EFFECT OF THE IMPLEMENTATION OF THE FLUVIAL PERFORMANCE STANDARD ON MAINTENANCE OF BRIDGES AND CULVERTS

Final Report

SPR 715

RESEARCH

Oregon Department of Transportation

EFFECT OF THE IMPLEMENTATION OF THE FLUVIAL PERFORMANCE STANDARD ON MAINTENANCE OF BRIDGES AND CULVERTS

Final Report

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by

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16. Abstract

The objective of this project was to determine what factors influence maintenance cost of Oregon Department of Transportation (ODOT) stream-crossing structures. Data acquired for the project included structure characteristics, stream characteristics, peak flows, and 1996-2010 maintenance costs for five maintenance activities. Nine factors were selected to investigate: active channel width, ratio of valley width to active channel width, number of hardwoods, number of conifers, ratio of bridge length to active channel width, ratio of longest bridge span to active channel width, and the ratio of peak flow to average flow both the year of maintenance and the year prior to maintenance. Possible relationships were investigated through the use of scatter-plots and bar-charts. Potential problems with the datasets may have prevented the discovery of relationships. The average maintenance interval and the average annual cost of maintenance over the fifteen-year period were both found to be very low.

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APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
		AREA		
in^2	square inches	645.2	millimeters squared	mm^2
ft^2	square feet	0.093	meters squared	m^2
yd^2	square yards	0.836	meters squared	m^2
ac	acres	0.405	hectares	ha
mi^2	square miles	2.59	kilometers squared	km^2
		VOLUME		
fl oz	fluid ounces	29.57	milliliters	ml
gal	gallons	3.785	liters	L
ft^3	cubic feet	0.028	meters cubed	m^3
yd^3	cubic yards	0.765	meters cubed	m^3
	NOTE: Volumes greater than 1000 L shall be shown in m^3.			
		MASS		
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams	Mg
		TEMPERATURE (exact)		
°F	Fahrenheit	(F-32)/1.8	Celsius	°C

APPROXIMATE CONVERSIONS FROM SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
		AREA		
mm^2	millimeters squared	0.0016	square inches	in^2
m^2	meters squared	10.764	square feet	ft^2
m^2	meters squared	1.196	square yards	yd^2
ha	hectares	2.47	acres	ac
km^2	kilometers squared	0.386	square miles	mi^2
		VOLUME		
ml	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m^3	meters cubed	35.315	cubic feet	ft^3
m^3	meters cubed	1.308	cubic yards	yd^3
		MASS		
g	grams	0.035	ounces	oz
kg	kilograms	2.205	pounds	lb
Mg	megagrams	1.102	short tons (2000 lb)	T
		TEMPERATURE (exact)		
°C	Celsius	1.8C+32	Fahrenheit	°F

*SI is the symbol for the International System of Measurement

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1.0 INTRODUCTION

In the first decade of the 21st century, the Oregon Department of Transportation (ODOT) began implementing new fluvial performance standards (FPS) for stream-crossing structures (i.e. bridges and culverts) to facilitate sediment transport, allow better passage of fluvial debris, and provide for "longitudinal and lateral continuity and conductivity" (*ODOT 2004*). The goal of these standards is to reduce negative effects on the environment, specifically with regard to endangered species and wetlands. The intention is to improve both hydraulic and habitat connectivity and reduce the impact that the structures have on sediment and debris transport by the stream. The implementation of the FPS has been gradual, starting with the Oregon Transportation Investment Act (OTIA III) State Bridge Delivery Program projects in 2007, and codified in August 2008 in the Standard Local Operating Procedures for Endangered Species (SLOPES IV).

The FPS and SLOPES IV have produced a readily recognized benefit of streamlined permitting and compliance with environmental regulations. In exchange for these benefits, designing for more than just hydraulic adequacy often results in additional costs to construct a larger stream-crossing structure that impinges less on the stream. The change in the approach to designing stream-crossing structures may carry with it additional benefits. This project sought to explore one of these potential benefits: reduced maintenance.

1.1 OBJECTIVES

The fundamental objective of this project was to determine if the FPS resulted in reduced maintenance costs for stream-crossing structures. The project originally envisioned that the maintenance costs of FPS compliant structures could be compared with the maintenance costs for non-FPS compliant structures to see if a detectable decrease in maintenance costs occurred.

The characteristics of the readily available data to use for this objective dictated a modified project objective. The objective became the investigation of the factors that influence maintenance costs on ODOT stream-crossing structures. The hope was that a cost function with the influencing factors as variables could be developed. With a greater understanding of the factors that drive maintenance for stream-crossing structures, regardless of what standards they were built under, the effect the FPS have on stream-crossing structure maintenance costs can be explored more fully.

1.2 APPROACH

One of the ways the FPS reduces environmental effects is to require that single span structures and culverts have an opening at least 1.5 times the active channel width and multi-span structures have an opening at least 2.2 times the active channel width, although provisions are allowed for situations where that is not possible (*USACE 2008*). These requirements result in longer bridges and wider culverts than previous bridge and culvert standards. One of the objectives of these larger stream-crossing structures is to facilitate the transport of large woody debris and sediment. For example, the FPS standards state that FPS structures must, “allow the fluvial transport of large wood, up to a site potential tree height in size, through the project area without becoming stranded on the bridge structure” (*USACE 2008*). If this is accomplished, then some maintenance costs should be lower for stream-crossing structures built under these refined FPS standards. One common maintenance activity frequently performed is drift removal; that is to say, the removal of woody debris that has been caught under or on a stream crossing structure. Accumulation of woody debris compromises safety by raising the water flow levels at the stream-crossing structure. Woody debris may also damage the structure or surrounding soils and rip rap. The FPS should result in less need for drift removal and the associated costs.

This project relied exclusively on data sources already in existence and did not engage in any field collection of new data. The project was also completely dependent on the nature of ODOT’s tracking of maintenance activities and their associated costs. As such, the project relied heavily on the knowledge and experience of ODOT personnel. Table 1.1 lists the individuals who provided assistance with this project, from compiling data to clarifying aspects of the FPS, and maintenance procedures.

Table 1.1: List of Contributing Experts

Name	Position
William Fletcher	Water Resources Program Coordinator, Geo/Environmental Section, ODOT
Dean Fuller	District 4 Assistant District Manager, ODOT
Richard Groff	Retired Senior Load Rating Engineer for the Bridge Program, ODOT
Ryan Johnson	GIS Analyst, ODOT
Bradley Livingston	Wetlands Program Coordinator, ODOT
Bo Miller	Hydraulics Engineer, ODOT
Zak Toledo	Natural Resources Coordinator, Oregon Bridge Delivery Partners
Theresa Yih	Bridge Program System Analyst, ODOT

We identified four main categories of information needed to pursue the objectives of this project. First, we would need information regarding the location and characteristics of ODOT’s stream-crossing structures. Second, we would need information regarding ODOT’s maintenance activities at these stream-crossing structures and the associated costs. Third, we would need information about the characteristics of the streams being crossed by the structures. Fourth, and finally, we needed information about the timing of peak stream flows relative to performance of the maintenance activities. Each of these four data categories had some level of information available. The data sets are described in the following sections.

1.3 ODOT BRIDGES AND CULVERTS

ODOT has what is essentially a complete listing of “structures,” including bridges. It also includes culverts that are over 6 feet wide (as measured in the direction the roadway crossing the structure). ODOT calls this inventory the “Oregon Department of Transportation Bridge Log” (Bridge Log). Various electronic data systems incorporate the data of the Bridge Log. A partial list of these includes the “Bridge Data System” (BDS), the “Bridge Management System”

(BMS), the “National Bridge Inventory” (NBI), “PONTIS” (aka “AASHTOware Bridge Management”), and “TransGIS.”

Richard Groff provided an Excel version of the Bridge Log as it stood February 23, 2010. The data fields in the bridge log considered pertinent to this project were: highway, milepost, bridge ID, old bridge ID, bridge name, description of bridge spans, additional descriptions, year built, years of major modifications, ODOT region, and comments. About 3,400 stream-crossing structures were in the version of the Bridge Log used.

ODOT also maintains an inventory of culverts. This inventory partially overlaps with the Bridge Log because of the Bridge Log including culverts six feet wide and larger as “structures.” For many years, ODOT maintained the culvert inventory in ITIS (Integrated Transportation Information System). The ITIS inventory is fundamentally created and maintained based on “as built” construction documents. It is widely accepted and recognized within ODOT that this inventory is far from complete. The total number of culverts in ODOT’s system is estimated to be in the tens of thousands. Many streams pass under ODOT roadways through culverts that are less than 6 feet in size.

In recent years, ODOT has begun the process of creating a Drainage Facility Management System (DFMS). ODOT is working on populating the DFMS with culvert data based upon on-site visits. The intention being that this will lead to a more complete inventory of culverts that are part of the state highway system.

The level of information about stream-crossing structures in ODOT’s highways system covers a broad range. At the high end, the information on bridges includes design drawings and as-built drawings as well as biennial inspection information. At the low end, ODOT realizes that there are culverts beneath state highways about which nothing is known, including their location and very existence.

1.4 ODOT MAINTENANCE ACTIVITIES

ODOT maintenance activities are carried out by a system of Maintenance Districts. Fifteen maintenance districts collectively cover the entire state. The Districts track their maintenance activities according to roadway segments that are multiple miles long. Because of this, no data ties maintenance activities to individual smaller culverts. However, beginning in 1996 maintenance crews did begin recording activities related to specific larger “structures” such as those included in the Bridge Log. Dean Fuller provided spreadsheets of maintenance costs, by structure, for 1996-2010. Data tied to specific structures was not available for prior to 1996 (*D. Fuller, personal communication, August 27, 2010*). Thus, a very small subset of the total number of stream crossing structures has data regarding maintenance costs available.

The spreadsheets separate the maintenance cost data by coded maintenance activity. Table 1.2 shows the five different maintenance activities deemed applicable to the project. The maintenance cost data used for this project are included in Appendix A, Appendix B, and Appendix C.

Table 1.2: Description of Maintenance Activities

Maintenance Activity	Code	Description
Repair/Replace Rip Rap	343	Repair or replace rip rap and bioremediation
Repair/Replace Slope Paving	344	Repair or replace slope paving at bridges
Repair/Replace Other Drainage	345	Repair or replace drainage facilities. Includes screens, trash racks, siphons, flumes, and tide/flood gates
Maintain Brush	346	Remove brush and trees near structures and in waterways under bridges to maintain channel flow, provide access to the structure for inspection or other work and to prevent structural deterioration
Drift Removal	347	Remove drift and ice flows from bridge piers, bents, and waterways to prevent structural damage - includes patrols to inspect for drift during storms or floods

Maintenance costs are recorded by expenditure account (EA). Each EA corresponds to an individual structure that is identified by an ID number. There were approximately 1,500 stream crossing structures in the cost spreadsheets. This indicates that less than 40% of the stream crossings in the 2010 Bridge Log received recorded maintenance during the 15-year period, 1996 to 2010. This finding has significance to this project.

1.5 DATA ON STREAM CHARACTERISTICS

The Oregon Department of Fish and Wildlife (ODFW) has an inventory known as the Aquatic Inventories Project (AIP). The AIP is a research program started by ODFW in 1990. Although primarily concerned with monitoring fish populations, one of the goals of the AIP is to assess aquatic habitat through basin wide surveys (*AIP 2011*). This stream survey information is organized into two datasets: reach and habitat. The two datasets differ primarily in scale; habitat data is collected every time there is a change in stream gradient, with an average segment length of 69 ft. The reach dataset is more generalized information with an average segment length of 5,918 ft. Figure 1.1 shows an example of the relative scale or habitat segments and reach segments. Moore et al. (*1997*) describe the survey methods of the AIP in detail. The AIP data was in the form of GIS files for each surveyed watershed.

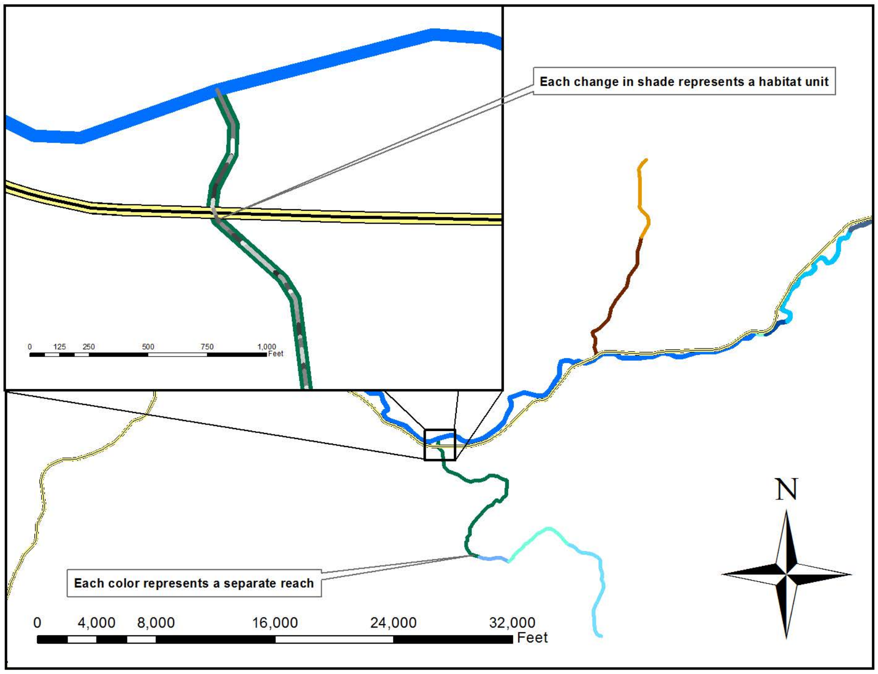

Figure 1.1: A map comparing the scale of reach segments and habitat segments of streams in the AIP data

From the 90 fields of data contained in the AIP files, we selected five stream characteristics that could reasonably be expected to affect stream-crossing structure maintenance activities:

- Active channel width (ACW)-can be used as a surrogate for stream size to investigate whether stream size is reflected in maintenance costs. This parameter is also used in SLOPES IV.

- Stream slope-may influence scour, which could affect the amount of rip-rap repair necessary.

- The numbers of conifers along a stream-might correlate to the amount of woody debris that could require removal.

- The number of hardwoods along a stream might correlate to the amount of woody debris that could require removal.

- The ratio of valley width to ACW, or the valley width index (VWI)-an indication of how much a stream is naturally constrained, which may affect maintenance needs at a man-made constriction such as a stream-crossing structure.

Active channel width (ACW) and valley width index are illustrated in Figure 1.2 below. Active channel width is defined as the "distance across channel at 'bankfull' flow. Bankfull flow is formally defined as the level the stream flow attains every 1.5 years on average (*Moore et al. 1997*).

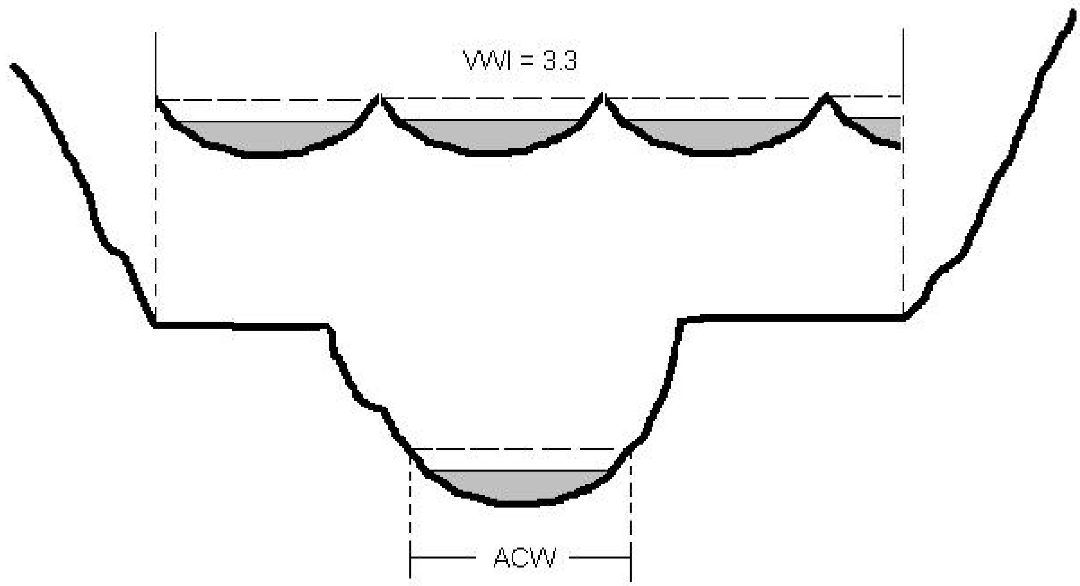

Figure 1.2: Illustration of the meaning of Active Channel Width (ACW) and Valley Width Index (VWI)

1.6 UNITED STATES GEOLOGICAL SURVEY (USGS) GAUGES

Flood-flows in streams have the capacity to move large amounts and larger individual pieces of woody debris and sediment. As such, they are likely to be one of the key factors that drive bridge and culvert maintenance. In order to examine the effect of stream-flow on maintenance, we used peak flow data from the US Geological Survey (USGS). There were 144 USGS stream gages in Oregon that had peak flow records during the period 1995 to 2009. The USGS provides the data in the form of tab-delineated text files for each gage. The USGS also provides GIS data for all Oregon gauges that includes the locations, gauge characteristics, and average annual stream-flow.

2.0 METHODS

To determine if the FPS resulted in reduced maintenance costs for stream-crossing structures any correlations between parameters in the four basic data categories needed to be indentified. To do this data on stream characteristics, stream flows, bridge characteristics and maintenance costs needed to be integrated. What any pair of data sets shared in common was different for the different pairings and thus required a variety of techniques for integrating the data sets. In some cases, a spatial relationship was used. In other cases, equivalent data fields could be used to establish the relationship.

The overlap of the various individual data sets was also an important factor that influenced the size and scope of the data that available for exploring correlations. Figure 2.1 is an attempt to illustrate that while the individual data sets had hundreds, or thousands of entries, the correspondence of entries between individual data sets was limited.

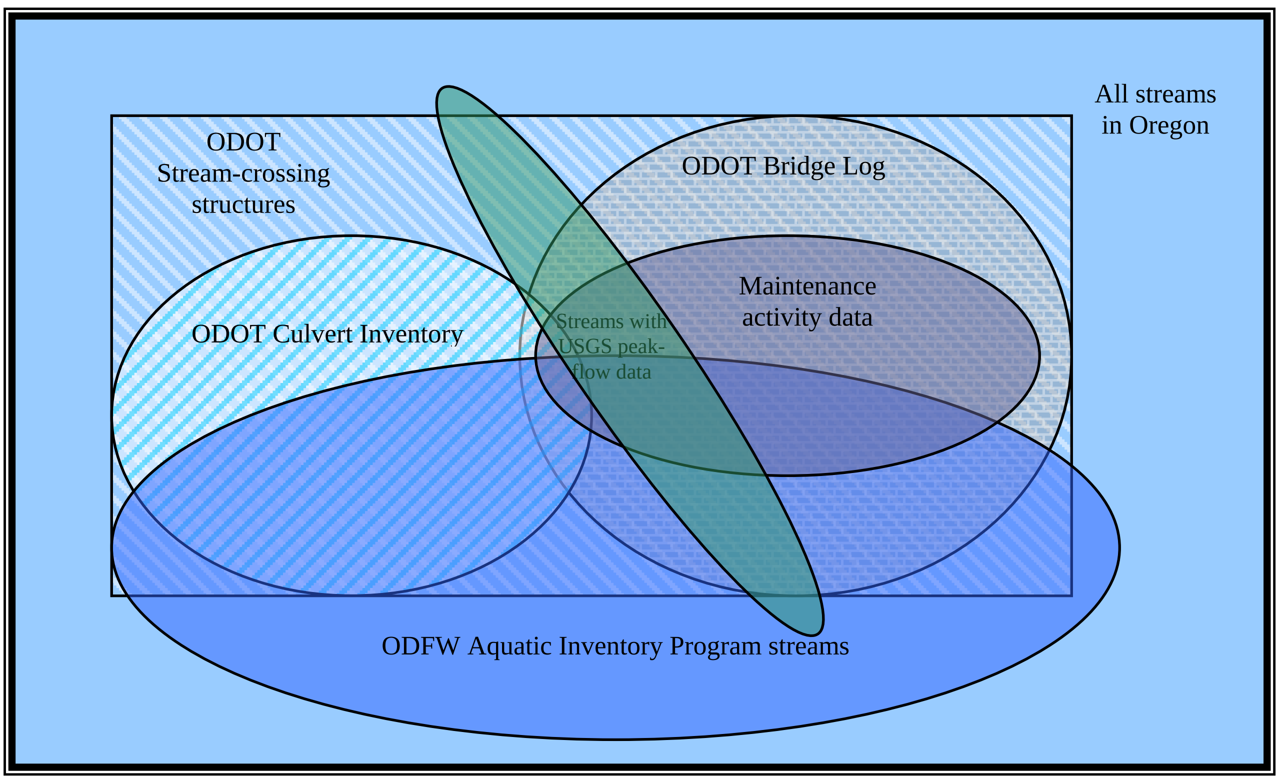

Figure 2.1: Diagram showing interrelationships of the various data categories. The sizes of the various regions are not proportional to the amount of data available

2.1 MERGING MAINTENANCE DATA AND BRIDGE DATA

The maintenance data did not include any spatial information. It did include the Expenditure Account (EA) that was charged. These expenditure accounts were in-turn associated with a individual structure through a bridge ID. Each EA also included a description of the bridge. In most cases, the bridge ID listed for an EA matched the bridge ID in the Bridge Log. However, it was common to have an EA that, based on the EA and Bridge Log descriptions, clearly referred to a certain bridge in the Bridge Log but used a different, older bridge ID. These discrepancies involving bridge IDs occurred throughout the project and were always resolved based on the assumption that the 2010 Bridge Log was the most accurate source. In some cases, the EA descriptions do not match the standard creek name, highway, and milepost format. We removed some of these costs because the description appeared to refer to something other than bridge maintenance, such as “inmate crew.” After further correspondence with Dean Fuller, we concluded that those removals were likely inappropriate. Most, likely all, of them pertained to bridges that were not included the final dataset. Maintenance costs often had more than one “subjob” for a particular bridge. For example, a new subjob might be assigned for unusual work related to a major storm (*D. Fuller, personal communication, September 23, 2010*). For this project, we combined all subjobs to yield a single maintenance cost per bridge per activity per year.

To facilitate associating bridge data with stream data we used the ODOT GIS data on bridges. This GIS information incorporates the Bridge Log data. Most of the approximately 1,500 bridges in the cost spreadsheets were easily associated with the GIS file. For those that were not, a point was placed at the intersection of the stream and road listed in the Bridge Log Description field using the editor toolbar in ArcMap. Four bridges in the maintenance records did not have sufficient road or stream information to locate them on a map.

2.2 CORRELATING BRIDGES WITH AQUATIC INVENTORY STREAMS

Associating the AIP stream data with the Bridge Log data was the most difficult step in integrating the various data sets. The AIP streams are stored as linear features divided up in to reach and habitat segments.

The AIP’s linear features are based on the USGS’s 1:100,000 scale quadrangle maps series. As such, the positional accuracy of the AIP lines allows for errors of well over 100 feet. The formal standard is that less that 10% of the features on a 1:100,000-scale map are more than 0.02 map inches from their true position. At a 1:100,000 scale, 0.02 map inches corresponds to ~167 real-world feet. The locations of ODOT stream-crossing structures have been surveyed to an accuracy of less than a foot. Thus, the stream-crossing structures often appeared to be tens, or hundreds, of feet away from the nearest USGS stream. In order to automate the association of stream-crossing structures with the AIP data, a 300 ft buffer was created for each stream-crossing structure. An intersect operation was performed in ArcMap between the buffers and the AIP reach data. If the 300 ft. buffer of a bridge intersected with a reach segment, and the stream name was the same for both that stream and the stream listed in the bridge description, it was assumed that the bridge did indeed cross that stream, even if the line representing the stream did not pass through the bridge point in ArcMap. Figure 2.2 illustrates this process. The result was as listing of 274 stream-crossing structures that crossed AIP streams in the maintenance cost data set. The join function in ArcMap was used to find the reach and habitat stream segments closest to each of those 274 bridges.

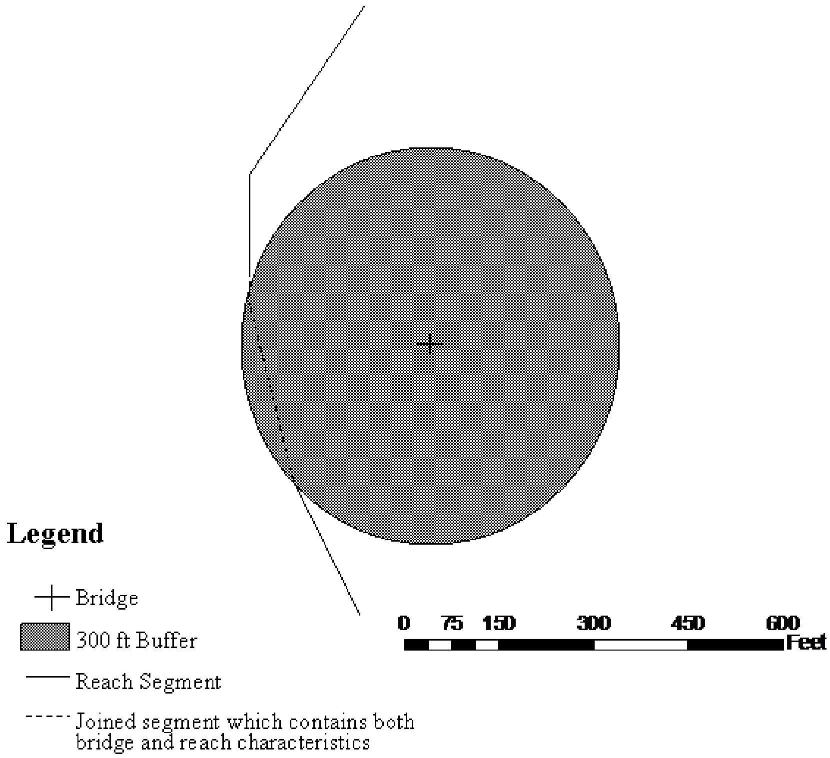

Figure 2.2: Joining reach segments and bridges process

While stream slope was measured for every habitat unit in the AIP surveys, active channel width (ACW) and valley width index (VWI) were measured at every tenth segment, or sometimes at even greater intervals. Every reach segment contained all the stream characteristics of interest, stream slope, ACW, VWI, number of hardwoods, and number of conifers, but reach sections were large, sometimes miles long, and generalized the habitat units (*ODFW 2004*). Since the generalized characteristics of a reach segment might not be anything similar to the actual characteristics at a stream crossing, we considered the reach segment data unsuitable for this project.

In light of these limitations, the best approach to determine stream characteristics at a bridge or culvert site was to locate the nearest habitat segment upstream of a bridge site where ACW and VWI had been measured and use those characteristics. Only upstream segments were considered because that is the source of water, sediment, and debris that passes through the structures. A total of 140 stream-crossing structures either did not have any habitat sections with those parameters upstream, or the measured habitat sections were upstream of a major tributary junction and thus unlikely to be representative of the bridge site. Therefore, for the investigation of relationships involving ACW and VWI, the dataset was further reduced from 274 to 134 bridges. Number of conifers and number of hardwoods data was inconsistently available in the habitat dataset, so the conifer and hardwood data for whichever reach encompassed a stream-crossing structure site was used for that structure. Appendix E lists the stream characteristics assigned to each bridge or culvert.

2.3 EXTRAPOLATING USGS FLOW DATA TO BRIDGE SITES

Only a few stream-crossing structures were on gaged streams, so peak flow information for each bridge site could not be directly obtained. To estimate the effects of flood events on stream-crossing structure maintenance, we calculated the peak flow to mean annual flow ratio for each year and gage. We did this based on the assumption that this ratio would be comparable between streams for watersheds in the same geographic area. Although the ratio of peak flow to mean annual peak flow may have been more suitable, mean annual peak flow data was not available for many of the gauges. We selected a stream gauge to use for each stream-crossing structure by visual inspection in ArcMap. Although this could have been done for all ODOT stream-crossing structures, we only assigned gages to the 274 structures that also had AIP stream characteristic data. A list, by bridge ID, of gauges and peak flow to mean annual flow ratios is in Appendix F.

Our matching by inspection was based primarily on gage proximity to a particular stream-crossing structure. We also considered the geography of the bridge site. For example, for a bridge in the Willamette Valley, preference would be given to a gage in the Willamette Valley over a gauge in the Cascades, even if the Cascades gage was actually closer to the bridge site. Another example is if the nearest stream gauge to a bridge was on a much larger stream, in such a case preference might be given to a gage on a stream farther away but more comparable in the size of its watershed. Gages affected by regulation or diversion were not used unless the bridge or culvert to be matched was also on that stream.

Figure 2.3 shows all of the ODOT stream-crossing structures in the cost database, the 274 ODOT bridges and culverts that cross AIP streams, AIP surveyed streams, and USGS gauges with peak flow records between 1996 and 2009.

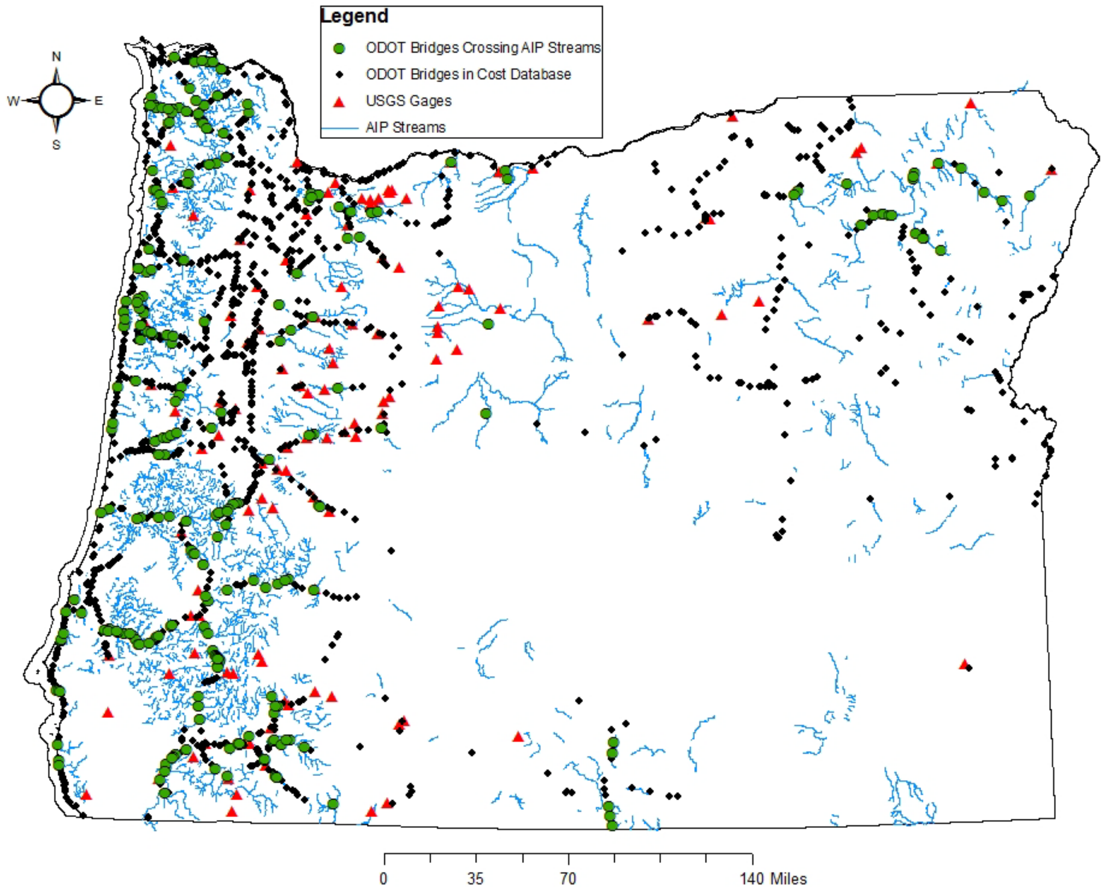

Figure 2.3: Map of bridges, gauges, and streams in the data sources used

2.4 CALCULATIONS

We examined two possible measures of stream-crossing structure maintenance: average annual maintenance cost and average maintenance interval. The majority of the structures in the cost database had maintenance performed on them only once during the 1996-2010 period. Since a true maintenance interval could only be calculated for a small percentage of the stream-crossing structures, average annual maintenance cost was chosen as the measure of bridge maintenance.

For each of the five maintenance activities, total cost over the 1996-2010 period and average annual cost for each bridge were calculated. In some cases, maintenance occurred in the same year that a structure was replaced with no indication as to whether the maintenance occurred on the old structure or the new structure. Based on field observations of construction still in progress after the replacement date in the Bridge Log, it was assumed that maintenance listed in a replacement year likely occurred on the old structure at that location. It is also possible that the maintenance occurred during replacement construction when two structures were present.

The Bridge Log we were provided only had a description of the current structure at each location, therefore no analysis was conducted for structures no longer in existence because structure dimensions were unknown, even when cost data was available for them. Bridge Logs for previous years do exist and potentially could be used for structures replaced from 1996 to

2010. Average annual cost was calculated as the total cost for a bridge divided by fifteen years, or in the case of structures built between 1996-2010, as the total cost divided by the difference between 2010 and the year of construction. While averaging for differing time periods was not ideal, it was decided that expanding the dataset by including these newer structures would benefit the analysis.

The FPS minimum opening requirement, 1.5 times the Active Channel Width (ACW) for single span structures and 2.2 times ACW for multi-span structures, refers to embankment fills as well as actual bridge span. However, ODOT hypothesized that a larger ratio of span to ACW ratio might tend to allow better passage of drift. It was logical therefore, to also investigate the relationship between the ratio of bridge span to ACW and maintenance cost. In addition, the possibility exists that, for multi span structures, the ratio of the longest span to ACW may affect maintenance cost. This is because the longest span is typically the closest to the center of the stream and most likely to hinder drift movement. Appendix E contains these ratios.

Using the description of spans in the Bridge Log, two new columns were added to the Excel spreadsheet version of the Bridge Log. One column summed the spans to yield a total bridge length, and one column listed the length of the longest span. For culverts, total structure span was calculated as the culvert width, or sum of culvert widths in the case of multiple culverts. For single culverts and single span bridges, the longest span value was equal to the bridge length or culvert length value. We identified culverts from the structure descriptions and a new column was created that explicitly identified a structure as either a bridge or culvert.

2.5 ANALYSIS

After considering the data available, nine factors were selected that could be reasonably expected to have an effect on bridge maintenance. These nine are:

1. active channel width (ACW)
2. stream slope
3. number of conifers along a stream
4. number of hardwoods along a stream
5. the ratio of valley width to ACW (VWI)
6. the ratio of bridge length to ACW
7. the ratio of the longest span of a bridge to ACW
8. the ratio of peak stream flow to average annual flow the year prior to maintenance
9. the ratio of peak stream flow to average annual flow the year of maintenance.

We combined all the data in Microsoft Access using the bridge ID as the common field. This resulted in a large table with all the cost information, bridge characteristics, stream characteristics, and peak flow for every year in a single row for each bridge. Next, we used a series of queries in Access to narrow the table to the nine factors of interest, and the results were exported to Excel for further analysis. In Excel, the ratios of structure length to ACW, and longest span length to ACW were calculated. Data was then divided into three new tables, one for total cost per year per bridge, one for drift removal (activity 347) per year per bridge, and one for repairing and replacing rip rap (activity 343) per year per bridge. Activities 347 and 343 were chosen for separate analysis because, of the five FPS-related maintenance activities, they seemed the most likely to correlate to one of the nine factors.

The climate east of the Cascades is considerably different from the climate west of the Cascades, and there is a substantial difference in the abundance and type of vegetation as well. It is conceivable that relationships between the nine factors and bridge maintenance might be different between these two regions. Therefore, ODOT Regions 4 and 5, which correspond roughly to the east side of the Cascades, were analyzed separately from ODOT Regions 1, 2, and 3, which are west of the Cascades. Since differences might also exist between bridges and culverts, we also divided and analyzed the data by structure type.

For the peak flow data, we examined two data combinations. The first was the peak flow to average flow ratio versus the maintenance cost in that year. The second was the peak flow to average flow ratio versus the maintenance cost the next year. Both of these data combinations were examined because if maintenance were performed right after or during a flood, it would appear in the same year as the high peak flow. However, if the maintenance need was less critical, although still in response to the flood, maintenance might have been performed the following summer, in which case the maintenance cost might appear in the year after the high peak flow. Years of zero maintenance were generally not included, although a few plots that included them were examined to see if there was a significant difference.

This approach of examining maintenance costs the year of, and the year following, high peak-flows admittedly ignores the possibility of there being multi-year lag times for high peak-flow generated debris to reach a structure. The lag is likely extremely variable between structures and reaches. For this reason, there is no way to otherwise correlate debris accumulations with high-flow events using the data available for this project.

In order to get an initial idea of what relationships might exist; over 150 scatter-plots of the various characteristics of interest versus average annual cost of maintenance were created for activity 343, activity 347, and total maintenance. Figure 2.4 shows example scatter-plots.

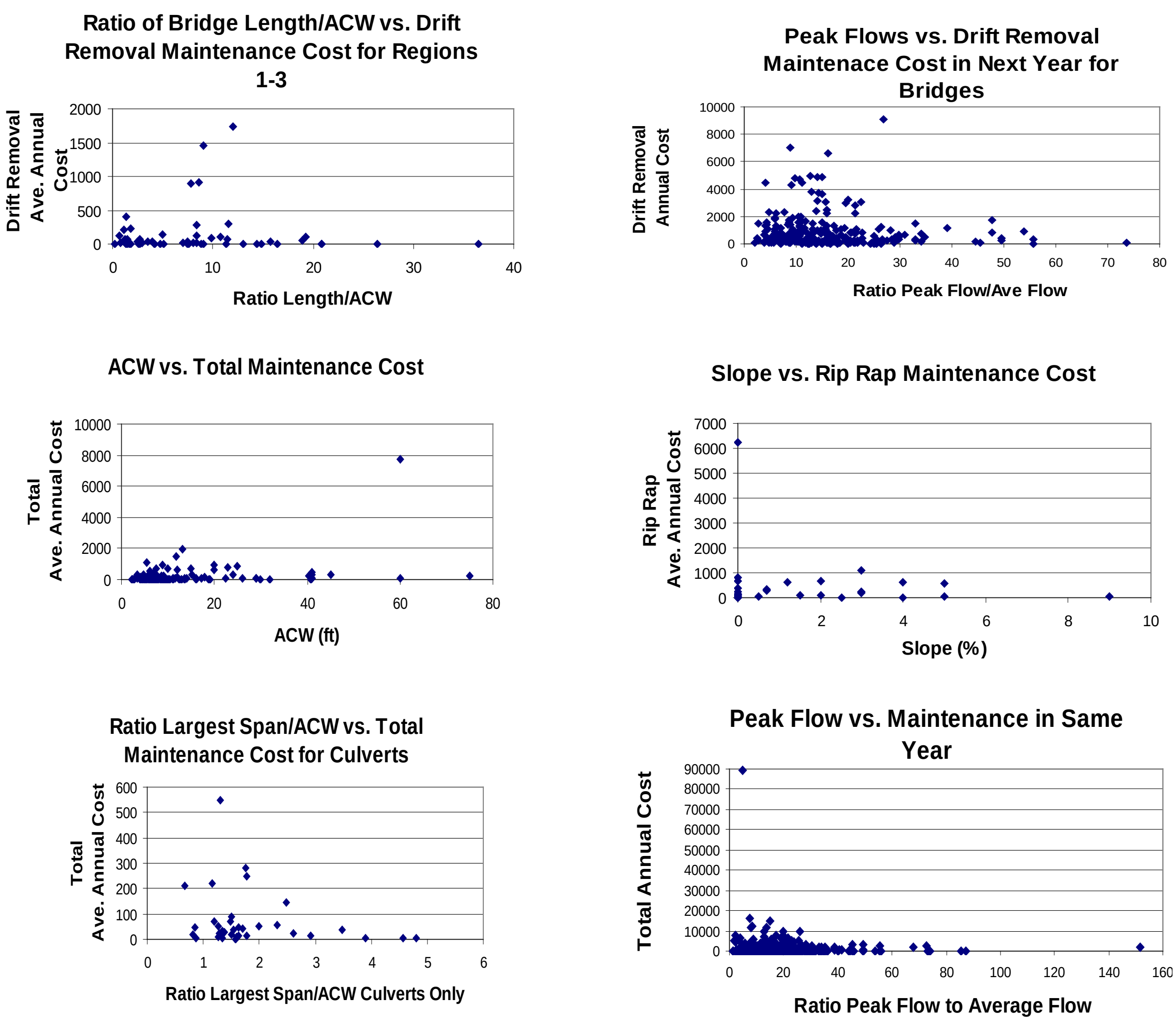

Figure 2.4: Example Scatter-plots

Finally, for a random sample of 30 bridges, the peak flow to average flow ratio and maintenance cost were graphed in bar charts over time to see if patterns emerged that might not have been apparent in the earlier peak flow analyses. Figure 2.5 shows examples of these plots.

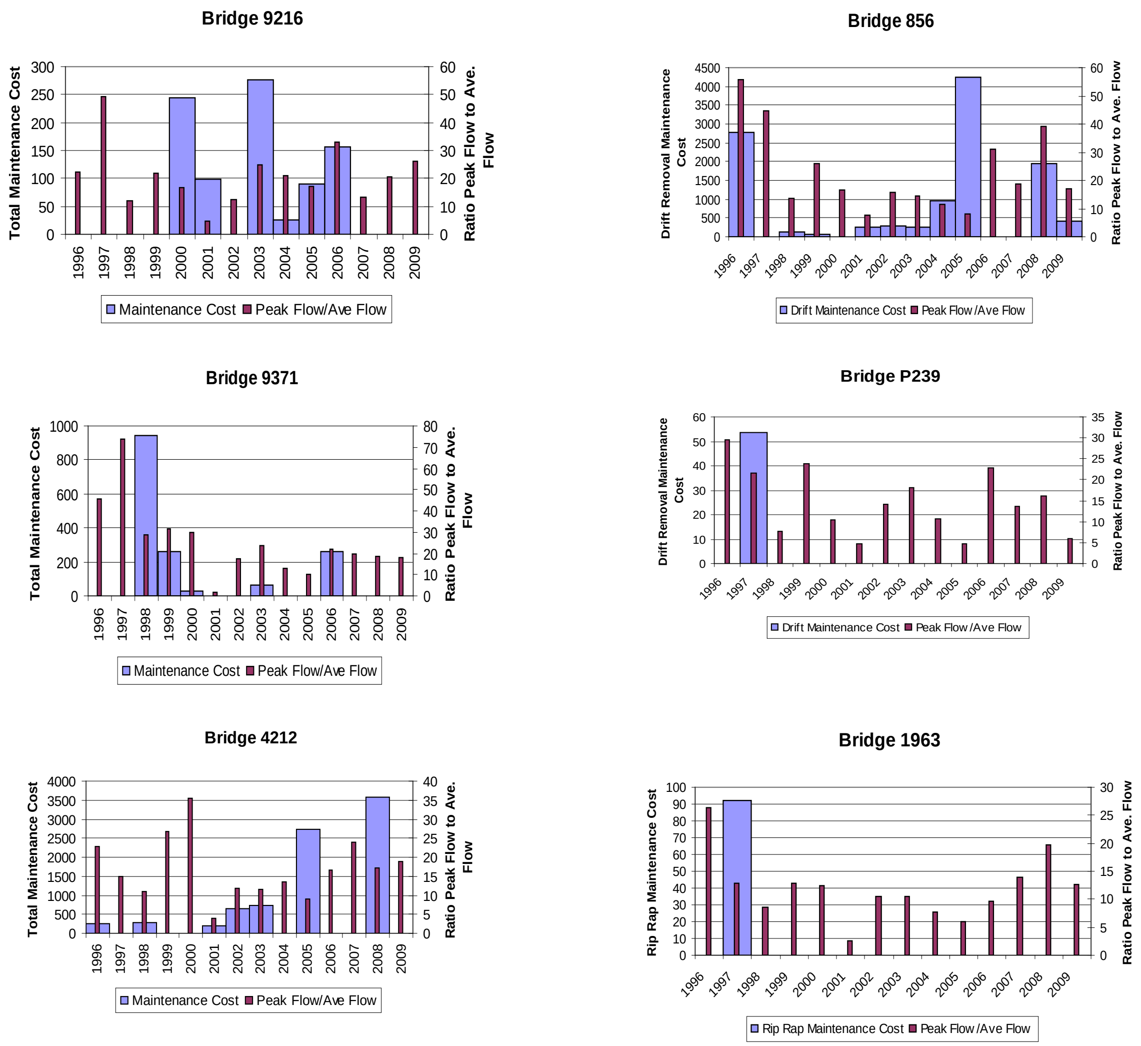

Figure 2.5: Example bar charts

3.0 RESULTS AND DISCUSSION

Because the objective of this project was changed in response to the nature of the data available, a discussion of the data that did pertain to the original objective is in order. After that, a discussion of the results, based on the new objective and a discussion of the limitations of the data available follow.

3.1 FLUVIAL PERFORMANCE STANDARD (FPS) MAINTENANCE COSTS

Table 3.1 lists bridges planned and designed explicitly according to the FPS. When compared to the maintenance cost spreadsheets, only one bridge on the list had maintenance performed on it. Bridge 20335, highlighted in the table, had $10 of brush removal performed in 2009. There was also $216 of brush removal performed on Bridge 20583 in 2009, but since that bridge was constructed in 2009, that maintenance was assumed to have been done on the previous bridge at that site or during construction.

Table 3.1: FPS Bridges

New Bridge ID	Bridge ID	Completion Date	Bridge Name
20242	07745A	5/18/2007	Coast Fork Willamette River, Hwy 1 NB
20335	07757A	5/18/2007	Gettings Creek, Hwy 1 SB
20156	1825	8/15/2007	Crescent Creek, Hwy 18
20155	1826	8/15/2007	Odell Creek, Hwy 18
20051	7490	11/7/2008	Bridge Creek, Hwy 41 at MP 65.63
20052	7491	11/7/2008	Bridge Creek, Hwy 41 at MP 65.85
20768	3915	6/1/2009	Crooked Creek, Hwy 19 at MP 126.92
20395	05287B	6/5/2009	Willamette River Relief Opening, Hwy 18
20360	6768	6/5/2009	Lost Creek, Hwy 18
20585	1406	6/8/2009	Elk Creek, Hwy 45 at MP 39.97
20586	1424	6/8/2009	Hardscrabble Creek, Hwy 45
20584	1465	6/8/2009	Elk Creek, Hwy 45 at MP 39.64
20583	1601	6/8/2009	Elk Creek, Hwy 45 at MP 38.76
20582	1614	6/8/2009	Elk Creek, Hwy 45 at MP 36.39
20397	08233S	9/10/2009	Sodom Ditch, Hwy 1 SB
20396	08233N	9/10/2009	Sodom Ditch, Hwy 1 NB
20326	2553	11/16/2009	Marks Creek, Hwy 41 at MP 33.99
20649	2201	11/16/2009	Ochoco Creek, Hwy 41
20327	7649	11/16/2009	Marks Creek, Hwy 41 at MP 37.44
20597	08175N	11/30/2009	McKenzie River & Frtg Rd, Hwy 1 NB (Spores)
20598	08175S	11/30/2009	McKenzie River & Frtg Rd, Hwy 1 SB (Spores)
20611	07931N	12/31/2009	South Umpqua River, Hwy 1 NB (Missouri Bottom)
20612	07931S	12/31/2009	South Umpqua River, Hwy 1 SB (Missouri Bottom)
20376	07793B	6/10/2010	Brown Creek, Hwy 1 SB
20377	07736C	6/10/2010	Camas Swale, Hwy 1 SB
20675	08742N	6/29/2010	Bear Creek, Hwy 1 NB at MP 14.96

New Bridge ID	Bridge ID	Completion Date	Bridge Name
20674	08742S	6/29/2010	Bear Creek, Hwy 1 SB at MP 14.96
20549	08018N	7/11/2010	Louse Creek & Conn, Hwy 1 NB
20550	08018S	7/11/2010	Louse Creek & Conn, Hwy 1 SB
	02194B	7/21/2010	Moffett Creek, Hwy 2 EB
20642	07809A	8/20/2010	Coast Fork Willamette River, Hwy 1 NB
20641	07809B	8/20/2010	Coast Fork Willamette River, Hwy 1 SB
20645	07861B	8/20/2010	Martin Creek, Hwy 1 SB
	7393	10/31/2010	Mosier Creek, Hwy 2
20720	7316	10/31/2010	Powder River, Hwy 71 at MP 41.19 (Rancheria)
	7431	10/31/2010	Powder River, Hwy 71 at MP 42.31 (Salisbury)
	2365	4/30/2011	McKay Creek, Hwy 47 WB
	2366	4/30/2011	East Fork Dairy Creek, Hwy 47 WB
	8446	9/1/2011	Siuslaw River, Hwy 62
	07469B	9/1/2011	Bear Creek, Hwy 1 at MP 163.43
	8370	9/1/2011	Knowles Creek, Hwy 62 at MP 18.47
	00308A	10/31/2011	Fifteen Mile Creek, Hwy 2
20872	2655	11/21/2011	John Day River, Hwy 5 (Goose Rock)
20870	7696	11/21/2011	John Day River, Hwy 5 (Coles)
20871	4728	11/21/2011	Camas Creek, Hwy 28
20869	8050	11/21/2011	McKay Creek, Hwy 28
20868	03522A	11/21/2011	Silvies Slough, Hwy 442 at MP 0.69
20867	3596	11/21/2011	Trout Creek Oflow, Hwy 48 at MP 42.95
20873	4729	11/21/2011	North Fork John Day River, Hwy 28 (Dale)
	8780	3/30/2012	Grande Ronde River & INP RR, Hwy 10 (Indian Creek)
	4041	11/30/2012	Bear Creek, Hwy 200
	4062	11/30/2012	South Fork Siuslaw River, Hwy 200
	8329	10/31/2013	Willamette River & Hwy 15 & UPRR, Hwy 1 & Hwy 1W
	6875	11/30/2013	Sandy River, Hwy 2 EB
	06875A	11/30/2013	Sandy River, Hwy 2 WB

Based on the frequency of maintenance for the older structures in the Bridge Log, it is assumed that many years will need to pass before a significant amount of maintenance data is available for structures explicitly designed according to the FPS. It was based on this fact that the original project objective was adjusted to focus on pre-FPS bridge maintenance costs.

3.2 FACTORS THAT AFFECT BRIDGE AND CULVERT MAINTENANCE

All but one of the 150 scatter-plots we produced showed no relationship, as can be seen in Figure 2.4, which is representative of all the results. Although further statistical analysis could have been performed, we deemed it not to be a productive use of time, since visual inspection of the plots clearly showed no relationship. The one possible exception was the plot of ACW versus maintenance activity 343 for ODOT Regions 4 and 5. As seen in Figure 3.1, the plot shows that bridges on wider channels appear to have lower annual rip rap maintenance costs than bridges on narrower channels for bridges and culverts east of the Cascades. When a linear trend-line was added to this plot in Excel, the resulting R^2 value was 0.85. It should be noted that this relationship appears because this plot excludes structures that had no maintenance.

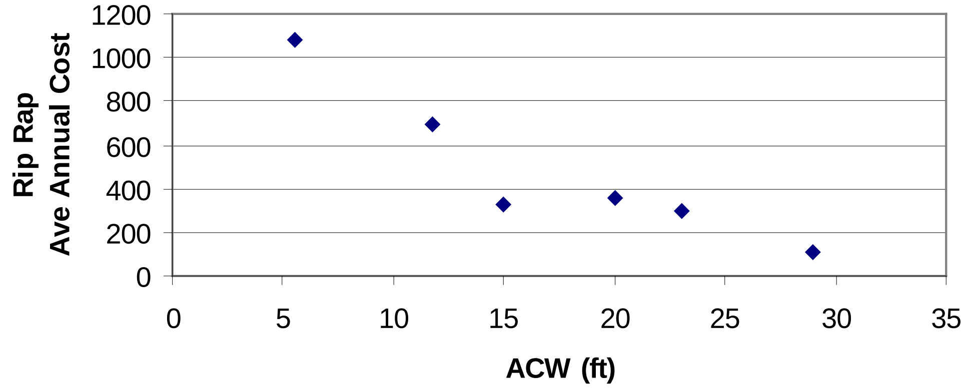

Figure 3.1: ACW vs. Rip Rap Maintenance Cost, ODOT Regions 4 and 5

Based on the bar charts in Figure 2.5, some of the maintenance occurrences do appear to follow or correspond to high peak flow to average annual flow ratios (i.e. Bridge 9371 in figure 2.5). However, there were as many, if not more, cases where the maintenance occurrence had no apparent link to the ratio (i.e. Bridge 4212 in figure 2.5). Furthermore, the interval between a high ratio and a possibly related maintenance occurrence was not consistent. Sometimes they occurred in the same year (i.e. 1996 for Bridge 856), sometimes the maintenance would be in the year following the high ratio (i.e. 1997 and 1998 for Bridge 9371), sometimes it would be 2 or 3 years later (i.e. 1997 and 2000 for Bridge 9216). For these reasons, we draw no conclusions based on these bar charts. Some record of when the conditions developed that required maintenance would be needed for a confident interpretation of these plots.

The hypothesis that the factors investigated would influence maintenance cost seems sound. So why was only one possible relationship found? There are two possible answers to that question. One is that, despite the apparent reasonableness of the hypothesis, no actual relationship exists. The other is that there are problems with the datasets that prevent the true relationships from being discerned. This second possibility is a very real and deserves some discussion.

3.3 LIMITATIONS OF THE DATA AVAILABLE

Throughout the project, multiple problems with the datasets became apparent. The data we assembled for use was designed and collected for other purposes. The relationships between the various data sources were at times either incomplete or ambiguous. The nature of the collection of the various data sources also gives rise to non-random samples being drawn from each of the separate sets for use in this project.

The entire study hinges on the assumption that the maintenance cost records are accurate and representative of maintenance needs, when in fact they may be neither. Maintenance crews assign costs to bridges in dollar amounts as small as $10. When trying to keep track of expenses in such small increments, mistakes are likely. In interviews, ODOT personnel mentioned that probably not all maintenance is always recorded in the correct account. For example, crews may spend a small portion of time on a stream-crossing structure related activity, but when reporting their time, may lump the activity into an unrelated EA since that was the majority of their work for the given time period.

Any conclusion drawn from data is only as good as the data itself, and if the accounting of maintenance costs is inconsistent, then the results of any analysis are of questionable value. This is not to say that the maintenance cost data is flawed. Rather, ODOT's purpose in collecting the information is different from what we attempted in this project. Its utility for this project may be limited.

Putting aside the issue of cost database accuracy, if maintenance is not consistently performed on an as-needed basis, relationships between characteristics and maintenance may not be visible. An NBI bridge, which most of the ODOT bridges as well as some of the culverts are, is typically inspected every 2 years, while a non-NBI culvert is only inspected every 4 years (*T. Yih, personal communication, July 19, 2010*). If maintenance is only scheduled based on these inspections, then rip rap at one bridge may have been eroding gradually over four years, while another may have lost all its rip rap in a recent storm; however the maintenance cost records would not reflect that difference.

Even if the maintenance cost data set was perfect, problems with the other datasets may have affected the results. The AIP surveys, while exhaustive, were not performed with this project in mind. Because of the difference in accuracy of the AIP GIS files and the ODOT GIS information, there was difficulty in matching stream segments with bridges and culverts. In ArcMap, often bridges did not display on the AIP streams but instead were as much as 300 ft (as measured in ArcMap) off the streams. This made it difficult, at times, to determine which stream segment actually crossed under a particular bridge, especially since stream segments were often less than 20 ft long. Furthermore, while every stream segment had stream slope recorded, the remainder of the stream characteristics were only surveyed, at most, every tenth segment. For many streams it was necessary to go hundreds of feet upstream to find a segment that had ACW and VWI recorded, and these segments may not have been representative of conditions at the bridge site.

Regarding the bridge data, the actual channel geometry through structures was not considered. Thus, two structures of the same span were considered equivalent. While one may have had sloping, rip-rap protected abutments, the other may have had vertical concrete abutments. The channel width under the two structures at various stream stages could be markedly different. Likewise, the Bridge Log used was from a moment in time in 2010 while the maintenance data was collected over 15 years and the AIP data was from various years.

Finally, there was potential for considerable error when matching gages to structures. Very few gauges existed that had peak flow data for the period of interest on the coast, and most of the gauges in southern Oregon are on large rivers, while the bridges are predominately on smaller streams. For these parts of Oregon especially, the gage chosen to represent the structure's stream was sometimes more than 40 miles away and may have been subject to different storm patterns.

4.0 CONCLUSION

After looking at stream and structure parameters such as:

- the active channel width (ACW)
- stream slope
- number of conifers along a stream
- number of hardwoods along a stream
- VWI
- the ratio of bridge length to ACW
- the ratio of the longest span of a bridge to ACW
- peak flow the year prior to maintenance
- peak flow the year of maintenance

We found no correlation with the average annual maintenance cost.

The closest thing to a correlation was for stream-crossing structures in ODOT Regions 4 and 5 where rip-rap repair was completed. For this set of data there was a negative linear relationship between ACW and average annual cost of rip rap repair and maintenance.

These results do not necessarily mean that no correlations exist, but may merely point to inadequacies in the datasets used. To reach more conclusive findings, additional field study involving the measurement of parameters of interest as well as careful monitoring of erosion and drift accumulation could be performed.

The most significant finding is the fact that out of 3,400 stream-crossing structures for which maintenance records were theoretically tracked; only 1,500 had any maintenance that might have been related to the Fluvial Performance Standard. This is based on a 15-year record of maintenance. Thus, the average maintenance interval for pre-FPS structures could be in excess of 15 years. Therefore, a considerable amount of time may need to pass to get a sufficiently long period of maintenance records for post-FPS structures before a direct comparison of post-FPS and pre-FPS structures' maintenance cost would be meaningful. Even if the FPS was found to generate savings, the magnitude of those savings would be limited by the relatively small amount of related maintenance that is required without the FPS.

There are several areas in which additional, or better, data could improve confidence in future conclusions.

> *One:* Actual drift transport and accumulation rates at stream-crossing structures as a function of flow, channel geometry, sediment supply, topography, vegetation.
>
> *Two*: Actual drift accumulation rates at stream-crossing structures as a function of the structures' geometries.
>
> *Three:* Measurements of stream characteristics over a specific distance immediately upstream of a stream-crossing structure.
>
> *Four:* Documenting to what extent is maintenance driven by scheduling convenience and other non-environmental factors rather than need for maintenance.
>
> *Five:* Maintenance activities and costs associated with culverts that are not in the Bridge Log.
>
> *Six:* Pre-FPS structures categorized into those that coincidentally conform to the FPS and those that do not conform to the FPS. Likewise, it will be important to identify post-FPS structures that are not built according to the standard through an exception.
>
> *Seven:* Flow data collected at, or near, actual stream-crossing structure sites.
>
> *Eight:* Inventorying and tracking debris through reaches over time.

While all of these would be beneficial, not all of them would be required for a significant improvement in the confidence one would have in the resulting conclusions.

5.0 REFERENCES

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APPENDIX A:
REPAIR AND REPLACE RIP RAP (ACTIVITY 343) COSTS

Appendix A-Repair and Replace Rip Rap (Activity 343) Costs															
Bridge ID	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Average Annual Cost
1144			461.66									2207.00			177.91
1250				2413.66											160.91
1583		19.60													1.31
1584		625.11													41.67
1600					11865.00										791.00
1626		7870.12	85425.79		446.00										6249.46
1812A		9279.76													618.65
1831												830.00	9469.00		686.60
18427											69.00				6.27
19015												404.00			67.33
1926A				16239.96											1082.66
19626										140.00					23.33
19627										140.00					23.33
1963		92.48													6.17
2012					178.00	65.00									16.20
2336				4835.14											322.34
3084										448.00	42.00	672.00			77.47
3099										3841.00					256.07
3108	1000.59												135.00		75.71
3373A			4402.31												293.49
3769				10.50							1162.00	7154.00			555.10
4190	645.52														43.03
4192									2620.00		957.00				238.47
4834A				2200.36						578.00			7576.00		690.29
4847A			5123.17	234.77						0.00					357.20
626	1698.42														113.23
7347	555.05														37.00
7840													16.00		1.07
9187			1926.92												128.46
9463		1846.08													123.07
P294		1884.48	7702.77												639.15

APPENDIX B:
DRIFT REMOVAL (ACTIVITY 347) COSTS

Appendix B-Drift Removal (Activity 347) Costs

Bridge ID	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Average Annual Cost
1038A			1597.74												106.52
1089												225.00			15.00
1194A	28.43														1.90
1236A		279.15	215.17												32.95
1268A				39.62											2.64
1271A	84.31														5.62
1274	88.52			116.62											13.68
1275						79.00						341.00			28.00
1324A				39.86				121.00							10.72
1345C	588.66	329.88	220.67	665.19							1470.00				218.29
1402A								409.00							34.60
1403		327.07			124.00										30.07
1415	1648.70														109.91
1452		1875.77		128.93	187.00	159.00		2488.00	692.00	401.00	109.00				402.71
1577A									412.00						27.47
1600									69.00						4.60
1607A	46.50	329.36	315.08		83.00				65.00	57.00	57.00		108.00		70.73
1626	347.08	7050.85	3608.38	2276.03	1399.00		452.00	714.00	578.00		1893.00	2009.00		1427.00	1450.29
16859				37.71											2.51
1688A								722.00		1166.00					125.87
1691							448.00								29.87
1707A													968.00		64.53
17334	755.60														50.37
1748A								127.00				203.00			22.00
18091							132.00	179.00			205.00	473.00			65.93
18096								630.00							52.50
1817	172.97	389.84	291.18					1488.00						1143.00	232.33
18262											58.00				4.83
18730							264.00		44.00				551.00		78.09
1914A							125.00								8.33
19626											1286.00				214.33
1963	66.40														4.43
1968A		180.20			298.00		125.00								40.21
1972A		828.23		0.00			670.00							2847.00	289.68
1987A						4987.00									332.47
1991		1206.13		339.94	3783.00		1500.00	1998.00	1598.00		1081.00	4806.00	4868.00	4891.00	1738.07
1996			716.24							399.00	706.00		1330.00	969.00	274.68
2008A											109.00				7.27

Bridge ID	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Average Annual Cost
2184				1092.09								1332.00	862.00	2269.00	370.34
2239	266.81			116.62								1292.00	1356.00	1327.00	290.56
2279A											240.00				16.00
2321	6.40			712.44	547.00			395.00				633.00		9058.00	761.66
2336					188.00				1011.00				889.00	1700.00	252.53
2472													1469.00	956.00	161.67
2671A										258.00	1039.00		332.00	4691.00	421.33
2737														51.00	3.40
3004	226.61		393.70								1134.00		416.00		144.69
3010													1077.00		71.80
3062										108.00					7.20
3081											292.00				19.47
3084	88.52			0.00							913.00		3162.00	213.00	291.77
3086	12.31														0.82
3088	177.04	46.29	94.78	116.62						607.00	671.00				114.18
3221A									36.00						2.40
3416A								62.00							4.13
3436A				1972.94				1470.00	894.00		58.00				293.00
3769			101.90												6.79
3920A					1193.00				101.00		35.00				88.60
3921					635.00				101.00		35.00				51.40
3923				368.06	728.00				85.00	2993.00	35.00				280.60
4021	163.06	513.33		233.24			192.00				206.00				87.18
4022			98.52								206.00		510.00	251.00	71.03
4023											206.00				13.73
4025A	231.30	34.61	197.04	916.07	1045.00		611.00	1095.00		177.00	206.00		551.00		337.60
4037							189.00								12.60
4117A	473.20	95.00	105.08			121.00									52.95
4149A			267.49	168.61	598.00	383.00	516.00	148.00	614.00	96.00					186.07
4151A		467.17		26.12	1315.00	567.00				5791.00					544.42
4190					250.00			369.00	174.00	104.00					59.80
4192							183.00		923.00						73.73
4199	23.08														1.54
4212	255.34		280.70			202.00	642.00	741.00		2723.00			3589.00		562.20
4278A	100.12	910.29			840.00		2274.00	793.00	2426.00		291.00	129.00	88.00	4501.00	897.23
4566B			816.48	2227.47	435.00	106.00	267.00	1650.00	708.00	944.00	1386.00	1107.00	1116.00	2941.00	913.60
4834A			656.22	1123.97	282.00					1322.00	1785.00	1876.00	4485.00	516.00	803.08
4841A											1611.00		585.00		146.40
4847A		498.05		241.98		386.00					1446.00			981.00	236.87

Bridge ID	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Average Annual Cost
558A			193.71	670.51											57.61
6343				78.38	274.00		118.00	67.00							35.83
6530A				61.63				184.00							16.38
6605A							66.00								4.40
666A			94.48												6.30
6787A											71.00				4.73
6797A	64.10														4.27
6821A														44.00	2.93
690			94.48												6.30
6900	303.64	547.38	126.16	1651.59	373.00	62.00	1352.00	1948.00	3258.00	551.00	5100.00	2422.00	7744.00	6633.00	2746.05
7082												344.00	607.00		63.40
7181		653.16								564.00					81.14
725A												213.00			14.20
7347		51.58													3.44
7361			147.49		483.00										42.03
7461		100.36	180.79												18.74
7472A				209.32											13.95
7475	44.20														2.95
7598				74.95											5.00
762	652.60	3097.95		105.46				428.00				286.00			304.67
7786												188.00	820.00		67.20
7787								57.00							3.80
7840													47.00		3.13
7894		721.38	132.58	340.74											79.65
7904				51.00	212.00					111.00	35.00			3740.00	276.60
7944			305.33			121.00									28.42
800A				799.86						2196.00					199.72
8094N				30.81											2.05
8094S				30.81											2.05
8427														995.00	66.33
844A												3087.00	4308.00	921.00	554.40
856	2788.50		117.43	67.05		252.00	302.00	260.00	949.00	4256.00			1933.00	403.00	755.20
8566												543.00			36.20
858A			83.96												5.60
860A				304.93	224.00		56.00		164.00				94.00	117.00	64.00
861				17.20					231.00						16.55
863	40.15	44.21		26.36			57.00								11.18
877														1086.00	72.40
8771S											112.00				7.47
8780									1210.00	348.00	759.00			1608.00	261.67

Bridge ID	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Average Annual Cost
8842			420.10												28.01
8891N								125.00							8.33
8936								33.00							2.20
9185								67.00							4.47
9186								67.00							4.47
9187		1105.96	479.17	3253.33	737.00			307.00			1015.00			1153.00	536.70
921		24.34	94.50				282.00	481.00						627.00	100.59
9215								33.00		250.00					18.87
9216					245.00			33.00		91.00					24.60
9420	87.09														5.81
9463		406.12	32.39					229.00							44.50
9474						114.00									7.60
9630A									365.00						24.33
9630B									158.00						10.53
983		256.42						398.00							43.63
M014	115.32														7.69
M086									933.00						62.20
M550			358.96	1228.57	115.00						118.00				121.37
M551				66.23							59.00				8.35
P153										396.00					26.40
P175														153.00	10.20
P178	235.22		380.31	1027.60							1600.00				216.74
P212									36.00						2.40
P239		53.66													3.58
P294	1130.46	4878.48	3765.10	4381.52	2789.00	328.00	836.00	454.00	214.00	295.00	4878.00	991.00	2978.00	1122.00	1978.70
P325									195.00						13.00
P468											59.00				3.93

APPENDIX C:
TOTAL MAINTENANCE COSTS

Appendix C-Total Maintenance Costs

Bridge ID	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Total Average Annual Cost
1038A			1597.74												106.52
1089				9.51								225.00			15.63
1113				72.42											4.83
1114	35.27			24.39											3.98
1144			461.66		1731.00							2207.00			293.31
1194A	28.43				154.00										12.16
1199A			100.54												6.70
1201A			277.36												18.49
1226A	129.24						214.00								22.88
1236A		279.15	215.17									225.00			47.95
1237					55.00		60.00								7.67
1250				2505.96											169.13
1268A			427.27	39.62	96.00										37.53
1269A			393.32	136.32											35.31
1271A	84.31		207.28												19.44
1274	88.52			116.62			60.00								17.68
1275			46.95	12.00		79.00	60.00					341.00			35.93
1319							60.00					494.00			36.93
1324A				39.86				863.00		579.00					98.79
1345C	588.66	329.88	220.67	665.19	66.00			251.00	400.00		1470.00				266.09
1349		61.44			52.00								609.00		48.16
1396													154.00		10.27
1402A								409.00							42.47
1403		327.07			124.00	228.00									45.27
1415	1648.70														109.91
1430A				64.79											4.32
1452		1875.77		128.93	187.00	159.00		2488.00	692.00	401.00	109.00	2170.00			547.38
1490				9.85											0.66
1577A									470.00						31.33
1583		19.60													1.31
1584		625.11								226.00					56.74
1600	405.81				11865.00				69.00			650.00			865.99
1607A	46.50	329.36	315.08		83.00	48.00	443.00		65.00	57.00	57.00		108.00		103.46
1626	433.84	14920.97	89034.17	2276.03	1845.00		452.00	714.00	578.00		1893.00	2009.00		1568.00	7714.93
16410									444.00						29.60
16412									409.00						27.27
16414											286.00	97.00			25.53
16416												65.00			4.33
16607												225.00			15.00
16859				37.71											2.51
1688A								722.00		1166.00				232.00	141.33
1691				32.83			448.00								32.06
1697							105.00	353.00							30.53
1707A													3571.00		238.07

Bridge ID	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Total Average Annual Cost
17082						414.00					304.00		2116.00		188.93
17334	755.60														50.37
17424								144.00	260.00	188.00					45.54
1748A								127.00				203.00			22.00
18091					104.00		132.00	179.00			205.00	473.00			72.87
18096						32.00	170.00	798.00						277.00	106.42
1812A		9497.72		110.38			65.00								644.87
18165								370.00						404.00	59.54
1817	172.97	389.84	291.18		103.00			1611.00						1143.00	247.40
18262								98.00			58.00				11.37
1831		46.24					131.00					830.00	9469.00		698.42
18427									583.00		69.00				59.27
185A				170.24			60.00								15.35
1863							60.00								4.00
1872A				175.35			121.00								19.76
18730						56.00	264.00		44.00				551.00		83.18
18900												52.00			5.20
18901												104.00			10.40
19015												550.00			91.67
1914A				9.85			125.00								8.99
1926A				16239.96											1082.66
1937	190.06		456.37		105.00										50.10
19626										140.00	1286.00				237.67
19627										140.00					23.33
1963	66.40	92.48													10.59
19681											1820.00				260.00
1968A		180.20		27.79	298.00		125.00			1028.00					110.60
196A														361.00	24.07
1972A		828.23		17.94			670.00							2847.00	290.88
19820													485.00		161.67
1987A						4987.00									332.47
1991		1206.13		339.94	4355.00		1775.00	1998.00	1698.00		1081.00	4806.00	4868.00	7139.00	1951.07
1995		321.14						191.00						157.00	44.61
1996			1006.24							399.00	706.00		1330.00	969.00	294.02
2008A											109.00				7.27
2012	178.96				596.00	65.00			39.00	295.00			614.00		121.26
2027A														443.00	29.53
20583														216.00	108.00
2082A	37.39		1746.85	2443.82	1029.00				186.00	108.00					370.07
2164	715.00	1585.78					2322.00		1208.00		129.00			392.00	423.45
2166								71.00							4.73
2184				1092.09								1332.00	1311.00	2269.00	400.27
2239	266.81			116.62								1292.00	1356.00	1327.00	290.56
2275		59.90													3.99
2279A							112.00	500.00		85.00	240.00	566.00	44.00		103.13

Bridge ID	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Total Average Annual Cost
2305				127.45				137.00			181.00				29.70
2321	6.40			712.44	547.00			395.00		69.00		747.00		9402.00	796.79
2336				4835.14	188.00	524.00			1011.00	180.00			889.00	3057.00	712.28
2379		199.36													13.29
2453					105.00										7.00
2462A													56.00		3.73
2472					909.00				1141.00			1948.00	3386.00	1473.00	590.47
2561				428.03								313.00			49.40
2671A										258.00	1039.00		332.00	4691.00	421.33
2737													190.00	51.00	16.07
3004	226.61		393.70								1134.00		416.00		144.69
3010													1077.00		71.80
3062						48.00	1138.00	52.00		108.00					89.73
3080		48.68	77.53	13.09	33.00	401.00	235.00	1526.00	1004.00	33.00			607.00		265.22
3081										34.00	292.00				21.73
3084	88.52	46.29	51.68	218.76			60.00		9.00	448.00	1130.00	672.00	3162.00	213.00	406.62
3086	12.31						60.00								4.82
3088	177.04	46.29	146.46	116.62			60.00			607.00	671.00				121.63
3091A				46.58			65.00			1712.00					121.57
3092A				46.58			65.00								7.44
3095	42.25						65.00								7.15
3099				104.32	99.00					3851.00					270.29
3108	1534.59				66.00		60.00						135.00		119.71
3184A					279.00							150.00			28.60
3196								33.00				56.00			5.93
3212A								148.00	25.00						11.53
3221A									36.00	107.00	208.00	62.00	248.00		44.07
333A														119.00	7.93
3373A			4402.31	7754.83											810.48
3416A								62.00				169.00			15.40
3436A				1972.94				1470.00	953.00		58.00				296.93
3454	32.01														2.13
3757B			362.50	107.16											31.31
3769			101.90	225.45	90.00						2140.00	7642.00			679.96
3920A			0.00	0.00	1193.00				101.00		35.00				88.60
3921			0.00	0.00	635.00				101.00		35.00				51.40
3923			0.00	368.06	728.00				85.00	2993.00	35.00				280.60
4021	163.06	513.33	0.00	233.24			192.00				206.00				87.18
4022			98.52	0.00							206.00		510.00	251.00	71.03
4023			0.00	0.00							206.00				13.73
4025A	231.30	34.61	197.04	1085.66	1457.00	91.00	611.00	1227.00		177.00	206.00		551.00		391.24
4037							189.00								12.60
4117A	562.36	274.35	105.08	26.36		121.00									72.61
4143A				28.55		54.00									5.50
4149A	1081.19		1695.30	288.29	598.00	6258.00	596.00	148.00	614.00	96.00					758.32

Bridge ID	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Total Average Annual Cost
4151A		551.28		78.30	2027.00	4465.00	231.00			5791.00					876.24
4190	645.52			3396.34	250.00			1412.00	174.00	104.00					398.79
4192		15.21					183.00		3543.00		957.00				313.21
4199	23.08														1.54
4212	255.34		280.70	9.85		202.00	642.00	741.00		2723.00			3589.00		562.86
4278A	100.12	910.29			840.00		2274.00	793.00	2426.00		291.00	129.00	88.00	5080.00	940.56
444B														361.00	24.07
4566B			816.48	2227.47	435.00	106.00	267.00	1650.00	708.00	944.00	1386.00	1107.00	1116.00	2941.00	913.60
482B								219.00	25.00		104.00				23.20
4834A			656.22	3324.33	282.00				357.00	1900.00	1785.00	1876.00	12061.00	516.00	1517.17
4841A											1611.00		585.00	1123.00	221.27
4847A		498.05	5123.17	476.75		386.00		491.00			1446.00	9.00	249.00	981.00	644.00
5272A					79.00										5.27
5283A			204.36	107.16											20.77
558A			193.71	670.51											57.61
559B												225.00			15.00
5640A	126.55														8.44
586A												21.00			1.40
626	1698.42														113.23
6343				106.93	274.00		118.00	67.00							37.73
6530A				61.63				184.00							16.38
6605A							66.00								4.40
660A			147.49	144.83			163.00								30.35
666A			94.48					177.00							18.10
678	125.37		187.50		105.00										27.86
6787A											398.00	11.00			27.27
6788A												80.00			5.33
6789A												50.00			3.33
6790A												80.00			5.33
6792A												103.00			6.87
6793A												20.00		230.00	16.67
6794A												123.00		230.00	23.53
6795A												89.00		153.00	16.13
6796A												153.00			10.20
6797A	64.10														4.27
6798A												96.00			6.40
6801A												78.00			5.20
6802A												64.00			4.27
681B	83.58														5.57
6821A					181.00		193.00	106.00		85.00		61.00		44.00	44.67
690			94.48					88.00							12.17
6900	303.64	547.38	126.16	1680.14	373.00	509.00	1352.00	4069.00	3258.00	785.00	5432.00	2422.00	8043.00	6633.00	3017.22
7082					103.00							344.00	607.00		70.27
7147						158.00									10.53
7158	32.01													139.00	11.40

Bridge ID	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Total Average Annual Cost
7159	32.01	226.15												139.00	26.48
7181		653.16								564.00					81.14
723A													563.00		37.53
725A												213.00			14.20
7347	555.05	51.58		95.03			401.00			101.00					80.24
7361			263.99		483.00										49.80
7417				96.78											6.45
7461		100.36	180.79												18.74
7464			228.38												15.23
7468															0.47
7469B			246.46				89.00								22.36
7472A				209.32											13.95
7475	44.20														2.95
7572A											227.00				15.13
7581			94.50			58.00									10.17
7598				74.95											5.00
762	747.68	3139.72		210.92	363.00		86.00	610.00		34.00		536.00	255.00		398.82
7641	218.12														14.54
765A				59.85											3.99
7786		48.67										188.00	820.00		70.44
7787	303.39						504.00	297.00						235.00	89.29
7840													63.00		4.20
7856A													410.00		27.33
7894		721.38	132.58	340.74											79.65
7899								73.00			54.00				8.47
7904				220.91	212.00					111.00	35.00			3740.00	287.93
7944			305.33			121.00									28.42
800A				799.86				548.00		2196.00					236.26
8076						127.00	131.00		276.00	236.00	51.00				54.73
8094N				30.81											2.05
8094S				30.81											2.05
8290										28.00					1.87
8412				111.63											7.44
8427														995.00	66.33
8431											796.00				53.07
8431A											1564.00				104.27
844A											295.00	3087.00	4308.00	2696.00	692.40
856	2788.50		117.43	67.05		252.00	302.00	260.00	949.00	4256.00			1933.00	403.00	768.33
8566												543.00			36.20
858A			83.96												5.60
860A				304.93	224.00		56.00		164.00				94.00	117.00	64.00
861				17.20					231.00						16.55
863	40.15	44.21		26.36			1123.00	1033.00							151.11
8719	146.46														9.76
877														1086.00	72.40

Bridge ID	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Total Average Annual Cost
8771S											112.00				7.47
8780									1210.00	348.00	759.00	976.00		1608.00	326.73
8830	189.85	621.73		116.62	142.00			192.00	25.00	228.00			193.00		113.88
8842	189.85		420.10	116.62	284.00	107.00		561.00	50.00	228.00					130.44
8875		192.79			284.00	135.00		239.00	13.00						57.59
8876				116.62	142.00		58.00	269.00	13.00						39.91
8890N			350.00		99.00										29.93
8890S			975.00	418.52		37.00									95.37
8891N				37.54	143.00	37.00		125.00							22.84
8935					420.00			304.00	25.00	197.00					63.07
8936				227.73	560.00			348.00	25.00		32.00				79.52
9185								306.00	25.00		282.00				40.87
9186			420.10					276.00	25.00		168.00				59.27
9187		1105.96	2901.89	3253.33	825.00			307.00			1015.00			1153.00	704.08
921		24.34	94.50				579.00	481.00						627.00	120.39
9215						65.00		238.00	25.00	250.00	156.00			724.00	97.20
9216					245.00	98.00		276.00	25.00	91.00	156.00				59.40
9310A									336.00						22.40
9374		90.43	44.29	0.00								39.00		135.00	20.58
941A				111.63											7.44
9420	87.09			27.79											7.66
9463		2252.20	32.39	51.90		0.00		229.00				153.00	14.00		182.17
9474						114.00	340.00	124.00	687.00						84.33
9630											5509.00	1202.00		728.00	495.93
9630A									365.00		4341.00				313.73
9630B									158.00		879.00				69.13
9670A													1785.00		119.00
9775			400.00		182.00									1017.00	106.60
9777			306.55		120.00										28.44
983		256.42						398.00				169.00	173.00		66.43
995											65.00	143.00			13.87
M014	115.32														7.69
M086				9.85					933.00						62.86
M339												55.00		135.00	12.67
M340												32.00		135.00	11.13
M342					99.00		87.00					118.00			20.27
M547													190.00		12.67
M550			358.96	1228.57	115.00						118.00		950.00	415.00	212.37
M551				66.23							59.00		389.00		34.28
P153			245.11				60.00			396.00					46.74
P174								71.00							4.73
P175								71.00						153.00	14.93
P178	235.22		380.31	1027.60	8.00			71.00			1600.00				221.48
P212								33.00	36.00	107.00	52.00	124.00			23.47

Bridge ID	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Total Average Annual Cost
P239		53.66												157.00	14.04
P272						36.00		191.00				209.00			29.07
P294	1130.46	6762.96	11467.87	4381.52	2789.00	328.00	836.00	454.00	214.00	295.00	4878.00	1727.00	2978.00	1122.00	2666.92
P325									195.00						13.00
P468											59.00			623.00	45.47

APPENDIX D:
BRIDGE CHARACTERISTICS

Appendix D-Bridge Characteristics						
Bridge ID	Bridge Name	Year Built	Bridge or Culvert	ODOT Region	Bridge Length (ft)	Longest Span Length (ft)
1038A	Wallowa River, Hwy 10 (Minam)	1965	B	Region 5	426	95
1089	Rocky Creek, Hwy 1 Frtg Rd Rt (Ben Jones)	1927	B	Region 2	360	160
1113	Cape Creek, Hwy 9	1931	B	Region 2	686	220
1114	China Creek, Hwy 9 at MP 175.68	1931	B	Region 2	66	33
1144	Chapman Creek, Hwy 38	1926	B	Region 3	30	33
1194A	Anderson Creek, Hwy 25 at MP 19.28	1927	B	Region 3	40	40
1199A	Reeves Creek, Hwy 25	1926	B	Region 3	31	31
1201A	Anderson Creek, Hwy 25 at MP 18.15	1927	B	Region 3	20	20
1226A	Miami River, Hwy 9	1994	B	Region 2	204	102
1236A	Ferry Creek, Hwy 9	1962	B	Region 3	21	21
1237	Mill Creek, Hwy 2W	1914	C	Region 2	9	9
1250	Pedee Creek, Hwy 191	1960	B	Region 2	79	40
1268A	Waters Creek,Hwy 25 (Slate Creek)	1927	B	Region 3	30	30
1269A	Slate Creek, Hwy 25 at MP 14.17	1927	B	Region 3		35
1271A	Butcher Knife Creek, Hwy 25	1927	B	Region 3	35	35
1274	Rock Creek, Hwy 2W	1927	C	Region 2	8	8
1275	Big Noise Creek, Hwy 2W	1927	C	Region 2	8	8
1319	Soapstone Creek, Hwy 46	1928	B	Region 2	152	108
1324A	Gate Creek, Hwy 15 (Vida)	1930	B	Region 2	180	60
1345C	Tillamook River, Hwy 131	1962	B	Region 2	650	106
1349	Foots Creek, Hwy 60	1928	B	Region 3	75	45
1396	Agency Creek, Hwy 32	1929	B	Region 2	81	45
1402A	Yaquina River, Hwy 180 at MP 4.93	1982	B	Region 2	148	66
1403	Indian Creek, Hwy 229	1929	B	Region 2	160	70
1415	East Fork Nehalem River, Hwy 102 at MP 57.14	1929	B	Region 1	120	50
1430A	Big Creek, Hwy 9 at MP 160.15	1929	B	Region 2	120	50
1452	Tryon Creek, Hwy 3	1930	C	Region 1	8	8
1490	Bear Creek, Hwy 181	1954	C	Region 2	10	10
1577A	South Santiam River, Hwy 16 (Garland)	1983	B	Region 2	240	100
1583	Finn Creek, Hwy 15	1931	C	Region 2	8	8
1584	Hatchery Creek, Hwy 15	1931	C	Region 2	10	10
1600	Hood River, Hwy 281 (Tucker)	1931	B	Region 1	188	100
1607A	Clear Creek, Hwy 161	1931	B	Region 1	150	50

Bridge ID	Bridge Name	Year Built	Bridge or Culvert	ODOT Region	Bridge Length (ft)	Longest Span Length (ft)
1626	Willamette River, Hwy 18 Frtg Rd (Barnard)	1932	B	Region 2	545	160
16410	Middle Fork Coquille River, Hwy 35 at MP 51.46	1984	B	Region 3	271	104
16412	Middle Fork Coquille River, Hwy 35 at MP 51.85	1984	B	Region 3	220	90
16414	Middle Fork Coquille River, Hwy 35 at MP 52.16	1984	B	Region 3	180	105
16416	Holmes Creek, Hwy 35	1984	C	Region 3	24	24
16607	Middle Fork Coquille River, Hwy 35 at MP 53.05	1984	B	Region 3	100	100
16859	Copeland Creek, Hwy 138	1960	B	Region 3	126	60
1688A	Mill Creek, Hwy 45	1952	B	Region 3	201	75
1691	Arnold Creek, Hwy 27	1932	B	Region 2	79	35
1697	Paradise Creek, Hwy 45	1932	B	Region 3	201	67
1707A	Sager Creek, Hwy 102	1979	B	Region 1	100	100
17082	Johnson Creek, Hwy 1E Conn to SE Tacoma St	1993	B	Region 1	108	108
17334	Catherine Creek, Hwy 66 at MP 16.43 (Main St)	1994	B	Region 5	47	47
17424	Beaver Creek, Hwy 162 WB at MP W8.88	1997	B	Region 2	114	57
1748A	Oak Ranch Creek, Hwy 102	1978	B	Region 1	70	70
18091	Slate Creek, Hwy 25 Frtg Rd Lt at MP F7.10	unknown	B	Region 3	47	47
18096	Brush Creek, Hwy 9 at MP 306.35	1998	B	Region 3	218	129
1812A	Necanicum River, Hwy 47 at MP 10.23	1970	B	Region 2	118	118
18165	Cow Creek, Hwy 103	1997	B	Region 2	35	35
1817	North Fork Nehalem River, Hwy 47 at MP 12.86	1933	C	Region 2	8	8
18262	Weatherly Creek, Hwy 45	1998	B	Region 3	160	160
1831	West Humbug Creek, Hwy 47	1934	B	Region 2	59	29
18427	Antelope Creek, Hwy 22	1999	B	Region 3	100	100
185A	Plympton Creek, Hwy 2W	1958	B	Region 2	69	27
1863	Squaw Creek, Hwy 130	1942	B	Region 2	71	29
1872A	Jordan Creek, Hwy 37	1937	B	Region 2	146	52
18730	Turner Creek, Hwy 62 at MP 20.39	1999	C	Region 2	16	16
18900	Shields Creek, Hwy 35 at MP 59.59	2000	C	Region 3	8	8
18901	Shields Creek, Hwy 35 at MP 60.06	2000	C	Region 3	8	8
19015	Bethel Creek, Hwy 9	2004	B	Region 3	82	82
1914A	Root Creek, Hwy 181	1989	B	Region 2	150	50
1926A	Little Sheep Creek, Hwy 350 at MP 15.12	1962	B	Region 5	72	48
1937	Sardine Creek, Hwy 271	1938	B	Region 3	130	50
19626	Grave Creek, Hwy 1 SB	2004	B	Region 3	302	82

Bridge ID	Bridge Name	Year Built	Bridge or Culvert	ODOT Region	Bridge Length (ft)	Longest Span Length (ft)
19627	Grave Creek, Hwy 1 NB	2004	B	Region 3	302	83
1963	South Fork Klaskanine River, Hwy 102 at MP 19.27	1934	B	Region 2	101	55
19681	Grande Ronde River & UPRR, Hwy 6 EB (Lower Quarry)	2003	B	Region 5	385	139
1968A	Euchre Creek, Hwy 181	1934	B	Region 2	134	50
196A	Rock Creek, Hwy 45	1976	B	Region 3	27	27
1972A	Cedar Creek, Hwy 181	1989	B	Region 2	140	70
19820	Fall Creek, Hwy 37 AT MP 13.62	2007	B	Region 2	154	154
1987A	Shitike Creek, Hwy 53	1966	B	Region 4	126	50
1991	Beneke Creek, Hwy 102	1934	B	Region 1	157	60
1995	Yellow Creek, Hwy 231	1934	B	Region 3	140	60
1996	Grande Ronde River, Hwy 10 at MP 20.62 (NE Elgin)	1935	B	Region 5	216	63
2008A	Johnson Creek, Hwy 1E (SE McLoughlin Blvd)	1993	B	Region 1	96	96
2012	Abiqua Creek, Hwy 160	1934	B	Region 2	165	60
2027A	North Fork Wolf Creek, Hwy 47	1938	B	Region 1	90	38
20583	Elk Creek, Hwy 45 at MP 38.76	2008	B	Region 3	340	150
2082A	Deep Creek, Hwy 171	1948	B	Region 1	166	45
2164	North Fork Quartz Creek, Hwy 47	1939	B	Region 1	835	105
2166	South Fork Quartz Creek, Hwy 47 at MP 24.47	1938	B	Region 1	27	27
2184	Wallowa River,Hwy 10 (Bear Creek)	1937	B	Region 5	230	58
2239	Fox Creek, Hwy 37	1937	C	Region 2	10	10
2275	West Olalla Slough, Hwy 33 Frtg Rd at MP F8.17	1936	B	Region 2	69	23
2279A	Deer Creek, Hwy 234	1937	B	Region 3	336	70
2305	North Fork Alsea River, Hwy 201	1937	B	Region 2	216	100
2321	Thomas Creek, Hwy 211 (Schindler)	1938	B	Region 2	237	56
2336	Catherine Creek, Hwy 340 (Park)	1940	B	Region 5	81	27
2379	Williams Creek, Hwy 272 Pedestrian Br	1917	B	Region 3	80	80
2453	Trail Creek, Hwy 230	1938	B	Region 3	170	70
2462A	South Fork Gales Creek, Hwy 37	1956	B	Region 1	21	21
2472	Devils Lake Fork Wilson River, Hwy 37 at MP 32.05	1940	B	Region 1	591	90
2561	East Fork Birch Creek, Hwy 28 (Pilot Rock)	1940	B	Region 5	54	18
2671A	Devils Lake Fork Wilson River, Hwy 37 at MP 28.38	1957	B	Region 1	152	70
2737	Steamboat Creek, Hwy 138	1949	B	Region 3	315	81
3004	Bummer Creek, Hwy 201	1967	C	Region 2	23	11
3010	Little Lobster Creek, Hwy 201	unknown	C	Region 2	8	8

Bridge ID	Bridge Name	Year Built	Bridge or Culvert	ODOT Region	Bridge Length (ft)	Longest Span Length (ft)
3062	Deep Creek, Hwy 172	1948	B	Region 1	161	63
3080	Shangri La Creek, Hwy 9 (Dooley)	1960	B	Region 2		
3081	Beerman Creek, Hwy 9	1954	C	Region 2	9	9
3084	Necanicum River, Hwy 46 at MP 0.11	1950	B	Region 2	76	19
3086	Bergsvik Creek, Hwy 46 at MP 1.46	1956	B	Region 2	38	19
3088	Jack Horner Creek, Hwy 46	1951	B	Region 2	75	19
3091A	Volmer Creek, Hwy 47	1942	B	Region 2	21	21
3092A	Johnson Creek, Hwy 47 at MP 3.26	1950	B	Region 2	19	19
3095	Lindsley Creek, Hwy 47	1955	B	Region 2	36	18
3099	Little Humbug Creek, Hwy 47	1956	B	Region 2	36	22
3108	Hamilton Creek, Hwy 102	1963	B	Region 2	72	28
3184A	Lampa Creek, Hwy 244	1987	B	Region 3	53	53
3196	Butte Creek, Hwy 9	1969	C	Region 3	13	13
3212A	Endicot Creek, Hwy 35	1962	B	Region 3	120	48
3221A	Belieu Creek, Hwy 35	1961	C	Region 3	10	10
333A	Fitch Creek, Hwy 45	1976	C	Region 3	12	12
3373A	Deschutes River, Hwy 15	1957	B	Region 4	344	90
3416A	Winchester Creek, Hwy 9	1953	C	Region 3	10	10
3436A	Luder Creek, Hwy 45	1958	C	Region 3	8	8
3454	Little Canyon Creek, Hwy 231 at MP 15.15	unknown	C	Region 3	12	6
3757B	Lick Creek, Hwy 270	1968	B	Region 3	80	32
3769	Humbug Creek, Hwy 272	1967	B	Region 3	20	20
3920A	South Fork Crane Creek, Hwy 19	1971	C	Region 4	16	8
3921	Cogswell Creek, Hwy 19	1928	C	Region 4	12	6
3923	Kelley Creek, Hwy 19	1966	C	Region 4	12	6
4021	Hula Creek, Hwy 229	1956	C	Region 2	7	7
4022	Chappels Creek, Hwy 229	1964	C	Region 2	12	6
4023	Wheeler Creek, Hwy 229	1959	B	Region 2	19	19
4025A	Greenleaf Creek, Hwy 229	1951	B	Region 2	140	54
4037	Ferguson Creek, Hwy 200	1963	B	Region 2	46	23
4117A	Willamette River, Hwy 222 (Jasper)	1952	B	Region 2	747	60
4143A	Fogarty Creek, Hwy 9	1955	B	Region 2	126	82
4149A	Wade Creek, Hwy 9	1947	C	Region 2	6	6
4151A	Moolack Creek, Hwy 9	1947	C	Region 2	6	6

Bridge ID	Bridge Name	Year Built	Bridge or Culvert	ODOT Region	Bridge Length (ft)	Longest Span Length (ft)
4190	Bear Creek, Hwy 39	1930	B	Region 2	98	40
4192	Salmon River, Hwy 39	1930	B	Region 2	152	80
4199	Randall Creek, Hwy 180	1961	B	Region 2	38	19
4212	Reed Creek, Hwy 181 at MP 9.05	1959	C	Region 2	8	8
4278A	Crabtree Creek, Hwy 211 (Tinker Jim)	1954	B	Region 2	156	60
444B	Sand Creek, Hwy 45	1976	B	Region 3	110	110
4566B	Johnson Creek, Hwy 68 (SE 82nd Ave)	1922	B	Region 1	76	19
482B	Sandy Creek, Hwy 35	1979	B	Region 3	155	55
4834A	Catherine Creek, Hwy 340 (State Yard)	1966	B	Region 5	80	32
4841A	Grande Ronde River, Hwy 341 (Hilgard)	1951	B	Region 5	132	52
4847A	Grande Ronde River, Hwy 341 (Red)	1951	B	Region 5	122	48
5272A	North Fork Clackamas River, Hwy 171	1979	C	Region 1	24	24
5283A	North Fork Little Butte Creek, Hwy 270 at MP 15.44	1968	B	Region 3	66	26
558A	Catherine Creek, Hwy 66 at MP 12.61 (Davis Dam),	1966	B	Region 5	80	32
559B	Middle Fork Coquille River, Hwy 35 at MP 52.42	1948	B	Region 3	141	53
5640A	Trask River, Hwy 131 (Stillwell)	1948	B	Region 2	333	100
586A	Jordan Creek, Hwy 1	1921	C	Region 3	17	8
626	Grande Ronde R & UPRR, Hwy 6 Frtg Rd (Perry Arch)	1924	B	Region 5	308	134
6343	Johnson Creek, Hwy 9 at MP 133.28	1942	C	Region 2	3	6
6530A	Coyote Creek, Hwy 1	1965	B	Region 3	30	30
6605A	Bear Creek, Hwy 22	1961	B	Region 3	213	63
660A	Jenny Creek, Hwy 21	1983	B	Region 3	95	38
666A	Cedar Creek, Hwy 26	1958	C	Region 1	14	14
678	Indian Creek, Hwy 22	1921	B	Region 3	40	40
6787A	Canyon Creek, Hwy 1 at MP 97.50	1951	C	Region 3	20	20
6788A	Canyon Creek, Hwy 1 at MP 97.34	1951	C	Region 3	20	20
6789A	Canyon Creek, Hwy 1 at MP 97.13	1951	C	Region 3	20	20
6790A	Canyon Creek, Hwy 1 at MP 96.96	1951	C	Region 3	20	20
6792A	Canyon Creek, Hwy 1 at MP 96.64	1951	C	Region 3	20	20
6793A	Canyon Creek, Hwy 1 at MP 96.42	1951	C	Region 3	20	20
6794A	Canyon Creek, Hwy 1 at MP 96.27	1951	C	Region 3	20	20
6795A	Canyon Creek, Hwy 1 at MP 96.05	1951	C	Region 3	20	20
6796A	Canyon Creek, Hwy 1 at MP 95.39	1951	C	Region 3	8	8
6797A	Canyon Creek, Hwy 1 at MP 94.20	1965	C	Region 3	15	15

Bridge ID	Bridge Name	Year Built	Bridge or Culvert	ODOT Region	Bridge Length (ft)	Longest Span Length (ft)
6798A	Canyon Creek, Hwy 1 at MP 93.87	1965	C	Region 3	15	15
6801A	Canyon Creek, Hwy 1 at MP 92.75	1965	C	Region 3	11	11
6802A	Canyon Creek, Hwy 1 at MP 92.56	1965	C	Region 3	11	11
681B	Little Butte Creek, Hwy 22	1981	B	Region 3	132	70
6821A	Deer Creek, Hwy 138	1967	B	Region 3	182	70
690	Whiskey Creek, Hwy 26	1921	C	Region 1	8	8
6900	Rocky Creek, Hwy 9 at MP 130.03	1954	C	Region 2	6	6
7082	Culvert, Hwy 9 at MP 26.72	1952	C	Region 2	6	6
7147	Trask River, Hwy 9	1949	B	Region 2	338	70
7158	Dodge Creek, Hwy 231 at MP 20.95	1953	B	Region 3	57	21
7159	Dodge Creek, Hwy 231 at MP 21.15	1953	B	Region 3	57	21
7181	Fawcett Creek, Hwy 9	1950	B	Region 2	101	22
723A	Wallowa River, Hwy 10 (Railroad)	1966	B	Region 5	180	80
725A	Prairie Creek, Hwy 10	1980	C	Region 5	24	24
7347	Little North Fork Santiam River, Hwy 162	1952	B	Region 2	387	207
7361	Table Rock Creek, Hwy 271 at MP 6.86	1951	C	Region 3	16	8
7417	Big Creek, Hwy 2W	1951	B	Region 2	156	62
7461	Pass Creek, Hwy 1 at MP 167.79	1951	C	Region 3	6	6
7464	Pass Creek, Hwy 1 at MP 167.05	1951	C	Region 3	8	8
7468	Pass Creek, Hwy 1 at MP 165.90	1951	C	Region 3	12	12
7469B	Bear Creek, Hwy 1 at MP 163.43	1952	B	Region 3	200	66
7472A	Buck Creek, Hwy 1	1981	C	Region 3	12	12
7475	Little Creek, Hwy 2W	1951	C	Region 2	8	8
7572A	Curtis Creek, Hwy 1	1953	B	Region 3	100	46
7581	Hunt Creek, Hwy 2W	1953	C	Region 2	7	7
7598	Galls Creek, Hwy 1	1952	C	Region 3	12	12
762	Fourmile Creek, Hwy 9	1929	B	Region 3	80	30
7641	Yoncalla Creek, Hwy 1 Conn	1954	B	Region 3	56	38
765A	Crooked Creek, Hwy 19 at MP 121.20	1966	B	Region 4	50	50
7786	Brush Creek, Hwy 9 Frtg Rd at MP F307.02	1955	B	Region 3	61	41
7787	Brush Creek, Hwy 9 at MP 307.79	1955	B	Region 3	100	40
7840	Clarks Branch Creek, Hwy 1	1956	C	Region 3	10	10
7856A	Newton Creek & Hwy 1 Frtg Rd Rt, Hwy 1	unknown	C	Region 3	8	8
7894	Willamette River, Hwy 18 (Barnard)	1955	B	Region 2	593	160

Bridge ID	Bridge Name	Year Built	Bridge or Culvert	ODOT Region	Bridge Length (ft)	Longest Span Length (ft)
7899	Vandine Creek, Hwy 1	1956	C	Region 3	8	8
7904	Rock Creek, Hwy 138	1954	B	Region 3	200	7
7944	Bear Creek, Hwy 229	1955	C	Region 2	10	10
800A	Grande Ronde R, Hwy 10 at MP 19.20 (South Elgin)	1966	B	Region 5	320	70
8076	Beaver Creek, Hwy 162 EB at MP E8.88	1960	B	Region 2	127	49
8094N	Jumpoff Joe Creek, Hwy 1 NB	1957	B	Region 3	269	61
8094S	Jumpoff Joe Creek, Hwy 1 SB	1957	B	Region 3	269	61
8290	Hunter Creek, Hwy 9	1959	B	Region 3	360	100
8412	Trail Creek, Hwy 22	1958	B	Region 3	150	58
8427	Grande Ronde River, Hwy6 Hamilton Cr Fr Rd (Perry)	1959	B	Region 5	256	71
8431	Grande Ronde R &UPRR &Hwy6 EB, Hwy66 WB (Oro Del	unknown	B	Region 5	675	108
8431A	Grande Ronde R & UPRR, Hwy 66 EB (Oro Dell)	1973	B	Region 5	448	131
844A	West Fork Birch Creek, Hwy 28	1922	B	Region 5	40	40
856	Little Elk Creek, Hwy 33 at MP 29.38	1951	C	Region 2	6	6
8566	Fivemile Creek, Hwy 4	1959	C	Region 4	16	8
858A	Thornton Creek, Hwy 33	1983	C	Region 2	18	18
860A	Simpson Creek, Hwy 33 at MP 15.25	1975	C	Region 2	25	13
861	Simpson Creek, Hwy 33 at MP 14.79	1971	C	Region 2	13	13
863	Simpson Creek, Hwy 33 at MP 11.61	1960	C	Region 2	10	10
8719	Pistol River, Hwys 9 & 255	unknown	B	Region 3	570	100
877	Simmons Creek, Hwy 9	1989	C	Region 2	21	21
8771S	Bear Creek, Hwy 1 SB at MP 30.69	1961	B	Region 3	206	52
8780	Grande Ronde River & INP RR, Hwy 10 (Indian Creek)	1962	B	Region 5	340	70
8830	Middle Fork Coquille River, Hwy 35 at MP 24.32	1962	B	Region 3	336	120
8842	Middle Fork Coquille River, Hwy 35 at MP 23.37	1962	B	Region 3	470	120
8875	Middle Fork Coquille River, Hwy 35 at MP 25.52	1962	B	Region 3	400	100
8876	Middle Fork Coquille River, Hwy 35 at MP 25.67	1962	B	Region 3	265	100
8890N	Bear Creek, Hwy 1 NB at MP 23.07	1962	B	Region 3	285	100
8890S	Bear Creek, Hwy 1 SB at MP 23.07	1962	B	Region 3	285	57
8891N	Bear Creek, Hwy 1 NB at MP 22.42	1962	B	Region 3	285	57
8891S	Bear Creek, Hwy 1 SB at MP 22.42	1962	B	Region 3	285	57
8935	Middle Fork Coquille River, Hwy 35 at MP 30.59	1962	B	Region 3	480	100
8936	Middle Fork Coquille River, Hwy 35 at MP 30.10	1962	B	Region 3	332	100
9185	Middle Fork Coquille River, Hwy 35 at MP 40.56	1964	B	Region 3	270	90

Bridge ID	Bridge Name	Year Built	Bridge or Culvert	ODOT Region	Bridge Length (ft)	Longest Span Length (ft)
9186	Middle Fork Coquille River, Hwy 35 at MP 40.77	1964	B	Region 3	342	90
9187	Deer Creek, Hwy 25	1964	B	Region 3	350	70
921	Gnat Creek, Hwy 2W	1929	B	Region 2	166	50
9215	Middle Fork Coquille River, Hwy 35 at MP 43.15	1965	B	Region 3	338	104
9216	Middle Fork Coquille River, Hwy 35 at MP 43.58	1965	B	Region 3	354	104
9310A	Middle Fork Coquille River, Hwy 35 at MP 47.68	1976	B	Region 3	442	100
9374	West Fork Canyon Creek, Hwy 1 Conn #2	1965	B	Region 3	86	34
941A	Lewis Creek, Hwy 62	1993	C	Region 3	15	15
9420	Mill Creek, Hwy 181	1967	C	Region 2	12	12
9463	Salmon River, Hwy 9	1960	B	Region 2	170	70
9474	Lost Creek, Hwy 215	1961	B	Region 2	182	46
9630	Grande Ronde River, Hwy 6 WB	1971	B	Region 5	300	80
9630A	Grande Ronde River, Hwy 6 EB	1971	B	Region 5	300	80
9630B	Grande Ronde River & Hwy 6, N 2nd St (La Grande)	1972	B	Region 5	398	107
9670A	Johnson Creek, Hwy 1E SB Conn to Hwy 171	1968	B	Region 1	150	60
9775	Antelope Creek, Hwy 270	1969	B	Region 3	110	110
9777	Little Butte Creek, Hwy 270	1969	B	Region 3	321	115
983	Scholfield Creek, Hwy 9	1952	B	Region 3	360	56
995	Myers Creek, Hwy 255	1924	B	Region 3	126	50
M014	Crooked Creek, Hwy 19 at MP 125.78	1960	C	Region 4	20	10
M086	Steaple Creek, Hwy 181	1933	C	Region 2	7	6
M339	Canyon Creek, Hwy 1 Conn Rt	1965	C	Region 3	13	13
M340	Canyon Creek, Hwy 1 Conn #2 (West Fork Intchg)	unknown	C	Region 3	8	8
M342	Galls Creek, Hwy 1 Frtg Rd Rt	1938	B	Region 3	90	90
M547	West Fork Oak Creek, Hwy 138	1969	C	Region 3	8	8
M550	Fairview Creek, Hwy 138	1960	C	Region 3	6	6
M551	Williams Creek, Hwy 138	1960	C	Region 3	10	10
P153	Supply Creek, Hwy 2W	1967	C	Region 2	7	7
P174	South Fork Quartz Creek, Hwy 47 at MP 24.74	unknown	C	Region 1	8	8
P175	South Fork Quartz Creek, Hwy 47 at MP 24.94	unknown	C	Region 1	8	8
P178	Rock Creek, Hwy 47	1975	C	Region 1	8	8
P212	Frenchie Creek, Hwy 35	unknown	C	Region 3	6	6
P239	Little Canyon Creek, Hwy 231 at MP 15.30	1965	C	Region 3	12	12
P272	Sevenmile Creek, Hwy 9	1960	C	Region 3	16	8

Bridge ID	Bridge Name	Year Built	Bridge or Culvert	ODOT Region	Bridge Length (ft)	Longest Span Length (ft)
P294	Turner Creek, Hwy 62 at MP 22.88	unknown	C	Region 2	7	7
P325	Twomile Creek, Hwy 6	1961	C	Region 5	6	6
P468	Susan Creek, Hwy 138	1960	C	Region 3	16	8

APPENDIX E:
STREAM CHARACTERISTICS

Appendix E-Stream Characteristics							
Bridge ID	Stream Slope	Total Hardwoods	Total Conifers	Active Channel Width (ft)	Valley Width Index	Bridge Length/ACW Ratio	Longest Span/ACW Ratio
1038A	0	0	0				
1089	999	386	224				
1113	2	0	0	18.8	2.2	36.49	11.70
1114	0	110	914	5	10	13.20	6.60
1144	3	686	411	4.7	99	6.38	7.02
1194A	0	589	772	4.5	10	8.89	8.89
1199A	2	122	61	8	10	3.88	3.88
1201A	0	589	772	6.3	20	3.17	3.17
1226A	16	122	0				
1236A	0.1	0	0	8.3	10	2.53	2.53
1237	1.5	0	0	5.3	5.2	1.60	1.60
1250	0	671	61	9.4	10	8.40	4.26
1268A	1.1	536	195	7.2	5	4.17	4.17
1269A	0	1107	376	10.2	10	0.00	3.43
1271A	2.7	1036	512	6.9	5	5.07	5.07
1274	6	351	739	9.8	1	0.82	0.82
1275	2	1097	1120	2.3	1.7	3.48	3.48
1319	0	274	457	19	3.5	8.00	5.68
1324A	1	0	0	22.5	2.4	8.00	2.67
1345C	0	0	61				
1349	3.5	0	0	3.5	0	21.43	12.86
1396	40	2902.4	169				
1402A	50	0	0				
1403	0.3	905.1	0				
1415	1	585.3	78.4	11.1	2	10.81	4.50
1430A	1	0	274				
1452	4.5	244	244	6.1	2	1.31	1.31
1490	2.5	244	61				
1577A	1	0	0	32	2.5	7.48	3.13
1583	0	1158	457	5.1	10	1.57	1.57
1584	9	579	122	4.3	3	2.33	2.33
1600	0	951	451	25	4	7.52	4.00
1607A	1.3	713	378				
1626	0	0	0	60	5	9.08	2.67
16410	0	2113	366	10.4	1	26.06	10.00
16412	0	1463	447	16	1	13.75	5.63
16414	0	1463	447	12.4	2.5	14.52	8.47
16416	0.3	1707	518	6.1	1.5	3.90	3.90
16607	0	1463	447	11	1.5	9.09	9.09
16859	0	927	1817	30	2	4.20	2.00
1688A	0	488	305				
1691	1	244	0	5	8	15.80	7.00
1697	0	2438	0				
1707A	0	1260	102	8.7	1	11.49	11.49
17082	0	610	30	8.5	20	12.71	12.71
17334	1	0	0	16	0	2.91	2.91
17424	0	131	0				
1748A	3.8	935	163	8.4	10	8.33	8.33
18091	0.8	579	30	17.3	20	2.72	2.72

Bridge ID	Stream Slope	Total Hardwoods	Total Conifers	Active Channel Width (ft)	Valley Width Index	Bridge Length/ACW Ratio	Longest Span/ACW Ratio
18096	1	1646	152	11.5	10	18.96	11.24
1812A	4	0	0	12	20	9.83	9.83
18165	2	1411	70	13.6	8	2.57	2.57
1817	2.5	853	823	4.5	2.3	1.78	1.78
18262	0	1240	386				
1831	2	1611.1	579.3	10	4	5.90	2.90
18427	0	0	0				
185A	2	1036	61	10.3	5	6.70	2.62
1863	0	0	181				
1872A	10	1890	0				
18730	4.8	1158	244				
18900	4	1341	640				
18901	0	1341	640				
19015	0	183	61	5.4	20	15.19	15.19
1914A	4.5	2073	451				
1926A	3	0	0	5.5	0	13.09	8.73
1937	0.5	0	0	6	0	21.67	8.33
19626	0	1244	329				
19627	0	1244	329				
1963	4	0	0	7	4	14.43	7.86
19681	0	0	0				
1968A	0	0	0				
196A	0	1113	152				
1972A	1	2731	49				
19820	2.5	1115	17				
1987A	1	3597	0	15.2	10	8.29	3.29
1991	0	274	0	13.1	50	11.98	4.58
1995	0	1085	158				
1996	0.1	1951	0				
2008A	0.5	610	30	8.5	20	11.29	11.29
2012	2.5	503	107	12	20	13.75	5.00
2027A	0	0	0	7	20	12.86	5.43
20583	0	2764	1585				
2082A	0	549	0				
2164	0	853	122	6.1	1	136.89	17.21
2166	6.3	1433	122	5.1	7	5.29	5.29
2184	4	0	0				
2239	0	975	81				
2275	0	965.4	0				
2279A	4	458.6	36.2				
2305	0.4	0	0				
2321	0	0	0				
2336	0.7	0	0	15	0	5.40	1.80
2379	0.3	2540	305	19	10	4.21	4.21
2453	0.1	800	358				
2462A	0	869	267				
2472	1.5	0	0				
2561	2	0	0				
2671A	0	0	0				
2737	0	213	640	2.6	10	121.15	31.15

Bridge ID	Stream Slope	Total Hardwoods	Total Conifers	Active Channel Width (ft)	Valley Width Index	Bridge Length/ACW Ratio	Longest Span/ACW Ratio
3004	3.1	874	0	4.6	15	4.96	2.48
3010	0	1179	305	5.4	1	1.48	1.48
3062	0	597	293				
3080	6.1	274	0	7.6	2	0.00	0.00
3081	0	0	0	7	20	1.29	1.29
3084	0	0	0				
3086	0	0	0	5	20	7.60	3.80
3088	0	1305	439	9	6	8.33	2.11
3091A	7	0	0	4	4	5.25	5.25
3092A	2	0	0	10	20	1.89	1.89
3095	5	0	0	6	20	6.00	3.00
3099	3	0	0	6	20	6.00	3.67
3108	1.5	965.4	90.5	8	10	9.00	3.50
3184A	0	0	0				
3196	2.8	341	0	2.8	18	4.57	4.57
3212A	0.1	0	0				
3221A	0.7	1046	30	5.9	4	1.69	1.69
333A	0	1768	218				
3373A	0.7	1339.5	645.6	23	1	14.96	3.91
3416A	0	274	549				
3436A	0	122	61				
3454	0	827	96				
3757B	10	402	85				
3769	5	0	0	7.5	10	2.67	2.67
3920A	0	61	0	5.3	20	3.02	1.51
3921	2	0	0	4.7	20	2.55	1.28
3923	1	561	0	3.4	20	3.53	1.76
4021	4	156.9	96.5				
4022	4	362	175				
4023	3.5	1311	183				
4025A	0	1138	427				
4037	1.5	575	44	6.5	30	7.08	3.54
4117A	0	772	10				
4143A	0.5	122	3597				
4149A	24	345	538				
4151A	0	807	328				
4190	5	378	73				
4192	0	0	0				
4199	6	651.7	736.1				
4212	0	183	61				
4278A	0	494.8	132.7	20	20	7.80	3.00
444B	0	217.2	30.2				
4566B	4	427	0	8.8	20	8.64	2.16
482B	1.3	1829	0	7.5	20	20.67	7.33
4834A	0	0	0	11.8	0	6.78	2.71
4841A	0	0	0	40.3	0	3.28	1.29
4847A	0	0	0	20	0	6.10	2.40
5272A	0	244	183	93	1.5	0.26	0.26
5283A	3	305	0				
558A	1	0	0				
559B	2	1463	447	8.9	1	15.84	5.96
5640A	5	435	113				

Bridge ID	Stream Slope	Total Hardwoods	Total Conifers	Active Channel Width (ft)	Valley Width Index	Bridge Length/ACW Ratio	Longest Span/ACW Ratio
586A	0	183	0				
626	2	0	0	29	0	10.62	4.62
6343	0	447	996				
6530A	0	711	0	10.1	20	2.97	2.97
6605A	0	0	0	13	0	16.38	4.85
660A	0.9	0	0				
666A	0	752	1019	9.3	3.5	1.51	1.51
678	0	780	12				
6787A	3	1043	298				
6788A	3	1043	298				
6789A	8	1043	298				
6790A	8	1043	298				
6792A	8	1043	298				
6793A	8	1043	298				
6794A	8	1043	298				
6795A	8	1043	298				
6796A	2.5	1170	951				
6797A	0	853	874				
6798A	1	853	874				
6801A	0	951	878				
6802A	5	951	878				
681B	1	478	5				
6821A	5	458.6	36.2				
690	5	610	335	4.5	10	1.78	1.78
6900	0	386	224				
7082	0	0	0	5	10	1.20	1.20
7147	0.2	435	113				
7158	0	691	224				
7159	0	650	102				
7181	1	549	61				
723A	0	0	0				
725A	50	0	0				
7347	0.5	0	0	26	0	14.88	7.96
7361	1	0	0	4	0	4.00	2.00
7417	1.5	732	122	13.5	20	11.56	4.59
7461	0	1402	0				
7464	0	1280	98				
7468	0	869	0				
7469B	0	739	69	4	20	50.00	16.50
7472A	0	475	24	4.1	20	2.93	2.93
7475	1	0	0	6	0	1.33	1.33
7572A	0	1210	17				
7581	6	732	305	5.5	7	1.27	1.27
7598	3	0	0	2.5	0	4.80	4.80
762	1.5	155	6	6.9	20	11.59	4.35
7641	0	0	0				
765A	0.1	0	0	2.2	99	22.73	22.73
7786	0.7	11339	0				
7787	0	396	0	11.1	5	9.01	3.60
7840	0	274	0				

Bridge ID	Stream Slope	Total Hardwoods	Total Conifers	Active Channel Width (ft)	Valley Width Index	Bridge Length/ACW Ratio	Longest Span/ACW Ratio
7856A	7	366	0				
7894	0	0	0	60	4	9.88	2.67
7899	0	1524	457				
7904	0.5	1237	965.4	24	1.5	1.37	1.37
7944	0	1219	488	7.3	1.5	4.27	0.93
800A	0.1	0	0	75	0	4.27	0.93
8076	0	131	0				
8094N	1.3	671	79	12.9	15	20.85	4.73
8094S	0	671	79	12.9	15	20.85	4.73
8290	0	0	0	40.9	1	8.80	2.44
8412	1.5	932	70				
8427	0	0	0	29	0	8.83	2.45
8431	0.5	0	0	41	0	16.46	2.63
8431A	0.5	0	0	41	0	10.93	3.20
844A	0	177	0				
856	2.5	0	0				
8566	1.4	1036	0	5.2	44	3.08	1.54
858A	3.5	244	61				
860A	0	0	0				
861	1.5	0	0				
863	0	0	0				
8719	1.5	0	0				
877	0	732	415				
8771S	0	0	0	7.8	0	26.41	6.67
8780	0.1	1448	30	45	0	7.56	1.56
8830	0.1	0	0				
8842	0.1	0	0				
8875	0.1	0	0				
8876	0.1	0	0				
8890N	0	0	0	9.1	0	31.32	10.99
8890S	0	0	0	9.1	0	31.32	6.26
8891N	1	0	0	7.8	0	36.54	7.31
8891S	0	0	0	7.8	0	36.54	7.31
8935	0.2	0	0				
8936	0.2	0	0				
9185	0.4	0	0				
9186	0.4	0	0				
9187	0	561.2	60.3				
921	5	259	274	8.6	1	19.30	5.81
9215	1.1	0	0				
9216	1.1	0	0				
9310A	1.1	0	0				
9374	2.5	1219	488				
941A	0	1366	280				
9420	0	1920	427				
9463	0	0	0				
9474	5	0	0	14	0	13.00	3.29
9630	0	0	0	41	0	7.32	1.95
9630A	0	0	0	41	0	7.32	1.95
9630B	0	0	0	41	0	9.71	2.61

Bridge ID	Stream Slope	Total Hardwoods	Total Conifers	Active Channel Width (ft)	Valley Width Index	Bridge Length/ACW Ratio	Longest Span/ACW Ratio
9670A	1.5	305	0	17.8	20	8.43	3.37
9775	7	0	0				
9777	0	478	5				
983	0	1951	0				
995	0	691	102	4	1.5	31.50	12.50
M014	0	0	0	6.2	50	3.23	1.61
M086	0	411	244				
M339	2.5	1170	951				
M340	0	1043	298				
M342	0	0	0	9.5	0	9.47	9.47
M547	0	0	0				
M550	3	622	463	9	1	0.67	0.67
M551	0	1605	2398	7.5	1.5	1.33	1.33
P153	5	1016	467	4	1.2	1.63	1.63
P174	0	1433	122	9.1	8.5	0.88	0.88
P175	0	1433	122	4.9	10	1.63	1.63
P178	0	679	627	6.5	8	1.15	1.15
P212	4	594	411	2.3	2.5	2.61	2.61
P239	0	827	96				
P272	0	914	0				
P294	1.2	1341	122				
P325	1.5	0	826.7				
P468	2.7	1402	1128	9.4	3.5	1.70	0.85

APPENDIX F:
PEAK FLOW/AVERAGE FLOW RATIOS

Appendix F-Peak Flow/Average Flow Ratios																
Bridge ID	USGS Gage #	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1038A	13331500	6	7	9	7	8	5	5	8	11	6	6	9	4	9	8
1089	14305500	12	23	15	11	27	35	4	12	11	14	9	17	24	17	19
1113	14306340	23	56	45	14	26	17	7	16	14	12	8	31	19	39	17
1114	14306500	11	22	19	7	22	16	5	10	9	8	5	19	12	19	11
1144	14377100	25	19	30	20	21	16	3	9	17	13	15	29	20	9	18
1194A	14377100	25	19	30	20	21	16	3	9	17	13	15	29	20	9	18
1199A	14377100	25	19	30	20	21	16	3	9	17	13	15	29	20	9	18
1201A	14377100	25	19	30	20	21	16	3	9	17	13	15	29	20	9	18
1226A	14301500	17	30	13	19	30	22	3	14	15	11	13	19	33	28	20
1236A	14325000	31	22	49	12	22	17	5	13	25	21	17	33	13	20	26
1237	14301000	11	26	13	9	13	13	3	10	10	8	6	10	14	20	13
1250	14190500	10	28	14	7	30	21	3	8	8	11	5	15	12	13	14
1268A	14377100	25	19	30	20	21	16	3	9	17	13	15	29	20	9	18
1269A	14377100	25	19	30	20	21	16	3	9	17	13	15	29	20	9	18
1271A	14377100	25	19	30	20	21	16	3	9	17	13	15	29	20	9	18
1274	14301000	11	26	13	9	13	13	3	10	10	8	6	10	14	20	13
1275	14301000	11	26	13	9	13	13	3	10	10	8	6	10	14	20	13
1319	14301000	11	26	13	9	13	13	3	10	10	8	6	10	14	20	13
1324A	14187000	15	37	25	7	17	17	3	11	8	18	9	17	10	9	14
1345C	14301500	17	30	13	19	30	22	3	14	15	11	13	19	33	28	20
1349	14308990	84	46	74	29	32	30	2	18	24	13	10	22	20	19	18
1396	14303200	14	40	24	12	31	26	3	10	9	10	5	19	36	24	23
1402A	14305500	12	23	15	11	27	35	4	12	11	14	9	17	24	17	19
1403	14306340	23	56	45	14	26	17	7	16	14	12	8	31	19	39	17
1415	14301000	11	26	13	9	13	13	3	10	10	8	6	10	14	20	13
1430A	14306340	23	56	45	14	26	17	7	16	14	12	8	31	19	39	17
1452	14206900	55	222	152	71	86	46	29	95	73	41	41	87	68	76	97
1490	14305500	12	23	15	11	27	35	4	12	11	14	9	17	24	17	19
1577A	14185000	14	39	28	8	21	35	4	14	13	17	9	17	12	10	15
1583	14187000	15	37	25	7	17	17	3	11	8	18	9	17	10	9	14
1584	14187000	15	37	25	7	17	17	3	11	8	18	9	17	10	9	14
1600	14120000	11	23	10	10	14	14	3	6	7	6	4	8	19	8	9
1607A	14211550	18	28	25	13	15	11	4	10	22	20	9	20	18	26	27
1626	14148000	6	9	15	5	9	5	3	6	5	7	6	11	6	4	6
16410	14309500	27	24	34	17	25	22	6	17	31	19	16	35	29	21	35
16412	14309500	27	24	34	17	25	22	6	17	31	19	16	35	29	21	35
16414	14309500	27	24	34	17	25	22	6	17	31	19	16	35	29	21	35
16416	14309500	27	24	34	17	25	22	6	17	31	19	16	35	29	21	35
16607	14309500	27	24	34	17	25	22	6	17	31	19	16	35	29	21	35
16859	14316700	17	22	43	14	28	21	4	17	12	18	18	36	14	9	23
Bridge ID	USGS Gage #	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1688A	14306340	23	56	45	14	26	17	7	16	14	12	8	31	19	39	17
1691	14306340	23	56	45	14	26	17	7	16	14	12	8	31	19	39	17
1697	14306340	23	56	45	14	26	17	7	16	14	12	8	31	19	39	17
1707A	14301000	11	26	13	9	13	13	3	10	10	8	6	10	14	20	13
17082	14211550	18	28	25	13	15	11	4	10	22	20	9	20	18	26	27
17334	13331500	6	7	9	7	8	5	5	8	11	6	6	9	4	9	8
17424	14182500	25	45	22	15	25	39	6	16	13	17	10	16	30	12	26
1748A	14301000	11	26	13	9	13	13	3	10	10	8	6	10	14	20	13
18091	14309500	27	24	34	17	25	22	6	17	31	19	16	35	29	21	35
18096	14400000	18	15	34	12	18	19	4	13	16	20	21	26	20	15	23
1812A	14301000	11	26	13	9	13	13	3	10	10	8	6	10	14	20	13
18165	14301000	11	26	13	9	13	13	3	10	10	8	6	10	14	20	13
1817	14301000	11	26	13	9	13	13	3	10	10	8	6	10	14	20	13
18262	14309500	27	24	34	17	25	22	6	17	31	19	16	35	29	21	35
1831	14301000	11	26	13	9	13	13	3	10	10	8	6	10	14	20	13

18427	14338000	11	27	52	21	24	22	2	19	19	19	18	56	16	11	16
185A	14301000	11	26	13	9	13	13	3	10	10	8	6	10	14	20	13
1863	14303200	14	40	24	12	31	26	3	10	9	10	5	19	36	24	23
1872A	14301500	17	30	13	19	30	22	3	14	15	11	13	19	33	28	20
18730	14166500	20	30	22	8	24	10	5	14	18	11	5	23	14	16	6
18900	14309500	27	24	34	17	25	22	6	17	31	19	16	35	29	21	35
18901	14309500	27	24	34	17	25	22	6	17	31	19	16	35	29	21	35
19015	14325000	31	22	49	12	22	17	5	13	25	21	17	33	13	20	26
1914A	14305500	12	23	15	11	27	35	4	12	11	14	9	17	24	17	19
1926A	13292000	9	8	40	12	8	4	3	5	6	4	5	7	3	12	5
1937	14308990	84	46	74	29	32	30	2	18	24	13	10	22	20	19	18
19626	14309500	27	24	34	17	25	22	6	17	31	19	16	35	29	21	35
19627	14309500	27	24	34	17	25	22	6	17	31	19	16	35	29	21	35
1963	14301000	11	26	13	9	13	13	3	10	10	8	6	10	14	20	13
19681	14020300	15	29	23	8	10	6	4	13	16	13	4	16	9	15	13
1968A	14305500	12	23	15	11	27	35	4	12	11	14	9	17	24	17	19
196A	14166500	20	30	22	8	24	10	5	14	18	11	5	23	14	16	6
1972A	14305500	12	23	15	11	27	35	4	12	11	14	9	17	24	17	19
19820	14303200	14	40	24	12	31	26	3	10	9	10	5	19	36	24	23
1987A	14090400	6	27	7	8	5	13	2	6	6	3	3	7	11	6	7
1991	14301000	11	26	13	9	13	13	3	10	10	8	6	10	14	20	13
1995	14309500	27	24	34	17	25	22	6	17	31	19	16	35	29	21	35
1996	13331500	6	7	9	7	8	5	5	8	11	6	6	9	4	9	8
2008A	14211550	18	28	25	13	15	11	4	10	22	20	9	20	18	26	27
2012	14201300	36	74	82	15	28	24	2	19	16	16	8	34	26	16	17
2027A	14301000	11	26	13	9	13	13	3	10	10	8	6	10	14	20	13
Bridge ID	USGS Gage #	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
20583	14312000	23	17	28	12	13	17	2	11	16	11	12	27	17	14	20
2082A	14211500	24	44	48	16	18	12	5	12	34	21	8	21	19	27	45
2164	14301000	11	26	13	9	13	13	3	10	10	8	6	10	14	20	13
2166	14301000	11	26	13	9	13	13	3	10	10	8	6	10	14	20	13
2184	13330300	9	11	8	5	10	6	6	9	13	7	6	11	10	9	8
2239	14303200	14	40	24	12	31	26	3	10	9	10	5	19	36	24	23
2275	14305500	12	23	15	11	27	35	4	12	11	14	9	17	24	17	19
2279A	14309500	27	24	34	17	25	22	6	17	31	19	16	35	29	21	35
2305	14306500	11	22	19	7	22	16	5	10	9	8	5	19	12	19	11
2321	14182500	25	45	22	15	25	39	6	16	13	17	10	16	30	12	26
2336	13331500	6	7	9	7	8	5	5	8	11	6	6	9	4	9	8
2379	14308990	84	46	74	29	32	30	2	18	24	13	10	22	20	19	18
2453	14308500	113	73	106	27	35	34	2	32	36	50	16	75	35	32	29
2462A	14301500	17	30	13	19	30	22	3	14	15	11	13	19	33	28	20
2472	14301500	17	30	13	19	30	22	3	14	15	11	13	19	33	28	20
2561	14020300	15	29	23	8	10	6	4	13	16	13	4	16	9	15	13
2671A	14301500	17	30	13	19	30	22	3	14	15	11	13	19	33	28	20
2737	14316700	17	22	43	14	28	21	4	17	12	18	18	36	14	9	23
3004	14306340	23	56	45	14	26	17	7	16	14	12	8	31	19	39	17
3010	14306340	23	56	45	14	26	17	7	16	14	12	8	31	19	39	17
3062	14141500	14	34	14	8	13	36	6	11	11	14	7	12	18	11	29
3080	14120000	11	23	10	10	14	14	3	6	7	6	4	8	19	8	9
3081	14301000	11	26	13	9	13	13	3	10	10	8	6	10	14	20	13
3084	14301000	11	26	13	9	13	13	3	10	10	8	6	10	14	20	13
3086	14301000	11	26	13	9	13	13	3	10	10	8	6	10	14	20	13
3088	14301000	11	26	13	9	13	13	3	10	10	8	6	10	14	20	13
3091A	14301000	11	26	13	9	13	13	3	10	10	8	6	10	14	20	13
3092A	14301000	11	26	13	9	13	13	3	10	10	8	6	10	14	20	13
3095	14301000	11	26	13	9	13	13	3	10	10	8	6	10	14	20	13
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3108	14301000	11	26	13	9	13	13	3	10	10	8	6	10	14	20	13
3184A	14325000	31	22	49	12	22	17	5	13	25	21	17	33	13	20	26

3196	14325000	31	22	49	12	22	17	5	13	25	21	17	33	13	20	26
3212A	14325000	31	22	49	12	22	17	5	13	25	21	17	33	13	20	26
3221A	14325000	31	22	49	12	22	17	5	13	25	21	17	33	13	20	26
333A	14166500	20	30	22	8	24	10	5	14	18	11	5	23	14	16	6
3373A	14091500	2	6	3	2	2	3	1	2	2	1	1	3	2	2	2
3416A	14306340	23	56	45	14	26	17	7	16	14	12	8	31	19	39	17
3436A	14306340	23	56	45	14	26	17	7	16	14	12	8	31	19	39	17
3454	14309500	27	24	34	17	25	22	6	17	31	19	16	35	29	21	35
3757B	14338000	11	27	52	21	24	22	2	19	19	19	18	56	16	11	16
Bridge ID	USGS Gage #	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
3769	14308990	84	46	74	29	32	30	2	18	24	13	10	22	20	19	18
3920A	11495800	10	17	12	10	11	7	3	11	6	4	8	12	5	6	11
3921	11495800	10	17	12	10	11	7	3	11	6	4	8	12	5	6	11
3923	11495800	10	17	12	10	11	7	3	11	6	4	8	12	5	6	11
4021	14306340	23	56	45	14	26	17	7	16	14	12	8	31	19	39	17
4022	14306340	23	56	45	14	26	17	7	16	14	12	8	31	19	39	17
4023	14306340	23	56	45	14	26	17	7	16	14	12	8	31	19	39	17
4025A	14306340	23	56	45	14	26	17	7	16	14	12	8	31	19	39	17
4037	14166500	20	30	22	8	24	10	5	14	18	11	5	23	14	16	6
4117A	14152000	4	5	6	5	5	4	1	4	3	4	3	6	4	3	6
4143A	14305500	12	23	15	11	27	35	4	12	11	14	9	17	24	17	19
4149A	14305500	12	23	15	11	27	35	4	12	11	14	9	17	24	17	19
4151A	14305500	12	23	15	11	27	35	4	12	11	14	9	17	24	17	19
4190	14305500	12	23	15	11	27	35	4	12	11	14	9	17	24	17	19
4192	14305500	12	23	15	11	27	35	4	12	11	14	9	17	24	17	19
4199	14305500	12	23	15	11	27	35	4	12	11	14	9	17	24	17	19
4212	14305500	12	23	15	11	27	35	4	12	11	14	9	17	24	17	19
4278A	14188610	23	54	13	10	16	21	8	21	14	23	10	15	25	14	26
444B	14166500	20	30	22	8	24	10	5	14	18	11	5	23	14	16	6
4566B	14211500	24	44	48	16	18	12	5	12	34	21	8	21	19	27	45
482B	14325000	31	22	49	12	22	17	5	13	25	21	17	33	13	20	26
4834A	13331500	6	7	9	7	8	5	5	8	11	6	6	9	4	9	8
4841A	14020300	15	29	23	8	10	6	4	13	16	13	4	16	9	15	13
4847A	14020300	15	29	23	8	10	6	4	13	16	13	4	16	9	15	13
5272A	14210000	9	25	12	9	13	13	3	8	8	7	6	13	12	9	13
5283A	14338000	11	27	52	21	24	22	2	19	19	19	18	56	16	11	16
558A	13331500	6	7	9	7	8	5	5	8	11	6	6	9	4	9	8
559B	14309500	27	24	34	17	25	22	6	17	31	19	16	35	29	21	35
5640A	14301500	17	30	13	19	30	22	3	14	15	11	13	19	33	28	20
586A	14308990	84	46	74	29	32	30	2	18	24	13	10	22	20	19	18
626	14020300	15	29	23	8	10	6	4	13	16	13	4	16	9	15	13
6343	14305500	12	23	15	11	27	35	4	12	11	14	9	17	24	17	19
6530A	14308990	84	46	74	29	32	30	2	18	24	13	10	22	20	19	18
6605A	14357500	12	33	153	22	26	16	2	10	25	34	16	73	17	21	7
660A	14357500	12	33	153	22	26	16	2	10	25	34	16	73	17	21	7
666A	14137000	19	36	10	8	15	26	4	8	10	9	4	10	14	6	22
678	14338000	11	27	52	21	24	22	2	19	19	19	18	56	16	11	16
6787A	14308990	84	46	74	29	32	30	2	18	24	13	10	22	20	19	18
6788A	14308990	84	46	74	29	32	30	2	18	24	13	10	22	20	19	18
6789A	14308990	84	46	74	29	32	30	2	18	24	13	10	22	20	19	18
6790A	14308990	84	46	74	29	32	30	2	18	24	13	10	22	20	19	18
Bridge ID	USGS Gage #	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
6792A	14308990	84	46	74	29	32	30	2	18	24	13	10	22	20	19	18
6793A	14308990	84	46	74	29	32	30	2	18	24	13	10	22	20	19	18
6794A	14308990	84	46	74	29	32	30	2	18	24	13	10	22	20	19	18
6795A	14308990	84	46	74	29	32	30	2	18	24	13	10	22	20	19	18
6796A	14308990	84	46	74	29	32	30	2	18	24	13	10	22	20	19	18
6797A	14308990	84	46	74	29	32	30	2	18	24	13	10	22	20	19	18

6798A	14308990	84	46	74	29	32	30	2	18	24	13	10	22	20	19	18
6801A	14308990	84	46	74	29	32	30	2	18	24	13	10	22	20	19	18
6802A	14308990	84	46	74	29	32	30	2	18	24	13	10	22	20	19	18
681B	14338000	11	27	52	21	24	22	2	19	19	19	18	56	16	11	16
6821A	14309500	27	24	34	17	25	22	6	17	31	19	16	35	29	21	35
690	14141500	14	34	14	8	13	36	6	11	11	14	7	12	18	11	29
6900	14305500	12	23	15	11	27	35	4	12	11	14	9	17	24	17	19
7082	14301000	11	26	13	9	13	13	3	10	10	8	6	10	14	20	13
7147	14301500	17	30	13	19	30	22	3	14	15	11	13	19	33	28	20
7158	14309500	27	24	34	17	25	22	6	17	31	19	16	35	29	21	35
7159	14309500	27	24	34	17	25	22	6	17	31	19	16	35	29	21	35
7181	14301500	17	30	13	19	30	22	3	14	15	11	13	19	33	28	20
723A	13330300	9	11	8	5	10	6	6	9	13	7	6	11	10	9	8
725A	13330300	9	11	8	5	10	6	6	9	13	7	6	11	10	9	8
7347	14182500	25	45	22	15	25	39	6	16	13	17	10	16	30	12	26
7361	14308990	84	46	74	29	32	30	2	18	24	13	10	22	20	19	18
7417	14301000	11	26	13	9	13	13	3	10	10	8	6	10	14	20	13
7461	14166500	20	30	22	8	24	10	5	14	18	11	5	23	14	16	6
7464	14166500	20	30	22	8	24	10	5	14	18	11	5	23	14	16	6
7468	14166500	20	30	22	8	24	10	5	14	18	11	5	23	14	16	6
7469B	14166500	20	30	22	8	24	10	5	14	18	11	5	23	14	16	6
7472A	14166500	20	30	22	8	24	10	5	14	18	11	5	23	14	16	6
7475	14301000	11	26	13	9	13	13	3	10	10	8	6	10	14	20	13
7572A	14166500	20	30	22	8	24	10	5	14	18	11	5	23	14	16	6
7581	14301000	11	26	13	9	13	13	3	10	10	8	6	10	14	20	13
7598	14308990	84	46	74	29	32	30	2	18	24	13	10	22	20	19	18
762	14325000	31	22	49	12	22	17	5	13	25	21	17	33	13	20	26
7641	14166500	20	30	22	8	24	10	5	14	18	11	5	23	14	16	6
765A	11495800	10	17	12	10	11	7	3	11	6	4	8	12	5	6	11
7786	14400000	18	15	34	12	18	19	4	13	16	20	21	26	20	15	23
7787	14400000	18	15	34	12	18	19	4	13	16	20	21	26	20	15	23
7840	14309500	27	24	34	17	25	22	6	17	31	19	16	35	29	21	35
7856A	14309500	27	24	34	17	25	22	6	17	31	19	16	35	29	21	35
7894	14148000	6	9	15	5	9	5	3	6	5	7	6	11	6	4	6
7899	14309500	27	24	34	17	25	22	6	17	31	19	16	35	29	21	35

Bridge ID	USGS Gage #	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
7904	14316700	17	22	43	14	28	21	4	17	12	18	18	36	14	9	23
7944	14166500	20	30	22	8	24	10	5	14	18	11	5	23	14	16	6
800A	13331500	6	7	9	7	8	5	5	8	11	6	6	9	4	9	8
8076	14201300	36	74	82	15	28	24	2	19	16	16	8	34	26	16	17
8094N	14309500	27	24	34	17	25	22	6	17	31	19	16	35	29	21	35
8094S	14309500	27	24	34	17	25	22	6	17	31	19	16	35	29	21	35
8290	14400000	18	15	34	12	18	19	4	13	16	20	21	26	20	15	23
8412	14338000	11	27	52	21	24	22	2	19	19	19	18	56	16	11	16
8427	14020300	15	29	23	8	10	6	4	13	16	13	4	16	9	15	13
8431	14020300	15	29	23	8	10	6	4	13	16	13	4	16	9	15	13
8431A	14020300	15	29	23	8	10	6	4	13	16	13	4	16	9	15	13
844A	14020300	15	29	23	8	10	6	4	13	16	13	4	16	9	15	13
856	14306340	23	56	45	14	26	17	7	16	14	12	8	31	19	39	17
8566	14120000	11	23	10	10	14	14	3	6	7	6	4	8	19	8	9
858A	14305500	12	23	15	11	27	35	4	12	11	14	9	17	24	17	19
860A	14305500	12	23	15	11	27	35	4	12	11	14	9	17	24	17	19
861	14305500	12	23	15	11	27	35	4	12	11	14	9	17	24	17	19
863	14305500	12	23	15	11	27	35	4	12	11	14	9	17	24	17	19
8719	14400000	18	15	34	12	18	19	4	13	16	20	21	26	20	15	23
877	14303200	14	40	24	12	31	26	3	10	9	10	5	19	36	24	23
8771S	14357500	12	33	153	22	26	16	2	10	25	34	16	73	17	21	7
8780	13331500	6	7	9	7	8	5	5	8	11	6	6	9	4	9	8
8830	14325000	31	22	49	12	22	17	5	13	25	21	17	33	13	20	26

8842	14325000	31	22	49	12	22	17	5	13	25	21	17	33	13	20	26
8875	14325000	31	22	49	12	22	17	5	13	25	21	17	33	13	20	26
8876	14325000	31	22	49	12	22	17	5	13	25	21	17	33	13	20	26
8890N	14357500	12	33	153	22	26	16	2	10	25	34	16	73	17	21	7
8890S	14357500	12	33	153	22	26	16	2	10	25	34	16	73	17	21	7
8891N	14357500	12	33	153	22	26	16	2	10	25	34	16	73	17	21	7
8891S	14357500	12	33	153	22	26	16	2	10	25	34	16	73	17	21	7
8935	14325000	31	22	49	12	22	17	5	13	25	21	17	33	13	20	26
8936	14325000	31	22	49	12	22	17	5	13	25	21	17	33	13	20	26
9185	14325000	31	22	49	12	22	17	5	13	25	21	17	33	13	20	26
9186	14325000	31	22	49	12	22	17	5	13	25	21	17	33	13	20	26
9187	14377100	25	19	30	20	21	16	3	9	17	13	15	29	20	9	18
921	14301000	11	26	13	9	13	13	3	10	10	8	6	10	14	20	13
9215	14325000	31	22	49	12	22	17	5	13	25	21	17	33	13	20	26
9216	14325000	31	22	49	12	22	17	5	13	25	21	17	33	13	20	26
9310A	14309500	27	24	34	17	25	22	6	17	31	19	16	35	29	21	35
9374	14308990	84	46	74	29	32	30	2	18	24	13	10	22	20	19	18
941A	14338000	11	27	52	21	24	22	2	19	19	19	18	56	16	11	16
Bridge ID	USGS Gage #	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
9420	14305500	12	23	15	11	27	35	4	12	11	14	9	17	24	17	19
9463	14305500	12	23	15	11	27	35	4	12	11	14	9	17	24	17	19
9474	14158850	4	6	7	3	3	5	1	4	3	3	2	5	4	3	3
9630	14020300	15	29	23	8	10	6	4	13	16	13	4	16	9	15	13
9630A	14020300	15	29	23	8	10	6	4	13	16	13	4	16	9	15	13
9630B	14020300	15	29	23	8	10	6	4	13	16	13	4	16	9	15	13
9670A	14211550	18	28	25	13	15	11	4	10	22	20	9	20	18	26	27
9775	14338000	11	27	52	21	24	22	2	19	19	19	18	56	16	11	16
9777	14338000	11	27	52	21	24	22	2	19	19	19	18	56	16	11	16
983	14321000	13	14	23	8	16	13	2	9	11	14	13	23	13	9	18
995	14400000	18	15	34	12	18	19	4	13	16	20	21	26	20	15	23
M014	11495800	10	17	12	10	11	7	3	11	6	4	8	12	5	6	11
M086	14305500	12	23	15	11	27	35	4	12	11	14	9	17	24	17	19
M339	14308990	84	46	74	29	32	30	2	18	24	13	10	22	20	19	18
M340	14308990	84	46	74	29	32	30	2	18	24	13	10	22	20	19	18
M342	14308990	84	46	74	29	32	30	2	18	24	13	10	22	20	19	18
M547	14316700	17	22	43	14	28	21	4	17	12	18	18	36	14	9	23
M550	14316700	17	22	43	14	28	21	4	17	12	18	18	36	14	9	23
M551	14316700	17	22	43	14	28	21	4	17	12	18	18	36	14	9	23
P153	14301000	11	26	13	9	13	13	3	10	10	8	6	10	14	20	13
P174	14301000	11	26	13	9	13	13	3	10	10	8	6	10	14	20	13
P175	14301000	11	26	13	9	13	13	3	10	10	8	6	10	14	20	13
P178	14301000	11	26	13	9	13	13	3	10	10	8	6	10	14	20	13
P212	14325000	31	22	49	12	22	17	5	13	25	21	17	33	13	20	26
P239	14166500	20	30	22	8	24	10	5	14	18	11	5	23	14	16	6
P272	14325000	31	22	49	12	22	17	5	13	25	21	17	33	13	20	26
P294	14166500	20	30	22	8	24	10	5	14	18	11	5	23	14	16	6
P325	14020300	15	29	23	8	10	6	4	13	16	13	4	16	9	15	13
P468	14316700	17	22	43	14	28	21	4	17	12	18	18	36	14	9	23