to account for REGION Add-Ons

#### Input:
- \( P = \text{Number of Portal Frames} \)
- \( S = \text{Number of Sway Frames} \)
- \( W = \text{Bridge Width} \)
- \( VC = \text{Minimum Vertical Clearance} \)
- \( EP = \text{Number of End Posts (assume 2 per portal)} \)
- \( EPH = \text{End Post Height (assume VC + 5')} \)

#### Quantity Calculations:
- Portal beams total pounds of steel = 4,594 LBS
- Sway beams total pounds of steel = 7,052 LBS
- End post total pounds of steel = 3,144 LBS
- Subtotal total pounds of steel = 15,770 LBS
- Total pounds including gusset & misc. steel factor = 16,907 LBS

#### Cost Calculations:
- Cost Estimate for portal and sway retrofit = $211,336
- Cost Estimate for heat straightening and/or additional member retrofit = $10,567
- Sub total = $221,903
- Cost Estimate due to construction difficulty factor = $66,571
- **TOTAL Bridge Cost** = **$288,500**
- **Cost Estimate for Region Add-On Items** = $280,500

**TOTAL PROJECT COST ESTIMATE** = $577,000

---

Figure 11 – Example Scoping Level Construction Cost Estimate – White River Bridge No 410/101
RECOMMENDATIONS AND CONCLUSIONS

Based on the findings of this risk assessment evaluation and study of all through-type truss structures with vertical clearances below the minimum 16’-6”, the following recommendations are suggested.

1. The study has confirmed there are numerous through-truss type bridges in the WSDOT inventory with substandard vertical clearance that are at risk of being hit by over height loads. These impacts could cause minor damage or could lead to catastrophic failures similar to the Skagit River Bridge. These structures have been prioritized into 3 groups based on level of risk.

2. Over 90 percent of the existing through truss type bridges with vertical clearances less than 16’-6” in the WSDOT inventory have experienced previous high load hits to existing portal or sway members.

3. The majority of existing portal and sway horizontal members are constructed with a parabolic curve geometry, whereby the vertical clearance over the roadway is greater at the centerline of the bridge than at the curb lines. This adds additional risk to the trucking industry in that the clearances at the bridges are dependent on the traffic lane traveled. This was the case for the Skagit River Bridge. Had the truck passed in the middle lanes of the bridge, there would have been no impact. Raising the portal and sways with a horizontal member will greatly reduce the variability in clearance for a bridge and simplify the reporting process.

4. It is recommended that a program be developed to retrofit existing through-trusses to begin raising the portal and sway members on the most critical and vulnerable structures. This program could be similar to the seismic retrofit program where funding is provided over a period of time and structures are retrofitted based on their ranking in the program. The structures were grouped into 3 groups based on level of risk. The priority of the structures within each group will be determined at the time funding is available.

5. In addition to developing a portal and sway raising program, funding needs to be requested through the budgeting process to begin to finance the program.

6. As structures identified as needing portal and sway retrofit become candidates for retrofit or painting projects, consideration should be given to increasing the scope to add the portal and sway raising work.

7. Some bridges requiring portal and sway retrofit may be good candidates for State Forces to perform the work, depending on location of bridge and complexity and cost of the work.

8. The 2-page summary sheet for each bridge is intended to provide all the information necessary to make budgeting and programming decisions for retrofit of the structures. These 2-page summary sheets can be distributed to Regions during scoping level planning efforts.
REFERENCES


3. Low Vertical Clearance Sign Policy, Washington State Department of Transportation


APPENDIX A
## APPENDIX A – PRIORITY GROUP 1 TRUSS BRIDGE RETROFIT RECOMMENDATIONS

<table>
<thead>
<tr>
<th>Bridge Name</th>
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<th>Min. Vert Clear At Curb</th>
<th>Scoping Level Construction Costs</th>
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<tr>
<td>COWLITZ RIVER CORA BRIDGE</td>
<td>12/265</td>
<td>Southwest</td>
<td>14’10</td>
<td>$624,400.00</td>
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<td>Southwest</td>
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<td>Eastern</td>
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<td>GRAYS RIVER BRIDGE</td>
<td>4/110</td>
<td>Southwest</td>
<td>14’11</td>
<td>$520,200.00</td>
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<tr>
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<td>202/60</td>
<td>Northwest</td>
<td>15’11</td>
<td>$608,000.00</td>
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</tbody>
</table>
Truss Vertical Clearance Report

BRIDGE NAME: WHITE RIVER BRIDGE
BRIDGE NUMBER: 410/101
STRUCTURE ID: 0003523A
REGION: Northwest
YEAR BUILT/WIDENED: 1949
SUFFICIENCY RATING: 44.89
TRUSS BRIDGE LENGTH: 200 FT
AVE DAILY TRAFFIC: 19,698
AVE DAILY TRUCK TRAFFIC: 788
NUMBER OF LANES: 2

VERTICAL CLEARANCE INFORMATION
BRIDGE WIDTH (curb to curb): 32 FT
PORTAL/SWAY SPAN WIDTH: 36 FT
MINIMUM VERTICAL CLEARANCE AT CURB: 14' 03
MINIMUM VERTICAL CLEARANCE AT FOG LINE: 15' 03
MINIMUM SHOULDER WIDTH: 03' 04
NUMBER OF PORTAL FRAMES: 2
NUMBER OF SWAY FRAMES: 4
PREVIOUS HIGH LOAD HIT? YES
ADDITIONAL MEMBERS REQUIRING RETROFIT? NO

RECOMMENDATIONS AND COST ESTIMATES
RECOMMENDATION:
1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearance.
2. Heat straighten and/or repair other damaged truss members.
3. One sway frame raised in 2015 under a repair contract

COST ESTIMATES: (See page 2 for breakdown)

<table>
<thead>
<tr>
<th>COST ITEM</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>COST ESTIMATE FOR PORTAL AND SWAY RETROFIT</td>
<td>$211,336</td>
</tr>
<tr>
<td>COST ESTIMATE FOR ADDITIONAL MEMBER RETROFIT</td>
<td>$10,567</td>
</tr>
<tr>
<td>SUB TOTAL</td>
<td>$221,903</td>
</tr>
<tr>
<td>COST ESTIMATE FOR DIFFICULTY OF CONSTRUCTION FACTOR</td>
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</tr>
<tr>
<td>TOTAL BRIDGE COST</td>
<td>$288,500</td>
</tr>
<tr>
<td>COST ESTIMATE FOR REGION ADD-ON ITEMS</td>
<td>$288,500</td>
</tr>
<tr>
<td>TOTAL PROJECT COST ESTIMATE</td>
<td>$577,000</td>
</tr>
</tbody>
</table>
TRUSS PORTAL AND SWAY RETROFIT ESTIMATE
Truss Name = WHITE RIVER BRIDGE
Truss Bridge Number = 410/101

Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = 12.50 $/LB

Cost Adjustment Factors:
10% = Factor to account for gussets & misc. steel
5% = Factor if significant heat straightening or repair of other members is anticipated
30% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
100% = Factor to account for REGION Add-Ons

Input:
- P = Number of Portal Frames
- S = Number of Sway Frames
- W = Bridge Width
- VC = Minimum Vertical Clearance
- EP = Number of End Posts (assume 2 per portal)
- EPH = End Post Height (assume VC + 5')

P = 2 Each
S = 4 Each
W = 36.00 Ft
VC = 14.25 Ft
EP = 4 Each
EPH = 19.25 Ft

Quantity Calculations:
- Portal beams total pounds of steel = 4,594 LBS
- Sway beams total pounds of steel = 7,632 LBS
- End post total pounds of steel = 3,144 LBS
- Subtotal pounds of steel = 15,370 LBS
- Total pounds including gusset & misc. steel factor = 16,907 LBS

Cost Calculations:
- Cost Estimate for portal and sway retrofit = $211,336
- Cost Estimate for heat straightening and/or additional member retrofit = $10,567
- Sub total = $221,903
- Cost Estimate due to construction difficulty factor = $66,571
- TOTAL Bridge Cost = $288,500
- Cost Estimate for Region Add-on items = $288,500

TOTAL PROJECT COST ESTIMATE = $577,000
Truss Vertical Clearance Report

BRIDGE NAME: SNOHOMISH RIVER BRIDGE
BRIDGE NUMBER: 529/10E
STRUCTURE ID: 0000965A
REGION: Northwest
YEAR BUILT/WIDENED: 1927
SUFFICIENCY RATING: 33.83
TRUSS BRIDGE LENGTH: 0 FT
AVE DAILY TRAFFIC: 15,527
AVE DAILY TRUCK TRAFFIC: 1397
NUMBER OF LANES: 2
BRIDGE WIDTH (curb to curb) 24 FT
PORTAL/SWAY SPAN WIDTH 26 FT
MINIMUM VERTICAL CLEARANCE AT CURB: 14' 03
MINIMUM VERTICAL CLEARANCE AT FOG LINE: 14' 04
MINIMUM SHOULDER WIDTH: 01' 00
NUMBER OF PORTAL FRAMES: 16
NUMBER OF SWAY FRAMES: 58
PREVIOUS HIGH LOAD HIT? YES
ADDITIONAL MEMBERS REQUIRING RETROFIT? YES

RECOMMENDATIONS AND COST ESTIMATES

1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearance.
2. Heat straighten and/or repair other damaged truss members.
3. Raise control house and lifting girders on lift spans

COST ESTIMATES:

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>COST ESTIMATE FOR PORTAL AND SWAY RETROFIT</td>
<td>$1,809,761</td>
</tr>
<tr>
<td>COST ESTIMATE FOR ADDITIONAL MEMBER RETROFIT</td>
<td>$90,488</td>
</tr>
<tr>
<td>SUB TOTAL</td>
<td>$1,900,249</td>
</tr>
<tr>
<td>COST ESTIMATE FOR DIFFICULTY OF CONSTRUCTION FACTOR</td>
<td>$380,050</td>
</tr>
<tr>
<td>TOTAL BRIDGE COST</td>
<td>$3,080,300</td>
</tr>
<tr>
<td>COST ESTIMATE FOR REGION ADD-ON ITEMS</td>
<td>$3,080,300</td>
</tr>
<tr>
<td>TOTAL PROJECT COST ESTIMATE</td>
<td>$6,160,600</td>
</tr>
</tbody>
</table>
Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = 12.50 $/LB

Cost Adjustment Factors:
- 10% = Factor to account for gussets & misc. steel
- 5% = Factor if significant heat straightening or repair of other members is anticipated
- 20% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
- 100% = Factor to account for REGION Add-Ons

Input:
- P = Number of Portal Frames
- S = Number of Sway Frames
- W = Bridge Width
- VC = Minimum Vertical Clearance
- EP = Number of End Posts (assume 2 per portal)
- EPH = End Post Height (assume VC + 5')

P = 16 Each
S = 58 Each
W = 26.00 Ft
VC = 14.25 Ft
EP = 32 Each
EPH = 19.25 Ft

Quantity Calculations:
- Portal beams total pounds of steel = 26,542 LBS
- Sway beams total pounds of steel = 79,924 LBS
- End post total pounds of steel = 25,153 LBS
- Subtotal pounds of steel = 131,619 LBS
- Total pounds including gusset & misc. steel factor = 144,781 LBS

Cost Calculations:
- Cost Estimate for portal and sway retrofit = $1,809,761
- Cost Estimate for heat straightening and/or additional member retrofit = $90,488
- Sub total = $1,900,249
- Cost Estimate due to construction difficulty factor = $380,050
- TOTAL Bridge Cost = $3,080,300
- Cost Estimate for Region Add-on items = $3,080,300

TOTAL PROJECT COST ESTIMATE = $6,160,600

Additional Costs:
- Raise control house = $500,000
- Raise lifting girders (2) = $300,000
**Truss Vertical Clearance Report**

**BRIDGE NAME:** METHOW RIVER BRIDGE

**BRIDGE NUMBER:** 153/4

**STRUCTURE ID:** 0003704A

**REGION:** North Central

**YEAR BUILT/WIDENED:** 1950

**SUFFICIENCY RATING:** 49.99

**TRUSS BRIDGE LENGTH:** 222 FT

**AVE DAILY TRAFFIC:** 1,678

**AVE DAILY TRUCK TRAFFIC:** 268

**NUMBER OF LANES:** 2

**NUMBER OF PORTAL FRAMES:** 2

**NUMBER OF SWAY FRAMES:** 5

**PREVIOUS HIGH LOAD HIT?** YES

**ADDITIONAL MEMBERS REQUIRING RETROFIT?** YES

**Bridge Width**

**Minimum Vertical Clearance (Typ)**

**Bridge Portal or Sway (Typ)**

**VERTICAL CLEARANCE INFORMATION**

- **BRIDGE WIDTH (curb to curb):** 24 FT
- **PORTAL/SWAY SPAN WIDTH:** 27 FT
- **MINIMUM VERTICAL CLEARANCE AT CURB:** 14' 06
- **MINIMUM VERTICAL CLEARANCE AT FOG LINE:** 15' 01
- **MINIMUM SHOULDER WIDTH:** 01' 05
- **NUMBER OF PORTAL FRAMES:** 2
- **NUMBER OF SWAY FRAMES:** 5
- **PREVIOUS HIGH LOAD HIT?** YES
- **ADDITIONAL MEMBERS REQUIRING RETROFIT?** YES

**LOCATION**

- **SR 153**
- **MILEPOST:** 4.22
- **LATITUDE:** 48.07657988
- **LONGITUDE:** -119.969688

**DETOUR & ROUTE MAX VERTICAL CLEARANCE**

- **FULL BRIDGE CLOSURE ESTIMATED DETOUR:** 23 Miles
- **MAXIMUM VERTICAL CLEARANCE IN ROUTE:** 15' 10
- **MINIMUM VERTICAL CLEARANCE IN ROUTE:** 14' 06

**RECOMMENDATIONS AND COST ESTIMATES**

**RECOMMENDATION:**

1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearance.
2. Heat straighten and/or repair other damaged truss members.

**COST ESTIMATES:** (See page 2 for breakdown)

<table>
<thead>
<tr>
<th>Description</th>
<th>Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>COST ESTIMATE FOR PORTAL AND SWAY RETROFIT</td>
<td>$189,548</td>
</tr>
<tr>
<td>COST ESTIMATE FOR ADDITIONAL MEMBER RETROFIT</td>
<td>$28,432</td>
</tr>
<tr>
<td>SUB TOTAL</td>
<td>$217,980</td>
</tr>
<tr>
<td>COST ESTIMATE FOR DIFFICULTY OF CONSTRUCTION FACTOR</td>
<td>$43,596</td>
</tr>
<tr>
<td>TOTAL BRIDGE COST</td>
<td>$261,600</td>
</tr>
<tr>
<td>COST ESTIMATE FOR REGION ADD-ON ITEMS</td>
<td>$261,600</td>
</tr>
<tr>
<td><strong>TOTAL PROJECT COST ESTIMATE</strong></td>
<td>$523,200</td>
</tr>
</tbody>
</table>
Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = 12.50 $/LB

Cost Adjustment Factors:
- 10% = Factor to account for gussets & misc. steel
- 15% = Factor if significant heat straightening or repair of other members is anticipated
- 20% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
- 100% = Factor to account for REGION Add-Ons

Input:

- P = Number of Portal Frames
  P = 2 Each

- S = Number of Sway Frames
  S = 5 Each

- W = Bridge Width
  W = 27.00 Ft

- VC = Minimum Vertical Clearance
  VC = 14.50 Ft

- EP = Number of End Posts (assume 2 per portal)
  EP = 4 Each

- EPH = End Post Height (assume VC + 5’)
  EPH = 19.50 Ft

Quantity Calculations:
- Portal beams total pounds of steel = 3,445 LBS
- Sway beams total pounds of steel = 7,155 LBS
- End post total pounds of steel = 3,185 LBS
- Subtotal pounds of steel = 13,785 LBS
- Total pounds including gusset & misc. steel factor = 15,164 LBS

Cost Calculations:
- Cost Estimate for portal and sway retrofit = $189,548
- Cost Estimate for heat straightening and/or additional member retrofit = $28,432
- Sub total = $217,980
- Cost Estimate due to construction difficulty factor = $43,596
- TOTAL Bridge Cost = $261,600
- Cost Estimate for Region Add-on items = $261,600

TOTAL PROJECT COST ESTIMATE = $523,200
Truss Vertical Clearance Report

Bridge and Structures Office
11/11/2017

BRIDGE NAME: COWLITZ RIVER BRIDGE
BRIDGE NUMBER: 5/203W
STRUCTURE ID: 0004367B
REGION: Southwest
YEAR BUILT/WIDENED: 1953
SUFFICIENCY RATING: 48.36
TRUSS BRIDGE LENGTH: 480 FT
AVE DAILY TRAFFIC: 22,119
AVE DAILY TRUCK TRAFFIC: 4424
NUMBER OF LANES: 2

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<tr>
<th>LOCATION</th>
<th>SR 5</th>
<th>MILEPOST: 59.06</th>
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<tr>
<td>LATITUDE: 46.41286666</td>
<td>LONGITUDE: -122.890002</td>
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</tbody>
</table>

Vertically clearance information

Bridge Width: 32 FT
Portal/Sway Span Width: 36 FT
Minimum vertical clearance at curb: 14' 06"
Minimum vertical clearance at fog line: 15' 07"
Minimum shoulder width: 02' 03"
Number of portal frames: 4
Number of sway frames: 10
Previous high load hit? YES
Additional members requiring retrofit? YES

RECOMMENDATIONS AND COST ESTIMATES

Recommendation:
1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearance.
2. Heat straighten and/or repair other damaged truss members.

Cost Estimates: (See page 2 for breakdown)

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost estimate for portal and sway retrofit</td>
<td>$476,266</td>
</tr>
<tr>
<td>Cost estimate for additional member retrofit</td>
<td>$23,813</td>
</tr>
<tr>
<td>Sub total</td>
<td>$500,079</td>
</tr>
<tr>
<td>Cost estimate for difficulty of construction factor</td>
<td>$150,024</td>
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<tr>
<td>Total bridge cost</td>
<td>$650,200</td>
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<tr>
<td>Cost estimate for region add-on items</td>
<td>$650,200</td>
</tr>
<tr>
<td>Total project cost estimate</td>
<td>$1,300,400</td>
</tr>
</tbody>
</table>
TRUSS PORTAL AND SWAY RETROFIT ESTIMATE

Truss Name = COWLITZ RIVER BRIDGE
Truss Bridge Number = 5/203W

Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = 12.50 $/LB

Cost Adjustment Factors:
- 10% = Factor to account for gussets & misc. steel
- 5% = Factor if significant heat straightening or repair of other members is anticipated
- 30% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
- 100% = Factor to account for REGION Add-Ons

Input:
- P = Number of Portal Frames
- S = Number of Sway Frames
- W = Bridge Width
- VC = Minimum Vertical Clearance
- EP = Number of End Posts (assume 2 per portal)
- EPH = End Post Height (assume VC + 5')

Quantity Calculations:
- Portal beams total pounds of steel = 9,188 LBS
- Sway beams total pounds of steel = 19,080 LBS
- End post total pounds of steel = 6,370 LBS
- Subtotal pounds of steel = 34,638 LBS
- Total pounds including gusset & misc. steel factor = 38,101 LBS

Cost Calculations:
- Cost Estimate for portal and sway retrofit = $476,266
- Cost Estimate for heat straightening and/or additional member retrofit = $23,813
- Sub total = $500,079
- Cost Estimate due to construction difficulty factor = $150,024
- TOTAL Bridge Cost = $650,200
- Cost Estimate for Region Add-on items = $650,200

TOTAL PROJECT COST ESTIMATE = $1,300,400
Truss Vertical Clearance Report

BRIDGE NAME: WENATCHEE RIVER BRIDGE
BRIDGE NUMBER: 207/4
STRUCTURE ID: 0002657A
REGION: North Central
YEAR BUILT/WIDENED: 1940
SUFFICIENCY RATING: 63.47
TRUSS BRIDGE LENGTH: 160 FT
AVE DAILY TRAFFIC: 2,007
AVE DAILY TRUCK TRAFFIC: 361
NUMBER OF LANES: 2
BRIDGE WIDTH (curb to curb) 24 FT
PORTAL/SWAY SPAN WIDTH 27 FT
MINIMUM VERTICAL CLEARANCE AT CURB: 14' 07
MINIMUM VERTICAL CLEARANCE AT FOG LINE: 15' 04
MINIMUM SHOULDER WIDTH: 00' 07
NUMBER OF PORTAL FRAMES: 2
NUMBER OF SWAY FRAMES: 5
PREVIOUS HIGH LOAD HIT? YES
ADDITIONAL MEMBERS REQUIRING RETROFIT? YES

VERTICAL CLEARANCE INFORMATION

RECOMMENDATIONS AND COST ESTIMATES

RECOMMENDATION:
1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearance.
2. Heat straighten and/or repair other damaged truss members.

COST ESTIMATES: (See page 2 for breakdown)

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
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</thead>
<tbody>
<tr>
<td>COST ESTIMATE FOR PORTAL AND SWAY RETROFIT</td>
<td>$189,735</td>
</tr>
<tr>
<td>COST ESTIMATE FOR ADDITIONAL MEMBER RETROFIT</td>
<td>$18,974</td>
</tr>
<tr>
<td>SUB TOTAL</td>
<td>$208,709</td>
</tr>
<tr>
<td>COST ESTIMATE FOR DIFFICULTY OF CONSTRUCTION FACTOR</td>
<td>$20,871</td>
</tr>
<tr>
<td>TOTAL BRIDGE COST</td>
<td>$229,600</td>
</tr>
<tr>
<td>COST ESTIMATE FOR REGION ADD-ON ITEMS</td>
<td>$229,600</td>
</tr>
</tbody>
</table>

TOTAL PROJECT COST ESTIMATE = $459,200
TRUSS PORTAL AND SWAY RETROFIT ESTIMATE

Truss Name = WENATCHEE RIVER BRIDGE
Truss Bridge Number = 207/4

Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = 12.50 $/LB

Cost Adjustment Factors:
- 10% = Factor to account for gussets & misc. steel
- 10% = Factor if significant heat straightening or repair of other members is anticipated
- 10% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
- 100% = Factor to account for REGION Add-Ons

Input:
- \( P = \) Number of Portal Frames
- \( S = \) Number of Sway Frames
- \( W = \) Bridge Width
- \( VC = \) Minimum Vertical Clearance
- \( EP = \) Number of End Posts (assume 2 per portal)
- \( EPH = \) End Post Height (assume \( VC + 5' \))

Assumed plate sections (in)

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<tr>
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</thead>
<tbody>
<tr>
<td>W12x53</td>
<td>53</td>
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</tr>
</tbody>
</table>

Quantity Calculations:
- Portal beams total pounds of steel = 3,445 LBS
- Sway beams total pounds of steel = 7,155 LBS
- End post total pounds of steel = 3,199 LBS
- Subtotal pounds of steel = 13,799 LBS
- Total pounds including gusset & misc. steel factor = 15,179 LBS

Cost Calculations:
- Cost Estimate for portal and sway retrofit = $189,735
- Cost Estimate for heat straightening and/or additional member retrofit = $18,974
- Sub total = $208,709
- Cost Estimate due to construction difficulty factor = $20,871
- TOTAL Bridge Cost = $229,600
- Cost Estimate for Region Add-on items = $229,600

TOTAL PROJECT COST ESTIMATE = $459,200
Truss Vertical Clearance Report

BRIDGE NAME: WALLACE RIVER BRIDGE
BRIDGE NUMBER: 2/30
STRUCTURE ID: 0002649A
REGION: Northwest
YEAR BUILT/WIDENED: 1940
SUFFICIENCY RATING: 47.86
TRUSS BRIDGE LENGTH: 161 FT
AVERAGE DAILY TRAFFIC: 11,705
AVERAGE DAILY TRUCK TRAFFIC: 1522
SUFFICIENCY RATING: 47.86

NUMBER OF LANES: 2
BRIDGE WIDTH (curb to curb): 24 FT
PORTAL/SWAY SPAN WIDTH: 27 FT
MINIMUM VERTICAL CLEARANCE AT CURB: 14' 07
MINIMUM VERTICAL CLEARANCE AT FOG LINE: 15' 06
MINIMUM SHOULDER WIDTH: 00' 06
NUMBER OF PORTAL FRAMES: 2
NUMBER OF SWAY FRAMES: 5
PREVIOUS HIGH LOAD HIT? YES
ADDITIONAL MEMBERS REQUIRING RETROFIT? YES

RECOMMENDATIONS AND COST ESTIMATES

RECOMMENDATION:
1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearance.
2. Heat straighten and/or repair other damaged truss members.

COST ESTIMATES: (See page 2 for breakdown)

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>COST ESTIMATE FOR PORTAL AND SWAY RETROFIT</td>
<td>$189,735</td>
</tr>
<tr>
<td>COST ESTIMATE FOR ADDITIONAL MEMBER RETROFIT</td>
<td>$9,487</td>
</tr>
<tr>
<td>SUB TOTAL</td>
<td>$199,222</td>
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<tr>
<td>COST ESTIMATE FOR DIFFICULTY OF CONSTRUCTION FACTOR</td>
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</tr>
<tr>
<td>TOTAL BRIDGE COST</td>
<td>$259,000</td>
</tr>
<tr>
<td>COST ESTIMATE FOR REGION ADD-ON ITEMS</td>
<td>$259,000</td>
</tr>
<tr>
<td>TOTAL PROJECT COST ESTIMATE</td>
<td>$518,000</td>
</tr>
</tbody>
</table>
TRUSS PORTAL AND SWAY RETROFIT ESTIMATE

Truss Name = WALLACE RIVER BRIDGE
Truss Bridge Number = 2/30

Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = 12.50 $/LB

Cost Adjustment Factors:
- 10% = Factor to account for gussets & misc. steel
- 5% = Factor if significant heat straightening or repair of other members is anticipated
- 30% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
- 100% = Factor to account for REGION Add-Ons

Input:
- P = Number of Portal Frames = 2 Each
- S = Number of Sway Frames = 5 Each
- W = Bridge Width = 27.00 Ft
- VC = Minimum Vertical Clearance = 14.58 Ft
- EP = Number of End Posts (assume 2 per portal) = 4 Each
- EPH = End Post Height (assume VC + 5') = 19.58 Ft

Quantity Calculations:
- Portal beams total pounds of steel = 3,445 LBS
- Sway beams total pounds of steel = 7,155 LBS
- End post total pounds of steel = 3,199 LBS
- Subtotal pounds of steel = 13,799 LBS
- Total pounds including gusset & misc. steel factor = 15,179 LBS

Cost Calculations:
- Cost Estimate for portal and sway retrofit = $189,735
- Cost Estimate for heat straightening and/or additional member retrofit = $9,487
- Sub total = $199,222
- Cost Estimate due to construction difficulty factor = $59,767
- TOTAL Bridge Cost = $259,000
- Cost Estimate for Region Add-on items = $259,000

TOTAL PROJECT COST ESTIMATE = $518,000
Truss Vertical Clearance Report

BRIDGE NAME: SULTAN RIVER BRIDGE
BRIDGE NUMBER: 2/26
STRUCTURE ID: 0002580A
REGION: Northwest
YEAR BUILT/WIDENED: 1940
SUFFICIENCY RATING: 46.98
TRUSS BRIDGE LENGTH: 240 FT
AVE DAILY TRAFFIC: 19,359
AVE DAILY TRUCK TRAFFIC: 2129
NUMBER OF LANES: 2
BRIDGE WIDTH (curb to curb) 24 FT
PORTAL/SWAY SPAN WIDTH 27 FT
MINIMUM VERTICAL CLEARANCE AT CURB: 14' 07
MINIMUM VERTICAL CLEARANCE AT FOG LINE: 15' 02
MINIMUM SHOULDER WIDTH: 01' 00
NUMBER OF PORTAL FRAMES: 2
NUMBER OF SWAY FRAMES: 5
PREVIOUS HIGH LOAD HIT? YES
ADDITIONAL MEMBERS REQUIRING RETROFIT? YES

RECOMMENDATIONS AND COST ESTIMATES

RECOMMENDATION:
1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearance.
2. Heat straighten and/or repair other damaged truss members.

COST ESTIMATES: (See page 2 for breakdown)

<table>
<thead>
<tr>
<th></th>
<th>Cost Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>PORTAL AND SWAY RETROFIT</td>
<td>$189,735</td>
</tr>
<tr>
<td>ADDITIONAL MEMBER Retrofit</td>
<td>$9,487</td>
</tr>
<tr>
<td>SUB TOTAL</td>
<td>$199,222</td>
</tr>
<tr>
<td>DIFFICULTY OF CONSTRUCTION FACTOR</td>
<td>$29,883</td>
</tr>
<tr>
<td>TOTAL BRIDGE COST</td>
<td>$229,200</td>
</tr>
<tr>
<td>REGION ADD-ON ITEMS</td>
<td>$229,200</td>
</tr>
<tr>
<td>TOTAL PROJECT COST Estimate</td>
<td>$458,400</td>
</tr>
</tbody>
</table>

LOCATION
SR 2  MILEPOST: 22.04
LATITUDE: 47.8606  LONGITUDE: -121.821308
FULL BRIDGE CLOSURE ESTIMATED DETOUR: 12 Miles
MAXIMUM VERTICAL CLEARANCE IN ROUTE: 15' 07
MINIMUM VERTICAL CLEARANCE IN ROUTE: 14' 07

PORTAL_Sway Retrofit Reports G1.xlsx (2_26)
TRUSS PORTAL AND SWAY RETROFIT ESTIMATE

Truss Name = SULTAN RIVER BRIDGE
Truss Bridge Number = 2/26

Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = 12.50 $/LB

Cost Adjustment Factors:
- 10% = Factor to account for gussets & misc. steel
- 5% = Factor if significant heat straightening or repair of other members is anticipated
- 15% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
- 100% = Factor to account for REGION Add-Ons

Input:
- \( P = \text{Number of Portal Frames} = 2 \text{ Each} \)
- \( S = \text{Number of Sway Frames} = 5 \text{ Each} \)
- \( W = \text{Bridge Width} = 27.00 \text{ Ft} \)
- \( VC = \text{Minimum Vertical Clearance} = 14.58 \text{ Ft} \)
- \( EP = \text{Number of End Posts (assume 2 per portal)} = 4 \text{ Each} \)
- \( EPH = \text{End Post Height (assume VC + 5')} = 19.58 \text{ Ft} \)

Quantity Calculations:
- Portal beams total pounds of steel = 3,445 LBS
- Sway beams total pounds of steel = 7,155 LBS
- End post total pounds of steel = 3,199 LBS
- Subtotal pounds of steel = 13,799 LBS
- Total pounds including gusset & misc. steel factor = 15,179 LBS

Cost Calculations:
- Cost Estimate for portal and sway retrofit = $189,735
- Cost Estimate for heat straightening and/or additional member retrofit = $9,487
- Sub total = $199,222
- Cost Estimate due to construction difficulty factor = $29,883
- TOTAL Bridge Cost = $229,200
- Cost Estimate for Region Add-on items = $229,200

TOTAL PROJECT COST ESTIMATE = $458,400
**Truss Vertical Clearance Report**

**BRIDGE NAME:** S FK SKYKOMISH RIVER BRIDGE

**BRIDGE NUMBER:** 2/116

**STRUCTURE ID:** 0002332A

**REGION:** Northwest

**YEAR BUILT/WIDENED:** 1938

**SUFFICIENCY RATING:** 67.96

**TRUSS BRIDGE LENGTH:** 241 FT

**AVE DAILY TRAFFIC:** 5,272

**AVE DAILY TRUCK TRAFFIC:** 633

**NUMBER OF LANES:** 2

**BRIDGE WIDTH (curb to curb):** 24 FT

**PORTAL/SWAY SPAN WIDTH:** 27 FT

**MINIMUM VERTICAL CLEARANCE AT CURB:** 14' 10

**MINIMUM VERTICAL CLEARANCE AT FOG LINE:** 14' 10

**MINIMUM SHOULDER WIDTH:** 00' 00

**NUMBER OF PORTAL FRAMES:** 2

**NUMBER OF SWAY FRAMES:** 5

**PREVIOUS HIGH LOAD HIT?** YES

**ADDITIONAL MEMBERS REQUIRING RETROFIT?** YES

**PRIORITY RATING**

1

**LOCATION**

**SR 2**

**MILEPOST:** 49.65

**LATITUDE:** 47.71416666

**LONGITUDE:** -121.342

**DETOUR & ROUTE MAX VERTICAL CLEARANCE**

FULL BRIDGE CLOSURE ESTIMATED DETOUR: 3 Miles

**MAXIMUM VERTICAL CLEARANCE IN ROUTE:** 15' 07

**MINIMUM VERTICAL CLEARANCE IN ROUTE:** 14' 10

**RECOMMENDATIONS AND COST ESTIMATES**

**RECOMMENDATION:**

1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearance.
2. Heat straighten and/or repair other damaged truss members.

**COST ESTIMATES:** (See page 2 for breakdown)

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>COST ESTIMATE FOR PORTAL AND SWAY RETROFIT</td>
<td>$190,297</td>
</tr>
<tr>
<td>COST ESTIMATE FOR ADDITIONAL MEMBER RETROFIT</td>
<td>$9,515</td>
</tr>
<tr>
<td>SUB TOTAL</td>
<td>$199,811</td>
</tr>
<tr>
<td>COST ESTIMATE FOR DIFFICULTY OF CONSTRUCTION FACTOR</td>
<td>$19,981</td>
</tr>
<tr>
<td>TOTAL BRIDGE COST</td>
<td>$219,800</td>
</tr>
<tr>
<td>COST ESTIMATE FOR REGION ADD-ON ITEMS</td>
<td>$219,800</td>
</tr>
<tr>
<td>TOTAL PROJECT COST ESTIMATE</td>
<td>$439,600</td>
</tr>
</tbody>
</table>
TRUSS PORTAL AND SWAY RETROFIT ESTIMATE

Truss Name = S FK SKYKOMISH RIVER BRIDGE
Truss Bridge Number = 2/116

Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = 12.50 $/LB

Cost Adjustment Factors:
- 10% = Factor to account for gussets & misc. steel
- 5% = Factor if significant heat straightening or repair of other members is anticipated
- 10% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
- 100% = Factor to account for REGION Add-Ons

Input:
- P = Number of Portal Frames
- S = Number of Sway Frames
- W = Bridge Width
- VC = Minimum Vertical Clearance
- EP = Number of End Posts (assume 2 per portal)
- EPH = End Post Height (assume VC + 5')

Cost Calculations:
- Cost Estimate for portal and sway retrofit = $190,297
- Cost Estimate for heat straightening and/or additional member retrofit = $9,515
- Sub total = $199,811
- Cost Estimate due to construction difficulty factor = $19,815
- TOTAL Bridge Cost = $219,800
- Cost Estimate for Region Add-on items = $219,800

TOTAL PROJECT COST ESTIMATE = $439,600
**Truss Vertical Clearance Report**

**BRIDGE NAME:** GREEN RIVER (NEELEY BRIDGE)

**BRIDGE NUMBER:** 18/17S

**STRUCTURE ID:** 0006066B

**REGION:** Northwest

**YEAR BUILT/WIDENED:** 1959

**SUFFICIENCY RATING:** 49.22

**TRUSS BRIDGE LENGTH:** 200 FT

**AVE DAILY TRAFFIC:** 24,638

**AVE DAILY TRUCK TRAFFIC:** 2710

**NUMBER OF LANES:** 2

**BRIDGE WIDTH (curb to curb):** 30 FT

**PORTAL/SWAY SPAN WIDTH:** 34 FT

**MINIMUM VERTICAL CLEARANCE AT CURB:** 14’ 09

**MINIMUM VERTICAL CLEARANCE AT FOG LINE:** 15’ 05

**MINIMUM SHOULDER WIDTH:** 02’ 00

**NUMBER OF PORTAL FRAMES:** 2

**NUMBER OF SWAY FRAMES:** 0

**PREVIOUS HIGH LOAD HIT?** YES

**ADDITIONAL MEMBERS REQUIRING RETROFIT?** YES

---

**RECOMMENDATIONS AND COST ESTIMATES**

**RECOMMENDATION:**
1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearance.
2. Heat straighten and/or repair other damaged truss members.

**COST ESTIMATES:** (See page 2 for breakdown)

- **COST ESTIMATE FOR PORTAL AND SWAY RETROFIT =** $104,010
- **COST ESTIMATE FOR ADDITIONAL MEMBER RETROFIT =** $5,201
- **SUB TOTAL =** $109,211
- **COST ESTIMATE FOR DIFFICULTY OF CONSTRUCTION FACTOR =** $21,842
- **TOTAL BRIDGE COST =** $131,100
- **COST ESTIMATE FOR REGION ADD-ON ITEMS =** $131,100

**TOTAL PROJECT COST ESTIMATE =** $262,200

---

**LOCATION**

**SR 18**

**MILEPOST:** 6.62

**LATITUDE:** 47.30245

**LONGITUDE:** -122.177385

**DETOUR & ROUTE MAX VERTICAL CLEARANCE**

- **FULL BRIDGE CLOSURE ESTIMATED DETOUR:** 10 Miles
- **MAXIMUM VERTICAL CLEARANCE IN ROUTE:** 14’ 09
- **MINIMUM VERTICAL CLEARANCE IN ROUTE:** 14’ 09

---

*Reported to FHWA on 11/11/2017*
## TRUSS PORTAL AND SWAY RETROFIT ESTIMATE

**Truss Name:** GREEN RIVER (NEELEY BRIDGE)  
**Truss Bridge Number:** 18/17S

### Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = 12.50 $/LB

### Cost Adjustment Factors:
- 10% = Factor to account for gussets & misc. steel
- 5% = Factor if significant heat straightening or repair of other members is anticipated
- 20% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
- 100% = Factor to account for REGION Add-Ons

### Input:
- \( P = \) Number of Portal Frames \( = 2 \) Each
- \( S = \) Number of Sway Frames \( = 0 \) Each
- \( W = \) Bridge Width \( = 34.00 \) Ft
- \( VC = \) Minimum Vertical Clearance \( = 14.75 \) Ft
- \( EP = \) Number of End Posts (assume 2 per portal) \( = 4 \) Each
- \( EPH = \) End Post Height (assume VC + 5') \( = 19.75 \) Ft

### Quantity Calculations:
- Portal beams total pounds of steel = 4,339 LBS
- Sway beams total pounds of steel = 0 LBS
- End post total pounds of steel = 3,226 LBS
- Subtotal pounds of steel = 7,564 LBS
- Total pounds including gusset & misc. steel factor = 8,321 LBS

### Cost Calculations:
- Cost Estimate for portal and sway retrofit = $104,010
- Cost Estimate for heat straightening and/or additional member retrofit = $5,201
- Sub total = $109,211
- Cost Estimate due to construction difficulty factor = $21,842
- TOTAL Bridge Cost = $131,100
- Cost Estimate for Region Add-on items = $131,100

**TOTAL PROJECT COST ESTIMATE = $262,200**
Truss Vertical Clearance Report

BRIDGE NAME: CALAWAH RIVER BRIDGE
BRIDGE NUMBER: 101/308
STRUCTURE ID: 0002396A
REGION: Olympic
YEAR BUILT/WIDENED: 1938
SUFFICIENCY RATING: 44.88
TRUSS BRIDGE LENGTH: 170 FT
AVE DAILY TRAFFIC: 5,529
AVE DAILY TRUCK TRAFFIC: 829
NUMBER OF LANES: 2
BRIDGE WIDTH (curb to curb) 24 FT
PORTAL/SWAY SPAN WIDTH 27 FT
MINIMUM VERTICAL CLEARANCE AT CURB: 14' 09
MINIMUM VERTICAL CLEARANCE AT FOG LINE: 15' 03
MINIMUM SHOULDER WIDTH: 00' 04
NUMBER OF PORTAL FRAMES: 2
NUMBER OF SWAY FRAMES: 5
PREVIOUS HIGH LOAD HIT? YES
ADDITIONAL MEMBERS REQUIRING RETROFIT? YES

VERTICAL CLEARANCE INFORMATION
BRIDGE WIDTH (curb to curb) 24 FT
PORTAL/SWAY SPAN WIDTH 27 FT
MINIMUM VERTICAL CLEARANCE AT CURB: 14’ 09
MINIMUM VERTICAL CLEARANCE AT FOG LINE: 15’ 03
MINIMUM SHOULDER WIDTH: 00’ 04
NUMBER OF PORTAL FRAMES: 2
NUMBER OF SWAY FRAMES: 5
PREVIOUS HIGH LOAD HIT? YES
ADDITIONAL MEMBERS REQUIRING RETROFIT? YES

RECOMMENDATIONS AND COST ESTIMATES
RECOMMENDATION:
1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearance.
2. Heat straighten and/or repair other damaged truss members.

COST ESTIMATES: (See page 2 for breakdown)

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>COST ESTIMATE FOR PORTAL AND SWAY RETROFIT</td>
<td>$190,110</td>
</tr>
<tr>
<td>COST ESTIMATE FOR ADDITIONAL MEMBER RETROFIT</td>
<td>$9,505</td>
</tr>
<tr>
<td>SUB TOTAL</td>
<td>$199,615</td>
</tr>
<tr>
<td>COST ESTIMATE FOR DIFFICULTY OF CONSTRUCTION FACTOR</td>
<td>$39,923</td>
</tr>
<tr>
<td>TOTAL BRIDGE COST</td>
<td>$239,600</td>
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<tr>
<td>COST ESTIMATE FOR REGION ADD-ON ITEMS</td>
<td>$239,600</td>
</tr>
<tr>
<td>TOTAL PROJECT COST ESTIMATE</td>
<td>$479,200</td>
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</tbody>
</table>

LOCATION
SR 101 MILEPOST: 192.4
LATITUDE: 47.95961111 LONGITUDE: -124.39275
DETOUR & ROUTE MAX VERTICAL CLEARANCE
FULL BRIDGE CLOSURE ESTIMATED DETOUR: 99 Miles
MAXIMUM VERTICAL CLEARANCE IN ROUTE: 14’ 09
MINIMUM VERTICAL CLEARANCE IN ROUTE: 14’ 09

Reported to FHWA
11/11/2017
PRIORITY RATING 1
TRUSS PORTAL AND SWAY RETROFIT ESTIMATE

Truss Name = CALAWAH RIVER BRIDGE
Truss Bridge Number = 101/308

Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = 12.50 $/LB

Cost Adjustment Factors:
- 10% = Factor to account for gussets & misc. steel
- 5% = Factor if significant heat straightening or repair of other members is anticipated
- 20% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
- 100% = Factor to account for REGION Add-Ons

Input:
- P = Number of Portal Frames
- S = Number of Sway Frames
- W = Bridge Width
- VC = Minimum Vertical Clearance
- EP = Number of End Posts (assume 2 per portal)
- EPH = End Post Height (assume VC + 5')

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<th>Width</th>
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</table>

Quantity Calculations:
- Portal beams total pounds of steel = 3,445 LBS
- Sway beams total pounds of steel = 7,155 LBS
- End post total pounds of steel = 3,226 LBS
- Subtotal pounds of steel = 13,826 LBS
- Total pounds including gusset & misc. steel factor = 15,209 LBS

Cost Calculations:
- Cost Estimate for portal and sway retrofit = $190,110
- Cost Estimate for heat straightening and/or additional member retrofit = $9,505
- Sub total = $199,615
- Cost Estimate due to construction difficulty factor = $39,923
- TOTAL Bridge Cost = $239,600
- Cost Estimate for Region Add-on items = $39,920

TOTAL PROJECT COST ESTIMATE = $479,200
Truss Vertical Clearance Report

BRIDGE NAME: SOL DUC RIVER #2 BRIDGE
BRIDGE NUMBER: 101/314
STRUCTURE ID: 0002627A
REGION: Olympic
YEAR BUILT/WIDENED: 1941
SUFFICIENCY RATING: 40.45
TRUSS BRIDGE LENGTH: 160 FT
AVE DAILY TRAFFIC: 3,539
AVE DAILY TRUCK TRAFFIC: 602
NUMBER OF LANES: 2

VERTICAL CLEARANCE INFORMATION
BRIDGE WIDTH (curb to curb) 24 FT
PORTAL/SWAY SPAN WIDTH 27 FT
MINIMUM VERTICAL CLEARANCE AT CURB: 14' 09
MINIMUM VERTICAL CLEARANCE AT FOG LINE: 15' 04
MINIMUM SHOULDER WIDTH: 00' 05
NUMBER OF PORTAL FRAMES: 2
NUMBER OF SWAY FRAMES: 5
PREVIOUS HIGH LOAD HIT?: YES
ADDITIONAL MEMBERS REQUIRING RETROFIT?: YES

RECOMMENDATIONS AND COST ESTIMATES
RECOMMENDATION:
1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearance.
2. Heat straighten and/or repair other damaged truss members.

COST ESTIMATES: (See page 2 for breakdown)

<table>
<thead>
<tr>
<th>Item</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>COST ESTIMATE FOR PORTAL AND SWAY RETROFIT</td>
<td>$190,110</td>
</tr>
<tr>
<td>COST ESTIMATE FOR ADDITIONAL MEMBER RETROFIT</td>
<td>$28,516</td>
</tr>
<tr>
<td>SUB TOTAL</td>
<td>$218,626</td>
</tr>
<tr>
<td>COST ESTIMATE FOR DIFFICULTY OF CONSTRUCTION FACTOR</td>
<td>$65,588</td>
</tr>
<tr>
<td>TOTAL BRIDGE COST</td>
<td>$284,300</td>
</tr>
<tr>
<td>COST ESTIMATE FOR REGION ADD-ON ITEMS</td>
<td>$284,300</td>
</tr>
<tr>
<td>TOTAL PROJECT COST ESTIMATE</td>
<td>$568,600</td>
</tr>
</tbody>
</table>
Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = 12.50 $/LB

Cost Adjustment Factors:
- 10% = Factor to account for gussets & misc. steel
- 15% = Factor if significant heat straightening or repair of other members is anticipated
- 30% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
- 100% = Factor to account for REGION Add-Ons

Input:

<table>
<thead>
<tr>
<th>P = Number of Portal Frames</th>
<th>2</th>
<th>Each</th>
</tr>
</thead>
<tbody>
<tr>
<td>S = Number of Sway Frames</td>
<td>5</td>
<td>Each</td>
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<tr>
<td>W = Bridge Width</td>
<td>27.00 Ft</td>
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<tr>
<td>VC = Minimum Vertical Clearance</td>
<td>14.75 Ft</td>
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</tr>
<tr>
<td>EP = Number of End Posts (assume 2 per portal)</td>
<td>4</td>
<td>Each</td>
</tr>
<tr>
<td>EPH = End Post Height (assume VC + 5')</td>
<td>19.75 Ft</td>
<td></td>
</tr>
</tbody>
</table>

Quantity Calculations:
- Portal beams total pounds of steel = 3,445 LBS
- Sway beams total pounds of steel = 7,155 LBS
- End post total pounds of steel = 3,226 LBS
- Subtotal pounds of steel = 13,826 LBS
- Total pounds including gusset & misc. steel factor = 15,209 LBS

Cost Calculations:
- Cost Estimate for portal and sway retrofit = $190,110
- Cost Estimate for heat straightening and/or additional member retrofit = $28,516
- Sub total = $218,626
- Cost Estimate due to construction difficulty factor = $65,588
- TOTAL Bridge Cost = $284,300
- Cost Estimate for Region Add-on items = $284,300

TOTAL PROJECT COST ESTIMATE = $568,600
Truss Vertical Clearance Report

Bridge and Structures Office
11/11/2017

<table>
<thead>
<tr>
<th>BRIDGE NAME:</th>
<th>SOL DUC RIVER BRIDGE 316</th>
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<tbody>
<tr>
<td>BRIDGE NUMBER:</td>
<td>101/316</td>
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<tr>
<td>STRUCTURE ID:</td>
<td>0002627B</td>
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<tr>
<td>REGION:</td>
<td>Olympic</td>
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<tr>
<td>YEAR BUILT/WIDENED:</td>
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<tr>
<td>SUFFICIENCY RATING:</td>
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<tr>
<td>TRUSS BRIDGE LENGTH:</td>
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<tr>
<td>AVE DAILY TRAFFIC:</td>
<td>3,539</td>
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<td>AVE DAILY TRUCK TRAFFIC:</td>
<td>602</td>
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<tr>
<td>NUMBER OF LANES:</td>
<td>2</td>
</tr>
<tr>
<td>BRIDGE WIDTH (curb to curb):</td>
<td>24 FT</td>
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<tr>
<td>PORTAL/SWAY SPAN WIDTH:</td>
<td>27 FT</td>
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<tr>
<td>MINIMUM VERTICAL CLEARANCE AT CURB:</td>
<td>14' 09</td>
</tr>
<tr>
<td>MINIMUM VERTICAL CLEARANCE AT FOG LINE:</td>
<td>15' 03</td>
</tr>
<tr>
<td>MINIMUM SHOULDER WIDTH:</td>
<td>00' 07</td>
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<tr>
<td>NUMBER OF PORTAL FRAMES:</td>
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</tr>
<tr>
<td>NUMBER OF SWAY FRAMES:</td>
<td>5</td>
</tr>
<tr>
<td>PREVIOUS HIGH LOAD HIT?:</td>
<td>YES</td>
</tr>
<tr>
<td>ADDITIONAL MEMBERS REQUIRING RETROFIT?:</td>
<td>YES</td>
</tr>
</tbody>
</table>

VERTICAL CLEARANCE INFORMATION

RECOMMENDATION:
1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearance.
2. Heat straighten and/or repair other damaged truss members.

COST ESTIMATES: (See page 2 for breakdown)

| COST ESTIMATE FOR PORTAL AND SWAY RETROFIT = | $190,110 |
| COST ESTIMATE FOR ADDITIONAL MEMBER RETROFIT = | $9,505   |
| SUB TOTAL = | $199,615 |
| COST ESTIMATE FOR DIFFICULTY OF CONSTRUCTION FACTOR = | $59,884 |
| TOTAL BRIDGE COST = | $259,500 |
| COST ESTIMATE FOR REGION ADD-ON ITEMS = | $259,500 |
| TOTAL PROJECT COST ESTIMATE = | $519,000 |

Reported to FHWA

LOCATION
SR 101
MILEPOST: 203.7
LATITUDE: 48.06952711 LONGITUDE: -124.28525

DETOUR & ROUTE MAX VERTICAL CLEARANCE
FULL BRIDGE CLOSURE ESTIMATED DETOUR: 17 Miles
MAXIMUM VERTICAL CLEARANCE IN ROUTE: 14' 09
MINIMUM VERTICAL CLEARANCE IN ROUTE: 14' 09

Minimum Vertical Clearance (Typ)
Bridge Portal or Sway (Typ)
TRUSS PORTAL AND SWAY RETROFIT ESTIMATE

Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
   - Width: 14.00 ft, Height: 16.00 ft, Thick: 0.3125 in, #/LF: 63.8
2. Existing end posts will be strengthened with added plates
   - Width: 12.00 ft, Height: 1.00 ft, Thick: 40.8
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at $12.50/LB

Cost Adjustment Factors:
- 10% = Factor to account for gussets & misc. steel
- 5% = Factor if significant heat straightening or repair of other members is anticipated
- 30% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
- 100% = Factor to account for REGION Add-Ons

Input:
- P = Number of Portal Frames
  - P = 2 Each
- S = Number of Sway Frames
  - S = 5 Each
- W = Bridge Width
  - W = 27.00 ft
- VC = Minimum Vertical Clearance
  - VC = 14.75 ft
- EP = Number of End Posts (assume 2 per portal)
  - EP = 4 Each
- EPH = End Post Height (assume VC + 5')
  - EPH = 19.75 ft

Quantity Calculations:
- Portal beams total pounds of steel = 3,445 LBS
- Sway beams total pounds of steel = 7,155 LBS
- End post total pounds of steel = 3,226 LBS
- Subtotal pounds of steel = 13,826 LBS
- Total pounds including gusset & misc. steel factor = 15,209 LBS

Cost Calculations:
- Cost Estimate for portal and sway retrofit = $190,110
- Cost Estimate for heat straightening and/or additional member retrofit = $9,505
- Sub total = $199,615
- Cost Estimate due to construction difficulty factor = $59,884
- TOTAL Bridge Cost = $259,500
- Cost Estimate for Region Add-on items = $259,500

TOTAL PROJECT COST ESTIMATE = $519,000
## Truss Vertical Clearance Report

**Bridge Name:** SOL DUC RIVER BRIDGE 320  
**Bridge Number:** 101/320  
**Structure ID:** 0003372A  
**Region:** Olympic  
**Year Built/Widened:** 1948  
**Sufficiency Rating:** 64.29  
**Truss Bridge Length:** 160 FT  
**Average Daily Traffic:** 2,275  
**Average Daily Truck Traffic:** 432  
**Number of Lanes:** 2  
**Bridge Width (curb to curb):** 24 FT  
**Portal/Sway Span Width:** 27 FT  
**Minimum Vertical Clearance at Curb:** 14' 09  
**Minimum Vertical Clearance at Fog Line:** 15' 03  
**Minimum Shoulder Width:** 00' 06  
**Number of Portal Frames:** 2  
**Number of Sway Frames:** 5  
**Previous High Load Hit?** YES  
**Additional Members Requiring Retrofit?** YES

### Vertical Clearnace Information

<table>
<thead>
<tr>
<th>Location</th>
<th>Detour &amp; Route Max Vertical Clearance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Full Bridge Closure Estimated Detour:</td>
</tr>
<tr>
<td></td>
<td>Maximum Vertical Clearance in Route:</td>
</tr>
<tr>
<td></td>
<td>Minimum Vertical Clearance in Route:</td>
</tr>
</tbody>
</table>

### Recommendations and Cost Estimates

**Recommendation:**
1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearnance.  
2. Heat straighten and/or repair other damaged truss members.

**Cost Estimates:** (See page 2 for breakdown)

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost Estimate for Portal and Sway Retrofit</td>
<td>$190,110</td>
</tr>
<tr>
<td>Cost Estimate for Additional Member Retrofit</td>
<td>$28,516</td>
</tr>
<tr>
<td>Sub Total</td>
<td>$218,626</td>
</tr>
<tr>
<td>Cost Estimate for Difficulty of Construction Factor</td>
<td>$65,588</td>
</tr>
<tr>
<td>Total Bridge Cost</td>
<td>$284,300</td>
</tr>
<tr>
<td>Cost Estimate for Region Add-On Items</td>
<td>$284,300</td>
</tr>
<tr>
<td><strong>Total Project Cost Estimate</strong></td>
<td><strong>$568,600</strong></td>
</tr>
</tbody>
</table>
TRUSS PORTAL AND SWAY RETROFIT ESTIMATE

Truss Name = SOL DUC RIVER BRIDGE 320
Truss Bridge Number = 101/320

Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = $12.50/LB

Cost Adjustment Factors:
- 10% = Factor to account for gussets & misc. steel
- 15% = Factor if significant heat straightening or repair of other members is anticipated
- 30% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
- 100% = Factor to account for REGION Add-Ons

Input:
- P = Number of Portal Frames
- S = Number of Sway Frames
- W = Bridge Width
- VC = Minimum Vertical Clearance
- EP = Number of End Posts (assume 2 per portal)
- EPH = End Post Height (assume VC + 5')

<table>
<thead>
<tr>
<th>Assumed plate sections (in)</th>
<th>Width</th>
<th>Height</th>
<th>Thick.</th>
<th>#/LF</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>14.00</td>
<td>16.00</td>
<td>0.3125</td>
<td>63.8</td>
</tr>
<tr>
<td></td>
<td>12.00</td>
<td>1.00</td>
<td>40.8</td>
<td></td>
</tr>
<tr>
<td>W12x53</td>
<td></td>
<td></td>
<td></td>
<td>53</td>
</tr>
</tbody>
</table>

Quantity Calculations:
- Portal beams total pounds of steel = 3,445 LBS
- Sway beams total pounds of steel = 7,155 LBS
- End post total pounds of steel = 3,226 LBS
- Subtotal pounds of steel = 13,826 LBS
- Total pounds including gusset & misc. steel factor = 15,209 LBS

Cost Calculations:
- Cost Estimate for portal and sway retrofit = $190,110
- Cost Estimate for heat straightening and/or additional member retrofit = $28,516
- Sub total = $218,626
- Cost Estimate due to construction difficulty factor = $65,588
- TOTAL Bridge Cost = $284,300
- Cost Estimate for Region Add-on items = $284,300

TOTAL PROJECT COST ESTIMATE = $568,600
# Truss Vertical Clearance Report

**Bridge Name:** SOL DUC RIVER #5 BRIDGE  
**Bridge Number:** 101/322  
**Structure ID:** 0003372B  
**Region:** Olympic  
**Year Built/Widened:** 1948  
**Sufficiency Rating:** 61.11  
**Truss Bridge Length:** 160 FT  
**Ave Daily Traffic:** 2,275  
**Ave Daily Truck Traffic:** 432

**Number of Lanes:** 2  
**Bridge Width (curb to curb):** 24 FT  
**Portal/Sway Span Width:** 27 FT

**Minimum Vertical Clearance at Curb:** 14' 09
**Minimum Vertical Clearance at Fog Line:** 15' 03
**Minimum Shoulder Width:** 00' 06
**Number of Portal Frames:** 2  
**Number of Sway Frames:** 5  
**Previous High Load Hit?** YES  
**Additional Members Requiring Retrofit?** YES

## Vertical Clearance Information

<table>
<thead>
<tr>
<th>Location</th>
<th>Detour &amp; Route Max Vertical Clearance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Bridge Closure Estimated Detour</td>
<td>3 Miles</td>
</tr>
<tr>
<td>Maximum Vertical Clearance in Route</td>
<td>14' 09</td>
</tr>
<tr>
<td>Minimum Vertical Clearance in Route</td>
<td>14' 09</td>
</tr>
</tbody>
</table>

## Recommendations and Cost Estimates

**Recommendation:**
1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearance.
2. Heat straighten and/or repair other damaged truss members.

**Cost Estimates:** (See page 2 for breakdown)

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost Estimate for Portal and Sway Retrofit</td>
<td>$190,110</td>
</tr>
<tr>
<td>Cost Estimate for Additional Member Retrofit</td>
<td>$9,505</td>
</tr>
<tr>
<td>Sub Total</td>
<td>$199,615</td>
</tr>
<tr>
<td>Cost Estimate for Difficulty of Construction Factor</td>
<td>$29,942</td>
</tr>
<tr>
<td>Total Bridge Cost</td>
<td>$229,600</td>
</tr>
<tr>
<td>Cost Estimate for Region Add-on Items</td>
<td>$229,600</td>
</tr>
<tr>
<td>Total Project Cost Estimate</td>
<td>$459,200</td>
</tr>
</tbody>
</table>
TRUSS PORTAL AND SWAY RETROFIT ESTIMATE
Truss Name = SOL Duc RIVER #5 BRIDGE
Truss Bridge Number = 101/322

Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = 12.50 $/LB

Cost Adjustment Factors:
- 10% = Factor to account for gussets & misc. steel
- 5% = Factor if significant heat straightening or repair of other members is anticipated
- 15% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
- 100% = Factor to account for REGION Add-Ons

Input:
- P = Number of Portal Frames (2 Each)
- S = Number of Sway Frames (5 Each)
- W = Bridge Width (27.00 Ft)
- VC = Minimum Vertical Clearance (14.75 Ft)
- EP = Number of End Posts (assume 2 per portal) (4 Each)
- EPH = End Post Height (assume VC + 5') (19.75 Ft)

Quantity Calculations:
- Portal beams total pounds of steel = 3,445 LBS
- Sway beams total pounds of steel = 7,155 LBS
- End post total pounds of steel = 3,226 LBS
- Subtotal pounds of steel = 13,826 LBS
- Total pounds including gusset & misc. steel factor = 15,209 LBS

Cost Calculations:
- Cost Estimate for portal and sway retrofit = $190,110
- Cost Estimate for heat straightening and/or additional member retrofit = $9,505
- Sub total = $199,615
- Cost Estimate due to construction difficulty factor = $29,942
- TOTAL Bridge Cost = $229,600
- Cost Estimate for Region Add-on items = $229,600

TOTAL PROJECT COST ESTIMATE = $459,200
Truss Vertical Clearance Report

COLUMBIA R KETTLE FALLS BRIDGE

BRIDGE NAME: COLUMBIA R KETTLE FALLS BRIDGE
BRIDGE NUMBER: 395/545
STRUCTURE ID: 0002613A
REGION: Eastern
YEAR BUILT/WIDENED: 1941
SUFFICIENCY RATING: 42.78
TRUSS BRIDGE LENGTH: 1051 FT
AVE DAILY TRAFFIC: 4,269
AVE DAILY TRUCK TRAFFIC: 683
NUMBER OF LANES: 2
BRIDGE WIDTH (curb to curb): 24 FT
PORTAL/SWAY SPAN WIDTH: 28 FT
MINIMUM VERTICAL CLEARANCE AT CURB: 14' 10
MINIMUM VERTICAL CLEARANCE AT FOG LINE: 15' 01
MINIMUM SHOULDER WIDTH: 01' 04
NUMBER OF PORTAL FRAMES: 2
NUMBER OF SWAY FRAMES: 25
PREVIOUS HIGH LOAD HIT? YES
ADDITIONAL MEMBERS REQUIRING RETROFIT? YES

LOCATION
SR 395 MILEPOST: 241.5
LATITUDE: 48.62573266 LONGITUDE: -118.117441

DETOUR & ROUTE MAX VERTICAL CLEARANCE
FULL BRIDGE CLOSURE ESTIMATED DETOUR: 52 Miles
MAXIMUM VERTICAL CLEARANCE IN ROUTE: 14’ 11
MINIMUM VERTICAL CLEARANCE IN ROUTE: 14’ 10

RECOMMENDATIONS AND COST ESTIMATES
RECOMMENDATION:
1. Retrofit bridge by raising portals and sways to 16’-06” minimum vertical clearance.
2. Heat straighten and/or repair other damaged truss members.

COST ESTIMATES: (See page 2 for breakdown)

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>COST ESTIMATE FOR PORTAL AND SWAY RETROFIT</td>
<td>$603,795</td>
</tr>
<tr>
<td>COST ESTIMATE FOR ADDITIONAL MEMBER RETROFIT</td>
<td>$30,190</td>
</tr>
<tr>
<td>SUB TOTAL</td>
<td>$633,985</td>
</tr>
<tr>
<td>COST ESTIMATE FOR DIFFICULTY OF CONSTRUCTION FACTOR</td>
<td>$190,195</td>
</tr>
<tr>
<td>TOTAL BRIDGE COST</td>
<td>$824,200</td>
</tr>
<tr>
<td>COST ESTIMATE FOR REGION ADD-ON ITEMS</td>
<td>$824,200</td>
</tr>
<tr>
<td>TOTAL PROJECT COST ESTIMATE</td>
<td>$1,648,400</td>
</tr>
</tbody>
</table>
TRUSS PORTAL AND SWAY RETROFIT ESTIMATE

Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = 12.50 $/LB

Cost Adjustment Factors:

<table>
<thead>
<tr>
<th>Factor</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>10%</td>
<td>= Factor to account for gussets &amp; misc. steel</td>
</tr>
<tr>
<td>5%</td>
<td>= Factor if significant heat straightening or repair of other members is anticipated</td>
</tr>
<tr>
<td>30%</td>
<td>= Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes</td>
</tr>
<tr>
<td>100%</td>
<td>= Factor to account for REGION Add-Ons</td>
</tr>
</tbody>
</table>

Input:

- **P** = Number of Portal Frames = 2 Each
- **S** = Number of Sway Frames = 25 Each
- **W** = Bridge Width = 28.00 Ft
- **VC** = Minimum Vertical Clearance = 14.83 Ft
- **EP** = Number of End Posts (assume 2 per portal) = 4 Each
- **EPH** = End Post Height (assume VC + 5') = 19.83 Ft

Quantity Calculations:

- Portal beams total pounds of steel = 3,573 LBS
- Sway beams total pounds of steel = 37,100 LBS
- End post total pounds of steel = 3,239 LBS
- Subtotal pounds of steel = 43,912 LBS
- Total pounds including gusset & misc. steel factor = 48,304 LBS

Cost Calculations:

- Cost Estimate for portal and sway retrofit = $603,795
- Cost Estimate for heat straightening and/or additional member retrofit = $30,190
- Sub total = $633,985
- Cost Estimate due to construction difficulty factor = $190,195
- TOTAL Bridge Cost = $824,200
- Cost Estimate for Region Add-on items = $824,200

TOTAL PROJECT COST ESTIMATE = $1,648,400
# Truss Vertical Clearance Report

**BRIDGE NAME:** COLUMBIA R GRAND COULEE BRIDGE  
**BRIDGE NUMBER:** 155/101  
**STRUCTURE ID:** 000000JJ  
**REGION:** North Central  
**YEAR BUILT/WIDENED:** 1935  
**SUFFICIENCY RATING:** 48.81  
**TRUSS BRIDGE LENGTH:** 950 FT  
**AVE DAILY TRAFFIC:** 5,214  
**AVE DAILY TRUCK TRAFFIC:** 521  
**NUMBER OF LANES:** 2  

**BRIDGE WIDTH (curb to curb):** 20 FT  
**PORTAL/SWAY SPAN WIDTH:** 24 FT  
**MINIMUM VERTICAL CLEARANCE AT CURB:** 14’ 10”  
**MINIMUM VERTICAL CLEARANCE AT FOG LINE:** 14’ 10”  
**MINIMUM SHOULDER WIDTH:** 00’ 00”  
**NUMBER OF PORTAL FRAMES:** 8  
**NUMBER OF SWAY FRAMES:** 23  
**PREVIOUS HIGH LOAD HIT?** YES  
**ADDITIONAL MEMBERS REQUIRING RETROFIT?** YES  

---

**VERTICAL CLEARANCE INFORMATION**

- **Bridge Width (curb to curb):** 20 FT
- **Portal/Sway Span Width:** 24 FT
- **Minimum Vertical Clearance at Curbs:** 14’ 10”
- **Minimum Vertical Clearance at Fog Line:** 14’ 10”
- **Minimum Shoulder Width:** 00’ 00”
- **Number of Portal Frames:** 8
- **Number of Sway Frames:** 23
- **Previous High Load Hit?** YES
- **Additional Members Requiring Retrofit?** YES

---

**Recommendations and Cost Estimates**

**Recommendation:**
1. Retrofit bridge by raising portals and sways to 16’-06” minimum vertical clearance.  
2. Heat straighten and/or repair other damaged truss members.

**Cost Estimates:** (See page 2 for breakdown)

- **Cost Estimate for Portal and Sway Retrofit =** $748,877
- **Cost Estimate for Additional Member Retrofit =** $74,888
- **Sub Total =** $823,765
- **Cost Estimate for Difficulty of Construction Factor =** $164,753
- **Total Bridge Cost =** $988,600
- **Cost Estimate for Region Add-On Items =** $988,600

**Total Project Cost Estimate =** $1,977,200

---

**Detour & Route Max Vertical Clearance**

- **Full Bridge Closure Estimated Detour:** 1 Miles
- **Maximum Vertical Clearance in Route:** 14’ 10”
- **Minimum Vertical Clearance in Route:** 14’ 08”

---

**Location**

- **SR 155 Milepost:** 28.26
- **Latitude:** 47.96539166  
- **Longitude:** -118.982324

---

**Priority Rating**

1

---

**Vertical Clearance Information**

- **Location:** Reported to FHWA

---

**Bridge Details**

- **Bridge Portal or Sway (Typ):** Minimum Vertical Clearance (Typ)

---

**Map and Diagram**

- **Bridge and Structures Office**
- **11/11/2017**
TRUSS PORTAL AND SWAY RETROFIT ESTIMATE

Truss Name = COLUMBIA R GRAND COULEE BRIDGE
Truss Bridge Number = 155/101

Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = 12.50 $/LB

Cost Adjustment Factors:
10% = Factor to account for gussets & misc. steel
10% = Factor if significant heat straightening or repair of other members is anticipated
20% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
100% = Factor to account for REGION Add-Ons

Input:

\[
\begin{align*}
  P &= \text{Number of Portal Frames} & P &= 8 \text{ Each} \\
  S &= \text{Number of Sway Frames} & S &= 23 \text{ Each} \\
  W &= \text{Bridge Width} & W &= 24.00 \text{ Ft} \\
  VC &= \text{Minimum Vertical Clearance} & VC &= 14.83 \text{ Ft} \\
  EP &= \text{Number of End Posts (assume 2 per portal)} & EP &= 16 \text{ Each} \\
  EPH &= \text{End Post Height (assume VC + 5')} & EPH &= 19.83 \text{ Ft}
\end{align*}
\]

Quantity Calculations:

\[
\begin{align*}
  \text{Portal beams total pounds of steel} &= 12,250 \text{ LBS} \\
  \text{Sway beams total pounds of steel} &= 29,256 \text{ LBS} \\
  \text{End post total pounds of steel} &= 12,958 \text{ LBS} \\
  \text{Subtotal pounds of steel} &= 54,464 \text{ LBS} \\
  \text{Total pounds including gusset & misc. steel factor} &= 59,910 \text{ LBS}
\end{align*}
\]

Cost Calculations:

\[
\begin{align*}
  \text{Cost Estimate for portal and sway retrofit} &= $748,877 \\
  \text{Cost Estimate for heat straightening and/or additional member retrofit} &= $74,888 \\
  \text{Sub total} &= $823,765 \\
  \text{Cost Estimate due to construction difficulty factor} &= $164,753 \\
  \text{TOTAL Bridge Cost} &= $988,600 \\
  \text{Cost Estimate for Region Add-on items} &= $988,600
\end{align*}
\]

TOTAL PROJECT COST ESTIMATE = $1,977,200
BRIDGE NAME: SKYKOMISH RIVER BRIDGE
BRIDGE NUMBER: 203/106
STRUCTURE ID: 0005294B
REGION: Northwest
YEAR BUILT/WIDENED: 1957
SUFFICIENCY RATING: 57
TRUSS BRIDGE LENGTH: 340 FT
AVE DAILY TRAFFIC: 12,355
AVE DAILY TRUCK TRAFFIC: 1606
NUMBER OF LANES: 2
NUMBER OF PORTAL FRAMES: 2
NUMBER OF SWAY FRAMES: 7
PREVIOUS HIGH LOAD HIT? YES
ADDITIONAL MEMBERS REQUIRING RETROFIT? YES

VERTICAL CLEARANCE INFORMATION
BRIDGE WIDTH (curb to curb) 28 FT
PORTAL/SWAY SPAN WIDTH 36 FT
MINIMUM VERTICAL CLEARANCE AT CURB: 14' 10 Reported to FHWA
MINIMUM VERTICAL CLEARANCE AT FOG LINE: 15' 04
MINIMUM SHOULDER WIDTH: 01' 09
NUMBER OF PORTAL FRAMES: 2
NUMBER OF SWAY FRAMES: 7
PREVIOUS HIGH LOAD HIT? YES
ADDITIONAL MEMBERS REQUIRING RETROFIT? YES

LOCATION
SR 203     MILEPOST: 23.2
LATITUDE: 47.845383     LONGITUDE: -121.970366

DETOUR & ROUTE MAX VERTICAL CLEARANCE
FULL BRIDGE CLOSURE ESTIMATED DETOUR: 13 Miles
MAXIMUM VERTICAL CLEARANCE IN ROUTE: 14' 10
MINIMUM VERTICAL CLEARANCE IN ROUTE: 14' 11

RECOMMENDATIONS AND COST ESTIMATES
RECOMMENDATION:
1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearance.
2. Heat straighten and/or repair other damaged truss members.

COST ESTIMATES: (See page 2 for breakdown)

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>COST ESTIMATE FOR PORTAL AND SWAY RETROFIT</td>
<td>$291,351</td>
</tr>
<tr>
<td>COST ESTIMATE FOR ADDITIONAL MEMBER RETROFIT</td>
<td>$14,568</td>
</tr>
<tr>
<td>SUB TOTAL</td>
<td>$305,919</td>
</tr>
<tr>
<td>COST ESTIMATE FOR DIFFICULTY OF CONSTRUCTION FACTOR</td>
<td>$45,888</td>
</tr>
<tr>
<td>TOTAL BRIDGE COST</td>
<td>$351,900</td>
</tr>
<tr>
<td>COST ESTIMATE FOR REGION ADD-ON ITEMS</td>
<td>$351,900</td>
</tr>
<tr>
<td>TOTAL PROJECT COST ESTIMATE</td>
<td>$703,800</td>
</tr>
</tbody>
</table>
TRUSS PORTAL AND SWAY RETROFIT ESTIMATE

Truss Name = SKYKOMISH RIVER BRIDGE
Truss Bridge Number = 203/106

Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = 12.50 $/LB

Cost Adjustment Factors:
- 10% = Factor to account for gussets & misc. steel
- 5% = Factor if significant heat straightening or repair of other members is anticipated
- 15% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
- 100% = Factor to account for REGION Add-Ons

Input:
- \( P = \text{Number of Portal Frames} \)
- \( S = \text{Number of Sway Frames} \)
- \( W = \text{Bridge Width} \)
- \( VC = \text{Minimum Vertical Clearance} \)
- \( EP = \text{Number of End Posts (assume 2 per portal)} \)
- \( EPH = \text{End Post Height (assume VC + 5')} \)

Quantity Calculations:
- Portal beams total pounds of steel = 4,594 LBS
- Sway beams total pounds of steel = 13,356 LBS
- End post total pounds of steel = 3,239 LBS
- Subtotal pounds of steel = 21,189 LBS
- Total pounds including gusset & misc. steel factor = 23,308 LBS

Cost Calculations:
- Cost Estimate for portal and sway retrofit = $291,351
- Cost Estimate for heat straightening and/or additional member retrofit = $14,568
- Sub total = $305,919
- Cost Estimate due to construction difficulty factor = $45,888
- TOTAL Bridge Cost = $351,900
- Cost Estimate for Region Add-on items = $351,900

TOTAL PROJECT COST ESTIMATE = $703,800
**Truss Vertical Clearance Report**

**Bridge Name:** NOOKSACK RIVER BRIDGE 828E  
**Bridge Number:** 5/828E  
**Structure ID:** 0004856A  
**Region:** Northwest  
**Year Built/Widened:** 1955  
** Sufficiency Rating:** 57.09  
**Truss Bridge Length:** 220 FT  
**Ave Daily Traffic:** 23,907  
**Ave Daily Truck Traffic:** 1913  
**Number of Lanes:** 2  
**Bridge Width (curb to curb):** 28 FT  
**Portal/Sway Span Width:** 34 FT  
**Minimum Vertical Clearance at Curb:** 14' 10"  
**Minimum Vertical Clearance at Fog Line:** 15' 04"  
**Minimum Shoulder Width:** 02' 00"  
**Number of Portal Frames:** 2  
**Number of Sway Frames:** 5  
**Previous High Load Hit?** YES  
**Additional Members Requiring Retrofit?** YES  

**Recommendation:**
1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearance.
2. Heat straighten and/or repair other damaged truss members.

**Cost Estimates:** (See page 2 for breakdown)

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost Estimate</th>
</tr>
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<tbody>
<tr>
<td>Portal and Sway Retrofit</td>
<td>$228,085</td>
</tr>
<tr>
<td>Additional Member Retrofit</td>
<td>$22,808</td>
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<tr>
<td>Total</td>
<td>$250,893</td>
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<tr>
<td>Difficulty of Construction Factor</td>
<td>$50,179</td>
</tr>
<tr>
<td>Total Bridge Cost</td>
<td>$301,100</td>
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<tr>
<td>Region Add-on Items</td>
<td>$301,100</td>
</tr>
<tr>
<td>Total Project Cost Estimate</td>
<td>$602,200</td>
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</tbody>
</table>
TRUSS PORTAL AND SWAY RETROFIT ESTIMATE

Truss Name = NOOKSACK RIVER BRIDGE 828E
Truss Bridge Number = 5/828E

Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = 12.50 $/LB

Cost Adjustment Factors:
- 10% = Factor to account for gussets & misc. steel
- 10% = Factor if significant heat straightening or repair of other members is anticipated
- 20% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
- 100% = Factor to account for REGION Add-Ons

Input:

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<tr>
<td>P</td>
<td>Number of Portal Frames</td>
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<td>Number of Sway Frames</td>
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<td>EP</td>
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<tr>
<td>EPH</td>
<td>End Post Height (assume VC + 5')</td>
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<td>19.83</td>
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Quantity Calculations:

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<td>End post total pounds of steel</td>
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<td>LBS</td>
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<tr>
<td>Subtotal pounds of steel</td>
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<td>LBS</td>
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<tr>
<td>Total pounds including gusset &amp; misc. steel factor</td>
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<td>18,247</td>
<td>LBS</td>
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Cost Calculations:

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<tr>
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<tbody>
<tr>
<td>Cost Estimate for portal and sway retrofit</td>
<td>=</td>
<td>$228,085</td>
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<tr>
<td>Cost Estimate for heat straightening and/or additional member retrofit</td>
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<td>$22,808</td>
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<td>Sub total</td>
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<td>Cost Estimate due to construction difficulty factor</td>
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<td>$50,179</td>
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<tr>
<td>TOTAL Bridge Cost</td>
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<tr>
<td>Cost Estimate for Region Add-on items</td>
<td>=</td>
<td>$301,100</td>
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</tbody>
</table>

TOTAL PROJECT COST ESTIMATE = $602,200
Truss Vertical Clearance Report

Bridge and Structures Office
11/11/2017

BRIDGE NAME: NOOKSACK RIVER BRIDGE 860E
BRIDGE NUMBER: 539/860E
STRUCTURE ID: 0003802B
REGION: Northwest
YEAR BUILT/WIDENED: 1950
SUFFICIENCY RATING: 57.34
TRUSS BRIDGE LENGTH: 340 FT
AVE DAILY TRAFFIC: 7,930
AVE DAILY TRUCK TRAFFIC: 1110
NUMBER OF LANES: 2

VERTICAL CLEARANCE INFORMATION
BRIDGE WIDTH (curb to curb) 28 FT
PORTAL/SWAY SPAN WIDTH 36 FT
MINIMUM VERTICAL CLEARANCE AT CURB: 14’ 10”
MINIMUM VERTICAL CLEARANCE AT FOG LINE: N/A
MINIMUM SHOULDER WIDTH: 01’ 00
NUMBER OF PORTAL FRAMES: 2
NUMBER OF SWAY FRAMES: 7
PREVIOUS HIGH LOAD HIT?: YES
ADDITIONAL MEMBERS REQUIRING RETROFIT?: YES

RECOMMENDATIONS AND COST ESTIMATES
RECOMMENDATION:
1. Retrofit bridge by raising portals and sways to 16'-06” minimum vertical clearance.
2. Heat straighten and/or repair other damaged truss members.

COST ESTIMATES: (See page 2 for breakdown)

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
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</thead>
<tbody>
<tr>
<td>COST ESTIMATE FOR PORTAL AND SWAY RETROFIT</td>
<td>$291,351</td>
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<tr>
<td>COST ESTIMATE FOR ADDITIONAL MEMBER RETROFIT</td>
<td>$29,135</td>
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<tr>
<td>SUB TOTAL</td>
<td>$320,487</td>
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<tr>
<td>COST ESTIMATE FOR DIFFICULTY OF CONSTRUCTION FACTOR</td>
<td>$32,049</td>
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<tr>
<td>TOTAL BRIDGE COST</td>
<td>$352,600</td>
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<tr>
<td>COST ESTIMATE FOR REGION ADD-ON ITEMS</td>
<td>$352,600</td>
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<tr>
<td>TOTAL PROJECT COST ESTIMATE</td>
<td>$705,200</td>
</tr>
</tbody>
</table>

LOCATION
SR 539 MILEPOST: 9.43
LATITUDE: 48.91926877 LONGITUDE: -122.485536

DETOUR & ROUTE MAX VERTICAL CLEARANCE
FULL BRIDGE CLOSURE ESTIMATED DETOUR: 9 Miles
MAXIMUM VERTICAL CLEARANCE IN ROUTE: 14’ 10”
MINIMUM VERTICAL CLEARANCE IN ROUTE: 14’ 10”

Reported to FHWA
Bridge Portal or Sway (Typ)
**TRUSS PORTAL AND SWAY RETROFIT ESTIMATE**

**Truss Name:** NOOKSACK RIVER BRIDGE 860E

**Truss Bridge Number:** 539/860E

**Assumptions:**
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = 12.50 $/LB

**Cost Adjustment Factors:**
- 10% = Factor to account for gussets & misc. steel
- 10% = Factor if significant heat straightening or repair of other members is anticipated
- 10% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
- 100% = Factor to account for REGION Add-Ons

**Input:**
- \( P = \text{Number of Portal Frames} \) = 2 Each
- \( S = \text{Number of Sway Frames} \) = 7 Each
- \( W = \text{Bridge Width} \) = 36.00 Ft
- \( VC = \text{Minimum Vertical Clearance} \) = 14.83 Ft
- \( EP = \text{Number of End Posts (assume 2 per portal)} \) = 4 Each
- \( EPH = \text{End Post Height (assume VC + 5')} \) = 19.83 Ft

**Quantity Calculations:**
- Portal beams total pounds of steel = 4,594 LBS
- Sway beams total pounds of steel = 13,356 LBS
- End post total pounds of steel = 3,239 LBS
- Subtotal pounds of steel = 21,189 LBS
- Total pounds including gusset & misc. steel factor = 23,308 LBS

**Cost Calculations:**
- Cost Estimate for portal and sway retrofit = $291,351
- Cost Estimate for heat straightening and/or additional member retrofit = $29,135
- Sub total = $320,487
- Cost Estimate due to construction difficulty factor = $32,049
- TOTAL Bridge Cost = $352,600
- Cost Estimate for Region Add-on items = $352,600

**TOTAL PROJECT COST ESTIMATE** = $705,200
BRIDGE NAME: HUMPTULIPS RIVER BRIDGE
BRIDGE NUMBER: 101/150
STRUCTURE ID: 0003765B
REGION: Olympic
YEAR BUILT/WIDENED: 1950
SUFFICIENCY RATING: 71.13
TRUSS BRIDGE LENGTH: 260 FT
AVE DAILY TRAFFIC: 1,947
AVE DAILY TRUCK TRAFFIC: 467
NUMBER OF LANES: 2
BRIDGE WIDTH (curb to curb) 26 FT
PORTAL/SWAY SPAN WIDTH 34 FT
MINIMUM VERTICAL CLEARANCE AT CURB: 14' 10
MINIMUM VERTICAL CLEARANCE AT FOG LINE: 15' 00
MINIMUM SHOULD WIDTH: 01' 00
NUMBER OF PORTAL FRAMES: 2
NUMBER OF SWAY FRAMES: 5
PREVIOUS HIGH LOAD HIT?: YES
ADDITIONAL MEMBERS REQUIRING RETROFIT?: YES

VERTICAL CLEARANCE INFORMATION

MINIMUM VERTICAL CLEARANCE AT CURB: 14' 10
MINIMUM VERTICAL CLEARANCE AT FOG LINE: 15' 00
MINIMUM SHOULDER WIDTH: 01' 00
NUMBER OF PORTAL FRAMES: 2
NUMBER OF SWAY FRAMES: 5
PREVIOUS HIGH LOAD HIT?: YES
ADDITIONAL MEMBERS REQUIRING RETROFIT?: YES

RECOMMENDATIONS AND COST ESTIMATES

RECOMMENDATION:
1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearnance.
2. Heat straighten and/or repair other damaged truss members.

COST ESTIMATES: (See page 2 for breakdown)

- COST ESTIMATE FOR PORTAL AND SWAY RETROFIT = $228,085
- COST ESTIMATE FOR ADDITIONAL MEMBER RETROFIT = $11,404
- SUB TOTAL = $239,489
- COST ESTIMATE FOR DIFFICULTY OF CONSTRUCTION FACTOR = $71,847
- TOTAL BRIDGE COST = $311,400
- COST ESTIMATE FOR REGION ADD-ON ITEMS = $311,400
- TOTAL PROJECT COST ESTIMATE = $622,800
TRUSS PORTAL AND SWAY RETROFIT ESTIMATE

Truss Name = HUMPTULIPS RIVER BRIDGE
Truss Bridge Number = 101/150

Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = 12.50 $/LB

Cost Adjustment Factors:
- 10% = Factor to account for gussets & misc. steel
- 5% = Factor if significant heat straightening or repair of other members is anticipated
- 30% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
- 100% = Factor to account for REGION Add-Ons

Input:
- P = Number of Portal Frames
- S = Number of Sway Frames
- W = Bridge Width
- VC = Minimum Vertical Clearance
- EP = Number of End Posts (assume 2 per portal)
- EPH = End Post Height (assume VC + 5')

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<tr>
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</tbody>
</table>

Quantity Calculations:
- Portal beams total pounds of steel = 4,339 LBS
- Sway beams total pounds of steel = 9,010 LBS
- End post total pounds of steel = 3,239 LBS
- Subtotal pounds of steel = 16,588 LBS
- Total pounds including gusset & misc. steel factor = 18,247 LBS

Cost Calculations:
- Cost Estimate for portal and sway retrofit = $228,085
- Cost Estimate for heat straightening and/or additional member retrofit = $11,404
- Sub total = $239,489
- Cost Estimate due to construction difficulty factor = $71,847
- TOTAL Bridge Cost = $311,400
- Cost Estimate for Region Add-on items = $311,400

TOTAL PROJECT COST ESTIMATE = $622,800
Truss Vertical Clearance Report

BRIDGE NAME: COWLITZ RIVER CORA BRIDGE
BRIDGE NUMBER: 12/265
STRUCTURE ID: 0003348A
REGION: Southwest
YEAR BUILT/WIDENED: 1948
SUFFICIENCY RATING: 59.19
TRUSS BRIDGE LENGTH: 240 FT
AVE DAILY TRAFFIC: 2,765
AVE DAILY TRUCK TRAFFIC: 608
NUMBER OF LANES: 2
STRUCTURE WIDTH (curb to curb) 26 FT
PORTAL/SWAY SPAN WIDTH 34 FT
MINIMUM VERTICAL CLEARANCE AT CURB: 14' 10
MINIMUM VERTICAL CLEARANCE AT FOG LINE: 15' 02
MINIMUM SHOULDER WIDTH: 01' 00
NUMBER OF PORTAL FRAMES: 2
NUMBER OF SWAY FRAMES: 5
PREVIOUS HIGH LOAD HIT?: YES
ADDITIONAL MEMBERS REQUIRING RETROFIT?: YES

VERTICAL CLEARANCE INFORMATION
BAR CODE (curb to curb) 26 FT
PORTAL/SWAY SPAN WIDTH: 34 FT
MINIMUM VERTICAL CLEARANCE AT CURB: 14' 10
MINIMUM VERTICAL CLEARANCE AT FOG LINE: 15' 02
MINIMUM SHOULDER WIDTH: 01' 00
NUMBER OF PORTAL FRAMES: 2
NUMBER OF SWAY FRAMES: 5
PREVIOUS HIGH LOAD HIT?: YES
ADDITIONAL MEMBERS REQUIRING RETROFIT?: YES

RECOMMENDATIONS AND COST ESTIMATES
RECOMMENDATION:
1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearance.
2. Heat straighten and/or repair other damaged truss members.

COST ESTIMATES: (See page 2 for breakdown)

COST ESTIMATE FOR PORTAL AND SWAY RETROFIT = $228,085
COST ESTIMATE FOR ADDITIONAL MEMBER RETROFIT = $34,213
SUB TOTAL = $262,298
COST ESTIMATE FOR DIFFICULTY OF CONSTRUCTION FACTOR = $52,460
TOTAL BRIDGE COST = $314,800
COST ESTIMATE FOR REGION ADD-ON ITEMS = $314,800
TOTAL PROJECT COST ESTIMATE = $629,600
Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = 12.50 $/LB

Cost Adjustment Factors:
- 10% = Factor to account for gussets & misc. steel
- 15% = Factor if significant heat straightening or repair of other members is anticipated
- 20% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
- 100% = Factor to account for REGION Add-Ons

Input:
- P = Number of Portal Frames
- S = Number of Sway Frames
- W = Bridge Width
- VC = Minimum Vertical Clearance
- EP = Number of End Posts (assume 2 per portal)
- EPH = End Post Height (assume VC + 5"

Quantity Calculations:
- Portal beams total pounds of steel = 4,339 LBS
- Sway beams total pounds of steel = 9,010 LBS
- End post total pounds of steel = 3,239 LBS
- Subtotal pounds of steel = 16,588 LBS
- Total pounds including gusset & misc. steel factor = 18,247 LBS

Cost Calculations:
- Cost Estimate for portal and sway retrofit = $228,085
- Cost Estimate for heat straightening and/or additional member retrofit = $34,213
- Sub total = $262,298
- Cost Estimate due to construction difficulty factor = $52,460
- TOTAL Bridge Cost = $314,800
- Cost Estimate for Region Add-on items = $314,800

TOTAL PROJECT COST ESTIMATE = $629,600
BRIDGE NAME: CHEHALIS R RIVERSIDE BRIDGE
BRIDGE NUMBER: 6/123
STRUCTURE ID: 0002538B
REGION: Southwest
YEARS BUILT/WIDENED: 1939
SUFFICIENCY RATING: 55.11
TRUSS BRIDGE LENGTH: 240 FT
AVE DAILY TRAFFIC: 10,624
AVE DAILY TRUCK TRAFFIC: 1169
NUMBER OF LANES: 2
BRIDGE WIDTH (curb to curb): 24 FT
PORTAL/SWAY SPAN WIDTH: 27 FT
MINIMUM VERTICAL CLEARANCE AT CURB: 15' 02
MINIMUM VERTICAL CLEARANCE AT FOG LINE: 15' 07
MINIMUM SHOULDER WIDTH: 01' 00
NUMBER OF PORTAL FRAMES: 2
NUMBER OF SWAY FRAMES: 5
PREVIOUS HIGH LOAD HIT?: YES
ADDITIONAL MEMBERS REQUIRING RETROFIT?: YES

VEHICLE CLEARANCE INFORMATION
BLIND SPAN WIDTH:
MINIMUM VERTICAL CLEARANCE AT CURB:
MINIMUM VERTICAL CLEARANCE AT FOG LINE:
MINIMUM SHOULDER WIDTH:
NUMBER OF PORTAL FRAMES:
NUMBER OF SWAY FRAMES:
PREVIOUS HIGH LOAD HIT?
ADDITIONAL MEMBERS REQUIRING RETROFIT?

LOCATION
SR 6
MILEPOST: 50.94
LATITUDE: 46.65763888
LONGITUDE: -122.985972

DETOUR & ROUTE MAX VERTICAL CLEARANCE
FULL BRIDGE CLOSURE ESTIMATED DETOUR: 2 Miles
MAXIMUM VERTICAL CLEARANCE IN ROUTE: 15' 02
MINIMUM VERTICAL CLEARANCE IN ROUTE: 14' 10

RECOMMENDATIONS AND COST ESTIMATES
RECOMMENDATION:
1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearance.
2. Heat straighten and/or repair other damaged truss members.

COST ESTIMATES: (See page 2 for breakdown)
COST ESTIMATE FOR PORTAL AND SWAY RETROFIT = $191,045
COST ESTIMATE FOR ADDITIONAL MEMBER RETROFIT = $19,105
SUB TOTAL = $210,150
COST ESTIMATE FOR DIFFICULTY OF CONSTRUCTION FACTOR = $21,015
TOTAL BRIDGE COST = $231,200
COST ESTIMATE FOR REGION ADD-ON ITEMS =

TOTAL PROJECT COST ESTIMATE = $462,400
TRUSS PORTAL AND SWAY RETROFIT ESTIMATE

Truss Name = CHEHALIS R RIVERSIDE BRIDGE
Truss Bridge Number = 6/123

Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = 12.50 $/LB

Cost Adjustment Factors:
- 10% = Factor to account for gussets & misc. steel
- 10% = Factor if significant heat straightening or repair of other members is anticipated
- 10% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
- 100% = Factor to account for REGION Add-Ons

Input:
- P = Number of Portal Frames
- S = Number of Sway Frames
- W = Bridge Width
- VC = Minimum Vertical Clearance
- EP = Number of End Posts (assume 2 per portal)
- EPH = End Post Height (assume VC + 5')

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</table>

Quantity Calculations:
- Portal beams total pounds of steel = 3,445 LBS
- Sway beams total pounds of steel = 7,155 LBS
- End post total pounds of steel = 3,294 LBS
- Subtotal pounds of steel = 13,894 LBS
- Total pounds including gusset & misc. steel factor = 15,284 LBS

Cost Calculations:
- Cost Estimate for portal and sway retrofit = $191,045
- Cost Estimate for heat straightening and/or additional member retrofit = $19,105
- Sub total = $210,150
- Cost Estimate due to construction difficulty factor = $21,015
- TOTAL Bridge Cost = $231,200
- Cost Estimate for Region Add-on items = $231,200

TOTAL PROJECT COST ESTIMATE = $462,400
**Truss Vertical Clearance Report**

**BRIDGE NAME:** COLUMBIA R @ NORTHPORT BRIDGE  
**BRIDGE NUMBER:** 25/130  
**STRUCTURE ID:** 0003297A  
**REGION:** Eastern  
**YEAR BUILT/WIDENED:** 1948  
**SUFFICIENCY RATING:** 49.96  
**TRUSS BRIDGE LENGTH:** 840 FT  
**AVE DAILY TRAFFIC:** 904  
**AVE DAILY TRUCK TRAFFIC:** 280  
**NUMBER OF LANES:** 2  
**BRIDGE WIDTH (curb to curb):** 24 FT  
**PORTAL/SWAY SPAN WIDTH:** 32 FT  
**MINIMUM VERTICAL CLEARANCE AT CURB:** 14’ 11  
**MINIMUM VERTICAL CLEARANCE AT FOG LINE:** 15’ 03  
**MINIMUM SHOULDER WIDTH:** 00’ 08  
**NUMBER OF PORTAL FRAMES:** 8  
**NUMBER OF SWAY FRAMES:** 27  
**PREVIOUS HIGH LOAD HIT?** YES  
**ADDITIONAL MEMBERS REQUIRING RETROFIT?** YES  

**LOCATION**  
**SR 25**  
**MILEPOST:** 113.9  
**LATITUDE:** 48.92333266  
**LONGITUDE:** -117.777166  

**DETOUR & ROUTE MAX VERTICAL CLEARANCE**  
**FULL BRIDGE CLOSURE ESTIMATED DETOUR:** 99 Miles  
**MAXIMUM VERTICAL CLEARANCE IN ROUTE:** 14’ 11  
**MINIMUM VERTICAL CLEARANCE IN ROUTE:** 14’ 11  

**VERTICAL CLEARANCE INFORMATION**  
<table>
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<tr>
<th>Description</th>
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<tr>
<td>Portal/Sway Span Width</td>
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<td>Minimum Vertical Clearance at Curb</td>
<td>14’ 11</td>
</tr>
<tr>
<td>Minimum Vertical Clearance at FOG Line</td>
<td>15’ 03</td>
</tr>
<tr>
<td>Minimum Shoulder Width</td>
<td>00’ 08</td>
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<tr>
<td>Number of Portal Frames</td>
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</tr>
<tr>
<td>Number of Sway Frames</td>
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<tr>
<td>Previous High Load Hit?</td>
<td>YES</td>
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<tr>
<td>Additional Members Requiring Retrofit?</td>
<td>YES</td>
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</tbody>
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**RECOMMENDATIONS AND COST ESTIMATES**

**RECOMMENDATION:**
1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearance.
2. Heat straighten and/or repair other damaged truss members.

**COST ESTIMATES:** (See page 2 for breakdown)

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost Estimate for Portal and Sway Retrofit</td>
<td>$1,033,141</td>
</tr>
<tr>
<td>Cost Estimate for Additional Member Retrofit</td>
<td>$206,628</td>
</tr>
<tr>
<td>Sub Total</td>
<td>$1,239,770</td>
</tr>
<tr>
<td>Cost Estimate for Difficulty of Construction Factor</td>
<td>$371,931</td>
</tr>
<tr>
<td>Total Bridge Cost</td>
<td>$1,611,800</td>
</tr>
<tr>
<td>Cost Estimate for Region Add-on Items</td>
<td>$1,611,800</td>
</tr>
<tr>
<td>Total Project Cost Estimate</td>
<td>$3,223,600</td>
</tr>
</tbody>
</table>
**TRUSS PORTAL AND SWAY RETROFIT ESTIMATE**

Truss Name = COLUMBIA R @ NORTHPORT BRIDGE  
Truss Bridge Number = 25/130

Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = 12.50 $/LB

Cost Adjustment Factors:
- 10% = Factor to account for gussets & misc. steel
- 20% = Factor if significant heat straightening or repair of other members is anticipated
- 30% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
- 100% = Factor to account for REGION Add-Ons

Input:
- \( P \) = Number of Portal Frames  
- \( S \) = Number of Sway Frames  
- \( W \) = Bridge Width  
- \( VC \) = Minimum Vertical Clearance  
- \( EP \) = Number of End Posts (assume 2 per portal)  
- \( EPH \) = End Post Height (assume \( VC + 5' \))

<table>
<thead>
<tr>
<th>Width</th>
<th>Height</th>
<th>Thick.</th>
<th>#/LF</th>
</tr>
</thead>
<tbody>
<tr>
<td>14.00</td>
<td>16.00</td>
<td>0.3125</td>
<td>63.8</td>
</tr>
<tr>
<td>12.00</td>
<td>1.00</td>
<td>40.8</td>
<td></td>
</tr>
</tbody>
</table>

\[ \text{W12x53} \]

Quantity Calculations:
- Portal beams total pounds of steel = 16,333 LBS
- Sway beams total pounds of steel = 45,792 LBS
- End post total pounds of steel = 13,012 LBS
- Subtotal pounds of steel = 75,138 LBS
- Total pounds including gusset & misc. steel factor = 82,651 LBS

Cost Calculations:
- Cost Estimate for portal and sway retrofit = $1,033,141
- Cost Estimate for heat straightening and/or additional member retrofit = $206,628
- Sub total = $1,239,770
- Cost Estimate due to construction difficulty factor = $371,931
- TOTAL Bridge Cost = $1,611,800
- Cost Estimate for Region Add-on items = $1,611,800

TOTAL PROJECT COST ESTIMATE = $3,223,600
Truss Vertical Clearance Report

BRIDGE NAME: GRAYS RIVER BRIDGE
BRIDGE NUMBER: 4/110
STRUCTURE ID: 0002331A
REGION: Southwest
YEAR BUILT/WIDENED: 1938
SUFFICIENCY RATING: 52.01
TRUSS BRIDGE LENGTH: 220 FT
AVE DAILY TRAFFIC: 1,145
AVE DAILY TRUCK TRAFFIC: 389
NUMBER OF LANES: 2
BRIDGE WIDTH (curb to curb) 24 FT
PORTAL/SWAY SPAN WIDTH 27 FT
MINIMUM VERTICAL CLEARANCE AT CURB: 14' 11
MINIMUM VERTICAL CLEARANCE AT FOG LINE: 15' 07
MINIMUM SHOULDER WIDTH: 01' 05
NUMBER OF PORTAL FRAMES: 2
NUMBER OF SWAY FRAMES: 5
PREVIOUS HIGH LOAD HIT? YES
ADDITIONAL MEMBERS REQUIRING RETROFIT? YES

LOCATION
SR 4
MILEPOST: 19.3
LATITUDE: 46.35910555 LONGITUDE: -123.5666
DETOUR & ROUTE MAX VERTICAL CLEARANCE
FULL BRIDGE CLOSURE ESTIMATED DETOUR: 99 Miles
MAXIMUM VERTICAL CLEARANCE IN ROUTE: 14' 11
MINIMUM VERTICAL CLEARANCE IN ROUTE: 14' 11

RECOMMENDATIONS AND COST ESTIMATES
RECOMMENDATION:
1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearance.
2. Heat straighten and/or repair other damaged truss members.

COST ESTIMATES: (See page 2 for breakdown)

<table>
<thead>
<tr>
<th>COST ESTIMATE FOR PORTAL AND SWAY RETROFIT =</th>
<th>$190,484</th>
</tr>
</thead>
<tbody>
<tr>
<td>COST ESTIMATE FOR ADDITIONAL MEMBER RETROFIT =</td>
<td>$9,524</td>
</tr>
<tr>
<td>SUB TOTAL =</td>
<td>$200,008</td>
</tr>
<tr>
<td>COST ESTIMATE FOR DIFFICULTY OF CONSTRUCTION FACTOR =</td>
<td>$60,002</td>
</tr>
<tr>
<td>TOTAL BRIDGE COST =</td>
<td>$260,100</td>
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<tr>
<td>COST ESTIMATE FOR REGION ADD-ON ITEMS =</td>
<td>$260,100</td>
</tr>
<tr>
<td>TOTAL PROJECT COST ESTIMATE =</td>
<td>$520,200</td>
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</tbody>
</table>
TRUSS PORTAL AND SWAY RETROFIT ESTIMATE

Truss Name = GRAYS RIVER BRIDGE
Truss Bridge Number = 4/110

Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = 12.50 $/LB

Cost Adjustment Factors:
10% = Factor to account for gussets & misc. steel
5% = Factor if significant heat straightening or repair of other members is anticipated
30% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
100% = Factor to account for REGION Add-Ons

Input:

\[
\begin{align*}
P &= \text{Number of Portal Frames} & P &= 2 \quad \text{Each} \\
S &= \text{Number of Sway Frames} & S &= 5 \quad \text{Each} \\
W &= \text{Bridge Width} & W &= 27.00 \quad \text{Ft} \\
VC &= \text{Minimum Vertical Clearance} & VC &= 14.92 \quad \text{Ft} \\
EP &= \text{Number of End Posts (assume 2 per portal)} & EP &= 4 \quad \text{Each} \\
EPH &= \text{End Post Height (assume VC + 5')} & EPH &= 19.92 \quad \text{Ft}
\end{align*}
\]

Quantity Calculations:

\[
\begin{align*}
\text{Portal beams total pounds of steel} &= 3,445 \quad \text{LBS} \\
\text{Sway beams total pounds of steel} &= 7,155 \quad \text{LBS} \\
\text{End post total pounds of steel} &= 3,253 \quad \text{LBS} \\
\text{Subtotal pounds of steel} &= 13,853 \quad \text{LBS} \\
\text{Total pounds including gusset & misc. steel factor} &= 15,239 \quad \text{LBS}
\end{align*}
\]

Cost Calculations:

\[
\begin{align*}
\text{Cost Estimate for portal and sway retrofit} &= $190,484 \\
\text{Cost Estimate for heat straightening and/or additional member retrofit} &= $9,524 \\
\text{Sub total} &= $200,008 \\
\text{Cost Estimate due to construction difficulty factor} &= $60,002 \\
\text{TOTAL Bridge Cost} &= $260,100 \\
\text{Cost Estimate for Region Add-on items} &= $260,100
\end{align*}
\]

TOTAL PROJECT COST ESTIMATE = $520,200
# Truss Vertical Clearance Report

**Bridge and Structures Office**

**11/11/2017**

## BRIDGE NAME:
**SNOQUALMIE RIVER BRIDGE**

### BRIDGE NUMBER:
202/60

### STRUCTURE ID:
0001480A

### REGION:
Northwest

### YEAR BUILT/WIDENED:
1931

### SUFFICIENCY RATING:
46.13

### TRUSS BRIDGE LENGTH:
220 FT

### AVE DAILY TRAFFIC:
8,035

### AVE DAILY TRUCK TRAFFIC:
804

### NUMBER OF LANES:
2

### BRIDGE WIDTH (curb to curb):
24 FT

### PORTAL/SWAY SPAN WIDTH:
27 FT

### MINIMUM VERTICAL CLEARANCE AT CURB:
15' 11"

### MINIMUM VERTICAL CLEARANCE AT FOG LINE:
01' 60"

### MINIMUM SHOULDER WIDTH:
01' 04"

### NUMBER OF PORTAL FRAMES:
2

### NUMBER OF SWAY FRAMES:
8

### PREVIOUS HIGH LOAD HIT?
YES

### ADDITIONAL MEMBERS REQUIRING RETROFIT?
YES

### LOCATION
**SR 202**
MILEPOST: 26
LATITUDE: 47.53942188
LONGITUDE: -121.832685

### DETOUR & ROUTE MAX VERTICAL CLEARANCE
FULL BRIDGE CLOSURE ESTIMATED DETOUR: 6 Miles
MAXIMUM VERTICAL CLEARANCE IN ROUTE: 15' 09"
MINIMUM VERTICAL CLEARANCE IN ROUTE: 15' 10"

### RECOMMENDATIONS AND COST ESTIMATES
**RECOMMENDATION:**
1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearance.
2. Heat straighten and/or repair other damaged truss members.

**COST ESTIMATES:** (See page 2 for breakdown)

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>COST ESTIMATE FOR PORTAL AND SWAY RETROFIT</td>
<td>$251,758</td>
</tr>
<tr>
<td>COST ESTIMATE FOR ADDITIONAL MEMBER RETROFIT</td>
<td>$12,588</td>
</tr>
<tr>
<td>SUB TOTAL</td>
<td>$264,346</td>
</tr>
<tr>
<td>COST ESTIMATE FOR DIFFICULTY OF CONSTRUCTION FACTOR</td>
<td>$39,652</td>
</tr>
<tr>
<td>TOTAL BRIDGE COST</td>
<td>$304,000</td>
</tr>
<tr>
<td>COST ESTIMATE FOR REGION ADD-ON ITEMS</td>
<td>$304,000</td>
</tr>
<tr>
<td>TOTAL PROJECT COST ESTIMATE</td>
<td>$608,000</td>
</tr>
</tbody>
</table>
TRUSS PORTAL AND SWAY RETROFIT ESTIMATE

Truss Name = SNOQUALMIE RIVER BRIDGE
Truss Bridge Number = 202/60

Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = 12.50 $/LB

Cost Adjustment Factors:
- 10% = Factor to account for gussets & misc. steel
- 5% = Factor if significant heat straightening or repair of other members is anticipated
- 15% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
- 100% = Factor to account for REGION Add-Ons

Input:
- P = Number of Portal Frames = 2 Each
- S = Number of Sway Frames = 8 Each
- W = Bridge Width = 27.00 Ft
- VC = Minimum Vertical Clearance = 15.92 Ft
- EP = Number of End Posts (assume 2 per portal) = 4 Each
- EPH = End Post Height (assume VC + 5') = 20.92 Ft

Quantity Calculations:
- Portal beams total pounds of steel = 3,445 LBS
- Sway beams total pounds of steel = 11,448 LBS
- End post total pounds of steel = 3,416 LBS
- Subtotal pounds of steel = 18,310 LBS
- Total pounds including gusset & misc. steel factor = 20,141 LBS

Cost Calculations:
- Cost Estimate for portal and sway retrofit = $251,758
- Cost Estimate for heat straightening and/or additional member retrofit = $12,588
- Sub total = $264,346
- Cost Estimate due to construction difficulty factor = $39,652
- TOTAL Bridge Cost = $304,000
- Cost Estimate for Region Add-on items = $304,000

TOTAL PROJECT COST ESTIMATE = $608,000
APPENDIX B
**APPENDIX B – PRIORITY GROUP 2 TRUSS BRIDGE RETROFIT RECOMMENDATIONS**

<table>
<thead>
<tr>
<th>Bridge Name</th>
<th>Bridge No.</th>
<th>Region</th>
<th>Min. Vert Clear At Curb</th>
<th>Scoping Level Construction Costs</th>
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</thead>
<tbody>
<tr>
<td>Cowlitz River E Bridge</td>
<td>5/203E</td>
<td>Southwest</td>
<td>14’07</td>
<td>$1,201,200.00</td>
</tr>
<tr>
<td>Skookumchuck River Bridge</td>
<td>507/8</td>
<td>Southwest</td>
<td>14’08</td>
<td>$186,400.00</td>
</tr>
<tr>
<td>Spokane River Bridge</td>
<td>25/6</td>
<td>Eastern</td>
<td>14’08</td>
<td>$1,854,400.00</td>
</tr>
<tr>
<td>Snohomish River Bridge 118</td>
<td>9/118</td>
<td>Northwest</td>
<td>14’09</td>
<td>$262,200.00</td>
</tr>
<tr>
<td>Agate Pass Bridge</td>
<td>305/10</td>
<td>Olympic</td>
<td>14’11</td>
<td>$2,594,000.00</td>
</tr>
<tr>
<td>Snake River Clarkston Bridge</td>
<td>12/915</td>
<td>South Central</td>
<td>14’07</td>
<td>$2,303,400.00</td>
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<tr>
<td>John Glick Henry Mem Bridge</td>
<td>2/115A</td>
<td>Northwest</td>
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<td>$460,600.00</td>
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<td>Skagit River Bridge 15</td>
<td>536/15</td>
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<td>15’02</td>
<td>$2,551,600.00</td>
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<td>N FK Nooksack R U S Bridge</td>
<td>9/315</td>
<td>Northwest</td>
<td>15’00</td>
<td>$1,306,800.00</td>
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<tr>
<td>Hiimptuips River Bridge F10</td>
<td>109/10</td>
<td>Olympic</td>
<td>15’00</td>
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<tr>
<td>Snake R Lyons Ferry Bridge</td>
<td>261/125</td>
<td>South Central</td>
<td>14’09</td>
<td>$2,122,200.00</td>
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<tr>
<td>Yakima River Bridge</td>
<td>82/114S</td>
<td>South Central</td>
<td>15’00</td>
<td>$832,400.00</td>
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<tr>
<td>Lewis River Bridge</td>
<td>5/40W</td>
<td>Southwest</td>
<td>15’01</td>
<td>$3,004,600.00</td>
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<tr>
<td>Snohomish River Bridge 10W</td>
<td>529/10W</td>
<td>Northwest</td>
<td>15’01</td>
<td>$5,046,600.00</td>
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<tr>
<td>Skagit River Bridge</td>
<td>9/215</td>
<td>Northwest</td>
<td>15’01</td>
<td>$792,000.00</td>
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<tr>
<td>Naches River Bridge</td>
<td>82/115S</td>
<td>South Central</td>
<td>15’01</td>
<td>$259,800.00</td>
</tr>
<tr>
<td>Chilcoat Bridge</td>
<td>131/15</td>
<td>Southwest</td>
<td>15’01</td>
<td>$481,000.00</td>
</tr>
<tr>
<td>Elochoman River Bridge</td>
<td>4/125</td>
<td>Southwest</td>
<td>15’01</td>
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<tr>
<td>Cowlitz R - P Crawford Bridge</td>
<td>4/230</td>
<td>South Central</td>
<td>15’01</td>
<td>$2,359,400.00</td>
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<tr>
<td>Nisqually River Bridge</td>
<td>7/25</td>
<td>Southwest</td>
<td>15’02</td>
<td>$654,200.00</td>
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<tr>
<td>Kettle River Bridge</td>
<td>21/334</td>
<td>Eastern</td>
<td>15’03</td>
<td>$577,200.00</td>
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<tr>
<td>Chehalis River Bridge</td>
<td>107/4</td>
<td>Olympic</td>
<td>15’02</td>
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</tr>
<tr>
<td>Wishkah River Bridge</td>
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<td>Olympic</td>
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<tr>
<td>Naches River Nelson Bridge</td>
<td>12/328N</td>
<td>South Central</td>
<td>15’07</td>
<td>$704,000.00</td>
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<tr>
<td>Biggs Rapids-Sam Hill Bridge</td>
<td>97/1</td>
<td>South Central</td>
<td>15’07</td>
<td>$759,800.00</td>
</tr>
<tr>
<td>Harry E. Morgan Bridge</td>
<td>432/105</td>
<td>Southwest</td>
<td>15’08</td>
<td>$704,400.00</td>
</tr>
<tr>
<td>Naches River Bridge 115N</td>
<td>82/115N</td>
<td>South Central</td>
<td>15’09</td>
<td>$791,400.00</td>
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<tr>
<td>Columbia R Bridge @ Umatilla</td>
<td>82/280S</td>
<td>South Central</td>
<td>16’00</td>
<td>$3,720,000.00</td>
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<td>Columbia River Bridge Beebe</td>
<td>97/420</td>
<td>North Central</td>
<td>16’01</td>
<td>$1,462,600.00</td>
</tr>
</tbody>
</table>
**Truss Vertical Clearance Report**

**Bridge and Structures Office**

**BRIDGE NAME:** COWLITZ RIVER E BRIDGE

**BRIDGE NUMBER:** 5/203E

**STRUCTURE ID:** 0004367A

**REGION:** Southwest

**YEAR BUILT/WIDENED:** 1953

**SUFFICIENCY RATING:** 73.19

**TRUSS BRIDGE LENGTH:** 480 FT

**AVE DAILY TRAFFIC:** 22,119

**AVE DAILY TRUCK TRAFFIC:** 4424

**NUMBER OF LANES:** 2

**BRIDGE WIDTH (curb to curb):** 32 FT

**PORTAL/SWAY SPAN WIDTH:** 36 FT

**MINIMUM VERTICAL CLEARANCE AT CURB:** 14' 07

**MINIMUM VERTICAL CLEARANCE AT FOG LINE:** 15' 08

**MINIMUM SHOULDER WIDTH:** 02' 01

**NUMBER OF PORTAL FRAMES:** 4

**NUMBER OF SWAY FRAMES:** 10

**PREVIOUS HIGH LOAD HIT?** YES

**ADDITIONAL MEMBERS REQUIRING RETROFIT?** NO

**LOCATION**

SR 5

MILEPOST: 59.06

LATITUDE: 46.41288333

LONGITUDE: -122.889847

**DETOUR & ROUTE MAX VERTICAL CLEARANCE**

FULL BRIDGE CLOSURE ESTIMATED DETOUR: 1 Miles

MAXIMUM VERTICAL CLEARANCE IN ROUTE: 17' 01

MINIMUM VERTICAL CLEARANCE IN ROUTE: 14' 07

**RECOMMENDATIONS AND COST ESTIMATES**

**RECOMMENDATION:**

1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearance.
2. Heat straighten and/or repair other damaged truss members.

**COST ESTIMATES:** (See page 2 for breakdown)

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>COST ESTIMATE FOR PORTAL AND SWAY RETROFIT</td>
<td>$476,640</td>
</tr>
<tr>
<td>COST ESTIMATE FOR ADDITIONAL MEMBER RETROFIT</td>
<td>$23,832</td>
</tr>
<tr>
<td>SUB TOTAL</td>
<td>$500,472</td>
</tr>
<tr>
<td>COST ESTIMATE FOR DIFFICULTY OF CONSTRUCTION FACTOR</td>
<td>$100,094</td>
</tr>
<tr>
<td>TOTAL BRIDGE COST</td>
<td>$600,600</td>
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<tr>
<td>COST ESTIMATE FOR REGION ADD-ON ITEMS</td>
<td>$600,600</td>
</tr>
<tr>
<td>TOTAL PROJECT COST ESTIMATE</td>
<td>$1,201,200</td>
</tr>
</tbody>
</table>
## TRUSS PORTAL AND SWAY RETROFIT ESTIMATE

**Truss Name:** COWLITZ RIVER E BRIDGE  
**Truss Bridge Number:** 5/203E

### Assumptions:

1. Existing portal beams will be removed and replaced with built-up box section.  
2. Existing end posts will be strengthened with added plates.  
3. Existing sway beams will be removed and replaced with rolled I-beam section.  
4. Existing diagonal bracing will remain and will be cut to fit.  
5. Existing gusset plates will be replaced at connections.  
6. Cost is based on the total pounds of steel at = **12.50 $/LB**

### Cost Adjustment Factors:

- **10%** = Factor to account for gussets & misc. steel  
- **5%** = Factor if significant heat straightening or repair of other members is anticipated  
- **20%** = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes  
- **100%** = Factor to account for REGION Add-Ons

### Input:

- **P** = Number of Portal Frames  
- **S** = Number of Sway Frames  
- **W** = Bridge Width  
- **VC** = Minimum Vertical Clearance  
- **EP** = Number of End Posts (assume 2 per portal)  
- **EPH** = End Post Height (assume VC + 5')

### Assumed plate sections (in):

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<thead>
<tr>
<th>Width</th>
<th>Height</th>
<th>Thick.</th>
<th>#/LF</th>
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</thead>
<tbody>
<tr>
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<td>16.00</td>
<td>0.3125</td>
<td>63.8</td>
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<tr>
<td>12.00</td>
<td>1.00</td>
<td>40.8</td>
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</table>

<table>
<thead>
<tr>
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<tr>
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<th>#/LF</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Quantity Calculations:

- Portal beams total pounds of steel = 9,188 LBS  
- Sway beams total pounds of steel = 19,080 LBS  
- End post total pounds of steel = 6,397 LBS  
- Subtotal pounds of steel = 34,665 LBS  
- Total pounds including gusset & misc. steel factor = 38,131 LBS

### Cost Calculations:

- Cost Estimate for portal and sway retrofit = **$476,640**  
- Cost Estimate for heat straightening and/or additional member retrofit = **$23,832**  
- Sub total = **$500,472**  
- Cost Estimate due to construction difficulty factor = **$100,094**  
- **TOTAL Bridge Cost = $600,600**

- Cost Estimate for Region Add-on items = **$600,600**

### TOTAL PROJECT COST ESTIMATE = **$1,201,200**
Truss Vertical Clearance Report

BRIDGE NAME: SKOOKUMCHUCK RIVER BRIDGE
BRIDGE NUMBER: 507/8
STRUCTURE ID: 000000HV
REGION: Southwest
YEAR BUILT/WIDENED: 1928
SUFFICIENCY RATING: 36.45
TRUSS BRIDGE LENGTH: 150 FT
AVE DAILY TRAFFIC: 8,374
AVE DAILY TRUCK TRAFFIC: 502
NUMBER OF LANES: 2
BRIDGE WIDTH (curb to curb) 20 FT
PORTAL/SWAY SPAN WIDTH 23 FT
MINIMUM VERTICAL CLEARANCE AT CURB: 14' 08
MINIMUM VERTICAL CLEARANCE AT FOG LINE: 14' 08
MINIMUM SHOULDER WIDTH: 00' 09
NUMBER OF PORTAL FRAMES: 2
NUMBER OF SWAY FRAMES: 0
PREVIOUS HIGH LOAD HIT? YES
ADDITIONAL MEMBERS REQUIRING RETROFIT? YES

VERTICAL CLEARANCE INFORMATION

RECOMMENDATIONS AND COST ESTIMATES

RECOMMENDATION:
1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearnance.
2. Heat straighten and/or repair other damaged truss members.

COST ESTIMATES: (See page 2 for breakdown)

- COST ESTIMATE FOR PORTAL AND SWAY RETROFIT = $84,523
- COST ESTIMATE FOR ADDITIONAL MEMBER RETROFIT = $4,226

TOTAL BRIDGE COST = $93,200
TOTAL PROJECT COST ESTIMATE = $186,400
TRUSS PORTAL AND SWAY RETROFIT ESTIMATE

Truss Name = SKOOKUMCHUCK RIVER BRIDGE
Truss Bridge Number = 507/8

Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = 12.50 $/LB

Cost Adjustment Factors:
- 10% = Factor to account for gussets & misc. steel
- 5% = Factor if significant heat straightening or repair of other members is anticipated
- 5% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
- 100% = Factor to account for REGION Add-Ons

Input:

<table>
<thead>
<tr>
<th>P = Number of Portal Frames</th>
<th>S = Number of Sway Frames</th>
<th>W = Bridge Width</th>
<th>VC = Minimum Vertical Clearance</th>
<th>EP = Number of End Posts (assume 2 per portal)</th>
<th>EPH = End Post Height (assume VC + 5')</th>
</tr>
</thead>
<tbody>
<tr>
<td>Each</td>
<td>Each</td>
<td>Ft</td>
<td>Ft</td>
<td>Each</td>
<td>Ft</td>
</tr>
</tbody>
</table>

Assumed plate sections (in)

<table>
<thead>
<tr>
<th>Width</th>
<th>Height</th>
<th>Thick.</th>
<th>#/LF</th>
</tr>
</thead>
<tbody>
<tr>
<td>14.00</td>
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<td>0.3125</td>
<td>63.8</td>
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<tr>
<td>12.00</td>
<td>1.00</td>
<td>40.8</td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>W12x53</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>53</td>
</tr>
</tbody>
</table>

Quantity Calculations:

| Portal beams total pounds of steel | 2,935 LBS |
| Sway beams total pounds of steel  | 0 LBS     |
| End post total pounds of steel   | 3,212 LBS |
| Subtotal pounds of steel         | 6,147 LBS |
| Total pounds including gusset & misc. steel factor | 6,762 LBS |

Cost Calculations:

| Cost Estimate for portal and sway retrofit | $84,523 |
| Cost Estimate for heat straightening and/or additional member retrofit | $4,226 |
| Sub total | $88,749 |
| Cost Estimate due to construction difficulty factor | $4,437 |
| TOTAL Bridge Cost | $93,200 |
| Cost Estimate for Region Add-on items | $93,200 |

TOTAL PROJECT COST ESTIMATE = $186,400
**Truss Vertical Clearance Report**

**Bridge and Structures Office**  
11/11/2017

**Bridge Name:** Spokane River Bridge  
**Bridge Number:** 25/6  
**Structure ID:** 0002658A  
**Region:** Eastern  
**Year Built/Widened:** 1941  
**Sufficiency Rating:** 47.67  
**Truss Bridge Length:** 757 FT  
**Ave Daily Traffic:** 727  
**Ave Daily Truck Traffic:** 167  
**Number of Lanes:** 2  
**Bridge Width (curb to curb):** 24 FT  
**Portal/Sway Span Width:** 28 FT  
**Minimum Vertical Clearance at Curbs:** 14' 08"  
**Minimum Vertical Clearance at Fog Line:** 15' 03"  
**Minimum Shoulder Width:** 01' 00"  
**Number of Portal Frames:** 8  
**Number of Sway Frames:** 15  
**Previous High Load Hit?** Yes  
**Additional Members Requiring Retrofit?** No

**Vertical Clearance Information**  
- **Bridge Width (curb to curb):** 24 FT  
- **Portal/Sway Span Width:** 28 FT  
- **Minimum Vertical Clearance at Curbs:** 14' 08"  
- **Minimum Vertical Clearance at Fog Line:** 15' 03"  
- **Minimum Shoulder Width:** 01' 00"  
- **Number of Portal Frames:** 8  
- **Number of Sway Frames:** 15  
- **Previous High Load Hit?** Yes  
- **Additional Members Requiring Retrofit?** No

**Recommendations and Cost Estimates**

**Recommendation:**
1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearance.  
2. Heat straighten and/or repair other damaged truss members.

**Cost Estimates:** (See page 2 for breakdown)

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost Estimate for Portal and Sway Retrofit</td>
<td>$679,258</td>
</tr>
<tr>
<td>Cost Estimate for Additional Member Retrofit</td>
<td>$33,963</td>
</tr>
<tr>
<td>Sub Total</td>
<td>$713,221</td>
</tr>
<tr>
<td>Cost Estimate for Difficulty of Construction Factor</td>
<td>$213,966</td>
</tr>
<tr>
<td>Total Bridge Cost</td>
<td>$927,200</td>
</tr>
<tr>
<td>Cost Estimate for Region Add-On Items</td>
<td>$927,200</td>
</tr>
<tr>
<td>Total Project Cost Estimate</td>
<td>$1,854,400</td>
</tr>
</tbody>
</table>

**Location**
- **SR 25 Milepost:** 23.35  
- **Latitude:** 47.90810277  
- **Longitude:** -118.317366

**Detour & Route Max Vertical Clearance**

- **Full Bridge Closure Estimated Detour:** 99 Miles  
- **Maximum Vertical Clearance in Route:** 14' 08"  
- **Minimum Vertical Clearance in Route:** 14' 08"
TRUSS PORTAL AND SWAY RETROFIT ESTIMATE

Truss Name = SPOKANE RIVER BRIDGE
Truss Bridge Number = 25/6

Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = 12.50 $/LB

Cost Adjustment Factors:
- 10% = Factor to account for gussets & misc. steel
- 5% = Factor if significant heat straightening or repair of other members is anticipated
- 30% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
- 100% = Factor to account for REGION Add-Ons

Input:
- P = Number of Portal Frames
- S = Number of Sway Frames
- W = Bridge Width
- VC = Minimum Vertical Clearance
- EP = Number of End Posts (assume 2 per portal)
- EPH = End Post Height (assume VC + 5')

P = 8 Each
S = 15 Each
W = 28.00 Ft
VC = 14.67 Ft
EP = 16 Each
EPH = 19.67 Ft

Quantity Calculations:
- Portal beams total pounds of steel = 14,292 LBS
- Sway beams total pounds of steel = 22,260 LBS
- End post total pounds of steel = 12,849 LBS
- Subtotal pounds of steel = 49,401 LBS
- Total pounds including gusset & misc. steel factor = 54,341 LBS

Cost Calculations:
- Cost Estimate for portal and sway retrofit = $679,258
- Cost Estimate for heat straightening and/or additional member retrofit = $33,963
- Sub total = $713,221
- Cost Estimate due to construction difficulty factor = $213,966
- TOTAL Bridge Cost = $927,200
- Cost Estimate for Region Add-on items = $927,200

TOTAL PROJECT COST ESTIMATE = $1,854,400
## TRUSS VERTICAL CLEARANCE REPORT

**Bridge Name:** Snohomish River Bridge 118  
**Bridge Number:** 9/118  
**Structure ID:** 0005727A  
**Region:** Northwest  
**Year Built/Widened:** 1959  
**Sufficiency Rating:** 53.25  
**Truss Bridge Length:** 300 FT  
**Ave Daily Traffic:** 22,861  
**Ave Daily Truck Traffic:** 1829  
**Number of Lanes:** 2  
**Bridge Width (curb to curb):** 29 FT  
**Portal/Sway Span Width:** 34 FT  
**Minimum Vertical Clearance at Curb:** 14' 09  
**Minimum Vertical Clearance at Fog Line:** 15' 04  
**Minimum Shoulder Width:** 02' 00  
**Number of Portal Frames:** 2  
**Number of Sway Frames:** 0  
**Previous High Load Hit?:** YES  
**Additional Members Requiring Retrofit?:** YES  

### Vertical Clearance Information

<table>
<thead>
<tr>
<th>Bridge Width (curb to curb)</th>
<th>29 FT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portal/Sway Span Width</td>
<td>34 FT</td>
</tr>
<tr>
<td>Minimum Vertical Clearance at Curb</td>
<td>14' 09</td>
</tr>
<tr>
<td>Minimum Vertical Clearance at Fog Line</td>
<td>15' 04</td>
</tr>
<tr>
<td>Minimum Shoulder Width</td>
<td>02' 00</td>
</tr>
<tr>
<td>Number of Portal Frames</td>
<td>2</td>
</tr>
<tr>
<td>Number of Sway Frames</td>
<td>0</td>
</tr>
<tr>
<td>Previous High Load Hit?</td>
<td>YES</td>
</tr>
<tr>
<td>Additional Members Requiring Retrofit?</td>
<td>YES</td>
</tr>
</tbody>
</table>

### Recommendations and Cost Estimates

**Recommendation:**
1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearance.  
2. Heat straighten and/or repair other damaged truss members.

**Cost Estimates:** (See page 2 for breakdown)

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost Estimate for Portal and Sway Retrofit</td>
<td>$104,010</td>
</tr>
<tr>
<td>Cost Estimate for Additional Member Retrofit</td>
<td>$5,201</td>
</tr>
<tr>
<td>Sub Total</td>
<td>$109,211</td>
</tr>
<tr>
<td>Cost Estimate for Difficulty of Construction Factor</td>
<td>$21,842</td>
</tr>
<tr>
<td>Total Bridge Cost</td>
<td>$131,050</td>
</tr>
<tr>
<td>Cost Estimate for Region Add-on Items</td>
<td>$131,050</td>
</tr>
</tbody>
</table>

**Total Project Cost Estimate:** $262,200
## TRUSS PORTAL AND SWAY RETROFIT ESTIMATE

**Truss Name:** Snohomish River Bridge 118

**Truss Bridge Number:** 9/118

### Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = $12.50/LB

### Cost Adjustment Factors:
- 10% = Factor to account for gussets & misc. steel
- 5% = Factor if significant heat straightening or repair of other members is anticipated
- 20% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
- 100% = Factor to account for REGION Add-Ons

### Input:
- **P** = Number of Portal Frames
- **S** = Number of Sway Frames
- **W** = Bridge Width
- **VC** = Minimum Vertical Clearance
- **EP** = Number of End Posts (assume 2 per portal)
- **EPH** = End Post Height (assume VC + 5')

### Quantity Calculations:
- Portal beams total pounds of steel = 4,339 LBS
- Sway beams total pounds of steel = 0 LBS
- End post total pounds of steel = 3,226 LBS
- Subtotal pounds of steel = 7,564 LBS
- Total pounds including gusset & misc. steel factor = 8,321 LBS

### Cost Calculations:
- Cost Estimate for portal and sway retrofit = $104,010
- Cost Estimate for heat straightening and/or additional member retrofit = $5,201
- Sub total = $109,211
- Cost Estimate due to construction difficulty factor = $21,842
- **TOTAL Bridge Cost** = $131,100
- Cost Estimate for Region Add-on items = $131,100

---

**TOTAL PROJECT COST ESTIMATE = $262,200**
Truss Vertical Clearance Report

BRIDGE NAME: AGATE PASS BRIDGE
BRIDGE NUMBER: 305/10
STRUCTURE ID: 0003573A
REGION: Olympic
YEAR BUILT/WIDENED: 1950
AVERAGE DAILY TRAFFIC: 20,873
AVERAGE DAILY TRUCK TRAFFIC: 1461
NUMBER OF LANES: 2
BRIDGE WIDTH (curb to curb): 26 FT
PORTAL/SWAY SPAN WIDTH: 32 FT
MINIMUM VERTICAL CLEARANCE AT CURB: 14' 11
MINIMUM VERTICAL CLEARANCE AT FOG LINE: 15' 00
MINIMUM SHOULDER WIDTH: 01' 04
NUMBER OF PORTAL FRAMES: 4
NUMBER OF SWAY FRAMES: 27
PREVIOUS HIGH LOAD HIT?: YES
ADDITIONAL MEMBERS REQUIRING RETROFIT?: YES

RECOMMENDATIONS AND COST ESTIMATES

RECOMMENDATION:
1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearance.
2. Heat straighten and/or repair other damaged truss members.

COST ESTIMATES: (See page 2 for breakdown)

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>COST ESTIMATE FOR PORTAL AND SWAY RETROFIT</td>
<td>$831,391</td>
</tr>
<tr>
<td>COST ESTIMATE FOR ADDITIONAL MEMBER RETROFIT</td>
<td>$166,278</td>
</tr>
<tr>
<td>SUB TOTAL</td>
<td>$997,669</td>
</tr>
<tr>
<td>COST ESTIMATE FOR DIFFICULTY OF CONSTRUCTION FACTOR</td>
<td>$299,301</td>
</tr>
<tr>
<td>TOTAL BRIDGE COST</td>
<td>$1,297,000</td>
</tr>
<tr>
<td>COST ESTIMATE FOR REGION ADD-ON ITEMS</td>
<td>$1,297,000</td>
</tr>
<tr>
<td>TOTAL PROJECT COST ESTIMATE</td>
<td>$2,594,000</td>
</tr>
</tbody>
</table>

Reported to FHWA

LOCATION
SR 305
MILEPOST: 6.82
LATITUDE: 47.71152777
LONGITUDE: -122.563825
DETOUR & ROUTE MAX VERTICAL CLEARANCE
FULL BRIDGE CLOSURE ESTIMATED DETOUR: 99 Miles
MAXIMUM VERTICAL CLEARANCE IN ROUTE: 15' 00
MINIMUM VERTICAL CLEARANCE IN ROUTE: 14' 11

Bridge Width
Minimum Vertical Clearance (Typ) Bridge Portal or Sway (Typ)
TRUSS PORTAL AND SWAY RETROFIT ESTIMATE
Truss Name = AGATE PASS BRIDGE
Truss Bridge Number = 305/10

Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = 12.50 $/LB

Cost Adjustment Factors:
10% = Factor to account for gussets & misc. steel
20% = Factor if significant heat straightening or repair of other members is anticipated
30% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
100% = Factor to account for REGION Add-Ons

Input:
P = Number of Portal Frames
S = Number of Sway Frames
W = Bridge Width
VC = Minimum Vertical Clearance
EP = Number of End Posts (assume 2 per portal)
EPH = End Post Height (assume VC + 5')

P = 4 Each
S = 27 Each
W = 32.00 Ft
VC = 14.92 Ft
EP = 8 Each
EPH = 19.92 Ft

Quantity Calculations:
Portal beams total pounds of steel = 8,167 LBS
Sway beams total pounds of steel = 45,792 LBS
End post total pounds of steel = 6,506 LBS
Subtotal pounds of steel = 60,465 LBS
Total pounds including gusset & misc. steel factor = 66,511 LBS

Cost Calculations:
Cost Estimate for portal and sway retrofit = $831,391
Cost Estimate for heat straightening and/or additional member retrofit = $166,278
Sub total = $997,669
Cost Estimate due to construction difficulty factor = $299,301
TOTAL Bridge Cost = $1,297,000
Cost Estimate for Region Add-on items = $1,297,000

TOTAL PROJECT COST ESTIMATE = $2,594,000
BRIDGE NAME: SNAKE RIVER CLARKSTON BRIDGE
BRIDGE NUMBER: 12/915
STRUCTURE ID: 0002348A
REGION: South Central
YEAR BUILT/WIDENED: 1939
SUFFICIENCY RATING: 57.35
TRUSS BRIDGE LENGTH: 240 FT
AVERAGE DAILY TRAFFIC: 20,000
AVERAGE DAILY TRUCK TRAFFIC: 400
NUMBER OF LANES: 4
BRIDGE WIDTH (curb to curb): 40 FT
PORTAL/SWAY SPAN WIDTH: 27 FT
MINIMUM VERTICAL CLEARANCE AT CURB: 14’ 07
MINIMUM VERTICAL CLEARANCE AT FOG LINE: 14’ 07
MINIMUM SHOULDER WIDTH: 00’ 00
NUMBER OF PORTAL FRAMES: 4
NUMBER OF SWAY FRAMES: 17
PREVIOUS HIGH LOAD HIT?: NO
ADDITIONAL MEMBERS REQUIRING RETROFIT?: NO
MINIMUM VERTICAL CLEARANCE IN ROUTE: 14’ 07
MAXIMUM VERTICAL CLEARANCE IN ROUTE: 17’ 05

RECOMMENDATIONS AND COST ESTIMATES

RECOMMENDATION:
1. Retrofit bridge by raising portals and sways to 16’-06” minimum vertical clearnance.
2. Heat straighten and/or repair other damaged truss members.
3. Address mechanical/electrical issues related to raising sways and portals on lift spans.

COST ESTIMATES: (See page 2 for breakdown)

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost estimate for Portal and Sway retrofit</td>
<td>$517,204</td>
</tr>
<tr>
<td>Cost estimate for additional member retrofit</td>
<td>$25,860</td>
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<tr>
<td>Sub total</td>
<td>$543,064</td>
</tr>
<tr>
<td>Cost estimate for difficulty of construction factor</td>
<td>$108,613</td>
</tr>
<tr>
<td>Total bridge cost</td>
<td>$1,151,700</td>
</tr>
<tr>
<td>Cost estimate for region add-on items</td>
<td>$1,151,700</td>
</tr>
<tr>
<td>Total project cost estimate</td>
<td>$2,303,400</td>
</tr>
</tbody>
</table>

LOCATION
SR 12
MILEPOST: 434.1
LATITUDE: 46.42029655
LONGITUDE: -117.0381
DETOUR & ROUTE MAX VERTICAL CLEARANCE
FULL BRIDGE CLOSURE ESTIMATED DETOUR: 2 Miles
MAXIMUM VERTICAL CLEARANCE IN ROUTE: 17’ 05
MINIMUM VERTICAL CLEARANCE IN ROUTE: 14’ 07

Reported to FHWA
11/11/2017
PRIORITY RATING
2
TRUSS PORTAL AND SWAY RETROFIT ESTIMATE

Truss Name = SNAKE RIVER CLARKSTON BRIDGE
Truss Bridge Number = 12/915

Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = 12.50 $/LB

Cost Adjustment Factors:
10% = Factor to account for gussets & misc. steel
5% = Factor if significant heat straightening or repair of other members is anticipated
20% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
100% = Factor to account for REGION Add-Ons

Input:
P = Number of Portal Frames
S = Number of Sway Frames
W = Bridge Width
VC = Minimum Vertical Clearance
EP = Number of End Posts (assume 2 per portal)
EPH = End Post Height (assume VC + 5')

Quantity Calculations:
Portal beams total pounds of steel = 6,891 LBS
Sway beams total pounds of steel = 24,327 LBS
End post total pounds of steel = 6,397 LBS
Subtotal pounds of steel = 37,615 LBS
Total pounds including gusset & misc. steel factor = 41,376 LBS

Cost Calculations:
Cost Estimate for portal and sway retrofit = $517,204
Cost Estimate for heat straightening and/or additional member retrofit = $25,860
Sub total = $543,064
Cost Estimate due to construction difficulty factor = $108,613
TOTAL Bridge Cost = $1,151,700
Cost Estimate for Region Add-on items = $1,151,700

TOTAL PROJECT COST ESTIMATE = $2,303,400

Assumed plate sections (in)

<table>
<thead>
<tr>
<th>Width</th>
<th>Height</th>
<th>Thick,</th>
<th>#/LF</th>
</tr>
</thead>
<tbody>
<tr>
<td>14.00</td>
<td>16.00</td>
<td>0.3125</td>
<td>63.8</td>
</tr>
<tr>
<td>12.00</td>
<td>1.00</td>
<td>40.8</td>
<td></td>
</tr>
</tbody>
</table>

W12x53 = 53

Additional costs:
Mech/elec. for lift span = $500,000
**TRUSS VERTICAL CLEARANCE REPORT**

**BRIDGE NAME:** JOHN GLICK HENRY MEM BRIDGE

**BRIDGE NUMBER:** 2/115A

**STRUCTURE ID:** 0002397A

**REGION:** Northwest

**YEAR BUILT/WIDENED:** 1939

**SUFFICIENCY RATING:** 68.1

**TRUSS BRIDGE LENGTH:** 220 FT

**AVE DAILY TRAFFIC:** 1,160

**AVE DAILY TRUCK TRAFFIC:** 58

**NUMBER OF LANES:** 2

**BRIDGE WIDTH (curb to curb):** 24 FT

**PORTAL/SWAY SPAN WIDTH:** 27 FT

**MINIMUM VERTICAL CLEARANCE AT CURB:** 15' 00

**MINIMUM VERTICAL CLEARANCE AT FOG LINE:** 15' 08

**MINIMUM SHOULDER WIDTH:** 01' 05

**NUMBER OF PORTAL FRAMES:** 2

**NUMBER OF SWAY FRAMES:** 5

**PREVIOUS HIGH LOAD HIT?** NO

**ADDITIONAL MEMBERS REQUIRING RETROFIT?** NO

**RECOMMENDATIONS AND COST ESTIMATES**

**RECOMMENDATION:**
1. Retrofit bridge by raising portals and sways to 16’-06” minimum vertical clearance.
2. Heat straighten and/or repair other damaged truss members.

**COST ESTIMATES:** (See page 2 for breakdown)

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>COST ESTIMATE FOR PORTAL AND SWAY RETROFIT</td>
<td>$190,671</td>
</tr>
<tr>
<td>COST ESTIMATE FOR ADDITIONAL MEMBER RETROFIT</td>
<td>$9,534</td>
</tr>
<tr>
<td>SUB TOTAL</td>
<td>$200,205</td>
</tr>
<tr>
<td>COST ESTIMATE FOR DIFFICULTY OF CONSTRUCTION FACTOR</td>
<td>$30,031</td>
</tr>
<tr>
<td>TOTAL BRIDGE COST</td>
<td>$230,300</td>
</tr>
<tr>
<td>COST ESTIMATE FOR REGION ADD-ON ITEMS</td>
<td>$230,300</td>
</tr>
<tr>
<td>TOTAL PROJECT COST ESTIMATE</td>
<td>$460,600</td>
</tr>
</tbody>
</table>
TRUSS PORTAL AND SWAY RETROFIT ESTIMATE

Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = $12.50 /LB

Cost Adjustment Factors:
- 10% = Factor to account for gussets & misc. steel
- 5% = Factor if significant heat straightening or repair of other members is anticipated
- 15% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
- 100% = Factor to account for REGION Add-Ons

Input:
- P = Number of Portal Frames
- S = Number of Sway Frames
- W = Bridge Width
- VC = Minimum Vertical Clearance
- EP = Number of End Posts (assume 2 per portal)
- EPH = End Post Height (assume VC + 5’)

P = 2 Each
S = 5 Each
W = 27.00 Ft
VC = 15.00 Ft
EP = 4 Each
EPH = 20.00 Ft

Quantity Calculations:
- Portal beams total pounds of steel = 3,445 LBS
- Sway beams total pounds of steel = 7,155 LBS
- End post total pounds of steel = 3,267 LBS
- Subtotal pounds of steel = 13,867 LBS
- Total pounds including gusset & misc. steel factor = 15,254 LBS

Cost Calculations:
- Cost Estimate for portal and sway retrofit = $190,671
- Cost Estimate for heat straightening and/or additional member retrofit = $9,534
- Sub total = $200,205
- Cost Estimate due to construction difficulty factor = $30,031
- TOTAL Bridge Cost = $230,300
- Cost Estimate for Region Add-on items = $230,300

TOTAL PROJECT COST ESTIMATE = $460,600
TRUSS VERTICAL CLEARANCE REPORT

BRIDGE NAME: SKAGIT RIVER BRIDGE 15
BRIDGE NUMBER: 536/15
STRUCTURE ID: 0004400A
REGION: Northwest
YEAR BUILT/WIDENED: 1953
SUFFICIENCY RATING: 57.2
TRUSS BRIDGE LENGTH: 448 FT
AVE DAILY TRAFFIC: 19,045
AVE DAILY TRUCK TRAFFIC: 1524
NUMBER OF LANES: 2
BRIDGE WIDTH (curb to curb): 28 FT
PORTAL/SWAY SPAN WIDTH: 36 FT
MINIMUM VERTICAL CLEARANCE AT CURB: 15' 02
MINIMUM VERTICAL CLEARANCE AT FOG LINE: 15' 11
MINIMUM SHOULDER WIDTH: 02' 07
NUMBER OF PORTAL FRAMES: 6
NUMBER OF SWAY FRAMES: 10
PREVIOUS HIGH LOAD HIT?: YES
ADDITIONAL MEMBERS REQUIRING RETROFIT?: YES

RECOMMENDATIONS AND COST ESTIMATES

RECOMMENDATION:
1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearance.
2. Heat straighten and/or repair other damaged truss members.

COST ESTIMATES: (See page 2 for breakdown)

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>COST ESTIMATE FOR PORTAL AND SWAY RETROFIT</td>
<td>$587,715</td>
</tr>
<tr>
<td>COST ESTIMATE FOR ADDITIONAL MEMBER RETROFIT</td>
<td>$58,772</td>
</tr>
<tr>
<td>SUB TOTAL</td>
<td>$646,487</td>
</tr>
<tr>
<td>COST ESTIMATE FOR DIFFICULTY OF CONSTRUCTION FACTOR</td>
<td>$129,297</td>
</tr>
<tr>
<td>TOTAL BRIDGE COST</td>
<td>$1,275,800</td>
</tr>
<tr>
<td>COST ESTIMATE FOR REGION ADD-ON ITEMS</td>
<td>$1,275,800</td>
</tr>
<tr>
<td>TOTAL PROJECT COST ESTIMATE</td>
<td>$2,551,600</td>
</tr>
</tbody>
</table>
TRUSS PORTAL AND SWAY RETROFIT ESTIMATE

Truss Name = Snohomish River Bridge
Truss Bridge Number = 529/10E

Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = 12.50 $/LB

Cost Adjustment Factors:

<table>
<thead>
<tr>
<th>Factor</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>10%</td>
<td>Factor to account for gussets &amp; misc. steel</td>
</tr>
<tr>
<td>10%</td>
<td>Factor if significant heat straightening or repair of other members is anticipated</td>
</tr>
<tr>
<td>20%</td>
<td>Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes</td>
</tr>
<tr>
<td>100%</td>
<td>Factor to account for REGION Add-Ons</td>
</tr>
</tbody>
</table>

Input:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Portal Frames (P)</td>
<td>6 Each</td>
</tr>
<tr>
<td>Number of Sway Frames (S)</td>
<td>10 Each</td>
</tr>
<tr>
<td>Bridge Width (W)</td>
<td>36.00 Ft</td>
</tr>
<tr>
<td>Minimum Vertical Clearance (VC)</td>
<td>15.17 Ft</td>
</tr>
<tr>
<td>Number of End Posts (EP)</td>
<td>12 Each</td>
</tr>
<tr>
<td>End Post Height (EPH) (assume VC + 5')</td>
<td>20.17 Ft</td>
</tr>
</tbody>
</table>

Quantity Calculations:

<table>
<thead>
<tr>
<th>Calculation</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portal beams total pounds of steel</td>
<td>13,781 LBS</td>
</tr>
<tr>
<td>Sway beams total pounds of steel</td>
<td>19,080 LBS</td>
</tr>
<tr>
<td>End post total pounds of steel</td>
<td>9,882 LBS</td>
</tr>
<tr>
<td>Subtotal pounds of steel</td>
<td>42,743 LBS</td>
</tr>
<tr>
<td>Total pounds including gusset &amp; misc. steel factor</td>
<td>47,017 LBS</td>
</tr>
</tbody>
</table>

Cost Calculations:

<table>
<thead>
<tr>
<th>Calculation</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost Estimate for portal and sway retrofit</td>
<td>$587,715</td>
</tr>
<tr>
<td>Cost Estimate for heat straightening and/or additional member retrofit</td>
<td>$58,772</td>
</tr>
<tr>
<td>Sub total</td>
<td>$646,487</td>
</tr>
<tr>
<td>Cost Estimate due to construction difficulty factor</td>
<td>$129,297</td>
</tr>
<tr>
<td>TOTAL Bridge Cost</td>
<td>$1,275,800</td>
</tr>
<tr>
<td>Cost Estimate for Region Add-on items</td>
<td>$1,275,800</td>
</tr>
</tbody>
</table>

TOTAL PROJECT COST ESTIMATE = $2,551,600

<table>
<thead>
<tr>
<th>Additional Costs:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raise control house</td>
</tr>
</tbody>
</table>
**Truss Vertical Clearance Report**

**Bridge and Structures Office**

11/11/2017

---

**BRIDGE NAME:** N FK NOOKSACK R US BRIDGE

**BRIDGE NUMBER:** 9/315

**STRUCTURE ID:** 0004542A

**REGION:** Northwest

**YEAR BUILT/WIDENED:** 1954

**SUFCIENCY RATING:** 53.3

**TRUSS BRIDGE LENGTH:** 320 FT

**AVE DAILY TRAFFIC:** 3,788

**AVE DAILY TRUCK TRAFFIC:** 682

**NUMBER OF LANES:** 2

**BRIDGE WIDTH (curb to curb):** 26 FT

**PORTAL/SWAY SPAN WIDTH:** 34 FT

**MINIMUM VERTICAL CLEARANCE AT CURB:** 15’ 00

**MINIMUM VERTICAL CLEARANCE AT FOG LINE:** 15’ 05

**MINIMUM SHOULDER WIDTH:** 01’ 09

**NUMBER OF PORTAL FRAMES:** 4

**NUMBER OF SWAY FRAMES:** 10

**PREVIOUS HIGH LOAD HIT?** YES

**ADDITIONAL MEMBERS REQUIRING RETROFIT?** YES

---

**VERTICAL CLEARANCE INFORMATION**

<table>
<thead>
<tr>
<th>Location</th>
<th>Bridge Width</th>
<th>Bridge Portal or Sway (Typ)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**RECOMMENDATIONS AND COST ESTIMATES**

**RECOMMENDATION:**

1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearance.
2. Heat straighten and/or repair other damaged truss members.

**COST ESTIMATES:** (See page 2 for breakdown)

- **COST ESTIMATE FOR PORTAL AND SWAY RETROFIT =** $456,918
- **COST ESTIMATE FOR ADDITIONAL MEMBER RETROFIT =** $45,692

**SUB TOTAL =** $502,610

- **COST ESTIMATE FOR DIFFICULTY OF CONSTRUCTION FACTOR =** $150,783

**TOTAL BRIDGE COST =** $653,400

- **COST ESTIMATE FOR REGION ADD-ON ITEMS =** $653,400

**TOTAL PROJECT COST ESTIMATE =** $1,306,800

---

**LOCATION**

<table>
<thead>
<tr>
<th>SR 9</th>
<th>MILEPOST: 78.87</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LATITUDE: 48.80877777</td>
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</tbody>
</table>

**DETOUR & ROUTE MAX VERTICAL CLEARANCE**

- **FULL BRIDGE CLOSURE ESTIMATED DETOUR:** 43 Miles
- **MAXIMUM VERTICAL CLEARANCE IN ROUTE:** 15’ 01
- **MINIMUM VERTICAL CLEARANCE IN ROUTE:** 15’ 00

---

Reported to FHWA

**Priority Rating:** 2

---

**VERTICAL CLEARANCE INFORMATION**

<table>
<thead>
<tr>
<th>Location</th>
<th>Bridge Width</th>
<th>Bridge Portal or Sway (Typ)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**RECOMMENDATION:**

1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearance.
2. Heat straighten and/or repair other damaged truss members.

**COST ESTIMATES:** (See page 2 for breakdown)

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- **COST ESTIMATE FOR REGION ADD-ON ITEMS =** $653,400

**TOTAL PROJECT COST ESTIMATE =** $1,306,800

---

Reported to FHWA

**Priority Rating:** 2

---

**VERTICAL CLEARANCE INFORMATION**

<table>
<thead>
<tr>
<th>Location</th>
<th>Bridge Width</th>
<th>Bridge Portal or Sway (Typ)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
TRUSS PORTAL AND SWAY RETROFIT ESTIMATE

Truss Name = NFK.NOOKSACK R US BRIDGE
Truss Bridge Number = 9/315

Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = 12.50 $/LB

Cost Adjustment Factors:
- 10% = Factor to account for gussets & misc. steel
- 10% = Factor if significant heat straightening or repair of other members is anticipated
- 30% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
- 100% = Factor to account for REGION Add-Ons

Input:
- \( P = \) Number of Portal Frames
- \( S = \) Number of Sway Frames
- \( W = \) Bridge Width
- \( VC = \) Minimum Vertical Clearance
- \( EP = \) Number of End Posts (assume 2 per portal)
- \( EPH = \) End Post Height (assume \( VC + 5' \))

\[
\begin{array}{|c|c|c|c|}
\hline
\text{Width} & \text{Height} & \text{Thick.} & \text{#/LF} \\
\hline
14.00 & 16.00 & 0.3125 & 63.8 \\
12.00 & 1.00 & 40.8 & \\
\hline
\end{array}
\]

Assumed plate sections (in):
- W12x53

Quantity Calculations:
- Portal beams total pounds of steel = 8,677 LBS
- Sway beams total pounds of steel = 18,020 LBS
- End post total pounds of steel = 6,533 LBS
- Subtotal pounds of steel = 33,230 LBS
- Total pounds including gusset & misc. steel factor = 36,553 LBS

Cost Calculations:
- Cost Estimate for portal and sway retrofit = $456,918
- Cost Estimate for heat straightening and/or additional member retrofit = $45,692
- Sub total = $502,610
- Cost Estimate due to construction difficulty factor = $150,783
- TOTAL Bridge Cost = $653,400
- Cost Estimate for Region Add-on items = $653,400

TOTAL PROJECT COST ESTIMATE = $1,306,800
Truss Vertical Clearance Report

**BRIDGE NAME:** HUMPTULIPS RIVER BRIDGE 10

**BRIDGE NUMBER:** 109/10

**STRUCTURE ID:** 0004874B

**REGION:** Olympic

**YEAR BUILT/WIDENED:** 1956

**SUFFICIENCY RATING:** 48.97

**TRUSS BRIDGE LENGTH:** 240 FT

**AVE DAILY TRAFFIC:** 5,213

**AVE DAILY TRUCK TRAFFIC:** 521

**NUMBER OF LANES:** 2

**BRIDGE WIDTH (curb to curb):** 26 FT

**PORTAL/SWAY SPAN WIDTH:** 34 FT

**MINIMUM VERTICAL CLEARANCE AT CURB:** 15' 00

**MINIMUM VERTICAL CLEARANCE AT FOG LINE:** 15' 03

**MINIMUM SHOULDER WIDTH:** 01' 03

**NUMBER OF PORTAL FRAMES:** 2

**NUMBER OF SWAY FRAMES:** 5

**PREVIOUS HIGH LOAD HIT?** YES

**ADDITIONAL MEMBERS REQUIRING RETROFIT?** NO

**LOCATION**

**SR 109**

**MILEPOST:** 10.24

**LATITUDE:** 47.05083333

**LONGITUDE:** -124.042416

**DETOUR & ROUTE MAX VERTICAL CLEARANCE**

**FULL BRIDGE CLOSURE ESTIMATED DETOUR:** 20 Miles

**MAXIMUM VERTICAL CLEARANCE IN ROUTE:** 15' 04

**MINIMUM VERTICAL CLEARANCE IN ROUTE:** 15' 00

**RECOMMENDATIONS AND COST ESTIMATES**

**RECOMMENDATION:**

1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearance.

2. Heat straighten and/or repair other damaged truss members.

**COST ESTIMATES:** (See page 2 for breakdown)

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>COST ESTIMATE FOR PORTAL AND SWAY RETROFIT</td>
<td>$228,459</td>
</tr>
<tr>
<td>COST ESTIMATE FOR ADDITIONAL MEMBER RETROFIT</td>
<td>$11,423</td>
</tr>
<tr>
<td>SUB TOTAL</td>
<td>$239,882</td>
</tr>
<tr>
<td>COST ESTIMATE FOR DIFFICULTY OF CONSTRUCTION FACTOR</td>
<td>$47,976</td>
</tr>
<tr>
<td>TOTAL BRIDGE COST</td>
<td>$287,900</td>
</tr>
<tr>
<td>COST ESTIMATE FOR REGION ADD-ON ITEMS</td>
<td>$287,900</td>
</tr>
<tr>
<td>TOTAL PROJECT COST ESTIMATE</td>
<td>$575,800</td>
</tr>
</tbody>
</table>
TRUSS PORTAL AND SWAY RETROFIT ESTIMATE

**Truss Name:** HUMPTULIPS RIVER BRIDGE 10

**Truss Bridge Number:** 109/10

**Assumptions:**
1. Existing portal beams will be removed and replaced with built-up box section 14.00 16.00 0.3125 63.8
2. Existing end posts will be strengthened with added plates 12.00 1.00 40.8
3. Existing sway beams will be removed and replaced with rolled I-beam section 53
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = 12.50 $/LB

**Cost Adjustment Factors:**
- 10% = Factor to account for gussets & misc. steel
- 5% = Factor if significant heat straightening or repair of other members is anticipated
- 20% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
- 100% = Factor to account for REGION Add-Ons

**Input:**
- **P = Number of Portal Frames**
- **S = Number of Sway Frames**
- **W = Bridge Width**
- **VC = Minimum Vertical Clearance**
- **EP = Number of End Posts (assume 2 per portal)**
- **EPH = End Post Height (assume VC + 5')**

<table>
<thead>
<tr>
<th>Width</th>
<th>Height</th>
<th>Thick.</th>
<th>#/LF</th>
</tr>
</thead>
<tbody>
<tr>
<td>14.00</td>
<td>16.00</td>
<td>0.3125</td>
<td>63.8</td>
</tr>
<tr>
<td>12.00</td>
<td>1.00</td>
<td>40.8</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Assumed plate sections (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>W12x53 53</td>
</tr>
</tbody>
</table>

**Quantity Calculations:**
- Portal beams total pounds of steel = 4,339 LBS
- Sway beams total pounds of steel = 9,010 LBS
- End post total pounds of steel = 3,267 LBS
- Subtotal pounds of steel = 16,615 LBS
- Total pounds including gusset & misc. steel factor = 18,277 LBS

**Cost Calculations:**
- Cost Estimate for portal and sway retrofit = $228,459
- Cost Estimate for heat straightening and/or additional member retrofit = $11,423
- Sub total = $239,882
- Cost Estimate due to construction difficulty factor = $47,976
- **TOTAL Bridge Cost = $287,900**
- Cost Estimate for Region Add-on items = $287,900

**TOTAL PROJECT COST ESTIMATE = $575,800**
Truss Vertical Clearance Report

BRIDGE NAME: SNAKE R. Lyons Ferry Bridge
BRIDGE NUMBER: 261/125
STRUCTURE ID: 0008390A
REGION: South Central
YEAR BUILT/WIDENED: 1927
SUFFICIENCY RATING: 67.5
TRUSS BRIDGE LENGTH: 960 FT
AVE DAILY TRAFFIC: 359
AVE DAILY TRUCK TRAFFIC: 57
NUMBER OF LANES: 2

VERTICAL CLEARANCE INFORMATION
BRIDGE WIDTH (curb to curb) 20 FT
PORTAL/SWAY SPAN WIDTH 23 FT
MINIMUM VERTICAL CLEARANCE AT CURB: 14' 09
MINIMUM VERTICAL CLEARANCE AT FOG LINE: 15' 01
MINIMUM SHOULDER WIDTH: 00' 03
NUMBER OF PORTAL FRAMES: 10
NUMBER OF SWAY FRAMES: 19
PREVIOUS HIGH LOAD HIT? YES
ADDITIONAL MEMBERS REQUIRING RETROFIT? YES

LOCATION
SR 261 MILEPOST: 14.8
LATITUDE: 46.58976911 LONGITUDE: -118.219405

RECOMMENDATIONS AND COST ESTIMATES
RECOMMENDATION:
1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearance.
2. Heat straighten and/or repair other damaged truss members.

COST ESTIMATES: (See page 2 for breakdown)
- COST ESTIMATE FOR PORTAL AND SWAY RETROFIT = $742,014
- COST ESTIMATE FOR ADDITIONAL MEMBER RETROFIT = $74,201
- SUB TOTAL = $816,215
- COST ESTIMATE FOR DIFFICULTY OF CONSTRUCTION FACTOR = $244,865
- TOTAL BRIDGE COST = $1,061,100
- COST ESTIMATE FOR REGION ADD-ON ITEMS = $1,061,100
- TOTAL PROJECT COST ESTIMATE = $2,122,200

Reported to FHWA 11/11/2017

PRIORITY RATING 2
Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at $12.50/LB

Cost Adjustment Factors:
- 10% = Factor to account for gussets & misc. steel
- 10% = Factor if significant heat straightening or repair of other members is anticipated
- 30% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
- 100% = Factor to account for REGION Add-Ons

Input:
- \( P = \text{Number of Portal Frames} \) = 10 Each
- \( S = \text{Number of Sway Frames} \) = 19 Each
- \( W = \text{Bridge Width} \) = 23.00 Ft
- \( VC = \text{Minimum Vertical Clearance} \) = 14.75 Ft
- \( EP = \text{Number of End Posts (assume 2 per portal)} \) = 20 Each
- \( EPH = \text{End Post Height (assume VC + 5')} \) = 19.75 Ft

Quantity Calculations:
- Portal beams total pounds of steel = 14,674 LBS
- Sway beams total pounds of steel = 23,161 LBS
- End post total pounds of steel = 16,129 LBS
- Subtotal pounds of steel = 53,965 LBS
- Total pounds including gusset & misc. steel factor = 59,361 LBS

Cost Calculations:
- Cost Estimate for portal and sway retrofit = $742,014
- Cost Estimate for heat straightening and/or additional member retrofit = $74,201
- Sub total = $816,215
- Cost Estimate due to construction difficulty factor = $244,865
- TOTAL Bridge Cost = $1,061,100
- Cost Estimate for Region Add-on items = $1,061,100

TOTAL PROJECT COST ESTIMATE = $2,122,200
Truss Vertical Clearance Report

**BRIDGE NAME:** YAKIMA RIVER BRIDGE  
**BRIDGE NUMBER:** 82/114S  
**STRUCTURE ID:** 0006123B  
**REGION:** South Central  
**YEAR BUILT/WIDENED:** 1960  
**SUFFICIENCY RATING:** 69.69  
**TRUSS BRIDGE LENGTH:** 285 FT  
**AVE DAILY TRAFFIC:** 10,493  
**AVE DAILY TRUCK TRAFFIC:** 2623  
**NUMBER OF LANES:** 3  
**BRIDGE WIDTH (curb to curb):** 40 FT  
**PORTAL/SWAY SPAN WIDTH:** 46 FT  
**MINIMUM VERTICAL CLEARANCE AT CURB:** 15' 00  
**MINIMUM VERTICAL CLEARANCE AT FOG LINE:** 15' 10  
**MINIMUM SHOULDER WIDTH:** 02' 00  
**NUMBER OF PORTAL FRAMES:** 2  
**NUMBER OF SWAY FRAMES:** 7  
**PREVIOUS HIGH LOAD HIT?** YES  
**ADDITIONAL MEMBERS REQUIRING RETROFIT?** YES

**VERTICAL CLEARANCE INFORMATION**

<table>
<thead>
<tr>
<th>Bridge Width (curb to curb)</th>
<th>40 FT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portal/Sway Span Width</td>
<td>46 FT</td>
</tr>
<tr>
<td>Minimum Vertical Clearance at Curb</td>
<td>15' 00</td>
</tr>
<tr>
<td>Minimum Vertical Clearance at Fog Line</td>
<td>15' 10</td>
</tr>
<tr>
<td>Minimum Shoulder Width</td>
<td>02' 00</td>
</tr>
<tr>
<td>Number of Portal Frames</td>
<td>2</td>
</tr>
<tr>
<td>Number of Sway Frames</td>
<td>7</td>
</tr>
<tr>
<td>Previous High Load Hit?</td>
<td>YES</td>
</tr>
<tr>
<td>Additional Members Requiring Retrofit?</td>
<td>YES</td>
</tr>
</tbody>
</table>

**RECOMMENDATIONS AND COST ESTIMATES**

**RECOMMENDATION:**

1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearance.  
2. Heat straighten and/or repair other damaged truss members.

**COST ESTIMATES:** (See page 2 for breakdown)

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost Estimate for Portal and Sway Retrofit</td>
<td>$360,284</td>
</tr>
<tr>
<td>Cost Estimate for Additional Member Retrofit</td>
<td>$18,014</td>
</tr>
<tr>
<td>Sub Total</td>
<td>$378,298</td>
</tr>
<tr>
<td>Cost Estimate for Difficulty of Construction Factor</td>
<td>$37,830</td>
</tr>
<tr>
<td>Total Bridge Cost</td>
<td>$416,200</td>
</tr>
<tr>
<td>Cost Estimate for Region Add-On Items</td>
<td>$416,200</td>
</tr>
<tr>
<td>Total Project Cost Estimate</td>
<td>$832,400</td>
</tr>
</tbody>
</table>

**LOCATION**

<table>
<thead>
<tr>
<th>SR 82</th>
</tr>
</thead>
<tbody>
<tr>
<td>MILEPOST: 30.77</td>
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<tr>
<td>LATITUDE: 46.63140211</td>
</tr>
<tr>
<td>LONGITUDE: -120.518024</td>
</tr>
</tbody>
</table>

**DETOUR & ROUTE MAX VERTICAL CLEARANCE**

| Full Bridge Closure Estimated Detour: | 1 Miles |
| Maximum Vertical Clearance in Route: | 17' 09 |
| Minimum Vertical Clearance in Route: | 15' 00 |

Reported to FHWA

Bridge and Structures Office  
11/11/2017
**TRUSS PORTAL AND SWAY RETROFIT ESTIMATE**

**Truss Name =** YAKIMA RIVER BRIDGE

**Truss Bridge Number =** 82/114S

### Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = **12.50 $/LB**

### Cost Adjustment Factors:
- 10% = Factor to account for gussets & misc. steel
- 5% = Factor if significant heat straightening or repair of other members is anticipated
- 10% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
- 100% = Factor to account for REGION Add-Ons

### Input:
- \( P = \text{Number of Portal Frames} \)
- \( P = 2 \) Each
- \( S = \text{Number of Sway Frames} \)
- \( S = 7 \) Each
- \( W = \text{Bridge Width} \)
- \( W = 46.00 \) Ft
- \( VC = \text{Minimum Vertical Clearance} \)
- \( VC = 15.00 \) Ft
- \( EP = \text{Number of End Posts (assume 2 per portal)} \)
- \( EP = 4 \) Each
- \( EPH = \text{End Post Height (assume VC + 5')} \)
- \( EPH = 20.00 \) Ft

### Quantity Calculations:
- Portal beams total pounds of steel = 5,870 LBS
- Sway beams total pounds of steel = 17,066 LBS
- End post total pounds of steel = 3,267 LBS
- Subtotal pounds of steel = 26,202 LBS
- Total pounds including gusset & misc. steel factor = 28,823 LBS

### Cost Calculations:
- Cost Estimate for portal and sway retrofit = **$360,284**
- Cost Estimate for heat straightening and/or additional member retrofit = **$18,014**
- Sub total = **$378,298**
- Cost Estimate due to construction difficulty factor = **$37,830**
- TOTAL Bridge Cost = **$416,200**
- Cost Estimate for Region Add-on items = **$416,200**

**TOTAL PROJECT COST ESTIMATE =** **$832,400**
# Truss Vertical Clearance Report

**Bridge and Structures Office**

**11/11/2017**

---

## Bridge Information

<table>
<thead>
<tr>
<th>BRIDGE NAME:</th>
<th>LEWIS RIVER BRIDGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>BRIDGE NUMBER:</td>
<td>5/40W</td>
</tr>
<tr>
<td>STRUCTURE ID:</td>
<td>0002559A</td>
</tr>
<tr>
<td>REGION:</td>
<td>Southwest</td>
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<tr>
<td>YEAR BUILT/WIDENED:</td>
<td>1940</td>
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<tr>
<td>SUFFICIENCY RATING:</td>
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<tr>
<td>TRUSS BRIDGE LENGTH:</td>
<td>810 FT</td>
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<tr>
<td>AVE DAILY TRAFFIC:</td>
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<td>AVE DAILY TRUCK TRAFFIC:</td>
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<tr>
<td>NUMBER OF LANES:</td>
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## Vertical Clearance Information

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<table>
<thead>
<tr>
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<tbody>
<tr>
<td>BRIDGE WIDTH (curb to curb)</td>
<td>48 FT</td>
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<tr>
<td>PORTAL/SWAY SPAN WIDTH</td>
<td>51 FT</td>
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<tr>
<td>MINIMUM VERTICAL CLEARANCE AT CURB:</td>
<td>15' 01&quot;</td>
</tr>
<tr>
<td>MINIMUM VERTICAL CLEARANCE AT FOG LINE:</td>
<td>16' 09&quot;</td>
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<tr>
<td>MINIMUM SHOULDER WIDTH:</td>
<td>05' 06&quot;</td>
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<tr>
<td>NUMBER OF PORTAL FRAMES:</td>
<td>2</td>
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<td>NUMBER OF SWAY FRAMES:</td>
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<tr>
<td>PREVIOUS HIGH LOAD HIT?</td>
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</tr>
<tr>
<td>ADDITIONAL MEMBERS REQUIRING RETROFIT?</td>
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---

## Recommendations and Cost Estimates

**RECOMMENDATION:**

1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearance.
2. Heat straighten and/or repair other damaged truss members.

**COST ESTIMATES:** (See page 2 for breakdown)

- **COST ESTIMATE FOR PORTAL AND SWAY RETROFIT** = $1,138,075
- **COST ESTIMATE FOR ADDITIONAL MEMBER RETROFIT** = $113,807
- **SUB TOTAL** = $1,251,882
- **COST ESTIMATE FOR DIFFICULTY OF CONSTRUCTION FACTOR** = $250,376
- **TOTAL BRIDGE COST** = $1,502,300
- **COST ESTIMATE FOR REGION ADD-ON ITEMS** = $1,502,300
- **TOTAL PROJECT COST ESTIMATE** = $3,004,600

---

**Location**

- **SR 5**
- **MILEPOST:** 19.83
- **LATITUDE:** 45.88873577
- **LONGITUDE:** -122.732633

**DETOUR & ROUTE MAX VERTICAL CLEARANCE**

- **FULL BRIDGE CLOSURE ESTIMATED DETOUR:** 1 Miles
- **MAXIMUM VERTICAL CLEARANCE IN ROUTE:** Unknown
- **MINIMUM VERTICAL CLEARANCE IN ROUTE:** Unknown

---

**Reported to FHWA**
TRUSS PORTAL AND SWAY RETROFIT ESTIMATE

Truss Name = LEWIS RIVER BRIDGE
Truss Bridge Number = 5/40W

Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = 12.50 $/LB

Cost Adjustment Factors:
- 10% = Factor to account for gussets & misc. steel
- 10% = Factor if significant heat straightening or repair of other members is anticipated
- 20% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
- 100% = Factor to account for REGION Add-Ons

Input:
- P = Number of Portal Frames
- S = Number of Sway Frames
- W = Bridge Width
- VC = Minimum Vertical Clearance
- EP = Number of End Posts (assume 2 per portal)
- EPH = End Post Height (assume VC + 5')

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</table>

Quantity Calculations:
- Portal beams total pounds of steel = 6,508 LBS
- Sway beams total pounds of steel = 72,981 LBS
- End post total pounds of steel = 3,280 LBS
- Subtotal pounds of steel = 82,769 LBS
- Total pounds including gusset & misc. steel factor = 91,046 LBS

Cost Calculations:
- Cost Estimate for portal and sway retrofit = $1,138,075
- Cost Estimate for heat straightening and/or additional member retrofit = $113,807
- Sub total = $1,251,882
- Cost Estimate due to construction difficulty factor = $250,376
- TOTAL Bridge Cost = $1,502,300
- Cost Estimate for Region Add-on items = $1,502,300

TOTAL PROJECT COST ESTIMATE = $3,004,600
Truss Vertical Clearance Report

Bridge and Structures Office

BRIDGE NAME: SNOHOMISH RIVER BRIDGE 10W
BRIDGE NUMBER: 529/10W
STRUCTURE ID: 0004331A
REGION: Northwest
YEAR BUILT/WIDENED: 1954
SUFFICIENCY RATING: 56.4
TRUSS BRIDGE LENGTH: 981 FT
AVE DAILY TRAFFIC: 15,527
AVE DAILY TRUCK TRAFFIC: 1397
NUMBER OF LANES: 2
BRIDGE WIDTH (curb to curb): 28 FT
PORTAL/SWAY SPAN WIDTH: 36 FT
MINIMUM VERTICAL CLEARANCE AT CURB: 15' 01
MINIMUM VERTICAL CLEARANCE AT FOG LINE: 15' 09
MINIMUM SHOULDER WIDTH: 02' 00
NUMBER OF PORTAL FRAMES: 12
NUMBER OF SWAY FRAMES: 25
PREVIOUS HIGH LOAD HIT?: YES
ADDITIONAL MEMBERS REQUIRING RETROFIT?: YES

VERTICAL CLEARANCE INFORMATION

LOCATION
SR 529  MILEPOST: 3.85
LATITUDE: 48.01266666  LONGITUDE: -122.189305

DETOUR & ROUTE MAX VERTICAL CLEARANCE
FULL BRIDGE CLOSURE ESTIMATED DETOUR: 1 Miles
MAXIMUM VERTICAL CLEARANCE IN ROUTE: Unknown
MINIMUM VERTICAL CLEARANCE IN ROUTE: Unknown

RECOMMENDATIONS AND COST ESTIMATES

RECOMMENDATION:
1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearance.
2. Heat straighten and/or repair other damaged truss members.
3. Raise control house and lift beams and perform any necessary mech/elec modifications.

COST ESTIMATES: (See page 2 for breakdown)

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost Estimate</th>
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<tr>
<td>COST ESTIMATE FOR PORTAL AND SWAY RETROFIT</td>
<td>$1,305,482</td>
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<tr>
<td>COST ESTIMATE FOR ADDITIONAL MEMBER RETROFIT</td>
<td>$130,548</td>
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<tr>
<td>SUB TOTAL</td>
<td>$1,436,031</td>
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<tr>
<td>COST ESTIMATE FOR DIFFICULTY OF CONSTRUCTION FACTOR</td>
<td>$287,206</td>
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<tr>
<td>TOTAL BRIDGE COST</td>
<td>$2,523,300</td>
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<tr>
<td>COST ESTIMATE FOR REGION ADD-ON ITEMS</td>
<td>$2,523,300</td>
</tr>
<tr>
<td>TOTAL PROJECT COST ESTIMATE</td>
<td>$5,046,600</td>
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</tbody>
</table>
TRUSS PORTAL AND SWAY RETROFIT ESTIMATE

Truss Name = SNOHOMISH RIVER BRIDGE 10W
Truss Bridge Number = 529/10W

Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = 12.50 $/LB

Cost Adjustment Factors:
- 10% = Factor to account for gussets & misc. steel
- 10% = Factor if significant heat straightening or repair of other members is anticipated
- 20% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
- 100% = Factor to account for REGION Add-Ons

Input:
- P = Number of Portal Frames = 12 Each
- S = Number of Sway Frames = 25 Each
- W = Bridge Width = 36.00 Ft
- VC = Minimum Vertical Clearance = 15.08 Ft
- EP = Number of End Posts (assume 2 per portal) = 24 Each
- EPH = End Post Height (assume VC + 5') = 20.08 Ft

Quantity Calculations:
- Portal beams total pounds of steel = 27,563 LBS
- Sway beams total pounds of steel = 47,700 LBS
- End post total pounds of steel = 19,682 LBS
- Subtotal pounds of steel = 94,944 LBS
- Total pounds including gusset & misc. steel factor = 104,439 LBS

Cost Calculations:
- Cost Estimate for portal and sway retrofit = $1,305,482
- Cost Estimate for heat straightening and/or additional member retrofit = $130,548
- Sub total = $1,436,031
- Cost Estimate due to construction difficulty factor = $287,206
- TOTAL Bridge Cost = $2,523,300
- Cost Estimate for Region Add-on items = $2,523,300

TOTAL PROJECT COST ESTIMATE = $5,046,600

Additional costs:
- Raise control house = $500,000
- Raise lifting girders (2) = $300,000

Assumed plate sections (in)

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**BRIDGE NAME:** SKAGIT RIVER BRIDGE

**BRIDGE NUMBER:** 9/215

**STRUCTURE ID:** 0005773A

**REGION:** Northwest

**YEAR BUILT/WIDENED:** 1959

**SUFFICIENCY RATING:** 43.21

**TRUSS BRIDGE LENGTH:** 700 FT

**AVE DAILY TRAFFIC:** 9,746

**AVE DAILY TRUCK TRAFFIC:** 975

**NUMBER OF LAGES:** 2

**BRIDGE WIDTH (curb to curb):** 28 FT

**PORTAL/SWAY SPAN WIDTH:** 34 FT

**MINIMUM VERTICAL CLEARANCE AT CURB:** 15' 01

**MINIMUM VERTICAL CLEARANCE AT FOG LINE:** 15' 07

**MINIMUM SHOULDER WIDTH:** 01' 07

**NUMBER OF PORTAL FRAMES:** 6

**NUMBER OF SWAY FRAMES:** 0

**PREVIOUS HIGH LOAD HIT?** YES

**ADDITIONAL MEMBERS REQUIRING RETROFIT?** YES

### Vertical Clearance Information

- **Bridge Width (curb to curb):** 28 FT
- **Portal/Sway Span Width:** 34 FT
- **Minimum Vertical Clearance at Curbs:** 15' 01
- **Minimum Vertical Clearance at Fog Line:** 15' 07
- **Minimum Shoulder Width:** 01' 07
- **Number of Portal Frames:** 6
- **Number of Sway Frames:** 0
- **Previous High Load Hit?** YES
- **Additional Members Requiring Retrofit?** YES

### Recommendations and Cost Estimates

**Recommendation:**

1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearance.
2. Heat straighten and/or repair other damaged truss members.

**Cost Estimates:** (See page 2 for breakdown)

- **Cost Estimate for Portal and Sway Retrofit:** $314,276
- **Cost Estimate for Additional Member Retrofit:** $15,714
- **Sub Total:** $329,990
- **Cost Estimate for Difficulty of Construction Factor:** $65,998
- **Total Bridge Cost:** $396,000
- **Cost Estimate for Region Add-On Items:** $396,000
- **Total Project Cost Estimate:** $792,000

---

**Bridge Width**

---

**Minimum Vertical Clearance (Typ) Bridge Portal or Sway (Typ)**

---

**Location**

- **SR 9 Milepost:** 54.38
- **Latitude:** 48.4835274
- **Longitude:** -122.243

**Detour & Route Max Vertical Clearance**

- **Full Bridge Closure Estimated Detour:** 21 Miles
- **Maximum Vertical Clearance in Route:** 15' 08
- **Minimum Vertical Clearance in Route:** 15' 01
TRUSS PORTAL AND SWAY RETROFIT ESTIMATE

Truss Name = SKAGIT RIVER BRIDGE
Truss Bridge Number = 9/215

Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = 12.50 $/LB

Cost Adjustment Factors:
- 10% = Factor to account for gussets & misc. steel
- 5% = Factor if significant heat straightening or repair of other members is anticipated
- 20% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
- 100% = Factor to account for REGION Add-Ons

Input:
- P = Number of Portal Frames
- S = Number of Sway Frames
- W = Bridge Width
- VC = Minimum Vertical Clearance
- EP = Number of End Posts (assume 2 per portal)
- EPH = End Post Height (assume VC + 5')

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<th>#:/LF</th>
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</thead>
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<tr>
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<td>0.3125</td>
<td>63.8</td>
</tr>
<tr>
<td>12.00</td>
<td>1.00</td>
<td>40.8</td>
<td></td>
</tr>
</tbody>
</table>

Assumed plate sections (in)
- W12x53 53

Quantity Calculations:
- Portal beams total pounds of steel = 13,016 LBS
- Sway beams total pounds of steel = 0 LBS
- End post total pounds of steel = 9,841 LBS
- Subtotal pounds of steel = 22,856 LBS
- Total pounds including gusset & misc. steel factor = 25,142 LBS

Cost Calculations:
- Cost Estimate for portal and sway retrofit = $314,276
- Cost Estimate for heat straightening and/or additional member retrofit = $15,714
- Sub total = $329,990
- Cost Estimate due to construction difficulty factor = $65,998
- TOTAL Bridge Cost = $396,000
- Cost Estimate for Region Add-on items = $396,000

TOTAL PROJECT COST ESTIMATE = $792,000
**Truss Vertical Clearance Report**

**BRIDGE NAME:** NACHES RIVER BRIDGE  
**BRIDGE NUMBER:** 82/115S  
**STRUCTURE ID:** 0006123C  
**REGION:** South Central  
**YEAR BUILT/WIDENED:** 1960  
**SUFFICIENCY RATING:** 68.33  
**TRUSS BRIDGE LENGTH:** 280 FT  
**AVE DAILY TRAFFIC:** 21,451  
**AVE DAILY TRUCK TRAFFIC:** 3003  
**NUMBER OF LANES:** 3  

**VERTICAL CLEARANCE INFORMATION**  
| Bridge Width (curb to curb) | 40 FT |  
| Portal/Sway Span Width | 46 FT |  
| Minimum Vertical Clearance at Curbs | 15' 01 | Reported to FHWA  
| Minimum Vertical Clearance at Fog Line | 15' 11 |  
| Minimum Shoulder Width | 02' 00 |  
| Number of Portal Frames | 2 |  
| Number of Sway Frames | 0 |  
| Previous High Load Hit? | NO |  
| Additional Members Requiring Retrofit? | NO |  

**RECOMMENDATIONS AND COST ESTIMATES**  
1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearance.  
2. Heat straighten and/or repair other damaged truss members.  

**COST ESTIMATES:** (See page 2 for breakdown)  
- **COST ESTIMATE FOR PORTAL AND SWAY RETROFIT =** $125,813  
- **COST ESTIMATE FOR ADDITIONAL MEMBER RETROFIT =** $6,291  
- **SUB TOTAL =** $132,104  
- **COST ESTIMATE FOR DIFFICULTY OF CONSTRUCTION FACTOR =** $13,210  
- **TOTAL BRIDGE COST =** $145,400  
- **COST ESTIMATE FOR REGION ADD-ON ITEMS =** $145,400  
- **TOTAL PROJECT COST ESTIMATE =** $290,800  

**LOCATION**  
- **SR 82**  
- **MILEPOST:** 30.9  
- **LATITUDE:** 46.63004933  
- **LONGITUDE:** -120.516033  

**DETOUR & ROUTE MAX VERTICAL CLEARANCE**  
- FULL BRIDGE CLOSURE ESTIMATED DETOUR: 1 Miles  
- MAXIMUM VERTICAL CLEARANCE IN ROUTE: 17' 11  
- MINIMUM VERTICAL CLEARANCE IN ROUTE: 15' 01
TRUSS PORTAL AND SWAY RETROFIT ESTIMATE

Truss Name = NACHES RIVER BRIDGE
Truss Bridge Number = 82/115S

Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = 12.50 $/LB

Cost Adjustment Factors:
- 10% = Factor to account for gussets & misc. steel
- 5% = Factor if significant heat straightening or repair of other members is anticipated
- 10% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
- 100% = Factor to account for REGION Add-Ons

Input:
- P = Number of Portal Frames
  - P = 2 Each
- S = Number of Sway Frames
  - S = 0 Each
- W = Bridge Width
  - W = 46.00 Ft
- VC = Minimum Vertical Clearance
  - VC = 15.08 Ft
- EP = Number of End Posts (assume 2 per portal)
  - EP = 4 Each
- EPH = End Post Height (assume VC + 5')
  - EPH = 20.08 Ft

Quantity Calculations:
- Portal beams total pounds of steel = 5,870 LBS
- Sway beams total pounds of steel = 0 LBS
- End post total pounds of steel = 3,280 LBS
- Subtotal pounds of steel = 9,150 LBS
- Total pounds including gusset & misc. steel factor = 10,065 LBS

Cost Calculations:
- Cost Estimate for portal and sway retrofit = $125,813
- Cost Estimate for heat straightening and/or additional member retrofit = $6,291
- Sub total = $132,104
- Cost Estimate due to construction difficulty factor = $13,210
- TOTAL Bridge Cost = $145,400
- Cost Estimate for Region Add-on items = $145,400

TOTAL PROJECT COST ESTIMATE = $290,800
Truss Vertical Clearance Report

BRIDGE NAME: CHILCOAT BRIDGE
BRIDGE NUMBER: 131/15
STRUCTURE ID: 08214800
REGION: Southwest
YEAR BUILT/WIDENED: 1949
SUFFICIENCY RATING: 68.01
TRUSS BRIDGE LENGTH: 220 FT
AVE DAILY TRAFFIC: 1,511
AVE DAILY TRUCK TRAFFIC: 196
NUMBER OF LANES: 2
BRIDGE WIDTH (curb to curb) 24 FT
PORTAL/SWAY SPAN WIDTH 27 FT
MINIMUM VERTICAL CLEARANCE AT CURB: 15' 01
MINIMUM VERTICAL CLEARANCE AT FOG LINE: 15' 07
MINIMUM SHOULDER WIDTH: 02' 00
NUMBER OF PORTAL FRAMES: 2
NUMBER OF SWAY FRAMES: 5
PREVIOUS HIGH LOAD HIT? YES
ADDITIONAL MEMBERS REQUIRING RETROFIT? YES

VERTICAL CLEARANCE INFORMATION

LOCATION
SR 131
MILEPOST: 1.82
LATITUDE: 46.53186044 LONGITUDE: -121.95775

DETOUR & ROUTE MAX VERTICAL CLEARANCE
FULL BRIDGE CLOSURE ESTIMATED DETOUR: 19 Miles
MAXIMUM VERTICAL CLEARANCE IN ROUTE: 15' 10
MINIMUM VERTICAL CLEARANCE IN ROUTE: 15' 01

RECOMMENDATIONS AND COST ESTIMATES

RECOMMENDATION:
1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearance.
2. Heat straighten and/or repair other damaged truss members.

COST ESTIMATES: (See page 2 for breakdown)

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
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<tr>
<td>COST ESTIMATE FOR PORTAL AND SWAY RETROFIT</td>
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<td>COST ESTIMATE FOR ADDITIONAL MEMBER RETROFIT</td>
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<tr>
<td>COST ESTIMATE FOR REGION ADD-ON ITEMS</td>
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<tr>
<td>TOTAL PROJECT COST ESTIMATE</td>
<td>$481,000</td>
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TRUSS PORTAL AND SWAY RETROFIT ESTIMATE

Truss Name = CHILCOAT BRIDGE
Truss Bridge Number = 131/15

Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = 12.50 $/LB

Cost Adjustment Factors:
- 10% = Factor to account for gussets & misc. steel
- 5% = Factor if significant heat straightening or repair of other members is anticipated
- 20% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
- 100% = Factor to account for REGION Add-Ons

Input:
- P = Number of Portal Frames
- S = Number of Sway Frames
- W = Bridge Width
- VC = Minimum Vertical Clearance
- EP = Number of End Posts (assume 2 per portal)
- EPH = End Post Height (assume VC + 5')

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<tr>
<td>12.00</td>
<td>1.00</td>
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<td></td>
</tr>
</tbody>
</table>

Assumed plate sections (in)
- W12x53

Quantity Calculations:
- Portal beams total pounds of steel = 3,445 LBS
- Sway beams total pounds of steel = 7,155 LBS
- End post total pounds of steel = 3,280 LBS
- Subtotal pounds of steel = 13,881 LBS
- Total pounds including gusset & misc. steel factor = 15,269 LBS

Cost Calculations:
- Cost Estimate for portal and sway retrofit = $190,858
- Cost Estimate for heat straightening and/or additional member retrofit = $9,543
- Sub total = $200,401
- Cost Estimate due to construction difficulty factor = $40,080
- TOTAL Bridge Cost = $240,500
- Cost Estimate for Region Add-on items = $240,500

TOTAL PROJECT COST ESTIMATE = $481,000
Truss Vertical Clearance Report

**BRIDGE NAME:** ELOCHOMAN RIVER BRIDGE
**BRIDGE NUMBER:** 4/125
**STRUCTURE ID:** 0004999A
**REGION:** Southwest

**YEAR BUILT/WIDENED:** 1955
**SUFFICIENCY RATING:** 76.06
**TRUSS BRIDGE LENGTH:** 160 FT
**AVE DAILY TRAFFIC:** 1,995
**AVE DAILY TRUCK TRAFFIC:** 539
**NUMBER OF LANES:** 2
**BRIDGE WIDTH (curb to curb):** 26 FT

**VERTICAL CLEARANCE INFORMATION**
- **PORTAL/SWAY SPAN WIDTH:** 34 FT
- **MINIMUM VERTICAL CLEARANCE AT CURB:** 15' 01
- **MINIMUM VERTICAL CLEARANCE AT FOG LINE:** 15' 07
- **MINIMUM SHOULDER WIDTH:** 01' 01
- **NUMBER OF PORTAL FRAMES:** 2
- **NUMBER OF SWAY FRAMES:** 2
- **PREVIOUS HIGH LOAD HIT?** YES
- **ADDITIONAL MEMBERS REQUIRING RETROFIT?** YES

**RECOMMENDATIONS AND COST ESTIMATES**

**RECOMMENDATION:**
1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearance.
2. Heat straighten and/or repair other damaged truss members.
3. Note some sways have already been raised

**COST ESTIMATES:** (See page 2 for breakdown)
- **COST ESTIMATE FOR PORTAL AND SWAY RETROFIT =** $154,314
- **COST ESTIMATE FOR ADDITIONAL MEMBER RETROFIT =** $23,147
- **SUB TOTAL =** $177,461
- **COST ESTIMATE FOR DIFFICULTY OF CONSTRUCTION FACTOR =** $35,492
- **TOTAL BRIDGE COST =** $213,000
- **COST ESTIMATE FOR REGION ADD-ON ITEMS =** $213,000

**TOTAL PROJECT COST ESTIMATE =** $426,000

**LOCATION**
- **SR 4**
- **MILEPOST:** 33.71
- **LATITUDE:** 46.2283266
- **LONGITUDE:** -123.391666
- **DETOUR & ROUTE MAX VERTICAL CLEARANCE**
  - **FULL BRIDGE CLOSURE ESTIMATED DETOUR:** 5 Miles
  - **MAXIMUM VERTICAL CLEARANCE IN ROUTE:** 15' 01
  - **MINIMUM VERTICAL CLEARANCE IN ROUTE:** 15' 01

Reported to FHWA
11/11/2017
TRUSS PORTAL AND SWAY RETROFIT ESTIMATE

Truss Name = ELOCHOMAN RIVER BRIDGE
Truss Bridge Number = 4/125

Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = 12.50 $/LB

Cost Adjustment Factors:
10% = Factor to account for gussets & misc. steel
15% = Factor if significant heat straightening or repair of other members is anticipated
20% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
100% = Factor to account for REGION Add-Ons

Input:

P = Number of Portal Frames
= 2 Each
S = Number of Sway Frames
= 2 Each
W = Bridge Width
= 34.00 Ft
VC = Minimum Vertical Clearance
= 15.08 Ft
EP = Number of End Posts (assume 2 per portal)
= 4 Each
EPH = End Post Height (assume VC + 5')
= 20.08 Ft

Quantity Calculations:

Portal beams total pounds of steel = 4,339 LBS
Sway beams total pounds of steel = 3,604 LBS
End post total pounds of steel = 3,280 LBS
Subtotal pounds of steel = 11,223 LBS
Total pounds including gusset & misc. steel factor = 12,345 LBS

Cost Calculations:

Cost Estimate for portal and sway retrofit = $154,314
Cost Estimate for heat straightening and/or additional member retrofit = $23,147
Sub total = $177,461
Cost Estimate due to construction difficulty factor = $35,492
TOTAL Bridge Cost = $213,000
Cost Estimate for Region Add-on items = $213,000

TOTAL PROJECT COST ESTIMATE = $426,000
Truss Vertical Clearance Report

BRIDGE NAME: COWLITZ R - P CRAWFORD BRIDGE
BRIDGE NUMBER: 4/230
STRUCTURE ID: 0003717A
REGION: Southwest
YEAR BUILT/WIDENED: 1951
SUFFICIENCY RATING: 47.25
TRUSS BRIDGE LENGTH: 640 FT
AVE DAILY TRAFFIC: 19,019
AVE DAILY TRUCK TRAFFIC: 380
NUMBER OF LANES: 4

VERTICAL CLEARANCE INFORMATION
BRIDGE WIDTH (curb to curb) 56 FT
PORTAL/SWAY SPAN WIDTH 60 FT
MINIMUM VERTICAL CLEARANCE AT CURB: 15' 01
MINIMUM VERTICAL CLEARANCE AT FOG LINE: 15' 01
MINIMUM SHOULDER WIDTH: 01' 05
NUMBER OF PORTAL FRAMES: 2
NUMBER OF SWAY FRAMES: 17
PREVIOUS HIGH LOAD HIT? NO
ADDITIONAL MEMBERS REQUIRING RETROFIT? NO

LOCATION
SR 4 MILEPOST: 61.08
LATITUDE: 46.14728855 LONGITUDE: -122.917972

DETOUR & ROUTE MAX VERTICAL CLEARANCE
FULL BRIDGE CLOSURE ESTIMATED DETOUR: 6 Miles
MAXIMUM VERTICAL CLEARANCE IN ROUTE: 17' 06
MINIMUM VERTICAL CLEARANCE IN ROUTE: 15' 01

RECOMMENDATIONS AND COST ESTIMATES
RECOMMENDATION:
1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearance.
2. Heat straighten and/or repair other damaged truss members.

COST ESTIMATES: (See page 2 for breakdown)

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>COST ESTIMATE FOR PORTAL AND SWAY RETROFIT</td>
<td>$893,702</td>
</tr>
<tr>
<td>COST ESTIMATE FOR ADDITIONAL MEMBER RETROFIT</td>
<td>$89,370</td>
</tr>
<tr>
<td>SUB TOTAL</td>
<td>$983,072</td>
</tr>
<tr>
<td>COST ESTIMATE FOR DIFFICULTY OF CONSTRUCTION FACTOR</td>
<td>$196,614</td>
</tr>
<tr>
<td>TOTAL BRIDGE COST</td>
<td>$1,179,700</td>
</tr>
<tr>
<td>COST ESTIMATE FOR REGION ADD-ON ITEMS</td>
<td>$1,179,700</td>
</tr>
<tr>
<td>TOTAL PROJECT COST ESTIMATE</td>
<td>$2,359,400</td>
</tr>
</tbody>
</table>
TRUSS PORTAL AND SWAY RETROFIT ESTIMATE

Truss Name = COWLITZ R - P CRAWFORD BRIDGE
Truss Bridge Number = 4230

Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = 12.50 $/LB

Cost Adjustment Factors:
- 10% = Factor to account for gussets & misc. steel
- 10% = Factor if significant heat straightening or repair of other members is anticipated
- 20% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
- 100% = Factor to account for REGION Add-Ons

Input:
- P = Number of Portal Frames
- S = Number of Sway Frames
- W = Bridge Width
- VC = Minimum Vertical Clearance
- EP = Number of End Posts (assume 2 per portal)
- EPH = End Post Height (assume VC + 5')

<table>
<thead>
<tr>
<th>Assumed plate sections (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width</td>
</tr>
<tr>
<td>14.00</td>
</tr>
<tr>
<td>12.00</td>
</tr>
<tr>
<td>W12x53</td>
</tr>
</tbody>
</table>

Quantity Calculations:
- Portal beams total pounds of steel = 7,656 LBS
- Sway beams total pounds of steel = 54,060 LBS
- End post total pounds of steel = 3,280 LBS
- Subtotal pounds of steel = 64,997 LBS
- Total pounds including gusset & misc. steel factor = 71,496 LBS

Cost Calculations:
- Cost Estimate for portal and sway retrofit = $893,702
- Cost Estimate for heat straightening and/or additional member retrofit = $89,370
- Sub total = $983,072
- Cost Estimate due to construction difficulty factor = $196,614
- TOTAL Bridge Cost = $1,179,700
- Cost Estimate for Region Add-on items = $1,179,700

TOTAL PROJECT COST ESTIMATE = $2,359,400
**Truss Vertical Clearance Report**

**BRIDGE NAME:** NISQUALLY RIVER BRIDGE

**BRIDGE NUMBER:** 7/25

**STRUCTURE ID:** 0004348A

**REGION:** Southwest

**YEAR BUILT/WIDENED:** 1953

**SUFFICIENCY RATING:** 55.71

**TRUSS BRIDGE LENGTH:** 200 FT

**AVE DAILY TRAFFIC:** 2,060

**AVE DAILY TRUCK TRAFFIC:** 391

**NUMBER OF LANES:** 2

**BRIDGE WIDTH (curb to curb):** 28 FT

**PORTAL/SWAY SPAN WIDTH:** 36 FT

**MINIMUM VERTICAL CLEARANCE AT CURB:** 15' 02

**MINIMUM VERTICAL CLEARANCE AT FOG LINE:** 15' 10

**MINIMUM SHOULDER WIDTH:** 01' 00

**NUMBER OF PORTAL FRAMES:** 2

**NUMBER OF SWAY FRAMES:** 5

**PREVIOUS HIGH LOAD HIT?** YES

**ADDITIONAL MEMBERS REQUIRING RETROFIT?** NO

---

**VERTICAL CLEARANCE INFORMATION**

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>DETOUR</th>
<th>ROUTE MAX VERTICAL CLEARANCE</th>
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</thead>
<tbody>
<tr>
<td>SR 7</td>
<td>16.74</td>
<td>99 Miles</td>
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<tr>
<td>LATITUDE</td>
<td>46.76194444</td>
<td>16' 02</td>
</tr>
<tr>
<td>LONGITUDE</td>
<td>-122.192166</td>
<td>15' 02</td>
</tr>
</tbody>
</table>

---

**RECOMMENDATIONS AND COST ESTIMATES**

**RECOMMENDATION:**
1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearance.
2. Heat straighten and/or repair other damaged truss members.

**COST ESTIMATES:** (See page 2 for breakdown)

- **COST ESTIMATE FOR PORTAL AND SWAY RETROFIT =** $239,630
- **COST ESTIMATE FOR ADDITIONAL MEMBER RETROFIT =** $11,982
- **SUB TOTAL =** $251,612
- **COST ESTIMATE FOR DIFFICULTY OF CONSTRUCTION FACTOR =** $75,483
- **TOTAL BRIDGE COST =** $327,100
- **COST ESTIMATE FOR REGION ADD-ON ITEMS =** $327,100

**TOTAL PROJECT COST ESTIMATE =** $654,200

---

Reported to FHWA 11/11/2017

**PRIORITY RATING**

2
TRUSS PORTAL AND SWAY RETROFIT ESTIMATE

Truss Name = NISQUALLY RIVER BRIDGE
Truss Bridge Number = 7/25

Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = 12.50 $/LB

Cost Adjustment Factors:
10% = Factor to account for gussets & misc. steel
5% = Factor if significant heat straightening or repair of other members is anticipated
30% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
100% = Factor to account for REGION Add-Ons

Input:
P = Number of Portal Frames  S = Number of Sway Frames
W = Bridge Width  VC = Minimum Vertical Clearance
EP = Number of End Posts (assume 2 per portal)  EPH = End Post Height (assume VC + 5')

P = 2  Each  S = 5  Each  W = 36.00  Ft  VC = 15.17  Ft
EP = 4  Each  EPH = 20.17  Ft

Quantity Calculations:
Portal beams total pounds of steel = 4,594  LBS
Sway beams total pounds of steel = 9,540  LBS
End post total pounds of steel = 3,294  LBS
Subtotal pounds of steel = 17,428  LBS
Total pounds including gusset & misc. steel factor = 19,170  LBS

Cost Calculations:
Cost Estimate for portal and sway retrofit = $239,630
Cost Estimate for heat straightening and/or additional member retrofit = $11,982
Sub total = $251,612
Cost Estimate due to construction difficulty factor = $75,483
TOTAL Bridge Cost = $327,100
Cost Estimate for Region Add-on items = $327,100

TOTAL PROJECT COST ESTIMATE = $654,200
Truss Vertical Clearance Report

Bridge Name: KETTLE RIVER BRIDGE
Bridge Number: 21/334
Structure ID: 0006282A
Region: Eastern
Year Built/Widened: 1960
Sufficiency Rating: 81.24
Truss Bridge Length: 200 FT
Average Daily Traffic: 781
Average Daily Truck Traffic: 141
Number of Lanes: 2
Bridge Width (curb to curb): 26 FT
Portal/Sway Span Width: 34 FT
Minimum Vertical Clearance at Curb: 15’ 03
Minimum Vertical Clearance at Fog Line: 15’ 10
Minimum Shoulder Width: 01’ 10
Number of Portal Frames: 2
Number of Sway Frames: 5
Previous High Load Hit?: YES
Additional Members Requiring Retrofit?: NO

Recommendations and Cost Estimates

Recommendation:
1. Retrofit bridge by raising portals and sways to 16’-06” minimum vertical clearance.
2. Heat straighten and/or repair other damaged truss members.
3. Note - sway frames may be OK as is

Cost Estimates: (See page 2 for breakdown)

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost Estimate</th>
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<tbody>
<tr>
<td>Cost Estimate for Portal and Sway Retrofit</td>
<td>$229,021</td>
</tr>
<tr>
<td>Cost Estimate for Additional Member Retrofit</td>
<td>$11,451</td>
</tr>
<tr>
<td>Sub Total</td>
<td>$240,472</td>
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<tr>
<td>Cost Estimate for Difficulty of Construction Factor</td>
<td>$48,094</td>
</tr>
<tr>
<td>Total Bridge Cost</td>
<td>$288,600</td>
</tr>
<tr>
<td>Cost Estimate for Region Add-On Items</td>
<td>$288,600</td>
</tr>
<tr>
<td>Total Project Cost Estimate</td>
<td>$577,200</td>
</tr>
</tbody>
</table>
# WSDOT Truss Vertical Clearance Study

## Portal and Sway Retrofit Estimate

### Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at $12.50/LB

### Cost Adjustment Factors:
- 10% = Factor to account for gussets & misc. steel
- 5%  = Factor if significant heat straightening or repair of other members is anticipated
- 20% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
- 100% = Factor to account for REGION Add-Ons

### Input:
- **P** = Number of Portal Frames = 2 Each
- **S** = Number of Sway Frames = 5 Each
- **W** = Bridge Width = 34.00 Ft
- **VC** = Minimum Vertical Clearance = 15.25 Ft
- **EP** = Number of End Posts (assume 2 per portal) = 4 Each
- **EPH** = End Post Height (assume VC + 5') = 20.25 Ft

### Quantity Calculations:
- Portal beams total pounds of steel = 4,339 LBS
- Sway beams total pounds of steel = 9,010 LBS
- End post total pounds of steel = 3,308 LBS
- Subtotal pounds of steel = 16,656 LBS
- Total pounds including gusset & misc. steel factor = 18,322 LBS

### Cost Calculations:
- Cost Estimate for portal and sway retrofit = $229,021
- Cost Estimate for heat straightening and/or additional member retrofit = $11,451
- Sub total = $240,472
- Cost Estimate due to construction difficulty factor = $48,094
- TOTAL Bridge Cost = $288,600
- Cost Estimate for Region Add-on items = $288,600

**TOTAL PROJECT COST ESTIMATE = $577,200**
BRIDGE NAME: CHEHALIS RIVER BRIDGE
BRIDGE NUMBER: 107/4
STRUCTURE ID: 0005827A
REGION: Olympic
YEAR BUILT/WIDENED: 1958
SUFFICIENCY RATING: 45.49
TRUSS BRIDGE LENGTH: 300 FT
AVE DAILY TRAFFIC: 3,533
AVE DAILY TRUCK TRAFFIC: 565
NUMBER OF LANES: 2
BRIDGE WIDTH (curb to curb) 26 FT
PORTAL/SWAY SPAN WIDTH 34 FT
MINIMUM VERTICAL CLEARANCE AT CURB: 15’ 02
MINIMUM VERTICAL CLEARANCE AT FOG LINE: 15’ 09
MINIMUM SHOULDER WIDTH: 01’ 03
NUMBER OF PORTAL FRAMES: 2
NUMBER OF SWAY FRAMES: 7
PREVIOUS HIGH LOAD HIT? YES
ADDITIONAL MEMBERS REQUIRING RETROFIT? NO

RECOMMENDATIONS AND COST ESTIMATES

RECOMMENDATION:
1. Retrofit bridge by raising portals to 16'-06" minimum vertical clearance.
2. Heat straighten and/or repair other damaged truss members.
3. Note - sway frames may be OK as is

COST ESTIMATES: (See page 2 for breakdown)

<table>
<thead>
<tr>
<th>Cost Item</th>
<th>Amount</th>
</tr>
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<tbody>
<tr>
<td>COST ESTIMATE FOR PORTAL AND SWAY RETROFIT</td>
<td>$278,388</td>
</tr>
<tr>
<td>COST ESTIMATE FOR ADDITIONAL MEMBER RETROFIT</td>
<td>$13,919</td>
</tr>
<tr>
<td>SUB TOTAL</td>
<td>$292,308</td>
</tr>
<tr>
<td>COST ESTIMATE FOR DIFFICULTY OF CONSTRUCTION</td>
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<td>TOTAL BRIDGE COST</td>
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<tr>
<td>COST ESTIMATE FOR REGION ADD-ON ITEMS</td>
<td>$350,800</td>
</tr>
<tr>
<td>TOTAL PROJECT COST ESTIMATE</td>
<td>$701,600</td>
</tr>
</tbody>
</table>

Reported to FHWA
TRUSS PORTAL AND SWAY RETROFIT ESTIMATE
Truss Name = CHEHALIS RIVER BRIDGE
Truss Bridge Number = 107/4

Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = 12.50 $/LB

Cost Adjustment Factors:
10% = Factor to account for gussets & misc. steel
5% = Factor if significant heat straightening or repair of other members is anticipated
20% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
100% = Factor to account for REGION Add-Ons

Input:
P = Number of Portal Frames
S = Number of Sway Frames
W = Bridge Width
VC = Minimum Vertical Clearance
EP = Number of End Posts (assume 2 per portal)
EPH = End Post Height (assume VC + 5')

Quantity Calculations:
Portal beams total pounds of steel = 4,339 LBS
Sway beams total pounds of steel = 12,614 LBS
End post total pounds of steel = 3,294 LBS
Subtotal pounds of steel = 20,246 LBS
Total pounds including gusset & misc. steel factor = 22,271 LBS

Cost Calculations:
Cost Estimate for portal and sway retrofit = $278,388
Cost Estimate for heat straightening and/or additional member retrofit = $13,919
Sub total = $292,308
Cost Estimate due to construction difficulty factor = $58,462
TOTAL Bridge Cost = $350,800
Cost Estimate for Region Add-on items = $350,800

TOTAL PROJECT COST ESTIMATE = $701,600
### Truss Vertical Clearance Report

<table>
<thead>
<tr>
<th>BRIDGE NAME:</th>
<th>WISKAH RIVER BRIDGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>BRIDGE NUMBER:</td>
<td>12/12N</td>
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<tr>
<td>STRUCTURE ID:</td>
<td>0002311A</td>
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<tr>
<td>REGION:</td>
<td>Olympic</td>
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<tr>
<td>YEAR BUILT/WIDENED:</td>
<td>1925</td>
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<tr>
<td>SUFFICIENCY RATING:</td>
<td>51.51</td>
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<tr>
<td>TRUSS BRIDGE LENGTH:</td>
<td>188 FT</td>
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<tr>
<td>AVE DAILY TRAFFIC:</td>
<td>14,546</td>
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<tr>
<td>AVE DAILY TRUCK TRAFFIC:</td>
<td>873</td>
</tr>
<tr>
<td>NUMBER OF LANES:</td>
<td>2</td>
</tr>
<tr>
<td>BRIDGE WIDTH (curb to curb):</td>
<td>27 FT</td>
</tr>
<tr>
<td>PORTAL/SWAY SPAN WIDTH:</td>
<td>30 FT</td>
</tr>
<tr>
<td>MINIMUM VERTICAL CLEARANCE AT CURB:</td>
<td>15' 05</td>
</tr>
<tr>
<td>MINIMUM VERTICAL CLEARANCE AT FOG LINE:</td>
<td>15' 05</td>
</tr>
<tr>
<td>MINIMUM SHOULDER WIDTH:</td>
<td>00' 06</td>
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<tr>
<td>NUMBER OF PORTAL FRAMES:</td>
<td>2</td>
</tr>
<tr>
<td>NUMBER OF SWAY FRAMES:</td>
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<tr>
<td>PREVIOUS HIGH LOAD HIT?:</td>
<td>YES</td>
</tr>
<tr>
<td>ADDITIONAL MEMBERS REQUIRING RETROFIT?:</td>
<td>YES</td>
</tr>
</tbody>
</table>

**VERTICAL CLEARANCE INFORMATION**

- **BRIDGE WIDTH (curb to curb):** 27 FT
- **PORTAL/SWAY SPAN WIDTH:** 30 FT
- **MINIMUM VERTICAL CLEARANCE AT CURB:** 15' 05
- **MINIMUM VERTICAL CLEARANCE AT FOG LINE:** 15' 05
- **MINIMUM SHOULDER WIDTH:** 00' 06
- **NUMBER OF PORTAL FRAMES:** 2
- **NUMBER OF SWAY FRAMES:** 4
- **PREVIOUS HIGH LOAD HIT?** YES
- **ADDITIONAL MEMBERS REQUIRING RETROFIT?** YES

**RECOMMENDATIONS AND COST ESTIMATES**

1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearnance.
2. Heat straighten and/or repair other damaged truss members.

**COST ESTIMATES:** (See page 2 for breakdown)

- **COST ESTIMATE FOR PORTAL AND SWAY RETROFIT:** $185,939
- **COST ESTIMATE FOR ADDITIONAL MEMBER RETROFIT:** $18,594
  - **SUB TOTAL:** $204,533
- **COST ESTIMATE FOR DIFFICULTY OF CONSTRUCTION FACTOR:** $40,907
  - **TOTAL BRIDGE COST:** $245,500
- **COST ESTIMATE FOR REGION ADD-ON ITEMS:** $245,500
  - **TOTAL PROJECT COST ESTIMATE:** $491,000

**LOCATION**

- **SR 12**: 0.5
- **LATITUDE:** 46.9771382
- **LONGITUDE:** -123.810889

**DETOUR & ROUTE MAX VERTICAL CLEARANCE**

- **FULL BRIDGE CLOSURE ESTIMATED DETOUR:** 1 Miles
- **MAXIMUM VERTICAL CLEARANCE IN ROUTE:** Unknown
- **MINIMUM VERTICAL CLEARANCE IN ROUTE:** Unknown
TRUSS PORTAL AND SWAY RETROFIT ESTIMATE

Truss Name = WISHKAH RIVER BRIDGE
Truss Bridge Number = 12/12N

Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = 12.50 $/LB

Cost Adjustment Factors:
10% = Factor to account for gussets & misc. steel
10% = Factor if significant heat straightening or repair of other members is anticipated
20% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
100% = Factor to account for REGION Add-Ons

Input:
P = Number of Portal Frames
S = Number of Sway Frames
W = Bridge Width
VC = Minimum Vertical Clearance
EP = Number of End Posts (assume 2 per portal)
EPH = End Post Height (assume VC + 5')
P = 2 Each
S = 4 Each
W = 30.00 Ft
VC = 15.42 Ft
EP = 4 Each
EPH = 20.42 Ft

Quantity Calculations:
Portal beams total pounds of steel = 3,828 LBS
Sway beams total pounds of steel = 6,360 LBS
End post total pounds of steel = 3,335 LBS
Subtotal pounds of steel = 13,523 LBS
Total pounds including gusset & misc. steel factor = 14,875 LBS

Cost Calculations:
Cost Estimate for portal and sway retrofit = $185,939
Cost Estimate for heat straightening and/or additional member retrofit = $18,594
Sub total = $204,533
Cost Estimate due to construction difficulty factor = $40,907
TOTAL Bridge Cost = $245,500
Cost Estimate for Region Add-on items = $245,500

TOTAL PROJECT COST ESTIMATE = $491,000
**Truss Vertical Clearance Report**

**Bridge and Structures Office**

11/11/2017

**Bridge Name:** Naches River Nelson Bridge

**Bridge Number:** 12/328N

**Structure ID:** 0005742A

**Region:** South Central

**Year Built/Widened:** 1958

**Sufficiency Rating:** 74.96

**Truss Bridge Length:** 300 FT

**Ave Daily Traffic:** 8,634

**Ave Daily Truck Traffic:** 1036

**Number of Lanes:** 2

**Bridge Width (curb to curb):** 28 FT

**Portal/Sway Span Width:** 34 FT

**Minimum Vertical Clearance at Curb:** 15' 07

**Minimum Vertical Clearance at Fog Line:** 15' 07

**Minimum Shoulder Width:** 2' 00

**Number of Portal Frames:** 2

**Number of Sway Frames:** 7

**Previous High Load Hit?** Yes

**Additional Members Requiring Retrofit?** No

**Location**

SR 12

MILEPOST: 198.7

**Latitude:** 46.6322155

**Longitude:** -120.586555

**Detour & Route Max Vertical Clearance**

- Full Bridge Closure Estimated Detour: 1 Miles
- Maximum Vertical Clearance in Route: 15' 07
- Minimum Vertical Clearance in Route: Unknown

**Recommendations and Cost Estimates**

**Recommendation:**

1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearance.
2. Heat straighten and/or repair other damaged truss members.
3. Note - sway frames may be OK as is

**Cost Estimates:** (See page 2 for breakdown)

- Cost Estimate for Portal and Sway Retrofit = $279,324
- Cost Estimate for Additional Member Retrofit = $13,966
- Sub Total = $293,290
- Cost Estimate for Difficulty of Construction Factor = $58,658
- Total Bridge Cost = $352,000
- Cost Estimate for Region Add-On Items = $352,000

**Total Project Cost Estimate = $704,000**
# TRUSS PORTAL AND SWAY RETROFIT ESTIMATE

**Truss Name:** NACHES RIVER - NELSON BRIDGE  
**Truss Bridge Number:** 12/328N

## Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section.
2. Existing end posts will be strengthened with added plates.
3. Existing sway beams will be removed and replaced with rolled I-beam section.
4. Existing diagonal bracing will remain and will be cut to fit.
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = **$12.50/LB**

## Cost Adjustment Factors:
- 10% = Factor to account for gussets & misc. steel
- 5% = Factor if significant heat straightening or repair of other members is anticipated
- 20% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
- 100% = Factor to account for REGION Add-Ons

## Input:
- **P** = Number of Portal Frames  
  - 2 Each
- **S** = Number of Sway Frames  
  - 7 Each
- **W** = Bridge Width  
  - 34.00 Ft
- **VC** = Minimum Vertical Clearance  
  - 15.58 Ft
- **EP** = Number of End Posts (assume 2 per portal)  
  - 4 Each
- **EPH** = End Post Height (assume VC + 5')  
  - 20.58 Ft

## Assumed plate sections (in)
<table>
<thead>
<tr>
<th>Width</th>
<th>Height</th>
<th>Thick.</th>
<th>#/LF</th>
</tr>
</thead>
<tbody>
<tr>
<td>14.00</td>
<td>16.00</td>
<td>0.3125</td>
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<td><strong>W12x53</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>53</td>
</tr>
</tbody>
</table>

## Quantity Calculations:
- Portal beams total pounds of steel = 4,339 LBS
- Sway beams total pounds of steel = 12,614 LBS
- End post total pounds of steel = 3,362 LBS
- Subtotal pounds of steel = 20,314 LBS
- Total pounds including gusset & misc. steel factor = 22,346 LBS

## Cost Calculations:
- Cost Estimate for portal and sway retrofit = **$279,324**
- Cost Estimate for heat straightening and/or additional member retrofit = **$13,966**
- Sub total = **$293,290**
- Cost Estimate due to construction difficulty factor = **$58,658**
- TOTAL Bridge Cost = **$352,000**
- Cost Estimate for Region Add-on items = **$352,000**

## TOTAL PROJECT COST ESTIMATE = **$704,000**
Truss Vertical Clearance Report

Bridge and Structures Office
11/11/2017

BRIDGE NAME: BIGGS RAPIDS-SAM HILL BRIDGE
BRIDGE NUMBER: 97/1
STRUCTURE ID: 0006539A
REGION: Southwest
YEAR BUILT/WIDENED: 1962
SUFFICIENCY RATING: 60.91
TRUSS BRIDGE LENGTH: 340 FT
AVE DAILY TRAFFIC: 5,000
AVE DAILY TRUCK TRAFFIC: 1800

VERTICAL CLEARANCE INFORMATION
BRIDGE WIDTH (curb to curb) 26 FT
PORTAL/SWAY SPAN WIDTH 32 FT
MINIMUM VERTICAL CLEARANCE AT CURB: 15’ 07
MINIMUM VERTICAL CLEARANCE AT FOG LINE: 16’ 01
MINIMUM SHOULDER WIDTH: 02’ 00
NUMBER OF PORTAL FRAMES: 2
NUMBER OF SWAY FRAMES: 7
PREVIOUS HIGH LOAD HIT? YES
ADDITIONAL MEMBERS REQUIRING RETROFIT? NO

RECOMMENDATIONS AND COST ESTIMATES
RECOMMENDATION:
1. Retrofit bridge by raising portals and sways to 16’-06” minimum vertical clearance.
2. Heat straighten and/or repair other damaged truss members.
3. Note - sway frames may be OK as is

COST ESTIMATES: (See page 2 for breakdown)

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>COST ESTIMATE FOR PORTAL AND SWAY RETROFIT</td>
<td>$265,613</td>
</tr>
<tr>
<td>COST ESTIMATE FOR ADDITIONAL MEMBER RETROFIT</td>
<td>$26,561</td>
</tr>
<tr>
<td>SUB TOTAL</td>
<td>$292,174</td>
</tr>
<tr>
<td>COST ESTIMATE FOR DIFFICULTY OF CONSTRUCTION FACTOR</td>
<td>$87,652</td>
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<tr>
<td>TOTAL BRIDGE COST</td>
<td>$379,900</td>
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<tr>
<td>COST ESTIMATE FOR REGION ADD-ON ITEMS</td>
<td>$379,900</td>
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<tr>
<td>TOTAL PROJECT COST ESTIMATE</td>
<td>$759,800</td>
</tr>
</tbody>
</table>

Full Bridge Closure Estimated Detour: 36 Miles
Maximum Vertical Clearance In Route: 15’ 11
Minimum Vertical Clearance In Route: 15’ 07

Regional Add-On Items

LOCATION
SR 97  MILEPOST: 0
LATITUDE: 45.67247155  LONGITUDE: -120.834861

DETOUR & ROUTE MAX VERTICAL CLEARANCE

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
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</thead>
<tbody>
<tr>
<td>Full Bridge Closure Detour</td>
<td>36 Miles</td>
</tr>
<tr>
<td>Maximum Vertical Clearance In Route</td>
<td>15’ 11</td>
</tr>
<tr>
<td>Minimum Vertical Clearance In Route</td>
<td>15’ 07</td>
</tr>
</tbody>
</table>
**TRUSS PORTAL AND SWAY RETROFIT ESTIMATE**

**Input:**
- **P** = Number of Portal Frames = 2
- **S** = Number of Sway Frames = 7
- **W** = Bridge Width = 32.00 Ft
- **VC** = Minimum Vertical Clearance = 15.58 Ft
- **EP** = Number of End Posts (assume 2 per portal) = 4
- **EPH** = End Post Height (assume VC + 5') = 20.58 Ft

**Quantity Calculations:**
- Portal beams total pounds of steel = 4,083 LBS
- Sway beams total pounds of steel = 11,872 LBS
- End post total pounds of steel = 3,362 LBS
- Subtotal pounds of steel = 19,317 LBS
- Total pounds including gusset & misc. steel factor = 21,249 LBS

**Cost Adjustments:**
- 10% = Factor to account for gussets & misc. steel
- 10% = Factor if significant heat straightening or repair of other members is anticipated
- 30% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
- 100% = Factor to account for REGION Add-Ons

**Cost Calculations:**
- Cost Estimate for portal and sway retrofit = $265,613
- Cost Estimate for heat straightening and/or additional member retrofit = $26,561
- Sub total = $292,174
- Cost Estimate due to construction difficulty factor = $87,652
- **TOTAL Bridge Cost =** $379,900
- Cost Estimate for Region Add-on items = $379,900

**TOTAL PROJECT COST ESTIMATE =** $759,800
Truss Vertical Clearance Report

Bridge and Structures Office
11/11/2017

BRIDGE NAME: HARRY E. MORGAN BRIDGE
BRIDGE NUMBER: 432/10S
STRUCTURE ID: 0006321A
REGION: Southwest
YEAR BUILT/WIDENED: 1961
SUFFICIENCY RATING: 67.04
TRUSS BRIDGE LENGTH: 300 FT
AVE DAILY TRAFFIC: 15,007
AVE DAILY TRUCK TRAFFIC: 2251
NUMBER OF LANES: 2

VERTICAL CLEARANCE INFORMATION

Bridge Width (curb to curb) 30 FT
PORTAL/SWAY SPAN WIDTH 34 FT
MINIMUM VERTICAL CLEARANCE AT CURB: 15' 08"
MINIMUM VERTICAL CLEARANCE AT FOG LINE: 16' 08"
MINIMUM SHOULDER WIDTH: 02' 07"
NUMBER OF PORTAL FRAMES: 2
NUMBER OF SWAY FRAMES: 7
PREVIOUS HIGH LOAD HIT? YES
ADDITIONAL MEMBERS REQUIRING RETROFIT? NO

RECOMMENDATIONS AND COST ESTIMATES

RECOMMENDATION:
1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearance.
2. Heat straighten and/or repair other damaged truss members.
3. Note - sway frames may be OK as is

COST ESTIMATES:

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
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<tbody>
<tr>
<td>COST ESTIMATE FOR PORTAL AND SWAY RETROFIT</td>
<td>$279,511</td>
</tr>
<tr>
<td>COST ESTIMATE FOR ADDITIONAL MEMBER RETROFIT</td>
<td>$13,976</td>
</tr>
<tr>
<td>SUB TOTAL</td>
<td>$293,487</td>
</tr>
<tr>
<td>COST ESTIMATE FOR DIFFICULTY OF CONSTRUCTION FACTOR</td>
<td>$58,697</td>
</tr>
<tr>
<td>TOTAL BRIDGE COST</td>
<td>$352,200</td>
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<tr>
<td>COST ESTIMATE FOR REGION ADD-ON ITEMS</td>
<td>$352,200</td>
</tr>
<tr>
<td>TOTAL PROJECT COST ESTIMATE</td>
<td>$704,400</td>
</tr>
</tbody>
</table>

LOCATION

SR 432  MILEPOST: 9.58
LATITUDE: 46.10691388  LONGITUDE: -122.894419

DETOUR & ROUTE MAX VERTICAL CLEARANCE

FULL BRIDGE CLOSURE ESTIMATED DETOUR: 1 Miles
MAXIMUM VERTICAL CLEARANCE IN ROUTE: 16' 03"
MINIMUM VERTICAL CLEARANCE IN ROUTE: 16' 08"

Reported to FHWA

Bridge Width
Minimum Vertical Clearance (Typ)
TRUSS PORTAL AND SWAY RETROFIT ESTIMATE
Truss Name = HARRY E. MORGAN BRIDGE
Truss Bridge Number = 432/10S

Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = 12.50 $/LB

Cost Adjustment Factors:
- 10% = Factor to account for gussets & misc. steel
- 5% = Factor if significant heat straightening or repair of other members is anticipated
- 20% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
- 100% = Factor to account for REGION Add-Ons

Input:

\[
P = \text{Number of Portal Frames} \\
S = \text{Number of Sway Frames} \\
W = \text{Bridge Width} \\
VC = \text{Minimum Vertical Clearance} \\
EP = \text{Number of End Posts (assume 2 per portal)} \\
EPH = \text{End Post Height (assume VC + 5')} \\
\]

\[
\begin{array}{|c|c|c|c|}
\hline
\text{Width} & \text{Height} & \text{Thick, #/LF} \\
\hline
14.00 & 16.00 & 0.3125 & 63.8 \\
12.00 & \ & 1.00 & 40.8 \\
\hline
\text{W12x53} & \ & \ & \ \\
\hline
\end{array}
\]

Quantity Calculations:

\[
\text{Portal beams total pounds of steel} = 4,339 \text{ LBS} \\
\text{Sway beams total pounds of steel} = 12,614 \text{ LBS} \\
\text{End post total pounds of steel} = 3,376 \text{ LBS} \\
\text{Subtotal pounds of steel} = 20,328 \text{ LBS} \\
\text{Total pounds including gusset & misc. steel factor} = 22,361 \text{ LBS} \\
\]

Cost Calculations:

\[
\text{Cost Estimate for portal and sway retrofit} = \$279,511 \\
\text{Cost Estimate for heat straightening and/or additional member retrofit} = \$13,976 \\
\text{Sub total} = \$293,487 \\
\text{Cost Estimate due to construction difficulty factor} = \$58,697 \\
\text{TOTAL Bridge Cost} = \$352,200 \\
\text{Cost Estimate for Region Add-on items} = \$352,200 \\
\]

\[
\text{TOTAL PROJECT COST ESTIMATE} = \$704,400
\]
**Truss Vertical Clearance Report**

**Bridge and Structures Office**

**Bridge Name:** Naches River Bridge 115N

**Bridge Number:** 82/115N

**Structure ID:** 0001583B

**Region:** South Central

**Year Built/Widened:** 1932

**Sufficiency Rating:** 55.42

**Truss Bridge Length:** 220 FT

**Average Daily Traffic:** 21,451

**Average Daily Truck Traffic:** 3003

**Number of Lanes:** 3

**Bridge Width (curb to curb):** 36 FT

**Portal/Sway Span Width:** 39 FT

**Minimum Vertical Clearance at Curb:** 15' 09

**Minimum Vertical Clearance at Fog Line:** 15' 09

**Minimum Shoulder Width:** 00' 00

**Number of Portal Frames:** 2

**Number of Sway Frames:** 7

**Previous High Load Hit?** YES

**Additional Members Requiring Retrofit?** NO

**Recommendations and Cost Estimates**

**Recommendation:**
1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearance.
2. Heat straighten and/or repair other damaged truss members.
3. Some repair work has been performed on sways and portals.

**Cost Estimates:** (See page 2 for breakdown)

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost Estimate for Portal and Sway Retrofit</td>
<td>$313,978</td>
</tr>
<tr>
<td>Cost Estimate for Additional Member Retrofit</td>
<td>$15,699</td>
</tr>
<tr>
<td>Sub Total</td>
<td>$329,676</td>
</tr>
<tr>
<td>Cost Estimate for Difficulty of Construction Factor</td>
<td>$65,935</td>
</tr>
<tr>
<td>Total Bridge Cost</td>
<td>$395,700</td>
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<tr>
<td>Cost Estimate for Region Add-On Items</td>
<td>$395,700</td>
</tr>
<tr>
<td><strong>Total Project Cost Estimate</strong></td>
<td><strong>$791,400</strong></td>
</tr>
</tbody>
</table>

**Location**

**SR 82**

**Milepost:** 30.9

**Latitude:** 46.63022711

**Longitude:** -120.515403

**Detour & Route Max Vertical Clearance**

**Full Bridge Closure Estimated Detour:** 1 Miles

**Maximum Vertical Clearance in Route:** 15' 09

**Minimum Vertical Clearance in Route:** Unknown

**Reported to FHWA:** 11/11/2017

**Priority Rating:** 2

**Vertical Clearance Information**

<table>
<thead>
<tr>
<th>Item</th>
<th>Value</th>
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<tbody>
<tr>
<td>Bridge Width (curb to curb)</td>
<td>36 FT</td>
</tr>
<tr>
<td>Portal/Sway Span Width</td>
<td>39 FT</td>
</tr>
<tr>
<td>Minimum Vertical Clearance at Curb</td>
<td>15' 09</td>
</tr>
<tr>
<td>Minimum Vertical Clearance at Fog Line</td>
<td>15' 09</td>
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<tr>
<td>Minimum Shoulder Width</td>
<td>00' 00</td>
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<tr>
<td>Number of Portal Frames</td>
<td>2</td>
</tr>
<tr>
<td>Number of Sway Frames</td>
<td>7</td>
</tr>
<tr>
<td>Previous High Load Hit?</td>
<td>YES</td>
</tr>
<tr>
<td>Additional Members Requiring Retrofit?</td>
<td>NO</td>
</tr>
</tbody>
</table>
TRUSS PORTAL AND SWAY RETROFIT ESTIMATE

Truss Name = NACHES RIVER BRIDGE 115N
Truss Bridge Number = 82/115N

Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = 12.50 $/LB

Cost Adjustment Factors:
10% = Factor to account for gussets & misc. steel
5% = Factor if significant heat straightening or repair of other members is anticipated
20% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
100% = Factor to account for REGION Add-Ons

Input:
- P = Number of Portal Frames = 2 Each
- S = Number of Sway Frames = 7 Each
- W = Bridge Width = 39.00 Ft
- VC = Minimum Vertical Clearance = 15.75 Ft
- EP = Number of End Posts (assume 2 per portal) = 4 Each
- EPH = End Post Height (assume VC + 5') = 20.75 Ft

Quantity Calculations:
- Portal beams total pounds of steel = 4,977 LBS
- Sway beams total pounds of steel = 14,469 LBS
- End post total pounds of steel = 3,389 LBS
- Subtotal pounds of steel = 22,835 LBS
- Total pounds including gusset & misc. steel factor = 25,118 LBS

Cost Calculations:
- Cost Estimate for portal and sway retrofit = $313,978
- Cost Estimate for heat straightening and/or additional member retrofit = $15,699
- Sub total = $329,676
- Cost Estimate due to construction difficulty factor = $65,935
- TOTAL Bridge Cost = $395,700
- Cost Estimate for Region Add-on items = $395,700

TOTAL PROJECT COST ESTIMATE = $791,400
B R I D G E  N A M E :  C O L U M B I A  R  B R I D G E  @  U M A T I L L A
B R I D G E  N U M B E R :  8 2 / 2 8 0 5
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R E G I O N :  S o u t h  C e n t r a l
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S U F F I C I E N C Y  R A T I N G :  5 3 . 5 1
T R U S S  B R I D G E  L E N G T H :  1 9 2 0  F T
A V E  D A I L Y  T R A F F I C :  8 , 9 4 7
A V E  D A I L Y  T R U C K  T R A F F I C :  2 1 4 7
N U M B E R  O F  L A N E S :  2

V E R T I C A L  C L E A R A N C E  I N F O R M A T I O N
B R I D G E  W I D T H  (c u r b  t o  c u r b ) :  2 8  F T
P O R T A L / S W A Y  S P A N  W I D T H :  3 2  F T
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N U M B E R  O F  S W A Y  F R A M E S :  5 4
P R E V I O U S  H I G H  L O A D  H I T ?  Y E S

R E C O M M E N D A T I O N S  A N D  C O S T  E S T I M A T E S

R E C O M M E N D A T I O N :  
1. Retrofit bridge by raising portals and sways to 16’-06” minimum vertical clearance.
2. Heat straighten and/or repair other damaged truss members.

C O S T  E S T I M A T E S :  (S e e  p a g e  2  f o r  b r e a k d o w n )

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>COST ESTIMATE FOR PORTAL AND SWAY RETROFIT</td>
<td>$1,362,588</td>
</tr>
<tr>
<td>COST ESTIMATE FOR ADDITIONAL MEMBER RETROFIT</td>
<td>$68,129</td>
</tr>
<tr>
<td>SUB TOTAL</td>
<td>$1,430,718</td>
</tr>
<tr>
<td>COST ESTIMATE FOR DIFFICULTY OF CONSTRUCTION FACTOR</td>
<td>$429,215</td>
</tr>
<tr>
<td>TOTAL BRIDGE COST</td>
<td>$1,860,000</td>
</tr>
<tr>
<td>COST ESTIMATE FOR REGION ADD-ON ITEMS</td>
<td>$1,860,000</td>
</tr>
<tr>
<td>TOTAL PROJECT COST ESTIMATE</td>
<td>$3,720,000</td>
</tr>
</tbody>
</table>
TRUSS PORTAL AND SWAY RETROFIT ESTIMATE

Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = $12.50/LB

Cost Adjustment Factors:
- 10% = Factor to account for gussets & misc. steel
- 5% = Factor if significant heat straightening or repair of other members is anticipated
- 30% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
- 100% = Factor to account for REGION Add-Ons

Input:
- P = Number of Portal Frames
- S = Number of Sway Frames
- W = Bridge Width
- VC = Minimum Vertical Clearance
- EP = Number of End Posts (assume 2 per portal)
- EPH = End Post Height (assume VC + 5')

<table>
<thead>
<tr>
<th>Width</th>
<th>Height</th>
<th>Thick.</th>
<th>#/LF</th>
</tr>
</thead>
<tbody>
<tr>
<td>14.00</td>
<td>16.00</td>
<td>0.3125</td>
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</tr>
<tr>
<td>12.00</td>
<td>1.00</td>
<td>40.8</td>
<td></td>
</tr>
</tbody>
</table>

W12x53

Quantity Calculations:
- Portal beams total pounds of steel = 4,083 LBS
- Sway beams total pounds of steel = 91,584 LBS
- End post total pounds of steel = 3,430 LBS
- Subtotal pounds of steel = 99,097 LBS
- Total pounds including gusset & misc. steel factor = 109,007 LBS

Cost Calculations:
- Cost Estimate for portal and sway retrofit = $1,362,588
- Cost Estimate for heat straightening and/or additional member retrofit = $68,129
- Sub total = $1,430,718
- Cost Estimate due to construction difficulty factor = $429,215
- TOTAL Bridge Cost = $1,860,000
- Cost Estimate for Region Add-on items = $1,860,000

TOTAL PROJECT COST ESTIMATE = $3,720,000
Truss Vertical Clearance Report

Bridge and Structures Office
11/11/2017

BRIDGE NAME: COLUMBIA RIVER BRIDGE BEEBE
BRIDGE NUMBER: 97/420
STRUCTURE ID: 0006835A
REGION: North Central
YEAR BUILT/WIDENED: 1962
SUFFICIENCY RATING: 43.33
TRUSS BRIDGE LENGTH: 1040 FT
AVE DAILY TRAFFIC: 4,916
AVE DAILY TRUCK TRAFFIC: 1082
NUMBER OF LANES: 2

VERTICAL CLEARANCE INFORMATION
BRIDGE WIDTH (curb to curb): 26 FT
PORTAL/SWAY SPAN WIDTH: 34 FT
MINIMUM VERTICAL CLEARANCE AT CURB: 16' 01
MINIMUM VERTICAL CLEARANCE AT FOG LINE: 16' 02
MINIMUM SHOULDER WIDTH: 01' 00
NUMBER OF PORTAL FRAMES: 4
NUMBER OF SWAY FRAMES: 12
PREVIOUS HIGH LOAD HIT? YES
ADDITIONAL MEMBERS REQUIRING RETROFIT? YES

RECOMMENDATIONS AND COST ESTIMATES

RECOMMENDATION:
1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearance.
2. Heat straighten and/or repair other damaged truss members.

COST ESTIMATES: (See page 2 for breakdown)

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>COST ESTIMATE FOR PORTAL AND SWAY RETROFIT</td>
<td>$511,339</td>
</tr>
<tr>
<td>COST ESTIMATE FOR ADDITIONAL MEMBER RETROFIT</td>
<td>$51,134</td>
</tr>
<tr>
<td>SUB TOTAL</td>
<td>$562,473</td>
</tr>
<tr>
<td>COST ESTIMATE FOR DIFFICULTY OF CONSTRUCTION FACTOR</td>
<td>$168,742</td>
</tr>
<tr>
<td>TOTAL BRIDGE COST</td>
<td>$731,300</td>
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<tr>
<td>COST ESTIMATE FOR REGION ADD-ON ITEMS</td>
<td>$731,300</td>
</tr>
<tr>
<td>TOTAL PROJECT COST ESTIMATE</td>
<td>$1,462,600</td>
</tr>
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LOCATION
SR 97
MILEPOST: 234.8
LATITUDE: 47.81450833
LONGITUDE: -119.972966
FV-0037
DETOUR & ROUTE MAX VERTICAL CLEARANCE
FULL BRIDGE CLOSURE ESTIMATED DETOUR: 83 Miles
MAXIMUM VERTICAL CLEARANCE IN ROUTE: 15' 11
MINIMUM VERTICAL CLEARANCE IN ROUTE: 16' 01

Reported to FHWA

Bridge Width
Minimum Vertical Clearance (Typ)
Bridge Portal or Sway (Typ)

FULL BRIDGE CLOSURE ESTIMATED DETOUR: 83 Miles
MAXIMUM VERTICAL CLEARANCE IN ROUTE: 15' 11
MINIMUM VERTICAL CLEARANCE IN ROUTE: 16' 01

TOTAL PROJECT COST ESTIMATE = $1,462,600

PORTAL_SWAY Retrofit Reports G2.xlsx (97_420)
TRUSS PORTAL AND SWAY RETROFIT ESTIMATE

Truss Name = COLUMBIA RIVER BRIDGE BEEBE
Truss Bridge Number = 97/420

Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = 12.50 $/LB

Cost Adjustment Factors:
- 10% = Factor to account for gussets & misc. steel
- 10% = Factor if significant heat straightening or repair of other members is anticipated
- 30% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
- 100% = Factor to account for REGION Add-Ons

Input:
- P = Number of Portal Frames
- S = Number of Sway Frames
- W = Bridge Width
- VC = Minimum Vertical Clearance
- EP = Number of End Posts (assume 2 per portal)
- EPH = End Post Height (assume VC + 5')

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<tr>
<td>W12x53</td>
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Quantity Calculations:
- Portal beams total pounds of steel = 8,677 LBS
- Sway beams total pounds of steel = 21,624 LBS
- End post total pounds of steel = 6,887 LBS
- Subtotal pounds of steel = 37,188 LBS
- Total pounds including gusset & misc. steel factor = 40,907 LBS

Cost Calculations:
- Cost Estimate for portal and sway retrofit = $511,339
- Cost Estimate for heat straightening and/or additional member retrofit = $51,134
- Sub total = $562,473
- Cost Estimate due to construction difficulty factor = $168,742
- TOTAL Bridge Cost = $731,300
- Cost Estimate for Region Add-on items = $731,300

TOTAL PROJECT COST ESTIMATE = $1,462,600
APPENDIX C
## APPENDIX C – PRIORITY GROUP 3 TRUSS BRIDGE RETROFIT RECOMMENDATIONS

<table>
<thead>
<tr>
<th>Bridge Name</th>
<th>Bridge No.</th>
<th>Region</th>
<th>Min. Vert Clear At Curb</th>
<th>Scoping Level Construction Costs</th>
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<tbody>
<tr>
<td>E FK LEWIS R BRIDGE</td>
<td>5/36E</td>
<td>Southwest</td>
<td>15’00</td>
<td>$916,000.00</td>
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<tr>
<td>STEAMBOAT SLOUGH BRIDGE</td>
<td>529/20E</td>
<td>Northwest</td>
<td>15’01</td>
<td>$2,123,000.00</td>
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<tr>
<td>STEAMBOAT SLOUGH BRIDGE 20W</td>
<td>529/20W</td>
<td>Northwest</td>
<td>15’02</td>
<td>$3,368,000.00</td>
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<td>NISQUALLY RIVER BRIDGE 345E</td>
<td>5/345E</td>
<td>Northwest</td>
<td>15’01</td>
<td>$1,003,000.00</td>
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<td>SKOKOMISH RIVER BRIDGE</td>
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<td>North Central</td>
<td>16’03</td>
<td>$438,000.00</td>
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<tr>
<td>N FK NOOKSACK R WARNICK BRIDGE</td>
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<td>Southwest</td>
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<td>$423,600.00</td>
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<td>WYNOOOCHEE RIVER BRIDGE</td>
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<td>Southwest</td>
<td>16’03</td>
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<td>YAKIMA RIVER BRIDGE 114N</td>
<td>82/114N</td>
<td>North Central</td>
<td>16’03</td>
<td>$794,200.00</td>
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<td>JULIA BUTLER HANSEN BRIDGE</td>
<td>409/10</td>
<td>Northwest</td>
<td>16’04</td>
<td>$326,200.00</td>
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</table>
Truss Vertical Clearance Report

BRIDGE NAME: E FK LEWIS R BRIDGE
BRIDGE NUMBER: 5/36E
STRUCTURE ID: 0002473A
REGION: Southwest
YEAR BUILT/WIDENED: 1936
SUFFICIENCY RATING: 32.87
TRUSS BRIDGE LENGTH: 248 FT
AVE DAILY TRAFFIC: 32,564
AVE DAILY TRUCK TRAFFIC: 6187
NUMBER OF LANES: 3
BRIDGE WIDTH (curb to curb) 48 FT
PORTAL/SWAY SPAN WIDTH 51 FT
MINIMUM VERTICAL CLEARANCE AT CURB: 15' 00
MINIMUM VERTICAL CLEARANCE AT FOG LINE: 16' 08
MINIMUM SHOULDER WIDTH: 05' 09
NUMBER OF PORTAL FRAMES: 2
NUMBER OF SWAY FRAMES: 5
PREVIOUS HIGH LOAD HIT? YES
ADDITIONAL MEMBERS REQUIRING RETROFIT? NO

VERTICAL CLEARANCE INFORMATION

RECOMMENDATIONS AND COST ESTIMATES

RECOMMENDATION:
1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearance.
2. Heat straighten and/or repair other damaged truss members.

COST ESTIMATES: (See page 2 for breakdown)

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
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<tbody>
<tr>
<td>COST ESTIMATE FOR PORTAL AND SWAY RETROFIT</td>
<td>$320,230</td>
</tr>
<tr>
<td>COST ESTIMATE FOR ADDITIONAL MEMBER RETROFIT</td>
<td>$32,023</td>
</tr>
<tr>
<td>SUB TOTAL</td>
<td>$352,253</td>
</tr>
<tr>
<td>COST ESTIMATE FOR DIFFICULTY OF CONSTRUCTION FACTOR</td>
<td>$105,676</td>
</tr>
<tr>
<td>TOTAL BRIDGE COST</td>
<td>$458,000</td>
</tr>
<tr>
<td>COST ESTIMATE FOR REGION ADD-ON ITEMS</td>
<td>$458,000</td>
</tr>
<tr>
<td>TOTAL PROJECT COST ESTIMATE</td>
<td>$916,000</td>
</tr>
</tbody>
</table>
TRUSS PORTAL AND SWAY RETROFIT ESTIMATE

Truss Name = E FK LEWIS R BRIDGE
Truss Bridge Number = 5/36E

Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = 12.50 $/LB

Cost Adjustment Factors:
- 10% = Factor to account for gussets & misc. steel
- 10% = Factor if significant heat straightening or repair of other members is anticipated
- 30% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
- 100% = Factor to account for REGION Add-Ons

Input:
- P = Number of Portal Frames = 2 Each
- S = Number of Sway Frames = 5 Each
- W = Bridge Width = 51.00 Ft
- VC = Minimum Vertical Clearance = 15.00 Ft
- EP = Number of End Posts (assume 2 per portal) = 4 Each
- EPH = End Post Height (assume VC + 5') = 20.00 Ft

Quantity Calculations:
- Portal beams total pounds of steel = 6,508 LBS
- Sway beams total pounds of steel = 13,515 LBS
- End post total pounds of steel = 3,267 LBS
- Subtotal pounds of steel = 23,289 LBS
- Total pounds including gusset & misc. steel factor = 25,618 LBS

Cost Calculations:
- Cost Estimate for portal and sway retrofit = $320,230
- Cost Estimate for heat straightening and/or additional member retrofit = $32,023
- Sub total = $352,253
- Cost Estimate due to construction difficulty factor = $105,676
- TOTAL Bridge Cost = $458,000
- Cost Estimate for Region Add-on items = $320,230

TOTAL PROJECT COST ESTIMATE = $916,000
TRUSS VERTICAL CLEARANCE REPORT

**BRIDGE NAME:** STEAMBOAT SLOUGH BRIDGE
**BRIDGE NUMBER:** 529/20E
**STRUCTURE ID:** 0004373A
**REGION:** Northwest
**YEAR BUILT/WIDENED:** 1954
**SUFFICIENCY RATING:** 57.67
**TRUSS BRIDGE LENGTH:** 648 FT
**AVE DAILY TRAFFIC:** 14,943
**AVE DAILY TRUCK TRAFFIC:** 1345
**NUMBER OF LANES:** 2
**BRIDGE WIDTH (curb to curb):** 28 FT
**PORTAL/SWAY SPAN WIDTH:** 36 FT
**MINIMUM VERTICAL CLEARANCE AT CURB:** 15' 01
**MINIMUM VERTICAL CLEARANCE AT FOG LINE:** 15' 09
**MINIMUM SHOULDER WIDTH:** 02' 00
**NUMBER OF PORTAL FRAMES:** 8
**NUMBER OF SWAY FRAMES:** 17
**PREVIOUS HIGH LOAD HIT?** NO
**ADDITIONAL MEMBERS REQUIRING RETROFIT?** NO

**LOCATION**
**SR 529**
**MILEPOST:** 5.44
**LATITUDE:** 48.03488855
**LONGITUDE:** -122.181499
**LATITUDE:** 48.03488855
**LONGITUDE:** -122.181499

**RECOMMENDATIONS AND COST ESTIMATES**

**RECOMMENDATION:**
1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearance.
2. Heat straighten and/or repair other damaged truss members.

**COST ESTIMATES:** (See page 2 for breakdown)

- **COST ESTIMATE FOR PORTAL AND SWAY RETROFIT =** $879,067
- **COST ESTIMATE FOR ADDITIONAL MEMBER RETROFIT =** $43,953
- **SUB TOTAL =** $923,020
- **COST ESTIMATE FOR DIFFICULTY OF CONSTRUCTION FACTOR =** $138,453
- **TOTAL BRIDGE COST =** $1,061,500
- **COST ESTIMATE FOR REGION ADD-ON ITEMS =** $1,061,500

**TOTAL PROJECT COST ESTIMATE =** $2,123,000
TRUSS PORTAL AND SWAY RETROFIT ESTIMATE

Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = 12.50 $/LB

Cost Adjustment Factors:
- 10% = Factor to account for gussets & misc. steel
- 5% = Factor if significant heat straightening or repair of other members is anticipated
- 15% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
- 100% = Factor to account for REGION Add-Ons

Input:
- P = Number of Portal Frames = 8 Each
- S = Number of Sway Frames = 17 Each
- W = Bridge Width = 36.00 Ft
- VC = Minimum Vertical Clearance = 15.08 Ft
- EP = Number of End Posts (assume 2 per portal) = 16 Each
- EPH = End Post Height (assume VC + 5') = 20.08 Ft

Quantity Calculations:
- Portal beams total pounds of steel = 18,375 LBS
- Sway beams total pounds of steel = 32,436 LBS
- End post total pounds of steel = 13,121 LBS
- Subtotal pounds of steel = 63,932 LBS
- Total pounds including gusset & misc. steel factor = 70,325 LBS

Cost Calculations:
- Cost Estimate for portal and sway retrofit = $879,067
- Cost Estimate for heat straightening and/or additional member retrofit = $43,953
- Sub total = $923,020
- Cost Estimate due to construction difficulty factor = $138,453
- TOTAL Bridge Cost = $1,061,500
- Cost Estimate for Region Add-on items = $1,061,500

TOTAL PROJECT COST ESTIMATE = $2,123,000
**Truss Vertical Clearance Report**

**Bridge and Structures Office**

**11/11/2017**

<table>
<thead>
<tr>
<th>BRIDGE NAME:</th>
<th>STEAMBOAT SLOUGH BRIDGE 20W</th>
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<tbody>
<tr>
<td>BRIDGE NUMBER:</td>
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<td>STRUCTURE ID:</td>
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<td>YEAR BUILT/WIDENED:</td>
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<td>SUFICIENCY RATING:</td>
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<td>TRUSS BRIDGE LENGTH:</td>
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<td>AVE DAILY TRUCK TRAFFIC:</td>
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<td>NUMBER OF LANES:</td>
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**MINIMUM VERTICAL CLEARANCE INFORMATION**

| BRIDGE WIDTH (curb to curb) | 24 FT |
| PORTAL/SWAY SPAN WIDTH | 27 FT |
| MINIMUM VERTICAL CLEARANCE AT CURB: | 15' 02 |
| MINIMUM VERTICAL CLEARANCE AT FOG LINE: | 15' 10 |
| MINIMUM SHOULDER WIDTH: | 01' 00 |
| NUMBER OF PORTAL FRAMES: | 6     |
| NUMBER OF SWAY FRAMES: | 23    |
| PREVIOUS HIGH LOAD HIT?: | YES   |
| ADDITIONAL MEMBERS REQUIRING RETROFIT?: | YES |

**RECOMMENDATIONS AND COST ESTIMATES**

1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearance.
2. Heat straighten and/or repair other damaged truss members.
3. Note: control house, portals and sways already raised on a previous contract although still below 16'-06"

**COST ESTIMATES:** (See page 2 for breakdown)

| COST ESTIMATE FOR PORTAL AND SWAY RETROFIT | $730,546 |
| COST ESTIMATE FOR ADDITIONAL MEMBER RETROFIT | $73,055 |
| SUB TOTAL | $803,600 |
| COST ESTIMATE FOR DIFFICULTY OF CONSTRUCTION FACTOR | $80,360 |
| TOTAL BRIDGE COST | $1,684,000 |
| COST ESTIMATE FOR REGION ADD-ON ITEMS | $1,684,000 |
| TOTAL PROJECT COST ESTIMATE | $3,368,000 |

**DETOUR & ROUTE MAX VERTICAL CLEARANCE**

| SR 529 | MILEPOST: 5.42 |
| LATITUDE: | 48.034833 |
| LONGITUDE: | -122.182749 |

**FULL BRIDGE CLOSURE ESTIMATED DETOUR:** 1 Miles

**MAXIMUM VERTICAL CLEARANCE IN ROUTE:** 15' 10

**MINIMUM VERTICAL CLEARANCE IN ROUTE:** Unknown

---

**Bridge Width**

- **Minimum Vertical Clearance (Typ)**
- **Bridge Portal or Sway (Typ)***
TRUSS PORTAL AND SWAY RETROFIT ESTIMATE

Truss Name = STEAMBOAT SLOUGH BRIDGE 20W
Truss Bridge Number = 529/20W

Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = 12.50 $/LB

Cost Adjustment Factors:
- 10% = Factor to account for gussets & misc. steel
- 10% = Factor if significant heat straightening or repair of other members is anticipated
- 10% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
- 100% = Factor to account for REGION Add-Ons

Input:
- P = Number of Portal Frames
- S = Number of Sway Frames
- W = Bridge Width
- VC = Minimum Vertical Clearance
- EP = Number of End Posts (assume 2 per portal)
- EPH = End Post Height (assume VC + 5')

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<th>Width</th>
<th>Height</th>
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<th>Assumed plate sections (in)</th>
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<td>W12x53</td>
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<tr>
<td>53</td>
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Quantity Calculations:
- Portal beams total pounds of steel = 10,336 LBS
- Sway beams total pounds of steel = 32,913 LBS
- End post total pounds of steel = 9,882 LBS
- Subtotal pounds of steel = 53,131 LBS
- Total pounds including gusset & misc. steel factor = 58,444 LBS

Cost Calculations:
- Cost Estimate for portal and sway retrofit = $730,546
- Cost Estimate for heat straightening and/or additional member retrofit = $73,055
- Sub total = $803,600
- Cost Estimate due to construction difficulty factor = $80,360
- TOTAL Bridge Cost = $1,684,000
- Cost Estimate for Region Add-on items = $300,000

TOTAL PROJECT COST ESTIMATE = $3,368,000

Additional costs:
- Raise control house = $500,000
- Raise lifting girders (2) = $300,000
**Truss Vertical Clearance Report**

**BRIDGE NAME:** NISQUALLY RIVER BRIDGE 345E

<table>
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<td>NUMBER OF LANES:</td>
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**VERTICAL CLEARANCE INFORMATION**

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<tr>
<th>Bridge Width (curb to curb)</th>
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<td>Portal/Sway Span Width</td>
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<tr>
<td>Minimum Vertical Clearance at Curb</td>
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<tr>
<td>Minimum Vertical Clearance at Fog Line</td>
<td>16' 00</td>
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<tr>
<td>Minimum Shoulder Width</td>
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<tr>
<td>Number of Portal Frames</td>
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<tr>
<td>Number of Sway Frames</td>
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<td>Previous High Load Hit?</td>
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<tr>
<td>Additional Members Requiring Retrofit?</td>
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<tr>
<td>MILEPOST: 114.9</td>
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<tr>
<td>LONGITUDE: -122.7048644</td>
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</table>

**DETOUR & ROUTE MAX VERTICAL CLEARANCE**

| FULL BRIDGE CLOSURE ESTIMATED DETOUR: | 4 Miles |
| MAXIMUM VERTICAL CLEARANCE IN ROUTE: | 16' 10 |
| MINIMUM VERTICAL CLEARANCE IN ROUTE: | 16' 00 |

**RECOMMENDATIONS AND COST ESTIMATES**

**RECOMMENDATION:**
1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearance.
2. Heat straighten and/or repair other damaged truss members.

**COST ESTIMATES:** (See page 2 for breakdown)

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<thead>
<tr>
<th>Description</th>
<th>Amount</th>
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<td>COST ESTIMATE FOR PORTAL AND SWAY RETROFIT</td>
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<td>COST ESTIMATE FOR ADDITIONAL MEMBER RETROFIT</td>
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<td>SUB TOTAL</td>
<td>$385,693</td>
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<td>COST ESTIMATE FOR DIFFICULTY OF CONSTRUCTION FACTOR</td>
<td>$115,708</td>
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<tr>
<td>TOTAL BRIDGE COST</td>
<td>$501,500</td>
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<tr>
<td>COST ESTIMATE FOR REGION ADD-ON ITEMS</td>
<td>$501,500</td>
</tr>
<tr>
<td>TOTAL PROJECT COST ESTIMATE</td>
<td>$1,003,000</td>
</tr>
</tbody>
</table>
TRUSS PORTAL AND SWAY RETROFIT ESTIMATE

Truss Name = NISQUALLY RIVER BRIDGE 345E
Truss Bridge Number = 5/345E

Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = 12.50 $/LB

Cost Adjustment Factors:
- 10% = Factor to account for gussets & misc. steel
- 5% = Factor if significant heat straightening or repair of other members is anticipated
- 30% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
- 100% = Factor to account for REGION Add-Ons

Input:
- P = Number of Portal Frames = 2 Each
- S = Number of Sway Frames = 7 Each
- W = Bridge Width = 47.00 Ft
- VC = Minimum Vertical Clearance = 15.08 Ft
- EP = Number of End Posts (assume 2 per portal) = 4 Each
- EPH = End Post Height (assume VC + 5') = 20.08 Ft

Quantity Calculations:
- Portal beams total pounds of steel = 5,997 LBS
- Sway beams total pounds of steel = 17,437 LBS
- End post total pounds of steel = 3,280 LBS
- Subtotal pounds of steel = 26,715 LBS
- Total pounds including gusset & misc. steel factor = 29,386 LBS

Cost Calculations:
- Cost Estimate for portal and sway retrofit = $367,327
- Cost Estimate for heat straightening and/or additional member retrofit = $18,366
- Sub total = $385,693
- Cost Estimate due to construction difficulty factor = $115,708
- TOTAL Bridge Cost = $501,500
- Cost Estimate for Region Add-on items = $501,500

TOTAL PROJECT COST ESTIMATE = $1,003,000
Truss Vertical Clearance Report

BRIDGE NAME: SKOKOMISH RIVER BRIDGE
BRIDGE NUMBER: 101/418
STRUCTURE ID: 0001604A
REGION: North Central
YEAR BUILT/WIDENED: 1932
SUFFICIENCY RATING: 50.02
TRUSS BRIDGE LENGTH: 240 FT
AVE DAILY TRAFFIC: 6,559
AVE DAILY TRUCK TRAFFIC: 918
NUMBER OF LANES: 2
BRIDGE WIDTH (curb to curb) 24 FT
PORTAL/SWAY SPAN WIDTH 27 FT
MINIMUM VERTICAL CLEARANCE AT CURB: 16’ 03
MINIMUM VERTICAL CLEARANCE AT FOG LINE: 16’ 03
MINIMUM SHOULDER WIDTH: 00’ 11
NUMBER OF PORTAL FRAMES: 2
NUMBER OF SWAY FRAMES: 4
PREVIOUS HIGH LOAD HIT? YES
ADDITIONAL MEMBERS REQUIRING RETROFIT? YES

RECOMMENDATIONS AND COST ESTIMATES

RECOMMENDATION:
1. Retrofit bridge by raising portals and sways to 16’-06” minimum vertical clearance.
2. Heat straighten and/or repair other damaged truss members.

COST ESTIMATES: (See page 2 for breakdown)

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>COST ESTIMATE FOR PORTAL AND SWAY RETROFIT</td>
<td>$173,802</td>
</tr>
<tr>
<td>COST ESTIMATE FOR ADDITIONAL MEMBER RETROFIT</td>
<td>$8,690</td>
</tr>
<tr>
<td>SUB TOTAL</td>
<td>$182,492</td>
</tr>
<tr>
<td>COST ESTIMATE FOR DIFFICULTY OF CONSTRUCTION FACTOR</td>
<td>$36,498</td>
</tr>
<tr>
<td>TOTAL BRIDGE COST</td>
<td>$219,000</td>
</tr>
<tr>
<td>COST ESTIMATE FOR REGION ADD-ON ITEMS</td>
<td>$219,000</td>
</tr>
<tr>
<td>TOTAL PROJECT COST ESTIMATE</td>
<td>$438,000</td>
</tr>
</tbody>
</table>
TRUSS PORTAL AND SWAY RETROFIT ESTIMATE

Truss Name = SKOKOMISH RIVER BRIDGE
Truss Bridge Number = 101/418

Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = 12.50 $/LB

Cost Adjustment Factors:
- 10% = Factor to account for gussets & misc. steel
- 5% = Factor if significant heat straightening or repair of other members is anticipated
- 20% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
- 100% = Factor to account for REGION Add-Ons

Input:
- P = Number of Portal Frames
- S = Number of Sway Frames
- W = Bridge Width
- VC = Minimum Vertical Clearance
- EP = Number of End Posts (assume 2 per portal)
- EPH = End Post Height (assume VC + 5’)

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<tr>
<th>Width</th>
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</thead>
<tbody>
<tr>
<td>14.00</td>
<td>16.00</td>
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</tr>
<tr>
<td>12.00</td>
<td>1.00</td>
<td>40.8</td>
<td></td>
</tr>
</tbody>
</table>

Assumed plate sections (in):
- W12x53 = 53

Quantity Calculations:
- Portal beams total pounds of steel = 3,445 LBS
- Sway beams total pounds of steel = 5,724 LBS
- End post total pounds of steel = 3,471 LBS
- Subtotal pounds of steel = 12,640 LBS
- Total pounds including gusset & misc. steel factor = 13,904 LBS

Cost Calculations:
- Cost Estimate for portal and sway retrofit = $173,802
- Cost Estimate for heat straightening and/or additional member retrofit = $8,690
- Sub total = $182,492
- Cost Estimate due to construction difficulty factor = $36,498
- TOTAL Bridge Cost = $219,000
- Cost Estimate for Region Add-on items = $219,000

TOTAL PROJECT COST ESTIMATE = $438,000
**Bridge Name:** N FK NOOKSACK R WARNICK BRIDGE  
**Bridge Number:** 542/30  
**Structure ID:** 0001494A  
**Region:** Southwest  
**Year Built/Widened:** 1931  
**Sufficiency Rating:** 44.88  
**Truss Bridge Length:** 152 FT  
**Ave Daily Traffic:** 1,522  
**Ave Daily Truck Traffic:** 107  
**Number of Lanes:** 2  
**Bridge Width (curb to curb):** 20 FT  
**Portal/Sway Span Width:** 23 FT  
**Minimum Vertical Clearance at Curb:** 16’ 03  
**Minimum Vertical Clearance at Fog Line:** 16’ 04  
**Minimum Shoulder Width:** 01’ 00  
**Number of Portal Frames:** 2  
**Number of Sway Frames:** 4  
**Previous High Load Hit?** YES  
**Additional Members Requiring Retrofit?** YES  

**Recommendations and Cost Estimates**

1. Retrofit bridge by raising portals and sways to 16’-06” minimum vertical clearance.  
2. Heat straighten and/or repair other damaged truss members.  
3. Sway frames may be OK as is.

**Cost Estimates:** (See page 2 for breakdown)

- Cost Estimate for Portal and Sway Retrofit = $155,124  
- Cost Estimate for Additional Member Retrofit = $7,756  
- Sub Total = $162,880  
- Cost Estimate for Difficulty of Construction Factor = $48,864  
- Total Bridge Cost = $211,800  
- Cost Estimate for Region Add-On Items = $211,800

**Total Project Cost Estimate =** $423,600
TRUSS PORTAL AND SWAY RETROFIT ESTIMATE

Truss Name = N FK NOOKSACK R. WARNICK BRIDGE
Truss Bridge Number = 542/30

Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = 12.50 $/LB

Cost Adjustment Factors:
- 10% = Factor to account for gussets & misc. steel
- 5% = Factor if significant heat straightening or repair of other members is anticipated
- 30% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
- 100% = Factor to account for REGION Add-Ons

Input:
- P = Number of Portal Frames
- S = Number of Sway Frames
- W = Bridge Width
- VC = Minimum Vertical Clearance
- EP = Number of End Posts (assume 2 per portal)
- EPH = End Post Height (assume VC + 5')

<table>
<thead>
<tr>
<th>Width</th>
<th>Height</th>
<th>Thick.</th>
<th>#:/LF</th>
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</thead>
<tbody>
<tr>
<td>14.00</td>
<td>16.00</td>
<td>0.3125</td>
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</tr>
<tr>
<td>12.00</td>
<td>1.00</td>
<td>40.8</td>
<td></td>
</tr>
</tbody>
</table>

Assumed plate sections (in)
- W12x53

Assumed plate sections (in)

Quantity Calculations:
- Portal beams total pounds of steel = 2,936 LBS
- Sway beams total pounds of steel = 4,876 LBS
- End post total pounds of steel = 3,471 LBS
- Subtotal pounds of steel = 11,282 LBS
- Total pounds including gusset & misc. steel factor = 12,410 LBS

Cost Calculations:
- Cost Estimate for portal and sway retrofit = $155,124
- Cost Estimate for heat straightening and/or additional member retrofit = $7,756
- Sub total = $162,880
- Cost Estimate due to construction difficulty factor = $48,864
- TOTAL Bridge Cost = $211,800
- Cost Estimate for Region Add-on items = $211,800

TOTAL PROJECT COST ESTIMATE = $423,600
**Truss Vertical Clearance Report**

**Bridge and Structures Office**

**BRIDGE NAME:** WYNOOCHEE RIVER BRIDGE

**BRIDGE NUMBER:** 12/25

**STRUCTURE ID:** 0001949A

**REGION:** Southwest

**YEAR BUILT/WIDENED:** 1935

**SUFFICIENCY RATING:** 44.88

**TRUSS BRIDGE LENGTH:** 200 FT

**AVE DAILY TRAFFIC:** 19,118

**AVE DAILY TRUCK TRAFFIC:** 1721

**NUMBER OF LANES:** 4

**BRIDGE WIDTH (curb to curb):** 44 FT

**PORTAL/SWAY SPAN WIDTH:** 44 FT

**MINIMUM VERTICAL CLEARANCE AT CURB:** 16’ 03"

**MINIMUM VERTICAL CLEARANCE AT FOG LINE:** 16’ 03"

**MINIMUM SHOULDER WIDTH:** 00’ 05"

**NUMBER OF PORTAL FRAMES:** 2

**NUMBER OF SWAY FRAMES:** 5

**PREVIOUS HIGH LOAD HIT?** YES

**ADDITIONAL MEMBERS REQUIRING RETROFIT?** YES

**LOCATION**

- **SR 12**
- **MILEPOST: 8.33**
- **LATITUDE:** 46.97658266
- **LONGITUDE:** -123.643944

**RECOMMENDATIONS AND COST ESTIMATES**

**RECOMMENDATION:**
1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearance.
2. Heat straighten and/or repair other damaged truss members.
3. Note - portals and sways raised in the past.

**COST ESTIMATES:** (See page 2 for breakdown)

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
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</thead>
<tbody>
<tr>
<td>COST ESTIMATE FOR PORTAL AND SWAY RETROFIT</td>
<td>$285,249</td>
</tr>
<tr>
<td>COST ESTIMATE FOR ADDITIONAL MEMBER RETROFIT</td>
<td>$14,262</td>
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<td>SUB TOTAL</td>
<td>$299,512</td>
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<td>COST ESTIMATE FOR DIFFICULTY OF CONSTRUCTION FACTOR</td>
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<tr>
<td>TOTAL BRIDGE COST</td>
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<tr>
<td>COST ESTIMATE FOR REGION ADD-ON ITEMS</td>
<td>$329,500</td>
</tr>
<tr>
<td>TOTAL PROJECT COST ESTIMATE</td>
<td>$659,000</td>
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</tbody>
</table>

**Note:** Reported to FHWA.
TRUSS PORTAL AND SWAY RETROFIT ESTIMATE

Truss Name = WYNOOCHEE RIVER BRIDGE
Truss Bridge Number = 12/25

Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = 12.50 $/LB

Cost Adjustment Factors:
- 10% = Factor to account for gussets & misc. steel
- 5% = Factor if significant heat straightening or repair of other members is anticipated
- 10% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
- 100% = Factor to account for REGION Add-Ons

Input:
- \( P = \text{Number of Portal Frames} \) = 2 Each
- \( S = \text{Number of Sway Frames} \) = 5 Each
- \( W = \text{Bridge Width} \) = 44.00 Ft
- \( VC = \text{Minimum Vertical Clearance} \) = 16.25 Ft
- \( EP = \text{Number of End Posts (assume 2 per portal)} \) = 4 Each
- \( EPH = \text{End Post Height (assume VC + 5')} \) = 21.25 Ft

Assumed plate sections (in)

<table>
<thead>
<tr>
<th>Width</th>
<th>Height</th>
<th>Thick.</th>
<th>#/LF</th>
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<tbody>
<tr>
<td>14.00</td>
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<table>
<thead>
<tr>
<th>Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>W12x53</td>
</tr>
<tr>
<td>53</td>
</tr>
</tbody>
</table>

Quantity Calculations:
- Portal beams total pounds of steel = 5,615 LBS
- Sway beams total pounds of steel = 11,660 LBS
- End post total pounds of steel = 3,471 LBS
- Subtotal pounds of steel = 20,745 LBS
- Total pounds including gusset & misc. steel factor = 22,820 LBS

Cost Calculations:
- Cost Estimate for portal and sway retrofit = $285,249
- Cost Estimate for heat straightening and/or additional member retrofit = $14,262
- Sub total = $299,512
- Cost Estimate due to construction difficulty factor = $29,951
- TOTAL Bridge Cost = $329,500
- Cost Estimate for Region Add-on items = $329,500

TOTAL PROJECT COST ESTIMATE = $659,000
Truss Vertical Clearance Report

<table>
<thead>
<tr>
<th>BRIDGE NAME:</th>
<th>YAKIMA RIVER BRIDGE 114N</th>
</tr>
</thead>
<tbody>
<tr>
<td>BRIDGE NUMBER:</td>
<td>82/114N</td>
</tr>
<tr>
<td>STRUCTURE ID:</td>
<td>0001583A</td>
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<tr>
<td>REGION:</td>
<td>North Central</td>
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<tr>
<td>YEAR BUILT/WIDENED:</td>
<td>1932</td>
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<tr>
<td>SUFFICIENCY RATING:</td>
<td>61.18</td>
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<tr>
<td>TRUSS BRIDGE LENGTH:</td>
<td>284 FT</td>
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<tr>
<td>AVE DAILY TRAFFIC:</td>
<td>10,493</td>
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<tr>
<td>AVE DAILY TRUCK TRAFFIC:</td>
<td>2623</td>
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<tr>
<td>NUMBER OF LANES:</td>
<td>3</td>
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</tbody>
</table>

VERTICAL CLEARANCE INFORMATION

<table>
<thead>
<tr>
<th>BRIDGE WIDTH (curb to curb)</th>
<th>36 FT</th>
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</thead>
<tbody>
<tr>
<td>PORTAL/SWAY SPAN WIDTH</td>
<td>39 FT</td>
</tr>
<tr>
<td>MINIMUM VERTICAL CLEARANCE AT CURB:</td>
<td>16' 03</td>
</tr>
<tr>
<td>MINIMUM VERTICAL CLEARANCE AT FOG LINE:</td>
<td>16' 03</td>
</tr>
<tr>
<td>MINIMUM SHOULDER WIDTH:</td>
<td>00' 00</td>
</tr>
<tr>
<td>NUMBER OF PORTAL FRAMES:</td>
<td>2</td>
</tr>
<tr>
<td>NUMBER OF SWAY FRAMES:</td>
<td>7</td>
</tr>
<tr>
<td>PREVIOUS HIGH LOAD HIT?</td>
<td>YES</td>
</tr>
<tr>
<td>ADDITIONAL MEMBERS REQUIRING RETROFIT?</td>
<td>YES</td>
</tr>
</tbody>
</table>

RECOMMENDATIONS AND COST ESTIMATES

RECOMMENDATION:
1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearnance.
2. Heat straighten and/or repair other damaged truss members.
3. Some repair work has been performed on sways and portals

COST ESTIMATES: (See page 2 for breakdown)

| COST ESTIMATE FOR PORTAL AND SWAY RETROFIT | $315,100 |
| COST ESTIMATE FOR ADDITIONAL MEMBER RETROFIT | $15,755 |
| TOTAL SUB TOTAL | $330,855 |
| COST ESTIMATE FOR DIFFICULTY OF CONSTRUCTION FACTOR | $66,171 |
| TOTAL BRIDGE COST | $397,100 |
| COST ESTIMATE FOR REGION ADD-ON ITEMS | $397,100 |
| TOTAL PROJECT COST ESTIMATE | $794,200 |

LOCATION

| SR 82 | MILEPOST: 30.78 |
| LATITUDE: 46.63105488 | LONGITUDE: -120.516833 |

DETOUR & ROUTE MAX VERTICAL CLEARANCE

| FULL BRIDGE CLOSURE ESTIMATED DETOUR: | 1 Miles |
| MAXIMUM VERTICAL CLEARANCE IN ROUTE: | 16' 05 |
| MINIMUM VERTICAL CLEARANCE IN ROUTE: | 16' 03 |

Reported to FHWA

11/11/2017

PRIORITY RATING: 3
TRUSS PORTAL AND SWAY RETROFIT ESTIMATE

Truss Name = YAKIMA RIVER BRIDGE 114N
Truss Bridge Number = 82/114N

Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = $12.50/LB

Cost Adjustment Factors:
- 10% = Factor to account for gussets & misc. steel
- 5% = Factor if significant heat straightening or repair of other members is anticipated
- 20% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
- 100% = Factor to account for REGION Add-Ons

Input:
- P = Number of Portal Frames = 2 Each
- S = Number of Sway Frames = 7 Each
- W = Bridge Width = 39.00 Ft
- VC = Minimum Vertical Clearance = 16.25 Ft
- EP = Number of End Posts (assume 2 per portal) = 4 Each
- EPH = End Post Height (assume VC + 5’) = 21.25 Ft

Quantity Calculations:
- Portal beams total pounds of steel = 4,977 LBS
- Sway beams total pounds of steel = 14,469 LBS
- End post total pounds of steel = 3,471 LBS
- Subtotal pounds of steel = 22,916 LBS
- Total pounds including gusset & misc. steel factor = 25,208 LBS

Cost Calculations:
- Cost Estimate for portal and sway retrofit = $315,100
- Cost Estimate for heat straightening and/or additional member retrofit = $15,755
- Sub total = $330,855
- Cost Estimate due to construction difficulty factor = $66,171
- TOTAL Bridge Cost = $397,100
- Cost Estimate for Region Add-on items = $397,100

TOTAL PROJECT COST ESTIMATE = $794,200
**TRUSS VERTICAL CLEARANCE REPORT**

**BRIDGE NAME:** JULIA BUTLER HANSEN BRIDGE  
**BRIDGE NUMBER:** 409/10  
**STRUCTURE ID:** 0002377A  
**REGION:** Northwest  
**YEAR BUILT/WIDENED:** 1938  
**SUFFICIENCY RATING:** 38.45  
**TRUSS BRIDGE LENGTH:** 1080 FT  
**AVE DAILY TRAFFIC:** 1,924  
**AVE DAILY TRUCK TRAFFIC:** 212  
**NUMBER OF LANES:** 2  
**BRIDGE WIDTH (curb to curb):** 20 FT  
**PORTAL/SWAY SPAN WIDTH:** 24 FT  
**MINIMUM VERTICAL CLEARANCE AT CURB:** 16' 04"  
**MINIMUM VERTICAL CLEARANCE AT FOG LINE:** 16' 04"  
**MINIMUM SHOULDER WIDTH:** 00' 00"  
**NUMBER OF PORTAL FRAMES:** 3  
**NUMBER OF SWAY FRAMES:** 0  
**PREVIOUS HIGH LOAD HIT?** YES  
**ADDITIONAL MEMBERS REQUIRING RETROFIT?** YES  

**RECOMMENDATIONS AND COST ESTIMATES**

**RECOMMENDATION:**
1. Retrofit bridge by raising portals and sways to 16'-06" minimum vertical clearance.
2. Heat straighten and/or repair other damaged truss members.
3. Sways have been raised in the past

**COST ESTIMATES:** (See page 2 for breakdown)

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>COST ESTIMATE FOR PORTAL AND SWAY RETROFIT</td>
<td>$135,031</td>
</tr>
<tr>
<td>COST ESTIMATE FOR ADDITIONAL MEMBER RETROFIT</td>
<td>$6,752</td>
</tr>
<tr>
<td>SUB TOTAL</td>
<td>$141,782</td>
</tr>
<tr>
<td>COST ESTIMATE FOR DIFFICULTY OF CONSTRUCTION FACTOR</td>
<td>$21,267</td>
</tr>
<tr>
<td>TOTAL BRIDGE COST</td>
<td>$163,100</td>
</tr>
<tr>
<td>COST ESTIMATE FOR REGION ADD-ON ITEMS</td>
<td>$163,100</td>
</tr>
<tr>
<td>TOTAL PROJECT COST ESTIMATE</td>
<td>$326,200</td>
</tr>
</tbody>
</table>

**LOCATION**

- **SR 409**  
- **MILEPOST:** 2.79  
- **LATITUDE:** 46.19124966  
- **LONGITUDE:** -123.385139

**DETOUR & ROUTE MAX VERTICAL CLEARANCE**

- **FULL BRIDGE CLOSURE ESTIMATED DETOUR:** 99 Miles  
- **MAXIMUM VERTICAL CLEARANCE IN ROUTE:** 16' 05"  
- **MINIMUM VERTICAL CLEARANCE IN ROUTE:** 16' 04"
TRUSS PORTAL AND SWAY RETROFIT ESTIMATE

Truss Name = JULIA BUTLER HANSEN BRIDGE
Truss Bridge Number = 409/10

Assumptions:
1. Existing portal beams will be removed and replaced with built-up box section
2. Existing end posts will be strengthened with added plates
3. Existing sway beams will be removed and replaced with rolled I-beam section
4. Existing diagonal bracing will remain and will be cut to fit
5. Existing gusset plates will be replaced at connections.
6. Cost is based on the total pounds of steel at = 12.50 $/LB

Cost Adjustment Factors:
- 10% = Factor to account for gussets & misc. steel
- 5% = Factor if significant heat straightening or repair of other members is anticipated
- 15% = Factor for overall construction difficulty due to location, traffic impact, potential detours, number of lanes
- 100% = Factor to account for REGION Add-Ons

Input:
- $P = Number of Portal Frames
- $S = Number of Sway Frames
- $W = Bridge Width
- $VC = Minimum Vertical Clearance
- $EP = Number of End Posts (assume 2 per portal)
- $EPH = End Post Height (assume VC + 5')

Quantity Calculations:
- Portal beams total pounds of steel = 4,594 LBS
- Sway beams total pounds of steel = 0 LBS
- End post total pounds of steel = 5,227 LBS
- Subtotal pounds of steel = 9,820 LBS
- Total pounds including gusset & misc. steel factor = 10,802 LBS

Cost Calculations:
- Cost Estimate for portal and sway retrofit = $135,031
- Cost Estimate for heat straightening and/or additional member retrofit = $6,752
- Sub total = $141,782
- Cost Estimate due to construction difficulty factor = $21,267
- TOTAL Bridge Cost = $163,100
- Cost Estimate for Region Add-on items = $163,100

TOTAL PROJECT COST ESTIMATE = $326,200
Americans with Disabilities Act (ADA) Information:
This material can be made available in an alternate format by emailing the Office of Equal Opportunity at wsdotada@wsdot.wa.gov or by calling toll free, 855-362-4ADA(4232). Persons who are deaf or hard of hearing may make a request by calling the Washington State Relay at 711.

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It is the Washington State Department of Transportation’s (WSDOT) policy to assure that no person shall, on the grounds of race, color, national origin or sex, as provided by Title VI of the Civil Rights Act of 1964, be excluded from participation in, be denied the benefits of, or be otherwise discriminated against under any of its federally funded programs and activities. Any person who believes his/her Title VI protection has been violated, may file a complaint with WSDOT’s Office of Equal Opportunity (OEO). For additional information regarding Title VI complaint procedures and/or information regarding our non-discrimination obligations, please contact OEO’s Title VI Coordinator at (360) 705-7082.