



Columbia River Port Engineers

**REPORT TO
THE PORT OF HOOD RIVER
SEPTEMBER 2, 2015**

HOOD RIVER BRIDGE HEAVY TRUCK ASSESSMENT



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Executive Summary

This report summarizes the research performed in response to a contract between the Port of Hood River and Columbia River Port Engineers. The report summarizes the weight rules and regulations governing truck traffic in Washington and Oregon, evaluates the Hood River Bridge toll structure and its potential impact on truck operations. The report presents toll rates from other bridges and the results of interviews with the Oregon Department Transportation Motor Carrier Division as well as the Washington State Patrol's Motor Carrier Enforcement. Several current weigh in motion systems are presented.

Potential actions to consider include a Port provided weigh in motion system tied to a license plate reader, additional signage throughout a wide area, raise tolls for overweight trucks, conduct public outreach efforts to encourage voluntary compliance, engage the Washington State Patrol and the motor carrier Division of the Oregon department transportation to perform random scale station and citation efforts, and develop a self-enforcement system that uses weigh in motion technology.

A handwritten signature in black ink, appearing to read "Christian Steinbrecher". The signature is fluid and cursive, with the first name "Christian" written in a larger, more prominent script than the last name "Steinbrecher".

Christian F. Steinbrecher, P.E.

August 22, 2015

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Overview

The Hood River Bridge (“HR Bridge”) provides a crossing for truck and tourist traffic between Washington and Oregon. The nearest downstream bridge is the Bridge of the Gods in Cascade Locks 18 miles to the west which is load limited to 80,000#. The next nearest bridge to the west is the I-205 Bridge which is constructed to full contemporary interstate standards. The nearest bridge to the east is the crossing at The Dalles. The functionality of the HR Bridge is impacted by its narrow lanes and its load limit. However, it provides a truck crossing between Washington and Oregon for the movement of fruit, forest products and short haul commodities such as aggregates.

The Port of Hood River is concerned that excessive truck weights cause accelerated degradation of the bridge. The Port seeks to identify possible strategies in order to reduce long-term degradation. In particular, whether there are there toll strategies and/or enforcement measures that can be taken to reduce the number of overweight trucks using the Bridge.

Summary of Research

This report is in response to the contract between the Port of Hood River and Columbia River Port Engineers to research a number of specific issues.

Task 1 - Weight Rules and Regulations in Oregon and Washington

Truck Component Limitations

The weight laws in the states of Oregonⁱ and Washingtonⁱⁱⁱ are based on the Federal Bridge equation^v with some modifications. The Oregon

weight laws limit a tire to a maximum load of 600 pounds (500 in WA) per width of tire or the manufacture’s limit on the sidewall of the tire. In addition there are axle maximums of 20,000 pounds. Oregon has a wheel maximum of 10,000 pounds. Tandem loads are limited to 34,000 pounds.^{vi} ^{vii}

Weight Tables

Vehicle weights are further controlled by the weight tables. These tables take into account the length of the load and the number of axles. For example a 5 axle truck 43 feet long is limited to 74,000 lbs. Thus the 80,000# posted weight limit on the HR Bridge is not absolute and must be adjusted by vehicle length and axle count.

Oregon’s basic table is limited to 80,000 pounds. However extended weight permits that allow weights of 105,500 pounds are routinely granted. The state of Oregon granted approximately 130,000 of these permits in the last year. Washington’s basic weight table allows 105,500 pounds.^{viii} The table below compares the Washington and Oregon weight laws. It should be noted that emergency vehicles and transit vehicles are granted certain exemptions.^{ix}

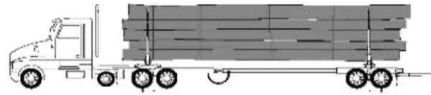
Weight Law Summary

	Descript’n	Oregon	Washington
1	Basic weight table (includes analysis of wheel groups)	80,000# (weight table 1) + exceptions 1 & 2	105,500# (vehicle weight table)
2	Additional allowed with annual permit \$8/yr + \$8/yr per county	105,500# (weight table 2)	Incl in above
3	Tandem max	34,000#	34,000#
4	Axle Max	20,000#	20,000#
5	Wheel max	10,000#	None
6	Tire width max	600#/in or factory limit	500#/in or factory limit; 2 tire max
7	Steer axle tire width max	Incl in above	600#/in or manufacturer’s max
8	Log truck exception	Attachmn’t 19 - for self loaders only	74,800#, five axles, 37’ WB min

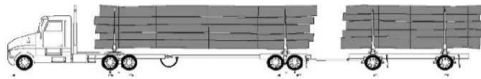


Task 2 – Truck Illustrations^{xi}

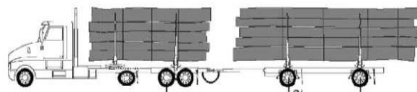
Truck Configurations



One Trailer Log Truck w stinger; (w drop axle)



Two Trailer Log Truck – stinger and trailer



One Trailer Log Truck (w drop axle)

Characteristics of Potentially Overloaded Vehicles

1. Loads to the top or over the forks
2. Slow acceleration
3. Low on springs
4. Swaying motion while underway
5. Tire squat



Fruit Truck

Characteristics of Potentially Overloaded Vehicles (Apples and Pears)

1. Fully loaded fruit bins (1,300# ea)
2. Full load of bins (10L X 2W X 4H = 106K# + truck & trailer)
3. Slow acceleration
4. Low on springs
5. Swaying motion while underway
6. Tire squat

Visual Weight Estimation of Vehicles

This is an art as much as a science. Per Ed Scribner of ODOT, ODOT's Motor Carrier Inspectors who weigh trucks on a daily basis develop a level of expertise that gives them a basis for visual guestimates, which is then always verified by actual scale weights. Their experience gives them the ability to visually take in the vehicle type, length, load heights, vehicle acceleration, how the truck sits on its springs, number of axles, tire squat and if it "wallows" as it moves along. However this judgment is highly subjective and is realistically limited to those on the scales on a daily basis.

For example a five axle highly loaded log hauler with a 50' wheelbase would in all likelihood exceed 80,000# if it exhibited all of these characteristics. A fruit truck with similar characteristics might also be over 80,000#. It should be noted that shorter trucks might not exhibit these characteristics, weigh less than 80,000#, but also be overweight per the weight tables.



Task 3 - Evaluation of Toll Structure and Impact on Truck Operations

Hood River Bridge Tolls

The Hood River Bridge assesses tolls for trucks based on the axle count of the vehicle combinations. A typical tractor and trailer with five axles will pay \$5.00. Each additional axle is assessed at \$1.00 per axle. When the bridge opened in 1925 the toll was \$5 for a truck 4 tons and over - which would be \$62.50 in today's dollars.

Overview of Trucking Operations

Trucking operations are a for profit business or part of a larger for profit business. Therefore decisions made by truck operators are made to maximize profits. There are two major models for truck operations and these models respond differently to toll structures.^{xii xiii}

Private Carriers

Private carriers are trucking operations that are owned by a major manufacturing or distribution firm which self performs its transportation function. Examples include Safeway, Wal-Mart and others. While cost is an issue for this model, it is a sub component of a much larger business entity. For these businesses transportation costs are a consideration, but the profits are usually driven by issues much broader than transportation costs.

Key measures of success for private carriers include things like on time delivery, minimizing fuel costs and minimizing labor costs. The incremental costs of miscellaneous expenditures such as tolls are of lesser importance. This group will avoid tolls if possible, but not take excessive measures to do so.

For Hire Carriers

For hire carriers includes the broad spectrum of owner operators as well as transportation companies which are not affiliated with a manufacturing or distribution business entity. That is, the main purpose of this company is to provide transportation services to other businesses.

These companies are more sensitive to incremental costs. Their profits are made on the margins and are impacted by things like tolls and taxes. While they recognize that their reputations also require on time delivery, the push to reduce costs is significant. Incremental costs such as tolls are oftentimes not passed through to a consumer; or the consumer refuses to pay.^{xiv}

In addition to the profit motivator, there is a cultural disposition against paying tolls by this group. This would encourage behaviors such as picking up drop axles as tollbooths are crossed.

Log Haulers

Log haulers are a significant percentage of the truck traffic across the bridge. The operating costs of log trucks are relatively high, as they are built to move loads in relatively rugged environments. Their engine sizes and tires are not focused on fuel economy.^{xv} Truck weights are an issue for this group and many vehicles have on board scales.^{xvi} This group is sensitive to toll structures and takes measures to avoid or reduce them. Most of these fleets are small fleets; less than 20 trucks.^{xvii}

Trucking Costs

The American Transportation Research Institute is a recognized entity with expertise in developing cost data and performing analyses for the trucking industry.^{xviii} They represent nationwide averages and there may be some



fluctuation for individual carriers in specific situations. Their 2014 Update of the Analysis of Operational Costs of Trucking puts the cost of operating a truck at \$1.67 per mile or \$67.00 per hour.

The largest costs associated with operating trucks include fuel costs and labor costs. Tolls represent less than 2¢ per mile. This toll cost per mile could increase in the case of operations which are short hauls across highly priced toll facilities.

Route Motivators

Detours either upstream or downstream from the HR Bridge could involve trips of 45 miles or more. The toll at the Hood River Bridge is a bargain as compared to the costs incurred in diverting to the Bridge of the Gods (which is weight limited at 80,000#), I-205, the bridge at The Dalles or at Biggs Junction.

The enforcement of weight limitations by ODOT may encourage some additional truck traffic over the HR Bridge. Fines for overweight trucks^{xix} can amount to thousands of dollars which can easily erase the profits made on any particular haul. In Oregon there are scales at Cascade Locks. However in Washington there are no operating scales on SR 14 in the proximity of Hood River. The scales at Home Valley, WA are not functional and there is no date for repair.

Trucks may also cross the HR Bridge in an attempt to avoid Oregon’s weight mile taxes. By crossing the bridge and paying the toll they avoid weight mile taxes which run anywhere from 15 to 17¢ per mile. This group would be less sensitive to toll charge increases until the charges approached the avoided weight mile tax rate.

Toll Rate Summary

The attached table is a survey of bridges and the tolls charged for a 6 axle truck.^{xx xxi xxii}This includes mega structures such as the George Washington Bridge and the Oakland Bay Bridge as well as small structures in the Midwest.

Six axle truck Toll Survey			
Oregon			
Hood River Bridge	\$ 6.00		Both directions
Bridge of the Gods	\$ 9.00		Both directions
Washington			
Tacoma Narrows	\$ 15.00	\$ 21.00	15.00 on good to go pass; 21.00 on pay by mail. Eastbound only
Evergreen Point	\$ -	\$ 16.55	Zero - midnight to 5 am. 16.50 pay by mail 3 to 6 pm; electronic collection only. Both directions.
Cathlamet Ferry	\$ 65.00		Calculation is per length. \$10 + \$1/lf over 25'. Both directions.
California			
Golden Gate	\$ 37.50	\$ 43.50	Electronic payment only. Low for FasTrak account; high for credit card. Southbound only
Richmond San Rafael	\$ 30.00		Westbound only
Oakland Bay	\$ 30.00		Westbound only
San Mateo	\$ 30.00		Westbound only
Delaware			
Milford Montegue	\$ 21.60	\$ 24.00	Westbound only
Delaware Water Gap	\$ 21.60	\$ 24.00	Westbound only
Portland Columbia	\$ 21.60	\$ 24.00	Westbound only
Easton Phillipsburg	\$ 21.60	\$ 24.00	Westbound only
I-78	\$ 21.60	\$ 24.00	Westbound only
New Hope Lambertville	\$ 21.60	\$ 24.00	Westbound only
Morrisville Trenton	\$ 21.60	\$ 24.00	Westbound only
Nebraska			
Bellevue Bridge	\$ 6.00		Both directions

Task 4 - Interviews with WA & OR Weighmaster Representatives

Interviews were conducted with Ed Scribner of the Oregon Department of Transportation Motor Carrier Transportation Division and Linda Powell of the Washington State Patrol’s Motor Carrier Enforcement Group.



Indiana			
I-65 Bridge	\$ 10.00	\$ 12.00	Northbound only. Low for transponder, high for video license capture.
Kennedy Bridge	\$ 10.00	\$ 12.00	Southbound only. Low for transponder, high for video license capture.
Delaware			
Delaware Memorial Bridge	\$ 30.00		Southbound only
Pennsylvania			
Burlington Bristol Bridge	\$ 27.00		Westbound only
Tacony-Palmyra Bridge	\$ 27.00		Westbound only
Texas			
Mountain Creek Lake Bridge	\$ 2.95	\$ 4.45	Both Directions
Lewisvill Lake Toll Bridge	\$ 5.90	\$ 8.85	Both Directions
New York			
George Washington Bridge	\$ 81.00	\$ 114.00	Eastbound only. Low is weekday overnight, high is peak.
Bayonne Bridge	\$ 81.00	\$ 114.00	Eastbound only. Low is weekday overnight, high is peak.
Outerbridge	\$ 81.00	\$ 114.00	Eastbound only. Low is weekday overnight, high is peak.
Verrazano Bridge	\$ 63.74	\$ 100.00	Southbound only - low is E-Z pass, high is cash
Vancouver BC			

Port Man Bridge	\$ 3.63	\$ 9.05	Converted \$US. Both directions. Low is transponder 9pm to 5 pm. High includes \$2.30 license plate processing fee during daytime hours.
Louisiana			
Lk Pontchartrain	\$ 7.50	\$ 15.00	Low if for less than 7' high, Northbound only.
Louisiana Hwy 1	\$ 15.00		

Oregon Comments

Mr. Scribner’s^{xxiii} background includes almost 30 years of motor vehicle regulation and enforcement at county, state and Federal levels throughout the country. His initial response to a proposal of voluntary compliance was that without enforcement compliance levels will be low.

Based on his experience he believes that drivers generally know what their trucks weigh. Many log trucks have on board scales and that combined with experience tells drivers what

their loads weigh. Mr. Scribner felt that there were significant reasons for overweight trucks crossing the Hood River Bridge including avoiding weight mile taxes in Oregon and the corresponding enforcement activities in Oregon.

Mr. Scribner felt that extensive efforts should be made on signage to avoid trapping drivers in an illegal situation. He recommends that signs be posted a sufficient distance from the bridge to allow drivers to make decisions for alternate routes. He also pointed out that the state and counties have the ability to take civil enforcement actions against repeat offenders along with on the spot citations. These actions can include 5 day shutdowns, 10 day shutdowns and total revocations of authorizations to operate.

To Mr. Scribner it is apparent that drivers will take extensive measures to avoid overweight fines. They can amount to thousands of dollars. Fines of this size erase profits from particular runs or operations. He felt that voluntary cooperation requires a significant continuing education component.

He believes that loggers comprise 30 to 40% of the truck traffic across the Hood River Bridge. Furthermore he indicated wood chips could be a problem because loading them on trucks and maintaining axle and tandem weight limitations can be difficult.

He reiterated that the fundamental weight laws in Oregon limit trucks to 80,000 pounds with extended weight permits available to go to 105,000 pounds and over. Oregon issued 130,000 permits for extended weight operations.



ODOT operations include weigh in motion systems to screen trucks at preclearance sites. If there appear to be weight or other violations ODOT brings them into a scale station for a more accurate reading. Adoption of transponders that support ODOT's greenlight system is low - only about 5 to 10%.

High speed weigh in motion systems are accurate to about 10% for axles and about 6% on the gross vehicle weight. He indicated that the advent of super heavy vehicles which include 65,000 pounds on a wheelbase of 25 foot or less is a challenge for everyone. Gasoline tanker trucks as well as dump trucks are a primary users of this type of vehicle.

He pointed out that Oregon's weight laws are different from the National System. Oregon has two different permit tables for loads up to 105,500. Washington has only one for trucks up to 105,500 pounds. He felt that it was critical that there be consequences for overweight vehicles. He offered ODOT staff to assist and advise but cautioned that there is no labor available for extensive enforcement action on behalf of the Port of Hood River.

Washington Comments

Linda Powell^{xxiv} of the Washington State Patrol Motor Vehicle Enforcement Group explained that Washington has weigh in motion systems and virtual weigh in motion programs which include license plate readers. She pointed out that SR 14, which runs on the north side of the Columbia River opposite of Oregon, has no active scales. There are scales in Home Valley but those scales are not currently operative. There is presently no schedule for making them operative.

She echoed the comments by Oregon's representative that there are on board scales

for logging trucks and chip trucks. Container trucks and flatbed trucks are less likely have on board scale systems.



Logging trucks in her opinion have on board scale systems because their route usually goes from a landing in the forest to a mill. This does not allow them the opportunity to weigh their trucks before they come on public roads. Therefore they need to know at the point of loading whether they are legal or not. Fines for overweight trucks are relatively high. With the modest cost of the onboard scale the cost/benefit ratios are attractive

Task 5 – Technology and Weigh in Motion Systems

There are several vendors who provide weigh in motion systems. One vendor, Cardinal has provided extensive information and pricing information. Cardinal provides two systems, a slow weigh in motion system and a quick weigh in motion system. The slow weigh in motion system relies on load cells embedded in a section of the pavement. It operates in a manner similar to stationary platform scales, except that the truck does not have to be completely stopped.

Quick weigh motion systems work on piezometric sensors that are installed in the



pavement and respond to weight. This installation cost is less than the slow weigh in motion system. The slow weigh in motion system (SWIM) can weigh vehicles traveling from 0 to 15 miles per hour while quick weigh in motion systems (QWIM) handle vehicles traveling over 15 miles per hour. Other manufacturers have similar offerings.

Costs of the system vary from \$1,500 quoted by ODOT^{xxv} to \$22,000^{xxvi} per lane quoted by Cardinal. Detailed Cardinal quotations are included in the appendix materials to this report. The slow weigh in motion system are more accurate and may be more suitable for the Port's purposes. The higher speed systems have trouble differentiating between trucks at low speeds. They use an embedded loop system to detect the ends of the vehicles and the system becomes confused when a truck is stopped overhead. It is not suitable for stop and go traffic.

The systems can be connected to a license plate reader, PC and data collection systems. Potentially the toll taker could be aware of truck weights. In addition they can be connected to an LED readout that would display the truck's weight at any location. Additional features that can be added would include data analysis to allow the identification of systemic violators of weight limitations.

Recommendations

a. Providing Courtesy Weight Information

Based on this research, it is apparent that trucking companies and their drivers currently have a pretty good understanding of the weight of their vehicles. This understanding is acquired

in several ways. The first method includes on board scales. The scales work with load cells or in combination with the compressed air system to provide drivers with the weight of their vehicles.

Several local companies in Eugene and Salem build air based on board systems. ^{xxvii}They are priced between \$600 and \$2,000. With a potential overweight ticket fine in the thousands of dollars the cost benefit of this equipment is self-evident. Log haulers are one of the major consumers of these systems as logs are generally loaded far from any scales. Interviews with Kenworth dealers tell us that most of the equipment that they sell is equipped with on board scales.

Secondly, experienced drivers understand by the response of their equipment to acceleration and ride whether their loads are reasonably close to legal maximums. This intuitive sense is shared by personnel at the scale stations. Weighmasters tell us that experienced personnel at the scale houses can guesstimate the weight of a truck fairly closely before the trucks even come on the scales.

Potential Accomplishments of a WIM System

Providing weight information would accomplish several things. First it would provide those truck drivers who are inexperienced with the weight of their vehicles. The intuitive understanding that many drivers gain comes only after many years of experience.

The second value added proposition for providing weights is the "you know that we know" approach. As a driver crosses the scales and their weights are called out (perhaps over a weight limit sign of 80,000 pounds), the drivers will realize there are risks that they take in making the crossing. For it is always within the



purview of the Port of Hood River to call for enforcement. This unspoken threat could go a long way to reducing the overweight vehicles.

Thirdly an advantage of providing weight information is that it would give the Port the option of disallowing those vehicles which are grossly overweight access across the bridge. While this would create disruption, it is likely that these are exceptions rather than the rule. However the ability of the Port to present specific examples of denied passage due to overweight could go a long way to ensuring that drivers and companies keep their trucks within the legal limits.

Fourth the Port of Hood River could chose to include a license plate reader in the weigh in motion system.^{xxviii} Trends could be developed and frequent violators could be contacted at the executive or ownership level. The message at that level is that the bridge is load limited at 80,000 pounds and safety factors are only slightly above acceptable numbers at these weights.

Recommendation:

Provide weigh in motion systems that would weigh trucks. Tie in with a license plate reader and related data analyzer^{xxix} to provide more in depth information to both the driver, the vehicle owner and the Port



b. Changes to Toll Schedule and Communications

Changes to the toll schedule must be considered with an eye on the economics of the trucking industry. The economics of the industry are complex in that not only are there different commodities being transported, but the ownership of trucking efforts reside at different levels in the business hierarchy. These differences affect the sensitivity of transportation companies to toll changes. As noted previously there are private carriers who have extensive trucking fleets, as well as for hire carriers. Private carriers focus more on the on time delivery and other objectives that support the overall business. While for the hire fleets focus specifically on the economics of trucking effort itself.

Toll Costs as Related to Operating Costs

There has been extensive work done on the per mile cost of operating a truck. The research is Nationwide and on a relative basis it applies to operations in the Washington and Oregon area. As can be seen from this analysis, tolls are a small part of operating a truck, somewhere on the order of 2¢ as opposed the \$1.67 per mile that it costs to operate a truck. In order to impact behaviors, tolls would have to rise to such an extent that they create an economic incentive that drives compliant behavior.

Behavioral Incentives

This economic incentive to modify behavior is currently lacking with the Breeze By rate. A sufficient disincentive would be needed to raise the tolls to a level at which the cost of crossing the bridge on an overload is greater than using the nearest alternative route, i.e to The Dalles on the east or to I-205 on the west. The cost of driving 45 miles to The Dalles is approximately



\$67.00. Therefore any toll less than \$67.00 for overweight trucks would not be a sufficient disincentive and still cause drivers to use the Hood River Bridge.

The bridge at Cascade Locks is currently posted at 80,000 pounds. Whatever strategies are employed for the bridge at Hood River, they should not create an undue burden at the Bridge of the Gods.

With an electronic weigh in motion system coupled to a license plate reader, tolls could be assessed through electronic or other means. It might not be necessary to stop the trucks. Repeated failures to pay would result in civil actions by the Port/county which could include five and 10 day suspensions similar to those afforded the state.

The interviews and research conducted in this study indicate that measures must be significant. They must have sufficient impact on the business proposition of the transportation companies to change behaviors. While assessing a toll increase of this magnitude could be difficult, a gradual ramping up with adequate notice could accomplish the port's desired result.

Signage

In addition to potentially raising tolls, the port must make a wider and more intensive effort to communicate the weight limitations of the bridge. Currently there are signs at the toll booth on the south side and at the bridge abutment on the north side. In the opinion of the Oregon weighmaster this creates a trap for the truck. For without adequate notice or opportunity even those truck drivers who would wish to remain compliant have little or no options that would not cause significant inconvenience.

Communications efforts fall into at least two categories. First is additional signage on all routes, both in Washington and Oregon, which lead to the bridge. They should be located in areas so as to allow drivers the opportunity to search out alternative routes. They should note that there is a WIM system active 24/7.

On I-84 signs would be at the bridges at The Dalles, Biggs Junction, Cascade Locks and at I-205. OR 35 and OR 197 also need advance signage that provides drivers with alternate routing.

Corresponding signage would be necessary on SR 14. In addition SR 142 and SR 141 should be posted as should the Wind River Highway and Forest Service Road 86.

Outreach

Continual outreach to industries which potentially drive overweight traffic across the bridge must be made. The message to these industries is that their industry will suffer if drivers have to cross the river at the alternate routes described above.

The latest load rating that was performed in 2006, is based on an 80,000 pound truck. ^{xxx}The resultant safety factors of 1.06 and 1.07 for critical truss members are based on these loads. ^{xxxi} Anecdotal information indicates that trucks may routinely be running overweight. A load rating of the bridge should be performed with the actual overweights that the bridge is experiencing as opposed to theoretical weights. This information should be incorporated in a fatigue analysis. It is likely that the safety factors would be reduced. ^{xxxii}

This analysis should be presented to responsible executives for the purposes of persuading them that exceeding the bridge weight limits is in no



one's interest. It should also be brought to trucker's attention that the 2006 load rating was accompanied by memorandum from the Oregon Department of Transportation indicating that enforcement of an 80,000 pound weight limit must be made.

As part of the communications to private industries the costs of tolling trucks if a new bridge were built should also be included.

Pointed communications based on license plate readers might be effective as well. License plate readers coupled with a weigh in motion system would allow the port to pinpoint those violators who are consistent. Consistent violators could be warned and then civil action could be undertaken against them if there was continued noncompliance.

As noted elsewhere in this report random and occasional enforcement will help reinforce the seriousness with which the Port takes this issue. All are in agreement that whatever measures the port undertakes, it is with the intent of maintaining economic activity and not significantly impeding it. Random and periodic enforcement provides that additional communication which indicates that the port requires compliance to avoid a de-rating of the bridge - which would cause even more disruption.



Recommendations:

- 1) Raise tolls for overweight trucks to a level that provides a sufficient incentive for compliant behaviors. A weigh in motion system would be part of this proposal.
- 2) Provide highway signage at locations noted above to provide trucks with adequate opportunities to engage in alternate routes. Indicate a 24/7 WIM system.
- 3) Engage in a public outreach effort to encourage weight compliance.
 - a. Include toll rates that would cover the costs of a new bridge.
 - b. Include data gained through a load rating study based on actual weights to demonstrate that safety factors are unacceptable.
 - c. Present disruption costs related to down rated bridge.
 - d. Tailor the presentation to both the private fleets as well as the for hire fleets.

c. - Enforcement Mechanisms

The opinions from the weighmasters in both Washington and Oregon are that enforcement must be a part of this effort. An additional interview was conducted with Motor Carrier Enforcement Division of the Maryland Department of Transportation.^{xxxiii} On the east and west approaches to the 4+ mile long Chesapeake Bay Bridge, weigh in motion systems are installed. The weigh in motion systems are used for pre clearance, and those trucks which are overweight are waved aside for weighing on a platform scale.



While the weigh in motion system is continually active, the platform scale must be manned and only operates for approximately 8 hours a day. The sampling of information from the 24/7 weigh in motion scales indicates that after the platform scales are closed the weights of trucks increase. The Montana Department of Transportation has similar experience with a scale at Lolo Pass.

Self-Enforcement by the PoHR

A self-enforcement strategy which focuses on a weigh in motion system with a license plate reader and adjusts tolls for vehicles which are overweight could be effective. This self-managed system would give the Port the option of turning trucks back who are beyond the legal limits. It will require adequately trained and skilled personnel to implement.

Enforcement by ODOT

The second option for the port is to actively engage the Oregon Department of Transportation to randomly set up truck weigh stations. The Port of Hood River may choose to contract with the Oregon Department of Transportation to periodically operate “jump scales” at the approaches to the HR Bridge. In addition to weighing trucks, this would also include safety checks and other activities that are related to truck operations.

ⁱ From http://www.oregon.gov/ODOT/MCT/pages/OD.aspx#Weight_Tables,_RUAF_and_More; August 2015
ⁱⁱ Oregon Department of Transportation Motor Carrier Education Manual; July 2015
ⁱⁱⁱ WSDOT Legal Load Limits, Overweight Loads and Pavement and Bridges; June 2006
^{iv} Washington State Commercial Vehicle Guide; 2014-2015; WSDOT, WSP, Wa Dept of Licensing, Wa State Utilities and Transportation Commission
^v Bridge Formula Weights, FHWA; Revised May 2015

Enforcement by Washington State Patrol

A third option is to engage the Washington State patrol to also conduct random truck weighing operations on SR 14. Similar to the above they would set up truck weigh stations and conduct safety checks and other activities related to truck operations. On the north side of the bridge immediately to the east there is a parking lot which would provide for sufficient space for this activity.

A fourth option would be to encourage the WSP to reactivate the weigh station in Home Valley. This might entail financial participation to assist in the reactivation.

Recommendation:

- 1) Engage both the Washington State Patrol and the Motor Carrier Division of ODOT to set up at random scale stations and issue citations for noncompliance. Reactivate the Home Valley WSP scale location.
- 2) Develop and install a self-enforcement system that uses weigh in motion systems and public readouts posted above the weight limit sign.

^{vi} ODOT On Line Presentation; Heavy Haul and Axle Use in Oregon; accessed August 2015
^{vii} Oregon Extended Weight Permit Application; Accessed August 2015.
^{viii} From Vehicle Weight table (RCW 46.44.041); Accessed August 2015
^{ix} Emergency Vehicle Size and Weight Regulation Guideline; International Association of Fire Chiefs; 11/22/2011
^x An Analysis of Transit Bus Axle Weights; American Public Transportation Association; November 2014



^{xi} From www.wsp.wa.gov; Proper Securement of Fruit Bins; Washington State Patrol; 2006

^{xii} Impact of Incentives on Toll Road Use by Trucks; Transportation Research Record; Journal of the Transportation Research Board No 2115; 2009

^{xiii} Toll Roads, Toll Rates and Driver Behavior; Texas A&M Research Institute; Curtis Beaty; December 2012

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