Assessment of the Vancouver Energy Socioeconomic Impacts:

Secondary Economic Impacts

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Assessment of the Socioeconomic Impacts of the Vancouver Energy Distribution Project: Secondary Impacts

Todd Schatzki and Bruce Strombom[1]

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Tesoro Savage Petroleum Terminal LLC ("Tesoro Savage", a joint venture between Tesoro Refining & Marketing Company LLC ("Tesoro") and Savage Companies ("Savage"), is proposing to develop the Vancouver Energy project ("the Project" or "Vancouver Energy") in Vancouver, Washington, which will facilitate the movement of crude oil produced in North America to West Coast refineries. The Project would be located in the Port of Vancouver.

This technical report provides an assessment of expected socioeconomic impacts of the proposed Project, and is designed to provide input to the Draft Environmental Impact Statement. The assessment will enumerate and quantify, to the extent possible, certain changes to economic activity ("economic impacts") likely to arise from the development and operation of the Project. Our analysis in this report considers the *expected secondary and ancillary impacts* from the proposed Project. Secondary impacts reflect impacts to existing or potential new economic activity from development and operation of the Project, including activities associated with the Project operations, such as the transportation of crude oil by rail to the Project.[2]

Economic impacts will be assessed over both the region nearby the Project and more broadly over the state of Washington. Within this geographic framework, we consider the potential for various effects from the Project and make best efforts to quantify those that are likely to be significant. The secondary Project impacts of greatest potential significance are likely to arise from potential changes in rail traffic as a consequence of trains delivering crude oil to the Project. Our analysis explicitly considers several potential impacts from increased rail traffic, including:

1. Dis-amenity, such as noise and aesthetic impacts, from increased rail traffic;
2. Increased road congestion at at-grade rail crossings;
3. Increased congestion on the rail system; and
4. Rail accidents.

[1] Dr. Strombom is a Managing Principal and Dr. Schatzki is a Vice President at Analysis Group. The report was conducted on behalf of Tesoro Savage Petroleum Project LLC, but the opinions expressed are exclusively those of the authors. To request further information or provide comments, Dr. Schatzki can be reached at: tschatzki@analysisgroup.com .

[2] This report does not assess impacts associated with marine vessel traffic. Due to the nature of the transport systems involved, the types of potential impacts from rail traffic evaluated in this report, such as crossing delays and system congestion, are less relevant for marine traffic.

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Each of the impacts would likely lead to adverse economic consequences discussed in more detail below.

The specific secondary/ancillary impacts evaluated in this report reflect negative impacts that tend to offset (to some degree) the positive economic impacts of the Project resulting from the immediate or "primary" impact of Project construction and operations on employment, labor income, tax revenues and profits for local businesses. We have analyzed those primary economic impacts in a separate technical report.[3] That report estimated primary economic benefits to a 10-county study region, but did not consider additional positive impacts beyond this economic region or benefits due to certain upstream and downstream transportation activities, such as increased transport of crude via rail and ship.[4] Thus, there may be additional economic benefits both within and outside the 10-county study area that are not considered or quantified in our primary impacts report.

It is also important to recognize that there could be positive secondary impacts from Project development that we have not evaluated in further detail. For example, as discussed immediately below, depending on the alternative use of Port facilities (and the increase in rail traffic that would be associated with that alternative use) and the transport of crude supplies through Vancouver in the absence of the Project, operation of the Project could, in theory, reduce rail traffic through Vancouver. If that were the case, then the Project would reduce negative secondary impacts (along with providing positive primary economic impacts).

This study is divided into six sections. In Section I, we discuss certain methodological issues related to the counterfactual or baseline conditions that would prevail if the Project were not developed. In Section II, we assess impacts associated with the dis-amenity of increased rail traffic, including an assessment of impact estimates developed by Johnson Economics. In Section III, we assess secondary impacts from increased traffic at at-grade road crossings, and in Section IV, we assess the impacts of potential increases in rail traffic on rail system congestion. Section V considers the economic impacts of rail accidents involving trains carrying crude oil, when such accidents occur. Section IV provides conclusions.

I. OVERVIEW OF METHODOLOGICAL APPROACH

Economic impacts are evaluated through comparison between a Policy Case in which the Project is developed and a Base Case in which the Project is not developed. Likely secondary impacts depend, in part, on the difference between rail traffic in the Policy Case and the Base Case. If the Project is not developed, the amount of rail traffic that would pass through Vancouver as a consequence would depend on two factors. The first factor is the different use that would be made of the Port's resources in place of

[3] Schatzki, Todd and Bruce Strombom, "Assessment of the Socioeconomic Impacts of the Vancouver Energy Distribution Project: Primary Economic Impacts," July 2014.

[4] The 10-county study area was identified based on Washington State Energy Facility Site Evaluation Council ("EFSEC") regulatory requirements, which require a socio-economic impact assessment of areas within a 1-hour commute of the proposed project. WAC 463-60-535.

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the Project. The second factor is route and mode (e.g., rail or ship) taken by crude oil that West Coast refineries would use to replace the crude oil supplies they would have received from the Project. To assess the range of potential outcomes in the Base Case, we consider each of these factors.

Our Base Case assumes that the parcel in the Port that the Project would occupy in the Policy Case remains undeveloped (a "No Action Base Case"). In this case, there would be no incremental rail traffic to the Port as compared to current traffic levels. Comparison between this Base Case and the Policy Case provides a measure of the Project's "stand alone" impact. Our assessment of this No Action Base Case is provided in Section II through IV.

A. Rail Traffic from Alternative Use of Port

The magnitude of the secondary impacts we assess is conservative (*i.e.,* the negative impacts are larger) compared to a base case in which another industrial activity is developed in the Port on the parcels where the Project would be located.[5] These alternative Port uses could lead to rail traffic levels that, while higher than the No Action Base Case, are less than, equal to or greater than the anticipated rail traffic from the Project. A comparison between such an "Alternative Port Use Base Case" and the Policy Case would provide a measure of the Project's impact relative to other potential uses.

Estimated impacts of the Project relative to an alternative Port use would depend critically on the particular type of business and the details of its operations that would be developed in place of the Project. Based on communications with the Port, there is no preferred or likely secondary use of Port resources if the Project is not developed. However, the Port's decision to pursue the development of a crude-by-rail Project through a competitive solicitation was made after analysis by the Port indicated that this use was highly compatible with available parcels and would provide the greatest revenue stream to the Port.[6] This suggests the proposed Project is the highest and best use from a purely economic standpoint at the present time.

B. Rail Traffic from Replacement Crude

In addition to traffic from an alternative Port use, rail traffic through Vancouver under both base cases would be affected by the route and mode taken by crude that West Coast refineries would use in the absence of the Project ("VE Replacement Supplies"). The purpose of the Project is to facilitate the transportation of crude supplies, largely, if not only, from inland sources (North American mid-continent crude) to West Coast refineries, including those in California and Washington.[7] Crude would arrive at the

[5] Such an "Alternative Use Base Case" could correspond to either the "No Action Alternative 1" or "No Action Alternative 2" in the Draft Environmental Impact Statement ("DEIS"). The "No Action Alternative 1" assumes other facilities would be developed to handle the crude supplies that would have been handled by the Project, while "No Action Alternative 2" assumes no such facilities are developed.

[6] Personal communication with Port of Vancouver personnel.

[7] At present, crude supplies produced in the U.S. cannot be exported to other countries.

Project via unit trains with 100 or more cars and be transferred to marine tankers at the Project. We assume a volume of traffic equivalent to four trains daily (on average), based on limits included in the permit application. Other than transferring crude from rail to tanker and possible blending of crude slates, crude would undergo no processing at the Project. The Project would thus enable delivery of lower cost mid-continent crude supplies to these existing west coast refineries and displace higher cost supplies. A portion of these cost savings can be expected to be passed on to consumers, due to the competitive dynamics of the fuel markets. However, the Project would not alter these refineries' use of or demand for crude supplies, because there are many potential alternative means of transporting crude, particularly pipeline and rail transport of domestic supplies directly to the refineries and marine transport of imported and domestic supplies. Consequently, if the Project were not constructed, it is expected that the existing refineries would continue operations using other means of crude transport to the refinery.

Because demand for crude by West Coast refineries is unlikely to be affected by development of the Project, it is important to consider alternative means by which crude oil would be delivered to these refineries absent development of the Project. Market conditions for the foreseeable future could support several alternative routes or modes for crude deliveries to West Coast refineries. The range of potential outcomes is bounded by two alternatives. On the one hand, absent the Project, crude supplies that would have been delivered via the Project could be transported directly to the refineries by rail through Vancouver. Such supplies could include shipments to Washington refineries or even to California refineries to the extent they relied on the southern end of the Pacific Northwest Rail Corridor (which runs through Eugene, Oregon) and routes further south into California. In this case, an additional four trains of crude supplies would pass through Vancouver per day (the same number as would be the case if the Project were developed). On the other hand, absent the Project, crude supplies to West Coast refineries could be delivered via marine vessels (particularly for imports) or via rail lines by-passing Washington. In this case, no additional trains of crude supplies would pass through Vancouver.

C. Total Incremental Effect on Rail Traffic

Taking into account these two factors – traffic from an alternative Port use and traffic from VE Replacement Supplies, the Project could increase, decrease or have no effect on rail traffic through Vancouver. Traffic may increase with the Project in place under a number of scenarios, particularly if there is no alternative Port use or if little of the crude supply needed to replace Vancouver Energy deliveries would pass through Vancouver. If the combined traffic from an alternative Port use and VE Replacement Supplies is four trains a day, then the Project would lead to no net change in rail traffic, because four trains a day would pass through Vancouver under both the Policy Case and the respective base case. If this combined traffic (alternative Port use and VE Replacement Supplies) was greater than four trains per day, then rail traffic would actually be lower with the Project as compared to traffic under this alternative base case. If the alternative Port use led to rail traffic through Vancouver in excess of four trains per day, the Project would reduce rail traffic compared to this alternative use base case regardless of the route and mode of VE Replacement Supplies.

In our analysis, we generally consider the impacts of four trains per day (on average), which is the maximum level of incremental traffic as a consequence of Vancouver Energy. Along with the level of

rail traffic, impacts could also be affected by the type of commodity transported. In particular, the rail accident risks associated with crude rail transport would differ from impacts associated with other commodities. An assessment of risk associated with transport of crude or other commodities is beyond the scope of this study. The range of economic impacts that may be associated with a spill, based on publically available information from PHMSA is discussed in Section V, below.

II. DIS-AMENITY IMPACT ON LOCAL DEVELOPMENT AND ECONOMIC ACTIVITY FROM INCREASED RAIL TRAFFIC

Increased rail traffic potentially has an adverse impact on local development and economic activity in any area near rail lines because of the dis-amenity of rail traffic (e.g., noise, vibration, odor and visual impact). All things being equal, residents or businesses may prefer to locate at a distance from rail lines to avoid these dis-amenities and other impacts from rail traffic, such as delays at road crossings, which can impose delay costs. On the other hand, proximity to rail can provide benefits, particularly when it provides better access to passenger rail systems for households or certain commercial businesses (e.g., office space) or improved access to freight transportation for industries and certain commercial businesses (e.g., warehousing).

In this section we address several aspects of such potential impacts. First, we assess potential impacts using a benefits-transfer approach that relies on hedonic (statistical) analyses of the impacts of rail traffic on property values that have been previously performed in other locales.[8] Specifically, we use hedonic studies of the impact of increases in rail traffic in non-Vancouver locales to estimate the expected impact of potential increases in rail traffic on the residential property values in Vancouver.[9] Second, we assess estimates of the potential impacts of the Project on real estate activity in Vancouver developed by Johnson Economics.[10]

A. Hedonic Analysis of Property Value Impacts

One approach to evaluating the economic impact of a particular land use is to analyze how proximity to the land use of interest affects real estate values. From an economic standpoint, the market value of a residential property reflects the attributes of the property (the parcel size, the size of the house, the quality of construction, the number of bedrooms, etc.), its location, attributes of the neighborhood and its proximity to other land uses (e.g., parks, schools, major roads, rail lines). The value of properties for commercial and industrial use would reflect a different set of attributes relevant to those types of uses. Economists have used a statistical approach called hedonic analysis to estimate how each of these

[8] U.S. Environmental Protection Agency, "Guidelines for Preparing Economic Analysis," updated, National Center for Environmental Economics, Office of Policy, May 2014.

[9] For this report, we have not evaluated market prices within the Vancouver and surrounding area real estate markets.

[10] The studies were submitted as exhibits to comments submitted by Columbia Waterfront LLC to the EFSEC.

attributes affect property values.[11] Hedonic analysis uses information about the actual prices paid for properties and the actual property attributes to determine how variations in property values are explained by differences in property and location attributes.

Research using hedonic analysis has evaluated how proximity to rail lines affects property values. In these studies, the measured impact reflects the impact of proximity to a rail corridor compared to properties that are distant from a rail corridor. However, in the current case, the rail corridor already exists and will be unaffected by the Project; therefore, these studies do not provide an appropriate benchmark for evaluating the impacts of the Project.[12]

Instead, the Project may affect the number of trains that travel along the existing rail line. We performed a literature search of studies evaluating the impact of rail proximity on property values and identified two studies that provide statistical estimates of the impact of incremental rail traffic on property values. Our search excludes studies based on subjective assessment without empirical support.[13] One study is by Futch (2011) and the other is by Simons and El Jaouhari (2004).[14] Each study estimates the impacts of changes in rail traffic on single-family residences, with one study examining impacts in Los Angeles (Futch) and the other in Cleveland (Simons and El Jaouhari). Using the parameter estimates provided in these studies, we have estimated the expected impact of additional rail traffic on property values in Vancouver assuming that operation of the Project increases rail traffic past residences by four trains per day. Given assumed routing of inbound and outbound traffic to the Project (described further below in Section IV), these are the largest estimated impacts on property values from increased traffic volume given that the increase in rail traffic from the Project would be at most four trains per day.[15] [16] Our estimates are reported in Tables 1 and 2.

[11] Freeman, A. Myrick III. *The Measurement of Environmental and Resource Values, Theory and Methods*," Resources for the Future: Washington, D.C.

[12] Research using hedonic analysis has also evaluated how proximity to large facilities affects residential property values. We do not use such research to evaluate the impacts of the Project itself to properties values in Vancouver because the distance between the Project and the closest residential properties is relatively great (approximately 0.6 miles) and the Project will be sited within a large pre-exiting property dedicated exclusively to industrial uses (the Port of Vancouver).

[13] *For example*, Eastman Group, "Increased Coal Train Traffic and Real Estate Values: A study of the potential impact of increased coal train traffic on property values resulting from the proposed Gateway Pacific Project at Cherry Point, WA," October 30, 2012.

[14] Futch, Michael, "Examining the Spatial Distribution of Externalities: Freight Rail Track and Home Values in Los Angeles," November 11, 2011; Simons, Robert A. and Abdellaziz El Jaouhari, "The Effect of Freight Railroad Tracks and Train Activity on Residential Property Values," *The Appraisal Journal* Summer 2004, pp. 223-233.

[15] These estimated effects reflect the specific types of freight that were transported along the rail lines studied, which likely reflects a diversity of cargo. To the extent that impacts for particular types of cargo would impose greater or lesser impacts, these results would not reflect such differences. We identify no previous empirical research that attempted to evaluate the effects on property values of changes in the volume of crude oil traffic specifically.

Based on parameter estimates from Futch, an increase in rail traffic of four trains per day could reduce values of single-family residential properties near the rail line by an estimated 0.37 percent to 1.49 percent. Table 1 provides impact estimates for varying distances from the rail corridor. Results are provided under several modeling assumptions ("specifications") used by Futch to illustrate the range (and average) of potential effects. Across these three specifications, impacts decrease as the distance from the rail corridor increases. Within one-third of a mile of the rail corridor, property values decrease by an estimated 0.85 percent to 1.49 percent. Beyond one-third of a mile, estimated negative impacts are at most 0.37 percent.

Table 1: Estimates of Percent Change in Single-Family Residential Property Values from Assumed Incremental Project Traffic (4 Trains per Day) Based on Futch (2011)

	Baseline	With Additional Explanatory Variables	Pre-"Market Crash" Sales Only	Average
0 - 1/3 mi. from Corridor	-0.85%	-0.93%	-1.49%	-1.09%
1/3 - 2/3 mi. from Corridor	-0.69%	-0.59%	-0.62%	-0.63%
2/3 - 1 mi. from Corridor	-0.37%	-0.34%	-0.67%	-0.46%

Note: Estimates reflect per ton-mile impacts as estimated by Futch, which are translated into per rail car impacts based on average rail car weight. Project impacts reflect assumed incremental traffic, given these per rail car impacts. Results are reported for three specifications: a baseline specification, a specification with additional explanatory variables (e.g., geographic zones, seasons and house characteristics), and a specification excluding transactions after the 2006-2007 "market crash" in housing prices. Average values reflect the unweighted average of the three model estimates. Reported estimates reflect (1) the specification that allows for asymmetric marginal effects for increases and decreases in rail traffic and (2) the sample that includes the construction period. Futch (2011).

Impacts based on estimates from Simons and El Jaouhari, shown in Table 2, appear smaller than those developed using estimates from Futch. While the magnitude of the impacts in Table 2 issimilar to those in Table 1, the distances from the rail line are significantly shorter. Futch's shortest distance to the rail line is one-third of a mile or 1,760 feet, which is 2.4 times greater than 750 feet, the furthest distance considered by Simons and El Jaouhari.[17]

[16] To the extent that actual routing differs from these assumptions such that incremental rail traffic exceeds four trains per day (e.g., if inbound and outbound trains took the southern route between Pasco and Vancouver), impacts would be proportionately greater than values reported in Tables 1 and 2.

[17] The magnitude of these estimated impacts differs from levels reported in some other recent studies which are more subjective in nature. For example, the Eastman Group has stated that impacts from the Gateway Pacific Project, with increased traffic of 18 trains daily in some areas, would range from 5 to 20 percent for single-family residences, 5 to 15 percent for multi-family residences, and 5 to 10 percent for commercial properties. On a per-train basis, these impacts are significantly higher than those derived from actual market transactions in the studies we evaluate.

Public information about rail line activity also potentially affects property value impacts. Greater information or publicity regarding rail impacts may lead people to place a greater emphasis or value on proximity to the rail corridor. The research by Simons and El Jaouhari, which evaluates impacts before and after a highly publicized rail merger that was anticipated to increase rail traffic, supports this conclusion. The impact estimates in Table 2 are based on transactions during a period after significant publicity about potential rail line impacts. However, estimates based on transactions from an earlier period show much less sensitivity of property values to both the proximity to a rail corridor and the amount of train traffic. In fact, in this period, Simons and El Jaouhari find that proximity to a rail line and frequency of rail traffic often has no statistically significant impact on property values.[18]

Table 2: Estimates of Percent Change in Single-Family Residential Property Values from Assumed Incremental Project Traffic (4 Trains per Day) Based on Simons and El Jaouhari (2004)

	Property Size		
Distance from Rail Line	**Small**	**Medium**	**Large**
Estimated Impact Per Freight Trip ($ per Trip)			
Less than 250 feet	-194	-262	-264
250 to 500 feet	-85	-107	-4
500 to 750 feet	-94	-72	-1
Percent Change in Property Value per Train/Day			
Less than 250 feet	-0.21%	-0.27%	-0.19%
250 to 500 feet	-0.09%	-0.11%	0.00%
500 to 750 feet	-0.10%	-0.07%	0.00%
Mean Sale price	91,007	97,851	138,510
Percent Change in Property Values from Terminal (4 Trains/Day)			
Less than 250 feet	-0.85%	-1.07%	-0.76%
250 to 500 feet	-0.37%	-0.44%	-0.01%
500 to 750 feet	-0.41%	-0.29%	0.00%

Based on existing empirical research analyzing the impact of changes in the volume of rail traffic on property values, we find that the additional rail traffic from the development of the Project, to the extent any exists, would be expected to reduce residential property values near the existing rail lines by 0 percent to 1.5 percent, with impacts diminishing as distance from the rail line increases. While there are differences between the circumstances of the Project on Vancouver and Washington State and the circumstances considered in these studies, the best available research indicates that the Project is unlikely to have significant impacts, if any, on property values due to increased volume of rail traffic.

[18] For example, the variable for the number of freight trips is not statistically significant in 8 of 9 regressions at the 5 percent confidence level (reflecting pairs of distance to track and property size). Similarly, 7 of 9 estimates of the impact of the presence of a rail corridor were not statistically significant.

B. Economic Impacts to the Waterfront Project and Downtown Vancouver

In this section, we consider the potential for the Project to have adverse impacts on economic activity in the city of Vancouver, including impact to a new development – the Waterfront project. The Waterfront project is a proposed multi-use project that has been approved for development along the Vancouver waterfront and adjacent to a portion of the rail corridor that potentially would experience increased traffic as a consequence of the Project.[19] We do not perform an independent assessment of these potential impacts. Instead, we assess two studies that attempt to evaluate potential impacts from the Project on local economic activity. These reports, prepared by Johnson Economics, were included as Exhibits D and E to EFSEC comments submitted by Columbia Waterfront LLC.[20] One report (in Appendix D) provides an IMPLAN assessment of the impact of the Waterfront project on the local economy. This report also posits that the development of the Project would have an adverse impact on the potential positive economic impacts from the Waterfront project, and develops an estimate of this impact.[21] We refer to this as the "Waterfront Report". The other report (in Appendix E) assesses the Project's potential impact on development and redevelopment in downtown Vancouver.[22] We refer to this as the "Downtown Report".

Our assessment of the Johnson Economics' reports proceeds as follows. First, we summarize Johnson Economics' estimates of these adverse impacts. Second, we compare these estimates to our estimates of the positive impacts of the Project on the region. Finally, we assess the reasonableness of the assumption made by Johnson Economics about the estimated impact of (or from) the Project.

a. Summary of Johnson Economics Results

Johnson Economics develops two reports that evaluate potential impacts of the Project on Vancouver. These reports develop impact estimates using different methodologies and measure impacts in terms of different economic metrics. The Waterfront Report assumes levels of investment and on-going economic activity from the Waterfront project, calculates the regional economic impacts through the IMPLAN model and then considers impacts from the Project. The Downtown Report assumes future levels of development and redevelopment in downtown Vancouver, and considers changes in this level of development and redevelopment activity from the Project. However, Johnson Economics does not translate these changes in development and redevelopment activity into regional economic impacts

[19] http://www.thewaterfrontvancouverusa.com/ .

[20] Columbia Waterfront LLC, SEPA Scoping Comments, Tesoro-Savage Energy Distribution Terminal, Docket EF-131590, December 18, 2013.

[21] Johnson Economics, "Estimated Economic and Fiscal Impacts of the Tesoro Savage Project on the Waterfront Vancouver Development and Downtown Vancouver," December 9, 2013.

[22] Johnson Economics, "Predicted Impacts of the Tesoro Savage Project on Development and Redevelopment in Downtown Vancouver, Washington," December 18, 2013.

through a model, such as IMPLAN. In both cases, the estimated adverse impacts of the Project reflect downward adjustments to certain modeling assumptions made by Johnson Economics.

Tables 3 and 4 replicate tables from the Johnson Economics' Waterfront Report. The tables provide Johnson Economics' estimates of the economic impact of construction and on-going operation of the Waterfront project. Impacts to employment, labor income and total value added are developed using the IMPLAN model. Table 3 reflects impacts over the entire construction period, which appears to be 6 years, while impacts in Table 4 reflect annual impacts.[23]

Table 3
Summary of Johnson Economics IMPLAN Results
Construction at Waterfront Project

Impact Type	Employment (job-years)	Labor Income ($ millions)	Total Value Added ($ millions)
Direct Effect	4,580.5	$ 245	$ 318
Indirect Effect	1,244.5	52	82
Induced Effect	1,356.6	56	105
Total Effect	**7,181.6**	**$ 353**	**$ 505**

Table 4

Summary of Johnson Economics IMPLAN Results
Annual Operations at Waterfront Project

Impact Type	Employment (job-years)	Labor Income ($ millions)	Total Value Added ($ millions)
Direct Effect	1,364.4	$ 65	$ 60
Indirect Effect	332.2	11	19
Induced Effect	347.2	14	27
Total Effect	**2,043.8**	**$ 91**	**$ 105**

Note on IMPLAN economic measures:[24]

> Job-years: Johnson Economics reports employment impacts in job-years. A job-year equals the equivalent of a full-time job held for one year. It can reflect full-time or an equivalent number of part-time jobs. For example, two half-time jobs

[23] The figure on page 10 of their report shows construction occurring over a 6 year period.

[24] For further description of IMPLAN and the economic measures produced by IMPLAN, *see* Schatzki, Todd and Bruce Strombom, "Assessment of Vancouver Energy Socioeconomic Impacts: Primary Impacts," July 28, 2014.

(held for one year) would be equivalent to one job-year. Job-years can be used to measure employment impacts occurring over multiple years. For example, one full-time job held for two years would be equivalent to two job-years.

Total Value Added: Total value added includes income to labor, tax revenues to government, and net income (profits) to privately held businesses.

The Johnson Economics Waterfront Report aims to estimate the extent to which the development of the Project would reduce the positive economic impacts that would otherwise be created by the Waterfront project. To estimate the adverse impact from the Project, Johnson Economics assumes that the Project would reduce the size of the Waterfront project by 30 percent. They write:

> "To evaluate the construction impacts of each scenario, we modeled the estimated impacts of the current master plan, and reconciled those impacts with a second scenario that *assumed a 30% reduction in development yield on the site*."[25] (Emphasis added.)

No explanation, justification or rationale is provided for the assumption that the Project would reduce the "development yield" of the Waterfront project by 30 percent – the statement above is the extent of the discussion or explanation for this crucial assumption. In fact, the linkage between the way in which the Project potentially impacts the Waterfront development (e.g., change in property value) and how such an impact translates into changes in economic activity (e.g., employment) is potentially complex. As discussed above, the linkage between dis-amenities and property values is well-established and well-studied. However, the subsequent linkage to development and redevelopment decisions and other factors that would affect regional economic activity are less well-studied. While the Johnson Economics report notes potential impacts on achievable pricing, pace of absorption, reduced investment "attractiveness" and resulting yields needed for investment, it does not draw any connection between such impacts and their modeling assumptions.[26]

To analyze the Project impacts, Johnson Economics simply reduces the full Waterfront Development impacts shown in Tables 3 and 4 by 30 percent. For example, to estimate the adverse impact of the Project on total construction employment from the Waterfront project, the total Employment Effect of 7,181.6 job-years is multiplied by 30 percent, leading to an estimated negative

[25] Johnson Economics, December 9, 2013, p. 2. Johnson Economics also notes that their approach is to "… model an alternative development program reflecting what is viable under an impacted scenario assuming the Tesoro Savage Facility." Johnson Economics, December 9, 2013, p. 8.

[26] "These negative impacts would be expected to have a significantly negative impact on both achievable pricing for residential and commercial tenants, reduce the pace of absorption and reduce the attractiveness of the location from an investment standpoint, increasing yields necessary to induce investment (reflected in higher capitalization rates)." Johnson Economics, December 9, 2013, p. 6.

impact of 2,154.5 job-years.[27] The complete set of negative impacts calculated by Johnson Economics is reproduced in Tables 5 and 6 below.

Table 5
Summary of Johnson Economics IMPLAN Results
Negative Impact of Vancouver Energy on Waterfront Project Construction Impacts

Impact Type	Employment (job-years)	Labor Income ($ millions)	Total Value Added ($ millions)
Direct Effect	(1,374)	$ (73)	$ (95)
Indirect Effect	(373)	(16)	(25)
Induced Effect	(407)	(17)	(31)
Total Effect	**(2,154)**	**$ (106)**	**$ (152)**

Table 6
Summary of Johnson Economics IMPLAN Results
Negative Impact of Vancouver Energy on Waterfront Project Annual Operations Impacts

Impact Type	Employment (job-years)	Labor Income ($ millions)	Total Value Added ($ millions)
Direct Effect	(409)	$ (19)	$ (18)
Indirect Effect	(100)	(3)	(6)
Induced Effect	(104)	(4)	(8)
Total Effect	**(613)**	**$ (27)**	**$ (32)**

Johnson Economics also fails to provide any tangible connection between the rationale for the claimed impacts (a reduction in "development yield" of 30 percent) and the approach used to estimate impacts (i.e., simply reducing Waterfront economic impacts by 30 percent).[28] In fact, a 30 percent reduction in development yield could have an impact on economic development that differs from (greater than or less than) 30 percent. Such impacts would depend on many factors, such as whether different types of properties (e.g., residential, commercial) would be equally affected, the extent to which common infrastructure (e.g., parking garages) is affected and the extent of fixed costs. For example, if 30 percent reduction in development yield did not reduce the need for certain fixed infrastructure costs, then aggregate spending may not decline by 30 percent. Thus, the impact of a 30 percent reduction in

[27] Note that the adverse impact of the Project reflects a difference between the impacts of the Waterfront project without the Project in place (the values in Tables 3 and 4) and the impacts of the Waterfront project with the Project in place (reflecting impacts equal to 70 percent of the values in Tables 3 and 4).

[28] We assume that, as used by Johnson Economics, "development yield" is the quantity of property developed, reflected in either size (e.g., square foot) or dollar terms. Development yield is also a measure of net cash flow from a real estate project commonly used in the field of real estate.

development yield may not result in 30 percent reduction in *regional economic impacts* from the Project, as the Waterfront Report simply assumes.

b. Assessment of Johnson Economics Estimates of the Impacts of the Project

To assess the results of the Johnson Economics study, we perform several analyses. First, we compare the adverse impacts on the Waterfront project, as estimated by Johnson Economics, against estimates of the positive or "primary" economic impacts from the Project that we have developed in a separate report.[29] Second, we assess the reasonableness of the impact of the Project on the Waterfront project assumed by Johnson Economics. We discuss Johnson Economics' estimated impacts to downtown Vancouver, although we do not make explicit comparisons between our estimates of primary economic impacts and Johnson Economics' estimates of changes in investment because these impact measures are not directly comparable.[30]

In order to appropriately compare the economic impacts of the Project and any assumed adverse impact to the Waterfront project, it is necessary to compare the timeline of construction and operations for both projects. Figure 1 below provides a summary of the timeline assumed in our analysis of the Project and the timeline of the Waterfront project assumed by Johnson Economics in its analysis.

Johnson Economics assumes that the Waterfront project is developed over a six year period, and that operations, reflecting occupancy of retail business, commercial office space and residences, increase for five years gradually during the construction period until the Waterfront project reaches full capacity after construction is complete.[31] Then, Johnson Economics considers impacts for an additional fourteen years. While, given the nature of the Waterfront project, its life could extend beyond this time period, it is reasonable to assume that any adverse impacts from the Project would not extend beyond the Project's life. In total, Johnson Economics considers six years of construction and 19 years of operation, which overlap to form a 20 year modeling period for the Waterfront project.[32]

[29] Schatzki and Strombom, July 28, 2014.

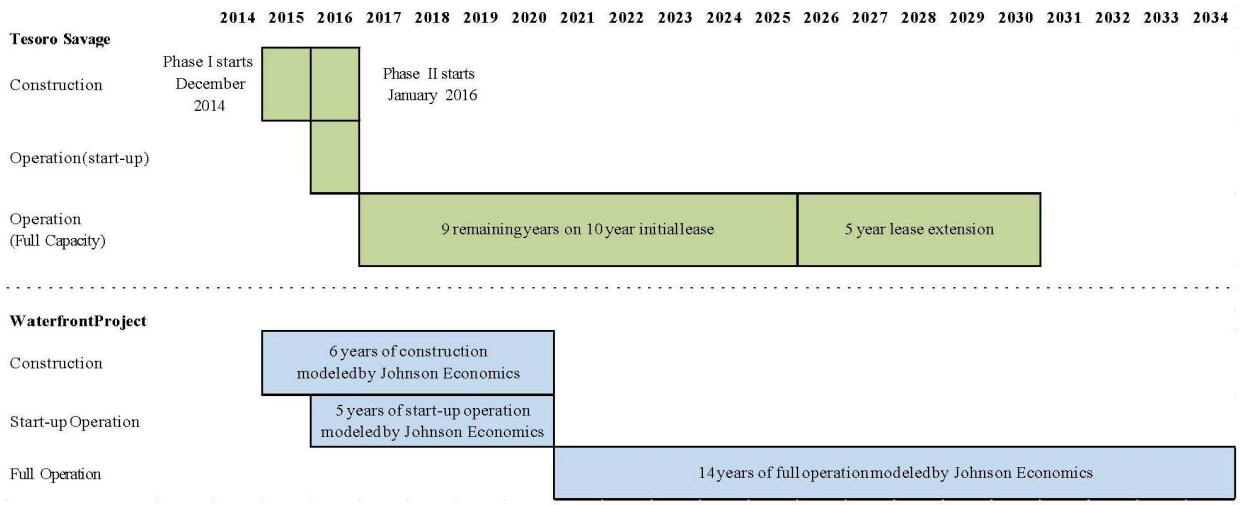
[30] The comparisons we develop between our estimated impacts of Vancouver Energy and impacts reported by Johnson Economics do not represent an endorsement of Johnson Economics' values. We did not conduct an independent assessment of the economic impact of the Waterfront project, nor have we assessed the reasonableness of the underlying analysis performed by Johnson Economics (although we assess the reasonableness of the magnitude of estimated impacts). To fully assess potential impacts of Vancouver Energy to the Waterfront project specifically or downtown Vancouver more generally, it would be necessary to complete such an assessment to capture existing or baseline conditions. However, such an analysis is beyond the scope of this report.

[31] Johnson Economics, December 9, 2013, figures on p. 10.

[32] Johnson Economics does not report any cumulative impacts. However, figures on page 10 of their report show impacts occurring over the sixteen year period we consider. Note that this comparison results in an additional three years of impacts beyond that assumed for the Project.

Figure 1

Timeline of Construction and Annual Operations of the Project and Waterfront Project



To compare positive and adverse impacts from the Project, we assume that construction of the Waterfront project would begin in parallel with construction of Vancouver Energy, and that Vancouver Energy would operate for fifteen years, under the ten year initial lease and a five year extension. We have thus modeled two years of construction and 15 years of operation, which overlap to form a 16 year modeling period.

Using this timeline, we compare the employment, labor income, and economic value added impacts over the modeling period 2015 through 2034 using the Johnson Economics assumption that the Project would reduce the economic impacts of the Waterfront project by 30 percent. Because impacts vary from year to year and between projects, labor income and value added impacts are compared in present value terms (in 2014 dollars, assuming a 7 percent discount rate).[33]

Along with present value comparisons, we also compare cumulative employment, labor income and value added impacts in Figures 2, 3 and 4, respectively. Each of these figures shows the cumulative positive impacts of the Project in the green bars, and the cumulative adverse impact to the Waterfront project (from the Project), as estimated by Johnson Economics, in the blue bars. The black dotted line represents the Project's net impact – that is, the "primary" benefits of the Project net of any adverse impact to the Waterfront project assumed by Johnson Economics.

[33] A 7 percent discount rate is consistent with guidance provided by the Office of Management and Budget (OMB) to regulatory agencies when performing regulatory analysis. Because employment is not a monetary measure, these values are not discounted. OMB, Circular No. A-94 Revised, October 29, 1992.

For all three economic metrics considered – employment, labor income and value added – the Project creates net benefits, even after accounting for adverse Project impacts at the levels assumed by Johnson Economics. Table 7 reports these cumulative impacts. For total employment, the Tesoro Savage Project is estimated to create 17,082 job-years over a 16 year construction and operating period (an average of 1,068 full-time jobs per year). By comparison, the reduced employment from Johnson Economics' assumed 30 percent reduction over a 20 year impact period is 12,271 job-years. Consequently, the Project creates, on net, 4,811 job-years even under the Johnson Economics' assumptions. Net impacts to labor income and total value added are similar – the net increase in labor income is $532 million, while the net increase in total value added is $713 million (both in present value terms).

Figure 2

Comparison of Cumulative Employment
Vancouver Energy and Johnson Economics Assumed Reductions to Waterfront Development

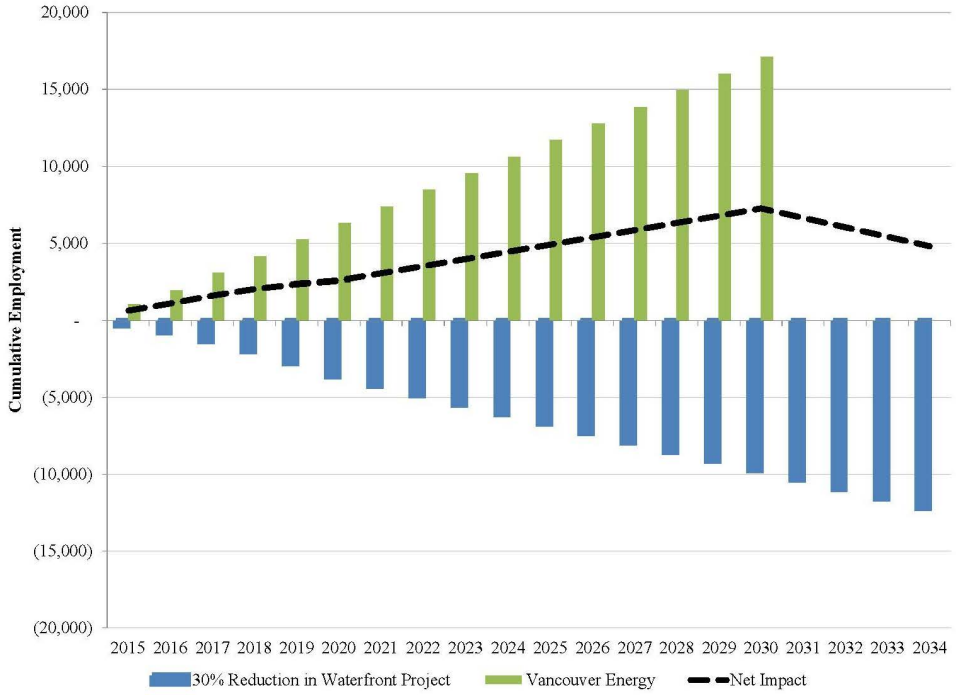


Figure 3
Comparison of Cumulative Labor Income (Present Value, $2014)
Vancouver Energy and Johnson Economics Assumed Reductions to Waterfront Development

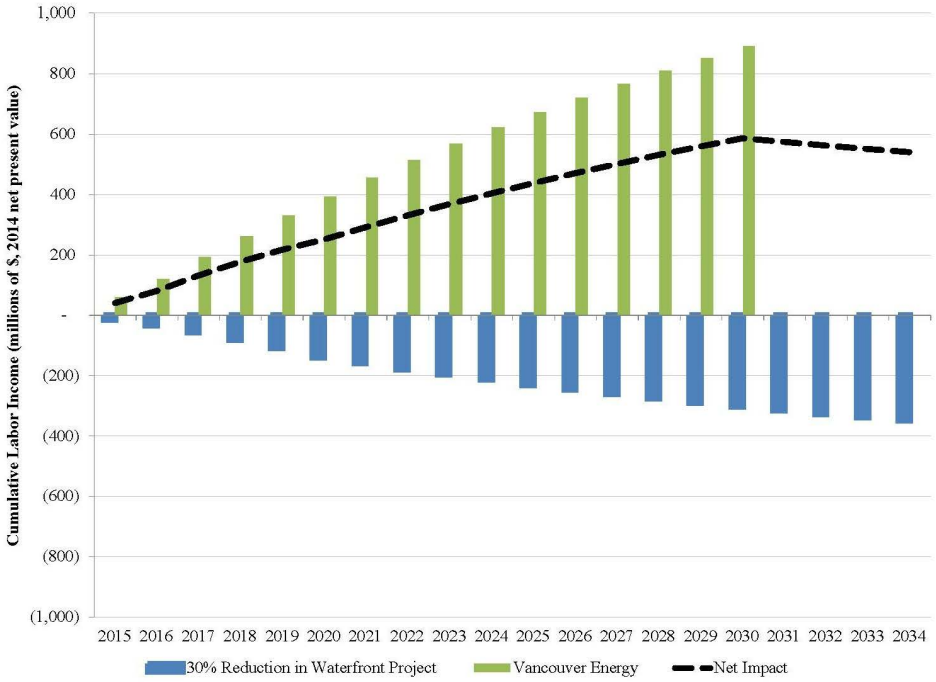
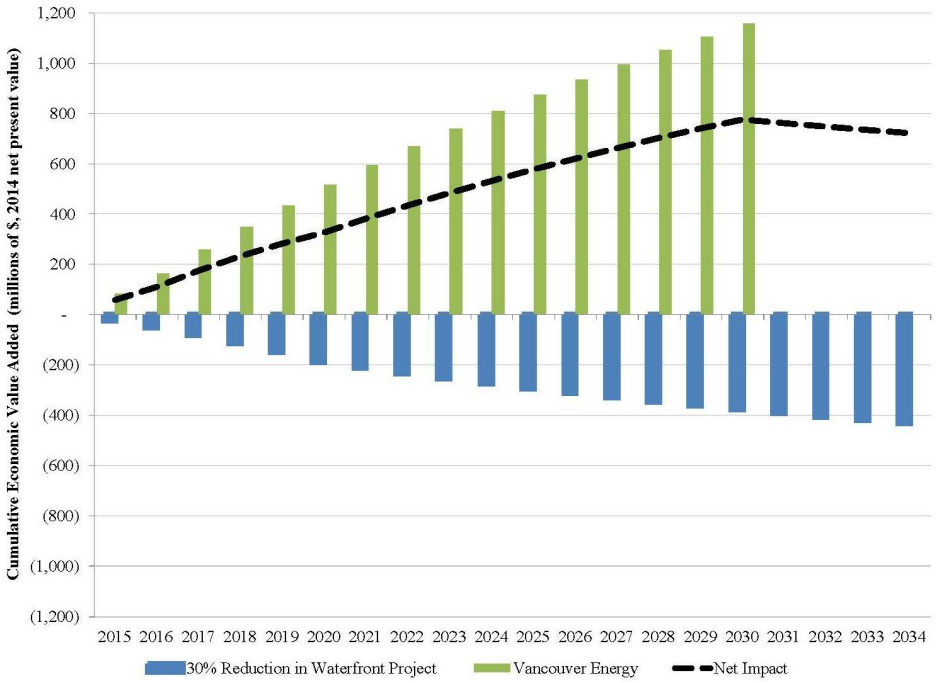


Figure 4
Comparison of Cumulative Economic Value Added (Present Value, $2014)
Vancouver Energy and Johnson Economics Assumed Reductions to Waterfront Development



In its analysis of downtown Vancouver, Johnson Economics estimates changes in development and redevelopment investment, but not the subsequent economic impacts in terms of increased jobs, income and taxes. Consequently, we cannot perform the same type of comparisons as provided above between the Vancouver Energy and Waterfront project. However, comparison of the Waterfront and downtown Vancouver investment amounts suggests that, given Johnson Economics' estimates, impacts to downtown Vancouver would be less than impacts to the Waterfront. On the one hand, a 30 percent reduction in Waterfront investment would correspond to $246 million (although it is important to recognize that a 30 percent reduction in development yield need not result in a 30 percent reduction in investment).[34] On the other hand, Johnson Economics estimates the change in downtown Vancouver development and redevelopment investment from the Project to be $98 million. Given that the estimated change in development and redevelopment investment in downtown Vancouver is much lower than the comparable change in Waterfront investment, it is reasonable to assume that the associated economic impacts would be lower.[35]

The analysis provided in Table 7 is performed assuming that the development of the Project would adversely affect the economic impacts of the Waterfront project by 30 percent, and that such an effect would extend for three years after Project closure.[36] As discussed earlier, Johnson Economics provided no rationale or support for this assumption.

Similarly, Johnson Economics' assessment of the impacts to downtown Vancouver is grounded in assumptions that are provided without support. Specifically, Johnson Economics assumes a 15 percent reduction in achievable rent levels and a 10 percent reduction in capitalization rates to reach the conclusion that development and redevelopment investment declines by 28 percent and real market value declines by 36 percent.[37] However, Johnson Economics provides no basis for its assumptions about changes in rent levels or capitalization rates, and its report provides insufficient detail to assess other aspects of its model.

In light of the large size of its assumed impacts and the lack of rationale or support, we have assessed the reasonableness of the assumptions that underlie Johnson Economics' analyses. Based on a number of considerations, we find that the assumptions upon which the Johnson Economics study is

[34] Johnson Economics reports total Waterfront construction costs of $818.884 million – 30 percent of this total amount is approximately $246. Johnson Economics, December 9, 2013, p. 8.

[35] Assuming a $246 million reduction in Waterfront development investment, the change in downtown Vancouver development and redevelopment would be 40 percent of the change in Waterfront development investment.

[36] This is likely a conservative assumption. Once operation of the Project ceases, the Waterfront project would effectively be in the same position it would have been in had the Project never been developed. We are aware of no reason that the Waterfront project could not be further developed after closure of the Project.

[37] Investment declines by $98.3 million from $351.0 million to $252.7 million. Real Estate Market Value (RMV) falls by $138.1 million, from $318.5 million to $243.4 million. Johnson Economics, December 18, 2013, p. 10.

based grossly overstate any adverse impact the Project would likely have on the Waterfront project and downtown Vancouver. Our conclusion is based on several factors.

Table 7

Comparison of Construction and Annual Operations for the Project and Johnson Economics' Assumed 30 percent Reduction in Waterfront Project Development

	Total Employment (job-years)		Labor Income ($ millions,2014 NPV)		EconomicValue Added ($ millions,2014 NPV)
VancouverEnergy					
Construction	1,429	$	80	$	114
OperationsPeriod	15,653		812		1,042
Total	17,082	$	892	$	1,156
Assumed30% Reductionin WaterfrontProject					
Construction	(2,154)	$	(92)	$	(132)
OperationsPeriod	(10,117)		(268)		(312)
Total	(12,271)	$	(360)	$	(443)
Net Impact Total	**4,811**	**$**	**532**	**$**	**713**

Notes:
[1] Labor income and value added are reported in $2014 net present value, using a 7 percent discount rate. Employment is reported in nominal terms.
[2] Waterfront Project values are based on information contained in Exhibit D, grown to nominal terms using IMPLAN's GDP deflators, and discounted back as noted above.

As discussed earlier, empirical studies that have used data on real estate prices to statistically estimate the impact of incremental rail traffic on property values indicate that the likely impact of the increase, if any, in rail traffic from operation of the Project on property values would be negligible.[38] As shown in Tables 1 and 2, based on results from two published empirical studies, we estimate that an increase in rail traffic of four trains per day to serve the Project at full build-out would reduce residential property values an estimated zero to 1.5 percent for properties in close proximity to the rail lines.[39]

In the context of the many economic factors that affect real estate values, these estimated changes in property values are relatively small. To provide some context, Figure 5 provides a price index for

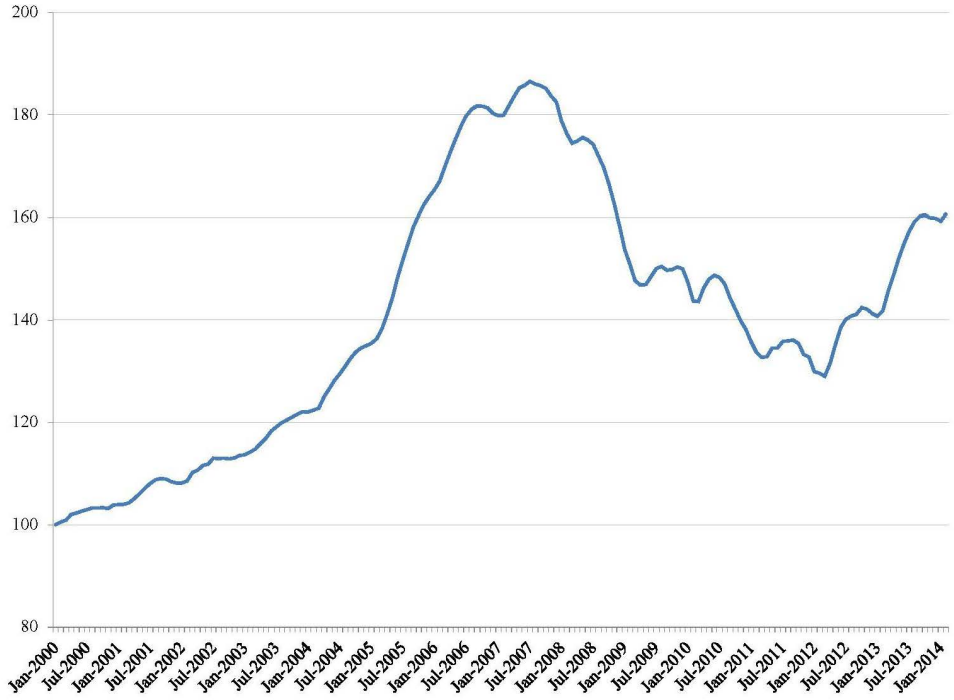
[38] As discussed earlier, the Johnson Economics study does not explain the mechanism by which an increase in rail traffic is expected to lead to a reduction in the size of the Waterfront project. Consequently we cannot comment directly on the reasonableness of that assumed process or the economic logic upon which the assumption is based. However we would expect a potential price variance on the order of one percent to be well within the normal range of forecasting uncertainty for a multi-year development project such as the Waterfront project. Given that, it seems highly implausible on its face that the increase, if any, in rail traffic from operation of the Project could necessitate a reduction in the size of the Waterfront project of 30 percent.

[39] Futch 2011; Simons and El Jaouhari 2004.

homes in the Portland, Oregon area. Since 2000, housing prices have varied dramatically, first increasing by over 80 percent through August 2007, and then declining by 30 percent (from August 2007 prices) through March 2012 before increasing in recent years. Thus, the magnitude of impacts estimated in these studies of 1.5 percent or less is relatively small in comparison to the variation experienced in recent years.

Along with these considerations regarding the magnitude of any likely impact, it is also important to consider the appropriate baseline against which certain impacts are evaluated.[40] In particular, the presence of the rail corridor and the potential for increases in rail traffic as a consequence of the West Vancouver Freight Access (WVFA) project were known and therefore assumed in development plans for the Waterfront project specifically and downtown Vancouver redevelopment generally. Further, there have been multiple efforts to mitigate the effects of rail traffic on nearby properties in the downtown Vancouver area, including construction of sub-grade crossings, adoption of a rail noise mitigation ordinance within Vancouver, and specific design requirements imposed on the Waterfront project specifically to address proximity to the rail line.[41]

Figure 5: S&P/Case-Shiller Portland, Oregon Home Price Index



Source: S&P Dow Jones Indices LLC.

[40] As discussed earlier, our analysis does not include an assessment of the reasonableness of the baseline level of economic impacts from the Waterfront project estimates by Johnson Economics.

[41] For example, *see* Downtown Waterfront Development Agreement between The City of Vancouver and Columbia Waterfront LLC, October 19, 2009.

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III. IMPACT ON ECONOMIC ACTIVITY FROM INCREASED DELAYS AT ROAD CROSSINGS

Various modes of transportation intersect at "crossings" at which one stream of traffic must wait for the other to clear before proceeding. In particular, "at grade" crossings between railways and roads require that road vehicle traffic wait for rail traffic to clear the crossing intersection before proceeding. Thus, the transportation of freight by rail can lead to delays in road traffic, which in turn can have potential economic consequences. This section considers whether the development of the Project would lead to significant economic impacts as a consequence of these delays.

As discussed above, development of the Project could lead to additional rail traffic, which would increase delays at at-grade crossings along the routes described above. Increases in these delays could lead to economic impacts to affected businesses and consumers.

In principle, vehicle traffic delays potentially have a number of economic consequences. First, such delays can inconvenience drivers by increasing travel times. When driving is for leisure or other non-business purposes, such delays may be a nuisance to drivers but do not necessarily reduce economic activity.[42] Second, delays can adversely affect business activity. Delays can impose costs on businesses, such as higher costs for labor, fuel and capital when business traffic is delayed at a crossing, or reduced customer demand if delays reduce the number of customers frequenting a business.

When impacts are not uniform across businesses, delays can lead to shifts in economic activity between businesses. For example, the added costs of delivery "across the tracks" could lead consumers to shift purchases to businesses "on the right side of the tracks." If such shifts were to occur, the impact on the regional economy would depend on the extent to which activity shifted to businesses outside the region. If business shifts outside the region, this would have adverse consequences for the region's aggregate economy. However, if business shifts within the region, this would not adversely affect the regional economy, although it may have varying distributional consequences among businesses (with some "winners" and some "losers"). Another alternative is that no shifts in economic activity occur, but that business either passes through the costs to customers or absorbs the costs in the form of lower profits.

We analyze the impact of delays at at-grade road crossings through an analysis of economic costs to business activities for crossings within Vancouver and at several different locales throughout

[42] In principle, increased driving times could cause consumers to reduce shopping and other consumption, which would lead to a drag on overall economic activity. However, such potential impact is expected to be negligible, if any, as consumers might respond by conducting fewer trips, but spending more, or by shopping at other businesses in the community that do not require crossing the tracks. We do not explicitly estimate this type of potential economic impact, because of this expected offsetting effect.

Washington State, which were identified as a representative case for the range of potential impacts that might occur across the state, including:[43]

1. Bingen – Bingen is a rural locale along the Columbia River where the rail line separates certain industrial properties from the rest of the town; and
2. Spokane – There are no major at-grade crossings within the city limits of Spokane.[44] We have identified and evaluated crossings outside the city limits along each of the two BNSF lines that pass through Spokane that are potentially affected.

Figure 6 provides a map illustrating these locations in the Vancouver region.

To provide an indicative measure of economic consequences, we estimate the costs to business activity from increased delays at rail crossings in each of these locales. The costs reflect a number of factors, including the number of incremental train crossings, anticipated down times (reflecting train length and speed), and average traffic volumes. Our analysis only considers potential impacts to economic activity, and does not reflect other potential impacts, such as increased delays for emergency vehicles.

Table 8 reports the underlying assumptions used in evaluating delay costs. Given assumed train speeds and lengths, and gate down times prior to and after crossings, the average length of a delay is roughly two minutes. This assumes a train speed of 30 miles per hour ("mph"). To the extent that train speeds were lower (higher), delays would be longer (shorter) and costs would be correspondingly larger (smaller). Table 8 also provides information on estimates of the value of lost time to individuals used in the calculation of the economic impacts of delays at rail crossings. These cost estimates are based on estimates of the value of lost time developed by the U.S. Department of Transportation and reflect full wage rates for individuals involved in business activity and a fraction of the wage rate for individuals involved in non-business activity.[45] Our estimates do not account for any incremental fuel costs (e.g., due to idling), externality values, or capital costs.[46]

Table 9 reports estimates of annual total costs and costs related to business activity for six at-grade intersections within Vancouver, while Table 10 reports the same metrics for 13 interactions outside

[43] Other studies have evaluated traffic impacts from increased rail traffic along different routes from those likely to be impacted by the Project. For example, Parametrix evaluate rail impacts at eight intersections in Seattle. Parametrix, Inc., ""Coal Train Traffic Impact Study," October 2012.

[44] Based on city limit boundaries identified in Google maps.

[45] U.S. Department of Transportation ("DOT"), "The Value of Time Savings: Departmental Guidance for Conducting Economic Evaluations," Revision 2, September 29, 2011.

[46] Delays could lead to capital costs if business operators needed to invest in additional transportation infrastructure, such as trucks, to meet a fixed level of service. Given the total incremental increase in delay projected by Project rail traffic, such capital costs are not anticipated. Moreover, significant heterogeneity in these costs makes reliable estimation challenging. Similarly, incremental fuel and externality costs associated with idling at the crossings are a small fraction of the value of lost time included in our calculation.

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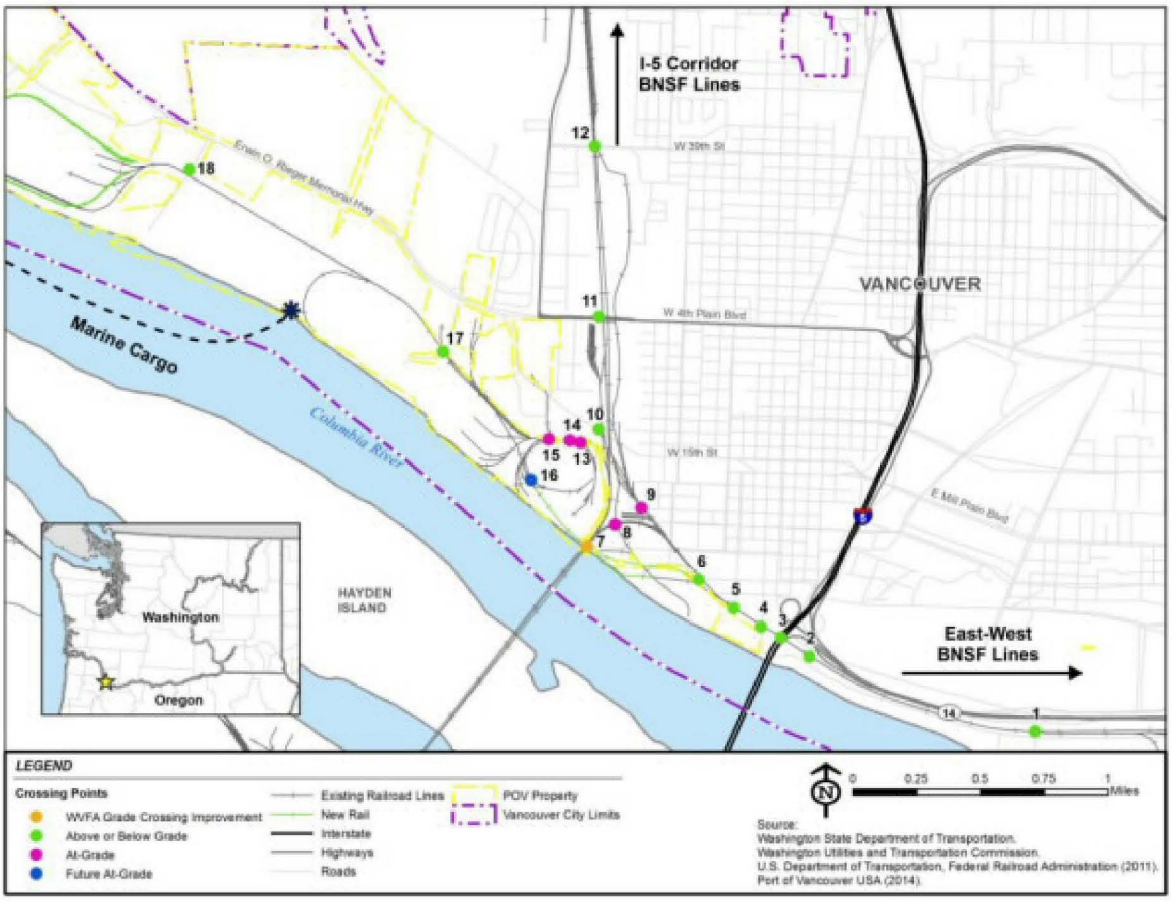
of the Vancouver area.[47] Traffic delays, on average, have a relatively limited impact from an economic standpoint. Because most travel is not business related, non-business impacts are greater than business impacts. These non-business impacts have limited effect in terms of lost income or lost value added.

Figure 6: Location of Vancouver At-Grade Crossings Evaluated



Note: Intersections evaluated in Table 9 include the following at-grade intersection: 8 (Hill St.), 9 (11th St.) and 13 (Ind St West 16th Street). Other at-grade crossings identified in Figure 6 (14 and 15, both in the industrial / Port area) were not reported in the U.S. DOT data. At-grade crossings included in Table 9 but not in Figure 6 are to the east of the geographic area included in Figure 6.

[47] Table 9 excludes the Jefferson and 8th Street at-grade crossings, which have been closed permanently. Two of the at-grade crossings in Table 9 are not in Figure 6, but are to the east of the geographic area shown.

Table 8: Assumptions Used in Calculating Costs of Rail Crossing Delays

Length of Delay Calculation:		
train length (feet)	7,800	**[A]** Draft EIS, p. 5-106
average train speed (mph)	30	**[B]** Assumption
gate down time prior (sec)	30	**[C]** Draft EIS, p. 5-16
gate down time post (sec)	12	**[D]** Draft EIS, p. 5-16
crossing time (min)	3.0	**[E]** = (([A]/ (5,280 ft per mile)) / [B]) * 60 min/h
total gate down time (min)	3.7	**[F]** = [E] + (([C] + [D]) / 60 s/min)
average length of delay (min)	**1.8**	**[G]** = [F] / 2
Value of Lost Time Calculation:		
Year Modeled	**2014**	**[H]**
Passengers / Vehicle	**1.0**	**[I]** Assumption
Hourly Earnings Car - Personal ($/hr)	$23.90	**[J]** DOT 2011, Table 3
Hourly Earnings Car - Business ($/hr)	$22.90	**[K]** DOT 2011, Table 3
Hourly Earnings Trucks ($/hr)	$24.70	**[L]** DOT 2011, Table 3
Personal % Earnings with Economic Impact	50%	**[M]** DOT 2011, Table 1
Business % Earnings with Economic Impact	100%	**[N]** DOT 2011, Table 1
Local % Business Travel vs. Total Travel	**4.6%**	**[O]** DOT 2011, p. 12
Weighted value of car time ($/hr)	$12.50	**[P]** = ([J] * [M] * (1 - [O])) + ([K] * [N] * [O])
Business value of car time ($/hr)	$22.90	**[Q]** = [K] * [N]
Value of truck time ($/hr)	$24.70	**[R]** = [L] DOT 2011, Table 1
Cost of car delay time, total ($/min)	**$0.21**	**[S]** = [P] / 60
Cost of car delay time, business only ($/min)	**$0.38**	**[T]** = [Q] / 60
Cost of truck delay time ($/min)	**$0.41**	**[U]** = [R] / 60

Notes:

[1] For [G], we assume vehicles arrive at a crossing at a constant rate, so that each vehicle's wait time will be, on average, half of the total gate downtime waiting.

[2] The Value of Lost Time calculations follow the DOT outlined procedure for valuing delay time in economic analyses.

Sources:

[1] Vancouver Energy Draft Environmental Impact Statement, Section 5.17.

[2] "Revised Departmental Guidance on Valuation of Travel Time in Economic Analysis," U.S. Department of Transportation, September 2011. Available at: http://www.dot.gov/sites/dot.dev/files/docs/vot_guidance_092811c.pdf.

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Table 9: Estimates of Delay Costs Associated with Increased Rail Traffic

Select Locations within Vancouver

	Intersection Characteristics			Volume per Delay		Annual Costs	
	Additional Trains	Average Vehicles	% Trucks	Cars	Trucks	All Vehicles	Business Travel
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Vancouver, Washington:							
Hill Street	4	100	4%	0.2	0.0	$154	$24
Beach Drive	4	342	1%	0.9	0.0	$511	$52
11th Street	4	1,000	5%	2.4	0.1	$1,552	$265
Ind St W 16th St	4	4,400	5%	10.6	0.6	$6,827	$1,164
SE 139th St	4	1,250	1%	3.1	0.0	$1,867	$191
SE 147th Ave	4	300	1%	0.8	0.0	$448	$46
Total						$11,359	$1,741

Notes:

[1] Four trains will be added to routes in Vancouver.

[2] DOT National Grade Crossing Inventory

[3] Data sources same as in [2]

[4] = ([2] * (([F])/(24hr * 60 min))) * (1 - [3])

[5] = ([2] * (([F])/(24hr * 60 min))) * [3]

[6] = (1.016^([H] - 2011)) * ((([4] * [S]) + ([5] * [U])) * [G]) * [I] * [1] * 365 days

[7] = (1.016^([I] - 2011))*((([4] * [T] * [O])+([5] * [U]))* [G]) * [I] * [1] * 365 days

[8] Intersections were selected by examining cities of interest using the US Department of Transportation National Grade Crossing Inventory and Google Maps Street view.

Sources:

[1] US Department of Transportation National Grade Crossing Inventory, available at: http://safetydata.fra.dot.gov/officeofsafety/publicsite/downloaddbf.aspx?itemno=7.02.

[2] Vancouver Energy Draft Environmental Impact Statement, Section 5.17.

[3] Value of travel time based on "Revised Departmental Guidance on Valuation of Travel Time in Economic Analysis," US Department of Transportation, September 2011. Available at: http://www.dot.gov/sites/dot.dev/files/docs/vot_guidance_092811c.pdf.

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Table 10: Estimates of Delay Costs Associated with Increased Rail Traffic
Select Locations Outside Vancouver

	Intersection Characteristics			Volume per Delay		Annual Costs	
	Additional Trains	Average Vehicles	% Trucks	Cars	Trucks	All Vehicles	Business Travel
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Bingen, Washington:							
Maple St	4	330	12%	0.7	0.1	$545	$152
Spokane, [9] Washington:							
East of Spokane							
N Park Rd	8	6,682	9%	15.4	1.5	$21,508	$5,032
N Vista Rd	8	2,185	9%	5.0	0.5	$7,033	$1,645
N University Rd	8	2,662	9%	6.1	0.6	$8,569	$2,005
N Pines Rd	8	11,000	7%	26.0	2.0	$34,772	$7,052
N Evergreen Rd	8	1,258	9%	2.9	0.3	$4,049	$947
N Flora Rd	8	362	9%	0.8	0.1	$1,165	$273
N Barker Rd	8	1,258	9%	2.9	0.3	$4,049	$947
Southwest of Spokane							
S Scribner Rd	8	37	11%	0.1	0.0	$121	$32
W Anderson Rd	8	90	11%	0.2	0.0	$295	$78
Pine St	8	480	5%	1.2	0.1	$1,490	$254
F Cheney Spa Rd	8	2,300	5%	5.5	0.3	$7,138	$1,217
Cheney-Plaza Rd	8	670	5%	1.6	0.1	$2,079	$355
Total						$92,269	$19,837

Notes:

[1] Spokane crossing are travelled by trains coming to and from Bakken. For these crossings, there are eight additional trains. The Bingen crossing is only travelled once and has four additional trains.

[2] Data for Seattle from DOT "Coal Train Traffic Impact Study." Other cities from the DOT National Grade Crossing Inventory

[3] Data sources same as in [2]

[4] = ([2] * ([F])/(24hr * 60 min))) * (1 - [3])

[5] = ([2] * ([F])/(24hr * 60 min))) * [3]

[6] = (1.016^([H] - 2011)) * ((([4] * [S]) + ([5] * [U])) * [G]) * [I] * [1] * 365 days

[7] = (1.016^([I] - 2011))*((([4] * [T] * [O])+([5] * [U]))* [G]) * [I] * [1] * 365 days

[8] Intersections were selected by examining cities of interest using the US Department of Transportation National Grade Crossing Inventory and Google Maps Street view.

[9] Our review showed that all relevant crossings in the Spokane city limits were either above or below grade. Instead, intersections were selected along the same lines to the East and West of the city.

Sources:

[1] US Department of Transportation National Grade Crossing Inventory, available at: http://safetydata.fra.dot.gov/officeofsafety/publicsite/downloaddbf.aspx?itemno=7.02.

[2] Data for Seattle, Washington includes adjustments to DOT data as reported in "Coal Train Traffic Impact Study," City of Seattle, October 2012. Avalable at: http://www.seattle.gov/transportation/docs/121105PR-CoalTrainTrafficImpactStudy.pdf.

[3] Vancouver Energy Draft Environmental Impact Statement, Section 5.17.

[4] Value of travel time based on "Revised Departmental Guidance on Valuation of Travel Time in Economic Analysis," U.S. Department of Transportation, September 2011. Available at: http://www.dot.gov/sites/dot.dev/files/docs/vot_guidance_092811c.pdf.

Business impacts are relatively limited. Within Vancouver, intersections potentially affected by incremental rail traffic all have relatively low traffic levels, with half of these occurring in industrial areas nearby the Port. The incremental impacts to business are all less than $300 annually. Outside of Vancouver, intersections east and west of Spokane, which are likely to have an additional 8 trains per day from the Project (four loaded inbound trains, and four empty outbound trains), experience impacts of up to $7,000 per year. Within Bingen, the more rural location, business impacts are below $200 annually per intersection. In aggregate, across the intersections evaluated, business impacts are less than $20,000 per year.

These impacts could have some tangible effects in terms of lost income or value added. However, compared to the magnitude of the economies of the communities in which these impacts occur, they are extremely limited. For example, in 2013, the total income earned for the city of Vancouver was about $4.3 billion, while total income in Spokane was about $12.4 billion.[48] In percentage terms, total business impacts (relative to income earned) are less than one-thousandth of one percent.

IV. CHANGES IN RAIL SYSTEM CONGESTION

As discussed above, under certain future scenarios, development of the Project could lead to increases in traffic on the rail system within Washington State which, in turn, could contribute incrementally to rail system congestion, potential delays, and associated impacts on rail operators and customers. In this section, we consider those potential economic consequences for the rail system.

Table 11 shows the potential impact of the Project on rail traffic in Washington, based on assumptions about the most likely routes for incoming and return traffic.[49] Figure 7 illustrates these routes. This table provides estimates of the short-run impact of the Project on rail traffic given current (2010) traffic levels as reported in the State of Washington's Final Draft State Rail Plan.[50] Specifically, Table 11 assumes that all inbound fully-loaded trains will arrive from the east via the BNSF rail lines that follow the Columbia River and that empty trains will head north towards Kalama/Longview back to their point of origin.[51]

[48] U.S. Census Bureau, State and County Quick Facts.

[49] These impacts were developed within Section 5.17 of the Draft Environmental Impact Statement.

[50] Washington State Department of Transportation, "Washington State Rail Plan, Integrated Freight and Passenger Rail Plan, 2013-2035," Final Report, prepared by Cambridge Systematics, March 2014; other recent estimates of rail capacity and forecast demand are provided in: BST Associates, MainLine Management, "Pacific Northwest Marine Cargo Forecast Update and Rail Capacity Assessment," prepared for Pacific Northwest Rail Coalition, December 2011.

[51] The estimates in Table 11 do not reflect certain investments currently being undertaken by BSNF that will likely increase rail capacity of the Washington rail system. In 2014, BNSF plans to invest $1 Billion in capital on expansion and maintenance on the Northern Corridor, with $235 million going to projects in Washington State. There are several major capital projects currently under way in Washington, including construction of a second

While we assume rail traffic along the route illustrated in Figure 7, it is important to recognize that, generally speaking, routing of freight rail traffic is very dynamic and does not adhere to a particular route. The route taken by a freight train on a given day will depend not only on convenience or distance, but also on other numerous factors, including weather events, customer needs and market demands. As a result, because there are three east-to-west routes through Washington from the eastern border to the Project in Vancouver, BNSF has greater flexibility and available capacity to ensure network fluidity than is reflected in our assumption that rail traffic follows the route identified in Figure 7. With that caveat in mind, this report assumes the most likely route, as demonstrated through current practice and given current conditions.

Table 11: Potential Changes in Daily Train Volume and Utilization from the Vancouver Energy Distribution Project (No Capital Improvements to Rail Infrastructure)

(Freight trains in parentheses for all alignments)

Rail Segment	Current Trains (2010)	Proposed Action	Capacity (2010)	Percent of Line Capacity	Existing Utilization (2010)	Utilization w/ Proposed Action (2010)	Rail Alignment
Assumed Inbound Route – Columbia River Alignment							
Sandpoint, ID, to Spokane, WA	48 (46)	56 (54)	74	11%	65%	76%	Columbia River + Central Return
Spokane, WA, to Pasco, WA	32 (30)	40 (38)	37	22%	86%	108%	Columbia River + Central Return
Pasco, WA, to Vancouver, WA	28 (26)	32 (30)	40	10%	70%	80%	Columbia River
Assumed Return Route – Central Alignment							
Vancouver, WA, to Kalama/Longview, WA	41 (31)	45 (35)	78	5%	53%	58%	Central Return
Kalama/Longview, WA, to Tacoma, WA	41 (31)	45 (35)	78	5%	53%	58%	Central Return
Tacoma, WA to Auburn, WA	41 (13)	45 (17)	115	3%	36%	39%	Central Return
Auburn, WA to Pasco, WA, via Stampede Pass	6 (6)	10 (10)	39	10%	15%	26%	Central Return

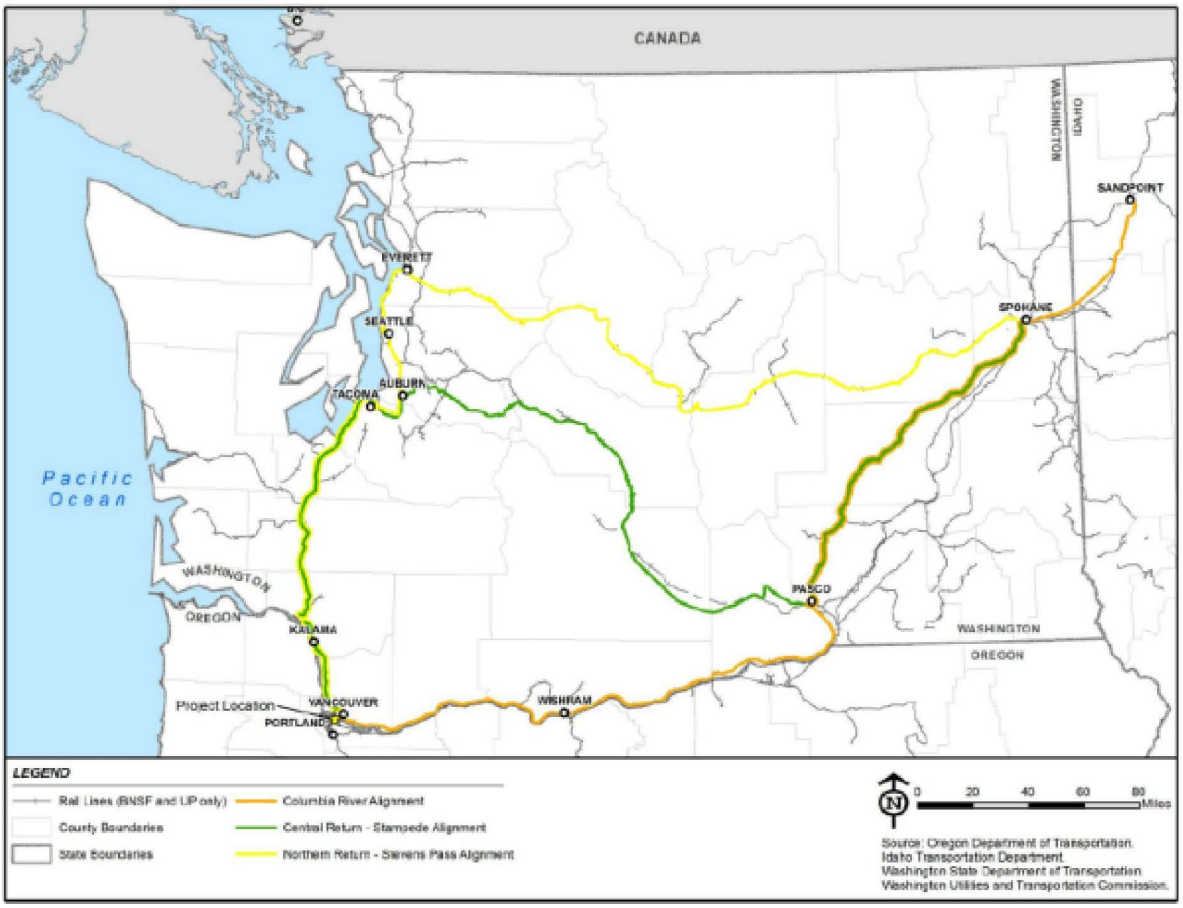
Sources: Current Trains and Capacity: Washington State Rail Plan, 2014, pages 41.

Over the assumed route, current utilization on affected lines ranges from 15 to 86 percent. With the additional traffic from the facility, and assuming none of the planned capital improvement projects

mainline track at various locations on the route between Cheney, Wash. and Mesa, Wash., and replacement of the railroad bridge over the Washougal River in Camas, Wash.

will be constructed, utilization would range from 26 to 108 percent. Thus, except for the Spokane to Pasco segment, there is sufficient capacity to accommodate increased rail traffic from the facility without any capital improvements to the rail infrastructure and without adjustments to other rail traffic. Even if trains were to return empty via the Columbia River, there would be sufficient capacity along the Vancouver to Pasco route to accommodate the additional demand for freight rail from the Project (traffic would increase to 36 trains on lines with a capacity of 40 trains). In addition, this analysis does not account for the excess capacity along the Seattle-to-Everett-to-Spokane route that could accommodate traffic from the Project or other customers using the Tacoma-to-Pasco-to-Spokane route.

Figure 7: Washington Rail System Map and Assumed Route for Project Rail Traffic



Estimates of rail segment utilization reported in Table 11 reflect estimates of current rail traffic and capacity for individual rail segments developed for the Washington State Department of Transportation ("DOT"). Other studies have developed similar estimates of rail traffic and capacity for these segments. In some cases, these traffic and capacity estimates differ meaningfully from those

developed by the Washington DOT.[52] We have not evaluated utilization relative to these other forecasts, nor have we performed an assessment of the relative accuracy or reliability of these estimates.

Table 11 provides a static view of the potential impact of the Project on the rail system in Washington State. It does not account for the various dynamic adjustments that can occur within an economic market that allow the supply of available and potential resources to shift to meet the demand for goods and services. In this case, rail system operators have many alternatives available to optimally utilize, enhance and expand the existing rail system to serve various rail customers whose demand for service may vary over time in both intensity and location. For example, BNSF is currently undertaking investments that would likely increase capacity in its Lakeside subdivision, which roughly corresponds to the Spokane to Pasco section listed in Table 11.[53]

From an economic standpoint, it is important to evaluate potential impacts from both short-run and long-run perspectives that account for the dynamic adjustments made by market participants that allow the supply (and location) of resources to meet demand. In the short-run, options to adjust rail use for new demand from the Project are more limited, while in the long-run, there is a larger set of options available to adjust system use, configuration and capacity. It is important to account for these economic adjustments in any assessment, because they can mitigate many apparent impacts from static assessments.

c. Short-run Impacts

As shown in Table 11, in the short-run, development of the Project could increase the demand for rail services in Washington State (relative to the No Action Base Case assuming all rail traffic to the Project is incremental). The incremental traffic from the Project would be modest in comparison to current levels of traffic. The additional traffic represents as little as 3 percent of route traffic (Tacoma-to-Auburn) and at most 22 percent of route traffic (Spokane-to-Pasco). With the additional traffic, route capacity utilization ranges from 26 percent (Auburn-to-Pasco) to 108 percent (Spokane-to-Pasco). While traffic would exceed the capacity of the Spokane-to-Pasco route, there is an alternative route (Tacoma-to-Everett-to-Spokane) with surplus capacity that could be used instead of the Spokane-to-Pasco route.

[52] BST Associates, Mainline Management, "Pacific Northwest Marine Terminal Cargo Forecast Update and Rail Capacity Analysis," Final Report, prepared for Pacific Northwest Rail Coalition, December 2011. Also, see prior rail capacity and system needs studies, in which capacity along some segments exceeds capacities in the most recent assessment: Washington State Department of Transportation, "Statewide Rail Capacity and System Needs Study," Final Report, prepared by Cambridge Systematics, et al., December 2006.

[53] This includes investment in siding and double-tracks. http://www.bnsf.com/customers/service-page/index.html. http://www.bnsf.com/media/news-releases/2014/may/2014-05-01a.html.

The static assessment represented in Table 11 does not account for adjustments that can be made in the short-run to either shift demand or increase supply along different rail routes. These adjustments include:[54]

1. Addition of more equipment, such as rail cars and engines;
2. Hiring (and training) of new employees;
3. Alternate routing and logistics, including the re-routing of trains to avoid bottleneck and implementation of advanced train control technologies;
4. Schedule and train speed adjustments;
5. Operation of longer trains;
6. Adjustments to the timing of shipments by shippers, including additional stockpiling of materials; and.
7. Certain track infrastructure investments

In prior periods, the rail system has faced significant increases in demand for services, and has successfully managed these shifts in demand through a number of the mechanisms discussed above. For example, in 2004, significant disruptions to freight transportation were anticipated as a result of the combination of steady growth in year-to-year demand for general freight combined with large grain harvests.[55] However, through a combination of adjustments by both the rail system and shippers, disruptions were limited and the predicted "meltdown" never occurred.

In addition to these adjustments to operations, in principle, short-term increases in prices can occur in response to increases in demand. Such changes would reflect complex interactions between rail system and economic conditions, and market regulation. Full evaluation of potential price impacts in the short term from development of the Project is outside the scope of this assessment. However, assuming that rail system adjustments and existing system flexibility due to the availability of multiple routes through Washington State is sufficient to avoid any existing capacity constraints (e.g., as shown in Figure 7 over the Spokane to Pasco segment), it is reasonable to conclude that no curtailments in service would be expected in the short-term.

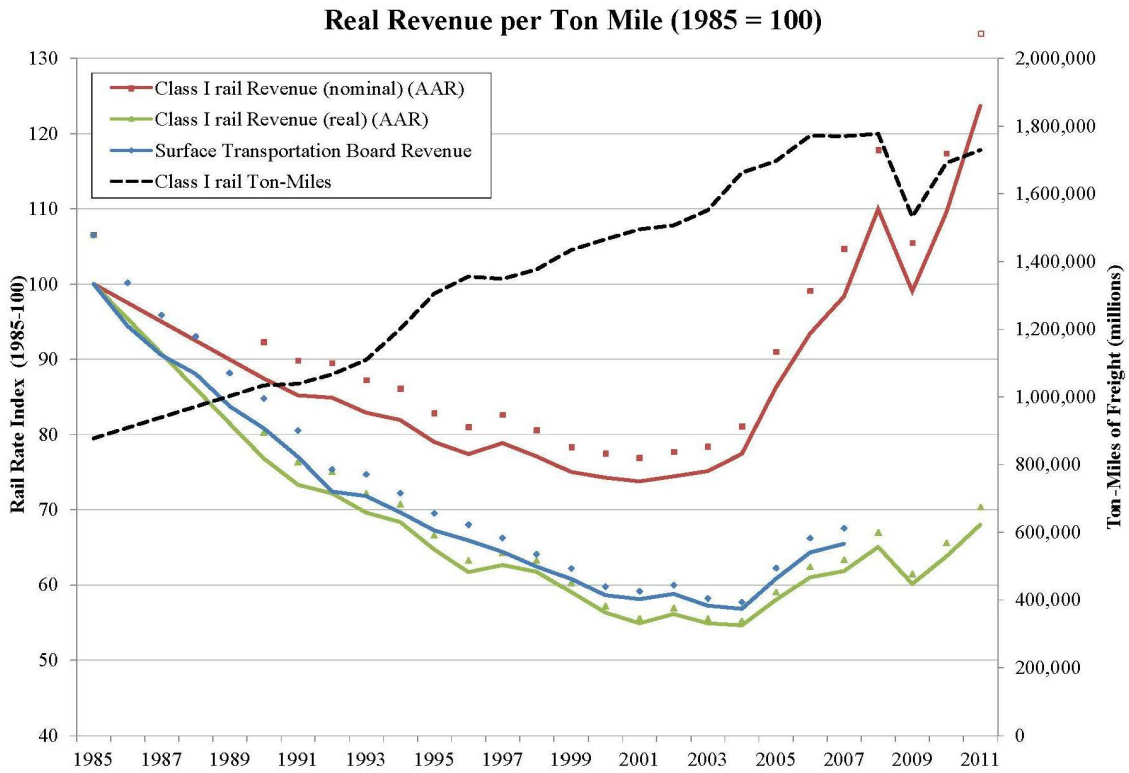
While we do not evaluate potential short-term price impacts, when considering potential for price impacts as a consequence of new rail traffic, it is important to put any such potential increases in the context of past trends in rail prices. As shown in Figure 8, while rail prices have increased in nominal terms since 2000, in real terms they have decreased significantly since deregulation of rail traffic in the mid-1980s. Moreover, prices have generally decreased over periods in which demand has been generally increasing. Price decreases have occurred due to a variety of factors, although the "rationalization" of rail

[54] Washington State Department of Transportation, "Washington State Rail Plan, Integrated Freight and Passenger Rail Plan, 2013-2035," prepared by Cambridge Systematics, Final Draft, December 2013, pp. 48-50; Congressional Budget Office ("CBO"), "Freight Rail Transportation: A Review of the 2004 Experience," Mary 2005.

[55] Congressional Budget Office (CBO), "Freight Rail Transportation: A Review of the 2004 Experience," May 2005.

services, including more efficient operations and existing infrastructure following deregulation of the rail industry is largely credited with these changes.[56]

Figure 8: Rail Rate Indices and Class I Traffic Volume, 1985-2007



Source: Department of Transportation, Association of American Railroads, Surface Transportation Board.

d. Long-run Impacts

In the long-run, at both a regional and national level, certain studies have forecasted that demand for rail services in future periods – for example, 10 to 20 years into the future – will exceed current capacity.[57] These increases reflect anticipated growth in economic activity and the associated demand for

[56] For example, *see* U.S. General Accountability Office, "Freight Railroads, Industry Health Has Improved, but Concerns about Competition and Capacity Should be Addressed," GAO-07-94, October 2006.

[57] While the system before deregulation was characterized by surplus capacity and inefficiencies along multiple dimensions, this surplus has diminished over time. As this surplus has diminished and system utilization has increased, a focus on increasing capacity at the national and regional level has emerged. Cambridge Systematics, *National Rail Freight Infrastructure Capacity and Investment Study,* prepared for the Association of American Railroads, September 2007; American Association of State Highway and Transportation Officials, "Transportation Investment in American, Freight-Rail Bottom Line Report," 2003.

transportation services, including rail and non-rail modes, and are not particular to any near-term trends in rail demand (e.g., crude by rail).

Within Washington State, while current capacity is sufficient to meet demand, planning studies indicate that the system could face shortfalls of capacity in future years *absent* expansion of system capacity. For example, the Washington State DOT found that projected daily train volume will exceed current capacity on a large fraction of lines by 2035.[58] Similarly, a recent study of the cumulative impact of additional train volume from energy Projects, including coal and crude oil, raised concerns that this additional demand would adversely affect existing users of the freight rail system by either "displacing" traffic or raising prices.[59] Our assessment does not include a review of these assessments, although we note that other parties have disagreed with certain findings.[60]

The rail system is privately owned and, for the most part, relies on private investment and operations decisions by the railroads to ensure that there is sufficient system capacity to meet demand. In recent years, reflecting a combination of factors, investment in rail infrastructure by rail operators has increased significantly. Figure 9 shows annual investment has grown about 65 percent over the past decade.[61] These investments reflect both upkeep of existing infrastructure as well as investments to expand rail capacity, including options to further expand capacity that are less feasible in the short-run, such as the deployment of advanced train control technologies, investment in additional rail lines (e.g., double- or triple-tracking rail corridors) and development of infrastructure to eliminate bottlenecks or constraints, such as raising tunnel ceilings, removing other obstacles to accommodate double-decker containers and replacing drawbridges that lead to rail delays.[62] Similarly, Figure 10 shows that the size of the Class I locomotive fleet has increased steadily over the last few decades. These investments have been one factor in allowing the industry to keep pace with the significant increases in services, as reflected in ton-miles in Figure 10, over the past several decades.

[58] Washington State Department of Transportation, "Washington State Rail Plan, Integrated Freight and Passenger Rail Plan, 2013-2035," prepared by Cambridge Systematics, Final Draft, December 2013.

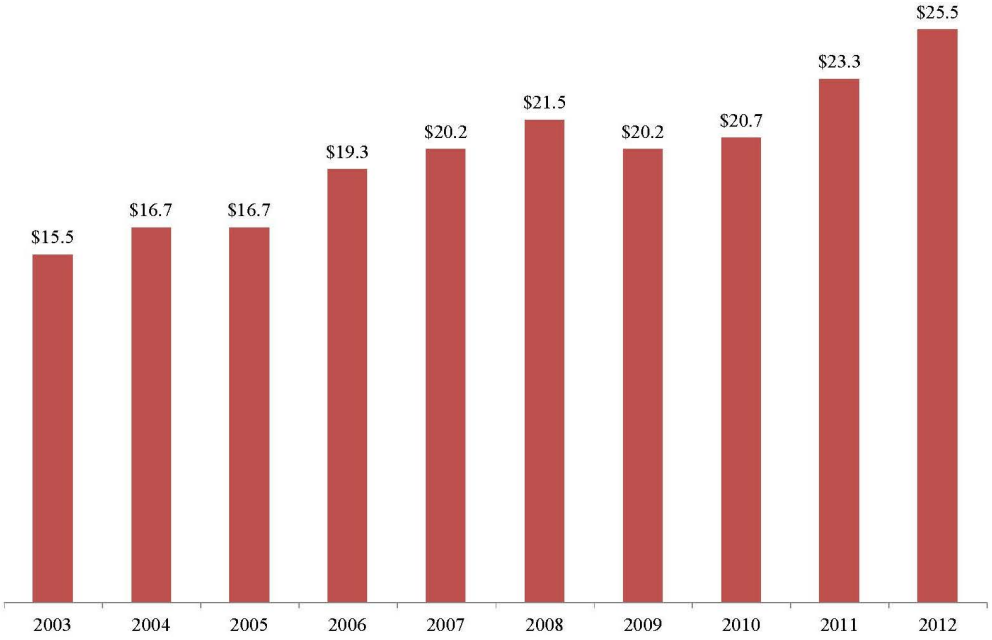
[59] Whiteside, Terry and Gerald Fauth III, "Heavy Traffic Still Ahead," prepared for the Western Organization of Resource Councils, February 2014.

[60] *For example*, LaBoe, Barbara, "Coal Facilities Would Tie Up NW Railroads, Study Says," *The Daily News*, July 11, 2012. http://tdn.com/mobile/article_1cb95c08-cbda-11e1-9a16-0019bb2963f4.html

[61] *See,* Morris, Betsy, "Boom Times on the Tracks: Rail Capacity, Spending Soar," *Wall Street Journal*, March 26, 2013.

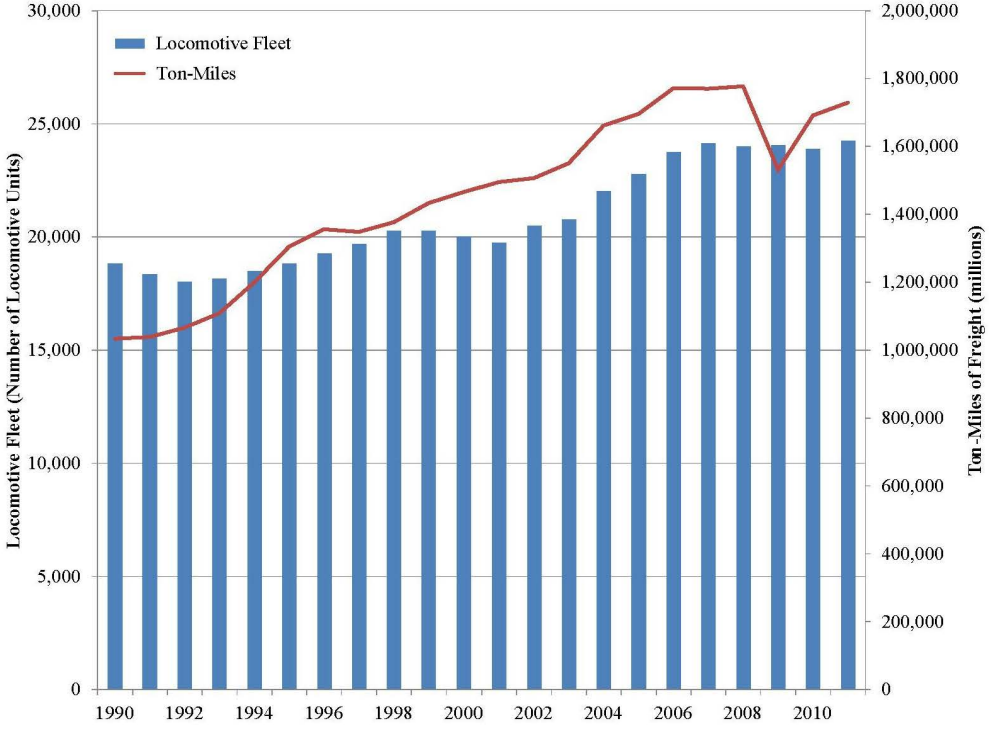
[62] Morris, 2003;

Figure 9: Freight Railroad Spending on Infrastructure and Equipment ($ Billion)



Source: Association of American Railroads.

Figure 10: Class I Locomotive Fleet, Number of Locomotive Units



Source: U.S. Department of Transportation.

In this context, it is worth noting that railroads in Washington State are undertaking capital investments to improve operational performance and capacity. For example, BNSF indicates that it is undertaking investments in siding projects along the Fallbridge (Pasco to Vancouver) and Lakeside subdivisions, and is undertaking five double-tracking projects along the Lakeside subdivision.[63] As noted earlier, these investments along the Lakeside route would increase capacity on the Spokane-to-Pasco section that appears potentially constrained under the highest level of incremental traffic from the Project.

Within this long-run context, the impact of any additional traffic from the Project is not expected to be significant. Moreover, the ability of the system to increase capacity to meet expanding demand will not depend on any additional traffic from the Project, but from factors such as the ability of the railroads to earn sufficient return to justify potentially significant investments.[64] Thus, the Project will not have significant impacts on the rail system, in the form of disruption to other services or significant price increases, in the long-run. While this is a topic beyond this scope of this assessment, it is important to note that many assessments conclude the rail system is likely to and has been able to meet capacity needs under a variety of circumstances.[65] For example, the Washington State Rail Plan notes that "[i]n reality, it is anticipated the Class I railroads (BNSF and UP) and other infrastructure owners will likely address key capacity issues as they emerge."[66] Similarly, the rail system has been able to meet past surges in demand for rail services, such as the significant new demand for the transport of coal from the Power River Basin in Wyoming, which grew steadily over a 25 year period.[67]

[63] http://www.bnsf.com/customers/service-page/index.html . A rail siding is a track section (usually a short length and designed for low speeds) that runs adjacent to an existing lines to allow two trains to pass or to allow a train to load/unload or temporarily stop while making the rail passable. Double-tracking involves two parallel tracks that run for a longer distance and can accommodate normal rail speeds.

[64] For example, *see* Cambridge Systematics, Inc., "National Rail Freight Infrastructure Capacity and Investment Study," prepared for the Association of American Railroads, September 2007.

[65] To the extent concerns are raised, these are typically used to suggest a role for public financing, which is justified by a number of factors, including public funding of infrastructure in competing transportation modes (e.g., highways for trucking, airports for air freight and publicly maintained waterways for water) and public benefits provided by rail systems. Moreover, all assessments conclude that the rail operators would provide the majority of any needed investment. For example, the *National Rail Freight Infrastructure Capacity and Investment Study* found that "Class I railroads anticipate that they will be able to generate approximately $96 billion of their $135 billion share through increased earnings from revenue growth, higher volumes and productivity improvements, while continuing to renew existing infrastructure and equipment." American Association of State Highway and Transportation Officials, "Transportation Investment in American, Freight-Rail Bottom Line Report," [n.d.]

[66] Washington State Department of Transportation, "Washington State Rail Plan, Integrated Freight and Passenger Rail Plan, 2013-2035," prepared by Cambridge Systematics, Final Draft, December 2013.

[67] *See,* United State Department of State, Keystone XL Pipeline Environmental Impact Statement, pp. 1.4-77 to 1.4-80.

V. ECONOMIC IMPACTS OF A CRUDE RAIL ACCIDENT

The transport of crude oil via rail can create certain accident risks that have potential economic consequences. Accidents of greatest concern involve those affecting environmental conditions (e.g., spills in sensitive environmental areas), economic activity (e.g., property damage) or human health (e.g., injuries or loss of life). In this section, we consider the economic consequences of such accidents, when they do occur. We do not, however, consider the likelihood that such accidents occur.

The potential impacts of rail accidents depend on multiple factors. Many of these are location specific, while others vary with the rail operator or system. Moreover, industry practices and regulations affecting crude rail transportation are rapidly evolving. On-going regulatory proceedings in the U.S. could increase the stringency of operational and safety standards by the time the Terminal comes into operation, leading (along with voluntary actions) to changes in tanker car designs and operating practices that improve safety.

When they occur, rail accidents potentially lead to a number of adverse economic consequences, including:

1. Environmental contamination from spills
2. Injury or loss of life from fire or collisions
3. Damages to property

In this section, we consider several issues related to the economic impacts of crude rail accidents.

A. Historical Crude Rail Accident Impacts

The extent to which an accident leads to economic, environmental and human health impacts will depend on many factors, including rail car design and the associated risk of spills or fires; the quantity of crude spilled; proximity to residences, economic activity (e.g., commerce, industry, agriculture and livestock) and environmental conditions (e.g., surface and groundwater, sensitive ecological areas or pristine natural resources); and speed and effectiveness of emergency response. When an accident occurs, it can lead to a number of different types of economic impacts, including: property damage (including freight, rail infrastructure, nearby homes, businesses or other properties); interruption of economic activity; response, environmental cleanup and remediation costs; and natural resource damages.

For the purposes of this report, we consider accidents that occur outside of the rail yard in which some quantity of hazardous material is spilled. The data relied on are collected by the Pipeline and Hazardous Materials Safety Administration ("PHMSA"). PHMSA requires that any transportation accident in which some quantity of transported hazardous materials is spilled (meeting certain reporting requirements) be reported to PHMSA. Thus, in principle, the data set provides comprehensive information on all accidents in which crude oil was spilled.[68] However, the U.S. Department of

[68] PHMSA provides information on rail accidents that result in the spill of hazardous materials above threshold levels. Information provided in the PHMSA data includes spill volume, dollar damages, injuries and fatalities. All

Transportation ("DOT"), in its regulatory impact analysis of proposed new operational requirements for trains carrying large volumes of crude, has identified certain "inaccuracies" in the PHMSA data,[69] such as the possibility that costs may be understated, without providing an assessment of the magnitude of any such inaccuracies.[70] Because our analysis of the PHMSA data to date does not include an assessment of data accuracy and reliability, we cannot at this stage assess the conclusions reached by DOT regarding the quality of the PHMSA data.

Based on a review of accident costs in the PHMSA data, the potential impacts of an accident involving a train carrying crude oil cargo can vary widely. Among accidents involving train incidents, damages reported in the PHMSA data range from less than $10,000 to $5.3 million.[71] Damages from accidents not involving train incidents have also ranged widely, from a low of $0 to a high of $21.1 million.[72] This section discusses the range of potential economic impacts based on PHMSA data on rail transport of hazardous material generally, rather than attempting to analyze the likely range of economic impacts associated with a potential accident due to traffic specifically related to the Vancouver Energy Terminal.

B. Economic Impacts and Distribution of Damages

In the event that an accident occurs, existing regulations require cleanup of releases by responsible parties.[73] In addition, existing statutes can require that a Natural Resource Damage Assessment occur to identify damages to natural resources and assign responsibility for such damages.[74] Cleanup actions, associated mitigation and other compensation can reduce impacts to local communities by reducing the period of time over which communities are adversely affected by the contamination,

data is self-reported by the transportation operator. Our analysis is limited to in-transit accidents. Rail accidents are also reported to the Federal Railway Administration (FRA), although reporting requirements differ, with, for example, FRA requiring the reporting of all accidents whether or not they involve hazardous materials. However, the FRA data provides limited information on accident impacts.

[69] U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, "Draft Regulatory Impact Analysis, Hazardous Materials: Enhanced Tank Car Standards and Operational Controls for High-Hazard Flammable Trains," Docket PHMSA-2012-0082, July 2014, p. 26.

[70] DOT, July 2014, pp. 29-30.

[71] Rail incidents considered include derailments, rollover incidents and vehicular crash or accident.

[72] The PHMSA data includes larger crude by rail accidents, such as those occurring in Casselton, North Dakota, Aliceville, Alabama, and Lynchburg, Virginia, but does not include accidents that occurred in Canada, including the accident in Lac-Mégantic, Quebec, which is likely to result in higher costs than those reported to PHMSA to date. Initial estimates put those costs at more than $200 million, although final costs could be higher than this amount. In its recent Regulatory Impact Analysis, the Department of Transportation assumes an estimated cost associated with the Lac-Mégantic accident of $1.2 billion, citing to press reports as a source for this estimate. National Transportation Safety Board, Safety Recommendation, R-14-1 to -3, January 23, 2014; DOT, PHMSA, 2014, p. 37.

[73] These statutes include the Resource Conservation and Recovery Act, the Safe Drinking Water Act, and the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA).

[74] These statutes include the Oil Pollution Act and CERCLA.

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requiring mitigating actions to reduce economic consequences (e.g., replacing contaminated drinking water supplies) and providing financial compensation for economic damages.

Under these laws, the financial costs associated with cleanup, mitigation and compensation would generally be incurred by the responsible party, rather than the communities in which accidents occur. In addition, government funds may be available to address certain types of costs, such as contaminant removal costs.[75] Thus, the final economic impact to communities affected by a crude rail accident would reflect compensation for economic damages as a result of a crude rail accident.

To ensure that rail operators can fulfill their liability for rail accidents, they are required to carry insurance to compensate for damages arising from rail accidents. In recent years, Class I railroads have carried $1 billion in insurance.[76] As a Class I railroad, BNSF, the rail operator to and from Vancouver Energy, would be expected to carry coverage at this general level, as available in the insurance market. As recently as 2008, BNSF reported carrying a combination of self-insurance and excess liability insurance of $1 billion.[77] Such insurance would be sufficient to cover impacts from all past accidents, as reflected in the range of costs reported in the PHMSA data associated with crude rail accidents in the U.S. to date described above. Thus, based on the incident costs reported to date by PHMSA, in all but perhaps the most severe of accidents, such as the Lac-Mégantic accident,[78] the amount of insurance coverage available is likely to be sufficient to cover the costs associated with a spill.

C. Forward-looking Adjustments

As discussed above, economic impacts from rail accidents depend, in part, on the practices of and equipment used by rail operators. Safety regulations, largely imposed by federal regulators including the Department of Transportation, affect these decisions. The economic consequences of rail accidents, thus, depend, in part, on the design and implementation of these regulations.

Within the past year, changes to rail safety regulations have been made and other regulatory changes have been proposed or are under consideration. Changes affecting braking power, train speeds, and proper materials testing and classification are under review, and regulatory changes are being

[75] For example, the Oil Spill Liability Trust Fund has funds to pay for certain costs, including removal costs that are uncompensated or performed by the Coast Guard or the Environmental Protection Agency, and payments to conduct natural resource damage assessments. http://www.uscg.mil/npfc/About_NPFC/osltf.asp.

[76] Union Pacific, Verified Statement of Warren B. Beach, Surface Transportation Board, Ex Parte No. 677, August 21, 2008; BNSF, Surface Transportation Board, Ex Parte No. 677, July 22, 2008; Department of Transportation, "The Transportation of Hazardous Materials: Insurance, Security, and Safety Costs," A Report to Congress as required by Section 1555(b) of the Implementing Recommendations of the 9/111 Commission Act of 2007, December 2009.

[77] BNSF, December 2009.

[78] See footnote 72 for a discussion of reported estimates of costs associated with this accident.

considered.[79] Notably, the U.S. Department of Transportation has recently proposed rules for enhanced tank car standards, including enhanced braking, and operational controls, including actions to lower operating speeds and improve rail routing, materials classification and safety authority notification.[80]

The changes that have occurred over the past year in rail safety regulation, together with additional changes anticipated with current federal rule-making, would be expected, all else equal, to reduce the magnitude of impacts from rail accidents involving trains carrying crude oil. However, we have not evaluated the extent to which recently enacted and proposed regulations would reduce potential economic impacts from incremental rail traffic associated with Vancouver Energy.

VI. CONCLUSION

This report provides an assessment of secondary impacts from potential increases in rail traffic associated with Vancouver Energy, including dis-amenity, such as noise and aesthetic impacts, from increased rail traffic, increased road congestion at at-grade rail crossings, increased congestion on the rail system; and rail accidents. We find that the dis-amenity, increased congestion at at-grade crossings and increase rail system congestion from Vancouver Energy would not be expected to impose significant economic impacts. We have not evaluated potential costs from rail accidents associated with Vancouver Energy. Such costs are highly variable and would reflect many factors particular to the rail route and rail operator. However, existing laws, spill response funds and hazardous materials handling insurance are expected to cover the economic impacts for all but the most severe accidents.

[79] American Association of Railroads, "Freight Railroads Join U.S. Transportation Secretary Foxx in Announcing Industry Crude by Rail Safety Initiative," February 21, 2014; Frittelli, John, et al., "U.S. Rail Transportation of Crude Oil: Background and Issues for Congress," Congressional Research Service, May 5, 2014; U.S. DOT, Amended and Restated Emergency Restriction/Prohibition Order, Docket No. DOT-OST-2014-0025.

[80] U.S. DOT, PHMSA, Hazardous Materials: Enhanced Tank Car Standards and Operational Controls for High-Hazard Flammable Trains, Docket No. PHMSA-2012-0082, August 1, 2013.