Final Report

Port and Modal Elasticity Study, Phase II

Robert C. Leachman

Leachman & Associates LLC

245 Estates Drive

Piedmont, CA 94611

leachman@LeachmanandAssociates.com

For

SOUTHERN CALIFORNIA ASSOCIATION of GOVERNMENTS

September 14, 2010

Funding: The preparation of this report was financed in part through grants from the United States Department of Transportation (DOT).

Table of Contents

Note: The contents of this report reflect the views of the author who is responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of SCAG, DOT or any organization contributing data in support of the study. This report does not constitute a standard, specification or regulation.

List of Tables

List of Figures

List of Figures (cont.)

Executive Summary

Sponsored by the Southern California Association of Governments (SCAG), Phase II of the Port and Modal Elasticity Study concerns the development and application in policy analysis of a database and analytical tools to predict flows of waterborne containerized imports from Asia to the United States through North American ports and landside supply-chain channels. The lead consultant performing this study was Leachman and Associates LLC.

In August, 2005, Leachman and Associates LLC completed a long-run elasticity analysis for SCAG. A Long-Run Elasticity Model developed by Leachman and Associates predicts the allocation of Asia – USA waterborne containerized imports to ports and landside channels as a function of the following input data: overall import volume; distribution of imports by regional destination, by declared value and by size and scope of importer; statistical distributions for container flow times from Asian origins across the water, through ports and through landside channels; transportation rates and trans-loading rates; and user-specified potential container fees. Repeated application of the model enables the public policy analyst to construct an elasticity curve of import volume vs. fee value. The Long-Run Model was used to predict import flows through the San Pedro Bay ports as a function of potential fees at the San Pedro Bay ports and as a function of container flow time distributions. In particular, in the case of no reduction in flow times, a fee of $60 per FEU (forty-foot equivalent unit) was predicted to cause a 6% reduction in total import volumes handled through the San Pedro Bay ports. On the other hand, if major improvements in infrastructure were made that enabled significant reductions in container flow times, the analysis showed that there would be no drop in total import volumes if fees of up to $200 per FEU were applied subsequent to the availability of the new infrastructure, although the mix of importers using the ports would evolve considerably.

The long-run elasticity analysis in Phase I generated considerable interest from stakeholders and public policymakers (and considerable misinterpretation of the results). Phase II of the Elasticity Study was initiated in May, 2006. Dialogue with stakeholders begun in the earlier study was pursued in Phase II as well, and useful feedback and more data were obtained. The technical work in Phase II included the following elements:

- Updating the database of Asia – USA import volumes by commodity and declared values to 2005, and updating total import volume to 2006
- Updating databases of infrastructure and container flow times by port and landside channel to 2006-2007
- Updating databases of transportation rates, handling rates, and fees to 2007
- The Long-Run Model was enhanced in Phase II for more accurate calculations, and the data feeding it was updated as indicated in the preceding bullet points.
- Development of the capability to conduct “short-run” elasticity calculations, in which port and rail infrastructure are fixed inputs to the model, as opposed to the assumption of the Long-Run Model taking container flow times as fixed inputs. Container flow times in the Short-Run Model are endogenous, calculated as a

function of inputs for the import volume and assumed infrastructure at the various ports and in the various landside channels. Development of the Short-Run Model involved the formulation and calibration of queuing formulas that predict container dwell times at port and rail terminals as a function of volume, staffing and acreage, as well as queuing formulas to predict container transit times in rail-line haul movement as a function of track infrastructure and rail traffic levels. Confidential data of container flow times vs. volume and infrastructure were received from railroads and from operators of port terminals, and these data were used to calibrate the queuing formulas.

- Short-Run and Long-Run elasticity calculations testing the imposition of hypothetical container fees at San Pedro Bay were made for various scenarios, including a 2007 Base Case scenario, serving to validate the model, and four future scenarios, serving to characterize the range of potential outcomes from imposition of fees. The future scenarios include a Near-Term Likely scenario, two different longer-term Optimistic scenarios (one assuming a 10% rise in all-water steamship line rates relative to rates via West Coast ports, the other assuming a 10% rise in the market share of large, nation-wide importers), and a longer-term Pessimistic scenario (assuming a 10% drop in all-water rates relative to West Coast rates). In addition, a Long-Run elasticity calculation was made of the Near-Term Likely scenario modified to assume a program of major infrastructure improvements in Southern California is put in place (the Near-Term Likely scenario with Congestion Relief). This scenario assumes the program of infrastructure improvements is completed and made available to importers at the moment container fees are introduced. This scenario represents an update of the analysis published in the 2005 Phase I report.

Total imports routed via San Pedro Bay may be broken down into three basic categories: (1) local imports, consisting of imports consumed within the greater region for which San Pedro Bay serves as the closest container port (closest in the sense of lowest landside transportation costs), i.e., imports consumed within the region encompassing Southern California, Southern Nevada, Arizona, New Mexico and southern portions of Utah and Colorado; (2) direct-shipping imports, consisting of imports destined to other regions which simply pass through Southern California while remaining intact in the marine box coming from Asia;[1] and (3) trans-loaded imports, which are imports consumed in other regions that are unloaded from the marine box in Southern California, perhaps stored in an import warehouse for weeks or months, possibly receiving value-added services such as labeling, repacking or minor final assembly, and ultimately re-loaded into domestic containers or trailers for re-shipment to other regions. A portion of trans-loaded imports are trans-loaded to domestic containers or trailers immediately using a cross-dock facility, but most are warehoused in Southern California for some time before re-shipment.[2]

---

[1] Marine boxes arriving from Asia that are forwarded out of Southern California via rail move under a single steamship-line bill of lading from Asia to the inland destination under what is termed inland point intermodal (IPI) service.

[2] Some local imports also are trans-loaded, but for the purposes of this analysis, the trans-load category defined herein includes only imports ultimately consumed in other regions. Also, many imports in the

Low-value goods imported via the San Pedro Bay ports that are consumed in other regions, as well as goods imported by small or regional importers, typically move through direct-shipping supply chains utilizing inland point intermodal (IPI) services, whereby the marine containers are loaded onto double-stack trains destined out of region. Trans-load strategies are practiced by large nation-wide importers of medium-value and high-value goods.[3] The consultant estimates that in 2006, imports ultimately consumed within the greater local region as defined above accounted for only 21% of all loaded containers from Asian origins handled through the San Pedro Bay ports, IPI accounted for 43% of these imports, and (non-local) trans-loaded imports plus out-of-region trucking of marine boxes accounted for the remaining 36%. By 2008, the IPI share of Asian imports via San Pedro Bay had declined to 41%, the local share of imports rose to 23%, and the share accounted for by trans-loaded out-of-region imports and out-of-region trucking of marine boxes held steady at 36%[4]

Figure S-1 highlights the disparate elasticities of these components of import volumes routed via San Pedro Bay in the face of new fees assessed on imports in the Base Case Scenario. As may be seen, for container fees of $200 per FEU, total imports routed via San Pedro Bay are predicted to decline about 19% by the Short-Run Model and about 43% by the Long-Run Model. But percentage declines in the various categories of imports are far from uniform. Local imports are predicted to decline not at all. Relatively expensive imports (declared values greater than $28 per cubic foot) that undergo consolidation-deconsolidation and trans-loading supply-chain management practices in Southern California en route to consumption in other regions, also are predicted to decline not at all. Moderately-valued imports (with declared values between $12 and $28 per cubic foot) that are consumed elsewhere and undergo consolidation-deconsolidation and trans-loading in Southern California are predicted to exhibit some decline in volume, down from 22% of Zero-Fee-Base-Case[5] imports to 18% in the Short-Run analysis and down from 22% to 9% in the Long-Run analysis. The largest decline is exhibited by IPI volumes , falling from 42% of Base-Case volume to 31% in the Short-Run analysis and from 41% to only 14% in the Long-Run analysis.[6]

---

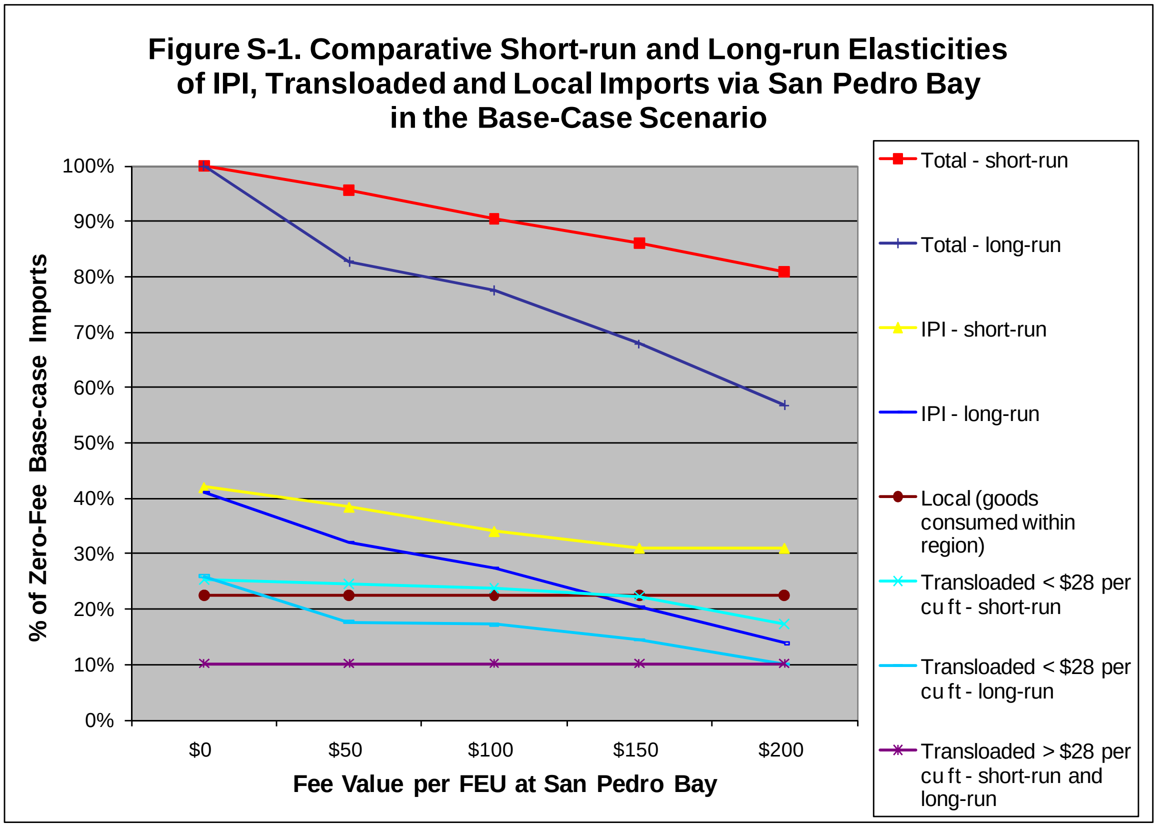
trans-load category change hands in Southern California, i.e., the goods are imported by an original equipment manufacturer (OEM) who pays for the transportation from Asia to an import warehouse in Southern California, then purchased from the OEM by a retailer who pays for the transportation from the import warehouse to regional distribution centers serving its retail outlets in other regions.

[3] Another frequently-used name for trans-load import strategies is consolidation – de-consolidation, a name arising because import shipments to multiple regions are consolidated as far as the port of entry before they are broken into separate shipments to the regions.

[4] The figures reported here for local and trans-loaded shares rest on the assumption that the final consumption of imported goods in the local region is proportional to the total purchasing power of the region relative to the total purchasing power in the Continental USA. The figures for the IPI shares are based on the actual traffic counts.

[5] Zero-Fee-Base-Case refers to the Base-Case Scenario with no new container fees.

[6] Under IPI service, the importer contracts with the steamship line for door-to-door service. The steamship line chooses the port of entry and subcontracts with railroads and draymen for landside movement. In that sense, the port of entry is discretionary for the line, and this makes IPI traffic quite elastic to fees or other costs imposed at one port but not at an alternative port.



What Figure S-1 reveals is that local imports are totally inelastic for the fee range depicted, trans-loaded expensive goods also are inelastic, trans-loaded moderate-value goods are somewhat elastic, while imports utilizing IPI services are very elastic. The trans-loaded imports generally contribute more to the local economy, providing significant warehousing and logistics employment, but at the same time contributing substantially more unfavorable environmental impacts in the local region (pollution and vehicular traffic), than the direct-shipping (IPI) imports. Consequently, the elasticity of trans-loaded goods is of considerable interest to policy-makers.

Figures S-2 and S-3 depict results of Short-Run and Long-Run analyses of the alternative future scenarios, contrasted with the Base Case. In the Near-term Likely Scenario, total imports via the San Pedro Bay ports exceed the Zero-Fee Base Case volume until about $100 per FEU in the Short-Run analysis and about $75 per FEU in the Long-Run analysis. Trans-loaded imports exceed Zero-Fee Base Case trans-loaded volumes until a fee of about $350 per FEU in the Short Run, but fall below the Zero-Fee Base-Case trans-loaded volume at about $150 per FEU in the Long Run. These results indicate that adequate infrastructure and/or staffing of that infrastructure are not yet in place at other ports to accommodate without congestion the diversion of trans-loaded volumes away from San Pedro Bay ports. However, the economics encouraging expansion at other ports and their landside channels arises when fees greater than $150 per FEU are imposed on imports through the San Pedro Bay ports.

Figure S-2. Short-Run Elasticities of Imports via the San Pedro Bay Ports in Future Scenarios

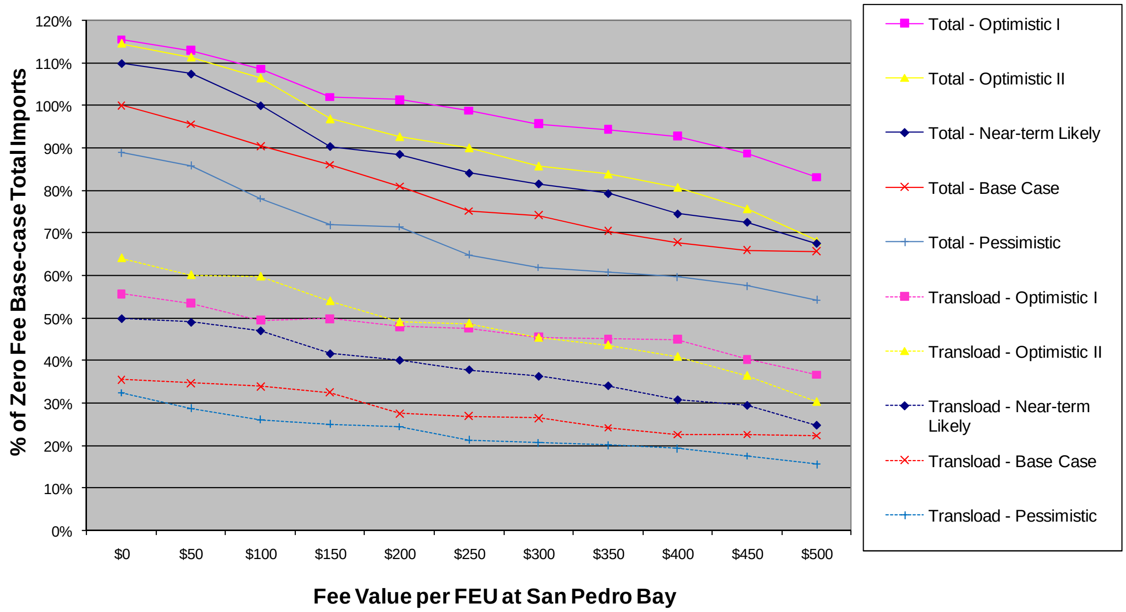
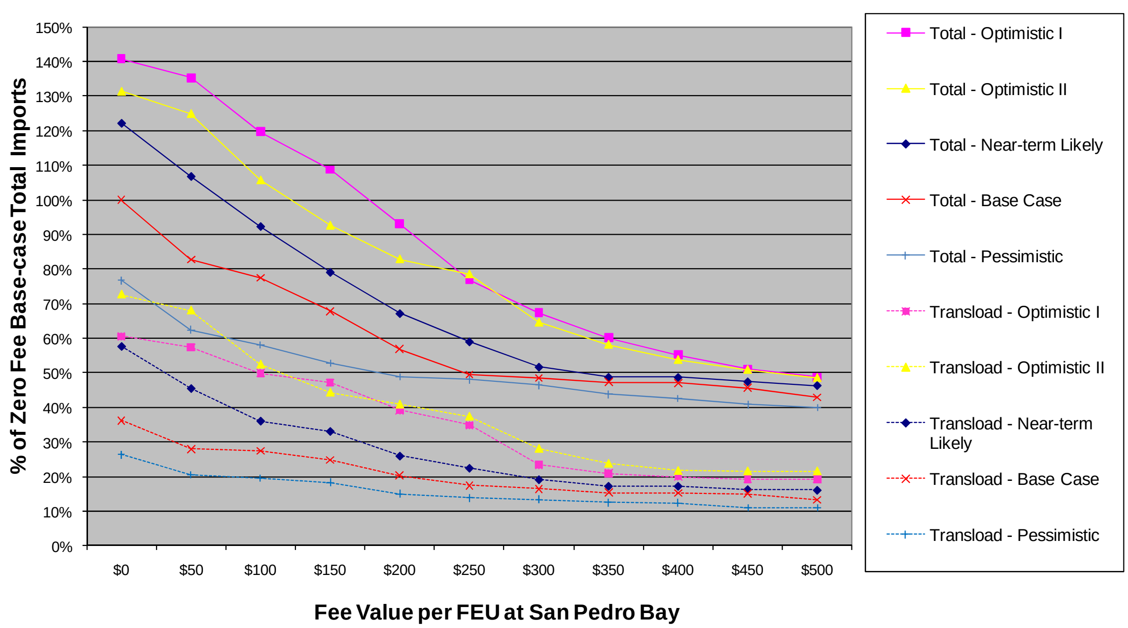


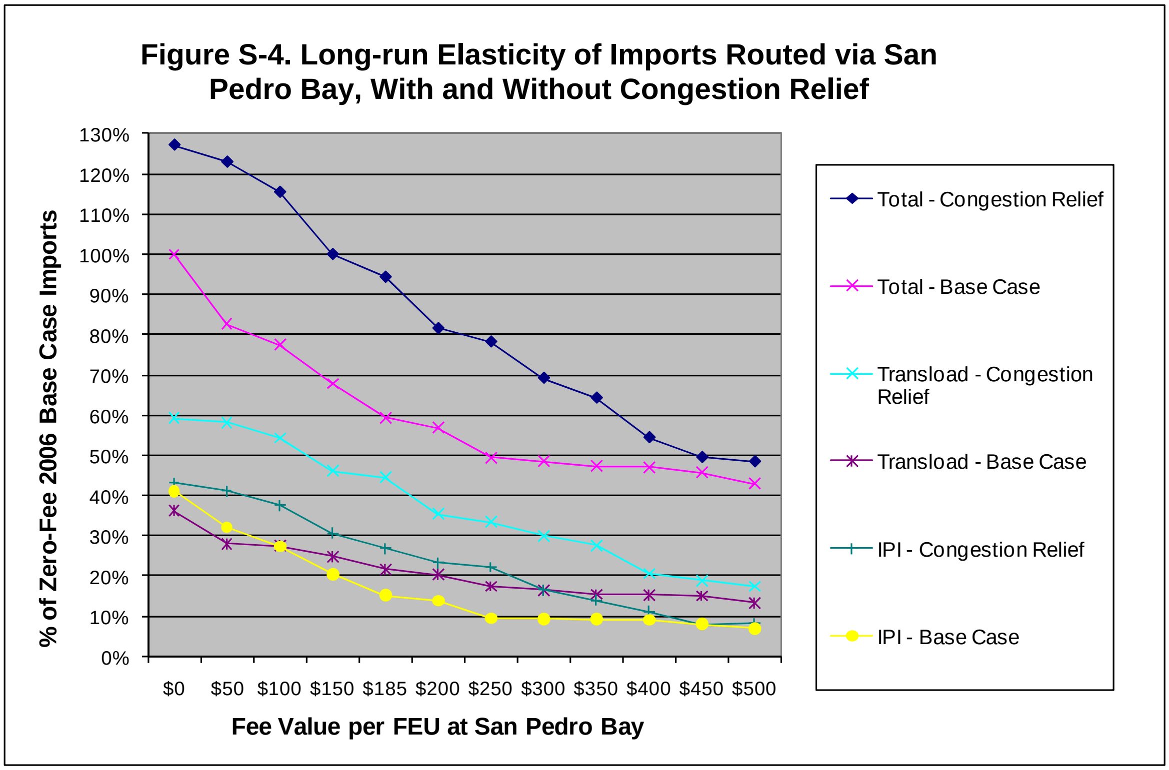
Figure S-3. Long-Run Elasticities of Imports via the San Pedro Bay Ports in Future Scenarios



In Optimistic scenarios, total import volumes via San Pedro Bay exceed Zero-Fee Base Case volume until container fees rise to about $125-$150 per FEU. In the Short Run analysis, trans-loaded volume in the Optimistic Scenarios exceeds that for the Zero-Fee Base Case over the entire range of container fees tested, but in the Long-Run analysis the trans-loaded volume falls to the Zero-Fee Base Case trans-loaded volume when container fees rise to about $250 per FEU. Again this is an indication that adequate infrastructure and/or staffing are not yet in place at other ports to accommodate diversion of trans-loaded volumes from the San Pedro Bay ports, but economic justification to make the needed investments or staffing additions arises once container fees imposed at San Pedro Bay are $250 per FEU or more.

In the Pessimistic scenario, total volume with no container fee is 11% less than Zero-Fee Base Case volume, and trans-loaded volume is 9% less. At a fee of $200 per FEU, both total volume and trans-loaded volume in the Long-Run Pessimistic scenario are less than half what they were in the Zero-Fee Base Case scenario. Such a volume loss would seem to be devastating to the Southern California economy.

Figure S-4 depicts the results of a Long-Run elasticity analysis of the Near Term Likely scenario supplemented with a major infrastructure program offering significant congestion relief vs. the Zero-Fee 2006 Base Case Scenario. This is an update of the analysis in the Phase I Elasticity Study. The assumed congestion relief program is very ambitious, including dedicated truck corridors from the ports to the major warehouse districts permitting 40 MPH operation of double-bottom drays, major expansion of port and rail intermodal terminals, and expansion of rail-line-haul capacity. As in the Phase I study, the assumption underlying this congestion relief scenario is that container fees are not assessed until after the new infrastructure is made available for use by importers. As may be seen, for a fee value up to about $150 per FEU, total market share of Asian imports at San Pedro Bay exceeds or matches that of the 2006 Zero-Fee Base-Case scenario. Examining the components of overall imports, the market share of inland-point intermodal imports falls below that of the Zero-Fee Base Case scenario for fees above $50 per FEU, while the market share of trans-loaded imports exceeds or matches that of the Zero-Fee Base Case scenario for fees up to about $200 per FEU.



Not analyzed was a scenario in which major infrastructure investments are assumed to be made in Southern California, but no investments are made at other North American ports, i.e., container flow times via those ports would increase if substantial import flows were diverted to them. In such a scenario, the diversion of traffic away from the San Pedro Bay ports when container fees are assessed would be somewhat less than what is depicted in Figure S-4. Nonetheless, then general nature of diversion would be similar – there would be more diversion of IPI imports than of trans-loaded imports.

A summary of the important findings of the elasticity analyses in Phase II is as follows:

- Compared to the 2005 analysis, the elasticity of imports via San Pedro Bay to potential container fees increased markedly. This was due to unfavorable evolutions in rail intermodal rates and dray costs. Particular changes include the disparate evolution of domestic-container and IPI rail rates (the former went up more in the 2003-2007 period than the latter), disparate evolutions of domestic-container rail rates from Southern California vs. from other West Coast ports (the former went up more in the 2003-2007 period than the latter), aggressive rate competition for IPI business via the new Prince Rupert port from the Canadian National Railroad, and increases in dray costs in Southern California much greater than at Pacific Northwest ports. The resulting rate disadvantage to Southern California ports of $0.05 - $0.10 per cubic foot of cargoes (depending on destination) may not seem like much, but considering the 4,000 cubic feet of space in a domestic container, that works out to be $200 - $400 per domestic container. And considering that a high-cube marine container accommodates 2,700 cubic feet of cargoes, such rate disadvantages work out to be $135 - $270 per FEU. In effect, the evolutions in steamship, rail and dray rates from 2003 to 2007 eliminated about $200 per FEU in inelasticity to container fees at San Pedro Bay. As embodied in the Near Term Likely scenario, about $150 per FEU in inelasticity is anticipated to be restored.

- Elasticity of imports to potential fees at San Pedro Bay is a function of rail and steamship rates, market shares of large nation-wide importers, and other factors not under the region's control. At issue is whether or not there are favorable developments in such factors that offset the impact of such fees, e.g., more competitive rail rates from Southern California, a rise in steamship line rates via the Panama Canal, increased market share for the large, nation-wide importers, and increased rail terminal capacity in Southern California. With such things present, small or moderate container fees do not result in volumes less than that in the Zero-Fee Base Case Scenario. But absent such things, or worse, juxtaposed with unfavorable developments such as a reduction in all-water rates or increases in rail rates out of Southern California but not elsewhere, there could be substantial drops in volumes resulting from the imposition of major fees.
- A major program of infrastructure improvements, whose bonds are retired by container fees not put into place until the time the infrastructure is opened for operation, can be a value proposition for large nation-wide importers practicing trans-load import strategies. In fact, the San Pedro Bay ports' share of such import traffic can be grown by a well-thought-out congestion relief program. But a major infrastructure program funded by container fees is much less a value proposition, or even a negative value proposition, for importers primarily using IPI services, including importers of low-value imports and small and regional importers. To remain competitive for the latter market, fees must be kept low or avoided entirely.
- The author believes that the Short-Run and Long-Run Elasticity Models show much promise for interesting policy analysis and infrastructure planning. It is exciting to be able to capture a complete view of Asia – US imports, the economics involved, and the limitations of current infrastructure and logistics services. However, in the author's opinion, the amount of data on which the Short-Run Model was calibrated is marginally adequate; much more could be done to refine the model as well as to facilitate wider application for improved policymaking, strategic planning, capital budgeting and financing of transportation infrastructure improvements. Moreover, considering the available budget, only a limited number of scenarios have been analyzed to date. There are no doubt other scenarios of interest to policymakers that will arise.
- Compared to the results of the Phase I Study, the Phase II results provide a cautionary lesson that elasticity of imports can change markedly in the span of only several years, suggesting the need for continuing analysis to keep up with the dynamics of industry and global economics.

Because of the ambitious scope of this study, this full presentation of the results is of necessity quite long. This report provides complete documentation of the results of the elasticity analysis, the assumptions underlying the analysis, and the development of the methodology. To facilitate comprehension of the array of findings, new analytical methodology, and applications of the methodology in policy analysis, this report includes a nine-page Overview following this Executive Summary. Sections delving into the details of the Study follow.

This report was prepared by Dr. Robert C. Leachman. The development of the Short-Run Model was a fascinating and very challenging project. I would like to acknowledge the assistance of Theodore Prince & Associates LLC, George R. Fetty & Associates, Inc., Dr. Anne Goodchild, Mr. David Lehlbach and Arellano Associates with data collection and stakeholder outreach efforts supporting the study. I also would like to express my gratitude to various companies and organizations that assisted the Study with the provision of insights or data to help calibrate the analytical models. In particular, the Port of Long Beach graciously provided access to Customs data from its PIERS and WTA subscriptions, and the BNSF and Union Pacific Railroads graciously supplied data on train counts, lift counts and intermodal transit times through their networks. MARAD also kindly provided PIERS data to the consultant. However, the Short-Run Model is an original work of the author. None of the agencies assisting this study participated in the development of the model, the analysis, or the formulation of findings and conclusions. No endorsement by them of any contents of this report should be assumed.

1. Overview

In September, 2005, the Southern California Association of Governments made public the “Port and Modal Elasticity Study.” This Study developed an economic optimization model predicting how importers would allocate Asian imports to port and landside channels so as to minimize their total supply chain logistics costs (considering transportation, handling and inventory costs). Totals for all importers yield a prediction of the overall allocations of imports to ports and channels. Repeated model calculations with varying levels of hypothetical container or user fees and with varying assumptions about container flow times and transportation rates enable policymakers to assess the elasticity of imports. The Study may be down-loaded from the SCAG web site at

http://www.scag.ca.gov/goodsmove/pdf/FinalElasticityReport0905rev1105.pdf.

SCAG subsequently sponsored a Phase II of this study. In Phase II, the data and assumptions of the model were refined, and capability was added to conduct “short-run” elasticity analyses whereby container flow times through ports and landside channels are endogenous to the model. In predicting port and modal shares, the short-run analysis accounts for congestion associated with potential shifts in port and modal allocations of imports utilizing fixed levels of port and channel infrastructure.

This document is the Final Report for Phase II. Phase II included the following work elements:

- Outreach to stakeholders concerning findings of the 2005 Elasticity Study (discussed above) and concerning Phase II elasticity research.

- Outreach to stakeholders concerning findings of a 2005 Southern California main-line rail capacity analysis performed by the author. That study also may be down-loaded from the SCAG web site at

http://www.scag.ca.gov/goodsmove/pdf/InlandEmpireRailStudyFinalReport.pdf .

- Updating data and trends concerning port and landside channel shares of Asia – USA waterborne containerized trade volumes. These data are not used in elasticity calculations, but serve as reference statistics about current practice for comparison to results from analytical models.

- Updating the distribution of waterborne containerized imports from Asia to the United States by commodity and value. These are important inputs to the elasticity analysis.

- Updating data concerning the transportation and handling costs for Asia – USA waterborne containerized imports. These also are important inputs to the elasticity analysis. Data on the size and composition of the fleet of domestic equipment for trans-loading imports also was updated.

- Assessment of the impacts of port contracts and of carrier and terminal operating strategies on the short-run elasticity of containerized imports from Asia to the United States. The assessment of these impacts helped to shape the development of the short-run elasticity analysis, as well as to understand limitations of the model.

- Development of analytical queuing formulas that predict container flow times as a function of congestion in port and landside rail channels. The collection of these formulas is termed the Queuing Model. It is the key new analytical development enabling short-run elasticity analysis. Supporting these analytical formulas, a new database of port terminal and rail intermodal terminal infrastructure was developed, as well as a new database of trackage configuration of the rail line-haul network and traffic levels on the network.

- Development of a Short-Run Elasticity Model for predicting flows of waterborne containerized imports from Asia to the United States through North American ports and landside channels. This Model encompasses the previously-developed Long-Run Elasticity Model, linked to the above-mentioned Queuing Model. The intent of this model is to assess the elasticity of imports to potential container fees passing through selected ports or landside channels assuming fixed rail line infrastructure and fixed port and rail terminal infrastructure with fixed staffing schedules for those terminals.

Outreach to Stakeholders

During the period June 1, 2006 through July 30, 2008, meetings were held with railroads, port terminal operators, ports, third party logistics firms, dray and trucking companies, and major importers. The general feedback received from these stakeholders may be summarized as follows: All stakeholders were grateful for the “big-picture” insights developed in the elasticity study. A typical remark: “I am glad somebody is able to look at the big picture.” Most stakeholders wanted to learn more about the study. All were encouraging of continuing studies, and most were willing to provide data in support of continuing studies. None were willing to express official support for infrastructure improvements funded by user fees.

Additional stakeholder outreach meetings were held during the period October 2009 to June 2010 with the San Pedro Bay ports, the Alameda Corridor Transportation Authority, the BNSF and UP railroads, port terminal operators, dray and trucking companies, and major importers. Their comments and feedback are reflected in this report.

As to the main line rail capacity study, all stakeholders expressed the view that plans proposed by the study are beyond their planning horizons, typically one to five years, in contrast to the five- to twenty-year horizons in the capacity study. For the near-term (2010) plans of the study, there was general acceptance, but a few objections were expressed. BNSF and Metrolink felt that a separation of Colton Crossing was required by 2010. In contrast, the consultant found that a separation is not required for the 2010 forecasts of rail traffic (assuming the BNSF main line is upgraded to have three main tracks at the crossing), but such a separation is required at higher traffic levels and was therefore included in the 2025 statement of requirements.

Updated Port and Model Shares of Trade Volumes

An extract of customs data for year 2005 in the PIERS database was provided to the author by MARAD. These data specify for each US port the total volumes of imports and exports (measured in twenty-foot equivalent units, or TEUs). Other important data sources examined by the author include 2005 and 2006 volumes reported by West Coast ports and by the Pacific Maritime Association, 2005 and 2006 volumes reported by the Intermodal Association of North America (IANA), and the vessel strings serving Asia – USA trade as reported by the steamship lines. The important trends that were observed are as follows.

The share of total Asia - USA imports handled by West Coast ports continued to decrease during the period 2003 - 2005, but the rate of decrease slowed considerably from previous years. Considering all waterborne containerized imports from Asia to the USA passing through US ports, in 2005, 74.5 % of total TEUs Asia – USA came through West Coast ports, compared to 76.6% in 2003. The distribution of total Asia - USA vessel strings by first port of call exhibits a similar trend.

The share of waterborne containerized imports from Asia to the USA passing through West Coast ports whose landside movement was handled by rail intermodal was steady over the period 2002 - 2006, averaging 46%. However, the shares at various West Coast ports fluctuated significantly. During 2005, the percentage of marine containers entering through Pacific Northwest ports that got on a train increased sharply, but then decreased sharply in 2006. The percentage for the San Pedro Bay ports declined during 2005 but then increased in 2006. In 2006, the figures for the Pacific Northwest ports and the San Pedro Bay ports were 70% and 40%, respectively.

It is believed that these fluctuations are primarily due to two factors. First, the steamship lines shifted certain vessel strings from San Pedro Bay to Puget Sound for the 2005 season, evidently in response to the summer, 2004 “melt-down” at the San Pedro Bay ports. After an uneventful 2005 season at San Pedro Bay, these vessel strings were shifted back to San Pedro Bay for the 2006 season. Also in the 2006 season, several new vessel strings serving San Pedro Bay using very large new vessels were introduced. Second, the allocation across ports of entry by imports warehoused in the hinterlands of ports of entry and then re-shipped to demand points in domestic vehicles has diversified. Port of entry for certain products that formerly were mostly or fully imported through San Pedro Bay and trans-loaded to domestic vehicles in Southern California became distributed across several ports. For example, most large, nation-wide “big-box” retailers practice a “Four Corners” policy, using two West Coast ports and two East Coast ports, each serving a quarter of the continental United States (and providing back-up supply to other quarters as required), or similar policies involving 3 or 5 ports. This has resulted in a net percentage increase in trans-loading activity at the Pacific Northwest ports and certain East Coast ports and a net percentage decrease at the San Pedro Bay ports.

The reasons for the shift from the trans-loading-all-at-San-Pedro-Bay strategy to multiple-port-trans-loading strategies are multiple, but two reasons stand out. First, with the introduction of PierPass in Southern California and the introduction of trans-loading facilities in the Sumner-Puyallup area relatively close to the Puget Sound ports, dray costs faced by trans-loading importers are significantly less in the Pacific Northwest. Second, goods that used to be imported by the manufacturer/wholesaler to a warehouse in Southern California and then re-sold to US retailers are increasingly purchased in Asia from the manufacturer/wholesaler by large “big-box” retailers. The large retailers import the goods themselves using “Four Corners” or similar policies.

Combining data from multiple sources, the following break-down of 2006 containerized imports through the San Pedro Bay ports was estimated: 21% was “local” traffic, i.e., imports consumed in Southern California, Southern Nevada, Arizona, New Mexico, Southern Utah or Southern Colorado; 43% was kept in the marine box and placed on a double-stack train destined east of the Rockies (this is known as inland-point-intermodal or “IPI” volume); and the remaining 36% was either (a) unloaded from marine boxes in the local region at a warehouse or trans-loading facility, re-loaded in domestic vehicles (truck or rail) and re-shipped for consumption outside the local region, or (b) kept in a marine box that was trucked outside the above-defined “local” region. The (b) part of the 36% category is believed to be very small. Thus the amounts of traffic in IPI and trans-loading categories at San Pedro Bay are roughly equal, and each is about double the local traffic. For the West Coast as a whole, “local” traffic was about 30% in 2006; IPI traffic was about 46%; and trans-loading/long-distance trucking was about 24%.

Since 2006, the SPB ports have lost some market share. The breakdown of 2008 containerized imports through the San Pedro Bay ports is estimated as 23% local region traffic, 41% IPI, and 36% trans-load to domestic containers or trailers for re-shipment out of the region plus out-of-region trucking of marine boxes.

Updated Distributions of Imports by Commodity and Value

Summaries of Customs data for year 2005 compiled by the Port Import Export Reporting Services (PIERS) and World Trade Atlas (WTA) data subscription services were provided to the author by the Port of Long Beach. These databases classify imports into 99 commodity types. The PIERS data provides volumes by commodity type (expressed in twenty-foot equivalent units, or TEUs). The WTA data provides total dollars of declared values in each commodity code. The PIERS data furnished to the author spans all waterborne containerized imports from Asia to the United States passing through West Coast ports. The World Trade Atlas data provides summaries by West Coast, East Coast and all USA ports. In addition, the U.S. Dept. of Transportation Maritime Administration (MARAD) provided the author with PIERS total volumes by port for Asian imports in 2005, but no break-out by commodity type. These data enabled the author to make estimates at the nation-wide level for volumes and declared values per cubic foot by commodity type.

The author previously performed a similar analysis on 2003 Customs data for the 2005 report. Trends 2003 to 2005 in the distributions by commodity and value were therefore assessed.

Generally, the distribution of declared values for Asia – USA waterborne containerized imports showed little change from 2003 to 2005. The average declared value per cubic foot of container capacity for these imports rose from $21.47 in 2003 to $21.66 in 2005. Declared values of Asian imports routed via West Coast ports are in aggregate greater than those routed via East and Gulf Coast ports; in 2005, the average declared value via West Coast ports was $22.66, while it was $18.57 via East and Gulf Coast ports. Again, this difference is little changed from that for 2003.

It is convenient to classify imports as inexpensive (less than $13 per cubic foot of container capacity), moderate (between $13 and $26 per cubic foot), and expensive (more than $26 per cubic foot). In 2005, about 25% of imports were inexpensive, 50% were of moderate value, and 25% were expensive. Compared to the 2003 distribution, the “tails” of the 2005 distribution spread out a bit, i.e., inexpensive goods became a bit cheaper and expensive goods became a bit more expensive, but the price-points for the 25-50-25 split of the distribution in 2005 remained basically unchanged from those for 2003.

To the author, this was a somewhat surprising result. During the period 2003 – 2005, energy and transportation costs rose and there were upward pressures on Asian currencies. But anecdotal evidence received from importers indicates there was an increase in the number of competitive suppliers in Asia for production of certain goods. The net overall effect was to leave the value distribution largely unchanged. It remains to be seen if, in future years, currency revaluations and rising energy and transportation costs shift upwards the value distribution curve for Asian imports.

Updated Transportation and Handling Costs

Transportation and handling costs for containerized imports from Asia to the United States were updated to levels prevailing in April, 2007. The availability of domestic containers for trans-loading imports out of marine containers for furtherance in domestic vehicles also was updated.

For the purposes of elasticity studies, the continental United States is subdivided into 21 regions. Costs to ship imports from the ports of Shenzen, Yantian and Chiwan in mainland China to selected single destinations within each region were researched. Costs to importers for routing imports via ten alternative North American ports of entry were developed. For each port of entry and each destination, rates were developed for two alternative supply-chain channels: (1) shipping marine containers direct from China to regional destinations, and (2) shipping marine containers to trans-loading warehouses in the hinterlands of the ports of entry, thence re-loading the imports in either domestic rail containers or domestic trailers for re-shipping from trans-loading warehouses to regional destinations.

Rate quotations to various importers from steamship lines, non-vessel-operating common carriers, intermodal marketing companies, trans-loading warehouse operators, and trucking companies were secured by the author. Considerable variation in rates from carrier to carrier and customer to customer was encountered. Average rates were developed from a basket of rates for each channel.

The great majority of waterborne containerized imports from Asia to the United States are “cube” freight rather than “weight” freight, in the sense that vehicles reach cubic capacity limits before weight limits are reached. Because of the disparity in vehicle size, it is convenient to normalize transportation and handling costs on a per-cubic-foot-of-imports basis. Roughly speaking, the contents of three high-cube 40-foot marine boxes fit in two 53-foot domestic vehicles, assuming the imports are “cube” freight rather than “weight” freight. In general, use of the trans-loading channels requires a $0.00 to $0.20 premium per cubic foot of imports in transportation and handling charges, compared to direct shipping. These extra transportation costs must be traded off against potential inventory savings afforded by pooling shipments to multiple regional destinations over the segment of the supply chain between Asia and the trans-loading warehouse. For high-value goods, such consolidation – de-consolidation supply-chain strategies are attractive; for low-value goods, they are not.

The viability of consolidation – de-consolidation supply-chain strategies depends upon an adequate supply of domestic equipment. It was confirmed by the author that the aggregate cubic capacity of domestic containers is continuing to grow at a rate comparable to the growth in imports. Considering the increased outsourcing of manufacturing from the United States to Asia (and hence declining volumes of domestic freight), this means there is sufficient equipment to expand the level of trans-loading activity. Looking ahead, a concern for the attractiveness of the trans-loading strategy is that decreased westbound domestic traffic from the US Midwest to the West Coast will lead to increased westbound empty movement of domestic vehicles and upward pressure on the eastbound domestic rates used by trans-loading importers.

Impact of Contracts and of Terminal and Carrier Operating Strategies

Steamship lines enter into long-term (10-30 year) contracts with ports. Many of these contracts involve fixed payments and/or volume incentives. Some offer incentives for rail intermodal movement of the marine containers (as opposed to placement of containers on truck chasses). These contracts limit or delay the flexibility of steamship lines in restructuring their vessel strings or their strategies for which port to off-load cargoes destined to inland points. The Short-Run Elasticity Model does not directly treat such constraints, but it admits them. In making a model run, the user may input required minimum import volumes for the ports that are respected in model calculations.

Steamship lines typically enter into contracts with a single western railroad (either BNSF or UP) to support their inland-point intermodal (IPI) services. Before 2006, these were typically long-term (8-10 year) contracts at favorable rates. All the more recent contracts have been year-to-year at 25-40% higher rates. Because some lines still enjoy legacy long-term contracts at discount rates while others pay the new higher rates, there have recent major shifts in market shares of the steamship lines, and this in turn has resulted in shifts in market shares between railroads, and, to a lesser extent, between ports (the latter because of the long-term contracts described above). Because the Short-Run Elasticity Model is based on averages of a basket of rate quotations, it ignores differences between lines. The last of the legacy discount contracts is set to expire in 2011, so hopefully this is only a temporary shortcoming of the model.

Major customers of steamship lines enter into contracts each spring for shipping over the subsequent one-year period May-to-May. Lines and major importers are loathe to make major adjustments to vessel service and supply-chain strategies, respectively, except at the May start of the annual shipping season. Thus changes predicted by model calculations may take some time for the industry to implement.

Before 2006, West Coast ports had major imbalances in the counts of inbound and outbound containers. The San Pedro Bay Ports had a surplus of inbound containers, while Oakland and the Puget Sound Ports had a surplus of outbound containers. Beginning in 2006 the railroads changed the terms of their rates and charges for major steamship line customers. Under the new terms, if a line’s inbound and outbound traffic to a West Coast port area is out of balance, major penalties are imposed. (The port areas for which this individually applies are San Pedro Bay, Oakland and Puget Sound.) As a result, container flows in and out of West Coast ports are much more in balance. In particular, there are more empty containers and export loads handled through the San Pedro Bay ports than before. In the Short-Run Elasticity Analysis Model, we only study imports and ignore issues of imbalance in returning westbound containers. This was an important issue among West Coast ports before flows were balanced at each port, but now that they are, it is anticipated that this balance will persist.

Before 2005, the gate at most West Coast port terminals was open one shift per day or perhaps two. After the institution of the PierPass program, a number of terminals on San Pedro Bay began night-shift operations, and growth of this practice has continued. This has a significant positive impact on terminal capacity and container flow times. In the Short-Run Elasticity Model, we explicitly account for the number of shifts per day terminals are operated.

A common practice among steamship lines when unloading vessels is to give preference to IPI containers over most containers that will exit the terminal on a truck chassis. Thus IPI containers and containers for local delivery have differing flow time statistics. These differences are accounted for in the Short-Run Elasticity Model.

Some large importers have negotiated contracts with steamship lines allowing them extra time to pick up inbound loaded containers before demurrage is assessed. In effect, the port terminal is used as a storage area by the importer. We ignore such phenomena in the Short-Run Elasticity Model.

Transit times for domestic-container intermodal trains tend to be shorter and more reliable than transit times for marine-container intermodal trains. We account for such differences in the Short-Run Elasticity Model.

Development of Queuing Formulas to Predict Container Flow Times

Analytical queuing formulas were developed for estimating import container flow times through port terminals, rail intermodal terminals and rail line-haul channels as a function of traffic volumes, infrastructure and staffing. Queuing theory is an area of Operations Research pioneered by English researchers in the 1950s with continuing development by American and international researchers up to the present day. Analytical formulas have been developed in this research expressing the expected or average time customers wait in a service system, as well as the total time spent in the system (i.e., wait time plus service time). In this report, queuing-theoretic formulas are developed to model container flow times through port terminals, rail intermodal terminals and rail line-haul channels. The queuing-theoretic formulas express waiting time as a non-linear function of utilization and the number of parallel servers. As utilization is increased, waiting time increases exponentially. For a fixed utilization, the waiting time can be mitigated by increasing the number parallel servers (e.g., more lift crews in an intermodal terminal or more tracks on a rail line).

The queuing formulas developed for each of the three types of applications (port terminals, rail terminals, rail line hauls) were statistically fitted to 2006 industry data to provide models of container flow time as a function of parameters for traffic volume, infrastructure (e.g., terminal acreage, number of rail main tracks), staffing, and hours of operation. The analyst may employ these models to calculate predictions of changes in container flow time as a function of changes in the parameters.

The formula developed for flow time through port terminals is as follows:

$$CT = 0.31 * \left(\frac{u^{\sqrt{2(m+1)}-1}}{m(1-u)} \right) + 2.3 \qquad \text{(S1)}$$

where *CT* denotes the average cycle time (in days) for imported containers, measured from ship arrival until truck departure out the gate or until release of double-stack train for pick-up by the railroad. The parameter *m* measures the number of loading crews working in parallel placing containers onto truck chasses or into railroad double-stack well cars. The parameter *u* measures the utilization of the loading crews and working space at the terminal, defined as the number of import containers handled per acre per crew-shift, divided by 4.

The formula developed for container flow times at rail intermodal terminals is similar in structure:

$$CT = 0.365 * \left(\frac{u^{\sqrt{2(m+1)}-1}}{m(1-u)} \right) + 0.334 \qquad \text{(S2)}$$

where *CT* expresses the average time (in days) from truck entry of the gate of the terminal until departure of the intermodal train. The parameter *m* expresses the number of parallel loading crews while the parameter *u* expresses the utilization of loading crews and working space at the terminal, defined as the total number of lifts (both inbound and outbound) per acre per loading crew-shift, divided by 4.

Data also was furnished by the railroads concerning 2006 average dwell times at West Coast on-dock terminals from completion of loading of double-stack trains by the port terminal until departure of the train. A weighted average of these data is 7.1 hours.

The development of a queuing-theoretic mathematical model to estimate intermodal line-haul transit times (from departure at origin terminal until arrival at destination terminal) is summarized as follows. Data supplied by the railroads for rail corridors from West Coast terminals (Seattle, Tacoma, Oakland, Los Angeles – Long Beach) to major Midwest destinations (Chicago, Minneapolis, Kansas City, Dallas and Houston) were analyzed by the author. It was necessary to apply the queuing-theoretic formulas to individual segments of each of these rail corridors, whereby each corridor was broken down into segments with constant numbers of main tracks and approximately uniform through-train frequencies. Separate models were calibrated for transit times of international intermodal trains and for transit times of domestic intermodal trains. The inputs to the models include the following:

- Distance, speed, no. of main tracks for each segment of each route
- Average no. of through train movements per day on each segment
- No. of crew changes and no. of locomotive refueling stops on each route
- Extra running time for a train stopped in a siding to pass an opposing movement on single track

The mathematical form of the model is quite involved; it is not practical to present it in this executive summary. The interested reader is invited to review the body of this report for complete details. The parameters of the model were fit statistically to 2006 data provided by BNSF and Union Pacific railroads. The output of the model is the expected (statistical average) transit times for domestic and international intermodal trains. A database of the main-track configurations of the rail corridors, as of late 2006, was developed by the consultant and is included as an Appendix of this report.

The Short-Run Elasticity Model

A particular desired enhancement to the elasticity analysis concerned the capability to perform a “short-run” elasticity analysis. In a short-run analysis, port and landside infrastructure, staffing levels and operating schedules are pre-specified inputs to the analysis, in lieu of pre-specifying statistics on container flow times. In a short-run analysis, container flow times by port and channel are calculated by the model as a function of traffic levels. The results of a short-run analysis predict changes in import flows resulting from the imposition of a container fee assuming no changes in port and channel infrastructure or in staffing levels and operating schedules of the infrastructure. This assumption contrasts with the underlying assumption of the Long-Run Model, which assumes that infrastructure at other ports and channels serving those ports would be expanded as necessary to maintain current container flow times for increased shares of imports routed through those ports and channels.

In Phase II the consultant updated the database of import distributions by region, importer, commodity and value, as well as the database of transportation rates. A new database was developed concerning the existing infrastructure and staffing levels of port terminals, rail terminals, and the trackage configuration of the intermodal rail line-haul network. New analytic queuing formulas were developed by the consultant that predict container flow times through port terminals, rail intermodal terminals and rail line-haul movement as a function of import volume. These formulas were statistically calibrated to data supplied by port terminal operators and the railroads. The collection of these queuing formulas is termed the Queuing Model.

The Long-Run Elasticity Model developed by the author in Phase I was upgraded in Phase II and is now termed the Supply-Chain Optimization Model. Working importer by importer, the Supply-Chain Optimization Model determines the least-cost supply chain strategy for each importer, in terms of ports and landside channels to be used, where costs considered include costs for transportation and handling, container fees, pipeline inventory, and safety-stock inventory at destination regional distribution centers. The consequent import volumes by port and channel for all importers are tallied by the model to deduce the overall distribution of import flows.

The Short-Run Elasticity Model is an outgrowth of this Long-Run Elasticity Model. It consists of the Supply-Chain Optimization Model and the Queuing Model working in tandem. Iterative supply-chain optimization and queuing calculations are made within the Short-Run Model. Starting with initial estimates of container flow times, the Supply Chain Optimization Model selects supply-chain strategies for importers and tallies volumes through ports and channels. The Queuing Model takes those volumes as input and updates container flow times. Updated flow times are fed back to the Supply-Chain Optimization Model which in turn re-selects supply-chain strategies, and so on. After a series of iterations, the Short-Run Model converges to a stable set of import flows and reports the result. In all test applications to date, an equilibrium solution has been reached within ten iterations.

The Short-Run Elasticity Model calculates import volumes by port and landside channel as a function of given infrastructure and operating hours for port and rail terminals, given trackage configurations of the rail network and given levels of non-import rail traffic, given transportation rates, given contractual volume requirements at ports, given import volumes and a given value distribution for those imports. Like the Long-Run Elasticity Model developed before it, the Short-Run Model assumes a given distribution of imports among 83 large, nation-wide importers and 19 generic importers acting as proxies for small and regional importers, tailored to match the overall declared-value distribution of imports reflected in customs data. The continental United States is divided into 21 regions, with the entire import demand for each region concentrated at a single location. The geographical distribution of import destinations is assumed to be the same for all importers. At present, this distribution is set to be proportional to purchasing power in the regions, but other distributions could be input to the model. At present, eleven alternative ports of entry in Canada, the United States and Mexico are considered. Like the Long-Run Model, the Short-Run Model performs the Supply-Chain Optimization calculations to select the least-cost supply-chain strategy for each type of importer, considering total transportation and inventory costs borne by the importer.

The intent of the Long-Run Model is to assess the wisdom of potential long-term investments in port and landside transportation infrastructure, as well as to assess the impact of user fees to recover costs of such improvements. In the Long-Run Model, container flow times by channel are fixed, reflecting an assumption that over the long term the various ports and transportation carriers would make investments to maintain existing service quality and thereby protect market share. This conservative assumption is suitable for assessing the merits of potential investments with 25-50-year payback periods, as the intent is to evaluate potential investments assuming competing ports and competing channels may make the necessary investments to maintain their current service quality in the face of growing volume or growing competition.

In contrast, the Short-Run Model assumes the infrastructure of the entire transportation network is pre-specified and fixed.[7] It also observes minimum volumes that must be channeled through various ports, reflecting the requirements of prevailing contracts. Container flow times are endogenous to the Short-Run Model, responding to congestion (or lack thereof) in various ports and channels. The Short-Run Model is thus useful for projecting more near-term responses of importers to changes in fees, rates or infrastructure.

Tandem calculations of the two models provide a range for the diversion of import cargoes resulting from imposition of container fees. A conservative, short-term estimate stems from the short-run calculation, while a liberal, long-run-potential estimate stems from the long-run calculation. The Models may be used to predict changes in import traffic flows in response to not just potential fess, but also to changes in port and rail terminal infrastructure, staffing or operating hours; changes in rail network configuration or non-import traffic levels; changes in transportation rates; changes in the distribution of imports by value and by importer type; changes in the geographical distribution of import destinations; or changes in overall import volumes.

[7] Although the infrastructure and operating schedules input to the model need not be the same as current actual conditions, i.e., future scenarios can be analyzed.

Elasticity Analyses

Applications of the Long-Run and Short-Run Models were made to analyze hypothetical user fees at the San Pedro Bay ports in several scenarios, including a 2007 Base Case, a Near-term Likely scenario, an Optimistic I scenario (in which all-water rates rise by 10%), and Optimistic II scenario (in which the share of total imports for large, nation-wide importers rises from 40% to 50%), and a Pessimistic scenario (in which all-water rates fall by 10%).

Potential container fees in increments of $50 per FEU up to $500 per FEU were tested in model runs, and changes in the distribution of import flows were observed.

The Base Case scenario has the following features: 2006 total volume of Asia – USA waterborne containerized imports, 2005 distribution by declared value, 2007 transportation and handling rates, and mid-2006 infrastructure at ports and in landside channels. Large, nation-wide importers with average declared values for imports as specified in the consultant's Phase I (2005) report are assumed to have a 40% share of total imports. This Base Case represents the consultant's best estimate of conditions prevailing in 2007. Solutions of the Short and Long-Run Models for the Base Case Scenario match actual import flows in 2006-2007 very well.

The four future scenarios incorporate the same total volume of imports and the same distribution of imports by declared values as in Base Case Scenario, but vary assumptions about the evolutions of rail and steamship line rates and about future terminal infrastructure and staffing. One near-term future scenario, termed the Near-term Likely Scenario, and three longer-term future scenarios were formulated.

In terms of infrastructure, the Near-term Likely scenario is the same as the Base Case Scenario except a domestic intermodal rail terminal that was opened in 2009 at the Port of Tacoma is included in the scenario. Compared to the Base Case, significant adjustments were made to rail rates in this scenario: (1) Domestic rail container rates were adjusted to reduce the gap between rates via West Coast ports for inland point intermodal (IPI) movement of marine boxes and rates for reshipment in domestic rail containers after trans-loading. The gap was reduced by $0.10 per cubic foot of imported goods to Eastern destinations and by $0.05 per cubic foot to Midwestern destinations. (2) IPI and domestic container rail rates via San Pedro Bay Ports were adjusted to be more competitive with other USA West Coast ports to all Midwestern and Eastern destinations except Minneapolis. (Seattle-Tacoma has a rate advantage for imports destined to the Minneapolis region that is retained in this scenario.) After the adjustments described in (1), the total transportation and handling cost per cubic foot for the trans-loading channels via West Coast ports are $0.00 - $0.12 more per cubic foot than direct inland movement of marine boxes using IPI service, depending on the destination region. The rationale for (1) is that the gap between domestic-box and marine-box rail rates widened considerably during the period 2004 – 2008 because of fuel recovery surcharges placed on domestic rates while no fuel recovery surcharges were placed on the international "all-in" IPI rates.

Moreover, enough steamship lines continued to enjoy long-term legacy contract rates from railroads so as to keep IPI rates low. As the legacy contracts expire, the lines are forced into shorter-term contracts for IPI service from the railroads that feature steep rate increases, ranging 25% - 40%. The last of the legacy contracts will expire in 2011. Finally, the decline of the domestic economy has made the supply of domestic rail containers plentiful and placed downward pressure on domestic rates. The rationale for (2) is as follows: The 2007 rail rate quotations secured by the consultant favor Pacific Northwest ports over Southern California ports to a number of destinations. This made sense, perhaps, at a time when rail lines serving Southern California were more congested than lines serving the other West Coast ports, and when westbound was the head-haul direction for domestic boxes to/from the Pacific Northwest while eastbound was the head-haul direction to/from California. Starting in 2006 and continuing to the present, the railroads have made large investments to double-track their transcontinental main lines serving Southern California. The consultant expects the railroads to adjust their rates so as to insure utilization of that investment in lieu of encouraging traffic to use other West Coast ports served by rail lines with less capacity. The consultant believes this scenario is likely in the near term.

Beyond the near-term, it is difficult to forecast transportation rates and services and the shares of imports by large, nation-wide importers vs. small, regional ones. Accordingly, the consultant prepared several alternative scenarios illustrating the range of outcomes that are plausible. One crucial variable is what will happen to so-called “all-water” rates charged by steamship lines for container shipment via the Panama Canal to East and Gulf Coast ports. An optimistic scenario tested by the consultant features such rates rising by 10%. A pessimistic scenario features such rates falling by 10%. Another crucial variable concerns the share of total imports in the hands of large, nation-wide importers vs. that in the hands of small and regional importers. Accordingly, another optimistic scenario is formulated in which the total import share in the hands of large, nation-wide importers rises from 40% to 50%. A final important variable concerns the available terminal capacity and crew-shifts at port and rail terminals serving the various West Coast ports. Accordingly, the optimistic scenarios assume the BNSF railroad’s proposed Southern California Intermodal Gateway (SCIG) terminal is opened. The pessimistic scenario features increased terminal capacity at other West Coast ports but no increase at San Pedro Bay ports. Summary descriptions of the two optimistic and one pessimistic scenario are as follows:

Optimistic I: Includes all features of the Near-term Likely Scenario. In addition: assumes that the proposed BNSF SCIG rail terminal is opened, all-water steamship line rates via the Panama Canal are raised by 10%, and there are increased crew-shifts at certain Southern California rail terminals.

Optimistic II: Includes all features of the Near-term Likely Scenario. In addition: assumes that the proposed BNSF SCIG rail terminal is opened, the share of total imports for large, nation-wide importers rises to 50%, and there are increased crew-shifts at certain Southern California rail terminals.

Pessimistic: Includes all features of the Base Case Scenario. In addition: assumes all-water steamship rates via the Panama Canal are lowered by 10%, a new domestic intermodal rail terminal that was opened in 2009 at the Port of Tacoma is included, and there are increased crew-shifts of operation at Oakland and Pacific Northwest rail terminals.

For the Base Case Scenario, the Short-Run Elasticity Model predicts the imposition of a $100 per FEU container fee on imports via San Pedro Bay would result in a 10% drop in the market share of the San Pedro Bay Ports. The Long-Run Elasticity Model predicts a 23% drop for the same fee. Most of the diverted volume would move to the Puget Sound and Canadian West Coast ports. The specific amount of traffic loss from the San Pedro Bay ports would depend on the extent to which those ports increase operating hours, crews on duty, and/or acreage of their port terminals. It also would depend on potential responses of the railroads, who might be incentivized to adjust the transportation rates that they charge steamship lines for imports routed via Puget Sound ports vs. rates charged for imports routed via San Pedro Bay.

For the future scenarios, the elasticity results vary widely. In the Near-Term Likely scenario, total imports exceed Zero-Fee Base Case imports up to $100 per FEU in the Short-Run calculation and $75 per FEU in the Long-Run calculation. In Optimistic scenarios, total imports exceed Zero-Fee Base Case imports up to about $125 - $150 per FEU in both the Short-Run and Long-Run calculations. In contrast, in the Pessimistic scenario, total imports via San Pedro Bay fall sharply with fees. For a fee of $200 per FEU, total imports via San Pedro Bay fall by about 30% in the Short-Run calculation and 50% in the Long-Run calculation.

A Long-Run Elasticity calculation also was made of the Near-Term Likely scenario assuming a major program of congestion relief is in place before fees are assessed. This is the same program that was analyzed in the Phase I study. The results are somewhat different this time around. For container fees uniformly assessed on all imports, a fee of $150 per FEU results in the same market share for the San Pedro Bay ports as in the Zero-Fee 2007 Base Case scenario. For higher fees, total market share falls below of the Zero-Fee Base Case. Considering the components of overall imports, the share of IPI imports begins to fall below the Zero-Fee Base Case share once fees greater than $50 per FEU are assessed, while the San Pedro Bay ports' share of imports managed under the trans-load strategies would be higher than in the Zero-Fee Base Case only for fee values up to $200 per forty-foot equivalent unit (FEU).

The contents and conclusions of this report reflect solely the views of the author, and not those of the ports, terminal operators, the railroads, dray and trucking companies, logistics providers, SCAG, DOT, MARAD, or any other agency assisting this study. Although various importers, logistics firms, port terminal operators, Union Pacific and BNSF graciously supplied raw data and qualitative insights aiding the development of the Queuing Model, these parties were not involved in model development, analysis or conclusions; and, therefore, they should not be considered to have endorsed any findings in this report.

2. Outreach to Stakeholders

The consultant met with importers, transportation and logistics service providers, ports, and port and terminal operators. Feedback concerning the methodology and findings of the prior studies was requested, as well as data and guidance for performing the analysis in Phase II. During the period June 1, 2006 through June 30, 2008, meetings were held with the following stakeholders:

Railroads (BNSF and Union Pacific)
Port Terminal Operators (SSA Marine and MTC)
Ports (Tacoma, Seattle, Vancouver, Long Beach, Los Angeles)
Third Party Logistics Firms (Expeditors, Cal Cartage, APL Logistics, NFI National Distribution Centers, American Port Services)
Dray companies and associations (Container Freight EIT, Premier Transport, Washington Trucking Associations)
Major importers (Target, Toys 'R Us, Toyo Tires, Sony)

In addition, presentations were made at stakeholder forums sponsored by the following agencies:

Distribution Managers Association (Southern California Chapter)
SCAG (Goods Movement Task Force)

Appendix A of this report lists the specific stakeholder meetings that were held. The following sections summarize the feedback received by the consultant at those meetings.

2.1. Feedback from Stakeholders – Elasticity Studies

Feedback from Railroads

Both BNSF and Union Pacific expressed anxiety about user fee mechanisms. There is the fear that funds so collected might be diverted to pay for other, unrelated purposes. There is also the fear that fees might not have an appropriate "sunset" provision, or that legislation might be enacted extending fees indefinitely, i.e., the charges might continue even after the infrastructure bonds are retired, again resulting in funds diverted to pay for unrelated or unapproved purposes. They expressed concern that there is the prospect of this in the case of the Alameda Corridor fees.[8]

Some railroad managers expressed skepticism of continued growth in market share for imports trans-loaded at West Coast ports. They have experienced strong demand for intermodal movement of marine boxes to new inland distribution centers such as at Logistics Park, IL.

[8] In fact, there is a sunset provision in the case of the Alameda Corridor.

Feedback from Ports

The Port of Long Beach has been extremely helpful with data for the elasticity study, sharing Customs data secured under their subscriptions to PIERS and the World Trade Atlas. A meeting was held with Long Beach staff who explained the terms of port leases and operating agreements. Long Beach staff also provided the consultant with statistics they collected concerning the fraction of imported marine boxes moving inland on rail.

The Pacific Northwest ports were envious of the analyses the Ports of Long Beach and Los Angeles have received from the SCAG studies. They would like similar analyses performed for potential improvements in the access infrastructure to their ports.

The Port of Vancouver explained that imports to the USA via Canadian ports are practical in the case of direct shipping of marine containers. The marine boxes may move in bond from the Canadian port to the USA border, so that Canadian duties do not need to be paid by importers. Trans-loading of imports destined to the USA also can avoid Canadian duties if the entire contents of the marine boxes are going to the USA and if the trans-loading is carried out in a bonded warehouse. But de-consolidation and trans-loading at a third-party or importer-owned facility cannot avoid Canadian duties. And if inventory is to be held in Canada for some time and its final destination is not yet known, or if the contents of the marine box have mixed US and Canadian destinations, again Canadian duties on the entire contents cannot be avoided. Thus, it is uneconomic for importers to develop supply chains involving de-consolidation for the USA market using a Canadian port. Large importers distributing across both USA and Canada are forced to maintain separate supply chains for the Canadian and American markets. This is inefficient for them; typically, the Canadian market is one tenth the size of the USA market.

Feedback from Port Terminal Operators

Port terminal operators explained that the throughput capability of port terminals is determined by available acreage, staffing hours and staffing levels. If more working shifts are added and more space is provided, then more volume can be handled. If space is available, the port terminal operators believe existing port terminals have the capability to handle much more volume. They simply add more shifts when volume requires it (presuming they can obtain the workers).

Both SSA Marine and MTC, Inc. provided the consultant with statistical data on container dwell time vs. terminal utilization.

Feedback from Third-Party Logistics Providers

Third-party logistics providers observed a sharp up-tick in trans-loaded volumes in the spring of 2006 after rate increases were announced for direct inland shipping of marine boxes. They expect the trans-loaded market share to continue to improve. They note that railroads now have pricing power they did not have before. As long-term contracts with steamship lines for inland movement of marine boxes expire, the railroads are sharply raising the rates and demanding short contract durations (e.g., 1 year). Some lines experienced 30-40% rate increases from the railroads in the last couple of years. This is driving more import volume towards trans-loading strategies.

The primary opportunity area for increased trans-loaded volumes concerns cases where imports by a wholesaler are sold "on the water" to retailers, and the goods are trans-loaded into shipments to retailers from a de-consolidation warehouse in the hinterland of the port of entry. "The big-box-store companies already finished their transition to de-consolidation import strategies. Now the forefront of activity concerns integration of wholesaler and retailer supply chains by using de-consolidation in the hinterland of the port of entry and elimination of stationary inventory."

Another area of trans-loading growth concerns importers with a mixture of "weight freight" and "cube freight", such as a merchant of home improvement products (nuts and bolts are weight freight while furniture and cabinetry are cube freight). By suitably mixing weight freight and cube freight at a de-consolidation center, landside transport costs can be significantly reduced.

Trans-loading and de-consolidation is growing rapidly at the Pacific Northwest ports.

Feedback from Dray Companies

Driver shortages are a great challenge, yet dray companies still are not paid well. In Southern California, some importers and dray companies have organized to conduct all operations in and out of the port terminals at night to avoid the PierPass fee. In the Pacific Northwest, there has been considerable growth of trans-loading and de-consolidation facilities in Sumner, Puyallup and other municipalities in the Kent Valley. Dray operators report that they are often able to complete four import box movements from the Port of Tacoma to these de-consolidation facilities within a single driver shift.

Feedback from Large Importers

After the Summer, 2004 "meltdown" at the San Pedro Bay ports, a number of importers chose to diversify their supply chains. Most operating on a nation-wide scale with sufficient volume for de-consolidation strategies (e.g., the bog-box retailers) now practice a "four corners" strategy whereby nation-wide imports are allocated among four ports of entry, and then de-consolidation is carried out at each port of entry.[9] Thus, distribution in Southern California has evolved from distributing nation-wide to more focus on distributing for consumption only in the Southwest. The number of firms practicing de-

[9] Some importers practice two-corner, three-corner or five-corner strategies, but the basic concept is the same.

consolidation went up, and the total import volume went up, so the total trans-loaded volume through the San Pedro Bay ports did not decrease in spite of the increased adoption of "four corners" supply-chain strategies.

Another aspect of the evolution in supply-chain strategy among "big-box" importers was to erect large "import warehouses" in the hinterlands of the ports of entry selected for de-consolidation. Using "pull system" logic, only imports demanded by regional distribution centers are trans-loaded and shipped immediately, the rest are held in the import warehouse to wait and see where demands materialize. Once demand at a regional distribution center develops sufficiently to make a request to the import warehouse, if that warehouse is out of stock, the other import warehouses (at the other three corners) are checked for stock before a replenishment order is placed with the factory in Asia. Thus there is a nation-wide pooling of inventory, even though it is physically distributed across four import warehouses.

2.2. Feedback from Stakeholders – Capacity Study

Concerning the rail capacity planning study, the primary reaction of the railroads was that the time horizon of the SCAG study is beyond their planning horizon. They have not developed capacity plans within the Los Angeles Basin that far out in time (2025), so it is difficult for them to comment on the plans. Even 2010 is a stretch for them. There was general concern expressed about the difficulty in securing regulatory approval for capacity expansion projects in California compared to elsewhere. Union Pacific commented that they have no near-term plans for capacity expansion in the Los Angeles Basin, their priorities are elsewhere for the next couple of years. BNSF commented that they believed a grade separation of Colton Crossing would be required by 2010, slightly sooner than in the consultant's report. (More discussion of this point is provided below.) They also commented that, though the pooling of Union Pacific and BNSF trackage over Cajon Pass would be beneficial and would push out the need for large capital expenditures, it was not possible for them to negotiate an acceptable deal with Union Pacific. So the BNSF moved forward with building on its own a third main track over Cajon Pass.

Some of the importers were very concerned about potential shortfalls in rail intermodal capacity out of the Los Angeles Basin in particular and out of West Coast ports in general. They asked for a copy of the consultant's long-term capacity plan, and were very glad to receive it. They wondered why the railroads are not planning out to the horizon studied by SCAG. They perceive the growing capacity shortage and declining rail service quality as a serious problem for them.

During the spring of 2005, a number of meetings were held with stakeholders of the main-line rail capacity study. To more fully appreciate the perspectives of the stakeholders, the feedback received in these meetings is included in this report.

The preliminary findings of the rail main-line capacity study were presented to Metrolink and BNSF in Los Angeles on April 25, 2005. (BNSF serves as a strategic partner to Metrolink in planning track capacity for joint passenger and freight operations between Hobart and Colton Crossing.) Generally, improvements within the Los Angeles Basin planned on BNSF Lines by BNSF on behalf of Metrolink and those planned by the SCAG-sponsored study were in agreement. The only exceptions were at Colton Crossing. Metrolink and BNSF are projecting that a grade separation of Colton Crossing will be required by 2010 (whereas the SCAG-sponsored study finds it unnecessary for the 2010 traffic levels but required for higher traffic levels, the 2025 traffic level in particular). Metrolink and BNSF also were planning for a flying junction connection with the UP Yuma Line in 2010 (again not required in the rail main-line capacity study's Status Quo Alternative for 2010, but required in the Status Quo Alternative for 2025). As of the date of that meeting, Metrolink and BNSF had not analyzed traffic levels beyond those forecasted for year 2010.

Given this concern, the consultant retrieved the specific simulation results for Colton Crossing. These results are summarized as follows:

Scenario/Train Type	**Fraction of Trains Stopped**	**Average Delay (minutes)** (including trains not delayed)
2000 Base Case		
UP trains across crossing	31.4%	1.7
BNSF trains across crossing	36.6%	3.1
2010 Status Quo		
UP trains across crossing	63.6%	6.5
BNSF trains across crossing	26.6%	2.0
2010 Alts. to Status Quo		
UP trains across crossing	64.1%	11.2
BNSF trains across crossing	30.1%	2.6

Note that the simulated stoppages of BNSF trains decline slightly in 2010. This is because the BNSF Line is planned to have three main tracks across Colton Crossing in 2010, but it had only two main tracks in the Year 2000 Base Case. Note also that delays at Colton Crossing in 2010 are higher for UP trains and slightly higher for BNSF trains under the Alternatives to the Status Quo than under the Status Quo. This is evidently because of congestion at West Colton backing up along the UP Line to Colton Crossing. (The junction with the UP Palmdale Line at West Colton is planned to remain as is in the 2010 scenarios but is planned become a full flying junction in the 2025 scenarios.)

The consultant's conclusion is that an at-grade crossing at Colton is feasible for the 2010 traffic levels assumed in this study, provided the BNSF Line is equipped with three main tracks. However, this configuration has little capacity to spare. With almost one third of

BNSF trains getting stopped and almost two thirds of UP trains getting stopped at the crossing, the 2010 traffic levels are close to the maximums that can be accommodated without grade separation. So the BNSF – Metrolink proposal to implement the separation in 2010 is not many years early compared to the time when the consultant believes it would be truly required.

A letter dated April 28, 2005 was received from Metrolink indicating that levels of passenger service in 2010 and 2025 different than assumed in the rail main-line capacity study were being evaluated. These levels of service are as follows. (Figures include both Amtrak and Metrolink services. New Metrolink figures are cited first, assumptions of this study are second.)

Line Segment	**2010**	**2025**
BNSF Hobart – Fullerton	72 compared with 96	118 compared with 106
BNSF Atwood – Riverside	42 compared with 38	82 compared with 62
BNSF Riverside – Colton	24 compared with 24	40 compared with 36

Considering the time and budget limitations of the study, the consultant was unable to re-do the operational analysis for these new passenger train frequencies.

A second presentation of the preliminary findings of the rail main-line capacity study was made to BNSF management in Fort Worth, TX on May 5, 2005. This time, the discussion was focused on track capacity improvements between San Bernardino and Barstow (i.e., BNSF main lines outside the Metrolink service territory). BNSF's plans for 2010 call for three main tracks on their line between those points. The SCAG-sponsored study plans for three main tracks Summit – Barstow, but it plans a fourth main track San Bernardino – Summit (Status Quo Alternative), and it plans three main tracks San Bernardino – Summit plus integration of the UP Palmdale Line with the BNSF Line between Devore Road and Silverwood and a fourth main track Silverwood – Summit (Alternatives to the Status Quo). As discussed in Section 7 of the Main-Line Rail report (Leachman [2005b]), while the three-main-track configuration proposed by BNSF is indeed feasible, average freight train running times are predicted to be about 15 minutes longer than in the Year 2000 Base Case. The increased levels of improvements planned in this study are believed to be necessary to achieve Year 2000 transit times for the Year 2010 forecasts. As of the date of that meeting, BNSF had not analyzed 2025 traffic levels.

BNSF management also remarked that productivity improvements they are striving to achieve may temper train movement growth. They indicated that in 2004, BNSF intermodal unit volume (trailers and containers) to and from Southern California increased by about 14%, yet the number of intermodal trains operated increased by less than 4%.

A presentation of the preliminary findings of the Main-Line Rail study was made to UP management in Omaha, NE on May 6, 2005. In general, UP management concurred with the planned improvements. UP indicated that a similar plan had been jointly presented by

UP and BNSF two years ago to MTA, with copy to SCAG. (The consultant has not seen that plan.) UP also indicated that their plans for accommodating 2010 traffic levels call for increasing the percentage of UP train movements routed via the Alhambra Line between Colton and Pomona, and decreasing the percentage routed via the San Gabriel Line. This is consistent with the Alternatives to the Status Quo formulated in the SCAG-sponsored study. Complete double-tracking of the San Gabriel Line between West Riverside and Pomona was seen by UP management as unrealistic, whereas double-tracking the Alhambra Line between West Colton and Pomona was more practical and part of their plan, again consistent with the SCAG-sponsored study. UP management indicated that, in general, making capacity improvements in Southern California is much more difficult than elsewhere on their system, given the environmental reports and other requirements. As a result, no near-term track capacity improvements were planned by UP for the Los Angeles Basin, and their near-term capacity improvement projects were being undertaken elsewhere.

The preliminary findings of the Main-Line Rail study also were presented to SCAG's Goods Movement Task Force on April 20, 2005. In attendance were representatives of the Alameda Corridor – East Joint Powers Authority. ACE representatives remarked that they had approached the Union Pacific with a proposal to buy the former Southern Pacific main line west of Pomona (via Alhambra) and to buy the historical Union Pacific main line between Riverside and Pomona (via Pedley) from Union Pacific in order to make this route an exclusive passenger train route, leaving the former Southern Pacific main line east of Pomona and the historical Union Pacific main line west of Pomona as an exclusive freight route. ACE representatives related that Union Pacific refused this offer. The conclusion of ACE representatives was that efforts to re-route freight and passenger trains as proposed in this study were hopeless, because freight railroad agreement to do so is lacking.

What ACE proposed is roughly like Alternative 1(b) of the study, except much more extreme – mandating completely disjoint freight and passenger ownership and operation of lines. In the consultant's view, the ACE proposal represents too much of a hardship on Union Pacific, as certain freight trains need to run via the lines proposed by ACE for exclusive passenger use, e.g., intermodal trains to/from the City of Industry and the Los Angeles Transportation Center terminals, and carload freights to/from the Coast Line route to Northern California. The consultant believes Alternative 1(b) as presented is still quite viable and in the best interests of all concerned – public agencies, passenger service operators and freight railroads. The reception received by the consultant from Union Pacific is indicative of this.[10]

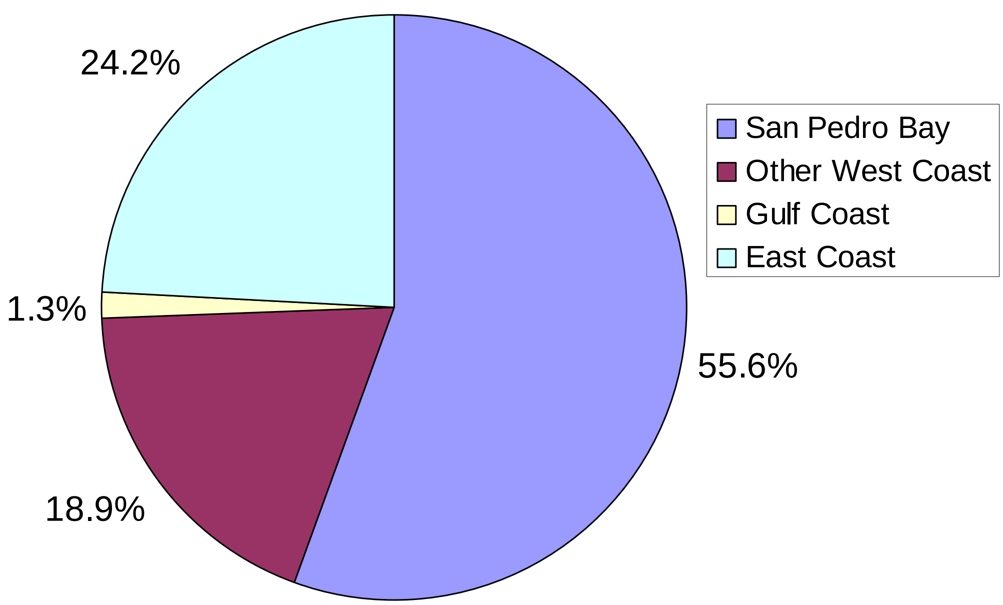
[10] Alternative 1(b) involves shifting all Metrolink operation between Pomona and Los Angeles off the line via East Los Angeles and onto the line via Alhambra. It also involves shifting Union Pacific through freight train operation between Colton and Ponoma off the line via Mira Loma and onto the line via West Colton, except for unit auto trains to/from the Mira Loma auto terminal. This separation of most freight and passenger operations reduces the capital investment requirements for high levels of both passenger and freight traffic as well as increases safety.

3. Port and Modal Shares of Imports

3.1. Port Shares of Containerized Trade Volumes

Figure 1 displays the 2005 shares of waterborne containerized imports from Asia to the USA as a percentage of the total passing through US ports. (Not included in the 100% total are imports from Asia to the USA that passed through Canadian or Mexican ports, and then came into the USA using landside border crossings.) These are figures on a TEU basis. As may be seen, 24.2% came through East Coast ports, 1.3% through Gulf Coast ports, 55.6% through the San Pedro Bay ports, and 18.9% through other West Coast ports.

Figure 1. US Port Shares of 2005 US Containerized Imports from Asia (TEU basis)

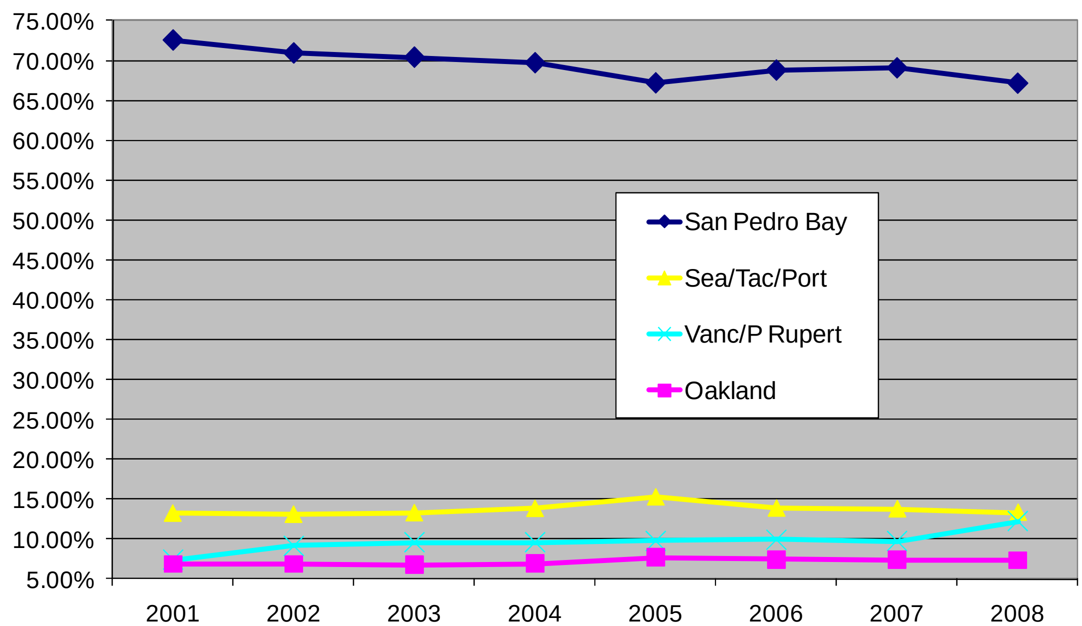


Source: PIERS, courtesy of MARAD

In 2003, the East Coast share was 23.4%; in 2002 it was 21.0%; and in 2001 it was 18.6%. Thus the rate of growth in East Coast share slowed during 2003 – 2005.

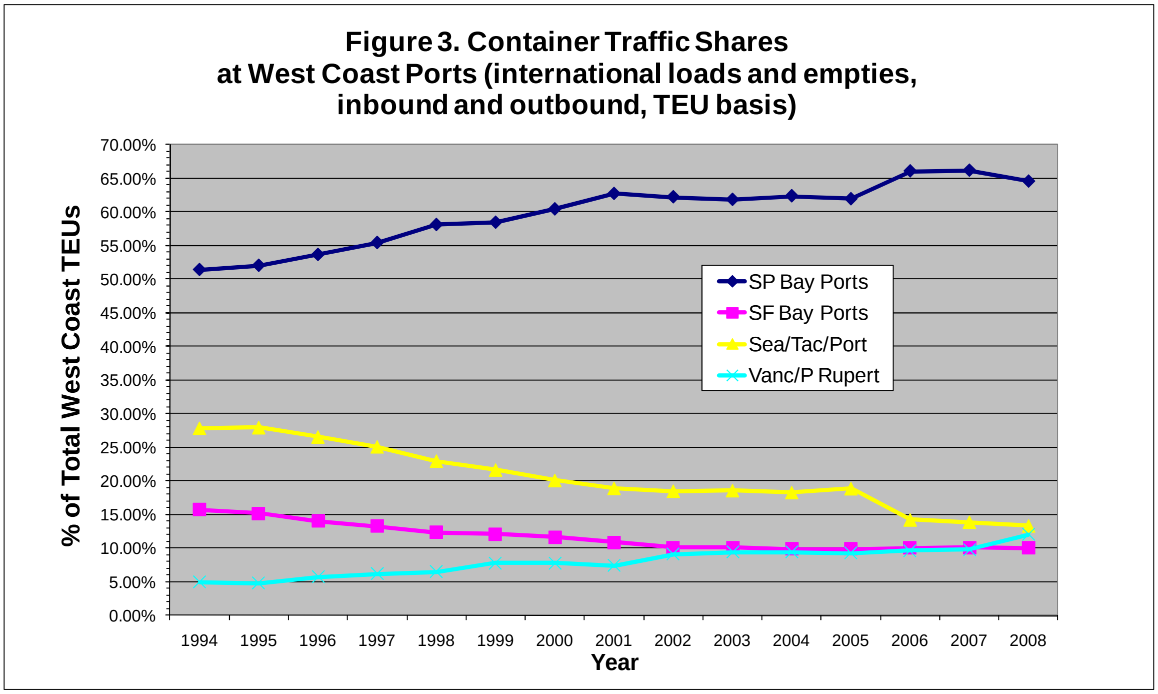
Focusing on West Coast ports, Figure 2 displays the trend in shares of total inbound loaded containers at major West Coast ports. As may be seen, the San Pedro Bay ports dominate other ports by a wide margin. The SPB ports' share has been eroding gradually. It took a sharp drop in 2005 (mostly diverted to the Pacific Northwest ports), then recovered most but not all of this in 2006. It is believed the sharp drop in 2005 reflected decisions by certain steamship lines to shift certain vessel strings from the San Pedro Bay ports to the Pacific Northwest ports for the 2005 season. These shifts were a response to the "melt-down" at the San Pedro Bay ports during the late summer of 2004. With the introduction of additional terminal shifts funded by the PierPass program, the 2005 season was handled smoothly at the San Pedro Bay ports. This encouraged the lines to shift the strings back to the San Pedro Bay ports for the 2006 season. In addition, more capacity in new strings serving San Pedro Bay was added for the 2006 season than was added serving the Pacific Northwest ports. Another drop occurred in 2008, mostly due to the opening of Prince Rupert and the shifting of a vessel string there from San Pedro Bay.

Figure 2. Shares of Inbound Loaded Containers at West Coast Ports (TEU basis)



Source: Port web sites.

Figure 3 displays trends in shares of total container movements, both inbound and outbound, both loaded and empty, at the West Coast ports. As may be seen, the share for San Pedro Bay was stable for the years 2001 – 2005, but then increased sharply in 2006 and has been fairly stable after that. Comparing to Figure 3, only a portion of this trend is explained by imports. The sharper rise in shares of total container movements stems more from increased outbound movement of containers. Indeed, outbound empty containers



Source: Port web sites.

were the fastest growing segment of container movements at the San Pedro Bay ports during 2006, albeit exports grew as well.[11]

It is believed that the most important reason for this trend stems from changes in business terms between railroads and the steamship lines. In 2006, the railroads initiated financial penalties on the lines that apply if their eastbound and westbound container flows to individual West Coast ports are out of balance. Before these penalties were instituted, the lines commonly brought most imports in through San Pedro Bay, but returned most westbound empties and export loads from interior points through Pacific Northwest ports. The lines would operate their vessels in strings that would call at San Pedro Bay first, then move up the Coast and call at Puget Sound last before returning to Asia. To save time on westbound transit and to reduce vessel loads, the westbound containers from interior points would be routed via the Pacific Northwest ports. This forced the railroads to absorb expenses for re-positioning empty well cars from the Pacific Northwest ports and Oakland down to the San Pedro Bay ports. The trains re-positioning empty intermodal equipment are known as “bare-table” trains. With the changed financial terms, the flow of bare-table trains down the West Coast is now much less, and the outbound flows of containers handled through the San Pedro Bay ports are higher.

[11] As of this writing, 2006 was the last year of growth for the San Pedro Bay ports in aggregate.

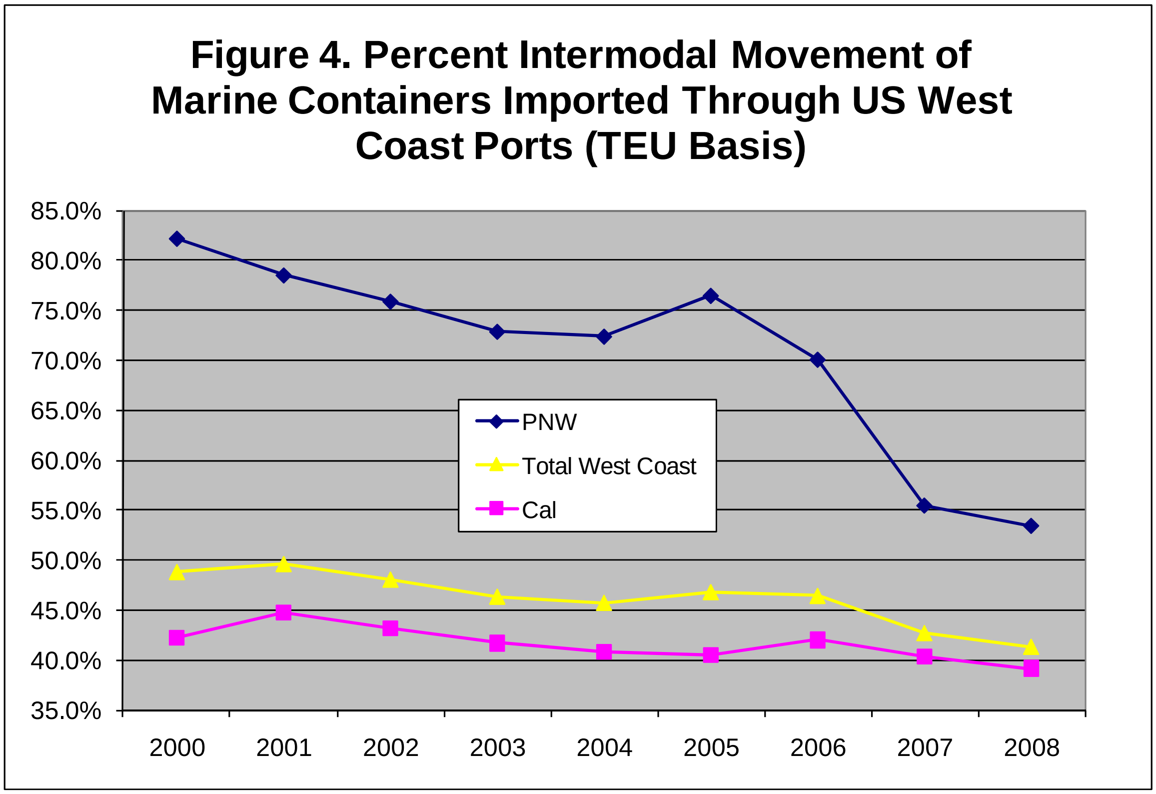
3.2. Landside Channel Shares of Waterborne Containerized Imports

Figure 4 displays trends in the fraction of containers imported through West Coast ports that are placed on double-stack trains for inland movement. (Not included in the rail movement shares are cargoes that were trans-loaded to domestic containers.) Statistics on rail movement of individual types of marine containers (20s, 40s and 45s) came from the Intermodal Association of North America (IANA). These figures were compared to statistics on total inbound loaded containers (TEUs) furnished by the ports. Also contributing to this analysis are statistics on the mix of marine box types (20s, 40s, 45s) handled through the West Coast ports, obtained from the Pacific Maritime Association. IANA does not break out figures for Oakland from those for San Pedro Bay; they are aggregated in the “Cal” category. The “PNW” category includes Portland, Tacoma and Seattle.

As may be seen, the fraction of total inbound loaded international marine containers via West Coast ports that got on a train declined from almost 50% in 2000-2001 to a little over 41% in 2008. Statistics by region are revealing. In 2005, there was a sharp increase in the Pacific Northwest, followed by a sharp drop in 2006. Concurrently, 2005 saw a slight drop in California, followed by a larger increase in 2006. In 2006, the PNW fraction stood at 70%, while California was at 42%. After 2006 there was a steep drop in the PNW and a smaller drop in California, bringing the PNW fraction down to about 54%, the California average below 40%, and the overall West Coast fraction down to a little over 41% in 2008.

The gradual decline of the inland point intermodal (IPI) share of inbound containers at the West Coast ports is believed to be primarily due to the increasing market share of large, nation-wide retailers who practice consolidation – de-consolidation inventory management strategies, and increasing adoption of such strategies by wholesalers of moderate-valued and expensive goods who import their products from Asia and sell to retailers in the USA.

The more turbulent trend in the IPI share of imports at the PNW ports is explained as follows. First, in 2005, much discretionary inland-point-intermodal (IPI) traffic was shifted from routing via San Pedro Bay to routing via the Pacific Northwest as a response to the “melt-down” during the 2004 peak season at the San Pedro Bay ports. As noted above, this volume shifted back in 2006. Second, there also were changes made to consolidation – de-consolidation strategies. Under such strategies, goods are stripped out of marine containers, sorted and re-loaded in domestic vehicles in the hinterlands of the ports of entry before movement inland. If not immediately required, the goods may be seasonally stored at warehouses in the hinterlands of the ports. Many goods that previously were imported solely or mostly through San Pedro Bay under such strategies began being imported using a set of 4-5 ports.



Source: IANA, Port web sites, PMA.

For example, a popular import distribution strategy among "big-box" retailers that has evolved is the so-called "Four Corners" strategy. An importer might use, say, San Pedro Bay, the Pacific Northwest, Savannah and New York – New Jersey as ports of entry for its imports. Warehouses and trans-load facilities located in the hinterlands of each of these four ports primarily serve one fourth of the continental United States, but can serve as back-up sources for serving any of the retailer's regional-distribution-center demand points. This strategy reduces transportation costs compared to an all-trans-loaded-through-San-Pedro-Bay strategy. Moreover, because all four ports can supply any location, safety stocks are effectively pooled nationwide, economizing on total inventory almost as much as if a single warehousing and trans-loading port were used. (On the downside, there is an increase in total inventory associated with the extra pipeline and safety stock inventory required by all-water transit to the East Coast. The Four Corners strategy is this better suited to moderate-valued goods than to expensive goods.) The strategy also serves to provide important diversification of the risk that trouble might develop in one of the port channels, such as what happened at San Pedro Bay in 2004. If there is surge capacity in the other channels, then the retailer's supply-chain strategy is made more robust under Four Corners than under a policy of bringing in all imports through one port.

The trend from single-port distribution strategy to multi-port distribution strategy also is influenced by the increasing market shares of the "big-box" retailers and their changing terms of business with their suppliers. Traditionally, these retailers bought goods from manufacturers here in the USA, even when the goods were manufactured in Asia. The manufacturer made the goods in Asia, then brought them into the USA to its warehouse in the hinterland of the San Pedro Bay ports. When the goods were sold to retailers, the retailers paid for the domestic freight from this warehouse to their USA locations. The "big-box" retailers increasingly negotiate with their suppliers to buy the goods in Asia at a reduced price, then handle the distribution themselves. Because of their large scale, the retailers may be able to achieve reduced total costs. In terms of trade impacts, this shifts goods from all-trans-loaded-through-San-Pedro-Bay to trans-loaded-through-four-ports. Very expensive goods with rapidly declining prices (e.g., electronics) and goods with very uncertain demands (e.g., style goods or new toys) are still imported by manufacturers/wholesalers using an all-through-San-Pedro-Bay strategy and then re-sold here in the USA (because the retailers do not want to risk the inventory investment), but everything else sold by the large, nation-wide retailers has moved to the multi-port strategies.

The net impact of increased use of multi-port trans-load import strategies is a sharp increase in the percentage trans-loading of imports and a sharp decrease in percentage IPI inland movement of marine containers at the Pacific Northwest ports, as depicted in Figure 4.

The customs data sources do not provide reliable data on the distribution of destinations for waterborne containerized imports. However, estimates may be developed from the data described above for the relative shares of three broad categories of imports for a single port or a group of West Coast ports: (1) Imports consumed in the general region that is "local" to the ports; (2) Imports for which the marine container containing them is placed on a double-stack train for movement east of the Rockies; and (3) Imports whose marine container was trucked out of the local region, plus imports which were unloaded from marine containers in the local region, then subsequently re-shipped out of the region in domestic vehicles, either rail or truck ("trans-loaded" imports). For the last category, it is believed that trans-loaded imports comprise a much larger volume than that for long-distance trucking of marine containers.

Such estimates were developed as follows for the West Coast ports as a group as well as for just the San Pedro Bay ports. To do this, it was assumed that geographical distribution of the consumption of Asian imports is proportional to the geographical distribution of purchasing power (population multiplied by income per capita). This is believed to be a reasonable assumption because the lion's share of imports to the USA from Asia are retail goods or goods that are very close to ready for retail sale. Imports of raw materials or inputs to manufacturing are much less.

Next, the region "local" to the West Coast ports was defined to include the following states: CA, OR, WA, ID, NV, UT, AZ, NM, CO, WY and MT. ("Local" is meant in the sense that containers of Asian imports with destinations in these states are most cheaply routed through West Coast ports. According the US Census web site, collectively these states account for 22.4% on the total purchasing power in the continental United States. According to Figure 1, about 74.5% of total imports Asia – USA came through West

Coast ports. Thus “local” traffic handled through the West Coast ports was (0.224)/(0.745) = 30%. According to Figure 4, direct inland rail intermodal movement of marine boxes from West Coast ports accounted for 46%. This leaves 24% in the third category (trans-loading plus any across-the-Rockies long-distance trucking of marine boxes.

Now consider the San Pedro Bay ports. Suppose we define the region “local” to the San Pedro Bay ports to include Southern California (62% of California purchasing power), Southern Nevada (67% of Nevada purchasing power), Arizona, New Mexico, Southern Utah (33% of Utah purchasing power), and Southern Colorado (50% of Colorado purchasing power). Again, “local’ is used in the sense of containers of Asian imports with destinations in this region are most cheaply routed through the San Pedro Bay ports. According the US Census web site, this region accounts for 11.8% of the total purchasing power in the continental United States. According to Figure 1, about 55.6% of total imports Asia – USA came through the San Pedro Bay ports. Thus approximately (0.118)/(0.556) = 21% of the 2006 imports through the San Pedro Bay ports were “local”.

Now let us assume 35% of the marine boxes imported through the Port of Oakland in 2006 got on a double-stack train. This is a judgment; the chosen figure is much less than the figure the Pacific Northwest ports (70%), and somewhat less than the figure for California as a whole (35%) and hence less than the (unknown) figure for Southern California. The rationale for this judgment is as follows: Oakland is more of a “local” port for imports than either the Pacific Northwest ports or the San Pedro ports, originating many less marine stack trains. On the other hand, trans-loading activity is much less than at either San Pedro Bay or Puget Sound. As noted in Figure 4, direct inland rail intermodal movement of marine boxes from all California ports accounted for 42%. Considering the relative import volumes at Oakland and at San Pedro Bay depicted in Figure 2 and the assumption of 40% rail intermodal movement from Oakland, the 42% figure for California translates into a figure of about 43% of the 2006 loaded marine boxes entering San Pedro Bay got on a train. This leaves 36% in the third category (trans-loading plus any across-the-Rockies long-distance trucking of marine boxes. In sum, inland-point-intermodal movement of marine containers and trans-loading of imports for re-shipment in domestic vehicles are roughly equal in Southern California (IPI is a bit larger), and each of those categories is about twice as large as “local” imports.

From the 2008 data point in Figure 4, it is estimated that in 2008 the IPI share of San Pedro Bay imports from Asia had fallen to 41%. Elasticity calculations discussed in section 8 estimate that total market share of the San Pedro Bay ports fell from 2006, such that local-region imports rose from 21% to 23% of the total Asian imports via San pedro Bay. This leaves the 2008 share accounted for by trans-loaded imports and marine boxes trucked out-of-region holding steady at 36%.

4. Distribution of Imports by Commodity and Value

US Customs defines 99 commodity types for classifying waterborne containerized imports to the United States. Two commercial subscription services are available for analyzing customs data. The PIERS database provides TEU volumes by commodity type and port. The World Trade Atlas (WTA) database provides breakdowns by total declared value by commodity type for groups of US ports (e.g., West Coast, South Atlantic and Gulf Coast, North Atlantic). PIERS totals by commodity type of imports from selected Asian countries (see Appendix B for a specific list) for calendar 2005 imported through West Coast ports were furnished to the author by the Port of Long Beach. The Port of Long Beach also furnished the author with nationwide WTA totals as well as West Coast totals for 2005. In addition, MARAD furnished the author with PIERS summaries of total TEUs of 2005 Asian imports by US port, but indicated it was not able to provide the author with a break-out by commodity type.

The author joined these data to develop statistics on the average declared value per TEU and the average declared value per cubic foot of imports for each commodity type. To compute values per cubic foot, the mix of loaded 20s, 40s and 45s imported through West Coast ports was secured from the Pacific Maritime Association's database. An assumption was added concerning the mix of standard-size (ISO) versus high-cube 40s.

PMA data for 2005 indicates that total TEUs of inbound loaded containers at West Coast ports were 12.74% 20s, 80.51% 40s, and 6.75% 45s. It was assumed that 40% of the 40s were ISO boxes and 60% were high-cube (9½ feet high). Usable cubic feet of capacity were assumed for the various box types as follows: 1,169 for 20s, 2,395 for ISO 40s, 2,684 for high-cube 40s, and 3,026 for 45s. This made for a weighted-average cubic capacity per TEU of 1,274.73 cubic feet.

The first step in the analysis was to take West Coast PIERS and WTA data and join them to obtain declared values per TEU and per cubic foot for each commodity type.[12] Table 1 summarizes the top twelve commodity types (by TEU volume) imported from Asia through West Coast ports for 2005. Shown are average declared values for each commodity type as well as for all imports. The top fifteen commodities account for more than 80% of the volume of imports. Furniture and bedding is the largest-volume commodity by a wide margin. The average declared value on the West Coast is $22.66 per cubic foot, which moved up only slightly from 2003. However, the value varies widely by commodity: For Furniture and Bedding, it is less than $8.00, while for Electronics and Electrical Equipment, it is almost $40.

[12] A subtle difficulty in doing this join is that the commodity types in PIERS and WTA extracts match in all but one category. PIERS includes a "Miscellaneous Manufactured Articles" commodity type, but WTA does not; WTA includes "Special Other" but PIERS does not. A weighted-average declared value per TEU developed from other manufactured commodity types was applied to the "Miscellaneous Manufactured Articles" commodity type in order to join the data.

Table 1: Top Commodities Imported from Asia Through US West Coast Ports in 2003 and 2005

Commodity Type	Estimated 2005 Volume (TEUs)	Estimated 2005 Avg. Declared Value ($ per cu. ft.)	Estimated 2003 Volume (TEUs)	Estimated 2003 Avg. Declared Value ($ per cu. ft.)
Furniture and Bedding	1,489,050	7.87	1,014,304	8.27
Electronics and Electrical Equipment	876,972	39.55	749,301	37.46
Machinery	838,461	51.40	660,809	50.23
Toys, Games & Sports Equipment	700,228	17.02	662,977	16.56
Motorcycles and Auto Parts	591,753	24.65	480,347	20.19
Plastic Goods	446,087	14.63	352,676	13.18
Apparel not knitted	407,402	26.30	329,477	27.93
Steel Goods	362,630	15.43	265,186	14.13
Footwear	357,244	24.91	318,032	24.37
Rubber goods	303,114	14.37	197,900	14.63
Miscellaneous Manufactured Articles	252,590	22.94	273,785	23.42
Leather Goods	228,805	16.14	199,295	18.05
Wooden Goods	209,892	8.24	104,707	10.91
Apparel knitted	171,525	51.71	149,591	53.81
Ceramic Goods	156,602	6.34	108,646	8.38
Subtotal, Top 15 Types	**7,392,356**		**5,867,036**	
All Commodities	**9,134,672**	**22.66**	**7,222,099**	**22.32**

Source: PIERS, WTA and PMA data.

Next, East Coast (including Gulf Coast) WTA data was analyzed. Because total TEUs of Asian goods imported through East and Gulf Coast ports are known from MARAD-supplied data, and total declared value of such goods is known from the WTA data, the average declared value for Asian goods imported through East Coast and Gulf Coast ports in 2005 could be deduced. This figure is $18.57, or about $4 less per cubic foot than the average figure for imports brought in through West Coast ports. This is in line with the expectation that high-value commodities are imported through the West Coast, typically only San Pedro Bay, in order to most tightly control inventory costs.

As a trial, West Coast average declared values per TEU were divided into the WTA-reported total declared values for each commodity type imported through East Coast and

Gulf Coast ports. The resulting TEU figures were summed across all commodity types to obtain an estimate of total TEUs imported through East Coast and Gulf Coast ports, and this figure was compared to the actual PIERS total for the East and Gulf Coasts. This resulted in too small a sum. The author then judged down the declared values of certain high-value commodities in order to get TEU totals to match. Next, the revised figures for West Coast and for East Coast/Gulf Coast were combined to develop nation-wide figures.

Table 2 displays the author's estimates of TEU volumes and average declared values for waterborne containerized imports from Asia to the United States in 2005. The top fifteen commodities account for about 78% of the total volume of imports, and the overall average declared value is $21.66 per cubic foot, only slightly higher than that for 2003.

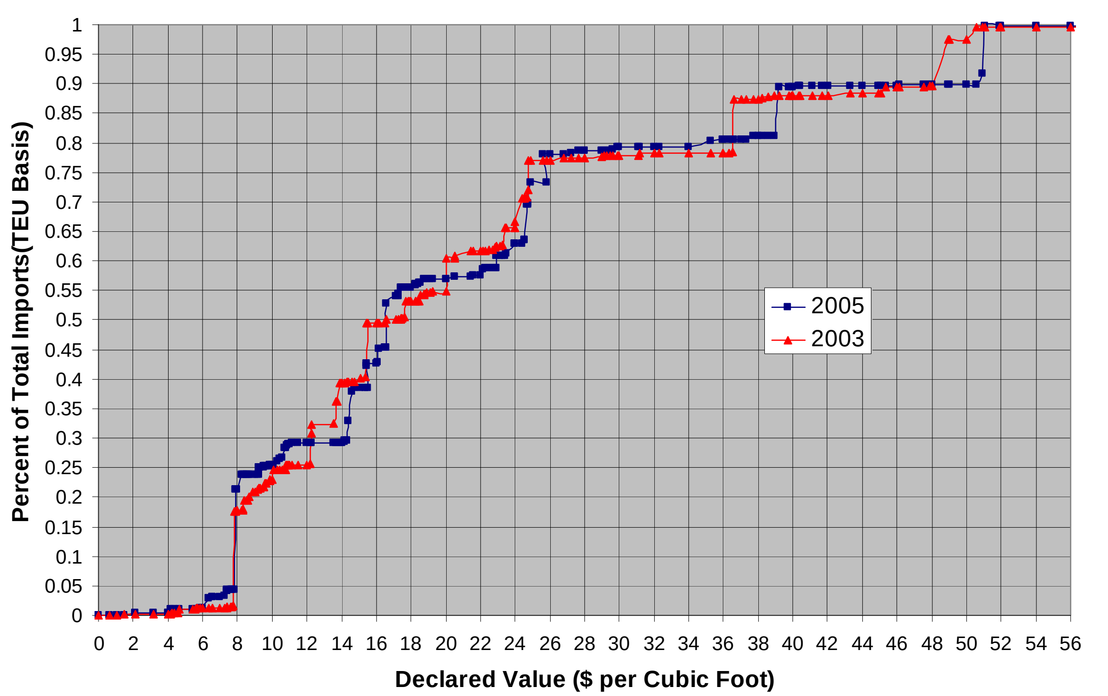
Table 2: Top Commodities and Declared Values for Waterborne Containerized Imports from Asia to the United States in 2005

Commodity Type	Estimated 2005 Volume (TEUs)	Estimated 2005 Avg. Declared Value ($ per cu. ft.)	Estimated 2003 Volume (TEUs)	Estimated 2003 Avg. Declared Value ($ per cu. ft.)
Furniture and Bedding	2,069,444	7.87	1,484,160	7.80
Electronics and Electrical Equipment	1,000,598	39.24	847,223	36.60
Machinery	969,789	51.08		48.97
Toys, Games & Sports Equipment	902,120	16.57	855,301	15.54
Motorcycles and Auto Parts	733,930	24.65	524,777	20.00
Plastic Goods	599,505	14.63	492,552	12.28
Apparel not knitted	585,670	25.60	451,775	25.78
Steel Goods	471,354	15.43	344,088	13.68
Footwear	425,897	24.91	370,784	24.37
Rubber goods	399,432	14.37	279,014	13.86
Miscellaneous Manufactured Articles	290,276	22.94	273,785	23.42
Leather Goods	280,131	16.14	237,649	17.72
Wooden Goods	252,590	8.24	146,437	10.08
Apparel knitted	240,721	50.93	195,839	50.55
Ceramic Goods	214,542	6.34	145,123	8.38
Subtotal, Top 15 Types	**9,436,000**		**7,401,863**	
All Commodities	**12,104,795**	**21.66**	**9,370,896**	**21.47**

Source: PIERS, WTA and PMA data.

A distribution of import volumes by declared value was developed by sorting the commodity types in increasing order of value. Cumulative distribution curves for 2003 and 2005 Asia – USA waterborne containerized imports are displayed in Figure 5. In the Figure, one can observe the declared values at which certain percentiles of total import volume are reached. Note that about 25% of imports have declared values of $13 or less, 25% have declared values of $26 or more, and 50% have declared values in between. We designate these three declared-value ranges as inexpensive, expensive and moderate, respectively. In the 2005 elasticity study by the author, it was found that inexpensive imports are most efficiently handled by direct inland shipment in marine containers via the closest port. Moderate-value imports, if distributed nation-wide, are most efficiently handled by a consolidation – de-consolidation strategy (such as the "Four Corners" strategy) using multiple ports with warehousing and trans-loading facilities in the hinterlands of the selected ports of entry, while expensive goods, if distributed nation-wide, are most efficiently handled by a consolidation – de-consolidation strategy using a single port of entry (most commonly San Pedro Bay).

Figure 5. 2003 vs. 2005 Cumulative Distributions of Containerized Asia – USA Imports

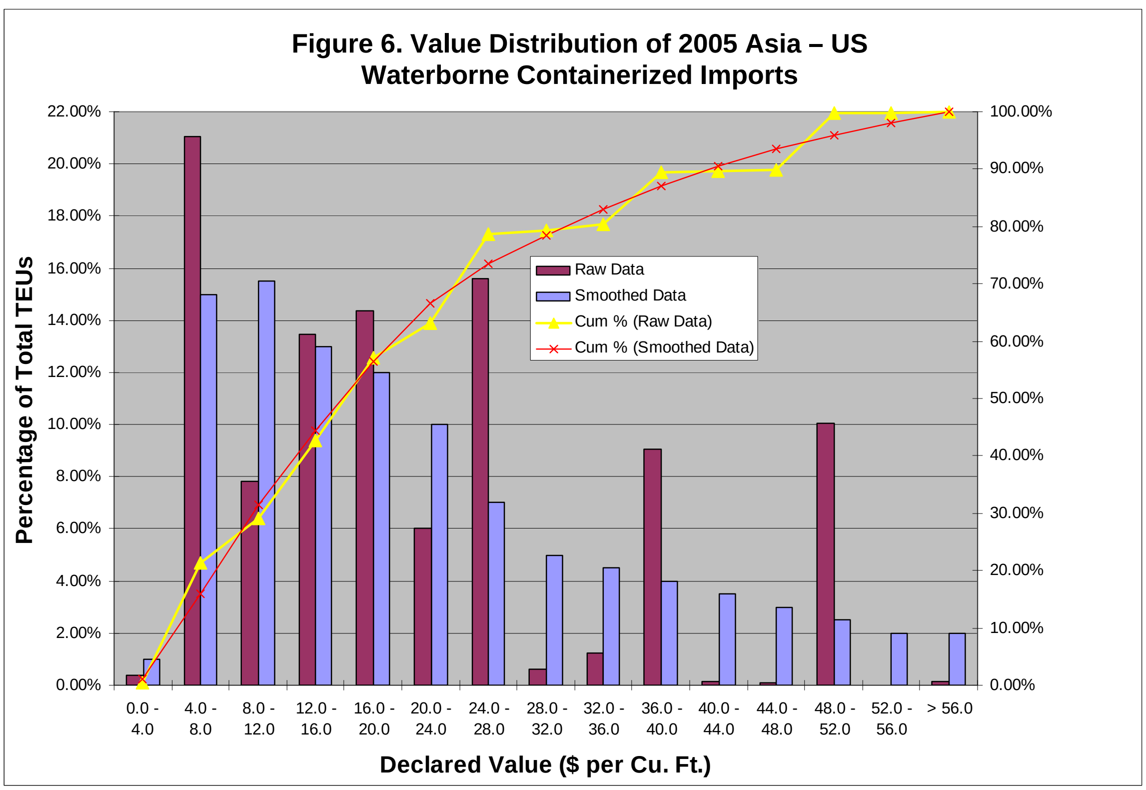


Source: PIERS, WTA and PMA data.

As may be seen in Figure 5, there were no great changes in the value distribution for Asian imports from 2003 to 2005. Where the blue (2005) curve is above the red (2003) curve, imports are getting cheaper; where the red curve is above the blue curve, imports are getting more expensive. There seems to be some spreading of the distribution, i.e., inexpensive imports are getting a bit cheaper while expensive imports are getting a bit pricier, but the inexpensive – moderate – expensive break points in the distribution are basically unchanged. The implication is that the overall, nation-wide allocation of imports to landside channels was basically unchanged from 2003 to 2005. (That implication is confirmed in Section 3 above.)

Given rising energy and transportation costs, and given upward pressure on Asian currencies, the author had anticipated some upward shift in the value distribution curve from 2003 to 2005. But basically this did not happen. Anecdotal evidence received from importers suggests that for some commodities, there are an increased number of competitive suppliers, thereby holding down prices for goods.

The distribution by value of Asian imports is an important input to the elasticity analysis. Figure 6 displays the 2005 distribution in both cumulative and uncumulative formats. The yellow line in the figure is the cumulative distribution as in Figure 1. The maroon bars comprise the corresponding uncumulative distribution. As may be seen, this distribution is very lumpy. This is because certain high-volume Customs commodity types are very broad and span a very wide range of declared values, e.g., the Electronics and Electrical Equipment includes everything from batteries to digital cameras and computers. A single average declared value is assigned to this commodity type.



The true distribution of values must be much smoother in shape. The author believes it should exhibit a Pareto-like shape, i.e., high volumes for low-value imports, with volumes steadily declining as values increase.

To develop a distribution more suitable for elasticity analysis, the author adjusted the yellow cumulative curve of raw data to smooth out the corners, as depicted by the red curve in Figure 6. This smooth cumulative curve was then uncumulated. This resulted in the value distribution defined by the blue bars in Figure 6. As may be seen, this distribution has the expected shape while still consistent with the Customs data (in the sense of matching average declared values by commodity type). It therefore was selected to serve as input data for elasticity analyses in Phase II.

5. Transportation Charges

There are many individual transportation charges assessed by various parties concerning the movement of containerized imports. Some of these charges are specifically billed to importers, some are absorbed by carriers and covered by their overall rate charged to the importer. Table 3 documents various landside charges and distinguishes those billed to the customer vs. those absorbed by the carrier. Three types of carriers are shown: steamship line, non-vessel-owning common carrier, and intermodal marketing company.

For the purposes of this study, a matrix of transportation and handling charges as faced by importers was developed for specific ports of entry and alternative modes of transport as follows.

5.1. Alternative Ports of Entry

Ten major North American ports of entry were included in the analysis, as follows:

Vancouver, BC. Assumed trans-load warehouse site is Abbotsford, BC.
Seattle-Tacoma, WA. Assumed trans-load warehouse site is Fife, WA.
Oakland, CA. Assumed trans-load warehouse site is Tracy, CA.
Los Angeles – Long Beach, CA. Assumed trans-load warehouse site is Ontario, CA.
Lazaro Cardenas, Mexico. No trans-loading, only direct shipment of marine boxes (to USA destinations) is assumed through this port.
Houston, TX. Assumed trans-load warehouse site is Baytown, TX.
Savannah, GA. Assumed trans-load warehouse site is Garden City, GA.
Charleston, SC. Assumed trans-load warehouse site is Summerville, SC.
Norfolk, VA. Assumed trans-load warehouse site is Suffolk, VA.
Port of New York – New Jersey. Assumed trans-load warehouse site is 50% East Brunswick, NJ and 50% Allentown, PA.

There are other ports handling Asian imports to North America, but in much smaller volumes than handled by the above ports. Prince Rupert, BC will become a significant port of entry for Asian imports beginning in late 2007, but at the time the rate database was assembled, quotations were unavailable to the author.

Table 3: Transportation Costs – Charges Separately Billed to Customer vs. Charges Absorbed by Carrier

(“Yes” indicates charge is separately billed to customer by carrier,
“No” indicates charge is absorbed by carrier and must be covered by overall rate)

<table>
<tr><th rowspan="2">Type of Charge</th><th colspan="3">Carrier Type</th></tr>
<tr><th>SSL on through B/L</th><th>NVOCC on through B/L</th><th>IMC B/L</th></tr>
<tr><td>Terminal gate charge for truck/dray</td><td colspan="3">No, always paid by SSL</td></tr>
<tr><td>JPA terminal gate charge (Alameda Corr.)</td><td colspan="3">No, always paid by SSL/collected by RR</td></tr>
<tr><td>PierPass charge for truck/dray</td><td colspan="3">Yes - surcharge always paid by customer</td></tr>
<tr><td>Dray to warehouse in Port of Entry hinterland</td><td>Yes for Group 4 rate</td><td colspan="2">Yes for Port B/L</td></tr>
<tr><td>Trans-load from marine container to domestic trailer or domestic container</td><td>Not involved</td><td colspan="2">Yes</td></tr>
<tr><td>Truck line-haul of marine container</td><td>Yes for Group 4 rate</td><td colspan="2">Yes for Port B/L</td></tr>
<tr><td>Truck line-haul of domestic trailer</td><td>Not involved</td><td colspan="2">Yes</td></tr>
<tr><td>Dray of domestic trailer or container from warehouse to origin rail ramp</td><td>Not involved</td><td colspan="2">Yes</td></tr>
<tr><td>Rail line-haul of marine container</td><td>No for MLB/IPI</td><td>Yes for SSL Port B/L
No for SSL IPI B/L</td><td>Yes for Third Party International (TPI)</td></tr>
<tr><td>Destination dray of marine intermodal container</td><td>No for SDD B/L
Yes for CY B/L</td><td colspan="2">No for SDD B/L
Yes for CY B/L</td></tr>
<tr><td>Rail line-haul of domestic trailer or container</td><td rowspan="3">Not involved</td><td rowspan="3">In some cases – but most likely not</td><td rowspan="3">Yes</td></tr>
<tr><td>Destination dray of domestic intermodal trailer or container</td></tr>
<tr><td>Third party booking fee (IMC) for rail intermodal movement</td></tr>
</table>

Abbreviations: B/L – bill of lading, SSL – steamship line, NVOCC – non-vessel-owning common carrier, IMC – intermodal marketing company, MLB – mini-land-bridge, IPI – inland point intermodal, SDD – store-door delivery, CY – container yard pick-up by customer, Group 4 rate – applies to store-door delivery in the Port of Entry hinterland.

5.2. Destinations

The typical large US importer/retailer operates regional distribution centers that restock retail stores located within an overnight driving distance. Typically, on the order of 15-30 regional centers are required to service all the retail outlets within the continental United States and Canada. This suggests that a reasonable approximation of import trade flows may be made by considering a comparable number of destination zones, each with one regional distribution center as a destination for Asian imports.

To model inland transportation costs, the continental United States was divided into 21 destination regions. It was assumed that a regional distribution center (RDC) located in a suburb of a major city within each region was the destination for all imported goods consumed within the region, as detailed below. Transportation costs for alternative modes/channels for Asian imports via alternative potential ports of entry to these distribution center sites were developed.

The destination regions and assumed site of the RDC within the region are as follows:[13]

Seattle Region – including Washington, Oregon, Idaho and Montana. Regional distribution center assumed to be in Fife, WA.
Oakland Region – including Wyoming, 50% of Colorado, 67% of Utah, 34% of California, and 33% of Nevada. Regional distribution center assumed to be in Tracy, CA.
Los Angeles Region – including Arizona, New Mexico, 66% of California, 67% of Nevada, 33% of Utah, and 50% of Colorado. Regional distribution center assumed to be in Ontario, CA.
Dallas Region – including Oklahoma and 50% of Texas. Regional distribution center assumed to be in Midlothian, TX.
Houston Region – including Louisiana, Mississippi and 50% of Texas. Regional distribution center assumed to be in Baytown, TX.
Memphis Region – including Arkansas, Tennessee and Kentucky. Regional distribution center assumed to be in Millington, TN.
Kansas City Region – including Kansas, Nebraska, Iowa and Missouri. Regional distribution center assumed to be in Lenexa, KS.
Minneapolis Region – including North Dakota, South Dakota, Minnesota and 50% of Wisconsin. Regional distribution center assumed to be in Rosemount, MN.
Chicago Region – including Illinois, Indiana, Michigan 50% of Wisconsin. Regional distribution center assumed to be in Joliet, IL.
Columbus Region – including 50% of Ohio. Regional distribution center assumed to be in Springfield, OH.
Cleveland Region – including 50% of Ohio and 25% of New York. Regional distribution center assumed to be in Chagrin Falls, OH.

---

[13] A percentage specified for a state defines the portion of import volume terminating in that state that is assumed to be assigned to a distribution center in the named region. For example, 50% of imports terminating in Pennsylvania are assumed to be served from an importer's Harrisburg Region distribution center, and 50% are assumed to be served from the importer's Pittsburgh Region distribution center.

Pittsburgh Region – including West Virginia and 50% of Pennsylvania. Regional distribution center assumed to be in Beaver Falls, PA.
Harrisburg Region – including 50% of Pennsylvania. Regional distribution center assumed to be in Allentown, PA.
Atlanta Region – including Alabama, Georgia and 50% of Florida. Regional distribution center assumed to be in Duluth, GA.
Savannah Region – including 50% of Florida. Regional distribution center assumed to be in Garden City, GA.
Charleston Region – including 50% of South Carolina. Regional distribution center assumed to be in Summerville, SC.
Charlotte Region – including North Carolina and 50% of South Carolina. Regional distribution center assumed to be in Salisbury, SC.
Norfolk Region – including Virginia. Regional distribution center assumed to be in Suffolk, VA.
Baltimore Region – including Maryland, DC and Delaware. Regional distribution center assumed to be in Frederick, MD.
New York Region – including New Jersey, Connecticut and 75% of New York. Regional distribution centers are assumed to be located 50% in East Brunswick, NJ and 50% in Allentown, PA.
Boston Region – including Rhode Island, Massachusetts, New Hampshire, Vermont and Maine. Regional distribution center assumed to be in Milford, MA.

For the purposes of elasticity analyses, the distribution of import volumes by destination region is assumed to be proportional to total purchasing power in each region. Data on per-capita personal incomes by state and state populations were obtained by the consultant from US Dept. of Commerce web sites, then aggregated into the regions as defined above. The results are displayed in Table 4.

5.3. Transportation Modes

When considering the shipment of containerized Asian imports to North America there are various options available to importers:

- Alternative vessel operating common carriers and non-vessel operating common carriers (NVOCCs), and alternative ports of entry.
- Through movement of marine containers from port of entry to inland destination via local dray (“Direct Dray”) or long-haul truck (“Direct Truck”).
- Through movement of marine containers from port of entry to inland destination via rail double-stack train and final dray from rail terminal to destination. An initial dray from port terminal to origin rail terminal is required if the rail terminal is not on-dock (“Direct Rail”).
- Dray of marine containers from port of entry to a trans-loading warehouse in the hinterland of the port of entry, trans-loading to the goods to a 53-foot trailer for truck movement to inland destination or local dray (“Trans-load Truck”).

- Dray of marine containers from port of entry to a trans-loading warehouse in the hinterland of the port of entry, trans-loading to the goods to a 53-foot container or trailer, dray to origin rail terminal, rail movement of the 53-foot container via double stack train, and final dray from rail terminal to destination ("Trans-load Rail").

Table 4: Assumed Distribution of Import Volumes by Destination Region

Region	Percentage of total imports
Seattle	4.024
Oakland	6.629
Los Angeles	11.782
Dallas	4.572
Houston	5.576
Memphis	3.765
Kansas City	4.219
Minneapolis	3.262
Chicago	10.990
Cleveland	3.807
Columbus	1.888
Pittsburgh	2.653
Atlanta	6.915
Savannah	2.811
Charleston	0.597
Charlotte	3.220
Harrisburg	2.161
Norfolk	2.740
Baltimore	2.870
New York	11.229
Boston	4.290
Total	100.000

The portions of the overall movement of each vehicle type (marine container, 53-foot trailer or 53-foot container) may be procured separately from multiple vendors, or they may be purchased as a bundled service from a single service provider. The vendors may be carriers or they may be third parties such as NVOCCs or intermodal marketing companies (IMCs).

Further complexity arises because many rates are contractual and confidential, with different rates applying to different customers. The consultant was able to view rates offered by various vendors. The costs reported herein are based on averages across baskets of rates charged by various vendors to various customers and therefore do not necessarily reflect the specific rates of any individual contract or individual carrier.

5.4. Components of Transportation Costs

Costs components that were estimated are:

- Direct Shipping of Marine Box (truck or dray): steamship line and NVOCC rates from Shenzen/Yantian/Chiwan origins to dockside at each port of entry for a 40-foot high-cube container ("CY" rates to ports)
- Direct Shipping of Marine Box (truck or dray): truck line haul rate or local dray rate from port to destination warehouse
- Direct Shipping of Marine Box (rail): "All-in" IPI rates from steamship lines and NVOCCs from Shenzen/Yantian/Chiwan origins to destination rail ramp
- Direct Shipping of Marine Box (rail): local dray rate from destination rail ramp to destination warehouse
- Trans-load from Marine Box to Domestic Vehicle (truck trailer or rail container): steamship line and NVOCC rates from Shenzen/Yantian/Chiwan origins to dockside at each port of entry for a 40-foot high-cube container ("CY" rates to ports)
- Trans-load from Marine Box to Domestic Vehicle (truck trailer or rail container): dray from port to trans-load warehouse plus trans-loading fee
- Trans-load from Marine Box to Domestic Trailer: dray or tuck rate from trans-load warehouse to destination warehouse
- Trans-load from Marine Box to Domestic Rail Container: dray from trans-load warehouse to origin rail ramp
- Trans-load from Marine Box to Domestic Rail Container: rail line haul charge and IMC booking fee
- Trans-load from Marine Box to Domestic Rail Container: dray from destination rail ramp to destination warehouse
- Trans-load from Marine Box to Domestic Rail Container: 10% duplicate customs duty for shipments crossing the USA-Canada border

As indicated above, most transportation rates are part of confidential contracts. For reasons of confidentiality, costs that are reported reflect the average of a basket of rates from multiple carriers rather than the specific rates of any particular contract or carrier. To further protect confidentiality, we report only total costs per cubic foot for each channel.

Domestic and marine vehicles have different cubic capacities. International cargo moves in 20-foot, 40-foot and 45-foot containers and has done so for many years. In contrast, the vehicles utilized for U.S. domestic freight have become progressively larger. Nowadays, the domestic truck fleet consists almost entirely of 53-foot trailers. Domestic containers and trailers used in rail intermodal service also have grown in size, from 40-foot trailers used in the early 1970s to 48-foot and 53-foot boxes today.

Domestic freight vehicles are not only longer than international containers, they are also taller and wider. The usable cubic space thus grows faster than the increment in length. Table 5 displays the useable cubic space of various vehicles. Note that a high-cube 53-foot domestic container or a domestic trailer offers about 50% more useable space than a high-cube international 40-foot container.

The great majority of Asian imports are "cube" freight, in the sense that cubic capacities are reached before weight capacities are reached. To properly compare transportation costs, it is therefore necessary to express costs on a cost per cubic foot basis. For the purposes of this analysis, we have assumed shipments in 40-foot marine containers are 94% in high-cube 40-foot boxes and 6% in standard 40-foot boxes, leading to the weighted average cubic capacity shown in Table 5. Shipments trans-loaded into domestic containers for rail intermodal movements are assumed to utilize hi-cube 53-foot containers. For cube freight, this means the contents of three high-cube marine (40-foot) containers may be re-stuffed into two domestic (53-foot) trailers or high-cube containers.

Table 5: **Space Capacities of Containers and Trucks**

Vehicle Type	Usable Space for Lading (cubic feet)	Space as a % of Avg 40ft Space
20ft standard container	1,163	43.61%
40ft standard container	2,395	89.80%
40ft hi-cube container	2,684	100.64%
Wtd. Avg. 40ft container	2,667	100.00%
45ft standard container	3,026	113.46%
48ft standard container	3,471	130.15%
53ft standard container	3,830	143.61%
53ft hi-cube container	3,955	148.29%
53ft trailer	4,090	153.36%

Note: The equipment specifications shown above represent those most commonly found in the industry. Actual specifications vary from carrier to carrier and across carrier fleets.

5.5. Transportation Unit Costs

Table 6 provides the estimated total rates per cubic foot for shipment from Shenzen/Yantian/Chiwan for direct shipping and trans-load channels to the selected North American destinations via the alternative ports of entry listed above. It is assumed that freight shipped is "cube" freight, and that the cubic space of transportation vehicles is fully utilized. Not all port-destination pairs are shown; unreasonable combinations, such as Vancouver – Houston or New York – Dallas are omitted. All figures are expressed in dollars per cubic foot. The total transportation cost ranges from slightly less than $1.00 to slightly more than $2.20 per cubic foot of goods, depending on the destination, choice of port and choice of channel. In general, direct shipping in the marine box via the nearest port minimizes transportation unit costs. Shown in the last column of the table for each destination is the premium for using a trans-load channel, considering the cheapest direct-shipping channel and the cheapest trans-loading channel to that destination. As may be seen, this premium ranges from zero up to $0.20 per cubic foot. These additional costs must be traded off against potential savings in inventory costs afforded by pooling shipments to multiple destinations over the portion of the supply chain between Asia and the port of entry.

Table 6: Transportation Rates Per Cubic Foot, Shenzen/Yantian/Chiwan – Selected North American Destinations

Port of entry	Destination region	Direct ship	Trans-load	Trans-load premium
Vancouver	Seattle	$0.97	$1.24	
Seattle-Tacoma	Seattle	**$0.94**	**$1.06**	**$0.12**
Oakland	Seattle	$1.41	$1.56	
Los Angeles-Long Beach	Seattle	$1.27	$1.49	
Vancouver	Oakland	n/a	$1.65	
Seattle-Tacoma	Oakland	$1.41	$1.46	
Oakland	Oakland	**$1.02**	**$1.16**	**$0.14**
Los Angeles-Long Beach	Oakland	$1.12	$1.25	
Vancouver	Los Angeles	n/a	$1.64	
Seattle-Tacoma	Los Angeles	$1.34	$1.45	
Oakland	Los Angeles	$1.15	$1.35	
Los Angeles-Long Beach	Los Angeles	**$0.96**	**$1.11**	**$0.15**
Houston	Los Angeles	n/a	$1.95	
Vancouver	Houston	n/a	$1.92	
Seattle-Tacoma	Houston	$1.87	$1.74	
Oakland	Houston	$1.57	$1.74	
Los Angeles-Long Beach	Houston	$1.58	$1.59	
Lazaro Cardenas	Houston	$1.53	n/a	
Houston	Houston	**$1.35**	**$1.48**	**$0.13**
Savannah	Houston	n/a	$2.01	
Charleston	Houston	n/a	$1.99	
Norfolk	Houston	n/a	$2.17	
NY-NJ	Houston	n/a	$2.21	
Vancouver	Dallas	n/a	$1.90	
Seattle-Tacoma	Dallas	$1.85	$1.71	
Oakland	Dallas	$1.53	$1.71	
Los Angeles-Long Beach	Dallas	$1.51	$1.59	
Lazaro Cardenas	Dallas	$1.59	n/a	
Houston	Dallas	**$1.44**	**$1.57**	**$0.13**
Savannah	Dallas	n/a	$1.97	
Charleston	Dallas	n/a	$2.05	
Norfolk	Dallas	n/a	$2.18	
NY-NJ	Dallas	n/a	$2.21	
Vancouver	Memphis	$1.63	$1.79	

Seattle-Tacoma	Memphis	$1.63	$1.55	
Oakland	Memphis	$1.59	$1.68	
Los Angeles-Long Beach	Memphis	**$1.57**	**$1.59**	**$0.02**
Lazaro Cardenas	Memphis	$1.65	n/a	
Houston	Memphis	**$1.57**	$1.75	
Savannah	Memphis	$1.72	$1.80	
Charleston	Memphis	$1.74	$1.85	
Norfolk	Memphis	$1.80	$1.95	
NY-NJ	Memphis	n/a	$2.05	
Vancouver	Kansas City	n/a	$1.69	
Seattle-Tacoma	Kansas City	$1.64	**$1.53**	**$0.04**
Oakland	Kansas City	$1.51	$1.57	
Los Angeles-Long Beach	Kansas City	**$1.49**	$1.55	
Lazaro Cardenas	Kansas City	$1.69	n/a	
Houston	Kansas City	$1.60	$1.75	
Savannah	Kansas City	n/a	$1.85	
Charleston	Kansas City	n/a	$1.86	
Norfolk	Kansas City	n/a	$1.97	
NY-NJ	Kansas City	n/a	$2.01	
Vancouver	Minneapolis	$1.48	$1.71	
Seattle-Tacoma	Minneapolis	**$1.47**	**$1.49**	**$0.02**
Oakland	Minneapolis	$1.58	$1.78	
Los Angeles-Long Beach	Minneapolis	$1.56	$1.81	
Lazaro Cardenas	Minneapolis	n/a	n/a	
Houston	Minneapolis	$1.77	$2.01	
Savannah	Minneapolis	n/a	$1.98	
Charleston	Minneapolis	n/a	$2.07	
Norfolk	Minneapolis	n/a	$2.06	
NY-NJ	Minneapolis	n/a	$2.15	
Vancouver	Chicago	$1.52	$1.64	
Seattle-Tacoma	Chicago	$1.52	**$1.54**	**$0.04**
Oakland	Chicago	$1.52	$1.60	
Los Angeles-Long Beach	Chicago	**$1.50**	$1.60	
Lazaro Cardenas	Chicago	$1.83	n/a	
Houston	Chicago	$1.72	$1.78	
Savannah	Chicago	$1.80	$1.86	
Charleston	Chicago	$1.80	$1.89	
Norfolk	Chicago	$1.72	$1.93	
NY-NJ	Chicago	$1.81	$1.99	
Vancouver	Cleveland	$1.64	$1.72	
Seattle-Tacoma	Cleveland	$1.65	**$1.62**	**$0.00**
Oakland	Cleveland	$1.65	$1.73	
Los Angeles-Long Beach	Cleveland	**$1.62**	$1.67	
Lazaro Cardenas	Cleveland	n/a	n/a	
Houston	Cleveland	n/a	$1.93	
Savannah	Cleveland	$1.79	$1.95	
Charleston	Cleveland	$1.79	$1.95	
Norfolk	Cleveland	$1.75	$1.88	
NY-NJ	Cleveland	$1.71	$1.94	
Vancouver	Columbus	$1.64	$1.73	

Seattle-Tacoma	Columbus	$1.65	**$1.63**	**$0.01**
Oakland	Columbus	$1.65	$1.74	
Los Angeles-Long Beach	Columbus	**$1.62**	$1.67	
Lazaro Cardenas	Columbus	n/a	n/a	
Houston	Columbus	n/a	$1.89	
Savannah	Columbus	$1.79	$1.94	
Charleston	Columbus	$1.79	$1.93	
Norfolk	Columbus	$1.75	$1.86	
NY-NJ	Columbus	$1.72	$1.94	
Vancouver	Pittsburgh	$1.72	$1.88	
Seattle-Tacoma	Pittsburgh	$1.68	**$1.82**	**$0.16**
Oakland	Pittsburgh	$1.68	$1.93	
Los Angeles-Long Beach	Pittsburgh	**$1.66**	$1.87	
Lazaro Cardenas	Pittsburgh	n/a	n/a	
Houston	Pittsburgh	n/a	$2.07	
Savannah	Pittsburgh	$1.83	$1.94	
Charleston	Pittsburgh	$1.83	$1.95	
Norfolk	Pittsburgh	$1.72	$1.87	
NY-NJ	Pittsburgh	$1.70	$1.92	
Vancouver	Atlanta	n/a	$1.88	
Seattle-Tacoma	Atlanta	$1.73	$1.80	
Oakland	Atlanta	$1.69	$1.81	
Los Angeles-Long Beach	Atlanta	$1.73	**$1.79**	**$0.18**
Lazaro Cardenas	Atlanta	$1.75	n/a	
Houston	Atlanta	$1.65	$1.84	
Savannah	Atlanta	**$1.61**	$1.82	
Charleston	Atlanta	$1.65	$1.83	
Norfolk	Atlanta	$1.71	$1.94	
NY-NJ	Atlanta	$1.88	$2.04	
Vancouver	Savannah	n/a	$2.02	
Seattle-Tacoma	Savannah	$1.71	$1.84	
Oakland	Savannah	$1.69	$1.86	
Los Angeles-Long Beach	Savannah	$1.72	$1.84	
Lazaro Cardenas	Savannah	n/a	n/a	
Houston	Savannah	n/a	$1.86	
Savannah	Savannah	**$1.47**	**$1.60**	**$0.13**
Charleston	Savannah	$1.60	$1.80	
Norfolk	Savannah	$1.70	$1.92	
NY-NJ	Savannah	n/a	$2.04	
Vancouver	Charlotte	n/a	$1.95	
Seattle-Tacoma	Charlotte	$1.76	$1.81	
Oakland	Charlotte	$1.76	$1.88	
Los Angeles-Long Beach	Charlotte	$1.78	$1.84	
Lazaro Cardenas	Charlotte	n/a	n/a	
Houston	Charlotte	n/a	$1.92	
Savannah	Charlotte	$1.59	$1.84	
Charleston	Charlotte	**$1.58**	**$1.66**	**$0.08**
Norfolk	Charlotte	$1.66	$1.85	
NY-NJ	Charlotte	n/a	$2.05	
Vancouver	Charleston	n/a	$2.05	

Seattle-Tacoma	Charleston	$1.72	$1.86	
Oakland	Charleston	$1.72	$2.06	
Los Angeles-Long Beach	Charleston	$1.74	$1.89	
Lazaro Cardenas	Charleston	n/a	n/a	
Houston	Charleston	n/a	$1.90	
Savannah	Charleston	$1.61	$1.69	
Charleston	Charleston	**$1.51**	**$1.61**	**$0.10**
Norfolk	Charleston	$1.71	$1.85	
NY-NJ	Charleston	n/a	$2.06	
Vancouver	Norfolk	n/a	$1.93	
Seattle-Tacoma	Norfolk	$1.74	$1.77	
Oakland	Norfolk	$1.74	$1.85	
Los Angeles-Long Beach	Norfolk	$1.74	$1.85	
Lazaro Cardenas	Norfolk	n/a	n/a	
Houston	Norfolk	n/a	$2.00	
Savannah	Norfolk	$1.64	$1.89	
Charleston	Norfolk	$1.65	$1.90	
Norfolk	Norfolk	**$1.51**	**$1.63**	**$0.12**
NY-NJ	Norfolk	n/a	$2.02	
Vancouver	Baltimore	$1.84	$2.03	
Seattle-Tacoma	Baltimore	$1.82	$1.79	
Oakland	Baltimore	$1.82	$1.84	
Los Angeles-Long Beach	Baltimore	$1.80	$1.87	
Lazaro Cardenas	Baltimore	n/a	n/a	
Houston	Baltimore	n/a	$2.16	
Savannah	Baltimore	$1.78	$1.86	
Charleston	Baltimore	$1.79	$1.86	
Norfolk	Baltimore	**$1.70**	**$1.76**	**$0.06**
NY-NJ	Baltimore	$1.71	$1.82	
Vancouver	Harrisburg	$1.85	$2.00	
Seattle-Tacoma	Harrisburg	$1.75	$1.87	
Oakland	Harrisburg	$1.75	$1.98	
Los Angeles-Long Beach	Harrisburg	$1.73	$1.91	
Lazaro Cardenas	Harrisburg	n/a	n/a	
Houston	Harrisburg	n/a	$2.15	
Savannah	Harrisburg	n/a	$1.94	
Charleston	Harrisburg	n/a	$1.93	
Norfolk	Harrisburg	$1.73	$1.89	
NY-NJ	Harrisburg	**$1.60**	**$1.80**	**$0.20**
Vancouver	NY-NJ	$1.84	$2.02	
Seattle-Tacoma	NY-NJ	$1.80	$1.85	
Oakland	NY-NJ	$1.80	$1.98	
Los Angeles-Long Beach	NY-NJ	$1.80	$1.92	
Lazaro Cardenas	NY-NJ	n/a	n/a	
Houston	NY-NJ	n/a	$2.11	
Savannah	NY-NJ	n/a	$1.94	
Charleston	NY-NJ	n/a	$1.93	
Norfolk	NY-NJ	$1.76	$1.90	
NY-NJ	NY-NJ	**$1.60**	**$1.80**	**$0.20**
Vancouver	Boston	$1.95	$2.09	

Seattle-Tacoma	Boston	$1.87	$2.01	
Oakland	Boston	$1.87	$2.10	
Los Angeles-Long Beach	Boston	$1.85	$2.03	
Lazaro Cardenas	Boston	n/a	n/a	
Houston	Boston	n/a	$2.28	
Savannah	Boston	n/a	$1.99	
Charleston	Boston	n/a	$1.98	
Norfolk	Boston	$1.85	$1.96	
NY-NJ	Boston	**$1.64**	**$1.84**	**$0.20**
Vancouver	Toronto	**$1.71**	**$1.83**	**$0.12**
Seattle-Tacoma	Toronto	$1.71	$1.91	
Oakland	Toronto	$1.67	$1.96	
Los Angeles-Long Beach	Toronto	$1.65	$1.99	
Lazaro Cardenas	Toronto	n/a	n/a	
Houston	Toronto	n/a	$2.23	
Savannah	Toronto	n/a	$2.36	
Charleston	Toronto	n/a	$2.28	
Norfolk	Toronto	n/a	$2.12	
NY-NJ	Toronto	$1.79	$2.16	

Note: Cost for the trans-load channel corresponds to either trans-load to rail container or trans-load to truck. The latter is selected if rail service is not available or if trucking is cheaper.

5.6. Domestic Equipment Availability

The feasibility of the consolidation-deconsolidation (trans-loading) import strategy depends upon an adequate supply of large domestic containers. Tracing the growth and mix of domestic intermodal container fleet over the last several years, one can confirm a continuing increase in the supply of 53-foot containers. Table 7 documents this growth. In 1998, only 14% of the domestic container fleet consisted of 53-foot boxes. By the end of 2002, 53-foot boxes accounted for almost half of the fleet, and by the end of 2006, they accounted for almost 83% of the fleet. Considering expiration dates of leases and anticipated retirements, in the 2005 SCAG Report it was projected that by 2007 about 85% of the fleet will consist of 53-foot boxes. This turned out to be a good estimate: Updated data the author has received now indicates slightly more than 89% of the fleet will be 53-foot boxes by the end of the 2007 calendar year.

Table 7: Domestic Container Fleet, 1998 to 2007

Container type	1998	2000	2002	2006	2007 projected in mid-2005	12-31-2007 projected in mid-2007
48 foot	76,112	77,670	65,124	26,505	24,000	17,300
53 foot	12,500	34,758	56,686	126,882	138,500	143,700
Total	**88,612**	**112,428**	**121,810**	**153,387**	**162,500**	**161,000**
53ft % of total	***14.1%***	***30.9%***	***46.5%***	***82.7%***	***85.2%***	***89.3%***
Annualized growth in cubic capacity		***14.9%***	***5.3%***	***8.0%***	***6.3%***	***5.8%***

These figures suggest that, in the short run, the supply of 53-foot domestic containers continues to be adequate to support continued growth in the West Coast distribution warehousing and trans-loading strategies as pursued by large importers. In the longer run, the continued outsourcing to Asia of manufacturing goods consumed in the USA suggests reductions in westbound domestic intermodal traffic from Midwest USA to the West Coast. This in turn implies westbound empty return of domestic equipment would be required to accommodate imports, which would place upward pressure on the eastbound rates for domestic containers.

6. Impacts of Port Contracts and of Carrier and Terminal Operating Strategies

6.1. Port Contracts

Steamship lines enter into long-term contracts with ports for use of terminal facilities and/or dock space. As will be discussed, the terms of contracts vary to some degree from port to port. From the point of view of elasticity studies, the important characteristic is that there can be short-term or medium-term financial constraints on the ability of lines to shift import volumes between ports. To illustrate the variety and implications of these constraints, the particular nature of contracts at selected ports are reviewed below.

The author interviewed the Port of Long Beach (POLB) as to their contracts with terminal operators. Each terminal is leased from the Port by a joint venture between a stevedoring company and a steamship line. (For example, Pier T is leased by TTI, a joint venture between Marine Terminals and Hanjin. China Shipping is a tenant.) Each contract between POLB and a joint venture lasts for 20 years and is termed a "Preferential Assignment Agreement". Contracts at Port of Los Angeles terminals are similar, though they have a 30-year term. Technically, POLB has the right to put other activity in the terminal, but as a practical matter, the agreement amounts to a lease of the terminal.

There is a guaranteed annual minimum payment (in dollars per acre) to POLB. This amount ranges from $120K (old agreements) to $175K (recent agreements). In addition, there are tariff rates per loaded box (20s, 40s and 45s, inbound and outbound, outbound is lower) published on the POLB web site that determine actual payments. There is a specified volume break point determining how much of the tariff rate is collected by POLB per box. The break point ranges from 35K to 50K metric revenue tons per acre per year. Below this break point, POLB collects 50% of the tariff rate. Above the break point, POLB collects 25%. There also is a published "wharfage" rate collected on empty containers.

The stevedoring company operating the terminal is paid by the joint venture on a per-box basis. Their incentive is to push as much volume through the terminal as possible. No POLB terminal has ever failed to meet the guaranteed annual minimum.

The POLB contracts also require terminals to enforce demurrage rules. Inbound boxes have four free working days from the time the box is grounded (effective July, 2005) before demurrage commences (the clock stops when the box goes out the terminal gate); outbound boxes have six free days before the published vessel sailing schedule (the clock starts when the box enters the terminal gate). The terminal joint venture is required to assess demurrage on boxes exceeding free-time limits. POLB audits the terminal joint venture's books; if demurrage was not assessed then the joint venture must pay POLB a penalty. There is a minimum demurrage charge ("wharf storage") specified on the POLB web site, but as a practical matter, all terminals charge a much higher rate.

Terminal leases at the Port of Seattle are somewhat similar in both rates and structure, but there are important differences. Leases are long-term leaseholds on terminals built by the Port. Leases are held by terminal operators such as SSA Marine, by stevedoring subsidiaries of steamship lines (Eagle, a subsidiary of APL), or by joint ventures by stevedoring companies and steamship lines (e.g., TTI and Hanjin). The lease life varies; the shortest lease is less than 10 years for TTI-Hanjin, while APL-Eagle and SSA Marine leases have terms of 25 and 30 years, respectively. Leases are structured on an escalating rent basis, based only on a per acre charge that is identical for all Port of Seattle terminals. Base rent as of the beginning of 2008 was about $104,000 per acre with fixed 6% annual compounded rent increases that are implemented every 5 years (i.e., about a 34.5% rent increase every five years, with the next increase in 2013). All rent increases occur on the same schedule for all tenants. In addition to basic land and improvement rent, there are slightly varying crane rents based on hours used with rates declining to 25% of full tariff after certain minimum volumes are met. Other than crane rent there are no volume related charges. The Port is responsible for all of the facility development, while tenants provide their own equipment. There are no wharfage, dockage, demurrage or other charges assessed.

Terminal leases at the Port of Tacoma exhibit more variability in rates, but are all somewhat similar in structure. They collect rent for basic land and improvements, much like the Port of Seattle, whereby the terminals all were built by the Port. Notably, the base rents as of early 2008 were about $80,000 per acre for the land and improvements, i.e., about 20% less than base rents at the Port of Seattle. Land and improvement rents in Tacoma generally inflate each year according to the consumer price index, but with a 1% minimum and a 5% maximum annual inflation. Tacoma also has intermodal minimum volume requirements built into each lease (except in the case of Maersk). Intermodal fees are set by the Port annually, not contractually specified in the leases. The terminals have different minimum intermodal guarantees, but they are all between 100,000 to 120,000 moves per year minimum, and the facility fee for using the intermodal yards is currently $20/box. There is significant variability with respect to cranes: Some terminals own and maintain their own cranes, while others are owned and maintained by the Port and charged on hourly rate basis to the customer. As in Seattle, there are no wharfage, dockage, demurrage, or other charges assessed. As of early 2008, Port of Tacoma leases were held by Maersk, Yang Ming, K-line, Hyundai, and Evergreen. The leases are generally for 20 year periods with renewal options. NYK Lines has signed a lease for a new terminal to be built. This lease has the same structure, but rates and intermodal guarantees are about three times the levels of rates and guarantees of the existing leases.

The Short-Run Elasticity Model does not analyze the impact of terminal lease terms. However, assumptions reflecting minimum import volumes to be respected at various ports can be input to the Model.

6.2. Contracts Between Steamship Lines and Railroads

Steamship lines enter into contracts with railroads in order to offer inland point intermodal (IPI) service. Each steamship line sells door-to-door transportation of marine boxes from Asia to inland US points, and uses the railroad as a subcontractor to move the box from an on-dock rail intermodal terminal or a near-dock intermodal terminal to an inland rail intermodal terminal. Dray operators making final delivery of the box from inland rail intermodal terminal to customer dock, and handling dray from dock-to-origin-rail-terminal (where required), also function as subcontractors to the steamship line. Typically, each steamship line selected one railroad (either BNSF or UP) to contract for hauling all or nearly all its IPI traffic through West Coast ports to Midwestern destinations or to gateways with eastern railroads for furtherance to Eastern US destinations.

Until 2006, the railroads entered into long-term (8-10 year) contracts with the steamship lines, offering the lines attractive rates. Contracts negotiated since the start of 2006 have featured one-year terms and sharp increases in rates, in the range of 25-40%. As of early 2008, some lines still enjoy a legacy long-term contract with a western railroad, while others are saddled with a new short-term contract at a much higher rate. This has led some lines to curtail their solicitation and/or raise prices for IPI service through West Coast ports, and, as a consequence, there have been major shifts in market shares among the lines. For example, in 2007, IPI traffic shares of Maersk and Evergreen declined, while IPI market shares of K Line and APL rose.

This has a couple of important impacts on short-term elasticity of imports. First, marine stack train traffic on BNSF grew more slowly (because Maersk and Evergreen are major BNSF accounts), while marine stack traffic on UP grew more quickly (because K Line and APL are major UP accounts). All other things being equal, this shift could tend to increase stack-train transit times somewhat in UP channels while decreasing stack-train transit times somewhat in BNSF channels. Second, because the various lines entered into varying contracts with West Coast ports, shifts in market shares between lines results in shifts in market shares between ports.

The last of the legacy long-term contracts will expire in 2011. It is expected that, at that time, all lines will have year-to-year contracts with the railroads at the higher rates.

In the Short-Run Elasticity Model, we utilize averages of a basket of rate quotations. Thus differences among lines are ignored.

6.3. Contracts Between Importers and Steamship Lines

Rates charged by steamship lines and service schedules are revised each spring. Generally, large importers enter into contracts with only one or perhaps a few lines for their imports over a one-year period, May-to-May. By signing up their entire Asia – USA import business with a single line, they are able to negotiate rates less than casual rates. This results in a seasonal inflexibility, whereby large importers tend to implement major changes in their supply chains only in the spring. Similarly, the lines are loath to make major changes in their vessel strings except at the start of each season (because currently contracted customers have structured their supply chains around the current service).

This results in a time-lagged response by carriers and importers to service changes or performance problems in supply chains, as well as potential overreaction to such problems. For example, as a reaction to the late-summer 2004 "melt-down" at the San Pedro Bay ports, several lines adjusted their service for the 2005 season to shift some vessel strings from off-loading IPI imports at the San Pedro Bay ports to off-loading IPI imports at the Puget Sound ports. But by summer of 2005, the PierPass program had been implemented successfully, more night shifts had been added at San Pedro Bay port terminals, the summer shipping peak broadened out, and the 2005 season (starting in May, 2005) was handled without major back-up at the San Pedro Bay ports. As a result, the lines shifted their vessel strings back to the San Pedro Bay ports at the start of the 2006 season (May, 2006).

In the Short-Run Elasticity Model, we ignore seasonal time lags in the optimization of supply chains.

6.4. Carrier and Terminal Operating Strategies

Rail Rates and the Balance of Inbound and Outbound Container Flows

A traditional practice of many steamship lines was to set up vessel strings as follows. Loaded vessels from Asia would call at the San Pedro Bay ports first (the largest local market) and unload local cargoes as well as most inland cargoes. The vessel would take on export loads and some empties and then transit up to call at Oakland, where it would unload local cargoes and take on more empties and export loads. The vessel would then transit to one of the Pacific Northwest ports to unload local cargoes and take on more exports and empties before embarking for Asia. Considering this cycle, the steamship lines could save cycle time on empty containers returning to Asia or export loads developing in the interior of the USA by routing them via the PNW ports.

This practice had several results. First, the San Pedro Bay ports enjoyed considerable import volumes without commensurate outbound flows of empties, whereas Oakland and Seattle/Tacoma had larger outbound flows of containers than inbound flows. Second, the western US railroads experienced considerable imbalances in marine container traffic flows (more eastbound than westbound containers at the San Pedro Bay ports, more westbound than eastbound at Oakland and the Pacific Northwest ports). This necessitated them to run many trains of empty well cars just to re-position them from Seattle/Tacoma and Oakland to San Pedro Bay for the next cycle of containers flowing into the USA and returning to Asia.

In 2006, the railroads began making major changes to their rate structures for steamship lines. Heavy penalties were introduced for imbalanced container flows to/from each of San Pedro Bay, Oakland and Seattle/Tacoma. During the latter half of 2006 and through 2007, this resulted in increased flows of empty containers and export loads via the San Pedro Bay ports and decreased flows of same at Oakland and Seattle/Tacoma. Per unit import volume, San Pedro Bay now accommodates larger flows of export containers and empty containers returning to Asia.

In the Short-Run Elasticity Analysis Model, we only study imports and ignore issues of imbalance in returning westbound containers. This was an important issue among West Coast ports before flows were balanced at each port, but now that they are, it is anticipated that this balance will persist.

Hours of Operation

Up through 2004, most West Coast container terminals conducted gate operations[14] only during day shift and, in some cases, during an additional swing shift. As a reaction to the melt-downs at San Pedro Bay port terminals during the late summer of 2004, this has changed. The “PierPass” program instituted a $100 charge for gate entry during day shift; proceeds were used to fund the introduction of swing and hoot shifts. During the off hours, gate entry is free. This financial incentive to spread gate activity around the clock has had a significant impact. It is estimated that during the 2006 season, about 34% of gate movements at the San Pedro Bay ports were handled off peak, compared to virtually none in 2004. This required changes in the operations of local warehouses, logistics service providers, and dray companies. Some importers or trans-load operators and their dray service providers completely switched to night operation. Others made room for storage of containers on site so that dray operations could be performed at night while warehouse and trans-load activities were conducted during the day.

Hours of gate operations at other West Coast ports also have increased in recent years, although as yet none match the percentage off-peak movement of containers achieved at the terminals at the San Pedro Bay ports.

In the Short-Run Elasticity Analysis model, we account for the hours of operation of the port terminals when predicting container flow times.

Unloading Sequence

[14] “Gate operations” refers to truck or dray movement of containers in and out of the terminal.

The large vessels now in service require multiple days to off-load all containers. Steamship line practices concerning segregation and sequencing of containers to be unloaded impact the relative lead times for container movement in landside channels.

A prominent practice in this regard is to segregate into different hatches of the vessel inland-point intermodal (IPI) boxes and store-door and container yard (CY) boxes. (IPI boxes are re-loaded on double-stack trains for landside movement, while store-door and CY boxes leave the port terminal via truck or local dray.) Typical practice is to unload the IPI hatches first, then unload the store-door and CY hatches. The reason for this is that importers receiving CY or store-door service may delay picking up the containers from the port terminal, if they have no pressing need for their cargoes. This can cause the terminal to back up. On the other hand, the steamship line is still in full control of the IPI boxes and can assure continued throughput of these boxes. To protect itself against potential back-ups, the carrier and/or terminal operator will adopt the policy of IPI first, store-door and CY second. For example, in the case of a large vessel requiring four days to fully unload, two days might be spent unloading IPI cargoes, followed by two days unloading store-door and CY hatches. In effect, store-door and CY cargoes have two extra days of container flow time compared to IPI cargoes because of this practice.

An exception to this general practice is when the steamship line and terminal offer “hot-hatch” service (perhaps for an additional fee). Hot-hatch cargoes are unloaded first, before ordinary IPI cargoes. In such cases, a store-door or CY importer can secure fast container flow time, but at additional cost.

In the Short-Run Elasticity Analysis Model, we utilize statistics on actual container flow times. These statistics reflect the unloading sequence practices at the various terminals.

Port Terminal Storage

As discussed above, ports generally require demurrage charges to be assessed against boxes held in port terminals for excessive amounts of time. In the case of the Port of Long Beach, four free days are allowed for imports before demurrage charges commence.

It was noted in Phase I of this study that, in the past, some large customers have negotiated terms allowing them to leave imported containers at port terminals for much longer periods than four days without demurrage payment, reportedly as much as 21 free days. In effect, the port terminal could be utilized like a free warehouse. Evidently the steamship line/terminal operator made such a deal in order to please a high-volume customer. Such deals make the analysis of import economics difficult, because of the bundling of inventory and transportation services.

We assume in the Short-Run Elasticity Analysis Model that such long periods of free time are not allowed.

Rail Service Priorities for Domestic and Marine Containers

Heading inland from West Coast ports, rail-borne marine and domestic containers are generally handled in separate trains. Generally, domestic containers are handled on "Z" or "Q" class trains, while marine containers are handled on "S" or "I" class trains. In addition to handling trans-loaded imports, domestic containers are used to haul time-sensitive, high-revenue domestic traffic such as wine, canned goods, package express, etc. Transit times and transit time reliability of trains handling domestic containers are generally superior to trains handling exclusively marine containers. This provides a container flow-time advantage to importers utilizing trans-loading channels that may partially or completely make up for time disadvantages associated with unfavorable port unloading sequence, and time for a side trip to visit a trans-loading facility in the hinterland of the port of entry.

In the Short-Run Elasticity Analysis Model, we utilize distinct statistics on actual flow times for marine and domestic containers in the various landside channels, and we apply these statistics to direct-shipping and trans-loading supply-chain alternatives, respectively.

7. Congestion Analysis

7.1. Background on Queuing Theory

The theory of waiting lines is based on probabilistic analysis of *service systems*. In a service system, customers arrive according to some random process. If a server is available, a customer proceeds immediately into service. Service commences and requires a random amount of time, after which the customer departs the system and the server is released. If on the other hand all servers are busy, the customer waits for the next available server. The expected waiting time (i.e., the probabilistic average waiting time) is a function of the probability distributions for customer inter-arrival times and service times in the service system.

Queuing theory concerns the development of analytical formulas for customer waiting time and total time in the system as a function of assumed probability distributions for inter-arrival times and service times. An important and widely used formula from queuing theory (see, for example, Hopp and Spearman, 2001) is as follows:

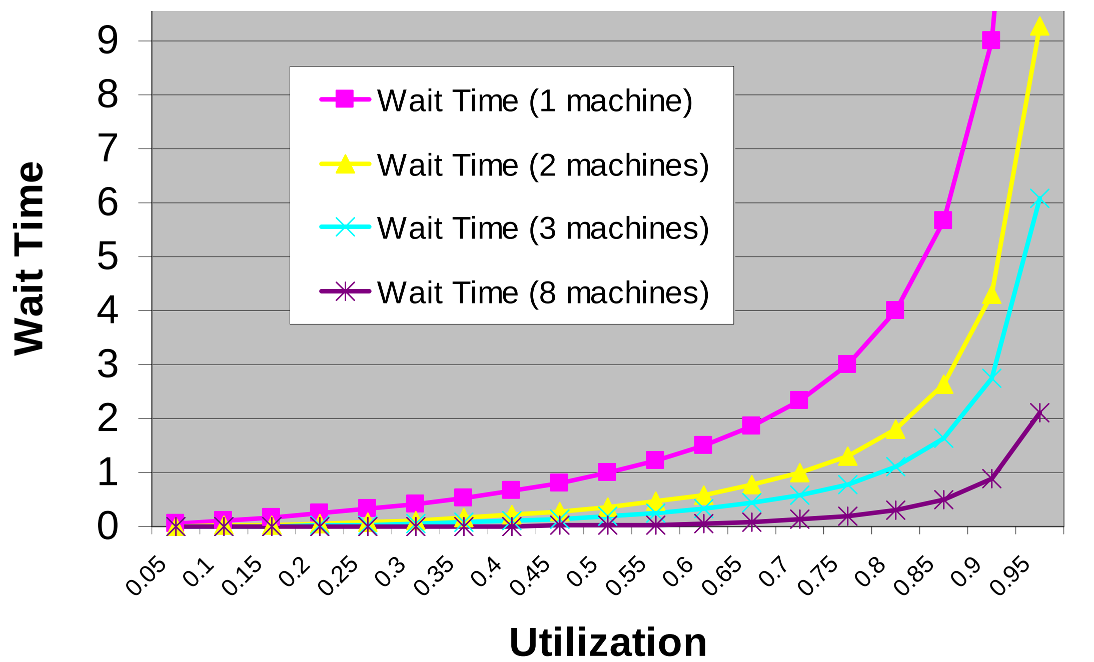
$$WT = \left(\frac{ca^2 + ce^2}{2}\right)\left(\frac{u^{\sqrt{2(m+1)}-1}}{m(1-u)}\right)\left(\frac{PT}{A}\right) \qquad (1)$$

where *WT* is waiting time, *ca* is the normalized variance in customer inter-arrival times, *ce* is the normalized variance in service time (including allowance for equipment break-downs), *u* is the fraction of time a server is engaged in serving customers, *m* is the number of parallel servers, *PT* is the average service time ("process time"), and *A* is the average fraction of time the server is available to provide service or providing service (i.e., the equipment is not in break-down and the crew is not on break).

As may be seen, waiting time is the product of three factors: a term in *variability* (i.e, the level of volatility in inter-arrival times and in service times), a term in utilization *u* and the number of servers *m*, and a term in service time *PT* normalized by the server availability *A*. Increased randomness, increased utilization (or a reduced number of servers), and increased service time (or reduced server availability) lead to increased waiting time.

The quantitative impact on waiting time from increasing *u* and *m* is graphed in Figure 7, which portrays data from a semiconductor manufacturing application of (1). (In the context of the manufacturing application, machines are the servers of the queuing system.) The middle term of (1) is a hyperbolic function, so that waiting time increases exponentially as utilization approaches 100%. How closely one can approach 100% utilization before waiting time becomes excessive depends on the variability in arrival and service rates (more variability, i.e., a larger value of the first time in (1), amplifies the exponential rise in waiting time). It also depends on the number of parallel servers. Note that increasing the number of parallel servers has an ameliorating effect on waiting time, but with diminishing returns as more and more servers are added. For this manufacturing example, average waiting time with only one server at 90% utilization is about 9 hours, whereas average waiting time with two parallel servers operating at 90% utilization is a little more than four hours. With eight servers at 90%, the waiting time drops to a bit less than one hour.

Figure 7.
Wait Time as a Function of Utilization and the Number of Servers



The expected (statistical average) total time a customer spends in the system, known as the *cycle time*, is expressed as

$$CT = WT + SCT \qquad (2)$$

where *WT* is the waiting time as in (1) and *SCT* is the *standard cycle time*, i.e., the expected time the customer will be in the system once service begins. *SCT* expresses how long it takes the customer to transit the system when there is no waiting for a server, while *PT* expresses how long the server is consumed serving one customer. In many applications, *SCT* and *PT* are identical, but in some situations they are not. For example, a system may consist of a single bottleneck step that may entail considerable waiting time plus other preceding and following steps with generous capacity involving little or no waiting.

In the Elasticity Study we are concerned about the impacts on container flow times resulting from changes in utilization (arising from changes in traffic level, changes in available facilities, and/or changes in hours of operation). To first approximation, we can assume that, without technological change, the terms in (1) concerning variability, server availability, process time and standard cycle time are constant when we make modest changes to traffic volume, operating hours or facility counts. This suggests that container flow time through any stage of the logistics chain satisfies (approximately) the following equation:

$$CT = a * \left(\frac{u^{\sqrt{2(m+1)}-1}}{m(1-u)} \right) + b \qquad (3)$$

where *a* and *b* are constants reflecting variability, server availability, process time and standard cycle time at that stage, and the middle term includes parameters concerning utilization and number of servers as defined for (1) above.

The analytical strategy taken in this study is to statistically fit equation (3) to industry data, i.e., to estimate the values of *a* and *b* for various logistics-chain applications, specifically, for container flow times through port terminals, rail intermodal terminals, and rail line-haul segments. The development of models for these applications is described in following sections.

7.2. Port Terminal Congestion Modeling

Typically, an import container experiences two lift cycles in a port terminal. The first cycle is a lift out of the ship and movement to a temporary staging area. The second cycle is a lift out of a position in the staging area onto a truck chassis or into a railroad double-stack well car (in the case of on-dock rail) for movement out of the terminal.

The most common productivity metric reviewed by managers of intermodal terminals is lifts per acre per year. The basis for this metric is that, as more space is made available, it is quicker to make required container movements. When a terminal is space-constrained, the boxes must be stacked in the staging area. This results in the need to lift and move other boxes out of way when the desired box is buried. Thus, utilization of more space improves productivity (i.e., it reduces waiting time in a queuing-theoretic sense).

Figures 8 and 9 illustrate the impact of acreage on port terminal productivity. Data points from two West Coast terminals are displayed. Both terminals are staffed by a single loading crew per shift, and both work three shifts per day five days per week. Figure 8 provides a plot of average import container dwell time vs. number of import containers per working day. Each point is a monthly statistic. Based on these data, it might seem that

Figure 8. Import Container Dwell Times vs. Import Volume at Selected Terminals
(one crew per shift, three shifts per day)

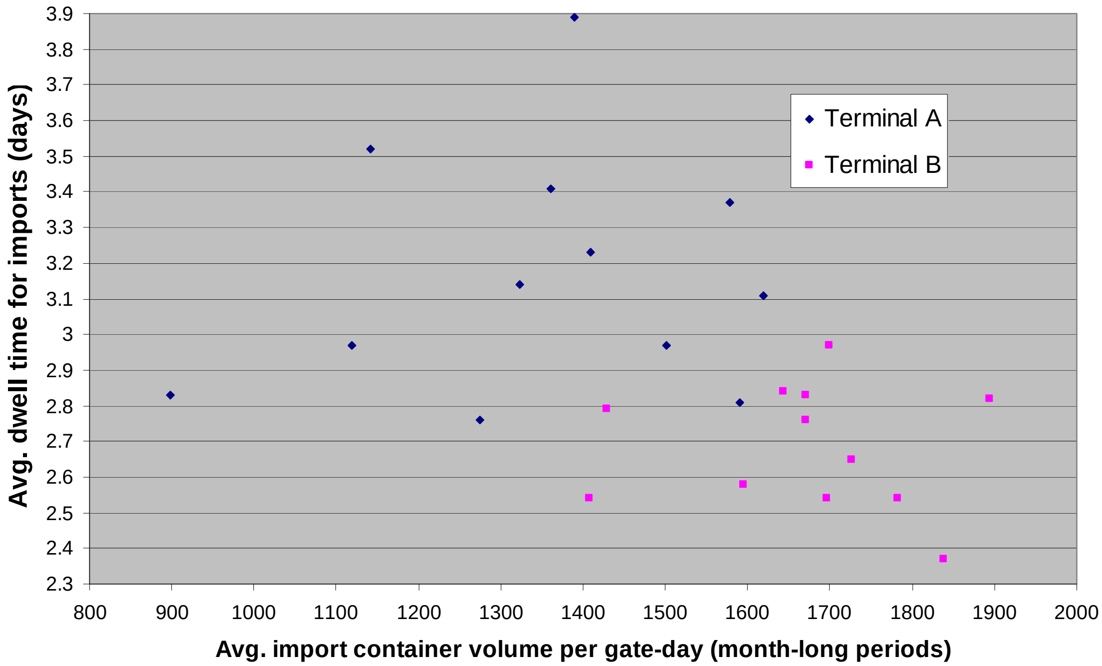
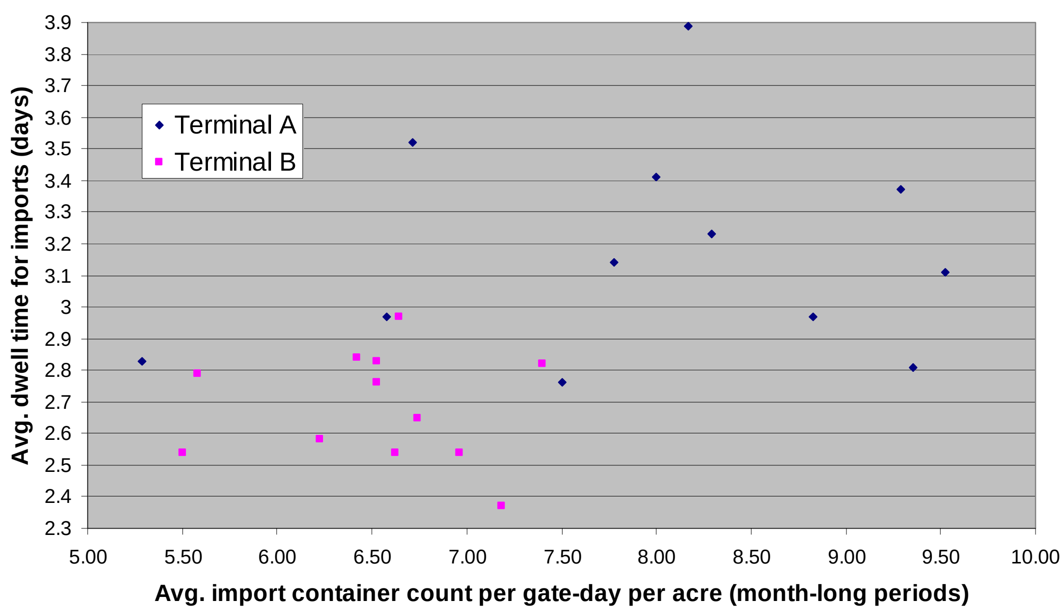


Figure 9. Import Container Dwell Times vs. Import Volume at Selected Terminals, Accounting for Acreage
(one crew per shift, three shifts per day)



Terminal B is more efficient than Terminal A in the sense that lower and more consistent dwell times are achieved while handling higher import volumes. Figure 9 re-plots the data after adjustment to account for available acreage. It is now clear that Terminal A is much more congested, attempting to handle much more volume per acre. A pattern emerges: As volume per acre per working day increases, dwell times increase and become more variable.

For the purposes of this study, we expand the industry-standard lifts-per-acre productivity metric to account for the hours of operation of the terminal. We express utilization in terms of lifts per acre per crew per hour. The idea here is that, with more hours worked per day or more crews working in parallel, throughput per day should increase in a terminal with a given acreage.

For application of the queuing model, the number of servers m is taken as the number of crews working in parallel to load truck chasses or railroad well cars. Utilization of a port terminal crew is more problematic to define. There needs to be a definition of the maximum capacity of a loading crew. For terminals manned three shifts per day by one crew lifting containers onto truck chasses or rail well cars, industry-reported import lifts per acre per working day (where a full working day includes three shifts of operation) generally are in the range of 5 to 10 lifts per acre. (Including export lifts, total lifts are roughly double these amounts.) To establish a utilization figure, the author posited 12 import lifts per acre per working day as equivalent to 100% utilization of a terminal staffed with one loading crew over three shifts per day. Utilization is then computed as follows:

Lifts per acre per crew hour = (Actual lifts per acre in the month) / [(No. of crew hours worked in the month)]

Utilization u = import lifts per acre per crew-hour / 0.5

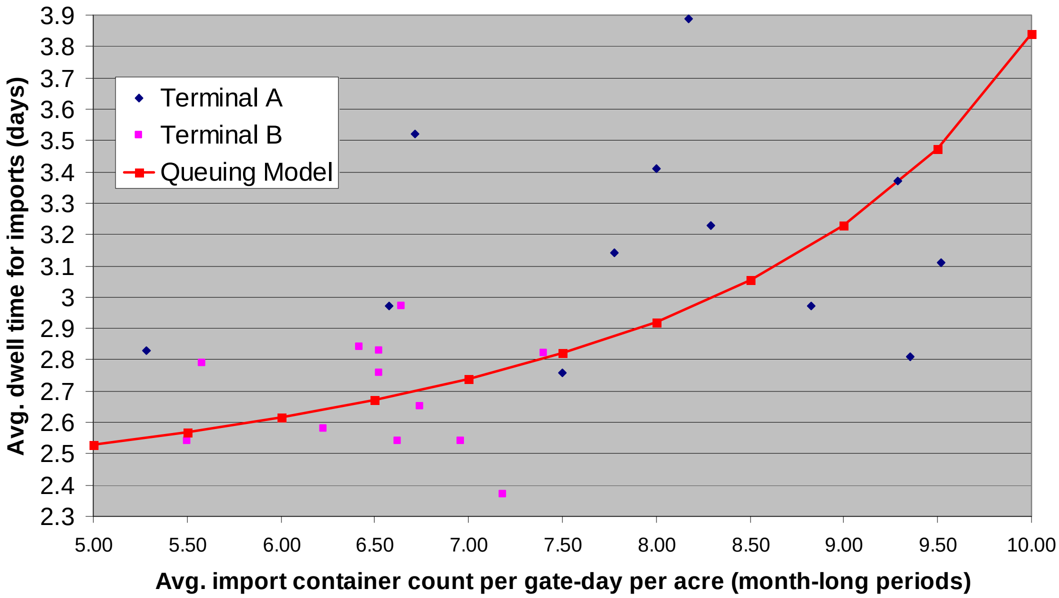
For example, suppose a terminal handled 22,371 import containers in a month over 22 working days. Each working day had three shifts, with one loading crew on duty each shift. The terminal has 170 acres. Then $u = \{ [22{,}371 / 170] / 24*22*0.5 \} = 49.85\%$.

The author secured monthly data for calendar 2006 from five container terminals at West Coast ports. These data include monthly import and export container volumes, number of shifts the gate was open during the month, number of loading crews on duty per shift, and average container dwell times (for imports, measured from ship docked and ready for unloading until container trucked out the gate or until on-dock rail train released to railroad).

Formula (3) was statistically fit to these data. The result is a = 7.36 hours (0.307 days) and b = 55.4 hours (2.31 days). That is, the model predicts that import container dwell time is 2.3 days plus 0.31 times the queuing formula's utilization factor as in equation (3).

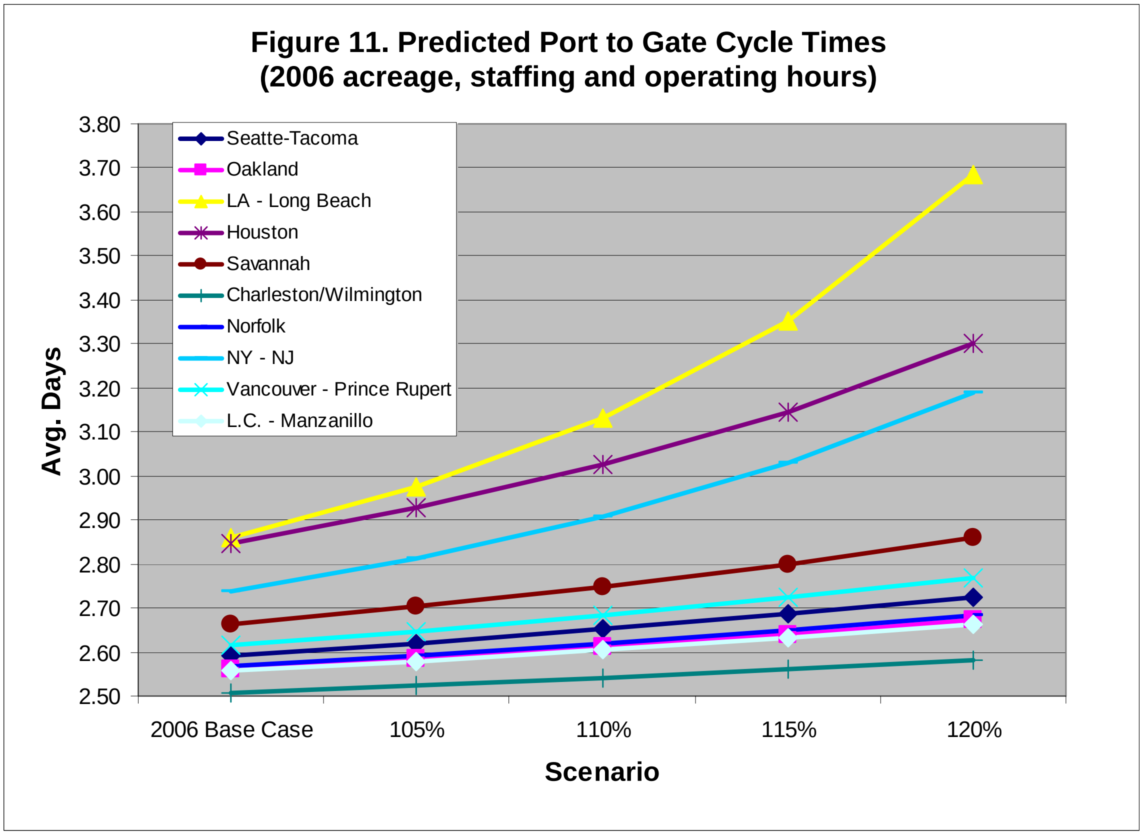
Figure 10 displays a comparison of the queuing model's predictions to actual data for the two terminals whose data appears in Figures 8 and 9. Actual container dwell times depend on a host of factors besides the productivity of the terminal crew: how quickly customers come to retrieve their box once they are notified, availability of chasses and railroad well cars, issues with unloading the vessel, etc. So the real data is quite "noisy" in the sense that waiting time based on utilization plus a standard cycle time does not fully explain dwell time. Nonetheless, it is asserted that the queuing model properly quantifies the effects of terminal congestion on average import container flow time.

Figure 10. Modeled and Actual Import Container Dwell Times vs. Import Volume at Selected Terminals
(one crew per shift, three shifts per day)



To illustrate the potential use of the queuing model within a short-term elasticity analysis, consider the data in Table 8 concerning assumed available acreage, assumed staffing at various ports, and an assumed scenario of port shares of total Asia – USA waterborne containerized imports. The 2006 import volume from Asia to US of 7,706,000 containers (12,430,000 TEUs) gives rise to terminal utilizations in the 45% - 72% range.

Now suppose we scale the 2006 import volume by 105%, 110%, 115% and 120% without adding acreage, crews or operating shifts at any port. The predictions of the queuing model are plotted in Figure 11. For this scenario, it would seem that the San Pedro Bay Ports, Houston and New York – New Jersey would have the most urgent need to expand crewing, operating hours and/or acreage to avoid unfavorable impacts on container flow times.



The reader is cautioned that aggregating all terminals in a port into one queuing system to be presented to queuing formula (1) will underestimate container flow times if there is significant variation among the terminals in utilization and/or in numbers of loading crews working in parallel. The hyperbolic functions portrayed in Figure 11 are not symmetric, i.e., the average waiting time across two terminals both working at 50% utilization is significantly less than the waiting time averaged across one terminal at 25% and the other at 75% utilization. For accurate results, the queuing model should be separately applied to terminals or groups of terminals with comparable utilizations and staffing.

7.3. Rail Terminal Congestion Modeling

A similar application of the queuing formula was made to rail intermodal terminals. 2006 statistics were provided by BNSF and Union Pacific concerning (1) average time from release of loaded on-dock stack trains until train departure from terminals at selected West Coast ports, and (2) available acreage and staffing schedules at 14 West Coast intermodal terminals, average time from in-gating of container-on-chassis until train departure vs. terminal lift volume.

Table 8: Port Terminal Data

Port	Assumed acreage available for Asia – US imports[15]	Assumed share of continental US import volume	Assumed avg. no. of crews per terminal per shift	Assumed avg. no. of gate shifts per day	2006 import containers per gate-day per acre (for the assumed mkt shares)	Est. utili-zation
Vancouver – Prince Rupert	431	0.0277	1	3	7.70	0.721
Seattle – Tacoma	1,034	0.0804	1	3	9.29	0.774
Oakland	759	0.0556	1	3	8.75	0.729
Los Angeles – Long Beach	2,968	0.4589	2	3	18.48	0.770
Lazaro Cardenas – Manzanillo	210	0.0152	1	3	8.65	0.721
Houston	345	0.0356	1.33	3	12.32	0.770
Savannah	966	0.0838	1.33	3	10.36	0.648
Charleston - Wilmington	396	0.0252	1	3	7.61	0.634
Hampton Roads	994	0.0737	1	3	8.87	0.739
NY - NJ	1,002	0.1439	2	3	17.18	0.781

For on-dock trains, actual times varied from 2.1 hours to 8.4 hours. Given the small overall flow time, it did not seem worth the trouble to model this in great detail. A simple weighted average of times from release by the port terminal to the railroad until train departure was 7.1 hours.

For rail intermodal terminals with boxes arriving on truck chasses, a similar metric of utilization was applied as with port terminals: One loading crew is assumed to be 100%

[15] 80% of available acreage at US East Coast ports assumed available for handling Asian imports. 20% of Vancouver acreage and 85% of Prince Rupert acreage assumed available for handling Asia – US imports. 70% of available acreage at L.C. – Manzanillo assumed available for handling Asia – US imports. Other space at these ports is assumed to be reserved for other trades. At all other ports, all acreage is assumed available for handling Asia – US imports.

utilized when completing 0.5 lifts per hour per acre (i.e., 4 lifts per shift per acre). The count of servers (*m*) again was taken to be the number of lift teams working in parallel. Table 9 displays data for eleven West Coast rail intermodal terminals used to calibrate the model.

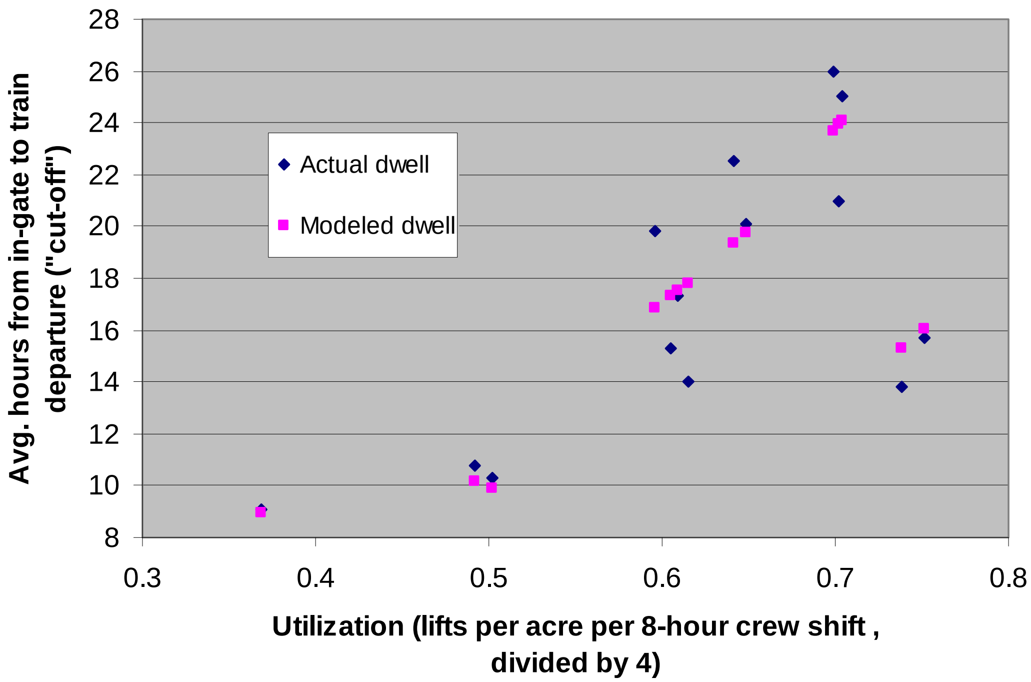
Table 9: Productivity Data for Rail Intermodal Terminals

Terminal[16]	Est. 2006 lifts per crew shift per acre	Est. 2006 utilization
T1	0.94	0.704
T2	0.79	0.596
T3	0.81	0.605
T4	0.81	0.609
T5	0.93	0.699
T6	0.86	0.642
T7	0.82	0.615
T8	1.00	0.752
T9	0.66	0.492
T10	0.86	0.648
T11	0.94	0.702
T12	0.67	0.502
T13	0.98	0.738
T14	0.49	0.369

The result of fitting equation (3) to these data and statistics on actual container dwell times was a = 8.76 hours (0.365 days) and b = 8.01 hours (0.334 days). A comparison of actual data to predictions of the queuing model is presented in Figure 12. As may be seen, the agreement between actual container flow times and predictions of the queuing model is good, and the model seems suitable for predicting changes in dwell time as a function of terminal infrastructure and staffing.

[16] Terminal names are coded in order to protect confidentiality of data furnished by the railroads. Terminal acreages and operating schedules are confidential.

Figure 12. Actual vs. Modeled Rail Intermodal Terminal Dwell Times
(West Coast terminals handling domestic and/or international boxes)



7.4. Rail Line-Haul Congestion Modeling

To estimate container transit time across the rail line-haul network, separate analyses were developed for single-track and multiple-track segments of the network, discussed as follows.

Single-Track Main Line Segments

When there are opposing train movements on single-track rail lines, one train must pull off the main track and stop in a passing siding. Generally, single-track rail lines are engineered with passing sidings spaced at roughly equal intervals of running time, e.g., spaced about 10 minutes apart for trains achieving the main-track speed limit. At locations where trains are liable to make conditional stops, e.g., at crew terminals or mountain summits, multiple sidings may be provided. The time the single-track segment is allocated to serve a train movement making track speed across the segment is

$$PT = (D + TL)/V + 2/60 \quad (4)$$

where PT is the queuing-theoretic process time expressed in hours, D is the distance across the segment in miles, TL is the train length in miles, and V is the track speed in

MPH. To the total time the segment is occupied by the train movement we add two minutes representing a minimum lag time to set the control signals authorizing the train to proceed through the segment.

Apart from time spent waiting in a siding for one or more opposing movements, there is extra delay from the loss of speed slowing down to enter the siding and accelerating back to track speed after leaving the siding, as well as a delay to release the train brakes once clearance to proceed is secured. In effect, the process time over a single-track segment is longer for a stopped train. We notate this extra time requirement when a train takes siding, i.e., the amount of extra time compared to (4), the process time for a through train movement, by *L*. We estimate *L* as follows:

$$L = \frac{2}{60} + \frac{V / a}{3600} \tag{5}$$

where *a* is the assumed acceleration rate, expressed in miles per hour per second (MPHPS). A value of 0.25 MPHPS was assumed for *a*. *L* includes an allowance of two minutes to release the brakes after clearance is secured (first term), plus the time required to accelerate the train back up to track speed (second term). During the acceleration, the train's average speed is *V*/2, so only half this time is lost, but it is assumed that there is an equivalent amount of loss to slow the train down when entering the siding.

Inevitably, train movements on busy single-track railroads tend to get fleeted, i.e., a stretch of single track tends to experience a busy period featuring a series of trains in the westbound direction, then a busy period featuring a series of trains in the eastbound direction, and so on. This practice results from efforts to minimize total train delays in light of the above fact that a train entering a single-track segment at track speed has a shorter process time over the segment than a train starting into the segment from a dead stop in a siding. This requires a modified queuing analysis detailed in Greenberg, Leachman and Wolff (1988). We summarize their queuing formula for single-track segments as follows.

We assume traffic on the rail line is symmetric, i.e., there are an equal number of trains run in each direction. Let *N* denote the average or expected number of trains per day over the segment, including movements in both directions. The utilization *u* of the segment is expressed as

$$u = N * PT / 24 \tag{6}$$

where *PT* is defined by (4). The probability that the track segment is experiencing a busy period in the opposite direction when a train arrives at the siding located at the start of a single-track segment is given by

$$P^{delay} = \frac{1}{2}\left[\frac{\left(e^{u/2}-1\right)\left(e^{u}+1\right)}{1+\left(e^{u/2}-1\right)\left(e^{u}+1\right)}\right], \tag{7}$$

The expected delay (in hours) at the track segment is the probability of delay multiplied by the expected remaining length of the busy period when the train arrives at the siding. This is given by

$$E^{delay} = P^{delay}\left[\frac{N}{48}e^{u/2} - \frac{(PT)(e^{u/2})}{e^{u/2}-1} + L\right] \qquad (8)$$

where N is the number of trains per day using the segment, P^{delay} is given by (7), u is given by (6), L is given by (5) and PT is given by (4).

A busy period of trains moving in the opposite direction is not the only source of delay on a single-track railroad. A fast-moving train may overtake a slower train moving in the same direction, and then lose time until the slower-moving train can be shunted off into a siding. The slow-moving train also experiences delay when overtaken by a faster train. Such delays are not accounted for by (8) but will be taken up in the next section.

Delays for Overtaking

In multiple-track segments of the rail network, a current-of-traffic can be established on each main track. If all trains moved at the same speed, there should be little or no delays. But different types of trains move at different speeds. As explained above, there are delays experienced are associated with fast trains overtaking slower trains moving in the same direction. We would expect such delays to rise as utilization rises, but to be ameliorated as more main tracks are made available. Thus we expect the overtake delay function to behave like the generic queuing formula (3). This formula is applied to both single-track and multiple-track segments, where m is taken as the number of main tracks and u is computed as

$$u = N * PT / (24 * m) \ . \qquad (9)$$

A couple of modifications to (3) are required. Because we calibrate the unknown constants a and b over data from multiple track segments with varying process times PT, we need to include process time in the formula. Moreover, we will be calibrating to total train transit time, not just to waiting time, so we must include the standard cycle time (SCT). The total expected (i.e., average) transit time for a train movement across the segment is the expected delay for opposing-movement busy periods (if single track), plus the delays for overtakes (following the form of equation (3)), plus the standard cycle time, plus time allowances for conditional stops (re-crewing and refueling). SCT is computed as

$$SCT = D/V \ . \qquad (10)$$

The overall formula used for the estimated cycle time, i.e., the total transit time over a series of single- or multiple-track segments comprising an intermodal route, is

$$CT = \sum_{i \in ST} E_i^{delay} + a * \sum_i \left(\frac{u_i^{\sqrt{2(m_i+1)}-1}}{m_i(1-u_i)} \right) (PT_i) + b + \sum_i SCT_i + ncc * scc + nrf * srf \qquad (11)$$

where the subscript i has been added to refer to line segment i within the overall origin-destination route. The first term in the expression for route cycle time expresses the estimated waiting time (dispatching delays) for opposing movement busy periods on single track, computed using (8). The notation "$i \in ST$" limits the summation to the segments belonging to the set ST of single-track segments within the route. The second term expresses the delays due to overtakes. For each segment, PT_i is computed using (4) and u_i is computed using (9). Here, a may be thought as the multiplicative parameter accounting for track non-availability (when possessed by maintenance staff or weather-related disruptions), as well as for the variability in train inter-arrival times and segment process times. The parameter b comprising the next term is a fixed factor to account for train delays independent of track capacity. The third term, the sum of the segment standard cycle times, expresses the theoretical running time over the route. Each SCT_i is computed as in (10). The last two terms express allowances for crew changes and locomotive refueling., where ncc denotes the number of crew changes on the route and nrf denotes the number of locomotive refueling stops on the route. The parameter scc denotes the assumed standard time, in hours, for a crew change and is computed as

$$scc = 0.25 + TL/12.5, \qquad (12)$$

i.e., scc is taken as 15 minutes plus the time to move one train length at 12.5 miles per hour. The parameter srf denotes the assumed standard time, in hours, for performing locomotive refueling. It is set to be 1.5 hours in this study.

Rail Network Database

A database of the track configuration was compiled for the major rail intermodal corridors from West Coast ports to major Midwest cities included as import destinations in the Elasticity Study. Specifically, track configuration data was developed from the ports of Seattle, Tacoma, Oakland, and Los Angeles – Long Beach to the destinations Minneapolis, Chicago, Kansas City, Memphis, Dallas and Houston. Each port-to-destination corridor was broken down into segments hosting approximately uniform numbers of through train movements. These segments were further broken down into sub-segments with constant numbers of main tracks.

The database, entirely developed from publically available information, specifies the segment length, estimated average train speed, number of main tracks. The number of sidings (single-track segments) or the number of main-track crossover locations (multiple-track segments) also is specified.

Appendix C provides this database reflecting the late-2006 track configurations used to calibrate equation (11).

Calibration of the Rail Line-Haul Model

BNSF and UP provided the consultant with confidential information concerning 2006 peak and off-peak train counts by segment and concerning peak and off-peak average times from train departure at origin terminal to arrival at destination terminal. BNSF selected a single week from the peak time of year and a single week from the off-peak time of year to provide the consultant with average train counts and average transit times. UP provided the same data types, but their data reflected separate averages over all peak-time-of-year weeks and over all off-peak-time-of-year weeks during 2006.

These data were used to calibrate the queuing model. For a particular service in a particular corridor, say, domestic intermodal on the Seattle – Chicago run, the total train counts on each segment of the run were used to compute the segment utilization, which in turn was plugged into the queuing model (12) to provide an expression for the total transit time in the corridor as a function of the unknown parameters a and b. Such expressions for all domestic intermodal corridors in peak and off-peak periods were then treated as a data set for the statistical calibration of the parameters a and b. Separate calibrations were made for trains hauling domestic containers (domestic intermodal service) and trains hauling marine containers (international intermodal service).

In some cases, there are alternate routes comprising a particular corridor. As an example, UP can route its Los Angeles – Chicago intermodal trains via El Paso or via Salt Lake City. As another example, BNSF can route its Tacoma – Chicago intermodal trains via Wenatchee, WA or via Vancouver, WA. The consultant made an allocation of trains to routes, consistent with total train counts provided by the railroads, in order to calibrate the model.

The results of calibration are shown in Table 10.

Generally, the railroads achieve faster transit times for domestic intermodal service than for international intermodal service. The average value of goods shipped on domestic intermodal trains is higher, as these trains carry the higher end of the value spectrum for imports and they carry time-sensitive domestic freight such as wine, canned goods and package express. The domestic intermodal trains are generally provided with more locomotive horsepower per ton and are given dispatching preference (where practical).

In light of this practice, the differences in the figures in Table 10 can be understood. As may be seen from the values for the fixed factor b, there is about 5.5 hours of transit time for domestic intermodal trains and 51.4 hours of transit time for international intermodal trains not explained by the parameters in (11), i.e., not explained by track capacity, ordinary running time, re-crewing and refueling. These extra times may reflect phenomena such as stops to pick up or set out at intermediate terminals, mechanical problems en route or inadequate horsepower to make track speed, time held out of terminals because of terminal congestion, and reduced dispatching priority. The larger value of the fixed factor *b* for international intermodal service is expected.

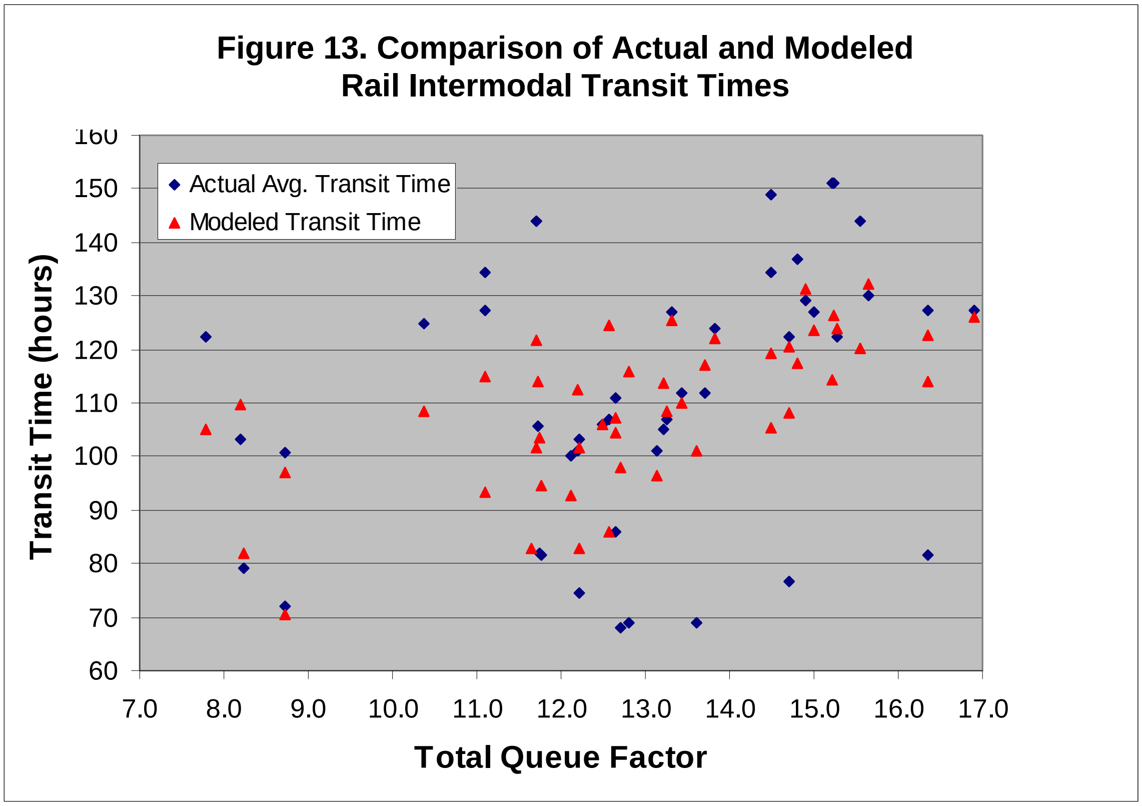
Table 10: Statistical Parameters of the Rail Line-Haul Transit Time Model

Service type	*a* (hours)	*b* (hours)
Domestic intermodal	3.506	5.53
International intermodal	1.224	51.41

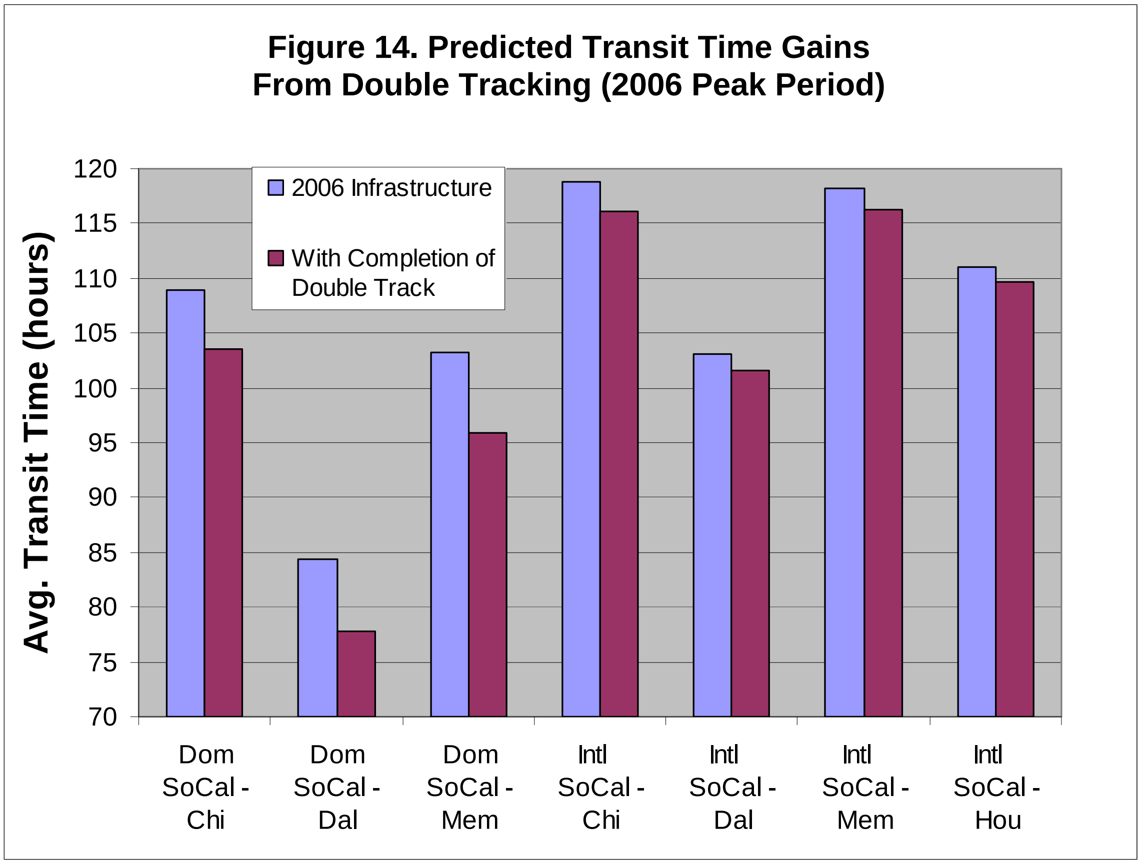
The coefficient *a*, concerning sensitivity to the tightness of track capacity, is much larger for domestic intermodal service, about 3.5, compared to a factor of about 1.2 for international intermodal. The achieved transit times for domestic intermodal trains depend to some extent on their high dispatching priority; as a line gets loaded up with trains, or if the line has fewer tracks, it becomes increasingly difficult to provide priority preference to certain trains. A rail line is most fluid and experiences the least total dispatching delays when all trains are afforded the same priority and move at comparable speeds. Hence the larger value of the queue-factor coefficient in the formula for domestic intermodal service is not surprising.

Figure 13 displays a comparison of actual average transit times provided by the railroads to predictions of the model. The "total queue factor" on the horizontal axis of the graph is the value of the utilization-server term of the queuing model, i.e., the value of the coefficient on *a* in equation (11). Agreement is far from perfect. The actual data shows disparity in average transit times ranging from 70 to 170 hours, but the model can only predict disparity in the range 80 to 130 hours. Some of this disparity likely reflects the limited amount of data on which the model is calibrated.[17] Nonetheless, it would seem the model does explain much of the difference in transit times among the corridors, traffic levels and service types.

[17] During 2006 both railroads carried out track capacity expansion projects and/or major track renewal projects in corridors serving the Southern California ports. These projects at times may have been disruptive of train service, resulting in extraordinary delays. This might account for the cluster of actual transit times around 150 – 170 hours, which seem to be outliers from the rest of the data. (The model predicts transit times of 130 – 140 hours for this cluster.) Another concern is that averages over only one week of operation of BNSF trains during peak and off-peak periods was provided to calibrate the model. The relatively infrequent but large disruptions characteristic of contemporary railroading are probably not present in these data.

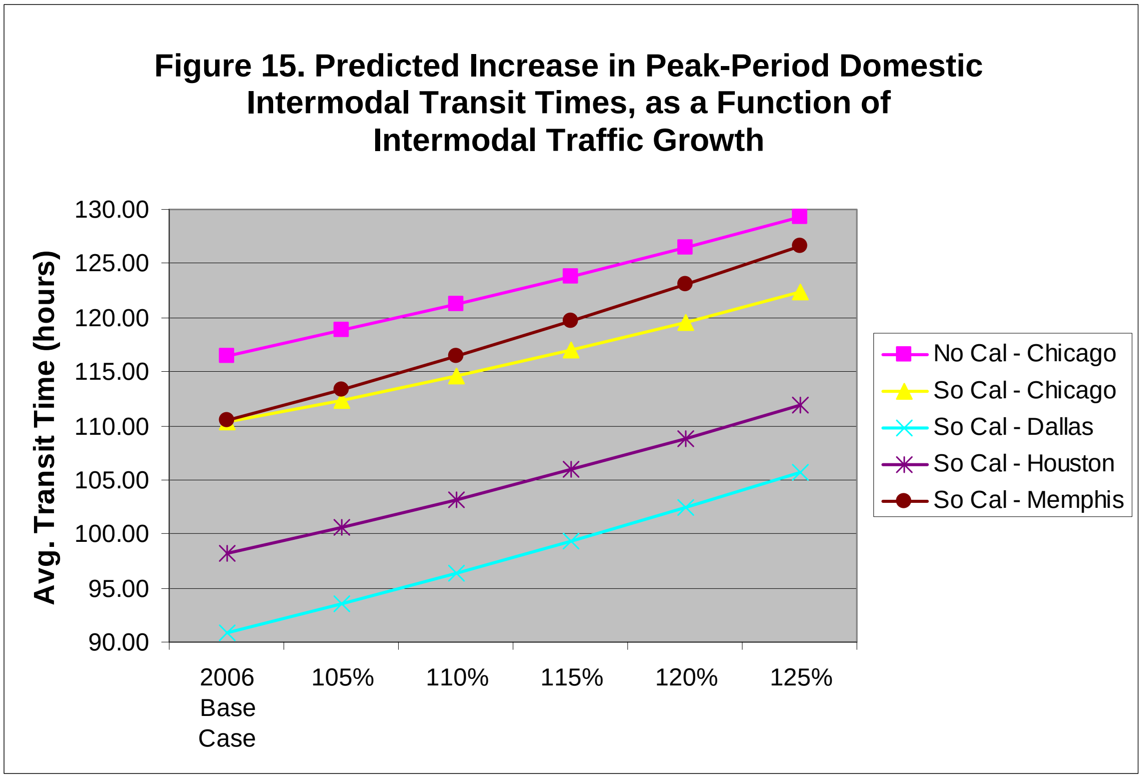


To illustrate the use of the model in predicting transit time reductions afforded by potential infrastructure improvements, the consultant re-applied (11) to the 2006 data after modifying the database to assume the completion of double-tracking UP's Sunset Route from Southern California to El Paso and completion of double-tracking of the remaining gaps in BNSF's "Transcon" line from Southern California to Kansas City. Results of this analysis are portrayed in Figure 14. Shown are the model-predicted average transit times (averaged across the two railroads) for the 2006 peak traffic period for the 2006 infrastructure and for a hypothetical case where the current railroad double-tracking projects would have been completed in time for the 2006 peak season. As may be seen, the double-tracking would have reduced 2006 peak-season intermodal transit times 2-8 hours, depending on the corridor.



As a final example of use the rail line-haul queuing model, the late 2006 infrastructure was subjected to increasing rail intermodal traffic levels, and the model was used to predict the increases in rail transit times for the various corridors. Figure 15 portrays the results for peak-traffic-period domestic intermodal service in selected corridors. Averages across the two railroads of model-predicted transit times are shown.[18] In this scenario, all non-intermodal rail traffic is assumed to experience zero growth; while all intermodal train movements are assumed to grow at the rates shown.

[18] The 2006 Base Case transit times are those predicted by the model, not actual times.



Note: Growth rates apply only to intermodal traffic. Zero traffic growth is assumed for non-intermodal traffic. All transit times, including for the Base Case, are model-predicted values, not actual data.

As may be seen, without infrastructure improvements, transit times in the Southern California – Memphis and Southern California – Dallas corridors are growing more quickly than transit times in the other selected corridors. The growth rate of transit time in the Southern California – Houston corridor is next largest. Growth rates of transit times in the Northern California – Chicago and Southern California – Chicago corridors are slowest and are very similar. This is just an example of the type of analysis that may be performed using the model. The story could be quite different once growth rates in non-intermodal traffic are included (especially coal).

8. The Short-Run Elasticity Model

8.1. Overview of the Short-Run Elasticity Model

Purpose

The basic aim of the Short-Run Elasticity Model is to predict the distribution of Asia – United States waterborne import volumes by port and landside channel for fixed port and landside transportation channel infrastructure, given levels of non-import traffic in rail channels, pre-specified potential port fees and minimum required port volumes, given transportation rates, and given hours of operation of port and rail terminals. Container flow times are endogenously calculated within the model. This contrasts to the case of the Long-Run Elasticity Model, in which (1) container flow times were fixed and sufficient infrastructure was assumed to be provided (in the long run) so as to enable achievement of the given flow times, and (2) there were no minimum volumes required at any port.

Structure and Overview of Calculations

The Short-Run Model incorporates two modules. We term these modules the Supply-Chain Optimization Model and the Queuing Model. See Figure 16. Application of the Short-Run Model involves iterative calculations of the Supply-Chain Optimization Model and the Queuing Model, mimicking the actual behavior of importers and carriers.

The Supply-Chain Optimization Model is based on a previous development; it is an updated version of the main calculation engine within the Long-Run Elasticity Model. A formal academic presentation of the mathematics involved is provided in Leachman [2008]. The model is initialized with assumed or current container flow times by port and channel and with an assumed distribution of imports by declared value, importer and region. See Figure 17. The development of the import distribution data is described in Section 4 above.

Calculations in the Supply-Chain Optimization Model are made to identify the best supply-chain strategy for each type of importer, identifying among strategies suitable for the importer the particular strategy that minimizes its total inventory and transportation costs. The resulting import volumes are then tallied by port and landside channel. A new feature of the Model not present in the Long-Run Elasticity Model is that there are optional minimum volumes that may be specified by the user for each of the various ports. These minimums may be used to model contractual requirements of steamship lines to ports and/or of importers to lines serving particular ports. If contractual commitments are not met by the aggregate volumes resulting from the importers' strategies, then volumes of discretionary imports are adjusted to satisfy these commitments with least total increase in cost. Once all constraints are satisfied, volumes by port and landside channel are tallied a final time and reported as output of the model.

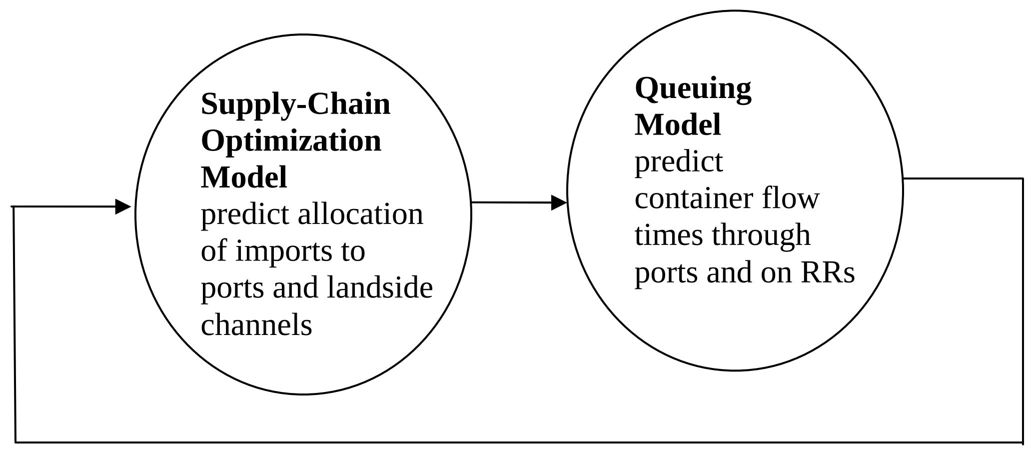


Figure 16. Structure of Short-Run Elasticity Model

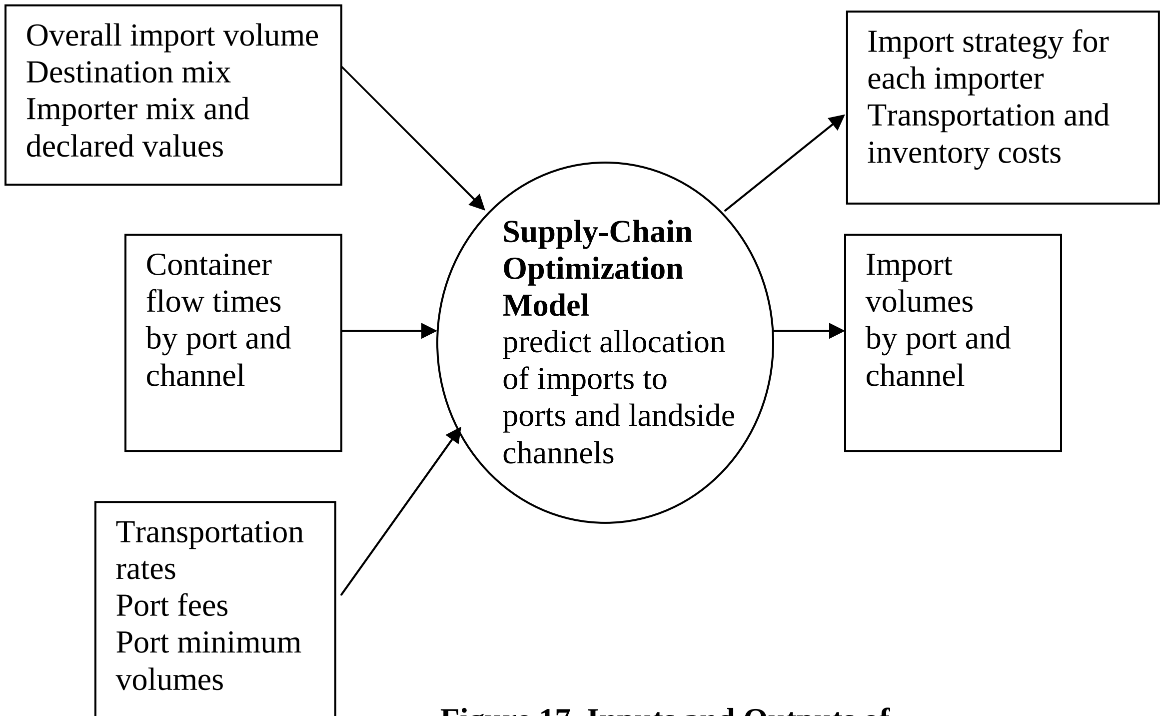


Figure 17. Inputs and Outputs of Supply-Chain Optimization Model

The Queuing Model is initialized with data concerning port terminals, rail intermodal terminals, and rail line-haul characteristics. Port terminal input data includes available acreage and crew shifts operated. Rail terminal input data includes terminal acreage, shifts operated per day, and port shares. Port shares are specified separately for direct inland movement of marine containers and for imports trans-loaded to domestic containers for the cases where ports are served by more than one rail terminal. The volumes calculated by the Long-Run Model may be fed into the Queuing Model, or exogenously defined volumes may be tendered to it.. The Queuing Model calculates updates to the container flow times, considering congestion or lack thereof at the various ports or in the various channels. See Figure 18. There are actually three sets of queuing calculations that are performed: (1) queuing analysis at port terminals to determine container dwell times from vessel arrival to container departure out the truck gate or on a double-stack train, (2) queuing analysis at rail terminals to determine container dwell times from container arrival until train departure, and (3) queuing analysis of rail lines to determine transit times from origin terminal to destination terminal for rail intermodal trains handling imports. The development and calibration of the queuing-theoretic formulas are described in Section 7 above. The results of the Queuing Model are summarized in a format suitable for input to the Supply-Chain Optimization Model in another iteration of that model.

Using the Short-Run Model, the Supply-Chain Optimization Model is re-applied after application of the Queuing Model to re-optimize supply-chain strategies for each type of importer. Again, volumes are tallied by port and channel, and compared to contractual minimums, again adjusting discretionary volumes as required. If there is significant change in volumes by port or channel, the adjusted volumes are fed back to the Queuing Model for re-calculation of flow times. This iteration continues until either (1) flow times and volumes by port and channel stabilize, or (2) a pre-specified maximum number of iterations is performed. Case (2) occurs if the Model cycles between two import distributions. As discussed below, the Short-Run Model has been engineered so that cycling, if it occurs, is between two import distributions with small differences. These differences are at the “noise level” of the model, reflecting alternative, equally-efficient import strategies for the importers. If one distribution is preferred for reasons outside the model the user can intervene and update the minimum volume requirements in certain ports or channels so as to force volume to distribute between the differing ports or channels appearing in the cycled solutions.

The iteration of the Supply-Chain Optimization and Queuing Models reflects the following basic phenomenon: Changes in flow times result in changes in inventory costs for importers. These changes induce changes in supply-chain strategies. This mimics real-life, iterative behavior of importers, transportation providers, and ports. For example, in the summer of 2004, the San Pedro Bay ports experienced severe congestion. Container flow times through the ports increased sharply. Because of contractual commitments and other operational impediments, reactions of importers and steamship lines were impeded and delayed. For the 2005 season, several steamship lines changed

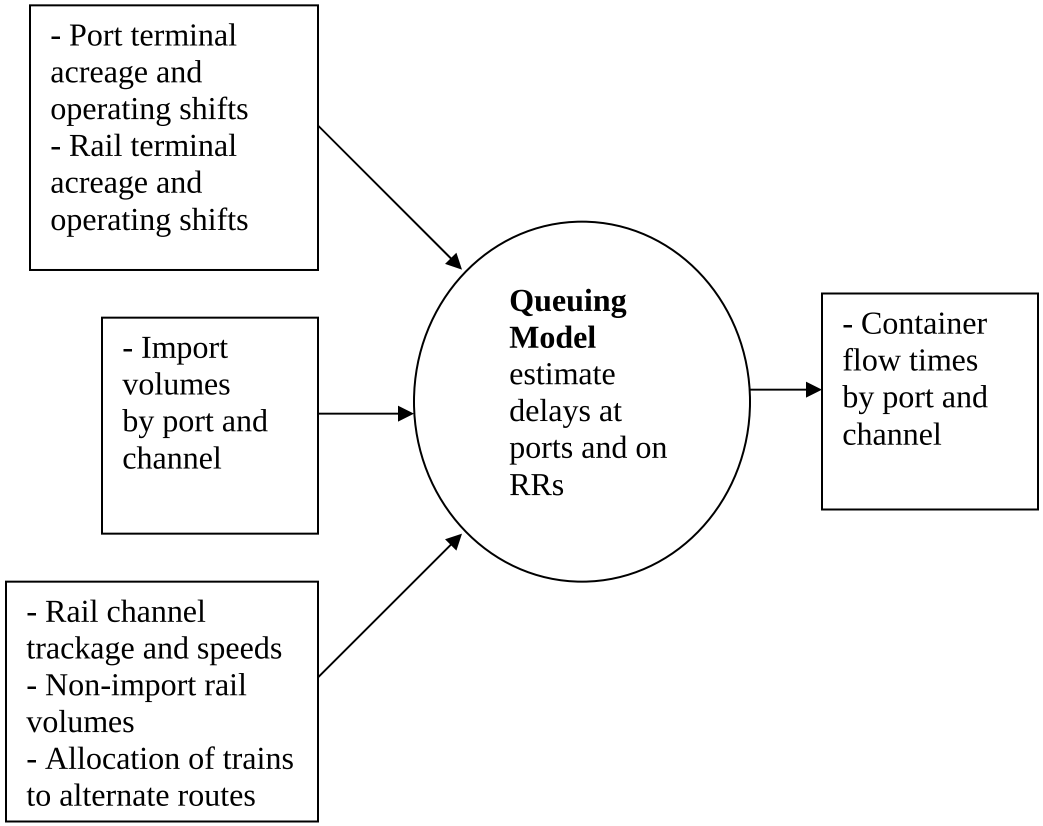


Figure 18. Inputs and Outputs of Queuing Model

certain of their Asia – North America vessel strings that called at San Pedro Bay ports to call at Puget Sound ports instead. Thus during the 2005 season, import share through the Puget Sound ports was up sharply, while it was down at the San Pedro Bay ports. During the 2005 season, PierPass was successfully implemented at San Pedro Bay, and container flow times experienced at the San Pedro Bay ports in the 2005 season were as short as, or shorter than, they were in 2003. But, on the other hand, container flow times through the Puget Sound ports and over railroads serving those ports increased during 2005. So for the 2006 season, the vessel strings that moved up to Puget Sound for the 2005 season were moved back to San Pedro Bay.

Note how the lines and importers over-reacted to the 2004 congestion. It was not until the start of the 2006 season that a new equilibrium was reached. Without intervention, the same sort of over-reaction can happen in the iterations between the Supply-Chain Optimization and Queuing Models. Without some sort of control, the Models could cycle indefinitely between two different allocations.

For this reason, a proportional controller is incorporated into the Short-Run Elasticity Model. Once new container flow times are calculated by the Queuing Model, instead of jumping to the new flow times, a *proportional* correction is made to the old flow times to define input for the next run of the Supply-Chain Optimization Model. See Figure 19. This correction takes the form of a weighted average of new and old flow times. Various values of weights were tested in model calculations, and a reliable weighted average was identified. The weight on the newly-calculated flow times is set to be 20%, with 80% weight remaining on the old flow times. This proportional correction induces a gradual and conservative change in overall import volumes in response to perceived opportunities to save transit time (and hence inventory expense). In subsequent iterations, if opportunity still exists, further import volume is shifted. This cautious approach enables convergence of the Short-Run Elasticity Model to a stable solution after a reasonable number of iterations and avoids cycling instabilities. Computational experience in this regard is discussed in Section 8.5 below.

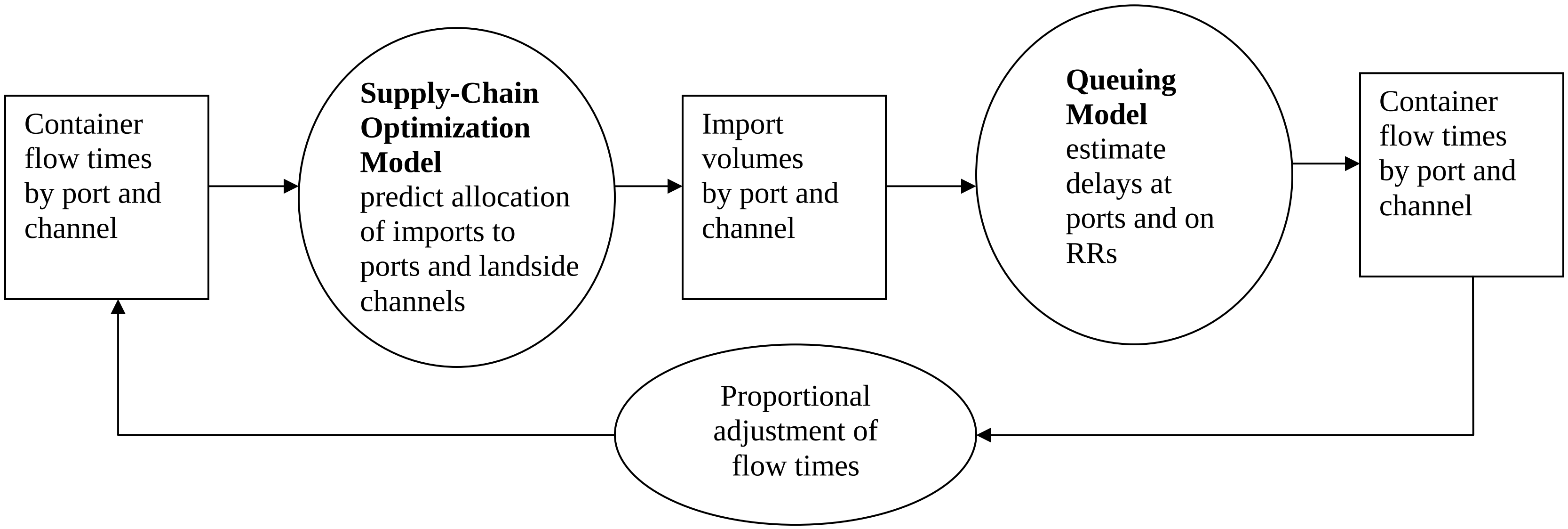


Figure 19. Interaction of Supply-Chain Optimization And Queuing Models

8.2. Input Data

A brief summary of the various input data for the elasticity models is as follows:

- Total annual import volume from Asia to the continental USA (in TEUs)
- Fraction of total imports destined to each of the 21 regions, applicable to every importer
- Fraction of total imports accounted for by each of 83 major importers
- Fraction of total accounted for by each of 19 generic importers, stratified into increments of $4 per cubic foot, ranging from $2 per cubic foot up to $74 per cubic foot. Generic importers are restricted to import strategies involving direct shipment of marine containers to destination regional distribution centers (RDCs), whereas major importers can consider consolidation – de-consolidation supply-chain strategies as well as direct strategies. The fractions for generic importers should be set such that the total of large importers' volumes and the generic importers volumes matches the distribution of declared values induced from overall customs data, as discussed in Section 4.
- Average declared value per cubic foot of marine container space for each importer
- Inventory holding cost rate per year for each importer
- List of alternative supply chain strategies and eligible ports under each strategy. Examples: the "Direct Shipment" strategy can use all eleven ports, the "Transload Four Corners" strategy can utilize Seattle-Tacoma, Los Angeles – Long Beach, Savannah and New York-New Jersey, and the "Transload LA-LB" strategy only uses the San Pedro Bay ports. The use of up to five ports is considered for consolidation – de-consolidation strategies. As described above, the Supply Chain Optimization Model optimizes the selection of channels under each alternative strategy for each importer. Comparing the optimized configuration of each alternative strategy, it then finds the least-cost strategy for the importer. The total cost of transportation, pipeline inventory and RDC safety stock is evaluated to identify the best strategy.
- Steamship "CY" (container yard) rates and transit times from Shenzen/Yantian/Chiwan to various North American ports. (For the purposes of the elasticity analysis, it is only the differences in the rates to various ports that matter, and these differences for most other Asian ports are believed to be similar to those for Shenzen/Yantian/Chiwan.)
- Wharfage and landing charge per FEU at each port (should be zero if such charges are invisible to importers, can be used to enter hypothetical container fees)
- Mount charge and Gate charge at each port (again, should be zero if such charges are invisible to importers, but can be used to test differential charges for on-dock-rail-departure and truck-departure from port terminal)
- Average cost to dray a 40-foot marine box from the port to a warehouse in the hinterland of the port, for each port. This cost applies to both the case of drays from the port to a de-consolidation center handling imports to multiple regions

routed via the port, and to the case of drays from the port to an RDC serving the local region (USA ports only).

- Average cost to dray to near-dock rail terminals, for each port. If such costs are included in IPI rates (also input data listed below), then these parameters should be set to zero.
- Weighted average of on-dock, near-dock and off-dock dray costs and fees, for each port.
- Average charge for trans-loading from marine boxes to domestic vehicles at each port, per FEU
- Average dray rate from a trans-loading warehouse or dock in the hinterland of the port of entry to rail intermodal terminal(s) serving that warehouse or dock.
- Average container flow time from vessel arrival to on-dock rail car mount for each port (Long-Run Model only)
- Average container flow time from vessel arrival to out-gate via truck for each port (Long-Run Model only)
- Average container flow time from vessel arrival to arrival at trans-load warehouse or dock for each port (Long-Run Model only)
- Average container flow time from warehouse to domestic rail terminal (Long-Run Model only)
- Standard deviation of container flow time from vessel arrival to on-dock rail car mount for each port
- Standard deviation of container flow time from vessel arrival to out-gate via truck for each port
- Standard deviation of container flow time from vessel arrival to arrival at trans-load warehouse or dock for each port
- Standard deviation of container flow time from warehouse to domestic rail terminal
- Usable space (cubic feet) within various types of marine and domestic containers
- Average IPI rate less CY rate via each port of entry to each destination RDC
- Average destination dray rate for marine box at each RDC city (before fuel surcharges)
- Average transit time for IPI movement from departure at each port to delivery at destination RDC
- Average domestic 53 rail intermodal rate (before fuel surcharges) from each port hinterland to each RDC destination, excluding origin and destination drays
- Average destination dray rate for a domestic 53 box at each RDC city (before fuel surcharges)
- Estimated transit time for domestic 53 intermodal service (including origin and destination drays and waiting time at terminals)
- Truck-miles between each port and each RDC city.
- Truck cost per mile of a forty-foot marine box (before fuel surcharges) for each port – RDC city pair.
- Estimated transit time for marine-box truck service between each port and each RDC city.

- Truck cost per mile of a domestic 53-foot box (before fuel surcharges) for each port – RDC city pair.
- Estimated transit time for domestic 53-foot box truck service between each port and each RDC city.
- Minimum required volume at each port (TEUs per day). These are user-specified optional parameters.
- Terminal acreage in service at each port (Short-Run Model only)
- Average number of crew-shifts per terminal per day at each port (Short-Run Model only)
- Average dwell time (hours) for a double-stack train loaded at an on-dock terminal, measured from release to railroad until train departure (Short-Run Model only)
- Rail intermodal terminal data (acreage, operating crews per shift, number of shifts per day, total volume handled) are confidential and not visible or accessible to the user (Short-Run Model only)
- Assumed shares of port volumes among rail terminals serving each port and warehouses in its hinterland (Short-Run Model only)
- Assumed shares by railroad (BNSF vs. UP) of marine box and domestic 53 box traffic outbound from each port (Short-Run Model only)
- Rail network data: Distance, speed, number of tracks, number of passenger trains by line segment. These are public data and are reproduced in Appendix C. Counts of non-import freight trains on each segment are confidential and not visible or accessible to the user (Short-Run Model only)

8.3. Output Data

Output data of the Supply-Chain Optimization and Queuing Models are summarized as follows.

Supply-Chain Optimization Model

Ports Summary

- The total import volume, expressed in TEUs per day, routed through each port. The user-specified minimums are shown, as well as the difference (the “slack”).

Channel Summary

- The total import volume by channel from each port to each RDC. Volumes are expressed in TEUs per day for “Direct Rail 40” (inland point intermodal movement of the marine box), “TL Rail 53” (consolidation – de-consolidation using domestic 53-foot boxes in rail intermodal service for the inland movement), “Direct Truck 40” (inter-region trucking of the marine box), “TL Truck 53” (consolidation – de-consolidation of imports into domestic trailers trucked to a region remote from that of the port), and "Direct Dray" (local delivery from the port).

Importer Routes

- Details of the strategies selected for each importer: Supply-Chain strategy selected; for example, "TL_5" under Wal-Mart indicates that imports are consolidated – de-consolidated using five ports of entry. For each RDC, the port and channel used to supply that RDC are shown. The total pipeline inventory plus transportation cost per cubic foot of imports is shown, as is the total import volume (TEUs per day).

Queuing Model (used in Short-Run Model runs only)

Port Dwell

- Average dwell times for import containers at each port, expressed in days and fractions thereof.

Rail Terminal Dwell

- Average dwell times, expressed in hours, for import containers at each rail terminal. Assumed railroad market shares and assumed rail terminal shares are used to calculate weighted-average dwell times for the alternative rail channels (Direct Rail 40 and TL Rail 53) for each port.

RR Ramp Volumes

- Total ramp volume for each rail ramp at each port.

RR Transit times

- Calculated rail transit times, expressed in days and fractions thereof, for Direct Rail 40 and TL Rail 53 channels from selected ports to selected regions. The transit time includes destination dray but not initial dray. Channels not listed are not included in the Queuing Model; their rail transit times are static. At present, rail channels from non-US-West-Coast ports are not included. As a practical matter, Asia-USA import rail traffic in such channels is at present very low, and transit times are not sensitive to modest changes in such volumes.

Asia to Ports Q Output

- Output concerning port dwell time and rail terminal dwell time in the format of input to the Supply Chain Optimization Model. This enables automated iteration of the models.

8.4. The Short-Run Model: Iteration of Supply Chain Optimization and Queuing Model Calculations

The Short-Run model iterates as follows. First, the Supply-Chain Optimization Model (AKA Long-Run Model) is activated. The Model identifies for each importer under each alternative strategy, the least-cost assignment of RDCs to ports and landside channels, considering pipeline inventory, transportation costs and fees. The entire volume for each RDC for each importer is assigned to a single channel and a single port. Next, the Supply-Chain Optimization Model identifies for each importer the least-cost strategy, in terms of total transportation, pipeline inventory and safety stock costs. The formulas for transportation and inventory costs described in Leachman [2005a] and Leachman [2008] are applied.

Next, the Supply-Chain Optimization Model checks if all minimums by port and landside channel are satisfied. If not, some RDC volumes for some importers must be moved. Considering "discretionary" imports (direct-shipping importers using IPI), the Model starts with the lowest-value importers. It moves volumes as required to satisfy the minimums, considering which shift of channels results in the least additional pipeline inventory plus transportation cost increment. Again, RDC volumes per importer are not split, but entirely assigned to a single port and a single channel. This results in slightly more volume than necessary to satisfy the minimum constraint at a port.

When complete, the Supply-Chain Optimization Model tallies total volumes by port and by landside channel, as well as the details for each importer. The volumes calculated in the next-to-last iteration also are stored.

Next, the Queuing Model is activated to perform queuing calculations for volumes output from the Supply-Chain Optimization Model. (Note: Transit times are assumed to be a fixed number of days for the following components of landside transit times: drays from port to trans-load warehouse, drays from port to delivery at local RDC, origin and destination drays in rail intermodal service, and long-distance trucking. The Queuing Model updates port dwell times, rail intermodal terminal dwell times and rail line-haul times. So the *increment* in container flow time calculated by the Queuing Model is added to the base-case transit times for each channel.

There are two railroads serving West Coast ports, BNSF and UP. Transit times are calculated separately for these roads. In channels served by both roads, the total channel volume is allocated to each railroad according to assumed fixed market shares. Weighted-average transit times are developed for each channel from calculated transit times for each railroad. There are multiple rail terminals serving West Coast ports and trans-loading facilities. Dwell times are calculated separately for each terminal. Channel volumes are allocated to each terminal according to pre-specified weights. Weighted-average dwell times by channel are developed from calculated dwell times for each terminal.

The output of the Queuing Model is used to prepare revised input data for the Supply-Chain Optimization Model. A weighted average of these data and the input data in the previous run of the Supply-Chain Model is computed. These weights are set to 20% on the new data and 80% on the old. The weighted-average data is used to initiate a new iteration of the two models. This process is automated.

There is no mathematical guarantee of convergence of the iterative solutions. However, in all the scenarios described in this report, within 10 iterations the Model converged to a single solution or began cycling between two solutions with minor differences (e.g., the routing of imports to one RDC for a single importer).

8.5. Application of the Short-Run and Long-Run Models

Multiple runs of the Short-Run and Long-Run Elasticity Models were made by the consultant. Total 2006 Asia – US import volume was used. The volume of imports by importer as documented in the 2005 study was proportionally scaled such that 40% of total 2006 imports were assumed to be accounted for by the 83 large, nationwide importers who can consider consolidation-deconsolidation inventory management practices, while the other 60% was accounted for by 19 "generic proxy" importers who must direct-ship marine boxes to destination RDCs. The assumed average declared values for large importer were kept mostly the same as in the 2005 study, but some minor changes were made to better fit the value distribution curve in Figure 6. A comparison of the 2008 and 2005 input data is provided in Table 11. (Differences compared to the 2005 analysis are shaded in yellow. The volumes of the 19 generic importers were set such that the overall distribution of imports by declared value matched the curve in Figure 6. Transportation rates and fees were updated to April, 2007. The assumed infrastructure and operating schedules for port and rail terminals reflected mid-2006 conditions, as did rail line configurations and non-import traffic levels.

Table 11: Assumed Shares and Declared Values for Large Importers, 2005 and 2008 Analyses

Importer	Assumed Percentage of Total Asia - USA Imports by Volume	Category	Assumed avg. declared value - 2005 analysis	Assumed avg. declared value - 2008 analysis
Wal-Mart	6.7151%	Big box	$15.00	$14.00
Home Depot	3.5114%	Furniture	$9.00	$12.00
Target	2.3631%	Big box	$20.00	$20.00
Sears (K-Mart)	2.1684%	Big box	$20.00	$20.00
Ikea	1.1658%	Furniture	$9.00	$9.00
Lowe's	1.1658%	Furniture	$9.00	$9.00
Costco	0.7741%	Big box	$20.00	$20.00

Ashley Furniture	0.7438%	Furniture	$9.00	$9.00
Payless ShoeSource	0.6319%	Shoes	$25.00	$25.00
Samsung	0.6155%	Electronics	$40.00	$44.00
Matsushita	0.6074%	Electronics	$40.00	$40.00
Toyota	0.6062%	Auto parts	$20.00	$20.00
GE	0.6039%	Appliances	$25.00	$25.00
Williams-Sonoma	0.5829%	Appliances	$25.00	$25.00
Mattel	0.5747%	Toys	$17.50	$17.50
Pier 1 Imports	0.5608%	Big box	$12.00	$9.00
Nike	0.5584%	Shoes	$25.00	$25.00
Sony	0.5491%	Electronics	$40.00	$44.00
Michelin	0.5374%	Tires	$15.00	$15.00
J C Penney	0.5246%	Big box	$20.00	$20.00
LG	0.5048%	Electronics	$40.00	$40.00
Bridgestone	0.4955%	Tires	$15.00	$15.00
Limited Brands	0.4815%	Big box	$30.00	$30.00
Dollar General	0.4663%	Big box	$15.00	$15.00
Toys R Us	0.4582%	Toys	$17.50	$17.50
Big Lots	0.4232%	Big box	$10.00	$10.00
Ford	0.3462%	Auto parts	$20.00	$20.00
Dorel	0.3346%	Furniture	$9.00	$9.00
Nissan	0.3323%	Auto parts	$20.00	$20.00
Yamaha	0.3183%	Auto parts	$20.00	$20.00
Philips	0.3171%	Electronics	$40.00	$40.00
Michaels Stores	0.3159%	Big box	$10.00	$10.00
Whirlpool	0.3124%	Appliances	$25.00	$25.00
Canon	0.3054%	Electronics	$40.00	$44.00
Walgreen	0.2973%	Big box	$10.00	$10.00
Rooms to Go	0.2821%	Furniture	$9.00	$9.00
Thomson	0.2821%	Electronics	$40.00	$40.00
Federated	0.2763%	Big box	$25.00	$25.00
Emerson	0.2635%	Elec Eqpt	$40.00	$40.00
Jarden	0.2541%	Appliances	$25.00	$25.00
Marubeni	0.2541%	Machinery	$50.00	$50.00
Reebok	0.2402%	Shoes	$25.00	$25.00
Hankook	0.2378%	Tires	$15.00	$15.00
Dollar Tree	0.2332%	Big box	$10.00	$10.00
Natuzzi	0.2291%	Furniture	$9.00	$9.00
Goodyear	0.2262%	Tires	$15.00	$15.00
Family Dollar	0.2250%	Big box	$10.00	$10.00
Retail Ventures	0.2192%	Big box	$15.00	$15.00
TJX (T J Maxx)	0.2122%	Big box	$20.00	$20.00
Sharp	0.2087%	Electronics	$40.00	$40.00
Conair	0.2075%	Appliances	$25.00	$25.00
Liz Claiborne	0.2040%	Apparel	$40.00	$39.00
Toyo	0.1970%	Tires	$15.00	$15.00
JoAnn Stores	0.1854%	Textiles	$20.00	$20.00
FoxConn	0.1795%	Electronics	$40.00	$40.00
Caterpillar	0.1784%	Machinery	$50.00	$50.00
Gap	0.1725%	Apparel	$40.00	$39.00

DaimlerChrysler	0.1702%	Auto parts	$20.00	$20.00
May	0.1690%	Big box	$18.00	$18.00
TPV International	0.1690%	Electronics	$40.00	$39.00
Best Buy	0.1679%	Electronics	$40.00	$40.00
Bombay	0.1667%	Furniture	$9.00	$9.00
Fuji	0.1667%	Film	$80.00	$80.00
BMW	0.1655%	Auto parts	$20.00	$20.00
Haier	0.1655%	Appliances	$25.00	$25.00
Hasbro	0.1655%	Toys	$17.50	$17.50
Salton	0.1644%	Appliances	$25.00	$25.00
Suzuki	0.1597%	Auto parts	$20.00	$20.00
Linens 'n Things	0.1586%	Textiles	$20.00	$20.00
Epson	0.1562%	Electronics	$40.00	$40.00
OfficeMax	0.1562%	Big box	$12.00	$12.00
Coaster of America	0.1551%	Furniture	$9.00	$9.00
Staples	0.1539%	Big box	$12.00	$12.00
Yazaki	0.1504%	Auto parts	$20.00	$20.00
Brother	0.1352%	Electronics	$40.00	$40.00
Ricoh	0.1352%	Electronics	$40.00	$40.00
Applica	0.1294%	Appliances	$20.00	$20.00
Adidas-Solomon	0.1259%	Shoes	$25.00	$25.00
Footstar	0.1224%	Shoes	$25.00	$25.00
Hamilton Beach	0.1212%	Appliances	$25.00	$25.00
Honda	0.1201%	Auto parts	$20.00	$20.00
CVS (Eckerds)	0.1189%	Big box	$10.00	$10.00

Model Validation

Table 12 compares actual 2006 data to results of Short-Run Model and Long-Run Model calculations for a Base Case Scenario assuming no new fees at any port. All statistics match fairly well. The solutions to the Models call for somewhat greater all-water share and less West Coast IPI share than was experienced in 2006, but the solutions match the actual 2007 and 2008 IPI shares fairly well. In the author's opinion, this is to be expected, given the use of 2007 season rates in the Models. There were major increases in rail rates charged to certain steamship lines beginning with the 2007 season, partially passed on as higher IPI rates for the 2007 season and more fully reflected in the 2008 rates.

Considering the extraordinary challenge posed by an attempt to precisely match reality with a simplified, nationwide economic model, in the author's opinion, the results indicate the Models are satisfactory for studying shifts in port and modal shares in response to hypothetical container fees.

Table 12: Comparison of 2006 Actual and Model-Predicted Traffic Shares

	2006 Actual	Solution to Short-Run Model for Zero Fee in Base Case Scenario	Solution to Long-Run Model for Zero Fee in Base Case Scenario
Port shares			
LA-LB	55.0%	52.4%	52.0%
Other West Coast	20.0%	19.0%	19.0%
All-Water	25.0%	28.5%	29.0%
LA-LB mix			
Regional	21.0%	22.5%	22.7%
IPI	43.0%	42.0%	41.1%
Trans-load	36.0%	35.5%	36.2%
USA West Coast mix			
Regional		27.9%	28.1%
IPI	46.0%	41.9%	41.2%
Trans-load		30.2%	30.7%

Note: Asia-US imports via Canada and Mexico are excluded from 2006 Actual statistics but included in Model statistics. The actual IPI share of imports via US West Coast ports was 42.7% in 2007 and 41.4% in 2008, closer to model predictions than the 2006 actual figure.

Analysis of Container Fees in the Base Case Scenario

The Base Case Scenario was repeatedly analyzed in Long-Run and Short-Run model calculations with hypothetical container fees applied to San Pedro Bay imports. Container fees in increments of $50 per FEU were tested up to $500 per FEU. Port minimums were set as in the last column of Table 13 below.

Table 13: Import Volumes vs. San Pedro Bay Container Fee, As Predicted by Short-Run Elasticity Model in Base-Case Scenario
(Figures are expressed in TEUs per day)

Fee Value	$0/FEU	$50/FEU	$100/FEU	$150/FEU	$200/FEU	Minimum
LA-Long Beach	20962	20039	18950	18026	16967	10000
Seattle-Tacoma	4429	5162	5333	5495	6193	1000
Oakland	1760	1760	2375	2714	2756	1000
Vancouver	540	540	514	537	574	500
Prince Rupert	655	655	655	655	655	500
LC - Manzanillo	224	224	224	224	224	200
Houston	1309	1568	1782	1783	1850	500
East Coast	10091	10023	10139	10536	10751	4000

The Short-Run Model run with a $0 per FEU fee stabilized to a solution after eight iterations (although ten iterations were run). In this solution, about 28% of total Asia – Continental US imports fall under consolidation – de-consolidation strategies, the other 72% under direct shipping strategies. The San Pedro Bay ports account for about 51% of total waterborne imports to the continental United States. Table 13 summarizes total import volumes by port of entry to North America, in the column labeled “$0/FEU”.

The second run ($50 per FEU) also stabilized to a solution after eight iterations (again, ten iterations were run). The relative mix of imports trans-loaded vs. direct shipped was unchanged. But total import volume through the San Pedro Bay ports declined by about 4%. Most of the volume diverted was discretionary, inland-point intermodal (IPI) volume, mostly shifted to Seattle-Tacoma, with increases also showing up at Oakland, on the East Coast, and at Houston. These results also are summarized in Table 13, in the column labeled “$50/FEU”.

The third run ($100 per FEU) stabilized to a pair of similar solutions after about five iterations (although once again, ten iterations were run). After five iterations, the solutions alternated between a pair of solutions whose port volumes differed by 3% or less, depending on the port. This is indicative of the existence of alternative import strategies with nearly identical costs for certain importers. In these solutions, total import volume through the San Pedro Bay ports declined by another 6%, or 10% compared to the base case with no fee. Again, most of this volume shifted to Seattle-Tacoma, with increases also showing up at Oakland, and, to a lesser extent, at Houston and on the East Coast. As before, the relative mix of imports trans-loaded vs. direct shipped was unchanged; the amounts of both types of imports routed via San Pedro Bay declined in the face of fees. These results, as well as results from the subsequent runs, also are summarized in Table 13.

These same fee increases were tested in Long-Run Elasticity Model calculations. According to Long-Run calculations, for a $50 per FEU fee, total volume through the San Pedro Bay ports declines by about 17%.[19] For a $100 per FEU fee, total volume through the San Pedro Bay ports declines by 23% (compared to the base case with no fee). These results, along with results for higher fee values, are summarized in Table 14.

[19] The 2005 Long-Run Elasticity Analysis predicted that a $60 per FEU fee would diminish San Pedro Bay import volumes by about 6%. The larger increase calculated in the present study is primarily the result of changes in freight rates. Driven by these changes, the share at San Pedro Bay of total direct imports increased since 2004 while the share of total trans-loaded imports decreased since 2004. As a result, imports via San Pedro Bay have become more elastic.

Table 14: **Import Volumes vs. San Pedro Bay Container Fee, As Predicted by Long-Run Elasticity Model in Base-Case Scenario**

(Figures are expressed in TEUs per day)

Fee Value	$0/FEU	$50/FEU	$100/FEU	$150/FEU	$200/FEU	Minimum
LA-Long Beach	20777	17188	16091	14097	11802	10000
Seattle-Tacoma	4430	7346	7717	8383	9706	1000
Oakland	1755	1760	2013	2542	2954	1000
Vancouver	540	503	510	503	508	500
Prince Rupert	655	655	655	655	655	500
LC - Manzanillo	224	224	224	224	224	200
Houston	1499	1882	1960	2337	2505	500
East Coast	10091	10413	10800	11231	11618	4000

Figure 20 combines the results of short-run and long-run elasticity calculations. The long-run elasticity of imports via San Pedro Bay is roughly double the short-run elasticity. If a container fee is imposed, most of the volume leaving the San Pedro Bay ports would be diverted to the Puget Sound ports. In the Short-Run analysis, the next largest diversion of volume is to Houston and the East Coast (so-called all-water channels). A slightly smaller amount is diverted to Oakland. In the Long-Run analysis, the diversion to all-water channels is roughly half the diversion to Puget Sound, and the diversion to Oakland is in turn about half the diversion to all-water channels.

An analysis of the elasticity of the components of overall imports routed through the San Pedro Bay ports is provided in Figure 21. As may be seen, the discretionary inland-point intermodal (IPI) volumes are very elastic and decline rapidly with growing fee values. Trans-loaded imports of moderate declared value are somewhat less elastic, while trans-loaded imports of high declared value and imports consumed within the region are very inelastic.

Figure 20. Short and Long Run Elasticity of Imports to Fees at the San Pedro Bay Ports in the Base Case Scenario (SR = Short-Run, LR = Long-Run)

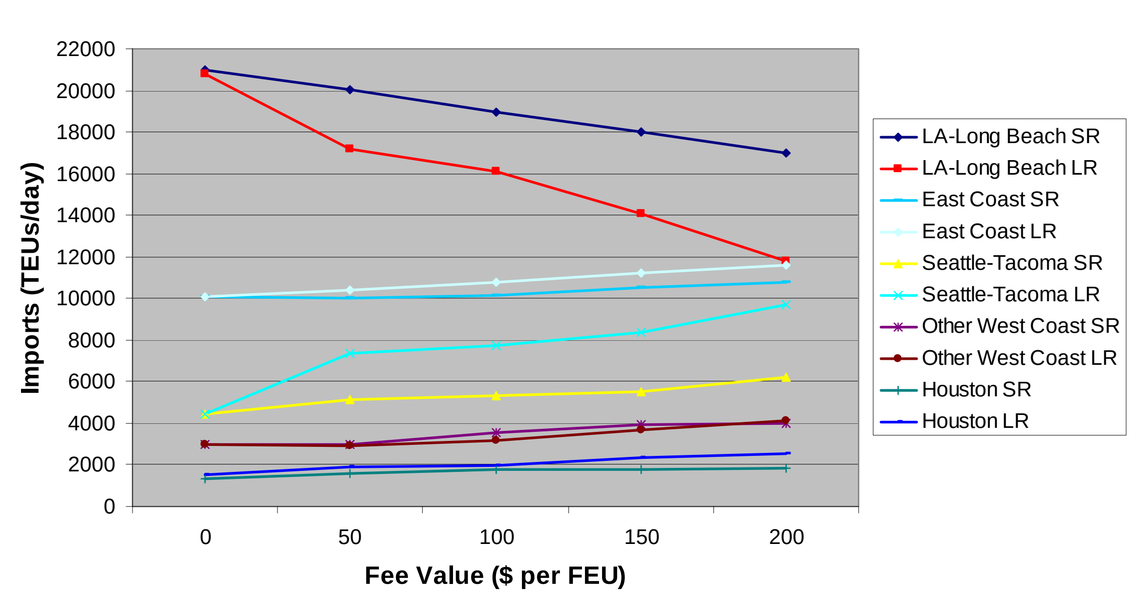
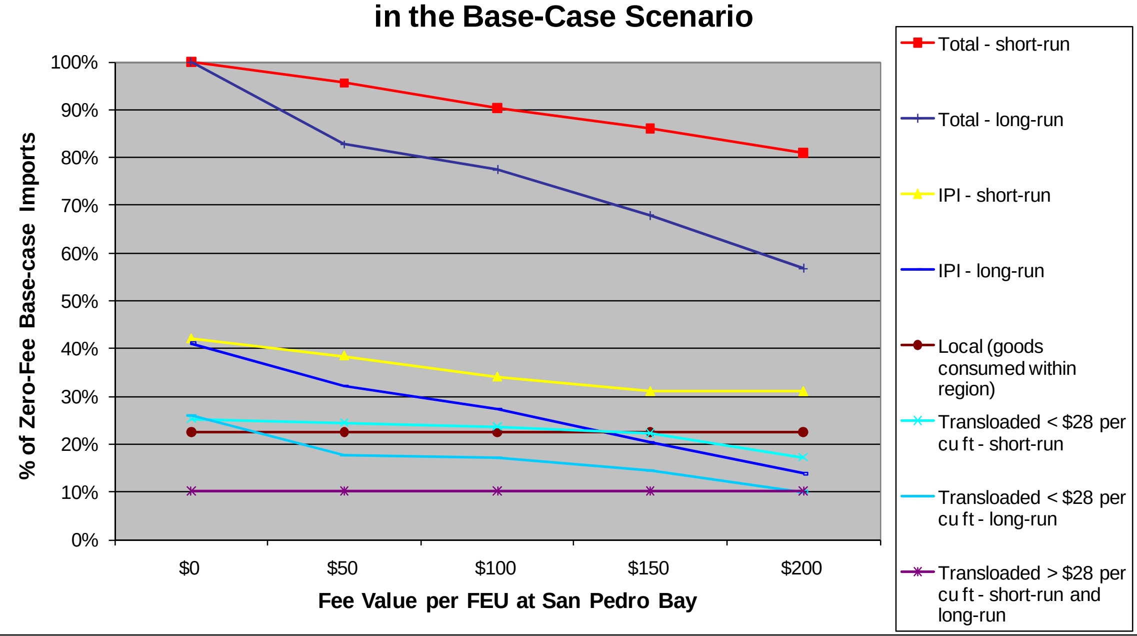
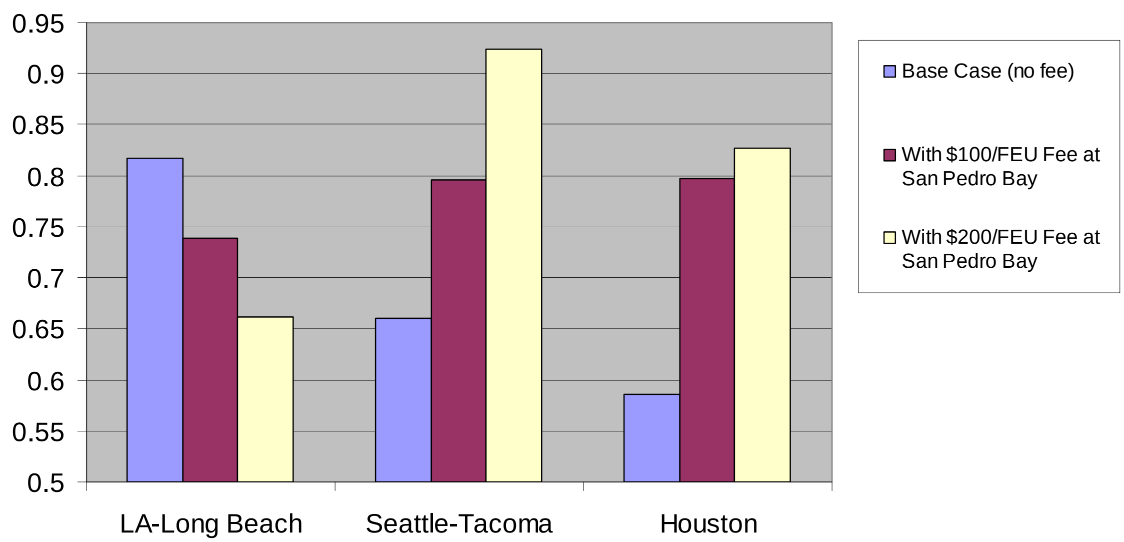


Figure 21. Comparative Short-run and Long-run Elasticities of Direct, Transloaded and Local Imports via San Pedro Bay in the Base-Case Scenario



Investigating the difference between short-run and long-run elasticity, the chief reason turns out to be port terminal utilization at Seattle-Tacoma and Houston. See Figure 22. In the Base Case, utilization of San Pedro Bay port terminals is about 82%; pushing utilization above this level would result in significantly longer container flow times. At the same time, utilization of port terminals at Seattle and Houston are significantly lower; there is ability to handle increased volumes there without a significant increase in container flow times. After imposition of a hypothetical $100 per FEU fee, the situation is reversed, with utilization at Puget Sound and Houston terminals pushed up to about 80%. For the current staffing, operating hours and acreage of port terminals there, the queuing calculations predict container dwell times at the Puget Sound ports and at Houston would rise by about 14 and 18 hours, respectively, for such a fee at San Pedro Bay. While low-value imports would move from San Pedro Bay to Puget Sound and Houston, high-value imports balk at moving away from San Pedro Bay, because the increase in pipeline inventory costs from using channels via those ports offsets the savings from avoidance of the fee. For imposition of a $200 per FEU fee, the congestion at Puget Sound terminals is more extreme, rising to 92%. For these very-high utilizations, the queuing calculations predict average container dwell times at the Puget Sound ports would be about 3.1 days above that for the Base Case.

Figure 22. Utilization of Selected Port Terminals (fixed crew-shifts and acreage)



The imposition of a container fee at the San Pedro Bay ports would present a significant opportunity for the Puget Sound and Houston ports to gain market share, but such gains are limited with existing crew shifts and acreage. Note that utilization of Houston port terminals assuming existing crew shifts and acreage would be pushed from 59% to 83% by the calculated solution of the Short-Run Elasticity Model for a $200 per FEU fee at San Pedro Bay. Similarly, the Puget Sound ports would be pushed from 66% to 93%. These are the limits found by the Short-Run Model; beyond these points, container flow times are getting so large that many importers prefer to pay the fee at the San Pedro Bay ports rather than endure the lengthy delays at congested terminals. But if the Puget Sound and Houston terminals can increase crew shifts and/or terminal acreage, they could accommodate some or all of the Long-Run Model's additional volumes diverted from San Pedro Bay without extending container flow times. As discussed earlier, in 2005, the Puget Sound imports accommodated a substantial diversion from San Pedro Bay of discretionary imports. It seems likely they could do as much again.

An unknown variable is the response of the railroads to the potential shift of import traffic from San Pedro Bay to Puget Sound. Both BNSF and UP are in the midst of large investments in track capacity for their channels serving San Pedro Bay. According to the queuing analysis, the shift of volume from San Pedro Bay to Puget Sound could be accommodated by the railroads, but there would be significant degradation of service for priority domestic freight to and from the Pacific Northwest. In the scenario of a $100 per FEU fee at San Pedro Bay, the queuing calculation predicts average transit times for domestic intermodal trains in the Chicago – Seattle corridor would increase by 4-5 hours, and domestic intermodal ramp dwell times would increase by another 5-5.5 hours. Perhaps this prospect of service degradation would incentivize the railroads to adjust their transportation rates charged to steamship lines so as to reduce the amount of import traffic diverted from San Pedro Bay.

Analysis of Container Fees in Future Scenarios

The consultant applied both Short and Long Run Models to several future scenarios. Each scenario was analyzed with hypothetical container fees in $50 increments from $0 up to $500 per FEU (forty-foot equivalent unit) applied to all imports routed via the San Pedro Bay ports. Results were compared to the 2007 Base Case Scenario.

Four future scenarios were formulated by the consultant and analyzed in Model runs. These scenarios incorporate the same total volume of imports and the same total import volume and the same distribution of imports by declared values as in Base Case Scenario, but vary assumptions about the evolutions of rail and steamship line rates and about future terminal infrastructure and staffing. One near-term scenario, termed the Near-term Likely Scenario, and three longer-term scenarios were formulated.

In terms of infrastructure, the Near-term Likely Scenario is the same as the Base Case Scenario except a domestic intermodal rail terminal that was opened in 2009 at the Port of Tacoma is included in the scenario. Compared to the Base Case, significant adjustments were made to rail rates in this scenario: (1) Domestic rail container rates were adjusted to reduce the gap between rates via West Coast ports for inland point intermodal (IPI) movement of marine boxes and rates for reshipment in domestic rail containers after trans-loading. The gap was reduced by $0.10 per cubic foot of imported goods to Eastern destinations and by $0.05 per cubic foot to Midwestern destinations. (2) IPI and domestic container rail rates via San Pedro Bay Ports were adjusted to be more competitive with other USA West Coast ports to all Midwestern and Eastern destinations except Minneapolis. (Seattle-Tacoma has a rate advantage for imports destined to the Minneapolis region that is retained in this scenario.) After the adjustments described in

(1), the total transportation and handling cost per cubic foot for the trans-loading channels via West Coast ports are $0.00 - $0.12 more per cubic foot than direct inland movement of marine boxes using IPI service, depending on the destination region. The rationale for (1) is that the gap between domestic-box and marine-box rail rates widened considerably during the period 2004 – 2008 because of fuel recovery surcharges placed on domestic rates while no fuel recovery surcharges were placed on the international "all-in" IPI rates. Moreover, enough steamship lines continued to enjoy long-term legacy contract rates from railroads so as to keep IPI rates low. As the legacy contracts expire, the lines are forced into shorter-term contracts for IPI service from the railroads that feature steep rate increases, ranging 25% - 40%. The last of the legacy contracts will expire in 2011. Finally, the decline of the domestic economy has made the supply of domestic rail containers plentiful and placed downward pressure on domestic rates. The rationale for (2) is as follows: The 2007 rail rate quotations secured by the consultant favor Pacific Northwest ports over Southern California ports to a number of destinations. This made sense, perhaps, at a time when rail lines serving Southern California were more congested than lines serving the other West Coast ports. Starting in 2006 and continuing to the present, the railroads have made large investments to double-track their transcontinental main lines serving Southern California. The consultant expects the railroads to adjust their rates so as to insure utilization of that investment in lieu of encouraging traffic to use other West Coast ports served by rail lines with less capacity. The consultant believes this scenario is likely in the near term.

Beyond the near-term, it is difficult to forecast transportation rates and the shares of imports by large, nation-wide importers vs. small, regional ones. Accordingly, the consultant prepared several alternative scenarios illustrating the range of outcomes that are plausible. One crucial variable is what will happen to so-called "all-water" rates charged by steamship lines for container shipment via the Panama Canal to East and Gulf Coast ports. An expansion of the Canal is underway, and Canal fees have been raised, but it is unclear what will be the longer-term net effect on all-water rates offered by the steamship lines. An optimistic scenario tested by the consultant features all-water rates rising by 10% while maintaining West Coast IPI and CY rates at 2007 levels. A pessimistic scenario features all-water rates falling by 10% while maintaining West Coast IPI and CY rates. Another crucial variable concerns the share of total imports in the hands of large, nation-wide importers vs. that in the hands of small and regional importers. Accordingly, another optimistic scenario is formulated in which the total import share in the hands of large, nation-wide importers rises from 40% to 50%. A final important variable concerns the available terminal capacity and crew-shifts at port and rail terminals serving the various West Coast ports. Accordingly, the optimistic scenarios assume the BNSF railroad's proposed Southern California Intermodal Gateway (SCIG) terminal is opened. The pessimistic scenario assumes increased terminal capacity at other USA West Coast ports but no increase at San Pedro Bay ports. Summary descriptions of the two optimistic and one pessimistic scenario are as follows:

Optimistic I: Includes all features of the Near-term Likely Scenario. In addition: assumes that the proposed BNSF SCIG rail terminal is opened, all-water steamship line rates via the Panama Canal are raised by 10%, and there are increased crew-shifts at certain Southern California rail terminals.

Optimistic II: Includes all features of the Near-term Likely Scenario. In addition: assumes that the proposed BNSF SCIG rail terminal is opened, the share of total imports for large, nation-wide importers rises to 50%, and there are increased crew-shifts at certain Southern California rail terminals.

Pessimistic: Includes all features of the Base Case Scenario. In addition: assumes all-water steamship rates via the Panama Canal are lowered by 10%, a new domestic intermodal rail terminal that was opened in 2009 at the Port of Tacoma is included, and there are increased crew-shifts of operation at Oakland and Pacific Northwest rail terminals.

Figures 23 and 24 depict the results of Short-Run and Long-Run analyses of the alternative future scenarios, contrasted with the Base Case. In the Near-term Likely Scenario, total imports via San Pedro Bay exceed Zero-Fee Base Case volume until about $100 per FEU in the Short-Run analysis and about $75 per FEU in the Long-Run analysis. Trans-loaded imports exceed Zero-Fee Base Case trans-loaded volumes until a fee of about $300 per FEU in the Short Run, but fall below the Zero-Fee Base-Case trans-loaded volume at about $125 per FEU in the Long Run. These results indicate that adequate infrastructure and/or staffing of that infrastructure are not yet in place to accommodate without congestion the diversion of trans-loaded volumes away from San Pedro Bay, but the economics encouraging expansion at other ports and their landside channels arises when fees greater than $125 per FEU are imposed.

In Optimistic scenarios, total import volumes via San Pedro Bay exceed the Zero-Fee Base Case volume until container fees rise to about $125-$150 per FEU. In the Short Run, trans-loaded volume in the Optimistic Scenarios exceeds that for the Zero-Fee Base Case for the entire range of container fees tested, but in the Long-Run the trans-loaded volume falls to the Zero-Fee Base Case trans-loaded volume when container fees rise to about $250 per FEU. Again this is an indication that adequate infrastructure and/or staffing are not yet in place at other ports to accommodate diversion of trans-loaded volumes from the San Pedro Bay ports, but economic justification to make the needed investments or staffing additions arises once container fees imposed at San Pedro Bay are $250 per FEU or more.

In the Pessimistic scenario, total volume with no container fee is 11% less than Zero-Fee Base Case volume, and trans-loaded volume is 9% less. At a fee of $200 per FEU, total volume and trans-loaded volume in the Long-Run Pessimistic scenario are less than half what they were in the Zero-Fee Base Case scenario.

The arresting feature of these results is how sensitive import volumes routed via San Pedro Bay are to changes in rates charged by steamship lines, railroads, third-party logistics firms and draymen, as well as elastic to potential container fees. As illustrated by the difference in results for the Near-term Likely and Base-Case scenarios, relatively

Figure 23. Short-Run Elasticities of Imports via the San Pedro Bay Ports in Future Scenarios

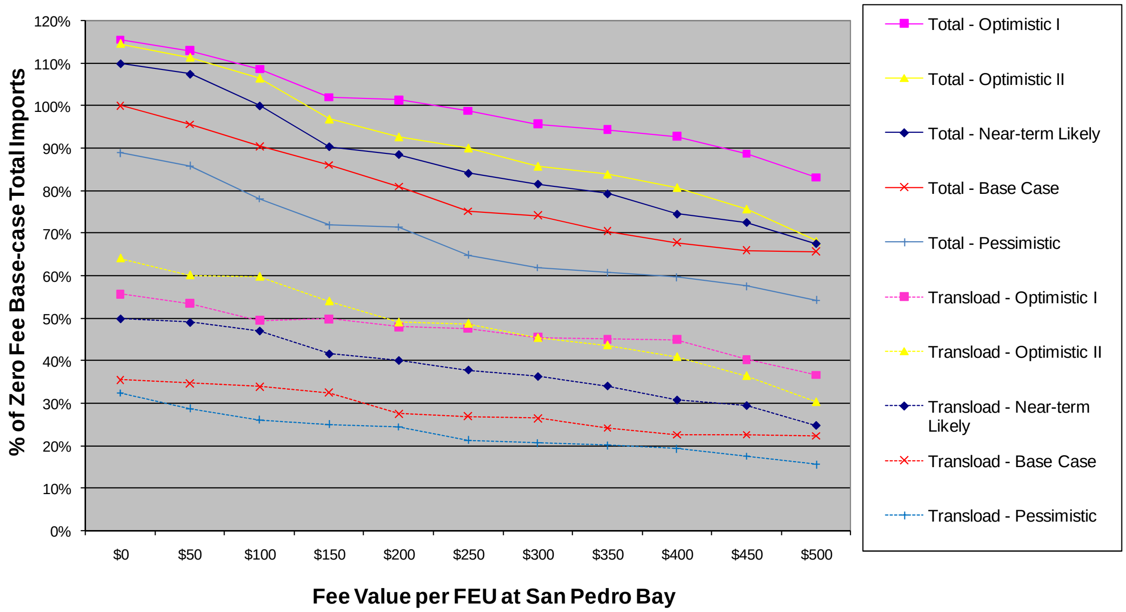
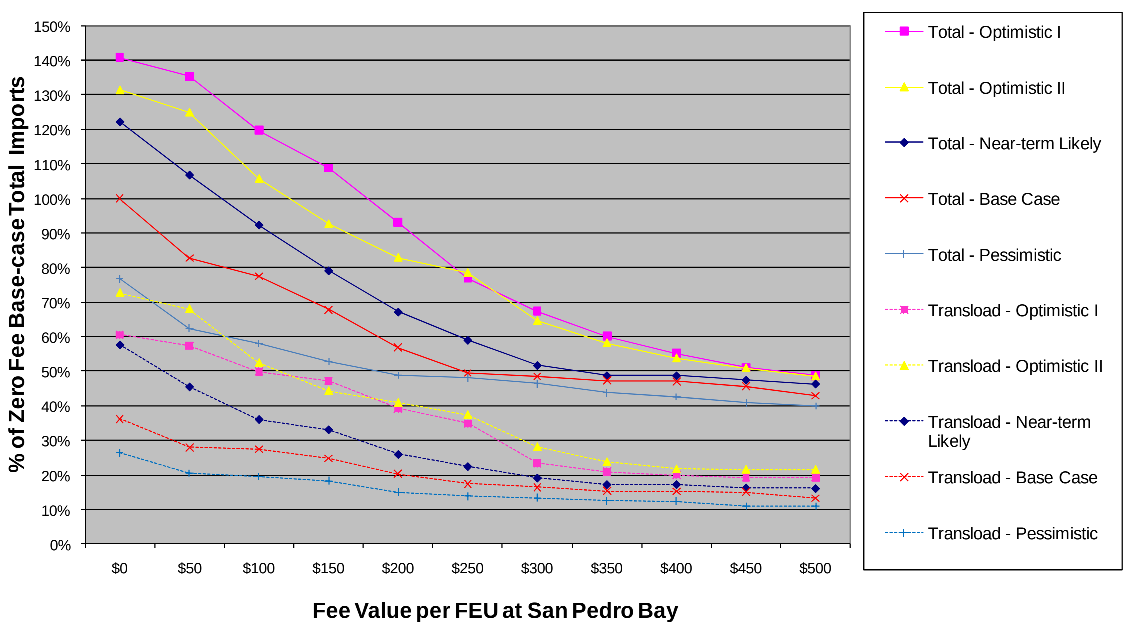


Figure 24. Long-Run Elasticities of Imports via the San Pedro Bay Ports in Future Scenarios

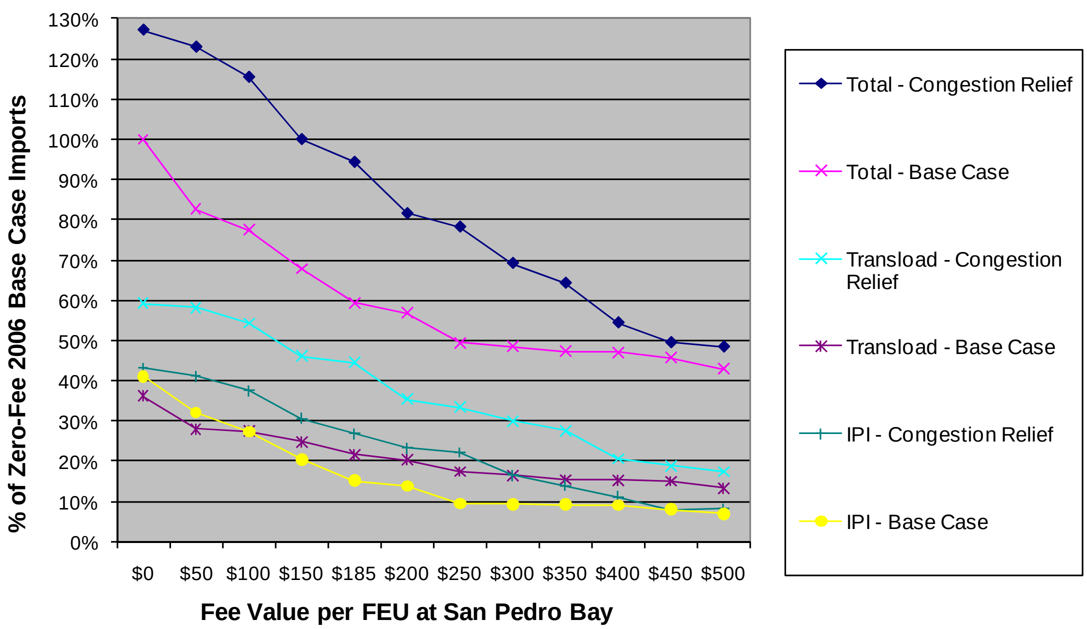


small, favorable adjustments in current rail rates for domestic boxes and for IPI movement of marine boxes can result in significant volume gains for the San Pedro Bay ports. Comparing the Optimistic and Pessimistic Scenarios, +/- 10% changes in all-water rates relative to rates via the West Coast ports result in very large swings in volume into or away from San Pedro Bay, respectively.

Analysis of a Congestion Relief Scenario

The 2005 long-run elasticity analysis of an infrastructure improvement program offering significant reductions in container flow times ("major congestion relief") was reiterated with the updated long-run model and data.[20] The Near-Term Likely scenario was supplemented with the congestion relief program assumed in the 2005 study. As before, the assumption here is that the infrastructure is constructed first, and only after its completion are container fees assessed to retire the bonds that funded the infrastructure. Results are summarized in Figure 25. As may be seen, for a fee value up to about $150 per FEU, total market share of Asian imports at San Pedro Bay exceeds or matches that of the 2006 Zero-Fee Base-Case scenario. Examining the components of overall imports, market share of inland-point intermodal imports falls below that of the Zero-Fee Base Case scenario for fees above $50 per FEU, while market share of trans-loaded imports exceeds or matches that of the Zero-Fee Base Case scenario for fees up to about $200 per FEU.

Figure 25. Long-run Elasticity of Imports Routed via San Pedro Bay, With and Without Congestion Relief



[20] For the specific assumptions concerning reductions in container flow times associated with major infrastructure improvements, see Leachman (2005a).

8.6. Conclusions

A Short-Run Elasticity Model has been successfully developed and demonstrated. This model complements the previously developed Long-Run Elasticity Model. Tandem calculations of the two models predict the range of diversion of import cargoes resulting from imposition of container fees, with a conservative estimate stemming from the short-run calculation and an aggressive estimate stemming from the long-run calculation. Changes in import traffic flows can also be predicted in response to changes in infrastructure, changes in transportation rates, or changes in overall import volumes.

The Short-Run and Long-Run Elasticity Models were applied to a Base Case Scenario reflecting the consultant's best efforts to formulate conditions prevailing in 2007, as well as to four future scenarios, a Near-term Likely scenario, two Optimistic scenarios and one Pessimistic scenario. In the Near-term Likely scenario, the Short-Run Elasticity Model predicts the imposition of a $100 per FEU container fee on imports via San Pedro Bay would result in little change in the market share of the San Pedro Bay Ports compared to the Zero Fee Base Case scenario, while the Long-Run Model predicts a 9% drop in total imports for a $100 per FEU fee. Trans-loaded imports would be at a substantially higher volume than that in the Zero Fee Base Case. The results are markedly different for the imposition of fees in the Base Case Scenario, where the Short-Run Model predicts a 9% drop in total San Pedro Bay imports for a $100 per FEU fee and the Long-Run Elasticity Model predicts a 23% drop for the same fee. Trans-loaded volumes also decline, albeit much less. Most of the diverted volume would move to the Puget Sound ports. The specific amount of traffic loss from the San Pedro Bay ports would depend on the extent to which the Puget Sound ports increase operating hours, crews on duty, and/or acreage of their port terminals.

In Optimistic Scenarios, total San Pedro Bay volume exceeds Zero Fee Base Case total volume until fees rise to about $150-$200 per FEU. Trans-loaded volumes in these scenarios are resilient against fees over the entire range tested in the Short-Run analysis and against fees up to about $250 per FEU in the Long-Run analysis. In the Pessimistic Scenario, even with no container fees, total San Pedro Bay volume drops 22% (Short-Run) and 42% (Long-Run) compared to Zero Fee Base Case volume. For a fee of $100 per FEU, total import volume through the San Pedro Bay ports in this scenario is predicted to be down 22% (Short-Run) and 42% (Long-Run), while trans-loaded imports are predicted to be down 31% (Short-Run) and 44% (Long-Run).

The important take-away from this analysis is that the net impact from the imposition of container fees at San Pedro Bay compared to the 2007 Base Case depends strongly on the future scenario. At issue is whether or not there are there other favorable developments that offset the impact of such fees, e.g., more competitive rail rates from Southern California, a rise in steamship line rates via the Panama Canal, increased market share for the large, nation-wide importers, or increased rail terminal capacity in Southern California. With such things present, small or moderate container fees do not result in volumes less than that in the Zero Fee Base Case Scenario. But absent such things, or worse, juxtaposed with unfavorable developments, there could be substantial drops in volumes resulting from the imposition of fees.

A related key point is that elasticity is quite sensitive to +/- 10% changes is rates, market shares of large vs. small importers, and other factors. Highlighting this point is how significantly the elasticity of San Pedro Bay ports' imports to fees evolved from 2003 to 2007. Going forward, it clearly will be important to periodically revisit the elasticity analysis in order to keep up with the impact of changes in the important parameters.

9. Glossary

All-water service – A service offering of the steamship lines in which cargoes from Asia to eastern USA points transit the Panama Canal and utilize a port of entry on the East Coast or the Gulf Coast.

Base Case scenario – A scenario for elasticity analysis with the following features: 2006 total import volume Asia – Continental USA, mid-2006 port and rail infrastructure, 2007 transportation and handling rates and container fees, 2005 US Customs distribution of declared values for imports, and large, nation-wide importers account for 40% of total Asia – Continental USA containerized imports. This scenario is the consultant's best estimate of conditions prevailing in 2006-2007.

Consolidation – De-consolidation supply chain – another name for a *trans-loaded imports* supply chain. Under this supply chain strategy, containerized shipments of Asian-manufactured goods ultimately destined to multiple *regional distribution centers (RDCs)* move under bills of lading showing the port of entry as the destination for the shipments. The multiple shipments are regarded by the importer as "consolidated" as far as the port of entry. The particular destinations for imported goods in a marine container shipped from Asia do not have to be decided until the goods are re-shipped in domestic containers or trailers out of *cross-dock* or *import warehouse* facilities in the hinterland of the port of entry. Once the decisions on final destinations for the goods are made, the imports are regarded as "de-consolidated." In contrast, in *direct-shipping* supply chains, the *RDC* destinations for imported goods must be decided before booking vessel passage from Asia.

Container yard service (*CY*) – CY is a service offered by the steamship lines for Asian imports to the USA in which the steamship line provides service only as far as the marine terminal at the port of entry. The customer is responsible for pick-up of the marine container at the marine terminal in the port of entry.

Cross-dock facility – a facility utilized to trans-load imported goods from marine containers to domestic containers and trailers. Typically, multiple marine containers are unloaded at the same time; the goods are sorted, and then re-loaded into domestic containers and trailers. A cross-dock facility is distinguished from an import warehouse in that it typically does not have capability to store goods except for very short periods of time, i.e., the destinations for the imported goods must be specified before marine containers are unloaded at the facility.

Direct-shipped imports – imports ultimately consumed outside the local region served by the port of entry that remain in the marine box until the marine box reaches the region in which the imports are ultimately consumed. Total imports include local imports, direct-shipping imports and trans-loaded imports.

Direct-shipping) – a supply-chain strategy in which imports remain in the marine box until the marine box reaches the region where the imports are ultimately consumed.

Direct-shipping supply-chain strategies are of necessity utilized by small and regional importers, but are also utilized by some large, nation-wide importers.

Domestic container – a container used for goods transport within North America, typically 53-feet long, 9-feet, 6-inches high and accommodating up to 4,000 cubic feet of cargoes.

Domestic stack train service – Importers employing *trans-loaded import* supply chains may contract with an *Intermodal marketing company (IMC)* for door-to-door service involving rail transport of a domestic container from an import warehouse or cross-docking facility to an inland RDC. The trains handling such containers are termed *domestic double stack container trains*.

FEU – an acronym standing for forty-foot equivalent unit. A 20-foot marine container counts as one half of an FEU. A 40-foot marine container counts as one FEU. A 45-foot marine container counts as 1.125 FEUs.

Four Corners supply chain strategy – A particular type of trans-load supply chain strategy in which four ports of entry are utilized, and the total fleet of RDCs across the Continental United States is split into four groups, each group served by a particular port of entry. For example, a Four Corners supply chain might utilize Puget Sound, San Pedro Bay, Savannah and New York – New Jersey as its four ports on entry, with an import warehouse situated in the hinterland of each of those four ports.

Import warehouse – a warehouse facility generally located in the hinterland of the port of entry that is utilized in trans-loaded import supply chain strategies. Imported goods not yet in demand in any local region are held in the import warehouse until demand materializes in some region. Goods are then re-shipped from the import warehouse to RDCs in multiple regions (including the local RDC). An import warehouse also is capable of *cross-dock* operations.

Inland point intermodal service (*IPI*) – IPI is a service offered by the steamship lines for Asian imports moving to inland USA destinations via rail. The importer pays one rate to the steamship line for a single bill of lading covering door-to-door service to ship a marine container from a factory in Asia to an RDC in the Continental United States. The steamship line subcontracts with draymen in Asia and the United States for pick-up and delivery of the marine box, and it subcontracts with a railroad for inland USA line-haul movement of the marine box in *marine double-stack container trains*. IPI is utilized by importers employing direct-shipping supply-chain strategies.

IMC – an acronym standing for intermodal marketing company. An IMC is a third-party enterprise that subcontracts with draymen and railroads to provide door-to-door rail intermodal transportation service of domestic containers between origins and destinations in North America.

Local imports – imports which are ultimately consumed in a region for which the port of entry is the nearest port. Twenty-one regions encompassing the Continental United States are defined in the elasticity models. A local region where the San Pedro Bay ports are the nearest port of entry comprises Southern California, all of Arizona and New Mexico, and the southern portions of Nevada, Utah and Colorado. Total imports include local imports, *direct-shipping imports* and *trans-loaded imports*.

Long-Run Elasticity Model – a set of mathematical formulas for predicting the allocation of total containerized import flows from Asia through Continental USA ports of entry and landside channels as a function of potential container fees assessed at the San Pedro Bay ports or other USA ports of entry, transportation and handling rates, statistics on container flow times, and assumed inventory holding cost rates. For each user-specified increment in potential fees, the Long-Run Elasticity Model applies the *Supply-Chain Optimization Model* to determine least-cost import supply chains for 102 importers and then tallies the results by port and landside channel. The Long-Run Elasticity Model makes the implicit assumption that ports and landside channel operators will make whatever investments are necessary to maintain container flow time statistics assumed as input to the model in the face of competitive opportunities to take market share away from other ports or channel operators. The "Long-Run" name arises from the fact that, for long-term major investments in port or channel infrastructure, it is most conservative to evaluate the impact of potential container fees and to assess the merits of potential infrastructure investments assuming competing channels will make whatever investments necessary to maintain their current service characteristics. It is thus relevant for predicting the allocation of import volumes to ports and landside channels in the long-run.

Marine container – a container primarily used for international transport of cargoes. Marine containers come in 20-foot (about 13% of the fleet), 40-foot (about 80%) and 45-foot lengths (about 7%). Of the 40-foot boxes, about 80% are 9-feet, 6-inches high ("high-cube" boxes) and 20% are 8-feet, 6-inches high ("ISO" boxes). The high-cube 40-foot boxes accommodate up to 2,680 cubic feet of cargoes.

Near-Term Likely scenario – A scenario for elasticity analysis with the following features: Port and rail terminal infrastructure updated to 2009, and adjustments in rail rates summarized as follows: (1) Domestic rail container rates adjusted to reduce the gap between rates via West Coast ports for inland point intermodal (IPI) movement of marine boxes and rates for reshipment in domestic rail containers after trans-loading. The gap was reduced by $0.10 per cubic foot of imported goods to Eastern destinations and by $0.05 per cubic foot to Midwestern destinations. (2) IPI and domestic container rail rates via San Pedro Bay Ports were adjusted to be more competitive with other USA West Coast ports to all Midwestern and Eastern destinations except Minneapolis.

NVOCC – an acronym standing for non-vessel-owning common carrier. An NVOCC is a third-party enterprise that subcontracts with steamship lines, draymen, trucking lines and railroads to provide door-to-door transportation service from Asian origins to destinations in the Continental United States. They do not own or operate container vessels.

OEM – an acronym standing for original equipment manufacturer. High-value imports, such as electronics, appliances, and auto parts, manufactured in Asia are typically imported by OEMs and then re-sold to retailers after arrival in the United States. Such imports are handled in *trans-loaded import* supply chains. Examples of OEMs are Samsung, Panasonic, Toyota, GE, and Bridgestone.

Optimistic I scenario – A scenario for elasticity analysis with the following features: Includes all features of the *Near-term Likely scenario*. In addition: assumes that the proposed BNSF SCIG (Southern California Intermodal Gateway) rail terminal is opened, all-water steamship line rates via the Panama Canal are raised by 10%, and there are increased crew-shifts at certain Southern California rail terminals.

Optimistic II scenario – A scenario for elasticity analysis with the following features: Includes all features of the *Near-term Likely scenario*. In addition: assumes that the proposed BNSF SCIG (Southern California Intermodal Gateway) rail terminal is opened, the share of total imports for large, nation-wide importers rises to 50%, and there are increased crew-shifts at certain Southern California rail terminals.

Pessimistic scenario – A scenario for elasticity analysis with the following features: Includes all features of the Base Case Scenario. In addition: assumes all-water steamship rates via the Panama Canal are lowered by 10%, a new domestic intermodal rail terminal that was opened in 2009 at the Port of Tacoma is included, and there are increased crew-shifts of operation at Oakland and Pacific Northwest rail terminals.

Port Terminal Model – A portion of the *Queuing Model* covering the estimation of container flow times through marine terminals at the port of entry. The import parameters of the formulas estimating flow times include traffic levels, operating hours, staffing levels, and acreage.

Queuing Model – A collection of mathematical formulas to estimate the average total time spent by containerized imports in port terminals, rail intermodal terminals and rail line-haul networks. The import parameters of the formulas for terminals include traffic levels, operating hours, staffing levels, and acreage. The input parameters of the formulas for the rail line-haul network include traffic levels, numbers of tracks, speed limits, inspection and re-fueling stops, etc. The Queuing Model is iteratively applied within the *Short-Run Elasticity Model* to update estimates of container flow times by port and rail channel.

Rail Line Haul Model – A portion of the *Queuing Model* covering the estimation of container flow times through the rail line-hail network. The input parameters of the formulas for the rail line-haul network include traffic levels, numbers of tracks, speed limits, inspection and re-fueling stops, etc.

Rail Terminal Model – A portion of the *Queuing Model* covering the estimation of container flow times through rail intermodal terminals. The import parameters of the formulas estimating flow times include traffic levels, operating hours, staffing levels, and acreage.

Regional distribution center (*RDC*) – large nation-wide importers operate fleets of warehouses distributed across the Continental United States known as regional distribution centers. RDCs supply retail outlets with imported goods. Depending on the size of importer and the nature of the goods, a fleet of 20-30 RDCs may be operated, situated such that most or all of the importer's retail outlets are within an overnight drive of an RDC. For the purposes of the elasticity analysis, twenty-one RDCs serving twenty-one local regions as the final destinations for import supply chains are analyzed within the elasticity models. Downstream from the RDC, distribution activity is assumed to be independent of import supply-chain strategy.

Short-Run Elasticity Model – a set of mathematical formulas for predicting the allocation of total containerized import flows from Asia through Continental USA ports of entry and landside channels as a function of potential container fees assessed at the San Pedro Bay ports or other USA ports of entry, transportation and handling rates, port terminal and rail line-haul network infrastructure, and assumed inventory holding cost rates. The Short-Run Elasticity Model differs from the Long-Run Elasticity Model in that port infrastructure and rail infrastructure are assumed to be fixed inputs instead of assuming container flow times as fixed inputs. The Short-Run Elasticity Model iteratively applies the *Supply-Chain Optimization Model* and the *Queuing Model*. For each user-specified increment in potential fees, the Long-Run Elasticity Model applies the *Supply-Chain Optimization Model* to determine least-cost import supply chains for 102 importers and then tallies the results by port and landside channel. The results of this calculation are fed to the Queuing Model, which updates the estimates of container flow times by port and landside channel, which are in turn fed by to the *Supply-Chain Optimization Model* to update supply-chain strategies. Iteration continues until an equilibrium set of import flows is realized. The Short-Run Elasticity Model makes the implicit assumption that there are no more investments made in infrastructure for port or landside channels, and that there is no increase in the assumed staffing and hours of operation of port and rail intermodal terminals. It is thus relevant for predicting the allocation of import volumes in the short-run.

Supply-Chain Optimization Model – A set of mathematical calculations to evaluate the total transportation, handling and inventory costs of alternative supply chains from Asian ports to 21 Continental USA *RDC*s, and to identify the least-cost alternative. The supply-chain optimization model is applied to an individual importer to identify the least-cost supply chain for that importer, considering that importer's scope (regional vs. nation-wide), total import volume, transportation and handling rates, statistics on container flow times by port and landside channel, average declared value of imports, and the assumed inventory holding cost rate. Within the *Long-Run Elasticity Model*, the supply-chain optimization model is repeatedly applied to 83 actual large, nation-wide importers plus 19 "generic proxy" importers representing all small and regional importers. The import volumes from all 102 importers are totaled to predict total import flows by port and landside channel. The Supply-Chain Optimization Model also is iteratively applied within the *Short-Run Elasticity Model*, exercised with container flow times supplied by the *Queuing Model.*

Store door delivery service (*SDD*) – SDD is a service offered by the steamship lines for Asian imports to the USA in which the steamship line provides service under a single bill of lading from a factory in Asia to a final destination located in the hinterland of the port of entry. The steamship line provides the dray from the marine terminal at the port of entry to the final destination. The final destination can be either an import warehouse or an RDC. Shipments to both RDCs and import warehouses move under SDD rates, and both types of shipments also may move under CY rates. The difference is that, under SDD rates, the dray cost is the responsibility of the steamship line, while under CY rates, the dray must be funded separately by the importer.

TEU – an acronym standing for twenty-foot equivalent unit. A 20-foot marine container counts as one TEU. A 40-foot marine container counts as 2 TEUs. A 45-foot marine container counts as 2.25 TEUs.

Trailer – a goods-shipping vehicle with the underframe and wheels permanently attached. In North America, trailers are generally 53 feet long and 9-feet, 6-inches high, accommodating up to 4,000 cubic feet of cargoes. Over-the-road long-distance truck shipments generally are made in trailers, which weigh less than domestic containers mounted on chasses. Smaller trailers are sometimes utilized for package express services and less-than-truckload (LTL) shipments.

Trans-loaded imports –imports ultimately consumed outside the local region served by the port of entry which are removed from the marine box, go through sorting and possibly some value-added processes, and are re-shipped in domestic containers or trailers to the region where they are ultimately consumed. . Total imports include local imports, direct-shipping imports and trans-loaded imports. See below for further explanation of *trans-loading.*

Trans-loading (a.k.a. *Consolidation – Deconsolidation supply chain strategy*) – A supply-chain strategy in which imports are removed from the marine box in the hinterland of the port of entry and re-shipped in domestic containers or trailers to the region where the imports are ultimately consumed. The imported goods may be transferred from marine boxes to domestic containers or trailers shortly after arrival at the port of entry using a *cross-dock facility,* or they may be held in an *import warehouse* located in the hinterland of the port of entry for some time before re-shipment in domestic containers or trailers. Trans-loading supply-chain strategies are utilized by some large, nation-wide importers.

Zero-Fee Base Case – Refers to the resulting import volumes when the *Base Case scenario* is analyzed assuming no new container fees are in place.

10. References

1. *California Region Timetable, Northwest Region Timetable, Rocky Mountain Region Timetable, Southwest Region Timetable, Mountain and Plains Region Timetable*, periodically published by Altamont Press Publishing Company LLC, P.O. Box 5264, Fullerton, CA 92838.

2. Greenberg, Betsy, Robert C. Leachman and Ronald W. Wolff (1988), "Predicting Dispatching Delays on a Low-Speed, Single-Track Railroad," *Transportation Science*, Vol. 22, No. 1, p. 31-38 (February, 1988).

3. Hopp, Wallace, and Mark Spearman (2001), *Factory Physics*, Second Edition, McGraw-Hill, New York, p. 273 (2001).

4. Leachman, Robert C., (2005a), *Port and Modal Elasticity Study*, prepared for Southern California Association of Governments, September, 2005.

5. Leachman, Robert C. (2005b), *Inland Empire Main-Line Rail Study*, prepared for Southern California Association of Governments, June, 2005.

6. Leachman, Robert C. (2008), "Port and Modal Allocation of Waterborne Containerized Imports from Asia to the United States," *Transportation Research Part E*, **44** (2), p. 313 – 331 (March, 2008).

Appendix A. Resume of Stakeholder Meetings

1. June 8, 2006, SSA Marine, Seattle, WA
2. June 15, 2006, Distribution Managers Association, Ontario, CA
3. June 22, 2006, Container Freight EIT, Paramount, CA
4. July 7, 2006, Freight Mobility Roundtable, Puget Sound Regional Council, Seattle, WA
5. July 10, 2006 Port of Long Beach, Long Beach, CA
6. July 10, 2006, Toys ‘R Us, Rialto, CA
7. July 12, 2006, Toyo Tires, Ontario, CA
8. July 12, 2006, Target Stores, Inc., Rialto, CA
9. July 13, 2006, NFI National Distribution Centers, Chino, CA
10. July 26, 2006, BNSF, Ft. Worth, TX
11. Sept. 6, 2006, Ports of Seattle and Tacoma, Seattle, WA
12. Sept. 6, 2006, SSA Marine, Seattle, WA
12. Dec. 1, 2006, Port of Vancouver Authority, Vancouver, BC
13. Dec. 4, 2006, Expeditors, Inc., Seattle, WA
14. Dec. 4, 2006, Washington Trucking Associations, Des Moines, WA
15. Dec. 4, 2006, Premier Transport, Des Moines, WA
16. Dec. 19, 2006, MTC, Inc., San Francisco, CA
17. Jan. 17, 2007, SCAG Goods Movement Task Force, Los Angeles, CA
18. Jan, 29, 2007, MTC, Inc., San Francisco, CA
19. March 21, 2007, Union Pacific, Omaha, NE
20. June 20, 2007, APL Logistics, Rancho Cucamonga, CA
21. June 27, 2007, Cal Cartage, Carson, CA
22. July 2, 2007, Triton Container, Inc., San Francisco, CA
23. July 18, 2007, Sony Logistics Americas, San Diego, CA
24. June 18, 2008, SCAG Goods Movement Task Force, Los Angeles, CA

Appendix B. Asian Origin Countries for Imports Included in the Study

<u>Countries Included in the Data:</u>
China (Mainland)
Japan
Hong Kong
China (Taiwan)
South Korea
Thailand
Indonesia
Malaysia
Philippines
Singapore
India
Viet Nam
Bangladesh
Pakistan
Macau
Cambodia
Sri Lanka
Burma (Myanmar)
Mongolia
Brunei
Nepal
Laos

Appendix C. Rail Line Configuration Data

Rail line data for rail intermodal corridors from rail terminals serving major West Coast ports to terminals serving major Midwestern destinations is provided. On following pages, BNSF and UP corridors are broken into segments. Shown for each segment are estimated average speed, number of main tracks, number of sub-segments (stretches between passing sidings on single track segments or between crossovers on multiple track segments), number of passenger trains per day and the estimated route allocation of subject intermodal trains when there are alternate routes or terminals. The principal sources for these data are the Altamont Press timetables and railroad employee timetables purchased on E-Bay. Also shown are estimated numbers of crew changes and refueling stops, and calculated standard cycle times (*SCT*) and process times (*PT*), facilitating application of the queuing models.

BNSF Lanes

Zone		Avg. Speed	Miles	Tracks	Seg-ments	Psgr Trains	Route Allocation	SCT Mins per segment	Cum SCT (mins)	PT Mins per segment
	South Seattle - Cicero									
South Seattle - SIG	South Seattle - Argo	30	4.4	3	2	20	1.00	8.80	17.60	9.43
SIG - Latah Jct.	Argo - Seattle	20	3.3	2	2	20	1.00	4.95	27.50	11.50
SIG - Latah Jct.	Seattle - MP 4	20	4.0	2	3	12	1.00	4.00	39.50	10.55
SIG - Latah Jct.	MP 4 - 23rd Ave	30	1.1	1	1	12	1.00	2.20	41.70	7.23
SIG - Latah Jct.	23rd Ave - MP 7	25	2.3	2	1	12	1.00	5.52	47.22	11.16
SIG - Latah Jct.	MP 7 - MP 8	30	0.3	1	1	12	1.00	0.60	47.82	5.63
SIG - Latah Jct.	MP 8 - MP 16	45	8.2	2	1	12	1.00	10.93	58.75	14.95
SIG - Latah Jct.	MP 16 - MP 18	45	1.9	1	1	12	1.00	2.53	61.29	6.55
SIG - Latah Jct.	MP 18 - MP 27	45	10.0	2	1	12	1.00	13.33	74.62	17.35
SIG - Latah Jct.	MP 27 - MP 28	35	0.7	1	1	12	1.00	1.20	75.82	5.80
SIG - Latah Jct.	MP 28 - Everett Jct.	40	4.3	2	1	12	1.00	6.45	82.27	10.72
SIG - Latah Jct.	Everett Jct. - Skykomish	45	51.3	1	5	2	1.00	13.68	150.67	17.70
SIG - Latah Jct.	Skykomish - Merritt	25	28.8	1	3	2	1.00	23.04	219.79	28.68
SIG - Latah Jct.	Merritt - Quincy	40	78.0	1	8	2	1.00	14.63	336.79	18.90
SIG - Latah Jct.	Qunicy - Lamona	55	72.4	1	6	2	1.00	13.16	415.77	16.82
SIG - Latah Jct.	Lamona - Bluestem	50	22.7	2	2	2	1.00	13.62	443.01	17.44
SIG - Latah Jct.	Bluestem - Latah Jct	50	38.6	1	4	2	1.00	11.58	489.33	15.40
Latah Jct. - Sunset Jct.	Latah Jct. - Sunset Jct.	25	0.8	1	1	3	1.00	1.92	491.25	7.56
Sunset Jct. - Spokane	Sunset Jct. - Spokane	25	0.8	2	1	4	1.00	1.92	493.17	7.56
Spokane - Sandpoint Jct.	Spokane - Irvin	30	8.3	2	4	2	1.00	4.15	509.77	9.18
Spokane - Sandpoint Jct.	Irvin - Otis Orchards	60	4.3	1	1	2	1.00	4.30	514.07	7.82
Spokane - Sandpoint Jct.	Otis Orchards - East Rathdrum	60	13.7	2	3	2	1.00	4.57	527.77	8.08
Spokane - Sandpoint Jct.	East Rathdrum - Athol	60	10.1	1	2	2	1.00	5.05	537.87	8.57
Spokane - Sandpoint Jct.	Athol - Cocollala	60	13.8	2	2	2	1.00	6.90	551.67	10.42
Spokane - Sandpoint Jct.	Cocollala - West Algoma	60	2.3	1	1	2	1.00	2.30	553.97	5.82
Spokane - Sandpoint Jct.	West Algoma - East Algoma	60	9.0	2	1	2	1.00	9.00	562.97	12.52
Spokane - Sandpoint Jct.	East Algoma - Sandpoint Jct.	45	2.2	1	1	2	1.00	2.93	565.91	6.95
Sandpoint Jct. - St. Paul	Sandpoint Jct. - Bonners Ferry	45	34.7	1	5	2	1.00	9.25	612.17	13.27
Sandpoint Jct. - St. Paul	Bonners Ferry - East Crossport	55	5.0	2	1	2	1.00	5.45	617.63	9.11

Sandpoint Jct. - St. Paul	East Crossport - Whitefish	50	147.9	1	18	2	1.00	9.86	795.11	13.68
Sandpoint Jct. - St. Paul	Whitefish - Conkelly	40	8.8	2	3	2	1.00	4.40	808.31	8.67
Sandpoint Jct. - St. Paul	Conkelly - Nyack	45	23.6	1	3	2	1.00	10.49	839.77	14.51
Sandpoint Jct. - St. Paul	Nyack - Paola	40	10.4	2	2	2	1.00	7.80	855.37	12.07
Sandpoint Jct. - St. Paul	Paola - Pinnacle	35	4.4	1	1	2	1.00	7.54	862.92	12.14
Sandpoint Jct. - St. Paul	Pinnacle - Java West	35	7.1	2	2	2	1.00	6.09	875.09	10.68
Sandpoint Jct. - St. Paul	Java West - Java East	25	0.9	1	1	2	1.00	2.16	877.25	7.80
Sandpoint Jct. - St. Paul	Java East - Summit	25	15.4	2	2	2	1.00	18.48	914.21	24.12
Sandpoint Jct. - St. Paul	Summit - Grizzly	40	13.7	1	2	2	1.00	10.28	934.76	14.55
Sandpoint Jct. - St. Paul	Grizzly - Spotted Robe	40	4.3	2	1	2	1.00	6.45	941.21	10.72
Sandpoint Jct. - St. Paul	Spotted Robe - Blackfoot	40	15.6	1	2	2	1.00	11.70	964.61	15.97
Sandpoint Jct. - St. Paul	Blackfoot - Cut Bank	50	26.1	2	2	2	1.00	15.66	995.93	19.48
Sandpoint Jct. - St. Paul	Cut Bank - Ethridge	60	9.2	1	1	2	1.00	9.20	1005.13	12.72
Sandpoint Jct. - St. Paul	Ethridge - Shelby	50	13.5	2	2	2	1.00	8.10	1021.33	11.92
Sandpoint Jct. - St. Paul	Shelby - Joplin	60	53.5	1	6	2	1.00	8.92	1074.83	12.43
Sandpoint Jct. - St. Paul	Joplin - Gildford East	60	13.1	2	4	2	1.00	3.28	1087.93	6.79
Sandpoint Jct. - St. Paul	Gildford East - Pacific Jct.	60	34.0	1	3	2	1.00	11.33	1121.93	14.85
Sandpoint Jct. - St. Paul	Pacific Jct. - Havre East	30	6.6	2	3	2	1.00	4.40	1135.13	9.43
Sandpoint Jct. - St. Paul	Havre East - Williston	65	306.3	1	26	2	1.00	10.87	1417.87	14.27
Sandpoint Jct. - St. Paul	Williston - Epping	65	5.1	2	1	2	1.00	4.71	1422.57	8.11
Sandpoint Jct. - St. Paul	Epping - Des Lacs	65	90.6	1	8	2	1.00	10.45	1506.20	13.85
Sandpoint Jct. - St. Paul	Des Lacs - Gassman Switch	65	8.0	2	1	2	1.00	7.38	1513.59	10.78
Sandpoint Jct. - St. Paul	Gassman Switch - WL Switch	40	1.2	1	1	2	1.00	1.80	1515.39	6.07
Sandpoint Jct. - St. Paul	WL Switch - JD Switch	45	8.2	2	3	2	1.00	3.64	1526.32	7.66
Sandpoint Jct. - St. Paul	JD Switch - Surrey Jct. Switch	65	196.4	1	17	0	1.00	10.66	1707.61	14.06
Sandpoint Jct. - St. Paul	Surrey Jct. Switch - Fargo	40	22.5	2	4	0	1.00	8.44	1741.36	12.71
Sandpoint Jct. - St. Paul	Fargo - Staples	55	110.7	2	13	2	1.00	9.29	1862.13	12.94
Sandpoint Jct. - St. Paul	Staples - Philbrook	60	6.0	2	1	2	1.00	6.00	1868.13	9.52
Sandpoint Jct. - St. Paul	Philbrook - Gregory	50	30.7	1	5	2	1.00	7.37	1904.97	11.19
Sandpoint Jct. - St. Paul	Gregory - Becker	60	45.8	2	5	2	1.00	9.16	1950.77	12.68
Sandpoint Jct. - St. Paul	Becker - Big Lake	55	9.5	1	1	2	1.00	10.36	1961.13	14.02
Sandpoint Jct. - St. Paul	Big Lake - Coon Creek	55	15.9	2	3	2	1.00	5.78	1978.48	9.43
Sandpoint Jct. - St. Paul	Coon Creek - Northtown	45	7.2	2	2	2	1.00	4.80	1988.08	8.82

St. Paul - Plum River	Northtown - St. Croix	25	43.7	2	12	2	1.00	8.74	2092.96	14.38
St. Paul - Plum River	St. Croix - Burns	35	2.7	2	1	0	1.00	4.63	2097.59	9.23
St. Paul - Plum River	Burns - Prescott	25	0.2	1	1	0	1.00	0.48	2098.07	6.12
St. Paul - Plum River	Prescott - Mears	55	44.7	2	3	0	1.00	16.25	2146.83	19.91
St. Paul - Plum River	Mears - Trevino	60	0.8	1	1	0	1.00	0.80	2147.63	4.32
St. Paul - Plum River	Trevino - Winona Jct.	65	36.4	2	4	0	1.00	8.40	2181.23	11.80
St. Paul - Plum River	Winona Jct. - Trempealeau	45	10.8	1	1	0	1.00	14.40	2195.63	18.42
St. Paul - Plum River	Trempealeau - Sullivan	60	14.3	2	2	0	1.00	7.15	2209.93	10.67
St. Paul - Plum River	Sullivan - Graf	40	6.8	1	1	0	1.00	10.20	2220.13	14.47
St. Paul - Plum River	Graf - Crawford	65	59.3	2	6	0	1.00	9.12	2274.87	12.52
St. Paul - Plum River	Crawford - Ports	25	2.7	1	1	0	1.00	6.48	2281.35	12.12
St. Paul - Plum River	Ports - East Dubuque	65	50.4	2	5	0	1.00	9.30	2327.87	12.70
St. Paul - Plum River	East Dubuque - Portage	40	13.0	2	2	0	1.00	9.75	2347.37	14.02
St. Paul - Plum River	Portage - Galena	25	0.6	1	1	0	1.00	1.44	2348.81	7.08
St. Paul - Plum River	Galena - Savanna	65	27.9	2	3	0	1.00	8.58	2374.56	11.98
St. Paul - Plum River	Savanna - Plum River	25	1.4	2	1	0	1.00	3.36	2377.92	9.00
Plum River - Aurora	Plum River - Flag Center	65	56.0	1	8	0	1.00	6.46	2429.62	9.86
Plum River - Aurora	Flag Center - Steward	40	9.0	2	4	0	1.00	3.38	2443.12	7.65
Plum River - Aurora	Steward - Aurora	65	38.9	1	5	0	1.00	7.18	2479.02	10.58
Aurora - Cicero	Aurora - Cicero	50	31.4	3	11	51	1.00	3.43	2516.70	7.24
	No. of crew changes							9.00	2717.16	
	No. of refuelings							2.00	2897.16	
	Total									
	Model									
	Portland - Cicero									
Portland - N. Portland Jct.	Lake Yard - MP 5.0	35	3.0	2	1	10	1.00	10.29	10.29	9.74
Portland - N. Portland Jct.	MP 5.0 - MP 5.5	30	0.5	2	1	10	1.00	1.00	11.29	6.03
Portland - N. Portland Jct.	MP 5.5 - N. Portland Jct.	45	3.0	2	1	10	1.00	4.00	15.29	8.02
N. Portland Jct. - Vancouver, WA	N. Portland Jct. - Vancouver	30	1.4	2	1	10	1.00	2.80	18.09	7.83

Vancouver, WA - Lakeside Jct.	Vancouver - McLoughlin	50	4.6	2	2	2	1.00	2.76	23.61	6.58
Vancouver, WA - Lakeside Jct.	McLoughlin - Avery	50	88.7	1	8	2	1.00	13.31	130.05	17.12
Vancouver, WA - Lakeside Jct.	Avery - Wishram	40	2.9	2	2	2	1.00	2.18	134.40	6.45
Vancouver, WA - Lakeside Jct.	Wishram - Roosevelt	60	41.1	1	4	2	1.00	10.28	175.50	13.79
Vancouver, WA - Lakeside Jct.	Roosevelt - SP&S Jct.	60	83.4	1	8	2	1.00	10.43	258.90	13.94
Vancouver, WA - Lakeside Jct.	SP&S Jct. - Pasco	30	1.7	1	1	2	1.00	3.40	262.30	8.43
Vancouver, WA - Lakeside Jct.	Pasco - Glade	60	8.6	2	5	2	1.00	1.72	270.90	5.24
Vancouver, WA - Lakeside Jct.	Glade - Cunningham	55	35.0	1	5	2	1.00	7.64	309.08	11.29
Vancouver, WA - Lakeside Jct.	Cunningham - Sand	35	17.1	2	2	2	1.00	14.66	338.39	19.25
Vancouver, WA - Lakeside Jct.	Sand - Lakeside Jct.	45	73.2	1	8	2	1.00	12.20	435.99	16.22
Lakeside Jct. - Sunset Jct.	Lakeside Jct. - Sunset Jct.	35	10.6	1	2	1	1.00	9.09	454.16	13.68
Lakeside Jct. - Latah Jct.	Lakeside Jct. - Latah Jct.	40	9.5	1	2	1	0.00	7.13	454.16	11.40
Latah Jct. - Sunset Jct.	Latah Jct. - Sunset Jct.	25	0.8	1	1	3	0.00	1.92	454.16	7.56
Sunset Jct. - Spokane	Sunset Jct. - Spokane	25	0.8	2	1	4	1.00	1.92	456.08	7.56
Spokane - Sandpoint Jct.	Spokane - Irvin	30	8.3	2	4	2	1.00	4.15	472.68	9.18
Spokane - Sandpoint Jct.	Irvin - Otis Orchards	60	4.3	1	1	2	1.00	4.30	476.98	7.82
Spokane - Sandpoint Jct.	Otis Orchards - East Rathdrum	60	13.7	2	3	2	1.00	4.57	490.68	8.08
Spokane - Sandpoint Jct.	East Rathdrum - Athol	60	10.1	1	2	2	1.00	5.05	500.78	8.57
Spokane - Sandpoint Jct.	Athol - Cocollala	60	13.8	2	2	2	1.00	6.90	514.58	10.42
Spokane - Sandpoint Jct.	Cocollala - West Algoma	60	2.3	1	1	2	1.00	2.30	516.88	5.82
Spokane - Sandpoint Jct.	West Algoma - East Algoma	60	9.0	2	1	2	1.00	9.00	525.88	12.52
Spokane - Sandpoint Jct.	East Algoma - Sandpoint Jct.	45	2.2	1	1	2	1.00	2.93	528.82	6.95
Sandpoint Jct. - St. Paul	Sandpoint Jct. - Bonners Ferry	45	34.7	1	5	2	1.00	9.25	575.08	13.27

Sandpoint Jct. - St. Paul	Bonners Ferry - East Crossport	55	5.0	2	1	2	1.00	5.45	580.54	9.11
Sandpoint Jct. - St. Paul	East Crossport - Whitefish	50	147.9	1	18	2	1.00	9.86	758.02	13.68
Sandpoint Jct. - St. Paul	Whitefish - Conkelly	40	8.8	2	3	2	1.00	4.40	771.22	8.67
Sandpoint Jct. - St. Paul	Conkelly - Nyack	45	23.6	1	3	2	1.00	10.49	802.68	14.51
Sandpoint Jct. - St. Paul	Nyack - Paola	40	10.4	2	2	2	1.00	7.80	818.28	12.07
Sandpoint Jct. - St. Paul	Paola - Pinnacle	35	4.4	1	1	2	1.00	7.54	825.83	12.14
Sandpoint Jct. - St. Paul	Pinnacle - Java West	35	7.1	2	2	2	1.00	6.09	838.00	10.68
Sandpoint Jct. - St. Paul	Java West - Java East	25	0.9	1	1	2	1.00	2.16	840.16	7.80
Sandpoint Jct. - St. Paul	Java East - Summit	25	15.4	2	2	2	1.00	18.48	877.12	24.12
Sandpoint Jct. - St. Paul	Summit - Grizzly	40	13.7	1	2	2	1.00	10.28	897.67	14.55
Sandpoint Jct. - St. Paul	Grizzly - Spotted Robe	40	4.3	2	1	2	1.00	6.45	904.12	10.72
Sandpoint Jct. - St. Paul	Spotted Robe - Blackfoot	40	15.6	1	2	2	1.00	11.70	927.52	15.97
Sandpoint Jct. - St. Paul	Blackfoot - Cut Bank	50	26.1	2	2	2	1.00	15.66	958.84	19.48
Sandpoint Jct. - St. Paul	Cut Bank - Ethridge	60	9.2	1	1	2	1.00	9.20	968.04	12.72
Sandpoint Jct. - St. Paul	Ethridge - Shelby	50	13.5	2	2	2	1.00	8.10	984.24	11.92
Sandpoint Jct. - St. Paul	Shelby - Joplin	60	53.5	1	6	2	1.00	8.92	1037.74	12.43
Sandpoint Jct. - St. Paul	Joplin - Gildford East	60	13.1	2	4	2	1.00	3.28	1050.84	6.79
Sandpoint Jct. - St. Paul	Gildford East - Pacific Jct.	60	34.0	1	3	2	1.00	11.33	1084.84	14.85
Sandpoint Jct. - St. Paul	Pacific Jct. - Havre East	30	6.6	2	3	2	1.00	4.40	1098.04	9.43
Sandpoint Jct. - St. Paul	Havre East - Williston	65	306.3	1	26	2	1.00	10.87	1380.78	14.27
Sandpoint Jct. - St. Paul	Williston - Epping	65	5.1	2	1	2	1.00	4.71	1385.48	8.11
Sandpoint Jct. - St. Paul	Epping - Des Lacs	65	90.6	1	8	2	1.00	10.45	1469.12	13.85
Sandpoint Jct. - St. Paul	Des Lacs - Gassman Switch	65	8.0	2	1	2	1.00	7.38	1476.50	10.78
Sandpoint Jct. - St. Paul	Gassman Switch - WL Switch	40	1.2	1	1	2	1.00	1.80	1478.30	6.07
Sandpoint Jct. - St. Paul	WL Switch - JD Switch	45	8.2	2	3	2	1.00	3.64	1489.23	7.66
Sandpoint Jct. - St. Paul	JD Switch - Surrey Jct. Switch	65	196.4	1	17	0	1.00	10.66	1670.53	14.06
Sandpoint Jct. - St. Paul	Surrey Jct. Switch - Fargo	40	22.5	2	4	0	1.00	8.44	1704.28	12.71
Sandpoint Jct. - St. Paul	Fargo - Staples	55	110.7	2	13	2	1.00	9.29	1825.04	12.94
Sandpoint Jct. - St. Paul	Staples - Philbrook	60	6.0	2	1	2	1.00	6.00	1831.04	9.52
Sandpoint Jct. - St. Paul	Philbrook - Gregory	50	30.7	1	5	2	1.00	7.37	1867.88	11.19
Sandpoint Jct. - St. Paul	Gregory - Becker	60	45.8	2	5	2	1.00	9.16	1913.68	12.68
Sandpoint Jct. - St. Paul	Becker - Big Lake	55	9.5	1	1	2	1.00	10.36	1924.04	14.02
Sandpoint Jct. - St. Paul	Big Lake - Coon Creek	55	15.9	2	3	2	1.00	5.78	1941.39	9.43

Sandpoint Jct. - St. Paul	Coon Creek - Northtown	45	7.2	2	2	2	1.00	4.80	1950.99	8.82
St. Paul - Plum River	Northtown - St. Croix	25	43.7	2	12	2	1.00	8.74	2055.87	14.38
St. Paul - Plum River	St. Croix - Burns	35	2.7	2	1	0	1.00	4.63	2060.50	9.23
St. Paul - Plum River	Burns - Prescott	25	0.2	1	1	0	1.00	0.48	2060.98	6.12
St. Paul - Plum River	Prescott - Mears	55	44.7	2	3	0	1.00	16.25	2109.74	19.91
St. Paul - Plum River	Mears - Trevino	60	0.8	1	1	0	1.00	0.80	2110.54	4.32
St. Paul - Plum River	Trevino - Winona Jct.	65	36.4	2	4	0	1.00	8.40	2144.14	11.80
St. Paul - Plum River	Winona Jct. - Trempealeau	45	10.8	1	1	0	1.00	14.40	2158.54	18.42
St. Paul - Plum River	Trempealeau - Sullivan	60	14.3	2	2	0	1.00	7.15	2172.84	10.67
St. Paul - Plum River	Sullivan - Graf	40	6.8	1	1	0	1.00	10.20	2183.04	14.47
St. Paul - Plum River	Graf - Crawford	65	59.3	2	6	0	1.00	9.12	2237.78	12.52
St. Paul - Plum River	Crawford - Ports	25	2.7	1	1	0	1.00	6.48	2244.26	12.12
St. Paul - Plum River	Ports - East Dubuque	65	50.4	2	5	0	1.00	9.30	2290.78	12.70
St. Paul - Plum River	East Dubuque - Portage	40	13.0	2	2	0	1.00	9.75	2310.28	14.02
St. Paul - Plum River	Portage - Galena	25	0.6	1	1	0	1.00	1.44	2311.72	7.08
St. Paul - Plum River	Galena - Savanna	65	27.9	2	3	0	1.00	8.58	2337.48	11.98
St. Paul - Plum River	Savanna - Plum River	25	1.4	2	1	0	1.00	3.36	2340.84	9.00
Plum River - Aurora	Plum River - Flag Center	65	56.0	1	8	0	1.00	6.46	2392.53	9.86
Plum River - Aurora	Flag Center - Steward	40	9.0	2	4	0	1.00	3.38	2406.03	7.65
Plum River - Aurora	Steward - Aurora	65	38.9	1	5	0	1.00	7.18	2441.94	10.58
Aurora - Cicero	Aurora - Cicero	50	31.4	3	11	51	1.00	3.43	2479.62	7.24
	No. of crew changes							9.00	2680.07	
	No. of refuelings							2.00	2860.07	
	Total									
	Model									
	South Seattle - Kansas City									
South Seattle - SIG	South Seattle - Argo	30	4.4	3	2	20	1.00	8.80	17.60	9.43
SIG - Latah Jct.	Argo - Seattle	20	3.3	2	2	20	1.00	4.95	27.50	11.50
SIG - Latah Jct.	Seattle - MP 4	20	4.0	2	3	12	1.00	4.00	39.50	10.55
SIG - Latah Jct.	MP 4 - 23rd Ave	30	1.1	1	1	12	1.00	2.20	41.70	7.23
SIG - Latah Jct.	23rd Ave - MP 7	25	2.3	2	1	12	1.00	5.52	47.22	11.16
SIG - Latah Jct.	MP 7 - MP 8	30	0.3	1	1	12	1.00	0.60	47.82	5.63
SIG - Latah Jct.	MP 8 - MP 16	45	8.2	2	1	12	1.00	10.93	58.75	14.95
SIG - Latah Jct.	MP 16 - MP 18	45	1.9	1	1	12	1.00	2.53	61.29	6.55

SIG - Latah Jct.	MP 18 - MP 27	45	10.0	2	1	12	1.00	13.33	74.62	17.35
SIG - Latah Jct.	MP 27 - MP 28	35	0.7	1	1	12	1.00	1.20	75.82	5.80
SIG - Latah Jct.	MP 28 - Everett Jct.	40	4.3	2	1	12	1.00	6.45	82.27	10.72
SIG - Latah Jct.	Everett Jct. - Skykomish	45	51.3	1	5	2	1.00	13.68	150.67	17.70
SIG - Latah Jct.	Skykomish - Merritt	25	28.8	1	3	2	1.00	23.04	219.79	28.68
SIG - Latah Jct.	Merritt - Quincy	40	78.0	1	8	2	1.00	14.63	336.79	18.90
SIG - Latah Jct.	Qunicy - Lamona	55	72.4	1	6	2	1.00	13.16	415.77	16.82
SIG - Latah Jct.	Lamona - Bluestem	50	22.7	2	2	2	1.00	13.62	443.01	17.44
SIG - Latah Jct.	Bluestem - Latah Jct	50	38.6	1	4	2	1.00	11.58	489.33	15.40
Latah Jct. - Sunset Jct.	Latah Jct. - Sunset Jct.	25	0.8	1	1	3	1.00	1.92	491.25	7.56
Sunset Jct. - Spokane	Sunset Jct. - Spokane	25	0.8	2	1	4	1.00	1.92	493.17	7.56
Spokane - Sandpoint Jct.	Spokane - Irvin	30	8.3	2	4	2	1.00	4.15	509.77	9.18
Spokane - Sandpoint Jct.	Irvin - Otis Orchards	60	4.3	1	1	2	1.00	4.30	514.07	7.82
Spokane - Sandpoint Jct.	Otis Orchards - East Rathdrum	60	13.7	2	3	2	1.00	4.57	527.77	8.08
Spokane - Sandpoint Jct.	East Rathdrum - Athol	60	10.1	1	2	2	1.00	5.05	537.87	8.57
Spokane - Sandpoint Jct.	Athol - Cocollala	60	13.8	2	2	2	1.00	6.90	551.67	10.42
Spokane - Sandpoint Jct.	Cocollala - West Algoma	60	2.3	1	1	2	1.00	2.30	553.97	5.82
Spokane - Sandpoint Jct.	West Algoma - East Algoma	60	9.0	2	1	2	1.00	9.00	562.97	12.52
Spokane - Sandpoint Jct.	East Algoma - Sandpoint Jct.	45	2.2	1	1	2	1.00	2.93	565.91	6.95
Sandpoint Jct. - St. Paul	Sandpoint Jct. - Bonners Ferry	45	34.7	1	5	2	1.00	9.25	612.17	13.27
Sandpoint Jct. - St. Paul	Bonners Ferry - East Crossport	55	5.0	2	1	2	1.00	5.45	617.63	9.11
Sandpoint Jct. - St. Paul	East Crossport - Whitefish	50	147.9	1	18	2	1.00	9.86	795.11	13.68
Sandpoint Jct. - St. Paul	Whitefish - Conkelly	40	8.8	2	3	2	1.00	4.40	808.31	8.67
Sandpoint Jct. - St. Paul	Conkelly - Nyack	45	23.6	1	3	2	1.00	10.49	839.77	14.51
Sandpoint Jct. - St. Paul	Nyack - Paola	40	10.4	2	2	2	1.00	7.80	855.37	12.07
Sandpoint Jct. - St. Paul	Paola - Pinnacle	35	4.4	1	1	2	1.00	7.54	862.92	12.14
Sandpoint Jct. - St. Paul	Pinnacle - Java West	35	7.1	2	2	2	1.00	6.09	875.09	10.68
Sandpoint Jct. - St. Paul	Java West - Java East	25	0.9	1	1	2	1.00	2.16	877.25	7.80
Sandpoint Jct. - St. Paul	Java East - Summit	25	15.4	2	2	2	1.00	18.48	914.21	24.12
Sandpoint Jct. - St. Paul	Summit - Grizzly	40	13.7	1	2	2	1.00	10.28	934.76	14.55
Sandpoint Jct. - St. Paul	Grizzly - Spotted Robe	40	4.3	2	1	2	1.00	6.45	941.21	10.72
Sandpoint Jct. - St. Paul	Spotted Robe - Blackfoot	40	15.6	1	2	2	1.00	11.70	964.61	15.97
Sandpoint Jct. - St. Paul	Blackfoot - Cut Bank	50	26.1	2	2	2	1.00	15.66	995.93	19.48
Sandpoint Jct. - St. Paul	Cut Bank - Ethridge	60	9.2	1	1	2	1.00	9.20	1005.13	12.72

Sandpoint Jct. - St. Paul	Ethridge - Shelby	50	13.5	2	2	2	1.00	8.10	1021.33	11.92
Sandpoint Jct. - St. Paul	Shelby - Joplin	60	53.5	1	6	2	1.00	8.92	1074.83	12.43
Sandpoint Jct. - St. Paul	Joplin - Gildford East	60	13.1	2	4	2	1.00	3.28	1087.93	6.79
Sandpoint Jct. - St. Paul	Gildford East - Pacific Jct.	60	34.0	1	3	2	1.00	11.33	1121.93	14.85
Sandpoint Jct. - St. Paul	Pacific Jct. - Havre East	30	6.6	2	3	2	1.00	4.40	1135.13	9.43
Sandpoint Jct. - St. Paul	Havre East - Williston	65	306.3	1	26	2	1.00	10.87	1417.87	14.27
Sandpoint Jct. - St. Paul	Williston - Epping	65	5.1	2	1	2	1.00	4.71	1422.57	8.11
Sandpoint Jct. - St. Paul	Epping - Des Lacs	65	90.6	1	8	2	1.00	10.45	1506.20	13.85
Sandpoint Jct. - St. Paul	Des Lacs - Gassman Switch	65	8.0	2	1	2	1.00	7.38	1513.59	10.78
Sandpoint Jct. - St. Paul	Gassman Switch - WL Switch	40	1.2	1	1	2	1.00	1.80	1515.39	6.07
Sandpoint Jct. - St. Paul	WL Switch - JD Switch	45	8.2	2	3	2	1.00	3.64	1526.32	7.66
Sandpoint Jct. - St. Paul	JD Switch - Surrey Jct. Switch	65	196.4	1	17	0	1.00	10.66	1707.61	14.06
Sandpoint Jct. - St. Paul	Surrey Jct. Switch - Fargo	40	22.5	2	4	0	1.00	8.44	1741.36	12.71
Sandpoint Jct. - St. Paul	Fargo - Staples	50	110.7	2	13	2	1.00	10.22	1874.20	14.04
Sandpoint Jct. - St. Paul	Staples - Philbrook	60	6.0	2	1	2	1.00	6.00	1880.20	9.52
Sandpoint Jct. - St. Paul	Philbrook - Gregory	50	30.7	1	5	2	1.00	7.37	1917.04	11.19
Sandpoint Jct. - St. Paul	Gregory - Becker	60	45.8	2	5	2	1.00	9.16	1962.84	12.68
Sandpoint Jct. - St. Paul	Becker - Big Lake	55	9.5	1	1	2	1.00	10.36	1973.21	14.02
Sandpoint Jct. - St. Paul	Big Lake - Coon Creek	55	15.9	2	3	2	1.00	5.78	1990.55	9.43
Sandpoint Jct. - St. Paul	Coon Creek - Northtown	45	7.2	2	2	2	1.00	4.80	2000.15	8.82
St. Paul - Plum River	Northtown - St. Croix	25	43.7	2	12	2	1.00	8.74	2105.03	14.38
St. Paul - Plum River	St. Croix - Burns	35	2.7	2	1	0	1.00	4.63	2109.66	9.23
St. Paul - Plum River	Burns - Prescott	25	0.2	1	1	0	1.00	0.48	2110.14	6.12
St. Paul - Plum River	Prescott - Mears	50	44.7	2	3	0	1.00	17.88	2163.78	21.70
St. Paul - Plum River	Mears - Trevino	60	0.8	1	1	0	1.00	0.80	2164.58	4.32
St. Paul - Plum River	Trevino - Winona Jct.	60	36.4	2	4	0	1.00	9.10	2200.98	12.62
St. Paul - Plum River	Winona Jct. - Trempealeau	45	10.8	1	1	0	1.00	14.40	2215.38	18.42
St. Paul - Plum River	Trempealeau - Sullivan	50	14.3	2	2	0	1.00	8.58	2232.54	12.40
St. Paul - Plum River	Sullivan - Graf	40	6.8	1	1	0	1.00	10.20	2242.74	14.47
St. Paul - Plum River	Graf - Crawford	60	59.3	2	6	0	1.00	9.88	2302.04	13.40
St. Paul - Plum River	Crawford - Ports	25	2.7	1	1	0	1.00	6.48	2308.52	12.12
St. Paul - Plum River	Ports - East Dubuque	60	50.4	2	5	0	1.00	10.08	2358.92	13.60
St. Paul - Plum River	East Dubuque - Portage	40	13.0	2	2	0	1.00	9.75	2378.42	14.02

St. Paul - Plum River	Portage - Galena	25	0.6	1	1	0	1.00	1.44	2379.86	7.08
St. Paul - Plum River	Galena - Savanna	60	27.9	2	3	0	1.00	9.30	2407.76	12.82
St. Paul - Plum River	Savanna - Plum River	25	1.4	2	1	0	1.00	3.36	2411.12	9.00
Plum River - Galesburg	Plum River - Galesburg	40	95.7	1	8	0	1.00	17.94	2554.67	22.22
Plum River - Galesburg	Galesburg - CP 1850	25	3.6	2	6	2	1.00	1.44	2563.31	7.08
Kansas City - Galesburg	CP 1850 - East Sibley	55	239.9	2	23	2	1.00	11.38	2825.02	15.03
Kansas City - Galesburg	East Sibley - West Sibley	30	1.4	1	1	2	1.00	2.80	2827.82	7.83
Kansas City - Galesburg	West Sibley - Kansas City	25	4.5	2	2	2	1.00	5.40	2838.62	11.04
	No. of crew changes							9.00	3039.08	
	No. of refuelings							2.00	3219.08	
	Total									
	Model									
	South Seattle - Memphis									
South Seattle - SIG	South Seattle - Argo	30	4.4	3	2	20	1.00	8.80	17.60	9.43
SIG - Latah Jct.	Argo - Seattle	20	3.3	2	2	20	1.00	4.95	27.50	11.50
SIG - Latah Jct.	Seattle - MP 4	20	4.0	2	3	12	1.00	4.00	39.50	10.55
SIG - Latah Jct.	MP 4 - 23rd Ave	30	1.1	1	1	12	1.00	2.20	41.70	7.23
SIG - Latah Jct.	23rd Ave - MP 7	25	2.3	2	1	12	1.00	5.52	47.22	11.16
SIG - Latah Jct.	MP 7 - MP 8	30	0.3	1	1	12	1.00	0.60	47.82	5.63
SIG - Latah Jct.	MP 8 - MP 16	45	8.2	2	1	12	1.00	10.93	58.75	14.95
SIG - Latah Jct.	MP 16 - MP 18	45	1.9	1	1	12	1.00	2.53	61.29	6.55
SIG - Latah Jct.	MP 18 - MP 27	45	10.0	2	1	12	1.00	13.33	74.62	17.35
SIG - Latah Jct.	MP 27 - MP 28	35	0.7	1	1	12	1.00	1.20	75.82	5.80
SIG - Latah Jct.	MP 28 - Everett Jct.	40	4.3	2	1	12	1.00	6.45	82.27	10.72
SIG - Latah Jct.	Everett Jct. - Skykomish	45	51.3	1	5	2	1.00	13.68	150.67	17.70
SIG - Latah Jct.	Skykomish - Merritt	25	28.8	1	3	2	1.00	23.04	219.79	28.68
SIG - Latah Jct.	Merritt - Quincy	40	78.0	1	8	2	1.00	14.63	336.79	18.90
SIG - Latah Jct.	Qunicy - Lamona	55	72.4	1	6	2	1.00	13.16	415.77	16.82
SIG - Latah Jct.	Lamona - Bluestem	50	22.7	2	2	2	1.00	13.62	443.01	17.44
SIG - Latah Jct.	Bluestem - Latah Jct	50	38.6	1	4	2	1.00	11.58	489.33	15.40
Latah Jct. - Sunset Jct.	Latah Jct. - Sunset Jct.	25	0.8	1	1	3	1.00	1.92	491.25	7.56
Sunset Jct. - Spokane	Sunset Jct. - Spokane	25	0.8	2	1	4	1.00	1.92	493.17	7.56
Spokane - Sandpoint Jct.	Spokane - Irvin	30	8.3	2	4	2	1.00	4.15	509.77	9.18
Spokane - Sandpoint Jct.	Irvin - Otis Orchards	60	4.3	1	1	2	1.00	4.30	514.07	7.82

Spokane - Sandpoint Jct.	Otis Orchards - East Rathdrum	60	13.7	2	3	2	1.00	4.57	527.77	8.08
Spokane - Sandpoint Jct.	East Rathdrum - Athol	60	10.1	1	2	2	1.00	5.05	537.87	8.57
Spokane - Sandpoint Jct.	Athol - Cocollala	60	13.8	2	2	2	1.00	6.90	551.67	10.42
Spokane - Sandpoint Jct.	Cocollala - West Algoma	60	2.3	1	1	2	1.00	2.30	553.97	5.82
Spokane - Sandpoint Jct.	West Algoma - East Algoma	60	9.0	2	1	2	1.00	9.00	562.97	12.52
Spokane - Sandpoint Jct.	East Algoma - Sandpoint Jct.	45	2.2	1	1	2	1.00	2.93	565.91	6.95
Sandpoint Jct. - St. Paul	Sandpoint Jct. - Bonners Ferry	45	34.7	1	5	2	1.00	9.25	612.17	13.27
Sandpoint Jct. - St. Paul	Bonners Ferry - East Crossport	55	5.0	2	1	2	1.00	5.45	617.63	9.11
Sandpoint Jct. - St. Paul	East Crossport - Whitefish	50	147.9	1	18	2	1.00	9.86	795.11	13.68
Sandpoint Jct. - St. Paul	Whitefish - Conkelly	40	8.8	2	3	2	1.00	4.40	808.31	8.67
Sandpoint Jct. - St. Paul	Conkelly - Nyack	45	23.6	1	3	2	1.00	10.49	839.77	14.51
Sandpoint Jct. - St. Paul	Nyack - Paola	40	10.4	2	2	2	1.00	7.80	855.37	12.07
Sandpoint Jct. - St. Paul	Paola - Pinnacle	35	4.4	1	1	2	1.00	7.54	862.92	12.14
Sandpoint Jct. - St. Paul	Pinnacle - Java West	35	7.1	2	2	2	1.00	6.09	875.09	10.68
Sandpoint Jct. - St. Paul	Java West - Java East	25	0.9	1	1	2	1.00	2.16	877.25	7.80
Sandpoint Jct. - St. Paul	Java East - Summit	25	15.4	2	2	2	1.00	18.48	914.21	24.12
Sandpoint Jct. - St. Paul	Summit - Grizzly	40	13.7	1	2	2	1.00	10.28	934.76	14.55
Sandpoint Jct. - St. Paul	Grizzly - Spotted Robe	40	4.3	2	1	2	1.00	6.45	941.21	10.72
Sandpoint Jct. - St. Paul	Spotted Robe - Blackfoot	40	15.6	1	2	2	1.00	11.70	964.61	15.97
Sandpoint Jct. - St. Paul	Blackfoot - Cut Bank	50	26.1	2	2	2	1.00	15.66	995.93	19.48
Sandpoint Jct. - St. Paul	Cut Bank - Ethridge	60	9.2	1	1	2	1.00	9.20	1005.13	12.72
Sandpoint Jct. - St. Paul	Ethridge - Shelby	50	13.5	2	2	2	1.00	8.10	1021.33	11.92
Sandpoint Jct. - St. Paul	Shelby - Joplin	60	53.5	1	6	2	1.00	8.92	1074.83	12.43
Sandpoint Jct. - St. Paul	Joplin - Gildford East	60	13.1	2	4	2	1.00	3.28	1087.93	6.79
Sandpoint Jct. - St. Paul	Gildford East - Pacific Jct.	60	34.0	1	3	2	1.00	11.33	1121.93	14.85
Sandpoint Jct. - St. Paul	Pacific Jct. - Havre East	30	6.6	2	3	2	1.00	4.40	1135.13	9.43
Sandpoint Jct. - St. Paul	Havre East - Williston	65	306.3	1	26	2	1.00	10.87	1417.87	14.27
Sandpoint Jct. - St. Paul	Williston - Epping	65	5.1	2	1	2	1.00	4.71	1422.57	8.11
Sandpoint Jct. - St. Paul	Epping - Des Lacs	65	90.6	1	8	2	1.00	10.45	1506.20	13.85
Sandpoint Jct. - St. Paul	Des Lacs - Gassman Switch	65	8.0	2	1	2	1.00	7.38	1513.59	10.78
Sandpoint Jct. - St. Paul	Gassman Switch - WL Switch	40	1.2	1	1	2	1.00	1.80	1515.39	6.07
Sandpoint Jct. - St. Paul	WL Switch - JD Switch	45	8.2	2	3	2	1.00	3.64	1526.32	7.66
Sandpoint Jct. - St. Paul	JD Switch - Surrey Jct. Switch	65	196.4	1	17	0	1.00	10.66	1707.61	14.06

Sandpoint Jct. - St. Paul	Surrey Jct. Switch - Fargo	40	22.5	2	4	0	1.00	8.44	1741.36	12.71
Sandpoint Jct. - St. Paul	Fargo - Staples	50	110.7	2	13	2	1.00	10.22	1874.20	14.04
Sandpoint Jct. - St. Paul	Staples - Philbrook	60	6.0	2	1	2	1.00	6.00	1880.20	9.52
Sandpoint Jct. - St. Paul	Philbrook - Gregory	50	30.7	1	5	2	1.00	7.37	1917.04	11.19
Sandpoint Jct. - St. Paul	Gregory - Becker	60	45.8	2	5	2	1.00	9.16	1962.84	12.68
Sandpoint Jct. - St. Paul	Becker - Big Lake	55	9.5	1	1	2	1.00	10.36	1973.21	14.02
Sandpoint Jct. - St. Paul	Big Lake - Coon Creek	55	15.9	2	3	2	1.00	5.78	1990.55	9.43
Sandpoint Jct. - St. Paul	Coon Creek - Northtown	45	7.2	2	2	2	1.00	4.80	2000.15	8.82
St. Paul - Plum River	Northtown - St. Croix	25	43.7	2	12	2	1.00	8.74	2105.03	14.38
St. Paul - Plum River	St. Croix - Burns	35	2.7	2	1	0	1.00	4.63	2109.66	9.23
St. Paul - Plum River	Burns - Prescott	25	0.2	1	1	0	1.00	0.48	2110.14	6.12
St. Paul - Plum River	Prescott - Mears	50	44.7	2	3	0	1.00	17.88	2163.78	21.70
St. Paul - Plum River	Mears - Trevino	60	0.8	1	1	0	1.00	0.80	2164.58	4.32
St. Paul - Plum River	Trevino - Winona Jct.	60	36.4	2	4	0	1.00	9.10	2200.98	12.62
St. Paul - Plum River	Winona Jct. - Trempealeau	45	10.8	1	1	0	1.00	14.40	2215.38	18.42
St. Paul - Plum River	Trempealeau - Sullivan	50	14.3	2	2	0	1.00	8.58	2232.54	12.40
St. Paul - Plum River	Sullivan - Graf	40	6.8	1	1	0	1.00	10.20	2242.74	14.47
St. Paul - Plum River	Graf - Crawford	60	59.3	2	6	0	1.00	9.88	2302.04	13.40
St. Paul - Plum River	Crawford - Ports	25	2.7	1	1	0	1.00	6.48	2308.52	12.12
St. Paul - Plum River	Ports - East Dubuque	60	50.4	2	5	0	1.00	10.08	2358.92	13.60
St. Paul - Plum River	East Dubuque - Portage	40	13.0	2	2	0	1.00	9.75	2378.42	14.02
St. Paul - Plum River	Portage - Galena	25	0.6	1	1	0	1.00	1.44	2379.86	7.08
St. Paul - Plum River	Galena - Savanna	60	27.9	2	3	0	1.00	9.30	2407.76	12.82
St. Paul - Plum River	Savanna - Plum River	25	1.4	2	1	0	1.00	3.36	2411.12	9.00
Plum River - Galesburg	Plum River - Galesburg	40	95.7	1	8	0	1.00	17.94	2554.67	22.22
Galesburg - Memphis	Galesburg - Bushnell	40	30.0	1	6	2	1.00	7.50	2599.67	11.77
Galesburg - Memphis	Bushnell - W. Quincy	50	71.0	1	7	2	1.00	12.17	2684.87	15.99
Galesburg - Memphis	W. Quincy - St. Louis	45	145.0	1	12	0	1.00	16.11	2878.21	20.13
Galesburg - Memphis	St. Louis - Chaffee	45	150.0	1	17	0	1.00	11.76	3078.21	15.78
Galesburg - Memphis	Chaffee - Memphis	50	177.0	1	20	0	1.00	10.62	3290.61	14.44
	No. of crew changes							11.00	3535.61	
	No. of refuelings							3.00	3805.61	
	Total									

Model

SIG - Cicero/Logistics Park/Corwith

SIG - Latah Jct.	SIG - Seattle	20	2.1	3	2	20	1.00	6.30	12.60	9.70
SIG - Latah Jct.	Seattle - MP 4	20	4.0	2	3	12	1.00	4.00	24.60	10.55
SIG - Latah Jct.	MP 4 - 23rd Ave	30	1.1	1	1	12	1.00	2.20	26.80	7.23
SIG - Latah Jct.	23rd Ave - MP 7	25	2.3	2	1	12	1.00	5.52	32.32	11.16
SIG - Latah Jct.	MP 7 - MP 8	30	0.3	1	1	12	1.00	0.60	32.92	5.63
SIG - Latah Jct.	MP 8 - MP 16	45	8.2	2	1	12	1.00	10.93	43.85	14.95
SIG - Latah Jct.	MP 16 - MP 18	45	1.9	1	1	12	1.00	2.53	46.39	6.55
SIG - Latah Jct.	MP 18 - MP 27	45	10.0	2	1	12	1.00	13.33	59.72	17.35
SIG - Latah Jct.	MP 27 - MP 28	35	0.7	1	1	12	1.00	1.20	60.92	5.80
SIG - Latah Jct.	MP 28 - Everett Jct.	40	4.3	2	1	12	1.00	6.45	67.37	10.72
SIG - Latah Jct.	Everett Jct. - Skykomish	45	51.3	1	5	2	1.00	13.68	135.77	17.70
SIG - Latah Jct.	Skykomish - Merritt	25	28.8	1	3	2	1.00	23.04	204.89	28.68
SIG - Latah Jct.	Merritt - Quincy	40	78.0	1	8	2	1.00	14.63	321.89	18.90
SIG - Latah Jct.	Qunicy - Lamona	55	72.4	1	6	2	1.00	13.16	400.87	16.82
SIG - Latah Jct.	Lamona - Bluestem	50	22.7	2	2	2	1.00	13.62	428.11	17.44
SIG - Latah Jct.	Bluestem - Latah Jct	50	38.6	1	4	2	1.00	11.58	474.43	15.40
Latah Jct. - Sunset Jct.	Latah Jct. - Sunset Jct.	25	0.8	1	1	3	1.00	1.92	476.35	7.56
Sunset Jct. - Spokane	Sunset Jct. - Spokane	25	0.8	2	1	4	1.00	1.92	478.27	7.56
Spokane - Sandpoint Jct.	Spokane - Irvin	30	8.3	2	4	2	1.00	4.15	494.87	9.18
Spokane - Sandpoint Jct.	Irvin - Otis Orchards	60	4.3	1	1	2	1.00	4.30	499.17	7.82
Spokane - Sandpoint Jct.	Otis Orchards - East Rathdrum	60	13.7	2	3	2	1.00	4.57	512.87	8.08
Spokane - Sandpoint Jct.	East Rathdrum - Athol	60	10.1	1	2	2	1.00	5.05	522.97	8.57
Spokane - Sandpoint Jct.	Athol - Cocollala	60	13.8	2	2	2	1.00	6.90	536.77	10.42
Spokane - Sandpoint Jct.	Cocollala - West Algoma	60	2.3	1	1	2	1.00	2.30	539.07	5.82
Spokane - Sandpoint Jct.	West Algoma - East Algoma	60	9.0	2	1	2	1.00	9.00	548.07	12.52
Spokane - Sandpoint Jct.	East Algoma - Sandpoint Jct.	45	2.2	1	1	2	1.00	2.93	551.01	6.95
Sandpoint Jct. - St. Paul	Sandpoint Jct. - Bonners Ferry	45	34.7	1	5	2	1.00	9.25	597.27	13.27
Sandpoint Jct. - St. Paul	Bonners Ferry - East Crossport	55	5.0	2	1	2	1.00	5.45	602.73	9.11
Sandpoint Jct. - St. Paul	East Crossport - Whitefish	50	147.9	1	18	2	1.00	9.86	780.21	13.68
Sandpoint Jct. - St. Paul	Whitefish - Conkelly	40	8.8	2	3	2	1.00	4.40	793.41	8.67
Sandpoint Jct. - St. Paul	Conkelly - Nyack	45	23.6	1	3	2	1.00	10.49	824.87	14.51

Sandpoint Jct. - St. Paul	Nyack - Paola	40	10.4	2	2	2	1.00	7.80	840.47	12.07
Sandpoint Jct. - St. Paul	Paola - Pinnacle	35	4.4	1	1	2	1.00	7.54	848.02	12.14
Sandpoint Jct. - St. Paul	Pinnacle - Java West	35	7.1	2	2	2	1.00	6.09	860.19	10.68
Sandpoint Jct. - St. Paul	Java West - Java East	25	0.9	1	1	2	1.00	2.16	862.35	7.80
Sandpoint Jct. - St. Paul	Java East - Summit	25	15.4	2	2	2	1.00	18.48	899.31	24.12
Sandpoint Jct. - St. Paul	Summit - Grizzly	40	13.7	1	2	2	1.00	10.28	919.86	14.55
Sandpoint Jct. - St. Paul	Grizzly - Spotted Robe	40	4.3	2	1	2	1.00	6.45	926.31	10.72
Sandpoint Jct. - St. Paul	Spotted Robe - Blackfoot	40	15.6	1	2	2	1.00	11.70	949.71	15.97
Sandpoint Jct. - St. Paul	Blackfoot - Cut Bank	50	26.1	2	2	2	1.00	15.66	981.03	19.48
Sandpoint Jct. - St. Paul	Cut Bank - Ethridge	60	9.2	1	1	2	1.00	9.20	990.23	12.72
Sandpoint Jct. - St. Paul	Ethridge - Shelby	50	13.5	2	2	2	1.00	8.10	1006.43	11.92
Sandpoint Jct. - St. Paul	Shelby - Joplin	60	53.5	1	6	2	1.00	8.92	1059.93	12.43
Sandpoint Jct. - St. Paul	Joplin - Gildford East	60	13.1	2	4	2	1.00	3.28	1073.03	6.79
Sandpoint Jct. - St. Paul	Gildford East - Pacific Jct.	60	34.0	1	3	2	1.00	11.33	1107.03	14.85
Sandpoint Jct. - St. Paul	Pacific Jct. - Havre East	30	6.6	2	3	2	1.00	4.40	1120.23	9.43
Sandpoint Jct. - St. Paul	Havre East - Williston	65	306.3	1	26	2	1.00	10.87	1402.97	14.27
Sandpoint Jct. - St. Paul	Williston - Epping	65	5.1	2	1	2	1.00	4.71	1407.67	8.11
Sandpoint Jct. - St. Paul	Epping - Des Lacs	65	90.6	1	8	2	1.00	10.45	1491.30	13.85
Sandpoint Jct. - St. Paul	Des Lacs - Gassman Switch	65	8.0	2	1	2	1.00	7.38	1498.69	10.78
Sandpoint Jct. - St. Paul	Gassman Switch - WL Switch	40	1.2	1	1	2	1.00	1.80	1500.49	6.07
Sandpoint Jct. - St. Paul	WL Switch - JD Switch	45	8.2	2	3	2	1.00	3.64	1511.42	7.66
Sandpoint Jct. - St. Paul	JD Switch - Surrey Jct. Switch	65	196.4	1	17	0	1.00	10.66	1692.71	14.06
Sandpoint Jct. - St. Paul	Surrey Jct. Switch - Fargo	40	22.5	2	4	0	1.00	8.44	1726.46	12.71
Sandpoint Jct. - St. Paul	Fargo - Staples	55	110.7	2	13	2	1.00	9.29	1847.23	12.94
Sandpoint Jct. - St. Paul	Staples - Philbrook	60	6.0	2	1	2	1.00	6.00	1853.23	9.52
Sandpoint Jct. - St. Paul	Philbrook - Gregory	50	30.7	1	5	2	1.00	7.37	1890.07	11.19
Sandpoint Jct. - St. Paul	Gregory - Becker	60	45.8	2	5	2	1.00	9.16	1935.87	12.68
Sandpoint Jct. - St. Paul	Becker - Big Lake	55	9.5	1	1	2	1.00	10.36	1946.23	14.02
Sandpoint Jct. - St. Paul	Big Lake - Coon Creek	55	15.9	2	3	2	1.00	5.78	1963.58	9.43
Sandpoint Jct. - St. Paul	Coon Creek - Northtown	45	7.2	2	2	2	1.00	4.80	1973.18	8.82
St. Paul - Plum River	Northtown - St. Croix	25	43.7	2	12	2	1.00	8.74	2078.06	14.38
St. Paul - Plum River	St. Croix - Burns	35	2.7	2	1	0	1.00	4.63	2082.69	9.23
St. Paul - Plum River	Burns - Prescott	25	0.2	1	1	0	1.00	0.48	2083.17	6.12

St. Paul - Plum River	Prescott - Mears	55	44.7	2	3	0	1.00	16.25	2131.93	19.91
St. Paul - Plum River	Mears - Trevino	60	0.8	1	1	0	1.00	0.80	2132.73	4.32
St. Paul - Plum River	Trevino - Winona Jct.	65	36.4	2	4	0	1.00	8.40	2166.33	11.80
St. Paul - Plum River	Winona Jct. - Trempealeau	45	10.8	1	1	0	1.00	14.40	2180.73	18.42
St. Paul - Plum River	Trempealeau - Sullivan	60	14.3	2	2	0	1.00	7.15	2195.03	10.67
St. Paul - Plum River	Sullivan - Graf	40	6.8	1	1	0	1.00	10.20	2205.23	14.47
St. Paul - Plum River	Graf - Crawford	65	59.3	2	6	0	1.00	9.12	2259.97	12.52
St. Paul - Plum River	Crawford - Ports	25	2.7	1	1	0	1.00	6.48	2266.45	12.12
St. Paul - Plum River	Ports - East Dubuque	65	50.4	2	5	0	1.00	9.30	2312.97	12.70
St. Paul - Plum River	East Dubuque - Portage	40	13.0	2	2	0	1.00	9.75	2332.47	14.02
St. Paul - Plum River	Portage - Galena	25	0.6	1	1	0	1.00	1.44	2333.91	7.08
St. Paul - Plum River	Galena - Savanna	65	27.9	2	3	0	1.00	8.58	2359.66	11.98
St. Paul - Plum River	Savanna - Plum River	25	1.4	2	1	0	1.00	3.36	2363.02	9.00
Plum River - Aurora	Plum River - Flag Center	65	56.0	1	8	0	0.90	6.46	2409.55	9.86
Plum River - Aurora	Flag Center - Steward	40	9.0	2	4	0	0.90	3.38	2421.70	7.65
Plum River - Aurora	Steward - Aurora	65	38.9	1	5	0	0.90	7.18	2454.01	10.58
Aurora - Cicero	Aurora - Cicero	50	31.4	3	11	51	0.90	3.43	2487.93	7.24
Plum River - Galesburg	Plum River - Galesburg	40	95.7	1	8	0	0.10	17.94	2502.28	22.22
Galesburg - Edelstein	Galesburg - Edelstein Jct.	60	37.5	2	4	0	0.10	9.38	2506.03	12.89
Edelstein - Joliet	Edelstein Jct. - Joliet	60	110.0	2	11	0	0.10	10.00	2517.03	13.52
Joliet - Corwith	Joliet - Corwith	45	31.6	2	6	16	0.00	7.02	2517.03	11.04
	No. of crew changes							9.00	2717.49	
	No. of refuelings							2.00	2897.49	
	Total									
	Model									
	Tacoma - Cicero/Logistics Park/Corwith									
Tacoma - Vancouver, WA	Tacoma - Ruston	20	5.9	2	3	8	0.25	11.80	8.85	12.45
Tacoma - Vancouver, WA	Ruston - Nelson Bennett	45	1.6	1	1	8	0.25	2.13	9.38	6.15
Tacoma - Vancouver, WA	Nelson Bennett - Vancouver	50	129.7	2	21	8	0.25	7.41	48.29	11.23

Vancouver, WA - Lakeside Jct.	Vancouver - McLoughlin	50	4.6	2	2	2	0.25	2.76	49.67	6.58
Vancouver, WA - Lakeside Jct.	McLoughlin - Avery	50	88.7	1	8	2	0.25	13.31	76.28	17.12
Vancouver, WA - Lakeside Jct.	Avery - Wishram	40	2.9	2	2	2	0.25	2.18	77.37	6.45
Vancouver, WA - Lakeside Jct.	Wishram - Roosevelt	60	41.1	1	4	2	0.25	10.28	87.65	13.79
Vancouver, WA - Lakeside Jct.	Roosevelt - SP&S Jct.	60	83.4	1	8	2	0.25	10.43	108.50	13.94
Vancouver, WA - Lakeside Jct.	SP&S Jct. - Pasco	30	1.7	1	1	2	0.25	3.40	109.35	8.43
Vancouver, WA - Lakeside Jct.	Pasco - Glade	60	8.6	2	5	2	0.25	1.72	111.50	5.24
Vancouver, WA - Lakeside Jct.	Glade - Cunningham	55	35.0	1	5	2	0.25	7.64	121.04	11.29
Vancouver, WA - Lakeside Jct.	Cunningham - Sand	35	17.1	2	2	2	0.25	14.66	128.37	19.25
Vancouver, WA - Lakeside Jct.	Sand - Lakeside Jct.	45	73.2	1	8	2	0.25	12.20	152.77	16.22
Lakeside Jct. - Sunset Jct.	Lakeside Jct. - Sunset Jct.	35	10.6	1	2	1	0.25	9.09	157.31	13.68
Lakeside Jct. - Latah Jct.	Lakeside Jct. - Latah Jct.	40	9.5	1	2	1	0.00	7.13	157.31	11.40
Tacoma - South Seattle	Tacoma - South Seattle	45	31.4	2	14	20	0.75	5.98	220.11	7.01
South Seattle - SIG	South Seattle - Argo	30	4.4	3	2	20	0.75	4.40	226.71	9.43
SIG - Latah Jct.	Argo - Seattle	20	3.3	2	2	20	0.75	4.95	234.14	11.50
SIG - Latah Jct.	Seattle - MP 4	20	4.0	2	3	12	0.75	4.00	243.14	10.55
SIG - Latah Jct.	MP 4 - 23rd Ave	30	1.1	1	1	12	0.75	2.20	244.79	7.23
SIG - Latah Jct.	23rd Ave - MP 7	25	2.3	2	1	12	0.75	5.52	248.93	11.16
SIG - Latah Jct.	MP 7 - MP 8	30	0.3	1	1	12	0.75	0.60	249.38	5.63
SIG - Latah Jct.	MP 8 - MP 16	45	8.2	2	1	12	0.75	10.93	257.58	14.95
SIG - Latah Jct.	MP 16 - MP 18	45	1.9	1	1	12	0.75	2.53	259.48	6.55
SIG - Latah Jct.	MP 18 - MP 27	45	10.0	2	1	12	0.75	13.33	269.48	17.35
SIG - Latah Jct.	MP 27 - MP 28	35	0.7	1	1	12	0.75	1.20	270.38	5.80

SIG - Latah Jct.	MP 28 - Everett Jct.	40	4.3	2	1	12	0.75	6.45	275.22	10.72
SIG - Latah Jct.	Everett Jct. - Skykomish	45	51.3	1	5	2	0.75	13.68	326.52	17.70
SIG - Latah Jct.	Skykomish - Merritt	25	28.8	1	3	2	0.75	23.04	378.36	28.68
SIG - Latah Jct.	Merritt - Quincy	40	78.0	1	8	2	0.75	14.63	466.11	18.90
SIG - Latah Jct.	Qunicy - Lamona	55	72.4	1	6	2	0.75	13.16	525.34	16.82
SIG - Latah Jct.	Lamona - Bluestem	50	22.7	2	2	2	0.75	13.62	545.77	17.44
SIG - Latah Jct.	Bluestem - Latah Jct	50	38.6	1	4	2	0.75	11.58	580.51	15.40
Latah Jct. - Sunset Jct.	Latah Jct. - Sunset Jct.	25	0.8	1	1	3	0.75	1.92	581.95	7.56
Sunset Jct. - Spokane	Sunset Jct. - Spokane	25	0.8	2	1	4	1.00	1.92	583.87	7.56
Spokane - Sandpoint Jct.	Spokane - Irvin	30	8.3	2	4	2	1.00	4.15	600.47	9.18
Spokane - Sandpoint Jct.	Irvin - Otis Orchards	60	4.3	1	1	2	1.00	4.30	604.77	7.82
Spokane - Sandpoint Jct.	Otis Orchards - East Rathdrum	60	13.7	2	3	2	1.00	4.57	618.47	8.08
Spokane - Sandpoint Jct.	East Rathdrum - Athol	60	10.1	1	2	2	1.00	5.05	628.57	8.57
Spokane - Sandpoint Jct.	Athol - Cocollala	60	13.8	2	2	2	1.00	6.90	642.37	10.42
Spokane - Sandpoint Jct.	Cocollala - West Algoma	60	2.3	1	1	2	1.00	2.30	644.67	5.82
Spokane - Sandpoint Jct.	West Algoma - East Algoma	60	9.0	2	1	2	1.00	9.00	653.67	12.52
Spokane - Sandpoint Jct.	East Algoma - Sandpoint Jct.	45	2.2	1	1	2	1.00	2.93	656.60	6.95
Sandpoint Jct. - St. Paul	Sandpoint Jct. - Bonners Ferry	45	34.7	1	5	2	1.00	9.25	702.87	13.27
Sandpoint Jct. - St. Paul	Bonners Ferry - East Crossport	55	5.0	2	1	2	1.00	5.45	708.33	9.11
Sandpoint Jct. - St. Paul	East Crossport - Whitefish	50	147.9	1	18	2	1.00	9.86	885.81	13.68
Sandpoint Jct. - St. Paul	Whitefish - Conkelly	40	8.8	2	3	2	1.00	4.40	899.01	8.67
Sandpoint Jct. - St. Paul	Conkelly - Nyack	45	23.6	1	3	2	1.00	10.49	930.47	14.51
Sandpoint Jct. - St. Paul	Nyack - Paola	40	10.4	2	2	2	1.00	7.80	946.07	12.07
Sandpoint Jct. - St. Paul	Paola - Pinnacle	35	4.4	1	1	2	1.00	7.54	953.62	12.14
Sandpoint Jct. - St. Paul	Pinnacle - Java West	35	7.1	2	2	2	1.00	6.09	965.79	10.68
Sandpoint Jct. - St. Paul	Java West - Java East	25	0.9	1	1	2	1.00	2.16	967.95	7.80
Sandpoint Jct. - St. Paul	Java East - Summit	25	15.4	2	2	2	1.00	18.48	1004.91	24.12
Sandpoint Jct. - St. Paul	Summit - Grizzly	40	13.7	1	2	2	1.00	10.28	1025.46	14.55
Sandpoint Jct. - St. Paul	Grizzly - Spotted Robe	40	4.3	2	1	2	1.00	6.45	1031.91	10.72
Sandpoint Jct. - St. Paul	Spotted Robe - Blackfoot	40	15.6	1	2	2	1.00	11.70	1055.31	15.97
Sandpoint Jct. - St. Paul	Blackfoot - Cut Bank	50	26.1	2	2	2	1.00	15.66	1086.63	19.48
Sandpoint Jct. - St. Paul	Cut Bank - Ethridge	60	9.2	1	1	2	1.00	9.20	1095.83	12.72
Sandpoint Jct. - St. Paul	Ethridge - Shelby	50	13.5	2	2	2	1.00	8.10	1112.03	11.92
Sandpoint Jct. - St. Paul	Shelby - Joplin	60	53.5	1	6	2	1.00	8.92	1165.53	12.43

Sandpoint Jct. - St. Paul	Joplin - Gildford East	60	13.1	2	4	2	1.00	3.28	1178.63	6.79
Sandpoint Jct. - St. Paul	Gildford East - Pacific Jct.	60	34.0	1	3	2	1.00	11.33	1212.63	14.85
Sandpoint Jct. - St. Paul	Pacific Jct. - Havre East	30	6.6	2	3	2	1.00	4.40	1225.83	9.43
Sandpoint Jct. - St. Paul	Havre East - Williston	65	306.3	1	26	2	1.00	10.87	1508.57	14.27
Sandpoint Jct. - St. Paul	Williston - Epping	65	5.1	2	1	2	1.00	4.71	1513.27	8.11
Sandpoint Jct. - St. Paul	Epping - Des Lacs	65	90.6	1	8	2	1.00	10.45	1596.90	13.85
Sandpoint Jct. - St. Paul	Des Lacs - Gassman Switch	65	8.0	2	1	2	1.00	7.38	1604.29	10.78
Sandpoint Jct. - St. Paul	Gassman Switch - WL Switch	40	1.2	1	1	2	1.00	1.80	1606.09	6.07
Sandpoint Jct. - St. Paul	WL Switch - JD Switch	45	8.2	2	3	2	1.00	3.64	1617.02	7.66
Sandpoint Jct. - St. Paul	JD Switch - Surrey Jct. Switch	65	196.4	1	17	0	1.00	10.66	1798.31	14.06
Sandpoint Jct. - St. Paul	Surrey Jct. Switch - Fargo	40	22.5	2	4	0	1.00	8.44	1832.06	12.71
Sandpoint Jct. - St. Paul	Fargo - Staples	55	110.7	2	13	2	1.00	9.29	1952.83	12.94
Sandpoint Jct. - St. Paul	Staples - Philbrook	60	6.0	2	1	2	1.00	6.00	1958.83	9.52
Sandpoint Jct. - St. Paul	Philbrook - Gregory	50	30.7	1	5	2	1.00	7.37	1995.67	11.19
Sandpoint Jct. - St. Paul	Gregory - Becker	60	45.8	2	5	2	1.00	9.16	2041.47	12.68
Sandpoint Jct. - St. Paul	Becker - Big Lake	55	9.5	1	1	2	1.00	10.36	2051.83	14.02
Sandpoint Jct. - St. Paul	Big Lake - Coon Creek	55	15.9	2	3	2	1.00	5.78	2069.18	9.43
Sandpoint Jct. - St. Paul	Coon Creek - Northtown	45	7.2	2	2	2	1.00	4.80	2078.78	8.82
St. Paul - Plum River	Northtown - St. Croix	25	43.7	2	12	2	1.00	8.74	2183.66	14.38
St. Paul - Plum River	St. Croix - Burns	35	2.7	2	1	0	1.00	4.63	2188.29	9.23
St. Paul - Plum River	Burns - Prescott	25	0.2	1	1	0	1.00	0.48	2188.77	6.12
St. Paul - Plum River	Prescott - Mears	55	44.7	2	3	0	1.00	16.25	2237.53	19.91
St. Paul - Plum River	Mears - Trevino	60	0.8	1	1	0	1.00	0.80	2238.33	4.32
St. Paul - Plum River	Trevino - Winona Jct.	65	36.4	2	4	0	1.00	8.40	2271.93	11.80
St. Paul - Plum River	Winona Jct. - Trempealeau	45	10.8	1	1	0	1.00	14.40	2286.33	18.42
St. Paul - Plum River	Trempealeau - Sullivan	60	14.3	2	2	0	1.00	7.15	2300.63	10.67
St. Paul - Plum River	Sullivan - Graf	40	6.8	1	1	0	1.00	10.20	2310.83	14.47
St. Paul - Plum River	Graf - Crawford	65	59.3	2	6	0	1.00	9.12	2365.57	12.52
St. Paul - Plum River	Crawford - Ports	25	2.7	1	1	0	1.00	6.48	2372.05	12.12
St. Paul - Plum River	Ports - East Dubuque	65	50.4	2	5	0	1.00	9.30	2418.57	12.70
St. Paul - Plum River	East Dubuque - Portage	40	13.0	2	2	0	1.00	9.75	2438.07	14.02
St. Paul - Plum River	Portage - Galena	25	0.6	1	1	0	1.00	1.44	2439.51	7.08
St. Paul - Plum River	Galena - Savanna	65	27.9	2	3	0	1.00	8.58	2465.26	11.98

St. Paul - Plum River	Savanna - Plum River	25	1.4	2	1	0	1.00	3.36	2468.62	9.00
Plum River - Aurora	Plum River - Flag Center	65	56.0	1	8	0	0.60	6.46	2499.64	9.86
Plum River - Aurora	Flag Center - Steward	40	9.0	2	4	0	0.60	3.38	2507.74	7.65
Plum River - Aurora	Steward - Aurora	65	38.9	1	5	0	0.60	7.18	2529.28	10.58
Aurora - Cicero	Aurora - Cicero	50	31.4	3	11	51	0.60	3.43	2551.89	7.24
Plum River - Galesburg	Plum River - Galesburg	40	95.7	1	8	0	0.40	17.94	2609.31	22.22
Galesburg - Edelstein	Galesburg - Edelstein Jct.	60	37.5	2	4	0	0.40	9.38	2624.31	12.89
Edelstein - Joliet	Edelstein Jct. - Joliet	60	110.0	2	11	0	0.10	10.00	2635.31	13.52
Joliet - Corwith	Joliet - Corwith	45	31.6	2	6	16	0.00	7.02	2635.31	11.04
	No. of crew changes							9.25	2841.34	
	No. of refuelings							2.00	3021.34	
	Total									
	Model									
	Oakland - Logistics Park/Corwith/Cicero									
OIG - Richmond	OIG - Stege	35	7.7	2	6	36	1.00	4.40	26.40	6.80
OIG - Richmond	Stege - Richmond	5	1.5	1	1	0	1.00	18.00	44.40	38.18
Richmond - Mariposa	Richmond - Port Chicago	35	25.0	1	6	0	1.00	7.14	87.26	11.74
Richmond - Mariposa	Port Chicago - Oakley	60	19.6	1	3	8	1.00	6.53	106.86	10.05
Richmond - Mariposa	Oakley - Bixler	70	7.2	2	2	8	1.00	3.09	113.03	6.38
Richmond - Mariposa	Bixler - Trull	50	2.6	1	1	8	1.00	3.12	116.15	6.94
Richmond - Mariposa	Trull - Holt	70	4.7	2	2	8	1.00	2.01	120.18	5.31
Richmond - Mariposa	Holt - W. Stockton	70	6.3	1	1	8	1.00	5.40	125.58	8.70
Richmond - Mariposa	W. Stockton - UP Crossing	30	1.5	2	1	8	1.00	3.00	128.58	8.03
Richmond - Mariposa	UP Crossing - Wheat	40	4.6	2	2	12	1.00	3.45	135.48	7.72
Richmond - Mariposa	Wheat - Mariposa	50	4.2	1	2	12	1.00	2.52	140.52	6.34
Mariposa - Fresno	Mariposa - Fresno	70	113.8	1	16	12	1.00	6.10	238.06	9.40
Fresno - Barstow	Fresno - Calwa	35	3.2	2	2	12	1.00	2.74	243.55	7.34
Fresno - Barstow	Calwa - Thorpe	30	1.9	1	1	12	1.00	3.80	247.35	8.83
Fresno - Barstow	Thorpe - E. Bowles	70	6.7	2	2	12	1.00	2.87	253.09	6.17
Fresno - Barstow	E. Bowles - Pitco	70	17.2	1	3	12	1.00	4.91	267.83	8.21
Fresno - Barstow	Pitco - Wagner	45	2.9	2	2	12	1.00	1.93	271.70	5.95
Fresno - Barstow	Wagner - Jastro	70	76.1	1	10	12	1.00	6.52	336.93	9.82
Fresno - Barstow	Jastro - Kern Jct.	30	5.9	2	4	12	1.00	2.95	348.73	7.98

Fresno - Barstow	Kern Jct. - Bena	50	14.2	2	5	0	1.00	3.41	365.77	7.23
Fresno - Barstow	Bena - Illmon	30	2.5	1	1	0	1.00	5.00	370.77	10.03
Fresno - Barstow	Illmon - Caliente	20	3.9	2	2	0	1.00	5.85	382.47	12.40
Fresno - Barstow	Caliente - Cable	20	21.2	1	8	0	1.00	7.95	446.07	14.50
Fresno - Barstow	Cable - S. Mojave	30	24.8	2	5	0	1.00	9.92	495.67	14.95
Fresno - Barstow	S. Mojave - Barstow	60	66.8	1	8	0	1.00	8.35	562.47	11.87
Barstow - Daggett	Barstow - Daggett	45	6.3	2	2	2	1.00	4.20	570.87	8.22
Daggett - Williams Jct.	Daggett - Needles	55	161.6	2	23	2	1.00	7.66	747.16	11.32
Daggett - Williams Jct.	Needles - Williams Jct.	55	203.0	2	31	2	1.00	7.14	968.61	10.80
Williams Jct. - Clovis	Williams Jct. - Belen	50	375.0	2	37	2	1.00	12.16	1418.61	15.98
Williams Jct. - Clovis	Belen - Sais	50	24.6	2	6	0	1.00	4.92	1448.13	8.74
Williams Jct. - Clovis	Sais - Scholle	50	4.8	1	1	0	1.00	5.76	1453.89	9.58
Williams Jct. - Clovis	Scholle - Carnero	60	72.3	2	10	0	1.00	7.23	1526.19	10.75
Williams Jct. - Clovis	Carnero - Vaughn	60	9.4	1	2	0	1.00	4.70	1535.59	8.22
Williams Jct. - Clovis	Vaughn - CP 7197	65	68.8	2	10	0	1.00	6.35	1599.10	9.75
Williams Jct. - Clovis	CP 7197 - Fort Sumner	65	2.9	1	1	0	1.00	2.68	1601.78	6.08
Williams Jct. - Clovis	Fort Sumner - East Clovis	65	61.1	2	9	0	1.00	6.27	1658.18	9.67
Williams Jct. - Clovis	East Clovis - Lone Star Jct.	65	8.1	2	3	0	1.00	2.49	1665.65	5.89
Clovis - Amarillo	Lone Star Jct. - Eastern	65	97.1	2	19	0	1.00	4.72	1755.28	8.12
Amarillo - Avard	Eastern - East Canadian	65	96.5	2	11	0	1.00	8.10	1844.36	11.50
Amarillo - Avard	East Canadian - West Clear Creek	70	1.7	1	1	0	1.00	1.46	1845.82	4.76
Amarillo - Avard	West Clear Creek - Goodwin	65	31.3	2	4	0	1.00	7.22	1874.71	10.62
Amarillo - Avard	Goodwin - East Curtis	65	53.7	1	8	0	1.00	6.20	1924.28	9.59
Amarillo - Avard	East Curtis - Heman	70	17.2	2	2	0	1.00	7.37	1939.02	10.67
Amarillo - Avard	Heman - Waynoka	70	3.2	1	1	0	1.00	2.74	1941.77	6.04
Amarillo - Avard	Waynoka - Avard	55	11.5	2	3	0	1.00	4.18	1954.31	7.83
Avard - East Jct.	Avard - Roland	60	97.9	1	15	0	1.00	6.53	2052.21	10.04
Avard - East Jct.	Roland - Cicero	45	11.9	2	2	0	1.00	7.93	2068.08	11.95
Avard - East Jct.	Cicero - West Jct.	60	8.8	1	2	0	1.00	4.40	2076.88	7.92
Avard - East Jct.	West Jct. - East Jct.	60	6.0	2	2	0	1.00	3.00	2082.88	6.52
East Jct. - Kansas City	East Jct. - Ellinor	60	91.1	2	6	0	1.00	15.18	2173.98	18.70
East Jct. - Kansas City	Ellinor - CP 74	60	117.3	2.5	16	2	1.00	7.33	2291.28	10.85
East Jct. - Kansas City	CP 74 - Kansas City	30	7.4	3	8	2	1.00	1.85	2306.08	6.88

Kansas City - Galesburg	Kansas City - West Sibley	25	4.5	2	2	2	1.00	5.40	2316.88	11.04
Kansas City - Galesburg	West Sibley - East Sibley	30	1.4	1	1	2	1.00	2.80	2319.68	7.83
Kansas City - Galesburg	East Sibley - CP 1850	55	239.9	2	23	2	1.00	11.38	2581.39	15.03
Galesburg - Edelstein	CP1850 - Edelstein Jct.	60	37.5	2	4	0	1.00	9.38	2618.89	12.89
Edelstein - Joliet	Edelstein Jct. - Joliet	60	110.0	2	11	0	0.10	10.00	2629.89	13.52
Joliet - Corwith	Joliet - Corwith	45	31.6	2	6	16	1.00	7.02	2672.02	11.04
Galesburg - Aurora	CP 1850 - Aurora	50	60.0	2	6	2	0.00	12.00	2672.02	15.82
Aurora - Cicero	Aurora - Cicero	50	31.4	3	11	51	0.00	3.43	2672.02	7.24
	No. of crew changes							11.00	2917.02	
	No. of refuelings							2.00	3097.02	
	Total									
	Model									
	Mariposa - Willow Springs									
Mariposa - Fresno	Mariposa - Fresno	70	113.8	1	16	12	1.00	12.19	195.09	9.40
Fresno - Barstow	Fresno - Calwa	35	3.2	2	2	12	1.00	2.74	200.57	7.34
Fresno - Barstow	Calwa - Thorpe	30	1.9	1	1	12	1.00	3.80	204.37	8.83
Fresno - Barstow	Thorpe - E. Bowles	70	6.7	2	2	12	1.00	2.87	210.11	6.17
Fresno - Barstow	E. Bowles - Pitco	70	17.2	1	3	12	1.00	4.91	224.86	8.21
Fresno - Barstow	Pitco - Wagner	45	2.9	2	2	12	1.00	1.93	228.72	5.95
Fresno - Barstow	Wagner - Jastro	70	76.1	1	10	12	1.00	6.52	293.95	9.82
Fresno - Barstow	Jastro - Kern Jct.	30	5.9	2	4	12	1.00	2.95	305.75	7.98
Fresno - Barstow	Kern Jct. - Bena	50	14.2	2	5	0	1.00	3.41	322.79	7.23
Fresno - Barstow	Bena - Illmon	30	2.5	1	1	0	1.00	5.00	327.79	10.03
Fresno - Barstow	Illmon - Caliente	20	3.9	2	2	0	1.00	5.85	339.49	12.40
Fresno - Barstow	Caliente - Cable	20	21.2	1	8	0	1.00	7.95	403.09	14.50
Fresno - Barstow	Cable - S. Mojave	30	24.8	2	5	0	1.00	9.92	452.69	14.95
Fresno - Barstow	S. Mojave - Barstow	60	66.8	1	8	0	1.00	8.35	519.49	11.87
Barstow - Daggett	Barstow - Daggett	45	6.3	2	2	2	1.00	4.20	527.89	8.22
Daggett - Williams Jct.	Daggett - Needles	55	161.6	2	23	2	1.00	7.66	704.18	11.32
Daggett - Williams Jct.	Needles - Williams Jct.	55	203.0	2	31	2	1.00	7.14	925.64	10.80
Williams Jct. - Clovis	Williams Jct. - Belen	50	375.0	2	37	2	1.00	12.16	1375.64	15.98
Williams Jct. - Clovis	Belen - Sais	50	24.6	2	6	0	1.00	4.92	1405.16	8.74

Williams Jct. - Clovis	Sais - Scholle	50	4.8	1	1	0	1.00	5.76	1410.92	9.58
Williams Jct. - Clovis	Scholle - Carnero	60	72.3	2	10	0	1.00	7.23	1483.22	10.75
Williams Jct. - Clovis	Carnero - Vaughn	60	9.4	1	2	0	1.00	4.70	1492.62	8.22
Williams Jct. - Clovis	Vaughn - CP 7197	65	68.8	2	10	0	1.00	6.35	1556.13	9.75
Williams Jct. - Clovis	CP 7197 - Fort Sumner	65	2.9	1	1	0	1.00	2.68	1558.80	6.08
Williams Jct. - Clovis	Fort Sumner - East Clovis	65	61.1	2	9	0	1.00	6.27	1615.20	9.67
Williams Jct. - Clovis	East Clovis - Lone Star Jct.	65	8.1	2	3	0	1.00	2.49	1622.68	5.89
Clovis - Amarillo	Lone Star Jct. - Eastern	65	97.1	2	19	0	1.00	4.72	1712.31	8.12
Amarillo - Avard	Eastern - East Canadian	65	96.5	2	11	0	1.00	8.10	1801.39	11.50
Amarillo - Avard	East Canadian - West Clear Creek	70	1.7	1	1	0	1.00	1.46	1802.84	4.76
Amarillo - Avard	West Clear Creek - Goodwin	65	31.3	2	4	0	1.00	7.22	1831.74	10.62
Amarillo - Avard	Goodwin - East Curtis	65	53.7	1	8	0	1.00	6.20	1881.31	9.59
Amarillo - Avard	East Curtis - Heman	70	17.2	2	2	0	1.00	7.37	1896.05	10.67
Amarillo - Avard	Heman - Waynoka	70	3.2	1	1	0	1.00	2.74	1898.79	6.04
Amarillo - Avard	Waynoka - Avard	55	11.5	2	3	0	1.00	4.18	1911.34	7.83
Avard - East Jct.	Avard - Roland	60	97.9	1	15	0	1.00	6.53	2009.24	10.04
Avard - East Jct.	Roland - Cicero	45	11.9	2	2	0	1.00	7.93	2025.10	11.95
Avard - East Jct.	Cicero - West Jct.	60	8.8	1	2	0	1.00	4.40	2033.90	7.92
Avard - East Jct.	West Jct. - East Jct.	60	6.0	2	2	0	1.00	3.00	2039.90	6.52
East Jct. - Kansas City	East Jct. - Ellinor	60	91.1	2	6	0	1.00	15.18	2131.00	18.70
East Jct. - Kansas City	Ellinor - CP 74	60	117.3	2.5	16	2	1.00	7.33	2248.30	10.85
East Jct. - Kansas City	CP 74 - Kansas City	30	7.4	3	8	2	1.00	1.85	2263.10	6.88
Kansas City - Galesburg	Kansas City - West Sibley	25	4.5	2	2	2	1.00	5.40	2273.90	11.04
Kansas City - Galesburg	West Sibley - East Sibley	30	1.4	1	1	2	1.00	2.80	2276.70	7.83
Kansas City - Galesburg	East Sibley - CP 1850	55	239.9	2	23	2	1.00	11.38	2538.41	15.03
Galesburg - Edelstein	CP1850 - Edelstein Jct.	60	37.5	2	4	0	1.00	9.38	2575.91	12.89
Edelstein - Joliet	Edelstein Jct. - Joliet	60	110.0	2	11	0	0.10	10.00	2586.91	13.52
Joliet - Corwith	Joliet - Willow Springs	45	20.5	2	4	16	1.00	6.83	2603.25	10.85
	No. of crew changes							11.00	2848.25	
	No. of refuelings							2.00	3028.25	
	Total									
	Model									

LALB - Corwith/Cicero/Logistics Park

LALB - Redondo	LALB - Redondo	30	19.3	3	12	0	1.00	4.02	48.25	8.25
Redondo - Riverside	Redondo - Hobart	25	1.6	2	1	0	1.00	3.84	52.09	9.48
Redondo - Riverside	Hobart - Vail	50	4.1	3	4	46	1.00	1.23	57.01	5.05
Redondo - Riverside	Vail - Basta	50	14.2	2	6	46	1.00	2.84	74.05	6.66
Redondo - Riverside	Basta - Fullerton Jct.	50	2.5	3	1	46	1.00	3.00	77.05	6.82
Redondo - Riverside	Fullerton Jct. - Atwood	50	4.9	2	1	0	1.00	5.88	82.93	9.70
Redondo - Riverside	Atwood - West Riverside	45	30.0	2	5	16	1.00	8.00	122.93	12.02
Riverside - San Bernardino	West Riverside - Highgrove	45	4.5	3	1	11	1.00	6.00	128.93	10.02
Riverside - San Bernardino	Highgrove - Colton Crossing	40	2.9	2	1	11	1.00	4.35	133.28	8.62
Colton Crossing	Colton Crossing	25	0.3	2	1	11	1.00	0.72	134.00	6.36
Riverside - San Bernardino	Colton Crossing - San Bernardino	30	3.2	3	2	11	1.00	3.20	140.40	8.23
San Bernardino - Barstow	San Bernardino - Silverwood	20	24.9	3	7	2	1.00	10.67	215.10	17.22
San Bernardino - Barstow	Silverwood - Barstow	40	61.5	2	5	2	1.00	18.45	307.35	22.72
Barstow - Daggett	Barstow - Daggett	45	6.3	2	2	2	1.00	4.20	315.75	8.22
Daggett - Williams Jct.	Daggett - Needles	55	161.6	2	23	2	1.00	7.66	492.04	11.32
Daggett - Williams Jct.	Needles - Williams Jct.	55	203.0	2	31	2	1.00	7.14	713.50	10.80
Williams Jct. - Clovis	Williams Jct. - Belen	50	375.0	2	37	2	1.00	12.16	1163.50	15.98
Williams Jct. - Clovis	Belen - Sais	50	24.6	2	6	0	1.00	4.92	1193.02	8.74
Williams Jct. - Clovis	Sais - Scholle	50	4.8	1	1	0	1.00	5.76	1198.78	9.58
Williams Jct. - Clovis	Scholle - Carnero	60	72.3	2	10	0	1.00	7.23	1271.08	10.75
Williams Jct. - Clovis	Carnero - Vaughn	60	9.4	1	2	0	1.00	4.70	1280.48	8.22
Williams Jct. - Clovis	Vaughn - CP 7197	65	68.8	2	10	0	1.00	6.35	1343.98	9.75
Williams Jct. - Clovis	CP 7197 - Fort Sumner	65	2.9	1	1	0	1.00	2.68	1346.66	6.08
Williams Jct. - Clovis	Fort Sumner - East Clovis	65	61.1	2	9	0	1.00	6.27	1403.06	9.67
Williams Jct. - Clovis	East Clovis - Lone Star Jct.	65	8.1	2	3	0	1.00	2.49	1410.54	5.89
Clovis - Amarillo	Lone Star Jct. - Eastern	65	97.1	2	19	0	1.00	4.72	1500.17	8.12

Amarillo - Avard	Eastern - East Canadian	65	96.5	2	11	0	1.00	8.10	1589.24	11.50
Amarillo - Avard	East Canadian - West Clear Creek	70	1.7	1	1	0	1.00	1.46	1590.70	4.76
Amarillo - Avard	West Clear Creek - Goodwin	65	31.3	2	4	0	1.00	7.22	1619.59	10.62
Amarillo - Avard	Goodwin - East Curtis	65	53.7	1	8	0	1.00	6.20	1669.16	9.59
Amarillo - Avard	East Curtis - Heman	70	17.2	2	2	0	1.00	7.37	1683.91	10.67
Amarillo - Avard	Heman - Waynoka	70	3.2	1	1	0	1.00	2.74	1686.65	6.04
Amarillo - Avard	Waynoka - Avard	55	11.5	2	3	0	1.00	4.18	1699.19	7.83
Avard - East Jct.	Avard - Roland	60	97.9	1	15	0	1.00	6.53	1797.09	10.04
Avard - East Jct.	Roland - Cicero	45	11.9	2	2	0	1.00	7.93	1812.96	11.95
Avard - East Jct.	Cicero - West Jct.	60	8.8	1	2	0	1.00	4.40	1821.76	7.92
Avard - East Jct.	West Jct. - East Jct.	60	6.0	2	2	0	1.00	3.00	1827.76	6.52
East Jct. - Kansas City	East Jct. - Ellinor	60	91.1	2	6	0	1.00	15.18	1918.86	18.70
East Jct. - Kansas City	Ellinor - CP 74	60	117.3	2.5	16	2	1.00	7.33	2036.16	10.85
East Jct. - Kansas City	CP 74 - Kansas City	30	7.4	3	8	2	1.00	1.85	2050.96	6.88
Kansas City - Galesburg	Kansas City - West Sibley	25	4.5	2	2	2	1.00	5.40	2061.76	11.04
Kansas City - Galesburg	West Sibley - East Sibley	30	1.4	1	1	2	1.00	2.80	2064.56	7.83
Kansas City - Galesburg	East Sibley - CP 1850	55	239.9	2	23	2	1.00	11.38	2326.27	15.03
Galesburg - Edelstein	CP1850 - Edelstein Jct.	60	37.5	2	4	0	1.00	9.38	2363.77	12.89
Edelstein - Joliet	Edelstein Jct. - Joliet	60	110.0	2	11	0	1.00	10.00	2473.77	13.52
Joliet - Corwith	Joliet - Corwith	45	31.6	2	6	16	0.25	7.02	2374.30	11.04
Galesburg - Aurora	CP 1850 - Aurora	50	60.0	2	6	2	0.00	12.00	2374.30	15.82
Aurora - Cicero	Aurora - Cicero	50	31.4	3	11	51	0.00	3.43	2374.30	7.24
	No. of crew changes							9.00	2574.76	
	No. of refuelings							2.00	2754.76	
	Total									
	Model									
	Hobart - Willow Springs									
Redondo - Riverside	Hobart - Vail	50	4.1	3	4	46	1.00	1.54	6.15	5.05
Redondo - Riverside	Vail - Basta	50	14.2	2	6	46	1.00	2.84	23.19	6.66
Redondo - Riverside	Basta - Fullerton Jct.	50	2.5	3	1	46	1.00	3.00	26.19	6.82
Redondo - Riverside	Fullerton Jct. - Atwood	50	4.9	2	1	0	1.00	5.88	32.07	9.70
Redondo - Riverside	Atwood - West Riverside	45	30.0	2	5	16	1.00	8.00	72.07	12.02

Riverside - San Bernardino	West Riverside - Highgrove	45	4.5	3	1	11	1.00	6.00	78.07	10.02
Riverside - San Bernardino	Highgrove - Colton Crossing	40	2.9	2	1	11	1.00	4.35	82.42	8.62
Colton Crossing	Colton Crossing	25	0.3	2	1	11	1.00	0.72	83.14	6.36
Riverside - San Bernardino	Colton Crossing - San Bernardino	30	3.2	3	2	11	1.00	3.20	89.54	8.23
San Bernardino - Barstow	San Bernardino - Silverwood	20	24.9	3	7	2	1.00	10.67	164.24	17.22
San Bernardino - Barstow	Silverwood - Barstow	40	61.5	2	5	2	1.00	18.45	256.49	22.72
Barstow - Daggett	Barstow - Daggett	45	6.3	2	2	2	1.00	4.20	264.89	8.22
Daggett - Williams Jct.	Daggett - Needles	55	161.6	2	23	2	1.00	7.66	441.18	11.32
Daggett - Williams Jct.	Needles - Williams Jct.	55	203.0	2	31	2	1.00	7.14	662.64	10.80
Williams Jct. - Clovis	Williams Jct. - Belen	50	375.0	2	37	2	1.00	12.16	1112.64	15.98
Williams Jct. - Clovis	Belen - Sais	50	24.6	2	6	0	1.00	4.92	1142.16	8.74
Williams Jct. - Clovis	Sais - Scholle	50	4.8	1	1	0	1.00	5.76	1147.92	9.58
Williams Jct. - Clovis	Scholle - Carnero	60	72.3	2	10	0	1.00	7.23	1220.22	10.75
Williams Jct. - Clovis	Carnero - Vaughn	60	9.4	1	2	0	1.00	4.70	1229.62	8.22
Williams Jct. - Clovis	Vaughn - CP 7197	65	68.8	2	10	0	1.00	6.35	1293.12	9.75
Williams Jct. - Clovis	CP 7197 - Fort Sumner	65	2.9	1	1	0	1.00	2.68	1295.80	6.08
Williams Jct. - Clovis	Fort Sumner - East Clovis	65	61.1	2	9	0	1.00	6.27	1352.20	9.67
Williams Jct. - Clovis	East Clovis - Lone Star Jct.	65	8.1	2	3	0	1.00	2.49	1359.68	5.89
Clovis - Amarillo	Lone Star Jct. - Eastern	65	97.1	2	19	0	1.00	4.72	1449.31	8.12
Amarillo - Avard	Eastern - East Canadian	65	96.5	2	11	0	1.00	8.10	1538.38	11.50
Amarillo - Avard	East Canadian - West Clear Creek	70	1.7	1	1	0	1.00	1.46	1539.84	4.76
Amarillo - Avard	West Clear Creek - Goodwin	65	31.3	2	4	0	1.00	7.22	1568.73	10.62
Amarillo - Avard	Goodwin - East Curtis	65	53.7	1	8	0	1.00	6.20	1618.30	9.59
Amarillo - Avard	East Curtis - Heman	70	17.2	2	2	0	1.00	7.37	1633.05	10.67
Amarillo - Avard	Heman - Waynoka	70	3.2	1	1	0	1.00	2.74	1635.79	6.04
Amarillo - Avard	Waynoka - Avard	55	11.5	2	3	0	1.00	4.18	1648.33	7.83
Avard - East Jct.	Avard - Roland	60	97.9	1	15	0	1.00	6.53	1746.23	10.04
Avard - East Jct.	Roland - Cicero	45	11.9	2	2	0	1.00	7.93	1762.10	11.95

Avard - East Jct.	Cicero - West Jct.	60	8.8	1	2	0	1.00	4.40	1770.90	7.92
Avard - East Jct.	West Jct. - East Jct.	60	6.0	2	2	0	1.00	3.00	1776.90	6.52
East Jct. - Kansas City	East Jct. - Ellinor	60	91.1	2	6	0	1.00	15.18	1868.00	18.70
East Jct. - Kansas City	Ellinor - CP 74	60	117.3	2.5	16	2	1.00	7.33	1985.30	10.85
East Jct. - Kansas City	CP 74 - Kansas City	30	7.4	3	8	2	1.00	1.85	2000.10	6.88
Kansas City - Galesburg	Kansas City - West Sibley	25	4.5	2	2	2	1.00	5.40	2010.90	11.04
Kansas City - Galesburg	West Sibley - East Sibley	30	1.4	1	1	2	1.00	2.80	2013.70	7.83
Kansas City - Galesburg	East Sibley - CP 1850	55	239.9	2	23	2	1.00	11.38	2275.41	15.03
Galesburg - Edelstein	CP1850 - Edelstein Jct.	60	37.5	2	4	0	1.00	9.38	2312.91	12.89
Edelstein - Joliet	Edelstein Jct. - Joliet	60	110.0	2	11	0	0.10	10.00	2323.91	13.52
Joliet - Corwith	Joliet - Willow Springs	45	20.5	2	4	16	1.00	6.83	2340.24	10.85
	No. of crew changes							9.00	2540.70	
	No. of refuelings							2.00	2720.70	
	Total									
	Model									
	LALB - Alliance									
LALB - Redondo	LALB - Redondo	30	19.3	3	12	0	1.00	4.02	48.25	8.25
Redondo - Riverside	Redondo - Hobart	25	1.6	2	1	0	1.00	3.84	52.09	9.48
Redondo - Riverside	Hobart - Vail	50	4.1	3	4	46	1.00	1.23	57.01	5.05
Redondo - Riverside	Vail - Basta	50	14.2	2	6	46	1.00	2.84	74.05	6.66
Redondo - Riverside	Basta - Fullerton Jct.	50	2.5	3	1	46	1.00	3.00	77.05	6.82
Redondo - Riverside	Fullerton Jct. - Atwood	50	4.9	2	1	0	1.00	5.88	82.93	9.70
Redondo - Riverside	Atwood - West Riverside	45	30.0	2	5	16	1.00	8.00	122.93	12.02
Riverside - San Bernardino	West Riverside - Highgrove	45	4.5	3	1	11	1.00	6.00	128.93	10.02
Riverside - San Bernardino	Highgrove - Colton Crossing	40	2.9	2	1	11	1.00	4.35	133.28	8.62
Colton Crossing	Colton Crossing	25	0.3	2	1	11	1.00	0.72	134.00	6.36
Riverside - San Bernardino	Colton Crossing - San Bernardino	30	3.2	3	2	11	1.00	3.20	140.40	8.23
San Bernardino - Barstow	San Bernardino - Silverwood	20	24.9	3	7	2	1.00	10.67	215.10	17.22

San Bernardino - Barstow	Silverwood - Barstow	40	61.5	2	5	2	1.00	18.45	307.35	22.72
Barstow - Daggett	Barstow - Daggett	45	6.3	2	2	2	1.00	4.20	315.75	8.22
Daggett - Williams Jct.	Daggett - Needles	55	161.6	2	23	2	1.00	7.66	492.04	11.32
Daggett - Williams Jct.	Needles - Williams Jct.	55	203.0	2	31	2	1.00	7.14	713.50	10.80
Williams Jct. - Clovis	Williams Jct. - Belen	50	375.0	2	37	2	1.00	12.16	1163.50	15.98
Williams Jct. - Clovis	Belen - Sais	50	24.6	2	6	0	1.00	4.92	1193.02	8.74
Williams Jct. - Clovis	Sais - Scholle	50	4.8	1	1	0	1.00	5.76	1198.78	9.58
Williams Jct. - Clovis	Scholle - Carnero	60	72.3	2	10	0	1.00	7.23	1271.08	10.75
Williams Jct. - Clovis	Carnero - Vaughn	60	9.4	1	2	0	1.00	4.70	1280.48	8.22
Williams Jct. - Clovis	Vaughn - CP 7197	65	68.8	2	10	0	1.00	6.35	1343.98	9.75
Williams Jct. - Clovis	CP 7197 - Fort Sumner	65	2.9	1	1	0	1.00	2.68	1346.66	6.08
Williams Jct. - Clovis	Fort Sumner - East Clovis	65	61.1	2	9	0	1.00	6.27	1403.06	9.67
Williams Jct. - Clovis	East Clovis - Lone Star Jct.	65	8.1	2	3	0	1.00	2.49	1410.54	5.89
Clovis - Amarillo	Lone Star Jct. - Eastern	65	97.1	2	19	0	0.75	4.72	1477.31	8.12
Amarillo - Alliance	Eastern - BC Jct.	20	1.7	2	1	0	0.75	5.10	1481.11	11.65
Amarillo - Alliance	BC Jct - Acme	60	136.1	1	12	0	0.75	11.34	1582.51	14.86
Amarillo - Alliance	Acme - Quanah	35	4.9	2	1	0	0.75	8.40	1588.76	13.00
Amarillo - Alliance	Quanah - Orient	60	73.7	1	6	0	0.75	12.28	1643.67	15.80
Amarillo - Alliance	Orient - West Wichita	40	0.9	2	1	0	0.75	1.35	1644.68	5.62
Amarillo - Alliance	West Wichita - Alliance	60	90.0	1	10	0	0.75	9.00	1711.73	12.52
Clovis - Sweetwater	Lone Star Jct. - Lubbock	50	89.7	1	9	0	0.25	11.96	1738.10	15.78
Clovis - Sweetwater	Lubbock - East Lubbock	20	2.0	2	1	0	0.25	6.00	1739.57	12.55
Clovis - Sweetwater	East Lubbock - Sweetwater	50	116.9	1	12	0	0.25	11.69	1773.94	15.51
Sweetwater - Alliance	Sweetwater - Ft. Worth	55	196.4	1	20	0	0.25	10.71	1826.43	14.37
Sweetwater - Alliance	Ft. Worth - Alliance	35	14.0	2	3	0	0.25	8.00	1832.31	12.60
	No. of crew changes							7.00	1988.22	
	No. of refuelings							1.00	2078.22	
	Total									
	Model									
	Hobart - Alliance									
Redondo - Riverside	Hobart - Vail	50	4.1	3	4	46	1.00	1.54	6.15	5.05

Redondo - Riverside	Vail - Basta	50	14.2	2	6	46	1.00	2.84	23.19	6.66
Redondo - Riverside	Basta - Fullerton Jct.	50	2.5	3	1	46	1.00	3.00	26.19	6.82
Redondo - Riverside	Fullerton Jct. - Atwood	50	4.9	2	1	0	1.00	5.88	32.07	9.70
Redondo - Riverside	Atwood - West Riverside	45	30.0	2	5	16	1.00	8.00	72.07	12.02
Riverside - San Bernardino	West Riverside - Highgrove	45	4.5	3	1	11	1.00	6.00	78.07	10.02
Riverside - San Bernardino	Highgrove - Colton Crossing	40	2.9	2	1	11	1.00	4.35	82.42	8.62
Colton Crossing	Colton Crossing	25	0.3	2	1	11	1.00	0.72	83.14	6.36
Riverside - San Bernardino	Colton Crossing - San Bernardino	30	3.2	3	2	11	1.00	3.20	89.54	8.23
San Bernardino - Barstow	San Bernardino - Silverwood	20	24.9	3	7	2	1.00	10.67	164.24	17.22
San Bernardino - Barstow	Silverwood - Barstow	40	61.5	2	5	2	1.00	18.45	256.49	22.72
Barstow - Daggett	Barstow - Daggett	45	6.3	2	2	2	1.00	4.20	264.89	8.22
Daggett - Williams Jct.	Daggett - Needles	55	161.6	2	23	2	1.00	7.66	441.18	11.32
Daggett - Williams Jct.	Needles - Williams Jct.	55	203.0	2	31	2	1.00	7.14	662.64	10.80
Williams Jct. - Clovis	Williams Jct. - Belen	50	375.0	2	37	2	1.00	12.16	1112.64	15.98
Williams Jct. - Clovis	Belen - Sais	50	24.6	2	6	0	1.00	4.92	1142.16	8.74
Williams Jct. - Clovis	Sais - Scholle	50	4.8	1	1	0	1.00	5.76	1147.92	9.58
Williams Jct. - Clovis	Scholle - Carnero	60	72.3	2	10	0	1.00	7.23	1220.22	10.75
Williams Jct. - Clovis	Carnero - Vaughn	60	9.4	1	2	0	1.00	4.70	1229.62	8.22
Williams Jct. - Clovis	Vaughn - CP 7197	65	68.8	2	10	0	1.00	6.35	1293.12	9.75
Williams Jct. - Clovis	CP 7197 - Fort Sumner	65	2.9	1	1	0	1.00	2.68	1295.80	6.08
Williams Jct. - Clovis	Fort Sumner - East Clovis	65	61.1	2	9	0	1.00	6.27	1352.20	9.67
Williams Jct. - Clovis	East Clovis - Lone Star Jct.	65	8.1	2	3	0	1.00	2.49	1359.68	5.89
Clovis - Amarillo	Lone Star Jct. - Eastern	65	97.1	2	19	0	0.75	4.72	1426.45	8.12
Amarillo - Alliance	Eastern - BC Jct.	20	1.7	2	1	0	0.75	5.10	1430.25	11.65
Amarillo - Alliance	BC Jct - Acme	60	136.1	1	12	0	0.75	11.34	1531.65	14.86
Amarillo - Alliance	Acme - Quanah	35	4.9	2	1	0	0.75	8.40	1537.90	13.00
Amarillo - Alliance	Quanah - Orient	60	73.7	1	6	0	0.75	12.28	1592.81	15.80
Amarillo - Alliance	Orient - West Wichita	40	0.9	2	1	0	0.75	1.35	1593.82	5.62

Amarillo - Alliance	West Wichita - Alliance	60	90.0	1	10	0	0.75	9.00	1660.87	12.52
Clovis - Sweetwater	Lone Star Jct. - Lubbock	50	89.7	1	9	0	0.25	11.96	1687.24	15.78
Clovis - Sweetwater	Lubbock - East Lubbock	20	2.0	2	1	0	0.25	6.00	1688.71	12.55
Clovis - Sweetwater	East Lubbock - Sweetwater	50	116.9	1	12	0	0.25	11.69	1723.08	15.51
Sweetwater - Alliance	Sweetwater - Ft. Worth	55	196.4	1	20	0	0.25	10.71	1775.57	14.37
Sweetwater - Alliance	Ft. Worth - Alliance	35	14.0	2	3	0	0.25	8.00	1781.45	12.60
	No. of crew changes							7.00	1937.36	
	No. of refuelings							1.00	2027.36	
	Total									
	Model									
	LALB - Pearland									
LALB - Redondo	LALB - Redondo	30	19.3	3	12	0	1.00	4.02	48.25	8.25
Redondo - Riverside	Redondo - Hobart	25	1.6	2	1	0	1.00	3.84	52.09	9.48
Redondo - Riverside	Hobart - Vail	50	4.1	3	4	46	1.00	1.23	57.01	5.05
Redondo - Riverside	Vail - Basta	50	14.2	2	6	46	1.00	2.84	74.05	6.66
Redondo - Riverside	Basta - Fullerton Jct.	50	2.5	3	1	46	1.00	3.00	77.05	6.82
Redondo - Riverside	Fullerton Jct. - Atwood	50	4.9	2	1	0	1.00	5.88	82.93	9.70
Redondo - Riverside	Atwood - West Riverside	45	30.0	2	5	16	1.00	8.00	122.93	12.02
Riverside - San Bernardino	West Riverside - Highgrove	45	4.5	3	1	11	1.00	6.00	128.93	10.02
Riverside - San Bernardino	Highgrove - Colton Crossing	40	2.9	2	1	11	1.00	4.35	133.28	8.62
Colton Crossing	Colton Crossing	25	0.3	2	1	11	1.00	0.72	134.00	6.36
Riverside - San Bernardino	Colton Crossing - San Bernardino	30	3.2	3	2	11	1.00	3.20	140.40	8.23
San Bernardino - Barstow	San Bernardino - Silverwood	20	24.9	3	7	2	1.00	10.67	215.10	17.22
San Bernardino - Barstow	Silverwood - Barstow	40	61.5	2	5	2	1.00	18.45	307.35	22.72
Barstow - Daggett	Barstow - Daggett	45	6.3	2	2	2	1.00	4.20	315.75	8.22
Daggett - Williams Jct.	Daggett - Needles	55	161.6	2	23	2	1.00	7.66	492.04	11.32
Daggett - Williams Jct.	Needles - Williams Jct.	55	203.0	2	31	2	1.00	7.14	713.50	10.80
Williams Jct. - Clovis	Williams Jct. - Belen	50	375.	2	37	2	1.00	12.16	1163.50	15.98

			0							
Williams Jct. - Clovis	Belen - Sais	50	24.6	2	6	0	1.00	4.92	1193.02	8.74
Williams Jct. - Clovis	Sais - Scholle	50	4.8	1	1	0	1.00	5.76	1198.78	9.58
Williams Jct. - Clovis	Scholle - Carnero	60	72.3	2	10	0	1.00	7.23	1271.08	10.75
Williams Jct. - Clovis	Carnero - Vaughn	60	9.4	1	2	0	1.00	4.70	1280.48	8.22
Williams Jct. - Clovis	Vaughn - CP 7197	65	68.8	2	10	0	1.00	6.35	1343.98	9.75
Williams Jct. - Clovis	CP 7197 - Fort Sumner	65	2.9	1	1	0	1.00	2.68	1346.66	6.08
Williams Jct. - Clovis	Fort Sumner - East Clovis	65	61.1	2	9	0	1.00	6.27	1403.06	9.67
Williams Jct. - Clovis	East Clovis - Lone Star Jct.	65	8.1	2	3	0	1.00	2.49	1410.54	5.89
Clovis - Sweetwater	Lone Star Jct. - Lubbock	50	89.7	1	9	0	1.00	11.96	1518.18	15.78
Clovis - Sweetwater	Lubbock - East Lubbock	20	2.0	2	1	0	1.00	6.00	1524.18	12.55
Clovis - Sweetwater	East Lubbock - Sweetwater	50	116.9	1	12	0	1.00	11.69	1664.46	15.51
Sweetwater - Temple	Sweetwater - Temple	45	241.5	1	26	0	1.00	12.38	1986.46	16.40
Temple - Houston	Temple - Rogers	30	13.5	2	3	0	1.00	9.00	2013.46	14.03
Temple - Houston	Rogers - Somerville	50	63.3	1	8	0	1.00	9.50	2089.42	13.31
Temple - Houston	Somerville - Rosenberg	45	76.2	1	7	0	1.00	14.51	2191.02	18.53
Temple - Houston	Rosenberg - Pearland	45	46.6	1	5	0	1.00	12.43	2253.15	16.45
	No. of crew changes							8.00	2431.33	
	No. of refuelings							2.00	2611.33	
	Total									
	Model									
	Hobart - Pearland									
Redondo - Riverside	Hobart - Vail	50	4.1	3	4	46	1.00	1.54	6.15	5.05
Redondo - Riverside	Vail - Basta	50	14.2	2	6	46	1.00	2.84	23.19	6.66
Redondo - Riverside	Basta - Fullerton Jct.	50	2.5	3	1	46	1.00	3.00	26.19	6.82
Redondo - Riverside	Fullerton Jct. - Atwood	50	4.9	2	1	0	1.00	5.88	32.07	9.70
Redondo - Riverside	Atwood - West Riverside	45	30.0	2	5	16	1.00	8.00	72.07	12.02
Riverside - San Bernardino	West Riverside - Highgrove	45	4.5	3	1	11	1.00	6.00	78.07	10.02
Riverside - San Bernardino	Highgrove - Colton Crossing	40	2.9	2	1	11	1.00	4.35	82.42	8.62
Colton Crossing	Colton Crossing	25	0.3	2	1	11	1.00	0.72	83.14	6.36
Riverside - San Bernardino	Colton Crossing - San Bernardino	30	3.2	3	2	11	1.00	3.20	89.54	8.23

San Bernardino - Barstow	San Bernardino - Silverwood	20	24.9	3	7	2	1.00	10.67	164.24	17.22
San Bernardino - Barstow	Silverwood - Barstow	40	61.5	2	5	2	1.00	18.45	256.49	22.72
Barstow - Daggett	Barstow - Daggett	45	6.3	2	2	2	1.00	4.20	264.89	8.22
Daggett - Williams Jct.	Daggett - Needles	55	161.6	2	23	2	1.00	7.66	441.18	11.32
Daggett - Williams Jct.	Needles - Williams Jct.	55	203.0	2	31	2	1.00	7.14	662.64	10.80
Williams Jct. - Clovis	Williams Jct. - Belen	50	375.0	2	37	2	1.00	12.16	1112.64	15.98
Williams Jct. - Clovis	Belen - Sais	50	24.6	2	6	0	1.00	4.92	1142.16	8.74
Williams Jct. - Clovis	Sais - Scholle	50	4.8	1	1	0	1.00	5.76	1147.92	9.58
Williams Jct. - Clovis	Scholle - Carnero	60	72.3	2	10	0	1.00	7.23	1220.22	10.75
Williams Jct. - Clovis	Carnero - Vaughn	60	9.4	1	2	0	1.00	4.70	1229.62	8.22
Williams Jct. - Clovis	Vaughn - CP 7197	65	68.8	2	10	0	1.00	6.35	1293.12	9.75
Williams Jct. - Clovis	CP 7197 - Fort Sumner	65	2.9	1	1	0	1.00	2.68	1295.80	6.08
Williams Jct. - Clovis	Fort Sumner - East Clovis	65	61.1	2	9	0	1.00	6.27	1352.20	9.67
Williams Jct. - Clovis	East Clovis - Lone Star Jct.	65	8.1	2	3	0	1.00	2.49	1359.68	5.89
Clovis - Sweetwater	Lone Star Jct. - Lubbock	50	89.7	1	9	0	1.00	11.96	1467.32	15.78
Clovis - Sweetwater	Lubbock - East Lubbock	20	2.0	2	1	0	1.00	6.00	1473.32	12.55
Clovis - Sweetwater	East Lubbock - Sweetwater	50	116.9	1	12	0	1.00	11.69	1613.60	15.51
Sweetwater - Temple	Sweetwater - Temple	45	241.5	1	26	0	1.00	12.38	1935.60	16.40
Temple - Houston	Temple - Rogers	30	13.5	2	3	0	1.00	9.00	1962.60	14.03
Temple - Houston	Rogers - Somerville	50	63.3	1	8	0	1.00	9.50	2038.56	13.31
Temple - Houston	Somerville - Rosenberg	45	76.2	1	7	0	1.00	14.51	2140.16	18.53
Temple - Houston	Rosenberg - Pearland	45	46.6	1	5	0	1.00	12.43	2202.29	16.45
	No. of crew changes							8.00	2380.47	
	No. of refuelings							2.00	2560.47	
	Total									
	Model									
	LALB - New Orleans									
LALB - Redondo	LALB - Redondo	30	19.3	3	12	0	1.00	4.02	48.25	8.25
Redondo - Riverside	Redondo - Hobart	25	1.6	2	1	0	1.00	3.84	52.09	9.48
Redondo - Riverside	Hobart - Vail	50	4.1	3	4	46	1.00	1.23	57.01	5.05

Redondo - Riverside	Vail - Basta	50	14.2	2	6	46	1.00	2.84	74.05	6.66
Redondo - Riverside	Basta - Fullerton Jct.	50	2.5	3	1	46	1.00	3.00	77.05	6.82
Redondo - Riverside	Fullerton Jct. - Atwood	50	4.9	2	1	0	1.00	5.88	82.93	9.70
Redondo - Riverside	Atwood - West Riverside	45	30.0	2	5	16	1.00	8.00	122.93	12.02
Riverside - San Bernardino	West Riverside - Highgrove	45	4.5	3	1	11	1.00	6.00	128.93	10.02
Riverside - San Bernardino	Highgrove - Colton Crossing	40	2.9	2	1	11	1.00	4.35	133.28	8.62
Colton Crossing	Colton Crossing	25	0.3	2	1	11	1.00	0.72	134.00	6.36
Riverside - San Bernardino	Colton Crossing - San Bernardino	30	3.2	3	2	11	1.00	3.20	140.40	8.23
San Bernardino - Barstow	San Bernardino - Silverwood	20	24.9	3	7	2	1.00	10.67	215.10	17.22
San Bernardino - Barstow	Silverwood - Barstow	40	61.5	2	5	2	1.00	18.45	307.35	22.72
Barstow - Daggett	Barstow - Daggett	45	6.3	2	2	2	1.00	4.20	315.75	8.22
Daggett - Williams Jct.	Daggett - Needles	55	161.6	2	23	2	1.00	7.66	492.04	11.32
Daggett - Williams Jct.	Needles - Williams Jct.	55	203.0	2	31	2	1.00	7.14	713.50	10.80
Williams Jct. - Clovis	Williams Jct. - Belen	50	375.0	2	37	2	1.00	12.16	1163.50	15.98
Williams Jct. - Clovis	Belen - Sais	50	24.6	2	6	0	1.00	4.92	1193.02	8.74
Williams Jct. - Clovis	Sais - Scholle	50	4.8	1	1	0	1.00	5.76	1198.78	9.58
Williams Jct. - Clovis	Scholle - Carnero	60	72.3	2	10	0	1.00	7.23	1271.08	10.75
Williams Jct. - Clovis	Carnero - Vaughn	60	9.4	1	2	0	1.00	4.70	1280.48	8.22
Williams Jct. - Clovis	Vaughn - CP 7197	65	68.8	2	10	0	1.00	6.35	1343.98	9.75
Williams Jct. - Clovis	CP 7197 - Fort Sumner	65	2.9	1	1	0	1.00	2.68	1346.66	6.08
Williams Jct. - Clovis	Fort Sumner - East Clovis	65	61.1	2	9	0	1.00	6.27	1403.06	9.67
Williams Jct. - Clovis	East Clovis - Lone Star Jct.	65	8.1	2	3	0	1.00	2.49	1410.54	5.89
Clovis - Sweetwater	Lone Star Jct. - Lubbock	50	89.7	1	9	0	1.00	11.96	1518.18	15.78
Clovis - Sweetwater	Lubbock - East Lubbock	20	2.0	2	1	0	1.00	6.00	1524.18	12.55
Clovis - Sweetwater	East Lubbock - Sweetwater	50	116.9	1	12	0	1.00	11.69	1664.46	15.51
Sweetwater - Temple	Sweetwater - Temple	45	241.5	1	26	0	1.00	12.38	1986.46	16.40
Temple - Houston	Temple - Rogers	30	13.5	2	3	0	1.00	9.00	2013.46	14.03

Temple - Houston	Rogers - Somerville	50	63.3	1	8	0	1.00	9.50	2089.42	13.31
Temple - Houston	Somerville - Rosenberg	45	76.2	1	7	0	1.00	14.51	2191.02	18.53
Temple - Houston	Rosenberg - Pearland	45	46.6	1	5	0	1.00	12.43	2253.15	16.45
Temple - Houston	Pearland - Houston	50	9.4	1	2	0	1.00	5.64	2264.43	9.46
Houston - New Orleans	Houston - Beaumont	45	87.0	2	8	1	1.00	14.50	2380.43	18.52
Houston - New Orleans	Beaumont - Lafayette	45	130.0	1	13	1	1.00	13.33	2553.76	17.35
Houston - New Orleans	Lafayette - Avondale	45	126.0	1	13	1	1.00	12.92	2721.76	16.94
	No. of crew changes							10.00	2944.49	
	No. of refuelings							2.00	3124.49	
	Total									
	Model									
	LALB - Memphis									
LALB - Redondo	LALB - Redondo	30	19.3	3	12	0	1.00	4.02	48.25	8.25
Redondo - Riverside	Redondo - Hobart	25	1.6	2	1	0	1.00	3.84	52.09	9.48
Redondo - Riverside	Hobart - Vail	50	4.1	3	4	46	1.00	1.23	57.01	5.05
Redondo - Riverside	Vail - Basta	50	14.2	2	6	46	1.00	2.84	74.05	6.66
Redondo - Riverside	Basta - Fullerton Jct.	50	2.5	3	1	46	1.00	3.00	77.05	6.82
Redondo - Riverside	Fullerton Jct. - Atwood	50	4.9	2	1	0	1.00	5.88	82.93	9.70
Redondo - Riverside	Atwood - West Riverside	45	30.0	2	5	16	1.00	8.00	122.93	12.02
Riverside - San Bernardino	West Riverside - Highgrove	45	4.5	3	1	11	1.00	6.00	128.93	10.02
Riverside - San Bernardino	Highgrove - Colton Crossing	40	2.9	2	1	11	1.00	4.35	133.28	8.62
Colton Crossing	Colton Crossing	25	0.3	2	1	11	1.00	0.72	134.00	6.36
Riverside - San Bernardino	Colton Crossing - San Bernardino	30	3.2	3	2	11	1.00	3.20	140.40	8.23
San Bernardino - Barstow	San Bernardino - Silverwood	20	24.9	3	7	2	1.00	10.67	215.10	17.22
San Bernardino - Barstow	Silverwood - Barstow	40	61.5	2	5	2	1.00	18.45	307.35	22.72
Barstow - Daggett	Barstow - Daggett	45	6.3	2	2	2	1.00	4.20	315.75	8.22
Daggett - Williams Jct.	Daggett - Needles	55	161.6	2	23	2	1.00	7.66	492.04	11.32
Daggett - Williams Jct.	Needles - Williams Jct.	55	203.0	2	31	2	1.00	7.14	713.50	10.80

Williams Jct. - Clovis	Williams Jct. - Belen	50	375.0	2	37	2	1.00	12.16	1163.50	15.98
Williams Jct. - Clovis	Belen - Sais	50	24.6	2	6	0	1.00	4.92	1193.02	8.74
Williams Jct. - Clovis	Sais - Scholle	50	4.8	1	1	0	1.00	5.76	1198.78	9.58
Williams Jct. - Clovis	Scholle - Carnero	60	72.3	2	10	0	1.00	7.23	1271.08	10.75
Williams Jct. - Clovis	Carnero - Vaughn	60	9.4	1	2	0	1.00	4.70	1280.48	8.22
Williams Jct. - Clovis	Vaughn - CP 7197	65	68.8	2	10	0	1.00	6.35	1343.98	9.75
Williams Jct. - Clovis	CP 7197 - Fort Sumner	65	2.9	1	1	0	1.00	2.68	1346.66	6.08
Williams Jct. - Clovis	Fort Sumner - East Clovis	65	61.1	2	9	0	1.00	6.27	1403.06	9.67
Williams Jct. - Clovis	East Clovis - Lone Star Jct.	65	8.1	2	3	0	1.00	2.49	1410.54	5.89
Clovis - Amarillo	Lone Star Jct. - Eastern	65	97.1	2	19	0	1.00	4.72	1500.17	8.12
Amarillo - Avard	Eastern - East Canadian	65	96.5	2	11	0	1.00	8.10	1589.24	11.50
Amarillo - Avard	East Canadian - West Clear Creek	70	1.7	1	1	0	1.00	1.46	1590.70	4.76
Amarillo - Avard	West Clear Creek - Goodwin	65	31.3	2	4	0	1.00	7.22	1619.59	10.62
Amarillo - Avard	Goodwin - East Curtis	65	53.7	1	8	0	1.00	6.20	1669.16	9.59
Amarillo - Avard	East Curtis - Heman	70	17.2	2	2	0	1.00	7.37	1683.91	10.67
Amarillo - Avard	Heman - Waynoka	70	3.2	1	1	0	1.00	2.74	1686.65	6.04
Amarillo - Avard	Waynoka - Avard	55	11.5	2	3	0	1.00	4.18	1699.19	7.83
Avard - Springfield	Avard - Tulsa	55	177.0	1	17	0	1.00	11.36	1892.29	15.01
Avard - Springfield	Tulsa - Springfield	45	187.0	1	18	0	1.00	13.85	2141.62	17.87
Springfield - Memphis	Springfield - Memphis	45	282.0	1	28	0	1.00	13.43	2517.62	17.45
	No. of crew changes							10.00	2740.35	
	No. of refuelings							2.00	2920.35	
	Total									
	Model									
	Hobart - Memphis									
Redondo - Riverside	Hobart - Vail	50	4.1	3	4	46	1.00	1.54	6.15	5.05
Redondo - Riverside	Vail - Basta	50	14.2	2	6	46	1.00	2.84	23.19	6.66
Redondo - Riverside	Basta - Fullerton Jct.	50	2.5	3	1	46	1.00	3.00	26.19	6.82
Redondo - Riverside	Fullerton Jct. - Atwood	50	4.9	2	1	0	1.00	5.88	32.07	9.70
Redondo - Riverside	Atwood - West Riverside	45	30.0	2	5	16	1.00	8.00	72.07	12.02
Riverside - San Bernardino	West Riverside - Highgrove	45	4.5	3	1	11	1.00	6.00	78.07	10.02

Riverside - San Bernardino	Highgrove - Colton Crossing	40	2.9	2	1	11	1.00	4.35	82.42	8.62
Colton Crossing	Colton Crossing	25	0.3	2	1	11	1.00	0.72	83.14	6.36
Riverside - San Bernardino	Colton Crossing - San Bernardino	30	3.2	3	2	11	1.00	3.20	89.54	8.23
San Bernardino - Barstow	San Bernardino - Silverwood	20	24.9	3	7	2	1.00	10.67	164.24	17.22
San Bernardino - Barstow	Silverwood - Barstow	40	61.5	2	5	2	1.00	18.45	256.49	22.72
Barstow - Daggett	Barstow - Daggett	45	6.3	2	2	2	1.00	4.20	264.89	8.22
Daggett - Williams Jct.	Daggett - Needles	55	161.6	2	23	2	1.00	7.66	441.18	11.32
Daggett - Williams Jct.	Needles - Williams Jct.	55	203.0	2	31	2	1.00	7.14	662.64	10.80
Williams Jct. - Clovis	Williams Jct. - Belen	50	375.0	2	37	2	1.00	12.16	1112.64	15.98
Williams Jct. - Clovis	Belen - Sais	50	24.6	2	6	0	1.00	4.92	1142.16	8.74
Williams Jct. - Clovis	Sais - Scholle	50	4.8	1	1	0	1.00	5.76	1147.92	9.58
Williams Jct. - Clovis	Scholle - Carnero	60	72.3	2	10	0	1.00	7.23	1220.22	10.75
Williams Jct. - Clovis	Carnero - Vaughn	60	9.4	1	2	0	1.00	4.70	1229.62	8.22
Williams Jct. - Clovis	Vaughn - CP 7197	65	68.8	2	10	0	1.00	6.35	1293.12	9.75
Williams Jct. - Clovis	CP 7197 - Fort Sumner	65	2.9	1	1	0	1.00	2.68	1295.80	6.08
Williams Jct. - Clovis	Fort Sumner - East Clovis	65	61.1	2	9	0	1.00	6.27	1352.20	9.67
Williams Jct. - Clovis	East Clovis - Lone Star Jct.	65	8.1	2	3	0	1.00	2.49	1359.68	5.89
Clovis - Amarillo	Lone Star Jct. - Eastern	65	97.1	2	19	0	1.00	4.72	1449.31	8.12
Amarillo - Avard	Eastern - East Canadian	65	96.5	2	11	0	1.00	8.10	1538.38	11.50
Amarillo - Avard	East Canadian - West Clear Creek	70	1.7	1	1	0	1.00	1.46	1539.84	4.76
Amarillo - Avard	West Clear Creek - Goodwin	65	31.3	2	4	0	1.00	7.22	1568.73	10.62
Amarillo - Avard	Goodwin - East Curtis	65	53.7	1	8	0	1.00	6.20	1618.30	9.59
Amarillo - Avard	East Curtis - Heman	70	17.2	2	2	0	1.00	7.37	1633.05	10.67
Amarillo - Avard	Heman - Waynoka	70	3.2	1	1	0	1.00	2.74	1635.79	6.04
Amarillo - Avard	Waynoka - Avard	55	11.5	2	3	0	1.00	4.18	1648.33	7.83
Avard - Springfield	Avard - Tulsa	55	177.0	1	17	0	1.00	11.36	1841.43	15.01
Avard - Springfield	Tulsa - Springfield	45	187.0	1	18	0	1.00	13.85	2090.76	17.87
Springfield - Memphis	Springfield - Memphis	45	282.0	1	28	0	1.00	13.43	2466.76	17.45

	No. of crew changes							10.00	2689.49	
	No. of refuelings							2.00	2869.49	
	Total									
	Model									
	LALB - Birmingham									
LALB - Redondo	LALB - Redondo	30	19.3	3	12	0	1.00	4.02	48.25	8.25
Redondo - Riverside	Redondo - Hobart	25	1.6	2	1	0	1.00	3.84	52.09	9.48
Redondo - Riverside	Hobart - Vail	50	4.1	3	4	46	1.00	1.23	57.01	5.05
Redondo - Riverside	Vail - Basta	50	14.2	2	6	46	1.00	2.84	74.05	6.66
Redondo - Riverside	Basta - Fullerton Jct.	50	2.5	3	1	46	1.00	3.00	77.05	6.82
Redondo - Riverside	Fullerton Jct. - Atwood	50	4.9	2	1	0	1.00	5.88	82.93	9.70
Redondo - Riverside	Atwood - West Riverside	45	30.0	2	5	16	1.00	8.00	122.93	12.02
Riverside - San Bernardino	West Riverside - Highgrove	45	4.5	3	1	11	1.00	6.00	128.93	10.02
Riverside - San Bernardino	Highgrove - Colton Crossing	40	2.9	2	1	11	1.00	4.35	133.28	8.62
Colton Crossing	Colton Crossing	25	0.3	2	1	11	1.00	0.72	134.00	6.36
Riverside - San Bernardino	Colton Crossing - San Bernardino	30	3.2	3	2	11	1.00	3.20	140.40	8.23
San Bernardino - Barstow	San Bernardino - Silverwood	20	24.9	3	7	2	1.00	10.67	215.10	17.22
San Bernardino - Barstow	Silverwood - Barstow	40	61.5	2	5	2	1.00	18.45	307.35	22.72
Barstow - Daggett	Barstow - Daggett	45	6.3	2	2	2	1.00	4.20	315.75	8.22
Daggett - Williams Jct.	Daggett - Needles	55	161.6	2	23	2	1.00	7.66	492.04	11.32
Daggett - Williams Jct.	Needles - Williams Jct.	55	203.0	2	31	2	1.00	7.14	713.50	10.80
Williams Jct. - Clovis	Williams Jct. - Belen	50	375.0	2	37	2	1.00	12.16	1163.50	15.98
Williams Jct. - Clovis	Belen - Sais	50	24.6	2	6	0	1.00	4.92	1193.02	8.74
Williams Jct. - Clovis	Sais - Scholle	50	4.8	1	1	0	1.00	5.76	1198.78	9.58
Williams Jct. - Clovis	Scholle - Carnero	60	72.3	2	10	0	1.00	7.23	1271.08	10.75
Williams Jct. - Clovis	Carnero - Vaughn	60	9.4	1	2	0	1.00	4.70	1280.48	8.22
Williams Jct. - Clovis	Vaughn - CP 7197	65	68.8	2	10	0	1.00	6.35	1343.98	9.75
Williams Jct. - Clovis	CP 7197 - Fort Sumner	65	2.9	1	1	0	1.00	2.68	1346.66	6.08

Williams Jct. - Clovis	Fort Sumner - East Clovis	65	61.1	2	9	0	1.00	6.27	1403.06	9.67
Williams Jct. - Clovis	East Clovis - Lone Star Jct.	65	8.1	2	3	0	1.00	2.49	1410.54	5.89
Clovis - Amarillo	Lone Star Jct. - Eastern	65	97.1	2	19	0	1.00	4.72	1500.17	8.12
Amarillo - Avard	Eastern - East Canadian	65	96.5	2	11	0	1.00	8.10	1589.24	11.50
Amarillo - Avard	East Canadian - West Clear Creek	70	1.7	1	1	0	1.00	1.46	1590.70	4.76
Amarillo - Avard	West Clear Creek - Goodwin	65	31.3	2	4	0	1.00	7.22	1619.59	10.62
Amarillo - Avard	Goodwin - East Curtis	65	53.7	1	8	0	1.00	6.20	1669.16	9.59
Amarillo - Avard	East Curtis - Heman	70	17.2	2	2	0	1.00	7.37	1683.91	10.67
Amarillo - Avard	Heman - Waynoka	70	3.2	1	1	0	1.00	2.74	1686.65	6.04
Amarillo - Avard	Waynoka - Avard	55	11.5	2	3	0	1.00	4.18	1699.19	7.83
Avard - Springfield	Avard - Tulsa	55	177.0	1	17	0	1.00	11.36	1892.29	15.01
Avard - Springfield	Tulsa - Springfield	45	187.0	1	18	0	1.00	13.85	2141.62	17.87
Springfield - Memphis	Springfield - Memphis	45	282.0	1	28	0	1.00	13.43	2517.62	17.45
Memphis - Birmingham	Memphis - Amory	45	127.0	1	12	0	1.00	14.11	2686.95	18.13
Memphis - Birmingham	Amory - Birmingham	45	125.0	1	12	0	1.00	13.89	2853.62	17.91
	No. of crew changes							11.00	3098.62	
	No. of refuelings							2.00	3278.62	
	Total									
	Model									
	Hobart - Birmingham									
Redondo - Riverside	Hobart - Vail	50	4.1	3	4	46	1.00	1.54	6.15	5.05
Redondo - Riverside	Vail - Basta	50	14.2	2	6	46	1.00	2.84	23.19	6.66
Redondo - Riverside	Basta - Fullerton Jct.	50	2.5	3	1	46	1.00	3.00	26.19	6.82
Redondo - Riverside	Fullerton Jct. - Atwood	50	4.9	2	1	0	1.00	5.88	32.07	9.70
Redondo - Riverside	Atwood - West Riverside	45	30.0	2	5	16	1.00	8.00	72.07	12.02
Riverside - San Bernardino	West Riverside - Highgrove	45	4.5	3	1	11	1.00	6.00	78.07	10.02
Riverside - San Bernardino	Highgrove - Colton Crossing	40	2.9	2	1	11	1.00	4.35	82.42	8.62
Colton Crossing	Colton Crossing	25	0.3	2	1	11	1.00	0.72	83.14	6.36
Riverside - San Bernardino	Colton Crossing - San Bernardino	30	3.2	3	2	11	1.00	3.20	89.54	8.23

San Bernardino - Barstow	San Bernardino - Silverwood	20	24.9	3	7	2	1.00	10.67	164.24	17.22
San Bernardino - Barstow	Silverwood - Barstow	40	61.5	2	5	2	1.00	18.45	256.49	22.72
Barstow - Daggett	Barstow - Daggett	45	6.3	2	2	2	1.00	4.20	264.89	8.22
Daggett - Williams Jct.	Daggett - Needles	55	161.6	2	23	2	1.00	7.66	441.18	11.32
Daggett - Williams Jct.	Needles - Williams Jct.	55	203.0	2	31	2	1.00	7.14	662.64	10.80
Williams Jct. - Clovis	Williams Jct. - Belen	50	375.0	2	37	2	1.00	12.16	1112.64	15.98
Williams Jct. - Clovis	Belen - Sais	50	24.6	2	6	0	1.00	4.92	1142.16	8.74
Williams Jct. - Clovis	Sais - Scholle	50	4.8	1	1	0	1.00	5.76	1147.92	9.58
Williams Jct. - Clovis	Scholle - Carnero	60	72.3	2	10	0	1.00	7.23	1220.22	10.75
Williams Jct. - Clovis	Carnero - Vaughn	60	9.4	1	2	0	1.00	4.70	1229.62	8.22
Williams Jct. - Clovis	Vaughn - CP 7197	65	68.8	2	10	0	1.00	6.35	1293.12	9.75
Williams Jct. - Clovis	CP 7197 - Fort Sumner	65	2.9	1	1	0	1.00	2.68	1295.80	6.08
Williams Jct. - Clovis	Fort Sumner - East Clovis	65	61.1	2	9	0	1.00	6.27	1352.20	9.67
Williams Jct. - Clovis	East Clovis - Lone Star Jct.	65	8.1	2	3	0	1.00	2.49	1359.68	5.89
Clovis - Amarillo	Lone Star Jct. - Eastern	65	97.1	2	19	0	1.00	4.72	1449.31	8.12
Amarillo - Avard	Eastern - East Canadian	65	96.5	2	11	0	1.00	8.10	1538.38	11.50
Amarillo - Avard	East Canadian - West Clear Creek	70	1.7	1	1	0	1.00	1.46	1539.84	4.76
Amarillo - Avard	West Clear Creek - Goodwin	65	31.3	2	4	0	1.00	7.22	1568.73	10.62
Amarillo - Avard	Goodwin - East Curtis	65	53.7	1	8	0	1.00	6.20	1618.30	9.59
Amarillo - Avard	East Curtis - Heman	70	17.2	2	2	0	1.00	7.37	1633.05	10.67
Amarillo - Avard	Heman - Waynoka	70	3.2	1	1	0	1.00	2.74	1635.79	6.04
Amarillo - Avard	Waynoka - Avard	55	11.5	2	3	0	1.00	4.18	1648.33	7.83
Avard - Springfield	Avard - Tulsa	55	177.0	1	17	0	1.00	11.36	1841.43	15.01
Avard - Springfield	Tulsa - Springfield	45	187.0	1	18	0	1.00	13.85	2090.76	17.87
Springfield - Memphis	Springfield - Memphis	45	282.0	1	28	0	1.00	13.43	2466.76	17.45
Memphis - Birmingham	Memphis - Amory	45	127.0	1	12	0	1.00	14.11	2636.09	18.13
Memphis - Birmingham	Amory - Birmingham	45	125.0	1	12	0	1.00	13.89	2802.76	17.91
	No. of crew changes							11.00	3047.76	
	No. of refuelings							2.00	3227.76	

	Total									
	Model									
	LALB - Kansas City									
LALB - Redondo	LALB - Redondo	30	19.3	3	12	0	1.00	4.02	48.25	8.25
Redondo - Riverside	Redondo - Hobart	25	1.6	2	1	0	1.00	3.84	52.09	9.48
Redondo - Riverside	Hobart - Vail	50	4.1	3	4	46	1.00	1.23	57.01	5.05
Redondo - Riverside	Vail - Basta	50	14.2	2	6	46	1.00	2.84	74.05	6.66
Redondo - Riverside	Basta - Fullerton Jct.	50	2.5	3	1	46	1.00	3.00	77.05	6.82
Redondo - Riverside	Fullerton Jct. - Atwood	50	4.9	2	1	0	1.00	5.88	82.93	9.70
Redondo - Riverside	Atwood - West Riverside	45	30.0	2	5	16	1.00	8.00	122.93	12.02
Riverside - San Bernardino	West Riverside - Highgrove	45	4.5	3	1	11	1.00	6.00	128.93	10.02
Riverside - San Bernardino	Highgrove - Colton Crossing	40	2.9	2	1	11	1.00	4.35	133.28	8.62
Colton Crossing	Colton Crossing	25	0.3	2	1	11	1.00	0.72	134.00	6.36
Riverside - San Bernardino	Colton Crossing - San Bernardino	30	3.2	3	2	11	1.00	3.20	140.40	8.23
San Bernardino - Barstow	San Bernardino - Silverwood	20	24.9	3	7	2	1.00	10.67	215.10	17.22
San Bernardino - Barstow	Silverwood - Barstow	40	61.5	2	5	2	1.00	18.45	307.35	22.72
Barstow - Daggett	Barstow - Daggett	45	6.3	2	2	2	1.00	4.20	315.75	8.22
Daggett - Williams Jct.	Daggett - Needles	55	161.6	2	23	2	1.00	7.66	492.04	11.32
Daggett - Williams Jct.	Needles - Williams Jct.	55	203.0	2	31	2	1.00	7.14	713.50	10.80
Williams Jct. - Clovis	Williams Jct. - Belen	50	375.0	2	37	2	1.00	12.16	1163.50	15.98
Williams Jct. - Clovis	Belen - Sais	50	24.6	2	6	0	1.00	4.92	1193.02	8.74
Williams Jct. - Clovis	Sais - Scholle	50	4.8	1	1	0	1.00	5.76	1198.78	9.58
Williams Jct. - Clovis	Scholle - Carnero	60	72.3	2	10	0	1.00	7.23	1271.08	10.75
Williams Jct. - Clovis	Carnero - Vaughn	60	9.4	1	2	0	1.00	4.70	1280.48	8.22
Williams Jct. - Clovis	Vaughn - CP 7197	65	68.8	2	10	0	1.00	6.35	1343.98	9.75
Williams Jct. - Clovis	CP 7197 - Fort Sumner	65	2.9	1	1	0	1.00	2.68	1346.66	6.08
Williams Jct. - Clovis	Fort Sumner - East Clovis	65	61.1	2	9	0	1.00	6.27	1403.06	9.67
Williams Jct. - Clovis	East Clovis - Lone Star Jct.	65	8.1	2	3	0	1.00	2.49	1410.54	5.89

Clovis - Amarillo	Lone Star Jct. - Eastern	65	97.1	2	19	0	1.00	4.72	1500.17	8.12
Amarillo - Avard	Eastern - East Canadian	65	96.5	2	11	0	1.00	8.10	1589.24	11.50
Amarillo - Avard	East Canadian - West Clear Creek	70	1.7	1	1	0	1.00	1.46	1590.70	4.76
Amarillo - Avard	West Clear Creek - Goodwin	65	31.3	2	4	0	1.00	7.22	1619.59	10.62
Amarillo - Avard	Goodwin - East Curtis	65	53.7	1	8	0	1.00	6.20	1669.16	9.59
Amarillo - Avard	East Curtis - Heman	70	17.2	2	2	0	1.00	7.37	1683.91	10.67
Amarillo - Avard	Heman - Waynoka	70	3.2	1	1	0	1.00	2.74	1686.65	6.04
Amarillo - Avard	Waynoka - Avard	55	11.5	2	3	0	1.00	4.18	1699.19	7.83
Avard - East Jct.	Avard - Roland	60	97.9	1	15	0	1.00	6.53	1797.09	10.04
Avard - East Jct.	Roland - Cicero	45	11.9	2	2	0	1.00	7.93	1812.96	11.95
Avard - East Jct.	Cicero - West Jct.	60	8.8	1	2	0	1.00	4.40	1821.76	7.92
Avard - East Jct.	West Jct. - East Jct.	60	6.0	2	2	0	1.00	3.00	1827.76	6.52
East Jct. - Kansas City	East Jct. - Ellinor	60	91.1	2	6	0	1.00	15.18	1918.86	18.70
East Jct. - Kansas City	Ellinor - CP 74	60	117.3	2.5	16	2	1.00	7.33	2036.16	10.85
East Jct. - Kansas City	CP 74 - Kansas City	30	7.4	3	8	2	1.00	1.85	2050.96	6.88
	No. of crew changes							7.00	2206.87	
	No. of refuelings							2.00	2386.87	
	Total									
	Model									
	Hobart - Kansas City									
Redondo - Riverside	Hobart - Vail	50	4.1	3	4	46	1.00	1.54	6.15	5.05
Redondo - Riverside	Vail - Basta	50	14.2	2	6	46	1.00	2.84	23.19	6.66
Redondo - Riverside	Basta - Fullerton Jct.	50	2.5	3	1	46	1.00	3.00	26.19	6.82
Redondo - Riverside	Fullerton Jct. - Atwood	50	4.9	2	1	0	1.00	5.88	32.07	9.70
Redondo - Riverside	Atwood - West Riverside	45	30.0	2	5	16	1.00	8.00	72.07	12.02
Riverside - San Bernardino	West Riverside - Highgrove	45	4.5	3	1	11	1.00	6.00	78.07	10.02
Riverside - San Bernardino	Highgrove - Colton Crossing	40	2.9	2	1	11	1.00	4.35	82.42	8.62
Colton Crossing	Colton Crossing	25	0.3	2	1	11	1.00	0.72	83.14	6.36
Riverside - San Bernardino	Colton Crossing - San Bernardino	30	3.2	3	2	11	1.00	3.20	89.54	8.23
San Bernardino - Barstow	San Bernardino - Silverwood	20	24.9	3	7	2	1.00	10.67	164.24	17.22

San Bernardino - Barstow	Silverwood - Barstow	40	61.5	2	5	2	1.00	18.45	256.49	22.72
Barstow - Daggett	Barstow - Daggett	45	6.3	2	2	2	1.00	4.20	264.89	8.22
Daggett - Williams Jct.	Daggett - Needles	55	161.6	2	23	2	1.00	7.66	441.18	11.32
Daggett - Williams Jct.	Needles - Williams Jct.	55	203.0	2	31	2	1.00	7.14	662.64	10.80
Williams Jct. - Clovis	Williams Jct. - Belen	50	375.0	2	37	2	1.00	12.16	1112.64	15.98
Williams Jct. - Clovis	Belen - Sais	50	24.6	2	6	0	1.00	4.92	1142.16	8.74
Williams Jct. - Clovis	Sais - Scholle	50	4.8	1	1	0	1.00	5.76	1147.92	9.58
Williams Jct. - Clovis	Scholle - Carnero	60	72.3	2	10	0	1.00	7.23	1220.22	10.75
Williams Jct. - Clovis	Carnero - Vaughn	60	9.4	1	2	0	1.00	4.70	1229.62	8.22
Williams Jct. - Clovis	Vaughn - CP 7197	65	68.8	2	10	0	1.00	6.35	1293.12	9.75
Williams Jct. - Clovis	CP 7197 - Fort Sumner	65	2.9	1	1	0	1.00	2.68	1295.80	6.08
Williams Jct. - Clovis	Fort Sumner - East Clovis	65	61.1	2	9	0	1.00	6.27	1352.20	9.67
Williams Jct. - Clovis	East Clovis - Lone Star Jct.	65	8.1	2	3	0	1.00	2.49	1359.68	5.89
Clovis - Amarillo	Lone Star Jct. - Eastern	65	97.1	2	19	0	1.00	4.72	1449.31	8.12
Amarillo - Avard	Eastern - East Canadian	65	96.5	2	11	0	1.00	8.10	1538.38	11.50
Amarillo - Avard	East Canadian - West Clear Creek	70	1.7	1	1	0	1.00	1.46	1539.84	4.76
Amarillo - Avard	West Clear Creek - Goodwin	65	31.3	2	4	0	1.00	7.22	1568.73	10.62
Amarillo - Avard	Goodwin - East Curtis	65	53.7	1	8	0	1.00	6.20	1618.30	9.59
Amarillo - Avard	East Curtis - Heman	70	17.2	2	2	0	1.00	7.37	1633.05	10.67
Amarillo - Avard	Heman - Waynoka	70	3.2	1	1	0	1.00	2.74	1635.79	6.04
Amarillo - Avard	Waynoka - Avard	55	11.5	2	3	0	1.00	4.18	1648.33	7.83
Avard - East Jct.	Avard - Roland	60	97.9	1	15	0	1.00	6.53	1746.23	10.04
Avard - East Jct.	Roland - Cicero	45	11.9	2	2	0	1.00	7.93	1762.10	11.95
Avard - East Jct.	Cicero - West Jct.	60	8.8	1	2	0	1.00	4.40	1770.90	7.92
Avard - East Jct.	West Jct. - East Jct.	60	6.0	2	2	0	1.00	3.00	1776.90	6.52
East Jct. - Kansas City	East Jct. - Ellinor	60	91.1	2	6	0	1.00	15.18	1868.00	18.70
East Jct. - Kansas City	Ellinor - CP 74	60	117.3	2.5	16	2	1.00	7.33	1985.30	10.85
East Jct. - Kansas City	CP 74 - Kansas City	30	7.4	3	8	2	1.00	1.85	2000.10	6.88
	No. of crew changes							7.00	2156.01	
	No. of refuelings							2.00	2336.01	
	Total									
	Model									

	SIG - Midway									
SIG - Latah Jct.	SIG - Seattle	20	2.1	3	2	20	1.00	6.30	12.60	9.70
SIG - Latah Jct.	Seattle - MP 4	20	4.0	2	3	12	1.00	4.00	24.60	10.55
SIG - Latah Jct.	MP 4 - 23rd Ave	30	1.1	1	1	12	1.00	2.20	26.80	7.23
SIG - Latah Jct.	23rd Ave - MP 7	25	2.3	2	1	12	1.00	5.52	32.32	11.16
SIG - Latah Jct.	MP 7 - MP 8	30	0.3	1	1	12	1.00	0.60	32.92	5.63
SIG - Latah Jct.	MP 8 - MP 16	45	8.2	2	1	12	1.00	10.93	43.85	14.95
SIG - Latah Jct.	MP 16 - MP 18	45	1.9	1	1	12	1.00	2.53	46.39	6.55
SIG - Latah Jct.	MP 18 - MP 27	45	10.0	2	1	12	1.00	13.33	59.72	17.35
SIG - Latah Jct.	MP 27 - MP 28	35	0.7	1	1	12	1.00	1.20	60.92	5.80
SIG - Latah Jct.	MP 28 - Everett Jct.	40	4.3	2	1	12	1.00	6.45	67.37	10.72
SIG - Latah Jct.	Everett Jct. - Skykomish	45	51.3	1	5	2	1.00	13.68	135.77	17.70
SIG - Latah Jct.	Skykomish - Merritt	25	28.8	1	3	2	1.00	23.04	204.89	28.68
SIG - Latah Jct.	Merritt - Quincy	40	78.0	1	8	2	1.00	14.63	321.89	18.90
SIG - Latah Jct.	Qunicy - Lamona	55	72.4	1	6	2	1.00	13.16	400.87	16.82
SIG - Latah Jct.	Lamona - Bluestem	50	22.7	2	2	2	1.00	13.62	428.11	17.44
SIG - Latah Jct.	Bluestem - Latah Jct	50	38.6	1	4	2	1.00	11.58	474.43	15.40
Latah Jct. - Sunset Jct.	Latah Jct. - Sunset Jct.	25	0.8	1	1	3	1.00	1.92	476.35	7.56
Sunset Jct. - Spokane	Sunset Jct. - Spokane	25	0.8	2	1	4	1.00	1.92	478.27	7.56
Spokane - Sandpoint Jct.	Spokane - Irvin	30	8.3	2	4	2	1.00	4.15	494.87	9.18
Spokane - Sandpoint Jct.	Irvin - Otis Orchards	60	4.3	1	1	2	1.00	4.30	499.17	7.82
Spokane - Sandpoint Jct.	Otis Orchards - East Rathdrum	60	13.7	2	3	2	1.00	4.57	512.87	8.08
Spokane - Sandpoint Jct.	East Rathdrum - Athol	60	10.1	1	2	2	1.00	5.05	522.97	8.57
Spokane - Sandpoint Jct.	Athol - Cocollala	60	13.8	2	2	2	1.00	6.90	536.77	10.42
Spokane - Sandpoint Jct.	Cocollala - West Algoma	60	2.3	1	1	2	1.00	2.30	539.07	5.82
Spokane - Sandpoint Jct.	West Algoma - East Algoma	60	9.0	2	1	2	1.00	9.00	548.07	12.52
Spokane - Sandpoint Jct.	East Algoma - Sandpoint Jct.	45	2.2	1	1	2	1.00	2.93	551.01	6.95
Sandpoint Jct. - St. Paul	Sandpoint Jct. - Bonners Ferry	45	34.7	1	5	2	1.00	9.25	597.27	13.27
Sandpoint Jct. - St. Paul	Bonners Ferry - East Crossport	55	5.0	2	1	2	1.00	5.45	602.73	9.11
Sandpoint Jct. - St. Paul	East Crossport - Whitefish	50	147.9	1	18	2	1.00	9.86	780.21	13.68
Sandpoint Jct. - St. Paul	Whitefish - Conkelly	40	8.8	2	3	2	1.00	4.40	793.41	8.67
Sandpoint Jct. - St. Paul	Conkelly - Nyack	45	23.6	1	3	2	1.00	10.49	824.87	14.51
Sandpoint Jct. - St. Paul	Nyack - Paola	40	10.4	2	2	2	1.00	7.80	840.47	12.07
Sandpoint Jct. - St. Paul	Paola - Pinnacle	35	4.4	1	1	2	1.00	7.54	848.02	12.14

Sandpoint Jct. - St. Paul	Pinnacle - Java West	35	7.1	2	2	2	1.00	6.09	860.19	10.68
Sandpoint Jct. - St. Paul	Java West - Java East	25	0.9	1	1	2	1.00	2.16	862.35	7.80
Sandpoint Jct. - St. Paul	Java East - Summit	25	15.4	2	2	2	1.00	18.48	899.31	24.12
Sandpoint Jct. - St. Paul	Summit - Grizzly	40	13.7	1	2	2	1.00	10.28	919.86	14.55
Sandpoint Jct. - St. Paul	Grizzly - Spotted Robe	40	4.3	2	1	2	1.00	6.45	926.31	10.72
Sandpoint Jct. - St. Paul	Spotted Robe - Blackfoot	40	15.6	1	2	2	1.00	11.70	949.71	15.97
Sandpoint Jct. - St. Paul	Blackfoot - Cut Bank	50	26.1	2	2	2	1.00	15.66	981.03	19.48
Sandpoint Jct. - St. Paul	Cut Bank - Ethridge	60	9.2	1	1	2	1.00	9.20	990.23	12.72
Sandpoint Jct. - St. Paul	Ethridge - Shelby	50	13.5	2	2	2	1.00	8.10	1006.43	11.92
Sandpoint Jct. - St. Paul	Shelby - Joplin	60	53.5	1	6	2	1.00	8.92	1059.93	12.43
Sandpoint Jct. - St. Paul	Joplin - Gildford East	60	13.1	2	4	2	1.00	3.28	1073.03	6.79
Sandpoint Jct. - St. Paul	Gildford East - Pacific Jct.	60	34.0	1	3	2	1.00	11.33	1107.03	14.85
Sandpoint Jct. - St. Paul	Pacific Jct. - Havre East	30	6.6	2	3	2	1.00	4.40	1120.23	9.43
Sandpoint Jct. - St. Paul	Havre East - Williston	65	306.3	1	26	2	1.00	10.87	1402.97	14.27
Sandpoint Jct. - St. Paul	Williston - Epping	65	5.1	2	1	2	1.00	4.71	1407.67	8.11
Sandpoint Jct. - St. Paul	Epping - Des Lacs	65	90.6	1	8	2	1.00	10.45	1491.30	13.85
Sandpoint Jct. - St. Paul	Des Lacs - Gassman Switch	65	8.0	2	1	2	1.00	7.38	1498.69	10.78
Sandpoint Jct. - St. Paul	Gassman Switch - WL Switch	40	1.2	1	1	2	1.00	1.80	1500.49	6.07
Sandpoint Jct. - St. Paul	WL Switch - JD Switch	45	8.2	2	3	2	1.00	3.64	1511.42	7.66
Sandpoint Jct. - St. Paul	JD Switch - Surrey Jct. Switch	65	196.4	1	17	0	1.00	10.66	1692.71	14.06
Sandpoint Jct. - St. Paul	Surrey Jct. Switch - Fargo	40	22.5	2	4	0	1.00	8.44	1726.46	12.71
Sandpoint Jct. - St. Paul	Fargo - Staples	55	110.7	2	13	2	1.00	9.29	1847.23	12.94
Sandpoint Jct. - St. Paul	Staples - Philbrook	60	6.0	2	1	2	1.00	6.00	1853.23	9.52
Sandpoint Jct. - St. Paul	Philbrook - Gregory	50	30.7	1	5	2	1.00	7.37	1890.07	11.19
Sandpoint Jct. - St. Paul	Gregory - Becker	60	45.8	2	5	2	1.00	9.16	1935.87	12.68
Sandpoint Jct. - St. Paul	Becker - Big Lake	55	9.5	1	1	2	1.00	10.36	1946.23	14.02
Sandpoint Jct. - St. Paul	Big Lake - Coon Creek	55	15.9	2	3	2	1.00	5.78	1963.58	9.43
Sandpoint Jct. - St. Paul	Coon Creek - Northtown	45	7.2	2	2	2	1.00	4.80	1973.18	8.82
	No. of crew changes							6.00	2106.81	
	No. of refuelings							2.00	2286.81	
	Total									
	Model									
	Tacoma - Midway									

Tacoma - Vancouver, WA	Tacoma - Ruston	20	5.9	2	3	8	0.25	11.80	8.85	12.45
Tacoma - Vancouver, WA	Ruston - Nelson Bennett	45	1.6	1	1	8	0.25	2.13	9.38	6.15
Tacoma - Vancouver, WA	Nelson Bennett - Vancouver	50	129.7	2	21	8	0.25	7.41	48.29	11.23
Vancouver, WA - Lakeside Jct.	Vancouver - McLoughlin	50	4.6	2	2	2	0.25	2.76	49.67	6.58
Vancouver, WA - Lakeside Jct.	McLoughlin - Avery	50	88.7	1	8	2	0.25	13.31	76.28	17.12
Vancouver, WA - Lakeside Jct.	Avery - Wishram	40	2.9	2	2	2	0.25	2.18	77.37	6.45
Vancouver, WA - Lakeside Jct.	Wishram - Roosevelt	60	41.1	1	4	2	0.25	10.28	87.65	13.79
Vancouver, WA - Lakeside Jct.	Roosevelt - SP&S Jct.	60	83.4	1	8	2	0.25	10.43	108.50	13.94
Vancouver, WA - Lakeside Jct.	SP&S Jct. - Pasco	30	1.7	1	1	2	0.25	3.40	109.35	8.43
Vancouver, WA - Lakeside Jct.	Pasco - Glade	60	8.6	2	5	2	0.25	1.72	111.50	5.24
Vancouver, WA - Lakeside Jct.	Glade - Cunningham	55	35.0	1	5	2	0.25	7.64	121.04	11.29
Vancouver, WA - Lakeside Jct.	Cunningham - Sand	35	17.1	2	2	2	0.25	14.66	128.37	19.25
Vancouver, WA - Lakeside Jct.	Sand - Lakeside Jct.	45	73.2	1	8	2	0.25	12.20	152.77	16.22
Lakeside Jct. - Sunset Jct.	Lakeside Jct. - Sunset Jct.	35	10.6	1	2	1	0.25	9.09	157.31	13.68
Lakeside Jct. - Latah Jct.	Lakeside Jct. - Latah Jct.	40	9.5	1	2	1	0.00	7.13	157.31	11.40
Tacoma - South Seattle	Tacoma - South Seattle	45	31.4	2	14	20	0.75	5.98	220.11	7.01
South Seattle - SIG	South Seattle - Argo	30	4.4	3	2	20	0.75	4.40	226.71	9.43
SIG - Latah Jct.	Argo - Seattle	20	3.3	2	2	20	0.75	4.95	234.14	11.50
SIG - Latah Jct.	Seattle - MP 4	20	4.0	2	3	12	0.75	4.00	243.14	10.55
SIG - Latah Jct.	MP 4 - 23rd Ave	30	1.1	1	1	12	0.75	2.20	244.79	7.23

SIG - Latah Jct.	23rd Ave - MP 7	25	2.3	2	1	12	0.75	5.52	248.93	11.16
SIG - Latah Jct.	MP 7 - MP 8	30	0.3	1	1	12	0.75	0.60	249.38	5.63
SIG - Latah Jct.	MP 8 - MP 16	45	8.2	2	1	12	0.75	10.93	257.58	14.95
SIG - Latah Jct.	MP 16 - MP 18	45	1.9	1	1	12	0.75	2.53	259.48	6.55
SIG - Latah Jct.	MP 18 - MP 27	45	10.0	2	1	12	0.75	13.33	269.48	17.35
SIG - Latah Jct.	MP 27 - MP 28	35	0.7	1	1	12	0.75	1.20	270.38	5.80
SIG - Latah Jct.	MP 28 - Everett Jct.	40	4.3	2	1	12	0.75	6.45	275.22	10.72
SIG - Latah Jct.	Everett Jct. - Skykomish	45	51.3	1	5	2	0.75	13.68	326.52	17.70
SIG - Latah Jct.	Skykomish - Merritt	25	28.8	1	3	2	0.75	23.04	378.36	28.68
SIG - Latah Jct.	Merritt - Quincy	40	78.0	1	8	2	0.75	14.63	466.11	18.90
SIG - Latah Jct.	Qunicy - Lamona	55	72.4	1	6	2	0.75	13.16	525.34	16.82
SIG - Latah Jct.	Lamona - Bluestem	50	22.7	2	2	2	0.75	13.62	545.77	17.44
SIG - Latah Jct.	Bluestem - Latah Jct	50	38.6	1	4	2	0.75	11.58	580.51	15.40
Latah Jct. - Sunset Jct.	Latah Jct. - Sunset Jct.	25	0.8	1	1	3	0.75	1.92	581.95	7.56
Sunset Jct. - Spokane	Sunset Jct. - Spokane	25	0.8	2	1	4	1.00	1.92	583.87	7.56
Spokane - Sandpoint Jct.	Spokane - Irvin	30	8.3	2	4	2	1.00	4.15	600.47	9.18
Spokane - Sandpoint Jct.	Irvin - Otis Orchards	60	4.3	1	1	2	1.00	4.30	604.77	7.82
Spokane - Sandpoint Jct.	Otis Orchards - East Rathdrum	60	13.7	2	3	2	1.00	4.57	618.47	8.08
Spokane - Sandpoint Jct.	East Rathdrum - Athol	60	10.1	1	2	2	1.00	5.05	628.57	8.57
Spokane - Sandpoint Jct.	Athol - Cocollala	60	13.8	2	2	2	1.00	6.90	642.37	10.42
Spokane - Sandpoint Jct.	Cocollala - West Algoma	60	2.3	1	1	2	1.00	2.30	644.67	5.82
Spokane - Sandpoint Jct.	West Algoma - East Algoma	60	9.0	2	1	2	1.00	9.00	653.67	12.52
Spokane - Sandpoint Jct.	East Algoma - Sandpoint Jct.	45	2.2	1	1	2	1.00	2.93	656.60	6.95
Sandpoint Jct. - St. Paul	Sandpoint Jct. - Bonners Ferry	45	34.7	1	5	2	1.00	9.25	702.87	13.27
Sandpoint Jct. - St. Paul	Bonners Ferry - East Crossport	55	5.0	2	1	2	1.00	5.45	708.33	9.11
Sandpoint Jct. - St. Paul	East Crossport - Whitefish	50	147.9	1	18	2	1.00	9.86	885.81	13.68
Sandpoint Jct. - St. Paul	Whitefish - Conkelly	40	8.8	2	3	2	1.00	4.40	899.01	8.67
Sandpoint Jct. - St. Paul	Conkelly - Nyack	45	23.6	1	3	2	1.00	10.49	930.47	14.51
Sandpoint Jct. - St. Paul	Nyack - Paola	40	10.4	2	2	2	1.00	7.80	946.07	12.07
Sandpoint Jct. - St. Paul	Paola - Pinnacle	35	4.4	1	1	2	1.00	7.54	953.62	12.14
Sandpoint Jct. - St. Paul	Pinnacle - Java West	35	7.1	2	2	2	1.00	6.09	965.79	10.68
Sandpoint Jct. - St. Paul	Java West - Java East	25	0.9	1	1	2	1.00	2.16	967.95	7.80
Sandpoint Jct. - St. Paul	Java East - Summit	25	15.4	2	2	2	1.00	18.48	1004.91	24.12
Sandpoint Jct. - St. Paul	Summit - Grizzly	40	13.7	1	2	2	1.00	10.28	1025.46	14.55

Sandpoint Jct. - St. Paul	Grizzly - Spotted Robe	40	4.3	2	1	2	1.00	6.45	1031.91	10.72
Sandpoint Jct. - St. Paul	Spotted Robe - Blackfoot	40	15.6	1	2	2	1.00	11.70	1055.31	15.97
Sandpoint Jct. - St. Paul	Blackfoot - Cut Bank	50	26.1	2	2	2	1.00	15.66	1086.63	19.48
Sandpoint Jct. - St. Paul	Cut Bank - Ethridge	60	9.2	1	1	2	1.00	9.20	1095.83	12.72
Sandpoint Jct. - St. Paul	Ethridge - Shelby	50	13.5	2	2	2	1.00	8.10	1112.03	11.92
Sandpoint Jct. - St. Paul	Shelby - Joplin	60	53.5	1	6	2	1.00	8.92	1165.53	12.43
Sandpoint Jct. - St. Paul	Joplin - Gildford East	60	13.1	2	4	2	1.00	3.28	1178.63	6.79
Sandpoint Jct. - St. Paul	Gildford East - Pacific Jct.	60	34.0	1	3	2	1.00	11.33	1212.63	14.85
Sandpoint Jct. - St. Paul	Pacific Jct. - Havre East	30	6.6	2	3	2	1.00	4.40	1225.83	9.43
Sandpoint Jct. - St. Paul	Havre East - Williston	65	306.3	1	26	2	1.00	10.87	1508.57	14.27
Sandpoint Jct. - St. Paul	Williston - Epping	65	5.1	2	1	2	1.00	4.71	1513.27	8.11
Sandpoint Jct. - St. Paul	Epping - Des Lacs	65	90.6	1	8	2	1.00	10.45	1596.90	13.85
Sandpoint Jct. - St. Paul	Des Lacs - Gassman Switch	65	8.0	2	1	2	1.00	7.38	1604.29	10.78
Sandpoint Jct. - St. Paul	Gassman Switch - WL Switch	40	1.2	1	1	2	1.00	1.80	1606.09	6.07
Sandpoint Jct. - St. Paul	WL Switch - JD Switch	45	8.2	2	3	2	1.00	3.64	1617.02	7.66
Sandpoint Jct. - St. Paul	JD Switch - Surrey Jct. Switch	65	196.4	1	17	0	1.00	10.66	1798.31	14.06
Sandpoint Jct. - St. Paul	Surrey Jct. Switch - Fargo	40	22.5	2	4	0	1.00	8.44	1832.06	12.71
Sandpoint Jct. - St. Paul	Fargo - Staples	55	110.7	2	13	2	1.00	9.29	1952.83	12.94
Sandpoint Jct. - St. Paul	Staples - Philbrook	60	6.0	2	1	2	1.00	6.00	1958.83	9.52
Sandpoint Jct. - St. Paul	Philbrook - Gregory	50	30.7	1	5	2	1.00	7.37	1995.67	11.19
Sandpoint Jct. - St. Paul	Gregory - Becker	60	45.8	2	5	2	1.00	9.16	2041.47	12.68
Sandpoint Jct. - St. Paul	Becker - Big Lake	55	9.5	1	1	2	1.00	10.36	2051.83	14.02
Sandpoint Jct. - St. Paul	Big Lake - Coon Creek	55	15.9	2	3	2	1.00	5.78	2069.18	9.43
Sandpoint Jct. - St. Paul	Coon Creek - Northtown	45	7.2	2	2	2	1.00	4.80	2078.78	8.82
	No. of crew changes							6.25	2217.98	
	No. of refuelings							2.00	2397.98	
	Total									
	Model									
	South Seattle - Midway									
South Seattle - SIG	South Seattle - Argo	30	4.4	3	2	20	1.00	8.80	17.60	9.43
SIG - Latah Jct.	Argo - Seattle	20	3.3	2	2	20	1.00	4.95	27.50	11.50
SIG - Latah Jct.	Seattle - MP 4	20	4.0	2	3	12	1.00	4.00	39.50	10.55
SIG - Latah Jct.	MP 4 - 23rd Ave	30	1.1	1	1	12	1.00	2.20	41.70	7.23

SIG - Latah Jct.	23rd Ave - MP 7	25	2.3	2	1	12	1.00	5.52	47.22	11.16
SIG - Latah Jct.	MP 7 - MP 8	30	0.3	1	1	12	1.00	0.60	47.82	5.63
SIG - Latah Jct.	MP 8 - MP 16	45	8.2	2	1	12	1.00	10.93	58.75	14.95
SIG - Latah Jct.	MP 16 - MP 18	45	1.9	1	1	12	1.00	2.53	61.29	6.55
SIG - Latah Jct.	MP 18 - MP 27	45	10.0	2	1	12	1.00	13.33	74.62	17.35
SIG - Latah Jct.	MP 27 - MP 28	35	0.7	1	1	12	1.00	1.20	75.82	5.80
SIG - Latah Jct.	MP 28 - Everett Jct.	40	4.3	2	1	12	1.00	6.45	82.27	10.72
SIG - Latah Jct.	Everett Jct. - Skykomish	45	51.3	1	5	2	1.00	13.68	150.67	17.70
SIG - Latah Jct.	Skykomish - Merritt	25	28.8	1	3	2	1.00	23.04	219.79	28.68
SIG - Latah Jct.	Merritt - Quincy	40	78.0	1	8	2	1.00	14.63	336.79	18.90
SIG - Latah Jct.	Qunicy - Lamona	55	72.4	1	6	2	1.00	13.16	415.77	16.82
SIG - Latah Jct.	Lamona - Bluestem	50	22.7	2	2	2	1.00	13.62	443.01	17.44
SIG - Latah Jct.	Bluestem - Latah Jct	50	38.6	1	4	2	1.00	11.58	489.33	15.40
Latah Jct. - Sunset Jct.	Latah Jct. - Sunset Jct.	25	0.8	1	1	3	1.00	1.92	491.25	7.56
Sunset Jct. - Spokane	Sunset Jct. - Spokane	25	0.8	2	1	4	1.00	1.92	493.17	7.56
Spokane - Sandpoint Jct.	Spokane - Irvin	30	8.3	2	4	2	1.00	4.15	509.77	9.18
Spokane - Sandpoint Jct.	Irvin - Otis Orchards	60	4.3	1	1	2	1.00	4.30	514.07	7.82
Spokane - Sandpoint Jct.	Otis Orchards - East Rathdrum	60	13.7	2	3	2	1.00	4.57	527.77	8.08
Spokane - Sandpoint Jct.	East Rathdrum - Athol	60	10.1	1	2	2	1.00	5.05	537.87	8.57
Spokane - Sandpoint Jct.	Athol - Cocollala	60	13.8	2	2	2	1.00	6.90	551.67	10.42
Spokane - Sandpoint Jct.	Cocollala - West Algoma	60	2.3	1	1	2	1.00	2.30	553.97	5.82
Spokane - Sandpoint Jct.	West Algoma - East Algoma	60	9.0	2	1	2	1.00	9.00	562.97	12.52
Spokane - Sandpoint Jct.	East Algoma - Sandpoint Jct.	45	2.2	1	1	2	1.00	2.93	565.91	6.95
Sandpoint Jct. - St. Paul	Sandpoint Jct. - Bonners Ferry	45	34.7	1	5	2	1.00	9.25	612.17	13.27
Sandpoint Jct. - St. Paul	Bonners Ferry - East Crossport	55	5.0	2	1	2	1.00	5.45	617.63	9.11
Sandpoint Jct. - St. Paul	East Crossport - Whitefish	50	147.9	1	18	2	1.00	9.86	795.11	13.68
Sandpoint Jct. - St. Paul	Whitefish - Conkelly	40	8.8	2	3	2	1.00	4.40	808.31	8.67
Sandpoint Jct. - St. Paul	Conkelly - Nyack	45	23.6	1	3	2	1.00	10.49	839.77	14.51
Sandpoint Jct. - St. Paul	Nyack - Paola	40	10.4	2	2	2	1.00	7.80	855.37	12.07
Sandpoint Jct. - St. Paul	Paola - Pinnacle	35	4.4	1	1	2	1.00	7.54	862.92	12.14
Sandpoint Jct. - St. Paul	Pinnacle - Java West	35	7.1	2	2	2	1.00	6.09	875.09	10.68
Sandpoint Jct. - St. Paul	Java West - Java East	25	0.9	1	1	2	1.00	2.16	877.25	7.80
Sandpoint Jct. - St. Paul	Java East - Summit	25	15.4	2	2	2	1.00	18.48	914.21	24.12
Sandpoint Jct. - St. Paul	Summit - Grizzly	40	13.7	1	2	2	1.00	10.28	934.76	14.55

Sandpoint Jct. - St. Paul	Grizzly - Spotted Robe	40	4.3	2	1	2	1.00	6.45	941.21	10.72
Sandpoint Jct. - St. Paul	Spotted Robe - Blackfoot	40	15.6	1	2	2	1.00	11.70	964.61	15.97
Sandpoint Jct. - St. Paul	Blackfoot - Cut Bank	50	26.1	2	2	2	1.00	15.66	995.93	19.48
Sandpoint Jct. - St. Paul	Cut Bank - Ethridge	60	9.2	1	1	2	1.00	9.20	1005.13	12.72
Sandpoint Jct. - St. Paul	Ethridge - Shelby	50	13.5	2	2	2	1.00	8.10	1021.33	11.92
Sandpoint Jct. - St. Paul	Shelby - Joplin	60	53.5	1	6	2	1.00	8.92	1074.83	12.43
Sandpoint Jct. - St. Paul	Joplin - Gildford East	60	13.1	2	4	2	1.00	3.28	1087.93	6.79
Sandpoint Jct. - St. Paul	Gildford East - Pacific Jct.	60	34.0	1	3	2	1.00	11.33	1121.93	14.85
Sandpoint Jct. - St. Paul	Pacific Jct. - Havre East	30	6.6	2	3	2	1.00	4.40	1135.13	9.43
Sandpoint Jct. - St. Paul	Havre East - Williston	65	306.3	1	26	2	1.00	10.87	1417.87	14.27
Sandpoint Jct. - St. Paul	Williston - Epping	65	5.1	2	1	2	1.00	4.71	1422.57	8.11
Sandpoint Jct. - St. Paul	Epping - Des Lacs	65	90.6	1	8	2	1.00	10.45	1506.20	13.85
Sandpoint Jct. - St. Paul	Des Lacs - Gassman Switch	65	8.0	2	1	2	1.00	7.38	1513.59	10.78
Sandpoint Jct. - St. Paul	Gassman Switch - WL Switch	40	1.2	1	1	2	1.00	1.80	1515.39	6.07
Sandpoint Jct. - St. Paul	WL Switch - JD Switch	45	8.2	2	3	2	1.00	3.64	1526.32	7.66
Sandpoint Jct. - St. Paul	JD Switch - Surrey Jct. Switch	65	196.4	1	17	0	1.00	10.66	1707.61	14.06
Sandpoint Jct. - St. Paul	Surrey Jct. Switch - Fargo	40	22.5	2	4	0	1.00	8.44	1741.36	12.71
Sandpoint Jct. - St. Paul	Fargo - Staples	55	110.7	2	13	2	1.00	9.29	1862.13	12.94
Sandpoint Jct. - St. Paul	Staples - Philbrook	60	6.0	2	1	2	1.00	6.00	1868.13	9.52
Sandpoint Jct. - St. Paul	Philbrook - Gregory	50	30.7	1	5	2	1.00	7.37	1904.97	11.19
Sandpoint Jct. - St. Paul	Gregory - Becker	60	45.8	2	5	2	1.00	9.16	1950.77	12.68
Sandpoint Jct. - St. Paul	Becker - Big Lake	55	9.5	1	1	2	1.00	10.36	1961.13	14.02
Sandpoint Jct. - St. Paul	Big Lake - Coon Creek	55	15.9	2	3	2	1.00	5.78	1978.48	9.43
Sandpoint Jct. - St. Paul	Coon Creek - Northtown	45	7.2	2	2	2	1.00	4.80	1988.08	8.82
	No. of crew changes							7.00	2143.99	
	No. of refuelings							2.00	2323.99	
	Total									
	Model									
	Oakland - Kansas City									
OIG - Richmond	OIG - Stege	35	7.7	2	6	36	1.00	4.40	26.40	6.80
OIG - Richmond	Stege - Richmond	5	1.5	1	1	0	1.00	18.00	44.40	38.18
Richmond - Mariposa	Richmond - Port Chicago	35	25.0	1	6	0	1.00	7.14	87.26	11.74
Richmond - Mariposa	Port Chicago - Oakley	60	19.6	1	3	8	1.00	6.53	106.86	10.05

Richmond - Mariposa	Oakley - Bixler	70	7.2	2	2	8	1.00	3.09	113.03	6.38
Richmond - Mariposa	Bixler - Trull	50	2.6	1	1	8	1.00	3.12	116.15	6.94
Richmond - Mariposa	Trull - Holt	70	4.7	2	2	8	1.00	2.01	120.18	5.31
Richmond - Mariposa	Holt - W. Stockton	70	6.3	1	1	8	1.00	5.40	125.58	8.70
Richmond - Mariposa	W. Stockton - UP Crossing	30	1.5	2	1	8	1.00	3.00	128.58	8.03
Richmond - Mariposa	UP Crossing - Wheat	40	4.6	2	2	12	1.00	3.45	135.48	7.72
Richmond - Mariposa	Wheat - Mariposa	50	4.2	1	2	12	1.00	2.52	140.52	6.34
Mariposa - Fresno	Mariposa - Fresno	70	113.8	1	16	12	1.00	6.10	238.06	9.40
Fresno - Barstow	Fresno - Calwa	35	3.2	2	2	12	1.00	2.74	243.55	7.34
Fresno - Barstow	Calwa - Thorpe	30	1.9	1	1	12	1.00	3.80	247.35	8.83
Fresno - Barstow	Thorpe - E. Bowles	70	6.7	2	2	12	1.00	2.87	253.09	6.17
Fresno - Barstow	E. Bowles - Pitco	70	17.2	1	3	12	1.00	4.91	267.83	8.21
Fresno - Barstow	Pitco - Wagner	45	2.9	2	2	12	1.00	1.93	271.70	5.95
Fresno - Barstow	Wagner - Jastro	70	76.1	1	10	12	1.00	6.52	336.93	9.82
Fresno - Barstow	Jastro - Kern Jct.	30	5.9	2	4	12	1.00	2.95	348.73	7.98
Fresno - Barstow	Kern Jct. - Bena	50	14.2	2	5	0	1.00	3.41	365.77	7.23
Fresno - Barstow	Bena - Illmon	30	2.5	1	1	0	1.00	5.00	370.77	10.03
Fresno - Barstow	Illmon - Caliente	20	3.9	2	2	0	1.00	5.85	382.47	12.40
Fresno - Barstow	Caliente - Cable	20	21.2	1	8	0	1.00	7.95	446.07	14.50
Fresno - Barstow	Cable - S. Mojave	30	24.8	2	5	0	1.00	9.92	495.67	14.95
Fresno - Barstow	S. Mojave - Barstow	60	66.8	1	8	0	1.00	8.35	562.47	11.87
Barstow - Daggett	Barstow - Daggett	45	6.3	2	2	2	1.00	4.20	570.87	8.22
Daggett - Williams Jct.	Daggett - Needles	55	161.6	2	23	2	1.00	7.66	747.16	11.32
Daggett - Williams Jct.	Needles - Williams Jct.	55	203.0	2	31	2	1.00	7.14	968.61	10.80
Williams Jct. - Clovis	Williams Jct. - Belen	50	375.0	2	37	2	1.00	12.16	1418.61	15.98
Williams Jct. - Clovis	Belen - Sais	50	24.6	2	6	0	1.00	4.92	1448.13	8.74
Williams Jct. - Clovis	Sais - Scholle	50	4.8	1	1	0	1.00	5.76	1453.89	9.58
Williams Jct. - Clovis	Scholle - Carnero	60	72.3	2	10	0	1.00	7.23	1526.19	10.75
Williams Jct. - Clovis	Carnero - Vaughn	60	9.4	1	2	0	1.00	4.70	1535.59	8.22
Williams Jct. - Clovis	Vaughn - CP 7197	65	68.8	2	10	0	1.00	6.35	1599.10	9.75
Williams Jct. - Clovis	CP 7197 - Fort Sumner	65	2.9	1	1	0	1.00	2.68	1601.78	6.08
Williams Jct. - Clovis	Fort Sumner - East Clovis	65	61.1	2	9	0	1.00	6.27	1658.18	9.67
Williams Jct. - Clovis	East Clovis - Lone Star Jct.	65	8.1	2	3	0	1.00	2.49	1665.65	5.89

Clovis - Amarillo	Lone Star Jct. - Eastern	65	97.1	2	19	0	1.00	4.72	1755.28	8.12
Amarillo - Avard	Eastern - East Canadian	65	96.5	2	11	0	1.00	8.10	1844.36	11.50
Amarillo - Avard	East Canadian - West Clear Creek	70	1.7	1	1	0	1.00	1.46	1845.82	4.76
Amarillo - Avard	West Clear Creek - Goodwin	65	31.3	2	4	0	1.00	7.22	1874.71	10.62
Amarillo - Avard	Goodwin - East Curtis	65	53.7	1	8	0	1.00	6.20	1924.28	9.59
Amarillo - Avard	East Curtis - Heman	70	17.2	2	2	0	1.00	7.37	1939.02	10.67
Amarillo - Avard	Heman - Waynoka	70	3.2	1	1	0	1.00	2.74	1941.77	6.04
Amarillo - Avard	Waynoka - Avard	55	11.5	2	3	0	1.00	4.18	1954.31	7.83
Avard - East Jct.	Avard - Roland	60	97.9	1	15	0	1.00	6.53	2052.21	10.04
Avard - East Jct.	Roland - Cicero	45	11.9	2	2	0	1.00	7.93	2068.08	11.95
Avard - East Jct.	Cicero - West Jct.	60	8.8	1	2	0	1.00	4.40	2076.88	7.92
Avard - East Jct.	West Jct. - East Jct.	60	6.0	2	2	0	1.00	3.00	2082.88	6.52
East Jct. - Kansas City	East Jct. - Ellinor	60	91.1	2	6	0	1.00	15.18	2173.98	18.70
East Jct. - Kansas City	Ellinor - CP 74	60	117.3	2.5	16	2	1.00	7.33	2291.28	10.85
East Jct. - Kansas City	CP 74 - Kansas City	30	7.4	3	8	2	1.00	1.85	2306.08	6.88
	No. of crew changes							9.00	2506.53	
	No. of refuelings							2.00	2686.53	
	Total									
	Model									
	Mariposa - Kansas City									
Mariposa - Fresno	Mariposa - Fresno	70	113.8	1	16	12	1.00	12.19	195.09	9.40
Fresno - Barstow	Fresno - Calwa	35	3.2	2	2	12	1.00	2.74	200.57	7.34
Fresno - Barstow	Calwa - Thorpe	30	1.9	1	1	12	1.00	3.80	204.37	8.83
Fresno - Barstow	Thorpe - E. Bowles	70	6.7	2	2	12	1.00	2.87	210.11	6.17
Fresno - Barstow	E. Bowles - Pitco	70	17.2	1	3	12	1.00	4.91	224.86	8.21
Fresno - Barstow	Pitco - Wagner	45	2.9	2	2	12	1.00	1.93	228.72	5.95
Fresno - Barstow	Wagner - Jastro	70	76.1	1	10	12	1.00	6.52	293.95	9.82
Fresno - Barstow	Jastro - Kern Jct.	30	5.9	2	4	12	1.00	2.95	305.75	7.98
Fresno - Barstow	Kern Jct. - Bena	50	14.2	2	5	0	1.00	3.41	322.79	7.23
Fresno - Barstow	Bena - Illmon	30	2.5	1	1	0	1.00	5.00	327.79	10.03
Fresno - Barstow	Illmon - Caliente	20	3.9	2	2	0	1.00	5.85	339.49	12.40
Fresno - Barstow	Caliente - Cable	20	21.2	1	8	0	1.00	7.95	403.09	14.50
Fresno - Barstow	Cable - S. Mojave	30	24.8	2	5	0	1.00	9.92	452.69	14.95
Fresno - Barstow	S. Mojave - Barstow	60	66.8	1	8	0	1.00	8.35	519.49	11.87

Barstow - Daggett	Barstow - Daggett	45	6.3	2	2	2	1.00	4.20	527.89	8.22
Daggett - Williams Jct.	Daggett - Needles	55	161.6	2	23	2	1.00	7.66	704.18	11.32
Daggett - Williams Jct.	Needles - Williams Jct.	55	203.0	2	31	2	1.00	7.14	925.64	10.80
Williams Jct. - Clovis	Williams Jct. - Belen	50	375.0	2	37	2	1.00	12.16	1375.64	15.98
Williams Jct. - Clovis	Belen - Sais	50	24.6	2	6	0	1.00	4.92	1405.16	8.74
Williams Jct. - Clovis	Sais - Scholle	50	4.8	1	1	0	1.00	5.76	1410.92	9.58
Williams Jct. - Clovis	Scholle - Carnero	60	72.3	2	10	0	1.00	7.23	1483.22	10.75
Williams Jct. - Clovis	Carnero - Vaughn	60	9.4	1	2	0	1.00	4.70	1492.62	8.22
Williams Jct. - Clovis	Vaughn - CP 7197	65	68.8	2	10	0	1.00	6.35	1556.13	9.75
Williams Jct. - Clovis	CP 7197 - Fort Sumner	65	2.9	1	1	0	1.00	2.68	1558.80	6.08
Williams Jct. - Clovis	Fort Sumner - East Clovis	65	61.1	2	9	0	1.00	6.27	1615.20	9.67
Williams Jct. - Clovis	East Clovis - Lone Star Jct.	65	8.1	2	3	0	1.00	2.49	1622.68	5.89
Clovis - Amarillo	Lone Star Jct. - Eastern	65	97.1	2	19	0	1.00	4.72	1712.31	8.12
Amarillo - Avard	Eastern - East Canadian	65	96.5	2	11	0	1.00	8.10	1801.39	11.50
Amarillo - Avard	East Canadian - West Clear Creek	70	1.7	1	1	0	1.00	1.46	1802.84	4.76
Amarillo - Avard	West Clear Creek - Goodwin	65	31.3	2	4	0	1.00	7.22	1831.74	10.62
Amarillo - Avard	Goodwin - East Curtis	65	53.7	1	8	0	1.00	6.20	1881.31	9.59
Amarillo - Avard	East Curtis - Heman	70	17.2	2	2	0	1.00	7.37	1896.05	10.67
Amarillo - Avard	Heman - Waynoka	70	3.2	1	1	0	1.00	2.74	1898.79	6.04
Amarillo - Avard	Waynoka - Avard	55	11.5	2	3	0	1.00	4.18	1911.34	7.83
Avard - East Jct.	Avard - Roland	60	97.9	1	15	0	1.00	6.53	2009.24	10.04
Avard - East Jct.	Roland - Cicero	45	11.9	2	2	0	1.00	7.93	2025.10	11.95
Avard - East Jct.	Cicero - West Jct.	60	8.8	1	2	0	1.00	4.40	2033.90	7.92
Avard - East Jct.	West Jct. - East Jct.	60	6.0	2	2	0	1.00	3.00	2039.90	6.52
East Jct. - Kansas City	East Jct. - Ellinor	60	91.1	2	6	0	1.00	15.18	2131.00	18.70
East Jct. - Kansas City	Ellinor - CP 74	60	117.3	2.5	16	2	1.00	7.33	2248.30	10.85
East Jct. - Kansas City	CP 74 - Kansas City	30	7.4	3	8	2	1.00	1.85	2263.10	6.88
	No. of crew changes							9.00	2463.56	
	No. of refuelings							2.00	2643.56	
	Total									
	Model									
	Oakland - Memphis									
OIG - Richmond	OIG - Stege	35	7.7	2	6	36	1.00	4.40	26.40	6.80

OIG - Richmond	Stege - Richmond	5	1.5	1	1	0	1.00	18.00	44.40	38.18
Richmond - Mariposa	Richmond - Port Chicago	35	25.0	1	6	0	1.00	7.14	87.26	11.74
Richmond - Mariposa	Port Chicago - Oakley	60	19.6	1	3	8	1.00	6.53	106.86	10.05
Richmond - Mariposa	Oakley - Bixler	70	7.2	2	2	8	1.00	3.09	113.03	6.38
Richmond - Mariposa	Bixler - Trull	50	2.6	1	1	8	1.00	3.12	116.15	6.94
Richmond - Mariposa	Trull - Holt	70	4.7	2	2	8	1.00	2.01	120.18	5.31
Richmond - Mariposa	Holt - W. Stockton	70	6.3	1	1	8	1.00	5.40	125.58	8.70
Richmond - Mariposa	W. Stockton - UP Crossing	30	1.5	2	1	8	1.00	3.00	128.58	8.03
Richmond - Mariposa	UP Crossing - Wheat	40	4.6	2	2	12	1.00	3.45	135.48	7.72
Richmond - Mariposa	Wheat - Mariposa	50	4.2	1	2	12	1.00	2.52	140.52	6.34
Mariposa - Fresno	Mariposa - Fresno	70	113.8	1	16	12	1.00	6.10	238.06	9.40
Fresno - Barstow	Fresno - Calwa	35	3.2	2	2	12	1.00	2.74	243.55	7.34
Fresno - Barstow	Calwa - Thorpe	30	1.9	1	1	12	1.00	3.80	247.35	8.83
Fresno - Barstow	Thorpe - E. Bowles	70	6.7	2	2	12	1.00	2.87	253.09	6.17
Fresno - Barstow	E. Bowles - Pitco	70	17.2	1	3	12	1.00	4.91	267.83	8.21
Fresno - Barstow	Pitco - Wagner	45	2.9	2	2	12	1.00	1.93	271.70	5.95
Fresno - Barstow	Wagner - Jastro	70	76.1	1	10	12	1.00	6.52	336.93	9.82
Fresno - Barstow	Jastro - Kern Jct.	30	5.9	2	4	12	1.00	2.95	348.73	7.98
Fresno - Barstow	Kern Jct. - Bena	50	14.2	2	5	0	1.00	3.41	365.77	7.23
Fresno - Barstow	Bena - Illmon	30	2.5	1	1	0	1.00	5.00	370.77	10.03
Fresno - Barstow	Illmon - Caliente	20	3.9	2	2	0	1.00	5.85	382.47	12.40
Fresno - Barstow	Caliente - Cable	20	21.2	1	8	0	1.00	7.95	446.07	14.50
Fresno - Barstow	Cable - S. Mojave	30	24.8	2	5	0	1.00	9.92	495.67	14.95
Fresno - Barstow	S. Mojave - Barstow	60	66.8	1	8	0	1.00	8.35	562.47	11.87
Barstow - Daggett	Barstow - Daggett	45	6.3	2	2	2	1.00	4.20	570.87	8.22
Daggett - Williams Jct.	Daggett - Needles	55	161.6	2	23	2	1.00	7.66	747.16	11.32
Daggett - Williams Jct.	Needles - Williams Jct.	55	203.0	2	31	2	1.00	7.14	968.61	10.80
Williams Jct. - Clovis	Williams Jct. - Belen	50	375.0	2	37	2	1.00	12.16	1418.61	15.98
Williams Jct. - Clovis	Belen - Sais	50	24.6	2	6	0	1.00	4.92	1448.13	8.74
Williams Jct. - Clovis	Sais - Scholle	50	4.8	1	1	0	1.00	5.76	1453.89	9.58
Williams Jct. - Clovis	Scholle - Carnero	60	72.3	2	10	0	1.00	7.23	1526.19	10.75
Williams Jct. - Clovis	Carnero - Vaughn	60	9.4	1	2	0	1.00	4.70	1535.59	8.22
Williams Jct. - Clovis	Vaughn - CP 7197	65	68.8	2	10	0	1.00	6.35	1599.10	9.75

Williams Jct. - Clovis	CP 7197 - Fort Sumner	65	2.9	1	1	0	1.00	2.68	1601.78	6.08
Williams Jct. - Clovis	Fort Sumner - East Clovis	65	61.1	2	9	0	1.00	6.27	1658.18	9.67
Williams Jct. - Clovis	East Clovis - Lone Star Jct.	65	8.1	2	3	0	1.00	2.49	1665.65	5.89
Clovis - Amarillo	Lone Star Jct. - Eastern	65	97.1	2	19	0	1.00	4.72	1755.28	8.12
Amarillo - Avard	Eastern - East Canadian	65	96.5	2	11	0	1.00	8.10	1844.36	11.50
Amarillo - Avard	East Canadian - West Clear Creek	70	1.7	1	1	0	1.00	1.46	1845.82	4.76
Amarillo - Avard	West Clear Creek - Goodwin	65	31.3	2	4	0	1.00	7.22	1874.71	10.62
Amarillo - Avard	Goodwin - East Curtis	65	53.7	1	8	0	1.00	6.20	1924.28	9.59
Amarillo - Avard	East Curtis - Heman	70	17.2	2	2	0	1.00	7.37	1939.02	10.67
Amarillo - Avard	Heman - Waynoka	70	3.2	1	1	0	1.00	2.74	1941.77	6.04
Amarillo - Avard	Waynoka - Avard	55	11.5	2	3	0	1.00	4.18	1954.31	7.83
Avard - Springfield	Avard - Tulsa	55	177.0	1	17	0	1.00	11.36	2147.40	15.01
Avard - Springfield	Tulsa - Springfield	45	187.0	1	18	0	1.00	13.85	2396.74	17.87
Springfield - Memphis	Springfield - Memphis	45	282.0	1	28	0	1.00	13.43	2772.74	17.45
	No. of crew changes							12.00	3040.01	
	No. of refuelings							2.00	3220.01	
	Total									
	Model									
	Mariposa - Memphis									
Mariposa - Fresno	Mariposa - Fresno	70	113.8	1	16	12	1.00	12.19	195.09	9.40
Fresno - Barstow	Fresno - Calwa	35	3.2	2	2	12	1.00	2.74	200.57	7.34
Fresno - Barstow	Calwa - Thorpe	30	1.9	1	1	12	1.00	3.80	204.37	8.83
Fresno - Barstow	Thorpe - E. Bowles	70	6.7	2	2	12	1.00	2.87	210.11	6.17
Fresno - Barstow	E. Bowles - Pitco	70	17.2	1	3	12	1.00	4.91	224.86	8.21
Fresno - Barstow	Pitco - Wagner	45	2.9	2	2	12	1.00	1.93	228.72	5.95
Fresno - Barstow	Wagner - Jastro	70	76.1	1	10	12	1.00	6.52	293.95	9.82
Fresno - Barstow	Jastro - Kern Jct.	30	5.9	2	4	12	1.00	2.95	305.75	7.98
Fresno - Barstow	Kern Jct. - Bena	50	14.2	2	5	0	1.00	3.41	322.79	7.23
Fresno - Barstow	Bena - Illmon	30	2.5	1	1	0	1.00	5.00	327.79	10.03
Fresno - Barstow	Illmon - Caliente	20	3.9	2	2	0	1.00	5.85	339.49	12.40
Fresno - Barstow	Caliente - Cable	20	21.2	1	8	0	1.00	7.95	403.09	14.50
Fresno - Barstow	Cable - S. Mojave	30	24.8	2	5	0	1.00	9.92	452.69	14.95
Fresno - Barstow	S. Mojave - Barstow	60	66.8	1	8	0	1.00	8.35	519.49	11.87

Barstow - Daggett	Barstow - Daggett	45	6.3	2	2	2	1.00	4.20	527.89	8.22
Daggett - Williams Jct.	Daggett - Needles	55	161.6	2	23	2	1.00	7.66	704.18	11.32
Daggett - Williams Jct.	Needles - Williams Jct.	55	203.0	2	31	2	1.00	7.14	925.64	10.80
Williams Jct. - Clovis	Williams Jct. - Belen	50	375.0	2	37	2	1.00	12.16	1375.64	15.98
Williams Jct. - Clovis	Belen - Sais	50	24.6	2	6	0	1.00	4.92	1405.16	8.74
Williams Jct. - Clovis	Sais - Scholle	50	4.8	1	1	0	1.00	5.76	1410.92	9.58
Williams Jct. - Clovis	Scholle - Carnero	60	72.3	2	10	0	1.00	7.23	1483.22	10.75
Williams Jct. - Clovis	Carnero - Vaughn	60	9.4	1	2	0	1.00	4.70	1492.62	8.22
Williams Jct. - Clovis	Vaughn - CP 7197	65	68.8	2	10	0	1.00	6.35	1556.13	9.75
Williams Jct. - Clovis	CP 7197 - Fort Sumner	65	2.9	1	1	0	1.00	2.68	1558.80	6.08
Williams Jct. - Clovis	Fort Sumner - East Clovis	65	61.1	2	9	0	1.00	6.27	1615.20	9.67
Williams Jct. - Clovis	East Clovis - Lone Star Jct.	65	8.1	2	3	0	1.00	2.49	1622.68	5.89
Clovis - Amarillo	Lone Star Jct. - Eastern	65	97.1	2	19	0	1.00	4.72	1712.31	8.12
Amarillo - Avard	Eastern - East Canadian	65	96.5	2	11	0	1.00	8.10	1801.39	11.50
Amarillo - Avard	East Canadian - West Clear Creek	70	1.7	1	1	0	1.00	1.46	1802.84	4.76
Amarillo - Avard	West Clear Creek - Goodwin	65	31.3	2	4	0	1.00	7.22	1831.74	10.62
Amarillo - Avard	Goodwin - East Curtis	65	53.7	1	8	0	1.00	6.20	1881.31	9.59
Amarillo - Avard	East Curtis - Heman	70	17.2	2	2	0	1.00	7.37	1896.05	10.67
Amarillo - Avard	Heman - Waynoka	70	3.2	1	1	0	1.00	2.74	1898.79	6.04
Amarillo - Avard	Waynoka - Avard	55	11.5	2	3	0	1.00	4.18	1911.34	7.83
Avard - Springfield	Avard - Tulsa	55	177.0	1	17	0	1.00	11.36	2104.43	15.01
Avard - Springfield	Tulsa - Springfield	45	187.0	1	18	0	1.00	13.85	2353.76	17.87
Springfield - Memphis	Springfield - Memphis	45	282.0	1	28	0	1.00	13.43	2729.76	17.45
	No. of crew changes							12.00	2997.03	
	No. of refuelings							2.00	3177.03	
	Total									
	Model									
	LALB - Midway									
LALB - Redondo	LALB - Redondo	30	19.3	3	12	0	1.00	4.02	48.25	8.25
Redondo - Riverside	Redondo - Hobart	25	1.6	2	1	0	1.00	3.84	52.09	9.48
Redondo - Riverside	Hobart - Vail	50	4.1	3	4	46	1.00	1.23	57.01	5.05
Redondo - Riverside	Vail - Basta	50	14.2	2	6	46	1.00	2.84	74.05	6.66

Redondo - Riverside	Basta - Fullerton Jct.	50	2.5	3	1	46	1.00	3.00	77.05	6.82
Redondo - Riverside	Fullerton Jct. - Atwood	50	4.9	2	1	0	1.00	5.88	82.93	9.70
Redondo - Riverside	Atwood - West Riverside	45	30.0	2	5	16	1.00	8.00	122.93	12.02
Riverside - San Bernardino	West Riverside - Highgrove	45	4.5	3	1	11	1.00	6.00	128.93	10.02
Riverside - San Bernardino	Highgrove - Colton Crossing	40	2.9	2	1	11	1.00	4.35	133.28	8.62
Colton Crossing	Colton Crossing	25	0.3	2	1	11	1.00	0.72	134.00	6.36
Riverside - San Bernardino	Colton Crossing - San Bernardino	30	3.2	3	2	11	1.00	3.20	140.40	8.23
San Bernardino - Barstow	San Bernardino - Silverwood	20	24.9	3	7	2	1.00	10.67	215.10	17.22
San Bernardino - Barstow	Silverwood - Barstow	40	61.5	2	5	2	1.00	18.45	307.35	22.72
Barstow - Daggett	Barstow - Daggett	45	6.3	2	2	2	1.00	4.20	315.75	8.22
Daggett - Williams Jct.	Daggett - Needles	55	161.6	2	23	2	1.00	7.66	492.04	11.32
Daggett - Williams Jct.	Needles - Williams Jct.	55	203.0	2	31	2	1.00	7.14	713.50	10.80
Williams Jct. - Clovis	Williams Jct. - Belen	50	375.0	2	37	2	1.00	12.16	1163.50	15.98
Williams Jct. - Clovis	Belen - Sais	50	24.6	2	6	0	1.00	4.92	1193.02	8.74
Williams Jct. - Clovis	Sais - Scholle	50	4.8	1	1	0	1.00	5.76	1198.78	9.58
Williams Jct. - Clovis	Scholle - Carnero	60	72.3	2	10	0	1.00	7.23	1271.08	10.75
Williams Jct. - Clovis	Carnero - Vaughn	60	9.4	1	2	0	1.00	4.70	1280.48	8.22
Williams Jct. - Clovis	Vaughn - CP 7197	65	68.8	2	10	0	1.00	6.35	1343.98	9.75
Williams Jct. - Clovis	CP 7197 - Fort Sumner	65	2.9	1	1	0	1.00	2.68	1346.66	6.08
Williams Jct. - Clovis	Fort Sumner - East Clovis	65	61.1	2	9	0	1.00	6.27	1403.06	9.67
Williams Jct. - Clovis	East Clovis - Lone Star Jct.	65	8.1	2	3	0	1.00	2.49	1410.54	5.89
Clovis - Amarillo	Lone Star Jct. - Eastern	65	97.1	2	19	0	1.00	4.72	1500.17	8.12
Amarillo - Avard	Eastern - East Canadian	65	96.5	2	11	0	1.00	8.10	1589.24	11.50
Amarillo - Avard	East Canadian - West Clear Creek	70	1.7	1	1	0	1.00	1.46	1590.70	4.76
Amarillo - Avard	West Clear Creek - Goodwin	65	31.3	2	4	0	1.00	7.22	1619.59	10.62
Amarillo - Avard	Goodwin - East Curtis	65	53.7	1	8	0	1.00	6.20	1669.16	9.59
Amarillo - Avard	East Curtis - Heman	70	17.2	2	2	0	1.00	7.37	1683.91	10.67
Amarillo - Avard	Heman - Waynoka	70	3.2	1	1	0	1.00	2.74	1686.65	6.04

Amarillo - Avard	Waynoka - Avard	55	11.5	2	3	0	1.00	4.18	1699.19	7.83
Avard - East Jct.	Avard - Roland	60	97.9	1	15	0	1.00	6.53	1797.09	10.04
Avard - East Jct.	Roland - Cicero	45	11.9	2	2	0	1.00	7.93	1812.96	11.95
Avard - East Jct.	Cicero - West Jct.	60	8.8	1	2	0	1.00	4.40	1821.76	7.92
Avard - East Jct.	West Jct. - East Jct.	60	6.0	2	2	0	1.00	3.00	1827.76	6.52
East Jct. - Kansas City	East Jct. - Ellinor	60	91.1	2	6	0	1.00	15.18	1918.86	18.70
East Jct. - Kansas City	Ellinor - CP 74	60	117.3	2.5	16	2	1.00	7.33	2036.16	10.85
East Jct. - Kansas City	CP 74 - Kansas City	30	7.4	3	8	2	1.00	1.85	2050.96	6.88
Kansas City - Galesburg	Kansas City - West Sibley	25	4.5	2	2	2	1.00	5.40	2061.76	11.04
Kansas City - Galesburg	West Sibley - East Sibley	30	1.4	1	1	2	1.00	2.80	2064.56	7.83
Kansas City - Galesburg	East Sibley - CP 1850	55	239.9	2	23	2	1.00	11.38	2326.27	15.03
Galesburg - Edelstein	CP1850 - Edelstein Jct.	60	37.5	2	4	0	0.00	9.38	2326.27	12.89
Edelstein - Joliet	Edelstein Jct. - Joliet	60	110.0	2	11	0	0.00	10.00	2326.27	13.52
Joliet - Corwith	Joliet - Corwith	45	31.6	2	6	16	0.00	7.02	2326.27	11.04
Galesburg - Aurora	CP 1850 - Aurora	50	60.0	2	6	2	1.00	12.00	2398.27	15.82
Aurora - Cicero	Aurora - Cicero	50	31.4	3	11	51	1.00	3.43	2435.95	7.24
St. Paul - Plum River	Northtown - St. Croix	25	43.7	2	12	2	1.00	8.74	2540.83	14.38
St. Paul - Plum River	St. Croix - Burns	35	2.7	2	1	0	1.00	4.63	2545.46	9.23
St. Paul - Plum River	Burns - Prescott	25	0.2	1	1	0	1.00	0.48	2545.94	6.12
St. Paul - Plum River	Prescott - Mears	55	44.7	2	3	0	1.00	16.25	2594.70	19.91
St. Paul - Plum River	Mears - Trevino	60	0.8	1	1	0	1.00	0.80	2595.50	4.32
St. Paul - Plum River	Trevino - Winona Jct.	65	36.4	2	4	0	1.00	8.40	2629.10	11.80
St. Paul - Plum River	Winona Jct. - Trempealeau	45	10.8	1	1	0	1.00	14.40	2643.50	18.42
St. Paul - Plum River	Trempealeau - Sullivan	60	14.3	2	2	0	1.00	7.15	2657.80	10.67
St. Paul - Plum River	Sullivan - Graf	40	6.8	1	1	0	1.00	10.20	2668.00	14.47
St. Paul - Plum River	Graf - Crawford	65	59.3	2	6	0	1.00	9.12	2722.74	12.52
St. Paul - Plum River	Crawford - Ports	25	2.7	1	1	0	1.00	6.48	2729.22	12.12
St. Paul - Plum River	Ports - East Dubuque	65	50.4	2	5	0	1.00	9.30	2775.74	12.70
St. Paul - Plum River	East Dubuque - Portage	40	13.0	2	2	0	1.00	9.75	2795.24	14.02
St. Paul - Plum River	Portage - Galena	25	0.6	1	1	0	1.00	1.44	2796.68	7.08
St. Paul - Plum River	Galena - Savanna	65	27.9	2	3	0	1.00	8.58	2822.44	11.98
St. Paul - Plum River	Savanna - Plum River	25	1.4	2	1	0	1.00	3.36	2825.80	9.00
Plum River - Aurora	Plum River - Flag Center	65	56.0	1	8	0	1.00	6.46	2877.49	9.86

Plum River - Aurora	Flag Center - Steward	40	9.0	2	4	0	1.00	3.38	2890.99	7.65
Plum River - Aurora	Steward - Aurora	65	38.9	1	5	0	1.00	7.18	2926.90	10.58
Aurora - Cicero	Aurora - Cicero	50	31.4	3	11	51	1.00	3.43	2964.58	7.24
	No. of crew changes							14.00	3276.40	
	No. of refuelings							3.00	3546.40	
	Total									
	Model									
	Hobart - Midway									
Redondo - Riverside	Hobart - Vail	50	4.1	3	4	46	1.00	1.54	6.15	5.05
Redondo - Riverside	Vail - Basta	50	14.2	2	6	46	1.00	2.84	23.19	6.66
Redondo - Riverside	Basta - Fullerton Jct.	50	2.5	3	1	46	1.00	3.00	26.19	6.82
Redondo - Riverside	Fullerton Jct. - Atwood	50	4.9	2	1	0	1.00	5.88	32.07	9.70
Redondo - Riverside	Atwood - West Riverside	45	30.0	2	5	16	1.00	8.00	72.07	12.02
Riverside - San Bernardino	West Riverside - Highgrove	45	4.5	3	1	11	1.00	6.00	78.07	10.02
Riverside - San Bernardino	Highgrove - Colton Crossing	40	2.9	2	1	11	1.00	4.35	82.42	8.62
Colton Crossing	Colton Crossing	25	0.3	2	1	11	1.00	0.72	83.14	6.36
Riverside - San Bernardino	Colton Crossing - San Bernardino	30	3.2	3	2	11	1.00	3.20	89.54	8.23
San Bernardino - Barstow	San Bernardino - Silverwood	20	24.9	3	7	2	1.00	10.67	164.24	17.22
San Bernardino - Barstow	Silverwood - Barstow	40	61.5	2	5	2	1.00	18.45	256.49	22.72
Barstow - Daggett	Barstow - Daggett	45	6.3	2	2	2	1.00	4.20	264.89	8.22
Daggett - Williams Jct.	Daggett - Needles	55	161.6	2	23	2	1.00	7.66	441.18	11.32
Daggett - Williams Jct.	Needles - Williams Jct.	55	203.0	2	31	2	1.00	7.14	662.64	10.80
Williams Jct. - Clovis	Williams Jct. - Belen	50	375.0	2	37	2	1.00	12.16	1112.64	15.98
Williams Jct. - Clovis	Belen - Sais	50	24.6	2	6	0	1.00	4.92	1142.16	8.74
Williams Jct. - Clovis	Sais - Scholle	50	4.8	1	1	0	1.00	5.76	1147.92	9.58
Williams Jct. - Clovis	Scholle - Carnero	60	72.3	2	10	0	1.00	7.23	1220.22	10.75
Williams Jct. - Clovis	Carnero - Vaughn	60	9.4	1	2	0	1.00	4.70	1229.62	8.22
Williams Jct. - Clovis	Vaughn - CP 7197	65	68.8	2	10	0	1.00	6.35	1293.12	9.75

Williams Jct. - Clovis	CP 7197 - Fort Sumner	65	2.9	1	1	0	1.00	2.68	1295.80	6.08
Williams Jct. - Clovis	Fort Sumner - East Clovis	65	61.1	2	9	0	1.00	6.27	1352.20	9.67
Williams Jct. - Clovis	East Clovis - Lone Star Jct.	65	8.1	2	3	0	1.00	2.49	1359.68	5.89
Clovis - Amarillo	Lone Star Jct. - Eastern	65	97.1	2	19	0	1.00	4.72	1449.31	8.12
Amarillo - Avard	Eastern - East Canadian	65	96.5	2	11	0	1.00	8.10	1538.38	11.50
Amarillo - Avard	East Canadian - West Clear Creek	70	1.7	1	1	0	1.00	1.46	1539.84	4.76
Amarillo - Avard	West Clear Creek - Goodwin	65	31.3	2	4	0	1.00	7.22	1568.73	10.62
Amarillo - Avard	Goodwin - East Curtis	65	53.7	1	8	0	1.00	6.20	1618.30	9.59
Amarillo - Avard	East Curtis - Heman	70	17.2	2	2	0	1.00	7.37	1633.05	10.67
Amarillo - Avard	Heman - Waynoka	70	3.2	1	1	0	1.00	2.74	1635.79	6.04
Amarillo - Avard	Waynoka - Avard	55	11.5	2	3	0	1.00	4.18	1648.33	7.83
Avard - East Jct.	Avard - Roland	60	97.9	1	15	0	1.00	6.53	1746.23	10.04
Avard - East Jct.	Roland - Cicero	45	11.9	2	2	0	1.00	7.93	1762.10	11.95
Avard - East Jct.	Cicero - West Jct.	60	8.8	1	2	0	1.00	4.40	1770.90	7.92
Avard - East Jct.	West Jct. - East Jct.	60	6.0	2	2	0	1.00	3.00	1776.90	6.52
East Jct. - Kansas City	East Jct. - Ellinor	60	91.1	2	6	0	1.00	15.18	1868.00	18.70
East Jct. - Kansas City	Ellinor - CP 74	60	117.3	2.5	16	2	1.00	7.33	1985.30	10.85
East Jct. - Kansas City	CP 74 - Kansas City	30	7.4	3	8	2	1.00	1.85	2000.10	6.88
Kansas City - Galesburg	Kansas City - West Sibley	25	4.5	2	2	2	1.00	5.40	2010.90	11.04
Kansas City - Galesburg	West Sibley - East Sibley	30	1.4	1	1	2	1.00	2.80	2013.70	7.83
Kansas City - Galesburg	East Sibley - CP 1850	55	239.9	2	23	2	1.00	11.38	2275.41	15.03
Galesburg - Edelstein	CP1850 - Edelstein Jct.	60	37.5	2	4	0	0.00	9.38	2275.41	12.89
Edelstein - Joliet	Edelstein Jct. - Joliet	60	110.0	2	11	0	0.00	10.00	2275.41	13.52
Joliet - Corwith	Joliet - Corwith	45	31.6	2	6	16	0.00	7.02	2275.41	11.04
Galesburg - Aurora	CP 1850 - Aurora	50	60.0	2	6	2	1.00	12.00	2347.41	15.82
Aurora - Cicero	Aurora - Cicero	50	31.4	3	11	51	1.00	3.43	2385.09	7.24
St. Paul - Plum River	Northtown - St. Croix	25	43.7	2	12	2	1.00	8.74	2489.97	14.38
St. Paul - Plum River	St. Croix - Burns	35	2.7	2	1	0	1.00	4.63	2494.60	9.23
St. Paul - Plum River	Burns - Prescott	25	0.2	1	1	0	1.00	0.48	2495.08	6.12
St. Paul - Plum River	Prescott - Mears	55	44.7	2	3	0	1.00	16.25	2543.84	19.91
St. Paul - Plum River	Mears - Trevino	60	0.8	1	1	0	1.00	0.80	2544.64	4.32
St. Paul - Plum River	Trevino - Winona Jct.	65	36.4	2	4	0	1.00	8.40	2578.24	11.80
St. Paul - Plum River	Winona Jct. - Trempealeau	45	10.8	1	1	0	1.00	14.40	2592.64	18.42

St. Paul - Plum River	Trempealeau - Sullivan	60	14.3	2	2	0	1.00	7.15	2606.94	10.67
St. Paul - Plum River	Sullivan - Graf	40	6.8	1	1	0	1.00	10.20	2617.14	14.47
St. Paul - Plum River	Graf - Crawford	65	59.3	2	6	0	1.00	9.12	2671.88	12.52
St. Paul - Plum River	Crawford - Ports	25	2.7	1	1	0	1.00	6.48	2678.36	12.12
St. Paul - Plum River	Ports - East Dubuque	65	50.4	2	5	0	1.00	9.30	2724.88	12.70
St. Paul - Plum River	East Dubuque - Portage	40	13.0	2	2	0	1.00	9.75	2744.38	14.02
St. Paul - Plum River	Portage - Galena	25	0.6	1	1	0	1.00	1.44	2745.82	7.08
St. Paul - Plum River	Galena - Savanna	65	27.9	2	3	0	1.00	8.58	2771.58	11.98
St. Paul - Plum River	Savanna - Plum River	25	1.4	2	1	0	1.00	3.36	2774.94	9.00
Plum River - Aurora	Plum River - Flag Center	65	56.0	1	8	0	1.00	6.46	2826.63	9.86
Plum River - Aurora	Flag Center - Steward	40	9.0	2	4	0	1.00	3.38	2840.13	7.65
Plum River - Aurora	Steward - Aurora	65	38.9	1	5	0	1.00	7.18	2876.04	10.58
Aurora - Cicero	Aurora - Cicero	50	31.4	3	11	51	1.00	3.43	2913.72	7.24
	No. of crew changes							14.00	3225.54	
	No. of refuelings							3.00	3495.54	
	Total									
	Model									
	Oakland - Alliance									
OIG - Richmond	OIG - Stege	35	7.7	2	6	36	1.00	4.40	26.40	6.80
OIG - Richmond	Stege - Richmond	5	1.5	1	1	0	1.00	18.00	44.40	38.18
Richmond - Mariposa	Richmond - Port Chicago	35	25.0	1	6	0	1.00	7.14	87.26	11.74
Richmond - Mariposa	Port Chicago - Oakley	60	19.6	1	3	8	1.00	6.53	106.86	10.05
Richmond - Mariposa	Oakley - Bixler	70	7.2	2	2	8	1.00	3.09	113.03	6.38
Richmond - Mariposa	Bixler - Trull	50	2.6	1	1	8	1.00	3.12	116.15	6.94
Richmond - Mariposa	Trull - Holt	70	4.7	2	2	8	1.00	2.01	120.18	5.31
Richmond - Mariposa	Holt - W. Stockton	70	6.3	1	1	8	1.00	5.40	125.58	8.70
Richmond - Mariposa	W. Stockton - UP Crossing	30	1.5	2	1	8	1.00	3.00	128.58	8.03
Richmond - Mariposa	UP Crossing - Wheat	40	4.6	2	2	12	1.00	3.45	135.48	7.72
Richmond - Mariposa	Wheat - Mariposa	50	4.2	1	2	12	1.00	2.52	140.52	6.34
Mariposa - Fresno	Mariposa - Fresno	70	113.8	1	16	12	1.00	6.10	238.06	9.40
Fresno - Barstow	Fresno - Calwa	35	3.2	2	2	12	1.00	2.74	243.55	7.34
Fresno - Barstow	Calwa - Thorpe	30	1.9	1	1	12	1.00	3.80	247.35	8.83
Fresno - Barstow	Thorpe - E. Bowles	70	6.7	2	2	12	1.00	2.87	253.09	6.17
Fresno - Barstow	E. Bowles - Pitco	70	17.2	1	3	12	1.00	4.91	267.83	8.21

Fresno - Barstow	Pitco - Wagner	45	2.9	2	2	12	1.00	1.93	271.70	5.95
Fresno - Barstow	Wagner - Jastro	70	76.1	1	10	12	1.00	6.52	336.93	9.82
Fresno - Barstow	Jastro - Kern Jct.	30	5.9	2	4	12	1.00	2.95	348.73	7.98
Fresno - Barstow	Kern Jct. - Bena	50	14.2	2	5	0	1.00	3.41	365.77	7.23
Fresno - Barstow	Bena - Illmon	30	2.5	1	1	0	1.00	5.00	370.77	10.03
Fresno - Barstow	Illmon - Caliente	20	3.9	2	2	0	1.00	5.85	382.47	12.40
Fresno - Barstow	Caliente - Cable	20	21.2	1	8	0	1.00	7.95	446.07	14.50
Fresno - Barstow	Cable - S. Mojave	30	24.8	2	5	0	1.00	9.92	495.67	14.95
Fresno - Barstow	S. Mojave - Barstow	60	66.8	1	8	0	1.00	8.35	562.47	11.87
Barstow - Daggett	Barstow - Daggett	45	6.3	2	2	2	1.00	4.20	570.87	8.22
Daggett - Williams Jct.	Daggett - Needles	55	161.6	2	23	2	1.00	7.66	747.16	11.32
Daggett - Williams Jct.	Needles - Williams Jct.	55	203.0	2	31	2	1.00	7.14	968.61	10.80
Williams Jct. - Clovis	Williams Jct. - Belen	50	375.0	2	37	2	1.00	12.16	1418.61	15.98
Williams Jct. - Clovis	Belen - Sais	50	24.6	2	6	0	1.00	4.92	1448.13	8.74
Williams Jct. - Clovis	Sais - Scholle	50	4.8	1	1	0	1.00	5.76	1453.89	9.58
Williams Jct. - Clovis	Scholle - Carnero	60	72.3	2	10	0	1.00	7.23	1526.19	10.75
Williams Jct. - Clovis	Carnero - Vaughn	60	9.4	1	2	0	1.00	4.70	1535.59	8.22
Williams Jct. - Clovis	Vaughn - CP 7197	65	68.8	2	10	0	1.00	6.35	1599.10	9.75
Williams Jct. - Clovis	CP 7197 - Fort Sumner	65	2.9	1	1	0	1.00	2.68	1601.78	6.08
Williams Jct. - Clovis	Fort Sumner - East Clovis	65	61.1	2	9	0	1.00	6.27	1658.18	9.67
Williams Jct. - Clovis	East Clovis - Lone Star Jct.	65	8.1	2	3	0	1.00	2.49	1665.65	5.89
Clovis - Amarillo	Lone Star Jct. - Eastern	65	97.1	2	19	0	0.75	4.72	1732.43	8.12
Amarillo - Alliance	Eastern - BC Jct.	20	1.7	2	1	0	0.75	5.10	1736.23	11.65
Amarillo - Alliance	BC Jct - Acme	60	136.1	1	12	0	0.75	11.34	1837.62	14.86
Amarillo - Alliance	Acme - Quanah	35	4.9	2	1	0	0.75	8.40	1843.88	13.00
Amarillo - Alliance	Quanah - Orient	60	73.7	1	6	0	0.75	12.28	1898.79	15.80
Amarillo - Alliance	Orient - West Wichita	40	0.9	2	1	0	0.75	1.35	1899.79	5.62
Amarillo - Alliance	West Wichita - Alliance	60	90.0	1	10	0	0.75	9.00	1966.84	12.52
Clovis - Sweetwater	Lone Star Jct. - Lubbock	50	89.7	1	9	0	0.25	11.96	1993.21	15.78
Clovis - Sweetwater	Lubbock - East Lubbock	20	2.0	2	1	0	0.25	6.00	1994.68	12.55
Clovis - Sweetwater	East Lubbock - Sweetwater	50	116.9	1	12	0	0.25	11.69	2029.05	15.51
Sweetwater - Alliance	Sweetwater - Ft. Worth	55	196.4	1	20	0	0.25	10.71	2081.55	14.37

Sweetwater - Alliance	Ft. Worth - Alliance	35	14.0	2	3	0	0.25	8.00	2087.43	12.60
	No. of crew changes							9.00	2287.88	
	No. of refuelings							2.00	2467.88	
	Total									
	Model									
	Mariposa - Alliance									
Mariposa - Fresno	Mariposa - Fresno	70	113.8	1	16	12	1.00	12.19	195.09	9.40
Fresno - Barstow	Fresno - Calwa	35	3.2	2	2	12	1.00	2.74	200.57	7.34
Fresno - Barstow	Calwa - Thorpe	30	1.9	1	1	12	1.00	3.80	204.37	8.83
Fresno - Barstow	Thorpe - E. Bowles	70	6.7	2	2	12	1.00	2.87	210.11	6.17
Fresno - Barstow	E. Bowles - Pitco	70	17.2	1	3	12	1.00	4.91	224.86	8.21
Fresno - Barstow	Pitco - Wagner	45	2.9	2	2	12	1.00	1.93	228.72	5.95
Fresno - Barstow	Wagner - Jastro	70	76.1	1	10	12	1.00	6.52	293.95	9.82
Fresno - Barstow	Jastro - Kern Jct.	30	5.9	2	4	12	1.00	2.95	305.75	7.98
Fresno - Barstow	Kern Jct. - Bena	50	14.2	2	5	0	1.00	3.41	322.79	7.23
Fresno - Barstow	Bena - Illmon	30	2.5	1	1	0	1.00	5.00	327.79	10.03
Fresno - Barstow	Illmon - Caliente	20	3.9	2	2	0	1.00	5.85	339.49	12.40
Fresno - Barstow	Caliente - Cable	20	21.2	1	8	0	1.00	7.95	403.09	14.50
Fresno - Barstow	Cable - S. Mojave	30	24.8	2	5	0	1.00	9.92	452.69	14.95
Fresno - Barstow	S. Mojave - Barstow	60	66.8	1	8	0	1.00	8.35	519.49	11.87
Barstow - Daggett	Barstow - Daggett	45	6.3	2	2	2	1.00	4.20	527.89	8.22
Daggett - Williams Jct.	Daggett - Needles	55	161.6	2	23	2	1.00	7.66	704.18	11.32
Daggett - Williams Jct.	Needles - Williams Jct.	55	203.0	2	31	2	1.00	7.14	925.64	10.80
Williams Jct. - Clovis	Williams Jct. - Belen	50	375.0	2	37	2	1.00	12.16	1375.64	15.98
Williams Jct. - Clovis	Belen - Sais	50	24.6	2	6	0	1.00	4.92	1405.16	8.74
Williams Jct. - Clovis	Sais - Scholle	50	4.8	1	1	0	1.00	5.76	1410.92	9.58
Williams Jct. - Clovis	Scholle - Carnero	60	72.3	2	10	0	1.00	7.23	1483.22	10.75
Williams Jct. - Clovis	Carnero - Vaughn	60	9.4	1	2	0	1.00	4.70	1492.62	8.22
Williams Jct. - Clovis	Vaughn - CP 7197	65	68.8	2	10	0	1.00	6.35	1556.13	9.75
Williams Jct. - Clovis	CP 7197 - Fort Sumner	65	2.9	1	1	0	1.00	2.68	1558.80	6.08
Williams Jct. - Clovis	Fort Sumner - East Clovis	65	61.1	2	9	0	1.00	6.27	1615.20	9.67
Williams Jct. - Clovis	East Clovis - Lone Star Jct.	65	8.1	2	3	0	1.00	2.49	1622.68	5.89
Clovis - Amarillo	Lone Star Jct. - Eastern	65	97.1	2	19	0	0.75	4.72	1689.45	8.12

Amarillo - Alliance	Eastern - BC Jct.	20	1.7	2	1	0	0.75	5.10	1693.25	11.65
Amarillo - Alliance	BC Jct - Acme	60	136.1	1	12	0	0.75	11.34	1794.65	14.86
Amarillo - Alliance	Acme - Quanah	35	4.9	2	1	0	0.75	8.40	1800.91	13.00
Amarillo - Alliance	Quanah - Orient	60	73.7	1	6	0	0.75	12.28	1855.81	15.80
Amarillo - Alliance	Orient - West Wichita	40	0.9	2	1	0	0.75	1.35	1856.82	5.62
Amarillo - Alliance	West Wichita - Alliance	60	90.0	1	10	0	0.75	9.00	1923.87	12.52
Clovis - Sweetwater	Lone Star Jct. - Lubbock	50	89.7	1	9	0	0.25	11.96	1950.24	15.78
Clovis - Sweetwater	Lubbock - East Lubbock	20	2.0	2	1	0	0.25	6.00	1951.71	12.55
Clovis - Sweetwater	East Lubbock - Sweetwater	50	116.9	1	12	0	0.25	11.69	1986.08	15.51
Sweetwater - Alliance	Sweetwater - Ft. Worth	55	196.4	1	20	0	0.25	10.71	2038.57	14.37
Sweetwater - Alliance	Ft. Worth - Alliance	35	14.0	2	3	0	0.25	8.00	2044.45	12.60
	No. of crew changes							9.00	2244.91	
	No. of refuelings							2.00	2424.91	
	Total									
	Model									
	Oakland - Houston									
OIG - Richmond	OIG - Stege	35	7.7	2	6	36	1.00	4.40	26.40	6.80
OIG - Richmond	Stege - Richmond	5	1.5	1	1	0	1.00	18.00	44.40	38.18
Richmond - Mariposa	Richmond - Port Chicago	35	25.0	1	6	0	1.00	7.14	87.26	11.74
Richmond - Mariposa	Port Chicago - Oakley	60	19.6	1	3	8	1.00	6.53	106.86	10.05
Richmond - Mariposa	Oakley - Bixler	70	7.2	2	2	8	1.00	3.09	113.03	6.38
Richmond - Mariposa	Bixler - Trull	50	2.6	1	1	8	1.00	3.12	116.15	6.94
Richmond - Mariposa	Trull - Holt	70	4.7	2	2	8	1.00	2.01	120.18	5.31
Richmond - Mariposa	Holt - W. Stockton	70	6.3	1	1	8	1.00	5.40	125.58	8.70
Richmond - Mariposa	W. Stockton - UP Crossing	30	1.5	2	1	8	1.00	3.00	128.58	8.03
Richmond - Mariposa	UP Crossing - Wheat	40	4.6	2	2	12	1.00	3.45	135.48	7.72
Richmond - Mariposa	Wheat - Mariposa	50	4.2	1	2	12	1.00	2.52	140.52	6.34
Mariposa - Fresno	Mariposa - Fresno	70	113.8	1	16	12	1.00	6.10	238.06	9.40
Fresno - Barstow	Fresno - Calwa	35	3.2	2	2	12	1.00	2.74	243.55	7.34
Fresno - Barstow	Calwa - Thorpe	30	1.9	1	1	12	1.00	3.80	247.35	8.83
Fresno - Barstow	Thorpe - E. Bowles	70	6.7	2	2	12	1.00	2.87	253.09	6.17
Fresno - Barstow	E. Bowles - Pitco	70	17.2	1	3	12	1.00	4.91	267.83	8.21
Fresno - Barstow	Pitco - Wagner	45	2.9	2	2	12	1.00	1.93	271.70	5.95

Fresno - Barstow	Wagner - Jastro	70	76.1	1	10	12	1.00	6.52	336.93	9.82
Fresno - Barstow	Jastro - Kern Jct.	30	5.9	2	4	12	1.00	2.95	348.73	7.98
Fresno - Barstow	Kern Jct. - Bena	50	14.2	2	5	0	1.00	3.41	365.77	7.23
Fresno - Barstow	Bena - Illmon	30	2.5	1	1	0	1.00	5.00	370.77	10.03
Fresno - Barstow	Illmon - Caliente	20	3.9	2	2	0	1.00	5.85	382.47	12.40
Fresno - Barstow	Caliente - Cable	20	21.2	1	8	0	1.00	7.95	446.07	14.50
Fresno - Barstow	Cable - S. Mojave	30	24.8	2	5	0	1.00	9.92	495.67	14.95
Fresno - Barstow	S. Mojave - Barstow	60	66.8	1	8	0	1.00	8.35	562.47	11.87
Barstow - Daggett	Barstow - Daggett	45	6.3	2	2	2	1.00	4.20	570.87	8.22
Daggett - Williams Jct.	Daggett - Needles	55	161.6	2	23	2	1.00	7.66	747.16	11.32
Daggett - Williams Jct.	Needles - Williams Jct.	55	203.0	2	31	2	1.00	7.14	968.61	10.80
Williams Jct. - Clovis	Williams Jct. - Belen	50	375.0	2	37	2	1.00	12.16	1418.61	15.98
Williams Jct. - Clovis	Belen - Sais	50	24.6	2	6	0	1.00	4.92	1448.13	8.74
Williams Jct. - Clovis	Sais - Scholle	50	4.8	1	1	0	1.00	5.76	1453.89	9.58
Williams Jct. - Clovis	Scholle - Carnero	60	72.3	2	10	0	1.00	7.23	1526.19	10.75
Williams Jct. - Clovis	Carnero - Vaughn	60	9.4	1	2	0	1.00	4.70	1535.59	8.22
Williams Jct. - Clovis	Vaughn - CP 7197	65	68.8	2	10	0	1.00	6.35	1599.10	9.75
Williams Jct. - Clovis	CP 7197 - Fort Sumner	65	2.9	1	1	0	1.00	2.68	1601.78	6.08
Williams Jct. - Clovis	Fort Sumner - East Clovis	65	61.1	2	9	0	1.00	6.27	1658.18	9.67
Williams Jct. - Clovis	East Clovis - Lone Star Jct.	65	8.1	2	3	0	1.00	2.49	1665.65	5.89
Clovis - Sweetwater	Lone Star Jct. - Lubbock	50	89.7	1	9	0	1.00	11.96	1773.29	15.78
Clovis - Sweetwater	Lubbock - East Lubbock	20	2.0	2	1	0	1.00	6.00	1779.29	12.55
Clovis - Sweetwater	East Lubbock - Sweetwater	50	116.9	1	12	0	1.00	11.69	1919.57	15.51
Sweetwater - Temple	Sweetwater - Temple	45	241.5	1	26	0	1.00	12.38	2241.57	16.40
Temple - Houston	Temple - Rogers	30	13.5	2	3	0	1.00	9.00	2268.57	14.03
Temple - Houston	Rogers - Somerville	50	63.3	1	8	0	1.00	9.50	2344.53	13.31
Temple - Houston	Somerville - Rosenberg	45	76.2	1	7	0	1.00	14.51	2446.13	18.53
Temple - Houston	Rosenberg - Pearland	45	46.6	1	5	0	1.00	12.43	2508.27	16.45
	No. of crew changes							10.00	2730.99	
	No. of refuelings							2.00	2910.99	
	Total									
	Model									

	Mariposa - Pearland									
Mariposa - Fresno	Mariposa - Fresno	70	113.8	1	16	12	1.00	12.19	195.09	9.40
Fresno - Barstow	Fresno - Calwa	35	3.2	2	2	12	1.00	2.74	200.57	7.34
Fresno - Barstow	Calwa - Thorpe	30	1.9	1	1	12	1.00	3.80	204.37	8.83
Fresno - Barstow	Thorpe - E. Bowles	70	6.7	2	2	12	1.00	2.87	210.11	6.17
Fresno - Barstow	E. Bowles - Pitco	70	17.2	1	3	12	1.00	4.91	224.86	8.21
Fresno - Barstow	Pitco - Wagner	45	2.9	2	2	12	1.00	1.93	228.72	5.95
Fresno - Barstow	Wagner - Jastro	70	76.1	1	10	12	1.00	6.52	293.95	9.82
Fresno - Barstow	Jastro - Kern Jct.	30	5.9	2	4	12	1.00	2.95	305.75	7.98
Fresno - Barstow	Kern Jct. - Bena	50	14.2	2	5	0	1.00	3.41	322.79	7.23
Fresno - Barstow	Bena - Illmon	30	2.5	1	1	0	1.00	5.00	327.79	10.03
Fresno - Barstow	Illmon - Caliente	20	3.9	2	2	0	1.00	5.85	339.49	12.40
Fresno - Barstow	Caliente - Cable	20	21.2	1	8	0	1.00	7.95	403.09	14.50
Fresno - Barstow	Cable - S. Mojave	30	24.8	2	5	0	1.00	9.92	452.69	14.95
Fresno - Barstow	S. Mojave - Barstow	60	66.8	1	8	0	1.00	8.35	519.49	11.87
Barstow - Daggett	Barstow - Daggett	45	6.3	2	2	2	1.00	4.20	527.89	8.22
Daggett - Williams Jct.	Daggett - Needles	55	161.6	2	23	2	1.00	7.66	704.18	11.32
Daggett - Williams Jct.	Needles - Williams Jct.	55	203.0	2	31	2	1.00	7.14	925.64	10.80
Williams Jct. - Clovis	Williams Jct. - Belen	50	375.0	2	37	2	1.00	12.16	1375.64	15.98
Williams Jct. - Clovis	Belen - Sais	50	24.6	2	6	0	1.00	4.92	1405.16	8.74
Williams Jct. - Clovis	Sais - Scholle	50	4.8	1	1	0	1.00	5.76	1410.92	9.58
Williams Jct. - Clovis	Scholle - Carnero	60	72.3	2	10	0	1.00	7.23	1483.22	10.75
Williams Jct. - Clovis	Carnero - Vaughn	60	9.4	1	2	0	1.00	4.70	1492.62	8.22
Williams Jct. - Clovis	Vaughn - CP 7197	65	68.8	2	10	0	1.00	6.35	1556.13	9.75
Williams Jct. - Clovis	CP 7197 - Fort Sumner	65	2.9	1	1	0	1.00	2.68	1558.80	6.08
Williams Jct. - Clovis	Fort Sumner - East Clovis	65	61.1	2	9	0	1.00	6.27	1615.20	9.67
Williams Jct. - Clovis	East Clovis - Lone Star Jct.	65	8.1	2	3	0	1.00	2.49	1622.68	5.89
Clovis - Sweetwater	Lone Star Jct. - Lubbock	50	89.7	1	9	0	1.00	11.96	1730.32	15.78
Clovis - Sweetwater	Lubbock - East Lubbock	20	2.0	2	1	0	1.00	6.00	1736.32	12.55
Clovis - Sweetwater	East Lubbock - Sweetwater	50	116.9	1	12	0	1.00	11.69	1876.60	15.51
Sweetwater - Temple	Sweetwater - Temple	45	241.5	1	26	0	1.00	12.38	2198.60	16.40
Temple - Houston	Temple - Rogers	30	13.5	2	3	0	1.00	9.00	2225.60	14.03

Temple - Houston	Rogers - Somerville	50	63.3	1	8	0	1.00	9.50	2301.56	13.31
Temple - Houston	Somerville - Rosenberg	45	76.2	1	7	0	1.00	14.51	2403.16	18.53
Temple - Houston	Rosenberg - Pearland	45	46.6	1	5	0	1.00	12.43	2465.29	16.45
	No. of crew changes							10.00	2688.02	
	No. of refuelings							2.00	2868.02	
	Total									
	Model									

UP Lanes

Zone		Avg. Speed	Miles	Tracks	Seg-ments	Psgr Trains	Route Allocation	SCT Mins per segment	Cum SCT (mins)	PT Mins per segment
	Seattle/Tacoma - Chicago Intl									
Argo - Black River	Argo - Black River	25	6.6	3	3	28	0.50	10.56	15.84	10.92
Black River - Tacoma	Black River - Reservation	35	26.3	1	3	0	0.50	15.03	38.38	19.63
Tacoma - Vancouver, WA	Reservation - Ruston	20	6.8	2	2	8	1.00	10.20	58.78	16.75
Tacoma - Vancouver, WA	Ruston - Nelson Bennett	30	1.6	1	1	8	1.00	3.20	61.98	8.23
Tacoma - N. Portland Jct.	Nelson Bennett - N. Portland Jct.	45	131.5	2	23	8	1.00	7.62	237.32	11.64
N. Portland Jct. - Peninsula Jct.	N. Portland Jct. - Peninsula Jct.	15	1.0	1	1	0	1.00	4.00	241.32	12.06
Peninsula Jct. - Granger	Albina - Peninsula Jct.	20	4.0	1	1	0	0.00	12.00	241.32	18.55
Peninsula Jct. - Granger	Peninsula Jct. - Troutdale	35	20.4	1	3	0	1.00	11.66	276.29	16.25
Peninsula Jct. - Granger	Troutdale - Crates	45	64.5	1	7	0	1.00	12.29	362.29	16.31
Peninsula Jct. - Granger	Crates - Biggs	45	21.6	2	3	0	1.00	9.60	391.09	13.62
Peninsula Jct. - Granger	Biggs - Westland	55	78.9	1	10	0	1.00	8.61	477.16	12.26
Peninsula Jct. - Granger	Westland - Stanfield	25	5.9	2	3	0	1.00	4.72	491.32	10.36
Peninsula Jct. - Granger	Stanfield - Gibbon	45	48.3	1	10	0	1.00	6.44	555.72	10.46
Peninsula Jct. - Granger	Gibbon - Highbridge	25	25.7	1	5	0	1.00	12.34	617.40	17.97
Peninsula Jct. - Granger	Highbridge - Nordeen	18	9.0	2	2	0	1.00	15.00	647.40	22.05
Peninsula Jct. - Granger	Nordeen - W. La Grande	18	15.6	1	3	0	1.00	17.33	699.40	24.38
Peninsula Jct. - Granger	W. La Grande - Lone Tree	20	7.6	2	3	0	1.00	7.60	722.20	14.15
Peninsula Jct. - Granger	Lone Tree - Telocaset	40	18.1	1	3	0	1.00	9.05	749.35	13.32
Peninsula Jct. - Granger	Telocaset - Sago	40	3.3	2	1	0	1.00	4.95	754.30	9.22
Peninsula Jct. - Granger	Sago - W. Encina	45	35.7	1	6	0	1.00	7.93	801.90	11.95
Peninsula Jct. - Granger	W. Encina - Pleasant Valley	30	5.0	2	2	0	1.00	5.00	811.90	10.03
Peninsula Jct. - Granger	Pleasant Valley - Oxman	18	4.3	1	1	0	1.00	14.33	826.23	21.38
Peninsula Jct. - Granger	Oxman - Prichard Creek	18	5.6	2	1	0	1.00	18.67	844.90	25.72
Peninsula Jct. - Granger	Prichard Creek - W. Nampa	45	99.3	1	14	0	1.00	9.46	977.30	13.48
Peninsula Jct. - Granger	W. Nampa - Fox	35	15.9	2	3	0	1.00	9.09	1004.56	13.68
Peninsula Jct. - Granger	Fox - Reverse	55	55.5	1	7	0	1.00	8.65	1065.10	12.30
Peninsula Jct. - Granger	Reverse - Ticeska	55	37.3	2	3	0	1.00	13.56	1105.79	17.22
Peninsula Jct. - Granger	Ticeska - Shoshone	65	32.9	1	5	0	1.00	6.07	1136.16	9.47

Peninsula Jct. - Granger	Shoshone - Dietrich	55	8.4	2	1	0	1.00	9.16	1145.33	12.82
Peninsula Jct. - Granger	Dietrich - Michaud	55	92.0	1	14	0	1.00	7.17	1245.69	10.82
Peninsula Jct. - Granger	Michaud - McCammon	35	33.0	2	6	0	1.00	9.43	1302.26	14.03
Peninsula Jct. - Granger	McCammon - Topaz	35	3.8	1	1	0	1.00	6.51	1308.78	11.11
Peninsula Jct. - Granger	Topaz - Blaser	45	8.9	2	2	0	1.00	5.93	1320.64	9.95
Peninsula Jct. - Granger	Blaser - Pescadero	55	56.6	1	8	0	1.00	7.72	1382.39	11.37
Peninsula Jct. - Granger	Pescadero - Dingle	55	12.5	2	3	0	1.00	4.55	1396.02	8.20
Peninsula Jct. - Granger	Dingle - Granger	55	107.9	1	17	0	1.00	6.92	1513.73	10.58
Granger - Gibbon	Granger - W. Laramie	50	276.9	2	40	0	1.00	8.31	1846.01	12.13
Granger - Gibbon	W. Laramie - Hermosa	30	23.2	3	4	0	1.00	11.60	1892.41	16.63
Granger - Gibbon	Hermosa - Dale Jct.	30	1.8	2	1	0	1.00	3.60	1896.01	8.63
Granger - Gibbon	Dale Jct. - Barnett	30	39.0	3	6	0	1.00	13.00	1974.01	18.03
Granger - Gibbon	Barnett - O'Fallons	50	206.2	2	22	0	1.00	11.25	2221.45	15.07
Granger - Gibbon	O'Fallons - Gibbon	40	124.8	3	21	0	1.00	8.91	2408.65	13.19
Gibbon - Nelson	Gibbon - Missouri Valley	55	198.1	2	19	0	1.00	11.37	2624.76	15.03
Gibbon - Nelson	Missouri Valley - MP 271.5	55	57.9	2	5	0	1.00	12.63	2687.93	16.29
Gibbon - Nelson	MP 271.5 - MP 266	35	5.5	2	1	0	1.00	9.43	2697.35	14.03
Gibbon - Nelson	MP 266- MP 208	50	58.0	2	6	0	1.00	11.60	2766.95	15.42
Gibbon - Nelson	MP 208 - Boone	30	5.8	2	1	0	1.00	11.60	2778.55	16.63
Gibbon - Nelson	Boone - Clinton	50	196.6	2	19	0	1.00	12.42	3014.47	16.24
Gibbon - Nelson	Clinton - East Clinton	25	4.0	2	1	0	1.00	9.60	3024.07	15.24
Gibbon - Nelson	East Clinton - Nelson	55	31.5	2	3	0	1.00	11.45	3058.44	15.11
Nelson - Global 3	Nelson - Global 3	55	64.2	2	6	0	1.00	11.67	3128.47	15.33
Global 3 - Global 2	Global 3 - Elburn	55	30.8	2	4	0	0.67	8.40	3150.99	12.05
Global 3 - Global 2	Elburn - GX	50	6.8	3	1	58	0.67	8.16	3156.45	11.98
Global 3 - Global 2	GX - WX	50	5.1	2	1	58	0.67	6.12	3160.55	9.94
Global 3 - Global 2	WX - Proviso (Global 2)	50	17.6	3	5	58	0.67	4.22	3174.70	8.04
Global 2 - Global 1	Proviso - Kedzie	35	10.9	4	3	58	0.33	6.23	3180.87	10.83
Global 2 - Global 1	Kedzie - Wood Street (Global 1)	20	2.5	3	1	58	0.33	7.50	3183.35	14.05
	No. of crew changes							11.00	3428.35	
	No. of refuelings							2.00	3608.35	
	Total									
	Model									
	PNW - Chicago Domestic									

Argo - Black River	Argo - Black River	25	6.6	3	3	28	1.00	10.56	31.68	10.92
Black River - Tacoma	Black River - Reservation	35	26.3	1	3	0	1.00	15.03	76.77	19.63
Tacoma - N. Portland Jct.	Reservation - Ruston	20	6.8	2	2	8	1.00	10.20	97.17	16.75
Tacoma - N. Portland Jct.	Ruston - Nelson Bennett	30	1.6	1	1	8	1.00	3.20	100.37	8.23
Tacoma - N. Portland Jct.	Nelson Bennett - N. Portland Jct.	45	131.5	2	23	8	1.00	7.62	275.70	11.64
N. Portland Jct. - Peninsula Jct.	N. Portland Jct. - Peninsula Jct.	15	1.0	1	1	0	1.00	4.00	279.70	12.06
Peninsula Jct. - Granger	Albina - Peninsula Jct.	20	4.0	1	1	0	1.00	12.00	291.70	18.55
Peninsula Jct. - Granger	Peninsula Jct. - Troutdale	35	20.4	1	3	0	1.00	11.66	326.67	16.25
Peninsula Jct. - Granger	Troutdale - Crates	45	64.5	1	7	0	1.00	12.29	412.67	16.31
Peninsula Jct. - Granger	Crates - Biggs	45	21.6	2	3	0	1.00	9.60	441.47	13.62
Peninsula Jct. - Granger	Biggs - Westland	55	78.9	1	10	0	1.00	8.61	527.54	12.26
Peninsula Jct. - Granger	Westland - Stanfield	25	5.9	2	3	0	1.00	4.72	541.70	10.36
Peninsula Jct. - Granger	Stanfield - Gibbon	45	48.3	1	10	0	1.00	6.44	606.10	10.46
Peninsula Jct. - Granger	Gibbon - Highbridge	25	25.7	1	5	0	1.00	12.34	667.78	17.97
Peninsula Jct. - Granger	Highbridge - Nordeen	18	9.0	2	2	0	1.00	15.00	697.78	22.05
Peninsula Jct. - Granger	Nordeen - W. La Grande	18	15.6	1	3	0	1.00	17.33	749.78	24.38
Peninsula Jct. - Granger	W. La Grande - Lone Tree	20	7.6	2	3	0	1.00	7.60	772.58	14.15
Peninsula Jct. - Granger	Lone Tree - Telocaset	40	18.1	1	3	0	1.00	9.05	799.73	13.32
Peninsula Jct. - Granger	Telocaset - Sago	40	3.3	2	1	0	1.00	4.95	804.68	9.22
Peninsula Jct. - Granger	Sago - W. Encina	45	35.7	1	6	0	1.00	7.93	852.28	11.95
Peninsula Jct. - Granger	W. Encina - Pleasant Valley	30	5.0	2	2	0	1.00	5.00	862.28	10.03
Peninsula Jct. - Granger	Pleasant Valley - Oxman	18	4.3	1	1	0	1.00	14.33	876.62	21.38
Peninsula Jct. - Granger	Oxman - Prichard Creek	18	5.6	2	1	0	1.00	18.67	895.28	25.72
Peninsula Jct. - Granger	Prichard Creek - W. Nampa	45	99.3	1	14	0	1.00	9.46	1027.68	13.48
Peninsula Jct. - Granger	W. Nampa - Fox	35	15.9	2	3	0	1.00	9.09	1054.94	13.68
Peninsula Jct. - Granger	Fox - Reverse	55	55.5	1	7	0	1.00	8.65	1115.49	12.30
Peninsula Jct. - Granger	Reverse - Ticeska	55	37.3	2	3	0	1.00	13.56	1156.18	17.22
Peninsula Jct. - Granger	Ticeska - Shoshone	65	32.9	1	5	0	1.00	6.07	1186.55	9.47
Peninsula Jct. - Granger	Shoshone - Dietrich	55	8.4	2	1	0	1.00	9.16	1195.71	12.82
Peninsula Jct. - Granger	Dietrich - Michaud	55	92.0	1	14	0	1.00	7.17	1296.07	10.82
Peninsula Jct. - Granger	Michaud - McCammon	35	33.0	2	6	0	1.00	9.43	1352.64	14.03
Peninsula Jct. - Granger	McCammon - Topaz	35	3.8	1	1	0	1.00	6.51	1359.16	11.11
Peninsula Jct. - Granger	Topaz - Blaser	45	8.9	2	2	0	1.00	5.93	1371.03	9.95

Peninsula Jct. - Granger	Blaser - Pescadero	55	56.6	1	8	0	1.00	7.72	1432.77	11.37
Peninsula Jct. - Granger	Pescadero - Dingle	55	12.5	2	3	0	1.00	4.55	1446.41	8.20
Peninsula Jct. - Granger	Dingle - Granger	55	107.9	1	17	0	1.00	6.92	1564.12	10.58
Granger - Gibbon	Granger - W. Laramie	50	276.9	2	40	0	1.00	8.31	1896.40	12.13
Granger - Gibbon	W. Laramie - Hermosa	30	23.2	3	4	0	1.00	11.60	1942.80	16.63
Granger - Gibbon	Hermosa - Dale Jct.	30	1.8	2	1	0	1.00	3.60	1946.40	8.63
Granger - Gibbon	Dale Jct. - Barnett	30	39.0	3	6	0	1.00	13.00	2024.40	18.03
Granger - Gibbon	Barnett - O'Fallons	50	206.2	2	22	0	1.00	11.25	2271.84	15.07
Granger - Gibbon	O'Fallons - Gibbon	40	124.8	3	21	0	1.00	8.91	2459.04	13.19
Gibbon - Nelson	Gibbon - Missouri Valley	55	198.1	2	19	0	1.00	11.37	2675.15	15.03
Gibbon - Nelson	Missouri Valley - MP 271.5	55	57.9	2	5	0	1.00	12.63	2738.31	16.29
Gibbon - Nelson	MP 271.5 - MP 266	35	5.5	2	1	0	1.00	9.43	2747.74	14.03
Gibbon - Nelson	MP 266- MP 208	50	58.0	2	6	0	1.00	11.60	2817.34	15.42
Gibbon - Nelson	MP 208 - Boone	30	5.8	2	1	0	1.00	11.60	2828.94	16.63
Gibbon - Nelson	Boone - Clinton	50	196.6	2	19	0	1.00	12.42	3064.86	16.24
Gibbon - Nelson	Clinton - East Clinton	25	4.0	2	1	0	1.00	9.60	3074.46	15.24
Gibbon - Nelson	East Clinton - Nelson	55	31.5	2	3	0	1.00	11.45	3108.82	15.11
Nelson - Global 3	Nelson - Global 3	55	64.2	2	6	0	1.00	11.67	3178.86	15.33
Global 3 - Global 2	Global 3 - Elburn	55	30.8	2	4	0	0.67	8.40	3201.37	12.05
Global 3 - Global 2	Elburn - GX	50	6.8	3	1	58	0.67	8.16	3206.84	11.98
Global 3 - Global 2	GX - WX	50	5.1	2	1	58	0.67	6.12	3210.94	9.94
Global 3 - Global 2	WX - Proviso (Global 2)	50	17.6	3	5	58	0.67	4.22	3225.09	8.04
Global 2 - Global 1	Proviso - Kedzie	35	10.9	4	3	58	0.33	6.23	3231.25	10.83
Global 2 - Global 1	Kedzie - Wood Street (Global 1)	20	2.5	3	1	58	0.33	7.50	3233.73	14.05
	No. of crew changes							11.00	3478.73	
	No. of refuelings							2.00	3658.73	
	Total									
	Model									
	East LA - Chicago via Ogden									
LALB - Redondo	LALB - Redondo	30	19.3	3	12	0	0.00	4.02	0.00	8.25
Redondo - Colton	East LA - City of Industry	40	11.3	2	4	1	1.00	5.30	21.19	8.51
Redondo - Colton	City of Industry - Colton	40	36.0	2	8	1	1.00	6.75	75.19	11.02
Riverside - Colton	West Riverside - Highgrove	45	4.5	3	1	11	0.40	0.00	75.19	10.02
Riverside - Colton	Highgrove - Colton	40	2.9	2	1	11	0.40	0.00	75.19	8.62

Colton Crossing	Colton Crossing	25	0.3	2	1	11	1.00	0.72	75.91	6.36
Colton - San Bernardino	Colton - San Bernardino	30	3.2	3	3	11	1.00	2.13	82.31	7.16
San Bernardino - Barstow	San Bernardino - Silverwood	20	24.9	3	7	2	1.00	10.67	157.01	17.22
San Bernardino - Barstow	Silverwood - Barstow	40	61.5	2	10	2	1.00	9.23	249.26	13.50
Barstow - Daggett	Barstow - Daggett	45	6.3	2	2	2	1.00	4.20	257.66	8.22
Daggett - Ogden	Daggett - Smelter	50	611.1	1	93	0	1.00	7.89	990.98	11.70
Daggett - Ogden	Smelter - Ogden	40	56.8	2	10	2	1.00	8.52	1076.18	12.79
Ogden - Granger	Ogden - Granger	40	146.1	2	13	0	1.00	16.86	1295.33	21.13
Granger - Gibbon	Granger - W. Laramie	50	276.9	2	40	0	1.00	8.31	1627.61	12.13
Granger - Gibbon	W. Laramie - Hermosa	30	23.2	3	4	0	1.00	11.60	1674.01	16.63
Granger - Gibbon	Hermosa - Dale Jct.	30	1.8	2	1	0	1.00	3.60	1677.61	8.63
Granger - Gibbon	Dale Jct. - Barnett	30	39.0	3	6	0	1.00	13.00	1755.61	18.03
Granger - Gibbon	Barnett - O'Fallons	50	206.2	2	22	0	1.00	11.25	2003.05	15.07
Granger - Gibbon	O'Fallons - Gibbon	40	124.8	3	21	0	1.00	8.91	2190.25	13.19
Gibbon - Nelson	Gibbon - Missouri Valley	55	198.1	2	19	0	1.00	11.37	2406.36	15.03
Gibbon - Nelson	Missouri Valley - MP 271.5	55	57.9	2	5	0	1.00	12.63	2469.52	16.29
Gibbon - Nelson	MP 271.5 - MP 266	35	5.5	2	1	0	1.00	9.43	2478.95	14.03
Gibbon - Nelson	MP 266- MP 208	50	58.0	2	6	0	1.00	11.60	2548.55	15.42
Gibbon - Nelson	MP 208 - Boone	30	5.8	2	1	0	1.00	11.60	2560.15	16.63
Gibbon - Nelson	Boone - Clinton	50	196.6	2	19	0	1.00	12.42	2796.07	16.24
Gibbon - Nelson	Clinton - East Clinton	25	4.0	2	1	0	1.00	9.60	2805.67	15.24
Gibbon - Nelson	East Clinton - Nelson	55	31.5	2	3	0	1.00	11.45	2840.03	15.11
Nelson - Global 3	Nelson - Global 3	55	64.2	2	6	0	1.00	11.67	2910.07	15.33
Global 3 - Global 2	Global 3 - Elburn	55	30.8	2	4	0	0.67	8.40	2932.58	12.05
Global 3 - Global 2	Elburn - GX	50	6.8	3	1	58	0.67	8.16	2938.05	11.98
Global 3 - Global 2	GX - WX	50	5.1	2	1	58	0.67	6.12	2942.15	9.94
Global 3 - Global 2	WX - Proviso (Global 2)	50	17.6	3	5	58	0.67	4.22	2956.30	8.04
Global 2 - Global 1	Proviso - Kedzie	35	10.9	4	3	58	0.33	6.23	2962.47	10.83
Global 2 - Global 1	Kedzie - Wood Street (Global 1)	20	2.5	3	1	58	0.33	7.50	2964.94	14.05
	No. of crew changes							10.00	3187.67	
	No. of refuelings							2.00	3367.67	
	Total									
	Model									
	LALB - Chicago via Dalhart									

LALB - Redondo	LALB - Redondo	30	19.3	3	12	0	1.00	4.02	48.25	8.25
Redondo - Colton	Redondo - City of Industry	40	12.0	2	4	1	1.00	5.63	22.50	8.77
Redondo - Colton	City of Industry - Colton	40	36.0	2	8	1	1.00	6.75	76.50	11.02
Riverside - Colton	West Riverside - Highgrove	45	4.5	3	1	11	0.40	0.00	76.50	10.02
Riverside - Colton	Highgrove - Colton	40	2.9	2	1	11	0.40	0.00	76.50	8.62
Colton Crossing	Colton Crossing	25	0.3	2	1	11	1.00	0.72	77.22	6.36
Colton - El Paso	Colton - Garnet	30	49.3	2	8	1	1.00	12.33	175.82	17.36
Colton - El Paso	Garnet - W. Indio	50	22.3	1	5	1	1.00	5.35	202.58	9.17
Colton - El Paso	W. Indio - Coachella	50	4.8	2	1	1	1.00	5.76	208.34	9.58
Colton - El Paso	Coachella - Araz	50	111.4	1	16	1	1.00	8.36	342.02	12.17
Colton - El Paso	Araz - East Yard	25	11.7	2	2	1	1.00	14.04	370.10	19.68
Colton - El Paso	East Yard - Fortuna	50	2.4	1	1	1	1.00	2.88	372.98	6.70
Colton - El Paso	Fortuna - Blaisdell	55	6.4	2	1	1	1.00	6.98	379.96	10.63
Colton - El Paso	Blaisdell - Dome	45	4.3	1	1	1	1.00	5.73	385.70	9.75
Colton - El Paso	Dome - Wellton	55	17.6	2	2	1	1.00	9.60	404.90	13.25
Colton - El Paso	Wellton - Stanwix	55	48.3	1	6	1	1.00	8.78	457.59	12.43
Colton - El Paso	Stanwix - Sentinel	55	12.1	2	1	1	1.00	13.20	470.79	16.85
Colton - El Paso	Sentinel - Petrie	55	152.0	1	20	1	1.00	8.29	636.60	11.94
Colton - El Paso	Petrie - Cochise	30	84.7	2	12	1	1.00	14.12	806.00	19.15
Colton - El Paso	Cochise - Raso	55	15.7	1	2	1	1.00	8.56	823.13	12.22
Colton - El Paso	Raso - Luzena	55	10.6	2	1	1	1.00	11.56	834.70	15.22
Colton - El Paso	Luzena - San Simon	55	21.2	1	3	1	1.00	7.71	857.82	11.36
Colton - El Paso	San Simon - Mondel	45	21.8	2	4	1	1.00	7.27	886.89	11.29
Colton - El Paso	Mondel - Lordsburg	55	15.1	1	2	1	1.00	8.24	903.36	11.89
Colton - El Paso	Lordsburg - Strauss	55	130.8	2	14	1	1.00	10.19	1046.05	13.85
Colton - El Paso	Strauss - Tower 47	20	19.2	2	6	1	1.00	9.60	1103.65	16.15
El Paso - West Topeka	Tower 47 - Dalhart	55	428.6	1	29	0	1.00	16.12	1571.22	19.78
El Paso - West Topeka	Dalhart - Herington	60	370.4	1	26	0	1.00	14.25	1941.62	17.76
El Paso - West Topeka	Herington - East Herington	50	3.5	2	1	0	1.00	4.20	1945.82	8.02
El Paso - West Topeka	East Herington - Dwight	60	20.6	1	2	0	1.00	10.30	1966.42	13.82
El Paso - West Topeka	Dwight - Volland	60	14.0	2	2	0	1.00	7.00	1980.42	10.52
El Paso - West Topeka	Volland - West Topeka	60	39.9	1	3	0	1.00	13.30	2020.32	16.82
West Topeka - Kansas City	West Topeka - Kansas City	50	71.2	2	8	0	1.00	10.68	2105.76	14.50
Kansas City - Galesburg	Kansas City - West Sibley	25	4.5	2	2	2	1.00	5.40	2116.56	11.04

Kansas City - Galesburg	West Sibley - East Sibley	30	1.4	1	1	2	1.00	2.80	2119.36	7.83
Kansas City - Galesburg	East Sibley - CP 1850	55	239.9	2	23	2	1.00	11.38	2381.07	15.03
Galesburg - Edelstein	CP1850 - Edelstein Jct.	60	37.5	2	4	0	1.00	9.38	2418.57	12.89
Edelstein - Nelson	Edelstein Jct. - Nelson	45	65.0	1	3	0	1.00	28.89	2505.23	32.91
Nelson - Global 3	Nelson - Global 3	55	64.2	2	6	0	1.00	11.67	2575.27	15.33
Global 3 - Global 2	Global 3 - Elburn	55	30.8	2	4	0	0.67	8.40	2597.78	12.05
Global 3 - Global 2	Elburn - GX	50	6.8	3	1	58	0.67	8.16	2603.25	11.98
Global 3 - Global 2	GX - WX	50	5.1	2	1	58	0.67	6.12	2607.35	9.94
Global 3 - Global 2	WX - Proviso (Global 2)	50	17.6	3	5	58	0.67	4.22	2621.50	8.04
Global 2 - Global 1	Proviso - Kedzie	35	10.9	4	3	58	0.33	6.23	2627.66	10.83
Global 2 - Global 1	Kedzie - Wood Street (Global 1)	20	2.5	3	1	58	0.33	7.50	2630.14	14.05
	No. of crew changes							11.00	2875.14	
	No. of refuelings							2.00	3055.14	
	Total									
	Model									
	LALB - Dallas									
LALB - Redondo	LALB - Redondo	30	19.3	3	12	0	1.00	4.02	48.25	8.25
Redondo - Colton	Redondo - City of Industry	40	12.0	2	4	1	1.00	5.63	22.50	8.77
Redondo - Colton	City of Industry - Colton	40	36.0	2	8	1	1.00	6.75	76.50	11.02
Riverside - Colton	West Riverside - Highgrove	45	4.5	3	1	11	0.40	0.00	76.50	10.02
Riverside - Colton	Highgrove - Colton	40	2.9	2	1	11	0.40	0.00	76.50	8.62
Colton Crossing	Colton Crossing	25	0.3	2	1	11	1.00	0.72	77.22	6.36
Colton - El Paso	Colton - Garnet	30	49.3	2	8	1	1.00	12.33	175.82	17.36
Colton - El Paso	Garnet - W. Indio	50	22.3	1	5	1	1.00	5.35	202.58	9.17
Colton - El Paso	W. Indio - Coachella	50	4.8	2	1	1	1.00	5.76	208.34	9.58
Colton - El Paso	Coachella - Araz	50	111.4	1	16	1	1.00	8.36	342.02	12.17
Colton - El Paso	Araz - East Yard	25	11.7	2	2	1	1.00	14.04	370.10	19.68
Colton - El Paso	East Yard - Fortuna	50	2.4	1	1	1	1.00	2.88	372.98	6.70
Colton - El Paso	Fortuna - Blaisdell	55	6.4	2	1	1	1.00	6.98	379.96	10.63
Colton - El Paso	Blaisdell - Dome	45	4.3	1	1	1	1.00	5.73	385.70	9.75
Colton - El Paso	Dome - Wellton	55	17.6	2	2	1	1.00	9.60	404.90	13.25
Colton - El Paso	Wellton - Stanwix	55	48.3	1	6	1	1.00	8.78	457.59	12.43
Colton - El Paso	Stanwix - Sentinel	55	12.1	2	1	1	1.00	13.20	470.79	16.85
Colton - El Paso	Sentinel - Petrie	55	152.0	1	20	1	1.00	8.29	636.60	11.94

Colton - El Paso	Petrie - Cochise	30	84.7	2	12	1	1.00	14.12	806.00	19.15
Colton - El Paso	Cochise - Raso	55	15.7	1	2	1	1.00	8.56	823.13	12.22
Colton - El Paso	Raso - Luzena	55	10.6	2	1	1	1.00	11.56	834.70	15.22
Colton - El Paso	Luzena - San Simon	55	21.2	1	3	1	1.00	7.71	857.82	11.36
Colton - El Paso	San Simon - Mondel	45	21.8	2	4	1	1.00	7.27	886.89	11.29
Colton - El Paso	Mondel - Lordsburg	55	15.1	1	2	1	1.00	8.24	903.36	11.89
Colton - El Paso	Lordsburg - Strauss	55	130.8	2	14	1	1.00	10.19	1046.05	13.85
Colton - El Paso	Strauss - Tower 47	20	19.2	2	6	1	1.00	9.60	1103.65	16.15
El Paso - Sierra Blanca	Tower 47 - Belen	20	12.4	2	5	1	1.00	7.44	1140.85	13.99
El Paso - Sierra Blanca	Belen - Sierra Blanca	55	73.1	1	8	1	1.00	9.97	1220.60	13.62
Sierra Blanca - Sweetwater	Sierra Blanca - Sweetwater	55	320.9	1	23	0	1.00	15.22	1570.67	18.87
Sweetwater - Ft. Worth	Sweetwater - Ft. Worth	55	196.4	1	20	0	1.00	10.71	1784.93	14.37
Ft. Worth - Dallas	Ft. Worth - Tower 19 (Dallas)	45	37.2	2	10	1	1.00	4.96	1834.53	8.98
	No. of crew changes							7.00	1990.43	
	No. of refuelings							1.00	2080.43	
	Total									
	Model									
	East LA - Dallas									
LALB - Redondo	LALB - Redondo	30	19.3	3	12	0	0.00	4.02	0.00	8.25
Redondo - Colton	East LA - City of Industry	40	11.3	2	4	1	1.00	5.30	21.19	8.51
Redondo - Colton	City of Industry - Colton	40	36.0	2	8	1	1.00	6.75	75.19	11.02
Riverside - Colton	West Riverside - Highgrove	45	4.5	3	1	11	0.40	0.00	75.19	10.02
Riverside - Colton	Highgrove - Colton	40	2.9	2	1	11	0.40	0.00	75.19	8.62
Colton Crossing	Colton Crossing	25	0.3	2	1	11	1.00	0.72	75.91	6.36
Colton - El Paso	Colton - Garnet	30	49.3	2	8	1	1.00	12.33	174.51	17.36
Colton - El Paso	Garnet - W. Indio	50	22.3	1	5	1	1.00	5.35	201.27	9.17
Colton - El Paso	W. Indio - Coachella	50	4.8	2	1	1	1.00	5.76	207.03	9.58
Colton - El Paso	Coachella - Araz	50	111.4	1	16	1	1.00	8.36	340.71	12.17
Colton - El Paso	Araz - East Yard	25	11.7	2	2	1	1.00	14.04	368.79	19.68
Colton - El Paso	East Yard - Fortuna	50	2.4	1	1	1	1.00	2.88	371.67	6.70
Colton - El Paso	Fortuna - Blaisdell	55	6.4	2	1	1	1.00	6.98	378.65	10.63
Colton - El Paso	Blaisdell - Dome	45	4.3	1	1	1	1.00	5.73	384.38	9.75
Colton - El Paso	Dome - Wellton	55	17.6	2	2	1	1.00	9.60	403.58	13.25
Colton - El Paso	Wellton - Stanwix	55	48.3	1	6	1	1.00	8.78	456.27	12.43

Colton - El Paso	Stanwix - Sentinel	55	12.1	2	1	1	1.00	13.20	469.47	16.85
Colton - El Paso	Sentinel - Petrie	55	152.0	1	20	1	1.00	8.29	635.29	11.94
Colton - El Paso	Petrie - Cochise	30	84.7	2	12	1	1.00	14.12	804.69	19.15
Colton - El Paso	Cochise - Raso	55	15.7	1	2	1	1.00	8.56	821.82	12.22
Colton - El Paso	Raso - Luzena	55	10.6	2	1	1	1.00	11.56	833.38	15.22
Colton - El Paso	Luzena - San Simon	55	21.2	1	3	1	1.00	7.71	856.51	11.36
Colton - El Paso	San Simon - Mondel	45	21.8	2	4	1	1.00	7.27	885.58	11.29
Colton - El Paso	Mondel - Lordsburg	55	15.1	1	2	1	1.00	8.24	902.05	11.89
Colton - El Paso	Lordsburg - Strauss	55	130.8	2	14	1	1.00	10.19	1044.74	13.85
Colton - El Paso	Strauss - Tower 47	20	19.2	2	6	1	1.00	9.60	1102.34	16.15
El Paso - Sierra Blanca	Tower 47 - Belen	20	12.4	2	5	1	1.00	7.44	1139.54	13.99
El Paso - Sierra Blanca	Belen - Sierra Blanca	55	73.1	1	8	1	1.00	9.97	1219.29	13.62
Sierra Blanca - Sweetwater	Sierra Blanca - Sweetwater	55	320.9	1	23	0	1.00	15.22	1569.36	18.87
Sweetwater - Ft. Worth	Sweetwater - Ft. Worth	55	196.4	1	20	0	1.00	10.71	1783.61	14.37
Ft. Worth - Dallas	Ft. Worth - Tower 19 (Dallas)	45	37.2	2	10	1	1.00	4.96	1833.21	8.98
	No. of crew changes							7.00	1989.12	
	No. of refuelings							1.00	2079.12	
	Total									
	Model									
	LALB - Memphis									
LALB - Redondo	LALB - Redondo	30	19.3	3	12	0	1.00	4.02	48.25	8.25
Redondo - Colton	Redondo - City of Industry	40	12.0	2	4	1	1.00	5.63	22.50	8.77
Redondo - Colton	City of Industry - Colton	40	36.0	2	8	1	1.00	6.75	76.50	11.02
Riverside - Colton	West Riverside - Highgrove	45	4.5	3	1	11	0.40	0.00	76.50	10.02
Riverside - Colton	Highgrove - Colton	40	2.9	2	1	11	0.40	0.00	76.50	8.62
Colton Crossing	Colton Crossing	25	0.3	2	1	11	1.00	0.72	77.22	6.36
Colton - El Paso	Colton - Garnet	30	49.3	2	8	1	1.00	12.33	175.82	17.36
Colton - El Paso	Garnet - W. Indio	50	22.3	1	5	1	1.00	5.35	202.58	9.17
Colton - El Paso	W. Indio - Coachella	50	4.8	2	1	1	1.00	5.76	208.34	9.58
Colton - El Paso	Coachella - Araz	50	111.4	1	16	1	1.00	8.36	342.02	12.17
Colton - El Paso	Araz - East Yard	25	11.7	2	2	1	1.00	14.04	370.10	19.68
Colton - El Paso	East Yard - Fortuna	50	2.4	1	1	1	1.00	2.88	372.98	6.70
Colton - El Paso	Fortuna - Blaisdell	55	6.4	2	1	1	1.00	6.98	379.96	10.63
Colton - El Paso	Blaisdell - Dome	45	4.3	1	1	1	1.00	5.73	385.70	9.75

Colton - El Paso	Dome - Wellton	55	17.6	2	2	1	1.00	9.60	404.90	13.25
Colton - El Paso	Wellton - Stanwix	55	48.3	1	6	1	1.00	8.78	457.59	12.43
Colton - El Paso	Stanwix - Sentinel	55	12.1	2	1	1	1.00	13.20	470.79	16.85
Colton - El Paso	Sentinel - Petrie	55	152.0	1	20	1	1.00	8.29	636.60	11.94
Colton - El Paso	Petrie - Cochise	30	84.7	2	12	1	1.00	14.12	806.00	19.15
Colton - El Paso	Cochise - Raso	55	15.7	1	2	1	1.00	8.56	823.13	12.22
Colton - El Paso	Raso - Luzena	55	10.6	2	1	1	1.00	11.56	834.70	15.22
Colton - El Paso	Luzena - San Simon	55	21.2	1	3	1	1.00	7.71	857.82	11.36
Colton - El Paso	San Simon - Mondel	45	21.8	2	4	1	1.00	7.27	886.89	11.29
Colton - El Paso	Mondel - Lordsburg	55	15.1	1	2	1	1.00	8.24	903.36	11.89
Colton - El Paso	Lordsburg - Strauss	55	130.8	2	14	1	1.00	10.19	1046.05	13.85
Colton - El Paso	Strauss - Tower 47	20	19.2	2	6	1	1.00	9.60	1103.65	16.15
El Paso - Sierra Blanca	Tower 47 - Belen	20	12.4	2	5	1	1.00	7.44	1140.85	13.99
El Paso - Sierra Blanca	Belen - Sierra Blanca	55	73.1	1	8	1	1.00	9.97	1220.60	13.62
Sierra Blanca - Sweetwater	Sierra Blanca - Sweetwater	55	320.9	1	23	0	1.00	15.22	1570.67	18.87
Sweetwater - Ft. Worth	Sweetwater - Ft. Worth	55	196.4	1	20	0	1.00	10.71	1784.93	14.37
Ft. Worth - Dallas	Ft. Worth - Tower 19 (Dallas)	45	37.2	2	10	1	1.00	4.96	1834.53	8.98
Dallas - Memphis	Tower 19 - Big Sandy	55	100.4	1	14	1	1.00	7.82	1944.05	11.48
Dallas - Memphis	Big Sandy - Bald Knob	55	315.6	2	60	1	1.00	5.74	2288.34	9.39
Dallas - Memphis	Bald Knob - Marion	55	73.6	1	8	0	1.00	10.04	2368.63	13.69
	No. of crew changes							9.00	2569.09	
	No. of refuelings							2.00	2749.09	
	Total									
	Model									
	East LA - Memphis									
LALB - Redondo	LALB - Redondo	30	19.3	3	12	0	0.00	4.02	0.00	8.25
Redondo - Colton	East LA - City of Industry	40	11.3	2	4	1	1.00	5.30	21.19	8.51
Redondo - Colton	City of Industry - Colton	40	36.0	2	8	1	1.00	6.75	75.19	11.02
Riverside - Colton	West Riverside - Highgrove	45	4.5	3	1	11	0.40	0.00	75.19	10.02
Riverside - Colton	Highgrove - Colton	40	2.9	2	1	11	0.40	0.00	75.19	8.62
Colton Crossing	Colton Crossing	25	0.3	2	1	11	1.00	0.72	75.91	6.36
Colton - El Paso	Colton - Garnet	30	49.3	2	8	1	1.00	12.33	174.51	17.36
Colton - El Paso	Garnet - W. Indio	50	22.3	1	5	1	1.00	5.35	201.27	9.17
Colton - El Paso	W. Indio - Coachella	50	4.8	2	1	1	1.00	5.76	207.03	9.58

Colton - El Paso	Coachella - Araz	50	111.4	1	16	1	1.00	8.36	340.71	12.17
Colton - El Paso	Araz - East Yard	25	11.7	2	2	1	1.00	14.04	368.79	19.68
Colton - El Paso	East Yard - Fortuna	50	2.4	1	1	1	1.00	2.88	371.67	6.70
Colton - El Paso	Fortuna - Blaisdell	55	6.4	2	1	1	1.00	6.98	378.65	10.63
Colton - El Paso	Blaisdell - Dome	45	4.3	1	1	1	1.00	5.73	384.38	9.75
Colton - El Paso	Dome - Wellton	55	17.6	2	2	1	1.00	9.60	403.58	13.25
Colton - El Paso	Wellton - Stanwix	55	48.3	1	6	1	1.00	8.78	456.27	12.43
Colton - El Paso	Stanwix - Sentinel	55	12.1	2	1	1	1.00	13.20	469.47	16.85
Colton - El Paso	Sentinel - Petrie	55	152.0	1	20	1	1.00	8.29	635.29	11.94
Colton - El Paso	Petrie - Cochise	30	84.7	2	12	1	1.00	14.12	804.69	19.15
Colton - El Paso	Cochise - Raso	55	15.7	1	2	1	1.00	8.56	821.82	12.22
Colton - El Paso	Raso - Luzena	55	10.6	2	1	1	1.00	11.56	833.38	15.22
Colton - El Paso	Luzena - San Simon	55	21.2	1	3	1	1.00	7.71	856.51	11.36
Colton - El Paso	San Simon - Mondel	45	21.8	2	4	1	1.00	7.27	885.58	11.29
Colton - El Paso	Mondel - Lordsburg	55	15.1	1	2	1	1.00	8.24	902.05	11.89
Colton - El Paso	Lordsburg - Strauss	55	130.8	2	14	1	1.00	10.19	1044.74	13.85
Colton - El Paso	Strauss - Tower 47	20	19.2	2	6	1	1.00	9.60	1102.34	16.15
El Paso - Sierra Blanca	Tower 47 - Belen	20	12.4	2	5	1	1.00	7.44	1139.54	13.99
El Paso - Sierra Blanca	Belen - Sierra Blanca	55	73.1	1	8	1	1.00	9.97	1219.29	13.62
Sierra Blanca - Sweetwater	Sierra Blanca - Sweetwater	55	320.9	1	23	0	1.00	15.22	1569.36	18.87
Sweetwater - Ft. Worth	Sweetwater - Ft. Worth	55	196.4	1	20	0	1.00	10.71	1783.61	14.37
Ft. Worth - Dallas	Ft. Worth - Tower 19 (Dallas)	45	37.2	2	10	1	1.00	4.96	1833.21	8.98
Dallas - Memphis	Tower 19 - Big Sandy	55	100.4	1	14	1	1.00	7.82	1942.74	11.48
Dallas - Memphis	Big Sandy - Bald Knob	55	315.6	2	60	1	1.00	5.74	2287.03	9.39
Dallas - Memphis	Bald Knob - Marion	55	73.6	1	8	0	1.00	10.04	2367.32	13.69
	No. of crew changes							9.00	2567.78	
	No. of refuelings							2.00	2747.78	
	Total									
	Model									
	LALB - Houston									
LALB - Redondo	LALB - Redondo	30	19.3	3	12	0	1.00	4.02	48.25	8.25
Redondo - Colton	Redondo - City of Industry	40	12.0	2	4	1	1.00	5.63	22.50	8.77
Redondo - Colton	City of Industry - Colton	40	36.0	2	8	1	1.00	6.75	76.50	11.02
Riverside - Colton	West Riverside - Highgrove	45	4.5	3	1	11	0.40	0.00	76.50	10.02

Riverside - Colton	Highgrove - Colton	40	2.9	2	1	11	0.40	0.00	76.50	8.62
Colton Crossing	Colton Crossing	25	0.3	2	1	11	1.00	0.72	77.22	6.36
Colton - El Paso	Colton - Garnet	30	49.3	2	8	1	1.00	12.33	175.82	17.36
Colton - El Paso	Garnet - W. Indio	50	22.3	1	5	1	1.00	5.35	202.58	9.17
Colton - El Paso	W. Indio - Coachella	50	4.8	2	1	1	1.00	5.76	208.34	9.58
Colton - El Paso	Coachella - Araz	50	111.4	1	16	1	1.00	8.36	342.02	12.17
Colton - El Paso	Araz - East Yard	25	11.7	2	2	1	1.00	14.04	370.10	19.68
Colton - El Paso	East Yard - Fortuna	50	2.4	1	1	1	1.00	2.88	372.98	6.70
Colton - El Paso	Fortuna - Blaisdell	55	6.4	2	1	1	1.00	6.98	379.96	10.63
Colton - El Paso	Blaisdell - Dome	45	4.3	1	1	1	1.00	5.73	385.70	9.75
Colton - El Paso	Dome - Wellton	55	17.6	2	2	1	1.00	9.60	404.90	13.25
Colton - El Paso	Wellton - Stanwix	55	48.3	1	6	1	1.00	8.78	457.59	12.43
Colton - El Paso	Stanwix - Sentinel	55	12.1	2	1	1	1.00	13.20	470.79	16.85
Colton - El Paso	Sentinel - Petrie	55	152.0	1	20	1	1.00	8.29	636.60	11.94
Colton - El Paso	Petrie - Cochise	30	84.7	2	12	1	1.00	14.12	806.00	19.15
Colton - El Paso	Cochise - Raso	55	15.7	1	2	1	1.00	8.56	823.13	12.22
Colton - El Paso	Raso - Luzena	55	10.6	2	1	1	1.00	11.56	834.70	15.22
Colton - El Paso	Luzena - San Simon	55	21.2	1	3	1	1.00	7.71	857.82	11.36
Colton - El Paso	San Simon - Mondel	45	21.8	2	4	1	1.00	7.27	886.89	11.29
Colton - El Paso	Mondel - Lordsburg	55	15.1	1	2	1	1.00	8.24	903.36	11.89
Colton - El Paso	Lordsburg - Strauss	55	130.8	2	14	1	1.00	10.19	1046.05	13.85
Colton - El Paso	Strauss - Tower 47	20	19.2	2	6	1	1.00	9.60	1103.65	16.15
El Paso - Sierra Blanca	Tower 47 - Belen	20	12.4	2	5	1	1.00	7.44	1140.85	13.99
El Paso - Sierra Blanca	Belen - Sierra Blanca	55	73.1	1	8	1	1.00	9.97	1220.60	13.62
Sierra Blanca - San Antonio	Sierra Blanca - Withers	45	518.1	1	53	1	1.00	13.03	1911.40	17.05
Sierra Blanca - San Antonio	Withers - East Yard	25	11.4	2	5	1	1.00	5.47	1938.76	11.11
San Antonio - Houston	East Yard - Bellaire Jct.	45	203.2	1	23	1	1.00	11.78	2209.69	15.80
San Antonio - Houston	Bellaire Jct. - Houston	20	4.2	2	2	1	1.00	6.30	2222.29	12.85
	No. of crew changes							8.00	2400.47	
	No. of refuelings							2.00	2580.47	
	Total									
	Model									
	East LA - Houston									
LALB - Redondo	LALB - Redondo	30	19.3	3	12	0	0.00	4.02	0.00	8.25

Redondo - Colton	East LA - City of Industry	40	11.3	2	4	1	1.00	5.30	21.19	8.51
Redondo - Colton	City of Industry - Colton	40	36.0	2	8	1	1.00	6.75	75.19	11.02
Riverside - Colton	West Riverside - Highgrove	45	4.5	3	1	11	0.40	0.00	75.19	10.02
Riverside - Colton	Highgrove - Colton	40	2.9	2	1	11	0.40	0.00	75.19	8.62
Colton Crossing	Colton Crossing	25	0.3	2	1	11	1.00	0.72	75.91	6.36
Colton - El Paso	Colton - Garnet	30	49.3	2	8	1	1.00	12.33	174.51	17.36
Colton - El Paso	Garnet - W. Indio	50	22.3	1	5	1	1.00	5.35	201.27	9.17
Colton - El Paso	W. Indio - Coachella	50	4.8	2	1	1	1.00	5.76	207.03	9.58
Colton - El Paso	Coachella - Araz	50	111.4	1	16	1	1.00	8.36	340.71	12.17
Colton - El Paso	Araz - East Yard	25	11.7	2	2	1	1.00	14.04	368.79	19.68
Colton - El Paso	East Yard - Fortuna	50	2.4	1	1	1	1.00	2.88	371.67	6.70
Colton - El Paso	Fortuna - Blaisdell	55	6.4	2	1	1	1.00	6.98	378.65	10.63
Colton - El Paso	Blaisdell - Dome	45	4.3	1	1	1	1.00	5.73	384.38	9.75
Colton - El Paso	Dome - Wellton	55	17.6	2	2	1	1.00	9.60	403.58	13.25
Colton - El Paso	Wellton - Stanwix	55	48.3	1	6	1	1.00	8.78	456.27	12.43
Colton - El Paso	Stanwix - Sentinel	55	12.1	2	1	1	1.00	13.20	469.47	16.85
Colton - El Paso	Sentinel - Petrie	55	152.0	1	20	1	1.00	8.29	635.29	11.94
Colton - El Paso	Petrie - Cochise	30	84.7	2	12	1	1.00	14.12	804.69	19.15
Colton - El Paso	Cochise - Raso	55	15.7	1	2	1	1.00	8.56	821.82	12.22
Colton - El Paso	Raso - Luzena	55	10.6	2	1	1	1.00	11.56	833.38	15.22
Colton - El Paso	Luzena - San Simon	55	21.2	1	3	1	1.00	7.71	856.51	11.36
Colton - El Paso	San Simon - Mondel	45	21.8	2	4	1	1.00	7.27	885.58	11.29
Colton - El Paso	Mondel - Lordsburg	55	15.1	1	2	1	1.00	8.24	902.05	11.89
Colton - El Paso	Lordsburg - Strauss	55	130.8	2	14	1	1.00	10.19	1044.74	13.85
Colton - El Paso	Strauss - Tower 47	20	19.2	2	6	1	1.00	9.60	1102.34	16.15
El Paso - Sierra Blanca	Tower 47 - Belen	20	12.4	2	5	1	1.00	7.44	1139.54	13.99
El Paso - Sierra Blanca	Belen - Sierra Blanca	55	73.1	1	8	1	1.00	9.97	1219.29	13.62
Sierra Blanca - San Antonio	Sierra Blanca - Withers	45	518.1	1	53	1	1.00	13.03	1910.09	17.05
Sierra Blanca - San Antonio	Withers - East Yard	25	11.4	2	5	1	1.00	5.47	1937.45	11.11
San Antonio - Houston	East Yard - Bellaire Jct.	45	203.2	1	23	1	1.00	11.78	2208.38	15.80
San Antonio - Houston	Bellaire Jct. - Houston	20	4.2	2	2	1	1.00	6.30	2220.98	12.85
	No. of crew changes							8.00	2399.16	
	No. of refuelings							2.00	2579.16	
	Total									

	Model									
	Oakland - Chicago									
Oakland - Elvas	Oakland - Shellmound	25	4.5	2	3	36	1.00	4.50	13.50	9.24
Oakland - Elvas	Shellmound - San Pablo	50	10.1	2	2	36	1.00	6.06	25.62	9.88
Oakland - Elvas	San Pablo - Martinez	30	16.7	2	7	36	1.00	4.77	59.02	9.80
Oakland - Elvas	Martinez - Sacramento	55	56.9	2	6	28	1.00	10.35	121.09	14.00
Oakland - Elvas	Sacramento - Elvas	25	3.1	2	2	32	1.00	3.72	128.53	9.36
Elvas - Binney Jct.	Elvas - Roseville	40	14.4	2	5	6	1.00	4.32	150.13	8.59
Elvas - Binney Jct.	Roseville - Binney Jct.	50	35.5	2	4	2	1.00	10.65	192.73	14.47
Binney Jct. - Ogden	Binney Jct. - Oroville Yard	55	22.4	1	2	0	1.00	12.22	217.17	15.87
Binney Jct. - Ogden	Oroville Yard - Poe	40	31.6	1	4	0	1.00	11.85	264.57	16.12
Binney Jct. - Ogden	Poe - Keddie	25	41.8	1	4	0	1.00	25.08	364.89	30.72
Binney Jct. - Ogden	Keddie - Portola	25	46.3	1	5	0	1.00	22.22	476.01	27.86
Binney Jct. - Ogden	Portola - Sano	45	83.9	1	9	0	1.00	12.43	587.88	16.45
Binney Jct. - Ogden	Sano - Weso	60	131.7	1	13	0	1.00	10.13	719.58	13.65
Binney Jct. - Ogden	Weso - Alazon	55	182.7	2	18	2	1.00	11.07	918.88	14.73
Binney Jct. - Ogden	Alazon - Wells	55	3.9	1	1	0	1.00	4.25	923.14	7.91
Binney Jct. - Ogden	Wells - Moor	40	8.9	2	1	0	1.00	13.35	936.49	17.62
Binney Jct. - Ogden	Moor - Valley Pass	50	24.0	1	3	0	1.00	9.60	965.29	13.42
Binney Jct. - Ogden	Valley Pass - Lucin	40	39.2	2	4	0	1.00	14.70	1024.09	18.97
Binney Jct. - Ogden	Lucin - W. Lakeside	50	54.8	1	6	0	1.00	10.96	1089.85	14.78
Binney Jct. - Ogden	W. Lakeside - E. Lakeside	45	2.7	2	1	0	1.00	3.60	1093.45	7.62
Binney Jct. - Ogden	E. Lakeside - W. Promontory Point	45	17.6	1	1	0	1.00	23.47	1113.32	27.49
Binney Jct. - Ogden	W. Promontory Point - E. Promontory Point	45	4.2	2	1	0	1.00	5.60	1099.05	9.62
Binney Jct. - Ogden	E. Promontory Point - Little Mountain	50	8.1	1	1	0	1.00	9.72	1123.04	13.54
Binney Jct. - Ogden	Little Mountain - Ogden	50	14.4	2	2	0	1.00	8.64	1130.60	12.46
Ogden - Granger	Ogden - Granger	40	146.1	2	13	0	1.00	16.86	1349.75	21.13
Granger - Gibbon	Granger - W. Laramie	50	276.9	2	40	0	1.00	8.31	1682.03	12.13
Granger - Gibbon	W. Laramie - Hermosa	30	23.2	3	4	0	1.00	11.60	1728.43	16.63
Granger - Gibbon	Hermosa - Dale Jct.	30	1.8	2	1	0	1.00	3.60	1732.03	8.63
Granger - Gibbon	Dale Jct. - Barnett	30	39.0	3	6	0	1.00	13.00	1810.03	18.03
Granger - Gibbon	Barnett - O'Fallons	50	206.2	2	22	0	1.00	11.25	2057.47	15.07

Granger - Gibbon	O'Fallons - Gibbon	40	124.8	3	21	0	1.00	8.91	2244.67	13.19
Gibbon - Nelson	Gibbon - Missouri Valley	55	198.1	2	19	0	1.00	11.37	2460.78	15.03
Gibbon - Nelson	Missouri Valley - MP 271.5	55	57.9	2	5	0	1.00	12.63	2523.94	16.29
Gibbon - Nelson	MP 271.5 - MP 266	35	5.5	2	1	0	1.00	9.43	2533.37	14.03
Gibbon - Nelson	MP 266- MP 208	50	58.0	2	6	0	1.00	11.60	2602.97	15.42
Gibbon - Nelson	MP 208 - Boone	30	5.8	2	1	0	1.00	11.60	2614.57	16.63
Gibbon - Nelson	Boone - Clinton	50	196.6	2	19	0	1.00	12.42	2850.49	16.24
Gibbon - Nelson	Clinton - East Clinton	25	4.0	2	1	0	1.00	9.60	2860.09	15.24
Gibbon - Nelson	East Clinton - Nelson	55	31.5	2	3	0	1.00	11.45	2894.45	15.11
Nelson - Global 3	Nelson - Global 3	55	64.2	2	6	0	1.00	11.67	2964.49	15.33
Global 3 - Global 2	Global 3 - Elburn	55	30.8	2	4	0	0.67	8.40	2987.00	12.05
Global 3 - Global 2	Elburn - GX	50	6.8	3	1	58	0.67	8.16	2992.47	11.98
Global 3 - Global 2	GX - WX	50	5.1	2	1	58	0.67	6.12	2996.57	9.94
Global 3 - Global 2	WX - Proviso (Global 2)	50	17.6	3	5	58	0.67	4.22	3010.72	8.04
Global 2 - Global 1	Proviso - Kedzie	35	10.9	4	3	58	0.33	6.23	3016.88	10.83
Global 2 - Global 1	Kedzie - Wood Street (Global 1)	20	2.5	3	1	58	0.33	7.50	3019.36	14.05
	No. of crew changes							10.00	3242.09	
	No. of refuelings							2.00	3422.09	
	Total									
	Model									
	Lathrop - Chicago									
Lathrop - Elvas	Lathrop - Stockton	35	11.1	2	1	0	1.00	23.79	23.79	23.63
Lathrop - Elvas	Stockton - Elvas	60	45.1	2	4	4	1.00	11.28	68.89	14.79
Elvas - Binney Jct.	Elvas - Roseville	40	14.4	2	5	6	1.00	4.32	90.49	8.59
Elvas - Binney Jct.	Roseville - Binney Jct.	50	35.5	2	4	2	1.00	10.65	133.09	14.47
Binney Jct. - Ogden	Binney Jct. - Oroville Yard	55	22.4	1	2	0	1.00	12.22	157.52	15.87
Binney Jct. - Ogden	Oroville Yard - Poe	40	31.6	1	4	0	1.00	11.85	204.92	16.12
Binney Jct. - Ogden	Poe - Keddie	25	41.8	1	4	0	1.00	25.08	305.24	30.72
Binney Jct. - Ogden	Keddie - Portola	25	46.3	1	5	0	1.00	22.22	416.36	27.86
Binney Jct. - Ogden	Portola - Sano	45	83.9	1	9	0	1.00	12.43	528.23	16.45
Binney Jct. - Ogden	Sano - Weso	60	131.7	1	13	0	1.00	10.13	659.93	13.65
Binney Jct. - Ogden	Weso - Alazon	55	182.7	2	18	2	1.00	11.07	859.24	14.73
Binney Jct. - Ogden	Alazon - Wells	55	3.9	1	1	0	1.00	4.25	863.49	7.91
Binney Jct. - Ogden	Wells - Moor	40	8.9	2	1	0	1.00	13.35	876.84	17.62

Binney Jct. - Ogden	Moor - Valley Pass	50	24.0	1	3	0	1.00	9.60	905.64	13.42
Binney Jct. - Ogden	Valley Pass - Lucin	40	39.2	2	4	0	1.00	14.70	964.44	18.97
Binney Jct. - Ogden	Lucin - W. Lakeside	50	54.8	1	6	0	1.00	10.96	1030.20	14.78
Binney Jct. - Ogden	W. Lakeside - E. Lakeside	45	2.7	2	1	0	1.00	3.60	1033.80	7.62
Binney Jct. - Ogden	E. Lakeside - W. Promontory Point	45	17.6	1	1	0	1.00	23.47	1053.67	27.49
Binney Jct. - Ogden	W. Promontory Point - E. Promontory Point	45	4.2	2	1	0	1.00	5.60	1039.40	9.62
Binney Jct. - Ogden	E. Promontory Point - Little Mountain	50	8.1	1	1	0	1.00	9.72	1063.39	13.54
Binney Jct. - Ogden	Little Mountain - Ogden	50	14.4	2	2	0	1.00	8.64	1070.95	12.46
Ogden - Granger	Ogden - Granger	40	146.1	2	13	0	1.00	16.86	1272.82	21.13
Granger - Gibbon	Granger - W. Laramie	50	276.9	2	40	0	1.00	8.31	1605.10	12.13
Granger - Gibbon	W. Laramie - Hermosa	30	23.2	3	4	0	1.00	11.60	1651.50	16.63
Granger - Gibbon	Hermosa - Dale Jct.	30	1.8	2	1	0	1.00	3.60	1655.10	8.63
Granger - Gibbon	Dale Jct. - Barnett	30	39.0	3	6	0	1.00	13.00	1733.10	18.03
Granger - Gibbon	Barnett - O'Fallons	50	206.2	2	22	0	1.00	11.25	1980.54	15.07
Granger - Gibbon	O'Fallons - Gibbon	40	124.8	3	21	0	1.00	8.91	2167.74	13.19
Gibbon - Nelson	Gibbon - Missouri Valley	55	198.1	2	19	0	1.00	11.37	2383.85	15.03
Gibbon - Nelson	Missouri Valley - MP 271.5	55	57.9	2	5	0	1.00	12.63	2447.01	16.29
Gibbon - Nelson	MP 271.5 - MP 266	35	5.5	2	1	0	1.00	9.43	2456.44	14.03
Gibbon - Nelson	MP 266- MP 208	50	58.0	2	6	0	1.00	11.60	2526.04	15.42
Gibbon - Nelson	MP 208 - Boone	30	5.8	2	1	0	1.00	11.60	2537.64	16.63
Gibbon - Nelson	Boone - Clinton	50	196.6	2	19	0	1.00	12.42	2773.56	16.24
Gibbon - Nelson	Clinton - East Clinton	25	4.0	2	1	0	1.00	9.60	2783.16	15.24
Gibbon - Nelson	East Clinton - Nelson	55	31.5	2	3	0	1.00	11.45	2817.52	15.11
Nelson - Global 3	Nelson - Global 3	55	64.2	2	6	0	1.00	11.67	2887.56	15.33
Global 3 - Global 2	Global 3 - Elburn	55	30.8	2	4	0	0.67	8.40	2910.07	12.05
Global 3 - Global 2	Elburn - GX	50	6.8	3	1	58	0.67	8.16	2915.54	11.98
Global 3 - Global 2	GX - WX	50	5.1	2	1	58	0.67	6.12	2919.64	9.94
Global 3 - Global 2	WX - Proviso (Global 2)	50	17.6	3	5	58	0.67	4.22	2933.79	8.04
Global 2 - Global 1	Proviso - Kedzie	35	10.9	4	3	58	0.33	6.23	2939.96	10.83
Global 2 - Global 1	Kedzie - Wood Street (Global 1)	20	2.5	3	1	58	0.33	7.50	2942.43	14.05
	No. of crew changes							10.00	3165.16	
	No. of refuelings							2.00	3345.16	

	Total									
	Model									
	Oakland - Memphis									
Oakland - Elvas	Oakland - Shellmound	25	4.5	2	3	36	1.00	4.50	13.50	9.24
Oakland - Elvas	Shellmound - San Pablo	50	10.1	2	2	36	1.00	6.06	25.62	9.88
Oakland - Elvas	San Pablo - Martinez	30	16.7	2	7	36	1.00	4.77	59.02	9.80
Oakland - Elvas	Martinez - Sacramento	55	56.9	2	6	28	1.00	10.35	121.09	14.00
Oakland - Elvas	Sacramento - Elvas	25	3.1	2	2	32	1.00	3.72	128.53	9.36
Elvas - Binney Jct.	Elvas - Roseville	40	14.4	2	5	6	1.00	4.32	150.13	8.59
Elvas - Binney Jct.	Roseville - Binney Jct.	50	35.5	2	4	2	1.00	10.65	192.73	14.47
Binney Jct. - Ogden	Binney Jct. - Oroville Yard	55	22.4	1	2	0	1.00	12.22	217.17	15.87
Binney Jct. - Ogden	Oroville Yard - Poe	40	31.6	1	4	0	1.00	11.85	264.57	16.12
Binney Jct. - Ogden	Poe - Keddie	25	41.8	1	4	0	1.00	25.08	364.89	30.72
Binney Jct. - Ogden	Keddie - Portola	25	46.3	1	5	0	1.00	22.22	476.01	27.86
Binney Jct. - Ogden	Portola - Sano	45	83.9	1	9	0	1.00	12.43	587.88	16.45
Binney Jct. - Ogden	Sano - Weso	60	131.7	1	13	0	1.00	10.13	719.58	13.65
Binney Jct. - Ogden	Weso - Alazon	55	182.7	2	18	2	1.00	11.07	918.88	14.73
Binney Jct. - Ogden	Alazon - Wells	55	3.9	1	1	0	1.00	4.25	923.14	7.91
Binney Jct. - Ogden	Wells - Moor	40	8.9	2	1	0	1.00	13.35	936.49	17.62
Binney Jct. - Ogden	Moor - Valley Pass	50	24.0	1	3	0	1.00	9.60	965.29	13.42
Binney Jct. - Ogden	Valley Pass - Lucin	40	39.2	2	4	0	1.00	14.70	1024.09	18.97
Binney Jct. - Ogden	Lucin - W. Lakeside	50	54.8	1	6	0	1.00	10.96	1089.85	14.78
Binney Jct. - Ogden	W. Lakeside - E. Lakeside	45	2.7	2	1	0	1.00	3.60	1093.45	7.62
Binney Jct. - Ogden	E. Lakeside - W. Promontory Point	45	17.6	1	1	0	1.00	23.47	1113.32	27.49
Binney Jct. - Ogden	W. Promontory Point - E. Promontory Point	45	4.2	2	1	0	1.00	5.60	1099.05	9.62
Binney Jct. - Ogden	E. Promontory Point - Little Mountain	50	8.1	1	1	0	1.00	9.72	1123.04	13.54
Binney Jct. - Ogden	Little Mountain - Ogden	50	14.4	2	2	0	1.00	8.64	1130.60	12.46
Ogden - Granger	Ogden - Granger	40	146.1	2	13	0	1.00	16.86	1349.75	21.13
Granger - Gibbon	Granger - W. Laramie	50	276.9	2	40	0	1.00	8.31	1682.03	12.13
Granger - Gibbon	W. Laramie - Hermosa	30	23.2	3	4	0	1.00	11.60	1728.43	16.63
Granger - Gibbon	Hermosa - Dale Jct.	30	1.8	2	1	0	1.00	3.60	1732.03	8.63
Granger - Gibbon	Dale Jct. - Barnett	30	39.0	3	6	0	1.00	13.00	1810.03	18.03

Granger - Gibbon	Barnett - O'Fallons	50	206.2	2	22	0	1.00	11.25	2057.47	15.07
Granger - Gibbon	O'Fallons - Gibbon	40	124.8	3	21	0	1.00	8.91	2244.67	13.19
Gibbon - West Topeka	Gibbon - West Topeka	50	219.6	2	29	0	1.00	9.09	2508.19	12.91
West Topeka - Kansas City	West Topeka - Kansas City	50	71.2	2	8	0	1.00	10.68	2593.63	14.50
Kansas City - E. St. Louis	Kansas City - Lees Summit	35	25.0	2	2	2	1.00	21.43	2636.48	26.03
E. St. Louis - Memphis	Lees Summit - River Jct.	50	130.0	1	8	0	1.00	19.50	2792.48	23.32
E. St. Louis - Memphis	River Jct. - E. St. Louis	50	128.0	2	12	2	1.00	12.80	2946.08	16.62
E. St. Louis - Memphis	E. St. Louis - Menard Jct.	50	61.0	2	10	0	1.00	7.32	3019.28	11.14
E. St. Louis - Memphis	Menard Jct. - Raddle Jct.	50	15.4	1	4	0	1.00	4.62	3037.76	8.44
E. St. Louis - Memphis	Raddle Jct. - Howardton Jct.	50	14.1	2	3	0	1.00	5.64	3054.68	9.46
E. St. Louis - Memphis	Howardton Jct. - Halsey Jct.	50	4.5	1	1	0	1.00	5.40	3060.08	9.22
E. St. Louis - Memphis	Halsey Jct. - Capedeau Jct.	35	27.7	2	4	0	1.00	11.87	3107.57	16.47
E. St. Louis - Memphis	Capedeau Jct. - Illmo	25	1.0	1	1	0	1.00	2.40	3109.97	8.04
E. St. Louis - Memphis	Illmo - Bald Knob	55	164.2	2	16	0	1.00	11.20	3289.10	14.85
Dallas - Memphis	Bald Knob - Marion	55	73.6	1	8	0	1.00	10.04	3369.39	13.69
	No. of crew changes							13.00	3658.93	
	No. of refuelings							3.00	3928.93	
	Total									
	Oakland - Kansas City									
Oakland - Elvas	Oakland - Shellmound	25	4.5	2	3	36	1.00	4.50	13.50	9.24
Oakland - Elvas	Shellmound - San Pablo	50	10.1	2	2	36	1.00	6.06	25.62	9.88
Oakland - Elvas	San Pablo - Martinez	30	16.7	2	7	36	1.00	4.77	59.02	9.80
Oakland - Elvas	Martinez - Sacramento	55	56.9	2	6	28	1.00	10.35	121.09	14.00
Oakland - Elvas	Sacramento - Elvas	25	3.1	2	2	32	1.00	3.72	128.53	9.36
Elvas - Binney Jct.	Elvas - Roseville	40	14.4	2	5	6	1.00	4.32	150.13	8.59
Elvas - Binney Jct.	Roseville - Binney Jct.	50	35.5	2	4	2	1.00	10.65	192.73	14.47
Binney Jct. - Ogden	Binney Jct. - Oroville Yard	55	22.4	1	2	0	1.00	12.22	217.17	15.87
Binney Jct. - Ogden	Oroville Yard - Poe	40	31.6	1	4	0	1.00	11.85	264.57	16.12
Binney Jct. - Ogden	Poe - Keddie	25	41.8	1	4	0	1.00	25.08	364.89	30.72
Binney Jct. - Ogden	Keddie - Portola	25	46.3	1	5	0	1.00	22.22	476.01	27.86
Binney Jct. - Ogden	Portola - Sano	45	83.9	1	9	0	1.00	12.43	587.88	16.45
Binney Jct. - Ogden	Sano - Weso	60	131.7	1	13	0	1.00	10.13	719.58	13.65
Binney Jct. - Ogden	Weso - Alazon	55	182.7	2	18	2	1.00	11.07	918.88	14.73

Binney Jct. - Ogden	Alazon - Wells	55	3.9	1	1	0	1.00	4.25	923.14	7.91
Binney Jct. - Ogden	Wells - Moor	40	8.9	2	1	0	1.00	13.35	936.49	17.62
Binney Jct. - Ogden	Moor - Valley Pass	50	24.0	1	3	0	1.00	9.60	965.29	13.42
Binney Jct. - Ogden	Valley Pass - Lucin	40	39.2	2	4	0	1.00	14.70	1024.09	18.97
Binney Jct. - Ogden	Lucin - W. Lakeside	50	54.8	1	6	0	1.00	10.96	1089.85	14.78
Binney Jct. - Ogden	W. Lakeside - E. Lakeside	45	2.7	2	1	0	1.00	3.60	1093.45	7.62
Binney Jct. - Ogden	E. Lakeside - W. Promontory Point	45	17.6	1	1	0	1.00	23.47	1113.32	27.49
Binney Jct. - Ogden	W. Promontory Point - E. Promontory Point	45	4.2	2	1	0	1.00	5.60	1099.05	9.62
Binney Jct. - Ogden	E. Promontory Point - Little Mountain	50	8.1	1	1	0	1.00	9.72	1123.04	13.54
Binney Jct. - Ogden	Little Mountain - Ogden	50	14.4	2	2	0	1.00	8.64	1130.60	12.46
Ogden - Granger	Ogden - Granger	40	146.1	2	13	0	1.00	16.86	1349.75	21.13
Granger - Gibbon	Granger - W. Laramie	50	276.9	2	40	0	1.00	8.31	1682.03	12.13
Granger - Gibbon	W. Laramie - Hermosa	30	23.2	3	4	0	1.00	11.60	1728.43	16.63
Granger - Gibbon	Hermosa - Dale Jct.	30	1.8	2	1	0	1.00	3.60	1732.03	8.63
Granger - Gibbon	Dale Jct. - Barnett	30	39.0	3	6	0	1.00	13.00	1810.03	18.03
Granger - Gibbon	Barnett - O'Fallons	50	206.2	2	22	0	1.00	11.25	2057.47	15.07
Granger - Gibbon	O'Fallons - Gibbon	40	124.8	3	21	0	1.00	8.91	2244.67	13.19
Gibbon - West Topeka	Gibbon - West Topeka	50	219.6	2	29	0	1.00	9.09	2508.19	12.91
West Topeka - Kansas City	West Topeka - Kansas City	50	71.2	2	8	0	1.00	10.68	2593.63	14.50
	No. of crew changes							9.00	2794.08	
	No. of refuelings							2.00	2974.08	
	Total									
	Lathrop - Kansas City									
Lathrop - Elvas	Lathrop - Stockton	35	11.1	2	1	0	1.00	23.79	23.79	23.63
Lathrop - Elvas	Stockton - Elvas	60	45.1	2	4	4	1.00	11.28	68.89	14.79
Elvas - Binney Jct.	Elvas - Roseville	40	14.4	2	5	6	1.00	4.32	90.49	8.59
Elvas - Binney Jct.	Roseville - Binney Jct.	50	35.5	2	4	2	1.00	10.65	133.09	14.47
Binney Jct. - Ogden	Binney Jct. - Oroville Yard	55	22.4	1	2	0	1.00	12.22	157.52	15.87
Binney Jct. - Ogden	Oroville Yard - Poe	40	31.6	1	4	0	1.00	11.85	204.92	16.12
Binney Jct. - Ogden	Poe - Keddie	25	41.8	1	4	0	1.00	25.08	305.24	30.72
Binney Jct. - Ogden	Keddie - Portola	25	46.3	1	5	0	1.00	22.22	416.36	27.86

Binney Jct. - Ogden	Portola - Sano	45	83.9	1	9	0	1.00	12.43	528.23	16.45
Binney Jct. - Ogden	Sano - Weso	60	131.7	1	13	0	1.00	10.13	659.93	13.65
Binney Jct. - Ogden	Weso - Alazon	55	182.7	2	18	2	1.00	11.07	859.24	14.73
Binney Jct. - Ogden	Alazon - Wells	55	3.9	1	1	0	1.00	4.25	863.49	7.91
Binney Jct. - Ogden	Wells - Moor	40	8.9	2	1	0	1.00	13.35	876.84	17.62
Binney Jct. - Ogden	Moor - Valley Pass	50	24.0	1	3	0	1.00	9.60	905.64	13.42
Binney Jct. - Ogden	Valley Pass - Lucin	40	39.2	2	4	0	1.00	14.70	964.44	18.97
Binney Jct. - Ogden	Lucin - W. Lakeside	50	54.8	1	6	0	1.00	10.96	1030.20	14.78
Binney Jct. - Ogden	W. Lakeside - E. Lakeside	45	2.7	2	1	0	1.00	3.60	1033.80	7.62
Binney Jct. - Ogden	E. Lakeside - W. Promontory Point	45	17.6	1	1	0	1.00	23.47	1053.67	27.49
Binney Jct. - Ogden	W. Promontory Point - E. Promontory Point	45	4.2	2	1	0	1.00	5.60	1039.40	9.62
Binney Jct. - Ogden	E. Promontory Point - Little Mountain	50	8.1	1	1	0	1.00	9.72	1063.39	13.54
Binney Jct. - Ogden	Little Mountain - Ogden	50	14.4	2	2	0	1.00	8.64	1070.95	12.46
Ogden - Granger	Ogden - Granger	40	146.1	2	13	0	1.00	16.86	1272.82	21.13
Granger - Gibbon	Granger - W. Laramie	50	276.9	2	40	0	1.00	8.31	1605.10	12.13
Granger - Gibbon	W. Laramie - Hermosa	30	23.2	3	4	0	1.00	11.60	1651.50	16.63
Granger - Gibbon	Hermosa - Dale Jct.	30	1.8	2	1	0	1.00	3.60	1655.10	8.63
Granger - Gibbon	Dale Jct. - Barnett	30	39.0	3	6	0	1.00	13.00	1733.10	18.03
Granger - Gibbon	Barnett - O'Fallons	50	206.2	2	22	0	1.00	11.25	1980.54	15.07
Granger - Gibbon	O'Fallons - Gibbon	40	124.8	3	21	0	1.00	8.91	2167.74	13.19
Gibbon - West Topeka	Gibbon - West Topeka	50	219.6	2	29	0	1.00	9.09	2431.26	12.91
West Topeka - Kansas City	West Topeka - Kansas City	50	71.2	2	8	0	1.00	10.68	2516.70	14.50
	No. of crew changes							9.00	2717.15	
	No. of refuelings							2.00	2897.15	
	Total									
	Seattle - Kansas City									
Argo - Black River	Argo - Black River	25	6.6	3	3	28	0.50	10.56	15.84	10.92
Black River - Tacoma	Black River - Reservation	35	26.3	1	3	0	0.50	15.03	38.38	19.63
Tacoma - Vancouver, WA	Reservation - Ruston	20	6.8	2	2	8	1.00	10.20	58.78	16.75
Tacoma - Vancouver, WA	Ruston - Nelson Bennett	30	1.6	1	1	8	1.00	3.20	61.98	8.23
Tacoma - N. Portland Jct.	Nelson Bennett - N. Portland Jct.	45	131.5	2	23	8	1.00	7.62	237.32	11.64

N. Portland Jct. - Peninsula Jct.	N. Portland Jct. - Peninsula Jct.	15	1.0	1	1	0	1.00	4.00	241.32	12.06
Peninsula Jct. - Granger	Albina - Peninsula Jct.	20	4.0	1	1	0	0.00	12.00	241.32	18.55
Peninsula Jct. - Granger	Peninsula Jct. - Troutdale	35	20.4	1	3	0	1.00	11.66	276.29	16.25
Peninsula Jct. - Granger	Troutdale - Crates	45	64.5	1	7	0	1.00	12.29	362.29	16.31
Peninsula Jct. - Granger	Crates - Biggs	45	21.6	2	3	0	1.00	9.60	391.09	13.62
Peninsula Jct. - Granger	Biggs - Westland	55	78.9	1	10	0	1.00	8.61	477.16	12.26
Peninsula Jct. - Granger	Westland - Stanfield	25	5.9	2	3	0	1.00	4.72	491.32	10.36
Peninsula Jct. - Granger	Stanfield - Gibbon	45	48.3	1	10	0	1.00	6.44	555.72	10.46
Peninsula Jct. - Granger	Gibbon - Highbridge	25	25.7	1	5	0	1.00	12.34	617.40	17.97
Peninsula Jct. - Granger	Highbridge - Nordeen	20	9.0	2	2	0	1.00	13.50	644.40	20.05
Peninsula Jct. - Granger	Nordeen - W. La Grande	20	15.6	1	3	0	1.00	15.60	691.20	22.15
Peninsula Jct. - Granger	W. La Grande - Lone Tree	20	7.6	2	3	0	1.00	7.60	714.00	14.15
Peninsula Jct. - Granger	Lone Tree - Telocaset	40	18.1	1	3	0	1.00	9.05	741.15	13.32
Peninsula Jct. - Granger	Telocaset - Sago	40	3.3	2	1	0	1.00	4.95	746.10	9.22
Peninsula Jct. - Granger	Sago - W. Encina	45	35.7	1	6	0	1.00	7.93	793.70	11.95
Peninsula Jct. - Granger	W. Encina - Pleasant Valley	30	5.0	2	2	0	1.00	5.00	803.70	10.03
Peninsula Jct. - Granger	Pleasant Valley - Oxman	20	4.3	1	1	0	1.00	12.90	816.60	19.45
Peninsula Jct. - Granger	Oxman - Prichard Creek	20	5.6	2	1	0	1.00	16.80	833.40	23.35
Peninsula Jct. - Granger	Prichard Creek - W. Nampa	45	99.3	1	14	0	1.00	9.46	965.80	13.48
Peninsula Jct. - Granger	W. Nampa - Fox	35	15.9	2	3	0	1.00	9.09	993.06	13.68
Peninsula Jct. - Granger	Fox - Reverse	55	55.5	1	7	0	1.00	8.65	1053.60	12.30
Peninsula Jct. - Granger	Reverse - Ticeska	55	37.3	2	3	0	1.00	13.56	1094.29	17.22
Peninsula Jct. - Granger	Ticeska - Shoshone	65	32.9	1	5	0	1.00	6.07	1124.66	9.47
Peninsula Jct. - Granger	Shoshone - Dietrich	55	8.4	2	1	0	1.00	9.16	1133.83	12.82
Peninsula Jct. - Granger	Dietrich - Michaud	55	92.0	1	14	0	1.00	7.17	1234.19	10.82
Peninsula Jct. - Granger	Michaud - McCammon	35	33.0	2	6	0	1.00	9.43	1290.76	14.03
Peninsula Jct. - Granger	McCammon - Topaz	35	3.8	1	1	0	1.00	6.51	1297.28	11.11
Peninsula Jct. - Granger	Topaz - Blaser	45	8.9	2	2	0	1.00	5.93	1309.14	9.95
Peninsula Jct. - Granger	Blaser - Pescadero	55	56.6	1	8	0	1.00	7.72	1370.89	11.37
Peninsula Jct. - Granger	Pescadero - Dingle	55	12.5	2	3	0	1.00	4.55	1384.52	8.20
Peninsula Jct. - Granger	Dingle - Granger	55	107.9	1	17	0	1.00	6.92	1502.23	10.58
Granger - Gibbon	Granger - W. Laramie	50	276.9	2	40	0	1.00	8.31	1834.51	12.13
Granger - Gibbon	W. Laramie - Hermosa	30	23.2	3	4	0	1.00	11.60	1880.91	16.63

Granger - Gibbon	Hermosa - Dale Jct.	30	1.8	2	1	0	1.00	3.60	1884.51	8.63
Granger - Gibbon	Dale Jct. - Barnett	30	39.0	3	6	0	1.00	13.00	1962.51	18.03
Granger - Gibbon	Barnett - O'Fallons	50	206.2	2	22	0	1.00	11.25	2209.95	15.07
Granger - Gibbon	O'Fallons - Gibbon	40	124.8	3	21	0	1.00	8.91	2397.15	13.19
Gibbon - West Topeka	Gibbon - West Topeka	50	219.6	2	29	0	1.00	9.09	2660.67	12.91
West Topeka - Kansas City	West Topeka - Kansas City	50	71.2	2	8	0	1.00	10.68	2746.11	14.50
	No. of crew changes							10.00	2968.84	
	No. of refuelings							2.00	3148.84	
	Total									
	PNW - Kansas City Domestic									
Argo - Black River	Argo - Black River	25	6.6	3	3	28	1.00	10.56	31.68	10.92
Black River - Tacoma	Black River - Reservation	35	26.3	1	3	0	1.00	15.03	76.77	19.63
Tacoma - N. Portland Jct.	Reservation - Ruston	20	6.8	2	2	8	1.00	10.20	97.17	16.75
Tacoma - N. Portland Jct.	Ruston - Nelson Bennett	30	1.6	1	1	8	1.00	3.20	100.37	8.23
Tacoma - N. Portland Jct.	Nelson Bennett - N. Portland Jct.	45	131.5	2	23	8	1.00	7.62	275.70	11.64
N. Portland Jct. - Peninsula Jct.	N. Portland Jct. - Peninsula Jct.	15	1.0	1	1	0	1.00	4.00	279.70	12.06
Peninsula Jct. - Granger	Albina - Peninsula Jct.	20	4.0	1	1	0	1.00	12.00	291.70	18.55
Peninsula Jct. - Granger	Peninsula Jct. - Troutdale	35	20.4	1	3	0	1.00	11.66	326.67	16.25
Peninsula Jct. - Granger	Troutdale - Crates	45	64.5	1	7	0	1.00	12.29	412.67	16.31
Peninsula Jct. - Granger	Crates - Biggs	45	21.6	2	3	0	1.00	9.60	441.47	13.62
Peninsula Jct. - Granger	Biggs - Westland	55	78.9	1	10	0	1.00	8.61	527.54	12.26
Peninsula Jct. - Granger	Westland - Stanfield	25	5.9	2	3	0	1.00	4.72	541.70	10.36
Peninsula Jct. - Granger	Stanfield - Gibbon	45	48.3	1	10	0	1.00	6.44	606.10	10.46
Peninsula Jct. - Granger	Gibbon - Highbridge	25	25.7	1	5	0	1.00	12.34	667.78	17.97
Peninsula Jct. - Granger	Highbridge - Nordeen	18	9.0	2	2	0	1.00	15.00	697.78	22.05
Peninsula Jct. - Granger	Nordeen - W. La Grande	18	15.6	1	3	0	1.00	17.33	749.78	24.38
Peninsula Jct. - Granger	W. La Grande - Lone Tree	20	7.6	2	3	0	1.00	7.60	772.58	14.15
Peninsula Jct. - Granger	Lone Tree - Telocaset	40	18.1	1	3	0	1.00	9.05	799.73	13.32
Peninsula Jct. - Granger	Telocaset - Sago	40	3.3	2	1	0	1.00	4.95	804.68	9.22
Peninsula Jct. - Granger	Sago - W. Encina	45	35.7	1	6	0	1.00	7.93	852.28	11.95
Peninsula Jct. - Granger	W. Encina - Pleasant Valley	30	5.0	2	2	0	1.00	5.00	862.28	10.03
Peninsula Jct. - Granger	Pleasant Valley - Oxman	18	4.3	1	1	0	1.00	14.33	876.62	21.38

Peninsula Jct. - Granger	Oxman - Prichard Creek	18	5.6	2	1	0	1.00	18.67	895.28	25.72
Peninsula Jct. - Granger	Prichard Creek - W. Nampa	45	99.3	1	14	0	1.00	9.46	1027.68	13.48
Peninsula Jct. - Granger	W. Nampa - Fox	35	15.9	2	3	0	1.00	9.09	1054.94	13.68
Peninsula Jct. - Granger	Fox - Reverse	55	55.5	1	7	0	1.00	8.65	1115.49	12.30
Peninsula Jct. - Granger	Reverse - Ticeska	55	37.3	2	3	0	1.00	13.56	1156.18	17.22
Peninsula Jct. - Granger	Ticeska - Shoshone	65	32.9	1	5	0	1.00	6.07	1186.55	9.47
Peninsula Jct. - Granger	Shoshone - Dietrich	55	8.4	2	1	0	1.00	9.16	1195.71	12.82
Peninsula Jct. - Granger	Dietrich - Michaud	55	92.0	1	14	0	1.00	7.17	1296.07	10.82
Peninsula Jct. - Granger	Michaud - McCammon	35	33.0	2	6	0	1.00	9.43	1352.64	14.03
Peninsula Jct. - Granger	McCammon - Topaz	35	3.8	1	1	0	1.00	6.51	1359.16	11.11
Peninsula Jct. - Granger	Topaz - Blaser	45	8.9	2	2	0	1.00	5.93	1371.03	9.95
Peninsula Jct. - Granger	Blaser - Pescadero	55	56.6	1	8	0	1.00	7.72	1432.77	11.37
Peninsula Jct. - Granger	Pescadero - Dingle	55	12.5	2	3	0	1.00	4.55	1446.41	8.20
Peninsula Jct. - Granger	Dingle - Granger	55	107.9	1	17	0	1.00	6.92	1564.12	10.58
Granger - Gibbon	Granger - W. Laramie	50	276.9	2	40	0	1.00	8.31	1896.40	12.13
Granger - Gibbon	W. Laramie - Hermosa	30	23.2	3	4	0	1.00	11.60	1942.80	16.63
Granger - Gibbon	Hermosa - Dale Jct.	30	1.8	2	1	0	1.00	3.60	1946.40	8.63
Granger - Gibbon	Dale Jct. - Barnett	30	39.0	3	6	0	1.00	13.00	2024.40	18.03
Granger - Gibbon	Barnett - O'Fallons	50	206.2	2	22	0	1.00	11.25	2271.84	15.07
Granger - Gibbon	O'Fallons - Gibbon	40	124.8	3	21	0	1.00	8.91	2459.04	13.19
Gibbon - West Topeka	Gibbon - West Topeka	50	219.6	2	29	0	1.00	9.09	2722.56	12.91
West Topeka - Kansas City	West Topeka - Kansas City	50	71.2	2	8	0	1.00	10.68	2808.00	14.50
	No. of crew changes							10.00	3030.72	
	No. of refuelings							2.00	3210.72	
	Total									
	Seattle - Memphis									
Argo - Black River	Argo - Black River	25	6.6	3	3	28	0.50	10.56	15.84	10.92
Black River - Tacoma	Black River - Reservation	35	26.3	1	3	0	0.50	15.03	38.38	19.63
Tacoma - Vancouver, WA	Reservation - Ruston	20	6.8	2	2	8	1.00	10.20	58.78	16.75
Tacoma - Vancouver, WA	Ruston - Nelson Bennett	30	1.6	1	1	8	1.00	3.20	61.98	8.23
Tacoma - N. Portland Jct.	Nelson Bennett - N. Portland Jct.	45	131.5	2	23	8	1.00	7.62	237.32	11.64
N. Portland Jct. - Peninsula Jct.	N. Portland Jct. - Peninsula Jct.	15	1.0	1	1	0	1.00	4.00	241.32	12.06

Peninsula Jct. - Granger	Albina - Peninsula Jct.	20	4.0	1	1	0	0.00	12.00	241.32	18.55
Peninsula Jct. - Granger	Peninsula Jct. - Troutdale	35	20.4	1	3	0	1.00	11.66	276.29	16.25
Peninsula Jct. - Granger	Troutdale - Crates	45	64.5	1	7	0	1.00	12.29	362.29	16.31
Peninsula Jct. - Granger	Crates - Biggs	45	21.6	2	3	0	1.00	9.60	391.09	13.62
Peninsula Jct. - Granger	Biggs - Westland	55	78.9	1	10	0	1.00	8.61	477.16	12.26
Peninsula Jct. - Granger	Westland - Stanfield	25	5.9	2	3	0	1.00	4.72	491.32	10.36
Peninsula Jct. - Granger	Stanfield - Gibbon	45	48.3	1	10	0	1.00	6.44	555.72	10.46
Peninsula Jct. - Granger	Gibbon - Highbridge	25	25.7	1	5	0	1.00	12.34	617.40	17.97
Peninsula Jct. - Granger	Highbridge - Nordeen	20	9.0	2	2	0	1.00	13.50	644.40	20.05
Peninsula Jct. - Granger	Nordeen - W. La Grande	20	15.6	1	3	0	1.00	15.60	691.20	22.15
Peninsula Jct. - Granger	W. La Grande - Lone Tree	20	7.6	2	3	0	1.00	7.60	714.00	14.15
Peninsula Jct. - Granger	Lone Tree - Telocaset	40	18.1	1	3	0	1.00	9.05	741.15	13.32
Peninsula Jct. - Granger	Telocaset - Sago	40	3.3	2	1	0	1.00	4.95	746.10	9.22
Peninsula Jct. - Granger	Sago - W. Encina	45	35.7	1	6	0	1.00	7.93	793.70	11.95
Peninsula Jct. - Granger	W. Encina - Pleasant Valley	30	5.0	2	2	0	1.00	5.00	803.70	10.03
Peninsula Jct. - Granger	Pleasant Valley - Oxman	20	4.3	1	1	0	1.00	12.90	816.60	19.45
Peninsula Jct. - Granger	Oxman - Prichard Creek	20	5.6	2	1	0	1.00	16.80	833.40	23.35
Peninsula Jct. - Granger	Prichard Creek - W. Nampa	45	99.3	1	14	0	1.00	9.46	965.80	13.48
Peninsula Jct. - Granger	W. Nampa - Fox	35	15.9	2	3	0	1.00	9.09	993.06	13.68
Peninsula Jct. - Granger	Fox - Reverse	55	55.5	1	7	0	1.00	8.65	1053.60	12.30
Peninsula Jct. - Granger	Reverse - Ticeska	55	37.3	2	3	0	1.00	13.56	1094.29	17.22
Peninsula Jct. - Granger	Ticeska - Shoshone	65	32.9	1	5	0	1.00	6.07	1124.66	9.47
Peninsula Jct. - Granger	Shoshone - Dietrich	55	8.4	2	1	0	1.00	9.16	1133.83	12.82
Peninsula Jct. - Granger	Dietrich - Michaud	55	92.0	1	14	0	1.00	7.17	1234.19	10.82
Peninsula Jct. - Granger	Michaud - McCammon	35	33.0	2	6	0	1.00	9.43	1290.76	14.03
Peninsula Jct. - Granger	McCammon - Topaz	35	3.8	1	1	0	1.00	6.51	1297.28	11.11
Peninsula Jct. - Granger	Topaz - Blaser	45	8.9	2	2	0	1.00	5.93	1309.14	9.95
Peninsula Jct. - Granger	Blaser - Pescadero	55	56.6	1	8	0	1.00	7.72	1370.89	11.37
Peninsula Jct. - Granger	Pescadero - Dingle	55	12.5	2	3	0	1.00	4.55	1384.52	8.20
Peninsula Jct. - Granger	Dingle - Granger	55	107.9	1	17	0	1.00	6.92	1502.23	10.58
Granger - Gibbon	Granger - W. Laramie	50	276.9	2	40	0	1.00	8.31	1834.51	12.13
Granger - Gibbon	W. Laramie - Hermosa	30	23.2	3	4	0	1.00	11.60	1880.91	16.63
Granger - Gibbon	Hermosa - Dale Jct.	30	1.8	2	1	0	1.00	3.60	1884.51	8.63
Granger - Gibbon	Dale Jct. - Barnett	30	39.0	3	6	0	1.00	13.00	1962.51	18.03

Granger - Gibbon	Barnett - O'Fallons	50	206.2	2	22	0	1.00	11.25	2209.95	15.07
Granger - Gibbon	O'Fallons - Gibbon	40	124.8	3	21	0	1.00	8.91	2397.15	13.19
Gibbon - West Topeka	Gibbon - West Topeka	50	219.6	2	29	0	1.00	9.09	2660.67	12.91
West Topeka - Kansas City	West Topeka - Kansas City	50	71.2	2	8	0	1.00	10.68	2746.11	14.50
Kansas City - E. St. Louis	Kansas City - Lees Summit	35	25.0	2	2	2	1.00	21.43	2788.97	26.03
Kansas City - E. St. Louis	Lees Summit - River Jct.	50	130.0	1	8	2	1.00	19.50	2944.97	23.32
Kansas City - E. St. Louis	River Jct. - E. St. Louis	50	128.0	2	12	2	1.00	12.80	3098.57	16.62
E. St. Louis - Memphis	E. St. Louis - Menard Jct.	50	61.0	2	10	0	1.00	7.32	3171.77	11.14
E. St. Louis - Memphis	Menard Jct. - Raddle Jct.	50	15.4	1	4	0	1.00	4.62	3190.25	8.44
E. St. Louis - Memphis	Raddle Jct. - Howardton Jct.	50	14.1	2	3	0	1.00	5.64	3207.17	9.46
E. St. Louis - Memphis	Howardton Jct. - Halsey Jct.	50	4.5	1	1	0	1.00	5.40	3212.57	9.22
E. St. Louis - Memphis	Halsey Jct. - Capedeau Jct.	35	27.7	2	4	0	1.00	11.87	3260.06	16.47
E. St. Louis - Memphis	Capedeau Jct. - Illmo	25	1.0	1	1	0	1.00	2.40	3262.46	8.04
E. St. Louis - Memphis	Illmo - Bald Knob	55	164.2	2	16	0	1.00	11.20	3441.58	14.85
Dallas - Memphis	Bald Knob - Marion	55	73.6	1	8	0	1.00	10.04	3521.87	13.69
	No. of crew changes							12.00	3789.15	
	No. of refuelings							3.00	4059.15	
	Total									
	LALB - Kansas City									
LALB - Redondo	LALB - Redondo	30	19.3	3	12	0	1.00	4.02	48.25	8.25
Redondo - Colton	Redondo - City of Industry	40	12.0	2	4	1	1.00	5.63	22.50	8.77
Redondo - Colton	City of Industry - Colton	40	36.0	2	8	1	1.00	6.75	76.50	11.02
Riverside - Colton	West Riverside - Highgrove	45	4.5	3	1	11	0.40	0.00	76.50	10.02
Riverside - Colton	Highgrove - Colton	40	2.9	2	1	11	0.40	0.00	76.50	8.62
Colton Crossing	Colton Crossing	25	0.3	2	1	11	1.00	0.72	77.22	6.36
Colton - El Paso	Colton - Garnet	30	49.3	2	8	1	1.00	12.33	175.82	17.36
Colton - El Paso	Garnet - W. Indio	50	22.3	1	5	1	1.00	5.35	202.58	9.17
Colton - El Paso	W. Indio - Coachella	50	4.8	2	1	1	1.00	5.76	208.34	9.58
Colton - El Paso	Coachella - Araz	50	111.4	1	16	1	1.00	8.36	342.02	12.17
Colton - El Paso	Araz - East Yard	25	11.7	2	2	1	1.00	14.04	370.10	19.68
Colton - El Paso	East Yard - Fortuna	50	2.4	1	1	1	1.00	2.88	372.98	6.70
Colton - El Paso	Fortuna - Blaisdell	55	6.4	2	1	1	1.00	6.98	379.96	10.63
Colton - El Paso	Blaisdell - Dome	45	4.3	1	1	1	1.00	5.73	385.70	9.75

Colton - El Paso	Dome - Wellton	55	17.6	2	2	1	1.00	9.60	404.90	13.25
Colton - El Paso	Wellton - Stanwix	55	48.3	1	6	1	1.00	8.78	457.59	12.43
Colton - El Paso	Stanwix - Sentinel	55	12.1	2	1	1	1.00	13.20	470.79	16.85
Colton - El Paso	Sentinel - Petrie	55	152.0	1	20	1	1.00	8.29	636.60	11.94
Colton - El Paso	Petrie - Cochise	30	84.7	2	12	1	1.00	14.12	806.00	19.15
Colton - El Paso	Cochise - Raso	55	15.7	1	2	1	1.00	8.56	823.13	12.22
Colton - El Paso	Raso - Luzena	55	10.6	2	1	1	1.00	11.56	834.70	15.22
Colton - El Paso	Luzena - San Simon	55	21.2	1	3	1	1.00	7.71	857.82	11.36
Colton - El Paso	San Simon - Mondel	45	21.8	2	4	1	1.00	7.27	886.89	11.29
Colton - El Paso	Mondel - Lordsburg	55	15.1	1	2	1	1.00	8.24	903.36	11.89
Colton - El Paso	Lordsburg - Strauss	55	130.8	2	14	1	1.00	10.19	1046.05	13.85
Colton - El Paso	Strauss - Tower 47	20	19.2	2	6	1	1.00	9.60	1103.65	16.15
El Paso - West Topeka	Tower 47 - Dalhart	55	428.6	1	29	0	1.00	16.12	1571.22	19.78
El Paso - West Topeka	Dalhart - Herington	60	370.4	1	26	0	1.00	14.25	1941.62	17.76
El Paso - West Topeka	Herington - East Herington	50	3.5	2	1	0	1.00	4.20	1945.82	8.02
El Paso - West Topeka	East Herington - Dwight	60	20.6	1	2	0	1.00	10.30	1966.42	13.82
El Paso - West Topeka	Dwight - Volland	60	14.0	2	2	0	1.00	7.00	1980.42	10.52
El Paso - West Topeka	Volland - West Topeka	60	39.9	1	3	0	1.00	13.30	2020.32	16.82
West Topeka - Kansas City	West Topeka - Kansas City	50	71.2	2	8	0	1.00	10.68	2105.76	14.50
	No. of crew changes							9.00	2306.21	
	No. of refuelings							2.00	2486.21	
	Total									
	Model									
	East LA - Kansas City									
LALB - Redondo	LALB - Redondo	30	19.3	3	12	0	0.00	4.02	0.00	8.25
Redondo - Colton	East LA - City of Industry	40	11.3	2	4	1	1.00	5.30	21.19	8.51
Redondo - Colton	City of Industry - Colton	40	36.0	2	8	1	1.00	6.75	75.19	11.02
Riverside - Colton	West Riverside - Highgrove	45	4.5	3	1	11	0.40	0.00	75.19	10.02
Riverside - Colton	Highgrove - Colton	40	2.9	2	1	11	0.40	0.00	75.19	8.62
Colton Crossing	Colton Crossing	25	0.3	2	1	11	1.00	0.72	75.91	6.36
Colton - El Paso	Colton - Garnet	30	49.3	2	8	1	1.00	12.33	174.51	17.36
Colton - El Paso	Garnet - W. Indio	50	22.3	1	5	1	1.00	5.35	201.27	9.17
Colton - El Paso	W. Indio - Coachella	50	4.8	2	1	1	1.00	5.76	207.03	9.58
Colton - El Paso	Coachella - Araz	50	111.4	1	16	1	1.00	8.36	340.71	12.17

Colton - El Paso	Araz - East Yard	25	11.7	2	2	1	1.00	14.04	368.79	19.68
Colton - El Paso	East Yard - Fortuna	50	2.4	1	1	1	1.00	2.88	371.67	6.70
Colton - El Paso	Fortuna - Blaisdell	55	6.4	2	1	1	1.00	6.98	378.65	10.63
Colton - El Paso	Blaisdell - Dome	45	4.3	1	1	1	1.00	5.73	384.38	9.75
Colton - El Paso	Dome - Wellton	55	17.6	2	2	1	1.00	9.60	403.58	13.25
Colton - El Paso	Wellton - Stanwix	55	48.3	1	6	1	1.00	8.78	456.27	12.43
Colton - El Paso	Stanwix - Sentinel	55	12.1	2	1	1	1.00	13.20	469.47	16.85
Colton - El Paso	Sentinel - Petrie	55	152.0	1	20	1	1.00	8.29	635.29	11.94
Colton - El Paso	Petrie - Cochise	30	84.7	2	12	1	1.00	14.12	804.69	19.15
Colton - El Paso	Cochise - Raso	55	15.7	1	2	1	1.00	8.56	821.82	12.22
Colton - El Paso	Raso - Luzena	55	10.6	2	1	1	1.00	11.56	833.38	15.22
Colton - El Paso	Luzena - San Simon	55	21.2	1	3	1	1.00	7.71	856.51	11.36
Colton - El Paso	San Simon - Mondel	45	21.8	2	4	1	1.00	7.27	885.58	11.29
Colton - El Paso	Mondel - Lordsburg	55	15.1	1	2	1	1.00	8.24	902.05	11.89
Colton - El Paso	Lordsburg - Strauss	55	130.8	2	14	1	1.00	10.19	1044.74	13.85
Colton - El Paso	Strauss - Tower 47	20	19.2	2	6	1	1.00	9.60	1102.34	16.15
El Paso - West Topeka	Tower 47 - Dalhart	55	428.6	1	29	0	1.00	16.12	1569.90	19.78
El Paso - West Topeka	Dalhart - Herington	60	370.4	1	26	0	1.00	14.25	1940.30	17.76
El Paso - West Topeka	Herington - East Herington	50	3.5	2	1	0	1.00	4.20	1944.50	8.02
El Paso - West Topeka	East Herington - Dwight	60	20.6	1	2	0	1.00	10.30	1965.10	13.82
El Paso - West Topeka	Dwight - Volland	60	14.0	2	2	0	1.00	7.00	1979.10	10.52
El Paso - West Topeka	Volland - West Topeka	60	39.9	1	3	0	1.00	13.30	2019.00	16.82
West Topeka - Kansas City	West Topeka - Kansas City	50	71.2	2	8	0	1.00	10.68	2104.44	14.50
	No. of crew changes							7.00	2260.35	
	No. of refuelings							2.00	2440.35	
	Total									
	Model									